G&R

GSPOOL™

Network Printer Emulation

G&R

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Contents

Contents

Host Links Gspool

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

The Gspool program 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.

In **Connect mode** Gspool supports output from applications like TDS or TP. When started, Gspool logs on to the host application automatically using the normal *G&R/Gline* parameters for default node (-dn), default application (-da), etc. In this mode Gspool also supports GCOS8 remote print administration utilities like 'Dispatch8' and 'DPF8-Store & Forward' ('DPF8-S&F') by appearing as a ROP network printer.

In **Terminal writer mode** (-TW) Gspool supports the Terminal Writer (TWRITER) product on GCOS7, and RSM8 on GCOS8. In this mode Gspool waits for remote connects from TWRITER or RSM8.

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 connects from DPF8-DS.

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 connection from SNM.

In **IBM mode** Gspool supports unformatted and formatted print (LU type 1 and 3) and SNA Character String (SCS) codes directed to an IBM3287 printer 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 which is sent from the front-end.

In **TN3270 mode** Gspool supports unformatted and formatted print (LU type 1 and 3) and SNA Character String (SCS) codes directed to an IBM3287 printer through a TN3270-to-SNA gateway, as specified in RFC1646.

Gspool

In **TN3270E mode** Gspool supports TN3270E print as specified in RFC1647. Gspool supports unformatted and formatted print (LU type 1 and 3) and SNA Character String (SCS) codes directed to an IBM3287-1 printer through a TN3270E-to-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 (Windows), Bull's TN3270E server in MainWay and Bull's SNA/20 (AIX) are examples of SNA gateways that support RFC1647.

Run-time licenses

In order to run Gspool, the following license keys must be present in your `licenses` file:

`basic`	For the base G&R run-time system
`gspool`	For Gspool

On UNIX/Linux systems the `licenses` file is normally located in the `/usr/gar/config/` directory and on Windows systems in the `C:\gar\config\` directory.

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 users or simultaneous sessions the product is licensed for. If a limitation is specified in the license, only the licensed number of users or sessions can be active at any time.

Starting Gspool

In order for Gspool to accept incoming calls, the DSA listener **must** always be started before Gspool.

On Demand on all servers: The DSA listener can be configured to start Gspool on demand when a connection is received for a given mailbox. See the section on *Starting Gspool on demand* on page 32 for more information. This is the recommended way of starting Gspool.

Prestarted on UNIX/Linux servers: Gspool can be started at UNIX/Linux start-up by including the Gspool command line in the `/etc/inittab` file. For more information see the *Installation & Configuration* manual for *Host Links on UNIX/Linux*. Gspool can also be started manually from the UNIX/Linux command line prompt.

Prestarted on Windows servers: Gspool can be started as a Windows service by including the Gspool startup command in the `Gservice` configuration file. For more information on `Gservice`, see the *Installation & Configuration* manual for *Host Links on Windows servers*. Gspool can also be started manually on Windows systems using the Host Links administrator, `Gmanager`, to enter a command line that will be passed to Gservice for launching.

Windows workstations: Gspool can be started interactively or from the Startup group.

Parameter usage

Parameters for Gspool are divided into two categories, parameters for Gspool itself and parameters for the line handler (`gl_dsa`, or `gl_tcp`). Parameters for Gspool must precede the `-LI` parameter that signals that the following parameters are for the line handler.

The `-USER` and `-HOST` parameters may later be used to switch between Gspool and line handler parameters. Parameters may be pre-configured in Gspool configuration files:

Windows	`\gar\config\default\gspool.cfg`
UNIX/Linux	`/usr/gar/config/default/gspool.cfg`

See the section entitled ***Gspool configuration file*** for details.

Generic parameters

Parameter		Description
`-ID`	`Ext`	Gspool identifier and filename extension for configuration file. When using pre-started Gspool instances it must be specified in the Gspool command line, and is a maximum of 3 characters. Gspool first reads command line parameters and then the `gspool.ext` config file, if any.
		When running multiple copies of Gspool, each Gspool **must** be started with a unique identifier. The default config file extension is `.cfg`, and default Gspool identifier is `DEF`.
		When Gspool is started on demand an `-ID` is generated if not supplied.
`-HIST`	`ON/off/ all`	Report printing history. Written to file `report.history` in the Gspool server directory.
		Default `ON` is to write a history line for all reports that fail. If `ALL` it writes a history line for all reports.

Mode of operation

`-TW`	`on/OFF`	Start Gspool in GCOS7 GTwriter mode (automatically sets several options. It turns off `-CN`, turns on `-TS` and generally configures for GTwriter mode)
`-DPF8`		Start Gspool in DPF8-Distributed SYSOUT mode.
`-CN`	`ON/off`	Start Gspool in connect mode. Instructs the line handler to connect using the configured connection parameters.
`-RC`	`on/OFF`	Reconnect. Can be used in connect mode (`-CN`) to instruct Gspool to attempt to reconnect once a minute when disconnected.

Mainframe print interpretation

`-CC`	`on/OFF`	Set/cancel print interpretation. This is normally off allowing 'transparent' print, which assumes that the printer understands the print control sequences included in the host print data. For Windows systems this normally means that the GUI interface must be bypassed to send the data 'transparently', see `-tp`. However for `-tm PRT722X`, `-tm a2`, `-tm IBM3287`, `-am tn3270` or `tn3270E` Gspool must normally convert control sequences to standard ASCII print, so `-cc` is set `on`, and it must explicitly be turned `off` if you don't want print interpretation (you have the required physical printer). All print interpretation parameters either require, or force `-cc on`.
`-CRLF`	`on/OFF`	Enable LF -> CR LF conversion, so that UNIX/Linux print files can be interpreted correctly on Windows platforms. This forces `-CC ON`.
`-FF50`	`on/OFF`	Some printers do not reset the print head to column 1 when they receive a Form Feed. By default Gspool inserts a CR (0x0D) before every Form Feed (0x0C) to make the printer work as expected. This parameter causes Gspool to insert the CR after the Form Feed. This parameter is only active with `-CC ON`.
`-IG`	`on/OFF`	When enabled and not in semi-transparent print mode Gspool ignores SI and SO characters. The default behavior is that the SI (hex 0E) and SO (hex 0F) characters switch Gspool in and out of graphic mode. This parameter is only active with `-CC ON`.

GCOS7 print interpretation

See section entitled *Gcos7 print*

`-ST`	`on/OFF`	Semi-transparent print mode. In this mode SS2 sequences (`ESC E, 0x19`) are decoded to high ASCII (Single Shift 2 means that the following one or two seven bit characters define an eight bit character). All other control sequences are delivered unmodified to the printer or spooler. For Windows systems this normally means that the GUI interface must be bypassed to send the data 'transparently', see `-tp`. This parameter forces `-CC ON`.
`-19SS2`	`ON/off`	If this parameter is disabled hexadecimal 19 is ignored as an SS2 signal and passed untouched to the printer. This parameter is only active with `-ST ON`.
`-ESS2`	`ON/off`	If this parameter is disabled Esc E is ignored as an SS2 signal and is passed to the printer. This parameter is only active with `-ST ON`.
`-DE`	`on/OFF`	Strip off multiple `ESC` characters when in semi-transparent print mode, and deliver the final Esc sequence to the printer. Sequences such as `ESC ESC E` are delivered to the print output device or spooler. This technique was used by defunct Atlantis gateways.

Print addressing

`-PA`	`ON/off`	Print all output regardless of addressing. Must be turned off if the host is using addressing.
`-PT`	`ON/off`	If `-PA` is off, blocks with print addressing in the VIP header are sent directly to the printer, others are scanned looking for print addressing in the text. `-PT` can be turned off to ignore the VIP header if the host is using both VIP header and printer addressing in the text. The printer addressing would otherwise be sent to the printer.

Mainframe character set transliteration

-SX	on/OFF	Use Scandinavian transliteration of EBCDIC national characters for IBM3287 print.
-XL	US	Translation to *Host Links* (ISO/Do11) 8-bit characters in Gspool from the 7-bit equivalents on the host. The correct -XL (GB, GE, FR, SF, DE, NO, SP, IT, JA) must be specified.
-XX	hxhx	Any incoming character from the host can be translated into any other internally in Gspool. Both are expressed in hex, and the first becomes the second.

End of print job detection

-PW	n/30	Wait time in seconds before Gspool will deliver accumulated print for spooling. In DPF8-DS mode the idle time-out before Gspool disconnects.
-PSTR	hex	Spool flag of up to 30 bytes expressed in hex. A flag embedded anywhere in the print block causes the current print operation from the host to be terminated, and the print command (-pc command or -ps printer) to be executed. Any remaining data in the block goes to the next file for spooling later.

Flow control

-TS	ON/off	Simulate print terminal; transmit after print blocks if Gspool has the turn. A form of End to End ACK.

Security

-KEEP	on/OFF	For Windows systems only. When enabled Gspool will keep all the temporary print files instead of releasing/removing them after completion of the print command (-PC or -PS). Should be used with care in that the temporary print files might occupy a lot of disk space.

Macros

-MP	path	Path to the directory where the Gspool macro directory is to be found. Defaults to: /gar/gspl_mac
-MD	name	Macro directory name. Defaults to default.
-MI	macro	Macro to run at startup.

Logging and tracing

-DBG	on/OFF new/app	Enable internal tracing in Gspool. Especially useful when debugging printing from DPF8-DS.
-HIST	ON/off/ all	Session history log. Default ON logs failing print sessions. ALL logs all print sessions. The log is at: \gar\servers\SCID.gsp\report.history

DPF8-DS parameters

Parameter		Description
–DPF8		Start Gspool in DPF8-Distributed SYSOUT mode.
–DPFB	on/OFF	Add a banner using the DPF8 title field.
–DPFC	on/OFF	Enable mapping of the DPF8-DS '-copies' parameter to a Gspool print command (-PC) option.
		The default is to append the parameter –NXX to the print command, but an exception is made if 'lpr' is configured as the print command. In these situations the parameter '-# xx' is appended instead.
–DPFF	on/OFF	Add form feeds before and after title banner and after DPF8 trailer report.
–DPFI	on/OFF	Enable setting of the Gspool print command from the DPF8-DS parameter –INTF, introduced in DPF8-DS version 3.0.
		If set Gspool uses the text string set with –INTF as the print command. Note that the –INTF parameter field is only 4 characters long. Gspool converts it to lower case so on a case-sensitive system (UNIX/Linux) the executable referenced by this parameter must also have a lowercase name.
		If Gspool is started with the command:
		gspool -dpf8 -dpfq -dpfi -li tcp
		you can use the DPF8-DS parameters:
		-d gars -q lexmark -intf lp
		to instruct Gspool to execute an 'lp' command to print the report on the printer queue 'lexmark'.
–DPFO	on/OFF	Map the DPF8-DS option field to local print options
		For UNIX/Linux the DPF8-DS option 'OptionString' is inserted in the print command as -oOptionString.
		For Windows systems the string is used to set Gspool print options e.g. the string **-PTM 0 -PBM 0** could be used to set the top and bottom margins to zero.

Parameter		Description
`-DPFQ`	`on/OFF`	Map DPF8-DS queue option to local print destination.
		For UNIX/Linux the DPF8-DS queue name 'QueueString' is inserted in the print command as -dQueueString.
		For Windows systems the DPF8 queue name is used to supply the printer port name. The first part of the path is taken from `-PS`.
`-DPFX`	`on/OFF`	For UNIX/Linux only, enable/disable generation of the OpenSpool print command (`np`) using the print parameters supplied by DPF8-DS. When this option is disabled, Gspool generates the standard print command specified by the `-pc` parameter.
`-PP`	`Path`	For DPF8-DS `-PP` points to a directory where print reports in transit are stored temporarily.
`-PW`	`n/30`	Wait time in seconds before Gspool disconnects. The DPF8-DS client never disconnects.

IBM-handling parameters

Parameter		Description
`-FM`	`on/OFF`	Explicitly enable/disable formatted IBM3287 print. Needed when using OSF gateway in the Datanet. When using TN3270 or TN3270E this is signaled in the protocol and handled automatically.

Printer-handling parameters

Parameter		Description
-CHS	nnnn	Sets printer character set. Gspool assumes the ISO 8859-1 character set internally, and will by default write the print data to the printer in this character set. This parameter instructs Gspool to translate the print data to the given character set. For a complete list of supported character sets, see the section entitled *Printer character set*.
-DCK	30/nn	For Windows systems only. It defines how often the printer assigned with the -PS parameter should be checked for availability. When enabled (-DCK > 0) Gspool will check the status of the print queue at startup and then every NN seconds when it is idle. If the printer is unavailable the connection from the remote system is aborted and the print data remains on the host system until the printer becomes available again.
-PC	Command	Print command used to spool the print file from the print path, -PP, to a device, program or print queue. The print file is deleted after the command.
-PIF	filename	A local print file to be inserted before the print data is delivered to the local spooling system. Can be used to insert a logo or other image.
-PCC	Command	Print check command used to check the device, program or print queue. Gspool will check the status with this command at startup. If the check fails the connection from the remote system is aborted and the print data remains on the host system until the device, program or print queue becomes available again.
-CCK	30/nn	Used in combination with -PCC; it defines how often the check command defined with the -PCC parameter should be used when Gspool is idle. If the check fails the connection from the remote system is aborted and the print data remains on the host system until the device, program or print queue becomes available again.

`Parameter`		Description
`-PP`	`Path`	When the `-PC` parameter is specified `-PP` defaults to a temporary file, but can be overridden by `-PP`. If `-PP` is used it sets the path to which print output from the host is written. Either a file path or a device name may be specified. The path may be a simple filename, in which case the print is written to the Host Links TEMPDIR directory or it can be a full path. If no `-PC` is used all print is appended to the file. For DPF8-DS `-PP` points to a directory where print reports in transit are stored temporarily.
`-PS`	`port`	For Windows systems only, the UNC path to the printer port used to spool the print file. For example, to spool the file to a printer, LEXMARK, on a print server, SERVER, you specify `-PS \\SERVER\LEXMARK` If no –PS is set then the `-PC` and `-PP` must be used as for UNIX/Linux.
`-PTM`	`nn`	Sets top margin to nn pixels in GUI mode. In 'passthrough' mode (`-TP ON`) both on UNIX/Linux and Windows it: 1) Adds nn CRLFs to the print file when it receives: the first print data more data after a print command 2) Adds nn CRLFs after Form Feed if `-CC` is `ON`
`-WPC`	`ON/off`	Wait for Print Command to complete. By default Gspool waits until the configured print command (`-PC` option) has completed before it continues to process incoming host data. When disabled Gspool will continue processing incoming host data immediately after initiating the print command.
`-WPT`	`1/nn`	Wait for Print command Timer. If the Wait for Print Command is disabled (`-WPC OFF`), this parameter allows you to configure a delay before Gspool continues to process incoming host data. The default is 1 second.

Choose GUI or transparent print

`-TP`	`on/OFF`	For Windows systems bypass the GUI print interface and send the data 'transparently' using the Windows 'pass-through' print option to deliver exactly what was sent from the host to the printer. This must be set if the host print data includes formatting and other control sequences that are understood and needed by the target printer.
	`ON/off`	For UNIX/Linux this parameter is on by default, and all it does is to enable insertion of as many CRLFs (0x0D0A) at the top of each page as are assigned with the `-PTM` parameter.

Windows GUI options

Device characteristics		
`-PCP`	`1/nn`	Set number of copies.
`-PDUP`	`SIM` `HOR` `VER`	Double sided (duplex) print SIM – Normal (non-duplex) printing HOR - Short-edge binding (long edge horizontal) VER - Long-edge binding (long edge vertical)
`-PSC`	`100/nn`	Scaling factor
`-PSRC`	`source`	**AUT**/LOW/CAS/MAN/ENV/ENVM/ONL/ FORM/TRA/SMF/LAF/TRAYn The names supported by the driver can be obtained from Gmanager. Or use Gspool PBIN command.
Paging		
`-WFF`	`ON/off`	Enable/disable generation of form feed character at page breaks when running in non-transparent mode (`-TP OFF`). Disabling it will rely completely on receiving form feeds from the host.
Orientation, quality, lines per page and margins		
`-POR`	`[d|p|l]`	Select print format mode as default (d), portrait (p) or landscape (l).

`-PQU`	`[n|d|p]`	Select print quality mode as normal (n), draft (d) or proof (p)
`-PLPP`	`nn`	Set lines per page
`-PTM`	`Pixels`	Sets top margin
`-PBM`	`Pixels`	Sets bottom margin
`-PLM`	`Pixels`	Sets left margin
`-PRM`	`Pixels`	Sets right margin
Font		
`-PAP`	`on/OFF`	Accept Any Pitch. The default (OFF) is to request a Fixed Pitch font from Windows.
`-PFN`	`Font name`	Name of the printer font. Defaults to the printer's monotype font. The font name must be enclosed in quotes if more than one word (e.g. `-pfn "Lucida Sans Typewriter"`)
`-PFS`	`Font size`	The default font size is 10.
`-TRAY`	`on/OFF`	Inserts a Gspool icon in the taskbar notification area when enabled.

Command line examples

In a production environment the commands used to start copies of Gspool that accept incoming connections would normally be included in the configuration file for the *Host Links* listener (config.dsa or config.diw). See the section about Gspool start up on demand on page 32. The listener (nl_dsa) must be used for Windows systems, and for UNIX/Linux to allow multiple copies of Gspool to accept connections or to allow sharing of the DSA node with other *Host Links* products accepting incoming connections.

Note that if start on demand is **not** used for the modes where Gspool waits passively for a DSA connection, the -LN parameter **must** be used, and an ID (-ID) parameter **must** be supplied. When starting multiple copies of Gspool in connect mode an ID (-ID) parameter **must** always be supplied.

In all of the following examples the line length (-LL) parameter may be adjusted to conserve memory, but must be set large enough to receive the largest block of print sent by the host.

Connect mode for TDS or TP

The following command might be used to start Gspool in Connect mode with automatic connect to TP8 on GCOS8, the initialization macro sends the necessary log on dialog (answering the LID question if the front-end is configured to ask):

Windows	gspool -id gs1 -ps \\SERVER\LEXMARK
	          -mi init -li dsa -hm dps8
	          -da tptst -ll 512

UNIX/Linux	gspool -id gs1 -pc lp -mi init -li dsa -hm dps8 -da tptst -ll 512

SNM mode

The following command might be used to start Gspool in Passive mode to wait for SNM:

Windows	gspool	-id gs2 -ps \\SERVER\LEXMARK -cn off -li dsa -hm dps6 -ln -mn snmprt
UNIX/Linux	gspool	-id gs2 -pc lp -cn off -li dsa -hm dps6 -ln -mn snmprt

Terminal writer mode

The following command might be used to start Gspool in Terminal Writer mode:

Windows	gspool	-id gs4 -ps \\SERVER\LEXMARK -tw -li dsa -hm dps7 -ln -mn twpr -tm A2
UNIX/Linux	gspool	-id gs4 -pc lp -tw -li dsa -hm dps7 -ln -mn twpr -tm A2

IBM mode

The following command might be used to start Gspool in IBM mode:

Windows	gspool	-id gs5 -ps \\SERVER\LEXMARK -li dsa -hm ibm -ln -mn g32print -tm ibm3287
UNIX/Linux	gspool	-id gs5 -pc lp -li dsa -hm ibm -ln -mn g32print -tm ibm3287

TN3270 mode

The following command might be used to start Gspool in TN3270 mode:

Windows	gspool	-id gs7 -ps \\SERVER\LEXMARK -li tcp -am tn3270 -ho some.ibm.host -lu luname -tm ibm-3287-1
UNIX/Linux	gspool	-id gs7 -pc lp -li tcp -am tn3270 -ho some.ibm.host -lu luname -tm ibm-3287-1

TN3270E mode

The following command might be used to start Gspool in TN3270E mode:

Windows	gspool	-id gs8 -ps \\SERVER\LEXMARK -li tcp -am tn3270e -ho some.ibm.host -lu luname -ap -tm ibm-3287-1
UNIX/Linux	gspool	-id gs8 -pc lp -li tcp -am tn3270e -ho some.ibm.host -lu luname -ap -tm ibm-3287-1

DPF8-DS mode

The following command might be used to start Gspool in DPF8-DS mode:

Windows	gspool	-dpf8 -id gs9 -pw 3600 -ps \\SERVER\LEXMARK -li tcp
UNIX/Linux	gspool	-dpf8 -id gs9 -pw 3600 -dpfq -pc lp -li tcp

Mode of operation

Print output is directed to the defined print path (`-PP`), and printed with the defined print command (`-PC` or `-PS`) when the print job is complete. Gspool waits for the print command to complete before it continues to accept connects or new print reports. If the print path is a physical printer no print command is necessary, but the printer is released so that another user can share it. Some 'end of print' signal is necessary to mark the end of the print job. This may be done using a time-out, so that after a configurable number of seconds (`-PW`) where the connection is idle the print job is considered complete. In modes where the host connects to Gspool the print job is considered complete when the host disconnects. Alternatively the host may force the end of the print job. See the section entitled Host control of spooling on page 36.

In DPF8-DS mode the host has a command channel used to initiate spooling of the print reports, so no mechanism is needed. In this mode the `-PW` parameter is used to specify an idle time-out, default 30 seconds, which causes Gspool to disconnect. The idle timer starts when there are no longer any print reports in transit i.e. all reports delivered over the data channel have been printed as a result of commands on the command channel. The DPF8-DS client on GCOS8 supports a limited number of simultaneous connections to print servers, and so for situations where there are many servers in the network, a disconnect mechanism is necessary. It is also desirable when the line costs are related to time of connection. For connections where line costs are fixed and networks where there are few Gspools the disconnections can be avoided by setting `-PW` to a higher value (maximum 4000).

If no print command (`-PC` or `-PS`) is specified, Gspool will append print data to the configured print path (`-PP`). The `-PP` parameter can point to a physical device that is seen as a file; otherwise print is accumulated on the file you specify. For DPF8-DS `-PP` must point to a directory where the print reports in transit are stored. Print reports in transit have been delivered over the data channel and are waiting for print commands on the command channel.

Gspool

The `-PP` is optional if the `-PC` parameter has been specified. If you use `-PC` but do not supply a `-PP` the default is to create the print file in the directory defined by the Host Links TEMPDIR. TEMPDIR can be set in one of the Host Links `profiles` files, and the default values are.

Windows	`\gar\config\system\temp`
UNIX/Linux	`/usr/gar/tmp/`

The default print file name is:

Windows Normal	`gsp-[mailbox-]<pid>.<count>`
Windows DPF8	`gsp-[mailbox-]<pid>_iiiissss`
UNIX/Linux Normal	`<scid>_gsp_<pid>`
UNIX/Linux DPF8	`<scid>_gsp_<pid>_iiiissss`

`<scid>`	DSA node name
`[mailbox-]`	DSA printer mailbox name if not on-demand
`<pid>`	Process id
`<count>`	Counter
`iiii`	DPF8-DS report id
`ssss`	GCOS8 SNUMB (up to 4 characters)

When print interpretation is active `-CC ON`, Gspool allows the print path `-PP` to be set from host, anywhere in the data stream with the command：

```
<CSI> 17x printpath <CR>
1B 5B 31 37 78 <printpath> 0D
```

When Gspool sees this sequence, Gspool closes the current print file and executes the print command to print data received up to now. Then Gspool sets the new print path and continues to process print data - writing to the new print path.

When the output is directed to a file you normally want the print file to be delivered to the local spooler or some other application at the end of the print job. In this case you must supply the command to be used with the `-PC` parameter or a

UNC printer path with the `-PS` parameter on a Windows system. If you are using Gspool as a kind of file transfer package the `-PC` command might simply rename the file, leaving it in the `-PP` directory for later use by other applications, e.g. COLD (Computer Output On Laser Disc).

Host print data format

Host print data is generally either formatted simply for a generic printer using only CRLF and FF or contains printer specific printer control sequences understood by the target printer. If you have a printer that understands the formatting used by the host then the print can be delivered 'transparently'. This means that Gspool does not need to interpret the print data (`-cc off`), or needs only to interpret SS2 sequences that define high ASCII national characters (`-st on`). To deliver the print transparently you must bypass the GUI print interface of Windows systems (`-tp on`) and deliver the print directly to the printer. UNIX/Linux has no GUI print interface so the print is always delivered directly to the printer or queue.

If the host print data contains control sequences that are not understood by the target printer these must be filtered (`-cc on`). The resulting print data can then be formatted as regards font, width height etc. using the Windows systems GUI print interface. UNIX/Linux has no built in GUI print interface, and the print is always delivered directly to the printer or queue (`-tp on` by default).

Print commands

If the print command itself has arguments the command must be enclosed by quotes.

```
-pc "command arg1 arg2"
```

When spooling of a print file is due, Gspool builds a command line by appending the print path (`-PP`, either as defined or default temporary file) to the defined command:

```
command <arguments> <path to print file>
```

UNIX/Linux print commands

Example: `gspool -pc "lp -dpr1"`

If you use the standard UNIX/Linux print spooler command (`lp`), Gspool will automatically add the parameters `-c` and `-s` to instruct `lp` to make its own copy of the print file and to print this copy suppressing messages otherwise sent by `lp`. In this case the command line built by Gspool would be:

```
lp <arguments> <-c -s> <path to print file>
```

For DPF8-DS there are options that can be mapped to parameters for `lp` and `lpr`. See the section entitled DPF8 Distributed SYSOUT on page 41.

Windows print commands

To deliver the file to the local spooler you use the `-PS` parameter to supply the name of the printer port to be used. The printer port should be specified in the UNC format. Examples, spooling via the default `-PP` file to the local spooler:

```
gspool -ps \\SERVER\LEXMARK
gspool -ps LEXMARK
```

If a printer port is not set a `-PC` command must be set. The command used might launch a Windows application or start a BAT file. If the command starts a BAT file then the path to the print file is available as a parameter in the standard way for BAT files started from a command line. If your `-PC` has no other arguments then the path to the print file is available within the BAT as `%1` e.g.

```
gspool -pc c:\gar\config\gspool.bat
```

would give a command line of:

```
c:\gar\config\gspool.bat <path to print file>
```

and the BAT file could contain command lines in the form:

```
copy %1 c:\temp\gsp.prt > NUL
lpr.exe -S lexmark.gar.no -P lexmark c:\temp\gsp.prt
```

that would deliver the print file to an LPD printer.

After printing

By default Gspool waits for the print command to complete before it resumes its operation, but by setting −WPC OFF you instruct Gspool to continue processing incoming host data immediately after the print command has been initiated. In this case you can use the −WPT nn parameter to set a delay in seconds before Gspool continues its operation.

The print file is by default automatically deleted after execution of the spool command (−PC), so if the standard spooler is not used, then the sequence started with your print command should begin by copying (or renaming) the print file. Otherwise you risk that the print file is deleted before your command is executed. With the parameter −KEEP ON you can instruct Gspool to keep all the 'temporary' print files.

Printer character set

Gspool assumes the ISO 8859-1 character set internally, and by default writes the print data to the print files in this character set. The −CHS nnnn parameter causes Gspool to transliterate the print data to another character set in cases where your printer is set up for a given character set.

Note that if the internal character set is not really ISO8859-1 then the transliterations given here cannot be used. For example, it is quite usual that GCOS systems send 'transparent' print that has both control sequences and character set specific to the target printer. Such 'transparent' print must be delivered 'asis' to the printer, with the exception that SS2 encoding of 8bit (accented) characters for Bull printers such as PRT722X, A4, PRT1220 must be decoded (−ST and associated parameters).

Here follows a complete list of supported character sets.

Number	Character set description
5000	Apple Macintosh
517	Digital Equipment Corporation MCS
111	ECMA cyrillic
008	Hewlett-Packard Roman-8 extended

Gspool

Number	Character set description
037	IBM codepage 037 — EBCDIC USA
038	IBM codepage 038 — EBCDIC International
273	IBM codepage 273 — EBCDIC
274	IBM codepage 274 — EBCDIC-be
275	IBM codepage 275 — EBCDIC-br
277	IBM codepage 277 — EBCDIC-no/dk
278	IBM codepage 278 — EBCDIC-sf
280	IBM codepage 280 — EBCDIC-it
281	IBM codepage 281 — EBCDIC-jp
284	IBM codepage 284 — EBCDIC-es
285	IBM codepage 285 — EBCDIC-gb
297	IBM codepage 297 — EBCDIC-fr
420	IBM codepage 420 — EBCDIC-arabic-1
423	IBM codepage 423 — EBCDIC-gr
424	IBM codepage 424 — EBCDIC-he
437	IBM codepage 437 — USA
500	IBM codepage 500 — EBCDIC-be/ch
737	IBM codepage 737 — Greek (formerly **"437G"**)
850	IBM codepage 850 — Multilingual 1 (European)
851	IBM codepage 851 — Greek
852	IBM codepage 852 — Multilingual 2 (Slavic)
855	IBM codepage 855 — Slavic
860	IBM codepage 860 — Portuguese
861	IBM codepage 861 — Icelandic
862	IBM codepage 862 — Hebrew
864	IBM codepage 864 — Arabic 1

Number	Character set description
868	IBM codepage 868 — Arabic 2
869	IBM codepage 869 — Greek
870	IBM codepage 870 — EBCDIC-yu
871	IBM codepage 871 — EBCDIC-is
891	IBM codepage 891 — ISO 646
897	IBM codepage 897 — Hungarian
899	IBM codepage 899 — Russian
905	IBM codepage 905 — EBCDIC-tr
290	IBM codepage 290 — EBCDIC jp-katakana
8510	IBM codepage 8510 — Greek Alternate
8600	IBM codepage 8600 — Portugal Alternate
863	IBM codepage 863 — French/Canadian
865	IBM codepage 865 — Danish/Norwegian
866	MS-DOS codepage 866 — Russian
880	IBM codepage 880 — EBCDIC-cyrillic
895	IBM codepage 895 — Czechoslovakian
918	IBM codepage 918 — EBCDIC-arabic-2
646	ISO 646 — American
6465	ISO 646-DK — Danish
6463	ISO 646-FR — French
6461	ISO 646-GB — British
6462	ISO 646-GE — German
6468	ISO 646-IT — Italian
6469	ISO 646-JP — Japan (JIS ascii)
6466	ISO 646-NO — Norwegian
6464	ISO 646-SF — Swedish/Finnish

Gspool

Number	Character set description
6467	ISO 646-SP — Spanish
8859	ISO 8859-1 (Latin1 for Server6) — Europe, Latin America, Caribbean, Canada, Africa
8852	ISO 8859-2 (Latin2) — Eastern Europe
8853	ISO 8859-3 (Latin3) — SE Europe/miscellaneous (Esperanto, Maltese, etc.)
8854	ISO 8859-4 (Latin4) — Scandinavia/Baltic
8855	ISO 8859-5 — Cyrillic
8856	ISO 8859-6 — Arabic
8857	ISO 8859-7 — Greek
8858	ISO 8859-8 — Hebrew
8809	ISO 8859-9 (Latin5) — Turkish
8860	ISO 8859-10 (Latin6) — for Lappish/Nordic/Eskimo languages
1003	Microsoft Windows (like Latin1)
1250	Microsoft Windows (like Latin2) — Slavic
1251	Microsoft Windows (Cyrillic)
1252	Microsoft Windows (like Latin1)
1253	Microsoft Windows (Greek)

DSA network configuration

Before you can start Gspool for DSA connections you must have configured the DSA network. The same DSA network configuration applies to both the native DSA protocol, and the defunct DIWS protocol. You choose the protocol in the command line for Gspool (`-LI DSA` or `-LI DIWS`) and for the listener (`nl_dsa –prot dsa` or `nl_dsa –prot diws`).

If you are using OSI-transport then you must begin by installing and configuring the OSI-transport stack on the Host Links platform. Please refer to the *Host Links installation and configuration* manual for UNIX/Linux or Windows systems for details on how to install and configure OSI-stacks.

If you are using RFC1006 to transport DSA sessions over a TCP/IP network there is no need for an OSI-transport stack, RFC1006 is included in Host Links, and needs no configuration other than DSA configuration.

Please refer to the *Host Links Gline* manual for details of DSA configuration and the `dsa.cfg` network configuration file.

Outgoing connects

The `-CN` parameter causes Gspool to connect to the configured application (`-DA` parameter) and node (`-DN` parameter). The only configuration requirement is that the host node should be configured in the `dsa.cfg` file.

Note that a Gspool that connects to a host application at startup (`-CN`) will by default terminate when the host disconnects. This may happen when an intermediate front-end is rebooted. Gspool can be instructed to stay in execution and attempt repetitive connections (once a minute) by setting the reconnect parameter (`-RC`).

Using a log-on macro

The connect may be enough to signal to the host application that the 'printer' is present, but for those applications where some form of dialog is necessary before printing can commence a macro execution facility is included. Gspool is able to execute an initialization macro (-MI) configured in the macro directory (-MD). The macro must be generated by first logging on to the system using *Qsim* (see the *Qsim* manual) while in macro definition mode, and interactively giving the commands that must be sent to the host before printing can start. The commands are executed as they are recorded in the macro giving an automatic test. The macro is made available for Gspool users by copying the macro to the Gspool macro directory, i.e. assuming -MD default and -MI initmac then the macro is copied to:

Windows	`\gar\gspl_mac\default\initmac`
UNIX/Linux	`/usr/gar/gspl_mac/default/initmac`

after definition. Thereafter, when Gspool is started with the same parameters (-MD, -MI), Gspool will repeat the log-on dialog, and receive the print.

Incoming connects

The commands that start copies of Gspool that accept incoming connections should be configured in the listener's configuration file. The DSA listener will then start new instances of this Gspool when it receives connects to the mailbox name specified for the command line. See the section on *Starting Gspool on demand* on page 32.

If start on demand is **not** used for copies of Gspool that wait for connections from Terminal Writer mode, SNM mode or IBM mode, they must be configured to 'listen' (-LN) for connections.

The node name of the Host Links platform must be configured as a remote node in the Bull Mainframe, Datanet, MainWay or GCOS6 system which will be issuing the connect. The mailbox name to which the application will connect must be the one configured for Gspool (-MN).

A 'connect accept' is registered with the listener if Gspool is configured for start on demand or started otherwise with the 'listen' parameter (-LN). The DSA listener will forward the incoming connection when it arrives.

Note that the DSA listener must run as `root` user if RFC1006 transport is used from GCOS to the Host Links system. The reason for this is that the DSA listener needs `root` privileges to listen on the TCP port number (102) assigned for RFC1006 communication.

Multiple incoming connections

If multiple copies of Gspool for UNIX/Linux are to be run simultaneously, or if Gspool is to coexist with other *Host Links* products that accept connections, you must remember to start the appropriate *Host Links* listener program before you start Gspool.

The *Host Links* listener supports multiple incoming connections to the same node and even the same mailbox. This daemon listener program must be started before the programs accepting incoming connections. When the connections arrive for the different mailboxes, the listener program (`nl_dsa`) forwards the connections to the programs waiting for them, or starts the program configured for the mailbox name in the `config.diw` or `config.dsa` file.

See the *Gline* manual for more information about `nl_dsa`.

Start on demand

A configuration file controls the mapping from the DSA mailbox name (-mn) and, optionally, extension (-mx) to the command line for the Gspool to be started. There is one file for each DSA node name (SCID) for which connections are being accepted. It is placed in the servers directory:

Windows	\gar\servers\<scid>.gli
UNIX/Linux	/usr/gar/servers/<scid>.gli

The file is either config.dsa or config.diw for DSA and DIWS connections respectively.

Example file /usr/gar/servers/grdl.gli/config.dsa:

```
* Three printer mailboxes
listen -mn printer1 -cmd gspool -pc "lp -dprt1"
listen -mn printer2 -cmd gspool -pc "lp -dprt2"
listen -mn printer3 -lim 1 -cmd gspool -pc "lp -dprt3"
```

When a connection arrives for node grdl and mailbox name printer1 the configured Gspool is started. The Gspool command does not need the -LN parameter to tell it to listen, it is implicit, and it does not need a -ID parameter, it is generated. A Gspool started in this way will terminate after each completed print job after executing the print command or releasing the printer. The commands associated with printer2 or printer3 would be started on demand in the same way.

Note that multiple simultaneous connects to the mailboxes are allowed, and multiple instances of any of the Gspool commands will be started unless this is disabled with the -LIM parameter as for printer3 above.

Mailbox pools for incoming connects

If you use the Host Links listener you may pre-start multiple instances of products accepting connections to the same mailbox name on the same DSA node (SCID). Each instance must use a different mailbox extension. The instances of the product will be allowed to start execution, register the mailbox name and extension for which they are accepting connects with the listener, and act as a mailbox pool for applications connecting to the mailbox name.

An incoming connect to a mailbox without an extension will be passed to a random instance of the product which is accepting connects to a mailbox with the correct name, and that isn't currently busy handling a session. An incoming connect with a mailbox and extension will only be connected to a product which is accepting connects that match both.

Example:

```
gspool -id gs1 -pc "lp -dprt1" -li dsa -ln -mn printer1 -mx p1
gspool -id gs2 -pc "lp -dprt2" -li dsa -ln -mn printer1 -mx p2
gspool -id gs3 -pc "lp -dprt3" -li dsa -ln -mn printer1 -mx p3
```

The three instances would start, all listening on mailbox printer1. Connects to mailbox printer1 would be given to any of these Gspool instances which was not already busy. Because the instance that is selected is random the three instances should deliver print to a printer or printer queue with the same print characteristics. If a certain application needs a specific printer or print queue that is otherwise used in the pool, then that application should address the correct mailbox extension. Print output needing another type of printer altogether would have to connect to another mailbox name, serviced by one or more Gspool instances with a different printer or printer queue.

Multiple DSA nodes

A single Host Links platform can accept connections to several different DSA nodes. The DSA nodes must be configured in the Bull Mainframe, Datanet, MainWay or GCOS6 system which will be issuing the connect, as separate DSA nodes and transport stations, but using the same network address.

Gspool can then use any of these local node names as an argument to the -LN parameter to specify a specific node for which the Gspool will accept connections. These local node names used to accept incoming connections can be configured in the DSA configuration file of the Host Links platform. This is generally just for documentation, but some OSI-stacks require all local node names to be configured. Please refer to the *Host Links Gline manual* for details.

Each local DSA node name can only be used by one instance of Gspool that is accepting incoming connections. It cannot be shared with other products that accept connections, unless a DSA listener is running on behalf of the node.

Please note that this functionality is not available if using RFC1006. Please consult your distributor.

GCOS print addressing

Print addressing may be the TP (transparent print) mode using the VIP-header, or addressing may be included in the text using an emulator specific escape sequence for start and stop (or end of message). PT (print formatted screen) addressing in the VIP-header is recognized, but treated as TP, i.e. transparent. The default is to print all output, regardless of addressing, but if 'print all' is disabled (-pa off), then only data with print addressing will be printed, in which case data with screen addressing will cause execution of the print command, or release of the physical printer. If GCOS uses both print addressing in the VIP-header and an emulation specific print addressing sequence in the text of the message then VIP-header addressing must be ignored (-PT off). Otherwise the escape sequence is delivered to the printer.

Non-print output

The default in Gspool is to direct all output to the print path. This may be inconvenient if the host application assumes that the terminal has a screen, and reports error situations by sending messages to the Gspool session with screen addressing. If the application is using some form of print addressing for print output then you can turn off the 'print all' functionality using the `-pa off` parameter in the Gspool command line. In this case only print output is directed to the output path, and all other messages cause a spool of the previous print report.

Mainframe print format

The `-TM` line parameter for terminal mode is by default set to DKU7107 so that the 'printer' is regarded as an attached printer on a synchronous Questar terminal. Changing the `-TM` parameter will change the host's view of which physical printer is connected to the Gspool mailbox, and the host may change the print presentation to match the printer.

The mainframe may also change the print format depending on the attributes of the printer, as reported in the connect letter, or in the accept letter for an incoming connect. These printer attributes can be set using line parameters:

`-WI nnn`	Page/screen width of terminal in characters (max. 255)
`-PL nnn`	Page/screen length of terminal in lines (max. 255)

By default Gspool delivers the print transparently to the printer path. The host is assumed to be delivering all control sequences needed. This print format is preferred if the physical printer that is finally used accepts and interprets the control sequences used by the host in the print text.

If the printer is of another type than the intended printer then a suitable print profile or a mapping program must be started to convert the control sequences sent by the host to something the printer understands.

For `-TM PRT722X`, `-TM A2`, or `-TM IBM3287` and `-AM tn3270` or `tn3270E`, `-XL` and `-ST ON` Gspool does control code analysis. The output will be split into logical lines, and the control codes will be translated to the standard ASCII printer CR/LF and FF codes. For terminal mode IBM3287 the control code analysis is limited to detection of the Form Feed (EBCDIC hex 0C) and Linefeed (EBCDIC hex 15), as well as allowing Scandinavian transliteration of EBCDIC to ASCII using the `-SX` parameter. If the terminal mode is PRT722X or A2 then Gspool will interpret the SS2 sequences for 8-bit national characters and the SI/SO sequences for graphics, which will be generated as the *Host Links* internal standard (see the *Host Links Installation and Configuration* manual). All other control sequences are suppressed. In all cases where `-cc` is on and the translation parameter `-XL xy` has been used, then the 7-bit national characters of country `xy` will be mapped to the correct ISO 8-bit representation.

GCOS7 print

GCOS7, for historical reasons, assumes that 7bit lines all terminals are used to attach all terminals, and uses a 'shift' mechanism to send 8bit print data.

If you are sending 8bit data in the printers own native mode, then the best way to avoid problems is to use the GTwriter parameter CSET=NO in the TERM definition.

If you are using G&R/Ggate to connect to GCOS7, then a new G&R printer type has been defined for the GCOS7 Diane systems using PLW internally. If you set your printer terminal type to PRT9220 then all 8bit (accented) characters are sent as single characters, and need no SS2 decoding. Ask G&R or Bull for the necessary Diane update level.

If you are using a print application to deliver print data to a printer with an extended character set, and have used printer terminal mode PRT722X, A2, PRT1220 or DKU7107 (attached printer) to enable it, then 8bit (accented) characters are encoded as SS2 (Single Shift Two) sequences of 7bit characters for transmission. Gspool must decode these sequences to single 8bit characters before they are sent to a UNIX/Linux or Windows printer.

There are two alternative SS2 encodings, Esc E and 0x19. The one used depends on how the printer is configured in the mainframe, but in most cases you can simply enable both options (`-st on`). There are specific cases where this doesn't work; for example if the application sends 'transparent' (text) print containing PCL (Print Control Language) to a printer. Print Control Language uses Esc E as a control sequence (print reset), and it must arrive at the printer unchanged. For these applications you must configure the printer in the mainframe to use 0x19, and you would set `-ESS2 OFF`. There are also print applications (bar code printers) that use only Esc E for SS2, and expect 0x19 to be delivered to the printer (`--19SS2 OFF`).

There are some non-standard print applications that use Esc E as SS2 but need to send a 'real' Esc E command through to the printer. Gspool provides a work-around; you may send the command as Esc Esc E. If you set `-DE ON` this results in a single Esc E being sent to the printer rather than used as SS2. This last option only takes effect if you also use `-ST ON`.

Mainframe control of spooling

When delivering print output to a spooling system, it is often important to make sure that a complete logical print job is collected before being delivered for print. A timer may be used (`-PW`), but the safest way is for the host to signal to the print spooler when it would like a particular job delivered. Gspool offers the following in addition to a timer:

- Any message without print addressing (only if `-pa off`).

- The *G&R/Glink* 'start printer spooling' command sequence:

  ```
  ESC [ 9 7 8 x (hex 1B 5B 39 37 38 78)
  ```

  forces print of the collected file, and then disables the timer such that all following print will be collected on one file, regardless of pauses in host output. The string must come as a single record from the host.

- The *Glink* 'end printer spooling' command sequence:

  ```
  ESC [ 9 7 9 x (hex 1B 5B 39 37 39 78)
  ```

  forces print of the collected file. The string must come as a single record from the host.

- A user-defined string (`-PSTR hxhxhxhx`) arriving anywhere within a print block will force print of the collected file, including the partial block.

- Disconnection.

In DPF8-DS mode the host has a command channel used to initiate spooling of the print reports, so no mechanism is needed. In this mode the `-PW` parameter is used to specify an idle time-out, default 30 seconds, which causes Gspool to disconnect. The idle timer starts when there are no longer any print reports in transit i.e. all reports delivered over the data channel have been printed as a result of commands on the command channel.

GCOS7 GTwriter spooling control

GTwriter on GCOS7 has various options that can be used to decide when to deliver a report to the local spooler.

You can set the `TERM` directive `KEEP` off to make GCOS7 disconnect when the queue of reports to a printer is empty. You can set the `DISCO` parameter to make GCOS7 disconnect at the end of each report.

The `-PSTR` parameter can be used if it is possible to add a sequence at the end of each report to flag when Gspool should spool the report. If you cannot add a sequence to the reports, then one possible method is to use a printing environment (`ENV` in the `FORM` directive of the form used to print the report). This is the name of a file in `SYS.TWENV` that is sent to your printer at the start of each report using the `FORM`. You might actually need this in order to set up the printer, but if not you can use a file with a single CR (Carriage return). Use of the `ENV` parameter enables use of the `RESET` parameter in the `TERM` definition. The `RESET` string can be up to five characters, and is sent at the end of every report where the `FORM` has an `ENV`. Choose some sequence that does not occur in your reports, specify it as the `RESET` in your `TERM` definition, and as your `-PSTR` in Gspool, and your reports will be spooled individually, even though you have `KEEP` in the `TERM` definition, and there are more reports queued for the `TERM`. Note that Gspool by default waits until the -PC or `-PS` command is finished before sending the final TURN to GCOS7, so you can ensure safe delivery of the report before allowing GTwriter to mark the report as delivered.

Flow control

The GCOS7 TWRITER uses the 'turn' as flow control, and in Terminal Writer mode Gspool will return the 'turn' whenever it has processed a print block and finds itself with the turn. TWRITER normally disconnects the logical line at output completion, and Gspool then executes the print command or releases the physical printer, and waits for another remote connect.

The Secondary Network Manager never gives Gspool the 'turn' and does not seem to have any form for flow control.

Some of the GCOS8 print management systems also use the 'turn' as a flow control mechanism and refer to the mode as 'End to End Acknowledgment' (incorrectly, see below). If Gspool is configured with the -TS parameter it will give back the 'turn' each time it receives it, by transmitting a null block. RSM8 expects to get the 'turn' back in this way, and also connects out to Gspool, so use -TW mode as for TWRITER.

Gspool sends the turn back only when it is finished processing the current block. If the block causes the spool command to be executed, then Gspool will wait for the spool command to complete before continuing, thus preventing the host from sending more print during the spooling operation.

If you are using a spool command then it will terminate immediately after the print report has been delivered to the spooler. If it is your intention that Gspool should not accept more print until the current print is completed you must delay termination of the print command. A simple example using lp would be the following script:

```
RQ=`lp $* | cut -f 4 -d ' '`
while test `lpstat | grep -c $RQ` -eq 1
do
   sleep 2
done
```

This script can be used instead of lp directly, to delay the turn.

Gspool

GCOS8 DAC or DAC-Q applications can use End to End ACK as documented in the DSA dialog protocol. This means that an acknowledgment request is set in the DSA header of output data records and the acceptor signals reception by transmitting a DSA attention record back. This is supported at the line protocol level using the parameter `-EE`. If turned on it will negotiate EEACK with the gateway, and then automatically ACK every block that requests EEACK as it is received. If you wish that DSA EEACK should function as a real flow control mechanism at the Gspool level you must set the Gline `-DEE` parameter. In this case the EEACK mechanism will be converted in Gline to a 'turn' mechanism. Gline will not send the ACK until it has received the 'turn' back from Gspool (Gspool needs the `-ts` parameter). See the description of the 'turn' based flow control above.

The newer GCOS8 DSA300 applications implement End to End ACK using minor synchronization records. These are negotiated automatically, and need no parameter.

DPF8-DS has a flow control mechanism built into the protocol.

DPF8 - Distributed SYSOUT

DPF8-DS is a GCOS8 spooler that can pick up GCOS8 print in SYSOUT format from the GCOS8 spooling area on disk. The SYSOUT format is complex with slew codes, media codes, report codes, etc. DPF8-DS converts it to ROP format, and sends it using TCP/IP. When started with the `-DPF8` parameter Gspool on any Host Links platform accepts DPF8-DS print via TCP/IP and delivers the print in the way specified in the Gspool configuration.

In DPF8-DS mode the `-li tcp` line parameter is required. Gspool will start two TCP line handlers that will automatically wait for DPF8-DS connects to the Data and Command channels. DPF8-DS will open these channels by connecting to the TCP ports 9000 and 9001. When Gspool is started in DPF8-DS mode and you execute a 'netstat -a' command, these two ports will be listed as being in a LISTEN state – meaning that Gspool is ready to accept a connection from DPF8-DS. DPF8-DS will not disconnect the session once established. Because DPF8-DS supports a limited number of simultaneous connections, and because the line costs may be related to connect time, Gspool in DPF8-DS mode uses the `-PW` parameter to set an idle time-out, default 30 seconds, after which it will disconnect. If you have few Gspool sites accepting SYSOUT from DPF8-DS, and if line costs are fixed you can avoid the disconnections by setting a higher value (maximum 4000).

Gspool concatenates DPF8-DS report files that logically belong to the same print request before executing the print operation for the job. This reduces the total number of jobs in the local print queue dramatically and makes it a lot easier to track DPF8-DS print jobs. Note that this behavior is only important when communicating with older DPF8-DS versions. DPF8-DS version 3.0 offers the same functionality and Gspool sees all print requests from DPF8-DS version 3.0 as single files.

Gspool normally delivers the print using a print command configured with the `-PC` parameter. On UNIX/Linux Gspool normally delivers to the standard spooler, 'lp', or any other print program. On Windows systems Gspool normally delivers to the local spooler using the printer port from `-PS`.

Gspool

When `-DPFC` is specified, Gspool will map the DPF8-DS `copies` parameter to a Gspool print command (`-PC`) option. The default is to append the parameter `-nxx` to the print command, but an exception is made if `lpr` is configured as the print command. In these situations the parameter `-# xx` is appended instead. This functionality is supported in both the UNIX/Linux and the Windows version.

When `-DPFQ` is specified, Gspool will map the DPF8-DS print queue option `-q Queuename'` to a local print destination. Under UNIX/Linux the DPF8-DS queue name is inserted in the print command, before the filename, as `-dQueuename'`. Unless `lpr` is configured as the print command, in which case Gspool address a `lpr` queue with `-P Queuename`. Also under Windows systems the DPF8-DS queue name can be used to supply the printer queue name. In this case only the first part of the path to the printer port should be configured in Gspool e.g. `-PS \\SERVER` and the final part of the path name should be given with the DPF8-DS parameter –Q QUEUENAME.

When `-DPFI` is specified, Gspool will use the DPF8-DS interface field as the print command. It is converted to lowercase by Gspool and overrides any print command defined with the –PC parameter. Note that the DPF8-DS parameter, `-INTF cccc`, has a maximum length of 4 characters.

When `-DPFO` is specified, Gspool will map the DPF8-DS option field to a local print command option. Under UNIX/Linux the DPF8-DS option `-o "Option"'` will be inserted in the print command, before the filename, as `-oOption`.

On UNIX/Linux you may use `-DPFX`; Gspool will then deliver the print to OpenSpool (from HP, but marketed by Bull as DPF OpenSpool) by generating a print command in the following format:

```
np -b titlepos -c copies -F font -P form -k keep
   -o options -q queue -T titletext -p priority
   -B bannerscript -Z trailingbanner -n requestname
```

You may of course write your own UNIX/Linux shell script that replaces OpenSpool and takes advantage of all this information to customize your print reports.

Gspool identifies itself with version number and date stamp when the ID option is used with the DPF8-DS status command, e.g. `prtctl st -d gars -o id`.

Gspool acknowledges successful reception and printing of DPF8-DS print reports with a text message. Gspool sends the text "Gspool_print_ok", and this text is displayed when executing DPF8-DS status commands on GCOS8.

Map uppercase printer queue name to mixed case (UNIX/Linux only)

The printer queue name specified with the DPF8-DS parameter –Q is transferred to Gspool as an uppercase text string. This text string can be mapped to the real (mixed-case) printer queue name in the Gspool file `gspool.map`

The resulting printer queue name can contain a mix of upper and lower case characters.

Gspool will read the file `/usr/gar/config/default/gspool.map` if it exists, and check the printer queue mappings before executing the print command. The content of the file must have format:

```
-label1 printqueue1
-label2 printqueue2
```

where 'label1' and 'label2' are compared to the DPF8-DS print queue name and if a match is found the print queue name following the matching label is substituted for the value delivered by DPF8-DS. If no match is found, the print queue name delivered by DPF8-DS is converted to lowercase and used as it is.

Example `gspool.map`:

```
-dpf8q1        Hpprinter
-hpprinter     Hpprinter
-dpf8q2        Lexmark
-printer       Canon
```

Example of a Gspool startup command:

```
gspool -id dpf -dpf8 -dpfq -pc lp -li tcp
```

and examples of possible DPF8-DS print parameters:

Gspool

```
-D GARS -Q DPF8Q1
-D GARS -Q PRINTER
-D GARS -Q HPPRINTER
```

would result in Gspool (on gars) executing the following print commands:

```
lp -d Hpprinter filename
lp -d Canon filename
lp -d Hpprinter filename
```

TN3270/TN3270E print

Gspool supports TN3270 print as specified by RFC1646, and as implemented in the OCS TN3270 gateway. The parameters `-TM IBM-3287-1 -LU luname` allow Gspool and the `gl_tcp` line handler to connect to the TN3270 gateway in such a way that a specific or pooled printer LU is addressed.

Gspool also supports TN3270E print as specified by RFC1647, and as implemented in the TN3270E gateway bundled with MS SNA Server for Windows. The parameters `-TM IBM-3287-1 -LU luname` allow Gspool and the `gl_tcp` line handler to address a generic printer LU when connecting to the TN3270E gateway. If the parameter `-AP ON` is used together with `-TM IBM-3287-1 -LU luname`, Gspool will get the printer LU that is associated with the terminal LU `luname` in the TN3270E configuration.

Gspool

Administration

Gmanager

All active instances of Gspool report their current status to the Gmanager database. This can be viewed using Gmanager for UNIX/Linux or Gmanager for Windows. Gmanager's server status list will show you the most recent status message from all Gspools sharing the G&R system directory, and you can view their log files. You can also issue commands to GSPOOL.

Standard commands

The commands that are accepted by all servers are:

➢ DOWN - terminates the server

➢ STATUS - reports server-specific status information to the log file

➢ PARAM - brings up a dialog box that allows the operator to give a command line parameter to the server. Note that some parameters do not work when given interactively i.e. they can only be handled at server startup time

➢ DEBUG ON/OFF - toggles on and off tracing interactively

Gspool-specific commands

➢ DEBUG ON/OFF/NEW/APP – changes trace mode interactively

➢ PRINT - prints the current Gspool collection file, using the configured `-PC` or `-PS` parameter.

➢ PBIN - For Windows only. Requests the printer driver to list the supported paper source names in the Gspool log. The standard Windows names are:

```
auto, lower, cassette, manual envelope, envmanual,
onlyone, formsource, tractor, smallfmt, largefmt, trayn
```

Gmanager has a 'Tools' menu entry that returns the supported list.

Gspool event log

As with all other Host Links server programs, all active Gspools now write an event log in a product specific directory under the servers directory in the G&R system directory. There is one Gspool directory for each DSA node name <SCID> for which connections are being accepted. Gspool platforms that do not have a DSA configuration file, such as Gspool platforms using TCP/IP for socket level communication with DPF8-DS or TN3270/TN3270E/TNVIP modes, use the first 4 characters of the logical name of the UNIX/Linux or Windows system instead of the SCID.

Windows	\gar\servers\<scid>.gsp
UNIX/Linux	/usr/gar/servers/<scid>.gsp

The log file name is _logfile.<id> where the ID is by default def and which must be made unique if multiple Gspools are used by setting the -id parameter. When started on demand the IDs are generated as _00, _01, _02 etc.

Example of the content of the log file:

```
File: K:\GMAIL\SERVERS\IS2C.GSP\_LOGFILE.DEF

[1997/01/07 14:29:14] G&R/Gspool printer simulation 5.0.0c Jan  7
[1997/01/07 14:29:14] $$TCP: Connected to application.
[1997/01/07 14:29:16] $$TCP: Disconnected by application.
[1997/01/07 14:29:16] Normal termination
[1997/01/07 15:39:10] G&R/Gspool printer simulation 5.0.0c Jan  7
[1997/01/07 15:39:11] $$TCP: Connected to application.
[1997/01/07 15:41:15] $$TCP: Disconnected by application.
```

The event logs are 64k long, and we keep the last three generations for reference.

```
Directory : K:\GMAIL\SERVERS\IS2C.GSP

 file  _LOG_001.DEF
 file  _LOG_002.DEF
 file  _LOG_003.DEF
```

Gspool session history log

Gspool maintains a session summary log if configured. The session log is optionally updated each time a host session terminates and contains session status information: amount of data received, copy of print data (if the print command failed) etc. The history log makes it easier for the administrator to follow Gspool activity and make sure that print problems are resolved.

The history log is located in Gspool's server directory:

Windows	`\gar\servers\<scid>.gsp\report.history`
UNIX/Linux	`/usr/gar/servers/<scid>.gsp/report.history`

where 'SCID' is the local session control ID.

The history logging is controlled by a Gspool command line parameter:

```
-HIST [ON/off/all]
```

If all is specified, Gspool writes information about all sessions in the history log. In the default case (ON), only failing sessions are logged.

The Gspool Monitor

If the Gspool session history log is activated and your server is Windows, your administrator can use the Gspool Monitor utility to administrate your Gspool sessions. The administrator can check all sessions, verifying that print reports received by Gspool have been successfully transferred and properly handled at the final destination. See Appendix entitled **The Gspool Monitor**.

Gspool for Windows

All copies of Gspool can run as Windows services, administrated by Gservice. For start on demand the DSA listener launches Gspools as services via Gservice. Copies that are to be pre-started at Windows startup must be configured in Gservice's configuration file. Gmanager can be used to monitor active Gspools, to stop active copies of Gspool, and to restart copies that have stopped.

Gspool for UNIX/Linux

Status information about running Gspools can be listed by the qstat command. Only users with root privileges will get information on copies of Gspool started by others than themselves.

Based on the process-id information from qstat Gspool daemons can be stopped using the normal UNIX/Linux kill command. All network events are reported to the log in the standard *Gline* format with a header identifying the line-handler, e.g. $$DSA from gl_dsa.

Gmanager can be used to monitor active Gspools, to stop active copies of Gspool, and to restart copies that have stopped.

Error handling

Connects/disconnects

In TWRITER (also used by RSM8), DPF8-DS, SNM and IBM mode Gspool waits for connections from the remote host. When a connection is received, Gspool reports the connect with the message:

```
$*$CN mailbox_name,node
```

where `mailbox_name` is the remote mailbox name and `node` is remote node.

When in TWRITER, SNM or IBM mode, the disconnections are reported:

```
$$DSA: Disconnected by application
```

Some host applications (RSM8) abort the session.

Note that a Gspool that connects to a host application at startup (`-CN`) will by default terminate when the host disconnects. This may happen when an intermediate Datanet is rebooted. Gspool can be instructed to stay in execution and attempt repetitive connections (once a minute) by setting the reconnect parameter (`-RC`).

Windows Printer not available

On Windows systems when sending the print to a printer defined with the `-PS` parameter, the printer may become unavailable after the print has been received from the remote host, but before or during delivery to the printer queue. In this case the Gspool print operation fails and Gspool makes a copy of the temporary print file to the Gspool server directory:

Windows `\gar\servers\<scid>.gsp\gsp-<pid>.<counter>`

Where `<scid>` is the DSA node name, `<pid>` is the process id of this instance of Gspool and `<counter>` is the number of print failures for this process-id. In order to prevent print data to be transferred from the remote host to the Gspool system if the printer itself is unavailable, we have introduced the `-DCK nn` parameter. When enabled ($nn > 0$), Gspool will check that the printer is available at startup and then every nn seconds when Gspool is idle, waiting for remote connections or print data. When Gspool discovers that the printer is unavailable it aborts the host connection. The remote host regards the print operation as failed and will schedule a re-print.

Troubleshooting

If you are experiencing any kind of problem when using Gspool to print data from your host application you should consider Gspool monitor. For extra information on problems you should consider running Gproxy, and checking the warnings HTML pages generated by Gproxy for Gspool error reports. If you need to report a problem to your distributor the Gspool trace file and/or the line handler trace file will provide useful documentation of the problem. See the appendix *Host Links Trace* for a full discussion of how to generate G&R/Host Links trace files.

Gspool trace file

This trace file contains details about Gspool's processing of host input. To enable this tracing, add the `-DBG` option to the Gspool start-up command or to the relevant section of the Gspool configuration file:

```
        -USER
                -DBG ON/off/new/app
```

ON	default if no parameter is given to `-DBG`
OFF	is the default if `-DBG` is not used
NEW	creates a new debug for each print job, using the process ID as a debug file name suffix (gsp.01668)
APP	append debug information to the debug file using the standard suffix (e.g. 'def')

Line handler trace file

This trace file contains details about line handler operation. To enable line handler tracing, add one or both of the `-D_` and `-S_` options to the Gspool start-up command or to the relevant section of the Gspool configuration file:

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

Gspool and line handler trace file examples

Examples of directory- and file-names

`/usr/gar/debug/en01`	**Debug directory for DSA node 'en01'**	
`gsp.def`	Gspool (default `-id`) trace file	`(-dbg)`
`gsp.01668`	Gspool trace of print job with process ID 01668	`(-dbg new)`
`gsp-gli.def`	Gspool (default `-id`) line handler trace file	`(-li dsa -s_)`
`/usr/gar/debug/en02`	**Debug directory for DSA node 'en02'**	
`gsp.abc`	Gspool (`-id abc`) trace file	`(-dbg)`
`gsp-gli.abc`	Gspool (`-id abc`) line handler trace file	`(-li dsa -s_)`
`gspc-gli.def`	Gspool DPF8 command line handler trace file	`(-li tcp -s_)`
`gspd-gli.def`	Gspool DPS8 data line handler trace file	`(-li tcp -s_)`
`gsp._00`	Gspool started on demand trace file	`(-dbg)`
`gsp-gli._00`	Gspool started on demand line handler trace file	`(-li dsa -s_)`

When connecting through Ggate

UNIX/Linux location:	/usr/gar/debug/**ZZZZ**/gga**NN-PPPP**.dbg
Windows location:	C:\gar\debug**ZZZZ**\gga**NN-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 Gspool in this case)

When Gspool or any other G&R or customer applications based on GlAPI connect through Ggate to the host application, the line handler trace will be generated on the Ggate system, with the name and location shown in the table above. In this case the Gspool start-up command or Gspool configuration file would look like this:

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

(YYY =line handler identification, i.e. DSA or DIWS)
(PPPP =IP-address of the system running Ggate)

Gspool configuration file

The configuration file is located at:

Windows	`\gar\config\default\gspool.cfg`
UNIX/Linux	`/usr/gar/config/default/gspool.cfg`

By using the `-ID ext` parameter, where `ext` can be any valid filename extension, you may instruct Gspool to use another configuration file than the default `gspool.cfg` file and another identity than the default `.DEF` when updating the Gmanager database. i.e. `gspool -ID gtw` will instruct Gspool to use `gspool.gtw`. This allows several copies of Gspool to be run simultaneously, each with its own configuration file and identity for the Gmanager database. For compatibility with earlier releases the `-CFG ext` parameter is still supported.

Example `gspool.cfg` file:

```
Default
-cn off
-pc 'lp -dpr1'
-li dsa
-ll 6144
-mn twpr
-ln grdl
```

Gspool

The dsa.cfg file

For details of DSA network configuration on the Host Links platforms please refer to the *Host Links Gline* manual.

The DSA configuration file is found:

Windows	\gar\config\dsa.cfg
UNIX/Linux	/usr/serverx/config/dsa.cfg

The DSA configuration needed is minimal. Here is a Host Links system GRDL that will access, and be accessed by, a GCOS7 system with an ISL:

```
# dsa.cfg: Configuration for G&R Host Links node GRDL

# Local node. DSA/DIWS type, LAN access.
sc grdl -addr 54:60

# Remote nodes accessed by GRDL

# A DPS7 system, B7DL, LAN access (over ISL)
rsc b7dl -addr 1:4 -ts b7dl_lan
ts  b7dl_lan -class 4 -ns 080038017777 -tp grdl_lan

# Local transport provider (TP4)
tp grdl_lan -attach 02608c200441
```

Here is the same Host Links system as it would be configured for access to a GCOS8 system via a Datanet:

```
# dsa.cfg: Configuration for G&R Host Links node GRDL

# Local node. DSA/DIWS type, WAN access.
sc grdl -addr 54:60

# Remote nodes accessed by GRDL

# A DPS8 system (DNET/ROUT and CXI), accessed over WAN in DN01
rsc b8dt -addr 1:1 -ts dn01_wan
rsc b8dc -addr 1:2 -ts dn01_wan

# The Datanet, used for WAN access to DPS8
ts dn01_wan -class 2 -ns 130399 -tp grdl_wan

# Local transport provider (TP2)
tp grdl_wan -attach 130355
```

Gspool

Host configuration files

Secondary Network Manager

For GCOS6 SNM the node and name are specified in the network configuration file. For example, to send print to a Gspool using mailbox name SNMPRINT on node EN3D you might configure:

CLM_USER

```
*-----------SNM -- --*
SNMLEV 24                 * snm level
SNMDEV 150                  * SNM lrns
DEVICE STD150,150,24,X'FFC0',SNMSCREEN,,N   * DKU
DEVICE STD150,150,24,X'FFC0',SNMPRINT,,N,,,,ROP
```

This defines two devices, a screen and a printer, as being in the secondary network. These must then be defined in the network configuration using the same LRN (150). The printer device name is used as the mailbox name only for clarity. The LRN is the connection between the two configurations.

NW_CONFIG secondary network

```
     TERM   -NAME SNM150 -- unknown rem DKU, mbx snm150
            -MODE USER   -NTD NTDVIP
            -TYPE DKU7107 -EL 150

     TERM   -NAME PRT150 -- remote printer on GRDL
            -MODE IMPLO -NTD NTDVIP
            -TYPE TTU8125 -EL 150

     RTERM  -NAME SNMPRX -- conn. from SNM to SNMPRINT
            -CM DSA -AD1 GRDL
            -AD2 SNMPRINT -GN PRT150
```

Terminal Writer

For Terminal Writer the node and name are specified in the `TWRITER GENERATION` file on GCOS7. For example, to send output to a Gspool using mailbox name `TWPR` on DSA/DIWS node `GRDL` you would configure.

```
COMM *TERMINAL DEFINITION;
TERM TWPR ID=TWPR NODE=GRDL DRIVER=TW01;
```

When working with Terminal Writer you may find the following commands useful:

GCOS7 command	Comment
`STO TWPR`	Start Terminal Output to printer TWPR. Required from the console when the printer is in CLS state.
`DPR <FILE> <LIB>.<MEMBER> TWDEST=TWPR;`	Send the file <FILE> from the library <LIB>.<MEMBER> to the printer TWPR.
`DTO;`	Display Terminal Output: Display Twriter report details.
`DTO TWDEST=TWPR DETAILED=1;`	Display detailed information about printer TWPR
`CTO R66;`	Cancel Terminal Output: Cancel Twriter report R66
`HTO R66`	Hold Terminal Output: Hold Twriter report R66.
`MDTO`	Modify values for a Twriter report.

Datanet OSF SNA gateway

For IBM hosts the 'printer' (Gspool) is specified in the VTAM configuration as a LOCADDR on the LU describing the OSF gateway. OSF maps the LOCADDRs sequentially onto the EUx devices described in the CO entry for the RSND corresponding to the DSA/OSI node. If the VTAM LU entry doesn't use LOCADDR 1 then you need a dummy EUx entry in the OSF config, and thereafter you must describe the devices in the LOCADDR sequence from the VTAM LU configuration. Here is an example describing a screen and a print device configured in VTAM as LOCADDR 1 and 2. The 'printer' will be Gspool using mailbox name G32PRINT, and is a dedicated device in OSF, which means that both the 'node' session control address (-SITE below) and the mailbox name must be defined so that OSF can connect to Gspool.

```
CO GRDLLU    RSND   -SITE GRDL -GM GRDLG32 GRDLL32

CO GRDLG32   PLMB   -GE DCBT0011

CO DCBT0011  EU3    -TYPE SC32

CO GRDLL32   GRMB   -GE DCBT0012

CO DCBT0012  EU2    -TYPE LP32 -APPL G32PRINT
```

Gspool

Appendix: The Gspool Monitor

Background

One of the key components in the Host Links program suite is the DSA/DIWS session 'listener'. The listener's main task is to listen for incoming connections from the network e.g. incoming file transfer and print job requests, and to start the appropriate Host Links server applications to handle such requests. These server applications can be pre-started, in which case the host initiated session is simply passed on to the waiting server application, or the server application can be launched automatically 'on demand' when the host initiated request is received. In either case, the process of running the server application to completion is normally completely transparent to the Host Links administrator or user.

In a heavily loaded configuration there might be hundreds of host initiated requests running simultaneously, all started by the listener; and thousands of sessions might be processed during the course of a production day. If, some time after processing is complete, there is a need to investigate a given session; it can be a time-consuming exercise to find the required information in the various Host Links log files. This is particularly a problem for a Gspool session, due to the fact that even if the print data is successfully transferred to Gspool and the session terminated normally; the succeeding print operation can fail, requiring some sort of recovery. This is where the Gspool Monitor comes into play.

Scope of the product

The Gspool Monitor is a Windows-only utility program that provides the administrator with a single administrative entry point for monitoring all Gspool sessions. The administrator can check all sessions, verifying that print reports received by Gspool have been successfully transferred and properly handled at the final destination. In the event that print data handling was not performed successfully, e.g. due to a printer or spooler problem, the Monitor offers the administrator the possibility of manually reissuing the print request after the printer problem has been corrected, redirecting the print data to another printer in the network or passing the print data to a command or a script procedure. If necessary the administrator can use the Monitor to dynamically change the Gspool print parameters before issuing a new print request.

Starting the Gspool Monitor

The Gspool Monitor is typically launched from the Host Links main administrative component *Gmanager* (Tools menu) but can also be started directly from the Host Links binary directory using a command line.

Input data

The Monitor builds a Gspool session structure based on the information in the 'history file' that is optionally maintained by Gspool sessions. The history file contains information about Gspool sessions, such as date and time, number of bytes transferred, parameters used to process the print data, status of the print procedure and, in the case of a failing print procedure, the name of the saved report file.

The history file name is:

```
report.history
```

and is located in the Gspool server directory with path name:

```
c:\gar\servers\SCID.gsp\report.history
```

where SCID is the local node name in the DSA configuration file.

The history file can contain information about all Gspool sessions processed, or only sessions that require some kind of manual intervention. The Gspool command line parameter that is used to control this is:

```
-HIST [ON/all/off]
```

ON   Gspool creates a new entry in the history file if the print request fails (default).

ALL   Gspool always updates the history file upon session completion.
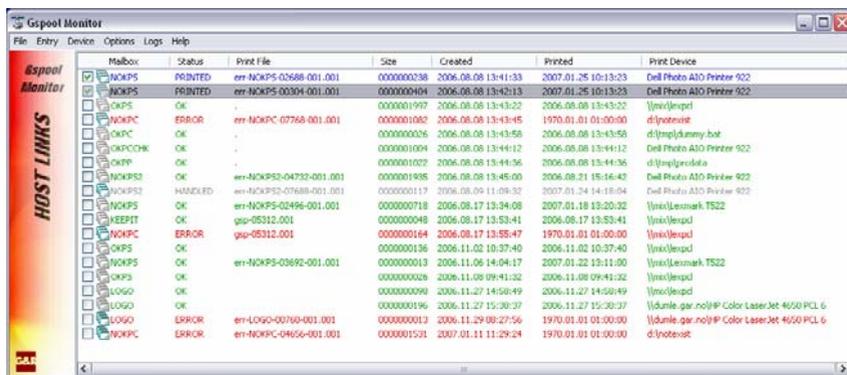
OFF   Gspool does not update the history file.

The following is a sample Gspool command (set in 'gservice.cfg' if pre-started or in the listener configuration file 'config.dsa' for 'start on demand'):

```
gspool -tw -hist all -ps //server/prt01 -li dsa -ln -mn prt01mb
```

Monitor window

The main Monitor window contains a list of Gspool session information as saved to the history file, one line per session. A sample of a Gspool Monitor display window follows:

If you choose to run with –HISTORY ALL, the list will contain successful sessions (default green) as well as failed sessions (default red). For all failed sessions the print data is automatically saved by Gspool and is hence available for recovery action.

Gspool

For each entry (session) in the history file, the following fields are listed:

Mailbox

The name of the HOST LINKS application mailbox (corresponds to the name of the logical printer). It can be up to 12 characters long and is configured in the `gservice.cfg` file (for pre-started Gspool server) or in the Listener configuration file `config.dsa` (in the case of a Gspool server started 'on demand').

Status

This is the current status of the session entry. It can be one of the following:

OK	The session terminated without any problem.
ERROR	The session terminated with error and some interaction (e.g. reprint) is necessary.
PRINTING	A print request (from this Gspool Monitor) is in progress.
PRINTED	A print request (from this Gspool Monitor) has been performed.
EXECUTING	A print command request (from this Gspool Monitor) is in progress.
EXECUTED	A print request (from this Gspool Monitor) has been performed.
HANDLED	A print or command request has been performed previously (i.e. by another Gspool Monitor session).

Print File

This is the name of the print file saved by Gspool. A default filename is composed as follows:

```
err-MBXNAME-ppppp-nnn.mmm
```

MBXNAME	is the name of the application mailbox ('printer name')
ppppp	is the PID (process ID) of the Gspool process that created the file
nnn	
mmm	are sequence numbers

Size

This is the size of the print file (in characters).

Created

The date and time the file was created.

Printed

The date and time the file was printed (by either Gspool or Gspool Monitor).

Print Device

This is the name of the printer/spooler or the command name used for this session entry.

Typical usage

The administrator periodically goes through all the failed sessions in the Gspool Monitor list and either reissues the original request - assuming that the reason for the Gspool failure has been found and corrected, redirects the print to some other device or spooler, or launches some other procedure (e.g. a BAT file) to handle the print data. The following is a typical list of keyboard actions necessary to reissue a failed Gspool print request:

- Select (position to) the Gspool session you want to work with in the session list

- Right click or double-click the mouse

- Choose an action from the list (e.g. Print this report)

- To print the report on a different device, select a device from the list

- Click the Print button

When a session entry has been successfully recovered the session entry will be updated in the Gspool Monitor view of the history file, and will be marked blue (default) in the list.

History file access

Gspool Monitor creates an in-memory copy of the history file when it starts. It then closes the file immediately. Updates to the history file made by new Gspool sessions (i.e. those started after Gspool Monitor was launched) are not automatically displayed in the list. To obtain an up-to-date view including all sessions the user must issue a manual refresh request.

Gspool

When the Gspool Monitor user performs an update to the session structures, the default procedure is to only update the in-memory copy of the file. Typically the user applies the changes physically to the file when he leaves the monitor, but can optionally choose to apply history file changes automatically to the physical file immediately after each request.

The menu interface

All Gspool Monitor functions are available as selections from the menu bar. The following menus and menu entries are available:

The File menu

```
Refresh History
Save History
Save History As
_____
Delete all printed reports
_____
Print a file
_____
Exit                    Alt-X
```

Refresh history data

The Refresh command forces a reload of the history file after possible updates to the file have been saved. It then repaints the list view. If Gspool sessions have completed since the last load of the file, these session will now be displayed. (Accelerator is F5).

Save history data

Force a save of the current status of the file.

Save history data as

Save `report.history` to a new file.

Delete all printed reports

Delete the print data of the current session.

Print a file

Start the generic print function.

The Entry menu

Print current entry
Print checked entries

Set new printer
Set new parameters

Execute cmd/script
Set new cmd/script

Mark as printed
Mark as not printed

View current report
Edit current report
Save current report as
Delete current report

Delete current entry

Print current entry

Display a dialog box that lets you select a device (printer) and gives you the possibility of changing the printer parameters (as inherited from Gspool).

Print checked entries

Mark any number of session entries and print them on the current device.

Set new printer

Select a new printer for the current session entry.

Set new parameters

Set/change print parameters for the current session entry.

Execute cmd/script

Start a command or script using the current report data.

Set new cmd/script

Assign a command or script to the current session entry.

Mark as printed

Set the current (unprinted) session entry status to 'PRINTED'.

Mark as not printed

Set the current (printed) session entry status to 'ERROR' (i.e. not printed).

View current report

Show the print data of the current (selected) session in a separate window (using the viewer configured in the 'VMAP').

Edit current report

Display the print data of the current (selected) session in an editor in a separate window (using the editor configured in the 'VMAP'). This function can be disabled by an environment variable.

Save current report as

Save the print data belonging to the current session to a new file.

The Device menu

```
Set default device
Issue Device Check
Get Device Attributes
Get Printer Bins
Start PrintJob Monitor
```

Set default device

Set a default device to be used as the selected device in all subsequent commands.

Issue device check

Send a dummy print request to the current device to verify that it is operative. If the check succeeds, a 'Device appears to be OK' message is returned, otherwise an error message is returned.

Get device attributes

Send an attribute request to the device. The request returns information about the device such as 'port used', 'driver name', 'location' etc.

Get printer bins

Send an attribute request to the device that returns information about addressable printer bins for the device.

Start print job monitor

Start a separate process that opens a window containing information about the current device's activities (i.e. detailed information about pending print jobs).

The Option menu

✔ Show all entries
✔ Show parameters

✔ Use confirmations
　 Immediate update

　 ListView Colors
　 ListView Font

　 Set default options

Show all entries

Choose between a list of all session entries or just the session entries that are in an error (unprinted) state.

Show parameters

Show the Gspool parameters used for the current session entry (shown when hovering over the entry).

Use confirmation

The Monitor requests a confirmation before performing many of the available functions. This option can disable confirmation for most of them.

Immediate update

When you request an action (e.g. a print request) the in-memory session entry is updated but the physical file `report.history` is not, and you must save the changes manually before leaving the Monitor. This option forces immediate update.

List-view colors

Choose the colors to be used to indicate the status of the various session entries.

Set default options

Reset the various options to their default values.

The Logs menu

Show my logfile
Show Gspool logfile

Show my log file

The Gspool Monitor maintains its own log file that contains information about the actions that have been performed. This displays the log file in a new window.

Show Gspool log file

Display the log file of the current Gspool session in a new window.

Help menu

Help

The information in this appendix.

About

Release information.

Appendix: Host Links Manuals

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

Installation	
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
Line handling	
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
GlAPI	Application Programming Interfaces
Gsftp	Gateway between FTP and SFTP
Emulations	
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

Gspool

Appendix: Host Links Server Administration

Gmanager is the Host Links administration tool. It can be used to control, configure and monitor all the G&R Host Links server programs.

The dialog and interaction between the server programs and Gmanager is based on information located in a database file _active.srv that is located in the Host Links servers directory. The first time a Host Links server program starts up it registers itself in this 'active' file. Thereafter the server program updates this database with status information whenever the server is active.

The Gmanager program is available in 2 different versions – a Windows GUI based version gmanw.exe and a character based subset gman (UNIX/Linux binary) or gman.exe (PC console application).

The basic functionality of the two versions is the same, but the Windows version interfaces directly to other Windows-only Host Links administrative tools (*Gconfig*, *Gservice*), and can also start the browser directly to view HTML reports produced by Gproxy, if enabled, or to view the HTML pages associated with a *Gweb* or *Glink for Java* installation.

The *Gproxy* reports, *Gweb* and *Glink for Java* web pages are of course available to administrators of UNIX/Linux Host Links systems, and can be viewed by starting a browser manually, and connecting to the appropriate URLs:

```
http://mysite.mydomain.com/Gproxy
http://mysite.mydomain.com/Gweb
http://mysite.mydomain.com/GlinkJ
```

Gmanager can be used to perform the most common Host Links administrative tasks. A summary of the available functions follows. The Windows-only functions are marked.

Gspool

➢ View the last reported status information from the servers

➢ Stop or restart all servers, start a new server, stop, restart or delete a server

➢ Send a command to a server

➢ Load the DSA configuration into an editor, compile the DSA configuration

➢ Start the server configuration program or the configuration wizard (Windows)

➢ Load the *Gservice* configuration into an editor (Windows)

➢ Edit the product specific configuration files

➢ View a server log file, a server trace file or the server configuration file

➢ View program version numbers, program link information (Windows)

➢ View license info and license usage (Windows)

➢ View Host Links environment information, the 'VMAP' (Windows)

➢ Start Gdir directory administrator, Ggate monitor, Gspool monitor

➢ Gather all traces and logs for trouble-shooting by support

➢ Gping a DSA node to check the connection, use Gerror to explain error code

➢ Set a transport route state (down, enbl, lock, used)

➢ Check if a printer is on-line, request a list of bins

➢ Connect directly to the *Gproxy*, *Gweb*, *GlinkJ* HTML pages(Windows)

The commands that are accepted by all servers are:

➢ DOWN - terminates the server

➢ STATUS - reports server-specific status information to the log file

➢ PARAM - allows the operator to give a command line parameter to the server. Note that some parameters do not work when given interactively i.e. they can only be handled at server startup time

➢ DEBUG ON/OFF - toggles on and off tracing interactively

Additionally, the server in question might support other interactive commands. For a description of the supported commands, check the server-specific documentation.

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?:
```

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 snm151
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
```

Gspool

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.

Windows server	gspool -id gs1 -dbg -ps \\SERVER\LEXMARK -li dsa -da tptst -d_ on
UNIX Linux	gspool -id gs1 -dbg-pc lp -li dsa -da tptst -d_ on

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.

Gspool

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:

Windows server	`\gar\debug`
UNIX Linux	`/usr/gar/debug`

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 GlAPI 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:

Windows server	\gar\debug\NODE\gga**NN-PPPP**.dbg
UNIX Linux	/usr/gar/debug/NODE/gga**NN-PPPP**.dbg

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

The trace file name consists of the prefix gga**NN-** followed by the IP-address of the client, suffixed by .dbg for a terminal session or -dbp 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:

/usr/gar/debug/jim	**Debug directory for user 'jim'**	
qsm.dbg	Qsim emulator debug file	-dbg

Gspool

`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_`
`/usr/gar/debug/mike`	**Debug directory for user 'mike'**	
`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_`
`/usr/gar/debug/en01`	**Debug directory for node 'en01'**	
`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_`
`/usr/gar/debug/en02`	**Debug directory for node 'en02'**	
`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_`

gsp._00	Gspool started on demand debug	-dbg
gsp-gli._00	Gspool started on demand trace	-li dsa -s_

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>

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

Gspool

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

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/Gerror utility will display when given the DSA code as a parameter.

code	Description
00xx	**General Errors**
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	DNSC: (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.

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.
01xx	**Session Control**
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.

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.

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.
02xx	**Presentation Control**
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.
03xx	**Terminal Management**
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.

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.
17xx	**Network Layer**
1701	PAD connection refused.
1702	Flow control error.

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.

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.

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
18xx	**Transport Layer**
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. 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: 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 (for example, lack of resources).
1835	ISO:QOS priority permanently unavailable locally (for example, due 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.

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.

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.

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 WSAStartup() 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.