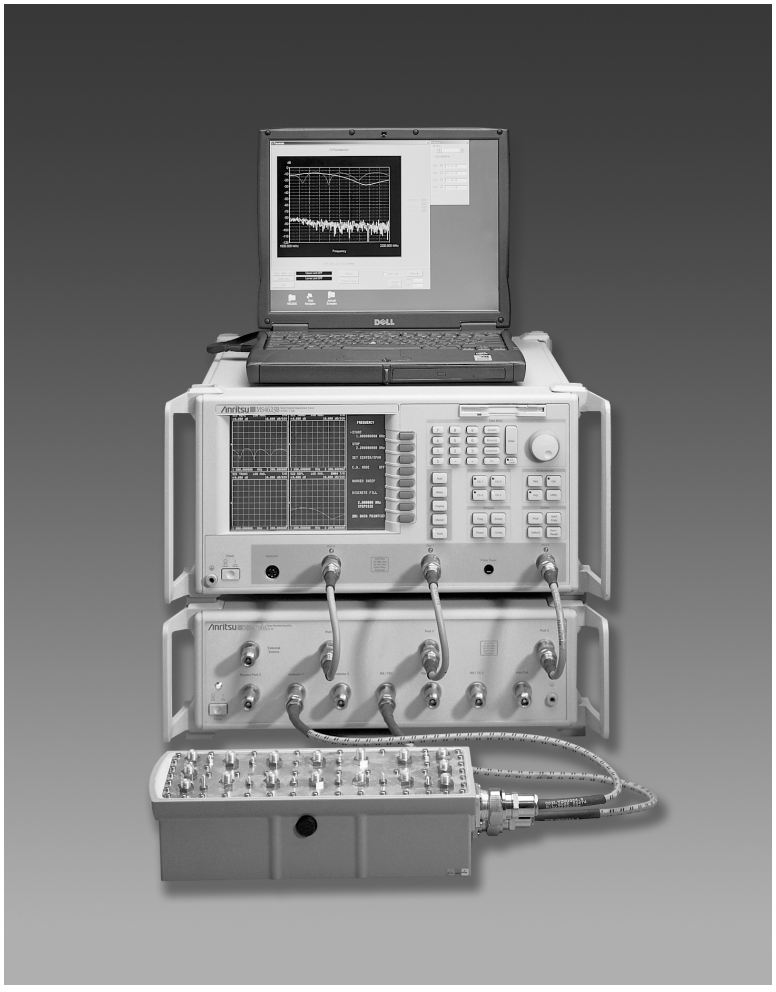
MODEL

MN4790A TEST SET FOR THE

ME7842B

TOWER MOUNTED AMPLIFIER TEST SYSTEM

MAINTENANCE MANUAL



Anritsu

490 JARVIS DRIVE | MORGAN HILL, CA 95037-2809

P/N: 10410-00245
REVISION: A
PRINTED: MARCH 2003

WARRANTY

The Anritsu product(s) listed on the title page is (are) warranted against defects in materials and workmanship for three years from the date of shipment.
Anritsu's obligation covers repairing or replacing products which prove to be defective during the warranty period. Buyers shall prepay transportation charges for equipment returned to Anritsu for warranty repairs. Obligation is limited to the original purchaser. Anritsu is not liable for consequential damages.

LIMITATION OF WARRANTY

The foregoing warranty does not apply to Anritsu connectors that have failed due to normal wear. Also, the warranty does not apply to defects resulting from improper or inadequate maintenance by the Buyer, unauthorized modification or misuse, or operation outside of the environmental specifications of the product. No other warranty is expressed or implied, and the remedies provided herein are the Buyer's sole and exclusive remedies.

TRADEMARK ACKNOWLEDGEMENTS

Scorpion and Scorpion Navigator are registered trademarks of Anritsu Company.
Windows is a registered trademark of Microsoft Corporation.

NOTICE

Anritsu Company has prepared this manual for use by Anritsu Company personnel and customers as a guide for the proper installation, operation and maintenance of Anritsu Company equipment and computer programs. The drawings, specifications, and information contained herein are the property of Anritsu Company, and any unauthorized use or disclosure of these drawings, specifications, and information is prohibited; they shall not be reproduced, copied, or used in whole or in part as the basis for manufacture or sale of the equipment or software programs without the prior written consent of Anritsu Company.

Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, ANRITSU Company uses the following symbols to indicate safety-related information. For your own safety, please read this information carefully BEFORE operating the equipment.

Symbols used in manuals

DANGER	Indicates a very dangerous procedure that could result in serious injury or death if not performed properly.
WARNING	Indicates a hazardous procedure that could result in serious injury or death if not performed properly.
CAUTION	Indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

Safety Symbols Used on Equipment and in Manuals

Some or all of the following five symbols may or may not be used on all ANRITSU equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.

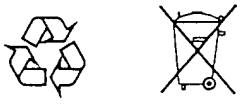
The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE operating the equipment.

This symbol indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.

This symbol indicates a compulsory safety precaution. The required operation is indicated symbolically in or near the circle.

This symbol indicates warning or caution. The contents are indicated symbolically in or near the triangle.

This symbol indicates a note. The contents are described in the box.



These symbols indicate that the marked part should be recycled.

For Safety

WARNING

Always refer to the operation manual when working near locations at which the alert mark, shown on the left, is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.

Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

or

WARNING

When supplying AC power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

Repair

WARNING ⚠

WARNING

This equipment cannot be repaired by the operator. DO NOT attempt to remove the equipment covers or to disassemble internal components. Only qualified service technicians with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

WARNING

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Table of Contents

Chapter 4 Troubleshooting

Chapter 5 Removal and Replacement Procedures

Appendix A Connector Maintenance Check Procedures

Index

Chapter 1
General Information

1-1 SCOPE OF MANUAL

This manual provides general service and preventive maintenance information for the Anritsu MN4790A test set for the ME7842B Tower Mounted Amplifier Test System. It contains procedures for:

- Testing the instrument for proper operation
- Verifying measurement accuracy and traceability to National Institute of Standards and Technology (NIST)
- Troubleshooting a failed instrument to the exchange subassembly level or to the subsystem requiring adjustment
- Locating and replacing failed parts

Throughout this manual, the terms *ME7842B* and *Tower Mounted Amplifier Test System* (or *TMATS*) will be used interchangeably to refer to the entire ME7842B Tower Mounted Amplifier Test System; the terms *MS4623B, Vector Network Measurement System* (or *VNMS*), and *Scorpion*® will be used interchangeably to refer to the model MS4623B Vector Network Measurement System; the terms *MN4790A* and *test set* will be used interchangeably to refer to the model MN4790A test set, unless otherwise noted.

1-2 INTRODUCTION

This chapter provides a general description of the Tower Mounted Amplifier Test System's serial numbers, frequency ranges, and related manuals. It also includes a service strategy, available service facilities, static-sensitive component handling precautions, and a list of recommended test equipment.

1-3 IDENTIFICATION NUMBER

All Anritsu instruments are assigned a six-digit ID number, such as "021001." This number appears on a decal affixed to the rear panel. Please use this identification number during any correspondence with Anritsu Customer Service about this instrument.

1-4 ONLINE MANUAL

This manual is available on CD ROM as an Adobe Acrobat™ (*.pdf) file. The file can be viewed using Acrobat Reader™, a free program that is also available on the CD ROM. This file is "linked" such that the viewer can choose a topic to view from the displayed "bookmark" list and "jump" to the manual page on which the topic resides. The text can also be word-searched. A copy of this CD ROM can be ordered from Anritsu.

1-5 TMATS SYSTEM OVERVIEW

The Anritsu ME7842B Tower Mounted Amplifier Test System is intended for the measurement and real-time graphical display of a tower mounted amplifier in the frequency range from 10 MHz to 6 GHz of the following parameters:

- S-Parameters Including Hot S_{22}
- K-Factor
- Gain Compression and Phase Distortion
- Intermodulation Distortion (500 MHz to 6 GHz)
- Harmonics
- Noise Figure
- Drain Current and Power Added Efficiency (PAE)
- Adjacent Channel Power Ratio (ACPR)

1-6 HARDWARE DESCRIPTION

The ME7842B hardware (Figure 1-) consists of an MS4623B 3-port Scorpion, an MN4790A test set, and a customer supplied personal computer (PC).

1-7 SYSTEM DESCRIPTION

An overall block diagram of the TMATS is shown in Figure 1-2 on page 1-5. Brief descriptions of the MS4623B 3-port Scorpion and the MN4790A test set are given below:

MS4623B VNMS

The Scorpion Vector Network Measurement System functions under GPIB control of the software residing in the PC. The software supports tuning and alignment operations by generating real time graphical displays of the measured data on the PC screen.

Under software control, 3^{rd}, 5^{th} and 7^{th} order IMD products can be measured and displayed. Also, the Upper and Lower Side Band (USB & LSB) components of the IMD products are measured and displayed separately.

The 3-port Scorpion includes the following capabilities:

- Two internal, independent RF sources. Each source has a range of –15 dBm to +5 dBm. A 0 dB to 70 dB step attenuator (10 dB-per-step) is provided for each source resulting in a power output range of –85 dBm to +5 dBm from each source.
- Complete built-in capability for IMD measurements (A combiner is provided within the test set.)
- Complete built-in reflectometer for S-parameter measurements

MN4790A Test Set The Series MN4790A test set contains two SPDT pin switches at Test Port 1 and Test Port 3. One output of each switch is linked to a Wilkinson type combiner that combines the two RF signals from Port 1 and Port 3 of the Scorpion. As an option to boost the input RF power to the amplifier-under-test (AUT), external preamplifiers can be inserted between:

- Scorpion Port 1 and the test set Test Port 1
- Scorpion Port 3 and the test set Test Port 3

The output of the combiner is fed to a SP3T source selection switch that enables one of the following to be applied to the AUT:

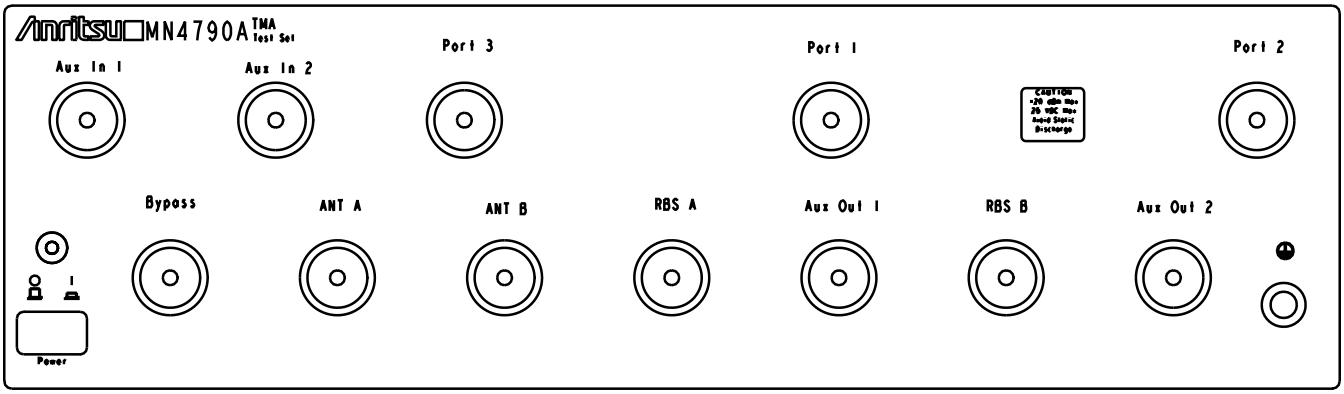
- The combined signal from the Scorpion sources
- The signal from the Scorpion Source 1 via Port 1 (bypassing the combiner)
- A modulated signal from an optional, external modulation synthesizer

The second output of the switch at Test Port 1 is linked to the source selection switch. The second output of the switch at Test Port 3 is linked to the Bypass output port at the front panel.

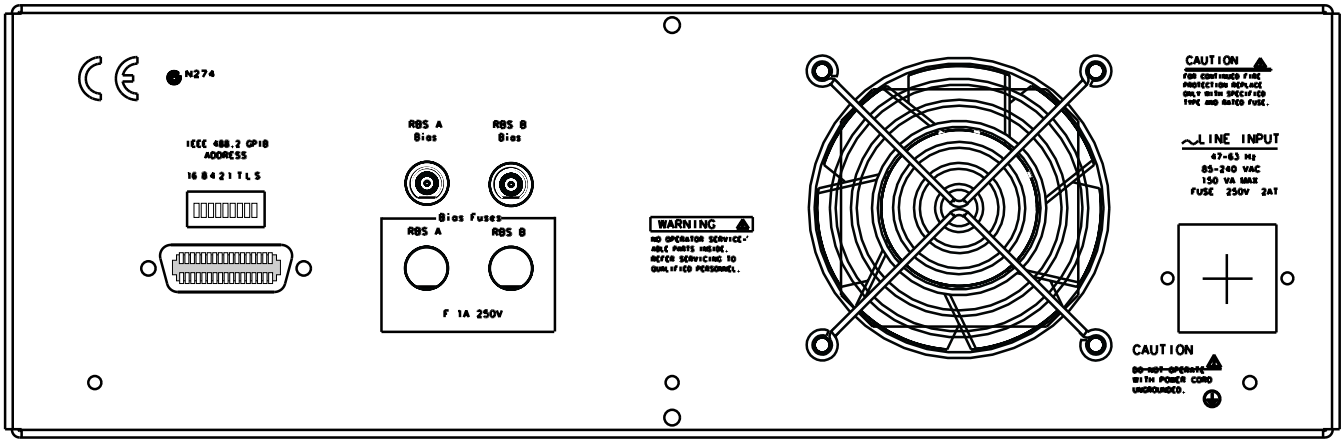
The output of the source selection switch is fed to a SPDT switch that enables the signal to be routed to the ANT A port or the ANT B port at the front panel.

An SPDT switch multiplexes the signal to and from the RBS A and RBS B ports at the front panel. The output of this switch is linked to a SP3T selection switch that enables the signal to be routed to one of the two AUX Out ports, or via the built-in step attenuator to Test Port 2 of the test set.

The MN4790A front and rear panels are illustrated in Figure 1-1 on the following page. Figure 1-2, on page 1-5, shows an overall block diagram of the test system.



Front Panel



Rear Panel

Figure 1-1. *MN4790A Test Set Front and Rear Panel*

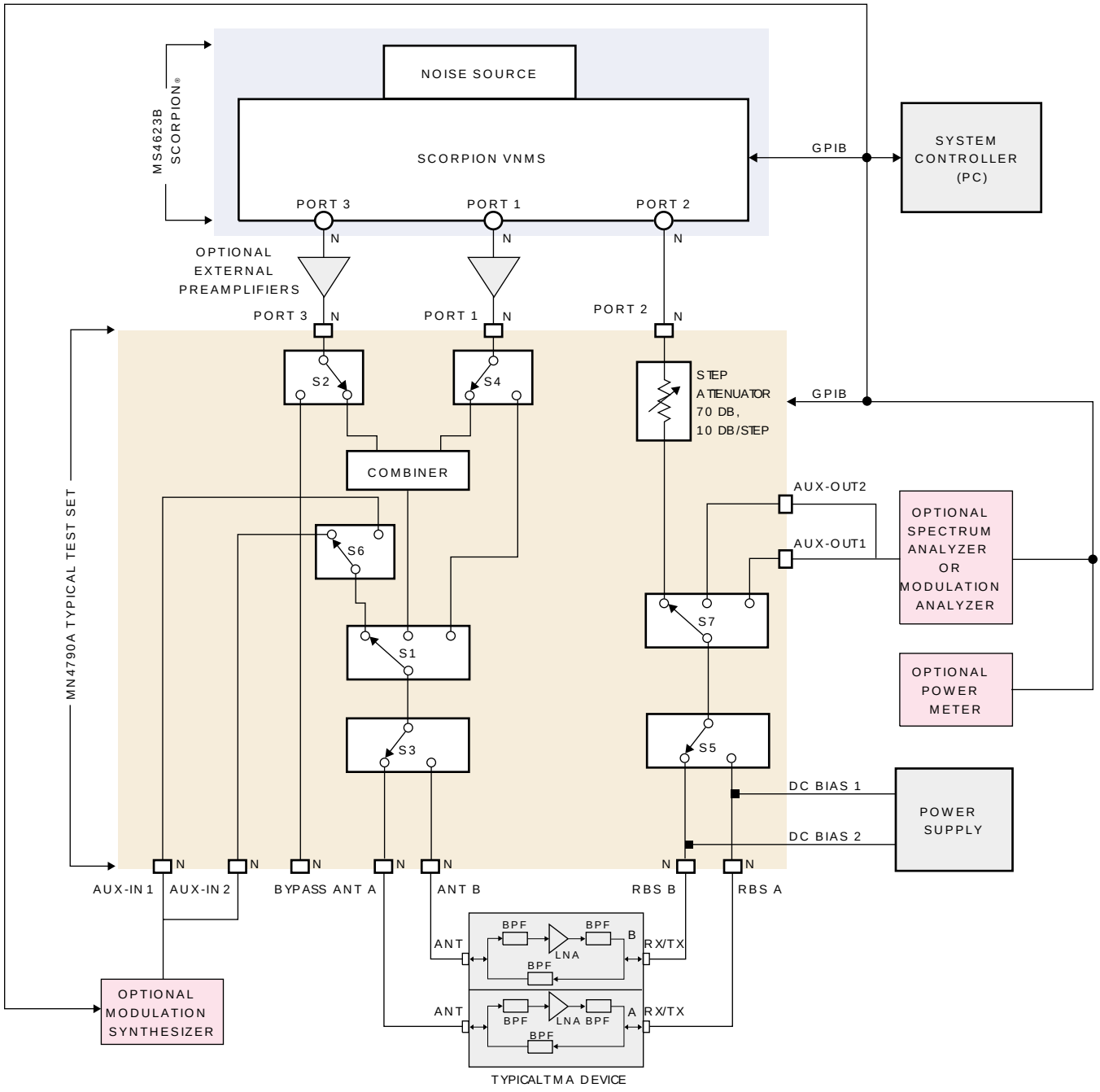


Figure 1-2. *Basic Functional Block Diagram of the Tower Mounted Amplifier Test System (TMATS) with the MN4790A Test Set*

1-8 RECOMMENDED TEST EQUIPMENT

Table 1-1 lists the recommended test equipment to be used for all maintenance activities for the MN4790A models. Note the "Use" codes listed in the right hand column of the table. These codes list the applicable maintenance activities for the equipment listed.

Table 1-1. *Recommended Test Equipment*

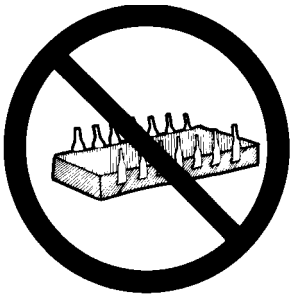
INSTRUMENT	CRITICAL SPECIFICATION	RECOMMENDED MANUFACTURER/MODEL	USE*
Power Meter		Anritsu ML2437A or ML2438A	P
Power Sensor		Anritsu MA2472A	P
GPIB Cable	IEEE 488.2 compliant	Anritsu 2100-2, or equivalent	P
Air Line		Anritsu 18N50 or SC3833	P
Short		Anritsu 22A50	P
Offset Termination	20 dB Return Loss	Anritsu 29A50-20	P
Thru Line	Return Loss 35 dB, DC to 3 GHz	Anritsu 3670NN50-2 or 15NN50-0.6B	P, T
Calibration Kit		Anritsu 3753R or 3753LF	P, T
Personal Computer	Windows 98/2000/XP	Any	P, T
GPIB Interface	IEEE 488.2	National Instruments PCI-GPIB (Desktop) National Instruments PCMCIA-GPIB (Notebook)	P

* USE CODES:
- A Adjustment / Internal Hardware Calibration
- O Operational Testing
- P Performance Verification
- T Troubleshooting

1-9 STATIC SENSITIVE COMPONENT HANDLING PROCEDURES

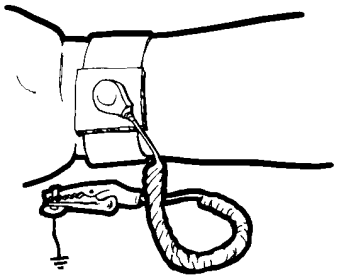
The MN4790A test set contains components that can be damaged by static electricity. Figure 1-3, on the following page, illustrates the precautions that should be followed when handling static-sensitive subassemblies and components. If followed, these precautions will minimize the possibilities of static-shock damage to these items.

1. Do not touch exposed contacts on any static sensitive component.



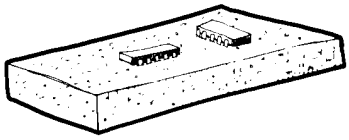
2. Do not slide static sensitive component across any surface.

3. Do not handle static sensitive components in areas where the floor or work surface covering is capable of generating a static charge.

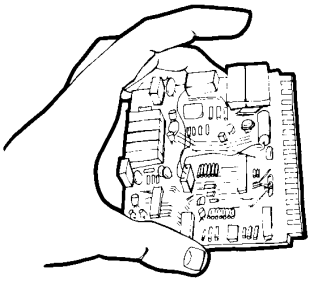


4. Wear a static-discharge wristband when working with static sensitive components.

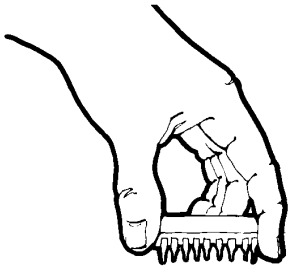
5. Label all static sensitive devices.



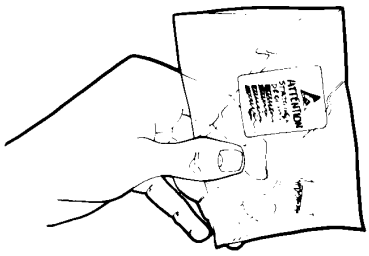
6. Keep component leads shorted together whenever possible.



7. Handle PCBs only by their edges. Do not handle by the edge connectors.



8. Lift & handle solid state devices by their bodies – never by their leads.



9. Transport and store PCBs and other static sensitive devices in static-shielded containers.

10. ADDITIONAL PRECAUTIONS:

- Keep work spaces clean and free of any objects capable of holding or storing a static charge.
- Connect soldering tools to an earth ground.
- Use only special anti-static suction or wick-type desoldering tools.

Figure 1-3. *Static Sensitive Component Handling Procedures*

1-10 SERVICE CENTERS

Anritsu offers a full range of repair and calibration services at fully staffed and equipped service centers throughout the world. Table 1-2 lists all of the Anritsu services centers.

Table 1-2. *Anritsu Service Centers*

UNITED STATES

ANRITSU COMPANY
490 Jarvis Drive
Morgan Hill, CA 95037-2809
Telephone: (408) 776-8300
1-800-ANRITSU
FAX: 408-776-1744

ANRITSU COMPANY
10 New Maple Ave., Unit 305
Pine Brook, NJ 07058
Telephone: (973) 227-8999
1-800-ANRITSU
FAX: 973-575-0092

ANRITSU COMPANY
1155 E. Collins Blvd
Richardson, TX 75081
Telephone: 1-800-ANRITSU
FAX: 972-671-1877

AUSTRALIA

ANRITSU PTY. LTD.
Unit 3, 170 Foster Road
Mt Waverley, VIC 3149
Australia
Telephone: 03-9558-8177
FAX: 03-9558-8255

BRAZIL

ANRITSU ELECTRONICA LTDA.
Praia de Botafogo, 440, Sala 2401
CEP22250-040, Rio de Janeiro, RJ, Brasil
Telephone: 021-527-6922
FAX: 021-53-71-456

FRANCE

ANRITSU S.A
9 Avenue du Quebec
Zone de Courtaboeuf
91951 Les Ulis Cedex
Telephone: 016-09-21-550
FAX: 016-44-61-065

GERMANY

ANRITSU GmbH
Grafenberger Allee 54-56
D-40237 Dusseldorf, Germany
Telephone: 0211-968550
FAX: 0211-9685555

INDIA

MEERA AGENCIES PVT. LTD.
23 Community Centre
Zamroodpur, Kailash Colony Extension,
New Delhi, India 110 048
Phone: 011-2-6442700/6442800
FAX : 011-2-644250023

ISRAEL

TECH-CENT, LTD.
4 Raul Valenberg St
Tel-Aviv 69719
Telephone: (03) 64-78-563
FAX: (03) 64-78-334

ITALY

ANRITSU Sp.A
Roma Office
Via E. Vittorini, 129
00144 Roma EUR
Telephone: (06) 50-99-711
FAX: (06) 50-22-4252

JAPAN

ANRITSU CUSTOMER SERVICE LTD.
1800 Onna Atsugi-shi
Kanagawa-Prf. 243 Japan
Telephone: 0462-96-6688
FAX: 0462-25-8379

SINGAPORE

ANRITSU (SINGAPORE) PTE LTD.
10, Hoe Chiang Road
#07-01/02 Keppel Towers
Singapore 089315
Telephone: 282-2400
FAX: 282-2533

SOUTH AFRICA

ETECSA
12 Surrey Square Office Park
330 Surrey Avenue
Ferndale, Randburt, 2194
South Africa
Telephone: 011-27-11-787-7200
FAX: 011-27-11-787-0446

SWEDEN

ANRITSU AB
Botivid Center
Fittja Backe 13A
145 84 Stockholmn
Telephone: (08) 534-707-00
FAX: (08) 534-707-30

TAIWAN

ANRITSU CO., INC.
7F, No. 316, Section 1
NeiHu Road
Taipei, Taiwan, R.O.C.
Telephone: 886-2-8751-1816
FAX: 886-2-8751-2126

Chapter 2
Replaceable Parts

2-1 INTRODUCTION

This chapter provides replaceable parts information for the model MN4790A test set. The major replaceable test set assemblies and parts are listed in Table 2-1, following page. The locations of these assemblies/parts are shown in Figure 2-1 on page 2-3.

2-2 EXCHANGE ASSEMBLY PROGRAM

Anritsu maintains a module exchange program for selected subassemblies. If a malfunction occurs in one of these subassemblies, the defective item can be exchanged. Upon receiving your request, Anritsu will ship the exchange subassembly to you, typically within 24 hours. You then have 45 days in which to return the defective item. All exchange subassemblies or RF assemblies are warranted for 90 days from the date of shipment, or for the balance of the original equipment warranty, whichever is longer.

NOTE

Please have the exact model number and serial number of your unit available when requesting this service, as the information about your unit is filed according to the instrument's model and serial number. For more information about the program, contact your local sales representative or call Anritsu Customer Service direct (refer to Section 2-4).

2-3 REPLACEABLE SUBASSEMBLIES AND PARTS

Table 2-1 lists the major replaceable subassemblies and parts for the MN4790A. These assemblies and parts are presently covered by the Anritsu exchange assembly program.

Table 2-1. *Replaceable Subassemblies*

Part Number	Description	Location (Figure 2-1)
1020-46	SP3T Switch	S1 and S7
1020-47	SPDT Switch	S2 to S6
1091-346	Combiner	A2
2000-989	GPIB Interface Assembly	A1
40-159	Power Supply	A6
SC6737	Bias Tee Assembly	A4 and A5
ND60327	Fan Assembly	FAN
43045-3	Control PCB Assembly	A7
339H40998A	Step Attenuator	A3
B45259	N Type Test Port Connector	N-Connectors

2-4 PARTS ORDERING INFORMATION

All parts listed in Table 2-1 may be ordered from your local Anritsu service center (Table 1-2, page 1-8). Or, they may be ordered directly from the factory at the following address:

Anritsu Company
ATTN: Customer Service
490 Jarvis Drive
Morgan Hill, CA 95037-2809

Telephone: (408)-778-2000
FAX: (408)-778-0239

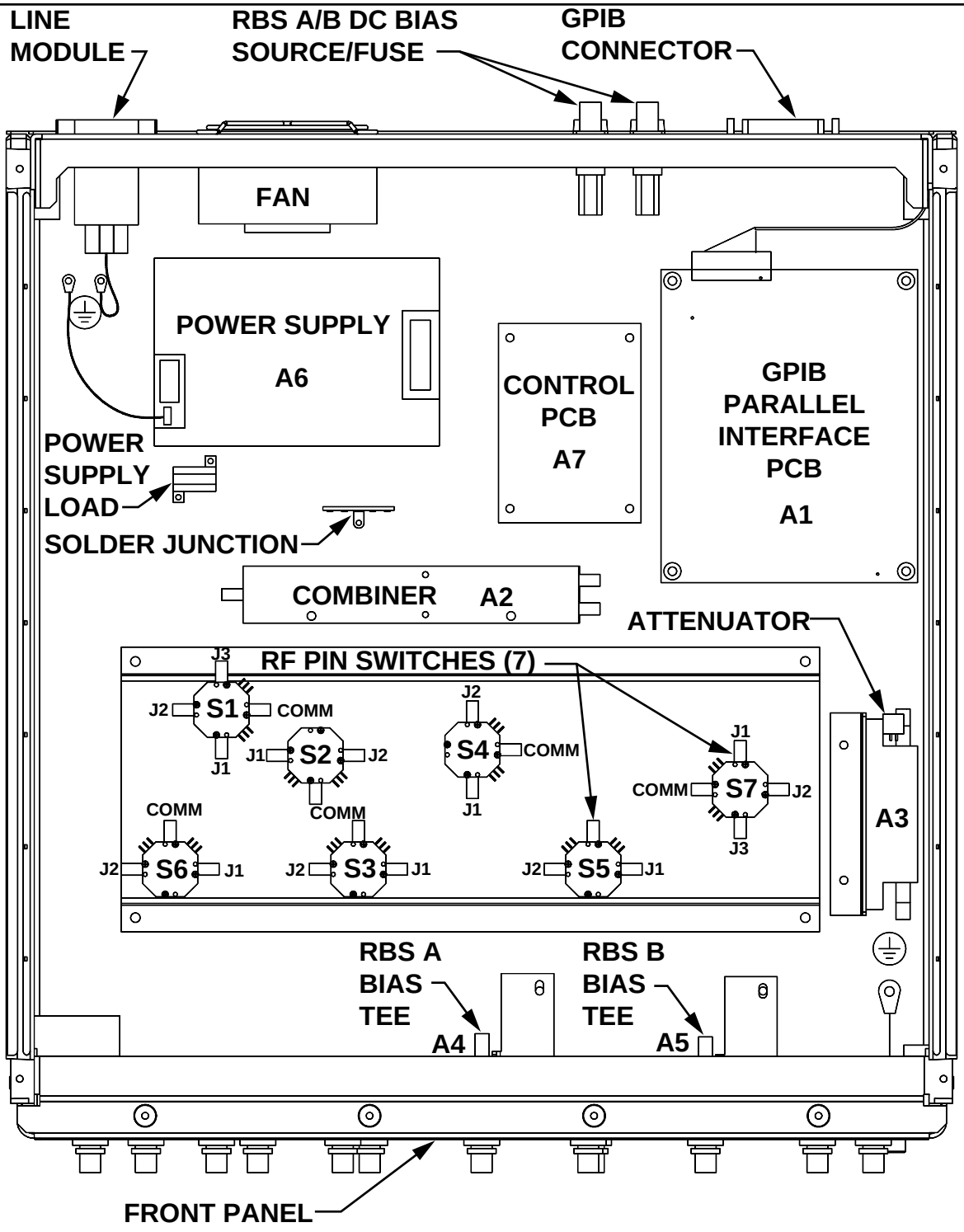


Figure 2-1. *MN4790A Major Assemblies Location Diagram (Top View)*

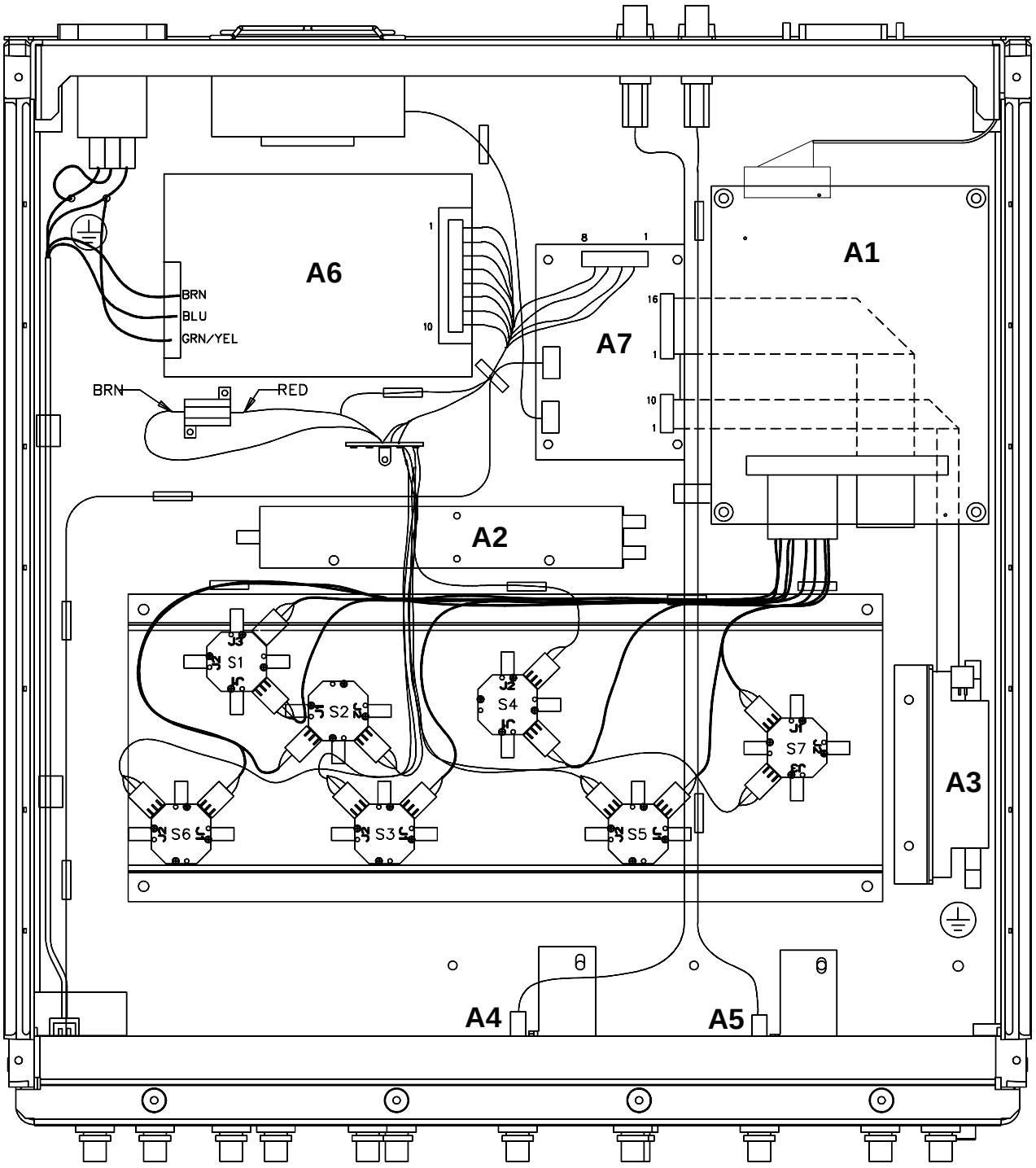


Figure 2-2. *MN4790A Wiring Diagram (Top View)*

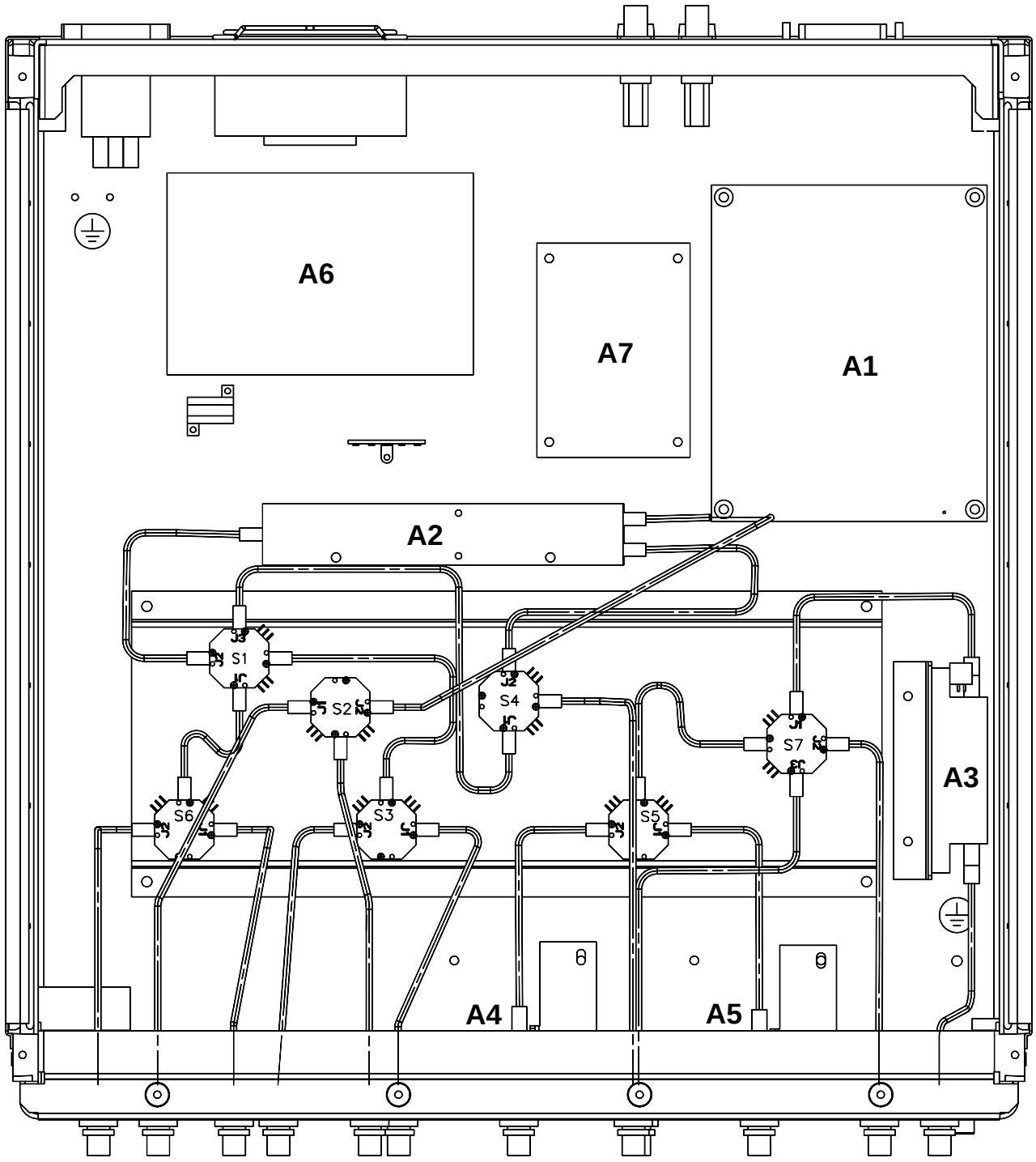


Figure 2-3. *MN4790A RF Cabling Diagram (Top View)*

Chapter 3
Performance Verification Procedure

3-1 INTRODUCTION

This chapter provides test procedures to verify the performance of the Tower Mounted Amplifier Test System. The following tests should be used to verify the performance of the equipment:

- MS4623B VNMS Performance Verification
- ME7842B (MS4623B and MN4790A) TMATS Performance Verification

3-2 CONVENTIONS

The test instructions in this chapter will direct the use of the front panel hard-keys and soft-keys of the MS4623B. These hard-keys and soft-keys are distinguished by a different typeface. For example:

Step 1. Press the Utility key and select:

DIAGNOSTICS
TROUBLESHOOTING
MORE
VERIFY ALC CALIBRATION

The Utility key is a front panel hard-key and the DIAGNOSTICS, TROUBLESHOOTING, MORE, and VERIFY ALC CALIBRATION keys are all soft-keys.

3-3 PRELIMINARY

The following information describes the preliminary setup and indicates the general tests that verify the performance of your test system. It is important to first verify the performance of the MS4623B separate from TMATS.

MS4623B VNMS

Prior to performing any of the MS4623B performance verification tests, disconnect the RF cables linked between the front panels of the MS4623B and the MN4790A test set.

Follow the procedures in Chapter 2 of the *MS462XX Vector Network Measurement Systems Maintenance Manual* (part number 10410-00205) to verify that the MS4623B is working properly.

ME7842B TMATS

Prior to performing any of the ME7842B TMATS performance verification tests:

- Install the Scorpion Navigator Software on the PC controller
- Connect the RF cables between the MS4623B and the MN4790A test set.

The ME7842B Performance Verification includes the following tests:

- Directivity and Test Port Match Verification
- Dynamic Range Verification
- IMD Measurement Operational Checkout

Required Equipment

The following equipment list is required for all test set verification tests in this chapter:

- Anritsu MS4623B Vector Network Measurement System
- Anritsu 15NN50-0.6B or 3670NN50-2 Test Port Cable
- Personal Computer with a Windows Operating System, Scorpion Navigator, and a National Instruments GPIB Interface Installed

The following is an addition requirement for the dynamic range verification:

- Anritsu 3753LF or 3753R N Connector Calibration Kit

The following are additional requirements for the directivity and test port match verifications:

- Anritsu 3753LF or 3753R N Connector Calibration Kit
- Anritsu 18N50 or SC3833 Air Line
- Anritsu 29A50-20 Offset Termination (2)
- Anritsu 22A50 Open/Short

Preliminary Setup

Turn on the MS4623B and the MN4790A test set and allow them to warm up for 30 minutes.

Step 1. Connect a GPIB cable between the IEEE488.2 port of the MS4623B and the GPIB port of the MN4790A test set.

Step 2. Connect a GPIB cable between the IEEE488.2 port of the MS4623B and the GPIB interface of the PC controller.

Step 3. On the PC, open the Windows Explorer program and locate the executable 'MN4790A.exe' in the 'C:\Program Files\Navigator' folder, as shown in Figure 3-1.

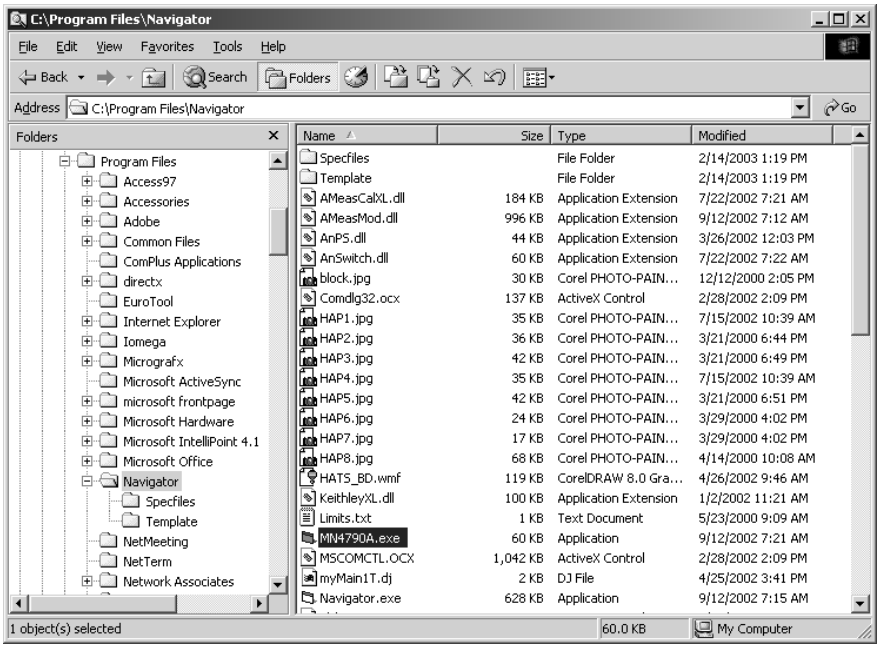
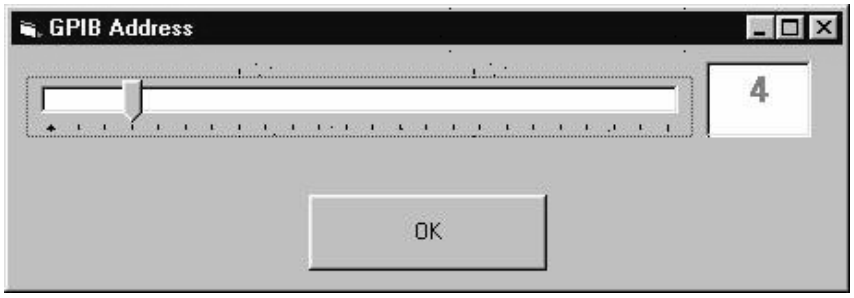


Figure 3-1. *Starting the MN4790A*

Step 4. Move the mouse pointer to highlight MN4790A.exe and double click to open the program. A GPIB configuration window, below, will be displayed.



Step 5. If the GPIB address of the MN4790A test set is four, then click the OK button. If not, move the slide to select a GPIB address that matches the GPIB address of the MN4790A test set, then click the OK button.

NOTE

The GPIB address of the MN4790A test set is configured via the dip switch jumper block located above the GPIB

port connector on the rear panel. Figure 3-2 shows the dip switch setting for a GPIB address of four.

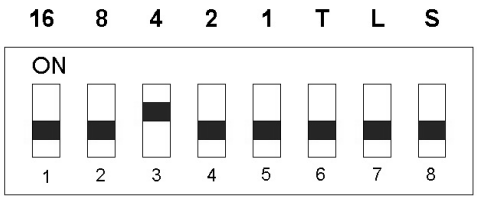
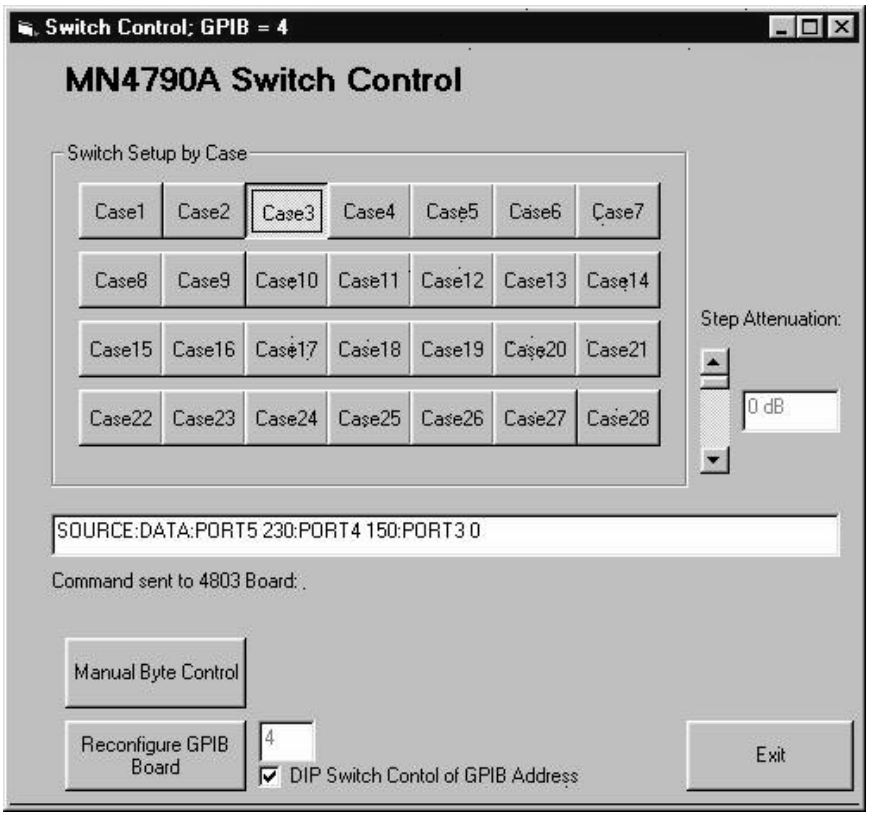


Figure 3-2. *GPIB Dip Switch Block for the MN4790A*

After selecting the GPIB address, the MN4790A Switch Control window, below, will be displayed.



Step 6. This window allows you to select different switched signal paths by using pre-defined cases. Refer to Table A-1 in the ME7842B operation manual for definitions of the switched signal path for each case.

NOTE

The scroll bar under the Step Attenuation reference allows you to change the step attenuator in 10 dB increments.

3-4 DIRECTIVITY AND TEST PORT MATCH

This procedure verifies the corrected directivity and test port match of the:

- ANT A Port
- RBS A Port
- ANT B Port
- RBS B Port

Test Procedure

Step 1. Follow the preliminary setup procedures on pages 3-2 through 3-4.

Step 2. Click on the Case3 button in MN4790A Switch Control window. This will configure the switches in the MN4790A test set to allow the signals to go through the following paths:

- Test Port 1 to the ANT A Port (bypassing the internal combiner)
- Test Port 2 to the RBS A Port
- Test Port 3 to the Bypass Port

Step 3. On the MS4623B, press the Default key, then the 0 key to reset the instrument.

Step 4. Insert the Calibration Component Coefficients diskette into the floppy drive of the MS4623B.

Step 5. Press the Cal key and select:

MORE
COMPONENT UTILITIES
INSTALL KIT INFO FROM FLOPPY DISK

Step 6. Allow the instrument to completely load the data, then select:

RETURN
PERFORM CAL 2 PORT
NEXT CAL STEP
REFLECTION ONLY
BOTH PORTS (S11, S22)
NORMAL (1601 POINTS MAXIMUM)
DATA POINTS
801 MAX PTS
NEXT CAL STEP

Step 7. Verify that the PORT 1 CONN and PORT 2 CONN are TYPE N (F), (If not, press the PORT 1 CONN or PORT 2 CONN soft-key to change the connector type.) then select:

START CAL

Step 8. When prompted by the MS4623B, connect the associated calibration components from the calibration kit to the ANT A port for Test Port 1 and to the RBS A port for Test Port 2. Select MEASURE BOTH PORTS to continue.

Step 9. After the calibration is complete, press the Enter key to continue.

Step 10. Press the Display key and select:

DISPLAY MODE
SINGLE CHANNEL
RETURN
GRAPH TYPE
LOG MAGNITUDE

Step 11. Connect the N male connector end of the air line to the ANT A port and terminate the GPC-7 end of the air line with the short.

Step 12. Press the Display key and select AUTO SCALE.

Step 13. Press the Marker key and select READOUT MARKERS.

Step 14. Turn on Marker 1, Marker 2, and Marker 3.

Step 15. Using the rotary knob, position Marker 1 and Marker 2 to adjacent peaks of the ripple with the greatest negative trough (or to adjacent troughs if the ripple has the greatest positive peak).

Step 16. Position Marker 3 to the bottom of the trough (or to the top of the peak if the ripple has the greatest positive peak). Refer to Figure 3-3, below.

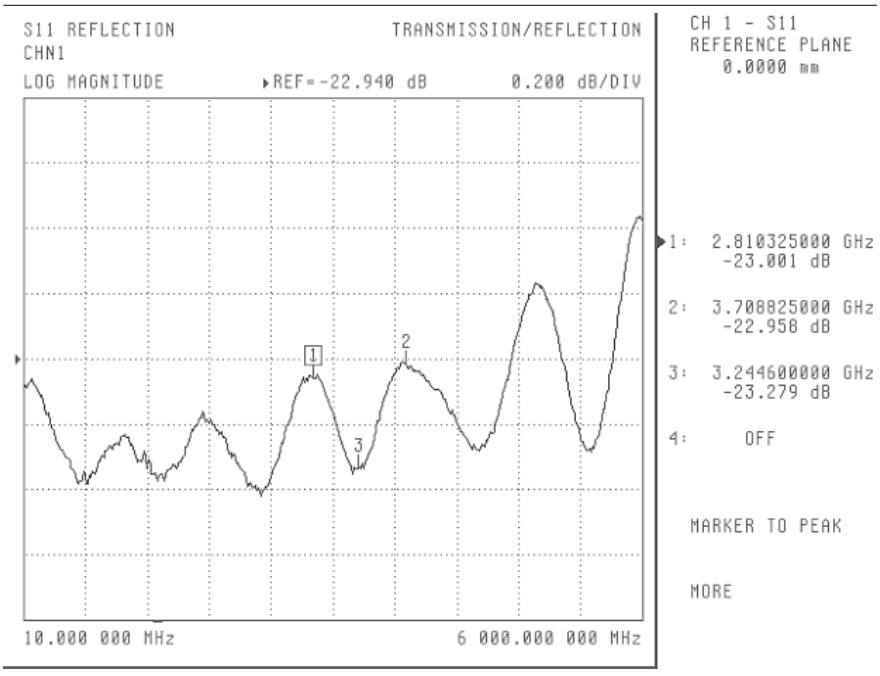


Figure 3-3. *Log Magnitude Display Plot*

Step 17. Sum the values of the two markers (Marker 1 and Marker 2) at the peaks (or troughs) and divide the result by two. This is the average value of the two peaks (or troughs). Refer to the example formula below:

$$AverageValue = \frac{M1 + M2}{2} = \frac{(-23.001) + (-22.958)}{2} = -22.980$$

Record this average value.

Step 18. Record the Marker 3 value.

Step 19. Find the absolute difference of the values recorded in Steps 17 and 18 as follows:

$$|M3| - |AverageValue| = 23.279 - 22.980 = 0.299$$

This is the peak-to-peak ripple value. Use an RF measurement chart (page 3-10) to find the corresponding return loss value. This is the measured effective test port match. Verify that the test port match is better than 35 dB.

Step 20. Remove the short and connect the 29A50-20 offset termination to the GPC-7 end of the air line.

Step 21. Press the Display key and select AUTO SCALE.

Step 22. Find the largest ripple between 10 MHz and 3 GHz.

Step 23. Repeat Steps 15 through 19.

Step 24. Find the corresponding *1 + X* or *1 – X* value from the RF measurement chart. Use the following formula to calculate the effective directivity value:

For ripple with a negative trough:

Effective Directivity =
Return Loss value + |(Marker 3 value)| - |(1 - X value)|

For ripple with a positive peak:

Effective Directivity =
Return Loss value + |(Marker 3 value)| + |(1 + X value)|

Step 25. Verify that the directivity is better than 40 dB from 10 MHz to 3 GHz.

Step 26. Find the largest ripple between 3 GHz and 6 GHz.

Step 27. Repeat Steps 23 through 24 and verify that the effective directivity is better than 35 dB from 3 GHz to 6 GHz.

Step 28. Press the Ch 4 key, then the Display key.

Step 29. Select:

GRAPH TYPE
LOG MAGNITUDE
RETURN

Step 30. Remove the air line from the ANT A port and connect it to the RBS A port. Terminate the GPC-7 end of the air line with the short.

Step 31. Repeat Steps 14 through 27.

Step 32. On the PC, click the Case4 button on the MN4790A Switch Control window. This will configure the switches in the MN4790A test set to allow signals to go through the following paths:

- Test Port 1 to the ANT B Port (Bypassing the internal combiner)
- Test Port 2 to the RBS B Port
- Test Port 3 to the Bypass Port

Step 33. On the MS4623B, press the Cal key and select REPEAT PREVIOUS CAL.

Step 34. When prompted by the MS4623B, connect the associated calibration components from the calibration kit to the ANT B port for Test Port 1 and to the RBS B port for Test Port 2. Select MEASURE BOTH PORTS to continue.

Step 35. After the calibration is complete, press the Enter key to continue.

Step 36. Press the Ch 1 key.

Step 37. Connect the N male connector end of the air line to the ANT B port and terminate the GPC-7 end of the air line with the short.

Step 38. Repeat Steps 12 through 31.

Step 39. Press the Ch 4 key.

Step 40. Remove the air line from the ANT B port and connect it to the RBS B port. Terminate the GPC-7 end of the air line with the short.

Step 41. Repeat Steps 12 through 31.

Table 3-1, below, shows the test port match and directivity specifications. Table 3-2, following page, shows the RF measurement chart.

Table 3-1. *Test Port Match and Directivity Specifications*

	Specifications	ANT A	RBS A	ANT B	RBS B
Test Port Match 10 MHz to 6 GHz	35 dB				
Directivity 10 MHz to 3 GHz	40 dB				
Directivity 3 GHz to 6 GHz	35 dB				

Table 3-2. *RF Measurement Chart*

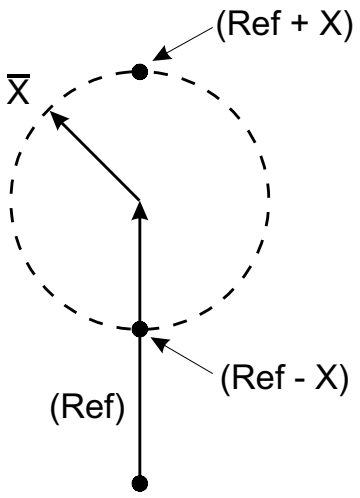
The first three columns are conversion tables for return loss, reflection coefficient, and SWR.

The last four columns are values for interactions of a small phasor X with a large phasor (unity reference) expressed in dB related to the reference.

The RF Measurement Chart can be used to determine the uncertainty due to bridge/autotester VNA directivity. The "X dB Below Reference" column represents the difference between the directivity and the measured reflection (return loss). The "Ref + X dB" and "Ref – X dB" values are 360°. Therefore, the peak-to-peak ripple (1 ± X) is the total measurement uncertainty caused by the error signal.

For example, if a 30 dB return loss is measured with a 40 dB directivity autotester, the X dB Below Reference value is 10 dB. The Ref + X dB value is 2.3866 dB and the Ref – X dB value is 3.3018 dB.

The actual return loss is between 27.6134 dB (– 30 + 2.3866) and 33.3018 dB (– 30 – 3.3018). The peak-to-peak ripple on a swept measurement will be 5.6884 dB. If the error and directivity signals are equal, the Ref + X dB value equals 6 dB (voltage doubling causes a 6 dB change) and the Ref – X dB value becomes infinite, since the two signals are equal in amplitude and 180° out of phase (zero voltage).



Phasor Interaction

SWR	Reflection Coefficient	Return Loss (dB)	Relative to Unity Reference			
			X dB Below Reference	Ref + X (dB)	Ref - X (dB)	Ref ± X Pk to Pk Ripple (dB)
17.3910	0.8913	1	1	5.5350	-19.2715	24.8065
8.7242	0.7943	2	2	5.0780	-13.7365	18.8145
5.8480	0.7079	3	3	4.6495	-10.6907	15.3402
4.4194	0.6310	4	4	4.2489	-8.6585	12.9073
3.5698	0.5623	5	5	3.8755	-7.1773	11.0528
3.0095	0.5012	6	6	3.5287	-6.0412	9.5699
2.6146	0.4467	7	7	3.2075	-5.1405	8.3480
2.3229	0.3981	8	8	2.9108	-4.4096	7.3204
2.0999	0.3548	9	9	2.6376	-3.8063	6.4439
1.9250	0.3162	10	10	2.3866	-3.3018	5.6884
1.7849	0.2818	11	11	2.1567	-2.8756	5.0322
1.6709	0.2512	12	12	1.9465	-2.5126	4.4590
1.5769	0.2239	13	13	1.7547	-2.2013	3.9561
1.4985	0.1995	14	14	1.5802	-1.9331	3.5133
1.4326	0.1778	15	15	1.4216	-1.7007	3.1224
1.3767	0.1585	16	16	1.2778	-1.4988	2.7766
1.3290	0.1413	17	17	1.1476	-1.3227	2.4703
1.2880	0.1259	18	18	1.0299	-1.1687	2.1986
1.2528	0.1122	19	19	0.9237	-1.0337	1.9574
1.2222	0.1000	20	20	0.8279	-0.9151	1.7430
1.1957	0.0891	21	21	0.7416	-0.8108	1.5524
1.1726	0.0794	22	22	0.6639	-0.7189	1.3828
1.1524	0.0708	23	23	0.5941	-0.6378	1.2319
1.1347	0.0631	24	24	0.5314	-0.5661	1.0975
1.1192	0.0562	25	25	0.4752	-0.5027	0.9779
1.1055	0.0501	26	26	0.4248	-0.4466	0.8714
1.0935	0.0447	27	27	0.3796	-0.3969	0.7765
1.0829	0.0398	28	28	0.3391	-0.3529	0.6919
1.0736	0.0355	29	29	0.3028	-0.3138	0.6166
1.0653	0.0316	30	30	0.2704	-0.2791	0.5495
1.0580	0.0282	31	31	0.2414	-0.2483	0.4897
1.0515	0.0251	32	32	0.2155	-0.2210	0.4365
1.0458	0.0224	33	33	0.1923	-0.1967	0.3890
1.0407	0.0200	34	34	0.1716	-0.1751	0.3467
1.0362	0.0178	35	35	0.1531	-0.1558	0.3090
1.0322	0.0158	36	36	0.1366	-0.1388	0.2753
1.0287	0.0141	37	37	0.1218	-0.1236	0.2454
1.0255	0.0126	38	38	0.1087	-0.1100	0.2187
1.0227	0.0112	39	39	0.0969	-0.0980	0.1949
1.0202	0.0100	40	40	0.0864	-0.0873	0.1737
1.0180	0.0089	41	41	0.0771	-0.0778	0.1548
1.0160	0.0079	42	42	0.0687	-0.0693	0.1380
1.0143	0.0071	43	43	0.0613	-0.0617	0.1230
1.0127	0.0063	44	44	0.0546	-0.0550	0.1096
1.0113	0.0056	45	45	0.0487	-0.0490	0.0977
1.0101	0.0050	46	46	0.0434	-0.0436	0.0871
1.0090	0.0045	47	47	0.0387	-0.0389	0.0776
1.0080	0.0040	48	48	0.0345	-0.0346	0.0692
1.0071	0.0035	49	49	0.0308	-0.0309	0.0616
1.0063	0.0032	50	50	0.0274	-0.0275	0.0549
1.0057	0.0028	51	51	0.0244	-0.0245	0.0490
1.0050	0.0025	52	52	0.0218	-0.0218	0.0436
1.0045	0.0022	53	53	0.0194	-0.0195	0.0389
1.0040	0.0020	54	54	0.0173	-0.0173	0.0347
1.0036	0.0018	55	55	0.0154	-0.0155	0.0309
1.0032	0.0016	56	56	0.0138	-0.0138	0.0275
1.0028	0.0014	57	57	0.0123	-0.0123	0.0245
1.0025	0.0013	58	58	0.0109	-0.0109	0.0219
1.0022	0.0011	59	59	0.0097	-0.0098	0.0195
1.0020	0.0010	60	60	0.0087	-0.0087	0.0174

3-5 DYNAMIC RANGE

This procedure verifies the dynamic range of the:

- ANT A Port to the RBS A Port
- ANT B Port to the RBS B Port
- Bypass Port to the RBS B Port

Test Procedure

Step 1. Follow the preliminary setup procedures on pages 3-2 through 3-4.

Step 2. Click on the Case3 button in MN4790A Switch Control window. This will configure the switches in the MN4790A test set to allow the signals to go through the following paths:

- Test Port 1 to the ANT A Port (bypassing the internal combiner)
- Test Port 2 to the RBS A Port
- Test Port 3 to the Bypass Port

Step 3. On the MS4623B, press the Default key, then the 0 key to reset the instrument.

Step 4. Press the Ch 3 key, then the Display key.

Step 5. Select:

DISPLAY MODE
SINGLE CHANNEL
RETURN
GRAPH TYPE
LOG MAGNITUDE

Step 6. Press the Avg key and select:

SELECT I.F. BANDWIDTH
I.F. BW 10 Hz

Step 7. Connect a test port cable between the ANT A port and the RBS A port. Wait until one sweep has completed.

Step 8. Press the Display key and select:

TRACE MEMORY
STORE DATA TO MEMORY
VIEW DATA (/) MEMORY
RETURN
SCALE

Step 9. Change the REFERENCE VALUE to -80 dB.

Step 10. Disconnect the cable from the ANT A port.

Step 11. Connect the offset terminations to the ANT A port and to the open end of the cable.

Step 12. Verify that the displayed trace is below -75 dB from 10 MHz to 50 MHz and below -80 dB from 50 MHz to 6 GHz.

Step 13. On the PC, click the Case4 button in the MN4790A Switch Control window. This will configure the switches in the MN4790A test set to allow the signals to go through the following paths:

- Test Port 1 to the ANT B Port (bypassing the internal combiner)
- Test Port 2 to the RBS B Port
- Test Port 3 to the Bypass Port

Step 14. Connect the test port cable between the ANT B port and the RBS B port. Wait until one sweep has completed.

Step 15. On the MS4623B, press the Display key and select:

TRACE MEMORY
STORE DATA TO MEMORY
VIEW DATA (/) MEMORY

Step 16. Disconnect the cable from the ANT B port.

Step 17. Connect the offset terminations to the ANT B port and to the open end of the cable.

Step 18. Verify that the displayed trace is below -75 dB from 10 MHz to 50 MHz and below -80 dB from 50 MHz to 6 GHz.

Step 19. Press the Meas key and select:

MORE
S23, TRANS b1/a3

Step 20. Disconnect the terminations from the ANT B port and from the open end of the cable. Connect the open end of the cable to the Bypass port. Wait until one sweep has completed.

Step 21. Press the Display key and select:

TRACE MEMORY
STORE DATA TO MEMORY
VIEW DATA (/) MEMORY

Step 22. Disconnect the cable from the Bypass port.

Step 23. Connect the offset termination to the Bypass port and to the open end of the cable.

Step 24. Verify that the displayed trace is below -80 dB.

Table 3-3. *Dynamic Range Test Specifications*

Dynamic Range Between Ports	Specification	Measured
ANT A and RBS A 10 MHz to 50 MHz 50 MHz to 6 GHz	 75 dB 80 dB	
ANT B and RBS B 10 MHz to 50 MHz 50 MHz to 6 GHz	 75 dB 80 dB	
Bypass and RBS B 10 MHz to 6 GHz	 80 dB	

3-6 IMD MEASUREMENT

This procedure verifies that the IMD measurement signal path is operational.

Test procedure

Step 1. Follow the preliminary setup procedures on pages 3-2 through 3-4.

Step 2. Click on the Case1 button in the MN4790A Switch Control window. This will configure the switches in the MN4790A test set to allow the signals to go through the following paths:

- Test Port 1 to the ANT A Port (through the combiner)
- Test Port 3 to the ANT A Port (through the combiner)
- Test Port 2 to the RBS A Port

Step 3. On the MS4623B, press the Default key, then the 0 key to reset the instrument.

Step 4. Press the Appl key and select:

CHANGE APPLICATION SETUP
MEASUREMENT TYPE
IMD

Step 5. Press the Display key and select:

DISPLAY MODE
SINGLE CHANNEL
RETURN
GRAPH TYPE
LOG MAGNITUDE

Step 6. Connect a test port cable between the ANT A port and the RBS A port.

Step 7. Press the Appl key and select:

SWEEP MODE: CW RCVR
DISPLAY SELECTION: PRODUCT
RETURN
TONE 2 OFFSET: 301 kHz

Step 8. Press the Freq key and select:

CW MODE ON

Step 9. Change the CW frequency to 869 MHz.

Step 10. Press the Display key and select:

AUTO SCALE

Step 11. Press the Avg key and select:

SELECT I.F. BANDWIDTH
I.F. BW 10 Hz

Step 12. Press the Marker key and select:

READOUT MARKERS

Step 13. Select the soft-key next to the 1:, 2:, 3:, and 4: markings to turn on these markers. Use the rotary knob to move:

- Marker 1 to the peak of Tone 1
- Marker 2 to the peak of Tone 2
- Marker 3 to the peak left of Tone 1
- Marker 4 to the peak right of Tone 2

Step 14. Select the soft-key next to the 1: marking so that Marker 1 is now the active marker (distinguished by a square surrounding the marker number). See Figure 3-4.

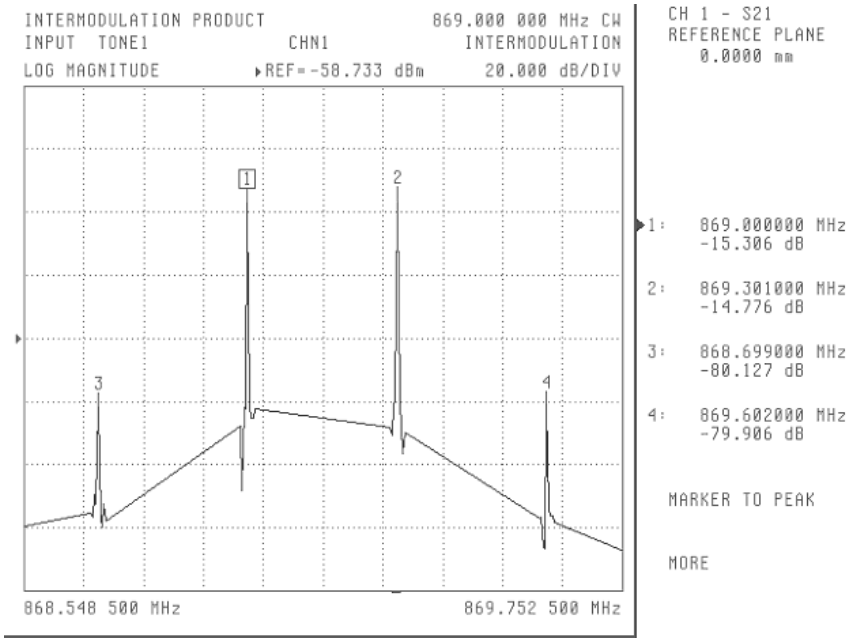


Figure 3-4. *Log Magnitude Display Plot*

Step 15. Press the Marker key and select:

ΔREF MODE: ON
READOUT MARKERS

Step 16. Verify that the (1-2) reading is less than 2 dB and that the (1-3) and (1-4) readings are less than 60 dB (see Figure 3-5).

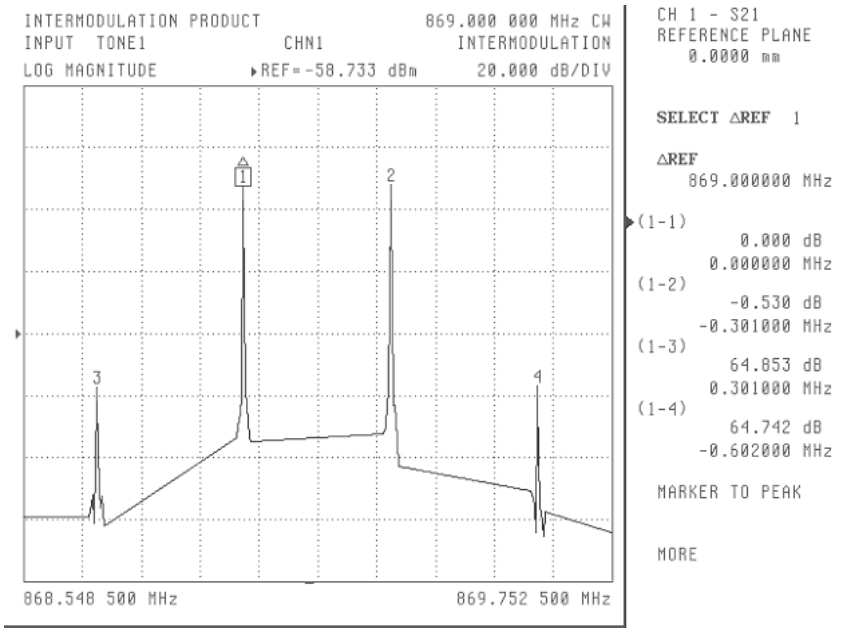


Figure 3-5. *Log Magnitude Display Plot*

Chapter 4
Troubleshooting

4-1 INTRODUCTION

The tests in this section provide a method of testing the MN4790A test set for proper operation. These tests are intended to be used as troubleshooting tools for checking the operational functionality of the components in the MN4790A.

4-2 OPERATIONAL CHECK

Operational tests for the MN4790A consists of the following:

- Internal Signal Path Insertion Loss Check
- Test Channel Step Attenuator Check

NOTE

Prior to performing these tests, the MS4623B must be verified to be in good condition. Follow the procedures in Chapter 2 of the *MS462XX Vector Network Measurement Systems Maintenance Manual* (part number 10410-00205) to verify that the MS4623B is working properly.

Required Equipment

- Anritsu MS4623B Vector Network Measurement System
- Anritsu 3753R or 3753LF N Connector Type Calibration Kit
- Anritsu 33NN50B (from 3753R/1) or 34NN50A Adapter
- Anritsu 3670NN50-2 Through Cable or Equivalent
- Anritsu 3670N50-2 Through Cable or Equivalent
- Anritsu 2100-2 GPIB Interface Cable
- Personal Computer with a Windows Operating System, Scorpion Navigator, and a National Instruments GPIB Interface Installed

4-3 INTERNAL SIGNAL PATH INSERTION LOSS CHECK

This test checks the insertion loss of various switched signal paths. If the measured insertion loss is improperly high, then a RF component in that signal path may be defective.

Test Setup

Step 1. Follow the preliminary setup procedures on pages 3-2 through 3-4.

Step 2. On the MS4623B, connect a through cable to Port 1 and a second through cable to Port 2.

Step 3. Perform a Forward Path Transmission Frequency Response calibration from 10 MHz to 6 GHz with 401 data points.

Step 4. Set up the MS4623B display to:

SINGLE CHANNEL
S21
LOG MAGNITUDE

Test Procedure This test procedure is illustrated in Table 4-1.

Step 1. For each test sequence, click on the appropriate "Case" button in the Switch Control window

Step 2. Connect the through cables to the appropriate ports of the test system and measure the insertion loss of the pre-set signal path per Table 4-1.

Table 4-1. *Internal Signal Path Insertion Loss Test Sequences*

Test Sequence	Case Button	Connect Port 1 of the MS4623B to	Connect Port 2 of the MS4623B to	Measured Insertion Loss	Maximum Allowable Insertion Loss
A	Case3	Test Port 1 of the MN4790A	ANT A Port of the MN4790A		15 dB
B	Case3	Test Port 3 of the MN4790A	Bypass Port of the MN4790A		15 dB
C	Case3	RBS A Port of the MN4790A	Test Port 2 of the MN4790A		15 dB
D	Case4	Test Port 1 of the MN4790A	ANT B Port of the MN4790A		15 dB
E	Case4	RBS B Port of the MN4790A	Test Port 2 of the MN4790A		15 dB
F*	Case1	Test Port 1 of the MN4790A	ANT A Port of the MN4790A		15 dB
G*	Case1	Test Port 3 of the MN4790A	ANT A Port of the MN4790A		15 dB
H	Case20	Aux In 1 Port of the MN4790A	ANT B Port of the MN4790A		15 dB
I	Case19	Aux In 2 Port of the MN4790A	ANT A Port of the MN4790A		15 dB
J	Case21	RBS A Port of the MN4790A	Aux Out 1 Port of the MN4790A		15 dB
K	Case8	RBS B Port of the MN4790A	Aux Out 2 Port of the MN4790A		15 dB

* Measure Insertion Loss from 500 MHz to 6 GHz only.

Step 3. Refer to Table 4-2, following page, for solutions to any of the insertion loss tests failures

Table 4-2. *Internal Signal Path Insertion Loss Test Sequence Failure Solutions*

Test Sequence Failure	Solutions
A	Replace Switches S3, S1 or S4
B	Replace Switch S2
C	Replace Switches S5, S7 or Step Attenuator
D	Replace Switch S3
E	Replace Switches S5, S7 or Step Attenuator
F	Replace Switch S4 or Combiner
G	Replace Switch S2 or Combiner
H	Replace Switch S6
I	Replace Switch S6
J	Replace Switches S5 or S7
K	Replace Switches S5 or S7

4-4 TEST CHANNEL STEP ATTENUATOR CHECK

This test checks that the Test Channel Step Attenuator functions properly.

Test Setup

Step 1. Follow the preliminary setup procedures on pages 3-2 through 3-4.

Step 2. On the MS4623B, press the Default key, then the 0 key to reset the instrument.

Step 3. Press the Display key.

Step 4. Select:

DISPLAY MODE
SINGLE CHANNEL
RETURN

Step 5. Press the Ch 3 key, then the Display key.

Step 6. Select:

GRAPH TYPE
LOG MAGNITUDE
RETURN

Step 7. Press the Avg key.

Step 8. Select:

SELECT I.F. BANDWIDTH
I. F. BW 10 Hz

Step 9. Connect a through cable between Port 1of the MS4623B and the RBS A port of the MN4790A. Connect a second through cable between Port 2 of the MS4623B and Test Port 2 of the MN4790A.

Test Procedure

Step 1. On the PC controller, select the Case3 button in the MN4790A Switch Control window.

Step 2. On the MS4623B, select:

TRACE MEMORY

Step 3. Allow the trace to sweep twice, then select:

STORE DATA TO MEMORY
VIEW DATA (/) MEMORY
RETURN

Step 4. Select:

SCALE
10 dB/DIV

Step 5. On the PC, position the mouse pointer to the scroll bar on the right hand side of the MN4790A Switch Control window. Right-click to move the pointer downward and change the attenuation setting to 10 dB.

Step 6. Verify that the displayed S21 trace is within the range specified in Table 4-3.

Step 7. Repeat Steps 5 and 6 for the other specified attenuation levels in Table 4-3.

Table 4-3. *Step Attenuator Specifications*

Step Attenuator Setting	Attenuation Specification (dB)
10	10 ± 1
20	20 ± 1
30	30 ± 2
40	40 ± 2
50	50 ± 2
60	60 ± 3
70	70 ± 3

Step 8. If the test result is out of the expected range, replace the step attenuator.

4-5 TROUBLESHOOTING

The following paragraphs provide suggestions for troubleshooting certain test-set components.

Test Set Fails to Power Up

If the MN4790A test set fails to power up when connected to an ac power source and the Power key is pressed, perform the power supply checks described below.

WARNING

Hazardous voltages are present inside the instrument when ac line power is connected. Turn off the instrument and remove the line cord before removing any covers or panels. Troubleshooting or repair procedures should only be performed by qualified service personnel who are fully aware of the potential hazards.

WARNING ⚠

Line Source and Interface Checks

Step 1. Verify that the ac power source is providing stable power at the correct line voltage.

NOTE

The MN4790A is designed to automatically sense and operate with ac line voltages in the range of 85 to 264 VAC, with a frequency of 47 to 63 Hz.

Step 2. Verify that the power input cord is in good condition.

Step 3. Verify that the power line fuse is installed, that it is not blown (open), and that it is the correct value (1.6A, Slow Blow, part number 631-81).

Power Supply Voltage Check

Step 1. Turn off the test set and disconnect the power cord from the instrument. Ensure that all external cable connections to the test set's front and rear panel are also disconnected.

Step 2. Remove the top cover.

Step 3. Reconnect the power cord to the test set and turn it on.

Step 4. Using a digital multi-meter or oscilloscope, measure the dc power supply voltages on the Controller PCB at the test points listed in Table 4-1 (see to Figure 4-2, below).

Table 4-1. *Power Supply Voltages*

Measured Pin	Common Pin	DC Supply Voltage (V)
TP2	TP1	+5 ± 0.25
TP4	TP1	+15 ± 0.9

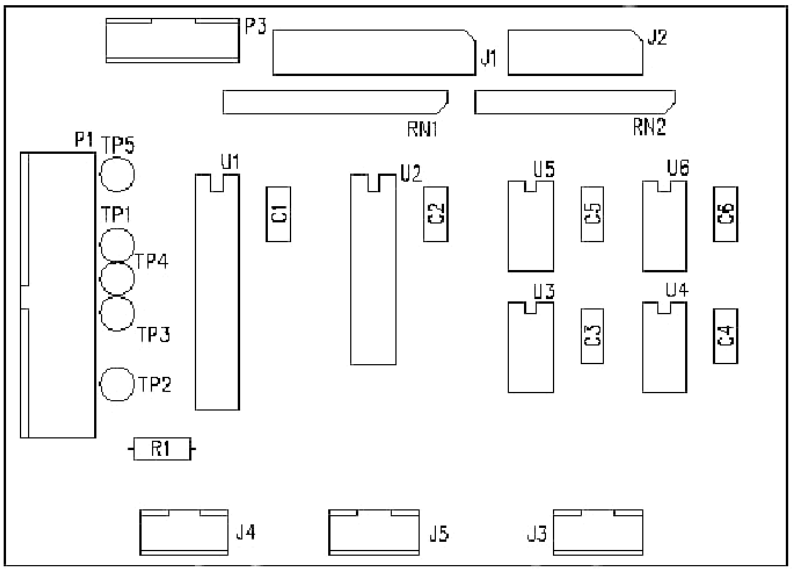


Figure 4-2. *A6 Power Supply Test Point Location Diagram*

Step 5. If any of the dc voltage tests fail, replace the A6 dc power supply. Refer to the A6 power supply remove and replace procedures in Chapter 5.

Chapter 5
Removal and Replacement Procedures

5-1 INTRODUCTION

This chapter provides procedures for removing and reinstalling the replaceable subassemblies listed in Chapter 2, Table 2-1.

5-2 EQUIPMENT REQUIRED

All procedures in this chapter require the use of either a #1 or #2 size Phillips type screw driver. Most procedures require the use of a 5/16 inch wrench and the Anritsu 01-201 (8 inch-pounds) torque wrench. Some procedures require the use of a small jewelers Phillips screwdriver.

CAUTION

Always use a torque wrench calibrated to 8 inch-pounds when tightening SMA connectors. Over-torquing will cause damage to the RF connectors.

5-3 REMOVING THE COVERS

Troubleshooting operations require removal of the top cover. Replacement of some test set assemblies and parts require removal of all covers. The following procedure describes this process.

Preliminary

Step 1. Switch the test set power off and remove the power cord.

Step 2. Remove the test set from the ME7842B test system by disconnecting all cable connections and separating the test set from the MS4623B.

Procedure Refer to Figure 5-1, page 5-3, during this procedure.

NOTE

It is only necessary to loosen the test set's front handle assemblies to remove the top, bottom, or side covers. However, if the front panel is to be removed, the handle assemblies should also be removed.

Step 3. Loosen (or remove) the right and left handle assemblies, as follows:

a. Place the test set on its top (bottom-side up).

b. Loosen (or remove) the screws at the sides of the handle assemblies.

c. If removing the handles, pull them away from the unit and set aside.

CAUTION

The green headed screws have metric threads. Be sure to retain all of the screws and replace them in their original location.

Step 4. To remove the top cover:

a. Place the test set in normal (top-side up) position.

b. Remove the feet from the two top corners at the rear of the test set.

c. Remove the center screw from the rear of the top cover.

d. Lift and slide the top cover away from the test set.

Step 5. To remove the bottom cover:

a. Place the test set on its top (bottom-side up).

b. Remove the feet from the two bottom corners at the rear of the test set.

c. Remove the center screw from rear of the bottom cover.

d. Lift and slide the bottom cover away from the test set.

Step 6. To remove the right cover:

a. Place the test set on its left side.

b. Remove the feet from the two right-side corners at the rear of the test set.

c. Remove the center screw from the right cover.

d. Lift and slide the side cover away from the test set.

Step 7. To remove the left cover:

a. Place the test set its right side.

b. Remove the feet from the two left-side corners at the rear of the test set.

c. Remove the center screw from rear of the left side cover.

d. Lift and slide the side cover away from the test set.

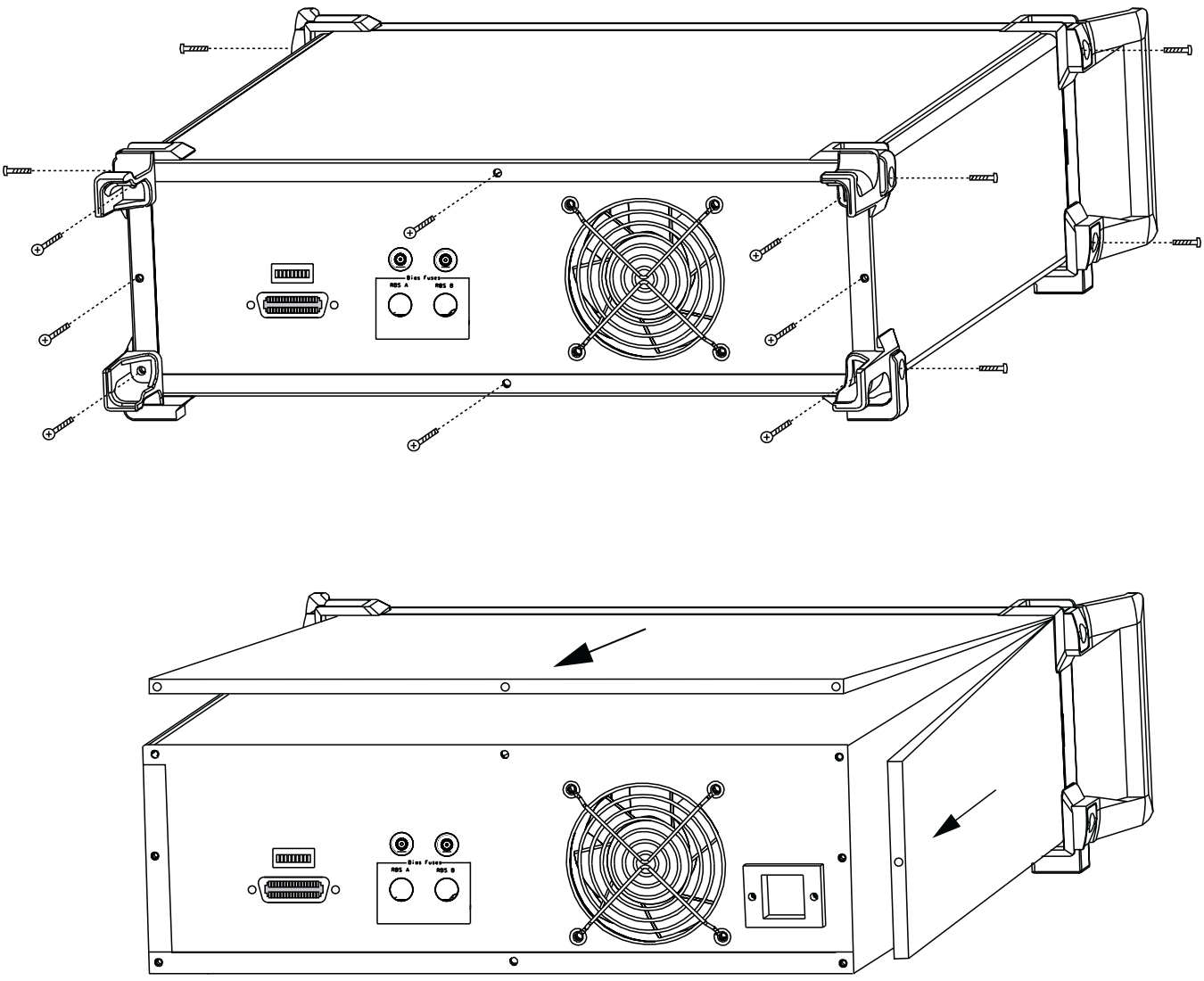


Figure 5-1. *MN4790A Test Set Cover Removal*

To replace the instrument covers, perform the previous steps in the reverse order.

5-4 A1 GPIB PARALLEL INTERFACE PCB

This Section provides a procedure for removing and replacing the A1 GPIB Parallel Interface PCB in the test set.

Step 1. Remove the top cover from the test set (Section 5-3).

Step 2. Disconnect the two cables from connectors J2 and J3. (Figure 5-2).

Step 3. Remove the four mounting screws.

Step 4. Lift the A1 PCB assembly out from the test set chassis.

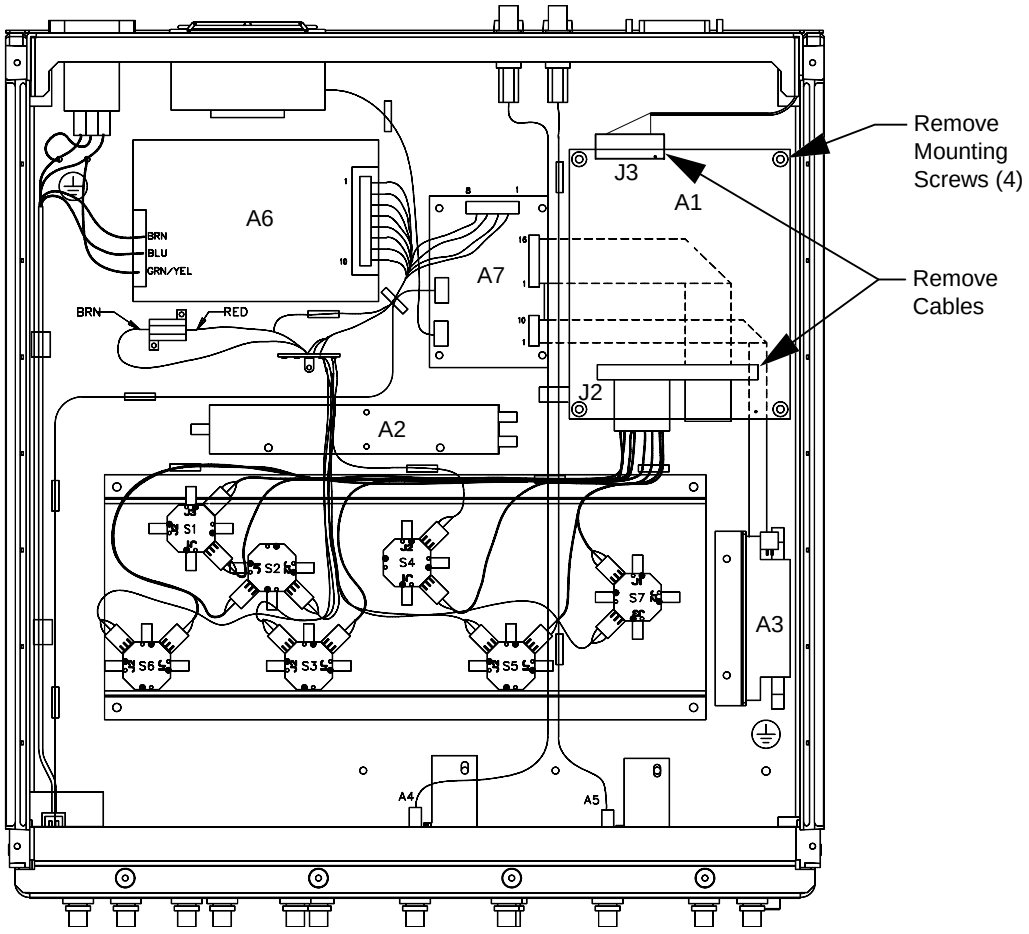


Figure 5-2. *A1 GPIB Parallel Interface PCB Removal*

To replace A1 GPIB Parallel Interface PCB, reverse the order of the removal procedure.

5-5 A2 COMBINER

This Section provides a procedure for removing and replacing the A2 Combiner in the test set.

Step 1. Remove the top cover from the test set (Section 5-3).

Step 2. Disconnect the three RF cables from the Combiner using a 5/16-inch wrench (Figure 5-3).

Step 3. Remove the two Combiner mounting screws with a Phillips screwdriver.

Step 4. Lift the Combiner out from the test set chassis.

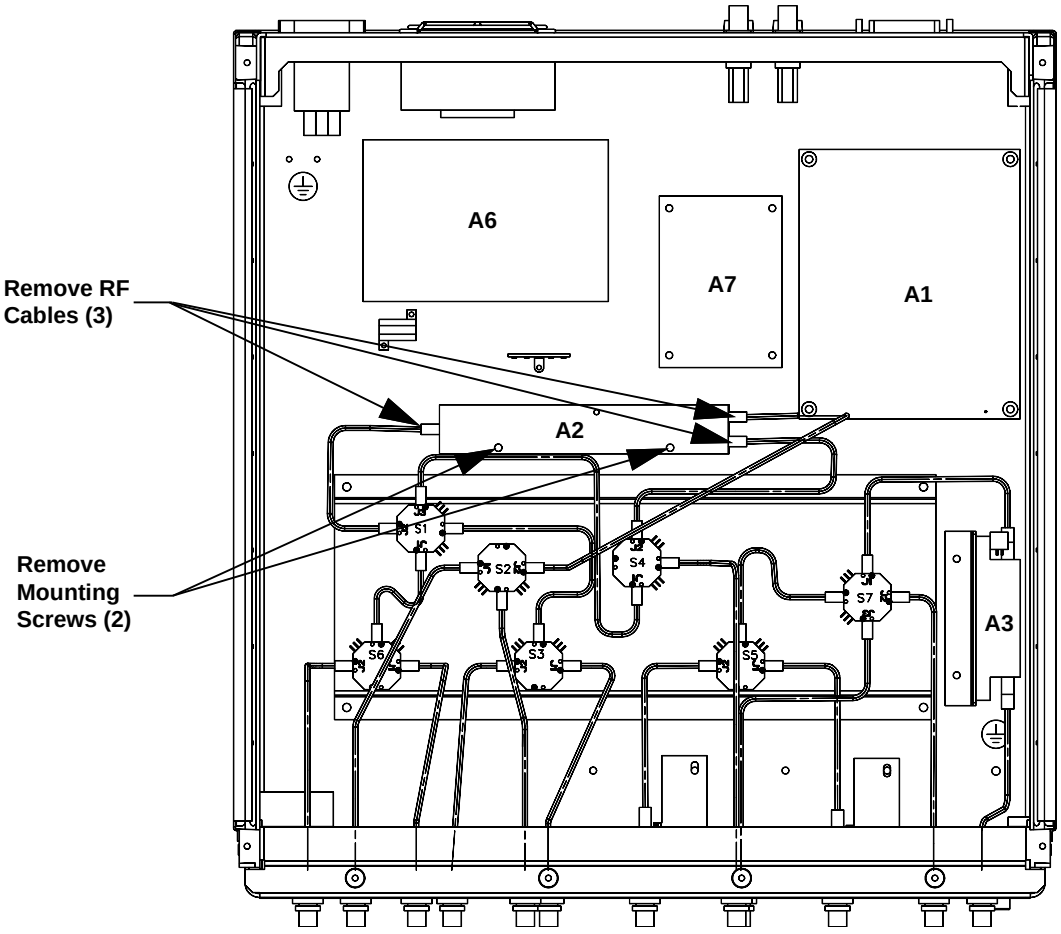


Figure 5-3. *A4 Combiner Removal*

To replace combiner, reverse the order in the removal procedure.

5-6 A3 STEP ATTENUATOR

This Section provides a procedure for removing and replacing the A3 Step Attenuator in the test set.

Step 1. Remove the right side cover from the test set (Section 5-3).

Step 2. Disconnect the Step Attenuator ribbon-cable from the Step Attenuator (Figure 5-4).

Step 3. Disconnect the RF cables from the Step Attenuator using a 5/16-inch wrench.

Step 4. Remove the two large Step Attenuator mounting screws with a Phillips screwdriver.

Step 5. Slide the Step Attenuator out from the test set chassis.

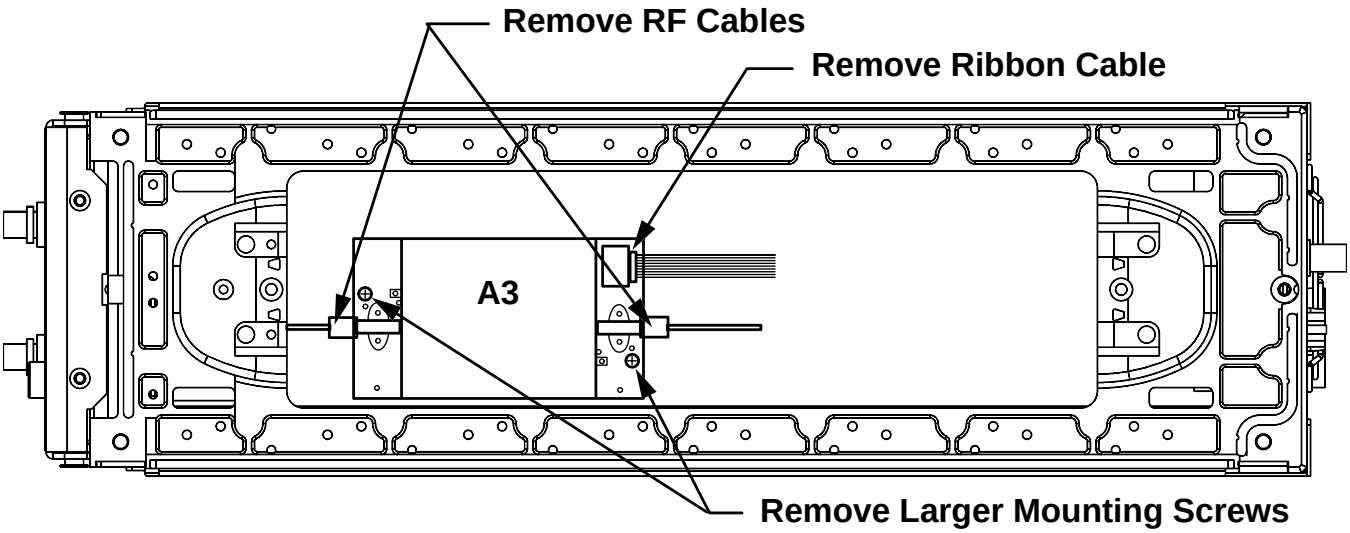


Figure 5-4. *A3 Step Attenuator Removal*

To replace the step attenuator, reverse the order of the removal procedure.

5-7 A4 AND A5 BIAS TEES

This Section provides a procedure for removing and replacing the A4 and A5 Bias Tees in the test set.

Step 1. Remove the top cover from the test set (Section 5-3).

Step 2. Unscrew the RBS Bias connectors from the top of the Bias Tee using a 3/16-inch wrench (Figure 5-5).

Step 3. Remove the RF cables from the Bias Tee and the SP3T switch with a 5/16-inch wrench.

Step 4. Remove the Bias Tee mounting screws with a #1 Phillips screwdriver.

Step 5. Unscrew the Bias Tee from the front panel RF connector with a 5/16-inch wrench and remove the Bias Tee.

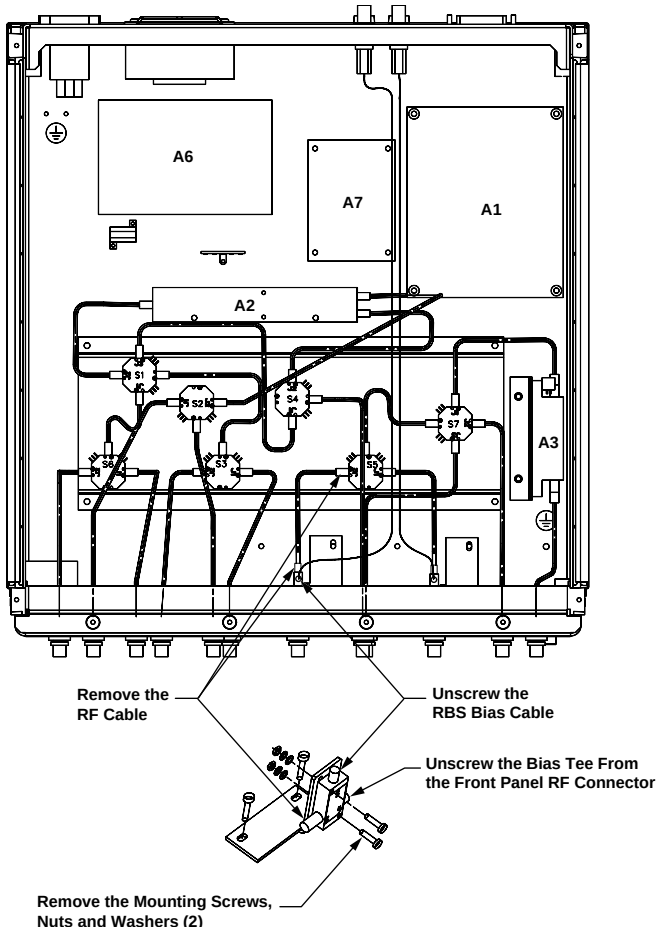


Figure 5-5. *A4, A5 Bias Tee Removal*

To replace the Bias Tee, reverse the order of the removal procedure.

5-8 A6 POWER SUPPLY

This Section provides a procedure for removing and replacing the A6 Power Supply in the test set.

Step 1. Remove the top and bottom covers from the test set (Section 5-3).

Step 2. Disconnect all the cable connections from the Power Supply (Figure 5-6).

Step 3. Turn the test set on its side.

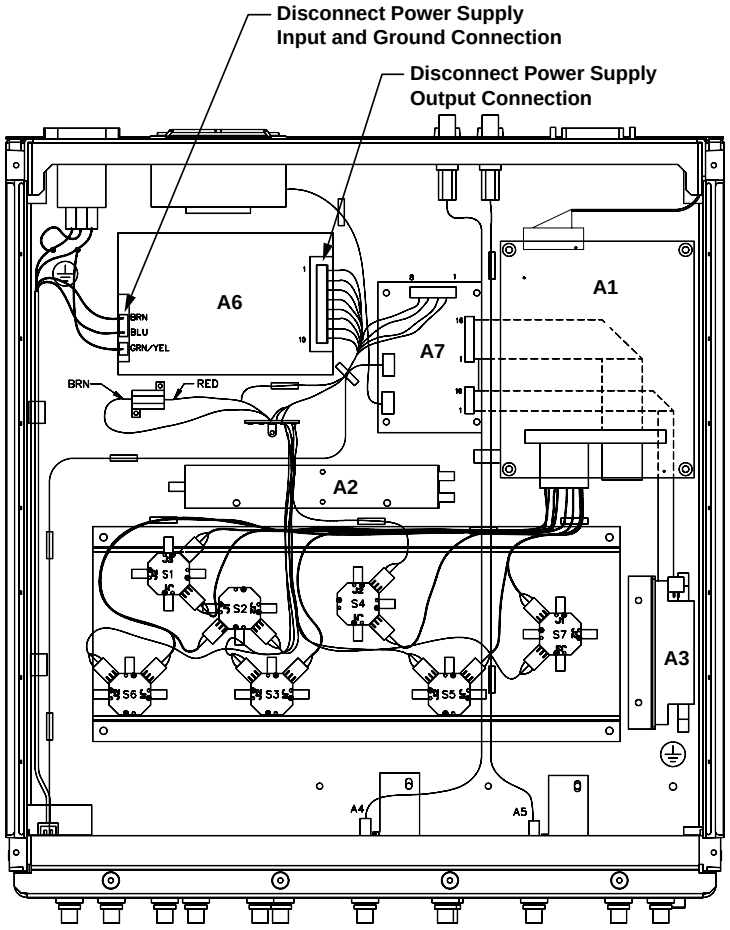


Figure 5-6. *A6 Power Supply Removal (Bottom View)*

Step 4. Hold the Power Supply and remove the four mounting screws with a Phillips screwdriver (Figure 5-7).

Step 5. Lift the Power supply out from the test set chassis.

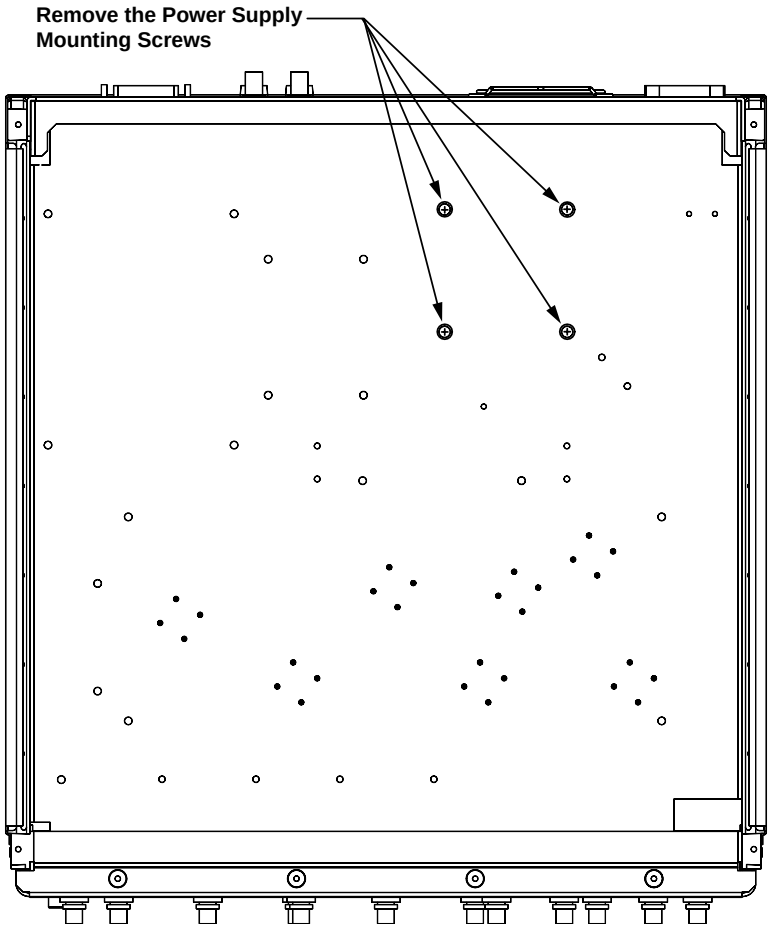


Figure 5-7. *A6 Power Supply Removal (Bottom View)*

To replace the Power Supply, reverse the order of the removal procedure.

5-9 A7 CONTROL PCB

This Section provides a procedure for removing and replacing the A7 Control PCB in test set.

Step 1. Remove the top cover from the test set (Section 5-3).

Step 2. Disconnect the cables on the Control PCB at P1, J1, J2, J3, J4, and J5 (Figure 5-8).

Step 3. Remove the four mounting screws.

Step 4. Lift the Control PCB out from the test set chassis.

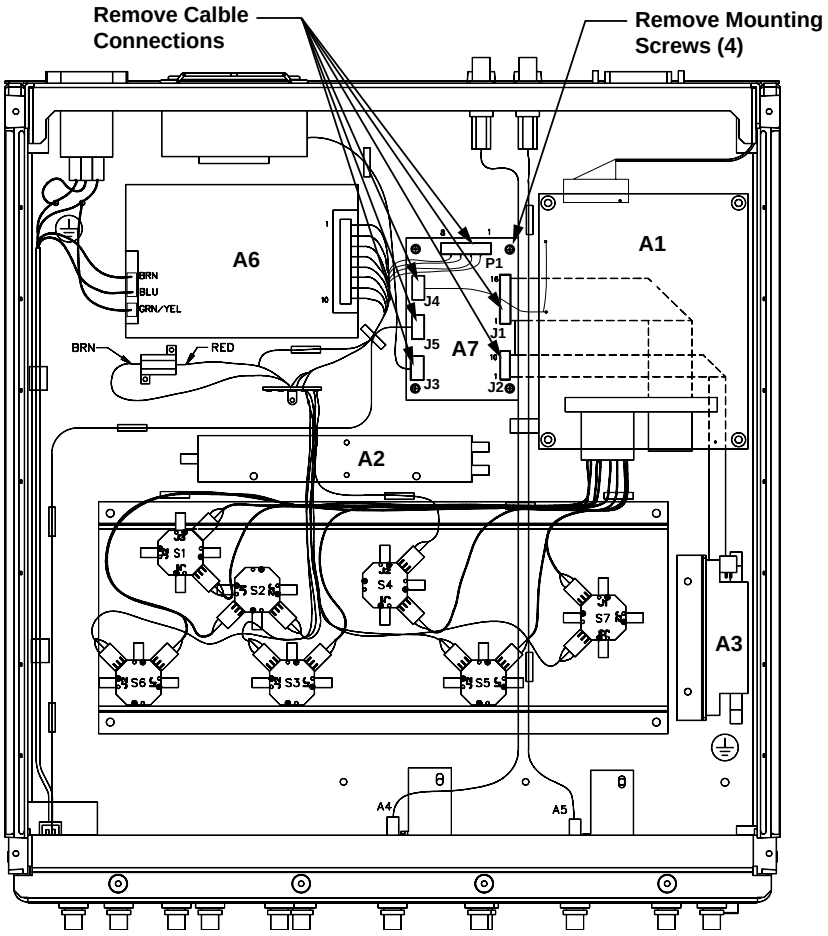


Figure 5-8. *A7 Control PCB Removal*

To replace the Control PCB, reverse the order of the removal procedure.

5-10 FAN ASSEMBLY

This Section provides a procedure for removing and replacing the rear panel fan assembly.

Step 1. Remove the top cover from the test set (Section 5-3).

Step 2. Remove the four screws holding the fan guard in place (Figure 5-9).

Step 3. Remove the fan guard and lift out the fan.

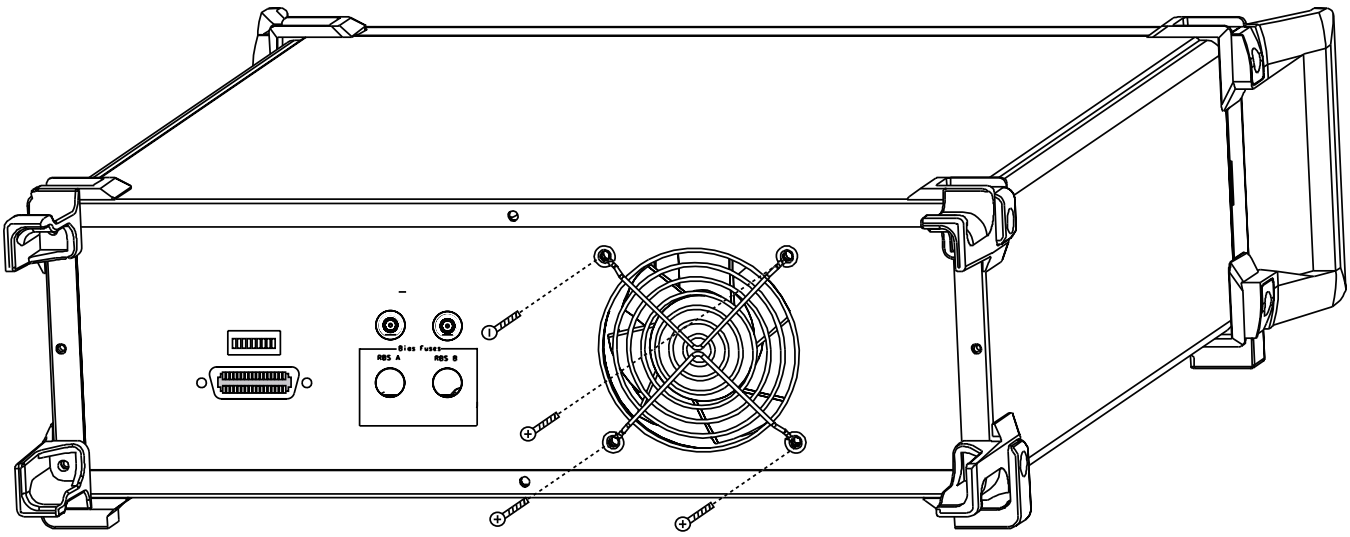


Figure 5-9. *Fan Removal*

To replace the fan, reverse the order of the removal procedure.

5-11 SP3T AND SPDT SWITCHES

This Section provides a procedure for removing and replacing the SP3T and SPDT RF switches.

Step 1. Remove the top cover from the test set (Section 5-3).

Step 2. Disconnect the RF cables from the SP3T or SPDT switch (Figure 5-10).

Step 3. Disconnect the wire connectors from the SP3T or SPDT switch.

Step 4. Remove the four Phillips screws from the SP3T or SPDT switch.

Step 5. Lift the SP3T or SPDT switch out from the test set chassis.

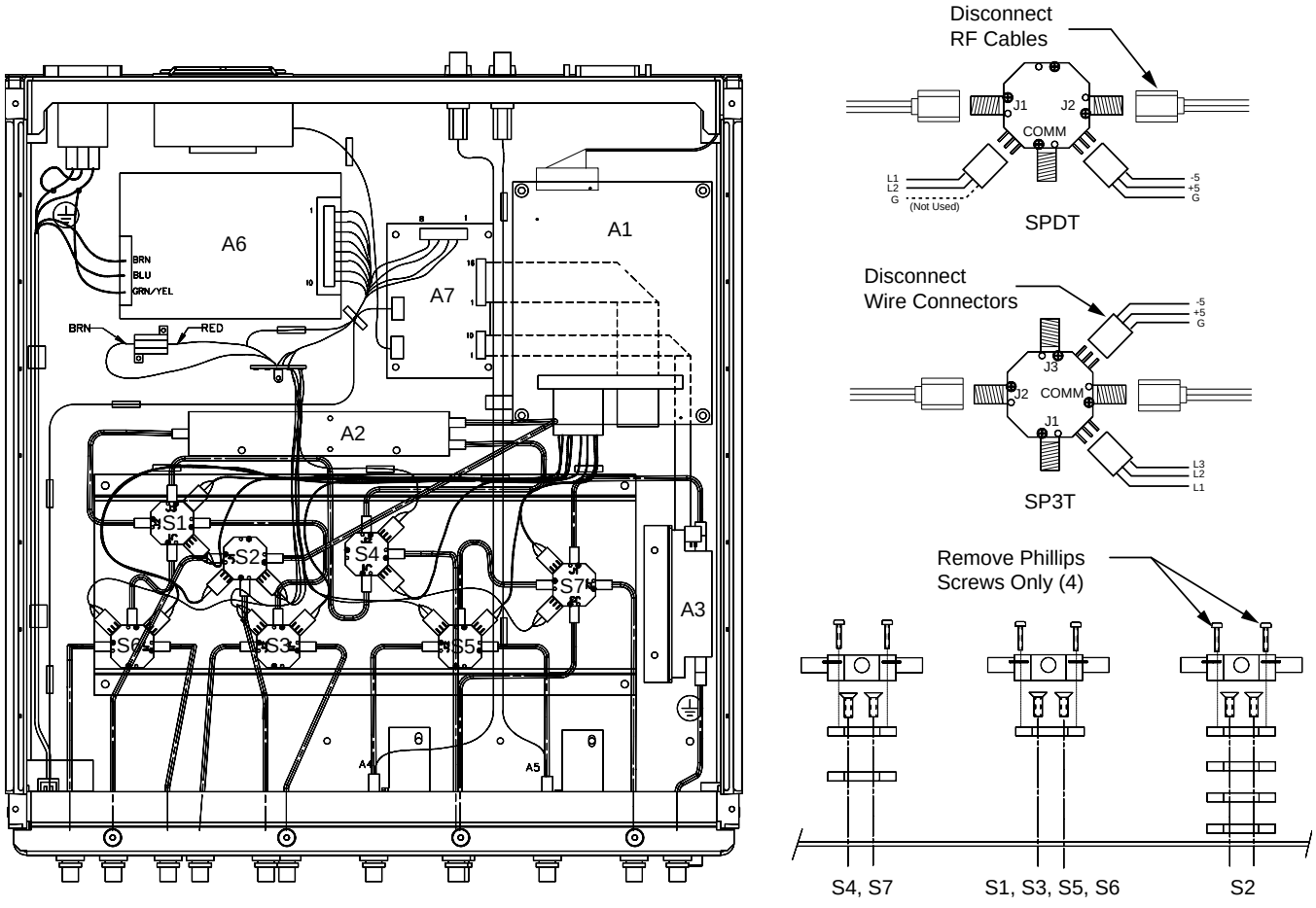


Figure 5-10. *SP3T and SPDT RF Switch Removal*

To replace the SP3T or SPDT switch, reverse the order of the removal procedure.

Table 5-1 . *SP3T and SPDT RF Switch Wiring Legend*

SP3T or SPDT Switch Number	Pin –5 Wire Color	Pin +5 Wire Color	Pin G Wire Color	Pin L1 Wire Color	Pin L2 Wire Color	Pin L3 Wire Color
S1	Orange	Red	Brown	Brown	Red	Orange
S2	Orange	Red	Brown	Green	Blue	Not Used
S3	Orange	Red	Brown	Purple	Gray	Not Used
S4	Orange	Red	Brown	Black	White	Not Used
S5	Orange	Red	Brown	Red	Brown	Not Used
S6	Orange	Red	Brown	Orange	Yellow	Not Used
S7	Orange	Red	Brown	Green	Yellow	Blue

Appendix A
Connector Maintenance Check Procedures

A-1 INTRODUCTION

This appendix provides general, precautionary information and instructions pertaining to precision connectors.

A-2 PRECAUTIONS

The following paragraphs are precautionary notes relating to maintenance considerations for precision connectors

Pin Depth Problems

Based on Anritsu precision components returned for repair, destructive pin depth of mating connectors is the major cause of failure in the field. When a precision component is mated with a connector having a destructive pin depth, damage will likely occur to the precision component's connector. A connector is considered to have destructive pin depth when the center pin is too long with respect to the connector's reference plane (Figure A-1).

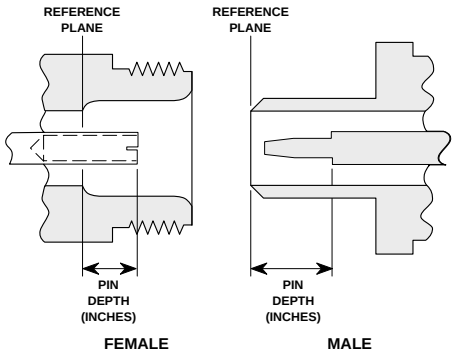


Figure A-1. *N Connector Pin Depth Definition*

Before mating an unknown or new device with your test set port connectors or calibration devices, always measure the pin depth of the device's connectors. Use an Anritsu Pin Depth Gauge, or equivalent, for these measurements (Figure A-2). Also, measure the connector pin depth of a device when intermittent or degraded performance is suspected.

Gauging sets for measuring the pin depth of precision connectors are available from your nearest Anritsu service center, or from the factory. Instructions for measuring connector pin depth are included with the gauging set.

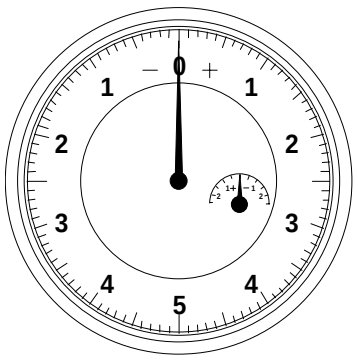


Figure A-2. *Pin Depth Gauge*

Pin Depth Tolerance

The center pin of a precision connector has a tolerances measured in mils (one mil = 1/1000 inch). The connectors of test devices may not be precision types and they may not have the proper pin depth. These connectors should be measured before mating to ensure suitability.

When gauging pin depth, if the connector being measured indicates out of tolerance in the "+" region of the gauge (Table A-1), the center pin is too long. *Mating under this condition will likely damage the mating connector.* On the other hand, if the test device connector indicates out of tolerance in the "–" region, the center pin is too short. While this will not cause any damage, it will result in a poor connection and a consequent degradation in performance.

Table A-1. *Connector Pin Depth Tolerance*

Port Connector Type	Pin Depth (Mils)	Gauge Reading
GPC-7	+0.000 –0.003	Same As Pin Depth
N Male	207 –0.000 +0.004	207 +0.000 –0.004
N Female	207 –0.004 +0.000	Same As Pin Depth
3.5 mm Male, Female	–0.000 +0.002	
K Male, Female	+0.0000 –0.0035	
V Male	+0.000 to –0.001	
V Female	+0.000 to –0.001	

Avoid Over Torquing Connectors

Over torquing connectors is destructive; it may damage the connector center pin. Finger tight is usually sufficient, especially on Type N connectors. Should it be necessary to use a wrench to tighten SMA or WSMA connectors, use a torque wrench that breaks at 8 inch-pounds. As a general rule, *never use pliers to tighten connectors.*

Teflon Tuning Washers

The center conductor on many precision connectors contains a small Teflon tuning washer located near the point of mating (interface). This washer compensates for minor impedance discontinuities at the interface. The washer's location is critical to the connector's performance. *Do not disturb the Teflon Tuning Washer.*

Avoid Mechanical Shock

Precision connectors are designed to withstand years of normal bench handling. Do not drop or otherwise treat them roughly. They are laboratory-quality devices, and like other such devices, they require careful handling.

Keep Connectors Clean

The precise geometry that makes a precision connector's high performance possible can be disturbed by dirt and other contamination adhering to connector interfaces. When not in use, keep the connectors covered.

Visual Inspection

Precision connectors should be inspected periodically. Check for the following:

- Bent or broken center pin
- Damaged threads
- Other bent or damaged connector parts
- Dirt or foreign material in connector cavity

A-3 REPAIR AND MAINTENANCE

Anritsu recommends that no maintenance other than cleaning be attempted by the customer. Any device with a suspected defective connector should be returned to Anritsu for repair and/or service when needed.

Index

A

B

C

D

E

F

G

H

I

L

M

N

O

P

R

S

T

V

Anritsu

Discover What's Possible®