Maintenance Manual

Bit Master MP1026B

Eye Pattern Analyzer

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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.

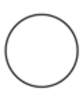
Caution

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

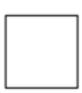
The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions *before* operating the equipment. Some or all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

Caution

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

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

Table of Contents

Chapter 1 — Introduction

1-1 Introduction

This manual provides maintenance instructions for the Bit Master Model MP1026B Eye Pattern Analyzer. The manual provides operational tests, performance verification procedures, battery pack information, part replacement procedures, and a list of replaceable parts and assemblies. Appendix A contains a blank test record to copy for recording measured values.

Familiarity with the basic operation of the front panel keys (for example, accessing menus using the **Shift** key, or the meaning of submenu key or soft key is assumed).

Caution	Before making any measurement, ensure that all equipment has warmed up for at least 30 minutes.

1-2 Description

The MP1026B is a handheld eye pattern analyzer that is capable of sampling and displaying eye patterns or pulse patterns for high speed signals such as OC192, 10 Gbps Ethernet, and Fiber Channel. It provides convenient measurements for field or lab use and is an excellent diagnostic tool for identifying sources of noise and jitter that degrade signal quality.

1-3 Recommended Test Equipment

Table 1-1 lists the recommended equipment for use in testing and maintaining the MP1026B Eye Pattern Analyzer.

Table 1-1. Recommended Test Equipment

Instrument	Critical Specification	Recommended Manufacturer/Model
Pulse Pattern Generator	Internal Clock Frequency: 0.05 GHz to 12.5 GHz Amplitude: *V*p-p = 2.0 V Pattern: PRBS	Anritsu Model MP1763x[a] with Option 01
Synthesized Signal Generator	Frequency: 10 MHz to 40 GHz	Anritsu Model MG3694A or MG3694B with options 2A and 5
Power Meter	Power Range: –70 dBm to +20 dBm	Anritsu Model ML2437A or Model ML2438A
Power Sensor	Frequency: 10 MHz to 40 GHz Power Range: –70 dBm to +20 dBm	Anritsu Model MA2474D
Frequency Reference	Frequency: 10 MHz	Symmetricom Model RubiSource T&M
DC Power Supply	0 to 500 mVDC capability	Agilent Model E3631A
DC Multimeter	0 to ±500 mVDC capability	Agilent Model 34401A
Fixed Attenuator	Frequency: DC to 40 GHz Attenuation: 20 dB	Anritsu 43KC-20
Power Splitter	Frequency: DC to 40 GHz	Anritsu Model K241C
RF Cables	Frequency: DC to 40 GHz	Anritsu Model 15KKF50-1.5A (Quantity 3)
Termination	Frequency: DC to 40 GHz	Anritsu Model 28K50 or K210
Adapter	Frequency: DC to 40 GHz K(f) to K(f)	Anritsu Model K222B
Adapter	Frequency: DC to 40 GHz K(m) to K(m)	Anritsu Model K220B
Adapter	Banana plug to BNC(f)	Any (quantity 2)
Adapter	BNC(f) to SMA(m)	Any
BNC Tee	Impedance: 50 Ohm	Any
BNC(m) to BNC(m) cable	Impedance: 50 Ohm	Any (quantity 2)

a. The instructions in Chapter 2 and Chapter 3 are written based on the use of an Anritsu Model MP1763x Pulse Pattern Generator (PPG). An Anritsu Model MP1800A Signal Quality Analyzer with the following suggested configurations may substitute for the Anritsu MP1763x PPG.

Suggested MP1800A Configuration:

– MP1800A Main Frame with MP1800A-014 (2 slots for PPG and/or ED [2-Option])
– MU181000A 12.5 GHz Synthesizer Module
– MU181020A Pulse Pattern Generator Module with MU181020A-002 and MU181020A-011

Chapter 2 — Operational Tests

2-1 Introduction

The tests in this chapter are confidence checks to help ensure that the MP1026B is functioning properly. To verify conformance to specifications, perform the tests in Chapter 3-1, Performance Verification Tests.

Note	Anritsu company recommends that you use an external power supply during operational tests of the MP1026B.

Operational Tests

- Application Self-Test
- Clock Trigger Frequency Lock Test

2-2 Application Self-Test

1. Press the **Shift** key and then the **Calibrate** (2) key. Press the Calibrate Amplitude soft key and then press the **Enter** key to perform an amplitude calibration.

Caution	Do not apply any signals to the input ports of the MP1026B while performing amplitude calibration.

2. Press the **Shift** key and then the **System** (8) key. Press the Application Self-Test soft key to perform a self test on the MP1026B. Verify that the test is successful.

2-3 Clock Trigger Frequency Lock Test

1. Set the Pattern Pulse Generator (PPG) clock to 1.0 GHz, PPG clock amplitude to 2 Vpp, and PPG data amplitude to 500 mVpp.
2. Install a 20 dB fixed attenuator to the CLK IN connector of the MP1026B.
3. Connect the PPG clock cable to the attenuator on the CLK IN connector of the MP1026B. The attenuator reduces the PPG clock signal from $V_{p\text{-}p}$ = 2 V to $V_{p\text{-}p}$ = 200 mV.
4. Connect the PPG data cable to the CH1 connector of the MP1026B. Refer to Figure 2-1.

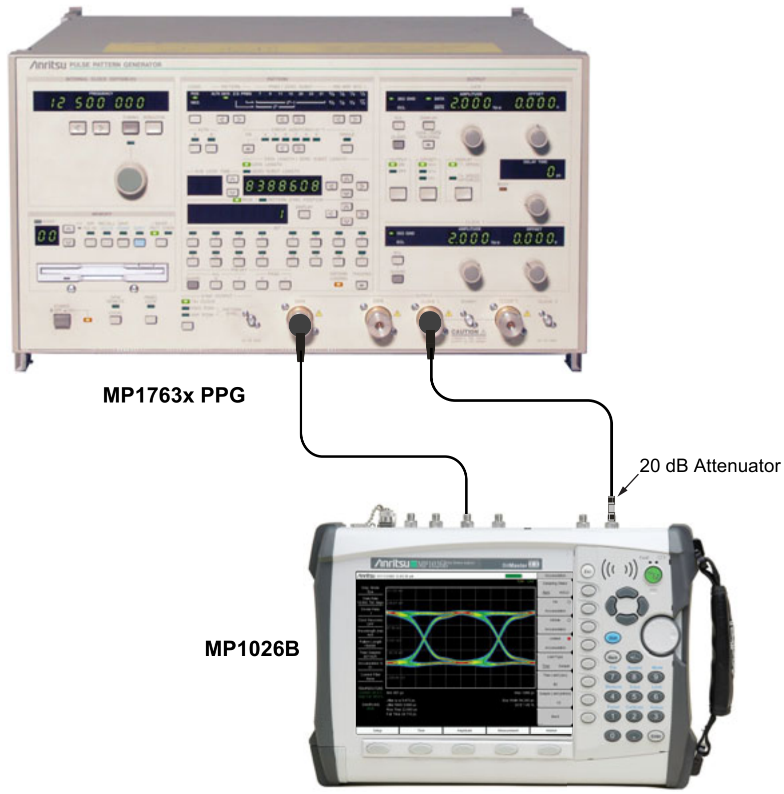


Figure 2-1. Clock Trigger Frequency Lock Test Setup

5. Press the **Shift** key and then the **Preset** key. Press the Preset soft key to preset the MP1026B.
6. Press the Time soft key and then press the Acquire Clock Rate soft key.
7. Verify that the clock rate that is shown on the upper left corner of the display changes to 1.000 GHz.
8. Change the PPG clock frequency to 12.495 GHz.
9. On the MP1026B, press the Acquire Clock Rate soft key again and verify that the displayed clock rate is 12.495 GHz.
10. Change the PPG clock frequency to 999 MHz.
11. On the MP1026B, press the Acquire Clock Rate soft key again and verify that the clock rate display changes to 999 MHz.

Chapter 3 — Performance Verification Tests

3-1 Performance Verification Tests

The performance verification tests in this chapter ensure that the instrument is capable of making measurements to published accuracy specifications. A blank performance verification test record (including specifications) is provided in Appendix A, “Test Records”. Make a copy of the test record and use it to record measured values.

Note	Anritsu Company recommends that you use an external power supply during performance verification tests of the MP1026B.

Verification Tests

- Bandwidth Verification
- Amplitude Accuracy Verification
- RMS Noise Verification
- RMS Jitter Verification
- Clock Recovery (CRU) RMS Jitter Verification (Option 2)

3-2 Bandwidth Verification

Required Test Equipment:

- Synthesized Signal Generator, Anritsu Model MG3694A or MG3694B with options 2A and 5
- Power Meter, Anritsu Model ML2437A or Model ML2438A
- Power Sensor, Anritsu Model MA2474D
- Power Splitter,Anritsu Model K241C
- Adapter, Anritsu Model K220B
- Adapter, Anritsu Model K222B
- RF Cables (2), Anritsu Model 15KKF50-1.5A
- MP1026B

Verification Test:

1. Perform a Zero/Cal on the MA2474x power sensor. Set the calibration factor of the power sensor to 100 MHz.
2. Connect the external 10 MHz reference signal to 10 MHz Ref In connector on the rear panel of the MG3694x synthesized signal generator.
3. Set the MG3694x as follows:

   F1 to 100 MHz
   Level to –5 dBm
4. Restore the MP1026B to factory settings by pressing the **Shift** key and then the **Preset** key, then by pressing the Preset soft key.

5. Press the **Shift** key and then the **Calibrate** key. Press the Calibrate Amplitude soft key, and then press the **Enter** key to perform an amplitude calibration.

Caution	Do not apply any signals to the input ports on the MP1026B while performing amplitude calibration.

6. Connect the instruments, power splitter, and adapters as shown in the diagram in Figure 3-1.

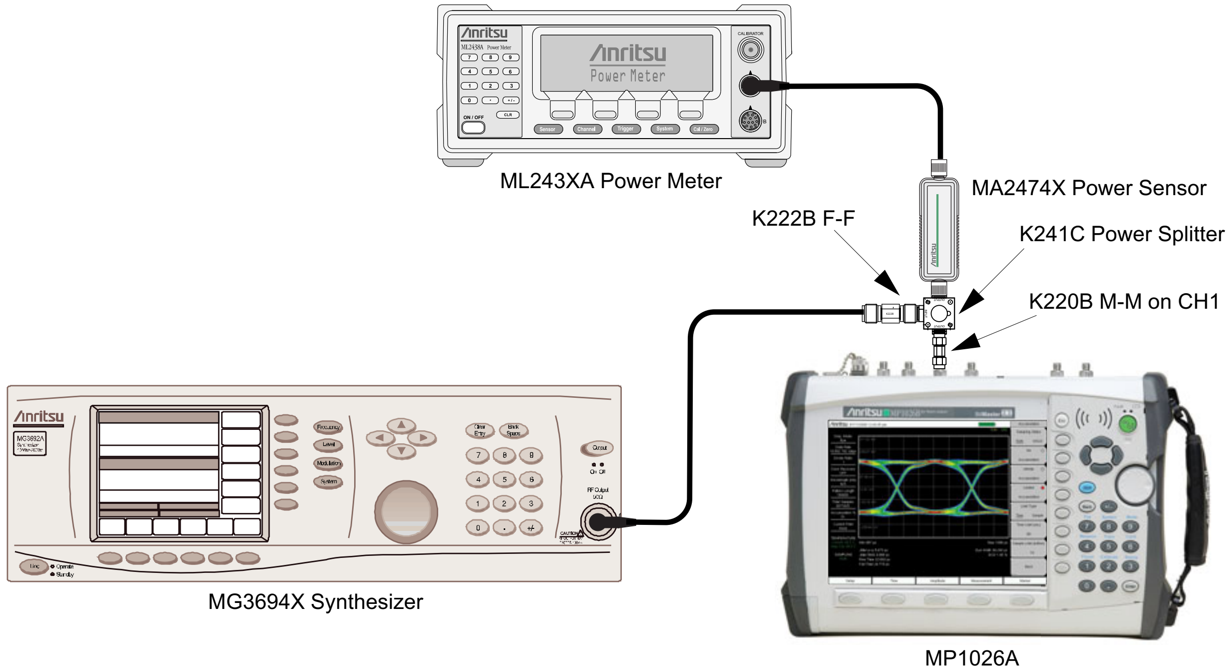


Figure 3-1. Bandwidth Verification Setup

7. Adjust the level of the MG3694X so that the power meter reads –10.0 dBm ± 0.1 dB.
8. On the MP1026B, press the Setup soft key and set the Display Mode to Pulse.
9. Press the Measurement soft key, then press Histogram, and ensure that Axis is set to Ampl.
10. Set the histogram window (defined by the red borders) as follows:

    X1 to 0
    X2 to 2
    Y1 to 120 mV
    Y2 to –120 mV

11. Press the Amplitude soft key and set the Scale of CH1 to 50 mV.
12. In the measurement results section at the bottom left of the display, note the p p (peak-to-peak) value. Record this value as the Reference Value in Table A-1, "CH1 Bandwidth Verification" on page A-2. Multiply the p p value by 0.707 to compute the half-power point (3 dB bandwidth point) voltage. Record the calculated half-power point voltage in Table A-1.
13. Set the frequency of the MG3694X to 18 GHz.
14. Set the calibration factor of the power sensor to 18 GHz.
15. Adjust the output level of the MG3694X until –10.0 dBm ± 0.1 dB appears on the power meter.
16. Record the p p value at 18 GHz and compare it to the half-power point voltage. It should be greater than the half-power point voltage.
17. Increase the frequency of the MG3694X by 1 GHz and set the sensor calibration factor to match the new frequency.

18. Adjust the level of the MG3694X so that –10.0 dBm ± 0.1 dB appears on the power meter.

19. Record the p p value in Table A-1 for the new frequency and compare it to the half-power point voltage. It should be greater than the half-power point voltage.

20. Repeat Step 17 through Step 19 until the p p voltage falls below the half-power point. (It is generally not necessary to test all of the frequencies in Table A-1, “CH1 Bandwidth Verification” on page A-2. Stop testing when the voltage falls below the half-power point voltage. The half-power point must be above 20 GHz).

21. Press the Measurement soft key, change Active Channel to CH2, and move the connection on the MP1026B from CH1 to CH2.

22. On the MG3694X, set the frequency to 100 MHz and set the level to –5 dBm.

23. Repeat Step 7 through Step 20 for CH2 and record the values in Table A-2, “CH2 Bandwidth Verification” on page A-3.

3-3 Amplitude Accuracy Verification

Required Test Equipment:

- Pulse Pattern Generator, Anritsu Model MP1763x with Option 01
- DC Multimeter, Agilent Model 34401A
- DC Power Supply, Agilent Model E3631A
- MP1026B
- BNC Tee
- RF Cable, Anritsu Model 15KKF50-1.5A

Verification Test:

1. Restore the MP1026B to factory settings by pressing the **Shift** key and then the **Preset** key, and then by pressing the Preset soft key.
2. Press the Time soft key and set the Clock Rate to 10.0 GHz. Confirm that the Divide Ratio is 1.
3. Press the **Shift** key and then the **Calibrate** key. Press the Calibrate Amplitude soft key, and then press the **Enter** key to perform an amplitude calibration.

Caution	Do not apply any signals to the input ports on the MP1026B while performing amplitude calibration.

4. Set the clock output of the Pulse Pattern Generator (PPG) to 10.0 GHz, 500 mVpp. Connect the PPG clock output to the CLK IN connector of the MP1026B.
5. Set the voltage output of the power supply to 400 mV.

Caution	A voltage greater than ± 2 Volts (at any connector) may damage the MP1026B.

6. Connect the power supply, multimeter, BNC Tee, and cables as shown in the diagram in Figure 3-2. The power is applied through the BNC Tee to the CH1 test port of the MP1026B.

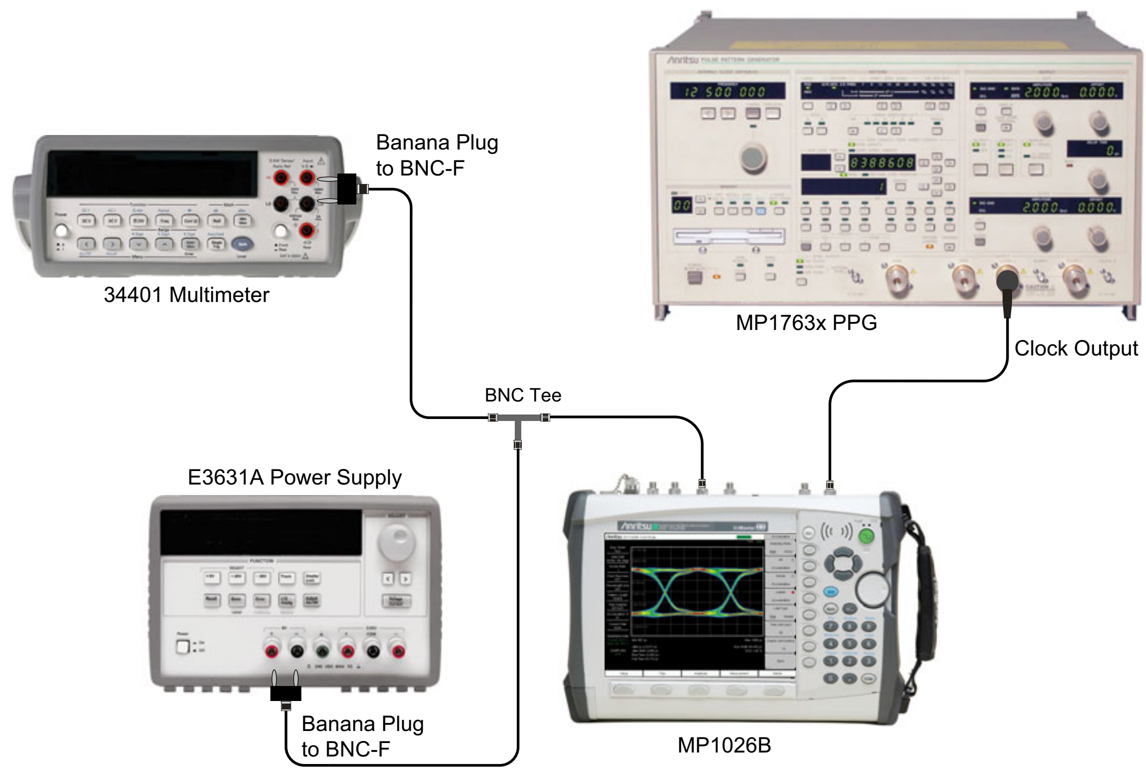


Figure 3-2. Amplitude Accuracy Test Setup

7. On the MP1026B, press the Setup soft key and set Display Mode to Eye.
8. Press the Measurement soft key and press Histogram.
9. Set the histogram window (defined by the red borders) as follows:

   X1 to 0
   X2 to 2
   Axis to Ampl

10. Press the Amplitude soft key and set the Scale of Channel 1 to 140 mV.
11. Adjust the voltage output of the power supply so that the display reads +420 mV. This is the first DC voltage in Table 3-1 on page 3-6.
12. Press the Measurement soft key on the MP1026B and press Histogram.
13. Set Y1 to 450 mV and Y2 to 390 mV.
14. Press the Setup soft key and press Clear Display to refresh the display.
15. Record the mean voltage (shown in the measurement results window at the bottom of the display) in Table A-3, “CH1 Amplitude Accuracy Verification” on page A-4, and confirm that the measured value is within the upper and lower specifications.
16. Adjust the power supply so the DVM displays the next voltage in Table 3-1.
17. Set Scale per Table 3-1.
18. Set Y1 and Y2 per Table 3-1.
19. Press the Setup soft key and press Clear Display to refresh the display.

20. Record the mean voltage (shown in the measurement results area) in Table A-3, “CH1 Amplitude Accuracy Verification” on page A-4.
21. Repeat Step 16 through Step 20 for all positive voltages in Table 3-1.
22. Change the polarity of the input voltage by rotating the banana plug at the power supply.
23. Repeat Step 16 through Step 20 for the negative voltages for the CH1 input.
24. Press the Measurement soft key and change Active Channel to CH2.
25. Move the cable from the CH1 connector to the CH2 connector of the MP1026B.
26. Repeat Step 10 through Step 23 for CH2 of the MP1026B, and record the measurement results in Table A-4, “CH2 Amplitude Accuracy Verification” on page A-5.

Table 3-1. MP1026B Settings for Amplitude Accuracy Test

DC Voltage (mV)	Channel Scale (mV/div)	Offset (V)	Y1 (mV)	Y2 (mV)
420	140	0	450	390
240	80	0	262	218
120	40	0	137	103
60	30	0	75	45
60	20	0	75	45
30	15	0	44	16
30	10	0	44	16
15	5	0	28	2
0	5	0	12.5	–12.5
–15	5	0	–2	–28
–30	10	0	–16	–44
–30	15	0	–16	–44
–60	20	0	–45	–75
–60	30	0	–45	–75
–120	40	0	–103	–137
–240	80	0	–218	–262
–420	140	0	–390	–450

3-4 RMS Noise Verification

Required Test Equipment:

- Pulse Pattern Generator, Anritsu Model MP1763x with Option 01
- RF Cable, Anritsu Model 15KKF50-1.5A
- Termination, Anritsu Model 28K50 or K210
- MP1026B

Verification Test:

1. Restore the MP1026B to factory settings by pressing the **Shift** key and then the **Preset** key, and then by pressing the Preset soft key.
2. Press the **Shift** key and then the **Calibrate** key. Press the Calibrate Amplitude soft key, and then press the **Enter** key to perform an amplitude calibration.

Caution	Do not apply any signals to the input ports on the MP1026B while performing amplitude calibration.

3. Press the Time soft key, and set the Clock Rate to 10.0 GHz.
4. Set the clock output of the Pulse Pattern Generator (PPG) to 10.0 GHz, 500 mVpp.
5. Connect the PPG clock output cable to the CLK IN connector of the MP1026B.
6. Install the termination to the CH1 input connector.
7. Press the Amplitude soft key, set the CH1 Scale to 1 mV, and set the CH2 Scale to 1 mV.
8. Press the Measurement soft key and press Histogram.
9. Set the histogram window as follows:

   Axis to Ampl
   X1 to 0
   X2 to 2
   Y1 to 4.0 mV
   Y2 to –4.0 mV
10. Press the Setup soft key, and press Clear Display to refresh the display.
11. Record the standard deviation (std Dev shown in the measurement results area) in Table A-5, "RMS Noise Verification" on page A-6.
12. Press the Measurement soft key and then change Active Channel to CH2. Move the termination from the CH1 input to the CH2 input.
13. Press the Setup soft key, and press Clear Display to refresh the display.
14. Record the CH2 standard deviation (RMS Noise) in Table A-5.

3-5 RMS Jitter Verification

Required Test Equipment:

- Pulse Pattern Generator, Anritsu Model MP1763x with Option 01
- RF Cable, Anritsu Model 15KKF50-1.5A
- MP1026B

Verification Test:

1. Set the clock output of the Pulse Pattern Generator (PPG) to 10.0 GHz, 500 mVpp.
2. Set the PPG data output to a symmetrical pattern (010101) by the following key presses:
   a. Press the key under PRBS Mark Ratio so that the ½ LED is On.
   b. In the Pattern section, press the **Left Arrow** key so that the LED under DATA is On.
   c. In the Data Length section, press the Up Arrow key so that 6 is flashing
   d. Press the 2, 4, and 6 buttons so that the 2, 4, and 6 LEDs are On.
   e. In the Offset section, set the Offset to VOH.
   f. Adjust the Amplitude of the Data signal to $V_{p\text{-}p}$ = 500 mV, offset + 250 mV.
   g. In the Output section, turn On the Output.
3. Connect the PPG clock output signal to the CLK IN connector of the MP1026B and connect the PPG data signal to the CH1 input connector.
4. Restore the MP1026B to factory settings by pressing the **Shift** key and then the **Preset** key, and then by pressing the Preset soft key.
5. Press the Setup soft key and set the MP1026B as follows:

   Display Mode to Eye
   Channel 2 to Off
   Sampling and Accumulation to Infinite Accumulation
6. Press the Time soft key, and set the Clock Rate to 10 GHz.
7. Press the Amplitude soft key. Set the CH1 Scale to 30 mV, and set Offset to 0 mV. A steep pulse rise and fall trace should appear as shown in Figure 3-3.
8. Press the Measurement soft key and press Histogram.
9. Set the histogram window as follows:

   Y1 to 5 mV
   Y2 to –5 mV
   Axis to Time
10. Set X1 and X2 so that the histogram window is over the rising edge of the steep data signal and slightly wider than the data. The histogram window should encompass the width of the rising edge data. Refer to Figure 3-3.

11. Set Y1 to 2 mV and Y2 to –2 mV.

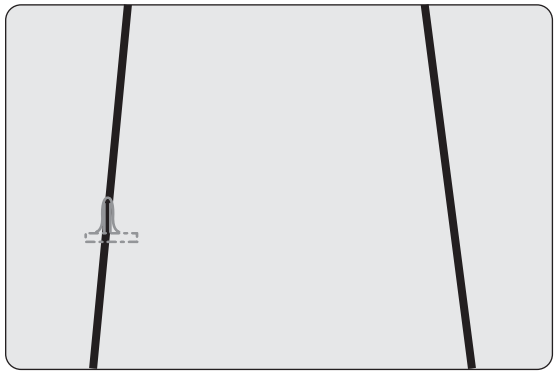


Figure 3-3. Jitter Measurement Using Histogram Window

12. Press the Setup soft key, and then press Clear Display to refresh the display.
13. After Hits count (bottom of the measurement results area) passes 10,000, observe std Dev data, which is equivalent to the RMS Jitter. Record the value in Table A-6, "RMS Jitter Verification" on page A-6.

3-6 Clock Recovery (CRU) RMS Jitter Verification (Option 2)

Caution	RMS Jitter Verification (Section 3-5) must be performed prior to doing this test.

Required Test Equipment:

- Pulse Pattern Generator, Anritsu Model MP1763x with Option 01
- RF Cable, Anritsu Model 15KKF50-1.5A
- MP1026B

Verification Test:

1. Set the clock output of the Pulse Pattern Generator (PPG) to 10.0 GHz, 500 mVpp.
2. Set the PPG data output to a symmetrical pattern (010101) by the following key presses:
   a. Press the key under PRBS Mark Ratio so that the ½ LED is On.
   b. In the Pattern section, press the Left Arrow key so that the LED under DATA is On.
   c. In the Data Length section press the **Up Arrow** so that 6 is flashing
   d. Press the 2, 4, and 6 buttons so that the 2, 4, and 6 LEDs are On.
   e. In the Offset section, set the Offset to VOH.
   f. Adjust the Amplitude of the Data to $V_{p\text{-}p}$ = 500 mV, offset + 250 mV.
3. Connect the PPG clock output to the CLK IN connector of the MP1026B.
4. Connect the PPG Data signal to the CRU IN connector.
5. Connect an RF cable between CRU OUT connector and CH2 Input connector.
6. Restore the MP1026B to factory settings by pressing the **Shift** key and then the **Preset** key, and then by pressing the Preset soft key.
7. Press the Setup soft key and set the MP1026B as follows:

   Display Mode to Eye
   Channel 1 to Off
   Clock Recovery to >8.5
   Sampling and Accumulation to Infinite Accumulation
8. Press the Time soft key and set the Clock Rate to 10 GHz.
9. Press the Amplitude soft key, set the CH2 Scale to 30 mV, and set Offset to 0 mV. A steep pulse rise and fall signal should appear.
10. On the Pulse Pattern Generator, in the Output section, turn the Output on.
11. On the MP1026B, press the Measurement soft key, set Active Channel to CH2 and then press Histogram.
12. Set the histogram window as follows:

    Set Y1 to 5 mV
    Set Y2 to –5 mV
    Set Axis to Time
13. Set X1 and X2 to set the window over the rising edge of the steep data signal, and slightly wider than the data (refer to Figure 3-3).
14. Press the Setup soft key, and press Clear Display soft key to refresh the display.
15. After Hits count (bottom of the measurement results area) passes 10,000, observe std Dev data. Record the value in Table A-7, "CRU RMS Jitter Verification" on page A-6.

16. Using the RMS Jitter data from Section 3-5, Step 13 and the std Dev data from the previous step (Step 15), calculate the CRU RMS Jitter using the following formula:

$$\text{CRU RMS Jitter} = \sqrt{\text{Std Dev}^2 - \text{RMS Jitter}^2}$$

17. Record the CRU RMS Jitter in Table A-7.

Chapter 4 — Battery Information

4-1 Introduction

The following information relates to the care and handling of the Anritsu 633-44 battery pack and of Lithium-Ion batteries in general.

- The 633-44 battery pack that is supplied with the MP1026B may need charging before use. Before using the MP1026B, the internal battery may be charged either in the MP1026B by using either the AC-DC Adapter (40-168) or the 12 Volt DC adapter (806-141), or separately in the optional Dual Battery Charger (2000-1374).
- Use only Anritsu approved battery packs. Some non-approved battery packs will fit into the MP1026B, but they are electrically incompatible and will not charge correctly.
- Recharge the battery only in the MP1026B or in an Anritsu approved charger.
- When the MP1026B or the charger is not in use, disconnect it from the power source.
- Do not charge batteries for longer than 24 hours. Overcharging may shorten battery life.
- 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.
- 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 sessions becomes noticeably shorter than normal.
- Never use a damaged or worn out charger or battery.
- Storing the battery in extreme hot or cold places will reduce the capacity and lifetime of the battery.
- Never short-circuit the battery terminals.
- Do not drop, mutilate, or attempt to disassemble the battery.
- Do not dispose of batteries in a fire!
- Batteries must be recycled or disposed of properly. Do not place batteries in household garbage.
- Always use the battery for only its intended purpose.

4-2 RTC Battery Information

The date and time are saved using a +3 V coin-style battery mounted on the main PCB. This real time clock battery has a finite lifespan. When sufficiently discharged, the boot-up self-test will fail. Refer to Chapter 5 for the location of the RTC battery and replacement instructions.

Note	Only the coin type RTC battery can be replaced by the procedure in Section 5-6 “Replacing the RTC Battery” on page 5-11. If the RTC battery is not a coin type, then Anritsu Company highly recommends that the instrument be returned to an authorized service center.

4-3 Battery Pack Removal and Replacement

This section provides instructions for the removal and replacement of the MP1026B battery pack.

Many of the procedures in this section are generic and apply to many similar instruments. Photos and illustrations that are used here are representative and may show instruments other than the MP1026B.

1. With the MP1026B laying flat and face up, locate the battery access door, as illustrated in Figure 4-1.

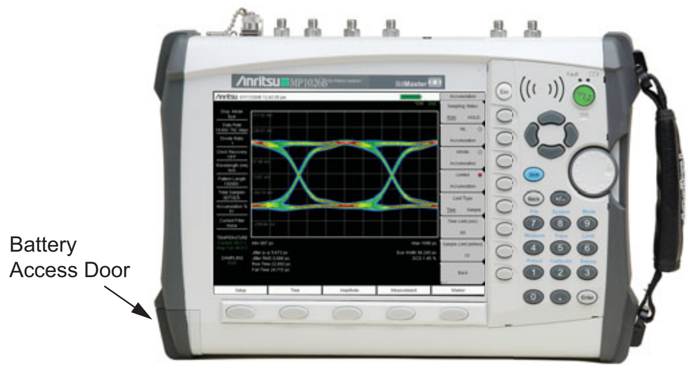


Figure 4-1. MP1026 Battery Access Door Location

2. Place a finger in the battery access door notch and push the door down towards the bottom of the instrument, as illustrated in Figure 4-3.

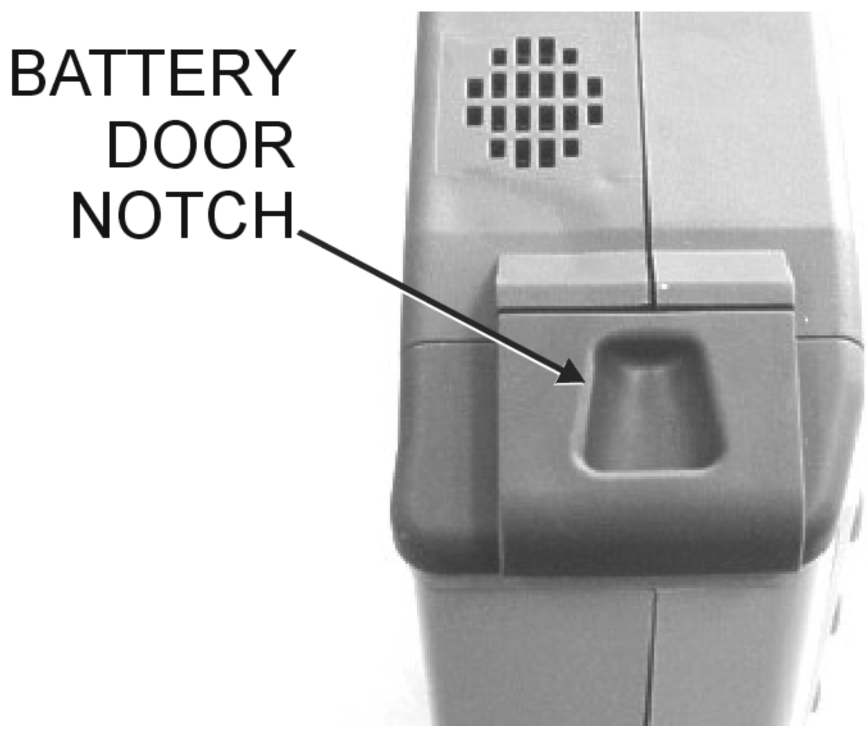


Figure 4-2. Battery Access Door Notch

3. Remove the battery access door, as illustrated in Figure 4-3.

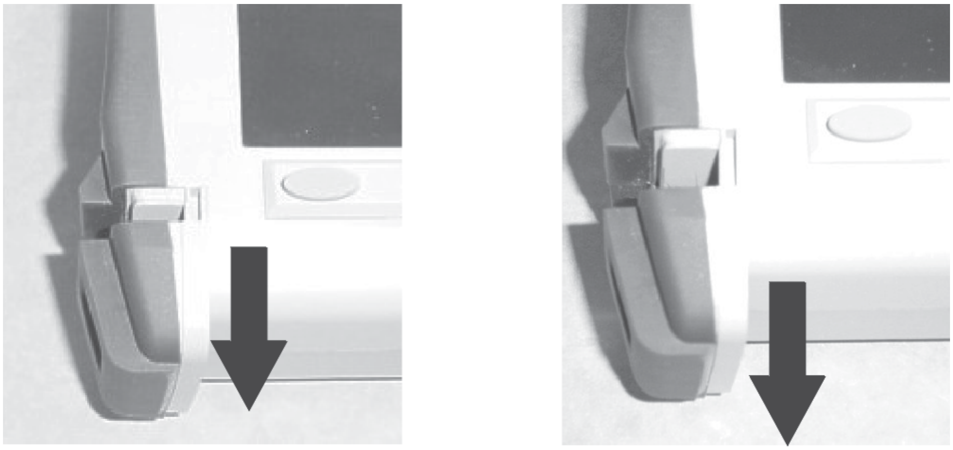


Figure 4-3. Removing the Battery Access Door

4. With the battery access door completely removed, grasp the lanyard of the battery and pull the battery straight out of the unit, as shown in Figure 4-4.

Figure 4-4. Removing the 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 (refer to Figure 4-5).

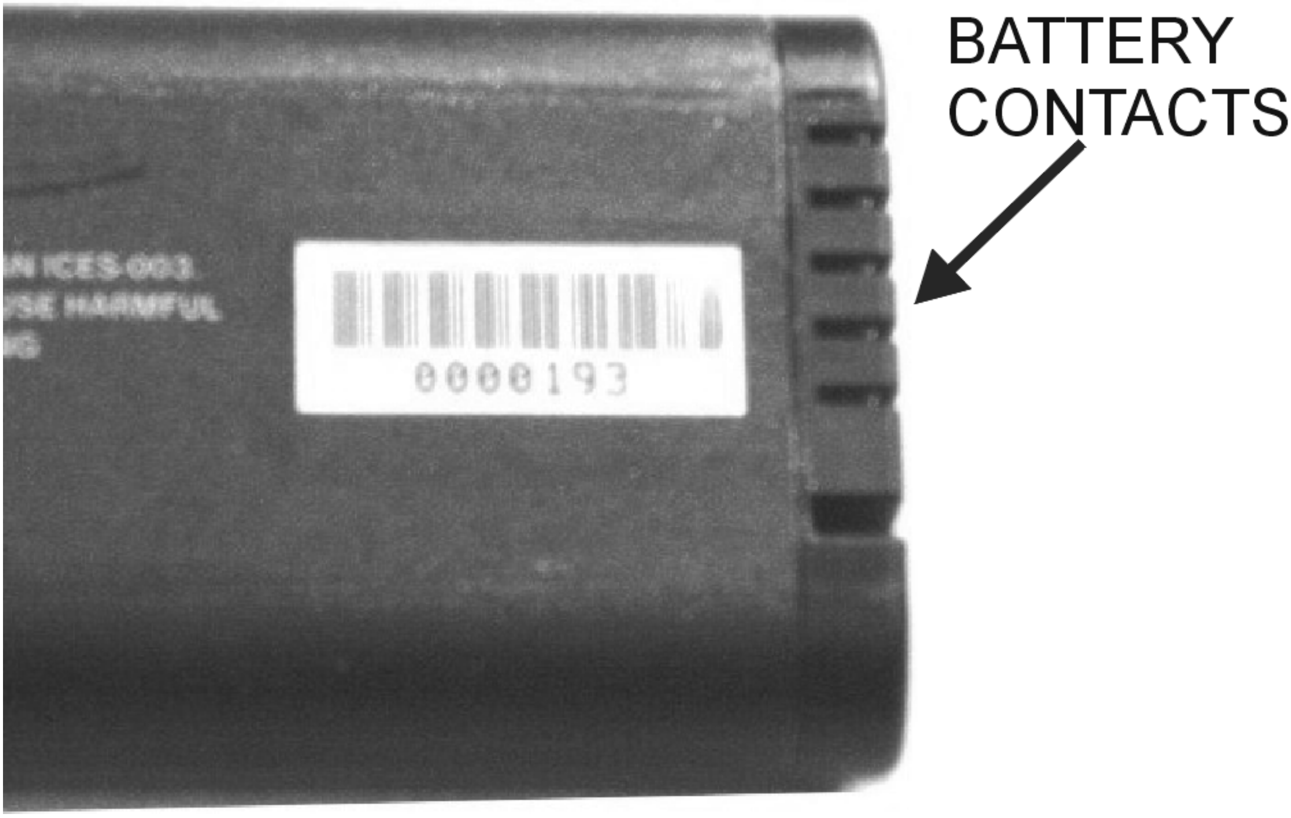


Figure 4-5. Battery Contacts

Chapter 5 — Removal and Replacement Procedures

5-1 Introduction

This chapter contains a list of replaceable parts and instructions for replacement of the major assemblies. Part numbers for all replaceable parts are found in Table 5-1.

Only qualified Service personnel should attempt to perform repairs on this instrument. During the warranty period, opening of the case by non-Anritsu Service personnel will void the warranty.

Extreme care must be used when handling internal assemblies. Careless handling causes damage.

Unless authorized by the factory, no attempts should be made to repair a defective assembly. (However, discharged RTC batteries on the main PCB may be replaced). Exchange assemblies that are determined to be damaged by improper handling will not be accepted for credit.

Removing RF shields from PC boards or adjusting screws on or near the shields may detune sensitive RF circuits and will result in degraded instrument performance.

Caution	Ensure that all work is performed at a static-safe work area.

5-2 Removal and Replacement Procedures

- Opening the MP1026B Case
- Replacing the RTC Battery
- Removing the Main PCB and Display Assemblies
- Removing LCD and Backlight Driver PCB from Main PCB
- Removing the Oscilloscope PCB
- Removing CRU Module from Scope PCB
- Removing O/E Module from Scope PCB
- Replacing Keypad Assemblies
- Replacing Function Hard Key Membrane and Switchpad

5-3 Replaceable Assemblies

Table lists the part numbers for all of the available replacement assemblies.

Table 5-1. Replaceable Assemblies

Part Number	Description
ND69854	Main MB PCB Assembly
ND69855	Oscilloscope PCB Assembly
ND69856	Clock Recovery Unit (CRU) PCB Assembly
ND69857	Optical to Electrical (OE) PCB Assembly
3-71027-3	Main Keypad PCB
3-71030-3	Soft keys PCB
3-15-118	LCD Display
3-66549-3	LCD Backlight Driver PCB
ND64383	Fan
ND68808	Top Case (excluding keypad items)
ND68809	Bottom Case with Tilt Bail
3-790-661	Case Gasket Material
61368	LCD Protective Cover
61379-2	Battery Door
3-61361	Mode keys rubber keypad
3-61362	Main keys rubber keypad
3-61363-1	Main Keyboard Bezel
3-61378-1	Soft key bezel
790-625	Speaker
3-410-103	Encoder (excluding knob)
3-61360-2	Knob (excluding encoder)
65729	Soft Carrying Case
3-2000-1567	512 MB Compact Flash Card
633-44	Li-ion Battery Pack
40-168-R	AC Adapter

For all assemblies, installation of the new assemblies is the opposite of removal.

The main PCB and oscilloscope PCB are factory-repairable exchange assemblies, which should be returned to Anritsu promptly for credit. AC adapters, batteries, LCDs, keypad parts, and non-electrical parts are not exchange assemblies and need not be returned to Anritsu.

After replacement of the main PCB or the oscilloscope PCB, recalibrations are not required.

5-4 Instrument Drawings

The figures in this section provide an overview of instrument construction.

Bit Master Case

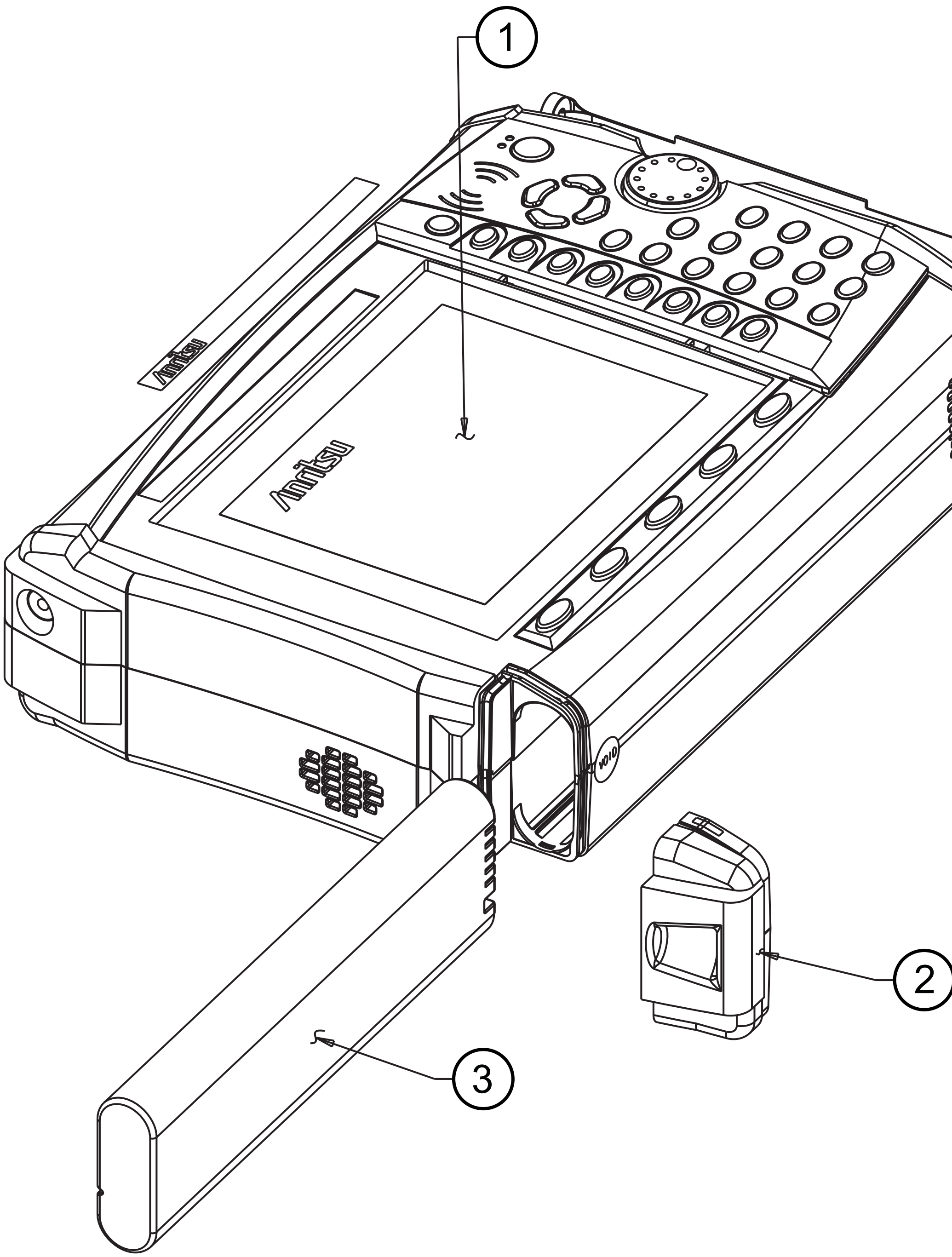


Figure 5-1. Bit Master Case and Parts Overview

1.	Display Screen
2.	Battery Door
3.	Battery

Opening the Case

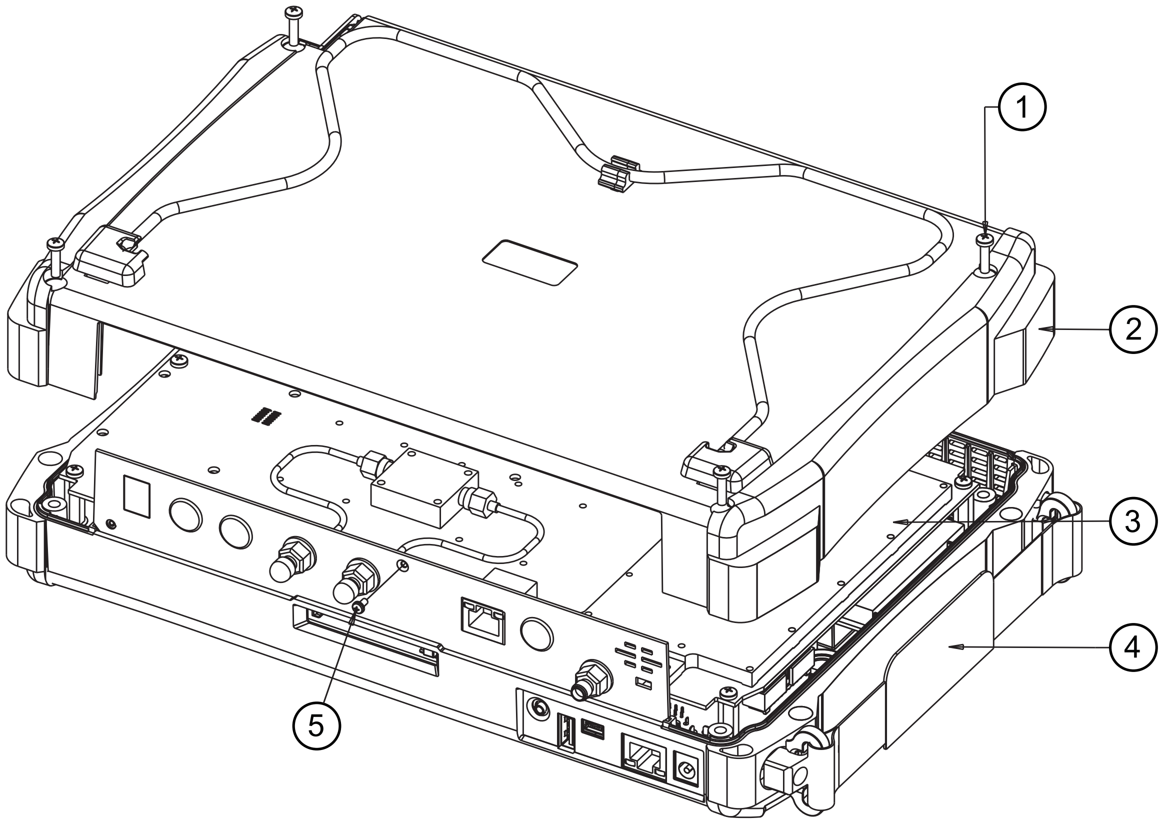


Figure 5-2. Bit Master Case Assembly Overview

1.	Phillips-Head, Pan-Head Screw (4 screws hold case bottom to case top)
2.	Case Bottom
3.	Motherboard and LCD Assembly
4.	Case Top
5.	Screw in Top Panel, adjacent to Connector CH2

Oscilloscope PCB Attaches to Motherboard

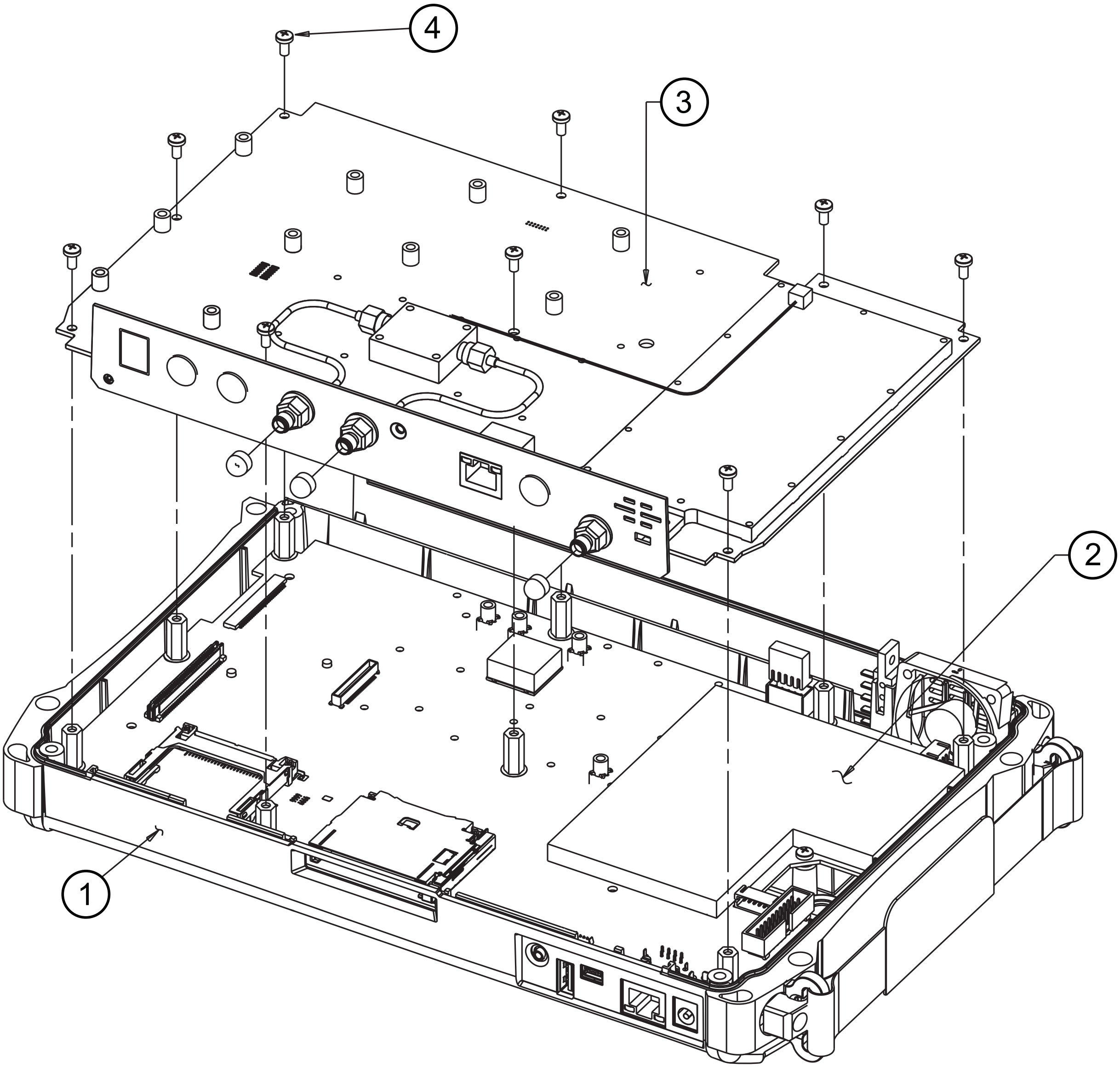


Figure 5-3. Bit Master Top Case and PWB Assembly Overview

1.	Top Case Assembly
2.	Motherboard and LCD Assembly
3.	Oscilloscope Board and Top Assembly
4.	Phillps-Head, Pan-Head Screw (9 screws hold scope board and top assembly to case top)

Motherboard in Case

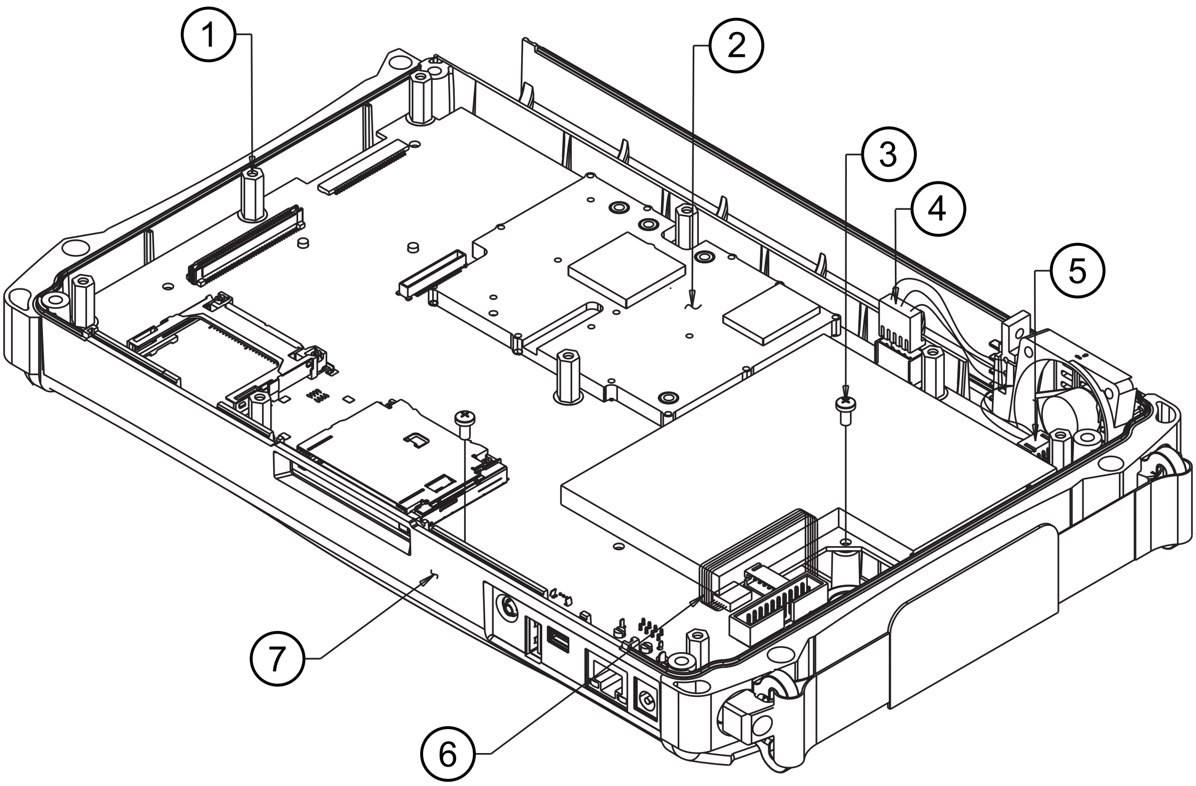


Figure 5-4. Motherboard and LCD Assembly in Top Case

1.	Standoff (8 standoffs secure motherboard and LCD assembly to top case assembly)
2.	Motherboard and LCD Assembly
3.	Phillps-Head, Pan-Head Screw (2 screws hold motherboard along with standoffs)
4.	Battery Cable Connector (plugs into J1001)
5.	Fan Cable Connector (plugs into J1002)
6.	Encoder Cable Connector (plugs into J5010)
7.	Top Case Assembly

Motherboard and LCD

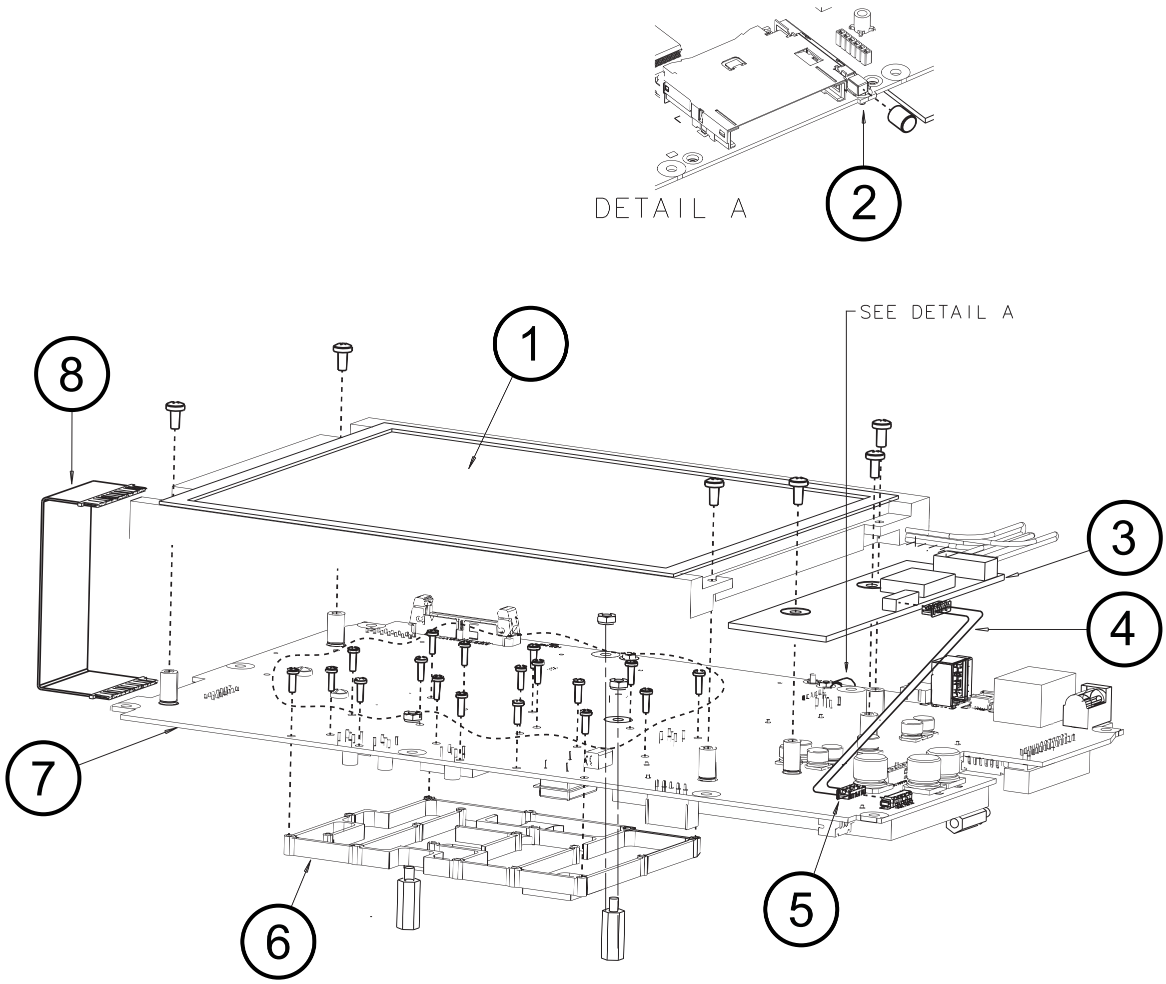


Figure 5-5. Motherboard and LCD Display

1.	LCD Display Screen
2.	Injector of Compact Flash Drive
3.	Inverter PCB for Display Backlight
4.	Inverter Cable (Inverter PCB to Motherboard)
5.	Motherboard connector J5002 (for Inverter Cable)
6.	Shield
7.	Motherboard
8.	LCD Display Cable Assembly (LCD to Motherboard)

Oscilloscope Board

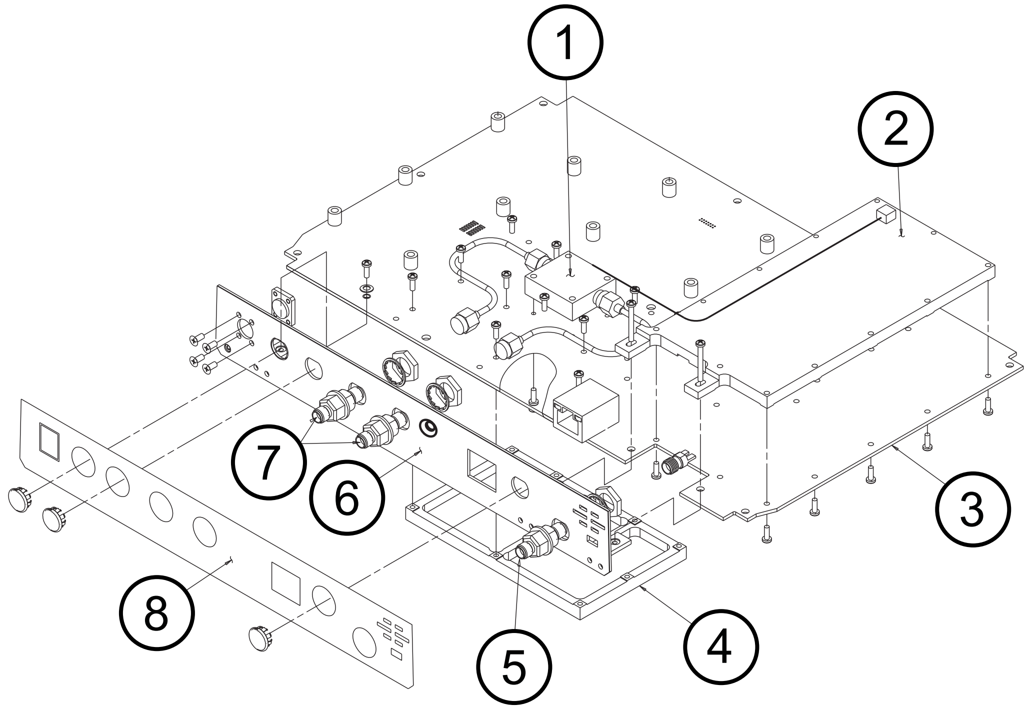


Figure 5-6. Oscilloscope Board

1.	Dual Sampler
2.	Upper Shield
3.	Oscilloscope Board
4.	Lower Shield
5.	K-female Connector Clock IN
6.	Front Panel for Connectors
7.	K-female Connectors, Channel 1 and Channel 2 Input
8.	Label for Front Panel

Oscilloscope Board with Options

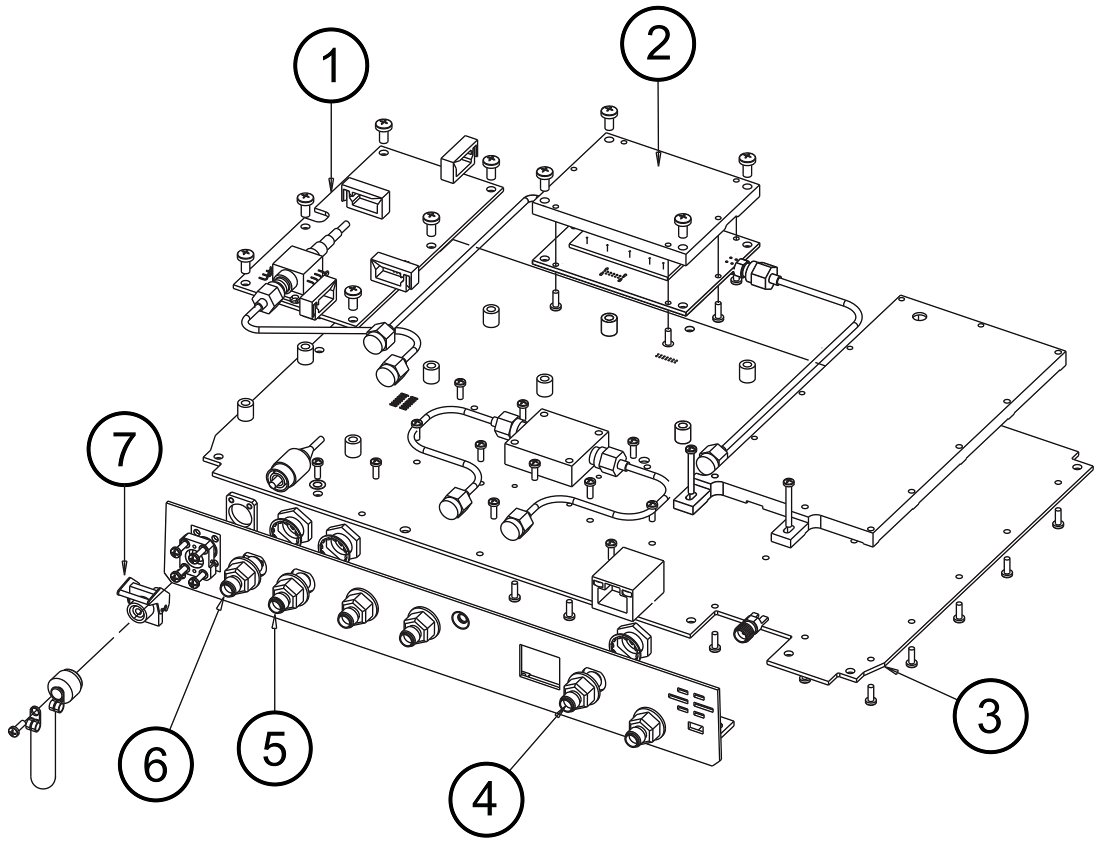


Figure 5-7. Oscilloscope Board with Option 2 and Option 3

1.	Option 3 board and Components, Optical/Electrical Interface
2.	Option 2 Board and Components, Clock Recovery Unit (CRU)
3.	Oscilloscope Board
4.	K-female Connector for CRU OUT (Option 2)
5.	K-female Connector O/E OUT, Electrical signal (Option 3)
6.	K-female Connector CRU IN (Option 2)
7.	Optical FC Connector (Option 3)

5-5 Opening the MP1026B Case

This procedure provides instructions for opening the case. Except for keypad parts replacement (refer to Section 5-12 “Replacing Keypad Assemblies” on page 5-17), the case must be opened for all maintenance operations.

Before opening the case, Anritsu Company strongly recommends that all internally saved files be saved to a PC by using the Master Software Tools utility program or be copied to an external CF card on the MP1026B. If the main PCB needs to be replaced, then this will prevent permanent loss of these files.

1. Stand up the unit in the normal operating position and remove the battery door by inserting your thumb into notch and pushing downward. Refer to Figure 4-3 on page 4-3 and Figure 4-4 on page 4-3.
2. Remove the screw next to the CH2 input connector on the top panel connector assembly.

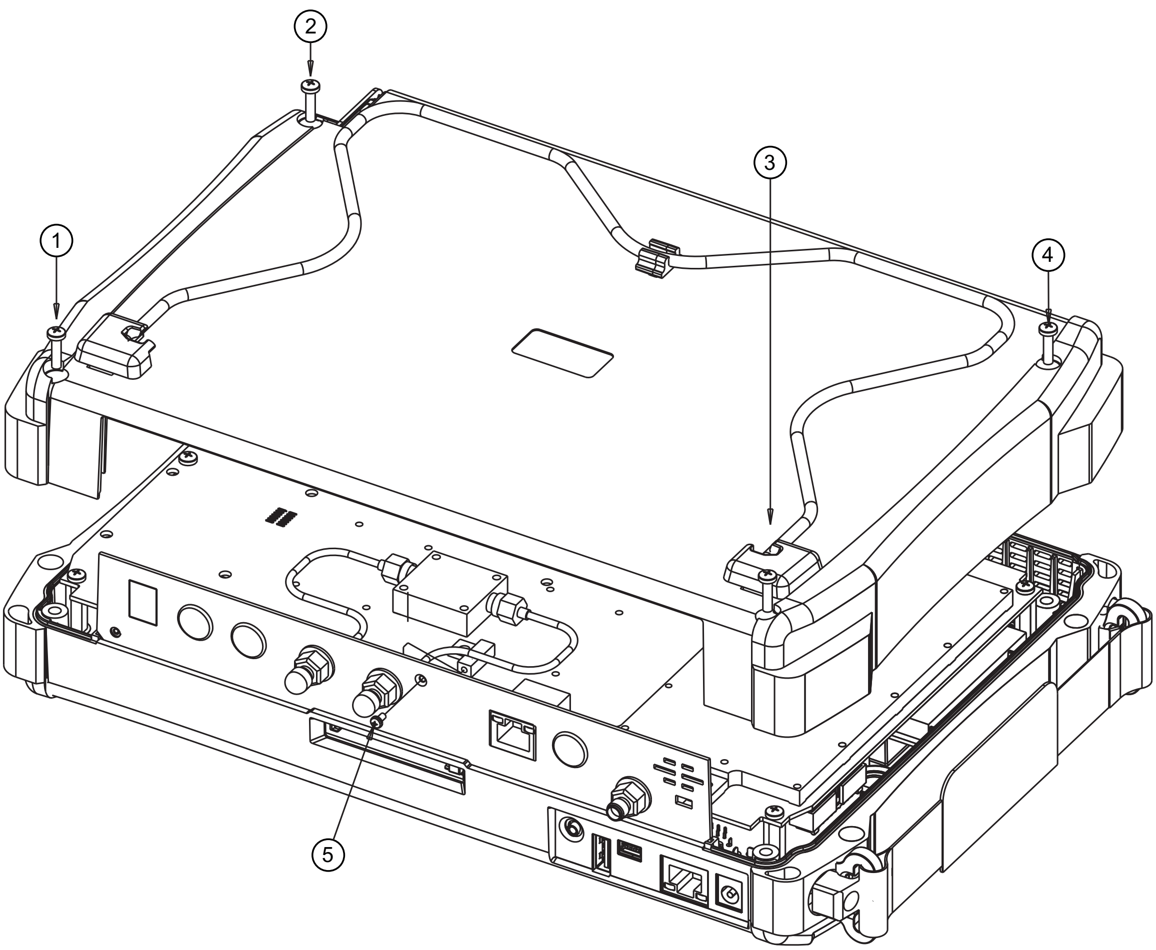


Figure 5-8. Opening the Case

1 through 4	Remove 4 Screws from Back Cover
5	Remove Screw adjacent to Connector CH1

3. Remove the 4 screws that secure the back case to the front case, as shown in Figure 5-8.
4. Carefully separate the two halves of the case.

5-6 Replacing the RTC Battery

1. If the RTC battery is discharged, then Self-Test Failed, Contact Customer Support may appear at boot-up.
2. After the case is open (refer to Section 5-5 “Opening the MP1026B Case” on page 5-10), remove the Oscilloscope PCB (refer to Section 5-9 “Removing the Oscilloscope PCB” on page 5-13). The location of the battery is shown in Figure 5-9. Remove the old battery and install the new battery with the + on the battery facing up. Apply 2 small drops of RTV compound bridging the top of the battery and the holder as an extra precaution to hold the battery securely.

Note	Only the coin type RTC battery can be replaced by this procedure. If the RTC battery is not a coin type, then Anritsu Company highly recommends that the instrument be returned to an authorized service center.

3. After replacing the battery, ensure that the case gasket material is within the grooves of the case, and reassemble the 2 halves of the instrument. Enter the correct date and time under the **System** menu.

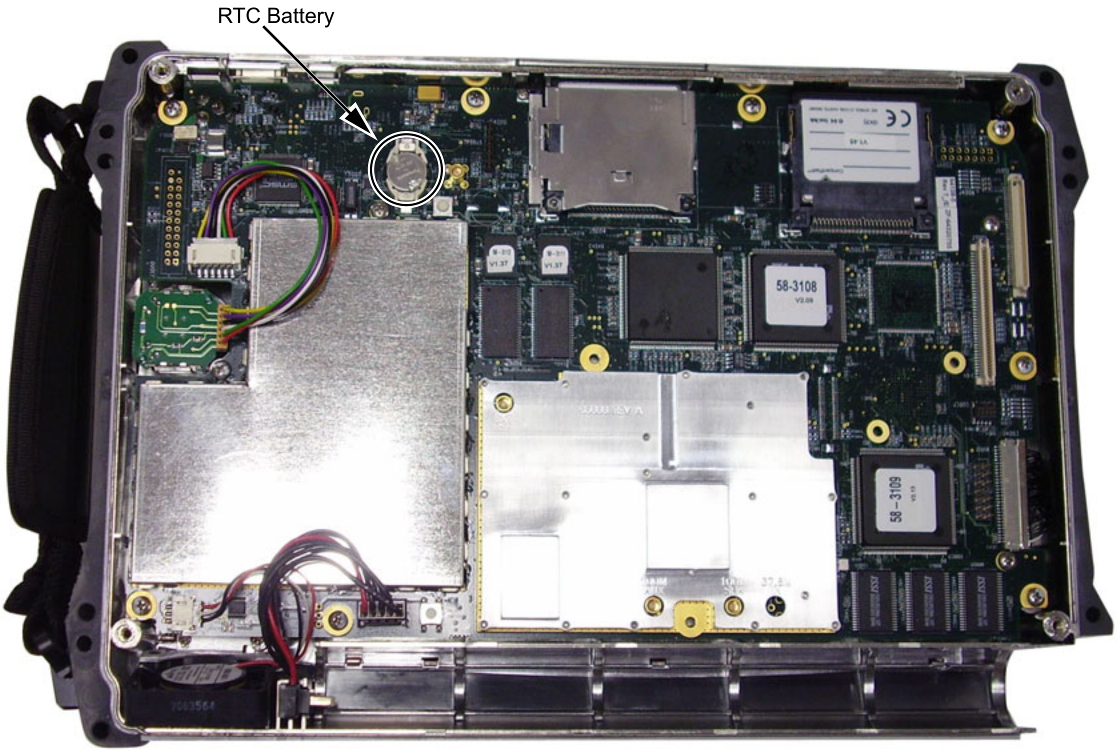


Figure 5-9. RTC Battery Location

5-7 Removing the Main PCB and Display Assemblies

1. Open the case, as described in Section 5-5 “Opening the MP1026B Case” on page 5-10.
2. Remove the Oscilloscope PCB (refer to Section 5-9 “Removing the Oscilloscope PCB” on page 5-13).
3. Push the external CF card ejector button to the in position.
4. Unplug the cables to the fan, battery pack connector, and encoder knob from the main PCB. Refer to the photograph in Figure 5-10 and to items 4, 5, and 6, in Figure 5-4 on page 5-6. Refer also to Figure 5-3 on page 5-5. Remove the 9 screws around the PCB edge to release the PCB/LCD assembly from the case. Lift the main PCB/LCD assembly out of the case.

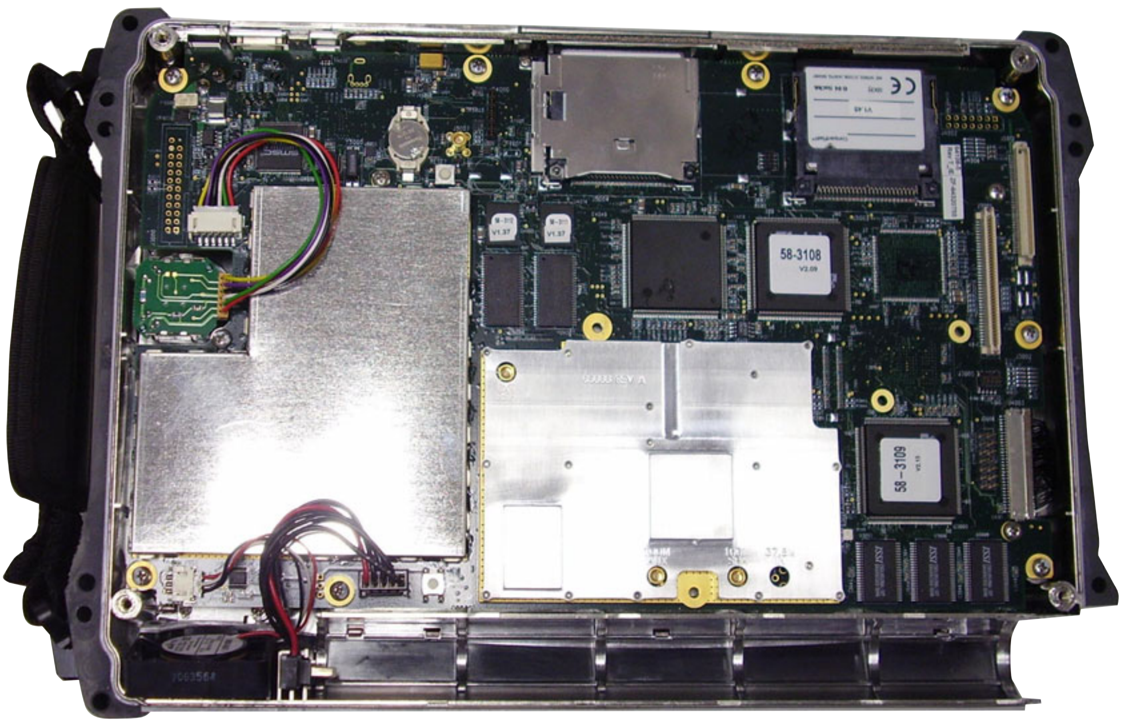


Figure 5-10. Removing the Main PCB

5-8 Removing LCD and Backlight Driver PCB from Main PCB

For parts orientation, refer to Figure 5-5 on page 5-7.

1. Using a tool such as tweezers or a knife blade, gently unplug one end of the 4 cm long LCD digital data cable (wraps around the edge of the main PCB, refer to item 8 in Figure 5-5). Unplug the 8 wire bias cable that connects between the backlight driver PCB and the main PCB (refer to item 4 in Figure 5-5). Unplug the *high voltage* wires (usually pink and white) at the connector on the backlight driver PCB.
2. Remove the 4 screws that attach the LCD to the main PCB (Motherboard). Remove the 2 screws that attach the backlight driver PCB to the main PCB. Lift off the LCD and backlight driver PCB.

5-9 Removing the Oscilloscope PCB

Figure 5-11 identifies the oscilloscope PCB. When this board is to be replaced, retain the semi rigid cables, the K connectors, and the options modules for reuse on the replacement Scope board. Refer to Figure 5-7 on page 5-9 for a view of the option PCBs. Follow the steps below to remove the board from the case.

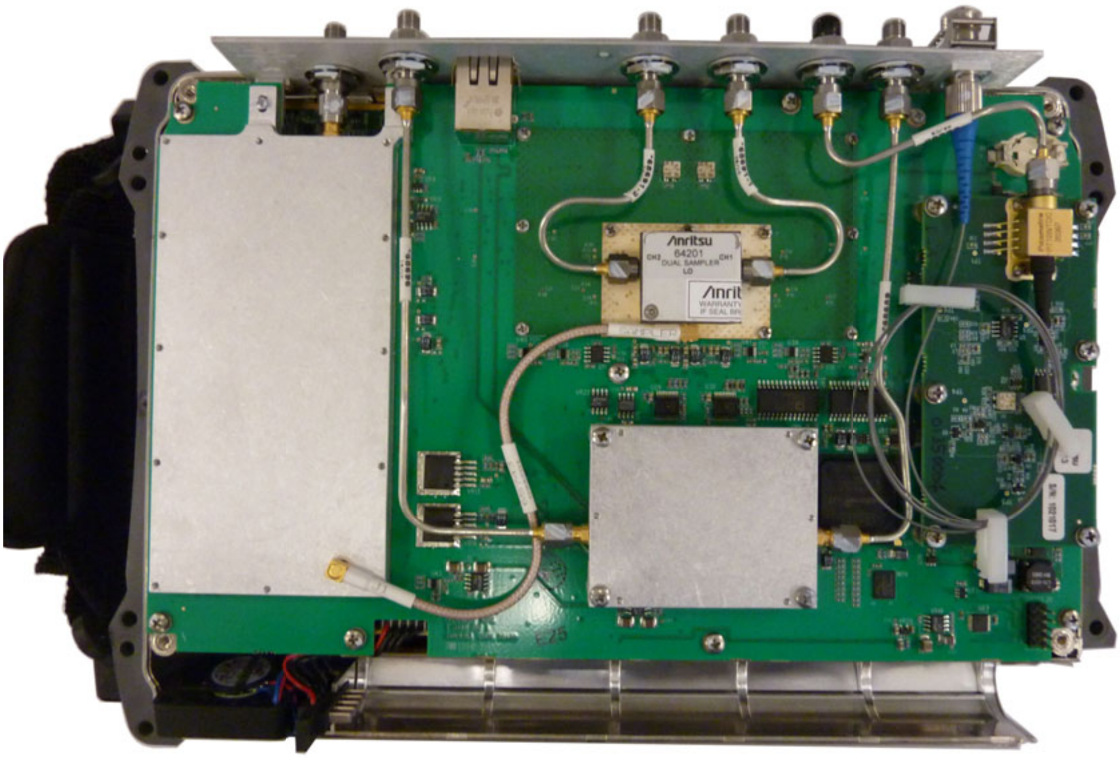


Figure 5-11. Oscilloscope PCB

1. Open the case as described in Section 5-5 “Opening the MP1026B Case” on page 5-10.
2. If the instrument has Option 02, then disconnect the 2 semi rigid cables from the Option 2 (CRU) module and from the K connectors on the top panel assembly.
3. Remove the 2 panel K connectors (P/N B17942) for CRU In and CRU Out. They are to be transferred to the replacement Scope board.
4. Remove the 4 screws that attach the CRU module to the Scope PCB.
5. If the instrument has Option 03, then disconnect the semi rigid cables from the Option 03 (OE) module and from the K connector on the top panel assembly.
6. Loosen and remove the fiber optic cable from the back of the top panel assembly. Be careful because the fiber optic cable is very delicate. Ensure that the loops remain intact.
7. Remove the panel K connector (P/N B17942) for OE Out.
8. Remove the dust cover from the OE In connector. Pull the retaining clip down and remove the plug-in connector. This provides access to the 4 screws that are used to mount the fiber optic connector shells to the top panel assembly.
9. Remove the 4 screws that attach the fiber optic connector front shell to the back shell.
10. Remove the 6 screws that attach the OE module to the Scope board.
11. Transfer the CRU module or OE module, or both, to the replacement Scope PCB and reassemble by reversing this procedure.

12. Remove the 9 screws that attach the Scope PCB to the Motherboard. Lift the assembly out of the case. The original Oscilloscope PCB is now ready for return.

Important Notes Regarding Reassembly with the Oscilloscope PCB

Ensure that gasket material around the edge of the instrument is in good condition and is pressed securely into the grooves in the covers before reassembling the instrument. If necessary, replace damaged gasket material. (Refer to Table 5-1 on page 5-2 for the part number.)

Ensure that all wires of the LCD bias cable are pushed under the backlight driver PCB where they will not interfere with the keyboard connector.

5-10 Removing CRU Module from Scope PCB

Refer to Figure 5-7 on page 5-9 for a view of the Option 2 PCB and its cables.

1. Disconnect the 2 semi rigid cables from the Option 2 (CRU) module and at the K connectors on the top panel assembly.
2. Remove the 4 screws that attach the CRU module to the Scope PCB. Lift the assembly off of the Scope PCB. The module is now ready for return.

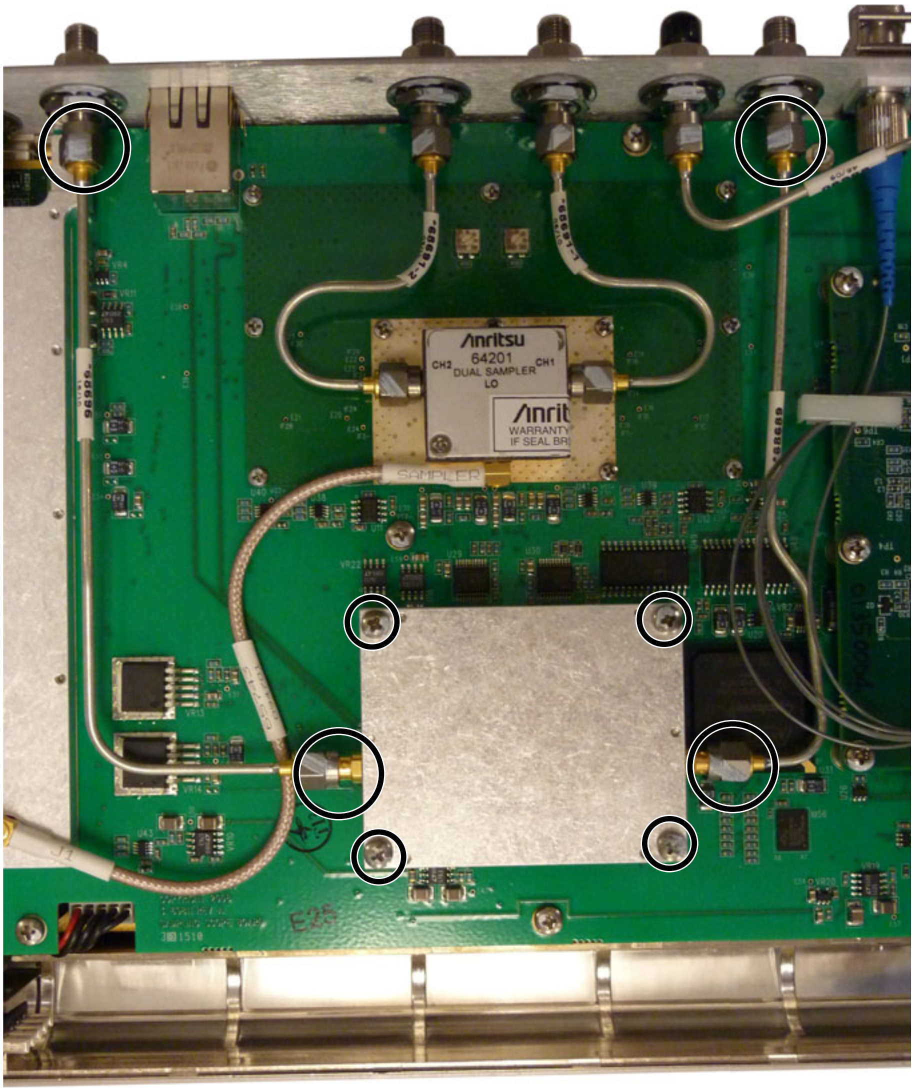


Figure 5-12. Clock Recovery Unit Module Removal

5-11 Removing O/E Module from Scope PCB

Refer to Figure 5-7 on page 5-9 for a view of the Option 3 PCB and its cables.

1. Disconnect the semi rigid cable from the Option 3 (O/E) module and from the K connector on the top panel assembly.
2. Loosen and remove the fiber optic cable from the back of the top panel assembly. Be careful because the fiber optic cable is very delicate. Ensure that the loops remain intact.
3. Remove the 6 screws that attach the OE module to the Scope PCB. Lift the assembly off of the Scope PCB.

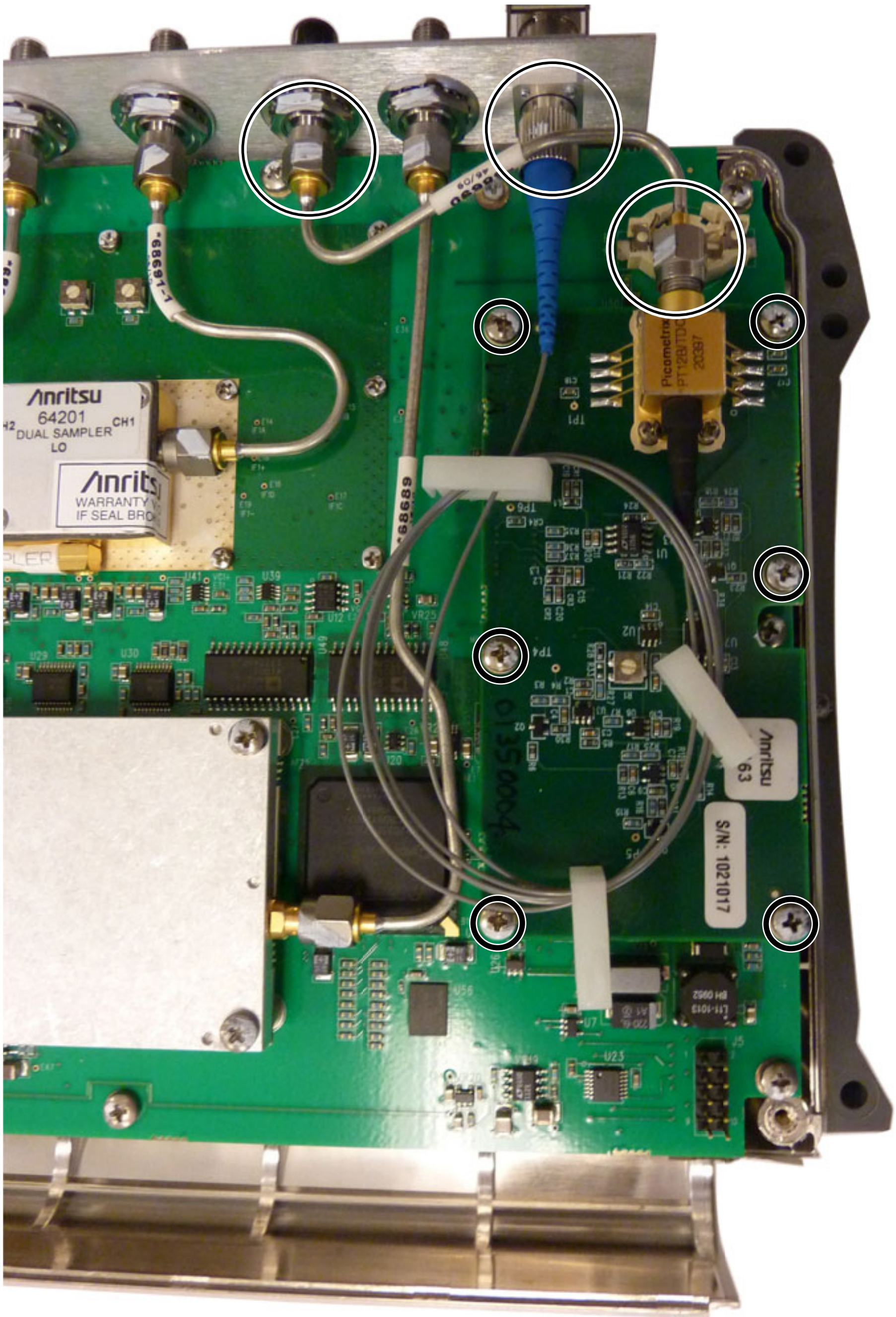


Figure 5-13. Optical/Electrical Module Removal

5-12 Replacing Keypad Assemblies

When replacing keypad components, opening the case is not necessary.

Replacing the Main Keypad Membrane

This procedure provides instructions for removing and replacing the main keypad (numeric) membrane and PCB. All keypad parts can be replaced without opening the MP1026B case.

1. Place the instrument face up on a protected work surface.
2. Eight locking tabs hold the keypad bezel to the case. Using a small flat-blade screwdriver, carefully pry the front bezel locking tabs free of the main body of the case. This will expose the keypad membrane. For locking tab locations, refer to Figure 5-14.

Figure 5-14. Locking Tabs on Front Bezel

3. Remove the keypad membrane by carefully lifting the speaker and pulling the membrane off of the keypad PCB.

Caution	The speaker is held in place by four locating pins on the inside of the keypad bezel. 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.

Replacing the Main Keypad PCB Assembly

1. Disconnect the function hard key flexible switchpad from connector J2 of the keypad PCB by carefully lifting the locking tab on connector J2 to release the flexible switchpad (Figure 5-15).

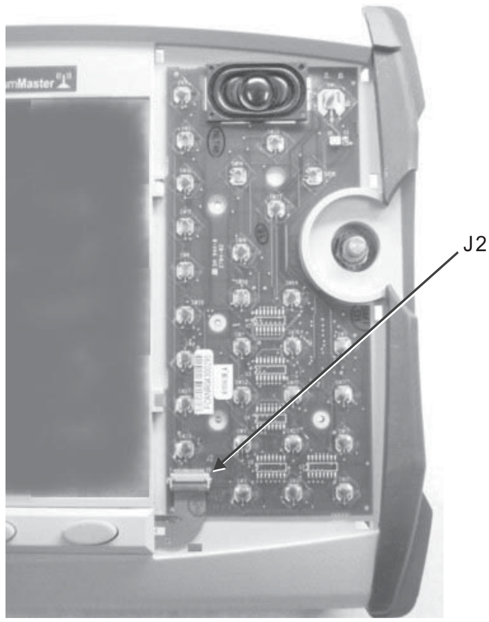


Figure 5-15. Connector J2 on Keypad PCB

2. Remove the keypad PCB, taking care not to damage the speaker wires.
3. Reverse the above steps to install the replacement assembly, with the following cautions:
   - **a.** Carefully close the locking tab on connector J2 to secure the flexible switchpad connection. The tab should *snap* into position when fully closed.
   - **b.** Insert the membrane over the keypad PCB, and under the speaker. Take care to properly orient the membrane so that the rubber pins are aligned with the keypad switches on the PCB.
   - **c.** The speaker is held in place by four locating pins on the inside of the keypad bezel. Verify that the four locating pins are properly seated into the four corner holes of the speaker when reinstalling the bezel.
   - **d.** Verify that all locking tabs are fully seated into the main body of the case when reinstalling the bezel.

5-13 Replacing Function Hard Key Membrane and Switchpad

This procedure provides instructions for replacing the function hard keys (5 keys beneath the LCD) membrane and switchpad. All keypad parts can be replaced without opening the MP1026B case.

1. Place the instrument face up on a static protected work surface.
2. Remove the keypad bezel and membrane as directed in Section 5-12 on page 5-17.
3. Six locking tabs hold the function hard key bezel to the case. Using a small flat-blade screwdriver or knife blade, carefully pry the function key bezel locking tabs free of the main body of the case. This exposes the function hard key membrane.
4. Remove the function hard key membrane by gently pulling the membrane up and away from the front panel (Figure 5-16).

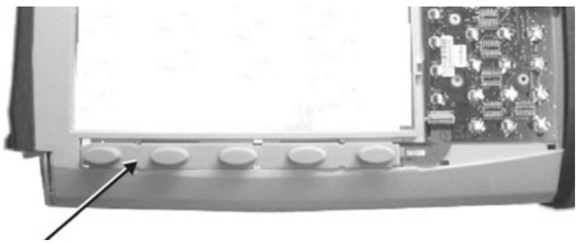


Figure 5-16. Function Hard Key Membrane and Switchpad

5. Disconnect the function hard key flexible switchpad from connector J2 of the keypad PCB by carefully lifting the locking tab on connector J2 to release the flexible switchpad (connector J2 is shown in Figure 5-15).
6. Reverse the above steps to install the replacement switchpad or membrane.
7. Carefully close the locking tab on connector J2 to secure the flexible switchpad connection. The tab should *snap* into position when fully closed.

Chapter 6 — Troubleshooting

This chapter describes the primary troubleshooting operations that can be performed by all Anritsu Service Centers. Perform the troubleshooting suggestions in the order that they are listed. Operators of the MP1026B should refer to the User Guide for troubleshooting help.

Refer to Chapter 5, Removal and Replacement Procedures for important information before opening the case of the instrument.

6-1 Boot-up Problems

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

1. Battery may be fully discharged. Use an external charger (Anritsu part number 2000-1374) to charge a completely discharged battery.
2. Battery may be the wrong type. Ensure that the battery has an Anritsu label.
3. External power supply may have failed or be the wrong type. Replace the external power supply.
4. On/Off switch is damaged. Replace the keypad PCB or rubber keypad.
5. Main PCB has failed. Replace the main PCB assembly.

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

1. Using Master Software Tools, perform the Emergency Repair procedure and then update the system software (via the Tools menu).
2. Possible failure of the internal CF card. Install a new CF card onto the main PCB and use the Emergency Repair feature in Master Software Tools to format and reprogram the internal CF card.
3. Main PCB has failed. Replace the main PCB assembly.

Unit makes normal boot-up sounds, but the display has a problem:

1. If the display is dim, check the brightness setting under the System Menu / System Options.
2. Replace the Backlight Driver PCB.
3. Replace the LCD assembly.
4. The Main PCB has failed. Replace the main PCB assembly.

Boot-up Self Test fails:

1. Check the condition of the RTC (coin-style) battery on the main PCB. This may be checked using the Self-Test function under the System Menu.
2. Perform a Master Reset by pressing the **Shift** key then the **System** (8) key, and then by pressing System Options. In the System Options menu, press Reset. In the Reset menu, press Master Reset.
3. Main PCB has failed. Replace the main PCB assembly.

Measurements are not accurate or not stable:

1. Perform a Master Reset.
2. Oscilloscope PCB has failed. Replace the oscilloscope PCB.

Fan or Temperature warnings:

1. Ensure air intake and outlet holes are not obstructed.
2. Refer to Appendix A of the User Guide for fan operation information.
3. Replace the fan.
4. Replace the main PCB.

Battery Pack Charging Problems:

Refer to Chapter 4, Battery Information.

Appendix A — Test Records

This appendix provides test records that can be used to record the performance of the MP1026B Bit Master. Please make a copy of the following Test Record pages to document the measured values each time a Performance Verification is performed. Continuing to document this process each time it is performed provides a detailed history of the instrument's performance.

MP1026B	Firmware Revision:	Operator:	
Serial Number:		Options:	Date:

A-1 Bandwidth Verification

CH1 (Specification: 3 dB (Half-Power) Point $\geq$ 20 GHz)

100 MHz Reference Voltage: ______________________________ mV peak-to-peak

Computed 3 dB (Half-Power) Point: ______________________________ mV peak-to-peak

Table A-1. CH1 Bandwidth Verification

Frequency	
18 GHz	mV peak-to-peak
19 GHz	mV peak-to-peak
20 GHz	mV peak-to-peak
21 GHz	mV peak-to-peak
22 GHz	mV peak-to-peak
23 GHz	mV peak-to-peak
24 GHz	mV peak-to-peak
26 GHz	mV peak-to-peak
28 GHz	mV peak-to-peak
30 GHz	mV peak-to-peak
32 GHz	mV peak-to-peak
34 GHz	mV peak-to-peak

MP1026B	Firmware Revision:	Operator:	
Serial Number:		Options:	Date:

A-2 Bandwidth Verification (continued)

CH2 (Specification: 3 dB (Half-Power) Point $\geq$ 20 GHz)

100 MHz Reference Voltage: ______________________ mV peak-to-peak

Computed 3 dB (Half-Power) Point: ______________________ mV peak-to-peak

Table A-2. CH2 Bandwidth Verification

Frequency	
18 GHz	mV peak-to-peak
19 GHz	mV peak-to-peak
20 GHz	mV peak-to-peak
21 GHz	mV peak-to-peak
22 GHz	mV peak-to-peak
23 GHz	mV peak-to-peak
24 GHz	mV peak-to-peak
26 GHz	mV peak-to-peak
28 GHz	mV peak-to-peak
30 GHz	mV peak-to-peak
32 GHz	mV peak-to-peak
34 GHz	mV peak-to-peak

MP1026B	Firmware Revision:	Operator:	
Serial Number:		Options:	Date:

A-3 Amplitude Accuracy Verification

CH1

Table A-3. CH1 Amplitude Accuracy Verification

Input DC Voltage (mV)	Channel Scale (mV/div)	Offset (V)	Measured Value (Mean)	Upper spec (mV)	Lower spec (mV)
420	140	0		440	400
240	80	0		252	228
120	40	0		127	113
60	30	0		65	55
60	20	0		65	55
30	15	0		34	26
30	10	0		34	26
15	5	0		18	12
0	5	0		2.5	–2.5
–15	5	0		–12	–18
–30	10	0		–26	–34
–30	15	0		–26	–34
–60	20	0		–55	–65
–60	30	0		–55	–65
–120	40	0		–113	–127
–240	80	0		–228	–252
–420	140	0		–400	–440

MP1026B	Firmware Revision:	Operator:	
Serial Number:		Options:	Date:

A-4 Amplitude Accuracy Verification (continued)

CH2

Table A-4. CH2 Amplitude Accuracy Verification

Input DC Voltage (mV)	Channel Scale (mV/div)	Offset (V)	Measured Value (Mean)	Upper spec (mV)	Lower spec (mV)
420	140	0		440	400
240	80	0		252	228
120	40	0		127	113
60	30	0		65	55
60	20	0		65	55
30	15	0		34	26
30	10	0		34	26
15	5	0		18	12
0	5	0		2.5	–2.5
–15	5	0		–12	–18
–30	10	0		–26	–34
–30	15	0		–26	–34
–60	20	0		–55	–65
–60	30	0		–55	–65
–120	40	0		–113	–127
–240	80	0		–228	–252
–420	140	0		–400	–440

MP1026B	Firmware Revision:	Operator:	
Serial Number:		Options:	Date:

A-5 RMS Noise Verification

Table A-5. RMS Noise Verification

Input Port	Measured Value	Specification
CH1	mV	≤ 1.75 mV
CH2	mV	≤ 1.75 mV

A-6 RMS Jitter Verification

Table A-6. RMS Jitter Verification

Measurement	Measured Value	Specification
RMS Jitter	ps	≤ 1.5 ps

A-7 CRU RMS Jitter Verification (Option 2)

Table A-7. CRU RMS Jitter Verification

Measurement	Measured Value	Specification
Std Dev		N/A
CRU RMS Jitter	ps	≤ 4 ps

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