

ESV Series Workstations

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# Kodak Printer User's Manual

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Salt Lake City, Utah

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Part Number: 517941-961 AA

September, 1991

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## Introduction

This document describes the user interface and configuration files for the KODAK XL 7700 Printer. The KODAK XL 7700 Printer allows you to print a full 24-bit color image from the monitor. It can be configured as a network resource using standard BSD line printer support. By using this capability, one KODAK printer can be available to anyone as a networked printer.

## Set Up

To set up the printer, several files have to be changed. The most important is the `/etc/printcap` file. There is already an entry in this file for the KODAK XL 7700 Digital Continuous Tone Printer. The system administrator simply needs to uncomment the entry. Once the printer software has been installed and the `printcap` file updated, the printer can be used by the local machine.

To use the printer from a remote ESV Workstation, two things have to be done. First, the remote workstation's name must be put into the `/etc/hosts.equiv` file on the machine with the printer. Second, the remote workstation's `/etc/printcap` file must have a remote printer entry added for the KODAK printer. There already exists a sample entry for a line printer or postscript printer that can be modified for use. Following is a sample entry for a remote KODAK XL 7700 Printer:

```
cp|kodak|Kodak Color Printer:\
    :lp=:rm=machinename:sd=/usr/spool/lp:\
    :lf=/usr/adm/kodak-log:af=/usr/adm/kodak.acct:
```

Make sure that the BSD line printer daemon is running on each machine. The BSD `lpd` command is used to enable the printer daemon. Refer to the `lpd` manual page for more information.

For information on setting up the KODAK XL 7700 Printer's configuration file see the "Color Matching" section below which describes the parameters that can be set in the configuration file.

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## X Interface

Under the X Window System, **xwd** and **xkpr** are used to grab the image of a window and print it on the KODAK XL 7700 Printer. **xwd** allows you to point the cursor and click on the window of choice. **xwd** then grabs the visible contents of the window, reformats it, and sends it to **stdout** (which can be sent to a file using UNIX redirection).

**xkpr** takes the output of **xwd** and turns it into a format suitable for **lpr** to accept and print. **xkpr** is an X-to-printer translation program. It is provided by MIT and has been modified to know about the special format required by the KODAK XL 7700 Printer. Following is a sample command line:

```
xwd | xkpr [options] | lpr -Pkodak
```

The print command is done in UNIX fashion which requires user input and interaction. "Print screen" or "print window" buttons do not exist on the system. You can add these features using Motif and some customization files.

For custom applications you will have to use the X interface to dump an X window to the printer. Of course, it is always possible for the application to execute those commands on behalf of the user, and this would produce a kind of "print window button" for that application.

## CDRS Interface

A print window interface function is available for CDRS applications. It performs the same function as **xwd** above, but it doesn't require user interaction. This function allows CDRS to specify which window it wants to print and what part of that window to print on the KODAK XL 7700 Printer.

## Color Matching

One of the most difficult tasks is to get the colors of the image on the printed page to look like the colors of the image on the screen. There is a fundamental difficulty in doing this since one media is reflective (paper) and the other is transmissive (the monitor) meaning it emits light. The way color is created using these two media is completely different and leads to the difficulty of color matching.

For instance, creating a nice bright fully saturated red on the screen is done by hitting the red phosphorus with maximum energy. This causes the phosphorus to glow bright red. To produce bright red on paper all the color except red is absorbed, so only the red of the incident light is reflected back. This makes the appearance of printed material very dependent on the surrounding lighting. Unfortunately the lighting conditions for viewing the monitor are usually inadequate for viewing a print properly. If you try to make a print look like the screen (in the same light in which the screen is being

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viewed), you will probably have a very poor print when you take it into bright light.

Initially the printer color lookup tables (CLUTs) were adjusted using an in-house printer to produce prints that were close to the picture on the screen but also looked good in full light. This proved to be insufficient so more flexibility has been added to the KODAK support routines. A configuration file that a user (with **root** permissions) can change has been added. It is located in **/usr/lib/kodakdefaults**. This file contains information telling the printer how to build color lookup tables for various types of screen data. A sample configuration file is shown in the "Sample Configuration File" section below.

The configuration information is divided into two sections, local and global information. The global information includes the number of prints to make (duplicates), which image enhancement mode to use, image mirroring, image density, and transparency density.

The local information is the data describing the CLUT for various screen types. The three screen types are truecolor, directcolor, and CDRS. Each screen type has its own section defining the parameters for the CLUTs for that type of screen.

Truecolor images always use a gamma based CLUT. You can specify the gamma, brightness, contrast, and the scale for each color component (red, green, and blue.) You can also specify a custom 256 entry CLUT for each color component if nothing else comes close enough.

Directcolor and CDRS ARS images (CDRS wireframe and dynamic polygon images are truecolor) are closely related. Both use a linear CLUT allowing you to specify the scale (slope) of each color component, the brightness, and the contrast of the image. CDRS uses a direct color screen, but because CDRS uses a known color map it has a separate section in the configuration file to allow default, CDRS-only, values to be used.

## Configuration File Parameters

The following is a complete description of the parameters that can be specified in the configuration file.

### Global

The global parameters may come anywhere in the file before the end as long as they are not in a local definition. If a global parameter is specified more than once, the last one in the file is used.

**duplicates** *<integer>* Specifies how many copies of the image are to be printed. The default is one. This can be useful for "production" runs of images for distribution.

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**sharpness** *<integer>* Specifies the KODAK printer's image processing switch. The default is 0 and shouldn't be changed unless you want the printer to try and "sharpen" the edges of the image. Valid values are between 0 and 7.

**mirror** *<on/off>* If turned on, this causes the printer to print a mirror image of the image. The default is *off*.

**density** *<integer>* Specifies the density of the printed image in dots per inch. The density is usually computed by **xkpr** so as to enlarge the image to fill as much of the page as possible while maintaining the aspect ratio (and fitting on the header and/or footer if any.) This should only be used if you understand and are willing to accept the consequences of overriding **xkpr**.

The printer's 1:1 density is 300 dots per inch. It can be set to as low as 50 or to as high as 1000 dots per inch. This causes the image to be enlarged or reduced. If the specified density causes the picture to be too large to be printed on the page, the printer gives an error message and aborts the print.

**transparency** *<light/normal/heavy>* Specifies the transparency density for transparency prints. This defaults to normal density and doesn't need to be changed under normal use.

#### Local

**truecolor**

**directcolor**

**cdrs**

**end** *<truecolor|directcolor|cdrs>*

Specifies a local parameter list. A local area is started by a single keyword (**truecolor**, **directcolor**, or **cdrs**) on a line by itself. All parameters specified after this line and before the corresponding end line are assigned to that screen type. The local screen parameters section is ended by the keyword **end** followed immediately by the screen type **truecolor**, **directcolor**, or **cdrs**.

**contrast** *<real>* Controls the contrast of the image meaning the difference between the darkest and lightest colors in the print. The default is 1.0 which should be sufficient for the most dynamic prints. A smaller value (between 0.0



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and 1.0) reduces the difference between the darkest and lightest colors in the print. This affects all screen types.

**gamma** *<real>*

Defines the gamma used for the truecolor CLUT. The gamma defaults to 1.33. It can be changed to any positive real number but probably only numbers between 0.5 and 5.0 are practical. This only affects truecolor prints.

**step** *<real>*

Used in computing a density CLUT. If the gamma is equal to 1.0, then **step** produces a density CLUT only. If the gamma is not equal to 1.0 and **step** is not equal to 1.0, then a combined density/gamma CLUT is produced. **step** defaults to 1.0. This is only used with the truecolor screen type.

**brightness** *<real>*

Specifies the minimum intensity of a pixel. This defaults to 1.0 but can be set anywhere between 1.0 to 256.0. Changing this makes the overall image "brighter" by lightening the darker parts of the image. This affects all screen types.

**scale** *<real>*

**red scale** *<real>*

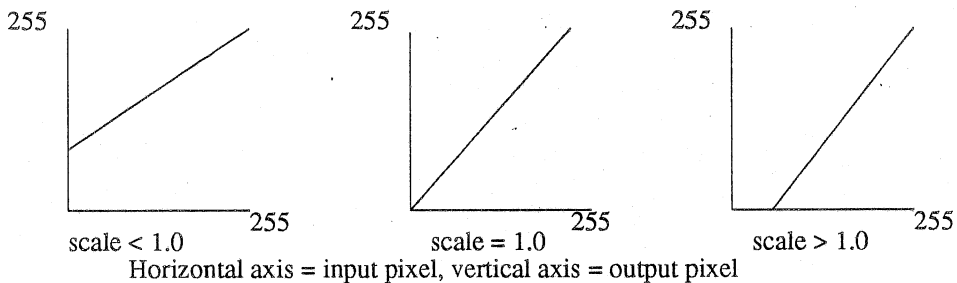
**green scale** *<real>*

**blue scale** *<real>*

Used to adjust how soon and how quickly each color component is added into the CLUT. These parameters affect all screen types. The single keyword **scale** is used to set all of the scale factors to one single value. The individual keywords (**red scale**, **green scale**, **blue scale**) set the scale factor for that particular color component.

In testing the printer tended to make things a little red, so the **red scale** defaults to 1.3. This reduces the amount of red in the darker regions. The other scale factors are set at 1.0.

The scale factor is actually the slope of a line that goes through the point (255,255). The CLUTs map input pixel values to output pixel values. This means that the point (255, 255) is where the input value is at its maximum and it corresponds to the maximum output value. By varying the slope of the line through this point it changes when and how fast the output pixel values increase with respect to input pixel values.



As the diagram indicates when **scale** is less than 1.0 (between 0.0 and 1.0) the output pixel values start out greater than 0 and slowly go to maximum. When **scale** is equal to 1.0 it is a direct map of input values to output values. And finally when **scale** is greater than 1.0 the smaller input values map to a 0 output value (to a certain point) then output values increase rapidly to maximum.

**clut** <256 integers>

**red clut** <256 integers>

**green clut** <256 integers>

**blue clut** <256 integers>

**end clut**

Allows you to specify your own color look up table. The keyword **clut** by itself defines all the CLUTs to be the same. The individual parameters allow only that color's CLUT to be defined.

After the keywords there are 256 integers (between 0 and 255) to define the CLUT. The values do not have to be formatted in any particular way. They are taken in order; the first number is the output value for input value 0, the second the output value for input value 1, and so on. The CLUT is completed by the **end clut** statement on a line by itself. If there are not 256 integers in the table, an error message is generated and the table is not used.

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## Sample Configuration File

The default configuration file is called **kodakdefaults**. It is located in the **/usr/lib** directory. It can only be changed by **root**. The following is an example of a default file.

```
# comment lines start with a #
duplicates 1      # everything after a # is also a comment
transparency heavy # This causes printer to make 2 prints on
# transparency material to make it very dark/heavy.
mirror off

truecolor        # Starts a truecolor local definition
gamma 1.33       # set gamma to 1.33
red scale 1.1    # set red scale to 1.1 (default is 1.3)
green scale 1.0
blue scale 1.0
end truecolor    # end truecolor local parameters

directcolor      # start directcolor local definition
red scale 1.1
green scale 1.0
blue scale 1.0
end directcolor  # end directcolor local parameters

cdrs             # Start CDRS local definition
brightness 1.0
contrast 1.0
red scale 1.3
green scale 1.0
blue scale 1.0
end cdrs        # end CDRS local parameter

end             # end configuration script, nothing should follow
```

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## xkpr

### Name

**xkpr** - print an ESV X window dump

### Synopsis

```
xkpr [ -device dev ] [ -scale scale ] [ -height inches ] [ -width inches ]  
[ -left inches ] [ -top inches ] [ -header string ] [ -trailer string ]  
[ -landscape ] [ -portrait ] [ -plane number ] [ -gray ] [ -rv ] [ -compact ]  
[ -cdrs ] [ -output filename ] [ -append filename ] [ -noff ] [ -split n ]  
[ -psfig ] [ -density dpi ] [ -cutoff level ] [ -noposition ]  
[ -gamma correction ] [ -render algorithm ] [ -slide ] [ filename ]
```

### Description

**xkpr** takes as input a window dump file produced by **xwd(1)** and formats it for output on the KODAK XL7700 Digital Continuous Tone Printer. If no file argument is given, the standard input is used. By default, **xkpr** prints the largest possible representation of the window on the output page. Options allow the user to add headers and trailers, specify margins, adjust the scale and orientation, and append multiple window dumps to a single output file. Output is to standard output unless **-output** is specified.

### Arguments

- |                              |   |
|------------------------------|---|
| <b>-device</b> <i>dev</i>    | Specifies the device on which the file is to be printed. The printer currently supported is:<br><br><b>kodak</b> KODAK XL 7700<br>Digital Continuous Tone Printer   |
| <b>-scale</b> <i>scale</i>   | Affects the size of the window on the page. The KODAK printer is able to translate each bit in a window pixel map into a grid of a specified size. For example each bit might translate into a 3x3 grid. This would be specified by <b>-scale 3</b> . By default a window is printed with the lowest density that will fit onto the page for the specified orientation. |
| <b>-height</b> <i>inches</i> | Specifies the maximum height of the page in inches.   |
| <b>-width</b> <i>inches</i>  | Specifies the maximum width of the page in inches.  |
| <b>-left</b> <i>inches</i>   | Specifies the left margin in inches. Fractions are allowed. By default the window is centered on the page.  |
| <b>-top</b> <i>inches</i>    | Specifies the top margin for the picture in inches. Fractions are allowed.  |
| <b>-header</b> <i>string</i> | Specifies a header string to be printed above the window.   |

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<b>-trailer <i>string</i></b>	Specifies a trailer string to be printed below the window.
<b>-landscape</b>	Forces the window to be printed in landscape mode. By default a window is printed such that its longest side follows the long side of the paper.
<b>-portrait</b>	Forces the window to be printed in portrait mode. By default a window is printed such that its longest side follows the long side of the paper.
<b>-plane <i>number</i></b>	This has no effect. Included for compatibility with <b>xpr</b> .
<b>-gray 2   3   4</b>	This has no effect. Included for compatibility with <b>xpr</b> .
<b>-rv</b>	This has no effect. Included for compatibility with <b>xpr</b> .
<b>-compact</b>	This has no effect. Included for compatibility with <b>xpr</b> .
<b>-cdrs</b>	Specifies that the image should use the special CDRS color tables.
<b>-output <i>filename</i></b>	Specifies an output filename. If this option is not specified, standard output is used.
<b>-append <i>filename</i></b>	Specifies a filename previously produced by <b>xkpr</b> to which the window is to be appended.
<b>-noff</b>	When specified in conjunction with <b>-append</b> , the current window appears on the same page as the previous window.
<b>-split <i>n</i></b>	This has no effect. Included for compatibility with <b>xpr</b> .
<b>-psfig</b>	This has no effect. Included for compatibility with <b>xpr</b> .
<b>-density <i>dpi</i></b>	Indicates the dot-per-inch density to be used by the KODAK printer.
<b>-cutoff <i>level</i></b>	This has no effect. Included for compatibility with <b>xpr</b> .
<b>-noportion</b>	This has no effect. Included for compatibility with <b>xpr</b> .
<b>-gamma <i>correction</i></b>	This changes the intensity of the colors printed by the KODAK printer. The correction is a floating point value in the range 0.00 to 3.00. Consult the operator's manual to determine the correct value for a specific printer.
<b>-render <i>algorithm</i></b>	This allows the KODAK printer to vary edge enhancement. Consult the operator's manual to determine which algorithms are available.

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<b>-slide</b>	This has no effect. Included for compatibility with <b>xpr</b> .
<b>filename</b>	Specifies the filename of the image to be printed.

**See Also**

**xwd(1), xwud(1), X(1)**

**Limitations**

The current version of **xkpr** can only print out X windows that are 32-bit true color visuals or 32-bit direct color visuals using the KODAK XL 7700 printer.