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DataColor - Graphics Processing and Display System

The DataColor is a modular system in the DataBoard series, generating colour graphics for display on high resolution colour monitors. It is a high speed display system, which is flexible and includes intelligent command decoding. The system can be operated from a host computer or from an internal user control program.

The DataColor system consists of a DataBoard 4680 single board computer system (Z80-CPU) and a graphic unit, all built into a standard 19" chassis. User programs can easily be included in EPROM and can be special intelligent command decoders or a complete control program. Using the optional keyboard, a general stand alone system can be built. The system can be directly connected to process equipment using interface cards from the extensive DataBoard 4680 series.

Resolution

The resolution 320 * 256 pixels per picture or higher as 640 * 512 pixels is selectable by commands, if enough memory modules are inserted. Up to four independant display pages can be used to be separately displayed or combined to pages with high resolution. Two pages can be used in foreground/background relation on one picture.

Colours

The colours are selected by commands from 512 possible nuances. A combination of 16 colours can be simultaneously displayed on the screen, giving a wide choise of colour combinations.

Addressing

For all dots on the screen, individual colours can be set. Addressing and writing a dot takes 2 microseconds, giving a high picture update speed. Function displays (as vector drawing), including vector calculation time, can take 23 microsec/pixel.

Commands

The DataColor system responds to about 60 commands, generating symbols, characters or special functions or setting up function parameters. As standard, the commands are sent from a host computer via a V24(RS232C) line, but other protocols can be delivered.

Generators

Symbols of any size and complexity and character fonts can be stored in EPROM in the DataColor or sent to the DataColor via commands for storage in RAM. A symbol is called up for display on the screen by a single byte command. A symbol can include other symbols or characters.

Digitizer and Keyboard

A digitizer table and a serial keyboard can optionally be connected to the DataColor system and are handled by special digitizer and keyboard commands. The digitizer can control a special "cursor" on the DataColor screen and the keyboard input can be buffered and echoed locally on the DataColor screen before sending to the host computer.

Symbol editor program

A symbol editor program is available in Extended BASIC for a DataBoard 4680 host computer, simplifying the building and editing of user symbols. The digitizer can be used and the editing is done interactively with on-line display of an enlarged symbol on the DataColor screen.

DataBoard BASIC DataColor option

A DataColor option for the DataBoard Extended BASIC is available, which includes DataColor commands as BASIC statements.

Example: The BASIC program below writes the text "DATACOLOR" in red within a yellow circle.

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10 GINIT                ! Initiate (Red is selected)
20 GPOS 140,100          ! Position to X=140,Y=100
30 GPRINT "DATACOLOR"    ! Red is selected at initiation
40 GFGCOL 3              ! Init sets colour 3 to yellow
50 GPOS 100,100
60 GCIRCLE 164,100,8*64 ! Draw circle
70 END
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Information in this document is subject to change without notice.

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TECHNICAL DATA

- Resolution: Standard: 320 * 256 pixels
Option: 640 * 512, 640 * 256, 320 * 512 pixels
- Pages: Standard: 1 page 320 * 256
Option: 4 pages 320 * 256
2 pages 640 * 256 or 320 * 512
1 page 640 * 512
- Foreground/Background pages:
Two pages can be simultaneously displayed on the screen. The background pixels are displayed where the foreground pixels have the colour "0".
- Colours: Graphics and text in 16 colours on the screen, program selectable from 512 nuances. For each colour, a flash condition can be set, where all pixels with the defined colour, flashes with a separately defined alternate colour.
- Scaling: Characters and symbols can be scaled.
- Rotation: Characters and symbols can be rotated.
- Character generators: Max 4 character generators, each with max 96 characters, predefined in EPROM or defined by commands. Character matrix size is max 8 * 15 pixels. As standard, one character generator in EPROM is included with the normal ASCII character set in a 5 * 7 matrix.
A separate character background colour can be set.
- Characters/line: Max 53 or 106, depending on resolution selected.
- Lines/page: Max 32 or 64, depending on resolution selected.
- Symbol generators: Max 4 symbol generators, each with max 96 symbols, predefined in EPROM or defined by commands. Each symbol can be of any complexity or size, including also other symbols and characters and are defined with efficient symbol functions.

A Symbol Editor Program is available for a DataBoard 4680 host computer for efficient building and editing of symbols, interactively on the DataColor screen.
- Command communication: Standard: V24 (RS232C) serial communication, with 9600 or 19200 Baud, 8 bits or 7 bits data.
Option: Parallel or IEC bus interface
- Buffer: 256 bytes command receive buffer. New commands are received while earlier commands execute.
- Commands: About 60 commands are standard in the system, setting parameters and performing functions. User defined commands and programs can be added.

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- Hardware: Graphic unit and a single board computer on Eurocards in a 19" rack.
- Standard: 1 Single board computer
5 Graphic processing boards
2 Picture memory boards
- Options: 6 more Picture memory boards
3 I/O slots for DataBoard I/O boards
3 Memory slots for DataBoard memory boards.
- Colour monitor: Any high resolution colour monitor using the CCIR 625 lines standard, can be used.
- RED, GREEN, BLUE video 0-1 V peak-to peak
SYNC 1 V peak-to peak
- Coaxial cables should be used and the cables should be correctly terminated.
- Digitizer: BITPAD ONE digitizer, using serial communication 9600 Baud. Including four switches, which the system can read.
- Keyboard: Any serial keyboard, connected either on the digitizer input channel or on a separate UART interface.

COMMAND PROTOCOL

Received bytes are normally considered as a character or symbol pointer, displaying the character or symbol from the selected generator on the screen.

A command is sent as one command byte, followed by parameters. It is recognized as a command if bit 7 is set in the byte, using 8-bit communication. The parameters are decoded by the command interpreter in the DataColor unit. When 7-bit communication is used, a command byte is preceded by an ESC character.

All data, sent on the command line, except command or control bytes, are sent biased as printable ASCII characters. ASCII range 40 - 377 octal. (40 - 177 octal, using 7-bit communication.)

SHORT PRESENTATION OF THE COMMANDS

NOTE! The description below is not complete. The DataColor manual must be used when working with the system.

(PRINT) When sending bytes without preceding command byte, the corresponding characters or symbols from the earlier selected generator are displayed on the DataColor screen. Using the standard character generator, the DataColor displays the ASCII characters on the line as normal ASCII characters.

INIT Initiates the system and sets default parameters. The picture memories are emptied and earlier defined generators are erased.

CLEAR Clears the screen to a defined background colour.

FGCOL Selects foreground colour (1 of 16).

BGCOL Selects background colour (1 of 16).

DIR Defines character and symbol rotation and sets character step direction.

SCALE Sets the horizontal and vertical scaling for character and symbols, written after this command.

STEP Changes the character step size (Width and Height). I.e. the size of the step taken between each character and for each step control byte from the line.

IOPAGE Selects the page to update with new commands (1 of 4).

VIDEOPAGE Selects the page to display on the screen. Disselects the FGPAGE and BGPAGE command.

FGPAGE Selects the page to be used as foreground page.

BGPAGE Selects the page to be used as background page.

MIX Defines the 16 colours, selected from the 512 possible combinations of red, green and blue intensities. Also defines 16 other colours, to be used as alternate colours when flashing is selected.

FLASH Defines the colours and frequencies for flashing. All pixels on the screen with certain colours can be set to flash independantly with alternate colours.

PUSH Saves the DataColor status on the stack.

POP Restores the DataColor status from the stack.

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GEN Selects the generator to use. 0-3 are character generators and 16-19 are symbol generators.

GENNEW Creates a new character or symbol generator in RAM memory in the DataColor system.

GENDEF Defines a new character or symbol in a RAM generator. A defining string is sent as parameters.

Character defining string:

A character is defined by sending the pixel pattern within the character matrix.

Symbol defining string:

A symbol defining string is a string of function commands and/or incremental step commands and/or calls to include other symbols or characters in the symbol. The incremental step commands can be up, right, down, left and can leave coloured dots.

Available function commands are:

- FCOL Select earlier foreground colour
- BCOL Select earlier background colour
- PCOL Select the colour defined at entry to symbol.
- DIRBIAS Set relative rotation
- MULTIMOVE Multiple incremental steps
- MULTIDOT MULTIMOVE drawing a line.
- COLOUR Colour select by number.
- SCALE Temporary scaling
- PAINT Fill area with colour
- CIRCLE Draw a circle
- MOVE Move to a new position
- LINE Draw line to a new position
- RECT Draw a filled rectangle
- CALL Include another symbol at display time
- XCALL Include another symbol or character from another generator.
- POS Define the position at exit from the symbol. The status set within a symbol (as colour, scaling etc..) are reset automatically at exit from the symbol.
- EOS Indicates the end of the symbol defining string.

EXEC Displays a symbol on the screen, corresponding to the symbol defining string, sent as parameters. The string is not stored in the DataColor memory.

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POSABS Moves to a new position on the screen. The position
POSABS*4 can be absolute or relative. A short form is used
POSREL for high speed moves.

LINEABS Draws a straight line on the screen. (See POSABS..)
LINEABS*4
LINEREL

RECTABS Draws a filled rectangle on the screen. (See POSABS..)
RECTABS*4
RECTREL

PAINT Fills an area on the screen within boundaries with
the foreground colour.

CIRCLE Draws a circle on the screen.

DASHLINE Draws a dashed line on the screen.

MODE DataColor mode setting commands:

- X640 Select horizontal resolution
- X320
- Y512 Select vertical resolution
- Y256
- Interlace Select interlace on display
- NoInterlace
- Dotting Modulate horizontal lines on the screen
- NoDotting for compatibility with vertical lines.
- AutoNewLine Characters, displayed after the end of a
- NoAutoNewL. line, are continued on the next line.
- Transparency Characters are displayed with or
- NoTransp. without a background colour within the
matrix.
- CR Data, sent back on the command line,
- NoCR (as Cursor positions etc..), are
terminated by a 'CR'.
- SPEC Keyboard termination characters are
- NORM converted to a special code, avoiding
ASCII control characters on the line to
the host computer.

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CURS Cursor and digitizer control commands.

- CURON Display the cursor, which continuously
- CUROFF is updated from the digitizer.
- CURTRACK Enable tracking=leave a trace on the
- screen when a digitizer button is pressed.
- CURLINE Display the cursor as a moving
- 'rubber-band' line from the present
- position to the cursor position.
- CURHYST Stabilize the cursor
- CURLOCK Lock the cursor colour, independant of
- later foreground colour changes.
- CURREAD Send back, to the host computer, the
- cursor position and the status of the
- four switches on the digitizer pen.
- CURPOSIT Move the cursor to a given position.
- CURCOPY Set the position (for the next command
- on the screen) to the cursor position.
- CURSET Move the cursor to the position
- selected for the next command.
- CURSCALE Set scaling of the digitizer X,Y values
- before updating the cursor position.

KEYB Keyboard commands for a connected serial keyboard.

- KBMODE Select buffering with echo on the
- screen, or direct transfer to the host
- computer without echo. Also select which
- characters to accept in the buffer.
- KBECHO Select buffer size and the echo position
- on the screen, as well as generator,
- scaling and echo colour.
- KBRECT As KBECHO, but also draws an open
- rectangle around the echo area on the
- screen.

SPECO Special commands to call user implemented programs
SPEC1 and command interpreters in EPROM in the DataColor
 unit.
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SPEC7