PS 390

EVANS & SUTHERLAND

**The PS 390 is the first computer
graphics system to use Evans &
Sutherland Shadowfax™
technology—custom VLSI
design—to produce fully anti-
aliased, calligraphic-quality
wireframe models and locally
rendered, static shaded models
on a raster display.**

**This innovative new technology
allows the PS 390 to address
real-world challenges at a new
level of performance.**

The PS 390 allows you to create,
display, modify, and manipulate
complex 2D and 3D wireframe
models interactively. High-quality,
static, shaded images may be
locally rendered full screen or in
selected portions of the display
screen.

The PS 390 design incorporates
Shadowfax™ custom VLSI to
provide high-performance features
which include:
- 8192 x 6912 Image quality
- 365,000 3D vector transforma-
  tions per second
- Real-time wireframe anti-aliasing
- Local solid shaded rendering
- PS 300 Family software
  compatibility

The PS 390 interfaces with a
variety of host computers over a
broad range of interfaces, includ-
ing high-speed DEC and IBM
interfaces.

Several types of RGB video output,
including NTSC or PAL, are availa-
ble to satisfy needs for static
hardcopy, dynamic laser disk or
video tape production, video
projection, and film recorders.

*The PS 390 displays dynamic, anti-aliased
wireframe images and locally computed
shaded images on a single raster display.
This model was created using GEOMOD™,
part of the I-DEAS™ package from SDRC.*
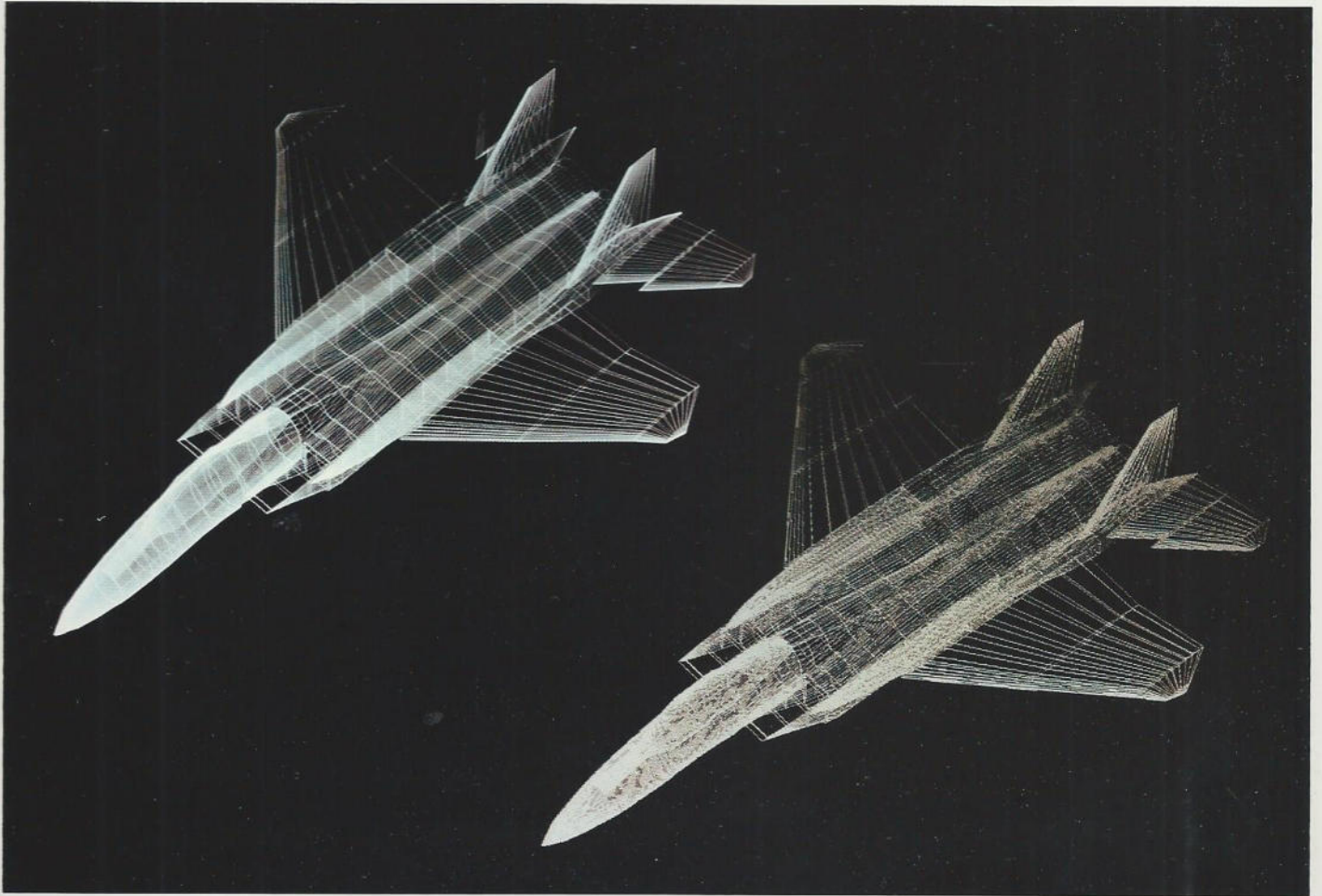
SUPERIOR IMAGE QUALITY

The PS 390's custom Shadowfax VLSI circuitry implements innovative anti-aliasing techniques and performs the rastering of lines and polygons. Shadowfax VLSI sub-pixel processing mathematically divides each pixel into 64 sub-pixels. This provides addressability and image quality of 8192 x 6912 on a 1024 x 864 pixel display.

The result is the elimination of the incorrect information present in a raster display, such as stair-stepping, aliasing, and moire effects. Models can be positioned more precisely, a greater level of observable detail is possible, endpoint match is exact, and inaccurate information resulting from jagged or mislocated lines is eliminated.

Anti-aliased images are indispensible for accurate understanding of complex models. The image on the right shows the model as it would appear on any standard 1024 x 864 display. The image on the left was taken from the PS 390, in which Evans & Sutherland's proprietary VLSI chips produce image quality of 8192 x 6912.
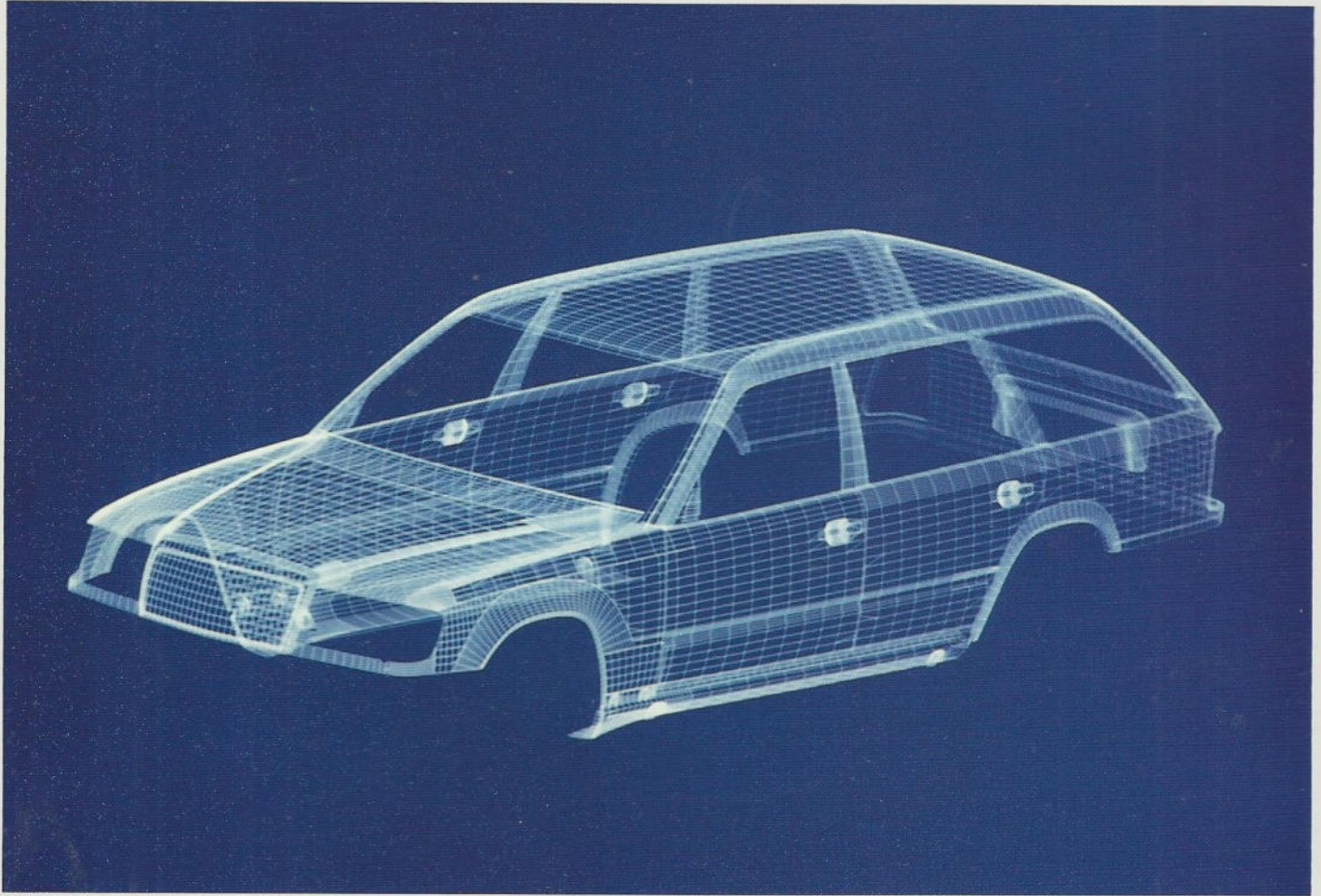
COMPLEX MODEL CAPACITY

The PS 390 is particularly well suited for applications requiring very complex display models comprised of a large number of vectors.

The PS 390 calculates over 365,000 double-precision vector transformations per second, including depth-cueing, perspective computation, viewport mapping, 6-plane clipping, and anti-aliasing.

Fast, 32-bit data storage and 32-bit graphics pipeline processing ensure that the user has enough graphics resolution to view a complex model in its entirety and still zoom in to view a single feature without losing model definition.

Full color capability, smooth line quality and smooth dynamics, depth-cueing, and high quality text resolution are vital for clear model understanding. This model contains approximately 55,000 vectors. Model data courtesy of Daimler Benz, West Germany.

ENHANCED COLOR FEATURES

Through a wide choice of colors, parts of a model can be subtly or dramatically highlighted.

PS 390 color capabilities include:
- 1,801 color selection for wire-frame images
- Depth-cueing is performed to any user-selected background color, providing valuable cues for interpreting 3D models
- Colors are automatically blended where lines intersect or overlap, giving the user a better understanding of the model.
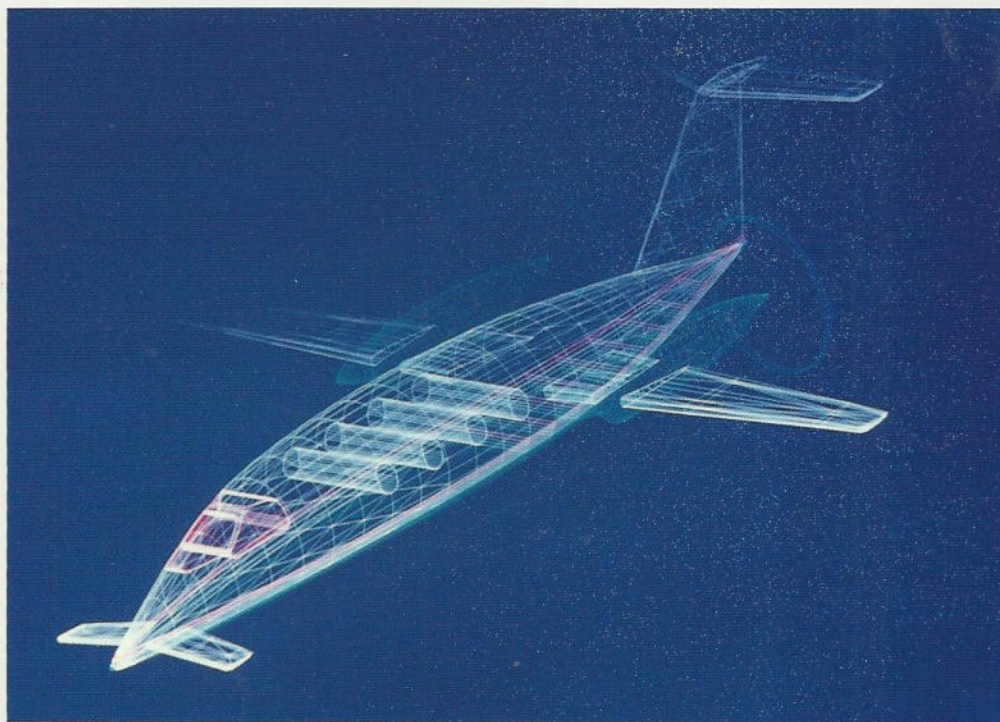
The user may select background colors. Images are depth-cued to the selected background color, including vectors of different colors.
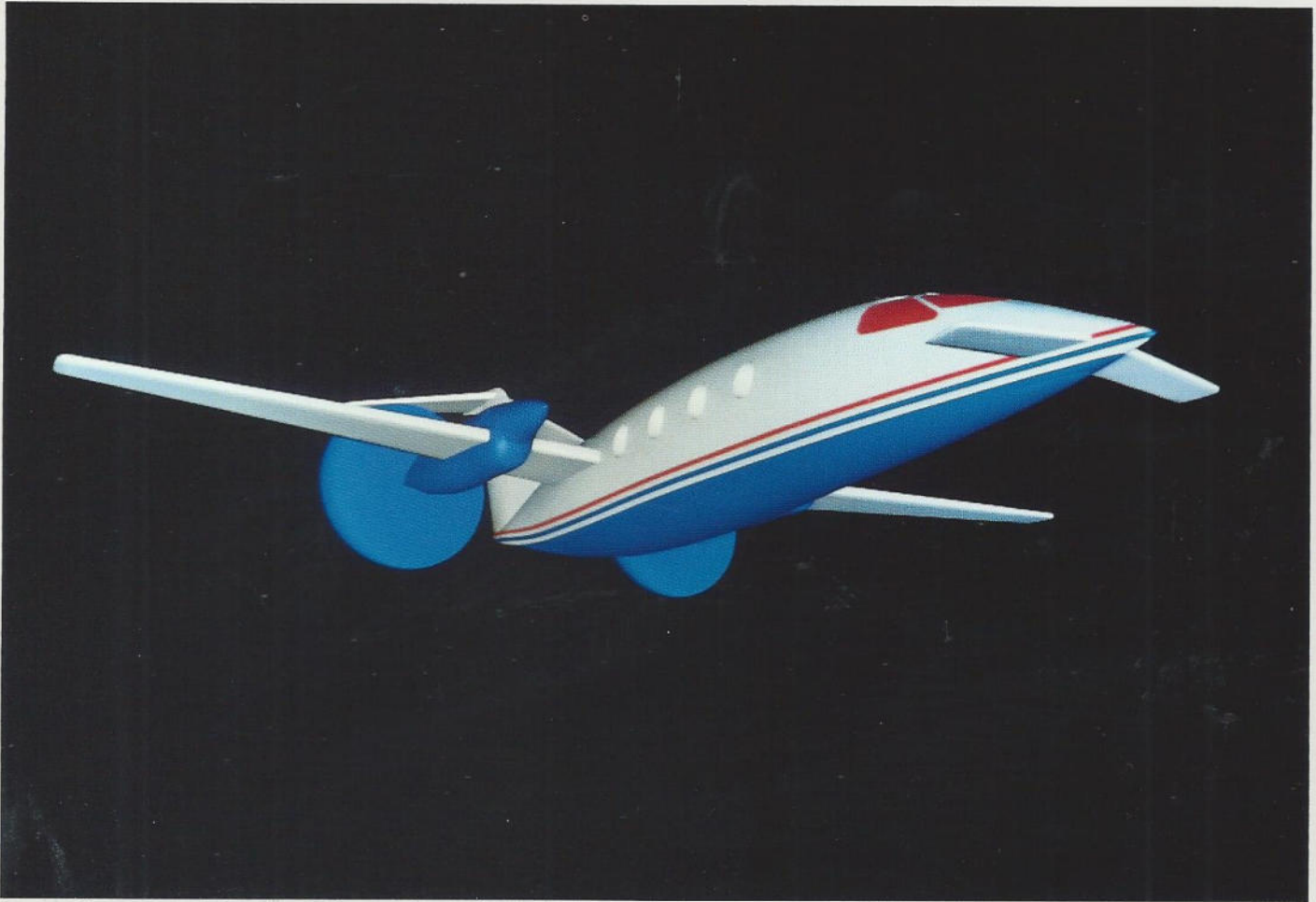
SHADED IMAGE RENDERING

An optional capability of the PS 390 is static shaded image rendering. Smooth shading is calculated locally on the PS 390 using a number of selectable shading techniques, including Gouraud and Phong. Color is automatically blended across the surface of a polygon.

Other rendering options are also available, including three levels of edge anti-aliasing and the rendering of transparent polygons.

Shaded models may be viewed full screen or in selected viewports, and can be viewed at the same time wireframe models are being manipulated interactively on another portion of the screen.

Users may also view polygonal objects as cross sections or in hidden line form, and may specify colors independently for each polygon. Multiple programmable light sources make it easy for the PS 390 user to create natural looking, real-life models.

The Piaggio Avanti is one of today's most promising business aircraft designs. The PS 390 user selects shading algorithms and levels of anti-aliasing to locally render the model, trading off image quality against speed of computation. Model data courtesy of SDRC.

SOFTWARE COMPATIBILITY

The PS 390 is compatible with today's most popular and powerful application software programs. Complete compatibility with existing PS 340 and PS 350 software includes application programs for:

- Molecular modeling
- Mechanical CAD & CAE
- Aircraft & auto surface design
- Engineering simulation
- Structural analysis
- Medical imaging
- Seismic and petroleum research

SUPPORT

Full documentation, from site preparation through user programming, is provided with the PS 390.

All PS 390 models, interactive devices, and options ordered for simultaneous delivery include installation and are covered by a 60-day full service warranty.

After the original warranty has expired, a variety of maintenance service plans is available, tailored to fit individual customer requirements. Maintenance and service are supplied by the Evans & Sutherland Customer Engineering Department.
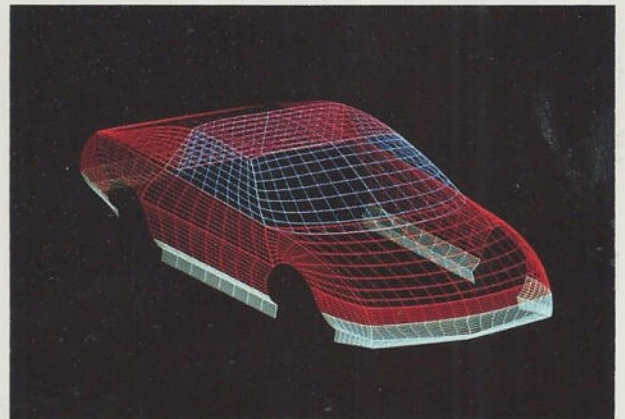

This complex motor assembly was created using GEOMOD™, a part of the I-DEAS™ software package from SDRC.
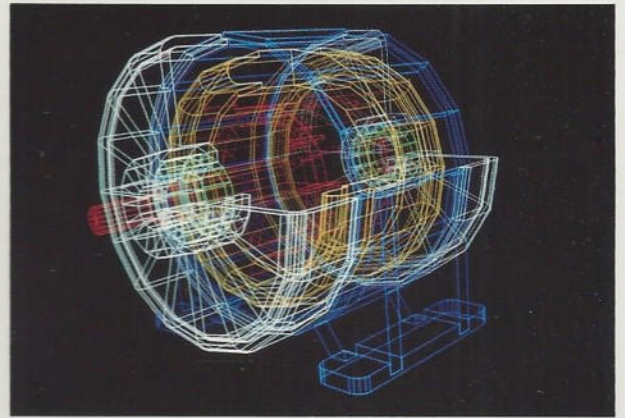
This Phong-shaded, fully anti-aliased rendering was computed locally on the PS 390 from GEOMOD™ data.
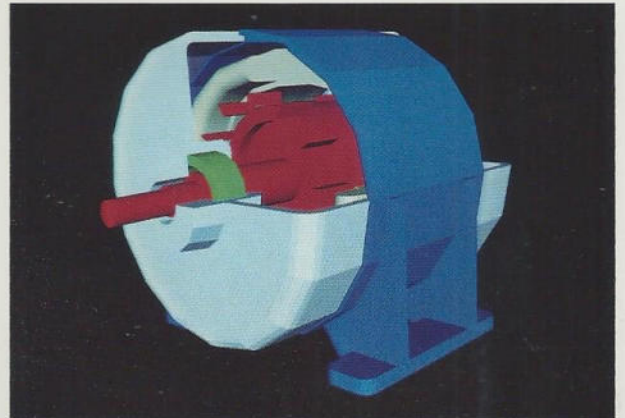
This prototype automobile model, photographed on the PS 390, was orginally created with proprietary software on an earlier PS 300 system.

Available molecular modeling solutions from Evans & Sutherland and third-party vendors include crystallography, drug design, protein engineering, and other organic, inorganic, and organometallic applications.

PS 390 BRIEF SPECIFICATIONS

GENERAL

- Anti-aliased dynamic wireframe & static shaded images on single color raster display
- Graphics commands interpreted locally by Graphics Control Processor
- 127 selectable hardware-generated line textures
- Advanced hierarchical data structuring capabilities
- Picking capability
- Extensive graphics command repertoire

CONTROL UNIT

Graphics Control Processor

- Dedicated MC68000 (10 MHZ)
- Local handling of interactive devices
- Interpretation of graphics commands to perform a wide variety of graphics operations
- Host communications
- Power-up confidence testing
- Stand-alone diagnostic capability

Mass Memory

- Provides storage for graphical hierarchical data structures and locally processed function networks
- Expandable to 4 megabytes of dual-ported memory

Display Processor

- Proprietary bit-slice microprocessor
- High-speed processing of data primitives and matrix transformations
- 32-bit precision floating-point transformations
- Transformations expressed as 4 x 4 matrices
- Translation in any direction
- Rotation about any axis
- Scaling with respect to any axis
- Mirror images about a plane
- Compound matrix transformations
- Viewporting capabilities
- Performs perspective, clipping as standard features

Shadowfax™ Technology

- Produces calligraphic-quality lines on raster display
- High-speed custom VLSI circuitry
- Performs depth-cueing as standard feature

INTERACTIVE DEVICES AND OPTIONS

- Color Raster Display
- DEC, Ethernet, IBM high transfer rate and Asynchronous interfaces
- Alphanumeric keyboard (LED labels optional)
- Control dials (LED labels optional)
- Lighted function buttons
- Data tablet with 4 button cursor
- Optical mouse

Display Characteristics

Color Raster Display

- 19 inch diagonal display (11 inches x 15 inches usable area)
- 1024 x 864 60 HZ non-interlaced
- RGB raster monitor
- 24 bit planes double buffered (8 bits, each for R,G, and B)
- 16.7 million colors
- 8192 x 6912 addressability

PHYSICAL, POWER & ENVIRONMENTAL

Control Unit

- Height 26.5" (67 cm) Width 21" (53 cm)
- Depth 28" (71 cm) Weight 120 lbs. (55 kg)
- Primary power: 120 VAC + −10%, 47-63 Hz single phase, 12 amps max. (220 VAC + 15% −10%), 47-63 Hz. single, 6 amps max.)
- Heat dissipation: 4710 BTU's/Hr.
- Power consumption: 1380 watts maximum
- Operating temperature: 50° to 104°F (10° to 40° C)
- Relative Humidity: 20% to 80%

Peripheral Multiplexer

- Primary power: 90-130 VAC, 6 amps max., 47-63 Hz; (180-250 VAC, 3 amps max.)
- Heat dissipation: 512 BTU's/Hr.
- Power consumption: 150 watts nominal

Color Raster Display

- Height 21.25" (54 cm) Width 19.5" (50 cm)
- Depth 22" (56 cm) Weight 90 lbs. (41 kg)
- Primary Power: 115 VAC + −10%, 57-63 Hz single phase, 1.5 amps max. (220 VAC + − 10%, 47-63 Hz single phase, .65 amps max.)
- Power consumption: 150 watts nominal
- Heat dissipation: 512 BTU's/Hr.
- Operating temperature: 50° to 104° F (10° to 40° C)
- Relative Humidity 10% to 95%

Optional RGB Video Output Formats

- The PS 390 offers a selection of NTSC or PAL/SECAM and one of two high resolution outputs, as well as the PS 390 system display format. Only one video format is available at any one time.
- System Display Format
  Resolution: 1024 x 864
  Refresh Rate: 60 Hz. Non-Interlaced
- High Resolution RS-343 Format
  Resolution: 1024 x 864
  Refresh Rate: 30 Hz. Interlaced
- NTSC-Compatible RS-170A Format
  Resolution: 640 x 484 (RS-170A)
  Refresh Rate: 30 Hz. Interlaced
- High Resolution RS-343 Optional Format
  Resolution: 1024 x 1024
  Refresh Rate: 30 Hz. Interlaced
- PAL/SECAM-Compatible Optional Format
  Resolution: 768 x 574
  Refresh Rate: 25 Hz. Interlaced

(Due to our ongoing committment to advancing technology, specifications are subject to change without notice.)