Maintenance Manual

VectorStar® MN4690B Series Multiport Test Set

VectorStar MN4694B Multiport Test Set for VectorStar MS4642A/MS4644A VNAs, K Connectors

VectorStar MN4697B Multiport Test Set for VectorStar MS4645A/MS4647A VNAs, V Connectors

Anritsu Company
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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 the information carefully *before* operating the equipment.

Symbols Used in Manuals

Danger

This indicates a very dangerous procedure that could result in serious injury or death, and possible loss related to equipment malfunction, if not performed properly.

Warning

This indicates a hazardous procedure that could result in light-to-severe injury or loss related to equipment malfunction, if proper precautions are not taken.

Caution

This indicates a hazardous procedure that could result in loss related to equipment malfunction if proper precautions are not taken.

Safety Symbols Used on Equipment and in Manuals

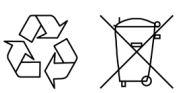
The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions *before* operating the equipment. Some or all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

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

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

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

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



These indicate that the marked part should be recycled.

For Safety

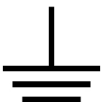
Warning

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.

Warning

or

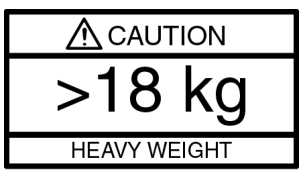


When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied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

Warning

This equipment can not 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



Use two or more people to lift and move this equipment, or use an equipment cart. There is a risk of back injury if this equipment is lifted by one person.

Caution

Electrostatic Discharge (ESD) can damage the highly sensitive circuits in the instrument. ESD is most likely to occur as test devices are being connected to, or disconnected from, the instrument's front and rear panel ports and connectors. You can protect the instrument and test devices by wearing a static-discharge wristband. Alternatively, you can ground yourself to discharge any static charge by touching the outer chassis of the grounded instrument before touching the instrument's front and rear panel ports and connectors. Avoid touching the test port center conductors unless you are properly grounded and have eliminated the possibility of static discharge.

Repair of damage that is found to be caused by electrostatic discharge is not covered under warranty.

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Chapter 1 — General Information

1-1 Introduction

This manual provides general service and maintenance instructions for Anritsu MN4690B Series Multiport Test Set. It contains procedures for:

- Testing the system for proper operation
- Verifying System Performance in conjunction with a 2-port MS4640A VectorStar VNA
- Troubleshooting tests and techniques
- Locating and replacing failed parts in the MS469xB Series Test Set

1-2 Models

The MN4690B Series Multiport Test Set family includes two models:

- MN4694B – 70 kHz to 40 GHz, K Connectors, for MS4642A or MS4644A VNA
    - MS4642A, K Connectors, 10 MHz to 20 GHz, 70 kHz with low frequency option
    - MS4644A, K Connectors, 10 MHz to 40 GHz, 70 kHz with low frequency option
- MN4697B – 70 kHz to 70 GHz, V Connectors, for MS4645A or MS4647A VNA
    - MS4645A, V Connectors, 10 MHz to 50 GHz, 70 kHz with low frequency option
    - MS4647A, V Connectors, 10 MHz to 70 GHz, 70 kHz with low frequency option

Naming Conventions

Throughout this manual, the term "Test Set" is used interchangeably to refer to the MN4690B Series Multiport Test Set, the term "VNA" is used interchangeably to refer to MS4640A VectorStar® Vector Network Analyzer, and the term "Multiport VNA System" is used interchangeably to refer to MS4640A VectorStar Vector Network Analyzer / MN4690B Test Set Multiport VNA System.

1-3 Identification Number

All Anritsu instruments are assigned an unique identification number (up to seven-digit), such as "090201" or "1010222". This number appears on a decal affixed to the rear panel. Please use this identification number during any correspondence with Anritsu Customer Service about Anritsu instruments.

1-4 Online Manual

This manual is available on CD-ROM as a Portable Document Format file which can be viewed using Acrobat Reader™, a free program that is available from Adobe System Incorporated (http://www.adobe.com).

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 manual on CD ROM can be ordered from Anritsu.

1-5 Related Manuals and Documentation

Manuals and Documentation related to the operation and maintenance of the VectorStar MN4690B Series Multiport Test Sets are listed below. For additional literature related to the Anritsu VectorStar family of products, refer to: http://www.anritsu.com/en-US/Products-Solutions/Products/MS4640A-Series.aspx.

VNA System Documentation List

The following documentation sets are available in support of the VectorStar VNA instruments and VNA Systems including the MS4640A Series VNAs, MS7828A Standard BB/mm-Wave System, ME7838A Modular BB/mm-Wave System, and the MN4690B Series Multiport VNA System. See the VectorStar MS4640A Series VNA Operation Manual – 10410-00266 for longer descriptions of the primary MS4640A VNA documents as well as option and configuration information for each of the instruments and systems below. For more information on VNA systems, consult the system Technical Data Sheet (TDS). Most documents are available on the Anritsu Internet Web Site at www.anritsu.com. Maintenance manuals are available from Anritsu Customer Serivice. Printed copies of most manuals in 3-ring binders are available at nominal cost.

VectorStar MS4640A Series Vector Network Analyzer

- MS4640A Series VNA Technical Data Sheet (TDS) – 11410-00432
- MS4640A Series VNA User Interface Reference (UI-RM) – 10410-00307
- MS4640A Series VNA Operation Manual (OM) – 10410-00266
- MS4640A Series VNA Measurement Guide (MG) – 10410-00269
- MS4640A Series VNA Programming Manual (PM) – 10410-00267
- MS4640A Series VNA Programming Manual Supplement (PM-S) – 10410-00308
- MS4640A Series VNA Help System (HELP) – 10450-00008
    - Contains OM, UI-RM, PM, PM-S, and MG
- MS4640A Series VNA Maintenance Manual (MM) – 10410-00268
- MS4640A Series VNA User Documentation Compact Disc (CD) – 10920-00049
    - Contains 40A TDS, 30A TDS, OM, UI-RM, PM, PM-S, MG, MM, and HELP above.

VectorStar ME7838A Series Modular BB/Millimeter-Wave VNA Measurement System

- ME7838A Series Modular BB/Millimeter-Wave (mm-Wave) Technical Data Sheet – 11410-00593
- ME7838A Series Modular BB/mm-Wave Quick Start Guide (QSG) – 10410-00292
- ME7838A Series Modular BB/mm-Wave Installation Guide (IG) – 10410-00293
- 3743A Millimeter-Wave Module Reference Manual (RM) – 10410-00311
- ME7838A Series Modular BB/mm-Wave Maintenance Manual – 10410-00304
- ME7838A Series Modular BB/mm-Wave User Documentation CD – 10920-00062
    - Contains TDS, QSG, IG, RM, and MM above.

VectorStar ME7828A Series Standard BB/mm-Wave VNA Measurement System

- ME7828A Series BB/mm-Wave Technical Data Sheet – 11410-00452
- ME7828A Series BB/mm-Wave Quick Start Guide – 10410-00289
- ME7828A Series BB/mm-Wave Installation Guide – 10410-00287
- ME7828A Series BB/mm-Wave Maintenance Manual – 10410-00304
- ME7828A Series BB/mm-Wave User Documentation CD – 10920-00051
    - Contains TDS, QSG, IG, and MM above.

VectorStar MN4690B Series Multiport VNA Measurement System

- MN4690B Series Multiport VNA Measurement System Technical Data Sheet – 11410-00528
- MN4690B Series Multiport Test Set Quick Start Guide – 10410-00290
- MN4690B Series Multiport Test Set Installation Guide – 10410-00288
- MN4690B Series Multiport Test Set Maintenance Manual – 10410-00305

- MN4690B Series Multiport VNA Measurement System User Documenation CD – 10920-00053
    - Contains TDS, QSG, and IG above.

Calibration Kits

- 36585K and 36585V Precision Automatic Calibrator (AutoCal) Module Reference Manual – 10410-00279
    - 36585K-2F, Precision AutoCal Module, 70 kHz to 40 GHz, K (f) to K (f)
    - 36585K-2M, Preciscion AutoCal Module, 70 kHz to 40 GHz, K (m) to K (m)
    - 36585K-2MF, Precision AutoCal Module, 70 kHz to 40 GHz, K (m) to K (f)
    - 36585V-2F, Precision AutoCal Module, 70 kHz to 70 GHz, V (f) to V (f)
    - 36585V-2M, Precision AutoCal Module, 70 kHz to 70 GHz, V (m) to V (m)
    - 36585V-2MF, Precision AutoCal Module, 70 kHz to 70 GHz, V (m) to V (f)
- 3650A SMA/3.5 mm, 3651A GPC-7, 3652A K, 3653A Type N, and 3654D V Mechanical Calibration Kit Reference Manual – 10410-00278
    - 3650A Mechanical Calibration Kit, SMA/3.5 mm Connectors
    - 3650A-1 Mechanical Calibration Kit, SMA/3.5 mm Connectors with Sliding Loads
    - 3651A Mechanical Calibration Kit, GPC-7 Connectors
    - 3651A-1 Mechanical Calibration Kit, GPC-7 Connectors with a Single Sliding Load
    - 3652A Mechanical Calibration Kit, K Connectors
    - 3652A-1 Mechanical Calibration Kit, K Connectors with Sliding Loads
    - 3653A Mechanical Calibration Kit, Type N Connectors
    - 3654D Mechanical Calibration Kit, V Connectors
    - 3654D-1 Mechanical Calibration Kit, V Connectors with Sliding Loads

1-6 VectorStar Multiport VNA System Overview

An overall block diagram of the VectorStar Multiport VNA system is shown in Figure 1-1.

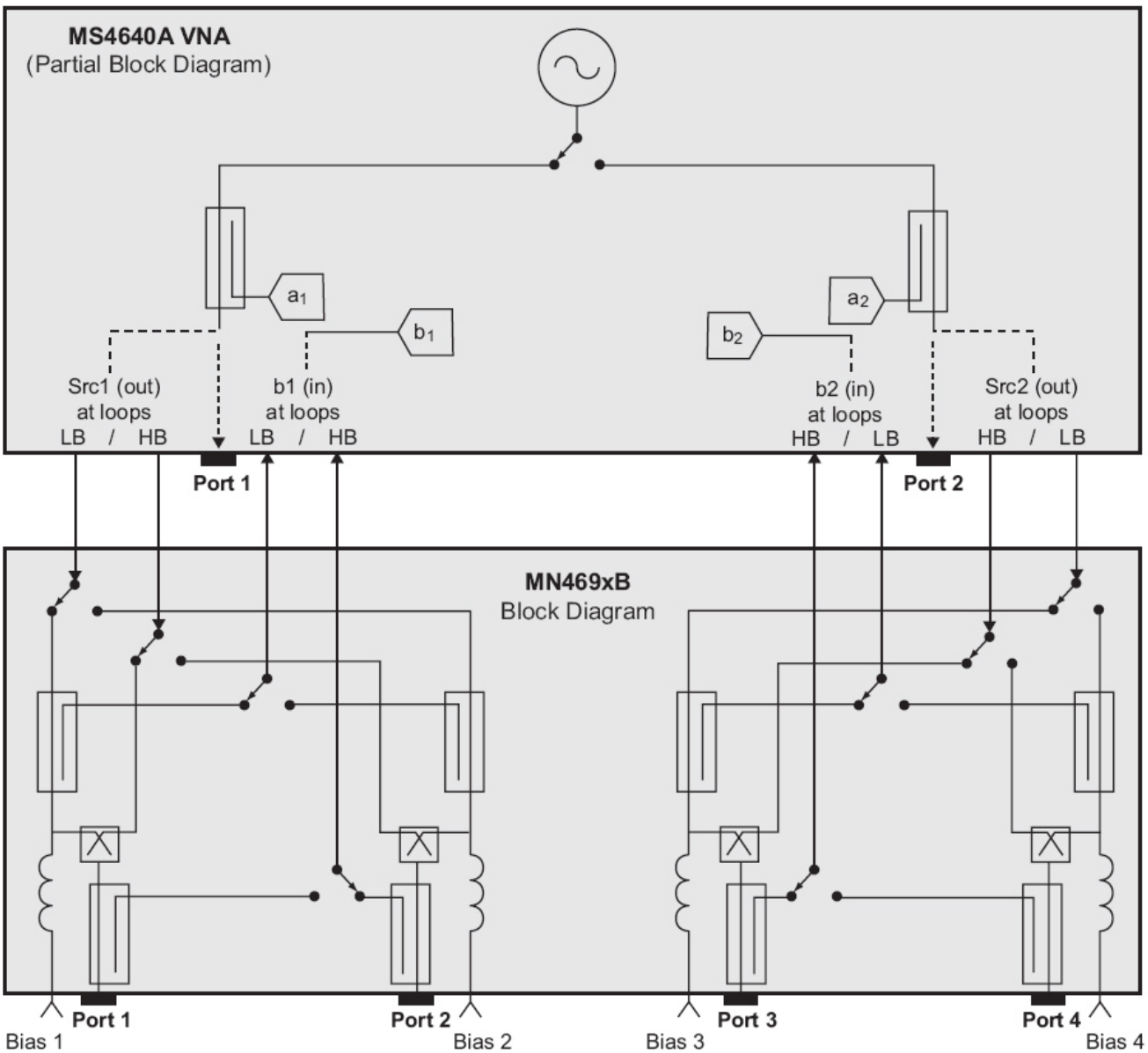


Figure 1-1. Overall Block Diagram of the VectorStar Multiport VNA System

The Anritsu MN4690B Series Multiport Test Set provides multiple test port capabilities for the Anritsu VectorStar MS4640A Series Vector Network Analyzer.

The MN4690B Series Test Set contains a switch matrix and switch matrix controller that facilitates multiple test port connections to the device under test. The test set is controlled by the connected VectorStar VNA (except for power on/off) via the IEEE-488 General Purpose Interface Bus (GPIB).

The MN4690B Series Test Sets only contribute loss to the source and test paths, and uncorrected (raw) port directivity and match. Therefore, system performance is specified when connected to a base 2-port VectorStar VNA with option 051 (Direct Access Loops). If additional options are added to the base VectorStar VNA that affect its port performance, those effects must also be added to these system specifications. Specifically, adding option 06x, Active Measurement Suites will affect available test port power and dynamic range.

1-7 MN4690B Multiport Test Set Functional Description

A block diagram of the MN4690B Series Multiport Test Set is shown in Figure 1-2.

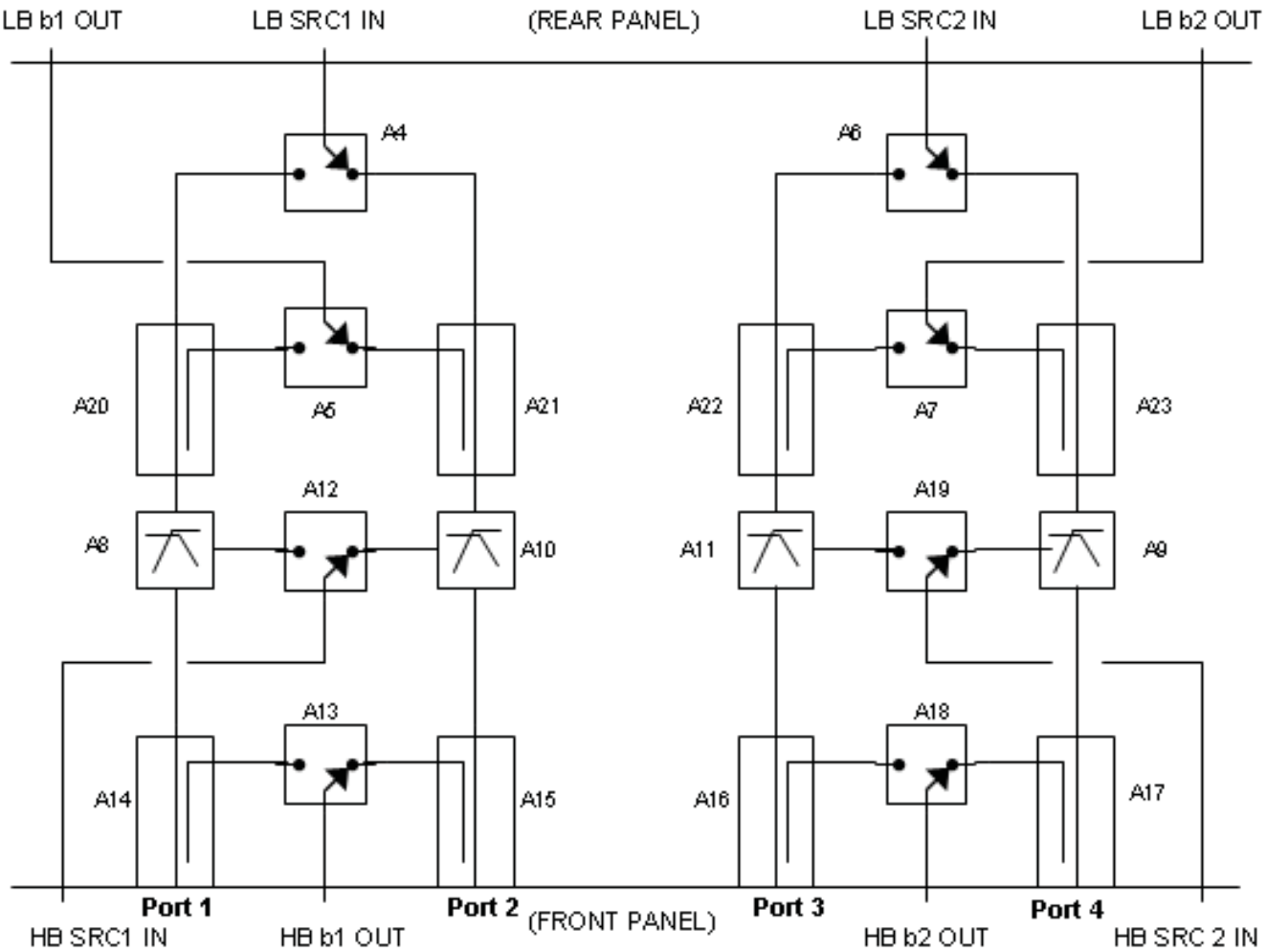


Figure 1-2. MN4690B Functional Block Diagram

The VectorStar VNA sends switch control commands via the GPIB bus to the GPIB to Parallel Digital Interface PCB Assembly in the test set. The logic in this PCB is translated by the 4-Port Test Set Control PCB to the appropriate levels at any given time to control each one of the SPDT RF switches in the test set.

The MN4690B test set contains eight SPDT RF switches. Four switches, A4, A5, A6 and A7, operate in low band frequencies below 2.5 GHz. Four switches, A12, A13, A18 and A19, operate in high band frequencies from 2.5 GHz and beyond.

Any one or two test ports may be selected for forward and/or reverse measurements. There is an LED below each test port (Ports 1 to 4). When the connection paths are set via GPIB commands, the test port LEDs will light according to the connections. A lit LED under a test port indicates that it is selected as an active test port.

There is an LED above the Power switch. When AC power is first applied, the Power LED will light.

Low Band Operation – 70 kHz to 2.5 GHz

The A4 Low Band Switch routes the stimulus signal from the VectorStar VNA Low Band Source 1 Output to either Port 1 through the A20 Port 1 Low Band Bridge, A8 Diplexer/Bias Tee Assembly and then A14 Port 1 Coupler or to Port 2 through the A21 Port 2 Low Band Bridge, A10 Diplexer/Bias Tee Assembly and then A15 Port 2 Coupler.

The A6 Low Band Switch routes the stimulus signal from the VectorStar VNA Low Band Source 2 Output to either Port 3 through the A22 Port 3 Low Band Bridge, A11 Diplexer/Bias Tee Assembly and then A16 Port 3 Coupler or to Port 4 through the A23 Port 4 Low Band Bridge, A9 Diplexer/Bias Tee Assembly and then A17 Port 2 Coupler.

The reflected or transmitted signal measured at Port 1 passes directly through the A14 Port 1 Coupler and A8 Diplexer/Bias Tee Assembly, and then is coupled via the A20 Low Band Bridge to the A5 Low Band Switch.

The reflected or transmitted signal measured at Port 2 passes directly through the A15 Port 2 Coupler and A10 Diplexer/Bias Tee Assembly, and then is coupled via the A21 Low Band Bridge to the A5 Low Band Switch.

The A5 Low Band Switch routes the measured reflected or transmitted signal from either Port 1 or Port 2 to the VectorStar VNA Low Band b1 Input.

The reflected or transmitted signal measured at Port 3 passes directly through the A16 Port 3 Coupler and A11 Diplexer/Bias Tee Assembly, and then is coupled via the A22 Low Band Bridge to the A7 Low Band Switch.

The reflected or transmitted signal measured at Port 4 passes directly through the A17 Port 4 Coupler and A9 Diplexer/Bias Tee Assembly, and then is coupled via the A23 Low Band Bridge to the A7 Low Band Switch.

The A7 Low Band Switch routes the measured reflected or transmitted signal from either Port 3 or Port 4 to the VectorStar VNA Low Band b2 Input.

High Band Operation – 2.5 GHz and beyond

The A12 High Band Switch routes the stimulus signal from the VectorStar VNA How Band Source 1 Output to either Port 1 through the A8 Diplexer/Bias Tee Assembly and then A14 Port 1 Coupler or to Port 2 through the A10 Diplexer/Bias Tee Assembly and then A15 Port 2 Coupler.

The A19 High Band Switch routes the stimulus signal from the VectorStar VNA High Band Source 2 Output to either Port 3 through the A11 Diplexer/Bias Tee Assembly and then A16 Port 3 Coupler or to Port 4 through the A9 Diplexer/Bias Tee Assembly and then A17 Port 2 Coupler.

The reflected or transmitted signal measured at Port 1 is coupled via the A14 Port 1 Coupler to the A13 High Band Switch.

The reflected or transmitted signal measured at Port 2 is coupled via the A15 Port 2 Coupler to the A13 High Band Switch.

The A13 High Band Switch routes the measured reflected or transmitted signal from either Port 1 or Port 2 to the VectorStar VNA High Band b1 Input.

The reflected or transmitted signal measured at Port 3 is coupled via the A16 Port 3 Coupler to the A18 High Band Switch.

The reflected or transmitted signal measured at Port 4 is coupled via the A17 Port 4 Coupler to the A18 High Band Switch.

The A18 High Band Switch routes the measured reflected or transmitted signal from either Port 3 or Port 4 to the VectorStar VNA High Band b2 Input.

1-8 Anritsu Customer Service Centers

For the latest service and sales information in your area, please visit the URL: http://www.anritsu.com/Contact.asp. Choose a country for regional contact information.

1-9 Electrostatic Discharge (ESD) Prevention

All electronic devices, components, and instruments can be damaged by electrostatic discharge. It is important to take preventative measures to protect the instrument and its internal subassemblies from electrostatic discharge.

An ESD safe work area and proper ESD handling procedures that conform to ANSI/ESD S20.20-1999 or ANSI/ESD S20.20-2007 is mandatory to avoid ESD damage when handling subassemblies or components found in the MN4690B Series test sets.

Take steps to eliminate the static charges built-up on coaxial cables prior to connecting them to the VNA System test ports. This can be done by terminating one end of the cable with the short from the calibration kit and then grounding the outer conductor of the connector of the cables.

1-10 Recommended Test Equipment

Below, Table 1-1 provides a list of recommended test equipment needed for the performance verification and troubleshooting procedures presented in this manuals.

Table 1-1. Required Test Equipment List (1 of 2)

Instrument	Critical Specification	Recommended Manufacturer and Model	Use
Calibration Kit	Connector Type: K	Anritsu Model 3652A	MN4694B
Extension Cable	Frequency: DC to 40 GHz Connector Type: K male to K female	Anritsu Model 3670K50-2 (Qty 2)	MN4694B
Adapter	Type: K male to K female	Anritsu Model 33KKF50B (Qty 2)	MN4694B
Air Line	Connector Type: K female	Anritsu Model T2023-2	MN4694B
Offset Termination	Return Loss: 20 dB Connector Type: V female	Anritsu Model SC4808	MN4694B
Calibration Kit	Connector Type: V	Anritsu Model 3654D	MN4697B
Extension Cable	Frequency: DC to 70 GHz Connector Type: V male to V female	Anritsu Model 3670V50B-2 (Qty 2)	MN4697B
Adapter	Type: V male to V female	Anritsu Model 33VVF50C (Qty 2)	MN4697B
Air Line	Connector Type: V female	Anritsu Model T2025-2	MN4697B
Offset Termination	Return Loss: 20 dB Connector Type: V female	Anritsu Model SC5727	MN4697B
Power Meter	Power Range: –70 to +20 dBm	Anritsu Model ML2437A or ML2438A	All Models
Power Sensor	Frequency: 70 kHz to 70 GHz Connector Type: V male	Anritsu Model SC7770	All Models
Adapter	Type: N male to V female	Pasternack Model PE9720	All Models

Table 1-1. Required Test Equipment List (2 of 2)

Instrument	Critical Specification	Recommended Manufacturer and Model	Use
PC Controller	Configuration: – Intel Pentium IV – 1 GB RAM – Windows XP SP2 – 20 MB Hard-disk free space – 1024x768 Display Resolution – CD ROM Drive – USB 2.0 Type A Port – National Instruments GPIB Controller and Driver – National Instruments NI-VISA Version	Any	All Models
Test Software	–	Anritsu 2300-531-R	All Models
Torque Wrench	8 mm (5/16”) Torque End Wrench, set to 0.9 N•m (8 lbf•in)	Anritsu 01-201, use with 01-204 below.	All Models
Torque Wrench	12.7 mm (1/2”) Torque End Wrench, set to 6.779 N•m (60 lbf•in)	Mountz MTBN10 or equivalent with 1/2” socket.	All Models
Torque Wrench	20.6 mm (13/16”) Torque Socket Wrench, set to 20.34 N•m (15 lbf•ft)	Craftsman 009-44594 or equivalent with 13/16” deep socket on 3/8” (9.525 mm) drive	All Models
End Wrench	5/16” (8 mm) End Wrench	Anritsu 01-204, use with 01-201 above	All Models

Chapter 2 — Replaceable Parts

2-1 Introduction

This chapter provides replaceable parts information for MN4690B Series Multiport Test Sets.

2-2 Exchange Assembly Program

Anritsu maintains a module exchange program for selected subassemblies. If a malfunction occurs in one of these sub-assemblies, the defective item can be exchanged. Upon receiving your request, Anritsu will ship the exchange subassembly to you. 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.

Please have the exact model number and serial number of your equipment available when requesting this service, as the information about your equipment is filed according to the instrument model and serial number. For more information about this program, contact your local Anritsu Service Center.

2-3 Replaceable Parts

Table 2-1 lists the replaceable parts found in the MN4690B Series Test Set.

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

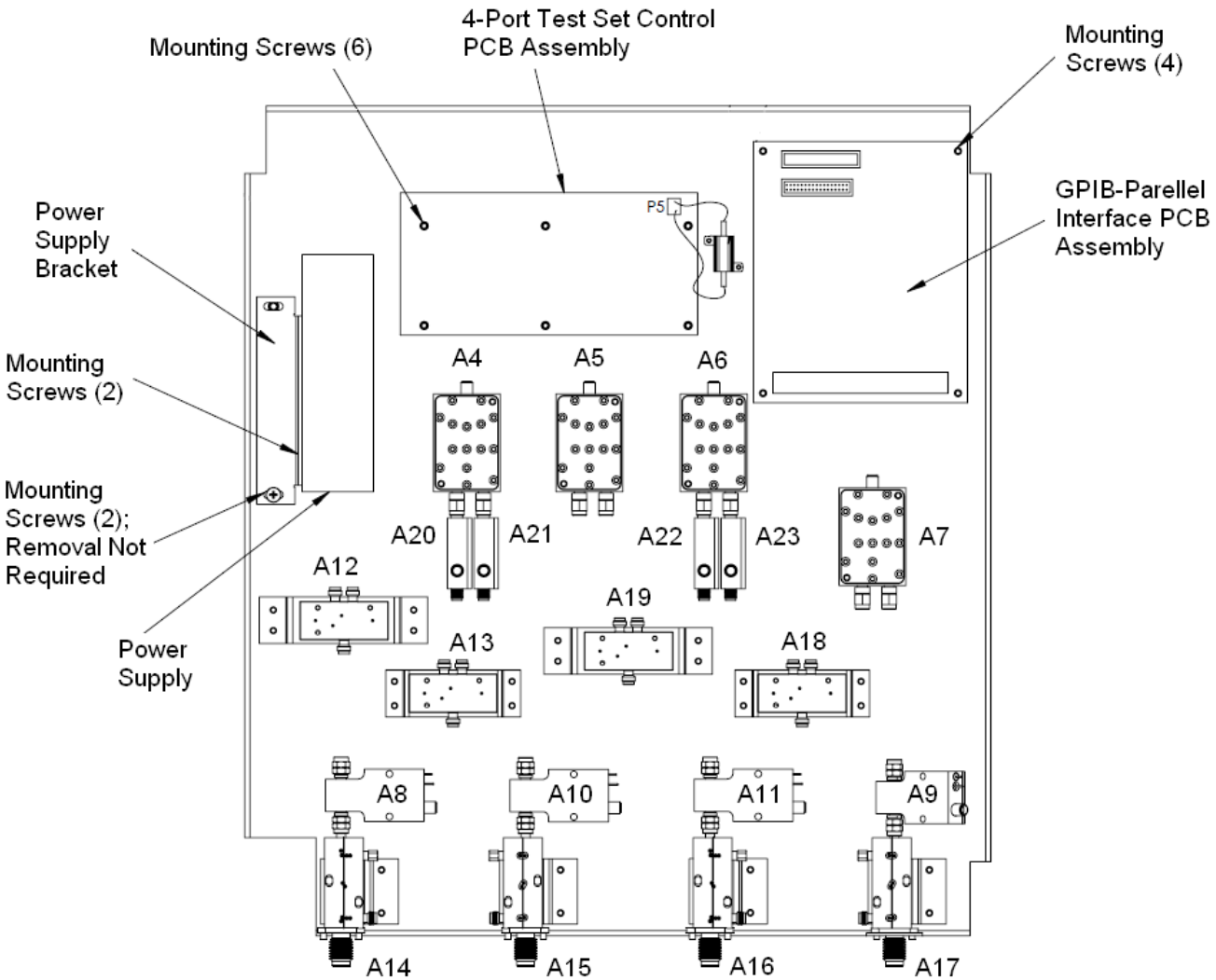
Part Number	Part Description – Drawing "A" Number	Use
2000-989	GPIB-Parallel Interface PCB Assembly	All Models
ND70926	High Band SPDT Switch Control PCB Assembly – Mounts on top of A12, A13, A18, A19	All Models
ND70927	4-Port Test Set Control PCB Assembly	All Models
40-159	Power Supply	All Models
ND70078	Low Band Bridge – A20, A21, A22, A23	All Models
ND70079	Low Band Switch – A4, A5, A6, A7	All Models
70241	High Band SPDT Switch Assembly, V Connector, 70 GHz – A12, A13, A18, A19	MN4697B
70242	High Band SPDT Switch Assembly, K Connector, 40 GHz – A12, A13, A18, A19	MN4694B
64911	Diplexer Assembly, V Connector, 70 GHz – A8, A9, A10, A11	MN4697B
66465	Diplexer Assembly, K Connector, 40 GHz – A8, A9, A10, A11	MN4694B
66245	Port Coupler, V Connector, 70 GHz – A14, A15, A16, A17	MN4697B
66480	Port Coupler, K Connector, 40 GHz – A14, A15, A16, A17	MN4694B
34YK50C	K Test Port Connector – Mounts on A14, A15, A16, A17	MN4694B
34YV50C	V Test Port Connector – Mounts on A14, A15, A16, A17	ND4697B
62109-142	RF Cable, V Connector, VNA to Test Set, Front Panel	MN4697B
67357-146	RF Cable, K Connector, VNA to Test Set, Front Panel	MN4694B

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

Part Number	Part Description – Drawing "A" Number	Use
62112-140	RF Cable, SMA Connector, VNA Bx to Test Set Bx, Rear Panel	All Models
62112-141	RF Cable, SMA Connector, VNA Src to Test Set Src, Rear Panel	All Models
ND71327	Fan Assembly, Rear Panel	All Models

2-4 Major Internal Components and Subassemblies

Figure 2-1 below shows the location of major components and sub-assemblies as viewed from the top with the top cover moved.



See Table 2-1, "Replaceable Parts List" on page 2-1 above for identification of Engineering "A" Numbers.

Figure 2-1. Major Internal Components and Sub-assemblies

Chapter 3 — Performance Verification

3-1 Introduction

This chapter contains procedures that can be used to verify the performance of the VectorStar Multiport Vector Network Analyzer System which is comprised of a MS4640A VNA and MN4690B Test Set.

Note	The MN4690B Series Test Sets provide multiple test port capabilities for the Anritsu VectorStar MS4640A Series Vector Network Analyzers. The test sets do not have any performance specifications separate from the VectorStar VNA. Therefore, MN4690B Test Set must be verified with a 2-port VectorStar VNA as a system. The test set frequency range that can be verified is limited by the frequency range of the 2-port VectorStar VNA.

The procedures include the following tests:

- "Directivity and Test Port Match Verification" on page 3-2
- "Test Port Power Verification" on page 3-12
- "Noise Floor Verification" on page 3-14

Note	The 2-port VectorStar VNA should be verified as a stand-alone unit. Consult the **VectorStar MS4640A Series VNA Maintenance Manual – 10410-00268**, prior to performing these system tests.

3-2 Directivity and Test Port Match Verification

The following test can be used to verify the corrected directivity and port match of each test port of the VectorStar Multiport VNA System.

Equipment Required for VNA System with MN4694B

- Calibration Kit, K Connector, Anritsu Model 3652A
- Phase Equal Adapter, K(m) to K(f) Anritsu Model 33KKF50B (Qty 2)
- Air Line, K Connector, Anritsu Model T2023-2
- 20 dB Offset Termination, K(f) Connector, Anritsu Model SC4808

Equipment Required for VNA System with MN4697B

- Calibration Kit, V Connector, Anritsu Model 3654D
- Phase Equal Adapter, V(m) to V(f) Anritsu Model 33VVF50C (Qty 2)
- Air Line, V Connector, Anritsu Model T2025-2
- 20 dB Offset Termination, V(f) Connector, Anritsu Model SC5727

Procedure

1. Install the MS464xA VNA on the MN4690B Test Set per the **VectorStar MN4690B Multiport Test Set Installation Guide – 10410-00288**. Power on the MN4690B Test Set first.
2. Install four Phase Equal Adapters to each test port on MN4690B.

Note	Use the Anritsu 01-204 Torque Wrench to tighten the adapters to the MN4690B test ports so they will not be loosen during the calibration steps and adversely affect the calibration quality.

3. Power on the MN4690B Test Set.

Note	If the VNA is powered up before the test set, the VNA application will stay in 2-port mode and only 2-port mode features and functions will be available.

4. Power on the MS464xA VNA and allow it to complete self test.
5. Allow both VNA and Test Set to warm up for at least one hour.
6. Preset the VNA.
   a. Ensure that Trace 1 is set to S11, Trace 2 set to S12, Trace 3 set to S21, and Trace 4 set to S22.
7. Select Sweep Setup | Freq-based Seg. Sweep Setup
8. When the Freq-based Seg. Sweep Setup Table appears on the bottom of the display, do the following:
   a. Enter the information into the Setup Table on the bottom of the VNA display per Table 3-1 on page 3-3 below for MN4694B or Table 3-2 on page 3-3 below for MN4697B.
   b. Omit the frequency bands that are outside of the frequency coverage of the 2-port VectorStar VNA.
   c. Select Add to add a new segment.

Table 3-1. VectorStar VNA Segmented Sweep Setup for VNA System with MN4694B Test Set

F1	F2	# of Pts	IFBW	P1 Src Pwr	P2 Src Pwr
70 kHz	200 kHz	11	10 Hz	+5 dBm	+5 dBm
300 kHz	1 MHz	21	10 Hz	+5 dBm	+5 dBm
2 MHz	9 MHz	21	10 Hz	+5 dBm	+5 dBm
10 MHz	998 MHz	51	10 Hz	+5 dBm	+5 dBm
1000 MHz	2499 MHz	51	1 kHz	+5 dBm	+5 dBm
2500 MHz	5000 MHz	51	1 kHz	+5 dBm	+5 dBm
5001 MHz	20000 MHz	401	1 kHz	+5 dBm	+5 dBm
20001 MHz	38000 MHz	601	1 kHz	+5 dBm	+5 dBm
38001 MHz	40000 MHz	51	1 kHz	+5 dBm	+5 dBm

Table 3-2. VectorStar VNA Segmented Sweep Setup for VNA System with MN4697B Test Set

F1	F2	# of Pts	IFBW	P1 Src Pwr	P2 Src Pwr
70 kHz	200 kHz	11	10 Hz	–8 dBm	–8 dBm
300 kHz	1 MHz	21	10 Hz	–8 dBm	–8 dBm
2 MHz	9 MHz	21	10 Hz	–8 dBm	–8 dBm
10 MHz	998 MHz	51	10 Hz	–8 dBm	–8 dBm
1000 MHz	2499 MHz	51	1 kHz	–8 dBm	–8 dBm
2500 MHz	5000 MHz	51	1 kHz	–8 dBm	–8 dBm
5001 MHz	20000 MHz	401	1 kHz	–8 dBm	–8 dBm
20001 MHz	38000 MHz	601	1 kHz	–8 dBm	–8 dBm
38001 MHz	40000 MHz	51	1 kHz	–8 dBm	–8 dBm
40001 MHz	50000 MHz	201	1 kHz	–8 dBm	–8 dBm
50001 MHz	65000 MHz	151	1 kHz	–8 dBm	–8 dBm
65001 MHz	67000 MHz	51	1 kHz	–8 dBm	–8 dBm
67001 MHz	70000 MHz	51	1 kHz	–8 dBm	–8 dBm

9. Select Save Table to File

a. Enter the file name and click OK to save the Table.

10. Select Back | Sweep Type | Segmented Sweep (Freq-based)

11. Ensure that **Tr1** is highlighted. If not, move the mouse pointer over Tr1 and click to select.

12. Select Display | Trace Format | Log Mag

13. Change Display Trace Format of Tr2, Tr3, Tr4 to Log Mag.

14. Select Response | Tr2 | S22
15. Select Tr3 | More Single Mode | S33
16. Select Tr4 | More Single Mode | S44
17. Insert the Calibration Kit Components Coefficients USB Memory Stick into one of the front panel USB ports.
18. Select Calibration | Cal Kit/AutoCal Characterization | Install Kit/Charac.
19. Select Cal Kit file type and then click the Browse button. See Figure 3-1 below.

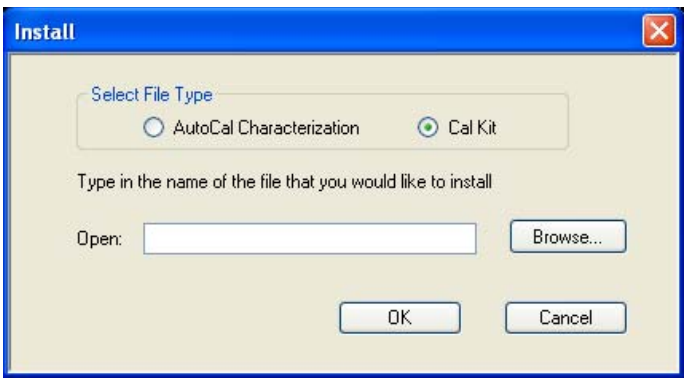


Figure 3-1. Install Dialog Box

20. Select the file with ".ccf" file extension and then click the Open button. See Figure 3-2 below.

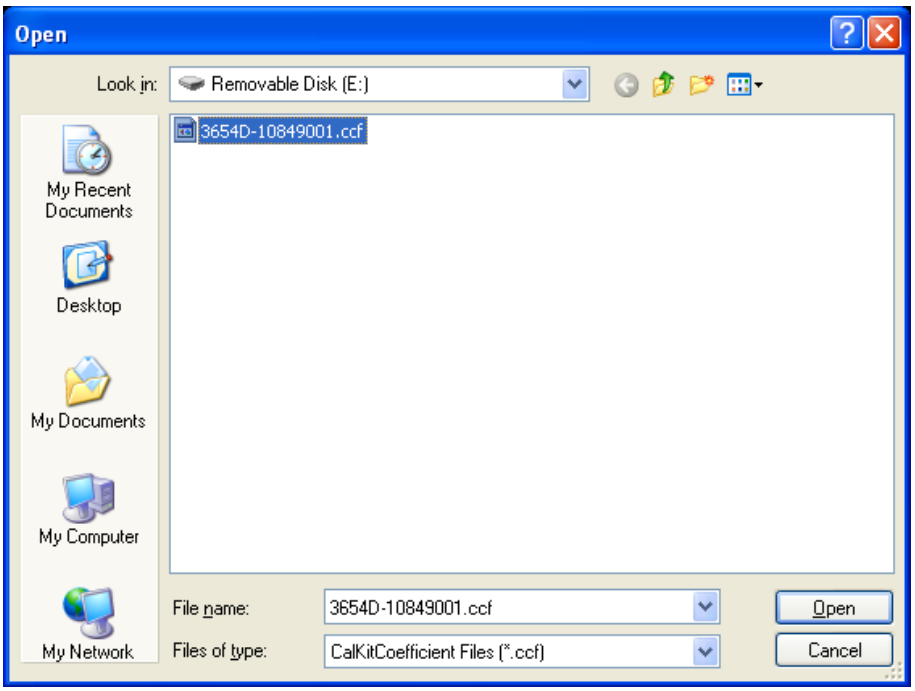


Figure 3-2. Open Dialog Box

21. Click on the OK button and then the Install button to install the Calibration Kit Components Coefficients.
22. Select Calibration | Calibrate | Manual Cal | 1-Port Cal | Modify Cal Setup | Edit Cal Params

23. Change all DUT Connector settings to K-Conn(F) for MN4694B or V-Conn(F) for MN4697B in the One Port Cal Setup dialog box. Click the OK button when done. See Figure 3-3 below.

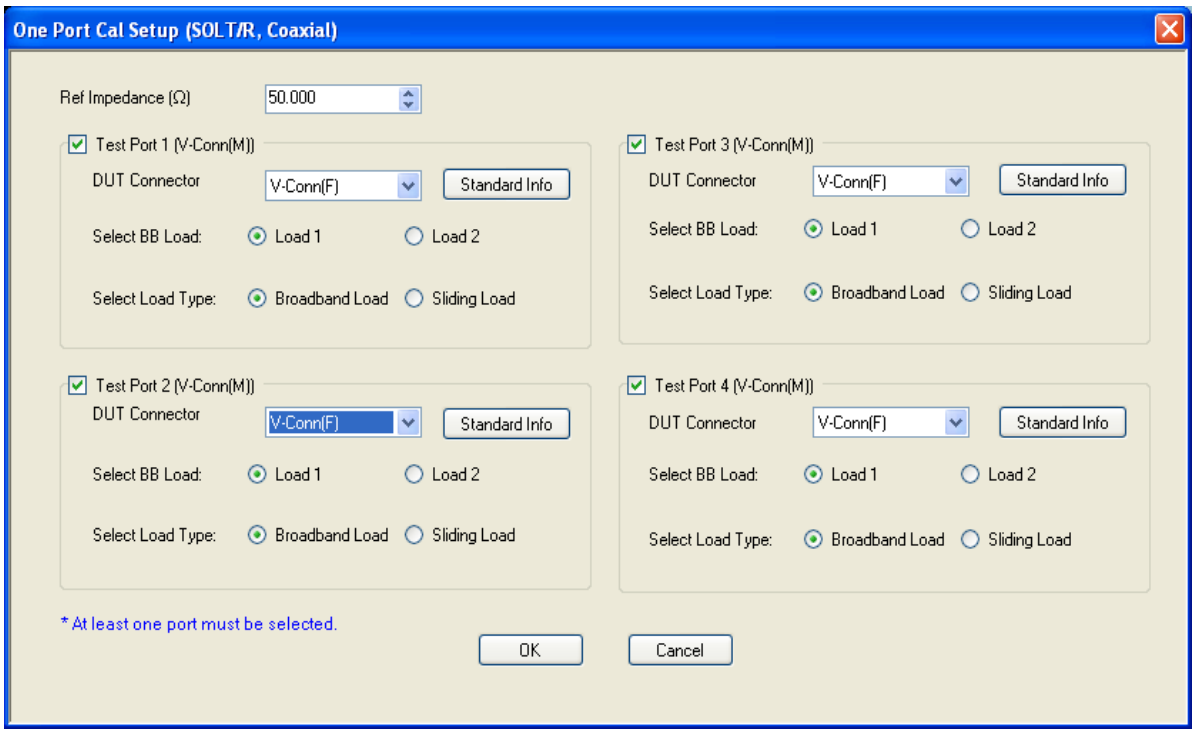


Figure 3-3. One Port Cal Setup Dialog Box

24. Select Back to return to the One Port Cal/s Menu. See Figure 3-4 below.

Figure 3-4. One Port Cal/s Menu

25. Select Port 1 Reflective Device to display the REFL. DEVICE(S) menu. See Figure 3-5 below.

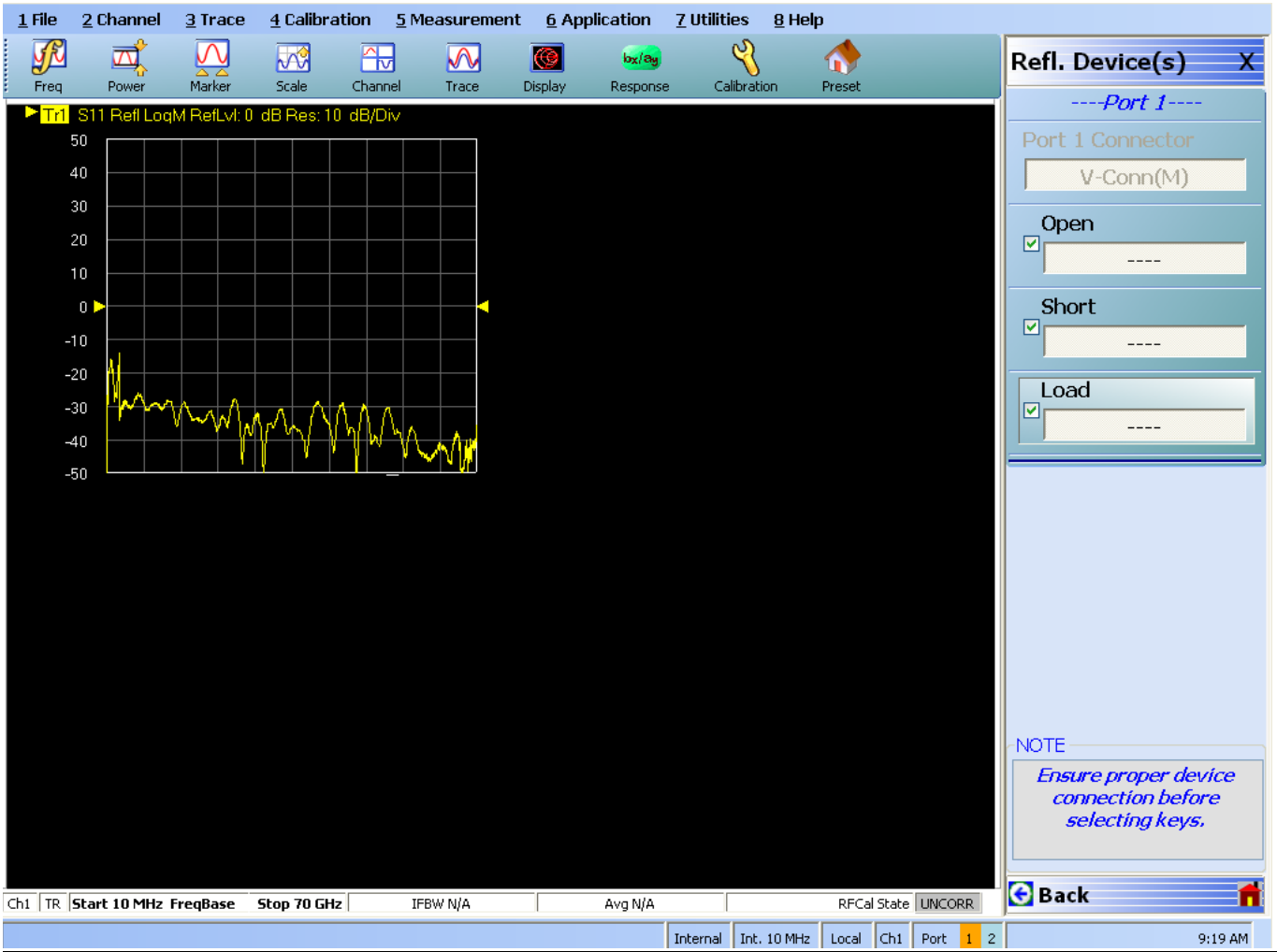


Figure 3-5. Refl. Device(s) Menu

26. Connect the Open from the Calibration Kit to Port 1 of MN4690B.

Note	Use the Anritsu 01-201 torque wrench from the Anritsu 365xx Calibration Kit to tighten the connection to improve the quality of the calibration. Do the same for other calibration standards (e.g. Short and Load) in subsequent steps.

27. Select Open.

Note	A check mark will appear on the button when the measurement or process is complete. See examples on right side of Figure 3-5 above.

28. Disconnect the Open from Port 1 and connect the Short.

29. Select Short

30. Disconnect the Short from Port 1 and connect the termination.

31. Select Load

32. Select Back to return to previous menu.

33. Select Port 2 Reflective Device

34. Connect the Open from the Calibration Kit to Port 2 of MN4690B.

35. Select Open.

36. Disconnect the Open from Port 2 and connect the Short.

37. Select Short

38. Disconnect the Short from Port 2 and connect the termination.

39. Select Load

40. Select Back to return to previous menu.

41. Select Port 3 Reflective Device

42. Connect the Open from the Calibration Kit to Port 3 of MN4690B.

43. Select Open.

44. Disconnect the Open from Port 3 and connect the Short.

45. Select Short

46. Disconnect the Short from Port 3 and connect the termination.

47. Select Load

48. Select Back to return to previous menu.

49. Select Port 4 Reflective Device

50. Connect the Open from the Calibration Kit to Port 4 of MN4690B.

51. Select Open.

52. Disconnect the Open from Port 4 and connect the Short.

53. Select Short

54. Disconnect the Short from Port 4 and connect the termination.

55. Select Load

56. Select Back to return to previous menu.

57. Select Done

58. Select Tr1 | Trace | Trace Max

59. Connect the Air Line to Port 1 and then terminate the Air Line with the Offset Termination.

Caution	Finger tighten only. Do not use torque wrench to tighten the connector connection for this step.

60. Select Scale | Auto Scale Active Trace

61. Select Marker

62. Click Mkr 1, Mkr 2 and Mkr 3 to turn these markers On.

63. Using the mouse to move Mkr 1 and Mkr 3 to adjacent peaks of the ripple with the greatest negative trough (or adjacent troughs if the ripple has the greatest positive peak) in the frequency band of interest as shown in Figure 3-6 on page 3-9 below. For frequency band information, in Appendix A, "Test Records", refer to either:

- Table A-1, "Directivity Record for MN4694B Multiport Test Set" on page A-2 for MN4694B
- Table A-4, "Directivity Record for MN4697B Multiport Test Set" on page A-4 for MN4697B

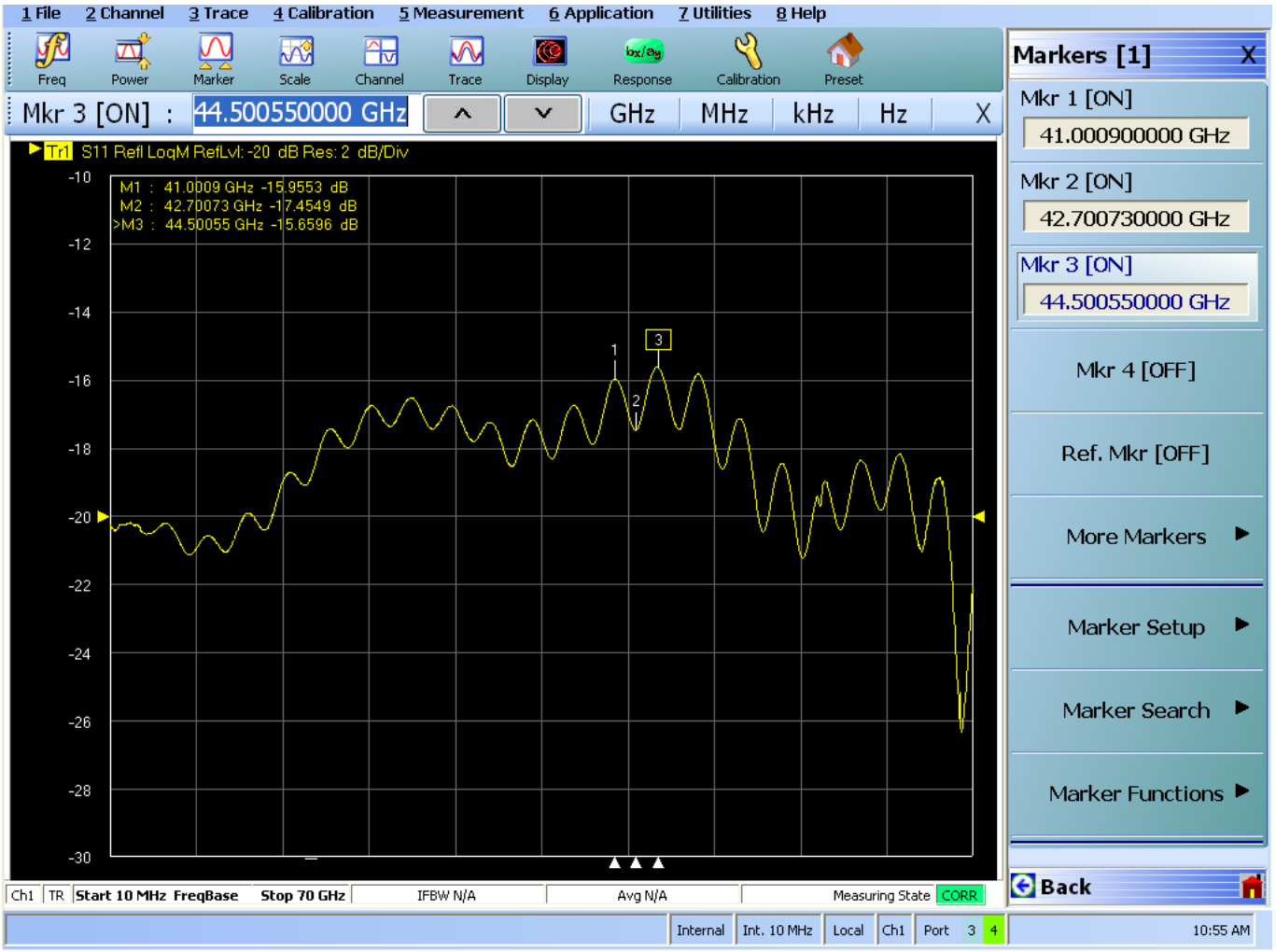


Figure 3-6. Log Mag Display

64. Position Mkr 2 to the bottom of the trough (or to the top of the peak if the ripple has the greatest position peak.)

65. Sum the magnitude values of Mkr 1 and Mkr 3 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:

Average Value = (Mkr 1 + Mkr 2)/2 = (–15.9634 dB) + (–15.641 dB)/2 = –15.8022 dB

66. Calculate the peak-to-peak ripple value (absolute difference of the Mkr 2 value and the Average Value) as follows:

dB_{p-p} = |Mkr 2 value| – |Average Value| = 17.452 dB – 15.8022 dB = 1.6498 dB

67. Use a RF measurement chart in Figure 3-7 on page 3-10 to find the corresponding return loss value of the peak-to-peak ripple value.

- Example: The corresponding Return Loss value of 1.6498 dB_{p-p} is approximately 20 dB

68. Also find the corresponding Ref + X or Ref – X value from the RF measurement chart.

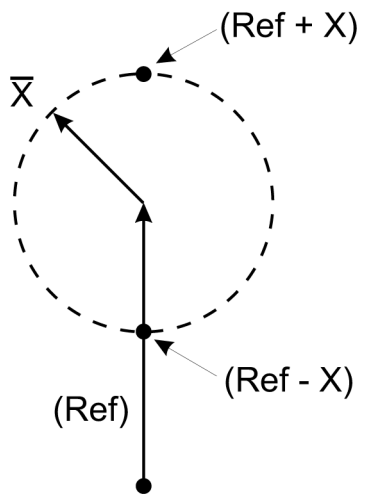
The first three columns are conversion tables for return loss, reflection coefficient, and SWR.

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

Figure 3-7. RF Measurement Chart

69. Use the following formula to calculate the directivity:

- For ripple with a negative trough:

  Directivity = Return Loss value + |Mkr 2 value| – |Ref – X value|

- For ripple with a positive peak:

  Directivity = Return Loss value + |Mkr 2 value| + |Ref + X value|

- Example:

  Directivity = 20 dB + 17.452 dB - 0.9151 dB = 36.5369 dB

70. Record the directivity value into the Port 1 Measured column of the following applicable table in Appendix A:

- Table A-1, "Directivity Record for MN4694B Multiport Test Set" on page A-2 for MN4694B
- Table A-4, "Directivity Record for MN4697B Multiport Test Set" on page A-4 for MN4697B.

71. Repeat Step 63 to Step 70 for other frequency bands listed in Table A-1 for MN4694B or Table A-4 for MN4697B in Appendix A.

72. Disconnect the Offset Termination from the Air Line and connect a short.

73. Select Scale | Auto Scale Active Trace

74. Repeat Step 63 to Step 67. Record the Return Loss value into the appropriate table and the Port 1 Measured column in Appendix A:

- Table A-2, "Test Port Match Record for MN4694B Multiport Test Set" on page A-2 for MN4694B
- Table A-5, "Test Port Match Record for MN4697B Multiport Test Set" on page A-4 for MN4697B.

75. Repeat Step 74 for other frequency bands listed in Table A-2 for MN4694B or Table A-5 for MN4697B in Appendix A.

76. Disconnect the Short from the Air Line and then disconnect the Air Line from the Test Port.

77. Select Trace | Trace Next

78. Connect the Air Line to the next Test Port (e.g. Port 2 for S22, Port 3 for S33 or Port 4 for S44) on MN4690B and then terminate the Air Line with the Offset Termination.

79. Repeat Step 60 to Step 76 to verify the Directivity and Port Match of the Test Port being tested.

80. Repeat Step 77 to Step 79 for the rest of the Test Ports on MN4690B.

3-3 Test Port Power Verification

The following test can be used to verify the test port power of each test port of the VectorStar Multiport VNA System meets specification.

Note	Perform this test only when the 2-Port VectorStar VNA has Option 051 installed.

Equipment Required

- Power Meter, Anritsu Model ML2437A or ML2438A
- Power Sensor, Anritsu Model SC7770
- Adapter, N male to V female, Pasternack Model PE9720
- Calibration Kit, K Connector, Anritsu Model 3652A
- Calibration Kit, V Connector, Anritsu Model 3654D

Procedure

1. Power on the power meter allow to warm up for at least 15 minutes.
2. Connect the N male to V female adapter to the power meter calibrator port.
3. Connect the sensor to the power meter calibrator port. Zero and calibrate the power sensor.
4. Disconnect the power sensor from the calibrator port and install a female to female Phase Equal adapter (such as 33KFKF50B) from the calibration kit to convert the power sensor input to a female connector.
5. Place the MS464xA VNA on top of the MN4690B Test Set and connect the font and rear panel cables per the **VectorStar MN4690B Multiport Test Set Installation Guide – 10410-00288.**
6. Power on the MN4690B Test Set first.

Note	If the VNA is powered up before the test set, the VNA application will stay in 2-port mode and only 2-port mode features and functions will be available.

7. Power on the MS464xA VNA and allow it to complete self test.
8. Allow both VNA and Test Set to warm up for at least one hour.
9. Preset the VNA.
10. Select Trace | # of Traces | 1 | Enter
11. Select Trace Max
12. Select Frequency | CW Mode

Note	This turn CW Mode On.

13. Select CW Frequency
14. Enter the first frequency value from Table A-3, “Test Port Power Record for MN4694B Multiport Test Set” on page A-3 for MN4694B or Table A-6, “Test Port Power Record for MN4697B Multiport Test Set” on page A-5 for MN4697B in Appendix A.
15. On the power meter, set the Cal factor to match the frequency entered in the previous step.
16. Connect the power sensor to Port 1 of MN4690B Test Set.
17. Select Power | Port 1 Power
18. Set Port 1 Power to the corresponding value in the VNA Port 1 Power Setting column of Table A-3 on page A-3 for MN4694B or Table A-6 on page A-5 for MN4697B.

- For example, set Port 1 Power to +9 dBm for 70 kHz

19. Record the power meter reading into the Port 1 Power Measured column of Table A-3 for MN4694B or Table A-6 for MN4697B.

20. Select Response | S22

21. Disconnect the power sensor from Port 1 of MN4690B and connect it to Port 2.

22. Record the power meter reading into the Port 2 Power Measured column of Table A-3 for MN4694B or Table A-6 for MN4697B.

23. Select More Single-Mode | S33

24. Disconnect the power sensor from Port 2 of MN4690B and connect it to Port 3.

25. Record the power meter reading into the Port 3 Power Measured column of Table A-3 for MN4694B or Table A-6 for MN4697B.

26. Select S44

27. Disconnect the power sensor from Port 3 of MN4690B and connect it to Port 4.

28. Record the power meter reading into the Port 4 Power Measured column of Table A-3 for MN4694B or Table A-6 for MN4697B.

29. Select Power | Port 1 Power | –10 dBm

30. Repeat Step 13 through Step 29 for other frequencies listed in Table A-3 for MN4694B or Table A-6 for MN4697B.

3-4 Noise Floor Verification

This test verifies the noise floor performance of the VectorStar Multiport VNA system at the test port of the MN4690B.

The Noise Floor test procedures are automated by using the VectorStar MS4640A Instrument Test Software, CDROM part number 2300-531-R.

The software guides you through the calibration process and the measurement of the noise floor. The software then computes the test results which are expressed in RMS values.

Refer to the **VectorStar MS4640A Series VNA 2300-533-R System Verification Software Quick Start Guide – 10410-00291**, for information about required equipment and details about running the software.

After the automated test is complete, print the test result and attached it the Test Records in Appendix A.

Chapter 4 — Troubleshooting

4-1 Introduction

This chapter provides information about troubleshooting tests that can be used to check the MN4690B Multiport Test Set for proper operation. These tests are intended to be used as a troubleshooting tool for checking the functionality of the components and sub-assemblies in the test set.

4-2 General Safety Warnings

Many of the troubleshooting procedures presented in this chapter require the removal of instrument covers to gain access to subassemblies and modules. When using these procedures, please observe the warning and caution notices.

Warning	Hazardous voltages are present inside the instrument when AC line power is connected. Before removing any covers, turn off the instrument via the Main power switch on the front panel and unplug the AC power cord.

Caution	Many assemblies and modules in the MN4690B contain static-sensitive components. Improper handling of these assemblies and modules may result in damage to the assembly and modules. Always observe the static-sensitive component handling precautions.

4-3 Troubleshooting Strategy

The VectorStar Multiport VNA System consists of two instruments:

- The 2-Port VectorStar MS4640A Series VNA
- The VectorStar Multiport MN4690B Test Set

A good understanding of the VectorStar Multiport VNA System operation is an important aid to troubleshooting system failures. Refer to the descriptions of system operation, and block diagrams located in Section 1-6 "VectorStar Multiport VNA System Overview" on page 1-4 and Section 1-7 "MN4690B Multiport Test Set Functional Description" on page 1-5.

It is also imperative to isolate whether the system fault is in the VectorStar VNA or the MN4690B Test Set.

Suggested Troubleshooting Steps

The suggested troubleshooting steps for MN4690B Test Set are as follows:

- Identify whether the fault is unique to the MN4690B Test Set (e.g. Unable to power on, etc.).
- Verify whether the fault is related to system setup and installation (e.g. GPIB cable, GPIB Address, inter-connect RF cable condition and connection and etc). Refer to **VectorStar MN4690B Series Multiport Test Set Installation Guide – 10410-00288.**
- Verify whether the 2-Port VectorStar VNA is in good condition by itself. Refer to **VectorStar MS4640A Series VNA Maintenance Manual – 10410-00268**.
- Perform the troubleshooting tests in this chapter.
- If possible, swap the suspected faulty component or PCB with the component or PCB from the known working switching signal path.
    - For example, if you suspect that Port 1/Port 2 Low Band Switch is faulty, swap it with the Port 3/Port 4 Low Band Switch.

4-4 Troubleshooting – Test Set Fails to Power Up

If the MN4690B 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 disconnect the AC line cord before removing any covers. Troubleshooting or repair procedures should only be performed by qualified service personnel who are fully aware of the potential hazards.

Line Source and Interface Checks

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

Note	The MN4690B is designed to automatically sense and operate with AC line voltage in the range of 85 to 264 Volt AC, with a frequency range of 47 to 63 Hz.

2. Verify the AC power cord is in good condition.
3. Verify the power line fuse is installed and that is not blown (open).

Power Supply Voltage Check

1. Turn off the test set and disconnect the AC power cord from the instrument. Ensure that all external front and rear panel cable connections to the test set are also disconnected.
2. Remove the top cover.
   - Refer to Section 5-3 “Removing the Covers” on page 5-2.
3. Re-connect the power cord to the test set and turn it on.
4. Using a digital multi-meter or oscilloscope, measure the expected DC power supply voltages on the 4-Port Test Set Control PCB at the P4 connector pins or test points listed in Table 4-1 below.
   - See Figure 4-1, “4-Port Test Set Control PCB P4 Connector Location” on page 4-3 below for test point locations.
5. If any of the DC voltage is much lower than the expected value, replace the Power Supply.
   - Refer to Section 5-8 “Power Supply – 40-159” on page 5-10.

Note	**V1 Adj** and **V2 Adj** Trim Potentiometers on the Power Supply allow adjustment to the output voltage at pin 8 and pin 5 respectively.

Table 4-1. Power Supply Voltages

Measured Pin	Common Pin	Expected DC Voltage
P4 pin 1 (or TP7)	P4 pin 2	–15 V
P4 pin 4 (or TP6)	P4 pin 2	+15 V
P4 pin 5 (or TP5)	P4 pin 2	–5.5 V
P4 pin 8 (or TP2)	P4 pin 2	+5.5 V

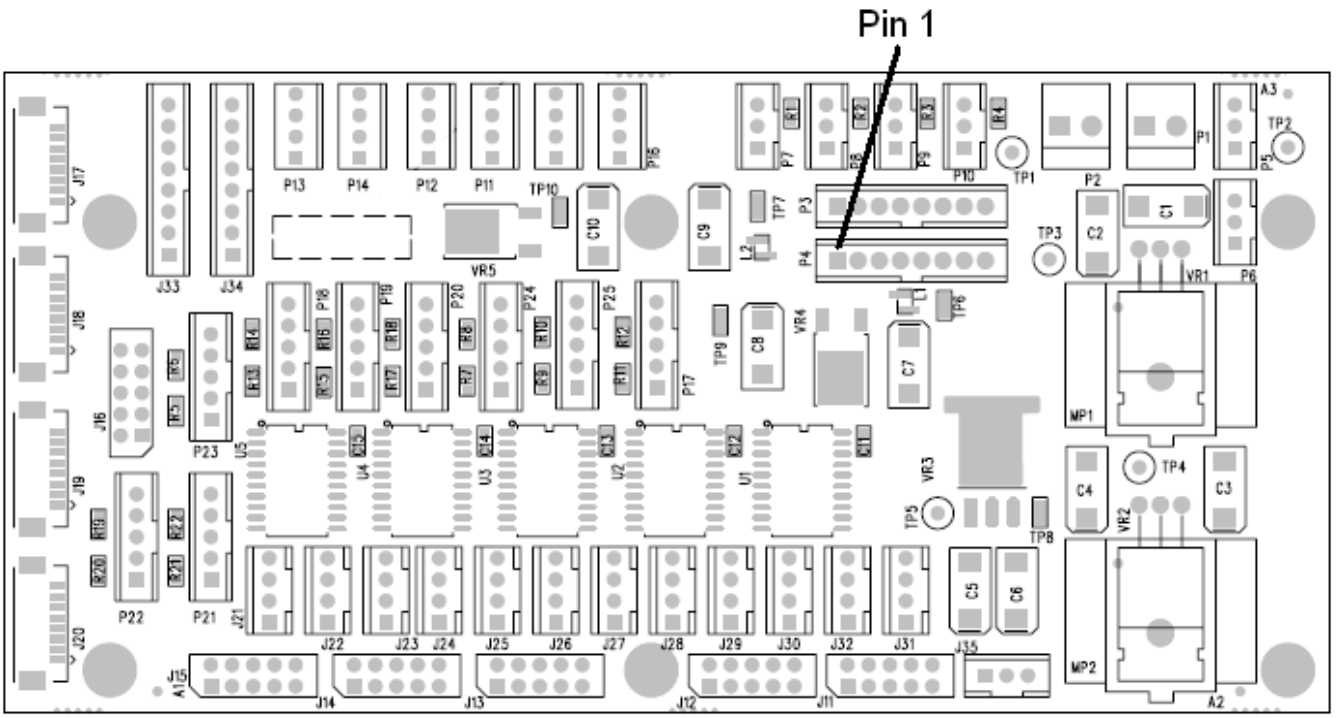


Figure 4-1. 4-Port Test Set Control PCB P4 Connector Location

4-5 Troubleshooting – RF Switch Functional Check

This section provides the procedures to check if the respective RF switches of each test port are working properly.

Note	Port 1 and Port 2 share the same set of RF switches. Port 3 and Port 4 share a separate set of RF switches.

Equipment Required for VNA System with MN4694B

- Anritsu Model 3652A K Connector Calibration Kit (For MN4694B)
- Anritsu Model 3670K50-2 K Connector Through Cable (For MN4694B)

Equipment Required for VNA System with MN4697B

- Anritsu Model 3654D V Connector Calibration Kit (For MN4697B)
- Anritsu Model 3670V50B-2 K Connector Through Cable (For MN4697B)

Procedure

1. Set up the VNA for S11 Log Mag graph type Single Display.
2. Connect a short to Port 1 of the test set.
3. Observe if there is any abnormality in the S11 trace (e.g. power roll off in the low frequency band, power drop off in the entire low band or high band, and etc.).
4. If no abnormalities are observed, then the switches are working properly for Port 1.
5. Change the VNA display for S22.
6. Disconnect the Short from Port 1 and connect it to Port 2.
7. Observe if there is any abnormality in the S22 trace (e.g. power roll off in the low frequency band, power drop off in the entire low band or high band, and etc.).
8. If no abnormalities are observed, then the switches are working properly for Port 2.
9. If abnormalities are observed, determine if the fault is in the Source Channel RF switch or b Channel RF switch by do the following:
    a. Change the VNA display for S31.
    b. Connect a through cable between Port 1 and Port 3.
    c. Observe if the same abnormality appears on S31 trace.
    d. If yes, check the control cable connection to the respective b Channel RF Switch, replace the High Band SPDT Switch Control PCB (if applicable), and then replace the respective b Channel RF Switch.
        - For example, if abnormality is shown below 2.5 GHz, replace the b Channel Low Band Switch.
    e. If no, check the control cable connection to the respective Source Channel RF Switch, replace the High Band SPDT Switch Control PCB (if applicable), and then replace the respective Source Channel RF Switch.
10. Repeat Step 1 through Step 9 for Port 3 and Port 4. Set the VNA display for S33, S44 and then S13 for the tests.

4-6 Troubleshooting – Directivity and Test Port Match Failure

This section provides the test procedures to isolate the cause of failure when the test set fails either the directivity and test port match tests. Refer to Section 3-2 “Directivity and Test Port Match Verification” on page 3-2 above for VNA setup information.

Equipment Required for VNA System with MN4694B

- Calibration Kit, K Connector, Anritsu Model 3652A
- Phase Equal Adapter, K(m) to K(f) Anritsu Model 33KKF50B (Qty 2)
- Air Line, K Connector, Anritsu Model T2023-2
- 20 dB Offset Termination, K(f) Connector, Anritsu Model SC4808

Equipment Required for VNA System with MN4697B

- Calibration Kit, V Connector, Anritsu Model 3654D
- Phase Equal Adapter, V(m) to V(f) Anritsu Model 33VVF50C (Qty 2)
- Air Line, V Connector, Anritsu Model T2025-2
- 20 dB Offset Termination, V(f) Connector, Anritsu Model SC5727

Directivity Failure Troubleshooting Procedure

1. Use a different Termination from the Calibration Kit to perform an One Port Cal on Port 1 of the VectorStar Multiport VNA System.
2. Verify if the system passes the directivity test.
3. If the system passes, then the cause of the failure is caused by a defective termination in the Calibration Kit.
4. If the system fails, do the following:
    a. Separate the test set from the 2-port VectorStar VNA.
    b. Re-install the front panel and rear panel loop cables to the VectorStar VNA.
    c. Perform an One Port Cal on Port 1 of the VectorStar VNA.
    d. Verify that directivity of 2-port VNA configuration are the same as those of 4-port VNA configuration.
    e. If yes, the failure is caused by the termination in the calibration kit.
    f. If no, replace the respective b Channel RF Switch (Low Band Switch or High Band SPDT Switch, depending on frequencies that the failure occurs).

Test Port Match Failure Troubleshoot Procedure

1. Separate the test set from the 2-Port VectorStar VNA.
2. Re-install the front panel and rear panel loop cables to the VectorStar VNA.
3. Perform an One Port Cal on Port 1 of the VectorStar VNA.
4. Verify that test port match of 2-port VNA configuration are the same as those of 4-port VNA configuration.
5. If yes, the failure is caused by the Open and Short in calibration kit.
6. If no, do the following:
    a. Replace the Diplexer.
    b. Replace the respective Source Channel RF Switch.

Chapter 5 — Remove And Replace

5-1 Introduction

This chapter provides procedures for removing and re-installing the replaceable components and sub-assemblies in MN4690B Series Multiport Test Sets.

5-2 Equipment Required

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

Caution	Always use a torque wrench calibrated to 8 lbf.in when tightening the RF connectors on semi-rigid RF cables. Over-torquing will cause damage to the RF connectors.

Some procedures require the use of the following tools:

- Small jewelers Phillips screwdriver
- Right angle (offset) #1 size Phillips screwdriver
- Adjustable wrench, 4 inch length, 9/16 inch Jaw Opening
- 60 lbf.in Torque Wrench with 1/2" Open End Head – Mountz MTBN10 with 1/2" Open End Head or equivalent.
- 15 lbf.in Torque Wrench with 13/16" Socket – Craftsman 009-44594 with 13/16" deep socket on 3/8" drive or equivalent.

5-3 Removing the Covers

The following procedure describes the process of removing the covers.

Procedure

Note	Refer to Figure 5-1 on page 5-3 below during this procedure.

1. Switch the VectorStar VNA and the MN4690B Test Set power off and remove the power cords.
2. Remove the MN4690B Test Set from the VectorStar VNA by disconnecting all cable connections and separating the test set from the VectorStar VNA.
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.

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

   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.

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.
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 the rear of the bottom cover.
   d. Lift and slide the bottom cover away from the test set.
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 right cover away from the test set.
7. To remove the left cover:
   a. Place the test set on 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 left cover.
   d. Lift and slide the left cover away from the test set.

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

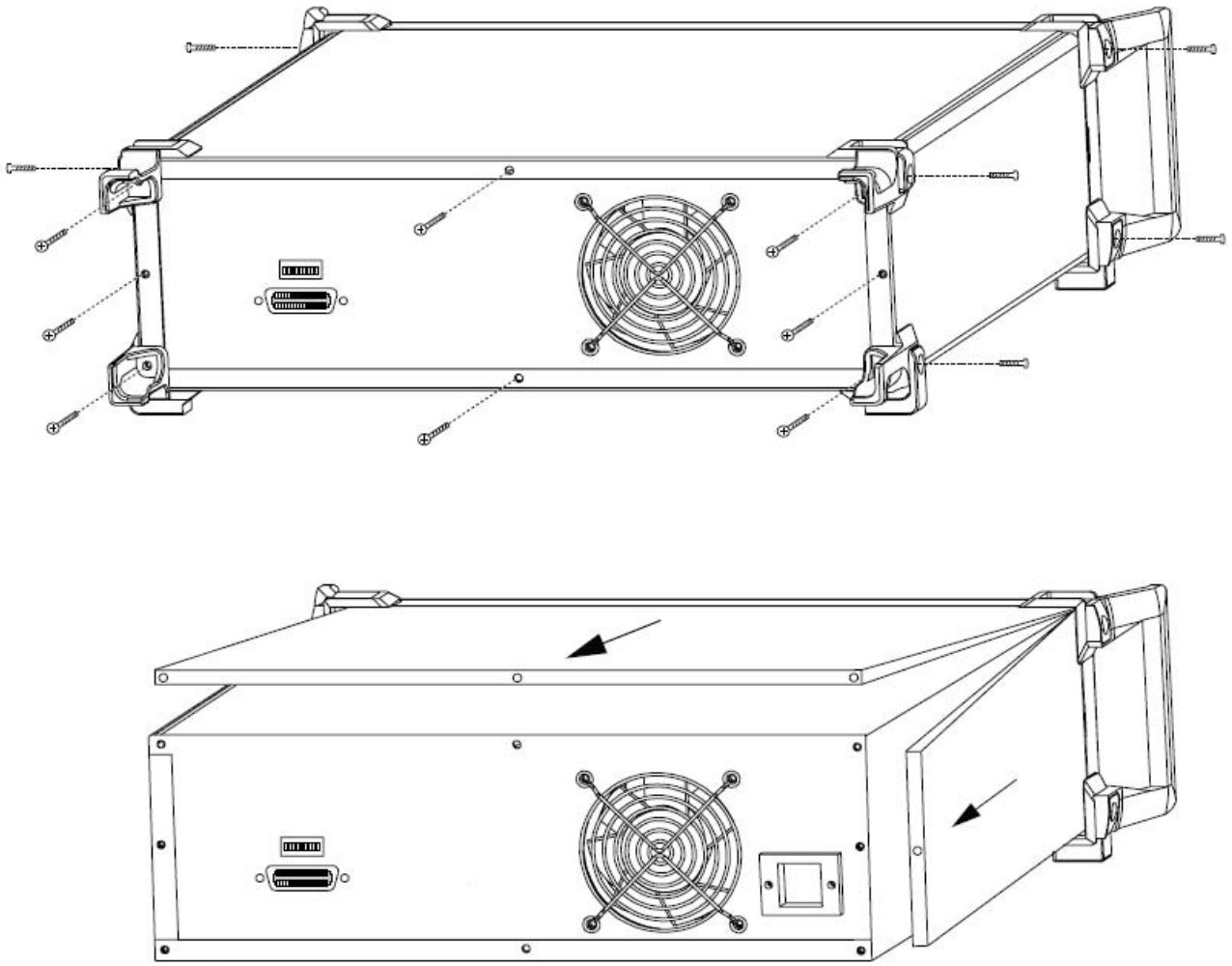
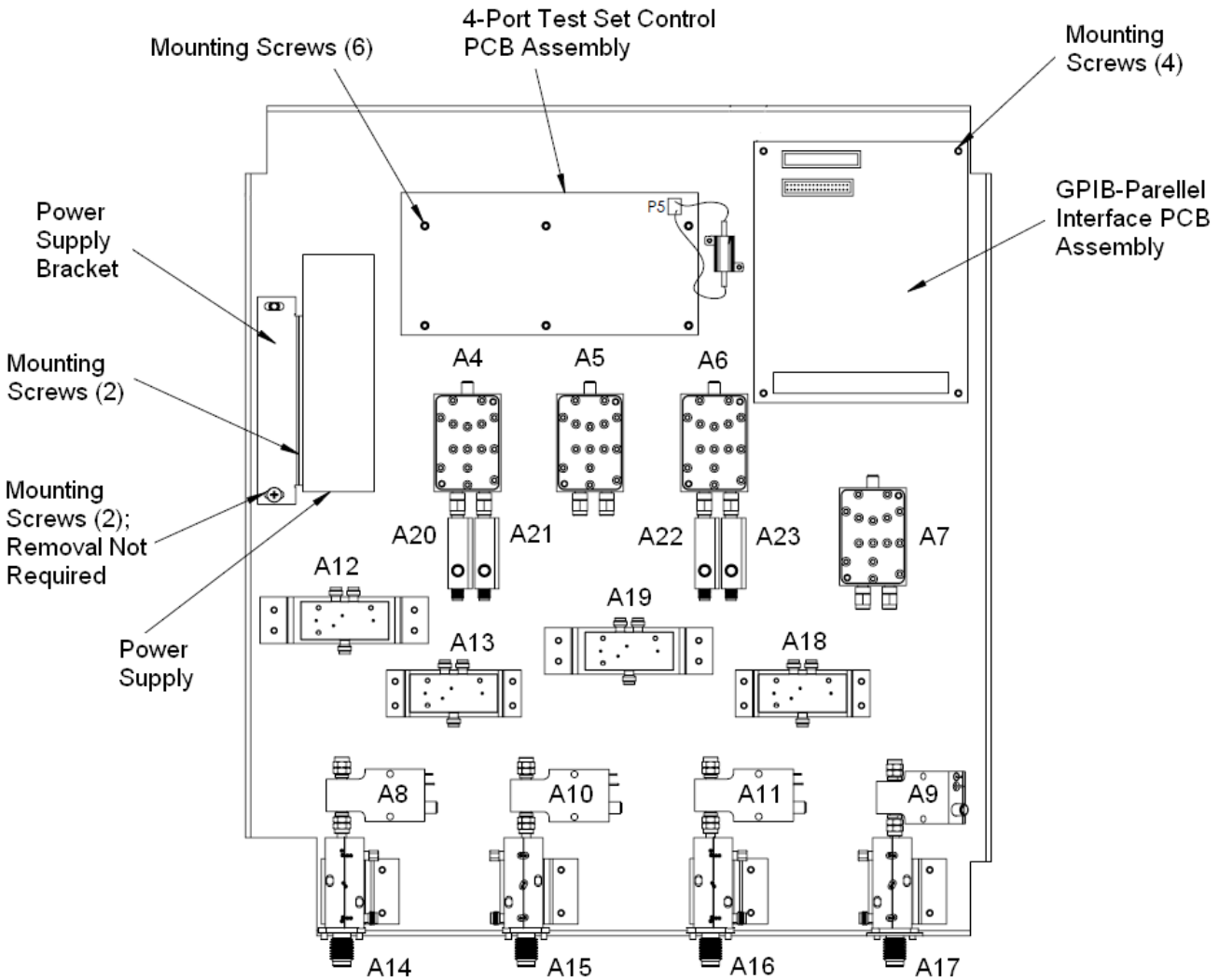


Figure 5-1. MN4690B Test Set Cover Removal

5-4 Location of Major Components and Sub-assemblies

Figure 5-2 below shows the location of major components and sub-assemblies in the MN4690B Series Multiport Test Sets.



See Table 2-1, "Replaceable Parts List" on page 2-1 above for identification of Engineering "A" Numbers.

Figure 5-2. Location of Major Components and Subassemblies

5-5 GPIB-Parallel Interface PCB Assembly – 2000-989

This section provides a procedure for removing and replacing the GPIB-Parallel Interface PCB Assembly in the test set.

Procedure

1. Remove the top cover from the test set. Refer to Section 5-3 “Removing the Covers” on page 5-2.
2. Disconnect the two cables from the connectors as shown in Figure 5-3.
3. Un-solder (de-solder) the black and red power wires on the left side of the PCB.
4. Remove the four mounting screws.
5. Lift the PCB Assembly away from the test set chassis.
6. To replace the GPIB-Parallel Interface PCB, reverse the order of the removal procedure.

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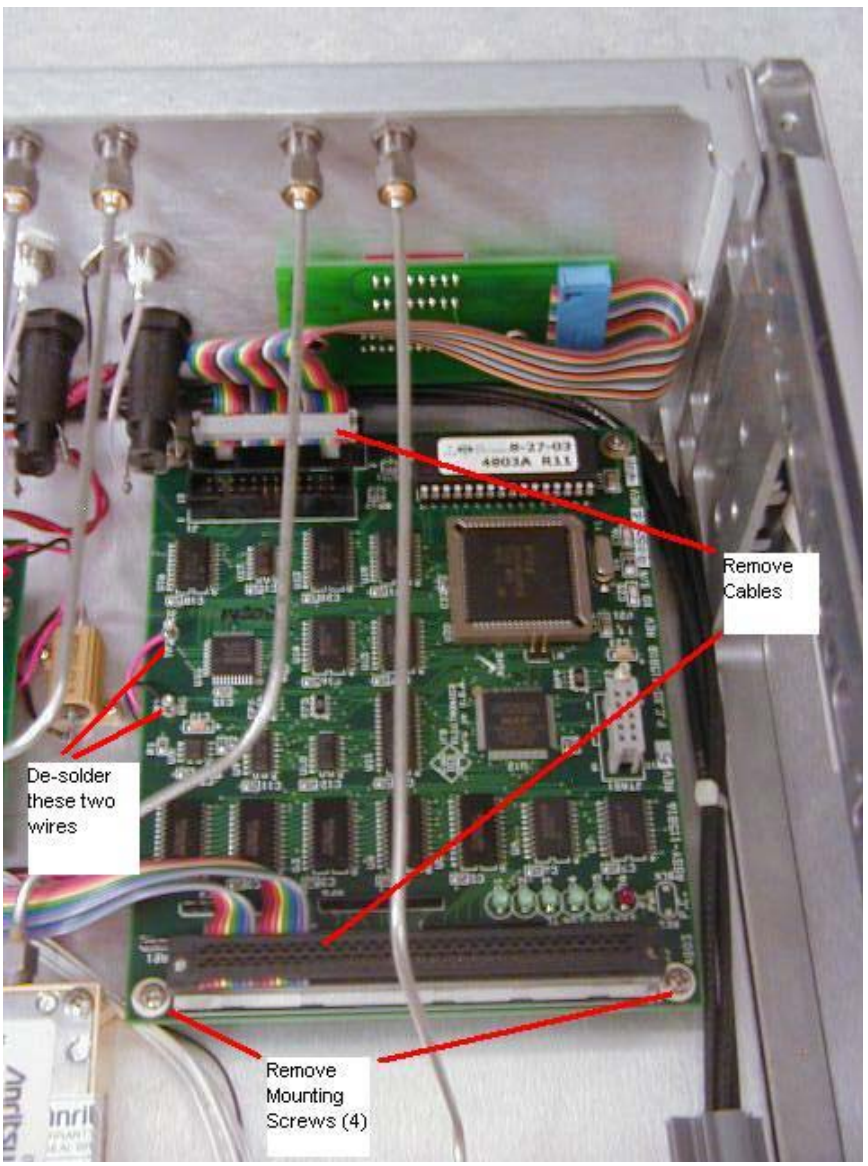


Figure 5-3. GPIB-Parallel Interface PCB Removal

5-6 Rear Panel GPIB Connector PCB Assembly – 2000-989

This section provides a procedure for removing and replacing the Rear Panel GPIB Connector PCB in the test set.

Note	The Rear Panel GPIB Connector PCB Assembly is a part of the GPIB-Parallel Interface PCB Assembly Replacement Kit, part number 2000-989.

Procedure

1. Remove the top cover from the test set. Refer to Section 5-3 “Removing the Covers” on page 5-2.
2. Disconnect the ribbon cable from the GPIB-Parallel Interface PCB Assembly. Refer to Figure 5-3.
3. Use an adjustable spanner wrench to un-screw the two hex nuts from the rear panel.
4. Remove the GPIB Connector PCB Assembly from the rear panel. Refer to Figure 5-4.
5. To replace the GPIB Connector PCB Assembly, reverse the order of the removal procedure.

Note	Ensure that the two jumper wires are installed as shown in Figure 5-5.

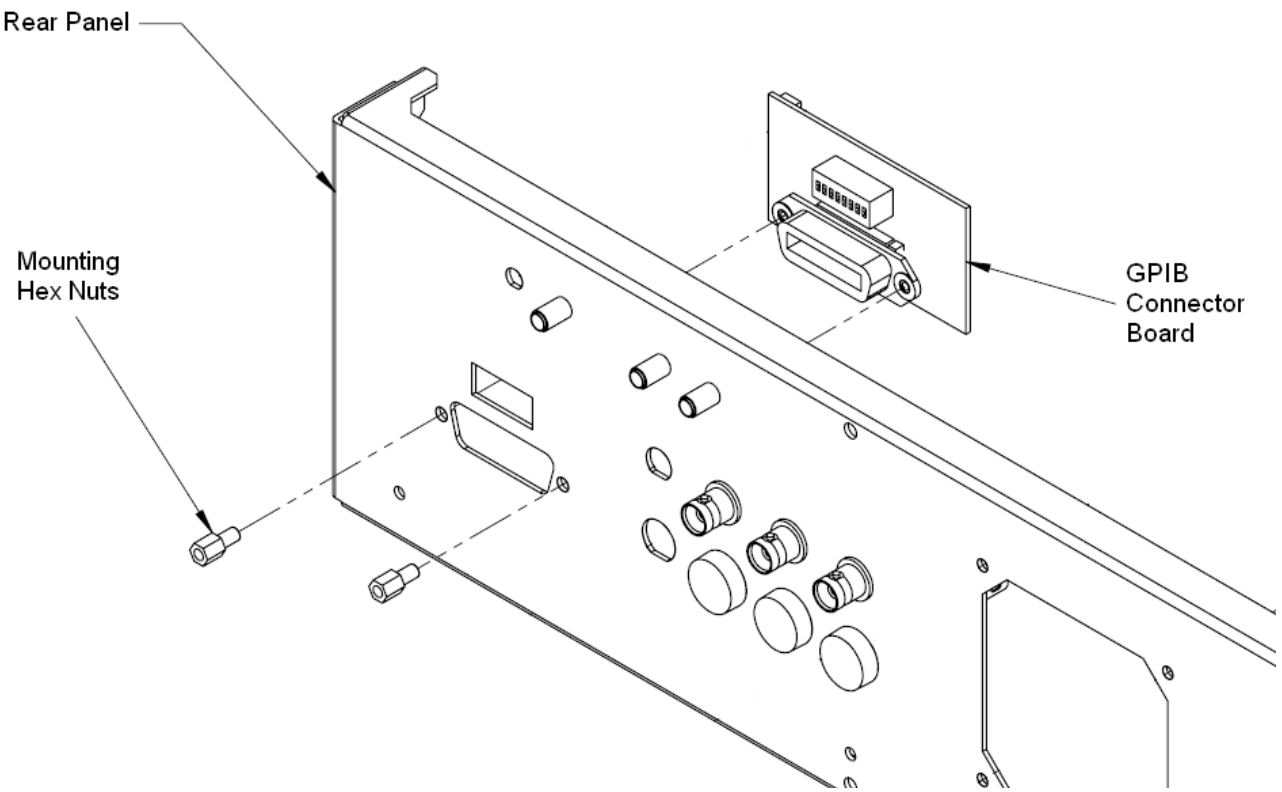
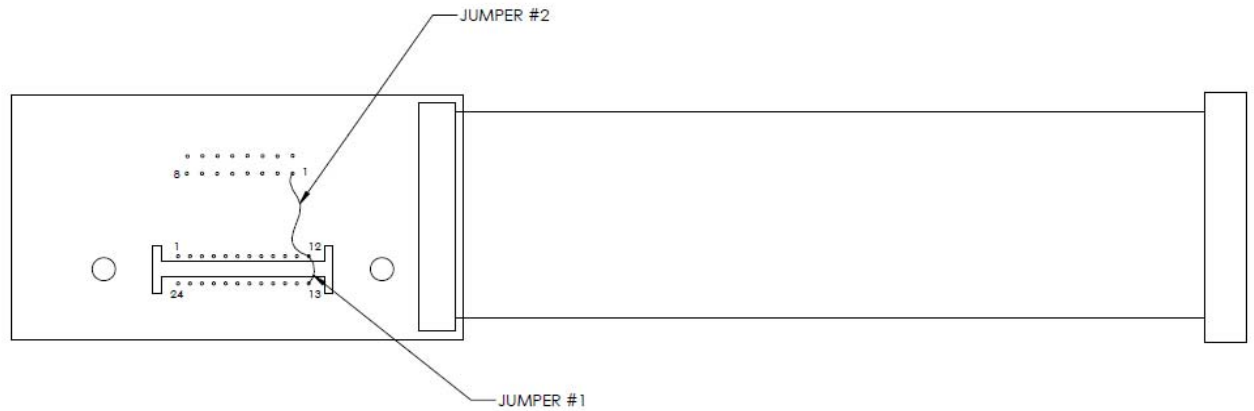


Figure 5-4. GPIB Connector PCB Assembly Removal



NOTES:

1. JUMPER #1 GOES FROM PIN 12 OF GPIB CONNECTOR TO PIN 13 OF GPIB CONNECTOR
2. JUMPER #2 GOES FROM PIN 12 OF GPIB CONNECTOR TO PIN 1 OF THE DIP SWITCH CONNECTOR

Figure 5-5. Back side of GPIB Connector PCB Assembly

5-7 4-Port Test Set Control PCB Assembly – ND70927

This section provides a procedure for removing and replacing the 4-Port Test Set Control PCB in the test set.

Procedure

1. Remove the top cover from the test set. Refer to Section 5-3 “Removing the Covers” on page 5-2.
2. Disconnect the two ribbon cables from the GPIB-Parallel Interface PCB from J13 and J15 connectors of the 4-Port Test Set Control PCB.
   - Figure 5-6 on page 5-9 below shows that two blue ribbon cable connectors are plugged into J13 and J15 on the Control PCB.
3. Disconnect the GPIB-Parallel Interface PCB power cable from the J35 connector of the Control PCB.
4. Disconnect the Power Supply Load cable from the P6 connector of the Control PCB.
5. Disconnect the Fan Power cable from the P5 connector of the Control PCB.
6. Disconnect the Power Supply cables from P1 and P3 connectors of the Control PCB.
7. Disconnect the Front Panel Power Indicator LED cable from the P7 connector of the Control PCB.
8. Disconnect the Front Panel Port Indicator LED cables from P17 and P18 connectors of the Control PCB.
9. Disconnect the four switch control cables from J17, J18, J19 and J20 connectors of the Control PCB.
10. Remove the six mounting screws from the Control PCB.
    - See Figure 5-2, “Location of Major Components and Subassemblies” on page 5-4 above for screw locations.
11. Lift the Control PCB away from the test set chassis.
12. To replace the 4-Port Test Set Control PCB Assembly, reverse the order of the removal procedure.

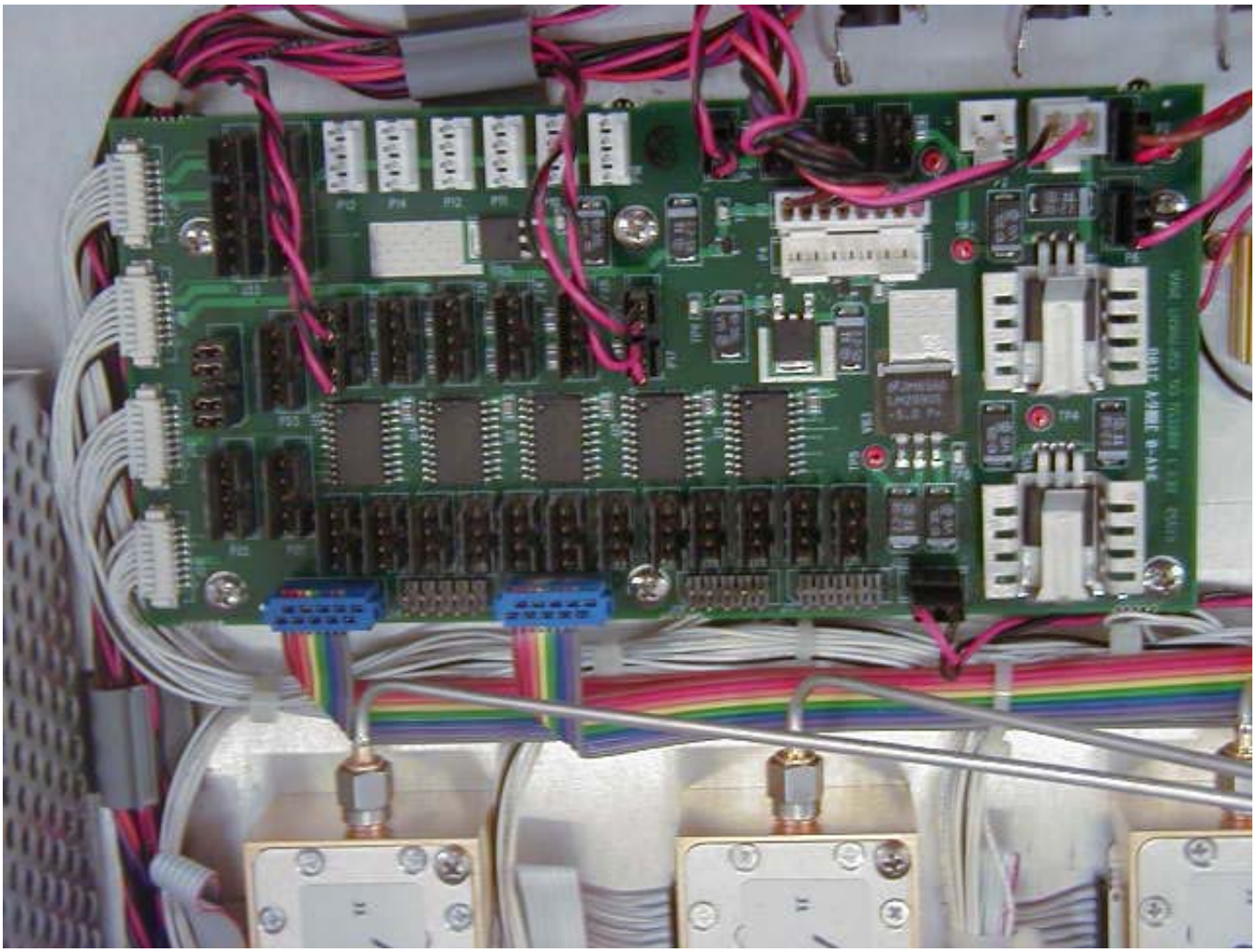


Figure 5-6. 4-Port Test Set Control PCB Assembly

5-8 Power Supply – 40-159

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

Procedure

1. Remove the top cover and left cover from the test set.
   - Refer to Section 5-3 “Removing the Covers” on page 5-2.
2. Disconnect the AC Input cables (linked to the AC Input Module on the rear panel) and the green Ground wire from the Power Supply.
   - See Figure 5-7 below.
3. Disconnect the DC Output cable (linked to the 4-Port Test Set Control PCB Assembly) from the Power Supply.
   - See Figure 5-8, “Power Supply DC Output” on page 5-12 below.
4. Remove the two mounting screws from the vertical plane of the Power Supply Bracket which faces toward the left side panel.
   - See Figure 5-2, “Location of Major Components and Subassemblies” on page 5-4 above for screw locations.
5. To replace the Power Supply, reverse the order of the removal procedure.

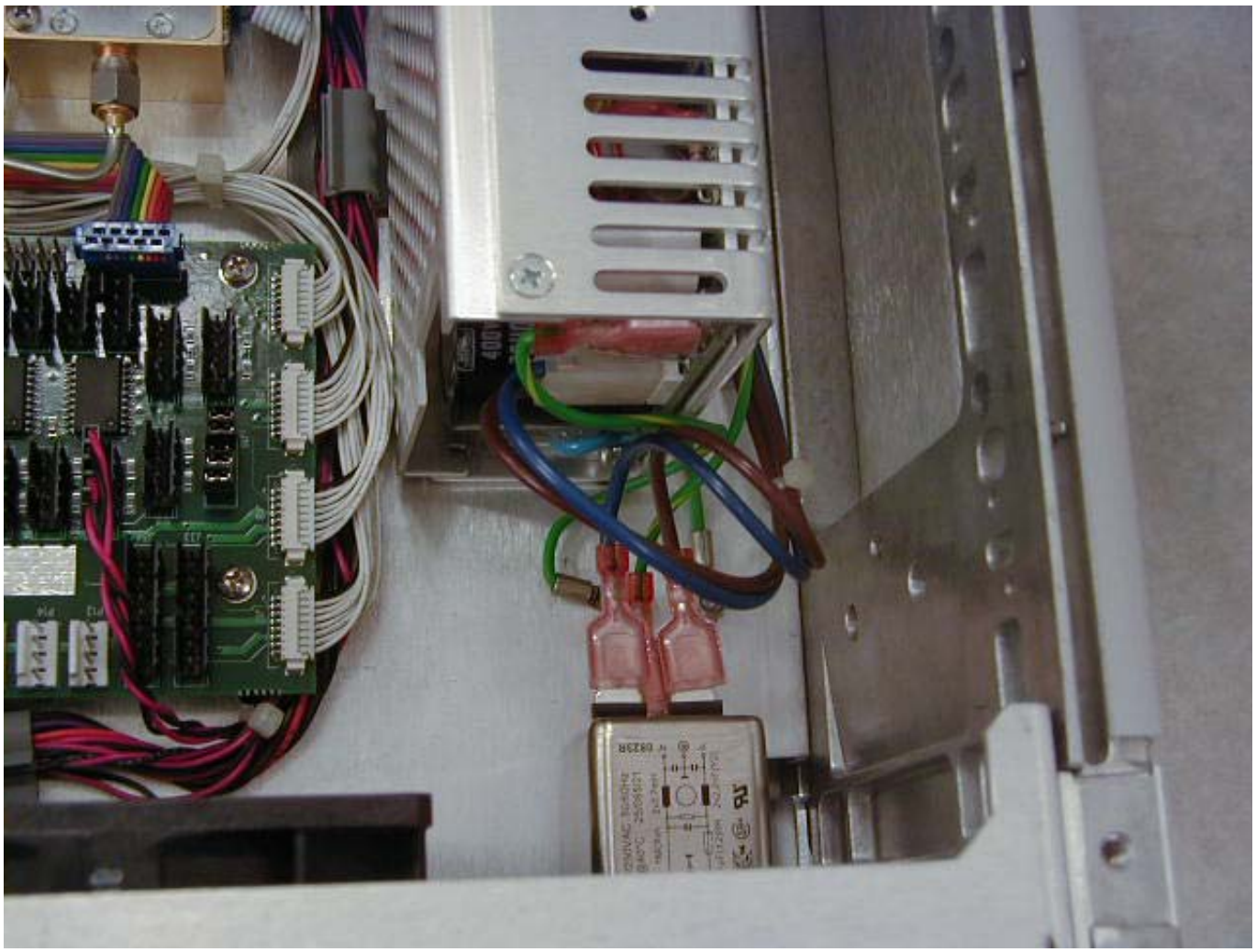


Figure 5-7. Power Supply AC Input

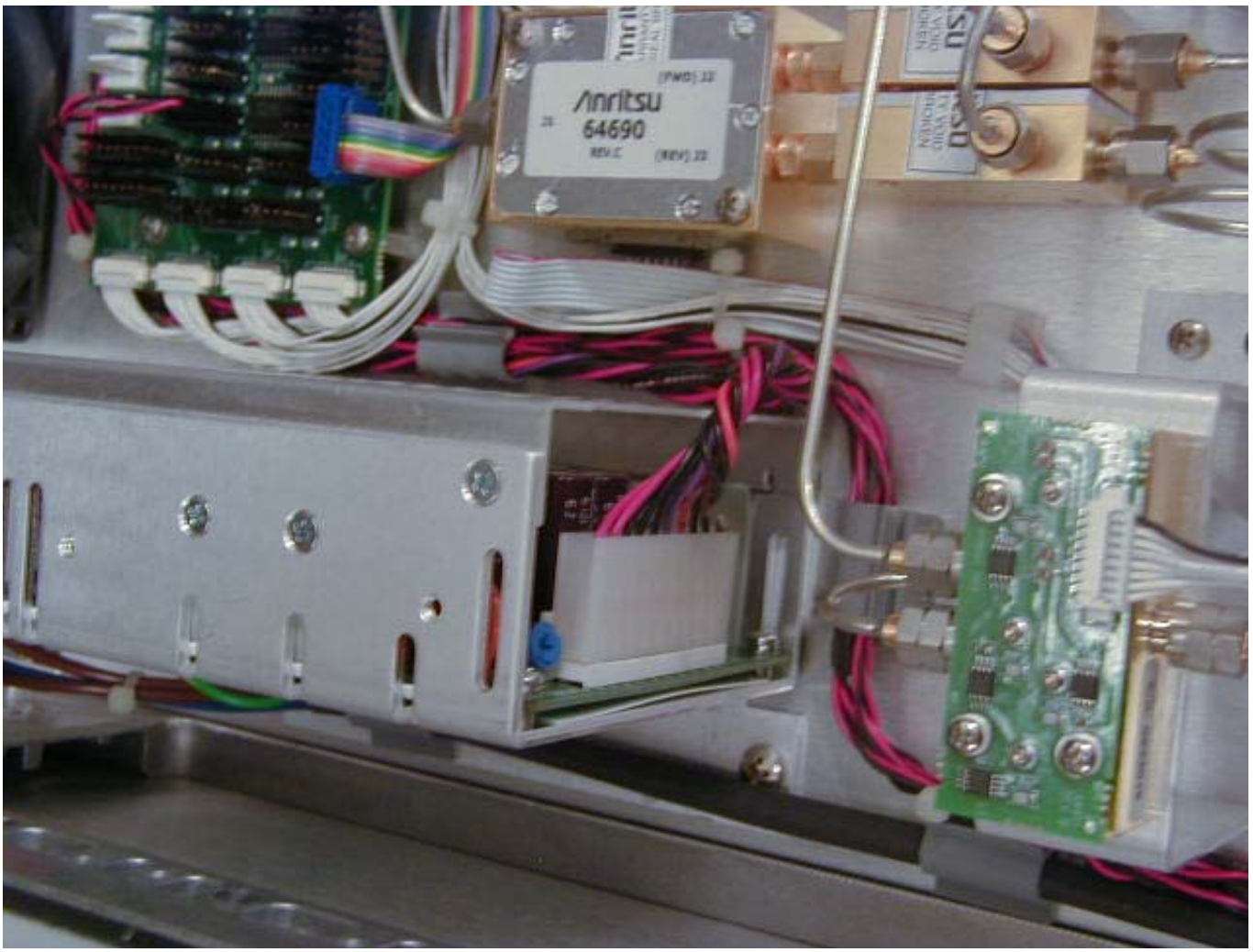


Figure 5-8. Power Supply DC Output

5-9 Low Band Switch – ND70079 – A4, A5, A6, A7

This section provides a procedure for removing and replacing the Low Band Switches in the test set. There are four Low Band Switches, A4, A5, A6 and A7, installed in the test set. In Figure 5-2 on page 5-4 above, refer to the A4, A5, A6, and A7 engineering references. Their removal and replacement procedures are very similar and only differ in whether RF cables or Low Band Bridges are connected to the switch.

Procedure

1. Remove the top cover from the test set.
   - Refer to Section 5-3 “Removing the Covers” on page 5-2 above.
2. Disconnect the control cable from the left side of the Low Band Switch Module.
3. Remove the two shiny phillips mounting screws from the Low Band Switch Module.
   - Refer to Figure 5-9 on page 5-14 below.
4. Disconnect the RF cable from the J1 connector of the module.
5. Disconnect the two RF cables from J2 and J3 connectors of the module for A5 or A7 Low Band Switch.
6. Disconnect the two Low Band Bridges from J2 and J3 connectors of the module for A4 or A6 Low Band Switch.
7. Lift the module away from the test set chassis.
8. To replace the Low Band Switch, reverse the order of the removal procedure.

Note Use Anritsu 01-201 Torque Wrench to tighten all RF connectors.

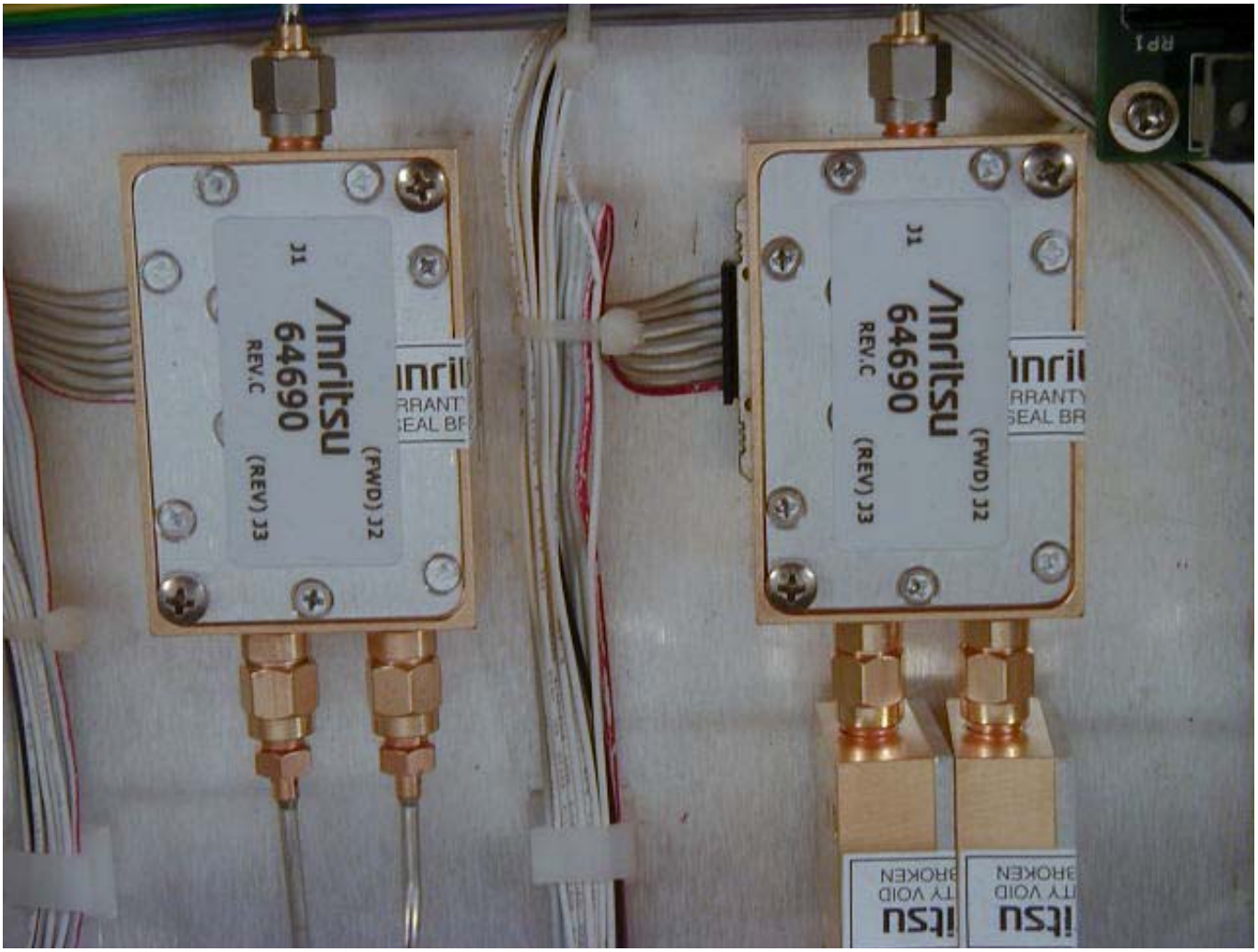


Figure 5-9. Low Band Switches (A5 is shown on the left and A6 is shown on the right)

5-10 Low Band Bridge – ND70078 – A20, A21, A22, A23

This section provides a procedure for removing and replacing the Low Band Bridges in the test set. There are four Low Band Bridges, A20, A21, A22 and A23, installed in the test set. Refer to Figure 5-2 on page 5-4 above.

Procedure

1. Remove the top cover from the test set.
   - Refer to Section 5-3 "Removing the Covers" on page 5-2 above.
2. Remove the two mounting screws from the Low Band Switch. This is done to allow the combined assembly to move so the connected RF cables can be disconnected.
   - See Figure 5-9 on page 5-14 above.
3. Disconnect the RF cable from the JB connector of the Low Band Bridge.
   - See Figure 5-10, "Low Band Bridges – A20 at bottom – A21 at top" on page 5-16 below.

Note	JB connector is the one facing upward.

4. Disconnect the RF cable from the P connector of the Low Band Bridge.
5. Disconnect the Low Band Bridge from the Low Band Switch.
6. Lift the Low Band Bridge away from the test set chassis.
7. To replace the Low Band Bridge, reverse the order of the removal procedure.

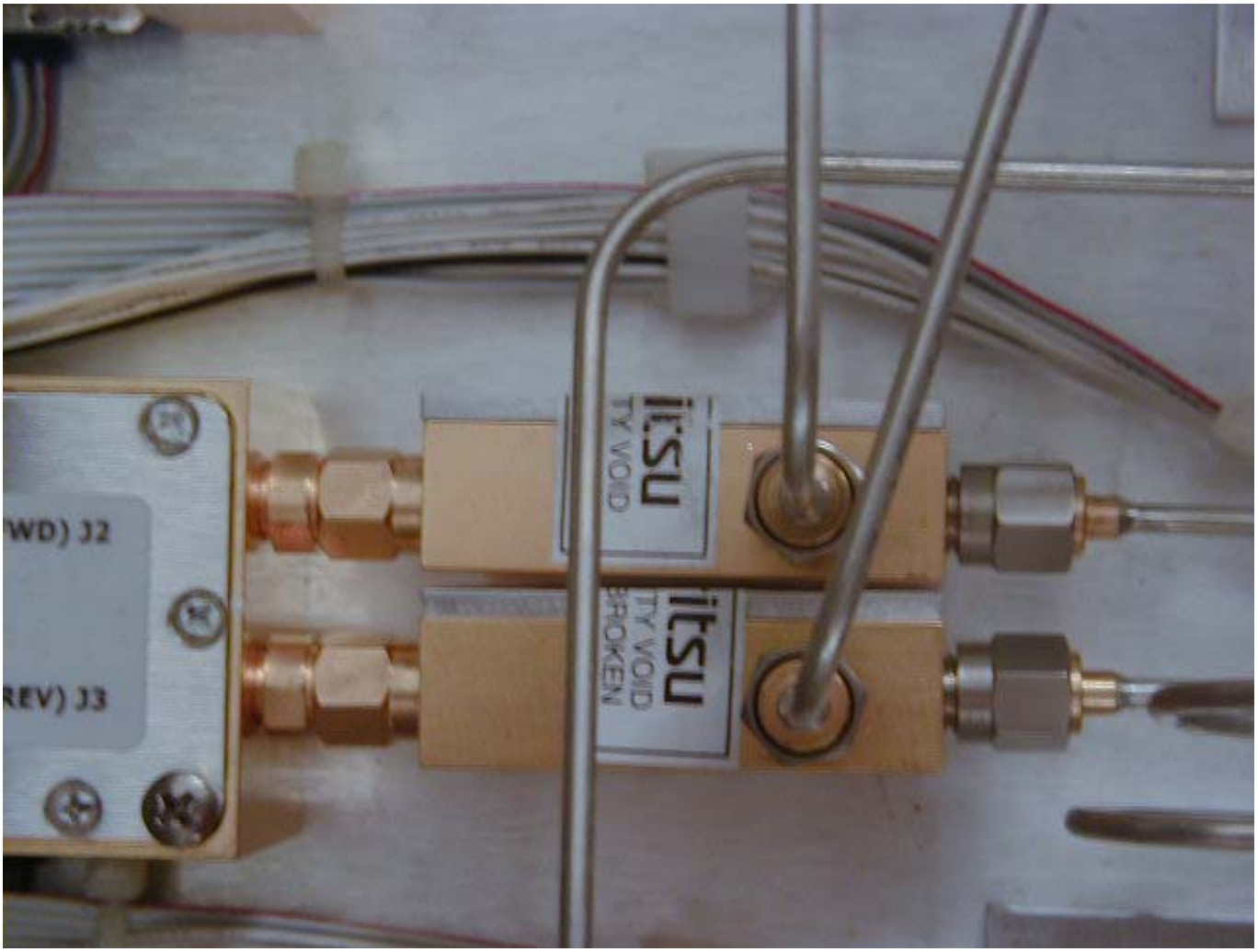


Figure 5-10. Low Band Bridges – A20 at bottom – A21 at top

5-11 High Band SPDT Switch Control PCB Assembly – ND70926

This section provides a procedure for removing and replacing the High Band SPDT Switch Control PCB Assembly in the test set. For locations, refer to Figure 5-2, “Location of Major Components and Subassemblies” on page 5-4 above and the A12, A13, A18, and A19 engineering references.The High Band SPDT Switch Control PCB Assembly is mounted on top of the High Band SPDT Switch Assembly, 70241 or 70242. See Figure 5-11 below.

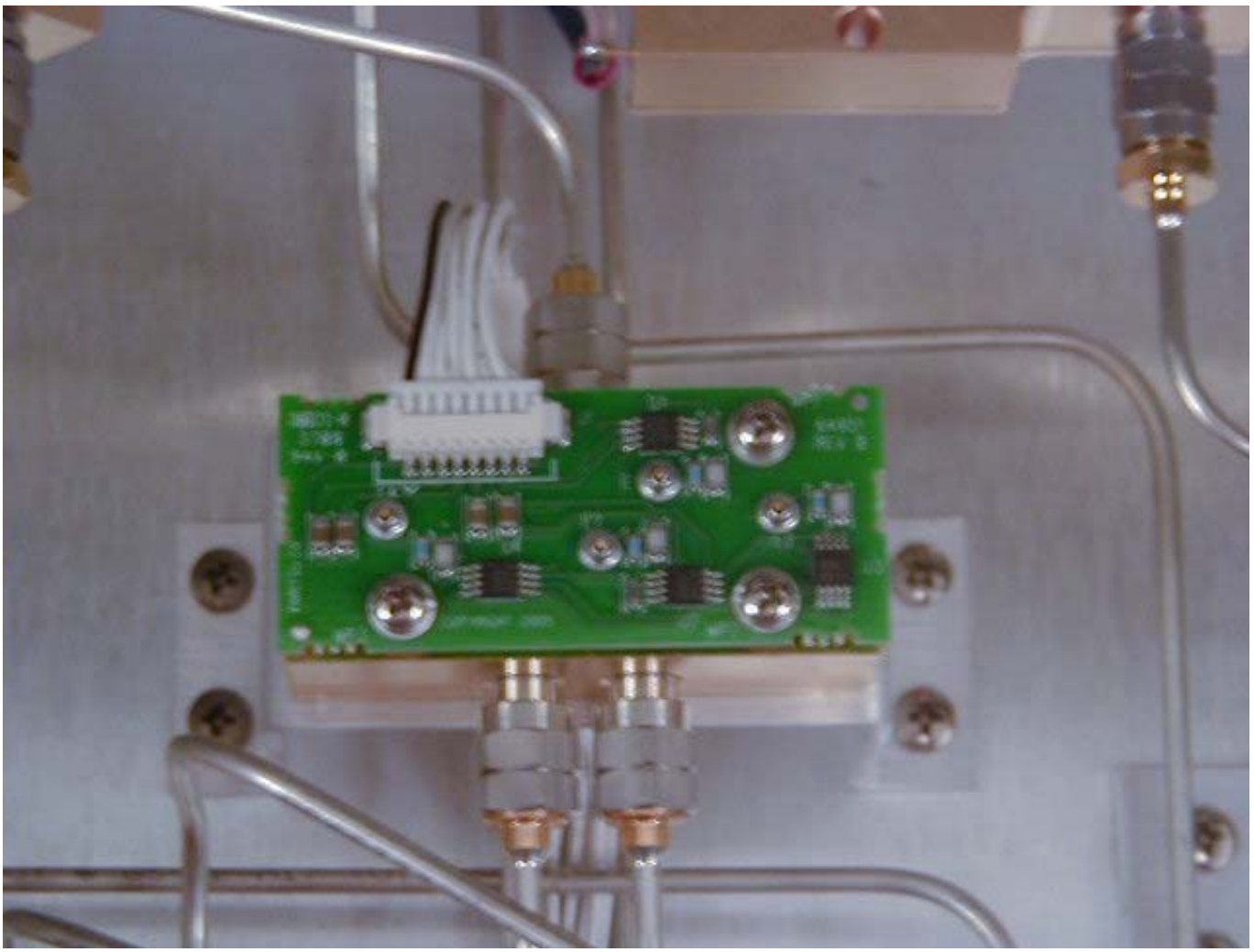


Figure 5-11. High Band SPDT Switch Control PCB Assembly, High Band SPDT Switch and Bracket

Procedure

1. Remove the top cover from the test set.
   - Refer to Section 5-3 “Removing the Covers” on page 5-2.
2. Disconnect the switch control cable from the High Band SPDT Switch Control PCB Assembly.
3. Remove the three mounting screws from the Switch Control PCB. Save the screws and washers.
4. Unplug the Switch Control PCB from the High Band SPDT Switch.

5. To replace the High Band SPDT Switch Control PCB Assembly, reverse the order of the removal procedure.

Caution	Do not force the Control PCB onto the Switch Assembly. The Control PCB must be in good alignment with the Switch contact pins.

5-12 High Band SPDT Switch Assembly – 70241 or 70242 – A12, A13, A18, A19

This section provides a procedure for removing and replacing the High Band SPDT Switch Assembly in the test set. There are four High Band SPDT Switch Assemblies, A12, A13, A18 and A19 installed in the test set. Refer to Figure 5-2 on page 5-4 above.

Procedure

1. Remove the top cover from the test set.

- Refer to Section 5-3 “Removing the Covers” on page 5-2.

2. Remove the High Band SPDT Switch Control PCB Assembly.

- Refer to Section 5-11 “High Band SPDT Switch Control PCB Assembly – ND70926” on page 5-17 above.

3. Remove the four mounting screws from the Switch Bracket.

- See Figure 5-12, “High Band SPDT Switch Removal” on page 5-20 below.

4. Disconnect all RF cables from the High Band SPDT Switch.

5. Remove the two mounting screws that secure the High Band SPDT Switch to its bracket.

- See Figure 5-12 below.

6. Lift the High Band SPDT Switch away from its bracket.

7. To replace the High Band SPDT Switch Assembly, reverse the order of the removal procedure.

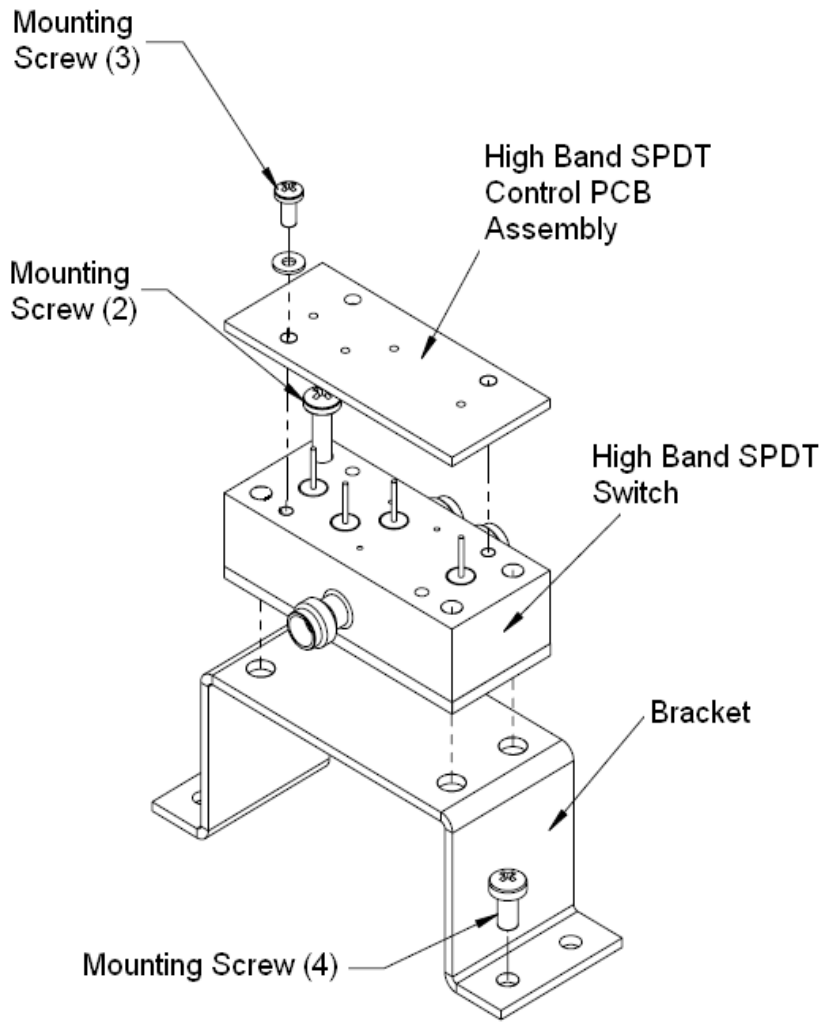


Figure 5-12. High Band SPDT Switch Removal

5-13 Diplexer Assembly – 64911 or 66465 – A8, A9, A10, A11

This section provides a procedure for removing and replacing the Diplexer Assembly in the test set. There are four Diplexer Assemblies, A8, A9, A10 and A11, installed in the test set. Refer to Figure 5-2, "Location of Major Components and Subassemblies" on page 5-4 above.

Procedure

1. Remove the top cover from the test set.
   - Refer to Section 5-3 "Removing the Covers" on page 5-2 above.
2. De-solder the DC Bias cable from the Diplexer Assembly.
   - See Figure 5-13 below.
3. Disconnect the two RF cables from the Diplexer Assembly.
4. Disconnect the Diplexer Assembly from the Port Coupler.
5. To replace the Diplexer Assembly, reverse the order of the removal procedure.

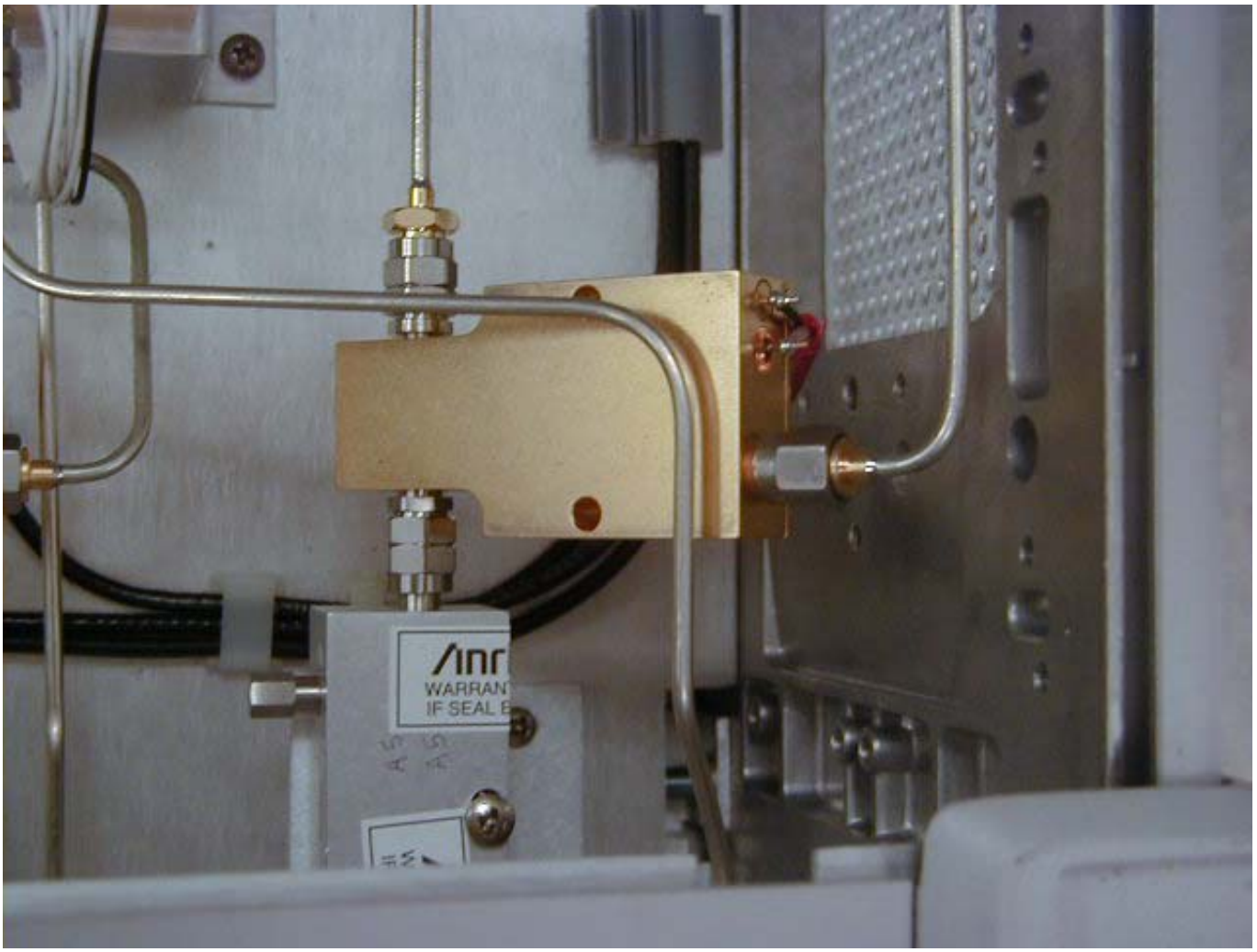


Figure 5-13. Diplexer Assembly (A9 is shown)

5-14 Test Port Connector – 34YK50C or 34YV50C

This section provides a procedure for removing and replacing the Test Port Connector in the test set.

Removal Procedure

1. Use a 1/2” torque wrench set to 60 lbf in to loosen the Test Port Connector.
2. When loose, rotate the connector counterclockwise by hand until it is completely separated from the Port Coupler.

Replacement Procedure

1. Carefully place the Test Port Connector on the threaded coupler shaft, making sure that the connector center pin is correctly aligned.
2. Thread the replacement on by hand, making sure that the threads are correctly engaged and not cross threaded.
3. When fully threaded on, tighten to finger tight.
4. Torque the Test Port Connector using a 1/2” torque wrench set to 60 lbf in.

5-15 Port Coupler – 66245 or 66480 – A14, A15, A16, A17

This section provides a procedure for removing and replacing the Port Coupler in the test set.There are four Port Couplers, A14, A15, A16 and A17, installed in the test set. Refer to Figure 5-2, "Location of Major Components and Subassemblies" on page 5-4 above.

Removal Procedure

1. Remove the top cover from the test set.
   - Refer to Section 5-3 "Removing the Covers" on page 5-2 above.
2. Remove the Diplexer Assembly.
   - Refer to Section 5-13 "Diplexer Assembly - 64911 or 66465 – A8, A9, A10, A11" on page 5-21 above.

Note	De-soldering of the DC Bias cable from the Diplexer Assembly is not required.

3. Remove the Test Port Connector.
   - Refer to Section 5-14 "Test Port Connector - 34YK50C or 34YV50C" on page 5-22 above.
4. Use an adjustable wrench to loosen the Port Connector Nut from the front panel and then remove.
5. Remove the Port Connector Thrust Washer from the front panel.
6. Remove the two screws that secure the Port Coupler to the front panel plate.
7. Use a right angle Phillips screwdriver to remove the two mounting screws that secure the Port Coupler to the bracket.
   - See Figure 5-14 on page 5-24 below.
8. Lift the Port Coupler away from the bracket.
9. Separate the Coupler Spacer from the Port Coupler.

Replacement Procedure

1. Place the Coupler Spacer on the threaded end of the Port Coupler. Ensure that the two holes are aligned properly with the Port Coupler.
   - See Figure 5-14 below.
2. Install the Port Coupler with the Coupler Spacer to the front panel plate and secure with two screws through the front panel.
3. Install two mounting screws to secure the Port Coupler to the bracket.
4. Install the Port Connector Thrust Washer to the front panel.
5. Install the Port Connector Nut. Torque to 15 lbf.in using a torque wrench.
6. Install the Test Port Connector.
   - Refer to Section 5-14 "Test Port Connector - 34YK50C or 34YV50C" on page 5-22.
7. Install the Diplexer Assembly.
   - Refer to Section 5-13 "Diplexer Assembly - 64911 or 66465 – A8, A9, A10, A11" on page 5-21.
8. Install the top cover.
   - Refer to Section 5-3 "Removing the Covers" on page 5-2.

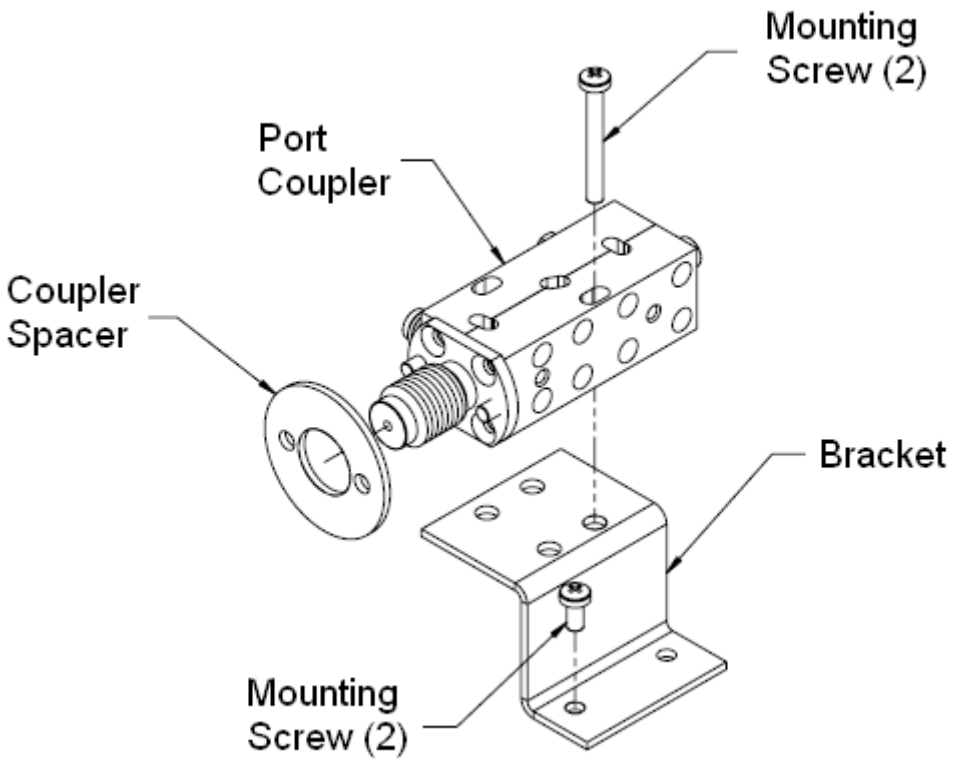


Figure 5-14. Port Coupler Assembly

5-16 Fan Assembly – ND71327

This section provides a procedure for removing and replacing the rear panel fan assembly in the test set.

Procedure

1. Remove the top cover from the test set.
   - Refer to Section 5-3 “Removing the Covers” on page 5-2.
2. Disconnect the fan power cable from the P5 connector of the 4-Port Test Set Control PCB Assembly.
3. Remove the four fan guard mounting nuts.
   - See Figure 5-15 below.
4. Remove the four mounting nuts from the rear panel. Use of right angle Phillips screwdriver is required to hold the mounting screws in place for these nuts’ removal.
5. Lift the Fan Assembly away from the rear panel.
6. To replace the Fan Assembly, reverse the order of the removal procedure.

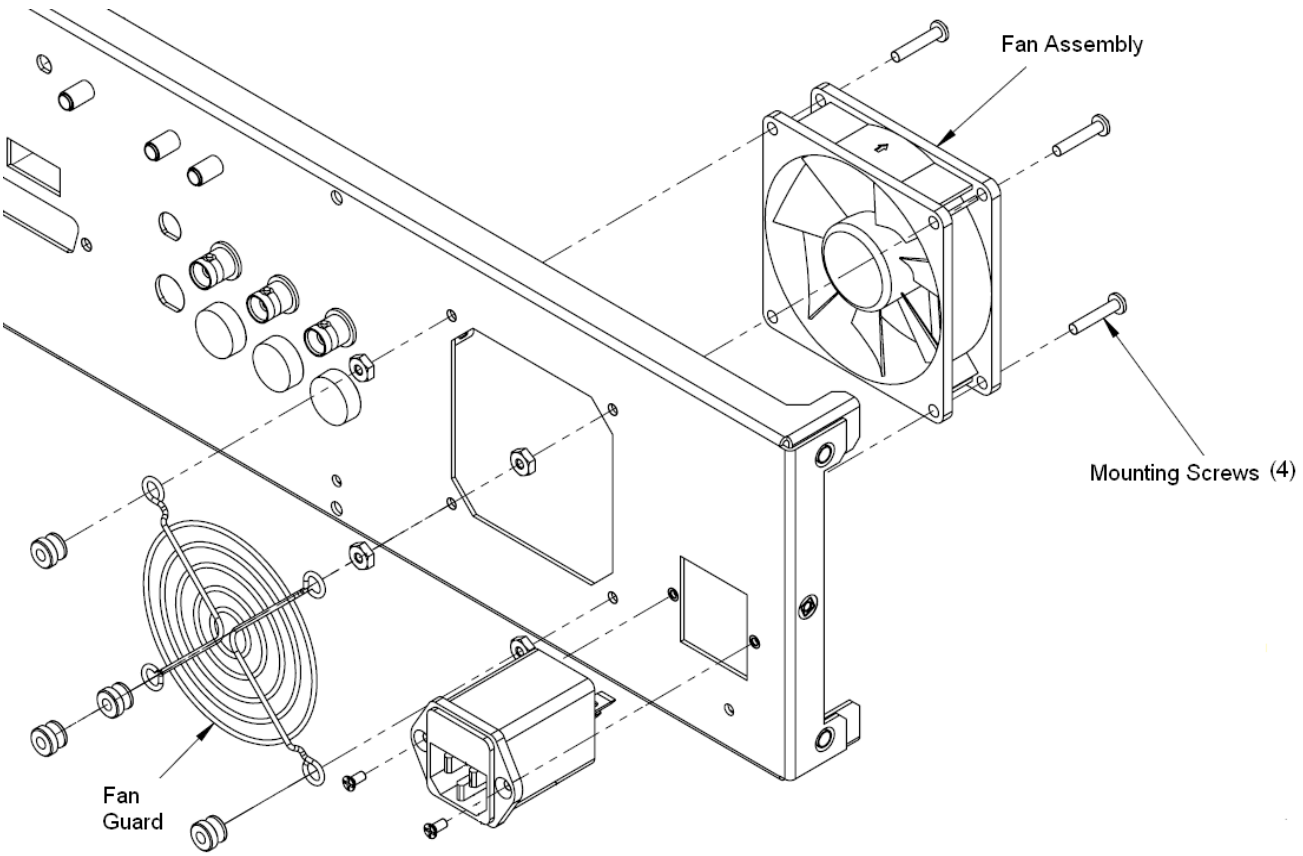


Figure 5-15. Fan Assembly Removal

Appendix A — Test Records

A-1 Introduction

This appendix provides test records that can be used to record the performance of MN4690B in conjunction of a 2-Port VectorStar VNA.

Note	As the MN4690B Series Test Set provides multiple test port capabilities for the Anritsu VectorStar MS4640A Series Vector Network Analyzer, they do not have any performance specifications separate from the VectorStar VNA. Therefore, MN4690B Test Set must be verified with a 2-port VectorStar VNA as a system. The frequency range that can be verified will be limited by frequency range of the 2-port VectorStar VNA.

Make a copy of the following Test Record pages and document the measured values each time performance verification is performed. Continuing to document this process each performance verification session provides a detailed history of the instrument's performance.

The following test record forms are available:

A-2 MN4694B Multiport VNA System Test Record

Instrument Information for MN4694B

MN4694B Serial Number:	Operator:	Date:
VectorStar VNA Model: MS4642A [ ] MS4644A [ ]	VectorStar VNA Serial Number:	VectorStar VNA Options: 051 [ ] 061 [ ] 062 [ ] 070 [ ]

Directivity for MN4694B

Table A-1. Directivity Record for MN4694B Multiport Test Set

Freq (GHz)	Port 1 Measured	Port 2 Measured	Port 3 Measured	Port 4 Measured	Specification
<0.01	dB	dB	dB	dB	>38 dB
0.01 to 2.5	dB	dB	dB	dB	>37 dB
2.5 to 20	dB	dB	dB	dB	>34 dB
20 to 40	dB	dB	dB	dB	>32 dB

Test Port Match for MN4694B

Table A-2. Test Port Match Record for MN4694B Multiport Test Set

Freq (GHz)	Port 1 Measured	Port 2 Measured	Port 3 Measured	Port 4 Measured	Specification
<0.01	dB	dB	dB	dB	>36 dB
0.01 to 2.5	dB	dB	dB	dB	>41 dB
2.5 to 20	dB	dB	dB	dB	>39 dB
20 to 40	dB	dB	dB	dB	>34 dB

Test Port Power for MN4694B

Note	This section only for MN4694B Multiport VNA Systems with MS4642A or MS4644A VNAs equipped with Option 051 – Front Panel Loops.

Table A-3. Test Port Power Record for MN4694B Multiport Test Set

CW Freq	VNA Port 1 Power Setting	Port 1 Measured	Port 2 Measured	Port 3 Measured	Port 4 Measured	Specification
70 kHz	**+9 dBm**	dBm	dBm	dBm	dBm	≥ +4 dBm
10 MHz	**+11 dBm**	dBm	dBm	dBm	dBm	≥ +6 dBm
500 MHz	**+11 dBm**	dBm	dBm	dBm	dBm	≥ +6 dBm
1 GHz	**+8 dBm**	dBm	dBm	dBm	dBm	≥ +6 dBm
2 GHz	**+8 dBm**	dBm	dBm	dBm	dBm	≥ +6 dBm
3 GHz	**+8 dBm**	dBm	dBm	dBm	dBm	≥ +2 dBm
5 GHz	**+8 dBm**	dBm	dBm	dBm	dBm	≥ +2 dBm
10 GHz	**+8 dBm**	dBm	dBm	dBm	dBm	≥ +2 dBm
15 GHz	**+8 dBm**	dBm	dBm	dBm	dBm	≥ +2 dBm
20 GHz	**+8 dBm**	dBm	dBm	dBm	dBm	≥ +2 dBm
25 GHz	**+8 dBm**	dBm	dBm	dBm	dBm	≥ +2 dBm
30 GHz	**+8 dBm**	dBm	dBm	dBm	dBm	≥ +2 dBm
35 GHz	**+8 dBm**	dBm	dBm	dBm	dBm	≥ +2 dBm
40 GHz	**+8 dBm**	dBm	dBm	dBm	dBm	≥ +2 dBm

Noise Floor for MN4694B

_____ Refer to Attached Test Data Report

A-3 MN4697B Multiport VNA System Test Record

Instrument Information for MN4697B

MN4697B Serial Number:	Operator:	Date:
VectorStar VNA Model: MS4645A [ ] MS4647A [ ]	VectorStar VNA Serial Number:	VectorStar VNA Options: 051 [ ] 061 [ ] 062 [ ] 070 [ ]

Directivity for MN4697B

Table A-4. Directivity Record for MN4697B Multiport Test Set

Freq (GHz)	Port 1 Measured	Port 2 Measured	Port 3 Measured	Port 4 Measured	Specification
<0.01	dB	dB	dB	dB	>38 dB
0.01 to 20	dB	dB	dB	dB	>40 dB
20 to 40	dB	dB	dB	dB	>35 dB
40 to 67	dB	dB	dB	dB	>32 dB
67 to 70	dB	dB	dB	dB	>28 dB

Test Port Match for MN4697B

Table A-5. Test Port Match Record for MN4697B Multiport Test Set

Freq (GHz)	Port 1 Measured	Port 2 Measured	Port 3 Measured	Port 4 Measured	Specification
<0.01	dB	dB	dB	dB	>36 dB
0.01 to 2.5	dB	dB	dB	dB	>39 dB
2.5 to 20	dB	dB	dB	dB	>37 dB
20 to 40	dB	dB	dB	dB	>32 dB
40 to 67	dB	dB	dB	dB	>28 dB
67 to 70	dB	dB	dB	dB	>26 dB

Test Port Power for MN4697B

Note	This section only for MN4697B Multiport VNA Systems with MS4645A or MS46447 VNAs equipped with Option 051 – Front Panel Loops.

Table A-6. Test Port Power Record for MN4697B Multiport Test Set

CW Freq	VNA Port 1 Power Setting	Port 1 Measured	Port 2 Measured	Port 3 Measured	Port 4 Measured	Specification
70 kHz	**+9 dBm**	dBm	dBm	dBm	dBm	≥ +4 dBm
10 MHz	**+11 dBm**	dBm	dBm	dBm	dBm	≥ +6 dBm
500 MHz	**+11 dBm**	dBm	dBm	dBm	dBm	≥ +6 dBm
1 GHz	**+5 dBm**	dBm	dBm	dBm	dBm	≥ +6 dBm
2 GHz	**+5 dBm**	dBm	dBm	dBm	dBm	≥ +6 dBm
3 GHz	**+4 dBm**	dBm	dBm	dBm	dBm	≥ –3 dBm
5 GHz	**+4 dBm**	dBm	dBm	dBm	dBm	≥ –3 dBm
10 GHz	**+4 dBm**	dBm	dBm	dBm	dBm	≥ –3 dBm
15 GHz	**+4 dBm**	dBm	dBm	dBm	dBm	≥ –3 dBm
20 GHz	**+4 dBm**	dBm	dBm	dBm	dBm	≥ –3 dBm
25 GHz	**+4 dBm**	dBm	dBm	dBm	dBm	≥ –3 dBm
30 GHz	**+4 dBm**	dBm	dBm	dBm	dBm	≥ –3 dBm
35 GHz	**+4 dBm**	dBm	dBm	dBm	dBm	≥ –3 dBm
38 GHz	**+4 dBm**	dBm	dBm	dBm	dBm	≥ –3 dBm
40 GHz	**+3 dBm**	dBm	dBm	dBm	dBm	≥ –3 dBm
45 GHz	**+3 dBm**	dBm	dBm	dBm	dBm	≥ –7 dBm
50 GHz	**+3 dBm**	dBm	dBm	dBm	dBm	≥ –7 dBm
55 GHz	**–2 dBm**	dBm	dBm	dBm	dBm	≥ –13 dBm
60 GHz	**–2 dBm**	dBm	dBm	dBm	dBm	≥ –13 dBm
65 GHz	**–2 dBm**	dBm	dBm	dBm	dBm	≥ –13 dBm
67 GHz	**–3 dBm**	dBm	dBm	dBm	dBm	≥ –20 dBm
70 GHz	**–6 dBm**	dBm	dBm	dBm	dBm	≥ –20 dBm

Noise Floor for MN4697B

_____ Refer to Attached Test Data Report

Appendix B — Specifications

B-1 Technical Data Sheet

Use this tab to store the latest version of the VectorStar technical data sheets:

- **VectorStar MS4640A Series VNA Technical Data Sheet – 11410-00435**
- **VectorStar MN4690B Series Multiport Test Set Technical Data Sheet – 11410-00528**

These and other related VectorStar documents are available on the Anritsu web at:

- http://www.anritsu.com/en-US/Products-Solutions/Products/MS4640A-Series.aspx

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