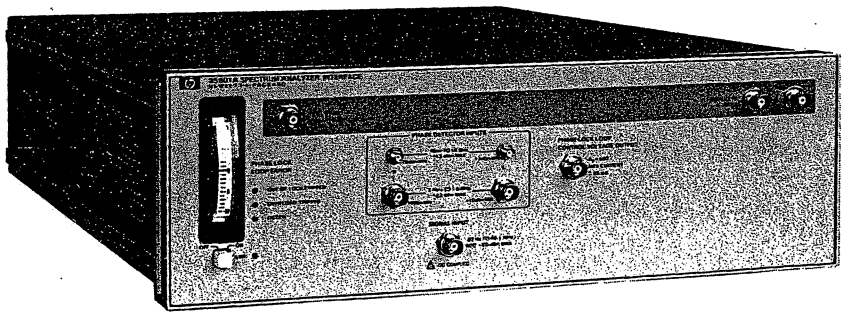
OPERATING AND SERVICE MANUAL

HP 35601A SPECTRUM ANALYZER INTERFACE



HEWLETT PACKARD

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYERS'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

ASSISTANCE

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.

HP 35601A
SPECTRUM ANALYZER
INTERFACE

EAST 24001 MISSION AVENUE, TAF C-34, SPOKANE, WASHINGTON, U.S.A., 99220

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Printed in U.S.A.: SEPTEMBER 1982

HEWLETT
PACKARD

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HEWLETT PACKARD

SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Hewlett-Packard Company assumes no liability for the customer's failure to comply with these requirements. This is a Safety Class 1 instrument.

GROUND THE INSTRUMENT

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three-conductor ac power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable meet International Electrotechnical Commission (IEC) safety standards.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to a Hewlett-Packard Sales and Service Office for service and repair to ensure that safety features are maintained.

DANGEROUS PROCEDURE WARNINGS

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

WARNING

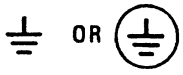
Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution when handling, testing, and adjusting.

SAFETY SYMBOLS

General Definitions of Safety Symbols Used On Equipment or In Manuals.

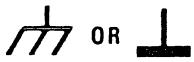
Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect against damage to the instrument.

Indicates dangerous voltage (terminals fed from the interior by voltage exceeding 1000 volts must be so marked).



Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal which must be connected to ground before operating equipment.

Low-noise or noiseless, clean ground (earth) terminal. Used for a signal common, as well as providing protection against electrical shock in case of a fault. A terminal marked with this symbol must be connected to ground in the manner described in the installation (operating) manual, and before operating the equipment.



Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.

Alternating current (power line).

Direct current (power line).

Alternating or direct current (power line).

The WARNING sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death to personnel.

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, condition or the like, which,if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

NOTE: The NOTE sign denotes important information. It calls attention to procedure, practice, condition or the like, which is essential to highlight.

SECTION I
GENERAL INFORMATION

1.1 INTRODUCTION

This Operating and Service Manual contains information for the installation, operation, testing, adjustments, and service of the Hewlett Packard Model 35601A Spectrum Analyzer Interface. Figure 1-1 shows the 35601A installed in an -hp- 3047A Spectrum Analyzer System. This manual is part of the system library for the -hp-3047A. The part numbers for both the printed manual and the manual on microfiche are listed on the title page of this manual. Additional copies of this manual, in either form, are available through your nearest Hewlett-Packard Sales/Service office (a list of these are in the back of this manual).

This section contains the specifications, general description, safety considerations, and recommended test equipment for the -hp-35601A Spectrum Analyzer Interface.

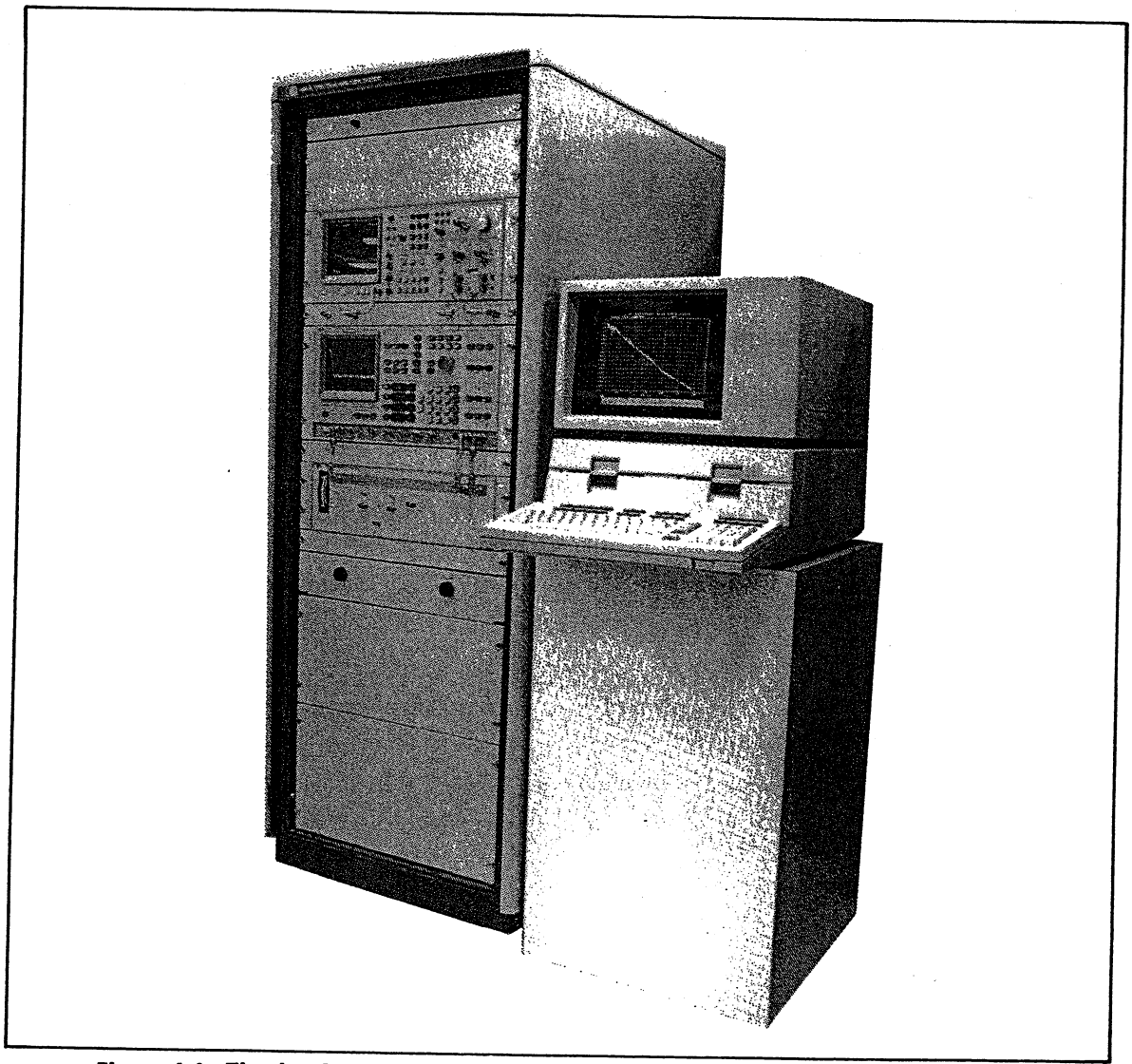


Figure 1-1. The -hp- 35601A Spectrum Analyzer Interface Installed in the -hp- 3047A

1-2. DESCRIPTION

The -hp- 35601A is the Spectrum Analyzer Interface for the -hp-3047A Spectrum Analyzer System. This instrument is not available by itself or as an accessory; it has been designed exclusively for the -hp- 3047A System. The -hp- 35601A provides the necessary interfacing of the spectrum analyzers in all three operating modes of the -hp- 3047A.

1-3. SPECIFICATIONS

The -hp- 35601A has no specifications of its own. The -hp- 3047A Spectrum Analyzer System has specifications for the entire system as well as for the individual spectrum analyzers, however there are no specifications that apply to the Spectrum Analyzer Interface alone.

1-4. SAFETY CONSIDERATIONS

The Spectrum Analyzer Interface is a Safety Class I instrument and has been designed according to international safety standards. To ensure safe operation and to retain the instrument in a safe condition, the Operating and Service Manual contains information, cautions and warnings which must be adhered to by the user. NOTE: See the Safety Summary following the Table of Contents of this manual for a discussion of basic safety precautions and safety symbology.

The 35601A front panel contains a  symbol which is an international symbol meaning "refer to the Operating and Service Manual". The symbol flags important operating instructions located in Section III required to prevent damage to the instrument. To retain the operating condition of the instrument these instructions must be adhered to.

1-5. RECOMMENDED TEST EQUIPMENT

The equipment recommended for the testing and calibration of the -hp- 35601A is shown in Table 1-1.

Table 1-1. Recommended Test Equipment

Equipment	Critical Specifications	Recommended -hp- Model No.
Service Tape for -hp-9845B Series 100 or Service Tape for -hp- 9845B Series 200 or Service Disc for -hp- 9836		-hp- part number 35601-10001 -hp- part number 35601-10006 -hp- part number 35601-10011
Desktop Computer	HP-IB Capability	-hp- 9836 or -hp- 9845B with -hp- 98034A
Synthesizer	HP-IB Controllable 10MHz Reference	-hp- 3325A opt 001
Digital Voltmeter	HP-IB Controllable	-hp- 3455A
Oscilloscope	75MHz Bandwidth	-hp- 180A,1808A, 1821A or -hp- 1740A
Counter	100MHz	-hp- 5314A
Signature Analyzer		-hp- 5004A
50ΩTermination		-hp- 11048A
(2) HP-IB Cable		-hp- 10833A
(5) BNC Cables		-hp- 11170C
(2) BNC "T"		-hp- part number 1250-0781

SECTION II
INSTALLATION

2-1. INTRODUCTION

This section contains information for the installation of the -hp- Model 35601A into the -hp- 3047A Spectrum Analyzer System. Also included in this section is a discussion of the instrument's power requirements and repackaging information. Since the -hp- 3047A is supplied with the -hp- 35601A installed, this section is provided only for reference in case the -hp- 35601A has been removed for service. However, as a precaution, make sure the correct line voltage selection has been made before applying power to the instrument.

2-2. POWER REQUIREMENTS

CAUTION

Before applying ac-line power to the -hp- 35601A, be sure that the VOLTAGE SELECTOR switches are set for the proper line voltage and the correct line fuse is installed in the rear panel FUSE holder.

2-3. Line Voltage and Frequency

The -hp- 35601A requires a single phase power source of:

86 V to 127 V (48Hz to 66Hz), or
189 V to 225 V (48Hz to 66Hz)

2-4. Grounding Requirements

To protect operating personnel, the instrument's panel and cabinet must be grounded. The -hp- 35601A is equipped with a three-wire power cord which, when plugged into an appropriate receptacle, grounds the instrument. The offset pin on the power plug is the ground connection.

WARNING

1. The power cable plug must be inserted into a socket outlet provided with a protective earth contact. The protection of the grounded instrument cabinet must not be negated by the use of an extension cord without a protective conductor.

2. If this instrument is to be energized via an auto-transformer to reduce or increase the line voltage, make sure that the common terminal is connected to the Earth pole of the power source.

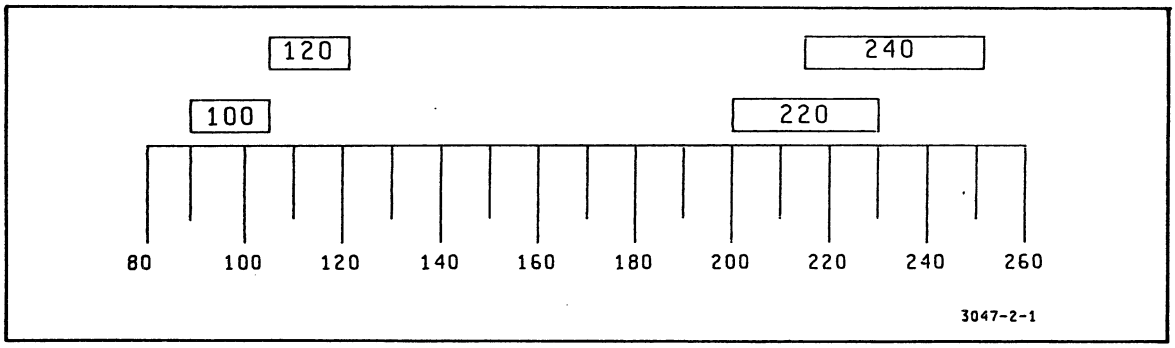


Figure 2-1. Line Voltage Ranges

2-5. INSTALLATION INTO SYSTEM

The -hp- 3047A is supplied with the -hp- 35601A Spectrum Analyzer Interface already installed. Unless the instrument has been removed from the system for calibration or service, just check for proper fuse installation and line voltage selection before applying power to the instrument.

2-6. Line Voltage and Fuse Selection

CAUTION

Before applying ac-line power to the -hp- 35601A, be sure that the VOLTAGE SELECTOR switches are set for the proper line voltage and the correct line fuse is installed in the rear panel FUSE holder.

Voltage selection switches on the rear panel are used to configure the instrument to operate on one of four input line voltage ranges. The range of input voltages for each configuration of the switches is illustrated in Figure 2-1. Set the switches to conform with the line voltage to be used with this instrument. The switch positions for each input voltage range are indicated on the rear panel and in Figure 2-2.

Verify that the line fuse installed in the fuse holder on the rear panel is the correct fuse (0.5 amps, -hp- part number 2110-0012).

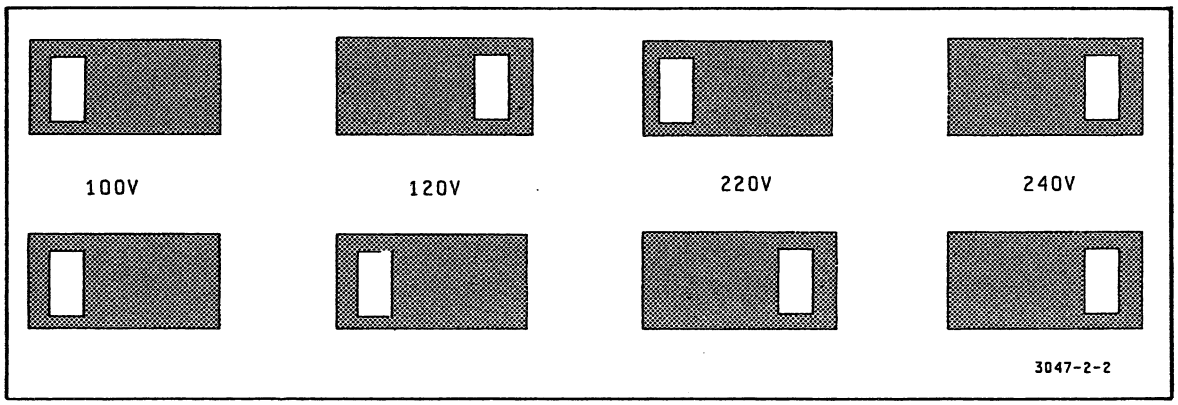
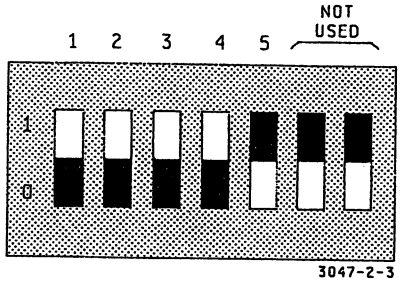


Figure 2-2. Switch Positions For Line Voltage Ranges

2-7. HP-IB Address Selection

The -hp- 35601A is shipped from the factory with a Select Code of 15. The -hp- 3047A software requires that the -hp- 35601A have a select code of 15. This may be changed to another address, if desired, providing no other instrument in the system has its new address. Changing the Select Code is accomplished using the DIP switches on the rear panel (see Figure 2-3).



	ASCII Code Character		Address Switches					Decimal
	Listen	Talk	A1	A2	A3	A4	A5	Code
	SP	@	0	0	0	0	0	00
	!	A	1	0	0	0	0	01
	"	B	0	1	0	0	0	02
	#	C	1	1	0	0	0	03
	$	D	0	0	1	0	0	04
	%	E	1	0	1	0	0	05
	&	F	0	1	1	0	0	06
	'	G	1	1	1	0	0	07
	(	H	0	0	0	1	0	08
	)	I	1	0	0	1	0	09
	*	J	0	1	0	1	0	10
	+	K	1	1	0	1	0	11
	,	L	0	0	1	1	0	12
	-	M	1	0	1	1	0	13
	.	N	0	1	1	1	0	14
Factory Set Address	/	O	1	1	1	1	0	15
	0	P	0	0	0	0	1	16
	1	Q	1	0	0	0	1	17
	2	R	0	1	0	0	1	18
	3	S	1	1	0	0	1	19
	4	T	0	0	1	0	1	20
	5	U	1	0	1	0	1	21
	6	V	0	1	1	0	1	22
	7	W	1	1	1	0	1	23
	8	X	0	0	0	1	1	24
	9	Y	1	0	0	1	1	25
	:	Z	0	1	0	1	1	26
	;	[	1	1	0	1	1	27

Figure 2-3. Address Selection

2-8. Mounting

The -hp- 35601 was installed into the -hp- 3047A with support rails, rack mount flanges, and rear frame brackets. When mounting this instrument into the -hp- 3047A after servicing these parts should be used. These are illustrated in Figure 2-4.

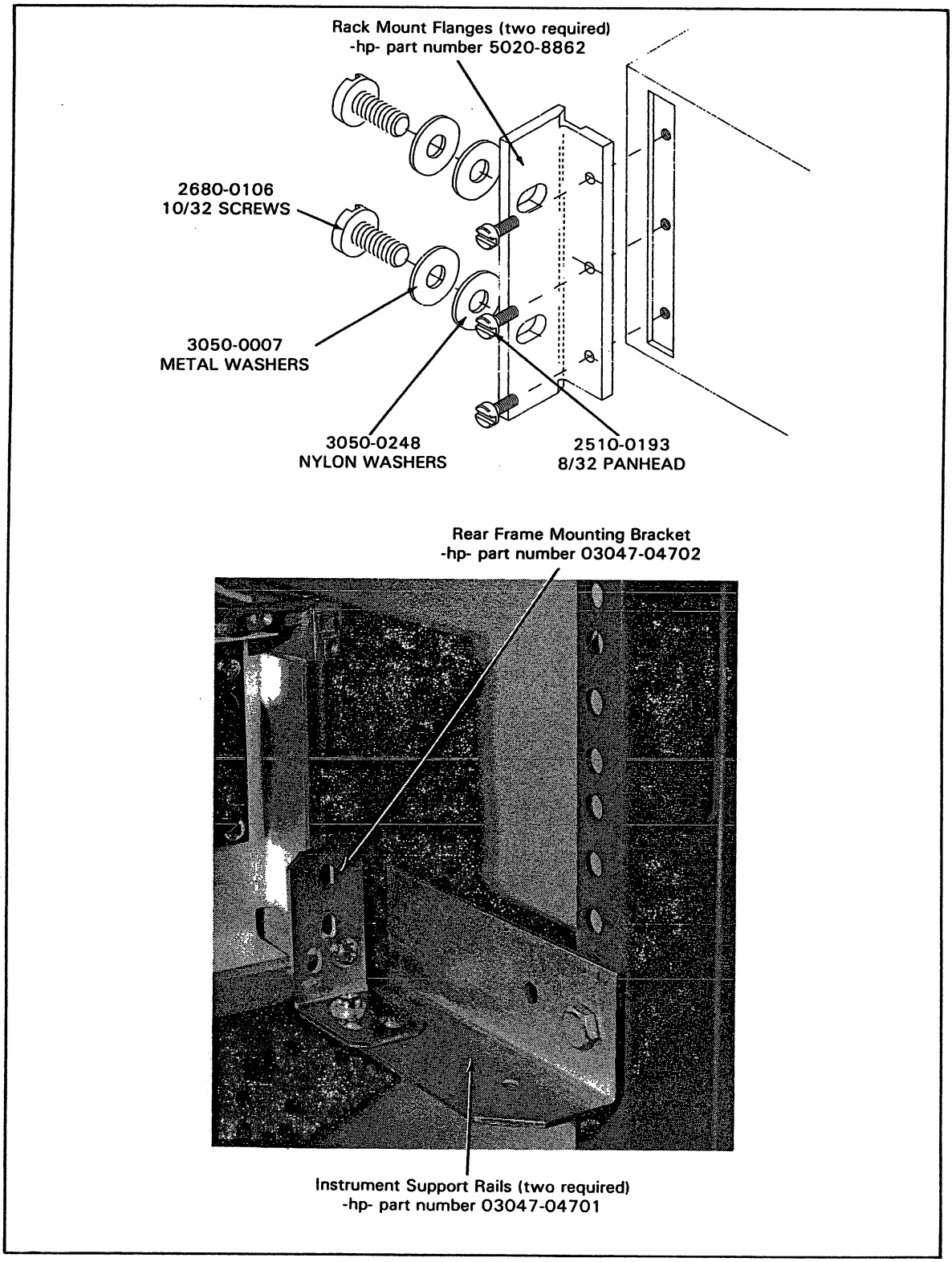


Figure 2-4. Mounting Hardware

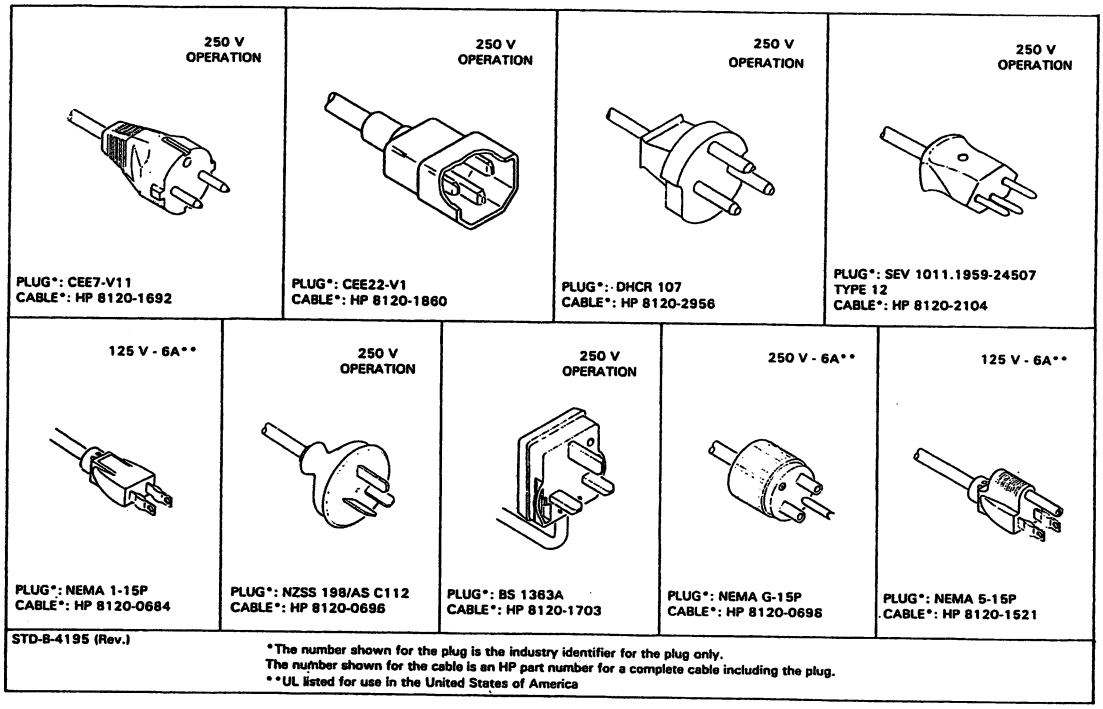


Figure 2-5. Power Cables

2-9. Power Cable Connection

The -hp- 35601A was installed into the -hp- 3047A using a three-wire power cord (-hp- part number 8120-2307). This is the type of cable that should be used to supply power to the instrument while it is installed in the -hp- 3047A, regardless of power line voltage and frequency. If, for some reason, the instrument is to be operated out of the system, then use the appropriate power cable from the ones shown in Figure 2-5.

With the front panel power switch in the OFF position, connect the ac power cable to the rear panel LINE connector. Plug the other end of the power cable into the three-terminal grounded power strip in the system cabinet.

WARNING

To protect operating personnel, the -hp- 35601A chassis and cabinet must be grounded. The -hp- 35601A is equipped with a three-wire power cord which, when plugged into an appropriate receptacle, grounds the instrument. The offset pin on the power plug is the ground connection. To preserve this protection feature, the power plug shall only be inserted in a three-terminal receptacle having a protective earth ground contact. The protective action must not be negated by the use of an extension cord or adapter that does not have the required earth ground connection. Grounding one conductor of the two-conductor outlet is not sufficient protection.

2-10. Signal Connections

There are three cables to connect to the front panel of the -hp-35601A, and six on the rear panel.

NOTE

Use the cables included with the -hp- 3047A when reinstalling the -hp- 35601A into the system. Also, make sure that the positions of the cables are those of the original installation. (See the -hp- 3047A Installation Manual for part number and cable routing Information.) If either of these conditions is not met, the -hp- 3047A may not perform as specified.

1. From the jack on the upper left front panel labeled "Input from 3585A Tracking Generator", connect a cable to the output of the 3585A Tracking Generator.

2. From the jack on the front panel labeled "OUTPUTS TO 3585A 1MΩ" connect a cable to the 3585A 1MΩ input.

3. From the jack on the front panel labeled "50Ω" connect a cable to the 3585A 50Ω input.

4. From the jack on the rear panel of the -hp- 35601A labeled "IF INPUT FROM 3585A IF OUTPUT", connect a cable to the 3585A IF Output (rear panel of 3585A).

5. From the jack on the rear panel labeled "10MHz REF INPUT FROM 3585A 10MHz REF OUTPUT", connect a cable to the 3585A 10MHz Reference Output.

6. To the jack labeled "OUTPUT TO 3582A A CHANNEL INPUT", connect the correct cable from the patch panel below the -hp- 3582A.

7. To the jack labeled "OUTPUT TO 3582A B CHANNEL INPUT", connect the correct cable from the patch panel below the -hp- 3582A.

8. To the jack labeled "INPUT FROM 3582A NOISE SOURCE", connect the correct cable from the patch panel below the -hp- 3582A.

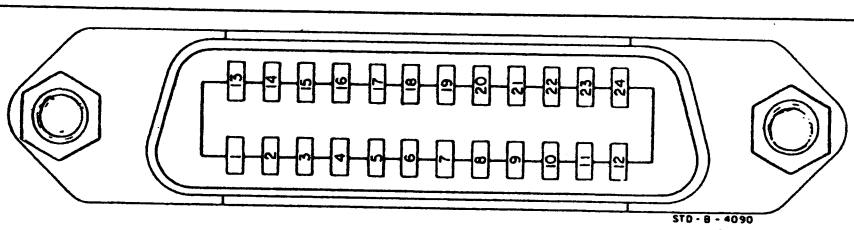
9. Connect the HP-IB cable from the other instruments to the HP-IB input on the rear panel of the -hp- 35601A. See the NOTE below and Figure 2-6 for more information.

NOTE

To achieve design performance with the HP-IB, proper voltage levels and timing relationships must be maintained. If the system cables are too long, the lines cannot be driven properly and, consequently, the system will fail to operate. When interconnecting any HP-IB system, observe the following rules:

a. The total cable length for the system must be less than or equal to 20 metres (65 feet).

b. The total cable length for the system must be less than or equal to 2 metres (6 feet) times the total number of devices connected to the bus.



PIN	LINE	
1	DI01	
2	DI02	
3	DI03	
4	DI04	
13	DI05	
14	DI06	
15	DI07	
16	DI08	
5	EOI	
17	REN	
6	DAV	
7	NRFD	
8	NDAC	
9	IFC	
10	SRQ	
11	ATN	
12	SHIELD—CHASSIS GROUND	
18	P/O TWISTED PAIR WITH PIN 6	THESE PINS ARE INTERNALLY GROUNDED
19	P/O TWISTED PAIR WITH PIN 7	
20	P/O TWISTED PAIR WITH PIN 8	
21	P/O TWISTED PAIR WITH PIN 9	
22	P/O TWISTED PAIR WITH PIN 10	
23	P/O TWISTED PAIR WITH PIN 11	
24	ISOLATED DIGITAL GROUND	

CAUTION

The -hp- 35601A contains metric threaded HP-IB cable mounting studs as opposed to English threads. Metric threaded -hp- 10631A, B, C or D HP-IB cable lockscrews must be used to secure the cable to the instrument. Identification of the two types of mounting studs and lockscrews is made by their color. English threaded fasteners are colored silver and metric threaded fasteners are colored black. DO NOT mate silver and black fasteners to each other or the threads of either or both will be destroyed. Metric threaded HP-IB cable hardware illustrations and part numbers follow.

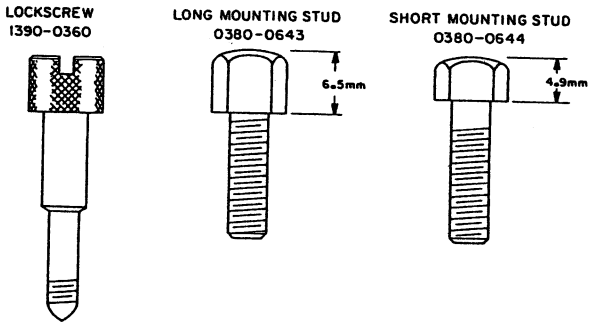


Figure 2-6. HP-IB Connector

2-11. OPERATING AND STORAGE ENVIRONMENT

WARNING

To prevent potential electrical shock or fire hazard, do not expose equipment to rain or moisture.

2-12. Operating Environment

In order for the -hp- 35601A to function properly, the operating environment must be within the following limits:

Temperature..... 0°C to +55°C (+32°F to +131°F)
Relative Humidity..... <95%
Altitude..... <4600 metres (15000 ft)
Magnetic Field Strength..... <0.05 gauss

2-13. Storage and Shipping Environment

The -hp- 35601A should be stored in a clean, dry environment. The following are environmental limitations to both storage and shipment:

Temperature.....-40°C to +75°C (-40 °F to +158°F)
Relative Humidity.....<95%
Altitude.....<15300 metres (50000 ft)

In high-humidity environments, the instrument must be protected from temperature variations that could cause internal condensation.

2-14. REPACKAGING FOR SHIPMENT

NOTE

If the instrument is to be returned to -hp- for service, attach a tag indicating the type of service required. Include any symptoms or details that may be of help to the service technician. Also include your return address, the instrument's model number and full serial number. In any correspondence, identify the instrument by model number and full serial number.

2-15. -hp- Packaging

The instrument is best packaged for shipping using a shipping container and packing materials available through and -hp- Sales/Service office. A list of -hp- Sales/Service offices is given at the back of this manual. Be sure to allow eight to ten centimetres of packaging material on all sides of the instrument and seal the container with strong tape or metal bands. Also mark the container "FRAGILE" to ensure careful handling.

2-16. Other Packaging

The following general instructions should be used for packaging with commercially available materials:

a. Wrap the instrument in heavy paper or plastic.

b. Use a strong shipping container. A double wall carton made of 115-kilogram (250-pound) test material is adequate.

c. Use enough shock-absorbing material (eight to ten centimetres) around all sides of the instrument to provide firm cushion and prevent movement inside the container. Protect the front panel with cardboard.

d. Seal the shipping container securely.

e. Mark the shipping container FRAGILE to ensure careful handling.

SECTION III
OPERATION

3-1. INTRODUCTION

This section contains the operating information for the front and rear panels of the -hp- 35601A. Since this instrument is only used in the -hp- 3047A System, the actual programming of the -hp- 35601A is not discussed in this operating section; all of the necessary HP-IB control is included in the system software. The operator of the -hp- 35601A need only be concerned with the uses of the front and rear panel controls and jacks.

3-2. FRONT PANEL

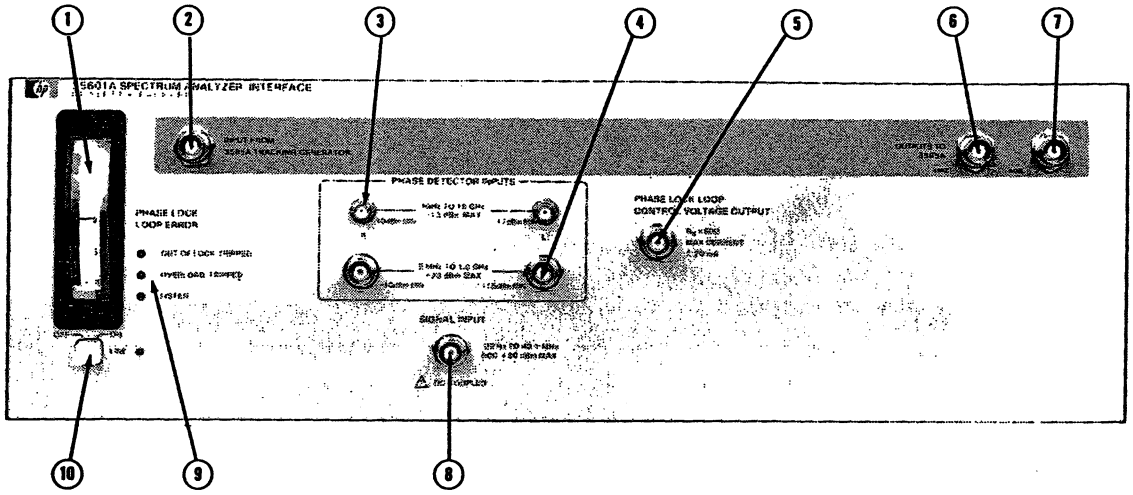
Figure 3-1 contains a diagram of the front panel of the -hp- 35601A. The text included in Figure 3-1 describes the numbered items in the diagram.

CAUTION

Before applying ac-line power to the -hp- 35601A, be sure that the VOLTAGE SELECTOR switches are set for the proper line voltage and the correct line fuse is installed in the rear panel FUSE holder.

3-3. REAR PANEL

Figure 3-2 contains a diagram of the rear panel of the -hp- 35601A. The text included in Figure 3-2 describes the numbered items in the diagram.



(1) Phase lock loop error meter: This meter shows the error of the high frequency phase lock loop during Phase Noise Analysis measurements or the deviation from quadrature in non-phase-locked measurements. The meter also shows the frequency drift of the source under test in AM/PM Noise Analysis mode.

(2) Input from 3585A Tracking Generator: This input accepts the Tracking Generator output of the 3585A.

(3) Phase detector inputs (1GHz to 18GHz): These are inputs for the reference vco and the vco under test in Phase Noise Analysis. The inputs can operate from 1.0GHz to 18GHZ with a maximum input of +13dBm. The impedance of these inputs is 50Ω. Each input may be used for the reference or the device under test.

(4) Phase detector inputs (1.2GHz to 18GHz): These are inputs for the reference vco and the vco under test in Phase Noise Analysis. The inputs can operate from 1.2GHz to 18GHz with a maximum input of +10dBm. The impedance of these inputs is 50® . Each input may be used for the reference or the device under test.

(5) Phase lock loop vco control voltage output: This output provides the control voltage for the vco under test in Phase Noise Analysis. The output has a 50Ω source impedance.

(6) Output to 3585A (1MΩ): This output connects to the 1MΩ input of the 3585A.

(7) Output to 3585A (50Ω):This output connects to the 50Ω input of the 3585A.

(8) Signal input: This is used in Phase Noise Analysis when it is desired to use an external mixer for phase difference detection of the reference and test sources.

(9) Indicators: The four LEDs on the front panel, from top to bottom, are the following indicators:

a) Out-of-lock. Indicates that the high frequency phase lock loop is not locked, or has had a large perturbation in phase error.

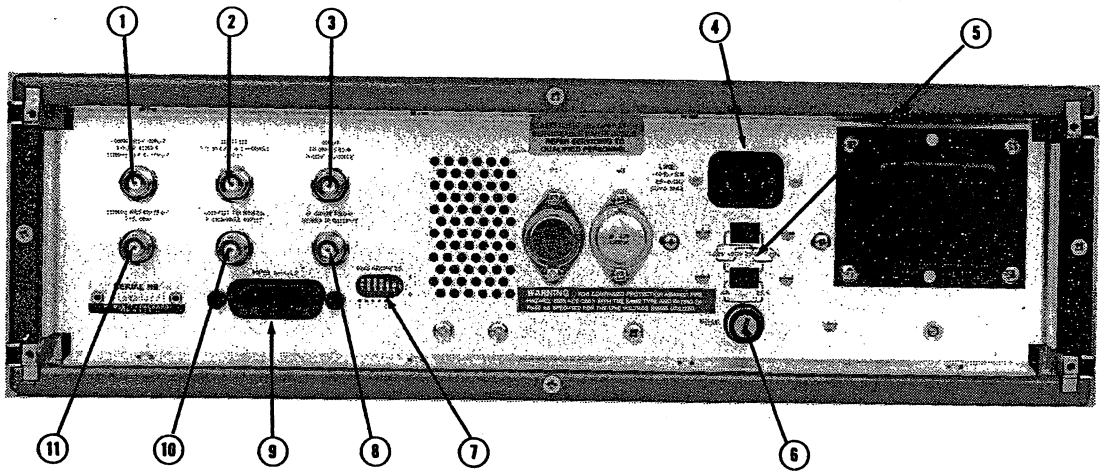
b) Overload. This LED will light, and remain on, whenever the signal input instantaneously exceeds ±2 volts.

c) Listen. This indicates that the -hp- 35601A is accepting commands over the HP-IB. Note that this instrument only listens and never talks.

d) On. Indicates power on.

(10) Line off/on: Turns the instrument power on and off.

Figure 3-1. -hp- 35601A Front Panel



(1) 10MHz Input: This input accepts the 10MHz Reference Output from the -hp- 3585A.

(2) Output to 3582A B Channel Input: This output is routed to the -hp- 3582A B Input via a patch-panel below the -hp- 3582A.

(3) Noise Input: This input accepts the Noise Output from the -hp- 3582A.

(4) AC Power Line Connector: Connects instrument to ac mains. (See the Installation section for appropriate power cable.)

(5) Line Voltage Selector Switches: These switches should be set to select the appropriate power line voltage range for the mains available where the instrument is to be operated. (See the Installation section of this manual for instructions on setting these switches.)

(6) Fuse Holder: Holds ac power line fuse. (See the Installation section for appropriate fuse size.)

(7) HP-IB Address Selection Switches: Selects the desired HP-IB address. (See the Installation section for instructions.)

(8) IF Input: This input accepts the IF Output from the -hp- 3585A.

(9) HP-IB Connector: Provides HP-IB control of the instrument; accepts a standard HP-IB cable. (See the Installation section for instructions.)

(10) 10MHz Output: This output provides the 10MHz Reference Output of the -hp-3585A after having been buffered by the -hp- 35601A.

(11) Output to 3582A A Channel Input: This output is routed to the -hp- 3582A A Input via a patch-panel below the -hp- 3582A.

Figure 3-2. -hp- 35601A Rear Panel

SECTION IV
REPLACEABLE PARTS

4-1. INTRODUCTION

This section contains information for ordering replacement parts. Table 4-3 lists parts in alphanumeric order of their reference designators; it indicates the description, -hp- part number of each part, and any applicable notes. The following is included:

- -hp- part number
- The total quantity of the part used in the instrument (Qty column). This number is only shown the first time the part appears.
- Descriptions of the part (see the list of abbreviations in Table 4-1).
- Typical manufacturer of the part in a five-digit code (see Table 4-2 for a list of manufacturers).
- Manufacturer's part number.

Mechanical parts and parts not associated with an assembly are listed at the end of Table 4-3.

4-2. ORDERING INFORMATION

To obtain replacement parts, address the order or inquiry to your local Hewlett-Packard Sales/Service office. (See the list at end of this manual for office locations.) Identify parts by their Hewlett-Packard part numbers. Include the instrument's model number and serial number.

Table 4-1. Standard Abbreviations

ABBREVIATIONS

Ag . . . silver	Hz . . . hertz (cycle(s) per second)	NPO . . . negative positive zero (zero temperature coefficient)	sl . . . slide
Al . . . aluminum	ID . . . inside diameter	ns . . . nanosecond(s) = 10^{-9} seconds	SPDT . . . single-pole double-throw
A . . . ampere(s)	impg . . . impregnated	nsr . . . not separately replaceable	SPST . . . single-pole single-throw
Au . . . gold	incd . . . incandescent		
	ins . . . insulation(ed)	Ω . . . ohm(s)	Ta . . . tantalum
C . . . capacitor		obd . . . order by description	TC . . . temperature coefficient
cer . . . ceramic	kΩ . . . kilohm(s) = 10^{+3} ohms	OD . . . outside diameter	TiO_2 . . . titanium dioxide
coef . . . coefficient	kHz . . . kilohertz = 10^{+3} hertz		tog . . . toggle
com . . . common		p . . . peak	tol . . . tolerance
comp . . . composition	L . . . inductor	pA . . . picoampere(s)	trim . . . trimmer
conn . . . connection	lin . . . linear taper	pc . . . printed circuit	TSTR . . . transistor
	log . . . logarithmic taper	pF . . . picofarad(s) 10^{-12} farads	
dep . . . deposited		piv . . . peak inverse voltage	V . . . volt(s)
DPDT . . . double-pole double-throw	mA . . . milliampere(s) = 10^{-3} amperes	p/o . . . part of	vacw . . . alternating current working voltage
DPST . . . double-pole single-throw	MHZ . . . megahertz = 10^{+6} hertz	pos . . . position(s)	var . . . variable
	MΩ . . . megohm(s) = 10^{+6} ohms	poly . . . polystyrene	vdcw . . . direct current working voltage
elect . . . electrolytic	met flm . . . metal film	pot . . . potentiometer	
encap . . . encapsulated	mfr . . . manufacturer	p-p . . . peak-to-peak	W . . . watt(s)
	ms . . . millisecond	ppm . . . parts per million	w/ . . . with
F . . . farad(s)	mtg . . . mounting	prec . . . precision (temperature coefficient, long term stability and/or tolerance)	wiv . . . working inverse voltage
FET . . . field effect transistor	mV . . . millivolt(s) = 10^{-3} volts		w/o . . . without
fxd . . . fixed	μF . . . microfarad(s)		ww . . . wirewound
	μs . . . microsecond(s)	R . . . resistor	
GaAs . . . gallium arsenide	μV . . . microvolt(s) = 10^{-6} volts	Rh . . . rhodium	
GHz . . . gigahertz = 10^{+9} hertz	my . . . Mylar ®	rms . . . root-mean-square	* . . . optimum value selected at factory, average value shown (part may be omitted)
gd . . . guard(ed)		rot . . . rotary	** . . . no standard type number assigned selected or special type
Ge . . . germanium	nA . . . nanoampere(s) = 10^{-9} amperes		
gnd . . . ground(ed)	NC . . . normally closed	Se . . . selenium	® Dupont de Nemours
	Ne . . . neon	sect . . . section(s)	
H . . . henry(ies)	NO . . . normally open	Si . . . silicon	
Hg . . . mercury			

DESIGNATORS

A . . . assembly	FL . . . filter	Q . . . transistor	TS . . . terminal strip
B . . . motor	HR . . . heater	QCR . . . transistor-diode	U . . . microcircuit
BT . . . battery	IC . . . integrated circuit	R(p) . . . resistor(pack)	V . . . vacuum tube, neon bulb, photocell, etc.
C . . . capacitor	J . . . jack	RT . . . thermistor	W . . . cable
CR . . . diode or thyristor	K . . . relay	S . . . switch	X . . . socket
DL . . . delay line	L . . . inductor	T . . . transformer	XDS . . . lampholder
DS . . . lamp	M . . . meter	TB . . . terminal board	XF . . . fuseholder
E . . . misc electronic part	MP . . . mechanical part	TC . . . thermocouple	Y . . . crystal
F . . . fuse	P . . . plug	TP . . . test point	Z . . . network

4-3. PARTS NOT LISTED

To obtain a part not listed include the following information:

- Instrument model number
- Instrument serial number
- A description of the part
- The function and location of the part

4-4. DIRECT MAIL ORDER SYSTEM

Within the United States, Hewlett Packard can supply parts through a direct mail order system. Guidelines for using this ordering system are as follows:

- Order parts directly from the -hp- Corporate Parts Center in Mountain View, California.
- No minimum or maximum purchase requirements for any mail order. (A minimum order amount is required for parts ordered through a local -hp- Sales/Service office when orders require billing and invoicing.)
- Prepay transportation charges.
- Include a check or money order with each order.
- Mail-order forms and specific ordering information are available through your local -hp- Sales/Service office. See the list at the back of this manual for addresses and phone numbers of your local -hp- office.

Table 4-2. Manufacturers Code List

Mfr No.	Manufacturer Name	Address
01121	Allen-Bradley Co	Milwaukee WI 53204
01295	Texas Instr Inc Semicond Cmpnt Div	Dallas TX 75222
0192B	RCA Corp Solid State Div	Somerville NJ 08876
03888	KDI Pyrofilm Corp	Whippany NJ 07981
04713	Motorola Semiconductor Products	Phoenix AZ 85062
07263	Fairchild Semiconductor Div	Mountain View CA 94042
13606	Sprague Elect Co Semiconductor Div	Concord NH 03301
17856	Siliconix Inc	Santa Clara CA 95054
18324	Signetics Corp	Sunnyvale CA 94086
19701	Mepco/Electra Corp	Mineral Wells TX 76067
20932	Emcon Div Itw	San Diego CA 92129
24546	Corning Glass Works (Bradford)	Bradford PA 16701
27014	National Semiconductor Corp	Santa Clara CA 95051
28480	Hewlett-Packard Co Corporate Hq	Palo Alto CA 94304
51642	Centre Engineering Inc	State College PA 16801
56289	Sprague Electric Co	North Adams MA 02147
72136	Electro Motive Corp Sub IEC	Willimantic CT 06226
80103	Lambda Electronics Corp	Melville NY 11746

Replaceable Parts

Table 4-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	35601-66501	0	1	HPIB-I/O PC ASSEMBLY	28480	35601-66501
A1C1	0160-4571	8	94	CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A1C2	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A1C3	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A1C4	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A1C5	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A1C6	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A1C7	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A1C8	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A1C9	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A1C10	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A1C11	0160-2204	0	2	CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A1C12	0160-2204	0		CAPACITOR-FXD 100PF +-5% 300VDC MICA	28480	0160-2204
A1C13	0180-0229	7	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	56289	150D336X9010B2
A1C14	0180-0291	3	7	CAPACITOR-FXD 1UF+-10% 35VDC TA	56289	150D105X9035A2
A1C15	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A1C16	0180-0228	6	2	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A1C17	0180-2396	3	2	CAPACITOR-FXD 1000UF+75-10% 75VDC AL	56289	39D108G075JP4
A1C18	0180-2396	3		CAPACITOR-FXD 1000UF+75-10% 75VDC AL	56289	39D108G075JP4
A1C19	0180-2730	9	1	CAPACITOR-FXD 1700UF+75-10% 30VDC AL	28480	0180-2730
A1CR6	1901-0040	1	9	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1CR7	1902-0025	4	2	DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A1CR8	1901-0026	3	6	DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
A1CR9	1901-0026	3		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
A1CR10	1902-0025	4		DIODE-ZNR 10V 5% DO-35 PD=.4W TC=+.06%	28480	1902-0025
A1CR11	1901-0026	3		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
A1CR12	1901-0026	3		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
A1CR13	1901-0026	3		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
A1CR14	1901-0026	3		DIODE-PWR RECT 200V 750MA DO-29	28480	1901-0026
A1CR18	1906-0096	7	2	DIODE-FW BRDG 200V 2A	04713	MDA202
A1CR19	1906-0096	7		DIODE-FW BRDG 200V 2A	04713	MDA202
A1F1	2110-0381	7	2	FUSE 3A 250V TD 1.25X.25	28480	2110-0381
A1F2	2110-0381	7		FUSE 3A 250V TD 1.25X.25	28480	2110-0381
A1J1	1251-6428	2	3	CONNECTOR 5-PIN M POST TYPE	28480	1251-6428
A1J2	1251-5722	7	2	CONNECTOR 50-PIN M POST TYPE	28480	1251-5722
A1J3	1251-6428	2		CONNECTOR 5-PIN M POST TYPE	28480	1251-6428
A1J4	1251-7264	6	3	HEADER-34 PIN	28480	1251-7264
A1J5	1251-7264	6		HEADER-34 PIN	28480	1251-7264
A1J6	1251-3825	7	4	CONNECTOR 5-PIN M POST TYPE	28480	1251-3825
A1J7	1251-3750	7	1	CONNECTOR 10-PIN M POST TYPE	28480	1251-3750
A1J8	1251-3638	0	1	CONNECTOR 6-PIN M POST TYPE	28480	1251-3638
A1J9	1251-3825	7		CONNECTOR 5-PIN M POST TYPE	28480	1251-3825
A1L1	9100-3560	6	1	INDUCTOR RF-CH-MLD 5.6UH 5% .166DX.385LG	28480	9100-3560
A1R1	0683-1035	1	23	RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A1R2	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A1R3	0683-1815	5	1	RESISTOR 180 5% .25W FC TC=-400/+600	01121	CB1815
A1R4	0683-1325	2	8	RESISTOR 1.3K 5% .25W FC TC=-400/+700	01121	CB1325
A1R5	0683-1325	2		RESISTOR 1.3K 5% .25W FC TC=-400/+700	01121	CB1325
A1R6	0683-1325	2		RESISTOR 1.3K 5% .25W FC TC=-400/+700	01121	CB1325
A1R7	0683-1325	2		RESISTOR 1.3K 5% .25W FC TC=-400/+700	01121	CB1325
A1R8	0683-1325	2		RESISTOR 1.3K 5% .25W FC TC=-400/+700	01121	CB1325
A1R9	0757-0442	9	5	RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1R10	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A1R11	0683-6835	9	14	RESISTOR 68K 5% .25W FC TC=-400/+800	01121	CB6835
A1R12	0683-4735	4	18	RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A1R13	0683-1325	2		RESISTOR 1.3K 5% .25W FC TC=-400/+700	01121	CB1325
A1R14	0683-1325	2		RESISTOR 1.3K 5% .25W FC TC=-400/+700	01121	CB1325
A1R15	0683-1325	2		RESISTOR 1.3K 5% .25W FC TC=-400/+700	01121	CB1325
A1RP1	1810-0269	3	2	NETWORK-RES 9-SIP10.0K OHM X 8	28480	1810-0269
A1RP2	1810-0269	3		NETWORK-RES 9-SIP10.0K OHM X 8	28480	1810-0269
A1S1	3101-1341	3	2	SWITCH-SL SPDT SUBMIN .5A 125VAC/DC	28480	3101-1341
A1S2	3101-1341	3		SWITCH-SL SPDT SUBMIN .5A 125VAC/DC	28480	3101-1341
A1S3	3101-2094	5	1	SWITCH-RKR DIP-RKR-ASSY 8-1A .05A 30VDC	28480	3101-2094
A1U1	1820-1730	6	10	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A1U2	1820-1730	6		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A1U3	1820-1730	6		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A1U4	1820-1730	6		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A1U5	1820-1730	6		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A1U6	1820-1689	4	4	IC UART TTL QUAD	01295	MC3446P
A1U7	1820-1689	4		IC UART TTL QUAD	01295	MC3446P
A1U8	1820-1730	6		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A1U9	1820-1730	6		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A1U10	1820-1730	6		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1U11	1820-1730	6		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A1U12	1820-1730	6		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01295	SN74LS273N
A1U13	1820-1689	4		IC UART TTL QUAD	01295	MC3446P
A1U14	1820-1689	4		IC UART TTL QUAD	01295	MC3446P
A1U15	1820-1216	3	2	IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A1U16	1820-1216	3		IC DCDR TTL LS 3-TO-8-LINE 3-INP	01295	SN74LS138N
A1U17	1820-1444	9	1	IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS298N
A1U18	1820-1470	1	2	IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS157N
A1U19	1820-1470	1		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS157N
A1U20	1820-1917	1	1	IC BFR TTL LS LINE DRVR OCTL	01295	SN74LS240N
A1U21	1820-1492	7	1	IC BFR TTL LS INV HEX 1-INP	01295	SN74LS368AN
A1U22	1820-1201	6	4	IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
A1U23	1820-1419	8	2	IC COMPTR TTL LS MAGTD 4-BIT	01295	SN74LS85N
A1U24	1820-1201	6		IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
A1U25	1820-1197	9	2	IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A1U26	1820-1208	3	1	IC GATE TTL LS OR QUAD 2-INP	01295	SN74LS32N
A1U27	1820-1204	9	1	IC GATE TTL LS NAND DUAL 4-INP	01295	SN74LS20N
A1U28	1820-1199	1	7	IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A1U29	1820-1201	6		IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
A1U30	1820-1207	2	1	IC GATE TTL LS NAND 8-INP	01295	SN74LS30N
A1U31	1820-1419	8		IC COMPTR TTL LS MAGTD 4-BIT	01295	SN74LS85N
A1U32	1820-1144	6	1	IC GATE TTL LS NOR QUAD 2-INP	01295	SN74LS02N
A1U33	1820-1423	4	2	IC MV TTL LS MONOSTBL RETRIG DUAL	01295	SN74LS123N
A1U34	1820-1416	5	1	IC SCHMITT-TRIG TTL LS INV HEX 1-INP	01295	SN74LS14N
A2	35601-66502	1	1	DISPLAY PC ASSEMBLY	28480	35601-66502
	05328-40003	8	1	STAND-L.E.D.	28480	05328-40003
A2DS1	1990-0487	7	4	LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A2DS2	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A2DS3	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A2DS4	1990-0487	7		LED-LAMP LUM-INT=1MCD IF=20MA-MAX BVR=5V	28480	5082-4584
A2J1	1251-7269	1	2	CONNECTOR-8 PIN, MALE	28480	1251-7269
A2J2	1251-6429	3	3	CONNECTOR 3-PIN M POST TYPE	28480	1251-6429
A3	35601-66503	2	1	LOW FREQUENCY PC ASSEMBLY	28480	35601-66503
A3C100	0180-1746	5	48	CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C101	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C102	0160-4532	1	13	CAPACITOR-FXD 1000PF +-20% 50VDC CER	28480	0160-4532
A3C103	0160-2331	4	8	CAPACITOR-FXD 8200PF +-1% 100VDC MICA	28480	0160-2331
A3C104	0140-0231	7	4	CAPACITOR-FXD 440PF +-1% 300VDC MICA	72136	DM15F441F0300WV1C
A3C105	0160-2331	4		CAPACITOR-FXD 8200PF +-1% 100VDC MICA	28480	0160-2331
A3C106	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C107	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C108	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C109	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C110	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C111	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C112	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C113	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C114	0160-2331	4		CAPACITOR-FXD 8200PF +-1% 100VDC MICA	28480	0160-2331
A3C115	0140-0231	7		CAPACITOR-FXD 440PF +-1% 300VDC MICA	72136	DM15F441F0300WV1C
A3C116	0160-2331	4		CAPACITOR-FXD 8200PF +-1% 100VDC MICA	28480	0160-2331
A3C117	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C118	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C119	0160-2331	4		CAPACITOR-FXD 8200PF +-1% 100VDC MICA	28480	0160-2331
A3C120	0160-2331	4		CAPACITOR-FXD 8200PF +-1% 100VDC MICA	28480	0160-2331
A3C121	0140-0231	7		CAPACITOR-FXD 440PF +-1% 300VDC MICA	72136	DM15F441F0300WV1C
A3C122	0160-2331	4		CAPACITOR-FXD 8200PF +-1% 100VDC MICA	28480	0160-2331
A3C123	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C124	0160-2331	4		CAPACITOR-FXD 8200PF +-1% 100VDC MICA	28480	0160-2331
A3C125	0140-0231	7		CAPACITOR-FXD 440PF +-1% 300VDC MICA	72136	DM15F441F0300WV1C
A3C126	0160-2223	3	1	CAPACITOR-FXD 1600PF +-5% 300VDC MICA	28480	0160-2223
A3C127	0160-2228	8	1	CAPACITOR-FXD 2700PF +-5% 300VDC MICA	28480	0160-2228
A3C200	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C201	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C202	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C203	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C204	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C205	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C206	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C207	0160-4824	4	1	CAPACITOR-FXD 680PF +-5% 100VDC CER	28480	0160-4824
A3C208	0160-4800	7	8	CAPACITOR-FXD 120PF +-5% 100VDC CER	28480	0160-4800
A3C209	0160-4532	1		CAPACITOR-FXD 1000PF +-20% 50VDC CER	28480	0160-4532
A3C210	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C211	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3C212	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C213	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C214	0160-4808	4	2	CAPACITOR-FXD 470PF +-5% 100VDC CER	28480	0160-4808
A3C215	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C216	0160-0157	8	2	CAPACITOR-FXD 4700PF +-10% 200VDC POLYE	28480	0160-0157
A3C217	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C218	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C219	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C220	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C223	0160-4532	1		CAPACITOR-FXD 1000PF +-20% 50VDC CER	28480	0160-4532
A3C300	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C301	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C302	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C303	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C304	0160-3563	6	3	CAPACITOR-FXD 10UF +-5% 50VDC MET-POLYC	28480	0160-3563
A3C306	0160-4846			CAPACITOR 1500PF 50%		0160-4846
A3C307	0160-3563	6		CAPACITOR-FXD 10UF +-5% 50VDC MET-POLYC	28480	0160-3563
A3C309	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	28480	0160-4571
A3C310	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C311	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C312	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C314	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C315	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C316	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C317	0160-3563	6		CAPACITOR-FXD 10UF +-5% 50VDC MET-POLYC	28480	0160-3563
A3C318	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C319	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C320	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C321	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C322	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C324	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C325	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C326	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C327	0160-4846	0	2	CAPACITOR-FXD 1500PF +-5% 100VDC CER	28480	0160-4846
A3C328	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C329	0160-4801	7		CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A3C330	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C331	0180-2249	5		CAPACITOR-FXD 47UF+-10% 20VDC TA	56289	150D156X9020B2
A3C332	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C333	0160-0157	8		CAPACITOR-FXD 4700PF +-10% 200VDC POLYE	28480	0160-0157
A3C334	0160-3914			CAPACITOR 0.01UF 100V		0160-3914
A3C400	0160-0164	7	4	CAPACITOR-FXD .039UF +-10% 200VDC POLYE	28480	0160-0164
A3C401	0160-0164	7		CAPACITOR-FXD .039UF +-10% 200VDC POLYE	28480	0160-0164
A3C402	0160-0167	0	2	CAPACITOR-FXD .082UF +-10% 200VDC POLYE	28480	0160-0167
A3C403	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C404	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C405	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C406	0160-4819	7		CAPACITOR-FXD 2200PF +-5% 100VDC CER	28480	0160-4819
A3C407	0160-4819	7		CAPACITOR-FXD 2200PF +-5% 100VDC CER	28480	0160-4819
A3C408	0160-0168	1	4	CAPACITOR-FXD .1UF +-10% 200VDC POLYE	28480	0160-0168
A3C409	0160-0168	1		CAPACITOR-FXD .1UF +-10% 200VDC POLYE	28480	0160-0168
A3C410	0160-0166	9	2	CAPACITOR-FXD .068UF +-10% 200VDC POLYE	28480	0160-0166
A3C411	0160-0166	9		CAPACITOR-FXD .068UF +-10% 200VDC POLYE	28480	0160-0166
A3C412	0160-0194	3	2	CAPACITOR-FXD .015UF +-10% 200VDC POLYE	28480	0160-0194
A3C413	0160-0194	3		CAPACITOR-FXD .015UF +-10% 200VDC POLYE	28480	0160-0194
A3C414	0160-3787	6	5	CAPACITOR-FXD 1UF +-10% 50VDC MET-POLYC	28480	0160-3787
A3C415	0160-4819	7		CAPACITOR-FXD 2200PF +-5% 100VDC CER	28480	0160-4819
A3C416	0160-4819	7		CAPACITOR-FXD 2200PF +-5% 100VDC CER	28480	0160-4819
A3C417	0160-0168	1		CAPACITOR-FXD .1UF +-10% 200VDC POLYE	28480	0160-0168
A3C418	0160-4822	2	4	CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A3C419	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A3C420	0160-0168	1		CAPACITOR-FXD .1UF +-10% 200VDC POLYE	28480	0160-0168
A3C421	0160-0164	7		CAPACITOR-FXD .039UF +-10% 200VDC POLYE	28480	0160-0164
A3C422	0160-0164	7		CAPACITOR-FXD .039UF +-10% 200VDC POLYE	28480	0160-0164
A3C423	0160-0167	0		CAPACITOR-FXD .082UF +-10% 200VDC POLYE	28480	0160-0167
A3C500	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C501	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C502	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C503	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C504	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C505	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C506	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C700	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3C701	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A3C702	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C703	0160-4571	8		CAPACITOR-FXD 0.1UF 50VDC	28480	0160-4571
A3C704	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A3CR100	1901-0033	2	14	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3CR101	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3CR102	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3CR103	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3CR104	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3CR105	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3CR106	1901-0518	8	3	DIODE-SM SIG SCHOTTKY	28480	1901-0518
A3CR107	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A3CR200	0122-0089	5	6	DIODE-VVC 29PF 10% C3/C25-MIN=5 BVR=30V	04713	MV109
A3CR201	0122-0089	5		DIODE-VVC 29PF 10% C3/C25-MIN=5 BVR=30V	04713	MV109
A3CR202	1902-0041	4	3	DIODE-ZNR 5.11V 5% DO-35 PD=.4W	28480	1902-0041
A3CR203	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A3CR301	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3CR302	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3CR303	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A3CR304	1901-0518	8		DIODE-SM SIG SCHOTTKY	28480	1901-0518
A3CR305	0122-0089	5		DIODE-VVC 29PF 10% C3/C25-MIN=5 BVR=30V	04713	MV109
A3CR306	0122-0089	5		DIODE-VVC 29PF 10% C3/C25-MIN=5 BVR=30V	04713	MV109
A3CR307	0122-0089	5		DIODE-VVC 29PF 10% C3/C25-MIN=5 BVR=30V	04713	MV109
A3CR308	0122-0089	5		DIODE-VVC 29PF 10% C3/C25-MIN=5 BVR=30V	04713	MV109
A3CR309	1902-0954			DIODE ZNR 6.8V 5%		1902-0954
A3CR310	1902-0950			DIODE - ZNR 4.7V 5%		1902-0950
A3CR311	1902-0954			DIODE ZNR 6.8V 5%		1902-0954
A3CR312	1902-0950			DIODE - ZNR 4.7V 5%		1902-0950
A3CR400	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3CR401	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3CR402	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3CR403	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3CR404	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3CR405	1901-0033	2		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A3CR700	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3CR701	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3CR702	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3CR703	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3CR704	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3CR705	1901-0040	1	13	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3CR706	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3CR707	1901-0040	1		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3J1	1250-1255	1		CONNECTOR-SMB ST JK	28480	1250-1255
A3J2	1250-1255	1		CONNECTOR-SMB ST JK	28480	1250-1255
A3J3	1250-1255	1		CONNECTOR-SMB ST JK	28480	1250-1255
A3J4	1250-1255	1		CONNECTOR-SMB ST JK	28480	1250-1255
A3J5	1250-1255	1		CONNECTOR-SMB ST JK	28480	1250-1255
A3J6	1250-1255	1	8	CONNECTOR-SMB ST JK	28480	1250-1255
A3J7	1250-1255	1		CONNECTOR-SMB ST JK	28480	1250-1255
A3J8	1250-1255	1		CONNECTOR-SMB ST JK	28480	1250-1255
A3J9	1251-6429	3		CONNECTOR-3-PIN MALE	28480	1251-6429
A3J10	1251-4670	2		CONNECTOR-3-PIN MALE	28480	1251-4670
A3J11	1251-4670	2		CONNECTOR-3-PIN MALE	28480	1251-4670
A3J12	1251-4670	2		CONNECTOR-3-PIN MALE	28480	1251-4670
A3J13	1251-4670	2		CONNECTOR-3-PIN MALE	28480	1251-4670
A3J14	1251-4670	2	2	CONNECTOR-3-PIN MALE	28480	1251-4670
A3J15	1251-4670	2		CONNECTOR-3-PIN MALE	28480	1251-4670
A3J16	1251-3825	7		CONNECTOR 5-PIN M POST TYPE	28480	1251-3825
A3J17	1251-3305	8		CONNECTOR 4-PIN M POST TYPE	28480	1251-3305
A3J18	1251-3305	8		CONNECTOR 4-PIN M POST TYPE	28480	1251-3305
A3J19	1251-7264	6		HEADER-34 PIN	28480	1251-7264
A3J20	1251-4670	2	27	CONNECTOR-3-PIN MALE	28480	1251-4670
A3J21	1251-4670	2		CONNECTOR-3-PIN MALE	28480	1251-4670
A3L05	9140-0210	1	8	INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L021	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L100	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L101	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L102	9140-0289	4		COIL-VAR 23UH-27UH Q=200 PC-MTG	28480	9140-0289
A3L103	9140-0289	4		COIL-VAR 23UH-27UH Q=200 PC-MTG	28480	9140-0289
A3L104	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L105	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L105	9140-0289	4		COIL-VAR 23UH-27UH Q=200 PC-MTG	28480	9140-0289
A3L106	9140-0289	4		COIL-VAR 23UH-27UH Q=200 PC-MTG	28480	9140-0289
A3L107	9140-0289	4		COIL-VAR 23UH-27UH Q=200 PC-MTG	28480	9140-0289
A3L109	9140-0289	4		COIL-VAR 23UH-27UH Q=200 PC-MTG	28480	9140-0289
A3L110	9140-0289	4		COIL-VAR 23UH-27UH Q=200 PC-MTG	28480	9140-0289
A3L111	9140-0289	4		COIL-VAR 23UH-27UH Q=200 PC-MTG	28480	9140-0289
A3L200	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3L201	9100-1618	1	13	INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A3L203	9140-0627	4	1	INDUCTOR-SHIELDED 1 UH	28480	9140-0627
A3L204	9140-0137	1	4	INDUCTOR RF-CH-MLD 1MH 5% .2DX.45LG Q=60	28480	9140-0137
A3L206	9100-3313	7	1	INDUCTOR RF-CH-MLD 22UH 5% .166DX.385LG	28480	9100-3313
A3L207	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L208	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A3L209	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L210	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A3L300	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L301	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L302	9100-1673			INDUCTOR 6.8mH 5%		9100-1673
A3L303	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L304	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L305	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L306	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A3L307	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L308	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L309	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A3L310	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L311	9100-1647	6	4	INDUCTOR RF-CH-MLD 470UH 5% .2DX.45LG	28480	9100-1647
A3L312	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L313	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L314	9100-3313	3	2	INDUCTOR-RF-CH-MLD 22UH 5% .166DX.385LG	28480	9100-3313
A3L315	9100-3313	3		INDUCTOR-RF-CH-MLD 22UH 5% .166DX.385LG	28480	9100-3313
A3L316	9140-0284	9	1	INDUCTOR RF-CH-MLD 2.4UH 5% .166DX.385LG	28480	9140-0284
A3L317	9100-3561	7	3	INDUCTOR RF-CH-MLD 6.2UH 5% .166DX.385LG	28480	9100-3561
A3L318	9100-1647	6		INDUCTOR RF-CH-MLD 470UH 5% .2DX.45LG	28480	9100-1647
A3L319	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L400	9140-0238	3	2	INDUCTOR RF-CH-MLD 82UH 5% .166DX.385LG	28480	9140-0238
A3L401	9100-1637	4	2	INDUCTOR RF-CH-MLD 120UH 5% .166DX.385LG	28480	9100-1637
A3L402	9100-1648	7	2	INDUCTOR RF-CH-MLD 560UH 5% .2DX.45LG	28480	9100-1648
A3L403	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L404	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L405	9140-0131	5		INDUCTOR RF-CH-MLD 10MH 5% .25DX.75LG	28480	9140-0131
A3L406	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L407	9140-0131	5		INDUCTOR RF-CH-MLD 10MH 5% .25DX.75LG	28480	9140-0131
A3L408	9140-0479	4	4	INDUCTOR 225UH 5% Q=100	28480	9140-0479
A3L409	9140-0479	4		INDUCTOR 225UH 5% Q=100	28480	9140-0479
A3L410	9140-0480	7	2	INDUCTOR 110UH 5% Q=100	28480	9140-0480
A3L411	9140-0131	5		INDUCTOR RF-CH-MLD 10MH 5% .25DX.75LG	28480	9140-0131
A3L412	9140-0131	5		INDUCTOR RF-CH-MLD 10MH 5% .25DX.75LG	28480	9140-0131
A3L415	9140-0479	4		INDUCTOR 225UH 5% Q=100	28480	9140-0479
A3L416	9140-0479	4		INDUCTOR 225UH 5% Q=100	28480	9140-0479
A3L417	9140-0480	7		INDUCTOR 110UH 5% Q=100	28480	9140-0480
A3L418	9140-0238	3		INDUCTOR RF-CH-MLD 82UH 5% .166DX.385LG	28480	9140-0238
A3L419	9100-1637	4		INDUCTOR RF-CH-MLD 120UH 5% .166DX.385LG	28480	9100-1637
A3L420	9100-1648	7		INDUCTOR RF-CH-MLD 560UH 5% .2DX.45LG	28480	9100-1648
A3L500	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A3L501	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A3L502	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A3L503	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A3L504	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A3L505	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A3L506	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A3L700	9100-1393	9	2	COIL,XFMR-TRIFILAR,.375DIAX.625HI,ENCAP	28480	9100-1393
A3L700	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3L701	9100-1647	6		INDUCTOR RF-CH-MLD 470UH 5% .2DX.45LG	28480	9100-1647
A3L702	9100-1393	9		COIL,XFMR-TRIFILAR,.375DIAX.625HI,ENCAP	28480	9100-1393
A3L702	9100-1647	6		INDUCTOR RF-CH-MLD 470UH 5% .2DX.45LG	28480	9100-1647
A3L703	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A3Q100	1853-0010	2	19	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A3Q101	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A3Q102	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A3Q103	1854-0019	3	10	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A3Q104	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A3Q105	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A3Q106	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A3Q107	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A3Q200	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A3Q201	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A3Q202	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A3Q203	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A3Q204	1854-0215	1	4	TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A3Q205	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A3Q300	1855-0410	0	2	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0410

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3Q301	1855-0410	0		TRANSISTOR J-FET N CHAN D-MODE TO-18 SI	28480	1855-0410
A3Q302	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A3Q303	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A3Q304	1854-0247	9	5	TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A3Q305	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A3Q306	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A3Q307	1853-0010	2		TRANSISTOR PNP SI TO-10 PD=360MW	28480	1853-0010
A3Q700	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A3Q701	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A3Q702	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A3Q703	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A3Q704	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A3Q705	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A3R29	0698-4435	2	2	RESISTOR 2.49K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2491-F
A3R100	0683-3925	2	10	RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A3R101	0683-4725	2	8	RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
A3R102	0683-4705	8	45	RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R103	0683-6835	9		RESISTOR 60K 5% .25W FC TC=-400/+800	01121	CB6835
A3R104	0683-3335	8	7	RESISTOR 33K 5% .25W FC TC=-400/+800	01121	CB3335
A3R105	0698-4428	3	3	RESISTOR 1.69K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1691-F
A3R106	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A3R107	0683-3335	8		RESISTOR 33K 5% .25W FC TC=-400/+800	01121	CB3335
A3R108	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R109	0683-3925	2		RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A3R110	0698-3445	2	3	RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A3R111	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R112	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A3R113	0683-3335	8		RESISTOR 33K 5% .25W FC TC=-400/+800	01121	CB3335
A3R114	0757-0427	0	2	RESISTOR 1.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1501-F
A3R115	0757-0280	3	5	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A3R116	0683-2225	3	4	RESISTOR 2.2K 5% .25W FC TC=-400/+700	01121	CB2225
A3R117	0683-6825	7	5	RESISTOR 6.8K 5% .25W FC TC=-400/+700	01121	CB6825
A3R118	0683-6825	7		RESISTOR 6.8K 5% .25W FC TC=-400/+700	01121	CB6825
A3R119	0683-2225	3		RESISTOR 2.2K 5% .25W FC TC=-400/+700	01121	CB2225
A3R120	0683-1025	9	37	RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R121	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R122	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
A3R123	0683-2225	3		RESISTOR 2.2K 5% .25W FC TC=-400/+700	01121	CB2225
A3R124	0683-6825	7		RESISTOR 6.8K 5% .25W FC TC=-400/+700	01121	CB6825
A3R125	0683-6825	7		RESISTOR 6.8K 5% .25W FC TC=-400/+700	01121	CB6825
A3R126	0683-2225	3		RESISTOR 2.2K 5% .25W FC TC=-400/+700	01121	CB2225
A3R127	0757-0410	1	1	RESISTOR 301 1% .125W F TC=0+-100	24546	C4-1/8-T0-301R-F
A3R128	0698-4429	4	1	RESISTOR 1.87K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1871-F
A3R129	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A3R130	0698-3445	2		RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A3R131	0683-3925	2		RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A3R132	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R133	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A3R134	0683-3335	8		RESISTOR 33K 5% .25W FC TC=-400/+800	01121	CB3335
A3R135	0698-4428	3		RESISTOR 1.69K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1691-F
A3R136	0698-3445	2		RESISTOR 348 1% .125W F TC=0+-100	24546	C4-1/8-T0-348R-F
A3R137	0683-3925	2		RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A3R138	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R139	0683-3335	8		RESISTOR 33K 5% .25W FC TC=-400/+800	01121	CB3335
A3R140	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A3R141	0698-4428	3		RESISTOR 1.69K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1691-F
A3R142	2100-3210	6	2	RESISTOR-TRMR 10K 10% C TOP-ADJ 1-TRN	28480	2100-3210
A3R143	0683-1045	3	2	RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A3R144	0683-4745	6	11	RESISTOR 470K 5% .25W FC TC=-800/+900	01121	CB4745
A3R145	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R146	0683-4745	6		RESISTOR 470K 5% .25W FC TC=-800/+900	01121	CB4745
A3R200	0683-6835	9		RESISTOR 68K 5% .25W FC TC=-400/+800	01121	CB6835
A3R201	0683-6835	9		RESISTOR 68K 5% .25W FC TC=-400/+800	01121	CB6835
A3R202	0683-6835	9		RESISTOR 68K 5% .25W FC TC=-400/+800	01121	CB6835
A3R203	0683-6835	9		RESISTOR 68K 5% .25W FC TC=-400/+800	01121	CB6835
A3R204	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R205	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R206	0683-6835	9		RESISTOR 68K 5% .25W FC TC=-400/+800	01121	CB6835
A3R207	0683-4715	0	8	RESISTOR 470 5% .25W FC TC=-400/+600	01121	CB4715
A3R208	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
A3R209	0683-4715	0		RESISTOR 470 5% .25W FC TC=-400/+600	01121	CB4715
A3R210	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R211	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A3R212	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R213	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A3R214	0683-6815	5	2	RESISTOR 680 5% .25W FC TC=-400/+600	01121	CB6815
A3R215	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R216	0683-6835	9		RESISTOR 68K 5% .25W FC TC=-400/+800	01121	CB6835

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	CD	Qty	Description	Mfr Code	Mfr Part Number
A3R217	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R218	0683-2235	5	17	RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A3R219	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R220	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R221	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R222	0757-0467	8	2	RESISTOR 121K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1213-F
A3R223	0757-0453	2	2	RESISTOR 30.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3012-F
A3R224	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A3R225	0683-6815	5		RESISTOR 680 5% .25W FC TC=-400/+600	01121	CB6815
A3R226	0757-0444	1	2	RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A3R228	0683-6825	7		RESISTOR 6.8K 5% .25W FC TC=-400/+700	01121	CB6825
A3R229	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A3R230	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R231	0683-6835	9		RESISTOR 68K 5% .25W FC TC=-400/+800	01121	CB6835
A3R232	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R237	0683-2035	3	1	RESISTOR 20K 5% .25W FC TC=-400/+800	01121	CB2035
A3R300	0683-2425	5	1	RESISTOR 2.4K 5% .25W FC TC=-400/+700	01121	CB2425
A3R301	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R302	0683-3925	2		RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A3R303	0683-4745	6		RESISTOR 470K 5% .25W FC TC=-800/+900	01121	CB4745
A3R304	2100-3214	0	1	RESISTOR-TRMR 100K 10% C TOP-ADJ 1-TRN	28480	2100-3214
A3R305	0698-3179	9	1	RESISTOR 2.55K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2551
A3R306	0698-4513	7	1	RESISTOR 97.6K 1% .125W F TC=0+-100	03888	PME55-1/8-T0-9762-F
A3R307	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R308	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R309	0683-6835	9		RESISTOR 68K 5% .25W FC TC=-400/+000	01121	CB6835
A3R310	0698-4426	1	2	RESISTOR 1.58K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1581-F
A3R311	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A3R312	0698-4523	9	1	RESISTOR 169K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1693-F
A3R313	0698-4525	1	1	RESISTOR 187K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1873-F
A3R314	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R315	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
A3R316	0683-2245	7	5	RESISTOR 220K 5% .25W FC TC=-800/+900	01121	CB2245
A3R317	0683-2245	7		RESISTOR 220K 5% .25W FC TC=-800/+900	01121	CB2245
A3R318	0698-4426	1		RESISTOR 1.58K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1581-F
A3R319	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A3R320	0683-1525	4	3	RESISTOR 1.5K 5% .25W FC TC=-400/+700	01121	CB1525
A3R321	0698-8557	7	1	RESISTOR 887K 1% .125W F TC=0+-100	28480	0698-8557
A3R322	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A3R323	0698-4473	8	1	RESISTOR 8.06K 1% .125W F TC=0+-100	24546	C4-1/8-T0-8061-F
A3R324	2100-3252	6	1	RESISTOR-TRMR 5K 10% C TOP-ADJ 1-TRN	28480	2100-3252
A3R325	0683-3335	8		RESISTOR 33K 5% .25W FC TC=-400/+800	01121	CB3335
A3R326	0683-2245	7		RESISTOR 220K 5% .25W FC TC=-800/+900	01121	CB2245
A3R327	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A3R328	0683-1545	8	5	RESISTOR 150K 5% .25W FC TC=-800/+900	01121	CB1545
A3R329	0683-3335	8		RESISTOR 33K 5% .25W FC TC=-400/+800	01121	CB3335
A3R330	0683-4745	6		RESISTOR 470K 5% .25W FC TC=-800/+900	01121	CB4745
A3R331	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A3R332	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A3R333	0683-4745	6		RESISTOR 470K 5% .25W FC TC=-800/+900	01121	CB4745
A3R334	0683-3925	2		RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A3R335	0757-0444	1		RESISTOR 12.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1212-F
A3R336	0698-5187	3	1	RESISTOR 866K 1% .125W F TC=0+-100	28480	0698-5187
A3R338	0683-2245	7		RESISTOR 220K 5% .25W FC TC=-800/+900	01121	CB2245
A3R339	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A3R340	0683-2245	7		RESISTOR 220K 5% .25W FC TC=-800/+900	01121	CB2245
A3R341	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A3R342	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A3R343	0683-3925	2		RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A3R344	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R345	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A3R346	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A3R347	0683-6835	9		RESISTOR 68K 5% .25W FC TC=-400/+800	01121	CB6835
A3R348	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R349	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R350	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R351	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A3R352	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A3R353	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R354	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R355	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A3R356	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A3R357	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R358	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
A3R359	0683-2025	1	9	RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3R360	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R361	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A3R362	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A3R363	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R364	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R365	0757-0441			RESISTOR 8250 1%		0757-0441
A3R367	0698-3279			RESISTOR 4.99K 1%		0698-3279
A3R368	2100-3210	6		RESISTOR-TRMR 10K 10% C TOP-ADJ 1-TRN	28480	2100-3210
A3R369	0683-1045	1		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045
A3R370	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
A3R371	0683-3925	2		RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A3R400	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R401	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A3R402	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R403	0698-4467	0	2	RESISTOR 1.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1051-F
A3R404	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A3R405	0757-0437	2	2	RESISTOR 4.75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4751-F
A3R406	0698-4421	6	7	RESISTOR 249 1% .125W F TC=0+-100	24546	C4-1/8-T0-249R-F
A3R407	0683-3345	0	1	RESISTOR 330K 5% .25W FC TC=-800/+900	01121	CB3345
A3R408	0683-4745	6		RESISTOR 470K 5% .25W FC TC=-800/+900	01121	CB4745
A3R409	0698-4125	2	4	RESISTOR 953 1% .125W F TC=0+-100	24546	C4-1/8-T0-1071-F
A3R410	0698-4125	2		RESISTOR 953 1% .125W F TC=0+-100	24546	C4-1/8-T0-1071-F
A3R411	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R412	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R413	0683-4745	6		RESISTOR 470K 5% .25W FC TC=-800/+900	01121	CB4745
A3R414	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R415	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A3R416	0683-5625	3	2	RESISTOR 5.6K 5% .25W FC TC=-400/+700	01121	CB5625
A3R417	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R418	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R419	0757-0449	6	5	RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A3R420	0698-3279	0	5	RESISTOR 4.99K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4991-F
A3R421	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R422	0698-4125	2		RESISTOR 953 1% .125W F TC=0+-100	24546	C4-1/8-T0-1071-F
A3R423	0683-1545	8		RESISTOR 150K 5% .25W FC TC=-800/+900	01121	CB1545
A3R424	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R425	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R426	0683-4745	6		RESISTOR 470K 5% .25W FC TC=-800/+900	01121	CB4745
A3R427	0683-1545	8		RESISTOR 150K 5% .25W FC TC=-800/+900	01121	CB1545
A3R428	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R429	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R430	0757-0437	2		RESISTOR 4.75K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4751-F
A3R431	0698-4421	6		RESISTOR 249 1% .125W F TC=0+-100	24546	C4-1/8-T0-249R-F
A3R432	0698-4467	0		RESISTOR 1.05K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1051-F
A3R433	0683-1055	5	1	RESISTOR 1M 5% .25W FC TC=-800/+900	01121	CB1055
A3R434	0683-4745	6		RESISTOR 470K 5% .25W FC TC=-800/+900	01121	CB4745
A3R435	0698-4125	2		RESISTOR 953 1% .125W F TC=0+-100	24546	C4-1/8-T0-1071-F
A3R436	0683-5625	3		RESISTOR 5.6K 5% .25W FC TC=-400/+700	01121	CB5625
A3R437	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A3R438	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A3R439	0698-3279	0		RESISTOR 4.99K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4991-F
A3R440	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A3R441	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R442	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A3R443	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A3R444	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A3R444	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R445	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A3R446	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A3R447	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A3R448	0683-6835			RESISTOR 68K 5%		0683-6835
A3R449	0683-1025			RESISTOR 1000 5% .125W		0683-1025
A3R450	0683-4715			RESISTOR 470 5% .125W		0683-4715
A3R451	2100-3214			RESISTOR VAR 100K 1%		2100-3214
A3R676	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A3R700	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R701	0683-4715	0		RESISTOR 470 5% .25W FC TC=-400/+600	01121	CB4715
A3R702	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R703	0683-4715	0		RESISTOR 470 5% .25W FC TC=-400/+600	01121	CB4715
A3R704	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R705	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R706	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R707	0683-2015	9	2	RESISTOR 200 5% .25W FC TC=-400/+600	01121	CB2015
A3R708	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R709	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3R710	0683-2015	9		RESISTOR 200 5% .25W FC TC=-400/+600	01121	CB2015
A3R711	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A3T701	9100-3262	5	2	TRANSFORMER TRANSFORMER; TOROIDAL PULSE	28480	9100-3262
A3T703	9100-3262	5		TRANSFORMER TRANSFORMER; TOROIDAL PULSE	28480	9100-3262

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A3U100	1826-0081	0	2	IC OP AMP WB TO-99 PKG	27014	LM318H
A3U101	1820-1971	7	13	IC SWITCH ANLG QUAD 16-DIP-P PKG	17856	DG201CJ
A3U200	1820-1112	8	3	IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A3U201	1820-1442	7	3	IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A3U202	1820-1277	6	2	IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS192N
A3U203	1820-1277	6		IC CNTR TTL LS DECD UP/DOWN SYNCHRO	01295	SN74LS192N
A3U204	1826-0081	0		IC OP AMP WB TO-99 PKG	27014	LM318H
A3U205	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A3U206	1820-1197	9		IC GATE TTL LS NAND QUAD 2-INP	01295	SN74LS00N
A3U207	1820-1442	7		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A3U208	1820-1442	7		IC CNTR TTL LS DECD ASYNCHRO	01295	SN74LS290N
A3U300	1826-0138	8	3	IC COMPARATOR GP QUAD 14-DIP-P PKG	01295	LM339N
A3U301	1820-1423	4		IC MV TTL LS MONOSTBL RETRIG DUAL	01295	SN74LS123N
A3U302	1826-0138	8		IC COMPARATOR GP QUAD 14-DIP-P PKG	01295	LM339N
A3U303	1826-0522	4	4	IC OP AMP QUAD 14-DIP-P PKG	01295	TL074CN
A3U304	1820-1971	7		IC SWITCH ANLG QUAD 16-DIP-P PKG	17856	DG201CJ
A3U305	1820-1210	7	1	IC GATE TTL LS AND-OR-INV DUAL 2-INP	01295	SN74LS51N
A3U306	1826-0110	6	1	IC OP AMP LOW-BIAS-H-IMPD TO-99 PKG	27014	LM212H
A3U307	1826-0716	8	4	IC OP AMP LOW-NOISE DUAL 8-DIP-C PKG	18324	NE5532AFE
A3U308	1820-1971	7		IC SWITCH ANLG QUAD 16-DIP-P PKG	17856	DG201CJ
A3U309	1820-1971	7		IC SWITCH ANLG QUAD 16-DIP-P PKG	17856	DG201CJ
A3U400	1826-0716	8		IC OP AMP LOW-NOISE DUAL 8-DIP-C PKG	18324	NE5532AFE
A3U401	1826-0716	8		IC OP AMP LOW-NOISE DUAL 8-DIP-C PKG	18324	NE5532AFE
A3U402	1820-1971	7		IC SWITCH ANLG QUAD 16-DIP-P PKG	17856	DG201CJ
A3U403	1826-0522	4		IC OP AMP QUAD 14-DIP-P PKG	01295	TL074CN
A3U404	1820-1971	7		IC SWITCH ANLG QUAD 16-DIP-P PKG	17856	DG201CJ
A3U405	1820-1971	7		IC SWITCH ANLG QUAD 16-DIP-P PKG	17856	DG201CJ
A3U406	1820-1971	7		IC SWITCH ANLG QUAD 16-DIP-P PKG	17856	DG201CJ
A3U407	1820-1971	7		IC SWITCH ANLG QUAD 16-DIP-P PKG	17856	DG201CJ
A3U408	1826-0521	3	1	IC OP AMP DUAL 8-DIP-P PKG	01295	TL072CP
A3U500	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A3U501	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A3U502	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A3V300	0410-0437	8	1	CRYSTAL	28480	0410-0437
A4	35601-66504	3	1	HI-FREQUENCY PC ASSEMBLY	28480	35601-66504
A4C1	0160-3879	7	4	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A4C2	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A4C3	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A4C4	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A4C5	0160-4383	0	2	CAPACITOR-FXD 6.8PF +-.5PF 200VDC CER	20932	5024E0200RD689D
A4C6	0160-3874	2	3	CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A4C7	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A4C8	0160-4386	3	2	CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-330J
A4C9	0160-4386	3		CAPACITOR-FXD 33PF +-5% 200VDC CER 0+-30	51642	200-200-NP0-330J
A4C10	0160-4350	1	2	CAPACITOR-FXD 68PF +-5% 200VDC CER 0+-30	28480	0160-4350
A4C11	0160-4389	6	1	CAPACITOR-FXD 100PF +-5PF 200VDC CER	51642	200-200-NP0-101J
A4C12	0160-4350	1		CAPACITOR-FXD 68PF +-5% 200VDC CER 0+-30	28480	0160-4350
A4C13	0160-3874	2		CAPACITOR-FXD 10PF +-.5PF 200VDC CER	28480	0160-3874
A4C14	0160-4791	4	3	CAPACITOR-FXD 10PF +-5% 100VDC CER 0+-30	28480	0160-4791
A4C15	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A4C16	0160-4791	4		CAPACITOR-FXD 10PF +-5% 100VDC CER 0+-30	28480	0160-4791
A4C17	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A4C18	0160-4791	4		CAPACITOR-FXD 10PF +-5% 100VDC CER 0+-30	28480	0160-4791
A4C19	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A4C20	0160-4822	2		CAPACITOR-FXD 1000PF +-5% 100VDC CER	28480	0160-4822
A4C21	0160-4819	7		CAPACITOR-FXD 2200PF +-5% 100VDC CER	28480	0160-4819
A4C22	0160-0300	3	1	CAPACITOR-FXD 2700PF +-10% 200VDC POLYE	28480	0160-0300
A4C23	0160-4820	0	1	CAPACITOR-FXD 1800PF +-5% 100VDC CER	28480	0160-4820
A4C24	0160-4808	4		CAPACITOR-FXD 470PF +-5% 100VDC CER	28480	0160-4808
A4C25	0160-4819	7		CAPACITOR-FXD 2200PF +-5% 100VDC CER	28480	0160-4819
A4C26	0160-4819	7		CAPACITOR-FXD 2200PF +-5% 100VDC CER	28480	0160-4819
A4C27	0160-0127	2	6	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A4C28	0180-0228	6		CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
A4C29	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A4C30	0180-1702	3	1	CAPACITOR-FXD 100UF+-20% 6VDC TA	56289	150D107X0006R2
A4C31	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020R2
A4C32	0160-4793	6	1	CAPACITOR-FXD 6.8PF +-.5PF 100VDC CER	28480	0160-4793
A4C33	0160-4383	0		CAPACITOR-FXD 6.8PF +-.5PF 200VDC CER	20932	5024E0200RD689D
A4C34	0160-3787	6		CAPACITOR-FXD 1UF +-10% 50VDC MET-POLYC	28480	0160-3787
A4C35	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020R2
A4C36	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A4C37	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A4C38	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A4C39	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A4C40	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4C41	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A4C42	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A4C73	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A4C74	0160-0576	5	3	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A4C75	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A4C76	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A4C77	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A4C78	0160-4801	7		CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A4CR25	1901-0050	3	44	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A4F1	2110-0384	0	6	FUSE .062A 125V .281X.093	28480	2110-0384
A4F2	2110-0384	0		FUSE .062A 125V .281X.093	28480	2110-0384
A4F3	2110-0384	0		FUSE .062A 125V .281X.093	28480	2110-0384
A4F4	2110-0384	0		FUSE .062A 125V .281X.093	28480	2110-0384
A4F5	2110-0384	0		FUSE .062A 125V .281X.093	28480	2110-0384
A4F6	2110-0384	0		FUSE .062A 125V .281X.093	28480	2110-0384
A4J1	1250-0643	9	7	CONNECTOR-RF BNC FEM SGL-HOLE-RR 50-OHM	28480	1250-0643
A4J2	1250-0643	9		CONNECTOR-RF BNC FEM SGL-HOLE-RR 50-OHM	28480	1250-0643
A4J3	1250-0643	9		CONNECTOR-RF BNC FEM SGL-HOLE-RR 50-OHM	28480	1250-0643
A4J6	1250-0643	9		CONNECTOR-RF BNC FEM SGL-HOLE-RR 50-OHM	28480	1250-0643
A4J7	1250-0643	9		CONNECTOR-RF BNC FEM SGL-HOLE-RR 50-OHM	28480	1250-0643
A4J8	1250-0643	9		CONNECTOR-RF BNC FEM SGL-HOLE-RR 50-OHM	28480	1250-0643
A4J9	1250-0643	9		CONNECTOR-RF BNC FEM SGL-HOLE-RR 50-OHM	28480	1250-0643
A4J10	1250-1255	1		CONNECTOR-SMB ST JK	28480	1250-1255
A4J11	1250-1255	1		CONNECTOR-SMB ST JK	28480	1250-1255
A4J12	1250-1707	8	1	CONNECTOR-RF	28480	1250-1707
A4J13	1251-3825	7		CONNECTOR 5-PIN M POST TYPE	28480	1251-3825
A4J14	1251-5491	7	1	CONNECTOR 25-PIN F POST TYPE	28480	1251-5491
A4K1	0490-1318			RELAY 2C 12VDC-COIL .5A 28VDC		0490-1318
A4K2	0490-1318			RELAY 2C 12VDC-COIL .5A 28VDC		0490-1318
A4K3	0490-0916	6	7	RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-0916
A4K4	0490-0916	6		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-0916
A4K5	0490-1287	6	4	RELAY-REED	28480	0490-1287
A4K6	0490-0916	6		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-0916
A4K7	0490-0916	6		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-0916
A4K8	0490-1318			RELAY 2C 12VDC-COIL .5A 28VDC		0490-1318
A4K9	0490-1318			RELAY 2C 12VDC-COIL .5A 28VDC		0490-1318
A4K10	0490-0916	6		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-0916
A4K11	0490-1318			RELAY 2C 12VDC-COIL .5A 28VDC		0490-1318
A4K12	0490-1318			RELAY 2C 12VDC-COIL .5A 28VDC		0490-1318
A4K13	0490-1287	6		RELAY-REED	28480	0490-1287
A4K14	0490-1318			RELAY 2C 12VDC-COIL .5A 28VDC		0490-1318
A4L1	9100-3818	7	1	INDUCTOR RF-CH-MLD 47NH 20% .166DX.305LG	28480	9100-3818
A4L2	9140-0637	6	1	INDUCTOR-.068UH	28480	9140-0637
A4L3	9100-3807	4	1	INDUCTOR RF-CH-MLD 110NH 5% .166DX.385LG	28480	9100-3807
A4L4	9140-0638	7	1	INDUCTOR-.51UH	28480	9140-0638
A4L5	9140-0262	3	2	INDUCTOR RF-CH-MLD 200NH 5% .166DX.385LG	28480	9140-0262
A4L6	9140-0262	3		INDUCTOR RF-CH-MLD 200NH 5% .166DX.385LG	28480	9140-0262
A4L7	9140-0261	2	1	INDUCTOR RF-CH-MLD 100NH 5% .166DX.385LG	28480	9140-0261
A4L8	9140-0399	7	1	INDUCTOR RF-CH-MLD 2.2UH 5% .166DX.385LG	28480	9140-0399
A4L9	9100-3913	3	1	INDUCTOR RF-CH-MLD 3.3UH 5% .166DX.385LG	28480	9100-3913
A4L10	9100-3912	2	1	INDUCTOR RF-CH-MLD 15UH 5% .166DX.385LG	28480	9100-3912
A4L11	9100-3561	7		INDUCTOR RF-CH-MLD 6.2UH 5% .166DX.305LG	28480	9100-3561
A4L12	9100-3561	7		INDUCTOR RF-CH-MLD 6.2UH 5% .166DX.365LG	28480	9100-3561
A4L13	9140-0285	0	1	INDUCTOR RF-CH-MLD 3UH 5% .166DX.385LG	28480	9140-0285
A4L14	9170-0894	0	5	CORE-SHIELDING BEAD	28480	9170-0894
A4L15	9140-0137	1		INDUCTOR RF-CH-MLD 1MH 5% .2DX.45LG Q=60	28480	9140-0137
A4L16	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A4L17	9140-0636	5	1	INDUCTOR-40 MH .05	28480	9140-0636
A4L18	9140-0131	5		INDUCTOR RF-CH-MLD 10MH 5% .25DX.75LG	28480	9140-0131
A4L19	9100-1661	4	1	INDUCTOR RF-CH-MLD 2.2MH 5% .23DX.57LG	28480	9100-1661
A4L20	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A4L21	9100-1618	1		INDUCTOR RF-CH-MLD 5.6UH 10%	28480	9100-1618
A4L22	9140-0210	1		INDUCTOR RF-CH-MLD 100UH 5% .166DX.385LG	28480	9140-0210
A4L23	9140-0137	1		INDUCTOR RF-CH-MLD 1MH 5% .2DX.45LG Q=60	28480	9140-0137
A4L24	9140-0144	0	36	INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L25	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L26	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L27	9140-0137	1		INDUCTOR RF-CH-MLD 1MH 5% .2DX.45LG Q=60	28480	9140-0137
A4L28	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L29	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L30	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4L31	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L32	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L33	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L34	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L35	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L36	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L37	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L38	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L39	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L40	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L41	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L42	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L43	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A4L44	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A4L45	9170-0894	0		CORE-SHIELDING BEAD	28480	9170-0894
A4L46	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4L47	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A4P1	1251-2501	4	12	CONNECTOR-SGL CONT SKT .022-IN-BSC-SZ	28480	1251-2501
A4P2	1251-2501	4		CONNECTOR-SGL CONT SKT .022-IN-BSC-SZ	28480	1251-2501
A4P3	1251-2501	4		CONNECTOR-SGL CONT SKT .022-IN-BSC-SZ	28480	1251-2501
A4P4	1251-2501	4		CONNECTOR-SGL CONT SKT .022-IN-BSC-SZ	28480	1251-2501
A4P5	1251-2501	4		CONNECTOR-SGL CONT SKT .022-IN-BSC-SZ	28480	1251-2501
A4P6	1251-2501	4		CONNECTOR-SGL CONT SKT .022-IN-BSC-SZ	28480	1251-2501
A4P7	1251-2501	4		CONNECTOR-SGL CONT SKT .022-IN-BSC-SZ	28480	1251-2501
A4P8	1251-2501	4		CONNECTOR-SGL CONT SKT .022-IN-BSC-SZ	28480	1251-2501
A4P9	1251-2501	4		CONNECTOR-SGL CONT SKT .022-IN-BSC-SZ	28480	1251-2501
A4P10	1251-2501	4		CONNECTOR-SGL CONT SKT .022-IN-BSC-SZ	28480	1251-2501
A4P11	1251-2501	4		CONNECTOR-SGL CONT SKT .022-IN-BSC-SZ	28480	1251-2501
A4P12	1251-2501	4		CONNECTOR-SGL CONT SKT .022-IN-BSC-SZ	28480	1251-2501
A4Q1	1854-0247	9		TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A4Q2	1854-0247	9		TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A4Q3	1853-0354	7	2	TRANSISTOR PNP SI TO-92 PD=350MW	28480	1853-0354
A4Q4	1854-0795	2	1	TRANSISTOR NPN SI TO-92 PD=625MW	04713	MPSH10
A4Q5	1854-0247	9		TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A4Q6	1854-0247	9		TRANSISTOR NPN SI TO-39 PD=1W FT=800MHZ	28480	1854-0247
A4Q7	1853-0354	7		TRANSISTOR PNP SI TO-92 PD=350MW	28480	1853-0354
A4Q8	1854-0215	1		TRANSISTOR NPN SI PD=350MW FT=300MHZ	04713	2N3904
A4Q9	1854-0019	3		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4Q10	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A4R1	0699-0195	5	1	RESISTOR 47.5 1% .25W F TC=0+-100	28480	0699-0195
A4R2	0698-3443	0	7	RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A4R3	0698-4364	6	3	RESISTOR 17.4 1% .125W F TC=0+-100	03888	PME55-1/8-T0-17R4-F
A4R4	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A4R5	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A4R6	0698-4364	6		RESISTOR 17.4 1% .125W F TC=0+-100	03888	PME55-1/8-T0-17R4-F
A4R7	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A4R8	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A4R9	0698-4364	6		RESISTOR 17.4 1% .125W F TC=0+-100	03888	PME55-1/8-T0-17R4-F
A4R10	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A4R10	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A4R11	0698-4392	0	1	RESISTOR 71.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-71R5-F
A4R12	0698-4410	3	1	RESISTOR 137 1% .125W F TC=0+-100	24546	C4-1/8-T0-137R-F
A4R13	0757-0368	8	1	RESISTOR 34 1% .125W F TC=0+-100	24546	C4-1/8-T0-34R0-F
A4R14	0698-4418	1	1	RESISTOR 205 1% .125W F TC=0+-100	24546	C4-1/8-T0-205R-F
A4R15	0698-4382	8	1	RESISTOR 52.3 1% .125W F TC=0+-100	24546	C4-1/8-T0-52R3-F
A4R16	0698-3113	1	4	RESISTOR 100 5% .125W CC TC=-270/+540	01121	BB1015
A4R17	0698-3113	1		RESISTOR 100 5% .125W CC TC=-270/+540	01121	BB1015
A4R18	0698-3113	1		RESISTOR 100 5% .125W CC TC=-270/+540	01121	BB1015
A4R19	0698-3113	1		RESISTOR 100 5% .125W CC TC=-270/+540	01121	BB1015
A4R20	0698-3377	9	2	RESISTOR 47 5% .125W CC TC=-270/+540	01121	BB4705
A4R21	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A4R22	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A4R23	0683-1065	7	2	RESISTOR 10M 5% .25W CC TC=-900/+1100	01121	CB1065
A4R24	0683-1545	8		RESISTOR 150K 5% .25W FC TC=-800/+900	01121	CB1545
A4R25	0683-4745	6		RESISTOR 470K 5% .25W FC TC=-800/+900	01121	CB4745
A4R26	0683-1235	3	2	RESISTOR 12K 5% .25W FC TC=-400/+800	01121	CB1235
A4R27	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A4R28	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A4R29	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A4R30	0683-4745	6		RESISTOR 470K 5% .25W FC TC=-800/+900	01121	CB4745
A4R31	0683-1235	3		RESISTOR 12K 5% .25W FC TC=-400/+800	01121	CB1235
A4R32	0683-1065	7		RESISTOR 10M 5% .25W CC TC=-900/+1100	01121	CB1065
A4R33	0683-1545	8		RESISTOR 150K 5% .25W FC TC=-800/+900	01121	CB1545
A4R34	0698-3377	9		RESISTOR 47 5% .125W CC TC=-270/+540	01121	BB4705
A4R35	0683-1535	6	1	RESISTOR 15K 5% .25W FC TC=-400/+800	01121	CB1535

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4R36	0683-1015	7	2	RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A4R37	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A4R38	2100-3355	0	1	RESISTOR-TRMR 100K 10% C SIDE-ADJ 1-TRN	28480	2100-3355
A4R39	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A4R40	0698-4123	5	4	RESISTOR 499 1% .125W F TC=0+-100	24546	C4-1/8-T0-499R-F
A4R41	0757-0427	0		RESISTOR 1.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1501-F
A4R42	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A4R43	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A4R44	0698-3279	0		RESISTOR 4.99K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4991-F
A4R45	0757-0401	0	2	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A4R46	0698-4123	5		RESISTOR 499 1% .125W F TC=0+-100	24546	C4-1/8-T0-499R-F
A4R47	0757-0453	2		RESISTOR 30.1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3012-F
A4R48	0698-3228	9	3	RESISTOR 49.9K 1% .125W F TC=0+-100	28480	0698-3228
A4R49	0698-4486	3	4	RESISTOR 24.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2492-F
A4R50	0698-3228	9		RESISTOR 49.9K 1% .125W F TC=0+-100	28480	0698-3228
A4R51	2100-3207	1	1	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	28480	2100-3207
A4R52	0698-3434	9	1	RESISTOR 34.8 1% .125W F TC=0+-100	24546	C4-1/8-T0-34R8-F
A4R53	0683-1015	7		RESISTOR 100 5% .25W FC TC=-400/+500	01121	CB1015
A4R54	0698-4454	5	1	RESISTOR 523 1% .125W F TC=0+-100	24546	C4-1/8-T0-523R-F
A4R56	0757-0384	8	2	RESISTOR 20 1% .125W F TC=0+-100	19701	MF4C1/8-T0-20R0-F
A4R57	0757-0384	8		RESISTOR 20 1% .125W F TC=0+-100	19701	MF4C1/8-T0-20R0-F
A4R58	0698-4420	5	1	RESISTOR 226 1% .125W F TC=0+-100	24546	C4-1/8-T0-226R-F
A4R60	0683-4715	0		RESISTOR 470 5% .25W FC TC=-400/+600	01121	CB4715
A4R62	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A4R63	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A4R64	0683-4715	0		RESISTOR 470 5% .25W FC TC=-400/+600	01121	CB4715
A4R65	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A4R66	0698-4123	5		RESISTOR 499 1% .125W F TC=0+-100	24546	C4-1/8-T0-499R-F
A4R67	2100-3426	6	1	RESISTOR-TRMR 20 10% C SIDE-ADJ 1-TRN	28480	2100-3426
A4R68	0698-4436	3	1	RESISTOR 2.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2801-F
A4R69	0757-0277	8	1	RESISTOR 49.9 1% .125W F TC=0+-100	24546	C4-1/8-T0-4992-F
A4R70	2100-3351	6	2	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A4R71	0698-4421	6		RESISTOR 249 1% .125W F TC=0+-100	24546	C4-1/8-T0-249R-F
A4R72	0698-4468	1	1	RESISTOR 1.13K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1131-F
A4R73	0698-4123	5		RESISTOR 499 1% .125W F TC=0+-100	24546	C4-1/8-T0-499R-F
A4R74	0757-0440	7	1	RESISTOR 7.5K 1% .125W F TC=0+-100	24546	C4-1/8-T0-7501-F
A4R75	0698-4433	0	2	RESISTOR 2.26K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2261-F
A4R76	0698-3511	3	1	RESISTOR 665 1% .125W F TC=0+-100	24546	C4-1/8-T0-665R-F
A4R77	0698-3510	2	1	RESISTOR 453 1% .125W F TC=0+-100	24546	C4-1/8-T0-453R-F
A4R78	0683-3315	4	1	RESISTOR 330 5% .25W FC TC=-400/+600	01121	CB3315
A4R79	0698-4610	5	1	RESISTOR 866 1% .25W F TC=0+-100	24546	C5-1/4-T0-866R-F
A4R80	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A4R81	0757-0392	8	2	RESISTOR 43.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-43R2-F
A4R82	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A4R83	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A4R84	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A4R85	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A4R86	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A4R87	0757-0392	8		RESISTOR 43.2 1% .125W F TC=0+-100	24546	C4-1/8-T0-43R2-F
A4R88	0698-3430	5	1	RESISTOR 21.5 1% .125W F TC=0+-100	03888	PME55-1/8-T0-21R5-F
A4R89	0757-0393	9	1	RESISTOR 47.5 1% .125W F TC=0+-100	24546	C4-1/8-T0-47R5-F
A4R90	0683-2205	9	15	RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A4R91	0683-2205	9		RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A4R92	0683-2205	9		RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A4R93	0683-2205	9		RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A4R94	0683-2205	9		RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A4R95	0683-2205	9		RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A4R96	0683-2205	9		RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A4R97	0683-2205	9		RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A4R98	0683-2205	9		RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A4R99	0683-2205	9		RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A4R100	0683-2205	9		RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A4R101	0683-2205	9		RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A4R102	0683-6835	9		RESISTOR 68K 5% .25W FC TC=-400/+800	01121	CB6835
A4R103	0683-6835	9		RESISTOR 68K 5% .25W FC TC=-400/+800	01121	CB6835
A4R104	0683-2205	9		RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A4R105	0683-2205	9		RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A4R106	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+700	01121	CB1035
A4R107	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A4R108	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A4R109	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A4R110	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A4R111	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A4R112	0757-0414	5	1	RESISTOR 432 1% .125W F TC=0+-100	24546	C4-1/8-T0-432R-F

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A4U1	0960-0640	0	1	MIXER-DC 1500MHZ	28480	0960-0640
A4U3	1826-0412	1	1	IC COMPARATOR PRCN DUAL 8-DIP-P PKG	27014	LM393N
A4U4	1826-0715	7	4	IC OP AMP LOW-NOISE 8-DIP-P PKG	18324	NE5534AN
A4U5	1826-0715	7		IC OP AMP LOW-NOISE 8-DIP-P PKG	18324	NE5534AN
A4U6	1820-1201	6		IC GATE TTL LS AND QUAD 2-INP	01295	SN74LS08N
A4U7	1858-0047	5	4	TRANSISTOR ARRAY 16-PIN PLSTC DIP	13606	ULN-2003A
A4U8	1858-0047	5		TRANSISTOR ARRAY 16-PIN PLSTC DIP	13606	ULN-2003A
A4U9	1826-0035	4	1	IC OP AMP LOW-DRIFT TO-99 PKG	27014	LM308AH
A4W1	35601-61622	6	1	CABLE-SEMI-RIGID	28480	35601-61622
	35601-00604	6	1	SHIELD-BNC	28480	35601-00604
	35601-01209	9	1	BRACKET-MIXER 1	28480	35601-01209
A5	35601-66505	4	1	PHASE LOCK LP CONTROL	28480	35601-66505
A5C1	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A5C2	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A5C3	0160-4803	9	1	CAPACITOR-FXD 68PF +-5% 100VDC CER 0+-30	28480	0160-4803
A5C4	0160-4801	7		CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A5C5	0160-4846	0		CAPACITOR-FXD 1500PF +-5% 100VDC CER	28480	0160-4846
A5C6	0160-3405	5	1	CAPACITOR-FXD 2UF +-10% 50VDC MET-POLYC	28480	0160-3405
A5C7	0160-3013			**CAPACITOR-FXD 96PF +-5% 300VDC**		0160-3013
A5C8	0160-5202	4	1	CAPACITOR-FXD	28480	0160-5202
A5C9	0160-5348	9	2	CAPACITOR-FXD 51PF +-5% 100VDC CER 0+-30	28480	0160-5348
A5C10	0160-4812	0	1	CAPACITOR-FXD 220PF +-5% 100VDC CER	28480	0160-4812
A5C11	0160-4832			**CAPACITOR-FXD .01UF 100VDC**		0160-4832
A5C12	0160-4801	7		CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A5C13	0180-1794		2	**CAPACITOR-FXD 22UF 35V**		0180-1794
A5C14	0180-1794			**CAPACITOR-FXD 22UF 35V**		0180-1794
A5C15	0160-3787	6		CAPACITOR-FXD 1UF +-10% 50VDC MET-POLYC	28480	0160-3787
A5C16	0160-3787	6		CAPACITOR-FXD 1UF +-10% 50VDC MET-POLYC	28480	0160-3787
A5C17	0160-3787	6		CAPACITOR-FXD 1UF +-10% 50VDC MET-POLYC	28480	0160-3787
A5C18	0160-3747	8	1	CAPACITOR-FXD 47PF +-10% 200VDC CER	28480	0160-3747
A5C19	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A5C20	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A5C21	0160-4805	1	1	CAPACITOR-FXD 47PF +-5% 100VDC CER 0+-30	28480	0160-4805
A5C22	0160-5348	9		CAPACITOR-FXD 51PF +-5% 100VDC CER 0+-30	28480	0160-5348
A5C23	0160-4787	8	2	CAPACITOR-FXD 22PF +-5% 100VDC CER 0+-30	28480	0160-4787
A5C24	0160-4801	7		CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A5C25	0160-4801	7		CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
A5C26	0160-4787	8		CAPACITOR-FXD 22PF +-5% 100VDC CER 0+-30	28480	0160-4787
A5C27	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A5C28	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A5C29	0160-0127	2		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A5C30	0140-0182			**CAPACITOR-FXD 5000PF 300VDC**		0140-0182
A5CR1	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR2	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR3	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR4	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR5	1902-1375	9	2	DIODE-ZENER 5.6V .05	28480	1902-1375
A5CR6	1902-1375	9		DIODE-ZENER 5.6V .05	28480	1902-1375
A5CR7	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR8	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR9	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR10	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR11	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR12	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR13	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR14	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR15	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR16	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR17	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5CR18	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A5J1	1251-6900	5	1	CONNECTOR-25 PIN, MALE	28480	1251-6900
A5J2	1251-5722	7		CONNECTOR 50-PIN M POST TYPE	28480	1251-5722
A5J3	1251-7269	1		CONNECTOR-8 PIN, MALE	28480	1251-7269
A5J4	1251-6429	3		CONNECTOR 3-PIN M POST TYPE	28480	1251-6429
A5J5	1250-1255	1		CONNECTOR-RF SMB M PC 50-OHM	28480	1250-1255
A5J6	1250-1255	1		CONNECTOR-RF SMB M PC 50-OHM	28480	1250-1255
A5J7	1250-1255	1		CONNECTOR-RF SMB M PC 50-OHM	28480	1250-1255
A5Q1	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A5Q2	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A5Q3	1854-0071	7	1	TRANSISTOR NPN SI PD=300MW FT=200MHZ	28480	1854-0071
A5R1	0757-0415			**RESISTOR 475 1% .125W**		0757-0415
A5R2	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
A5R3	0698-4386	2	1	RESISTOR 59 1% .125W F TC=0+-100	24546	C4-1/8-T0-59R0-F
A5R4	0698-4480	1	1	RESISTOR 93.1 1% .125W F TC=0+-100	24546	C4-1/8-T0-93R1-F
A5R5	0698-3438	3	1	RESISTOR 147 1% .125W F TC=0+-100	24546	C4-1/8-T0-147R-F

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A5R7	0757-0412	3	1	RESISTOR 365 1% .125W F TC=0+-100	24546	C4-1/8-T0-365R-F
A5R8	0698-4458	9	1	RESISTOR 590 1% .125W F TC=0+-100	24546	C4-1/8-T0-590R-F
A5R9	0698-4465	8	1	RESISTOR 931 1% .125W F TC=0+-100	24546	C4-1/8-T0-931R-F
A5R10	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+790	01121	CB1035
A5R11	0757-0415			RESISTOR 475 1% .125W		0757-0415
A5R12	0683-1035	1		RESISTOR 10K 5% .25W FC TC=-400/+790	01121	CB1035
A5R13	0757-0283	6	3	RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A5R14	0757-0161	9	1	RESISTOR 604 1% .125W F TC=0+-100	24546	C4-1/8-T0-604R-F
A5R15	0698-4413	6	1	RESISTOR 154 1% .125W F TC=0+-100	24546	C4-1/8-T0-154R-F
A5R16	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
A5R17	0698-4421	6		RESISTOR 249 1% .125W F TC=0+-100	24546	C4-1/8-T0-249R-F
A5R18	0698-4449	8	1	RESISTOR 309 1% .125W F TC=0+-100	24546	C4-1/8-T0-309R-F
A5R19	0757-0413	4	1	RESISTOR 392 1% .125W F TC=0+-100	24546	C4-1/8-T0-392R-F
A5R20	0698-3178	8	1	RESISTOR 487 1% .125W F TC=0+-100	24546	C4-1/8-T0-487R-F
A5R21	0757-0418	9	1	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
A5R22	0757-0273	4	1	RESISTOR 3.01K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3011-F
A5R23	0698-7332	4	3	RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-7332
A5R24	0698-3492			RESISTOR 2670 1% .125W		0698-3492 2432-F
A5R25	0698-4543	3	2	RESISTOR 487K 1% .125W F TC=0+-100	28480	0698-4543
A5R26	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A5R27	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A5R28	0698-3279	0		RESISTOR 4.99K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4991-F
A5R29	0698-4435	2		RESISTOR 2.49K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2491-F
A5R30	0698-3279			RESISTOR 4.99K 1%		0698-3279
A5R31	0757-0273			RESISTOR 3.01K 1%		0757-0273
A5R32	0757-0280			RESISTOR 1000 1% .125W		0757-0280
A5R33	0757-0280			RESISTOR 1000 1% .125W		0757-0280
A5R34	0698-8827			RESISTOR 1M 1% .125W		0698-8827
A5R35	0757-0280			RESISTOR 1000 1% .125W		0757-0280
A5R36	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A5R37	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A5R38	0757-0465	6	10	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A5R39	0757-0454	3	2	RESISTOR 33.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3322-F
A5R40	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A5R41	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A5R42	0757-0454	3		RESISTOR 33.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3322-F
A5R43	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A5R44	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A5R45	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A5R46	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A5R47	0683-2215	1	4	RESISTOR 220 5% .25W FC TC=-400/+600	01121	CB2215
A5R48	0683-2215	1		RESISTOR 220 5% .25W FC TC=-400/+600	01121	CB2215
A5R49	0757-0435	8	1	RESISTOR 3.92K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3921-F
A5R50	0698-3158	4	1	RESISTOR 23.7K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2372-F
A5R51	0698-4430	7	1	RESISTOR 1.91K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1911-F
A5R52	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F
A5R53	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A5R54	0698-4539	7	1	RESISTOR 402K 1% .125W F TC=0+-100	28480	0698-4539
A5R55	0698-7332	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-7332
A5R56	0698-7332	4		RESISTOR 1M 1% .125W F TC=0+-100	28480	0698-7332
A5R57	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A5R58	0698-3264			RESISTOR 11.8K 1%		0698-3264
A5R59	0698-4484			RESISTOR 19.1K 1%		0698-4484
A5R60	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A5R61	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A5R62	0698-4486	3		RESISTOR 24.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2492-F
A5R63	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A5R64	0698-3215	4	1	RESISTOR 499K 1% .125W F TC=0+-100	28480	0698-3215
A5R65	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A5R66	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
A5R67	0698-3228	9		RESISTOR 49.9K 1% .125W F TC=0+-100	28480	0698-3228
A5R68	0757-0472	5		RESISTOR 200K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2003-F
A5R69	0683-2215	1		RESISTOR 220 5% .25W FC TC=-400/+600	01121	CB2215
A5R69	0698-3486	1	1	RESISTOR 232 1% .125W F TC=0+-100	24546	C4-1/8-T0-232R-F
A5R70	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A5R71	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A5R72	0698-3519			RESISTOR 12.4K 1%		0698-3519 1001-F
A5R73	0698-4486	3		RESISTOR 24.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2492-F
A5R74	0698-4486	3		RESISTOR 24.9K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2492-F
A5R75	0698-3279	0		RESISTOR 4.99K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4991-F
A5R76	0698-3279			RESISTOR 4.99K 1%		0698-3279
A5R77	0698-8025			RESISTOR 1910 .125W TZ		0698-8025
A5R78	2100-3351	6		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	28480	2100-3351
A5R79	0757-0442	9		RESISTOR 10K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1002-F
A5R80	0757-0449	6		RESISTOR 20K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2002-F

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A5R81	0698-3487	2	1	RESISTOR 255 1% .125W F TC=0+-100	24546	C4-1/8-T0-255R-F
A5R81	0698-4543	3		RESISTOR 487K 1% .125W F TC=0+-100	28480	0698-4543
A5R82	0757-0467	8		RESISTOR 121K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1213-F
A5R83	0698-3582	8	1	RESISTOR 41.2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4122-F
A5R84	0698-4480	7	1	RESISTOR 15.8K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1582-F
A5R85	0698-3497	4	1	RESISTOR 6.04K 1% .125W F TC=0+-100	24546	C4-1/8-T0-604R-F
A5R86	0698-4434	1	1	RESISTOR 2.32K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2321-F
A5R87	0698-3495	2	1	RESISTOR 866 1% .125W F TC=0+-100	24546	C4-1/8-T0-866R-F
A5R88	0698-3443	0		RESISTOR 287 1% .125W F TC=0+-100	24546	C4-1/8-T0-287R-F
A5R89	1810-0329	6	1	NETWORK-RES 10-SIP7.5K OHM X 9	01121	210A752
A5R90	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A5R91	0683-2215	1		RESISTOR 220 5% .25W FC TC=-400/+630	01121	CB2215
A5R92	0683-2235	5		RESISTOR 22K 5% .25W FC TC=-400/+800	01121	CB2235
A5R93	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A5R94	0757-0283	6		RESISTOR 2K 1% .125W F TC=0+-100	24546	C4-1/8-T0-2001-F
A5R95	0698-4475	0	1	RESISTOR 9.76K 1% .125W F TC=0+-100	03888	PME55-1/8-T0-9761-F
A5R96	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
A5R97	0683-4735	4		RESISTOR 47K 5% .25W FC TC=-400/+800	01121	CB4735
A5U1	1826-0188	8	1	IC CONV 8-B-D/A 16-DIP-C PKG	04713	MC1408L-8
A5U2	1820-1315	3	3	IC MULTIPLXR 8-CHAN-ANLG 16-DIP-P PKG	0192B	CD4051BE
A5U3	1820-1315	3		IC MULTIPLXR 8-CHAN-ANLG 16-DIP-P PKG	0192B	CD4051BE
A5U4	1820-1315	3		IC MULTIPLXR 8-CHAN-ANLG 16-DIP-P PKG	0192B	CD4051BE
A5U5	1820-1971	7		IC SWITCH ANLG QUAD 16-DIP-P PKG	17856	DG201CJ
A5U6	1820-1971	7		IC SWITCH ANLG QUAD 16-DIP-P PKG	17856	DG201CJ
A5U7	1820-1971	7		IC SWITCH ANLG QUAD 16-DIP-P PKG	17856	DG201CJ
A5U8	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A5U9	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A5U10	1820-1199	1		IC INV TTL LS HEX 1-INP	01295	SN74LS04N
A5U11	1820-1112	8		IC FF TTL LS D-TYPE POS-EDGE-TRIG	01295	SN74LS74AN
A5U12	1826-0542			IC OP-14		1826-0542
A5U13	1826-0715	7		IC OP AMP LOW-NOISE 8-DIP-P PKG	18324	NE5534AN
A5U14	1826-0715	7		IC OP AMP LOW-NOISE 8-DIP-P PKG	18324	NE5534AN
A5U15	1826-0522	4		IC OP AMP QUAD 14-DIP-P PKG	01295	TL074CN
A5U16	1826-0138	8		IC COMPARATOR GP QUAD 14-DIP-P PKG	01295	LM339N
A5U17	1820-1971	7		IC SWITCH ANLG QUAD 16-DIP-P PKG	17856	DG201CJ
A5U18	1826-0522	4		IC OP AMP QUAD 14-DIP-P PKG	01295	TL074CN
A5U19	1826-0716	8		IC OP AMP LOW-NOISE DUAL 8-DIP-C PKG	18324	NE5532AFE
A6	35601-66506	5		10MHZ SWG PC ASSEMBLY	28480	35601-66506
	35601-60606	4	1	10MHZ BOX ASSEMBLY	28480	35601-60606
	35601-00606	8	1	BOX ASSEMBLY	28480	35601-00606
	35601-61616			ARMST PWR & 10MHZ		35601-61616
A6C1	0160-0345	6	2	CAPACITOR-FDTHRU 1000PF GMV 500V CER	01121	FB2A-102W
A6C1	0160-4532	1		CAPACITOR-FXD 1000PF +-20% 50VDC CER	28480	0160-4532
A6C2	0160-4532	1		CAPACITOR-FXD 1000PF +-20% 50VDC CER	28480	0160-4532
A6C3	0160-4532	1		CAPACITOR-FXD 1000PF +-20% 50VDC CER	28480	0160-4532
A6C4	0160-4532	1		CAPACITOR-FXD 1000PF +-20% 50VDC CER	28480	0160-4532
A6C5	0160-4532	1		CAPACITOR-FXD 1000PF +-20% 50VDC CER	28480	0160-4532
A6C6	0160-4532	1		CAPACITOR-FXD 1000PF +-20% 50VDC CER	28480	0160-4532
A6C7	0160-4532	1		CAPACITOR-FXD 1000PF +-20% 50VDC CER	28480	0160-4532
A6C9	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A6C10	0160-4532	1		CAPACITOR-FXD 1000PF +-20% 50VDC CER	28480	0160-4532
A6C11	0160-4532	1		CAPACITOR-FXD 1000PF +-20% 50VDC CER	28480	0160-4532
A6C12	0160-4532	1		CAPACITOR-FXD 1000PF +-20% 50VDC CER	28480	0160-4532
A6CR1	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A6CR2	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A6J1	1250-1611	3	7	CONNECTOR-RF SMB	28480	1250-1611
A6J2	1250-1611	3		CONNECTOR-RF SMB	28480	1250-1611
A6J3	1250-1611	3		CONNECTOR-RF SMB	28480	1250-1611
A6J4	1250-1611	3		CONNECTOR-RF SMB	28480	1250-1611
A6J5	1251-6428	2		CONNECTOR-5 PIN ,MALE	28480	1251-6428
A6K1	0490-0916	6		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-0916
A6L1	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A6L2	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A6L3	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A6L4	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A6L5	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A6L6	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A6L7	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A6Q1	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A6Q2	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A6Q3	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010
A6Q4	1853-0010	2		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0010

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A6R1	1810-0030	6	2	NETWORK-RES 8-SIP1.0K OHM X 7	28480	1810-0030
A6R2	1810-0030	6		NETWORK-RES 8-SIP1.0K OHM X 7	28480	1810-0030
A6R3	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A6R4	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A6R5	0683-1525	4		RESISTOR 1.5K 5% .25W FC TC=-400/+700	01121	CB1525
A6R6	0683-3925	2		RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A6R7	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A6R8	0683-1525	4		RESISTOR 1.5K 5% .25W FC TC=-400/+700	01121	CB1525
A6R9	0683-3925	2		RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A6R10	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A6R11	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A6R12	0683-2205	9		RESISTOR 22 5% .25W FC TC=-400/+500	01121	CB2205
A6R13	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A6R14	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A6R15	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A6R16	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A6R17	0683-3925	2		RESISTOR 3.9K 5% .25W FC TC=-400/+700	01121	CB3925
A6R18	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A6R19	0683-4705	8		RESISTOR 47 5% .25W FC TC=-400/+500	01121	CB4705
A6R20	0683-1025	9		RESISTOR 1K 5% .25W FC TC=-400/+600	01121	CB1025
A6T1	08552-6044	1	2	TRANS-6 TURNS	28480	08552-6044
A6T2	08552-6044	1		TRANS-6 TURNS	28480	08552-6044
A6U1	1820-0810	1	1	IC RCVR ECL LINE RCVR TPL 2-INP	04713	MC10116P
A6U2	1820-0803	2	1	IC GATE ECL OR-NOR TPL	04713	MC10105P
A6U4	1858-0047	5		TRANSISTOR ARRAY 16-PIN PLSTC DIP	13606	ULN-2003A
A6W1	35601-61617	9	2	CABLE-SHIELDED BOARDS	28480	35601-61617
A7	35601-60607	5	1	BOX ASSEMBLY-ARMSTRONG	28480	35601-60607
A7C1	0160-0345	6		CAPACITOR-FDTHRU 1000PF GMV 500V CER	01121	FB2B-102W
A7C4	0160-0332	1	4	CAPACITOR-FXD 133PF +-1% 300VDC MICA	28480	0160-0332
A7C5	0160-0332	1		CAPACITOR-FXD 133PF +-1% 300VDC MICA	28480	0160-0332
A7C6	0160-0332	1		CAPACITOR-FXD 133PF +-1% 300VDC MICA	28480	0160-0332
A7C7	0160-0332	1		CAPACITOR-FXD 133PF +-1% 300VDC MICA	28480	0160-0332
A7C8	0160-2645	3	2	CAPACITOR-FXD 317.3PF +-1% 300VDC MICA	28480	0160-2645
A7C9	0160-2645	3		CAPACITOR-FXD 317.3PF +-1% 300VDC MICA	28480	0160-2645
A7C10	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A7C11	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A7C12	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A7C13	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A7C15	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A7C18	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A7C19	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A7C20	0160-4571	8		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-4571
A7C21	0180-1746	5		CAPACITOR-FXD 15UF+-10% 20VDC TA	56289	150D156X9020B2
A7CR2	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A7J1	1250-1611	3		CONNECTOR-RF SMB	28480	1250-1611
A7J2	1250-1611	3		CONNECTOR-RF SMB	28480	1250-1611
A7J3	1250-1611	3		CONNECTOR-RF SMB	28480	1250-1611
A7J5	1250-6428	0	1	CONNECTOR-5 PIN ,MALE	28480	1250-6428
A7K2	0490-0916	6		RELAY-REED 1A 500MA 100VDC 5VDC-COIL	28480	0490-0916
A7K3	0490-1287	6		RELAY-REED	28480	0490-1287
A7K4	0490-1287	6		RELAY-REED	28480	0490-1287
A7L3	9140-0395	3	2	INDUCTOR RF-CH-MLD 560NH 5% .166DX.385LG	28480	9140-0395
A7L4	9140-0395	3		INDUCTOR RF-CH-MLD 560NH 5% .166DX.385LG	28480	9140-0395
A7L5	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A7L6	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A7L7	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A7L8	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A7L9	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A7L10	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A7L13	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A7L14	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A7L15	9140-0144	0		INDUCTOR RF-CH-MLD 4.7UH 10% .105DX.26LG	28480	9140-0144
A7R1	0683-4725	2		RESISTOR 4.7K 5% .25W FC TC=-400/+700	01121	CB4725
A7R2	0698-4383	9	4	RESISTOR 53.6 1% .125W F TC=0+-100	24546	C4-1/8-T0-53R6-F
A7R3	0698-4383	9		RESISTOR 53.6 1% .125W F TC=0+-100	24546	C4-1/8-T0-53R6-F
A7R4	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CB2025
A7R5	0683-1045	3		RESISTOR 100K 5% .25W FC TC=-400/+800	01121	CB1045

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A7R6	0698-4383	9		RESISTOR 53.6 1% .125W F TC=0+-100	24546	C4-1/8-T0-53R6-F
A7R7	0698-4383	9		RESISTOR 53.6 1% .125W F TC=0+-100	24546	C4-1/8-T0-53R6-F
A7R8	0698-4461	4	1	RESISTOR 698 1% .125W F TC=0+-100	24546	C4-1/8-T0-698R-F
A7R9	0683-2025	1		RESISTOR 2K 5% .25W FC TC=-400/+700	01121	CR2025
A7U2	0960-0622	8	1	POWER DIVIDER	28480	0960-0622
A7U7	1858-0047	5		TRANSISTOR ARRAY 16-PIN PLSTC DIP	13606	ULN-2003A
A7W1	35601-61616	8	1	CABLE-POWER (ARMSTRONG)	28480	35601-61616
A7W2	35601-61617	9		CABLE-SHIELDED BOARDS	28480	35601-61617
A7X1	0955-0087	8	1	DOUBLE BALANCED MIXERS	28480	0955-0087
A62	35601-66562	3	1	HPIB CABLE PC ASSEMBLY	28480	35601-66562
A62S1	3101-2215	2	1	SWITCH-RKR DIP-RKR-ASSY 7-1A .05A 30VDC	28480	3101-2215
A62W1	8120-3139	6	1	CABLE ASSEMBLY-HPIB	28480	8120-3139
				ACCESSORY KIT		
	35601-84401	7	1	KIT-ACCESSORY	28480	35601-84401
	03585-61601	3	4	CABLE ASSEMBLY-EXTENDER	28480	03585-61601
	03585-61616	0	2	CABLE ASSEMBLY-ADAPTOR	28480	03585-61616
	1250-0669	9	4	ADAPTER-COAX STR M-SMB M-SMB	28480	1250-0669
	35601-66508	7	1	SERVICE PC ASSEMBLY	28480	35601-66508

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				CHASSIS MOUNTED ELECTRICAL COM		
C101	0180-0230	0	2	CAPACITOR-FXD 1UF+-20% 50VDC TA	56289	150D105X0050A2
C102	0180-0230	3		CAPACITOR-FXD 1UF+-20% 50VDC TA	56289	150D105X0050A2
C103	0180-0230	3		CAPACITOR-FXD 1UF+-20% 50VDC TA	56289	150D105X0050A2
C104	0180-0230	0		CAPACITOR-FXD 1UF+-20% 50VDC TA	56289	150D105X0050A2
C105	0180-0230	3		CAPACITOR-FXD 1UF+-20% 50VDC TA	56289	150D105X0050A2
C106	0180-0230	3		CAPACITOR-FXD 1UF+-20% 50VDC TA	56289	150D105X0050A2
C107	0180-0230	3		CAPACITOR-FXD 1UF+-20% 50VDC TA	56289	150D105X0050A2
C108	0180-0230	3		CAPACITOR-FXD 1UF+-20% 50VDC TA	56289	150D105X0050A2
CR1	1902-1369	1	2	DIODE-ZNR 1N3316B 17V 5% PD=50W IR=5UA	28480	1902-1369
CR2	1702-1369	1		DIODE-ZNR 1N3316B 17V 5% PD=50W IR=5UA	28480	1702-1369
CR3	1902-1217	8	1	DIODE-ZNR 6.2V 5% DO-4 PD=10W TC=+.035%	28480	1902-1217
F1	2110-0012	1	1	FUSE .5A 250V NTD 1.25X.25 UL	28480	2110-0012
R101	0757-0408	7	2	RESISTOR 243 1% .125W F TC=0+-100	24546	C4-1/8-T0-243R-F
R102	0698-3152	8	2	RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481 F
R103	0757-0408	7		RESISTOR 243 1% .125W F TC=0+-100	24546	C4-1/8-T0-243R-F
R104	0698-3152	8		RESISTOR 3.48K 1% .125W F TC=0+-100	24546	C4-1/8-T0-3481-F
T1	T-39279	3	1	TRANSFORMER-POWER	28480	T-39279
U1	1826-0402	9	1	IC V RGLTR TO-3	80103	LAS-1515
U2	1826-0403	0	1	IC V RGLTR TO-3	80103	LAS-1815
U3	1820-0430	1	1	IC 309 V RGLTR TO-3	07263	LM309K
U4	1826-0523	5	1	IC 337 V RGLTR TO-3	27014	LM337K
U5	1826-0423	4	1	IC V RGLTR TO-3	27014	LM317K

See introduction to this section for ordering information
*Indicates factory selected value

Replaceable Parts

Table 4-3. Replaceable Parts (Cont'd)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
				MISCELLANEOUS MECHANICAL PARTS		
FL1	9100-3875	6	1	FILTER	28480	9100-3875
S2	3101-2042	3	2	SWITCH-SLIDE	28480	3101-2042
S3	3101-2042	3		SWITCH-SLIDE	28480	3101-2042
	35601-00103	0	1	MAIN DECK	28480	35601-00103
	35601-00201	9	1	FRONT SUB-PANEL	28480	35601-00201
	35601-00202	0	1	REAR PANEL	28480	35601-00202
	35601-00601	3	1	SHIELD-FRONT	28480	35601-00601
	35601-00602	4	1	SHIELD-REAR	28480	35601-00602
	35601-00603	5	1	SHIELD-TRANSFORMER	28480	35601-00603
	35601-01201	1	1	BRACKET-POWER SWITCH	28480	35601-01201
	35601-01203	3	1	BRACKET-REGULATOR	28480	35601-01203
	35601-04101	6	1	COVER-INSULATOR	28480	35601-04101
	35601-04102	7	1	COVER-TOP (PERFORATED)	28480	35601-04102
	35601-04103	8	1	COVER ASSEMBLY- TRANSFORMER	28480	35601-04103
	5020-8803	6	1	FRONT FRAME	28480	5020-8803
	5020-8804	7	1	REAR CASTING	28480	5020-8804
	5020-8838	7	4	STRUT-CORNER	28480	5020-8838
	5040-7202	9	1	TRIM-TOP	28480	5040-7202
	5060-9913	5	2	COVER-SIDE (PERFORATED)	28480	5060-9913
	5060-9994	2	1	COVER-BOTTOM	28480	5060-9994
	35601-61610	2	1	CABLE ASSY-POWER	28480	35601-61610
	35601-61611	3	1	CABLE ASSY-REGULATOR	28480	35601-61611
	35601-61612	4	1	CABLE-LF POWER-1	28480	35601-61612
	35601-61613	5	1	CABLE-LF POWER-2	28480	35601-61613
	35601-61614	6	1	CABLE-HI-FREQUENCY POWER	28480	35601-61614
	35601-61618	0	1	CABLE-HI-FREQUENCY CONTROL	28480	35601-61618
	35601-61619	1	1	CABLE ASSEMBLY-DISPLAY	28480	35601-61619
	35601-61620	4	1	CABLE METER	28480	35601-61620
	35601-61621	5	1	CABLE HFA-METER	28480	35601-61621
	35601-61670	4	2	CABLE-10MHZ (REAR PANEL)	28480	35601-61670
	35601-61671	5	1	CABLE-ARMST 10 MHZ	28480	35601-61671
	35601-61672	6	1	CABLE-PHASE LP HF	28480	35601-61672
	35601-61673	7	1	CABLE-AM PM	28480	35601-61673
	35601-61674	8	1	CABLE-IF (REAR PANEL)	28480	35601-61674
	35601-61675	9	1	CABLE-NOISE/ARMS	28480	35601-61675
	35601-61676	0	1	CABLE-NOISE/HF	28480	35601-61676
	35601-61677	1	1	CABLE-NOISE/RP	28480	35601-61677
	35601-61678	2	1	CABLE-NOISE	28480	35601-61678
	35601-61679	3	1	CABLE-CHANNEL B/RP	28480	35601-61679
	35601-61680	6	1	CABLE-CHANNEL A/RP	28480	35601-61680
	35601-61681	7	1	CABLE-DS 10 MHZ	28480	35601-61681
				NON-METRIC HARDWARE		
	2110-0569		1	FUSEHOLDER NUT		
	2110-0564		1	FUSEHOLDER BODY		
	2740-0002		1	HEX NUT, CR3 ZENER		
	2950-0134		2	HEX NUT, CR1, & CR2		
	2950-0035		13	15/32" HEX NUT (FRONT AND REAR PANEL BNC'S)		
	0590-0060		8	12-32 HEX NUT (FEEDTHRU CAPS 10MHZ & ARMSTNG)		
	2950-0078		7	10-32 NUTS, GOLD PLATED (SMB CONNECTORS)		
	1250-1611		7	SMB CONNECTORS, 10-32 MALE THREAD		
	1250-1707		1	SMA PLUG, FEMALE (A4 MIXER OPTION)		
	35601-04102		1	COVER, TOP PERFORATED		
	5020-8803		1	FRAME, FRONT		
	5020-8804		1	FRAME, REAR		
	5060-9913		2	COVER, SIDE PERFORATED		
	5060-9994		1	COVER, BOTTOM PERFORATED		
	2510-0192		16	8-32, ¼", 100 °DEG° SCREW		

See introduction to this section for ordering information
*Indicates factory selected value

SECTION V
BACKDATING

5-1. INTRODUCTION

This section contains backdating changes which make this manual applicable to earlier instruments. Where possible, backdating changes have been integrated into the manual text, parts list and schematic diagrams. Changes that are too long or otherwise impractical to integrate into the manual are covered in this section.

5.2. A5 0-20dB AMPLIFIER, 0-20dB ATTENUATOR, DIGITAL-TO-ANALOG CONVERTOR, AND WEIN-BRIDGE OSCILLATOR CIRCUITS

Applies to Serial Numbers 2129A00100 Through 2129A00115

Affected Manual Areas

A5 Schematic
Replaceable Parts, Table 4-3

Description of Change

The following parts are applicable for these instruments:

A5C13	0180-0100	CAPACITOR-FXD	4.7UF	+-5% 20VDC
A5C14	0180-0100	CAPACITOR-FXD	4.7UF	+-5% 220VDC
A5R1	0683-4751	RESISTOR	470	5% .25W
A5R11	0683-4751	RESISTOR	470	5% .25W
A5R30	0698-3223	RESISTOR	1.24K	1% .125W
A5R31	0757-0420	RESISTOR	750	1% .125W
A5R32	0698-4421	RESISTOR	249	1% .125W
A5R33	0698-4421	RESISTOR	249	1% .125W
A5R34	0757-0472	RESISTOR	200K	1% .125W
A5R58	0757-0446	RESISTOR	15K	1% .125W
A5R59	0757-0446	RESISTOR	15K	1% .125W
A5R72	0757-0280	RESISTOR	1K	1% .125W
A5R76	0757-0280	RESISTOR	1K	1% .125W

The following parts apply to Serial Number 2129A00100:

A5C11	0160-4571	CAPACITOR-FXD	.1UF	+80-20% 50VDC
A5R77	0698-4433	RESISTOR	2.26K	1% .125W

The following parts apply to Serial Numbers 2129A00101 through 2129A00115:

A5C11	0160-4835	CAPACITOR-FXD	.1UF	50VDC
A5R77	0698-8025	RESISTOR	1910	.125W

5-3. A3 10 MHz VCXO, 10 MHz REF INPUT, PHASE DETECTOR, MIXER DRIVER, AND LOW PASS FILTER CIRCUITS

Applies to Serial Numbers 2129A00100 through 2129A00120

Affected Manual Areas

A5 Schematic and Component Locator
Replaceable Parts, Table 4-3
Channel A DC Offset Adjustment

Description of Change

Figures 5-1 and 5-2, A3 Schematic and Component Locator applies to these instruments

The following parts are applicable for these instruments:

A3C306	0160-4819	CAPACITOR-FXD	2200PF	+−5% 100VDC
A3C318	0160-4571	CAPACITOR-FXD	0.1UF	50VDC
A3C330	0160-4571	CAPACITOR-FXD	0.1UF	50VDC
A3L302	9140-0131	INDUCTOR RF-CH-MLD	10MHZ	5% .25DX .75LG
A3R305	0698-3179	RESISTOR	2.55K	1% .125W
A3R308	0683-1025	RESISTOR	1K	5% .25W
A3R345	0683-1035	RESISTOR	10K	5% .25W
A3R346	0683-4735	RESISTOR	47K	5% .25W
A3R347	0683-6835	RESISTOR	68K	5% .25W
A3R365	0683-6835	RESISTOR	68K	5% .25W
A3R366	0683-4735	RESISTOR	47K	5% .25W
A3R367	0683-1035	RESISTOR	10K	5% .25W

The following parts are not used on these instruments:

A3CR309 through A3CR312, A3R233 through A3R235, and A3R448 through A3R451.

The Channel A DC Offset Adjustment does not apply to these instruments.

5-4. A5 SUMMING AMPLIFIER BUFFER AND 0-20 dB AMPLIFIER CIRCUIT

Applies to Serial Numbers 2129A00100 through 2129A00120

Affected Manual Areas

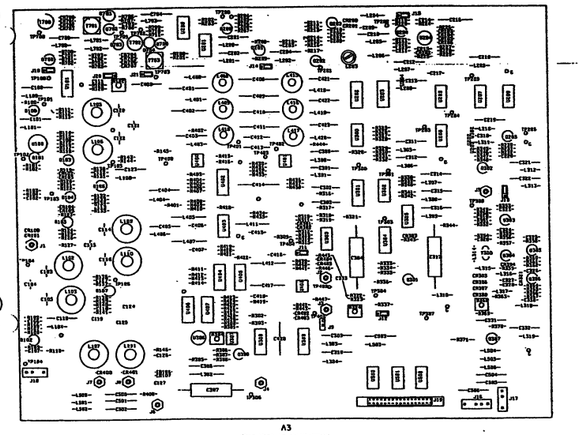
A5 Schematic and Component Locator
Replaceable Parts, Table 4-3

Description of Change

The following parts are applicable for these instruments:

A5C7	0160-4801	CAPACITOR-FXD	100PF	+−5% 100VDC CER
A5R24	0757-0451	RESISTOR	24.3K	1% .125W
A5U12	1826-0111	IC OP AMP GP TO 99 PKG		

A5C30 is not used in these instruments.



A3
hp Part No 35601-66503

NOTE

Refer to the Service Group text for disassembly instructions to access this circuit board.

NOTE

Refer to Appendix B for IC diagrams and truth tables.

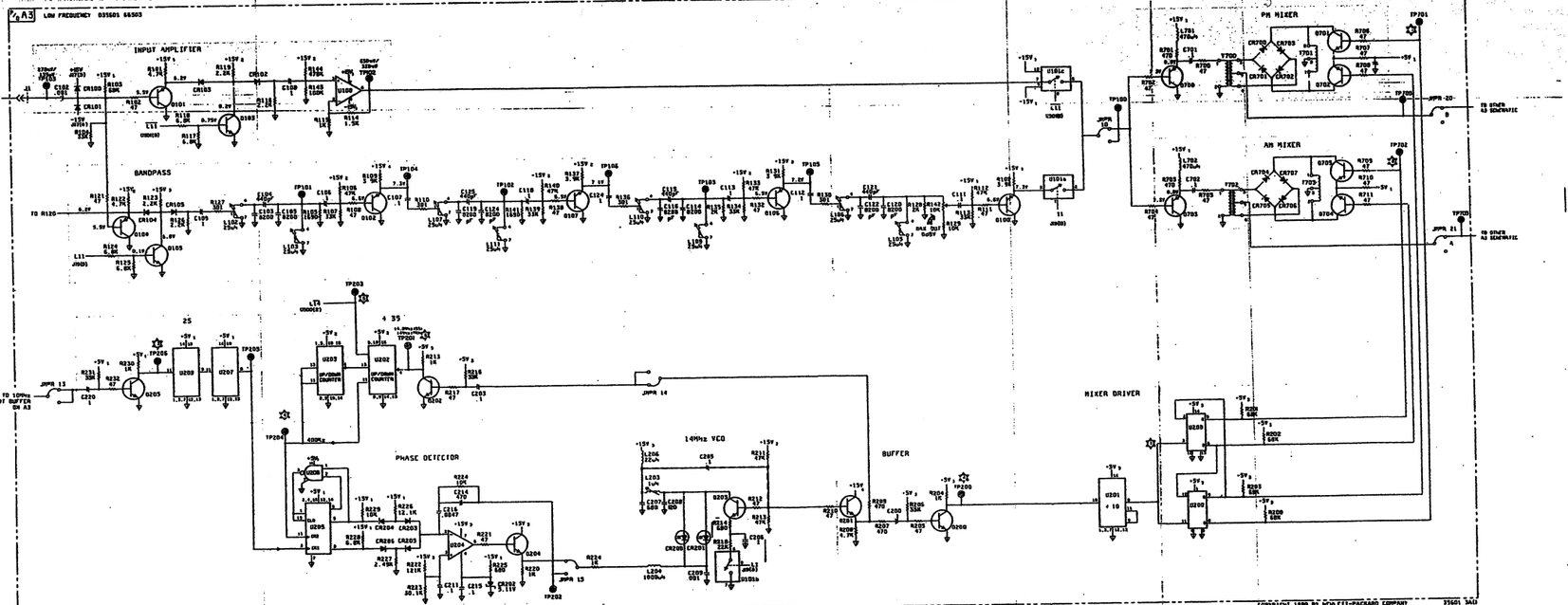
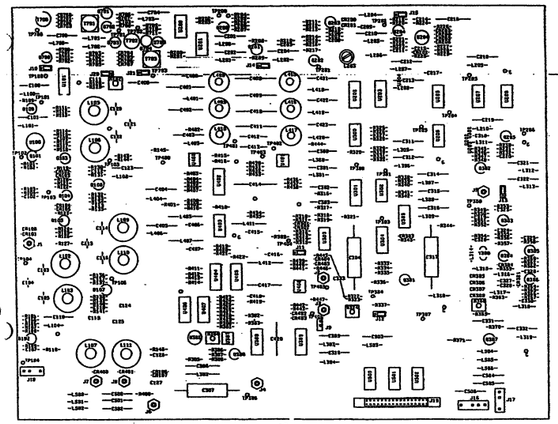


Figure 5-1. A3 Schematic and Component Locator
Revision A

Figure 5-1. A3 Schematic and Component Locator
Revision A

5-3/5-4



A3

8-P Part No 33601-66503

NOTE

In order for waveshapes to be valid, L13 must be driven high (turn-on state is low). This is done most easily using "SWITCH". See paragraph 8-28 for instructions on using "SWITCH".

NOTE

Refer to the Service Group text for disassembly instructions to access this circuit board.

NOTE

Refer to Appendix B for IC diagrams and truth tables.

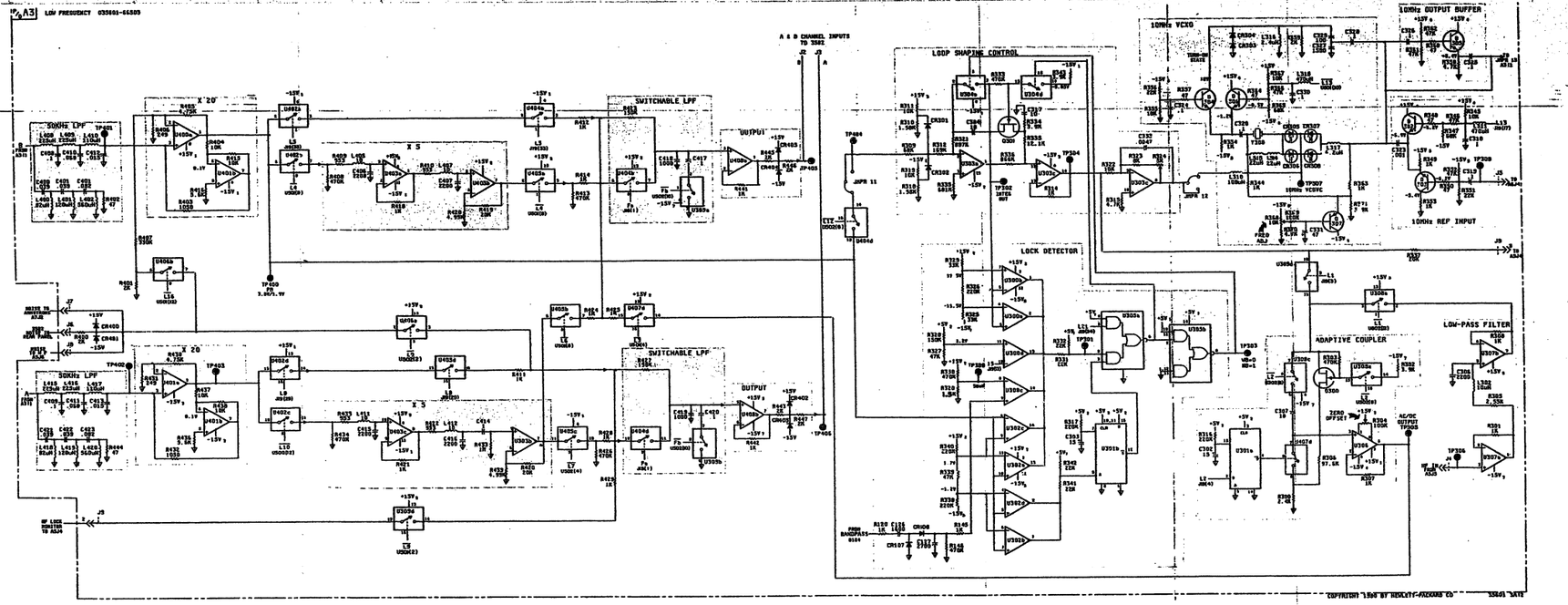


Figure 5-2. A3 Schematic and Component Locator
Revision A **5-5/5-6**

Figure 5-2. A3 Schematic and Component Locator
Revision A **5-5/5-6**

WARNING

Maintenance described herein is performed with power supplied to the instrument, and protective covers removed. Such maintenance should be performed only by service-trained personnel who are aware of the hazards involved (for example, fire and electrical shock). Where maintenance can be performed without power applied, the power should be removed.

SECTION VI
SERVICE

6-1. INTRODUCTION

This section contains the information necessary to test, troubleshoot, and repair the -hp-35601A Spectrum Analyzer Interface of the -hp- 3047A Spectrum Analyzer System. Included in this section are the following topics: Introduction, Safety Considerations, Equipment Required, Automatic Testing and Adjustments, Controlling the -hp- 35601A, and Service Groups.

The information in this section is used in conjunction with the -hp-35601A test program. The -hp-35601A test program is a combination of test and adjustments which test various signal paths in the -hp-35601A. For each test in the -hp-35601A test program, there is a section in this manual that contains a block diagram of the circuit path under test and additional information on the test procedures.

System specifications are verified by running the Performance Tests found in the -hp- 347 Reference Manual;
It is only necessary to run the -hp-35601A test program if a -hp-35601A failure is indicated by the -hp-3047A System check program. Once a problem is indicated by the -hp-3047A System check program, the complete set of -hp-35601A test may be run sequentially to isolate the problem to a small functional circuit, or the technician may verify a suspected problem by running a selected test.

A troubleshooting aid of the -hp-35601A test program is the -hp- 35601A control subprogram "SWITCH". "SWITCH" is used in conjunction with a computer to control the various switches and relays in the -hp- 35601A. Any configuration of signal paths may be created using this ability.

Six Service Groups comprise the circuit documentation for the -hp- 35601A. Each Service Group consists of the following: schematics, component locators, schematic notes, and a theory of operation.

6-2. SAFETY CONSIDERATIONS

The System Interface is a Safety Class I instrument and has been designed according to international safety standards. To ensure safe operation and to retain the instrument in a safe condition, the Operating and Service Manual contains information, cautions and warnings which must be adhered to by the user.

NOTE

See the Safety Summary following the Table of Contents of this manual for a discussion of basic safety precautions and safety symbology.

The 35601A front panel contains a ⚠ symbol which is an international symbol meaning "refer to the Operating and Service Manual". The symbol flags important operating instructions located in Section III required to prevent damage to the instrument. To ensure the safety of the operating and maintenance personnel and to retain the operating condition of the instrument, these instructions must be adhered to.

Before applying power to the -hp- 35601A or removing any covers, review the following warnings and cautions:

WARNING

Read the WARNING at the beginning of this section, and the WARNINGS in Section II (Installation) before servicing this instrument.

WARNING

Line voltage is present within this instrument. To prevent electric shock, use care when working in the vicinity of the power supply (p/o A1 board) and when working near the front panel power switch.

CAUTION

Before applying ac-line power to the -hp- 35601A, be sure that the VOLTAGE SELECTOR switches are set for the proper line voltage and the correct line fuse is installed in the rear panel FUSE holder.

CAUTION

The -hp- 35601A contains semiconductors that may be damaged if subjected to static electrical discharge.

6-3. RECOMMENDED TEST EQUIPMENT

The equipment recommended for the testing and calibration of -hp- 35601A is shown in Table 6-1.

Table 6-1. Recommended Test Equipment

Equipment	Critical Specifications	Recommended -hp- Model No.
Service Tape for -hp-9845B Series 100 or Service Tape for -hp- 9845B Series 200 or Service Disc for -hp- 9836		-hp- part number 35601-10001 -hp- part number 35601-10006 -hp- part number 35601-10011
Desktop Computer	HP-IB Capability	-hp- 9836 or -hp- 9845B with -hp- 98034A
Synthesizer	HP-IB Controllable 10MHz Reference	-hp- 3325A opt 001
Digital Voltmeter	HP-IB Controllable	-hp- 3455A
Oscilloscope	75MHz Bandwidth	-hp- 180A,1808A, 1821A or -hp- 1740A
Counter	100MHz	-hp- 5314A
Signature Analyzer		-hp- 5004A
50ΩTermination		-hp- 11048A
(2) HP-IB Cable		-hp- 10833A
(5) BNC Cables		-hp- 11170C
(2) BNC "T"		-hp- part number 1250-0781

6-4. AUTOMATIC TESTING AND ADJUSTMENTS

6-5. General Instructions

To get started, read the information contained in the paragraphs entitled: Connect the Instruments, Starting the Program, and Selecting a Menu. In each test procedure is an introduction to the test; it contains a summary of what is automatically tested, and what is adjusted. Following this are instructions for initiating the test. When this is done, the instructions displayed on the computer should be followed to perform the test. A block diagram, with the tested signal path darkened, accompanies each test procedure. If a test fails and an adjustment isn't sufficient to correct it, the procedures indicate key areas to begin troubleshooting. Troubleshooting is aided with the "SWITCH" routine and the Service Groups.

NOTE

Refer to Section II (Installation), Figure 2-6 and the note preceding it for information on using HP-IB cables as instructed in the next paragraph.

6-6. Connect The Instruments

The following connections should be made before beginning the automatic testing:

1. Connect one end of a HP-IB cable to the -hp-9836 computer HP-IB connector or set the HP-IB interface (-hp- 98034A) to select code 7 and plug the interface into a receptacle in the back of the -hp- 9845B computer.

2. Connect the other end of the HP-IB interface cable to the HP-IB input connector of the -hp- 35601A. Set the address of the -hp- 35601A to 15.

3. Connect an HP-IB cable (-hp- 10833A) from the -hp- 35601A to the HP-IB input of the -hp- 3325A opt 001. Set the -hp- 3325A opt 001 address to 17.

4. Connect an HP-IB cable (-hp- 10833A) from the -hp- 3325A opt 001 to the HP-IB input of the -hp- 3455A. Set the -hp- 3455A address to 22.

5. Turn on the power of all the instruments.

6-7. Starting The Program

To start the test and adjustment program, perform the following procedures:

1. Insert the data cartridge or disc containing the service program into the right drive of the computer.

2. On the -hp- 9845B, enter the following key sequence:

GET "601TST" [EXEC] [RUN]

3. On the -hp-9836, enter the following key sequence:

LOAD "35601TEST", 1 [EXECUTE]

In a short period of time, the computer will display the following prompt:

"IS THE ET PART OF YOUR SYSTEM?"

This prompt is for the calibration and testing of the instrument using the test system (Electronic Tool) at the factory. In response to this prompt, press continue. Shortly, the following prompt will be displayed:"

DO YOU WISH TO TEST THE HIGH-FREQ OR LOW-FREQ SECTION? (HF/LF)

When this prompt is displayed, the program has been initialized correctly; testing, adjusting, and/or troubleshooting may continue from this point.

6-8. Selecting a Menu

Two menus are available in the -hp-35601A test program. They correspond to the high-frequency section and the low-frequency section of the -hp- 35601A. The High Frequency Menu is shown in Table 6-2:

Table 6-2. High Frequency Menu of the -hp-35601A Test Program

-hp-9836 Special Function Key	-hp-9845A Special Function Key	Description
K0	K0	Perform Tests Automatically (sequentially)
K1	K1	Bypass Path Test
K2	K2	2MHz Lowpass Filter Test
K3	K3	x100 Amplifier Test
K4	K4	Pads in Tracking Generator Input Path
K5	K5	Adaptive Coupler Test
K6	K6	Digital-to-Analog Convertor Test
K7	K7	Output Attenuator Test
K8	K8	Wein Bridge Oscillator Test
K9	K9	3582 Noise Input to Summing Junction Test
Shift K0	K10	Tracking Generator Input to Summing Junction Test
Shift K1	K11	Ouput Path to 3582/3585
Shift K2	K12	Programmable Gains Test
Shift K2	K13	1.5GHz Mixer DC Offset Test
Shift K5	K15	INITIALIZE PROGRAM - CHOOSE HF/LF MENU
Shift K6	Shift K11	"SWITCH" (-hp-35601A control subprogram)

The Low-Frequency Menu is shown in Table 6-3:

Table 6-3. Low Frequency Menu of the -hp-35601A Test Program

-hp-9836 Special Function Key	-hp-9845B Special Function Key	Description
K0	K0	Perform Tests Automatically (sequentially)
K1	K1	350kHz/370kHz Synthesizer Test
K2	K2	Voltage Controlled Crystal Oscillator Test
K3	K3	350kHz Bandpass Filter Test
K4	K4	X20 and X5 Amplifiers Test
K5	K5	Switchable Lowpass Filters Test
K6	K6	Test/Adjust Channel A DC offset
K7	K7	HP-IB with digital signature analysis
Shift K5	K15	INITIALIZE PROGRAM - CHOOSE HF/LF MENU
Shift K6	K11	"SWITCH"

The High Frequency Menu is selected (once the procedures in the "Starting the Program" paragraph have been followed) by entering HF to the prompt for testing the high or low frequency section of the -hp-35601A and pressing the computer continue key. Similarly, the Low Frequency Menu is selected by entering LF and pressing the computer continue key.

In either menu, test routines are selected and run by pressing the special function key (SFK) for the desired test. Two menu selections are used for troubleshooting the instrument and accessing the menu that is not displayed. The SWITCH entry accesses a routine that aids the technician in troubleshooting the -hp-35601A by setting internal switches, relays, attenuators, and amplifiers to obtain alternate signal paths. The INITIALIZE PROGRAM-CHOOSE HF/LF MENU entry provides access to the alternate (high frequency or low frequency) menu routines from the displayed menu.

NOTE

If you are beginning the tests and adjustments procedures on an instrument for the first time, (i.e., for initial testing or prior to servicing) select the High Frequency Menu and run the tests sequentially (exclude the SWITCH routine). Then select the Low Frequency Menu and run these tests sequentially.

NOTE

If you find that the -hp- 35601A is not responding to HP-IB command, proceed directly to Service Group Four (A1 - HP-IB control and Power Supply). The HP-IB handshake circuitry must be working before the -hp-35601A test program can be of any use.

6-9. Bypass Path Test

This test checks the continuity of the signal path shown in Figure 6-1. A signal is input at the 0-40MHz Input of the -hp- 35601A; it is then measured with an -hp- 3455A voltmeter at the 50Ω OUTPUT TO 3585A. The program displays equipment set-up instructions, performs the test, displays the desired results, asks if a retest is desired, and prints the results.

Initializing the Bypass Path Test

With the High Frequency Menu displayed, press special function key (SFK) K1 to initialize the test. After initialization, follow the instructions displayed on the computer.

What if the Test Fails?

After determining that the test equipment was connected properly, determine which relay is bad. This can be accomplished using a scope to see at which relay the input signal is not present. (Also, "SWITCH" subprogram could be used to open and close the relays while checking the continuity of each relay.) Refer to Service Group Two for schematics and component locators. In all likelihood, only one of the relays is bad. If, however, the entire instrument is not responding to HP-IB command, proceed to Service Group Four for HP-IB handshake troubleshooting.

Equipment Set Up

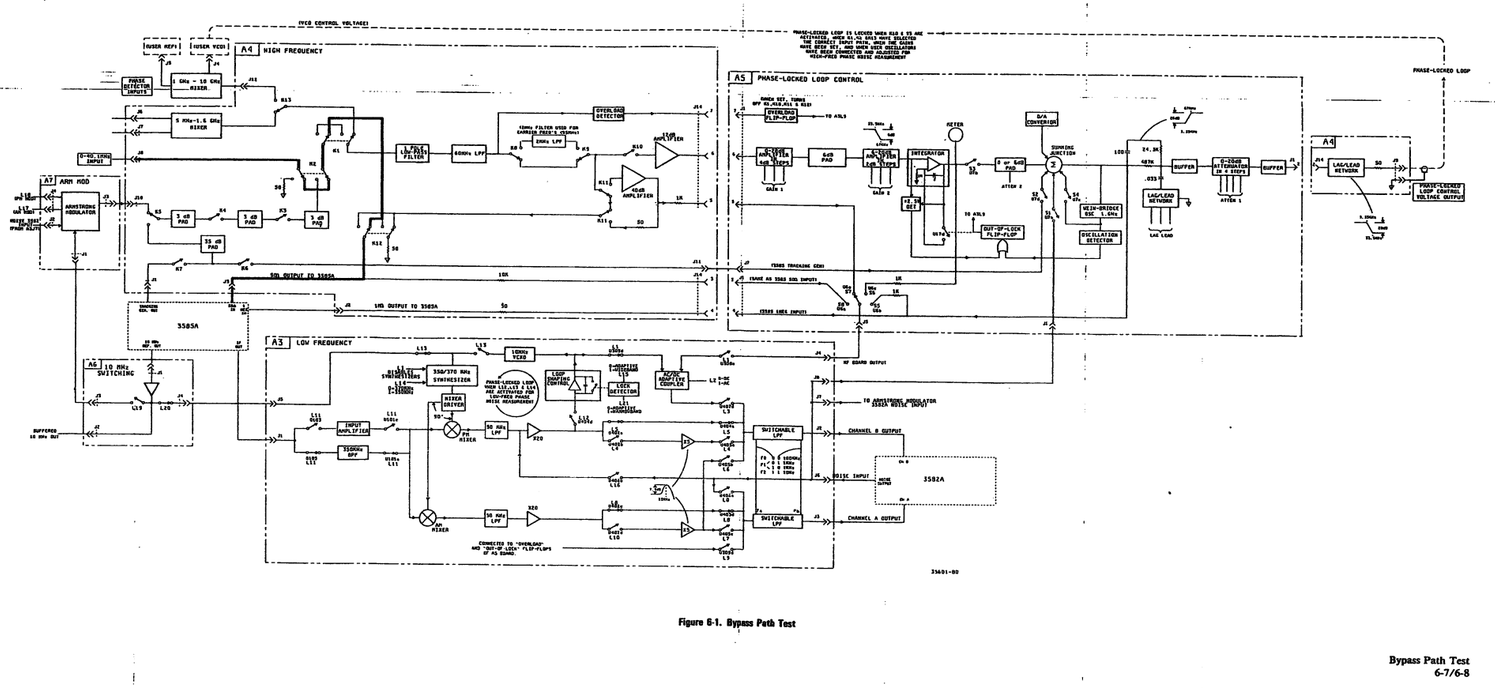


Figure 6-1. Bypass Path Test

6-10. 2MHz Lowpass Filter Test

This test checks the circuit elements in the signal path shown in Figure 6-2. A signal is input to the 0-40MHz Input from the -hp- 3325A; the 50Ω OUTPUT to 3585A is measured with a scope. First, the program switches in the path that bypasses the 2MHz lowpass filter. Then, the program switches in the lowpass filter. In each case, the response of the switched-in network is viewed on the scope as the amplitude envelope of a swept signal. The user of the program is asked to confirm the response of the network. The results are printed.

Initiating the 2MHz Lowpass Filter Test

With the High Frequency Menu displayed, press SFK K2 to initialize the test. After initialization, follow the instructions displayed on the computer.

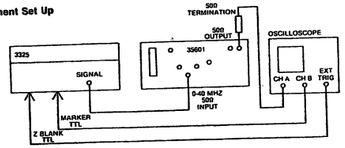
What if the Test Fails?

If this test has failed, (and the previous test passed) one of the following is probably at fault:

- Relay K1, K2, K8, K9, or K11
- The one-pole lowpass filter
- The 60MHz lowpass filter
- The 2MHz lowpass filter

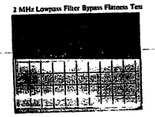
Refer to Service Group Two for the appropriate schematic, component locator, and circuit descriptions. "SWITCH" can aid troubleshooting these circuits. (Refer to the discussion following these test procedures for information on using the "SWITCH" subprogram to control the -hp- 35601A.)

Equipment Set Up



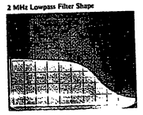
Example Wave Shapes

2 MHz Lowpass Filter Bypass Flatness Test



Sweep 10mS/div
Ch A .05V/div
Bottom Screen = Ground
Ch B 5V/div
Bottom Screen = Ground

2 MHz Lowpass Filter Shape



Sweep 10mS/div
Ch A .05V/div
Bottom Screen = Ground
Ch B 5V/div
Bottom Screen = Ground

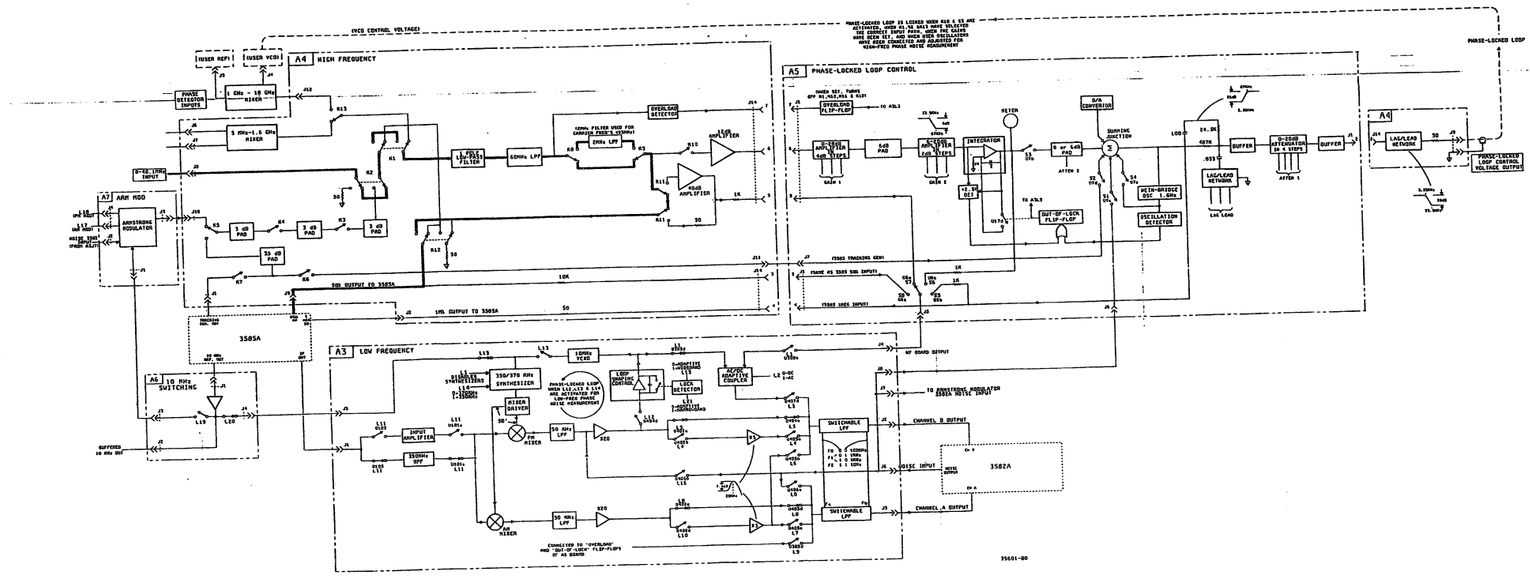


Figure 6-2. 2MHz Lowpass Filter Test

6-11. x100 Amplifier Test

This test checks the circuits in the signal path shown in Figure 6-3. If the previous tests have been performed, the only untested circuit in this path is the x100 Amplifier. Three adjustments must be made to the x100 Amplifier: the low frequency input impedance, the gain, and the dc-offset of its output. Initially, the scope and the -hp- 3325A opt 001 are connected to the 0-40MHz Input. The input signal is displayed on the scope, and the input impedance is adjusted until the correct amplitude is obtained. The output signal is then displayed and the gain is adjusted to obtain the correct amplitude. Finally, the output is measured with an -hp-3455A voltmeter and the dc-offset is adjusted for zero volts. The program allows the user to cycle through these procedures repeatedly to ensure proper adjustment.

Initializing the x100 Amplifier Test

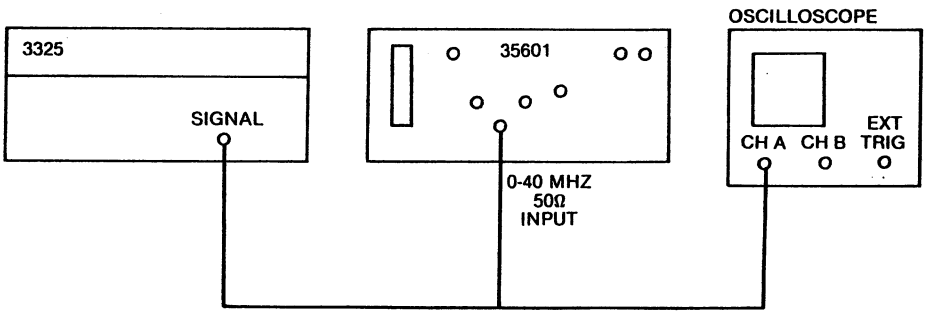
With the High Frequency Menu displayed, press SFK K3 to initialize the test. After initialization, follow the instructions displayed on the computer.

What if the Test Fails?

Assuming that the previous test has passed, and that the equipment is properly connected, the x100 Amplifier, relay K11, or K14 is probably at fault. Refer to Service Group Two for a schematic, component locator, and circuit description for the 40dB Amplifier. The "SWITCH" subprogram may be useful in troubleshooting this circuit.

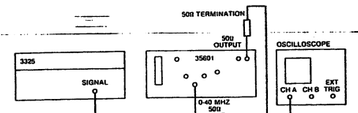
Equipment Set Up

A4R51 Adjustment



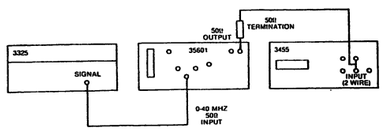
NOTE: Turn off -hp-3455A for adjustment of A4R51.

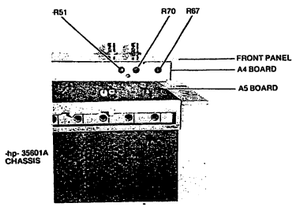
A4R70 Adjustment



NOTE: Turn off -hp-3455A for adjustment of A4R70.

A4R67 Adjustment





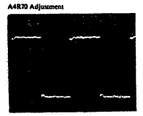
Adjustment locations (bottom view of -hp-35601A)

Example Wave Shapes

A4R31 Adjustment

Sweep 10mS/div
Ch A 2mV/div
Center Screen = Ground

A4R30 Adjustment



Sweep 10mS/div
Ch A .1V/div
Center Screen = Ground

NOTE: It may be necessary to vary the dc offset of the oscilloscope to accurately adjust A4R70.

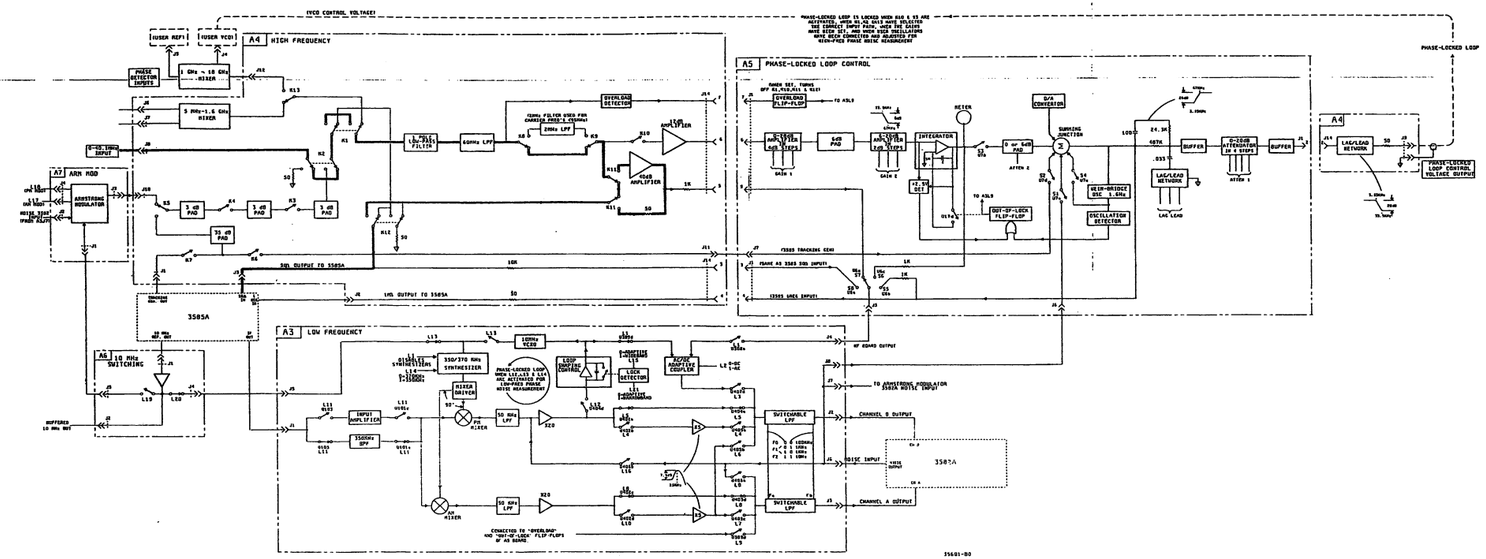


Figure 6-3. x100 Amplifier Test

6-12. Pads in Tracking Generator Input Path Test

This test checks the circuits in the signal path shown in Figure 6-4. If the previous tests have been performed successfully, the only circuits being tested are the Tracking Generator Input Pads, and relays K3, 4, 5, and 7. A signal is input to the Tracking Generator Input of the -hp- 35601A from an -hp- 3325A opt 001. The OUTPUT to 3585A is measured with an -hp- 3455A voltmeter. The program notes the voltmeter reading; if the reading is outside the specified limits, the user is given the option of retesting. The program prints the final results of the test.

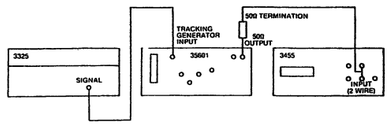
Initializing the Test

With the High Frequency Menu displayed, press SFK K4 to initialize the test. After initialization, follow the instructions displayed on the computer.

What if the Test Fails?

Assuming that the previous tests have passed, and that the equipment is properly connected, one of the input pads or relays K3, 4, 5, or 7 is probably at fault. Refer to Service Group 2 for schematics, component locators, and circuit descriptions. The "SWITCH" subprogram can be used to isolate the cause of the failure to one of the relays or pads.

Equipment Set Up



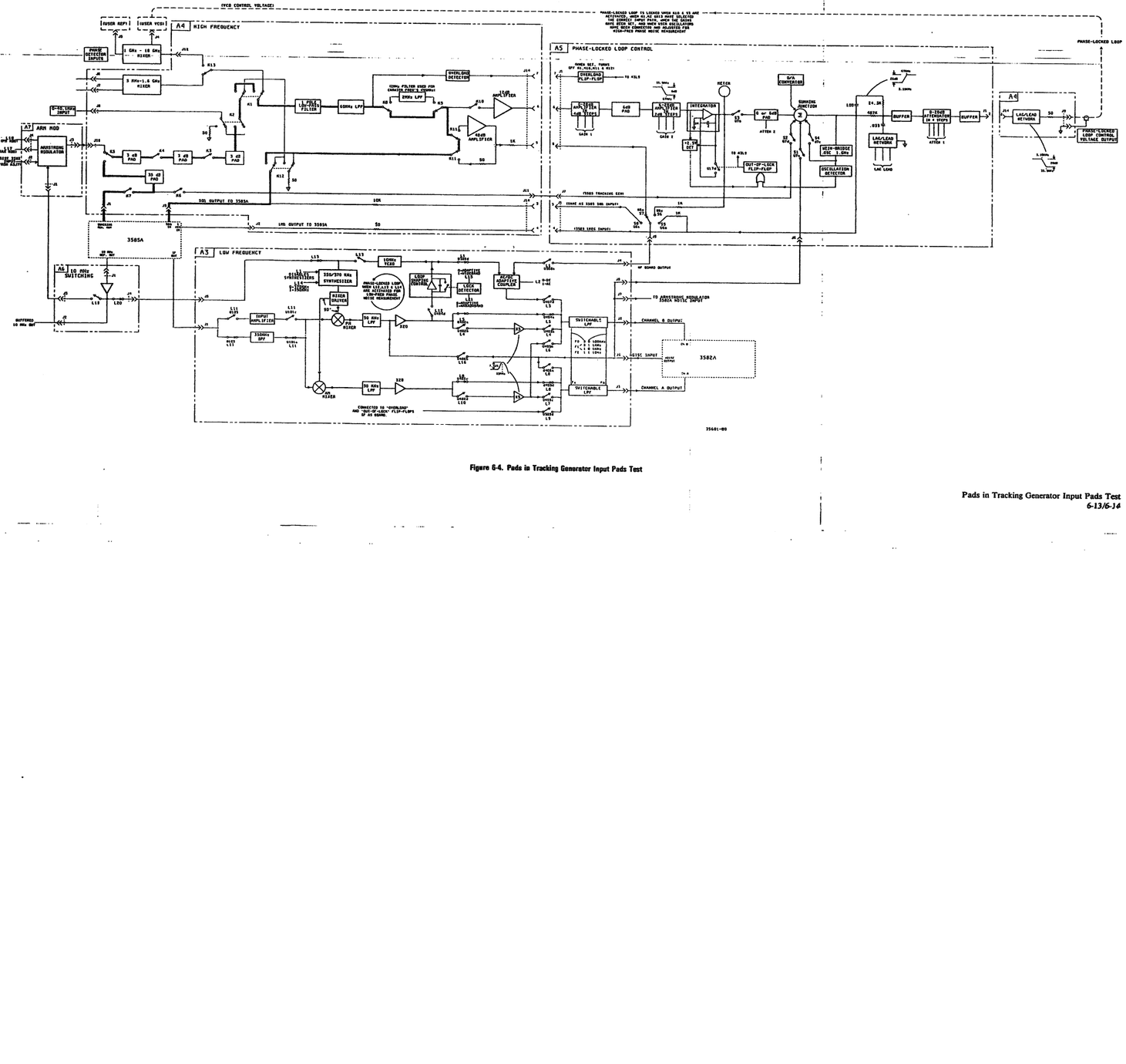


Figure 6-4. Pads in Tracking Generator Input Pads Test

6-13. Adaptive Coupler Test

This test checks the circuits in the signal path shown in Figure 6-5. If the previous tests have been performed successfully, the only circuits being tested are the Adaptive Coupler, and FET switches S8, L1, and L2. The signal must also pass through a Switchable Lowpass Filter and an Output Buffer, but the filter states are not tested at this time. The -hp- 3325A opt 001 is connected to the 0-40MHz Input to provide 50Ω termination. (The synthesizer is set to 0 volts at 0 Hz.) The Channel B output of the Low Frequency board is measured with an -hp- 3455A voltmeter. The program puts the Adaptive Coupler into its AC mode (L2 = 1). The DC offset of the Adaptive Coupler is then adjusted using A3R304. If the adjustment can be made, the test passes and the results are printed.

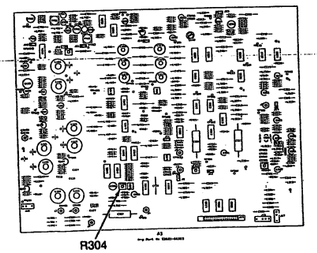
Initializing the Test

With the High Frequency Menu displayed, press SFK K5 to initialize the test. After initialization, follow the instructions displayed on the computer.

What if the Test Fails?

Assuming that the previous tests have passed, and that the equipment is properly connected, one of the switches (S8, L1, or L3), the Lowpass Filter, or the Adaptive Coupler is probably at fault. Refer to Service Group One for schematics, component locators, and circuit descriptions. If S8 is suspected, refer to service Group 3. The "SWITCH" subprogram can facilitate finding the cause of the failure.

Equipment Set Up



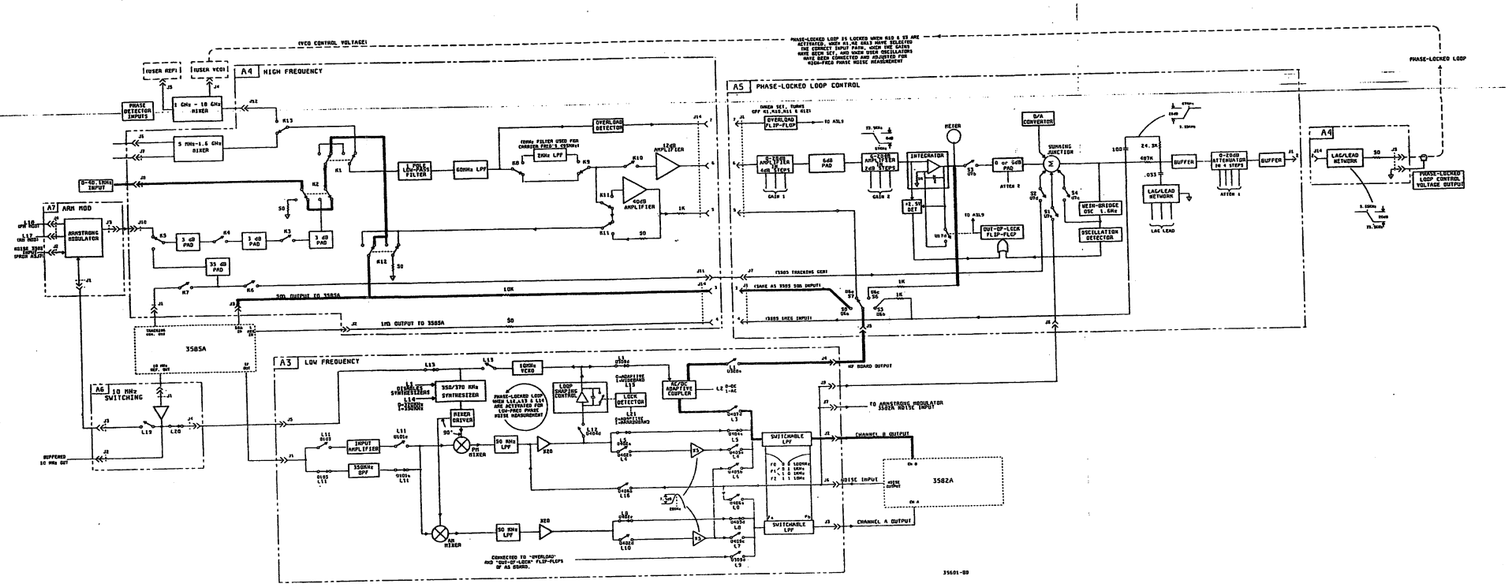


Figure 6-5. Adaptive Coupler Test

6-14. Digital-to-Analog Converter Test

This test checks the circuits in the signal path shown in Figure 6-6. The only circuits being tested are the Digital-to-Analog Converter (DAC), the Summing Junction, and the circuit path. A voltage is generated from the DAC that corresponds to its full-scale. An -hp- 3455A voltmeter is connected to the 1MΩ OUTPUT TO 3585A to measure this voltage. The DAC range is then adjusted with A5R78 to its proper value, as read by the voltmeter. If the adjustment is possible, and the DAC steps to various values with <100mv error, the circuits are considered functional. The program prints the results of the test.

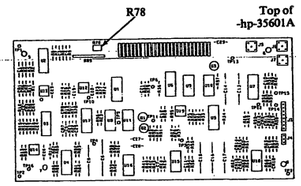
Initializing the Test

With the High Frequency Menu displayed, press SFK K6 to initialize the test. After initialization, follow the instructions displayed on the computer.

What if the Test Fails?

Assuming that the correct digital control is provided for the DAC, the most probable cause for not being able to make this adjustment is failure of the DAC or failure of the Summing Junction. Use the "SWITCH" subprogram to vary the voltage output of the DAC; the measured voltage of the 1MΩ OUTPUT TO 3585A should vary accordingly while doing this. If no voltage change occurs, use a probe and a voltmeter to see if the DAC voltage will change at the DAC operational amplifier output. If it does, the problem is in the Summing Junction or the signal path following the DAC output. If no voltage change occurs at the output of the DAC (i.e., across pins 1 and 7 of U12) while varying its digital input (with "SWITCH"), then the problem is in the DAC. Refer to Service Group Three for schematics, component locators, and circuit descriptions.

Equipment Set Up



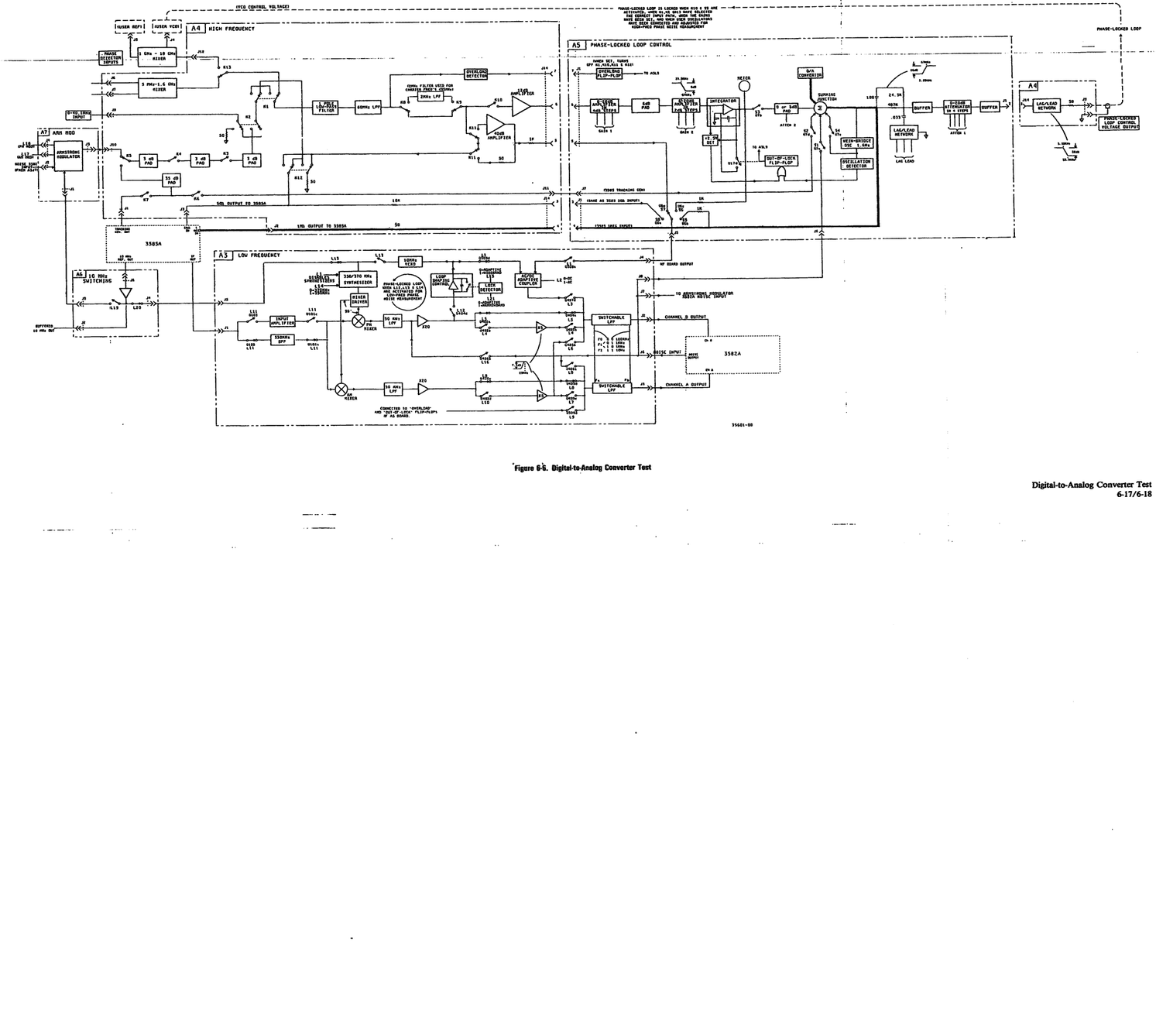


Figure 6-6. Digital-to-Analog Converter Test

Figure 6-6. Digital-to-Analog Converter Test

6-15. Output Attenuator Test

This test checks the circuits in the signal path shown in Figure 6-7. If the previous tests have been performed, the only major circuits tested are two buffers, and the 0-20dB Attenuator. A signal is derived from the DAC. It is fed through the Summing Junction, a frequency shaping network, a buffer, the output attenuator, another buffer and, finally, measured at the VCO Control Voltage Output with an -hp- 3455A voltmeter. The program selects all four states of the attenuator, checking for the correct voltage readings from the voltmeter on each step. The user is given the option of discontinuing the test after the first reading if the test appears to be failing. The program prints the results of the test.

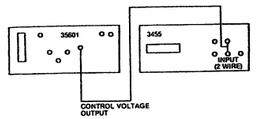
Initializing the Test

With the High Frequency Menu displayed, press SFK K7 to initialize the test. After initialization, follow the instructions displayed on the computer.

What if the Test Fails?

Assuming that the DAC test passed, the only probable causes of failure are: one of the buffers, the frequency shaping network, or the Attenuator. As in the DAC test, "SWITCH" can be used to vary the output of the DAC. The signal should then be traced along the path shown in Figure 6-7 using a voltmeter or a scope. Refer to Service Group Three for schematics, component locators, and circuit descriptions.

Equipment Set Up



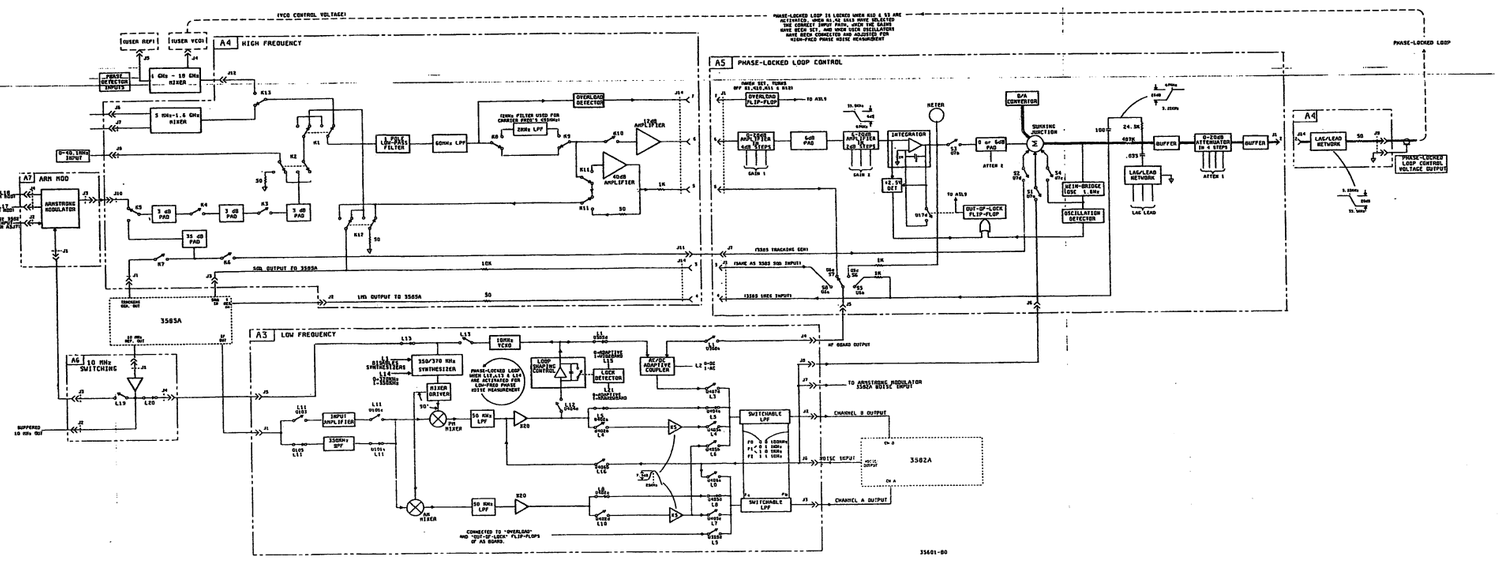


Figure 6-7. Output Attenuator Test

6-16. Wein Bridge Oscillator Test

This test checks the circuits in the signal path shown in Figure 6-8. If the previous tests have been performed, the only circuits that have not been tested are the Wein Bridge Oscillator, and the switch S4. The program closes S4, enabling the Wein Bridge Oscillator. The output of the oscillator is measured with an -hp- 3455A voltmeter at the VCO Control Voltage Output. The user is given the option of discontinuing the program if something seems to be failing. The test passes if the voltage swing and frequency are within acceptable limit. The program prints the results of the test.

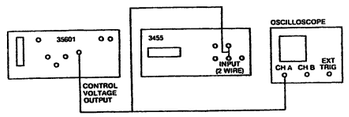
Initializing the Test

With the High Frequency Menu displayed, press SFK K8 to initialize the test. After initialization, follow the instructions displayed on the computer.

What if the Test Fails?

Assuming that the DAC test and the Output Attenuator test passed, the only probable causes of failure are: the switch S4, or Wein Bridge Oscillator. "SWITCH" can be used to open and close S4; this should be done while checking the output of the oscillator using a voltmeter or a scope. The signal should then be traced along the path shown in Figure 6-8 using a voltmeter or a scope. Refer to Service Group Three for schematics, component locators, and circuit descriptions.

Equipment Set Up



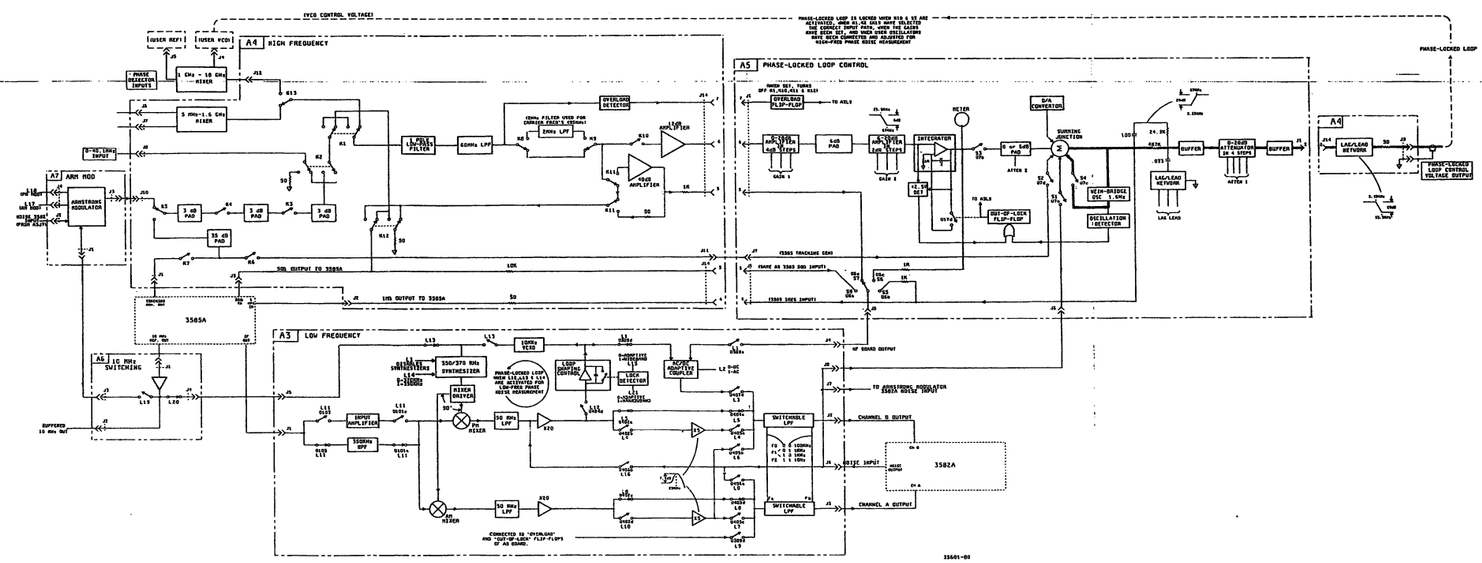


Figure 6-8. Wein Bridge Oscillator Test

6-17. Noise Input to Summing Junction Test

This test checks the circuits in the signal path shown in Figure 6-9. If the previous tests have been performed, the only circuit that has not been checked is the signal path from the Noise Input to the Summing Junction. A signal is input to the Noise Input from an -hp- 3325A opt 001 and the signal is measured with an -hp- 3455A voltmeter at the 1MΩ OUTPUT to 3585A. The program gives the user the option of discontinuing the test if the test appears to be failing. The program then prints the results.

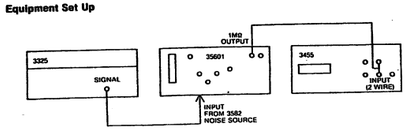
Initializing the Test

With the High Frequency Menu displayed, press SFK K9 to initialize the test. After initialization, follow the instructions displayed on the computer.

What if the Test Fails?

Assuming that the previous tests have passed, the only probable cause of failure is the switch S1. This can easily be checked using "SWITCH" and a voltmeter. Refer to Service Group Three for schematics and component locators.

Equipment Set Up



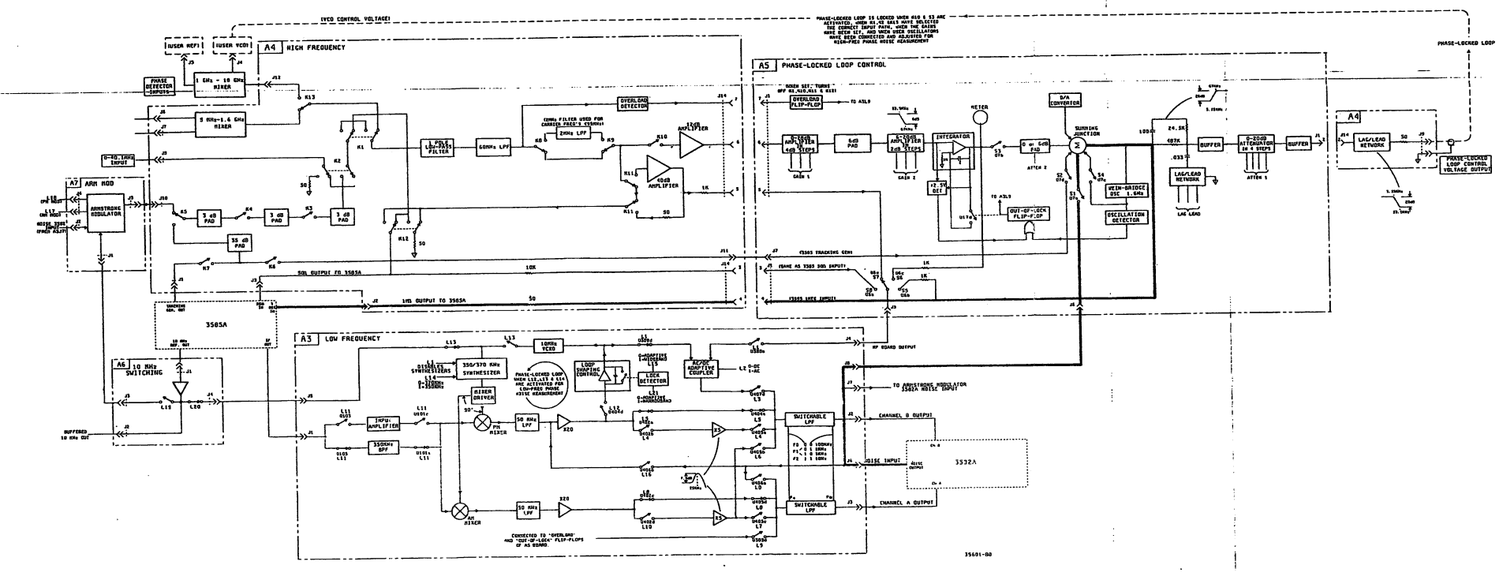


Figure 6-9. Noise Input to Summing Junction Test

Noise Input to Summing Junction Test
6-23/6-24

6-18. Tracking Generator Input to Summing Junction Test

This test checks the signal path shown in Figure 6-10. If the previous tests have been performed, the only circuits tested include relay K6 and switch S2 as well as the signal path between K7 and the Summing Junction. A signal is input in the Tracking Generator Input from an -hp- 3325A opt 001. This signal is measured with an -hp-3455A voltmeter at the 1MΩ OUTPUT to 3585A. The user is then given the option of discontinuing the test in case an improper voltage reading is obtained (i.e., there is no continuity). If the test is continued, the program automatically measures the loss in the signal path. The results are printed.

Initializing the Test

With the High Frequency Menu displayed, press shift SFK K0 (-hp-9836) or SFK K10 (-hp-9845B) to initialize the test. After initialization, follow the instructions displayed on the computer.

What if the Test Fails?

Assuming that the previous tests have passed, the only probable cause of failure is relay K6 or switch S2. This can easily be checked using "SWITCH" and a voltmeter. Refer to Service Groups 2 and 3 for schematics and component locators.

Equipment Set Up

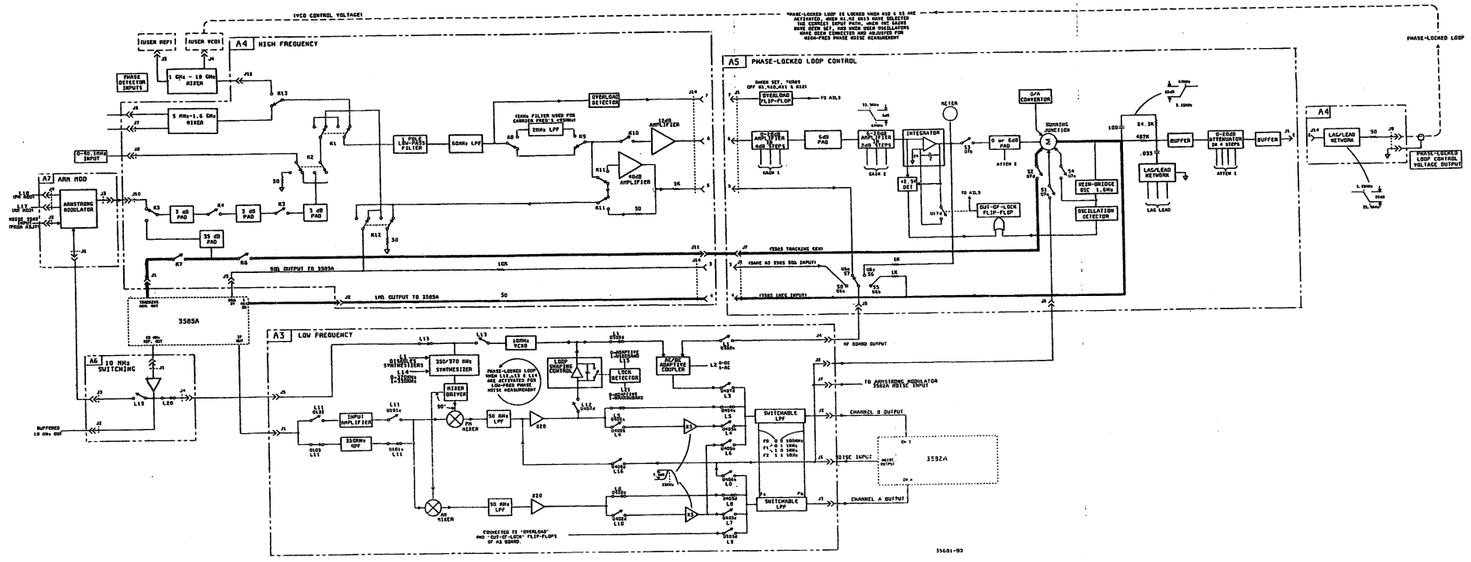


Figure 6-10. Tracking Generator Input to Summing Junction Test

6-19. Output Path to 3582/3585

This test checks the circuits in the signal path shown in Figure 6-11. If the previous tests have been performed, the only circuit being checked that hasn't been tested, is switch S5. A voltage is generated by the Digital to Analog Converter. The voltage is then measured by an -hp- 3455A Voltmeter at the 1MΩ OUTPUT to 3585A and at the Channel B Output. In this test, the Adaptive Coupler is in the DC mode (L2=0). At one point in the program, the user is given the option of discontinuing the test if it appears to be failing. If he chooses to continue the program, the test is completed and the results are printed.

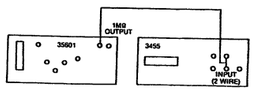
Initializing the Test

With the High Frequency Menu displayed, press shift SFK K1 (-hp-9836) or SFK K11 (-hp-9845B) to initialize the test. After initialization, follow the instructions displayed on the computer.

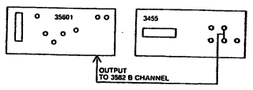
What if the Test Fails?

Assuming that the previous tests have passed, the only probable cause of failure is the switch S5. The "SWITCH" subprogram can be used to open and close this switch when troubleshooting. Refer to Service Group Three for schematics and component locators.

Equipment Set Up



1 MΩ Signal Path Measurement



-hp- 3582A Channel B Signal Path Measurement

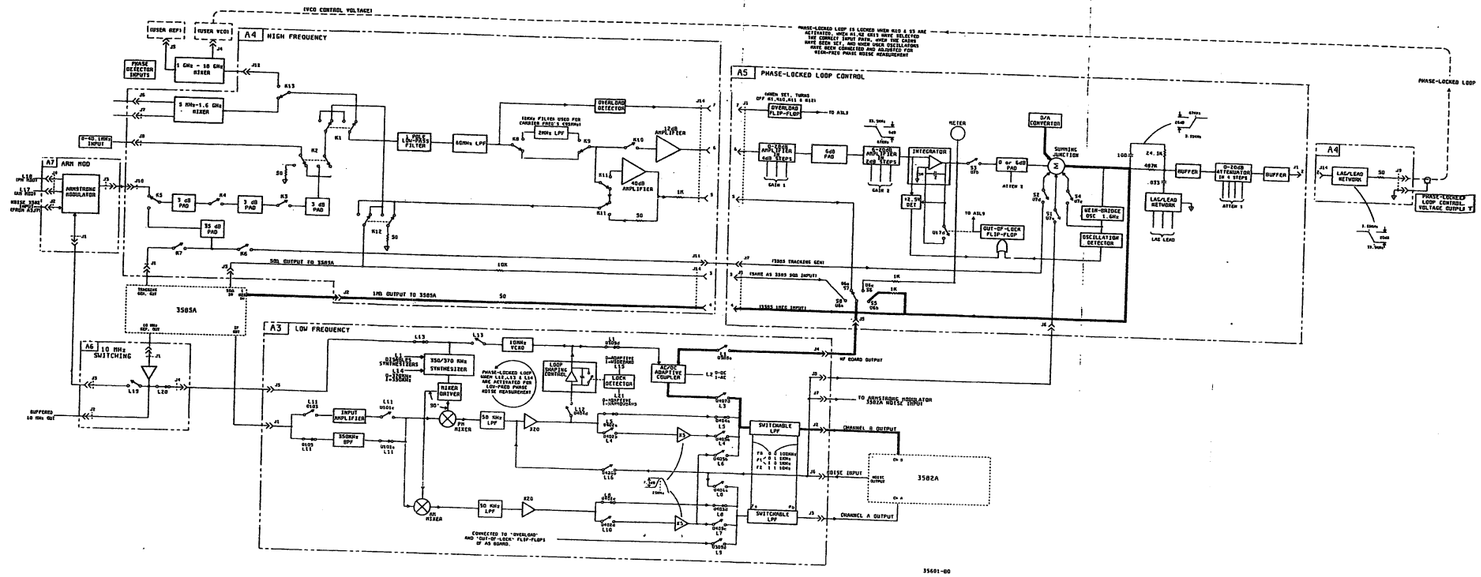


Figure 6-11. Channel B and 1MΩ Outputs

6-20. Programmable Gain Steps Test

This test checks the circuits in the signal path shown in Figure 6-12. If the previous tests have been performed, the only circuits checked are the relay K10, the switch S3, the 12dB Amplifier, the 0-28dB Amplifier, the 6dB Attenuator, the 0-20dB Amplifier, the Integrator, and the 6dB Pad. A signal is input into the 0-40MHz Input using an -hp- 3325A opt 001 set at 5kHz. An -hp- 3455A Voltmeter measures the Channel A Output, then measures the 1MΩ OUTPUT to 3585A. The program checks that the Overload Flip-Flop is not set and the Out-of-Lock Flip-Flop is set. If either of these conditions fails to occur, the user is given the option of trying the test again (after some troubleshooting) or discontinuing the test. The program then selects all of the gains sequentially; for each gain change, the program adjusts the level of the -hp- 3325A opt 001 a corresponding amount. So, if the attenuators and amplifiers are working properly, a constant level should be maintained at the output. The program confirms the output level for each gain step. In the next part of the program, the user is asked to zero the DC offset of the 12dB Amplifier and gain stages. Finally, the program prints the results of all the tests.

Initializing the Test

With the High Frequency Menu displayed, press shift SFK K2 (-hp-9836) or SFK K12 (-hp-9845B) to initialize the test. After initialization, follow the instructions displayed on the computer.

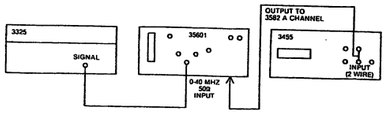
What if the Test Fails?

If the state of either flip-flop was incorrect at the beginning of the test, check the operation of the detection circuits as well as the flip-flop circuits themselves. However, if the flip-flops were in the proper states, and assuming that the previous tests have passed, the probable causes of failure include the following:

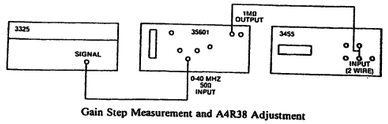
- 12dB Amplifier
- 0-28dB Amplifier
- 6dB Attenuator
- 6-20dB Amplifier
- Integrator
- 6dB Pad

Using "SWITCH", vary the gain of the blocks (one at a time) and confirm that the gain changes. Also make sure that the 12dB Amplifier, the 6dB Attenuator, and the Integrator work by measuring the input and output of each. "SWITCH" should also be used to check the operation of relay K10 and switch S3. Refer to Service Groups 2 and 3 for schematics, component locators, and circuit descriptions.

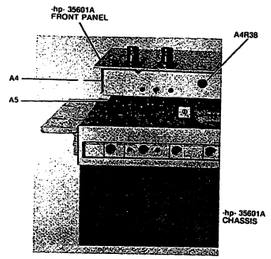
Equipment Set Up



Out-Of-Lock Check



Gain Step Measurement and A4R38 Adjustment



A4R38 Location (Top View of -hp- 35601A)

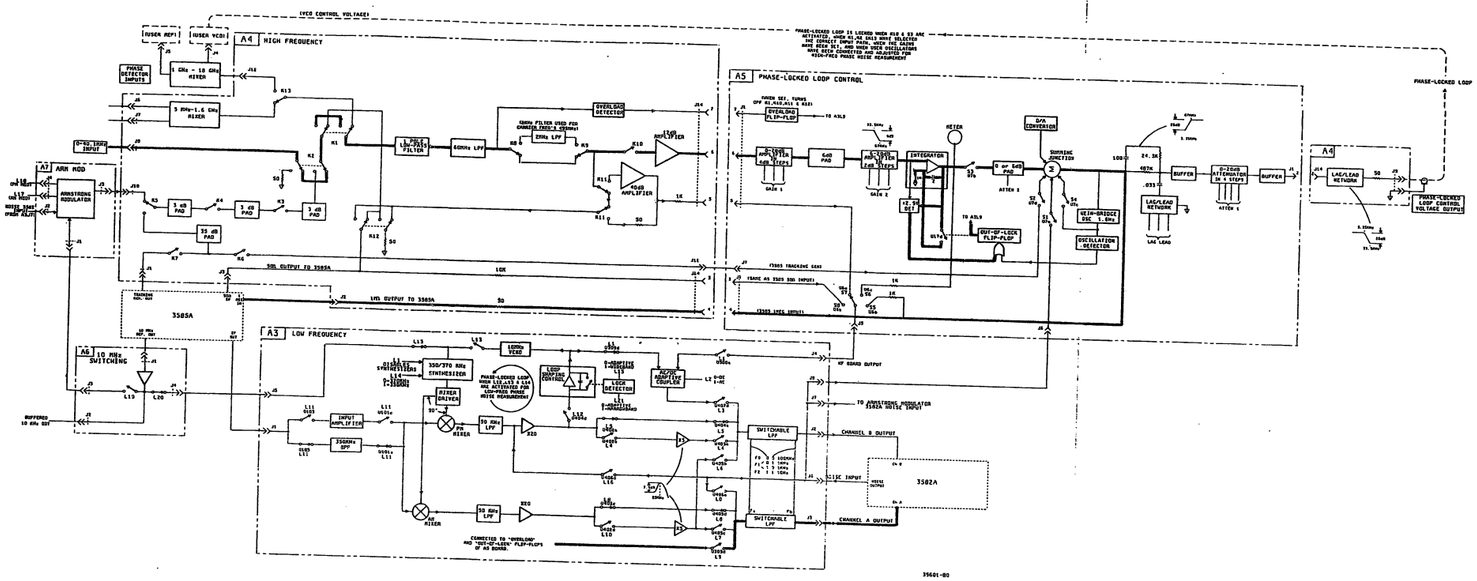


Figure 6-12. Programmable Gain Steps Test

6-21. 1.5GHz Mixer DC Offset Test

This test checks the level of DC offset at the output of the Phase Detector mixer as shown in Figure 6-13. The output of an -hp- 3325A is connected to the L Phase Detector input (+15dBm) on the front panel of the -hp- 35601A; terminate the other Phase Detector input with 50Ω (-hp- 11048A). The output of the mixer is measured with an -hp- 3455A multimeter at the 3585A 50Ω connector on the 35601. The dc offset of the mixer is measured using the 3455A at 5MHz, 10MHz, 15MHz, and 20MHz. The program then prints the results.

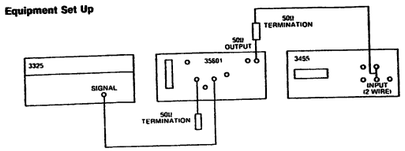
Initializing the Test

With the High Frequency Menu displayed, press shift SFK K3 (-hp-9836) or SFK K13 (-hp-9845B) to initialize the test. After initialization, follow the instructions displayed on the computer.

What if the Test Fails?

Assuming continuity exists in the signal path of this test, a failure in dc offset is almost certainly due to a mixer failure. This mixer is not serviceable; it must be replaced if it has failed.

Equipment Set Up



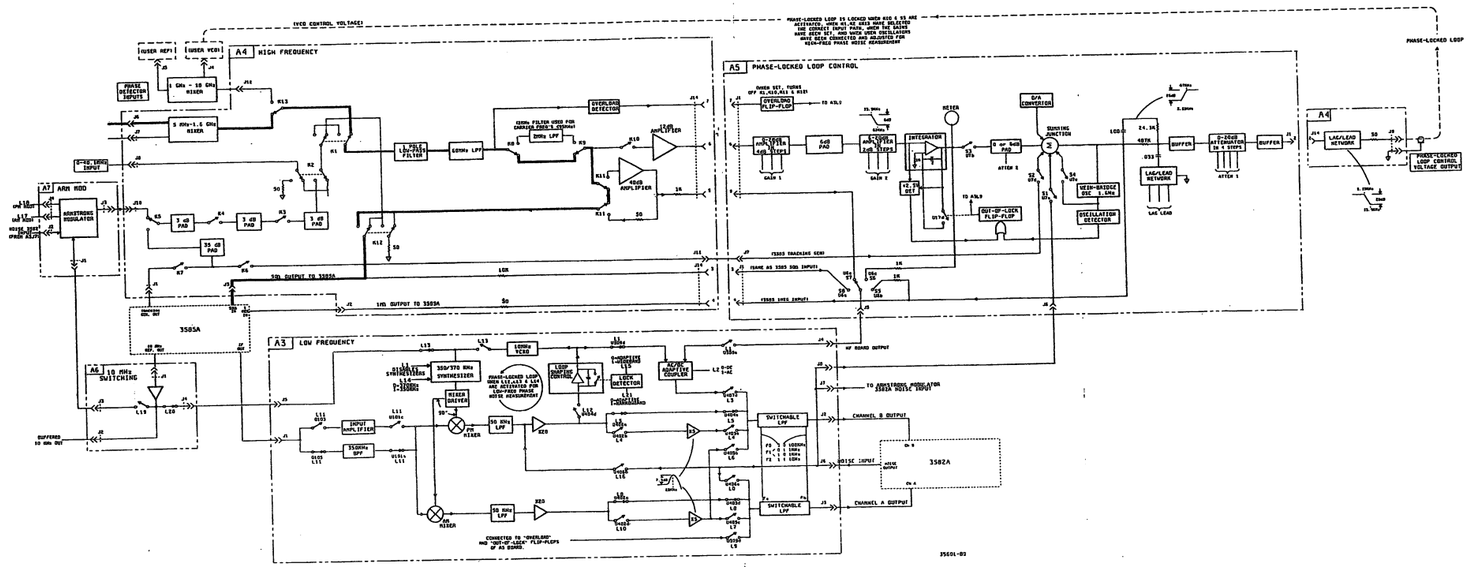


Figure 6-13. 1.5GHz Mixer DC Offset Test

6-22. 350kHz/370kHz Synthesizer Test

This test checks the circuits in the signal path shown in Figure 6-14. Although the measured signals pass through many blocks, the circuit extensively tested is the 350kHz/370kHz Synthesizer. A 10MHz reference signal from the rear panel of the -hp- 3325A opt 001 is input to the 10MHz switching box. A counter measures the frequency at A3TP205 of the ÷25 block of the 350kHz/370kHz Synthesizer. A 3455A voltmeter is connected to A3TP202. L14 is switched into both states; the user is asked to check for the correct frequency reading for each state. The counter is then connected to A3TP200 and the test is repeated. A procedure for adjusting A3L203 then follows. In the next part of the test, the counter is connected to the Channel B, Output and the output of the -hp- 3325A opt 001 is connected to the IF Input of the -hp- 35601A. Again, the frequency reading of the counter is checked for both states of L14. The program doesn't take readings from the counter in this test; all readings are user verified. The results are printed.

Initializing the Test

With the Low Frequency Menu is displayed, press special function key (SFK) K1 to initialize the test. After initialization, follow the instructions displayed on the computer.

What if the Test Fails?

If the frequency reading at A3TP205 is incorrect, check the following circuits:

- Q200 of the ÷25 block
- Q302 of the 10MHz Output Buffer
- the 10MHz Reference Input block
- the 10MHz Switching board (A6)

If the frequency reading at A3TP200 is incorrect, check the following circuits:

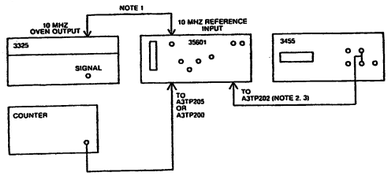
- the ÷25 block
- the ÷35 block
- the Phase Detector block
- the 14MHz VCO block
- the Buffer block following the VCO

If the frequency reading was correct at A3TP205 and A3TP200, but is incorrect at the Channel B Output, then the failure is not in the 350kHz/370kHz Synthesizer. The failure is probably in one of the following circuits:

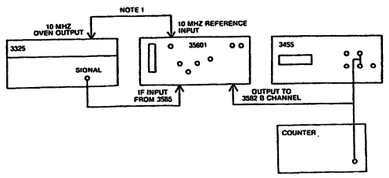
- the Mixer Driver
- the PM Mixer
- the Input Amplifier or the 350kHz Bandpass Filter
- the 50kHz LPF, X5 Amplifier, X20 Amplifier, Switchable LPF, the Output Buffer, or any of the associated switches and drive circuitry.

Refer to Service Group One for schematics, component locators, and circuit descriptions.

Equipment Set Up



400 kHz, 14 MHz, and 14.8 MHz Measurement and A3L203 Adjustment



1 kHz, 19 kHz and Mixer DC Offset Measurements

NOTE 1

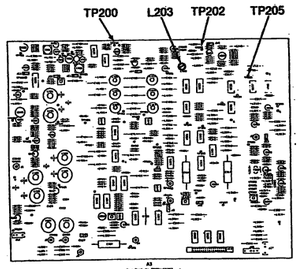
A 10 MHz reference oscillator must be connected to the -hp-35601A rear panel 10 MHz Reference Input for this test.

NOTE 2

Use a cable of one foot or less in length when connecting the -hp-3455 Voltmeter to A3TP202 to avoid adding the effects of excess capacitance to the measurement.

NOTE 3

Unsolder and remove the shield covering A31203 to adjust A3L203. With the shield removed, the voltage readings at A3TP202 are approximately .2 to .7 Volts low. Resolder the shield over A3L203 before proceeding to the next test.



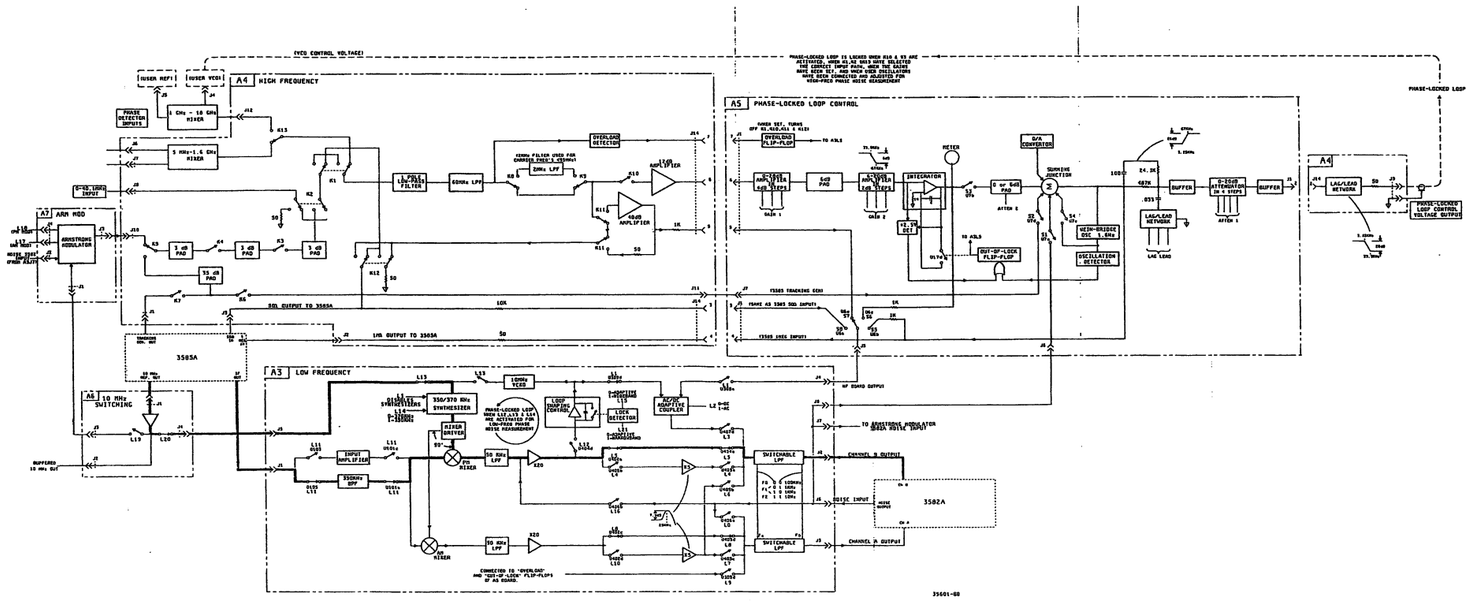


Figure 6-14. 350kHz/370kHz Synthesizer Test

Figure 6-14. 350kHz/370kHz Synthesizer Test

6-23. Voltage Controlled Crystal Oscillator Test

This test checks the circuits in the signal path shown in Figure 6-15. The circuits that are specifically tested are the Voltage Controlled Crystal Oscillator (including two adjustments), the Loop Shaping Control, and the Lock Detector. A signal is input to the IF Input from an -hp- 3325A opt 001. First, the Channel B output is measured with a counter while the VCO center frequency is adjusted; this is done with L12 open. Then, the Channel B output is measured with a scope while the VCO tuning range is adjusted; this is done with L12 closed. The test passes if the adjustments can be made. The results are printed.

Initializing the Test

With the Low Frequency Menu displayed, press SFK K2 to initialize the test. After initialization, follow the instructions displayed on the computer.

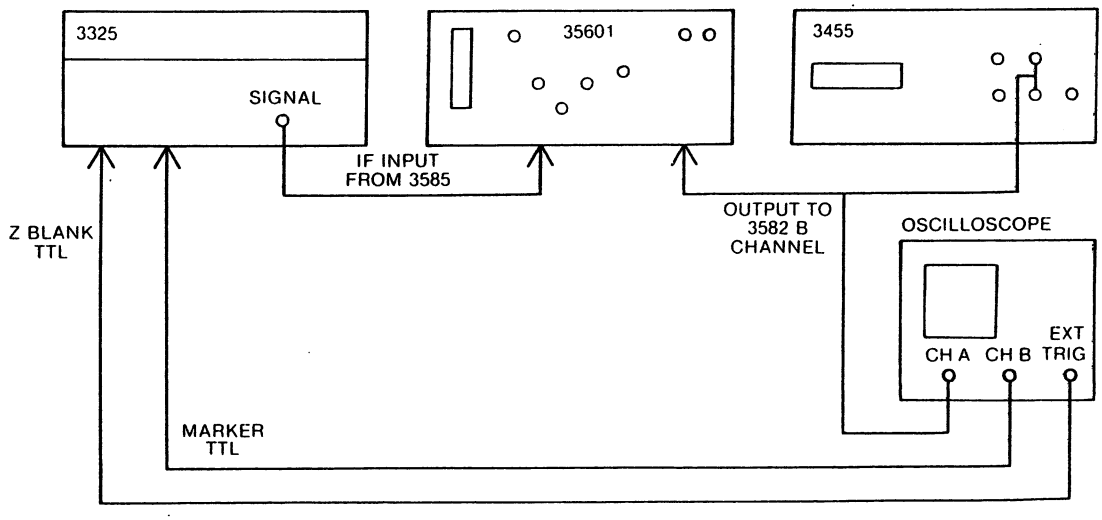
What if the Test Fails?

Assuming the previous tests have passed, the most probable cause of failure will be one of the following:

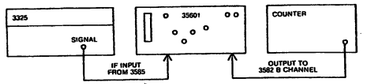
- the VCxO
- the Loop Shaping Control
- the Lock Detector
- the associated switches and their driving circuits

Refer to Service Group One for schematics, component locators, and circuit descriptions. The subprogram "SWITCH" can be helpful in isolating the problem.

Equipment Set Up



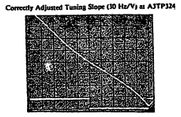
Set Up For A3R324 Adjustment



Set Up For A3R368 Adjustment

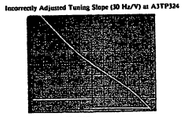
Example Wave Shapes

Correctly Adjusted Tuning Slope (30 Hz/V) at A3TP324

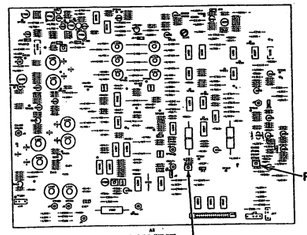


Sweep 10mS/div
Ch A 2V/div Center
Center Screen = Ground
Ch B 5V/div Bottom
Bottom Screen = Ground

Incorrectly Adjusted Tuning Slope (30 Hz/V) at A3TP324



Sweep 10mS/div
Ch A 2V/div Center
Center Screen = Ground
Ch B 5V/div Bottom
Bottom Screen = Ground



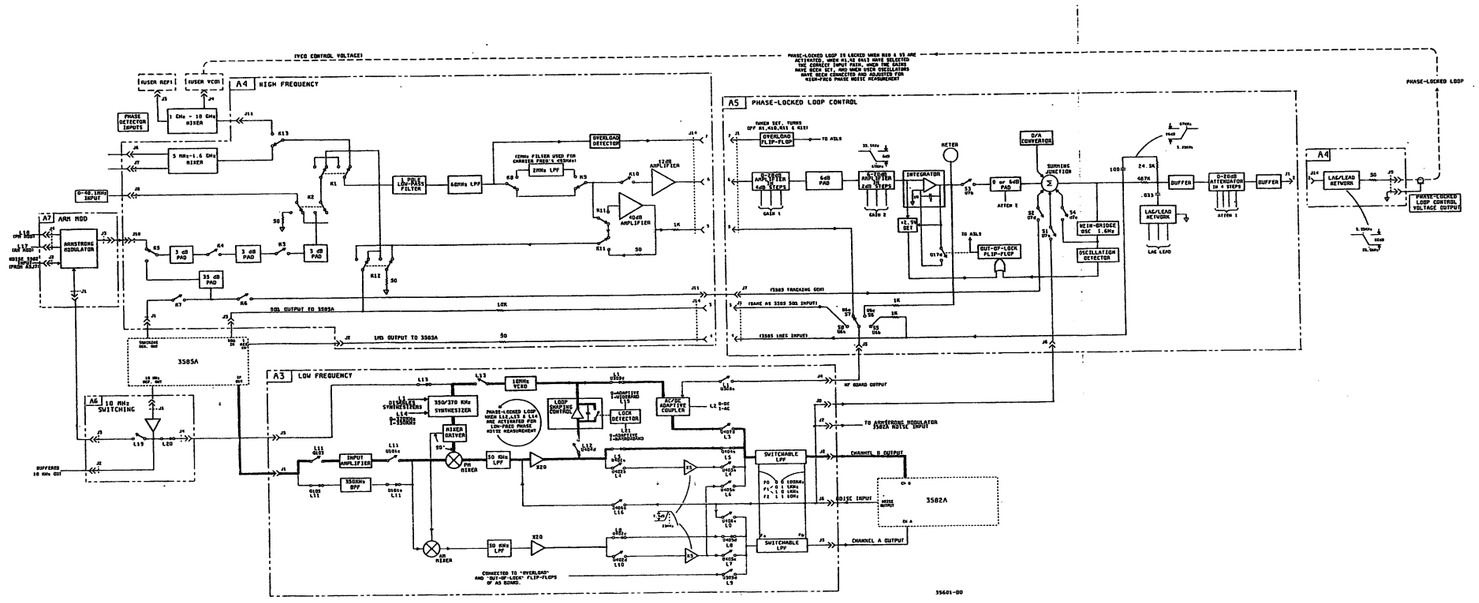


Figure 6-15. Voltage Controlled Crystal Oscillator Test

6-24. 350kHz Bandpass Filter Test

This test checks the circuits in the signal path shown in Figure 6-16; in particular, it tests the 350kHz Bandpass Filter. A signal is input to the IF Input from an -hp- 3325A opt 001. 10MHz is input to the Reference Input. The Channel B output is measured with a scope. Because the input frequency is sweeping from 340kHz to 360kHz, the envelope of the signal on the scope represents the frequency response of the 350kHz Bandpass Filter about its cutoff freqeuncy. The overall gain of the filter is adjusted while the scope is connected in this manner. With the scope connected to various points within the filter, the filter shape is optimized with several other adjustments. If the adjustments can be made, the test passes. The results are printed.

Initializing the Test

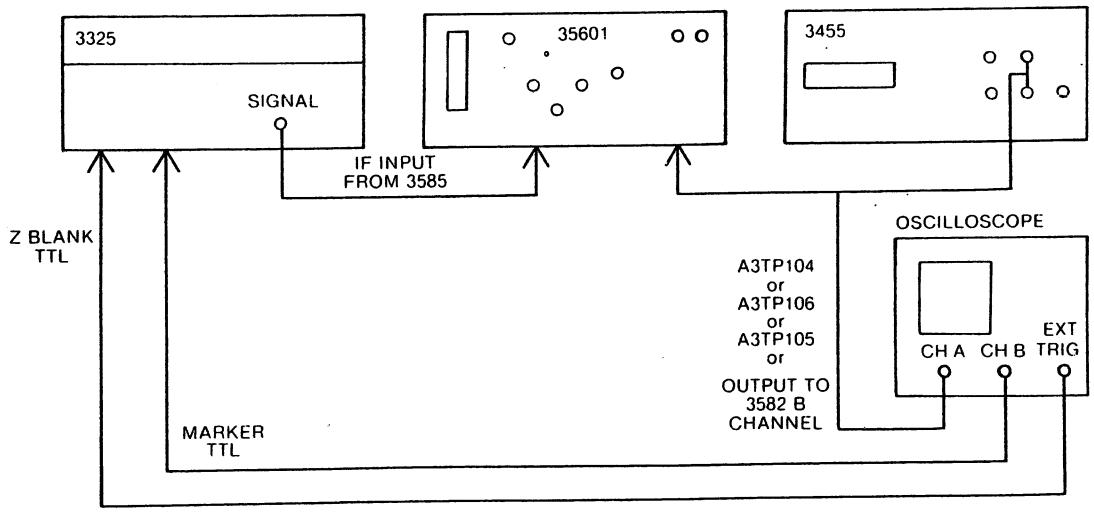
If the Low Frequency Menu is displayed, press special function key 3 to initialize the test. If the High Frequency Menu is displayed, press special function key 15, then select the Low Frequency Menu and, finally, press special function key 3. After initialization, follow the instructions displayed on the -hp- 9845B.

What if the Test Fails?

Assuming the previous tests have passed, the most likely cause of failure is the 350kHz Bandpass Filter. The operation of L11 can be confirmed using "SWITCH". Refer to Service Group One for schematics, component locators and circuit descriptions.

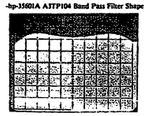
Equipment Set Up

Remove the top cover for this adjustment. The oscilliscope is connected to each stage of the band pass filter at the Test points given below.



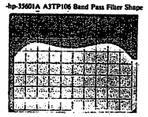
Example Wave Shapes

-hp-35601A A3TP104 Band Pass Filter Shape



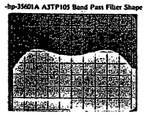
Sweep 10nS/div
Ch A .05V/div, dc Coupled
Bottom Screen = Ground
Ch B 5V/div, dc Coupled
Bottom Screen = Ground

-hp-35601A A3TP106 Band Pass Filter Shape



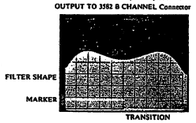
Sweep 10nS/div
Ch A .05V/div, dc Coupled
Bottom Screen = Ground
Ch B 5V/div, dc Coupled
Bottom Screen = Ground

-hp-35601A A3TP105 Band Pass Filter Shape



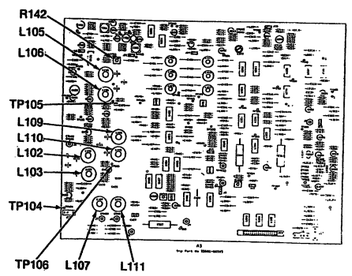
Sweep 10nS/div
Ch A .05V/div, dc Coupled
Bottom Screen = Ground
Ch B 5V/div, dc Coupled
Bottom Screen = Ground

Band Pass Filter Shape at -hp-35601A
OUTPUT TO 3582 B CHANNEL Connector



Sweep 10nS/div
Ch A .05V/div, dc Coupled
Bottom Screen = Ground
Ch B 5V/div, dc Coupled
Bottom Screen = Ground

.Filter shape must be symmetrical about the transition of the marker signal.



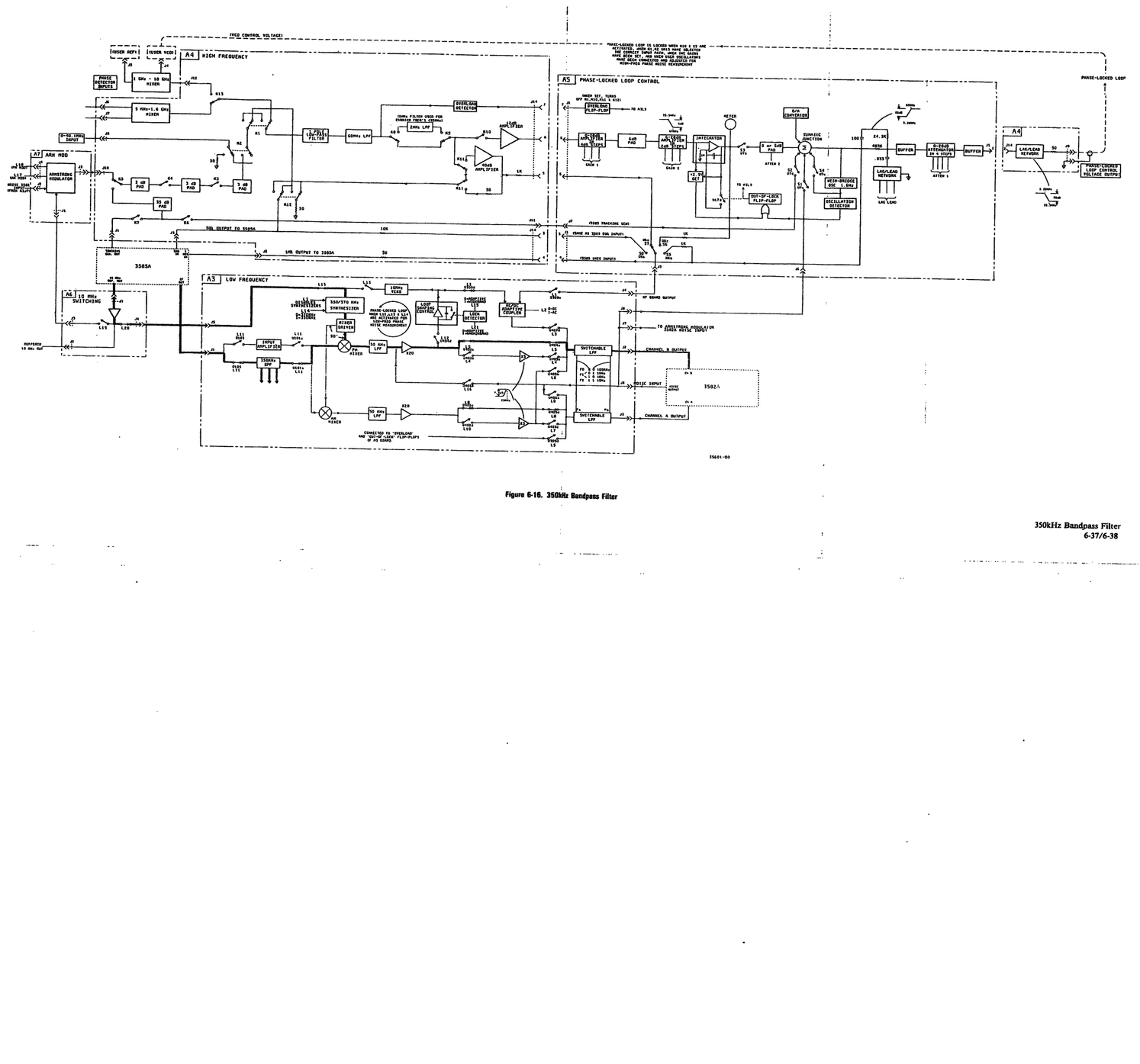


Figure 6-16. 350kHz Bandpass Filter

Figure 6-16. 350kHz Bandpass Filter

6-25. X20 and X5 Amplifiers Test

This test checks the circuits shown in the signal path in Figure 6-17. In particular, the X20 and X5 Amplifiers of channels A and B are tested. The same signal sources are used in this test as were used in the previous test. An -hp- 3455A Multimeter is connected to the output of each 50kHz Lowpass Filter to check rolloffs. The voltmeter is connected to Channel A and B Outputs to check for proper gain of the the amplifiers and the proper peaking in the X5 Amplifiers. The results of the test are printed.

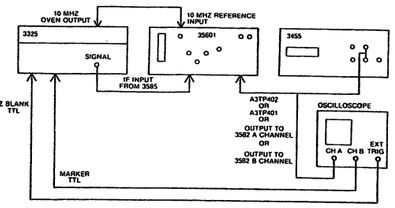
Initializing the Test

With the Low Frequency Menu displayed, press SFK K4 to initialize the test. After initialization, follow the instructions displayed on the computer.

What if the Test Fails?

Assuming the previous tests have passed, the most likely cause of failure would be the 50kHz Lowpass Filter, the X20 Amplifier, or the X5 Amplifier of either channel. Isolation of the failure should be straightforward because each test checks the operation of only one block. Use "SWITCH" to check the operation of the switches. Refer to Service Group One for schematics, component locators, and circuit descriptions.

Equipment Set Up

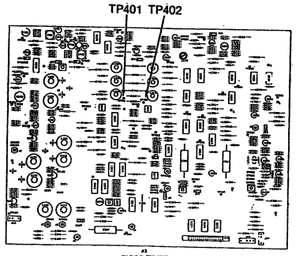


Example Wave Shapes

500 kHz Low Pass Filter Shape to -hp-3582A Channel A and B

Sweep 10mS/div
Ch A 1V/div
Bottom Screen = Ground
Ch B 5V/div
Bottom Screen = Ground

TP401 TP402



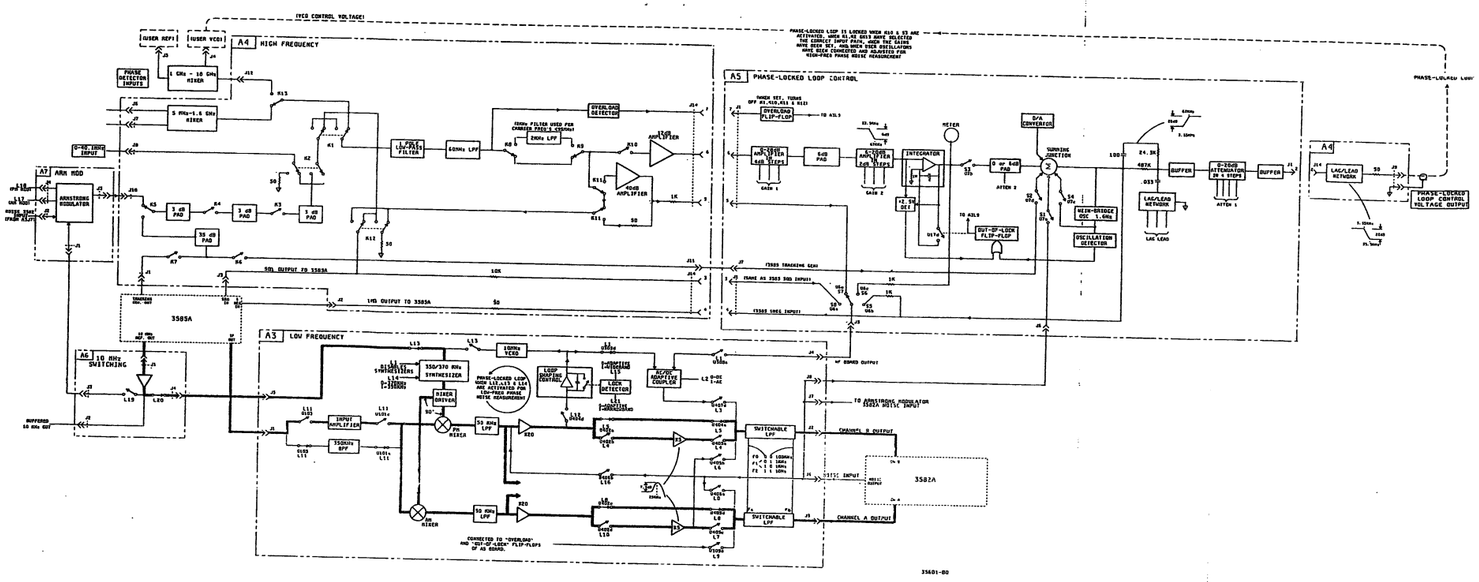


Figure 6-17. X20 and X5 Amplifiers Test

6-26. Switchable Lowpass Filters Test

This test checks the circuits in the signal path shown in Figure 6-18. In particular, the Switchable Lowpass Filter in each channel is tested. A signal is input to the 0-40MHz Input from an -hp- 3325A opt 001; the output of Channel B is measured with a scope and an -hp- 3455A Voltmeter. The -hp- 3325A opt 001 is then connected to the Noise Input of the -hp- 35601A; the output of Channel A is measured with the scope and voltmeter. All three modes of the filters are tested: 100kHz, 1kHz, and 10Hz. The user is asked to confirm the shape of each filter and the program checks for proper levels with the voltmeter. The results are printed.

Initializing the Test

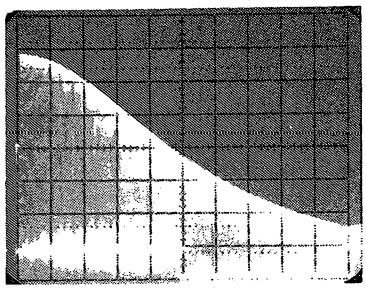
With the Low Frequency Menu displayed, press SFK K5 to initialize the test. After initialization, follow the instructions displayed on the computer.

What if the Test Fails?

Assuming the previous tests have passed, the most likely cause of failure is one of the Switchable Lowpass Filters. "SWITCH" can be used to check the operation of the control lines for the filters. Refer to Service Group One for schematics, component locators, and circuit descriptions.

Example Wave Shapes

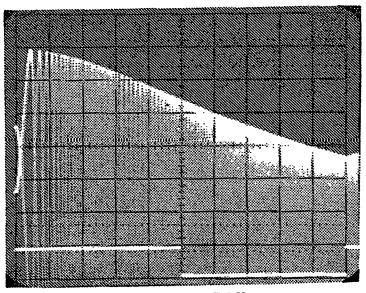
Channel A 100 kHz Low Pass Filter Shape



Sweep 10mS/div
Ch A .2mV/div
Ch B 5V/div

-hp-3325A: .1 S, 0 to 200 kHz Sweep Marker Amplitude approximately −5dB

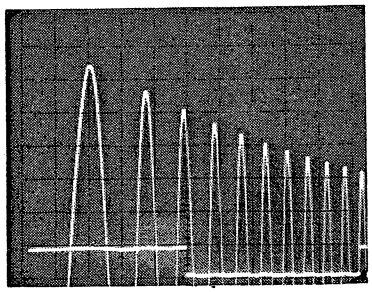
Channel A 1 kHz Low Pass Filter Shape



Sweep 10mS/div
Ch A .2mV/div
Ch B 5V/div

-hp-3325A: .1 S, 0 to 2 kHz Sweep Marker Amplitude approximately −2dB

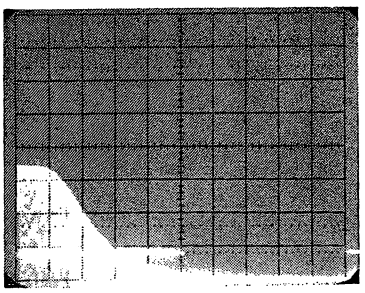
Channel A 10 kHz Low Pass Filter Shape



Sweep .1S/div
Ch A .2mV/div
Ch B 5V/div

-hp-3325A: 1 S, 0 to 20 Hz Sweep Marker Amplitude approximately −3dB

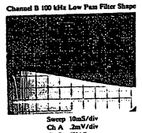
Channel B 100 kHz Low Pass Filter Shape



Sweep 10mS/div
Ch A .2mV/div
Ch B 5V/div

-hp-3325A: .1 S, 0 to 200 kHz Sweep Marker Amplitude approximately −25dB

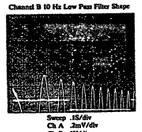
Channel B 100 kHz Low Pass Filter Shape



Sweep 10mS/div
Ch A .2mV/div
Ch B 5V/div

-hp-3325A: 1 S, 0 to 2 kHz Sweep Marker Amplitude approximately −2dB

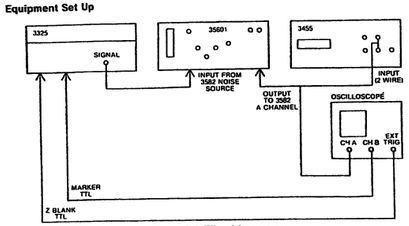
Channel B 10 Hz Low Pass Filter Shape



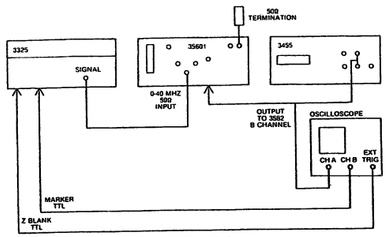
Sweep .1S/div
Ch A .2mV/div
Ch B 5V/div

-hp-3325A: 1 S, 0 to 20 Hz Sweep Marker Amplitude approximately −3dB

Equipment Set Up



Channel A Filter Measurement



Channel B Filter Measurement

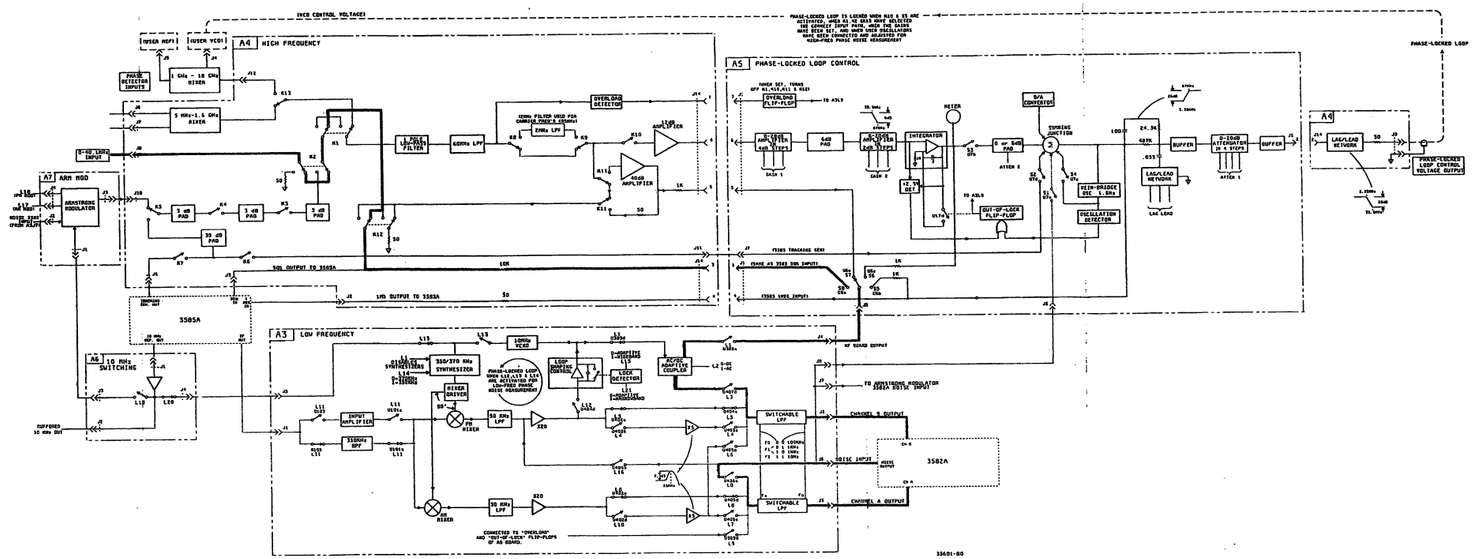


Figure 6-18. Switchable Lowpass Filters Test

Figure 6-18. Switchable Lowpass Filters Test

Switchable Lowpass Filters Test
6-41/6-42

6-27. Channel A DC Offset Adjustment

This test checks the dc offset output of the -hp-35601A to the -hp-3582A channel A. During operation, the synthesizer is disabled, the path in Figure 6-19 is established, and the channel A output of the -hp-35601A is measured with an -hp-3455A. The user is asked to adjust the dc offset for a 0 volt indication on the -hp-3455A.

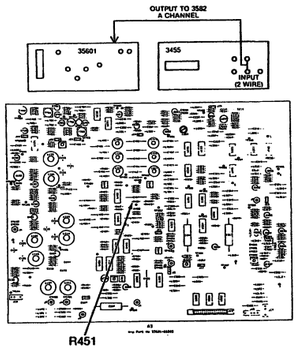
Initializing the Test

With the Low Frequency Menu displayed, press shift SFK K6 to initialize the test. After initialization, follow the instructions displayed on the computer.

What If the Test Fails?

Assuming the previous test have passed, the most likely cause of failure is the X5 Amplifier, dc offset adjustment circuit or switchable LPF (low pass filter) circuit. Refer to Service Group One for schematics, component locators, and circuit descriptions.

Equipment Set Up



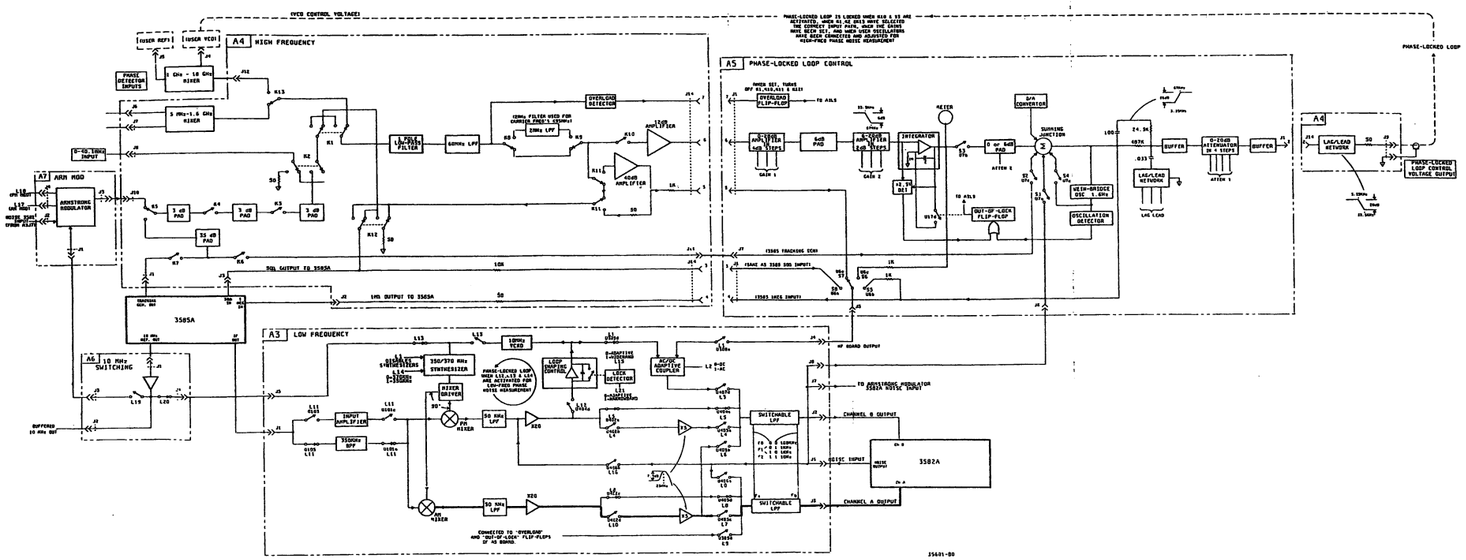
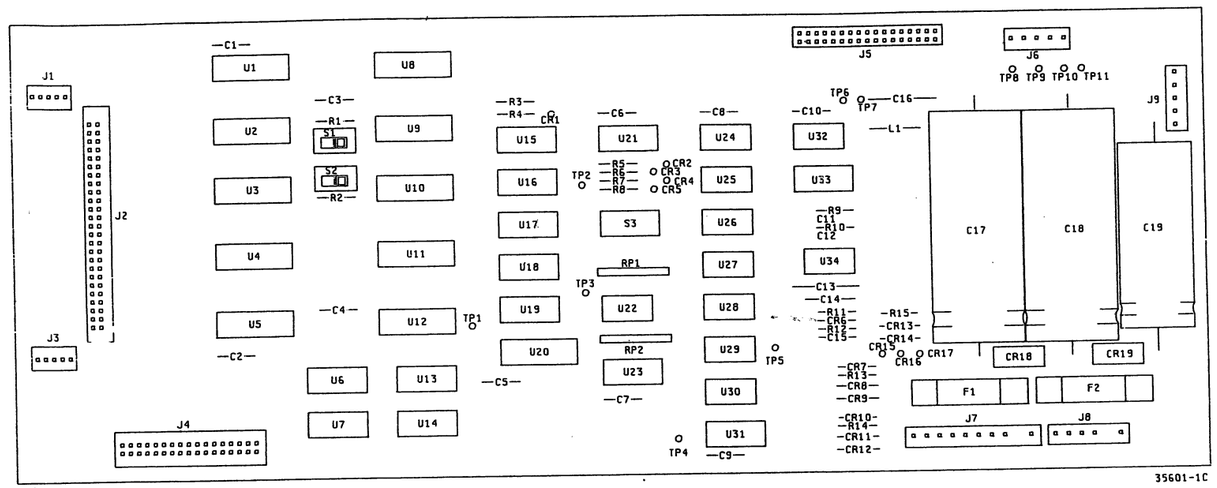


Figure 6-19. Channel A DC Offset Adjustment



A1

h-p Part No 35601-66501

Signature Analyzer set-up:

START - positive edge, connect to TP1 (ATN)
STOP - negative edge, connect to TP1 (ATN)
CLOCK - negative edge, connect to TP4 (DAV)

6-28. HP-IB Test with Digital Signature Analysis

This test checks the operation of the digital control circuitry on the A1 Board. The program executes a routine that will generate predictable signatures at various points in the circuit if the circuit is working properly. Figure 6-20 shows the circuit diagram for the HP-IB control portion of the A1 Board. After initializing the test, simply check for the proper signatures at all the indicated points in the circuit. Chances are quite good that if all the previous tests have passed, the circuitry checked in this test is working properly. This test passes if all the signature readings are correct.

NOTE

If you find that the -hp- 35601A is not responding to HP-IB command, proceed directly to Service Group Four (A1 - HP-IB control and Power Supply). The HP-IB handshake circuitry must be working before this test can be of any use.

Initializing the Test

With the Low Frequency Menu displayed, press SFK K7 to initialize the test. After initialization, follow the instructions displayed on the computer. This test will not be initialized in the automatic mode.

What if the Test Fails?

If this test fails, check the circuitry around the faulty signatures. If the handshake circuits are working, the problem is probably in one of the latches or multiplexers; this type of problem should be easy to isolate with signature readings. If the handshake circuits are not working, probably none of the signatures on the board will be correct. Refer to Service Group Four for troubleshooting techniques of the handshake circuitry. Also refer to Service Group Four for schematics, component locators, and circuit descriptions.

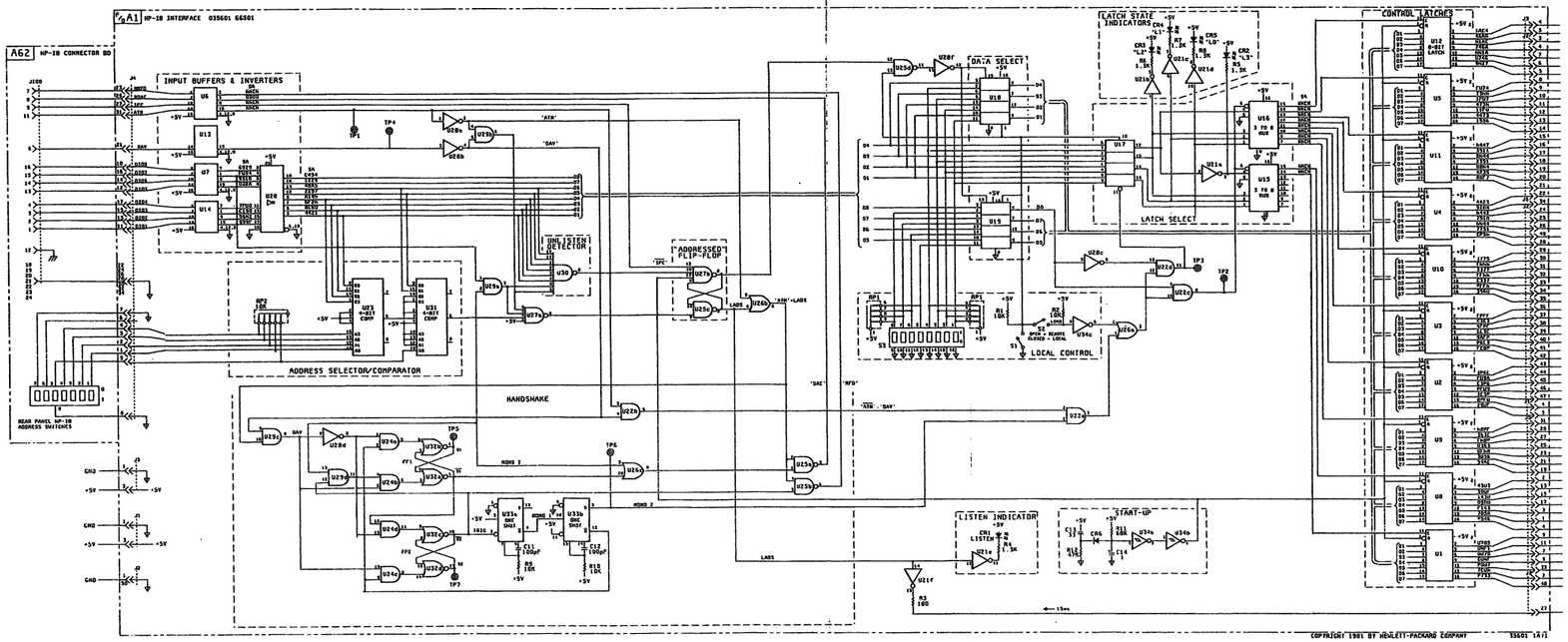


Figure 6-20. HB-IB Test with Digital Signature Analysis

Figure 6-20. HB-IB Test with Digital Signature Analysis

HB-IB Test with Digital Signature Analysis
6-45

6-29. CONTROLLING THE -hp- 35601A USING SUBPROGRAM "SWITCH"

Introduction

"SWITCH" is a subprogram of the -hp-35601A test program. "SWITCH" enables the user to control all of the switches, relays, and programmable parameters of the -hp- 35601A via a computer. This subprogram is useful for troubleshooting since the -hp- 35601A has virtually no front panel controls. After "SWITCH" has been initialized, the display of the computer always shows the present setup state of the interface unit.

6-30. Initializing "SWITCH"

With either the Low or High Frequency Menu displayed, press shift SFK K6 (-hp-9836) or shift SFK K11 (-hp-9845B) to initialize "SWITCH". (Refer to Automatic Tests and Adjustments to initialize the -hp-35601A test program.) After initialization, special function key prompts are displayed along with the -hp-35601A interface setup status. If the -hp-35601A is in the turn on state, the following is displayed for the -hp-35601A interface status:

```
INTERFACE SETUP
DAC VOLTAGE      =0      CONTROL VOLTAGE OUTPUT=0
GAIN1 (dB)       =0
GAIN2 (dB)       =6
LEADLAG FILTER   =0
ATTEN1           =0
ATTEN2           =1

FO
```

"SWITCH" options can now be accesed through the use of special function keys or the entry of a command string. Special function key assignments and entry of a command string are covered in the following sections.

6-31. Special Function Keys

The special function keys assignments used in the "SWITCH" subroutine permit each switch, relay, amplifier, and attenuator in the -hp-35601A interface to be controlled by a computer. SFK K0 and K1 turn off the overload and out-of-lock indicators on the front panel. SFK K2 through K7 are used to change various parameters of the signal path in the Phase-Locked Loop Control board. When one of these keys (K2-K7) is pressed, the computer displays a prompt for value. When the value of the parameter is entered, and continue is pressed, the Interface Setup Status display is updated showing the present state of the -hp-35601A. SFK K8 is used with the -hp-9836 computer to enter a command string (The -hp-9845B computer allows entry of the command string without pressing a special function key). Pressing SFK K9 (-hp-9836) or shift K11 (-hp-9845B) returns the user to the main portion of the -hp-35601A test program.

K0 ... Toggle Overload

Pressing this key resets the Overload Flip-Flop on the A5 board which turns off the OVERLOAD indicator on the front panel of the -hp- 35601A. If an overload condition still exists, however, the overload Flip-Flop will immediately set again. In this case, the front panel indicator will remain on. Pressing K0 will not turn the indicator on (i.e. set the Overload Flip-Flop) if it is off.

K1 ... Toggle Out-Of-Lock

Pressing this key resets the Out-of-Lock Flip-Flop on the A5 board which turns off the OUT-OF-LOCK indicator on the front panel of the -hp- 35601A. If an out-of-lock condition still exists, the Out-of-Lock Flip-Flop will immediately set again. In this case, the front panel indicator will remain on. Pressing K1 will not turn the indicator on if it is off.

K2 ... Change DAC

When this key is pressed the display prompts the operator to enter a number from -10 to 10. When this number is entered and CONTINUE is pressed, the computer sends the appropriate data to the -hp-35601A. (The number must be a multiple of 0.04 or the software will round the absolute value of the number to the lower multiple of 0.04.) In addition, the computer display is updated to show the present output voltage of the DAC.

K3 ... Change Gain1

This key affects the gain of the 0-28dB Amplifier. When the calculator prompts the user to enter a number, a multiple of 4 from 0 to 28 should be entered, followed by pressing CONTINUE. The -hp- 9845B will change the gain to the value entered and update its display to reflect the change.

K4 ... Change Gain2

This key affects the gain of the 6-20dB Amplifier. When the calculator prompts the user to enter a number, a multiple of 2 from 6 to 20 should be entered; followed by pressing CONTINUE. The computer will change the gain to the value entered and update its display to reflect the change.

K5 ... Change Lead Lag

This key changes the lead/lag characteristics of the phase-locked loop on the A5 board. When the calculator prompts the user, a number from 0 to 7 should be entered followed by pressing CONTINUE. The computer will change the lead/lag number to the entered value and update its display to reflect the change.

K6 ... Change Attenuation1

Pressing this key enables the user to change the attenuation of the 0-20dB Attenuator. The computer prompts the user to enter a number (1, .5, .2, or .1) that represents the ratio of the output voltage to the input voltage of the attenuator. When CONTINUE is pressed, the state of the attenuator is changed and the calculator display is updated.

K7 ... Change Attenuation2

Pressing this key enables the user to select the attenuation of the 0 or 6dB Attenuator. The computer prompts the user to enter a number (1 or .5) that represents the ratio of the output voltage to the input voltage of the attenuator. When CONTINUE is pressed, the state of the attenuator is changed and the computer display is updated.

K8 ... ENTER SETTINGS (-hp-9836)

Pressing this key permits the user to change the state of the relays and switches shown in Figure 6-19 by direct entry of commands indicating the desired switch or relay state. Entering the command string is described in the following section.

K9 ... SWITCH EXIT (-hp-9836)

(shift) K11 ... Return to Main Program (-hp-9845)

Pressing this key returns the user to the -hp- 35601A test main program. After troubleshooting with "SWITCH", the Automatic Tests and Adjustments may be repeated or continued after pressing this key.

6-32. Entering a Command String

To Change the state of the switches and relays shown in Figure 6-19, a command string must be entered. A command simply consists of the switch number shown in the block diagram in Figure 6-19 for a particular switch. The possible switch numbers are shown in Table 6-4.

When a "SWITCH" command is entered, and continue is pressed, the command is displayed. A displayed command (with the prefix K, S, or L) indicates that the corresponding switch or relay is in the state opposite to that shown in the block diagrams (Figure 6-1 through 6-19). The commands that have an F prefix control the cut-off frequency of the Switchable Lowpass Filter; for this reason, one of these commands is always displayed. To return a switch or relay to the state shown in the block diagrams, enter the command preceded by a minus sign. Command strings are performed by entering multiple commands separated by commas.

Table 6-4. "SWITCH" Commands.

Commands	Function
K1, K2, K3, K4, K5, K6, K7, K8, K9, K10, K11, K12, K13, K14	Relays on the A4 board
S1, S2, S3, S4, S5, S6, S7, S8 (only one of S5, S6, S7, and S8 may be selected)	Switches on the A5 board
F0, F1, F2 (one of these will always be displayed)	Switchable Lowpass Filter on the A3 board
L0, L1, L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14, L15, L16, L17, L18, L19, L20, L21	Switches on the A3, A6, and A7 boards

SERVICE GROUP ONE
A3 BOARD: LOW FREQUENCY INTERFACING

6-33. INTRODUCTION TO THE A3 BOARD

The -hp- 35601 A3 board provides the mixdown for the 3585A IF Output. This is accomplished by mixing the 350kHz IF signal from the -hp- 3585A with either a 350kHz or a 370kHz signal synthesized by the A3 board. The output is either DC or 20kHz and is analyzed by the -hp- 3582A.

6-34. The A3 Board in the Narrow Band Analysis Mode

In the Narrow Band Analysis mode, the A3 board is configured as follows: The 350kHz IF from the -hp- 3585A is bandpass filtered before being mixed with 370kHz to generate 20kHz. The 20kHz is then amplified and analyzed on channel B of the -hp-3582A. The 370kHz is synthesized from the -hp- 3585A 10MHz oven reference.

6-35. The A3 Board in the AM/PM Analysis Mode

In the Side Band Analysis Mode, the -hp- 3585A 350kHz IF output is used as a reference for a phase locked loop on the A3 board. The IF is amplified and mixed with 350kHz. The mixers output is amplified and filtered to control a 10MHz VCXO (voltage controlled crystal oscillator). The loop is completed by dividing the 10MHz VCXO to 350kHz. An integrator can be switched into the loop, forcing the mixer output to a nominal zero volts DC. The signal from the mixer represents the phase fluctuations of the IF signal. The signal can then be spectrum analyzed with the -hp- 3582A. The 350kHz driving the mixer is also 90 degrees phase shifted and used to drive a second mixer. The output of the second mixer represents the amplitude fluctuations on the IF signal; these fluctuations are analyzed on channel A of the -hp- 3582A.

6-36. DETAILED DESCRIPTION OF THE A3 BOARD

6-37. Input Section

There are two channels in the input section of the A3 Board. One is an amplified channel with a gain of 2.5. The other channel is a bandpass filter section which consists of four 350kHz bandpass filter stages. The bandpass filter provides image rejection and amplitude compensation for the roll-off of the -hp- 3585A IF signal. The amplitude compensation is accomplished by peaking each 350kHz section at about $\pm$5kHz from their centers. At the front of each channel is discrete diode switching.

6-38. Mixer Section

There are two ring diode mixers, one for AM, the other PM. The switching signal for the AM mixer is 90 degrees out of phase with the switching signal for the PM mixer. The outputs of the mixers are fed into separate 50kHz lowpass filters.

6-39. 50kHz and 0.16Hz Filters

Each 50kHz filter consists of a lowpass and a highpass section, arranged so that the input impedance of the network is 50Ω at all frequencies; this matches the output impedance of the mixers. The output of each lowpass section is amplified by 20. In channel A, the X20 amplifier feeds a highpass filter with a cutoff frequency 0.16Hz. The reason for the 0.16Hz highpass filter is to maximize the sensitivity of the -hp- 3582 when measuring amplitude fluctuations.

6-40. Loop Shaping Control and Lock Detector

The output of the channel B X20 amplifier is fed to the Loop-Shaping Control whose output drives the VCXO control voltage input. In the beginning of a measurement, the integrator (U300a) in the Loop Shaping Control is disabled. The lock range of the phase-locked loop in this state is from about 100Hz to 150Hz. This configuration is used to acquire lock. Once the Lock Detector has determined that the loop is locked, it enables the integrator in the Loop Shaping Control. This changes the lock range of the phase-locked loop to about 5Hz to 10Hz. The Lock Detector will disable the integrator if no IF signal is present, the integrator op-amp is saturated, the phase detector is operating in a non-linear region, or if the operator disables the integrator by calculator control. The Lock Detector can also be overridden by calculator control to force the integrator into the circuit.

6-41. 10MHz Voltage Controlled Crystal Oscillator

The VCXO is a grounded base oscillator; the center of the tuning range is controlled by the bias on varicaps CR300-CR303. This bias is set by adjusting R367. The width of the tuning range is varied by changing the gain in the last amplifier of the Loop Shaping Control (U300b) with R360. The purpose of these adjustments is to make a zero volt control voltage correspond to a 10MHz output from the oscillator and to ensure that the frequency range of the VCXO is ±6kHz. The rest of the circuitry in the VCXO disables the oscillator if the -hp-3585 10MHz reference is used.

6-42. Adaptive Coupler

The adaptive coupler is either a unity gain amplifier or a highpass filter with a cutoff frequency of 0.16Hz. If the highpass filter is selected, the capacitor C328 initially charges through a low resistance; this reduces the settling time of the highpass filter. Both the control voltage of the 10MHz VCXO and the A5 board output are inputs to the Adaptive Coupler. The output of the Adaptive Coupler is routed to the -hp- 3582.

6-43. 350kHz/370kHz Synthesizer

The output of the 10MHz Output Buffer is fed into the ÷25 circuit. This 400kHz is a reference for a phase-locked loop which synthesizes 14MHz or 14.8MHz, depending on the state of L14. This 14MHz or 14.8MHz signal is divided by 40 to provide the LO signal for the mixer of 350kHz or 370kHz.

This phase-locked loop consists of a Phase Detector, a 14MHz VCO, a Buffer, and a ÷35 or ÷37 circuit. The ÷35 or ÷37 circuit determines either the 14MHz or 14.8MHz. The Phase Detector uses dual D flip-flops (U205) that switch current sources. The current sources feed a current-to-voltage converter whose output is the control voltage for the 14MHz VCO.

The 14MHz VCO is an LC Colpitts oscillator; it operates at either 14MHz or 14.8MHz, depending on the state of L14 (which selects either divide by 35 or 37). The output of the divider is 400kHz which is compared with the 400kHz derived from the 10MHz reference or the 10MHz VCXO.

The Mixer Driver divides the 14 or 14.8MHz signal by 10 and then by 4, utilizing U201 and U200, respectively. U200 also provides a local oscillator signal for the AM mixer that is 90 degrees out of phase with the LO for the PM mixer.

6-44. X5 Amplifiers

At the output of the X20 amplifier in channel B and at the output of the 0.16Hz High Pass Filter of channel A is a bypass path and a X5 Amplifier path. Either the bypass path or the X5 amplifier may be selected. The purpose of the amplification is to provide more gain when measuring phase noise. The amplifier path has a frequency response compensation for the roll-off of the 350kHz IF of the -hp- 3585. This compensation corrects the amplitude response when measuring sideband noise. The bypass path and the output of the X5 Amplifier join at the input of the Low Pass Filters. The output of the Adaptive Coupler also joins Channel B at this point. L6 connects Channel A and Channel B.

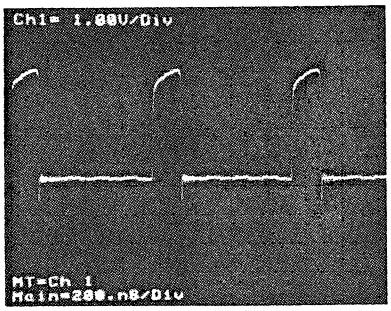
6-45. Lowpass Filters

Each Lowpass Filter is programmable to provide either a 100kHz, a lkHz or a 10Hz cutoff frequency. The output of each filter is fed into a unity gain buffer. These are the Output stages which drive the channel A and channel B inputs of the -hp- 3582.

REMOVING THE A3 BOARD FOR SERVICING

When servicing is required, the A3 board may be removed by pulling up all of the black retainer pins. After this, the board may be placed vertically (for ease of testing) by rotating the board toward the back of the instrument and inserting the bottom edge and the side edge into the plastic holders provided. You may desire to remove a few cables to facilitate the rotating of the board.

1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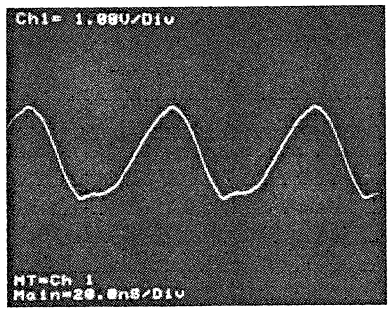
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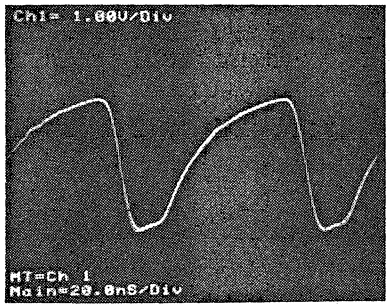
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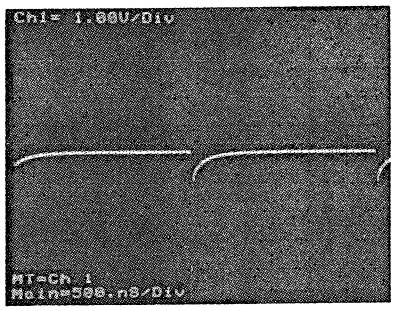
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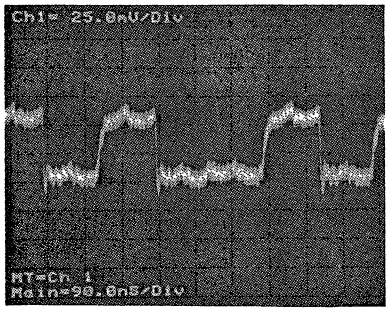
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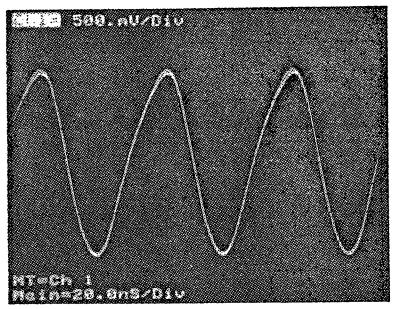
6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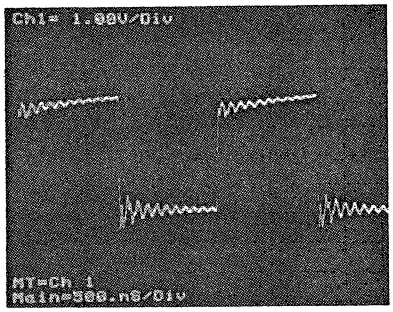
MT=Ch 1
Main=20.0nS/Div

7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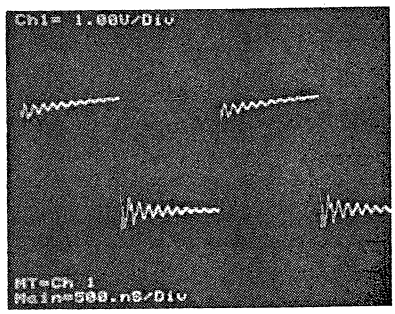
Main=500.nS/Div

8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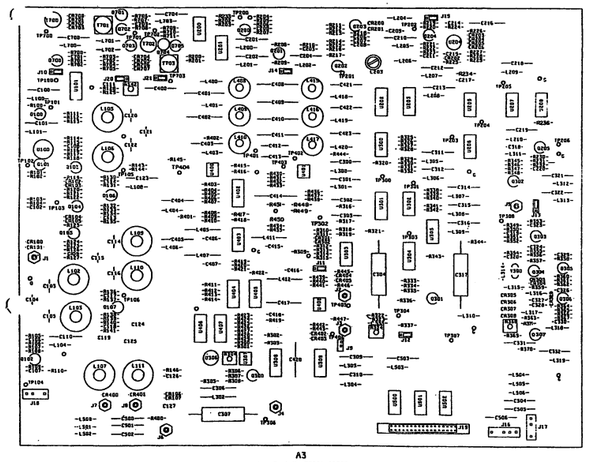


A3
h-p Part No 35601-66503

NOTE

Refer to the Service Group text for disassembly instructions to access this circuit board.

NOTE

Refer to Appendix B for IC diagrams and truth tables.

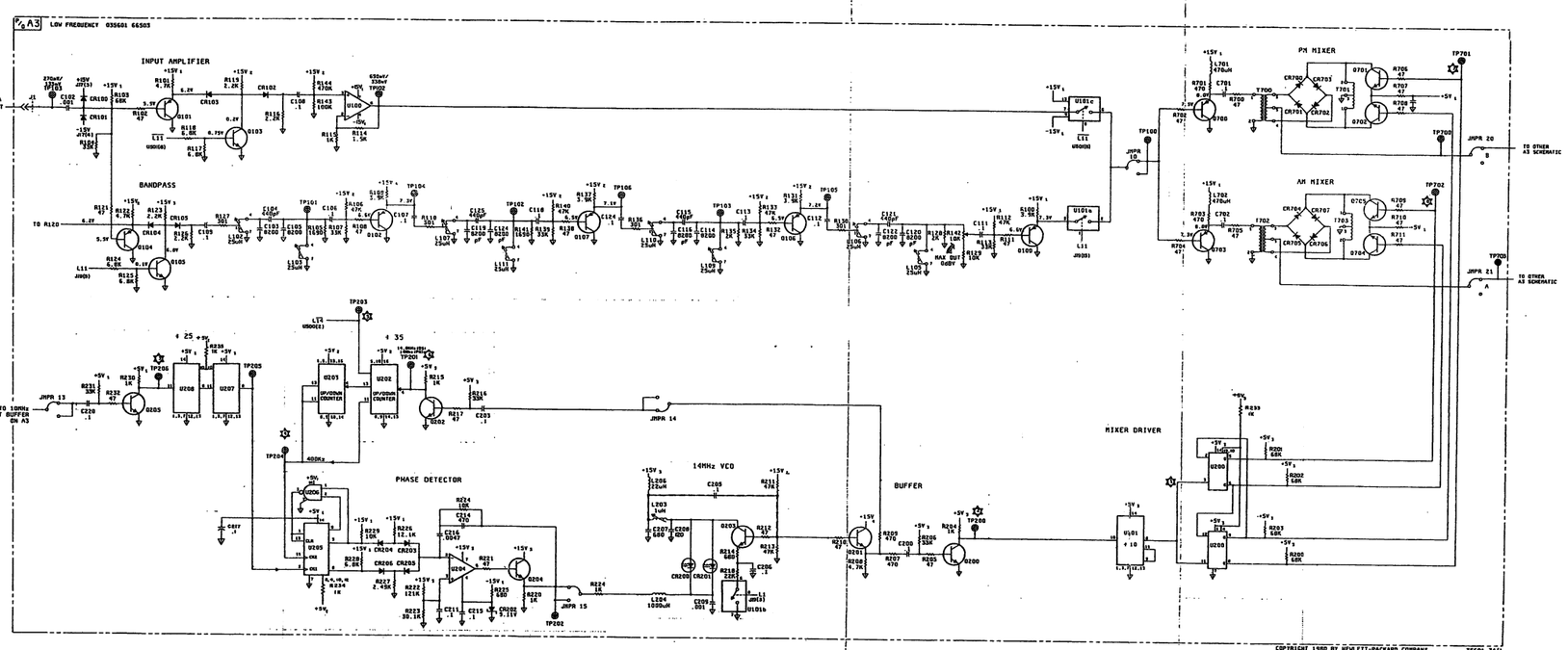
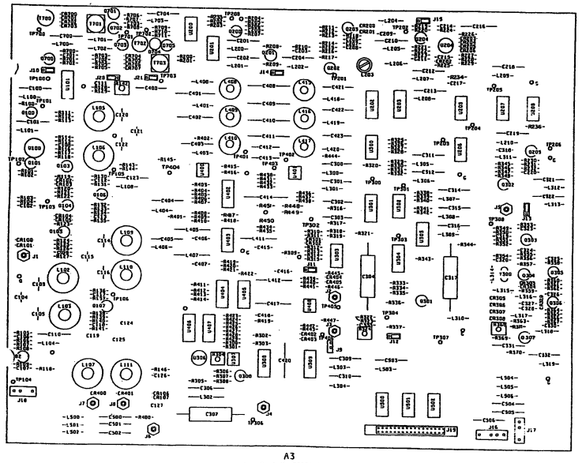


Figure 6-21. A3 Schematic and Component Locator



A3

h-p Part No 35601-66503

NOTE

In order for waveshapes to be valid, L13 must be driven high (turn-on state is low). This is done most easily using "SWITCH". See paragraph 6-28 for instructions on using "SWITCH".

NOTE

Refer to the Service Group text for disassembly instructions to access this circuit board.

NOTE

Refer to Appendix B for IC diagrams and truth tables.

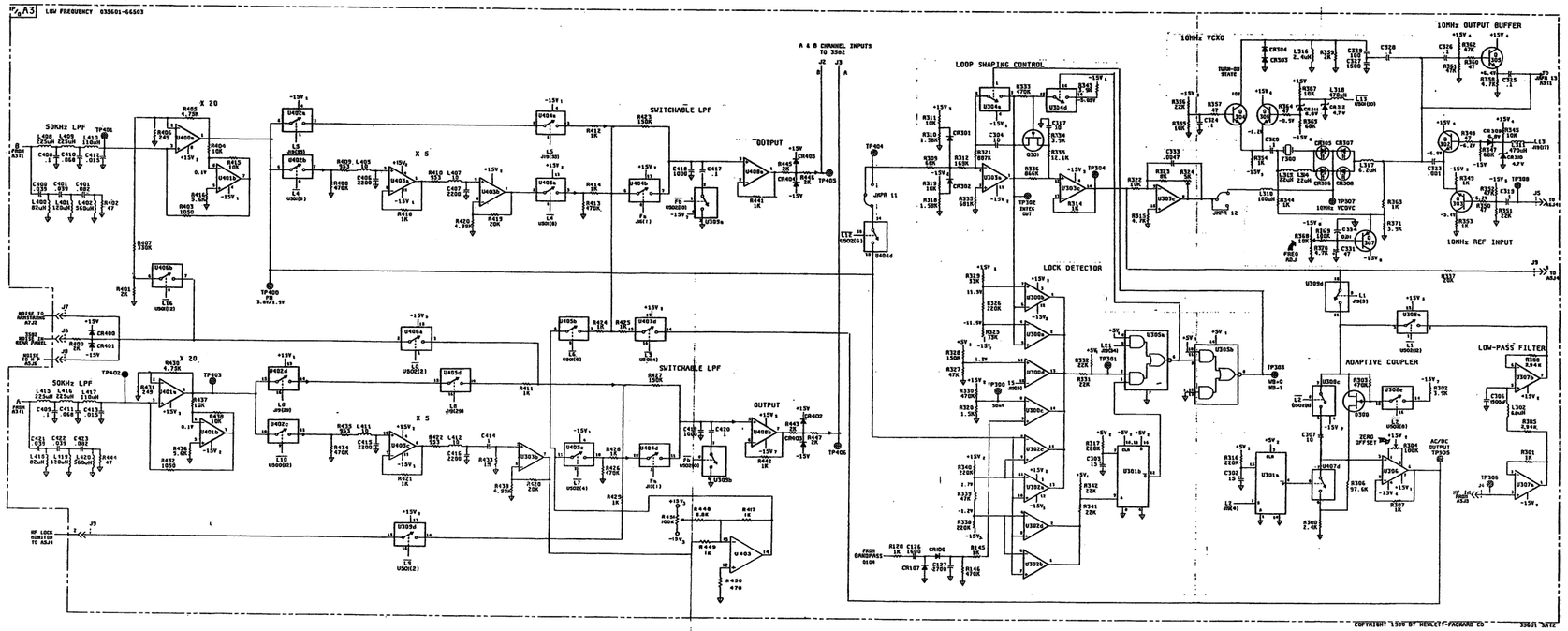
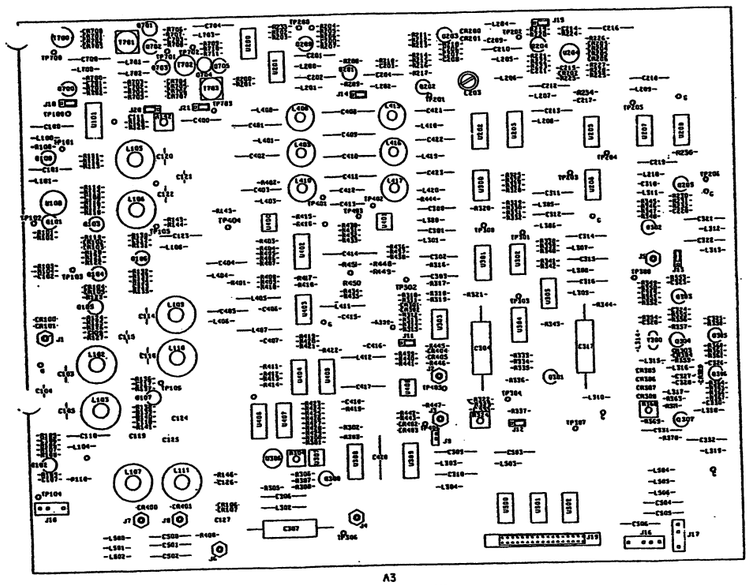


Figure 6-22. A3 Schematic and Component Locator
Revision B



A3

h-p Part No 35601-66503

NOTE

Refer to the Service Group text for disassembly instructions to access this circuit board.

NOTE

Refer to Appendix B for IC diagrams and truth tables.

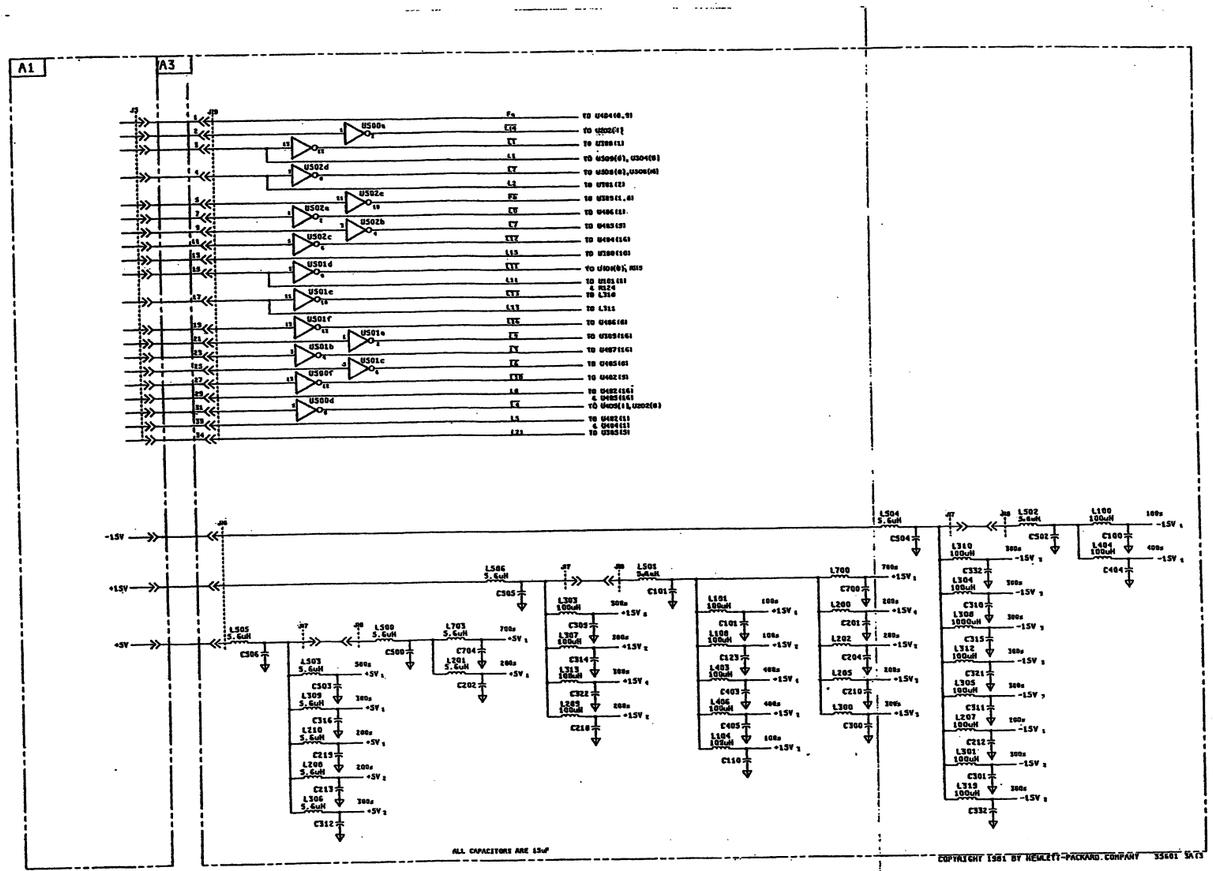


Figure 6-23. A3 Power Supply Filters and Control Input

SERVICE GROUP TWO
A4 BOARD: HIGH FREQUENCY INTERFACING

6-46. INTRODUCTION

The main signal path begins at J8 on the front panel (0-40MHz Input Signal). It then passes through Relay K2, where an alternate calibration signal can be switched in. The main signal then passes through Kl into a coaxial bypass path. C5 and C33 are high frequency return loss compensation capacitors. Finally, the signal goes through K12 to the output connector J5, which goes to the 50Ω input of the -hp- 3585A.

This path is used for direct input to the -hp- 3585A, primarily in the Narrow Band Analysis mode. There is a small amount of insertion loss in this path: approximately .07dB at low frequencies, increasing to about .4dB at 40MHz. The software of the system takes this insertion loss into account by utilizing a power series equation with experimentally determined coefficients. These coefficients are an average value for all -hp- 35601A units not for each particular unit.

This direct input path is also used in the Noise Sideband Analysis mode, again as a direct input to the -hp- 3585A. In this operating mode, the insertion loss of the path is not critical to the accuracy of the measurement, so no compensation is made for the insertion loss.

6-47. DETAILED DESCRIPTION OF THE A4 BOARD

6-48. Input Mixers

The inputs used for high frequency Phase Noise measurements are either of two high frequency, doubly balanced, mixers Ul or U2. Ul is preceded by coupling capacitors (C1-C4) on each of its two inputs. The capacitors protect the mixer against large DC and low frequency signals. The lGHz to 18GHz mixer has internal coupling capacitors to provide the same kind of protection.

6-49. One-Pole Lowpass Filter

The output of either mixer is selected by K13. This signal, or the signal routed from an external phase detector or frequency discriminator through J8, is selected by Kl and routed into the one-pole lowpass filter. This filter has a cutoff frequency of about 200MHz; the filter has a 50Ω input impedance at all frequencies. In other words, power at frequencies above 200MHz is dissipated by the resistors in the filter.

6-50. 60MHz Lowpass Filter

The next circuit block is a 60MHz Butterworth Lowpass Filter which has a 50Ω input impedance at all frequencies. A highpass filter with complementary characteristics is connected in parallel with the low pass filter to provide the constant resistance. Power at frequencies above 60MHz is dissipated in the 47Ω resistor R20.

6-51. Overload Detector

The Overload Detector is connected to the output of the 60MHz Lowpass Filter. This circuitry senses voltages exceeding about 2 volts peak; these voltages could damage subsequent amplifiers. If the Overload Detector senses an overload, it sets the Overload Flip-Flop U11b on the Phase Locked Loop Control board (A5). The output of Overload Flip-Flop (A5U8e, pin 10) returns to the A4 Board and drives the common inputs of the gates in U6. If this line goes low, none of the relays connected to the output of the U6 can be actuated. So, if an overload exists, Kl, K12, Kll, K14, and K10 are all de-energized; this sends the overloading signal into the bypass path and directly to the -hp- 3585A. The -hp- 3585A is protected for inputs up to one watt in normal operation; higher DC voltages cause the -hp- 3585A to disconnect its input circuitry.

The Overload Detector has both positive and negative peak detectors. The two diodes CRl and CR6 together with R7l and C14 form a protection circuit for the Overload Detector itself. CR2 and CR5 are rectifying diodes, and CR3 and CR4 provide temperature compensation for the rectifiers. If either a positive or negative peak, exceeding approximately 2 volts, is detected, either U3A or U3B output is clamped to -15 volts which sets the Overload FlipFlop. The transistor Q10 is used to ensure that no overload detection can occur if the internal mixer path is selected. A damaging signal connot be sent through the internal mixer path, so the overload circuitry is not needed under these conditions.

6-52. 2MHz Lowpass Filter

Following the 60MHz Lowpass Filter is a 2MHz Lowpass Filter which is switched in for phase detector measurement frequencies below 95MHz. The 2MHz filter has a complementary highpass filter connected in parallel with it; power at frequencies over 2MHz is dissipated in R34. The output of the 2MHz Filter is fed to relay Kll in the normal path, i.e., KllB is normally closed and K14B is normally open. The signal then goes through K12 to the -hp- 3585A. This path is used for all calibration measurements for Phase Noise; and also for Phase Noise measurements when the phase fluctuations are longer.

6-53. 40dB Amplifier

Where greater sensitivity is required in normal operation of the Phase Noise mode, the 40dB Amplifier is switched in with K11 and K14. This provides a gain of 100 to the emitter of Q9. Also at this point, a 49.90 ohm back-match resistor feeds the -hp- 3585A through K14 and K12 so that the gain into the 50Ω load is 34dB. At the input of the amplifier there is a 1/16 amp fuse F2. This fuse is intended to burn out if a fast, large transient is applied. A large current will flow through F2, L16, and into the clamp diodes CR11, 12, 13, and 14. If the transient is sufficiently large and fast, the fuse will blow; if the transient is not large and fast, the overload detector will disconnect the relays (as previously discussed) and prevent the fuse from blowing. In the 40dB amplifier, the inputs are protected by the diodes until the fuse can burn out or until the overload circuitry shuts down the input signal in the case of an overload.

The amplifier has two parallel circuit paths, a high frequency path and a DC path. The signals are diplexed between these two paths by C28 and L16; the approximate cutoff frequency is 170Hz. All signals above 170Hz pass through the high frequency section of the amplifier; all signals lower than 170Hz go through the DC path. C28, L16, R54, and R51 are chosen or set so that the input impedance of the amplifier is approximately 43 ohms. The

resistance of F2 is approximately 7 ohms; so the signal from the Lowpass Filters and the mixers is terminated into 50Ω at all frequencies.

In the AC path, Ql through Q4 form a 20dB low noise amplifier with shunt feedback to set the input impedance to 43 ohms. This amplifier is AC coupled to an operational amplifier circuit which sums the AC signals from Q4 and DC signals from U5 (the low frequency path). This amplifier has 20dB gain and has feedback via R77 and C32. C32 is chosen to set the high frequency response in the amplifier. In the DC path, the output is taken from U5 via the low pass filter L18, R52, R53, and C27. There is a DC feedback path from the output of U9 to the input of U5 to set the 43 ohm input impedance of the DC amplifier. The output of Q9 is a pick-off point for R80 which is used for amplified measurements that are made by the -hp- 3582A.

6-54. Tracking Generator Input Pads

When K7 is closed J1 sends the -hp- 3585A Tracking Generator output through a 35dB pad to K5. The signal from K7 can also be passed by K6 to the Phase Locked Loop Control Board (A5) for transfer function measurements. The signal may also be sent through K5 to the succession of 3dB pads and K2 (the calibration relay) into either the bypass path or the lowpass filter to amplifier paths. After this point, the signal is measured by the -hp- 3585A and used to calibrate the insertion losses or gains of these various paths so that exact gain values are available for use by the software.

6-55. Armstrong Modulator Related Paths.

If K5 is left in its normally closed position, and if K3, K4, and K2 are actuated, then a signal from the Armstrong modulator is sent to the -hp- 3585A. The Armstrong modulator signal is used for flatness checks of the Noise Sideband measurement mode. J2 and J9 on the High Frequency Board (A4) receive signals from the PhaseLocked Loop Control Board (A5). J2 is the output feeding the lM ohm input of the -hp- 3585A. J9 receives the phase locked-loop control voltage for the external oscillator being used in the Phase Noise measurement.

6-56. Lag/Lead

The High Frequency Board (A4) has a lag-lead network which attenuates noise from the Phase Locked-Loop Control Board above about 3.5 kHz. This consists of the following components: L19, R88, R112, R89, and C34.

6-57. Power Supplies

Power supplies for both the High Frequency Board and the Phase Locked-Loop Control Board come from J13 of the A5 Board. The filtering for each supply takes place on the High Frequency Board. Power is passed to the Phase Locked-Loop Control Board from the High Frequency Board via A5J1 and A4J14.

6-58. Relay Drivers

All of the relays on the A4 board are actuated by Darlington transistor relay drivers. Each relay driver has additional filtering. RF filtering at the relay consists of either two resistors and two capacitors, or two inductors and two capacitors. In several cases, the relays are operated such that when one relay in a circuit path is closed, the circuit path is completed by another relay being open. In this way, when one relay is activated, the other is deactivated and combined power consumption of the two relays remains constant.

6-59. Making Phase Noise Measurements with Voltage Control/the 12dB Amplifier

In order to make Phase Noise measurements on oscillators from 5MHz to 18GHz, a phase locked loop must be established between the reference oscillator and the oscillator under test. Either of these oscillators may be voltage-controlled. In this case, a frequency correction signal (from the output of a Mixer on the A4 Board) must be provided for the voltage-controlled oscillator. The output for this phase locked-loop control is taken from the output of K9, the 2MHz Lowpass Filter, or the 2MHz Lowpass Filter bypass. The signal at this point passes through an inductor and fuse F1 (which protects U4 when K10 is closed). The clamp diodes CR7-10 also protect U4. With K10 closed, L15 and the stray circuit capacitance form a lMHZ low pass filter. U4 amplifies the phase error signal by 12dB (a factor of four) then passes the signal to the Phase Locked-Loop Control Board.

REMOVING THE A4 BOARD FOR SERVICING

When servicing is required, the A4 board may be accessed by following these procedures:

1. Remove the trim strips from the top and bottom of the front panel frame.

2. Remove the retaining screws for the front panel; these are normally hidden by the trim strips. The front panel assembly should now be easily removable; the various cables will still be attached, of course.

3. The A5 board should be removed by sliding it off the plastic retaining pins and the connector that joins it to the A4 board.

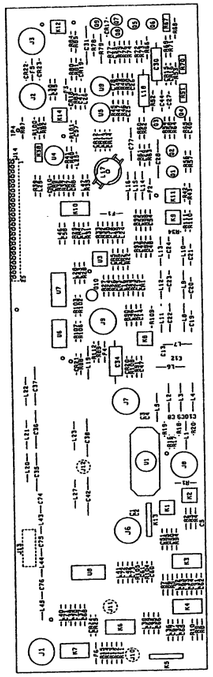
4. Remove the screws securing the stainless steel cover to the back of the front panel assembly.

5. Now that the A4 board is accessible, the A5 board may be plugged into the A4 board using the right angle connector (-hp- part number 035601-66508) provided in the accessory kit (-hp- part number 035601-84401).

The A4 board may be tested while in this configuration, although you may experience some difficulty in identifying some of the components. If this is the case, or if a component on the board needs to be replaced, the A4 board may be removed by continuing with the following step:

6. The A4 board is removable from the front panel assembly by removing the nuts from the front panel connectors. To do this, use the nut drivers with the protective plastic inserts that are available as accessories (9/16" nut driver and protector 8720-0008 and 8710-0560; 5/16" nut driver and protector 8720-0003 and 8710-0559).

Make sure to use the nut drivers with protective plastic inserts to remove the nuts from the front panel connectors. Failure to do this will probably result in cosmetic damage to the front panel finish.



hp Part No 35601-66504

NOTE

Refer to the Service Group text for disassembly instructions to access this circuit board.

NOTE

Refer to Appendix B for IC diagrams and truth tables.

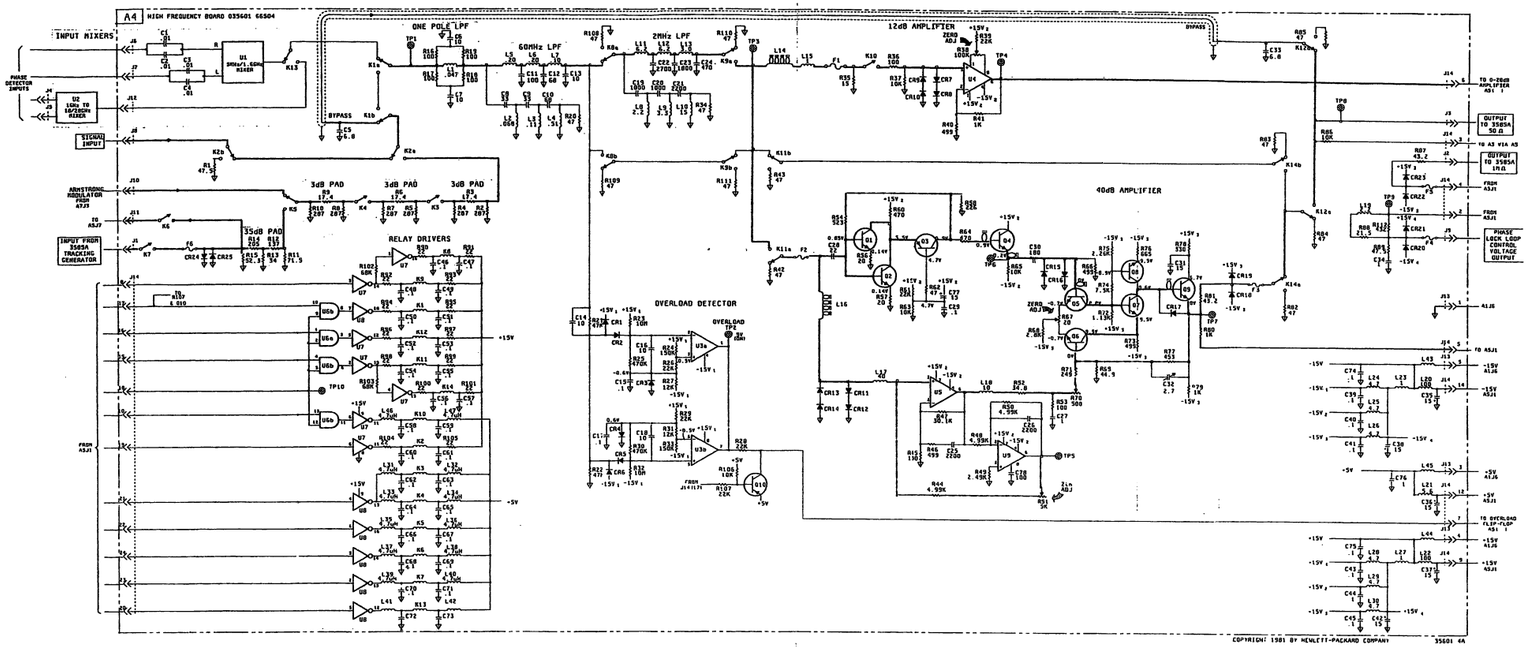


Figure 6-24. A4 Schematic and Component Locator
6-63/6-64

SERVICE GROUP THREE
A5 BOARD: PHASE LOCKED LOOP CONTROL

6-60. DETAILED DISCUSSION OF THE A5 BOARD

6-61. 0 to 28dB Amplifier in 4dB Steps

The phase error signal from the High Frequency Board (A4) is amplified in two adjustable gain stages. The first amplifier includes U13 as the amplifier. The combination of U2 and a resistor network comprise the feedback to provide the desired gain. The output of U13 is clamped by CR2 and CR4 to ensure that the voltage at this point never exceeds 6 volts; this is done to avoid damaging the CMOS multiplexer U2. The three control lines, pins 9, 10, and 11 of U2, select the feedback resistance for U13. The gain is set in 4dB steps from 0 to 28dB; eight steps are possible. Following U13 is a 6dB attenuator consisting of two resistors, R94 and R13.

6-62. 6 to 20dB Amplifier in 2dB Steps

U14 can have a gain ranging from 6-20dB in 2dB steps. The output of U14 is fed back via R22; this provides 6dB attenuation to the junction of CR7 and CR8. This point has been clamped at ±6 volts to protect the CMOS Multiplexer U3. Pins 9,10, and 11 of U3 select the feedback resistance for U14. This provides eight gain steps, from 6dB to 20dB, in 2dB steps.

6-63. 5 Volt Detector and Integrator

Following the 6-20dB Amplifier, a comparator circuit detects if the input or output of the integrator U15 exceeds ±2.1 volts. If the voltage at the input or output of U15 exceeds 2.1 volts, the Out-of-Lock Flip-Flop will be set; this closes a switch around the integrator capacitor on U15. (i.e., The integrator becomes a unity gain amplifier when the 2.1 Volt Detector trips.) It is assumed that if the voltages at this point have exceeded ±2.1 volts, the loop is either out of lock or on the verge of being out of lock. Therefore, if the voltage exceeds ±2.1 volts, the Out-of-Lock Flip-Flop is set and the the LED on the front panel labeled "OUT OF LOCK TRIPPED" is turned on.

6-64. Front Panel Meter

Following the Integrator is a meter which is mounted on the front panel. This meter indicates whether or not the control voltage being sent to an external oscillator is in an acceptable range. In particular, it warns the user when one of the oscillators is drifting (before the phase locked-loop unlocks). The meter also indicates a quadrature phase relationship between two signals sent into the input mixer when Phase Noise measurements without voltage control are being made.

6-65. Summing Amplifier

If the phase locked loop is to be operated, the switch U7B is closed. Two gains are available (depending on whether or not U17C is actuated) at the summing junction of op-amp U19A. This Summing Amplifier combines the error-signal for the phase-locked loop (which comes from U15A) with the signal from the Digital-to-Analog Converter. This provides a DC offset at the output of U19A. Also summed at the Summing Amplifier is the Noise Source from the -hp- 3582A (if desired) or the Tracking Generator signal from the -hp- 3585A. The addition of the noise source or the tracking generator permits the measurement of the error function of the closed phase-locked loop. This enables the calculation of the correction factors used in Phase Noise measurements. The calculations are based on the actual dynamic conditions of the phase-locked loop when it is closed.

At the output of the Summing Amplifier U19A, a signal is sent to the 1MΩ input of the -hp- 3585A for transfer function measurements at frequencies above a few hundred Hz. The output of the Summing Amplifier also provides a signal for channel B of the -hp- 3582A for transfer function measurements below a few kHz.

6-66. Wein Bridge Oscillator

Also connected around the summing amplifier is the Wein Bridge Oscillator U15D. The Wein Bridge Oscillator operates at a frequency of approximately 1.6Hz. When the phase-locked loop is open, sufficient gain exists in U19A for the Wein Bridge Oscillator to operate. The Wein Bridge Oscillator provides a searching signal for the external oscillator. When the phase-locked loop closes, U19 appears to the Wein Bridge Oscillator to have very low gain; therefore the Wein Bridge Oscillator does not operate.

6-67. Oscillation Detector

If the Wein Bridge Oscillator is operating, its output is split into two components, each 90 degrees apart from the other. These components are converted to provide a four-phase signal to diodes CR14, 15, 16 and 17. This signal is rectified by U18C and used as an indication that the loop is unlocked with the Wein Bridge Oscillator searching. This signal also sets the Out-of-Lock Flip-Flop U11A.

6-68. Lag/Lead Network

The output of Summing Amplifier is fed to a Lag/Lead frequency compensation network consisting of R25, C8 and various resistors selected by the CMOS multiplexer U4. The Lag/Lead resistor is selected by U4; this is determined by the software. The software determines this by the characteristics of the external oscillator within the phase-locked loop. U15B is a buffer for the Lag/Lead network.

6-69. 0 to 20 dB Attenuator/Output

The Lag/Lead Network is followed by 0 to 20dB attenuator. The phase-locked loop error-signal is finally sent to the external oscillator via pin 2 of J1 on the A5 Board.

6-70. FET Switch Drivers

All control signals from the HP-IB Interface board (A1) for both A4 and A5 boards are sent, via A1J2 and a 50 pin cable, to J2 on the A5 board. The control signals used on the A4 board are simply passed from J1 of the A5 board to J14 of the A4 board. The control signals that operate the CMOS devices of A5 (U2, U3, U4) are tied to +5 volts with resistor pack R89. The +5 volts is necessary to guarantee that the CMOS will be switched properly. All the control signals that operate the FET switches of A5 (U5, U6, U7, U17) are inverted with U8, U9, and U10 so that any FET switch will be opened when its control line is low.

6-71. Overload Flip-Flop

The Phase-Locked Loop Control Board (A5) contains Overload Flip-Flop U11B. If an overload occurs, J1 pin 7 is pulled low which pre-sets U11B; the Q output (pin 9) goes high. This output is inverted with U8E and sent to the A4 board where it disables some of the relay drivers. The inverted output of U11B (pin 8) is sent to Q1 to drive the front panel overload indicator.

6-72. Out-of-Lock Flip-Flop

The Out-of-Lock Flip-Flop is U11A; it operates the "Out-of-Lock" indicator on the front panel. In addition, U11A closes U17D to short the capacitor of the Integrator. The output of UllA is then inverted with U8D; this line controls U17D and can be clamped to ground by Q3. This is done by the same line that controls U7B (which closes phase lock loop). If the phase-locked loop is open, the control line feeding U7B is high. This causes Q3 to saturate and guarantees that the integrating capacitor is always shorted by U17D. Then, if the software toggles the flip-flop UllA, the "Out-of-Lock" light will be out yet the integrating capacitor will be shorted. This permits the meter to read correctly when there is no phase-locked loop. The meter then indicates the quadrature on the input mixers by a reading of zero.

6-73. Digital to Analog Converter

The D-to-A converter U1 takes its inputs directly from the HP-IB Control board (A1). The output is converted from current to voltage by U12A; U12B inverts this signal. U17A and U17B select a positive or negative voltage to be connected to the summing node of U19A.

REMOVING THE A5 BOARD FOR SERVICING

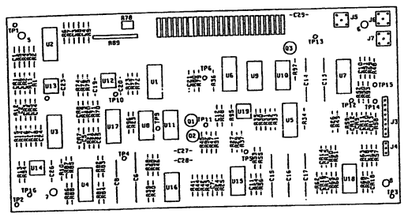
When servicing is required, the A5 board may be accessed by following these procedures:

1. Remove the trim strips from the top and bottom of the front panel frame.

2. Remove the retaining screws for the front panel; these are normally hidden by the trim strips. The front panel assembly should now be easily removable; the various cables will still be attached, of course.

3. The A5 board should be removed by sliding it off the plastic retaining pins and the connector that joins it to the A4 board.

4. The A5 board may be plugged into the A4 board using the right angle connector (-hp- part number 035601-66508) provided in the accessory kit (-hp- part number 035601-84401).



A5
h-p Part No 35601 66505

NOTE

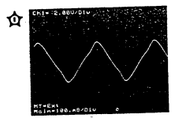
Refer to the Service Group text for disassembly instructions to access this circuit board.

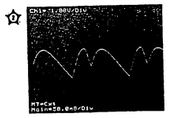
NOTE

Refer to Appendix B for IC diagrams and truth tables.

NOTE

These waveforms are obtained when the Wein Bridge Oscillator is running; that is, when S4 is closed. S4 may be closed using "SWITCH", a subprogram of "601TST". Refer to paragraph 6-28 for the discussion entitled "CONTROLLING THE -hp-35601A USING SUBPROGRAM SWITCH".





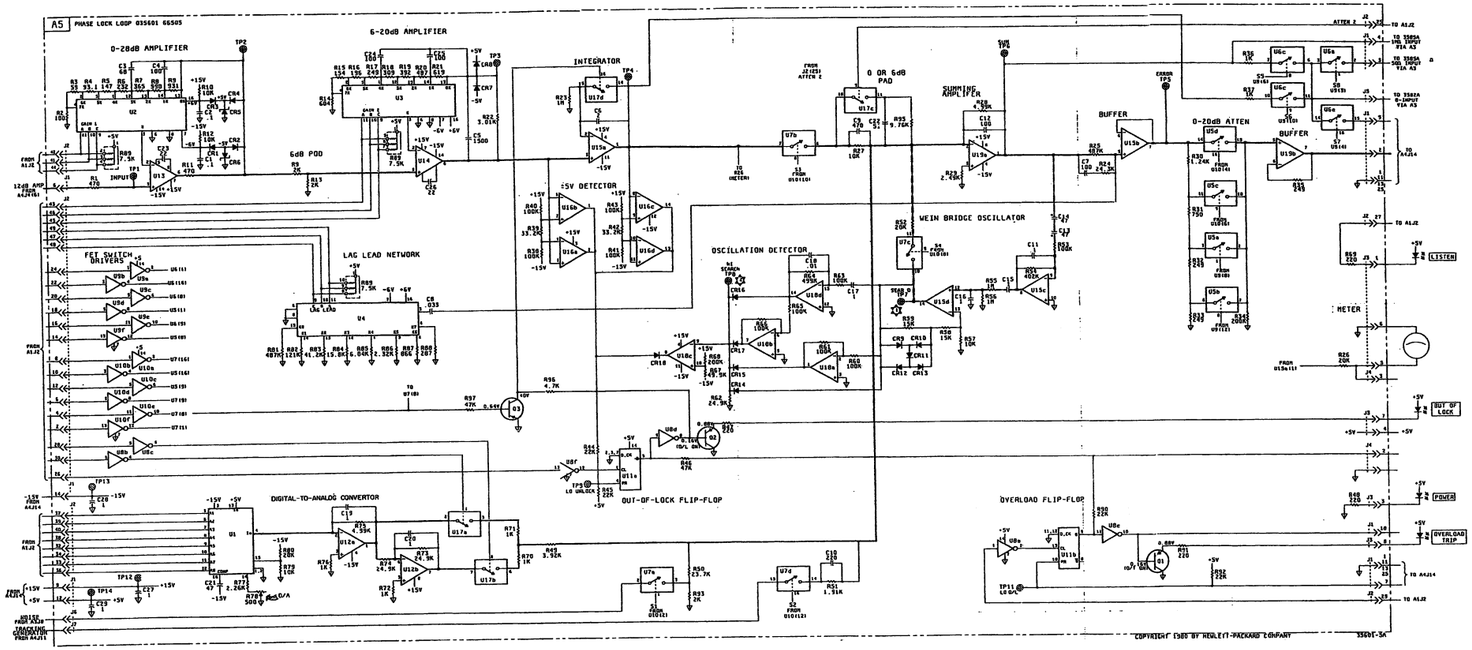


Figure 6-25. A5 Schematic and Component Locator

SERVICE GROUP FOUR
A1 BOARD: HP-IB INTERFACING/POWER SUPPLY

6-74. INTRODUCTION

The purpose of the A1 board is to drive the lines that control switches in the rest of the -hp-35601A. These lines are latched on the A1 board in IC's U1 through U5 and U8 through U12. The latches can be loaded manually or via the HP-IB. All the lines have a high-true logic definition except for the HP-IB lines at J4.

6-75. DETAILED DESCRIPTION OF THE A1 BOARD

6-76. Power Supply

The power supply has a typical configuration: transformer, rectifiers, filters, and regulators. The regulators are simply integrated circuit regulators. Diodes CR8, CR9, and CR11-CR14 protect the regulator ICs. LEDs CR15-CR17 indicate that the supplies are working.

6-77. Start-up of the A1 Board.

When the power supply is turned on, C14 will charge slowly through R11. This forces the reset line to remain low for a period of time, allowing the board to preset. R11 and R12 determine the final voltage at the input of U4A. C13 and CR6 force C14 to discharge quickly when the power is removed.

6-78. Local Operation

SW3 determines the latched data as well as the latch number. The most significant bit of SW3 determines whether the other bits of SW3 comprise data or a latch number. When SW3 bit 8 is open (i.e., a logic level of 1), SW3 is in the data mode; when bit 8 is closed(0), SW3 determines the latch number. SW1 determines whether U17, U18, and U19 select data from SW3 or the HP-IB.

For manual operation, SW1 must be closed. When SW3 bit 8 is closed, closing SW2 generates a latch pulse that controls U17 via U19, U28C, and U22D. This latches the latch number, set by SW3 bits 7 through 1, into U17. The output of U17 is then decoded by U16 and U15 to select the correct latch to send the data pulse to. A data pulse is generated when SW3 bit 8 is open and SW2 is closed; it is sent to the appropriate latch via U19, U22, and U16 or U15. The latch number is displayed by CR2-CR5.

Refer to the Appendix at the end of this manual for detailed information on operating the -hp- 35601A locally.

6-79. Remote Operation

The latch portion of the A1 board works the same in the remote mode as it does in the local mode. However, in the remote mode, the input to the Data Selectors is from the HP-IB and the load data pulse is generated by the Handshake circuitry.

NOTE

HP-IB input lines have a low true logic definition.
The signals denoted with ' ' are HP-IB control lines.

When the A1 board is addressed to listen or the 'ATN' line is true (low), the A1 board must do a three-wire handshake to get data from lines 'DIO1' through 'DIO8'. This is done using the 'NRFD' and 'NDAC' lines which are driven by the Handshake circuitry

6-80. Handshake

Three R-S flip-flops, each consisting of gates, are included in the circuit; for this discussion, these will be defined as FF1, FF2, and FF3. FF1 consists of U32A and U32B where pin 4 is defined as Q1. FF2 consists of U32C and U32D where pin 13 is defined as Q2. FF3 (the addressed flip-flop) consists of U27B and U25D with the Q output (defined as LADS) at pin 8. Figure 6-25 shows the timing relationship of the handshake signals; Figure 6-26 is a state diagram of the events in the handshake which shows the outputs of FF1 and FF2 (Q1 and Q2) as their inputs vary.

The output of U33A is pin 4 and defined as MONO1. The output of U33B is pin 5 and defined as MONO2. U33A is triggered by a positive-going edge on pin 3; the monostable signal (MONO1) has a period of 0.5 Ω sec. U33B is triggered by a negative-going edge on pin 10; MONO2 has a period of 0.5 Ω sec.

The next state of FF1 and FF2 is determined by the HP-IB handshake signals, MONO2, and the present states of FF1 and FF2. These flip-flops are driven by U24, U29D, U29C, and U28D. NDAC is generated by U26C and is determined by this expression:

$$\text{'NDAC'} = \text{DAC} \bullet \overline{\text{MONO2}}$$

DAV is generated by U26B and is defined as follows:

$$\text{DAV} = \text{'DAV'} \bullet (\text{'ATN'} + \text{LADS})$$

RFD is generated by FF1 and is equivalent to Q1; DAC is generated by FF2 and is equivalent to Q2.

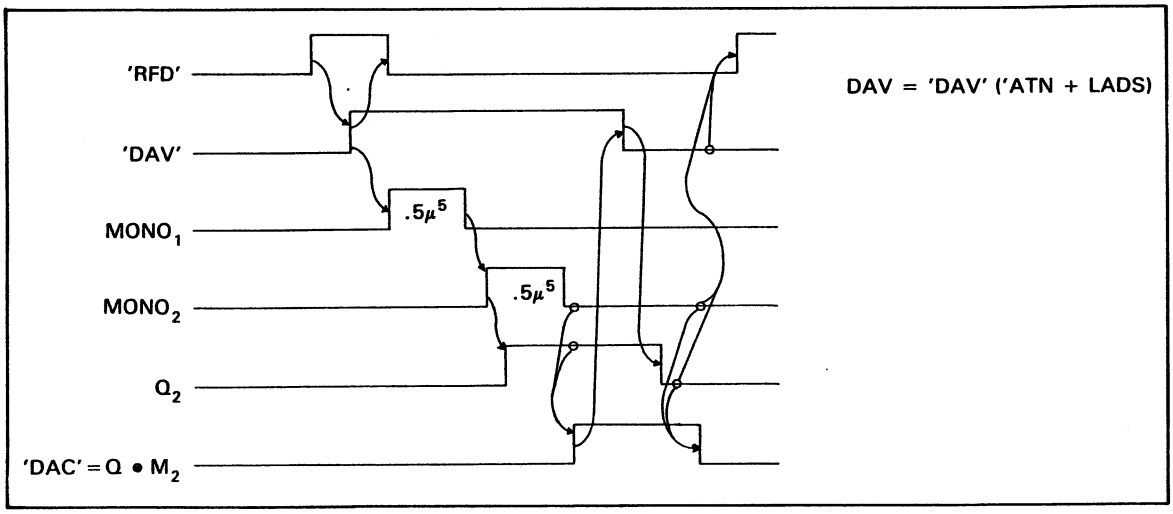


Figure 6-25. Timing Diagram for HP-IB Handshake

After start-up, RFD is normally set high ('NRFD' = 1) and DAC is set low ('NDAC' = 0); this is state 10 in Figure 6-26. When the HP-IB talker sees this, it will put data on lines 'DIO1' through 'DIO8', wait for the lines to settle, then set DAV high (the HP-IB line 'DAV' = 0). When the handshake circuitry sees DAV = 1, it will go to state 00, set RFD low, and trigger MONO1. After 0.5Ω sec, MONO1 will trigger MONO2. If DAV is still high, the circuitry will go to state 01; it will keep RFD low and set Q2 high. MONO2 will generate the latch pulse to either U17 or one of the control latches depending on the state of DIO8. At the end of MONO2, the data has been latched, so 'NDAC' is set high. When the listener sees this, it makes 'DAV'(the HP-IB line) high; DAV (U29 pin 8) goes low. When the circuitry sees DAV go low, it returns to state 10 via state 00. At this point, the handshake is ready for another cycle.

NOTE

The latch pulse is only allowed when DAV is true and ATN is false, as determined by U22B and U22A. At start-up, the board will go to state 01 if DAV is true. This case should never exist, but is defined to avoid any system hang-up.

6-81. Addressing the A1 Board.

Addressing to listen occurs when the talker sets the Listen Flip-Flop. First, the talker sets 'ATN' true (low) and 'DIO1' through 'DIO5' to the address of the -hp- 35601A. 'DIO6' is set true, and 'DIO7' is set false; this is HP-IB convention. The A1 Board compares the data on the 'DIO1' through 'DIO5' to the address of the -hp- address. This is accomplished with U23 and U31 which also checks that 'DIO6' is true. U29A checks that 'DIO7' is false. If a true comparison exists, U31 pin 6 gets high. (far out) When an address comparison exists, and DAV is set true with ATN true, as determined by U29B, the address flip-flop (FF3) will be set by a pulse from MONO2 to U29A pin 2.

The A1 board can be unaddressed in three ways:

1. At start-up with a reset pulse.
2. By 'IFC' being set true by the talker.
3. When the unlisten command is sent. This is detected by U30.

When the board has been addressed to listen, LED CR1 is turned on by U21E and the front panel ADDRESSED indicator is turned on by U21F. If SW1 is set to REMOTE and the board is unaddressed, the data lines to the control latches are disabled by U25D. This is done to prevent digital noise from leaking to the rest of the instrument because of poor isolation from the control latches. The control latches have a different power supply for the same reason.

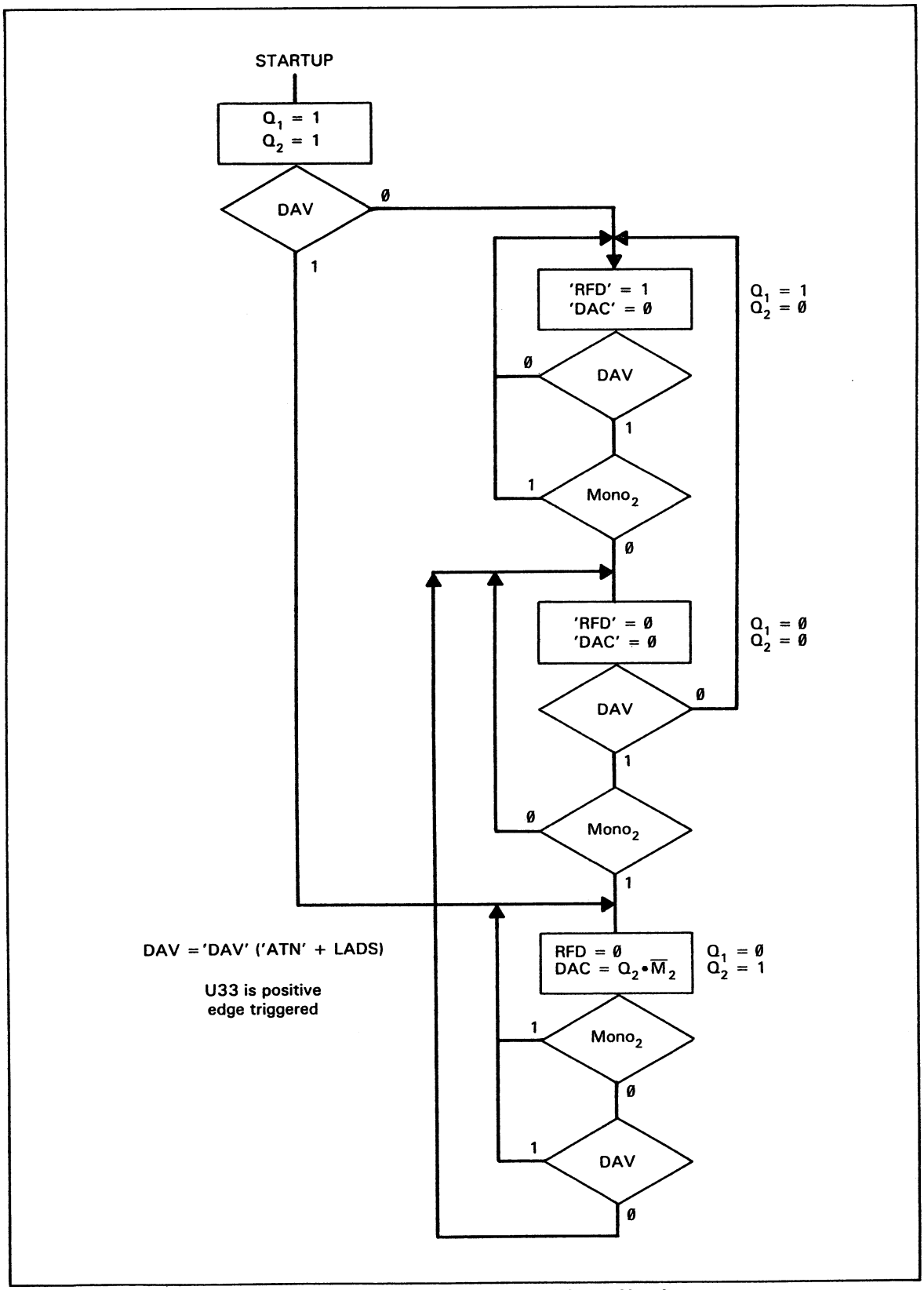


Figure 6-26. Flowchart for A1 Handshake Circuitry

6-82. TROUBLESHOOTING THE DIGITAL CIRCUITRY OF THE A1 BOARD

This troubleshooting procedure should be used when the Digital Signature Analysis Test (test 18 from the Automatic Tests and Adjustments) completely fails, or when the -hp-35601A is not responding to HP-IB command. These symptoms indicate that the handshake is not occurring; use the following procedure when this occurs. If all of the tests pass, the A1 Board should be able to handshake with HP-IB.

a. Disconnect the HP-IB cable and do the following:
   1. Check that 'DIO1' through 'DIO8', 'ATN', 'IFC', and 'DAV' are biased at about 2.4v (TTL logical high).
   2. Ground 'DIO1' through 'DIO8' at the inputs of U7 and U14; check for the correct levels at the output of U20.
   3. Ground 'ATN', 'IFC', and 'DAV'; check for the correct logic levels as far as possible.
   4. Switch each HP-IB select code switch and check for the correct levels at inputs of U23 and U31.

b. Cycle the power and check that the start-up sequence works by doing the following:
   1. Check start-up pulse with scope at U34 pin 4.
   2. Check address flip-flop (FF3) U25 pin 8 for a low.
   3. Ensure that Q1 is high and Q2 is low.
   4. Check that the ADDRESSED indicator on the front panel is off.

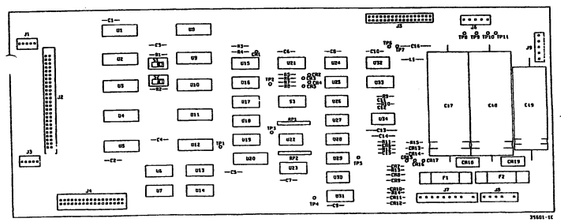
c. Ensure that the address flip-flop (FF3) will set and that the handshake works by doing the following:
   1. Set the HP-IB address switches to 00001.
   2. Ground 'DIO1', 'DIO6', 'DAV', and 'ATN'.
   3. Check that Q1 is low and Q2 is high (changed states).
   4. Check that 'NRFD' is low and 'NDAC' is high.
   5. Check that the ADDRESSED indicator on the front panel is on.

d. Check that the address flip-flop (FF3) will stay set and that the rest of the handshake works by doing the following:
   1. Remove the ground from 'DAV'.
   2. Check that Q1 is low and Q2 is high.
   3. Check that 'NRFD' is high and 'NDAC' is low.
   4. Check that the ADDRESSED indicator on the front panel is still on.

e. Check ATN operation by doing the following:
   1. Remove the ground from 'ATN'.
   2. Ground 'DAV', then remove the ground.
   3. Check that the address flip-flop (FF3) LED is still on.
   4. Check that the latch state LEDs L0-L3 are 1000.
   5. Move the ground from 'DIO1' to 'DIO2'.
   6. Repeat step 2.
   7. L0-L3 should be 0100.
   8. Move the ground from 'DIO2' to 'DIO3'.
   9. Repeat step 2.
   10. L0-L3 should be 0010.
   11. Move the ground from 'DIO3' to 'DIO4'.
   12. Repeat step 2.
   13. L0-L3 should read 0001.

REMOVING THE A1 BOARD FOR SERVICING

When servicing is required, the A1 board may be removed by pulling up all of the black retainer pins. After this, the board may be placed vertically (for ease of testing) by rotating the board toward the back of the instrument and inserting the bottom edge and the side edge into the plastic holders provided. You may desire to remove a few cables to facilitate the rotating of the board.



A1
h-p Part No 35601-66501

NOTE

Refer to the Service Group text for disassembly instructions to access this circuit board.

NOTE

Refer to Appendix B for IC diagrams and truth tables.

NOTE

This waveform is obtained by triggering the scope with the +5 volt power supply on the A1 board and viewing the test point while turning on the instrument.

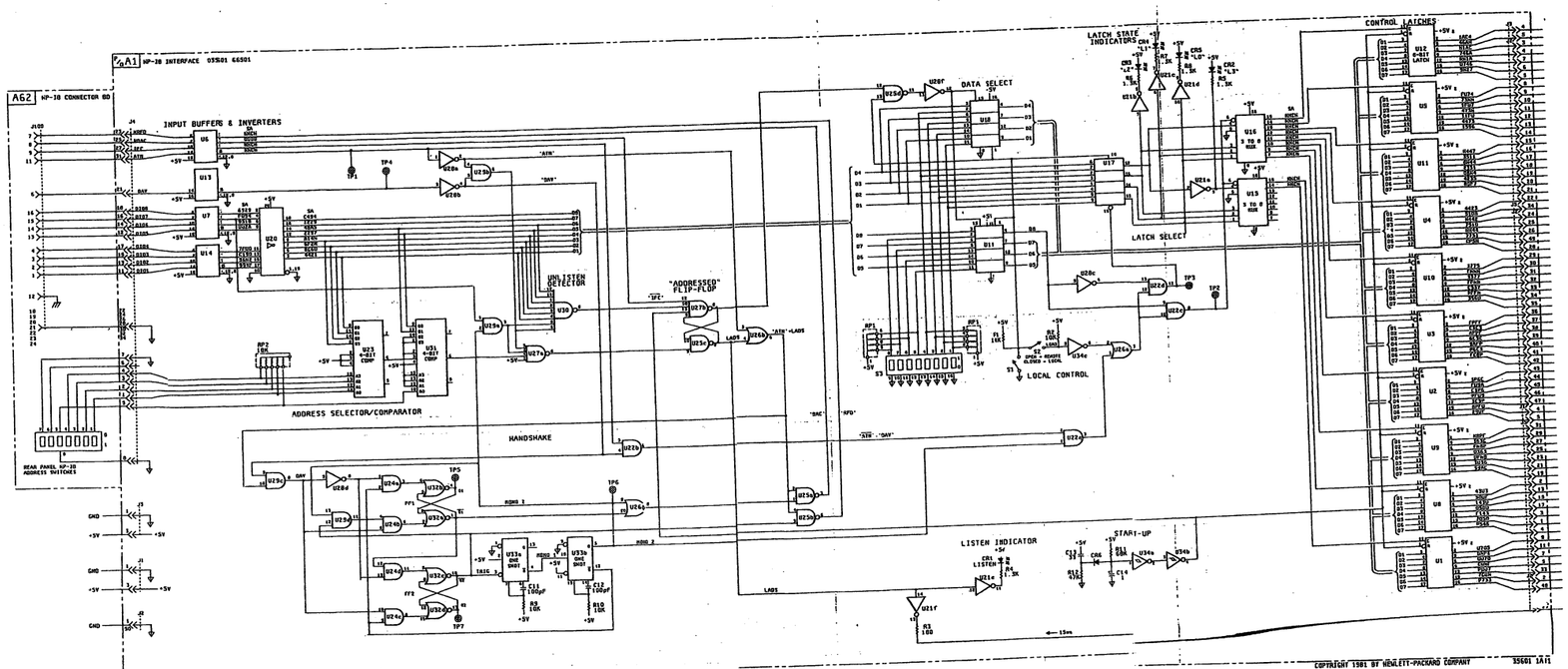
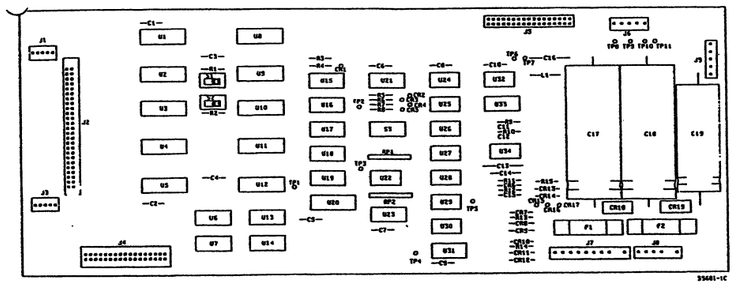


Figure 6-28. A1 Schematic and Component Locator with Digital Signature Analysis
6-77/6-78



A1
h-p Part No 35601-66501

NOTE

Refer to the Service Group text for disassembly instructions to access this circuit board.

NOTE

Refer to Appendix B for IC diagrams and truth tables.

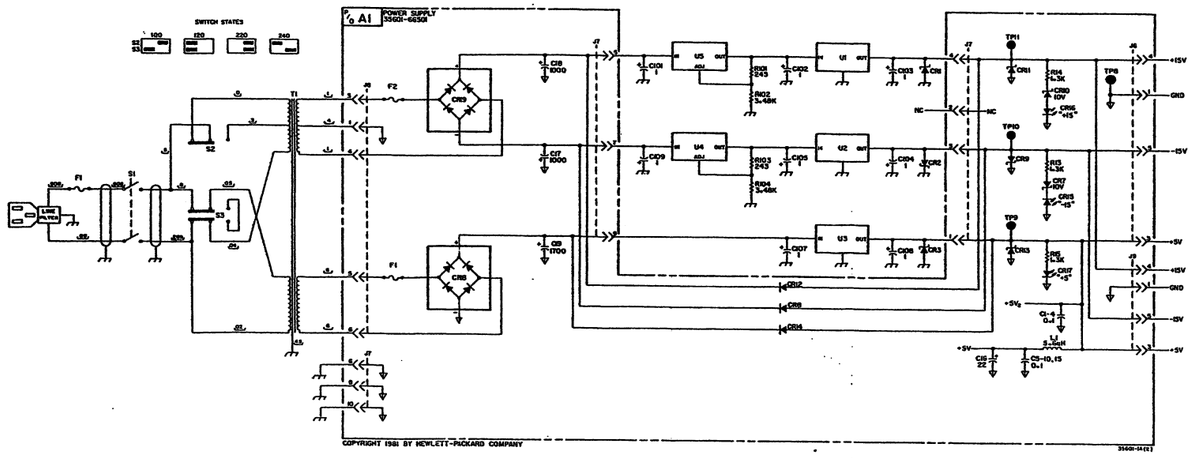


Figure 6-29. Power Supply
Revision A 6-79/6-80

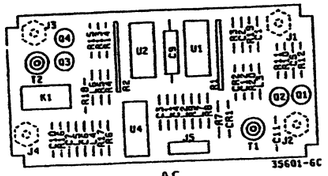
SERVICE GROUP FIVE
A6 BOARD: 10 MHz SWITCHING

6-83. DESCRIPTION OF THE A6 BOARD

The A6 board takes the 10MHz reference output from the -hp- 3585 at +10dBm and provides a +16dBm reference output for the -hp- 3047 system. It also provides a +10dBm 10MHz signal for the Armstrong Modulator and it provides a -3dBm signal which is used by the -hp- 35601 A3 board in the Narrow Band Analysis mode.

REMOVING THE A6 BOARD FOR SERVICING

When servicing is required, the A6 board may be accessed by removing the cover of the shielding box labeled "10MHz Switching".



A6
h-p Part No 35601-66506
REV A2

NOTE

Refer to the Service Group text for disassembly instructions to access this circuit board.

NOTE

Refer to Appendix B for IC diagrams and truth tables.

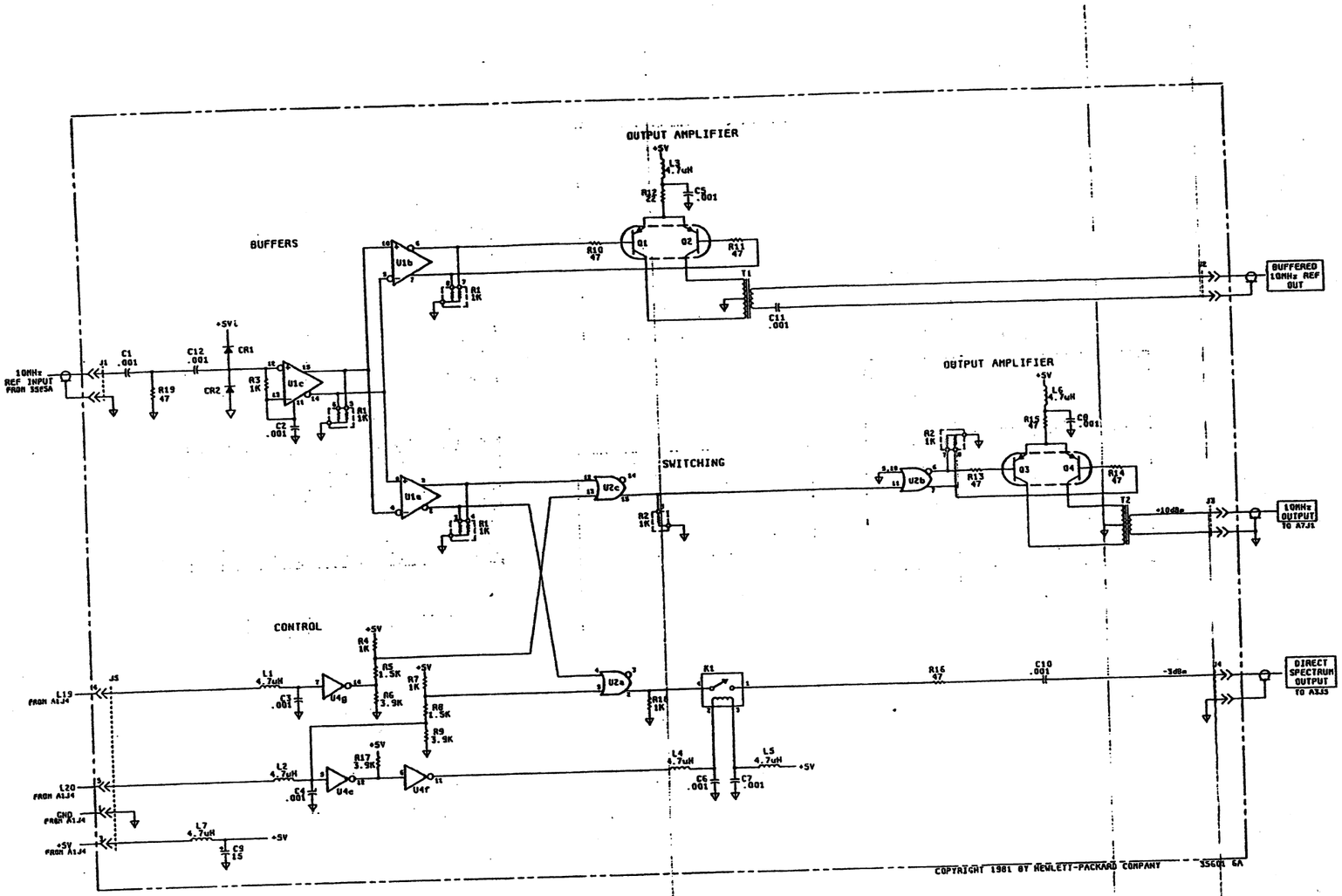


Figure 6-30. A6 Schematic and Component Locator
6-83/6-84

SERVICE GROUP SIX
A7 BOARD: ARMSTRONG MODULATOR

6-84. DESCRIPTION OF THE A7 BOARD

One input to the Armstrong Modulator is a +10dBm 10MHz which comes from the A6 board (10MHz Switching). The output of the Armstrong Modulator is either AM modulated 10MHz or PM modulated 10MHz. The modulating signal is the -hp- 3582 noise source, which has a flat frequency response to 25kHz.

Upon entering the A7 board, the 10MHz is quadrature-split into two signals. One 10MHz signal drives the mixer while the other 10MHz signal goes through a 29dB pad to a power combiner.

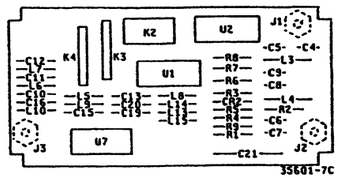
The other input to the Armstrong Modulator is the -hp- 3582 noise source; this source can be DC offset. The output of the mixer can then be selected as the output of the A7 board. The output of the mixer can also be fed to the power combiner and summed with the 90 degree shifted 10MHz. In this case, the output of the power combiner is the output of the A7 board.

If a PM spectrum is desired using a 10MHz source, the following happens. The 10MHz initially goes through the 90 degree power splitter. One of the 10MHz signals goes through the doubly balanced mixer and is mixed with the -hp- 3582 noise source. The suppressed carrier output of the mixer is summed with a 90 degrees phase shifted carrier, is in the power combiner and phase modulation is generated. AM is generated by mixing the 10MHz signal with the DC offset Noise Source of the -hp- 3582. The output of the mixer is then AM modulated 10MHz.

The result from this is a flat AM or PM noise spectrum about a 10MHz carrier. If this AM or PM modulated 10MHz is fed into the -hp- 3047 system, the output would be a flat AM or PM noise plot.

REMOVING THE A7 BOARD FOR SERVICING

When servicing is required, the A7 board may be accessed by removing the cover of the shielding box labeled "ARMSTRONG MODULATOR".



A7
h-p Part No 35601-66507
REV A2

NOTE

Refer to the Service Group text for disassembly instructions to access this circuit board.

NOTE

Refer to Appendix B for IC diagrams and truth tables.

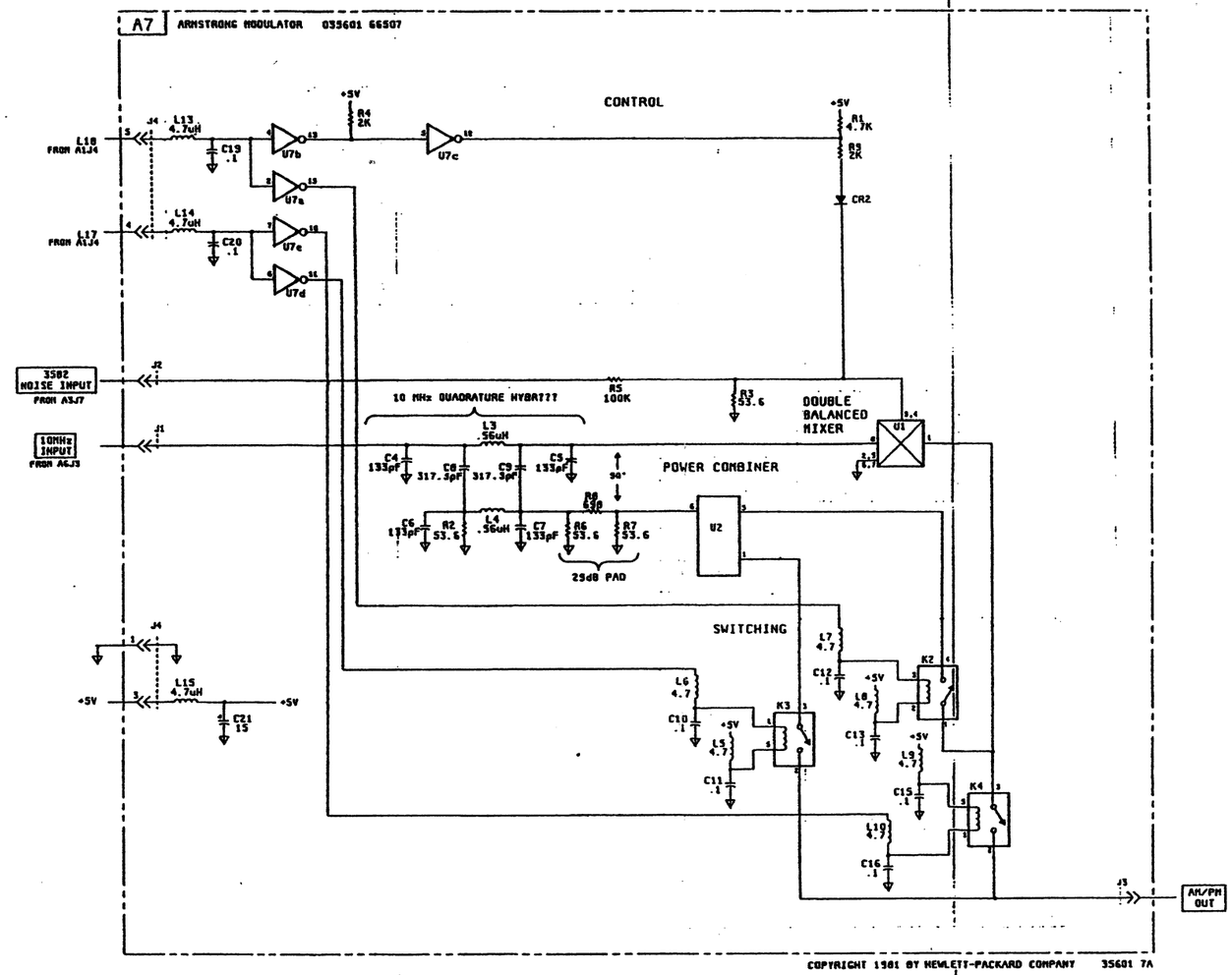


Figure 6-31. A7 Schematic and Component Locator
6-87/6-88

APPENDIX A
Operating the -hp- 35601A Locally

This appendix outlines the procedure for controlling the state of the -hp-35601A using the switches on the A1 board. Normally, the easiest way to control the -hp-35601A is with a computer and the program "SWITCH" (see Section V). In the case where the handshake circuitry of the A1 board is not working, or computer is not available, the 35601A may skill be controlled in the following manner:

- Set switch SW1 to the LOCAL position (closed). SW1 must remain in this position while controlling the 35601A in the local mode.

- Set switch SW3, bit 8 to the 0 position (closed). With bit 8 in this position, bits 1 through 7 of SW3 determine the latch selected when SW2 is switched to the load position and back. See Table A-1 following this discussion for the states of bits 1 through 7 necessary to select a particular latch.

- After the latch has been selected, set switch SW3 bit 8 to the 1 position (open). With bit 8 in this position, bits 1 through 7 of SW3 determine the states of the bits in the latch selected in the previous step, when SW2 is switched to the load position and back. See Table A-1 following this discussion for the function of each bit in the latch. This may be a difficult step because in order to change only one bit in a latch, the previous states of the other six bits must be entered in addition to the state of the changed bit. In other words, it is impossible to enter the state of only one bit in a latch; the states for all bits in a latch must be entered.

Note that in the turn-on state of the 35601A, the output of each latch bit is zero. These states correspond to the switch positions shown in the block diagrams in Section VI and in Figure A-1. The states of the switches and relays (K's, S's, & L's) may be changed from those in the block diagrams by loading the appropriate latch number and latch bits as shown in Table A-1. The absolute DAC voltage is programmed with eight separate bits (0 through 7). The sign of the DAC voltage is programmed either positively or negatively by setting high the appropriate bit. The remaining bits set the gains, attenuations, and lead/lag number. Again, the turn-on states for all these bits are zero.

Table A-1. Latches and Latch bits for Controlling the -hp- 35601A Locally

"SWITCH" Function	Loaded Latch (SW3)	*Loaded Latch Bits (SW3)	Latch Ref. Desig. (A1 board)	"SWITCH" Function	Loaded Latch (SW3)	*Loaded Latch Bits (SW3)	Latch Ref. Desig. (A1 board)
	(87654321)	(87654321)		L13	0XXX1000	1xxxAxxx	U8
K1	0XXX0010	1xxxxAxx	U11	L14	0XXX1000	1xxxxxxA	U8
K2	0XXX0001	1xAxxxxx	U5	L15	0XXX1000	1xxxxxAx	U8
K3	0XXX0001	1xxxxxAx	U5	L16	0XXX0111	1Axxxxxx	U9
K4	0XXX0001	1xxxxxAx	U5	L17	0XXX0110	1Axxxxxx	U2
K5	0XXX0000	1xxAxxxx	U12	L18	0XXX0110	1xAxxxxx	U2
K6	0XXX0000	1xxxxAxx	U12	L19	0XXX0000	1xxxxxxA	U12
K7	0XXX0000	1Axxxxxx	U12	L20	0XXX0000	1xxxxxAx	U12
K8	0XXX0100	1Axxxxxx	U10	L21	0XXX0011	1xxxxxAx	U4
K9	0XXX0100	1Axxxxxx	U10				
K10	0XXX0100	1xxxxAxx	U10	DAC Bits			
K11	0XXX0010	1Axxxxxx	U11	0	0XXX0101	1xxxxxxA	U3
K12	0XXX0010	1xxAxxxx	U11	1	0XXX0100	1xxAxxxx	U10
K13	0XXX0001	1xxxAxxx	U5	2	0XXX0100	1xAxxxxx	U10
K14	0XXX0010	1Axxxxxx	U11	3	0XXX0100	1xxxAxxx	U10
S1	0XXX1001	1xAxxxxx	U1	4	0XXX0101	1xxxxAxx	U3
S2	0XXX0001	1xxxxxxA	U5	5	0XXX0101	1xxAxxxx	U3
S3	0XXX0000	1xxxAxxx	U12	6	0XXX0101	1xxxAxxx	U3
S4	0XXX0000	1xAxxxxx	U12	7	0XXX0101	1xxxxxAx	U3
S5	0XXX0010	1xAxxxxx	U11	positive	0XXX0011	1Axxxxxx	U4
S6	0XXX0010	1xxxxxAx	U11	negative	0XXX0100	1xxxxxAx	U10
S7	0XXX0011	1xxxxxxA	U4				
S8	0XXX0011	1xxxxAxx	U4	GAIN1 Bits			
F0	0XXX1000	1x0xxxxx	U8	0	0XXX0101	1Axxxxxx	U3
	0XXX1001	1xxx0xxx	U1	1	0XXX0101	1xAxxxxx	U3
F1	0XXX1000	1x0xxxxx	U8	2	0XXX0110	1xxxxxAx	U2
	0XXX1001	1xxx1xxx	U1				
	or			GAIN2 Bits			
	0XXX1000	1x1xxxxx	U8	0	0XXX0110	1xxxxxxA	U2
	0XXX1001	1xxx0xxx	U1	1	0XXX0110	1xxxAxxx	U2
F3	0XXX1000	1x1xxxxx	U8	2	0XXX0110	1xxxxAxx	U2
	0XXX1001	1xxx1xxx	U1				
L0	0XXX1001	1xxxxAxx	U1	LEAD LAG Bits			
L1	0XXX1000	1xxAxxxx	U8	0	0XXX0011	1xAxxxxx	U4
L2	0XXX1000	1Axxxxxx	U8	1	0XXX0110	1xxAxxxx	U2
L3	0XXX0111	1xxAxxxx	U9	2	0XXX1001	1xxxxAxx	U2
L4	0XXX0111	1xxxxxxA	U9				
L5	0XXX1001	1xxAxxxx	U1	ATTEN1 Bits			
L6	0XXX0111	1xxxAxxx	U9	0	0XXX0001	1Axxxxxx	U5
L7	0XXX1001	1xxxxxxA	U1	1	0XXX0010	1xxxAxxx	U11
L8	0XXX0111	1xxxxxAx	U9	2	0XXX0001	1xxAxxxx	U5
L9	0XXX0111	1xAxxxxx	U9	3	0XXX0001	1xxxxAxx	U5
L10	0XXX0111	1xxxxAxx	U9				
L11	0XXX1000	1xxxxAxx	U8	ATTEN2 Bits			
L12	0XXX1001	1xxxxxAx	U1	0	0XXX0011	1xxxAxxx	U4

*The x's in this column are not "don't care" states; these states should correspond to the previous states of the latch. (i.e. Every bit in a latch must be entered again even if only one bit is being changed.) The A's may be either 1 or 0; in the turn-on state, all A's are 0.

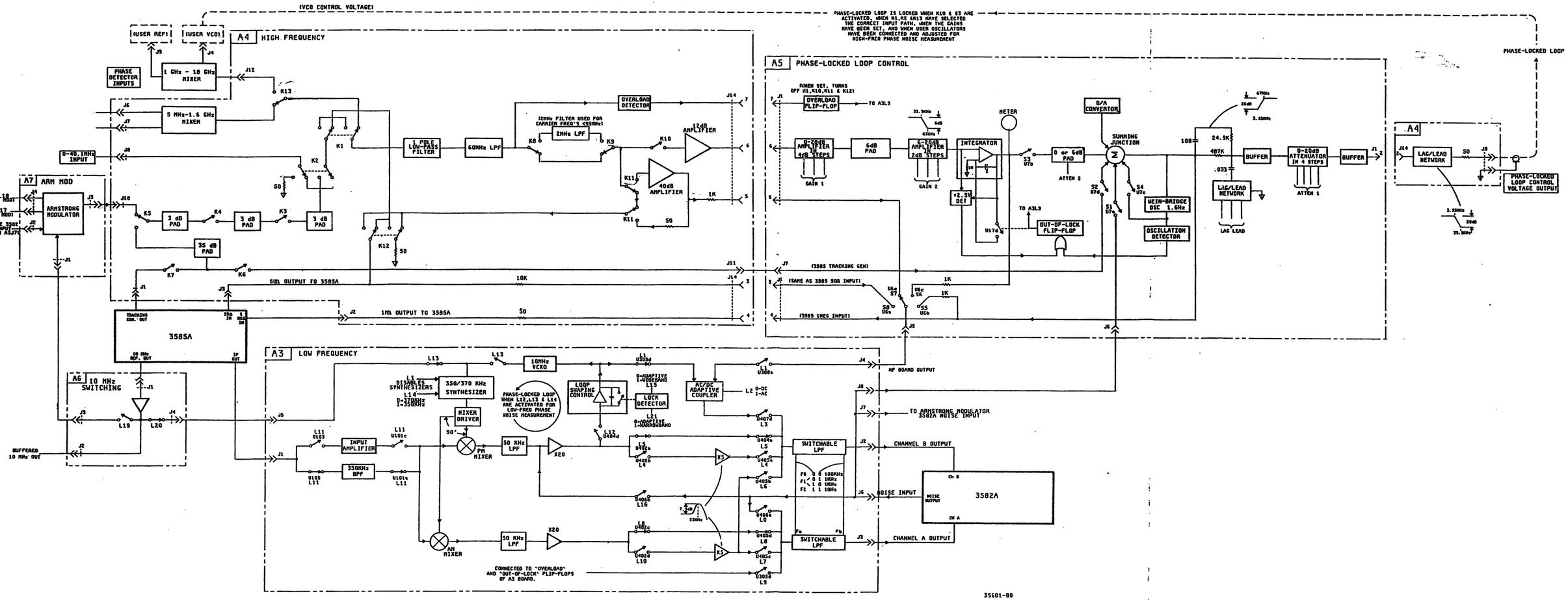
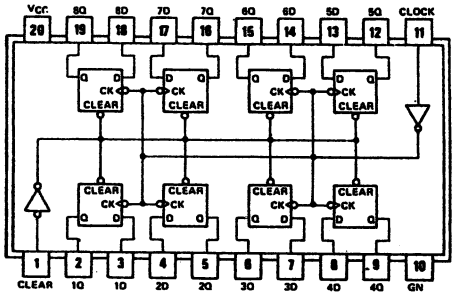


Figure A-1. 35601A Block Diagram
A-3/A-4

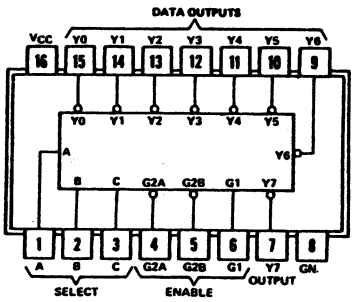
APPENDIX B
INTEGRATED CIRCUIT DIAGRAMS AND TRUTH TABLES

A1 Board: U1, U2, U3, U4, U5, U8, U9, U10, U11, U12
-hp- part number 1820-1730
mfr. part number SN74LS273N



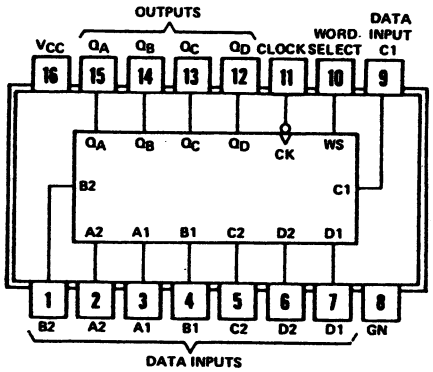
INPUTS			OUTPUT
CLEAR	CLOCK	D	Q
L	X	X	L
H	+edge	H	H
H	+edge	L	L
H	L	X	Qo

A1 Board: U15, U16
-hp- part number 1820-1216
mfr. part number SN74LS138N



INPUTS					OUTPUTS							
ENABLE		SELECT										
G1	G2	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	H	X	X	X	H	H	H	H	H	H	H	H
L	X	X	X	X	H	H	H	H	H	H	H	H
H	L	L	L	L	L	H	H	H	H	H	H	H
H	L	L	L	H	H	L	H	H	H	H	H	H
H	L	L	H	L	H	H	L	H	H	H	H	H
H	L	L	H	H	H	H	H	L	H	H	H	H
H	L	H	L	L	H	H	H	H	L	H	H	H
H	L	H	L	H	H	H	H	H	H	L	H	H
H	L	H	H	L	H	H	H	H	H	H	L	H
H	L	H	H	H	H	H	H	H	H	H	H	L

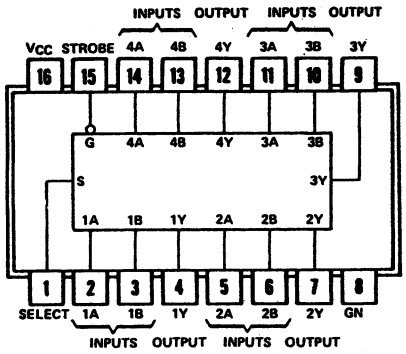
A1 Board: U17
-hp- part number 1820-1444
mfr. part number SN74LS298N



INPUTS		OUTPUTS			
WORD SELECT	CLOCK	Qa	Qb	Qc	Qd
L	-edge	a1	b1	c1	d1
H	-edge	a2	b2	c2	d2
X	H	Qao	Qbo	Qco	Qdo

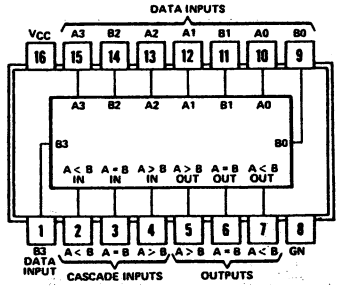
Qao, Qbo, etc. = the level of Qa, Qb, etc. entered on the most recent negative-going transition of the clock input.

A1 Board: U18, U19
-hp- part number 1820-1470
mfr. part number SN74LS157N



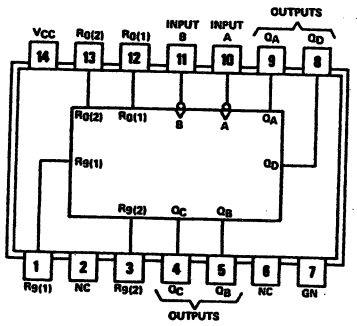
INPUT				OUTPUT Y
STROBE	SELECT	A	B	
H	X	X	X	L
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	H

A1 Board: U20
-hp- part number 1820-1419
mfr. part number SN74LS85N



COMPARING INPUTS				CASCADING INPUTS			OUTPUTS		
A3,B3	A2,B2	A1,B1	A0,B0	A>B	A<B	A=B	A>B	A<B	A=B
A3>B3	X	X	X	X	X	X	H	L	L
A3<B3	X	X	X	X	X	X	L	H	L
A3=B3	A2>B2	X	X	X	X	X	H	L	L
A3=B3	A2<B2	X	X	X	X	X	L	H	L
A3=B3	A2=B2	A1>B1	X	X	X	X	H	L	L
A3=B3	A2=B2	A1<B1	X	X	X	X	L	H	L
A3=B3	A2=B2	A1=B1	A0>B0	X	X	X	H	L	L
A3=B3	A2=B2	A1=B1	A0<B0	X	X	X	L	H	L
A3=B3	A2=B2	A1=B1	A0=B0	X	X	H	L	L	H
A3=B3	A2=B2	A1=B1	A0=B0	H	H	L	L	L	L

A3 Board: U201, U207, U208
-hp- part number 1820-1442
mfr. part number SN74LS290N

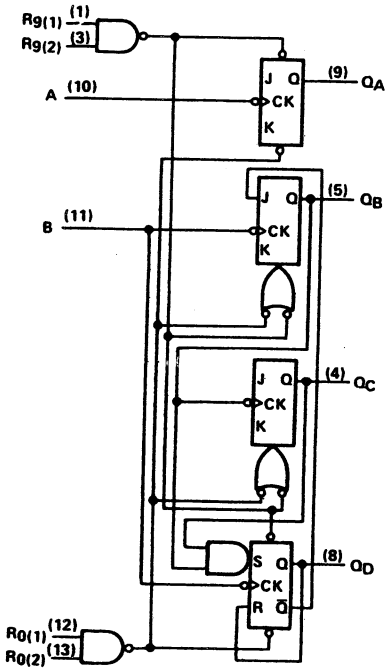


BCD COUNT SEQUENCE

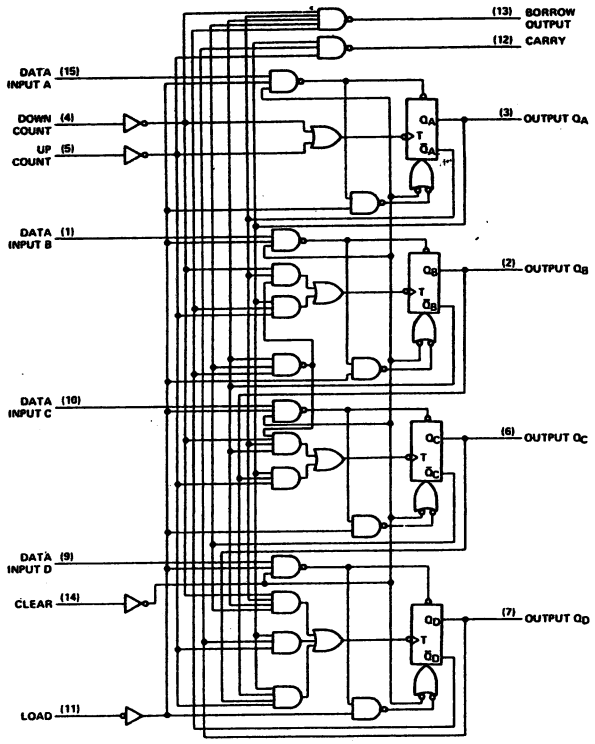
COUNT	OUTPUT			
	Qd	Qc	Qb	Qa
0	L	L	L	L
1	L	L	L	H
2	L	L	H	L
3	L	L	H	H
4	L	H	L	L
5	L	H	L	H
6	L	H	H	L
7	L	H	H	H
8	H	L	L	L
9	H	L	L	H

RESET/COUNT FUNCTION TABLE

RESET INPUTS				OUTPUTS			
R0(1)	R0(2)	R9(1)	R9(2)	QD	QC	QB	QA
H	H	L	X	L	L	L	L
H	H	X	L	L	L	L	L
X	X	H	H	H	L	L	H
X	L	X	L		CLEAR		
L	X	L	X		CLEAR		
L	X	X	L		CLEAR		
X	L	L	X		CLEAR		



A3 Board: U202, U203
-hp- part number 1820-1277
mfr. part number SN74LS192N



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