3700

HIGH-SPEED, HIGH-PERFORMANCE DISPLAY PROCESSOR WITH 60 Hz COLOR

Lexidata's new 3700 display processor provides unparalleled price/performance for high-speed graphics applications. The 3700 combines writing speeds of up to 42 million pixels per second with the power of Writable Control Store (WCS) programmability, downloadable character fonts, a versatile bit-slice architecture...and the availability of 1280x1024 50/60 Hz non-interlaced color. The result is the premier product in the Lexidata System 3000 family of compatible display processors.

FEATURES

- Available 1280x1024, 50/60 Hz Non-Interlaced Color or Monochrome
- Writing Speeds Up to 42 Million Pixels Per Second in Block Mode
- 750 Nanoseconds Per Pixel Vector Write Time
- Writable Control Store Programmability

- A Variety of Flexible Configurations
- Up to 4096 Colors
- Plug Compatible With Lexidata 3400

BENEFITS

- Displays Bright, Flicker- Free Color or Monochrome Graphics
- Provides Extremely Fast Fills and Horizontal Vectors
- Displays Complex Drawings Quickly

- Allows User to Add Specialized High-Speed Functions
- Serves Multiple Application Requirements
- Displays Color or Greyscale Images
- Runs Existing Software Without Modifications

LEXIDATA™

HARDWARE DESIGNED FOR HIGH-PERFORMANCE APPLICATIONS

1280x1024 50/60 Hz Color or Monochrome

The 3700's 50/60 Hz non-interlaced configuration updates the entire screen in one pass, sixty times per second. With the high refresh rate, short persistence monitor phosphors can be used for brighter, more vivid colors. Even horizontal lines show no visible flicker. The 3700's high resolution provides the additional benefit of exceptional display detail and clarity.

Lexidata first introduced 1280x1024 50/60 Hz *non-interlaced monochrome* systems in 1979. The Company's long-time experience in the graphics display industry allows it to now offer this technology in *color* at prices even lower than many competing *interlaced* systems.

Up to 42 Million Pixels Per Second in Block Mode

Special hardware in the 3700 allows the high-resolution, non-interlaced configuration to write in blocks of up to 80 pixels simultaneously, resulting in speeds of up to 42 million pixels per second. The circuitry automatically prompts the processor to write in blocks instead of individual pixels whenever appropriate. This is especially important for area fills which require writing large numbers of pixels. The result is virtually instantaneous fills—an important feature for CAD/CAM users concerned with mechanical design, IC design, and PC layout.

750 Nanoseconds Per Pixel Vector Write Time

When not writing in blocks, the 3700 writes at 750 nanoseconds per pixel, *continuously*, not just in bursts or during retrace. This measure of display processor performance is critical for overall throughput in line drawing applications. Complex drawings are displayed quickly on the 3700, increasing user productivity. High-speed drawing capability allows complex objects to be dragged smoothly across the screen. And the 1280x1024 50/60 Hz non-interlaced display eliminates the smearing that long-persistence phosphors create.

WCS Programmability

The 3700 provides a standard 4K Writable Control Store programmability feature. This allows the user to add powerful graphics functions by taking full advantage of the 3700's speed. The 3700 processor handles multiple operations simultaneously, independently of user-written code, which allows the speed of parallel operations without the difficulty of writing special pipelined code. Easy-to-use cross assemblers are available for a variety of host computers, including the Digital Equipment Corporation VAX™ family of 32-bit computers.

Configuration Flexibility for the OEM

The 3700's modular design separates major system functions onto different boards, allowing a variety of configurations. Five basic systems are available, using three different lookup tables. (See Figure 1 and the 3700 Configuration Summary.) Included are 640x512 50/60 Hz, two versions of 1280x1024 25/30 Hz, and two versions of 1280x1024 50/60 Hz systems. These basic configurations can be combined with desired options to create systems suited to most any application.

3700 LOOKUP TABLES

LUT	Input Bits	Simultaneous Colors	Output Bits Per Channel	Color Palette
4x4	4	16	4	4096
8x8	8	256	8	16.7 M
12x8	12	4096	8	16.7 M

Figure 1. A VARIETY OF LOOKUP TABLES—Three different lookup tables are available to meet the various application needs of the 3700 user. The 16-color capability of the 4x4 lookup table is sufficient for most line drawing applications. The 8x8 provides 256 colors for more demanding applications, while the 12x8 offers 4096 simultaneous shades needed for color or greyscale images.

Continuous Access to Pixel Memory

The 3700's interleaved, dual-ported memory design assures the processor of continuous access to pixel memory. Pixel update and display refresh occur continually, not just during monitor retrace periods. This continuous pixel memory access is especially important for functions which require reading and writing of pixels (i.e. as in the case of fills).

Downloadable Character Fonts

A separate Random Access Memory (RAM) is provided on the 3700 for storing user-defined characters and symbols. Multiple fonts can be defined using any matrix size up to 64x64 pixels. Fonts of different sizes can be stored simultaneously. Once defined, the characters can be placed anywhere on the screen with a simple function call. The 16K bytes of character RAM provide ample storage for a wide range of characters and symbols.

A SYSTEM ARCHITECTURE BUILT FOR SPEED

The 3700 display processor is uniquely designed for speed. Each system component module has been optimized for fast operation. Data from the host computer is transferred to the 3700 via a 16-bit parallel Direct Memory Access (DMA) port, which operates at up to one megaword per second. An input buffer stores commands, increasing total system throughput while reducing communications loading. Commands are pulled out of the buffer and executed by the 3700's bipolar processor in a 185-nsec instruction cycle time. A separate memory controller outputs the pixel data from the dual-ported memory, allowing display refresh to occur concurrently with display memory updating. (See Figure 2.)

An optional pan/zoom controller provides zoom in integer increments (other systems usually increment zoom in powers of 2), as well as smooth vertical scrolling and horizontal panning.
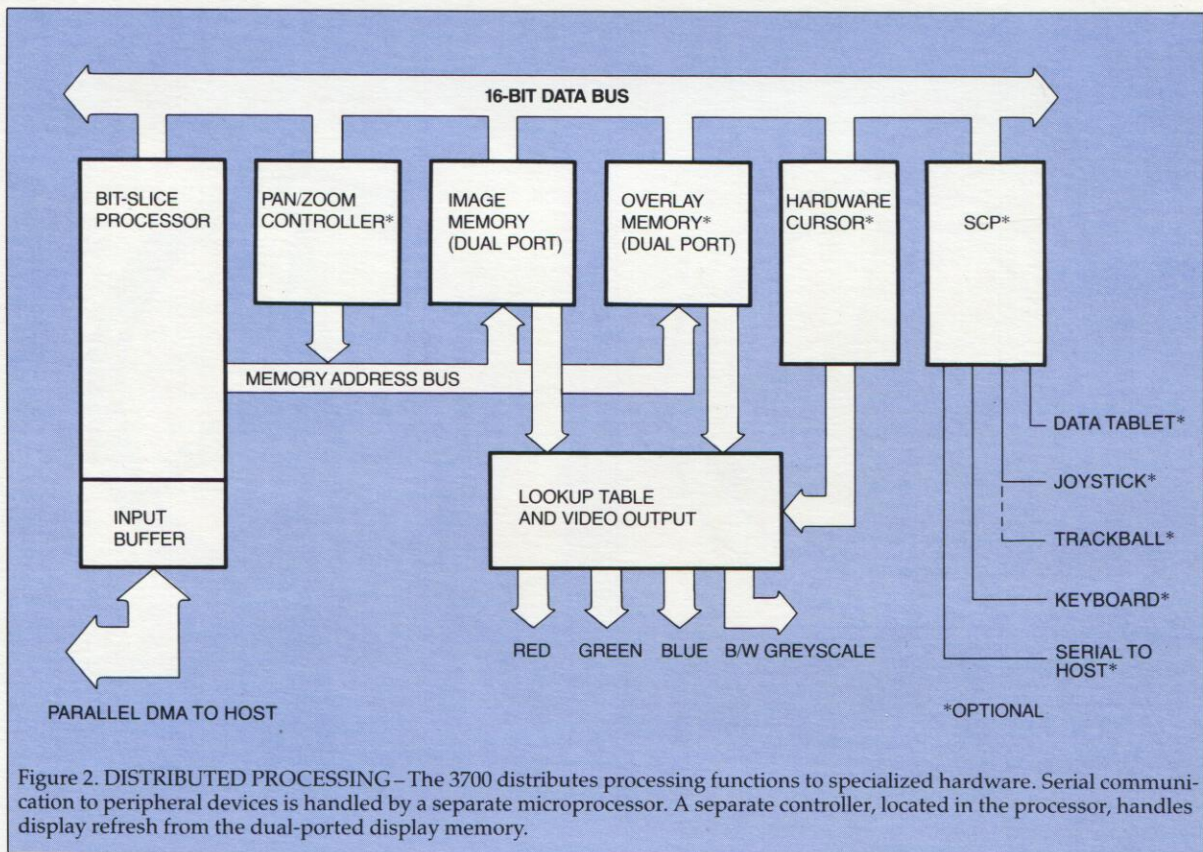

Figure 2. DISTRIBUTED PROCESSING – The 3700 distributes processing functions to specialized hardware. Serial communication to peripheral devices is handled by a separate microprocessor. A separate controller, located in the processor, handles display refresh from the dual-ported display memory.

High-Speed Processor Handles All Primitives

While many displays simply use the processor to "set up" a dedicated graphics controller, the 3700 processor handles all graphics operations directly. Complex operations can therefore be executed quickly, without having to work through the primitives of a graphics controller. This is especially important when adding new functions through the Writable Control Store feature. The 185-nsec instruction cycle of the processor ensures that *all* functions run fast, not just particular primitives.
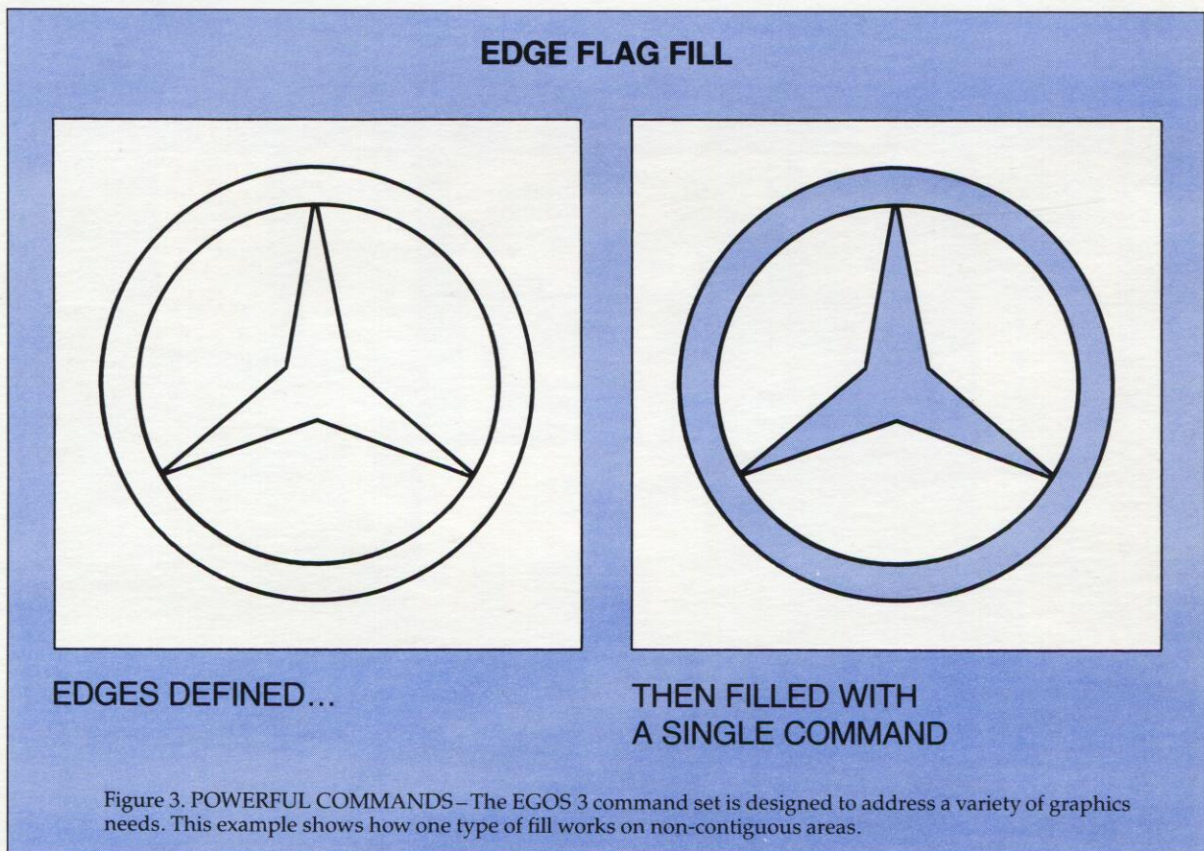
Distributed Processing for Serial Communications

The 3700 provides a distributed approach to serial communications. Rather than burdening the main processor (or the host) with time-consuming peripheral handling, all serial communications are controlled by the 3700's Serial Communications Processor (SCP), a microprocessor-based option with on-board intelligence that deals with such tasks as data packing and unpacking, I/O buffering, peripheral setup and error detection.

POWERFUL, COMPATIBLE FIRMWARE – EGOS 3

EGOS 3 is the latest, most powerful version of Lexidata's popular EGOS (Extended Graphics Operating System) firmware package. Since EGOS 3 is compatible with earlier versions of EGOS, existing software will run without modification. Current EGOS users will notice one change, however, *unprecedented speed*. All hardware enhancements

EDGE FLAG FILL

EDGES DEFINED...

THEN FILLED WITH A SINGLE COMMAND

Figure 3. POWERFUL COMMANDS – The EGOS 3 command set is designed to address a variety of graphics needs. This example shows how one type of fill works on non-contiguous areas.

have been implemented transparently. Just plug in the 3700 and it runs significantly faster than previous EGOS systems. (For a complete listing of EGOS commands, see the 3700 Command Summary.)

An Upgrade Path for the Future

EGOS 3 is a member of a growing Lexidata family of compatible firmware. Future firmware revisions will introduce new capabilities without modifying existing functions. These new functions will continue to meet the changing needs of the graphics industry. And, since the firmware is designed to adapt to changing hardware trends, EGOS users will be able to take full advantage of technology advances as they occur.

FLEXIBILITY TO SATISFY A VARIETY OF INDUSTRY APPLICATIONS

CAD/CAM

Since productivity is the key to successful CAD/CAM applications, display speeds are an important consideration. The 3700's fast vector write times ensure that drawings are displayed quickly. Its speed is so rapid that complex (even filled) objects can be dragged easily and quickly. The WCS programmability allows the user to add specific features (such as a proprietary protocol) or special primitives (such as a spline). The availability of 1280x1024 50/60 Hz color or monochrome allows the clarity of high resolution to be combined with the ergonomic benefits of a high refresh rate display.

PC/IC

Printed Circuit (PC) and Integrated Circuit (IC) design systems typically require high-quality graphics to increase user productivity. IC designs require many filled rectangular areas, while PC applications use many horizontal and vertical lines. The block writing capability at up to 42 million pixels per second makes the 3700 particularly well-suited for these requirements. Its 50/60 Hz non-interlaced configuration adds the extra advantage of ultra-high refresh, providing flicker-free horizontal lines and filled areas.

Mapping

The 3700's high-speed fills are excellent for mapping applications which require filled areas. The downloadable text fonts allow easy map annotation and special symbol handling. With configurations offering up to 256 colors at 1280x1024, the 3700 provides the power and features necessary for a successful mapping system.

Workstations

The system builder can combine the 3700's speed and flexibility with an existing computer hardware/software base to optimize user productivity. Parallel DMA host interfaces are available for Digital Equipment Corporation VAX,™ PDP-11™ and Q-BUS,™ and Data General Corporation NOVA,™ and ECLIPSE™ systems; as well as other popular host computers.

SUMMARY

Lexidata's new 3700 display processor combines the performance, features, and functionality needed for today's interactive graphics applications. High-speed vectors ensure virtually instantaneous screen updates. 1280x1024 50/60 Hz non-interlaced refresh offers the user the comfort of bright, flicker-free color, as well as high resolution. The 3700's WCS programmability allows OEMs to add the functions (and hence the value) that their customers demand. And, with EGOS 3, the 3700 provides a pathway to the future, at prices that will open up a whole new range of lower-priced, high-performance graphics systems.

3700 COMMAND SUMMARY

The 3700's EGOS 3 is a powerful command set which combines graphics, imaging, hardware set-up and peripheral I/O functionality. Its straightforward format and multiple operational modes simplify application development.

INITIALIZATION

DSCFG	Configure
DSCHAN	Set channel masks
DSCLR	Clear display
DSGCF	Get configuration
DSGCH	Get channel masks
DSSCF	Set configuration

TEXT FUNCTIONS

DSSAO	Set text parameters
DSTXT	Display text
DSDF	Delete font
DSGCD	Get character definition
DSGFD	Get font definition
DSGTA	Get text control character (action character) enable
DSGTC	Get text foreground/background colors
DSGTF	Get text current font
DSGTI	Get text position increment mode
DSGTM	Get text write mode
DSGTP	Get text character path
DSGTR	Get text rotation
DSGTS	Get text scale factor
DSGTT	Get text 'text cursor display' mode
DSGTV	Get text video mode
DSGTW	Get text window
DSGTX	Get text current x,y position
DSSCD	Set character definition
DSSFD	Set font definition
DSSTA	Set text control character (action character) enable
DSSTC	Set text foreground/background colors
DSSTF	Set text current font
DSSTI	Set text position increment mode
DSSTM	Set text write mode
DSSTP	Set text character path
DSSTR	Set text character rotation
DSSTS	Set text scale factor
DSSTT	Set text 'text cursor display' mode
DSSTV	Set text video mode
DSSTW	Set text window
DSSTX	Set text current x,y position

GRAPHICS FUNCTIONS

DSARC	Arc
DSCIR	Circle
DSCVEC	Chained vectors
DSDISP	Set write mode, line weight and pattern, and fill enable

DSEFIL	Edge flag fill
DSPNT	Display points
DSPOLY	Fill polygon
DSRECT	Draw a rectangle
DSRNR	Random pixel read
DSRNW	Random pixel write
DSSFIL	Seed fill
DSVEC	Display vector
DSGDP	Get display parameters
DSBUFF	Set memory buffer attributes
DSGBF	Get memory buffer attributes

IMAGE FUNCTIONS

DSBMOV	Block move/copy
DSGET	Sequential read
DSLIM	Set rectangular limits
DSPPR	Packed pixel read
DSPPW	Packed pixel write
DSPUT	Sequential write
DSRUNL	Run length encoded write
DSGLM	Get sequential read/write limits

PAN/ZOOM FUNCTIONS*

DSZOM	Zoom and pan
DSGZM	Get zoom parameters
DSMOV	Movie
DSMRG	Zoom margins
DSGMG	Get margin parameters
DSGMO	Get movie parameters

HARDWARE CURSOR FUNCTIONS

DSCXY	Set cursor position
DSCER	Erase matrix cursor
DSCLD	Load matrix cursor
DSCSL	Select cursor
DSGCS	Get cursor selection

BLINK CONTROL FUNCTIONS*

DSBCTL	Blink control
DSBLIN	Blink rate
DSGBC	Get blink control parameters
DSGBL	Get blink rate

PERIPHERAL CONTROL FUNCTIONS*

DSGXY	Read cursor position, switches
DSITAB	Initialize data tablet
DSRTAB	Read data tablet
DSSL	Set trackball/joystick lights
DSGKB	Get keyboard data, set lamps

LOOKUP TABLE FUNCTIONS

DSLLU	Lookup table ramp load
DSLRD	Lookup table read
DSLWT	Lookup table write

MISCELLANEOUS/CONTROL FUNCTIONS

DSECHO	Set echo mode
DSDLY	Delay
DSGERR	Get most recent error
DSVSN	Wait on vertical sync

*Hardware/configuration dependent.

3700 SYSTEM SPECIFICATIONS

Alphanumerics
Alphanumeric character fonts are provided which support upper and lower case text, numerals, and punctuation. The standard font types are:

Character	Box	Case	Resolution
5x7	7x11	upper/lower	640x512
7x9	9x14	upper/lower	1280x1024

Downloadable Fonts
RAM Size – 16K bytes.
Character Definition – Programmable, up to 64x64 pixel matrix.

Hardware Options
Pan/Zoom – 1x, 2x, 3x... to 16x selectable over the screen area.

Serial Communications Processor – Microprocessor-based. Up to 19.2K baud operation. Four dedicated ports handle peripherals and/or host.

Hardware Cursor – Size and shape of cursor is user-definable within 64x64 pixel matrix. Full screen cross-hair cursor is also software selectable.

Data Transfer Rate
Up to one megaword (16 bits/word) per second.

Performance
Vector Write After Set-Up – 750 nsec per pixel, continuous.

Block Vector Write (1280x1024, 50/60 Hz system) – 23 nsec per pixel, continuous.

Power Requirements
115 VAC ± 10% 47-63 Hz (3 wire)
230 VAC ± 10% 47-63 Hz (3 wire)
600 watts average.
Requirements vary depending on configuration size.

Environmental Requirements
Operating Temperature
10 to 40 degrees C

Storage Temperature
−35 to 70 degrees C

Operating Relative Humidity
10% to 90% (non-condensing)

Storage Relative Humidity
10% to 90% (non-condensing)

Altitude
8,000 ft.

Acoustic Noise Level
The acoustic noise level shall not exceed the NC-60 noise criteria curve.

Chassis Dimensions
8-slot: 5.25" high x 19" wide x 27" deep.
12-slot: 8.75" high x 19" wide x 27" deep.

Weight
8-slot: 40-70 lbs. including power supply.
12-slot: 60-100 lbs. including power supply.

3700 CONFIGURATION SUMMARY

Model	3701	3702	3703	3704	3705
Display resolution	1280x1024	1280x1024	640x512	1280x1024	1280x1024
Display refresh rate	25/30 Hz interlaced	25/30 Hz interlaced	50/60 Hz non-interlaced	50/60 Hz non-interlaced	50/60 Hz non-interlaced
Standard memory	4 planes	6 planes	8 planes	3 planes	1 plane
Maximum memory	4 planes	8 planes	12 planes	3 planes	1 plane
Chassis	8 slot	12 slot	8 slot	8 slot	8 slot
Video output	4x4 CLUT	8x8 CLUT	12x8 CLUT	ECL video hardwired	ECL video hardwired
Maximum number of simultaneously displayable colors	16	256	4096	8	monochrome
Overlay memory	1 plane option	2 planes option	4 planes option	1 plane option	1 plane option
Serial Communications Processor (SCP)	option	option	option	option	option
Hardware cursor	option	option	option	option	option
Pan/zoom controller	option	option	option	not available	not available

⊔LEXIDATA

CORPORATE WORLD HEADQUARTERS

Lexidata Corporation
755 Middlesex Turnpike
Billerica, MA (USA) 01865
(617) 663-8550
TWX: 710-347-1574

U.S. offices:

Boston
Chicago
Houston
Ithaca
Los Angeles
New York
Raleigh
San Francisco
Washington, D.C.

EUROPEAN HEADQUARTERS

Lexidata, LTD
Weaver House
Station Road
Hook, Basingstoke
Hampshire
RG27 9JY
UNITED KINGDOM
(44) (025672) 4334
TWX: 851/858364 LEXUK G

International offices:

Australia
France
Israel
Japan
Netherlands
Switzerland
United Kingdom
West Germany

LEXIDATA FRANCE SARL
30, Rue du Morvan SILIC 557
94643 RUNGIS Cédex
Tél. (1) 686 56 71
Télex 204 683 LEXI-FR