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HP References in this Manual

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HP 85630A
SCALAR
TRANSMISSION/REFLECTION
TEST SET

SERIAL NUMBERS

This manual applies directly to the HP 85630A test set with serial number prefix 3101A and above.

For additional information about serial numbers, refer to TEST SETS COVERED BY MANUAL in General Information.

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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 Institute of Standards and Technology (NIST, formerly NBS), to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

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BP24.2

HP 85630A SCALAR TRANSMISSION/REFLECTION TEST SET

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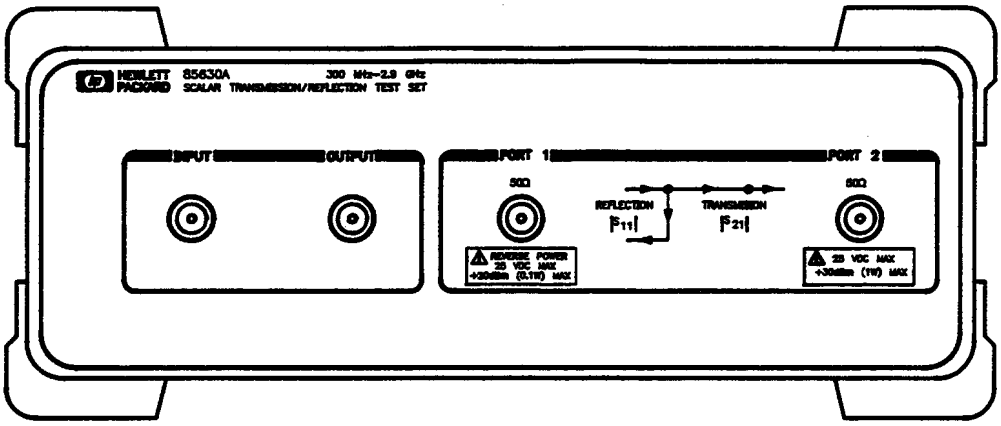
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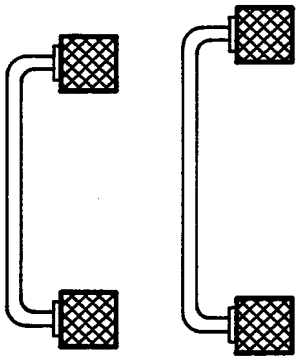
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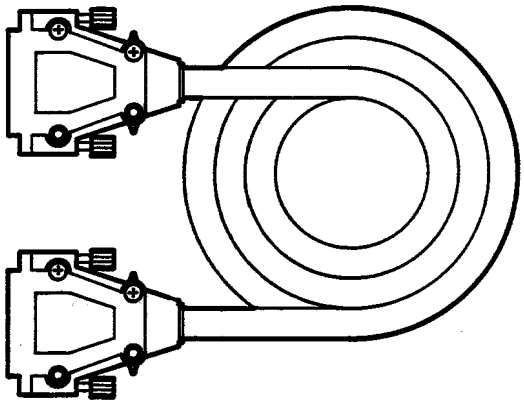
Test Set



Stacking Shoe (2)



RF Cables



Aux Interface Cable

Figure 1-1. HP 85360 Test Set and Accessories

Chapter 1. General Information

INTRODUCTION

The purpose of this manual is to enable you to use your HP 85630 scalar test set efficiently and confidently. To use the HP 85630 to perform a specific function (without reading the entire manual), follow the directions in "Using the HP 85630".

This chapter (1) outlines how to begin using the HP 85630 as quickly as possible, (2) describes what instruments are covered by this manual, (3) describes the test set itself, (4) mentions operating precautions, safety considerations and warranty restrictions, (5) lists the additional equipment required and (6) defines and lists the instrument's specifications.

USING THE HP 85630

The HP 85630 has been designed to operate specifically with the HP 859x series spectrum analyzers with tracking generator option and the HP 85714A scalar measurements personality.

- To install the test set: turn to chapter 2, "Installation"
- To check the proper operation of the HP 85630, see the Operator's Check in chapter 3, "Operation"
- To verify that the test set meets its published specifications, turn to chapter 4, "Performance Tests"
- To troubleshoot the HP 85630, turn to chapter 8, "Service"
- To operate the test set, refer to the "HP 85714A Scalar Measurements Personality Operating Guide."

TEST SETS COVERED BY MANUAL

This manual covers the test set it was shipped with. The manual also covers earlier versions of the test set (usually without modification). Significant differences, if any, between early and current test sets are documented in the "Instrument History" chapter.

You will find a two-part serial number on the rear panel of the test set. The first four digits and the letter are the serial number prefix. The last five digits are the sequential suffix which is unique to each test set. The contents of this manual apply directly to test sets with the serial number prefix printed on the title page under the heading SERIAL NUMBERS.

DESCRIPTION AND OPERATING CHARACTERISTICS OF THE TEST SET

The HP 85630 scalar test set has been designed to operate with the HP 859x series spectrum analyzers listed in table 1-2. The HP 85630 provides a convenient means of measuring forward reflection and transmission coefficients (scattering parameters, S11, S21) of one-port or two-port devices operating within the frequency range of 300 kHz to 2.9 GHz. Optionally it can also adjust the signal level to the DUT (device under test).

Table 1-1 lists the operating specifications and characteristics of the HP 85630. The test set is illustrated on the cover of this manual and shown in a typical measurement setup in Figure 3-1.

OPTIONS

Option 910 provides a duplicate of this manual and the HP 85714A operating guide at time of order. Otherwise, use the manual part number (on title page).

Option 001 enables the test set to vary the power level to the DUT by 70 dB in 10 dB steps.

Option W30 adds two additional years of return-to-HP support to the standard one year warranty (for a total of three years of return-to-HP support).

ACCESSORIES

Accessories Supplied

Figure 1-1 shows the HP 85630 with the accessories supplied:

- Two type-N RF semi-rigid connecting cables
- Aux Interface cable
- Two stacking shoes

Accessories Available

Calibration and Accessory Kits contain the components required to characterize the systematic errors of various measurement systems. The components also allow adaptation of devices to various measurement systems.

The accessory kits listed contain the components generally required to measure devices with the types of connectors indicated. Additional information is included in the spectrum analyzer manual and the data sheet.

Connector Type	Calibration Kit	Accessory Kit
Type-N 50 ohm	HP 85032B	HP 11853A*
3.5 mm (SMA)	HP 85033C	(HP 85033A)
7 mm	HP 85031B	
BNC 50 ohm		HP 11854A*

*use with HP 85032B type-N 50 ohm calibration kit

Cable Sets extend the test ports (ports 1 and 2) of the HP 85630. Typically the HP 11500B (or C or D) 50 ohm type-N test port return cable set is used. Additional information is included in the HP spectrum analyzer manual.

Transistor fixtures (listed below) are available to measure the S11 and S21 parameters of transistors with the HP 85630. To bias transistors, use a device such as the HP 11590B external bias network.

- HP 11600B* tests TO-18/TO-72 type transistors
- HP 11602B* tests TO-5/TO-12 type transistors
- HP 11608A tests 50Ω stripline transistors

*use with HP 11858A transistor fixture adapter

OPERATING AND SAFETY PRECAUTIONS

Operating

WARNING

Turn off the spectrum analyzer before connecting or disconnecting the test set AUX INTERFACE cable. Failure to do so may damage the instruments.

Otherwise, you need observe only normal precautions in handling and operating the HP 85630. Do not exceed the operating levels listed in Table 1-1.

Service

The voltages in this test set do not warrant more than normal caution for operator safety. Nevertheless, service should be performed only by qualified personnel.

ADDITIONAL EQUIPMENT REQUIRED

Table 1-2 lists additional equipment and accessories required for use with the HP 85630. The table notes which items are required to verify the performance of the test set and which are required to operate it. Other equipment may be substituted if its specifications meet or exceed the specifications listed in the critical specifications column.

SPECIFICATIONS

Definitions

The specifications listed in Table 1-1 range from those guaranteed by Hewlett-Packard to those typical of most HP 85630 instruments but not guaranteed. Codes in the far right column of Table 1-1 reference a specification definition listed below. These definitions are intended to clarify the extent to which Hewlett-Packard supports the specified performance of the HP 85630.

S: This performance parameter is field verifiable using performance tests documented in the service manual.

T: Typical but non-warranted performance characteristics intended to provide information useful in applying the instrument. Typical characteristics are representative of most instruments, though not necessarily tested in each unit and not field tested.

Table 1-1. Specifications

Parameter	Specification Return Loss (SWR)	Definition
Port Match		
RF Input		
300 kHz to 1.2 GHz	>25 dB (1.1)	S
1.2 GHz to 2.9 GHz	>22 dB (1.2)	S
RF Output		
300 kHz to 1.2 GHz	>24 dB (1.1)	S
1.2 GHz to 2.9 GHz	>18 dB (1.3)	S
Port 1		
300 kHz to 1.2 GHz	>19 dB (1.3)	S
1.2 GHz to 2.9 GHz	>18 dB (1.3)	S
Port 2		
300 kHz to 1.2 GHz	>14 dB (1.5)	S
1.2 GHz to 2.9 GHz	>11 dB (1.8)	S
Insertion Loss		
300 kHz to 2.9 GHz		
RF Input to Port 1	6.5 to 10 dB	S
RF Output to Port 2	6.5 to 10 dB	S
Directivity		
RF Input		
300 kHz to 1.2 GHz	>34 dB	S
1.2 GHz to 2.9 GHz	>30 dB	S
Isolation		
RF Input to RF Output		
300 kHz to 1.2 GHz	>97 dB	S
1.2 GHz to 2.9 GHz	>94 dB	S
Operating level: (do not exceed)	Input: +30 dBm (1 watt) CW Port 1: 25 VDC, +20 dBm (0.1 W) Port 2: 30 VDC, +30 dBm (1 W)	T T T
Power:	from spectrum analyzer	
Dimensions (H, W, L):	115 mm x 325 mm x 430 mm (4.5 x 12.8 x 19.9 inches), not including feet	
Weight:	6.1 kg (13.5 lb) net; 8.4 kg (18.5 lb) shipping	

Table 1-2. Recommended Test Equipment

Instrument	Critical Specifications	Recommended Model or p/n	Use*
Spectrum analyzer with option 010	no substitute	HP 8590B HP 8591A HP 8593A HP 8594A HP 8595A	O, P, T
Scalar measurement personality	no substitute	HP 85714A	O, P, T
RF cable set, two cables	50 ohm type-N, DC to 3 GHz	HP 11500B	O, P, T
Network analyzer	no substitute	HP 8753A HP 8753B HP 8753C	P, T
S-parameter test set	no substitute	HP 85046A HP 85047A	P, T
50 Ohm load	Type-N	85032-60004	P, T
Adapter	Type-N (f) to (f)	1250-1472	P, T
Calibration kit	no substitute	HP 85032B	P
Multimeter	range: DC to 50V	HP 3456A	T
Oscilloscope	100 MHz bandwidth	HP 54501A	T

*O=operation; P=performance test; T=troubleshooting

Chapter 2. Installation

INTRODUCTION

This chapter explains how to install the HP 85630 test set. The topics covered include initial inspection, environmental considerations, positioning and connecting the test set for use, and packaging the instrument.

INITIAL INSPECTION

Inspect the shipping container (including cushioning material) for damage. If it is damaged, keep it until you have checked the contents for completeness. The contents are listed in Table 2-1.

In addition, check the test set mechanically and electrically. If the test set and shipping container are undamaged, performing the Operator's Check in chapter 3 should suffice for incoming inspection. If the test set does not pass the Operator's Check, refer to the troubleshooting procedures in chapter 8.

If the shipping container is damaged, perform all four electrical performance tests in chapter 4. If the test set fails the electrical tests, or is damaged, defective, or incomplete, keep the shipping materials and notify both the carrier and the nearest Hewlett-Packard office. The HP office will arrange for repair or replacement of the test set without waiting for settlement of the claim.

Table 2-1. Components of HP 85630 Test Set

Item	HP Part Number
Operating and service manual	85630-90001
Aux Interface cable	8120-5343
RF input semi-rigid cable	85630-20017
RF output semi-rigid cable	85630-20018
Stacking shoes (2)	5041-8971

ENVIRONMENTAL CONSIDERATIONS

Operation and Storage

For best performance, the HP 85630 should be operated in temperatures between 0°C and +55°C with relative humidity between 5% and 95% at 40°C (non-condensing). It may be operated at altitudes up to 4,500 metres (15,000 feet).

The HP 85630 may be stored in temperatures from −40°C to +75°C, with relative humidity up to 90% at +65°C (non-condensing) and at altitudes up to 15,240 metres (50,000 feet).

PREPARATION FOR USE

Positioning the Test Set

Typically the HP 85630 is placed under the HP 859x series spectrum analyzer. To install the HP 85630 for use on a bench, place it on an anti-static work surface (to lessen the chance of ESD damage). Place one of the stacking shoes between the two top front feet of the test set. Place the second shoe at the back. Put the spectrum analyzer on top of the test set so that its feet engage the stacking shoes of the test set.

Connecting the Test Set

Mating Connectors of ports 1 and 2 and the input and output ports of the HP 85630 are 50 ohm precision type-N female connectors. They mate with 50 ohm precision type-N male connectors whose dimensions conform to US specification MIL-C-39012.

WARNING

Turn off the spectrum analyzer before connecting or disconnecting the test set aux interface cable. Failure to do so may damage the instruments.

The aux interface connectors are nine-pin subminiature D connectors. They are wired in parallel.

Power and Control Connections are made by the spectrum analyzer-to-test set aux interface cable. Connect the aux interface cable from the AUX INTERFACE connector on the rear panel of the HP 85630 to the AUX INTERFACE connector on the rear panel of the spectrum analyzer.

Signal Path Connections are most easily made with the test set under the spectrum analyzer.

Test Set	Spectrum Analyzer	DUT	Cable
Input	TG Out		straight*
Output	RF Input		bent*
Port 1		one port DUT	HP 11500B
Port 2		one port DUT	HP 11500B

*of two supplied semi-rigid type-N cables

PACKAGING

In General

If reshipping is required, each test set should be repackaged in the original factory package. Containers and materials identical to those used by the factory are available through Hewlett-Packard offices. Alternatively, comparable packaging materials may be used. Wrap the test set in heavy paper or anti-static plastic.

For Service or Calibration

NOTE: Ship spectrum analyzer and scalar measurements personality with test set or make other arrangements with your service center.

If shipping to an HP Office or Service Center for service, complete and attach a service tag. Use sufficient shock absorbing material on all sides of the HP 85630 to provide a thick, firm cushion and prevent movement. Seal the shipping container securely and mark it FRAGILE.

In any correspondence with HP, refer to the HP 85630 by full model and serial number.

Chapter 3. Operation

INTRODUCTION

This chapter illustrates the features and functions of the front and rear panels of the HP 85630 (Figures 3-1 and 3-2). Figure 3-3 depicts the RF signal path through the test set for S21 (forward transmission) and S11 (forward reflection) measurements. Figure 3-4 shows a typical test set measurement setup.

To operate the test set, refer to the "HP 85714A Scalar Measurements Personality Operating Guide."

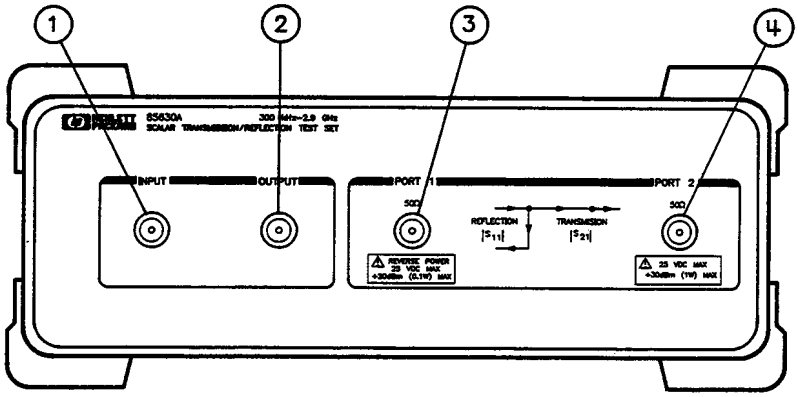


Figure 3-1. Front Panel Features

1. **INPUT** port receives the RF input from the tracking generator of the spectrum analyzer.
2. **OUTPUT** port transmits the RF output from the test set to the spectrum analyzer.

CAUTION

Expensive damage to the instrument can result if these levels are exceeded: Port 1: +20 dBm (0.1 W) or 25 Vdc. Port 2: +30 dBm (1 W) or 25 Vdc.

3. **PORT 1** transmits power to the DUT and measures the reflected power in S11 mode.
4. **PORT 2** receives power transmitted through the DUT in S21 mode.

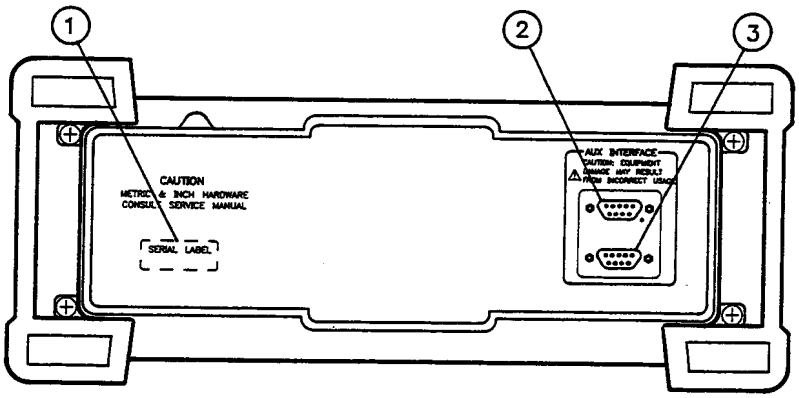
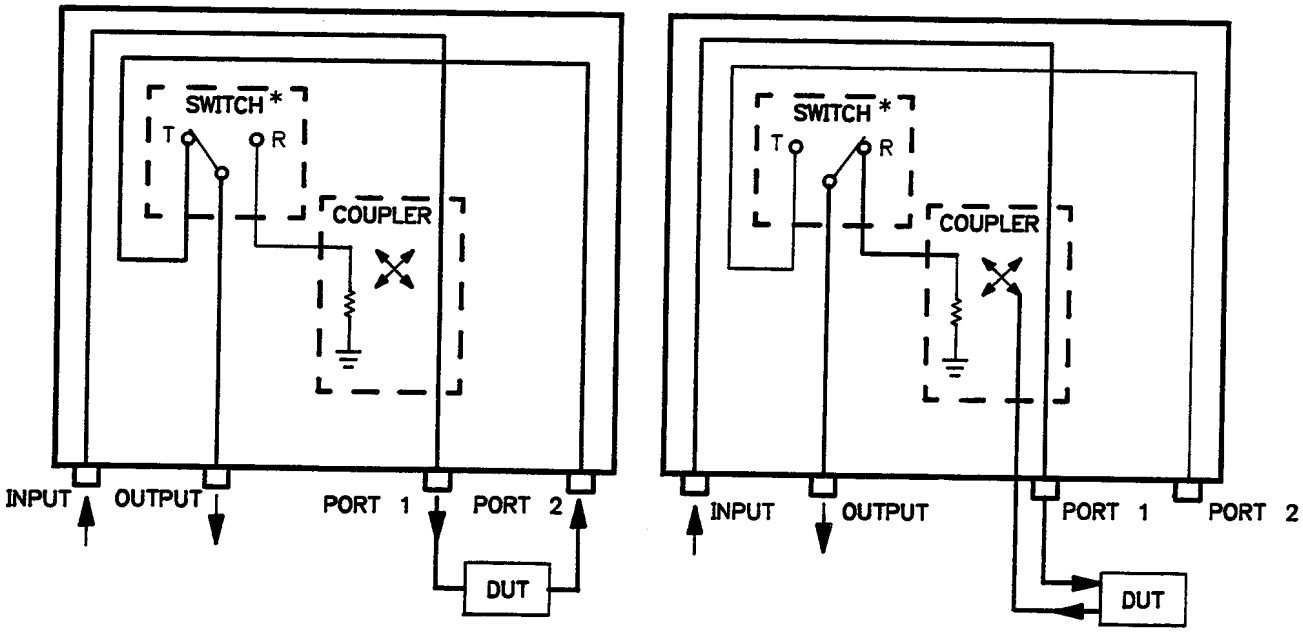


Figure 3-2. Rear Panel Features

1. **Serial number label** shows the version of the test set (prefix, first four digits and letter) and its unique identification number (last five digits).
2. **Female subminiature nine-pin connector (upper)** accepts power and control signals from signal analyzer. It is wired in parallel with the lower connector.
3. **Male subminiature nine-pin connector (lower)** enables user to connect another test set to the analyzer.



* **NOTE:** Transfer switch, terminates unused port with 50 ohm termination.

Figure 3-3. Transmission and Reflection RF Signal Paths

OPERATOR'S CHECK

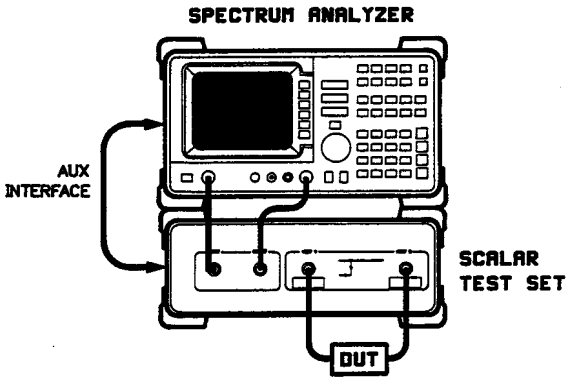


Figure 3-4. Operator's Check Setup

EQUIPMENT

Spectrum analyzer, opt 010	HP 859x series
Aux interface cable	supplied with test set
Test set-analyzer cables	supplied with test set
Scalar personality	HP 85714A
RF cable set	HP 11500B

DESCRIPTION AND PROCEDURE

This quick check confirms that the test set is functional. It consists of a measurement calibration, and transmission and reflection checks. Use it for incoming inspection or a routine check.
To test the performance of the test set more rigorously, see the performance tests chapter (next).

Measurement Calibration

1. Connect the spectrum analyzer to the test set with the supplied aux interface (9-pin) cable. Turn on the analyzer. Allow sufficient time for it to warm up and then calibrate it (refer to its manual for details). Install the HP 85714 scalar measurement personality (refer to its manual for details).

2. Press (MODE) ***[SCALAR ANALYZER]*** and wait for the system to change modes.

   Then press (FREQUENCY) ***[START FREQ]*** (10 MHz) (CONFIG) ***[More 1 of 3] [More 2 of 3] [TEST SET]*** to underline YES.

3. Connect the RF OUT port of the spectrum analyzer to the INPUT port of the test set with a type-N cable.

4. Press (CAL) ***[TRACKING PEAK]*** and wait for auto peak to finish. Then press ***[CAL THRU] [STORE THRU]***.

5. This completes the measurement calibration. Continue with the transmission check (next), the reflection check (step 9), or both as desired.

Transmission Check

6. Press (DISPLAY) ***[DSP LINE]*** (-) (20) (DB).

7. Connect the analyzer and the test set RF paths using the supplied semi-rigid cables. Connect PORT 1 to PORT 2 of the test set with a type-N cable.

8. The trace on the spectrum analyzer CRT is the insertion loss of the test set transmission path. The loss should be <20 dB (above the display line on the graticule).

   Remove the type-N cable from the test set. Continue with the reflection check (next) or perform step 14 to return the system to the test set mode.

Reflection Check

NOTE: Nothing should be connected to ports 1 or 2 of the test set now.

9. Press (MEAS/USER) ***[REFL]*** and wait for the system to change to reflection.

10. Press (CONFIG) ***[More 1 of 3] [More 2 of 3] [TEST SET]*** to underline NO.

11. Press (MEAS/USER) ***[TRANS]*** and wait for the change to transmission. Then press (DISPLAY) ***[DSP LINE]*** (-) (36) (DB).

    The trace on the CRT is the insertion loss of the test set reflection measurement path. The loss should be <36 dB (above the display line on the graticule).

12. Press (TRACE) ***[More 1 of 3] [More 2 of 3] [A - C]*** (TRACE) ***[TRACE ABC] [TRACE ABC] [VIEW C]***.

13. Connect a 50 ohm load to PORT 1. The trace on the CRT should drop 20 to 50 dB (or more) below the stored trace "C." (The amount of drop depends on the quality of the load used.)

14. This completes the operator's check. To re-configure the scalar personality of the analyzer to drive the test set, press (CONFIG) ***[More 1 of 3] [More 2 of 3] [TEST SET]*** to underline YES.

In case of difficulty, refer to chapter 8, "Service."

Chapter 4. Performance Tests

INTRODUCTION

Follow the procedures in this chapter to test the port match, insertion loss, directivity, and isolation of your test set. The test specifications (reproduced in the performance test record) are those of Table 1-1.

Each test procedure lists the equipment required to test the HP 85630. You may substitute test equipment if the substitute equipment meets or exceeds the critical specifications of Table 1-2.

Each of the tests can be performed independently of the others, but typically all are performed together as ordered.

Each of the tests can be performed without access to the interior of the instrument.

Calibrate the network analyzer system prior to performing any or all of the performance tests.

PERFORMANCE TEST RECORD

Use the performance test record (Table 4-1) to tabulate the results of the performance tests. It also provides space to record test conditions and lists the measurement uncertainties associated with each test. Test results recorded during incoming inspection can be used for comparison with test results obtained after periodic maintenance, troubleshooting or repair.

NETWORK ANALYZER SYSTEM CALIBRATION

The main parts of the network analyzer system are the HP 8753 network analyzer, an HP 85046A or 85047 S-parameter test set, and (optionally) a printer or plotter. Connect them as shown and explained below.

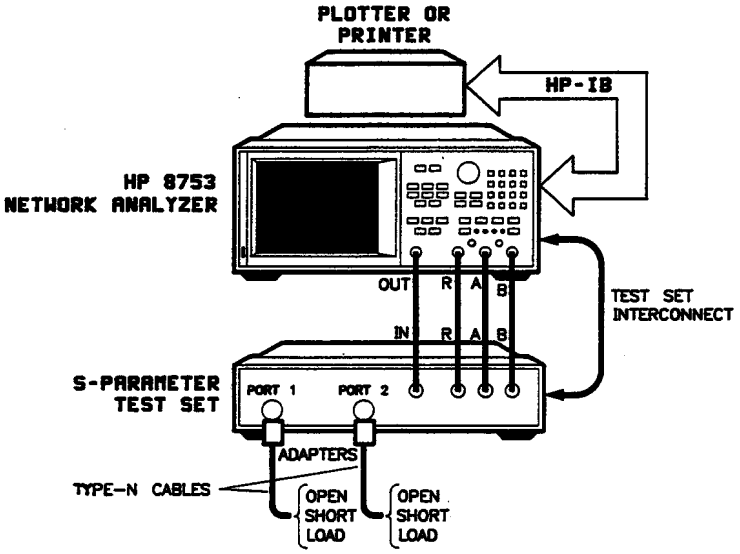


Figure 4-1. Network Analyzer System Setup

NETWORK ANALYZER SYSTEM EQUIPMENT

Network analyzer	HP 8753
S-parameter test set	HP 85046A or 85047A
Interconnect cable	part of test set
Type-N RF cables (4)	part of test set
Type-N RF cable set	HP 11500B
Calibration kit, type-N	HP 85032B
Additional loads (2)	HP p/n 85032-60004
Adapter N(f) to N(f)	1250-1472

CALIBRATION PROCEDURE

1. Connect the S-parameter test set to the network analyzer with the four short RF cables and the test set interconnect cable.

   Connect a printer or plotter to the network analyzer with an HP-IB cable if you want to print or plot test results.

   Connect a 7mm to type-N (f) adapter to port 1 and port 2 of the S-parameter test set. Connect a type-N cable to each adapter. The free ends of the type-N cables are now, in effect, the (male) test ports of the S-parameter test set.

2. Turn on the network analyzer and allow it to warm up.

3. On the network analyzer, press (PRESET) (AVG) (IF BW) (1) (0) (x1) (CAL) ***[CAL KIT] [N 50 ohm]*** to decrease the IF bandwidth and select the type-N cal kit. Then press (CAL) ***[CALIBRATE MENU] [FULL 2-PORT]***.

4. Press (REFLECTION) ***[S11: OPENS]***. Connect the female open to the port 1 cable end and press ***[OPEN (M)]*** to measure the open. Remember, the "M" (male) describes the port 1 cable end NOT the standard (the female open). When the network analyzer underlines the softkey and beeps, press (DONE: OPENS).

   Connect a female short to the port 1 cable and press (SHORTS) ***[SHORT (M)]***. At the beep and underline, press ***[DONE: SHORTS]***.

   Connect a female load to the port 1 cable and press ***[LOAD]***.

5. Repeat step 4 at (the cable end of) port 2 using the S22 softkeys. Then press ***[REFLECTION DONE]*** to finish the reflection calibration.

6. Connect the type-N cable at port 1 to the cable at port 2 with the N(f) to N(f) adapter. Press ***[TRANSMISSION]*** and ***[FWD. TRANS. THRU]*** to begin the transmission calibration. At the beep and underline, press the other three softkeys in turn. Press ***[TRANS. DONE]*** to finish the transmission calibration.

7. Connect male loads (50 ohm terminations) to ports 1 and 2. Press (AVG) ***[AVERAGING ON]*** (CAL) (RESUME CAL SEQUENCE) ***[ISOLATION]***. Press ***[FWD ISOL'N ISOL'N STD]***.

   At the beep and underline, press ***[REV ISOL'N ISOL'N STD]***. At the beep and underline, press ***[ISOLATION DONE] [DONE 2-PORT CAL]*** to finish the calibration and calculate the coefficients.

8. The calibration is finished when the notation "Cor" appears on the left side of the graticule. Press one of the top five softkeys to save the calibration.

PORT MATCH PERFORMANCE TEST

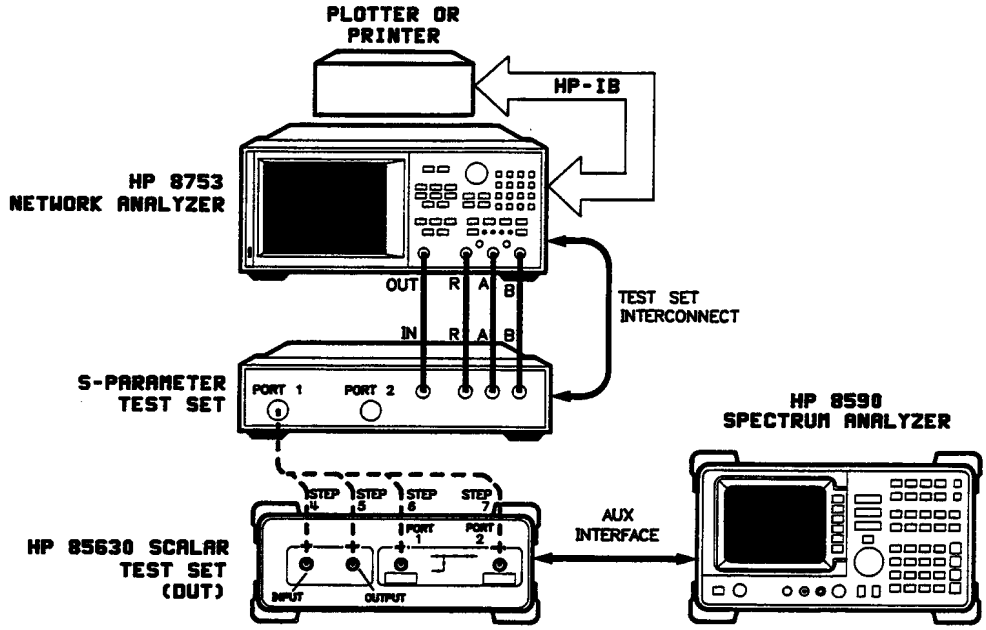


Figure 4-2. Port Match Set-up

EQUIPMENT

Network analyzer system	See Figure 4-1
Spectrum analyzer	HP 859x series w option 010
Scalar personality	HP 85714A

DESCRIPTION AND PROCEDURE

This procedure uses the network analyzer system to measure the port match of all four ports of the DUT (HP 85630).

NOTE: Refer to "Network Analyzer System Calibration," above, to calibrate and configure the system unless you have already done so.

1. Connect the HP 85630 to the spectrum analyzer with the aux interface cable.
2. Turn on the spectrum analyzer and press (PRESET) ***[MODE] [SCALAR ANALYZER] [MEASURE] [TRANS]***.
3. On the network analyzer, press (CH 1) ***[MEAS] [S11]*** (MKR FCTN) (MKR).

4. Connect port 1 of the S-parameter test set to the input port of the DUT (HP 85630). Connect a load directly to port 1 of the DUT.

   On the network analyzer press (MENU) ***[MEASUREMENT RESTART]***. Rotate the network analyzer RPG knob to identify the maximum level in each of the two frequency ranges listed on the "Port match, INPUT" lines of the test record card. Record those maximum levels in the "Test Result" column and print or plot the results if desired.

5. As in step 4, connect port 1 to the output port of the DUT. Connect a load directly to port 2 of the DUT.

On the network analyzer press (MENU) ***[MEASUREMENT RESTART]***. Identify and record the maximum levels in the two frequency ranges and print or plot the results if desired.

6. On the spectrum analyzer, press ***[REFL]***. Connect port 1 to port 1 of the DUT. Connect a load directly to the input port of the DUT.

On the network analyzer press (MENU) ***[MEASUREMENT RESTART]***. Identify and record the maximum levels in the two frequency ranges and print or plot the results if desired.

7. Connect port 1 to port 2 of the DUT. Connect a load directly to the output port of the DUT.

   On the network analyzer press (MENU) ***[MEASUREMENT RESTART]***. Identify and record the maximum levels in the two frequency ranges and print or plot the results if desired.

8. If the results of this test are not within specification, refer to the service chapter of this manual.

INSERTION LOSS PERFORMANCE TEST

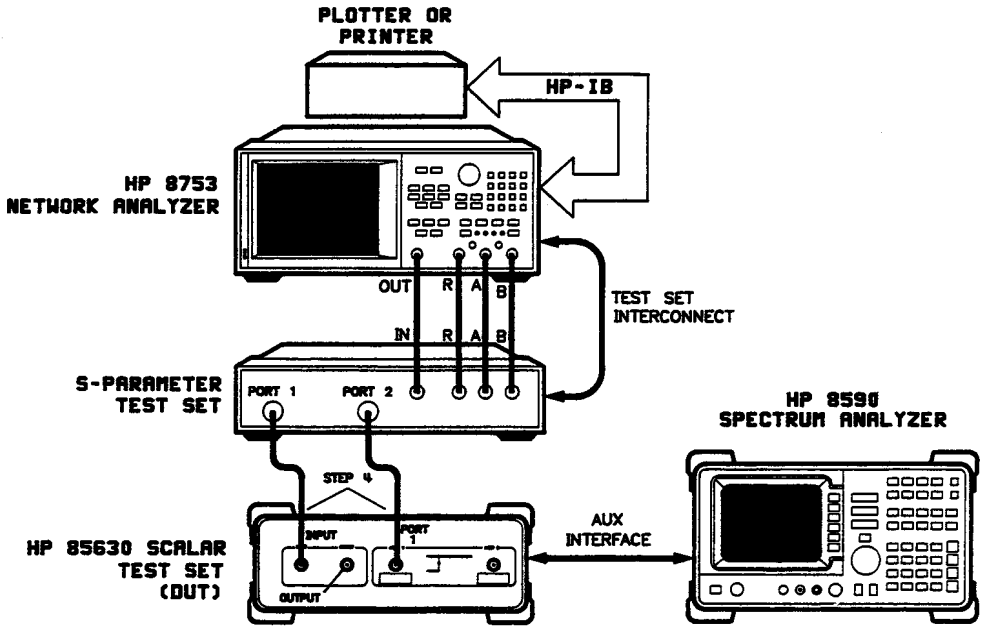


Figure 4-3. Insertion Loss Setup

EQUIPMENT

Network analyzer system	See Figure 4-1
Spectrum analyzer	HP 859x series w option 010
Scalar personality	HP 85714A

DESCRIPTION AND PROCEDURE

This procedure measures the insertion loss of the test set.

NOTE: Refer to "Network Analyzer System Calibration," above to calibrate and configure the system unless you have already done so.

1. Connect the HP 85630 to the spectrum analyzer with the aux interface cable.
2. Turn on the spectrum analyzer and press (PRESET) ***[SCALAR ANALYZER] [MEASURE] [TRANS]***.
3. On the network analyzer, press ***[MKR FCTN] [MARKER SEARCH] [TRACKING ON] [SEARCH MAX]***.
4. Connect port 1 of the S-parameter test set to the input port of the DUT (HP 85630); port 2 to port 1 of the DUT (as shown in Figure 4-3). On the network analyzer, press (CH 1) (MEAS) ***[S21]*** (MENU) ***[MEASURE RESTART]***.

   On the "Insertion loss, input to port 1" line of the test record, record the level indicated by the marker readout on the CRT. Print or plot the results if desired.
5. Connect port 1 of the S-parameter test set to the output port of the DUT (HP 85630); port 2 to port 2 of the DUT (as shown in Figure 4-4). On the network analyzer, press (CH 1) (MEAS) ***[S12]*** (MENU) ***[MEASURE RESTART]***.

   On the "Insertion loss, port 2 to output" line of the test record, record the level indicated by the marker readout on the CRT. Print or plot the results if desired.

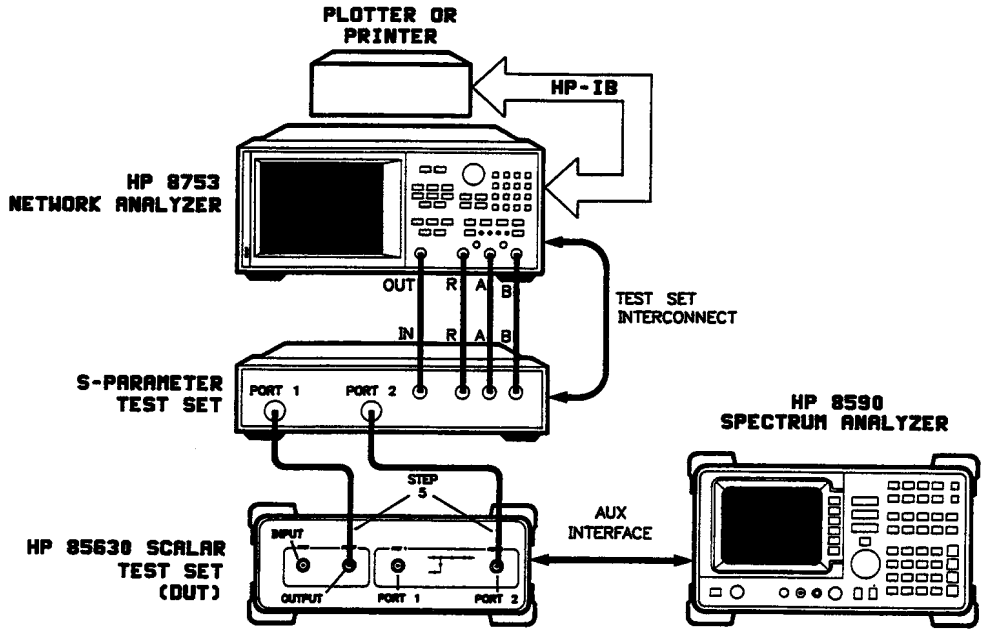
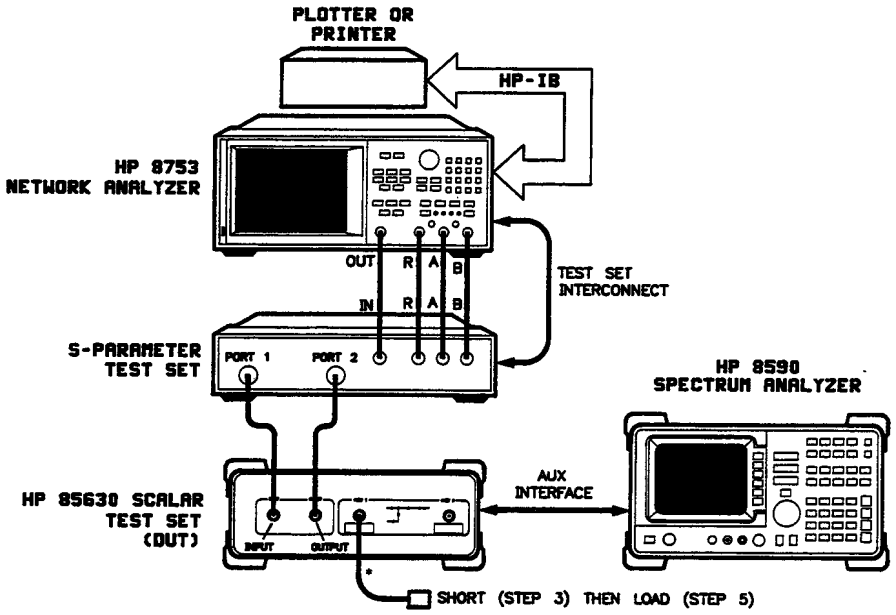


Figure 4-4. Insertion Loss Setup

6. If the results of this test are not within specification, refer to the service chapter of this manual.

DIRECTIVITY PERFORMANCE TEST



* Direct connection

Figure 4-5. Directivity Test Setup

EQUIPMENT

Network analyzer system	See Figure 4-1
Spectrum analyzer	HP 859x series w option 010
Scalar personality	HP 85714A

DESCRIPTION AND PROCEDURE

Directivity is a measure of the ability of a directive device (the HP 85630) to discriminate between incident and reflected signals. This procedure determines directivity by comparing the signal reflected by a short to that reflected by a Z_0 load (termination). Since the return loss of the termination is much greater than the directivity return loss, the measurement is essentially the directivity of the DUT.

Use the highest quality termination available as that factor determines the accuracy of the test.

NOTE: Refer to "Network Analyzer System Calibration," above, to calibrate and configure the system unless you have already done so.

1. Connect the HP 85630 to the spectrum analyzer with the aux interface cable.
2. Turn on the spectrum analyzer and press (PRESET) ***[MODE] [SCALAR ANALYZER] [MEASURE] [REFL]***.

3. Connect port 1 of the S-parameter test set to the input port of the DUT (HP 85630); port 2 to the output port of the DUT (as shown in Figure 4-5). Terminate port 1 of the DUT with a short.

   On the network analyzer, press (CH 1) (MEAS) ***[S21] [MKR]*** (MENU) ***[MEASURE RESTART]***. (If tracking is on, turn it off.)

4. On the network analyzer, press (DISPLAY) ***[DATA → MEMORY]***. At the beep, press ***[DATA/MEMORY]*** and ***[MKR]***.

5. Replace the short at port 1 of the DUT with a load. On the network analyzer press (MENU) ***[MEASURE RESTART]***. Rotate the RPG knob to identify the point of maximum signal strength in the low frequency range. Record that value on the first "Directivity, Input" line of the test record.

6. On the network analyzer, press ***[MARKER 2]*** and rotate the RPG knob to identify the point of maximum signal strength in the high frequency range. Record that value on the second "Directivity, Input" line of the test record. Print or plot the screen if desired.

7. If the results of this test are not within specification, refer to the service chapter of this manual.

ISOLATION PERFORMANCE TEST

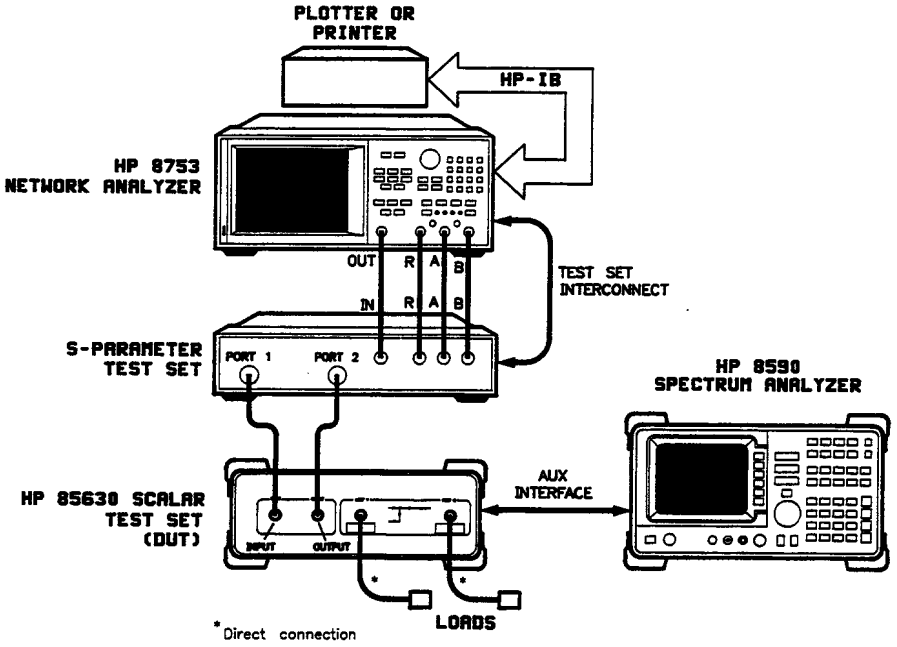


Figure 4-6. Isolation Setup

EQUIPMENT

Network analyzer system	See Figure 4-1
Spectrum analyzer	HP 859x series w option 010
Scalar personality	HP 85714A

NOTE: Refer to "Network Analyzer System Calibration," above to calibrate and configure the system unless you have already done so.

1. Connect the DUT (HP 85630) to the spectrum analyzer with the aux interface cable. Connect the cable of port 1 of the S-parameter test set to the input port of the DUT; port 2 to output (Figure 4-6).

   Connect 50 ohm loads directly to ports 1 and 2 of the DUT.

2. Turn on the spectrum analyzer and press (PRESET) ***[MODE] [SCALAR ANALYZER] [MEASURE] [TRANS]***.

3. On the network analyzer, press (CH 1) (MEAS) ***[S21]*** (SCALE/REF) (2) (5) (x1) (AVG) ***[AVERAGING ON]*** (MKR) to set up the network analyzer system.

4. The number of averages is displayed next to the upper left side of the graticule. After 16 averages, rotate the RPG knob to identify the highest frequency point (least negative Db value) between 300 kHz and 1.2 GHz. Note the marker value on the "Isolation, 300 kHz to 1.2 GHz" line of the test record.

   Rotate the RPG knob to identify the highest frequency point (least negative dB value) between 1.2 GHz and 2.9 GHz. Note the marker value on the "Isolation, 1.2 GHz to 2.9 GHz" line of the test record.

   Print or plot the results if desired.

5. If the results of this test are not within specification, refer to the service chapter of this manual.

Table 4-1. HP 85630A Performance Test Record

Date: _____ *Temperature:* _____ *Humidity:* _____ *Person:* _____

Parameter	Specification	Measurement Uncertainty	Test Result
Port Match			
Input			
300 kHz to 1.2 GHz	>25 dB	± 1.8 dB	_____
1.2 GHz to 2.9 GHz	>22 dB	± 1.5 dB	_____
Output			
300 kHz to 1.2 GHz	>24 dB	± 1.7 dB	_____
1.2 GHz to 2.9 GHz	>18 dB	± 1.2 dB	_____
Port 1			
300 kHz to 1.2 GHz	>19 dB	± 1.3 dB	_____
1.2 GHz to 2.9 GHz	>18 dB	± 1.2 dB	_____
Port 2			
300 kHz to 1.2 GHz	>14 dB	± 1.1 dB	_____
1.2 GHz to 2.9 GHz	>11 dB	± 1.0 dB	_____
Insertion Loss			
300 kHz to 2.9 GHz			
Input to Port 1	6.5 to 10 dB	±0.44 dB	_____
Port 2 to Output	6.5 to 10 dB	±0.44 dB	_____
Directivity			
Input			
300 kHz to 1.2 GHz	>34 dB	±0.44 dB	_____
1.2 GHz to 2.9 GHz	>30 dB	±0.44 dB	_____
Isolation			
Input to Output			
300 kHz to 1.2 GHz	>97 dB	±2.35 dB	_____
1.2 GHz to 2.9 GHz	>94 dB	±2.35 dB	_____

Chapter 5. Adjustments

The HP 85630 scalar test set has no adjustable components.

Chapter 6. Replaceable Parts

INTRODUCTION

This section contains information for ordering parts. It is arranged as follows:

- "Low Cost Rebuilt-Exchange Assembly" describes how to order the rebuilt assembly on an exchange basis at lower-than-new cost
- Figure 6-1: major assemblies and cables of the test set
- Figure 6-2: chassis parts and hardware visible from the front
- Figure 6-3: chassis parts and hardware visible from the rear
- Figure 6-4: chassis parts and hardware visible from the side
- Figure 6-5: chassis parts and hardware visible from the top with the cover removed (but listed)
- Figure 6-6: power supply/control board assembly component layout diagram

LOW COST REBUILT-EXCHANGE ASSEMBLY

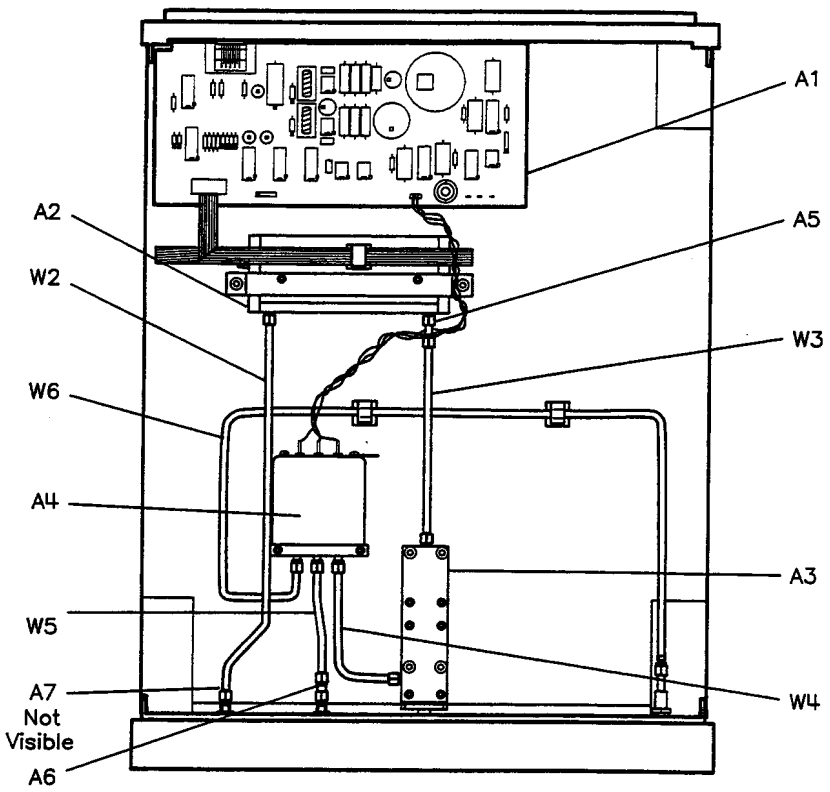
The (RF) coaxial switch (A4, see Figure 6-1) is not field-repairable. It is, however, replaceable on an rebuilt-exchange basis at a considerable cost saving.

To realize the cost savings of the rebuilt-exchange process you must return defective assembly for credit. Thus, assemblies required for spare parts stock must be ordered by the new assembly part number (Figure 6-1).

REPLACEABLE PARTS LISTS

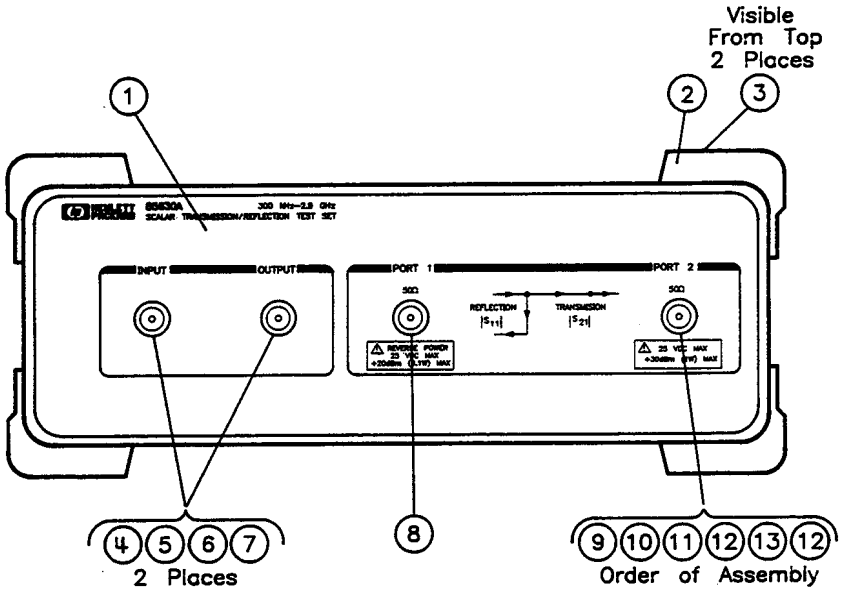
Accompanying each replaceable parts illustration is a replaceable parts list. The parts are listed in alpha-numerical order by reference designator. The lists share this structure:

- Reference Designator: keys the part listed to the illustration
- HP Part Number (second column): identifies part to HP
- Q(uanti)ty: total number of the part in the accompanying figure
- Description: may be used for ordering common parts from non-HP vendors



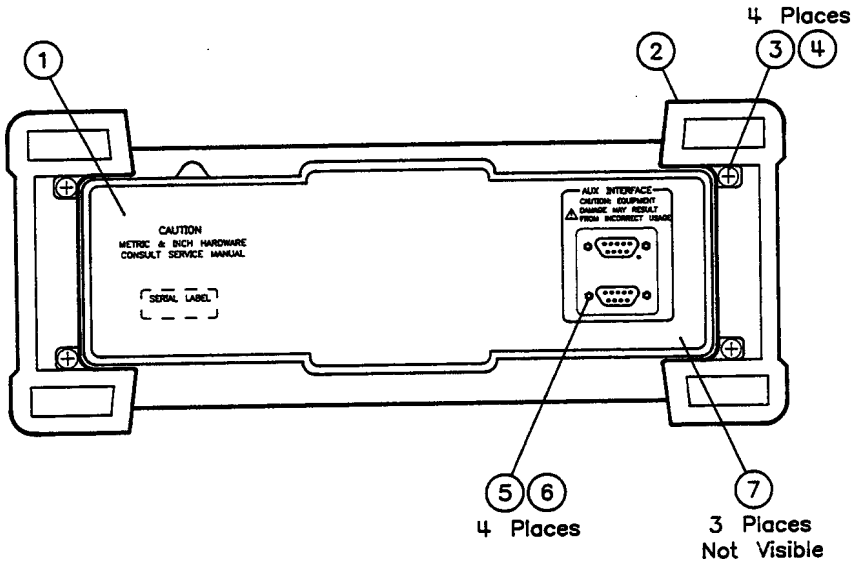
Reference Designation	HP Part Number	Qty.	Description
A1	(see Fig 6-6)	1	power supply/control board assy
A2	85630-60002*	1	70 dB prog attenuator
A3	5086-7579	1	directional coupler
A4	5086-7539	1	coaxial switch
	5086-6539		coaxial switch (rebuilt-exchange)
A5	0955-0522*	1	coax pad
A6	0955-0522	1	coax pad
A7	0955-0522**	1	coax pad (not shown, behind input connector)
W1	85630-20016**	1	input to coupler cable assy (not shown)
W2	85630-20002*	1	input to attn cable assy
W3	85630-20003*	1	atten to coupler cable assy
W4	85630-20004	1	coupler to switch cable assy
W5	85630-20005	1	switch to output cable assy
W6	85630-20006	1	port 2 to switch cable assy
W7	85630-20017	1	analyzer to test set input cable assy (not shown)
W8	85630-20018	1	test set output to analyzer cable assy (not shown)
			* add for option 001
			** delete for option 001

Figure 6-1. Major Assemblies and Cables



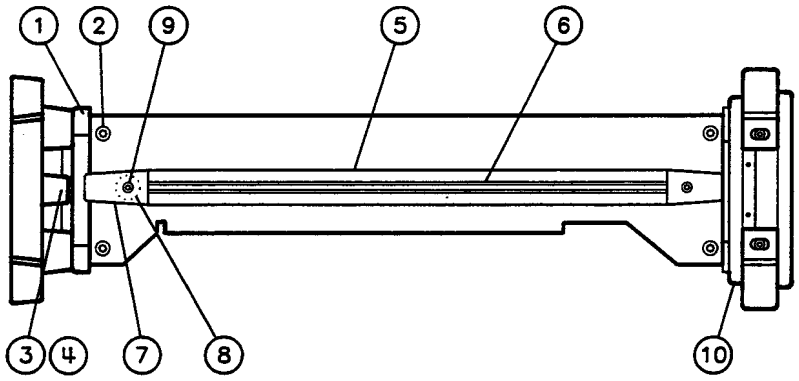
Reference Designation	HP Part Number	Qty.	Description
1	85630-60005	1	front panel
2	5041-8928	4	front foot
3	0515-0430	8	M3x6 screw
4	86290-60005	2	type-N (f) connector
5	2190-0347	2	flat washer
6	2190-0104	2	star washer
7	92950-0132	2	hex nut
8			port 1 connector (part of coupler, Fig 6-1)
9	85630-60004	1	type-N (f) connector
10	3050-0313	4	plastic washer
11	3050-1016	2	flat washer
12	2950-0054	4	hex nut
13	2190-0068	2	lock washer

Figure 6-2. Front View Chassis Parts and Hardware



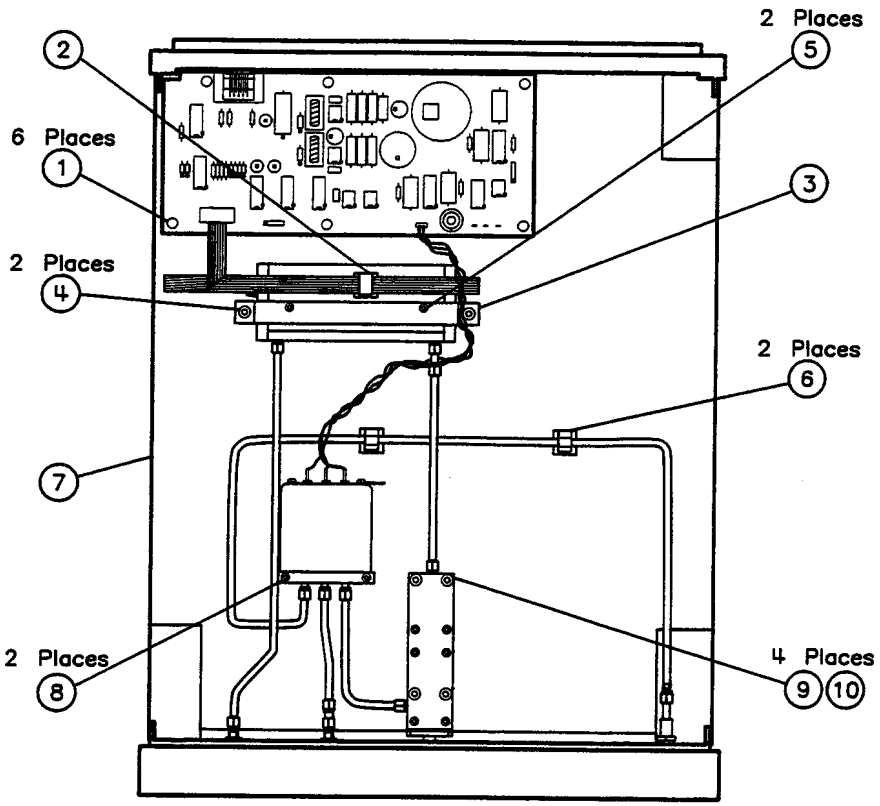
Reference Designation	HP Part Number	Qty.	Description
1	85630-00002	1	rear panel
2	5041-8929	2	rear foot
3	0515-1218	4	M5x40 screw
4	2190-0587	4	lock washer
5	1251-7812	4	jack nut, connector
6	2190-0583	4	lock washer
7	0535-0082	3	M4 hex nut rear frame (see figure 6-4)

Figure 6-3. Rear View Chassis Parts and Hardware



Reference Designation	HP Part Number	Qty.	Description
1	5021-8694	1	rear frame
2	0515-2043	8	M4x8 screw
3	08590-40005	2	plastic spacer
4	0515-0488	2	M4x8 screw
5	85630-40001	1	side handle vinyl cover
6	85630-00005	1	steel strap (internal, not shown)
7	35672-45004	2	side handle end cap
8	85630-20007	2	side handle anchor stud
9	0515-1143	2	M4x16 screw
10			front frame (part of front panel, see Fig 6-2)

Figure 6-4. Side View Chassis Parts and Hardware



Reference Designation	HP Part Number	Qty.	Description
1	0515-0374	6	M3x10 screw
2	1400-1470	1*	COL.ficable clip
3	85630-00006	1*	attenuator bracket
4	0515-0430	2*	M3x6 screw
5	0515-0430	2*	M3x6 screw
6	1400-1470	2	cable clip
7	85630-00003	1	deck
8	0515-1410	2	M3x20 screw
9	0515-0667	4	M3x25 screw
10	3050-0892	4	washer
11	85630-00004	1	cover (not shown)
			* add for option 001

Figure 6-5. Top View Chassis Parts and Hardware

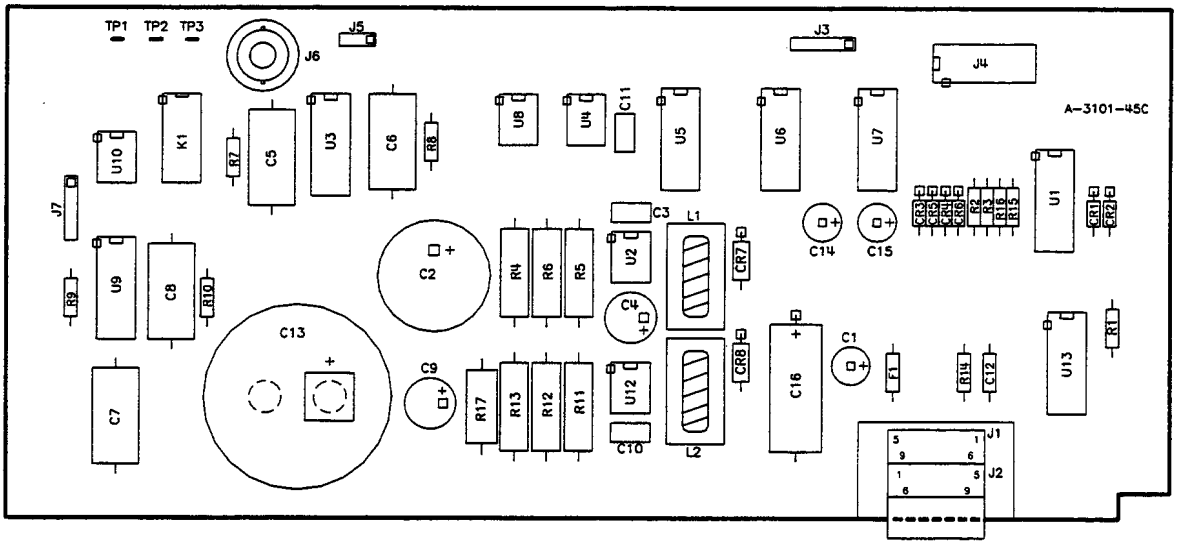


Figure 6-6. Power Supply/Control Board Assembly (1 of 2)

Reference Designation	HP Part Number	Qty.	Description
A1	85630-60001	1	POWER SUPPLY/CONTROL BOARD ASSY
C1	0180-3831	1	CAP-FXD 10uF ±10% 35 V TA
C2	0180-3285	1	CAP-FXD 1200uF +100% -10% 50 V AL-ELCTLT
C3	0160-4535	1	CAP-FXD 1uF ±10% 50 V CER X7R
C4	0180-3297	1	CAP-FXD 100uF ±20% 63 V AL-ELCTLT
C5	0160-3674	1	CAP-FXD 0.47uF ±5% 100 V POLYC-MET
C6	0160-3674	1	CAP-FXD 0.47uF ±5% 100 V POLYC-MET
C7	0160-3674	1	CAP-FXD 0.47uF ±5% 100 V POLYC-MET
C8	0160-3674	1	CAP-FXD 0.47uF ±5% 100 V POLYC-MET
C9	0180-3858	1	CAP-FXD 470uF ±20% 35 V AL-ELCTLT
C10	0160-4535	1	CAP-FXD 1uF ±10% 50 V CER X7R
C11	0160-4535	1	CAP-FXD 1uF ±10% 50 V CER X7R
C12	0160-4835	1	CAP-FXD 0.1uF ±10% 50 V CER X7R
C13	0180-0480	1	CAP-FXD 4500uF +75% -10% 25 V AL-ELCTLT
C14	0180-3849	1	CAP-FXD 47uF ±10% 10 V TA
C15	0180-3941	1	CAP-FXD 100uF ±10% 10 V TA
C16	0180-2614	1	CAP-FXD 100uF ±10% 30 V TA
CR1	1901-1098	1	DIODE-SWITCHING 1N4150 50V 200MA 4NS
CR2	1901-1098	1	DIODE-SWITCHING 1N4150 50V 200MA 4NS
CR3	1901-1098	1	DIODE-SWITCHING 1N4150 50V 200MA 4NS
CR4	1901-1098	1	DIODE-SWITCHING 1N4150 50V 200MA 4NS
CR5	1901-1098	1	DIODE-SWITCHING 1N4150 50V 200MA 4NS
CR6	1901-1098	1	DIODE-SWITCHING 1N4150 50V 200MA 4NS
CR7	1901-0734	1	DIODE-PWR RECT 1N5818 30V 1A
CR8	1901-0734	1	DIODE-PWR RECT 1N5818 30V 1A
F1	2110-0665	1	FUSE-SUBMINIATURE 1A 125V NTD AX UL CSA
J1	1252-4079	1	CONNECTOR-ASSEMBLY 2 VERTICALLY STACKED
J2	1252-4079	1	CONNECTOR-ASSEMBLY 2 VERTICALLY STACKED
J4	1200-0638	1	SOCKET-IC-DIP 14-CONT DIP DIP-SLDR
J5	1251-6793	1	CONN-POST TYPE .100-PIN-SPCG 3-CONT
J6	1250-1687	1	CONNECTOR-RF BNC FEM PC-W-STDFS 50-OHM
K1	0490-0916	1	RELAY-REED 1A 500MA 100VDC 5VDC-COIL
L1	9140-1483	1	INDUCTOR 94.1H +20% -12%
L2	9140-1483	1	INDUCTOR 94.1H +20% -12%
MP2	2680-0128	2	SCREW-MACH 10-32 .25-IN-LG PAN-HD-POZI
MP3	2190-0011	2	WASHER-LK INTL T NO. 10 .195-IN-ID
R1	0757-0280	1	RESISTOR 1K ±1% .125W TF TC=0±100
R2	0757-0280	1	RESISTOR 1K ±1% .125W TF TC=0±100
R3	0757-0280	1	RESISTOR 1K ±1% .125W TF TC=0±100
R4	0698-4922	1	RESISTOR 18.7K ±1% .5W TF TC=0±100
R5	0757-0159	1	RESISTOR 1K ±1% .5W TF TC=0±100
R6	0757-0821	1	RESISTOR 1.21K ±1% .5W TF TC=0±100
R7	0757-0465	1	RESISTOR 100K ±1% .125W TF TC=0±100
R8	0757-0465	1	RESISTOR 100K ±1% .125W TF TC=0±100
R9	0757-0465	1	RESISTOR 100K ±1% .125W TF TC=0±100
R10	0757-0465	1	RESISTOR 100K ±1% .125W TF TC=0±100
R11	0757-0159	1	RESISTOR 1K ±1% .5W TF TC=0±100
R12	0757-0821	1	RESISTOR 1.21K ±1% .5W TF TC=0±100
R13	0698-3103	1	RESISTOR 28.7K ±1% .5W TF TC=0±100
R14	0698-3440	1	RESISTOR 196 ±1% .125W TF TC=0±100
R15	0698-3156	1	RESISTOR 14.7K ±1% .125W TF TC=0±100
R16	0757-0439	1	RESISTOR 6.81K ±1% .125W TF TC=0±100
R17	0698-3620	1	RESISTOR 100 ±5% 2W MO TC=0±200
TP1	1460-2201	1	ER DIVISION
TP2	1460-2201	1	ER DIVISION
TP3	1460-2201	1	ER DIVISION
U1	1820-3344	1	IC SHF-RGTR CMOS/74HC SYNC/ASYNC
U2	1826-2213	1	IC V RGLTR-SWG 40/65V 8-DIP-P PKG
U3	1820-1423	1	IC MV TTL/LS MONOSTBL RETRIG DUAL
U4	1820-0535	1	IC-INTERFACE DRVR AND DUAL -888-BIT
U5	1820-2634	1	IC INV TTL/ALS HEX
U6	1820-2656	1	IC GATE TTL/ALS NAND QUAD 2-INP
U7	1820-2656	1	IC GATE TTL/ALS NAND QUAD 2-INP
U8	1820-0535	1	IC-INTERFACE DRVR AND DUAL -888-BIT
U9	1820-1423	1	IC MV TTL/LS MONOSTBL RETRIG DUAL
U10	1820-0535	1	IC-INTERFACE DRVR AND DUAL -888-BIT
U12	1826-2213	1	IC V RGLTR-SWG 40/65V 8-DIP-P PKG
U13	1820-3185	1	IC SCHMITT-TRIG CMOS/74HC INV HEX

Figure 6-6. Power Supply/Control Board Assembly (2 of 2)

Chapter 7. Instrument History

INTRODUCTION

This chapter contains information (when appropriate) pertaining to earlier versions of the test set. Earlier versions have serial number prefixes lower than the one on the title page.

APPLICATION

Since there are no earlier versions of this instrument (with lower serial number prefixes), this manual applies directly to instruments with the serial number prefix on the title page.

Chapter 8. Service

INTRODUCTION

This chapter provides instructions for troubleshooting and repairing the HP 85630 test set. It includes simplified diagrams and schematic diagrams of the assemblies.

TROUBLESHOOTING

To troubleshoot the test set, follow the suggestions of "Overall Troubleshooting Procedure," below and refer to Figure 8-1 and 8-2. See Table 1-2 for recommended test equipment.

SERVICE

Major Assemblies

The directional coupler (including the RF connector) is not field-repairable but it is replaceable on a rebuilt-exchange basis at a considerable cost saving. The A1 power supply/control assembly is also replaceable on a rebuilt-exchange basis. See "Low Cost Rebuilt-Exchange Assemblies" in chapter 6 for additional information.

OVERALL TROUBLESHOOTING PROCEDURE

Check for proper voltages on the test set power supply/control board assembly (the only circuit board in the instrument). Refer to Figure 6-6 as required. Check for the following conditions:

A1 Board Assembly Locations			
Voltage	**J1 Pin**	**Test Point**	**U1 Pin**
−15V	7	TP 1	
GND	6	TP 2	8
+15V	9	TP 3	
+5V	8		16

Proper voltages at the above *J1 pins* indicate that the interconnect cable is properly connected and functioning. Proper voltages at the above *U1 pins* indicate that the data register should be able to function.

Power Supply/Control Assembly Troubleshooting

The (programmable) step attenuator and the (RF) coaxial switch are controlled by signals from the analyzer. Within the test set the control signals are decoded by U1 (the data register) in conjunction with U13. U1 then activates drivers to perform the desired command. U5, U6 and U7 drive the step attenuator; U5 and U8 drive the coaxial switch.

U2 is the +19V switching regulator. It powers the coaxial switch. U12 is a ±15V switching regulator. It powers the step attenuator.

To troubleshoot control problems, determine whether the step attenuator or the coaxial switch work. If neither works, see "No Control," below. If one of those assemblies works, assume that U1 is OK. Check the non-functional assembly for these voltages and signals and either replace the assembly or troubleshoot back to U1 as indicated.

Attenuator			Switch		
Status	**J4 Pin**	**V/S**	**Status**	**J5 Pin**	**V/S**
Power	6	+15V	Power	2	+19V
GND	12	GND			
10 dB	2	TTL Lo	Trans.	3	+19V
	13	TTL Hi	Trans.	1	Lo
20 dB	5	TTL Lo	Refl.	1	+19V
	11	TTL Hi	Refl.	3	Lo
40 dB	9	TTL Lo			
	3	TTL Hi			

For example, on the spectrum analyzer select 10 dB of test set attenuation: you should see a Lo signal at J4 pin 2 and Hi at J4 pin 13. If so (and the attenuator has not switched), replace the attenuator. If not, check the signals at U1.

U1 Data Register		
Condition	**U1 Pin**	**V/S**
Transmission	5	Lo
Reflection	5	Hi
0 dB attn.	1, 2, 3	Lo
10 dB attn.	1	Hi
20 dB attn.	2	Hi
30 dB attn.	3	Hi

If the output signals at U1 are incorrect, replace U1; if correct, troubleshoot the associated drivers.

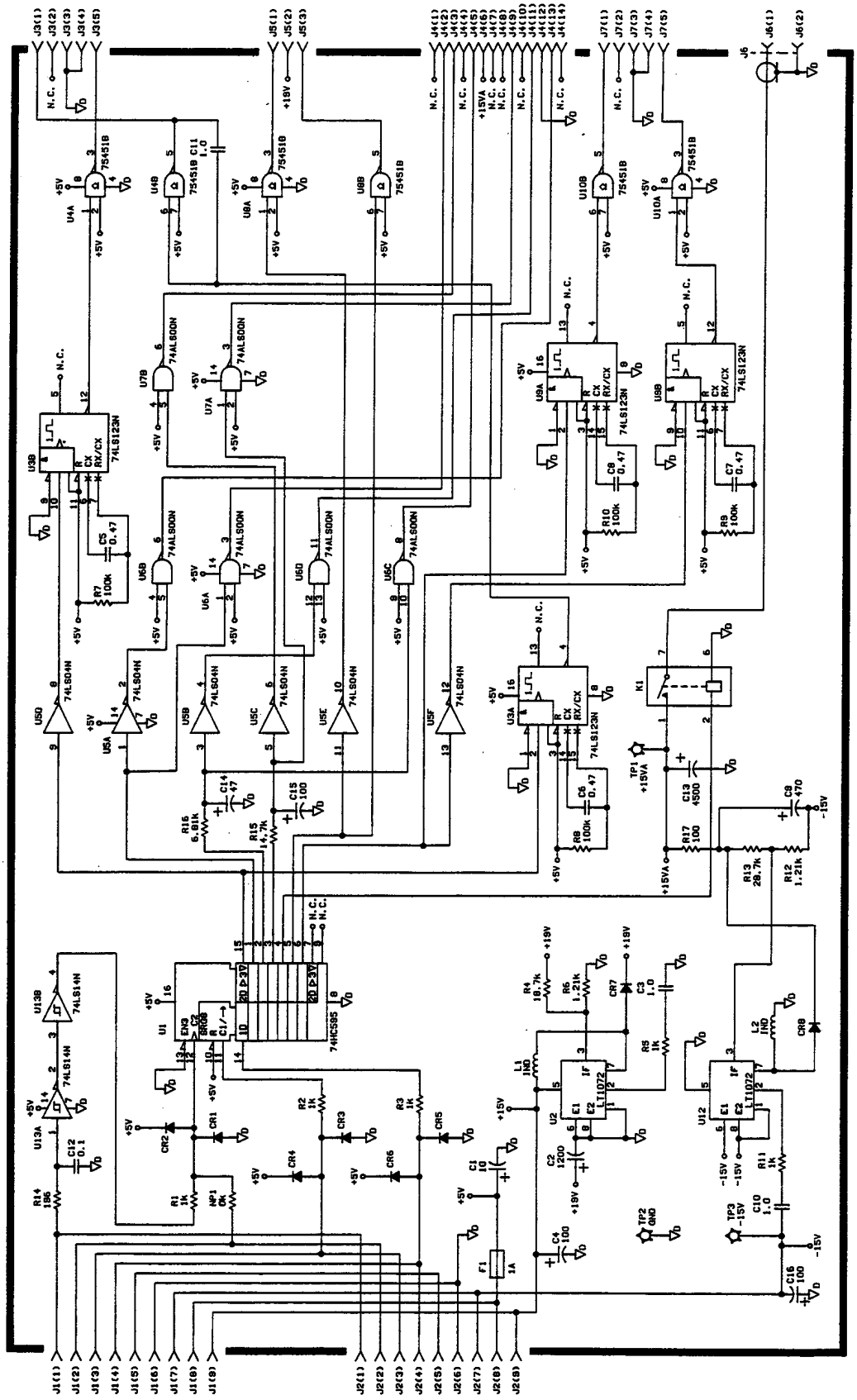


Figure 8-1. Schematic Diagram

No Control

If neither the attenuator or switch work, make sure the test set interconnect cable is sound and properly connected. Check the power supply voltages in the test set. Then, either replace U1 or check its input.

To check the inputs of U1, use a oscilloscope to observe TTL signals at U1 pin 12 and pin 14. Alternately select 0 dB and 70 dB test set attenuation. Watch for activity. If there is activity, troubleshoot toward the drivers; if not, look toward the spectrum analyzer.

RF Troubleshooting Procedure

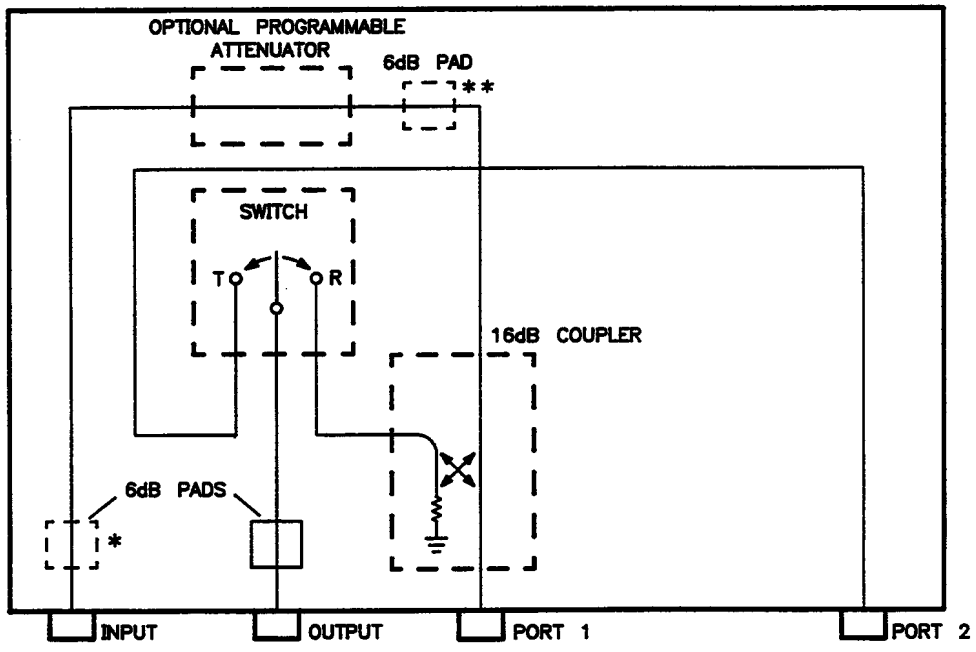
To troubleshoot RF path problems, connect the HP 85630 to the spectrum analyzer with the interconnect cable. Use the spectrum analyzer to apply an RF signal of 1.5 GHz CW at 0 dBm to the INPUT port of the test set. If the problem is a power hole, check the frequency of concern.

NOTE: You may damage assemblies or the internal SMA connectors if you exceed this torque: 7 to 10 in-lb (0.8 to 1.1 Nm).

Measure power levels with a power meter (or the analyzer itself), refer to Figure 8-2, and keep these hints in mind:

- The coupler is a 16 dB coupler (16 dB of loss in reverse [reflection] direction).
- The programmable attenuator at 0 dB setting, coupler in forward direction, coaxial switch all have *nominal* loss of 0 dB, but
- Insertion loss due to semi-rigid cables and components may be up to 3 dB (excluding 6 dB pads).

In case of performance degradation or subtle RF problems, perform the directivity performance test (chapter 4). If the directivity is less than specified in Table 1-1, check the cables and connectors for loose connections and damage. If the cables and connectors are OK and directivity is still less than specified, replace the coupler.



* APPEARS HERE IN TEST SETS WITHOUT PROGRAMMABLE ATTENUATOR

** APPEARS HERE IN TEST SETS WITH PROGRAMMABLE ATTENUATOR

Figure 8-2. RF Path of Test Set

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