The Ethernet II Guide

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About this guide

Ethernet II is an additional network services software package for the Helios parallel operating system. It requires a correctly installed **Ethernet I** package. Hereafter, Ethernet II will be referred to as *Network Services*.

The Network Services package comprises three systems and hence this document is divided into three parts, each containing an overview, an installation guide and a reference. The three parts are:

- Network file server (NFS)

The NFS system provides access to the file systems of remote machines through the Ethernet. Helios provides the client side of NFS; remote access to Helios file systems is not currently supported.

- Line printing system

The line printing system provides access to the printing services of remote machines. Print requests are sent to the remote line printing daemon and subsequently issued to printers residing on the remote host.

- Mail system

The mail system provides a means of sending mail messages between users. Local mail (that is between users on the same Helios network) is delivered directly. External mail is sent to a remote mail daemon which is responsible for

routing the messages to the specified recipients. The Helios mail daemon waits for mail from the remote system and initiates the local delivery of the messages.

A program for manually manipulating the network routing tables is also provided to allow access to other TCP/IP networks through a local gateway.

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Checking things out

Before installing the Network Services, check that your system satisfies the following :

- Helios 1.2.1 or later

- Ethernet 1.0.3 or later

- Memory requirements

  - NFS

  In addition to its code, the Helios NFS server requires approximately 60 Kbytes of permanent workspace plus approximately 14 Kbytes per open file.

  - Line printer daemon

  The line printer daemon requires 62 Kbytes. The auxiliary program that is activated to transfer print requests to the remote host requires approximately 84 Kbytes.

  - Sendmail daemon

  The sendmail daemon requires 72 Kbytes. The auxiliary program that is activated to receive mail messages from the remote host requires approximately 100 Kbytes.

- Disc Space

    The complete installation (including optional examples) requires 450 Kbytes of disc space.

Now check your Network Services package; it should contain the following:

- Two floppy discs (part number:M3110081 for 3.5 inch discs and M5110081 for 5.25 inch discs).

- An Ethernet II Guide (part number: DM5057).

Notice that the package contains a choice of two PC-format floppy discs, 3.5 inch 720 Kbyte and 5.25 inch 1.2 Mbyte. Examine the contents of the disc that suits your system. It should contain the following files:

helios/bin/

lpc	line printer control program
lpq	examine printer spool queue
lpr	create print jobs
lprm	remove jobs from printer spool queue
lptest	generate test output
mail	mail program
route	manipulate routing tables
umount	unmount file system

helios/lib/

lpd	line printer daemon
lpd_aux	auxiliary daemon
nfs	network file system
sendmail	communicate with remote mail system
smtp	runs Simple Mail Transfer Protocol

helios/etc/

printcap	printer capability database
sendmail.hf	help file

helios/local/tcpip/laserp/

laserpri.c	example filter program
laserp	shell script to pipe output from filter to **lpr**
readme	description of **laserpri.c** and **laserp**
makefile	

helios/local/tcpip/tinybiff/

tinybiff.c	simple biff daemon

```
readme                    description of tinybiff.c
makefile

install/netw.ins          loadpac installation script
```

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Loadpac Installation

Before doing anything, it is advisable to make a backup of the installation discs. The Network Services package should be installed using the **loadpac** utility as follows:

1. Type **loadpac.**

2. Select installation drive.

3. Select item 4 from the menu (**Install new software**).

4. Depending on the version of Helios, the option to install item 10 (**Network_Services**) will appear in the menu. If this item does not appear, you should enter the option to install **Unlisted Software.**

5. The **loadpac** program will install the Network Services software. The user will be presented with the following options :

   - Overwrite existing printer capability database (**/helios/ etc/printcap**) if it exists. If the Network Services package has previously been installed and the **printcap** file has been amended, you will probably want to keep the existing file.

   - Install network routing utility program (**/helios/bin/route**). This program is only required if it is necessary to manually manipulate the network routing tables. Please refer to section 7 for details on **route**.

- Install example filter program. If selected, the source code for an HP Laserjet filter will be installed in the directory **/helios/ local/tcpip/laserp**. A **readme** file, explaining the usage of the filter program, will also be copied to this directory.

- Install example biff daemon. If selected, the source code for a simple biff daemon will be installed in the directory **/helios/ local/tcpip/tinybiff**. A **readme** file, explaining the usage of the daemon, will also be copied to this directory.

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Network file server

4.1 Overview

The Helios NFS server provides access to the file systems of remote machines through the Ethernet. The remote machines must provide an NFS server interface. At present Helios only provides the client side of NFS, allowing Helios programs to access remote discs. Remote access to Helios file systems is not supported.

Terminology

NFS is a client/server system where a server on some machine provides remote file access primitives to a remote client via a protocol over the Ethernet. Helios is also a client/server based system, and the NFS program implements a Helios server providing file access primitives to Helios clients. However it is also a client of the remote NFS server. To avoid confusion between the different clients and servers the following terms will be used:

Helios client   - any Helios program

Helios server   - any Helios server

NFS host   - any NFS server on the Ethernet

NFS client	- any NFS client on the Ethernet
Helios NFS server	- the NFS program

Protection

Because of the differences between Helios and Unix access controls, some aspects of NFS protection are only partially supported.

When the Helios NFS server is run, it contains a fixed user and group id pair which are used in all NFS requests. By default these both have a value of zero, which is normally the **superuser**. To prevent NFS clients getting superuser privileges most NFS hosts translate this to a dummy user id with only **public** access to the file system. The **-u** option to the Helios NFS server (see the manual page entry on page 13) causes it to use the user and group id of an entry in the password file for all requests.

To allow such things as directory listings to correctly reflect the user's access rights, a simple translation from NFS access rights (which are equivalent to Unix access rights) to Helios access matrix categories is used (see chapter 14 of The Helios Parallel Operating Systems, ISBN 0-13-381237-5, 1991). The **owner** access rights are mapped into the **V** category of the matrix, the **group** access rights are mapped into both the **X** and **Y** categories, and the **public** access rights are mapped into the **Z** category. Additionally, the **V** category is given the **Alter** access right, and the **V**, **X** and **Y** categories are all given the **Delete** right. If the object is a directory, the **V** category is given **V** access right, the **X** and **Y** categories are given both **X** and **Y** rights, and the **Z** category is given **Z** access rights. An equivalent translation is made in the reverse direction, although the NFS **group** access rights are derived only from the **X** category.

For example, the following modes and matrices are equivalent:

```
Mode             Matrix
drwxrwxr-x       rwv---da:rw-xy-d-:rw-xy-d-:r---z--
-rwxr-xr-x       rwe---da:r-e---d-:r-e---d-:r-e----
-rw-rw-r--       rw----da:rw----d-:rw----d-:r------
```

The access mask stored in a capability returned in **Locate**, **Open** and **Create** operations is manufactured by **ORing** together categories from the matrix manufactured above.

All masks contain the **Z** category, equivalent to **public** access. If the Helios NFS server's user id is the same as the file's owner id, the **V** category is **ORed** into the mask. If the Helios NFS server's group id is the same as the file's group id, the **X** category is ORed into the mask.

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As a result of these translations, the **chmod** command and Posix call will both have an effect on the file access mode equivalent to the changes made on the access matrix.

The **chown** command and the Posix call are not supported: such operations must be performed on the server machine.

4.2   Installation

The following files are installed by the **loadpac** program:

/helios/lib/nfs	Helios NFS server
/helios/bin/umount	Unmount command

The mounting of a remote file system requires the remote host's name and internet address to be present in **/helios/etc/hosts** of the client machine.

It may also be necessary to add the name of the Helios machine to the remote host's **/etc/exports** file: this may require superuser privileges on the remote host.

4.3   User's reference

This section contains a brief summary of each of the commands.

nfs

Purpose: Provides access to the file systems of remote machines through the
Ethernet.

Format: */helios/lib/nfs [-u user] [-s RW] <fsname> <host> <root>*

The arguments are as follows:

-u makes the server use the **uid** and **gid** from the passwd file for the
given user. These *must* correspond to the values used on **<host>**.
At present only one **gid** is used, so choose carefully. All the **nfs**
accesses will use the same **uid/gid** set.

-s Set read and write block sizes. **R** and **W** are single digits ranging
from 1 to 8 and represent the number of Kbytes per read or write
respectively. The default is 5K reads and 8K writes. Note, how-
ever, that a limitation in PC IO servers before V1.2.2 means that
writes greater than 1K will not work through PC ethernet cards.
Such cards are also unable to read more than 5K due to a lack of
hardware buffering. There are no such restrictions for transputer
based ethernet hardware (Parsytec or Inmos cards), so **-s88**
should work.

<fsname> is the Helios server name by which the remote file system will be
known.

<host> is the server machine.

<root> is the root of the directory tree on **<host>** to be mounted.

Description:

nfs mounts a remote file system.

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Example:

```
/helios/lib/nfs -u nick /giga sparky /giga
```

This mounts the **/giga** disc on the host **sparky**. The directory **/giga/users/nick** may now be accessed via exactly the same name from Helios.

Diagnostics

- **<host>: RPC: Port mapper failure - RPC: unable to send**
- **NFS <fsname>: failed to mount <host>:<root> error 1**

  Unable to locate TCP/IP server

umount

Purpose: Clear an NFS host's mount table

Format: *umount <host>*

The argument is as follows:

<host>   The host whose table is to be cleared.

Description:

Most NFS hosts maintain a table of active clients. This table is maintained for information only (it is not essential to the operation of NFS) however it can fill with obsolete entries.

umount is a simple program which clears a given server's mount table of all the entries for the calling client machine. It is good practice to invoke this program for all the NFS hosts used at system shutdown. Alternatively, using it just before starting the Helios NFS servers is also acceptable.

Example:

umount sparky

Clears the mount table on **sparky** of all entries for this machine.

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Line printing system

5.1 Overview

The Helios line printing system provides access to the printing services of remote machines. Directly connected printing devices are not supported. Printers can only be accessed through a remote line printer daemon. The system comprises a line printer daemon (`lpd`) and a number of commands that may be used to submit, examine and remove print jobs. A line printer control program is also provided to administer the operation of the local line printing system. Print jobs are created in a printer's local spool area with the `lpr` command. A print request is then sent to the local line printer daemon which is responsible for transferring the job to the remote system for subsequent printing. The `lpq` and `lprm` commands (examine printer queue and remove jobs, respectively) operate on both the local and remote spool queues. The printer control program, `lpc`, does not affect the operation of the remote line printer system. All operations take `lp` as the default printer if none is specified. This can be overridden by setting the environment variable `PRINTER`.

Notes:

-   Filters

The line printing system does not provide local filter support. Filters must reside on the remote host, and the remote printer capability database must contain the appropriate entries. It is, however, possible to take the output of a local filter program and pipe this to **lpr**. An example filter and details on its usage are provided on the installation disc.

- Lock Files

  To prevent simultaneous multi-user access to control and data files, a file locking mechanism has been implemented. It is possible that a lock file may not be removed in the normal course of events (if, for example, the machine is reset). On encountering a lock file, the system waits for 20 seconds for it to be removed. If the lock is not cleared in this time, the system will assume that the lock file is unclaimed and will delete it. Operations may be delayed while lock files are being cleaned up.

5.2   Installation

5.2.1   Files

The following files and directories are installed by the **loadpac** program:

/helios/bin/	
lpc	line printer control program.
lpq	examine printer spool queue
lpr	create print jobs.
lprm	remove jobs from printer spool queue.
lptest	generate test output.
/helios/lib/	
lpd	line printer daemon.
lpd_aux	auxiliary daemon.
/helios/etc/	
printcap	printer capability database.
/helios/local/spool/	spool directory.
/helios/local/spool/lp/	default printer spool directory.
/helios/local/adm/	error logging directory.

Optional

/helios/local/tcpip/laserp/	
laserpri.c	example filter program.
laserp	shell script to pipe output from filter to **lpr**.
readme	description of **laserpri.c** and

```
                                   laserp.
makefile
```

In addition, the following files are subsequently created and used by the line printer system:

```
/helios/local/spool/
lpd.lock                    task identity of line printer daemon.
<printer>/                  spool directories (default printer
                            queue is lp).
<printer>/lock              task identity of auxiliary daemon
                            (lpd_aux).
<printer>/lockmode          status of printer (numeric).
<printer>/status            status of printer (text).
<printer>/seq               sequence number of next print job.
<printer>/cf*               control file (temporary).
<printer>/df*               data file (temporary).
<printer>/tf*               copy of 'cf' file (temporary).
adm/lpd-errs                error log file.
```

5.2.2   Setting up

The following local and remote database files require modification.

5.2.2.1   Local

To communicate with the remote line printing daemon, the IP address of the remote machine must be known to the local system. If not already present, the name of the remote machine must be added to the hosts database (**/helios/etc/hosts**). If this machine is also the remote **sendmail** host, it will also be necessary to add the alias **mailhost** (refer to section 6.2.2.1).

5.2.2.2   Remote

The name of your machine must be present in the hosts database, and must also be added to the file **/etc/hosts.lpd**. Only hosts listed in this file are permitted access to the line printer services.

Note:

- Alias host names should *not* be used in **/etc/hosts.lpd**

5.2.3   Installing printers

For every printer available to the system, it is necessary to:

- describe the printer in the printer capability database (**/helios/etc/printcap**).

- create a spool directory (**/helios/local/spool/<printer>**)

In a remote printing environment, the local printcap database need only contain the minimum information necessary to identify the names of the remote machine and the printers, and to specify the local spool directories. The installation of printers is best illustrated by an example. Assume that the remote machine, **jabberwocky**, has two printers named **laserjet** and **qms**. The **printcap** file would typically be set up as follows:

```
lp|laserjet:\
   :rm=jabberwocky:rp=laserjet:\
   :sd=/helios/local/spool/lp:\
   :lf=/helios/local/adm/lpd-errs:

qms:\
   :rm=jabberwocky:rp=qms:\
   :sd=/helios/local/spool/qms:\
   :lf=/helios/local/adm/lpd-errs:
```

The above entries have the following meaning:

```
lp|laserjet:
qms:
```

The names(s) of the printer. The first printer, **laserjet**, is also known as **lp** which is the default printer

```
rm=jabberwocky:
```

The name of the remote host. This entry must be present.

```
rp=laserjet:
rp=qms:
```

The name of remote printer (default is **lp**)

```
sd=/helios/local/spool/lp:
sd=/helios/local/spool/qms:
```

The printer spool directory (default is **/helios/local/spool/lp**)

```
lf=/helios/local/adm/lpd-errs:
```

The name of the error logging file (the default is the controlling console).

Local spool directories must be created for each of the printers. Since **laserjet** is the default printer, the spool directory should be

`/helios/local/spool/lp`; the **qms** printer spool directory is simply `/helios/local/spool/qms`. In general, the entries in the above example are sufficient for describing remote printers.

There are several other options that may be used to configure the local system (for example, **:lo=<lock file>:**, **:st=<status file>:**, **:mc# <maximum copies>:**), and a far wider range of specifications that pertain directly to the remote host and which are meaningless to the local system (for example, **:br#<baud rate>:**). Furthermore, accounting is not supported locally; consequently the corresponding codes (**:af=<accounting file>:** and **:pc#<price per page>:**) are ignored.

It is also important to be aware that the line printing system does not provide local filter support. The filters must reside on the remote host, and the associated filter specifications (**:cf**, **:df**, **:gf**, **:if**, **:nf**, **:of**, **:rf**, **:tf** and **:vf**) must be specified in the remote printer capability database.

5.3   User's reference

This section contains a brief summary of each of the commands.

lpc

Purpose: Line printer control program.

Format: *lpc [command [argument ...]]*

Description:

`lpc` is used to control the local line printing system. The operation of the remote system is unaffected by this program. If no arguments are given, the program will prompt for commands from the standard input. Commands may be abbreviated.

Recognized commands are as follows:

```
? [command ...]
help [command ...]
```
Print a brief description of the specified command.

```
abort {all | printer ...}
```
Kill the active printer daemon (if it exists) and disable printing.

```
clean {all | printer ...}
```
Remove unprintable control and data files from the specified printer's spool queue.

```
disable {all | printer ...}
```
Disable queuing.

```
down {all | printer} message ...
```
Disable queuing and printing, and write message to the printer status file.

```
enable {all | printer ...}
```
Enable queuing.

```
exit | quit
```
Exit from `lpc`.

restart {all | printer ...}

Activate a new printer daemon and process any print requests that may be queued.

start {all | printer ...}

Enable printing and activate a printer daemon.

status {printer ...}

Display the status of the local spool queue.

stop {all | printer ...}

Kill the active printer daemon (if it exists) and disable printing.

topq printer [jobnum ...] [user ...]

Move the specified jobs to the top of the queue.

up {all | printer ...}

Enable queuing and printing, and activate a printer daemon (opposite of down).

Example:

lpc status lp

Displays the status of the default printer queue (that is whether queuing and printing are enabled or disabled) and the number of jobs currently in the queue.

Note:

- The contents of the status file can be misleading. If, for example, the command **stop** is issued, the message **printing disabled** is written to the status file. If printing is then re-enabled using the **start** command, the file is not modified to reflect the new printer status.

Diagnostics:

?Ambiguous command

Abbreviation is not unique.

?Invalid command

Self explanatory.

```
<printer> lpc:connect: No such file or directory
  couldn't start daemon
```

The line printer daemon is not active.

```
<printer>:
  no daemon to abort
```

With regard to commands that attempt to kill active printer daemons (for example **abort**), it is worth clarifying that the daemon in question refers to the *active* printer daemon (the task that is activated to process print requests) as opposed to **lpd** itself.

lpd

Purpose: **Line printer daemon.**

Format: */helios/lib/lpd [-l]*

Description:

The line printer daemon waits for local print requests. On receiving a request, it activates an auxiliary program, **/helios/lib/lpd_aux**, which is responsible for transferring the request to the remote system. When **lpd** is started, it examines the spool areas of the printers defined in the printer capability database (**/helios/etc/printcap**) and processes all queued requests.

The arguments are as follows:

-l   Extra logging information. Gives **SYSLOG** notification of daemon activation and print requests.

Note

- **lpd** is typically invoked from an **initrc** file or resource map with a command of the form:
  run -e /helios/lib/lpd lpd -l

Diagnostics :

- **SYSLOG: lpd already exists (<taskname>)**

  It is not possible for more than one printer daemon to be active simultaneously. It is necessary to terminate the existing daemon prior to starting up a new one.

lpq

Purpose: Examine printer spool queue.

Format: *lpq [-l] [-P printer] [job# ...] [user ...]*

Description:

lpq displays the status of the jobs in a printer's spool area. **lpq** first examines the local printer queue, and then reports on the status of the remote queue.

The arguments are as follows:

-l	extended listing.
-P printer	list jobs in **printer** spool queue.
job#	list specified job numbers.
user	list jobs belonging to user.

Example:

lpq -P qms craig

Lists all jobs in the **qms** printer queue that belong to user **craig**.

Diagnostics:

- <hostname>: Warning: no daemon present

It should be noted that the daemon in question refers to the *active* printer daemon (this is the task that is activated to process print requests) as opposed to **lpd** itself.

lpr

Purpose : Line printer program

Format : *lpr [-Pprinter] [-#num] [-C class] [-J job] [-T title] [-i[numcols]]*
[-wnum] [-pltndgvcfrmh] [name ...]

Description :

`lpr` creates print jobs in a printer's local spool area. Files to be printed are
represented as data and control files. `lpr` sends a print request to the local line
printer daemon which is responsible for transferring the job to the remote system
for subsequent printing.

The arguments are as follows:

`-Pprinter`	send output to `printer.`
`-#num`	number of copies.
`-C class`	job classification.
`-J job`	job name.
`-r`	remove file on completion.
`-m`	send mail on completion.
`-i[numcols]`	indent output by `numcols` characters.
`-h`	suppress printing of burst page.
`-l`	use a filter that prints control characters and suppress page breaks.
`name ...`	the name of the file to be printed. If not specified, `lpr` will take the standard input terminated by `EOF`.

pr options:

-p	use remote **pr** program to format the output.
-T title	title string used by **pr.**
-wnum	page width used by **pr.**

Note:

– it is assumed that **pr** does in fact reside on the remote host

filter options

-c	use cifplot data filter
-d	use TeX data filter
-g	use graph data filter
-n	use ditroff data filter
-r	use FORTRAN style filter
-t	use troff data filter
-v	use raster image filter

Note:

– As indicated in section 5.1, support is not provided for local filters. If the above filter options are used, the following warning diagnostic will be generated:

```
lpr: warning - remote filter specification for
format '<option>' assumed
```

– It is presumed that the filter resides on the remote host and has been specified in the remote printer capability database (using a **:cf**, **:df**, **:gf**, **:if**, **:nf**, **:of**, **:rf**, **:tf** or **:vf** option). If a filter option is specified in the local printer database, the following warning will be written to the error log file:

```
lpd_aux: <printer>: printcap filter specification
(<entry=name>) ignored
```

Example:

```
lpr -Pqms -r -m /c/note
```

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Sends the file **/c/note** to the remote **qms** printer. The file will be deleted and the remote line printer daemon will send a mail message on completion of printing.

Notes:

- **lpr** will complain if you attempt to print binary files or directories

- If printing has been disabled (using the **lpc** command), **lpr** will queue print requests.

Diagnostics :

- **lpr: connect: No such file or directory**
  jobs queued, but cannot start daemon.

  The line printer daemon is not active. The request is queued in the printer spool area; when **lpd** is started, the request will be processed.

- **lpr: cannot   create   /helios/local/spool/<print-er>/seq**

  The printer spool directory (**/helios/local/spool/<printer>**) does not exist

- **lpr: cannot access <name>**

  The specified file does not exist

- **lpr: Printer queue is disabled.**

  Queuing is disabled. Use **lpc enable <printer>** to enable queuing.

lprm

Purpose: Remove jobs from printer spool queue.

Format: *lprm [-Pprinter] [-] [job# ...] [user ...]*

Description:

lprm is used to remove jobs from a printer's spool area. If the specified job is
not resident in the local printer queue, **lprm** will attempt to remove the job from
the remote queue. If no arguments are specified, **lprm** will remove the currently
active job (if it exists and is owned by the user invoking the operation).

The arguments are as follows:

-Pprinter	remove job from **printer** queue.
-	remove all owned jobs.
job#	remove specific job from queue.
user	remove all jobs belonging to user.

Example:

lprm -Pqms craig

Removes all jobs from the **qms** printer queue that belong to user **craig**.

Notes:

-   When a job is successfully removed (either from a local or remote printer
    queue), **lprm** displays the names of the corresponding data and control files.
    If, however, a job cannot be removed (if, for example, it is not in the printer
    spool queue), nothing is displayed.

Diagnostics:

- **`<control file name>: Permission denied`**
  The user invoking the command does not own the job.

lptest

Purpose: Generate test output

Format: *lptest [length [count]]*

Description:

`lptest` writes a test pattern using all of the printable ASCII characters to the standard output.

The arguments are as follows:

`length`   output line length (default is 79).

`count`   number of lines (default is 200).

Example:

`lptest 20 30`

Generates a pattern 30 lines long and 20 characters wide.

5.4   Diagnostics

A brief description of pertinent diagnostics and error messages common to the majority of the commands is included below to assist with trouble-shooting. The diagnostics that appear in the user reference (see section 5.3) should also be consulted when attempting to identify error conditions. It should also be remembered that if an error logging file has been defined in the printer capability database, certain errors will be written to file and not to the console.

Printer Capability Database

- **`<command>:   <printer>:   cannot   open   printer   des-cription file`**

   Unable to locate **`/helios/etc/printcap`**

- **`<command>: <printer>: unknown printer`**

   The specified printer has not been defined in the printer capability database.

- **`<command>: <printer>: no remote host to connect to`**
- **`SYSLOG: lpd_aux: no line printer device or host name`**

   Remote machine entry (**`:rm`**) omitted

- **`<command>: <printer>: unknown host <name>`**
- **`unable to get hostname for remote machine <name>`**
- **`SYSLOG: lpd_aux unable to get hostname for remote machine <name>`**

   Invalid / empty remote machine entry (see also *Host Database Files* below)

- **`lpd_aux: <printer>: invalid output device: <name>`**

   Invalid output device (**`:lp`** entry should be empty or omitted)

Host Database Files

- **`<command>: <printer>: unknown host <name>`**
- **`unable to get hostname for remote machine <name>`**
- **`SYSLOG: lpd_aux unable to get hostname for remote machine <name>`**

   The name of the remote machine has not been specified in **`/helios/etc/hosts`** (see also *Printer Capability Database* above)

- `<remote machine name>: <pathname>: Your host does not have line printer access`
- `SYSLOG: lpd_aux <local machine name> unable to access remote printer`

  The local machine name is not listed in the remote **/etc/hosts.lpd** database

Unable to locate TCP/IP server

- `<command>: gethostname: No such file or directory`
- `unable to get network name for local machine`
- `SYSLOG: lpd_aux unable to get network name for local machine`

System Directories

- `<command>: <printer>: cannot chdir to spooling directory`
- `SYSLOG: lpd_aux /helios/local/spool/<printer>: No such file or directory`
- `SYSLOG: lpd /helios/local/spool/lpd.lock: No such file or directory`

  A spool directory (**/helios/local/spool** or **/helios/local/spool/<printer>**) does not exist.

- `SYSLOG: lpd_aux /helios/local/adm/<file>: No such file or directory`

  The directory **/helios/local/adm** does not exist.

Printing/Queuing disabled

- `<host>: Warning: <printer> is down`
- `<host>: Warning: <printer> queue is turned off`

  Use **lpc enable <printer>** to enable queuing, and **lpc start <printer>** to enable printing.

6

Mail

6.1 Overview

The Helios mail system provides a means of communicating with a remote **sendmail** daemon. The system comprises a local mail daemon (**/helios/lib/sendmail**) and a program (**/helios/bin/mail**) for composing and reading mail messages. The function of **sendmail** is to communicate with the remote mail daemon (using the Simple Mail Transfer Protocol (SMTP)). Incoming messages from the remote machine are received by the sendmail daemon, which then invokes **mail** to perform the local delivery. **sendmail** is also responsible for re-directing outgoing mail (either composed using **mail** or fed directly into **sendmail**) to the remote mail system which is then responsible for routing the messages to the specified recipient. Messages that are sent between local users (users within the same Helios network) obviously need not be routed via the remote system; these are delivered directly.

Notes:

- Host Aliases
  On receiving mail messages, the system must determine whether they should be delivered locally or passed on to the remote system. To do so, the host

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name in the recipient address is matched against the local machine name (the name that is specified when the TCP/IP server is invoked). The presence of aliases in the hosts database is not considered. Consequently, messages addressed to aliases of local host names will be interpreted as non-local and re-directed to the remote system.

- Lock Files
  The file locking strategy described in section 5.1 is used to prevent simultaneous multi-user access to strategic files. Operations may be delayed while lock files are being cleaned up.

6.2   Installation

6.2.1   Files

The following files and directories are installed by the **loadpac** program:

/helios/bin
mail	process mail messages

/helios/lib/
sendmail	communicate with remote mail system
smtp	runs Simple Mail Transfer Protocol

/helios/etc/
sendmail.hf	help file

/helios/local/spool/
mail/	mail directory
mqueue/	queue directory

Optional
/helios/local/tcpip/tinybiff/
tinybiff.c	simple biff daemon
readme	description of **tinybiff.c**
makefile	

In addition, the following files are subsequently created and used by the mail system:

/helios/etc/
sendmail.pid	task name of **sendmail** daemon

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`/helios/local/spool/` `mail/*`	mail messages for user *
`mqueue/*`	temporary control and data files (these files are only retained if errors occur while processing the mail request)
`/helios/tmp/*`	temporary mail files
`<home>/dead.letter`	undelivered mail messages - created when, for example, an invalid recipient address is specified
`<home>/mbox`	default file used if no file name is specified when saving a mail message

6.2.2   Setting up

The following modifications should be made to the local and remote systems.

6.2.2.1   Local

The IP address of the remote mail host must be known to the local system. If not already present, the name of the remote machine must be added to the hosts database (`/helios/etc/hosts`). It is also necessary to explicitly identify this machine as the remote mail host - this is done by aliasing the name of the machine to `mailhost`:

```
12.34.56.78 jabberwocky mailhost
```

Notes:

– Login script (optional)
   The Helios `login` program does not currently check for the presence of mail. You may wish to add something along the lines of the following to your `loginrc`:

```
test -s /helios/local/spool/mail/<username>
if ($status == 0) echo You have mail
```

– User postmaster (optional)
   It is useful to add the name 'postmaster' to the password file (`/helios/etc/passwd`) in order to catch any mail that may be addressed to the postmaster of the local machine.

6.2.2.2   Remote

The mail system must be informed that your machine is on the network. This is done by adding the name of your machine to the file **/etc/localhosts**.

Notes:

- For this change to become effective, it is necessary to re-create the sendmail configuration freeze file (by running **sendmail** with the **-bz** option)

- Alias host names should not be used in **/etc/localhosts**

- Re-directing mail to your machine (optional)
  If you are currently receiving mail on the remote machine, you may wish to automatically re-direct the mail to your Helios machine. There are a number of ways of achieving this. The simplest way is to use a **.forward** file. Mail is automatically forwarded to the recipient name(s) listed in the **.forward** file in your home directory.

6.3   User's reference

This section contains a brief summary of each of the commands.

mail

Purpose: Process mail messages.

Format: *mail [-b] [-q] [-f filename]*

mail [-v] [[address] ...]

Description:

`mail` is a program for generating and reading mail messages. Outgoing messages are sent to `sendmail` for delivery to the remote system; incoming messages are received by `sendmail` and passed on to `mail` for local delivery.

If no arguments are specified, `mail` tests for the presence of mail by examining the file `/helios/local/spool/mail/<username>`. If there is mail, the first message is immediately printed out. Mail messages are, by default, displayed in a last-in, first-out order.

The following commands may be used to process messages:

`x`	exit without changing mail.
`p`	print current message.
`s [file]`	save current message to file (default is `<home>/mbox`) and remove from mail file.
`w [file]`	save message without 'From' line.
`-`	go to previous message.
`+`	go to next message.
`d`	delete current message.
`m user`	send current message to user and remove from mail file.

| **! cmd** | execute **cmd.** |
| **?** | display the above list. |

The arguments are as follows:

-f filename	use **/helios/local/spool/mail/filename** as the mail file.
-b	reverse order of the processing mail file (FIFO).
-p	print all messages in the mail file.
-v	print version and send verbose flag to **sendmail**.
address ...	take the standard input (terminated by **EOF** or '**.**') and send it via **sendmail** to each recipient.

Examples:

```
mail -f /helios/local/spool/postmaster
```

Tests whether there is any mail for user **postmaster**

```
mail craig nick@sparky < note
```

Mails the contents of the file **note** to the local user **craig** and also the user **nick** on the machine **sparky**.

Notes:

- **mail** does not use configuration files (for example **.mailrc**).

- If an error occurs (for example, an invalid address is specified), the file **dead.letter** that is subsequently created is placed in the user's home directory.

Diagnostics:

```
- mail: can't send to <username>
  User unknown
```

The recipient name is invalid.

sendmail

Purpose: Send mail messages to the remote system.

Receive mail messages from the remote system.

Format: *   /helios/lib/sendmail [-l] [-bd]*

/helios/lib/sendmail [-v] [-l] [-bs] [[address] ...]

Description:

When running as a daemon, **sendmail** waits for notification of incoming mail messages from the remote system. On receipt of a message, **sendmail** activates an auxiliary program, **/helios/lib/smtp**, which collects the contents of the mail message from the remote machine. **smtp** then invokes **/helios/bin/mail** to perform the actual delivery.

sendmail is also used to send mail messages to the remote system. A connection with the remote sendmail daemon is set up and the messages are transferred to the remote machine. It is then the responsibility of the remote mail system to route the messages to the specified recipient(s).

The arguments are as follows:

-bd   run as a daemon.

-bs   use SMTP. This allows the user to explicitly specify the sender, recipient and text of the mail message, using the SMTP commands listed below.

-l   extra logging information. Gives **SYSLOG** notification of process activation, and the sender and recipients of incoming and outgoing mail.

-v   verbose mode.

address ...	takes the standard input (terminated by **EOF** or '**.**') and sends it to each recipient. Local mail is delivered by **/helios/bin/mail** and external mail is sent to the remote system for subsequent delivery.

SMTP Commands :

HELP [<topic>]	give help information.
HELLO <hostname>	introduce yourself.
MAIL FROM: <sender>	specify sender.
RCPT TO: <recipient>	specify recipient(s).
DATA	collect message text.
RESET	reset the system.
QUIT	exit SMTP.
NOOP	do nothing.

Notes:

- Typically, the **sendmail** daemon is started from an **initrc** file or resource map, using a command of the form:

  run -e /helios/lib/sendmail -bd -l

- **sendmail** does not make use of configuration files.

Example:

/helios/lib/sendmail -v craig@craigpc

Takes the standard input and sends it to the user **craig** on the machine **craigpc**, displaying the SMTP dialogue between the local and remote mail systems.

Diagnostics:

- **SYSLOG: sendmail already exists (<taskname>)**

  It is not possible for more than one **sendmail** daemon to be active simultaneously. It is necessary to terminate the existing daemon prior to starting up a new one.

- **Recipient name(s) must be specified**

  A recipient address must be given when using **sendmail** to deliver mail.

- **SYSLOG: smtp Bad address format**
  SYSLOG: smtp Error in message delivery

  Invalid sender/recipient address format.

6.4   Diagnostics

A brief description of pertinent diagnostics and error messages common to **mail** and **sendmail** is included below to assist with trouble-shooting. The diagnostics included in the user reference (see section 6.3) should also be consulted when attempting to identify error conditions. In addition, diagnostics generated by the remote system (typically concerning protocol errors) are written to error transcript files (**/helios/local/spool/mqueue/xf***).

Host Database Files

- **SYSLOG: sendmail AAnnnn: SYSERR: Unable to identify mailhost: Error 100**
- **Unable to identify mailhost: Error 100**
  Local configuration error

  The alias **mailhost** has not been setup in **/helios/etc/hosts**

Unable to locate TCP/IP server

- **SYSLOG: sendmail NOQUEUE: SYSERR: failed to get host name: No such file or directory**
- **failed to get host name: No such file or directory**

System Directories

- **SYSLOG: sendmail NOQUEUE: SYSERR: cannot chdir(/helios/local/spool/mqueue): No such file or directory**
- **cannot chdir(/helios/local/spool/mqueue): No such file or directory**

  The queue directory (**/helios/local/spool/mqueue**) does not exist

- **mail: /helios/local/spool/mail/<username>: cannot append**

  The mail directory (**/helios/local/spool/mail**) does not exist

Mail Host

- **Connection failed: Connection timed out during user open with mailhost**

  The remote mail host is down.

- **Connection failed: Connection refused by mailhost**

  The remote **sendmail** daemon is not active.

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- Service unavailable

The remote **sendmail** daemon is active, but is unable to service the request (this will happen if , for example, a Helios machine is mistakenly set up to be the **mailhost**).

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Additional network utilities

The following network utility program, **route**, is optionally installed by **loadpac**. It is typically used by network administrators who require to set up communication between TCP/IP networks via a gateway.

route

Purpose: Manually manipulate network routing tables.

Format: *route add | delete [net | host] destination gateway [metric]*

Description:

route is a program for modifying the TCP/IP network routing tables. This makes it possible to access other TCP/IP networks through a local gateway.

route takes the following arguments:

add   add route.

delete   delete route.

[net | host] interpret destination as network or host.

destination address of destination host or network.

gateway   address of network gateway through which packets should be sent.

[metric]   maximum number of hops to destination (required for **add** commands). Must be zero if destination is on a directly attached network.

Examples:

Consider the following scenario. A Helios machine with a TCP/IP address **12.34.56.78** is on a class B network, **12.34**. There is a second class B network, **12.90**, which is accessible through a local gateway with local leg address **12.34.56.254**. The command:

route add net 12.90.0.0 12.34.56.254 1

will enable access to the machines in the second class B network through the gateway.

Notes:

– the routing tables of the machines on non-local networks must contain a route-table entry to the network on which the Helios host resides

– the routing table must be updated every time Helios is rebooted or the TCP/IP server loaded.

Diagnostics :

- routing table overflow
- route: out of memory
 Insufficient memory to perform operation

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