Errata

Title & Document Type: **8755P Automatic Scalar Network Analyzer Operating and Service Manual**

Manual Part Number: **08755-90065**

Revision Date: **March 1981**

About this Manual

We've added this manual to the Agilent website in an effort to help you support your product. This manual provides the best information we could find. It may be incomplete or contain dated information, and the scan quality may not be ideal. If we find a better copy in the future, we will add it to the Agilent website.

HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, life sciences, and chemical analysis businesses are now part of Agilent Technologies. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A. We have made no changes to this manual copy.

Support for Your Product

Agilent no longer sells or supports this product. You will find any other available product information on the Agilent Test & Measurement website:

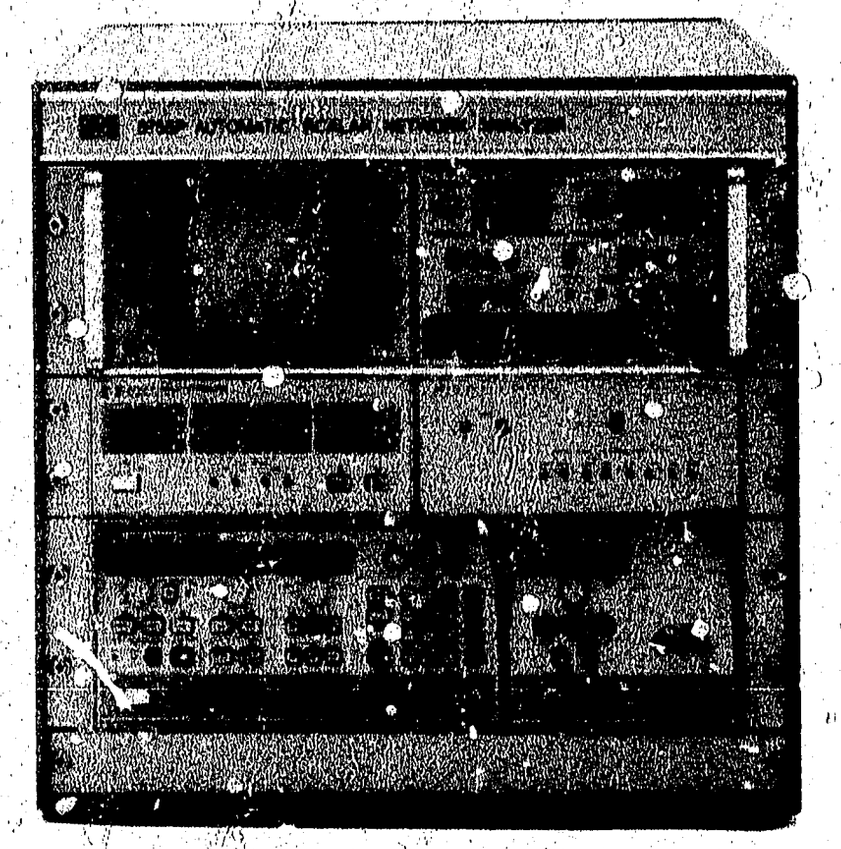
www.agilent.com

Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.

Agilent Technologies

OPERATING AND SERVICE MANUAL

8755P
AUTOMATIC SCALAR NETWORK ANALYZER



PRESS PROOF

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 BUYER'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.

8755P
AUTOMATIC SCALAR NETWORK ANALYZER

SERIAL NUMBERS

This manual applies directly to HP Model 8755P Automatic Scalar Network Analyzer systems having serial number prefix 2008A.

For additional information about serial numbers, refer to SYSTEMS COVERED BY MANUAL in Section I.

MANUAL PART NO. 08755-90065
MICROFICHE PART NO. 08755-90066

Printed: MARCH 1981

HEWLETT PACKARD

CONTENTS

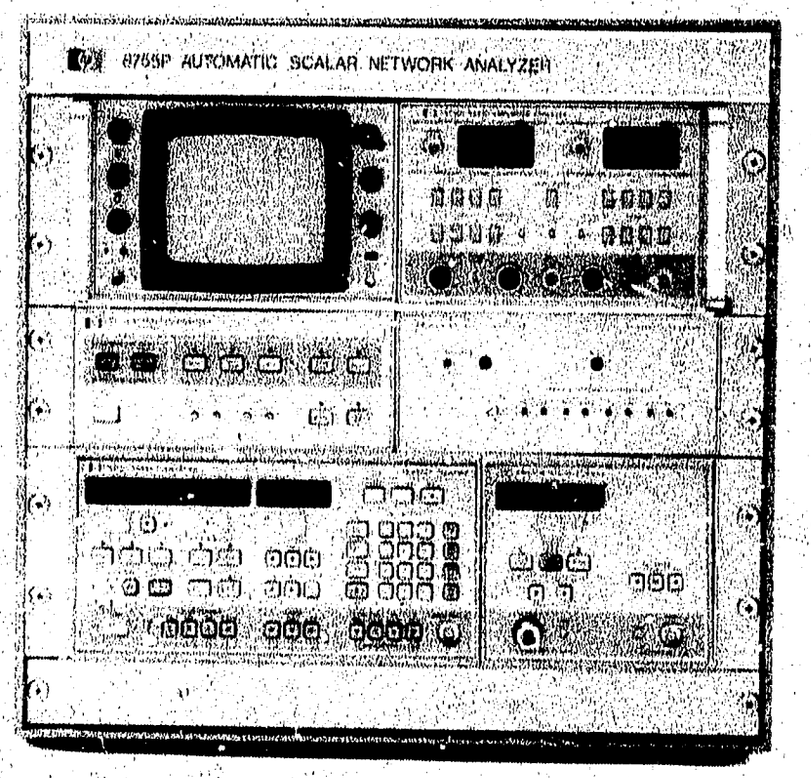
Section		Page
I	GENERAL INFORMATION	1-1
	1-1. Introduction	1-1
	1-4. System Characteristics	1-1
	1-6. Safety Considerations	1-1
	1-8. Safety Symbols	1-2
	1-9. Safety Earth Ground	1-2
	1-11. Servicing	1-2
	1-12. Systems Covered by Manual	1-2
	1-18. System Description	1-4
	1-22. System Components	1-5
	1-24. Options	1-5
	1-29. Accessories Available	1-6
	1-31. Recommended Test Equipment	1-6
II	INSTALLATION	2-1
	2-1. Introduction	2-1
	2-3. Initial Inspection	2-1
	2-6. Preparation For Use	2-1
	2-8. 8755C Installation Instructions	2-1
	2-10. Detector/Reflectometer Bridge Installation Instructions	2-1
	2-12. RF Plug-in Installation Instructions	2-3
	2-15. 8750A Network Analyzer Interface Board Selection	2-3
	2-17. Preset States	2-3
	2-24. Power Requirements	2-4
	2-26. Line Voltage and Fuse Selection	2-4
	2-28. Power Cables	2-6
	2-31. Power Distribution and Circuit Breaker	2-6
	2-34. Interconnections	2-6
	2-36. Mating Connectors	2-6
	2-38. Operating Environment	2-7
	2-43. Rack Mount Information	2-7
	2-45. Storage and Shipment	2-7
	2-46. Environment	2-7
	2-49. Packaging	2-7
III	OPERATION	3-1
	3-1. Introduction	3-1
	3-3. Safety Considerations	3-1
	3-5. Operating Characteristics	3-1
	3-7. Panel Features	3-1
	3-9. Operating Instructions	3-1
	3-11. Local Operation	3-1
	3-13. Remote Operation	3-1
	3-15. Duplicating the Measurement Program	3-5
	3-17. Operator's Checks	3-5
	3-19. Operator Adjustments	3-5
	3-21. Alternate Sweep Operation	3-13
	3-23. Error Codes	3-13
	3-25. Operator's Maintenance	3-13
	3-27. Service Tag Information	3-13
IV	SYSTEM FUNCTIONAL TEST	4-1
	4-1. Introduction	4-1
	4-3. Equipment Required	4-1
	4-9. Test Results	4-1
	4-12. System Functional Test	4-2
V	SYSTEM ADJUSTMENTS	5-1
	5-1. Introduction	5-1
	5-4. Safety Considerations	5-1
	5-6. Equipment Required	5-1
	5-8. Related Adjustments	5-1
	5-10. Adjustment Procedures	5-1
	5-12. 83592A Frequency Calibration	5-4
	5-13. 8755C Adjustments	5-6
	5-14. 8750A Storage-Normalizer Adjustments	5-8
	5-15. 59313A Calibration	5-13
VI	REPLACEABLE PARTS	6-1
	6-1. Introduction	6-1
	6-3. Replaceable Parts List	6-1
	6-6. Ordering Information	6-1
VII	MANUAL BACKDATING CHANGES	7-1
	7-1. Introduction	7-1
VIII	SERVICE	8-1
	8-1. Introduction	8-1
	8-4. 8755P System Theory of Operation	8-1
	8-6. Major Signal Flow	8-3
	8-18. System Troubleshooting	8-4
	8-20. Initial Inspection	8-5
	8-24. Local Versus Remote Operation Troubleshooting	8-5
	8-30. Instrument Verification	8-6
	8-52. Recommended Test Equipment	8-9

ILLUSTRATIONS

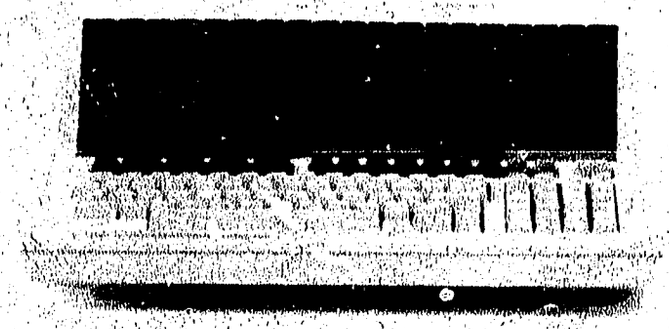
Figure		Page
1-1.	Model 8755P Automatic Scalar Network Analyzer System	1-0
1-2.	Typical Serial Number Plate	1-2
1-3.	Simplified 8755P System Block Diagram	1-4
2-1.	8755P System Interconnections	2-2
3-1.	8755P System Front Panel Features	3-2
3-2.	8755P System Rear Panel Features	3-4
3-3.	Transmission, Reflection, and Power Measurements with the 8755P	3-6
4-1.	System Functional Test Setup	4-3
4-2.	Full Band Display of 3 dB Attenuator Measurement	4-6
4-3.	MKR SWEEP Display of 3 dB Attenuator Measurement	4-6
4-4.	Full Band Display of 8750A Storage-Normalizer Check	4-8
4-5.	Normalized Full Band Display with Markers	4-8
4-6.	HP 85 Plot of Typical 3 dB Attenuator Measurement	4-9
5-1.	83592A Frequency Calibration Adjustment Setup	5-5
5-2.	8755C Adjustments Setup	5-7
5-3.	8350A Marker Display with 8750A in BYPASS Mode	5-11
5-4.	8350A Marker Display with 8750A in INPUT Mode	5-11
5-5.	8750A Inputs Interface Adjustment Location	5-12
5-6.	59313A CAL Switch Location	5-14
8-1.	Simplified 8755P System Block Diagram	8-2
8-2.	8350A Sweep OUT/IN Output for 83592A Full Band Sweep	8-7
8-3.	8350A POS Z BLANK Output for 83592A Full Band Sweep with Markers	8-7
8-4.	8755P Troubleshooting Block Diagram	8-11

TABLES

Table		Page
1-1.	Supplemental Operating Characteristics	1-3
1-2.	8755P System List of Equipment	1-5
1-3.	8755P System Recommended Test Equipment	1-6
2-1.	Line Voltage Selection and Fuse Ratings	2-4
2-2.	AC Power Cables Available	2-5
5-1.	8755P System Adjustments	5-2
5-2.	8755P System Related Adjustments	5-3
6-1.	Replaceable Parts	6-2



HP 8755P SCALAR NETWORK ANALYZER



HP 85 COMPUTING CONTROLLER

NOTE: Refer to Table 1-2 for Complete 8755P System List of Equipment

Figure 1-1. Model 8755P Automatic Scalar Network Analyzer System

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This system guide contains information required to install, operate, test, and service the Model 8755P Automatic Scalar Network Analyzer. The 8755P is shown in Figure 1-1.

1-3. This system guide is designed as a basis of information for the 8755P Operating and Service Manual Set. Overall system subjects are discussed in this system guide with references to specific topics in each of the individual instrument Operating and Service Manuals. This system guide is divided into eight major sections which provide the following information:

a. SECTION I, GENERAL INFORMATION, includes a brief description of the system, safety considerations, system characteristics, options, accessories available, and a list of recommended test equipment.

b. SECTION II, INSTALLATION, provides information for initial inspection, preparation for use, operating environment considerations, storage, and shipment.

c. SECTION III, OPERATION, provides front and rear panel feature identification photos with descriptions, operating characteristics, measurement instructions, and operator's maintenance instructions. A complete listing of the measurement program tape supplied with the system is also given.

d. SECTION IV, SYSTEM FUNCTIONAL TEST, provides the operator with procedures required to verify that the 8755P is functioning correctly as an integrated system.

e. SECTION V, SYSTEM ADJUSTMENTS, presents the operator with procedures necessary to maintain instrument compatibility and correct system calibration.

f. SECTION VI, REPLACEABLE PARTS, provides information necessary to reference and order all parts and assemblies within the system.

g. SECTION VII, MANUAL BACKDATING, provides backdating information, when applicable, to make this manual compatible with earlier shipment configurations.

h. SECTION VIII, SERVICE, presents service aid information, theory of operation, and troubleshooting procedures necessary to isolate a system problem to an individual instrument. Once the suspected instrument is found, that instrument's Operating and Service Manual is referenced for more specific troubleshooting information necessary to isolate the problem to the assembly or component level.

1-4. SYSTEM CHARACTERISTICS

1-5. Supplemental operating characteristics of the 8755P system are listed in Table 1-1. These characteristics are not system specifications but are typical characteristics included as information for the user. Refer to the individual instrument manuals for additional operating characteristics and specifications.

1-6. SAFETY CONSIDERATIONS

1-7. This system, and the individual instruments contained within it, have been manufactured and tested in accordance with international safety standards. Before operation, this system and related documentation must be reviewed for familiarization with safety markings and instructions. A complete listing of safety considerations and symbols used in this system is given below.

1-8. Safety Symbols

Refer to Operating and Service Manual: This symbol on an instrument means that the user must refer to the instrument's Operating and Service manual to protect the instrument from damage.

Protective Earth Ground: Indicates protective earth ground terminal of the ac power source or the instrument. All exposed metal surfaces on the instrument *must* connect to a protective earth ground terminal.

Frame or Chassis Terminal: This symbol identifies a terminal that is normally common to all exposed metal surfaces on the instrument.

WARNING

The WARNING sign denotes a hazard to personnel. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION

The CAUTION sign denotes a hazard to the instrument. It calls attention to an operating or maintenance procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to the instrument. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

1-9. Safety Earth Ground

1-10. This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptable safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and be secured against any unintended operation.

1-11. Servicing

WARNING

Any servicing, adjustment (internal instrument level), maintenance, or repair of this product must be performed only by qualified personnel.

1-12. SYSTEMS COVERED BY MANUAL

1-13. Attached to the 8755P cabinet is a serial number plate which has the system serial number printed on it. Additionally, each individual instrument has a separate serial number. All serial numbers are recorded upon initial shipment so that service and warranty information can be maintained by the factory for the specific combination shipped.

1-14. A typical serial number plate is shown in Figure 1-2. The serial number is in two parts. The first four digits followed by a letter comprise the serial number prefix. The last five digits form the sequential suffix that is unique to each system. The content of this manual applies directly to systems having the same serial number prefix as those listed on the title page of this manual under SERIAL NUMBER.

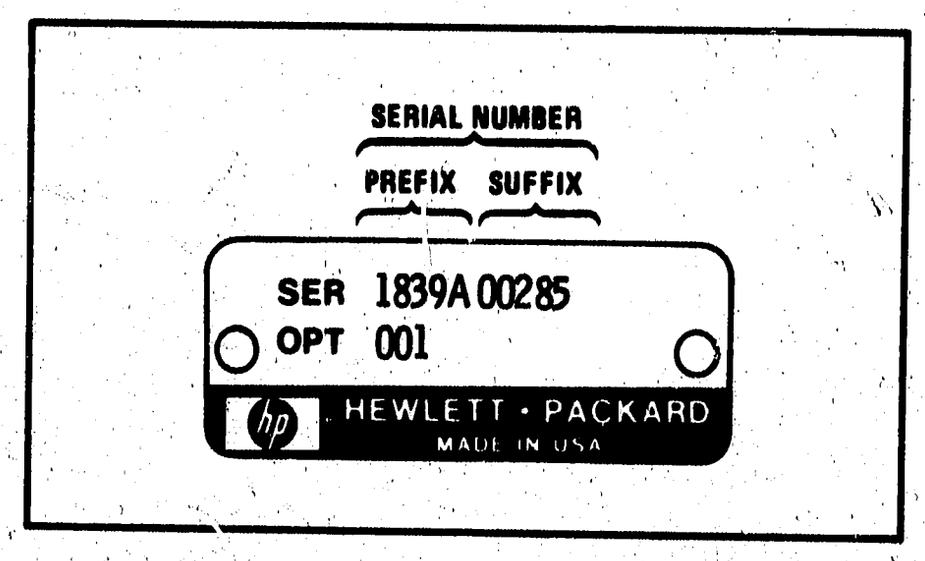


Figure 1-2. Typical Serial Number Plate

1-15. A system manufactured after the printing of this manual may have a serial prefix that is not listed on the title page. An unlisted serial prefix indicates that the system is different from those documented in this manual. The manual for the system is then supplied with a Manual Changes supplement that contains information which documents the differences.

Table 1-1. Supplemental Operating Characteristics

Data supplied in this table are not specifications but are typical characteristics included to provide useful information to the user in applying the system by giving typical, but nonwarranted, performance parameters. Refer to the individual instrument Operating and Service Manuals for additional operating characteristics and specifications. The 8755P system is fully assembled and integrated at the factory. All accessories and cables necessary for making transmission and reflection measurements are supplied with the system including calibration accessories such as a short circuit and shielded open circuit.

Dynamic Range: 60dB (+10 dBm to −50dBm) in all three detector inputs (A, B, and R).

Amplitude Accuracy:

Insertion Loss: Calibrated with a through to remove frequency response errors.

Return Loss: Calibrated with an open/short linear average to remove frequency response errors.

Amplitude Resolution: 0.1% of full screen range normally or 0.02% of full screen range if the signal falls within ±2 divisions of the center of the screen. For instance:

At 10 dB/div:
0.1 dB over full screen (100 dB range).
0.02dB, ±2 divisions from center (middle 40 dB).

At 1 dB/div:
0.01 dB over full screen (10 dB range).
0.002 dB, ±2 divisions from center (middle 4 dB).

Frequency Range: 0.04 to 18 GHz (2 to 18 GHz, Option 001).

Frequency Accuracy (at 25°C, when calibrated with FREQ CAL adjustment):

0.01 to 7.0 GHz: ±5 MHz
7.0 to 13.5 GHz: ±15 MHz
13.5 to 20 GHz: ±20 MHz

Frequency Resolution: 4096 points across each band. CW vernier may be programmed for greater resolution:

0.01 to 2.4 GHz: 0.6 MHz
2.4 to 7.0 GHz: 1.2 MHz
7.0 to 13.5 GHz: 1.6 MHz
13.5 to 20.0 GHz: 1.6 MHz

Output Power: +10 dBm (10mW) over full frequency range.

Power Accuracy (when programmed or set manually):

0.01 to 2.4 GHz: <±1 dB
2.4 to 13.5 GHz: <±1.3 dB
13.5 to 20 GHz: <±1.4 dB
0.01 to 20 GHz: <±1.5 dB

Power Resolution: Power level displayed to 0.1 dB at all times. May be programmed in 0.02 dB increments.

Measurement Time (after calibration):

Insertion or Return Loss: Typically 300 ms per frequency point.

Both Insertion and Return Loss: Typically 420 ms per frequency point.

Software: The 8755P system comes with a system software package that demonstrates many of the capabilities of the system. With it the system can:

- Automatically calibrate and measure up to 500 points of insertion or return loss, or up to 250 points of both.
- Automatically scale and display a plot of the measured loss or gain versus frequency. Hard copy plots may also be output.
- Print or display the measured data in tabular format.

The measurement program is written in a modular style so that it can be easily customized for specific measurement needs.

Manual Measurements: The 8755P system comes with an HP 8750A Storage-Normalizer to make manual measurements less fatiguing and more accurate. The 8750A uses digital storage to display slow-sweeping signals at a flicker-free rate, and it can store a calibration trace and subtract it from subsequent measurements for greater measurement accuracy.

Dimensions:

Cabinet: 44.5H × 53W × 56 mmD (17.5 × 21 × 22 in.).

Controller: 16H × 44W × 45 mmD (6.3 × 16.5 × 17.8 in.).

Weight:

Net: 74.9 kg (165 lbs).
Shipping: 118 kg (260 lbs).

Power Consumption: Approx. 550 volt-amps.

1-16. In addition to change information, the Manual Changes supplement contains information for correcting errors in the manual. To keep this manual as current as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is keyed to the manual's print date and part number, both of which appear on the title page. Complimentary copies of the Manual Changes supplement are available on request from Hewlett-Packard.

1-17. For information concerning a serial number prefix that is not listed on the title page or in the Manual Changes supplement, contact your nearest Hewlett-Packard Sales/Service office.

1-18. SYSTEM DESCRIPTION

1-19. The 8755P is an economical, computer controlled, scalar network analyzer measurement system including the HP 8755S Frequency Response Test Set, the HP 8350A Sweep Oscillator, the HP 59313A Analog to Digital Converter, the HP 85F Computing Controller, a Calibration Kit, and a Software Pac. The HP 8750A Storage-Normalizer is included as an aid to provide a digital storage display and digital normalization for improved manual measurement ease and accuracy. A simplified 8755P system block diagram is given in Figure 1-3.

1-20. When the HP 83592A Sweep Oscillator RF Plug-in is used with the 8350A, the system is capable of making insertion loss measurements over a frequency range of 0.01 to 20 GHz and return loss measurements over a range of 0.04 to 18 GHz. Other RF plug-ins offer different frequency range and power level coverage.

1-21. System control is provided by the HP 85F through the Hewlett-Packard Interface Bus (HP-IB). With the addition of computer control, measurements can be made more quickly with reduced chance of operator error. The computer improves the accuracy of the system by measuring known standards (up to 500 points of insertion loss or return loss, or up to 250 points of both) and uses this information to correct the measured insertion or return loss of the test device. In addition to increasing the measurement accuracy, the computer can print or

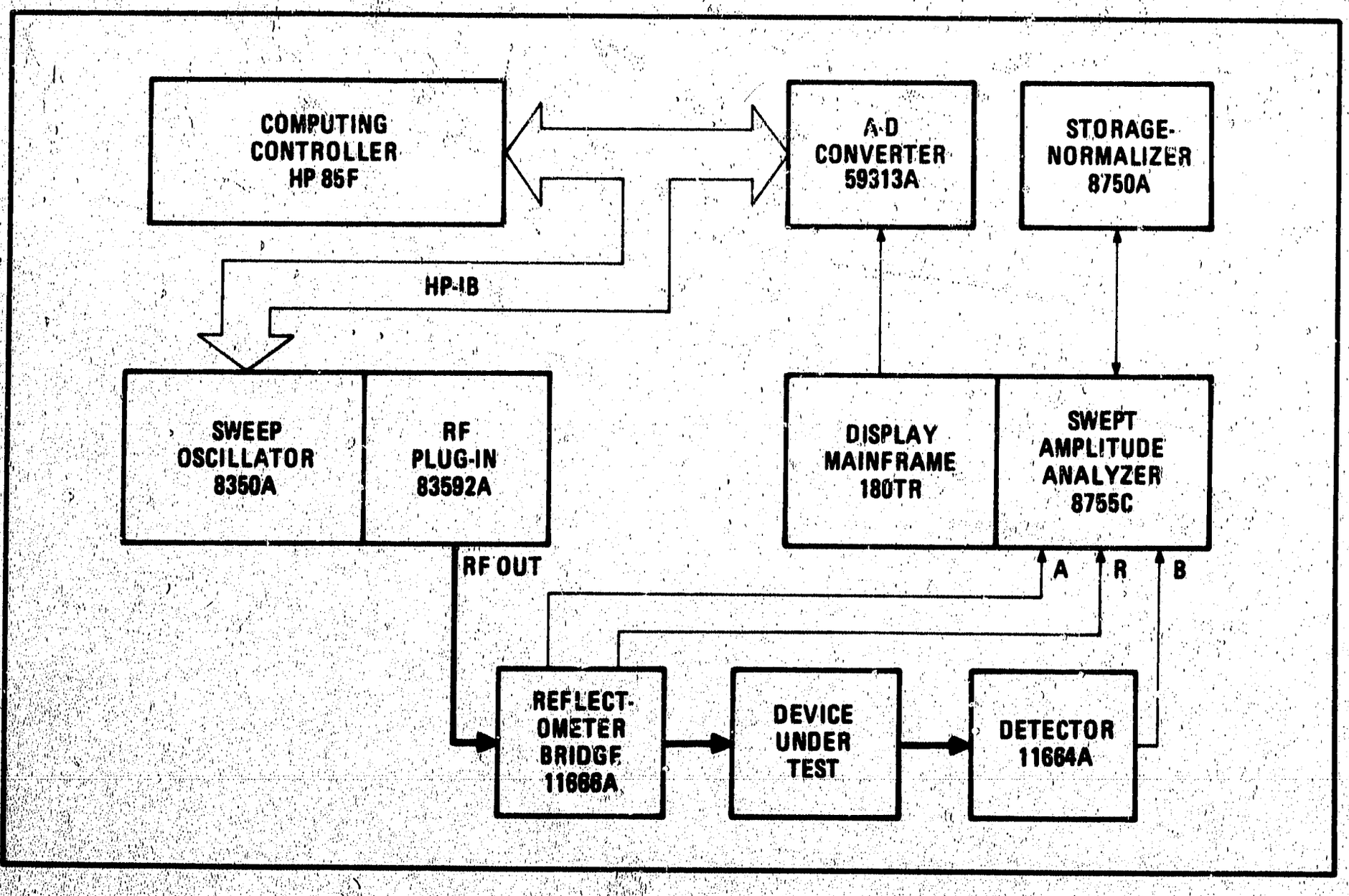


Figure 1-3. Simplified 8755P System Block Diagram

Table 1-2. 8755P System List of Equipment

NETWORK ANALYZER

8755C	Swept Amplitude Analyzer
180TR	Display Mainframe, Option C02
11664A	Detector
11666A	Reflectometer Bridge
8750A	Storage-Normalizer, Option 003 (8755 Interface Card)

SIGNAL SOURCE

8350A	Sweep Oscillator
83592A	RF Plug-in (0.01 to 20 GHz)

HP-IB ACCESSORIES

59313A	Analog to Digital Converter, Option H01
10833D	0.5m (1.6 ft.) HP-IB Cable
10834A	HP-IB Cable Adapter

CONTROLLER

HP 85A	Computing Controller
82936A	ROM Drawer
00085-15002	Plotter/Printer ROM
00085-15003	I/O ROM
82903A	16K Memory Module
82937A	HP-IB Interface Card

CALIBRATION KIT

1250-1472	Type N(f) to Type N(f) Precision 50 Ohm Adapter
1250-1475	Type N(m) to Type N(m) Precision 50 Ohm Adapter
85032-60001	Type N(m) 50 Ohm Shielded Open Circuit
11512A	Type N(m) 50 Ohm Short
909A	Type N(m) Coaxial 50 Ohm Termination (Opt. 012)

SOFTWARE PAC

Includes one Data Cartridge (08755-10001) pre-programmed with a calibration and measurement program as described in Section III, Operation, in this system guide. Also included is a blank data cartridge.

INTERCONNECTION ACCESSORIES

11170A	30cm (1 ft.) BNC Cable
11170B	60cm (2 ft.) BNC Cable (5 each)
1250-0781	BNC Adapter Tee (2 each)

CABINET

Includes all rack mount and internal instrument support hardware required (as listed in Section VI, Replaceable Parts, in this System Guide).

NOTE

Power cables for each individual instrument and a 5-outlet power strip is supplied, depending upon the country of destination.

OPTIONS

OPTION 001:
Delete 83592A RF Plug-in.
Add 86290B RF Plug-in (2 to 18 GHz).
Add 11869A RF Plug-in Adapter.

OPTION 002:
Delete HP 85A Computing Controller.
Delete 82936A ROM Drawer.
Delete 00085-15002 Plotter/Printer ROM.
Delete 00085-15003 I/O ROM.
Delete 82903A 16K Memory Module.
Delete 82937A HP-IB Interface Card.

OPTION 003:
Delete 83592A RF Plug-in.

display automatically scaled graphical plots or data tables of device response versus frequency. A sample measurement program Software Pac is included with the system to demonstrate the capabilities of the system. The measurement program is written in a modular format to allow for modifications to create programs tailored to specific measurement needs.

1-22. SYSTEM COMPONENTS

1-23. The equipment included in a standard 8755P system is listed in Table 1-2.

1-24. OPTIONS

1-25. Option 001 systems substitute the HP 86290B RF Plug-in for the HP 83592A RF Plug-in used in the standard system configuration. The 86290B RF Plug-in is designed for use in the HP 8620C Sweep Oscillator but is compatable with the HP 8350A Sweep Oscillator when used with an HP 11869A RF Plug-in Adapter, which is also included in Option 001 systems. The 11869A attaches to the rear of the 86290B, or other HP 86200 series RF plug-ins, before the pair is inserted in the 8350A. Refer to the 11869A manual for detailed information on the use of the plug-in adapter.

1-26. Option 002 systems delete the HP 85F Computing Controller and its accessories; the HP 82903A 16K Memory Module, the HP 82937A HP-IB Interface, and the Printer/Plotter

ROM. HP-IB connections and interfaces on the 8350A and 59313A remain intact and operational.

1-27. Option 003 systems delete the 83592A RF Plug-in; therefore, no RF plug-in is supplied with Option 003 systems.

1-28. Option 910 systems include an extra 8755P Operating and Service Manual Set. A complete manual set which includes one Operating and Service Manual for each instrument included in a standard 8755P system may also be ordered. Refer to the part number on the back of the system binders.

1-29. ACCESSORIES AVAILABLE

1-30. All accessories available for the HP 8755S Frequency Response Test Set or the 8350A Sweep Oscillator are compatable with the 8755P. Additional 11664A/B/C Detectors may be used with the system in place of the 11666A Reflectometer Bridge or to cover an extended frequency range. Additional HP 83500 series or HP 86200 series (with the addition of the HP 11869A RF Plug-in Adapter) RF Plug-ins may be substituted to cover a different frequency range. Additional accessories available include: the HP 11667A Power Splitter (DC to 18 GHz), HP 11668A High Pass Filter, HP 11678A Low Pass Filter Kit, HP 11679A/B Detector Extension Cables, HP 11500A/B RF Extender Cables, and a complete line of waveguide accessories and adapters.

1-31. RECOMMENDED TEST EQUIPMENT

1-32. A complete listing of test equipment required to test and adjust the 8755P system as a unit is given in Table 1-3. Refer to each individual instrument Operating and Service Manual for a list of the test equipment required to service only that specific instrument. Other test equipment may be substituted if it meets or exceeds the critical specifications indicated in the table.

Table 1-3. 8755P System Recommended Test Equipment

Instrument	Critical Specifications	Recommended Model	Use**
10 dB Attenuator	Attenuation: 10 ±0.5 dB Frequency Range: dc to 18 GHz	HP 8491B Opt. 010	A
3 dB Attenuator	Attenuation: 3 ±0.5 dB Frequency Range: dc to 18 GHz	HP 8491B Opt. 003	F, A
Frequency Counter	Frequency Range: As required by RF plug-in Input Impedance: 50 Ohms	HP 5383A	A, T
Adapter	Type N (m) to BNC (f)	HP Part No. 1250-0780	A, T
BNC Cable	120 cm (4 ft) (3 required)	HP 11170C	A, T
Oscilloscope	X versus Y capability Vertical Bandwidth: 20 MHz Minimum Vertical Sensitivity: 5 mV/DIV Horizontal Sweep Rate: 1 μSec/Div	HP 1740A	T
Power Meter/ Thermister Mount	Frequency Range: 10 MHz to 18 GHz Power Range: +10 dBm to –20 dBm	HP 432A/8478B	T
Digital Voltmeter	Range: –50 to +50 Vdc	HP 3455A	T

*Refer to each individual instrument's Operating and Service Manual for a list of test equipment required to service only that specific instrument.

**Use: F – System Functional Test, A – System Adjustments, T – System Troubleshooting

INSTALLATION

SECTION II
INSTALLATION

2-1. INTRODUCTION

2-2. This section provides installation instructions for the Model 8755P system. This section also includes information about initial inspection, damage claims, preparation for use, storage, packaging, and shipment of the system.

2-3. INITIAL INSPECTION

2-4. Inspect the shipping container for damage upon receipt. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the system has been checked mechanically and electrically. The contents of the shipment should be as listed in Table 1-2. Procedures for checking the electrical performance of the system are given in Section IV, System Functional Test, in this manual. If the system does not pass the System Functional Test, refer to Section V, System Adjustments, in this manual. If, after the adjustments have been made, the system still fails the System Functional Test, and an instrument malfunction is suspected, refer to the troubleshooting procedures in Section VIII, Service, in this manual to isolate the problem to a specific instrument.

2-5. If the shipment contents are incomplete or if there is mechanical damage or defect, notify the nearest Hewlett-Packard office. If the shipping container is damaged, or if the cushioning material shows sign of stress, notify the carrier as well as Hewlett-Packard. Keep the shipping materials for the carrier's inspection. The HP office will arrange for repair or replacement without waiting for claim settlement.

2-6. PREPARATION FOR USE

2-7. The 8755P system is shipped from the factory with the individual instruments assembled in the rack mount cabinet with the major internal interconnections complete. Only the power cords, detector, reflectometer bridge, and system controller need to be attached to make the 8755P a fully functioning system. All critical instrument settings such as HP-IB addresses and device select codes have been preset at the factory but should be verified as explained in this section prior to operation.

2-8. 8755C Installation Instructions

2-9. The 8755P is shipped from the factory with the 8755C installed. The 8755C plug-in obtains all necessary power from the 180TR Display Mainframe. The rear panel connector provides the interface. All 8755C rear panel plug signals and voltages are explained in the 8755C Operating and Service Manual. Should it be necessary to remove or install the 8755C, the following procedure is given (removal is the reverse of installation):

a. Set the display mainframe line switch to OFF.

b. Rotate the LOCK knob on the 8755C front panel fully counterclockwise.

c. Slide the 8755C into place toward the rear of the compartment and push firmly to mate the rear interconnect.

d. Rotate the LOCK knob clockwise until the 8755C is held solidly in the mainframe.

2-10. Detector/Reflectometer Bridge Installation Instructions

2-11. To install each of the detector and reflectometer bridge cables to the front panel of the 8755C:

a. Mate the cable connector to the appropriate 8755C front panel input (A, B, or R). Refer to Figure 2-1 for the system interconnection diagram.

b. Turn the connector locking collar clockwise to lock the cable to the 8755C.

c. Mount the matching colored plastic identification bands supplied on each end of the cables to help identify channel information at a glance.

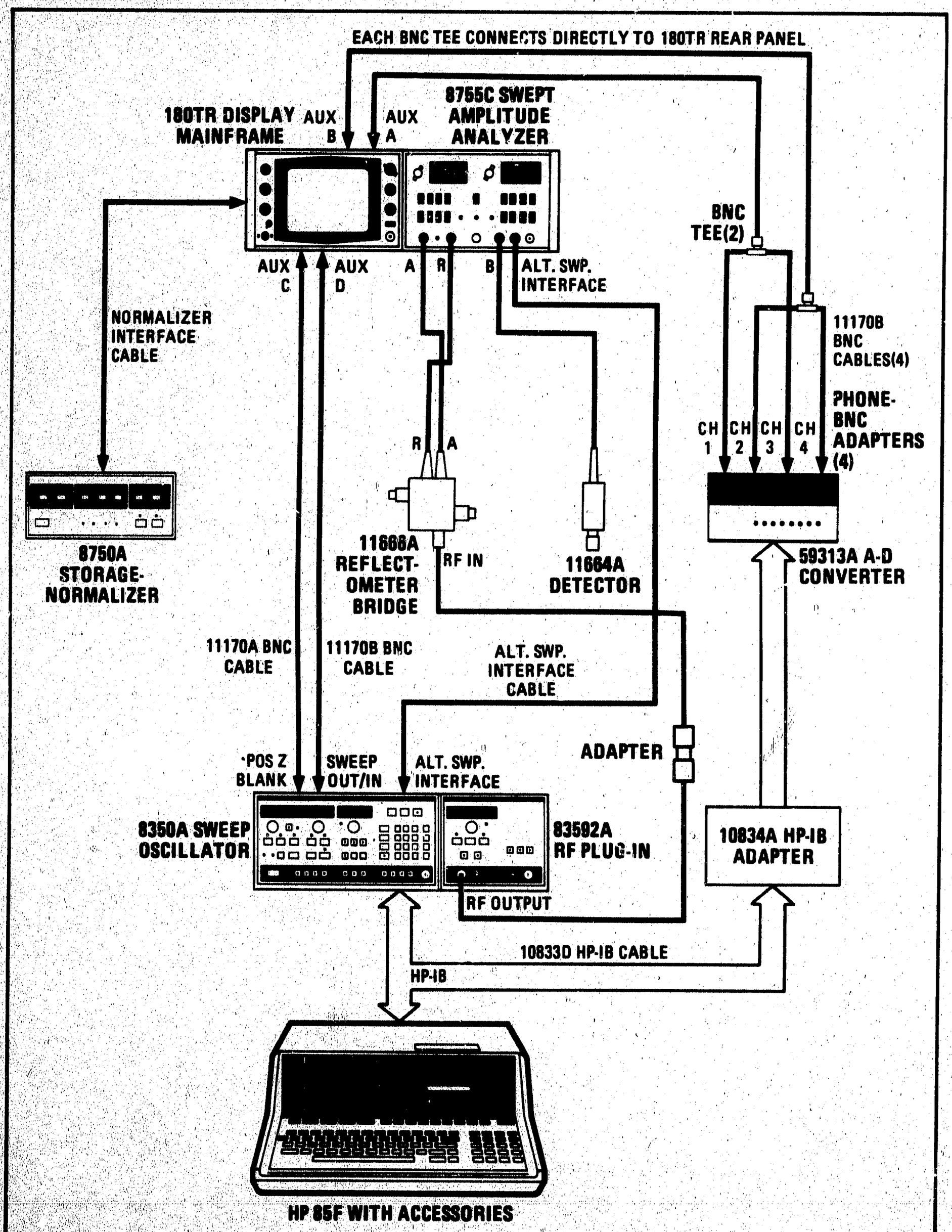


Figure 2-1. 8755P System Interconnections.

2-12. RF Plug-in Installation Instructions

2-13. To operate as a completely functional sweep oscillator, an RF plug-in must be installed in the 8350A. The standard 8755P system is shipped from the factory with the 83592A installed. Any HP 83500-series RF plug-in may be used directly. HP 86200-series RF plug-ins may be used with the addition of the HP 11869A RF Plug-in Adapter. Refer to the following procedure to install an HP 83500-series RF plug-in in the 8350A (removal is the reverse of installation):

a. Set the 8350A LINE switch to OFF.

b. Remove all connectors and accessories from the front and rear panel connectors of the plug-in to prevent them from being damaged.

c. Position the RF plug-in unit latching handle in the fully raised position. The latching handle should spring easily into the raised position and be held there by firm spring tension.

d. Ensure that the 8350A RF plug-in channel is clear, align the RF plug-in in the channel and slide it carefully into place towards the rear of the channel. It should slide easily without binding.

e. The drawer latch handle slot will engage with the locking pin just before the RF plug-in is fully seated in position.

f. Press the latch handle downward, while still pushing in on the RF plug-in, until the drawer latch is fully closed and the front panel of the RF plug-in is aligned with the sweep oscillator front panel.

2-14. When using an HP 86200-series RF plug-in with the 8350A, an 11869A RF Plug-in Adapter must be connected to the rear of the plug-in prior to insertion in the 8350A. Refer to the 11869A Operating and Service Manual for detailed installation instructions for 86200-series RF plug-ins.

2-15. 8750A Network Analyzer Interface Board Selection

2-16. The 8750A is shipped from the factory with three rear panel interface board assemblies. One is the standard Network Analyzer Interface Board, another is the standard Spectrum Analyzer Interface Board. The third is a special Network Analyzer Interface Board for use with the 8755 Swept Amplitude Analyzer (HP Part No. 08750-60032). The 8755P system is shipped from the factory with the special 8755 Network Analyzer Interface Board installed and calibrated. If calibration is necessary, refer to Section V, System Adjustments, in this manual.

2-17. Preset States

2-18. The following instrument settings are preset at the factory to allow for proper system operation. It is not necessary to modify any of these settings for normal operation.

2-19. 8350A Sweep Oscillator HP-IB Address. The 8350A HP-IB address is preset at the factory to 19 (decimal) for proper operation in the 8755P system with the Software Pac supplied. To verify that the 8350A address is currently set to 19, press SHIFT LCL and observe the HP-IB address displayed in the FREQUENCY/TIME display on the 8350A. If the number displayed is not 19, refer to the 8350A Operating and Service Manual for detailed instructions to change it.

2-20. HP 82937A HP-IB Interface Select Code. The select code of the 82937A HP-IB Interface for the HP 85 is set to 7 (decimal) at the factory prior to shipment. If it is required that it be changed, refer to the 82937A Operating and Service Manual for instructions on changing it.

2-21. HP 59313A A-D Converter Range Selection. The HP-IB address of the 59313A has been set to 10 (decimal) at the factory prior to shipment. The channel sensitivities have been set so that a full scale reading on Channels 1 and 2 is the result of a ±1 volt input and a full scale reading on Channels 3 and 4 is the result of a ±5 volt input. Refer to the 59313A Operating and Service Manual for detailed information on changing the HP-IB address or channel sensitivity.

2-22. The 59313A has been calibrated at the factory but should be recalibrated periodically. Refer to the Remote Operation portion of Section III or Section V, System Adjustments, in this manual for a detailed description of the calibration procedure.

2-23. HP 8755C Blanking Polarity Switch Selection. The POS/NEG blanking polarity switch (A11S1) on the A11 Normalizer Interface Board at the rear of the 8755C must be set to the POS position. This sets the 8755C for operation with the positive blanking signal output of the 8350A Sweep Oscillator.

2-24. Power Requirements

2-25. Each individual instrument in the cabinet, as well as the HP 85 system controller, obtains its own power through its own line voltage cord. The two exceptions are the 8755C and the RF plug-in which each receive power from their respective mainframes. Total power consumption of the system is approximately 550 volt-amps, depending upon the specific RF plug-in used.

2-26. Line Voltage and Fuse Selection

CAUTION

To prevent damage to an instrument, make the correct line voltage and fuse selection for each instrument in the system prior to connecting line power to the system.

2-27. Individual line voltage ranges and fuse ratings for the instruments in the 8755P system are given in Table 2-1. Line voltage ranges differ for each instrument so care must be taken when installing the system to ensure that the proper voltage range is selected for each instrument. The proper procedure for determining the correct line voltage range to use is as follows:

a. Measure the available line voltage.

b. Refer to Table 2-1. Select the correct line voltage range and fuse as specified in the table by matching the measured ac line voltage to the ranges specified. If the measured ac voltage does not fall within the acceptable limits for any range, an auto-transformer must be used between the power source and 8755P.

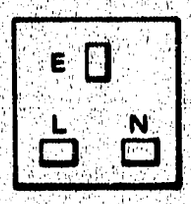
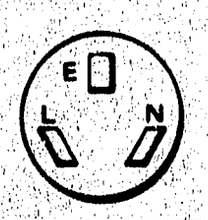
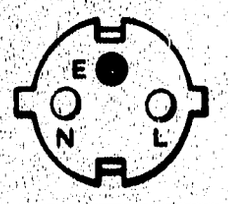
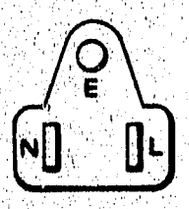
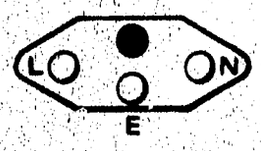
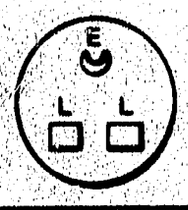
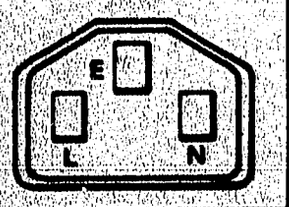
c. Change each individual line voltage selector according to the instructions given in the installation section of each instrument's manual.

d. Insert the proper value fuse for the line voltage range selected.

Table 2-1. Line Voltage Selection and Fuse Ratings

Instrument	Line Frequency Tolerance (Hz)	Line Voltage Range Selection	Line Voltage Tolerance (volts)	Required Fuse	HP Part No.
HP 180TR	48–440	115	103.5–126.5	1.6 A	2110-0005
		230	207–253	0.8 A (SB)	2110-0020
HP 59313A	48–66	115	103.5–126.5	0.2 A (SB)	2110-0235
		230	207–253	0.1 A (SB)	2110-0234
HP 8350A	50–60	100	90–105	4.0 A	2110-0055
		120	108–126		
		220	198–231	2.0 A	2110-0002
		240	216–252		
HP 85A	50–60	115	90–127	1.0 A	2110-0001
		230	200–254	0.5 A	2110-0012
HP 8750A	48–440	100	90–105	0.25 A	2110-0004
		120	108–126		
		220	198–231	0.125 A(SB)	2110-0318
		240	216–252		

Table 2-2. AC Power Cables Available

Plug Type	Cable HP Part Number	CD	Plug Description	Cable Length (inches)	Cable Color	For Use In Country
250V 	8120-1351 8120-1703	0 6	Straight*BS1363A 90°	90 90	Mint Gray Mint Gray	United Kingdom, Cyprus, Nigeria, Rhodesia, Singapore
250V 	8120-1369 8120-0696	0 4	Straight*NZSS198/ASC112 90°	79 87	Gray Gray	Australia, New Zealand
250V 	8120-1689 8120-1692	7 2	Straight*CEE7-Y11 90°	79 79	Mint Gray Mint Gray	East and West Europe, Saudi Arabia, Egypt So. Africa, India (unpolarized in many nations)
125V 	8120-1348 8120-1398 8120-1754 8120-1378 8120-1521 8120-1676	5 5 7 1 6 2	Straight*NEMA5-15P 90° Straight*NEMA5-15P Straight*NEMA5-15P 90° Straight*NEMA5-15P	80 80 36 80 80 36	Black Black Black Jade Gray Jade Gray Jade Gray	United States, Canada, Japan (100V or 200V), Mexico, Philippines, Taiwan
250V 	8120-2104	3	Straight*SEV10011 1959-24507 Type 12	79	Gray	Switzerland
250V 	8120-0698	6	Straight*NEMA6-15P			United States, Canada
220V 	8120-1957 8120-2956	2 3	Straight*DHCK 107 90°	79 79	Gray Gray	Denmark
250 V 	8120-1860	6	Straight*CEE22-VI (Systems Cabinet use)			

*Part number shown for plug is industry identifier for plug only. Number shown for cable is HP Part Number for complete cable including plug.
E = Earth Ground; L = Line; N = Neutral

2-28. Power Cables

2-29. In accordance with international safety standards, each instrument in this system is equipped with a three-wire power cable. When connected to an appropriate power line outlet, this cable grounds the instrument cabinet. Table 2-2 shows the styles of plugs available on power cables supplied with HP instruments. The HP Part Numbers for the plugs are part numbers for complete power cables. The type of power cable/plug shipped with the instrument depends upon the country of destination.

2-30. The offset pin of the three-prong connector is the grounding pin. When operating the 8755P system from a two contact outlet, the protective grounding feature may be preserved by using a three-prong to two-prong adapter (USA connector only, HP Part No.1251-0048) and connecting the green wire of the adapter to ground.

WARNING

Before switching on this system, be sure that only the specified power cable is used. Each instrument is provided with a three-wire power cord that grounds the instrument cabinet. This power cord should only be inserted in a socket outlet provided with a protective earth contact. This protective action should not be negated by the use of an extension cord (power cable) without a protective conductor (ground). Grounding one conductor of a two-conductor outlet is not sufficient protection.

2-31. Power Distribution and Circuit Breaker

2-32. A five-outlet line power module with an integrated circuit breaker may be supplied with the 8755P system, depending upon the country of destination. When included, this power module accepts five ac power cables and is attached to a bracket mounted at the rear of the system cabinet base. Individual power cables from the 180TR, 8750A, 59313A, 8350A, and HP 85 may be plugged into this power strip as a convenience to the user. A single line cable connection to the power source from the power module is all that is necessary.

CAUTION

Set the LINE switches of all instruments to the OFF position before making any line power connections or before resetting the circuit breaker on the line power module.

2-33. Included on the line power module is a 15 amp circuit breaker. This provides additional protection to the system instruments in the event of a current surge or short circuit. If this circuit breaker should trip upon power up, remove the line power from the system and set all instrument LINE switches to OFF. If a visual inspection of the instruments indicate that no apparent physical damage is present, check the individual instrument fuses and line voltage selectors. If the fuses are good and the line voltage selectors are properly set, reset the power line breaker by pressing the button on the end of the line module in until it clicks. Reconnect ac power to the system and switch the instrument LINE switches to ON. If the circuit breaker trips again, or if an instrument fuse blows, refer to Section VIII, Service, in this manual for information to find and correct the problem.

2-34. Interconnections

2-35. A complete system interconnection diagram is shown in Figure 2-1. All front and rear panel connections, with the exception of the line power connections are shown with references to the proper cables to be used. The system is supplied from the factory with all major interconnections to the rack mounted instruments completed.

NOTE

It is necessary to remove the front rack mount screws on the 180TR Display Mainframe or the 59313A/8750A instrument combination when removing or installing the Alternate Sweep Interface Cable. Use caution when reinstalling the instruments to avoid damaging the cable.

2-36. Mating Connectors

2-37. Mating connectors for all of the externally mounted connections on each instrument are given in the installation section of each individual Operating and Service Manual. Along with each mating connector is given an HP Part Number (when available), an industry identification number, and the part number from an alternate source.

2-38. Operating Environment

2-39. Temperature The system may be operated in temperatures from 0°C to +55°C.

2-40. Humidity The system may be operated in environments with humidity from 5% to 80% relative at +25°C to +40°C. However, the system should be protected from temperature extremes which may cause condensation within the system cabinet or individual instruments.

2-41. Altitude The system may be operated at altitudes up to 4572 meters (approximately 15,000 feet).

2-42. Cooling Adequate clearances have been allowed for inside the system cabinet to provide sufficient cooling airflow for the instruments. For this reason, mounting additional equipment in the cabinet or rearranging the existing configuration is not recommended.

2-43. Rack Mount Information

2-44. HP Part Numbers and mounting instructions for rack mount parts are included in Section VI, Replaceable Parts, in this manual or in the Operating and Service Manual of the individual instrument for which rack mount flanges or handles are desired.

2-45. STORAGE AND SHIPMENT

2-46. Environment

2-47. The system may be stored or shipped in environments within the following limits:

Temperature	−40°C to +75°C
Humidity...	5% to 95% relative at 0°C to +40°C
Altitude	Up to 15,240 meters (approx. 50,000 ft)

2-48. The system should also be protected from temperature extremes which may cause condensation within the system cabinet or individual instruments.

2-49. Packaging

2-50. Original Packaging. It is recommended that each individual instrument be packaged separately for maximum protection. Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. A corrugated carton with skids (HP Part No. 9211-3636) and two protective foam pads (HP Part No. 9220-3481, each) are available for packaging the 8755P system cabinet with the instruments installed (except the controller). This shipping carton with skids limits the stresses imposed upon the plug-in interconnections to some extent by keeping the system cabinet oriented in the same position on a shipping skid. If the system or an instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, instrument and/or system model number, and full serial number of the instrument and system (even if only one instrument is being returned). Service tags are available at the rear of Section III in this manual. The serial numbers may be found on the instrument rear panel and the system cabinet. In any correspondance, refer to the instrument and/or system by full model numbers and serial numbers.

2-51. Other Packaging. The following general instructions should be used for repackaging individual instruments with commercially available packaging materials:

a. Wrap the instrument in heavy paper or plastic. If shipping to a Hewlett-Packard Office or Service Center, attach a tag indicating the type of service required, return address, instrument model numbers, and full serial numbers of the instrument and the system from which it was removed.

b. Use a strong shipping container.

c. Use enough shock absorbing material around all sides of the instrument to provide a firm cushion and to prevent movement inside the container. Protect the control panel with cardboard.

d. Seal the shipping container securely.

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

f. In any correspondence, refer to the instrument by full model and serial number of both the instrument and the system from which it was removed.

OPERATION

SECTION III
OPERATION

3-1. INTRODUCTION

3-2. This section consists of all information necessary to operate the 8755P System. Included in this section are operating characteristics, front and rear panel feature diagrams, operating instructions for measurement procedures, and operator's maintenance instructions. Also supplied with this manual is a Remote Operation Manual which includes information specifically related to the system controller supplied with the system.

3-3. SAFETY CONSIDERATIONS

3-4. Before applying power to the system, refer to SAFETY CONSIDERATIONS in Section I, General Information, of this manual.

3-5. OPERATING CHARACTERISTICS

3-6. The 8755P is an economical, computer controlled, scalar network analyzer. It is capable of making manual (LOCAL) or automatic (REMOTE) scalar transmission measurements in the frequency range of 0.01 to 20 GHz and return loss (reflection) measurements in the frequency range of 0.04 to 18 GHz (with the 83592A RF Plug-in). During REMOTE operation, system operation is provided by a system controller through the Hewlett-Packard Interface Bus, or HP-IB. The system can then make measurements more quickly and accurately with reduced chance of operator error. A sample calibration and measurement program is supplied with the system. Complete operating instructions for using the sample measurement program with the system are given in the Remote Operation Section, supplied with this manual.

3-7. PANEL FEATURES

3-8. Complete front and rear panel feature diagrams are given in Figures 3-1 and 3-2. Each diagram gives a photo of the system cabinet with instruments installed. Adjacent to the photos are callouts which reference specific items the operator will need to become aquainted with. Each of these callouts is referenced to a brief description of the item below the photo. Additionally, on the front panel features diagram in Figure 3-1, system adjustments for each instrument are given following the major instrument headings.

3-9. OPERATING INSTRUCTIONS

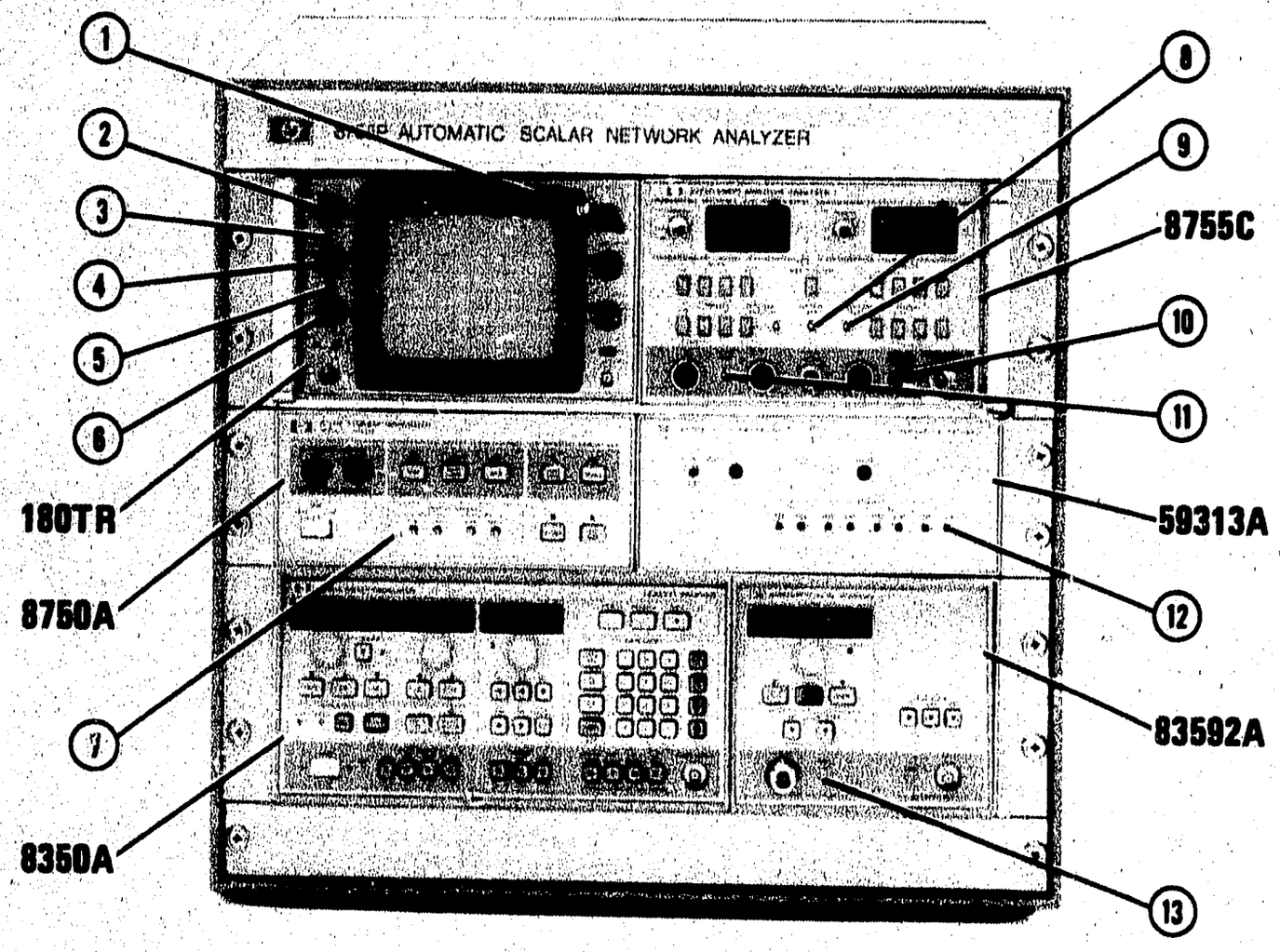
3-10. This operation section is divided into two major sections which correspond to the two basic operating modes of the 8755P. The 8755P system may be operated in the manual (LOCAL) mode or the automatic (REMOTE) mode of operation. These are dealt with separately in this manual because the procedures and equipment used for each are somewhat different. Local operation is covered in the following paragraphs of this manual. Remote operation is described in a separate document which is supplied as part of this manual.

3-11. Local Operation

3-12. Local operation may be simply described as manual operation. All instrument functions and controls for the system are manipulated manually by the operator. All measurement data is then interpreted by the operator based on the CRT display and the setting of the controls. In manual operation, the system controller, the HP-IB bus, and the 59313A A-D Converter are not used and need not even be connected to the operating system. A complete description of typical manual measurement procedures is given in Figure 3-3.

3-13. Remote Operation

3-14. In the Remote mode of operation, measurements are made with the help of the system controller. Some preset conditions are made on instruments which are not on the HP-IB bus. The actual measurement, with the calibration procedure, is then fully programmed by the



180TR Display Mainframe. Provides all power to the 8755C plug-in and displays the 8755C power or ratio measurement information on the vertical axis versus the sweep signal on the horizontal axis. All display controls and adjustments are conveniently placed around the CRT bezel (which also accepts a CRT camera). The A7 Normalizer Interface Assembly within the 180TR serves as a switching and distribution network for sweep, marker/blanking, and vertical output signals.

(1) **HORIZONTAL POSITION.** Adjusts CRT display horizontal position.

(2) **INTENSITY.** Adjusts brightness of display.

(3) **ASTIGMATISM.** Adjusts roundness of CRT writing spot.

(4) **FOCUS.** Adjusts writing beam for sharpest trace.

(5) **TRACE ALIGN.** Rotates trace around longitudinal axis of CRT.

(6) **SCALE.** Controls overall brightness of CRT face and graticule brightness.

8750A Storage-Normalizer. Provides digital storage and normalization of the displayed signal. When in the BYPASS mode, the 8750A is effectively removed from the 8755P system. When in the INPUT mode, the 8750A can store or normalize two independent traces and display them at a flicker-free rate, even at slow 8350A sweep speeds.

(7) **DISPLAY ADJUST Controls.** These adjustments provide calibration of the displayed trace to the CRT graticule when the 8750A is used in the INPUT mode. (8750A rear panel Inputs Interface Assembly adjustments are shown in the Rear Panel Features diagram).

Figure 3-1. 8755P System Front Panel Features (1 of 2)

8755C Scalar Network Analyzer. The 8755C plug-in unit is inserted in the 180TR Display Mainframe. All major network analyzer functions pertaining to the type of measurement (reflection/transmission) and displayed resolution are controlled from this point. The 8755C accepts the RF inputs (A, R, and B) from the 11664A Detector and 11666A Reflectometer Bridge and processes these signals for the desired display mode on the CRT.

(9) **VERTICAL GAIN.** Compensates for a difference in vertical gain of different display mainframes which the 8755C is used in. This control is common to both 8755C channels so it may be adjusted on either channel.

(8) **REFERENCE POSITION.** When the DISPLAY REFERENCE POSITION pushbutton is depressed, this screwdriver adjustment positions the reference trace to be anywhere between the top and bottom extremes of the display. Each channel on the 8755C has a separate REFERENCE POSITION adjustment selected by the adjacent pushbutton.

(10) **ALT SWP INTERFACE Connector.** This connector accepts the Alternate Sweep Interface Cable from the 8350A Sweep Oscillator rear panel and provides the system link for syncronization of the 8350A with the 8755C and 8750A during Alternate Sweep operation (as described in the 8350A manual).

(11) **HORIZ GAIN.** Compensates for a difference in horizontal gain of different display mainframes which the 8755C is used in. This control is common to both channels so it may be adjusted on either channel.

59313A A-D Converter. The 59313A provides the conversion from the 8755C analog vertical signals to a digital output signal to the HP-IB bus. The system controller then uses this information to determine vertical axis (power and ratio measurement) information.

(12) **Channel Adjustments.** Screwdriver adjustments which provide separate zero and gain adjustments for the output of each of the four channels.

8350A Sweep Oscillator. This sweep oscillator mainframe is the control center for the RF plug-in which provides the desired RF power and frequency for the measurement. Also output from the 8350A are a 0 to 10 volt sweep ramp, marker and blanking signal pulses, and alternate sweep control information. Sweep oscillator functions may be entered from the front panel or through HP-IB control from the system controller.

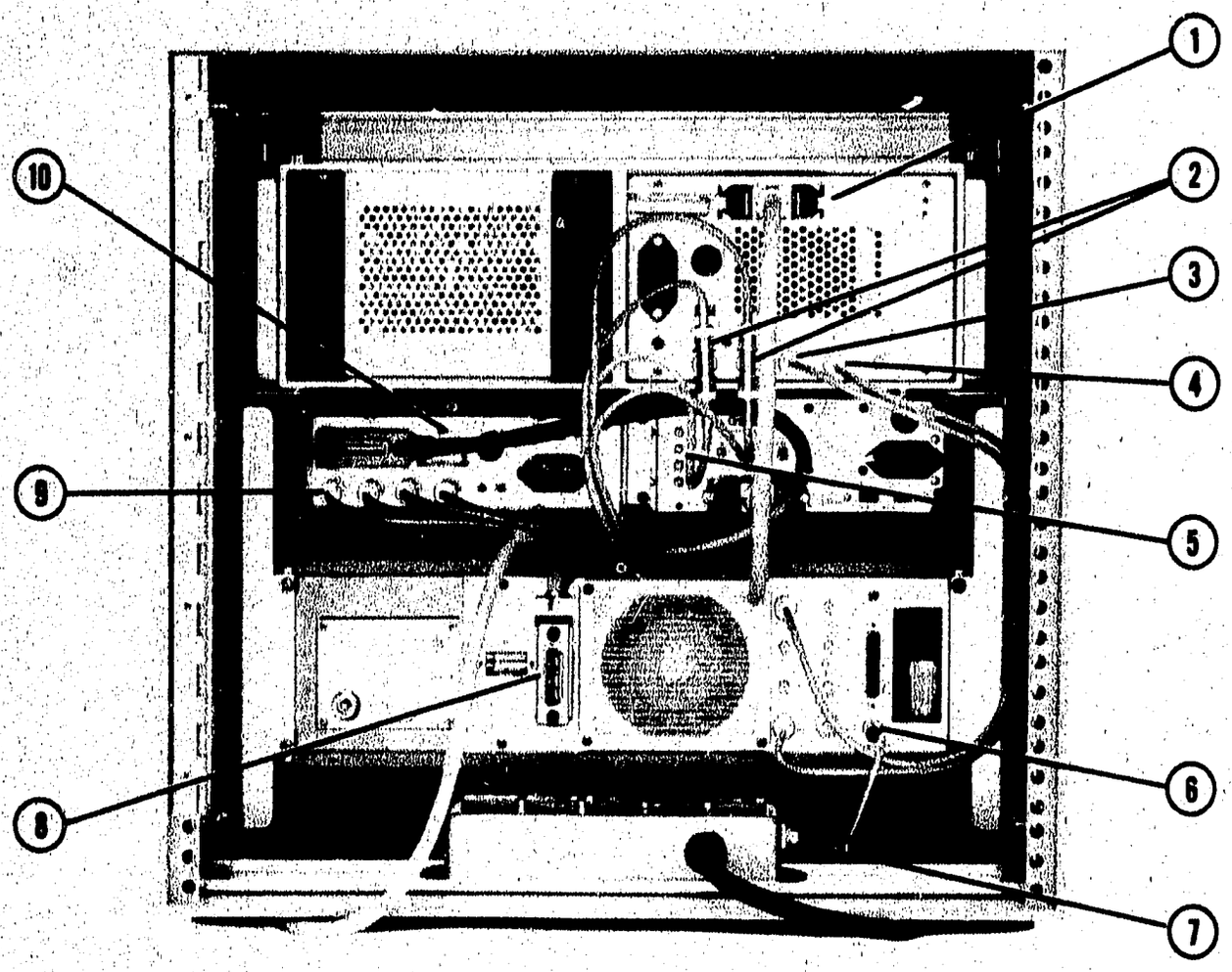
83592A RF Plug-in. This RF plug-in provides calibrated output power from 0.1 to 20 GHz for use in the 8350A Sweep Oscillator. It obtains all of its power and control information from the 8350A. Other RF plug-ins covering different frequency ranges which are compatible with the 8350A may also be used.

(13) **FREQ CAL.** Adjusts the frequency accuracy of the 83592A. Procedures for adjusting the FREQ CAL control are given in Section V, System Adjustments, of this manual.

NOTE

Not shown are the HP 85 Controller, the 11664A Detector, and the 11666A Reflectometer Bridge. The features of these are described in their respective manuals.

Figure 3-1. 8755P System Front Panel Features (2 of 2)



(1) **Normalizer Interconnect Cable.** Provides the system link for transmitting vertical signal information, horizontal sweep information, marker and blanking signals, and control signals to and from the 8750A via the A7 Normalizer Interface Assembly within the 180TR.

(2) **180TR AUX A and AUX B Connectors.** These BNC connectors output the 8755C Channel 1 (AUX A) and 2 (AUX B) vertical information (via the 180 TR) to the 59313A A-D Converter. A BNC tee is used to separate each output into two paths which are then scaled differently in the 59313A.

(3) **180TR AUX C Connector.** This BNC connector accepts the marker and blanking signal from the 8350A POS Z BLANK connector. Signal output consists of positive blanking pulses (+5 Vdc) and negative marker pulses (−8 Vdc active marker, −4 Vdc all others).

(4) **180TR AUX D Connector.** This BNC connector accepts the 0 to 10 Vdc horizontal sweep signal from the 8350A SWEEP OUT/IN connector.

(5) **8750A Plug-in Interface Board Assembly.** This assembly contains the circuits which interface the 8750A with the 8755C. Screwdriver adjustments provide offset and scaling control for the sweep and vertical information signals to match the 8750A to the 8755C being used.

(6) **ALT SWP INTERFACE Connector.** Provides the connection for the Alternate Sweep Interface cable to the 8755C. Control signals output from this connector synchronize channel control in the 8755C and the 8750A with the 8350A during alternate sweep operation.

(7) **Power Strip.** This power strip contains 5 outlets to accept the line power cords of all 8755P system instruments. An integral circuit breaker is included in the assembly. The circuit breaker reset button is visible at the right side of the assembly. (Installation of the power module depends upon country of destination).

Figure 3-2. 8755P System Rear Panel Features (1 of 2)

⑧ **8350A HP-IB Interface Connector.** Accepts the HP-IB Interface Cable from the HP 85 system controller. A parallel HP-IB connection is made to the 59313A A-D Converter.

⑨ **59313A Channel Inputs.** These phone connectors accept BNC-to-phone adapter plugs mated to BNC cables carrying the vertical information signals from the 180TR AUX A and AUX B connectors. Channel 1 and 2 inputs are set for ±1 volt full scale. Channel 3 and 4 inputs are set for ±5 volt full scale. Greater resolution is thus achieved when necessary to measure signals which occur within ±2 divisions of the reference graticule.

⑩ **59313A CAL Switch.** Provides an internal 0, −1, or −5 Vdc calibration signal to the inputs of the 59313A with no input signals (phone-to-phone BNC plugs removed) applied to the rear panel connectors.

Figure 3-2. 8755P System Rear Panel Features (2 of 2)

system controller. Measurement parameters such as frequency band and power level are set by the 8350A, which is on the HP-IB bus. Also on the bus is the 59313A A-D Converter which converts the analog vertical transmission and reflection parameters information into digital signals that are then interpreted by the system controller. The measurement data is then presented in a format (displayed, plotted, graphed, etc.) which the operator determines is most useful. A sample program which includes calibration and measurement routines is provided with the 8755P system. Since the calibration data may be stored by the system controller prior to the measurement, the 8750A Storage-Normalizer is not used in Remote operation.

3-15. Duplicating The Measurement Program

3-16. It is recommended that a copy of the measurement program provided with this system be made for a working copy and the original cassette be stored as a reference copy. After initial program duplication, a copy can be edited or modified for specific measurement needs while retaining the original copy. To duplicate the measurement tape, perform the following procedure using a blank data cartridge (HP 98200A).

a. Insert the blank data cartridge into the HP 85 and type ERASE TAPE END LINE.

b. Insert the pre-programmed measurement tape (HP Part Number 08755-10001) into the HP 85 and type LOAD "Autost" END LINE .

c. Insert the blank tape cartridge in the HP 85 and type STORE "Autost" END LINE .

d. Insert the pre-programmed tape cartridge into the HP 85 and type LOAD "Cal" END LINE .

e. Insert the blank tape into the HP 85 and type STORE "Cal" END LINE .

3-17. Operator Checks

3-18. In order for the operator to make a quick test of the system, a System Functional Test is given in Section IV of this manual. This procedure quickly exercises the major functions of the system and provides an excellent means of verifying and operational status of the system.

3-19. Operator Adjustments

3-20. Prior to making accurate measurements, the 8755P system must be calibrated. System Adjustment procedures which the operator must periodically reference are given in Section V of this manual. No system adjustments require the removal of any protective covers on the individual instruments. Additional adjustment procedures specifically related to internal instrument adjustments are referenced in Section V of each instrument's manual.

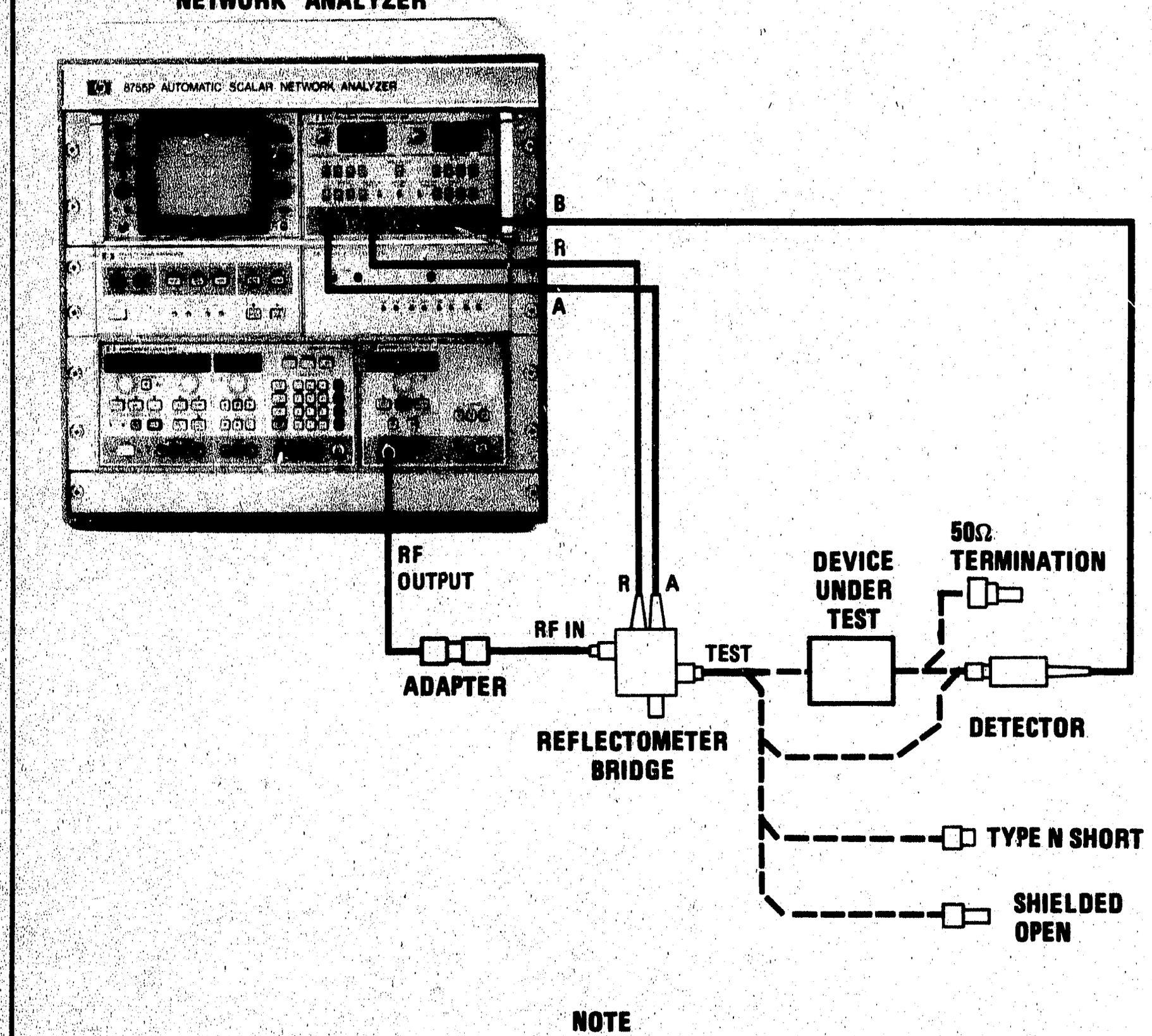


Figure 3-3. Transmission, Reflection, and Power Measurements with the 8755P (1 of 8)

TRANSMISSION MEASUREMENT

PROCEDURE

1. Connect the equipment as shown in the typical measurement setup diagram with the B Channel detector connected directly to the 11666A TEST port. If the system has not been previously calibrated, refer to the System Functional Test in Section IV and the System Adjustments in Section V of this manual prior to making the measurement. These sections include information necessary to ensure that the system is functioning properly with correct display calibration.

NOTE

For manual measurements, the system controller, HP-IB bus connections, and the 59313A A-D Converter do not need to be connected to the system. These items are only used in Remote Operation Procedures which are described in the Remote Operation paragraph in this section. Allow the 8755P system to warm up for 1 hour prior to making any calibration adjustments or measurements.

2. On the 8350A, press INSTR PRESET, then ⎍ MOD.

NOTE

Whenever INSTRUMENT PRESET is pressed on the 8350A, the ⎍ MOD funtion is cancelled and will need to be reset prior to measurement operations.

3. On the 8750A, press BYPASS.

Define Measurement Parameters

4. Set the 8350A and the 83592A for the desired measurement parameters (START/STOP frequency range, RF output power level, markers, etc.).

NOTE

Ensure that the frequency range selected does not exceed the frequency range of the test equipment or the device under test. Using the minimum sweep width necessary will eliminate unwanted signals on the display.

CAUTION

Ensure that the power level selected will not damage the test equipment or the device under test.

Calibrate

5. With the input B detector connected to the 11666A TEST port, set the 8755C controls as follows:

CH 1 DISPLAY	Off (All buttons out)
VIDEO FILTER	Off (Out)
CH 2 DISPLAY	REFERENCE POSITION
CH 2 VERNIER	OFF
CH 2 REFERENCE LEVEL	+00
CH 2 dB/DIV	10

Figure 3-3. Transmission, Reflection, and Power Measurements with the 8755P (2 of 8)

6. Set the 180TR display controls for the sharpest trace possible. Refer to Figure 3-1.

7. Adjust the 8755C Channel 2 REFERENCE POSITION screwdriver adjustment to set the reference trace on any convenient graticule line. This is now the reference level graticule. If the device under test has attenuation or loss, set the reference level near the top of the CRT. If it has gain, set the reference level near the bottom of the CRT.

8. On the 8755C, press Channel 2 DISPLAY B/R. Set the Channel 2 VERNIER switch to ON and adjust the VERNIER to center the trace on the reference graticule set in step 7. To make a finer adjustment, increase the display resolution by pressing Channel 2 .25 dB/DIV and readjust the Channel 2 VERNIER to recenter the trace on the reference graticule. Reset the Channel 2 display resolution to that which will be used during the measurement. The system is now ready to make a transmission measurement on Channel 2. Do not move the Channel 2 VERNIER control during the measurement or calibration will be lost.

9. If the 8750A is being used for trace normalization, the calibration trace may now be stored. Prepare the 8750A by pressing CH 2. The lamp on the CH 2 and INPUT buttons should be lit. To store the Channel 2 calibration trace, press STORE INPUT. The lamp in the STORE INPUT button should light then go out after a short period of time. The Channel 2 transmission measurement calibration trace is now stored in the 8750A.

NOTE

When using the 8750A, all measurements must be done at the same display resolution used when the calibraton trace was stored in the 8750A memory for the normalization to be correct.

10. To remove the frequency response errors from the measurement by the process of digital normalization in the 8750A, press CH 2, then INPUT-MEM. This operation causes the stored calibration trace for Channel 2 to be subtracted from the current input signal. Since the stored and input signals are the same, a flat trace on the reference graticule should now be visible.

Measure

11. Connect the device under test between the 11666A TEST port and the 11664A.

12. Adjust the Channel 2 REFERENCE LEVEL switches to bring the trace back near the reference graticule. If the device under test has attenuation, the REFERENCE LEVEL polarity switch should have a negative sign. Gain is indicated if the polarity switch is positive and the trace is above the reference graticule. When measuring attenuation, the total attenuation of the device is obtained by adding the REFERENCE LEVEL switch setting to the attenuation indication of the CRT trace below the reference graticule line. If the trace is above the reference graticule line, subtract the amount that it is above from the REFERENCE LEVEL setting to obtain the net attenuation. When calculating gain, add the REFERENCE LEVEL switch setting to the amount that the trace is above the reference graticule or subtract the amount that the trace is below the reference graticule. For example, if the REFERENCE LEVEL switches are set to −32 dB, 1 dB/DIV DISPLAY RESOLUTION is selected, and the trace is one half of one division below the reference graticule, the transmission loss through the device under test is −32.5 dB.

Figure 3-3. Transmission, Reflection, and Power Measurements with the 8755P (3 of 8)

REFLECTION MEASUREMENT

PROCEDURE

1. Connect the equipment as shown in the typical measurement setup diagram with the Type N short connected to the 11666A TEST port.
2. On the 8350A, press INSTR PRESET, then ⊔⊓ MOD.
3. On the 8750A, press BYPASS.

Define Measurement Parameters

4. Set the 8350A and the 83592A for the desired measurement parameters (START/STOP, RF output power level, markers, etc.).

NOTE

Ensure that the frequency range selected does not exceed the frequency range of the test equipment or the device under test. Using the minimum sweep width necessary will eliminate unwanted signals on the display.

CAUTION

Ensure that the power level selected will not damage the test equipment or the device under test.

Calibrate

5. With the Type N short connected to the 11666A TEST port, set the 8755C controls as follows:

CH 2 DISPLAY	Off (All buttons out)
VIDEO FILTER	Off (Out)
CH 1 DISPLAY	REFERENCE POSITION
CH 1 VERNIER	OFF
CH 1 REFERENCE LEVEL	00
CH 1 dB/DIV	10

6. Set the 180TR display controls for the sharpest trace possible.
7. Adjust the 8755C Channel 1 REFERENCE POSITION screwdriver adjustment to set the reference trace on any graticule near the top of the CRT (preferably on a different graticule than the transmission measurement reference graticule).
8. On the 8755C, press Channel 2 DISPLAY A/R. Set the Channel 1 VERNIER switch to ON and adjust the Channel 1 VERNIER to center the trace on the reference graticule set in step 7. To make a finer adjustment, increase the display resolution by pressing Channel 1 .25 dB/DIV and readjust the Channel 1 VERNIER to recenter the trace on the reference graticule. Reset the Channel 1 display resolution to that which will be used during the measurement. The system is now ready to make a reflection measurement on Channel 1. Do not move the Channel 1 VERNIER control during the measurement or proper calibration will be lost.
9. If the 8750A is being used for trace normalization, the calibration trace may now be stored. Prepare the 8750A by pressing CH 1. The lamp on the CH 1 and INPUT buttons should be lit. To store the Channel 1 calibration trace, press STORE INPUT. The lamp in the STORE INPUT button should light then go out after a short period of time. The Channel 1 reflection measurement calibration trace is now stored in the 8750A.

Figure 3-3. Transmission, Reflection, and Power Measurements with the 8755P (4 of 8)

NOTE

When using the 8750A, all measurements n... ... at the same display resolution as that which was used when t... ...rtion trace was stored in the 8750A memory.

10. To remove the frequency response errors from the measurement by the process of digital normalization in the 8750A, press CH 1, then INPUT MEM. This operation causes the stored calibration trace to be subtracted from the current input signal. Since the stored and input signals are the same, a flat trace on the reference graticule should now be visible.

Calibrating for Greater Accuracy

11. The 8755P system may be calibrated to make a more accurate reflection measurement by using both a short and an open. Each of these devices cause maximum reflections to occur but the reflected signals for each is 180 degrees out of phase with the other. Through the process of linear averaging, the magnitude components of these two calibration values can be compared to cancel out other errors in the measurement. In order to do this without the 8750A, after step 8, with the short still connected to the 11666A TEST port, trace the calibration trace on the face of the CRT with a grease pencil (which will not damage the CRT screen). Now, replace the short with the Type N open circuit. The difference between the displayed trace and the grease pencil trace is due to system errors. A more accurate calibration trace may now be obtained by drawing a new calibration trace at the average of the previous grease pencil trace and the current displayed trace.

12. If the 8750A is being used, only one calibration trace at a time may be stored. It is not possible to modify the calibration trace stored in memory. The 8750A may, however, be used to store the first calibration trace (drawn by the grease pencil with the Type N short connected) by pressing CH 1, then STORE INPUT, followed by INPUT-MEM. A flat trace should now be visible on the reference graticule. At this point the short may be replaced by the Type N open circuit and the average of the flat reference graticule and the displayed trace may be drawn with a grease pencil to show the new calibration trace.

Measure

13. Remove the Type N open or short from the 11666A TEST port and replace it with the device under test. If the device under test is a two port device, terminate the open port with the 50 Ohm Type N termination. In the absence of a 50 Ohm termination, the 11664A Detector may be used to terminate the device under test.

14. Adjust the Channel 1 REFERENCE LEVEL switches to bring the trace back near the reference graticule (or calibration trace). The return loss may now be determined by adding the setting of the Channel 1 REFERENCE LEVEL switches to the amount that the trace is below the reference graticule. If the trace is above the reference graticule, subtract the amount that the trace is above the reference graticule from the Channel 1 REFERENCE LEVEL switch setting. For example, if the REFERENCE LEVEL switches are set to −46, the DISPLAY RESOLUTION is set to 5 dB/DIV, and the trace is one half of one division above the reference graticule, the return loss of the device under test is −43.5.

Figure 3-3. Transmission, Reflection, and Power Measurements with the 8755P (5 of 8)

SIMULTANEOUS TRANSMISSION AND REFLECTION MEASUREMENT

The typical measurement setup diagram shown allows simultaneous transmission and reflection measurements to be made. The reflection measurement is made on Channel 1 of the 8755C and 8750A. The transmission measurement is made on Channel 2 of the 8755C and the 8750A. All 8755C front panel pushbuttons for each channel may be set independently for each measurement as long as the calibration trace stored in the 8750A was made at the same displayed resolution as the measurement. After the calibration steps have been performed for each measurement procedure, the calibration traces are stored in each channel of the 8750A. At this point, on the 8750A, press CH 1, then INPUT-MEM. Then press CH 2 followed by INPUT-MEM. This sets both channels of the 8750A to the necessary input modes for normalization. Each trace is now normalized, thereby eliminating frequency response errors in each channel.

POWER MEASUREMENT

PROCEDURE

1. The 8755P is designed so that with no REFERENCE LEVEL offset and the VERNIER OFF, the display directly indicates the absolute power level applied to the 11664A Detector (which may be used on any input, A, R, or B).

NOTE

The power applied to the detector is modulated with a symmetrical 27.8 kHz square wave. The average power level of this modulated signal is therefore 3 dB below the unmodulated power level. The 8755P display indicates the unmodulated power level ± approximately 2 dB. Greater accuracy can be obtained by calibrating the display using a power meter as described in the following paragraphs.

Only measurements with the input B detector are described. However, any of the 8755C inputs may be used with the 11664A as well as the 11666A Reflectometer Bridge. When using the 11666A Reflectometer Bridge, the R signal may be used by connecting the device to the RF IN port and using the 8755C R input and its controls. When using the 11666A A input for power measurements, it is necessary to connect the device under test to the 11666A TEST port (because the A signal is normally used for reflected power). In either case, the internal losses of the 11666A signal paths will be cancelled out when the display is calibrated.

2. Turn off the 8755C Channel 1 display by pressing one of the Channel 1 DISPLAY pushbuttons partially in and then releasing it to pop all of the Channel 1 buttons out.

Calibrate

3. Press Channel 2 DISPLAY REFERENCE POSITION and adjust the Channel 2 REFERENCE POSITION screwdriver adjustment to place the trace on any convenient graticule line. With the REFERENCE LEVEL switches at 00 dB and the VERNIER switch OFF, the reference graticule line is now 0 dBm.

Figure 3-3. Transmission, Reflection, and Power Measurements with the 8755P (6 of 8)

Measure

4. Press Channel 2 DISPLAY B and 10 dB/DIV.

5. Connect the B detector to the device under test at the point where signal power is to be measured.

6. Select a power point of interest on the CRT trace for the power measurement. Offset that point to the reference graticule with the REFERENCE LEVEL switches. If the trace falls exactly on the reference graticule, the power level (in dBm) may now be read directly from the REFERENCE LEVEL switches which are displaying the power level at the reference graticule.

7. Increase the resolution of the reading by pressing the 5, 1, or .25 dB/DIV DISPLAY RESOLUTION pushbuttons. If, for instance, .25 dB/DIV DISPLAY RESOLUTION were selected and the REFERENCE LEVEL switches were set at −31 dBm, then the reference graticule would be −31 dBm. One division below the reference graticule would be −30.75 dBm, and one division below the reference graticule would be −31.25 dBm.

POWER MEASUREMENT (Calibrated for Greater Accuracy)

PROCEDURE

1. Turn off the 8755C Channel 1 display by pressing one of the Channel 1 DISPLAY pushbuttons partially in and then releasing it to pop all of the Channel 1 buttons out. Set the Channel 2 REFERENCE LEVEL switches to 00 and the Channel 2 VERNIER switch to OFF.

Calibrate

2. Press Channel 2 DISPLAY REFERENCE POSITION and adjust the Channel 2 REFERENCE POSITION screwdriver adjustment to place the trace on any convenient graticule line.

3. On the 8350A, press INSTR PRESET, ⊓ MOD, CF 2 GHz, ΔF 0 MHz. This sets the RF plug-in for a 0 Hz sweep width at 2 GHz to provide a constant power level.

4. Connect a power meter to the 83592A RF Output. Adjust the 83592A RF Power Level for a power meter reading of −3 dBm.

NOTE

A low pass filter inserted between the 83592A RF Output and the power meter will make the power measurement more accurate by eliminating errors caused by harmonics of the RF plug-in output.

5. Connect the input B detector the 83592A RF Output (or the low pass filter output if the power level was set with it in place.

Figure 3-3. Transmission, Reflection, and Power Measurements with the 8755P (7 of 8)

6. Set the 8755C Channel REFERENCE LEVEL switches to −00, the DISPLAY RESOLUTION to 10 dB/DIV, and select Channel 2 DISPLAY B.

7. Set the Channel 2 VERNIER switch to ON and adjust the VERNIER to set the trace on the reference graticule. This sets the reference level at 0 dBm, relative to the accuracy of the power meter.

Measure

8. Connect the B detector to the device under test or any other signal point of interest.

9. Select a power point of interest on the CRT trace for the power measurement. Offset that point to the reference graticule with the REFERENCE LEVEL switches. If the trace falls exactly on the reference graticule, the power level (in dBm) may now be read directly from the REFERENCE LEVEL switches which are displaying the power level at the reference graticule.

10. Increase the resolution of the reading by pressing the 5, 1, or .25 dB/DIV DISPLAY RESOLUTION pushbuttons. If, for instance, .25 dB/DIV DISPLAY RESOLUTION were selected and the REFERENCE LEVEL switches were set at −31 dBm, then the reference graticule would be −31 dBm. One division below the reference graticule would be −30.75 dBm, and one division below the reference graticule would be −31.25 dBm.

Figure 3-3. Transmission, Reflection, and Power Measurements with the 8755P (8 of 8)

3-21. Alternate Sweep Operation

3-22. The 8755P system may be operated in the Alternate Sweep mode which allows the 8350A Sweep Oscillator to alternately sweep two independently programmed sweeps. This allows different frequency ranges, power levels, sweep times, markers, or the like to be used on each channel. Channel control for the 8755C and the 8350A are synchronized with the 8350A through the Alternate Sweep Interface Cable connections, supplied with the system. A complete description of this function and how it operates is included in the Operation section of the 8350A manual.

3-23. ERROR CODES

3-24. The 8350A, 83592A, and HP 85 undergo a self check routine following instrument turn on. If any error is detected, an error code will be displayed on these instruments' front panel displays. In the event that this should occur, do not attempt to make a measurement until the cause of the problem is found. A complete error code listing is included in Section VIII of the manual for each of these instruments.

3-25. OPERATOR'S MAINTENANCE

3-26. Operator's maintenance for the 8755P system consists of replacing defective fuses, cleaning the air filter on the 8350A, and cleaning the plug-in interface connections for the RF plug-in and the 8755C. These items are separately described in detail in the Operation Section of the manual for each individual instrument.

3-27. Service Tag Information

3-28. If the 8755P system needs service and the operator's maintenance is not sufficient to correct the problem, the system or faulty instrument may be sent, as described in Section II of this manual, to your local HP service organization. Before sending the instrument back, fill out and attach one of the blue service tags located at the rear of this section. Be sure to include any error codes, failure symptoms, or special control settings relating to the failure. The system serial number, located on a tag attached to the system cabinet, must be included on all service tags associated with 8755P system equipment which is returned. Even if only a separate instrument from the system is being returned, supply the system serial number as well as the individual instrument serial number. System packaging information is also included in Section II of this manual.

SECTION

SECTION IV
SYSTEM FUNCTIONAL TEST

4-1. INTRODUCTION

4-2. The 8755P System Functional Test procedure is designed to be a first-level check to ensure that the 8755P Automatic Scalar Network Analyzer is functioning correctly. It can be performed in less than one hour, and provides approximately 90% certainty that the system is functioning. The system's accuracy, and the specifications which pertain to the individual component instruments, are not checked. The procedure does not require access to the interior of the system or to any instrument. It is recommended as an incoming inspection verification of system operation.

4-3. EQUIPMENT REQUIRED

4-4. The System Functional Test can be performed on the standard system using only the instruments, controller, and accessories included as part of the 8755P. The device under test is all that is required. This can be the Type N male-to-male and Type N female-to-female adapters which may be used as a thru line. Transmission loss is predictable but return loss may vary widely. A better indication of system operation may be had by using a known characterized device. The suggested test device is a 3 dB attenuator. It is a common bench item and yields predictable and repeatable insertion and transmission loss results. Ideally, the device used for the System Functional Test should be kept as a system comparison device only. This ensures that electrical characteristics due to mechanical wear are not degraded during normal measurements.

4-5. The following modifications are necessary for option configured systems.

4-6. Option 001. Option 001 systems substitute the HP 86290B RF Plug-in (2 to 18 GHz) for the HP 83592A RF Plug-in (0.01 to 20 GHz). Also included in Option 001 systems is an 11869A RF Plug-in Adapter which mates with the 86290B prior to installation in the 8350A. The system basically operates in the same manner as called out in this procedure. The major difference is that the 86200-series RF plug-ins do not have calibrated output power displays. Power should be measured with a power meter to obtain a reasonably accurate power level at the start of the System Functional Test so that a point of reference can be obtained. The RF power is set to maximum leveled RF output at the start of the test and is not modified during the test.

4-7. Option 002. Option 002 systems delete the controller and its accessories. An HP 85 Controller with 16K memory, ROMs, and HP-IB interface, as called out in Table 1-2, is required.

4-8. Option 003. Option 003 systems delete the RF plug-in completely. An 83500-series RF plug-in of any frequency range is required. Any 86200-series RF plug-in (with the addition of the 11869A RF Plug-in Adapter) may also be used by referring to the Option 001 modifications listed above.

4-9. TEST RESULTS

4-10. The System Functional Test checks the 8755P for operation only. No Test Record Card with specifications or performance limits is provided. The measurement results obtained at the end of the test may be recorded and kept for future reference if desired.

4-11. If the system is functional but appears to be misadjusted, refer to Section V, System Adjustments, in this manual for the appropriate adjustment procedure. If the system appears to be non-functional, refer to the system troubleshooting procedures in Section VIII, Service, of this manual for troubleshooting information and hints.

NOTE

Turn on each instrument in the system and allow 1 hour to warm up before performing the System Functional Test.

NOTE

The System Functional Tests MUST be performed in the sequence listed.

4-12. SYSTEM FUNCTIONAL TEST

DESCRIPTION:

This test is divided into three major parts which verify overall system operation. First, the basic network analyzer is checked in manual operation. The second part of the procedure checks the 8750A Storage-Normalizer. Finally, the system is controlled by the HP 85 to fully exercise the system under HP-IB control utilizing the A-D converter output.

Steps 1 through 23 verify proper operation of: the 8350A Sweep Oscillator, RF Plug-in, 180TR Display Mainframe, 8755C Swept Amplitude Analyzer, 11666A Reflectometer Bridge, and 11664A Detector. The 8750A Storage-Normalizer is effectively removed from the system by setting it to the BYPASS mode. The 59313A A-D Conveter and the HP 85 Computing Controller and its accessories are not used but remain connected to the display mainframe vertical outputs and the HP-IB bus. First, the 8350A and the RF plug-in undergo a self-test routine. After calibrating the display, the 11666A is checked by using a short on the TEST port to cause maximum reflections which then generate a predictable display. Insertion and return loss characteristics (uncalibrated) are then measured on a 3 dB attenuator which is used as the test device. Marker generation and the MARKER SWEEP operation of the sweep oscillator is then checked. Finally, the ALTERNATE SWEEP FUNCTION of the 8350A is verified.

Steps 24 through 31 verify the input storage and normalization capabilities of the 8750A Storage-Normalizer. Channel 1 and 2 are sequentially stored and the frequency response errors are cancelled out by the INPUT-MEMORY function. Markers are stored as amplitude pulses on the displayed traces.

Steps 32 through 40 are a description of the necessary steps to run the calibration and measurement program supplied with the system. Insertion and return loss of the 3 dB attenuator is measured by the program. Analog Channel 1 and 2 vertical outputs from the display mainframe are converted to digital information by the 59313A A-D Converter and the digital output is stored in the calculator at a point referenced to the horizontal sweep position which has been calculated for the sweep oscillator. Calibration traces are stored, measurement traces are compared to them, and the resulting output is therefore normalized by the HP 85 to provide measurement data free of frequency response errors. The final output can be printed in tabular format or output on a scaled plot for comparison to the manual measurement procedure of the device under test.

EQUIPMENT:

8755P System	As listed in Table 1-2
Calibration Kit	As listed in Table 1-2
3 dB Attenuator	HP 8491B Opt. 003
Adapter Type N (m) to Type N (f)	HP Part No. 1250-1475 (Included in Calibration Kit)

PROCEDURE:

Basic Network Analyzer System Test

1. Connect the system as shown in Figure 4-1 with the TEST port of the 11666A Reflectometer Bridge and the 11664A Detector ports open.

CAUTION

Ensure that RF plug-in output power does not exceed +15 dBm at initial power on or at any time while using the 11666A Reflectometer Bridge. RF input power in excess of +15 dBm may damage the 11666A.

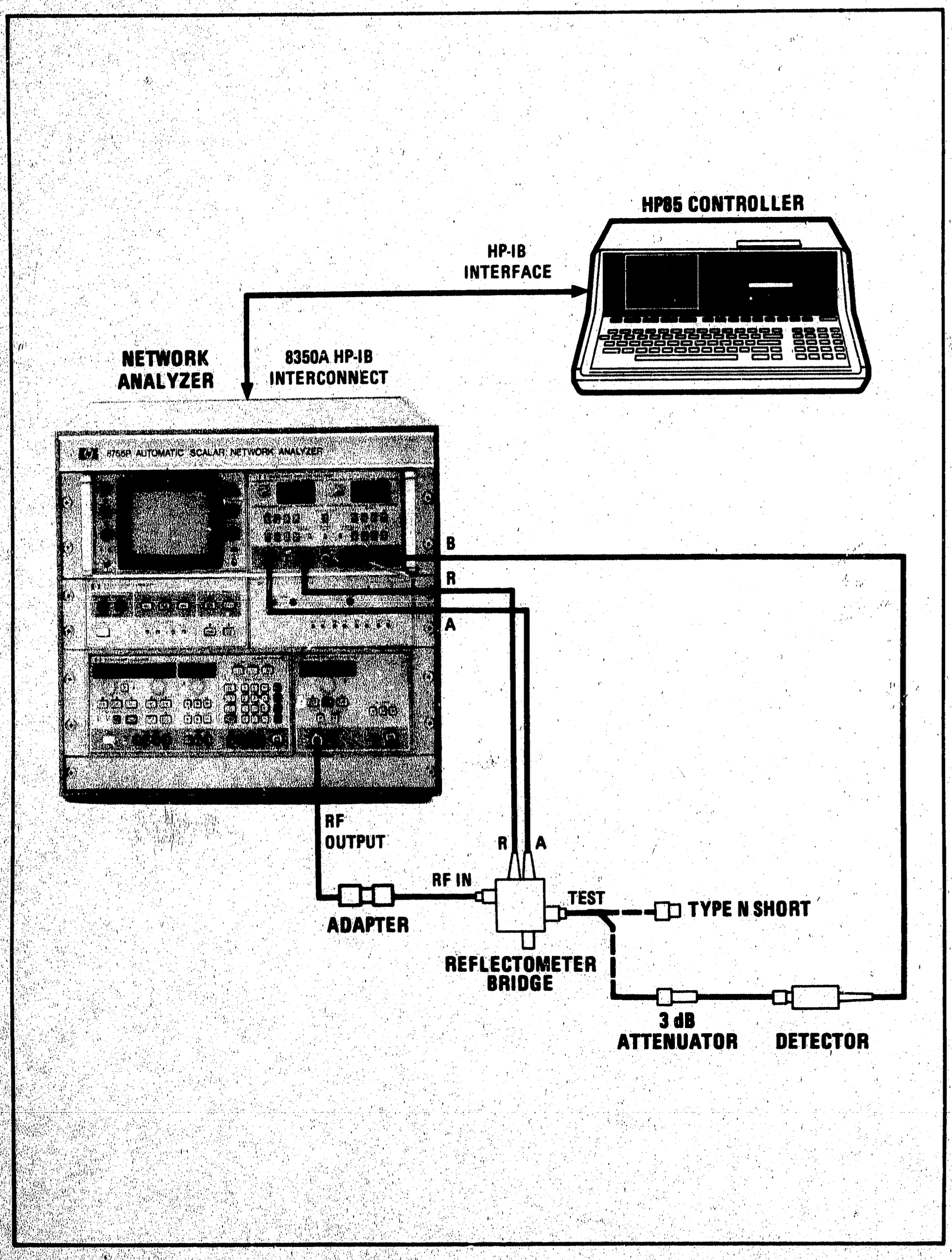


Figure 4-1. System Functional Test Setup

4-12. SYSTEM FUNCTIONAL TEST (Cont'd)

2. Turn the system instruments ON and allow them to warm up for 1 hour.

3. On the 8350A Sweep Oscillator, press INSTR PRESET. This causes the 8350A and the 83592A to execute a series of internal diagnostic self-checks. This routine is completed within a few seconds. When complete, the data displayed should stabilize. The correct START and STOP frequencies for full plug-in band operation should be displayed on the 8350A FREQUENCY display. The minimum full-band sweep time for the specific plug-in being used should be displayed on the 8350A FREQUENCY/TIME display. The maximum leveled RF plug-in power should be displayed on the plug-in POWER display. If an error is detected in the self-check routine, an error code will be displayed in the 8350A left FREQUENCY display. If this occurs, refer to the 8350A Operating and Service Manual for a description of the error codes and troubleshooting procedures.

4. On the 8350A, press the ⊔⊓ MOD key to engage the 8350A internal 27.8 kHz squarewave modulation.

NOTE

Internal 27.8 kHz squarewave modulation must be on at all times when using the 8755C detection accessories. If INSTR PRESET on the 8350A is pressed at any time when the system is operated in the manual mode, ⊔⊓ MOD will be cancelled and will need to be manually reset.

5. If the full-band START frequency of the RF plug-in is lower than 40 MHz, set the START frequency of the 8350A to 40 MHz. If the full-band STOP frequency of the RF plug-in is greater than 18 GHz, set the STOP frequency of the 8350A to 18 GHz. The frequency range is limited to 40 MHz to 18 GHz by the 11666A.

6. Connect the 11512A Type N Short to the 11666A TEST port as shown by the dotted line in Figure 4-1.

7. On the 8750A Storage-Normalizer, press BYPASS. The LED above the key should light. This removes the digital processing of the 8750A from the system.

8. On the 8755C Swept Amplitude Analyzer, set the controls for BOTH Channel 1 and Channel 2 as follows:

REFERENCE LEVEL	+00dBm
REFERENCE LEVEL VERNIER	OFF
Sensitivity	10dB/DIV
DISPLAY	REFERENCE POSITION
VIDEO FILTER	OFF(out)

9. On the 180TR Display Mainframe, set the controls as follows:

MAGNIFIER	X1
DISPLAY	INT

Adjust the INTENSITY, FOCUS, AND SCALE to obtain the sharpest possible traces.

10. Adjust the 8755C REFERENCE POSITION screwdriver adjustments for Channel 1 and 2 to center the traces on the center graticule of the display. When properly adjusted, the two reference traces should appear coincident as a single, horizontal line.

4-12. SYSTEM FUNCTIONAL TEST (Cont'd)

11. Adjust the 180TR HORIZONTAL POSITION so that the traces begin at the left-most graticule. The traces should be exactly 10 divisions wide. If they are not, refer to the System Adjustment procedures in Section V of this manual to adjust the traces for the proper length and positioning.

12. On the 8755C, press any Channel 2 DISPLAY pushbutton halfway in and release it to pop all Channel 2 DISPLAY buttons out. Select the Channel 1 DISPLAY R pushbutton. The display should show a single trace approximately 6 dB below the power level displayed in the RF plug-in POWER display.

13. On the 8755C, select the Channel 1 DISPLAY A pushbutton. The display should show a moderately flat trace approximately 18 dB below the power level displayed in the RF plug-in POWER display.

14. Remove the Type N short from the 11666A TEST port and replace it with the 3 dB attenuator followed by the 11664A Detector, as shown by the dotted lines in Figure 4-1. Ensure that all RF connections are snug.

15. On the 8755C, press any Channel 1 DISPLAY pushbutton halfway in and release it to pop all Channel 1 DISPLAY pushbuttons out. Select Channel 2 DISPLAY B. The display should show a moderately flat trace approximately 12 dB below the power level displayed in the RF plug-in POWER display.

16. Change the 8755C control setting as follows:

Channel 1 DISPLAY	A/R
Channel 2 DISPLAY	B/R
Channel 1 REFERENCE LEVEL	−20dBm
Channel 2 REFERENCE LEVEL	−20dBm

17. On the 8350A, press M1 followed by ▼ ▼ then M2 followed by ▲ ▲ and finally M3. The display should look like that in Figure 4-2 with two traces having three intensity markers displayed on each trace. The Channel 1 display shows the return loss characteristics (uncalibrated) of the 3 dB attenuator followed by the detector. The Channel 2 display shows the transmission characteristics (uncalibrated) of the same signal path.

18. On the 8350A, press SAVEn 1 to store this trace in register 1.

19. On the 8350A, press MKR SWEEP. The display should look like Figure 4-3 with the trace expanded to a new START and STOP frequency as set by the markers in the previous step. This step indicates that the 8350A and the RF plug-in are properly changing the frequency range being swept.

20. Press SAVEn 2 to store the trace in register 2.

21. Press MKR SWEEP again. The 8350A and display should return to the full-band sweep.

22. Press RECALLn 1 ALTn 2. The ALTn LED should light. The display should now show one full band sweep of Figure 4-2 and one marker sweep of Figure 4-3. The 8350A FREQENCY display will NOT change during the Alternate Sweep function but will display only the first, or reference, register frequency data.

23. Press ALTn. The ALTn LED should go out and the display should look like Figure 4-2 once again.

8750A Storage-Normalizer Check

24. On the 8350A, set a 2 second sweep time by pressing SWEEP TIME 2 s. The display should still look like Figure 4-2 except that the sweep time has slowed to 2 seconds.

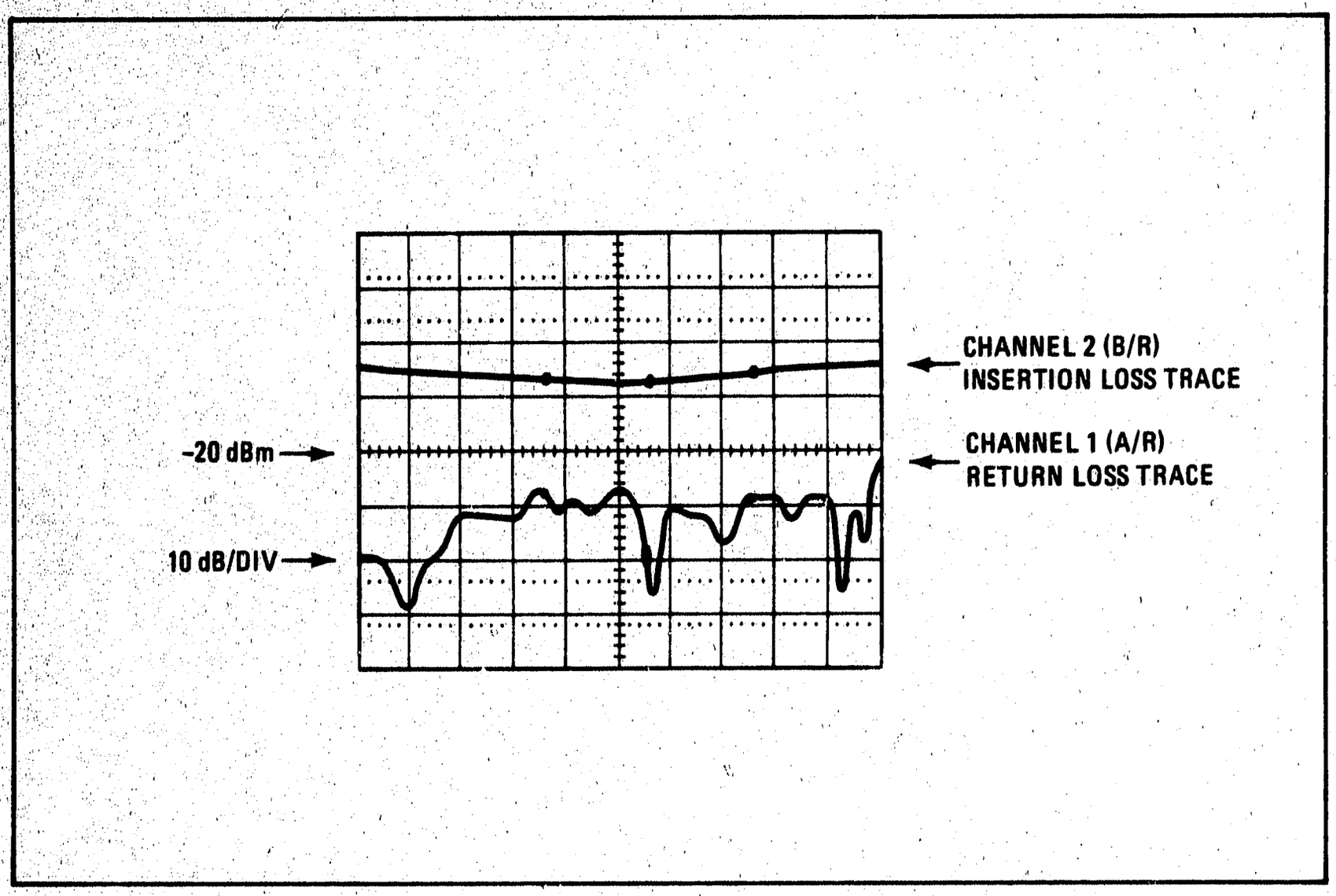


Figure 4-2. Full Band Display of 3 dB Attenuator Measurement

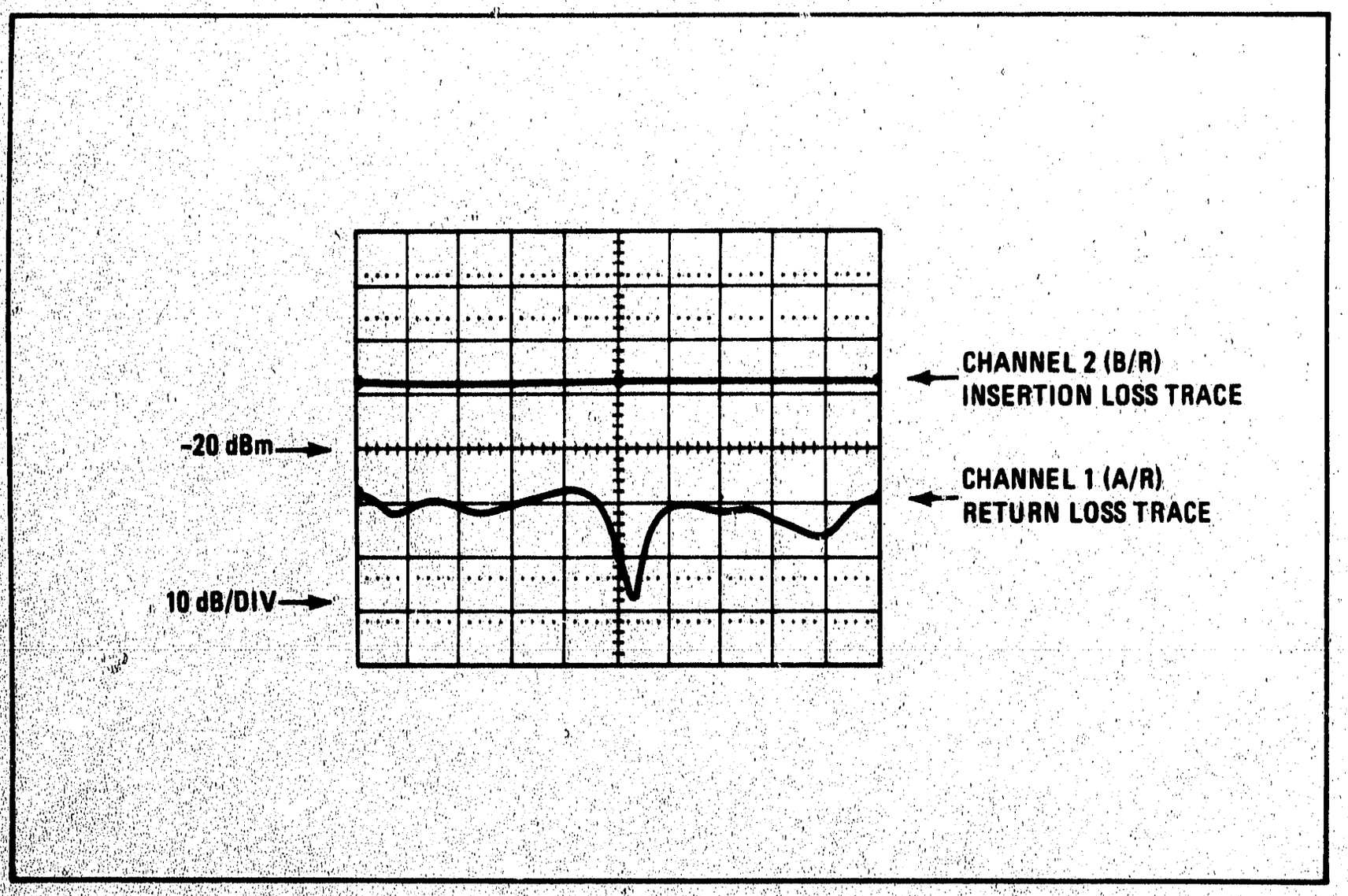


Figure 4-3. MKR SWEEP Display of 3 dB Attenuator Measurement

4-12. SYSTEM FUNCTIONAL TEST (Cont'd)

25. On the 8750A Storage-Normalizer, press INPUT and check that the INPUT LED is lit. The traces should be similar to Figure 4-4. Amplitude markers will replace the intensity markers. There should now be no apparent sweep flicker.

26. On the 8750A, press CH 1. Verify that the LED in the center of the CH 1 pushbutton is lit. Press STORE INPUT and verify that the STORE INPUT LED lights then turns off.

27. On the 8750A, press INPUT-MEM. Verify that the INPUT-MEM LED is lit. The display should show the Channel 1 return loss trace being replaced by a flat trace with three amplitude markers on the center reference graticule.

28. On the 8750A, press CH 2. Verify that the CH 2 LED is lit. Press STORE INPUT and verify that the STORE INPUT LED lights and then turns off.

29. On the 8750A, press INPUT-MEM and verify that the INPUT-MEM LED is lit. The display should show the Channel 2 transmission trace being replaced by a flat trace with markers on the center reference graticule. The display should then look like Figure 4-5. Both traces have been normalized to the center graticule reference position.

30. On the 8750A, press CH 1 and RECALL followed by CH 2 and RECALL. Their respective LEDs should be lit when each button is pressed. The original traces of Figure 4-2 should now be displayed. Press HOLD, then vary the RF plug-in power level. The display should not change.

31. On the 8750A, press BYPASS and verify that the BYPASS LED lights. The display should now show the original traces of Figure 4-2 being swept at a 2 second sweep speed.

HP 85/59313A Check

32. Insert the pre-programmed calibration and measurement data cartridge (HP Part No. 08755-10001) into the tape drive of the HP 85 Computing Controller. Turn the HP 85 line switch OFF (rear panel), wait briefly, then turn the power back ON. The HP 85 will then execute a self test, load the program and run it in about 40 seconds.

33. When prompted to SELECT MEASUREMENT by the HP 85, press K3 to measure both insertion loss and return loss.

34. When prompted for DATA ENTRY, enter the following responses for each prompt:

PROMPT	OPERATOR RESPONSE
START Frequency (GHz) ?	(RF plug-in full-band START frequency or 0.04 GHz, whichever is greater) END LINE
STOP Frequency (GHz) ?	(RF plug-in full-band STOP frequency or 18 GHz, whichever is less) END LINE
FREQUENCY STEP (GHz)?	0.1 END LINE
8755 Sensitivity (dB/DIV) ?	10 END LINE

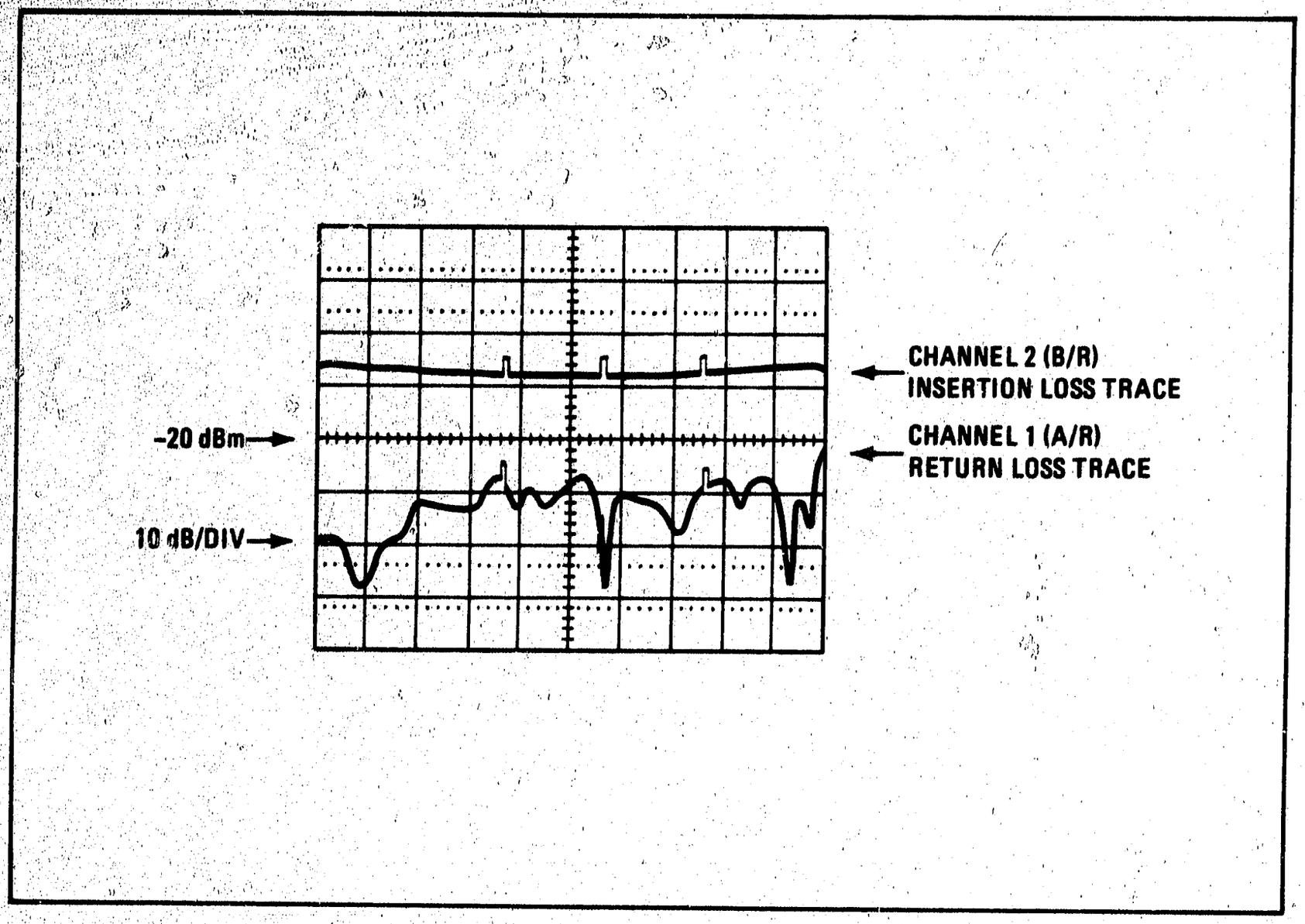


Figure 4-4. Full Band Display of 8750A Storage-Normalizer Check

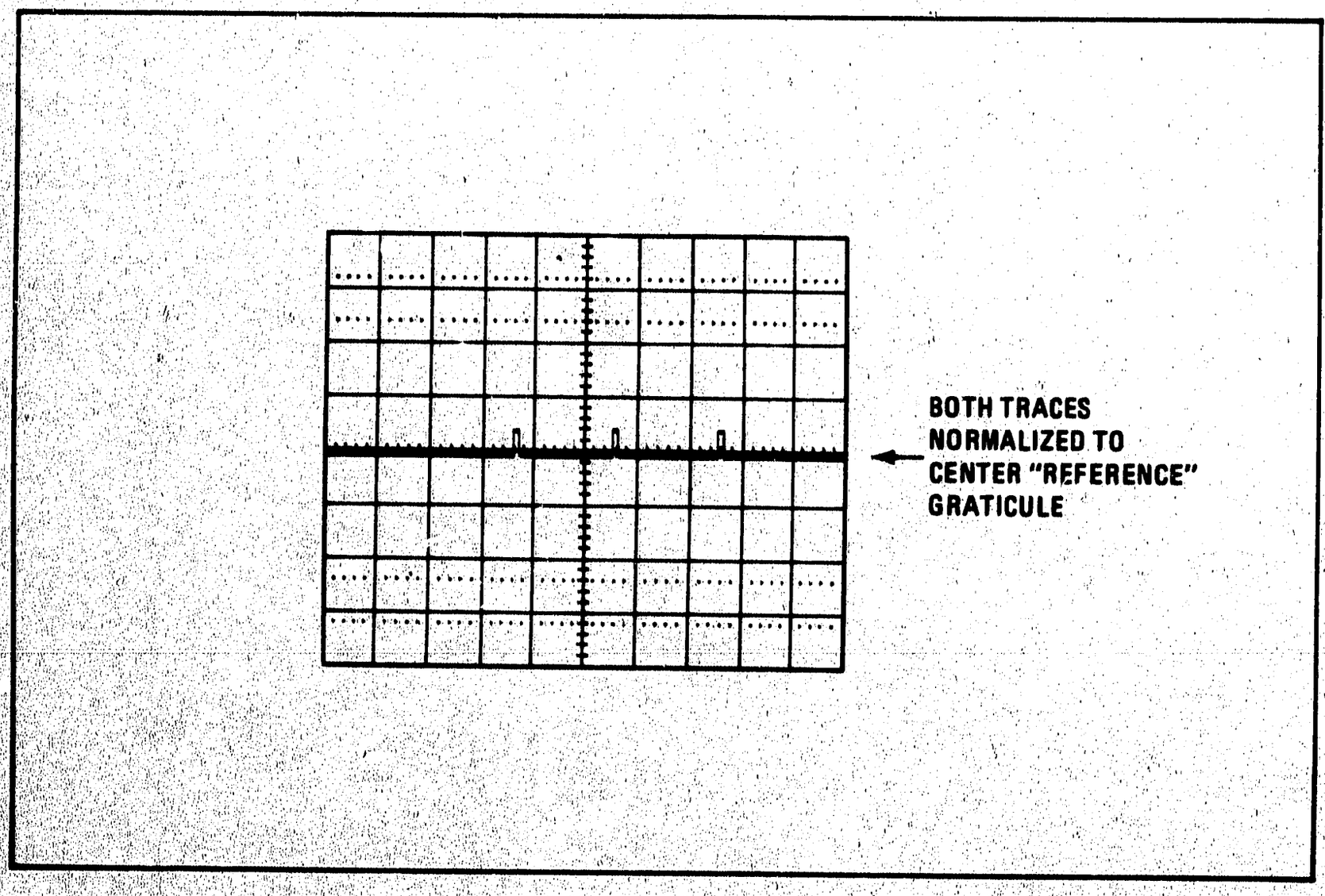


Figure 4-5. Normalized Full Band Display with Markers

4-12. SYSTEM FUNCTIONAL TEST (Cont'd)

35. When prompted for the SHORT, connect the Type N short to the 11666A TEST port and press CONT.

36. When prompted for the OPEN, connect the Type N shielded open to the 11666A TEST port and press CONT.

37. When prompted for the B detector, connect the 11664A Detector directly to the 11666A TEST port.

38. When prompted for the Test Device, disconnect the 11664A and connect the 3 dB attenuator followed by the 11664A. Then push CONT. When prompted for a Device lable, type "3 dB ATTENUATOR" and press END LINE.

39. When prompted to SELECT FUNCTION, press K1 to plot the data. The plot should be similar to Figure 4-6. When the plot is complete, hold SHIFT and push COPY to print the results. Press PAPER ADVANCE and tear off the printed copy to retain as the test results record. Compare this record to the results of the previous manual measurement of the 3 dB attenuator. The results should be similar if the system is operating correctly.

40. Press CONT to return to the test menu.

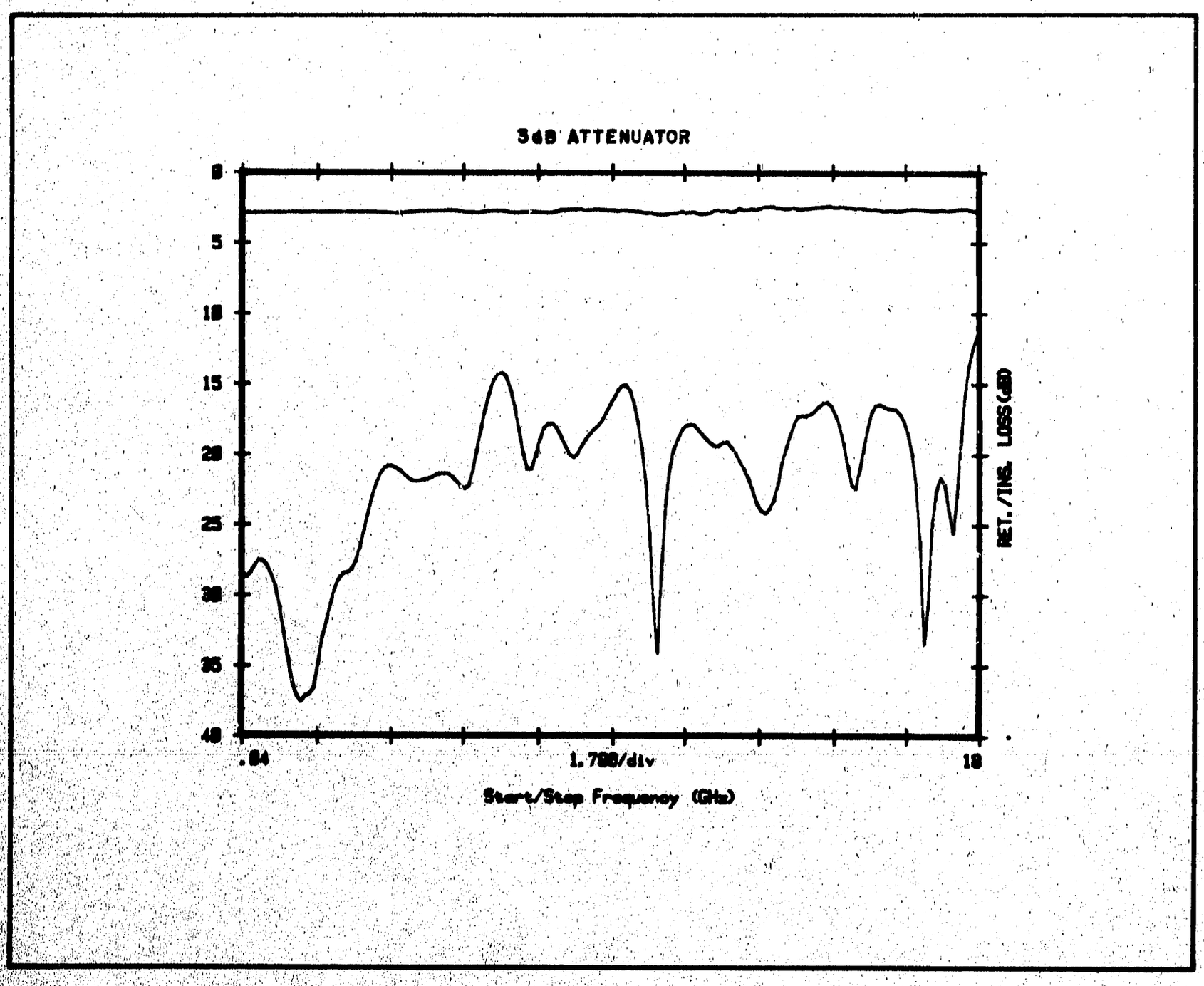


Figure 4-6. HP 85 Plot of Typical 3 dB Attenuator Measurement

SECTION

V

SECTION V
SYSTEM ADJUSTMENTS

5-1. INTRODUCTION

5-2. This section provides system adjustment procedures to set the individual 8755P Automatic Scalar Network Analyzer instruments for optimum compatibility with each other. These procedures should be done:

1. After repair or replacement of an instrument within the system,

2. When the System Functional Test in Section IV of this manual indicates that adjustments may be necessary, or

3. When an adjustment is referred to specifically by another part of this manual.

5-3. Each adjustment procedure deals with optimizing instrument compatibility within the system. All system adjustments have been made prior to shipment but may need readjustment upon arrival or periodically thereafter. Table 5-1 shows all of the adjustment procedures by Instrument Model Number, Adjustment Name, Adjustment Paragraph, Description, and Adjustment Period. Adjustment procedures are supplemented with test setup diagrams and adjustment location illustrations.

5-4. SAFETY CONSIDERATIONS

5-5. Although this system and the instruments contained within it have been designed in accordance with international safety standards, this manual contains information, cautions, and warnings which must be followed to ensure safe operation and to retain the system in safe condition. Service and adjustments should only be performed by a person who is aware of any hazard involved.

WARNING

All system adjustments are made with the instruments intact in the system cabinet and all protective covers remain on the instruments. Access to the inside of the system cabinet is necessary however and hazardous voltages do exist at all line power distribution points. Be extremely careful. Adjustments should only be performed by a person who is aware of the hazard involved.

NOTE

Use a non-metallic adjustment tool whenever possible.

5-6. EQUIPMENT REQUIRED

5-7. Table 1-3 lists the equipment required for the System Adjustment procedures. If the specific test equipment listed is not available, other test equipment may be substituted if its performance meets the Critical Specifications listed in Table 1-3. The specific equipment required for each procedure is referenced in each procedure.

5-8. RELATED ADJUSTMENTS

5-9. Interactive adjustments are noted in the adjustment procedures. Table 5-2 indicates, by paragraph number, the system adjustments that must be performed if an instrument within the system has been repaired or replaced or if an adjustment has been made to an instrument.

5-10. ADJUSTMENT PROCEDURES

5-11. System Adjustment procedures are given in the proper order to allow for any interrelated adjustments.

NOTE

Allow the 8755P system to warm up for 1 hour prior to making any adjustments.

Table 5-1. 8755P System Adjustments

Instrument Model Number	Adjustment Name	Adjustment Paragraph	Description
83592A*	83592A FREQ CAL	5-12	Sets 83592A frequency accuracy
8755C	HORIZ GAIN	5-13	Compensates for a difference in horizontal gain in different display mainframes
	REFERENCE POSITION	5-13	Sets position of reference trace when 8755C REFERENCE POSITION is depressed
	VERTICAL GAIN	5-13	Compensates for a difference of vertical gain in different display mainframes
8750A	VERT POSN	5-14	Adjusts vertical position of displayed trace in 8750A DISPLAY modes
	VERT GAIN	5-14	Adjusts vertical deflection of displayed trace in 8750A DISPLAY modes
	HORIZ POSN	5-14	Adjusts horizontal position of displayed trace in 8750A DISPLAY modes
	HORIZ GAIN	5-14	Adjusts horizontal length of displayed trace in 8750A DISPLAY modes
	VERT IN OFF	5-14	Adjusts offset of vertical input signal to 8750A from 8755C
	VERT IN GAIN	5-14	Adjusts gain of vertical input signal to 8750A from 8755C
	SWP IN OFF	5-14	Adjusts offset of horizontal sweep input signal to 8750A from 8755C
	SWP IN GAIN	5-14	Adjusts gain of horizontal sweep input signal to 8750A from 8755C
59313A	CHANNEL 1 ZERO	5-15	Adjusts 59313A Channel 1 output to zero with no input
	CHANNEL 1 GAIN	5-15	Adjusts 59313A Channel 1 output gain
	CHANNEL 2 ZERO	5-15	Adjusts 59313A Channel 2 output to zero with no input
	CHANNEL 2 GAIN	5-15	Adjusts 59313A Channel 2 output gain
	CHANNEL 3 ZERO	5-15	Adjusts 59313A Channel 3 output to zero with no input
	CHANNEL 3 GAIN	5-15	Adjusts 59313A Channel 3 output gain
	CHANNEL 4 ZERO	5-15	Adjusts 59313A Channel 4 output to zero with no input
	CHANNEL 4 GAIN	5-15	Adjusts 59313A Channel 4 output gain
180TR	ASTIGMATISM	5-13	Adjusts roundness of writing beam spot
	TRACE ALIGN	5-13	Rotates trace around longitudinal axis of CRT

*This adjustment depends upon the specific plug-in which is used.

Table 5-2. 8755P System Related Adjustments

Instrument Repaired or Replaced	Perform the Following Related Adjustments		Paragraph Number
180TR	180TR	ASTIGMATISM	5-13
		TRACE ALIGN	5-13
	8750A	VERT POSN	5-14
		VERT GAIN	5-14
		HORIZ POSN	5-14
		HORIZ GAIN	5-14
	8755C	HORIZ GAIN	5-13
		VERTICAL GAIN	5-13
		REFERENCE POSITION	5-13
8755C	8755C	HORIZ GAIN	5-13
		VERTICAL GAIN	5-13
		REFERENCE POSITION	5-13
	8750A	VERT IN OFF	5-14
		VERT IN GAIN	5-14
		SWP IN OFF	5-14
		SWP IN GAIN	5-14
8750A	8750A	VERT POSN	5-14
		VERT GAIN	5-14
		HORIZ POSN	5-14
		HORIZ GAIN	5-14
		VERT IN OFF	5-14
		SWP IN OFF	5-14
		SWP IN GAIN	5-14
59313A	59313A	Channel 1 ZERO	5-15
		Channel 1 GAIN	5-15
		Channel 2 ZERO	5-15
		Channel 2 GAIN	5-15
		Channel 3 ZERO	5-15
		Channel 3 GAIN	5-15
		Channel 4 ZERO	5-15
		Channel 4 GAIN	5-15
8350A	No adjustments necessary		
83592A	83592A FREQ CAL		5-12

SYSTEM ADJUSTMENTS

5-12. 83592A FREQUENCY CALIBRATION

DESCRIPTION:

After warmup, the 83592A RF Plug-in output frequency is adjusted to set the frequency accuracy at the start of the RF plug-in's range. Frequency accuracy is set relative to a frequency counter's accuracy.

NOTE

If an RF plug-in other than the 83592A is used, frequency calibration may or may not be necessary prior to operation. Refer to the Operating and Service Manual of the specific RF plug-in used to determine if frequency calibration is required.

EQUIPMENT:

Sweep Oscillator	HP 8350A*
RF Plug-in	HP 83592A*
Frequency Counter	HP 5383A
10 dB Attenuator	HP 8491A Opt. 010
Type N (m) to BNC (f) Adapter	HP Part No. 1250-0780
120cm (4ft) BNC Cable	HP 11170C

*Included as part of the 8755P system.

PROCEDURE:

1. Set up the equipment as shown in Figure 5-1.

2. Turn the 8350A LINE switch ON and allow the sweep oscillator and RF plug-in to warm up for 1 hour.

3. Set the instrument controls as follows:

8350A Sweep Oscillator

Sweep Mode	CW
Frequency	50 MHz
⎍ MOD	OFF

83592A RF Plug-in

RF Power	ON (LED in button lit)

5383A Frequency Counter

Gate Time	0.1 Second
Input Impedance	50 Ohm

4. Adjust the 83592A front panel FREQ CAL until the counter indicates 50 MHz ±0.1 MHz.

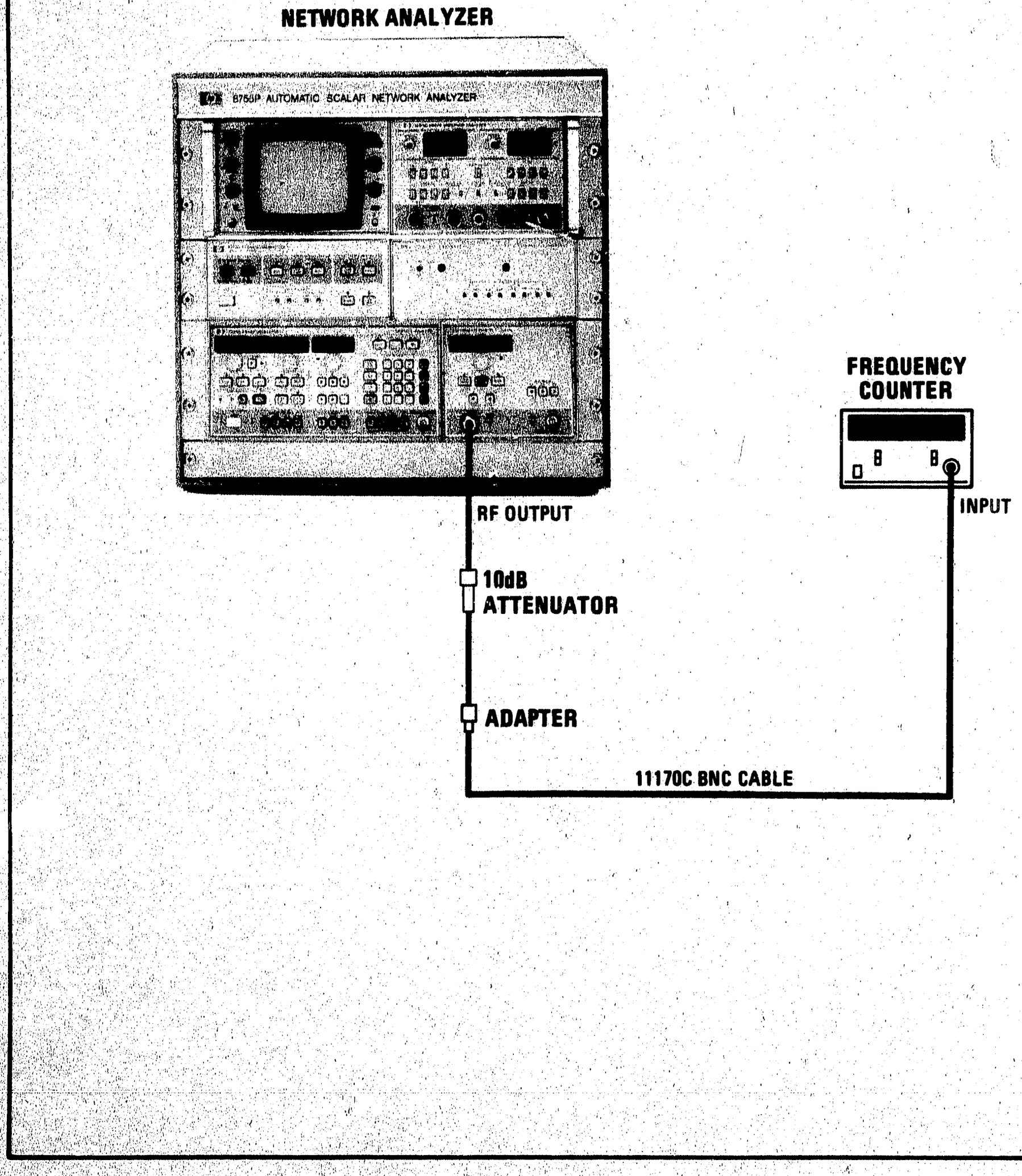


Figure 5-1. 83592A Frequency Calibration Adjustment Setup

5-13. 8755C ADJUSTMENTS

DESCRIPTION:

With the 8750A Storage-Normalizer in the BYPASS mode, the 8755C Swept Amplitude Analyzer trace calibration adjustments are set for the proper display responses. HORIZONTAL GAIN sets the horizontal length of the traces. Channel 1 and 2 REFERENCE POSITION adjustments set each trace on the center reference graticule of the display. VERTICAL GAIN calibrates the vertical deviation of the trace when the REFERENCE LEVEL is changed to compensate for a difference in vertical gain of different display mainframes.

EQUIPMENT:

Swept Amplitude Analyzer	HP 8755C*
Display Mainframe	HP 180TR*
Sweep Oscillator	HP 8350A*
RF Plug-in	HP 83592A* or any compatible RF plug-in
10 dB Attenuator	HP 8491A Opt. 010
Detector	HP 11664A*

*Included as part of the 8755P system.

PROCEDURE:

HORIZONTAL GAIN Adjustment

1. Connect the equipment as shown in Figure 5-2.
2. Turn the instruments on and allow them to warm up for 1 hour.
3. On the 8350A, press INSTR PRESET and ⊓ MOD.
4. On the 8750A, press BYPASS. Center the 8750A rear panel Network Analyzer Interface Board controls. (Refer to Figure 5-5 for the 8750A Netork Analyzer Interface Board location).
5. On the 8755C, set the Channel 1 and Channel 2 controls as follows:

VERNIER	OFF
REFERENCE LEVEL	+00dBm
dB/DIV	10
DISPLAY	REFERENCE POSITION
VIDEO FILTER	OFF(Out)

6. On the 180TR, adjust the INTENSITY, FOCUS, SCALE, ASTIGMATISM, and TRACE ALIGN controls to obtain the sharpest possible traces. Adjust the 8755C REFERENCE POSITION screwdriver adjustments to bring the traces near the center graticule. Adjust the 180TR front panel HORIZONTAL POSITION, if necessary, to center the traces horizontally on the CRT.
7. Adjust the 8755C HORIZONTAL GAIN control and the 180TR HORIZONTAL POSITION control to center the traces horizontally on the CRT so that they are exactly 10 divisions wide, beginning at the left-most graticule and ending at the right-most graticule. They need not be at the same vertical position. This will be adjusted next.

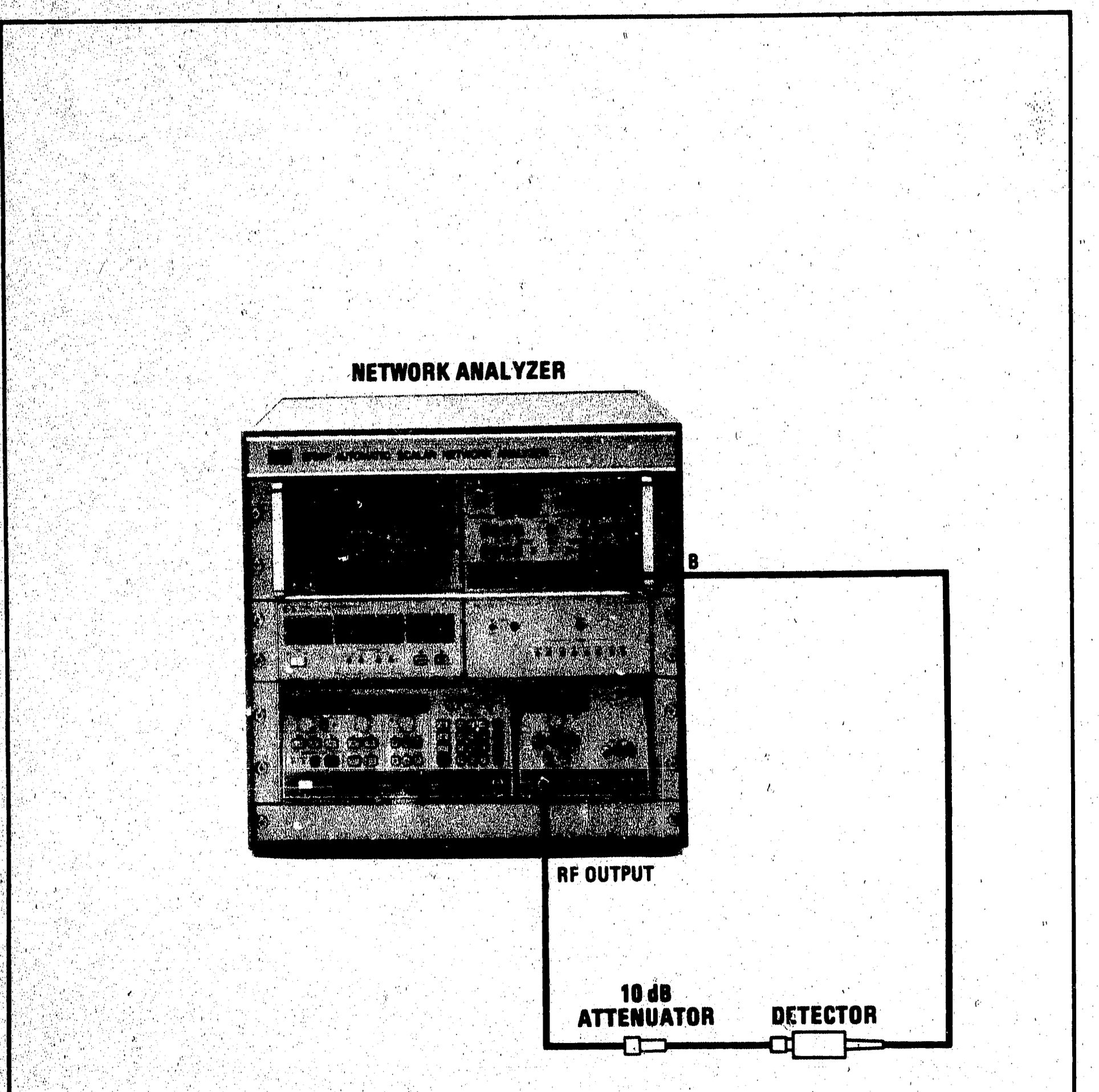


Figure 5-2. 8755C Adjustments Setup

REFERENCE POSITION Adjustment

8. Press one of the 8755C Channel 2 DISPLAY pushbuttons partially in and release it to pop all of the Channel 2 pushbuttons out. Adjust Channel 1 REFERENCE POSITION screwdriver adjustment to position the CRT trace on the center graticule line. Adjust the 180TR INTENSITY control, if necessary.

9. Press one of the 8755C Channel 1 DISPLAY pushbuttons partially in and release it to pop all of the Channel 1 DISPLAY pushbuttons out. Press Channel 2 REFERENCE POSITION. Adjust Channel 2 REFERENCE POSITION screwdriver adjustment to position the trace on the center graticule line.

VERTICAL GAIN Adjustment

NOTE

This adjustment should be done with the sweep oscillator set for zero sweep width so a flat response is observed on the CRT display. Since the VERTICAL GAIN control is common to both channels, it may be adjusted by observing the Channel 1 display or the Channel 2 display.

10. On th 8350A, press SHIFT CW 4 GHz (or any other mid-band frequency of the RF plug-in). SHIFT CW allows the sweep oscillator to set the RF plug-in to a CW frequency while still outputting a sweep ramp.

11. With the equipment connected as shown in Figure 5-2 and the sweep oscillator set as described in step 10, set the Channel 1 and Channel 2 controls as follows:

VERNIER	ON
REFERENCE LEVEL	+00dBm
dB/DIV	10
Channel 1 DISPLAY	OFF(All pushbuttons out)
Channel 2 DISPLAY	B

12. Adjust the Channel 2 VERNIER to set the trace on the center graticule. Select Channel 2 0.25 dB/DIV and readjust the Channel 2 VERNIER to set the trace on the center graticule.

13. Set the Channel 2 REFERENCE LEVEL switches to −01 dBm. The trace should move to the top of the screen. Adjust the 8755C VERTICAL GAIN to set the trace on the top graticule (4 divisions above the center graticule).

14. Change the polarity of the Channel 2 REFERENCE LEVEL switches to +01 dBm. The trace should move to the bottom graticule (4 divisions below the center graticule).

5-14. 8750A STORAGE-NORMALIZER ADJUSTMENTS

DESCRIPTION:

The 8750A Storage-Normalizer adjustments fall into two categories: (1) Display Outputs (front panel) and (2) Inputs Interface (rear panel). In both cases, the adjustments are set to match an uncalibrated, normalized trace (with amplitude markers) to the BYPASS mode trace (with intensity markers) which was previously calibrated in the 8755C adjustment procedure.

First, the sweep oscillator is set to a convenient START/STOP sweep with three intensity markers. With the 8750A in the BYPASS mode, Marker 1 is set one graticule line to the right of the far left graticule. Marker 2 is set one graticule to the left of the far right graticule line. Marker 3 is set to the center graticule line. Using this as the reference trace, the 8750A is set to the INPUT mode and the front panel DISPLAY ADJUSTMENTS are set to match the 180TR graticule spacing to provide the proper display calibration to the 180TR Display Mainframe. This sets the Display Outputs adjustments.

The Inputs Interface adjustments scale and offset the input signals from the 8755C for calibrated storage within the 8750A. It is important to note that the signal input and display output processing are individually adjusted.

EQUIPMENT:

Storage-Normalizer	HP 8750A*
Swept Amplitude Analyzer	HP 8755C*
Display Mainframe	HP 180TR*
Sweep Oscillator	HP 8350A*

*Included as part of the 8755P system.

1. There is no equipment setup other than the standard 8755P system configuration contained within the system cabinet.

NOTE

An RF plug-in does not need to be inserted in the 8350A Sweep Oscillator during this test. Markers which are set during the test are generated in the 8350A, not in the RF plug-in. If the test is done with no RF plug-in in the 8350A, an error code (E001) will appear on the left FREQUENCY display indicating there is a problem in the electrical connections to the RF plug-in. If the 8350A is operating normally, this error code will not affect the sweep or marker generation circuits used in this adjustment procedure.

2. Turn the instruments on and allow them to warm up for 1 hour.

3. On the 8750A, press BYPASS.

4. On the 8350A, Press INSTR PRESET.

5. Set the 8755C Channel 1 and Channel 2 controls as follows:

VERNIER	OFF
VIDEO FILTER	OFF(Out)
Channel 2 DISPLAY	OFF(All buttons out)
Channel 1 DISPLAY	REFERENCE POSITION

6. Adjust the Channel 1 REFERENCE POSITION screwdriver adjustment to set the trace on the center graticule line.

7. Adjust the 180TR Display Mainframe INTENSITY, FOCUS, and SCALE controls for the sharpest possible trace.

8. Iterate between the 180TR HORIZONTAL POSITION adjustment and the 8755C HORIZ GAIN adjustment to center the trace horizontally on the display. The trace should begin at the left-most graticule and end at the right-most graticule.

9. On the 8350A, press M1. An intensity spot should appear at the center of the screen. Rotate the RPG below the 8350A FREQUENCY/TIME display to set this Marker 1 exactly on the first graticule to the right of the left-most graticule. Press M2 and rotate the RPG to set Marker 2 on the first graticule to the left of the right-most graticle. Press M3 and set Marker 3 to center screen. The display should now look like Figure 5-3. If it does not, a possible sweep linearity problem may exist. Refer to the troubleshooting procedures in Section VIII of this manual if there are any adjustment problems.

8750A Display Outputs Adjustment

10. Ensure that the 8750A rear panel Normalizer Interface Board controls are centered and then press CH 1. It may be necessary to readjust the display intensity. If there appears to be no trace on the CRT, adjust the four 8750A front panel DISPLAY ADJUST controls as necessary to center a trace near the center of the display.

11. Adjust the 8750A front panel HORIZ POSN and HORIZ GAIN so that the intensified trace exactly fills 10 divisions. Do not try to adjust the marker spacing at this point, only the trace width (start and stop trace points, including any unwanted noise).

12. On the 8750A, press BYPASS.

13. Adjust the 8755C Channel 1 REFERENCE POSITION screwdriver adjustment control fully clockwise to move the trace well off of the top of the display graticule. It should no longer be visible on the screen.

14. On the 8750A, press STORE INPUT. When the STORE INPUT LED turns off after a moment, press INPUT-MEM. The trace should now be a horizontal line with three amplitude markers. Adjust the front panel 8750A VERT POSN control to position this trace on the center graticule.

15. On the 8750A, press INPUT and adjust VERT GAIN so that the trace is just above the top graticule line but is still visible on screen. This ensures that any input signal which causes the trace to be deflected off screen, as simulated in step 12, is still visible on the display.

16. On the 8750A, press BYPASS and adjust the 8755C Channel 1 DISPLAY REFERENCE POSITION screwdriver adjustment to move the trace back to the center graticule, as shown in Figure 5-3.

8750A Inputs Interface Adjustment

NOTE

The use of a mirror to view the display may be necessary as the rear panel adjustments are made with a long screwdriver.

17. On the 8750A, press INPUT. Adjust VERT IN OFF (Vertical Input Offset) on the Network Analyzer Interface Board (plugged into the 8750A rear panel) for a trace on the CRT center graticule, similar to the one in Figure 5-4. Refer to Figure 5-5 for adjustment locations on the Network Analyzer Interface Board. The horizontal marker spacing is not critical at this step.

18. On the 8750A, press BYPASS.

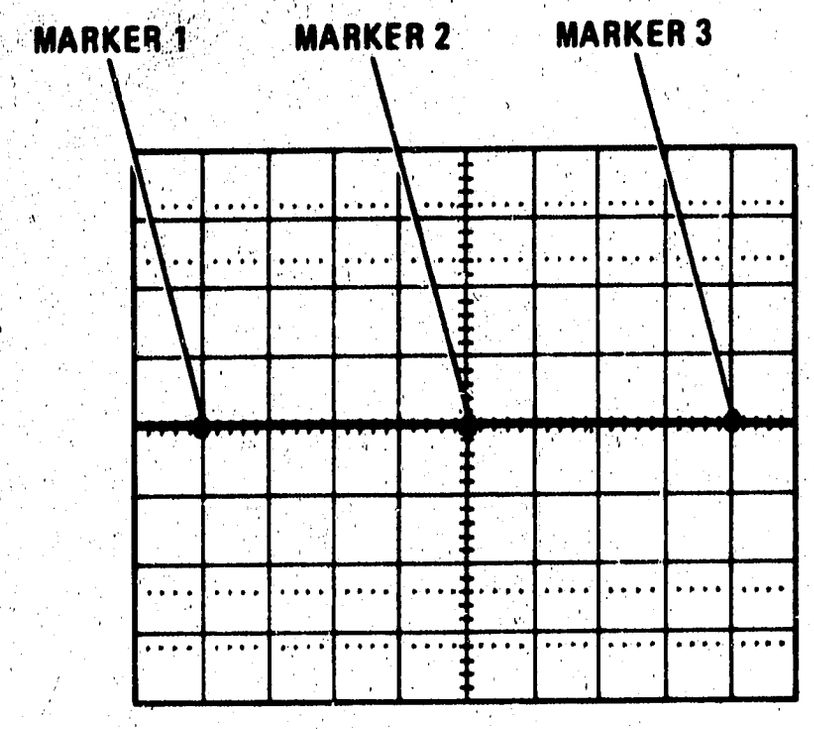


Figure 5-3. 8350A Marker Display With 8750A in BYPASS Mode

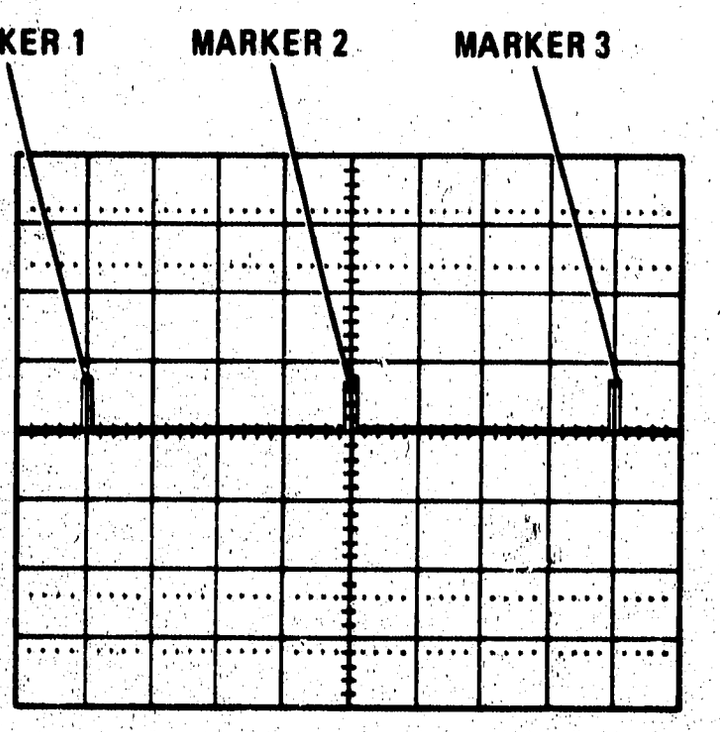


Figure 5-4. 8350A Marker Display With 8750A in INPUT Mode

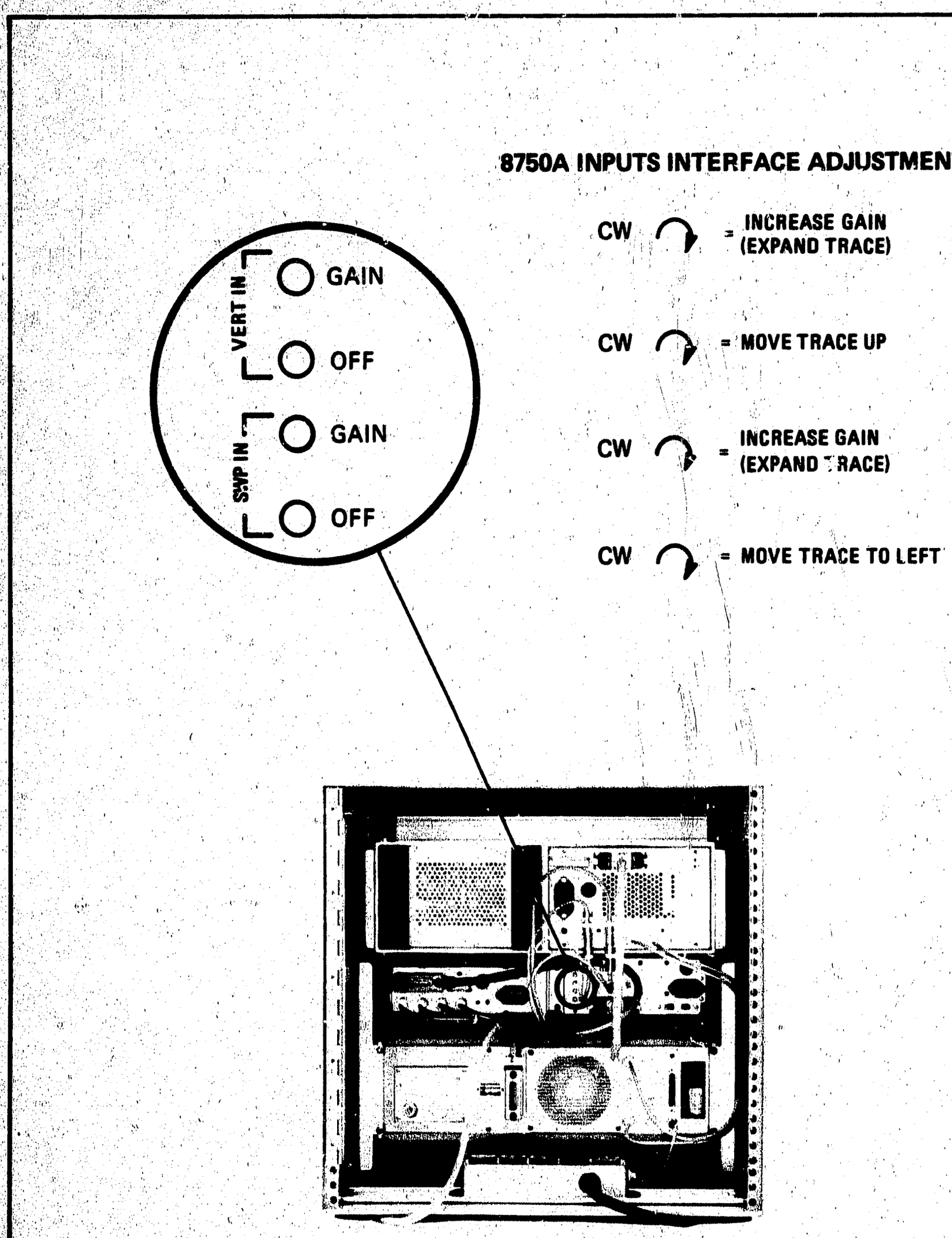


Figure 5-5. 8350A Inputs Interface Adjustment Location

19. On the 8755C, adjust the Channel 1 DISPLAY REFERENCE POSITION screwdriver adjustment to place the trace three graticule lines above the center graticule.

20. On the 8750A, press INPUT. Adjust VERT IN GAIN (Vertical Input Gain) on the Network Analyzer Interface Board (plugged into the 8750A rear panel) to place the trace on the third graticule line above the center graticule.

21. On the 8750A, press BYPASS.

22. Repeat steps 16 through 20 until the vertical position of the trace is the same in both the INPUT and BYPASS modes.

23. On the 8750A, press INPUT. Adjust SWP IN OFF (Sweep Input Offset) on the Network Analyzer Interface Board (plugged into the 8750A rear panel) to center the Marker 1 pulse on the first graticule line to the right of the far left graticule.

24. Adjust SWP IN GAIN (Sweep Input Gain) on the Network Analyzer Interface Board (plugged into the 8750A rear panel) to center the Marker 2 pulse on the first graticule line to the left of the far right graticule. SWP IN OFF may also have to be readjusted to keep the Marker 1 pulse on the assigned graticule. This adjustment makes the amplitude pulse markers of the INPUT mode appear at the same horizontal positions as the intensity markers of the BYPASS mode, thus matching the input signal scaling to the display output scaling.

25. Adjust the 8755C Channel 1 DISPLAY REFERENCE POSITION screwdriver adjustment to set the trace back to the center graticule line, as shown in Figure 5-4. The 8750A is now adapted to the 8755C.

5-15. 59313A CALIBRATION

DESCRIPTION:

The 59313A is calibrated using a program on the measurement and calibration tape (HP Part No. 08755-10001) supplied with the 8755P system. Channels 1, 2, 3, and 4 input signals are scaled and offset to provide the proper outputs for processing by the HP 85 Computing Controller when the system is controlled via the HP-IB bus.

EQUIPMENT:

A-D Converter	HP 59313A*
Controller	HP 85*
(With accessories listed in Table 1-2)	
Calibration Program	Included on HP Part No. 08755-10001*

* Included as part of the 8755P system.

PROCEDURE:

1. Remove all four Phone to BNC adapter plugs from the rear panel of the 59313A.

2. The 59313A with its HP-IB connections to the HP 85 is all that is required for this test. No other equipment in the 8755P system cabinet is used. Turn the 59313A on and allow it to warm up for 1 hour.

3. Set the HP 85 LINE switch to ON. Insert the tape cartridge in the HP 85 and press LOAD "Cal" END LINE. When the tape drive stops and the HP 85 CRT display appears, press RUN.

4. The program will display four numbers across the screen of the HP 85. These are the readings of Channels 1, 2, 3, and 4, respectively. The HP 85 will read and update these numbers continuously.

5. Set the 59313A rear panel CAL switch to the 0 position. Refer to Figure 5-6 for the 59313A CAL switch location. Adjust the front panel ZERO adjustment for each channel until all HP 85 channel displays read 0.

6. Set the rear panel CAL switch to the −1 position and adjust the front panel GAIN controls for Channel 1 and 2 until their respective HP 85 Channel readings show −1000.

7. Set the rear panel CAL switch to the −5 position and adjust the GAIN controls of Channels 3 and 4 until their respective HP 85 readings show −1000.

8. Reconnect the four Phone to BNC adapters. The 59313A is now calibrated for use in the 8755P system.

NOTE

Ensure that the Phone to BNC adapters are fully inserted in their sockets. If they are not, the inputs to the 59313A may be shorted causing a flat trace to be input.

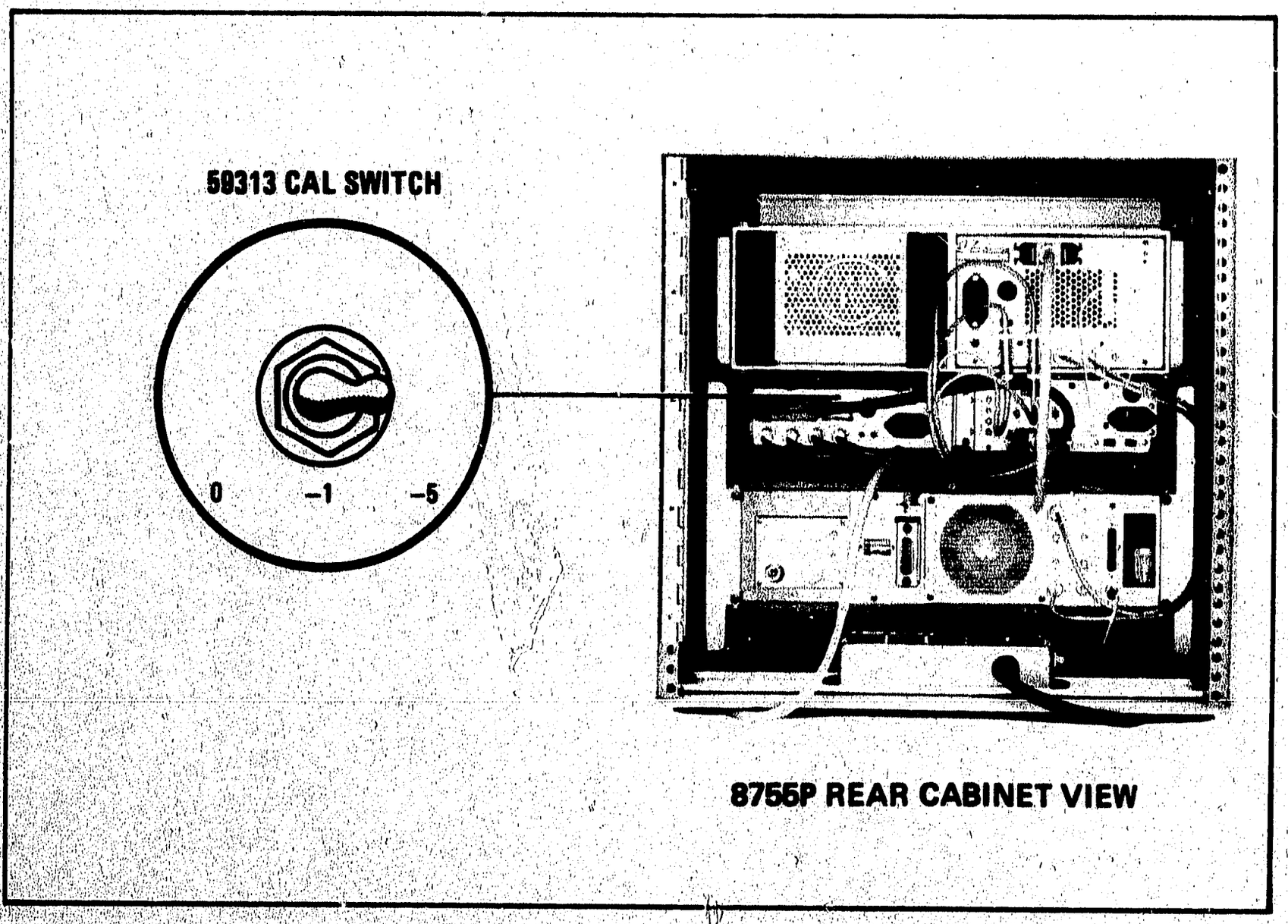


Figure 5-6. 59313A CAL Switch Location

PARTS LIST

SECTION VI
REPLACEABLE PARTS

6-1. INTRODUCTION

6-2. This section contains information for ordering all parts contained in the 8755P Automatic Scalar Network Analyzer System. Table 6-1 lists all replaceable parts including the major instruments.

NOTE

Refer to the individual Operating and Service Manuals of each separate instrument for the list of replaceable parts of that instrument.

6-3. REPLACEABLE PARTS LIST

6-4. Table 6-1 is the list of replaceable parts and is organized as follows:

a. Major system instruments and accessories.

b. Interconnect cables and adapters.

c. Cabinet and miscellaneaous hardware parts.

d. Calibration kit parts.

e. Miscellaneous parts including the Software Pac and a shipping carton for the main instrument cabinet.

f. Modifications to the standard instrument package for options.

6-5. The information given for each part consists of the following:

a. The Hewlett-Packard part number or instrument model number.

b. A check digit (CD) is listed for all HP part numbers as an aid in ordering efficiency.

c. The total quantity (Qty) in the immediate system assembly listed.

d. The description of the part.

6-6. ORDERING INFORMATION

6-7. To order a part listed in Table 6-1, quote the HP Part Number or Model Number, the check digit (where applicable), the total quantity required, and address the order to the nearest Hewlett-Packard office. The check digit will ensure accurate and timely processing of your order.

Table 6-1. Replaceable Parts (1 of 2)

HP Part or Model No.	C D	Qty	Description
			Major System Instruments
HP 8755C		1	Swept Amplitude Analyzer
HP 180TR		1	Rack Mount Display Mainframe (Opt. C02)
HP 11664A		1	Detector
HP 11666A		1	Reflectometer Bridge
HP 8750A		1	Storage-Normalizer (Opt. 003)
HP 8350A		1	Sweep Oscillator (Opt. 908)
HP 83592A		1	RF Plug-in (0.01 to 20 GHz)
HP 59313A		1	A-D Converter (Opt. H01)
HP 85A		1	Computing Controller
HP 82936A		1	ROM Drawer
00085-15002	0	1	Plotter/Printer ROM
00085-15003	1	1	I/O ROM
HP 82903A		1	16K Memory Module
HP 82937A		1	HP-IB Interface Card
			Interconnect Cables and Adapters
HP 11170A		1	30cm (1ft) BNC Cable Assembly
HP 11170B		5	60cm (2ft) BNC Cable Assembly
HP 10833D		1	0.5m (1.6ft) HP-IB Cable Assembly
HP 10834A		1	HP-IB Clearance Adapter
1250-0781	6	2	BNC Tee (m) (f) (f)
8120-3174	9	1	Alternate Sweep Interface Cable
08750-60034	8	1	Normalizer Interface Interconnect Cable
1251-3759	6	4	BNC Jack to Telephone Plug
			Cabinet and Hardware
7101-0482	5	1	Instrument Cabinet
08755-20040	4	1	8755P Front Panel Nameplate (Top)
08755-20041	5	1	Front Panel Rack Spacer (Bottom)
7120-3059	8	1	Serial Number Plate
0590-0804		16	NUT-SHEETMETAL 10-32 (rack mount hardware)
2680-0120		16	SCREW 10-32 .750 FLPD (rack mount hardware)
3050-0007		16	WSHR #12 FM .250ID (rack mount hardware)
3050-0248		16	WSHR #10 FL .200ID (rack mount hardware)
08755-00033	3	1	Left Support Bracket
08755-00034	4	1	Right Support Bracket
6960-0093	3	10	Nylon Glide Button
2360-0195	0	4	SCREW 6-32 .312 PNPD (8350 to bracket)
3050-0227	3	4	WSHR #6 FL .149ID (8350 to bracket)
2190-0006	1	4	WSHR #6 LK .141ID (8350 to bracket)
08755-00032	2	1	59313/8750 Rear Center Support Bracket
2360-0195	0	2	SCREW 6-32 .312 PNPD (59313 to bracket)
2360-0199	4	2	SCREW 6-32 .438 PNPD (8750 to bracket)
3050-0227	3	4	WSHR #6 FL .149ID (59313/8750 to bracket)
2190-0006	1	4	WSHR #6 LK .141ID (59313/8750 to bracket)
0050-0515	9	4	59313/8750 Front Lock Links
2510-0192	6	4	SCREW 6-32 .250 FLPD (lock links)
1600-0367	7	4	SS Lock Links (8350 to 59313/8750)
2360-0330	5	8	SCREW 8-32 .188 PNPD (lock link to 8350)
5061-0074	3	1	Rack Mount Kit (59313/8750)
5020-7622	5	1	Rack Mount Flange (180TR-display side)
08755-20042	6	1	Rack Mount Flange (180TR-plug-in side)
2510-0047	0	4	SCREW 8-32 .312 PNPD (180TR rack flanges)
1400-0814	5	2	Cable Clamp
2360-0195	0	2	SCREW 6-32 .312 PNPD (cable clamps)
2420-0001	5	2	NUT-HEX 6-32 (cable clamps)
1400-0493	6	4	Cable Tie Wrap

Table 6-1. Replaceable Parts (2 of 2)

HP Part or Model No.	C D	Qty	Description
08755-00035	5	1	Power Strip Bracket
1251-6984	5	1	Power Strip 5-Outlet
2510-0111	9	4	SCREW 8-32 .750 PNPD (power strip bracket)
2050-0139	6	4	WSHR #8 FL .172ID (power strip bracket)
2580-0003	5	4	NUT-HEX 8-32 (power strip bracket)
			Calibration Kit
08755-60039	5	1	Type N Calibration Kit (08755-60039 includes the following items)
1250-1472	4	1	Type N(f) to Type N(f) 50 Ohm Adapter
1250-1475	7	2	Type N(m) to Type N(m) 50 Ohm Adapter
85032-60001	9	1	Type N(m) 50 Ohm Shielded Open Circuit
HP 909A		1	Type N(m) Coax 50 Ohm Termination (Opt. 012)
HP 11512A		1	Type N(m) 50 Ohm Short Circuit
9211-1582	3	1	Cal. Kit Case
9220-2550	6	1	Cal. Kit Case Foam Inserts
7121-1345	3	1	Cal. Kit Case Label
			Miscellaneous
08755-10001	6	1	8755P Cal./Meas. Program Data Cartridge (08755-10001 is programmed at factory) An 8755P Software Pac, HP Part No. 08755- 60047, may be ordered which contains one preprogrammed 8755P Cal./Meas. Program Data Cartridge along with this 8755P O & S Manual. A blank data cartridge (with no label) may be ordered as HP 98200A.
9211-3636	2	1	Shipping Carton (with skids) for Cabinet
9220-3481	4	2	Shipping Carton Foam Insert Pads

Options

OPTION 001:	Delete HP 83592A RF Plug-in (0.01 to 20 GHz) Add HP [illegible]90B RF Plug-in (2 to 18 GHz) Add HP 11869A RF Plug-in Adapter
OPTION 002:	Delete HP 85A Computing Controller Delete HP 82936A ROM Drawer Delete 00085-15002 Plotter/Printer ROM Delete 00085-15003 I/O ROM Delete HP 82903A 16K Memory Module Delete HP 82937A HP-IB Interface Card
OPTION 003:	Delete HP 83592A RF Plug-in (0.01 to 20 GHz)

BACK DATING MANUAL CHANGES

SECTION VII
MANUAL BACKDATING CHANGES

7-1. INTRODUCTION

7-2. This manual has been written for and applies directly to systems with serial numbers prefixed as indicated on the title page. Earlier versions of the system (serial number prefixes lower than the one indicated on the title page) may be slightly different in design or appearance. The purpose of this section of the manual is to document these differences. With the information provided in this section, this manual can be corrected so that it applies to any earlier version or configuration of the system. Later versions of the system (serial number prefixes higher than the one indicated on the title page) are documented in a yellow Manual Changes supplement.

7-3. Since there are no earlier versions of the HP 8755P, there is no change information provided here. This manual applies directly to systems with serial numbers prefixed as indicated on the title page. If your system's serial number is different than the one on the title page, it will be documented in a Manual Changes supplement keyed to the print date and part number (listed on the title page) of this manual. Complimentary copies of this supplement can be obtained from your nearest Hewlett-Packard office. Refer to Systems Covered By Manual in Section I of this manual for more information about serial number coverage.

SERVICE INFORMATION

SECTION VIII
SERVICE

8-1. INTRODUCTION

8-2. This section contains information for troubleshooting 8755P system problems to the individual instrument level. Also included is a description of overall system signal flow, a system troubleshooting block diagram, local versus remote operation troubleshooting guidelines, individual instrument troubleshooting checks, and recommended test equipment information.

8-3. The information contained within this section is directed to system level faults only. Using the information in this manual will help to isolate the faulty instrument or interconnection. Further troubleshooting and repair information pertaining to the problem instrument will be found in Section VIII, Service, of the Operating and Service Manual for that specific instrument.

8-4. 8755P SYSTEM THEORY OF OPERATION

8-5. The 8755P can be most easily understood by breaking it down into the major functional blocks. A simplified block diagram of the 8755P system is given in Figure 8-1. A detailed system block diagram is given in Figure 8-4. Refer to these block diagrams in relation to the following major functional block descriptions:

- **8350A Sweep Oscillator.** Outputs a tuning voltage and digital control signals to the RF plug-in. It also generates a marker/blanking signal which is output at the rear panel POS Z BLANK BNC connector. A sweep ramp signal is generated and is output at the front or rear panel SWEEP OUT/IN BNC connector to be used as a horizontal deflection signal for the display. Alternate sweep control is provided for synchronizing the 8350A with the 8755C and 8750A through the rear panel ALT SWP INTERFACE connector. The 8350A communicates with the HP 85 through the HP-IB bus. The 8350A is set to address 19 (decimal) when shipped from the factory.

- **83592A RF Plug-in.** Generates the RF output frequency at a specified RF power level as controlled by the 8350A. The RF output is internally AM modulated at a 27.8 kHz rate (controlled by the 8350A) for use with the ac detection scheme used in the 8755C detection circuits.

- **11664A Detector.** Utilizes biased schottky diode ac detection to serve as the B input RF power level detector (may be used on the A or R input as well). Bias for the detector diode comes from the 8755C through the interconnect cable. The detected 27.8 kHz signal is then sent to the 8755C 27.8 kHz log amplifier.

- **11666A Reflectometer Bridge.** Includes two biased schottky diode ac detectors in a bridge configuration to sample the incident (R) and reflected (A) signals for ratioing by the 8755C. There is a 6 dB power loss for any signals which enter the 11666A RF IN port and exit the R (INCIDENT) port. There is a 9 dB loss for any signals which enter the RF IN port and exit the TEST port. There is a 9 dB loss for any signals which enter the TEST port and exit the A (REFL) port. Each of these losses are compensated for when the system is calibrated.

- **8755C Swept Amplitude Analyzer.** Processes the demodulated 27.8 kHz signals in three identical linear-to-logarithmic amplifier circuits to generate vertical deflection signals for the 180TR Display Mainframe. Front panel DISPLAY controls select the desired measurement mode and route the output signal through one of two channels. These two channels are sent to a diplay multiplexer where a single vertical deflection output signal is sent to the 180TR. Marker and channel control circuits in the

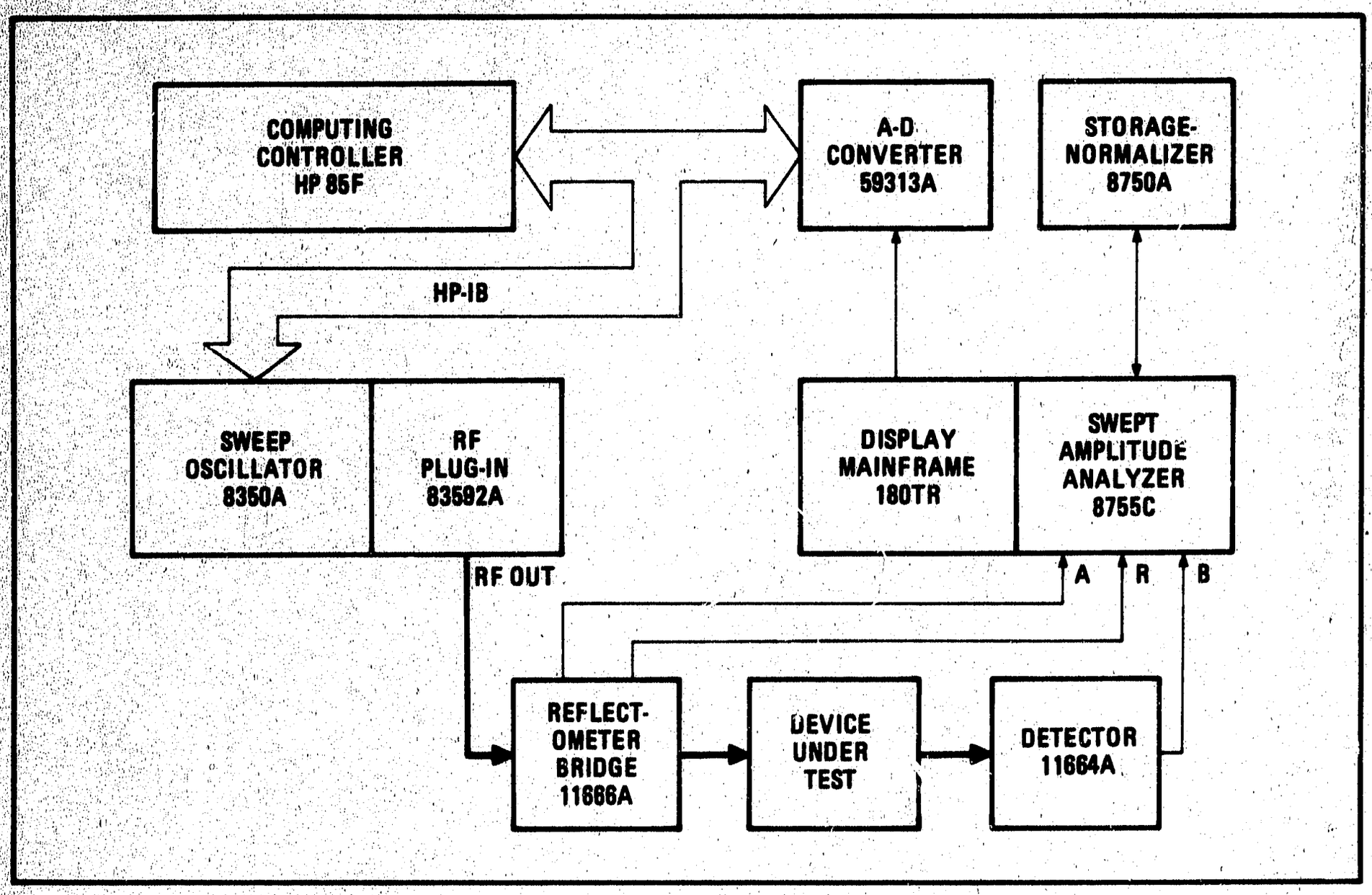


Figure 8-1. Simplified 8755P System Block Diagram

8755C generate all control signals to properly synchronize 8755C operation with the rest of the system. Alternate sweep control from the 8350A interfaces with the 8755C through the Marker and Channel Control circuits to control the 8750A.

- **180TR Display Mainframe.** Displays the measurement information on a frequency versus amplitude plot. Vertical deflection signal input is from the 8755C display control circuits. Horizontal sweep deflection signal input is indirectly from the 8350A Sweep Oscillator (in the 8750A BYPASS mode) or from the 8750A Storage-Normalizer (in the 8750A DISPLAY modes). CRT blanking and intensity is controlled by the 8755C Marker and Channel Control circuits. All power for the 8755C is supplied through the 8755C rear panel interconnect to the 180TR. The 180TR also contains the A7 Normalizer Interface Assembly. This assembly routes the various signals in the system to their appropriate destination for digital display normalization. Each of these signal paths is discussed in detail later in this section.

- **59313A A-D Converter.** This A-D converter monitors the Channel 1 and 2 vertical output signals which are available at the 180TR AUX A and AUX B outputs. Through HP-IB control from the HP 85, one of the inputs from each channel is selected and scaled, sent to an A-D converter, then output to the HP-IB bus. The 59313A operates on the HP-IB bus at address 10 (decimal). The 59313A also contains an internal calibration voltage generator.

- **8750A Storage-Normalizer.** The 8750A provides digital storage of the displayed information which yields several benefits. Slow sweep speeds may be displayed allowing a flicker-free display. Memory functions allow modifications of the stored trace or displayed trace for normalization techniques. The 8750A is divided into two major sections: vertical control and horizontal control. These work together under digital control to properly synchronize input, storage, and output operations. Inserted in the rear panel of the 8750A is a Network Analyzer Interface Board which

allows custom scaling for the 8755C vertical signal inputs to the 8750A. The channel vertical input is selected, scaled, and offset prior to A-D conversion. Horizontal sweep information works under digital control in conjunction with the A-D Converter to store the vertical information in Memory. Modifications to this memory allow current inputs to be offset by the stored reference information for cancelling out frequency response errors. The 8750A is only used in manual measurement procedures, never under HP 85 control (REMOTE operation).

- **HP 85 Controller.** The HP 85 serves as the system controller via the HP-IB Interface Bus. Using the calibration and measurement programs supplied with the system allows fast, accurate, and repeatable transmission and reflection measurements.

8-6. Major Signal Flow

8-7. There are several major signal groups in the 8755P system which can be categorized into the following types:

- RF signal paths
- Vertical deflection control
- Horizontal deflection control
- Marker/blanking and channel control

8-8. RF Signal Paths. The only RF signal path external to the system is generated by the RF plug-in at the Type N RF Output connector. This RF Output is amplitude modulated at 27.8 kHz and then sent to the 11666A Reflectometer Bridge which has a device under test connected to the TEST port. At the 11666A, the signal path is split into the R (Reference), the A (Reflected signal), and the TEST (RF output) port outputs. The A and R outputs are demodulated 27.8 kHz signals which are processed by the 8755C log amplifiers to calculate reflection measurements. When the 11664A Detector is connected to the output of the device under test, the transmission characteristics of the device can be measured. After the A, R, and B signals are processed by the 8755C log amplifiers, a detected linear output signal is sent to the 8755C Display Controls. At this point the signals are treated as Vertical Deflection Signals.

8-9. Vertical Deflection Control. With the 8750A in a BYPASS mode, the Channel 1 and 2 signals are routed straight to the Display Multiplexer. If only one channel is being used, the Display Multiplexer is set by the Channel Control circuits to output only that channel to the CRT vertical deflection plates. If both channels are being used, the Display Multiplexer will go into a chop mode to display what appears to be two separate traces.

8-10. The Channel 1 and 2 vertical output signals (500 mV/division) are routed through the 8755C rear panel interconnect plug to the 180TR A7 Normalizer Interface Assembly where they are always available at the AUX A and AUX B outputs. The vertical deflection signal present at the AUX A connector is routed to the CHAN 1 and CHAN 3 inputs of the 59313A A-D Converter. The AUX B output is routed to the 59313A CHAN 2 and CHAN 4 inputs. As shipped from the factory, CHAN 1 and CHAN 2 inputs are set for a ±1 volt full scale range. CHAN 3 and CHAN 4 are set for a ±5 volt full scale range. In this manner, greater resolution can be achieved to measure signals which occur within ±2 divisions of the reference graticule.

8-11. The vertical deflection signals for both channels are always present at the Channel 1 and 2 VERT IN (vertical input) connections on the 8750A Network Analyzer Interface Board. The channel which is selected in the 8750A is controlled by the 8750A Digital Control circuits via the 8755C Channel Control circuits. After this point, the vertical information is converted to digital information which is stored and manipulated in the 8750A Memory. The normalized output (YNORM) from the 8750A is a synthesized vertical output composite signal. This YNORM signal is then sent through the 180TR A7 Normalizer Interface Assembly to the 8755C. Here the signal is routed through a switch, controlled by LNORM (Low=Normalizer), to the Display Multiplexer Channel 1 input path. The Display Multiplexer is forced to display the Channel 1 output only, which, in this case, can be either Channel 1 or 2 information from the 8750A. In this manner, even though both Channels 1 and 2 are processed in the 8750A, only one at a time is output through the Channel 1 signal path. The horizontal sweep output (XNORM) generated by the 8750A is operating at approximately 50 Hz, so both traces seem to appear simultaneously.

8-12. Horizontal Deflection Control. Horizontal sweep control for the CRT horizontal

deflection plates comes from one of two sources. When the system is operating without the 8750A (or when it is in the BYPASS mode), the horizontal sweep ramp comes from the 8350A and into the 180TR at the rear panel AUX D connector. It is routed through the 180TR A7 Normalizer Interface Assembly to the 8755C. The displayed trace width may be adjusted in the 8755C by varying the HORIZ GAIN control. The horizontal position on the display is then set by varying the 180TR HOIZONTAL POSITION. The horizontal sweep signal is then routed through a switch on the 180TR A7 Normalizer Interface Assembly, the DISPLAY switch (INTERNAL position), and the Horizontal Amplifier to the horizontal deflection plates.

8-13. When the 8755P system is operated with the 8750A, the horizontal sweep signal is routed from the 8350A, through the 180TR A7 Normalizer Interface Assembly, to the 8750A. Adjustments on the 8750A Network Analyzer Interface Board scale and offset this input signal. The horizontal sweep signal is then referenced for storing the vertical information in memory. When information is output from the 8750A, a new horizontal sweep ramp (XNORM) is generated. This new sweep ramp operates at approximately 50 Hz and may be adjusted by the 8750A output amplifier controls (HORIZ POSN and HORIZ GAIN). YNORM data is output coincident with XNORM data to provide complete X and Y coordinate information for the display. The XNORM signal is then returned to the 180TR A7 Assembly, through a switch and into the DISPLAY switch and Horizontal Amplifier.

8-14. Proper synchronization of all of the switching networks is the key to proper routing of the vertical and horizontal deflection signals. These switching networks are each controlled by the signal LNORM which goes low whenever the 8750A is being used.

8-15. Marker/Blanking and Channel Control. All marker and blanking control signals are initally generated by the 8350A. Blanking (+5 volt) and marker (−8 volt: active marker; −4 volt: additional markers) signals are output from the 8350A rear panel POS Z BLANK connector which is connected to the 180TR rear panel AUX C connector. They are then routed through the 180TR A7 assembly directly to the 8755C Marker and Channel Control circuits. This is then the control point for all marker and blanking signals. The POS/NEG blanking switch in the 8755C is set to the POS (positive) position to accept the positive polarity blanking signals. From these circuits, the CRT is turned off or on by the blanking pulse. The trace may be intensified for a marker occurrance (the active marker is always the brightest marker). All 8350A mainframe markers are intensity markers when the system is used without the 8750A.

8-16. When the 8750A is used, the markers are displayed as amplitude markers. The 8755C Marker Control circuits send a pulse to the 8750A Digital Control circuits at the occurance of a marker input. The 8750A then stores a marker at the appropriate horizontal position. When the 8750A outputs a digitally stored trace with a marker, the vertical output signal (YNORM) has an amplitude pulse at the point of the marker occurance. The YNORM signal is still routed in the same manner as explained earlier.

8-17. All channel control signals for the system are controlled by the 8755C Channel Control circuits. From this point the 8750A vertical input switch, the 8755C Display Multiplexer, and ultimately, the CRT display the trace(s) selected by the 8755C front panel DISPLAY Controls. When the system is operated with the 8350A in the Alternate Sweep mode, the 8350A forces control of the 8755C and 8750A Channel Control circuits through the Alternate Sweep Interface cable.

8-18. SYSTEM TROUBLESHOOTING

8-19. These system level troubleshooting procedures are intended to isolate the problem to an instrument level. In order to do this it is necessary to carefully define the problem in order to isolate it to a major function if possible. First carefully qualify the problem by means of a complete visual inspection and use of the system controls. Is the problem apparently due to loss of line power at any instrument(s)? Does the problem only occur in local or remote operation? Does the problem seem to be due to a single function failure (i.e. no markers), or does the problem occur only with a major functional block (i.e. 8350A will not accept front panel pushbutton commands). Refer to the System Functional Test in Section IV of this manual. That will help to isolate operational problems. Using this Service section in conjunction with the troubleshooting diagrams and test procedures should help to quickly isolate the problem to an instrument level. At that point the Operating and Service Manual for that particular instrument should be referenced.

8-20. Initial Inspection

8-21. Make a complete visual inspection of the system. Check that the power plugs for all instruments are connected to the line outlet. Check that the correct line voltage is selected on the rear panel of the instrument. Make sure that all line power fuses are not burned out. If all instruments lack line power and the system has a 5-outlet line power strip installed, make sure that the power strip circuit breaker is reset. If the white button on the end of the power strip is popped out, turn off the LINE switch on all instruments and push the button in to reset it. Then turn on the instruments one by one to determine if a single faulty instrument caused the circuit breaker to trip. When the LINE switch for each instrument is turned on, make sure that the LINE or POWER lamp is lit.

8-22. Check that all wiring interconnects are intact and connected to the right jacks. Refer to the system interconnection diagram in Figure 2-1. If the system is used in local operation, make sure the the lamp in the 8350A ⎍ MOD pushbutton is lit indicating that the RF output is amplitude modulated at 27.8 kHz. In remote operation ⎍ MOD should be remotely programmed by the HP 85 under HP-IB control. Check also that the RF plug-in power is turned on.

8-23. If there is no display, determine if the problem is due to improper adjustment of the display controls or if there is no 8755C DISPLAY pushbutton selected. Adjust the 180TR INTENSITY control fully clockwise for maximum display brightness. If there is still no display, press BEAM FIND to verify that the CRT is working. A bright spot or trace should appear which then should be adjusted to mid screen by the display controls. On the 8755C, press both channel REFERENCE POSITION pushbuttons. This should display a pair of traces even with no input connected to the 11664A or 11666A. Vary the REFERENCE POSITION screwdriver adjustments and the 180TR HORIZONTAL POSITION adjustment while pressing BEAM FIND. This should indicate the proper direction to adjust each of the controls to bring both traces to center screen.

8-24. Local Versus Remote Operation Troubleshooting

8-25. The 8755P system operates in two major modes: local (manual operation), and remote (computer controlled operation. A major troubleshooting step is to determine if the problem occurs in only one of these two modes since different instruments and signal paths are used in each mode.

8-26. In local operation, the HP-IB bus is not used. If the 8755P functions in the local mode, but not in the remote mode, the problem must be limited to:

- HP 85 Controller or its accessories
- 59313A A-D Converter
- HP-IB Interface cable or connections
- 8350A HP-IB Interface circuits

8-27. The HP 85 and the 59313A may be completely removed from the system by disconnecting their HP-IB cable connections to the 8350A and disconnecting the AUX A and AUX B BNC cable connections to the 180TR. The system should now still be functional in the manual mode of operation.

8-28. In the remote operation mode, the 8750A Storage-Normalizer can be turned off, disconnected, or be set to any mode of operation (i.e. INPUT, BYPASS) without affecting remote operation. The 8750A can be quickly disconnected from the system by removing the Storage-Normalizer Interface Cable from the rear panel interconnect on the 180TR. Additionally, in the remote mode of operation, several signal paths shown in Figure 8-4 are not used. The vertical output signals from each channel in the 8755C are connected through the 180TR A7 assembly directly to the AUX A and AUX B connectors. These signal paths through the 180TR have no active components or switches. The 59313A monitors the AUX A and AUX B outputs and converts the analog vertical outputs into digital information for the HP 85. The entire 8750A, display portions of the 180TR (horizontal and vertical), and all 8755C circuits following the Channel 1 and 2 vertical amplifiers are not used in remote operation. The 180TR does however provide power supply voltages to the 8755C and its accessories. If the 8755P system functions normally in the remote mode but not the local mode, the problem must, therefore, be limited to:

- Bad 8350A SWEEP OUT or POS Z BLANK outputs or their signal paths
- 180TR High voltage or display circuitry

8-29. The 8750A is never used during remote operation, and need not be used during local operation. So, if the problem occurs only when the 8750A is turned on or in the INPUT mode, the problem must be:

- 8750A Storage-Normalizer or its interconnect cable
- 180TR A7 Normalizer Interface Assembly signal paths
- 8755C A11 Normalizer Interface Assembly circuits

8-30. Instrument Verification

8-31. The following troubleshooting hints deal specifically with individual instrument problems and their symptoms.

8-32. 8350A Sweep Oscillator. When the 8350A LINE power is turned on, or when the INSTRUMENT PRESET pushbutton is pressed, the 8350A performs an internal self-test routine. If any portion of the self-test routine fails, an error code is displayed in the 8350A FREQUENCY display. A complete list of error codes is included in the 8350A manual. If E001 appears, the RF plug-in or its interface should be suspected. Check that the correct START and STOP frequency limits are displayed for the plug-in being used. If E001 is displayed with the RF plug-in installed, turn off the 8350A LINE power, remove the RF plug-in, and restore the LINE power. If any error code other than E001 appears, the problem is probably in the 8350A.

8-33. On the 8350A, press INSTR PRESET and check the front and rear panel SWEEP OUT/IN connectors with an oscilloscope for a 0 to 10 Vdc sweep ramp. If the RF plug-in is an HP 83592A, as supplied in the standard system, the sweep ramp will appear as shown in Figure 8-2. Bandswitch points may clearly be seen on this sweep ramp.

8-34. Check the 8350A POS Z BLANK output with an oscilloscope. With and 83592A RF Plug-in installed in the standard system, press INSTR PRESET M1◆◆M2◆◆M3. The display should appear as shown in Figure 8-3 with positive blanking signals occuring during bandswitch transitions and retrace. Three marker pulses are shown, one in Band 2, one in Band 4, and the active marker (−8 volt pulse) is in Band 3. Varying the marker frequency should cause the marker pulse position to vary accordingly on the oscilloscope trace. Figures 8-2 and 8-3 may be simultaneously displayed to match the corresponding signal points for each band. The composition of this waveform will vary according to the RF plug-in being used, but the levels displayed will remain the same.

8-35. Isolate 8350A problems, when possible, by checking all front panel key functions. Many problems relating to a specific 8350A function can be isolated in this manner (i.e. frequency modes, markers, ect.).

8-36. 83592A RF Plug-in. When the 8350A LINE power is turned on or when INSTRUMENT PRESET is selected, parts of the RF plug-in are checked in the self-test routine. The 83592A RF Plug-in manual contains a list of error codes associated with 83592A problems. If the self-test routine is completed and no error codes are present, check that the correct power level is displayed in the POWER display (minimum or maximum, according to the internal RF plug-in configuration switch setting). Check that the RF ON pushbutton lamp is lit. To check for RF output power, attach a power meter to the RF OUTPUT connector. Use an attenuator if necessary to protect the detector from being overloaded. With the 8350A ⎍ MOD pushbutton lamp off, the displayed power level should match the power meter reading. When ⎍ MOD is selected, the power meter reading should drop 3 dB. This is due to the 27.8 kHz amplitude modulation which has a 50/50 power on/off ratio. If the power drop is not 3 dB, modulation symmetry problems may exist.

8-37. 11666A Reflectometer Bridge. If trouble is suspected in the 11666A, first ensure that the input RF power is correct and ⎍ MOD is selected, as described previously. With the 11666A connected to the RF OUTPUT, the output power at each port (A, R, and TEST) can be verified. The 8755C must be properly calibrated as described in Section V, System Adjustments, in this manual. With these conditions met, the level displayed when DISPLAY R is selected should be 6 dB below the RF output power due to internal losses in the R branch of the 11666A. Attach a Type N Short to the TEST port and select DISPLAY A on the 8755C. The display should now show a trace 18 dB below the RF output power level.

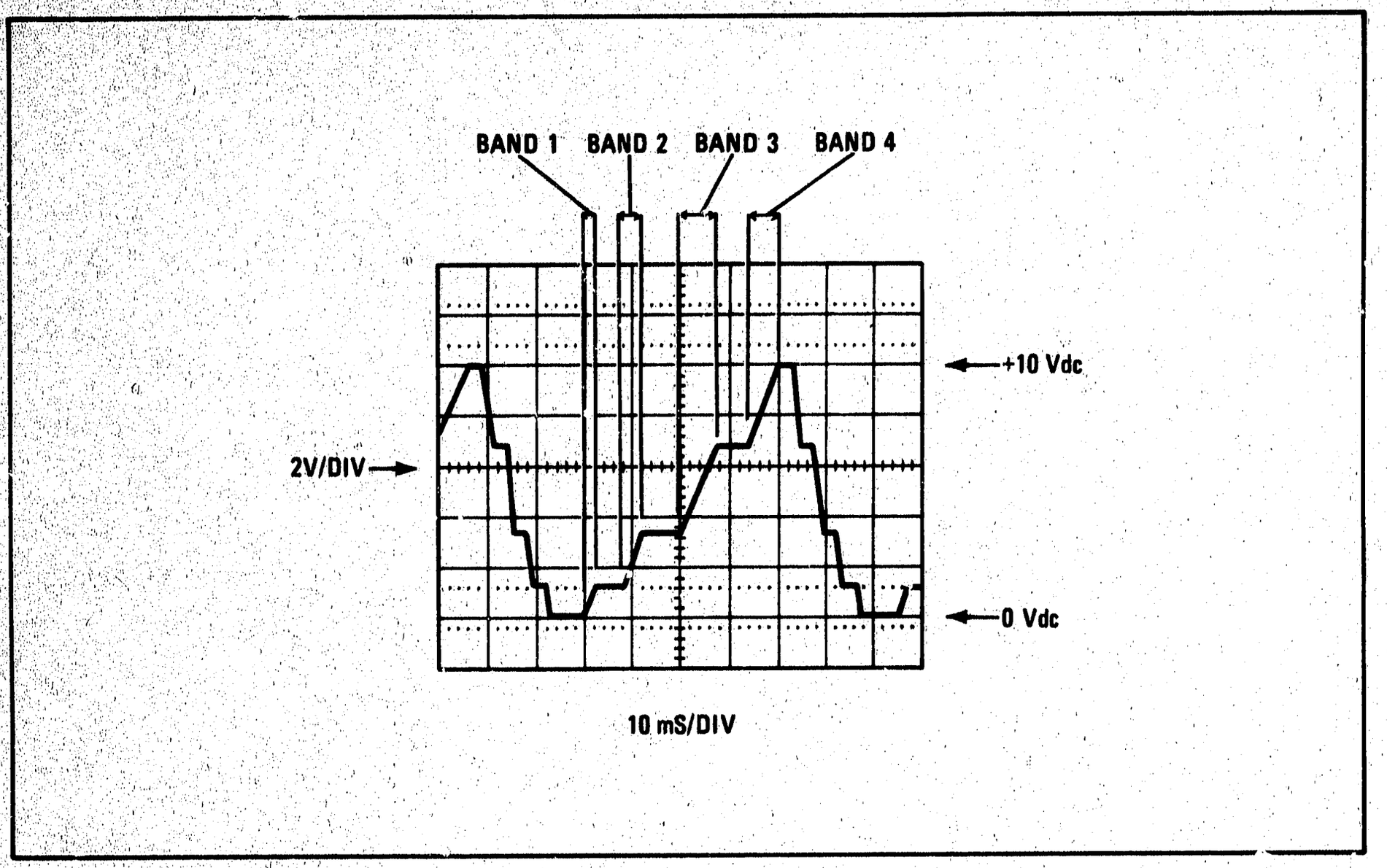


Figure 8-2. 8350A SWEEP OUT/IN Output for 83592A Full Band Sweep

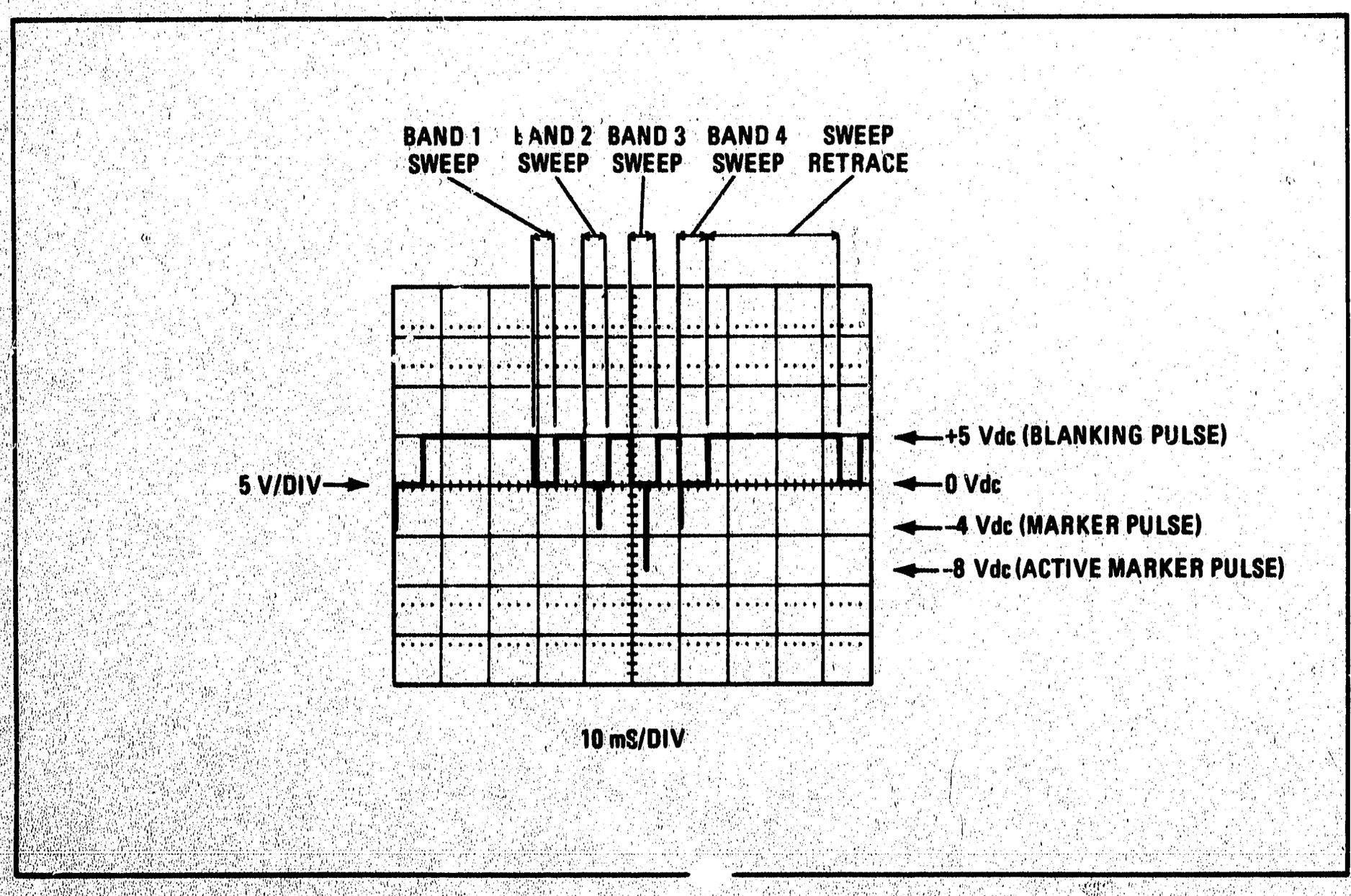


Figure 8-3. 8350A POS Z BLANK Output for 83592A Full Band Sweep With Markers

8-38. The System Functional Test in Section IV of this manual contains a detailed procedure to check for proper display responses for various TEST port loading. Additionally, procedures are given in the 11666A manual to test for equivalent directivity and SWR of the Reflectometer Bridge. Another simple test is to vary the 8350A START and STOP frequencies while observing the A/R display of a device with a known frequency response to verify that the trace shifts and changes according to the frequency variations. The A and R inputs may also be interchanged which will help to isolate a faulty input leg in either the 11666A or the 8755C.

8-39. 11664A Detector. Check for proper RF output power and 27.8 kHz amplitude modulation from the RF plug-in before looking for detector problems. The quickest way to isolate a detector problem is to interchange it with another input (A, R, or B). If the problem follows the detector, the detector is at fault. If the problem remains on one input, regardless of whether the 11666A or 11664A is connected, the 8755C is at fault.

8-40. 8755C Swept Amplitude Analyzer. Once again, make sure that the RF plug-in output power and ⎍ MOD are working properly before suspecting the 8755C. As can be seen in the troubleshooting block diagram in Figure 8-4, the input circuitry to the 8755C consists of three identical 27.8 kHz amplifiers and detectors. Since each of these amplifiers are identical, the inputs from the 11666A or 11664A may be interchanged to isolate a faulty input amplifier. Remember that ratio measurements will appear upside down if the inputs are reversed (i.e. A/R becomes R/A).

8-41. Exercising the 8755C DISPLAY controls will help to isolate a faulty function. The DISPLAY controls basically consist of a summing amplifier for each channel with input currents switched in from each of the log amplifiers, according to the DISPLAY mode selected. The dB/DIV pushbuttons vary the gain of the summing amplifiers and the REFERENCE LEVEL switches generate an offset current to the summing amplifiers. Each of these functions take place in a separate portion of the 8755C. The output of Channel 1 and 2 (500 mV/division) may be monitored with a scope at the 180TR AUX A and B outputs, respectively. If functional problems of this type are present, refer directly to the 8755C manual.

8-42. Horizontal sweep adjustment problems can be quickly isolated to the 8755C or its signal path by using the 8750A in the INPUT mode. The sweep ramp is then internally generated by the 8750A. If the horizontal sweep display is now good, the problem must be in the 8755C horizontal sweep signal path (which also extends to the 180TR A7 assembly).

8-43. Complete marker, channel, and display multiplexer control signal descriptions are given in the 8755C manual. If the 8755C marker circuits are inoperative, markers displayed when the 8750A is used will be bad as well. On the other hand, all 8750A marker problems are not necessarily due to 8755C marker control circuit problems. Since the 180TR has only one trace, the Display Multiplexer is responsible for generating the chop mode to simultaneously display both channels. By exercising the 8755C Channel 1 and 2 DISPLAY controls, the problem can be isolated to either the Display Multiplexer or the channel controls for one of the channels. If both channels work individually but both channels cannot be displayed simultaneously, the problem is in the Display Multiplexer or the Channel Control circuits.

8-44. 180TR Display Mainframe. Check to make sure that the 180TR is turned on, both channel DISPLAY REFERENCE POSITION pushbuttons are depressed on the 8755C, and the 8750A is in the BYPASS mode. If no trace is present, adjust the INTENSITY control fully clockwise to increase trace intensity. Pressing BEAM FIND should contract the displayed image to about 1/3 its normal size. If the trace appears off to one side, adjust the 180TR HORIZONTAL POSITION and the 8755C REFERENCE POSITION screwdriver adjustment to bring the trace to center screen. Display calibration procedures are given in Section V, System Adjustments, in this manual.

8-45. If a bright spot appears at the left edge of the display, but does not sweep across the screen, the sweep output from the 8350A is not being transmitted to the horizontal deflection plates of the CRT. Refer to Figure 8-4 to check the signal path of the horizontal sweep signal from the 8350A. Check for a sweep ramp with an oscilloscope as previously described in the 8350A troubleshooting description.

8-46. If no trace still appears, remove the BNC cable from the 8350A POS Z BLANK. If the

trace reappears, the problem may be with the 8350A blanking signal output. Slowing the sweep speed to 1 second may help to make the trace more visible.

8-47. An oscilloscope with X versus Y display mode capability can be substituted for the 180TR Display Mainframe. Connect the oscilloscope Y (vertical) deflection input to the 180TR AUX A or AUX B output. Connect the 8350A SWEEP OUT/IN to the oscilliscope X (horizontal) deflection input. To have marker and blanking capability, connect the 8350A POS Z BLANK output to the oscilloscope Z-axis input. Set the oscilloscope for X versus Y display mode and .5 volt/division vertical sensitivity. On the 8755C, press Channel 1 and 2 REFERENCE POSITION and adjust each channels reference position screwdriver adjustment to place the traces on the oscilloscopes zero volt graticule. The oscilloscope is now functioning as the 180TR display and should show two flat traces on the 0 volt reference graticule. Although the 8755C must still obtain its power supply voltages from the 180TR, this procedure should isolate the 180TR display circuitry problems.

8-48. 8750A Storage-Normalizer. The 8750A is not used during Remote operation. If turning the 8750A on or selecting the INPUT mode during remote operation causes problems, suspect the 8755C A11 Normalizer Interface Assembly. This assembly (not shown specifically on Figure 8-4) contains many of the control circuits for interfacing the 8755C with the 8750A.

8-49. Problems caused by the 8750A in Local operation should be apparent by an improper display. If disconnecting the rear panel Storage-Normalizer Interface Cable restores a proper display (conventional display), the problem may be with the 8755C A11 Assembly, 180TR A7 Normalizer Interface circuits, or the 8750A itself. Reconnect the 8750A but leave the 8750A line power off. Check the display again. If it changes, suspect the interface cable or the 8750A. Now switch the 8750A line power on and check the display in both the BYPASS and INPUT modes. If the display changes drastically, suspect the 8750A. If the display shifts noticably between the INPUT and BYPASS modes, or if the trace drops off abruptly at the start or end of a sweep, perform the System Adjustments in Section V of this manual.

8-50. 59313A A-D Converter. Verify that the proper input (from the 180 TR rear panel AUX A and AUX B) signals are present as described previously. If these are good at the input to the 59313A, run the "Cal" program described in Section IV of this manual. The 59313A has an internal calibration voltage source which is used during this calibration. Voltages of 0, −1, or −5 Vdc may be selected by a rear panel switch. This calibration voltage is automatically applied to the rear panel inputs when the plugs are removed. If the cal program runs properly, operation of the 59313A and HP-IB bus are assured. Slightly alter the 59313A GAIN and OFFSET adjustments to see that they affect the displayed values.

8-51. HP 85 Controller and HP-IB Bus. Check to make sure that all HP-IB connections are correct and snug. Ensure that the HP-IB Interface Card and the ROM drawer are firmly inserted in the HP 85 connectors. The HP 85 runs through a self check routine upon initial power up. If it finds a problem during this self test, it will beep and display Error 23: SELF TEST. Check the measurement program for software errors. If the programs supplied with the 8755P system are being used, try reloading and running the "Autost" program or the "Cal" program as described in the Remote Operation portion of Section III in this manual. If the programs are listed, they may be used for comparison to verify proper software. If the "Cal" program will run, this verifies the operation of the HP 85 I/O port, HP-IB Interface Card, and 59313A HP-IB Interface. At this point, suspect the 8350A HP-IB interface assemblies.

8-52. RECOMMENDED TEST EQUIPMENT

8-53. Test equipment required to troubleshoot the 8755P system is listed in Section I of this manual. If the equipment listed is not available, other equipment which meets the minimum specifications listed in the table may be substituted.

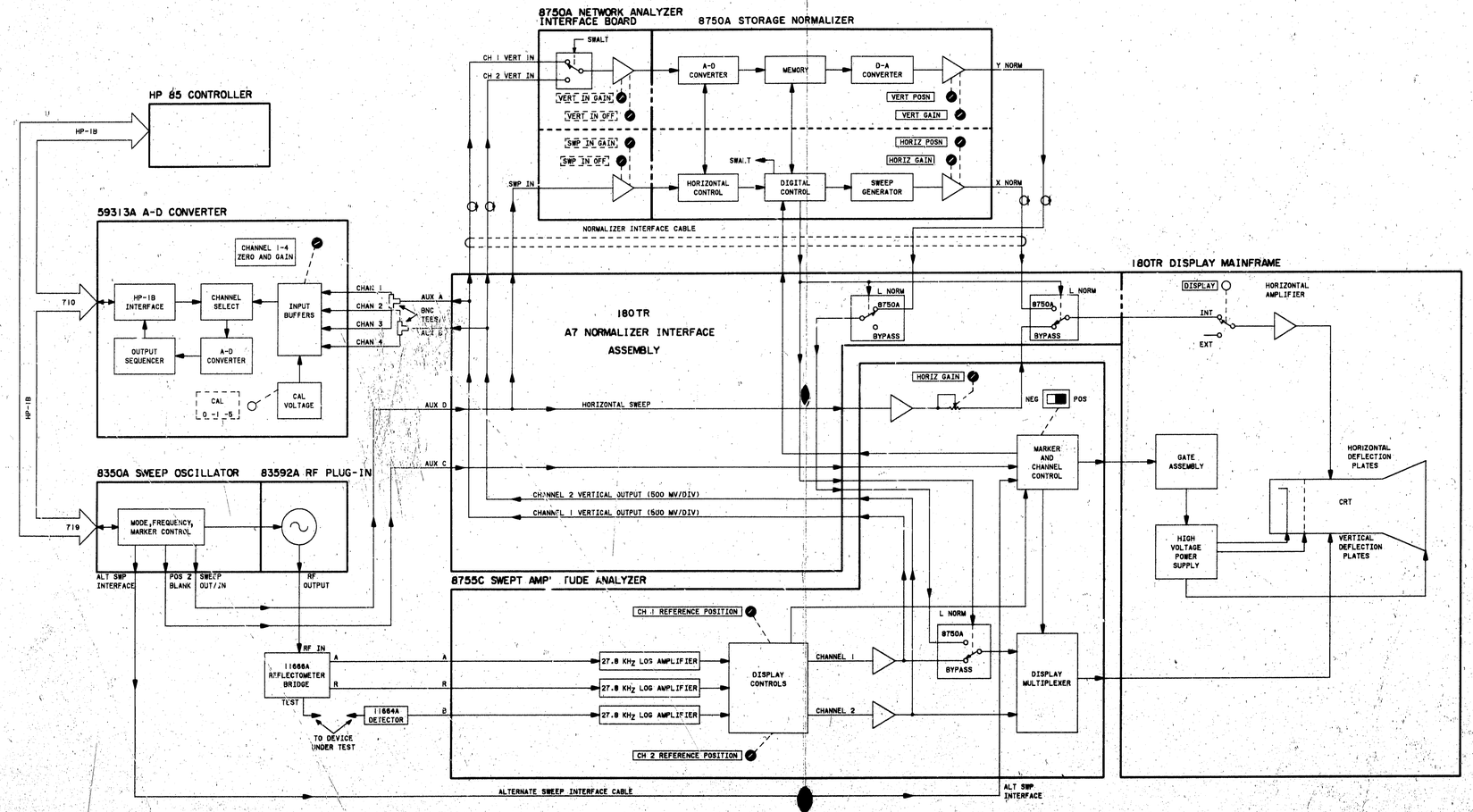


Figure 8-4. 8755P Troubleshooting Block Diagram