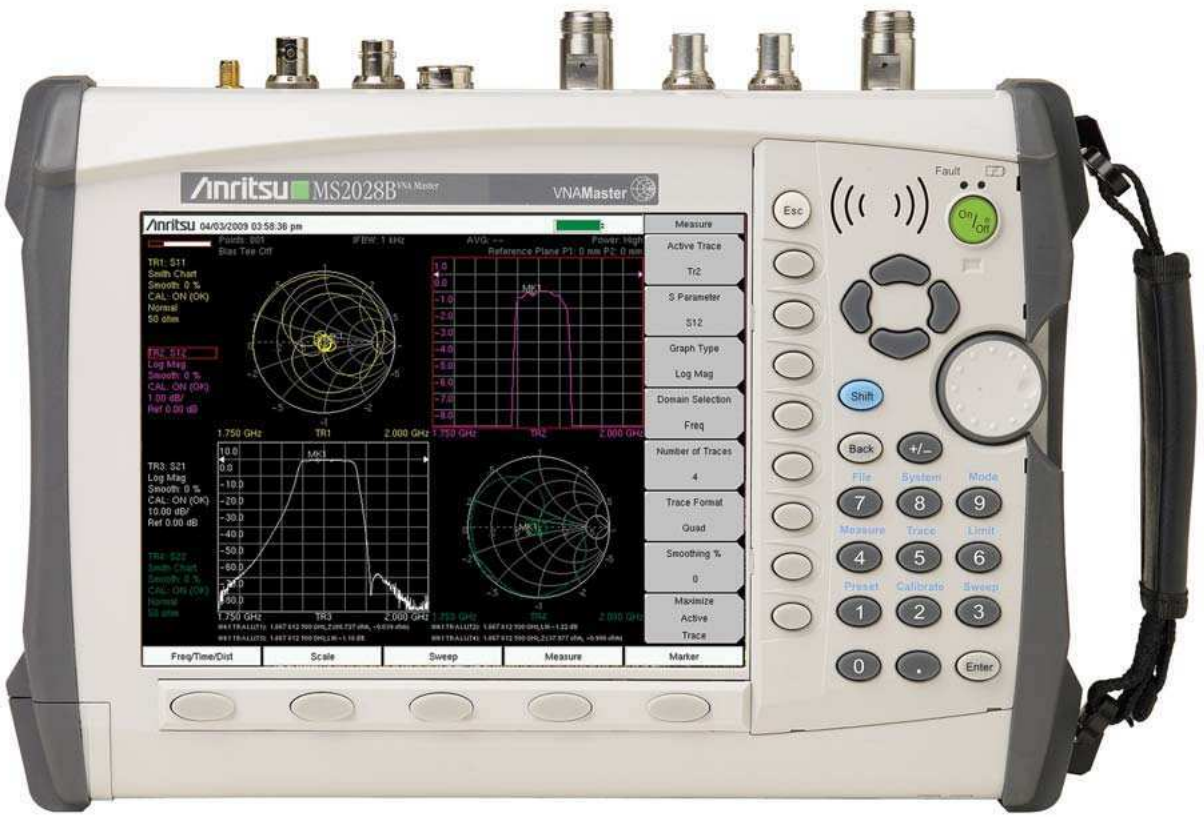
Maintenance Manual

VNA Master
MS2026B and MS2028B
Vector Network Analyzers

MS2026B Vector Network Analyzer 5 kHz to 6 GHz, N Connectors

MS2028B Vector Network Analyzer 5 kHz to 20 GHz, N or K Connectors



Anritsu

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Manufacturer's Name: ANRITSU COMPANY

Manufacturer's Address: Microwave Measurements Division
490 Jarvis Drive
Morgan Hill, CA 95037-2809
USA

declares that the product specified below:

Product Name: VNA Master

Model Number: MS202xB

conforms to the requirement of:

EMC Directive:	2004/108/EC
Low Voltage Directive:	2006/95/EC

Electromagnetic Compatibility: EN61326:2006

Emissions:	EN55011: 2007 Group 1 Class A	
Immunity:	EN 61000-4-2:1995 +A1:1998 +A2:2001	4kV CD, 8kV AD
	EN 61000-4-3:2006 +A1:2008	3V/m
	EN 61000-4-4:2004	0.5kV SL, 1kV PL
	EN 61000-4-5:2006	0.5kV L-L, 1kV L-E
	EN 61000-4-6: 2007	3V
	EN 61000-4-11: 2004	100% @ 20msec

Electrical Safety Requirement:

Product Safety: EN 61010-1:2001

Eric McLean, Corporate Quality Director

Morgan Hill, CA

12 MAR 2009
Date

European Contact: For Anritsu product EMC & LVD information, contact Anritsu LTD, Rutherford Close, Stevenage Herts, SG1 2EF UK, (FAX 44-1438-740202)

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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)	×	○	×	×	○	○
LCD	×	×	×	×	○	○
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。

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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 maintenance instructions for the VNA Master MS202XB. It describes the product and provides performance verification procedures, parts replacement procedures, and a replaceable parts list.

1-2 Description

The MS202XB VNA Master is a broadband Vector Network Analyzers which offer the industry's first 12-term error correction in a truly handheld, battery-operated, rugged multi-function instrument.

Key Features

- Two-port vector network analysis to 20 GHz
- Support for coaxial and waveguide connector types
- True 2-Port, 12-term error correction calibrations
- Fully reversing test port configuration

Frequency Ranges

- MS2026B 5 kHz to 6 GHz, N Connectors
- MS2028B 5 kHz to 20 GHz, N or K Connectors

Standard Accessories

- 10580-00220 MS202XB User Guide
- 65729 Soft Carrying Case
- 2300-498 Master Software Tools CD ROM
- 633-44 Rechargeable battery, Li-Ion
- 40-168-R AC – DC Adapter
- 806-141-R Automotive 12 Volt DC Adapter
- 3-2000-1498 USB A-mini B Cable, 3 meters (10 feet)
- 2000-1371-R Cat 5 Ethernet Cable
- 3-806-152 Cat 5 Ethernet Crossover Cable
- 2000-1520-R 2GB USB Memory Drive

1-3 Related Documents

Other documents are available for the MS2026B and MS2028B at the Anritsu web site at www.anritsu.com

- ***VNA Master MS2026B and MS2028B User Guide – PN 10580-00220***
- ***VNA Master MS2026B and MS2028B Programming Manual – PN 10580-00221***

1-4 Options

- Option 2 Time Domain Analysis
- Option 5 Power Monitor (requires external detector)
- Option 7 Secure Data Operation

- Option 10 Built-in Variable Bias-Tee (+12 to +32 V in 0.1 V steps)
- Option 11 K (f) Test Port Connectors (MS2028B Only)
- Option 15 Vector Voltmeter
- Option 19 High Accuracy Power Meter (requires external USB Sensor)
- Option 31 GPS Receiver (GPS antenna 2000-1528-R sold separately)
- Option 77 Balanced/Differential S-parameters, 1-Port

1-5 Recommended Test Equipment

The following test equipment is recommended for use in testing and maintaining the VNA Master.

Note	Verify that the test equipment is operating properly before it is used.

Table 1-1. Recommended Test Equipment

Equipment	Critical Specification	Recommended Manufacturer/Model
Frequency Counter	Frequency: 2 - 3 GHz	Anritsu Model MF2412B
Frequency Reference	Frequency: 10 MHz	Symmetricom Model RubiSource T&M
Open/Short/Load	Frequency: DC to 18 GHz Connector: N(m)	Anritsu Model OSLN50
Open/Short/Load	Frequency: DC to 18 GHz Connector: N(f)	Anritsu Model OSLNF50
RF Coaxial Cable	Frequency: DC to 18 GHz Impedance: 50 Ohm Connector: N(m) to N(m)	Anritsu Model 3670NN50-2
Verification Kit	Connector: N Type	Anritsu Model SC7858 (Includes verification software)
Open/Short/Load (for Option 11)	Frequency: DC to 20 GHz Connector: K(m)	Anritsu Model OSLK50
Open/Short/Load (for Option 11)	Frequency: DC to 20 GHz Connector: K (f)	Anritsu Model OSLKF50
RF Coaxial Cable (for Option 11)	Frequency: DC to 40 GHz Impedance: 50 Ohm Connector: K (f) to K(m)	Anritsu Model 3670K50-2
Verification Kit (for Option 11)	Connector: K Type	Anritsu Model SC7859 (includes verification software)
Adapter (for Option 11)	Frequency: DC to 40 GHz Connector: K(m) to K(m)	Anritsu Model 33KK50B
Adapter (for Option 11)	Frequency: DC to 18 GHz Connector: N(f) to K(m)	Anritsu Model 34NFK50
Synthesized Signal Generator (for Option 5)	Frequency: 1 GHz Power Level: -40 to +13 dBm	Anritsu Model MG3691B with Options 2A and 4 (or 5)
RF Detector (for Option 5)	Frequency: 10 MHz to 20 GHz	Anritsu Model 560-7N50B

Table 1-1. Recommended Test Equipment

Equipment	Critical Specification	Recommended Manufacturer/Model
Adapter (for Option 5)	Frequency: DC to 40 GHz Connector: K(m) to N(f)	Anritsu Model 3RKNF50
Power Meter (for Option 5)	Power Range: –70 to +20 dBm	Anritsu Dual Channel Model ML2437A
Power Sensor (for Option 5)	Frequency: 10 MHz to 18 GHz, Range: –67 to +20 dB	Anritsu Model MA2442D
Power Splitter (for Option 5)	Frequency: DC to 18 GHz	Areoflex/Weinschel Model 1870A
Load Test Fixture (for Option 10)	Resistance: 40 Ohm Power: 5 Watts	Anritsu Model T2904
Load Test Fixture (for Option 10)	Resistance: 105 Ohm Power: 1 Watt	Anritsu Model T3377
Load Test Fixture (for Option 10)	Resistance: 78 Ohm Power: 20 Watts	Anritsu Model T3536
Torque Wrench	3/4” (0.75”) Open End Wrench 12 in-lbs (1.35 Nm)	Anritsu Model 01-200
Torque Wrench (for Option 11)	5/16” (0.325“) Open End Wrench 8 in-lbs (0.90 Nm)	Anritsu Model 01-201
Personal Computer	Operating System: Windows XP Interface: Ethernet, RJ-48 Software: National Instruments VISA version 4.4.1	Any

1-6 Recommended Tools and Supplies

- Castellated Socket with 1/4” hex drive – For Castellated (Slotted) BNC Connector Dress Nuts
  - Anritsu Part Number – T1451
- Hex driver handle – For tool above
- Medium Phillips Head Screwdriver
- Small Flat Blade Screwdriver, with tip width of less than 3.5 mm – For Front Panel Keypad Bezels
- Small square of rubber or similar non-scratch material approximately 25 mm x 25 mm (1” x 1”) – For Front Panel Keypad Bezels
- 5.5 mm Angled-Head Open End Wrench
- 5/16” (~8 mm) Open End Wrench, 2 each recommended – For SMA Connectors
- 5/16” and 8 in-lbs Open End Torque Wrench, Anritsu Model 01-201– For Option 11
- 7/16” (~12 mm) Nut Driver – For Rotary Encoder
- 3/4” and 12 in-lbs Open End Torque Wrench, Anritsu Model 01-200
- Needle-Nose Pliers
- Small Cable Ties
- Scraper Tool – For removing RTV from connectors

- Room Temperature Vulcanizing (RTV) Silicon Sealant – For Keypad Flex PCB Replacement
  - Anritsu Part Number – 3-783-1102
- Approved cleaning supplies – For LCD Display, Clear Plastic LCD Protector, and instrument Case

1-7 Replaceable Parts and Assemblies

To ensure that the correct options are provided on the replacement assembly when ordering either a VNA Module Assembly or Main PCB Assembly, all installed instrument options must be declared on the order.

The installed options are listed on a label on the top of the MS202XB and can also be viewed in the System/Status display.

The table below summarizes the available replaceable parts and assemblies with links to Chapter 4, "Assembly Removal and Replacement" detailed procedures

Table 1-2. Replaceable Parts and Assemblies (1 of 2)

Part Number	Description
ND69864	Main PCB Assembly for MS2026B instruments – VNA Module not included – LCD Display not included – Section 4-14 "Replace Main PCB Assembly – ND69864, ND69865" on page 4-28
ND69865	Main PCB Assembly for MS2028B instruments – VNA Module not included – LCD Display not included – Section 4-14 "Replace Main PCB Assembly – ND69864, ND69865" on page 4-28
ND69866	VNA Module Assembly with N(f) connectors for MS2026B instruments – For MS2026B instruments equipped with standard N (f) Test Ports – Section 4-10 "Replace VNA Module Assembly – ND69866, ND69867, ND70363" on page 4-13
ND69867	VNA Module Assembly with N(f) connectors for MS2028B – For MS2028B instruments equipped with standard N (f) Test Ports – Section 4-10 "Replace VNA Module Assembly – ND69866, ND69867, ND70363" on page 4-13
ND70363	VNA Module Assembly with K (f) connectors for MS2028B – For MS2028B instruments equipped with Option 11 K (f) Test Ports – Section 4-10 "Replace VNA Module Assembly – ND69866, ND69867, ND70363" on page 4-13
ND67197	Power Monitor PCB Assembly, Option 5 – For MS2026B instruments equipped with Option 5 Power Monitor – For MS2028B instruments equipped with Option 5 Power Monitor – Section 4-9 "Replace Power Monitor PCB Assembly Option 5 – ND67197" on page 4-11
ND70320	GPS Receiver Module, Option 31 – For MS2026B instruments equipped with Option 31 GPS Receiver – For MS2028B instruments equipped with Option 31 GPS Receiver – Does not include GPS Antenna 2000-1528-R – Section 4-11 "Replace GPS Receiver Module Option 31 – ND70320" on page 4-17
3-15-118	LCD Display – For either MS2026B or MS2028B instruments – Section 4-16 "Replace LCD Display PCB Assembly – 3-15-118" on page 4-33
3-61368	Clear Plastic LCD Protector – For either MS2026B or MS2028B instruments – Section 4-17 "Replace Clear Plastic LCD Protector – 3-61368" on page 4-34
3-66549-3	LCD Backlight Power Inverter PCB – For either MS2026B or MS2028B instruments – Section 4-15 "Replace LCD Backlight Inverter PCB Assembly – 3-61362" on page 4-32
3-61362	Main Keypad Membrane – For either MS2026B or MS2028B instruments – Section 4-19 "Replace Main Keypad Components – 3-61362, 65027-3" on page 4-38

Table 1-2. Replaceable Parts and Assemblies (2 of 2)

Part Number	Description
65027-3	Main Keypad PCB – For either MS2026B or MS2028B instruments – Section 4-19 “Replace Main Keypad Components – 3-61362, 65027-3” on page 4-38
3-61361	Soft Key Keypad Membrane – For either MS2026B or MS2028B instruments – Section 4-20 “Replace Soft Key Keypad Membrane – 3-61361” on page 4-42
61333-3	Soft Key Keypad Flex PCB – For either MS2026B or MS2028B instruments – Section 4-21 “Replace Soft Key Keypad Components – 3-61361, 61333-3” on page 4-44
3-410-101	Rotary Encoder – For either MS2026B or MS2028B instruments – Does not include the Rotary Knob 3-61360-2 – Section 4-12 “Replace Rotary Encoder – 3-410-101” on page 4-20
3-61360-2	Encoder Rotary Knob (excluding encoder) – For either MS2026B or MS2028B instruments – Does not include the Rotary Encoder 3-410-101 – Section 4-12 “Replace Rotary Encoder – 3-410-101” on page 4-20
3-61470	Hand Strap – For either MS2026B or MS2028B instruments – Section 4-22 “Replace Hand Strap Handle – 3-61470” on page 4-48
61379-2	Battery Door – For either MS2026B or MS2028B instruments – See Chapter 3, “Battery Information and Replacement” for replacement of the battery door.
633-44	Rechargeable Battery, Lithium-Ion – For either MS2026B or MS2028B instruments – See Chapter 3, “Battery Information and Replacement” for replacement of the rechargeable battery.
40-168-R	AC to DC Power Adapter – For either MS2026B or MS2028B instruments
65729	Soft Carrying Case – For either MS2026B or MS2028B instruments
806-141	Automotive 12 Volt DC Adapter – For either MS2026B or MS2028B instruments
3-2000-1498	USB Type 2 A to Mini B Cable, 3 meters (10 feet) – For either MS2026B or MS2028B instruments
2000-1371-R	Category 5 (Cat5) Ethernet Cable – For either MS2026B or MS2028B instruments
3-806-152	Category 5 (Cat5) Crossover Cable – For either MS2026B or MS2028B instruments

Chapter 2 — Performance Verification

2-1 Introduction

This chapter contains tests that can be used to verify the performance or operation of the VNA Master MS2026B and MS2028B.

2-2 Frequency Accuracy

The following test can be used to verify the CW frequency accuracy of the VNA Master. Measurement calibration of the VNA is not required for this test.

Equipment Required

- Frequency Counter, Anritsu Model MF2412B
- RF Coaxial Cable, Anritsu Model 3670K50-2 or 3670NN50-2
- Adapter, Anritsu Model 33KK50B or 34NFK50

Procedure

1. Press the **On/Off** key to turn on the VNA Master.
2. Press the **Shift** key, the **Preset (1)** key, and then the Preset soft key to reset the instrument to the default starting conditions.

Note	Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

3. Press the Measure soft key and then the S-Parameter soft key. Select **S21**.
4. Press the # of Traces soft key and then select **1**. Press the Back soft key.
5. Press the Graph Type soft key. Then select Log Mag and press **Enter** key to accept the selection.
6. Press the Sweep soft key and change the Data Point to **1000**.
7. Press the Freq/Time/Dist soft key and then press the Start Freq soft key.
8. Enter **2.6** then press the GHz soft key to set the Start Frequency to 2.6 GHz.
9. Press the Stop Freq soft key.
10. Enter **2.6** and press the GHz soft key to set the Stop Frequency to 2.6 GHz.
11. Connect the RF cable from the VNA Master **Port 1** to the **RF Input1** connector on the Frequency Counter.
12. Turn on the Frequency Counter and press the **Preset** key.
13. Verify that Frequency Counter reading is **2.6 GHz, ± 3.9 kHz**.

2-3 Transmission Dynamic Range

The following test is used to verify the transmission dynamic range. Measurement calibration of the VNA Master is required for this test.

Equipment Required

- Calibration Tee, N male, Anritsu Model OSLN50
- Calibration Tee, N female, Anritsu Model OSLNF50
- RF Coaxial Cable, Anritsu Model 3670NN50-2
- Calibration Tee, K male, Anritsu Model OSLK50 (for units with Option 11)
- Calibration Tee, K female, Anritsu Model OSLKF50 (for units with Option 11)
- RF Coaxial Cable, Anritsu Model 3670K50-2 (for units with Option 11)
- Adapter, Anritsu Model 33KK50B (for units with Option 11)

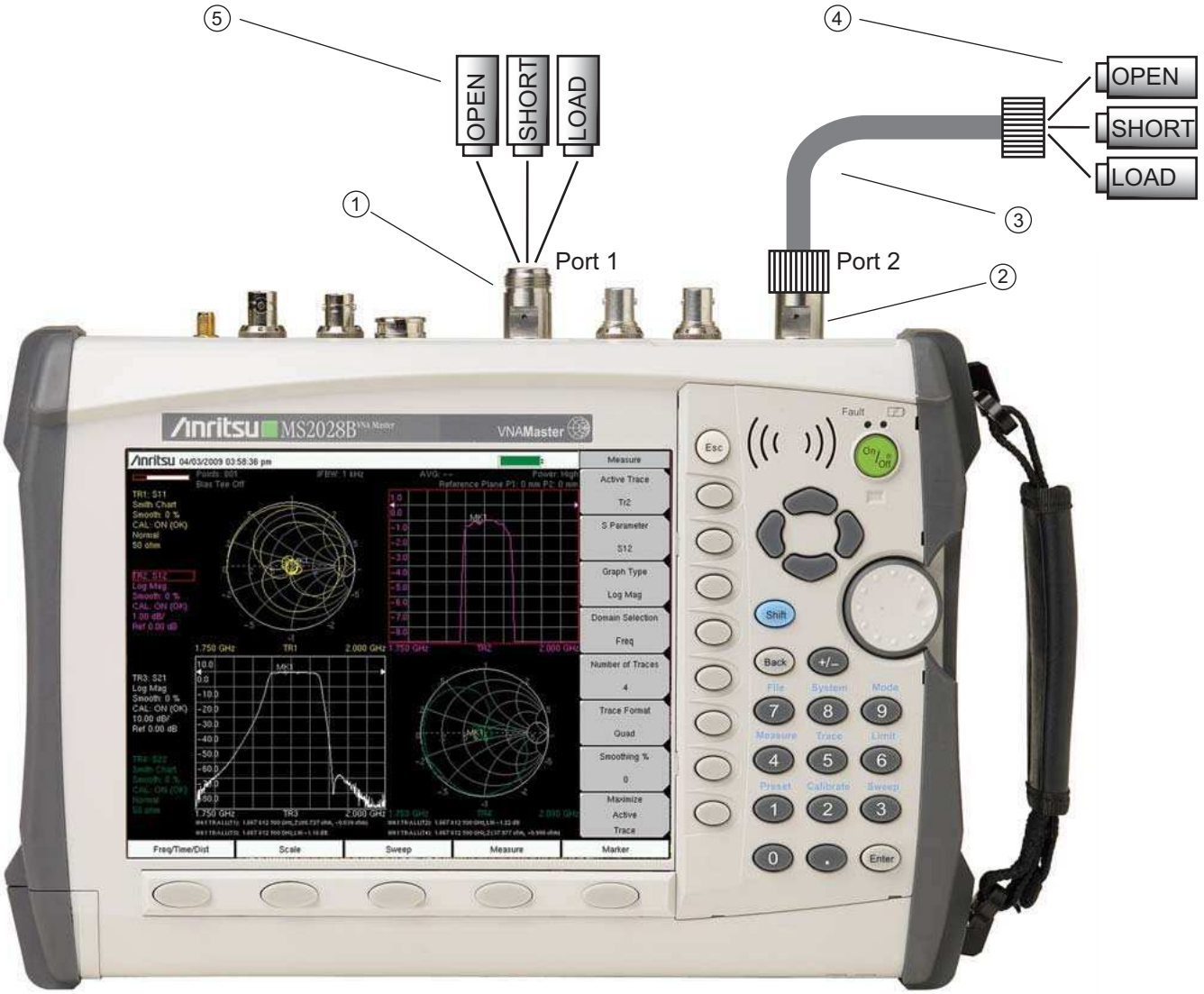
Procedure

1. Press the **On/Off** key to turn on the VNA Master.
2. Press the **Shift** key, the **Preset (1)** key, and then the Preset soft key to reset the instrument to the default starting conditions.

Note	Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

3. Press the Measure soft key and then the S-Parameter soft key. Select **S21**.
4. Press the # of Traces soft key and then select **1**. Press the Back soft key.
5. Press the Graph Type soft key. Then select Log Mag and press **Enter** key to accept the selection.
6. Press the Sweep soft key. Change the Data Point to **986** and IFBW to **10 Hz**.
7. Press the Freq/Time/Dist soft key and then press the Start Freq soft key.
8. Enter **5** then press the kHz soft key to set the Start Frequency to **5 kHz**.
9. Press the Stop Freq soft key.
10. Enter **3** and press the GHz soft key to set the Stop Frequency to **3 GHz**.
11. Connect the **RF cable** to the **VNA Master Port 2**. Refer to Figure 2-1 below for general hookup configuration. For instruments with Option 11, install the **33KK50B Adapter** to **Port 2** and then the **RF cable**.
12. Press the **Shift** key and then the **Calibrate (2)** key. Ensure that Cal Type is **Full 2-Port** and Cal Method is **SOLT**.
13. Press the DUT Port Setup soft key. Change Coax DUT Port 2 to N-Conn(F) or K-Conn(F). Press the Back soft key.

14. Press the Start Cal soft key and connect the appropriate standard of the calibration tees to **Port 1** and the open end of the **RF cable (extended Port 2)** as instructed at each Calibration step such as "Open Port 1", "Short Port 1", "Short Port 2", and so on. The figure below (Figure 2-1) shows the general calibration setup. See Table 2-1, "Transmission Dynamic Range Specification" on page 2-4 below at the end of this section for a summary of the Transmission Dynamic Range requirements by frequency range.



1. Test Port 1
2. Test Port 2
3. RF Test Cable
4. Open, Short, and Load Calibration Components
5. Open, Short, and Load Calibration Components

Figure 2-1. Calibration Setup

15. At the Calculate and Finish Cal step, disconnect the **RF cable** from **Port 1**. Use the up arrow key to select Isolation, Fwd & Rev (optional).

16. Connect the **loads** to both **Port 1** and the **open end** of the RF cable (**extended Port 2**) and then press the **Enter** key to measure isolation.

17. Now it goes back to Calculate and Finish Cal step again. Press the **Enter** key to finish the calibration.

18. Verify that the noise floor is below **–80dB**.

19. Press the Measure soft key and then the S-Parameter soft key. Select **S12**.

20. Verify that the noise floor is below **–80 dB**.

21. Press the Freq/Time/Dist soft key and then press the Start Freq soft key.

22. Enter **3** then press the GHz soft key to set the Start Frequency to 3 GHz.

23. Press the Stop Freq soft key.

24. Enter **6** and press the GHz soft key to set the Stop Frequency to 6 GHz.

25. Repeat Step #12 to Step #17 above.

26. Verify that the noise floor is below **–75 dB**.

27. Press the Measure soft key and then the S-Parameter soft key. Select **S21**.

28. Verify that the noise floor is below **–75 dB**. The test is now complete for MS2026B.

Complete Test for MS2028B Only

29. Press the Freq/Time/Dist soft key and then press the Start Freq soft key.

30. Enter **6** then press the GHz soft key to set the Start Frequency to 6 GHz.

31. Press the Stop Freq soft key.

32. Enter **20** and press the GHz soft key to set the Stop Frequency to 20 GHz.

33. Repeat Step #12 to Step #17 above.

34. Verify that the noise floor is below **–65 dB.**

35. Press the Measure soft key and then the S-Parameter soft key. Select **S12**.

36. Verify that the noise floor is below **–65 dB**.

Table 2-1. Transmission Dynamic Range Specification

Frequency Range	Dynamic Range (dB)
5 kHz to 3 GHz	80
3 GHz to 6 GHz	75
6 GHz to 20 GHz	65

2-4 S-Parameter Measurements Verification

The following test verifies S-parameter measurement capabilities of the VNA Master, calibration tees, test port cable, and any required adapters as a system by analyzing the measurement of artifacts that are traceable to national standards laboratories. The procedures are automated by using the S-parameter Measurement Verification software, which is supplied with each SC7858 or SC7859 Verification Kit.

The S-parameter Measurement Verification software guides the user to perform a full 12 Term calibration on the VNA Master using the appropriate calibration tees, measure the S-parameters of the impedance transfer standards in the verification kit, and verify that the measured values are within the specified measurement uncertainty limits.

The impedance transfer standards contained in the verification kit are:

- 20 dB Attenuation Standard
- 50 dB Attenuation Standard
- 50 Ohm Air Line Standard
- 25 Ohm Mismatch (Beatty) Standard

The devices in the verification kit are selected based on their ability to stress the envelope of possible measurement parameters while still providing a very stable and repeatable behavior. The key attribute of the devices is that of long term stability.

The quality of the verification result is very dependent on the degree of care taken by the user in maintaining, calibrating, and using the system. The most critical factors are:

- The stability and quality of the devices in the calibration tee and the verification kit.
- The condition of the VNA test port connectors and test port cables.
- The pin depths of all connectors.
- The proper torquing of connections.

Note	The use of non-Anritsu calibration tees or verification kits is not supported.

Equipment Required

- Calibration Tee, N male, Anritsu Model OSLN50
- Calibration Tee, N female, Anritsu Model OSLNF50
- RF Coaxial Cable, Anritsu Model 3670NN50-2
- N Connector Verification Kit, Anritsu Model SC7858
- 3/4” and 12 in-lb. Open End Torque Wrench, Anritsu 01-200
- Calibration Tee, K male, Anritsu Model OSLK50 (for units with Option 11)
- Calibration Tee, K female, Anritsu Model OSLKF50 (for units with Option 11)
- RF Coaxial Cable, Anritsu Model 3670K50-2 (for units with Option 11)
- Adapter, Anritsu Model 33KK50B (for units with Option 11)
- K Connector Verification Kit, Anritsu Model SC7859 (for units with Option 11)
- 5/16” and 8 in-lb. Open End Torque Wrench, Anritsu 01-201
- Personal Computer with Microsoft Windows XP Operating System, USB port, Ethernet interface, and National Instruments VISA software version 4.4.1

Special Precautions

When performing the procedures, observe the following precautions:

- Minimize vibration and movement of the system, attached components, and test cable.

- Clean and check the pin depth and condition of all adapters, test port cables, calibration components, and impedance transfer standards.
- Pre-shape the test cable so as to minimize its movement during calibration and measurement activities.

Procedure

1. Use a Cat5-E Ethernet cable to connect the VNA Master to a Local Area Network port close to the PC controller. Alternatively, use a Cat5-E Ethernet Crossover cable to connect the VNA Master directly to the PC Controller's Ethernet port. Refer to the ***MS202XB User Guide, PN 10580-00220*** for set up procedures.
2. Power on the PC controller and the VNA Master.
3. Install the **RF Coaxial Cable** to **Port 2** of the VNA Master. Install the **33KK50B Adapter** to the open end of the cable if verifying the instrument with Option 11.
4. Run the MS202XB S-parameter Measurement Verification software on the PC.
5. Verify that the PC controller is communicating with the VNA Master.
6. Insert the USB flash drive supplied with the verification kit to an available USB port on the PC controller. Set the data location of the verification software to the USB flash drive when prompt.
7. Follow the directions displayed on the computer to perform calibration with the appropriate calibration kit.

Note	Use an appropriate torque wrench to insure proper connection of calibration devices during calibration.

8. Follow the directions on the computer to perform measurements of impedance transfer standards of the appropriate verification kit.

Note	Use an appropriate torque wrench to insure proper connection of verification standard devices prior to starting verification measurements.

9. Pass/Fail status of the measurements is displayed on the computer. The software can also provide a hard copy printout of the measured data, measurement uncertainties, and the impedance transfer standards used.

If Verification Fails

If the verification fails, check the quality, cleanliness, and installation methods for the calibration and verification components. Specifically, check:

- The VNA test port connectors
- The calibration tee
- The impedance transfer standards
- The test port cables for damage and cleanliness
- The test port cables for proper connection and torquing
- The test port cables for phase stability

These are the most common causes for verification failures.

2-5 Power Monitor (Option 5) Verification

If the Power Monitor (Option 5) is installed in the VNA Master, the following test can be used to verify the accuracy of the power measurements.

Equipment Required

- Anritsu MG3691B Synthesized Signal Source with options 2A and 4 (or 5)
- Power Meter, Anritsu Model ML2437A
- Power Sensor, Anritsu Model MA2442D
- RF Detector, Anritsu 560-7N50B
- Power Splitter, Aeroflex/Weinschel Model 1870A
- RF Coaxial Cable, Anritsu Model 3670NN50-2
- Adapter, Anritsu Model 34RKNF50

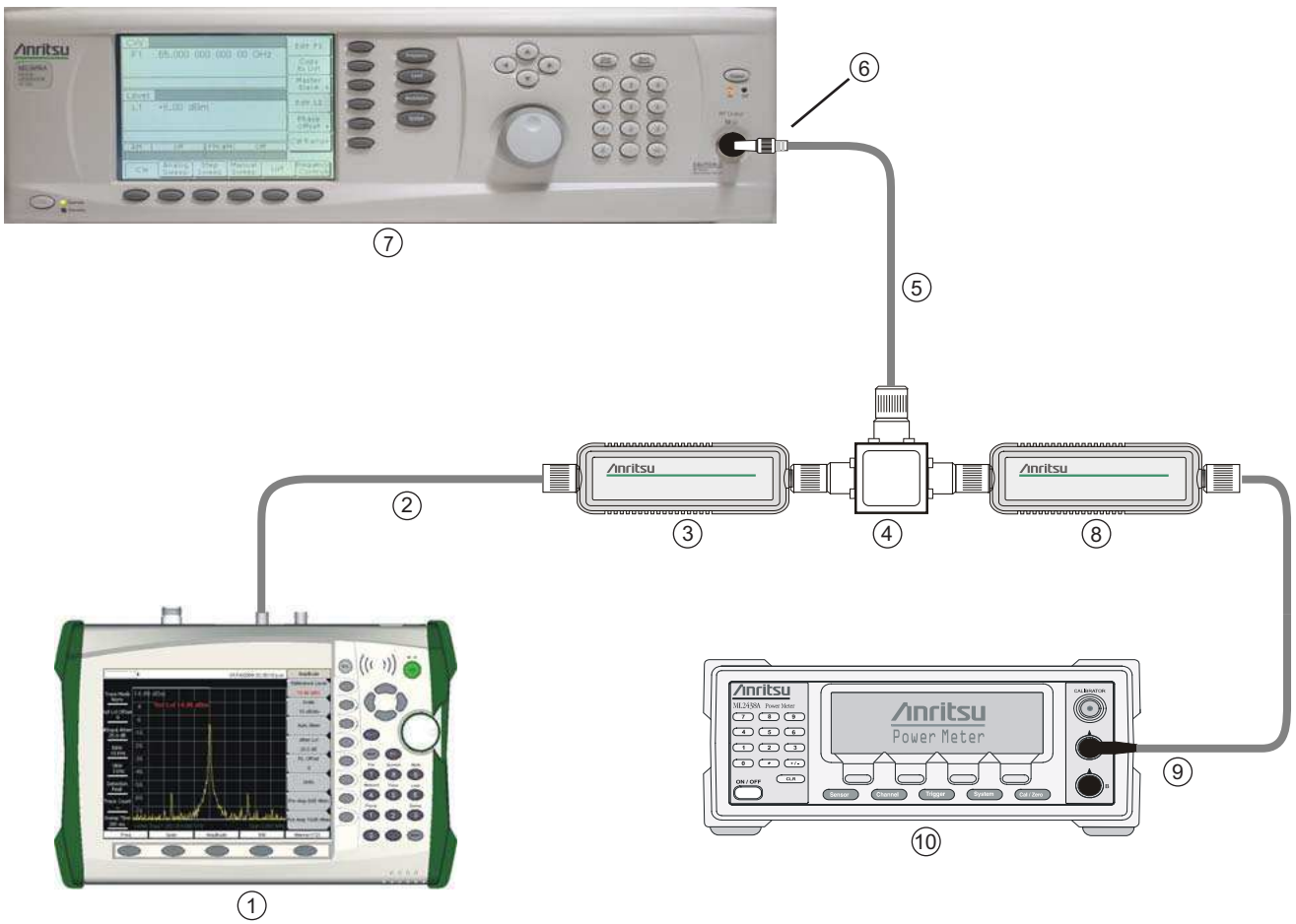
Procedure

1. Press the **On/Off** key to turn on the VNA Master.
2. Press the **Shift** key, the **Preset (1)** key, and then the Preset soft key to reset the instrument to the default starting conditions.
3. Press the **Shift** key and then the **Mode (9)** key. Select Power Monitor and press the **Enter** key.

Note	Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

4. Set the **MG3691B** output to **1.0 GHz**.
5. Connect the **Power Sensor** to the **Power Meter** and calibrate the sensor.

6. Connect **MG3691B**, **Power Meter**, **RF Detector**, and **Sensor** as shown below in Figure 2-2.



1. Anritsu MS2026/28B VNA Master
2. Cable
3. Anritsu RF Detector, PN 560-7N50B
4. Power Splitter, Aeroflex/Weinschel Model 1870A
5. Cable
6. Anritsu Adapter, PN 34RKNF50
7. Anritsu MS3691B Synthesized Signal Source with Options A2 and 4 (or 5)
8. Anritsu Power Sensor, PN MA2442D
9. Cable
10. Anritsu ML2437A Power Meter

Figure 2-2. Power Monitor Verification Test Setup

7. On the **MG3691B** press the **Level** key, then use the **knob** to adjust the power level so that the power meter reads –40 dBm.

8. Verify that the VNA Master reading is **40 ± 1.0 dBm**.

9. Repeat Step #7 and Step #8 for the other power level settings shown in Table 2-2 below.

Table 2-2. Power Monitor Verification Specifications

Power Level (dB)	Specification (dB)
–40	± 1.0
–21	
–4	
0	
+13	

2-6 Bias Tee (Option 10) Operational Check

If the Bias Tee (Option 10) is installed in the VNA Master, the following test can be used to verify the internal bias tee functionality.

Equipment Required

- 40 Ohm, 5 Watt, High Current Load, Anritsu T2904
- 78 Ohm, 1 Watt, Low Current Load, Anritsu T3536
- 105 Ohm, 1 Watt, Low Current Load, Anritsu T3377
- VNA Master External Power Supply, Anritsu Part Number 40-168-R

Procedure

1. Connect the external power supply (Anritsu part number 40-168-R) to the VNA Master. Note: The VNA Master must be powered by the external power supply for this test.
2. Press the **On/Off** key to turn on the VNA Master.
3. Press the **Shift** key, the **Preset key (1**), and then the Preset soft key to reset the instrument to the default starting conditions.
4. Press the Freq/Time/Dist soft key and then press the Start Freq soft key.
5. Enter **10** then press the MHz soft key to set the Start Frequency to 10 MHz.
6. Press the Stop Freq soft key.
7. Enter **6** (for MS2026B) or **20** (for MS2028B) and press the GHz soft key to set the Stop Frequency to **6** or **20** GHz.

Note	Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

8. Press the Measure soft key and then the S-Parameter soft key. Select **S21**.
9. Press the # of Traces soft key and then select **1**. Press the Back soft key.
10. Press the Maximize Active Trace soft key.
11. Press the Sweep soft key, the Configure Ports soft key and then the Bias Tee Setup soft key.
12. Press the Int Port Selection soft key to change to bias output to Port 1.

Voltage and Current Test

13. Connect the **105 Ohm** load to **Port 1**.
14. Ensure that Int Voltage P1 setting is **12.0 V**.
15. Press the Bias Tee soft key and then the Internal soft key to turn the Bias Tee On.
16. Verify the voltage and current readings displayed on the left upper corner of the screen are within the ranges shown in Table 2-3.
17. Press the Bias Tee soft key and then the Off soft key to turn the Bias Tee Off.
18. Press the Int Voltage P1 soft key. Change the voltage to **18.0 V**.
19. Repeat Step #15 through Step #17.
20. Remove the **105 Ohm Load** from **Port 1** and connect the **78 Ohm Load** to **Port 1**.
21. Press the Int Voltage P1 soft key. Change the voltage to **32.0 V**.

22. Repeat Step #15 through Step #17.

Table 2-3. Bias Tee Verification

Voltage Setting (V)	12.0	18.0	32.0
Expected Voltage (V)	10-12	15.7-17.7	28.5-30.9
Expected Current (mA)	85-145	142-202	361-411

Fault Test

23. Remove the **78 Ohm Load** from **Port 1** and connect the **40 Ohm Load** to **Port 1**.

24. Change Int Voltage P1 to **15.0 V**.

25. Press the Bias Tee soft key and then the Internal soft key to turn the Bias Tee On.

26. Verify that the instrument makes a clicking sound and the Bias Tee current reading displayed on the left side of the screen is **0 mA**.

27. Press the Bias Tee soft key and then the Off soft key to turn the Bias Tee Off.

28. Repeat Step #8 through Step #27 for **Port 2**.

Note	Helpful Tip: Set S Parameter to S12, set Int Port Selection to 2, change Int Voltage P2 and connect load to Port 2 as appropriate.

2-7 GPS (Option 31) Operational Check

The following test is used to verify the operation of the GPS option.

Note	Ensure that the Anritsu GPS Antenna is in a direct line-of-sight relationship to the GPS satellites or the Antenna is placed outside without any obstructions.

Equipment Required

- Anritsu 2000-1528-R GPS Antenna

Procedure

1. Press the **On/Off** key to turn on the VNA Master.
2. Press the **Shift** key, the **Preset key (1)**, and then the Preset soft key to reset the instrument to the default starting conditions.

Note	Before continuing, allow a 30-minute warm up for the internal circuitry to stabilize.

3. Connect the **GPS Antenna** to the **GPS Antenna connector** on the VNA Master.
4. Press the **Shift** key, and then press the **System (8)** key.
5. Press the GPS soft key, then press the GPS On/Off soft key to turn the **GPS On**.
6. When the GPS fix is acquired, the GPS indicator at the top of the screen will turn green.
7. Press the GPS Info soft key to view the latitude, longitude, altitude, and other GPS information.

Chapter 3 — Battery Information and Replacement

3-1 Introduction

This chapter describes the removal and replacement procedures for the instrument battery.

3-2 Replaceable Parts and Assemblies

The following replaceable parts are related to the battery pack and power adapters. To ensure that the correct parts are provided, be sure to list the model number, the instrument serial number, and the installed options with the order. The installed options are listed on a label on the top of the MS202XB and can also be viewed in the System/Status display.

Table 3-1. Replaceable Battery Parts and Assemblies

Part Number	Description
61379-2	Battery Door
40-168-R	AC to DC Power Adapter
633-44	Rechargeable Battery, Li-Ion
806-141	Automotive 12 Volt DC Adapter

3-3 Battery Information

The following general information relates to the care and handling of the VNA Master MS202XB Anritsu 633-44 Rechargeable Lithium-Ion Battery.

Approved Batteries Only

- Always use the battery for its intended purpose only.
- Use only Anritsu-approved battery packs. Some non-approved battery packs may fit into the VNA Master but are electrically incompatible and will not charge correctly.
- The battery can be charged and discharged hundreds of times, but it will eventually wear out.
- The battery may need to be replaced when the operating time between charging becomes noticeably shorter than normal.
- Never use a damaged or worn out charger or battery.

Recharging

- The battery pack supplied with the MS202XB VNA Master may need charging before use.
- Before using the VNA Master, the internal battery may be charged either in the VNA Master, using the 40-168R AC-DC Adapter, or in an automobile using the 806-141-R Automotive 12 Volt DC Adapter.
- The battery can also be charged separately in the optional 2000-1374 Dual Battery Charger.
- Recharge the battery only in the VNA Master or in an Anritsu-approved charger.
- Do not charge batteries for longer than 24 hours; overcharging may shorten battery life.

Analyzer Not In Use

- When the VNA Master or the charger is not in use, disconnect it from the power source.
- If left unused, a fully charged battery will discharge itself over time.
- Temperature extremes affect the ability of the battery to charge. Allow the battery to cool down or warm up as necessary before use or charging.
- Discharge the battery from time to time to improve battery performance and battery life.
- Storing the battery in extreme hot or cold places will reduce the capacity and lifetime of the battery.

Physical Handling of Batteries

- Never short-circuit the battery terminals.
- Do not drop, mutilate or attempt to disassemble the battery.

Battery Disposal

- The battery can be charged and discharged hundreds of times, but it will eventually wear out
- Do not dispose of batteries in a fire!
- Batteries must be recycled or disposed of properly. Do not place batteries in household garbage.

3-4 Battery Pack Removal and Replacement

This section provides instructions for the removal and replacing the VNA Master battery pack.

Note	Many of the procedures in this section are generic, and apply to many similar instruments. Photos and illustrations used are representative and may show instruments other than the MS202XB VNA Master.

1. With the VNA Master laying flat, face up, on a stable surface, locate the **Battery Access Door**, as shown in Figure 3-1, "Battery Access Door Location".

1. MS2026B/MS2028B VNA Master
2. Battery Access Door Location located at unit bottom.

Figure 3-1. Battery Access Door Location

2. Place a finger in the battery access door **notch** and push the door down towards the bottom of the instrument, as shown in Figure 3-2, "Battery Access Door Notch".

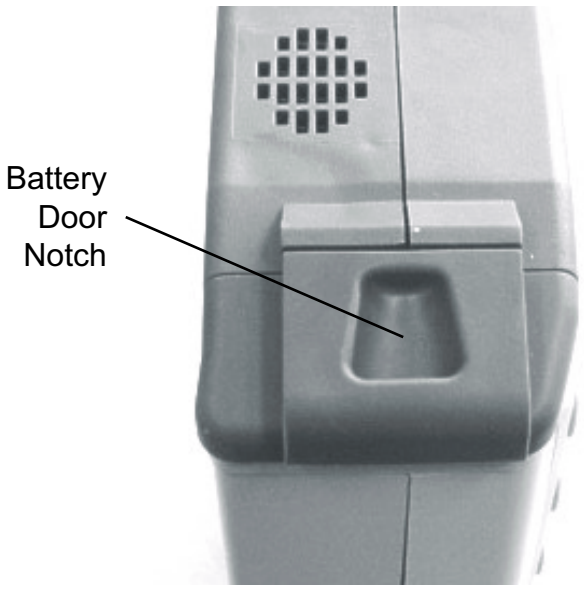


Figure 3-2. Battery Access Door Notch

3. Remove the **Battery Access Door**, as shown in Figure 3-3, "Removing the Battery Access Door".

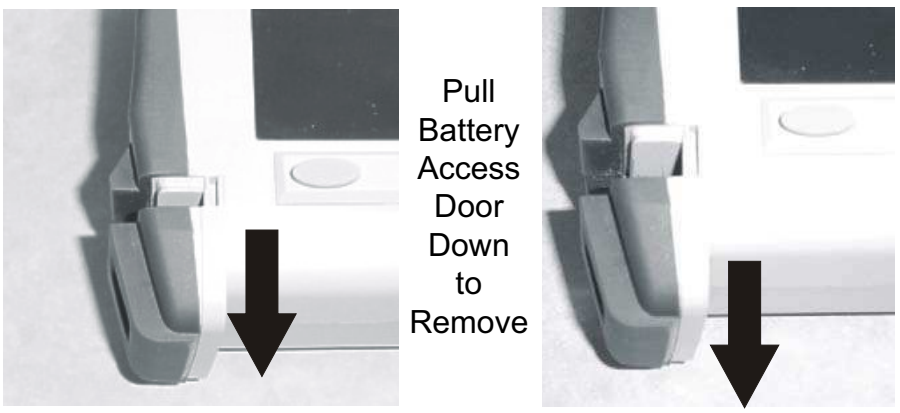


Figure 3-3. Removing the Battery Access Door

4. With the **Battery Access Door** completely removed, grasp the battery lanyard and pull the battery straight out of the unit, as illustrated in Figure 3-4, "Removing the Battery".

Figure 3-4. Removing the Battery

Figure 3-5. MS202XB Case, Battery Door, and Battery

5. Replacement is the opposite of removal. Note the orientation of the battery contacts, and be sure to insert the new battery with the contacts facing the bottom of the unit, as shown in Figure 3-6, "Orientation of Battery Contacts" below.

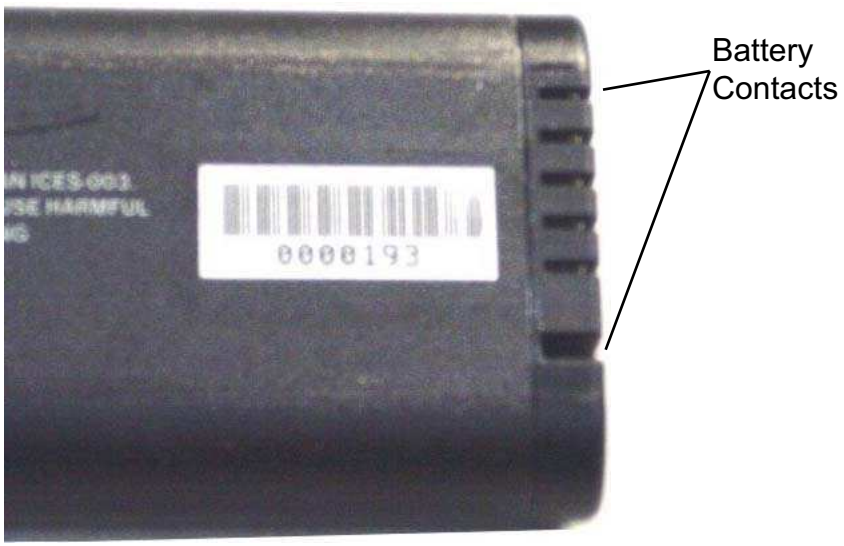


Figure 3-6. Orientation of Battery Contacts

Chapter 4 — Assembly Removal and Replacement

4-1 Introduction

This chapter describes the removal and replacement procedures for the various assemblies.

4-2 Electrostatic Discharge 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 MS2026B/MS2028B VNA Master.

4-3 Real Time Clock (RTC) Battery

Note	The Real Time Clock (RTC) battery is not field replaceable and the instrument must be returned to the factory for service.

4-4 Replaceable Parts, Assemblies, and Accessories

To ensure that the correct options are provided on the replacement assembly when ordering a Main PCB Assembly, all options that are installed on your instrument must be declared on the order. The installed options are listed on a label on the top of the MS202XB and can also be viewed in the System/Status display.

Table 4-1. Replaceable Parts and Assemblies (1 of 3)

Part Number	Description
ND69864	Main PCB Assembly for MS2026B instruments – VNA Module not included – LCD Display not included – Section 4-17 – Replace Main PCB Assembly – ND69864, ND69865 on page 4-34
ND69865	Main PCB Assembly for MS2028B instruments – VNA Module not included – LCD Display not included – Section 4-17 – Replace Main PCB Assembly – ND69864, ND69865 on page 4-34
ND69866	VNA Module Assembly with N(f) connectors for MS2026B instruments – For MS2026B instruments equipped with standard N (f) Test Ports – Section 4-13 – Replace VNA Module Assembly – ND69866 ND69867 ND70363 on page 4-17
ND69867	VNA Module Assembly with N(f) connectors for MS2028B – For MS2028B instruments equipped with standard N (f) Test Ports – Section 4-13 – Replace VNA Module Assembly – ND69866 ND69867 ND70363 on page 4-17
ND70363	VNA Module Assembly with K (f) connectors for MS2028B – For MS2028B instruments equipped with Option 11 K (f) Test Ports – Section 4-13 – Replace VNA Module Assembly – ND69866 ND69867 ND70363 on page 4-17

Table 4-1. Replaceable Parts and Assemblies (2 of 3)

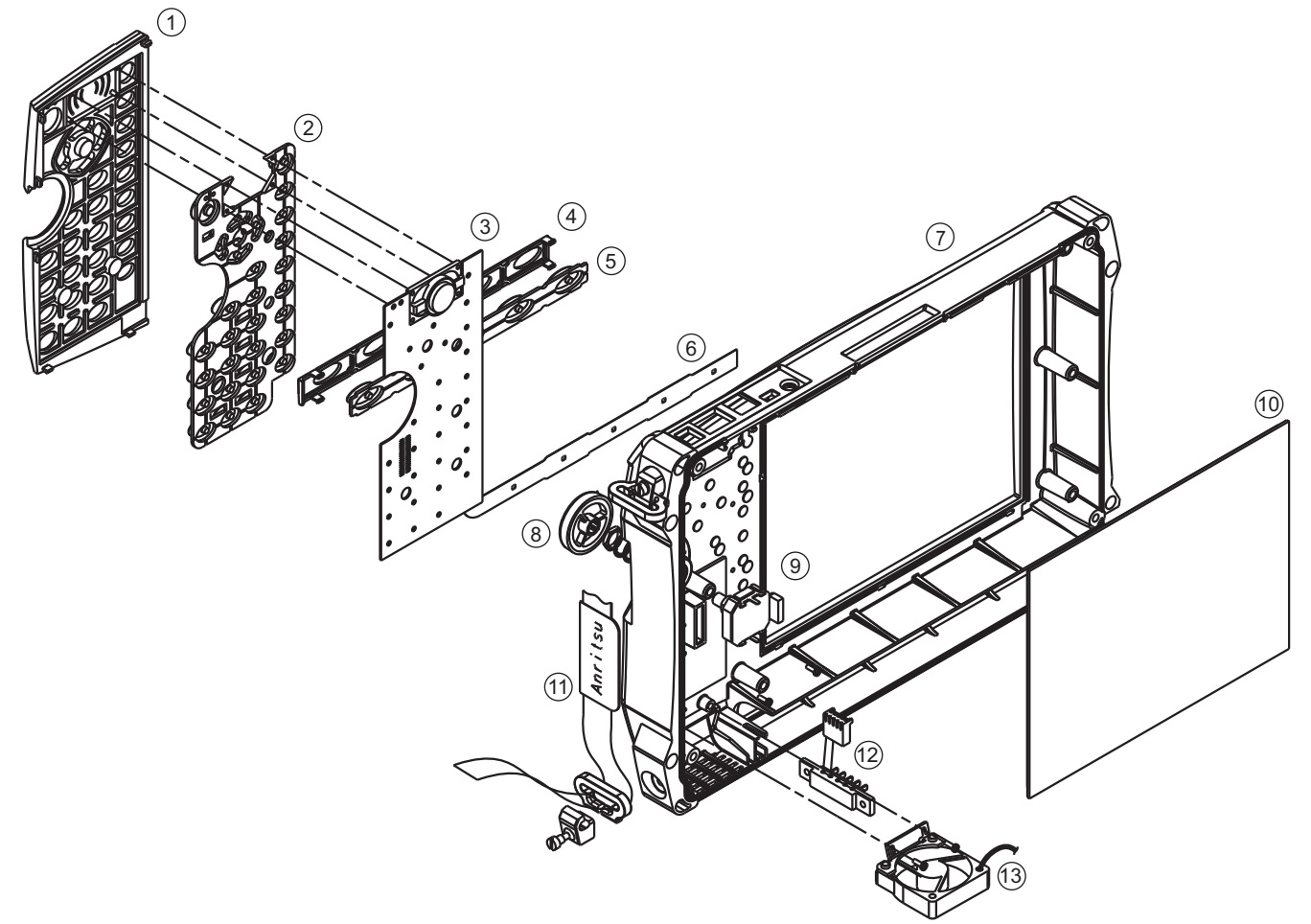
Part Number	Description
ND67197	Power Monitor PCB Assembly, Option 5 – For MS2026B instruments equipped with Option 5 Power Monitor – For MS2028B instruments equipped with Option 5 Power Monitor – Section 4-13 – Replace VNA Module Assembly – ND69866 ND69867 ND70363 on page 4-17
ND70320	GPS Receiver Module, Option 31 – For MS2026B instruments equipped with Option 31 GPS Receiver – For MS2028B instruments equipped with Option 31 GPS Receiver – Does not include GPS Antenna 2000-1528-R – Section 4-14 – Replace GPS Receiver Module Option 31 – ND70320 on page 4-24
3-15-118	LCD Display – VNA Module assembly not included – For either MS2026B or MS2028B instruments – Section 4-19 – Replace LCD Display PCB Assembly – 3-15-118 on page 4-39
3-61368	Clear Plastic LCD Protector – For either MS2026B or MS2028B instruments – Section 4-20 – Replace Clear Plastic LCD Protector – 3-61368 on page 4-40
3-66549-3	LCD Backlight Power Inverter PCB – For either MS2026B or MS2028B instruments – Section 4-18 – Replace LCD Backlight Inverter PCB Assembly – 3-61362 on page 4-38
3-61362	Main Keypad Membrane – For either MS2026B or MS2028B instruments – Section 4-22 – Replace Main Keypad Components – 3-61362, 65027-3 on page 4-45
65027-3	Main Keypad PCB – For either MS2026B or MS2028B instruments – Section 4-22 – Replace Main Keypad Components – 3-61362, 65027-3 on page 4-45
3-61361	Soft Key Keypad Membrane – For either MS2026B or MS2028B instruments – Section 4-23 – Replace Soft Key Keypad Membrane – 3-61361 on page 4-48
61333-3	Soft Key Keypad PCB – For either MS2026B or MS2028B instruments – Section 4-24 – Replace Soft Key Keypad Components – 3-61361, 61333-3 on page 4-50
3-410-101	Rotary Encoder – For either MS2026B or MS2028B instruments – Does not include the Rotary Knob 3-61360-2 – Section 4-15 – Replace Rotary Encoder – 3-410-101 on page 4-27
3-61360-2	Encoder Rotary Knob – For either MS2026B or MS2028B instruments – Does not include the Rotary Encoder 3-410-101 – Section 4-26 – Replace Rotary Knob – 3-61360-2 on page 4-55
3-61470	Hand Strap – For either MS2026B or MS2028B instruments – Section 4-25 – Replace Hand Strap Handle – 3-61470 on page 4-54
61379-2	Battery Door – For either MS2026B or MS2028B instruments – See Chapter 3 for replacement of the battery door.
633-44	Rechargeable Battery, Lithium-Ion – For either MS2026B or MS2028B instruments – See Chapter 3 for replacement of the rechargeable battery.

Table 4-1. Replaceable Parts and Assemblies (3 of 3)

Part Number	Description
40-168-R	AC to DC Power Adapter – For either MS2026B or MS2028B instruments – No disassembly required
65729	Soft Carrying Case – For either MS2026B or MS2028B instruments – No disassembly required
806-141	Automotive 12 Volt DC Adapter – For either MS2026B or MS2028B instruments – No disassembly required
3-2000-1498	USB Type 2 A to Mini B Cable, 3 meters (10 feet) – For either MS2026B or MS2028B instruments – No disassembly required
2000-1371-R	Category 5 (Cat5) Ethernet Cable – For either MS2026B or MS2028B instruments – No disassembly required
3-806-152	Category 5 (Cat5) Crossover Cable – For either MS2026B or MS2028B instruments – No disassembly required

4-5 Front Panel Components for VNA Master MS202XB

The figure below shows the major front panel components including the bezels, keypad membranes, PCBs, and other inner case components.

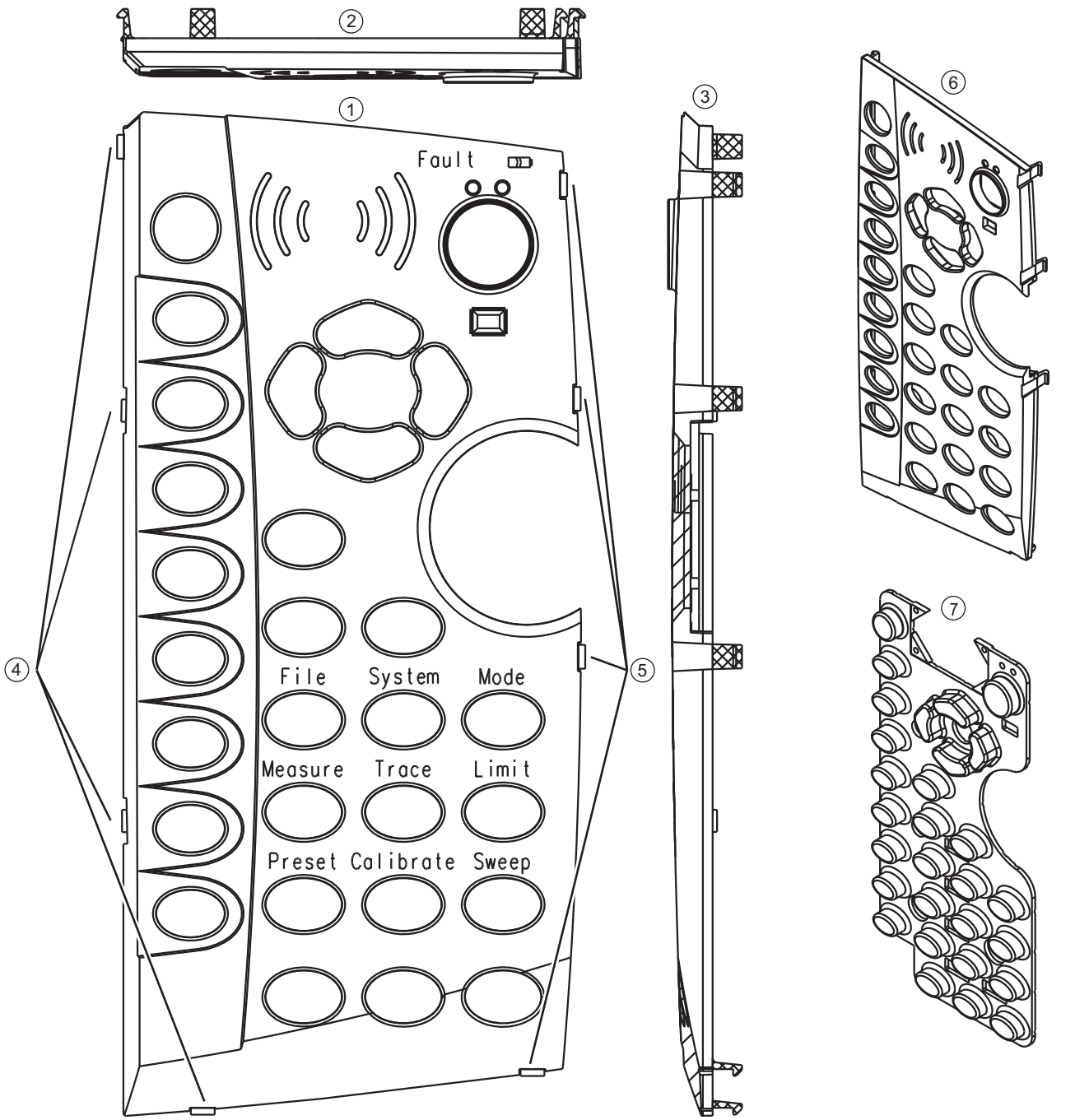


1. Main Keypad Switch Bezel
2. Main Keypad Switch Membrane
3. Main Keypad Switch PCB with installed speaker
4. Soft Key Switch Bezel
5. Soft Key Switch Membrane
6. Soft Key Switch Flex PCB connected to Main Keypad Switch PCB
7. Case Front
8. Rotary Knob
9. Rotary Encoder with attached cable harness
10. LCD Clear Plastic Protector
11. Handle Carrying Strap
12. Battery Connector Contacts with attached cable harness
13. Cooling Fan with mounting bracket and attached cable harness.

Figure 4-1. Case Front Components Overview

4-6 Main Keypad Bezel for VNA Master MS202XB

The figure below shows the Main Keypad Bezel, the location of its locking tabs, and its relationship to the Main Keypad Membrane.

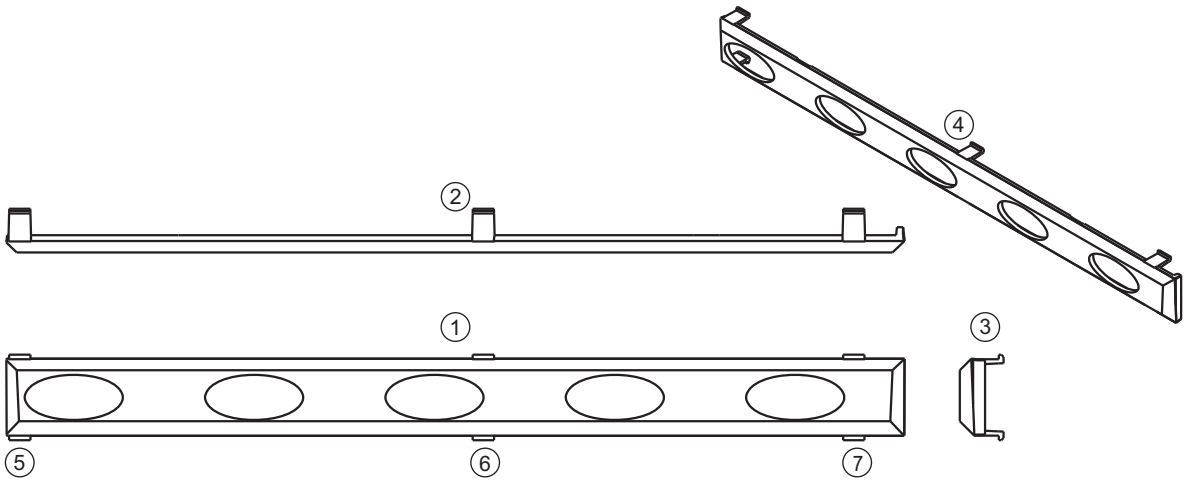


1. Main Keypad Bezel Front View
2. Top View
3. Side View
4. Left side locking tab locations
5. Right side locking tab locations
6. Three-Quarter View
7. Underlying Main Keypad Membrane

Figure 4-2. Main Keypad Bezel and Locking Tabs

4-7 Softkey Keypad Bezel for VNA Master MS202XB

The figure below shows the Softkey Keypad Bezel, the location of its locking tabs, and its orientation to the case.

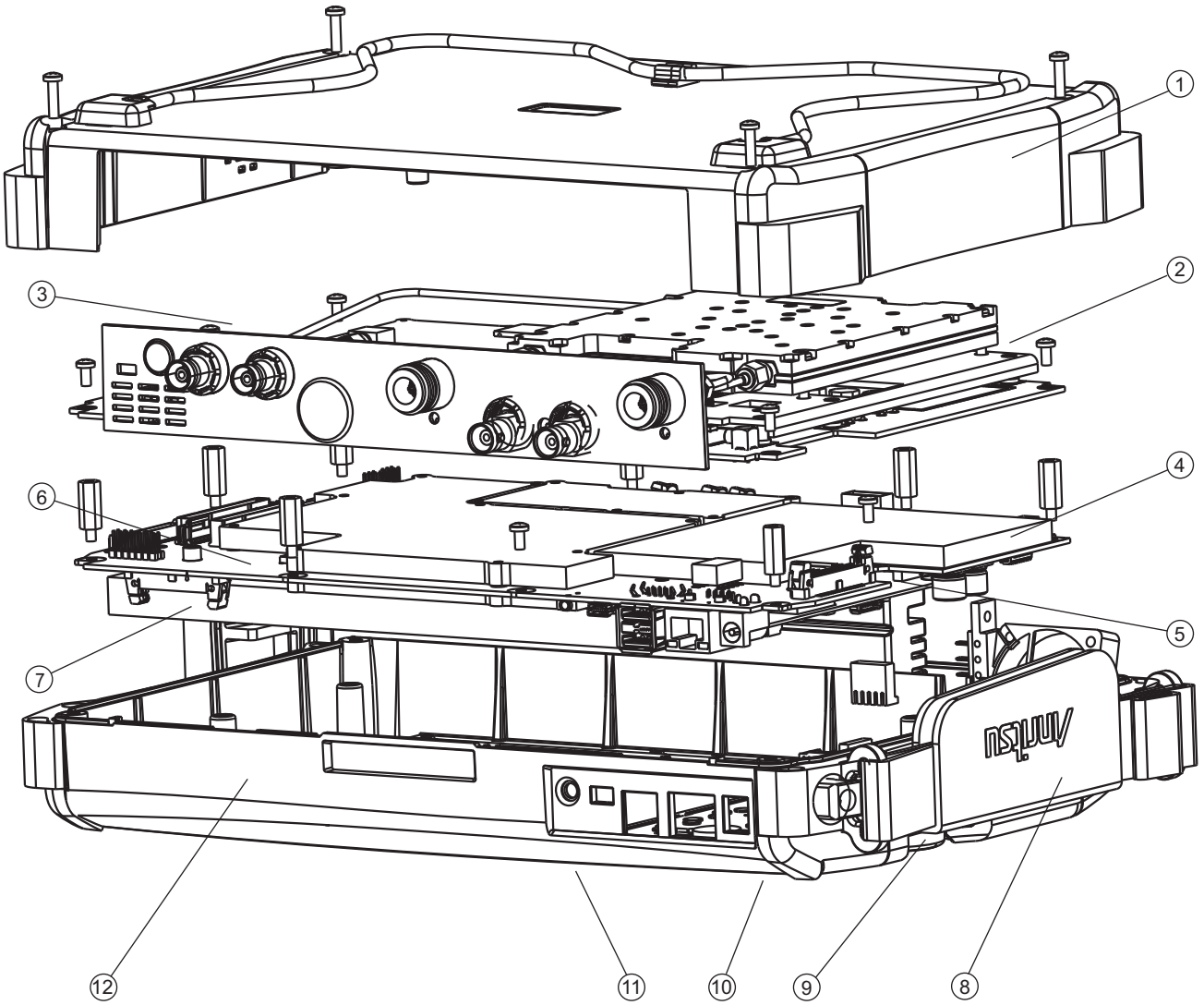


1. Softkey Keypad Bezel Front View
2. Top View
3. Side View
4. Three-Quarter View
5. Locking tab location for the left end of the bezel which goes toward the left side of the case
6. Locking tab location for bezel center
7. Locking tab location for the right end of the bezel which goes toward the right side (handle side) of the case

Figure 4-3. Softkey Keypad Bezel and Locking Tab Locations

4-8 Internal Anatomy of the VNA Master MS2026B

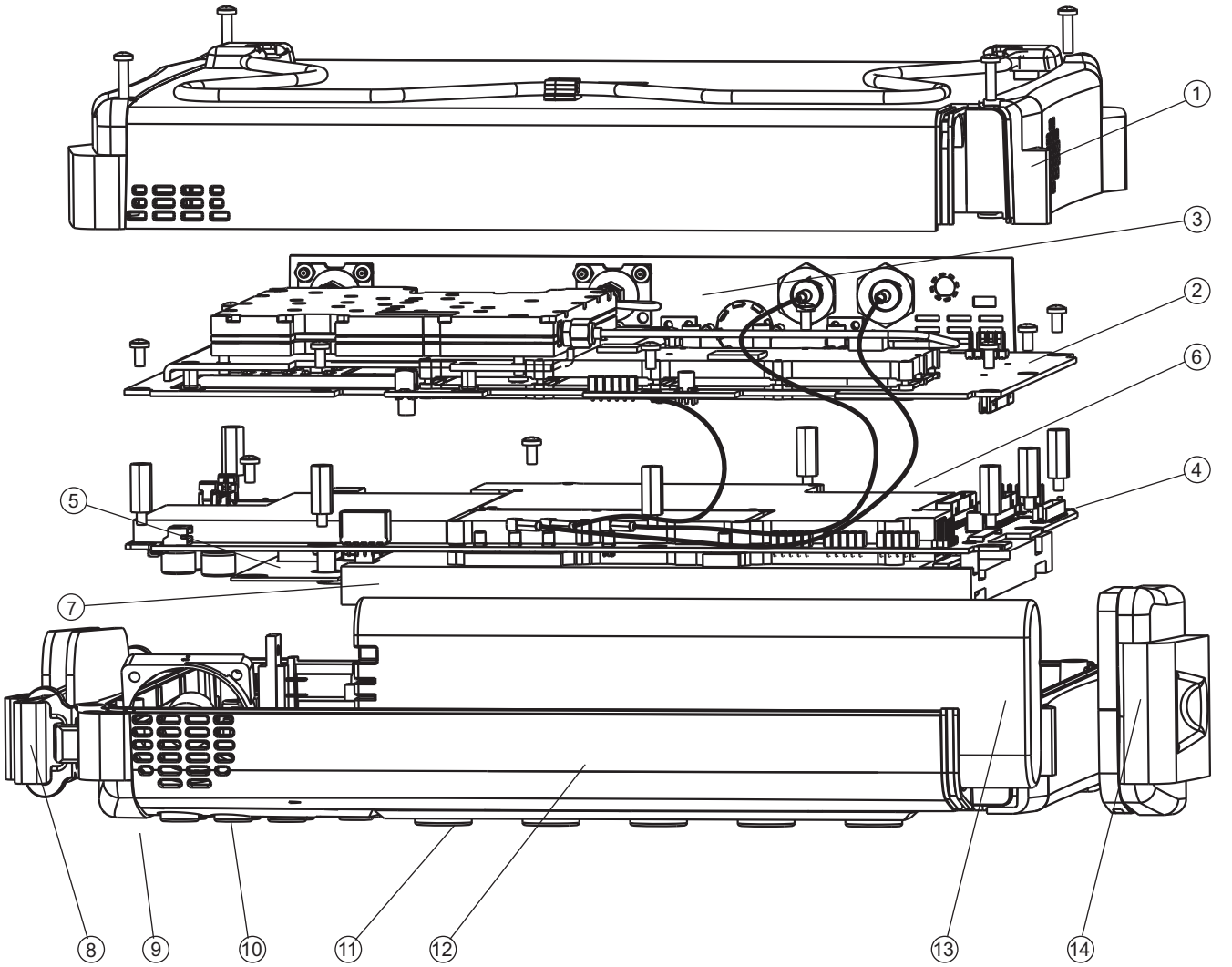
MS2026B View from Top Connector Strip



1. Case Back
2. VNA Module Assembly with N (f) Connectors
3. Power Monitor Option 5 PCB Assembly (behind connector strip)
4. Main PCB Assembly
5. LCD Backlight Power Inverter PCB (mounted on Main PCB Assembly)
6. GPS Module Option 31 PCB Assembly
7. LCD Display (mounted on Main PCB Assembly)
8. Hand Strap (mounted on Case Front)
9. Rotary Knob and Rotary Encoder (mounted on Case Front)
10. Main Keypad (mounted on Case Front)
11. Soft Key Keypad (mounted on Case Front)
12. Case Front

Figure 4-4. VNA Master MS2026B Major Assemblies – Viewed from Top Connector Strip

MS2026B View from Bottom

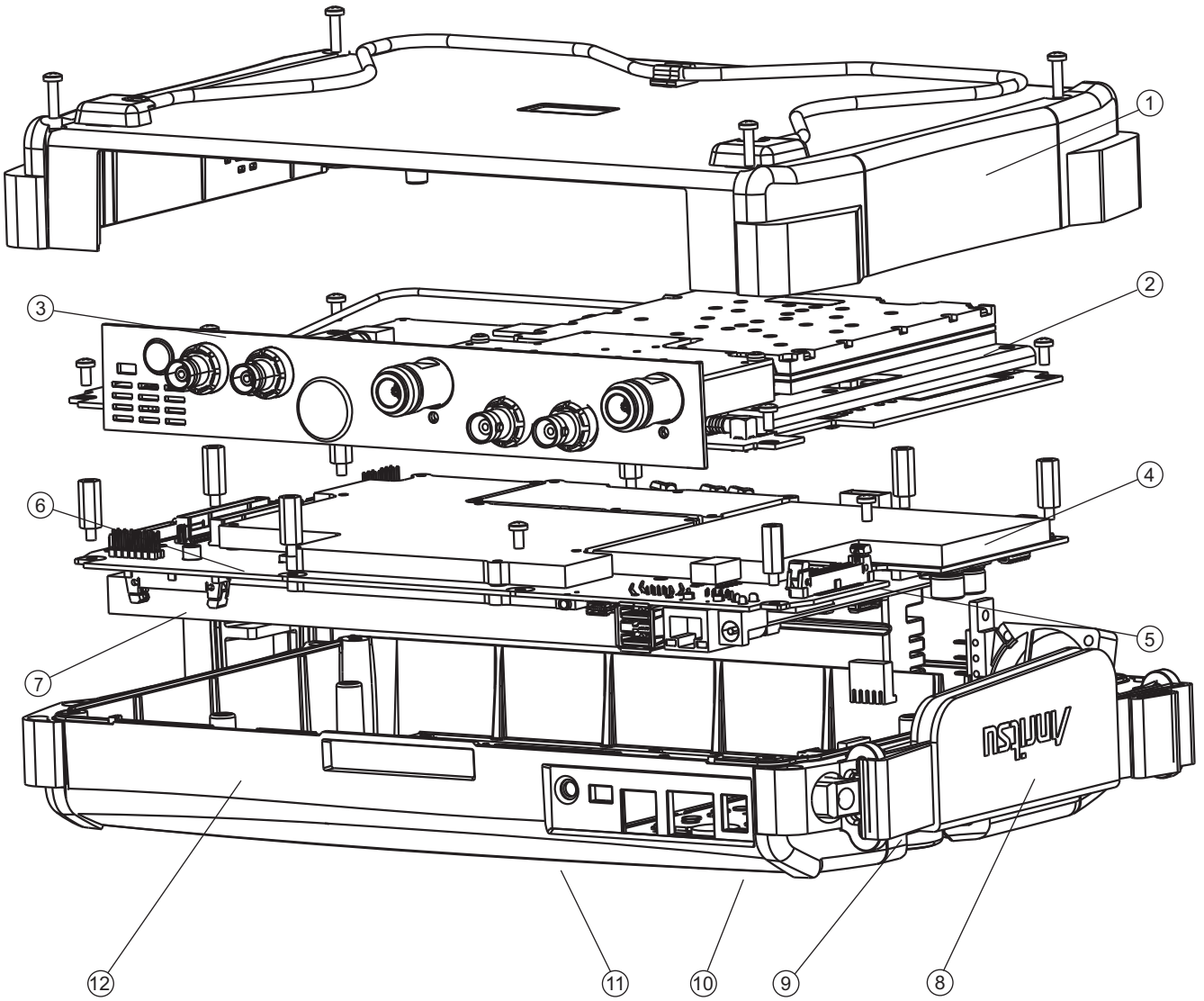


1. Case Back
2. VNA Module Assembly with N (f) Connectors
3. Power Monitor Option 5 PCB Assembly (behind connector strip)
4. Main PCB Assembly
5. LCD Backlight Power Inverter PCB (mounted on Main PCB Assembly)
6. GPS Module Option 31 PCB Assembly
7. LCD Display (mounted on Main PCB Assembly)
8. Hand Strap (mounted on Case Front)
9. Rotary Knob and Rotary Encoder (mounted on Case Front)
10. Main Keypad (mounted on Case Front)
11. Soft Key Keypad (mounted on Case Front)
12. Case Front
13. Battery
14. Battery Door

Figure 4-5. VNA Master MS2026B Major Assemblies – Viewed from Bottom

4-9 Internal Anatomy of the VNA Master MS2028B

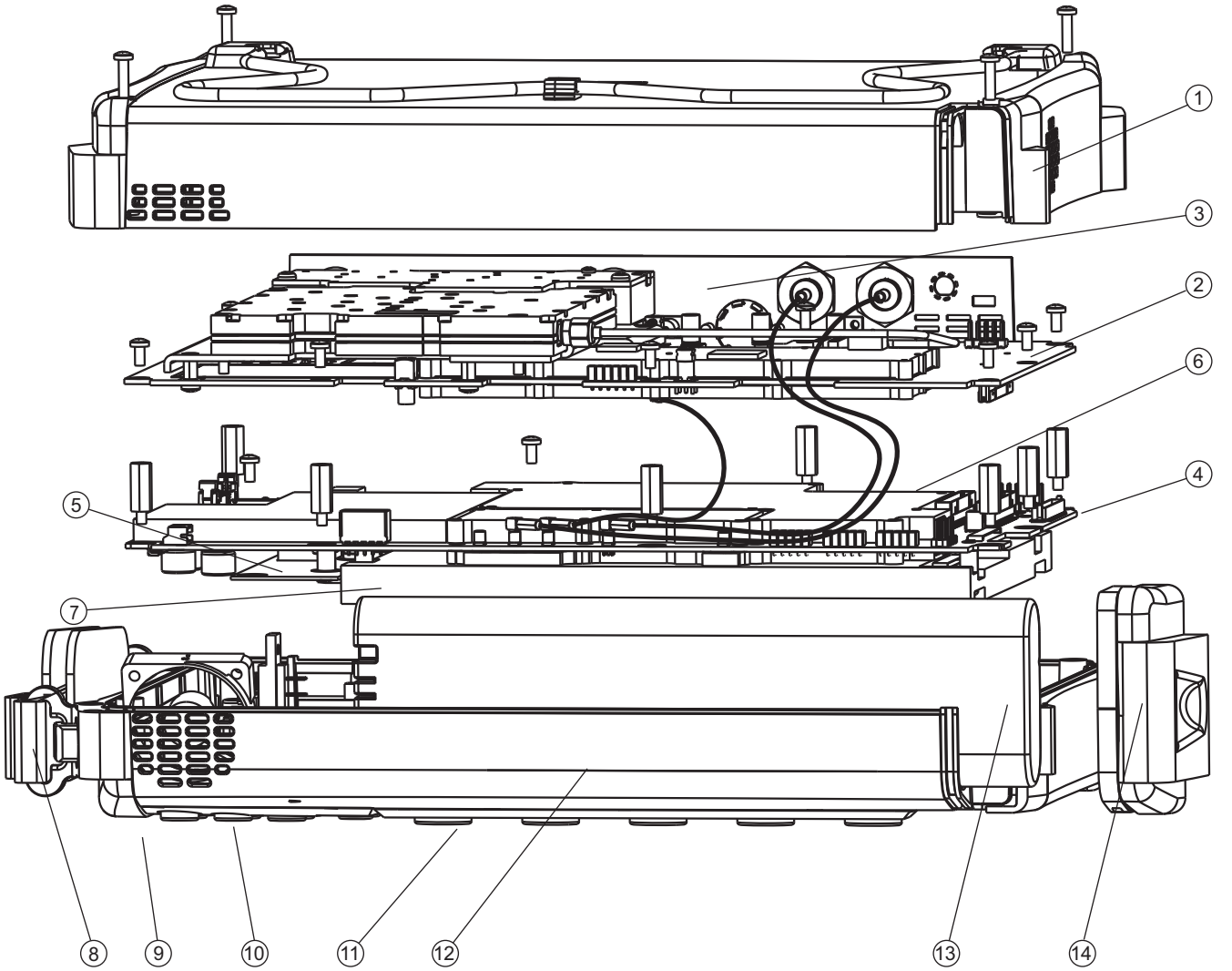
MS2028B View from Top Connector Strip



1. Case Back and Mounting Screws
2. VNA Module Assembly with N (f) Connectors and Mounting Screws
3. Power Monitor Option 5 PCB Assembly (behind connector strip)
4. Main PCB Assembly with Hex (m-f) Standoffs
5. LCD Backlight Power Inverter PCB (mounted on Main PCB Assembly)
6. GPS Module Option 31 PCB Assembly
7. LCD Display (mounted on Main PCB Assembly)
8. Hand Strap (mounted on Case Front)
9. Rotary Knob and Rotary Encoder (mounted on Case Front)
10. Main Keypad (mounted on Case Front)
11. Soft Key Keypad (mounted on Case Front)
12. Case Front

Figure 4-6. VNA Master MS2028B Major Assemblies – Viewed from Top Connector Strip

MS2028B View from Bottom



1. Case Back and Mounting Screws
2. VNA Module Assembly with N (f) or K (f) Connectors
3. Power Monitor Option 5 PCB Assembly (behind connector strip)
4. Main PCB Assembly
5. LCD Backlight Power Inverter PCB (mounted on Main PCB Assembly)
6. GPS Module Option 31 PCB Assembly
7. LCD Display (mounted on Main PCB Assembly)
8. Hand Strap (mounted on Case Front)
9. Rotary Knob and Rotary Encoder (not shown, mounted on Case Front)
10. Main Keypad (mounted on Case Front)
11. Soft Key Keypad (mounted on Case Front)
12. Case Front
13. Battery
14. Battery Door

Figure 4-7. VNA Master MS2028B Major Assemblies – Viewed from Bottom

4-10 Disassembly Sequence Overview

The following steps reduces the VNA Master MS202XB to its replaceable component parts:

1. Remove the Battery Door and the Battery.
2. Remove the Handle Hand Strap.
3. Remove the Rotary Encoder Knob.
4. Remove the Soft Key Keypad Bezel, Membrane, and PCB.
5. Remove the Main Key Keypad Bezel, Membrane, and PCB.
6. Open the case and remove the Case Back Assembly
7. Remove the castellated BNC dress nut from the Ext Trig Input BNC connector on the Connector Face Plate. Leave the BNC connector and its coaxial cable in place.
8. If the Power Monitor PCB Assembly Option 005 is equipped, remove the Detector connector flex cable from the Power Monitor PCB. Remove the three screws, and protecting the underlying header pins, remove the Power Monitor PCB.
9. Disconnect the GPS Antenna SMA connector and cable from the Connector Face Plate.
10. Remove the VNA Module and the attached Connector Face Plate.
11. Remove the Rotary Encoder from the case.
12. Disconnect the three (3) coaxial cables attached to the Main PCB Assembly
13. Remove the GPS Receiver Module PCB Option 31 from the Main PCB Assembly.
14. Remove the Main PCB Assembly.
15. Flip the Main PCB Assembly over so that the LCD display is up and remove the LCD Display Backlight Power Inverter PCB Assembly.
16. Remove the LCD Display Assembly from the Main PCB Assembly.
17. Remove the Clear Plastic LCD Protector from the Case Front.

4-11 Open the Instrument Case

This procedure provides instructions for opening the VNA Master case. With the case opened, the internal assemblies can be removed and replaced, as detailed in the following sections. Opening the instrument case provides access for the following replacement assemblies:

- Power Monitor PCB Assembly
- VNA Module Assembly
- GPS Receiver Module Option 31
- Rotary Encoder
- Main PCB Assembly
- LCD Display PCB Assembly
- LCD Backlight Power Inverter PCB Assembly
- Clear Plastic LCD Protector

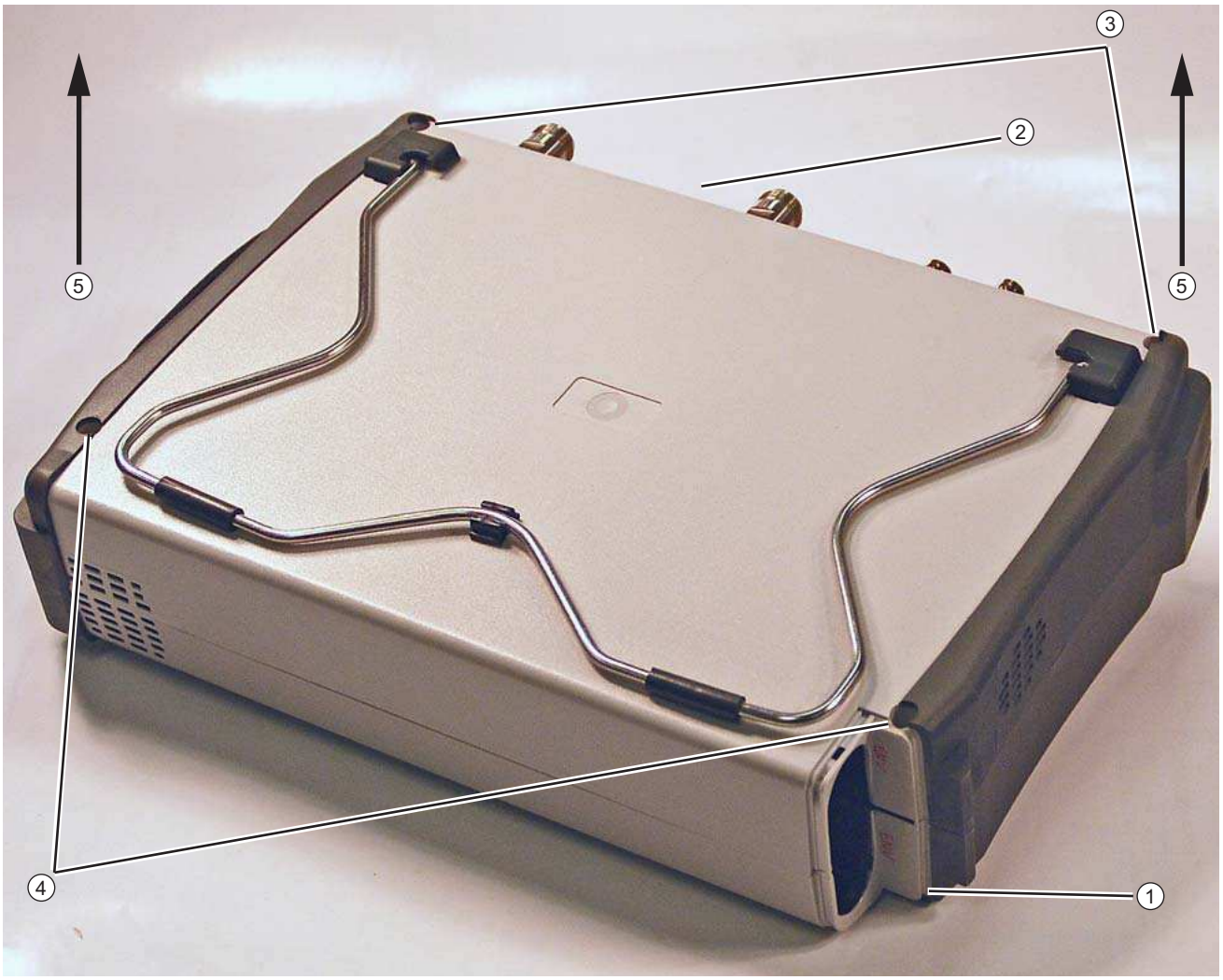
These parts can be replaced without opening the case:

- Main Keypad Membrane
- Main Keypad PCB Assembly
- Soft Key Keypad Membrane
- Soft Key Keypad PCB Assembly
- Rotary Knob
- Hand Strap Handle
- Battery and Battery Door

Procedure

1. As shown below (Figure 4-8), place the VNA Master MS202XB face down on a clean, stable work surface that will not scratch the front panel.
2. Remove the battery door and battery:
    - See Section 3-4 – Battery Pack Removal and Replacement on page 3-3.

3. Use a Phillips screwdriver to remove the four (4) Pan Head Phillips Head screws securing the two Case halves together.



1. Remove Battery Cover and Battery
2. Orient case with top Connector Panel as shown
3. Remove two (2) Phillips-head screws at top
4. Remove two (2) Phillips-head screws at bottom
5. At both ends of the Case Rear, lift up both ends evenly. The top Connector Panel stays with the Case Front Assembly.

Figure 4-8. Opening the Case

4. Carefully lift up on the sides of the case shown and begin to separate the two halves.

- The connector mounting strip stays with the front half of the case.

5. The two halves of the instrument can now be safely separated. Set the **Case Rear Assembly** aside. The **Case Front Assembly** contains all of the serviceable parts.

6. Refer to the following sections to remove and replace specific components of the instrument:

- Section 4-12 – Replace Power Monitor PCB Assembly Option 5 – ND67197 on page 4-15
- Section 4-13 – Replace VNA Module Assembly – ND69866 ND69867 ND70363 on page 4-17
- Section 4-14 – Replace GPS Receiver Module Option 31 – ND70320 on page 4-24

- Section 4-15 – Replace Rotary Encoder – 3-410-101 on page 4-27
- Section 4-16 – Remove Main PCB Assembly on page 4-30
- Section 4-17 – Replace Main PCB Assembly – ND69864, ND69865 on page 4-34
- Section 4-18 – Replace LCD Backlight Inverter PCB Assembly – 3-61362 on page 4-38
- Section 4-19 – Replace LCD Display PCB Assembly – 3-15-118 on page 4-39
- Section 4-20 – Replace Clear Plastic LCD Protector – 3-61368 on page 4-40

Note	Proper routing of the cables is important for instrument performance and being able to reassemble the case halves.

4-12 Replace Power Monitor PCB Assembly Option 5 – ND67197

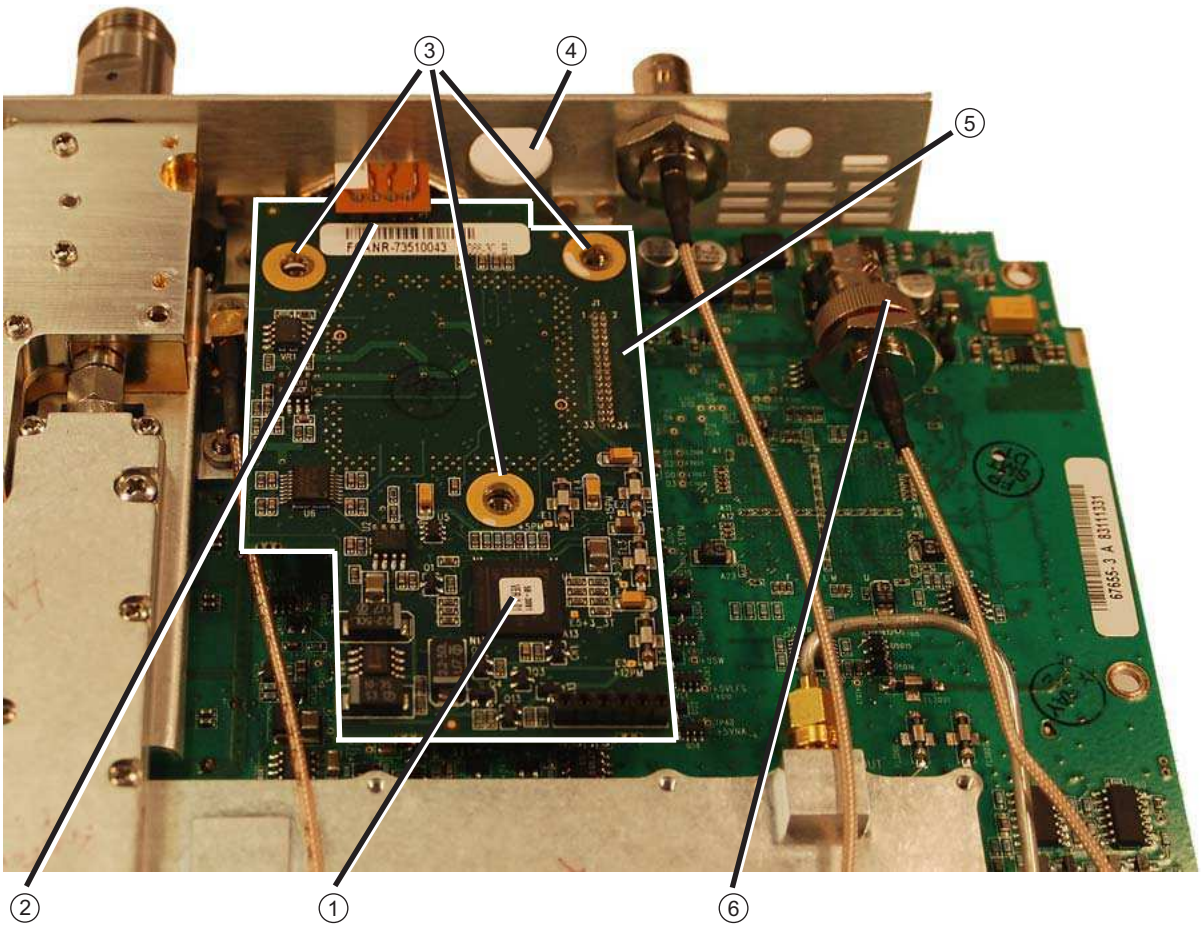
This procedure provides instructions for replacing the Power Monitor PCB Assembly Option 5 and its related Detector connector.

Part Number

- ND67197 – Power Monitor PCB Assembly
  - Includes the BNC connector on Flex Board and mounting hardware.

Procedure

1. Open the case as described above Section 4-11 – Open the Instrument Case on page 4-12.
2. Locate the Power Monitor Assembly PCB Option as shown in the figure below.



1. Optional Power Monitor PCB Assembly - Option 5
2. Removable Flex Cable 4-Pin connector between Detector connector (on Face Plate) and Power Monitor PCB.
3. Mounting screws (3 each), removed here
4. Mounting hole on Face Plate for removed Ext. Trig BNC connector.
5. Location of Header and M-M Header Pin Strip under PCB between Power Monitor and VNA Assembly PCBs
6. Ext. Trig BNC connector that must be removed to access a VNA Module PCB mounting screw (not shown).

Figure 4-9. Power Monitor PCB Assembly - Option 5

Disconnect Detector Connector Flex Cable

3. Pry out the Connector Flex Cable attached to the Detector connector from the Power Monitor PCB.
4. Remove the three (3) Phillips head screws from the Power Monitor PCB.

5. Holding the Connector Flex PCB Cable away from the Power Monitor PCB, gently lever up the PCB out of its header socket.

Check Header Pins

6. If the M-M Header Pins stay on the VNA Module PCB, remove the pins and re-install them on the Power Monitor PCB.

Power Monitor Detector Connector

7. To remove the Power Monitor Detector connector from the Connector Face Plate, use a 5.5 mm angled-head open end wrench to undo the two M3 x 0.5 Kep Nuts with lock washers.
8. When the nuts are removed, pull the Power Monitor Detector connector towards the VNA Module PCB until it clears the Connector Face Plate and set aside with the Power Monitor PCB.

Install Replacement Power Monitor PCB

9. Install the replacement Power Monitor Detector connector into the Connector Face Plate. Note that the Flex Cable must oriented above the Connector. Reinstall and tighten the two M3 x 0.5 Kep Nuts.
10. Holding the Flex Cable up, reinstall the Power Monitor PCB.
    - Use extreme care so as to not bend any of the header pins as they mate with a header strip on the VNA Module.
    - Be careful to not offset the header pins by one row.
11. Press on either side of the header strip to mate the two connectors.
12. Inspect the Header connectors from the side to make sure all pins are correctly inserted and no pins are bent.
13. Reinstall and tighten the three (3) Phillips head screws holding the Power Monitor PCB to the VNA Module PCB.

Connect Detector Flex Cable

14. Insert the 4-pin header on the end of the Detector Connector Flex Cable into the Power Monitor PCB.
15. Make sure all cables are clear from the Case assemblies.

Replace Case Rear Assembly and Battery

16. Replace the Case Bottom Assembly, making sure the Connector Face Plate is correctly centered in its mounting groove. Insert and tighten the four case mounting screws.
17. Re-install the Battery.
18. Re-install the Battery Door.

4-13 Replace VNA Module Assembly – ND69866 ND69867 ND70363

This replacement procedure provides instructions for replacing the VNA Modules for all variants of the MS202XB VNAs. In general, the VNA Module is removed as a complete unit and then exchanged for a replacement part.

Part Numbers

- ND69866 – VNA Module Assembly with N(f) connectors for MS2026B
  - For MS2026B instruments equipped with standard N (f) Test Ports
- ND69867 – VNA Module Assembly with N(f) connectors for MS2028B
  - For MS2028B instruments equipped with standard N (f) Test Ports
- ND70363 – VNA Module Assembly with K (f) connectors for MS2028B
  - For MS2028B instruments equipped with Option 11 K (f) Test Ports

Procedure

Open the Case

1. Open the case as described above Section 4-11 – Open the Instrument Case on page 4-12.

Remove Power Monitor PCB Option 5

2. If the Power Monitor PCB Option 5 is NOT installed, skip ahead to Step 3. If the Power Monitor PCB is installed, perform the substeps immediately below.
   a. See Figure 4-9 on page 4-15 above for Power Monitor PCB connectors and orientation. Pry out the flex cable attached to the Detector connector from the Power Monitor PCB.
   b. Remove the three Phillips head screws from the Power Monitor PCB.
   c. Using the Tool T1451 socket, remove the BNC Connector Dress Nut from the Ext Trig Input connector. Leave the Ext Trig Input connector and its attached coaxial cable loosely in place in the Connector Face Plate.
   d. Holding the Connector Flex Cable away from the Power Monitor PCB, gently lever up the PCB out of its header socket.
   e. If the Header Pins stay on the VNA Module PCB, remove the pins and re-install them on the Power Monitor PCB.
   f. Set the Power Monitor PCB assembly with header pins aside.
   g. Removing the Power Monitor PCB provides access to the Ext Trig Input BNC connector and a VNA Module PCB mounting screw.

Disconnect GPS Antenna Cable

3. If the GPS Receiver Module PCB Option 31 is NOT installed, skip ahead to Step 4. If the GPS Receiver Module PCB is installed, perform the substeps immediately below:
   a. Use two 5/16” (≅ 8 mm) wrenches to disconnect the GPS Antenna SMA connector from the Connector Face Plate.
   b. Remove the nut and lock washer and then remove the SMA connector from the Connector Face Plate.
   c. Route the cable to the right side, clearing its notch and the Face Plate, so it is clear of the VNA Module PCB.

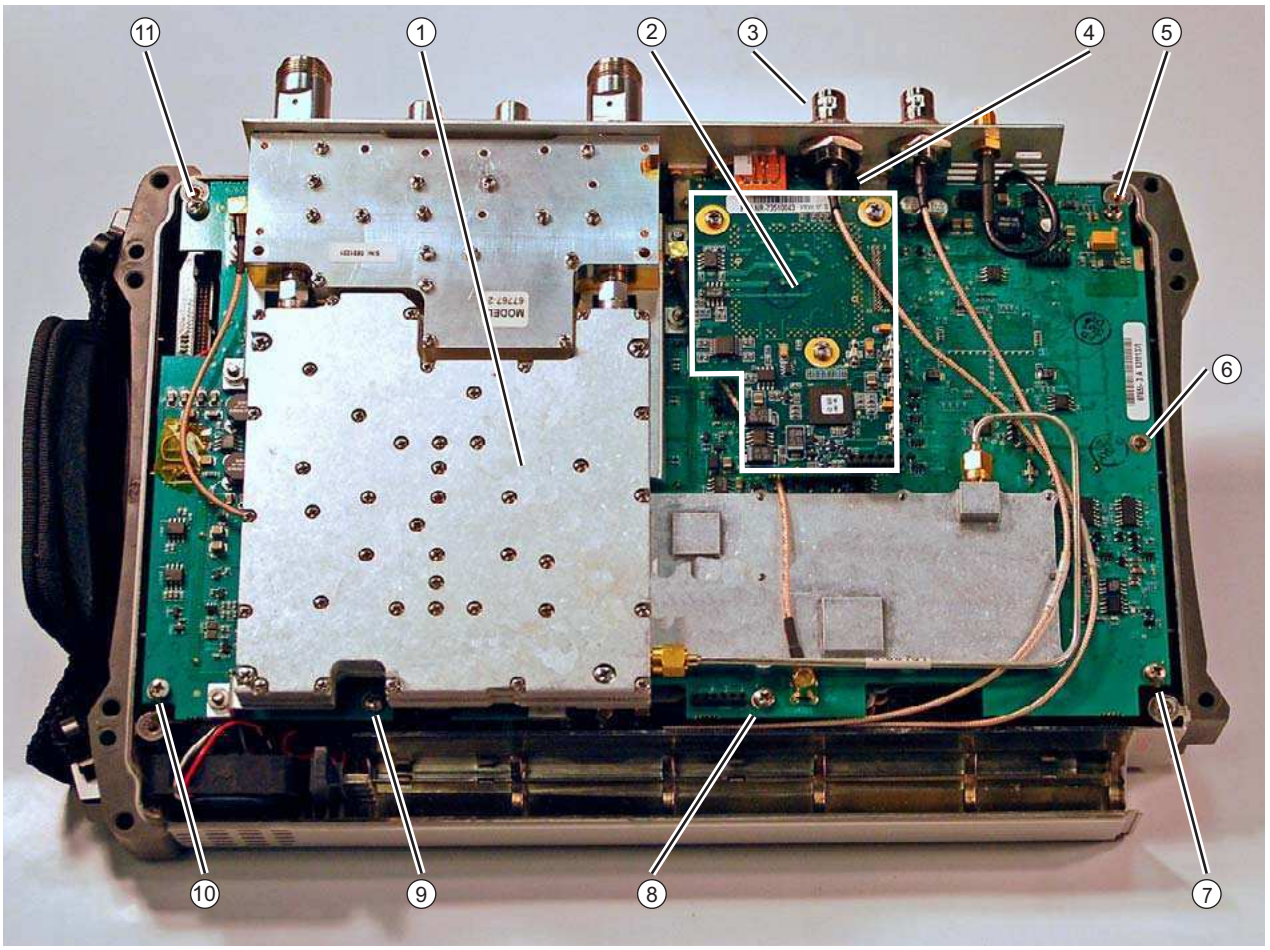
Remove Cables and Ext Trig Input BNC

4. Cut the cable tie that holds the Ext Trig Input and Ext Ref Input coaxial cables to the RF Out hardline coaxial cable.

5. Using the Tool T1451 socket, remove the BNC Connector Dress Nut from the Ext Trig Input connector. Pull the Ext Trig Input connector from the Connector Face Plate and position so it is out of the way.
    - Removing the Ext Trig Input connector provides access to on the VNA Module PCB mounting screws.

Identify VNA Module PCB Assembly Mounting Screws

6. Using the figure below, identify the locations of the eight (8) Phillips-head mounting screws holding the VNA Assembly PCB in place.

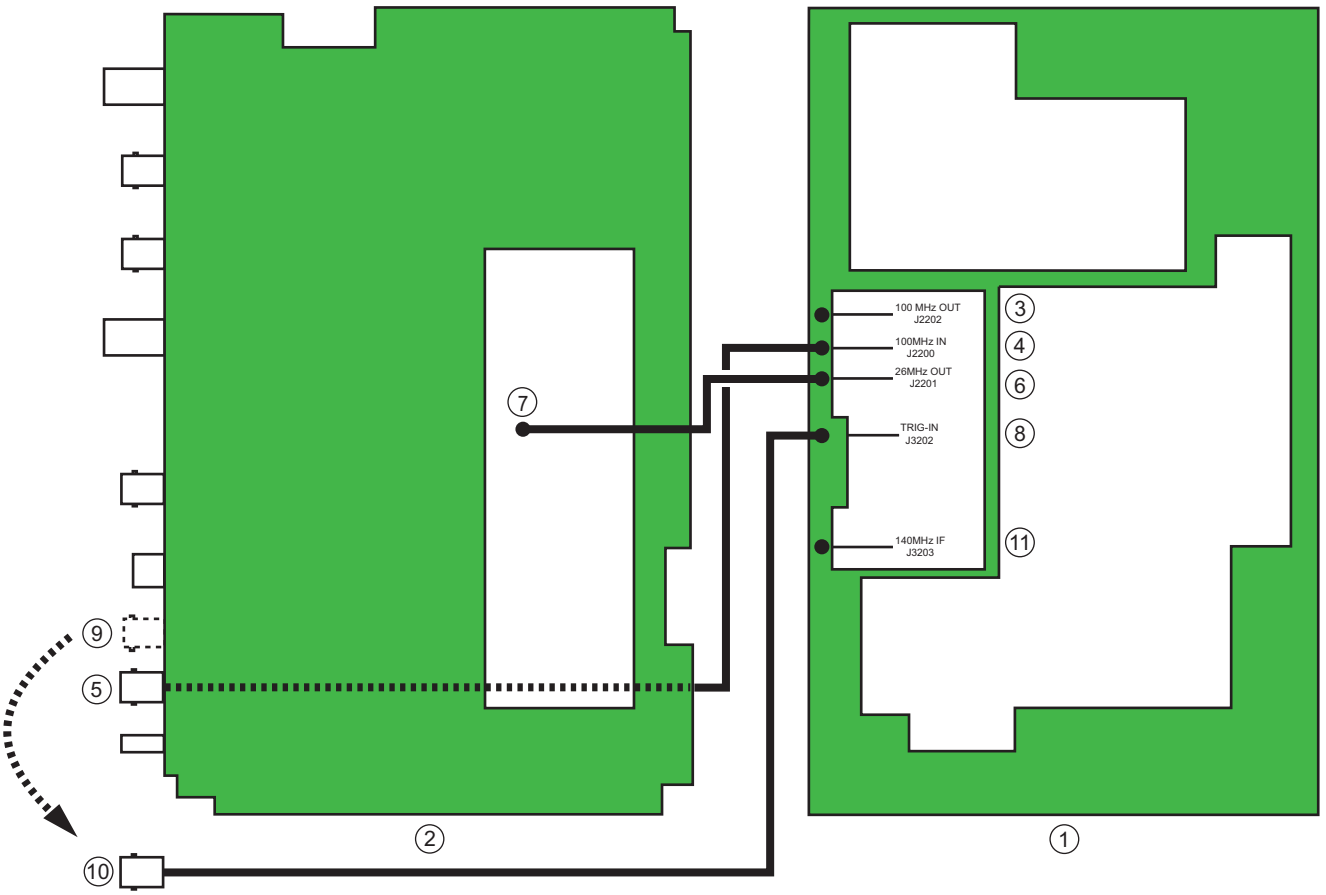


1. VNA Module Assembly PCB and related RF Shields with eight (8) total mounting screws
2. Location of Power Monitor Assembly PCB Option 5 with three (3) Phillips-head mounting screws
3. Remove the castellated nut and loosen the Ext Trig Input BNC Connector before removing Power Monitor PCB
4. The first VNA Module Assembly PCB Phillips-head mounting screw under Power Monitor PCB
5, 6, 7, 8, 9, 10, and 11. Additional Phillips-head mounting screws (7 total) holding VNA Module Assembly in place

Figure 4-10. VNA Module Assembly Screw Locations

Remove the VNA Module PCB Assembly

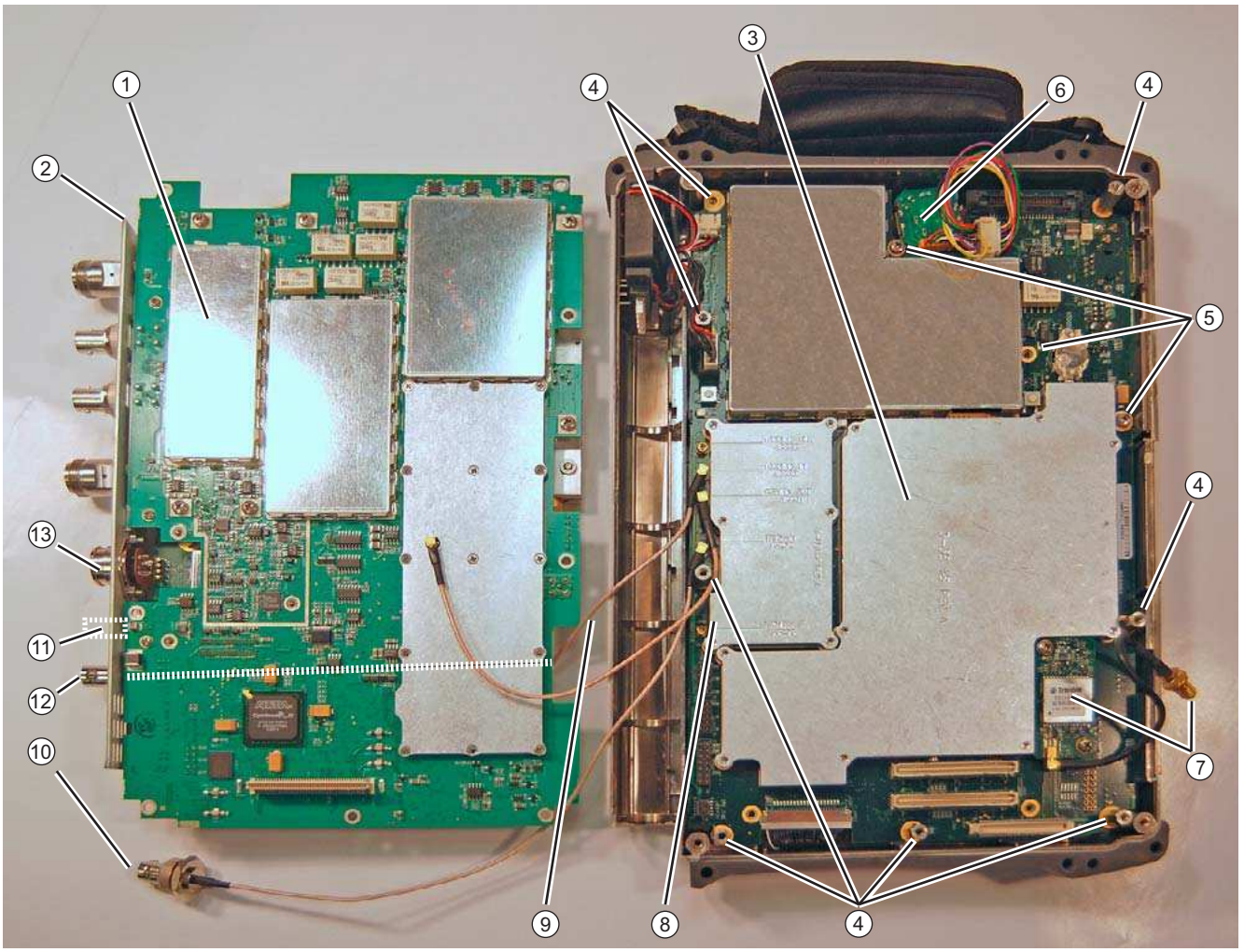
7. Using a Phillips head screwdriver, remove the eight (8) screws holding the VNA Module PCB in place.
8. With the Connector Face Plate facing away from you, start lifting up from the right edge of the VNA Module which disconnects the connector between the VNA Module and the underlying Main PCB Assembly.
9. Lift the VNA Module up towards the top of the case so the MCX Connectors and related cables are accessible near the bottom edge of the case. The figure immediately below (Figure 4-11) shows a schematic of the "folded" PCB orientation. See Figure 4-12 following for a photograph of the actual folded assemblies.



1. Main PCB Assembly, in Case Bottom, facing up.
2. VNA Module Assembly, viewed from bottom, after being "folded" over to left away from Main PCB.
3. 100 MHz Out J2202 MCX connector (not used).
4. 100 MHz In J2200 MCX connector and coaxial cable. Connects to Ext Ref In BNC connector.
5. Ext Ref Input BNC connector on face plate.
6. 26 MHz Out J2201 MCX connector and coaxial cable. Connects to MCX connector on VNA Module RF Shield.
7. Unmarked MCX connector on RF shield on bottom of VNA Module Assembly.
8. TRIG-IN J3202 MCX connector and coaxial cable. Connects to Ext Ref Input BNC connector.
9. Ext Trig Input BNC connector original mounted position on face plate.
10. Ext Trig Input BNC connector and coaxial cable in unmounted position.
11. 140 MHz IF J3203 MCX connector (not used).

Figure 4-11. VNA Module and Main PCB Assembly Coaxial Cable Connections

10. The figure photograph below shows the "folded" VNA Module Assembly PCB to the left of the next to Case Front with the Main PCB Assemble still in place. Note that both units are still connected with RF coaxial cables.



1. VNA Module PCB Assembly
2. Top Connector Panel
3. Main PCB Assembly attached to Case Front
4. Hex Standoffs (8 each) holding Main PCB in place
5. Phillips-head screws (3 each) holding Main PCB in place
6. Rotary Encoder, cable, and connector to Main PCB
7. GPS Module PCB Assembly, mounting screws (2 each), and GPS Antenna SMA connector (removed from Top Connector Panel)
8. Main PCB RF shield with coaxial cable connection labeling
9. Coaxial cable between Main PCB and Ext Ref Input BNC connector on Connector Panel. On the Main PCB, connects to the J2200 100 MHz In MCX connector
10. Ext Trig Input BNC connector and cable removed from Top Connector Panel
11. Original position of Ext Trig Input BNC connector
12. Ext Ref Input BNC connector
13. Detector connector (for removed Power Monitor PCB Assembly)

Figure 4-12. "Folded" VNA Module (on left) and Main PCB and Case Front (on right)

11. On the Main PCB Assembly, remove the cable from the J2200 100 MHz MCX connector. This cable stays with the VNA Module connected to the Ext Ref In connector.
12. On the upside down VNA Assembly, remove the single cable near the upper center of the board. This cable stays with the Main PCB and is connected to the J2201 26 MHz Out MCX Connector.
13. On the Main PCB Assembly, remove the cable from the J3202 Trig In MCX connector. This cable stays with the VNA Module.
14. Remove the VNA Module PCB and set it aside.

Prepare the Replacement VNA Module

15. Prepare the replacement VNA Module by remove the Ext Trig In BNC connector and its attached cable.
16. If equipped with the GPS Receiver Module Option 31, remove the hole plug for the GPS Antenna from the Face Plate.
17. If equipped with the **Power Monitor Option 5**, remove the hole plug for the Detector from the Face Plate prior to installing the PCB as described in the steps below.

Install the Replacement VNA Module

18. Position the replacement VNA Module upside down next to the Case Bottom Assembly. See Figure 4-11 on page 4-20 above for general orientation.
19. Connect the cable from the J2201 MCX Connector on the Main PCB to the MCX Connector in the upper middle of the replacement VNA Module Assembly.
20. Route the cable from the Ext Trig Ref connector through the notch to the Main PCB and connect it to the J2200 Ext Ref In MXC connector.
21. Route the cable from the Ext Trig Input connector through the notch to the Main PCB and connect it to the J3202 Trig In MXC connector.
22. “Fold” the VNA Module over above the Main PCB Assembly so that it is approximately 30 mm (1.5”) from the right edge of the case.
23. If the GPS Receiver Module PCB Option 31 is not installed, skip ahead to Step 24. If the GPS Receiver Module PCB is installed, perform the substeps immediately below:
    a. Route the GPS Antenna Cable with its SMA connector from the Main PCB, through the notch between the Face Plate and the PCB, and into its position in the Face Plate.
    b. Install the lock washer and then the nut, and tighten.
    c. Use two 5/16” (~8 mm) wrenches to connect the GPS Antenna SMA connector to the Connector Face Plate.
24. Carefully position the VNA Module PCB assembly over the Main PCB and the eight (8) hex standoffs.
25. Make sure the two connectors are loosely engaged.
26. Once the connectors and the standoffs are correctly aligned, press the VNA Module connector into the mating connector on the Main PCB.
27. Fasten the VNA Module PCB into place using (8) Phillips head screws.

Install the Power Monitor PCB Option 5

28. If the Power Monitor PCB Option 5 is not installed, skip ahead to Step 29. If the Power Monitor PCB is installed, perform the substeps immediately below:
    a. Insert the Detector connector with the Flex Cable into the Detector hole on the Face Plate.
    b. The Flex Cable must oriented above the Connector. Reinstall and tighten the two M3 x 0.5 Kep Nuts using the 5.5mm angled-head open end wrench.
    c. Carefully position the Power Module Assembly over its mounting standoffs.
    d. Use extreme care so as to not bend any of the header pins.

e. Be careful to not offset the header pins by one row.

f. Make sure the pins are loosely but correctly positioned before proceeding.

g. When perfectly aligned, press on either side of the header strip to mate the two connectors.

h. When the Power Monitor PCB is fully seated, inspect Header connectors from the side to make sure all pins are correctly inserted and no pins are bent.

i. Install the three (3) Phillips head screws holding the Power Monitor PCB in place.

j. Gently fold over the Flex Cable and insert it into the four connector socket on the PCB.

Install the Ext Trig BNC Connector and Dress Cables

29. Reinstall the Ext Trig Input BNC connector in the Face Place. Use the Tool T1451 socket to tighten the BNC Connector Dress Nut.

30. Make sure all cables are clear of the case edges.

31. Install a cable tie over the two coax cables and the RF hardline to keep them in place.

Replace Case Rear Assembly

32. Replace the Case Bottom Assembly, making sure the Connector Face Plate is correctly centered in its mounting groove and that all cables are clear. Insert and tighten the four case mounting screws.

33. Re-install the Battery.

34. Re-install the Battery Door.

4-14 Replace GPS Receiver Module Option 31 – ND70320

This replacement procedure provides instructions for replacing the GPS Receiver Module mounted on the Main PCB Assembly for all variants of the MS202XB VNAs. The basic procedure is to open the case, remove the VNA Module, and then service the GPS Module.

Part Numbers

- ND70320 – GPS Receiver Module, Option 31
  - For MS2026B instruments equipped with Option 31 GPS Receiver
  - For MS2028B instruments equipped with Option 31 GPS Receiver
  - Includes SMA face plate connector and cable to Receiver Module
  - Does not include GPS Antenna 2000-1528-R

Procedure

Open the Case

1. Open the case as described above Section 4-11 – Open the Instrument Case on page 4-12.

Remove Power Monitor PCB Option 5

2. If the Power Monitor PCB Option 5 is NOT installed, skip ahead to Step 3. If the Power Monitor PCB is installed, perform the substeps immediately below:
   a. See Figure 4-9 on page 4-15 above for Power Monitor PCB connectors and orientation. Pry out the flex cable attached to the Detector connector from the Power Monitor PCB.
   b. Remove the three Phillips head screws from the Power Monitor PCB.
   c. Using the Tool T1451 socket, remove the BNC Connector Dress Nut from the Ext Trig Input connector. Leave the Ext Trig Input connector and its attached coaxial cable loosely in place in the Connector Face Plate.
   d. Holding the Connector Flex Cable away from the Power Monitor PCB, gently lever up the PCB out of its header socket.
   e. If the Header Pins stay on the VNA Module PCB, remove the pins and re-install them on the Power Monitor PCB.
   f. Set the Power Monitor PCB assembly with header pins aside.
   g. Removing the Power Monitor PCB provides access to the Ext Trig Input BNC connector and a VNA Module PCB mounting screw.

Disconnect GPS Antenna Cable

3. Disconnect the GPS Antenna SMA connector from the Connector Face Plate by performing the substeps immediately below:
   a. Use two 5/16” (≅ 8 mm) end wrenches to disconnect the GPS Antenna SMA connector from the Connector Face Plate.
   b. Pull off the nut and lock washer and remove the SMA connector from the Connector Face Plate.
   c. Route the cable to the right side, clearing its notch and the Face Plate, so it is clear of the VNA Module PCB and the Case Front Assembly.

Remove Ext Trig Input BNC Connector

4. Cut the cable tie that holds the Ext Trig Input and Ext Ref Input coaxial cable to the RF Out hardline.
5. Using the Tool T1451 socket, remove the BNC Connector Dress Nut from the Ext Trig Input connector. Pull the Ext Trig Input connector from the Connector Face Plate and position so it is out of the way.
   - Removing the Ext Trig Input connector provides access to on the VNA Module PCB mounting screws.

6. Using a Phillips head screwdriver, remove the eight (8) screws holding the VNA Module PCB in place.

Partially Remove the VNA Module PCB Assembly

7. With the Connector Face Plate facing away from you, start lifting up from the right edge of the VNA Module which disconnects the connector between the VNA Module and the underlying Main PCB Assembly.
8. Move VNA Module to left about 3 cm (1.5") to expose the antenna cable attached to the underlying GPS Receiver Module.

Disconnect the GPS Antenna Cable

9. Use needle-nose pliers to remove the MCX RF coaxial connector from the GPS Receiver Module.
10. Move the VNA Module further to the right to fully expose the GPS Receiver Module.

Remove the GPS Receiver Module

11. Undo the two screws holding the GPS Receiver Module in place.
12. Gentle pull the GPS Receiver Module straight up to disconnect its 14-pin header connector. The header pins should stay with the GPS Module.

Prepare and Install the Replacement GPS Receiver Module

13. Remove the GPS Module from its packing material and prepare it for installation.
14. Position the replacement GPS Receiver Module so that it is lined up with its mounting holes and 14-pin header connector observing the following:
    a. Carefully position the GPB Receiver Module PCB over its mounting standoffs.
    b. Use extreme care so as to not bend any of the header pins.
    c. Be careful to not offset the header pins by one row.
    d. Make sure the header pins are loosely but correctly positioned before proceeding.
    e. When perfectly aligned, press on either side of the header strip to mate the two connectors.
15. Insert and tighten the two Phillips mounting screws.
    - Note that these screws are shorter than the screws used to hold the VNA Module in place.

Install the GPS Antenna Cable and SMA Connector

16. Snap the GPS Antenna Cable MCX connector into place on the GPS Receiver Module. Position the Antenna Cable off the right side of the Case.
17. "Fold" the VNA Module PCB back into position over the Main PCB and the eight (8) hex standoffs so it is loosely positioned.
18. Route the GPS Antenna Cable with SMA connector in the slot between the Connector Face Plate and the PCB, until the cable is correctly positioned in the PCB notch cutout.
19. Install the SMA connector into the Face Plate, add the lock washer, and finally the nut.
20. Use two 5/16" (≅ 8 mm) wrenches to tighten the GPS Antenna SMA connector to the Connector Face Plate.

Install the VNA Module

21. Position the VNA Module as accurately as possible over the Main PCB Assembly observing the following:
    - The two mating connectors on the right side of the PCBs are loosely engaged.
    - The fan and other cables on the left side of the Case are clear of the hex standoffs and the Case edge.
    - The GPS Antenna Cable is correctly routed between the Face Plate and the PCB and is located in its notch.
    - The three coaxial cables between the two PCBs are on the OUTSIDE of the hex standoffs and also clear of the Case edge.

22. Once the connectors and the standoffs are correctly aligned, press the VNA Module connector into the mating connector on the Main PCB.
23. Make sure the Connector Face Plate is correctly positioned in its mounting grove.
24. Fasten the VNA Module PCB into place using (8) Phillips head screws.

Install the Power Monitor PCB

25. If the Power Monitor PCB Option 5 is not installed, skip ahead to Step #26. If the Power Monitor PCB is installed, perform the substeps immediately below:
    a. Insert the Detector connector with the Flex Cable into the Detector hole on the Face Plate.
    b. The Flex Cable must oriented above the Connector. Reinstall and tighten the two M3 x 0.5 Kep Nuts using the 5.5mm angled-head open end wrench.
    c. Carefully position the Power Module Assembly over its mounting standoffs.
    d. Use extreme care so as to not bend any of the header pins.
    e. Be careful to not offset the header pins by one row.
    f. Make sure the pins are loosely but correctly positioned before proceeding.
    g. When perfectly aligned, press on either side of the header strip to mate the two connectors.
    h. When the Power Monitor PCB is fully seated, inspect the header connectors from the side to make sure all pins are correctly inserted and no pins are bent.
    i. Install the three (3) Phillips head screws holding the Power Monitor PCB in place.
    j. Gently fold over the Flex Cable and insert it into the four-connector socket on the PCB. See Figure 4-9 on page 4-15 for Power Monitor PCB and Connector orientation.

Install the Ext Trip Input BNC

26. Reinstall the Ext Trig Input BNC connector and coaxial cable into the Face Place. Route the coaxial cable under the RF hardline and use the Tool T1451 socket to tighten the BNC Connector Dress Nut.
27. Make sure all cables are clear of the case edges.
28. Install a cable tie over the two coaxial cables and the RF hardline to keep them in place.

Install Case Bottom Assembly and Battery

29. Replace the Case Bottom Assembly, making sure the Connector Face Plate is correctly centered in its mounting groove and that all cables are clear. Insert and tighten the four case mounting screws.
30. Reinstall the Battery.
31. Reinstall the Battery Door.

4-15 Replace Rotary Encoder – 3-410-101

Replacing the Rotary Encoder involves removing the Rotary Knob, and then opening the case and partially removing the VNA Module PCB Assembly. If the Power Monitor PCB Option 5 is installed, this PCB must be removed. If the GPS Receiver Module Option 31 is installed, the GPS Antenna must be disconnected. Once the VNA Module Assembly is "folded" out of the way, the Rotary Encoder mounting hardware can be loosened from the Front Panel, and its cable detached from the Main PCB Assembly. The Main PCB Assembly need not be removed to replace the Rotary Encoder.

Part Numbers

- 3-410-101 – Rotary Encoder
  - For either MS2026B or MS2028B instruments
  - Includes the connection cable to the Main PCB Assembly.
  - Does not include the Rotary Knob – 3-61360-2

Procedure

Remove the Rotary Knob

1. Use a flat blade screwdriver and piece of rubber to remove the Rotary Knob.
2. Use a 7/16" (≅ 12 mm) nut driver to remove the nut, lock washer, and flat washer that holds the Encoder in place.
3. Open the case as described above Section 4-11 – Open the Instrument Case on page 4-12.

Remove Power Monitor PCB Option 5

4. If the Power Monitor PCB Option 5 is NOT installed, skip ahead to Step 5. If the Power Monitor PCB is installed, perform the substeps immediately below:
   a. See Figure 4-9 on page 4-15 above for Power Monitor PCB connectors and orientation. Pry out the flex cable attached to the Detector connector from the Power Monitor PCB.
   b. Remove the three Phillips head screws from the Power Monitor PCB.
   c. Using the Tool T1451 socket, remove the BNC Connector Dress Nut from the Ext Trig Input connector. Leave the Ext Trig Input connector and its attached coaxial cable loosely in place in the Connector Face Plate.
   d. Holding the Connector Flex Cable away from the Power Monitor PCB, gently lever up the PCB out of its header socket.
   e. If the Header Pins stay on the VNA Module PCB, remove the pins and re-install them on the Power Monitor PCB.
   f. Set the Power Monitor PCB assembly with header pins aside.
   g. Removing the Power Monitor PCB provides access to the Ext Trig Input BNC connector and a VNA Module PCB mounting screw.

Remove the Ext Trig Input BNC Connector

5. Cut the cable tie that holds the Ext Trig Input and Ext Ref Input coaxial cable to the RF Out hardline.
6. Using the Anritsu Tool T1451, the castellated socket, remove the BNC Connector Dress Nut from the Ext Trig Input connector. Pull the Ext Trig Input connector from the Connector Face Plate and position so it is out of the way.
   - Removing the Ext Trig Input connector provides access to one the VNA Module PCB mounting screws.

Remove the VNA Module PCB Assembly

7. Using a Phillips head screwdriver, remove the eight (8) screws holding the VNA Module PCB in place.

8. With the Connector Face Plate facing away from you, start lifting up from the right edge of the VNA Module which disconnects the connector between the VNA Module and the underlying Main PCB Assembly.

Remove the GPS Receiver Module Option 31

9. If the GPS Receiver Module PCB Option 31 is not installed, skip ahead to Step 10. If it is installed, perform the substeps immediately below:
   a. Move VNA Module to the left about 3 cm (1.5”) to expose the antenna cable attached to the GPS Receiver Module.
   b. Use needle-nose pliers to remove the MCX RF coaxial connector from the GPS Receiver Module.
   c. Leave the GPS Antenna SMA connector attached to the Connector Face Plate.

Move the VNA Module

10. “Fold” the VNA Module PCB off the Main VNA PCB Assembly so that their bottom edges are next to each other and they are still connected with three coaxial cables. See Figure 4-11 on page 4-20 for VNA Module, Main PCB Assembly, and coaxial cable routing. See Figure 4-12 on page 4-21 for a photograph of the “folded” assemblies.

11. Remove the Rotary Encoder

12. On the inside of the case, disconnect the Rotary Encoder cable from the Main PCB Assembly.
13. Remove the old Rotary Encoder and its attached cable from the case and set aside.

Install Replacement Rotary Encoder

14. Position the **replacement Rotary Encoder** in the case with the cable connector towards the center of the Case.
15. Connect the Rotary Encoder cable to the Main PCB Assembly. The cable connector goes into the PCB connector on the side away from the Encoder with the connector ridges up. Coil up excess cable on top of the encoder PCB.
16. From the front panel, add in sequence the flat washer, lock washer, and nut. Tighten the nut to hold in place using the 7/16” (≅ 12 mm) nut driver.

Install GPS Receiver Module Option 31

17. If the GPS Receiver Monitor PCB Option 31 is not installed, skip ahead to Step 18. If it is installed, perform the substeps immediately below:
   a. “Fold” the module back over the Main PCB Assembly offset approximately 30 mm (1.5”) to the left so that the GPS Receiver Module and its antenna connector are visible.
   b. Route the GPS Antenna Cable MCX connector into place to the GPS Receiver Module.
   c. Use needle-nose pliers to connect the MCX connector to the GPS Receiver Module.

VNA Module

18. “Fold” the VNA Module PCB back into position over the Main PCB and the eight (8) hex standoffs so it is loosely positioned.
19. Position the VNA Module as accurately as possible over the Main PCB Assembly observing the following:
   a. The upper and lower connectors on the right side of the PCBs are loosely engaged.
   b. The fan and other cables on the left side of the Case are clear of the hex standoffs.
   c. The GPS Antenna Cable is correctly routed between the Face Plate and the PCB and is located in its notch.
   d. The three coaxial cables between the two PCBs are on the OUTSIDE of the hex standoffs.
   e. The PCB mounting holes are correctly aligned with the hex standoffs.

20. Once the connectors and the standoffs are correctly aligned, press the VNA Module connector into the mating connector on the Main PCB.
21. Make sure the Connector Face Plate is correctly positioned in its mounting grove.
22. Fasten the VNA Module PCB into place using (8) Phillips head screws.

Install Power Monitor PCB Option 5

23. If the Power Monitor PCB Option 5 is not installed, skip ahead to Step 24. If it is installed, perform the substeps immediately below:
    a. Insert the Detector connector with the Flex Cable into the Detector hole on the Face Plate.
    b. The Flex Cable must oriented above the Connector. Reinstall and tighten the two M3 x 0.5 Kep Nuts using the 5.5 mm angled-head open end wrench.
    c. Carefully position the Power Module Assembly over its mounting standoffs.
    d. Use extreme care so as to not bend any of the header pins.
    e. Be careful to not offset the header pins by one row.
    f. Make sure the pins are loosely but correctly positioned before proceeding.
    g. When perfectly aligned, press on either side of the header strip to mate the two connectors.
    h. When the Power Monitor PCB is fully seated, inspect the header connectors from the side to make sure all pins are correctly inserted and no pins are bent.
    i. Install the three (3) Phillips head screws holding the Power Monitor PCB in place.
    j. Gently fold over the Flex Cable and insert it into the four-connector socket on the PCB. See Figure 4-11 on page 4-20 for coaxial cable connections between the VNA Module and the Main PCB Assembly. See Figure 4-12 on page 4-21 for a photograph of the “folded” assemblies.

Install the Ext Trig Input BNC

24. Install the Ext Trig Input BNC connector and coaxial cable into the Face Place.
25. Route the coaxial cable UNDER the RF hardline and use the Tool T1451 socket to tighten the BNC Connector Dress Nut.
26. Make sure all cables are clear of the case edges.
27. Install a cable tie over the two coaxial cables and the RF hardline to keep them in place.

Install the Case Bottom Assembly and Battery

28. Replace the Case Bottom Assembly, making sure the Connector Face Plate is correctly centered in its mounting groove and that all cables are clear. Insert and tighten the four case mounting screws.
29. Install the Battery.
30. Install the Battery Door.

4-16 Remove Main PCB Assembly

This procedure covers removing the Main PCB Assembly from the MS2026B and MS2028B instruments by removing the Power Monitor PCB Assembly (if installed), the VNA Module PCB Assembly, the GPS Receiver Module (if installed), and finally the Main PCB Assembly. Once the Main PCB Assemble is removed, separate replacement procedures are available:

- Section 4-17 – Replace Main PCB Assembly – ND69864, ND69865 on page 4-34
- Section 4-18 – Replace LCD Backlight Inverter PCB Assembly – 3-61362 on page 4-38
- Section 4-19 – Replace LCD Display PCB Assembly – 3-15-118 on page 4-39
- Section 4-20 – Replace Clear Plastic LCD Protector – 3-61368 on page 4-40

Once the required replacement units are installed, the final procedure describes how to reinstall the Main PCB Assembly, GPS Receiver Module, VNA Module, Power Monitor PCB, and finally close the case:

- Section 4-21 – Install Main PCB and Reassemble Instrument on page 4-41

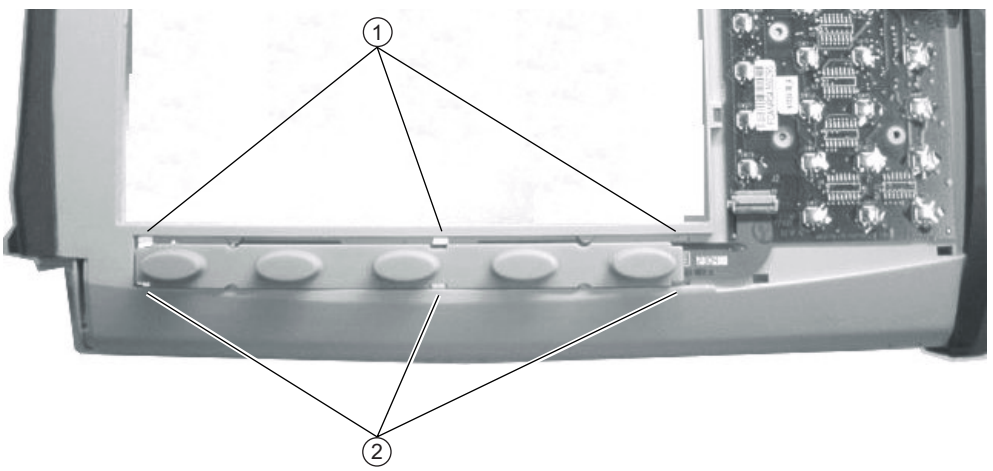
Procedure

1. Place the instrument face up on a protected work surface oriented with the Connector Strip away from you.
2. Remove the Battery Door and the Battery.
3. Using the medium flat blade screwdriver and a piece of protective rubber, remove the Rotary Knob by sliding the screwdriver under the knob and levering it up gently.

Remove Key Pad Bezels, Membranes, and PCB Assemblies

4. The Soft Key Keypad and the Main Keypad and Switch assembly should be removed before proceeding to protect the header pins that connect the Main Keypad Switch PCB to the Main PCB. This header pin connector is particularly vulnerable during the reassembly process.
5. Remove the Soft Key Keypad Bezel.
6. There are six (6) locking tabs holding the Soft Key Keypad Bezel to the case as shown below in Figure 4-19

Caution	Exercise extreme caution working around the LCD Display. Do not press in the middle of the display nor set any tools on it.



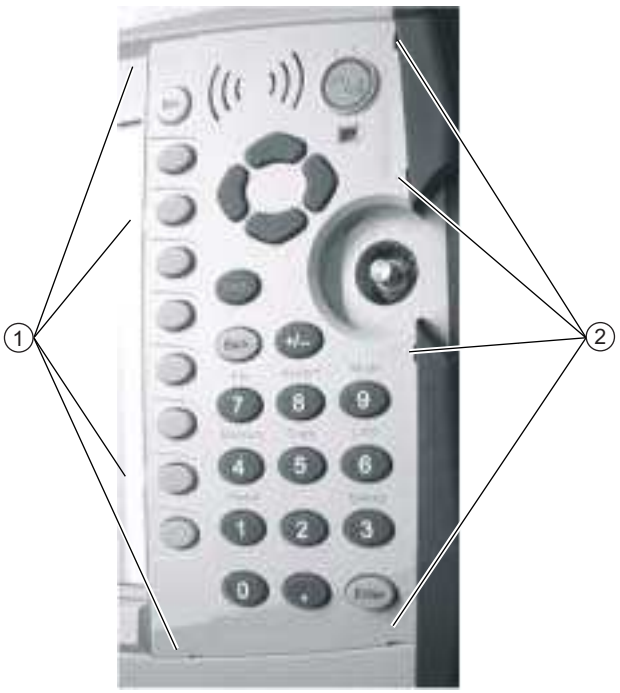
1. Location of three (3) upper locking tabs on the Soft Key Switch Bezel and underlying Soft Key Membrane.
2. Location of three (3) lower locking tabs.

Figure 4-13. Locking Tab Locations for Soft Key Keypad Bezel

7. Using a small flat blade screwdriver, carefully pry the six (6) Soft Key Keypad Bezel locking tabs free of the main body of the case.
   - The flat blade width must be less than 3.5 mm (0.13") wide and as thin as possible. If available, recommended is a screwdriver made of fiberglass or other material that will not scratch the bezel.
   - As each locking tab releases, the bezel comes up a bit.
   - The basic technique is to press the screwdriver straight in between the case and the bezel and then gently lever the screwdriver AWAY from the bezel so it slightly elevates.
8. When the six locking tabs are released, lift the bezel up and set aside.
9. Remove the existing Soft Key Keypad Membrane and set aside revealing the Soft Key Keypad Flex PCB cable

Caution	Exercise extreme caution working around the Soft Key Keypad ribbon cable. Do not touch it with a screwdriver or other tool.

10. There are eight (8) locking tabs holding the Main Keypad Bezel to the case as shown in Figure 4-14



1. Location of four (4) left side locking tabs on the Main Keypad Switch Bezel.
2. Location of four (4) right side locking tabs.

Figure 4-14. Main Keypad Bezel Locking Tab Locations

11. Using a small flat blade screwdriver, carefully pry the eight (8) Main Keypad Bezel locking tabs free of the main body of the case.
   - Use a small piece of rubber gasket or similar material to protect the front panel from the screwdriver.
   - The flat blade width must be less than 3.5 mm (0.13") wide and as thin as possible. If available, recommended is a screwdriver made of fiberglass or other material that will not scratch the bezel.
   - The basic technique move a protective piece of rubber next to the slot, press the screwdriver straight in between the case and the bezel, and then gently lever the screwdriver AWAY from the bezel.

- As each locking tab releases, the bezel comes up a bit.

Note	The Speaker sits on top of the Main Keypad PCB and is held in place by four locating pins on the inside of the Main Keypad Bezel around the speaker opening. When the keypad bezel is removed, the speaker is held only by the fragile connecting wires. Be careful removing the bezel and membrane as they might inadvertantly contain the speaker. The speaker must be detached and left with the underlying PCB before proceeding. Use care not to damage the speaker wires when removing or replacing the keypad bezel, membrane, or PCB.

12. When the eight locking tabs are released, lift the bezel up, carefully disconnecting the speaker from its mounting pins, and set aside.
13. Protecting the speaker wires, start at the bottom of the Main Keypad Membrane and lift it up and set aside. Hold the edge of the Speaker with one hand and remove the Membrane from one side and then the other side of the Speaker.
14. Gently pull up the Main Keypad PCB straight up as the header pins disconnect from the Main PCB Assembly header. Note that the Soft Key Keypad Flex PCB is attached and both PCB cables must removed as a unit. Set the PCB Assemblies aside, making sure to protect the protruding Header Pin connector.

Open Case

15. Open the case by removing the four (4) fastening screws. Lift up the Case Rear Assembly and set aside.

Remove Power Monitor PCB Option 5

16. If the Power Monitor PCB Option 5 is NOT installed, skip ahead to Step 17. If the Power Monitor PCB is installed, perform the substeps immediately below:
    a. See Figure 4-9 on page 4-15 above for Power Monitor PCB connectors and orientation. Pry out the flex cable attached to the Detector connector from the Power Monitor PCB.
    b. Remove the three Phillips head screws from the Power Monitor PCB.
    c. Using the Tool T1451 socket, remove the BNC Connector Dress Nut from the Ext Trig Input connector. Leave the Ext Trig Input connector and its attached coaxial cable loosely in place in the Connector Face Plate.
    d. Holding the Connector Flex Cable away from the Power Monitor PCB, gently lever up the PCB out of its header socket.
    e. If the Header Pins stay on the VNA Module PCB, remove the pins and re-install them on the Power Monitor PCB.
    f. Set the Power Monitor PCB assembly with header pins aside.
    g. Removing the Power Monitor PCB provides access to the Ext Trig Input BNC connector and a VNA Module PCB mounting screw.

Remove Ext Trig Input BNC Connector

17. Cut the cable tie that holds the Ext Trig Input and Ext Ref Input coaxial cable to the RF Out hardline.
18. Using the Tool T1451 socket, remove the BNC Connector Dress Nut from the Ext Trig Input connector. Pull the Ext Trig Input connector from the Connector Face Plate and position it out of the way.
    - Removing the Ext Trig Input connector provides access to one of the VNA Module PCB mounting screws.

Remove VNA Module PCB

19. Using a Phillips head screwdriver, remove the eight (8) screws holding the VNA Module PCB in place.
20. With the Connector Face Plate facing away from you, start lifting up from the right edge of the VNA Module which disconnects the connector between the VNA Module and the underlying Main PCB Assembly.

Remove GPS Receiver Module PCB Option 31

21. If the GPS Receiver Module PCB Option 31 is not installed, skip ahead to Step 22. If it is installed, perform the substeps immediately below:

a. Move VNA Module to right about 3 cm (1.5”) to expose the antenna cable attached to the GPS Receiver Module.

b. Use needle-nose pliers to remove the MCX RF coaxial connector from the GPS Receiver Module PCB.

c. Move the VNA Module further to the left to fully expose the GPS Receiver Module.

d. Undo the two screws holding the GPS Receiver Module in place.

e. Gentle pull the GPS Receiver Module straight up to disconnect its 14-pin header connector.

Remove Coaxial Cables

22. Using needle-nose pliers, remove the three attached coaxial cables from the Main PCB Assembly at the following locations. All three cables route to locations on the VNA Module Assembly PCB. Leave the cables attached to the VNA Module.

- J2200 100 MHz In – Cable connected to the Ext Ref In BNC connector on the VNA Module.
- J2201 26 MHz Out – Cable connected to the bottom RF shield on the VNA Module.
- J3202 Trig In – Cable connected to the Ext Trig In BNC connector on the VNA Module. See Figure 4-9 on page 4-15 for coaxial cable connections between the VNA Module and the Main PCB Assembly.

Note	On the Main PCB Assembly, the MCX connectors for **J2202 100 MHz Out** and **J3203 140 MHz IF** are not used.

Remove Main PCB Assembly

23. Remove the eight (8) hex standoffs and two (2) Pan Head screws holding the Main PCB Assembly to the Case Front Assembly. See Figure 4-12 on page 4-21 above for hex standoff and screw locations.

24. Near the left side of the case, disconnect the cable from the Rotary Encoder PCB. The Rotary Encoder stays mounted in the Case Front Assembly.

25. Near the left bottom of the case, disconnect the Battery Cable and the Fan Cable from the Main PCB and fold them over the case edge clear of the PCB.

26. At this point, proceed with any of the following replacement procedures described in the sections below:

- Section 4-17 – Replace Main PCB Assembly – ND69864, ND69865 on page 4-34
- Section 4-18 – Replace LCD Backlight Inverter PCB Assembly – 3-61362 on page 4-38
- Section 4-19 – Replace LCD Display PCB Assembly – 3-15-118 on page 4-39
- Section 4-20 – Replace Clear Plastic LCD Protector – 3-61368 on page 4-40

27. Once the required replacement procedures are complete, reassemble the instrument using the procedure at the end of this chapter:

- Section 4-21 – Install Main PCB and Reassemble Instrument on page 4-41

4-17 Replace Main PCB Assembly – ND69864, ND69865

This procedure assumes that the Main PCB Assembly has been removed from the instrument as described above in Section 4-16 – Remove Main PCB Assembly on page 4-30 and that the Main PCB Assembly is to be replaced. The basic replacement procedure is the same for MS2026B and MS2028B instruments.

If an assembly mounted on the Main PCB is to be replaced, skip to the appropriate section below:

- Section 4-18 – Replace LCD Backlight Inverter PCB Assembly – 3-61362 on page 4-38
- Section 4-19 – Replace LCD Display PCB Assembly – 3-15-118 on page 4-39
- Section 4-20 – Replace Clear Plastic LCD Protector – 3-61368 on page 4-40

Part Numbers

- ND69864 – Main PCB Assembly for MS2026B instruments
  - VNA Module not included
  - LCD Display not included
  - LCD Power Inverter PCB Assembly not included
  - GPS Receiver Module PCB not included
- ND69865 – Main PCB Assembly for MS2028B instruments
  - VNA Module not included
  - LCD Display not included
  - LCD Power Inverter PCB Assembly not included
  - GPS Receiver Module PCB not included

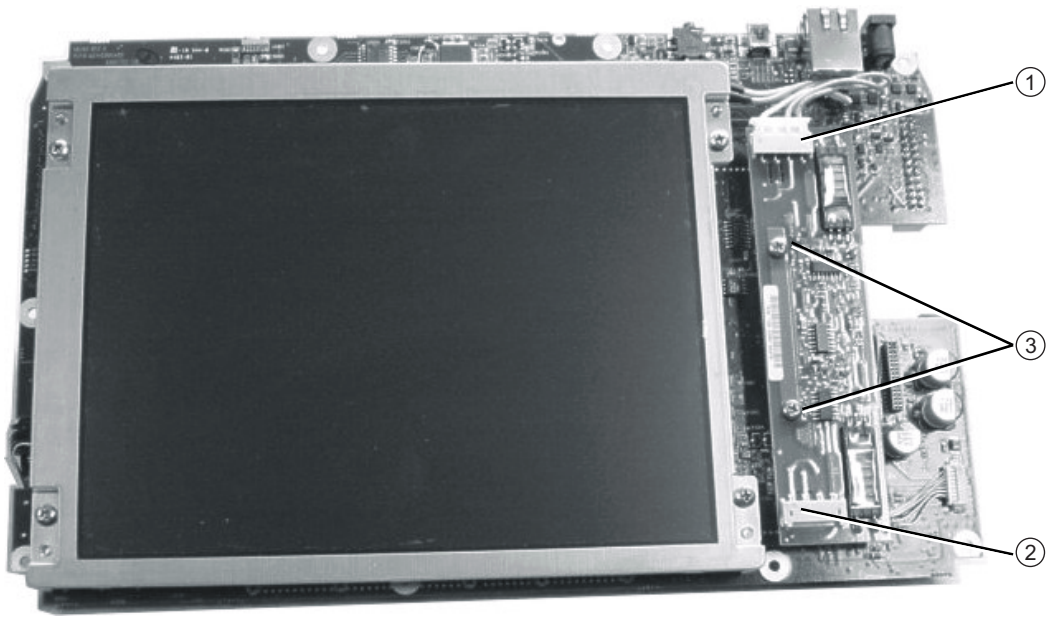
Procedure

1. The Main PCB Assembly has been removed from the Case Front Assembly.

Remove the LCD Backlight Power Inverter PCB Assembly

2. Orient the Main PCB with the remaining connectors away from you and the cutout for the Rotary Encoder to the right.
3. Disconnect the LCD 4-pin cable going to the LCD Inverter PCB Assembly.

- The cable is permanently attached to the LCD Panel



1. LCD Backlight Cable, permanently attached to LCD Assembly.
2. J4005 connector on Power Inverter. Disconnect cable here going to Main PCB Assembly.
3. Remove Phillips-head screws (2 each) and set LCD Backlight Power Inverter PCB Assembly aside.

Figure 4-15. LCD Backlight Power Inverter PCB Assembly Screws and Cables

4. Remove the two (2) Phillips head screws holding the LCD Inverter PCB Assembly in place.

- There is no header pin connector under the LCD Inverter PCB.

5. Remove the LCD Backlight Power Inverter PCB Assembly and set aside.

a. At this point, if the LCD Backlight Power Inverter PCB assembly is to be replaced, stop disassembling the Main PCB.

b. Prepare the replacement LCD Backlight Power Inverter PCB.

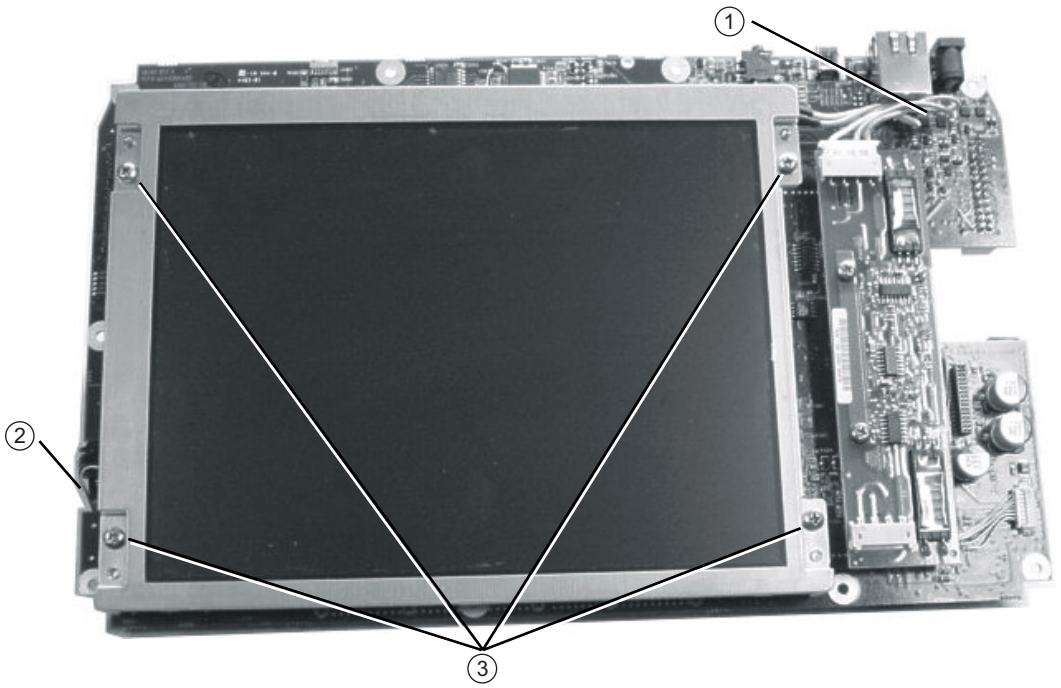
c. Skip ahead and install it as described below in Step #10.

Remove the LCD Display

6. Disconnect the remaining left side LCD multi-pin cable going to J4003 on the Main PCB Assembly.

- The cable is permanently attached to the LCD Panel

7. Undo the four (4) Phillips head screws holding the LCD Display in place and set the LCD aside.



1. LCD Backlight Cable, permanently attached to LCD. Connects to Backlight Power Inverter Assembly.
2. LCD Signal Cable, permanently attached to LCD. Connects to J4003 connector on Main PCB Assembly.
3. Phillips-head mounting screws (4 each) holding the LCD Assembly to the Main PCB Assembly.

Figure 4-16. LCD Cable, Mounting Screws, and Backlight Cable

Remove the GPS Receiver Module

8. If the GPS Receiver Module PCB Option 31 is not installed, or has already been removed, skip ahead to the next step. If it is installed and has not been removed, perform the substeps immediately below:

a. Undo the two screws holding the GPS Receiver Module in place.

b. Gentle pull the GPS Receiver Module straight up to disconnect its 14-pin header connector. The header connector should stay with the GPS Receiver Module.

Prepare the Replacement Main PCB

9. Prepare the replacement Main PCB by installing the LCD Power Inverter PCB, the LCD Display, and if equipped, the GPS Receiver Module as described in the steps below.

10. Install the LCD Backlight Power Inverter PCB Assembly:

a. Fasten the Inverter in place with two (2) Phillips head screws.

b. Connect the Inverter cable to the J4005 Connector on the Main PCB.

c. When reattaching, the connector orientation is with the exposed pins toward the Main PCB Assembly.

11. Install the LCD Panel Assembly:

a. Fasten the LCD assembly in place with four (4) pan head screws.

b. Connect the LCD Power cable to the LCD Power Inverter PCB

c. Connect the LCD Signal cable to the J4003 connector socket on the Main PCB.

12. Before installing the reassembled Main PCB Assembly, clean the Clear Plastic LCD Protection Plate by using compressed air and LCD compatible wipes.

13. The Main PCB Assembly is now ready to reassemble in the Case Front Assembly. Continue with the reassembly process in Section 4-21 – Install Main PCB and Reassemble Instrument on page 4-41 below.

4-18 Replace LCD Backlight Inverter PCB Assembly – 3-61362

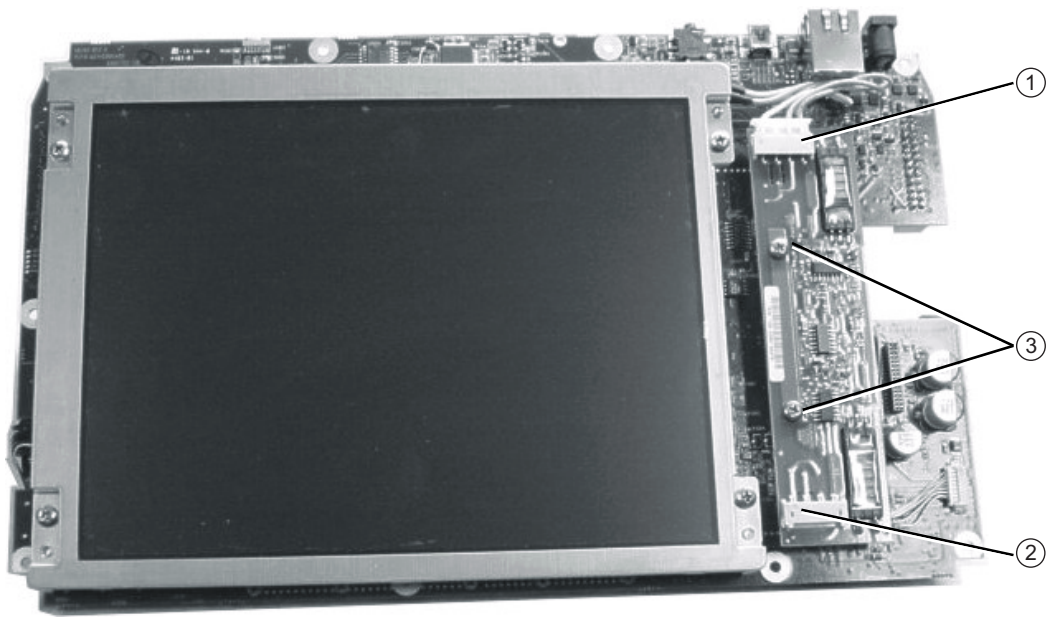
This procedure assumes that the Main PCB Assembly has been removed from the instrument as described above and that the LCD Backlight Power Inverter PCB Assembly must be replaced. The replacement procedure is the same for MS2026B and MS2028B instruments.

Part Numbers

- 3-66549-3 – LCD Backlight Power Inverter PCB Assembly
  - For either MS2026B or MS2028B instruments

Procedure

1. Open the instrument case and remove the Main PCB Assembly.
   - See Section 4-16 – Remove Main PCB Assembly on page 4-30
2. Disconnect the two cables going to the LCD Backlight Power Inverter PCB Assembly.
   - One cable is permanently attached to the LCD Display Assembly.
   - The other cable goes to the Main PCB at J4005. Leave this cable attached to the Main PCB.
3. Undo the two (2) Phillips pan head screws and remove the LCD Backlight Inverter PCB Assembly.
   - There are no header pins under the Inverter PCB.



1. LCD Backlight Cable, permanently attached to LCD. Connects to LCD Backlight Power Inverter Assembly.
2. J4005 connector on Power Inverter. Disconnect cable here going to Main PCB Assembly.
3. Phillips-head mounting screws (2 each) holding the LCD Power Inverter to Main PCB Assembly.

Figure 4-17. LCD Backlight Cables and Mounting Screws

4. Install the replacement LCD Backlight Power Inverter PCB Assembly by fastening it in place with two (2) Phillips-head screws.
5. Connect the cable from the Main PCB J4005 Connector to the Inverter J1 Connector.
6. Connect the cable from the LCD Display to the Inverter J2 Connector.
7. If there are no further replacement, install the Main PCB and reassemble the instrument by following the procedure in Section 4-21 – Install Main PCB and Reassemble Instrument on page 4-41.

4-19 Replace LCD Display PCB Assembly – 3-15-118

This procedure assumes that the Main PCB Assembly has been removed from the instrument as described above and that the LCD Display must be replaced. The replacement procedure is the same for MS2026B and MS2028B instruments.

Part Numbers

- 3-15-118 – LCD Display
  - For either MS2026B or MS2028B instruments

Procedure

1. Open the instrument case and remove the Main PCB Assembly.
   - See Section 4-16 – Remove Main PCB Assembly on page 4-30
2. Disconnect the two cables going to the LCD Display:
   - The power cable is permanently attached to the LCD Display Assembly and goes to the J2 Connector on the LCD Backlight Power Inverter PCB Assembly.
   - The signal cable is permanently attached to the LCD Display Assembly and goes to the J4003 Connector on the other side of the Main PCB.
3. Undo the four (4) Phillips pan head screws and remove the LCD Display Assembly.
4. Clean the replacement LCD Screen by using compressed air and LCD compatible wipes.
5. Install the replacement LCD Display Assembly by fastening it in place with four (4) Phillips head screws.
6. Connect the LCD Display power cable to the J2 Connector on the LCD Backlight Inverter Power PCB Assembly.

Note	Pay attention to the routing of the LCD Backlight and the LCD Signal Cables. The cables must be positioned so as not to be pinched when the assembly is reattached to the Case Front Assembly.

7. Connect the LCD Display signal cable to the J4003 Connector on the other side of the Main PCB.
8. If there are no further replacement, install the Main PCB and reassemble the instrument by following the procedure in Section 4-21 – Install Main PCB and Reassemble Instrument on page 4-41.

4-20 Replace Clear Plastic LCD Protector – 3-61368

This procedure assumes that the Main PCB Assembly has been removed from the instrument as described above and that the Clear Plastic LCD Protector must be replaced. The replacement procedure is the same for MS2026B and MS2028B instruments.

Part Numbers

- 3-61368 – Clear Plastic LCD Protector
  - For either MS2026B or MS2028B instruments

Procedure

1. Open the instrument case and remove the Main PCB Assembly.
   - See Section 4-16 – Remove Main PCB Assembly on page 4-30
2. Remove the Clear Plastic LCD Protector by pushing it from the front.
3. The protector has an inset edge which goes into the hole and faces out. The protector “lip” is set towards the inside of the case.
4. The outside of the Protector has a protective “skin” that should be left in place until the instrument is reassembled.
5. Clean the inside of the Protector by using compressed air and LCD compatible wipes.
6. Avoiding fingerprints, install the protector into the Case Front opening. The protector “lip” goes towards the inside of the case.
7. If there are no further unit replacements, install the Main PCB and reassemble the instrument by following the procedure in Section 4-21 – Install Main PCB and Reassemble Instrument on page 4-41.

4-21 Install Main PCB and Reassemble Instrument

This procedure assumes that the required assemblies have been replaced and installed on the Main PCB Assembly.

Procedure

Install the Main PCB Components

1. If not already done, install the LCD Display PCB Assembly and the LCD Backlight Power Inverter PCB on the Main PCB with the following substeps:
   a. Install the LCD Display on the Main PCB with four (4) pan head screws oriented so that the multi-conductor signal cable matches up with its notch and connector and the three-conductor is towards the LCD Backlight Inverter PCB position.
   b. Connect the LCD Display signal cable.
   c. Install the LCD Backlight Power Inverter PCB Assembly in place with two (2) Phillips pan head screws.
   d. Connect the cable from the LCD Display to the LCD Backlight Power Inverter PCB Assembly.

Install the Clear Plastic LCD Protector

2. If not already done, clean the inner surface of the Protector with compressed air and LCD compatible wipes, leaving the outer protective film in place, and place the Protector into the Case Front, with the "lip" towards the inside of the case.

Install the Main PCB

3. Insert the connector edge of the Main PCB first into the case.
4. Fasten into place with eight (8) hex standoffs and two (2) pan head screws.
5. Connect the Battery Power cable and the Fan cable.

Install GPS Receiver Module

6. If the GPS Receiver Module is not equipped, skip ahead to Step 7. If it is equipped, install it on the Main PCB by performing the substeps immediately below:
   a. Carefully position the replacement GPS Receiver Module so that it is lined up with its mounting standoff holes and 14-pin header connector on the Main PCB.
   b. Use extreme care so as to not bend any of the header pins.
   c. Be careful to not offset the header pins by one row.
   d. Make sure the header pins are loosely but correctly positioned before proceeding.
   e. When perfectly aligned, press on either side of the header strip to mate the connectors and the header pins.
   f. Insert and tighten the two (2) Phillips mounting screws. Note that these screws are shorter than the screws used to hold the VNA Module in place.
   g. Snap the GPS Antenna Cable MCX connector into place on the GPS Receiver Module. Position the Antenna Cable off the right side of the Case. Do not yet install the GPS Antenna SMA connector in the Connector Face Plate.

Install VNA Module

7. Place the VNA Module PCB upside down next to the left side of the Case and Main PCB.
   - See Figure 4-11 on page 4-20 for a schematic view of placement and cable routing.
   - See Figure 4-12 on page 4-21 for an orientation photograph of general placement and cable routing.
8. Using needle-nose pliers, connect the three coaxial cables between the Main PCB and the VNA Module:

- J2200 100 MHz In – Cable connected to the Ext Ref In BNC connector on the VNA Module.
- J2201 26 MHz Out – Cable connected to the bottom RF shield on the VNA Module.
- J3202 Trig In – Cable connected to the Ext Trig In BNC connector on the VNA Module.

Note	Note the routing for each cable. On the Main PCB Assembly, note that the MCX connectors for J2202 100 MHz Out and J3203 140 MHz IF are not used.

9. "Fold" the VNA Module PCB back into position over the Main PCB and the eight (8) hex standoffs so it is loosely positioned.

10. Route the GPS Antenna Cable with SMA connector in the slot between the Connector Face Plate and the PCB, until the cable is correctly positioned in the PCB notch cutout.

11. Position the VNA Module as accurately as possible over the Main PCB Assembly observing the following:

a. The two connectors on the right side of the PCBs are loosely engaged.

b. The fan and other cables on the left side of the Case are clear of the hex standoffs.

c. The three coaxial cables between the two PCBs are on the OUTSIDE of the hex standoffs.

12. Once the connectors and the standoffs are correctly aligned, press the VNA Module connector into the mating connector on the Main PCB.

Install GPS Antenna Connector

13. If the GPS Receiver Module Option 31 is not installed, skip ahead to Step 14. Otherwise, perform the substeps immediately below:
    a. Route the GPS Antenna cable from the Main PCB so that it is located between the Face Plate and the VNA Module and routed into its notch
    b. Install the GPS Antenna SMA connector into the Face Plate, add the lock washer, and finally the nut.
    c. Use two 5/16" (≅ 8 mm) end wrenches to avoid torquing the connector and tighten the nut.
14. Make sure the Connector Face Plate is correctly positioned in its mounting grove and fasten the VNA Module PCB into place using (8) Phillips head screws.

Install Power Monitor PCB Assembly

15. If the Power Monitor PCB Option 5 is not installed, skip ahead to Step 16. If the Power Monitor PCB is installed, perform the substeps immediately below:
    a. Insert the Detector connector with the Flex Cable into the Detector hole on the Face Plate.
    b. The Flex Cable must oriented above the Connector. Reinstall and tighten the two M3 x 0.5 Kep Nuts using the 5.5 mm angled-head open end wrench.
    c. Carefully position the Power Module Assembly over its mounting standoffs.
    d. Use extreme care so as to not bend any of the header pins.
    e. Be careful to not offset the header pins by one row.
    f. Make sure the pins are loosely but correctly positioned before proceeding.
    g. When perfectly aligned, press on either side of the header strip to mate the two connectors.
    h. When the Power Monitor PCB is fully seated, inspect the header connectors from the side to make sure all pins are correctly inserted and no pins are bent.
    i. Install the three (3) Phillips head screws holding the Power Monitor PCB in place.
    j. Gently fold over the Flex Cable and insert it into the four-connector socket on the PCB. See Figure 4-9 on page 4-15 for locations.

Install Ext Trig Input BNC

16. Install the Ext Trig Input BNC connector and coaxial cable into the Face Place. Route the coaxial cable under the RF hardline and use the Tool T1451 socket to tighten the BNC Connector Dress Nut.
    - The three coaxial cables should be on the outside of the hex standoffs.
17. Make sure all cables are clear of the case edges.
18. Install a cable tie over the two coaxial cables and the RF hardline to keep them in place.

Install Case Bottom Assembly

19. Replace the Case Bottom Assembly, making sure the Connector Face Plate is correctly centered in its mounting groove and that all cables are clear. Insert and tighten the four case mounting screws.

Install Main and SoftKey Keypads

20. Install the Main Keypad PCB and the Softkey Keypad Flex PCB into the front cover.
21. Carefully position the Main Keypad and insert the long header pin into the provided slot.
22. Gently press the Main Keypad into place so that the header pins mate with the connector on the Main PCB.
    - The header pins are located between SW19, SW3, SW15, and SW11.
23. Fit the Main Keypad Bezel over the Main Keypad so that it is under the Speaker. Make sure the Speaker is correctly positioned to fit into the pins.

Install Battery and Battery Door

24. Fit the Reinstall the Battery.

25. Reinstall the Battery Door.

4-22 Replace Main Keypad Components – 3-61362, 65027-3

This procedure provides instructions for removing and replacing the Main Keypad Membrane and/or the underlying Main Keypad PCB. All keypad parts can be replaced without opening the MS202XB case.

Part Numbers

- 3-61362 – Main Keypad Membrane
  - For either MS2026B or MS2028B instruments
- 65027-3 – Main Keypad PCB
  - For either MS2026B or MS2028B instruments

Procedure

Note	Use a small piece of rubber or similar material to prevent scratches to the front panel and the switch bezels.

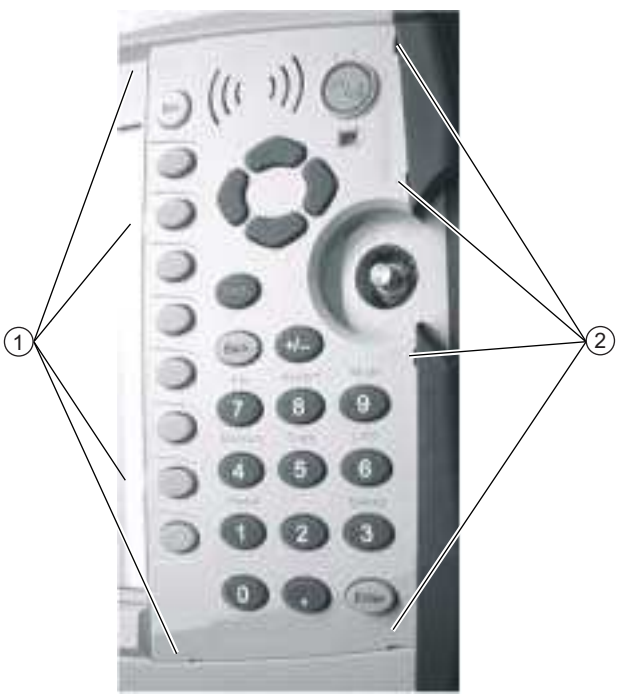
1. Place the instrument face up on a protected work surface oriented with the Connector Strip away from you.
2. Remove the Battery Door and the Battery.

Remove Rotary Knob

3. Using the medium flat blade screwdriver, remove the Rotary Knob by sliding it under the know and levering it up gently.

Remove Main Keypad Bezel

4. There are eight (8) locking tabs holding the Main Keypad Bezel to the case as shown in the figure below.



1. Location of Main Keypad Switch Bezel four (4) left side locking tabs
2. Location of four (4) right side locking tabs.

Figure 4-18. Main Keypad Bezel Locking Tab Locations

5. Using a small flat blade screwdriver and a piece of rubber as scratch protection, carefully pry the eight (8) Main Keypad Bezel locking tabs free of the main body of the case. The following tips help with the removal process:
   - The flat blade screwdriver width must be less than 3.5 mm (0.13") wide and as thin as possible.
   - If available, recommended is a screwdriver made of fiberglass or other material that will not scratch the bezel.
   - As each locking-tab releases, the bezel comes up a bit.
   - The basic technique is to position the protective piece of rubber (or similar material) next to the slot for scratch protection, press the screwdriver straight in between the case and the bezel, and then gently lever the screwdriver AWAY from the bezel.

Protect Speaker and Remove Bezel

Caution	The Speaker sits on top of the Main Keypad PCB and is held in place by four locating pins on the inside of the keypad bezel around the speaker opening. When the keypad bezel is removed, the speaker is held only by the fragile connecting wires. Use extreme care not to damage the speaker wires when removing or replacing the keypad membrane or PCB.

6. When the eight locking tabs are released, lift the bezel carefully up, disengage the speaker from its mounting pins (it stays attached to the underlying Main Keypad PCB) and set aside.
7. Protecting the Speaker wires, start at the bottom of the Main Keypad Membrane and lift it up.
8. Hold the edge of the Speaker with one hand and remove the Membrane from one side and then remove the Membrane from the other side.

Replacement Options

9. At this point, your options are to replace the Main Keypad Membrane, remove and replace the Main Keypad PCB, or to do both. Each procedure is described below.

Remove Main Keypad Membrane

10. Again starting at the bottom, lay in the replacement Membrane starting at the top of the keypad area.
11. At the top, lift up the left edge of the Speaker and lay in the Membrane.
12. Again at the top, lift up the right edge of the Speaker and lay in the Membrane.
13. When complete, the Speaker should sit ON TOP of the Membrane.
14. Make sure the Soft Key Keypad ribbon cable is still securely connected.
15. If you are not replacing the Main Keypad PCB, skip ahead to Step #26 below and replace the Keypad Bezel.

Remove Main Keypad PCB

16. At the bottom left corner of the Main Keypad PCB, remove the drop of silicon sealant holding the ZIF SMT Flip Door connector shut. The narrow ribbon cable in the connector is the Soft Key Keypad Flex PCB.
17. Lift the connector cover open, and gently lift out the Soft Key Keypad Flex PCB. The Flex PCB stays in the case, but must be protected and kept out of the way for the operations below.

Note	Do not crimp, fold, or puncture the Soft Key Keypad Flex PCB.

18. Note that there is a 16-pin header connector between the Main Keypad PCB and the Main PCB inside the case. The header pin connector is located between the SW9, SW3, SW15, and SW11 switches.
19. Protecting the speaker and its connections on the PCB, gently pry up the PCB as the header pins disconnect from underlying the Main PCB Assembly.

20. Set the Main Keypad PCB aside and install the replacement PCB. The replacement unit should come with an installed 16-pin header connector. The longer pins on the header go into the PCB. The short pins will ultimately connect through the front cover mounting slot into the Main PCB Assembly. Inspect the header pins to make sure they are straight and evenly spaced.

- If the 16-pin header connector is not included with the replacement PCB, remove the existing 16-pin header from the old PCB and install it into the replacement unit. As above, the long pins go into the PCB and the short pins go through the case slot into the Main PCB.

21. Carefully position the replacement Main Keypad PCB on the case with the 16-pin header going into the case slot.

22. When the position is verified, and you are sure the header is correctly located, gently press the PCB into place, making full contact with the Main PCB Assembly.

23. Open the connector Flip Latch in the lower left corner of the PCB and insert the Soft Key Keypad Flex PCB into the connector. Push the connector Flip Latch down and add a drop of RTV (Room Temperature Vulcanizing silicon sealant to hold the door shut. Allow ample time for the sealant to set.

- Anritsu Part Number: 3-783-1102 ñ RTV Silicon Sealant

24. Either replace or reinstall the Main Keypad Membrane by following Step #11 to Step #14 above.

Install Main Keypad Bezel

25. Replace Main Keypad Bezel by first centering it on the key membrane and the Speaker.

26. Work your way around the bezel gradually positioning each Locking Tab into its slot. Take care not to bend any Locking Tab.

27. When all are correctly inserted, go around again snapping each tab into place.

28. When complete, each button should protrude approximately 1.5 to 2 mm above the bezel.

Install Battery and Restart

29. Install the Battery and Battery Door. Restart the instrument.

30. Do a function check for each button on the Main Keypad and the Soft Key Keypad.

4-23 Replace Soft Key Keypad Membrane – 3-61361

This procedure provides instructions for removing and replacing the Soft Key Keypad Membrane. All keypad parts can be replaced without opening the MS202XB case.

If the both the membrane and the underlying Soft Key Keypad Flex PCB must be replaced, the Main Keypad Bezel must also be removed using the procedure in the next section below:

- Section 4-24 – Replace Soft Key Keypad Components – 3-61361, 61333-3 on page 4-50

Part Numbers

- 3-61361 – Soft Key Keypad Membrane
  - For either MS2026B or MS2028B instruments

Procedure

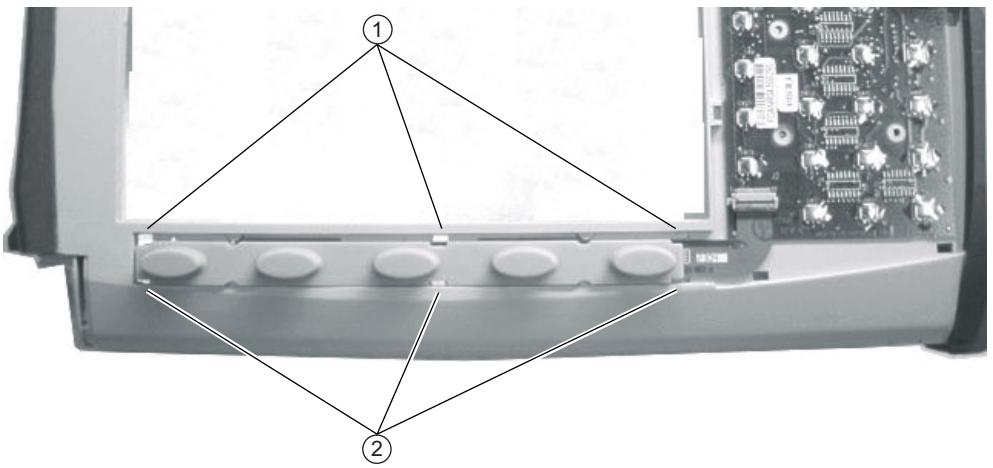
Note	Use a small piece of rubber or similar material to prevent scratches to the front panel and the switch bezel.

1. Place the instrument face up on a protected work surface oriented with the Connector Strip away from you.
2. Remove the Battery Door and the Battery.

Remove Soft Key Keypad Bezel

3. There are six (6) locking tabs holding the Soft Key Keypad Bezel to the case as shown below in Figure 4-19**l**

Caution	Exercise extreme caution working around the LCD Display. Do not press in the middle of the display nor set any tools on it.



1. Location of three (3) upper locking tabs on the Soft Key Keypad Bezel (not shown) and the Keypad Membrane.
2. Location of three (3) lower locking tabs.

Figure 4-19. Locking Tab Locations for Soft Key Keypad Bezel

4. Using a small flat blade screwdriver and a small piece of rubber or similar material, carefully pry the six (6) Soft Key Keypad Bezel locking tabs free from the case. The following tips help with the removal process:
   - The flat blade screwdriver tip must be less than 3.5 mm (0.13") wide and as thin as possible. If available, recommended is a screwdriver made of fiberglass or other material that will not scratch the bezel.
   - As each locking-tab releases, the bezel comes up a bit.
   - The basic technique is to move the protective piece of rubber (or similar material) next to the slot, press the screwdriver straight in between the case and the bezel, and then gently lever the screwdriver AWAY from the bezel using the rubber as protection for the case finish.
5. When the six (6) locking tabs are released, lift the bezel up and set aside.

Replace Soft Key Keypad Membrane

6. Lift the Soft Key Keypad Membrane out of the case and set it aside, revealing the underlying Soft Key Keypad Flex PCB.

Caution	Exercise extreme caution working around the Soft Key Keypad ribbon cable. Do not touch it with a screw driver or other tool.

7. Insert the replacement Soft Key Keypad Membrane into the case slot, marking sure the center Membrane latch cutouts correctly match up with the latch slots.

Install Soft Key Keypad Bezel

8. Replace the Soft Key Keypad Bezel by first correctly positioning it over its mounting slot, making sure that the latches at the very end of the bezel are to the left.
9. Work your way around the bezel gradually positioning each Locking Tab into its slot. Take care not to bend any Locking Tab.
10. When all tabs are correctly inserted, go around again snapping each tab into place.
11. When complete, each membrane button should protrude approximately 1.5 to 2 mm above the bezel.

Install Battery and Battery Door

12. Install the Batter and Battery Door and restart the instrument.
13. Do a function check for each button on the Main Keypad.

4-24 Replace Soft Key Keypad Components – 3-61361, 61333-3

This procedure provides instructions for removing and replacing both the Soft Key Keypad Membrane and the underlying Soft Key Keypad Flex PCB and assumes that the Main Keypad PCB will not be replaced. All keypad parts can be replaced without opening the MS202XB case. If only the Soft Key Keypad Membrane is to be replaced, use the prior procedure in the section above:

- Section 4-23 – Replace Soft Key Keypad Membrane – 3-61361 on page 4-48

Part Numbers

- 3-61361 – Soft Key Keypad Membrane
  - For either MS2026B or MS2028B instruments
- 61333-3 – Soft Key Keypad Flex PCB
  - For either MS2026B or MS2028B instruments

Procedure

Note	Use a small piece of rubber or similar material to prevent scratches to the front panel and the switch bezel.

1. Place the instrument face up on a protected work surface oriented with the Connector Strip away from you.
2. Remove the Battery Door and the Battery.

Remove Rotary Knob

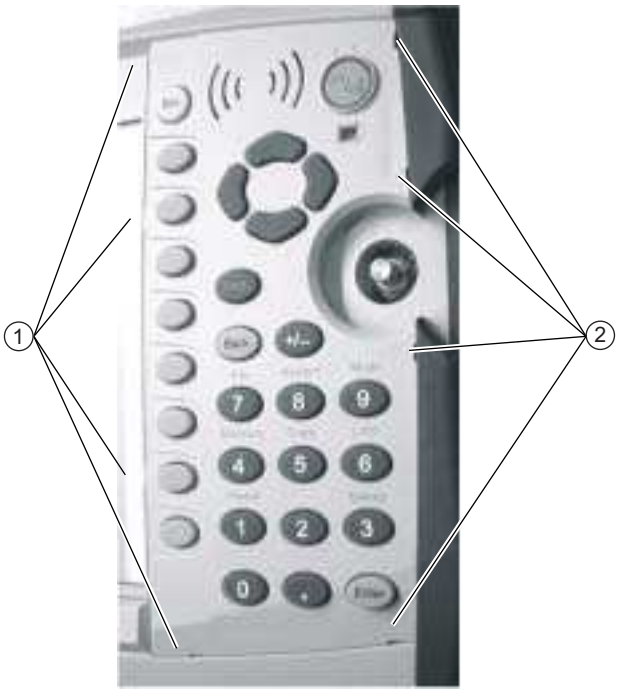
3. Remove the Rotary Knob by using a medium flat blade screwdriver and a small piece of gasket or rubber as antiscratch material.
4. Slide the screwdriver under the Knob, and gently lever it the Knob up and off of its shaft.

Remove Main Keypad Bezel

5. The Main Keypad Bezel and Membrane must be removed to access the connector on the Main Keypad PCB.

- The Main Keypad PCB does not need to be removed to service the Soft Key Keypad assembly.

6. There are eight (8) locking tabs holding the Main Keypad Bezel to the case as shown in Figure 4-20



1. Location of four (4) left side locking tabs on the Main Keypad Switch Bezel.
2. Location of four (4) right side locking tabs.

Figure 4-20. Locking Tab Locations for Main Keypad Bezel

7. Using a small flat blade screwdriver and a small piece of rubber or similar material, carefully pry the eight (8) Main Keypad Bezel locking tabs free of the main body of the case. The following tips help with the removal process:

- The flat blade screwdriver width must be less than 3.5 mm (0.13”) wide and as thin as possible. If available, recommended is a screwdriver made of fiberglass or other material that will not scratch the bezel.
- As each locking-tab releases, the bezel comes up a bit.
- The basic technique is to move the protective piece of rubber (or similar material) next to the slot, press the screwdriver straight in between the case and the bezel, and then gently lever the screwdriver AWAY from the bezel using the rubber as protection for the case finish.

Protect Speaker Removing Bezel

8. When the eight locking tabs are released, lift the bezel carefully up, disengage the speaker from its mounting pins (it stays attached to the underlying Main Keypad PCB, and set aside.

Note	The Speaker sits on top of the Main Keypad PCB and is held in place by four locating pins on the inside of the keypad bezel around the speaker opening. When the keypad bezel is removed, the speaker is held only by the fragile connecting wires. Use care not to damage the speaker wires when removing or replacing the keypad membrane or PCB.

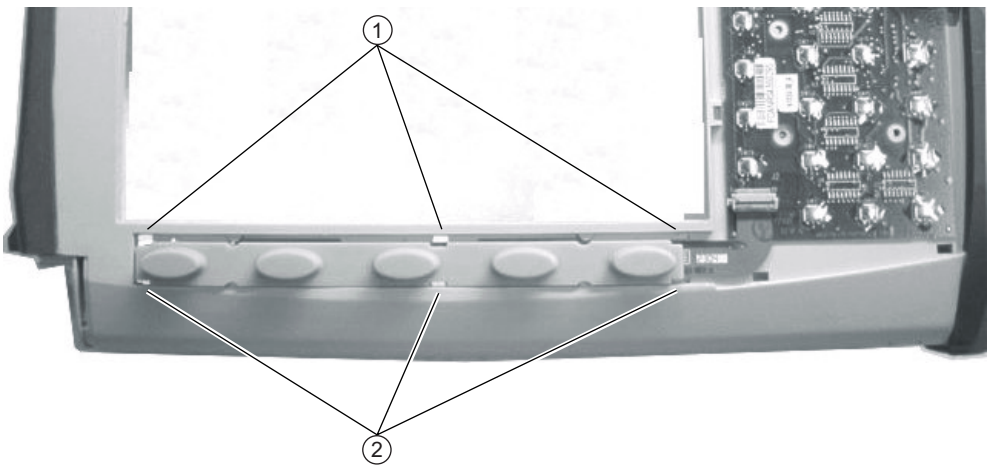
9. Protecting the Speakers wires, start at the bottom of the Main Keypad Membrane and lift it up.

10. Hold the edge of the Speaker with one hand and remove the Membrane from one side and then remove the Membrane from the other side, exposing the Main Keypad PCB.

Remove Soft Key Keypad Bezel

Caution	Exercise extreme caution working around the LCD Display. Do not press in the middle of the display nor set any tools on it.

11. There are six (6) locking tabs holding the Soft Key Keypad Bezel to the case as shown below in Figure 4-19**l**



1. Location of three (3) upper locking tabs on the Soft Key Keypad Bezel (not shown) and the Keypad Membrane.
2. Location of three (3) lower locking tabs.

Figure 4-21. Locking Tab Locations for Soft Key Keypad Bezel

12. Using a small flat blade screwdriver and a small piece of rubber or similar material, carefully pry the six (6) Softkey Keypad Bezel locking tabs free from the case. The following tips help with the removal process:

- The flat blade screwdriver tip must be less than 3.5 mm (0.13") wide and as thin as possible. If available, recommended is a screwdriver made of fiberglass or other material that will not scratch the bezel.
- As each locking-tab releases, the bezel comes up a bit.
- The basic technique is to move the protective piece of rubber (or similar material) next to the slot, press the screwdriver straight in between the case and the bezel, and then gently lever the screwdriver AWAY from the bezel using the rubber as protection for the case finish.

13. When the six (6) locking tabs are released, lift the bezel up and set aside.

Remove Soft Key Keypad Membrane and Flex PCB

14. Lift the Soft Key Keypad Membrane out of the case and set it aside, revealing the underlying Soft Key Keypad Flex PCB.

Caution	Exercise extreme caution working around the Soft Key Keypad ribbon cable. Do not touch it with a screw driver or other tool.

15. The Soft Key Keypad Flex PCB is connected to the Main Keypad PCB by a ZIF (Zero Insertion Force) “Flip Lock” SMF connector on the Main Keypad PCB.
16. The Connector Flip Lock is help in place with a drop of silicon sealant.
17. Using a plastic or similar scraper, scrape scrap the sealant off the connector, and gently pry to the connector latch up, freeing the Soft Key Keypad Flex PCB.
18. Remove and set aside the old Soft Key Keypad Flex PCB.

Caution	The two keypad PCBs are fragile. Handle them with great care.

Replace Soft Key Keypad Components

19. Insert the replacement Soft Key Keypad Flex PCB into its slot.
20. Gently feed the right end of the Soft Key Flex PCB into the open Flip Lock connector and when positioned correctly, snap the Lock into position.
21. Apply a drop of silicon sealant to the Flip Lock and the underlying Soft Key Keypad Flex PCB. The sealant drop should not protrude more than 2 mm above the top of the connector.
22. Allow ample time for the sealant to set before proceeding.
23. Insert the replacement Soft Key Keypad Membrane into the case slot, marking sure the center Membrane latch cutouts correctly match up with the case latch slots as shown in Figure 4-13 on page 4-30 above.
    - Note that the membrane can only go in one way with the center slots offset to the right.
24. Replace the Soft Key Keypad Bezel making sure that it has the correct orientation.
    - The bezel end with two latches goes towards the left side of the instrument.
    - The bezel end with two inset latches goes toward the right side of the instrument.
25. Work your way around the bezel gradually getting each Locking Tab into its slot. Take care not to bend any locking tab.
26. When all are correctly inserted, go around again snapping each tab into place.
27. When complete, each Soft Key button should protrude approximately 1.5 to 2 mm above the bezel.

Install Main Keypad Membrane and Bezel

28. Starting at the bottom of the Main Keypad, lay in the Main Keypad Membrane working towards the top.
29. At the top, lift up the left edge of the Speaker and lay in the Membrane.
30. Again at the top, lift up the right edge of the Speaker and lay in the Membrane.
31. When complete, the Speaker should sit ON TOP of the Membrane.
32. Make sure the Soft Key Keypad ribbon cable is still securely connected.
33. Replace Main Keypad Bezel by first centering it on the keys and the Speaker.
34. Work your way around the bezel gradually positioning each Locking Tab into its slot. Take care not to bend any Locking Tab.
35. When all are correctly inserted, go around again snapping each tab into place.
36. When complete, each button should protrude approximately 1.5 to 2 mm above the bezel.

Install Rotary Knob

37. Turn the instrument and install the Rotary Knob. There is no specific orientation for the Knob.

Install Battery and Battery Door

38. Install the Batter and Battery Door and restart the instrument.
39. Do a function check for each button on the Main Keypad and the Soft Key Keypad.

4-25 Replace Hand Strap Handle – 3-61470

This procedure provides instructions for replacing the right side Hand Strap using existing hardware. The case does not need to be opened for this procedure.

Part Numbers

- 3-61470 – Hand Strap

Procedure

1. Place the instrument face up on a protected work surface orientated with the Connector Strip toward the right.
2. Using the flat blade screwdriver, remove the two M3 Slotted Screws holding the two Plastic Ring Holders to the case.
3. Orient the strap so that the word “Anritsu” reads correctly.
4. Capture one Handle End Ring with the Ring Holder and screw into place.
5. Making sure the strap is not twisted, capture the remaining ring with the Ring Holder. and screw into place.

4-26 Replace Rotary Knob – 3-61360-2

This procedure covers removing and replacing the Rotary Knob. The case does not need to be opened for this procedure. Note that this part does not include the Rotary Encoder. To replace the Rotary Encoder, see:

- Section 4-15 – Replace Rotary Encoder – 3-410-101 on page 4-27

Part Numbers

- 3-61360-2 – Rotary Knob
  - For either MS2026B or MS2028B instruments
  - Does not include the 3-410-101 – Rotary Encoder

Procedure

1. Use a medium flat blade screwdriver and a small protective piece of rubber to remove the Rotary Knob.
2. Position the rubber piece next to the Knob, and slide in the screwdriver between the Knob and the Case.
3. Gentle lever the Knob up and off of its mounting shaft.
4. Position the replacement Knob over the shaft and press into place. There is no required orientation of the Knob.

Chapter 5 — Troubleshooting

5-1 Introduction

This chapter describes the primary troubleshooting operations that can be performed. Perform the troubleshooting suggestions in the order in which they are listed.

Only qualified service personnel should replace internal assemblies. Major sub-assemblies that are shown in the replaceable parts list are typically the items that may be replaced.

Because they are highly fragile, items that must be soldered may not be replaced without special training. Removal of RF shields from PC boards or adjustment of screws on or near the RF shields will detune sensitive RF circuits and will result in degraded instrument performance.

5-2 Turn-on Problems

Unit Cannot Boot Up

Unit cannot boot-up, no activity occurs when the **On/Off** key is pressed:

1. Battery may have been fully discharged. Use an external charger (Anritsu PN 2000-1374) to charge a completely discharged battery.
2. Battery may be the wrong type. Use only Anritsu approved battery packs. Some non-approved battery packs will fit into the MS202XB but they are electrically incompatible and will not charge correctly.
3. External AC to DC power adapter may have failed or be the wrong type. Replace the external power adapter.
4. **On/Off** switch may have damaged. Replace the rubber keypad membrane.
5. Main PCB may have failed. Replace the Main PCB Assembly.

Unit Cannot Complete Boot-Up

Unit begins the boot process, but does not complete boot-up:

1. Firmware update may not have completed. Reload firmware using Master Software Tools.
2. Main PCB may have failed. Replace the Main PCB Assembly.

Unit Boots with No Display

Unit produces a ding sound after a while, but with no display:

1. If the display is dim, check the Brightness setting under the System Menu | System Options.
2. LCD Backlight Inverter PCB may have failed. Replace LCD Backlight Inverter PCB.
3. LCD may have failed. Replace the LCD Display Assembly.
4. The Main PCB may have failed. Replace the Main PCB Assembly.

Boot-up Self Test Fails

The unit boot-up self test fails with an error message:

1. Perform a Master Reset (Press **Esc** and **On/Off** key to power on the unit after power off the unit).
2. The Main PCB may have failed. Replace the Main PCB Assembly.

5-3 Operating Problems

IF Out of Range Message

1. VNA Module may have damaged. Replace VNA Module.

Lock Error Message

1. VNA Module may have damaged. Replace VNA Module.

2. Main PCB may have failed. Replace Main PCB Assembly.

Option 5, Power Monitor Problems

1. Verify correct operation of RF detector.

2. Power Monitor PCB Assembly Option 5 PCB may have failed. Replace Option 5 PCB.

Appendix A — Test Records

A-1 Introduction

This appendix provides test records that can be used to record the performance of the MS2026B and MS2028B VNA Masters. 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:

- “MS2026B VNA Master Test Record” on page A-2
  - “Instrument Information” on page A-2
  - “VNA Frequency Accuracy” on page A-2
  - “S-Parameter Measurements Verification” on page A-2
  - “Transmission Dynamic Range” on page A-2
  - “Power Measurement (For instruments with Option 5 Power Monitor)” on page A-3
- “MS2028B VNA Master Test Record” on page A-4
  - “Instrument Information” on page A-4
  - “VNA Frequency Accuracy” on page A-4
  - “S-Parameter Measurements Verification” on page A-4
  - “Transmission Dynamic Range” on page A-4
  - “Power Measurement - Instruments with Option 5 Power Monitor” on page A-5

A-2 MS2026B VNA Master Test Record

Instrument Information

Serial Number:	Firmware Revision:	Operator:
Options:		Date:

VNA Frequency Accuracy

Table A-1. Spectrum Analyzer (SA) - Frequency Accuracy

VNA Output Frequency	Specification	Frequency Counter Reading
2.6 GHz	±3.9 kHz	kHz

S-Parameter Measurements Verification

_____ Attached Verification Report

Transmission Dynamic Range

Table A-2. Transmission Dynamic Range

Frequency Range	Specification	Measured Value (S21)	Measured Value (S12)
5 kHz to 3 GHz	80 dB	dB	dB
3 GHz to 6 GHz	75 dB	dB	dB

Power Measurement (For instruments with Option 5 Power Monitor)

Table A-3. Power Measurement for Instruments with Power Monitor Option 5

Power Level @ 1 GHz	Specification	Measured Value
+13 dBm	± 1 dB	dBm
0 dBm	± 1 dB	dBm
–7 dBm	± 1 dB	dBm
–21 dBm	± 1 dB	dBm
–40 dBm	± 1 dB	dBm

A-3 MS2028B VNA Master Test Record

Instrument Information

Serial Number:	Firmware Revision:	Operator:
Options:		Date:

VNA Frequency Accuracy

Table A-4. Spectrum Analyzer (SA) - Frequency Accuracy

VNA Output Frequency	Specification	Frequency Counter Reading
2.6 GHz	±3.9 kHz	kHz

S-Parameter Measurements Verification

_____ Attached Verification Report

Transmission Dynamic Range

Table A-5. Transmission Dynamic Range

Frequency Range	Specification	Measured Value (S21)	Measured Value (S12)
5 kHz to 3 GHz	80 dB	dB	dB
3 GHz to 6 GHz	75 dB	dB	dB
6 GHz to 20 GHz	65 dB	dB	dB

Power Measurement - Instruments with Option 5 Power Monitor

Table A-6. Power Measurements for Instruments with Power Monitor Option 5

Power Level @ 1 GHz	Specification	Measured Value
+13 dBm	±1 dB	dBm
0 dBm	±1 dB	dBm
–7 dBm	±1 dB	dBm
–21 dBm	±1 dB	dBm
–40 dBm	±1 dB	dBm

Appendix B — Test Fixture Schematics

B-1 Introduction

The following schematics are provided for those wishing to build their own test fixtures for the Option 10 verification test. The part numbers referenced in the schematics are Anritsu part numbers.

B-2 T2904 Test Fixture Schematic

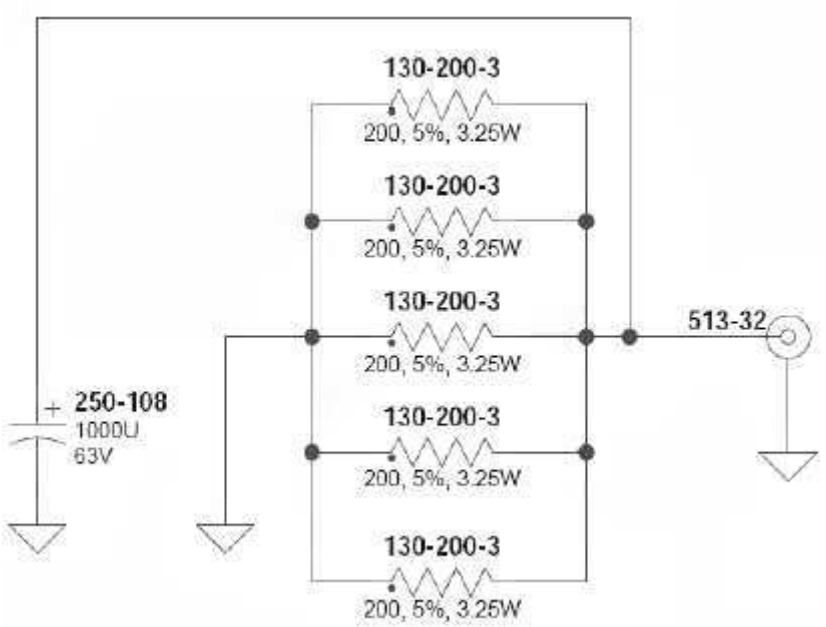


Figure B-1. T2904 Test Fixture Schematic

B-3 T3377 Test Fixture Schematic

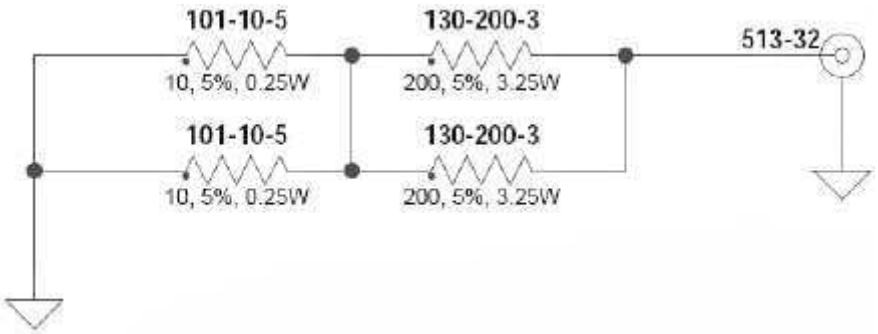


Figure B-2. T3377 Test Fixture Schematic

B-4 T3536 Test Fixture Schematic

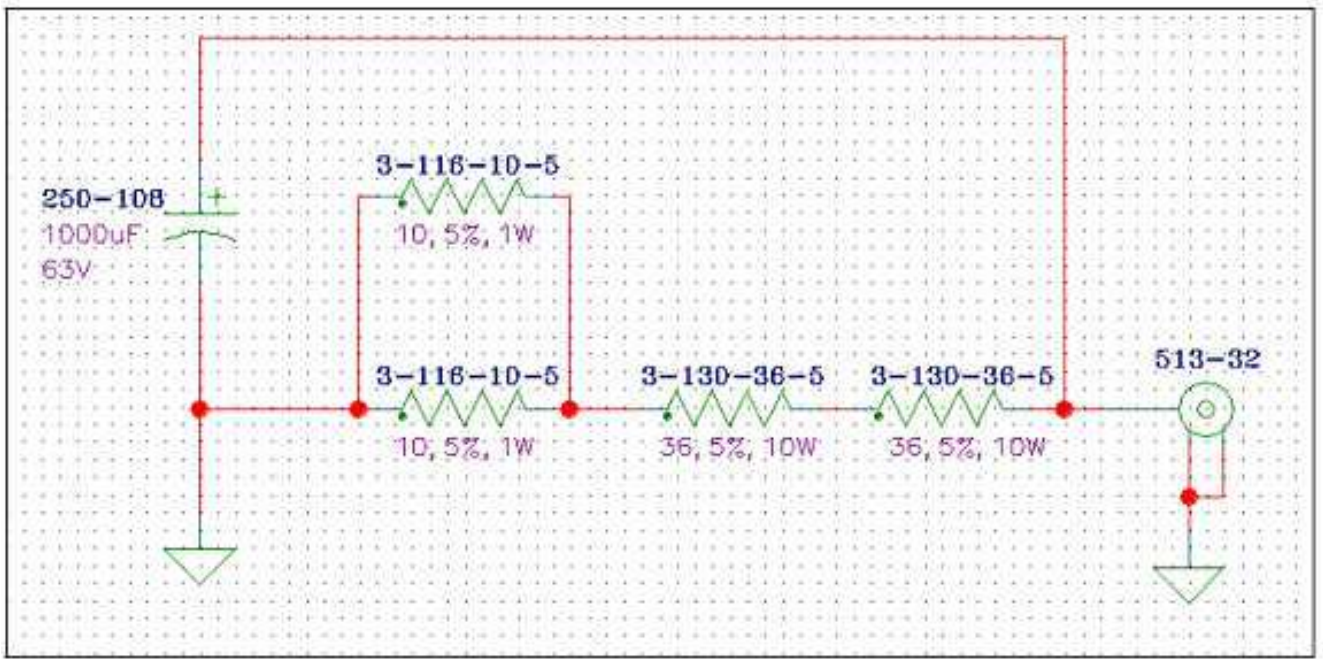


Figure B-3. T3536 Test Fixture Schematic

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