

OPERATING AND SERVICE MANUAL

12618A

SYNCHRONOUS DATA SET (TRANSMIT AND RECEIVE) INTERFACE KIT (FOR 2100-SERIES COMPUTERS)

Card Assemblies

12621-60001, Rev. 1008 and 1120

12622-60001, Rev. 1008, 1101, 1216, and 1402



Note

This manual is not complete in itself. Refer to the 12621A and 12622A manuals (part numbers 12621-90001 and 12622-90001) for detailed information on the card assemblies that make up this interface kit. All three manuals should be retained with the applicable computer system documentation.

HP Computer Museum
www.hpmuseum.net

For research and education purposes only.

TABLE OF CONTENTS

Section	Page	Section	Page
I		III	
GENERAL INFORMATION		THEORY OF OPERATION	
1-1.	1-1	3-1.	3-1
1-3.	1-1	3-3.	3-1
1-6.	1-1		
1-8.	1-1	IV	
1-10.	1-2	MAINTENANCE	
		4-1.	4-1
II		4-3.	4-1
INSTALLATION AND PROGRAMMING		4-5.	4-1
2-1.	2-1	4-7.	4-1
2-3.	2-1		
2-5.	2-1	V	
2-9.	2-1	REPLACEABLE PARTS	
2-11.	2-1	5-1.	5-1
2-13.	2-2	5-4.	5-1

LIST OF ILLUSTRATIONS

Figure	Title	Page	Figure	Title	Page
1-1.	HP 12618A Interface Kit	1-1	4-1.	Interconnecting Cable (12618-60001)	
1-2.	Typical Duplex Application	1-2		Wiring Diagram	4-1

LIST OF TABLES

Table	Title	Page	Table	Title	Page
2-1.	Interconnecting Cable (12618-60001)		5-1.	HP 12618A Interface Kit Replaceable	
	Information	2-2		Parts	5-1
3-1.	Signals to the Interface Cards from the		5-2.	Reference Designations and Abbreviations	5-2
	Data Set	3-1			
3-2.	Signals from the Interface Cards to the				
	Data Set	3-2			

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. This operating and service manual includes general information, installation, programming, theory of operation, maintenance, and replaceable parts information for the Hewlett-Packard 12618A Synchronous Data Set (Transmit and Receive) Interface Kit (figure 1-1). This manual is not complete in itself. Refer to the 12621A and 12622A Interface Kit Operating and Service Manuals for detailed information on the two interface cards included in the 12618A Interface Kit. All three manuals should be retained with the applicable computer system documentation.

1-3. GENERAL DESCRIPTION.

1-4. The 12618A Interface Kit interfaces Hewlett-Packard 2100-Series Computers with data communications networks equipped with high-speed synchronous data modulator-demodulators (modems) conforming to Electronic Industries Association (EIA) Standard RS-232-B. The Western Electric Model 201A Data Set is an example of an appropriate modem.

Note: If the interface kit is to be used in a 2115 or 2116 computer which includes the Direct Memory Access (DMA) Accessory, the character packing/unpacking program option of the DMA Accessory must not be used.

1-5. This kit is a transmit and receive interface that may be used for half-duplex or full-duplex applications. Figure 1-2 illustrates a typical duplex application.

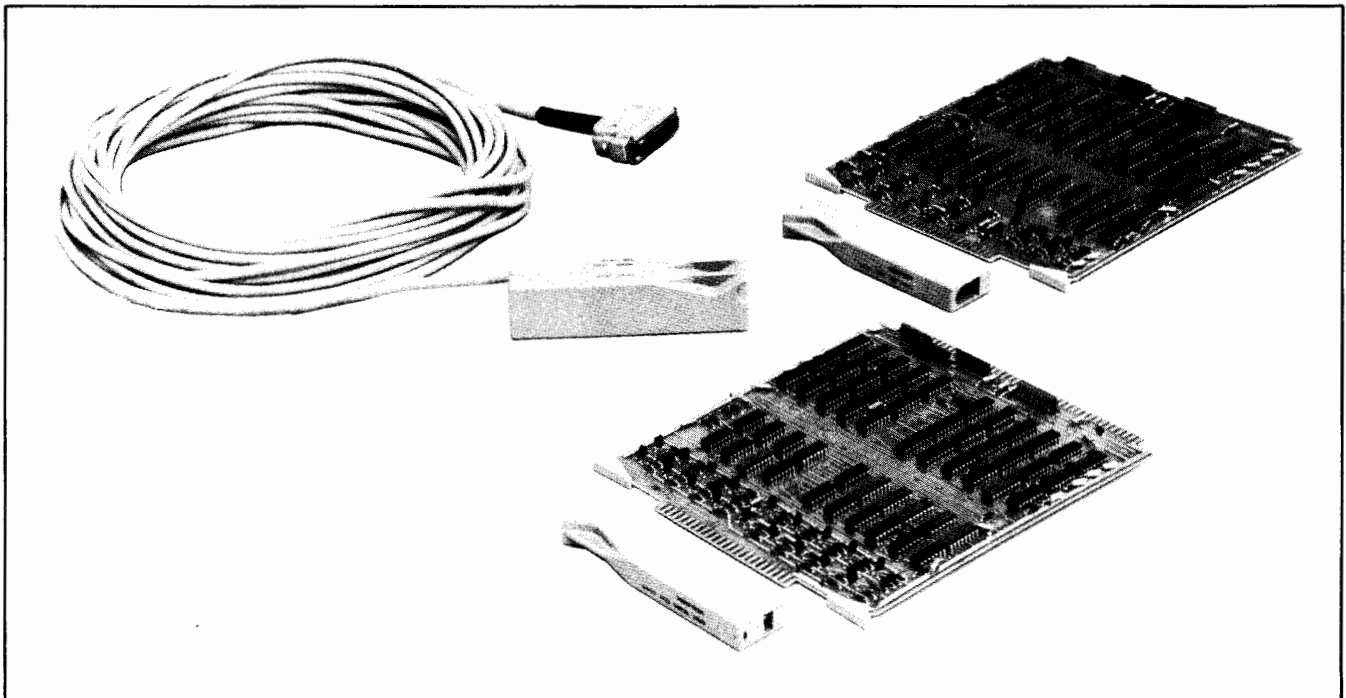
1-6. KIT CONTENTS.

1-7. The interface kit consists of the following:

- a. Synchronous Data Set (Receive) Interface Card (part no. 12621-60001).
- b. Synchronous Data Set (Transmit) Interface Card (part no. 12622-60001).
- c. Branched Cable Assembly (part no. 12618-60001).
- d. Test Connector Assembly (part no. 12621-60005).
- e. Test Connector Assembly (part no. 12622-60005).
- f. Operating and Service Manual (part no. 12621-90001).
- g. Operating and Service Manual (part no. 12622-90001).
- h. Operating and Service Manual (part no. 12618-90001).

1-8. IDENTIFICATION.

1-9. Printed-circuit card revisions are identified by a letter, a revision code, and a division code stamped on the



2094-1

Figure 1-1. HP 12618A Interface Kit

card (e.g., B-1008-22). The letter code identifies the version of the etched trace pattern on the unloaded card. The revision code (four middle digits) refers to the electrical characteristics of the loaded card. The division code (last two digits) identifies the Hewlett-Packard division that manufactured the card. If the revision code stamped on the printed-circuit card does not agree with the revision code shown on the title page of this manual, there are differences between your card and the card described in this manual. These differences are described in manual supplements available at the nearest HP Sales and Service Office.

1-10. SPECIFICATIONS.

1-11. Output signals and input signal circuits conform to the requirements of EIA Standard RS-232-B; i.e., signal levels between 5 and 25 volts (+ or -) and load impedance between 3 and 7 kilohms.

1-12. Power requirements for the receive card (12621-60001) are as follows:

- a. +12 volts at 55 milliamperes.
- b. +4.5 volts at 1.5 amperes.
- c. -2 volts at 130 milliamperes.
- d. -12 volts at 30 milliamperes.

1-13. Power requirements for the transmit card (12622-60001) are as follows:

- a. +12 volts at 40 milliamperes.
- b. +4.5 volts at 1.3 amperes.
- c. -2 volts at 100 milliamperes.
- d. -12 volts at 40 milliamperes.

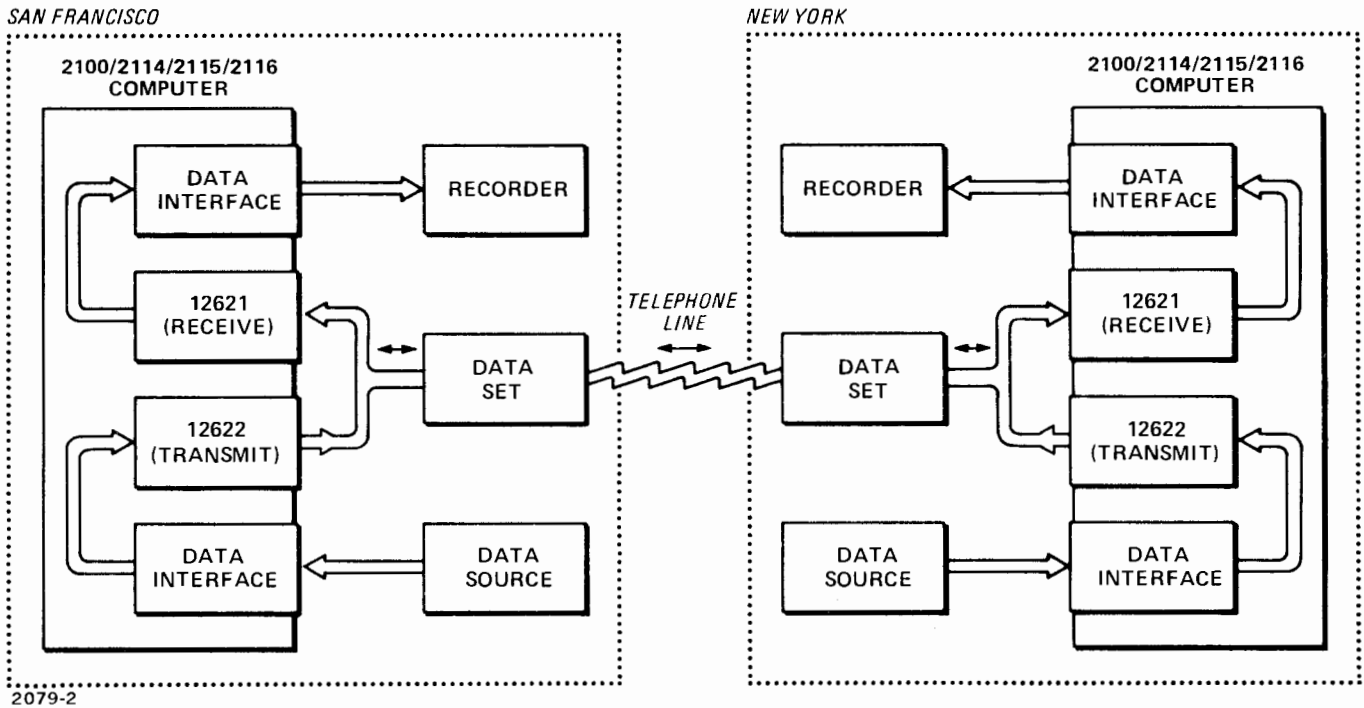


Figure 1-2. Typical Duplex Application

SECTION II

INSTALLATION AND PROGRAMMING



2-1. INTRODUCTION.

2-2. This section includes installation and programming information for the interface kit.

2-3. UNPACKING AND INSPECTION.

2-4. If the shipping carton is damaged upon receipt, request that the carrier's agent be present when the kit is unpacked. Inspect the kit items for damage (cracks, broken parts, etc.). If the kit items are damaged and fail to meet specifications, notify the carrier and the nearest Hewlett-Packard Sales and Service Office immediately. (Sales and Service Offices are listed at the back of this manual.) Retain the shipping container and the packing material for the carrier's inspection. The HP Sales and Service Office will arrange for the repair or replacement of the damaged items without waiting for any claims against the carrier to be settled.

2-5. INSTALLATION.

2-6. Determine if the computer power supplies will provide the additional current required for operation of the interface kits. Refer to the Hewlett-Packard computer documentation for a listing of current available from the computer power supplies.

2-7. Install the interface kit as follows:

- a. If computer is running a program, press HALT switch.
- b. Turn computer power off.

CAUTION

Turn computer power off before installing or removing printed-circuit cards, or damage to the computer may result.

c. Open computer and plug interface cards into the input/output slots assigned for the particular computer system. Install the cards in adjacent slots with the receive card (12621-60001) in the higher priority slot (lower select code) of the two. Make certain that all higher priority slots have either another I/O card or a priority jumper card installed.

d. Connect double 48-pin connector on interconnecting cable to installed cards. Pass other end of cable out of rear of computer.

e. Close computer and connect free end of interconnecting cable to connector on data set.

f. Perform the tests described in the diagnostic reference manuals, part numbers 12621-90008 and 12622-90008, to verify that the interface kit is operating properly.

2-8. Table 2-1 contains a list of pin assignments for the interconnecting cable. The table also includes circuit descriptions and EIA Standard RS-232-B interchange circuit identification letters.

2-9. PROGRAM WORD FORMATS.

2-10. The interface cards are programmed using HP assembly language. The word formats used in operation of the interface cards are illustrated and defined in section II of the applicable operating and service manual (12621-90001 or 12622-90001).

2-11. PROGRAMMING.

2-12. An HP standard software driver is not provided with the synchronous data set interface cards because the interface can best be utilized by user-generated software. Refer to the typical programs in section II of the interface card operating and service manuals and to the software documentation furnished in Volume Four of the Hewlett-Packard computer documentation to aid in writing a program. Additional information may be found in the manual titled "A Pocket Guide to Interfacing the HP 2100 Computer" (part number 5951-4498), which may be obtained from the nearest Hewlett-Packard Sales and Service Office. Observe the following precautions when writing a program for the interface:

a. Always load synchronization and special character shift registers on the receive card before data reception starts or immediately following an interrupt. Attempting to load a new character word during the circulate cycle, which occurs after each data character reception and lasts for 12 to 16 microseconds, may cause the new character word to be loaded into the shift register with the register shifted from the correct position. The shift registers are shifted around once during each circulate cycle and loading with the register shifted will cause the word to appear rotated in the eight-bit field.

b. If the application requires that the parity or hunt mode configuration be known for a specific character, make any parity or hunt mode configuration changes on the receive card before data reception starts or immediately following an interrupt. Because the parity and hunt

Table 2-1. Interconnecting Cable (12618-60001) Information

DATA SET	CONNECTOR PIN		DESCRIPTION	EIA STD RS-232-B CIRCUIT
	INTERFACE CARD			
	12621-60001	12622-60001		
1	24	BB	Protective Ground	AA
2		C	Transmitted Data*	BA
3	U		Received Data*	BB
4		A	Request to Send	CA
5		Y	Clear to Send	CB
6	B	W	Data Set Ready	CC
7	BB	24	Signal Ground	AB
8	N		Received Line Signal Detector	CF
14	Z		Secondary Transmitted Data	SBA
15		AA	Transmitter Signal Element Timing	DB
16		Z	Secondary Received Data	SBB
17	F		Receiver Signal Element Timing	DD
20		B	Data Terminal Ready	CD
22	A	X	Ring Indicator	CE

*Data is in bit serial form.

registers are double-buffered, changes which take place during character reception will not affect the character being received but will become effective on the next character.

c. For the receive card, include status word bit 14 in the normal status check when a character is received. If bit 14 is a logic 1, either continue to wait for synchronization to be acquired or return to the main program with an "attempting to acquire synchronization" status indication. This is necessary because when the receive card is checking to determine if it has received two successive synchronization characters, it treats the second character as a normal data character. Thus after telling the card to hunt for synchronization by output of a control word with bit 9 a logic 1, an interrupt may occur even though two successive synchronization characters have not been received. A check of the status word, however, will show that bit 14 is a logic 1, indicating that synchronization has not been acquired.

d. During a synchronization check, the receive card may indicate an error due to an attempt by the card to receive characters before it is locked onto the character stream. It is thus advantageous to output a control word immediately after synchronization has been acquired in order to clear the error indication.

e. Bit 13 of the transmit card control word provides the Data Terminal Ready signal to the data set, so the control word must be loaded into the transmit card before data transmission can begin.

f. Remember that the receive card is in an I/O slot with a lower select code than the transmit card.

2-13. OPERATING INSTRUCTIONS.

2-14. Refer to the computer documentation for operating instructions for the computer and standard peripheral devices. Refer to the data set documentation for operating instructions for the data set.

SECTION III

THEORY OF OPERATION

3-1. INTRODUCTION.

3-2. This section contains a brief functional description of the transmit and receive interface cards installed for duplex operation. Refer to section III in the appropriate Operating and Service Manual, part numbers 12621-90001 and 12622-90001, for complete functional descriptions and detailed theory of operation of the interface cards. Refer to the documents provided with the data set for description and operation of the data set in duplex applications.

3-3. FUNCTIONAL DESCRIPTION.

3-4. The interface cards operate the same whether the cards are used for simplex applications or for duplex applications. The type of application is determined by the

manner in which the computer is programmed and the data set configuration used.

3-5. Both interface cards normally provide a Request to Send (CA) signal, which is a fixed signal on the receive card, and a Data Terminal Ready (CD) signal to the data set. The interconnecting cable (12618-60001) supplied with the 12618A Interface Kit is wired so that these signals are provided by the transmit card only. The transmit card must be programmed by the computer to provide both of these signals. In addition, the cable is configured such that the two cards must occupy adjacent slots in the computer, with the receive card in the higher priority slot.

3-6. Table 3-1 describes the signals coming from the data set to the interface cards and table 3-2 describes the signals going from the interface cards to the data set.

Table 3-1. Signals to the Interface Cards from the Data Set

EIA STD RS-232-B CIRCUIT	SIGNAL	FUNCTION
BB	Received Data	Serial bit signal to receive card from data set. Negative signal* is a logic 1.
CB	Clear to Send	Positive signal* to transmit card which indicates to computer that data transmission may begin.
CC	Data Set Ready	Positive signal* to both cards indicates to computer that data set is on and is capable of receiving and transmitting data.
CE	Ring Indicator	Positive signal* to both cards indicates to computer that a station is calling.
CF	Received Line Signal Detector	Positive signal* to receive card indicates to computer that a transmitting station is on the line.
DB	Transmitter Signal Element Timing	Clock signal* to transmit card. Transmitted data changes on positive edge of clock signal.
DD	Receiver Signal Element Timing	Clock signal* to receive card. The data changes on positive edge of clock signal and should be read on negative edge of clock signal.
SBB	Secondary Received Data	Signal to transmit card is received over the low-speed auxiliary data channel (if available) on which data flows in a direction opposite to the high-speed channel. Positive signal* is a logic 1. Not used in applications using 201 type data sets.
*Signal levels are between 5 and 25 volts (+ or -). Load impedance is between 3k and 7k.		

Table 3-2. Signals from the Interface Cards to the Data Set

EIA STD RS-232-B CIRCUIT	SIGNAL	FUNCTION
BA	Transmitted Data	Serial bit data from transmit card to data set. Negative signal* is a logic 1.
CA	Request to Send	Positive signal* from transmit card which indicates to data set that computer desires to transmit data.
CD	Data Terminal Ready	Positive signal* from transmit card indicates to data set that computer is ready to transmit and receive data.
SBA	Secondary Transmitted Data	Signal from receive card is sent over the low-speed auxiliary data channel (if available) on which data flows in a direction opposite to the high-speed channel. Positive signal* is a logic 1. Not used in applications using 201 type data sets.
*Signal levels are between 5 and 25 volts (+ or -). Load impedance is between 3k and 7k.		

SECTION IV MAINTENANCE

4-1. INTRODUCTION.

4-2. This section contains maintenance information for the interface kit.

4-3. DIAGNOSTICS.

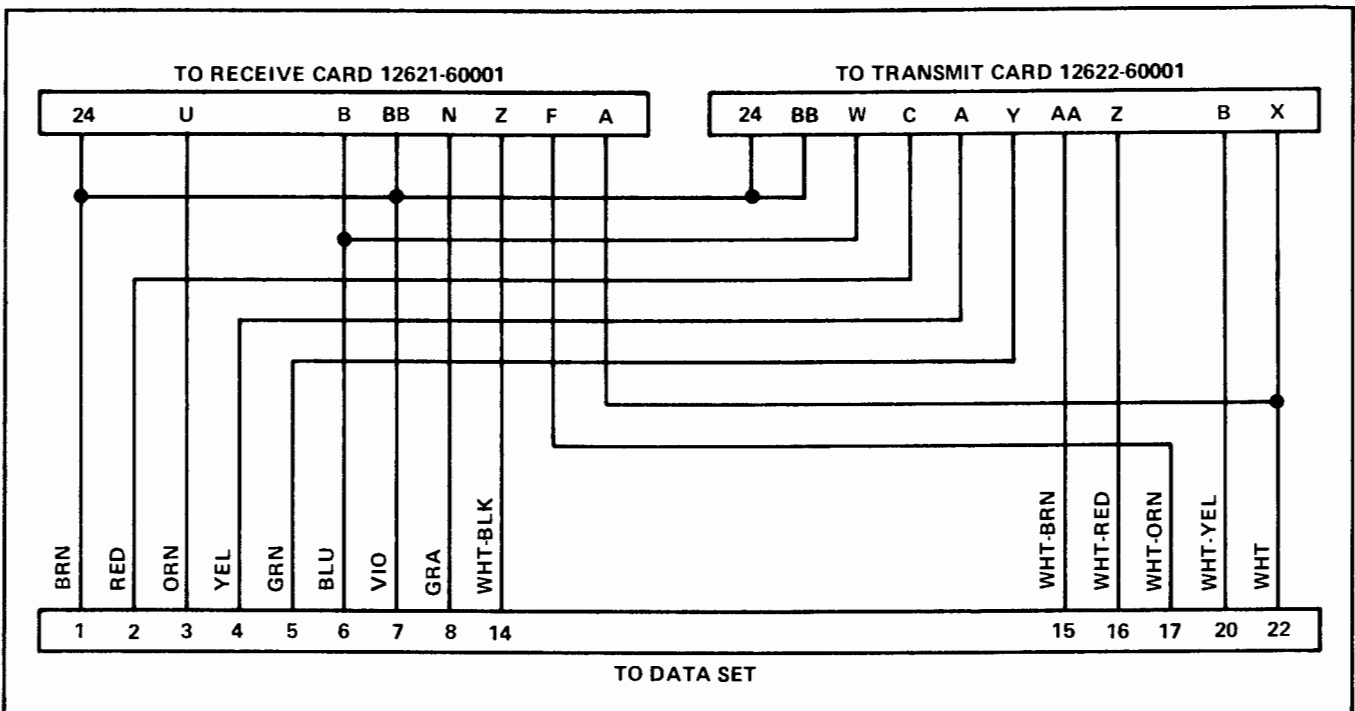
4-4. Individual diagnostic programs are provided for the 12621-60001 and 12622-60001 Interface Cards. When performing these diagnostic checkouts, refer to the appropriate Diagnostic Reference Manuals, part numbers 12621-90008 and 12622-90008.

4-5. TROUBLESHOOTING.

4-6. Detailed troubleshooting information for each of the interface cards is provided in section IV of the appropriate operating and service manual. Refer to figure 4-1 when troubleshooting the interconnecting cable.

4-7. PREVENTIVE MAINTENANCE.

4-8. Preventive maintenance for the interface kit should be performed when the preventive maintenance routines for the computer system are performed. Preventive maintenance consists of inspecting the interface card and cable assembly for burned or broken components, loose connections, and deteriorated insulating materials.



2094-2

Figure 4-1. Interconnecting Cable (12618-60001) Wiring Diagram

SECTION V

REPLACEABLE PARTS

5-1. INTRODUCTION.

5-2. This section contains information for ordering replacement parts for the 12618A Synchronous Data Set (Transmit and Receive) Interface Kit. Table 5-1 lists parts in numerical order of the HP stock numbers and lists the following information on each part.

a. Description of the part. (Refer to table 5-2 for an explanation of abbreviations used in the DESCRIPTION column.)

b. Typical manufacturer of the part in a five-digit code; 28480 is Hewlett-Packard Company, Palo Alto, Ca.

c. Manufacturers part number.

d. Total quantity of each part used in the interface kit.

5-3. Refer to section IV of Operating and Service Manuals, part numbers 12621-90001 and 12622-90001, for parts replacement information for the interface cards.

5-4. ORDERING INFORMATION.

5-5. To order replacement parts, address the order or inquiry to the local Hewlett-Packard Sales and Service Office. (Refer to the list at the end of this manual for addresses.) Specify the following information for each part ordered:

- a. Instrument model and serial number.
- b. Hewlett-Packard part number for each part.
- c. Description of each part.
- d. Circuit reference designation.

Table 5-1. HP 12618A Interface Kit Replaceable Parts

HP PART NO.	DESCRIPTION	MFR CODE	MFR PART NO.	TQ
12618-90001	Operating and Service Manual, 12618A	28480	12618-90001	1
12621-60001	Synchronous Data Set (Receive) Interface Card	28480	12621-60001	1
12621-60005	Test Connector Assy, Receive	28480	12621-60005	1
12621-60006	Interconnecting Cable Assy, Branched	28480	12621-60006	1
12621-90001	Operating and Service Manual, 12621A	28480	12621-90001	1
12622-60001	Synchronous Data Set (Transmit) Interface Card	28480	12622-60001	1
12622-60005	Test Connector Assy, Transmit	28480	12622-60005	1
12622-90001	Operating and Service Manual, 12622A	28480	12622-90001	1

Table 5-2. Reference Designations and Abbreviations

REFERENCE DESIGNATIONS		
A = assembly	K = relay	TB = terminal board
B = motor	L = inductor	TP = test point
BT = battery	M = meter	U = integrated circuit
C = capacitor	MC = microcircuit	V = vacuum tube, neon bulb, photocell, etc.
CR = diode	P = plug connector	VR = voltage regulator
DL = delay line	Q = transistor	W = cable, jumper
DS = indicator (lamp)	R = resistor	X = socket
E = misc hardware	RT = thermistor	Y = crystal
F = fuse	S = switch	Z = tuned cavity, network
FL = filter	T = transformer	
J = receptacle connector		
ABBREVIATIONS		
A = amperes	gnd = ground(ed)	ph = Phillips head
ac = alternating current	gra = gray	pk = peak
ad = anode	grn = green	p-p = peak-to-peak
Al = aluminum	H = henries	pt = point
AR = as required	Hg = mercury	PIV = peak inverse voltage
adj = adjust	hr = hour(s)	PNP = positive-negative-positive
Assy = assembly	Hz = hertz	PWV = peak working voltage
B = base	hdw = hardware	porc = porcelain
bp = bandpass	hex = hexagon, hexagonal	posn = position(s)
bfo = beat frequency oscillator	ID = inside diameter	pozi = pozidrive
blk = black	IF = intermediate frequency	ph brz = phosphor bronze
blu = blue	in. = inch, inches	rf = radio frequency
brn = brown	I/O = input/output	rdh = round head
brs = brass	int = internal	rmo = rack mount only
Btu = British thermal unit	incl = include(s)	rms = root-mean-square
bwc = backward wave oscillator	insul = insulation, insulated	RWV = reverse working voltage
Be Cu = beryllium copper	impgrg = impregnated	rect = rectifier
C = collector	incand = incandescent	r/min = revolutions per minute
cw = clockwise	k = kilo (10 ³), kilohm	s = second
ccw = counterclockwise	lp = low pass	SB = slow-blow
cer = ceramic	m = milli (10 ⁻³)	Se = selenium
cmo = cabinet mount only	M = mega (10 ⁶), megohm	Si = silicon
com = common	Myl = Mylar	scr = silicon-controlled rectifier
crt = cathode-ray tube	mfr = manufacturer	sil = silver
CTL = capacitor-transistor logic	mom = momentary	sst = stainless steel
cath = cathode	mtg = mounting	stl = steel
cd pl = cadmium plate	misc = miscellaneous	spcl = special
Comp = composition	met ox = metal oxide	spdt = single-pole, double-throw
conn = connector	mintr = miniature	spst = single-pole, single-throw
compl = complete	n = nano (10 ⁻⁹)	semicond = semiconductor
dc = direct current	nc = normally closed or no connection	Ta = tantalum
dr = drive	Ne = neon	td = time delay
DTL = diode-transistor logic	no. = number or normally open	Ti = titanium
depc = deposited carbon	np = nickel plated	tgl = toggle
dpdt = double-pole, double-throw	NPN = negative-positive-negative	thd = thread
dpst = double-pole, single-throw	NPO = negative positive zero (zero temperature coefficient)	tol = tolerance
E = emitter	NSR = not separately replaceable	TTL = transistor-transistor logic
ext = external	NRFR = not recommended for field replacement	term = terminal
encap = encapsulated	OD = outside diameter	U (μ) = micro (10 ⁻⁶)
elctlt = electrolytic	OBD = order by description	V = volt(s)
F = farads	orn = orange	var = variable
FF = flip-flop	ovh = oval head	vio = violet
flh = flat head	oxd = oxide	VDCW = direct current working volts
flm = film	p = pico (10 ⁻¹²)	W = watts
fxd = fixed	PC = printed circuit	ww = wirewound
filh = fillister head		wht = white
G = giga (10 ⁹)		WIV = working inverse voltage
Ge = germanium		yel = yellow
gl = glass		



SALES & SERVICE OFFICES

UNITED STATES

ALABAMA
8290 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 220
Birmingham 35209
Tel: (205) 942-2081

ARIZONA
2336 E. Magnolia St.
Phoenix 85034
Tel: (602) 244-1361
2424 East Aragon Rd.,
Tucson 85706
Tel: (602) 294-3148

ARKANSAS
Medical Service Only
P.O. Box 5646
Brady Station
Little Rock 72205
Tel: (501) 664-8773

CALIFORNIA
1430 East Orangehorpe Ave.
Fullerton 92631
Tel: (714) 870-1000
3939 Lankershim Boulevard
North Hollywood 91604
Tel: (213) 877-1282
TWX: 910-499-2170
6305 Arizona Place
Los Angeles 90045
Tel: (213) 649-2511
TWX: 910-328-6147
*Los Angeles
(213) 776-7500
3 Scott Boulevard
Santa Clara 95050
Tel: (408) 249-7000
TWX: 910-338-0518
*Ridgecrest
Tel: (714) 446-6165
2220 Watt Ave.
Sacramento 95825
Tel: (916) 482-1463

9606 Aero Drive
P.O. Box 23333
San Diego 92123
Tel: (303) 771-3200

COLORADO
5600 South Ulster Parkway
Englewood 80110
Tel: (303) 771-3455

CONNECTICUT
12 Lunar Drive
New Haven 06525
Tel: (203) 389-6551
TWX: 710-465-2029

FLORIDA
P.O. Box 24210
2806 W. Oakland Park Blvd.
Ft. Lauderdale 33307
Tel: (305) 731-2020
TWX: 510-955-4099
*Jacksonville
Medical Service only
Tel: (904) 725-6333
P.O. Box 13910
6177 Lake Ellenor Dr.
Orlando 32809
Tel: (305) 859-2900
TWX: 810-850-0311
P.O. Box 12826
Pensacola 32575
Tel: (904) 434-3081

GEORGIA
P.O. Box 105005
Atlanta 30348
Tel: (404) 434-4000
TWX: 810-766-4890
Medical Service Only
*Augusta 30903
Tel: (404) 736-0592

HAWAII
2875 So. King Street
Honolulu 96814
Tel: (808) 955-4455

ILLINOIS
5500 Howard Street
Skokie 60076
Tel: (312) 677-0400
TWX: 910-223-3613
*St. Joseph
Tel: (217) 469-2133

INDIANA
7301 North Shadeland Ave.
Indianapolis 46250
Tel: (317) 842-1000
TWX: 810-260-1796

IOWA
1902 Broadway
Iowa City 52240
Tel: (319) 338-9466
Night: (319) 338-9467

KANSAS
Derby
Tel: (316) 267-3655

KENTUCKY
Medical/Calculator Only
Atkinson Square
3901 Atkinson Dr.,
Suite 207
Louisville 40218
Tel: (502) 456-1573

LOUISIANA
P.O. Box 840
3239 Williams Boulevard
Kenner 70062
Tel: (504) 721-6201
TWX: 810-955-5524

MARYLAND
6707 Whitestone Road
Baltimore 21207
Tel: (301) 944-5400
TWX: 710-862-9157
2 Choke Cherry Road
Rockville 20850
Tel: (301) 948-6370
TWX: 710-828-9684

MASSACHUSETTS
32 Hartwell Ave.
Lexington 02173
Tel: (508) 861-8960
TWX: 910-983-0550

MICHIGAN
23855 Research Drive
Farmington Hills 48024
Tel: (313) 476-6400
TWX: 810-242-2900

MINNESOTA
2400 N. Prior Ave.
Roseville 55113
Tel: (612) 636-0700
TWX: 910-563-3734

MISSISSIPPI
*Jackson
Medical Service only
Tel: (601) 982-9363

MISSOURI
11131 Colorado Ave.
Kansas City 64137
Tel: (816) 763-8000
TWX: 910-771-2087
148 Weldon Parkway
Maryland Heights 63043
Tel: (314) 567-1455
TWX: 910-764-0830

NEBRASKA
Medical Only
7171 Mercy Road
Suite 110
Omaha 68106
Tel: (402) 392-0948

NEW JERSEY
W. 120 Century Rd
Paramus 07652
Tel: (201) 265-5000
TWX: 710-990-4951

NEW MEXICO
P.O. Box 11634
Station E
11300 Lomas Blvd., N. E.
Albuquerque 87123
Tel: (505) 292-1330
TWX: 910-989-1185

156 Wyatt Drive
Las Cruces 88001
Tel: (505) 526-2485
TWX: 910-983-0550

NEW YORK
6 Automation Lane
Computer Park
Albany 12205
Tel: (518) 458-1550
TWX: 710-441-8270
New York City
Manhattan, Bronx
Contact Paramus, NJ Office
Tel: (201) 265-5000
Brooklyn, Queens, Richmond
Contact Woodbury, NY Office
Tel: (516) 921-0300
201 South Avenue
Poughkeepsie 12601
Tel: (914) 454-7330
TWX: 510-248-0012
39 Saginaw Drive
Rochester 14623
Tel: (716) 473-9500
TWX: 510-253-5981
5858 East Molloy Road
Syracuse 13211
Tel: (315) 455-2486
TWX: 710-541-0482
1 Crossways Park West
Woodbury 11797
Tel: (516) 921-0300
TWX: 710-990-4951

NORTH CAROLINA
P.O. Box 5188
1923 North Main Street
High Point 27262
Tel: (919) 885-8101
TWX: 510-926-1516

OHIO
16500 Sprague Road
Cleveland 44130
Tel: (216) 243-7300
TWX: 810-423-9431

330 Progress Rd.
Dayton 45449
Tel: (513) 859-8202
TWX: 810-474-2818
1041 Kingsmill Parkway
Columbus 43229
Tel: (614) 436-1041

OKLAHOMA
P.O. Box 32008
Oklahoma City 73132
Tel: (405) 721-0200
TWX: 910-830-6862

OREGON
17890 SW Lower Boones
Ferry Road
Tualatin 97062
Tel: (503) 620-3350

PENNSYLVANIA
111 Zeta Drive
Pittsburgh 15238
Tel: (412) 782-0400
Night: 782-0401
TWX: 710-795-3124
1021 8th Avenue
King of Prussia Industrial Park
King of Prussia 19406
Tel: (215) 265-7000
TWX: 510-660-2670

SOUTH CAROLINA
6941-N. Trenholm Road
Columbia 29260
Tel: (803) 782-6493

TENNESSEE
*Memphis
Medical Service only
Tel: (901) 274-7472
*Nashville
Medical Service only
Tel: (615) 244-5448

TEXAS
P.O. Box 1270
201 E. Arapahoe Rd
Richardson 75080
Tel: (214) 231-6101
TWX: 910-867-4723

P.O. Box 27409
6300 Westpark Drive
Suite 100
Houston 77027
Tel: (713) 781-8000
TWX: 910-881-2645
205 Billy Mitchell Road
San Antonio 78226
Tel: (512) 434-8241
TWX: 910-871-1170

UTAH
2160 South 3270 West St
Salt Lake City 84119
Tel: (801) 487-0715

VIRGINIA
Medical Only
P.O. Box 12778
No. 7 Koger Exec. Center
Suite 212
Norfolk 23502
Tel: (804) 497-1026/7
P.O. Box 9854
2914 Hunnery Springs Road
Richmond 23228
Tel: (804) 285-3431
TWX: 710-956-0157

WASHINGTON
Bellefield Office Pk
1203-114th Ave. S. E.
Bellevue 98004
Tel: (206) 454-3971
TWX: 910-443-2446

***WEST VIRGINIA**
Medical/Analytical Only
Charleston
Tel: (304) 345-1640

WISCONSIN
9004 West Lincoln Ave.
West Allis 53227
Tel: (414) 541-0550

FOR U.S. AREAS NOT LISTED:
Contact the regional office nearest you. Atlanta, Georgia, North Hollywood, California, Rockville, Maryland, Skokie, Illinois. Their complete addresses are listed above.

*Service Only

CANADA

ALBERTA
Hewlett-Packard (Canada) Ltd.
11748 Kingsway Ave.
Edmonton T5G 0X5
Tel: (403) 452-3670
TWX: 610-831-2431 EDTH
Hewlett-Packard (Canada) Ltd.
915-42 Avenue S. E. Suite 102
Calgary T2G 1Z1
Tel: (403) 287-1672
TWX: 600-821-6141

BRITISH COLUMBIA
Hewlett-Packard (Canada) Ltd.
837 E. Cordova Street
Vancouver V6A 3R2
Tel: (604) 254-0531
TWX: 610-922-5059 VCR

MANITOBA
Hewlett-Packard (Canada) Ltd.
513 Century St.
St. James
Winnipeg R3H 0L8
Tel: (204) 786-7581
TWX: 610-671-3531

NOVA SCOTIA
Hewlett-Packard (Canada) Ltd.
800 Windmill Road
P.O. Box 931
Dartmouth B2Y 3Z6
Tel: (902) 469-7820
TWX: 610-271-4482 HFX

ONTARIO
Hewlett-Packard (Canada) Ltd.
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: 610-492-4246

QUEBEC
Hewlett-Packard (Canada) Ltd.
275 Hymus Blvd
Pointe Claire H9R 1G7
Tel: (514) 697-4232
TWX: 610-422-3022
TLX: 05-821521 HPCL

Hewlett-Packard (Canada) Ltd.
2376 Galvan Street
Ste-Foy G1N 4G4
Tel: (418) 688-8710
TWX: 610-571-5525

FOR CANADIAN AREAS NOT LISTED:
Contact Hewlett-Packard (Canada) Ltd. in Mississauga.

CENTRAL AND SOUTH AMERICA

ARGENTINA
Hewlett-Packard Argentina
S.A.C. e.I.
Lavalle 1171-3° Piso
Buenos Aires
Tel: 35-0436, 35-0627, 35-0341
Telex: Public Booth No. 9
Cable: HEWPACK ARG

Hewlett-Packard Do Brasil
I.E.C. Ltda.
Praça Dom Feliciano, 78-8° andar (Sala 806/8)
90000-Pôrto Alegre-RS
Tel: 25-84-70-DDD (0512)
Cable: HEWPACK Pôrto Alegre

Hewlett-Packard Do Brasil
I.E.C. Ltda.
Rua Siqueira Campos, 53, 4° andar-Copacabana
20000-Rio de Janeiro-GB
Tel: 257-80-94-DDD (021)
Telex: 391-212-1905 HEWP-BR
Cable: HEWPACK
Rio de Janeiro

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
C. Ltda.
Frei Caneca, 1140/52 Bela Vista
7-São Paulo-SP
288-71-11, 287-81-20,
287-61-93
Telex: 391-02-3602 HPBR-BR
Cable: HEWPACK São Paulo

Medical Only
General Machinery Co., Ltda.
Paraguay 494
Casilla 13910
Santiago
Tel: 31123, 31124
Cable: GEMCO Santiago

COLUMBIA
Instrumentación
Henrik A. Langebaek & Kier S.A.
Carrera 7 No. 48-75
Apartado Aéreo 6287
Bogotá, I.D.E.
Tel: 69-88-77
Cable: AARIS Bogotá
Telex: 044-400

COSTA RICA
Científica Costarricense S.A.
Calle Central, Avenidas 1 y 3
Casilla 2118
Santiago, I.
Tel: 396513
Telex: 350001 CALMET
Cable: CALMET Santiago

ECUADOR
Medical Only
A.F. Viscaino Compañía Ltda.
Av. Rio Amazonas No. 239
P.O. Box 2925
Quito
Tel: 527-088, 527-804
Cable: ASTDR Quito
Calculators Only
Computadoras y Equipos
Electrónicos
P.O. Box 2695
Avda. 12 De Octubre No. 2207
Quito
Tel: 233869, 236783
Telex: 02-2113 Sagita Ed
Cable: Sagita-Quito

EL SALVADOR
IPESA
Buevar de los Heroes II-48
San Salvador
Tel: 252787

GUATEMALA
IPESA
Avenida La Reforma 3-48,
Zona 9
Guatemala City
Tel: 63627, 64786
Telex: 4192 Teletro Gu

MEXICO
Hewlett-Packard Mexicana.
S.A. de C.V.
Torres Adalid No. 21, 11° Piso
Col del Valle
Mexico 12, D.F.
Tel: (905) 543-42-32
Telex: 017-74-507
Hewlett-Packard Mexicana.
S.A. de C.V.
Ave. Constitución No. 2184
Monterrey, N.L.
Tel: 48-71-32, 48-71-84
Telex: 03R-843

NICARAGUA
Roberto Terán G.
Apartado Postal 689
Edificio Terán
Managua
Tel: 25114, 23412, 23454
Cable: ROTERAN Managua

PANAMA
Electrónica Balboa, S.A.
P.O. Box 4929
Calle Samuel Lewis
Cuidad de Panama
Tel: 64-2700
Telex: 3431 103 Curunda
Cable: ELECTRON Panama

PARAGUAY
Z.J. Melamed S.R.L.
División: Aparatos y Equipos
Médicos
División: Aparatos y Equipos
Científicos y de Investigación
P.O. Box 676
Cable: RADIMU Montevideo

ASUNCION
Tel: 4-5069, 4-6272
Cable: RAMEL

PERU
Compañía Electro Médica S.A.
Los Flamencos 145
San Isidro Casilla 1030
Lima I
Tel: 413485
Cable: ELMED Lima

PUERTO RICO
Hewlett-Packard Inter-Américas
Puerto Rico Branch Office
P.O. Box 29081
65th Inf. Station
San Juan 00929
Calle 272, Urb. Country Club
Carolina 00639
Tel: (809) 762-7355 7455-7655
Telex: 3450514

URUGUAY
Pablo Ferrando S.A.
Comercial e Industrial
Avenida Italia 2877
Casilla de Correo 370
Montevideo
Tel: 40-3102
Cable: RADIMU Montevideo

VENEZUELA
Hewlett-Packard de Venezuela
C.A.
Apartado 50933, Caracas 105
Edificio Segre
Tercera Transversal
Los Ruices Norte
Caracas 107
Tel: 35-01-07, 35-00-84,
35-00-607, 35-00-31
Telex: 25146 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) 35 16 21 to 32
Cable: HEWPAK Vienna
Telex: 75923 hewpak a

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

DENMARK
Hewlett-Packard A/S
Datavej 52
DK-3460 Birkerød
Tel: (02) 81 66 40
Cable: HEWPAK AS
Telex: 166 40 hpas

Hewlett-Packard A/S
Navevej
DK-8600 Silkeborg
Tel: (06) 82 71 66
Telex: 166 40 hpas
Cable: HEWPAK AS

FINLAND
Hewlett-Packard Oy
Nahkahuusentie 5
P. O. Box 6
SF-00211 Helsinki 21
Tel: 6923031
Cable: HEWPAKCO Helsinki
Telex: 12-1563

FRANCE
Hewlett-Packard France
Quartier de Courtaubert
Boite Postale No 6
F-91401 Orsay
Tel: (1) 907 78 25
Cable: HEWPAK Orsay
Telex: 600048

Hewlett-Packard France
"Le Saquin"
Chemin des Mouilles
Boite Postale No. 12
F-69130 Ecully
Tel: (78) 33 81 25
Cable: HEWPAK Ecully
Telex: 310617

Hewlett-Packard France
Agence Régionale
Pénicentre de la Cépière
Chemin de la Cépière, 20
F-31300 Toulouse-Le Mirail
Tel: (61) 40 11 12
Telex: 510957F

Hewlett-Packard France
Agence Régionale
Aéroport principal de
Marseille-Margiane
F-13721 Margiane
Tel: (91) 89 32 36
Cable: HEWPAK MARGN
Telex: 410774F

Hewlett-Packard France
Agence Régionale
63, Avenue de Rochester
F-35000 Rennes
Tel: (99) 36 33 21
Cable: HEWPAK 74912
Telex: 740912F

Hewlett-Packard France
Agence Régionale
74, Allée de la Robertsau
F-67000 Strasbourg
Tel: (88) 35 23 20/21
Telex: 890141
Cable: HEWPAK STRBG

Medical/Calculator Only
Hewlett-Packard France
Agence Régionale
Centre Vauban
201, rue Colbert
Entrée A2
F-59000 Lille
Tel: (20) 51 44 14
Telex: 820744

GERMAN FEDERAL REPUBLIC
Hewlett-Packard GmbH
Vertriebszentrale Frankfurt
Bernstrasse 117
Postfach 560 140
D-6000 Frankfurt 56
Tel: (0611) 50 04-1
Cable: HEWPAKSA Frankfurt
Telex: 04 13249 hpFFmd

Hewlett-Packard GmbH
Technisches Buero Böblingen
Herrenbergerstrasse 130
D-7030 Böblingen Württemberg
Tel: (07031) 667-1
Cable: HEPAK Böblingen
Telex: 0765379 bon

Hewlett-Packard GmbH
Technisches Buero Düsseldorf
Emanuel-Lutze-Str. 1 (Seestern)
D-4000 Düsseldorf
Tel: (0211) 59711
Telex: 85186 533 hpdd d

Hewlett-Packard GmbH
Technisches Buero Hamburg
Wendenstrasse 23
D-2000 Hamburg 1
Tel: (040) 24 13 93
Cable: HEWPAKSA Hamburg
Telex: 21 63 032 hpnh d

Hewlett-Packard GmbH
Technisches Buero Hannover
Mellendorfer Strasse 3
D-3000 Hannover-Kleefeld
Tel: (0511) 55 60 46
Telex: 092 3259

Hewlett-Packard GmbH
Technisches Buero Nuremberg
Neumeyer Str. 90
D-8500 Nuremberg
Tel: (0911) 56 30 83/85
Telex: 0623 860

Hewlett-Packard GmbH
Technisches Buero München
Unterhachinger Strasse 28
ISAR Center
D-8012 Otobrunn
Tel: (089) 601 30 61/7
Telex: 52 49 85
Cable: HEWPAKSA München
Telex: 0524985

(West Berlin)
Hewlett-Packard GmbH
Technisches Buero Berlin
Keith Strasse 2-4
D-1000 Berlin 30
Tel: (030) 24 90 86
Telex: 18 3405 hpbin d

GREECE
Kostas Karayannis
18, Ermou Street
GR-Athens 126
Tel: 3237731
Cable: RAKAR Athens
Telex: 21 59 62 'kar gr

Analytical Only
"INTECO" G. Papathanassiou & Co.
Marini 17
GR - Athens 103
Tel: 521 915
Cable: INTEKNIKA
Telex: 21 5329 INTE GR

Medical Only
Technomed Hellas Ltd
52, Skoula Street
GR - Athens 135
Tel: 626 972.663.930.614.959
Cable: ETALAK Athens
Telex: 21-4693 ETAL GR

ICELAND
Medical Only
Elding Trading Company Inc.
Hafnarhollu - Tryggvatotu
IS-Reykjavik
Tel: 1 58 20
Cable: ELDING Reykjavik

IRAN
Hewlett-Packard Iran Ltd
Mir Emad Ave
14th Street No 19
IR-Tehran
Tel: 85 10 82/86

IRELAND
Hewlett-Packard Ltd.
King Street Lane
Winnesh, Wokingham
GB-Berkshire RG11 5AR
Tel: (0734) 78 47 74
Telex: 847178/848179

ITALY
Hewlett-Packard Italiana S.p.A.
Casella postale 3645
I-20124 Milano
Tel: (2) 6251 (10 lines)
Cable: HEWPAKIT Milano
Telex: 32046

Hewlett-Packard Italiana S.p.A.
Via Pietro Maroncelli 40
(ang. Via Visentini)
I-35100 Padova
Tel: (49) 66 48 88
Telex: 32046 via Milano

Medical only
Hewlett-Packard Italiana S.p.A.
Via d'Agliardi, 7
I-56100 Pisa
Tel: (050) 2 32 04
Telex: 32046 via Milano

Hewlett-Packard S.p.A.
Via G. Armetini 10
I-00143 Roma-Eur
Tel: (06) 54 69 61
Telex: 61514
Cable: HEWPAKIT Roma

Hewlett-Packard Italiana S.p.A.
Via S. Quirino, 46
I-10121 Torino
Tel: 53 82 64/54 84 68
Telex: 32046 via Milano

Medical/Calculators Only
Hewlett-Packard Italiana S.p.A.
Via Principe Nicola 43 G/C
I-95126 Catania
Tel: (095) 37 05 05

Hewlett-Packard Italiana S.p.A.
Via Amerigo Vespucci, 9
I-80142 Napoli
Tel: (81) 33 77 11
Hewlett-Packard Italiana S.p.A.
Via E. Masi, 9/B
I-40137 Bologna
Tel: (051) 30 78 87

LUXEMBURG
Hewlett-Packard Benelux
S.A. N.V.
Avenue du Col-Vert, 1
(Groenkraaglaan)
B-1170 Brussels
Tel: (02) 672 22 40
Cable: PALOBEN Brussels
Telex: 23 494

NETHERLANDS
Hewlett-Packard Benelux N.V.
Van Heussen Goedhartlaan 121
P. O. Box 687
NL-Amstelveen 1134
Tel: (020) 47 20 21
Cable: PALOBEN Amsterdam
Telex: 13 216 hepa ni

NORWAY
Hewlett-Packard Norge A/S
Nesveien 13
Box 149
N-1344 Hæslum
Tel: (02) 53 83 60
Telex: 16621 hpnas n

POLAND
BIURO INFORMACJI TECHNICZNEJ
Hewlett-Packard
Ul. Stawki, 2 6P
00-950 Warszawa
Tel: 39 67 43
Telex: 81 24 53 hepa pl

PORTUGAL
Telectra-Empresa Técnica de
Equipamentos Eléctricos S.a. r.l
Rua Rodrigo da Fonseca 103
P. O. Box 2531
P-Lisbon 1
Tel: (91) 68 60 72
Cable: TELECTRA Lisbon
Telex: 12598

Mundinter
Intercambio Mundial de Comercio
S.a. r.l
Av. A. de Aguiar 138
P. O. Box 2761
P - Lisbon
Tel: (191) 53 21 31/7
Cable: INTERCAMBIO Lisbon

RUMANIA
Hewlett-Packard Technical Office
BD N. Balcescu 16
Bucharest
Tel: 1580 23-138885
Telex: 10440

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

Hewlett-Packard Española, S.A.
Milaneso 21-23
E-Barcelona 17
Tel: (3) 203 6200 (5 lines)
Telex: 52603 hobbe e

Hewlett-Packard Española, S.A.
Av Ramon y Cajal, 1-9
(Edificio Sevilla)
E-Seville 5
Tel: 64 44 54/58

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.
Gran Via Fernando El Católico, 67
E-Valencia 8
Tel: 326 67 28/326 85 55

SWEDEN
Hewlett-Packard Sverige AB
Emghevägen 3
Fack
S-161 20 Bromma 20
Tel: (08) 730 05 50
Cable: MEASUREMENTS
Stockholm
Telex: 10721

Hewlett-Packard Sverige AB
Frotallsgatan 30
S-421 32 Västra Frölunda
Tel: (031) 49 09 50
Telex: 10721 Via Bromma Office

SWITZERLAND
Hewlett-Packard (Schweiz) AG
Zürcherstrasse 20
P. O. Box 307
CH-8952 Schlieren Zurich
Tel: (01) 96 78 21
Cable: HPAG CH
Telex: 53933 hpag ch

Hewlett-Packard (Schweiz) AG
S. Chemin Louis-Pictet
CH-1214 Vernier-Geneve
Tel: (022) 41 49 50
Cable: HEWPAKAG Geneva
Telex: 27 333 hpag ch

TURKEY
Telekom Engineering Bureau
P. O. Box 437
Bevliu
TR-Istanbul
Tel: 49 40 40
Cable: TELEMATION Istanbul

USSR
Hewlett-Packard Representative
Office USSR
Pokrovsky Boulevard 4/17, Suite 12
Moscow 101000
Tel: 294 2024
Telex: 7825 hewpak SU

YUGOSLAVIA
iskra-standard/Hewlett-Packard
Office
Miklošiceva 38/VII
61000 Ljubljana
Tel: 315-879/321-674
Telex: 31583 YU HEWPAK

AFRICA, ASIA, AUSTRALIA

AMERICAN SAMOA
Calculators Only
Oceanic Systems Inc.
P. O. Box 177
Pago Pago Bayfront Road
Pago Pago 96799
Tel: 633-5513
Cable: DECEANIC-Pago Pago

ANGOLA
Telectra
Empresa Técnica de
Equipamentos
Eléctricos, S.A. R.L.
R. Barbosa Rodrigues, 42-FDT-3
Caixa Postal, 6487
Luanda
Tel: 35515-6
Cable: TELECTRA Luanda

AUSTRALIA
Hewlett-Packard Australia
Pty Ltd
31-41, Joseph Street
Blackburn Victoria 3130
P. O. Box 36
Doncaster East, Victoria 3109
Tel: 89-6351
Telex: 31-024
Cable: HEWPAK Melbourne

Hewlett-Packard Australia
Pty Ltd
31 Bridge Street
Pymble
New South Wales, 2073
Tel: 449-6566
Telex: 21561
Cable: HEWPAK Sydney

Hewlett-Packard Australia
Pty Ltd
153 Greenhill Road
Parkside, 5063, S.A.
Tel: 27-2591
Telex: 82536 ADEL
Cable: HEWPAK ADELAIDE

Hewlett-Packard Australia
Pty Ltd
141 Sirling Highway
Nedlands WA 6009
Tel: 86-5455
Telex: 93859 PERTH
Cable: HEWPAK PERTH

Hewlett-Packard Australia
Pty Ltd
5th Floor
Teachers Union Building
495-499 Boundary Street
Spring Hill, 4000 Queensland
Tel: 29-1544
Telex: 42133 BRISBANE

CYPRUS
Kyronics
19 Gregorios & Xenopoulos Rd
P. O. Box 1152
Cy-Nicosia
Tel: 45628 29
Cable: KYPRONICS PANDEHS

GUAM
Medical/Pocket Calculators Only
Guam Medical Supply, Inc.
P. O. Box 177
Pago Pago Bayfront Road
Pago Pago 96799
Tel: 633-5513
Cable: DECEANIC Guam

HONG KONG
Schmidt & Co (Hong Kong) Ltd
P. O. Box 297
Connaught Centre
39th Floor
Connaught Road, Central
Hong Kong
Tel: H-255291-5
Telex: 74766 SCHMC HX
Cable: SCHMIDTCO Hong Kong

INDIA
Blue Star Ltd
Kasturi Buildings
Jamsheji Tata Rd
Bombay 400 020
Tel: 29 50 21
Telex: 2156
Cable: BLUESTAR
Blue Star Ltd.
Sahas
414/2 Vir Savarkar Marg
Prabhadevi
Bombay 400 025
Tel: 45 73 01
Telex: 4093
Cable: FROSTBLUE

Blue Star Ltd
Band Box House
Prabhadevi
Bombay 400 025
Tel: 3751
Cable: BLUESTAR

Blue Star Ltd
14 Star Ltd
40 Civil Lines
Kanpur 208 001
Tel: 6 88 82
Telex: 292
Cable: BLUESTAR

Blue Star Ltd
7 Hare Street
P. O. Box 506
Calcutta 700 001
Tel: 23-0131
Telex: 7655
Cable: BLUESTAR

Blue Star Ltd
Blue Star House,
34 Mahatma Gandhi Rd
Lalpatnagar
New Delhi 110 024
Tel: 62 32 76
Telex: 2463
Cable: BLUESTAR

Blue Star Ltd
Blue Star House
111A Magarath Road
Bangalore 560 025
Tel: 55668
Cable: BLUESTAR

JAPAN
Yokogawa-Hewlett-Packard Ltd.
Hashi Building
1-59-1 Yoyogi
Shibuya-ku, Tokyo
Tel: 03-370-2281-92
Telex: 232-2024YHP
Cable: YHPMARKET TOK 23-724

Yokogawa-Hewlett-Packard Ltd
Nissei Ibaraki Building
2-8 Kasuga 2-chrome, Ibaraki-shi
Osaka 567
Tel: (0726) 23-1641
Telex: 5332-385 YHP OSAKA

Blue Star Ltd.
Meeakshi Mandiran
xxx/1678 Mahatma Gandhi Rd
Cochin 682 016 Kerala
Tel: 32069, 32161, 32282
Telex: 046-514
Cable: BLUESTAR

Blue Star Ltd.
Saronni Devi Road
Secunderabad 500 003
Tel: 70126, 70127
Cable: BLUEFROST
Telex: 459

Blue Star Ltd.
23/24 Second Line Beach
Madras 600 001
Tel: 23954
Telex: 379
Cable: BLUESTAR

Blue Star Ltd
Nathraj Mansions
2nd Floor Bistupur
Jamahedpur 831 001
Tel: 7383
Cable: BLUESTAR
Telex: 240

INDONESIA
BERCA Indonesia P T
P. O. Box 496
1st Floor Jl. Cikini Raya 61
Jakarta
Tel: 56038 40369, 49886
Telex: 42895
Cable: BERCAON

BERCA Indonesia P T
63 Jl. Raya Gubeng
Surabaya
Tel: 44309

IRAN
Hewlett-Packard Iran Ltd
Mir Emad Ave
14th Street, No. 19
IR-Tehran
Tel: 851082 86
Telex: 21 25 74

ISRAEL
Electronics & Engineering Div
of Motorola Israel Ltd
16 Kremenetski Street
P. O. Box 25016
Tel-Aviv
Tel: 38973
Telex: 33569
Cable: BASTEL Tel-Aviv

Yokogawa-Hewlett-Packard Ltd
Nakamo Building
24 Kami Sasajima-cho
Nakamura-ku, Nagoya . 450
Tel: (052) 571-5171

Yokogawa-Hewlett-Packard Ltd
Tangaya Building
2-24-1 Tsuriya-choo
Kanagawa-ku
Yokohama, 221
Tel: 045-312-1252
Telex: 382-3204 YHP YOK

Yokogawa-Hewlett-Packard Ltd.
105 Mitsui Building
105, 1-chrome, San-no-maru
Mito (Ibaragi) 310
Tel: 0292-25-7470

Yokogawa-Hewlett-Packard Ltd
Inoue Building
1348-3, Asahi-cho, 1-chrome
Atsugi, Kanagawa 243
Tel: 0462-24-0452

KENYA
Technical Engineering
Services E A Ltd.
P. O. Box 18311
Nairobi
Tel: 53726 556762
Cable: PROTON

Medical Only
International Aeradio E A Ltd.
P. O. Box 19012
Nairobi Airport
Nairobi
Tel: 336055 56
Telex: 22201 22301
Cable: INTAERIO Nairobi

KOREA
American Trading Company
Korea
C. P. O. Box 1103
Dae Kyung Bldg., 8th Floor
107 Sejong-Ro
Chongro-Ku, Seoul
Tel: (4 lines) 73-8924-7
Telex: K-28338
Cable: AMTRACO Seoul

LEBANON
Constantin E Macridis
Clémenceau Street 34
P. O. Box 7213
RL-Beirut
Tel: 36 63 97 8
Telex: 21114 Leb
Cable: ELECTRONUCLEAR Beirut

MALAYSIA
The Electronics
P. M. B. 5402
Ipoh
Tel: 53-95 119
Telex: 31231 TEIL Nigeria
Cable: THETEL Ibadan

The Electronics Instrumenta-
tions Ltd
144 Agege Motor Road, Mushin
P. O. Box 6645
Lagos
Cable: THETEL Lagos
Tel: 21-0911 2714
Telex: 6-203 Negon Mo
Cable: NEGON

NEW ZEALAND
Hewlett-Packard (N.Z.) Ltd
4-12 Churckshank Street
Kilbirnie, Wellington 3
Mailing Address: Hewlett-Packard
(N.Z.) Ltd
P. O. Box 9443
Courtney Place
Wellington
Tel: 87-1799
Telex: NZ 3639
Cable: HEWPAK Wellington

Hewlett-Packard (N.Z.) Ltd
Pakuranga Professional Centre
267 Pakuranga Highway
Box 51092
Pakuranga
Tel: 569-651
Telex: NZ 3639
Cable: HEWPAK Auckland

Analytical/Medical Only
Medical Supplies N.Z. Ltd
Scientific Division
79 Carlton Gore Rd., Newmarket
P. O. Box 1234
Auckland
Tel: 75-289
Telex: 2958 MEDISUP
Cable: DENTAL Auckland

Analytical/Medical Only
Medical Supplies N.Z. Ltd
P. O. Box 1994
147-161 Tony St
Wellington
Tel: 850-799
Telex: 3858
Cable: DENTAL Wellington

Analytical/Medical Only
Medical Supplies N.Z. Ltd
P. O. Box 309
239 Stanmore Road
Christchurch
Tel: 892-019
Cable: DENTAL Christchurch

Analytical/Medical Only
Medical Supplies N.Z. Ltd
P. O. Box 309
239 Stanmore Road
Christchurch
Tel: 892-019
Cable: DENTAL Christchurch

PAKISTAN
Mushko & Company, Ltd
Osman Chambers
Abdullah Haroon Road
Karachi-3
Tel: 511027, 512927
Telex: KR99A
Cable: COOPERATOR Karachi

Mushko & Company, Ltd
38B, Satellite Town
Rawalpindi
Tel: 41924
Cable: FEMUS Rawalpindi

PHILIPPINES
The Online Paredes Systems
Corporation
6th Floor, Yujoco Building
560 Quimn Paredes Street
Binondo, Manila
Tel: 40-05-41, 40-05-31
Telex: 3327 GENBANK

RHODESIA
Field Technical Sales
45 Kelvin Road North
P. O. Box 3458
Salisbury
Tel: 705231 (5 lines)
Telex: RH 4122

SINGAPORE
Hewlett-Packard Singapore
(Pte) Ltd
Blk. 2, 6th Floor, Jalan
Bukit Merah
Redhill Industrial Estate
Alexandra P. O. Box 58,
Singapore 3
Tel: 633022
Telex: HPSPG SR 21486
Cable: HEWPAK Singapore

SOUTH AFRICA
Hewlett-Packard South Africa
(Pty) Ltd
Private Bag Wendywood
Sandton, Transvaal 2144
Hewlett-Packard House
Daphne Street, Wendywood,
Sandton, Transvaal 2144
Tel: 802-104016
Telex: SA43 4782JH
Cable: HEWPAK JOHANNESBURG

Hewlett-Packard South Africa
(Pty) Ltd
P. O. Box 120
Howard Place, Cape Province
7450
Pme Park Centre, Forest Drive
Pletlands, Cape Province, 7405
Tel: 53-95 119
Telex: 57-0006

Hewlett-Packard South Africa
(Pty) Ltd
P. O. Box 37099
Overport, Durban 4067
641 Ridge Road, Durban
Durban, 4001
Tel: 89-7478 88-1080 88-2520
Telex: 6-7954
Cable: HEWPAK

TAIWAN
Hewlett-Packard Far East Ltd.
Taiwan Branch
39 Chung Shiao West Road
Sec. 1, 7th Floor
Taipei
Tel: 289160 1, 2, 3
Telex: 21824 HEWPAK
Cable: HEWPAK TAIPEI

Hewlett-Packard Taiwan
38 Po-Ai Lane, San Min Chu.
Kaoshiung
Tel: (07) 242318

Analytical Only
San Kwang Instruments Co., Ltd.
No. 20, yung Su Road
Taipei
Tel: 371371-4
Telex: 22894 SANKWANG
Cable: SANKWANG TAIPEI

TANZANIA
Medical Only
International Aeradio (E.A.) Ltd
P. O. Box 861
Daresalaam
Tel: 21251 Ext. 265
Telex: 41030

THAILAND
UNIMESA Co. Ltd
Elcom Research Building
Bangkok Sukumvit Ave
Bangkok
Tel: 932387, 930338
Cable: UNIMESA Bangkok

UGANDA
Medical Only
International Aeradio (E.A.) Ltd.
P. O. Box 2577
Kampala
Tel: 54388
Cable: INTAERIO Kampala

ZAMBIA
R J Tibury (Zambia) Ltd
P. O. Box 2792
Luanska
Tel: 73793
Cable: ARJAYTEE, Lusaka

MEDITERRANEAN AND MIDDLE EAST COUNTRIES NOT SHOWN PLEASE CONTACT:
Hewlett-Packard S.A.
Mediterranean and Middle East Operations
35 Kokoitron Street
Platia Kefallaron
GR-Kifissia Athens
Tel: 21-6588
Cable: HEWPAKSA Athens

OTHER AREAS NOT LISTED, CONTACT:
Hewlett-Packard International
3200 Hillview Ave
Falo Alto, California 94304
Tel: (415) 493 1501
TWX 910-373-1267
Cable: HEWPAK Palo Alto
Telex: 034-8300, 034-8493

CERTIFICATION

Products, materials, parts, and services furnished on this order have been provided in accordance with all applicable Hewlett-Packard specifications. Actual inspection and test data pertaining to this order is on file and available for examination.

Hewlett-Packard's calibration measurements are traceable to the National Bureau of Standards to the extent allowed by the Bureau's calibration facilities.

The Hewlett-Packard Quality Program satisfies the requirements of MIL-Q-9858, MIL-I-45208, and MIL-C-45662.



MANUAL PART NO. 12618-90001
MICROFICHE PART NO. 12618-90003

PRINTED IN U.S.A.