

OPERATING AND SERVICE MANUAL
12596A
I/O EXTENDER INTERFACE KIT
(2151A INPUT/OUTPUT EXTENDER; 2116A/B COMPUTER)

Note

This manual should be retained with the Operating and Service Manual (part no. 02151-9003) for the HP 2151A Input/Output Extender.

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SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. The Hewlett-Packard 12596A I/O Extender Interface Kit interfaces an HP 2151A I/O Extender to an HP 2116A/B Computer. Figure 1-1 shows kit, extender, and computer items associated with the extender-computer interface. Tables 1-1 and 1-2 list these items.

1-3. DOCUMENTATION.

1-4. This manual contains installation instructions, maintenance data, and replaceable parts information for the items supplied with the HP 12596A I/O Extender Interface Kit. For complete documentation this manual must be used with the HP 2151A I/O Extender Operating and Service Manual (part no. 02151-9003), and Volumes Two and Three of the HP 2116A/B Computer documentation.

1-5. HEWLETT-PACKARD SALES AND SERVICE.

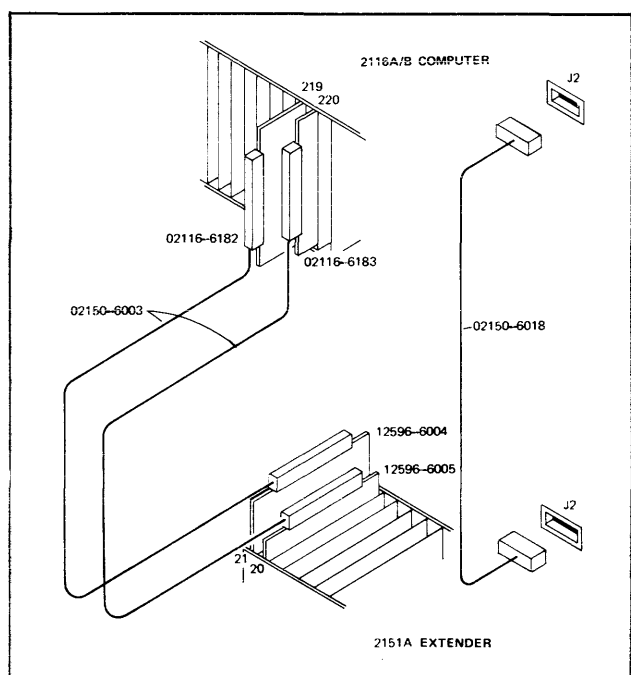
1-6. The address and phone number of the nearest Hewlett-Packard Sales and Service Office is listed in the back of this manual.

1-7. CARD IDENTIFICATION.

1-8. Printed circuit cards in the kit are identified by numbers and letters printed on the card, next to the Hewlett-Packard trademark. The first line contains the HP part number of the card, for example 12596-6004. The second line has three fields. In the first field a letter identifies the revision of the etched pattern on the card. A three-digit, year-week date code in the second field identifies the components used on the card. In the third field is a control number identifying the manufacturing division. If the date code on the card is not the same as the date code on a parts location diagram and schematic diagram with the same part number in this manual, a component change has occurred. The details of component changes are described in manual supplements and change sheets available from the nearest Hewlett-Packard Sales and Service Office.

1-9. SLOT IDENTIFICATION.

1-10. In the extender and the computer, printed circuit card slots are identified by decimal numbers and arrows (see table 1-3). Each slot is labeled with its assigned number and an arrow above the number pointing at the slot. Slot numbers and backplane socket reference designations are both derived from the reference designation of the card



2057 1

Figure 1-1. HP 12596A I/O Extender Interface Kit Installation

Table 1-1. Items Supplied with the HP 12596A I/O Extender Interface Kit

PART NO.	DESCRIPTION	QUANTITY
02116-6182	I/O-1 Extender Driver Card	1
02116-6183	I/O-2 Extender Driver Card	1
02150-6018	Interconnecting Cable, 14-conductor, 12 feet	1
12596-6004	I/O-X1 Extender Card	1
12596-6005	I/O-X2 Extender Card	1
12596-90021	12596A I/O Extender Interface Kit Operating and Service Manual	1

Table 1-2. Interface Items Supplied with the Extender

PART NO.	DESCRIPTION	QUANTITY	SOURCE
02150-6003	Interface Cable, 48-conductor, 10 feet	2	HP 2151A I/O Extender

that plugs into the socket. The reference designation of a card is printed on one of its extractor handles. In this manual slots are always referred to by slot number (decimal).

1-11. POWER SUPPLY REQUIREMENTS.

1-12. When calculating total current required by I/O options, the current required by the extender interface kit cards must be added to other I/O current requirements (refer to table 1-4).

Table 1-3. Slot Numbers and Associated Reference Designations

UNIT	REFERENCE DESIGNATION		SLOT NUMBER (DECIMAL)
	CARD	SOCKET	
2151A	A20	XA20	20
2151A	A21	XA21	21
2116A/B	A219	XA219	219
2116A/B	A220	XA220	220

Table 1-4. Current Required by the HP 12596A I/O Extender Interface Kit Cards

CARD LOCATION		PART NO.	DESCRIPTION	CURRENT SOURCE	CURRENT REQUIRED (AMP)			
UNIT	SLOT				+12V	-12V	-2V	+4.5V
2116A/B	219	02116-6182	I/O-1 Extender Driver	2116A/B	0	0	0.4	1.38
2116A/B	220	02116-6183	I/O-2 Extender Driver	2116A/B	0	0	0.4	1.38
2151A	20	12596-6005	I/O-X2 Extender	2151A	0	0	0.25	0
2151A	21	12596-6004	I/O-X1 Extender	2151A	0	0	0.25	0

SECTION II INSTALLATION

2-1. GENERAL.

2-2. This section contains interface cable signal data, and instructions for installing the kit.

2-3. UNPACKING AND INSPECTION.

2-4. If the shipping carton is received in a damaged condition, request that the carrier's agent be present when the kit is unpacked. Inspect the items comprising the kit for damage (cracks, lifted traces, broken components, etc.). If any of the items are damaged, notify both the carrier and the nearest Hewlett-Packard Sales and Service Office immediately. Retain the shipping carton and

packing material for the carrier's inspection. The Hewlett-Packard Sales and Service Office will arrange for the repair or replacement of damaged items without waiting for claims against the carrier to be settled.

2-5. INTERFACE SIGNALS AND CABLES.

2-6. Interface signals are coupled between the computer and the extender by two 48-conductor interface cables (part no. 02150-6003) and one 14-conductor interconnecting cable (part no. 02150-6018). The signals and the connector pin assignments of the cables are listed in tables 2-1, 2-2, and 2-3.

Table 2-1. Connector Pin Assignments for Interface Cable (02150-6003) Used Between Computer I/O-1 Extender Driver Card (02116-6182) and I/O-X1 Extender Card (12596-6004).

PIN	†SIGNAL	PIN	†SIGNAL
*A	(EDT)	1	GND
B	CLF	2	SKF
C	STF	3	FLG 1
D	CRS	4	FLG 2
E	POPIO	*5	(FLG 3)
F	CLC	6	IRQ 1
H	STC	7	IRQ 2
J	IOBO 0	8	IRQ 3
K	IOBO 1	9	IRQ 4
L	IOBO 2	10	IRQ 5
M	IOBO 3	11	IRQ 6
N	IOBO 4	12	IRQ 7
P	IOBO 5	13	IRQ 10
R	IOBO 6	14	IRQ 11
S	IOBO 7	15	IRQ 12
T	IOBO 8	16	IRQ 13
U	IOBO 9	17	IRQ 14
V	IOBO 10	18	IRQ 15
W	IOBO 11	19	IRQ 16
X	IOBO 12	20	IRQ 17
Y	IOBO 13	21	SPARE
Z	IOBO 14	22	SPARE
AA	IOBO 15	23	PON
*BB	(IOBO 16)	24	GND

* This pin, the cable conductor connected to it, and this signal (in parentheses) are not used in this application. Before using this pin as a spare, check the computer and the extender backplane wiring, and the schematic diagrams of the cards called out in the caption of this table.

† These signals are identified by computer mnemonics.

Table 2-2. Connector Pin Assignments for Interface Cable (02150-6003) Used Between Computer I/O-2 Extender Driver Card (02116-6183) and I/O-X2 Extender Card (12596-6005).

PIN	†SIGNAL	PIN	†SIGNAL
A	IEN 30	1	GND
B	SFC	2	SPARE
C	IAK	3	SPARE
D	T3	*4	(DE 2)
E	IOG	*5	(IOBI 16)
F	IOO	6	IOBI 0
H	IOI	7	IOBI 1
J	SFS	8	IOBI 2
K	SIR	9	IOBI 3
L	ENF	10	IOBI 4
*M	(SCM 0)	11	IOBI 5
N	SCM 3	12	IOBI 6
P	SCM 4	13	IOBI 7
*R	(SCM 5)	14	IOBI 8
*S	(SCM 6)	15	IOBI 9
*T	(SCM 7)	16	IOBI 10
U	SCL 0	17	IOBI 11
V	SCL 1	18	IOBI 12
W	SCL 2	19	IOBI 13
X	SCL 3	20	IOBI 14
Y	SCL 4	21	IOBI 15
Z	SCL 5	22	SPARE
AA	SCL 6	23	RUN
BB	SCL 7	24	GND

* This pin, the cable conductor connected to it, and this signal (in parentheses) are not used in this application. Before using this pin as a spare, check the computer and the extender backplane wiring, and the schematic diagrams of the cards called out in the caption of this table.

† These signals are identified by computer mnemonics.

Table 2-3. Connector Pin Assignments for Interconnecting Cable (02150-6018) Used Between Computer Connector J2 and Extender Connector J2

EXTENDER J2, PIN NO.	COMPUTER, J2 PIN NO.	SIGNAL
1	1	*
2	2	*
3	3	PWF
4	4	EPO
5	5	-18V
6	6	GND
7	7	*
8	8	*
9	9	*
10	10	SPARE
11	11	SPARE
12	12	SPARE
13	13	SPARE
14	14	SPARE

*These pins and cable conductors are not used in this application. Check the computer and the extender backplane wiring and the related card schematic diagrams before using these pins as spares.

2-7. INSTALLATION PROCEDURE.

CAUTION

Always turn off computer power before removing or inserting cards in computer or extender slots to prevent damage to card components and backplane connectors.

2-8. Install the kit as follows:

a. At the computer, turn off the POWER switch. (The computer POWER switch also controls the extender power supply.)

b. Plug the I/O-X2 extender card (12596-6005) into slot 20 in the extender (refer to paragraph 1-10).

c. Plug the I/O-X1 extender card (12596-6004) into slot 21 in the extender.

d. Plug the I/O-2 extender driver card (02116-6182) into slot 219 in the computer.

e. Plug the I/O-1 extender driver card (02116-6183) into slot 220 in the computer.

f. Connect one end of the interface cable (02150-6003) to the 48-pin edge of the I/O-1 extender driver card in slot 219 of the computer. Connect the other end of this cable to the 48-pin edge of the I/O-X1 extender card in slot 21 of the extender.

g. Connect one end of the second interface cable to the 48-pin edge of the I/O-2 extender driver card in slot 220 of the computer. Connect the other end of this cable to the 48-pin edge of the I/O-X2 extender card in slot 20 of the extender.

h. Connect one end of the interconnecting cable (02150-6018) to connector J2 in the computer. Connect the other end of this cable to connector J2 in the extender.

2-9. INSTALLATION CHECKOUT.

2-10. Check out the extender and the kit as follows:

a. Connect the extender power cable (part no. 5060-2267) to a suitable 115 volt, 50 to 60 Hz source.

b. At the computer, turn on the POWER switch.

c. Perform the voltage checks and adjustments specified in the HP 2151A I/O Extender Operating and Service Manual.

d. Using extender I/O slots instead of computer I/O slots, perform the procedure in the Diagnostic Test for Computer Interrupt Diagnostic, a manual supplement to Volume Three of the HP 2116A/B Computer documentation.

SECTION III

MAINTENANCE

3-1. GENERAL.

3-2. This section contains maintenance information consisting of parts location diagrams, reference designation indexes, and schematic diagrams. It pertains directly to the printed circuit cards furnished with the HP 12596 I/O Extender Interface Kit. If terminal data is required for signals associated with the extender-computer interface, refer to the backplane wiring lists and related schematic diagrams contained in the HP 2151A I/O Extender Operating and Service Manual. Refer also to Volumes Two and Three of the HP 2116A/B Computer documentation.

3-3. PREVENTIVE MAINTENANCE PROCEDURES.

3-4. Preventive maintenance procedures, including power supply voltage checks and adjustments, and trouble analysis procedures are specified in the HP 2151A Extender Operating and Service Manual.

3-5. PARTS LOCATION DIAGRAMS.

3-6. There is a parts location diagram for each card in the kit (see figures 3-1, 3-3, 3-5, and 3-7). Replaceable parts on any of the cards can be identified by comparing the card to the applicable parts location diagram. The

part number and other card identification shown in the diagrams is explained in paragraph 1-8. Parts are identified in the diagrams by reference designations (for example C1, R1, MC14). The same reference designation shown in a parts location diagram is also used to identify the part in a reference designation index and a schematic diagram.

3-7. REFERENCE DESIGNATION INDEXES.

3-8. The reference designation indexes (tables 3-1 through 3-4) list replaceable parts of the cards alphabetically by reference designation. A separate index is presented for each card. Each index provides the HP part number, a description of the part, the manufacturer's part number, and the code number identifying the manufacturer. The manufacturer's code numbers are listed with manufacturer's names in section IV, table 4-2. Section IV also contains spares provisioning and parts ordering information.

3-9. SCHEMATIC DIAGRAMS.

3-10. There is a schematic diagram for each card in the kit (see figures 3-2, 3-4, 3-6, and 3-7). For positive identification, the margin of the schematic contains the name, part number, and date code (refer to paragraph 1-8) of the card.

Table 3-1. I/O-1 Extender Driver Card (02116-6182) Reference Designation Index

REFERENCE DESIGNATION*	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
C1 thru C9	0180-0197	C: FXD ELECT 2.2 UF 10% 20 VDCW	28480	0180-0197
CR1,2	1901-0026	DIODE: SILICON 0.75A 200 PIV	28480	1901-0026
MC13,14,23,24,33,34,43,44, 53,54,63,64,73,74,83,84, 93,94,103,104,113,114, 123	1820-0956	INTEGRATED CIRCUIT: CTL	07263	SL 3459
R1 thru R24,45,46	0757-0916	R: FXD FLM 470 OHM 2% 1/8W	28480	0757-0916
R25 thru R44	0757-0900	R: FXD FLM 100 OHM 2% 1/8W	28480	0757-0900
W1 thru W13	8159-0005	JUMPER WIRE	28480	8159-0005

*Partial reference designations are listed; prefix each with computer assembly reference designation A219.

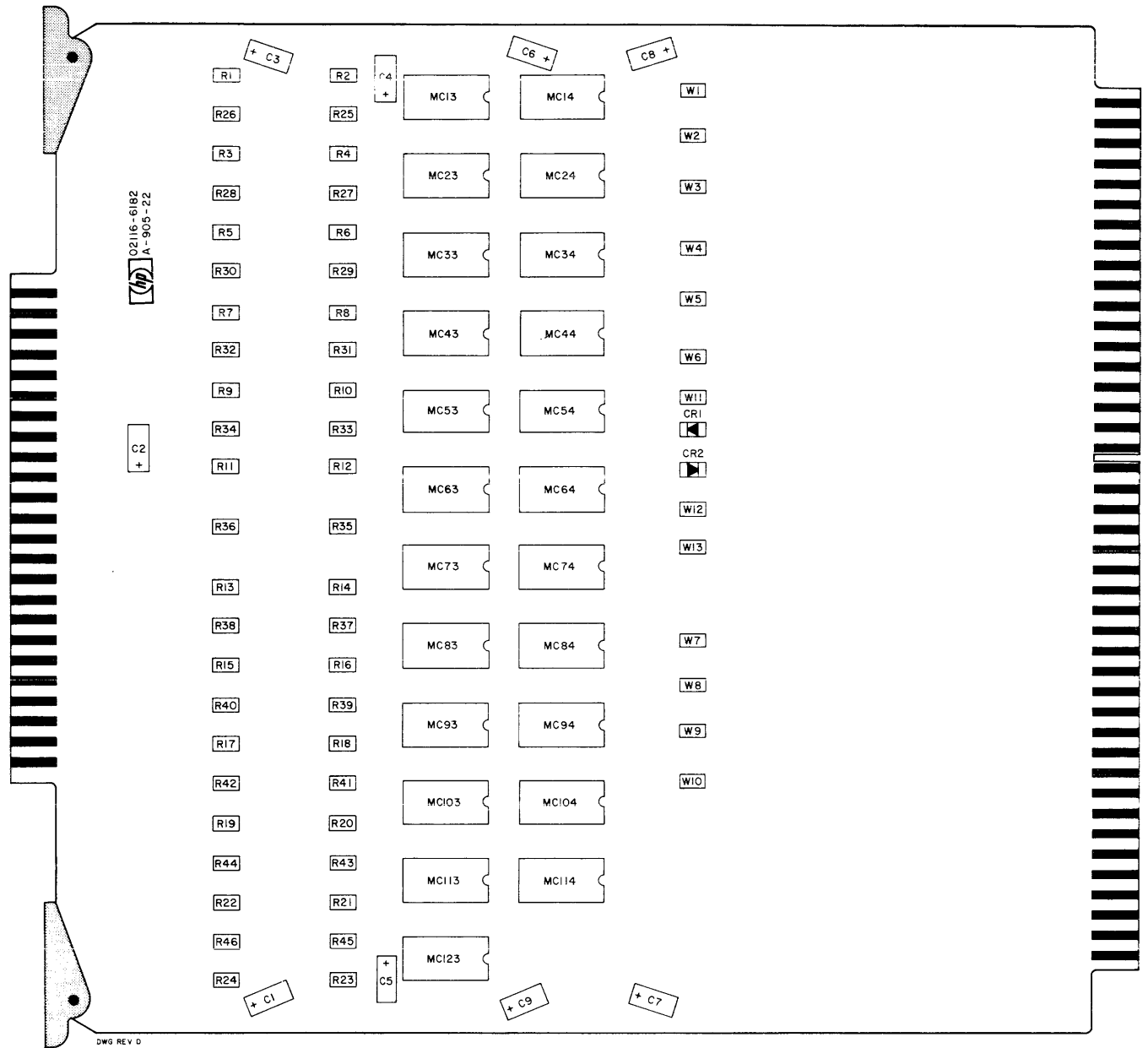


Figure 3-1. I/O-1 Extender Driver Card (02116-6182) Parts Location Diagram

n Diagram

- NOTES:
1. * INDICATES SIGNALS FROM/TO COMPUTER-EXTENDER OUTPUT DRIVER VIA 48-PIN CONNECTOR. ALL OTHER SIGNALS ARE FROM/TO COMPUTER VIA 86-PIN CONNECTOR.
 2. UNLESS OTHERWISE SPECIFIED ALL RESISTANCES ARE IN OHMS.

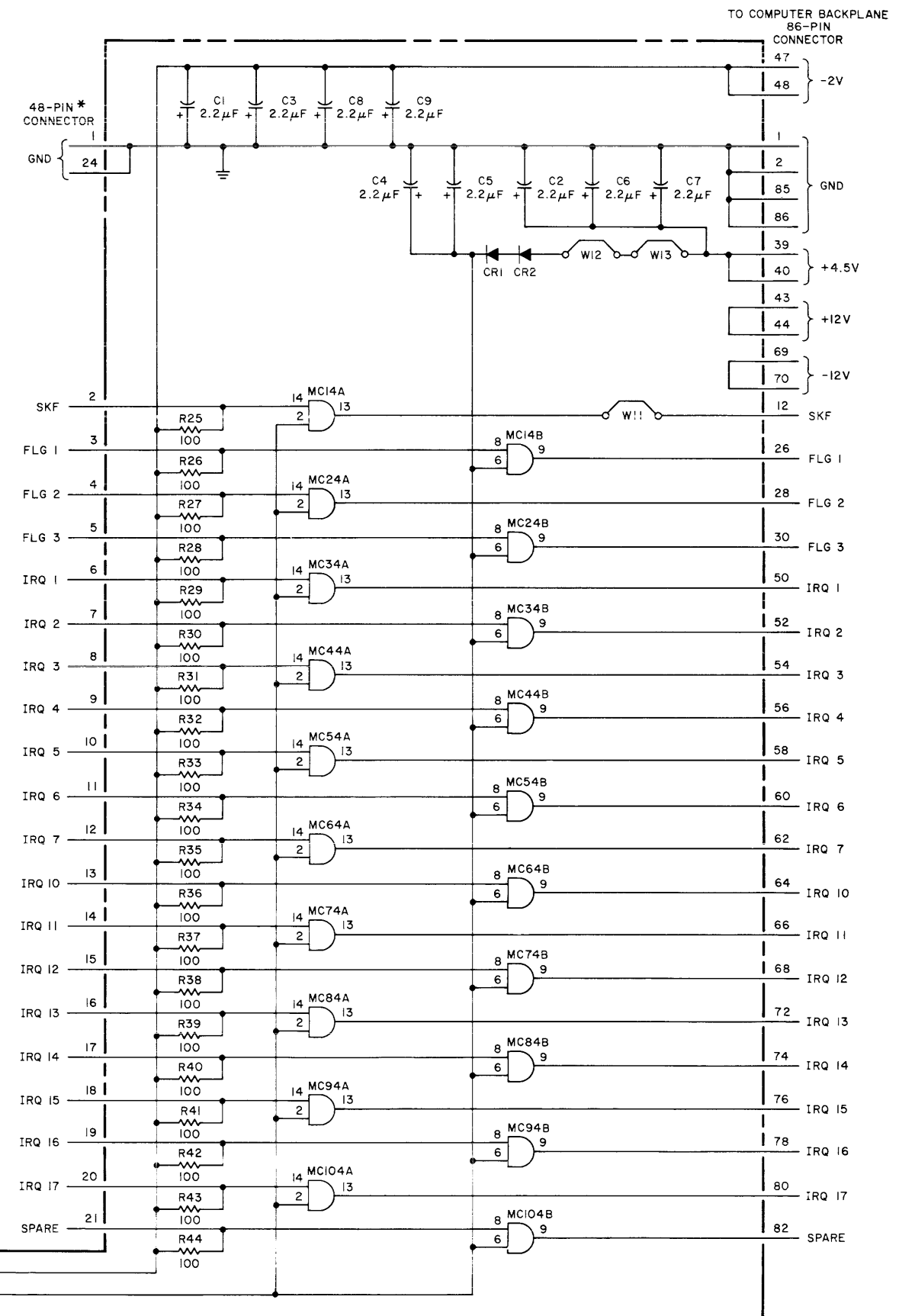
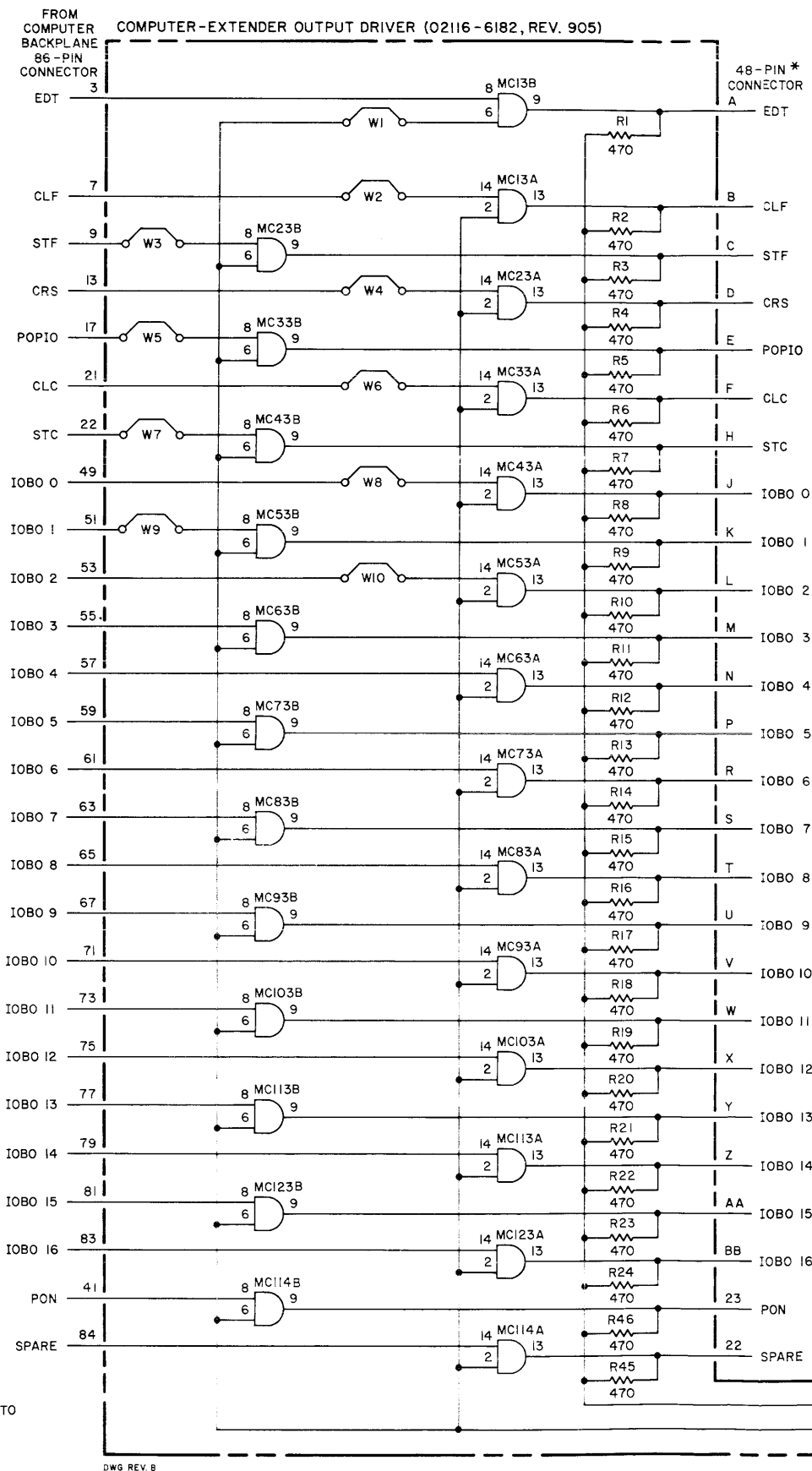


Figure 3-2. I/O-1 Extender Driver Card
(02116-6182) Schematic Diagram

Table 3-2. I/O-2 Extender Driver Card (02116-6183) Reference Designation Index

REFERENCE DESIGNATION*	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
C1 thru C9	0180-0197	C: FXD ELECT 2.2 UF 10% 20 VDCW	28480	0180-0197
CR1,2	1901-0026	DIODE: SILICON 0.75A 200 PIV	28480	1901-0026
MC13,14,23,24,33,34,43,44, 53,54,63,64,73,74,83,84, 93,94,103,104,113,114, 123	1820-0956	INTEGRATED CIRCUIT: CTL	07263	SL 3459
R1 thru R24,45,46	0757-0916	R: FXD FLM 470 OHM 2% 1/8W	28480	0757-0916
R25 thru R44	0757-0900	R: FXD FLM 100 OHM 2% 1/8W	28480	0757-0900
W1 thru W13	8159-0005	JUMPER WIRE	28480	8159-0005

*Partial reference designations are listed: prefix each with computer assembly reference designation A220.

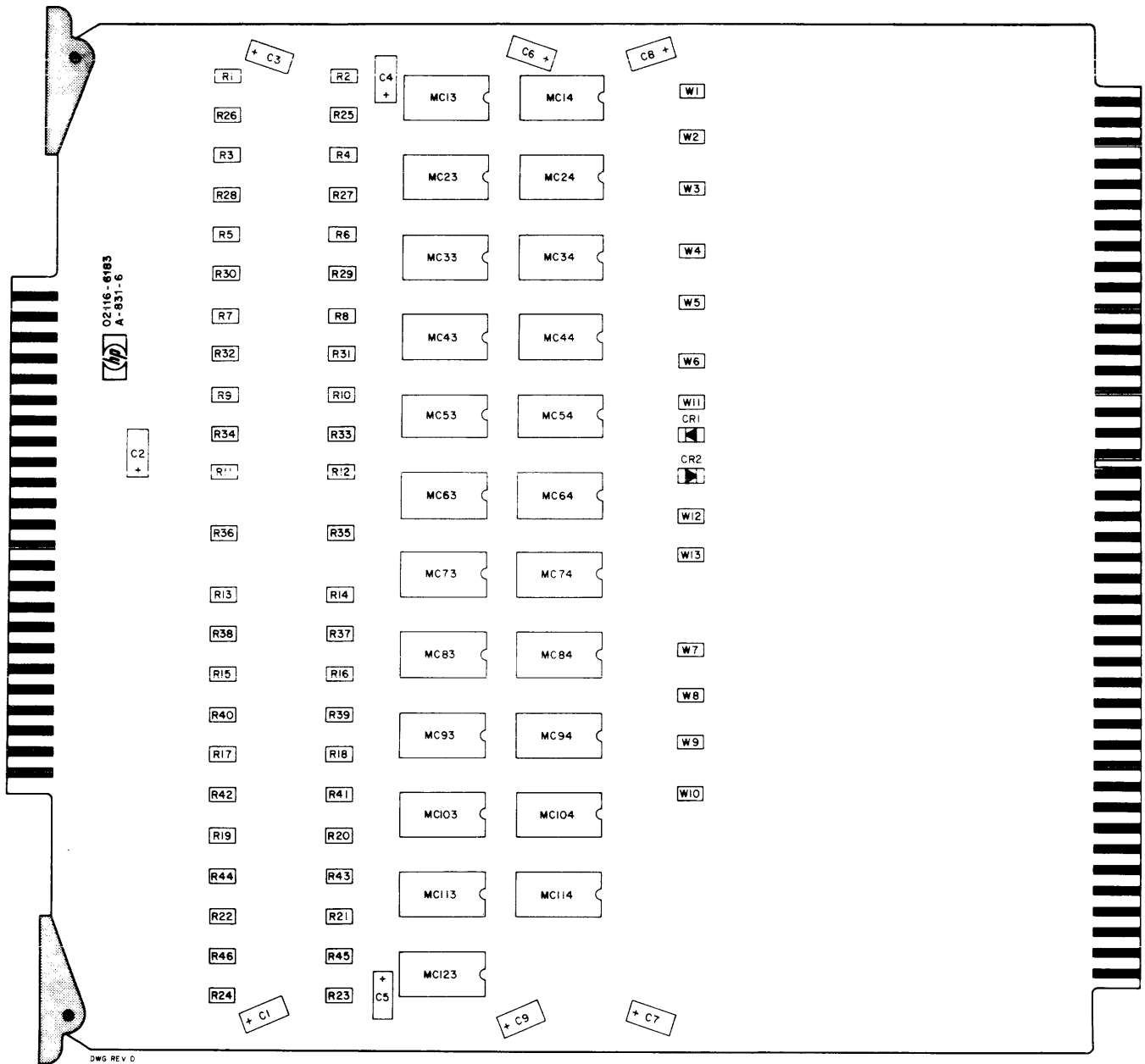
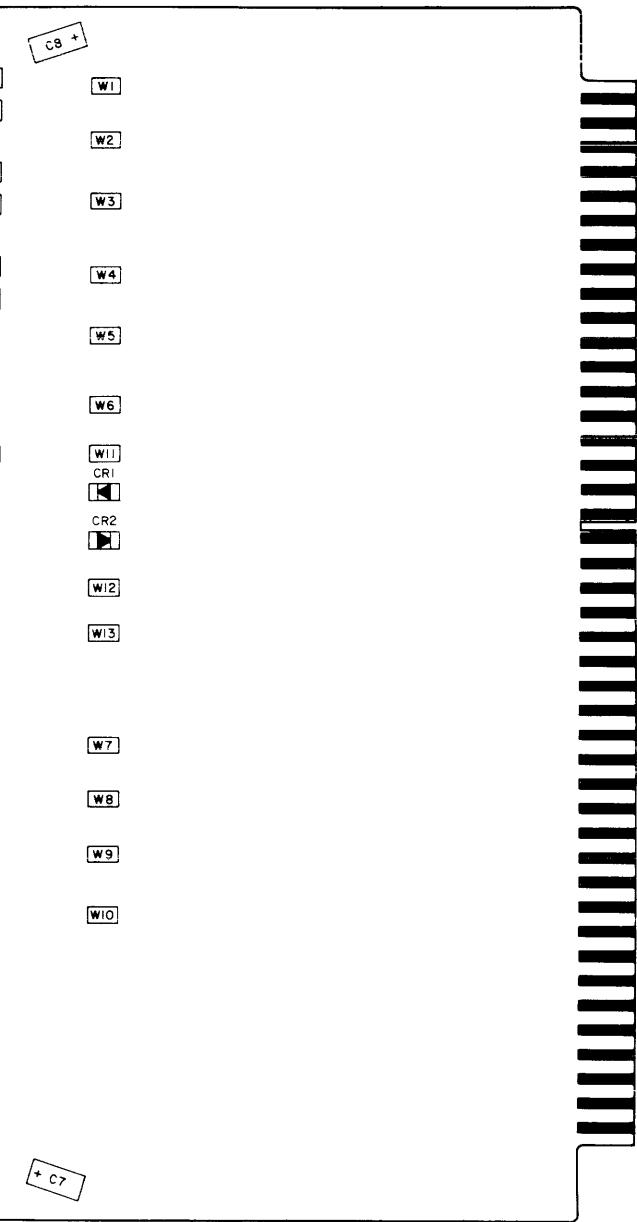


Figure 3-3. I/O-2 Extender Driver Card (02116-6183) Parts Location Diagram



2116-6183) Parts Location Diagram

- NOTES:
- * INDICATES SIGNALS FROM/TO COMPUTER-EXTENDER OUTPUT DRIVER VIA 48-PIN CONNECTOR. ALL OTHER SIGNALS ARE FROM/TO COMPUTER VIA 86-PIN CONNECTOR.
 - UNLESS OTHERWISE SPECIFIED ALL RESISTANCES ARE IN OHMS.
 - * PIN 55 IS SCM 0 IN HP 2116A/B COMPUTER; SCM 2 IN HP 2115A COMPUTER.

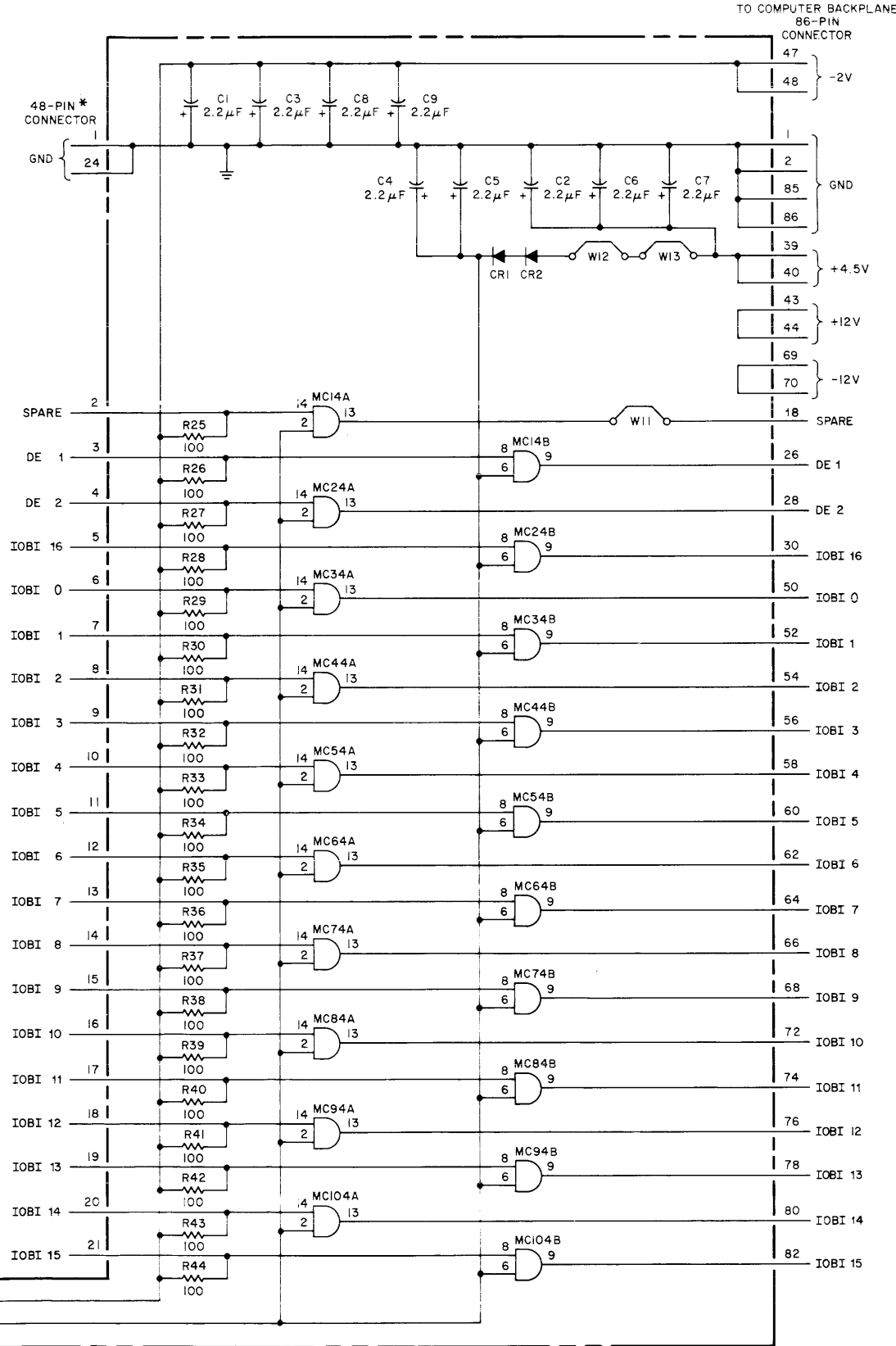
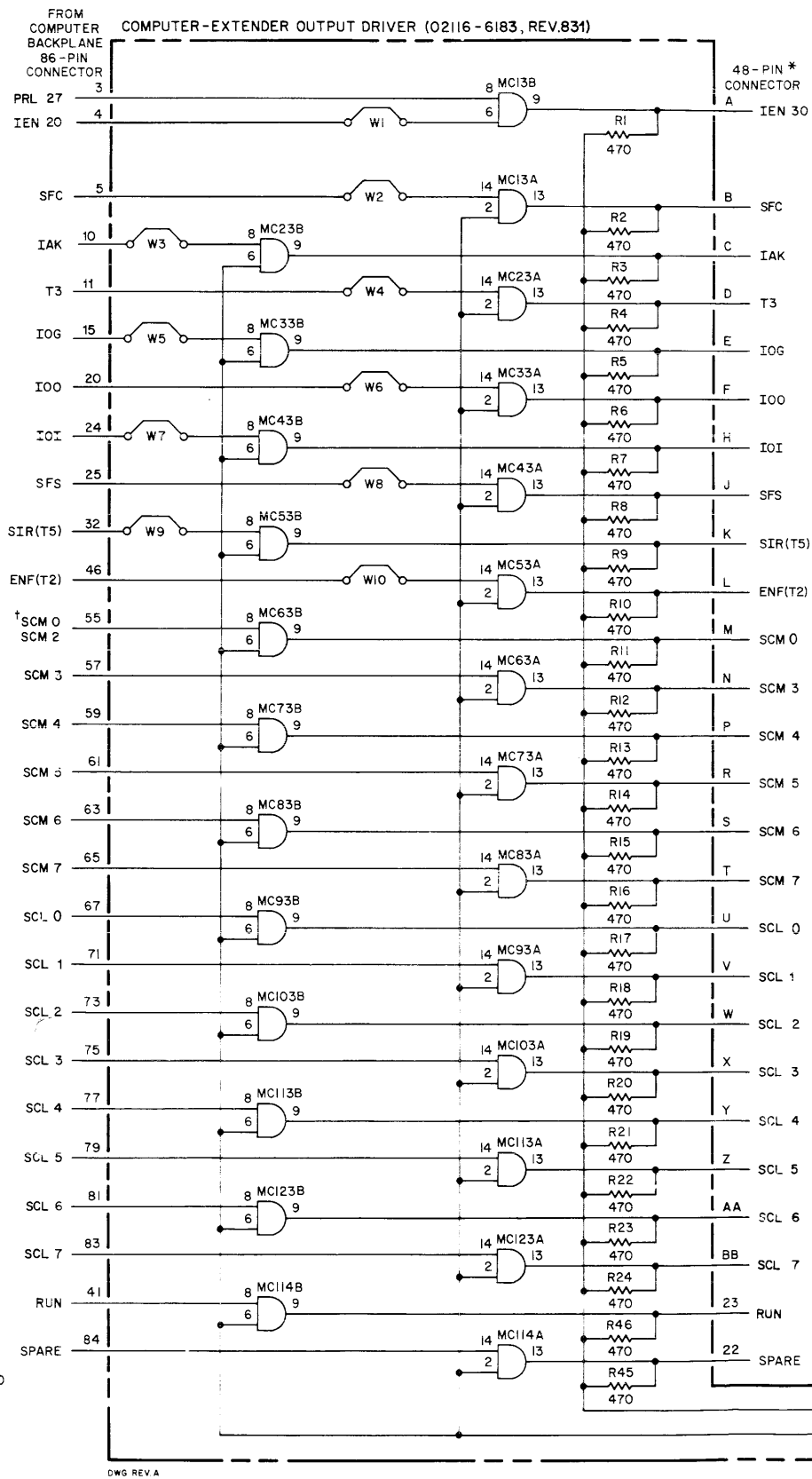


Figure 3-4. I/O-2 Extender Driver Card (02116-6183) Schematic Diagram

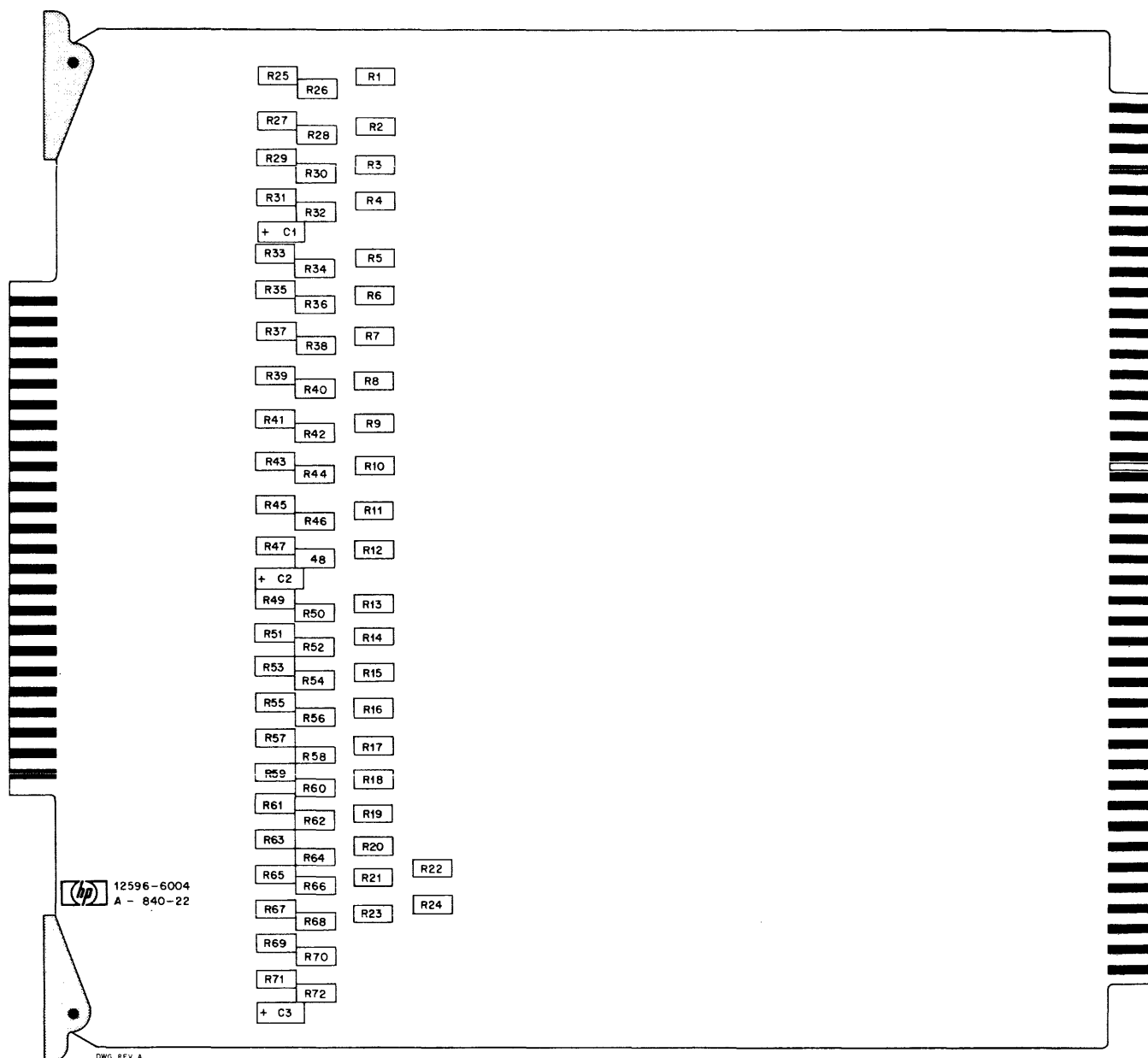


Figure 3-5. I/O-X1 Extender Card (12596-6004) Parts Location Diagram

Table 3-3. I/O-X1 Extender Card (12596-6004) Reference Designation Index

REFERENCE DESIGNATION*	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
C1 thru C3	0180-0197	C: FXD ELECT 2.2 UF 10% 20 VDCW	28480	0180-0197
R1 thru R20	0698-0082	R: FXD MET FLM 464 OHM 1% 1/8W	28480	0698-0082
R21 thru R72	0698-3441	R: FXD MET FLM 215 OHM 1% 1/8W	28480	0698-3441

*Partial reference designations are listed: prefix each with extender assembly reference designation A21.

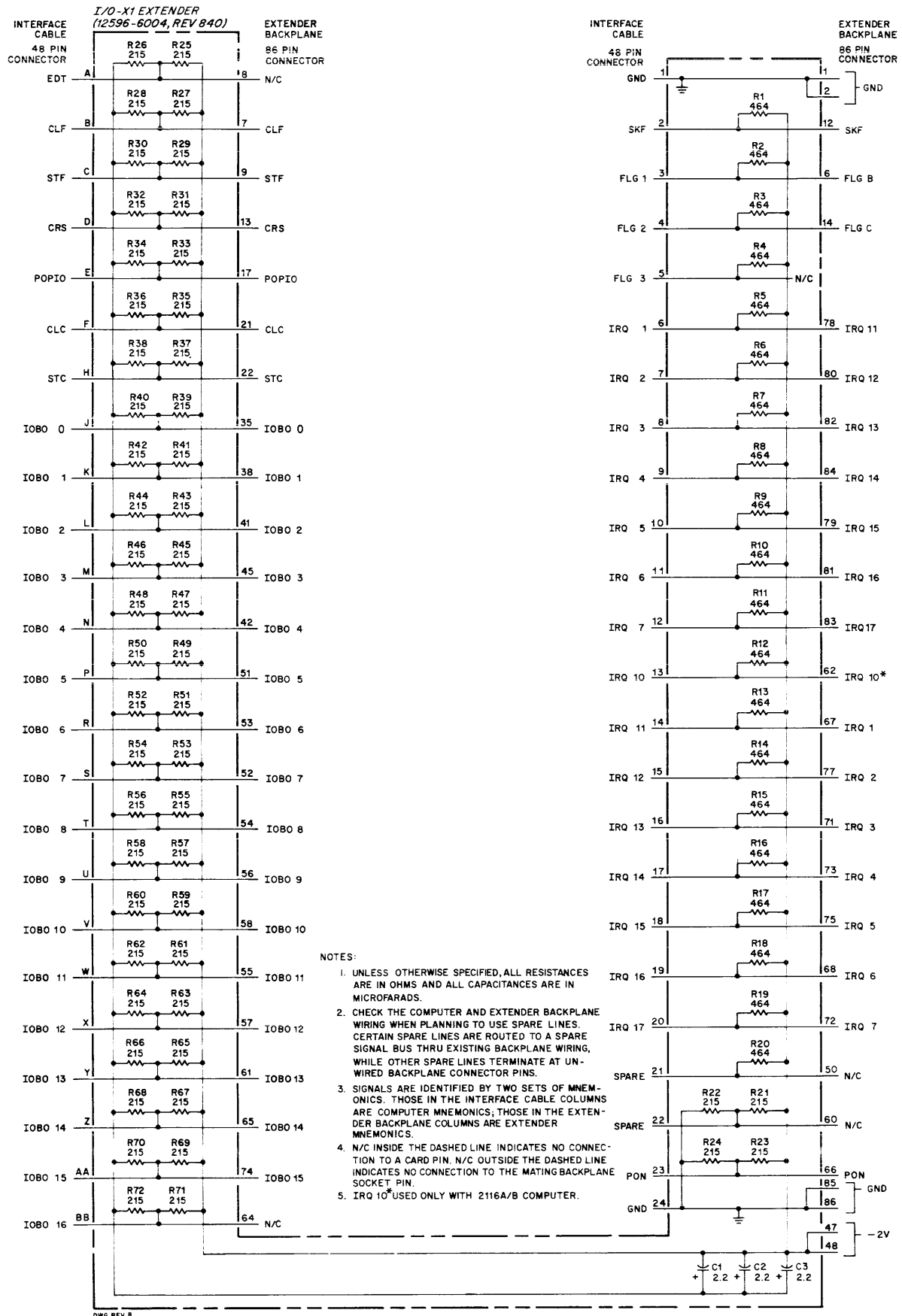


Figure 3-6. I/O-X1 Extender Card (12596-6004) Schematic Diagram

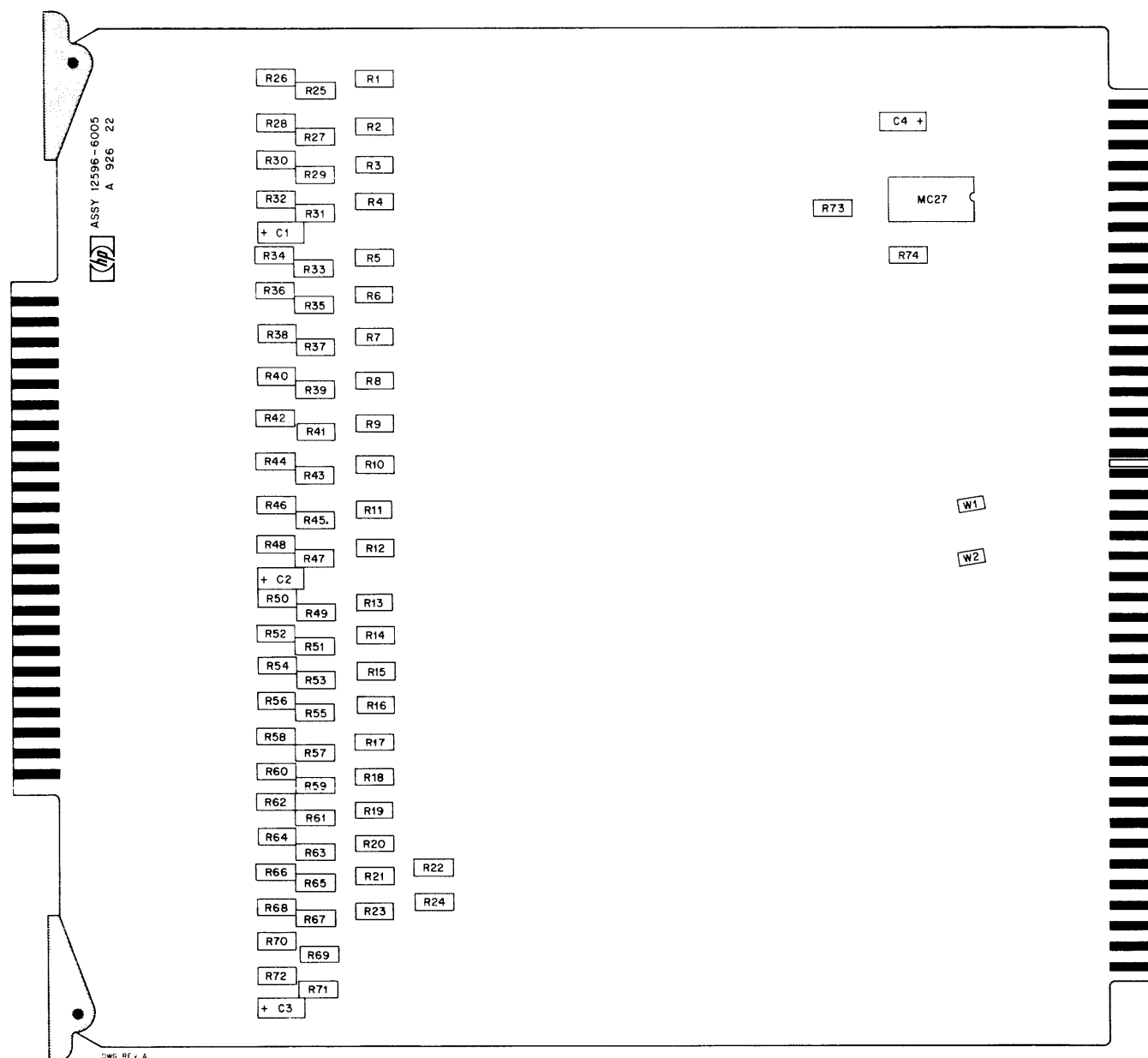
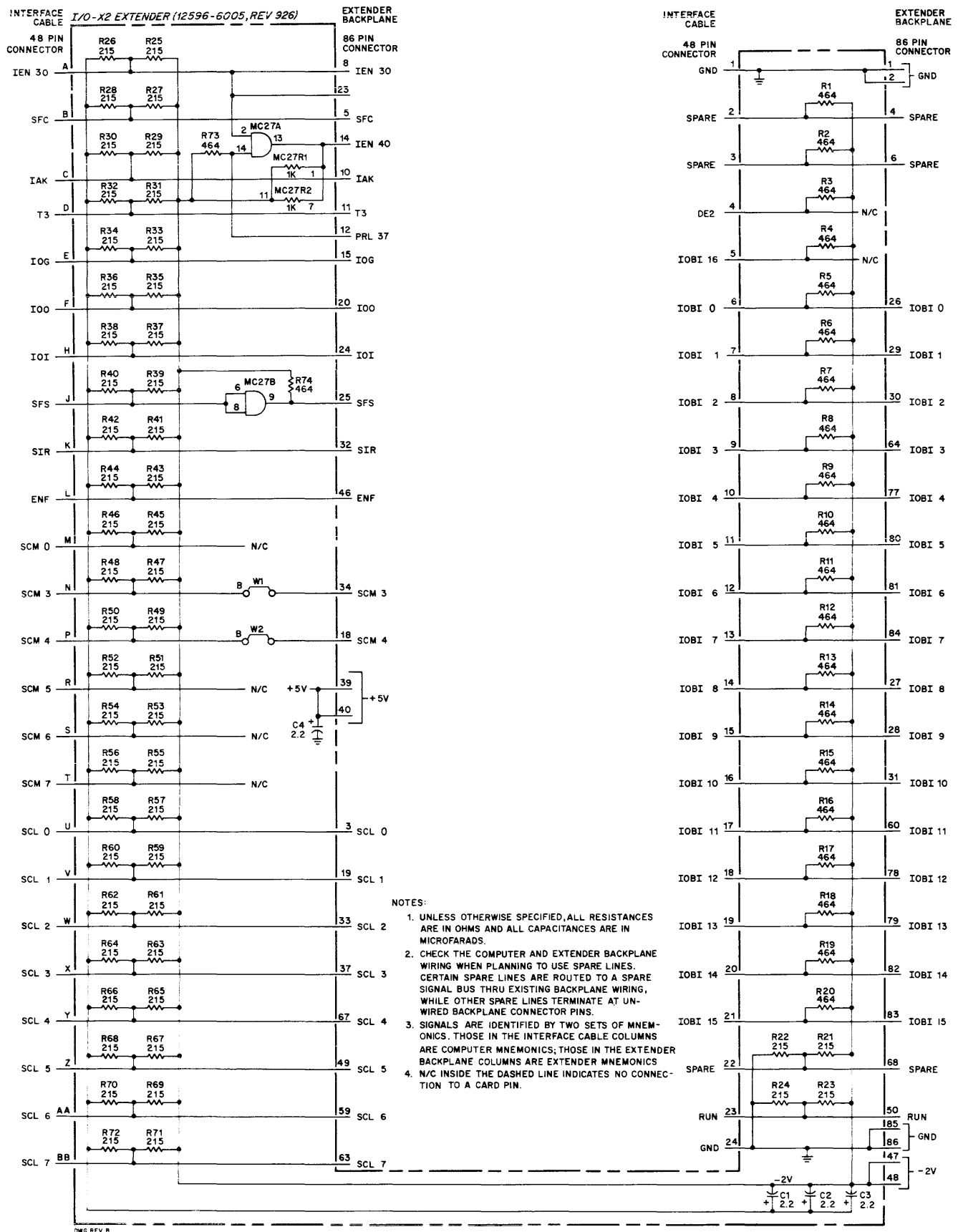


Figure 3-7. I/O-X2 Extender Card (12596-6005) Parts Location Diagram

Table 3-4. I/O-X2 Extender Card (12596-6005) Reference Designation Index

REFERENCE DESIGNATION*	HP PART NO.	DESCRIPTION	MFR. CODE NO.	MFR. PART NO.
C1 thru C4	0180-0197	C: FXD ELECT 2.2 UF 10% 20 VDCW	28480	0180-0197
MC27	1820-0956	INTEGRATED CIRCUIT: CTL	07263	SL 3459
R1 thru R20,73	0698-0082	R: FXD MET FLM 464 OHM 1% 1/8W	28480	0698-0082
R21 thru R72	0698-3441	R: FXD MET FLM 215 OHM 1% 1/8W	28480	0698-3441
W1,2	8159-0005	JUMPER WIRE	28480	8159-0005

*Partial reference designations are listed; prefix each with extender assembly reference designation A20.



SECTION IV

REPLACEABLE PARTS

4-1. GENERAL.

4-2. This section contains replaceable parts and ordering information for the HP 12596A I/O Extender Interface Kit.

4-3. PROVISIONING SPARES.

4-4. Table 4-1 lists the replaceable parts of the kit numerically by HP part number and provides the following: a description of each part, the code number identifying the manufacturer (refer to table 4-2), the manufacturer's part number, and the total quantity (TQ) of the part used in the kit. To obtain total parts quantities for an HP 2151A I/O Extender with a 12596A I/O Extender Interface Kit installed, the total quantities listed

in table 4-1 must be added to the total quantities listed in the HP 2151A I/O Extender Operating and Service Manual.

4-5. ORDERING INFORMATION.

4-6. To order a replaceable part, address the order or inquiry to the nearest Hewlett-Packard Sales and Service Office. They are listed in the back of this manual.

4-7. With the order or inquiry always include the following:

- a. Hewlett-Packard part number.
- b. Reference designation.
- c. Description.

Table 4-1. HP 12596A Replaceable Parts

Part No.	Description #	Mfr.	Mfr. Part No.	TQ
0180-0197	C:FXD ELECT 2.2 JF 10% 20VDCW	56289	1500225X9020A2-DYS	25
0698-0082	R:FXD MET FLM 464 OHM 1% 1/8W	14674	C4	42
0698-3441	R:FXD MET FLM 215 OHM 1% 1/8W	91637	MF-1/10-32	104
0757-0900	R:FXD FLM 100 OHM 2% 1/8W	28480	0757-0900	40
0757-0916	R:FXD FLM 470 OHM 2% 1/8W	28480	0757-0916	52
1820-0956	INTEGRATED CIRCUIT: CTL	07263	SL3459	47
1901-0026	DIODE:SILICON 0.75A 200 PIV	28480	1901-0026	4
8159-0005	JUMPER WIRE	28480	8159-0005	28
02116-6182	I/O-1 EXTENDER DRIVER CARD	04404	02116-6182	-1
02116-6183	I/O-2 EXTENDER DRIVER CARD	04404	02116-6183	1
02150-6018	INTERCONNECTING CABLE 14-CONDUCTOR	28480	02150-6018	1
12596-6004	I/O-X1 EXTENDER CARD	28480	12596-6004	1
12596-6005	I/O-X2 EXTENDER CARD	28480	12596-6005	1

See introduction to this section for ordering information

Table 4-2. Code List of Manufacturers

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) and their latest supplements. The date of revision and the date of the supplements used appear at the bottom of each page. Alphabetical codes have been arbitrarily assigned to suppliers not appearing in the H4 Handbooks.

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
00000	U.S.A. Common	Any supplier of U.S.	05245	Components Corp.	Chicago, Ill.	09145	Tech. Ind. Inc. Atchm. Elect.	Burbank, Calif.
00136	McCoy Electronics	Mount Holly Springs, Pa.	05277	Westinghouse Electric Corp.	Youngwood, Pa.	09250	Electro Assemblies, Inc.	Chicago, Ill.
00213	Sage Electronics Corp.	Rochester, N.Y.		Semi-Conductor Dept.		09353	C & K Components Inc.	Newton, Mass.
00287	Cemco Inc.	Danielson, Conn.	05347	Ultronix, Inc.	San Mateo, Calif.	09569	Mallory Battery Co. of	Canada, Ltd.
00334	Humical	Colton, Calif.	05397	Union Carbide Corp., Elect. Div.	New York, N.Y.			Toronto, Ontario, Canada
00348	Microtron Co., Inc.	Valley Stream, N.Y.				09922	Burndy Corp.	Norwalk, Conn.
00373	Garlock Inc.	Cherry Hill, N.J.	05574	Viking Ind. Inc.	Canoga Park, Calif.	10214	General Transistor Western Corp.	Los Angeles, Calif.
00656	Aerovox Corp.	New Bedford, Mass.	05593	Icare Electro-Plastics Inc.	Sunnyvale, Calif.			Berkeley, Calif.
00779	Amp. Inc.	Harrisburg, Pa.	05616	Cosmo Plastic		10411	Ti-Tal, Inc.	Niagara Falls, N.Y.
00781	Aircraft Radio Corp.	Boonton, N.J.		(c o Electrical Spec. Co.)	Cleveland, Ohio	10646	Carborundum Co.	Berne, Ind.
00815	Northern Engineering Laboratories, Inc.	Burlington, Wis.	05624	Barber Colman Co.	Rockford, Ill.	11236	CTS of Berne, Inc.	
			05728	Tiffen Optical Co.	Roslyn Heights, Long Island, N.Y.	11237	Chicago Telephone of California, Inc.	So. Pasadena, Calif.
00853	Sangamo Electric Co., Pickens Div.	Pickens, S.C.	05729	Metro-Tel Corp.	Westbury, N.Y.	11242	Bay State Electronics Corp.	Waltham, Mass.
00866	Goe Engineering Co.	City of Industry, Cal.	05783	Stewart Engineering Co.	Santa Cruz, Calif.	11312	Teledyne Inc., Microwave Div.	Palo Alto, Calif.
00891	Carl E. Holmes Corp.	Los Angeles, Calif.	05820	Wakefield Engineering Inc.	Wakefield, Mass.	11314	National Seal	Downey, Calif.
00929	Microfab Inc.	Livingston, N.J.	06004	Bassick Co., Div. of Stewart Warner Corp.	Bridgeport, Conn.	11453	Precision Connector Corp.	Jamaica, N.Y.
01002	General Electric Co., Capacitor Dept.	Hudson Falls, N.Y.				11534	Duncan Electronics Inc.	Costa Mesa, Calif.
01009	Alden Products Co.	Brockton, Mass.	06090	Raychem Corp.	Redwood City, Calif.	11711	General Instrument Corp., Semiconductor	Newark, N.J.
01121	Allen Bradley Co.	Milwaukee, Wis.	06175	Bausch and Lomb Optical Co.	Rochester, N.Y.			
01255	Litton Industries, Inc.	Beverly Hills, Calif.	06402	E. T. A. Products Co. of America	Chicago, Ill.	11717	Imperial Electronic Group	Buena Park, Calif.
01281	TRW Semiconductors, Inc.	Lawndale, Calif.	06540	Amatom Electronic Hardware Co., Inc.	New Rochelle, N.Y.	11870	Melabs, Inc.	Palo Alto, Calif.
01295	Texas Instruments, Inc., Transistor Products Div.	Dallas, Texas	06555	Beede Electrical Instrument Co., Inc.	Penacook, N.H.	12040	National Semiconductor	Danbury, Conn.
01349	The Alliance Mfg. Co.	Alliance, Ohio	06666	General Devices Co., Inc.	Indianapolis, Ind.	12136	Philadelphia Handle Co.	Camden, N.J.
01589	Pacific Relays, Inc.	Van Nuys, Calif.	06751	Components Inc., Ariz. Div.	Phoenix, Ariz.	12361	Grove Mfg. Co., Inc.	Shady Grove, Pa.
01670	Gudebrod Bros. Silk Co.	New York, N.Y.	06812	Torrington Mfg. Co., West Div.		12574	Gulton Ind. Inc. Data System Div.	Albuquerque, N.M.
01930	Amerock Corp.	Rockford, Ill.				12697	Clarostat Mfg. Co.	Dover, N.H.
01961	Pulse Engineering Co.	Santa Clara, Calif.	06980	Varian Assoc. Eimac Div.	Van Nuys, Calif.	12728	Elmar Filter Corp.	H. Waven, Conn.
02114	Ferroxcube Corp. of America	Saugerties, N.Y.	07088	Kelvin Electric Co.	Van Nuys, Calif.	12859	Nippon Electric Co., Ltd.	Tokyo, Japan
02116	Wheelock Signals, Inc.	Long Branch, N.J.	07126	Digitran Co.	Pasadena, Calif.	12881	Metex Electronics Corp.	Clark, N.J.
02286	Cole Rubber and Plastics Inc.	Sunnyvale, Calif.	07137	Transistor Electronics Corp.	Minneapolis, Minn.	12930	Delta Semiconductor Inc.	Newport Beach, Calif.
02660	Amphenol-Borg Electronics Corp.	Broadview, Ill.	07138	Westinghouse Electric Corp.		12954	Dickson Electronics Corp.	Scottsdale, Arizona
02735	Radio Corp. of America, Semiconductor and Materials Div.	Somerville, N.J.		Electronic Tube Div.	Elmira, N.Y.	13193	Thermolloy	Dallas, Texas
02771	Vocaline Co. of America, Inc.	Old Saybrook, Conn.	07149	Filmohm Corp.	New York, N.Y.	13396	Telefunken (GmbH)	Hanover, Germany
			07233	Cinch-Graphik Co.	City of Industry, Calif.	13835	Midland-Wright Div. of Pacific Industries, Inc.	Kansas City, Kansas
02777	Hopkins Engineering Co.	San Fernando, Calif.	07256	Silicon Transistor Corp.	Carle Place, N.Y.	14099	Sem-Tech	Newbury Park, Calif.
02875	Hudson Tool & Die Co.	Newark, N.J.	07261	Avnet Corp.	Culver City, Calif.	14193	Calif. Resistor Corp.	Santa Monica, Calif.
03508	G.E. Semiconductor Prod. Dept.	Syracuse, N.Y.	07263	Fairchild Camera & Inst. Corp.	Mountain View, Calif.	14298	American Components, Inc.	Conshohocken, Pa.
03705	Apex Machine & Tool Co.	Dayton, Ohio		Semiconductor Div.		14433	ITT Semiconductor, A Div. of Int. Telephone & Telegraph Corp.	West Palm Beach, Fla.
03797	Eidema Corp.	Compton, Calif.	07322	Minnesota Rubber Co.	Minneapolis, Minn.	14493	Hewlett-Packard Company	Loveland, Colo.
03818	Parker Seal Co.	Los Angeles, Calif.	07387	Birtcher Corp., The	Monterey Park, Calif.	14655	Cornell Dublier Electric Corp.	Newark, N.J.
03877	Transitron Electric Corp.	Wakefield, Mass.	07397	Sylvania Elect. Prod. Inc., Mt. View Operations	Mountain View, Calif.	14674	Corning Glass Works	Corning, N.Y.
03888	Pyrofilm Resistor Co., Inc.	Cedar Knolls, N.J.				14752	Electro Cube Inc.	San Gabriel, Calif.
03954	Singer Co., Diehl Div.	Sumerville, N.J.	07700	Technical Wire Products Inc.	Cranford, N.J.	14960	Williams Mfg. Co.	San Jose, Calif.
	Finderne Plant		07829	Bodine Elect. Co.	Chicago, Ill.	15203	Webster Electronics Co.	New York, N.Y.
04009	Arrow, Hart and Hegeman Elect. Co.	Hartford, Conn.	07910	Continental Device Corp.	Hawthorne, Calif.	15287	Scionics Corp.	Northridge, Calif.
			07933	Raytheon Mfg. Co., Semiconductor Div.	Mountain View, Calif.	15291	Adjustable Bushing Co.	N. Hollywood, Calif.
04013	Taurus Corp.	Lambertville, N.J.	07980	Hewlett-Packard Co., Boonton Radio Div.	Rockaway, N.J.	15558	Micron Electronics	Garden City, Long Island, N.Y.
04062	Arco Electronic Inc.	Great Neck, N.Y.				15566	Amprobe Inst. Corp.	Lynbrook, N.Y.
04222	Hi-Q Division of Aerovox	Myrtle Beach, S.C.	08145	U.S. Engineering Co.	Los Angeles, Calif.	15631	Cabletronics	Costa Mesa, Calif.
04354	Precision Paper Tube Co.	Wheeling, Ill.	08285	Blinn, Delbert Co.	Pomona, Calif.	15772	Twentieth Century Coil Spring Co.	Santa Clara, Calif.
04404	Dymec Division of Hewlett-Packard Co.	Palo Alto, Calif.	08358	Burgess Battery Co.	Niagara Falls, Ontario, Canada			Framingham, Mass.
04651	Sylvania Electric Products, Microwave Device Div.	Mountain View, Calif.	08524	Deutsch Fastener Corp.	Los Angeles, Calif.	15801	Fenwal Elect. Inc.	Mt. View, Calif.
04673	Dakota Engr. Inc.	Culver City, Calif.	08664	Bristol Co., The	Waterbury, Conn.	16037	Spruce Pine Mica Co.	Spruce Pine, N.C.
04713	Motorola, Inc., Semiconductor Prod. Div.	Phoenix, Arizona	08717	Sloan Company	Sun Valley, Calif.	16179	Omni-Spectra Inc.	Farmington, Mich.
			08718	ITT Cannon Electric Inc., Phoenix Div.	Phoenix, Arizona	16352	Computer Diode Corp.	Lodi, N.J.
04732	Filtron Co., Inc. Western Div.	Culver City, Calif.	08727	National Radio Lab. Inc.	Paramus, N.J.	16585	Boots Aircraft Nut Corp.	Pasadena, Calif.
04773	Automatic Electric Co.	Northlake, Ill.	08792	CBS Electronics Semiconductor Operations, Div. of C.B.S. Inc.	Lowell, Mass.	16688	Ideal Prec. Meter Co., Inc.	Brooklyn, N.Y.
04796	Sequale Wire Co.	Redwood City, Calif.				16758	Delco Radio Div. of G.M. Corp.	Kokoma, Ind.
04811	Precision Coil Spring Co.	El Monte, Calif.	08806	General Electric Co. Minat. Lamp Dept.	Cleveland, Ohio	17109	Thermometrics Inc.	Canoga Park, Calif.
04870	P.W. Motor Company	Westchester, Ill.	08964	Mel-Rain	Indianapolis, Ind.	17474	Tranex Company	Mountain View, Calif.
04919	Component Mfg. Service Co.	W. Bridgewater, Mass.	09026	Babcock Relays Div.	Costa Mesa, Calif.	17554	Components Inc.	Bideford, Ma.
05006	Twentieth Century Plastics, Inc.	Los Angeles, Calif.	09134	Texas Capacitor Co.	Houston, Texas	17675	Hamlin Metal Products Corp.	Akron, Ohio
						17745	Angstrom Prec. Inc.	No. Hollywood, Calif.

Table 4-2. Code List of Manufacturers (Continued)

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
17870	McGraw-Edison Co.	Manchester, N. H.	62119	Universal Electric Co.	Owosso, Mich.	73899	JFD Electronics Corp.	Brooklyn, N. Y.
18042	Power Design Pacific Inc.	Palo Alto, Calif.	63743	Ward-Leonard Electric Co.	Mt. Vernon, N. Y.	73905	Jennings Radio Mfg. Corp.	San Jose, Calif.
18083	Clevite Corp., Semiconductor Div.	Palo Alto, Calif.	64959	Western Electric Co., Inc.	New York, N. Y.	73957	Groov-Pin Corp.	Ridgefield, N. J.
18324	Signetics Corp.	Sunnyvale, Calif.	65092	Weston Inst. Inc. Weston-Newark	Newark, N. J.	74276	Signalite Inc.	Neptune, N. J.
18476	Ty-Car Mfg. Co., Inc.	Holliston, Mass.	66295	Witttek Mfg. Co.	Chicago, Ill.	74455	J. H. Winns, and Sons	Winchester, Mass.
18486	TRW Elect. Comp. Div.	Des Plaines, Ill.	66346	Minnesota Mining & Mfg. Co. Revere Mincom Div.	St. Paul, Minn.	74861	Industrial Condenser Corp.	Chicago, Ill.
18583	Curtis Instrument, Inc.	Mt. Kisco, N. Y.	70276	Allen Mfg. Co.	Hartford, Conn.	74866	R. F. Products Division of Amphenol-Borg Electronics Corp.	Danbury, Conn.
18612	Vishay Instruments Inc.	Malvern, Pa.	70309	Allied Control	New York, N. Y.	74970	E. F. Johnson Co.	Waseca, Minn.
18873	E. I. DuPont and Co., Inc.	Wilmington, Del.	70318	Allmetal Screw Product Co., Inc.	Garden City, N. Y.	75042	International Resistance Co.	Philadelphia, Pa.
18911	Durant Mfg. Co.	Milwaukee, Wis.	70417	Amplex, Div. of Chrysler Corp.	Detroit, Mich.	75263	Keystone Carbon Co., Inc.	St. Marys, Pa.
19315	The Bendix Corp., Navigation & Control Div.	Teterboro, N. J.	70485	Atlantic India Rubber Works, Inc.	Chicago, Ill.	75378	CTS Knights Inc.	Sandwich, Ill.
19500	Thomas A. Edison Industries, Div. of McGraw-Edison Co.	West Orange, N. J.	70563	Amperite Co., Inc.	Union City, N. J.	75382	Kulka Electric Corporation	Mt. Vernon, N. Y.
19589	Concoa	Baldwin Park, Calif.	70674	ADC Products Inc.	Minneapolis, Minn.	75818	Lenz Electric Mfg. Co.	Chicago, Ill.
19644	LRC Electronics	Horseheads, N. Y.	70903	Belden Mfg. Co.	Chicago, Ill.	75915	Littlefuse, Inc.	Des Plaines, Ill.
19701	Electra Mfg. Co.	Independence, Kansas	70998	Bird Electronic Corp.	Cleveland, Ohio	76005	Lord Mfg. Co.	Erie, Pa.
20183	General Atomics Corp.	Philadelphia, Pa.	71002	Birnbach Radio Co.	New York, N. Y.	76210	C. W. Marwedel	San Francisco, Calif.
21226	Executone, Inc.	Long Island City, N. Y.	71034	Bliley Electric Co., Inc.	Erie, Pa.	76433	General Instrument Corp., Micamp Division	Newark, N. J.
21335	Fafnir Bearing Co., The	New Britain, Conn.	71041	Boston Gear Works Div. of Murray Co. of Texas	Quincy, Mass.	76487	James Miller Mfg. Co., Inc.	Malden, Mass.
21520	Fansteel Metallurgical Corp.	N. Chicago, Ill.	71218	Bud Radio, Inc.	Willoughby, Ohio	76493	J. W. Miller Co.	Los Angeles, Calif.
23042	Texscan Corp.	Indianapolis, Ind.	71279	Cambridge Thermionics Corp.	Cambridge, Mass.	76530	Cinch-Monadnock, Div. of United Carr Fastener Corp.	San Leandro, Calif.
23783	British Radio Electronics Ltd.	Washington, D. C.	71286	Canloc Fastener Corp.	Paramus, N. J.	76546	Mueller Electric Co.	Cleveland, Ohio
24455	G. E. Lamp Division	Nela Park, Cleveland, Ohio	71313	Cardwell Condenser Corp.	Lindenhurst L. I., N. Y.	76703	National Union	Newark, N. J.
24655	General Radio Co.	West Concord, Mass.	71400	Bussmann Mfg. Div. of McGraw-Edison Co.	St. Louis, Mo.	76854	Oak Manufacturing Co.	Crystal Lake, Ill.
24681	Memcor Inc., Comp. Div.	Huntington, Ind.	71436	Chicago Condenser Corp.	Chicago, Ill.	77066	The Bendix Corp., Electrodynamics Div.	N. Hollywood, Calif.
24796	Parelec Inc.	San Juan Capistrano, Calif.	71447	Calif. Spring Co., Inc.	Pico-Rivera, Calif.	77075	Pacific Metals Co.	San Francisco, Calif.
26365	Gries Reproducer Corp.	New Rochelle, N. Y.	71450	CTS Corp.	Elkhart, Ind.	77221	Phanostran Instrument and Electronic Co.	South Pasadena, Calif.
26462	Grobet File Co. of America, Inc.	Carlstadt, N. J.	71468	ITT Cannon Electric Inc.	Los Angeles, Calif.	77252	Philadelphia Steel and Wire Corp.	Philadelphia, Pa.
26651	Compac Hollister Co.	Hollister, Calif.	71471	Cinema, Div. Aerovox Corp.	Burbank, Calif.	77342	American Machine & Foundry Co. Potter & Bramfield Div.	Princeton, Ind.
26992	Hamilton Watch Co.	Lancaster, Pa.	71482	C. P. Clare & Co.	Chicago, Ill.	77630	TRW Electronic Components Div.	Camden, N. J.
27251	Specialties Mfg. Co., Inc.	Stratford, Conn.	71590	Centralab Div. of Globe Union Inc.	Milwaukee, Wis.	77636	General Instrument Corp., Rectifier Div.	Brooklyn, N. Y.
28480	Hewlett-Packard Co.	Palo Alto, Calif.	71616	Commercial Plastics Co.	Chicago, Ill.	77764	Resistance Products Co.	Harrisburg, Pa.
28520	Heyman Mfg. Co.	Kenilworth, N. J.	71700	Cornish Wire Co., The	New York, N. Y.	77969	Rubbercraft Corp. of Calif.	Torrance, Calif.
30817	Instrument Specialties Co., Inc.	Little Falls, N. J.	71707	Colo Coil Co., Inc.	Providence, R. I.	78169	Shakeproof Division of Illinois Tool Works	Elgin, Ill.
33173	G. E. Receiving Tube Dept.	Owensboro, Ky.	71744	Chicago Miniature Lamp Works	Chicago, Ill.	78277	Sigma	So. Braintree, Mass.
35434	Lectech Inc.	Chicago, Ill.	71785	Cinch Mfg. Co., Howard B. Jones Div.	Chicago, Ill.	78283	Signal Indicator Corp.	New York, N. Y.
36196	Stanwyck Coil Products Ltd.	Hawkesbury, Ontario, Canada	71984	Dow Corning Corp.	Midland, Mich.	78290	Struthers-Dunn Inc.	Pittman, N. J.
36287	Cunningham, W. H. & Hill, Ltd.	Toronto Ontario, Canada	72136	Electro Motive Mfg. Co., Inc.	Wilmington, Conn.	78424	Specialty Leather Prod. Co.	Newark, N. J.
37942	P. R. Mallory & Co. Inc.	Indianapolis, Ind.	72619	Dialight Corp.	Brooklyn, N. Y.	78452	Thompson-Bremer & Co.	Chicago, Ill.
39543	Mechanical Industries Prod. Co.	Akron, Ohio	72656	Indiana General Corp., Electronics Div.	Keasby, N. J.	78471	Talley Mfg. Co.	San Francisco, Calif.
40920	Miniature Precision Bearings, Inc.	Keene, N. H.	72699	General Instrument Corp., Cap. Div.	Newark, N. J.	78488	Stackpole Carbon Co.	St. Marys, Pa.
42190	Muter Co.	Chicago, Ill.	72765	Drake Mfg. Co.	Harwood Heights, Ill.	78493	Standard Thomson Corp.	Waltham, Mass.
43990	C. A. Norgren Co.	Englewood, Colo.	72825	Hugh H. Eby Inc.	Philadelphia, Pa.	78553	Tinnerman Products, Inc.	Cleveland, Ohio
44655	Ohmite Mfg. Co.	Skokie, Ill.	72928	Gudeman Co.	Chicago, Ill.	78790	Transformer Engineers	San Gabriel, Calif.
46384	Penn Eng. & Mfg. Corp.	Doylestown, Pa.	72962	Elastic Stud Nut Corp.	Union, N. J.	78947	Uconite Co.	Newtown, Mass.
47904	Polaroid Corp.	Cambridge, Mass.	72964	Robert M. Hadley Co.	Los Angeles, Calif.	79136	Waldes Kohndor Inc.	Long Island City, N. Y.
48620	Precision Thermometer & Inst. Co.	Southampton, Pa.	72982	Erie Technological Products, Inc.	Erie, Pa.	79142	Veeder Root, Inc.	Hartford, Conn.
49956	Microwave & Power Tube Div.	Waltham, Mass.	73061	Hansen Mfg. Co., Inc.	Princeton, Ind.	79251	Wenco Mfg. Co.	Chicago, Ill.
52090	Rowan Controller Co.	Westminster, Md.	73076	H. M. Harper Co.	Chicago, Ill.	79727	Continental-Wirt Electronics Corp.	Philadelphia, Pa.
52983	Sanborn Company	Waltham, Mass.	73138	Helipot Div. of Beckman Inst., Inc.	Fullerton, Calif.	79963	Zierick Mfg. Corp.	New Rochelle, N. Y.
54294	Shallcross Mfg. Co.	Selma, N. C.	73293	Hughes Products Division of Hughes Aircraft Co.	Newport Beach, Calif.	80031	Meco Division of Sessions Clock Co.	Morrisstown, N. J.
55026	Simpson Electric Co.	Chicago, Ill.	73445	Amperex Elect. Co.	Hicksville, L. I., N. Y.	80120	Schnitzer Alloy Products Co.	Elizabeth, N. J.
55933	Sonotone Corp.	Elmsford, N. Y.	73506	Bradley Semiconductor Corp.	New Haven, Conn.	80131	Electronic Industries Association, Tube meeting EIA Standards-Washington, D. C.	Any brand
55938	Raytheon Co. Commercial Apparatus & Systems Div.	So. Norwalk, Conn.	73559	Carling Electric, Inc.	Hartford, Conn.	80207	Unimax Switch, Div. Maxon Electronics Corp.	Wallingford, Conn.
56137	Saulding Fibre Co., Inc.	Tonawanda, N. Y.	73566	Circle F Mfg. Co.	Trenton, N. J.	80223	United Transformer Corp.	New York, N. Y.
56289	Sprague Electric Co.	North Adams, Mass.	73682	George K. Garrett Co., Div. MSL Industries Inc.	Philadelphia, Pa.	80248	Oxford Electric Corp.	Chicago, Ill.
59446	Telex Corp.	Tulsa, Okla.	73734	Federal Screw Products Inc.	Chicago, Ill.	80294	Bourns Inc.	Riverside, Calif.
59730	Thomas & Betts Co.	Elizabeth, N. J.	73743	Fischer Special Mfg. Co.	Cincinnati, Ohio	80411	Acro Div. of Robertshaw Controls Co.	Columbus, Ohio
60741	Triplet Electrical Inst. Co.	Bluffton, Ohio	73793	General Industries Co., The	Elyria, Ohio			
61775	Union Switch and Signal, Div. of Westinghouse Air Brake Co.	Pittsburgh, Pa.	73846	Gosnell Stamping & Tool Co.	Goshen, Ind.			

Table 4-2. Code List of Manufacturers (Continued)

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
80486	All Star Products Inc.	Defiance, Ohio	86684	Radio Corp. of America, Electronic		95566	Arnold Engineering Co.	Marengo, Ill.
80509	Avery Label Co.	Monrovia, Calif.		Comp. & Devices Div.	Harrison, N. J.	95712	Dage Electric Co., Inc.	Franklin, Ind.
80583	Hammarlund Co., Inc.	Mars Hill, N. C.	86928	Seastrom Mfg. Co.	Glendale, Calif.	95984	Siemon Mfg. Co.	Wayne, Ill.
80640	Stevens, Arnold, Co., Inc.	Boston, Mass.	87034	Marco Industries	Anaheim, Calif.	95987	Weckesser Co.	Chicago, Ill.
80813	Dinco Gray Co.	Dayton, Ohio	87216	Philco Corporation (Lansdale Division)	Lansdale, Pa.	96067	Microwave Assoc., West Inc.	Sunnyvale, Calif.
81030	International Instruments Inc.	Orange, Conn.				96095	Hi-Q Div. of Aerovox Corp.	Olean, N. Y.
81073	Grayhill Co.	LaGrange, Ill.	87473	Western Fibrous Glass Products Co.	San Francisco, Calif.	96256	Thordarson-Meissner Inc.	Mt. Carmel, Ill.
81095	Triad Transformer Corp.	Venice, Calif.				96296	Solar Manufacturing Co.	Los Angeles, Calif.
81312	Winchester Elec. Div. Litton Ind., Inc.	Oakville, Conn.	87664	Van Waters & Rogers Inc.	San Francisco, Calif.	96306	Microswitch, Div. of Minn.-Honeywell	Freeport, Ill.
81349	Military Specification		87930	Tower Mfg. Corp.	Providence, R. I.			Chicago, Ill.
81463	International Rectifier Corp.	El Segundo, Calif.	88140	Cutler-Hammer, Inc.	Lincoln, Ill.	96330	Carlton Screw Co.	Burlington, Mass.
81541	Airpax Electronics, Inc.	Cambridge, Maryland	86220	Gold-National Batteries, Inc.	St. Paul, Minn.	96501	Excel Transformer Co.	Oakland, Calif.
81860	Barry Controls, Div. Barry Wright Corp.	Watertown, Mass.	88698	General Mills, Inc.	Buffalo, N. Y.	96733	San Fernando Elect. Mfg. Co.	San Fernando, Calif.
82042	Carter Precision Electric Co.	Skokie, Ill.	89231	Graybar Electric Co.	Oakland, Calif.			Long Is., N. Y.
82047	Sperli Faraday Inc., Copper Hewitt Electric Div.	Hoboken, N. J.	89473	G. E. Distributing Corp.	Schenectady, N. Y.	97464	Industrial Retaining Ring Co.	Irvine, N. Y.
82116	Electric Regulator Corp.	Norwalk, Conn.	89665	United Transformer Co.	Chicago, Ill.	97539	Automatic & Precision Mfg.	Englewood, N. J.
82142	Jeffers Electronics Division of Speer Carbon Co.	Du Bois, Pa.	90030	United Shoe Machinery Corp.	Beverly, Mass.	97979	Reon Resistor Corp.	Yonkers, N. Y.
82170	Fairchild Camera & Inst. Corp. Space & Defense System Div.	Paramus, N. J.	90179	US Rubber Co., Consumer Ind. & Plastics Prod. Div.	Passaic, N. J.	97983	Litton System Inc., Adler-Westrex Commun. Div.	New Rochelle, N. Y.
82209	Maguire Industries, Inc.	Greenwich, Conn.	90970	Bearing Engineering Co.	San Francisco, Calif.	98141	R-Tronics, Inc.	Jamaica, N. Y.
82219	Sylvania Electric Prod. Inc. Electronic Tube Division	Emporium, Pa.	91146	ITT Cannon Elect. Inc., Salem Div.	Salem, Mass.	98159	Rubber Teck, Inc.	Gardena, Calif.
82376	Astron Corp.	East Newark, Harrison, N. J.	91260	Connor Spring Mfg. Co.	San Francisco, Calif.	98220	Hewlett-Packard Co., Moseley Div.	Pasadena, Calif.
82389	Switchcraft, Inc.	Chicago, Ill.	91345	Miller Dial & Nameplate Co.	El Monte, Calif.	98278	Microdot, Inc.	So. Pasadena, Calif.
82647	Metals & Controls Inc. Spencer Products	Attleboro, Mass.	91418	Radio Materials Co.	Chicago, Ill.	98291	Sealectro Corp.	Mamaroneck, N. Y.
82768	Phillips-Advance Control Co.	Joliet, Ill.	91506	Augat Inc.	Attleboro, Mass.	98376	Zero Mfg. Co.	Burbank, Calif.
82866	Research Products Corp.	Madison, Wis.	91637	Dale Electronics, Inc.	Columbus, Nebr.	98410	Etc Inc.	Cleveland, Ohio
82877	Rotron Mfg. Co., Inc.	Woodstock, N. Y.	91662	Elco Corp.	Willow Grove, Pa.	98731	General Mills Inc., Electronics Div.	Minneapolis, Minn.
82893	Vector Electronic Co.	Glendale, Calif.	91737	Gremar Mfg. Co., Inc.	Wakefield, Mass.	98734	Paeco Div. of Hewlett-Packard Co.	Palo Alto, Calif.
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