

## Installation Guide

# VectorStar™ Pulse Modulator Test Set

### SM6628, 70 kHz to 40 GHz

Provides the MS4642B and MS4644B VNA with source modulation.

### SM6629, 70 kHz to 40 GHz

Provides the MS4642B and MS4644B VNA with source and receiver modulation.

### SM6630, 70 kHz to 70 GHz

Provides the MS4645B and MS4647B VNA with source modulation.

### SM6631, 70 kHz to 70 GHz

Provides the MS4645B and MS4647B VNA with source and receiver modulation.



# Anritsu

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产品中有毒有害物质或元素的名称及含量

For Chinese Customers Only NLNB

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 [Cr(VI)]	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷线路板 (PCA)	×	○	×	×	○	○
机壳、支架 (Chassis)	×	○	×	×	○	○
其他(电缆、风扇、连接器等) (Appended goods)	×	○	×	×	○	○

○：表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。  
 ×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求。

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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 risk from a very dangerous condition or procedure that could result in serious injury or death and possible loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

#### Warning



This indicates a risk from a hazardous condition or procedure that could result in light-to-severe injury or loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

#### Caution



This indicates a risk from a hazardous procedure that could result in loss related to equipment malfunction. Follow all precautions and procedures to minimize this risk.

### 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 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.

# Table of Contents

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## Chapter 1 — Overview

1-1	Introduction . . . . .	1-1
1-2	Description . . . . .	1-1
	Pulse Modulator Test Set Main Components . . . . .	1-1
1-3	Overview. . . . .	1-2
	Pulse Modulator Test Set Block Diagram . . . . .	1-2
1-4	Related Documentation . . . . .	1-4
1-5	Contacting Anritsu . . . . .	1-4

## Chapter 2 — System Assembly

2-1	Introduction. . . . .	2-1
2-2	Assembly Notes . . . . .	2-1
2-3	Required Tools . . . . .	2-1
2-4	Unpacking the Instruments. . . . .	2-1
2-5	Rear Panel Connections Between VNA and Test Set . . . . .	2-2
2-6	Front Panel Connections Between VNA and Test Set . . . . .	2-4
2-7	Operating Environment and Power Requirements . . . . .	2-5
2-8	Checking/Changing the Rear Panel Fuse . . . . .	2-5
2-9	Preparation for Storage and Shipment . . . . .	2-6

## Table of Contents (Continued)

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# Chapter 1 — Overview

## 1-1 Introduction

This guide provides a general overview and instructions for initial setup of the SM66xx Pulse Modulator Test Set with a VectorStar MS4640B Series VNA equipped with Option 035, IF Digitizer, Option 042, PulseView™, and Option 051, 061, or 062, Direct Access Loops. A description of the Pulse Modulator Test Sets follows. Refer to [Chapter 2, “System Assembly”](#) for instructions on initial setup.

## 1-2 Description

The Pulse Modulator Test Sets are available in four different models of two basic configurations, each with two different frequency ranges of operation. The test set frequency ranges are 70 kHz to 40 GHz and 70 kHz to 70 GHz, but the frequency measurement range is limited to that of the VNA model with which the test set is used. The two basic configurations include one configuration with source modulators and one configuration with source and receiver modulators.

- SM6628 Pulse Modulator Test Set, 40 GHz, Source Modulation
- SM6629 Pulse Modulator Test Set, 40 GHz, Source and Receiver Modulation
- SM6630 Pulse Modulator Test Set, 70 GHz, Source Modulation
- SM6631 Pulse Modulator Test Set, 70 GHz, Source and Receiver Modulation

### Pulse Modulator Test Set Main Components

The SM66xx Pulse Modulator Test Set components are listed in the following table:

**Table 1-1.** SM66xx Pulse Modulator Test Set Components

Part Number	Description	SM6628 Quantity	SM6629 Quantity	SM6630 Quantity	SM6631 Quantity
3-76223-1	Rear Panel Flex Cable Set	1	0	1	0
3-76223-2	Rear Panel Flex Cable Set	0	1	0	1
67357-38	Front Panel Cable, Coaxial K(m)-K(m)	6	10	0	0
62109-42	Front Panel Cable, Coaxial V(m)-V(m)	0	0	6	10
3-76220 & 3-74234	Cable Management Clips	1	1	1	1
K210	Termination DC to 40 GHz	2	2	0	0
V210	Termination DC to 70 GHz	0	0	2	2
3-1015-70	Termination DC to 12000 MHz	2	2	2	2
	Power Cord	1	1	1	1
	Calibration Certificate	1	1	1	1

**Note**

The SM66xx Pulse Modulator Test Set is not a stand alone instrument and must be installed with an MS4640B Series VNA with Option 035, IF Digitizer, Option 042, PulseView™, and Option 051, 061, or 062, Direct Access Loops.

### 1-3 Overview

The Anritsu VectorStar MS4640B Series Vector Network Analyzer is capable of measuring and generating pulsed signals when equipped with Option 035, IF Digitizer and Option 042, PulseView™. Pulse measurements include pulse profile, point-in-pulse, and pulse-to-pulse capability. Four internal signal generators are included to enable multiple ways to stimulate the device under test. For example, the pulse generators can be used in conjunction with a Pulse Modulator Test Set to pulse the RF to a DUT. The pulse generators may be used directly to pulse a DUT's power supply, or the two can be used together.

For cases when RF modulation is needed, Pulse Modulator Test Set configurations are available. Pulse Modulator Test Sets also include reference coupling, which can be useful in many applications. The block diagram of a base model has only the source path modulators and is shown in Figure 1-1. A fully configured test set (with source and receiver modulation) is shown in Figure 1-2.

#### Pulse Modulator Test Set Block Diagram

The block diagram of a base model Pulse Modulator Test Set is shown in Figure 1-1. The base model only includes the source path modulators. The block diagram of a fully configured test set (four modulators) is an extension of the base model and is shown in Figure 1-2.

To cover a full 70 kHz to 70 GHz range with pulse modulation and to support the architecture of the VectorStar MS4640B Series VNA, the modulation paths are split into above and below 2.5 GHz (high frequency modulator [HFM] and low frequency modulator, [LFM] respectively) with access ports on the front and rear panel for easy connection to the VNA.

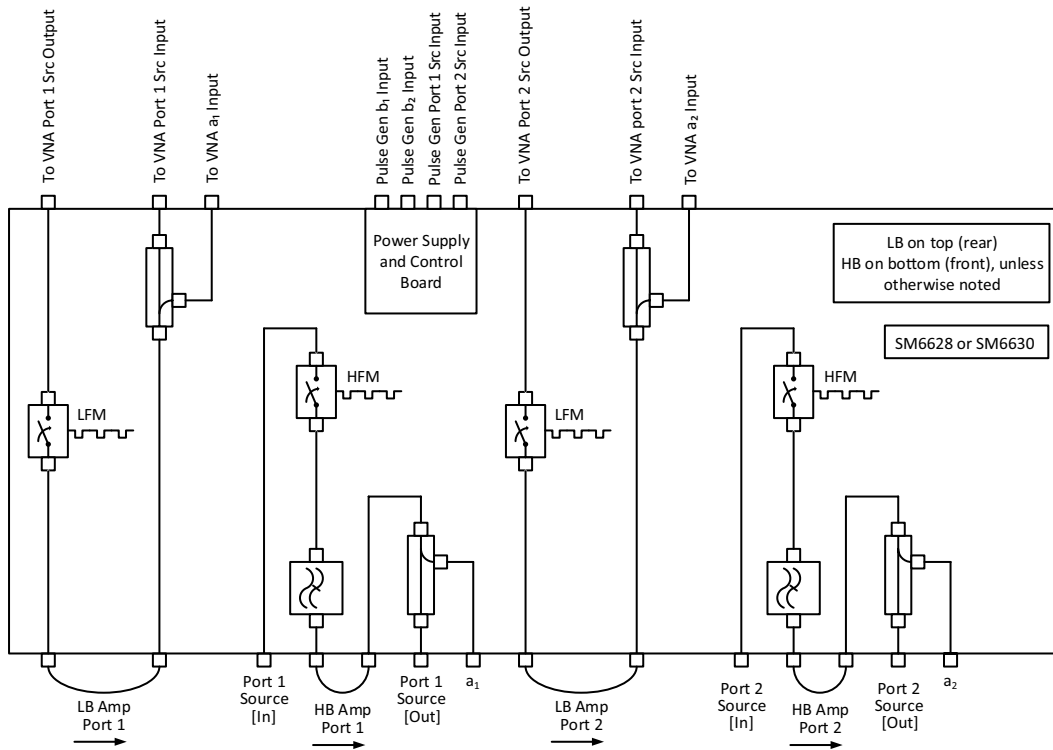
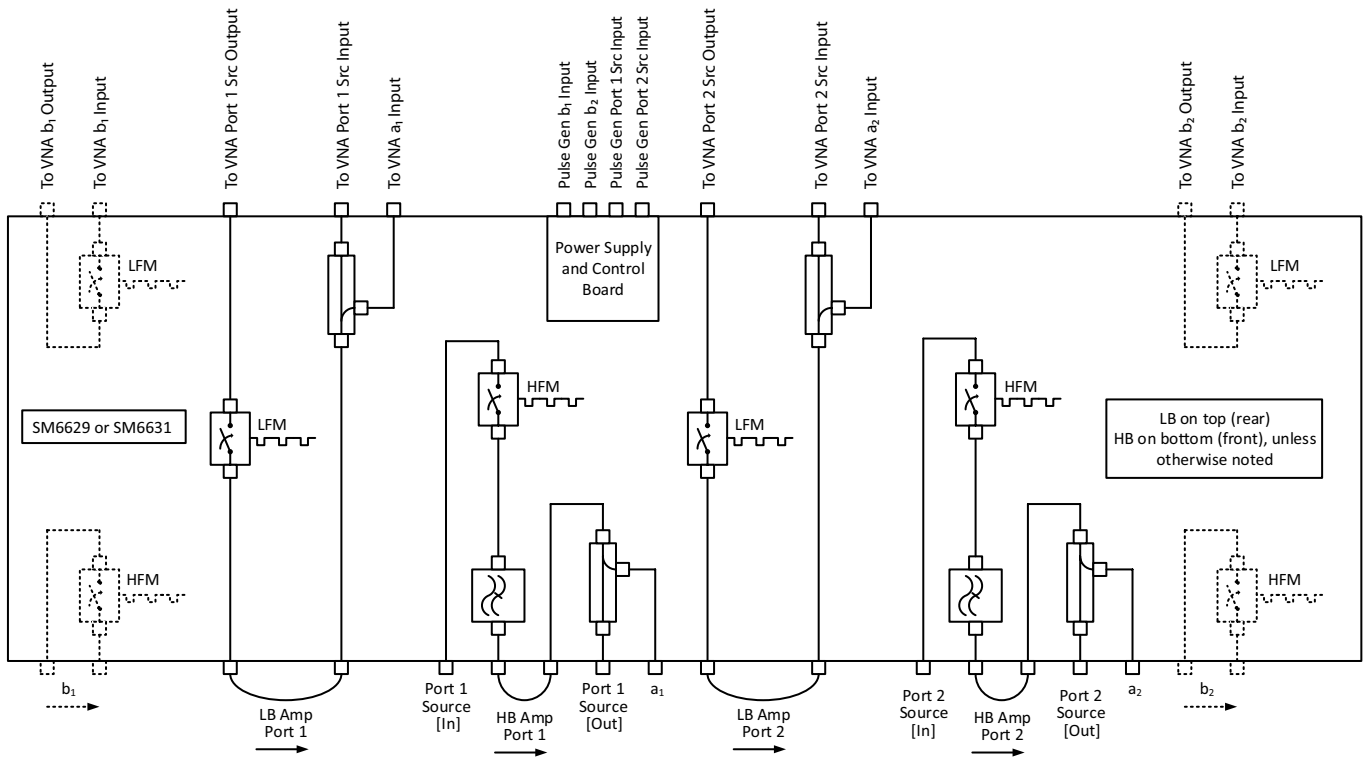


Figure 1-1. SM6628/SM6630 Pulse Modulator Test Set Block Diagram

**Note** The video connections between the control board and the modulators in Figure 1-1 are not shown for clarity.

As suggested by the block diagram in [Figure 1-2](#), the source side modulators include additional reference couplers that can be fed into the reference loops of the VNA to provide ratioing against a pulsed signal. This can be useful to ratio out potential ringing effects of the modulator. In many cases, these coupled paths do not have to be used and all ratioing can be performed against the usual non-pulsed stimulus signals. Access loops are also provided to allow for amplification on the drive paths, which may be needed in higher power applications (for example several watts of DUT input power).



**Figure 1-2.** SM6629/SM6631 Pulse Modulator Test Set Block Diagram

**Note** The video connections between the control board and the modulators in [Figure 1-2](#) are not shown for clarity.

Refer to the VectorStar MS4640B Series VNA Calibration and Measurement Guide – 10410-00318 for a more detailed discussion of pulse measurements.

## 1-4 Related Documentation

The following VectorStar™ documentation is available on the Anritsu web site: [www.anritsu.com/vectorstar](http://www.anritsu.com/vectorstar)

### VectorStar™ MS4640B Series Vector Network Analyzers

- MS4640B Series VNA Technical Data Sheet – 11410-00611
- MS4640B Series VNA Operation Manual – 10410-00317
- MS4640B Series VNA Calibration and Measurement Guide – 10410-00318
- MS4640B Series VNA User Interface Reference Manual – 10410-00319
- MS4640B Series VNA Maintenance Manual – 10410-00320
- MS4640B Series VNA Programming Manual – 10410-00322
- MS4640B Series VNA Programming Manual Supplement – 10410-00323
- MS4640B Series VNA User Help System – 10450-00040
- MS4640B Series VNA User Documentation Disc – 10920-00067

### VectorStar ME7838 Series 2-Port BB/mmW VNA Measurement System

- ME7838A Modular BB/mm-Wave Technical Data Sheet (TDS) – 11410-00593
- ME7838D Modular BB/mm-Wave Technical Data Sheet (TDS) – 11410-00778
- ME7838E Modular BB/mm-Wave Technical Data Sheet (TDS) – 11410-00767
- ME7838A Modular BB/mm-Wave Quick Start Guide (QSG) – 10410-00292
- ME7838D Modular BB/mm-Wave Quick Start Guide (QSG) – 10410-00732
- ME7838E Modular BB/mm-Wave Quick Start Guide (QSG) – 10410-00729
- ME7838 Series Modular BB/mm-Wave Installation Guide (IG) – 10410-00293
- VectorStar Broadband/Banded Millimeter-Wave Modules (RM) – 10410-00311
- ME7838 Series Modular BB/mm-Wave Maintenance Manual (MM) – 10410-000306

### VectorStar MN469xC Series Multiport VNA Measurement System

- MN469xC Series Multiport VNA Measurement System Technical Data Sheet – 11410-00777
- MN469xC Series Multiport Test Set Installation Guide – 10410-00737
- MN469xC Series Multiport Test Set Quick Start Guide – 10410-00738
- MN469xC Series Multiport Test Set Maintenance Manual – 10410-00730

### Calibration, Verification, and System Performance Verification

- 36585K and 36585V Precision Auto Calibrator (AutoCal) Module Reference Manual – 10410-00279
- 3650A, 3652A, and 3654D Mechanical Calibration Kit Reference Manual – 10410-00278
- 366X-1 Verification Kits (3666-1 3.5mm Connectors, 3668-1 K Connectors, 3669B-1 V Connectors) and 2300-527 Performance Verification Software (PVS) User Guide – 10410-00270
- 366X-1 Verification Kit and 2300-527 PVS Quick Start Guide – 10410-00285
- 3656B W1 (1 mm) Calibration/Verification Kit and 2300-496 System Performance Verification Software User Guide for the VectorStar™ ME7838A/ME7828A and Lightning ME7808A/B/C BB/mm-Wave VNA Systems – 10410-00286
- 3659 - Cal-Verif- Kit-UG and 2300-558 System Performance Verification Software for BB-mmW ME7838D with 0.8 mm Connectors – 10410-00327

## 1-5 Contacting Anritsu

To contact Anritsu, please visit:

<http://www.anritsu.com/contact.asp>

From here, you can select the latest sales, service and support contact information in your country or region, provide online feedback, complete a “Talk to Anritsu” form to get your questions answered, or obtain other services offered by Anritsu.

Updated product information can be found on your product page:

<http://www.anritsu.com/en-us/products-solutions/products/MS464xB-series.aspx>

On this web page, you can select various tabs for more information about your instrument. Included is a “Library” tab which contains links to all the latest technical documentation related to this instrument.



# Chapter 2 — System Assembly

## 2-1 Introduction

This chapter describes unpacking, assembly, and cabling procedures for the VectorStar SM66xx Pulse Modulator Test System. The major system components are listed below:

## 2-2 Assembly Notes

The following general assembly notes apply to the unpacking, installation, and assembly procedures:

- **Heavy:** The VectorStar VNA instrument is quite heavy. Use at least two people to lift the VNA and set it on top of the Pulse Modulator Test Set.
- **Fragile RF Cables and Cable Loops:** The VNA instrument has fragile RF cables (such as the Cable Loops) connected to both the front and rear panels. Be careful not to bend these cables when handling the instrument.
- **K, V, and SMA/3.5 mm Connectors:** Best practices recommend using an Anritsu 01-201 Torque End Wrench to tighten the 5/16" K, V, and SMA/3.5 mm connectors. The correct torque setting is 0.9 N·m (8 lbf·in). Use the torque wrench with an open end backing wrench when needed. Best practices recommend using an Anritsu 01-204 5/16" End Wrench.

## 2-3 Required Tools

- Anritsu 01-201 5/16" Torque Wrench or equivalent rated at 0.9 N·m (8 lbf·in)
- Anritsu 01-204 5/16" End Wrench or equivalent

## 2-4 Unpacking the Instruments

### Caution



A fully loaded MS4640B VNA unit weighs approximately 30kg (66 pounds) and must be installed by at least two people.

If mounting on a workbench surface, first position the Test Set with access to its front and rear panels.

If mounting into rack or console, make sure the Test Set has been installed and that the rack/console is carefully positioned on a flat and level surface. If equipped, make sure any casters are locked. Use two people to lift the VNA unit and guide it into its shelf rails.

The test loops on the front and rear panels of the VNA are delicate. Be careful not to bump or bend the test loops.

Unpack the various components and set aside in a clean static-free environment.

## 2-5 Rear Panel Connections Between VNA and Test Set

Figure 2-1 shows a fully cabled SM6631 system. Connect the cables between the MS4640B VNA and the SM66xx test set rear panels as described Table 2-1.

**Caution** After attaching the power cords to the VNA and the Test Set, *do not* yet plug the power cords into main AC power source.

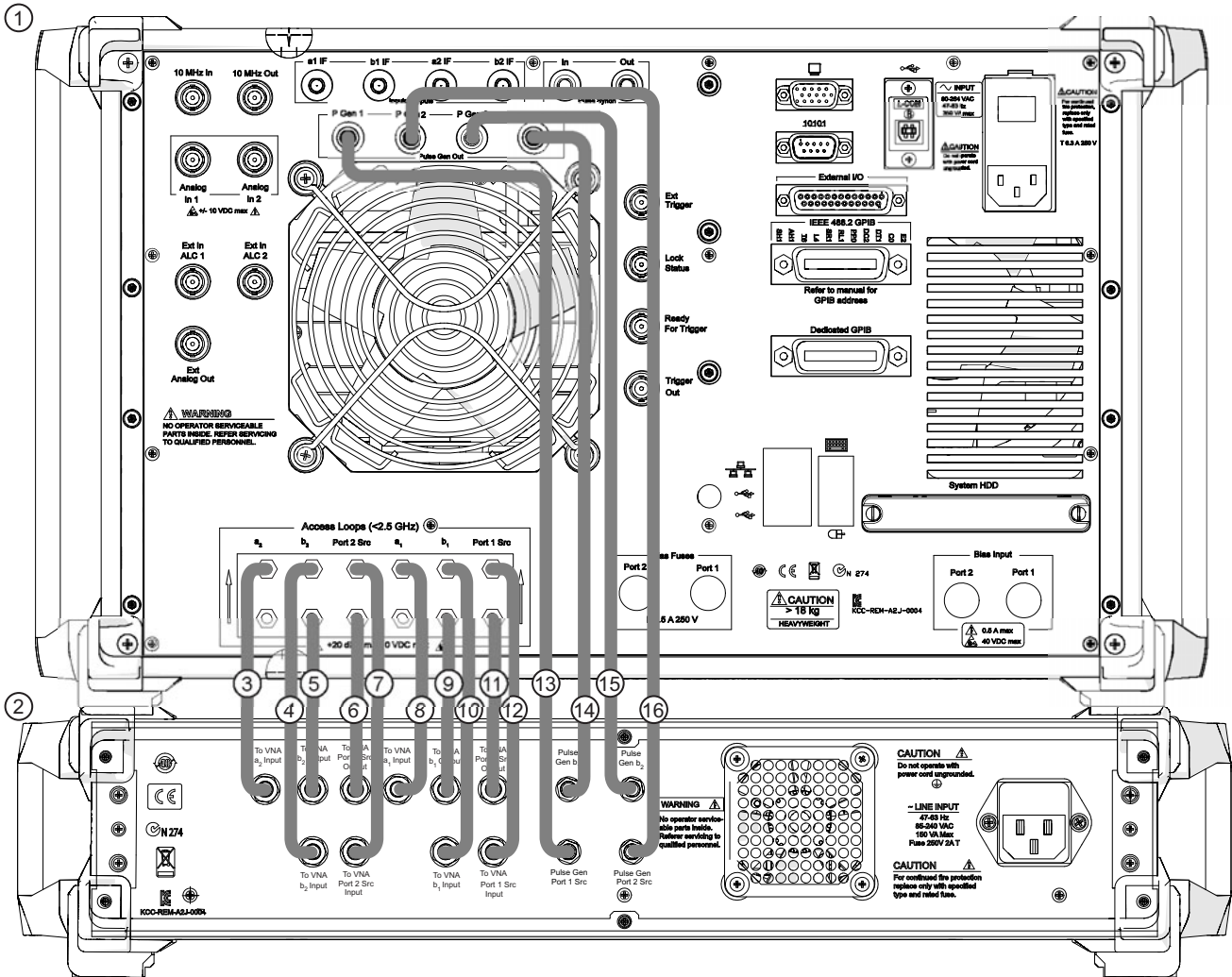


Figure 2-1. SM66xx to MS4640B Series VNA - Rear Panel Cable Connections



**Table 2-1.** SM66xx to MS4640B Series VNA - Rear Panel Cable Connections

Index	Part Number	Notes	VNA Port	SM66xx Test Set Port
1	MS4640B VNA			
2	SM66xx Pulse Modulator Test Set			
3	3-72243-18	SM66xx	a <sub>2</sub> Input	To VNA a <sub>2</sub> Input
	3-1015-70	Terminate the unused VNA a <sub>2</sub> output with the supplied terminator.		
4	3-72243-17	SM6629 and SM6631	b <sub>2</sub> Input	To VNA b <sub>2</sub> Input
5	3-72243-16	SM6629 and SM6631	b <sub>2</sub> Output	To VNA b <sub>2</sub> Output
6	3-72243-14	SM66xx	Port 2 Src Output	To VNA Port 2 Src Output
7	3-72243-15	SM66xx	Port 2 Src Input	To VNA Port 2 Src Input
8	3-72243-13	SM66xx	a <sub>1</sub> Input	To VNA a <sub>1</sub> Input
	3-1015-70	Terminate the unused VNA a <sub>1</sub> output with the supplied terminator.		
9	3-72243-11	SM6629 and SM6631	b <sub>1</sub> Output	To VNA b <sub>1</sub> Output
10	3-72243-12	SM6629 and SM6631	b <sub>1</sub> Input	To VNA b <sub>1</sub> Input
11	3-72243-9	SM66xx	Port 1 Src Output	To VNA Port 1 Src Output
12	3-72243-10	SM66xx	Port 1 Src Input	To VNA Port 1 Src Input
13 <sup>a</sup>	3-72243-5	SM66xx	P Gen 1 Output	Pulse Gen Port 1 Src Input
14 <sup>a</sup>	3-72243-8	SM6629 and SM6631	P Gen 4 Output	Pulse Gen b <sub>1</sub> Input
15 <sup>a</sup>	3-72243-7	SM6629 and SM6631	P Gen 3 Output	Pulse Gen b <sub>2</sub> Input
16 <sup>a</sup>	3-72243-6	SM66xx	P Gen 2 Output	Pulse Gen Port 2 Src Input

a. The four VNA pulse generator outputs (P Gen 1 through P Gen 4) can be connected in any configuration to the test set pulse generator inputs (Port 1 Src , Port 2 Src, b<sub>1</sub>, and b<sub>2</sub>).

<b>Note</b> Use the cable management clips 3-76220 and 3-74234 to keep the flexible cables organized.
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## 2-6 Front Panel Connections Between VNA and Test Set

Figure 2-2 shows a fully cabled SM6631 system. Connect the cables between the MS4640B VNA and the SM66xx test set front panels as described Table 2-2.

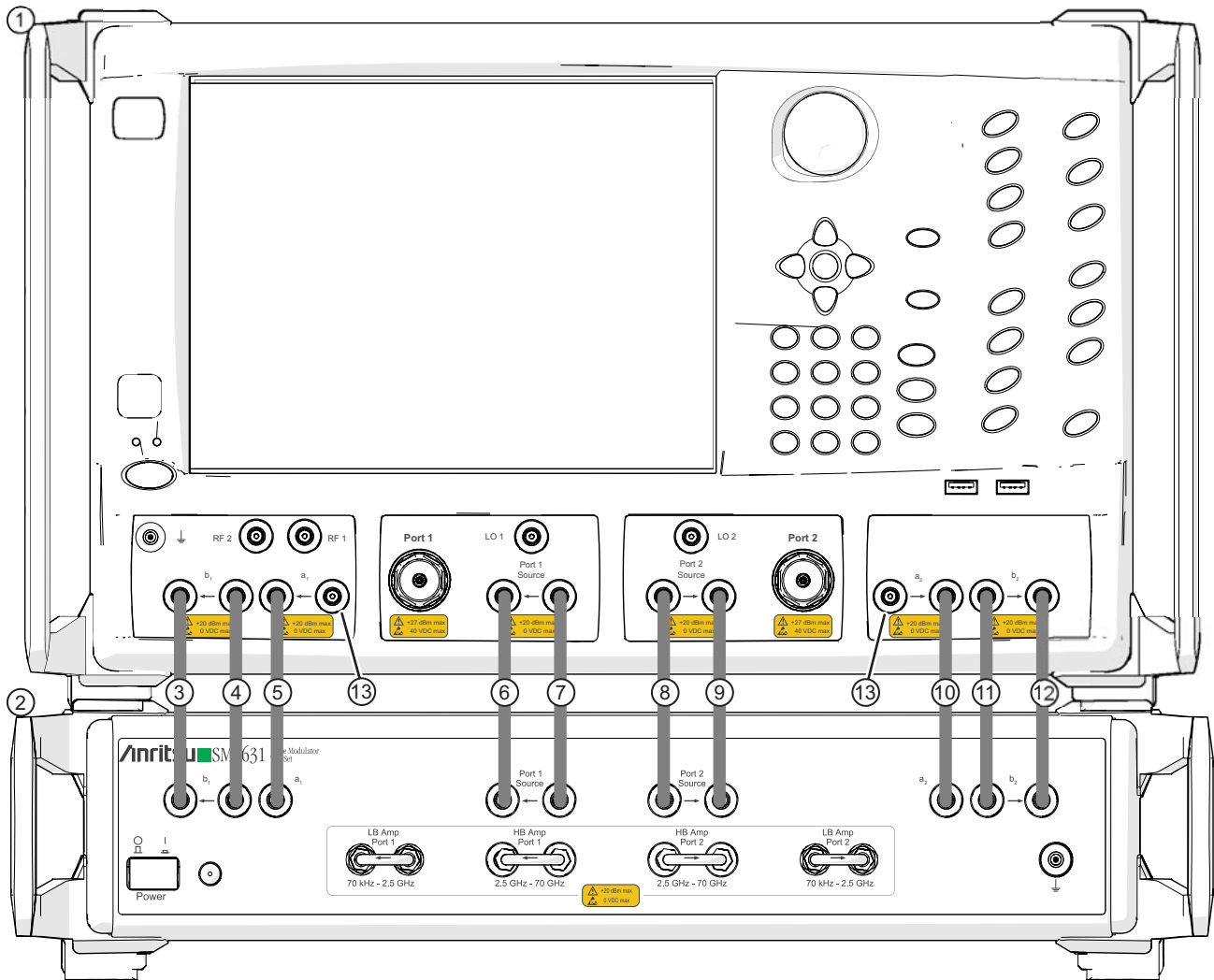


Figure 2-2. SM66xx to MS4640B Series VNA - Front Panel Cable Connections

**Table 2-2.** SM66xx to MS4640B Series VNA - Front Panel Cable Connections

Index	Part Number	Notes	VNA Port	SM66xx Test Set Port
1	MS4640B VNA			
2	SM66xx Test Set			
3	See Footnote <sup>a</sup>	SM6629 and SM6631	b <sub>1</sub> Input	b <sub>1</sub> Output
4		SM6629 and SM6631	b <sub>1</sub> Output	b <sub>1</sub> Input
5		SM66xx	a <sub>1</sub> Input	a <sub>1</sub> Output
6		SM66xx	Port 1 Source Input	Port 1 Source Output
7		SM66xx	Port 1 Source Output	Port 1 Source Input
8		SM66xx	Port 2 Source Output	Port 2 Source Input
9		SM66xx	Port 2 Source Input	Port 2 Source Output
10		SM66xx	a <sub>2</sub> Input	a <sub>2</sub> Output
11		SM6629 and SM6631	b <sub>2</sub> Output	b <sub>2</sub> Input
12		SM6629 and SM6631	b <sub>2</sub> Input	b <sub>2</sub> Output
13	K210/V210		Terminate the unused VNA a <sub>1</sub> and a <sub>2</sub> outputs with the supplied terminators.	

a. Use cable P/N 3-67357-28 for SM6628 and SM6629 systems with K Connectors.  
 Use cable P/N 3-62109-42 for SM6630 and SM6631 systems with V Connectors

## 2-7 Operating Environment and Power Requirements

Before installing the VectorStar™ MS4640B Series VNA in its operating environment, ensure that all airflow passages at the sides and rear of the instrument are clear and that the cooling fan filters remain clean so that the ventilation holes are not obstructed. The VectorStar™ MS4640B Series VNA can be operated within the following environmental limits:

**Table 2-3.** Operational Environmental Specifications and Power Requirements

Parameter	Specification
<b>Environmental Specifications</b>	
Operating Temperature Range:	0 to +50 degrees Celsius (per MIL-PRF-28800F)
Relative Humidity:	5 % to 95 % (per MIL-PRF-28800F)
Altitude:	4,600 meters, 43.9 cm Hg
Vibration:	Sinusoidal 5 Hz to 55 Hz on 3 axes
<b>Power Requirements</b>	
Voltages:	90 to 264 VAC maximum (single phase)
Frequency:	47 to 63 Hz (power factor controlled)
Power:	350 VA maximum
Installation Category:	The VectorStar™ MS4640B Series VNA test system is intended for Installation Category (Overvoltage Category) II

### Warning

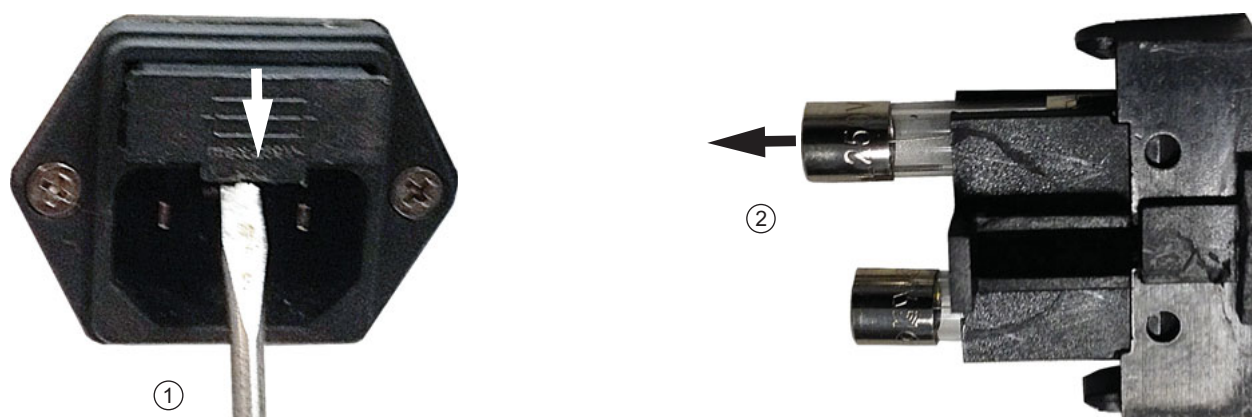
When supplying power to this equipment, connect the accessory 3-pin power cord only to a 3-pin grounded power outlet connected in turn to local AC Mains. If a grounded 3-pin outlet is not available, use a conversion adapter and ground the green wire, or connect the equipment frame to a suitable ground.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

## 2-8 Checking/Changing the Rear Panel Fuse

The value of the line fuse used in the test set is printed on the rear panel next to the line voltage module.

### Caution

Before changing the fuse, always remove the power cord from the power outlet. There is the risk of receiving a fatal electric shock if the fuse is replaced with the power cord connected. Always use a new fuse of the type and rating specified by the fuse markings on the rear panel of the instrument.



**Figure 2-3.** Replacing the Rear Panel Fuse

- |   |                                      |
|---|--------------------------------------|
| 1. Opening and removing the Rear Panel Fuse Holder with a flat blade screwdriver. | 2. Sliding out and replacing a fuse. |
|---|--------------------------------------|

**Figure 2-3.** Replacing the Rear Panel Fuse

## 2-9 Preparation for Storage and Shipment

### Storage

Preparing the test set for storage consists of cleaning the unit, packing the inside with moisture-absorbing desiccant crystals, and storing the unit in a temperature environment that is maintained between  $-40\text{ }^{\circ}\text{C}$  and  $+75\text{ }^{\circ}\text{C}$  ( $-40\text{ }^{\circ}\text{F}$  to  $+167\text{ }^{\circ}\text{F}$ ).

### Shipment

To provide maximum protection against damage in transit, the test set should be repackaged in the original shipping container. If this container is no longer available and the unit is being returned to Anritsu for repair, instructions for packaging and shipment are given below.

- **Use a Suitable Container:** Obtain a corrugated cardboard carton with a 125 kg (275 lb) test strength. This carton should have inside dimensions of no less than 15 cm (6.0") larger than the unit dimensions to allow for cushioning.
- **Dimensions:** The SM66xx Pulse Modulator Test Set dimensions are 109 mm H x 487 mm W x 588 mm D (4.3" H x 19.1" D x 23.2" W).
- **Protect the Instrument:** Surround the unit with polyethylene sheeting to protect the finish.
- **Cushion the Instrument:** Cushion the instrument on all sides by tightly packing dunnage or urethane foam between the carton and the unit. Provide at least three inches of dunnage on all sides.
- **Seal the Container:** Seal the carton by using either shipping tape or an industrial stapler.
- **Address the Container:** If the instrument is being returned to Anritsu for service, mark the address of the appropriate Anritsu service center and your return address on the carton in one or more prominent locations.





# Anritsu



Anritsu utilizes recycled paper and environmentally conscious inks and toner.

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