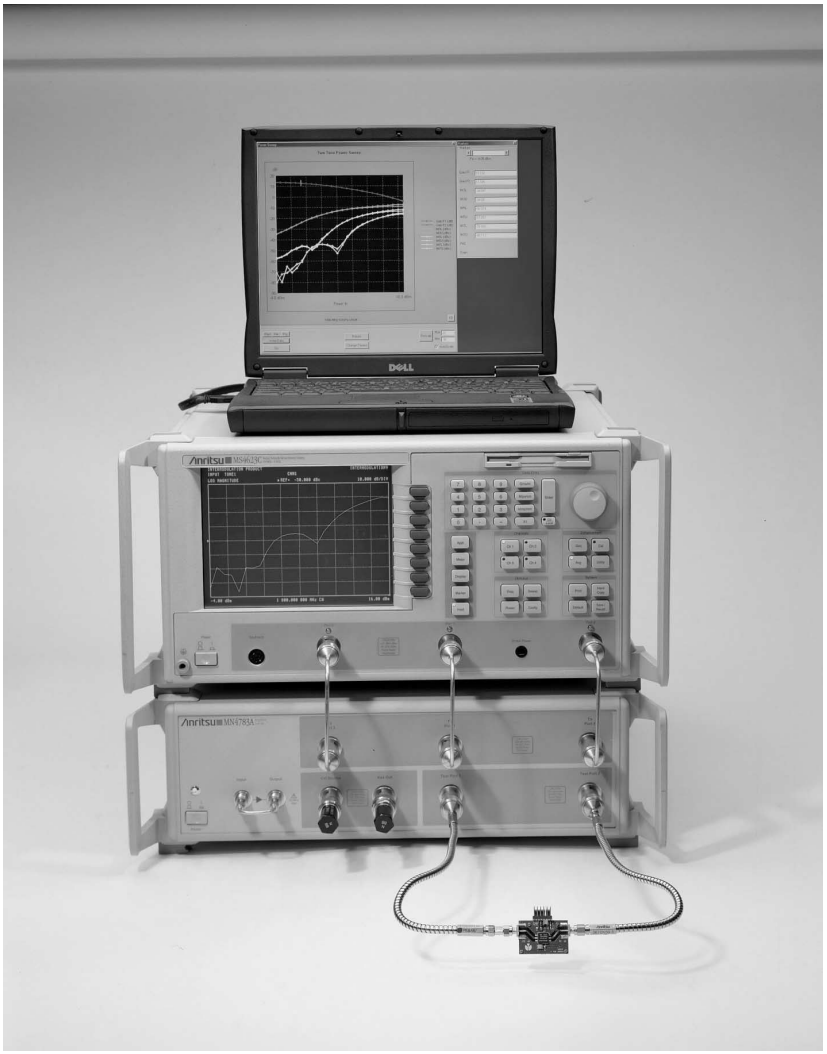
MODEL MN4783A TEST SET
FOR THE
ME7840/4 HANDSET AMPLIFIER TEST SYSTEM

MAINTENANCE MANUAL



Anritsu

490 JARVIS DRIVE | MORGAN HILL, CA 95037-2809

P/N: 10410-00248
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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

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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.

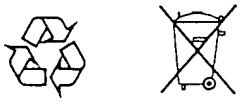
The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE operating the equipment.

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.

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Chapter 5 Removal and Replacement Procedures

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Chapter 1
General Information

1-1 SCOPE OF MANUAL

This manual provides general service and preventive maintenance information for the Anritsu MN4783A test set for the ME7840/4 Power Amplifier Test System, Handset Configuration. It contains procedures for:

- Testing the instrument for proper operation
- Verifying measurement accuracy and traceability to the 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

The procedures described in this manual presume a working knowledge of vector network analyzers and RF power amplifier testing procedures. Refer to the other manuals supplied with the ME7840/4 test system for more detailed explanations of the system equipment and procedures.

1-2 INTRODUCTION

This chapter provides a general description of the power amplifier test system's identification numbers, frequency ranges, and related manuals. It also includes service strategy, available service facilities, static-sensitive component handling precautions, and a list of recommended test equipment.

1-3 RELATED MANUALS

The ME7840/4 manual set consists of the following manuals:

Manual Description	Anritsu Part Number
ME7840/4 Operation Manual (OM)	10410-00247
MN4783A Maintenance Manual (MM)	10410-00248 (optional)
Scorpion Navigator User's Guide (SUG)	10410-00249
MS462XX Operating Manual (OM)	10410-00203
MS462XX Programming Manual (PM)	10410-00204
MS462XX Maintenance Manual (MM)	10410-00205 (optional)

The operating and programming manuals are supplied with the equipment; the maintenance manuals are optional items that may be purchased.

1-4 IDENTIFICATION NUMBER

All Anritsu instruments are assigned a six-digit ID number, such as "030101." 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.

1-5 CONVENTIONS

Throughout this manual, the ME7840/4 Power Amplifier Test System, Handset Configuration may be referenced as *ME7840/4*, or *test system*; the MS462XC Vector Network Measurement System may be referenced as *VNMS, Scorpion* or *MS462XC*; the MN4783A test set may be referenced as *test set* or *MN4783A*; the Amplifier Under Test, including the related components to their system, may be referenced as *AUT*.

1-6 SYSTEM OVERVIEW

The Anritsu ME7840/4 is intended for the measurement and real-time graphical display of the following parameters of a power amplifier in the frequency range of 10 MHz to 6 GHz:

- S-parameters including Hot S_{22} and K-factor
- Single-tone Power Sweep
- Two-tone Power Sweep
- Intermodulation Distortion
- Harmonics
- Noise Figure
- Adjacent Channel Power Ratio (ACPR)

The ME7840/4 test system is designed to facilitate alignment, tuning and pass/fail testing of the components, modules, and subassemblies of RF and microwave power amplifiers as well as the assembled amplifier systems.

1-7 HARDWARE DESCRIPTION

The ME7840/4 hardware consists of a MS462XC Direct Receiver Access (DRA) Scorpion®, a MN4783A test set, a customer supplied Personal Computer (PC), and an optional current probe. A block diagram of the ME7840/4 test system is shown in Figure 1-1 on the following page. General test set specifications appear below:

Table 1-1. *Test Set Configuration*

Model	Frequency Range (MHz)	Maximum AUT Power Output (Watts)	Reverse Measurements (S_{22}, Hot S_{22}, S_{12} Possible)	Attenuator or Isolator (at AUT Output Path)
MN4783A	10 to 6000 (Note 1)	5.0 (Note 2)	Yes	External

Notes:

1. The frequency range does not account for any restricting effects caused by use of external isolators or circulators.
2. The maximum AUT power assumes a minimum isolation of 20 dB provided by external isolators or circulators. The provided external 20 dB attenuator ensures the proper isolation for reverse measurements up to the specified maximum AUT power output.

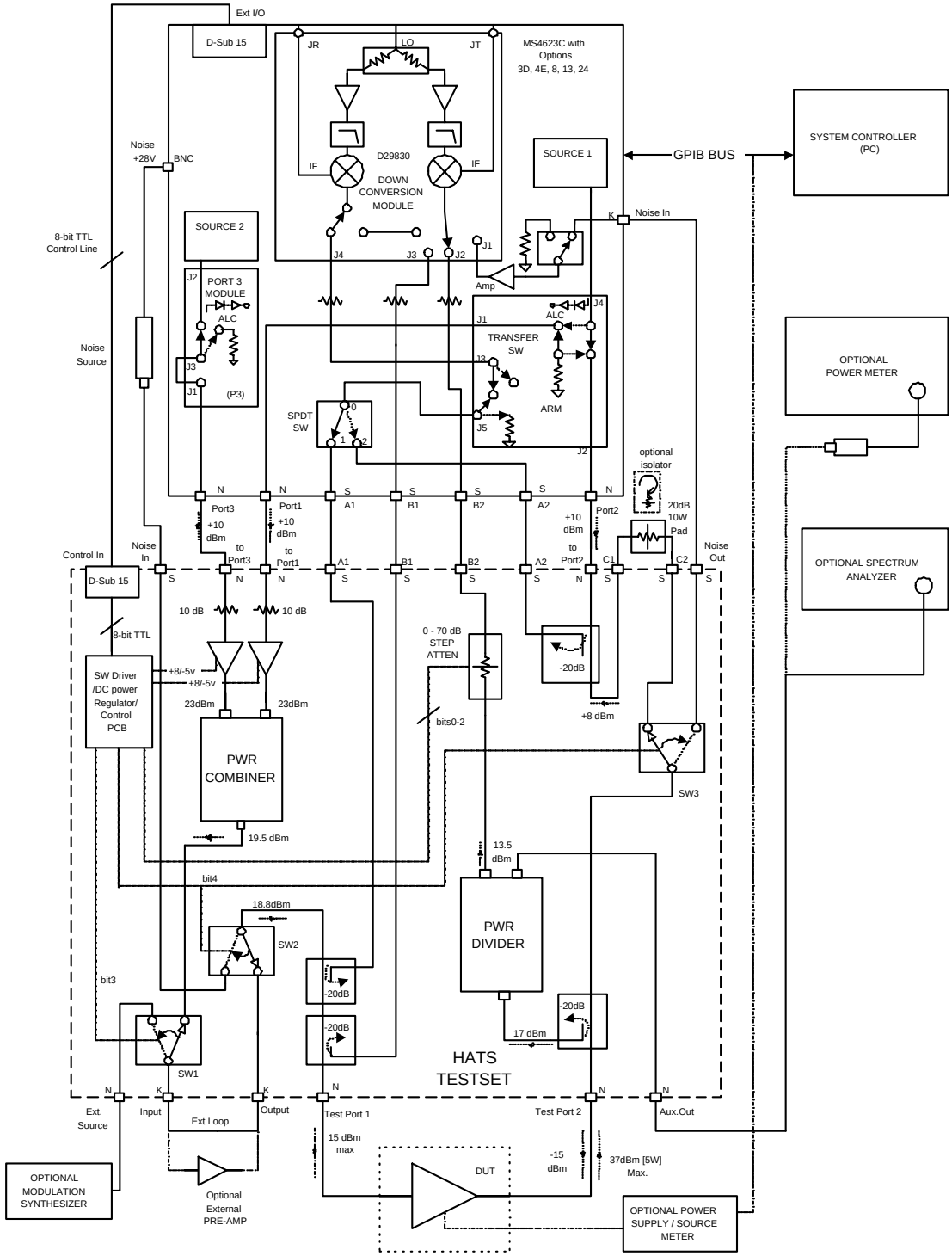


Figure 1-1. *Overall Functional Block Diagram of the ME7840/4 Power Amplifier Test System, Handset Configuration with the MN4783A Test Set.*

1-8 SYSTEM DESCRIPTION

The ME7840/4 test system consists of the MS462XC Direct Receiver Access Scorpion (DRA), the MN4783A Handset Amplifier Test Set and a library of external measurement software. Scorpion Navigator® orchestrates the calibration and performs measurements on power amplifiers in the 10 MHz to 6 GHz range. Software modules exist for S-parameters, K-factor, IMD, One-Tone Power Sweep, Two-Tone Power Sweep, Harmonics, Hot S_{22}, Noise Figure, and ACPR measurements. Scorpion Navigator software runs best on Windows® NT/2000/XP and requires a GPIB controller (preferably a National Instruments GPIB controller with NI-488.2 software version 1.7 or higher and NI VISA version 2.5 or higher) and Scorpion firmware version 1.11 or higher.

DRA Scorpion

The Scorpion Direct Receiver Access version of the Vector Network Measurement System functions under control of the software residing in the PC through GPIB commands. The software supports tuning and alignment operations by generating real time graphic displays of the measured data on the PC screen.

Under software control, 3rd, 5th, 7th, and 9th order IMD products can be measured and displayed. Also, the Upper and Lower Side Band (USB and LSB) components of the IMD products are measured and displayed separately.

The DRA Scorpion includes the following capabilities:

CAUTION

The combiner has a power input rating of 5 Watts maximum when terminated with a VSWR of 2:1. For an open or short at the combiner output, the combiner input power rating is 0.5 Watts maximum.

- Two internal, independent RF sources. Each source has a range of –15 dBm to +10 dBm. A 0 dB to 70 dB step attenuator (10 dB / step) is provided for each source resulting in a power output range of –85 dBm to +10 dBm from each source.
- Complete built-in capability for IMD measurements. A combiner is provided in the test set.
- Internal Transfer Switch enabling S_{22} and Hot S_{22} measurements. The reflectometer set-up is provided in the test set.
- Direct access to each of the four receiver channels (two reference channels and two test channels) for maximum flexibility in measuring forward and reverse S-parameters over a wide range of AUT output power. The test set provides incident and reflected signal separation.

MN4783A Test Set

The MN4783A test set contains a Wilkinson type combiner that combines the two RF signals from Port 1 and Port 3 (RF1 and RF3) of the Scorpion. Two preamplifiers at the combiner input boost the input RF power to the AUT.

The output of the combiner is fed to source selection switches that enable one of the following to be applied to the AUT:

- The combined signal from the Scorpion sources
- A modulated signal from an optional external modulation synthesizer
- An innovative noise figure measurement capability based on Y-factor techniques that can be routed through the test set for use in characterizing amplifiers

A provision for the insertion of an optional external preamplifier (after the combiner and source selection switch) is also provided.

The test set includes two VSWR bridges (Port Modules) connected back-to-back at the input of the AUT that separates the incident signal from the reflected signal. The power rating of these VSWR bridges is 5 Watts average. The –20 dB portion of the incident and reflected signals are applied to the Scorpion reference-port a_1 and test-port b_1, respectively, for S_{11} measurement. The S_{11} measurement determined by the DRA Scorpion is simply the ratio of the reflected signal to the incident signal.

The amplified output of the AUT is fed to a VSWR bridge in the test set. The power rating of this bridge is also 5 Watts average. The –20 dB coupled arm of this bridge is routed to the test-port b_2 of the Scorpion through a Wilkinson type power divider and a 0 dB to 70 dB step attenuator (10 dB/step).

The divider enables the connections of a power meter or spectrum analyzer, when desired, to measure the AUT output using the AUX OUT connector. The through arm of the bridge is routed to the Scorpion Port 2 via a 20 dB 10 Watt attenuator (or optional isolator).

In the MN4783A test set, the attenuator (or isolator) is external. In selecting an external isolator (alternatively, a circulator with a termination on the unused port may be used), the following criteria should be followed:

- *Power rating:* Should be no less than the power output of the AUT
- *Bandwidth:* Should be sufficiently wide to cover the frequency band of the AUT
- *Isolation:* Should be no less than (P_o –17 dB), where P_o is the power output in dBm of the AUT

Where S_{22} or Hot S_{22} measurements are not required, power amplifiers with up to 5 Watts average output power can be tested with the MN4783A test set without any isolator by connecting the 20 dB 10 Watt attenuator to port C1 and port C2 on the rear panel. The unit is shipped from the factory with this attenuator in place.

For S_{22} measurements, the transfer switch located within the Scorpion routes the Source 1 output signal to the output port of the AUT via Port 2 (RF2) of the Scorpion. A separate VSWR bridge in the test set applies the –20 dB portion of this incident signal to the Scorpion reference-port a_2. The –20 dB portion of the signal reflected from the AUT output port is applied to the Scorpion test-port b_2 by means of the AUT output VSWR bridge.

The ME7840/4 calibration is performed with the test set in place and at the connectors where the AUT will be connected directly. Therefore, the test set components and cables are included in the calibration loop and their effects are calibrated out, resulting in correct and accurate measurements of the AUT.

The software supplied by Anritsu supports operator control of the source selection switch and step attenuator in the test set. This control is achieved through the parallel TTL control lines available at the Scorpion rear panel "External I/O" connector. The GPIB commands from the PC to the Scorpion set the TTL control lines to the desired states.

Connectors and Ports

On the front panel of the model MS462XC DRA Scorpion, three type N (female) connectors are provided for Ports 1, 2 and 3.

Port 1 provides RF Source 1 when the transfer switch is in the forward position, and is terminated into 50 ohms to ground when the transfer switch is in the reverse position.

Port 2 provides RF Source 1 when the transfer switch is in the reverse position, and is terminated into 50 ohms to ground when the transfer switch is in the forward position.

Port 3 is allocated to RF Source 2. Under independent control, Port 3 provides RF Source 2 or is terminated into 50 ohms to ground.

On the rear panel of the Scorpion, four SMA connectors are provided for reference ports (a_1 and a_2) and test ports (b_1 and b_2). On the MN4783A test set, two additional SMA connectors provide for connecting an external isolator. If reverse measurements (S_{22} and Hot S_{22}) are not desired, then an isolator is not required. Instead, a 20 dB external attenuator should be connected between connectors C1 and C2. The MN4783A is shipped from the factory with this attenuator in place.

CAUTION

Connecting the external circulator incorrectly or placing a direct connection between C1 and C2 on the MN4783A rear panel will cause permanent damage to the MS462XC.

The unused port of the circulator must be terminated with a high power termination.

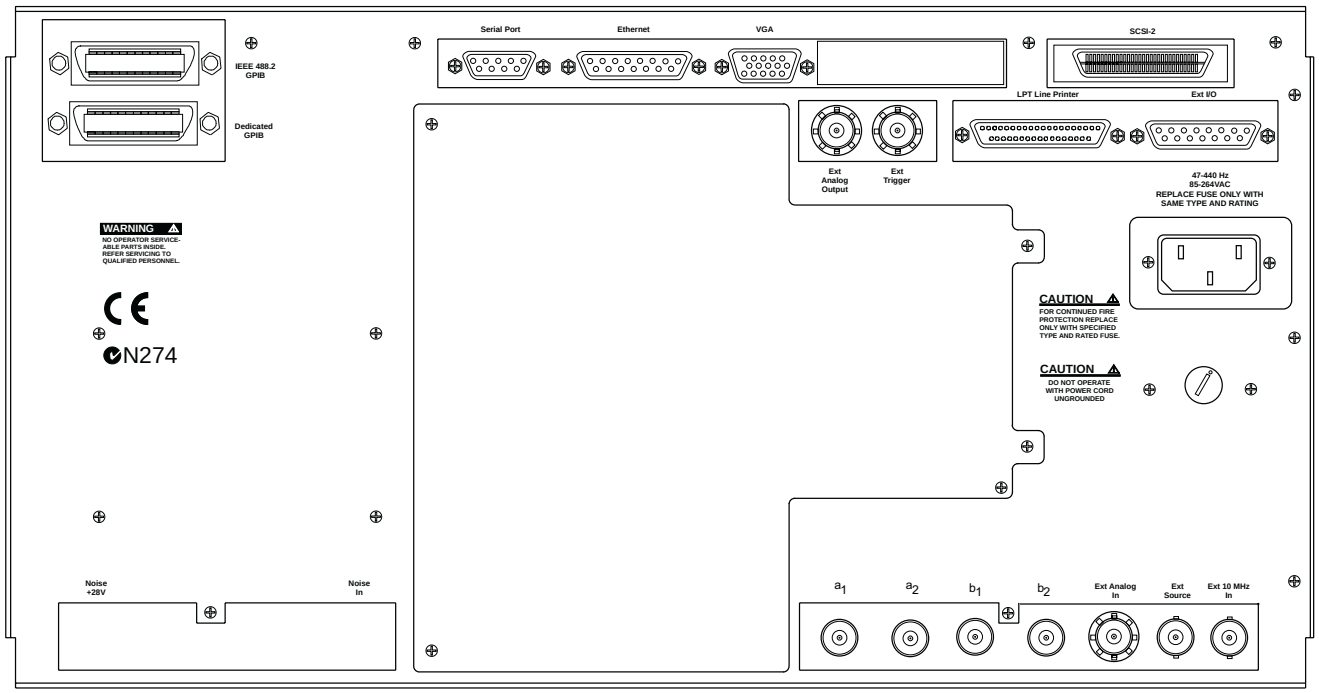


Figure 1-2. *MS462XC Rear Panel Drawing*

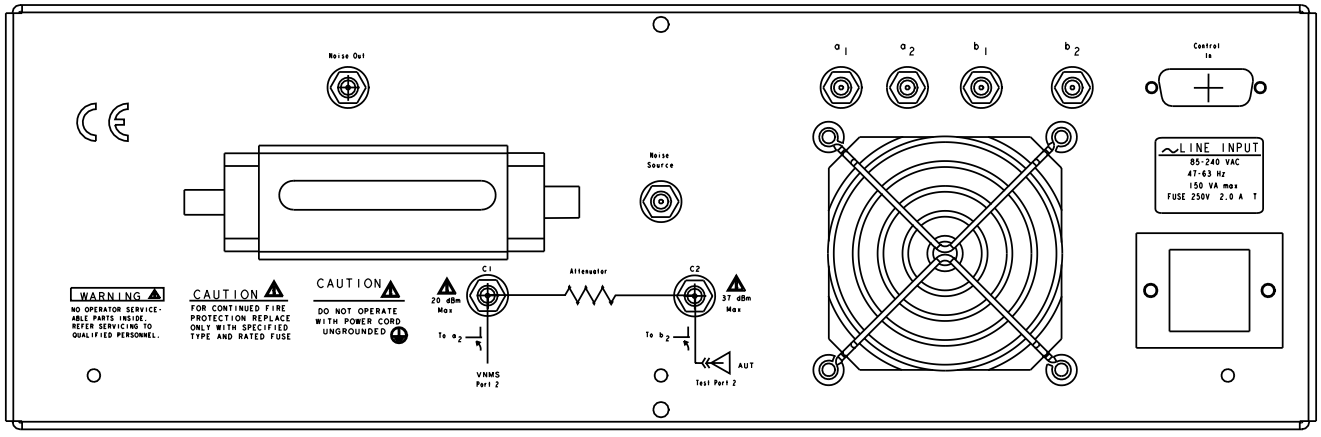


Figure 1-3. *MN4783A Rear Panel Drawing*

1-9 SERVICE CENTERS

Anritsu Company offers a full range of repair and calibration services at fully staffed and equipped service centers throughout the world. Table 1-3, located on page 1-10, lists all Anritsu services centers.

1-10 STATIC SENSITIVE COMPONENT HANDLING PROCEDURES

The test set contains components that can be damaged by static electricity. Figure 1-2 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.

1-11 RECOMMENDED TEST EQUIPMENT

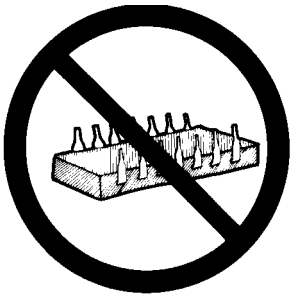
Table 1-2 lists the recommended test equipment to be used for all maintenance activities for the MN4783A test set. Note the "Use" codes listed in the right hand column of the table. These codes list the applicable maintenance activities for the equipment listed.

Table 1-2. *Recommended Test Equipment*

INSTRUMENT	CRITICAL SPECIFICATION	RECOMMENDED MANUFACTURER/MODEL	USE**
Power Meter		Anritsu ML2437A or MS2438A	P
Power Sensor		Anritsu MA2472A	P
GPIB Cable	IEEE 488-2 compliant	Anritsu 2100-2, or equivalent	P
Offset Termination	20 dB Return Loss	Anritsu 29A50-20	P
Termination	Return Loss 35 dB, DC to 3 GHz	Anritsu 28L50LF	OT
Adapter		Anritsu 34NFNF50 Anritsu 34SFSF50 Anritsu 34NKF50	O, T
Air Line		Anritsu 18N50 or Anritsu SC3833	P
Thru Line		Anritsu 3670NN50-2 or 15NN50-0.6B	P
Thru Line	Phase stable Length: 4 feet (2 each)	GORE PhaseFlex™ Part number EJD01D010480	O, T
Calibration Kit		Anritsu 3653 or 3753LF	P,O

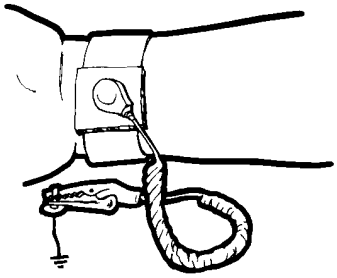
** USE CODES:
- A Adjustment / Internal Hardware Calibration
- O Operational Testing
- P Performance Verification
- T Troubleshooting

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



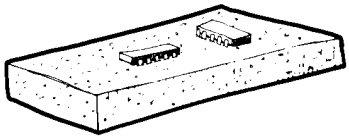
2. Do not slide static sensitive component across any surface.

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

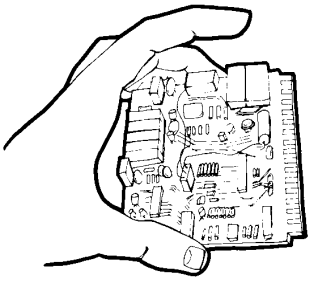


4. Wear a static-discharge wristband when working with static sensitive components.

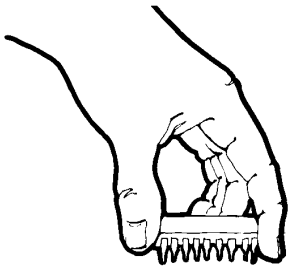
5. Label all static sensitive devices.



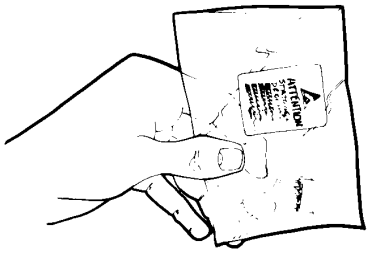
6. Keep component leads shorted together whenever possible.



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 1-4. *Static Sensitive Component Handling Procedures*

Table 1-3. *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

CANADA

ANRITSU INSTRUMENTS LTD.
700 Silver Seven Road, Suite 120
Kanata, Ontario K2V 1C3
Telephone: (613) 591-2003
FAX: (613) 591-1006

CHINA

ANRITSU ELECTRONICS (SHANGHAI) CO. LTD.
2F, Rm B, 52 Section Factory Building
No. 516 Fu Te Rd (N)
Shanghai 200131 P.R. China
Telephone:21-58680226, 58680227, 58680228
FAX: 21-58680588

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

KOREA

ANRITSU CORPORATION LTD.
Head Office:
14F, Hyunjuk Building 832-41
Yeoksam-Dong, Kangnam-Ku
Seoul 135-080, South Korea
Telephone: 02-553-6603
FAX: 02-553-6604

Service Center:
8F Hyunjuk Building
832-41, Yeoksam Dong
Kangnam-Gu
Seoul, South Korea 135-080
Telephone: 82-2-553-6603
FAX: 82-2-553-6605

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

UNITED KINGDOM

ANRITSU LTD.
200 Capability Green
Luton, Bedfordshire
LU1 3LU, England
Telephone: 015-82-433200
FAX: 015-82-731303

Chapter 2
Replaceable Parts

2-1 INTRODUCTION

This chapter provides replaceable parts information for both MN4783A models. The major replaceable test set assemblies and parts are listed in Table 2-1. The locations of these assemblies/parts are shown in Figure 2-1.

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***
> When sending a failed assembly to the factory for exchange, a copy of the Service Log *must always* accompany the failed assembly. This copy may be a printout, or a saved disk copy. Due to the importance of the service log information to the Anritsu factory Service Engineers, the exchange prices are only valid if the service log data is included with the failed assembly.

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 MN4783A. These assemblies/parts are presently covered by the Anritsu exchange assembly program.

Table 2-1. *Replaceable Subassemblies*

Part Number	Description
1010-49	20 dB Fixed Attenuator, 10 Watt
43KB-10	10 dB Fixed Attenuator
40-160	Power Supply
60547-3	Control PCB Assembly
61603	Combiner/Power Divider, 500 MHz to 6 GHz
ND60348	Amplifier 1 with Cable Harness
ND60349	Amplifier 2 with Cable Harness
ND60721	Switch 1 with Cable Harness
ND60722	Switch 2 with Cable Harness
ND60723	Switch 3 with Cable Harness
ND60327	Fan Assembly
339H40998A	Step Attenuator
46720	Port 1 and Port 2 Modules (VSWR Bridges)
B45259	N Female Test Port Connector

2-4 PARTS ORDERING INFORMATION

All of the parts listed in Table 2-1 may be ordered from your local Anritsu service center (Table 1-3, page 1-10). 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

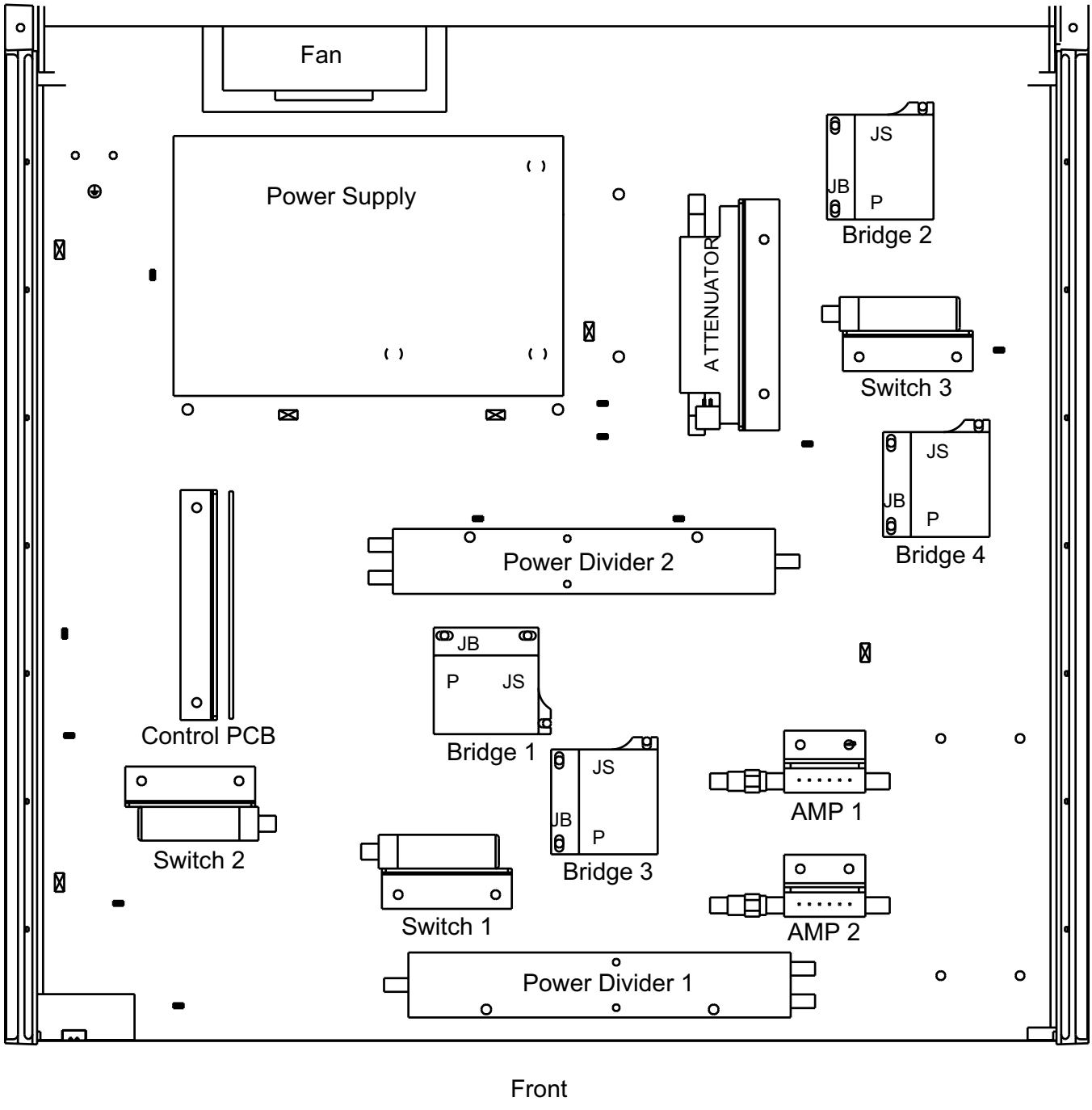
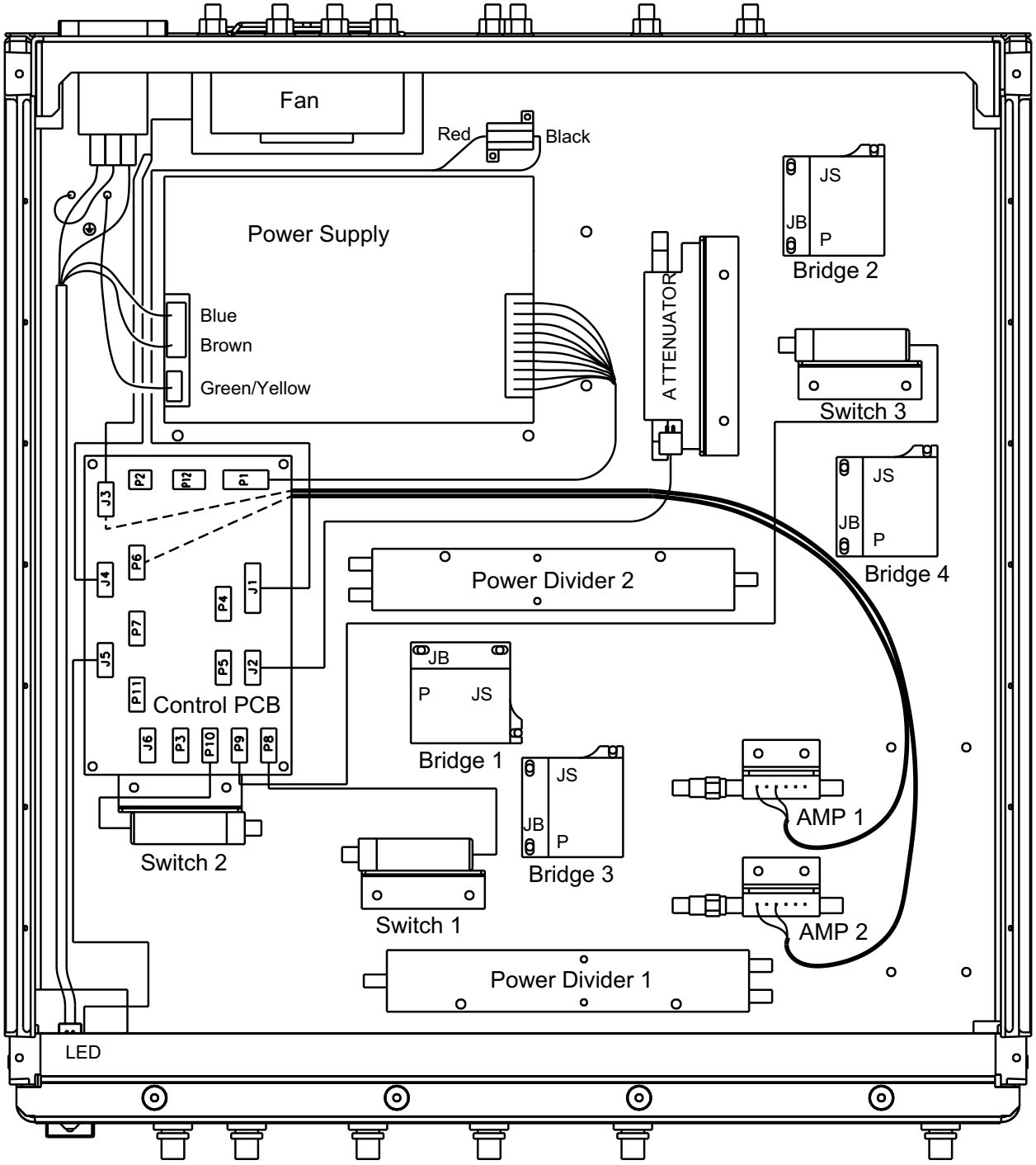


Figure 2-1. *Major Assemblies Location Diagram (Top View)*



Note: The Control PCB is shown face up for clarity.

Figure 2-2. *Major Assemblies Wiring Diagram (Top View)*

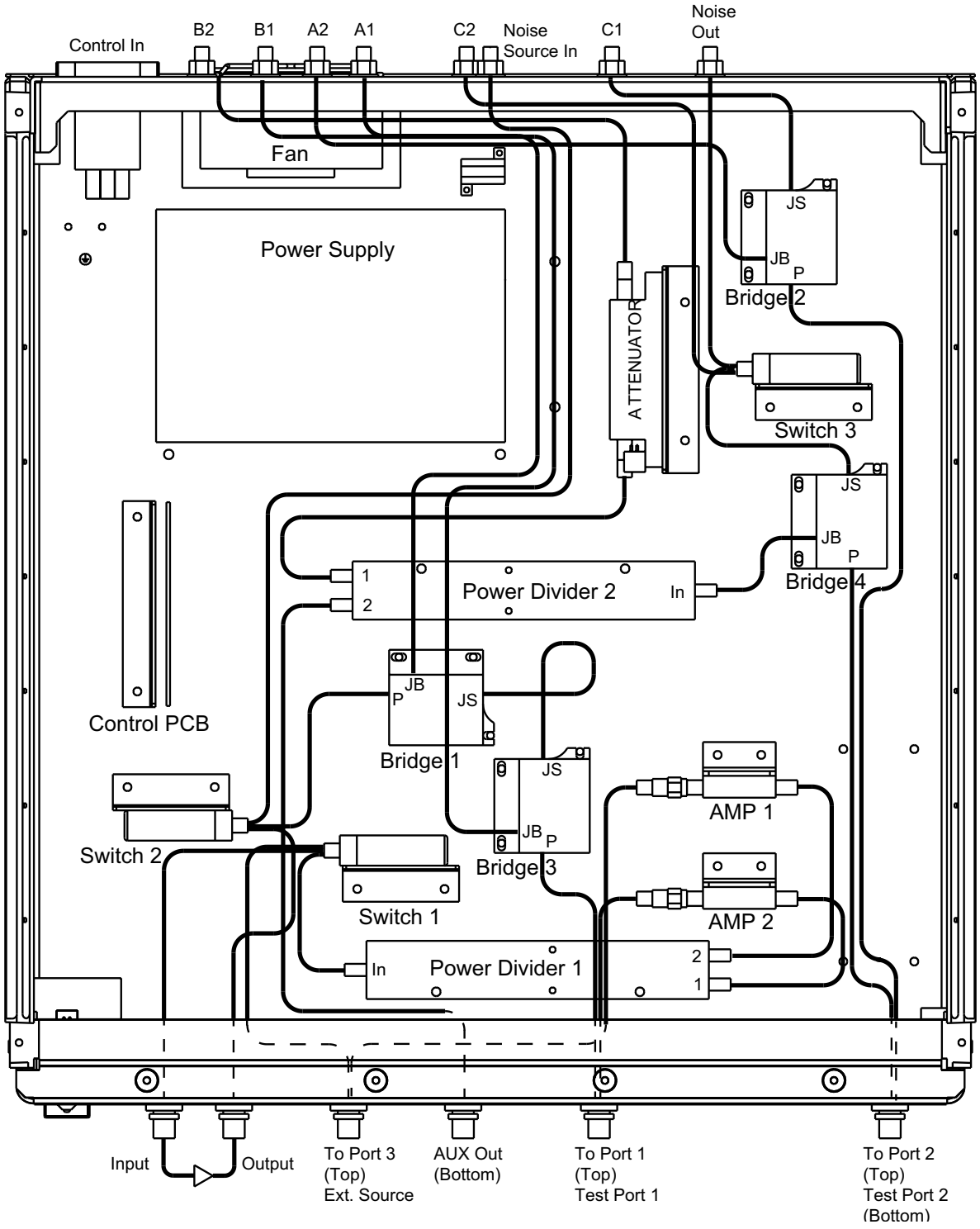


Figure 2-3. *Major Assemblies Cabling Diagram (Top View)*

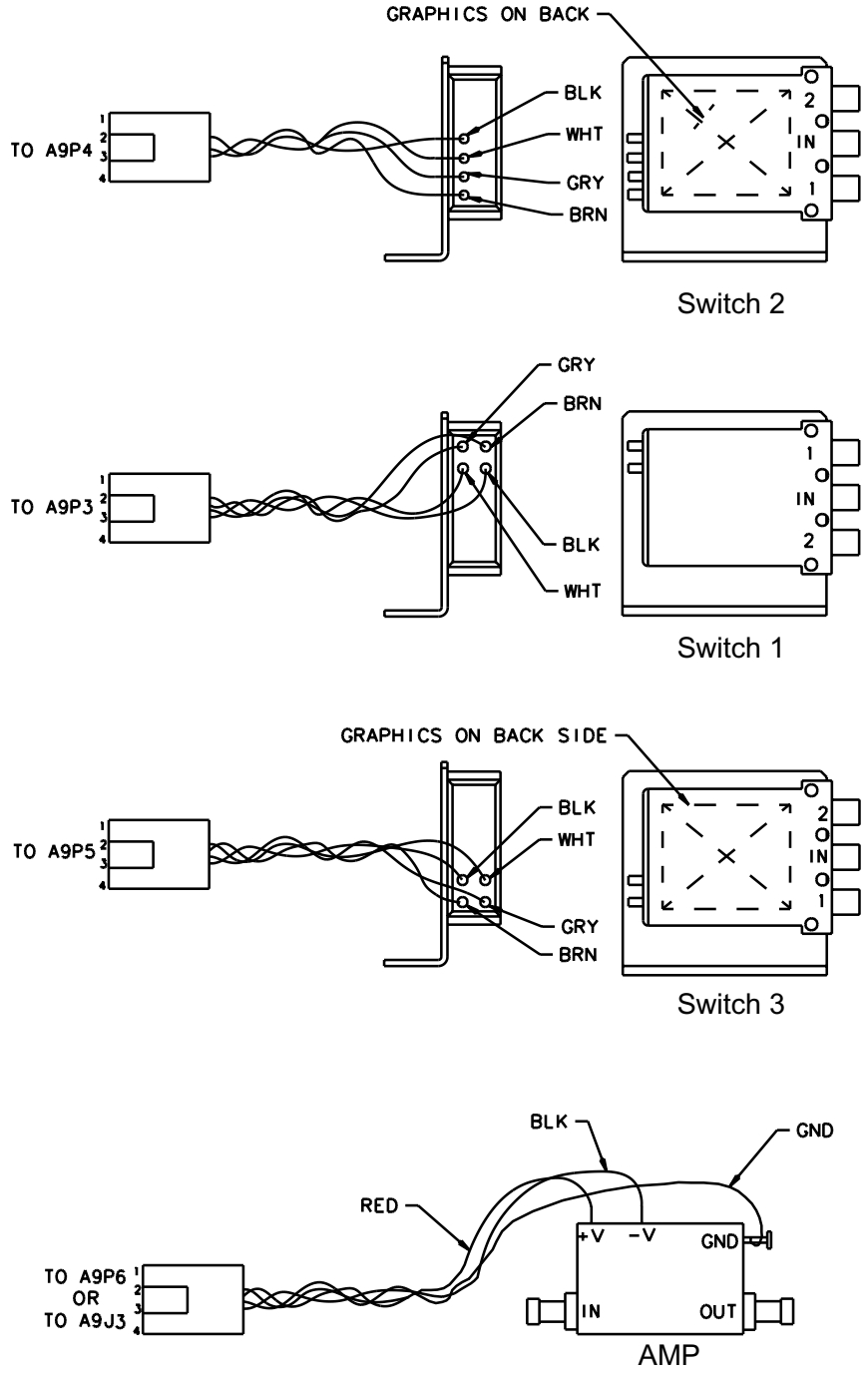


Figure 2-4. *Component Wiring Diagram*

Chapter 3
Performance Verification Procedure

3-1 INTRODUCTION

The following are the specific tests that should be used to verify the performance of the Power Amplifier Test System ME7840 with Option 4 (ME7840/4):

- MS462XC Source Output Level Accuracy Test
- Directivity and Test Port Match Verification
- Dynamic Range Verification

3-2 CONVENTIONS

The test instructions in this chapter will direct the use of front panel hard keys and soft keys. The hard keys and soft keys will appear in 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 DIAGNOSTICS, TROUBLESHOOTING, MORE, and VERIFY ALC CALIBRATION are all soft keys.

3-3 SOURCE OUTPUT ACCURACY

This test verifies the source output accuracy of the MS462XC. The test procedure uses the built-in Power ALC Verification function of the MS462XC Basic Measurement software.

Required Equipment: The following equipment is required to perform the Source Output Accuracy verification procedure:

- Anritsu ML2437A/ML2438A Power Meter
- Anritsu MA2472A Power Sensor or equivalent

Setup: Set up the test equipment as described below:

Step 1. Connect a GPIB cable between the power meter GPIB connector and the MS462XC dedicated GPIB connector, as shown in Figure 3-1.

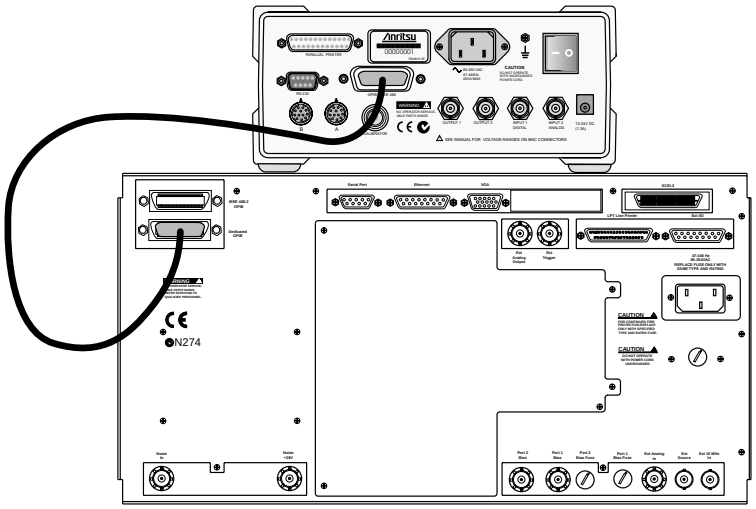


Figure 3-1. *ML2430A Series Power Meter GPIB connection to the MS462XC Vector Network Measurement System*

Step 2. Turn on the MS462XC VNMS and allow it to warm-up for at least one hour.

Test Procedure:

Step 1. Disconnect the interconnect cables between the output Port 1 of the MS462XC and the input Port 1 of the MN4782A test set and between the output Port 3 of the MS462XC and the input Port 3 of the MN4783A test set.

Step 2. Press the Utility key and select:

DIAGNOSTICS
TROUBLESHOOTING
MORE
VERIFY ALC CALIBRATION

Step 3. Calibrate and zero the power sensor.

Step 4. Connect the power sensor to Port 1 of the MS462XC and select the START VERIFICATION soft key.

Step 5. Verify that Source 1 passes this test.

> ***NOTE***
> Only the worst case test result will be displayed on the screen when the instrument fails this test. The failed test result is also recorded in the Service Log.

Step 6. Press the SELECT SOURCE soft key to select Source 2.

Step 7. Connect the power sensor to Port 3 of the MS462XC and select the START VERIFICATION soft key.

Step 8. Verify that Source 2 passes this test.

> ***CAUTION***
> The TROUBLESHOOTING function must be properly exited to restore normal measurement operation.

Step 9. Exit the TROUBLESHOOTING mode by selecting the menu soft keys as follows:

RETURN
RETURN
FINISHED, RECOVER FROM TROUBLESHOOTING

Step 10. Reconnect the interconnect cables between the output Port 1 of the MS462XC and the input Port 1 of the MN4783A test set and between the output Port 3 of the MS462XC and the input Port 3 of the MN4783A test set.

3-4 DIRECTIVITY AND TEST PORT MATCH

This procedure verifies that the corrected directivity (effective directivity) and test port match (effective test port match) of the system meets specifications.

Required Equipment: The following equipment is required to perform the Directivity and Test Port Match verification procedure:

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

Setup: Set up the test equipment as described below:

Step 1. Turn on the MS462XC VNMS and the MN4783A test set and allow them to warm-up for at least one hour.

Step 2. Press the Default key, then the 0 key.

Step 3. Press the Seq key and select:

TTL I/O
PARALLEL OUT SETUP
SET PARALLEL OUT PORT (0-255)

Step 4. Change the value from 0 to 8 and Select:

RETURN
RETURN

Step 5. Press the Display key and select:

DISPLAY MODE
SINGLE CHANNEL
RETURN
GRAPH TYPE
LOG MAGNITUDE

Test Procedure:

Step 1. If the calibration kit is an Anritsu Model 3753LF, insert the Calibration Component Coefficients disk into the MS462XC floppy disk drive. For the Model 3753R calibration kit, skip to Step 3.

Step 2. Press the Cal key and select:

COMPONENT UTILITIES
INSTALL KIT INFO FROM FLOPPY DISK
RETURN
PERFORM CAL 2 PORT

Step 3. Follow the prompts and select: (If skipped to step 3, what prompts?)

CAL METHOD: STANDARD
LINE TYPE: COAXIAL
SELECT CALIBRATION TYPE: REFLECTION ONLY – PORT 1 ONLY
FREQUENCY RANGE OF CALIBRATION: 10 MHz TO 6000 MHz
SELECT CALIBRATION DATA POINTS: NORMAL
DATA POINTS: 401 POINTS
PORT 1 CONNECTOR TYPE: N (F)
LOAD TYPE: BROADBAND LOAD

Step 4. Select the START CAL soft key to begin the calibration.

Step 5. Install the calibration device per the instruction on the display and select the appropriate soft key to measure the calibration device.

Step 6. When the message, "CALIBRATION SEQUENCE COMPLETED" is displayed, press the Enter key to continue.

Step 7. Connect the N male connector end of the Air Line to Test Port 1 of the MN4783A and terminate the GPC-7 connector end of the Air Line with a Short.

Step 8. Press the Display key and select AUTO SCALE.

Step 9. Press the Marker key and select READOUT MARKERS.

Step 10. Turn on Marker 1, Marker 2, and Marker 3. Find the largest ripple between 10 MHz and 3 GHz.

Step 11. Using the rotary knob, position Marker 1 and Marker 2 to adjacent peaks of the ripple with the greatest negative trough (or adjacent troughs if the ripple has the greatest positive peak). Also, position Marker 3 to the bottom of the trough (or the top of the peak if the ripple has the greatest positive peak). Refer to Figure 3-2 below.

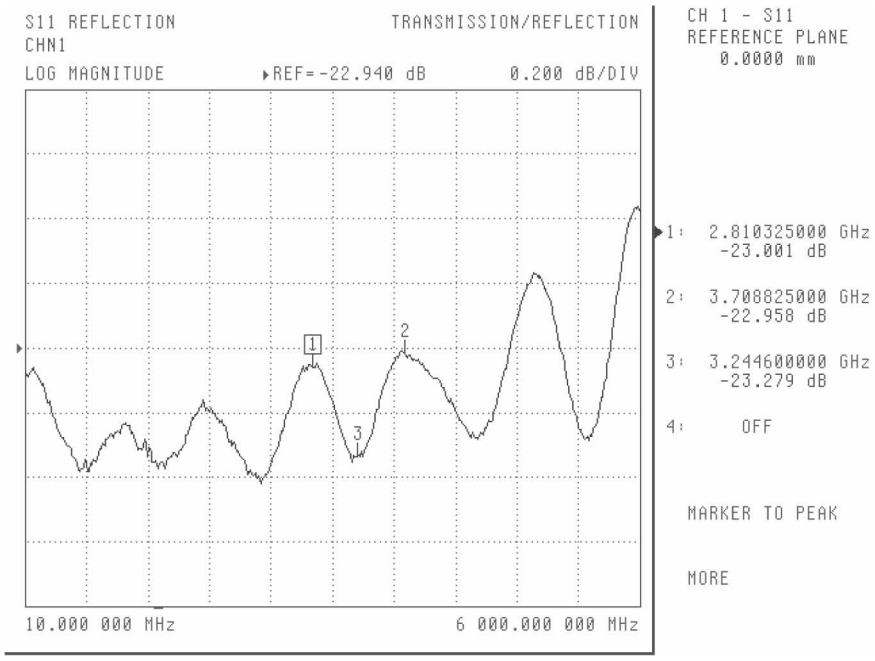


Figure 3-2. *Return Loss Measurement Display*

Step 12. Record the values of Marker 1 and Marker 2. Sum the two values and divide the result by 2 (see the formula below). This is the average value of the two peaks (or troughs). Record this average value.

3-5 SYSTEM DYNAMIC RANGE

This test verifies the test system's dynamic range.

Equipment Required: The following equipment is required to perform the System Dynamic Range verification procedure:

- Anritsu 3753LF or 3753R Calibration Kit
- Anritsu 3670NN50-2 Cable or equivalent

Setup:

Step 1. Turn on the MS462XC VNMS and the MN4783A test set and allow them to warm-up for one hour.

Step 2. Press the Default key, then the 0 key to reset the system.

Step 3. Press the Seq key and select:

TTL I/O
PARALLEL OUT SETUP
SET PARALLEL OUT PORT (0-255)

Step 4. Change the PARALLEL OUT PORT value from 0 to 8.

Step 5. Select:

RETURN
RETURN

Step 6. Press the Ch 3 key.

Step 7. Press the Display key and select:

DISPLAY MODE
SINGLE CHANNEL
RETURN
GRAPH TYPE
LOG MAGNITUDE

Step 8. Press the Power key and select the SOURCE 1 SETUP soft key.

Step 9. Change SOURCE 1 POWER to 10 dBm.

Test Procedure:

Step 1. Press the Cal key and select:

PERFORM CAL 2 PORT
NEXT CAL STEP
TRANSMISSION FREQUENCY RESPONSE
FORWARD PATH (S_{21})
INCLUDE ISOLATION (STANDARD)
N-DISCRETE FREQUENCIES (2 TO 1601 POINTS)

Step 2. Change START FREQ to 100 MHz and NUMBER OF POINTS to 60 POINT(S).

Step 3. Select the FILL THE RANGE soft key.
(60 ENTERED) will be displayed beneath FILL THE RANGE.

Step 4. Select the INDIVIDUAL FREQ INSERT soft key.

Step 5. Verify that the NEXT FREQUENCY value is 10 MHz. If not, change the value to 10 MHz.

Step 6. Select:

INSERT NET FREQUENCY
RETURN
NEXT CAL STEP
START CAL

Step 7. Install the calibration device per the instructions on the display and select the appropriate soft key to start the measurement.

Step 8. When prompted to connect the isolation device, press the Avg key and select:

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

Step 9. Select the MEASURE BOTH PORTS soft key to continue.

Step 10. When the software display prompts you for a throughline, connect a cable between Test Port 1 and Test Port 2 of the MN4783A test set.

Step 11. When the message, "CALIBRATION SEQUENCE COMPLETED" is displayed, press the Enter key to continue.

Step 12. Press the Avg key and select:

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

Step 13. Remove the through cable between Test Port 1 and Test Port 2 of the MN4783A test set and connect terminations to both test ports.

Step 14. Press the Display key, then select SCALE.

Step 15. Set the REFERENCE VALUE to –80.

Step 16. Verify that the trace is less than:

- –80 dB from 10 MHz to 100 MHz
- –80 dB from 100 MHz to 3 GHz
- –70 dB from 3 GHz to 6 GHz.

Table 3-1. *RF Measurement Chart*

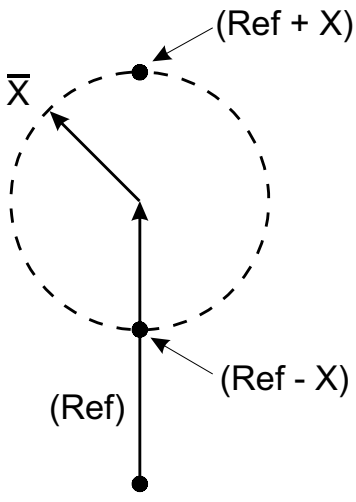
The first three columns are conversion tables for return loss, reflection coefficient, and SWR.

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

Chapter 4
Troubleshooting

4-1 INTRODUCTION

The tests in this section provide a method of testing the MN4783A test set for proper operation. These tests are intended to be used as a troubleshooting tool for checking the operational functionality of the components in the MN4783A.

> ***CAUTION***
>
> Prior to performing these tests, the MS462XC must be verified to be in good condition.

WARNING

> ***WARNING***
>
> Hazardous voltages are present inside the instrument when the 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.

4-2 TROUBLESHOOTING

Troubleshooting consists of isolating and repairing failures to the assembly level. The following failures are covered in this manual:

- Power Up Failure
- Directivity and Test Port Match Failure
- Dynamic Range Failure

Power Up Failure If the MN4783A test set does not power up when connected to an AC power source and the Power key is pressed, perform the power supply checks described below:

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

> ***Note***
> The MN4783A is designed to automatically sense and operate with an AC line voltage 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 (2A, Slow Blow, part number 631-82).

Step 4. Turn off the test set and disconnect the power cord from the instrument. Ensure that all external cable connections to the test set front and rear panel are also disconnected.

Step 5. Remove the top cover.

Step 6. Reconnect the power cord to the test set and turn it on.

Step 7. Using a digital multimeter or an oscilloscope, measure the DC power supply voltages listed in Table 4-1 (following page) by connecting the digital multimeter or oscilloscope to the test points on the Controller PCB assembly (shown in Figure 4-1 on the following page).

Step 8. If any of the DC voltage tests fail, replace the DC power supply as described in the removal and replacement procedures on page 5-8.

Table 4-1. *Power Supply Troubleshooting Connections*

Measured Pin	Common Pin	DC Supply Voltage
TP2	TP1	+5 ± 0.05V
TP3	TP1	+8 ± 0.08V
TP4	TP1	+12 ± 0.12V
TP5	TP1	-8 ± 0.08V

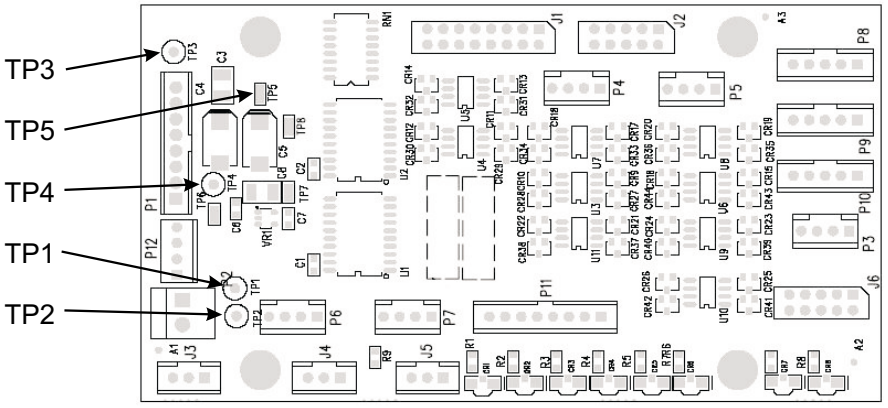


Figure 4-1. *Power Supply Troubleshooting Connections*

Directivity and Test Port Match Failure

If the system fails any of the directivity and test port match tests, perform the following initial checks:

Step 1. Use a different calibration kit for measurement calibration and repeat the Directivity Test. This step determines whether the calibration kit is the cause of the failure.

Step 2. Verify the performance of the MS462XC per Chapter 3 of the MS462XX Maintenance Manual (part number 10410-00205). This step determines whether the MS462XC is the cause of the failure.

Step 3. If both the calibration kit and the MS462XC are okay, then go to the next appropriate section of this troubleshooting procedure.

If the system fails the Directivity and Test Port Match tests at Port 1, perform the following checks:

Step 1. Perform the Port Module A check (refer to Section 4-5).

Step 2. If the insertion loss is too high, replace Port Module A (refer to the removal and replacement procedures for Bridge 1 on page 5-12).

Step 3. Verify that the directivity and test port match are now within specifications.

Step 4. Perform the Port Module B check (refer to Section 4-5).

Step 5. If the insertion loss is too high, replace Port Module B (refer to the removal and replacement procedures for Bridge 3 on page 5-12).

Step 6. Verify that the directivity and test port match are now within specifications.

Step 7. If the tests continue to fail, replace Switch 2 (refer to the removal and replacement procedures for Switch 2 on page 5-10).

Step 8. Verify that the directivity and test port match are now within specifications.

Step 9. If the tests continue to fail, perform the Combiner check (refer to Section 4-4).

If the System fails the Directivity and Test Port Match tests at Port 2, perform the following checks:

Step 1. Perform the Port Module C check (refer to Section 4-5).

Step 2. If the insertion loss is too high, replace Port Module C (refer to the removal and replacement procedures for Bridge 4 on page 5-12).

Step 3. Verify that the directivity and test port match are now within specifications.

Step 4. Perform the Port Module D check (refer to Section 4-5).

Step 5. If the test fails, replace Port Module D (refer to the removal and replacement procedures for Bridge 2 on page 5-12).

Step 6. Verify that the directivity and test port match are now within specifications.

Step 7. Perform the Test Channel Step Attenuator check (refer to Section 4-6).

Step 8. If the test fails, replace the Test Channel Step Attenuator (refer to the removal and replacement procedures for the Step Attenuator on page 5-6).

Step 9. Verify that the directivity and test port match are now within specifications.

Step 10. If the test fails, replace the Power Divider (refer to the removal and replacement procedures for Power Divider 1 on page 5-7).

Dynamic Range Failure If the system fails the Dynamic Range test, perform the following procedure:

Step 1. Verify the performance of the MS462XC per Chapter 3 of the MS462XX Maintenance Manual (part number 10410-00205). This step determines whether the MS462XC is the cause of the failure.

Step 2. Perform the Port Module D Check (refer to Section 4-5).

Step 3. If the test fails, replace Port Module D (refer to the removal and replacement procedures for Bridge 2 on page 5-12).

Step 4. Verify that the system dynamic range is now within specifications.

Step 5. Perform the Test Channel Step Attenuator check (refer to Section 4-6).

Step 6. If the test fails, replace the Test Channel Step Attenuator (refer to the removal and replacement procedures for the Step Attenuator on page 5-6).

Step 7. Verify that the system dynamic range is now within specifications.

Step 8. If the test fails, replace the Power Divider (refer to the removal and replacement procedures for Power Divider 2 on page 5-7).

4-3 OPERATIONAL CHECK

Operational tests for the MN4783A consists of the following:

- Combiner Check
- Port Module Check
- Test Channel Step Attenuator Check

4-4 COMBINER CHECK

This test checks whether the Combiner functions properly.

Equipment Required: The following equipment is required to perform the Combiner check:

- ❑ Anritsu ML243XA Power Meter
- ❑ Anritsu MA2472A Power Sensor
- ❑ Anritsu 2100-2 GPIB Interface Cable
- ❑ Anritsu 34NFNF50 Adapter
- ❑ Anritsu 3670NN50-2 Through Cable or Anritsu 15NN50-0.6B Cable

Setup: Set up the equipment as shown in Figure 4-2.

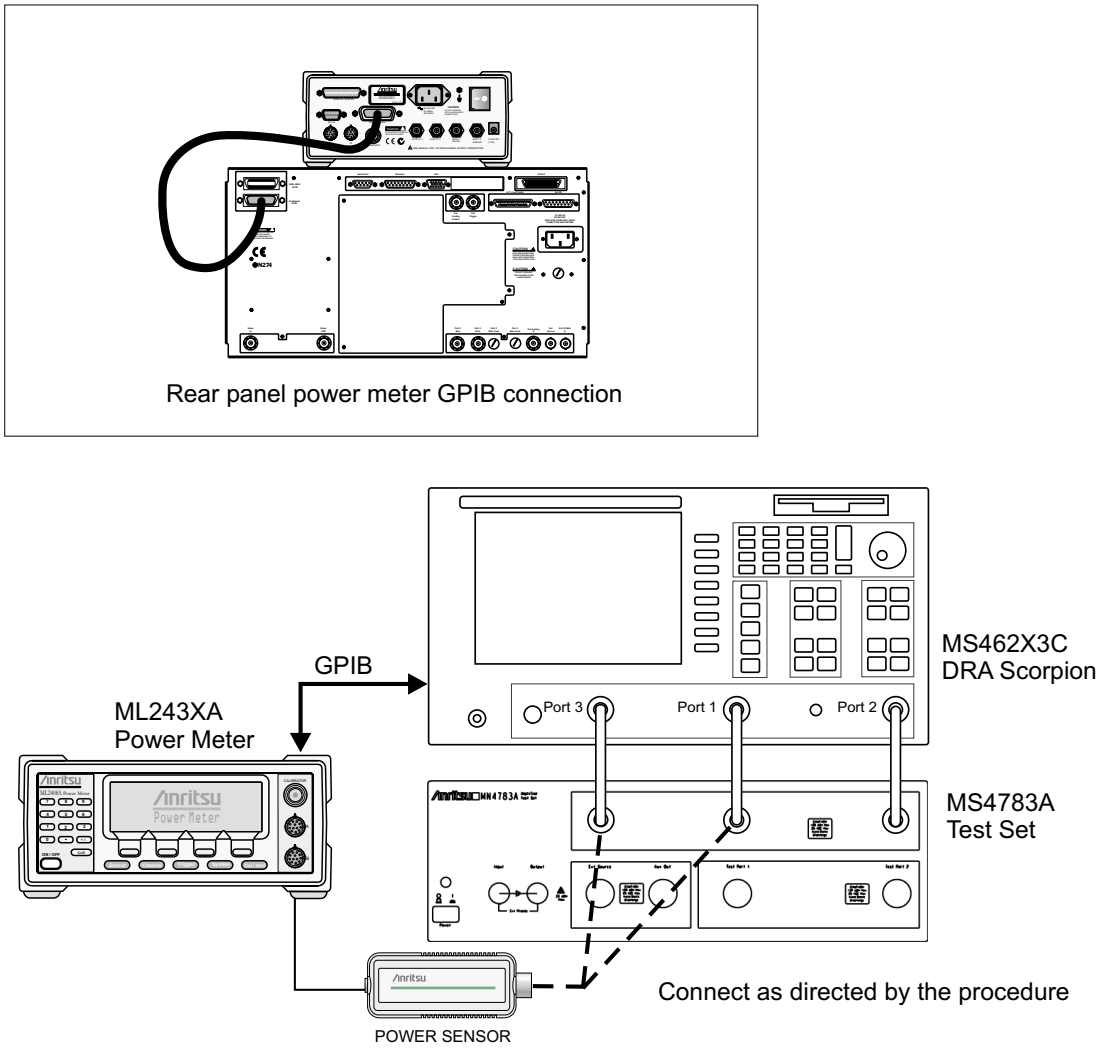


Figure 4-2. *Test Equipment Setup for Combiner Check*

Step 1. Turn on the ML243XA power meter, MS462XC Vector Network Measurement System, and the MN4783A test set. Allow the instruments to warm-up for one hour.

Step 2. Press the Default key, then the 0 key to reset the MS462XC.

Step 3. Change the START frequency to 500 MHz.

Step 4. Change the STOP frequency to 6000 MHz.

Step 5. Press the Seq key.

Step 6. Select:

TTL I/O
PARALLEL OUT SETUP
SET PARALLEL OUT PORT (0-255)

Step 7. Change the value from 0 to 8.

Step 8. Select:

RETURN
RETURN

Step 9. Press the Display key.

Step 10. Select:

DISPLAY MODE
SINGLE CHANNEL
RETURN
GRAPH TYPE
LOG MAGNITUDE
RETURN

Step 11. Press the Meas key.

Step 12. Select:

MORE
S23
MORE
USER DEFINED
CHANGE RATIO
b2 (Tb)
1
S23/USER 6
RETURN

Step 13. Press the Ch 3 key, then the Display key.

Step 14. Select:

GRAPH TYPE
LOG MAGNITUDE
RETURN

Step 15. Press the Meas key.

Step 16. Select:

MORE
S21
MORE
USER DEFINED
CHANGE RATIO
b2 (Tb)
1
S21/USER 1
RETURN

Step 17. Press the Config key.

Step 18. Select:

DATA POINTS
201 MAX PTS

Step 19. Disconnect the N male connector of the interconnect RF cable from the "To Port 1" front panel connector. Refer to Figure 4-2.

Step 20. Zero and calibrate the power sensor. Install the 34NFNF50 adapter to the input of the Power Sensor.

Step 21. Connect the Power Sensor to the end of the RF cable.

Step 22. Press Power key.

Step 23. Select:

SOURCE 1 SETUP
FLAT TEST PORT POWER CAL
POWER TARGET 0.00 dBm
BEGIN CAL

Step 24. After the calibration is complete, remove the power sensor from the RF cable and reconnect the cable to "To Port 1" front panel connector.

Step 25. Disconnect the N male connector of the interconnect RF cable from the "To Port 3" front panel connector. Refer to Figure 4-2.

Step 26. Connect the power sensor to the end of the RF cable.

Step 27. Press the Power key.

Step 28. Select:

SOURCE 2 SETUP
FLAT TEST PORT POWER CAL
POWER TARGET 0.00 dBm
BEGIN CAL

Step 29. After the calibration is complete, remove the power sensor from the RF cable and reconnect the cable to the "To Port 3" front panel connector.

Test Procedure:

Step 1. Connect a through cable between Test Port 1 and Test Port 2 of the MN4783A test set.

Step 2. Press the Display key.

Step 3. Select:

TRACE MEMORY

Step 4. Allow the trace to sweep twice.

Step 5. Select:

STORE DATA TO MEMORY
DISK OPERATIONS
SAVE MEMORY TO HARD DISK
CREATE NEW FILE

Step 6. Enter "COMBTST" as the file name and select DONE to save the data to the hard disk.

Step 7. Press the CH1 key.

Step 8. Press the Display key.

Step 9. Select:

TRACE MEMORY
DISK OPERATIONS
RECALL MEMORY FROM HARD DISK
COMBTST NRM
VIEW DATA (/) MEMORY

Step 10. Verify that the slope of the displayed trace is less than 1 dB.

Step 11. If the slope is larger than 1 dB, compare the two traces and determine whether the Port 1 or Port 3 path is the cause of the problem. Replace the appropriate amplifier or combiner as needed.

4-5 PORT MODULE CHECK

This test checks whether the Port 1 and Port 2 modules function properly.

Equipment Required: The following equipment is required to perform the port module check:

- Gore PhaseFlex™ cables (p/n EJD01D01048.0) (2 each) or equivalent
- Anritsu 34SFSF50 adapter or equivalent
- Anritsu 34NKF50 adapters (2 each) or equivalent
- Anritsu 28N50LF termination or equivalent
- Anritsu 28L50LF termination or equivalent

Setup: Set up the test equipment as described below:

Step 1. Disconnect all inter-connect RF cables between the MS462XC Vector Network Measurement System and the MN4783A test set.

> ***NOTE***
> Do not disconnect the cable connected between Ext I/O port of the MS462XC and Control In port of the MN4783A.

Step 2. Connect the MS462XC as shown in Figure 4-3.

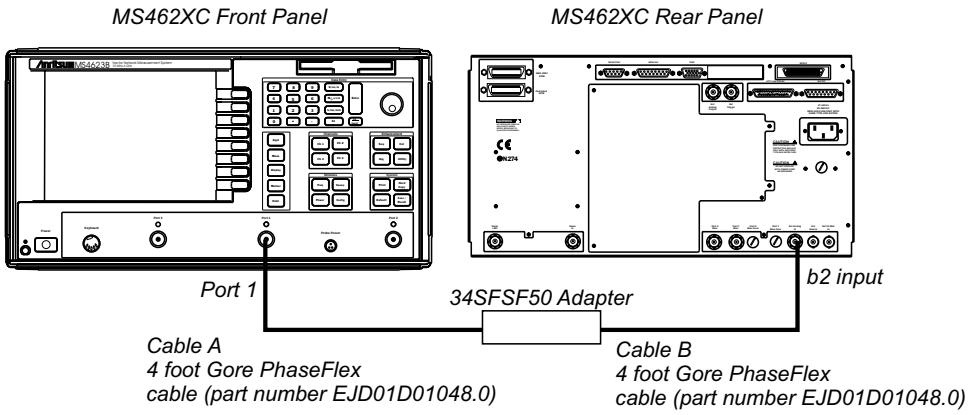


Figure 4-3. *Coupler Check Test Setup*

Step 3. Connect a through cable between the C1 and C2 connector ports of the MN4783A.

Step 4. Turn on the MS462XC Vector Network Measurement System and the MN4783A test set. Allow the system to warm-up for one hour.

Step 5. Press the Default key, then the 0 key to reset the MS462XC.

Step 6. Change the START frequency to 10 MHz.

Step 7. Change the STOP frequency to 6000 MHz.

Step 8. Press the Ch3 key, then the Display key.

Step 9. Select:

DISPLAY MODE
SINGLE CHANNEL
RETURN
GRAPH TYPE
LOG MAGNITUDE
RETURN

Step 10. Press the Meas key.

Step 11. Select:

MORE
S21
MORE
USER DEFINED
CHANGE RATIO
b2 (Tb)
1
S21/USER 1
RETURN

Step 12. Press Power key.

Step 13. Select:

SOURCE 1 SETUP
PORT 1 ATTN 2*10 dB (0 – 70)

Step 14. Verify that the PORT 1 POWER is below –15 dBm. Adjust the SOURCE 1 POWER control if necessary.

Step 15. Connect the two cables together with the 34SFSF50 adapter.

Step 16. Press the Display key.

Step 17. Select:

TRACE MEMORY

Step 18. Allow the trace to sweep twice, then select:

STORE DATA TO MEMORY
VIEW DATA (/) MEMORY

Step 19. Disconnect the connection between cable A and cable B at the adapter.

Test Procedure:

Step 1. Disconnect the Ext Pre-Amp RF loop cable between the Input and Output connectors.

Step 2. Connect cable A, cable B, and the terminations to the connector ports as indicated in Table 4-3. Refer to Figure 4-3 and Figure 4-4 (following page) for the connector locations.

Table 4-3. *Troubleshooting Connections*

Tests	Cable A (from Port 1 of MS462XC)	Cable B (to b1 Input of MS462XC)	Termination	Insertion Loss
A	External Pre-Amp Output connector of the MN4783A	a1 Output connector of the MN4783A	Test Port 1 connector	≤ 21 dB
B	Test Port 1 connector of the MN4783A	b1 Output connector of the MN4783A	Ext Pre-Amp Output connector of the MN4783A	≤ 21 dB
C	Test Port 2 connector of the MN4783A	Aux Out connector of the MN4783A	b2 Output connector and To Port 2 connector of the MN4783A	≤24 dB
D	To Port 2 connector of the MN4783A	a2 Output connector of the MN4783A	C1 connector of the MN4783A	≤ 21 dB

Step 3. Verify that the insertion loss in the corresponding path is within the tolerance as stated in Table 4-3.

Step 4. Repeat the test for the rest of the signal paths stated in Table 4-3.

Step 5. Reconnect all of the inter-connect RF cables between the MS462XC Vector Network Measurement System and MN4783A test set. Also, reconnect the Ext Pre Amp RF loop cable.

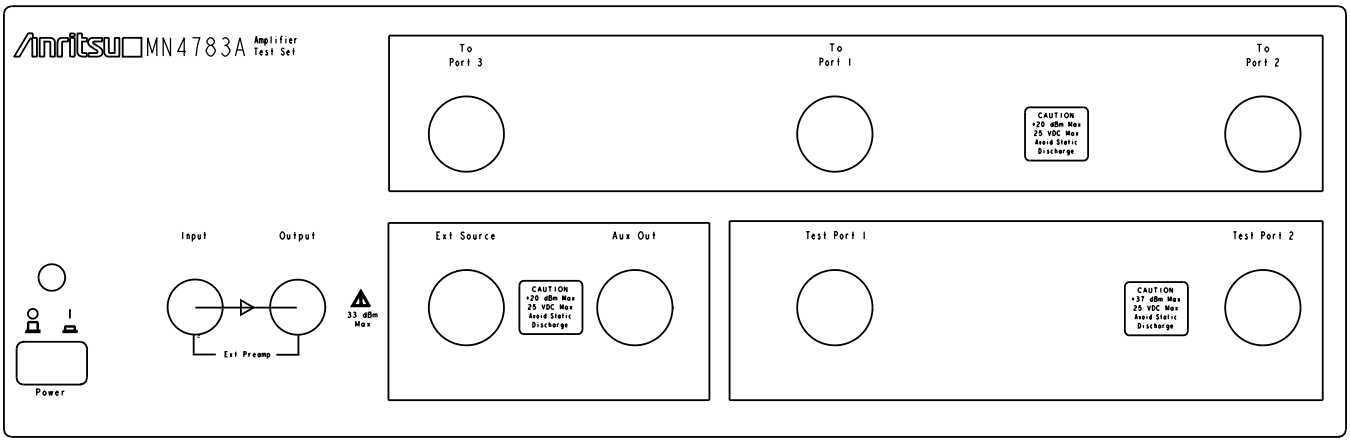


Figure 4-3. *Test Set Front Panel*

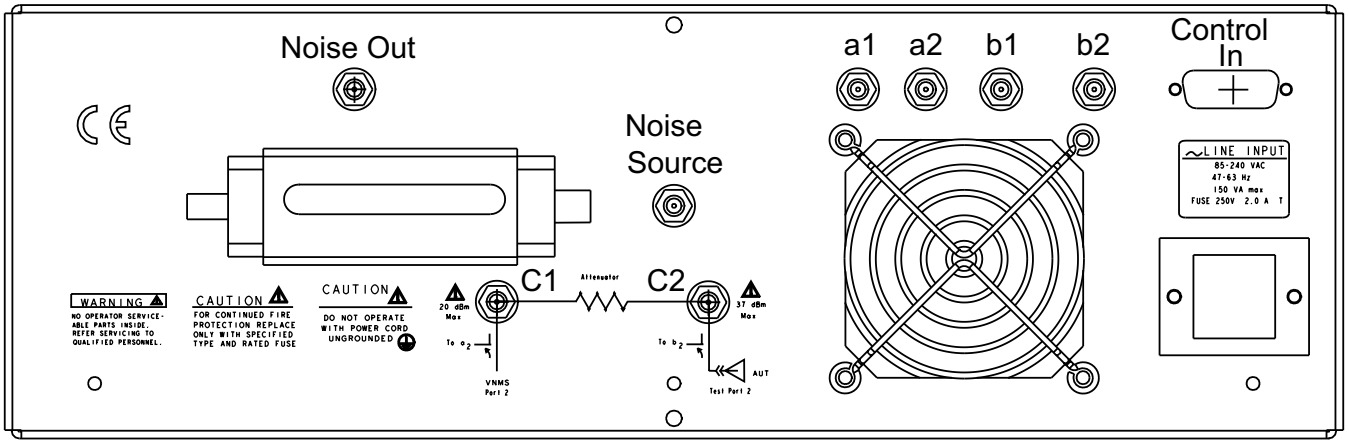


Figure 4-4. *Test Set Rear Panel*

4-6 TEST CHANNEL STEP ATTENUATOR CHECK

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

Setup: Set up the test equipment as described below:

Step 1. Turn on the MS462XC Vector Network Measurement System and the MN4783A test set and allow the equipment to warm-up for one hour.

Step 2. Press the Default key and then 0 key.

Step 3. Press the Seq key.

Step 4. Select:

TTL I/O
PARALLEL OUT SETUP
SET PARALLEL OUT PORT (0-255)

Step 5. Change the value from 0 to 8.

Step 6. Select:

RETURN
RETURN

Step 7. Press the Display key.

Step 8. Select:

DISPLAY MODE
SINGLE CHANNEL
RETURN

Step 9. Press the Ch 3 key, then the Display key.

Step 10. Select:

GRAPH TYPE
LOG MAGNITUDE
RETURN

Step 11. Press the Avg key.

Step 12. Select:

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

Test Procedure:

Step 1. Connect a through cable between Test Port 1 and Test Port 2.

Step 2. Select:

TRACE MEMORY

Step 3. Allow the trace to sweep twice.

Step 4. Select:

STORE DATA TO MEMORY
VIEW DATA (/) MEMORY
RETURN

Step 5. Select:

SCALE
10 dB/DIV

Step 6. Press the Seq key.

Step 7. Select:

TTL I/O
PARALLEL OUT SETUP
SET PARALLEL OUT PORT (0-255)

Step 8. Change the SET PARALLEL OUT PORT value to 9.

Step 9. Verify that the displayed S21 trace is within the range specified in Table 4-6.

Table 4-6. *Step Attenuator Specifications*

Parallel Out Port Value	Corresponding Step Attenuator Setting	Expected Range
9	10 dB	10 ± 1 dB
10	20 dB	20 ± 1 dB
12	40 dB	40 ± 2 dB

Step 10. Repeat Step 7 and Step 8 for the other PARALLEL OUT PORT values listed in Table 4-6.

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 ME7840/4 test system by disconnecting all cable connections and separating the test set from the MS462XC.

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 1. 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 them 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 2. To remove the top cover:

a. Place the test set in the 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 3. 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 the rear of the bottom cover.

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

Step 4. 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 5. 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 the rear of the left side cover.

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

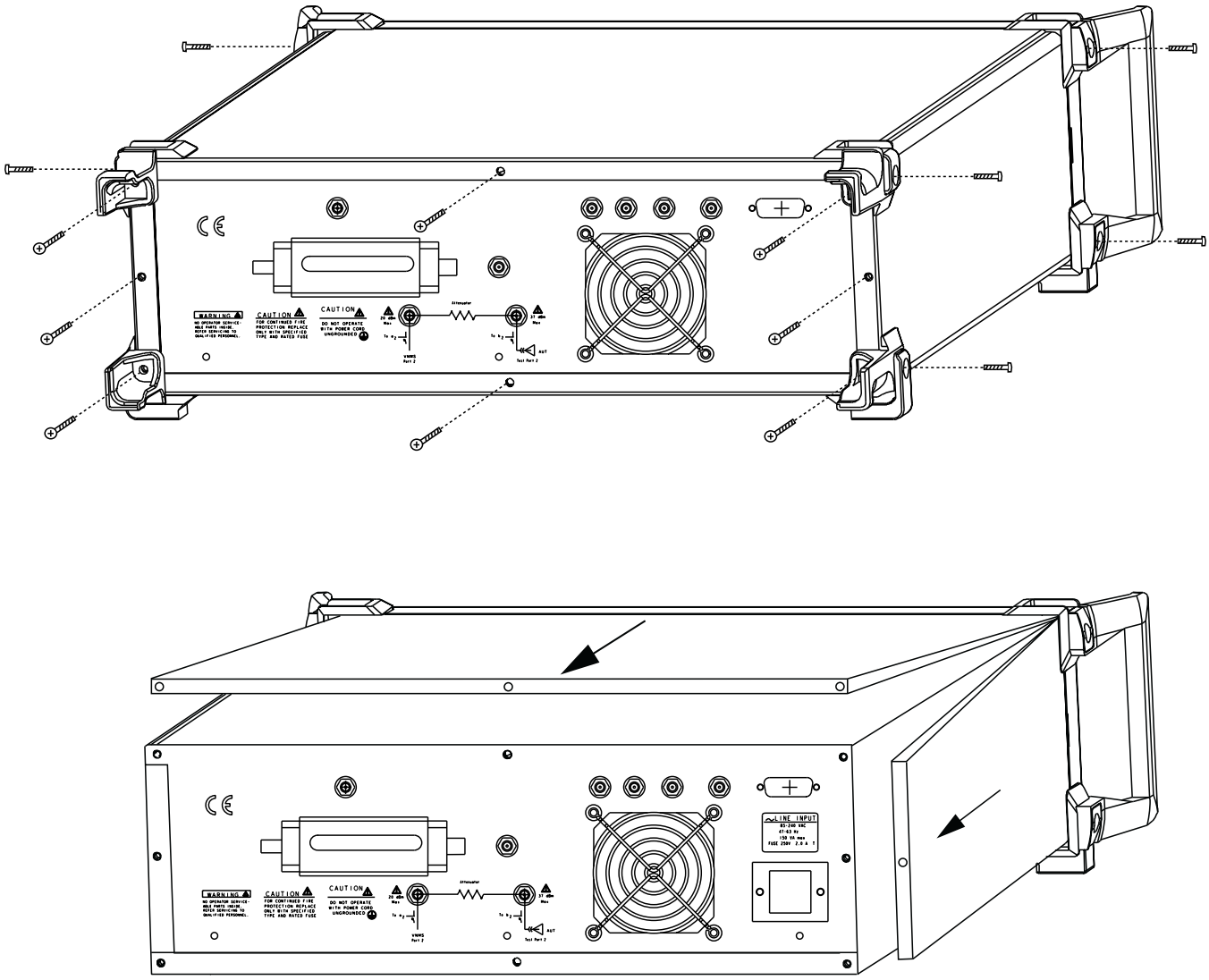


Figure 5-1. *MN4783A Test Set Cover Removal*

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

5-4 CONTROL PCB

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

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

Step 2. Disconnect the wires from connectors P1, P6, P8, P9, P10, J1, J2, J3, J4, and J5on the Control PCB (Figure 5-2).

Step 3. Use a #1 Phillips screwdriver to remove the four mounting screws.

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

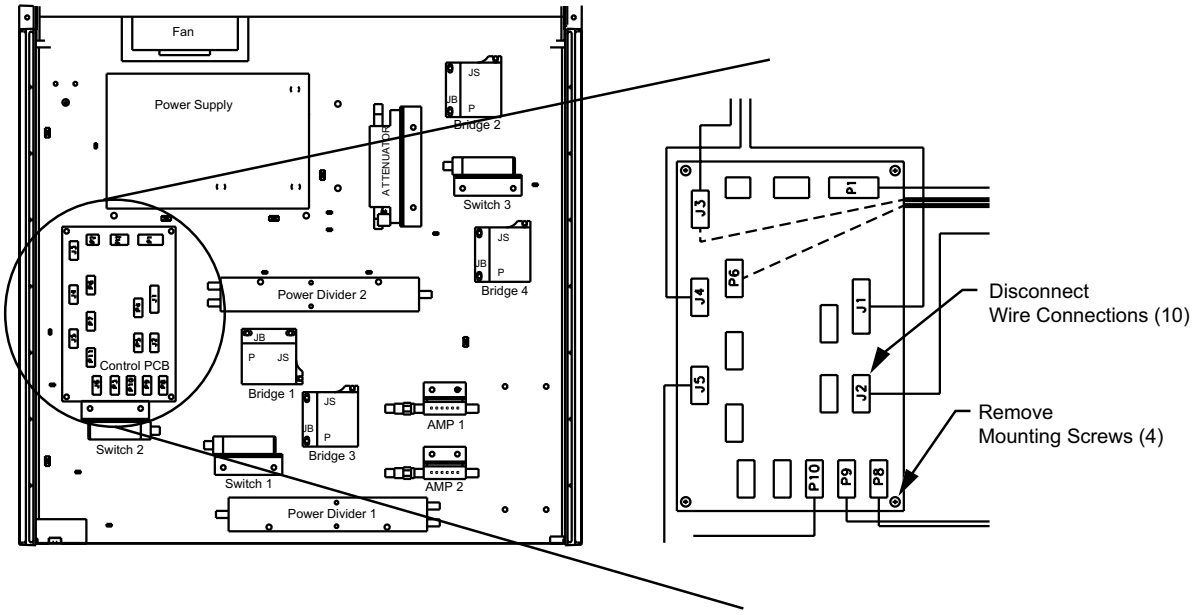


Figure 5-2. *Control PCB Removal*

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

5-5 RF AMPLIFIERS

This Section provides a procedure for removing and replacing the two RF Amplifiers in the test set.

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

Step 2. Disconnect the two RF cables from the RF amplifier with a 5/16-inch wrench (Figure 5-3).

Step 3. Disconnect the appropriate supply wire from J3 or P6 on the Control PCB.

Step 4. Remove the two amplifier mounting screws from the mounting bracket with a #1 Phillips screwdriver.

Step 5. Lift the amplifier out from the test set chassis.

Step 6. Remove the two Phillips screws that secure the amplifier to the mounting bracket.

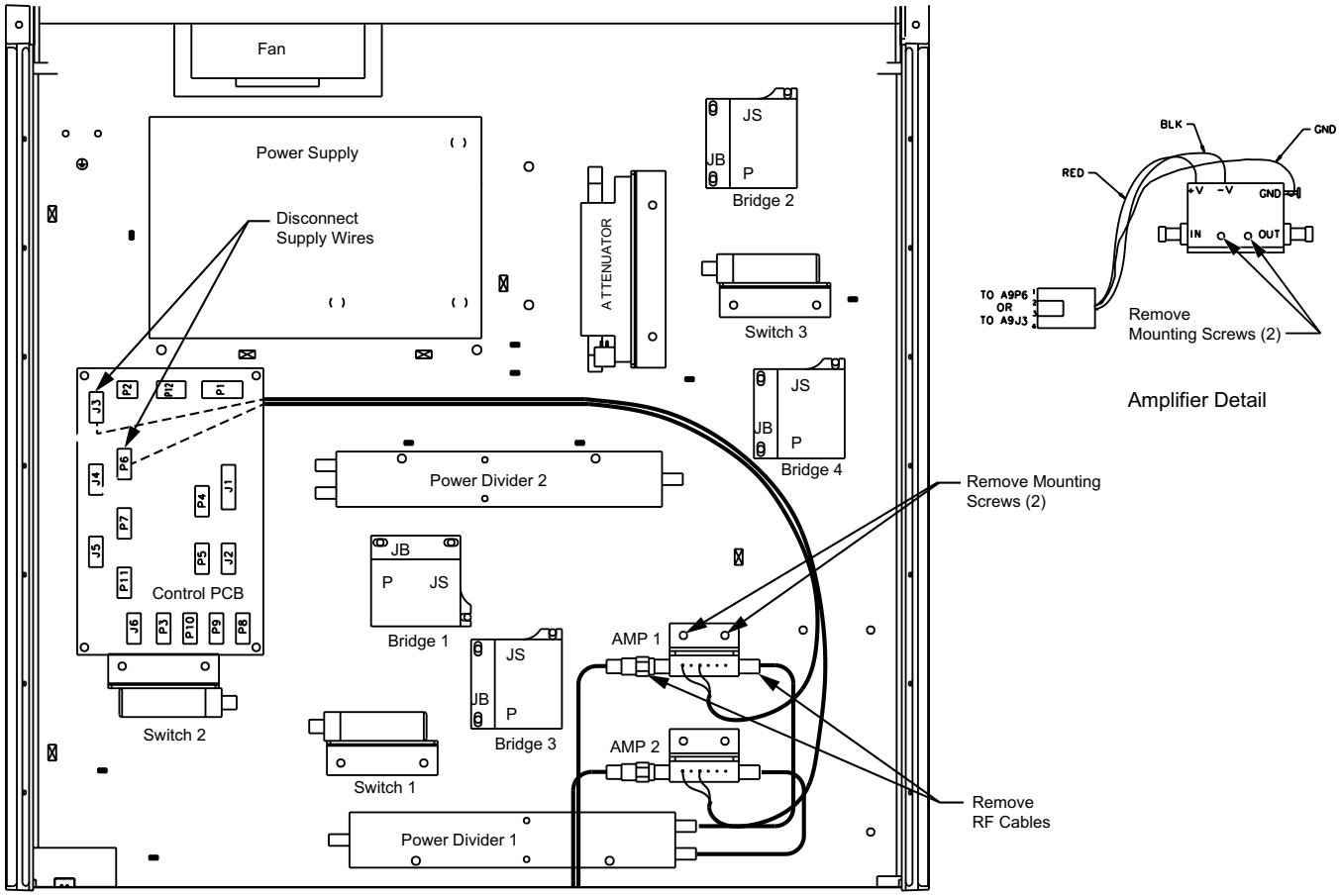


Figure 5-3. *Amplifier 1 and Amplifier 2 Removal*

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

5-6 STEP ATTENUATOR

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

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

Step 2. Disconnect the Step Attenuator ribbon-cable from the 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 Step Attenuator mounting screws from the mounting bracket with a #1 Phillips screwdriver.

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

Step 6. Remove the two larger Phillips screws that secure the attenuator to the mounting bracket.

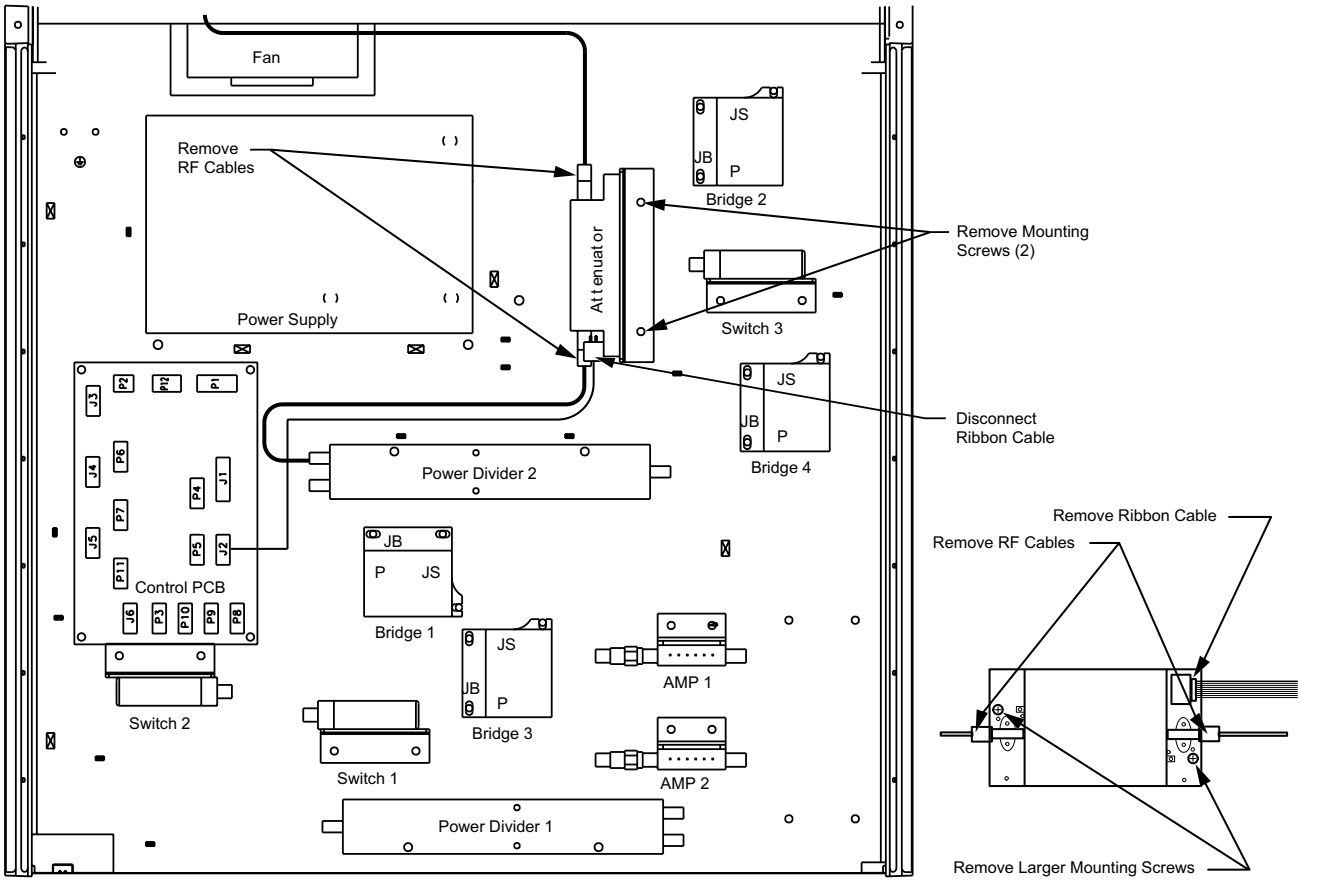


Figure 5-4. *Step Attenuator Removal*

To replace the Step Attenuator, reverse the order of the removal procedure.

5-7 POWER DIVIDERS

This Section provides a procedure for removing and replacing the Power Dividers 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 Power Divider using a 5/16-inch wrench (Figure 5-5).

Step 3. Remove the two Power Divider mounting screws with a #1 Phillips screwdriver.

Step 4. Lift the Power Divider out from the chassis.

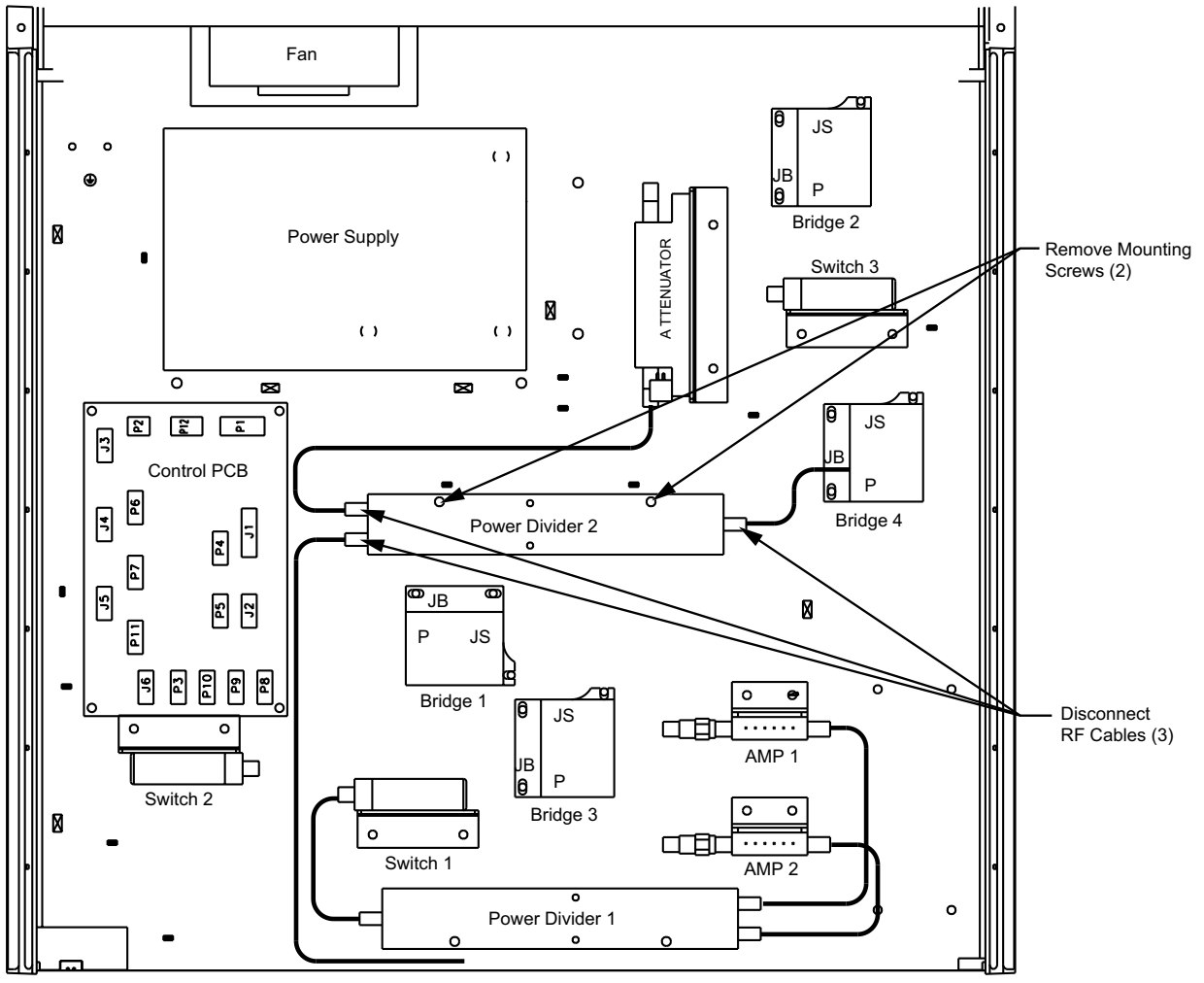


Figure 5-5. *Power Divider Removal*

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

5-8 POWER SUPPLY

This Section provides a procedure for removing and replacing the 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 of the wire connections from the Power Supply (Figure 5-6).

Step 3. Turn the test set on its side.

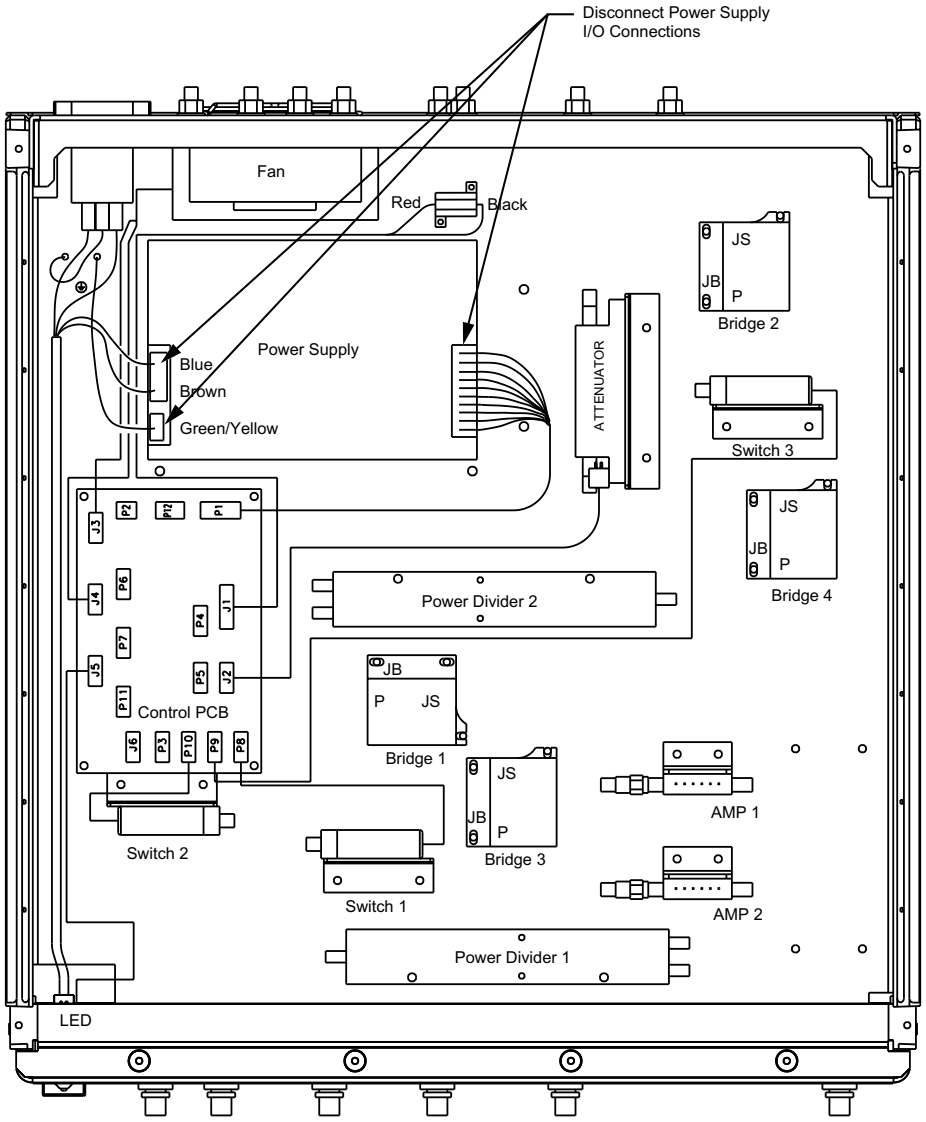


Figure 5-6. *Power Supply Removal (Top View)*

Step 4. Hold the Power Supply and remove the four mounting screws with a #1 Phillips screwdriver (Figure 5-7).

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

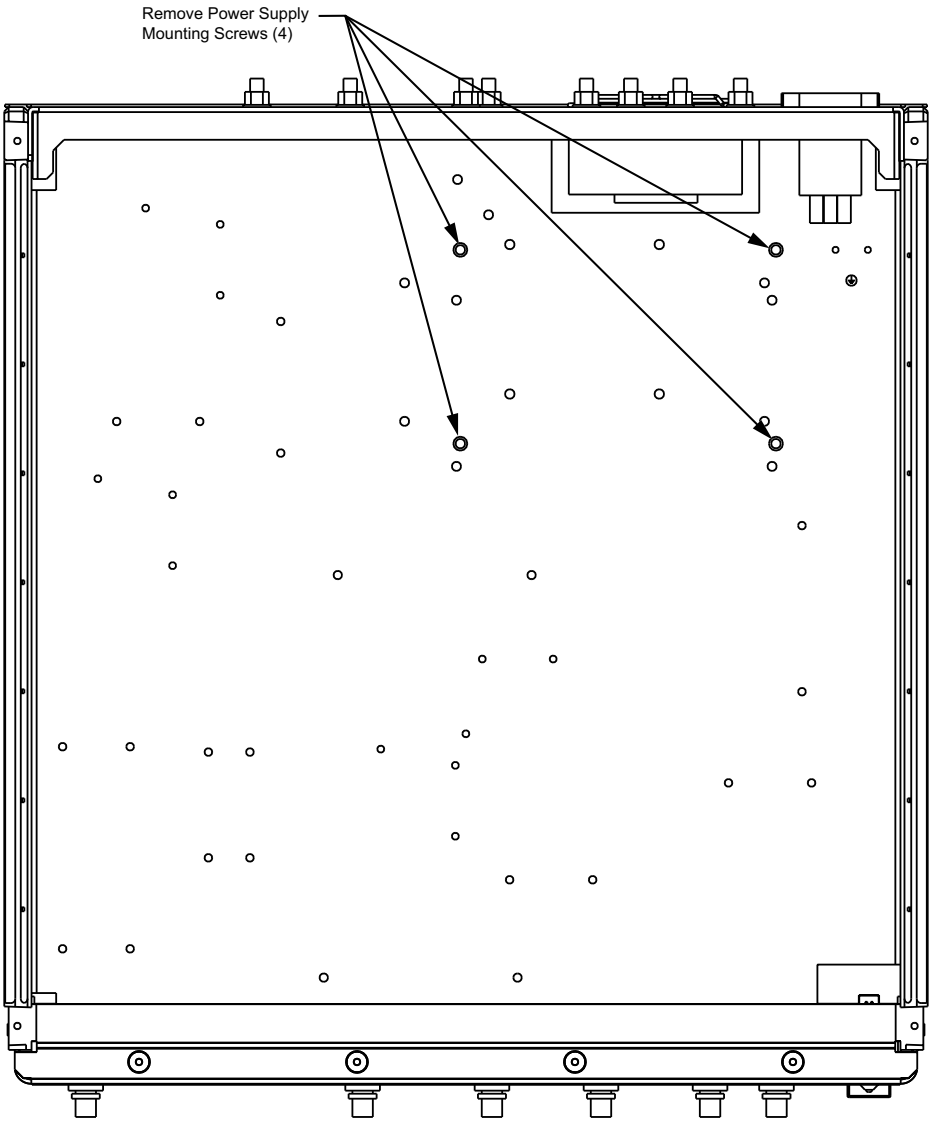


Figure 5-7. *Power Supply Removal (Bottom View)*

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

5-9 RF SWITCHES

This Section provides a procedure for removing and replacing the three RF Switches.

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

Step 2. Use a 5/16 inch wrench to disconnect the three RF cables from the RF Switch to be removed (Figure 5-8).

Step 3. Disconnect the appropriate wire connector from the Control PCB.

Step 4. Remove the two mounting screws from the mounting bracket with a #1 Phillips screwdriver.

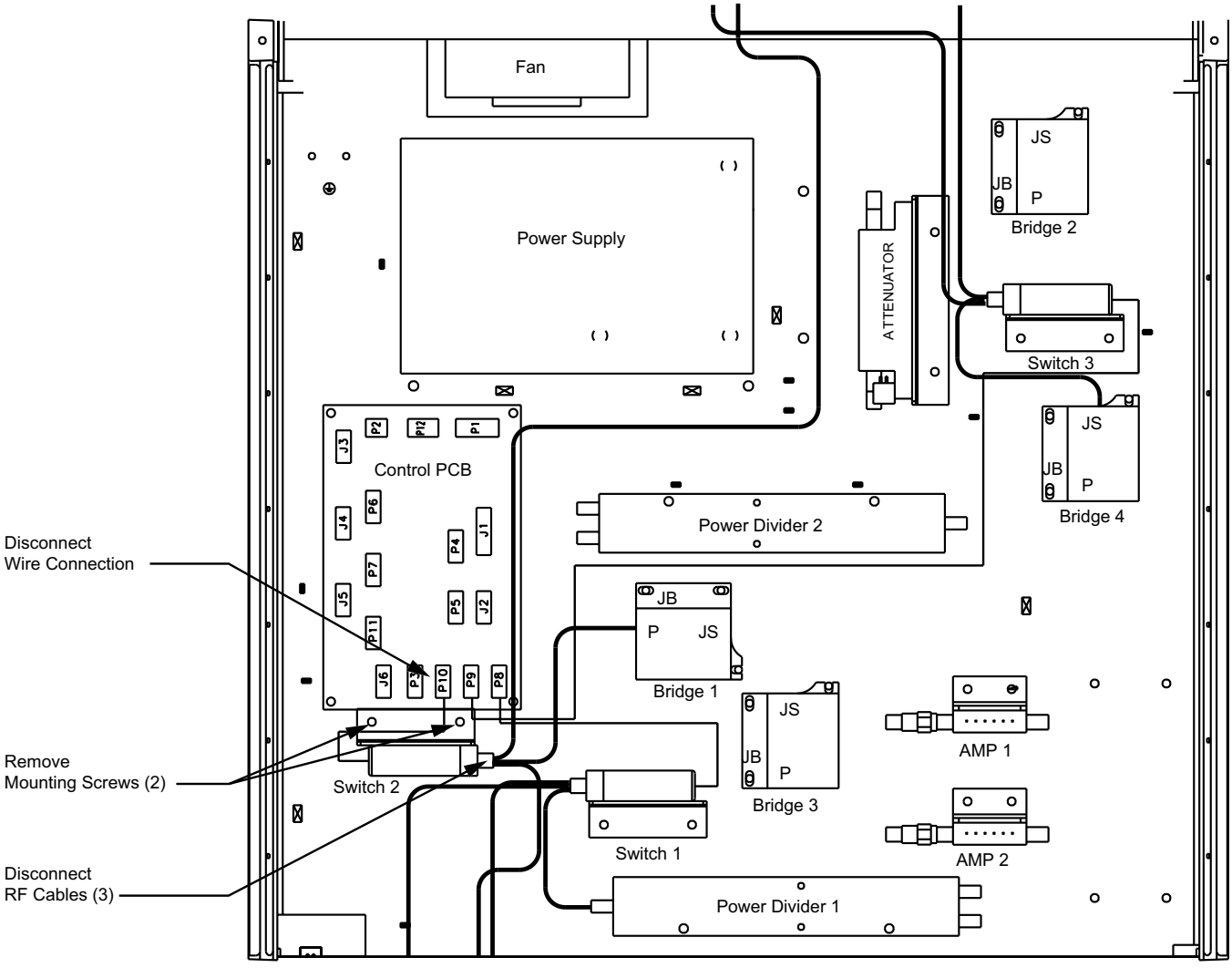


Figure 5-8. *RF Switch Removal*

Step 5. Lift the RF Switch out from the test set chassis.

Step 6. Remove the two Phillips screws that secure the RF Switch to the mounting bracket (Figure 5-9).

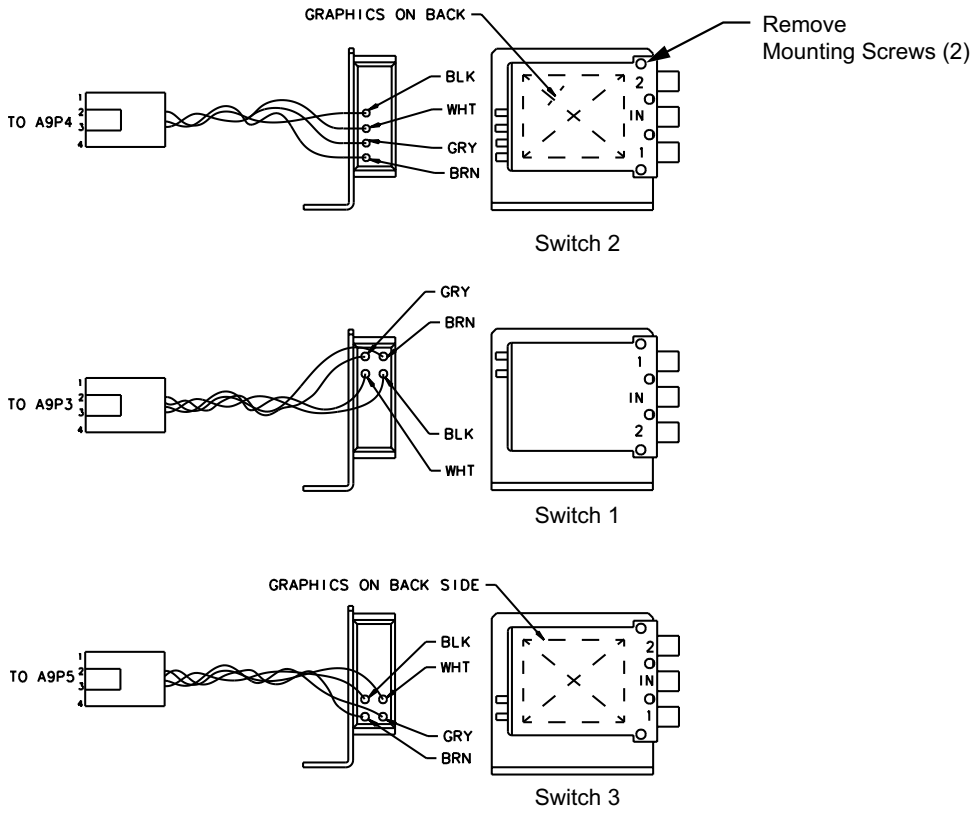


Figure 5-9. *Switch Wiring and Bracket Detail*

To replace the RF Switch, reverse the order of the removal procedure.

5-10 PORT MODULES

This section provides a procedure for removing and replacing the port modules (VSWR Bridges) in the test set.

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

Step 2. Use a 5/16 inch wrench to disconnect the RF cable connections on the port module at ports P, JB, and JS (Figure 5-10).

Step 3. Use a #1 Phillips screwdriver to remove the three mounting screws.

Step 4. Lift the port module out from the test set chassis.

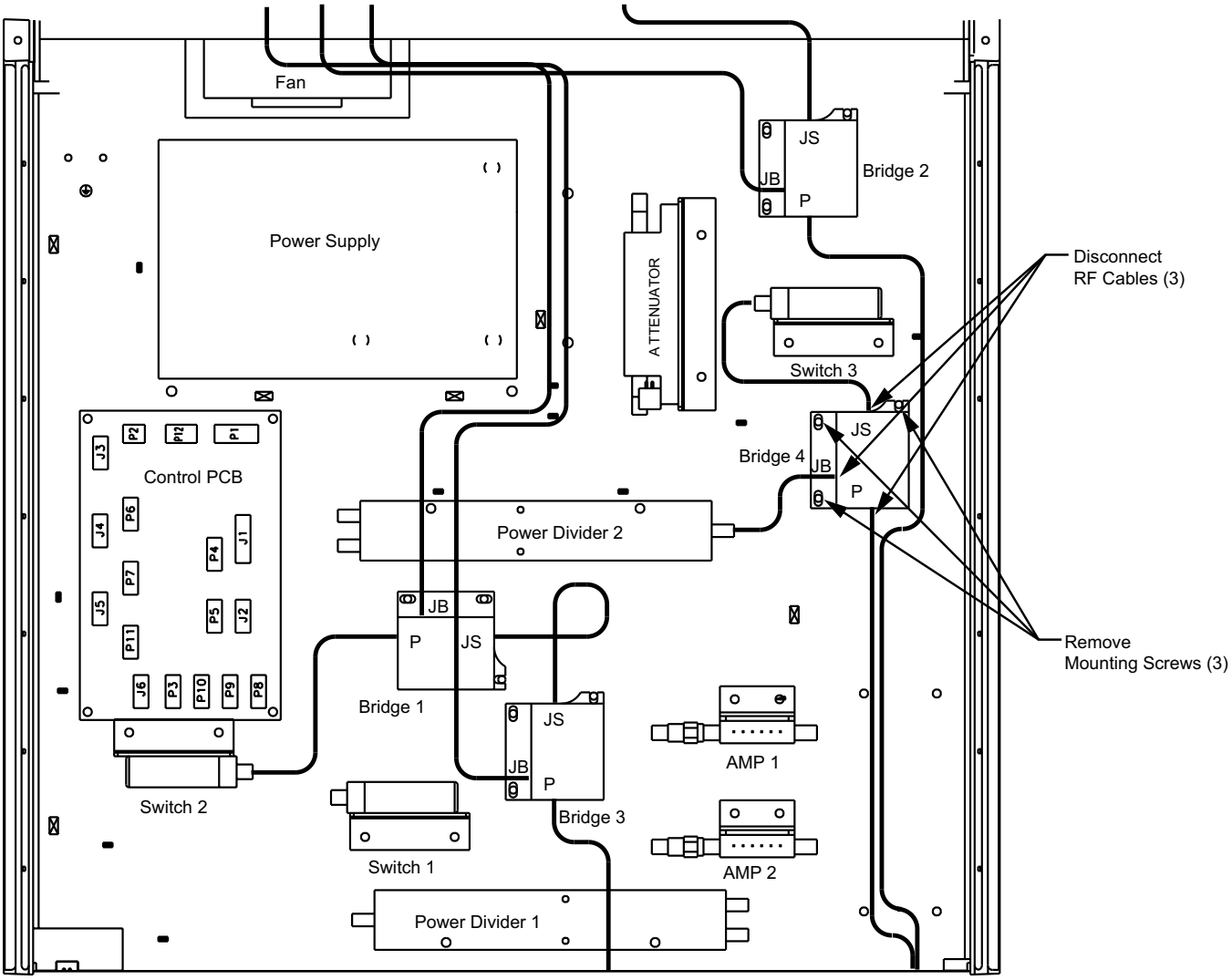


Figure 5-10. *Port Module Removal*

To replace the port module, reverse the order of the removal procedure.

5-11 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. Disconnect the fan supply wire at J3 of the control PCB (Refer to Section 5-4 for a diagram).

Step 3. Use a #1 Phillips screwdriver to remove the four screws holding the fan guard in place (Figure 5-11).

Step 4. Remove the fan guard and lift the fan out from the chassis.

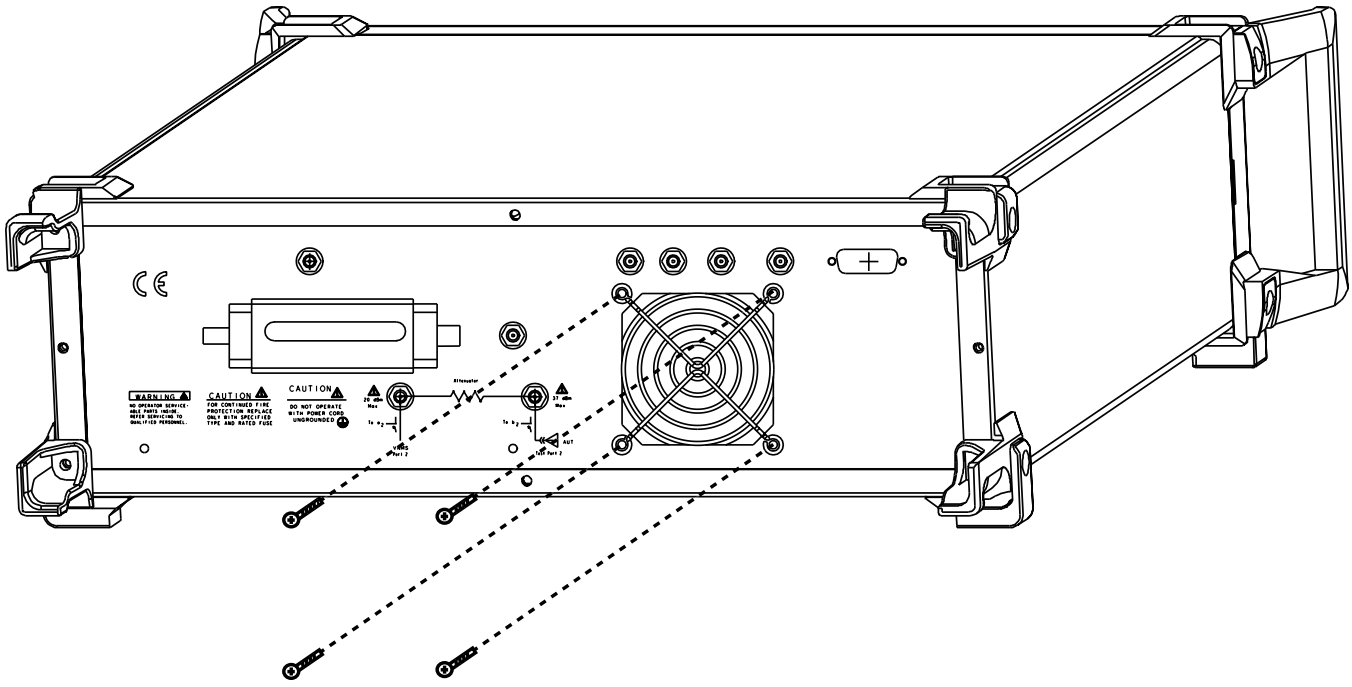


Figure 5-11. *Fan Removal*

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

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 in respect to the connector's reference plane (Figure A-1).

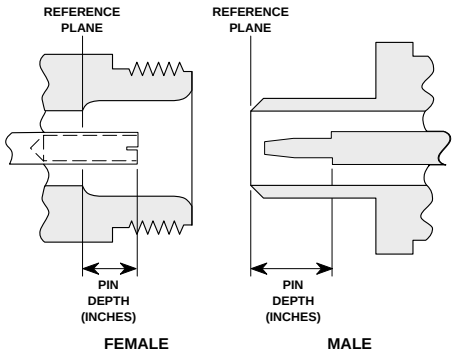


Figure A-1. *N Connector Pin Depth Definition*

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, following page). 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(s).

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.

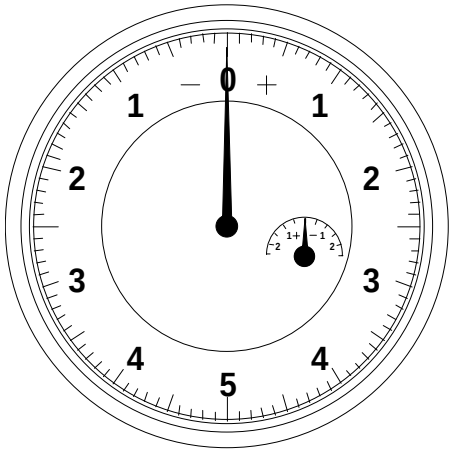


Figure A-2. *Pin Depth Gauge*

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 –0.001	
V Female	+0.000 –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 it.*

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/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.

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