

# Software Product Description

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Product Name: **CLP**

Product Description: Color Graphics Subroutine Library for Rastergraf 34020-based boards

Products Supported: VCL Series 34020-based boards

## CLP Description

The Rastergraf 34020 CLP Color Graphics Subroutine Library supports Rastergraf's VCL series of 8-bit and 24-bit display controllers (described on other side).

CLP is a library of routines which provides the high-level language programmer with powerful graphics functionality and insulates the application program from the specific details of the hardware. The functional portions of the library are implemented as a board-based library. The code can either be downloaded from the host or supplied in on-board PROM.

CLP functions access the board, initialize it, and perform the graphics primitives using the on-board Texas Instruments TMS34020 Graphics System Processor graphics processor. Included are common graphics functions such as bitblt, vector, polyline, circle, arc, paint, and bit-mapped characters.

The 34020 performs hardware filling using predefined patterns with foreground and background colors. The pattern is a bit-map supplied as part of the CLP fill routine.

The active drawing area is defined by a "clipping rectangle" that will prevent any drawing outside (or alternately, inside) the rectangle. Drawing specifications include foreground and background colors, if foreground and/or background will be drawn, and whether the existing data is replaced, ANdEd, ORed, or XORed.

Support is provided for both primary and overlay planes. Other routines load the board's hardware graphics cursors, and pan, zoom, and scroll registers.

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### Serial I/O

CLP provides routines for the Serial (RS-232) and PS/2 ports including initialization, buffer management, and PS/2 keyboard management. CLP does not contain routines which specifically support a Serial keyboard or mouse.

### Application Programming with CLP

A host CPU based program can make use of the routines by linking with a Rastergraf-supplied host side library/redirector. Subroutine package calls contained in the user program are passed to the board in this way.

Performance of CLP is maximized by allowing the host library/redirector to access the board through user space, thus avoiding the overhead of a system driver. As required by the operating system, a simple system driver is supplied by Rastergraf to establish memory mapping to the board and support interrupts. This does not affect the overall performance of the program.

A second and more powerful way to use CLP is to run your program on the board. If you order the Rastergraf 34020 Compiler Toolkit, you can build board-side programs which link to the subroutine library. You can first debug your program in the host and then move it to the board with a high degree of confidence that it will work.

Example C programs are provided which use the CLP functions to initialize the board and draw figures and text.

### Color Map Support

A color map translates the primary, overlay, and cursor pixel data into RGB triplets (8 bits each of Red, Green, and Blue) which are sent to the monitor. Routines are provided for both standard analog monitors and analog and digital color and monochrome flat panels.

CLP provides both RGB and HLS color systems. RGB is an additive primary system and is the native color mode of the board. HLS is applicable to analog monitors only. It is a system in which Hue, Lightness, and Saturation are converted to RGB values.

### Fonts

CLP contains a variety of bit-mapped fixed fonts in different weights and pitches. For efficiency the fonts are linked into the board side library, thus requiring that the library be rebuilt should you wish to add fonts.

### Development Environment

CLP applications are usually developed in a host/target environment. A Sun or UNIX workstation is the appropriate development platform. The 34020 Compiler Toolkit are available for PC and Sun.

CLP has been ported to Unix and several real-time target operating systems (see other side for details). Its language interface is C. CLP is compatible with Verdex ADA metaphors.

### Software Distribution

The CLP software distribution consists of the following components:

- host side library/redirector
- host side device driver (for interrupts and board mapping)
- host and board side sample programs
- board side library and downloader
- complete source code and makefiles

### PROM based Library

It is sometimes not desirable to download code to the board. Rastergraf can provide the CLP subroutine library code in board based PROM. Normally, this PROM contains an autoboot program which initializes the display to the customer's timing parameters and draws a test pattern of lines, circles, color bands, and text. It then goes into the CLP command polling loop.

## CLP Specifications

Note that due to differences in features, not all routines may apply to each board.

All arguments passed between CLP routines are integer, longword, or character data. Integer arrays and character strings are also used. CLP routines do not use any floating point (real) arguments.

Coordinates passed to CLP refer to a two-dimensional Cartesian system which includes both on- and off-screen memory. The origin is in the upper left corner.

### Initialize Workstation (Board)

- initialize screen, palette, text, video, and/or viewport
- set the control and data register addresses Load the 34020 with the desired monitor timing parameters
- put board into external sync mode

### Initialize Plotting Modes

- select a plot mode (e.g. replace)
- set a pixel value for plotting
- set a pattern for plotting and filling
- set the limits for bounded operations
- set all pixels to a specified value
- select plane (primary, overlay, or internal buffer) for drawing
- set or get transparency mode
- set or get writemask or pen size
- viewport functions: open, close, move, copy, select, clipping rectangle, origin

### General Image Inquiry and Support

- make the board active or inactive
- get data area size and compilation data
- general read and write routines
- copy between board and a host buffer
- pixel operations: bit expand, get pixel, get rectangle, move pixel, put pixel, zoom rectangle
- miscellaneous functions: delay, peek, poke, wait scan, pan, zoom

### Ordering Information

CLP is the designation for the VCL Graphics Subroutine Package. CLP is shipped as a full source distribution. A license agreement must be executed prior to shipment of the software. CD is the standard distribution media. Other methods are available by special arrangement and extra cost. Contact Rastergraf if you need an OS which doesn't appear in the table.

Operating System	Minimum OS Release Level
Solaris	2.4
VxWorks (PPC, 68K and SPARC)	5.1

### Color Map Support

- load the color map
- read/write color map entries
- read/write control registers
- hardware cursor support

### Serial I/O and PS/2 Port Support

- initialize ports
- input and output buffer management
- read and write data

### Bitmapped Text Support

- character and string memory read/write
- get and install font(s)

### Graphics Display Support

- point, vector, circle, oval, arc, rectangle, and polyline generation
- programmable "pen" attribute: single or multiple pixel, or pattern
- area fill routines (solid and pattern): fill to boundary, convex, oval, piearc, polygon, rectangle
- seed fill
- copy a rectangular screen area to another place on the screen
- change viewed area
- draw a rectangle or parallelogram using current pattern
- 3D Transformation Functions: copy matrix, copy vertex, rotate, scale, convert vertex to point, transform, translate
- single and double precision magnitude, exponential, logarithmic, and trig functions
- floating and fixed point conversion routines
- software horizontal and vertical pan of selected area

### High Speed Digital Input Port

CLP provides routines to transfer data into display or 34020 memory from the optional 20 MB/sec 32-bit data input port.

### Performance Features

CLP makes full use of the 34020, which provides hardware assisted line drawing, fills, and bitblt. Additional performance enhancements include optional 34082 FPU, hardware byte swapper and Video RAM writemask, color register, VFILL, VBLT, and page mode functions. The VRAM functions yield a 160 Mpixel/second fill rate for the VCL-V/8.

### Rastergraf VCL Series Boards

Rastergraf's VCL graphics boards are based on the TMS 34020 Graphics Processor. Features include:

- optional 34082 Floating Point Coprocessor/Accelerator (VCL-V only)
- programmable video timing and refresh
- Flash EEPROM for CLP
- 2 serial I/O ports
- PC type mouse and keyboard ports
- programmable color map
- hardware cursors, pan, zoom, and scroll
- hardware byte swapper
- external sync capability
- low power 6U VMEbus or PMC design
- extended temperature range options
- sufficient display memory to support double buffered displays

Most VCL "/8" boards have an 8-bit/pixel primary plane plus an 8-bit/pixel overlay plane and CLP supports both primary and overlay. The VCL supports analog RGB and/or analog and digital color and monochrome flat panels display output. Analog display resolution ranges from 640 x 485 up to 2048 x 1536 pixels. Digital display resolution ranges from 640 x 480 up to 1280 x 1024 pixels.

The VCL-V/24 series boards offer the same features as the VCL-V/8 with the additional enhancement of a true color (24-bit/pixel primary plane).

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