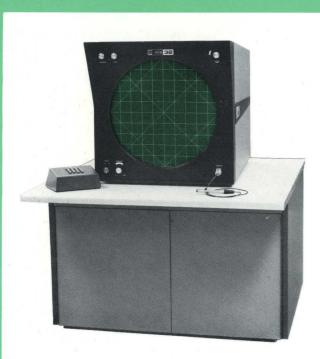




High Performance Interactive Graphics





MAN-COMPUTER INTERACTION IN REAL TIME GRAPHICS

System 32 is more than an ordinary graphics terminal. It has been designed, developed and produced to provide all the high speed, control and performance necessary for effective man-computer real time interaction in a broad range of sophisticated applications.

You can create, simulate, view, evaluate, alter, judge alternatives and make fast, precise decisions using the graphic/alphanumeric data medium provided by System 32 for computer inquiry and response.

For problems of design, construction or manufacturing, systems and materials analysis, process control, logistics, marketing or finance, System 32 can be your key to productive man-computer interface and efficient computer utilization.

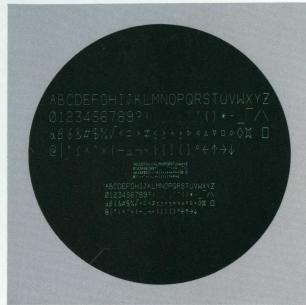
Performance Advantages

- Complex line drawing, alphanumeric and 3-D rotational capabilities
- Maximum information display per frame through high speed line drawing, character generation and display processing.
- Conserves buffer or dedicated core and reduces programming by use of:
 - Display Jump Subroutines
 - Conditional Jumps
 - Reflection and Rotation of Subroutines
- High data resolution for extremely precise applications requirements.
- High visual resolution for maximum ease of data interpretation.
- Command set efficiency and hardware generators increase processing speed, cut core storage and save programming time.

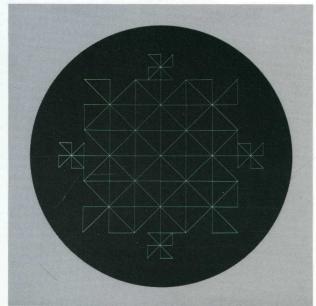
System Features

- Modular concept allows customer selection of specific capability and performance at maximum economy.
- Latest MSI and state-of-the-art technology achieves greater performance, reliability and economy with reduced equipment size.
- Large flat display area 314 square inch viewing surface on CRT.
- Line drawing High performance vector generators combine digital and analog integrated circuit technology and are capable of displaying 12,000 inches of 2-inch lines or 26,000 inches of 8-inch lines per 30 Hz frame. Solid, dot, dash or dot/dash line construction of four brightness levels can be selected.
- Programmed character generator offers 96 individually stylized characters and symbols, in either ASCII or EBCDIC code, for specific orders. Character set is changeable in style, size or content with minimal hardware. Lower case and expanded symbol set (to 192 characters) is an additional option.
- Versatile command set The operation command set provides a highly efficient
 software system for displaying individual or multiple vectors, circle or symbols with each
 32 bit word. Internal subroutine operational commands permit conditional jumps and
 returns to display repetitive items with less computer core space; or to display reference data
 occasionally interlaced with working data. Mode commands also permit changes in
 individual display mode variables without changing others. Some variables may be activated
 for individual command words as desired.
- Computer interfaces are available or can be provided for nearly all computers.

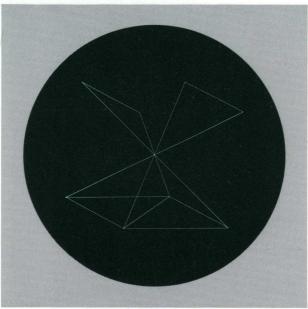
TEST PATTERNS INDICATIVE OF SYSTEM 32 CAPABILITIES



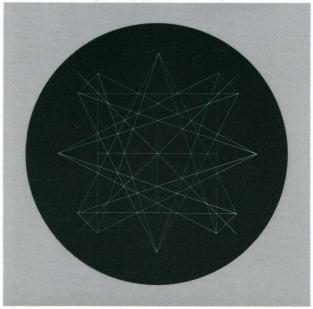
Symbols and characters illustrated in 3 of 4 standard sizes.



Triangles, drawn with short vectors, rotated for accuracy in positioning.



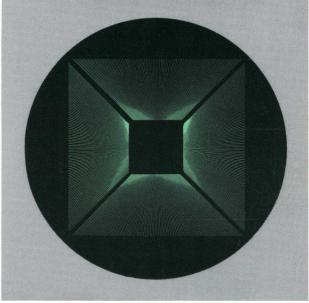
Diagonals of a cube rotated in space and orthogonally projected onto a plane.



Positional accuracy test pattern showing accuracy of long vector crossovers.



Circle generator showing 72 circles with varying radii and segment lengths.



Test pattern showing line drawing capability, resolution and menu blanking. Pattern drawn by using reflection and rotation in 8 different sections.



COMPUTER DISPLAY COMMAND SET

COMMAND	BIT	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Vector Short	VSH	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Vector Long	VLN	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Rectangle	REC	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Vector Alternate	ALT	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Circle	CIR	0 1 0 0 N N K K Rc
Ellipse	ELP	$0 1 0 1 N N K K \leftarrow R_X \rightarrow L B K K K K K K K K \leftarrow R_Y \rightarrow$
Vector Absolute Set Binary Multipliers	VAB SBM	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Set Mode	SMD	0 1 1 1 C* C ₀ C ₁ C ₂ C ₃ C ₄ C ₅ C ₆ C ₇ b* b ₀ b ₁ L* L B* B J* J D* D ₀ D ₁ M* M ₀ M ₁ T* t Z F*
Set Character Mode	SCM	1 0 0 0 N S* S ₀ S ₁ Char 0 Char 2 Char 2
Set Character Mode	SCM	Char 3 Char 4 Char 5 Char 6
No Operation	NOP	0 0 0 0 N N K K · · · · K
Jump	JUP	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$
Jump and Save	JUS	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Jump Back	JUB	1 0 1 1 N N K K K · · · · K
3-Dimensional	Autom	atic for VSH and VSL commands following a SMD where Z bit is true. Rotation and orthogonal projection is to the angle for which the SBMs are set.

CODE LEGEND

A = 0: $\triangle H = \triangle X$, $\triangle Y = 0$ 1st Vector $\triangle X = 0, \triangle V = \triangle Y$ 2nd Vector $A = 1: \triangle X = 0, \triangle V = \triangle Y$ 1st Vector

 $\triangle Y = 0$, $\triangle H = \triangle X$ 2nd Vector

()*= Alter mode

B = Blink

b = Brightness

C = Conditional jump

C = Unconditional jump

D = Line type

F* = Frame start

E = Reset 3-dimensional accumulator

I = Blanking

i = Italic character or

increased brightness level (bold)

J = Blanking in menu area

K = Not used

L = Enable light pen

M = Magnification

N = Reserved for op code expansions

P = Jump address

p = Point display

R = Subroutine reflection or rotation

R_c= Radius of circle

 $R_{x},R_{y} = X$ and Y ordinates of ellipse

S = Character size

T = Set binary multipliers

t = Tracking enable

Z = 3-dimensional data

CHARACTER FORMAT

0 1 2 3 4 5 6 7 ASCII **EBCDIC**

NOTE: Command Set shown includes both standard and optional features.

Software Support

Lundy provides (as an option) a complete graphic software capability called Lundy Graphics Subroutine Package (LGSP). It is easily implemented on most computers and gives the user a high level language for programming the display. LGSP is a general purpose, Fortran or Assembly language, callable set of sub-routines using all the hardware features of the Lundy Display plus features more efficiently performed by software. LGSP performs these functions:

MEMORY MANAGEMENT-

Allocation and control of the computer core memory to be used as the Display's refresher.

ORDER GENERATION-Producing display commands and inserting them into the appropriate place in the refresher memory.

INTERRUPT HANDLING-

Processing of display generated events (e.g., light pen strikes, function key depressions, etc).

DISPLAY CONTROL - Starting and stopping the display, sensing its status, etc.

MISCELLANEOUS - Pentracking, cursor-control, "3-D" rotation control, typewriter mode control, rotation and reflection of subpictures control, and "hardware subroutine" generation and control (e.g., conditional-jumping to a subpicture, repeating and displacing a subpicture "N" times on the screen, etc.)

LGSP also includes such features as "software-windowing" and scaling, grid-pattern or dot pattern generation for light-pen translation of subpictures and graph plotting subroutines.

SPECIFICATIONS, Standard System 32

PHYSICAL CHARACTERISTICS

208 ±10 VAC, 4 wire Power Input

3 phase, 60 ± 3 Hz, 2.5 KVA

50° to 90° F at 95% maximum Environment

relative humidity

56" high x 60" wide x Size (Approx.)

48" deep (46" width optional)

12" depth Writing Surface

CATHODE RAY TUBE

22" O.D. **Tube Size Tube Shape** Round

Radius of Tube

Face Curvature 215 ± 7" Phosphor Type P31

Colors White, vellow-green

Display Size 20" dia Display Area 314 sq. inches Brightness 40 ft. lamberts

Contrast 5 to 1

Implosion Panel Bonded, etched outer surface

Face Plate & Implosion Plate Combined

Transmission 40%

DEFLECTION SYSTEM

2048 x 2048 (20" x 20") Raster Count

.015 inches

Raster Interval .010

Focus Method Electromagnetic **Deflection Type** Random scan Drift $\pm 0.5\%$

Spot Diameter Deflection

Method Electromagnetic Repeatability \pm .020 inches

PROCESSOR DESIGN

Op Command Set, words 14 standard Word Length² 32 Bits

X and Y Accumulator

Registers 2048 x 2048 Menu Area Blanking 14" x 14"

Reflection and Rotation of

Standard Subset Line Vector Generator Standard Vector Absolute Generator Standard

Point Vector Generator Standard Rectangle Generator Standard Frame Timer (adjustable) 10 to 100 ms.

LINE VECTOR GENERATOR

Line Definition Analog Display Method Stroke

2047 raster units Max. Component Length Line Types Solid, dash, dot and

dot/dash

Mode Delta or Absolute

Intensity Levels Long Vectors per Word Short Vectors per Word 2

ALTERNATE VECTOR GENERATOR

Number of vectors 2 per word

RECTANGLE GENERATOR

Rectangle Location Clockwise from lower left

hand corner for positive values of X and Y at the last coordinate

Same as vector

Line Types Rectangles per Word

POINT VECTOR GENERATOR

Used with number of Command Words 5

COMPUTER INTERFACES

Computer

IBM-1130 PDP 9, 11 and 15 Varian 620/i or 620/f Other interfaces available

DISPLAY PERFORMANCE

Vector Drawing.

inches per sec. (max.)

Character Writing Speed, Text

5 or 8 μ sec.

average

Overhead time per

vector

2.0 to 4.5μ sec.

Overhead time per vector (3-dim.)

 5.8μ sec. and overlapped

NOTES: 1. Including optional features. 2. Optional 48 bits for 3-dimensional data

Optional Features

MANUAL INPUT DEVICES

Alphanumeric Keyboard 64 keys 16 or 32 keys **Function Keyboard**

Light Pen Pointer

Trackball **Tablet**

CHARACTER GENERATOR

Character Definition Analog

Display Method Stroke (5 average) Character Code ASCII - or EBCDIC

Number of Strokes per Character

Variable - max. of 16 components of vectors

Number of Characters in Font

96 upper case and symbols 192 upper, lower case and symbols

Character Aspect Ratio

 $\frac{\text{height}}{\text{width}} = \frac{5}{4}$ width

Character Height .125, .250, and .500

(.375 optional)

Bold and/or Italic Characters

Optional

CIRCLE, ELLIPSE GENERATOR

Circle, Ellipse Center

Coordinate Locations Last coordinates

Segment Start and Stop Display

Each programmable in 5°

increments CCW from 0°

reference axis

Circle Radius, Ellipse

Coordinates Programmable to 511

raster units

Circles, ellipses per Word

3-DIMENSIONAL ROTATION with ORTHOGONAL PROJECTION

Double precision accuracy without cumulative error

REFRESHER MEMORY

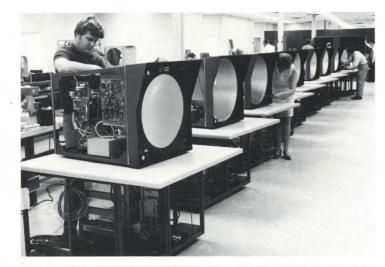
Type Core Word Size 16 Bits

Number of Words 8192 (Field expandable

to 16,384)

Cycle Time 1μ sec.

Specifications subject to change without notice





Computer Graphics Facility, Paramus, N.J.

ABOUT LUNDY

Lundy Electronics & Systems, Inc., listed on the American Stock Exchange, has been manufacturing computer peripheral equipment for many years through its Computer Peripheral Division. Recent Lundy Systems include remote terminal systems and MICR check repair and data processing systems for banks. Lundy, manufacturer of MICR reader-sorters for IBM, Honeywell, NCR and General Electric, is equipped with the most modern facilities and equipment available for the design and manufacture of computer peripheral systems and devices.

In addition to its Computer Graphics Facility at Paramus, New Jersey and the Computer Peripherals Plant in Charlotte, North Carolina, Lundy maintains a Defense Division and corporate headquarters at Glen Head, New York and other plants at Pompano Beach, Florida, Ipswich, Massachusetts and Cucamonga, California.





Computer Peripheral Plant, Charlotte, N.C.



LUNDY ELECTRONICS & SYSTEMS, INC. COMPUTER GRAPHICS OPERATION

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