



 **HEWLETT-PACKARD 9862A CALCULATOR PLOTTER**

**PERIPHERAL MANUAL**

## HP MANUAL CHANGES

Make all corrections in your manual according to errata. Check the following table for your instrument serial prefix and make indicated changes in the manual.

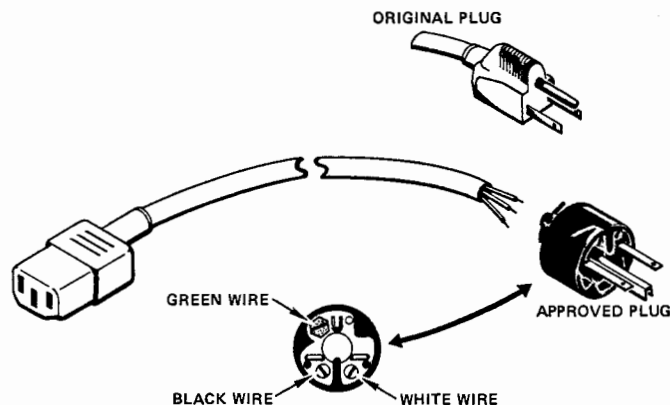
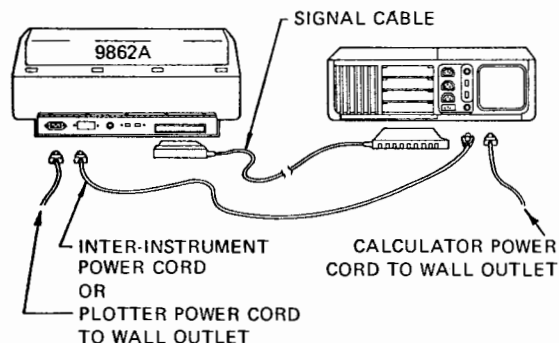
\*New Item

SERIAL PREFIX	MAKE CHANGE	SERIAL PREFIX	MAKE CHANGE	SERIAL PREFIX	MAKE CHANGE
*1504	I				

## ERRATA

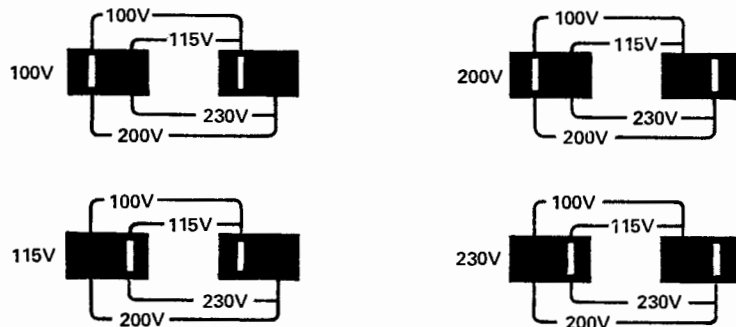
Page 2-1. To comply with Underwriters' Laboratories, Inc. requirements, replace INSTALLATION with the following:

Turn the Calculator OFF. Place the Plotter next to the Calculator and insert the Signal Cable into the appropriate connector on the rear of the Plotter and into any of the four connector slots on the rear of the Calculator.



Note that line voltages of 100 V and 200 V are not used in the United States.

Set the LINE SELECTOR switch, located on the rear panel of the Plotter, to agree with the line voltage used. Select the appropriate setting from the following:



Check that the proper fuse is installed. A 2 amp fuse is required for 100 V and 115 V operation, a 1 amp fuse for 200 V and 230 V operation.

The power cord (P/N 8120-1348) furnished with the Plotter complies with Underwriters' Laboratories, Inc. requirements only when used for 115 V operation. For 230 V operation, the power cord must be replaced or modified. To modify the cord, replace the male plug with a plug approved for 230 V operation. Refer to the following diagram.

MANUAL TITLE: 9862 Calculator Plotter Peripheral Manual

MANUAL PRINTED: April 1972

MANUAL PART NO: 09862-90012

CHANGE DATE: January 20, 1975

## \*CHANGE I

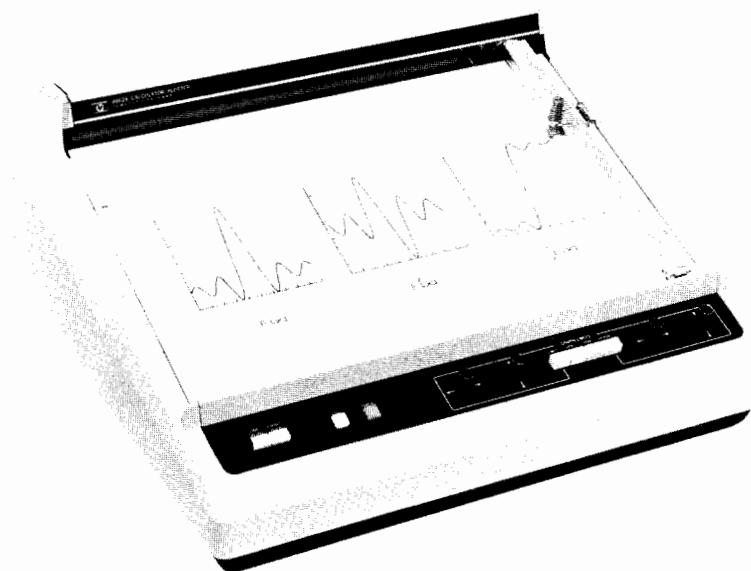
Change I involves installing a different pen lift solenoid in the 9862A Plotter. This change has no impact on the Peripheral Manual.



# PERIPHERAL MANUAL



## HEWLETT-PACKARD MODEL 9862A



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16399 W. BERNARDO DRIVE, SAN DIEGO, CALIFORNIA 92127

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Information about the Plotter can be divided into two classifications; general information, which is pertinent regardless of the Calculating System it is used with, and specific operating information for using the Plotter within a given system configuration. This manual provides the former type of information. Other manuals, generally supplied with an appropriate ROM for the Calculator, provide the specific operating and programming information.

## EQUIPMENT SUPPLIED

The accessories and equipment supplied with each Model 62 are listed below:

PART NO.	QTY	DESCRIPTION
09862-90012	2	Operating Manual
09862-60442	1	Signal Cable
8120-1348	1	Power Cord
8120-1655	1	Inter-Instrument Power Cord
4040-0477	1	Dust Cover
09862-90013	1	Pull-out Instruction Card
5080-3605	1	Slidewire Cleaner
5080-3635	1	Slidewire Lubricant
5080-1190	1	Pkg of 3 Red Pens
5080-1191	1	Pkg of 3 Blue Pens
5080-1193	1	Pkg of 3 Black Pens
9270-1004	10	Graph Paper (English)
9270-1024	10	Graph Paper (Metric)

## ACCESSORIES

## PENS AVAILABLE

DESCRIPTION	PART NUMBER
Package of 3 Red Pens	5081-1190
Package of 3 Blue Pens	5081-1191
Package of 3 Green Pens	5081-1192
Package of 3 Black Pens	5081-1193

## PLOTTING PAPER AVAILABLE

To gain maximum benefit from your Model 62 Calculator Plotter, you will want to use precision-ruled plotting paper. Hewlett-Packard Company offers a wide variety of papers, available through all field offices. These are 11 in. by 16.5 in. (28 cm by 42 cm) or 8.5 in. by 11 in. (21,6 cm by 28 cm) overall and are packaged 100 sheets per box.

### ACCESSORIES (continued)

	PLOT AREA	PART NO.
LINEAR	10 in. x 15 in.	9270-1004
	25 cm x 38 cm	9270-1024
	7 in. x 10 in.	9270-1006
	18 cm x 25 cm	9270-1023
SEMI-LOG	10 in. x 2 cycle	9280-0159
	10 in. x 3 cycle	9280-0160
	2 cycle x 15 in.	9280-0169
	3 cycle x 15 in.	9280-0168
LOG-LOG	2 cycle x 3 cycle	9280-0167
	3 cycle x 2 cycle	9280-0165
	3 cycle x 4 cycle	9280-0171
BLANK (W/SCALING POINTS)	10 in. x 15 in.	9280-0180

This graph paper, especially made for use with the Model 62 Calculator Plotter, is manufactured with rigid control over margin tolerances and alignment. This insures that vertical and horizontal lines drawn by the Plotter will always be parallel or perpendicular to the lines on the graph paper.

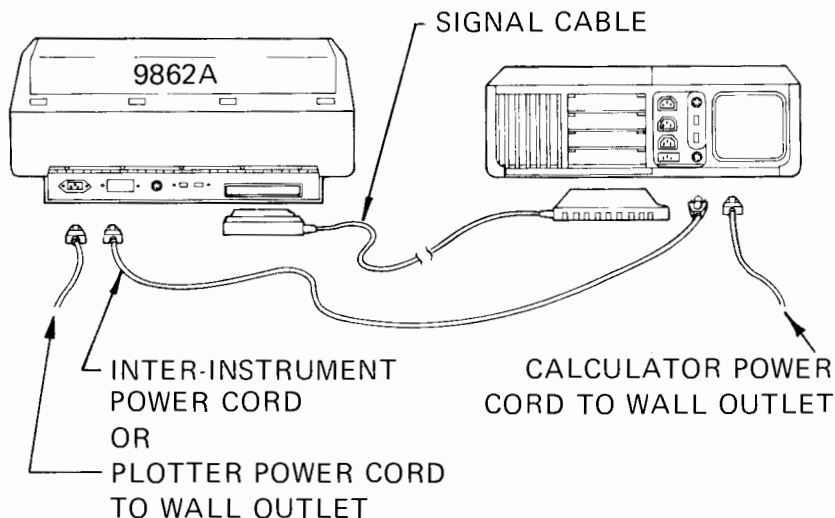
### SERVICE CONTRACTS

Service Contracts are recommended for your Model 62 Calculator Plotter to ensure maximum operating life. For further information contact your local Hewlett-Packard Sales and Service Office listed in the back of this manual.

The Plotter was carefully inspected prior to shipment. It should be free of marks or scratches and in perfect operating condition when received. Inspect the Plotter for physical damage and inventory the supplied accessories listed on page 1-1. If the Plotter is damaged or if a performance deficiency is indicated, file a claim with the carrier or contact your nearest Hewlett-Packard Sales and Service Office listed in the rear of this manual.

To verify proper operation of the Plotter refer to documentation supplied with your Calculator or Calculator ROM.

Turn the Calculator OFF. Place the Plotter next to the Calculator (see diagram) and insert the Signal Cable into the appropriate connector on the rear of the Plotter and into any one of the four connector slots on the rear of the Calculator. Set the line voltage selector switch on the back of the Plotter to agree with the line voltage used. Check that the proper fuse is installed. Remove the bracket securing the upper end of the carriage arm and pen carriage to the right side of the Platen. Connect the Plotter's power cord to an appropriate power receptacle.



To protect operating personnel, the National Electrical Manufacturer's Association (NEMA) recommends that the panels and cabinets of the 9800 Calculating System be grounded. The three-conductor power cables supplied provide this ground when plugged into the proper receptacle. The Model 62 meets the International Electro-Technical Commission (IEC) Specifications.

## INITIAL INSPECTION

## ELECTRICAL INSPECTION

## INSTALLATION

## GROUNDING REQUIREMENTS



## SHIPPING

Before returning the instrument for any reason, notify the local field sales office of the difficulty encountered, giving the model and serial number of the instrument. They will furnish shipping instructions. The following precautions should be taken when repackaging the Plotter.

1. Remove the ink pen.
2. Secure the upper end of the carriage arm and pen carriage to the right side of the Plotter with the bracket (5080-7834) supplied with the mainframe, to prevent movement while in transit.
3. If being returned for repair, do not send power cord, accessory kit, or other accessories.
4. Wrap the instrument in heavy paper or plastic and surround with three to four inches of shock-absorbing material to cushion and prevent movement inside the shipping container. The container should be sufficiently durable to prevent damage to the instrument during handling. If in doubt, request shipping carton (Part No. 09125-80210) from the nearest Hewlett-Packard Sales and Service Office listed in the rear of this manual.

The HP 9862A Calculator Plotter provides permanent graphic solutions to problems solved by an HP 9800 Series Calculator.

The Plotter plots a graph by moving a pen to the point on the paper corresponding to the coordinates specified. As each new point is entered, the Plotter moves the pen in a straight line from the old to the new point. By controlling whether or not the pen is in contact with the paper at the time the pen moves, the graph can be a solid line, a dashed line, or a series of points. Several ink colors are available and may be employed to superimpose graphs on the same sheet of paper.

The Plotter can produce graphs as large as 10 inches in the Y (vertical) direction by 15 inches in the X (horizontal) direction (25 x 38 cm on metric paper).

The plotting paper is held to the platen (plotting surface) by an electrostatic hold-down mechanism.

Before beginning a plot, the LOWER LEFT and UPPER RIGHT controls (these are the GRAPH LIMITS controls, see page 3-2) are adjusted to correspond to the overall size of the finished plot. This adjustment in no way affects the programmed relationship between the variables—only the physical size of the finished plot. The distance along the X axis as determined by the GRAPH LIMITS controls, is called the plotting range in X. A similar definition is made for Y.

Depending upon the specific Calculator System at your disposal, you may or may not need to concern yourself with the task of actually programming the transformation between problem variable units and units needed to define points on the plotting surface. You may only need to formulate it by telling the Calculator the range of numbers in terms of the problem variables, after which the Calculator automatically does the conversion as it gives the data to the Plotter. The extent of these and other capabilities, such as drawing axes, forming tic marks, and lettering, depends upon the specific Calculator configuration used to drive the Plotter.

Internally, the Plotter divides each plotting range into 10,000 parts, or "counts". The coordinate information that passes from the Calculator to the Plotter is in terms of these counts. For instance, to move the pen to the center of the graph, the Calculator must instruct the Plotter to move the pen to the location corresponding to 5,000 counts in the X-range and 5,000 counts in the Y-range.

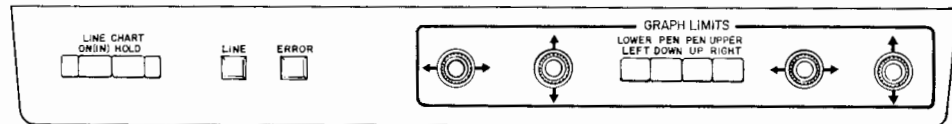
## NOTE

The actual distances in inches of the plotting ranges are determined by settings of the GRAPH LIMITS controls.

## THE PLOTTING PROCESS



## PANEL CONTROLS



LINE	When depressed, allows power to be supplied to Plotter.
CHART HOLD	When depressed, activates electrostatic paper holddown. When released, deactivates paper holddown and places unit in standby — a condition where unit is inactive.
LINE Indicator	Lights when power is applied to Plotter.
ERROR Indicator	Lights when data coordinates outside range of Plotter are received, the pen has traveled into one of the mechanical limits, or the Plotter recognizes a data transfer format error which would cause improper data to be plotted. The Calculator will continue to calculate but the pen will lift and remain stationary until plot can continue.
GRAPH LIMITS	
PEN DOWN	Lowers the pen; overriding the source-input pen information while depressed.
PEN UP	Lifts the pen; overriding the source-input pen information while depressed.
LOWER LEFT Controls	Enters ( $X_{\min}$ , $Y_{\min}$ ) allowing the position of lower left limit to be set anywhere in a 5 in. x 10 in. area of the lower left plotting surface. Controls, as indicated by arrows, adjust the lower left graph limit after depressing of the LOWER LEFT pushbutton.

**NOTE**

Set LOWER LEFT controls before UPPER RIGHT controls. LOWER LEFT interacts with UPPER RIGHT.

UPPER RIGHT Controls	Enters ( $X_{\max}$ , $Y_{\max}$ ) allowing the position of upper right limit to be set anywhere on the plotting surface to the right of and above lower left. Controls, as indicated by arrows, adjust the upper right graph limit after depressing of the UPPER RIGHT pushbutton.
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Standby is the condition in which the Plotter is inactive, the servos are muted, the pen is lifted, and the Plotter's arm may be moved freely. When power is applied, the Plotter automatically is placed in Standby and remains in Standby as long as CHART HOLD is released. If CHART HOLD is depressed, the Plotter may be removed from Standby by a command from the Calculator.

The Plotter may be returned to Standby by releasing CHART HOLD.

To position the paper, release the CHART HOLD switch. Place the paper against the bottom guide and the left paper stop. Depress the CHART HOLD switch and smooth the paper to the platen.

The error light will come on if an attempt is made to move the pen to coordinates corresponding to a position outside of the range established by the GRAPH LIMITS controls.

If the pen is driven against one of the mechanical limits, the pen will lift. The Calculator will continue to run its program.

## NOTE

The Plotter requires a recovery time of 1.3 seconds after ERROR indication is cleared.

## STANDBY

## PAPER POSITIONING

## ERROR INDICATIONS



The Model 62 must be properly maintained to obtain accurate, trouble-free operation. Proper maintenance includes periodic lubrication, performance checks, and visual and electrical checks. In accordance with good maintenance procedures for all precision instruments, your Plotter should be protected from dust by covering when not in use.

The Plotter should be cleaned at regular intervals determined by type of operation, local air contamination and climatic conditions.

The electrostatic platen should be cleaned as needed. Need for cleaning is indicated by the paper sliding easily or by the platen appearing dirty. Clean the electrostatic platen as follows:

1. Remove the pen and paper from the Plotter.
2. Carefully select a soap for cleaning. A mild liquid soap is preferable. Do not use any product with abrasives or corrosive chemicals.
3. Also be careful in selecting a cleaning cloth. Use a soft cloth that will not scratch the surface but will readily absorb water.
4. Saturate the cloth in warm, soapy water. Wring the cloth until the majority of the water has been removed.
5. Wipe the table surface clean with this damp cloth.

## CAUTION

NEVER LET WATER STAND ON THE PLATEN.

6. Wipe any moisture from surface.
7. Allow a few minutes to dry before operating the Plotter.

Irregular or "jumpy" plots on a properly adjusted Plotter may indicate worn or dirty balance slidewire or wipers. Slidewires should be cleaned at least every six months.

## CLEANING

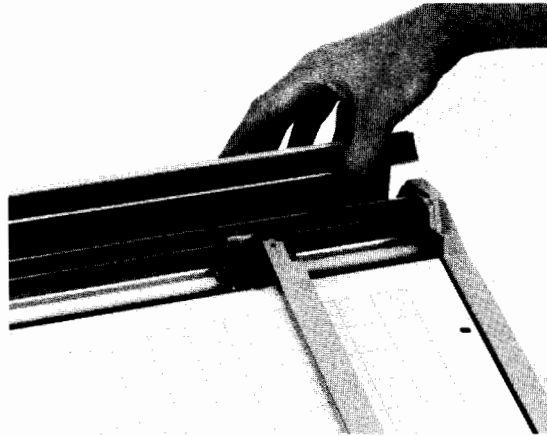
## BALANCE SLIDEWIRE MAINTENANCE

**BALANCE  
SLIDEWIRE  
MAINTENANCE**  
(continued)

**X—AXIS SLIDEWIRE ACCESS**

To gain access to the X—axis slidewire, the rear hood of the Model 62 must be removed.

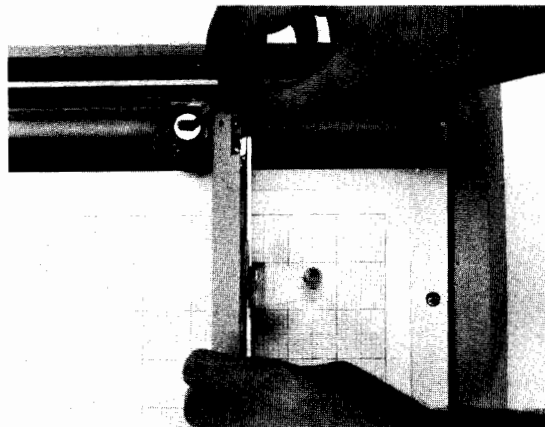
1. Turn the two screws securing the hood one full turn counterclockwise.
2. Remove the hood.



**Y—AXIS SLIDEWIRE ACCESS**

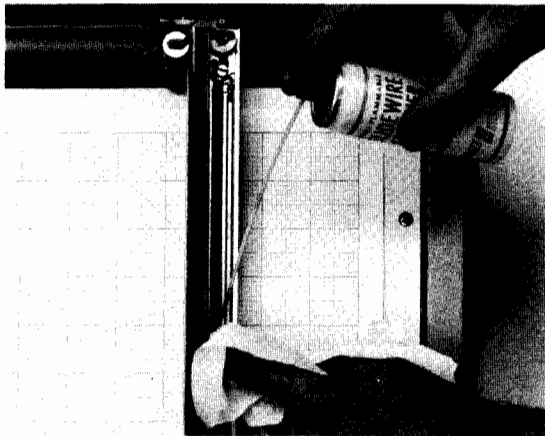
To gain access to the Y—axis slidewire, the rear hood must also be removed.

1. Remove the rear hood as described above.
2. Lift the pen holder up out of the way of the slidewire cover.
3. Turn the black plastic tab on the pen lift assembly one-quarter turn counterclockwise. This will free the slidewire cover.
4. Tilt the slidewire cover up, exposing the Y—axis slidewire.



## SLIDEWIRE CLEANING

To clean the slidewire, turn LINE switch off, then spray the entire slidewire with Slidewire Cleaner (Part No. 5080-3605). Move the carriage arm or pen carriage rapidly through several full-scale excursions. Again spray the wiper with Slidewire Cleaner. Saturate a Kimwipe or cotton swab with Slidewire Cleaner. Rub the slidewire (mandrel and return strip) with the moistened tissue or swab. Repeat the cleaning procedure until there is no stain on the tissue, then clean once more to ensure that all contaminants have been removed.



## SLIDEWIRE LUBRICATION

After cleaning, the slidewire (mandrel and return strip) must be lubricated sparingly with Slidewire Lubricant (Part No. 5080-3635). This lubrication will reduce wear and chemical contamination of the balance slidewire assembly. After completion of cleaning and lubrication, re-install the Y slidewire cover and rear hood.







## SPECIFICATIONS

## Plotting Area:

10 inches on the Y Axis by 15 inches on the X Axis (25 cm by 38 cm on metric paper).

## Graph Limit Controls: (Lower left limit must be set first.)

Enters ( $X_{\min}$ ,  $Y_{\min}$ ) allowing the lower left limit to be set anywhere in a 5 in. x 10 in. area of the lower left plotting surface. Also enters ( $X_{\max}$ ,  $Y_{\max}$ ) allowing the position of the upper right limit relative to ( $X_{\min}$ ,  $Y_{\min}$ ) to be set anywhere on the plotting surface to the right of and above the lower left limit.

## Plotter Vector Length:

Vectors of any length (within plotting area) may be drawn between consecutive data points.

## Pen Control:

Local control of electric pen lift by front panel switches. Remote control from Calculator by program commands. Maximum operations/second = 12. Time required per pen command = 40 milliseconds.

## Writing Method:

Ink, disposable pens.

## Plot Accuracy:

Better than 0.3% of full scale at 25 degrees C + 0.005%/degrees C worst case.

## Numerical Resolution:

1/10,000.

## Resettability:

0.007 inch (0.18 millimeter) maximum.

## Temperature Range:

5 degrees C to 45 degrees C. Lower left (origin) stability is better than 0.0025 in./degrees C (0.07 mm/degrees C). Upper right (full scale) temperature coefficient is better than 0.016%/degrees C.

**SPECIFICATIONS**  
(continued)

## Power:

100V, 115V, 200V, or 230V  $\pm 10\%$  (choice of 4 positions). 48 to 66 Hz,  
100 Watts.

## Weight:

Net 40 lbs (18,1 kg).  
Shipping 52 lbs (23,6 kg).

## Dimensions:

8½ in. high x 20 in. wide x 19⅞ in. deep (213 mm x 500 mm x 484 mm).

## Plotting Time:

The actual plotting time of the 9862A will be determined by the time required by either the Calculator or the Plotter, whichever is greater. The plotting time for a 0.5 in. vector is approximately 90 ms.







## SALES & SERVICE OFFICES

### UNITED STATES

**ALABAMA**  
6290 Whitesburg Dr., S.E.  
P.O. Box 4207  
**Huntsville** 35802  
Tel: (205) 881-4591  
TWX 810-726-2204  
Medical Only  
228 W. Valley Ave.,  
Room 302  
**Birmingham** 35209  
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TWX 910-367-2092

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Calculators Only  
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P.O. Box 13910  
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**Orlando** 32809  
Tel: (305) 859-2900  
TWX 810-850-0113  
21 East Wright St.  
Suite 1  
**Pensacola** 32501  
Tel: (904) 434-3081

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**Kenner** 70062  
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8003 Troutwood Court  
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TWX 910-989-1185

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TWX 710-441-8270  
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**Poughkeepsie** 12601  
Tel: (914) 454-7330  
TWX 510-248-0012

39 Saginaw Drive  
**Rochester** 14623  
Tel: (716) 473-9500  
TWX 510-253-9981  
5858 East Molloy Road  
**Syracuse** 13211  
Tel: (315) 455-2486  
TWX 710-541-0482

1 Crossways Park West  
**Woodbury** 11797  
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TWX 510-221-2168

**NORTH CAROLINA**  
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1923 North Main Street  
**High Point** 27262  
Tel: (919) 885-8101  
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**Columbus** 43229  
Tel: (614) 436-1041

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**Bellevue** 98004  
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Tel: (414) 541-0550

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TWX 610-831-2431  
Hewlett-Packard (Canada) Ltd.  
915-42 Avenue S.E. Suite 102  
**Calgary** T2G 1Z1  
Tel: (403) 287-1672

**BRITISH COLUMBIA**  
Hewlett-Packard (Canada) Ltd.  
837 E. Cordova Street  
**Vancouver** V6A 3R2  
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TWX 610-822-5059

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Hewlett-Packard (Canada) Ltd.  
513 Century St.  
St. James  
**Winnipeg** R3H 0L8  
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**NOVA SCOTIA**  
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800 Windmill Road  
**Dartmouth** B3B 1L1  
Tel: (902) 469-7820

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1785 Woodward Dr.  
**Ottawa** K2C 0P9  
Tel: (613) 225-6530  
TWX 610-562-8968  
Hewlett-Packard (Canada) Ltd.  
6877 Goreway Drive  
**Mississauga** L4V 1L9  
Tel: (416) 678-9430  
TWX 610-492-4746

**QUEBEC**  
Hewlett-Packard (Canada) Ltd.  
275 Hymus Blvd.  
**Pointe Claire** H9R 1G7  
Tel: (514) 697-4232  
TWX 610-427-3072  
TLX 05-821521 HPCL

Hewlett-Packard (Canada) Ltd.  
2376 Galvani Street  
**Ste-Foy** G1N 4G4  
Tel: (418) 688-8710

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Ltd. in Mississauga

### CENTRAL AND SOUTH AMERICA

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Hewlett-Packard Argentina  
S.A. C. I.  
Lavalle 1171-13, Piso  
**Buenos Aires**  
Tel: 35-0436, 35-0627, 35-0341  
Telex: 012-1009  
Cable: HEWPACK ARG  
**BOLIVIA**  
Stambuk & Mark (Bolivia) Ltda.  
Av. Mariscal Santa Cruz 1342  
**La Paz**  
Tel: 40626, 53163, 52421  
Telex: 3560014  
Cable: BUKMAR  
**BRAZIL**  
Hewlett-Packard Do Brasil  
I.E.C. Ltda.  
Rua Frei Caneca, 1.152-Bela Vista  
01307-São Paulo-SP  
Tel: 288-71-11, 287-81-20,  
287-61-40  
Telex: 309151-23  
Cable: HEWPACK São Paulo

Hewlett-Packard Do Brasil  
I.E.C. Ltda.  
Praça Dom Feliciano, 78-8  
andar (Sala 806-B)  
9000-Porto Alegre-RS  
Cable: HEWPACK Porto Alegre  
Hewlett-Packard Do Brasil  
I.E.C. Ltda.  
Rua Siqueira Campos, 53, 4  
andar (Copa Cabana)  
2000-Rio de Janeiro-GB  
Tel: 257-84-70, 000 (0512)  
Telex: 2100 79 HEWPACK  
Cable: BUKMAR  
Rio de Janeiro

**CHILE**  
Calcagni y Metcalfe Ltda.  
Calle Lira 81, Oficina 5  
Casilla 2118  
**Santiago**  
Tel: 396613  
Cable: CALMET

**COLOMBIA**  
Instrumentación  
Henrik A. Langebaek & Kier S.A.  
Carretera 7 No. 48-59  
Apartado Aéreo 6287  
**Bogotá**, I.D.E.  
Tel: 45-78-06, 45-55-46  
Cable: AARIS Bogotá  
Telex: 44400INSTCO  
**COSTA RICA**  
Científica Costarricense S.A.  
Apartado 10159  
**San José**  
Tel: 21-86-13  
Cable: GALGUR San José  
**GUATEMALA**  
IPESA  
Avenida La Reforma 3-48  
Zona 9  
**Guatemala**  
Tel: 63627, 64786  
Telex: 4192 TELTRO GU

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Hewlett-Packard Mexicana  
S.A. de C.V.  
Torres Adalberto No. 21, 11. Piso  
Col. del Valle  
**México**, D.F.  
Tel: (905) 543-42-32  
Telex: 017 74-507  
Hewlett-Packard Mexicana  
S.A. de C.V.  
Calle Constitución No. 2184  
**Monterrey**, N.L.  
Tel: 48-71-32, 48-71-84  
**NICARAGUA**  
Roberto Terán G.  
Apartado Postal 689  
Edificio Terán  
**Managua**  
Tel: 3451, 3452  
Cable: ROTERAN Managua

**PANAMA**  
Electrónico Balboa, S.A.  
P.O. Box 5167  
Ponce de León 154  
Pda. 3-PTA de Tierra  
**San Juan**, 0906  
Tel: (809) 725-3342, 722-3342  
Cable: SATRONICS San Juan  
Telex: SATRON 3450 332  
**PERU**  
Compañía Electro Médica S.A.  
Ave. Enrique Canaval 312  
San Isidro  
Casilla 1030  
**Lima**  
Tel: 22 3900  
Cable: ELMED Lima

**PUERTO RICO**  
San Juan Electronics, Inc.  
P.O. Box 5167  
Ponce de León 154  
Pda. 3-PTA de Tierra  
**San Juan**, 0906  
Tel: (809) 725-3342, 722-3342  
Cable: SATRONICS San Juan  
Telex: SATRON 3450 332  
**URUGUAY**  
Pablo Ferrando S.A.  
Comercial e Industrial  
Avenida Italia 2877  
Casilla de Correo 370  
**Montevideo**  
Tel: 40-3102  
Cable: RADIUM Montevideo

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Hewlett-Packard de Venezuela  
C.A.  
Apartado 50933  
Edificio Segre  
Tercera Transversal  
Los Rucios Norte  
**Caracas** 107  
Tel: 35-00-11  
Telex: 21146 HEWPACK  
Cable: HEWPACK Caracas

**FOR AREAS NOT LISTED, CONTACT:**  
Hewlett-Packard  
Inter-Américas  
3200 Hillview Ave.  
**Palo Alto**, California 94304  
Tel: (415) 493-1501  
TWX 910-373-1260  
Cable: HEWPACK Palo Alto  
Telex: 034-8300, 034-8493

## EUROPE

### AUSTRIA

Hewlett-Packard Ges. m. b. H.  
Handelska 52 3  
P. O. Box 7  
A-1205 Vienna  
Tel. (0222) 36 16 20 to 29  
Cable: HEWPAK Vienna  
Telex: 75923 hewpak a

### BELGIUM

Hewlett-Packard Benelux  
S.A. N.V.  
Avenue de Col-Vert 1  
(Groenkranslaan)  
B-1170 Brussels  
Tel. (02) 672 22 40  
Cable: PALOBEN Brussels  
Telex: 23 494 paloben bru

### DENMARK

Hewlett-Packard A/S  
Datavej 52  
DK-3460 Birkerød  
Tel. (02) 81 66 40  
Cable: HEWPAK AS  
Telex: 155 40 hpas  
Hewlett-Packard A/S  
Navevej 1  
DK-8600 Silkeborg  
Tel. (06) 82 71 66  
Telex: 155 40 hpas  
Cable: HEWPAK AS

### FINLAND

Hewlett-Packard Oy  
Nätkähuusentie 5  
P. O. Box 6  
SF-00211 Helsinki 21  
Tel. (09) 2031  
Cable: HEWPAK OY Helsinki  
Telex: 12-15383

### FRANCE

Hewlett-Packard France  
Quartier de Courbevoie  
Boite Postale No. 6  
F-91401 Orsay  
Tel. (1) 907 78 25  
Cable: HEWPAK France  
Telex: 60048

Hewlett-Packard France  
Agence Regionale  
Chemin des Mouilles  
Boite Postale No. 12  
F-69130 Ecully  
Tel. (78) 33 81 25  
Cable: HEWPAK France  
Telex: 31 617

Hewlett-Packard France  
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Zone Aeronautique  
Avenue Clement Ader  
F-31770 Colomiers  
Tel. (61) 78 11 55  
Telex: 51957

Hewlett-Packard France  
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Centre d'aviation generale  
F-13721 Aéroport de  
Marseille  
Tel. (91) 85 12 36  
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Hewlett-Packard France  
Agence Regionale  
F-35000 Rennes  
Tel. 74912  
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Hewlett-Packard France  
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F-67000 Strasbourg  
Tel. (88) 35 23 20 21  
Telex: 89141  
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Agence Regionale  
Centre Vauban  
201 rue Colbert  
Entree A  
F-59000 Lille  
Tel. (20) 51 44 14

### GERMAN FEDERAL REPUBLIC

Hewlett-Packard GmbH  
Vertriebszentrale Frankfurt  
Bismarckstrasse 117  
Postfach 560 140  
D-6000 Frankfurt 56  
Tel. (0511) 50 04 1  
Cable: HEWPAKSA Frankfurt  
Telex: 41 32 49 fra  
Hewlett-Packard GmbH  
Technisches Büro Böhlingen  
Herrnbergstrasse 130  
D-7030 Böblingen Württemberg  
Tel. (07031) 66 71  
Cable: HEPAK Böblingen  
Telex: 07265739 bbr  
Hewlett-Packard GmbH  
Technisches Büro Düsseldorf  
Vogelsanger Weg 38  
D-4000 Düsseldorf  
Tel. (0211) 63 30 31 5  
Telex: 85 86 533 hddj d  
Hewlett-Packard GmbH  
Technisches Büro Hamburg  
Wendelstrasse 23  
D-2000 Hamburg 1  
Tel. (040) 21 15 93  
Cable: HEWPAKSA Hamburg  
Telex: 21 63 032 hpm d

Hewlett-Packard GmbH  
Technisches Büro Düsseldorf  
Vogelsanger Weg 38  
D-4000 Düsseldorf  
Tel. (0211) 63 30 31 5  
Telex: 85 86 533 hddj d  
Hewlett-Packard GmbH  
Technisches Büro Hamburg  
Wendelstrasse 23  
D-2000 Hamburg 1  
Tel. (040) 21 15 93  
Cable: HEWPAKSA Hamburg  
Telex: 21 63 032 hpm d

Hewlett-Packard GmbH  
Technisches Büro Hamburg  
Wendelstrasse 23  
D-2000 Hamburg 1  
Tel. (040) 21 15 93  
Cable: HEWPAKSA Hamburg  
Telex: 21 63 032 hpm d

Hewlett-Packard GmbH  
Technisches Büro Hamburg  
Wendelstrasse 23  
D-2000 Hamburg 1  
Tel. (040) 21 15 93  
Cable: HEWPAKSA Hamburg  
Telex: 21 63 032 hpm d

Hewlett-Packard GmbH  
Technisches Büro Hannover  
Melanderstrasse 3  
D-3000 Hannover-Kleefeld  
Tel. (0511) 55 60 46  
Telex: 092 3259  
Hewlett-Packard GmbH  
Technisches Büro Nuremberg  
Neumeyer Str. 90  
D-8500 Nuremberg  
Tel. (0911) 56 30 83 85  
Telex: 0623 860  
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Technisches Büro München  
Unterhachinger Strasse 28  
ISAR Center  
Tel. (089) 601 30 61 7  
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Telex: 32046

Hewlett-Packard GmbH  
Technisches Büro München  
Unterhachinger Strasse 28  
ISAR Center  
Tel. (089) 601 30 61 7  
Telex: 52 49 85  
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Telex: 32046

Hewlett-Packard GmbH  
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Kottb. Strasse 2 4  
D-1000 Berlin 30  
Tel. (030) 24 90 86  
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Kottb. Strasse 2 4  
D-1000 Berlin 30  
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Telex: 21 6588

### IRELAND

Hewlett-Packard Ltd  
King Street Lane  
Winnemore, Wokingham  
GB-Berkshire RG11 5AR  
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Stamford New Road  
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Telex: 668068

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Telex: 32046  
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Via Pietro Maroncelli 40  
I-20124 Milan  
Tel. (2) 6251 (10 lines)  
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Telex: 32046

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Via Pietro Maroncelli 40  
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Telex: 32046  
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Via Pietro Maroncelli 40  
I-20124 Milan  
Tel. (2) 6251 (10 lines)  
Cable: HEWPAKIT Milan  
Telex: 32046

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Via Pietro Maroncelli 40  
I-20124 Milan  
Tel. (2) 6251 (10 lines)  
Cable: HEWPAKIT Milan  
Telex: 32046  
Hewlett-Packard Italiana S.p.A.  
Via Pietro Maroncelli 40  
I-20124 Milan  
Tel. (2) 6251 (10 lines)  
Cable: HEWPAKIT Milan  
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Hewlett-Packard Italiana S.p.A.  
Via Pietro Maroncelli 40  
I-20124 Milan  
Tel. (2) 6251 (10 lines)  
Cable: HEWPAKIT Milan  
Telex: 32046  
Hewlett-Packard Italiana S.p.A.  
Via Pietro Maroncelli 40  
I-20124 Milan  
Tel. (2) 6251 (10 lines)  
Cable: HEWPAKIT Milan  
Telex: 32046

Hewlett-Packard Italiana S.p.A.  
Via Pietro Maroncelli 40  
I-20124 Milan  
Tel. (2) 6251 (10 lines)  
Cable: HEWPAKIT Milan  
Telex: 32046  
Hewlett-Packard Italiana S.p.A.  
Via Pietro Maroncelli 40  
I-20124 Milan  
Tel. (2) 6251 (10 lines)  
Cable: HEWPAKIT Milan  
Telex: 32046

### NETHERLANDS

Hewlett-Packard Benelux N.V.  
Van Heumen Goedhartlaan 121  
P. O. Box 667  
NL-1134 Amstelveen  
Tel. (020) 47 20 21  
Cable: PALOBEN Amsterdam  
Telex: 13 216 hepa nl

### NORWAY

Hewlett-Packard Norge A/S  
Nesveien 13  
Box 149  
N-1344 Haslum  
Tel. 25 38 360  
Telex: 16621 hpnas n

### POLAND

Hewlett-Packard  
Warsaw Technical Office  
Ul. Spitalne 1  
00-120 Warsaw  
Tel. 268031 ext. 30  
Telex: 812453  
Hewlett-Packard  
Warsaw Technical Office  
Ul. Spitalne 1  
00-120 Warsaw  
Tel. 268031 ext. 30  
Telex: 812453

### PORTUGAL

Electra-Empresa Técnica de  
Equipamentos Electricos S. a r l  
Rua Rodrigo da Fonseca 103  
P. O. Box 2531  
P-Lisbon 1  
Tel. (01) 68 60 72  
Cable: TELETRA Lisbon  
Telex: 12598  
Hewlett-Packard  
InterCarbo Mundial de Comercio  
S. a r l  
Rua de Aguiar 138  
P. O. Box 2761  
P-Lisbon 1  
Tel. (01) 53 21 31 7  
Cable: INTERCAMBIO Lisbon  
Telex: 12598

### SPAIN

Hewlett-Packard Española S.A.  
Jerón. No. 3  
E-Madrid 16  
Tel. (1) 458 26 00 (10 lines)  
Telex: 23515 hpe  
Hewlett-Packard Española S.A.  
Jerón. No. 3  
E-Madrid 16  
Tel. (1) 458 26 00 (10 lines)  
Telex: 23515 hpe

Hewlett-Packard Española S.A.  
Jerón. No. 3  
E-Madrid 16  
Tel. (1) 458 26 00 (10 lines)  
Telex: 23515 hpe  
Hewlett-Packard Española S.A.  
Jerón. No. 3  
E-Madrid 16  
Tel. (1) 458 26 00 (10 lines)  
Telex: 23515 hpe

Hewlett-Packard Española S.A.  
Jerón. No. 3  
E-Madrid 16  
Tel. (1) 458 26 00 (10 lines)  
Telex: 23515 hpe  
Hewlett-Packard Española S.A.  
Jerón. No. 3  
E-Madrid 16  
Tel. (1) 458 26 00 (10 lines)  
Telex: 23515 hpe

Hewlett-Packard Española S.A.  
Edificio Albia II 7 B  
E-Bilbao  
Tel. 23 83 06 23 82 06  
Calculators Only  
Hewlett-Packard Española S.A.  
Alvaro Bazan, 12  
(Edificio Luz)  
E-Valencia - 10  
Tel. 60 42 00

### SWEDEN

Hewlett-Packard Sverige AB  
Engelstrevägen 1-3  
Fack  
S-161 20 Bromma 20  
Tel. (08) 730 05 50  
Cable: MEASUREMENTS  
Stockholm  
Telex: 10721  
Hewlett-Packard Sverige AB  
Hagapergsgatan 5C  
S-431 41 Mölndal  
Tel. (031) 27 68 00 01  
Telex: Via Bromma

### SWITZERLAND

Hewlett-Packard (Schweiz) AG  
Zürcherstrasse 20  
P. O. Box 64  
CH-8052 Schlieren Zurich  
Tel. (01) 98 18 21  
Cable: HPAG CH  
Telex: 53933 hpag  
Hewlett-Packard (Schweiz) AG  
9, chemin Louis-Pictet  
CH-1214 Vernier-Geneva  
Tel. (022) 41 49 50  
Cable: HEWPAKSA Geneva  
Telex: 27 333 hpsa ch

### TURKEY

Telekom Engineering Bureau  
Sadik Sok No. 15 1  
Ayaspaşa-Beyoğlu  
P. O. Box 437 Beyoğlu  
TR-Istanbul 1  
Tel. 49 40 40  
Cable: TELEMATIK Istanbul  
Hewlett-Packard (Schweiz) AG  
Zürcherstrasse 20  
P. O. Box 64  
CH-8052 Schlieren Zurich  
Tel. (01) 98 18 21  
Cable: HPAG CH  
Telex: 53933 hpag

### UNITED KINGDOM

Hewlett-Packard Ltd  
King Street Lane  
Winnemore, Wokingham  
GB-Berkshire RG11 5AR  
Tel. Wokingham 784774  
Telex: 847 178 848 179  
Hewlett-Packard Ltd  
The Griftons  
Stamford New Road  
GB-Altrincham, Cheshire  
Tel. (061) 928-9021  
Telex: 668068

Hewlett-Packard Ltd.  
c/o Makro  
South Service Wholesale Centre  
Amber Way  
Halesowen Industrial Estate  
GB-Halesowen, Worcs  
Tel. Birmingham 7860  
Hewlett-Packard Ltd  
4th Floor  
Wedge House  
799, London Road  
GB-Thornton Heath CR4 6XL  
Surrey  
Tel. (01) 684 0105  
Telex: 946825  
Hewlett-Packard Ltd.  
c/o Makro  
South Service Wholesale Centre  
Wear Industrial Estate  
Washington  
GB-New Town, County Durham  
Tel. Washington 464001 ext. 57 58  
Hewlett-Packard Ltd. s registered  
address for V.A.T. purposes  
only  
70, Finbury Pavement  
London, EC2A1SX  
Registered No. 690597

Hewlett-Packard Ltd.  
c/o Makro  
South Service Wholesale Centre  
Wear Industrial Estate  
Washington  
GB-New Town, County Durham  
Tel. Washington 464001 ext. 57 58  
Hewlett-Packard Ltd. s registered  
address for V.A.T. purposes  
only  
70, Finbury Pavement  
London, EC2A1SX  
Registered No. 690597

Hewlett-Packard Ltd.  
c/o Makro  
South Service Wholesale Centre  
Wear Industrial Estate  
Washington  
GB-New Town, County Durham  
Tel. Washington 464001 ext. 57 58  
Hewlett-Packard Ltd. s registered  
address for V.A.T. purposes  
only  
70, Finbury Pavement  
London, EC2A1SX  
Registered No. 690597

### USSR

Hewlett-Packard USSR  
c/o Commercial Office  
American Embassy (Box M)  
A-1099 Vienna, Austria  
Tel. 221 29 71  
Telex: 7825 hewpak SU  
Hewlett-Packard USSR  
c/o Commercial Office  
American Embassy (Box M)  
A-1099 Vienna, Austria  
Tel. 221 29 71  
Telex: 7825 hewpak SU

### YUGOSLAVIA

Iskra-Standard-Hewlett-Packard  
Office  
Miklosova 38 VII  
10000 Ljubljana  
Tel. 315-875 371-674  
Telex: 31265

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### ANGOLA

Electra  
Empresa Técnica de  
Equipamentos  
Electricos, S. A. R. L.  
R. Barbosa Rodrigues, 42-1 D1  
Caxa Postal, 6487-Luanda  
Tel. 35515-6  
Cable: TELETRA Luanda

### AUSTRALIA

Hewlett-Packard Australia  
Pty. Ltd.  
31-41 Joseph Street  
Blackburn Victoria 3130  
Tel. 89-6351, 89-6306  
Telex: 31-024  
Cable: HEWPAK Melbourne  
Hewlett-Packard Australia  
Pty. Ltd.  
31 Bridge Street  
Pymble  
New South Wales, 2073  
Tel. 439-6566  
Telex: 21561  
Cable: HEWPAK Sydney  
Hewlett-Packard Australia  
Pty. Ltd.  
97 Churchill Road  
Prospect 5082  
South Australia  
Tel. 44 8151  
Cable: HEWPAK Adelaide  
Hewlett-Packard Australia  
Pty. Ltd.  
141 Stirling Highway  
Claremont W.A. 6010  
Tel. 86-5455  
Telex: 93859  
Cable: HEWPAK  
Hewlett-Packard Australia  
Pty. Ltd.  
121 Wollongong Street  
Fyshwick A.C.T. 2609  
Tel. 95 3733

### CEYLON

United Electronics Ltd  
P. O. Box 681  
60, Park St  
Colombo 2  
Tel. 26566  
Cable: HOTPOINT Colombo  
Cyprus  
Aphronics  
19 Gregorinis & Xenodouris Rd  
P. O. Box 1152  
Cy P. Nicosia  
Tel. 45628 29  
Cable: KYPRONICS PANDEHS

### HONG KONG

Schmidt & Co. (Hong Kong) Ltd  
P. O. Box 297  
Commercial Centre  
39H Queen  
Connaught Road, Central  
Hong Kong  
Tel. 255291  
Telex: 22765SCHMCHX  
Cable: SCHMIDT CO Hong Kong

### INDIA

Blue Star Ltd.  
Kashin Building,  
Jamsheer Tara Rd  
Bombay 400 020  
Tel. 29 50 21  
Telex: 3751  
Cable: BLUESTAR  
Blue Star Ltd.  
Sahib  
414 2 V. Savarkar Marg  
Pranahadvi  
Bombay 400 025  
Tel. 45 73 51  
Telex: 3751  
Cable: BLUESTAR  
Blue Star Ltd.  
44 40 Civil Lines  
Kangur 208 001  
Tel. 6 88 82  
Cable: BLUESTAR  
Blue Star Ltd.  
7 Hare Street  
P. O. Box 506  
Calcutta  
Tel. 23 0131  
Telex: 655  
Cable: BLUESTAR  
Blue Star Ltd.  
Ohashi Building  
54 Ring Road  
Lajpat Nagar  
New Delhi 110 024  
Tel. 62 32 76  
Telex: 2463  
Cable: BLUESTAR  
Blue Star Ltd.  
11 11A Magarath Road  
Bangalore 560 025  
Tel. 55686  
Cable: BLUESTAR  
Blue Star Ltd.  
Meechik Mandiram  
50 1678 Mahatma Gandhi Rd  
Cochin 682 016 Kerala

### INDONESIA

Blue Star Ltd.  
1 1117  
Sahib Dev Road  
Secunderabad 500 003  
Tel. 7 63 97 73 93  
Cable: BLUESTAR  
Telex: 459  
Blue Star Ltd.  
23 24 Secunderabad  
Madras 600 001  
Tel. 23954  
Telex: 379  
Cable: BLUESTAR  
Blue Star Ltd.  
Nahira Vastous  
7th Floor, Bistapur  
Jamshedpur 831 001  
Tel. 36 04  
Cable: BLUESTAR  
Telex: 240  
Blue Star Ltd.  
Sahib  
414 2 V. Savarkar Marg  
Pranahadvi  
Bombay 400 025  
Tel. 45 73 51  
Telex: 3751  
Cable: BLUESTAR  
Blue Star Ltd.  
44 40 Civil Lines  
Kangur 208 001  
Tel. 6 88 82  
Cable: BLUESTAR  
Blue Star Ltd.  
7 Hare Street  
P. O. Box 506  
Calcutta  
Tel. 23 0131  
Telex: 655  
Cable: BLUESTAR  
Blue Star Ltd.  
Ohashi Building  
54 Ring Road  
Lajpat Nagar  
New Delhi 110 024  
Tel. 62 32 76  
Telex: 2463  
Cable: BLUESTAR  
Blue Star Ltd.  
11 11A Magarath Road  
Bangalore 560 025  
Tel. 55686  
Cable: BLUESTAR  
Blue Star Ltd.  
Meechik Mandiram  
50 1678 Mahatma Gandhi Rd  
Cochin 682 016 Kerala

### IRAN

Blue Star Ltd.  
Sahib  
414 2 V. Savarkar Marg  
Pranahadvi  
Bombay 400 025  
Tel. 45 73 51  
Telex: 3751  
Cable: BLUESTAR  
Blue Star Ltd.  
44 40 Civil Lines  
Kangur 208 001  
Tel. 6 88 82  
Cable: BLUESTAR  
Blue Star Ltd.  
7 Hare Street  
P. O. Box 506  
Calcutta  
Tel. 23 0131  
Telex: 655  
Cable: BLUESTAR  
Blue Star Ltd.  
Ohashi Building  
54 Ring Road  
Lajpat Nagar  
New Delhi 110 024  
Tel. 62 32 76  
Telex: 2463  
Cable: BLUESTAR  
Blue Star Ltd.  
11 11A Magarath Road  
Bangalore 560 025  
Tel. 55686  
Cable: BLUESTAR  
Blue Star Ltd.  
Meechik Mandiram  
50 1678 Mahatma Gandhi Rd  
Cochin 682 016 Kerala

### JAPAN

Yokogawa Hewlett-Packard Ltd  
Ohashi Building  
54 Ring Road  
Lajpat Nagar  
New Delhi 110 024  
Tel. 62 32 76  
Telex: 2463  
Cable: BLUESTAR  
Blue Star Ltd.  
44 40 Civil Lines  
Kangur 208 001  
Tel. 6 88 82  
Cable: BLUESTAR  
Blue Star Ltd.  
7 Hare Street  
P. O. Box 506  
Calcutta  
Tel. 23 0131  
Telex: 655  
Cable: BLUESTAR  
Blue Star Ltd.  
Ohashi Building  
54 Ring Road  
Lajpat Nagar  
New Delhi 110 024  
Tel. 62 32 76  
Telex: 2463  
Cable: BLUESTAR  
Blue Star Ltd.  
11 11A Magarath Road  
Bangalore 560 025  
Tel. 55686  
Cable: BLUESTAR  
Blue Star Ltd.  
Meechik Mandiram  
50 1678 Mahatma Gandhi Rd  
Cochin 682 016 Kerala

### KOREA

Yokogawa Hewlett-Packard Ltd  
Ohashi Building  
54 Ring Road  
Lajpat Nagar  
New Delhi 110 024  
Tel. 62 32 76  
Telex: 2463  
Cable: BLUESTAR  
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54 Ring Road  
Lajpat Nagar  
New Delhi 110 024  
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11 11A Magarath Road  
Bangalore 560 025  
Tel. 55686  
Cable: BLUESTAR  
Blue Star Ltd.  
Meechik Mandiram  
50 1678 Mahatma Gandhi Rd  
Cochin 682 016 Kerala

### LEBANON

Yokogawa Hewlett-Packard Ltd  
Ohashi Building  
54 Ring Road  
Lajpat Nagar  
New Delhi 110 024  
Tel. 62 32 76  
Telex: 2463  
Cable: BLUESTAR  
Blue Star Ltd.  
44 40 Civil Lines  
Kangur 208 001  
Tel. 6 88 82  
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Calcutta  
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Telex: 655  
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Blue Star Ltd.  
Ohashi Building  
54 Ring Road  
Lajpat Nagar  
New Delhi 110 024  
Tel. 62 32 76  
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11 11A Magarath Road  
Bangalore 560 025  
Tel. 55686  
Cable: BLUESTAR  
Blue Star Ltd.  
Meechik Mandiram  
50 1678 Mahatma Gandhi Rd  
Cochin 682 016 Kerala

### LIBYAN

Yokogawa Hewlett-Packard Ltd  
Ohashi Building  
54 Ring Road  
Lajpat Nagar  
New Delhi 110 024  
Tel. 62 32 76  
Telex: 2463  
Cable: BLUESTAR  
Blue Star Ltd.  
44 40 Civil Lines  
Kangur 208 001  
Tel. 6 88 82  
Cable: BLUESTAR  
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P. O. Box 506  
Calcutta  
Tel. 23 0131  
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Cable: BLUESTAR  
Blue Star Ltd.  
Ohashi Building  
54 Ring Road  
Lajpat Nagar  
New Delhi 110 024  
Tel. 62 32 76  
Telex: 2463  
Cable: BLUESTAR  
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11 11A Magarath Road  
Bangalore 560 025  
Tel. 55686  
Cable: BLUESTAR  
Blue Star Ltd.  
Meechik Mandiram  
50 1678 Mahatma Gandhi Rd  
Cochin 682 016 Kerala

### MACAU

Yokogawa Hewlett-Packard Ltd  
Ohashi Building  
54 Ring Road  
Lajpat Nagar  
New Delhi 1

