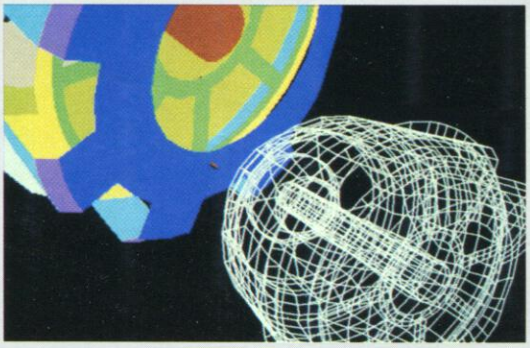
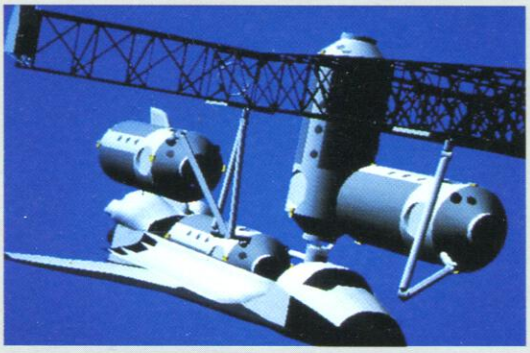
ADAGE

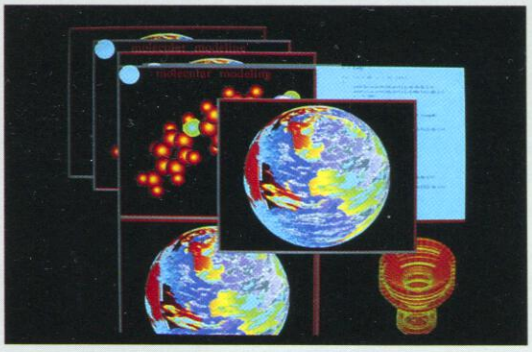
THE LEX 90™ FAMILY OF GRAPHICS DISPLAY PROCESSORS



SIMULRES



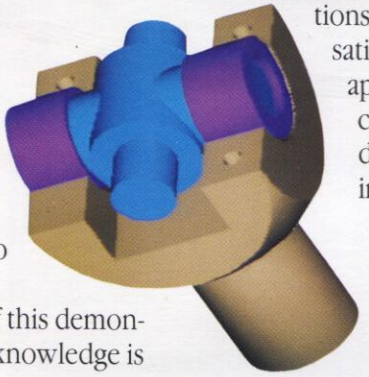
SOLIDVIEW®



VIRTUAL WINDOWS

LEX 90: OUR MOST ADVANCED FAMILY EVER.

For over two decades, Adage has been helping both end-users and OEMs satisfy their computer graphics requirements by designing and manufacturing high-performance, interactive graphics workstations, board sets, and display processors. By listening to and working with our customers, we have been able to provide them with unique solutions to their particular needs.



The culmination of this demonstrated experience and knowledge is the LEX 90.

LEX 90 is our most advanced family of raster graphics display processors. It is being used worldwide by major companies, government agencies, and universities to cost-effectively reduce the picture processing workload of host computers.

An extremely powerful, high-performance family, the LEX 90's standard hardware and firmware configurations have been designed to satisfy a variety of demanding application areas, such as computer-aided design (CAD), defense, graphic arts, medical imaging, and geological interpretation.

Utilizing our sophisticated graphics software, LEX 90 is capable of displaying 2-D graphics and 3-D solids. Its modular architecture makes the LEX 90 a highly-flexible product that not only allows you to buy the functionality you need today, but also gives you the ability to expand and upgrade the system later as requirements change – all at a minimum entry cost.

We invite you to take a closer look at the LEX 90 family, the leading price/performance solution for all your graphics requirements.

Cover: Three unique LEX 90 capabilities include (top to bottom): SimulRes, SOLIDVIEW, and Virtual Windows. (SimulRes image created using PDA Engineering's PATRAN© application software package. Space station model created with SOLIDVIEW running SDRC's I-DEAS™ Geomod© software and appears courtesy of Martin Marietta.)

The LEX 90 family's basic design (Figure 1) consists of several different logic modules that reside on separate printed circuit boards. One of these, the System Control Module (SCM), acts as the primary processing unit for every LEX 90 configuration. The SCM controls all the basic display processing functions including: communicating with the host computer, processing pixel data, and controlling the family's memory modules.

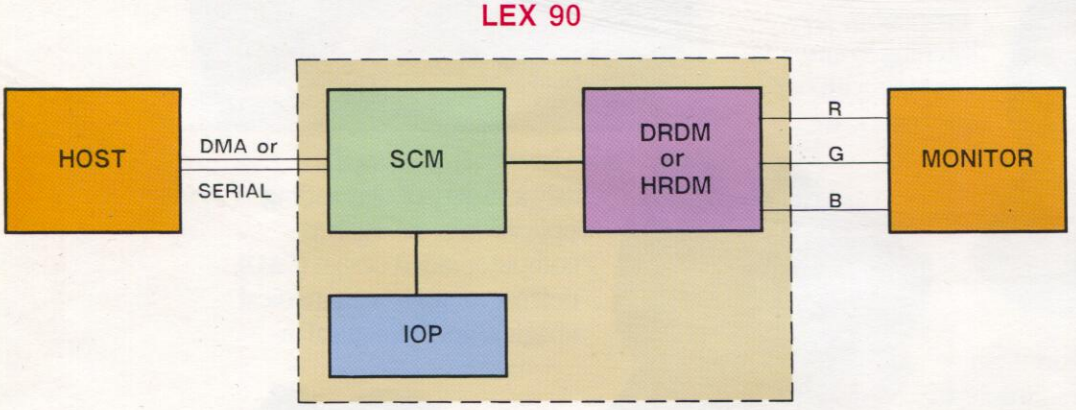


Figure 1. Block diagram illustrating the relationship between LEX 90's components.

The two main memory modules available on LEX 90 systems are either the Dual Resolution Display Module (DRDM) or the High Resolution Display Module (HRDM).

The DRDM contains software-configurable display memory and a flexible Color Lookup Table (CLUT). This module is designed for those users with applications that require either 640x512, 60Hz or 1280x1024, 30Hz resolutions – or both – where 3-D solids and line drawings are displayed concurrently.

The HRDM provides high resolution (1280x1024), flicker-free (60Hz) images for applications where large amounts of data needs to be displayed with precision and clarity.

Another major module or component of the LEX 90 family is the optional Input/Output Processor (IOP). The IOP handles local communications with a variety of available interactive input peripherals such as a data tablet, mouse, or joystick. If required, one of the IOP's RS232C ports may be used for serial communication with a host computer.

SYSTEM CONTROL MODULE (SCM)

At the heart of all LEX 90 configurations is the SCM (see Figure 2). The basic display processing functions handled by the SCM include high-speed pixel processing, host parallel communication, and video control functions. The SCM is a microprogrammed processor based on AMD 2900 Series bit-slice technology. It employs 8K x 56 bits of PROM-resident control store. The internal data bus of the SCM is 16 bits wide in order to accommodate pixel data. For paralle communications with a host compu the SCM uses our standard DMA inte face. A 16-word FIFO serves to buffe the host input, providing faster over response times. The SCM interfaces with either the DRDM or HRDM memory module through its video control logic.

In addition to the bit-slice pro cessor, the SCM contains a VLSI CI controller chip which provides all necessary CRT sync and blanking timing. The CRT controller is also responsible for generating video refresh addressing and pan/zoom control signals.

DUAL RESOLUTION DISPLAY MODULE (DRDM)

A major feature of the LEX 90 is its dual resolution capability. The DRD (Figure 2) is capable of switching between high (1280x1024, 30Hz) an medium (640x512, 60Hz) display resolutions under software control. This unique capability allows you to select between the higher resolution display for better quality line drawin and the lower resolution display for greater color variation.

In addition to these two basic display modes, a third mode – calle SimulRes – allows high resolution images to be overlayed on a medium resolution background. In the high resolution mode, the frame buffer is arranged as a 1280x1024 bitmap, fou planes deep, and is entirely visible. I the medium resolution mode, the bitmap is 640x1024, eight planes de and viewable through a 640x512 display area that may be controlled vertically.

Up to three DRDM boards may be included in a LEX 90 system to increase display memory and add functionality. Control registers on-board the DRDM provide the SCM with a means of programming additional functionality into the board. For a LEX 90 configuration with multiple DRDM boards, this programming capability translates into a variety of configurations and operating modes. The DRDM also offers blink-by-pixel, blink-by-plane, one to 16X zoom, and pan and scroll capabilities.

HIGH RESOLUTION DISPLAY MODULE (HRDM)

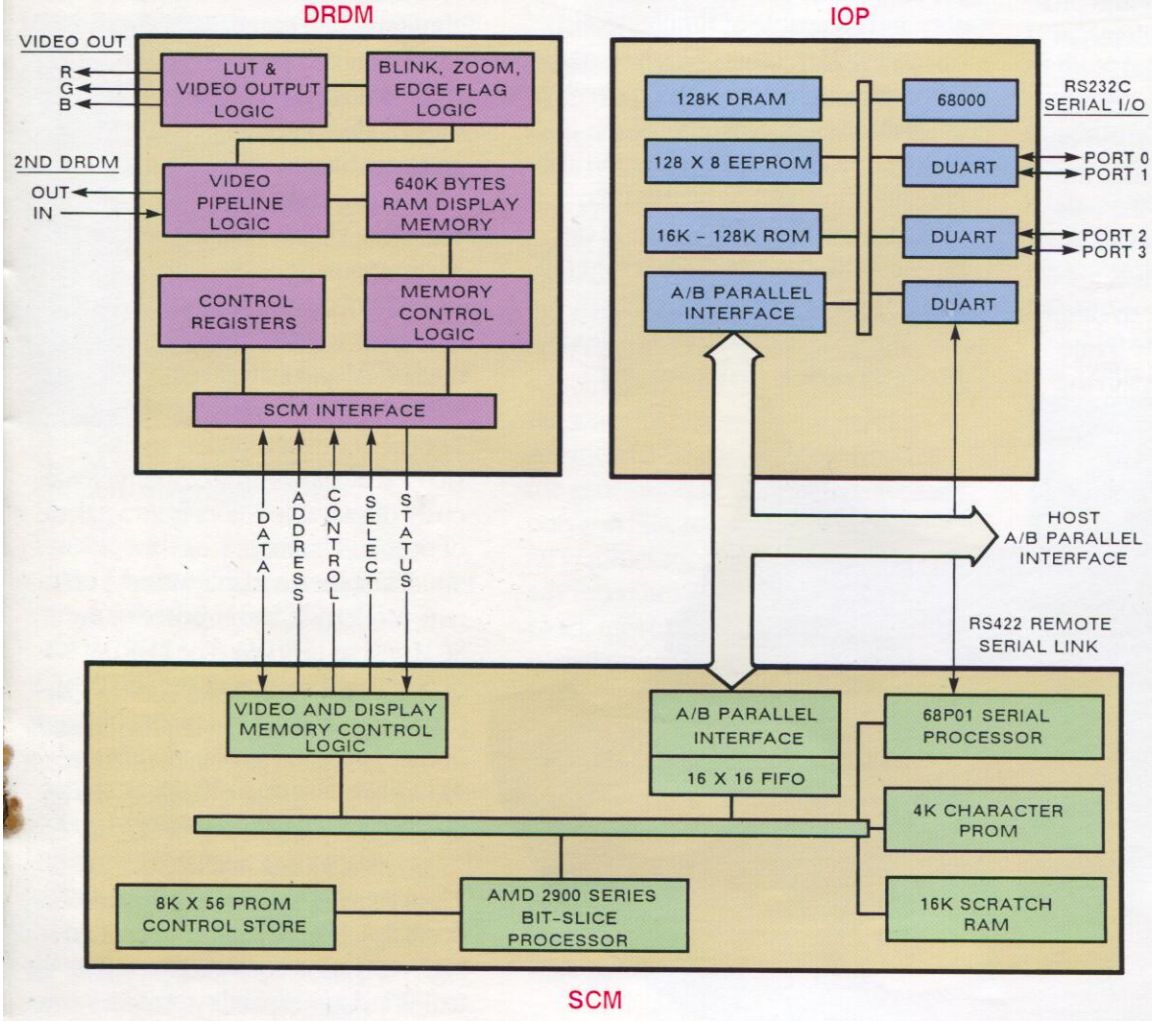
Certain LEX 90 models use an HRDM instead of the DRDM as the basic memory module. The HRDM supports 1280x1024 resolution color displays at a 60Hz, non-interlaced refresh rate and provides up to eight planes of high resolution frame buffer. The result is a picture that is sharp, bright, and flicker-free. Like the DRDM, the HRDM has a variety of control registers that allow the SCM to assign functionality to the module. The HRDM also has blink-by-plane, 2X zoom, and pan and scroll capabilities.

INPUT/OUTPUT PROCESSOR (IOP)

The SCM communicates with a variety of interactive peripheral devices by means of an optional IOP. The IOP (Figure 2) is designed to relieve the SCM of a great deal of overhead by handling the necessary multiplexing and buffering between the SCM and its peripherals. The IOP can interface with up to four input peripherals through its four RS232C ports. It communicates peripheral data to the SCM via a high-speed RS422 serial link. In the absence of a parallel host, one of the IOP's RS232C ports may be used to communicate serially with a host computer. When this occurs, the IOP communicates with the SCM via the parallel DMA interface.

Peripherals supported by the LEX 90 family include a data tablet, optical mouse, and 2-D/3-D joystick. These interactive devices are used to enter data, perform menu selection, locate data points on the graphics terminal, and digitize maps into the system.

Figure 2. This simplified block diagram depicts a LEX 90 system containing the SCM, DRDM, and IOP modules.



LEX 90: GOOD LOOKS RUN IN THE FAMILY.

The first members of the LEX 90 family are the LEX 90/35 Model 2 and Model 3.

MODEL 2

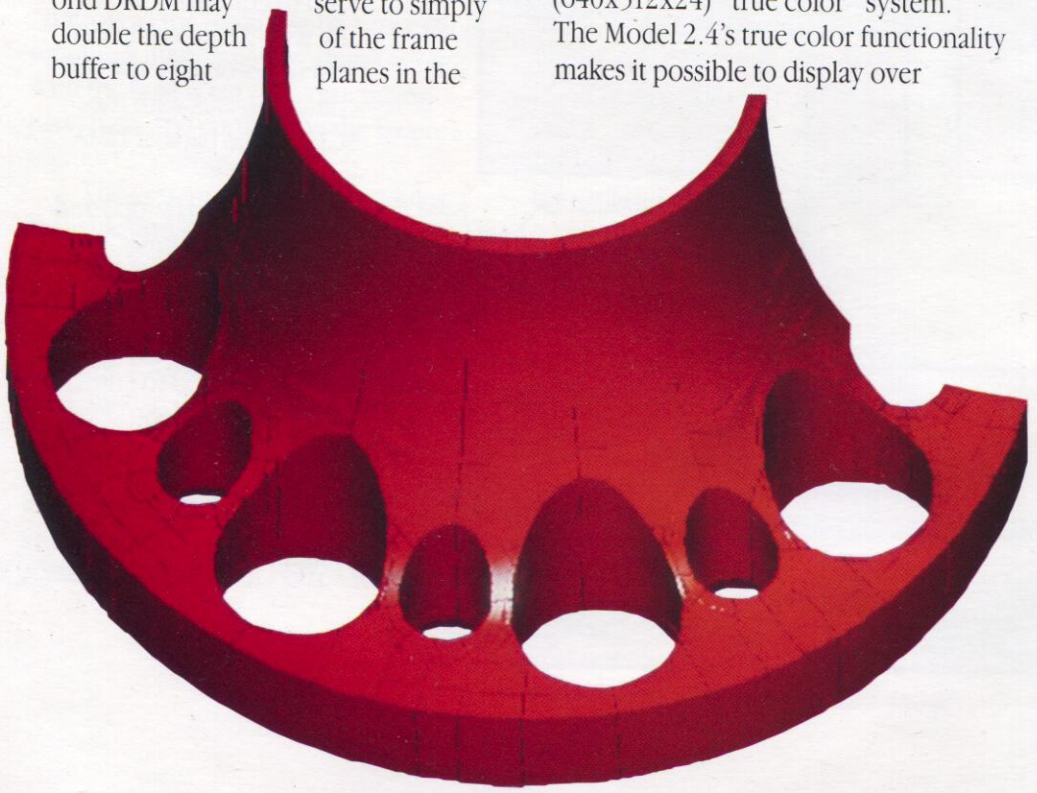
The Model 2 is available in four different configurations and all have the DRDM as its memory module. Model 2.1 is the entry-level member of the LEX 90 family and is comprised of two boards – the SCM and a DRDM-3 board. (The suffix -3 or -0 on the DRDM indicates the CLUT capability of that board.) With this configuration, memory can be used at its full 1280x1024 size and provide four bits of depth, or folded vertically and provide a 640x1024 size with a depth of eight bits.

The addition of another DRDM board to the minimum LEX 90/35 configuration significantly increases the system's capabilities. Model 2.2 contains the SCM, DRDM-3, and DRDM-0 boards. In its most obvious use, a second DRDM may serve to simply double the depth of the frame buffer to eight planes in the high resolution mode.

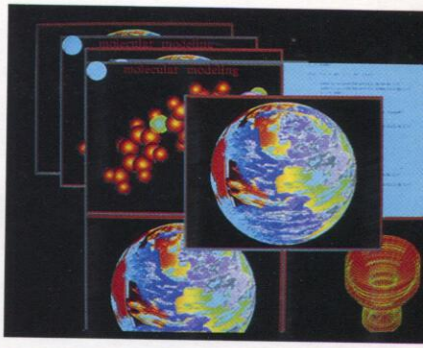
Model 2.2 also features LEX 90's unique *SimulRes* capability that allows for the simultaneous coexistence of medium resolution shaded images with high resolution line drawings. In this case, one DRDM board is configured for medium resolution and a second board is configured to provide 1280x1024x4 overlays.

A system containing three DRDM boards can have its frame buffer configured as a 1280x1024x8 bit map with a 1280x1024x4 overlay. This configuration, Model 2.3, also has SimulRes functionality and is capable of simultaneously displaying 256 colors of high resolution graphics with high resolution overlays available in eight different colors.

The Model 2.4 configuration also contains three DRDM boards (one DRDM-3 and two DRDM-1s) and can be configured as a medium resolution (640x512x24) "true color" system. The Model 2.4's true color functionality makes it possible to display over 16.7 million colors. In the true color configuration, each DRDM contains a single 8x8 LUT instead of the full 8x2 LUT because each is dedicated to a single video output channel, i.e., red, green, or blue.



Adage's patented SOLIDVIEW solid modelir display technology is offered on several LEX 90/35 systems. Photo courtesy of PDA Engineering.



The LEX 90's dynamic Virtual Windows functionality allows real-time *color* windo management of up to eight user-defined windows.

MODEL 3

The Model 3 is available in two different configurations and both have the HRDM as its basic memory module. Model 3.1 is made up of the SCM and the HRDM and features 1280x1024x8, 60Hz non-interlaced color graphics. The 3.1 configuration has an 8x24 CLUT that allows up to 256 simultaneously displayable colors from a palette of over 16.7 million.

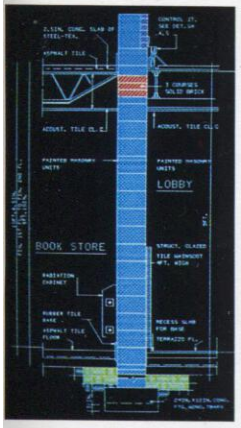
The other available Model 3 system, Model 3.2, is comprised of the SCM and an LHRDM. The LHRDM is a depopulated version of the HRDM and provides 1280x1024x4 planes of frame buffer. The CLUT is also modified to 4x12 providing up to 16 simultaneous colors selected from a palette of 4096.

VIRTUAL WINDOWS

The LEX 90/35 also offers Virtual Windows functionality in both medium and high resolution configurations. The Virtual Windows capability provides you

with real-time *color* window management.

With Virtual Windows, up to eight viewports can be defined, manipulated, and displayed simultaneously. A viewport is a user-defined rectangular area on the display monitor screen which corresponds to a software-selectable area of the bit map. Sizes and priorities for overlapping viewports can be host-selected enabling you to control and position information on the screen to suit your particular work habits. Virtual Windows supports this without burdening the host computer with continuous bit-block transfers. As a result, Virtual Windows gives you the ability to independently manage graphics and text information in an organized and highly productive environment. In addition, the high resolution Virtual Windows configuration is



The LEX 90/35 Model 3 is available in 1280x1024, 60Hz color configurations.

available with an Extended Bit Map option which increases the frame buffer storage area to 2056x2048.

SOLIDVIEW

Adage's patented SOLIDVIEW solid modeling display technology is available as a firmware option on selected LEX 90/35 models. SOLIDVIEW-M (the "M" denotes a medium resolution of 640x512) works together with the LEX 90 display processor and a host computer to simultaneously perform the necessary process involved in producing a 3-D shaded image. The host transforms and clips an object into a viewing volume and SOLIDVIEW-M removes hidden surfaces and

This gallery "exhibits" the true color capability of the LEX 90/35 Model 2.4 and appears courtesy of Cornell University's Program of Computer Graphics.

shades visible surfaces. The SOLIDVIEW functionality combines two buffers into 16-bits of depth buffer.

SOFTWARE CAPABILITIES

The LEX 90 software architecture is based upon our Extended Graphics Operating System (EGOS). EGOS is the PROM-resident operating system (or code) inside the display processor which handles all the system functions. Its powerful macro-library provides advanced 2-D graphics functions for the generation of arcs, circles, vectors, polygon fills, text, and other fundamental graphics tools. EGOS also provides advanced image functions such as block move/copy, and run-length encoded write which considerably enhance processing speed. EGOS enables you to work with an upwardly compatible command set and provides room for growth as applications become more complex.

In addition, the entire LEX 90 family is compatible with a variety of leading third party application software packages.

LIST LANGUAGE

Another member of the growing and expanding LEX 90 family is the LEX 90/45 Series that features intelligent List Language functionality.

The LEX 90/45 adds a Display List Processing Module (DLPM) to the SCM and the HRDM. The DLPM contains our sophisticated List Language that allows graphics and interactive functions to be managed locally. List Language functions go beyond traditional local object definition and storage capabilities and include: intelligent segment creation and manipulation, looping, conditional branching, arithmetic and Boolean logic operations, local picking, and local control of peripherals. Because LEX 90's List Language allows local management of all these functions, both the host computer *and* host application program are offloaded. As a result, the host can be used more efficiently to address your application requirements while the LEX 90 display processor performs the interactive graphics functions.

The LEX 90/45 is available in several 1280x1024, 60Hz configurations.

This is an excellent example of LEX 90's SimulRes functionality at work as a 640x512 solid image coexists *simultaneously* with a 1280x1024 line drawing representation of the same image. This particular application was created using PDA Engineering's PATRAN application software package.

LEX 90: THE TOTAL GRAPHICS SOLUTION.

In designing the LEX 90 family, we didn't stop at exceptional performance. Concerns like quality, reliability, on-board diagnostics, and ergonomics are also addressed and satisfied.

QUALITY & RELIABILITY

A blend of skilled, highly-trained manufacturing professionals and an extensive, automated manufacturing process ensures that you receive nothing less than a quality, reliable LEX 90 system.

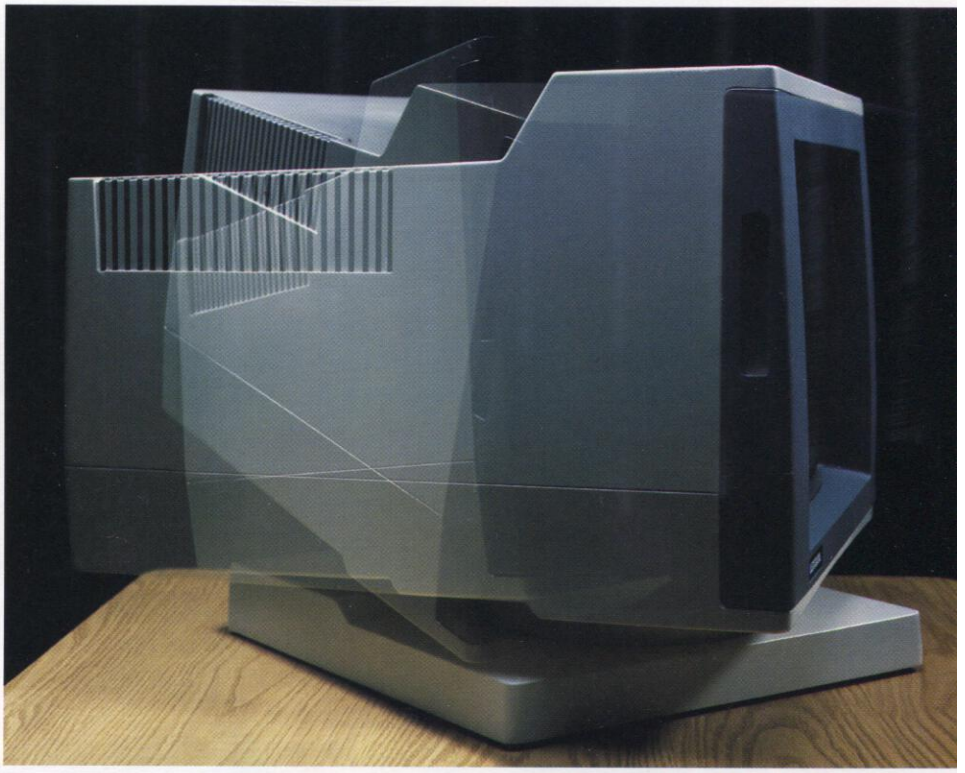
Every integrated circuit is certified by an in-house test group and is accepted for use only after being subjected to complete functional and DC and AC parametric testing at 70°C. Every printed circuit board is subjected to a "bed-of-nails" test by approved vendors that ensures no shorts or opens are resident. Every sub-assembly used in the LEX 90 family is pre-tested *before* assembly.

All boards are then loaded with integrated circuits using either Amistar or Dynapert automatic insertion equipment. The boards are wave-soldered and tested by a universal bare board tester for solder shorts, and then receive additional testing by a GenRad 2272 in-circuit tester. Each of these steps help to "build-in" a manufacturing consistency that is vital to producing a quality product.

Once a LEX 90 system is fully assembled, it is then burned-in at 50°C for 48 hours of error-free operation. After burn-in, each unit is then 100% functionally tested. A LEX 90 system is ready for shipment only after it passes each of these quality checkpoints in our manufacturing process.

ON-BOARD DIAGNOSTICS

Every LEX 90 display processor has a dedicated microprocessor for system diagnostics which help maximize uptin Two separate levels of diagnostic tests are provided: normal power-up and ex tended power-up diagnostics. Normal diagnostics run each time the LEX 90 is powered-up or reset, and quickly chec registers, memory boards, LUTs, and overall system functionality. A more ex haustive built-in test can be selected to perform an extensive diagnosis of the processor and all video RAM. A set of easily-viewed LEDs informs you of test results. These two procedures are both run locally without any host computer intervention. In addition, there is a signature analysis test to detect any problem in hardware that is inaccessible to the diagnostic processor.



Our ergonomically-designed monitor enclosure features an exceptionally smooth tilt-and-swivel mechanism that allows the monitor to be moved to a variety of viewing angles effortlessly. The optional free-standing display processor "tower" complements either office, laboratory, or computer room environments.

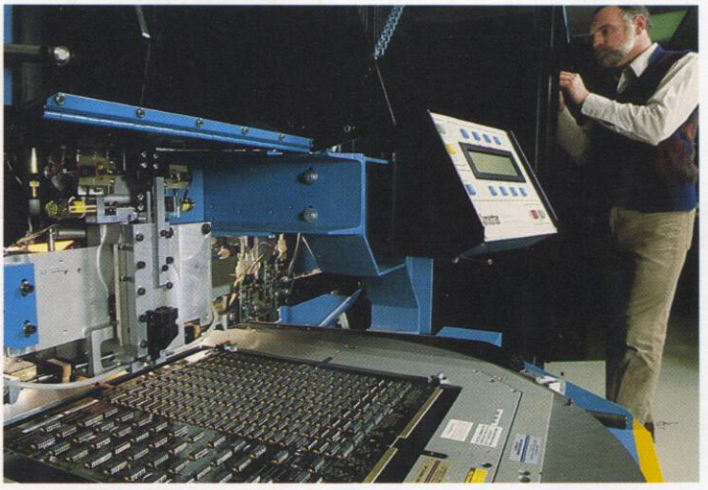
ERGONOMICS

All LEX 90 systems feature our unique, ergonomically-designed monitor enclosure. Because of the enclosure's exceptionally smooth tilt-and-swivel mechanism, the monitor can be moved quickly and precisely to a variety of viewing positions and angles – with just one hand. All operator controls, including power and brightness, are easily accessible on the monitor's front panel.

Additionally, all monitor connections are located in the rear of the enclosure's stationary base, thereby simplifying installation, and producing a clean, clutter-free work area. All LEX 90 monitors and enclosures are designed to conform to UL and CSA safety and VDE ergonomic standards.

To further enhance the work environment, an optional freestanding display processor enclosure is also available with the LEX 90 family. Designed as a "tower," this enclosure can be used either in computer rooms, saving valuable host system rack space, or in locations when the display processor must be located remotely from the host. Its sleek, attractive styling handsomely complements any office environment, and its dimensions match the new class of standalone/workstation microcomputers that fit conveniently underneath a desk.

The combination of our skilled manufacturing professionals and an extensive automated manufacturing process produces quality, reliable LEX 90 systems.



Integrated circuits are loaded onto printed circuit board with the help of an Amistar automatic insertion system.

DOCUMENTATION & SUPPORT

Adage is dedicated to helping LEX 90 users make optimal use of their purchase. Complete documentation is provided so that you can understand and learn the operation of LEX 90. Informative in-house or on-site training courses regarding the use and programming of LEX 90 are offered through our Technical Education Department. Systems engineering support is also available for fast, professional response to technical questions.

SUMMARY

LEX 90 has been designed as a complete family of high-speed, high-performance raster graphics display systems whose growth has been meticulously planned from initial concept.

The LEX 90 family is based on our proven, traditional strengths of innovation, quality, and outstanding price/performance. LEX 90 enhances Adage's reputation as a respected technological leader in the graphics display industry providing you with the total graphics solutions.

All printed circuit boards are tested using GenRad's 2272 in-circuit tester.

LEX 90™

LEX 90: SPECIFICATIONS.

FUNCTIONAL

CPU:	AMD 2900 Series bit-slice processor 8K x 56 bits of control store
DIAGNOSTICS:	Resident power-up self-test
CHARACTER MEMORY:	8K bytes ROM Up to 32K bytes RAM
DISPLAY MEMORY:	640K bytes per DRDM memory board expandable to 1.92 Mbytes (3 boards max.) 1.28 Mbytes per HRDM memory board
RESOLUTIONS:	1280x1024, 30Hz interlaced 1280x1024, 60Hz non-interlaced 640x512, 60Hz non-interlaced
VIDEO OUTPUT:	RS343-compatible composite video sync present on all channels
PERIPHERAL I/O:	Four RS232C serial ports (software-selectable up to 19.2 Kbaud)
HOST COMMUNICATION:	Our standard parallel DMA interface or RS232C serial interface software-selectable up to 19.2 Kbaud

CHASSIS DIMENSIONS

	(EIA Rack-Mountable)	(Optional Tower Enclosure)
HEIGHT:	5¼″	25.2″
WIDTH:	19″	12.2″ – Floorspace 8.9″ – Cabinet
DEPTH:	26″	33″
WEIGHT:	75 lbs. max.	55 lbs. (less electronics)

POWER

VOLTAGE:	Switch-selectable: 90-132 V rms – U.S. and Japan 187-264 V rms – U.K. and Europe
CURRENT:	7A @ 115VAC
FREQUENCY:	47-63Hz
HEAT DISSIPATION:	2650 BTU/hour
CIRCUIT PROTECTION:	10 Amp SLO-BLO fuse (externally accessible)

ENVIRONMENTAL

OPERATING TEMPERATURE:	50°F to 104°F (10°C to 40°C)
STORAGE TEMPERATURE:	–40°F to 167°F (–40°C to 75°C)
OPERATING RELATIVE HUMIDITY:	10% to 90% (non-condensing)
STORAGE RELATIVE HUMIDITY:	0% to 95% (non-condensing)
MAXIMUM ALTITUDE:	10,000 ft. (2.4 km) operating 30,000 ft. (9.1 km) non-operating

To receive additional Adage product information, or for the location of the Adage sales office in your area, call (617) 667-7070.

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089-65-20-51

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