

# PHOTO CAPTION



ADAGE, INC. ONE FORTUNE DRIVE, BILLERICA, MA 01821 (617) 667-7070

For News Release Datelined

Caption: The Adage CADstation<sup>TM</sup> 2/50 System is a high-performance stand-alone design/drafting system geared to CADAM<sup>®</sup> users.

CADstation<sup>TM</sup> 2/50 System is a trademark of Adage, Inc.

CADAM<sup>®</sup> is a registered trademark of CADAM Inc.

102655670



# ADAGE

## PHOTO CAPTION

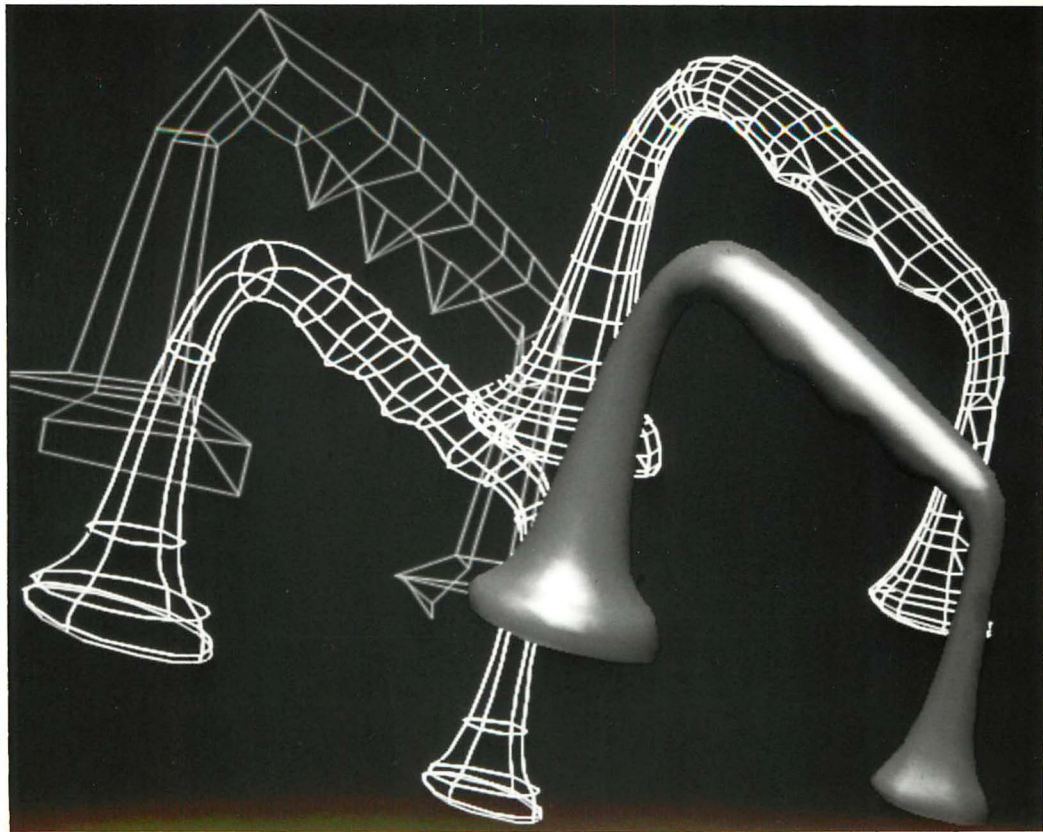
ADAGE, INC. ONE FORTUNE DRIVE, BILLERICA, MA 01821 (617) 667-7070

For News Release Datelined

Caption:

Solid model image created on an  
Adage 3000 Color Raster Display  
System using SOLID 3000 software  
in under 3 seconds.

102655670





## PHOTO CAPTION

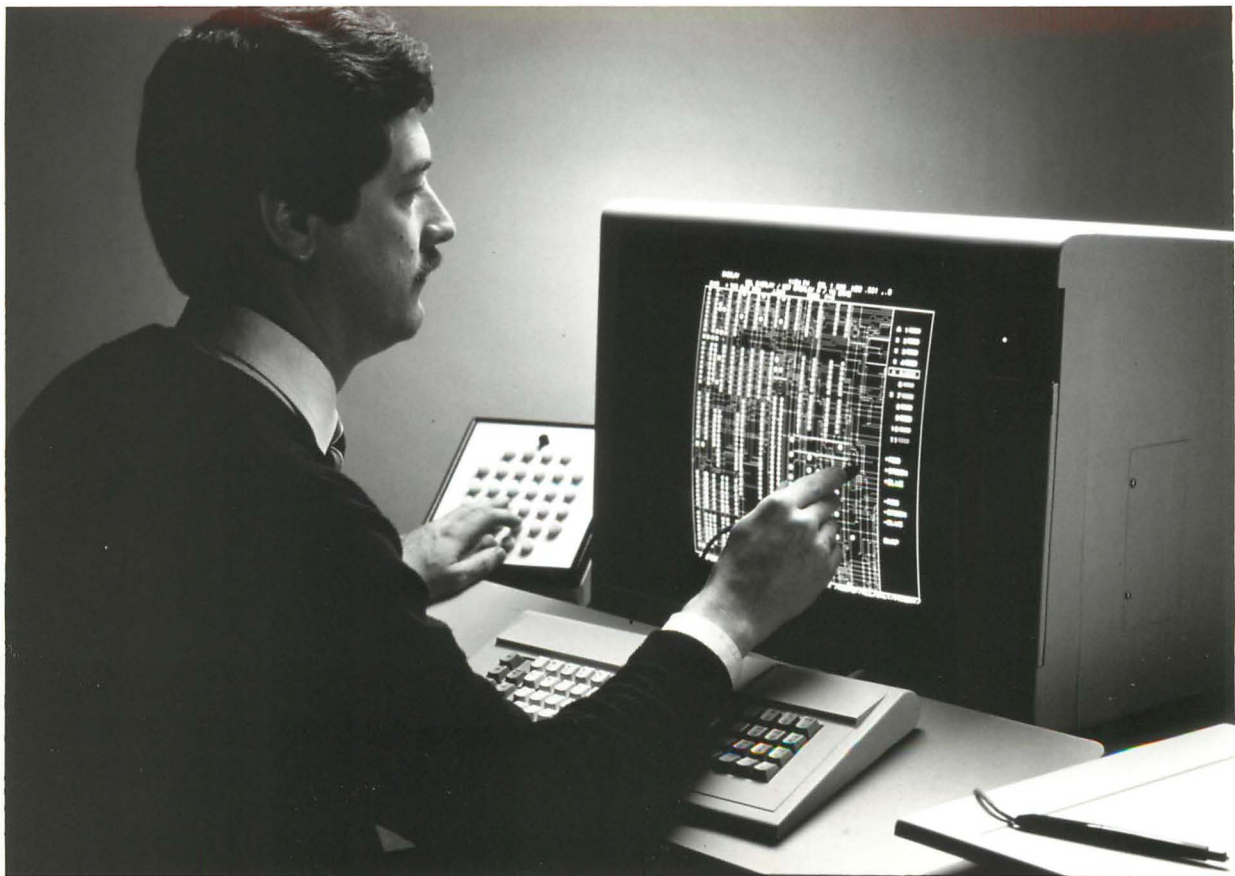
ADAGE, INC. ONE FORTUNE DRIVE, BILLERICA, MA 01821 (617) 667-7070

For News Release Datelined

Caption: An IBM-compatible Adage 4250 Color Raster Work Station is used to design a printed circuit board.

Photo Courtesy of Adage, Inc.

102655670





## PHOTO CAPTION

ADAGE, INC. ONE FORTUNE DRIVE, BILLERICA, MA 01821 (617) 667-7070

For News Release Datelined

Caption: The Adage 4370 Workstation, using NCAD™ software, is a high-resolution, three-dimensional vector refresh display for use with IBM or compatible mainframes.

NCAD™ is a trademark of Northrop Corporation

Photo Courtesy of Adage, Inc.

102655670







## PHOTO CAPTION

ADAGE, INC. ONE FORTUNE DRIVE, BILLERICA, MA 01821 (617) 667-7070

For News Release Datelined

Caption: IBM-compatible Adage 4250 Vector Refresh Workstations are used for many types of computer aided design and manufacturing applications.

Photo Courtesy of Adage, Inc.

1020055670



1

The Computer and the Image Gallery  
Exhibit Descriptions

<title> Adage 3010

<story> Render the teapot and allow interactive control of lighting, colour and possibly texture; compare with the real actual teapot.

<coordinator> Geoff

<general description> Adage 3010 display controller will (probably) be located next to the VAX, with 1 or 2 serial lines and 4 video cables running up to the gallery. A video amplifier may be required. In the gallery will be the color screen, trackball (or other pointing device) and crt terminal (hidden normally). Moving the trackball in response to a screen menu will cause different lights to illuminate the screen image and the actual teapot (enclosed in a case with miniature spotlights). Users can choose the color of each of 4 to 6 illumination sources. An alternative use might be to display Lucasfilm's "The road to Point Reyes" framebuffer image, giving users a choice of the elements to be included (or possibly just run it as a loop).

2  
The Computer and the Image Gallery  
Exhibit Descriptions

SPECIFICS

<hardware>

<size> Unit is rack-mounted, about 2-foot square. Only the monitor (19") and the trackball goes in the gallery.

<software> Comes with IDL2 microcode cross-assembler called IKASM; also with Fortran library for basic functions and a solid or seismic modelling package. Intermetrics produces a molecular modelling package, and has developed a tool for compiling microcode, a C-like language called ICROSS. It is unclear how much use of microcode the applications packages make.

<images>

<special requirements> The 3010 must have a parallel port to the host, limiting distance to about 50 feet. Video (4 cables) output is likewise limited to 50 feet unless amplified by a special device (not included, get specs). An RS-232 port is available for the trackball or a keyboard. Perhaps these peripherals should be connected to the VAX; depends on software.

<location> Control unit goes in Vax room on 1st floor. Monitor can go anywhere in gallery.

<operation>

<maintenance>

3  
The Computer and the Image Gallery  
Exhibit Descriptions

<status>            Apparently going through, but no written  
                     confirmation given us.

<contacts>         Keith Jones (hardware tech., installation)  
                     Don Davis (software guru)  
                     Clarence Tilger (marketing, in charge of donation)

March 1 1984

Mr Nick England  
Adage Inc  
531 Pylon Drive  
Raleigh  
NC 27606

Dear Mr England

Further to our telephone conversation today I am sending you some background material on the Computer Museum. Enclosed are two recent quarterly reports, one of them giving some pictures of our new downtown Bosotn site and a reprint from Discover magazine on the displays in our old site at Malboro.

We are planning one completely new 4000 square foot exhibit to open in December 1984 entitled The Computer and the Image and it is here that I hope Adage will participate. I enclose a proposal which indicates the exhibit's scope - from the beginnings of the subject to the present day. Perhaps one of the most striking state of the art exhibits would be to show a three-dimensional image by means of a fast display such as Adage's RDS 3000 viewed through a varifocal vibrating mirror. Professor Henry Fuchs of UNC would donate the required software and Richard Shorthill of Trivision has indicated that a mirror would be available. The Museum has the use of a VAX 750 to act as host.

We do appreciate that the RDS 3000 is an expensive piece of equipment and would be willing to consider setting up the display for a temporary period. We would be pleased to organise one or more evening lectures on the display of three-dimensional images and perhaps Adage might be interested in holding a function at the Museum too.

Please do not hesitate to contact me should you require any further information or have some comments. The address at the new site is : The Computer Museum, Museum Wharf, 300 Congress Street, Boston, MA 02210, telephone 426-7190.

Yours sincerely

Dr Oliver Strimpel  
Curator

enclosures

# ADAGE 3000

## SOLID MODEL DISPLAY SOFTWARE

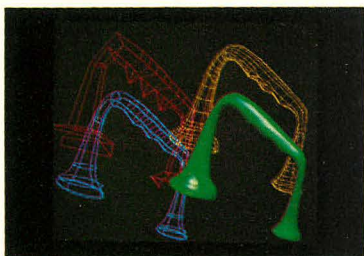
The Adage SOLID 3000 software package is a library of microcoded, FORTRAN-callable subroutines for the Adage 3000 Color Raster Display System. These subroutines allow the rapid display of 2-D and 3-D solid modeling data, as well as near real-time 3-D transformations of solid, shaded objects. The SOLID 3000 package is intended for software developers integrating the Adage 3000 into new or existing interactive CAD applications.

Dramatic performance gains in interaction and solid model display and manipulation are achieved by performing graphics processing locally. By handling all graphics display functions entirely within the Adage 3000, this system's powerful 32-bit, 208-nanosecond bit-slice processor frees the host CAD system to concentrate on the design process. The result is high-performance interactive solid modeling.

The Adage 3000—with its multi-processor architecture, advanced hardware and modular design—is uniquely suited for solid modeling CAD/CAM display tasks that require both high-speed graphics and imaging capabilities. In addition, high-performance Adage 3000 Systems are used in applications as varied as medical imaging, remote sensing, real-time 3-D flight simulation, and seismic data display and analysis.

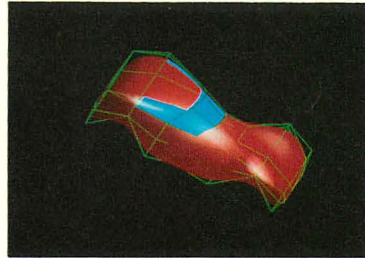
Unique display functions provided in the SOLID 3000 package include:

**Curved surface and curved line display, including bi-cubic B-spline surface patches.** Hidden surface elimination and smooth shading of complex curved surfaces are carried out in just a few seconds, allowing truly interactive design for the first time.



*Bi-cubic surface control points, patches, polygon subdivision and shaded display: less than 3 seconds.*

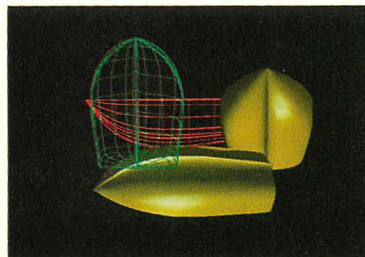
**Easy interface to modeling programs.** Curved surfaces and lines are concisely described to the Adage 3000 by just a few control points, and complete subdivisions and rendering are performed locally. Different types of curves and surfaces are supported by simply loading information about the appropriate parametric basis functions.



*Bi-cubic patch display from control points: less than 5 seconds.*

**Object and polygon mesh data types.** Fast vector and shaded, hidden surface display modes are provided. Shared vertex points are only loaded and transformed once, instead of for each occurrence in a polygon. This drastically cuts host computer loading and speeds user interaction by omitting any awkward reformatting of the CAD data base required for other display systems.

**Positionable colored light sources with specular reflection (highlights).** Image realism is enhanced and more information about surface curvature and structure is provided. High-speed microcode performs all shading calculations locally, without time-consuming host computer computation of surface normals and vertex shade intensities.



*Bi-cubic patch display with highlights: less than 5 seconds.*

**Anti-aliased, hidden surface shaded images.** Objectionable "jaggies" are essentially eliminated, giving a more accurate rendering of the model. Local microcode provides extraordinarily fast display generation. Interactive operation with improved user acceptance is the result.

**Transparent shaded surfaces.** SOLID 3000 provides a realistic transparency calculation with multiple layers and highlights, eliminating the annoying side effects of simpler "screen door" schemes. Complicated solid models can be presented by allowing the viewer to see through outer surfaces to inner parts. Fast, clear visualization of complex designs leads to increased CAD productivity.



*Transparency for complex objects: less than 10 seconds.*

The SOLID 3000 FORTRAN subroutines enhance and extend the standard Adage 3000 FORTRAN Support Subroutines display package. The standard FSS 3000 package provides such features as local rotation and perspective viewing, anti-aliased vectors, high-speed characters, and Z-buffer hidden surface display.

The SOLID 3000 package supports 1024 x 1024 and 512 x 512 screen resolutions, allowing, for example, a high-resolution, cost-effective, 64-color system to also be used for high-quality displays (16 million simultaneous colors) at the lower resolution.

The SOLID 3000 FORTRAN subroutines are written in ANSI FORTRAN and are easy to implement on most computers. The package uses standard Adage 3000 drivers for popular minicomputers. The microcode routines are written in a high-level language and may be modified or extended by using the ICROSS-3000 microcode compiler, which is available from Intermetrics, Inc.

### Worldwide Sales and Service

Adage Sales and Customer Service representatives are located throughout the U.S., Europe and Japan. For the location of the nearest Adage sales or service office, contact Adage at one of the offices listed below.



**Adage, Inc.,** One Fortune Drive, Billerica, Massachusetts 01821, (617) 667-7070  
TWX 710-347-1594

**Europe: Adage GmbH,** Mainzer Str. 75,  
6200 Wiesbaden, West Germany  
Telephone 6121/70 00 34

All information subject to change without notice.

© 1984 Adage, Inc. Printed in U.S.A. 38410M

June 14 1984

Clarence Tilger  
Adage Inc  
One Fortune Drive  
Billerica  
MA 01821

Dear Mr Tilger

Thank you very much for arranging a demonstration for Andy and me. It was most illuminating and I think I am now in a position to outline the way I would like to present the exhibit.

The power of the 3000 can best be conveyed by use of near real time interaction. I would like to obtain a 3-dimensional database and allow visitors to view it from different standpoints, zoom, pan and rotate. The same database should be represented as lines without hidden line suppression, with hidden line suppression, with polygons, with Gouraud shading, and Phong shading. Then the visitor should be able to switch on and off a light source and perhaps move one around. The interaction should be via a trackball and one or two special keys only.

One possible database is that of the city of Boston's tax assessing department. If the buildings of a small region visible from the window of the gallery were used, the public could use the system to fly around the area, alter the position of the sun and use the wire frame representation to see through foreground buildings. The architects Jung/Brannen also have a database of the area which they used for CAD studies before building the tower on Dewey Square. As you will remember, the view of downtown Boston is quite complex so considerable selection and simplification would have to be made.

Other databases may be available from the University of North Carolina or from NYIT.

I have spoken with a person who is consulting for us on the Museum's use of film and video. He says that line amplifiers for the video cables (between the 3000 and the monitor) are off-the-shelf and reliable and sees no difficulty running the video from the VAX room downstairs up to the exhibit. Is he right or is he missing something? If this could work it would be the best solution all round. The VAX is in a proper machine room, fully airconditioned and it is also extremely visible being the first exhibit everyone will see as they walk through our lobby into the large elevator.



We have located a possible programmer but wish to build as much as possible on existing software and databases. The above scheme will only come to fruition if it can be achieved from a high level language program using FSS and or SOLID 3000. Our main contribution will come in ensuring that the human interface is straightforward and comprehensible by a non-technically minded visitor.

We are pleased that Adage is making a system available for our exhibit and that a maintenance commitment will also be made. I look forward to hearing from your field engineer and to establishing a timescale of events that will enable us to meet our November public opening. I feel sure that this will become one of the most popular and impressive exhibits at the Museum.

Yours sincerely

Dr Oliver Strimpel  
Curator

# ADAGE FSS 3000

## ADAGE FORTRAN SUPPORT SUBROUTINES

FORTRAN Support Subroutines (FSS 3000) is a package of high-level, FORTRAN-callable subroutines designed to provide a straightforward and efficient interface between the Adage 3000 Color Raster Display System and device-independent application software packages. FSS 3000 offers a convenient tool for enhancing the creativity and productivity of professional application engineers. With FSS 3000, the user maintains access to the dynamic power and flexibility of the Adage 3000.

Local hidden surface display is a key feature of the FSS 3000 package. The package includes local interactive 3-D perspective transformation and clipping of complex solid objects. Smooth-shaded hidden surface display is provided for these objects.

Other advanced features, including real-time 3-D anti-aliased vector display and fast raster operations, are part of the comprehensive set of graphics display operations.

FSS 3000 interfaces with a set of microcode routines and an interpreter, which run on the Adage 3000 high-speed graphics generator (GPS) or the Adage 3000 advanced graphics generator (AGG4). FSS routines build a display list in the host machine to draw primitives such as rectangles, polygons, circles, and vectors. Other FSS routines then send the display list to the Adage 3000 System for execution and manipulation. The result is dynamic, interactive graphics programming at the FORTRAN level.

### Control Functions

FSS also contains a set of FORTRAN-callable routines to initialize or update components of the Adage 3000 System. Routines are available to:

1. Set display control-resolution, pan, scroll, and zoom.
2. Write an array to the color look-up tables.
3. Set the look-up table input channel selector.
4. Set the XBS video crossbar switch.
5. Set the write masks and shade registers.

### 2-D and 3-D Primitives

Absolute and relative moves and vectors; polygons, including non-convex polygons, and polygons with holes; anti-aliased vectors; text strings, user-defined character font, character rotation and zooming; area-fill; circles; rectangles; and logical RASTER-OP (block move functions).

### ATTRIBUTES

Attributes such as color, line style, and resolution ( $1024^2/512^2$ ) are global in nature and are written to a specific area in scratch pad memory separate from the user's display list. This means, for example, that an attribute such as line style (anti-aliased or jagged) can be set once and will apply to all subsequent vectors. By engaging these attributes, a user program may easily make use of the advanced capabilities of the Adage 3000 System. Attributes include:

#### Graphics:

Line type: *absolute or relative vectors.*

Line style: *jagged or anti-aliased.*

Screen resolution: *1024 × 1024 or 512 × 512.*

Hidden surface mode.

Polygon stipple mask.

Polygon-fill type: *hardware or software-fill.*

Circle type: *outline or fill.*

Raster operation type: *move or bit-wise Boolean operation.*

Flood read mask: *for control of area-fill.*

#### Color:

Full color or pseudocolor.

Gamma correction factor for colormap load.

Polygon shading: *flat, smooth (Gouraud).*

#### Character:

Character font: *FSS 3000 8 × 8 font table.*

Text attributes: *foreground and background color, character spacing, transparent or opaque background, character orientation (rotation), x and y zoom.*

### Extensions

FSS 3000 may be extended to include user-defined functions.

### Computer Independence

FSS 3000 is written in ANSI FORTRAN and is easy to implement on most computers. All machine-dependent aspects of I/O and file handling are in a small number of isolated subroutines.

### Device Drivers

FSS 3000 uses standard Adage 3000 drivers for popular minicomputers.

### Versions

There are two versions of FSS 3000:

1. FSS 3000G for the Adage 3000 high-speed graphics generator (GPS).
2. FSS 3000A for the Adage 3000 advanced graphics generator (AGG4).

### Worldwide Sales and Service

Adage Sales and Customer Service representatives are located throughout the U.S., Europe, and Japan. For the location of the nearest Adage sales or service office, contact Adage at one of the offices listed below.

**Adage, Inc.**, One Fortune Drive, Billerica, Massachusetts 01821, (617) 667-7070  
TWX 710-347-1594

**Europe: Adage GmbH**, Gutenbergstrasse 14  
7012 Fellbach, West Germany  
Telephone 0711/512056

All information subject to change without notice.

© 1983 Adage, Inc. Printed in U.S.A. 1183/10M

# The Computer Museum

300 Congress Street  
Boston, MA 02210

(617) 426-2800

Spoke w Lou Brentano 30 April  
will donate RDS 3000

March 1 1984

Mr Richard Spann  
President  
Adage Inc  
One Fortune Drive  
Billerica  
MA 01821

1-667 7070

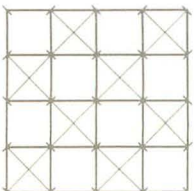
Dear Mr Spann

The Computer Museum is a non-profit, public, charitable foundation dedicated to preserving and exhibiting an industry-wide broad-based collection of the history of information processing. The Museum has recently moved into a new site in downtown Boston where it is expected to draw large numbers of visitors after reopening to the public in October 1984. I enclose three recent Museum quarterly reports to give you some background.

I am putting together a major exhibit entitled The Computer and the Image due to open in December 1984. An exhibit proposal is enclosed. The displays will span both the history of computer graphics and image processing as well as show state of the art examples. Hardware as well as the images will be shown and it is hoped to have a number of interactive working exhibits. Donations of equipment have already been made by DEC, Tektronix, HP, Apollo, Dataproducts, Grinnell and Lexidata. As Adage has played such an important role in the field I very much hope that your company will also wish to participate in this exhibit.

On the historical side, we would like to display the Adage Graphics Terminal as I believe it was the first commercially available display to include hardware for three-dimensional rotation. I have obtained a film dating from summer 1967 showing the AGT make the LEM 'fly'. Is there any chance that an AGT could be found? It would not be necessary to have it operating but ideally one would like to run occasional demonstrations on it.

On the modern side, we are hoping to display three-dimensional images using a varifocal vibrating mirror display. I have been discussing this possibility with Nick England as well as with Professor Henry Fuchs at the University of North Carolina and Richard Shorthill of Trivision who make the mirrors. The ideal terminal for this display would be an Adage RDS 3000. We already have a VAX 750 to act as host. We feel sure that such a display would excite considerable public interest.



We do appreciate that the RDS 3000 is an expensive piece of equipment but perhaps you might consider loaning the Museum one

# ADAGE

RECEIVED AUG 17 1984

16 August 1984

Mr. Oliver Strimpel, Curator  
Computer Museum  
300 Congress Street  
Boston, MA 02210

Dear Oliver,

Here is the list of the equipment that Adage is donating to the Computer Museum and the list price for the items.

Item	List Price
3006	\$20,900
CBS12/24	1,800
GM256 (3)	21,600
IK11B/50	1,450
MPC/32	3,500
GPS	15,000
XBS34	2,250
OVLY	500
MON19/HS	6,500
RGBS Cable/50	450
CRT1/M100	1,050
SOLID 3000 BASIC	4,500
Total	79,500

Please write a letter to Adage, acknowledging this donation, so that we can finish the paper work.

Sincerely,



Clarence A. Tilger  
Director of Market Planning

cc: Lew Brentano  
Bob Amrein

Andy -  
for info  
Chris

RECEIVED AUG 17 1984

16 August 1984

Mr. Oliver Strimpel, Curator  
Computer Museum  
300 Congress Street  
Boston, MA 02210

Dear Oliver,

Here is the list of the equipment that Adage is donating to the  
Computer Museum and the list price for the items.

Item	List Price
3006	\$20,900
CBS12/24	1,800
GM256 (3)	21,600
IK11B/50	1,450
MPC/32	3,500
GPS	15,000
XBS34	2,250
OVLY	500
MON19/HS	6,500
RGBS Cable/50	450
CRT1/M100	1,050
SOLID 3000 BASIC	4,500
Total	79,500

Please write a letter to Adage, acknowledging this donation, so  
that we can finish the paper work.

Sincerely,



Clarence A. Tilger  
Director of Market Planning

cc: Lew Brentano  
Bob Amrein

17 August 1984

Clarence Tilger  
Director of Market Planning  
Adage Inc  
One Fortune Drive  
Billerica  
MA 01821

Dear Mr Tilger

Thank you for your letter of 16 August.

The Computer Museum is pleased to accept the donation of Adage equipment and software as listed in the above letter.

The system will be used for the purposes of public display and education within the Museum.

May I take this opportunity of thanking Adage on behalf of the Museum for this important contribution to our major exhibit The computer and the Image.

Yours sincerely

Dr Oliver Strimpel  
Curator



JET PROPULSION LABORATORY California Institute of Technology • 4800 Oak Grove Drive, Pasadena, California 91109

September 5, 1984

Oliver Strimper  
The Computer Museum  
300 Congress St.  
Boston, MA 02210  
ATTN: Jeffrey Dutton

Dear Jeffrey,

We baked up

[BLINN.MODEL.PATCHS] TPOTS.BEZ and  
[BLINN.MODEL.PATCHS] TPOTS.PAT are in TPOTS.BAK.  
.BEZ is Bezier Control points.  
.PAT is Hermite Control points.

You also have, on this tape, the VS drawn with polygons in  
VW.BCK.

[BLINN.MODEL.POLYS.VW]\*.PLY

The tape is recorded 1600 BPI.

The TPOTS.BEZ file is 16 lines/patch, 1 line/point (x, y, x).  
The points are read off in 4 groups of 4. TPOTS.PAT is similarly  
read.

We are still collecting teapot pictures and will send them in a  
later package.

Sincerely,

Sylvie Rueff



ADAGE, INC.  
One Fortune Drive  
Billerica, MA 01821

PACKING LIST

SALES ORDER NO. 9242	RVSN 2	DATE 7/13/84	PAGE 1
CUSTOMER ORDER NO. N/A			
BILL OF LADING NO.		DATE SHIPPED 11/30/84	
SHIP VIA BEST		F.O.B. FACT	PPD. XXX P
S.A. 9914			
TERMS NET 30 2/0588			

B  
I  
L  
L  
T  
O

THE COMPUTER MUSEUM  
300 CONGRESS ST  
BOSTON, MA 02211

S  
H  
I  
P  
T  
O

THE COMPUTER MUSEUM  
300 CONGRESS ST  
BOSTON, MA 02211

BILL TO CUSTOMER ► COMPMU1000

SHIP TO CUSTOMER ► COMPMU1000

ITEM	PRODUCT NUMBER	DESCRIPTION	SERIAL NUMBER / REMARKS	CURR. QTY THIS ORD	QTY SHIPPED	NEW QTY BACK ORD
15	SOLID/3000 64K	SOFTWARE FOR ADAGE 3000(64K)		1	1	
17	PCP/100	PCP, 100' CABLE		1	1	
18	JS3/P50	JOYSTICK, CABLE TO PCP		1	1	
19	2MCM4	SECOND MICROCODE MEMORY		1	1	
20	RETROFIT/3000	RETROFIT OF 3000 EQUIPMENT (1)SET OF MONITOR SKINS FROM A MON19/HS AND (1) BEZEL		1	1	
		SALES ORDER SPECIAL INSTRUCTIONS: HOST: DEC OP.SYS. VMS3.4 11/750 + MEM.CONFIG: RGBA(0); 0-7 + REQ.DELIVERY: 8-15-84 + ORN COMM. APPROVAL RECEIVED + REV.1-TO CHANGE SALES CATEGORY TO DONATION. + REV.2-TO ADD ITEMS 17-20; TO NOTE SOFTWARE LICENSE RECEIVED.				

Solid 1600 AU51  
u. Ray

CME  
11/30/84





ADAGE, INC.  
One Fortune Drive  
Billerica, MA 01821

PACKING LIST

SALES ORDER NO. 9242	RVSN 1	DATE 7/13/84	PAGE 1
CUSTOMER ORDER NO. N/A			
BILL OF LADING NO.		DATE SHIPPED 9/21/84	
SHIP VIA BEST	Feeder Xpr	F.O.B. FACT	PPD. XXX
SA 9914			
TERMS NET 30			

B  
I  
L  
L  
T  
O

THE COMPUTER MUSEUM  
300 CONGRESS ST  
BOSTON, MA 02211

S  
H  
I  
P  
T  
O

THE COMPUTER MUSEUM  
300 CONGRESS ST  
BOSTON, MA 02211

BILL TO CUSTOMER ► COMPMU1000

SHIP TO CUSTOMER ► COMPMU1000

36320  
3 pcs @ 425

ITEM	PRODUCT NUMBER	DESCRIPTION	SERIAL NUMBER / REMARKS	CURR. QTY THIS ORD	QTY SHIPPED	NEW QTY BACK ORD
1	3006	BASE DISPLAY SYSTEM DR256	A 957061	1	1	
2	DR/GM256	SUBSTITUTE GM256		1	1	
3	CBS12/24	SUBSTITUTE CB24		1	1	
4	GM256	LARGE GRAPHICS MEMORY		3	3	
6	MPC/32	MPC, 32K BYTE RAM		1	1	
7	GPS	GRAPHICS PROCESSOR SET		1	1	
8	XBS34	CROSS BAR SWITCH		1	1	
9	OVLY	OVERLAY		1	1	
10	MON19/HS	19" COLOR MONITOR:HS		1	1	
11	RGBS CABLE/50	50' STANDARD CABLE SET		1	1	
12	DT11/M100	DIGITIZING TABLET, CABLE TO MPC		1	1	
13	CRT1/M100	CRT TERMINAL, CABLE TO MPC		1	1	
14	AIDS	DIAGNOSTIC TAPES P/N 20-103002-08		1	1	
15	SOLID/3000 64K	SOFTWARE FOR ADAGE 3000(64K)			1	
16	IK11B/50	DEC UNIBUS INTERFACE, 50' CABLE SALES ORDER SPECIAL INSTRUCTIONS: HOST: DEC OP.SYS. VMS3.4 11/750 + MEM.CONFIG: RGBA(0); 0-7 + REQ.DELIVERY: 8-15-84 + ORN COMM. APPROVAL RECEIVED +	201 9-21-84	1	1	

August 7, 1984

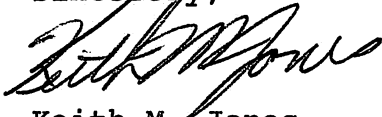
Mr. Andy Kristoffy  
Computer Museum  
300 Congress Street  
Boston, MA 02210

Dear Andy,

Enclosed you will find the site preparation data sheet for the Adage 3000. The information we discussed concerning the host to RDS and RDS to monitor maximum separations are contained.

The information concerning the data tablet maximum separation is 100 feet. If there are any other questions concerning your installation, please feel free to call me.

Sincerely,



Keith M. Jones  
Installation Specialist  
Customer Service

KJ/sfa

RDS 3000 Series

(Domestic)

Site Preparation Data For the ADAGE 3000 Series of  
Raster Display Systems

DIMENSIONS:

CB24:

24 slot

Height: 22.75 inches (57.8 cm)

Width: 19 inches (48.3 cm)

Depth: 27 inches (68.6 cm)

- what are these?  
- what mounts?

CBS12:

12 slot

Height: 14 inches (36 cm)

Width: 19 inches (48.3 cm)

Depth: 27 inches (68.6 cm)

monitor

WEIGHT:

Approximate weight, fully-configured

CBS12: 130 lb. (60 kg)

CB24: 160 lb. (74 kg)

ELECTRICAL REQUIREMENTS:

CBS12:

115V, 60 Hz, single phase

104 to 126V, working limits

15 amp circuit breaker per card cage

The AC wall outlet must be within 6 feet (1.8 meters) of the card cage. The wall outlet must accept a NEMA 5-15P (standard 3-prong U-ground).

Need a rack DEC 19"

9 Video. R6-59

CB24:

115V, 60 Hz, single phase

30 amp circuit breaker per card cage *= put in.*

104 to 126V, working limits

The AC wall outlet must be within 14 feet (4.3 meters) of the cage.  
The wall outlet must accept a NEMA L5-30R (twist lock).

HEAT GENERATION:

*Receptical.*

Maximum heat output: 5200 BTU/hour per card cage

Power Consumption: 1500 watts

OPERATING ENVIRONMENT:

Temperature: 60 degrees F to 90 degrees F  
(16 degrees C to 35 degrees C)

Relative Humidity: 40% to 80%

DEC HOST SLOT REQUIREMENTS:

IK11B: A HEX slot on the DEC UNIBUS which is configured for DMA operation.

The IK11B is the equivalent of one standard UNIBUS load.

IKQ: A single quad connector slot on the Q Bus. The IKQ is the equivalent of one standard Q Bus load.

DEC HOST ADDRESSING:

The IK11B and the IKQ both require eight contiguous addresses in the range 760000 to 777760. The base address that is used, must be a multiple of 20 octal. The factory installed base address is 772460. Three contiguous interrupt vector addresses are required in the range 0000 to 1740. The base vector interrupt address that is used, must be a multiple of 40 octal. The factory installed base interrupt vector is 400.

NOTE: All addresses are octal.

SEPARATION:

The standard host to RDS interface cable length is 25 feet (7.6 meters) which gives a standard rack separation of 15 feet (4.6 meters). A longer interface cable (50 feet, 15.25 meters) may be ordered which gives a rack separation of 40 feet (12.2 meters).

MONITOR AND CABLES:

If the monitor or cables are supplied by the customer, they must be made available at the time of installation if ADAGE performs the installation.

The monitor and cables can be ordered from ADAGE. The monitor has BNC connectors. ADAGE must be informed of the cable length, either 25 feet (7.6 meters) or 50 feet (15.25 meters), when the system is ordered.

If the monitor and cables are not ordered from ADAGE, they must conform to the following specifications:

1. The monitor must accept RGB composite or separate RGBS inputs.
2. Three cables are needed for RGB composite monitors. Four cables are needed for RGBS monitors. The cables must be RG59/U or equivalent, and must not exceed the 50 feet (15.25 meters) restriction. The cables must have BNC connectors AMPHENOL P/N 31-12, MIL P/N UG-260 at the end which will connect to the LUVVO. The other end must have the appropriate connectors for the monitor (usually BNC)

SOFTWARE INSTALLATION:

Currently ADAGE Only supports DEC hosts running the following operating systems:

VAX/VMS 3.0

RT11 4.0

RSX11-M 3.2

Berkley UNIX 4.1

Bell UNIX 7.0

Prior to ADAGE supported installation, the acceptance test diagnostics (AIDS) must be linked and compiled/assembled into the host system.

See the RDS3000 Installation (P/N 10-301-045-10A) for software installation procedures.



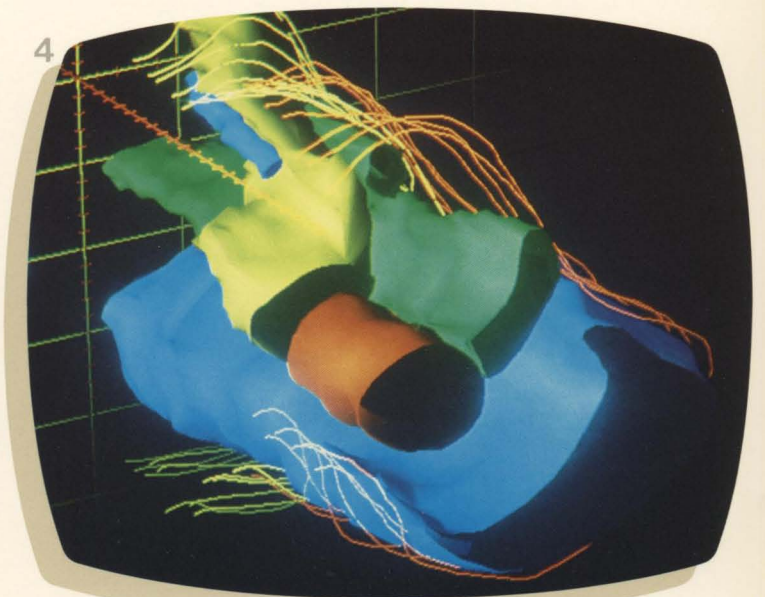
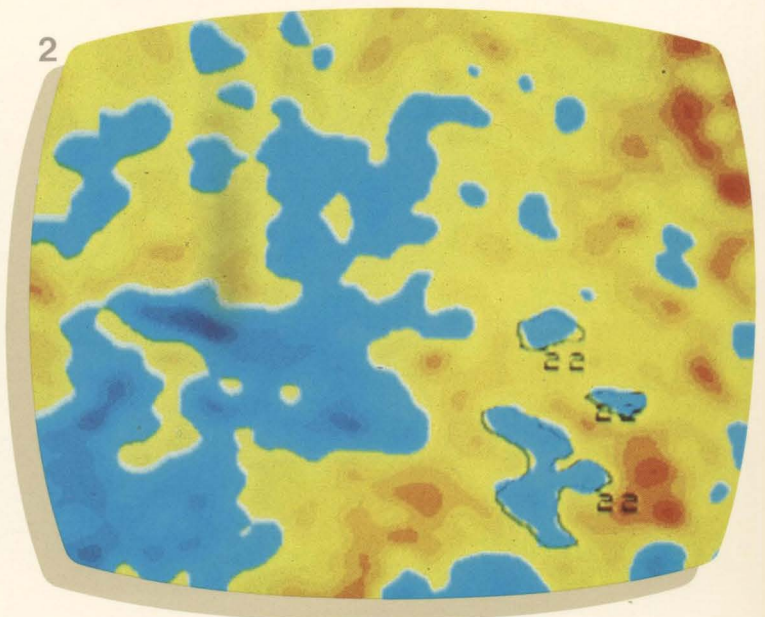
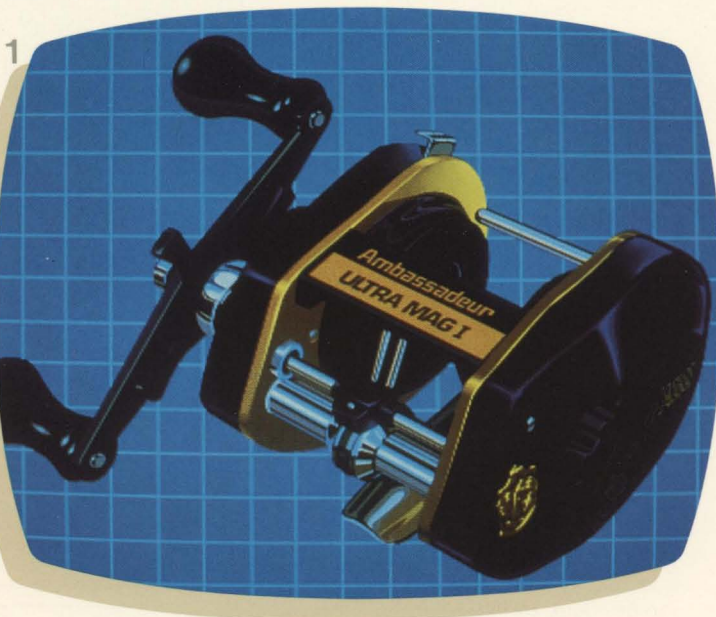
**Computer graphics**—the remarkably successful union of technical innovation and human creativity. Certainly the most efficient way to present, manipulate, and understand vast amounts of complex visual data. Highly productive. And, with its fast response and dynamic interaction, a vital stimulus to human creativity.

The Adage 3000 System—with its high performance, local processing power, and large image memories—takes demanding interactive applications in stride. It is already working for users in cinematography, industry, medicine, and science. It could be working for you, too. The successful union of your creativity and our innovation.

Typical high-resolution, fast-interaction applications being handled by the Adage 3000 System, and described on page 7, include: *Animation*, *Image Processing*, *CAD/CAM*, and *3-D Modeling*. Applications depicted below are: 1. *Animation* (photo credit: Client: Garcia; Agency: Y & R—Special Markets; Production: Computer Creations, Inc.), 2. *Seismic Analysis* (photo credit: Adage, Inc.), 3. *Simulation* (photo credit: Lockheed Georgia Co.—NASA Program), and 4. *Medical* (photo credit: D. Schlüsselberg, W. Smith, D. Woodward, UTHSC, Dallas).

**ADAGE 3000**

**COLOR RASTER DISPLAY SYSTEM**





## HIGH-PERFORMANCE FEATURES FOR COMPUTER GRAPHICS AND IMAGE PROCESSING APPLICATIONS.

*Wire-frame, solid-fill and shaded-surface images on same display.*

*Rapid image generation by multiple processors.*

*Programmable display formats.*

*Large display memory capacity.*

*Host computer interfaces to popular minicomputers.*

*Modular design for easy system configuration and expansion.*

The Adage 3000—with its multi-processor architecture, advanced hardware and modular design—combines the superior interactive performance common to Adage vector refresh work stations with the unique advantages of color raster technology. With the 3000 System you'll be able to generate color vectors, polygons, circles and rectangles . . . create solid-fill areas and shaded surfaces from a selection of up to 16 million colors . . . and combine high-resolution graphics and text in a single image.

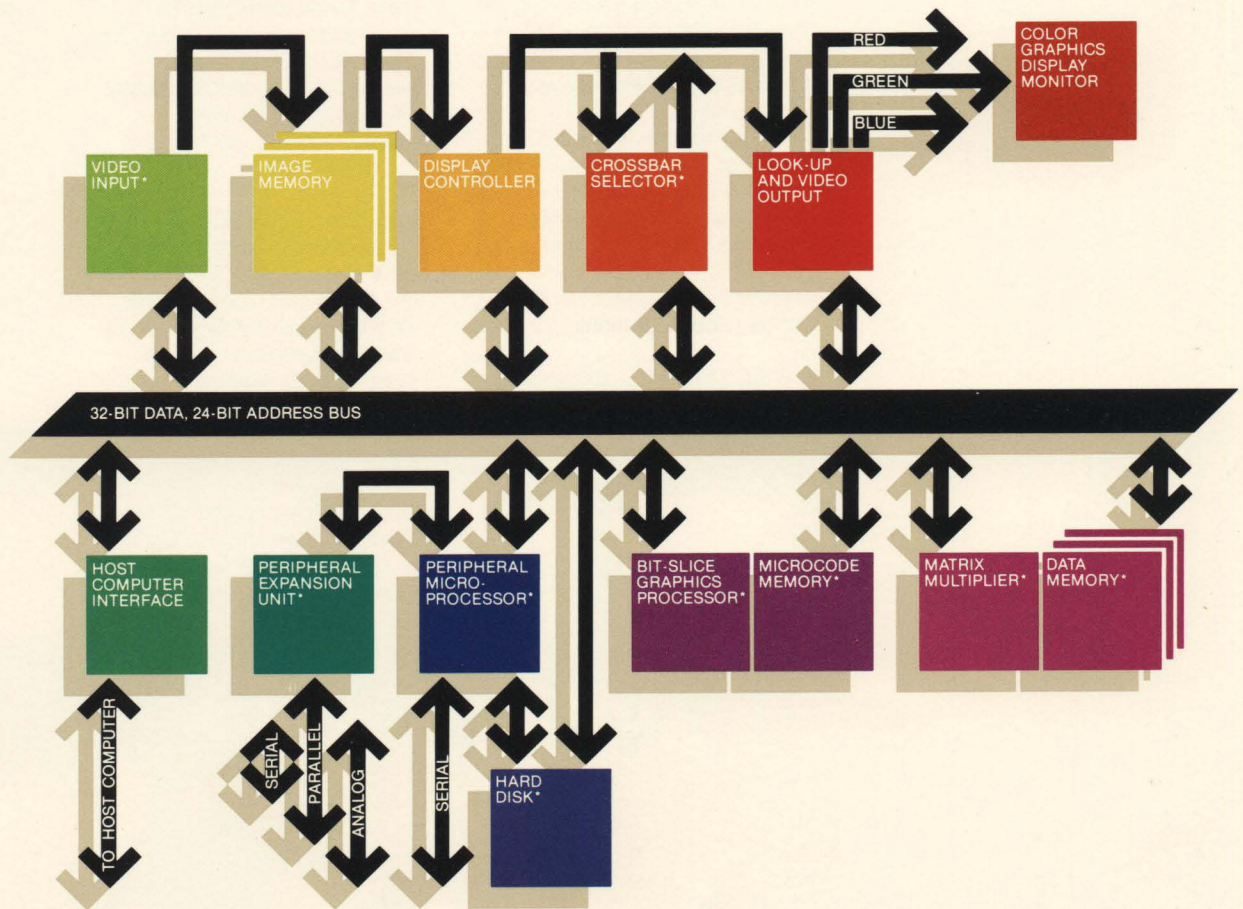
Among the many 3000 System capabilities: fast image generation, thanks to the system's parallel execution of time-consuming computational tasks. User-programmable selection of display formats, to give you the best format for your particular application. Real-time

multi-tasking software that lets you add custom programs for work station and interactive control. And an extensive selection of optional features and peripheral devices.

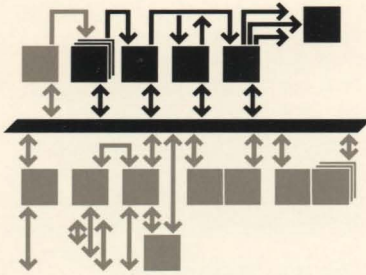
The Adage 3000 System is made up of a number of hardware modules that provide: 1. display capabilities, 2. processing capabilities, and 3. input/output capabilities. The 3000 System's architecture is based on a synchronous communications bus into which all system modules plug. Microstrip transmission line technology enables this 32-bit data, 24-bit address bus to run with a 208 nanosecond transfer time. All system control registers, as well as memory modules, are within the address space of the bus.

Because all modules are connected independently to the bus, each 3000 System can be configured for a particular application with the most cost-effective selection of memory size, display size, processing power, and other features.

The relationship of the communications bus, individual modules, and functional groups is illustrated below. Each functional group is described on a succeeding page.



\* OPTIONAL



## DISPLAY CAPABILITIES

### IMAGE MEMORY

The 3000 System's Image Memory provides up to 12 megabytes (2048<sup>2</sup> × 24) of storage. This extensive memory capacity gives the user as many as 16 million display colors. It also allows storage of considerably more data than can be displayed at one time, an important advantage in applications such as movie-loop animation and remote sensing. Using the Display Controller's pan and scroll capabilities, the user can examine different parts of a large image without reloading the image memory.

All 3000 System image memories incorporate write and erase masks which permit the restriction of write and auto-erase functions to selected bit planes. Such flexibility of control is especially useful for double-buffering and movie-looping applications. The user can also write to a single plane without disturbing data on other planes, simplifying the use of a single bit plane as an overlay.

Memory modules GM64 and GM256 also incorporate a "Mask Mode" write function, allowing users to write up to 32 pixels of a single color in a single write cycle. This ultra-fast area-fill capability significantly improves display update speeds.

The 3000 System's Image Memory can be dynamically reconfigured under program control to provide either 512<sup>2</sup> or 1024<sup>2</sup> display formats.

### DISPLAY CONTROLLER

The Display Controller provides a number of advanced features including pan, scroll, zoom and programmable cursor. It is also responsible for the 3000 System's Programmable Display Format feature. This unique capability lets the user select the most effective display format for his particular application: 525 lines (30Hz) to video tape images in NTSC format with external sync, 512<sup>2</sup> visible images at 30Hz refresh rate for fast response, 512<sup>2</sup> (60Hz) for flicker-free display, or 1024<sup>2</sup> (30Hz) for high resolution.

### COLOR LOOK-UP AND VIDEO OUTPUT

The 3000 System's Color Look-Up/Video Output function allows the user to select either 8-bit pseudocolor or 24-bit full-color display, depending on application requirements. Image enhancement, for example, can be accomplished with pseudocolor. Other applications may necessitate the realistic display of smooth-shaded solid reconstructions, requiring the use of full color.

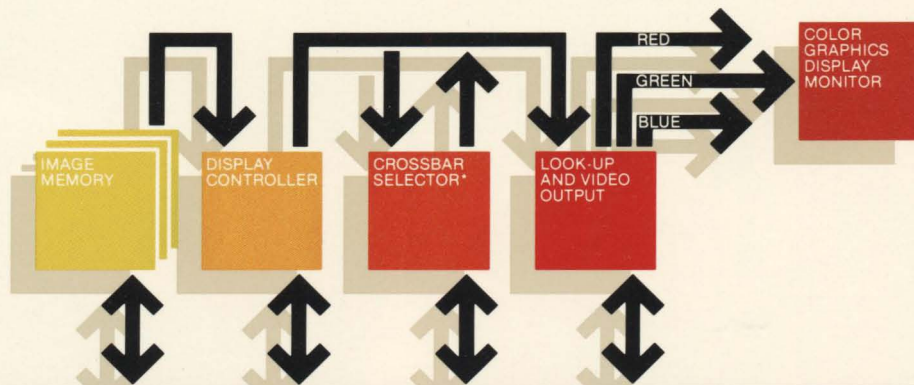
Each Color Look-Up/Video Output module contains three 8-bit look-up tables (one each for red, green and blue) and three ultra-high-speed 8-bit digital-to-analog converters. Optional 10-bit look-up tables and digital-to-analog converters are available for color-critical applications requiring gamma correction. A further 3000 System option, utilized with the Crossbar Selector feature, provides up to eight overlay bit planes.

### COLOR GRAPHICS DISPLAY MONITORS

Color Graphics Display Monitors for the 3000 System are ultra-high resolution, shadow mask, delta-gun raster scan units. Model MON19/LS supports 525 line (30Hz), the NTSC standard, and 512<sup>2</sup> visible (30Hz) display formats. Model MON19/HS supports a 512<sup>2</sup> visible (60Hz refresh) flicker-free display format and a 1024<sup>2</sup> visible (30Hz refresh) display format.

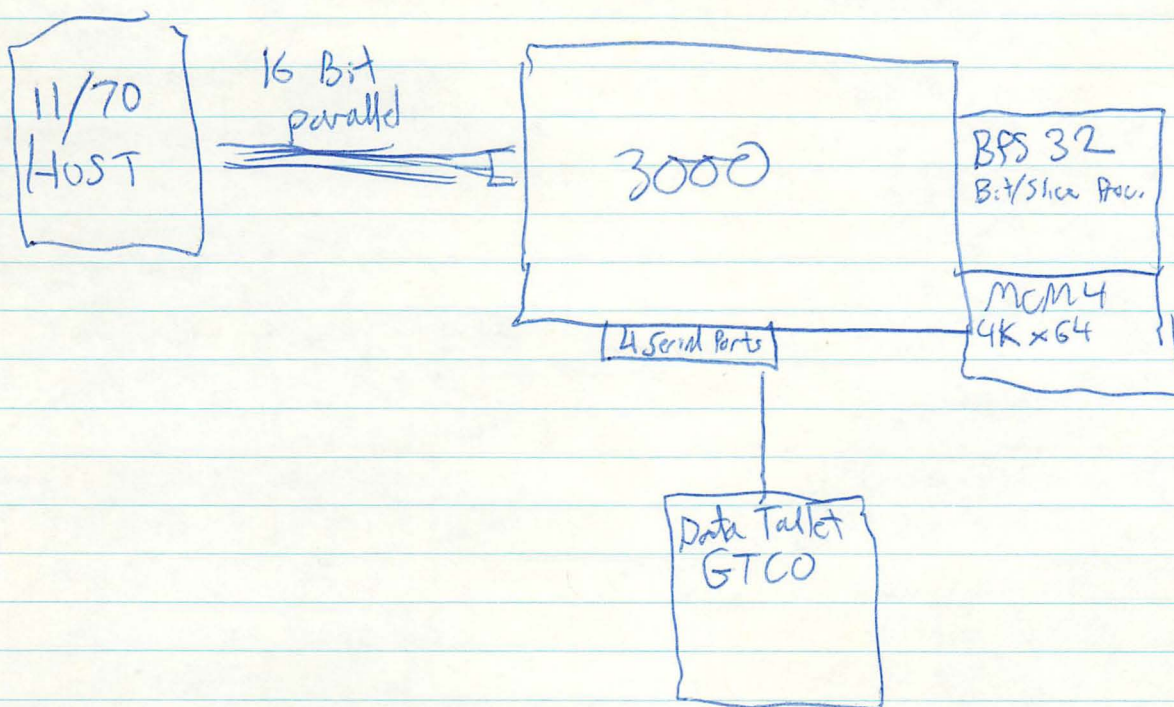
### CROSSBAR SELECTOR

The 3000 System's Crossbar Selector gives the user complete freedom in mapping stored bit planes to look-up table inputs. Application uses include selecting the number of bits per color; the splitting of stored bits for double-buffering when more than one frame time is needed to compute a new view; and the display of 10-bit data in pseudocolor or gray scale.



32-BIT DATA, 24-BIT ADDRESS BUS

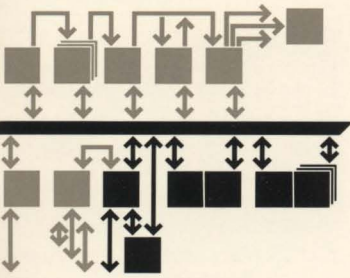
\* OPTIONAL



Cross assembler Provided : IKASM

Ask Intermetrics for ICROSS  
 High-level cross assembler like C.  
 Runs on VAX VMS or UNIX

512 x 512 x 32      DB256 Image Memory      1024 x 1024 x 24



**PROCESSING CAPABILITIES**

**GRAPHICS PROCESSOR**

The 3000 System Graphics Processor is a powerful, 32-bit user-programmable bit-slice computer. Able to access and control all system features, it creates graphics for display, manipulates existing images, creates color look-up tables, and controls functions such as pan, zoom and cursor location. With its advanced architecture and highly parallel microcode, the Graphics Processor is able to execute several operations in a single instruction cycle, providing exceptionally fast image generation, smooth motion for dynamic images, and high throughput rates for animation. The Graphics Processor is supported by a FORTRAN-based cross assembler and a graphics primitives package.

**MATRIX MULTIPLIER**

The Matrix Multiplier performs 2-D and 3-D perspective transformation of vectors, polygons, curved surfaces and solids. Performing transformations locally and in parallel with the Graphics Processor assures faster image generation and better real-time response. The Matrix Multiplier also provides clipping assists, and is user-programmable for specific functions such as bicubic spline manipulation.

**HARD DISK**

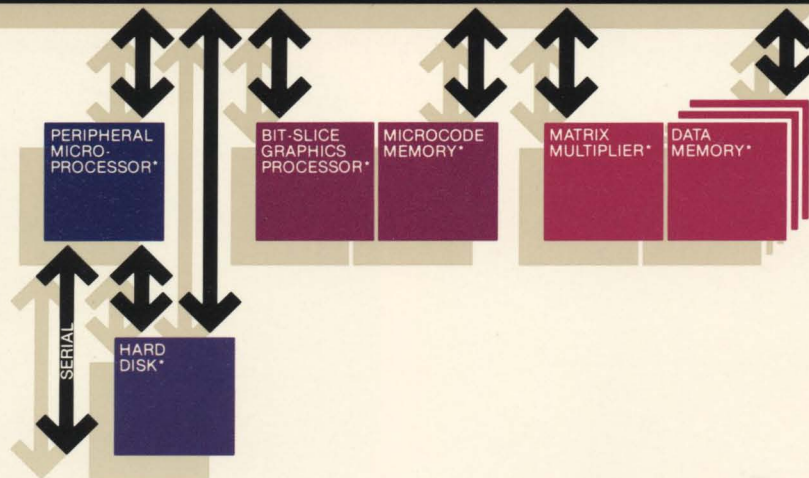
A dual-ported Hard Disk may be added to the 3000 System. One port, to the system bus, is used to transfer data to other system modules, such as image memory. The other port is to the Peripheral Microprocessor and enables the Hard Disk to serve as a system disk in stand-alone configurations.

**PERIPHERAL MICROPROCESSOR**

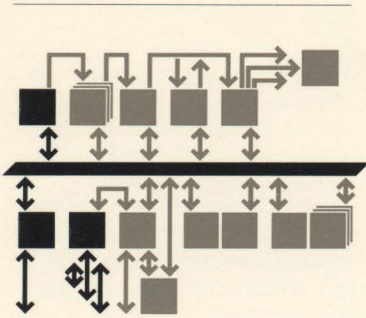
The Peripheral Microprocessor, a building block for work station and stand-alone configurations, contains a 16/32-bit general-purpose microprocessor (Motorola 68000) with up to 512K bytes of memory. By interfacing interactive devices directly to the display device, the 3000 System Peripheral Microprocessor eliminates the need for host computer intervention, speeding the acquisition of interactive inputs from the user. Standard software consists of a multi-tasking, real-time monitor with interactive routines and provision for user-supplied programs. The powerful UNIX<sup>TM</sup> operating system is also available for full flexibility in work station configurations.

UNIX<sup>TM</sup> is a trademark of Bell Laboratories.

32-BIT DATA, 24-BIT ADDRESS BUS



\*OPTIONAL



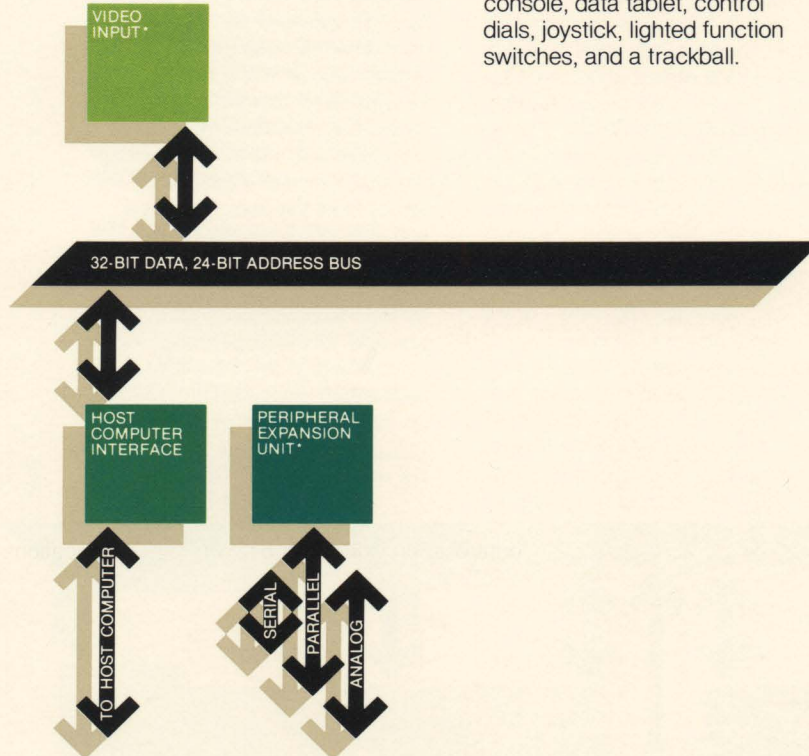
## INPUT/OUTPUT CAPABILITIES

### HOST COMPUTER INTERFACE

Host computer access to the 3000 System's image memory, system control registers, graphics processor, and data memory is provided by the Host Computer Interface, which can handle data transfers in both programmed input/output (PIO) and direct memory access (DMA) modes.

### VIDEO INPUT MODULE

The system's Video Input Module digitizes video signals from a television camera or video tape recorder and stores them in image memory. The module is available in monochrome (one-channel) or color (three-channel) models.



### PERIPHERAL EXPANSION UNIT

The Peripheral Expansion Unit, which connects to the Peripheral Microprocessor, allows additional interactive input devices to be interfaced directly to the 3000 System. The Peripheral Expansion Unit accepts analog, TTL parallel and serial inputs, giving the user exceptional flexibility in determining the most effective input devices for a specific application.

### INTERACTIVE PERIPHERAL DEVICES

Interactive peripheral devices supported by the 3000 System interface to the Peripheral Microprocessor (serial devices only) or to the Peripheral Expansion Unit. Devices available include an alphanumeric CRT console, data tablet, control dials, joystick, lighted function switches, and a trackball.

## SOFTWARE

### DIAGNOSTICS

All 3000 Systems are supported by a package of diagnostic programs, called AIDS, which fully exercises all system functions. AIDS programs are written in FORTRAN and are run on the host computer.

### DRIVERS/SUPPORT

The 3000 System is supported by drivers for the following operating systems: DEC RT-11™, RSX-11M™, and VMS™; UNIX Version 7 (16 bit) and UNIX 4.1 (32 bit).

IKASM is a cross assembler for the microprogrammable elements of the 3000 System—the Graphics Processor and Matrix Multiplier. IKASM is written in FORTRAN and is run on the host computer.

IDL2 is a graphics primitives language which enables the user to write display programs for execution by the Graphics Processor. The IDL2 environment includes a cross compiler which runs on the host computer and a set of microcode routines and an interpreter which run on the Graphics Processor. IDL2 is particularly appropriate in simulation applications requiring interaction with a set display format.

The UNIX operating system, used in conjunction with the Peripheral Microprocessor and the Hard Disk, makes the 3000 System a powerful stand-alone system or work station.

DEC RT-11™, RSX-11M™, and VMS™ are trademarks of Digital Equipment Corporation.

\* OPTIONAL

### ANIMATION APPLICATIONS

1. The 3000 System is a particularly valuable tool in animation and video production applications. By off-loading display generation from the host computer to its own powerful Graphics Processor, it dramatically reduces the time required to generate complex images. Among the many "artistic" uses for the 3000 System: the realistic rendering of complex solid models and other imagery; and the production of special effects such as a "chrome" look or an airbrush treatment.

(photo credit: Client: Cerveza Bohemia; Production: Computer Creations, Inc.)

### IMAGE PROCESSING APPLICATIONS

2. The 3000 System's large image memory and programmable Graphics Processor make it the ideal display system for image processing applications. Multi-spectral imagery, typical of remote sensing applications, is handled with ease. With complete random access to the image memories, the Graphics Processor can process partial-screen as well as full-screen areas. Interpretation of image data is made easier by fast look-up tables for pseudocolor image enhancement, and by overlay planes, which add identifying information to the display.

(photo credit: O. Brown, R. Evans/University of Miami)

### CAD/CAM APPLICATIONS

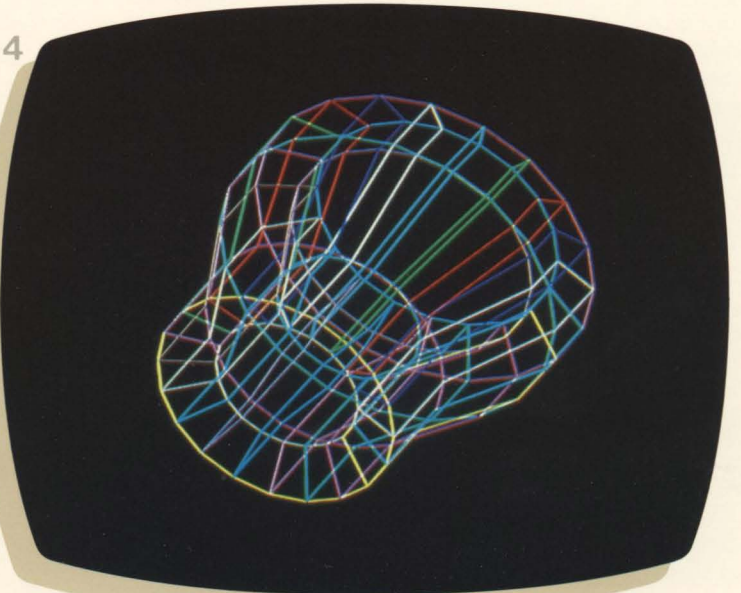
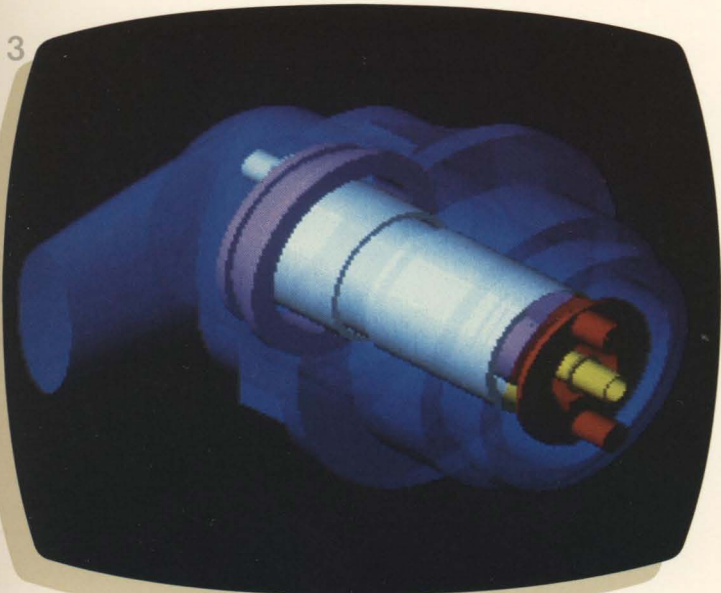
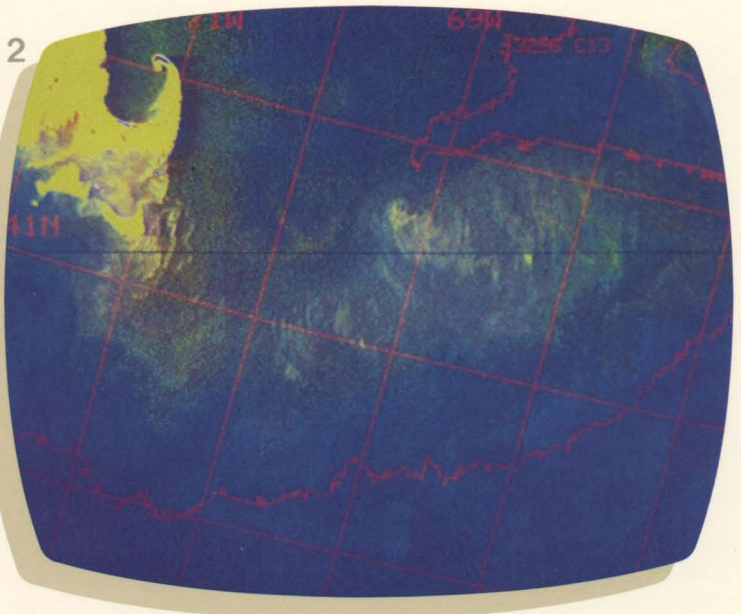
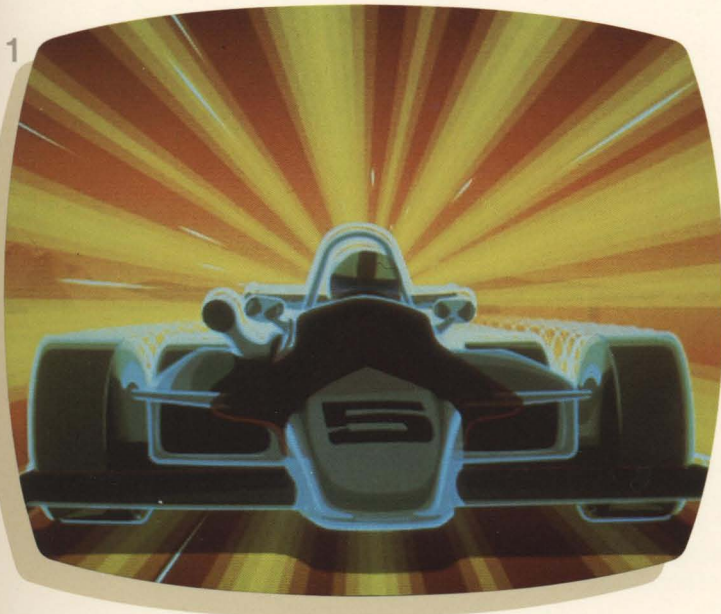
3. The 3000 System greatly simplifies the CAD/CAM designer's job, too. Its high-performance architecture and image processing elements permit real-time image manipulation. And—with its highly parallel microcode—it can often execute in one instruction, operations requiring multiple instructions on other processors. Additional 3000 System features of special interest to the CAD/CAM designer include local 3-D transformations, double-buffering, and ultra-fast area fill.

(photo credit: P. Atherton/General Electric Co.)

### 3-D MODELING APPLICATIONS

4. The 3000 System brings many extra dimensions to 3-D modeling applications. Most important, it can display and manipulate 3-D wire-frame or solid images on the same display system. Remove hidden surfaces or shade visible surfaces. Add sharp, crisp colors—by the millions. Make it easier to visualize inner structures with cut-away views and transparent surfaces. Or cure the "jaggies" with its special anti-aliasing feature.

(photo credit: Adage, Inc.)



## DISPLAY HARDWARE SPECIFICATIONS

### IMAGE MEMORY

Model	Mode	User-Programmable Format
DR64 and GM64	Storage	512 × 512 × 8 or 1024 × 1024 × 2 ✓
	Display	512 × 512 × 8 or 1024 × 1024 × 2
DR256 and GM256	Storage	1024 × 1024 × 8 or 2048 × 2048 × 2
	Display	512 × 512 × 8 or 1024 × 1024 × 2

Cycle Time: 416ns

Maximum Memory: 12 modules

### DISPLAY CONTROLLER

Line Rate: 200 to 2000 lines per frame (programmable)

Frame Rate: 20 to 80 frames per sec. (programmable)

Display: interlaced or non-interlaced (programmable)

Sync: internal or external (programmable)  
internal: RS-170A or RS-343 (programmable)

Pan and Scroll: pixel increments

Zoom: integer multiples from 1:1 to 16:1

### COLOR LOOK-UP TABLES AND VIDEO OUTPUT

Channel Selector: for pseudocolor or full color operation

Look-Up Tables: three 1024 × 8-bit tables  
Look-Up Table Inputs: 8 data bits, 1 cursor bit, 1 page bit

Optional Look-Up Tables: three 1024 × 10-bit tables

Digital-to-Analog Converters: three 8-bit DACs, 10ns settling time

Optional DACs: 10-bit DACs, 15ns settling time

Output: 75 Ω, 1V

Optional Overlay Channel: provides 8-bit overlay channel supporting 1 to 8 overlay bit planes (requires crossbar selector)

### COLOR GRAPHICS DISPLAY MONITORS

Technology: delta-gun raster scan

Display Size: 19" diagonal

Tri-Dot Spacing: 0.31mm ultra-high resolution

Bandwidth: 25MHz on model MON19/LS;  
50MHz on model MON19/HS

Horizontal Scan Frequency: 15 to 18KHz on model MON19/LS; 28 to 35KHz on model MON19/HS

### CROSSBAR SELECTOR \*

Input (from Display Controller): 32 image-data bits; 2 register bits; and 1 cursor bit

Selector: 34 control registers

Output (to Look-Up Tables): 24 image-data bits (in three 8-bit channels); 8 optional overlay bits; and 2 look-up table page bits

## PROCESSING HARDWARE SPECIFICATIONS

### BIT-SLICE GRAPHICS PROCESSOR \*

Microcode-Word Length: 64 bits

Data-Word Length: 32 bits

Instruction-Cycle Time: 208ns

Hardware Multiplier: 16 × 16-bit multiply

Microcode Memory: 4K × 64, expandable to 16K × 64 **LOK**

High-Speed Data Memory: 8K × 32, expandable to 32K × 32

Vector-Drawing Rate: 2,000,000 pixels per sec.

Polygon-Fill Rate: 1,000,000 pixels per sec.

Software: IKASM—microcode cross assembler; IDL2—graphics primitives

### MATRIX MULTIPLIER \*

Coefficient Storage: 1024 × 16 bits **UNSC**

Instruction-Cycle Time: 208ns

Multiply and Accumulate: 16 × 16-bit multiply; 35-bit accumulate

Data-Word Lengths: 16-bit X, Y, Z, W input; 16-bit X, Y, Z, W (transformed) output; and 12-bit X, Y, Z (perspective division) output

Clipping Support: six comparators

Transformation Rates: 280,000 points per sec. for 3-D; 200,000 points per sec. for perspective **Good**

### PERIPHERAL MICROPROCESSOR \*

Processor: Motorola 68000, 8MHz

Data-Word Length: 32-bit internal, 16-bit external

System Interface: full access to all 3000 System functions via memory mapping

External Ports: 4 serial RS-232 ports (one reserved for processor console); 1 parallel port (16 bits I/O); and 1 bus expansion port (16 bits data, 24 bits address)

Memory: 8K bytes of ROM; 32K bytes of RAM with parity; Memory Management Unit; and optional 256K bytes or 512K bytes of RAM

Software: multi-tasking, real-time monitor; user interface to monitor; debugging aids (program development requires user-supplied 68000 cross assembler); and optional UNIX operating system

### HARD DISK \*

Technology: 14" Winchester **One with ↑**

Capacity: 30, 60 or 160 Mbytes unformatted

Transfer Rate: 1 Mbyte/sec. maximum

Controller: dual ported to 3000 System bus and peripheral microprocessor; supports up to 4 disks with error correction

## INPUT/OUTPUT HARDWARE SPECIFICATIONS

### HOST COMPUTER INTERFACE

Host: minicomputers

Data-Transfer Modes: PIO or DMA (programmable)

Maximum Data-Transfer Rate Supported: 5.0 megabytes per sec. (host-dependent)

Host Access: host computer has direct read/write access to all 3000 System features

### VIDEO INPUT MODULE \*

Input: RS-170 video one-channel monochrome, three-channel color **Sample several times a second**

Sampling Resolution: 8 bits per sample per channel

Sampling Rate: 8 to 12MHz (programmable)

Sample Clock: internal or external (programmable)

Window and Viewport Control: fully programmable

Digitization Format: 16 × 16 to 512 × 512 (programmable)

Minification Factor: 1:1 to 16:1

### PERIPHERAL EXPANSION UNIT \*

System Interface: connects to parallel port of peripheral microprocessor

External Ports: 4 serial RS-232 ports; 8 parallel TTL ports (16 bits); 16 analog ports (12-bit digitization) **Joysticks / trackball**

### INTERACTIVE PERIPHERAL DEVICES \*

11" × 11" Data Tablet (serial)

3" Trackball (serial)

16 Lighted Function Switches (parallel)

8 Control Dials (analog)

CRT Terminal (serial)

Three-Axis Joystick (analog)

## SOFTWARE SPECIFICATIONS

Software: AIDS—FORTRAN diagnostics; FORTRAN drivers

Distribution Medium: magnetic tape; 800 bpi, 9 track

Tape Format: FLX or ANSI

\* OPTIONAL

# ADAGE

Adage, Inc., One Fortune Drive  
Billerica, Massachusetts 01821  
(617) 667-7070, TWX 710-347-1594

Europe: Adage GmbH, Gutenbergstrasse 14  
7012 Fellbach, West Germany  
Telephone 0711/512056

All information subject to change without notice.  
© 1983 Adage, Inc. Printed in U.S.A. 38315M

One Fortune Drive  
Billerica, MA 01821  
(617) 667-7070  
TWX 710-347-1594

SOFTWARE LICENSE AGREEMENT

Between

ADAGE, INC.  
One Fortune Drive  
Billerica, Massachusetts 01821

and

Computer Museum  
300 Congress St.  
Boston, MA 02210

*mailed Aug. 10, 1984*

This Software License Agreement (hereinafter referred to as "AGREEMENT") made this 7th day of August, 1984, is entered into between ADAGE, INC., (hereinafter referred to as "ADAGE") and COMPUTER MUSEUM (hereinafter referred to as "LICENSEE").

This AGREEMENT governs the use by LICENSEE of the ADAGE proprietary software described in Attachment "A" and all its elements (hereinafter referred to as "SOFTWARE"), which may include source code and documentation.

This AGREEMENT constitutes the complete and exclusive statement of the AGREEMENT between the parties and supercedes all proposals, oral or written, and all other communications relating to the subject matter of this AGREEMENT. No modification hereof shall be binding upon ADAGE unless acknowledged in writing by ADAGE's authorized representative.

1. LICENSE

ADAGE hereby grants to LICENSEE a paid-up, non-exclusive, license to use the SOFTWARE subject to the following terms, conditions, and restrictions:

- 1.1 The license granted under this AGREEMENT authorizes the LICENSEE to use the SOFTWARE solely on the host computer (hereinafter referred to as "HOST"), designated by type, serial number, and location as follows:



Type Digital Equipment VAX 11/750  
Serial No. BT 08710  
Location Museum Wharf  
300 Congress St.  
Boston, MA 02210

- 1.2 If the HOST designated in paragraph 1.1 becomes in-operative due to malfunction, preventive maintenance, or engineering changes, SOFTWARE may be temporarily transferred to a back-up machine or system until the designated HOST is restored to operative status.
- 1.3 No part of the SOFTWARE may be used in any form, nor reproduced by any means, nor transmitted, nor disclosed, nor translated into a machine language except as provided herein without the express written permission of ADAGE.
- 1.4 Use of or access to SOFTWARE in any manner by any person not employed by the LICENSEE is prohibited.
- 1.5 The right of the LICENSEE to use the SOFTWARE under the terms of this AGREEMENT shall continue until LICENSEE discontinues the use of the SOFTWARE or the HOST identified in 1.1 above, whichever first occurs. Within two (2) weeks after such discontinuance, LICENSEE shall return the SOFTWARE at LICENSEE's expense to ADAGE.
- 1.6 If the LICENSEE has possession of the source code in accordance with this AGREEMENT, the LICENSEE shall have the right to modify it to perform any functions which the LICENSEE deems desirable. The source code as so modified, shall nonetheless, remain subject to the same restrictions on use, reproduction, transmission, disclosure, translation and access as are contained in the AGREEMENT with respect to SOFTWARE.

## 2. ERRORS & WARRANTY

- 2.1 For a period of ninety (90) days following the date of delivery of the SOFTWARE, ADAGE will correct any errors found in the original SOFTWARE. Such correction shall

2. ERRORS & WARRANTY con't.

be at no cost to the LICENSEE, except that if ADAGE is called upon by LICENSEE to correct an error, and such error is found to be caused by data supplied by LICENSEE, modification of the SOFTWARE by LICENSEE, compiler or operating system characteristics, or any other cause not inherent in the original SOFTWARE, ADAGE reserves the right to charge LICENSEE at ADAGE's standard rates then in effect.

2.2 ADAGE shall not be responsible or liable for any damages suffered by LICENSEE or others resulting from use of the SOFTWARE including, but not limited to, special, indirect or consequential damages arising out of or in connection with any errors in the SOFTWARE or with the operation, use of performance of the SOFTWARE. ADAGE's responsibility and liability is limited solely to the correction of errors in accordance with Section 2.1 above, and IS IN LIEU OF ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ALL WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE.

3. CONSIDERATION

In consideration of the license to use the SOFTWARE granted to LICENSEE under Section 1 of this AGREEMENT, LICENSEE agrees to pay ADAGE, INC., the lump sum amount of \$           N/C          , promptly upon the receipt of an invoice from ADAGE, INC.

4. TITLE

Title to and ownership of the SOFTWARE shall at all times remain with ADAGE.

5. TERMINATION

In the event LICENSEE neglects or fails to perform or observe any of its obligations under this AGREEMENT, or if any assignment shall be made of its business for the benefit of creditors, or if a receiver, trustee in bankruptcy or a similar officer shall be appointed to take charge of all or part of its property, or if it is adjudged a bankrupt, and such condition(s) is not remedied within ten (10) days after written notice thereof has been given to LICENSEE, this AGREEMENT and all licenses granted hereunder shall immediately terminate.

5. TERMINATION con't.

Within two (2) weeks after any such termination, the LICENSEE shall return the SOFTWARE at LICENSEE's expense to ADAGE.

6. ASSIGNMENT

This AGREEMENT, the licenses granted hereunder and the SOFTWARE may not be assigned, sublicensed or otherwise transferred by the LICENSEE without prior written consent ADAGE. No right to reprint or copy the SOFTWARE, in whole or in part, is granted hereby except as otherwise provided herein.

7. GOVERNING LAW

This AGREEMENT shall be governed by the laws of the Commonwealth of Massachusetts.

Each party represents that it has full power and authority to enter into and perform this AGREEMENT, and the persons signing this AGREEMENT on behalf of each has been properly authorized and empowered to enter into this AGREEMENT. Each party further acknowledges that it has read this AGREEMENT, understands it, and agrees to be bound by it.

LICENSEE:

ADAGE, INC.

By: Olivier Stempel

By: \_\_\_\_\_

Title: Curator

Title: \_\_\_\_\_

Date: 8/9/84

Date: \_\_\_\_\_

ATTACHMENT "A"

FSS 3000 and SOLIDS 3000 at N/C.

TO: Andy K  
FROM: Geoffrey  
RE: What's Happening Next Week  
DATE: 20 July 1983

Hope you had a terrific time off and are rarin' to go. O and I made some progress in refining our view of what we want and what seems feasible. As to be expected, IBM is dragging its feet, which makes life hard for us wherever pc's are indicated. We have decided, more or less, to exploit Gwen's ATT connections and ask them for 4 of their PC's. I have been advised that the ATT-PC is both software-compatible and bus-compatible with the IBM-PC. This means that things like the Chorus frame grabber board and various frame buffers can be installed on the ATT machine. We have also requested 2 NEC APC machines, one of which may be used for a paint program, the other I'm not sure. The paint program I'm looking into is the XIPHIAS Videograph system. Tech. doc. should show up next week. Check it out, if you would.

While at SIGGRAPH, we'll talk to vendors of related material, such as Time Arts, Artronics, and board vendors such as Chorus and Number Nine Co. (which is in Cambridge). Those two seem the best bet for the Discernability and Window (raster version) exhibits. We'll also confer with Mandelbrot, and try to locate a vector refresh display to show the "slow vector" demo on, but may have to end up using a raster display for it. We still need a display for the pantograph demo. Perhaps AED (Sunnyvale, CA) will come through with one of their 512 terminals, which have hardware pan and zoom (1 to 16x) implemented via function keys. (OS note- Mindset would not do this in hardware so is not as good; also Mindset might then turn into a good paint system)

Meanwhile, you might put some effort into clarifying the following:

Zoetrope -- Can we buy or must we build? We want to show how a sequence of stills make an animation. There are one or more zoetropes downstairs (see the "Endings" gallery in the Children's museum. Ask them where they got them.)

Adage 3010 -- This is now officially coming. We intend to display Martin Newell's famous teapot in a little case next to it and a shaded image of same on screen. Visitors will be able to alter the lighting of both the object and its simulation simultaneously, probably via a menu with or without a trackball device to point to light sources and colors. In the display case will be 2 or 3 sets of 3 lamps (with red, green and blue filters), which will be controlled by the Adage via a serial port. Peter Beale says that a simplified version of the controller he's making for the Sage console would work, but may need drivers and/or relays for the lamps. He also says that a Vic-20 could do most of the work. Please consult him and work with him if he needs assistance.

*-Andy design? yes!*

Button Boxes -- We would like, if possible, to use a Universal Button Box for interaction, with or without a trackball as

appropriate. Masscomp, according to Lorin Gale, will make such a device for their demo, which they will package completely, including video camera, a monochrome monitor and a color monitor. Wish we had more firms as willing. Anyway, we should confer with their engineers about how to go about building other such interfaces; the Adage demo will need one, as will the discernability demo. Perhaps you could begin to catalog the interactive requirements of the exhibits you know about.

{ Chorus' president, Tom Hogan, promised me he'd send tech. doc. on programming their video input board. It hasn't arrived. Try to get him (or anyone there) to come through.

Have a great time...Wish you were there.

Will do  
Tilger.

7.8.84

Why

- need in writing value of system (not all needed)
- confirmation only ~~at~~ on reviewing equipment.

Will write. 7 Aug

O.

Need in writing the value of entire system (for tax) before make confirmation.

Who's tax? A why?  
Please return. Tell me more.

July 17, 1984

Mr. Oliver Strimpel, Curator  
Computer Museum  
300 Congress Street  
Boston, MA 02210

Dear Mr. Strimpel:

I am pleased to confirm Adage's donation of a 3010 graphics display system to the Computer Museum. In addition to the hardware components, we will include copies of our FSS 3000 and Solid 3000 software products that can be used to render 3-D, shaded images.

Clarence Tilger and Don Davis of Adage will be working with you to assure a timely delivery of the system, and to assist you in installation and start-up activities.

Adage welcomes the opportunity to become a corporate founder for the museum, and we look forward to working with you to help foster a first class representation of the computer and graphics industries.

Thank you again for your consideration and good luck in all your efforts.

Very truly yours,

ADAGE, INC.



Lewis D. Brentano  
Vice President, Marketing

LDB/ss

cc J. Cunningham  
D. Davis  
J. N. England  
B. Prasad  
R. Spann  
C. Tilger



9:05 a

Andy  
cancel visit to  
Mentor Graphics —  
they will call to  
reschedule

RETURN DATE: 8/31/84

SUMMER 1984

EMPLOYER END-OF-TERM COOPERATIVE EDUCATION APPRAISAL OF: Andrew Kristoffy

Supervisor's Name Oliver Stempel Title Curator

Work Address Computer Museum Work Phone 617-426 2800  
300 Congress Street  
Boston, MA 02210

Continue on reverse side if necessary. Please print or type responses. Thank you.

1. How long have you supervised this particular student employee? 2 1/2 months
2. Please give a general appraisal of the student employee's performance including your observation of his or her growth and development during the cooperative education placement period.  
A Kristoffy has absorbed a lot of material and is now contributing actively to the Museum. He is quick to learn and apply his knowledge
3. If circumstances permitted, would you hire him/her again? Yes
4. Please discuss your degree of satisfaction with the Office for Cooperative Education before and during placement (where appropriate).

CERTIFICATION OF PARTICIPATION:

Upon successful completion of their cooperative education placements and submission of all required reports, University students receive official recognition of the experience on their academic transcripts. It is very important to your student employee, therefore, that we receive the following information:

Total number of hours worked: \_\_\_\_\_ Employment dates: \_\_\_\_\_

O Stempel  
(Supervisor's signature)

Aug 6 1984  
(Date)

## ADAGE

INTERLACING  
ALIASING  
DOUBLE BUFFERING  
DEGRASS  
ALIEN

VMS

- 1 part on Unix

from VAX, send x, y, z points.

- the Adage does local fill in and shading.

Transparency, can leave out every other (Screen) pixel. → But not good for multilayered transparency.

Fortran call to Adage to

Anti-aliasing -

- Warship - is OK.

FSS 3000. Fortran commands, use to  
SOLID 3000

- Someone, computer Science, M.S., Math background  
- they could help ~~put~~ install software.

- 2Meg Ram on VAX 750

456 MByte.

1500 BTU's

5000 BTU's.

Would be nice to have field Service  
- comes and racks. 19"

Possibly need total <sup>disk</sup> space of: 20 MBytes  
- clean up.

What about their publicity?

What exactly are we getting from Adage.  
On loan??  
Service??

→ Find out what we have free.

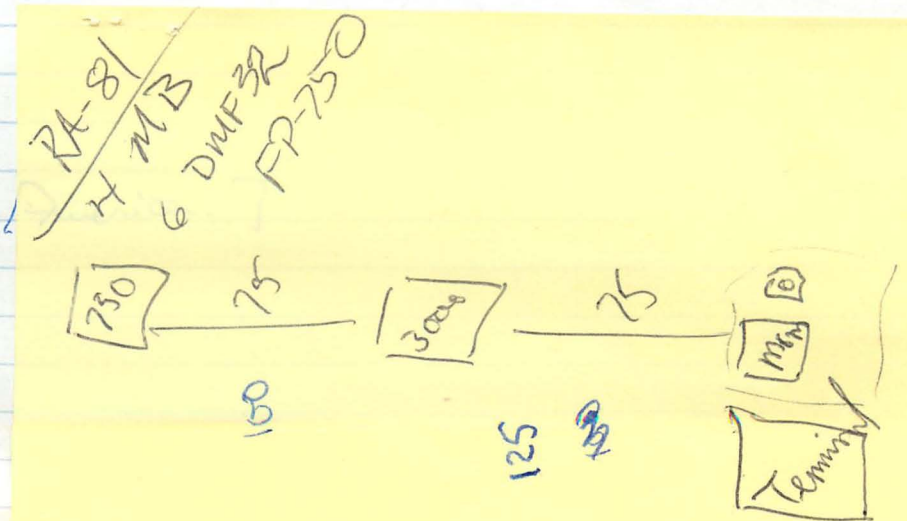
Contact Tom Williams, UMass.

Can he help us with getting data bases.

NYIT. - has great work w/ Adage.

Canada = Waterloo.

[Computer Corp. of



# ADAGE FSS 3000

## ADAGE FORTRAN SUPPORT SUBROUTINES

FORTRAN Support Subroutines (FSS 3000) is a package of high-level, FORTRAN-callable subroutines designed to provide a straightforward and efficient interface between the Adage 3000 Color Raster Display System and device-independent application software packages. FSS 3000 offers a convenient tool for enhancing the creativity and productivity of professional application engineers. With FSS 3000, the user maintains access to the dynamic power and flexibility of the Adage 3000.

Local hidden surface display is a key feature of the FSS 3000 package. The package includes local interactive 3-D perspective transformation and clipping of complex solid objects. Smooth-shaded hidden surface display is provided for these objects.

Other advanced features, including real-time 3-D anti-aliased vector display and fast raster operations, are part of the comprehensive set of graphics display operations.

FSS 3000 interfaces with a set of microcode routines and an interpreter, which run on the Adage 3000 high-speed graphics generator (GPS) or the Adage 3000 advanced graphics generator (AGG4). FSS routines build a display list in the host machine to draw primitives such as rectangles, polygons, circles, and vectors. Other FSS routines then send the display list to the Adage 3000 System for execution and manipulation. The result is dynamic, interactive graphics programming at the FORTRAN level.

### Control Functions

FSS also contains a set of FORTRAN-callable routines to initialize or update components of the Adage 3000 System. Routines are available to:

1. Set display control-resolution, pan, scroll, and zoom.
2. Write an array to the color look-up tables.
3. Set the look-up table input channel selector.
4. Set the XBS video crossbar switch.
5. Set the write masks and shade registers.

### 2-D and 3-D Primitives

Absolute and relative moves and vectors; polygons, including non-convex polygons, and polygons with holes; anti-aliased vectors; text strings, user-defined character font, character rotation and zooming; area-fill; circles; rectangles; and logical RASTER-OP (block move functions).

### ATTRIBUTES

Attributes such as color, line style, and resolution ( $1024^2/512^2$ ) are global in nature and are written to a specific area in scratch pad memory separate from the user's display list. This means, for example, that an attribute such as line style (anti-aliased or jagged) can be set once and will apply to all subsequent vectors. By engaging these attributes, a user program may easily make use of the advanced capabilities of the Adage 3000 System. Attributes include:

#### Graphics:

Line type: *absolute or relative vectors.*

Line style: *jagged or anti-aliased.*

Screen resolution: *1024 x 1024 or 512 x 512.*

Hidden surface mode.

Polygon stipple mask.

Polygon-fill type: *hardware or software-fill.*

Circle type: *outline or fill.*

Raster operation type: *move or bit-wise Boolean operation.*

Flood read mask: *for control of area-fill.*

#### Color:

Full color or pseudocolor.

Gamma correction factor for colormap load.

Polygon shading: *flat, smooth (Gouraud).*

#### Character:

Character font: *FSS 3000 8 x 8 font table.*

Text attributes: *foreground and background color, character spacing, transparent or opaque background, character orientation (rotation), x and y zoom.*

### Extensions

FSS 3000 may be extended to include user-defined functions.

### Computer Independence

FSS 3000 is written in ANSI FORTRAN and is easy to implement on most computers. All machine-dependent aspects of I/O and file handling are in a small number of isolated subroutines.

### Device Drivers

FSS 3000 uses standard Adage 3000 drivers for popular minicomputers.

### Versions

There are two versions of FSS 3000:

1. FSS 3000G for the Adage 3000 high-speed graphics generator (GPS).
2. FSS 3000A for the Adage 3000 advanced graphics generator (AGG4).

### Worldwide Sales and Service

Adage Sales and Customer Service representatives are located throughout the U.S., Europe, and Japan. For the location of the nearest Adage sales or service office, contact Adage at one of the offices listed below.



**Adage, Inc.,** One Fortune Drive, Billerica, Massachusetts 01821, (617) 667-7070  
TWX 710-347-1594

**Europe: Adage GmbH,** Gutenbergstrasse 14  
7012 Fellbach, West Germany  
Telephone 0711/512056

All information subject to change without notice.

© 1983 Adage, Inc. Printed in U.S.A. 1183/10M

# The Computer Museum

300 Congress Street  
Boston, MA 02210  
(617) 426-2800

June 14 1984

Clarence Tilger  
Adage Inc  
One Fortune Drive  
Billerica  
MA 01821

Dear Mr Tilger

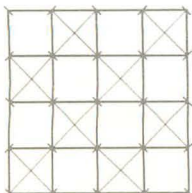
Thank you very much for arranging a demonstration for Andy and me. It was most illuminating and I think I am now in a position to outline the way I would like to present the exhibit.

The power of the 3000 can best be conveyed by use of near real time interaction. I would like to obtain a 3-dimensional database and allow visitors to view it from different standpoints, zoom, pan and rotate. The same database should be represented as lines without hidden line suppression, with hidden line suppression, with polygons, with Gouraud shading, and Phong shading. Then the visitor should be able to switch on and off a light source and perhaps move one around. The interaction should be via a trackball and one or two special keys only.

One possible database is that of the city of Boston's tax assessing department. If the buildings of a small region visible from the window of the gallery were used, the public could use the system to fly around the area, alter the position of the sun and use the wire frame representation to see through foreground buildings. The architects Jung/Brannen also have a database of the area which they used for CAD studies before building the tower on Dewey Square. As you will remember, the view of downtown Boston is quite complex so considerable selection and simplification would have to be made.

Other databases may be available from the University of North Carolina or from NYIT.

I have spoken with a person who is consulting for us on the Museum's use of film and video. He says that line amplifiers for the video cables (between the 3000 and the monitor) are off-the-shelf and reliable and sees no difficulty running the video from the VAX room downstairs up to the exhibit. Is he right or is he missing something? If this could work it would be the best solution all round. The VAX is in a proper machine room, fully airconditioned and it is also extremely visible being the first exhibit everyone will see as they walk through our lobby into the large elevator.



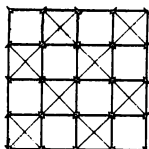
The  
Computer  
Museum

We have located a possible programmer but wish to build as much as possible on existing software and databases. The above scheme will only come to fruition if it can be achieved from a high level language program using FSS and or SOLID 3000. Our main contribution will come in ensuring that the human interface is straightforward and comprehensible by a non-technically minded visitor.

We are pleased that Adage is making a system available for our exhibit and that a maintenance commitment will also be made. I look forward to hearing from your field engineer and to establishing a timescale of events that will enable us to meet our November public opening. I feel sure that this will become one of the most popular and impressive exhibits at the Museum.

Yours sincerely

Dr Oliver Strimpel  
Curator



## ADAGE

- how far can we place from VAX.
- can we down-load in morning and leave running all day. Only Adage manipulation?



## ADAGE

Get cable, \$1/foot #8281

Then adjust gain + equalization controls on Adage 3000 or on the DA (\$600) to make up for the high frequency roll-off

- suggested by Dean Winkler.

- how far may we place control box?

## VAX 750

### ADAGE:

- need 1 UNIBUS parallel port
- only need to download in morning sending X, Y, Z points and a few commands. FORTRAN.

- would take a lot of memory at first to download - let us do this in morning.

- they use 10Meg, we have 2.

- will occupy 1 rack in room.

- need 20 Meg disk space.



ADAGE, INC.  
 One Fortune Drive  
 Billerica, MA 01821  
 (617) 667-7070  
 TWX 710-347-1594

FIELD SERVICE

REPORT NO. \_\_\_\_\_

SITE NAME <i>CHILDRENS MUSEUM</i>		EQUIP. TYPE <i>3000</i>	ORIG. H #	LABOR HOURS	PARTS USED Qty. - Part #/Descr. - LE #
DATE-(MO/DAY/YR)		TIME-(0000-2400)		ON-SITE REG. <i>4.5</i>	
REQUESTED	<i>10/18/84</i>			ON-SITE O.T.	
ARRIVAL	<i>10/18/84</i>	<i>1000</i>		TRAVEL <i>1</i>	
DEPARTURE	<i>10/18/84</i>	<i>1430</i>		BILLABLE MILEAGE	
SERVICE CATEGORY				CUSTOMER P.O. #	
STATUS ON DEPARTURE <i>RUNNING</i>				E.O.S. INSTALLED	BOARDS REPLACED - S/N - LE #
CSR SIGNATURE 		CUSTOMER SIGNATURE 			

**SUMMARY (SYMPTOM / ACTION FORMAT)**

SYMPTOM: INSTALLED SYSTEM ON 10/16/84 BUT SOFTWARE WAS NOT READY. CAME BACK ON 10/18/84. DATA TABLET AND MONITOR DID NOT WORK.

ACTION: RESEATED MPC BUT IT DID NOT HELP MOVED MPC TO ANOTHER SLOT AND MONITOR CAME UP. ONCE MONITOR CAME UP WAS ABLE TO GET DATA TABLET. SYSTEM PASSES FBI, ACCEPT, IXMTS. SYSTEM IS RUNNING

**ADAGE**

INTERACTIVE COMPUTER GRAPHICS

# MAINTENANCE INFORMATION

## ADAGE, INC.

One Fortune Drive  
Billerica, MA 01821  
(617) 667-7070  
TWX 710-347-1594

For service on your equipment, contact F. BONAVENTURA  
at X 458.

His immediate supervisor is TIM EDINGER,  
at X 456.

If neither can be reached for any reason, contact  
WARREN LEE at  
X 459.

Reference H# - \_\_\_\_\_



**INSTALLATION REPORT**

The below listed items have been inspected, installed and tested in accordance with standard Adage readiness tests. Adage certifies that the items fully comply with Adage test criteria and are ready for use. Exceptions, if any, are indicated below.

Customer The Computer Museum  
300 Congress Street  
Boston, MA 02211

Purchase Order No.  
 Adage Order No. 9242

Item	Quantity	Description	Serial Number/Remarks
1.	1	3006	<u>A957040</u>
2.	1	DR/GM256	
3.	1	CBS12/24	
4.	3	GM256	
6.	1	MPC/32	
7.	1	GPS	
8.	1	XPS34	
9.	1	OVLV	
10.	1	MON19/HS	
11.	1	RGBS Cable/50	
12.	1	DT11/M100	
13.	1	CRT1/M100	
14.	1	AIDS	
15.	1	SOLID/3000 64K	
16.		IK11B/50	

This section to be used for GSA customers only.

GSA 30 day test period started on 10/18/84 at 2:00 PM hours.

Customer Initials MA

Adage Rep Initials F.B

GSA 30 day test period completed on 11/17/84 at 2:00 PM hours. (Sign below)

ACKNOWLEDGED:

CUSTOMER:

ADAGE INC.

BY [Signature]

Title CS REP

Date 10/12/84

BY [Signature]

Title

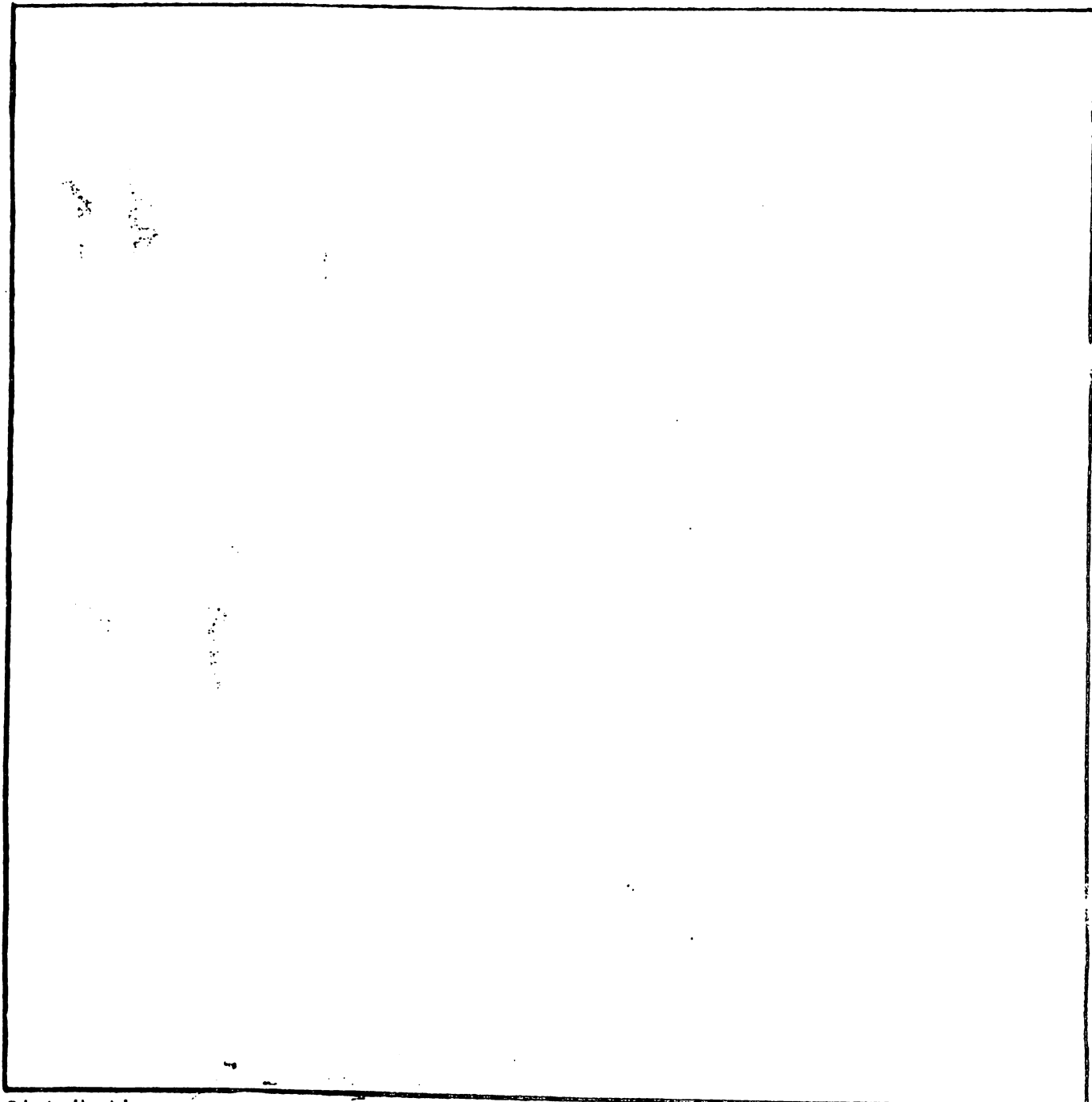
Date 11/12/84

H#  
Customer  
Date

9342  
Compuquip Machine  
9-21-21

C.S. PRE-SHIP ACCEPTANCE TEST - (DISCREPANCY/CHECK SHEET)

	<u>Initial/Date</u>	<u>Time Record</u>
1. Visual Inspection	A/3 9-21	
2. Special Considerations		
3. Documentation Package	A/3 9-21	
4. Mechanical Integrity	A/3 9-21	
5. Performance - ATPs	A/3 9-21	
6. SERIAL #	A9570-10	





RE: 30511.DATABASE ADAGE INC.  
TUE: SEP 11, 1984, 10:30 AM

KIT PICKING RF  
=====

RDS3007-203 REV: RDS3000/GM256 115V CR24  
WORK ORDER NUMBER: F0300125  
QUANTITY: 5  
MRP NEED DATE: 8/17/84  
PROMISED COMPLETION DATE: 7/27/84  
START DATE: 7/13/84

PART NUMBER	DESCRIPTION	RV	UN	SC
<i>RCS</i> 31-301-003-5	1000 11 F. C. ASSY-	H	FA	M1
31-301-012-00	<i>A857391</i> FBOR 54 BOARD - F.	H	EA	M1
31-301-005-00	<i>A856594</i> <i>A856469</i> BOARD-MEMORY-GM256 - <i>BC</i>	E	FA	M1
33-301-088-10	CABLE-24X72 CONDUCTOR	A	EG	R1
32-301-007-10	1000 11T COAR-PTT-R218	D	EA	M1
30-301-001-00	<i>A957061</i> B24 ASSY 115V, FCC	A	EA	M1

*9-17-84*  
*ADAGE*

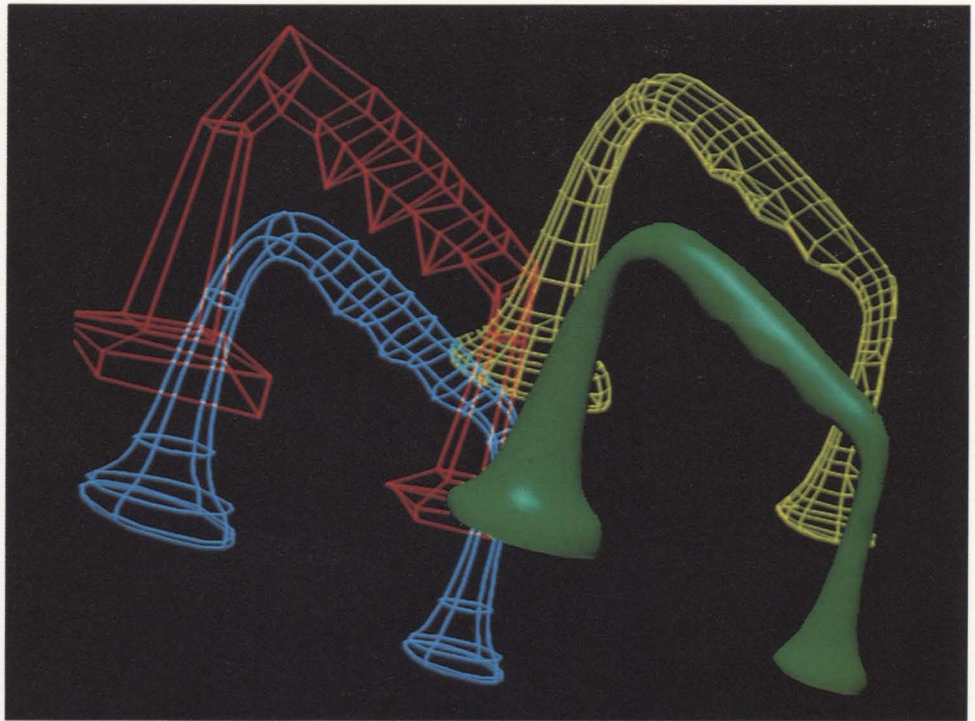




# Adage 3000 Solid Model Display Software

## ADAGE

- Curved surface and curved line display
- Bi-cubic B-spline surface patches
- Easy interface to modeling programs
- Hierarchical display list structure
- Object and polygon mesh data types
- Anti-aliased, hidden surface shaded images
- Transparent shaded surfaces



Bi-cubic surface control points, patches, polygon subdivision and shaded display: less than 3 seconds.

The Adage SOLID 3000 software package is a library of microcoded, FORTRAN-callable subroutines for the Adage 3000 Color Raster Display System. These subroutines allow the rapid display of 3-D solid modeling data, as well as interactive 3-D transformations of solid, shaded objects. The SOLID 3000 package is intended for software developers integrating the Adage 3000 into new or existing interactive CAD applications.

Dramatic performance gains in interaction and solid model display and manipulation are achieved by performing graphics processing locally. By handling all graphics display functions entirely within the Adage 3000, this system's powerful 32-bit, bit-slice processor frees the host CAD system to concentrate on the design process. The result is high-performance interactive solid modeling.

The Adage 3000 — with its multi-processor architecture, advanced hardware and modular design — is uniquely suited for solid modeling CAD/CAM display tasks that require

both high-speed graphics and imaging capabilities. In addition, high-performance Adage 3000 Systems are used in applications as varied as medical imaging, remote sensing, real-time 3-D flight simulation, and seismic data display and analysis.

Unique display functions provided in the SOLID 3000 package include:

### **Curved Surface And Curved Line Display Including Bi-Cubic B-Spline Surface Patches**

Hidden surface elimination and smooth shading of complex curved surfaces are carried out in just a few seconds, allowing truly interactive design for the first time.

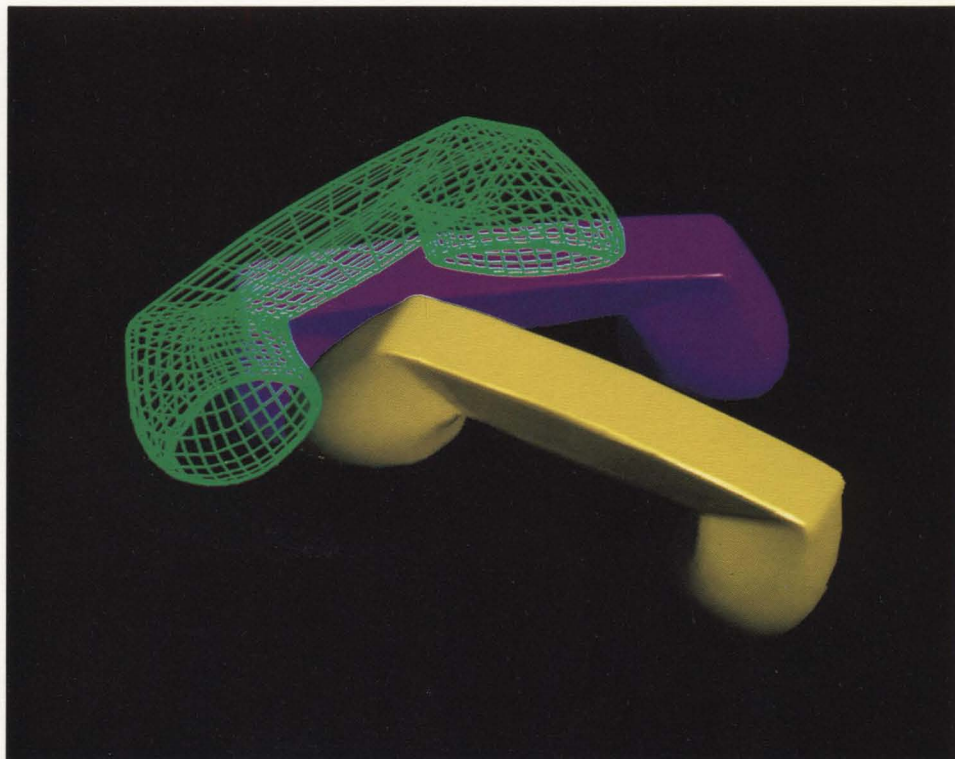
### **Easy Interface To Modeling Programs**

Curved surfaces and lines are concisely described to the Adage 3000 by just a few control points, and complete subdivision and rendering are performed locally. Different types of curves and surfaces are supported by simply loading information about the appropriate parametric basis functions.

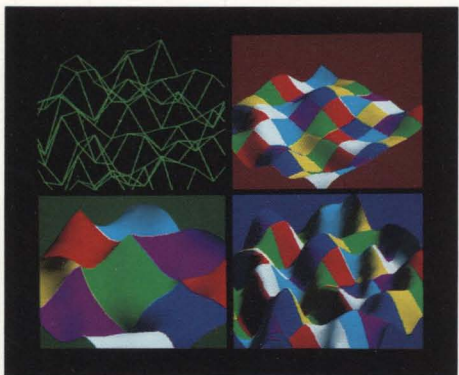
# Rapid Display and Interactive Manipulation



▲ Transparency for complex objects: less than 10 seconds.



▶ Anti-aliased isoparametric curves and B-spline surface: less than 15 seconds.



▲ B-spline, cardinal and Bezier patches: less than 15 seconds.

## Hierarchical Display List Structure

A powerful yet flexible display list structure supports nested transformations, instancing, picking and other advanced concepts needed for interactive design systems. Also included are contouring and sectioning functions for evaluation of complex intersecting surfaces.

## Object And Polygon Mesh Data Types

Fast vector and shaded, hidden surface display modes are provided. Shared vertex points are only loaded and transformed once, instead of for each occurrence in a polygon. This drastically cuts host computer loading and speeds user interaction by omitting any awkward reformatting of the CAD database required for other display systems.

## Positionable Colored Light Sources With Specular Reflection (Highlights)

Image realism is enhanced and more information about surface curvature and structure is provided. High-speed microcode performs all shading calculations locally without time-

consuming host computer computation of surface normals and vertex shade intensities.

## Anti-Aliased, Hidden-Surface Shaded Images

Objectionable "jaggies" are essentially eliminated, giving a more accurate rendering of the model. Local microcode provides extraordinarily fast display generation. Interactive operation with improved user acceptance is the result.

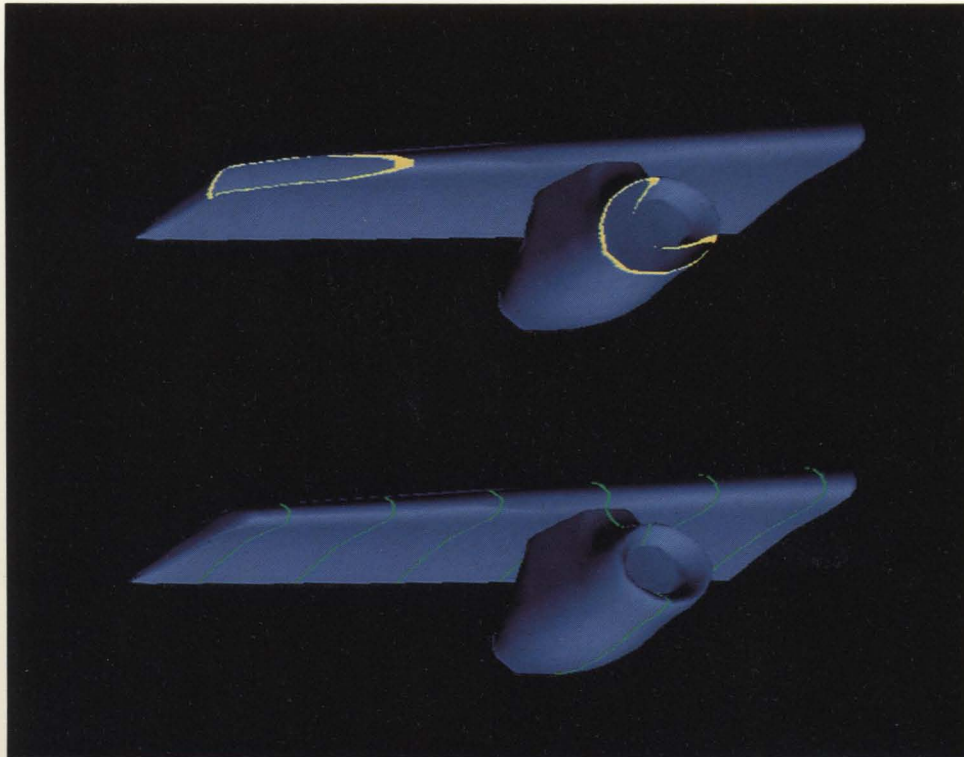
## Transparent Shaded Surfaces

SOLID 3000 provides a realistic transparency calculation with multiple layers and highlights, eliminating the annoying side effects of simpler "screen door" schemes. Complicated solid models can be presented by allowing the viewer to see through outer surfaces to inner parts. Fast, clear visualization of complex designs leads to increased CAD productivity.

## Advanced Display Techniques

In addition to true Phong shading with locally computed surface normals for accurate surface curvature display,

## of Three-Dimensional Solid Modeling Data



◀ B-spline surfaces with highlighted sectioning and contouring planes: less than 10 seconds.



▲ Local surface rendition from 3-D data points: less than 6 seconds.

SOLID 3000 provides two sophisticated texturing techniques. A colored picture or intensity array can be mapped onto a displayed surface to simulate different materials or lighting effects in just a few seconds. Simultaneously, a surface roughness pattern ("bump map") can be used in calculating the surface shading. Thus, very sophisticated images for visual design evaluation or product advertising can be speedily produced.

The SOLID 3000 FORTRAN subroutines are in addition to the standard Adage 3000 FORTRAN Support Subroutines display package. The standard FSS 3000 package provides such features as local rotation and perspective viewing, anti-aliased vectors, high-speed characters, and Z-buffer hidden surface display.

The SOLID 3000 package supports  $1024 \times 1024$  and  $512 \times 512$  screen resolutions, allowing, for example, a high-resolution, cost-effective, 64-color system to be used for high-quality displays (16 million simultaneous colors) at the lower resolution.

The SOLID 3000 FORTRAN subroutines are written in ANSI FORTRAN and are easy to implement on most computers. The package uses standard Adage 3000 drivers for popular minicomputers. The microcode routines are written in the high-level C language and may be modified or extended by using the ICROSS-3000 microcode compiler, which is available from Intermetrics, Inc.

# SPECIFICATIONS:

---

---

## SOLID 3000 FORTRAN Subroutines Summary

**NOTE:** SOLID-64K requires 16 bits/pixel image memory  
SOLID-16M requires 24 bits/pixel image memory

---

### Data Types

- Define a polygonal or curved surface with a list of vertices, and, optionally, lists of pointers, surface normals, and/or colors.
- Define a polygon or polyline with a list of vertices, and, optionally, lists of surface normals and/or colors.
- Define a string of text at a screen location.

### Display Attributes

- Enable shading or line drawing.
- Enable smooth shading or flat shading.
- Enable back-facing polygon cull.
- Define the default color of data.
- Enable Phong shading (interpolate surface normals and calculate light source intensity at each pixel) — SOLID-16M only — or Gouraud shading (calculate light source intensity at each vertex and interpolate color at each pixel).
- Enable anti-aliasing by calculating sub-pixel coverage — SOLID-16M only.
- Enable translucency as averaged color — SOLID-16M only — or as a "screen door" mask.
- Define the "screen door" translucency pixel mask.

### Light Source

- Define a light source with position, color, and ambient, diffuse, and specular components. (No specular component for SOLID-64K.)
  - Enable one, several or all light sources.
- 

### Viewing Attributes

- Define the current clipping window.
- Define the world to screen coordinate mapping.
- Define current transformation (including perspective).
- Enable sectioning of data by a plane on the Z axis.
- Enable contouring of displayed data with arbitrary 3-D data.

### Mapping (SOLID-16M Only)

- Enable parametric mapping.
- Enable texture mapping of image data onto 3-D surfaces.
- Enable 3-D surface normal perturbation by bump mapping.

### Curves/Surfaces

- Define curve/surface basis (such as B-spline, Bezier, Catmull-Rom).
  - Enable rational curves/surfaces.
  - Enable curve drawing or surface patch subdivision.
  - Define curve/surface end knot conditions.
  - Define curve/surface subdivision tolerance.
  - Enable curve/surface control vertex mesh drawing.
- 

## Worldwide Sales and Services

Adage Sales and Customer Service representatives are located throughout the U.S., Europe and Japan. For the location of the nearest Adage sales or service office, contact Adage at one of the offices listed below.

# ADAGE

---

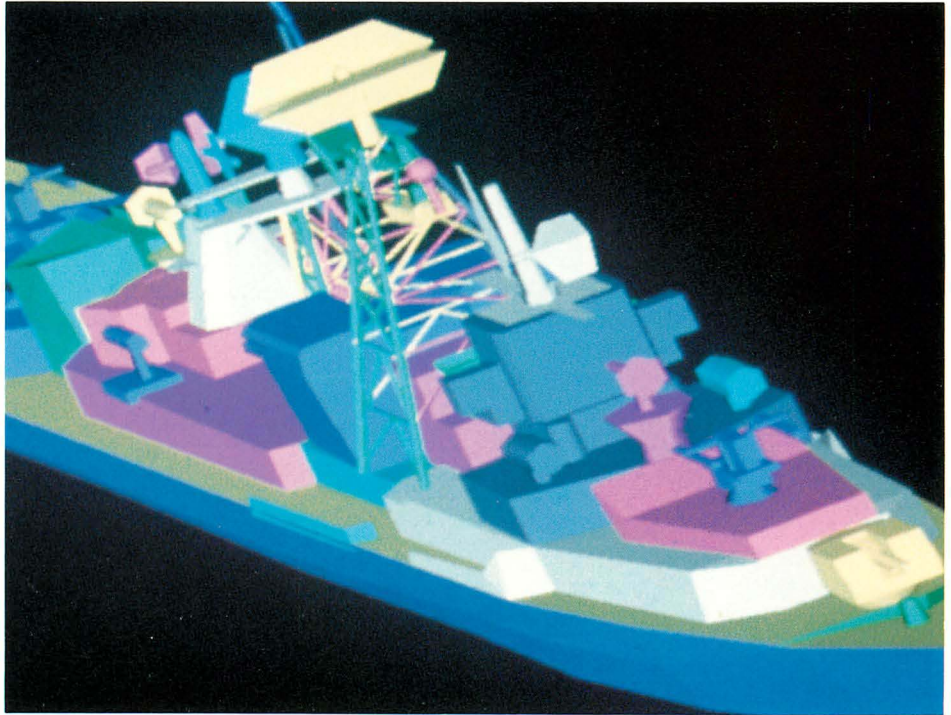
**Adage, Inc.**, One Fortune Drive, Billerica, Massachusetts 01821, (617)667-7070  
TWX 710-347-1594

**Europe: Adage GmbH**, Postfach 1161, Mainzer Str. 75, 6200 Wiesbaden,  
West Germany, Telephone 6121/70 00 34

# Adage 3000 FORTRAN Support Subroutines

## ADAGE

- 3-D polygon and vector display with hidden surface removal
- Real-time antialiased vectors
- Local transformation capability
- Display list driven graphics processor



Display of data sent from host—hidden surfaces locally removed. Data courtesy of NTEC.

The Adage FORTRAN Support Subroutines (FSS 3000) package features a library of high-level, FORTRAN-callable subroutines for use with the Adage 3000 Color Raster Display System. Designed to provide a straightforward and efficient interface between the Adage 3000 and device-independent application software packages, FSS 3000 offers a convenient tool for enhancing the creativity and productivity of professional application engineers. With FSS 3000, the user maintains access to the dynamic power and flexibility of the Adage 3000. The FSS 3000 package can reside in either the host computer or the workstation.

Local hidden surface removal is a key feature of the FSS 3000 package. The package includes local interactive 3-D perspective transformation and clipping of complex solid objects. Smooth-shaded hidden surface removal is provided for these objects.

Other advanced features, including real-time antialiased vector display and fast raster operations, are part of the comprehensive set of graphics display operations.

The FSS 3000 FORTRAN-callable subroutines interface with an interpreter, which runs on the Adage 3000 high-speed graphics generator (GPS). FSS routines build a display list in the host machine to draw primitives, such as rectangles, polygons, circles, and vectors. Other FSS routines then send the display list to the Adage 3000 System for interpretation and manipulation. The result is dynamic, interactive graphics programming at the FORTRAN level.

### CONTROL FUNCTIONS

FSS also contains a set of FORTRAN-callable routines to initialize or update components of the Adage 3000 System. Routines are available to:

- Set display resolution, pan, scroll, and zoom
- Write to the color look-up tables
- Set the look-up table input channel selector
- Set the XBS video crossbar switch
- Set the write masks and shade registers

### 2-D AND 3-D PRIMITIVES

2-D and 3-D primitives included with the package are: absolute and relative moves and vectors; polygons

---

---

(including non-convex polygons and polygons with holes); text strings; area-fill; circles; rectangles; and logical RASTER-OP functions. The text strings are displayed using characters from a standard FSS 8 x 8 character font or from user-defined character fonts.

#### **ATTRIBUTES**

Attributes such as color, line style, and resolution (1024x1024/512x512) are global in nature and are written to a specific area in scratch pad memory separate from the user's display list. This means, for example, that an attribute such as line style (normal or antialiased) can be set once and will apply to all subsequent vectors. By engaging these attributes, a user program may easily make use of the advanced capabilities of the Adage 3000 System.

Attributes include:

#### **GRAPHICS**

Line Type: Absolute or relative vectors  
Line Style: Normal or antialiased  
Screen Resolution: 1024x1024 or 512x512  
Hidden surface mode  
Polygon stipple mask  
Polygon-Fill Type: Hardware or software-fill  
Circle Type: Outline or fill  
Raster Operation Type: Move or bitwise Boolean operation  
Flood Read Mask: For control of area-fill

#### **Color**

Full color or pseudocolor  
Gamma correction factor for colormap load  
Polygon Shading: Flat or smooth (Gouraud)

#### **Character**

Foreground and background color, character spacing, transparent or opaque background, character orientation (rotation), x and y zoom

#### **FUNCTIONS**

##### **Transformation**

Object Space Transformation  
Clipping  
Perspective  
Stack Support or Transformation Hierarchy

##### **Display List**

Send List  
Append to List  
Update List

##### **Double Buffer**

Change Buffer  
Clear Buffer

#### **EXTENSIONS**

FSS 3000 may be extended to include user-defined functions.

#### **COMPUTER INDEPENDENCE**

FSS 3000 is written in ANSI FORTRAN and is easy to implement on most computers. All machine-dependent aspects of I/O and file handling are in a small number of isolated subroutines.

#### **DEVICE DRIVERS**

FSS 3000 uses standard Adage 3000 drivers for popular minicomputers.

---

#### **Worldwide Sales and Service**

Adage Sales and Customer Service representatives are located throughout the U.S., Europe, and Japan. For the location of the nearest Adage sales or service office, contact Adage at one of the offices listed below.

# **ADAGE**

---

**Adage, Inc.**, One Fortune Drive, Billerica, Massachusetts 01821 (617) 667-7070  
TWX 710-347-1594

**Europe: Adage GmbH**, Postfach 1161, Mainzer Str. 75, 6200 Wiesbaden,  
West Germany Telephone 6121/70 00 34 TELEX 4186007

1026 55670

# CADstation™ 2/50 System

## High-performance stand-alone raster design/drafting system for CADAM® users

- Uses CADRA™-I software to provide most of the functionality of the CADAM CAD-Only Interactive Module at a low cost per seat
- Supports a user interface similar to that of CADAM
- Requires virtually no retraining of CADAM operators
- Allows easy access to host-resident CADAM database
- Reduces connect time to the host computer while providing local, stand-alone capabilities
- Offers response times similar to that of typical CADAM mainframe systems

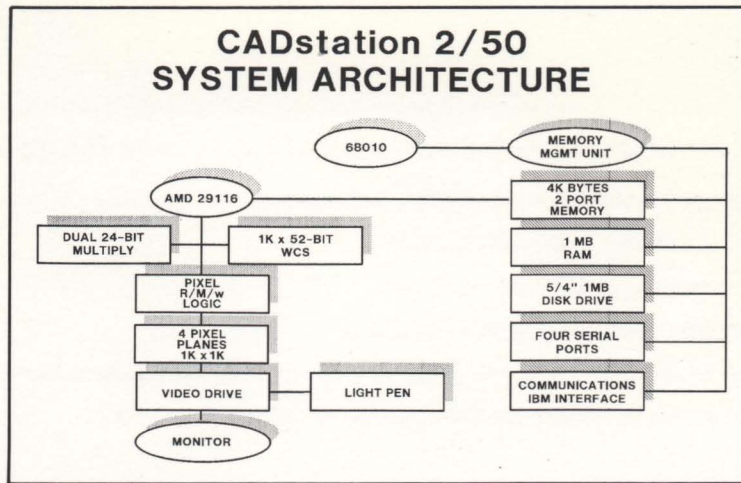
**ADAGE**

---

---







**Figure 1. Adage CADstation 2/50 Hardware Architecture**

The Adage CADstation 2/50 System is a stand-alone raster graphics system optimized for efficient and high-quality two-dimensional Computer-Aided Design and Drafting (CADD) drawings. Designed for high performance yet practically priced, the user-friendly CADstation 2/50 offers engineers, mechanical designers and draftsmen a desktop workstation that operates in essentially the same way as the CADAM system. CADstation 2/50 Systems offload the interactive, terminal-intensive portion of the design process from the host mainframe, allowing the host to concentrate on the more calculation-intensive analysis functions. The command languages and user interface of the CADstation 2/50 are so similar to the CADAM design package that most users require little or no retraining.

### Hardware:

The CADstation 2/50 System consists of a 19" monochrome raster graphics monitor and a stand-alone tower chassis, which houses the processing unit, display controller, disk drive and communications and I/O ports.

Interactive devices included with each system are a light pen, alphanumeric keyboard and 32 function keys. An optional data tablet with stylus is available for light pen emulation, and a cost-effective hardcopy device for obtaining screen copies from the graphics display is also optional. The graphics display monitor produces a bright, flicker-free display of high-resolution 1024 x 1024 60Hz non-interlaced images. Designed specifically for the office environment, the graphics monitor can be optionally mounted on an ergonomic tilt-swivel base for ease of viewing and use.

A powerful 32-bit microprocessor-based CPU with one Mbyte of local memory drives the system, while a one Mbyte, 5 1/4" floppy disk drive is used to load the CADRA-I software and to store and restore locally held drawings. The CADstation's bit-slice microprocessor-based geometry engine runs over 6.5 million instructions per second (mips) in order to perform the system's mathematical, geometric, and display functions. All calculations are done in double precision to maintain an accurate database. The CPU, local memory, geometry engine, and disk drive are housed in a floor-mounted tower chassis. The Adage CADstation 2/50 is designed to run in a standard office environment and has no special power requirements.

Figure 1 shows the hardware architecture of the Adage CADstation 2/50.

### Software:

The CADstation 2/50 System entirely offloads the host computer, communicating with the host only for file transfer of drawings, or while emulating an IBM 3278 Model 2 terminal.

CADRA-I, the workstation's design/drafting software, features state-of-the-art performance and functionality for design layouts, detailing and dimensioning. Since the software's input command structure nomenclature and method of interaction are very similar to that of CADAM, users already familiar with the CADAM package will have no difficulty adapting to the CADstation 2/50.

Operators can use the system to create original drawings or to call existing drawings from the CADAM database for annotation or reworking. All changes or additions to drawings are fully compatible with CADAM and can be easily refilled in the CADAM database. CADRA-I software includes a module, resident on the host computer, that permits this exchange of data. Figure 2 illustrates the interaction with the CADAM database.

The CADstation 2/50 includes enhancements that increase ease-of-use. Action keys located on the alphanumeric keyboard provide more efficient and dynamic windowing capabilities. Menu items are spelled out in full and an additional line of information for enhanced messages, prompts and status messages is also included.

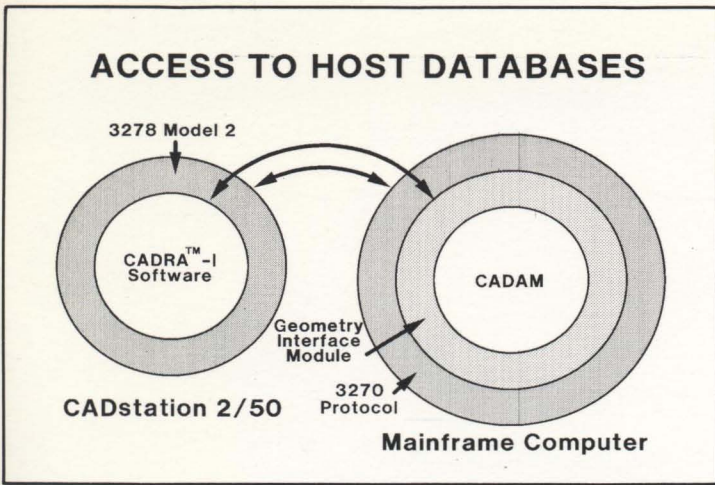


Figure 2. CADstation 2/50 Interaction with CADAM Database

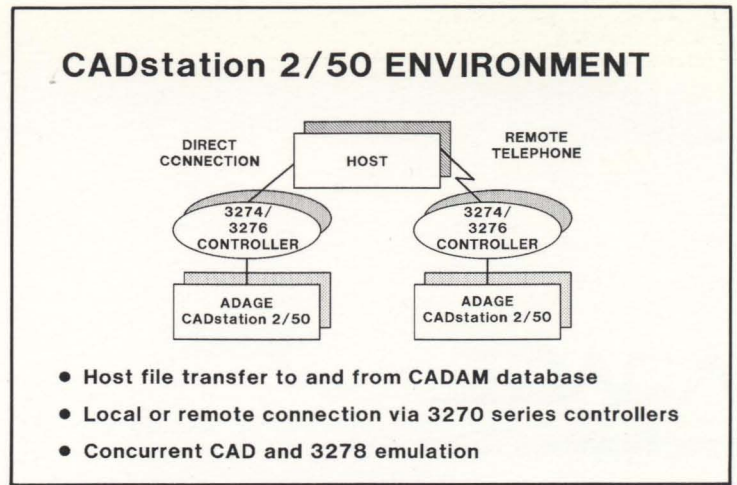


Figure 3. Typical CADstation 2/50 Site Configuration

### Stand-Alone Capabilities:

In addition to the ability to interact with the CADAM database, the CADstation 2/50 can be used for stand-alone operation. The system's local memory, storage and processing offer flexible off-line, self-contained operation, while providing response times similar to those expected by CADAM users. Affordable by most engineering, design, drafting or manufacturing departments, the system is easily cost-justified by considering not only the low initial cost, but also the ongoing advantages of greatly reduced host-connect time charges and no retraining costs.

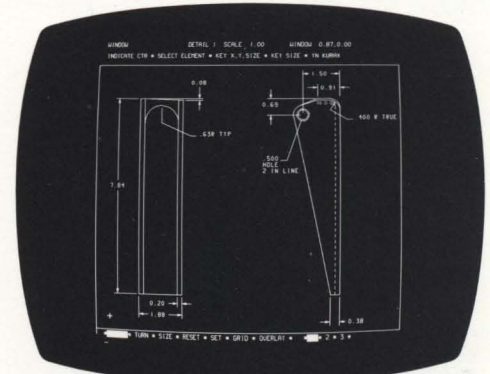
### Communications:

Although designed to operate in a stand-alone environment, the system uses the CADAM database resident on a host computer. The CADstation 2/50 can be connected to an IBM 3274 Control Unit, IBM 3276 Control Unit Display Station or equivalent, via an IBM Type A or equivalent coaxial cable and BNC connector.

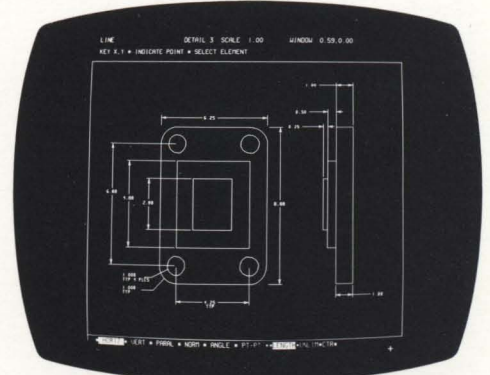
The system's screen display menu allows the user to select one of three operating environments: Local CAD, 3278 emulation mode, or concurrent CAD and 3278 modes. While in the Local CAD mode, the system is completely self-contained and interacts with the host only when transferring a drawing to or from the CADAM database.

In the 3278 mode, the system emulates an IBM 3278 Model-2 Terminal. Concurrent CAD and 3278 mode allows the user to do design/drafting while simultaneously viewing and accessing programs on the host in a 3278 session. The user can alternate between CAD and 3278 display screens. CAD mode file transfers to or from the host are not allowed during this concurrent mode.

A typical site configuration is presented in Figure 3.



Two views of a metal bracket created on a CADstation 2/50 System.



Menu and prompts of the CADstation 2/50 System are similar to CADAM.



## Specifications Summary

---

---

### Hardware:

---

**CPU:** 32-bit Motorola 68010, 10MHz clock rate

**Memory:** 1 megabyte

**Local Mass Storage:** 5¼" floppy disk, holds 1 megabyte, unformatted

**Geometry engine:** AMD 29116-based, bit-slice processor

#### Graphics Display Monitor:

**Type:** rectangular monochrome

**Technology:** raster scan, 60Hz, non-interlaced

**Size:** 19" (48.3 cm) diagonal

**Resolution:** 1024 x 1024 pixels x 4 bit-planes

**Graphics Area:** 11" x 11" (28 cm x 28cm)

**Menu/Status Text Area:** Similar to CADAM

#### Standard Peripheral Devices:

Alphanumeric Keyboard

Function Keyboard with 32 Keys

Light Pen

#### Communications:

Via IBM 3278 Model 2, input emulation in all operating modes.

File transfer times depend on communications rates permitted by the options selected on IBM 3274, IBM 3276 or equivalent.

**Line Picks:** Highlighted by increasing line intensity

### Software:

---

Design/drafting functionality similar to CADAM CAD-Only module.

IBM 3278 Model 2 terminal emulation software.

Enhanced windowing capabilities and menu prompting.

Host-resident software for CADstation 2/50 access to CADAM database via GIM (Geometry Interface Module).

Consistent response time similar to that of typical CADAM systems.

### Options:

---

#### Peripheral Devices:

Data Tablet with Stylus

Tilt and Swivel Monitor Base

Local Dot Matrix Printer

### Worldwide Sales and Service:

Adage Sales and Customer Service Representatives are located throughout the U.S., Europe and Japan. For the location of the nearest Adage sales or service office, contact Adage at one of the offices listed below.

**Adage, Inc.** One Fortune Drive,  
Billerica, Massachusetts 01821,  
U.S.A., (617) 667-7070,  
TWX 710-347-1594

**Europe: Adage GmbH,** Postfach  
1161, Mainzer Str. 75, 6200 Wiesbaden,  
West Germany, Telephone 6121/70 00 34  
TWX 4186007

All information subject to change without notice.

©1984 Adage, Inc. Printed in U.S.A. 98425M

# ADAGE ACS

## ADAGE CORE SYSTEM

Adage Core System (ACS) is a high-level, user-friendly and efficient software programming system used with Adage 4145 Work Stations. Modeled after the proposed ACM/SIGGRAPH Core standard, ACS includes an extensive library of graphics subroutines callable by FORTRAN application programs.

ACS was designed to give the applications programmer a standard interface to stroke graphics and to provide extensions to allow dynamics normally associated with high-performance vector refresh graphics. ACS has been structured to off-load the host by performing most functions in the terminal.

### **ACS Features**

---

ACS offers an extensive list of features for graphics application designers, including:

#### **2-D AND 3-D PRIMITIVES**

---

Absolute and Relative Moves, Draws, Markers, Polylines, Polymarkers, Circles, and Arcs.

#### **Character Attributes**

---

Size, Spacing, Italics, Character Path.

#### **Line Attributes**

---

Intensity, Linestyle.

#### **VIEWING OPERATIONS**

---

Window to Viewport Mapping; Full 3-D Viewing: Orthographic, Oblique, and Perspective Projection; Window Clipping; Depth Clipping.

#### **World Modeling System**

---

Ability to manipulate objects in their own coordinate system prior to viewing.

#### **DISPLAY LIST OPERATIONS**

---

##### **Dynamic Image Transformation Hierarchy**

Image transformation on both segment and primitive levels.

Ability to define relationships between applied image transformations (i.e., transformation compose).

Image transformation stack.

Dynamic hardware clipping.

##### **Display Subroutining**

---

Permits instancing operations.

##### **Retained Segments**

---

Allows partitioning of user display list.

Named segment attributes controlled include visibility, highlighting, pick sensitivity, pick priority, and image transformations.

#### **GRAPHICS INPUT FUNCTIONS**

---

The following logical device types are available: Button, Locator, Keyboard, Pick, Valuator, and Stroke. Multiple echo functions are supported for each logical device type to provide visual feedback for the operator. In addition, user control of input device value range for sampled devices is provided along with an event queue to simplify interaction of application programs with user input operations.

### **EASE OF DEBUGGING**

---

Built in error checking with user controllable error modes is included.

### **SUPPORTED OPTIONS**

---

The Adage 4145 Graphics Processor options supported are: Depth cueing, Local Refresh Buffer Memory up to 128K Bytes, Special Symbol Sets, and 2-D or 3-D Hardware and Identification Windows.

### **DEVICE DRIVERS**

---

Device drivers are available for the following systems: VAX/VMS, PDP-11/RX-11M, V77/VORTEX. Documentation is available for user development of drivers for non-supported host and operating systems.

### **Installation**

---

The ACS package consists of a FORTRAN subroutine source library and the ACS microcode for Adage 4145. The library is written in 1966 ANSI FORTRAN IV and has been designed to be as host independent as possible. A complete set of documentation is provided for customer installation. The distribution media is 1600 or 800 bpi ANSI formatted magnetic tape.

### **License**

---

Adage offers source code licenses for ACS and supported device drivers on per host computer basis.

### **Worldwide Sales and Service**

---

Adage Sales and Customer Service representatives are located throughout the U.S., Europe, and Japan. For the location of the nearest Adage sales or service office, contact Adage at one of the offices listed below.

# ADAGE

---

**Adage, Inc.**, One Fortune Drive, Billerica, Massachusetts 01821, (617) 667-7070  
TWX 710-347-1594

**Europe: Adage GmbH**, Gutenbergstrasse 14  
7012 Fellbach, West Germany  
Telephone 0711/512056



Linda J. Popky  
Senior Advertising / Sales Promotion Specialist

ADAGE, INC.  
ONE FORTUNE DRIVE / BILLERICA, MA 01821  
TELEPHONE (617) 667-7070

December 3, 1984

Mr. Jeff Dutton  
Computer Museum  
300 Congress Street  
Boston, MA 02108

Dear Jeff,

Enclosed are the black and white photographs you requested on Adage Vector Refresh and Raster Workstations. I have also included assorted product literature and background material on Adage, Inc.

Please let me know if I can provide any additional assistance.

Cordially,  
*Linda J. Popky*

Linda J. Popky  
Senior Advertising/Sales  
Promotion Specialist

LJP:cjd

cc: R.N. Spann  
L. Brentano  
D. Warren

# ADAGE 4250

## GRAPHICS WORK STATION

### **High-performance interactive graphics for mainframe users**

**Direct connection to mainframe channel of IBM, or IBM-compatible, computer**

**Executes 3250 graphics command set; offers extended graphics command set**

**Compatible with CADAM\* and CATIA\* software**

**Supports up to 16 high-performance, high-resolution work stations**

**Connection to microwave, telephone "T1," 56 Kbaud, or fiber optic links**

The Adage 4250 Work Station—a high-performance, high-resolution, vector refresh display—attaches directly to the mainframe channel of an IBM, or IBM-compatible, computer. The 4250 Work Station, which emulates an IBM 3250 Display Terminal by interpreting the graphics orders generated by software packages such as CADAM, provides the higher performance required by demanding CAD/CAM applications. A network of high-speed microprogrammed processors reduces channel-program execution time, handles interrupts quickly, and speeds up user interaction with complex images.

In addition to improved display capabilities and advanced ergonomics, Adage 4250 Work

Stations can be flexibly placed in relation to the mainframe. The 4250 can be located up to three miles (4,827m) from the mainframe channel via coaxial-cable pairs or remotely via microwave, Bell System "T1," fiber optic, or 56 Kbaud links. Full-duplex transmission rates of three Mbaud up to 1.5 miles (2,414m) or 1.5 Mbaud up to three miles (4,827m) are standard. A full-duplex transmission rate of 56 Kbaud is available.

Optional features that add to the 4250 Work Station's flexibility include: local zoom, hardware window, data tablet, and local hard copy.

### **4250 Hardware**

The 4250 Work Station consists of a channel unit, a graphics controller, and ergonomic display stations.

*The Channel Unit (CU/4201)* connects directly to the mainframe channel of an IBM, or IBM-compatible, computer and provides data transmission for up to 32 display stations on one IBM-channel connection. Four ports on the channel unit provide intelligent communications support, both local and remote, for graphics controllers.

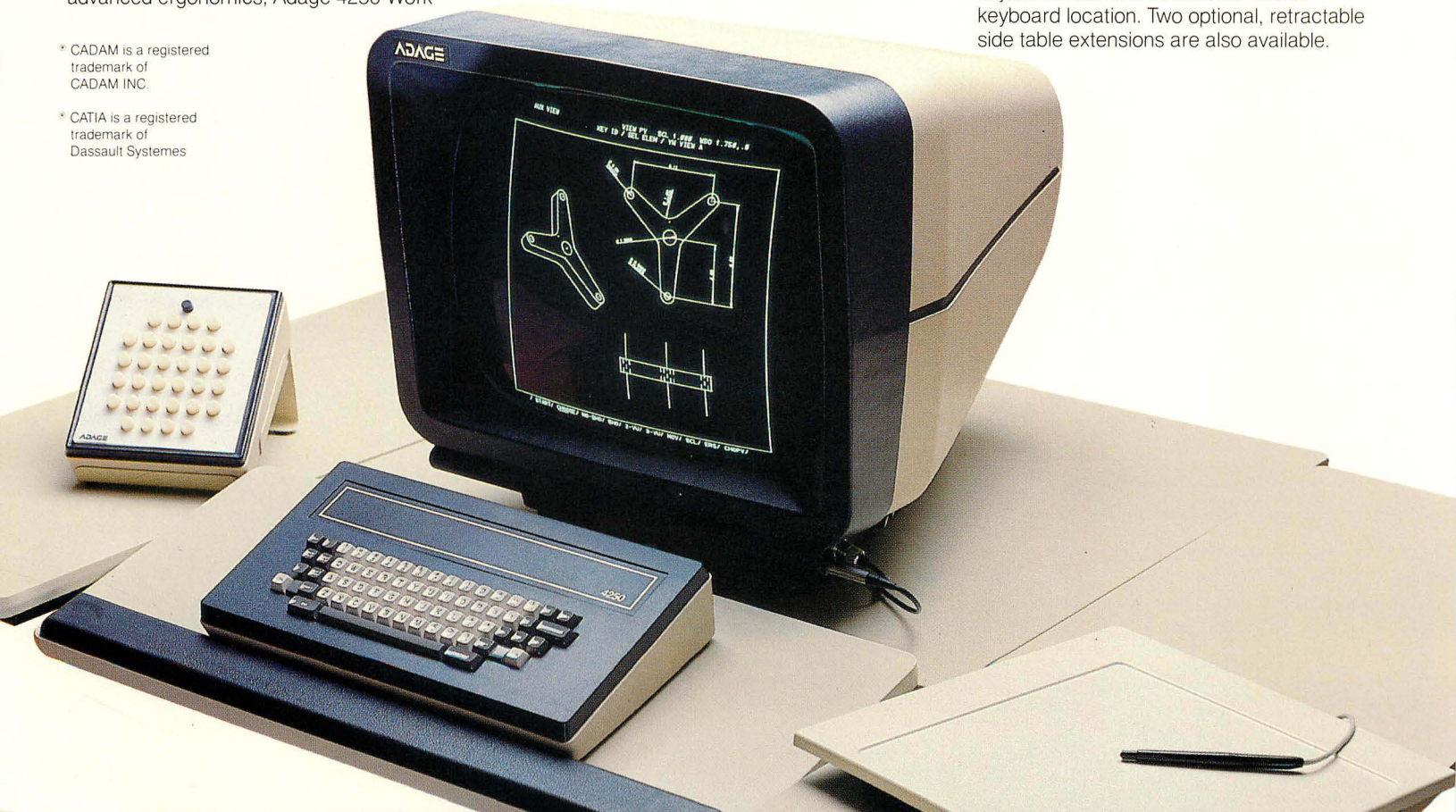
*Each Graphics Controller (GS/4250)* provides communication, processing, and memory for up to four displays. The Graphics Controller incorporates two microprogrammed processors. One processor controls interrupts and communications with the channel unit. The second processor, called a Digital Graphics Controller, contains firmware that: 1) interprets the IBM 3250 graphic-order set, 2) fetches and interprets data from the refresh buffer, 3) performs all image manipulation and 4) handles all interactive peripheral devices.

The graphics controller also contains a Refresh Buffer Memory and High-Speed Stroke Generator. The memory stores host-generated images and system parameters. Sufficient size allows increased off-loading of the host computer and significant local interaction at the display stations. The stroke generator converts digital data to analog signals to drive the displays. Interfacing for interactive peripheral devices is also located in the graphics controller.

*Four Ergonomic Display Stations (DS/4250E)* can be added to a GS/4250 Graphics Controller. The display station has been ergonomically designed to offer the user a flexible work environment and reduce operator fatigue. The tabletop for the ergonomic display station includes an adjustable surface section for flexible keyboard location. Two optional, retractable side table extensions are also available.

\* CADAM is a registered trademark of CADAM INC.

\* CATIA is a registered trademark of Dassault Systemes



# ADAGE 4250

Each display station includes a Remote Console Interface, a Graphics Display Monitor, tabletop and standard interactive devices which include a Light Pen, Alphanumeric Keyboard and Programmable Function Keys. A Digital Data Tablet, Alphanumeric Function Keyboard and Graphics Hard Copy Unit are optional. Displays can be separated by up to 190 feet (58 meters).

*The Graphics Display Monitor (GDM)* includes a bright, vector refresh, 21-inch rectangular CRT. The high-resolution monitor features a new improved phosphor composition and a high-contrast implosion panel that increase the amount of displayable flicker-free data and reduce operator fatigue.

## Worldwide Sales and Service

Adage Sales and Customer Service representatives are located throughout the U.S., Europe, and Japan. For the location of the nearest Adage sales or service office, contact Adage at one of the offices listed below.



**Adage, Inc.**, One Fortune Drive, Billerica, Massachusetts 01821, (617) 667-7070  
TWX 710-347-1594

**Europe: Adage GmbH**, Mainzer Str. 75, 6200 Wiesbaden, West Germany  
Telephone 6121/70 00 34

All information subject to change without notice.

© 1982 Adage, Inc. Printed in U.S.A. 38410M

## SPECIFICATIONS SUMMARY

### CU/4201 Channel Unit

**Input:** *standard IBM selector, or block multiplexer channel*

**Input Control:** *microprogrammed processor with local buffer memory that recognizes 16 device addresses*

**Output:** *customer-supplied coaxial-cable pairs*

**Output Control:** *four microprogrammed processors, capable of supporting a total of 32 displays and their associated graphics controllers*

**Data-Transfer Rates:** *3 Mbaud up to 1.5 mi. (2,414m); 1.5 Mbaud up to 3 mi. (4,827m)*

**Coaxial-Cable Connection Distance:** *up to 3 mi. (4,827m)*

**Transmit/Receive Mode:** *full duplex*

**Special Feature:** *self-contained readiness test*

### GS/4250 Graphics Controller

#### DISPLAY CONTROLLER

##### Digital Graphics Controller

**Graphic Orders:** *IBM 3250, plus extensions*

**Microinstruction-Word Length:** *56 bits*

**Data-Word Length:** *16 bits*

**Instruction-Cycle Time:** *200ns*

**Arithmetic Logic Unit (Multiplier-Adder):** *400ns for a 16 × 16-bit multiply*

**Control-Store Memory:** *4K ROM*

**Scratch-Pad Memory:** *1K × 16-bit words*

**Number of Displays Controlled:** *up to 4 displays, plus all peripheral devices on each display*

#### High-Speed Stroke Generator

**Drawing Method:** *stroke*

**Coordinate Resolution:** *13 bits over a 48" (122cm) display space (0.006" [0.15mm])*

**Intensity Levels:** *16 from visual cutoff to maximum brightness*

#### VECTOR GENERATOR

**Display Space:** *12" × 12" (30.5cm × 30.5cm)*

**Vector-Drawing Rate:** *750,000 in./sec. (19,050m/sec.)*

**Vector-Move Rate:** *1,500,000 in./sec. (38,100m/sec.)*

**Vector Line Textures:** *solid, dashed, dotted, and end-point dot or dot-dash*

#### SYMBOL GENERATOR

**Character Set:** *95 ASCII, plus 27 Adage-defined engineering symbols.*

**Average Drawing Time:** *less than 5μs*

**Character Sizes:** *240 programmable sizes from 0.08" to 1.3" (0.20cm to 3.3cm) high*

**Character-String Orientations:** *128 angles and 4 reflections*

### DS/4250E Ergonomic Display Station

#### DISPLAY MONITOR

**Type:** *rectangular monochrome*

**Size:** *21" (53.3cm) diagonal*

**Precision Area:** *10" × 10" (25.4cm × 25.4cm)*

**Usable Area:** *13" × 18" (33cm × 45.7cm)*

**Line Width:** *0.015" (0.38mm) typical; 0.20" (0.50mm) maximum*

**Phosphor:** *P40*

#### PERIPHERAL DEVICES

Alphanumeric Keyboard

Light Pen

32 Lighted Programmable Function Keys

#### Options

#### GRAPHICS PROCESSOR

**Refresh Buffer Memory Expansions:** *expand the local 64K-byte Refresh Buffer Memory up to 128K bytes*

**Local Zoom:** *maximum 4:1, capable of pan and scroll in a 96" × 96" virtual display space*

Hardware Window

#### PERIPHERAL DEVICES

Digital Data Tablet

Alphanumeric Function Keyboard (includes numeric keypad and Zoom keys)

Graphics Hard Copy Interface

**Local Graphics Hard Copy Unit:** *locally produces high-resolution, electrostatic paper copy of the displayed image without host interaction*

#### COMMUNICATIONS

**T1 Adapter:** *interfaces the Channel Unit and the Graphics Controller to a Bell T1, 1.544-Mbit/sec. specification link for microwave or fiber optic communication*

**56 Kbaud Adapter:** *interfaces the Channel Unit and Graphics Controller to the Bell System's 56 Kbaud Digital Data System (DDS) link*

102655670

# ADAGE 4370

## GRAPHICS WORK STATION

**Three-dimensional, high-performance graphics for mainframe users**

**Full three-dimensional, high-resolution displays**

**Direct connection to mainframe channel of IBM, or IBM-compatible, computer**

**Compatible with NCAD™ software**

**Maximizes off-loading of host computer**

**Connection to microwave, telephone "T1," 56 Kbaud, or fiber optic links**

The Adage 4370 Work Station is a high-performance, high-resolution, full three-dimensional vector refresh display. Designed to attach directly to the mainframe channel of IBM, or IBM-compatible, computers, the 4370 permits the local display, modification, and manipulation of complex, highly structured images. Working with software packages such as Northrop's three-dimensional NCAD System or CADAM®, the 4370 simplifies the most demanding design challenges. Several firmware options allow the user to exploit fully the 4370's advanced capabilities.

A network of high-speed microprocessors reduces channel-program execution time, handles interrupts quickly, and speeds up user interaction with complex images.

In addition to improved display capabilities and advanced ergonomics, Adage 4370 Work

Stations can be flexibly placed in relation to the mainframe. The 4370 can be located up to three miles (4,827m) from the mainframe channel via coaxial-cable pairs or remotely via microwave, Bell System "T1," fiber optic, or 56 Kbaud links. Maximum range for full-duplex transmission rates is three Mbaud up to 1.5 miles (2,414m) or 1.5 Mbaud up to three miles (4,827m). A full-duplex transmission rate of 56 Kbaud is also available.

Optional features that add to the 4370 Work Station's flexibility include: local zoom, hardware window, data tablet, variable control dials, joystick, and local hard copy.

### **4370 Hardware**

The 4370 Work Station consists of a channel unit, a graphics controller, and ergonomic display stations.

**The Channel Unit (CU/4201)** connects directly to the mainframe channel of an IBM, or IBM-compatible, computer and provides data transmission for up to 32 display stations on one IBM-channel connection. Four ports on the channel unit provide intelligent communications support, both local and remote, for graphics controllers.

**Each Graphics Controller (GS/4370)** provides communication, processing, and memory for up to four displays. The Graphics Controller incorporates two microprogrammed

processors. One processor controls interrupts and communications with the channel unit. The second processor, called a Digital Graphics Controller, contains three-dimensional and optional two-dimensional firmware that: 1) fetches and interprets data from the refresh buffer, 2) performs all image manipulation and 3) handles all interactive peripheral devices.

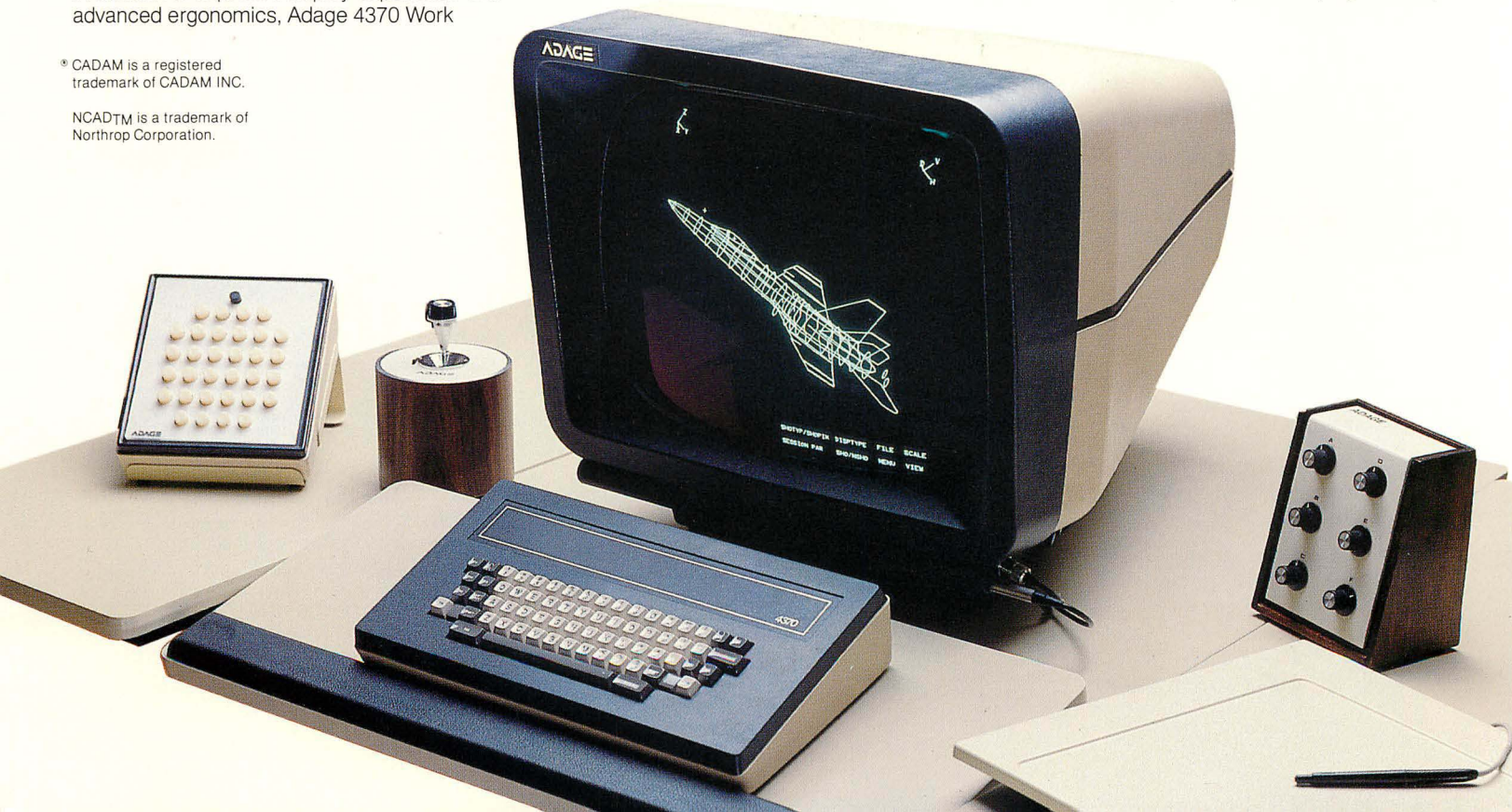
The graphics controller also contains a Refresh Buffer Memory and High-Speed Stroke Generator. The memory stores host-generated images and system parameters. Sufficient size allows increased off-loading of the host computer and significant local interaction at the display stations. The stroke generator converts digital data to analog signals to drive the displays. Interfacing for interactive peripheral devices is also located in the graphics controller.

**Four Ergonomic Display Stations (DS/4370E)** can be added to a GS/4370 Graphics Controller. The display station has been ergonomically designed to offer the user a flexible work environment and reduce operator fatigue. The tabletop for the ergonomic display station includes an adjustable surface section for flexible keyboard location. Two optional, retractable side table extensions are also available.

Each display station includes a Remote Console Interface, a Graphics Display Monitor,

\* CADAM is a registered trademark of CADAM INC.

NCAD™ is a trademark of Northrop Corporation.





# ADAGE 4370

tabletop and standard interactive devices which include a Light Pen, Alphanumeric Keyboard and Programmable Function Keys. A Digital Data Tablet, Joystick, Variable Control Dials and Graphics Hard Copy Unit are optional. Displays can be separated by up to 190 feet (58 meters).

**The Graphics Display Monitor (GDM)** includes a bright, vector refresh, 21-inch rectangular CRT. The high-resolution monitor features a new improved phosphor composition and a high-contrast implosion panel that increase the amount of displayable flicker-free data and reduce operator fatigue.

## 4370 Firmware

Adage 4370 firmware implements a comprehensive set of graphics commands that permit the local display, modification, and manipulation of complex, highly structured images. The command sets available give the user the ability to perform two-dimensional or full three-dimensional rotation, translation, post-translation displacement, and scaling of displayed objects.

## 4370 Software

GPL (Graphics Programming Language) is a high-level, high-performance language designed to optimize the power and flexibility of the Adage 4370 Graphics Work Station, while providing programming simplicity.

GPOTS (Graphics Peripheral Object Time System) is a set of FORTRAN-callable sub-routines and functions that provides the following capabilities: display-hardware control, dynamic graphics-element construction, interrupt processing, and application program-GPL image communication.

Both software packages, which require qualified IBM operating systems, are available as 4370 Support Software Modules.

## Worldwide Sales and Service

Adage Sales and Customer Service representatives are located throughout the U.S., Europe, and Japan. For the location of the nearest Adage sales or service office, contact Adage at one of the offices listed below.



**Adage, Inc.**, One Fortune Drive, Billerica, Massachusetts 01821, (617) 667-7070  
TWX 710-347-1594

**Europe: Adage GmbH**, Mainzer Str. 75,  
6200 Wiesbaden, West Germany  
Telephone 6121/70 00 34

All information subject to change without notice.

© 1982 Adage, Inc. Printed in U.S.A. 38410M

## SPECIFICATIONS SUMMARY

### CU/4201 Channel Unit

**Input:** standard IBM selector, or block multiplexer channel

**Input Control:** microprogrammed processor with local buffer memory that recognizes 16 device addresses

**Output:** customer-supplied coaxial-cable pairs

**Output Control:** four microprogrammed processors, capable of supporting a total of 32 displays and their associated graphics controllers

**Data-Transfer Rates:** 3 Mbaud up to 1.5 mi. (2,414m); 1.5 Mbaud up to 3 mi. (4,827m)

**Coaxial-Cable Connection Distance:** up to 3 mi. (4,827m)

**Transmit/Receive Mode:** full duplex

**Special Feature:** self-contained readiness test

### GS/4370 Graphics Controller

#### DISPLAY CONTROLLER

**Data I/O:** microprogrammed-processor controlled; full-duplex communications up to 3 Mbaud

**Local Refresh Buffer Memory:** 32K bytes, expandable to 128K bytes

#### Digital Graphics Controller

**Microinstruction-Word Length:** 56 bits

**Data-Word Length:** 16 bits

**Instruction-Cycle Time:** 200ns

**Arithmetic Logic Unit (Multiplier-Adder):** 400ns for a 16 × 16-bit multiply

**Control-Store Memory:** 4K RAM

**Scratch-Pad Memory:** 1K × 16-bit words

**Number of Displays Controlled:** up to 4 displays, plus all peripheral devices on each display

#### High-Speed Stroke Generator

**Drawing Method:** stroke

**Coordinate Resolution:** 13 bits over a 48" (122cm) display space (0.006" [0.15mm])

**Intensity Levels:** 64 from visual cutoff to maximum brightness

#### VECTOR GENERATOR

**Virtual Display Space:** 96" × 96" × 96" (243.8 cm × 243.8cm × 243.8cm)

**Vector-Drawing Rate:** 750,000 in./sec. (19,050m/sec.)

**Vector-Move Rate:** 1,500,000 in./sec. (38,100m/sec.)

**Vector Line Textures:** solid, dashed, dotted, and end-point dot or dot-dash

#### SYMBOL GENERATOR

**Character Set:** 95 ASCII, plus 27 Adage-defined engineering symbols

**Average Drawing Time:** less than 5μs

**Character Sizes:** 240 programmable sizes from 0.08" to 1.3" (0.20cm to 3.3cm)

**Symbol Reflections:** 8

**Other:** italics

### DS/4370E Ergonomic Display Station

#### DISPLAY MONITOR

**Type:** rectangular monochrome

**Size:** 21" (53.3cm) diagonal

**Precision Area:** 10" × 10" (25.4cm × 25.4cm)

**Usable Area:** 13" × 18" (33cm × 45.7cm)

**Line Width:** 0.015" (0.38mm) typical; 0.20" (0.50mm) maximum

**Phosphor:** P40

#### PERIPHERAL DEVICES

Alphanumeric Keyboard

Light Pen

32 Lighted Programmable Function Keys

#### Options

#### GRAPHICS PROCESSOR

Depth Cueing

Circle/Arc Generator

Local Refresh Buffer Memory

Expansion up to 128K Bytes

Special Symbol Sets

Local Zoom: increases transformation display space to 512' × 512' (156.1m × 156.1m)

2-D or 3-D Hardware Window

#### FIRMWARE

3-D General Purpose

3-D Optimized for use with NCAD

2-D 3250/4250 Graphics Order Set

#### PERIPHERAL DEVICES

Digital Data Tablet

Trackball

Joystick

Variable Control Dials: up to 18 dials

Graphics Hard Copy Interface

Local Graphics Hard Copy Unit: locally produces high-resolution, electrostatic paper copy of the displayed image without host interaction

Firmware Development Console

#### COMMUNICATIONS

**T1 Adapter:** interfaces the Channel Unit and the Graphics Controller to a Bell T1, 1.544-Mbit/sec. specification link for microwave or fiber optic communication

**56 Kbaud Adapter:** interfaces the Channel Unit and Graphics Controller to the Bell System's 56 Kbaud Digital Data System (DDS) link

# ADAGE 4100

## GRAPHICS WORK STATION

### High-performance interactive graphics for minicomputer users

---

#### Direct minicomputer connection

---

#### Maximizes off-loading of host computer

---

#### 2-D and full 3-D models

---

#### High-performance, high-resolution displays

---

#### Local hard copy capability

---

The Adage 4100 Work Station—a high-performance, high-resolution, vector refresh display—is designed specifically for direct connection to most popular minicomputers. Each 4100 Work Station includes a high-speed, microprogrammed processor that off-loads many time-consuming tasks from the host computer, thus improving overall system performance. A wide variety of peripheral devices and enhancement options, including local hard copy, assure maximum flexibility and ease-of-use. Interfaces are available to connect 4100 Work Stations to most popular minicomputers. Typical high-resolution and fast-interaction applications for the 4100 Work Station include computer-aided design and manufacturing (CAD/CAM), simulation, command and control, finite element modeling, and the analysis of engineering and seismic data.

### 4100 Hardware

The Adage 4100 Series includes one 2-D model (the 4115) and two 3-D models (the 4135 and 4145). Models 4115 and 4135 contain firmware in ROM control-store memory. Model 4145 contains a 4K-RAM control store that allows users to develop individual microcode applications. Together with firmware, each model contains a high-speed processor

dedicated to performing graphics operations, processing user inputs, and communicating with the host computer.

A 4100 cluster can include up to four fully interactive ergonomic display stations connected to a Graphics Controller. The Graphics Controller is comprised of a Host Computer Interface, a Refresh Buffer Memory, a Digital Graphics Controller and a High-Speed Stroke Generator. The four Display Stations each consist of a Remote Console Interface, Graphics Display Monitor, and tabletop. Display Stations receive all graphics commands and display-image information from the Graphics Controller.

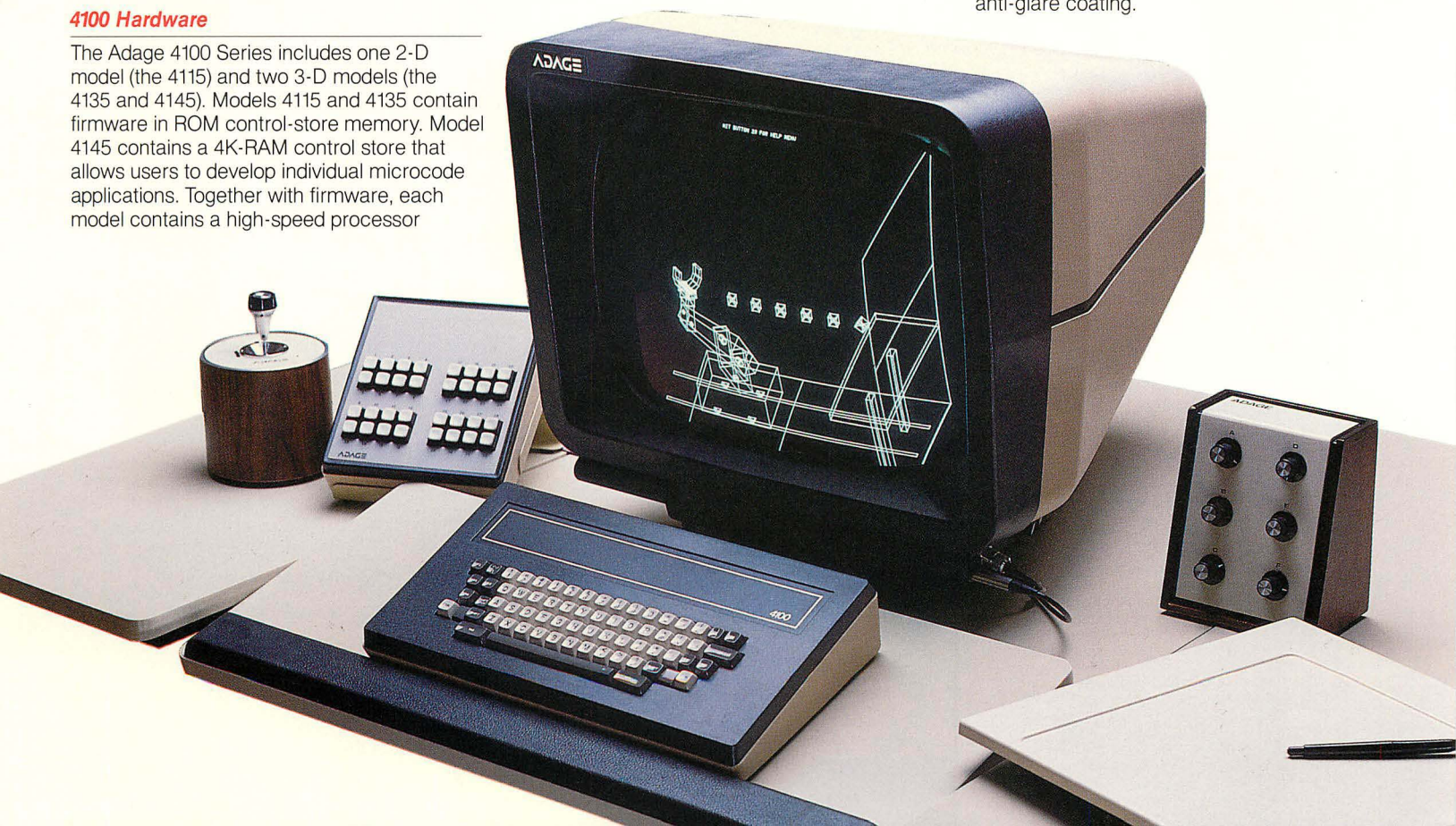
**Host Computer Interface:** Communicates image data and commands between the host and the Digital Graphics Controller. This 16-bit parallel interface provides high-speed data transfer to a wide variety of hosts. A bi-directional data link to the Refresh Buffer Memory rapidly down-loads image data files. The host initializes the system and processes interrupts via this link.

**Refresh Buffer Memory:** Stores host-generated images and system parameters. Buffer size allows increased off-loading of the host computer and significant local interaction at the display stations.

**Digital Graphics Controller:** Implements the complete graphics command set stored in ROM or 4K RAM. This microprogrammed processor fetches and executes each 56-bit microinstruction in 200 nanoseconds. Its Arithmetic Logic Unit further off-loads the host by performing the multiplications and additions to data files required for such coordinate transformations as scaling, translating, and rotating. Maintenance Control Logic permits manual control of the 4100 Work Station to simplify diagnostics and testing.

**High-Speed Stroke Generator:** Converts complex, digital vector and symbol data taken from the Digital Graphics Controller to analog signals and transmits them to the display monitors to generate images. The generator displays more than 20,000 short vectors or more than 22,000 inches of long vectors "flicker-free." A string of 100 average ASCII characters can be displayed in less than 500 microseconds.

**Graphics Display Monitors:** Provide high-resolution, high-density images. Each 21" rectangular, monochromatic cathode-ray tube (CRT) is mounted on a large, ergonomically designed work station. Optional monitors include a 21" rectangular, four-color, beam-penetration CRT and a 23" round, flat-faced, monochromatic CRT. All CRTs feature an anti-glare coating.



# ADAGE 4100

**Remote Console Interface:** Connects the Digital Graphics Controller to the interactive peripheral devices. Located at each work station, this interface transmits digital data over a single, 16-bit, bi-directional data bus. Input from analog devices must be processed through an analog-to-digital converter before transmission.

## 4100 Firmware/Software

The 4100 Work Stations include the firmware and software required for operation with the host computer. Functions provided by the Digital Graphics Controller's firmware include interpreting and processing graphics commands, executing image-manipulation routines, and handling peripheral devices. Host-computer software functions that control displays, process interrupts, perform attention handling and diagnostics, and generate calibration and maintenance images are available for most minicomputers. The Adage Graphics Programming Language is a FORTRAN-based, image-generation language.

## Worldwide Sales and Service

Adage Sales and Customer Service representatives are located throughout the U.S., Europe, and Japan. For the location of the nearest Adage sales or service office, contact Adage at one of the offices listed below.

# ADAGE

**Adage, Inc.**, One Fortune Drive, Billerica, Massachusetts 01821, (617) 667-7070  
TWX 710-347-1594

**Europe: Adage GmbH**, Mainzer Str. 75, 6200 Wiesbaden, West Germany  
Telephone 6121/70 00 34

All information subject to change without notice.

© 1982 Adage, Inc. Printed in U.S.A. 38410M

## SPECIFICATIONS SUMMARY

### Digital Graphics Controller

Microinstruction-Word Length: 56 bits

Data-Word Length: 16 bits

Instruction-Cycle Time: 200ns

Arithmetic Logic Unit (Multiplier-Adder):  
400ns for a 16 × 16-bit multiply

Control-Store Memory: 4145, 4K RAM; 4115  
and 4135, up to 4K ROM

Scratch-Pad Memory: 1K × 16-bit words

Number of Displays Controlled: up to  
4 displays, plus all peripheral devices on  
each display

Image Dimensions: 2-D and 3-D

### High-Speed Stroke Generator

Drawing Method: stroke

Coordinate Resolution: 13 bits over a 48"  
(122cm) display space (0.006" [0.15mm])

Intensity Levels: 64 from visual cutoff to  
maximum brightness

### VECTOR GENERATOR

Display Space: 48" × 48"  
(121.9cm × 121.9cm) square on  
the 4115 model;

### Graphics Display Monitors

	Standard Rectangular B&W	Optional Rectangular Color	Optional Round B&W
Size:	21" diagonal (53.3cm)	21" diagonal (53.3cm)	23" diameter (58.4cm)
Precision Area:	10" × 10" (25.4cm × 25.4cm)	10" × 10" (25.4cm × 25.4cm)	16" diameter (40.6cm)
Usable Area:	13" × 18" (33cm × 45.7cm)	13" × 18" (33cm × 45.7cm)	19.25" diameter (48.9cm)
Line Width:	0.015" typ. (0.38mm) 0.020" max. (0.50mm)	Same as B&W	Same as B&W
High-Resolution Option:	0.010" typ. (0.25mm) 0.015" max. (0.38mm)	N/A	—
Phosphor:	P40	4-color beam-penetration	P40

### Options

#### GRAPHICS PROCESSOR

Depth Cueing  
Circle/Arc Generators  
Raster Segment Generator  
Local Refresh Buffer Memory  
Expansion up to 128K Bytes  
Special Symbol Sets  
Zoom (Factor of 128:1)  
Hardware Divide/Shift  
2-D or 3-D Hardware and  
Identification Windows

48" × 48" × 48"  
(121.9cm × 121.9cm × 121.9cm) cube on  
models 4135 and 4145

Transformation Display Space: 96" × 96"  
(243.8cm × 243.8cm) square on the 4115  
model; 96" × 96" × 96"  
(243.8cm × 243.8cm × 243.8cm) cube on  
models 4135 and 4145

Vector-Drawing Rate: 750,000 in./sec.  
(19,050m/sec.)

Vector-Move Rate: 1,500,000 in./sec.  
(38,100m/sec.)

Vector Line Textures: solid, dashed, dotted,  
and either end-point dot or optional dot-dash

#### SYMBOL GENERATOR

Character Set: 95 ASCII, plus 27 Adage-  
defined symbols

Average Drawing Time: less than 5μs

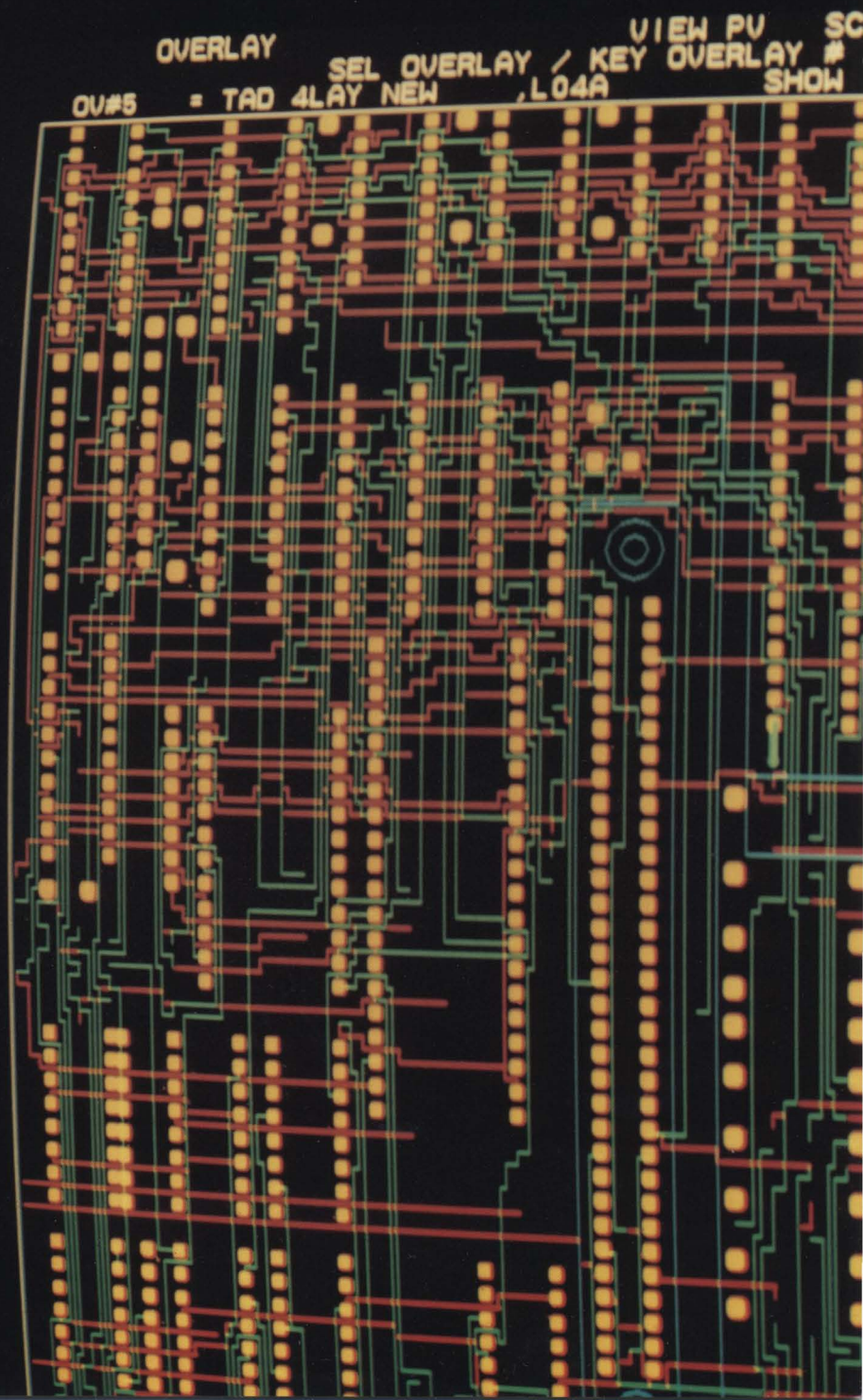
Character Sizes: 240 programmable sizes  
from 0.08" to 1.3" (0.20cm to 3.3cm)

Other: random positioning within 0.006"  
(0.15mm); 8 symbol reflections; italics

#### PERIPHERAL DEVICES

Alphanumeric Keyboard  
Digital Data Tablet  
Trackball  
32 Lighted Programmable  
Function Switches  
Joystick  
Variable Control Dials  
Light Pen  
Analog-to-Digital Converter  
Graphics Hard Copy Interface  
Local, Graphics Hard Copy Unit  
Firmware Development Console  
(Model 4145 Only)  
Extension Console Top

# 4250 Raster Workstations For IBM and IBM-Compatible Environments



ADAGE

---

---

### **Raster graphics from the pioneer in vector refresh technology**

The Adage Raster Workstation—a highly versatile and economical way to meet your interactive graphics requirements—connects directly to the mainframe channel of your IBM, or IBM-compatible, computer. It provides fully integrated computer-aided engineering capabilities for today's efficiency-conscious business environment. As many as 256 colors or shades of gray can be displayed simultaneously without compromising user response time or image clarity.

Principal components of the Adage 4250 Raster Workstation include a Channel Unit (CU/4201), which interfaces to the host computer; a Raster Graphics Controller (GRC/4250); and either a Color Raster Display Station (DC/4250), or a Monochrome Raster Display Station (DM/4250) with gray-scale capability.

### **Local processing power, faster response time**

With its extremely fast pixel writing speed of 50 nanoseconds, or less, the Raster Graphics Controller provides processing power for as many as four displays, allowing the user to form local display clusters. Its multiple high-speed microprocessors, which incorporate an Adage-proprietary bit/slice design, are dedicated to performing graphics operations, processing user inputs, and communicating with the host computer. A "pipeline" technique for data translation allows the

controller's components to function simultaneously, providing extremely fast user response time. The Adage 4250's local processing power off-loads many time-consuming tasks from the host computer, increasing user productivity, system interactivity and mainframe efficiency.

### **High-resolution, rapid image updates**

The Adage 4250 Raster's display is an ideal graphics tool for the design professional. Its 60Hz, non-interlaced refresh rate provides bright, flicker-free presentations that are virtually unaffected by ambient lighting conditions. With 1280 x 1024 addressable points on a 19" screen, images are sharp and precise, without jagged edges.

A double-buffered display memory effectively uncouples image update and refresh functions, assuring rapid modification of even the most complex images. The Remote Console Interface (RCI) links the Digital Graphics Controller (DGC), a microprogrammed processor, and peripheral devices, giving each display station maximum independence for rapid user interaction.

### **Special functions for greater operational flexibility**

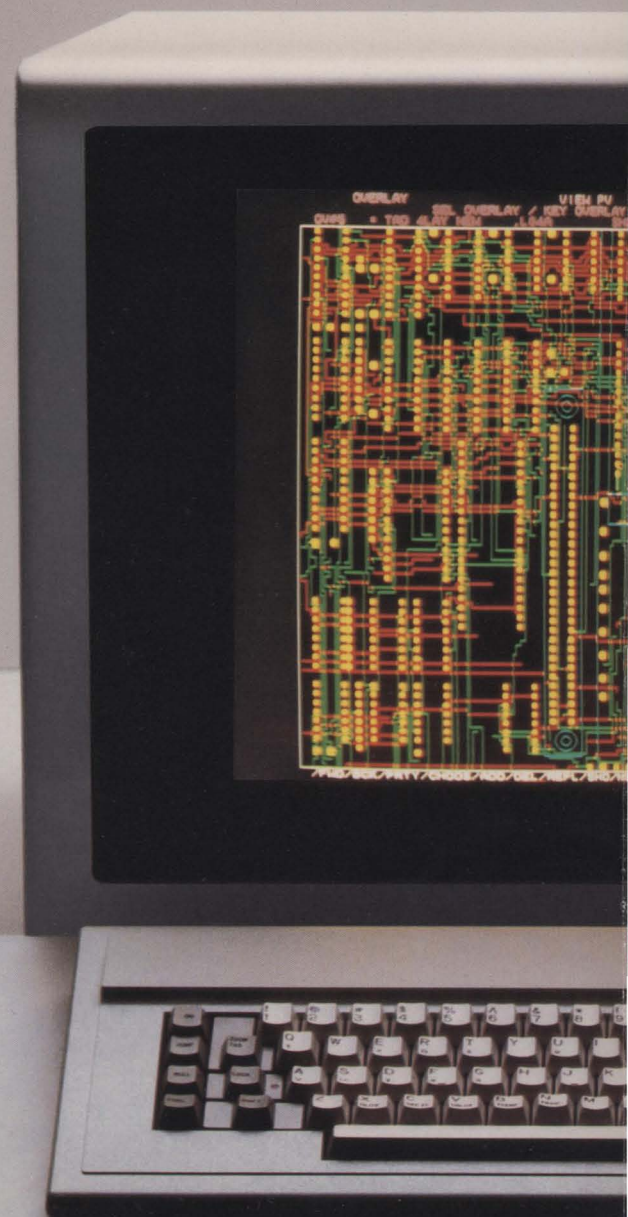
Other advanced functions available with Adage 4250 Raster Workstations include: simultaneous, high-speed vector-to-raster conversion and memory refresh; comprehensive polygon area fill; 2D/3D coordinate

# **High-Performance Workstations For IBM and IBM-Compat**

**Compatible with  
Adage vector refresh  
workstations**

**Supports CADAM®, Interactive  
Prance CADAM (IPC®), CATIA®,  
CAEDS™, and CBDS2 software**

**Remote connection to  
microwave, telephone "T1,"  
56 Kbaud, fiber optic,  
CCITT V.35, or satellite links**



# Interactive

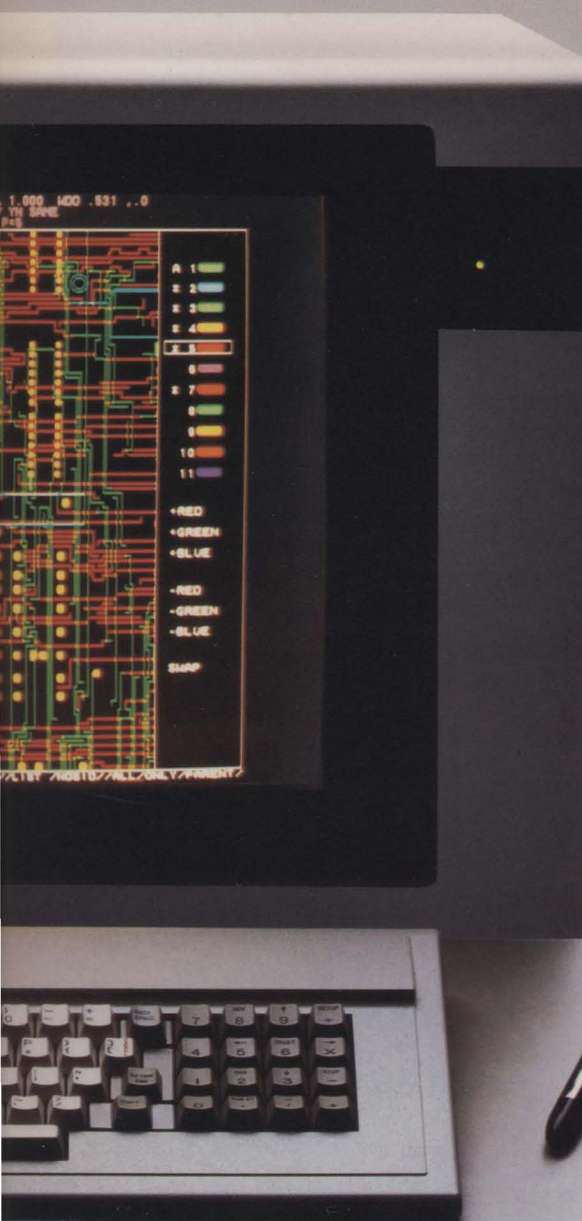
## Compatible Computers

**Simultaneous display  
of up to 256 colors or  
shades of gray**

**1280 x 1024 high-resolution  
display capability**

**< 50 nanosecond  
per pixel writing speed**

**Expandable  
to 32 workstations**



transformation and clipping; segment definition and highlighting; local pan and zoom; interaction with light pen and data tablet.

### Peripheral devices

Peripheral devices that help make the user's work easier and faster include a light pen, a low-profile alphanumeric keyboard and 32 programmable function keys, and a data tablet with stylus or cursor that facilitates light pen emulation and digitizing.

### A new dimension in configuration flexibility

Adage 4250 Raster Workstations are designed to give users more flexibility than ever before in configuring their graphics display network. The latest in Adage's line of IBM-compatible products, the 4250 Raster Workstation can run both color and monochrome raster displays off the same channel unit with existing cabling, even in the same local cluster off the same graphics controller. Adage raster displays can also be incorporated in the same network with existing 4250 and 4370 two-dimensional and three-dimensional vector refresh displays. Up to four raster or vector displays may be connected to each graphics controller, giving a maximum of 32 display stations per channel unit.

Even greater configuration flexibility is possible in the location of Adage workstation clusters. While channel length restrictions require the channel unit to be located near the host, the associated graphics controllers may be distributed locally to a distance of three miles by means of user-supplied coaxial cable pairs. Remote distribution over greater distances can be accomplished via microwave, Bell System "T1," fiber optic, Bell Digital Data System (DDS) 56 Kbaud, CCITT V.35, or satellite data links. Any combination of these linkages can operate from a single channel unit, provided that no more than two graphics controllers utilize Bell DDS 56 Kbaud and/or CCITT V.35 links.

### Data transfer rates are as follows:

Media	Data Transfer Rate
Coaxial Cable Pairs	Up to 3.0 Mbaud/second
Microwave	1.544 Mbaud/second
Bell System "T1"	1.544 Mbaud/second
Fiber Optic	1.544 Mbaud/second
Bell DDS 56 Kbaud	56 Kbaud/second
CCITT V.35	Network-dependent
Satellite	Network-dependent

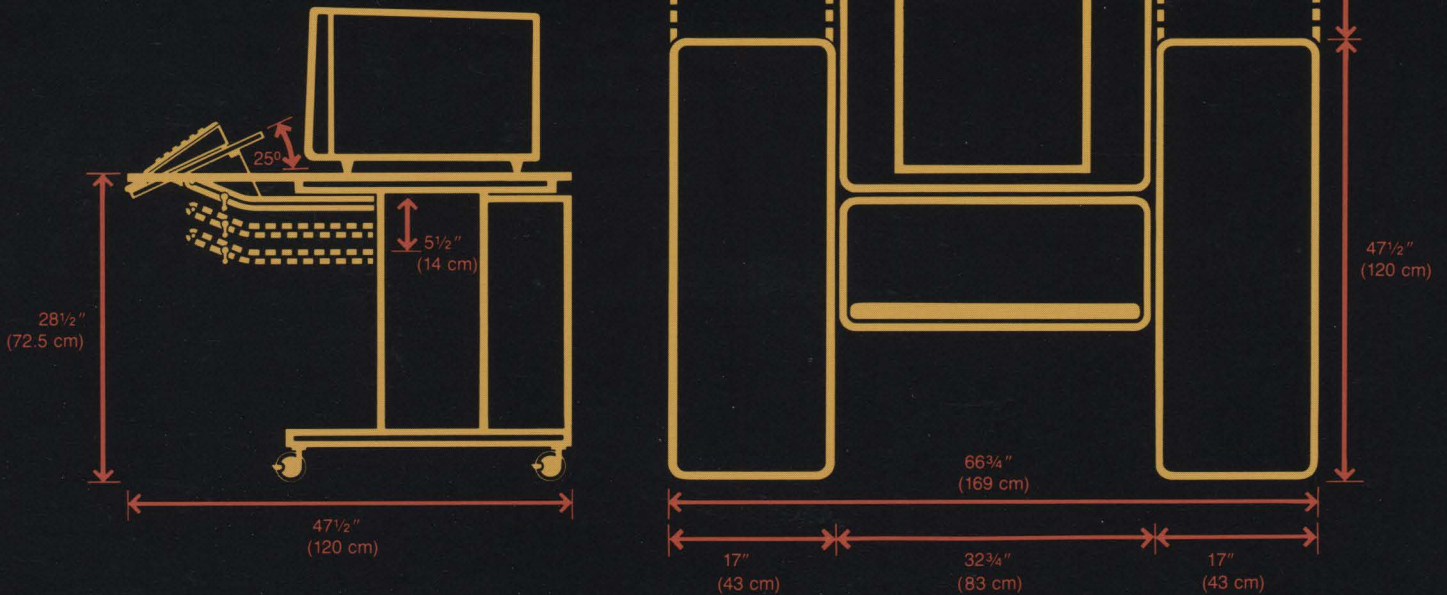
Individual display stations can be distributed up to 100 feet (30.48m) from their associated graphics controllers. Adage 4250 Raster Workstations can be added to established Adage installations with little or no modification of existing facilities.

© CADAM and IPC are registered trademarks of CADAM INC.

© CATIA is a registered trademark of Dassault Systemes.

™CAEDS is a trademark of SDRC.

**Workstation design includes adjustable table sections for operator comfort and convenience.**



### **Ergonomic design features that increase operator productivity**

The Adage 4250 Raster Workstation incorporates the latest ergonomic design features, minimizing user fatigue and increasing productivity. The bright 19" CRT provides maximum definition and contrast under ambient lighting conditions. An adjustable table section permits the keyboard to be moved up, down, or tilted for operator comfort and convenience. Optional side table extensions provide a larger work area for optimal positioning of peripheral devices.

### **More power for tough design applications**

The Adage 4250 Raster Workstation is one of the most powerful and flexible interactive graphics display tools available today. Whatever your application—from printed circuit board design to mechanical layout, facilities planning, or finite element highlighting—it will benefit from features that let you vary shades to differentiate parts or layers, pan or zoom to isolate important details, draw lines of variable thickness, or fill in an area for better definition.

Emulating an IBM 3250 Graphics Display Terminal and the CAD functions of the IBM 5080 Graphics System, the Adage 4250 Raster Workstation interprets graphics orders generated by some of the most popular applications software available today, including: CADAM, Interactive Prance CADAM, CATIA, CAEDS and CBDS2.

### **Worldwide sales and service**

Adage has one of the largest sales and service organizations in the graphics industry. Our extensive network of national and international sales, customer service and training facilities assures you of our total commitment to your investment in Adage products. For the location of the nearest Adage sales or service office, write or call us today.

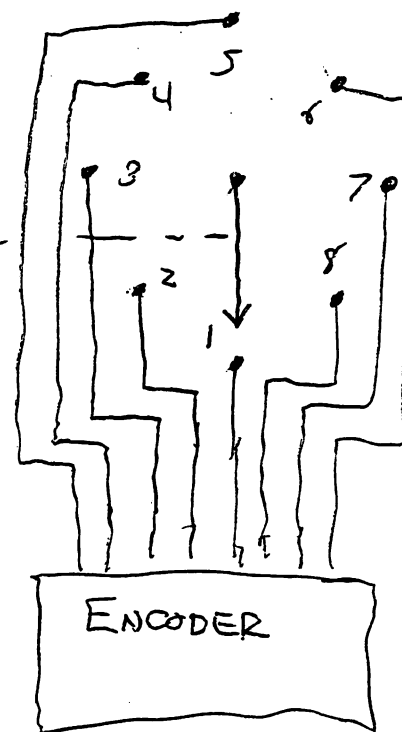
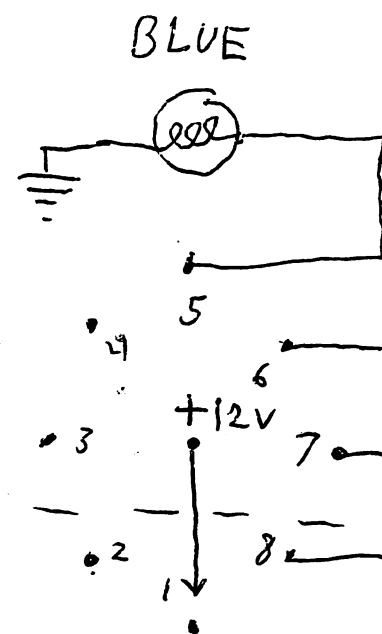
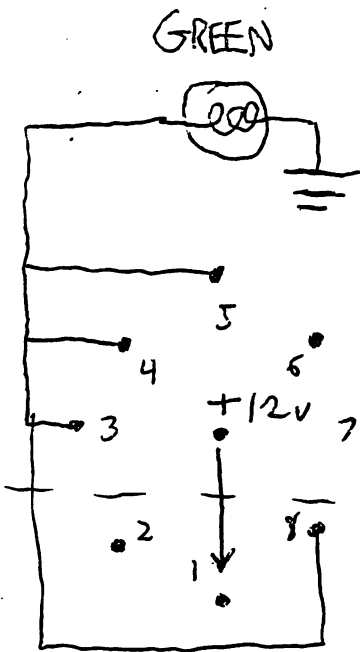
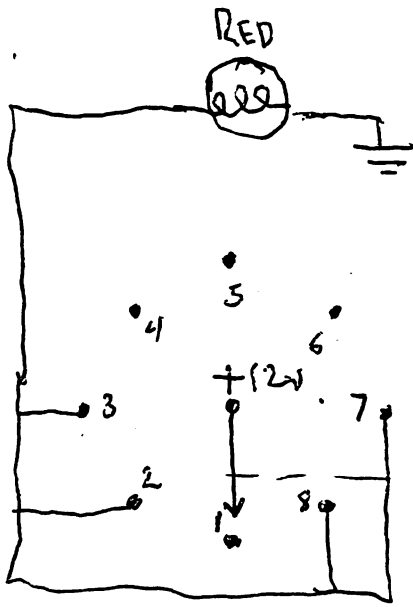
# ADAGE

**Adage, Inc.**, One Fortune Drive, Billerica, Massachusetts 01821, (617) 667-7070  
TWX 710-347-1594

**Europe: Adage GmbH**, Postfach 1161, Mainzer Str. 75, 6200 Wiesbaden, West Germany  
Telephone 6121/70 00 34

All information subject to change without notice.  
©1984 Adage, Inc., Printed in U.S.A. 6845M

102655670



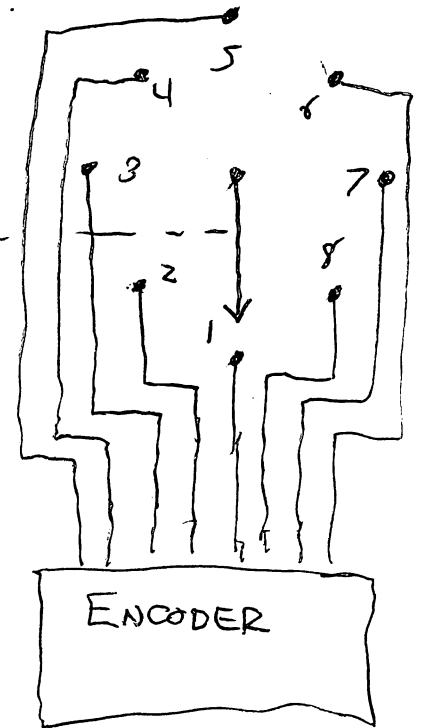
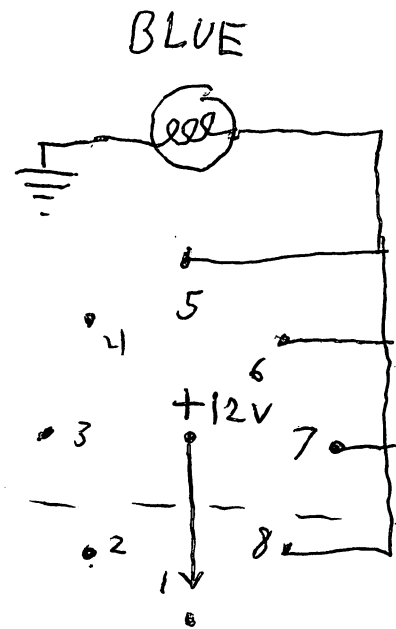
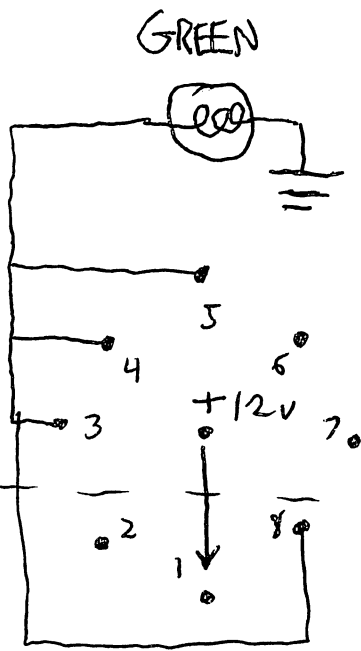
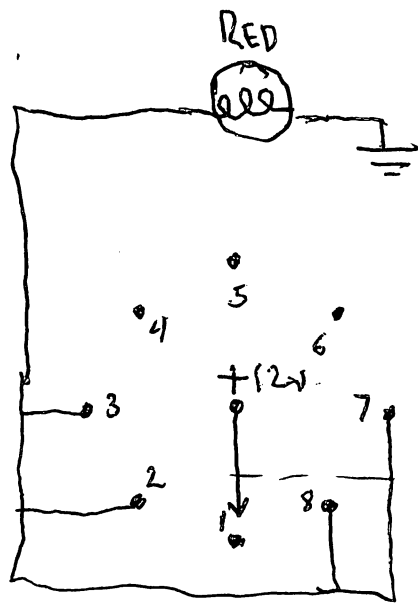
- 1 Black
- 2 Red
- 3 Yellow
- 4 Green
- 5 Cyan
- 6 Blue
- 7 Mayesta
- 8 White

ADAGE DEMO CONTROLS

WIRING DIAGRAM FOR EACH OF 3 BANKS OF LIGHTS; 4-Pole, 8-Position N/S switch used for each.

G.H. DUTTON  
Dec. 1984 TCM





- 1 Black
- 2 Red
- 3 Yellow
- 4 Green
- 5 Cyan
- 6 Blue
- 7 Magenta
- 8 White

ADAGE DEMO CONTROLS

WIRING DIAGRAM FOR EACH OF 3 BANKS OF LIGHTS; 4-Pole, 8-Position N/S switch used for each.

G.H. DUTTON  
Dec. 1984 TCM

Call McVickar re: Fiberoptics at Sikorsky

# THE ADAGE GRAPHICS USER UPDATE

---

---

A publication of AGUS, the  
Adage Graphics User's Society

SUMMER 1984

# TABLE OF CONTENTS

VOL. I - ISSUE 2

## THE EDITOR'S PAGE

NCGA Followup  
AGUS Meeting & Agenda.....3

## THE ADAGE FORUM

New Products & Services.....5

## NEW & NEWSWORTHY

Survey Responses.....6

## USER'S NOTES A

MA 1024 Addressing Protocol  
on the Adage 3000-by Daniel H. Miller,  
Intermetrics.....9

## USER'S NOTES B

Halftoning Algorithms Implemented on  
the Ikonas - by Linda A. Adlum, U.S.  
Naval Academy.....12

MEMBERSHIP UPDATE.....15

LETTERS TO THE EDITOR..... 2

CLASSIFIED..... 2

# LETTERS TO THE EDITOR

---

---

Please submit any letters to:

Keith L. McVicar  
Sikorsky Aircraft, Dept. CAD/M  
Stratford, CT 06602

# CLASSIFIED

---

---

This section will be made available for anyone wishing to utilize it. Please submit classified information to the editor.

---

The Adage Graphics User Update is an independent publication for AGUS (Adage Graphics User Society) and does not necessarily constitute the views, opinions or positions of Adage, Inc.

# THE EDITOR'S PAGE

---

The Adage Graphics User-Update — Summer 1984

Keith L. McVicar  
 Sikorsky Aircraft, Dept. CAD/M  
 Stratford, CT 06602  
 203-386-5196

Welcome to the second issue of the AGUS newsletter. There has been a lot of interest in AGUS generated since the first issue, and I hope it will continue on the upswing.

A new user mailing list is being developed by Adage, so that we may reach out to some of you who are new to AGUS. If you know of anyone who wishes to be on the mailing list, please notify Adage, Inc., (they are maintaining the user list). There is a reply form at the end of this newsletter.

```

SSSSSSS IIIIIII GGGGGGG GGGGGGG RRRRRRRR AAAAAAA PPPPPPPP H H
S I G G R R A A P P H H
S I G G R R A A P P H H
SSSSSS I G G RRRRRRR AAAAAAAAA PPPPPPPP HHHHHHHH
S I G GGGGG G GGGGG R R A A P H H
S I G G G G R R A A P H H
SSSSSSS IIIIIII GGGGGGG GGGGGGG R R A A P H H
    
```

```

'' 8888888 44
' 8 8 4 4
8 8 44 4
8888888 444444444
8 8 4
8 8 4
8888888 4
    
```

Our annual AGUS meeting is scheduled for SIGGRAPH '84 this year, which is being held July 23-27 in Minneapolis. There is free shuttle service from the Minneapolis Auditoriam to the hotel. Please contact me as soon as possible if you are interested in giving a presentation.

The following Agenda is planned:

CONTINUED

---

---

AGUS MEETING AT SIGGRAPH '84

DATE: Tuesday, July 24, 1984  
TIME: 3:30 P.M. - 8:00 P.M.  
PLACE: AMFAC Hotel  
30 South 7th Street  
Minneapolis, MN 55402  
Meeting Rooms 1 & 2  
(A light buffet will be served)

AGENDA

3:00 P.M.- Business/Organizational Meeting  
5:00 P.M. Report-User Network

5:00 P.M.- Speaker: Nick England, Adage  
5:30 P.M. Topic: Videotape, question and answer session

5:30 P.M.- Speaker: Representative from Bell Laboratories  
6:00 P.M. Topic: New Compiler for Bit Slicer

6:00 P.M.- Speaker: Ben Dawson, MIT  
6:30 P.M. Topic: Image Processing, Slide Show

6:30 P.M.- Speaker: Richard Pferdner, Technology Service  
7:15 P.M. Topic: Flight Simulator, Videotape

7:15 P.M.- Closing Comments  
7:30 P.M.

7:30 P.M.- Social  
8:00 P.M.

NCGA '84 followup: There was an inpromptu AGUS meeting held at NCGA '84 for interested parties. Some fine suggestions were made by Richard Pferdner of Technology Service Corporation concerning the production of the newsletter. Many people out there have dial out lines on their mainframes, or own personal computers. If we can have a central dumping ground (say an account on Adage's VAX), transfer of information would be much more efficient. This could also include information concerning user problems and an electronic mail center between users. Anyone interested in participating in the setup of this effort, please let me know.

# THE ADAGE FORUM

---

---

During the past several months, Adage has made a number of new product announcements. The purpose of this column is to inform the user community of recent announcements made by Adage for new products and services. Below is a brief summary of these news releases.

- ADAGE INC. AND ADRA SYSTEMS INC., ANNOUNCE PRODUCT AGREEMENT

Adra Systems is to supply a high performance CAD/CAM system product to Adage Inc. There are no specifics available for this product at this time (announcement this summer), but it will be exclusively marketed and serviced by Adage. Adra Systems Inc. was founded in July 1983 to develop, manufacture and market low-cost, high-quality CAD systems for industrial use. Adra is located in Lowell, Massachusetts.

- ADAGE 3010 SYSTEM PACKAGING REDUCES COST

Priced around \$40K, the Adage 3010 is a bundled package suited for work with the new Adage software packages SOLID-3000 and SEISMIC-3000. To make the product less expensive, new frame buffer memories are used (double buffered), and the unit is not as expandable as the Adage 3006. If these applications are what you are interested in, this gives you a reasonable startup price.

- ADAGE INC. SIGN UP MARKETING AGREEMENT WITH NIXDORF COMPUTER CORP.

Adage and Nixdorf have signed an agreement to facilitate the joint marketing of Adage 4250 workstations and Nixdorf 8890 series computers. This decision basically provides CADAM users (CATIA?) an alternative for running on IBM main-frame equipment. I have no information regarding the relative power of this machine compared to its IBM counterpart (i.e., same as 4341, 4361, etc.).

- ADAGE INC. ANNOUNCES SOLID - 3000 DISPLAY SOFTWARE PACKAGE

SOLID 3000 is a FORTRAN callable surface rendering microcode package for the Adage 3000 display system. (Really folk's, I believe SOLID-3000 is more of a misnomer, SURFACE-3000 perhaps?) Unlike some systems on the market today, SOLID-3000 can accept direct surface input rather than polygon data (it will take that also). Surfaces may be based on B-SPLINE, BEZIER, CARDINAL-SPLINE or other basis functions of up to 8th order. As far as display functions provided, hidden surface shading, highlighting, transparency, anti-aliasing, and curved line display are just a small sample of the functions provided. The software also provides an easy interface to modeling programs. Since SOLID-3000 is a microcode package, it is very fast (I believe it was written with ICROSS).

# NEW & NOTEWORTHY

The following is a summary of the survey which was distributed in the last AGUS newsletter, based on a response rate of 14 from the entire Adage user community. This may be due to the fact that the mailing list used in the last newsletter was out-dated and incomplete. Please return the form on the back of the newsletter to keep our list current.

NAME & ADDRESS	EQUIP	HOST/OS	APPLICATION	S/W EXCH.	AGUS FUNCTION
WILLIAM B COWAN Div. of Physics National Research Council of Canada Ottawa, Ontario K1A 0R6 Canada 613-993-2504 watmath!watcgl! nvccgc!cowan	3000(1)	PDP-1123 RT-11	Psychophysics of vision	Yes	Communications for application exchange
DON MEAGHER Phoenix Data Sys. 80 Wolf Road Albany, NY 12205 518-459-6202(51)	3000(7)	VAX-11/ 750 VMS	Solids Modeling	No	Equipment news updates
BRUCE A. WALLACE R/Greenberg Assoc. 240 Madison Ave. New York, NY 10016 212-684-7886(42)	3000(1)	VAX-11/ 750 VMS	Entertainment graphics	None(yet)	SIGGRAPH mtg., List of users
ANDREW B. WATSON MS 239-2 NASA Ames Res. Ctr. Moffett Field, CA 94035 415-965-6290	3000(1)	PDP-1123 RT-11	Vision Research	No	Information Exchange
JOSEPH L. OLD MS 494 NASA/LRC Hampton, VA 23665 804-865-3457	3000(1)	VAX 11/ 780 VMS	Flight NAV Displays	No	Information Exchange (concepts, techniques, hardware)
MARK DIPPE 573 Evans Hall Computer Science Div., Dept. of EECS Univ. of CA Berkeley, CA 94270 415-642-0344	3000(1)	VAX 11 750 UNIX 4.2 BSD	Image Synth. (Painting & CAD too)	Maybe	

CONTINUED



NAME & ADDRESS	EQUIP.	HOST/OS	APPLICATION	S/W EXCH.	AGUS FUNCTION
STEVEN G. SATTERFIELD CAD & Interactive Graphics Group US Naval Academy Annapolis, MD 21402 301-267-4413 decvax!brl-bmd! usna!steve	3000(1)	VAX-11/ 780 UNIX 4.2 BSD	CAD	Not Yet	User Cooperation and Information Exchange
R.C. DURFEE E.P. TINNEL S.M. MARGLE G25,4500N P.O. Box X Oak Ridge, TN 37830 615-574-7449	3000(1)	MODCOMP IV (MAX IV)	Geographics Information Systems	No	
PAUL HUGHETT Dragoncraft P.O. Box 60 Palo Alto, CA 94302 415-327-7285	3000(1)	Symbol- ics LN-2 (LISP)	Computer Animation	No	User Communica- tions
J.G. MIRBACH Lockheed Elect- ronics Co. 1501 US HGWY 22 Plainfield, NJ 07061 201-757-1600	4250 6-CS 11-DS	Omega 480-2 VM	CADAM	No	
DOUGLAS S. KAY Joblove/Kay, Inc. 1545 N. Wilcox Av. Suite 201 Hollywood, CA 90028 213-461-6424	3000(1)	PDP-1123 RSX11M v3.2	Computer Animation for film	No	Info. Exchange (problems, techniques future equip.)

CONTINUED

NAME & ADDRESS	EQUIP.	HOST/OS	APPLICAITON	S/W EXCH.	AGUS FUNCTION
PENELOPE SHERRARD Ship Analytics Inc. North Stonington Professional Ctr. Rts. 2 and 184 N. Stonington, CT 06359 203-535-0990	3000 (18)	VAX-11/ 780 VMS	Training Simulators	No	H/W, S/W error exchange consulting personnel pool
KEITH L. MCVICAR Sikorsky Aircraft Dept. CAD/M N. Main Street Stratford, CT 06602 203-386-5196	3000 (1) 4250 (38) 4250R (3) 4370 (15) 4135 (11)	IBM 3081K MVS	Image Synth. (CAD) CADAM, CATIA other CAD	None Avail.	Information exchange bug fixes user coop.
NICK ENGLAND 531 Pylon Drive Raleigh, NC 27606 919-833-5401 decvax!duke!mcnc! ikonas!jne	3000 (2)	VAX-11/ 750 VMS	S/W Dev.	through Adage Inc.	Trade S/W opinions, helpful hints

In conclusion, it would be helpful if any other users out there would like to respond (how about some 4000 users!!!). Please call me or send information to above address. It seems that this group is turning into a 3000 users group (this may show the way of the future!). Communications is the most wanted function of this group, so I suggest that we try to arrange the aforementioned central data pool at the Adage VAX. A network of PC's might be nice too. Any suggestions on this would be appreciated. I do not believe that it is necessary at this time to have a software "library", however, this may become reasonable in the future.

# USER'S NOTES

A

MA1024 ADDRESSING PROTOCOL ON THE ADAGE 3000  
(or, INFERNAL DEVICE EATS TWO WEEKS OF ENGINEERING TIME!)

Daniel H. Miller  
Intermetrics, Inc.

The following information should be of interest to all MA1024 users (the MA1024 is the matrix multiplier on the 3000). There appears to be an undocumented requirement for addressing the MA1024, and if you don't know about it, you can waste a good bit of time searching for a bug in your "technically correct" program (believe me, I know!). In this article, I will discuss the requirement, and its consequences with respect to microcode programs, ICROSS and other high-level language programs, and debuggers.

MA1024 addressing requirement:

Simply, the UDR (upper data register) must be equal to 204 (octal) when a microcode WRSTRMA instruction is issued to start the MA1024. In order to see why this is so, a brief review of the usage of the MA1024 is necessary. Assuming the MA1024 has been loaded with the standard Adage microcode, section 10 of the RDS 3000 Prog. Ref. Manual states:

The steps in using the MA1024 microcode routines is as follows:

- o Load the coefficient list or matrix into coefficient memory...
- o Load the points to be transformed into the SR-8 memory...
- o Load the MA1024 control registers...
- o Start the MA1024. Use a function code of 25 to store a 0 into address 20402%7.

The final step can be accomplished by issuing a WRSTRMA instruction, which the BPS-32 Prog. Guide states "performs WRITE operation and starts execution of the MA1024". Thus, if you place the address of the last MA1024 register you desire to write in the MAR (memory address register), , and the desired value in the MDR (memory data register), you can then issue a WRSTRMA to write the data and start the MA1024. In fact, WRSTRMA apparently does two simultaneous writes: a "normal" write using the MAR and MDR as expected, and a "special" write (to 20402%7) to start the MA1024. One would expect that the address 20402%7 would be "hardwired" into this latter write, but this does not appear to be the case; the special write seems to use the current value of the UDR as the upper portion of the address, with only the lower portion being "hardwired". If you follow the steps exactly as given above, you will have no problem, because you will be writing to the MA1024 control registers just before you issue the WRSTRMA, and the UDR will therefore contain the proper upper address. However, if you access the scratchpad after setting the MA1024 control registers and before the WRSTRMA, you will have set the UDR to 202 (octal). The WRSTRMA will do the normal write correctly, but the special write will not be able to access the register at 20402%7 and the MA1024 will not start. In general, after issuing a WRSTRMA, programs wait for the MA1024 to finish before going on by looping on the CCMAAC (MA1024 busy) condition. If you have made the above error, the MA1024 never started so will not be busy, and the program will immediately break out of the loop.

CONTINUED

9

---

---

Microcode consequences:

Once you are aware of the above problem, it is easy to avoid errors in a microcode program by loading the MA1024 control registers just before the WRSTRTMA (i.e. set the stopbit earlier). If, for some reason, you need to do other operations just before the WRSTRTMA, you can protect yourself by resetting the UDR:

```
<load MA1024 control registers>
<other operations...>
LDUDR 204          ;force UDR = 204 (octal)
WRSTRTMA
```

ICROSS and other high-level language consequences:

ICROSS is an Intermetrics product that compiles and assembles a C subset into Adage machine code. The advantage of ICROSS, or any other high-level language you may be using, is that you do not have to worry about the details of the microcode. In this one instance, however, the advantage turns into a disadvantage; you do have to keep track of the UDR. The best universal solution is again to load the MA1024 control registers just before starting the MA1024. In ICROSS for example:

```
MA1024_CREG(0) = 0;          /* fill MA1024 ctl. reg. 0 */
MA1024_CREG(1) = 0x02000100; /* fill MA1024 ctl. reg. 1 */
STARTMA;                    /* Does a WRSTRTMA          */
```

The key is to make sure nothing occurs to produce unexpected microcode just before the WRSTRTMA. Subtle errors can creep in. For example:

```
for (i=0; i<=3; i++)
    MA1024_CREG(i) = PREDEFINED_REG(i);
STARTMA;
```

This seems to be correct at first glance. Note, however, that after each MA1024 control register is loaded, the generated microcode will obviously have to check the value of the loop counter *i* against the limits in the "for" statement. Suppose *i* is stored in the scratchpad - the microcode will have to fetch it to make the comparison, and will of course have to set the UDR to 202 to access the scratchpad! As a long term solution, it may be best to have any high-level language "start the MA1024" instruction compile into two microinstructions:

```
LDUDR 204;
WRSTRTMA;
```

Debugger consequences:

The behavior of the WRSTRTMA instruction should be kept in mind when using Adage's IKDEB, Intermetrics' I2DEB, or any other debugger. Suppose you have the following correctly written microcode:

```
<load the MA1024 control registers>
WRSTRTMA;
```

and you desire to change the target/source offsets (MA1024 control register 1) for testing purposes. If you halt the program at the WRSTRTMA instruction, and manually reset the register, will the MA1024 perform correctly when the program is restarted? This actually depends on the order in which the registers were set in the statements above the WRSTRTMA instruction. If MA1024 control register 1 was the last register to be set, the MAR and the MDR will contain its address and the old data, and the normal write that the WRSTRTMA instruction

---

---

Debugger consequences (cont.):

does will reset the register back to the old value! In effect, the MA1024 will appear to be ignoring your efforts to reset that register. In order to do your testing in cases like this (where you intend to override the last register load), you should either load the MDR with the desired new value (if your debugger allows this), or halt the program just before the last register load instruction, reset the program counter to the WRSTRTMA instruction, manually reset the register, and restart the program (the next to last MA1024 control register will be loaded twice). Note that in general, if you halt the program at some other unrelated location, reset the program counter to the WRSTRTMA instruction, manually load the MA1024 control registers, and restart the program, if the UDR does not happen to contain 204(octal), the MA1024 will not start.

Conclusions:

The ideal solution, of course, would be for Adage to modify the WRSTRTMA instruction execution such that the upper part of the address is also hardwired. Whether the instruction should also do a normal write is debatable. But until this fix is made (if ever), you can avoid much frustration and possible insanity if you remember:

1. A WRSTRTMA will not start the MA1024 unless the UDR = 204 (octal).
2. A WRSTRTMA writes the MDR to the MAR address.

Halftoning Algorithms Implemented on the Ikonas  
Linda A. Adlum  
Computer Aided Design and Interactive Graphics Group  
U. S. Naval Academy  
Annapolis, Md. 21402

(301) 267 - 4413  
decvax!brl-bmd!usna!linda

April 16, 1984

The halftoning program was written to demonstrate several halftoning algorithms and, in addition, the capabilities of the Ikonas graphics system. The program was written in C and runs on a VAX 11/780 with the UNIX operating system.

Halftoning is a technique in which a picture of a number of varying intensities whether color or black and white, is displayed on a device which is limited to the display of fewer intensities. The purpose of halftoning is to increase the visual resolution if the picture on such an output device.

The halftone program presently processes only black and white pictures. The picture is stored as a binary file of 256 or 512 scan lines. Each scan line is 256 or 512 bytes, respectively. A byte holds an intensity value from 0 (black) to 255 (white). Because an Ikonas pixel is made up of three bytes for red, green, and blue data, the program reads the monochrome byte and stores it as the red byte of the pixel. The green and blue bytes of the pixel are set to zero. A scan line displayed on the Ikonas is made up of 256 or 512 pixels depending on the resolution of the picture.

The Ikonas system is initialized with the channel crossbar switch (on the LUV0) set to full color. Displaying a pixel with only the red byte containing an intensity value and the green and blue bytes set to zero, produces a red tinted picture. This is because the input red, green and blue channels are sending data to the output red, green, and blue channels, respectively. Therefore, the program sets the channel crossbar switch to red pseudocolor. The monochrome data is sent not only to the red output channel, but also the green and blue output channels. The picture is displayed in black and white.

Four halftoning algorithms are available. The user may select the appropriate algorithm from a menu displayed at the user's terminal. After displaying the picture according to the chosen algorithm, the program returns the user to the menu for another selection or to quit the program.

The four halftoning algorithms are Simple Thresholding, Floyd and Steinberg error distribution, ordered dither, and 2 X 2 binary patterning for 256 X 256 pictures.

The Simple Thresholding algorithm displays the picture using only two intensity values. One value is the minimum (0 or black) and the other value is the maximum (255 or white). The user is prompted to enter a threshold intensity value between 0 and 255. The picture is scanned "on the fly" from top to bottom and left to right one scan line at a time. If the intensity value is greater than the threshold, white is displayed otherwise black is displayed. The algorithm produces errors; i.e. the details of a picture which are usually depicted through multiple intensity values are not shown because the algorithm is limited to the display of only black and white intensity values.

CONTINUED

---

---

Halftoning Algorithms Implemented on the Ikonas (cont.):

The Floyd and Steinberg error distribution algorithm corrects the loss of detail by computing the error for each pixel intensity and distributing the error to adjacent pixels. Three-eighths of the error is added to the intensity value of the right adjacent pixel and the bottom adjacent pixel, and one-fourth of the error is added to the intensity value of the diagonally downward adjacent pixel. The user is prompted for a minimum intensity and a maximum intensity. For example, intensities entered may be black and white respectively. A threshold value is computed by adding the minimum and maximum and dividing by two. Scanning top to bottom, left to right, if the intensity value of the pixel under consideration is greater than the threshold, the maximum intensity is displayed. The error is computed to be the intensity less the given maximum; otherwise, the minimum intensity is displayed and the error is computed to be the intensity less the given minimum. This error is then distributed. The program stores all intensity values in an array. If memory resources are limited, instead of storing all intensity values, another method would be to store only two scan lines at all times; i.e., read ahead one scan line in addition to the current scan line being processed. This technique would supply the required adjacent pixel intensities which receive the error distribution.

The ordered dither matrix algorithm, also reads in all the intensity values into an array. In this case, storing the picture is not necessary and it may be scanned as read in. The user is prompted for the order of the dither matrix 2, 4, or 8. An ordered matrix larger than 8 is possible. The ordered matrix is filled using a recursive formula with an initial given 2X2 optimum matrix. The order of the maximum dither matrix may be made variable; however, the program presently contains a maximum ordered dither matrix of 8 stored in a static array. The ordered dither matrix represents a random error pattern. Before storing the intensity values, the values are scaled to the square of the user specified order. As an example, for a 8X8 matrix, values are scaled between 0 and 63. Again, the picture is scanned from top to bottom and left to right. The X,Y coordinate of the pixel under consideration is included in the computation of the row and column index which is used to look up the dither value in the ordered dither matrix. If the scaled pixel intensity value under consideration is less than the dither value, black is displayed otherwise white is used. The algorithm produces a checkerboard pattern on the display. For an 8X8 dither matrix, 64 intensities are possible.

The patterning algorithm with a 2X2 pattern cell expands a 256 X 256 resolution picture to 512 X 512. The cell is a 2X2 matrix where each element of the matrix is considered a pixel. The intensity values are described using the cell. For a 2X2 cell, five intensity values are available.

The pixel patterns representing the five values are:

- (1) all elements of the matrix are set to black;
- (2) the (1,2) element white, rest black;
- (3) the (1,2) and (2,1) elements white, rest black;
- (4) the (2,2) element black, rest white;
- (5) all elements of the matrix set to white.

CONTINUED

---

---

Halftoning Algorithms Implemented on the Ikonas (cont.):

It is important to choose patterns so as not to distort the pictures with incorrect lines. Note, pattern cells greater than 2X2 which provide additional intensity patterns are possible. Again, the picture is scanned "on the fly" from top to bottom. For each scan line read, two scan lines of 512 pixels are displayed. The 256 intensity levels are divided up into 5 intensity ranges corresponding to the above 5 pattern cells. Depending on what range the intensity falls in, a pattern is chosen and the cell is set accordingly. Note that a cell spans two scan lines, i.e. 256 cells are equivalent to two scan lines.

With the exception of the Simple Thresholding algorithm, these algorithms may also be implemented with color pictures. Additional information is contained in the reference given below. This program is available for distribution. Please submit a letter (on your letterhead) requesting the program along with a blank 9-track tape and return postage paid mailing label. The program will be returned in 1600 BPI UNIX 4.2 Tar format. Alternately, include your uucp address in your letter. The program will then be mailed to you via uucp.

REFERENCES:

Rogers, David F., Procedural Elements for Computer Graphics, McGraw-Hill Book Company, New York, 1984.

Foley, J. D. and Van Dam, A., Fundamentals of Interactive Computer Graphics, Addison-Wesley Publishing Company, Reading, Massachusetts, 1982.

Newman, William M. and Sproull, Robert F., Principles of Interactive Computer Graphics, second edition, McGraw-Hill Book Company, New York, 1979.



-----  
FOR YOU!  
-----

M E M B E R S H I P U P D A T E

Please take a moment to return this form to facilitate our mailing list program in the handy, postage paid reply envelope enclosed for your convenience. Please pass this on to anyone else who may be interested. Thank You.

NAME \_\_\_\_\_  
TITLE \_\_\_\_\_  
COMPANY \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_  
TELEPHONE \_\_\_\_\_ I AM A NEW MEMBER: YES \_\_\_ NO \_\_\_  
TYPE OF ADAGE SYSTEM USED: 3000 \_\_\_\_\_ 4250 RASTER \_\_\_\_\_  
4250 VECTOR \_\_\_\_\_ OTHER: (Explain) \_\_\_\_\_

-----  
FOR A FRIEND!  
-----

M E M B E R S H I P U P D A T E

Please take a moment to return this form to facilitate our mailing list program in the handy, postage paid reply envelope enclosed for your convenience. Please pass this on to anyone else who may be interested. Thank You.

NAME \_\_\_\_\_  
TITLE \_\_\_\_\_  
COMPANY \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_  
TELEPHONE \_\_\_\_\_ I AM A NEW MEMBER: YES \_\_\_ NO \_\_\_  
TYPE OF ADAGE SYSTEM USED: 3000 \_\_\_\_\_ 4250 RASTER \_\_\_\_\_  
4250 VECTOR \_\_\_\_\_ OTHER: (Explain) \_\_\_\_\_

Adage User Group Mtg.  
Tues 7/24

Paul Allan Sadocki

AFGL Ground RS (Weather Radar)

Hudson Road

Maynard MA

861 4405/6/  
/7

Has experience at NC State with Adage 3000  
willing to help us w demo.

Knows of Firm in Mass. that sells system to  
receive & display GOES weather images - about \$8K.  
Will let me know their name...

Also wrote a demo package for 3000 demonstrating  
shading and image proc techniques. Would give it and  
will maintain it.

---

Alain Fournier can ~~pre~~ supply Frame Buffer images for 3000  
includes Fractal surfaces and ray-traced images (see proc)

**SALES ORDER**

**ADAGE, INC.**  
 One Fortune Drive  
 Billerica, MA 01821

B  
I  
L  
L  
T  
O

**THE COMPUTER MUSEUM**  
 300 CONGRESS ST  
 BOSTON, MA 02211

S  
H  
I  
P  
T  
O

**THE COMPUTER MUSEUM**  
 300 CONGRESS ST  
 BOSTON, MA 02211

SALES ORDER NO. 9242	RVSN 0	DATE 7/24/84	PAGE 1
CUSTOMER ORDER NO. N/A			
ORDER DATE 7/13/84	SALES CAT. CONS	TAXABLE NO	
METHOD OF SHIPMENT BEST		F.O.B. FACT	P.P.D.
S.A. 9914			
TERMS NET 30			

BILL TO CUSTOMER ► **COMPMU1000**

SHIP TO CUSTOMER ► **COMPMU1000**

ITEM	PRODUCT NUMBER	DESCRIPTION	TAX	SCHEDULED SHIP DATE	QTY. ORDERED	UNIT PRICE	EXTENSION	DISCOUNT
1	3006	BASE DISPLAY SYSTEM DR256		8/17/84	1.0	.000	.00	.00
2	DR/GM256	SUBSTITUTE GM256		8/17/84	1.0	.000	.00	.00
3	CBS12/24	SUBSTITUTE CB24		8/17/84	1.0	.000	.00	.00
4	GM256	LARGE GRAPHICS MEMORY		8/17/84	3.0	.000	.00	.00
6	MPC/32	MPC, 32K BYTE RAM		8/17/84	1.0	.000	.00	.00
7	GPS	GRAPHICS PROCESSOR SET		8/17/84	1.0	.000	.00	.00
8	XBS34	CROSS BAR SWITCH		8/17/84	1.0	.000	.00	.00
9	OVLY	OVERLAY		8/17/84	1.0	.000	.00	.00
10	MON19/HS	19" COLOR MONITOR:HS		8/17/84	1.0	.000	.00	.00
11	RGBS CABLE/50	50' STANDARD CABLE SET		8/17/84	1.0	.000	.00	.00
12	DT11/M100	DIGITIZING TABLET, CABLE TO MPC		8/17/84	1.0	.000	.00	.00
13	CET1/M100	CET TERMINAL, CABLE TO MPC		8/17/84	1.0	.000	.00	.00
14	AIDS	DIAGNOSTIC TAPES P/N 20-103002-08		8/17/84	1.0	.000	.00	.00
15	SOLID/3000 64K	SOFTWARE FOR ADAGE 3000(64K)		8/17/84	1.0	.000	.00	.00
16	IK11B/50	DEC UNIBUS INTERFACE, 50' CABLE		8/17/84	1.0	.000	.00	.00
900	ST LOAN	SHORT TERM LOAN AGREE. REQ.		00/00/00	1.0	.000	.00	.00
		HOST: DEC OP.SYS. VMS3.4 11/750 + MEM.CONFIG: RGBA(0); 0-7 +					.00	

**CUSTOMER SERVICE**

ADAGE, INC.  
 One Fortune Drive  
 Billerica, MA 01821

THE COMPUTER MUSEUM  
 300 CONGRESS ST  
 BOSTON, MA 02211

H  
 I  
 P  
 T  
 O THE COMPUTER MUSEUM  
 300 CONGRESS ST  
 BOSTON, MA 02211

SALES ORDER

SALES ORDER NO. 9242	RVSN 0	DATE 7/24/84	PAGE 2
CUSTOMER ORDER NO. N/A			
ORDER DATE 7/13/84	SALES CAT. CONS	TAXABLE NO	
METHOD OF SHIPMENT BEST		F.O.B. FACT	P.P.D.
S.A. 9914			
TERMS NET 30			

BILL TO CUSTOMER ► COMPMU1000

SHIP TO CUSTOMER ► COMPMU1000

ITEM	PRODUCT NUMBER	DESCRIPTION	TAX	SCHEDULED SHIP DATE	QTY. ORDERED	UNIT PRICE	EXTENSION	DISCOUNT
		REQ.DELIVERY: 8-15-84 + ORN COMM. APPROVAL RECEIVED +						

CUSTOMER SERVICE