Model 2648A

2648A GRAPHICS TERMINAL

The 2648A Graphics Terminal combines the latest in micro-processor and raster scan technology to provide a bright, easy-to-read display. The 2648A is a flexible and feature oriented graphics terminal that is friendly and easy-to-use. It offers users the opportunity to explore and try out new ideas in graphics.

The 2648A is the first graphics terminal in the growing 2640 family of terminals. It offers high performance graphic capabilities to users requiring low cost graphic terminals. Also, the 2648A offers all the alphanumeric capabilities of the 2645 terminal, making it a versatile tool for inter-active graphics, data entry, and program development.

Features

Raster Scan Technology
- Bright, easy-to-read display
- Selective Erase

Independent Graphic and Alphanumeric Display Memories
- Graphics memory with 720 by 360 displayable points

Hardware Zoom and Pan
- Magnifies display up to 16 times
- Pans within the magnified display

Automatic Plotting
- Friendly, easy-to-use plot capability that is system/software independent

Rubber Band Line
- Quick, user-initiated picture generation

Rectangular Area Shading with User Specified Pattern

Graphics Text Composition
- Variable character orientation and size
- Block or slanted

Plus the following 2640 series features:

High Resolution Alphanumeric Display
- Multiple plug-in character sets
- Inverse video.
- Half-bright, underline and blinking (optional).

Choice of Communications Capability
- RS232C or 20ma current loop
- Point-to-point; asynchronous

Modular Architecture; Microprocessor Controlled

Hardcopy Interface
- RS232C serial printer interface
- HP parallel printer interface
- Video interface

Reliability, Serviceability/Self-Test
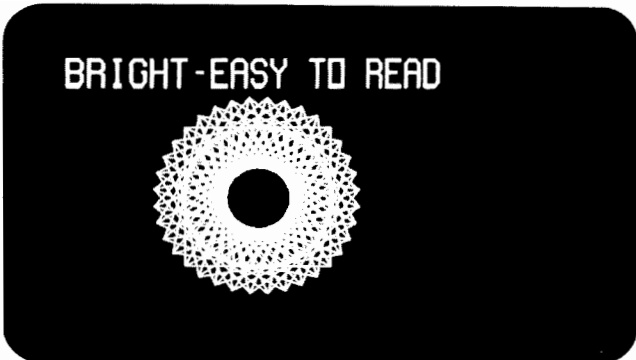
9 User-Defined Soft Keys
- Up to 80 characters per key

Forms Mode and Editing Capability
- Insert/delete lines or characters
- Character/block mode operation
- Field checking
- Automatic data logging

### Fully Integrated Mass Storage Option
- Dual mini cartridges with up to 110 kilobytes of storage each

RASTER SCAN TECHNOLOGY

The 2648A can be used in bright ambient light environments since raster scan provides a bright, easy-to-read display. The bright display also helps to minimize eye fatigue during extended sessions at the terminal.

With refreshed raster scan technology, the ability to modify selected portions of a picture is a natural feature. Portions of the picture can be modified without completely erasing and redrawing the entire display. This minimizes the system software overhead, user wait-time, and communication costs.
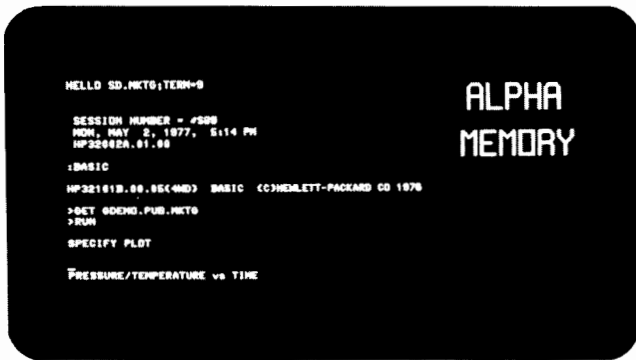
## INDEPENDENT GRAPHIC AND ALPHANUMERIC DISPLAY MEMORIES

The Graphic and Alphanumeric display each have their own independent random access memory (RAM). The alphanumeric display memory can typically contain up to one and one half pages of text (75) lines each containing 80 characters or over 350 short lines). The independent graphics memory, consisting of sixteen 16K RAMs, has 720 by 360 displayable points. Because these two separate memories are independent, computer transactions do not have to obscure the graphics picture. Either the graphics or alphanumeric memory display can be suppressed without disturbing the other, improving the readability of the display. Also, the graphic and alphanumeric displays each have their own separate cursor control keypad.
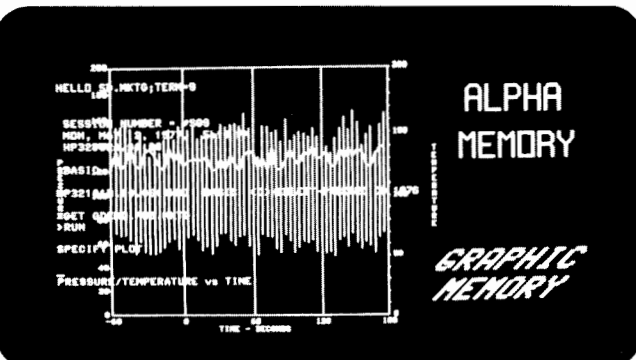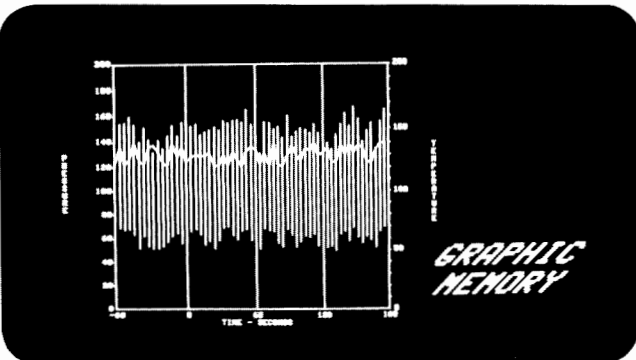
HARDWARE ZOOM AND PAN

The graphics display can be magnified incrementally from one to sixteen times (16X). This feature allows the user to make full use of the 720 by 360 dot resolution. This allows investigation and/or modification of dense display areas such as parallel lines separated by only a single dot spacing. Panning can then be used to view any area of the magnified display not in the viewing window. The complete display can be panned through without affecting the graphics display memory.
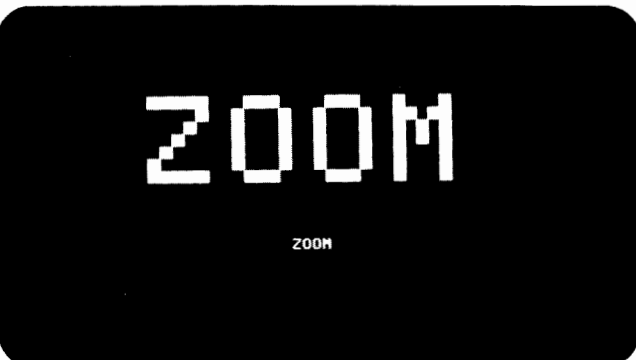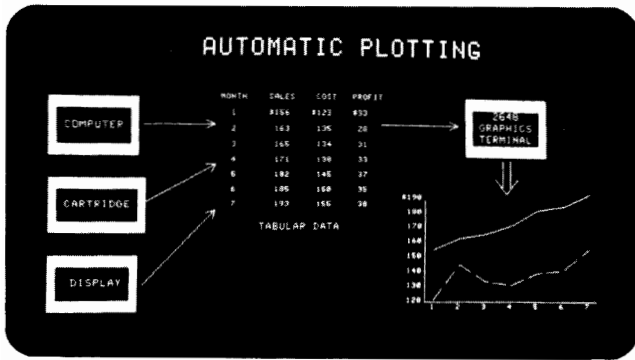
AUTOMATIC PLOTTING

To put graphics into the hands of those with little or no programming knowledge, the 2648A plots user generated tabular data automatically. A simple menu is provided to lead the user through a question and answer session about the data. Once the data parameters are defined, the data is plotted by a single keystroke. This powerful feature makes graphics friendly, easy-to-use, and is system/software independent.
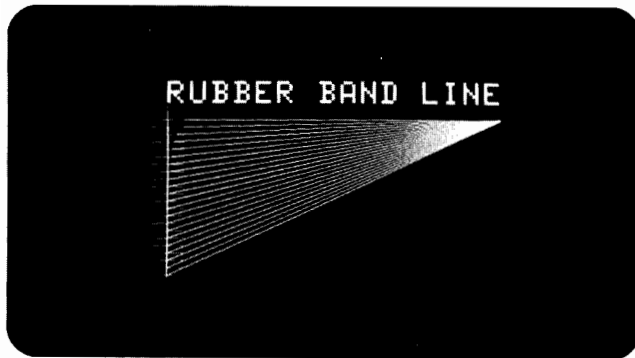
Rubber Band Line

Trial graphics can be performed with or without computer support using the Rubber Band Line. This provides quick, user initiated picture generation or modification. This feature allows the user to draw a line segment between a predetermined position and the graphics cursor. Through a simple set of keystrokes, one end of a line segment is fixed into position while the other is automatically drawn to the graphics cursor. As the graphics cursor moves to a desired position, the line segment automatically stretches with directional changes of the cursor. After the graphics cursor reaches its final position, a fixed line segment can be drawn.
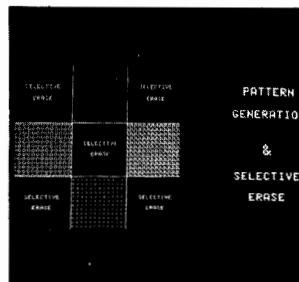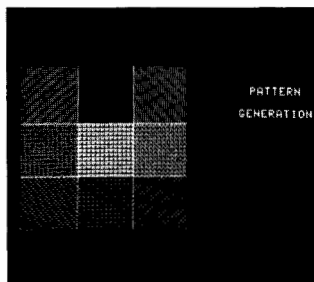
RECTANGULAR AREA SHADING

Rectangular area shading adds a new visual dimension to graphics by enhancing the shading of parts and assemblies, and facilitates differentiation of bar graphs. The user can specify unique patterns within an eight bit by eight bit cell, making it easy to use a variety of shading patterns.

GRAPHICS TEXT COMPOSITION

Characters entered into the graphics display memory can be varied in shape, size, and orientation. This feature allows the user to select an incremental character size, orientation (90-degree multiples), and slant (italic). In addition, it lets the user left/right justify or center graphics text automatically. This feature helps the user label axes and makes it easy to add notes or comments to a graph after it is displayed.

COMPATIBILITY MODE

When in compatibility mode, the 2648A can accept data formatted for some terminals with 1024 by 780 displayable points. The 2648A can either display a 720 by 360 dot subset of the picture for viewing or the entire 1024 by 780 formatted picture can be scaled automatically to fit in the 2648A's display.

Turn your ideas into pictures before you commit to final design. The 2648A helps make your ideas easy to visualize, from concept to final product.

BUSINESS DECISION MAKING

Try the 2648A's Automatic Plotting feature on your business application. You will find it an easy way to plot tabular data without the need to develop expensive system software. This feature allows you to quickly see market trends and explore your own market problems. For example, simply enter tabular data from the keyboard, cartridge tape, or remote computer; and with a few simple keystrokes it quickly plots the data.
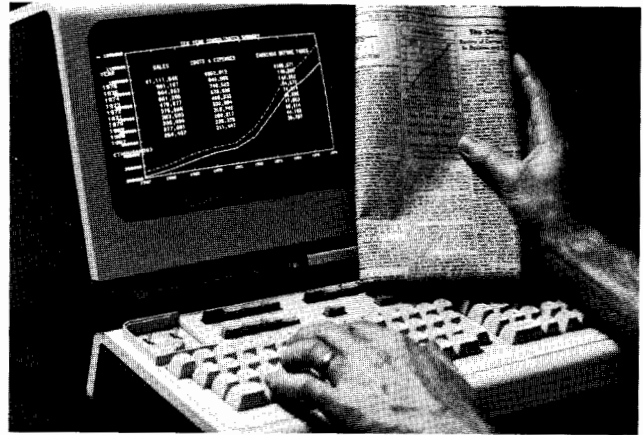
ANTENNA DESIGN

If you are doing computer aided antenna design and you need a quick look at the radiation field pattern, you can use the 2648A. The terminal coupled with your system, can plot contour maps quickly. Immediately the effect of varying design parameters is available for analysis. The alphanumeric display allows you to interact with your computer system and save computer transactions in the independent alphanumeric memory without disturbing the graphics picture.
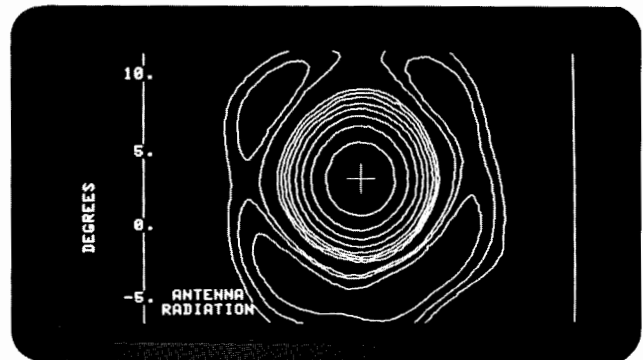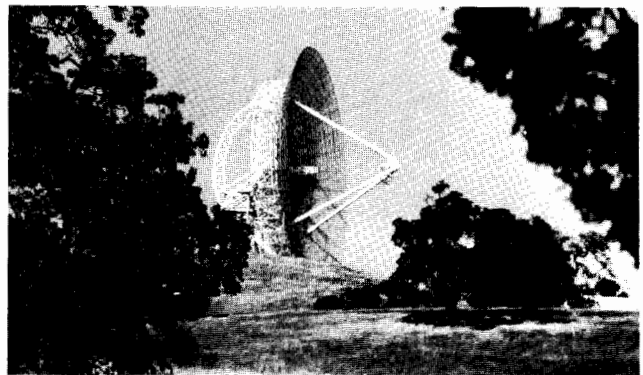
COMPUTER AIDED DESIGN

If you use a computer aided design system for electrical circuits, mechanical parts, or Integrated Circuit mask design, the 2648A can help. The zoom and pan features let you use the full resolution of the 720 by 360 displayable points. The zoom feature allows you to get a closer look at dense areas of the graphics display. You can also pan to any portion of the graphics memory display not in the viewing window. These features can help you see your design before you commit it to hardcopy thus saving you computer connect time and money.
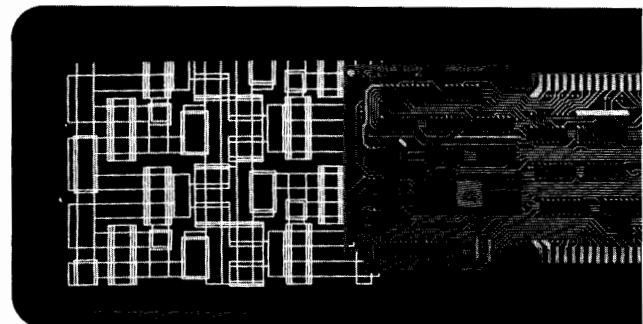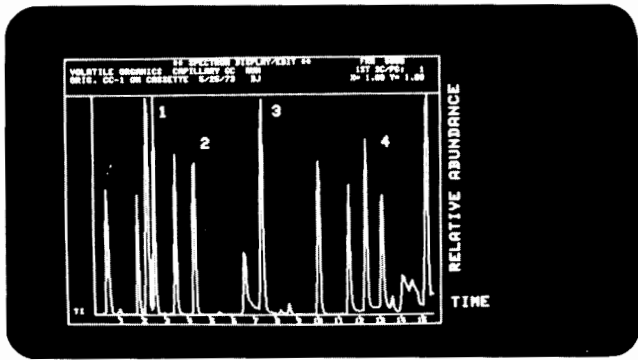
SPECTRAL ANALYSIS

If you have a computer-controlled gas chromatograph/mass spectrometer system and need spectral plots, the 2648A's bright display and graphics text composition can help. For example, during extended computer sessions where spectral plots might be analyzed, the 2648A's bright display will help reduce operator eye fatigue and stress. After analysis, your spectral plots can be readily labeled. Various points of interest can be annotated quickly and clearly.
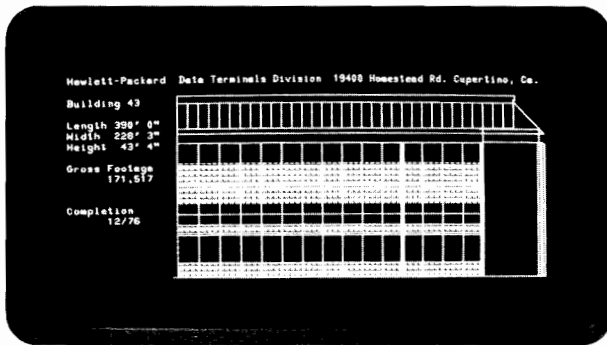

ARCHITECTURAL DESIGN

Computer aided architectual designs can be enhanced and improved using the 2648A. Various parts of a building can be easily distinguished from each other by using a variety of rectangular area shading patterns available in the 2648A. Rubber Band Line aids architectual design by offering quick user initiated picture modification. This will help reduce design and computer time.
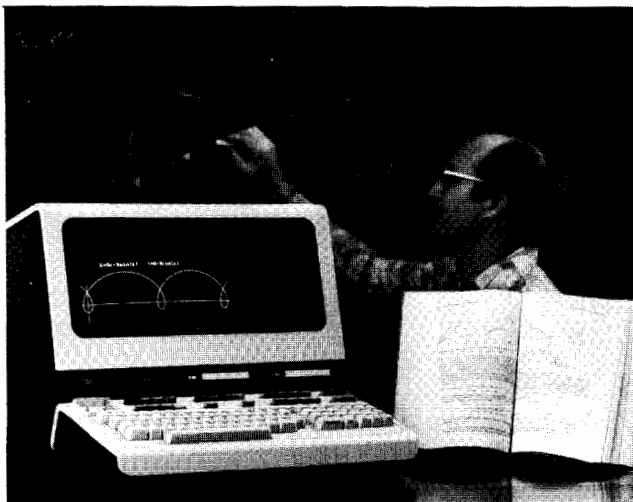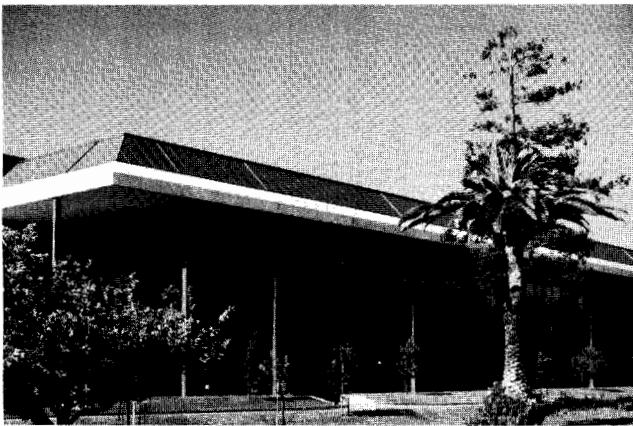
EDUCATION

Help your students visualize scientific, mathematical or engineering problems with the aid of graphics. With computer aided instruction systems, students learn to develop a "feel" for abstract mathematical and physical concepts. The 2648A as an integral part of your system can be used in brightly lit classrooms, making it ideal for lecture demonstrations and small group discussions. Also, the 2648A's bright, easy-to-read display, helps to minimize eye fatigue during extended lab sessions.

COMMUNICATIONS GROUP | CONTROL GROUP | DATA PATH GROUP | USER DEFINED SOFT KEY GROUP | EDIT GROUP

CHARACTER SET GROUP

GRAPHICS CONTROL GROUP | DISPLAY CONTROL GROUP
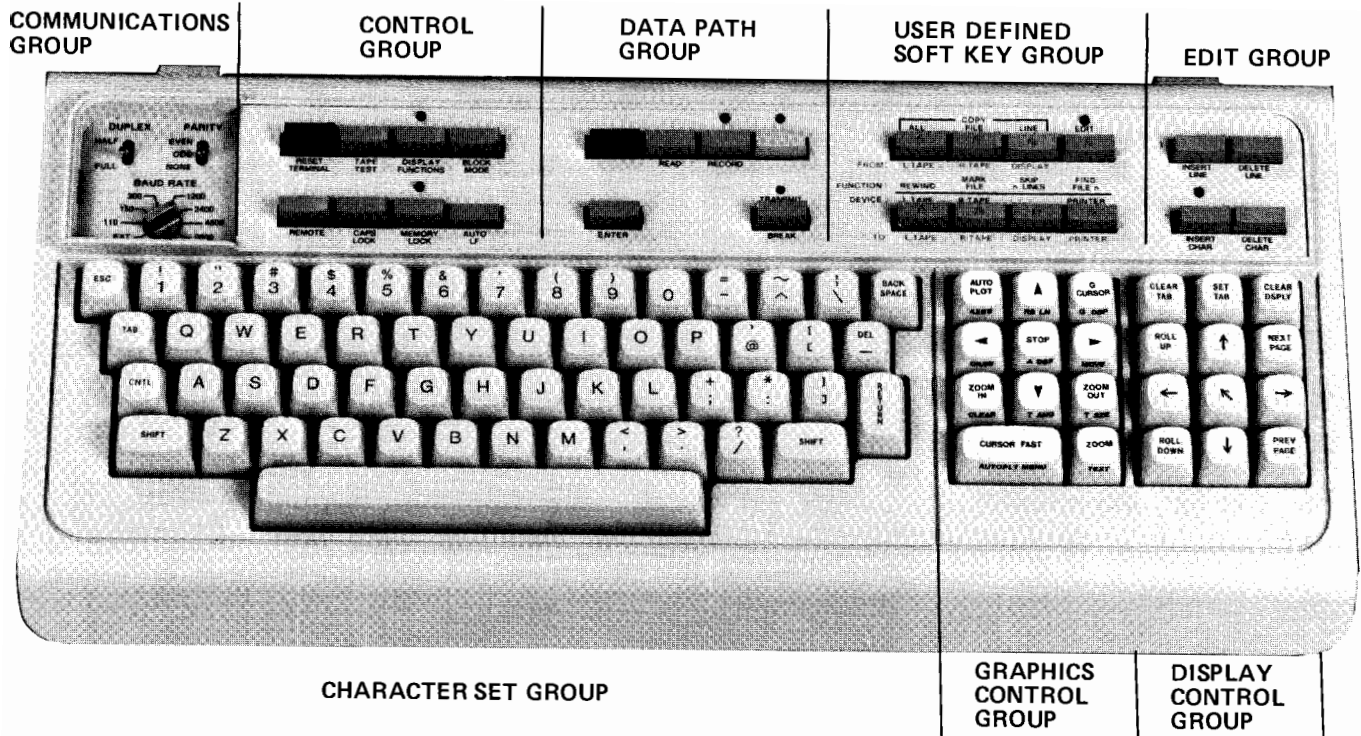
2648A MULTI-TASK KEYBOARD

CHOICE OF COMMUNICATIONS CAPABILITY

The standard 2648A offers asynchronous point-to-point data communications using an RS232C interface. Optional capabilities include: both asynchronous and synchronous (BISYNC) polling for multi-point communications which allow multiple terminals to share communications resources or 20mA DC current loop; split input/output speed and custom baud rates.

MODULAR ARCHITECTURE, MICROPROCESSOR CONTROLLED

Microprocessor implementation and modular architecture produce a terminal with a wide range of capabilities; and, as needs grow, the potential for flexibly adding such features as integrated tape units, alternate communications protocols, additional display memory, printer interfaces and display enhancements.

HARD-COPY INTERFACE

A wide variety of hard-copy devices can be accommodated via an optional RS232C serial interface, HP video output interface, or HP printer compatible parallel interface. Commands to print data can be initiated either locally from the terminal keyboard or remotely from a computer.

HIGH RELIABILITY, SERVICEABILITY

Every element of the 2648A terminal has been engineered for high reliability and ease of service. The optional Mini

Cartridge represents a significant reliability advance for low cost mass storage. The 2648A's Self-Test features give the user an instant diagnostic test that the terminal, including its data communications, is operating properly.

USER-DEFINED SOFT KEYS

Each of the 8 special function keys and the Return key can be easily used to issue a user-defined string of up to 80 characters or several control sequences stored in the 2648A. This feature allows the keyboard to adapt to specialized applications, and can considerably simplify use of the keyboard and result in greater efficiency — each soft key performs the operations of several key sequences. For example, the soft keys could issue frequently used programming sequences, search for files, aid forms construction for data entry, dynamically configure the terminal, or issue instructions to the operator/computer/or both.
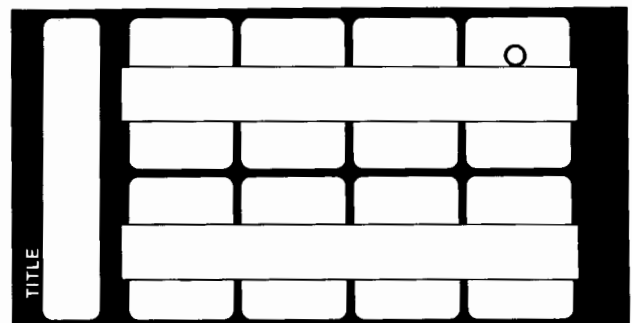
USER-LABELED KEY TEMPLATE

ORDERING EXAMPLE

This is an example of ordering a 2648A Graphics Terminal with cartridge tape, extra cartridges, video hardcopy interface and cable, to be used with a modem.
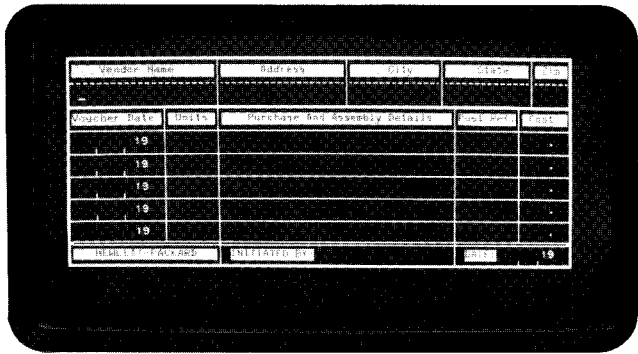
Note: With this configuration there is one available option slot.

2648A	Graphics Terminal
-007	Adds cartridge tape units
-013	Adds five cartridges
-032	Extended Async Data Communications
-054	Video Interface
13232N	103/202 Modem Cable
13232K	Cable, compatible video hardcopy

ORDERING INFORMATION

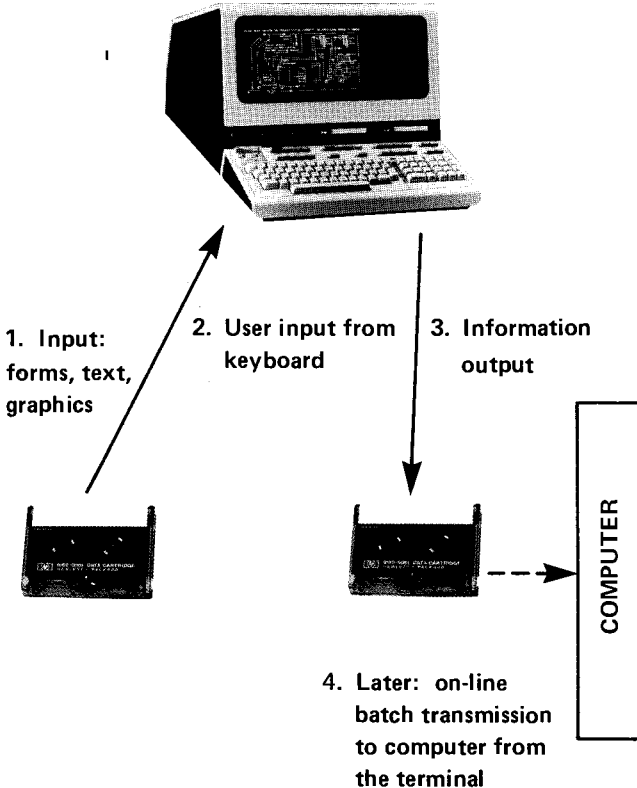| PRODUCT NUMBER	DESCRIPTION	PRICE
2648A	**GRAPHICS TERMINAL** 720 × 360 dot graphics image memory and random access alphanumeric memory. 128 character Roman, inverse video, editing, 9 user-defined soft keys, RS232C, 4 option slots. *Note: No interface cable included.*	
-003	DISPLAY ENHANCEMENTS Adds blinking, half-bright, underline, and Line Drawing character set; and provides for addition of two 128 character sets. (Requires 1 option slot.)	
-004	DISPLAY ENHANCEMENTS WITH MATH AND LARGE CHARACTER SETS Adds blinking, half-bright and underline; and Line Drawing, Math (integral signs, Greek letters, etc.) and Large Character sets. (Requires 1 option slot.)	
-007	INTEGRATED DUAL CARTRIDGE TAPE -- MINI DATA STATION Adds two built-in cartridge tape transports and electronics to provide Mini Data Station capabilities (requires 2 option slots.)	
-013	5 MINI CARTRIDGES	
-015	50 Hz, 230V	
-016	50 Hz, 115V	
-032	EXTENDED ASYNCHRONOUS COMMUNICATIONS Upgrade which provides either RS232C or 20mA current loop communications for the 2648A. Has split speed and custom baud rates.	
-033	ASYNCHRONOUS MULTIPOINT COMMUNICATIONS Provides asynchronous multipoint communications interface for the 2648A allowing daisy chained line sharing. Monitor Mode capability is included.	
-034	SYNCHRONOUS MULTIPOINT COMMUNICATIONS Provides synchronous multipoint communications interface for the 2648A allowing daisy chained line sharing. Monitor Mode capability is included.	
-054	VIDEO OUTPUT INTERFACE Provides video signal for a compatible monitor or hardcopy unit. (Requires 1 option slot.)	
-096	SHARED PERIPHERAL INTERFACE Provides shared interface for compatible devices, includes cable. Recommended peripherals are: 2631G, 7310A, 7245B, and 9876A. (Requires 1 option slot.)	
	ACCESSORIES	
13236B	INTEGRATED DUAL CARTRIDGE TAPE UPGRADE KIT Field upgrade for adding two built-in cartridge tape transports and electronics to provide Mini Data Station capabilities (requires 2 option slots). Includes installation. *Note: 13261A-003 also required.*	
13250B	SERIAL PRINTER INTERFACE Adds interface for connecting RS232C printing devices (requires 1 option slot). No interface cable included (local only, not shared).	
98200A	MINI-CARTRIDGE (available in boxes of fives from Corporate Parts Center).	
	CABLES	
13232C	RS232C cable, female, 5 ft.	
13232F	Current Loop Connector Kit, four wire, 5 ft.	
13232K	Video Cable. For connection to compatible video hardcopy.	
13232L	Video Cable. For connection to compatible video monitor.	
13232M	European Modem cable, male RS232C, 15 ft.	
13232N	Modem cable, male RS232C, 15 ft.	

FORMS MODE AND FULL EDITING CAPABILITY

The 2648A transmits character-by-character as an interactive terminal or is capable of operating on a block at a time. Local editing allows the user to verify and modify data before transmission to the computer. Standard features include character or line insert and delete, cursor sensing/positioning, numeric/alpha field checking, protected fields, transmit-only fields, tabulation, movable margins, character wraparound, automatic data logging, and positional memory display lock. Page select and scrolling can be used to display off-screen memory.

FULLY INTEGRATED MASS STORAGE (OPTION)

Benefits of Mass Storage: Many operations normally requiring connection to a computer system can now be done offline with the 2648A. Optional, dual in-board cartridge tape units allow batching of data or graphics information, and add extensive stand-alone capabilities which can significantly reduce user time; conserve both computer and communications resources; provide a tape backup; and very importantly, allow the terminal to keep on working even when a computer is unavailable.

STANDALONE/OFFLINE:

1. Input: forms, text, graphics

2. User input from keyboard

3. Information output

4. Later: on-line batch transmission to computer from the terminal

COMPUTER

Mini Cartridge: Highly reliable, interchangeable Mini Cartridges each provide the capacity for many hours of typing, up to 110,000 characters of storage formatted in variable length records and files. The tape units feature rapid data transfer and bi-directional high-speed search to access any file in seconds. The Mini Cartridge is ideally suited for storing data, graphics information, forms, programs or text, and is an excellent substitute for paper tape.

2648A SPECIFICATIONS

GENERAL

Screen Size: 127 mm (5 inches) X 254 mm (10 inches)

Screen Capacity: 24 lines X 80 columns (alphanumeric)
720 dots X 360 rows (graphics)

Character Generation: 7 X 9 enhanced (alphanumeric)
9 X 15 dot character cell
Non-interlaced raster scan

Character Size: 2.46 mm (.097 inches) X 3.175 mm
(.125 inches) (alphanumeric)
5 X 7 dot character cell (graphics)

Character Set: 128 character (alphanumeric)

Cursor: Blinking-Underline (alphanumeric)
Blinking-Crosshair (graphics)

Display Modes: White on Black; Black on White
(Inverse Video). Optional half-bright, underline and
blinking.

Refresh Rate: 60 Hz (50 Hz optional)

Tube Phosphor: P4

Implosion Protection: Bonded implosion panel

Memory:
Alphanumeric: 75 lines of 80 characters (less
enhancements)
Graphics: 720 dots by 360 rows of displayable points

Option Slots: 4 available

Keyboard: Detachable, bit pairing; User-defined soft keys,
18 control and editing keys; Graphics pad; cursor pad;
auto-repeat, n-key rollover; 1.2 m (4 foot) cable.

Cartridge Tape (option); Two mechanisms
Read/Write Speed: 10 ips
Search/Rewind Speed: 60 ips
Recording: 800 bpi
Mini Cartridge: 110 kilobyte capacity (maximum per
cartridge

DATA COMMUNICATIONS

Data Rate: 110, 150, 300, 1200, 2400, 4800, 9600 baud,
and external. Switch selectable. (110 selects two stop
bits). Operation above 2400 baud may require nulls or
handshake protocol to insure data integrity. External
clocking requires a TTL signal 16X bps.

Vector Drawing Time (9600 baud, typical):
7 ms — half screen
10 ms — full screen

Standard Asynchronous Communications Interface: EIA
standard RS232C; fully compatible with Bell 103A
modems; compatible with Bell 202C/D/S/T modems.
Choice of main channel or reverse channel line turn-
around for half duplex operation.

Optional Communications Interfaces (see 13260A/B/C/D
Communications data sheet for details):
- Current loop, split speed, custom baud rates
- Asynchronous Multipoint Communications
- Synchronous Multipoint Communications — Bisync

Transmission Modes: Full or half duplex, asynchronous

Operating Modes: On-Line; Off-Line; Character, Block

Parity: Switch selectable; Even, Odd, None

ENVIRONMENTAL CONDITIONS

Temperature, Free Space Ambient:
Non-Operating: −40 to +75°C (−40 to +167°F)
Operating: 0 to 55°C (+32 to +131°F)

Temperature, Free Space Ambient (Tape):
Non-Operating: −10 to 60°C (−15 to +140°F)
Operating: 5 to 40°C (+41 to +104°F)

Humidity: 5 to 95% (non-condensing)

Humidity (Tape): 20 to 80% (non-condensing)

Altitude:
Non-Operating: Sea level to 7620 metres (25,000 feet)
Operating: Sea level to 4572 metres (15,000 feet)

Vibration and Shock (Type tested to qualify for normal
shipping and handling in original shipping carton):
Vibration: .37 mm (0.015'') pp, 10 to 55 Hz, 3 axis
Shock: 30g, 11ms, 1/2 sine

PHYSICAL SPECIFICATIONS

Display Monitor Weight: 19.6 kg (43 pounds)

Keyboard Weight: 3.2kg (7 pounds)

Display Monitor Dimensions: 444 mmW X 457 mmD
X 342 mmH (17.5''W X 18''D X 13.5'' H)
(648 mmD (25.5''D) including keyboard)

Keyboard Dimensions: 444 mmW X 216 mmD X
90 mmH (17.5''W X 8.5''D X 3.5''H)

POWER REQUIREMENTS

Input Voltage: 115 (+10% −23%) at 50/60 Hz (±0.2%)
230 (+10% −23%) at 50 Hz (±0.2%)

Power Consumption: 115 W to 150 W max.

PRODUCT SAFETY

Product meets:
UL Requirements for: EDP equipment, office
appliances, teaching equipment
CSA Requirements for: EDP equipment

U.L. and CSA labels are applied to equipment shipped to
the U.S. and Canada.

PRODUCT SUPPORT

WARRANTY

90 day on-site parts and labor

HP SYSTEMS SUPPORT

Refer to appropriate HP system data sheet for use and
support of 2648A in systems. If this product is used in
a customer-assembled system, the overall operational
responsibility of the system rests with the customer.

INSTALLATION

All product preparation can be performed by the owner/
user. Refer to reference manual supplied with unit for
detailed instructions. HP assistance is provided for
installation upon request and at prevailing rates.

HARDWARE SUPPLIED
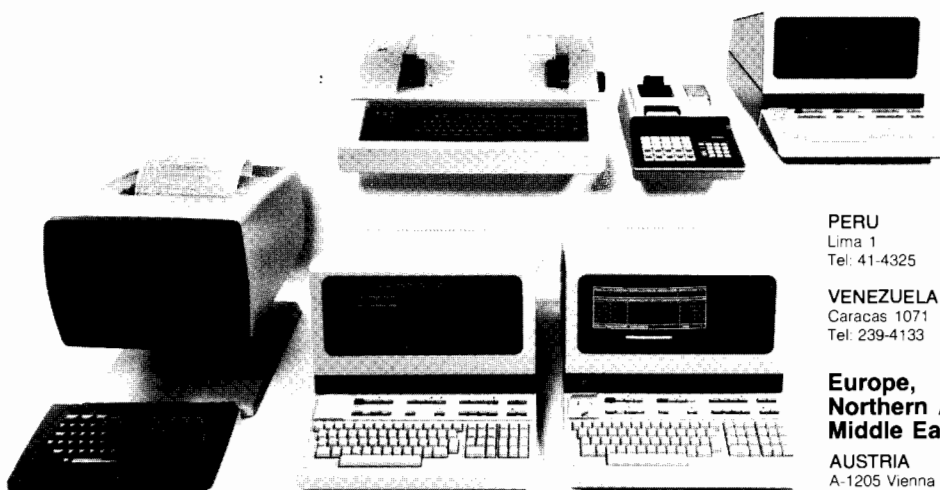
2648A Graphics Terminal

DOCUMENTATION SUPPLIED

2648A User's Manual (02648-90001)
2648A Reference Manual (02648-90002)

Contact Hewlett-Packard
We'll introduce you to our whole family
of data terminals.

United States

ALABAMA
Huntsville
Tel: (205) 881-4591

ARIZONA
Phoenix
Tel: (602) 244-1361

CALIFORNIA
Canoga Park
Tel: (213) 702-8300
Fullerton
Tel: (714) 870-1000
Los Angeles
Tel: (213) 970-7500
North Hollywood
Tel: (213) 877-1282
Palo Alto
Tel: (415) 857-8000
Sacramento
Tel: (916) 929-7222
San Diego
Tel: (714) 279-3200
Santa Clara
Tel: (408) 988-7000

COLORADO
Englewood
Tel: (303) 771-3455

CONNECTICUT
Wallingford
Tel: (203) 265-7801

FLORIDA
Ft. Lauderdale
Tel: (305) 973-2600
Orlando
Tel: (305) 859-2900

GEORGIA
Atlanta
Tel: (404) 955-1500

HAWAII
Honolulu
Tel: (808) 955-4455

ILLINOIS
Rolling Meadows
Tel: (312) 255-9800

INDIANA
Indianapolis
Tel: (317) 842-1000

IOWA
Iowa City
Tel: (319) 351-1020

KENTUCKY
Louisville
Tel: (502) 426-0100

LOUISIANA
Kenner
Tel: (504) 443-6201

MARYLAND
Hanover
Tel: (301) 796-7700
Rockville
Tel: (301) 948-6370

MASSACHUSETTS
Lexington
Tel: (617) 861-8960

MICHIGAN
Farmington Hills
Tel: (313) 476-6400

MINNESOTA
St. Paul
Tel: (612) 644-1100

MISSOURI
Kansas City
Tel: (816) 763-8000
St. Louis
Tel: (314) 878-0200

NEW JERSEY
Paramus
Tel: (201) 265-5000
Piscataway
Tel: (201) 981-1199

NEW MEXICO
Albuquerque
Tel: (505) 292-1330
Las Cruces
Tel: (505) 526-2484

NEW YORK
Albany
Tel: (518) 458-1550
Fairport
Tel: (716) 223-9950
New York City
Tel: (212) 971-0800
Syracuse
Tel: (315) 455-2486
Woodbury
Tel: (516) 921-0300

NORTH CAROLINA
Greensboro
Tel: (919) 852-1800

OHIO
Cleveland
Tel: (216) 243-7300
Dayton
Tel: (513) 859-8202

OKLAHOMA
Oklahoma City
Tel: (405) 721-0200
Tulsa
Tel: (918) 665-3300

OREGON
Wilsonville
Tel: (503) 682-8000

PENNSYLVANIA
King of Prussia
Tel: (215) 265-7000
Pittsburgh
Tel: (412) 782-0400

SOUTH CAROLINA
Columbia
Tel: (803) 782-6493

TEXAS
Houston
Tel: (713) 776-6400
Richardson
Tel: (214) 231-6101
San Antonio
Tel: (801)974-1700

UTAH
Salt Lake City
Tel: (801) 974-1700

VIRGINIA
Richmond
Tel: (804) 285-3431

WASHINGTON
Bellevue
Tel: (206) 454-3971

WISCONSIN
Brookfield
Tel: (414) 784-8800

Canada

ALBERTA
Calgary
Tel: (403) 253-2713

BRITISH COLUMBIA
Richmond
Tel: (604) 270-2277

NOVA SCOTIA
Dartmouth
Tel: (902) 469-7820

ONTARIO
Mississauga
Tel: (416) 678-9430
Ottawa
Tel: (613) 820-6483

QUEBEC
Pointe Claire
Tel: (514) 697-4232

Central and South America

ARGENTINA
Buenos Aires
Tel: 792-1293

BRAZIL
06400 Barueri-SP
Tel: 421-1311
90000-Porto Alegre-RS
Tel: 22-2998, 22-5621
20000-Rio de Janeiro-RJ
Tel: 286-0237

EL SALVADOR
San Salvador
Tel: 252787

GUATEMALA
Guatemala City
Tel: 316627, 314786,
66471-5, ext. 9

MEXICO
Mexico 23, D.F.
Tel: (905) 676-4600

PERU
Lima 1
Tel: 41-4325

VENEZUELA
Caracas 1071
Tel: 239-4133

Europe, Northern Africa, Middle East

AUSTRIA
A-1205 Vienna
Tel: 36-16-20-29

BELGIUM
B-1170 Brussels
Tel: 02/762 32 00

DENMARK
DK-3460 Birkerod
Tel: (02) 81-66-40

FINLAND
SF-02100 Espoo 10
Tel: (90) 455 0211

FRANCE
F-69130 Ecully
Tel: (78) 33.81.25
F-93153 Le Blanc Mesnil
Tel: (1) 865.44.52
F-91401 Orsay
Tel: (6) 907.78.25
F-31081 Toulouse
Tel: (61) 40.11.12

GERMAN FEDERAL REPUBLIC
D-1000 Berlin 30
Tel: (030) 24 90 86
D-7030 Boblingen Wurttemberg
Tel: (07031) 667-1
D-4000 Dusseldorf 11
Tel: (0211) 5971-1
D-6000 Frankfurt 56
Tel: (0611) 50-04-1
D-2000 Hamburg 60
Tel: (040) 63804-1
D-3000 Hannover 91
Tel: (0511) 46 60 01

GREAT BRITAIN
Altrincham,
Cheshire, WA14 1NU
Tel: (061) 928 6422
Castleford,
Yorkshire, WF10 1AE
Tel: (0977) 550016
London Colney,
Hertfordshire, AL2 1HA
Tel: (0727) 24400
Shirley, Solihull
West Midlands, B90 3BJ
Tel: (021) 7458800
Winnersh, Wokingham
Berkshire, RG11 5AR
Tel: (0734) 784774

GREECE
Athens 133
Tel: 32 30 303/32/37 371

IRELAND
Dublin 2
Tel: 680424, 26

ITALY
I-20063 Milano
Tel: (02) 903691
I-35100 Padova
Tel: (049) 664888
I-00143 Roma
Tel: (06) 54 69 61
I-10133 Torino
Tel: (011) 682245/659308

LUXEMBURG
B-1170 Brussels
Tel: 660.50.50

NETHERLANDS
Amstelveen
Tel: (20) 47 20 21

NORWAY
1345 Osteraas
Tel: (02) 1711 80

SCOTLAND
South Queensferry,
West Lothian, EH30 9TG
Tel: (031) 331 1188

SPAIN
Madrid 16
Tel: (1) 458 26 00
E-Barcelona 29
Tel: 322-2451, 321-7354

SWEDEN
S-161 Bromma 20
Tel: (08) 730 05 50

SWITZERLAND
CH-8952 Schlieren-Zurich
Tel: (01) 7305240/730182⊦
CH-1219 LeLignon-Geneva
Tel: (022) 83-81-11

USSR
Moscow 101000
Tel: 294-2024

Southern Africa, Asia, Australasia

AUSTRALIA
Blackburn, Victoria 3130
Tel: 89 6351
Fyshwick A.C.T. 2609
Tel: 804-244
Nedlands, W.A. 6009
Tel: 386-5455
North Ryde, N.S.W. 2113
Tel: 887-1611
Parkside, S.A. 5063
Tel: 272-5911
Spring Hill, QLD. 4000
Tel: 229-1544

HONG KONG
Kowloon
Tel: 3-697446

INDIA
Bangalore 560 025
Tel: 55668
Prabhadevi, Bombay 400 025
Tel: 46 65 55
New Dehli 110 024
Tel: 682547

JAPAN
Yodogawa-ku, Osaka, 532
Tel: 06-304-6021
Suginami-ku, Tokyo 168
Tel: 03-331-6111

NEW ZEALAND
Epsom, Aukland
Tel: 68-7159
Kilbirnie, Wellington 3
Tel: 877-199

PHILIPPINES
Metro Manila
Tel: 85-35-81, 85-34-91

SINGAPORE
Singapore 0511
Tel: 631788

SOUTH AFRICA
Sandton, 2144
Tel: 802-5111

TAIWAN
Kaohsiung
Tel: 241-2318
Taipei
Tel: 751-0404

For Countries and Areas Not Listed:

EASTERN USA
Paramus, New Jersey
Tel: (201) 265-5000

MIDWESTERN USA
Rolling Meadows, Illinois
Tel: (312) 255-9800

SOUTHERN USA
Atlanta, Georgia
Tel: (404) 955-1500

WESTERN USA
North Hollywood, California
Tel: (213) 877-1282

CANADA
Mississauga, Ontario
Tel: (416) 678-9430

EAST EUROPEAN AREAS
Vienna, Austria
Tel: (222) 35-16-20

EUROPEAN AREAS
Geneva, Switzerland
Tel: (022) 98-96-51

MEDITERRANEAN AND MIDDLE EAST AREAS
Athens, Greece
Tel: 808-0359, 808-0429

FAR EAST AREA HEADQUARTERS:
Kowloon, Hong Kong
Tel: 3-7211443/8

SOCIALIST COUNTRIES, CONTACT:
Vienna, Austria
Tel: 35-16-20-29

ALL OTHER AREAS
Hewlett-Packard Intercontinental
3495 Deer Creek Road
Palo Alto, California 94304, USA
Tel: (415) 857-1501

12-1-80

HEWLETT PACKARD