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OPERATING AND SERVICE MANUAL

M O D E L 3 0 4 8 A
O P T I O N K 2 3
D C B L O C K I N G F I L T E R

How To Use This Manual

This Manual should be used in conjunction with the HP 3048A Operating Manual, HP Part Number 03048-90001 (printed March 1988), the HP 3048A Reference Manual, HP Part Number 03048-90002 (printed June 1988), and the HP 3048A System Calibration Manual, HP Part Number 03048-90015 (printed January 1988).

Applicable Serial Numbers

This Manual applies to instruments with serial number prefixes greater than or equal to 2820A.

Updates to this Manual

Periodically, changes are made to this Manual to correct errors in the original printing and to include Option improvements. Corrections are indicated by a mark at the right-hand edge of the modified text. The mark used is keyed to the date the corrections are added (found on this cover page below the issue date).

Operating and Service Manual
HP Part Number 03048-92036

Issued December 1988
Updated June 1989 *
Updated April 1990 #

SECTION I. GENERAL INFORMATION

1-1. INTRODUCTION

This manual contains information required to install, operate, and service the Hewlett-Packard Model 3048A Option K23 DC Blocking Filter, an optional accessory for the HP 3048A Phase Noise Measurement System.

The DC Blocking Filter Operating and Service Manual has five sections. The subjects addressed are:

SECTION I.....GENERAL INFORMATION
SECTION II.....OPERATION
SECTION III.....PERFORMANCE TESTS
SECTION IV.....REPLACEABLE PARTS
SECTION V.....SERVICE

1-2. SPECIFICATIONS

Instrument specifications are listed in table 1-1. These specifications are the performance standards or limits against which the instrument may be tested.

Table 1-1. Specifications

CHARACTERISTICS	PERFORMANCE LIMITS	CONDITIONS
MAXIMUM INPUT DC	+/-30 V	
FLATNESS	+/-0.5 dB	5 Hz to 40 MHz

1-3. DESCRIPTION

The HP Model 3048A Option K23 DC Blocking Filter is an accessory to the HP 3048A Phase Noise Measurement System. It contains a blocking capacitor designed to allow noise measurements on power supplies with the HP 3048A.

The insertion loss of the DC Blocking Filter is typically 6.0 dB when loaded by the 50 ohm input of the HP 11848A Phase Noise Interface. The switch on the front cover can be set for either a positive or negative power supply.

1-4. INITIAL INSPECTION

Inspect the shipping container. If the container and/or packing material is damaged, it should be kept until the contents of the shipment have been checked mechanically and electrically. If there is mechanical damage or if the instrument does not pass the performance tests, notify the nearest Hewlett-Packard office. Keep the damaged shipping materials (if any) for inspection by the carrier and a Hewlett-Packard representative.

1-5. ACCESSORIES

The accessories supplied with the HP 3048A Opt. K23 are listed below:

IMPEDANCE MATCHING NETWORK.....	03048-62015	*
CALIBRATION LOAD.....	03048-62016	*
CALIBRATION CABLES (2).....	03048-62017	*
ADAPTER SMA(F) TO SMC(F) (3).....	1250-1694	*
ADAPTER SMA(M) TO SMC(F) (1).....	1250-1697	*
ADAPTER RT ANGLE SMA(M) TO SMA(M).....	1250-1397	#

SECTION II. OPERATION**2-1. APPLICATIONS**

The HP 3048A Opt. K23 DC Blocking Filter's main purpose is to make noise measurements on power supplies or any other baseband noise source that has a DC offset. The DC Blocking Filter will enable the HP 3048A to have maximum dynamic range. The HP 3048A has two methods of measuring baseband noise, Noise Measurement Using the HP 3561A Only, and Baseband Noise Measurement. These methods are described in the HP 3048A Phase Noise Measurement System Reference Manual (HP part number 03048-90002), Section 2, Measurement Definitions.

2-1. CONNECTIONS

Connect the output of the baseband noise source to the input of the DC Blocking Filter. The output of the DC Blocking Filter is connected to either the 'NOISE INPUT' of the HP 11848A or directly to the input of the HP 3561A. The best results will be obtained when semirigid coaxial cables are used to connect the components used in the measurement and should be used whenever possible.

A equipment setup diagram is given for each type of baseband measurement that the HP 3048A can perform. The setup diagrams for Noise Measurement Using the HP 3561A Only and Baseband Noise Measurement are shown in figure 2-1 and figure 2-2 respectively. Table 2-1 gives the insertion loss and low frequency cutoff for each of these measurement types.

Table 2-1. HP 3048A Option K23 Insertion Loss and Low Freq. Cutoff

HP 3048A MEASUREMENT TYPE	INSERTION LOSS	LOW FREQUENCY CUTOFF
Baseband Noise	6.0 dB typical	65 Hz typical
HP 3561A Only	< 0.25 dB typical	0.05 Hz typical

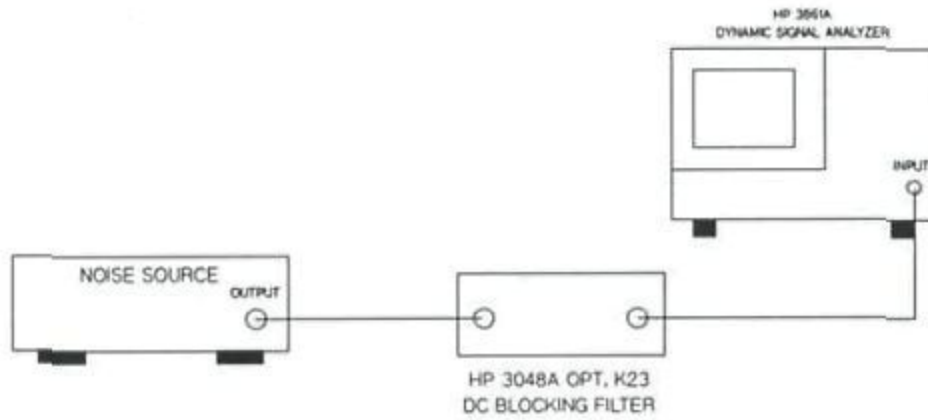


Figure 2-1

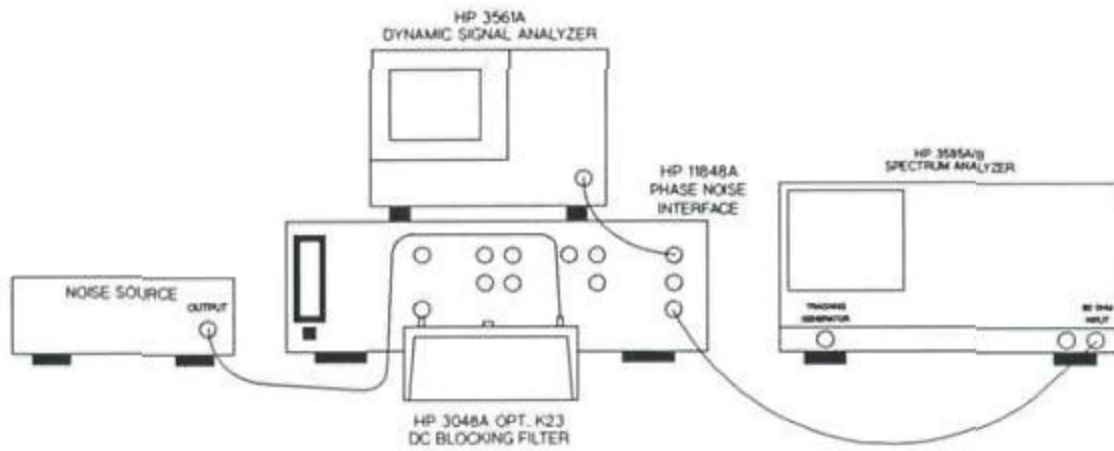


Figure 2-2

SECTION III. PERFORMANCE TESTS

3-1. INTRODUCTION

The procedures in this section test the instrument's electrical performance using the specifications of table 1-1 as performance standards. All tests are performed without accessing the interior of the instrument.

NOTE

*For greatest accuracy, allow the test equipment
to warm up at least one-half hour.*

3-2. PERFORMANCE TEST RESULTS

Results of the performance tests may be tabulated in the Test Results Tables at the end of each procedure. The Test Results Tables list all of the tests specifications and acceptable limits. The results recorded at incoming inspection, can be used for comparison in periodic maintenance, troubleshooting, and after repairs.

3-3. CALIBRATION CYCLE

This instrument requires periodic verification of performance. Depending on the use and environmental conditions, the instrument should be checked using the following performance tests at least once every year.

3-4. SPECIAL EQUIPMENT

A calibration load and impedance matching network are required to run these Performance Tests. One of each is supplied with the HP 3048A Opt. K23 DC Blocking Filter. Service information on these devices and an easy method to build replacements if the originals are lost or damaged are given starting on page 16 of this manual.

3-5. PERFORMANCE TESTING

No abbreviation of the performance testing is recommended.

PERFORMANCE TEST 1

100 KHZ TO 40 MHZ FLATNESS TEST

DESCRIPTION

This test measures the flatness of the HP 3048A Opt. K23 DC Blocking Filter from 100 kHz to 40 MHz with a HP 3585A/B. A reference is taken with the HP 3585A/B tracking generator connected by a short cable to the impedance matching network and calibration load. The calibration load output is connected to the 50-ohm input of the HP 3585A/B with a short cable. Once the reference trace is measured and stored in the HP 3585A/B's memory, the reference load is replaced with the device under test (DUT). The results are then measured and recorded in table 3-1.

EQUIPMENT

SPECTRUM ANALYZER.....	HP 3585A/B
IMPEDANCE MATCHING NETWORK.....	03048-62015
CALIBRATION LOAD.....	03048-62016
CALIBRATION CABLES (2).....	03048-62017

PROCEDURE

1. Connect the equipment as shown in figure 3-1.

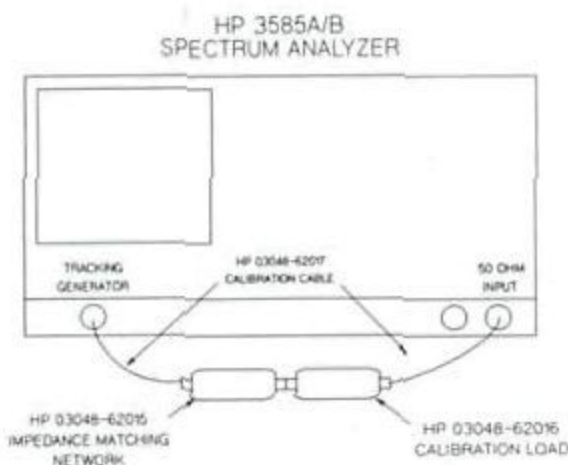


Figure 3-1. Setup For Reference Measurement With HP 3561A

2. Press the green [INSTR PRESET] key on the HP 3585A/B.
3. Setup the HP 3585A/B as follows:

AUTO RANGE.....	OFF
START FREQ.....	100 kHz
STOP FREQ.....	40 MHz
REFERENCE LEVEL.....	-25 dBm
dB/DIV.....	1 dB
4. The trace should be in the upper half of the HP 3585A/B display. Press the [STORE A -> B] key on the HP 3585A/B.
5. Press the [A-B] key on the HP 3585A/B to activate the trace.
6. Turn off the B trace by pressing the [VIEW B] key on the HP 3585A/B. There should only be one trace on the HP 3585A/B CRT and it should be a straight line in the middle of the screen.
7. Replace the Calibration Load with the Opt. K23 DC Blocking Filter as shown in Figure 3-2.

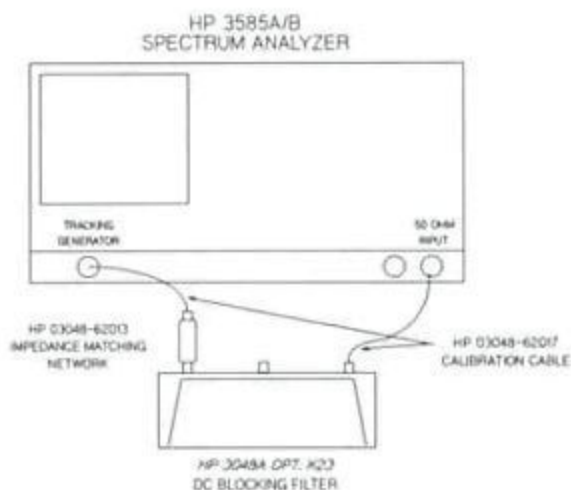


Figure 3-2. Setup for Flatness Test with HP 3585A/B

8. Set the 'DETECTOR POLARITY' switch on the HP 3048A Opt. K23 DC Blocking Filter to the 'POS' position.
9. Use the rotary knob on the HP 3585A/B to position the cursor as close as possible to the frequencies listed in table 3-1. Record the cursor level under the 'POS DETECTOR POLARITY' in table 3-1.
10. Set the 'DETECTOR POLARITY' switch to the 'NEG' position and repeat step 9. Record the results under 'NEG DETECTOR POLARITY' in table 3-1.

Table 3-1. Flatness Test Results from 100 kHz to 40 MHz

FREQ (MHz)	MEASURED RESULTS					
	POS DETECTOR POLARITY			NEG DETECTOR POLARITY		
	LEVEL (dB)	LOWER LIMIT (dB)	UPPER LIMIT (dB)	LEVEL (dB)	LOWER LIMIT (dB)	UPPER LIMIT (dB)
0.1		-0.5	0.5		-0.5	0.5
4.0	_____	-0.5	0.5	_____	-0.5	0.5
8.0	_____	-0.5	0.5	_____	-0.5	0.5
12.0	_____	-0.5	0.5	_____	-0.5	0.5
16.0	_____	-0.5	0.5	_____	-0.5	0.5
20.0	_____	-0.5	0.5	_____	-0.5	0.5
24.0	_____	-0.5	0.5	_____	-0.5	0.5
28.0	_____	-0.5	0.5	_____	-0.5	0.5
32.0	_____	-0.5	0.5	_____	-0.5	0.5
36.0	_____	-0.5	0.5	_____	-0.5	0.5
40.0	_____	-0.5	0.5	_____	-0.5	0.5

PERFORMANCE TEST 2

1 HZ TO 50 HZ FLATNESS TEST

DESCRIPTION

This test measures the flatness of the HP 3048A Opt. K23 from 1 Hz to 50 Hz with a HP 3561A. A reference is taken with the HP 3561A Noise Source (rear panel) connected with a BNC cable to the impedance matching network and calibration load. The calibration load output is connected to the HP 3561A input through a 50-ohm feedthru with a short cable. After the reference trace is measured and stored in the HP 3561A's memory, the reference load is replaced with the device under test (DUT). The results are then measured and recorded in table 3-3.

EQUIPMENT

SPECTRUM ANALYZER.....	HP 3561A
IMPEDANCE MATCHING NETWORK.....	03048-62015
CALIBRATION LOAD.....	03048-62016
CALIBRATION CABLES (2).....	03048-62017
50 OHM FEEDTHRU.....	HP 10100C
BNC CABLE.....	8120-1840
BNC ADAPTOR.....	1250-0080

PROCEDURE

1. Connect the equipment as shown in figure 3-3.

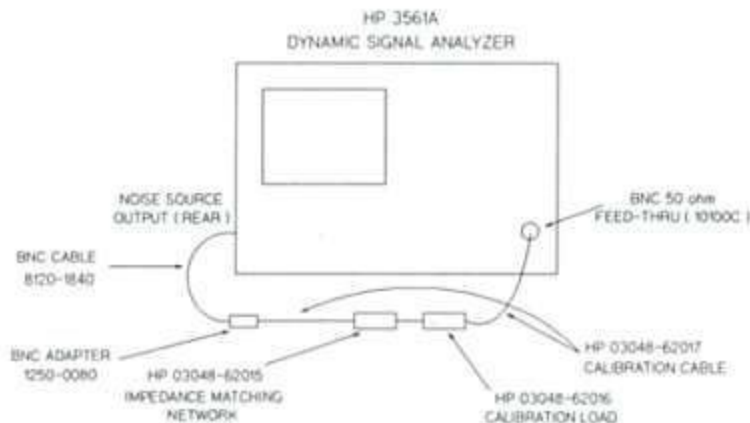


Figure 3-3. Setup for Reference Measurement with HP 3561A

2. Press the green [PRESET] key on the HP 3561A.

3. Set up the HP 3561A as follows:

```
FORMAT.....SINGLE
FREQ.....50 Hz SPAN
                FREQ AXIS to log
WINDOW.....UNIFORM
SOURCE.....PERIODIC NOISE
                0 dB ATTEN
RANGE.....AUTO RNG off
                perform SINGLE AUTO RNG
INPUT.....AUTO CAL off
                perform SINGLE CAL
AVG.....RMS
                DEFINE NUM AVGS
                4
                ENTER
START.....start a measurement sweep
```

4. Wait for the HP 3561A to complete the sweep of 4 averages and then continue the setup of the HP 3561A as follows:

```
VERT SCALE.....SINGLE AUTO SCL
STORE/RECALL.....STORE IN M1
DEFINE TRACE.....MATH FCN SELECT
                MAG
                /
                M1
                ENTER
VERT SCALE.....perform SINGLE AUTO SCL
                2 dBV FULL SCALE
```

5. The trace should be a straight line in the center of the HP 3561A display. Change VERT SCALE to 0.3 dBV FULL SCALE.

6. Replace the calibration load with the DC Blocking Filter as shown in figure 3-4 and set the 'DETECTOR POLARITY' switch to the 'POS' position.

7. Press the [START] key on the HP 3561A and wait for completion of the measurement.

8. Position the marker on the HP 3561A at each of the frequencies listed in table 3-2 by pressing [MKR], [DEFINE MKR POS], frequency to be measured (in hertz), and [Hz] on the HP 3561A. Record the marker level for each frequency under 'POS DETECTOR POLARITY' in table 3-2.

9. Set the 'DETECTOR POLARITY' switch to the 'NEG' position. Repeat steps 7 and 8. Record the results under 'NEG DETECTOR POLARITY' in table 3-2.

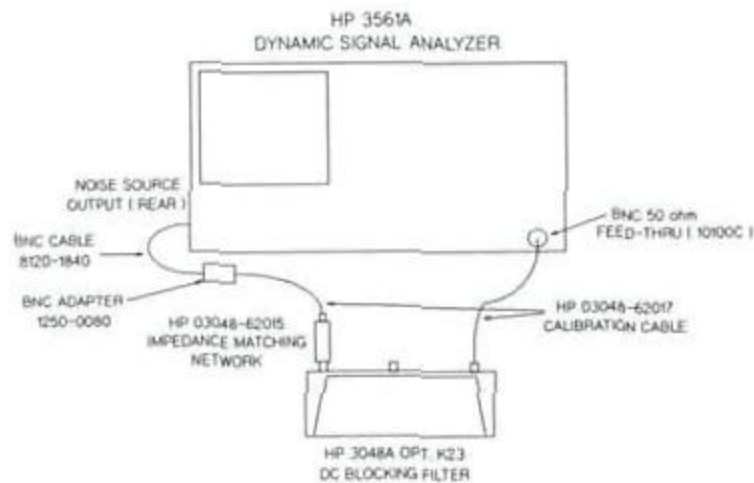


Figure 3-4. Setup for Flatness Test with HP 3561A

Table 3-2. Flatness Test Results from 1 Hz to 50 Hz

FREQ (MHz)	MEASURED RESULTS					
	POS DETECTOR POLARITY			NEG DETECTOR POLARITY		
	LEVEL (dB)	LOWER LIMIT (dB)	UPPER LIMIT (dB)	LEVEL (dB)	LOWER LIMIT (dB)	UPPER LIMIT (dB)
1	_____	-5.0	-2.0	_____	-5.0	-2.0
5	_____	-0.5	0.5	_____	-0.5	0.5
10	_____	-0.5	0.5	_____	-0.5	0.5
20	_____	-0.5	0.5	_____	-0.5	0.5
50	_____	-0.5	0.5	_____	-0.5	0.5

PERFORMANCE TEST 3

DC LEAKAGE TEST

DESCRIPTION

This test measures the leakage current of the capacitors in the DC Blocking Filter. A 30V supply is applied to the input. The output is connected through a 50-ohm feedthru to the input of a voltmeter. The voltage dropped across the 50-ohm feedthru is measured to determine the leakage current.

EQUIPMENT

VOLTMETER.....HP 3478A
POWER SUPPLY.....HP 6205B
50-OHM FEEDTHRU.....HP 10100C *

PROCEDURE

1. Connect the equipment as shown in figure 3-5.
2. Set the 'DETECTOR POLARITY' switch to the 'POS' position.
3. Turn on the power supply and set it for 30 Volts.
4. Wait for 2 minutes and then read the voltmeter. Record the voltmeter reading below:

Voltmeter reading _____ spec: < 3.5 mV

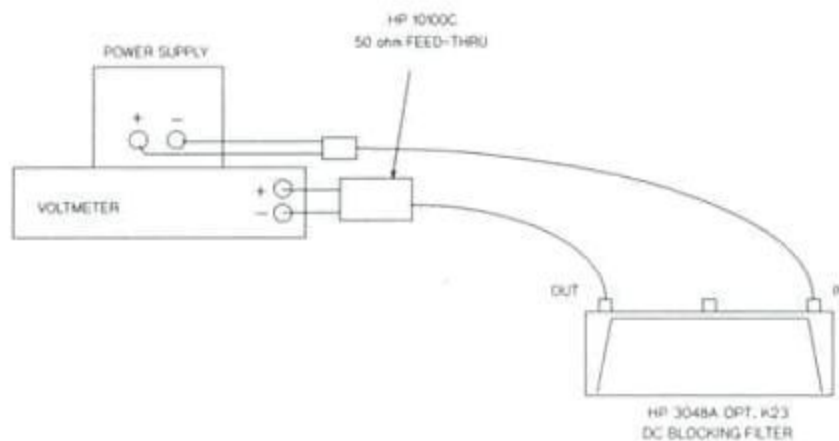


Figure 3-5

SECTION IV. REPLACEABLE PARTS

Table 4-1 lists the replaceable parts. It is organized with the electrical components first, in alphabetical order by reference designator, followed by mechanical parts. The following information is given for each part:

- a. the reference designator;
- b. the HP part number;
- c. the total quantity (Qty) used in the instrument;
- d. the part number check digit (CD); and
- e. the description of the parts.

Table 4-1. Replaceable Parts

REFER. DESIG.	HP PART NUMBER	QTY	C D	DESCRIPTION
A1	03048-60103	1	2	DC BLOCKING FILTER ASSEMBLY
A1C1	0160-3873	1	3	CAPACITOR-FXD 4.7PF +-5PF 200V CER
A1C2				NOT ASSIGNED
A1C3	0160-5469	1	9	CAPACITOR-FXD 1UF +-10% 50VDC MET-POLYE
A1C4	0180-1819	13	3	CAPACITOR-FXD 100UF +75-10% 50VDC AL
A1C5	0180-1819		3	CAPACITOR-FXD 100UF +75-10% 50VDC AL
A1C6	0180-1819		3	CAPACITOR-FXD 100UF +75-10% 50VDC AL
A1C7	0180-1819		3	CAPACITOR-FXD 100UF +75-10% 50VDC AL
A1C8	0180-1819		3	CAPACITOR-FXD 100UF +75-10% 50VDC AL
A1C9	0180-1819		3	CAPACITOR-FXD 100UF +75-10% 50VDC AL
A1C10	0180-1819		3	CAPACITOR-FXD 100UF +75-10% 50VDC AL
A1C11	0180-1819		3	CAPACITOR-FXD 100UF +75-10% 50VDC AL
A1C12	0180-1819		3	CAPACITOR-FXD 100UF +75-10% 50VDC AL
A1C13	0180-1819		3	CAPACITOR-FXD 100UF +75-10% 50VDC AL
A1C14	0180-1819		3	CAPACITOR-FXD 100UF +75-10% 50VDC AL
A1C15	0180-1819		3	CAPACITOR-FXD 100UF +75-10% 50VDC AL
A1C16	0180-1819		3	CAPACITOR-FXD 100UF +75-10% 50VDC AL
A1CR1	1901-0080	2	5	DIODE-GEN PRP 125MA DO-35
A1CR2	1901-0880		5	DIODE-GEN PRP 125MA DO-35
A1CR3	1901-0731	1		DIODE-PWR RECT 400V 1A
A1J1	1250-2091	2	5	CONNECTOR-RF SMA FEM PC 50-OHM
A1J2	1250-2091		5	CONNECTOR-FR SMA FEM PC 50-OHM
A1J3	1251-1998	12	3	CONNECTOR-SGL CONT SKT .025-IN-BSC-SZ
A1J4	1251-1998		3	CONNECTOR-SGL CONT SKT .025-IN-BSC-SZ
A1J5	1251-1998		3	CONNECTOR-SGL CONT SKT .025-IN-BSC-SZ

Table 4-1. Replaceable Parts (Cont'd)

REFER. DESIG.	HP PART NUMBER	QTY	C D	DESCRIPTION
A1J6	1251-1998		3	CONNECTOR-SGL CONT SKT .025-IN-BSC-SZ
A1J7	1251-1998		3	CONNECTOR-SGL CONT SKT .025-IN-BSC-SZ
A1J8	1251-1998		3	CONNECTOR-SGL CONT SKT .025-IN-BSC-SZ
A1J9	1251-1998		3	CONNECTOR-SGL CONT SKT .025-IN-BSC-SZ
A1J10	1251-1998		3	CONNECTOR-SGL CONT SKT .025-IN-BSC-SZ
A1J11	1251-1998		3	CONNECTOR-SGL CONT SKT .025-IN-BSC-SZ
A1J12	1251-1998		3	CONNECTOR-SGL CONT SKT .025-IN-BSC-SZ
A1J13	1251-1998		3	CONNECTOR-SGL CONT SKT .025-IN-BSC-SZ
A1J14	1251-1998		3	CONNECTOR-SGL CONT SKT .025-IN-BSC-SZ
A1L1	9135-0079	1	9	INDUCTOR 100NH +-5.5% 2.6D-MMX6.6LG-MM
A1MP1	5041-0201	1	6	PUSHBUTTON 1/4 CHINA WHITE
A1R1	0757-0394	6	0	RESISTOR 51.1 1% .05W TF TC=0+-100
A1R2				NOT ASSIGNED
A1R3	0698-7260	1	2	RESISTOR 10K 1% .05W TF TC=0+-100
A1R4	0757-0394		0	RESISTOR 51.1 1% .05W TF TC=0+-100
A1R5	0757-0394		0	RESISTOR 51.1 1% .05W TF TC=0+-100
A1R6	0757-0394		0	RESISTOR 51.1 1% .05W TF TC=0+-100
A1R7	0757-0394		0	RESISTOR 51.1 1% .05W TF TC=0+-100
A1R8	0757-0394		0	RESISTOR 51.1 1% .05W TF TC=0+-100
A1S1	3101-2252	1	3	SWITCH-PB DPDT ALTNG 4A 250 VAC
MP1	08640-20230	1	6	FILTER HOUSING
MP2	2200-0139	6	6	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI
MP3	2200-0139		6	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI
MP4	2200-0139		6	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI
MP5	2200-0139		6	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI
MP6	2200-0139		6	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI
MP7	2200-0139		6	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI
MP8	6960-0016	4	0	PLUG-HOLE TR-HD FOR .125-D-HOLE NYL
MP9	6960-0016		0	PLUG-HOLE TR-HD FOR .125-D-HOLE NYL
MP10	6960-0016		0	PLUG-HOLE TR-HD FOR .125-D-HOLE NYL
MP11	6960-0016		0	PLUG-HOLE TR-HD FOR .125-D-HOLE NYL
MP12	03048-02013	1	7	DC BLOCKING FILTER HOUSING COVER
MP13	08665-21006	2	7	SPACER
MP14	08665-21006		7	SPACER
MP15	1250-0569	2	8	NUT-RF CONN, 1/4-36 THD, 5/16-IN
MP16	1250-0569		8	NUT-RF CONN, 1/4-36 THD, 5/16-IN
MP17	1250-2280	2	4	WASHER-RF CONN
MP18	1250-2280		4	WASHER-RF CONN

SECTION V. SERVICE

5-1. INTRODUCTION

This section contains information for troubleshooting and repairing the DC Blocking Filter. Also included in this section are schematics and parts lists for the Impedance Matching Network and Calibration Load required to run the Performance Tests.

5-2. IMPEDANCE MATCHING NETWORK

The Impedance Matching Network requires no periodic maintenance. If servicing is required, refer to the schematic diagram in figure 5-1 on page 17 of this manual.

5-3. CALIBRATION LOAD

The Calibration Load requires no periodic maintenance. If servicing is required, refer to the schematic diagram in figure 5-3 on page 18 of this manual.

5-4. REPLACEMENTS

Replacements for the impedance matching network and calibration load can be built with the following procedure:

1. The parts required to build these devices are listed on pages 17 and 18.
2. Solder two SMC right angle pc board connectors (HP part number 1250-0836) together as shown in figures 5-1 and 5-3.
3. Cut the inside ground posts from the connectors.
4. Solder the resistors to the center and ground posts as shown in figures 5-2 and 5-4.

5-5. FUSES

To protect the DC Blocking Filter from a large dc voltage at the input, A1R1 acts as a fuse. If A1R1 is damaged, A1R4 thru A1R8 are spares and can be used to replace A1R1. A1R1, and A1R4 through A1R8 are inserted into sockets for easy removal and replacement.

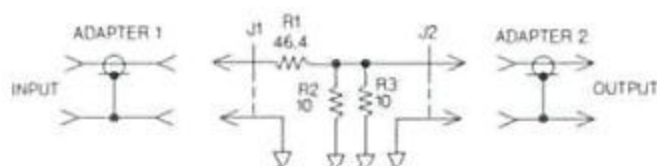


Figure 5-1

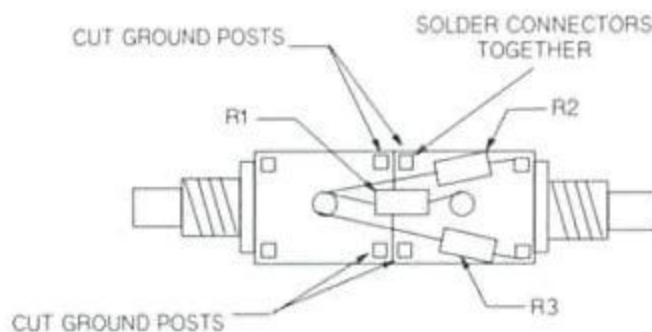


Figure 5-2

Table 5-1. Replacement Impedance Matching Network Parts List

REFER. DESIG.	HP PART NUMBER	QTY	C D	DESCRIPTION
R1	0698-7204	1	9	RESISTOR 46.4 1% .05W TF TC=0+-100
R2	0698-7188	2	8	RESISTOR 10 1% .05W TF TC=0+-100
R3	0698-7188	8	8	RESISTOR 10 1% .05W TF TC=0+-100
	1250-0836	2	2	CONNECTOR-RF SMC M PC 50-OHM
	1250-0836	2	2	CONNECTOR-RF SMC M PC 50-OHM
	1250-1694	1	2	ADAPTER-COAX STR F-SMA F-SMC
	1250-1697	1	5	ADAPTER-COAX STR M-SMA F-SMC

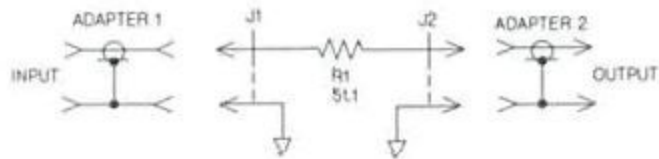


Figure 5-3

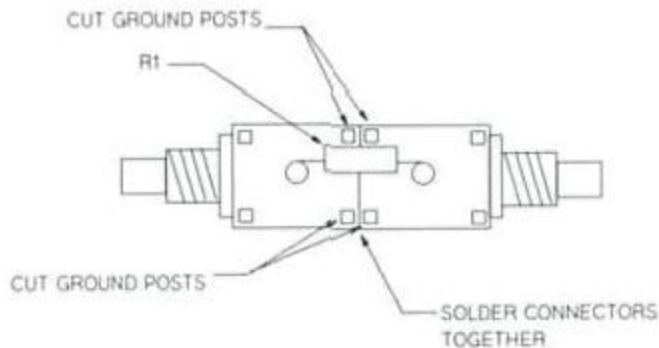


Figure 5-4

Table 5-2. Replacement Calibration Load Parts

REFER. DESIG.	HP PART NUMBER	QTY	C D	DESCRIPTION
R1	0698-7205	1	0	RESISTOR 51.1 1% .05W TF TC=0+-100
	1250-0836	2	2	CONNECTOR-RF SMC M PC 50-OHM
	1250-0836	2	2	CONNECTOR-RF SMC M PC 50-OHM
	1250-1694	2	2	ADAPTER-COAX STR F-SMA F-SMC
	1250-1694	2	2	ADAPTER-COAX STR F-SMA F-SMC

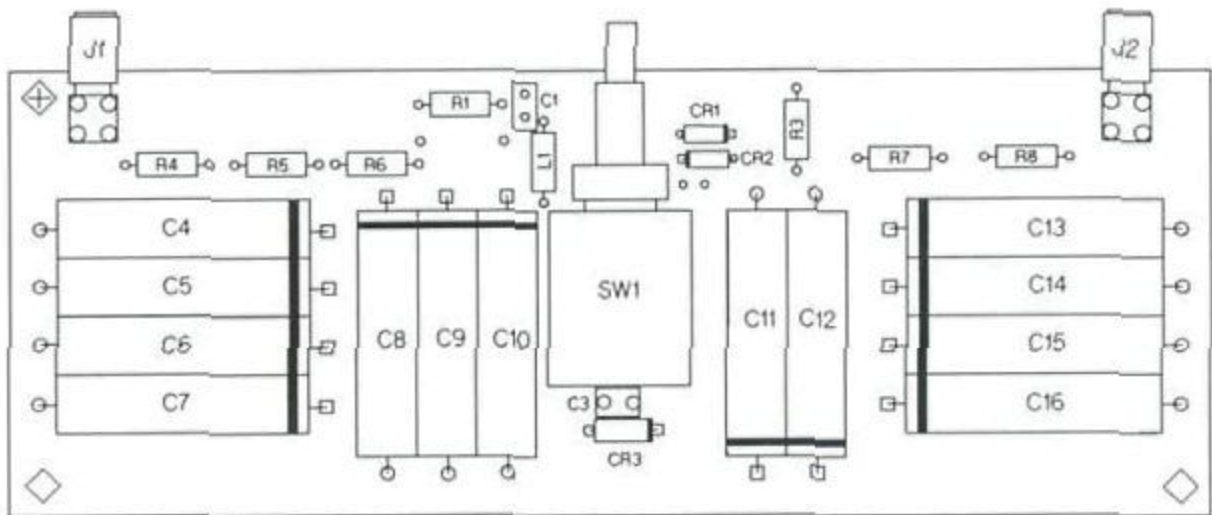
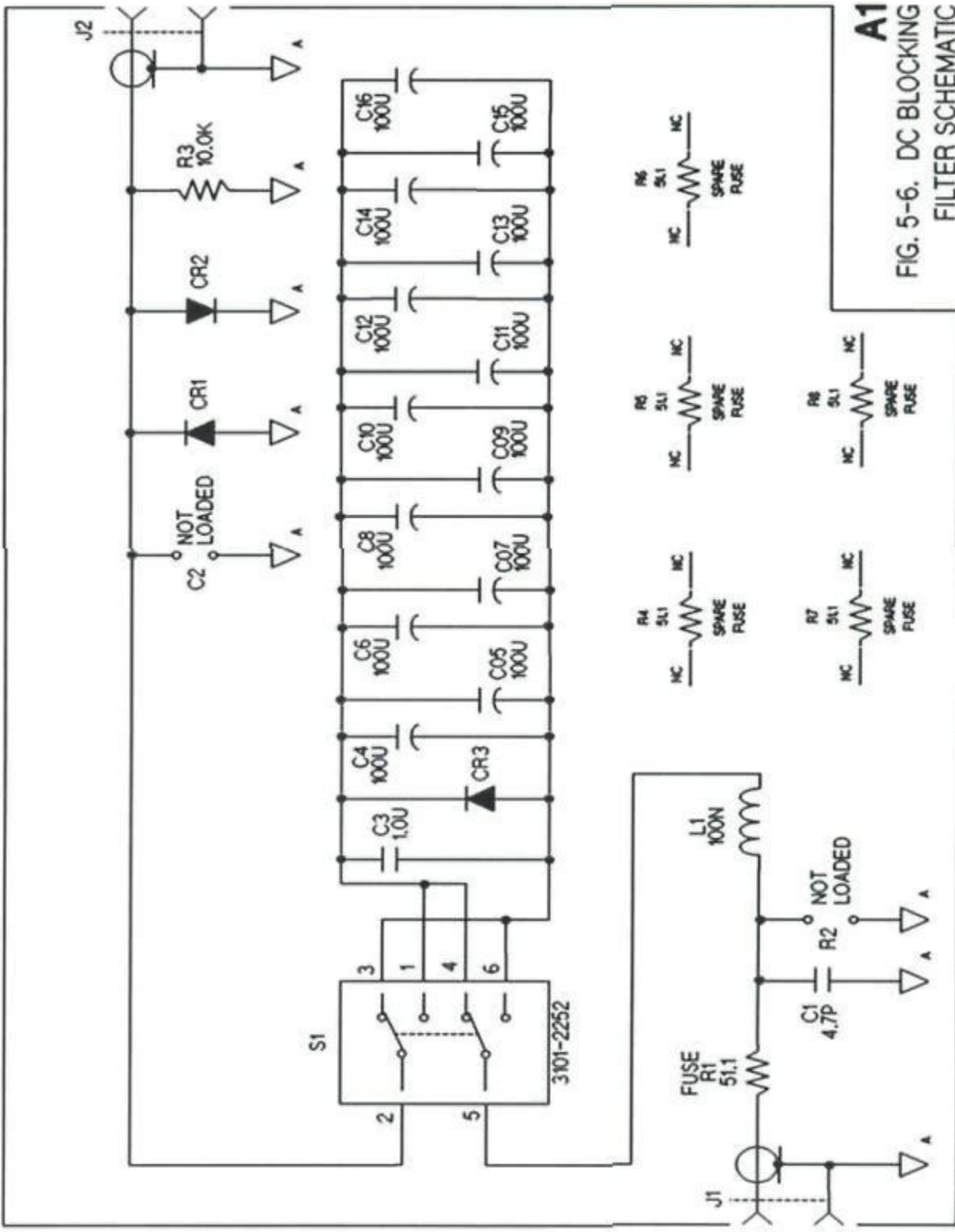


Figure 5-5. A1 Component Locator Diagram

A1 DC BLOCKING FILTER (03048-62103)



A1
FIG. 5-6. DC BLOCKING
FILTER SCHEMATIC
03048-62103