

**MAINTENANCE MANUAL**  
**Site Master™ Models S113C, S331C and S115BQ**  
**Antenna and Cable Analyzers**

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**Figure 1.** Site Master Model S331C

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## 1. INTRODUCTION

This manual provides maintenance instructions for the Site Master S113C/S331C and S115BQ Antenna and Cable Analyzer. It describes the product and provides performance verification procedures, parts replacement procedures, and a replaceable parts list.

## 2. DESCRIPTION

The Site Master (Figure 1) is a hand held SWR/RL (standing wave ratio/return loss), and Distance-To-Fault measurement instrument. It combines a synthesized source, VSWR Bridge, and receiver on a single printed circuit board (PCB). An optional power monitor is also available. A block diagram is shown in Figure 2.

## 3. PERFORMANCE VERIFICATION

Paragraphs 4 through 9 contain tests that can be used to verify the performance of the Site Master models S113C/ S331C and S115BQ having any version of firmware.

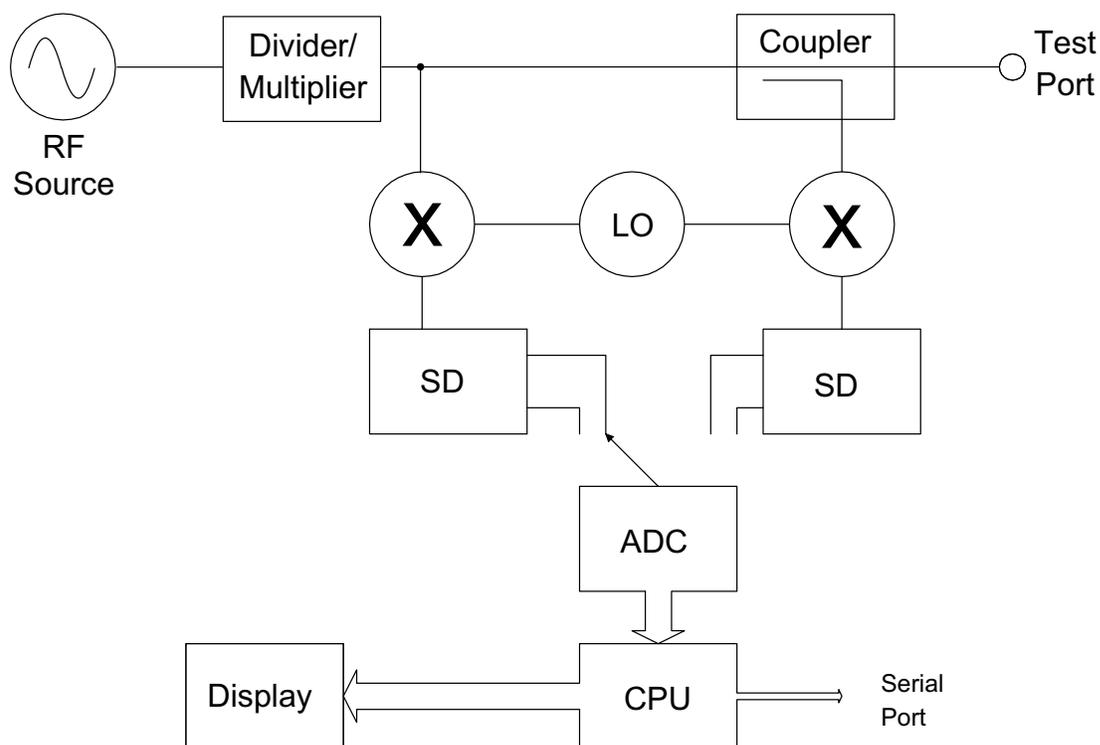
### 3.1. Initial Setup for Testing

1. Press and hold the ESCAPE/CLEAR key, then press the ON/OFF key to turn on the Site Master. (This sets the instrument to the factory preset state.)
2. Release the ESCAPE/CLEAR key and use the Up/Down arrow key to adjust the contrast to give a readable display.

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**Anritsu**

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**Figure 2.** Site Master Block Diagram

#### 4. FREQUENCY ACCURACY

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

**a. Equipment Required:**

- Spectrum Analyzer Anritsu Model MS2663C or equivalent

**b. Procedure:**

1. Press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Site Master. (This sets the instrument to the factory preset state.)

**NOTE**

Before continuing, allow a five minute warm up for the internal circuitry to stabilize.

2. Press the **FREQ/DIST** key, then press the F1 soft key and set F1 to 1000 MHz, then press the **ENTER** key.
3. Press the F2 soft key, set F2 to 1000 MHz, then press the **ENTER** key.
4. Connect the RF cable from the Site Master Reflection Test Port to the RF Input on the MS2663C or equivalent.
5. Set up the Spectrum Analyzer as follows:
  - (a) Press the **Preset** key, then select **Preset All (F1)**.
  - (b) Press the **Frequency** key.
  - (c) Press the **1** key and then the **GHz** key to change the Center Frequency to 1 GHz.
  - (d) Press the **Span** key.
  - (e) Press the **7, 5, 0,** and **kHz** keys sequentially to change the Frequency Span to 750 kHz.
  - (f) Press the **RBW** key.

- (g) Press the **1, 0** and **kHz** keys sequentially to change the RBW to 10 kHz.
  - (h) Press the **VBW** key.
  - (i) Press the **Filter Off** soft key (F3) to turn the VB filter off.
  - (j) Press the **Amplitude** key.
  - (k) Press the **1, 0,** and **dBm** keys sequentially to change the Reference Level to 10 dBm.
  - (l) Press the **Log Scale** soft key (F5)
  - (m) Select **2 dB/Div** (F3) and then press the **return** soft key (F6).
  - (n) Press the **Marker** key.
  - (o) Press the **Zone Width** soft key (F5).
  - (p) Select the **Spot** soft key (F1).
6. On the Site Master, press the **SYS** key, the **OPTIONS** soft key and then the **FIXED CW** soft key to turn Fixed CW on.

**NOTE:**

If the Site Master has gone into the hold mode, press the **RUN/HOLD** key to return to normal mode.

- 7. On the Spectrum Analyzer, press the **A, B** and then the **Storage** key (F5).
- 8. Press the **Max Hold** soft key (F2).
- 9. A peak response should appear on the Spectrum Analyzer.
- 10. Press the **Marker Peak Search** key on the Spectrum Analyzer. Verify that the marker peak readout value is 1000 MHz  $\pm$ 75 kHz.
- 11. On the Site Master, press the **SYS** key, the **OPTIONS** soft key and then the **FIXED CW** soft key to turn Fixed CW Off.

## 5. RETURN LOSS VERIFICATION

The following test can be used to verify the accuracy of return loss measurements. Measurement calibration of the Site Master is required for this test.

**a. Equipment Required:**

- 20 dB offset, Anritsu SC5270
- 6 dB offset, Anritsu SC5237
- Open/Short, Anritsu 22N50
- 50 Ohm Termination, Anritsu 28N50-2 or SM/PL

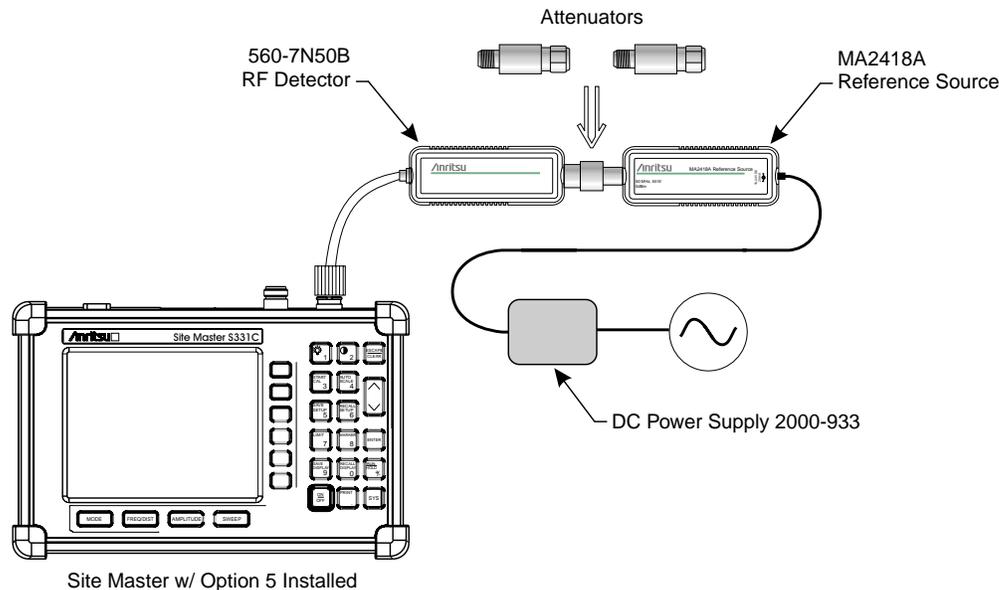
**b. Procedure:**

1. Press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Site Master. (This sets the instrument to the factory preset state.)

**NOTE**

Before continuing, allow a five minute warm up for the internal circuitry to stabilize.

2. Press the **MODE** soft key.
3. Use the **Up/Down Arrow** key to highlight **RETURN LOSS**, then press **ENTER**.
4. Press the **START CAL** key.
5. Follow the instructions on the screen to perform a calibration using a 22N50 Open/Short and 28N50-2 or SM/PL Termination.
6. Connect the 20 dB offset to the Refl Test Port and verify that the reading is:
  - S113C/S115BQ: 20 dB  $\pm$  1.7 dB
  - S331C: 20 dB  $\pm$  1.7 dB
7. Connect the 6 dB offset to the Refl Test Port and verify that the reading is:
  - S113C/S115BQ: 6 dB  $\pm$  1.2 dB
  - S331C: 6 dB  $\pm$  1.2 dB.



**Figure 3.** Power Monitor Verification

## 6. POWER MONITOR VERIFICATION

If the Power Monitor (Option 5) is installed in the Site Master, the following test can be used to verify the accuracy of the power measurements. Measurement calibration of the Site Master is **not** required for this test.

### a. Equipment Required:

- RF Detector, 10 MHz to 20 GHz, Anritsu 560-7N50C
- 10 dB Attenuator, Weinschel 1-10
- 30 dB Attenuator, Weinschel 1-30
- RF Reference Source, 0.050 GHz, Anritsu MA2418A
- DC Power Supply, Anritsu 2000-933

### b. Procedure

1. Connect the DC power supply to the MA2418A Reference Source. (Refer to Figure 3, page 4.)
2. Connect the MA2418A Reference Source to the input of the 560-7N50C RF detector.
3. Connect the RF Detector output to the RF Detector input of the Site Master.
4. Connect the DC power supply to the appropriate line voltage to supply power to the MA2418A Reference Source.
5. Press and hold the ESCAPE/CLEAR key, then press the ON/OFF key to turn on the Site Master. (This sets the instrument to the factory preset state.)
6. Press the MODE soft key.
7. Use the Up/Down Arrow key to highlight POWER MONITOR, then press ENTER.
8. Press the ZERO soft key to zero the power monitor. When complete, ZERO ADJ:ON is displayed in the message area.
9. Verify that the power monitor reading is 0.0 dBm  $\pm$  1 dB.
10. Connect the output of the MA2418A Reference Source to the two attenuators so as to add 40 dB of attenuation (Figure 3).
11. Connect the MA2418A Reference Source and the attenuators to the input of the 560-7N50C RF detector.
12. Verify that the power monitor reading is now -40.0 dBm  $\pm$  2 dB.

## 7. INSTACAL MODULE VERIFICATION

This test verifies the performance of the Anritsu Site Master InstaCal Calibration Module. The InstaCal Module, part number ICN50, is an optional accessory for the S113C, S331C, and S115BQ.

### **NOTE**

Full verification of the InstaCal module over its entire frequency range (2 - 4000 MHz) requires both an S113C (or S115BQ) and an S331C Site Master. However, limited verification is possible with either instrument for the frequency range of that instrument only. The frequency range of the S113C and S115BQ is 2 to 1600 MHz. The frequency range of the S331C is 25 to 4000 MHz.

#### **a. Equipment Required:**

- InstaCal Module, part number ICN50
- 20 dB offset, Anritsu SC5270
- 6 dB offset, Anritsu SC5237

#### **b. Procedure**

### **NOTE**

If performing full verification over the entire frequency range with both an S113C (or S115BQ) and an S331C Site Master, perform this procedure first on the S113C (or S115BQ) and then on the S331C.

1. Press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Site Master. (This sets the instrument to the factory preset state.)

### **NOTE**

Before continuing, allow a five minute warm up for the internal circuitry to stabilize.

2. Press the **MODE** soft key.
3. Use the Up/Down Arrow key to highlight **RETURN LOSS**, then press **ENTER**.
4. Press the **START CAL** key. The message "CONNECT OPEN or InstaCal TO RF Out PORT" will appear in the display.
5. Connect the InstaCal module to the RF Out port and press the **ENTER** key.

### **NOTE**

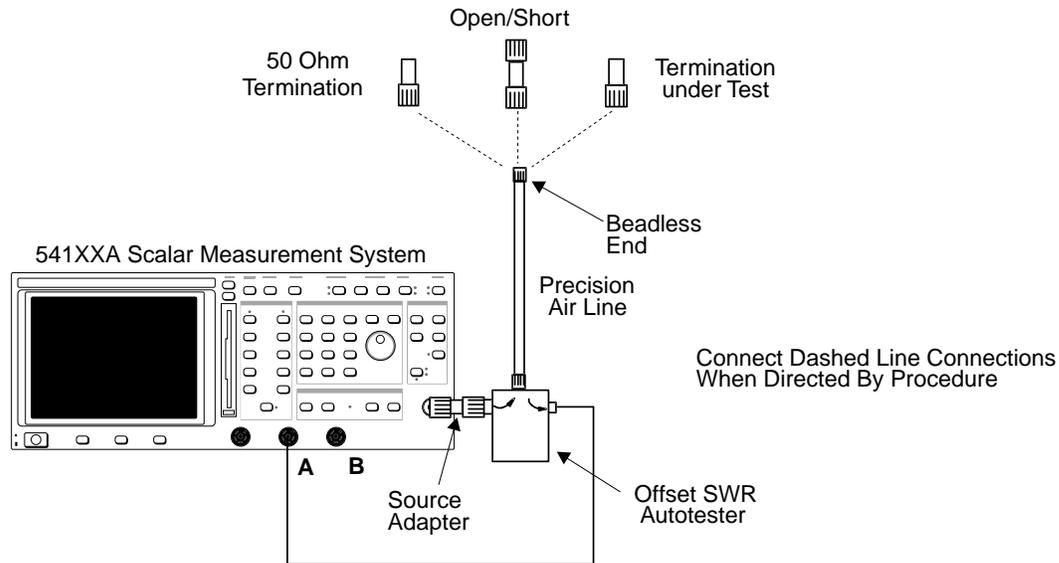
If this particular InstaCal module has been used to calibrate this Site Master before, the Site Master senses the familiar InstaCal module and automatically calibrates the unit using the OSL procedure.

If the Site Master senses that the characterization data for the InstaCal module connected to this Site Master is different than the one currently stored, it will display soft key options to keep or replace the InstaCal characterization data.

Selecting the **YES** soft key transfers all of the characterization data from this InstaCal module to the Site Master. The transfer may take up to three minutes. This option is preferred if this InstaCal module is to stay with this particular Site Master. Once completed, the data will not need to be transferred again for this combination of Site Master and InstaCal module.

Selecting the **NO** soft key will temporarily transfer only the portion of the characterization data necessary for this particular calibration. This transfer takes approximately 30 to 60 seconds, and will have to be repeated every time a calibration is done using this combination of Site Master and InstaCal module.

6. Verify that the calibration has been properly performed by checking that the **CAL ON!** message is displayed in the upper left corner of the display.
7. Remove the InstaCal module from the RF Out port and connect the 20 dB Offset to the RF Out port.
8. Measure the return loss of the 20 dB Offset. The level should be 20 dB,  $\pm 2$  dB across the calibrated frequency range.
9. Remove the 20 dB Offset from the RF Out port and connect the 6 dB Offset to the RF Out port.
10. Measure the return loss of the 6 dB Offset. The level should be 6 dB,  $\pm 1.2$  dB across the calibrated frequency range.



**Figure 4.** 541XXA Precision Return Loss Setup

## 8. TERMINATION VERIFICATION

This test verifies the accuracy of the Site Master SM/PL termination using the precision return loss mode of the 541XXA Scalar Measurement System. Measurements of terminations using this mode provide results that are traceable to the NIST (National Institute of Standards and Technology) standards for the precision airline.

### a. Equipment Required:

- Scalar Measurement System, Anritsu 541XXA
- Offset SWR Autotester, Anritsu 560-97A50-20
- Precision Airline, Anritsu 18N50
- Open/Short, Anritsu 22N50
- 50 Ohm Termination, Anritsu 28N50-2
- Source Adapter, Anritsu 34NN50A

### b. Procedure

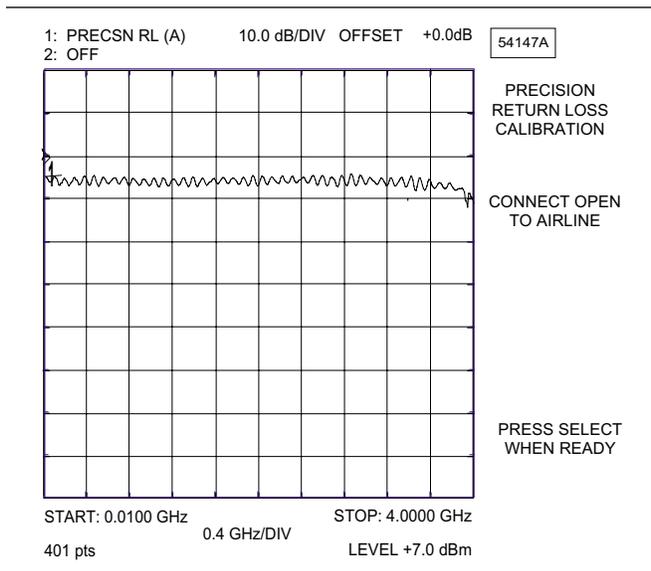
1. Connect the test equipment as shown in Figure 4, page 6.
2. Press the Power key on the 541XXA to On.
3. Press the System Menu key.
4. Using the Menu up-down keys: Highlight RESET, then press the Select key.
5. At the RESET MENU display, use the Menu up-down keys to highlight RESET TO FACTORY DEFAULTS, then press the Select key.
6. Set the signal source for the frequency range as follows:
  - (a) Press the Frequency key.
  - (b) Using the Data Entry Keypad or Data Entry Knob, set the Start frequency to 0.01 GHz. Press the Enter key.
  - (c) Using the Data Entry Keypad or Data Entry Knob, set the Stop frequency to 4.0 GHz. Press the Enter key.
7. Press the Channel 2 Display On/Off key to Off.
8. Press the Channel 1 Menu key.
9. Using the Menu up-down keys: Highlight PRECISION RL, then press the Select key.
10. At the PRECISION RETURN LOSS menu display, use the Menu up-down keys to highlight FINAL, then press the Select key.

11. Press the Calibration key.
12. At the CALIBRATION menu display, use the Menu up-down keys to highlight START CAL, then press the Select key.
13. At the PRECISION RETURN LOSS CALIBRATION menu display prompt, connect the Offset SWR Autotester to Input A, if you have not done so yet.
14. Connect the precision air line to the Offset SWR Autotester test port. Position the air line pointing vertically upward. Downward or horizontal positions make connector pin alignment difficult.

**NOTE**

Ensure that the bead-less end of the precision airline is at the measurement connection point.

15. Press the Select key when ready.
16. At the PRECISION RETURN LOSS CALIBRATION menu prompt, connect the Open to the bead-less end of the airline. Press the Select key to start the calibration.
17. Verify that the display resembles that shown in Figure 5.



**Figure 5.** Example of a Good Connection

**CAUTION**

During both calibration and measurement, be sure to properly align the bead-less connector of the airline. When the connectors are mis-aligned, a spike will usually be visible on the display.

18. At the next menu prompt, remove the Open and connect the Short to the bead-less end of the airline. Press the Select key to start the calibration process.
19. At the next menu prompt, remove the Short and connect the 50 Ohm Termination to the bead-less end of the air line. Press the Select key to start the calibration process.
20. When the calibration is complete, remove the 50 Ohm Termination.
21. Connect the SM/PL termination to the bead-less end of the air line and press the Select key to begin the measurement.
22. Observe that the waveform displayed resembles that shown in Figure 6.



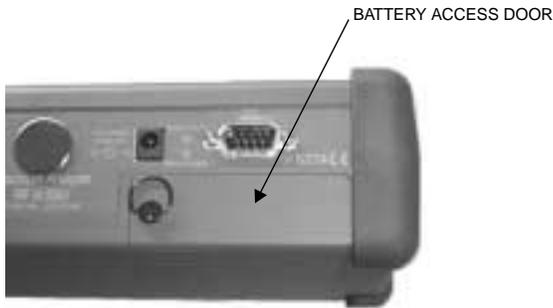
**Figure 6.** Direct Readout of the Precision Return Loss

23. Press the Cursor On/Off key to On.
24. Observe the Cursor menu readout. The minimum return loss reading for the SM/PL termination should be 42 dB.

## 9. BATTERY PACK REMOVAL AND REPLACEMENT

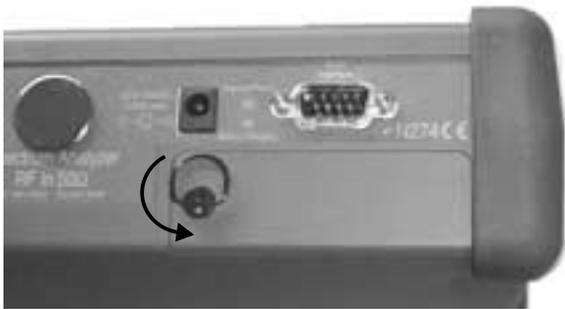
This procedure provides instructions for removing and replacing the Site Master battery pack.

1. With the Site Master standing upright on a stable surface, locate the battery access door (Figure 7).



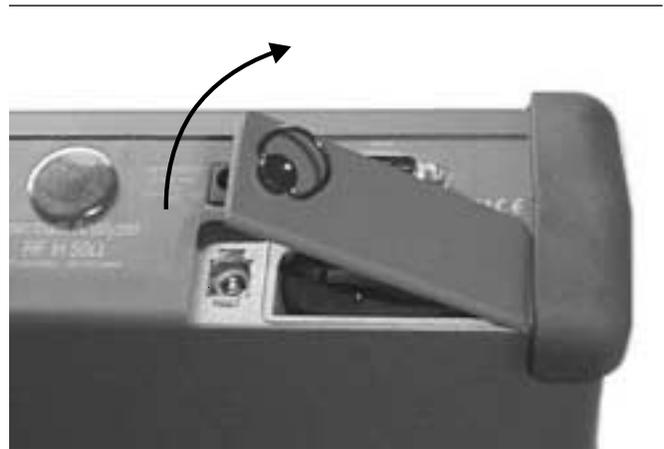
**Figure 7.** Battery Access Door Location

2. Lift up the access door handle and rotate it 90 degrees counterclockwise, as illustrated in Figure 8.

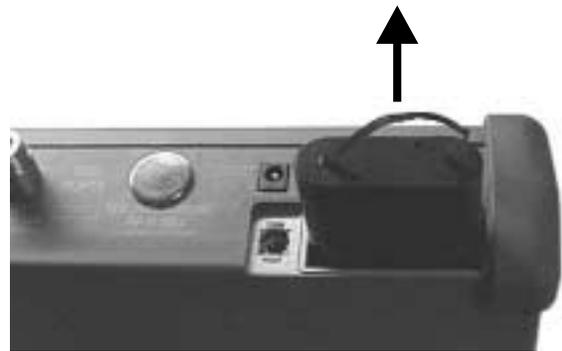


**Figure 8.** Rotate the Battery Access Door Handle

3. Lift the door and remove, as illustrated in Figure 11.
4. Grasp the battery lanyard and pull the battery straight up and out of the unit, as illustrated in Figure 9.

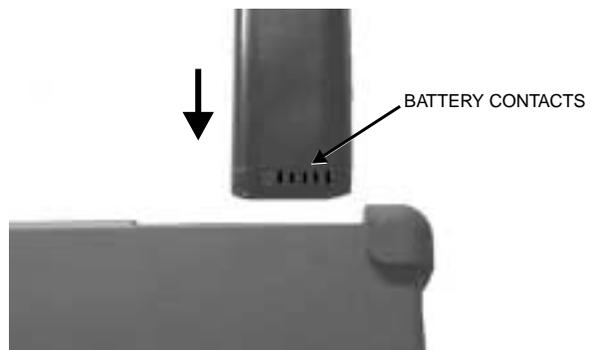


**Figure 9.** Removing the Battery Access Door



**Figure 10.** 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 rear of the unit (Figure 10).



**Figure 11.** Battery Orientation

## 10. BATTERY INFORMATION

The following information relates to the care and handling of the Site Master battery, and NiMH batteries in general.

- The Nickel Metal Hydride (NiMH) battery supplied with the Site Master is shipped in a discharged state. Before using the Site Master, the internal battery must first be charged for three hours, either in the Site Master or in the optional battery charger (Anritsu part number: 2000-1029).
- Use only Anritsu approved battery packs.
- Recharge the battery only in the Site Master or in an Anritsu approved charger.
- With a new NiMH battery, full performance is achieved after three to five complete charge and discharge cycles.
- When the Site Master 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 will affect the ability of the battery to charge: allow the battery to cool down or warm up as necessary before use or charging.
- Discharge an NiMH 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 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 its intended purpose only.

### 10.1. Battery Testing Procedure

1. With the Site Master off and the battery installed, connect the Universal AC Adapter to the 12.5-15VDC (1100 mA) connector. The External Power LED and the Battery Charging LED will light.
2. Disconnect the AC-DC Adapter when the Battery Charging LED turns off, indicating the battery is fully charged.
3. Press and hold the **ESCAPE/CLEAR** key, then press the **ON/OFF** key to turn on the Site Master. This sets the instrument to the factory preset state. Press **ENTER** when prompted to continue.
4. Press the **SYS** key, followed by the **STATUS** soft key. Verify that the indicated battery charge is  $\geq 80\%$ . If the value is 80% or above, press the **ESCAPE/CLEAR** key and continue with this procedure.

If the value is lower than 80%, a discharge/charge cycle may be needed to improve the battery capacity. Completely discharge the battery, as described in Steps 5 and 6 below, and then recharge the battery as described in Steps 1 and 2. If the battery capacity does not increase after a discharge/charge cycle, replace the battery.

5. Press the **START CAL** key (to keep the Site Master from going into HOLD mode) and make note of the test start time.
6. When the Site Master display fades and the Site Master switches itself off, make note of the test stop time.
7. The total test time (Step 5 to Step 6) should be  $\geq 2.5$  hours. If the total test time is  $< 2.5$  hours, replace the battery.

## 11. FRONT PANEL ASSEMBLY REMOVAL AND REPLACEMENT

This procedure provides instructions for removing and replacing the Site Master front panel assembly. With the front panel assembly removed, the LCD display, keypad PCB, keypad membrane, and main PCB assemblies can be removed and replaced.

1. Place the Site Master face up on a work surface.
2. Remove the four rubber corner bumpers by carefully sliding the bumpers off of the case corners (Figure 15).



**Figure 12.** Removing the Corner Bumpers

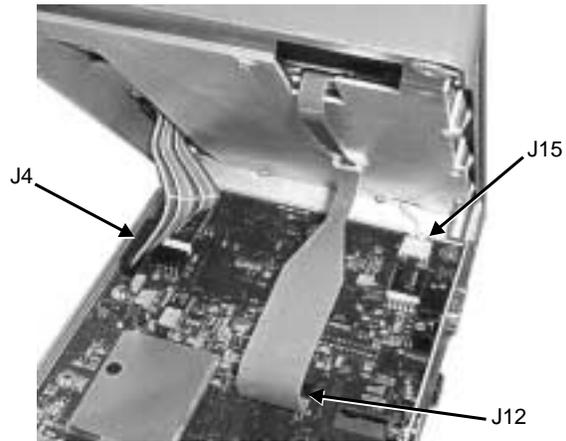
3. With the bumpers removed, the access holes for the case screws are revealed. Use a Phillips screwdriver to remove the four screws securing the two halves of the Site Master case together.
4. Carefully lift up on the right side (as viewed from the front) of the front half of the case and begin to separate the two halves.

### CAUTION

Do not force or pull the two halves of the case apart as there are delicate cables attached between the two halves that must be disconnected first.

5. Carefully depress the latch tab and disconnect the LCD display cable from J12 on the main PCB.
6. Carefully disconnect the keypad interface cable from J4 on the main PCB.

7. Carefully disconnect the LCD display backlight cable from J15 on the main PCB.



**Figure 13.** Corner Bumper Detail

8. Remove the front panel assembly.
9. Reverse the above steps to replace the front panel assembly.

### NOTE

The corner bumpers only mount one way. That is, the raised area inside one end of the bumper (Figure 13) is made to conform to the contour of the front cover only.

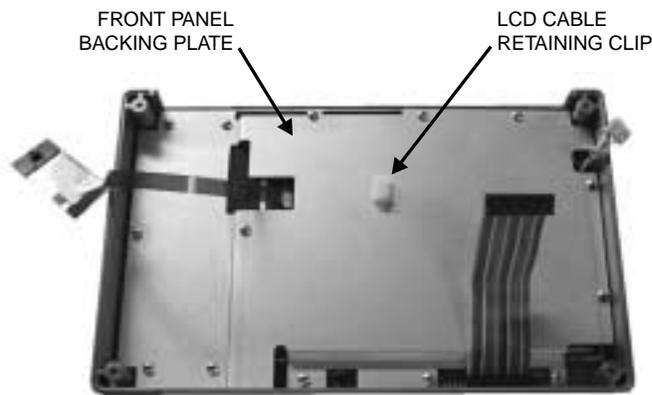


**Figure 14.** Site Master Front Panel Cable Connections

## 12. LCD ASSEMBLY REPLACEMENT

This procedure provides instructions for removing and replacing the Liquid Crystal Display (LCD) once the front panel assembly has been separated from the Site Master.

1. Remove the front panel assembly as directed in section 11.
2. Place the front panel assembly face down on a protected work surface.
3. Remove the 14 Phillips screws that attach the backing plate to the front panel assembly.
4. Release the LCD display cable from the retaining clip on the front panel backing plate.



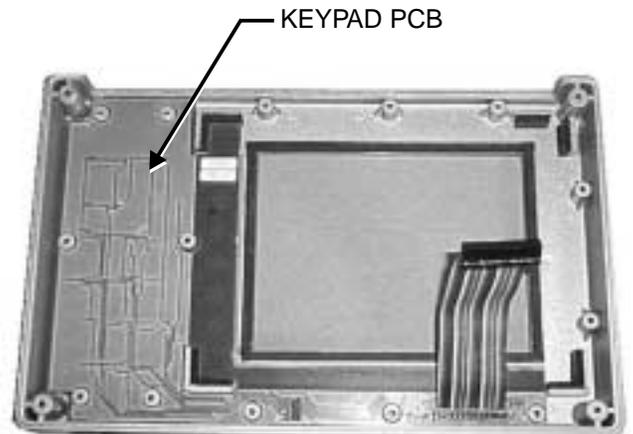
**Figure 15.** Front Panel Backing Plate

5. Remove the front panel backing plate, carefully feeding the LCD cable through the access hole to avoid damage to the cable or connector.
6. Remove the rubber cushion pad from the LCD assembly and remove the assembly.
7. Reverse the above steps to install the replacement assembly.

## 13. KEY PAD PCB REPLACEMENT

This procedure provides instructions for removing and replacing the key pad PCB.

1. Remove the front panel assembly as directed in section 11.
2. Place the front panel assembly face down on a protected work surface.
3. Remove the 14 Phillips screws that attach the backing plate to the front panel assembly.
4. Release the LCD display cable from the retaining clip on the front panel backing plate (Figure ).
5. Remove the front panel backing plate, carefully feeding the LCD cable through the access hole to avoid damage to the cable or connector.
6. Remove the rubber cushion pad from the key pad PCB and remove the PCB.



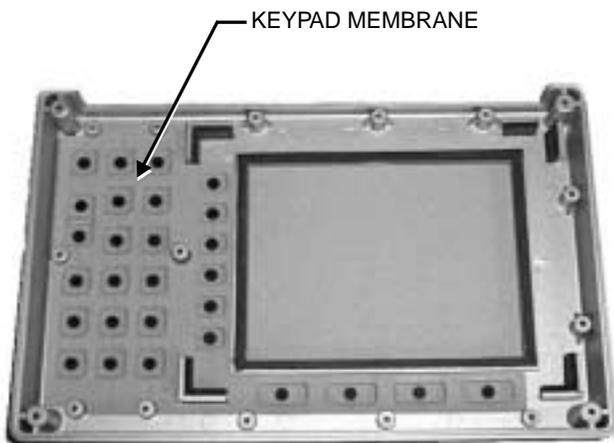
**Figure 16.** Front Panel Keypad PCB Location

7. Reverse the above steps to install the replacement assembly.

## 14. KEY PAD MEMBRANE REPLACEMENT

This procedure provides instructions for replacing the key pad membrane.

1. Remove the front panel assembly as directed in section 11.
2. Remove the key pad PCB as directed in section 13.
3. Remove the keypad membrane by gently pulling the membrane up and out of the holes in the front panel.



**Figure 17.** Front Panel Keypad Membrane

4. Reverse the above steps to install the replacement membrane.

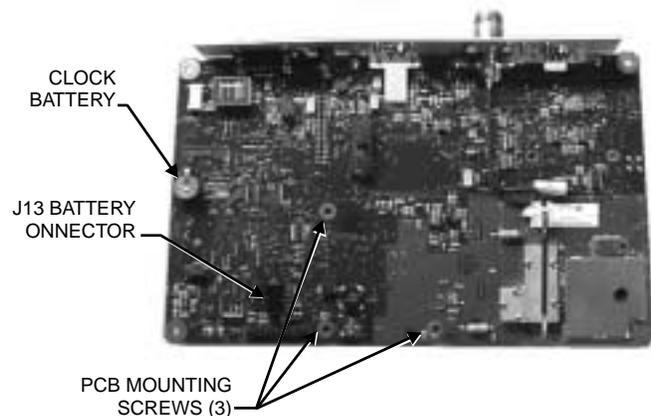
## 15. MAIN PCB ASSEMBLY REPLACEMENT

This procedure provides instructions for replacing the main PCB assembly with the connector panel attached.

### **NOTE**

The lithium-coin clock battery (part number 633-26) on the main PCB may be replaced as necessary without replacing the entire PCB.

1. Remove the front panel assembly as directed in section 11.
2. Disconnect the battery connector from J13 on the main PCB.
3. Remove the three PCB mounting screws and remove the PCB assembly with the connector panel attached.



**Figure 18.** Main PCB

4. Reverse the above steps to install the new main PCB.

### **NOTE**

The main PCB connector panel fits into grooves in the two halves of the Site Master case. Make sure the panel is correctly aligned with the grooves before reassembling the two halves together.

## 16. REPLACEABLE PARTS

Replaceable parts for the Site Master Model S113C/S331C and S115BQ are listed below.

**Table 1.** Replaceable Parts List

Part Number	Description	Qty
<b>Accessories</b>		
10580-00060	User's Guide, Site Master S113C, S114C, S331C, S332C	1
10580-00061	Programming Manual, Site Master S113C, S114C, S331C, S332C (available on disk only)	1
2300-347	Software Tools CD, Site Master	1
40-115	Universal AC Adapter	1
2000-1029	Battery Charger	1
22N50	Precision Short/Open, N Male	1
SM/PL	Precision RF Terminator, N Male	1
OSLN50LF	Precision Open/Short/Load, N Male	1
806-62	Cable Assy, Cig Plug, Female	1
800-441	Serial Interface Cable Assy	1
48258	Soft Carrying Case	1
<b>Replaceable Parts</b>		
510-87	N-Connector	1
ND57371	Option 05 Input Connector with cable	1
15-102	Liquid Crystal Display Assy	1
633-27	Rechargeable Battery, NiMH	1
ND57959	Main PCB Assembly, S113C	1
ND57963	Main PCB Assembly, S331C	1
ND57960	Main PCB Assembly, S113C with Option 05	1
ND57964	Main PCB Assembly, S331C with Option 05	1
47812-3	Keypad PCB Assy	1
46649-1	Membrane Keypad, Main	1
633-26	Lithium Coin Clock Battery	1

Part Number	Description	Qty
<b>Hardware</b>		
900-861	Pan Head Screw, 4-20, 0.365	15
900-869	Screw, 4-40, 0.875	4
900-720	Screw, 4-40, 0.187	3
900-697	Screw, 4-40, 0.312	3
785-929	M-F Stand off, 4-40, 11/16	3
900-326	Kep Nut, 4-40, 0.187	8
790-516	Hole Plug, 0.6875L	1
790-42	Hole Plug, 0.625	1
761-79	Cap Vinyl, Black, round	1
<b>Case Parts</b>		
46652-1	Top Case only, S113C/S331C	1
46652-2	Top Case only, S115BQ	1
46653-1	Bottom Case only	1
48297	Plastic Display Window, S115BQ	1
48231-1	Battery Door	1
790-509 790-510 790-511	Battery Door Latch (3 pieces)	1
46655	Case Corner Bumpers	4
46662	LCD Retainer Plate	1
48241	Foam, LCD Corners	8
48278	Foam, LCD Window	1
46659	Foam, LCD Backing	1
46661	Foam, Keypad Backing	1
48246	Foam, Battery Door	4
720-19	Cable Clamp	1
790-515	Spring, Battery Compartment	3
55216	ID Label, Model S113C	1
55223	ID Label, Model S331C	1
55224	ID Label, Model S115BQ	1

***NOTES***

**Table 2.** Anritsu Service Centers

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**UNITED STATES**

ANRITSU COMPANY  
685 Jarvis Drive  
Morgan Hill, CA 95037-2809  
Telephone: (408) 776-8300  
FAX: 408-776-1744

ANRITSU COMPANY  
10 NewMaple Ave., Unit 305  
Pine Brook, NJ 07058  
Telephone: (201) 227-8999  
FAX: 201-575-0092

ANRITSU COMPANY  
1155 E. Collins Blvd  
Richardson, TX 75081  
Telephone: 1-800-ANRITSU  
FAX: 972-671-1877

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