

# Printer Filter for HP LJ1100

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# Chapter 1

## Introduction

This printer driver is for the HP LaserJet 1100, a basic (but effective) black and white laser printer. The printer driver itself has been produced to run under FreeBSD, but may work as is or with limited porting on other BSD based UNIX operating systems.

### 1.1 Prerequisites

This printer driver has a few prerequisites and dependencies:

**Ghostscript** a PostScript [2] and PDF language interpreter and previewer.

**a2ps** a utility which format files for printing on a PostScript printer.

**nuweb** a simple literate programming tool. **nuweb** is not required for the driver itself but to be able to update the `ljfilt.w` source file. **nuweb** can be obtained from <https://sourceforge.net/projects/nuweb/><sup>1</sup>

**LaTeX** a structured text formatting and typesetting for TeX used to reproduce this documentation.

### 1.2 Abbreviations

Abbreviation	Description
HP	Hewlett Packard
PCL	Printer control language
PDF	Portable document format
PS	PostScript

---

<sup>1</sup>As of May 2018.

## Chapter 2

# Printer Filter

The printer filter is a shell script, `ljfilt`.

```
"ljfilt" 2≡
    #!/bin/sh
    #
    #  ljfilt , an HP LJ1100 printer filter supporting PostScript and PDF formats
    #
    < BSD 3-clause licence 8 >
    #
    #  Parts of this script were inspired by
    #  Swecoin's TTP8200 Unix drivers (http://www.swecoinus.com).
    #  and
    #  gsprint.sh Copyright (c) Olivier Mehani <shtrom-skbsji.net>, 2004
    #  see http://shtrom.ssji.net/skb/lpps.html
    #

    < Define the filter configuration 4b >
    < Define the commands for ljfilt 3a >
    < Define the arguments for ghostscript 4a >
    < Create temporary copy of file to be printed 3b >
    < Check file type and print 3c >
    < Tidy up temporary file 5 >
    # end of file
    ◇
```

The commands used by the filter are defined explicitly to avoid inadvertently using a command or application in the search path. However, there is a risk that the filter is fragile if the paths to commands or installed applications are changed.

```

< Define the commands for ljfilt 3a > ≡
  CAT=/bin/cat
  RM=/bin/rm
  COLRM=/usr/bin/colrm
  HEAD=/usr/bin/head
  LOGGER=/usr/bin/logger
  MKTEMP=/usr/bin/mktemp
  SED=/usr/bin/sed
  A2PS=/usr/local/bin/a2ps
  GS=/usr/local/bin/gs
  ◇

```

Fragment referenced in 2.

The file to be printed is replicated to a temporary file for subsequent processing.

```

< Create temporary copy of file to be printed 3b > ≡
  TEMPFILE='${MKTEMP} /tmp/ljfilt.XXXXXX'
  if [ $? -ne 0 ]; then
    $LOGGER -t ljfilt "Error: couldn't create temporary file"
    exit 1
  fi

  # send stdin to the temporary file
  $CAT > $TEMPFILE
  ◇

```

Fragment referenced in 2.

The filter accommodates three types of files:

- PostScript, for which the file starts %!;
- Portable document format (PDF), for which the file begins %PDF;
- Plain text files.

The known file types (PostScript or PDF) are tested for and the appropriate application used for the file type. Failing the determination of a specific file type is supplied then the file type is assumed to be plain text and processed accordingly.

```

< Check file type and print 3c > ≡
  # Test leading characters to determine the file 's type
  if [ "${HEAD-1}$TEMPFILE_|_$COLRM-3" = "%!" ]; then
    # PostScript file
    $GS $GSARGS $TEMPFILE
  elif [ "${HEAD-1}$TEMPFILE_|_$COLRM-5" = "%PDF" ]; then
    # PDF file
    $GS $GSARGS $TEMPFILE
  else
    # none of the above, we assume it is a plain text file
    < Process plain text options 4c >
  fi
  ◇

```

Fragment referenced in 2.

Uses: GSARGS 4a.

Ghostscript is used by the printer driver to translate from either PostScript or PDF to HP PCL understood by the printer. A number of arguments are defined for ghostscript:

- q starts ghostscript silently without the usual startup messages.
- sDEVICE specifies an initial output device rather than the default, in this case that specified by GSDEVICE.
- dNOPAUSE disables the prompt and pause at the end of each page.
- sOutputFile specifies a file for the output, in this case the standard output -.

```
< Define the arguments for ghostscript 4a > ≡
  GSARGS="-q_-sDEVICE=$GSDEVICE_-dNOPAUSE_-dBATCH_-sOutputFile=-"
  ◇
```

Fragment referenced in 2.  
 Defines: GSARGS 3c, 4c.  
 Uses: GSDEVICE 4b.

The configuration of the filter is defined as follows:

```
< Define the filter configuration 4b > ≡
  # gs driver to use
  GSDEVICE=ljet4

  # specify plain text file processing to be applied
  TEXTFILTER=TEXTCRLF
  ◇
```

Fragment referenced in 2.  
 Defines: GSDEVICE 4a, TEXTFILTER 4c.

Plain text files can be processed in several ways, specified by TEXTFILTER, which is set manually in the printer driver.

TEXTA2PS use the A2PS application to process file.

TEXTCRLF replace LF with a CRLF in the file.

TEXTRAW do nothing to the file.

```
< Process plain text options 4c > ≡
  if [ "$TEXTFILTER" == "TEXTA2PS" ]; then
    $A2PS $TEMPFILE -o - | $GS $GSARGS -
  elif [ "$TEXTFILTER" == "TEXTCRLF" ]; then
    # add a CR to the end of line
    CR='\r'
    $CAT $TEMPFILE | $SED -e "s/${CR}/g"
  else
    # no filtering
    $CAT $TEMPFILE
  fi ◇
```

Fragment referenced in 3c.  
 Uses: GSARGS 4a, TEXTFILTER 4b.

Having completed processing the temporary file for printing, tidy up by deleting the temporary file created.

```
< Tidy up temporary file 5 > ≡  
    # cleanup  
    $RM $TEMPFILE  
    ◇
```

Fragment referenced in 2.

# Chapter 3

## Installation

For the installation of this filter, the following assumptions have been made:

- User has `root` access.
- Prerequisites installed, §1.1.

### 3.1 Installing the `ljfilt` script

The installation process is currently a manual process. Refer to the §9 FreeBSD Handbook, [7].

For FreeBSD, the printer filter, `ljfilt`, should be installed in `/usr/local/libexec`.

Update the permissions and owner, as `root`,

```
$ chown root wheel /usr/local/libexec/ljfilt
```

```
$ chmod 755 /usr/local/libexec/ljfilt
```

### 3.2 Configuring `printcap`

Based on the §9.5.3 FreeBSD Handbook guidance, an example `printcap` file calling the filter `ljfilt` is as follows:

```
lp:\
    :lp=/dev/lpt0:\
    :sh:\
    :mx#0:\
    :sd=/var/spool/lpd/lp:\
    :if=/usr/local/libexec/ljfilt:\
    :lf=/var/log/lpd-errs:
```

### 3.3 Literate Programming

`ljfilt` is developed using literate programming techniques and the `nuweb` [1] tool. `nuweb` is inspired by the principles espoused by Knuth [4].



This filter is developed in a series of `nuweb` files, `*.w`, which are processed to produce the target printer filter `ljfilt`, `Makefile` and the documentation `LATEX*.tex` file.

## 3.4 Known issues

### 3.4.1 Security

As this printer filter creates a copy of the file to be printed in `/tmp` these will be viewable by anyone with `root` access until they are deleted by the filter. In addition, should the filter terminate before completing then a copy of the file to be printed will remain. Therefore, this printer filter may not be appropriate for secure or sensitive tasks.

### 3.4.2 a2ps Papersize

When printing text files using `TEXTA2PS` option they may fail to print because the papersize for the printer has not been specified. The papersize is detailed in `${PREFIX}/etc/papersize`. The default system papersize can be set using `paperconfig`.

## Chapter 4

# Licence and Copyright

This software uses the BSD 3-clause licence [5]. Both the printer filter, `ljfilt`, and the `Makefile` can use the same text as they use the same comment nomenclature, `#`.

```
< BSD 3-clause licence 8 > ≡  
# Copyright 2018 John S Glover  
#  
# Redistribution and use in source and binary forms, with or without  
# modification, are permitted provided that the following conditions are met:  
#  
# 1. Redistributions of source code must retain the above copyright notice,  
# this list of conditions and the following disclaimer.  
#  
# 2. Redistributions in binary form must reproduce the above copyright notice,  
# this list of conditions and the following disclaimer in the documentation  
# and/or other materials provided with the distribution .  
#  
# 3. Neither the name of the copyright holder nor the names of its  
# contributors may be used to endorse or promote products derived from  
# this software without specific prior written permission.  
#  
# THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND  
# CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES,  
# INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF  
# MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE  
# DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER OR  
# CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,  
# SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT  
# NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES;  
# LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER  
# CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT,  
# STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE)  
# ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF  
# ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.◇
```

Fragment referenced in 2, 9.

## Chapter 5

# Makefile

A simple `Makefile` is provided for constructing common targets. This `Makefile` uses the GNU `gmake` nomenclature [6]. Most targets work with regular `make`, but there are some limitations.

Example targets include:

`make ljfilt` - Build the `ljfilt` executable.

`make tar` - Build all files and package into a gzipped tar file.

```
"Makefile" 9≡
  < BSD 3-clause licence 8 >

  < Define commands for Makefile 10a >
  TARGET = ljfilt
  VERSION = 1.1

  BIBS = ljfilt .bib

  SRCS = ljfilt.w ljfilt.make.w $(BIBS)

  DIST = Makefile $(TARGET) $(TARGET).pdf $(SRCS) $(BIBS)

  < Implicit rules definitions for ljfilt 10b >
  < Explicit rules definitions for ljfilt 11a >
  < Utility rules for ljfilt 11b >
  ◇
```

Defines: `BIBS` Never used, `DIST` 11a, `SRCS` 10b, 11a, `TARGET` 10b, 11ab, `VERSION` 11a.

To ensure the commands are executed are those expected then a series of variables are defined. This may be excessive, but it prevents rogue applications being executed. A future refinement could make use of a utility such as `Autoconf` [3].

```
< Define commands for Makefile 10a > ≡
  CP = /bin/cp
  MKDIR = /bin/mkdir
  MV = /bin/mv
  RM = /bin/rm
  LPR = /usr/bin/lpr
  SED = /usr/bin/sed
  TAR = /usr/bin/tar
  BIBTEX = /usr/local/bin/bibtex
  DVIPDF = /usr/local/bin/dvipdf
  LATEX = /usr/local/bin/latex
  PDFLATEX = /usr/local/bin/pdflatex
  XDVI = /usr/local/bin/xdvi
  ◇
```

Fragment referenced in 9.

```
< Implicit rules definitions for ljfilt 10b > ≡
  ${TARGET}.tex: $(SRCS)
    nuweb -l $(TARGET)

  %.dvi: $(TARGET).tex
    $(LATEX) $(TARGET).tex

  %.pdf: $(TARGET).tex
    $(PDFLATEX) $(TARGET).tex
  ◇
```

Fragment referenced in 9.

Uses: SRCS 9, TARGET 9.

Several targets are provided with explicit rules.

*< Explicit rules definitions for ljfilt 11a > ≡*

```
all:
    $(MAKE) $(TARGET).tex
    $(MAKE) $(TARGET)

tar: $(SRCS)
    $(MAKE) $(TARGET)
    $(MKDIR) $(TARGET)-$(VERSION)
    $(CP) -R $(DIST) $(TARGET)-$(VERSION)
    $(MV) $(TARGET)-$(VERSION)/$(TARGET).pdf \
    $(TARGET)-$(VERSION)/$(TARGET)-$(VERSION).pdf
    $(TAR) -zcf $(TARGET)-$(VERSION).tar.gz $(TARGET)-$(VERSION)
    $(RM) -rf $(TARGET)-$(VERSION)

$(TARGET): $(SRCS)
    nuweb -l $(TARGET)
    $(LATEX) $(TARGET)
    nuweb -l $(TARGET)
    $(BIBTEX) $(TARGET)
    $(LATEX) $(TARGET)
    $(LATEX) $(TARGET)
    $(DVIPDF) $(TARGET)
```

◇

Fragment referenced in 9.

Uses: DIST 9, SRCS 9, TARGET 9, VERSION 9.

A number of routines and utilities are provided to support the maintenance of the ljfilt source code directory. The preceding '-' ignores errors in the command line (non-zero) exit status to be ignored the command to continue.

*< Utility rules for ljfilt 11b > ≡*

```
clean:
    -$(RM) -f *.tex *.log *.dvi *~ *.blg *.brf *.bbl *.out *.toc *.aux *.gz *.pdf \##*

view: $(TARGET).dvi
    $(XDVI) $(TARGET).dvi
```

◇

Fragment referenced in 9.

Uses: TARGET 9.

# Chapter 6

## Indices

Three sets of indices can be created automatically:

- an index of file names, §6.1;
- an index of fragment names, §6.2;
- an index of user-specified identifiers, §6.3.

An index entry includes the name of the entry, where it was defined, and where it was referenced.

### 6.1 Files

"`ljfilt`" Defined by 2.

"`Makefile`" Defined by 9.

### 6.2 Fragments

⟨BSD 3-clause licence 8⟩ Referenced in 2, 9.

⟨Check file type and print 3c⟩ Referenced in 2.

⟨Create temporary copy of file to be printed 3b⟩ Referenced in 2.

⟨Define commands for Makefile 10a⟩ Referenced in 9.

⟨Define the arguments for ghostscript 4a⟩ Referenced in 2.

⟨Define the commands for ljfilt 3a⟩ Referenced in 2.

⟨Define the filter configuration 4b⟩ Referenced in 2.

⟨Explicit rules definitions for ljfilt 11a⟩ Referenced in 9.

⟨Implicit rules definitions for ljfilt 10b⟩ Referenced in 9.

⟨Process plain text options 4c⟩ Referenced in 3c.

⟨Tidy up temporary file 5⟩ Referenced in 2.

⟨Utility rules for ljfilt 11b⟩ Referenced in 9.

### 6.3 Identifiers

BIBS: 9.

DIST: 9, 11a.  
GSARGS: 3c, 4a, 4c.  
GSDEVICE: 4a, 4b.  
SRCS: 9, 10b, 11a.  
TARGET: 9, 10b, 11ab.  
TEXTFILTER: 4b, 4c.  
VERSION: 9, 11a.

# Bibliography

- [1] The nuweb System for Literate Programming. online, 2018. [6](#)
- [2] Adobe Systems Incorporated. *PostScript Language Reference Manual*. Addison-Wesley Longman Publishing Co., Inc., Boston, MA, USA, second edition, 1991. [1](#)
- [3] Akim Demail. David MacKenzie, Ben Elliston. *Autoconf*. Free Software Foundation, 2.69 edition, 2012. [9](#)
- [4] Donald Ervin Knuth. Literate programming. *The Computer Journal*, 27(2):97–111, 1984. [6](#)
- [5] Regents of the University of California. BSD 3-clause license, July 1999. Also referred to as "BSD License 2.0", "Revised BSD License", "New BSD License", or "Modified BSD License". [8](#)
- [6] Paul D. Smith Richard M. Stallman, Roland McGrath. *The GNU Make Manual*. Free Software Foundation, 0.74 edition, May 2016. [9](#)
- [7] The FreeBSD Documentation Project. *FreeBSD Handbook*. The FreeBSD Foundation, 2018. [6](#)