

**HOST LINKS**

**G&R** ***PTHRU***™

***Terminal  
Gateway  
to the  
Bull Primary  
Network***

<http://www.gar.no/hostlinks/>



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# Contents

# Host Links Pthru

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## Installation

The G&R emulations and gateways are independent programs, but part of the *G&R Host Links* product set available on all major UNIX/Linux platforms. Many of the products are also available for Windows servers. For details on platforms supported, software delivery and installation refer to the *Host Links Installation and Configuration* manual.

## Host Links Product Overview

### Terminal environment

Host links products that run on UNIX or Linux servers with a terminal driven user interface include emulators and concentrators, as well as various utilities.

- **G3270** provides synchronous IBM3270 functionality. G3270 emulates IBM LU type 2, including base and extended colour together with extended highlighting.
- **Qsim** provides synchronous Questar terminal functionality. Qsim simulates all Questar models, including the DKU7007, DKU7107, DKU7105 and DKU7211 (Mono, four colour A/B and seven colour modes are supported). It also simulates the VIP7760 and the VIP7700.
- **V78sim** provides Bull VIP78xx (BDS) functionality. V78sim emulates all models of the VIP7800 family; the actual reference is the BDS7. All visual attributes including colour are supported.
- **Pthru** provides transparent VIP7800 visibility to Bull mainframes for users with asynchronous VIP7800 terminals or emulators. The terminals are used in text or forms mode.

## Server environment

Host Links products that run on UNIX, Linux or Windows servers.

- **Ggate** is a transparent gateway to the Bull native network. It avoids all need for Front-ends (MainWay/Datanet) or other gateways. It can be used to connect G&R/Glink (for Windows or Java) emulators or any of the emulators, concentrators, network printer emulators and file transfer clients/servers in the Host Links product set. It also supports third party clients using the TNVIP, TN3270, TN3270E and standard asynchronous Telnet protocols.
- **Gweb** provides a web browser interface to any host application that is otherwise accessible using the *Host Links Qsim, V78sim, or G3270* emulations.
- **Gspool** is designed to run as an unattended process and accept transparent print output from any type of host application (GCOS8, GCOS7, GCOS6, IBM) that normally sends print data to network printers (ROPs), or to a remote spooling system (DPF8-DS). On the Gspool system the print may be directed to a physical printer or to the local spooling system. Gspool operates in different modes, Connect mode, Terminal Writer mode, DPF8 mode, SNM mode, IBM mode, TN3270 mode and TN3270E mode.
- **GUFT** is a G&R implementation of the Bull UFT file transfer protocols. It enables transfer of data files between Host Links and GCOS systems over a DSA network.
- **Gproxy** is a network management program used for supervision, management, load balancing and license sharing of G&R *Host Links* applications. *Gproxy* can be set up as a freestanding monitor program and/or report generator in a small network, or play a bigger role in a larger network.
- **Gsftp** is a transparent gateway between two different File Transfer protocols: FTP (RFC 959) and SFTP (the SSH File Transfer Protocol). The purpose is to present a seamless integration between the two protocols, with automatic conversion.

# Scope of the product

## Functionality

G&R/Pthru provides transparent VIP7800 visibility to Bull mainframes for users with asynchronous VIP7800 terminals or emulators connected to a UNIX or Linux system. The terminals are used in text or forms mode. Pthru transforms the system into what appears to the mainframe as a synchronous VIP7800 terminal cluster. Pthru is not available for Windows. PC users with our *G&R/Glink* terminal emulator can also connect to Bull mainframes using Pthru, but it is more efficient for a *Glink* user to connect via *G&R/Ggate*. *Glink* users can also connect to Bull mainframes as VIP77xx, DKUxxxx or IBMxxxx terminal types, and Pthru will select the appropriate emulation mode in Glink when started, but again, these connections can be made more efficiently using *G&R/Ggate*.

## Network connections

DSA connections can be made in the traditional way using OSI-transport, which is a requirement when connecting via old-style Datanets. The Bull systems can be accessed over an X.25 WAN or Ethernet LAN through a Datanet or MainWay front-end. Alternatively access can be direct to GCOS6 using a LAN adapter or direct to GCOS7 using ISL. Access can be by an FDDI LAN direct to GCOS7 using FCP7 or direct to GCOS8 using FCP8 (both support OSI-transport).

DSA connections can also be made over a TCP/IP network, using the Internet standard RFC1006 transport protocol to replace OSI-transport. MainWay front-ends with an ONP (Open Network Processor) have RFC1006 support in the standard product, allowing DSA sessions over TCP/IP into the MainWay. RFC1006 can also be installed in the FCP7 and FCP8 cards to support DSA connections direct to the mainframes without passing through the front-end. The GNSP of newer GCOS8 systems and the Open System personality of GCOS7 Diane systems both support RFC1006 connections.

The *G&R/Ggate* product off-loads the DSA session protocol into gateways. By running Ggate on the system(s) with the mainframe connections the emulator platforms need only the very small and efficient Ggate protocol layer to connect over TCP/IP to a Ggate gateway with full native Bull network functionality. Ggate can make the mainframe connection using OSI-transport or RFC1006. If you must use OSI-transport for the mainframe connection, using Ggate will limit the need for OSI-stacks to the Ggate platforms.

## Pthru

The *Host Links Installation and Configuration* manuals cover the OSI stack installation and setup for the supported UNIX and Windows server systems.

Bull systems can be accessed using Telnet, TNVIP, TN3270 or TN3270E to connect to a Bull front-end. However, Ggate with RFC1006 increases throughput as compared to these gateways. Ggate also gives a real, fully functional DSA session over the TCP/IP network, as compared to the limited terminal session offered by TNVIP, TN3270 or Telnet. Third-party clients with only Telnet/TN3270/TNVIP protocol can connect via Ggate, which supports these protocols on the client side.

## Integration

Pthru allows you to execute local UNIX/Linux commands or the command shell, and you can switch to other *Host Links* products, all while keeping one or more mainframe sessions alive. This includes the Interactive Help System that has all the information available in this manual. System administrators may easily customize the menus provided.

In order to provide a command interface to the Pthru program itself, to the *Host Links* facilities and to UNIX/Linux services a command syntax is implemented in the familiar form of `$$command`. However, when running a host application it may be difficult to issue these commands, so the `-F12` parameter may be used to make F12 a command key, and issue the `$$` prompt in the status line. Users with VIP7800 terminals will find this convenient. For users with *G&R/Glink* a background script is provided to monitor the LF (GREY -) key, and give an interface.

## ***Run-time licenses***

In order to run Pthru, the following license keys must be present in your `/usr/gar/config/licenses` file:

|       |                                  |
|-------|----------------------------------|
| basic | For the base G&R run-time system |
| pthru | For Pthru                        |

The licenses file identifies the G&R distributor, the owner of the license and the licensed products. The license key for a product will normally state how many simultaneous sessions the product is licensed for. If a limitation is specified in the license, only the licensed number of sessions can be active at any time.



# ***Pthru service messages***

---

A connect command (F12 C when using the -F12 parameter) causes Pthru to make a connection request using the parameters set in the configuration file. However you may do your own connect by entering a connect command string;

## ***Using DSA***

The line handler accepts service messages for connect `$$CN`, disconnect `$$DIS`, break `$$BRK` (attention, and possibly purge undelivered data, depending on configuration of the mainframe, and/or application), the two attention signals `$$A1` (attention type 1), `$$A2` (attention type 2), identification query `$$ID` and lower case support `$$LC ON/off` from the communications product using the handler. You can type them and transmit when using a Host Links emulator or Glink/Ggate. Unknown service messages (messages beginning with `$$` but where the 2-3 following characters are not recognized) will cause an error message.

Interpretation of service messages within the message text can be disabled (`-DSD OFF` as an emulation parameter or `CFIX 2875` in Glink) so that they are transmitted as data to the mainframe. The emulators all have command keys for issuing service messages that may be used instead of typing `$$` if interpretation is disabled.

User applications using one of our communications APIs from the *GLAPI* library must send service messages themselves when the *Gline API* is used, but they will be sent automatically by `CMALLC`, `CMDEAL` and `CMSERR` when one of our *CPI-C APIs* is used.

## The connect command

3 different `*$CN` formats can be used:

### Using a predefined CONAME from `dsa.cfg` to connect:

```
*$CN coname
```

If the name given is not a predefined CONAME, it is assumed to be the application name and the connect will be carried out using the parameters set for the DSA session (i.e. explicitly by parameter setting from command line and/or the configuration file)

### Using the traditional G&R positional `*$CN` format:

*GCOS8 connect to 'appl' (application)*

```
*$CN appl,node[,str,password,project,billing]
```

*GCOS7 connect to 'appl' (application)*

```
*$CN userid,project,billing,appl,password,node[,str]
```

### Using the Terminal-Manager keyword connect format:

```
*$CN -scid NODE -dmb APPL -ext . . .
```

The following key words can be used:

```
-dmb, -ext, -scid, -lmb, -str, -usr, -ba, -pj, -pw, -mdmp
```

A GCOS8 connect normally requires only application and node, but you may need to specify a GRTS ID or LID depending on Datanet configuration. This is supplied as `-str`. You will need `password`, `project` if the target site has the 'Secure Workstation Environment', or is using the IDCHECK package developed by Bull Norway for securing networks.

A GCOS7 connect normally requires you to set all of the documented parameters. The string (-str) is used by GCOS7 to set application options. These are:

## IOF:

|                  |                                  |
|------------------|----------------------------------|
| ![NS] [NM] [NEW] | e.g. -str "!NM NEW"              |
| \$station-name   | e.g. -str "!NM NEW \$STAL"       |
| *environment     | e.g. -str "!NM NEW \$STAL *ENV1" |

Note that when using multiple space-separated options they must be enclosed in quotes.

|              |  |
|--------------|--|
| NS           | No Startup, user specific information suppressed |
| NM           | No Mail, user messages suppressed                |
| NEW          | New session, previous interrupted session lost   |
| station name | station for JOR and SYSOUT                       |
| environment  | IOF user context for session                     |

## TDS

?<option>[%string OR <length><system-header>]

e.g.     -str ?B40D25  
           -str ?A%JIM

|        |   |
|--------|---|
| option | A: system messages and edited mode<br>B: system messages and unedited mode<br>C: no system messages and edited mode<br>D: no system messages and unedited mode. |
| string | 8 alphanumeric characters to be input to the first TPR of the LOGON transaction   |
| header | service message header in the form of an alphanumeric prefix or a control code  |

Note that you can set the default values for the connect commands with parameters in the configuration file, but that if no default is configured then the last value used for this particular field becomes the default. So if you make an error in one of the parameters you need not specify the others in your next connect.

If you set all connect parameters in the configuration file you can connect from most of the *Host Links* products using a single key connect command, or by transmitting \$\*\$CN.

## **Connecting to GCOS8 CXI applications**

You must use `-HM CXI` if you log in to GCOS8 via CXI. When you log in the endpoint (at least for TP8) is:

```
node/mailbox/mailbox extension
```

When you define a LID in TP8 one of the parameters is mailbox extension, usually set to be equal to the LID. In the connect (`*$CN`) the first parameter (mailbox name) can be specified as follows:

```
*$CN XXXXXX YYYY,node
```

```
XXXXX the TP8 mailbox  
YYYY the extension for your LID
```

When the remote mailbox string contains 8 characters you must follow the mailbox string with the mailbox extension string without a space separator.

Alternatively the remote mailbox is configurable as default application (`-DA`) and in the same way the extension is configurable as default extension (`-DX`).

## **The disconnect command**

```
*$DIS
```

force disconnection (normally done by application).

## ***The break commands***

\$\*\$BRK

sends attention type 1, against turn if necessary. The host, and/or application session may be configured to purge undelivered data when a break is sent.

The default configuration for break is:

|       |                     |
|-------|---------------------|
| GCOS8 | Attention and purge |
| GCOS7 | Attention only      |
| DNS   | Attention only      |

For DSA300 applications (CXI applications such as TP8) an option 'data attention' may be negotiated. For these applications a data attention is used instead of attention when transmitting a break.

\$\*\$A1

sends attention type 1 as for break, but never purges undelivered data.

\$\*\$A2

sends attention type 2, no purge.

## ***The identification inquiry***

\$\*\$ID

returns the local DSA session control name, the local mailbox name and the terminal type used e.g.

\$SDSA: Your ID is: SC:EN3D MB:D24701 TM:DKU7107

## ***Using TNVIP***

The TNVIP handler (`-li tcp -am tnvip`) handles `*$CN`, `*$BRK` and `*$DIS`, but the connect format is different.

The only information required is the IP address in symbolic or numeric format and the port number if it is not the standard Telnet port e.g.

```
*$CN hostname:portnumber
```

# *Pthru Function keys*

---

The function keys on the synchronous and asynchronous versions of the VIP7800 family are defined as sending a control sequence to the host. This sequence is sent transparently through Pthru, and will be interpreted by the host application, as for directly connected terminals. Consult the VIP7800 or *G&R/Glink* reference manual for the control sequences generated, and the possibilities for modifying them, or other keyboard sequences.

Despite the wish for transparency, there is still a need to give commands to the UNIX/Linux operating system. A command interface is implemented using the `*$` syntax familiar from dialogue with the Datanet. If the `-F12` parameter is used `F12` will act as a prompt for the `$$` command sequence. Pressing `F12` again causes the `F12` sequence to be transmitted. Pressing any other `F-KEY` will cancel the prompt. Otherwise the commands may be entered as documented in the *commands* section on page 19.



# Printing

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## Hard copy

*Host Links* has a generic hard copy function in the video interface, but this is not available in the Pthru product because all presentation is being done by the VIP7800 terminal or by *G&R/Glink* on the PC.

## Host print output

### Gspool

As a print output station the *Host Links* mainframe print spooler *G&R/Gspool* is recommended. Gspool is designed to run as an unattended process and accept transparent print output from any type of mainframe application (GCOS8, GCOS7, GCOS6, IBM) that normally sends print data to network printers. On the Gspool system the print may be directed to a physical printer or to a file for spooling.

For all IBM print Gspool supports unformatted and formatted print (LU type 1 and 3) and SNA Character String (SCS) codes directed to an IBM3287 printer.

In IBM mode Gspool supports printers configured in a Bull front-end with the OSF SNA gateway (Janus). The front-end has the Gspool node and mailbox name configured as the location of the printer. Gspool waits for the connect request from the front-end.

In TN3270 mode Gspool supports printers via a TN3270/SNA gateway as specified in RFC1646. In TN3270E mode Gspool supports TN3270E print as specified in RFC1647 via a TN3270E/SNA gateway. It can be configured as a generic printer or associated printer through the use of TCP line handler parameters `-LU` and `-AP`. Microsoft's MS SNA Server (MS Windows), Bull's TN3270E server in MainWay and Bull's SNA/20 (AIX 4.1) are examples of SNA gateways that support RFC1647.

## **Pthru**

In SNM mode Gspool supports network printers configured in the SNM (GCOS6 Secondary network manager). When started with the 'no connect' option (`-CN off`), Gspool will wait for the connect request from SNM.

In GCOS8 or GCOS7 mode Gspool supports network printers configured in TP, TDS or Twriter. For Twriter Gspool waits for the connect from GCOS7.

In DPF8-DS mode (`-DPF8`) Gspool supports the 'DPF8-Distributed SYSOUT' ('DPF8-DS') product on GCOS8. In this mode Gspool starts two TCP/IP line handlers and waits for remote connect requests from DPF8-DS.

For more information about *Gspool* see the Gspool manual.

## ***Emulator print***

For occasional print output to the user terminal the emulators handle print from the mainframe. The print may be sent within the terminal session, or the mainframe may send to a separate print session that is associated with the terminal session using the merged print feature.

If the mainframe addresses the printer on the terminal using VIP7800 print control sequences embedded in the data, then these are passed transparently to the terminal, and will cause the print to be done on the attached printer.

If the mainframe addresses a separate print session, but you want this print session to be associated with the attached printer on your terminal, then you must configure the attached printer session in your `dsa.cfg`, and use the `-PCO` parameter. Please refer to the *Gline manual* for details of configuring a separate printer session.

# File transfer

---

## Unified File Transfer

*Host Links* has an implementation of the Bull Unified File Transfer (UFT) facility for transferring large quantities of data between the GCOS and local file systems. *G&R/Guft* is available both as a server and a client. The server version accepts incoming file transfer requests initiated from TSS or IOF on the Bull mainframes. You can use the client version to initiate transfers from your UNIX or Linux workstation.

## Kermit and MML

While in interactive dialog with GCOS you can use the G&R implementation of the GCOS 'Kermit' (FTRAN, GKRM or other Kermit versions).

On GCOS8, use the TSS command FTRA PC7800, or start the GKRM system. On GCOS7, use the MICROFIT command FTRAN MICROSYS, but you must log in through the MICROFIT system. In both cases the emulator recognizes the FTRA start-up.

If you have an ordinary terminal, or if you set parameter -GK ON, then the emulator will ask direction and mode, then start *G&R/Gkerm* (the *Host Links* Kermit, which is FTRA compatible). The file will be transferred between the mainframe and the local file system.

If your terminal is a PC with *G&R/Glink*, then the default action is to enter pass-through-mode and allow *Glink* to deal with the FTRA. The *Glink* Kermit window pops up, and you will be allowed to select direction and ASCII/Binary. The file will be transferred direct between the mainframe and your PC. In case of error, pass-through-mode can be terminated by transmit of a null block and the FTRA can then be terminated with a break (LF B).



# Commands

---

## Command overview

You can type the following commands immediately after a `$$` sequence to perform a Pthru command function. You can type the `$$` or obtain it as a prompt from F12. For *Glink* users a user-friendly interface for sending these commands while using a host application is provided by the *Glink* script `PTHRU.SCR`, which if executing in the background will be activated by the LF (GRAY -) key, to give a pop-up menu of commands available.

```

l(9)set count for command
! start the command shell (on gateway, UNIX)
# change context (1-9)      (followed by count)
$ directory administrator
B send break to the host
C connect to host
D disconnect from host
E execute command          (followed by the command)
H call help facility
Q exit Pthru concentrator
S set Pthru parameter

```

## Command interface

Pthru examines all messages from the terminal that begin with `$$` to see if they are Pthru commands, but if not they will be delivered to the Gline interface rather than rejected as they may be Gline commands. Typing a `$$` command sequence may be impossible while running a host application so Pthru allows F12 to be configured as a prompt key (-F12 parameter), and the status line is used to collect the command. For *Glink* users a background script is available that collects commands locally through pop-up menus, and transmits them without affecting the host screen image.

## Pthru

During execution of commands that use the terminal the screen image has to be saved and restored on return to Pthru. For Glink users the image is saved on the PC to save network traffic. For terminal users the image is saved in the UNIX/Linux file system:

```
/usr/gar/pthru_sv/$logname/pthru.cxn
```

the `n` in `.cxn` is the context number where Pthru is running. Directory `pthru_sv` should exist, and the users should have directory create permission.

## Commands in detail

### Command shell (\$\*\$!)

If you are working within the *Host Links* systems and are an advanced user, a UNIX/Linux specialist or the system administrator you might find it convenient to start a command line shell in order to work with UNIX/Linux commands for a period, without losing your *Host Links* context. Thus you can maintain several host connections or other activities while you temporarily work at command level.

```
F12 !XMIT --> start a command line shell
```

This may be inhibited in your `profiles` file (NOEXEC).

### Change context (\$\*\$#)

The *Host Links* multi-context feature is a set of utilities for allowing user friendly access to the UNIX/Linux multitasking capability such that a user may have several facilities in use at the same time and jump between them as desired without terminating or restarting. For example, you can start several copies of Pthru, each of them logged on to different host applications and then switch between these applications as desired.

Each facility started by the *Host Links* multi-context feature is defined as an active context. If you have installed this software, then the `$*$#` command allows you to jump directly to another active context.

A context number (1-9) is assigned to each active context. You set the desired context number by using a repetition count:

```

*$ $#      -->  switch to context menu
*$ $# 1    -->  switch to context 1
*$ $# 9    -->  switch to context 9

```

or with `-F12` parameter:

```

F12 #      -->  switch to context menu
F12 # 1    -->  switch to context 1
F12 # 9    -->  switch to context 9

```

## Call the directory manager (\$\*\$)

The *G&R/Gdir* file manager is a fully compatible interactive menu driven replacement for standard file commands in UNIX/Linux. It provides facilities for navigating in the directory structure and for creating and releasing files.

It also has a facility for activating the alphanumeric keyboard with user-oriented functions that can then be executed with a single keystroke. These functions may contain any command, and the name of the file or directory being pointed to with the cursor in the file display is available as a parameter to the commands.

The file manager is integrated with a configurable editor and print system, so the file pointed at may be read in to an editor or printed.

For a detailed explanation, enter the manager and type `LF H`.

*G&R/Gdir* is bundled with all *Host Links* products. *G&R/Gdir* may be inhibited in your `profiles` file (NODOLLAR).

## Send a break to the host application (\$\*\$B)

Several of the host systems you may access have situations where they keep the initiative in a dialogue, and if you want to regain it you are required to transmit a break signal. Please do not confuse this function with the `BREAK` key on your asynchronous terminal.

Because the host has the initiative, your keyboard may be locked for normal typing, unless inhibited with `-LK off`. However if running *Glink* script `PTHRU.SCR` you may send a break to the host with `LF B`, which will normally cause the host to give you the initiative.

## Pthru

You may of course unlock the keyboard manually. You can then use the command `$$B` by typing normally or using F12 for the `$$` prompt. You can send a break by typing:

```
$$BRK <TRANSMIT>
```

## ***Disconnect from host application (\$\$D)***

Disconnect from a mainframe application by entering the log-off sequence required by the host and transmitting. The mainframe will close the current session and a 'Disconnected' message will appear on your screen.

If this log-off procedure for some reason fails, you can send a session disconnect request to the mainframe by entering the Pthru command `$$D` by typing normally or F12 prompt. Normally you will then receive a disconnect confirmation message. You may also type manually:

```
$$DIS <TRANSMIT>
```

## ***Execute UNIX/Linux command (\$\$E)***

This command allows you to execute a UNIX/Linux command without exiting from *Host Links*. The following variations are available:

```
$$E      command  -->  show command, execute, wait for CR
$$E      *command -->  cursor to 1/24, execute, don't wait
$$E      **command --> same as the above
$$E      ***command --> execute command, no refresh
$$E      ****command --> execute command, refresh screen
```

All save and restore the screen except the 3 asterisk mode, which does not restore afterwards; so data written by the application to the screen is still there when Pthru regains control. Use four asterisks when starting *Host Links* or other full screen products that begin by blanking or otherwise initializing the screen.

This may be inhibited in your `profiles` file (NOEXEC).

## **Call the Host Links Help facility (\$\*\$H)**

This calls the *G&R/Gmenu* facility, which is an independent system that executes outside of the products. The menu facility navigates in a series of menus and/or information pages, and most *Host Links* products have a set of help menus that may be consulted using the system. Your own applications may also use it. Menus and information pages may be added or changed by the user or system administrator.

The G&R *Gmail* reference manual describes how to maintain the menus and information pages. *G&R/Gmenu* is bundled with all *Host Links* products.

## **Quit, leave the gateway (\$\*\$Q)**

This command is used to terminate Pthru. The host log-off sequence should be sent and a disconnect confirmation received before entering this command. However, if you leave Pthru with an active session, the network software will do an abnormal disconnect to close it.

## **Set parameter (\$\*\$S)**

You can set parameters when you start Pthru, or afterwards by using the \$\*\$S syntax, typed manually, or from the F12 prompt. The following format should be used:

```
-XX parameter1 -YY parameter2
```

If a parameter is for the line handler module the `-LI` argument should precede the actual parameter:

```
-LI DSA -XX parameter
```

For an overview of the parameters available see the Pthru configuration menu.

This may be inhibited in your `profiles` file (NOPARAM).



# ***National character sets***

---

## ***Internal character set***

When you use the Pthru the gateway machine will not involve itself in national character transliteration. Characters will be sent to the host exactly as they are received from the VIP7800 terminal or emulator.

## ***Using 8-bit terminals***

Only the VIP8800 is regarded as an 8-bit terminal by the mainframes.

## ***Using 7-bit terminals***

The VIP7800 models are all regarded as 7-bit by the mainframes.

## ***Mainframe character set***

### ***National 7-bit character sets***

The mainframe to which you connect may use a national 7-bit set. If you use a national 7-bit VIP7800 terminal or character set within Glink then both representations of national characters use the same 7-bit equivalents (square and curly brackets etc.).

### ***8-bit character sets***

All of the GCOS mainframes (GCOS6, GCOS7, GCOS8) have 8-bit capability in the sense that characters can be stored as 8-bit bytes, but the communications software involved often undermines this capability. The front-end software or the mainframe terminal-handling package may not recognize the terminal as having an 8-bit capability, and may cut off the top bit.

## **Pthru**

The standard VIP terminal types are defined as 7-bit. There is an encoding (SI/SO) for 8-bit, but this is not supported by the mainframes. There is a VIP8800 terminal type that is defined as 8-bit, and this must be used when connecting to 8-bit mainframes. The communications software may support it.

### ***G&R native 8-bit connections***

The G&R DSA/DIWS interfaces, and G&R/Ggate provide an 8-bit connection to GCOS mainframes.

If your mainframe is a GCOS7 system it only supports 8-bit ASCII sessions for VIP8800. If your GCOS7 system is a Diane, then you can use the 8-bit terminal types and associated 8bit printer type specially defined for G&R to Diane communication. These were defined for GCOS 7 TS 9910 and need the following co-requisite patches:

Q1606.02, Q1607.03, Q1608.04, Q1609.02

Additionally the definition of the new models must be appended in the H\_TERM sub-file of the SYS.HSLLIB library as follows:

```
DEFLIKE EXTYPE=VIP9800,LIKE=HDS7,DSAMODEL=20A3,CSETTYPE=9
DEFLIKE EXTYPE=PRT9220,LIKE=PRT1220,DSAMODEL=20A4,CSETTYPE=9
```

# Startup/Configuration

---

## Terminal types

### User terminal

The type of terminal being used to run Pthru is taken from the Host Links configuration of the user. The Host Links terminal type is taken from the UNIX/Linux TERM variable. If the TERM variable cannot be set correctly, the Host Links terminal type can be overridden using the VIDEO directive in the Host Links PROFILES file, see below. Pthru supports only two terminal types, real VIP7800 asynchronous terminals (or standard emulations of it) and *G&R/Glink*. Choosing a TERM name that starts with VIP indicates a real VIP7800 terminal and restricts the command set that Pthru uses to control it. Choosing a TERM name that starts with GLINK allows Pthru to use the extended command set supported by *G&R/Glink*.

### Mainframe terminal

The default mainframe terminal type is set to VIP7804. This can be changed using the -TM parameter to the line handler, see the section entitled *Line handler parameters*. Users with a real VIP terminal must choose the appropriate VIP as the mainframe terminal type. Glink users can choose any VIP7800 terminal type as necessary for the mainframe application.

For Glink only, you can specify the mainframe terminal type as a VIP77xx, DKUxxxx or IBMxxxx assuming the mainframe connection supports the terminal type. This will cause Pthru to switch Glink into the appropriate emulation mode.

## Command line

An example command line:

```
pthru -F12 -LI DSA -HM DPS7
```

Parameters for the G&R emulators and gateways are divided into two categories, parameters for the product itself and parameters for the line handler. Parameters for the product must precede the `-LI` argument that signals that the rest of the parameters are for the line handler module.

The `-USER` and `-HOST` parameters may later be used to switch between product and line parameters. Parameters may be pre-configured on:

```
/usr/gar/config/$LOGNAME/<product>.cfg
```

The user (`$LOGNAME`) directory may be replaced with `default` to give a configuration for users with no private directory.

## Configuration file (<product>.cfg)

The configuration file is grouped into sections.

|                        |   |
|------------------------|---|
| Default                | Parameters apply to all users             |
| User user(.acct.mode)  | Parameters apply to this user only        |
| Terminal terminal-name | Parameters apply to this terminal only    |
| TermUser terminal user | Parameters apply to this combination only |
| ContextUser ctx user   | Parameters apply to user in this context  |

The 'User' identifier may be in the standard star format, or the `.acct.mode` part can be omitted altogether. Comment lines are denoted by an asterisk or hash (`*`, `#`) in column 1, and may appear anywhere in the file. A section header must appear before the first parameter, but sections may be in any order. Both section headers and parameters can be indented for clarity. The file is processed sequentially and subsequent parameters will override any previous parameters of the same type.

Parameters for the product must be preceded by `-USER` if any line parameters have been delivered previously, e.g. in the `Default` section. Line parameters must always be preceded by `-LI XXX`.

In the following there are line parameters in the `Default` section, so the parameters in the user sections must be preceded with `-USER`, and the user's line parameters must be preceded with `-LI XXX` again.

e.g. `/usr/gar/config/default/pthru.cfg`

```
Default
  -LI DSA -D? OURGCOS6
User Peter
  -LI DSA -HM DPS7 -DA IOF -DN P7 -D? SECRET
  -DP DEVELOP
User Mary
  -USER -F12-HOST -DA TSS -DN PROD8 -HM DPS8
```

A user with a private configuration file would only have directives associated with his/her sessions. For a user with a private file the default file is not read or used.

Line parameters that are associated with the host rather than with the user can be configured in the `dsa.cfg` file. See section entitled *Line handler parameters*.

## Using Ggate

The G&R emulators and gateways support the *G&R/Ggate* protocol and may access the Bull or IBM mainframe through a *G&R/Ggate* system. In this case there is no need for a DSA stack on the system running the emulator. The emulator can use the *Ggate* protocol on top of TCP/IP to communicate with *Ggate*, and *Ggate* will run the DSA or DIWS line handlers on top of the transport software on its own system. In this case the emulator startup commands would use:

```
-LI DSA:gars.gar.no (DSA)
-LI DIWS:192.150.211.4 (DIWS)
```

Note that both the symbolic and numeric IP-address formats are supported. See the *Ggate* manual for more information about *Ggate*.

## Using TNVIP

The G&R Bull emulators and gateways can connect over a TCP/IP network using the TNVIP protocol to reach a TNVIP server in the MainWay, the GNSP of newer GCOS8 systems, the Open Systems personality of GCOS7 Diane systems or the Bull TNVIP server on AIX.

```
-li tcp -am tnvip
```

The TNVIP server on AIX uses a non-standard port, normally 7323, and requires parameter `-rp 7323`, or the port can be specified in the default node parameter together with the IP address of the server.

```
-li tcp -am tnvip -dn 192.150.211.4:7323
```

You can use the numeric IP-address directly or you can use a symbolic name to identify the host. In the latter case this symbolic name must be registered in your hosts file or with your name server. You can enter the port number directly or use a symbolic name for it. In the latter case this symbolic name must be registered in your services file.

The MainWay TNVIP server normally uses the default port (23), but may need the `-res` parameter to deliver a mailbox name to the server. This is used to select a specific terminal configuration.

We have implemented the TNVIP client protocol in the interest of completing our connectivity offer. Please note however that DSA over RFC1006 is supported by all MainWay front-ends with an ONP (Open Network Processor), by the GNSP front-end of newer GCOS8 systems, and by the Open Systems personality of the GCOS7 Diane systems. If used when communicating with G&R products DSA over RFC1006 will increase throughput as compared to using TNVIP. It will also give a real, fully functional DSA session over the TCP/IP network, as compared to the limited terminal session offered by TNVIP.

## Pthru parameters

This is an overview of the parameters for normal usage.

| Parameter      | Description   |
|----------------|---|
| -AI    rgb kiu | Information message attributes. Default green. Use either a combination of rgb for a colour or one of kiu for blink, inverse, underline.  |
| -AW    rgb kiu | Attribute for warning messages, default red.  |
| -CN    on/OFF  | Connect automatically to host application (defined by line handler parameters) at startup.  |
| -DBG   on/OFF  | Turns on an internal trace.   |
| -DQ    on/OFF  | Disconnect causes Pthru to quit, normal disconnect gives a return code of zero, abnormal disconnect gives a return code equal to the return code from the line. Pthru also quits on failing connection attempts with a nonzero return code. |
| -E8    on/OFF  | Exchange eight bit bytes with the terminal and the mainframe line handler. The default is to ignore the top bit.  |
| -EC    on/OFF  | As for -E8.   |
| -F12   on/OFF  | Treat F12 as command prompt. F12 F12 transmits F12. F12 followed by any F-KEY cancels the prompt.   |
| -LK    ON/off  | Lock keyboard on transmit and unlock on 'turn'.   |
| -MSG   ON/off  | Display Pthru and line handler messages.  |
| -PT    ON/off  | Map transparent print addressing in the VIP header to in-line print start- and stop-sequences.  |
| -PW    10      | Wait time in seconds before Pthru will deliver accumulated print for spooling. A value of zero stops automatic spooling.  |

## Host Links user profiles

Pthru uses the Host Links terminal type to differentiate between real VIP7800 terminals and *G&R/GLINK*. The correct terminal type is also needed for other Host Links products and utilities. You should set the TERM environment variable to inform Host Links of your terminal type. Any TERM variable starting with VIP will select the handler for the VIP7801 (BDS 7) terminal, and VIPUNIX tells the handler that the terminal is in 'Character Attribute Mode'. A TERM starting with GLINK will enable the *G&R/Glink* extensions. GLINKVIP leaves Glink in VIP78 mode when executing other UNIX/Linux products. This is the recommended way of running UNIX/Linux with Glink. If the TERM variable cannot be set correctly it may be overridden with the VIDEO directive in the PROFILES file.

### Profiles file structure

```
/usr/gar/config/default/profiles
/usr/gar/config/$LOGNAME/profiles
/usr/gar/config/system/profiles
```

These files are read in the sequence given above. Suggested commands should be given in `config/default/profiles`, user specific commands in `config/$LOGNAME/profiles` and `config/system/profiles` to override all other settings.

All files are organized in sections, which may apply either to all terminals (Default), a group of users (User), specific terminals (Terminal), a combination (Termuser), or specific terminal types (Termtype). Each section is prefaced with a header line:

```
DEFAULT
USER      person.project.mode
TERMINAL  terminal_name
TERMUSER  terminal_name person.project.mode
TERMTYPE  terminal_type
```

Commands may be put into any section to specify the *Host Links* environment for a user or terminal.

## Line handler parameters

All line handler parameters are described in the *G&R/Gline* manual.

### Line parameters for DSA

|                        |   |
|------------------------|---|
| -LI DSA/DIWS           | Use Bull DSA or DIWS                      |
| -LL line length        | For applications that send large blocks   |
| -HM DPS8/DPS7/CXI/DPS6 | DPS8 is the default                       |
| -MN mailbox name       | Local mailbox name of terminal            |
| -TM VIP7804            | Terminal type for connect letter          |
| -DA application        | Default application TSS, TDS, IOF, etc.   |
| -DN node               | Session control name of the host gateway. |
| -D? password           | User password for host or IDCHECK.        |

Example: `pthru -li dsa -tm vip7814 -da tss -dn ph13`

### Line parameters for TCP/IP

|                  |   |
|------------------|---|
| -LI TCP          | Use TCP/IP                                    |
| -AM Telnet/TNVIP | Telnet is default. TNVIP for TNVIP server     |
| -HO hostname     | Remote host name. Numeric/symbolic IP-address |
| -RES mailboxname | Resource name for TNVIP                       |
| -RP remote_port  | Non-standard remote port for connection       |
| -TM VIP7804      | Terminal type, must be a synchronous type.    |

Example: `pthru -li tcp -tm vip7814 -am tnvip`

## Terminal line parameters

Only a restricted set of parameters may be used on the terminal side. They are introduced with the `-TERM` parameter.

|                         |   |
|-------------------------|---|
| <code>-D_ on/OFF</code> | Data trace in Host Links debug structure  |
| <code>-EB on/OFF</code> | Add ETB to send data when enclosure = e_message. Automatically turned on for DKU terminal modes ( <i>Glink only</i> )           |
| <code>-EX on/OFF</code> | Add ETX to send data when enclosure > e_message. Automatically turned on for DKU and 3270 terminal modes ( <i>Glink only</i> ). |
| <code>-NX on/OFF</code> | Disable IXON/IOFF. Automatically turned on for DKU and 3270 terminal modes ( <i>Glink only</i> ).                               |
| <code>-S_ on/off</code> | Session trace of internal events and low level data.  |
| <code>-ST XXXXX</code>  | stty options.   |

# Troubleshooting

---

If you experience any kind of problem when using an emulator or gateway to access your host application, the product trace file and/or the line handler trace file will provide useful documentation of the problem, for your own use, to the G&R distributor or to G&R if it turns out to be caused by an error in the product. See the appendix *Host Link Trace* for a full discussion of how to generate G&R/Host Links trace files.

## Product trace files

```
/usr/gar/debug/XXX/YYY.dbg
```

*XXX = user name*

*YYY = product identifier g32, g52, qsi, v78, pth*

This traces details from internal processing. Enable it by adding `-DBG` to the start-up command or the `<product>.cfg` configuration file:

```
-USER
      -DBG ON
```

## Line handler trace files

```
/usr/gar/debug/XXX/YYY-gli.dbg
```

*XXX = user name*

*YYY = product identifier g32, g52, qsi, v78, pth*

This traces details of line handler operation. Enable it by adding one or both of `-D_` and `-S_` to the start-up command or the `<product>.cfg` configuration file:

```
-LI ZZZ
      -S_ -D_
(ZZZ =line handler identification, i.e. DSA, DIWS, TCP or X25)
```

## When connecting through Ggate

```
/usr/gar/debug/ZZZZ/ggaNN-PPPP.dbg
```

(**ZZZZ** = DSA node name, e.g. EN06 or PH13)

(**NN** = Instance number, starting at 01)

(**PPPP** = IP-address of the client system, running the emulator)

When any G&R or customer application based on GI-API connects through Ggate to the host application, the line handler trace will be generated on the Ggate system, with the name and location showed in the table above. In this case the product start-up command or <product>.cfg file would look like this:

```
-LI YYY:PPPP  
    -S_ -D_
```

(**YYY** = line handler identification, i.e. DSA or DIWS)

(**PPPP** = IP-address of the system running Ggate)

## The TTY line handler

You can obtain a line trace of the terminal side of Pthru by using `-TERM` to introduce parameters for the terminal side:

```
-TERM  
    -S_ -D_
```

# Appendix: Host Links Manuals

---

Below you find a complete list of all available Host Links manuals:

|                      |  |
|----------------------|--|
| <b>Installation</b>  |  |
| Host Links Servers   | Installation and Configuration on UNIX/Linux   |
| Host Links Emulators | Installation and Configuration on UNIX/Linux   |
| Host Links           | Installation and Configuration on Windows  |
| <b>Line handling</b> |  |
| Gline                | Line Handler and DSA/OSI Configuration   |
| Ggate                | Transparent Gateway  |
| Gproxy               | Network Manager & SNMP Proxy Agent   |
| G&R SSL              | Using SSL for security in G&R products   |
| GIAPI                | Application Programming Interfaces   |
| Gsftp                | Gateway between FTP and SFTP   |
| <b>Emulations</b>    |  |
| Gspool               | Network Printer Emulation  |
| GUFT                 | Unified File Transfer  |
| G3270                | Emulating IBM 3270 Terminals   |
| G5250                | Emulating IBM 5250 Terminals   |
| Pthru                | Gateway to the Bull Primary Network  |
| Qsim                 | Emulating Questar DKU7107-7211 & VIP7700-7760  |
| V78sim               | Emulating VIP7801 & VIP7814  |
| Gweb                 | Web Browser Front-end for DKU, VIP7700-7760, VIP7800, IBM3270 and IBM5250 Emulations |



# Appendix: Host Links DSA Utilities

---

The Gline package includes a set of Gline communication utilities. These are used when testing and debugging connection problems. The utilities are delivered as part of the Gline package and can be used without any additional configuration. The nodes to be tested must of course be configured in the `dsa.cfg` file.

## Gconame

Lists the parameters generated from a given CONAME. The utility works for both CONAME and RESOURCE e.g.:

```
gconame tnviptm

Checking 'dsa.cfg' for coname 'tnviptm'
Coname: tnviptm, type TM, parameters:
-DA misfld
-S_
-D_
-CODE 0000
-CODE 1000
-CODE 1800
-TEXT Remote SCID?:
-CODE 4700
-TEXT Remote application?:
-CODE 1400
-CODE 1600
-TEXT Password?:
```

## **Pthru**

### **Gerror**

Shows the text message associated with a DSA reason code. Only the most common codes are supported i.e. the ones related to network, transport and session communication layers. Errors generated by the OSI-stack on the Host Links platform are not covered by this utility; please refer to the documentation from the vendor of the stack e.g.:

```
gerror 0109
Reporting component: Session control (01) 0109, Dialog
protocol error or negotiation failed (wrong logical record).
```

For a detailed description of all reason codes, please consult the Bull manual *OSI/DSA Network System Messages and Return codes* (39A2 26DM).

### **Glnode**

List and verify the communications parameters of the local node e.g.:

```
glnode
Local node name : GRDL
Local session control id : GRDL
DSA200 address (area:tsm): 54:60 (36:3C)
```

### **Gmacfix**

When you connect to FCP cards on Bull mainframes via an Ethernet port on the LAN-Extender the mainframe address is given in Ethernet (LLC) format. If you connect to an FDDI adapter you must convert the MAC address to SMT. e.g.:

```
gmacfix 080038000fab
MAC address 080038000fab = 10001c00f0d5
```

### **Gping**

Connects to a remote system using the Gline parameters set on the command line. If successful it returns 'connected to application', otherwise it shows the error code returned e.g.:

```
gping -li dsa -dn b7dl -da iof -du jim -pw mydogsname
Gping - $$DSA: Connected to application
```

## Grnode

Return the parameters (in `dsa.cfg`) and the state of a remote node e.g.:

```
grnode b6dl
Checking 'dsa.cfg' for node 'b6dl'
Session control id : B6DL
DSA200 address (area:tsm) : 1:5 (1:5)
Inactivity interval : 0
Route 0
Load balance percentage : 0
TP class : 2
TP expedited : 0
TPDU size : 0
Network address : 130405
```

## Gtrace

Same as `gping` but writes the DSA communication trace on the user's terminal (applicable to UNIX versions) e.g.:

```
gtrace -li dsa -dn ln40 -da snml51
D6:Application event @ 14:17:17.6003. tokenitem = 00
D6:Application event @ 14:17:17.6082. tokenitem = 00
D6:Connect request called, node = LN40
D6:OurBufferSizes. ApplMaxXmit = 511, ApplMaxRecv = 500
Rec:4000 0002 s:2
Rec:506B 0010 s:16
etc etc
Gtrace - line trace ending.
Gtrace - $$DSA: Connected to application.
```

## Gtsupd

Update the state of a transport route. Transport routes can be set automatically in a disabled state if a backup route is configured. When such a state change occurs the route will be set back to the enabled state after a configurable timer has expired. The default is 15 minutes. You can reset the state of such a route with `gtsupd ts-name enbl/used/down/locked` e.g.:

```
gtsupd gars_rfc enbl
TS-entry 'gars_rfc', new state = enbl
```



# Appendix: Host Links Trace

---

If you experience any kind of problem when using a Host Links application, the application trace file and/or the line handler trace file will provide useful documentation of the problem.

## Trace activation

The Host Links products automatically create sub-directories in the debug directory when debug is activated: at product level using the `-dbg` parameter, or at line level using the `-d_` or `-s_` parameters to the line module.

|                           |  |
|---------------------------|--|
| <b>Windows<br/>server</b> | <code>gspool -id gsl -dbg -ps \\SERVER\LEXMARK<br/>-li dsa -da tptst -d_ on</code> |
| <b>UNIX<br/>Linux</b>     | <code>gspool -id gsl -dbg-pc lp -li dsa<br/>-da tptst -d_ on</code>                |

Most G&R products include a facility for setting product or line parameters dynamically. It is therefore generally possible to turn on debug or trace without modifying the command line or configuration of a production system.

## Trace types

All Host Links products accept a parameter `-dbg`, which starts an application level trace of internal events. This is useful when investigating malfunctions or looking closely at product behaviour.

All Gline line handlers accept a parameter `-d_` to turn on a data trace. It records data and enclosure level being exchanged with the line handler. It is useful when documenting product malfunction e.g. an emulation error, because it records exactly what the host sends and what the G&R application replies. It can be used to simulate a customer situation, reproduce a problem and to verify that a correction fixes the documented problem.

## Pthru

All Gline line handlers accept a parameter `-s_` to turn on a session trace. It records the raw data being exchanged between the line module and the underlying transport layer (e.g. OSI Transport, or TCP socket), as well as internal events and protocol states. It is useful when investigating protocol failures such as unsuccessful connect attempts or abnormal disconnections.

## Structure

The Host Links file structure includes a debug directory to collect the trace and debug files in one location where the permissions can be adjusted as required for security. By default only the Host Links administrator can access the directory. The debug directory is created by the initialization procedure and located (by default) in:

|                           |                             |
|---------------------------|-----------------------------|
| <b>Windows<br/>server</b> | <code>\gar\debug</code>     |
| <b>UNIX<br/>Linux</b>     | <code>/usr/gar/debug</code> |

If the application is a client type of application, a debug sub-directory with the same name as the user (UNIX username or PC login name) is created and all debug files are located there. This includes the line level trace except in the special case where the client application connects via Ggate and the line level trace is written on the Ggate system using the Ggate DSA node name as a debug sub-directory.

If the application is a server type of application, then a sub-directory will be created using the DSA node name on behalf of which the server application is executing. If the server does not use DSA the default local session control name is still used if there is a `dsa.cfg` file. If there is no `dsa.cfg` file then the system's UNIX or Windows communications node name is used. You can find this name using the command `uname -n` on UNIX systems, or the Network section of the control panel on Windows systems. This covers situations where several instances of a server are executing on the same system and accepting incoming calls to different DSA node names, or where several Host Links systems using the same server product share a file system.

## Tracing Ggate

When Glink, a Host Links client or a customer application based on GI-API connects through Ggate to the application, the line handler trace is generated on the Ggate system, with the name and location shown in the table:

|                       |   |
|-----------------------|---|
| <b>Windows server</b> | <code>\gar\debug\NODE\ggaNN-PPPP.dbg</code>     |
| <b>UNIX Linux</b>     | <code>/usr/gar/debug/NODE/ggaNN-PPPP.dbg</code> |

NODE is the local DSA node name used by the Ggate system.

The trace file name consists of the prefix `ggaNN-` followed by the IP-address of the client, suffixed by `.dbg` for a terminal session or `-dbg` for a printer session. The following is a trace file name for Ggate session sequence number 5 executing on Host Links system GRDL initiated from a Glink client on IP-address `jim.gar.no`:

`gga05-jim.gar.no.dbg`

This file, and possibly also a Glink debug file and a Glink communication trace file activated by the `/J` command line parameter will be needed by the support engineer investigating any problem.

To enable a line handler trace through Ggate the product's start-up command or configuration file would look like this:

`-LI YYY:ZZZZ -S_ -D_`

(*YYY =line handler identification, i.e. DSA or DIWS*)

(*ZZZZ =IP-address of the system running Ggate*)

## Examples - G&R products

Examples of directory and file names in the debug structure are:

|                                 |                                       |                   |
|---------------------------------|---------------------------------------|-------------------|
| <code>/usr/gar/debug/jim</code> | <b>Debug directory for user 'jim'</b> |                   |
| <code>qsm.dbg</code>            | Qsim emulator debug file              | <code>-dbg</code> |

## Pthru

|                            |  |             |
|----------------------------|--|-------------|
| qsm-gli.dbg                | Qsim host line trace                   | -li dsa -s_ |
| pth-glit.dbg               | Pthru terminal line trace              | -term -s_   |
| pth-glih.dbg               | Pthru -host line trace                 | -li dsa -s_ |
| g32.dbg                    | G3270 emulator debug file              | -dbg        |
| g32-gli.dbg                | G3270 host line trace                  | -s_         |
| <b>/usr/gar/debug/mike</b> | <b>Debug directory for user 'mike'</b> |             |
| v78.dbg                    | V78sim emulator debug file             | -dbg        |
| v78-gli.dbg                | V78sim host line trace                 | -li dsa -s_ |
| guf.dbg                    | GUFT client debug file                 | -dbg        |
| guf-gli.dbg                | GUFT client host line trace            | -li dsa -s_ |
| <b>/usr/gar/debug/en01</b> | <b>Debug directory for node 'en01'</b> |             |
| guf.def                    | GUFT server debug file                 | -dbg        |
| guf-gli.def                | GUFT server host line trace            | -li dsa -s_ |
| gli-gli.dsa                | DSA listener host line trace           | -s_         |
| gli-gli.diw                | DIWS listener host line trace          | -s_         |
| gsp.def                    | Gspool (default -id) debug file        | -dbg        |
| gsp-gli.def                | Gspool (default -id) host trace        | -li dsa -s_ |
| gga01-mike.gar.no.dbg      | Ggate line trace, first Glink          | -s_         |
| gga02-mike.gar.no.dbg      | Ggate line trace second Glink          | -s_         |
| <b>/usr/gar/debug/en02</b> | <b>Debug directory for node 'en02'</b> |             |
| gsp.abc                    | Gspool (-id abc) debug file            | -dbg        |
| gsp-gli.abc                | Gspool (-id abc) host trace            | -li dsa -s_ |
| gspc-gli.def               | Gspool DPF8 command trace              | -li tcp -s_ |
| gspd-gli.def               | Gspool DPS8 data trace                 | -li tcp -s_ |

|                          |                                |                          |
|--------------------------|--------------------------------|--------------------------|
| <code>gsp._00</code>     | Gspool started on demand debug | <code>-dbg</code>        |
| <code>gsp-gli._00</code> | Gspool started on demand trace | <code>-li dsa -s_</code> |

## ***CPI-C and Gweb trace files***

Gweb uses the CPI-C libraries so the Gweb debug structure is exactly the same as for CPI-C, except that Gweb inserts its own product identifier into the file name structure. CPI-C applications use the 'client' style of debug and create a debug directory with the UNIX username or PC login name used by the process that started them.

The application level debug (`-dbg`) and line trace (`-s_` and `-d_`) are set in the `cpic.cfg` file. The line trace goes to the debug directory, with the name built up as follows:

```
<product_id><session_id>-<process_id>.<debug_type>
```

| <b>product_id</b> | <i>Value</i>              | <i>Comment</i>                     |
|-------------------|---------------------------|------------------------------------|
|                   | <code>cpi</code>          | CPI-C API                          |
|                   | <code>cp3</code>          | CPI-C 3270                         |
|                   | <code>cp7</code>          | CPI-C 7800                         |
|                   | <code>cpd</code>          | CPI-C DKU                          |
|                   | <code>gw3</code>          | Gweb3270                           |
|                   | <code>gw7</code>          | Gweb7800                           |
|                   | <code>gwd</code>          | Gwebdku                            |
| <b>session_id</b> | <code>(nn)</code>         | If multi-session application, 1-63 |
| <b>process_id</b> | <code>n (n n n...)</code> | Varies by platform                 |
| <b>debug_type</b> | <code>dgb</code>          | Application level debug            |
|                   | <code>gli</code>          | Line trace                         |

## Pthru

Example:

|                   |                                   |                                   |
|-------------------|-----------------------------------|-----------------------------------|
| \gar\debug\system |                                   | debug directory for user "system" |
| cpi-16.dbg        | CPI-C single session debug        | -dbg                              |
| cpi-16.gli        | CPI-C single session line trace   | -li dsa -s_                       |
| cpi2-123.dbg      | CPI-C session 2 application debug | -dbg                              |
| gw7-20172.gli     | Gweb7800 host line trace          | -li dsa -s_                       |

# Appendix: Error codes

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## OSI/DSA error codes

Below is a list of OSI/DSA error codes and the corresponding description. These are the same descriptions that the G&R/Errord utility will display when given the DSA code as a parameter.

| code        | Description   |
|-------------|---|
| <b>00xx</b> | <b>General Errors</b>   |
| 0001        | Open Failure in LC - Reject for unknown reason  |
| 0002        | Open Failure in LC - Acceptor customer node inoperable  |
| 0003        | Open Failure in LC - Acceptor customer node saturated.  |
| 0004        | Open Failure in LC - Acceptor mailbox unknown.  |
| 0005        | Open Failure in LC - Acceptor mailbox inoperable.   |
| 0006        | Open Failure in LC - Acceptor mailbox saturated.  |
| 0007        | Open Failure in LC - Acceptor application program saturated                                   |
| 0008        | Connection refused. Transport protocol error or negotiation failed.                           |
| 0009        | Open Failure in LC - Dialog protocol error or negotiation failed                              |
| 000A        | Open Failure in LC - Presentation protocol error or negotiation failed                        |
| 000B        | Open Failure in LC / Connection refused lack of system resources                              |
| 000C        | Open Failure in LC / Connection refused from GCOS7 duplicate user                             |
| 000D        | Open Failure in LC, Duplicate implicit LID / Q class not started                              |
| 000E        | Open Failure in LC, Duplicate GRTS Id / lack of memory resources                              |
| 000F        | Open Failure in LC, No Logical line declared for DACQ / 7 connection refused                  |
| 0010        | Open Failure in LC, GCOS 8 GW Missing translation / Incorrect device length in ILCRL.         |
| 0011        | Open Failure in LC, DAC connection not initialized / Too many jobs executing                  |
| 0012        | Open Failure in LC, No binary transfer / impossible to start the IOF job                      |
| 0013        | Open Failure in LC, connection is not negotiated in FD mode / impossible to start the IOF job |

|      |  |
|------|--|
| 0014 | Disconnection - Timeout resulting from absence of traffic.                         |
| 0016 | Option missing for an RBF mailbox.   |
| 0017 | Connection refused - Incorrect access right for MB.                                |
| 0018 | Connection refused - Incorrect access rights for the application.                  |
| 0019 | Connection refused - Unknown pre-negotiated message path                           |
| 001A | Connection refused - Security validation failed.                                   |
| 001B | Connection refused - Unknown acceptor mailbox extension.                           |
| 001C | Connection refused - Inoperable acceptor mailbox extension.                        |
| 001D | Connection refused - Invalid Message group number.                                 |
| 001F | Disconnection - no more memory space.  |
| 0020 | Connection refused - Unknown node.   |
| 0021 | Connection refused - inaccessible node or Host down.                               |
| 0022 | Connection refused - saturated site.   |
| 0023 | Connection refused - inoperable mailbox.   |
| 0024 | (X.25) Packet too long. Problem with packet size. / Connection block already used. |
| 0030 | Syntax Error - option not known (received on close VC).                            |
| 0031 | (X.25) No response to call request packet - timer expired.                         |
| 0033 | (X.25) Timer expired for reset or clear indication.                                |
| 0039 | Disconnection - transport protocol error (MUX).                                    |
| 003C | Presentation Control Protocol Error  |
| 003E | The application has not the turn   |
| 003F | Message group closed   |
| 0040 | (X.25) Facility code not allowed. / Connection refused - unknown node              |
| 0041 | Connection refused - path not available.   |
| 0042 | Connection refused - Duplicate USER ID / Facility parameter not allowed            |
| 0044 | (X.25) Invalid calling address.  |
| 0045 | (X.25) Invalid facility length.  |
| 0047 | (X.25) No logical channel available.   |
| 004F | DNSSC: (X.25) Invalid call packet length.  |
| 0050 | Normal disconnection (GCOS3/8)   |
| 0051 | Error or Event on LC initiated by GW   |
| 0052 | Error or Event on LC initiated by GW.  |
| 0053 | Error or Event on LC initiated by GW. TCall  |
| 0054 | Error or Event on LC initiated by GW. DIA in LOCK State                            |
| 0055 | Error or Event on LC initiated by GW. DIA error                                    |
| 0056 | Error or Event on LC initiated by GW. GW has no known explanation.                 |
| 0057 | Error or Event on LC initiated by GW. Reject mailbox permanent                     |

|      |   |
|------|---|
| 0058 | Error or Event on LC initiated by GW. No more input lines in DACQ               |
| 0059 | Time-out on GCOS 3/8 gateway.   |
| 005A | Error or Event on LC initiated by GW. Disconnect from terminal without reason   |
| 005B | Error or Event on LC initiated by GW. Wrong letter or wrong record              |
| 005C | Error or Event on LC initiated by GW. Forbidden letter received                 |
| 005D | Error or Event on LC initiated by GW. Forbidden letter received                 |
| 005E | Error or Event on LC initiated by GW. No buffer for secondary letter            |
| 005F | Error or Event on LC initiated by GW. No buffer for fragmented letter           |
| 0060 | Error or Event on LC initiated by GW. Disconnect on end of phase record         |
| 0061 | Error or event on LC initiated by GW. No buffer for control letter.             |
| 0062 | Error or event on LC initiated by GW. Mailbox in closing phase                  |
| 0064 | Error or event on LC initiated by GW. Flow control error.                       |
| 0065 | Error or event on LC initiated by GW. CH locked by operator.                    |
| 0066 | Error or event on LC initiated by GW. Disconnect with a normal TMG F2 exchange. |
| 0067 | Error or event on LC initiated by GW. Teletel rerouting error from DACQ         |
| 0068 | Error or event on LC initiated by GW. Teletel routing error from DACQ           |
| 0069 | Error or event on LC initiated by GW. Teletel rerouting error from TM           |
| 006A | Error or event on LC initiated by GW. Teletel rerouting error from TM           |
| 006B | Syntax error - text too long.   |
| 006C | Syntax error - illegal object in a GA command.                                  |
| 006D | Syntax error - unknown node Id.   |
| 0078 | Syntax error - illegal command for this object.                                 |
| 0079 | Syntax error - illegal date.  |
| 007F | (X.25) No route available for X.25 switching.                                   |
| 0081 | No more network routes available for switching.                                 |
| 0082 | (X.25) Hop count reached for X.25 switching.                                    |
| 0083 | (X.25) Flow control negotiation error.  |
| 0085 | (X.25) Frame level disconnection.   |
| 0086 | (X.25) Frame level connection.  |
| 0087 | (X.25) Frame level reset.   |
| 0090 | Frame level not set.  |
| 0092 | (X.25) X.25 Echo service in use.  |
| 0093 | (X.25) Incorrect password for PAD connection.                                   |

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|-------------|--|
| 0094        | (X.25) No more PAD connections allowed.  |
| 0096        | (X.25) TS SX25 or NU X25 objects locked.   |
| 009C        | (X.25) Invalid packet header. X.25 protocol error.                                     |
| 009D        | (X.25) Incompatible header. X.25 protocol error.                                       |
| 009E        | (X.25) Logical Channel Number too high.  |
| 009F        | (X.25) Incorrect packet type.  |
| 00B2        | Use of invalid password through PAD  |
| 00B6        | Unknown mailbox selection for PAD connection using the PAD password.                   |
| 00C0        | (X.25) Normal disconnection.   |
| 00D7        | (X.25) TS image (of type DSA or DIWS) in LOCK state.                                   |
| 00DE        | (X.25) NS RMT or NR SW in LOCK state.  |
| 00E1        | Connection refused. Mailbox is not in ENBL state.                                      |
| 00E6        | QOS not available permanently.   |
| <b>01xx</b> | <b>Session Control</b>   |
| 0100        | Logical connection accepted or normal termination                                      |
| 0101        | Rejection for unknown reason or abnormal termination                                   |
| 0102        | Acceptor node inoperable.  |
| 0103        | Acceptor node saturated. When a node has no available resources                        |
| 0104        | Acceptor mailbox unknown.  |
| 0105        | Acceptor mailbox inoperable.   |
| 0106        | DNS: Acceptor mailbox saturated.   |
| 0107        | DNS: Acceptor application program saturated.   |
| 0108        | Transport protocol error or negotiation failed (DSA 200 only).                         |
| 0109        | Dialog protocol error or negotiation failed. (Wrong logical record).                   |
| 010A        | Time-out on session initiation / unknown LID   |
| 010B        | Acceptor mailbox extension unknown.  |
| 010C        | Acceptor mailbox extension inoperable.   |
| 010D        | Invalid Session Number.  |
| 010E        | Unknown node.  |
| 010F        | System error. System generation error or insufficient memory space                     |
| 0110        | Application abnormal termination. Subsequent to an abnormal occurrence in the dialogue |
| 0111        | Normal terminate rejected.   |
| 0112        | Protocol not supported.  |
| 0113        | Session control service purged by user.  |
| 0115        | Disconnection Time-out on message group initiation.                                    |
| 0117        | Incorrect Access Right for MB  |
| 0118        | Incorrect Access Right for the Application   |
| 0119        | Pre-negotiated Message Path Descriptor unknown   |
| 011A        | Security validation failed   |
| 011E        | Incorrect object status  |

|      |   |
|------|---|
| 011F | Not enough memory space available.  |
| 0120 | Node unknown.   |
| 0121 | The channel object (CH) is in LOCK state                                      |
| 0122 | Saturation - no plug available  |
| 0123 | Object status = LOCK  |
| 0124 | Connection block (TSCNX) already used   |
| 0125 | Disconnection already running   |
| 0126 | The connection block (TSCNX) is disconnected (or not connected)               |
| 0127 | Change Credit value < 0   |
| 0128 | Ineffective Change Credit ( delta = 0 )                                       |
| 0129 | No more deferred letters  |
| 012B | "Reinitialization" Request  |
| 012C | "Reinitialization" in progress  |
| 012D | "Reinitialization" in progress, letters are dropped                           |
| 012E | Close virtual circuit. Either no mapping exists between PA/NR or CL and VC/NS |
| 012F | Null connection object index.   |
| 0130 | Undefined function at Sysgen time.  |
| 0131 | Letter too large with respect to the negotiated size.                         |
| 0132 | The received letter is longer than the size which was                         |
| 0133 | Disconnection of the session control user                                     |
| 0134 | Interface error on EOR (End-Of-Record) processing.                            |
| 013C | Presentation control protocol error.  |
| 013E | You do not have the turn.   |
| 013F | Message group closed.   |
| 0140 | Session is closed.  |
| 0151 | Request refused, no system buffers available.                                 |
| 0152 | Incorrect addressing record.  |
| 0153 | No presentation record in the ILCAL or ILCRL                                  |
| 0154 | Negotiation failed on session mode  |
| 0156 | Negotiation failed on resynchronization.                                      |
| 0157 | Negotiation failed on END to END ACK  |
| 0158 | No presentation record in the connection letter                               |
| 0159 | Negotiation failed on session mode  |
| 015A | Negotiation failed on letter size (in the Logical Connection record).         |
| 015B | Negotiation failed on resynchronization (in the Logical Connection record).   |
| 015C | Negotiation failed on end-to-end ACK (Logical Connection record).             |
| 015D | No support of the "letter" interface because Multirecord is not negotiated.   |
| 0160 | Incorrect TSPACNX table.  |
| 0161 | Protocol error on letter reception.   |

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| 0162 | Negotiation failure.                                     |
| 0163 | Record header length error.                              |
| 0164 | Protocol error.  |
| 0165 | Protocol error reception of control letter.              |
| 0166 | Type or length error on interrupt letter.                |
| 0167 | Protocol error on reception of data letter.              |
| 0168 | Dialog protocol error.                                   |
| 0169 | Unknown event.   |
| 016A | Protocol error on data transfer.                         |
| 016B | Invalid status for a disconnection request.              |
| 016C | Invalid status for a recover                             |
| 016D | Invalid status for a suspend/resume request.             |
| 016E | Negotiation failure.                                     |
| 016F | Unknown command.   |
| 0170 | Error in presentation protocol                           |
| 0171 | Letter header length error in                            |
| 0172 | ILCAL is not DSA 200 protocol.                           |
| 0173 | Error in session record.                                 |
| 0174 | Normal disconnection, without complementary reason code. |
| 0175 | Letter is not in ASCII or EBCD.                          |
| 0176 | Connection protocol letter header                        |
| 0177 | Letter header protocol error.                            |
| 0178 | Record header protocol error.                            |
| 0179 | Record header length error.                              |
| 017A | Mbx record header length error.                          |
| 017B | Error on buffer transfer.                                |
| 017C | DSA 200 record header protocol                           |
| 017D | DSA 300 record header protocol                           |
| 017E | Unsupported connection options.                          |
| 017F | Character error in ASCII string.                         |
| 0180 | No segmented record size.                                |
| 0181 | Invalid mailbox object index.                            |
| 0182 | Mapping error for a remote connection.                   |
| 0190 | No more buffers.   |
| 0191 | Byte count is greater than GP.                           |
| 0192 | Byte count is greater than GP.                           |
| 0193 | Byte count is greater than GP.                           |
| 0194 | Byte count is greater than GP.                           |
| 0195 | Byte count is greater than GP.                           |
| 0196 | Byte count is greater than GP.                           |
| 0197 | Byte count is greater than GP.                           |
| 0198 | No more buffers.   |

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|-------------|--|
| 0199        | Byte count is greater than GP.   |
| 019A        | Byte count is greater than GP.   |
| 019B        | Byte count is greater than GP.   |
| 019C        | Byte count is greater than GP.   |
| 019D        | Byte count is greater than GP.   |
| 019E        | Byte count is greater than GP.   |
| 019F        | Byte count is greater than GP.   |
| 01A0        | Invalid transfer state.  |
| 01A1        | Suspend protocol running.  |
| 01A2        | Suspend protocol running.  |
| 01A3        | Recover protocol running.  |
| 01A4        | Forbidden function in write request. (\$WRITE)                                   |
| 01A5        | Conflicting parameters for segmented record. (SWBREC)                            |
| 01A6        | Protocol conflict - suspend/recover.   |
| 01A7        | Protocol not supported - letter/end-to-end ACK. (SWBLET)                         |
| 01A8        | Multi-record letter in progress.   |
| 01A9        | Interrupt request forbidden.   |
| 01AA        | Send control record request forbidden. (SCTROL)                                  |
| 01AB        | Forbidden for TWA session - turn is here. (SREAD)                                |
| 01AC        | Termination forbidden - suspend or recover in progress. (STERM)                  |
| 01C0        | No space available for downstream connection request. (SMECNX)                   |
| 01C1        | No space available for upstream connection request. (SMUCNX)                     |
| 01C2        | No space available for upstream SCF connection. (SMRCNX)                         |
| 01C3        | No space available for session context. (\$SCTX)                                 |
| 01E0        | Enclosure or data length error for a write request. (\$WRITE)                    |
| 01E1        | Enclosure or data length error for a write segment record request. (SWBREC)      |
| 01E2        | Enclosure error for 'give turn' request. (SGVTRN)                                |
| 01E3        | Interrupt request is not demand turn, attention/data attention, or purge record. |
| 01E4        | Input status for a send control letter is not permitted.                         |
| 01E8        | Write request without turn.  |
| 01E9        | Write segmented record request without turn.                                     |
| 01EA        | Write segmented letter request without turn.                                     |
| 01EB        | Send control letter request without turn.  |
| 01EC        | Disconnection request without turn.  |
| <b>02xx</b> | <b>Presentation Control</b>  |
| 0201        | Protocol level not supported   |
| 0202        | Application designation protocol error.  |
| 0203        | Character encoding error. TM cannot support the proposed encoding.               |
| 0204        | Character set error. TM cannot support the proposed character set.               |

|             |  |
|-------------|--|
| 0205        | Character subset error. TM cannot support the proposed character subset.                           |
| 0206        | Incorrect record encoding.   |
| 0207        | Incorrect parameter encoding.  |
| 0230        | Data presentation control error. The presentation control proposed for this session cannot be used |
| 0231        | Device type is incompatible with the configuration.  |
| 0232        | TM control protocol is incorrect.  |
| 0233        | Device-sharing attributes are invalid.   |
| 0234        | Initiator or acceptor configuration is not correct.  |
| 0235        | Logical device index error.  |
| 0236        | Number of logical devices is incompatible with the configuration.                                  |
| 0237        | TM protocol record not supported.  |
| <b>03xx</b> | <b>Terminal Management</b>   |
| 0300        | Sysgen error WARNING. There is no mapped object; some objects will be spare.                       |
| 0301        | Operator requested session abort or logged.  |
| 0302        | Idle time run out after secondary network failure.   |
| 0303        | Idle time run out for no traffic.  |
| 0304        | Form not found.  |
| 0305        | Operator requested suspension.   |
| 0306        | Destructive attention send on the session.   |
| 0307        | Unknown TX addressed in this session. TM is unable to a the session.                               |
| 030A        | Protocol error. A record was received which did not comply with current standards                  |
| 0310        | Insufficient resources. The receiver cannot act on the request because of a temporary              |
| 031E        | Incorrect value for Retry or Wait parameters on UP LL command.                                     |
| 0320        | Function not supported.  |
| 0321        | Parameter error. This can result   |
| 0322        | Resource not available. The  |
| 0323        | Intervention required (on principal device).   |
| 0324        | Request not executable.  |
| 0325        | EOI required.  |
| 0326        | Presentation space altered, request executed.  |
| 0327        | Presentation space altered, request not executed.  |
| 0328        | Presentation space integrity lost.   |
| 0329        | Device busy. The device is busy and cannot execute the request.                                    |
| 032A        | Device disconnected.   |
| 032B        | Resource not configured.   |
| 032C        | Symbol set not loaded.   |

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|-------------|--|
| 032D        | Read partition state error.  |
| 032E        | Page overflow.   |
| 0330        | Subsidiary device temporarily not available.                             |
| 0331        | Intervention required at subsidiary device.                              |
| 0332        | Request not executable because of subsidiary device.                     |
| 0340        | TM cannot accept a new connection.                                       |
| 0341        | Object status incorrect.   |
| 0342        | The TM configuration is not correct.                                     |
| 0343        | Unknown TX addressed on this session.                                    |
| 0344        | Data presentation protocol error.  |
| 0345        | Device type is incompatible with the configuration, or is not supported. |
| 0346        | TM control protocol incorrect.   |
| 0347        | Device shareability attributes are invalid.                              |
| 0348        | Initiator or acceptor configuration is not correct.                      |
| 0349        | Logical device index error.  |
| 034A        | Number of logical devices incompatible with the configuration.           |
| 0350        | Disconnection of TM after reinitialization of the network.               |
| 0360        | File not found. (Welcome and Broadcast Messages)                         |
| 0361        | Site not found. (Welcome and Broadcast Messages)                         |
| 0362        | NASF error. (Welcome and Broadcast Messages)                             |
| 0370        | No-session timeout. Device disconnected.                                 |
| 0371        | No-input timeout. Device disconnected.                                   |
| 0372        | No-output timeout. Device disconnected.                                  |
| 0373        | Timeout due to no backup session being initiated.                        |
| 0374        | Timeout due to no backup session being established.                      |
| 0375        | Connection refused because of late activation of back up session.        |
| 0376        | Disconnection of current session to switch to backup session.            |
| 0380        | AUTOCN parameter not declared.   |
| 0381        | Mixed ETB in data sent by VIP screen and cassette                        |
| 0382        | Data header sent by the terminal incorrect.                              |
| 0383        | Desynchronization in the exchange of data.                               |
| 0384        | KDS block count error.   |
| 038C        | Remote terminal is not connected   |
| 0390        | Unknown mailbox.   |
| 0391        | No call packet to return.  |
| 0392        | No "Possibility" command to return Protocol error                        |
| 03C0        | Slave device disconnection.  |
| <b>17xx</b> | <b>Network Layer</b>   |
| 1701        | PAD connection refused.  |
| 1702        | Flow control error.  |

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|------|--|
| 1706 | Logical channel number not zero in restart packet.   |
| 1707 | Illegal packet length or use of D-bit forbidden.   |
| 1708 | Illegal header.  |
| 1709 | Illegal Logical Channel Number.  |
| 1710 | Invalid packet type for the automaton state. Protocol error  |
| 1711 | Incorrect packet type.   |
| 1712 | Inconsistent network parameters in the generation file.  |
| 1713 | No more space.   |
| 1714 | DSAC network layer object not usable.  |
| 1717 | USED/ENBL transition. Transport station is locked.   |
| 1718 | USED/ENBL transition. This is a back-up NR.  |
| 1719 | USED/ENBL transition. Dynamic close due to load.   |
| 171A | USED/ENBL transition. Transfer time-out has elapsed.   |
| 171B | USED/ENBL transition. This is a back-up NR.  |
| 171C | USED/ENBL transition. Transport station is idle.   |
| 171E | USED/ENBL transition. NR object is locked.   |
| 171F | ENBL/LOCK transition. NR HDLC has no more memory space.  |
| 1721 | Remote station is inaccessible via the configured network. Check   |
| 1723 | Incorrect PAD password.  |
| 1724 | Virtual circuit already in use. LCN (Logical Channel Number) too high.                                   |
| 1725 | Invalid virtual circuit.   |
| 1726 | Packet too short. Protocol error for the equipment directly connected to the Bull Datanet.               |
| 1727 | Incompatibility between the generation parameters of two communicating systems on window or packet size. |
| 1729 | Packet size in communicating systems not the same.   |
| 1731 | Timer runs out while waiting for call confirmation.  |
| 1732 | Timer runs out while waiting for clear confirmation.   |
| 1733 | Timer has run out while waiting a reset confirm.   |
| 1740 | Call setup or call clearing problem.   |
| 1741 | Open failure on virtual circuit. No flow control on this NS.   |
| 1742 | Incorrect facility. Protocol error for the equipment directly connected to the Bull Datanet.             |
| 1744 | Unknown subscriber.  |
| 1745 | End of time-out on reset confirm. Invalid facility length. Protocol error for the equipment directly     |
| 1747 | No logical channel available.  |
| 1749 | End of time-out on call confirm.   |
| 174F | Incorrect packet length. Protocol error for the equipment directly connected to the Bull Datanet.        |
| 1755 | Flow control, window, packet size or reset error.  |

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| 1760 | Frame disconnection.   |
| 1770 | Frame connection.  |
| 1771 | Frame reset.   |
| 1781 | No more network routes available for X.25 switching.           |
| 1782 | Maximum of 15 switches have been used,                         |
| 1783 | Flow control negotiation error.                                |
| 1785 | Frame level disconnection.                                     |
| 1786 | Frame level connection.  |
| 1787 | Frame level reset.   |
| 1790 | Frame level not established.                                   |
| 1791 | No more logical paths available for the PAD.                   |
| 1792 | Echo service busy.   |
| 1793 | Incorrect PAD password.  |
| 1794 | All the PAD virtual circuits are used                          |
| 1795 | X.25 initialization not possible.                              |
| 179B | LCN not null in restart packet                                 |
| 179D | Incompatible header (receive error: all VC of concerned NS     |
| 179E | LCN greater than NBVC in NS directive                          |
| 179F | Incorrect packet type  |
| 17A0 | Invalid facility.  |
| 17B0 | Normal disconnection.  |
| 17B1 | X.25 Echo in use.  |
| 17B2 | No more logical channels available.                            |
| 17B3 | No more PAD connections allowed.                               |
| 17B4 | TS SX25 or NU X25 object locked.                               |
| 17B5 | Buffer capacity overflow.                                      |
| 17B6 | Normal disconnection.  |
| 17B8 | Unknown calling SNPA (Sub-Network Point of Attachment).        |
| 17B9 | Internet problem.  |
| 17CB | Call collision on VC   |
| 17CC | Incompatible generations (NR object without mapping).          |
| 17CE | Invalid status NR locked.                                      |
| 17CF | Lack of space.   |
| 17D0 | Unknown subscriber.  |
| 17D4 | TSCNX already used for another connection. SCF internal error. |
| 17D7 | Transport station locked.                                      |
| 17DD | Proper NS locked.  |
| 17DE | Invalid status NR locked.                                      |
| 17DF | Lack of space.   |
| 17E0 | Forbidden parameter or invalid value.                          |
| 17E1 | Invalid transition.  |
| 17E2 | Upward-mapped object (TS) not locked.                          |

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| 17E3        | No object mapped above.  |
| 17E4        | NR not locked (MP NR -ADD/-SUB) or virtual circuit already open.   |
| 17E5        | NR is last in list and the TS is not locked.   |
| 17E6        | No object mapped above (UP NR -PRIO). NR not mapped on TS.   |
| 17E7        | Upward mapped object not locked  |
| 17E9        | Mix of datagram and connection network   |
| 17EB        | Class inconsistent with NR.  |
| 17EE        | Incompatible generations. NR object without mapping.   |
| 17FF        | Wrong parameter in administrative CALL   |
| <b>18xx</b> | <b>Transport Layer</b>   |
| 1800        | Normal disconnection initiated by the correspondent  |
| 1801        | Local saturation at connection request time.   |
| 1802        | Failed negotiation at connection time.   |
| 1803        | Duplicate connection. Two or more requests have been issued for the same connection.                           |
| 1804        | Redundant request.   |
| 1805        | Retransmission Time-out at transport level.  |
| 1806        | Survey time-out at transport level.  |
| 1807        | Transport protocol error.  |
| 1808        | Session Control specified is not available (inaccessible).   |
| 1809        | Requested Session Control Id unknown by remote transport.  |
| 180A        | Termination because of disconnection by administration.  |
| 180B        | Session Control/Transport interface error.   |
| 180C        | Connection request on non-sharable VC in case of ISO Transport.<br>ISO: header or parameter length is invalid. |
| 1817        | Station in shut-down state.  |
| 181F        | No memory space at connection time.  |
| 1821        | Session Control inaccessible by configured session routes. ISO:<br>Session entity not attached to TSAP.        |
| 1824        | Collision between Close NC and Open TC.  |
| 182E        | Remote station not configured.   |
| 182F        | Resource saturation.   |
| 1831        | ISO: No route for the called NSAP.   |
| 1832        | ISO: Received NSAP addresses are wrong.  |
| 1833        | Segmentation violation.  |
| 1834        | ISO:QOS priority not available temporarily, due to a local condition<br>(for example, lack of resources).      |
| 1835        | ISO:QOS priority permanently unavailable locally (for example, due<br>to an error in the system generation).   |
| 183A        | ISO: Remote reason not specified.  |
| 183C        | ISO: Remote transport entity congestion at connect request time.   |
| 1840        | Server in terminating state. TC has been re-assigned on another NC.  |

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| 18A1 | An additional NC has been assigned to a TC.  |
| 18B0 | NC has been re-assigned on another VC.   |
| 18EF | Disconnection at Transport level caused by reception of RESTART DSA during the transfer phase. |

## Windows Sockets error Codes

Below is a list of Windows Sockets return codes and the corresponding description.

| Hex code | Windows Sockets Access Error name | Description   |
|----------|-----------------------------------|---|
| 2714     | WSAEINTR                          | The (blocking) call was cancelled via WSACancelBlockingCall()                       |
| 2719     | WSAEBADF                          | The socket descriptor is not valid.   |
| 271E     | WSAEFAULT                         | An invalid argument was supplied to the Windows Sockets API.                        |
| 2726     | WSAEINVAL                         | An invalid call was made to the Windows Sockets API.                                |
| 2728     | WSAEMFILE                         | No more file descriptors are available.   |
| 2733     | WSAEWOULDBLOCK                    | The socket is marked as non-blocking and no connections are present to be accepted. |
| 2734     | WSAEINPROGRESS                    | A blocking Windows Sockets call is in progress.                                     |
| 2735     | WSAEALREADY                       | The asynchronous routine being cancelled has already completed.                     |
| 2736     | WSAENOTSOCK                       | The descriptor is not a socket.   |
| 2737     | WSAEDESTADDRREQ                   | A destination address is required.  |
| 2738     | WSAEMSGSIZE                       | The datagram was too large to fit into the specified buffer and was truncated.      |
| 2739     | WSAEPROTOTYPE                     | The specified protocol is the wrong type for this socket.                           |
| 273A     | WSAENOPROTOOPT                    | The option is unknown or unsupported.   |
| 273B     | WSAEPROTONOSUPPORT                | The specified protocol is not supported.  |

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| 273C | WSAESOCKTNOSUPPORT | The specified socket type is not supported in this address family.  |
| 273D | WSAEOPNOTSUPP      | The referenced socket is not a type that supports connection-oriented service.  |
| 273E | WSAEPFNOSUPPORT    |   |
| 273F | WSAEAFNOSUPPORT    | The specified address family is not supported by this protocol.   |
| 2740 | WSAEADDRINUSE      | The specified address is already in use.  |
| 2741 | WSAEADDRNOTAVAIL   | The specified address is not available from the local machine.  |
| 2742 | WSAENETDOWN        | The Windows Sockets implementation has detected that the network subsystem has failed.  |
| 2743 | WSAENETUNREACH     | The network address can't be reached from this host. There is probably a problem in the way you have set up TCP/IP routing for your PC (most likely you have not defined a default router). |
| 2744 | WSAENETRESET       | The connection must be reset because the Windows Sockets implementation dropped it.   |
| 2745 | WSAECONNABORTED    | The connection has been closed.   |
| 2746 | WSAECONNRESET      |   |
| 2747 | WSAENOBUFS         | Not enough buffers available, or too many connections.  |
| 2748 | WSAEISCONN         | The socket is already connected.  |
| 2749 | WSAENOTCONN        | The socket is not connected.  |
| 274A | WSAESHUTDOWN       | The socket has been shutdown.   |
| 274B | WSAETOOMANYREFS    |   |
| 274C | WSAETIMEDOUT       | Attempt to connect timed out without establishing a connection.   |
| 274D | WSAECONNREFUSED    | The attempt to connect was forcefully rejected. The service on the other side is not available.   |
| 274E | WSAELOOP           | Too many symbolic links were encountered in translating the path name.  |
| 274F | WSAENAMETOOLONG    |   |
| 2750 | WSAEHOSTDOWN       | The host machine is out of service.   |
| 2751 | WSAEHOSTUNREACH    | The host machine is unreachable.  |

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| 2752 | WSAENOTEMPTY       |   |
| 2753 | WSAEPROCLIM        |   |
| 2754 | WSAEUSERS          |   |
| 2755 | WSAEDQUOT          |   |
| 2756 | WSAESTALE          |   |
| 2757 | WSAEREMOTE         |   |
| 276B | WSASYSNOTREADY     | Indicates that the underlying network subsystem is not ready for network communication.                                 |
| 276C | WSAVERNOTSUPPORTED | The version of Windows Sockets API support requested is not provided by this particular Windows Sockets implementation. |
| 276D | WSANOTINITIALISED  | A successful WSStartup() must occur before using this API.  |
| 2AF9 | WSAHOST_NOT_FOUND  | Authoritative answer host not found.  |
| 2AFA | WSATRY_AGAIN       | Non-authoritative answer host not found, or SERVERFAIL.   |
| 2AFB | WSANO_RECOVERY     | Non-recoverable errors, FORMERR, REFUSED, NOTIMP.   |
| 2AFC | WSANO_DATA         | Valid name, no data record of requested type.   |