

## 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.



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## 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.

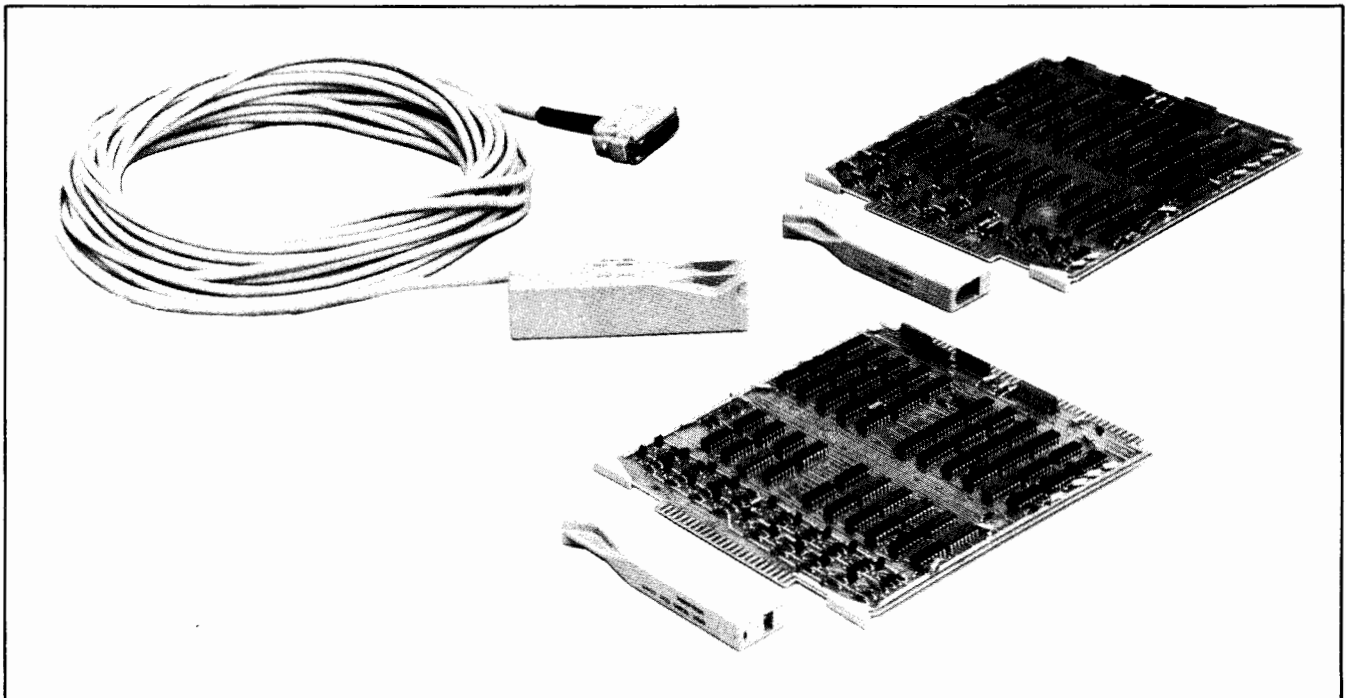
#### 1-6. KIT CONTENTS.

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



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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.

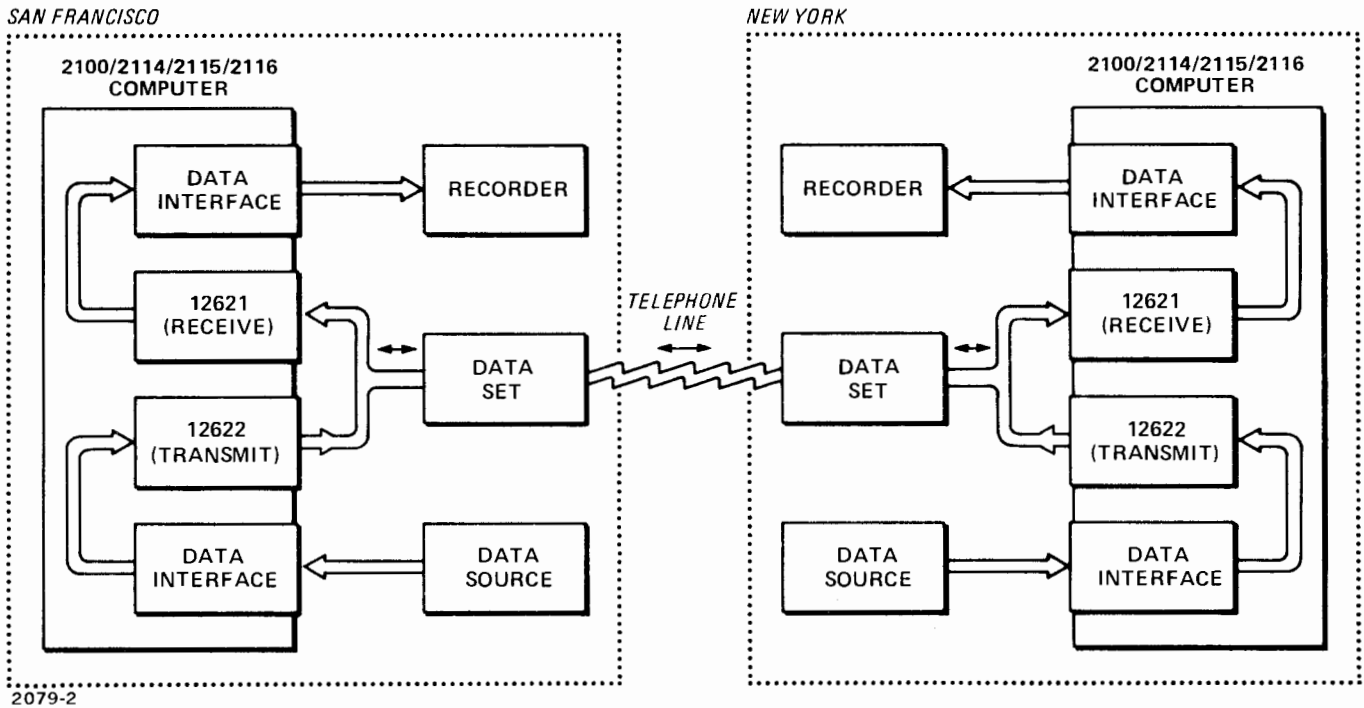


Figure 1-2. Typical Duplex Application

## 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.

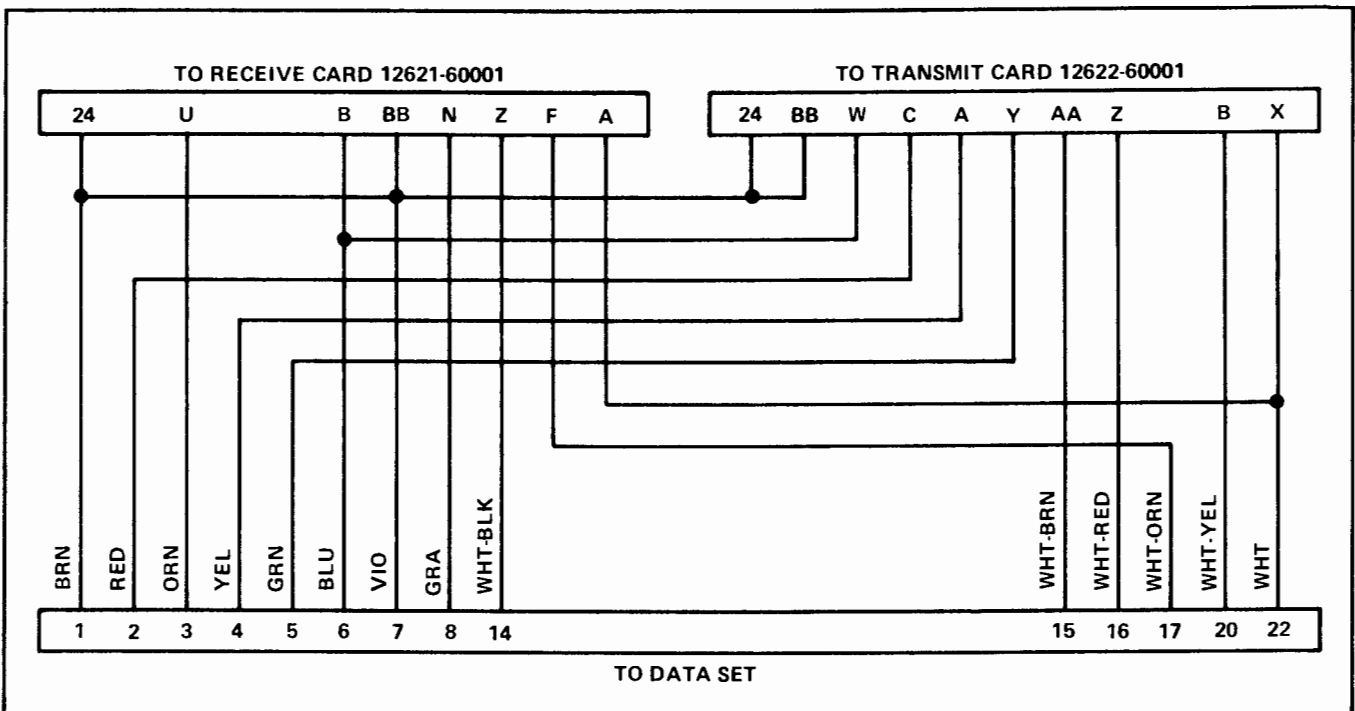
4-4. Individual diagnostic programs are provided for the 12621-60001 and 12622-60001 Interface Cards. When performing these diagnostic checkouts, refer to the appropriate Diagnostic Reference Manuals, part numbers 12621-90008 and 12622-90008.

### 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.



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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 <sup>3</sup> ), kilohm	s = second
ccw = counterclockwise	lp = low pass	SB = slow-blow
cer = ceramic	m = milli (10 <sup>-3</sup> )	Se = selenium
cmo = cabinet mount only	M = mega (10 <sup>6</sup> ), 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 <sup>-9</sup> )	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 <sup>-6</sup> )
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 <sup>-12</sup> )	W = watts
fxd = fixed	PC = printed circuit	ww = wirewound
filh = fillister head		wht = white
G = giga (10 <sup>9</sup> )		WIV = working inverse voltage
Ge = germanium		yel = yellow
gl = glass		



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## 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.*



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