Anritsu

Site Master
S810C and S820C
Microwave Transmission Line and Antenna Analyzer

User's Guide

Hand-Held Microwave Analyzer for Antennas,
Transmission Lines and Microwave Components

Color Front Cover only P/N: 00986-00054

WARRANTY

The Anritsu product(s) listed on the title page is (are) warranted against defects in materials and workmanship for one year from the date of shipment.
Anritsu's obligation covers repairing or replacing products which prove to be defective during the warranty period. Buyers shall prepay transportation charges for equipment returned to Anritsu for warranty repairs. Obligation is limited to the original purchaser. Anritsu is not liable for consequential damages.

LIMITATION OF WARRANTY

The foregoing warranty does not apply to Anritsu connectors that have failed due to normal wear. Also, the warranty does not apply to defects resulting from improper or inadequate maintenance by the Buyer, unauthorized modification or misuse, or operation outside the environmental specifications of the product. No other warranty is expressed or implied, and the remedies provided herein are the Buyer's sole and exclusive remedies.

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UPDATES

Updates to this manual, if any, may be downloaded from the Anritsu Internet site at: http://www.us.anritsu.com.

February 2003
10580-00076

Revision: B

DECLARATION OF CONFORMITY

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: Site Master

Model Number: S810C, S820C

conforms to the requirement of:

EMC Directive 89/336/EEC as amended by Council Directive 92/31/EEC & 93/68/EEC
Low Voltage Directive 73/23/EEC as amended by Council directive 93/68/EEC

Electromagnetic Interference:

Emissions:	CISPR 11:1990/EN55011: 1991 Group 1 Class A EN 61000-3-2:1995 Class A EN 61000-3-3:1995 Class A
Immunity:	EN 61000-4-2:1995/EN50082-1: 1997 - 4kV CD, 8kV AD EN 61000-4-3:1997/EN50082-1: 1997 - 3V/m ENV 50204/EN50082-1: 1997 – 3V/m EN 61000-4-4:1995/EN50082-1: 1997 - 0.5kV SL, 1kV PL EN 61000-4-5:1995/EN50082-1: 1997 - 1kV L-L, 2kV L-E EN 61000-4-6:1994/EN61326: 1998 – 3V EN 61000-4-11:1994/EN61326: 1998 – 1 cycle@100%

Electrical Safety Requirement:

Product Safety: The Product Complies when used with Company supplied Power Supply (tested to EN 60950)

Corporate Quality Director

Morgan Hill, CA

11 SEPT 02
Date

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

Table of Contents

Chapter 3 - Getting Started

Chapter 4 - Cable & Antenna Measurements

Chapter 5 - Power Measurement

Chapter 6 - Software Tools

Appendix A - Reference Data

Appendix B - Windowing

Index

Chapter 1
General Information

Introduction

1

This chapter provides a description, performance specifications, optional accessories, preventive maintenance, and calibration requirements for the Microwave Site Master models S810C and S820C. Throughout this manual, the term Site Master will refer to the models S810C and S820C.

Model	Frequency Range
S810C	3.3 - 10.5 GHz
S820C	3.3 - 20 GHz

Description

The Site Master is a hand held SWR/RL (standing wave ratio/return loss), and Distance-To-Fault (DTF) measurement instrument that includes a built-in synthesized signal source. All models include a keypad to enter data and a liquid crystal display (LCD) to provide graphic indications of SWR or RL over the selected frequency range and selected distance. The Site Master is capable of up to 2.5 hours of continuous operation from a fully charged field-replaceable battery and can be operated from a 12.5 dc source. Built-in energy conservation features can be used to extend battery life over an eight-hour work day.

The Site Master is designed for measuring SWR, return loss, cable or waveguide insertion loss and locating faulty RF components in antenna systems. Power monitoring is available as an option. The displayed trace can be scaled or enhanced with frequency markers or limit lines. A menu option provides for an audible “beep” when the limit value is exceeded. To permit use in low-light environments, the LCD can be back lit using a front panel key.

Standard Accessories

The Software Tools PC-based software program provides a database record for storing measurement data. Site Master Software Tools can also convert the Site Master display to a Microsoft Windows™ 95/98/NT4/2000/ME/XP workstation graphic. Measurements stored in the Site Master internal memory can be downloaded to the PC using the included null-modem serial cable. Once stored, the graphic trace can be displayed, scaled, or enhanced with markers and limit lines. Historical graphs can be overlaid with current data, and underlying data can be extracted and used in spreadsheets or for other analytical tasks.

The Site Master Software Tools program can display all of the measurements made with the Site Master (SWR, return loss, cable loss, distance-to-fault) as well as providing other functions, such as converting display modes and Smith charts. Refer to the chapter on Software Tools in this manual for more information.

The following items are supplied with the basic hardware.

- Soft Carrying Case
- AC-DC Adapter
- Automotive Cigarette Lighter 12 Volt DC Adapter,
- CDROM disk containing the Software Tools program. This program contains Fault Location (DTF) and Smith Chart functions
- Serial Interface Cable (null modem type)
- Ruggedized Adapter, Precision K (m) to N (f), Anritsu 34RKNF50
- One year Warranty (includes battery, firmware, and software)
- User's Guide

Options

- Option 5 — Add Power Monitor
- RF Detector, 10 MHz to 20 GHz, N(m) input connector, 50 Ohms, Part No. 560-7N50B

Printers

- 2000-766 HP DeskJet Printer, with Interface Cable, Black Print Cartridge, and U.S. Power Cable
- 2000-753 Serial-to-Parallel Converter Cable
- 2000-663 Power Cable (Europe) for DeskJet Printer
- 2000-664 Power Cable (Australia) for DeskJet Printer
- 2000-665 Power Cable (U.K.) for DeskJet Printer
- 2000-667 Power Cable (So. Africa) for DeskJet Printer
- 2000-1046 Serial-to-parallel Converter Cable w/ DIP switch labeling, 36-pin female Centronics to DB25 female
- 2000-1206 Black Print Cartridge for HP350 DeskJet
- 2000-1207 Rechargeable Battery Pack for HP 350 DeskJet

Optional Accessories

Part Number	Description
10580-00077	S810C/S820C Programming Manual (on CD ROM only)
10580-00078	S810C/S820C Maintenance Manual
760-215A	Transit Case for Site Master
633-27	Rechargeable Battery, NiMH
2000-1029	Battery Charger with universal power supply, NiMH only
48258	Soft Carrying Case
40-115	AC Adaptor Power Supply
806-62	Cable Assy, Cig Plug, Female
800-441	Serial Interface Cable Assy
551-1691	USB to Serial Adapter Cable
2300-347	Software Tools CD
22N50	Anritsu Precision N (m) Short/Open
22NF50	Anritsu Precision N (f) Short/Open
28N50-2	Anritsu Precision N (m) Load, 40 dB
28NF50-2	Anritsu Precision N (f) Load, 40 dB
22K50	Anritsu Precision K (m) Short/Open
22KF50	Anritsu Precision K (f) Short/Open
28K50	Anritsu Precision Termination, DC to 40 GHz, 50 Ohm, K (m)
28KF50	Anritsu Precision Termination, DC to 40 GHz, 50 Ohm, K (f)
34NN50A	Precision Adapter N (m) to N (m)
34NFNF50	Precision Adapter N (f) to N (f)
34RSN50	Precision Adapter, Ruggedized, 20 GHz, WSMA (m) to N (m)
K220B	Precision Adapter, 40 GHz, K (m) to K (m)
K222B	Precision Adapter, 40 GHz, K (f) to K (f),
15NNF50-1.5C	Armored Test Port Extension Cable, 1.5 meter, N (m) to N (f)
15NNF50-3.0C	Armored Test Port Extension Cable, 3.0 meter, N (m) to N (f)
15NNF50-5.0C	Armored Test Port Extension Cable, 5.0 meter, N (m) to N (f)
15KKF50-1.5A	Armored Test Port Extension Cable, 1.5 meter, K (m) to K (f)
15KKF50-3.0A	Armored Test Port Extension Cable, 3.0 meter, K (m) to K (f)
15KKF50-5.0A	Armored Test Port Extension Cable, 5.0 meter, K (m) to K (f)
15RKKF50-1.5A	Armored Test Port Extension Cable, 1.5 meter, K (m) to K (f)
560-7N50B	RF Detector, 50Ω, 10 MHz to 20 GHz, N (m) input connector
1N50C	5W Limiter, 18 GHz, N (m) to N (f)
42N50-20	5W Attenuator, 18 GHz, N (m) to N (f)

Performance Specifications

Performance specifications are provided in Table 1-1, on the following page.

Table 1-1. Performance Specifications (1 of 2)

Specifications are valid when the unit is calibrated at ambient temperature after a 5 minute warmup.

Description	Value
Frequency Range:	
Site Master S810C	3.3 to 10.5 GHz
Site Master S820C	3.3 to 20.0 GHz
Frequency Accuracy	≤20 KHz, for all frequencies
Frequency Resolution	1 MHz
SWR:	
Range	1.00 to 65.00
Resolution	0.01
Return Loss:	
Range	0.0 to 54.00 dB
Resolution	0.01 dB
Coax/Waveguide Insertion Loss:	
Range	0.0 to 54.00 dB
Resolution	0.01 dB
**Distance-To-Fault (DTF):	
Vertical Range Return Loss:	0.00 to 54.00 dB
SWR:	1.00 to 65.00
Horizontal Range	0 to ((# of data points –1) × resolution) a maximum of 1000m (3281 ft.) with a maximum of 517 points resolution, # of data pts. = 130, 259, 517
Horizontal Resolution for Coax (rectangular windowing)	$\frac{(1.5 \times 10^8)(Vp)}{\Delta F}$ Where V_p is the relative propagation velocity of the cable; dp is the number of data points (130, 259, 517); ΔF is the stop frequency minus the start frequency (Hz)
Horizontal Resolution for Waveguide	$\frac{1.5 \times 10^8 (\sqrt{1-(F_C / F_1)^2})}{\Delta F}$ Where F_C is the waveguide cutoff frequency (Hz); F_1 is the start frequency (Hz); ΔF is the stop frequency minus the start frequency (Hz)
Power Monitor:	
Range	–45.0 to +20 dBm *or* 30.0 nW to 100.0 mW
Offset Range	0 to +60.0 dB
Display Range	-80 dBm to +80 dBm
Resolution	0.1 dB *or* 0.1 xW
Test Port, Type K	50 Ohms
***Immunity to Interfering signals up to the level of	–10 dBm

Table 1-2. Performance Specifications (2 of 2)

Maximum Input (Damage Level):		
Test Port, Type K		+27 dBm
RF Detector		+20 dBm
Internal Memory:		
Trace Memory		200 maximum
Instrument Configuration		10 setup locations
RS-232		9 pin D-sub, three wire serial
Electromagnetic Compatibility		Complies with European community requirements for CE marking
External DC Input		+12.5 to +15 Vdc, 1100 mA max.
Temperature:	Storage	–20° C to 75° C
	Operating	0° C to 50° C
Weight:		1.89 kg (4.2 pounds)
Dimensions:		25.4 x 17.8 x 6.1 cm (10 x 7 x 2.4 inches)

** ±2 ppm/Δ°C from 25°C*

*** Fault location is accomplished by inverse Fourier Transformation of data taken with the* **Site Master**. *Resolution and maximum range depend on the number of frequency data points, frequency sweep range and relative propagation velocity of the cable or group velocity of the waveguide being tested.*

**** Immunity measurement is made in CW mode with incoming interfering signal exactly at the same frequency (worst case situation). Typical immunity is better when swept frequency is used.*

Preventive Maintenance

Site Master preventive maintenance consists of cleaning the unit and inspecting and cleaning the RF connectors on the instrument and all accessories.

Clean the Site Master with a soft, lint-free cloth dampened with water or water and a mild cleaning solution.

CAUTION: *To avoid damaging the display or case, do not use solvents or abrasive cleaners.*

Clean the RF connectors and center pins with a cotton swab dampened with denatured alcohol. Visually inspect the connectors. The fingers and pins of the connectors should be unbroken and uniform in appearance. If you are unsure whether the connectors are good, gauge the connectors to confirm that the dimensions are correct.

Visually inspect the test port cable(s). The test port cable should be uniform in appearance, not stretched, kinked, dented, or broken.

Calibration

The Microwave Site Master is a field portable unit operating in the rigors of the test environment. An Open-Short-Load (OSL) calibration for coax cable, or 1/8 offset, 3/8 offset and precision load calibration for waveguide, should be performed prior to making a measurement in the field (see Calibration, page 3-2). A built-in temperature sensor in the Site Master advises the user, via an icon located on the right side of the LCD screen, that the internal temperature has exceeded a safety window, and the user is advised to perform another OSL calibration in order to maintain the integrity of the measurement.

NOTES:
For best calibration results—compensation for all measurement uncertainties—ensure that the Open/Short/Load is at the end of the test port or optional extension cable; that is, at the same point that you will connect the antenna or device to be tested.

For best results, use a phase stable Test Port Extension Cable (see Optional Accessories). If you use a typical laboratory cable to extend the Site Master test port to the device under test, cable bending subsequent to the OSL calibration will cause uncompensated phase reflections inside the cable. Thus, cables which are NOT phase stable may cause measurement errors that are more pronounced as the test frequency increases.

For optimum calibration, Anritsu recommends using precision calibration components.

Annual Verification

Anritsu recommends an annual calibration and performance verification of the Site Master and the OSL calibration components by local Anritsu service centers. Anritsu service centers are listed in Table 1-2 on the following page.

The Site Master is self-calibrating, meaning that there are no field-adjustable components. However, the OSL calibration or 1/8 offset, 3/8 offset and precision load components are crucial to the integrity of the calibration and therefore, must be verified periodically to ensure performance conformity. This is especially important if the OSL or 1/8 offset, 3/8 offset or precision load calibration components have been accidentally dropped or over-torqued.

ESD Precautions

The Site Master, like other high performance instruments, is susceptible to ESD damage. Very often, coaxial cables or waveguides and antennas build up a static charge, which, if allowed to discharge by connecting to the Site Master, may damage the Site Master input circuitry. Site Master operators should be aware of the potential for ESD damage and take all necessary precautions. Operators should exercise practices outlined within industry standards like JEDEC-625 (EIA-625), MIL-HDBK-263, and MIL-STD-1686, which pertain to ESD and ESDS devices, equipment, and practices.

As these apply to the Site Master, it is recommended to dissipate any static charges that may be present before connecting the coaxial cables or antennas to the Site Master. This may be as simple as temporarily attaching a short or load device to the cable or antenna prior to attaching to the Site Master. It is important to remember that the operator may also carry a static charge that can cause damage. Following the practices outlined in the above standards will insure a safe environment for both personnel and equipment.

Table 1-2. Anritsu Service Centers

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., Suite 305
Pine Brook, NJ 07058
Telephone: 973-227-8999
FAX: 973-575-0092

ANRITSU COMPANY
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Richardson, TX 75081
Telephone: 1-800-ANRITSU
FAX: 972-671-1877

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ANRITSU PTY. LTD.
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Mt Waverley, VIC 3149
Australia
Telephone: 03-9558-8177
FAX: 03-9558-8255

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ANRITSU ELECTRONICA LTDA.
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Telephone: 021-527-6922
FAX: 021-53-71-456

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ANRITSU INSTRUMENTS LTD.
700 Silver Seven Road, Suite 120
Kanata, Ontario K2V 1C3
Telephone: (613) 591-2003
FAX: (613) 591-1006

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FAX: 86-21-58680588

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FAX: 016-44-61-065

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Germany
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FAX: 0211-9685555

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New Delhi, India 110 016
Telephone: 011-685-3959
FAX: 011-686-6720

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Telephone: 972-36-478563
FAX: 972-36-478334

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ANRITSU Sp.A
Rome Office
Via E. Vittorini, 129
00144 Roma EUR
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FAX: 06-50-22-4252

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FAX: 0462-25-8379

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FAX: 82-2-553-6605

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Fax: 011-27-11-787-0446

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Botvid Center
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FAX: (08)534-707-30

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Telephone: 886-2-8751-2126
FAX: 886-2-8751-1817

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200 Capability Green
Luton, Bedfordshire
LU1 3LU, England
Telephone: 015-82-43-3200
FAX: 015-82-73-1303

Chapter 2
Functions and Operations

Introduction

This chapter provides a brief overview of the Microwave Site Master functions and operations, providing the user with a starting point for making basic measurements. For more detailed information, refer to Chapter 4, *Cable & Antenna Measurements*, and Chapter 6, *Software Tools*.

The Microwave Site Master is designed specifically for field environments and applications requiring mobility. As such, it is a lightweight, handheld, battery operated unit which can be easily carried to any location, and is capable of up to 2.5 hours of continuous operation from a fully charged battery. Built-in energy conservation features allow battery life to be extended over an eight-hour workday. The Site Master can also be powered by a 12.5 Vdc external source. The external source can be either the Anritsu AC-DC Adapter (P/N 40-115) or 12.5 Vdc Automotive Cigarette Lighter Adapter (P/N 806-62). Both items are standard accessories.

Test Connector Panel

The connectors and indicators located on the test panel (Figure 2-2) are listed and described below.

12.5-15VDC (1100 mA) 12.5 to 15 Vdc @ 1100 mA input to power the unit or for battery charging.

WARNING

When using the AC-DC Adapter, always use a three-wire power cable connected to a three-wire power line outlet. If power is supplied without grounding the equipment in this manner, there is a risk of receiving a severe or fatal electric shock.

Battery Charging Illuminates when the battery is being charged. The indicator automatically shuts off when the battery is fully charged.

External Power Illuminates when the Site Master is being powered by the external charging unit.

Serial Interface RS232 DB9 interface to a COM port on a personal computer (for use with the Anritsu Software Tools program) or to a supported printer.

RF Out RF output, 50 Ω impedance, for reflection measurements.

RF Detector RF detector input for the Power Monitor.

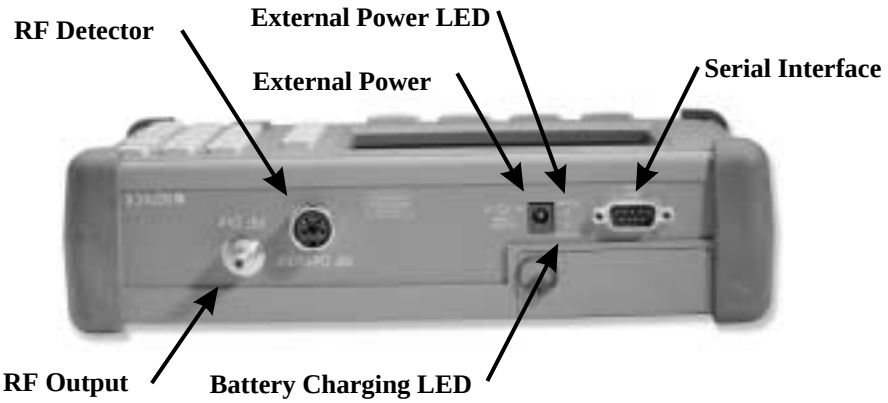


Figure 2-2. Test Connector Panel

Front Panel Overview

The Site Master menu-driven user interface is easy to use and requires little training. Hard keys on the front panel are used to initiate function-specific menus. There are four function hard keys located below the display, Mode, Frequency/Distance, Amplitude and Sweep.

There are seventeen keypad hard keys located to the right of the display. Twelve of the keypad hard keys perform more than one function, depending on the current mode of operation. The dual purpose keys are labeled with one function in black, the other in blue.

There are also six soft keys that change function depending upon the current mode selection. The current soft key function is indicated in the active function block to the right of the display. The locations of the different keys are illustrated in Figure 2-1.

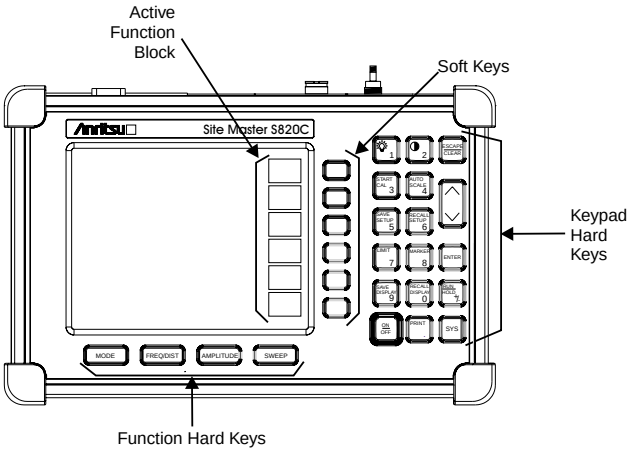


Figure 2-1. Site Master Soft Keys

The following sections describe the various key functions.

Function Hard Keys

MODE Opens the mode selection box (below). Use the Up/Down arrow key to select a mode. Press the ENTER key to implement.

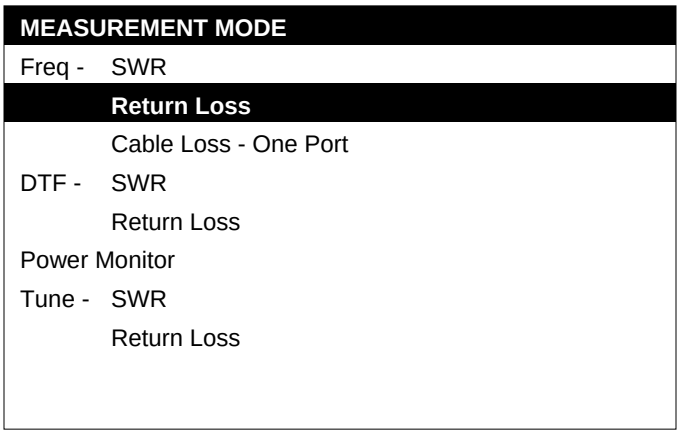


Figure 2-3. Mode Selection Box

FREQ/DIST Displays the Frequency or Distance to Fault softkey menus depending on the measurement mode.

AMPLITUDE Displays the amplitude softkey menu for the current operating mode.

SWEEP Displays the Sweep function softkey menu for the current operating mode.

Keypad Hard Keys

This section contains an alphabetical listing of the Site Master front panel keypad controls along with a brief description of each. More detailed descriptions of the major function keys follow.

The following keypad hard key functions are printed in **black** on the keypad keys.

0-9 These keys are used to enter numerical data as required to setup or perform measurements.

+/– The plus/minus key is used to enter positive or negative values as required to setup or perform measurements.

• The decimal point is used to enter decimal values as required to setup or perform measurements.

ESCAPE CLEAR Exits the present operation or clears the display. If a parameter is being edited, pressing this key will clear the value currently being entered and restore the last valid entry. Pressing this key again will close the parameter. During normal sweeping, pressing this key will move up one menu level.

UP/DOWN ARROWS Increments or decrements a parameter value. The specific parameter value affected typically appears in the message area of the LCD.

NOTE: At turn on, before any other keys are pressed, the Up/Down arrow key may be used to adjust the display contrast. Press ENTER to return to normal operation.

ENTER Implements the current action or parameter selection.

ON OFF Turns the Anritsu Site Master on or off. When turned on, the system state at the last turn-off is restored. If the **ESCAPE/CLEAR** key is held down while the **ON/OFF** key is pressed, the factory preset state will be restored.

SYS Allows selection of display language and system setup parameters. Choices are OPTIONS, CLOCK, SELF TEST, STATUS and LANGUAGE.

The following keypad hard key functions are printed in **blue** on the keypad keys.

Turns the liquid crystal display (LCD) back-lighting ON or OFF. (Leaving back lighting off conserves battery power.)

LCD Contrast adjust. Use the Up/Down arrow key and ENTER to adjust the display contrast.

AUTO SCALE Automatically scales the display for optimum resolution.

LIMIT Displays the limit line menu for the current operating mode.

MARKER Displays the marker menu of the current operating mode.

PRINT Prints the current display to the selected printer via the RS232 serial port.

RECALL DISPLAY Recalls a previously saved trace from memory. When the key is pressed, a Recall Trace selection box appears on the display. Select a trace using the Up/Down arrow key and press the ENTER key to implement.

To erase a saved trace, highlight the trace and select the DELETE TRACE softkey. To erase all saved traces, select the DELETE ALL TRACES softkey.

RECALL SETUP Recalls a previously saved setup from memory location 1 through 10. When the key is pressed, a RECALL SETUP selection box appears on the display. Select a setup using the Up/Down arrow key and press the ENTER key to implement. Setup 0 recalls the factory preset state.

RUN/HOLD When in the Hold mode, this key starts the Site Master sweeping and provides a Single Sweep Mode trigger; when in the Run mode, it pauses the sweep. When in the Hold mode, the hold symbol (page 2-17) appears on the display. Hold mode conserves battery power.

SAVE DISPLAY Saves up to 200 displayed traces to non-volatile memory. When the key is pressed, TRACE NAME: appears in the lower left of the display. Save the display with up to 16 alphanumeric characters for that trace name and press the ENTER key to implement.

SAVE SETUP Saves the current system setup to 1 of 10 internal non-volatile memory locations. When the key is pressed, a SAVE SETUP selection box appears on the display. Use the Up/Down arrow key to select a setup and press the ENTER key to implement.

START CAL Starts the calibration in SWR, Return Loss, Cable Loss, or DTF measurement modes.

Soft Keys

Each keypad key opens a set of soft key selections. Each of the soft keys has a corresponding soft key label area on the display. The label identifies the function of the soft key for the current Mode selection.

Figures 2-4 through 2-7 show the soft key labels for each Mode selection.

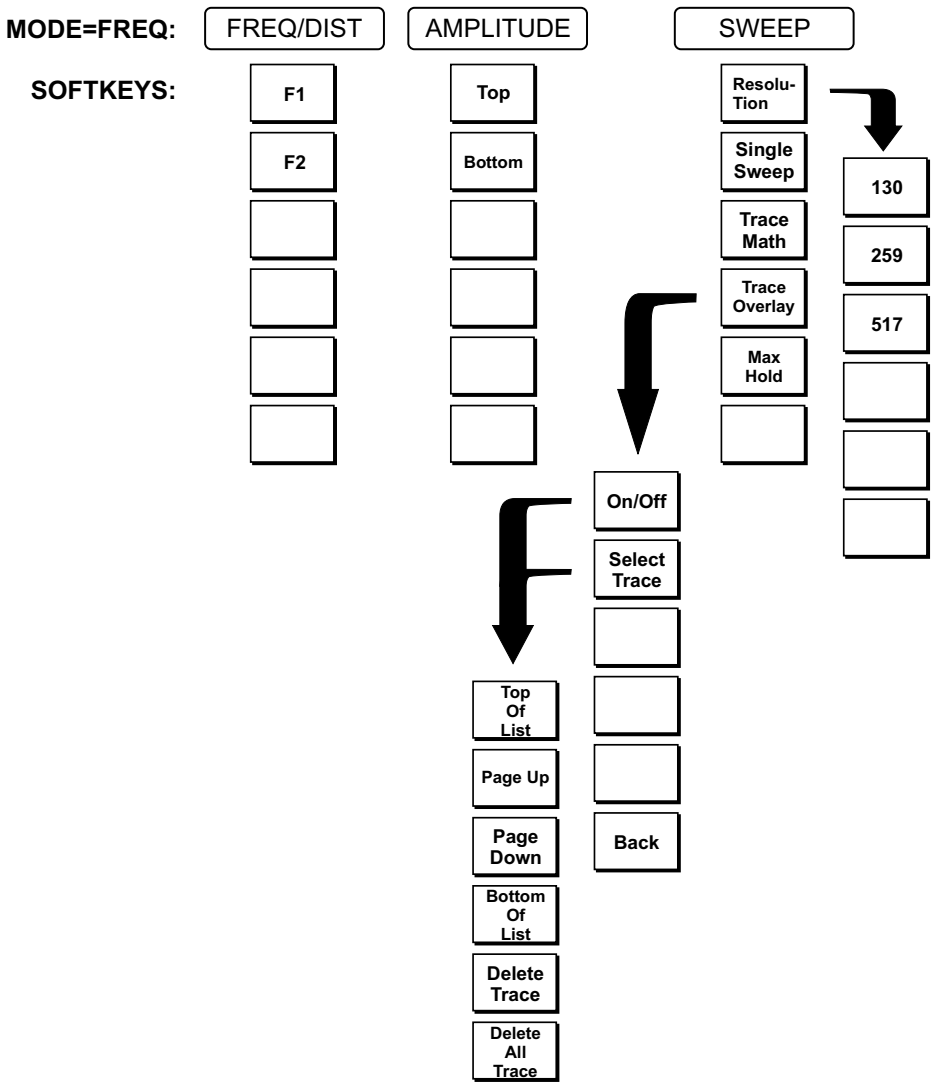


Figure 2-4. Frequency Mode Soft Key Labels

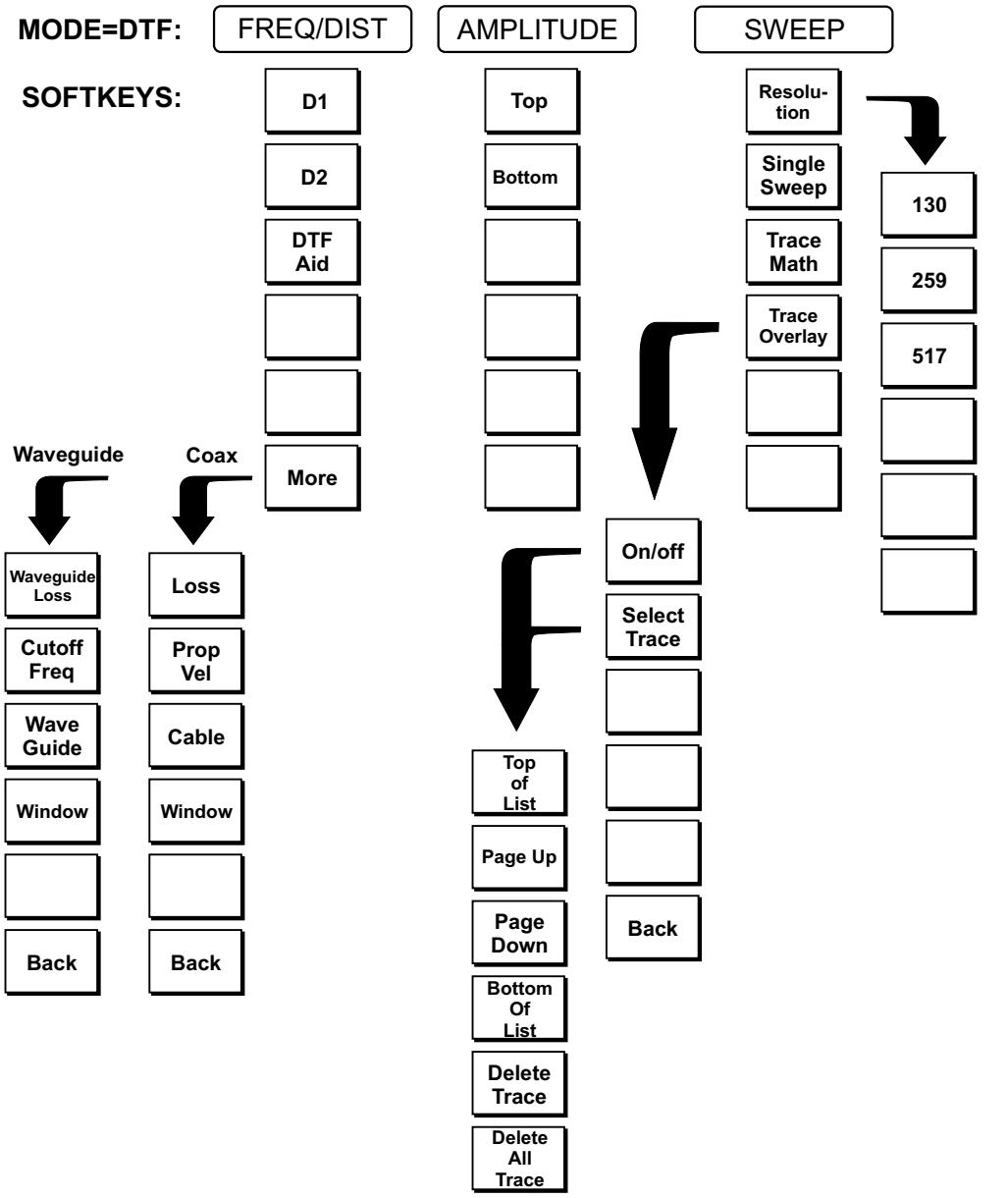


Figure 2-5. Distance to Fault Mode Soft Key Labels

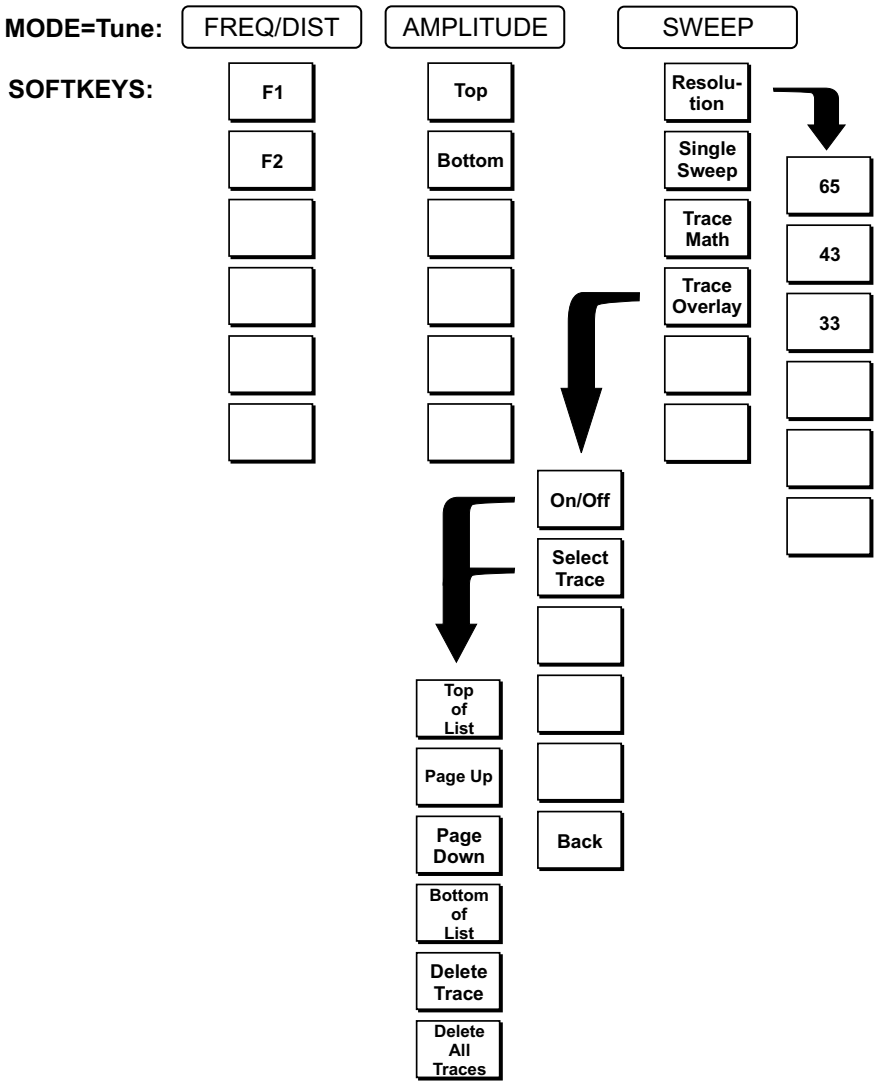


Figure 2-6. Tune Mode Soft Key Labels

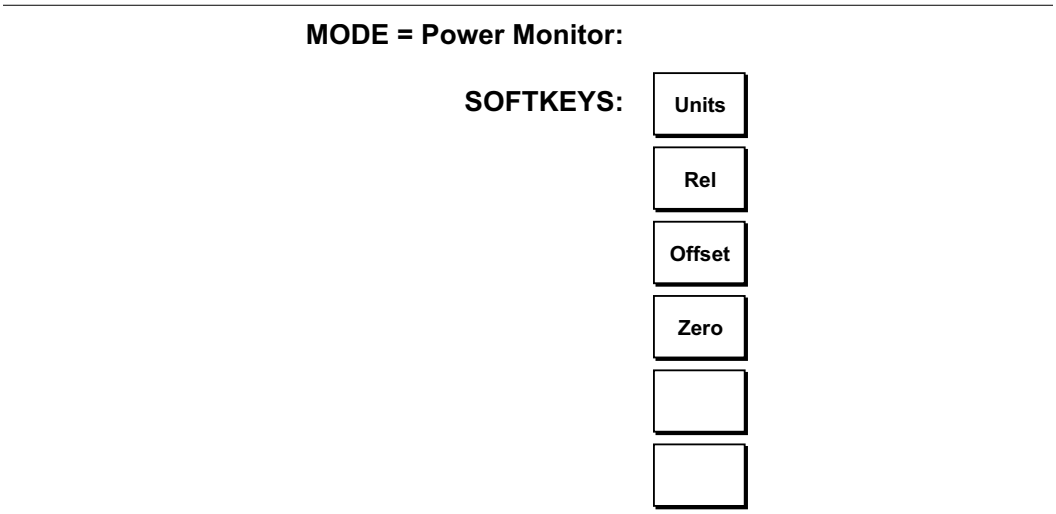


Figure 2-7. Power Monitor Mode Soft Key Labels

FREQ/DIST Displays the frequency and distance menu depending on the measurement mode.

Frequency Menu Provides for setting sweep frequency end points when FREQ mode is selected. Selected frequency values may be changed using the keypad or Up/Down arrow key.

- F1 — Opens the F1 parameter for data entry. This is the start value for the frequency sweep. Press ENTER when data entry is complete.
- F2 — Opens the F2 parameter for data entry. This is the stop value for the frequency sweep. Press ENTER when data entry is complete.

Distance Menu Provides for setting Distance to Fault parameters when a DTF mode is selected. Choosing DIST causes the soft keys, below, to be displayed and the corresponding values to be shown in the message area. Selected distance values may be changed using the keypad or Up/Down arrow key.

- D1 — Opens the start distance (D1) parameter for data entry. This is the start value for the distance range (D1 default = 0). Press ENTER when data entry is complete.
- D2 — Opens the end distance (D2) parameter for data entry. This is the end value for the distance range. Press ENTER when data entry is complete.
- DTF Aid — Provides interactive help to optimize DTF set up parameters. Use the Up/Down arrow key to select a parameter to edit. Press ENTER when data entry is complete.
- More — Selects one of the Distance Sub-Menus, detailed below, depending on whether coax cable or waveguide media is selected.

Distance Sub-Menu (Coax Cable) Provides for setting the cable loss and relative propagation velocity of the coaxial cable. Selected values may be changed using the Up/Down arrow key or keypad.

- Loss — Opens the Cable Loss parameter for data entry. Enter the loss per foot (or meter) for the type of transmission line being tested. Press ENTER when data entry is complete. (Range is 0.5 to 5.000 dB/m, 1.524 dB/ft)
- Prop Vel (relative propagation velocity) — Opens the Propagation Velocity parameter for data entry. Enter the propagation velocity for the type of transmission line being tested. Press ENTER when data entry is complete. (Range is 0.010 to 1.000)
- Cable — Opens a list of cable folders for selection of a common coaxial cable folder or custom coaxial cable folder. Select either folder and use the Up/Down arrow key and ENTER to make a selection. This feature provides a rapid means of setting both cable loss and propagation velocity (Refer to Appendix A for a listing of common coaxial cables showing values for Relative Propagation Velocity and Nominal Attenuation in dB/m or dB/ft). The custom cable folder can consist of up to 24 user-defined cable parameters downloaded via the Site Master Software Tools program.
- Window — Opens a menu of FFT windowing types for the DTF calculation. Scroll the menu using the Up/Down arrow key and make a selection with the ENTER key.
- Back — Returns to the Distance Menu.

Distance Sub-Menu (Waveguide)

Provides for setting the waveguide loss and cutoff frequency parameters of the waveguide. Selected values may be changed using the Up/Down arrow key or keypad.

- Waveguide Loss — Opens the Waveguide Loss parameter for data entry. Enter the loss per meter (or foot) for the type of transmission line being tested. Press ENTER when data entry is complete. (Range is 0 to 5.000 dB/m.)
- Cutoff Freq — Opens the cutoff frequency parameter for data entry. Enter the cutoff freq for the type of waveguide being tested. Press ENTER when data entry is complete. (Range is 1 to 20)
- Waveguide — Opens a list of waveguide folders allowing selection of the standard waveguide folder or a custom waveguide folder. Select either folder and use the Up/Down arrow key and ENTER to make a selection. This feature provides a rapid means of setting cutoff frequency and waveguide loss.
- Window — Opens a menu of FFT windowing types for the DTF calculation. Scroll the menu using the Up/Down arrow key and make a selection with the ENTER key.
- Back — Returns to the Distance Menu.

AMPLITUDE

Displays the amplitude or scale menu depending on the measurement mode.

Amplitude Menu

Provides for changing the display scale. Selected values may be changed using the Up/Down arrow key or keypad.

Choosing AMPLITUDE in Freq or DTF measurement modes causes the soft keys, below, to be displayed and the corresponding values to be shown in the message area.

- Top — Opens the top parameter for data entry and provides for setting the top scale value. Press ENTER when data entry is complete.
- Bottom — Opens the bottom parameter for data entry and provides for setting the bottom scale value. Press ENTER when data entry is complete.

SWEEP Displays the Sweep function soft key menu for the current operating mode.

Sweep Menu Provides for changing the display resolution, single or continuous sweep, and access to the Trace Math functions.

Choosing SWEEP in Freq or DTF measurement modes causes the soft keys below to be displayed.

- Resolution — Opens the display to change the resolution. Choose 130, 259, or 517 data points in Freq mode, or 33, 43, or 65 in Tune mode. (In DTF mode, resolution can be adjusted through the DTF-AID table.)
- Single Sweep — Toggles the sweep between single sweep and continuous sweep. In single sweep mode, each sweep must be activated by the RUN/HOLD button.
- Trace Math — Opens up the Trace Math function menu (Off, Trace – Memory, or Trace + Memory) for comparison of the real time trace in the display with any of the traces from memory. (Not available in DTF mode.)
- Trace Overlay — Opens up the Trace Overlay functions menu to allow the current trace to be displayed with a trace in memory overlaid on it. Choose ON or OFF and Select Trace to select the trace from memory to be overlaid.
- Max Hold — Displays the highest dB value for every data point in the sweep and all subsequent sweeps. Pressing the Max Hold soft key switches the function on or off.

MARKER

Choosing MARKER causes the soft keys, below, to be displayed and the corresponding values to be shown in the message area. Selected frequency marker or distance marker values may be changed using the keypad or Up/Down arrow key.

- M1 — Selects the M1 marker parameter and opens the M1 marker second level menu.
  - On/Off — Turns the selected marker on or off.
  - Edit — Opens the selected marker parameter for data entry. Press ENTER when data entry is complete or ESCAPE to restore the previous value.
  - Marker to Peak — Places the selected marker at the frequency or distance with the maximum amplitude value.
  - Marker to Valley — Places the selected marker at the frequency or distance with the minimum amplitude value.
  - Back — Returns to the Main Markers Menu.
- M2 through M4 — Selects the marker parameter and opens the marker second level menu.
  - On/Off — Turns the selected marker on or off.
  - Edit — Opens the selected marker parameter for data entry. Press ENTER when data entry is complete or ESCAPE to restore the previous value.
  - Delta (Mx-M1) — Displays delta amplitude value as well as delta frequency or distance for the selected marker with respect to the M1 marker.
  - Marker to Peak — Places the selected marker at the frequency or distance with the maximum amplitude value.
  - Marker to Valley — Places the selected marker at the frequency or distance with the minimum amplitude value.
  - Back — Returns to the Main Markers Menu.
- M5 — Selects the M5 marker parameter and opens the M5 second level menu.
  - On/Off — Turns the selected marker on or off.
  - Edit — Opens the selected marker parameter for data entry. Press ENTER when data entry is complete or ESCAPE to restore the previous value.
  - Peak Between M1 & M2 — Places the selected marker at the frequency or distance with the maximum amplitude value between marker M1 and marker M2.
  - Valley Between M1 & M2 — Places the selected marker at the frequency or distance with the minimum amplitude value between marker M1 and marker M2.
  - Back — Returns to the Main Markers Menu.
- M6 — Selects the M6 marker parameter and opens the M6 second level menu.
  - On/Off — Turns the selected marker on or off.
  - Edit — Opens the selected marker parameter for data entry. Press ENTER when data entry is complete or ESCAPE to restore the previous value.

- Peak Between M3 & M4 — Places the selected marker at the peak between marker M3 and marker M4.
- Valley Between M3 & M4 — Places the selected marker at the valley between marker M3 and marker M4.
- Back — Returns to the Main Markers Menu.

LIMIT

Pressing **LIMIT** on the data keypad activates a menu of limit related functions. Use the corresponding softkey to select the desired limit function. Then use the Up/Down arrow key to change its value, which is displayed in the message area at the bottom of the display.

Choosing LIMIT in Freq or DTF measurement modes causes the soft keys below to be displayed.

- Single Limit — Sets a single limit value in dBm. Menu choices are:
  - On/Off
  - Edit
  - Back
- Multiple Limits — Sets multiple user defined limits, and can be used to create a limit mask for quick pass/fail measurements. Menu choices are:
  - Segment 1
  - Segment 2
  - Segment 3
  - Segment 4
  - Segment 5
  - Back
- Limit Beep — Turns the audible limit beep indicator on or off.

SYS

Displays the System menu softkey selections.

- Options — Displays a second level of functions:
  - Units — Select the unit of measurement (English or metric).
  - Printer — Displays a menu of supported printers. Use the Up/Down arrow key and ENTER key to make the selection.
  - Fixed CW — Toggles the fixed CW function ON or OFF. When OFF, a narrow band of frequencies centered on the selected frequency is generated. When CW is ON, only the center frequency is generated. Output power is pulsed in all modes.
  - Change Date Format — Toggles the date format between MM/DD/YY, DD/MM/YY, and YY/MM/DD.
  - Set Connector Coeff — Displays coefficients for the coax calibration components.
  - Back — Returns to the top-level SYS Menu.
- Clock — Displays a second level of functions:
  - Hour — Enter the hour (0-23) using the Up/Down arrow key or the keypad. Press ENTER when data entry is complete or ESCAPE to restore the previous value.
  - Minute — Enter the minute (0-59) using the Up/Down arrow key or the keypad. Press ENTER when data entry is complete or ESCAPE to restore the previous value.
  - Month — Enter the month (1-12) using the Up/Down arrow key or the keypad. Press ENTER when data entry is complete or ESCAPE to restore the previous value.
  - Day — Enter the day using the Up/Down arrow key or the keypad. Press ENTER when data entry is complete or ESCAPE to restore the previous value.
  - Year — Enter the year (1997-2036) using the Up/Down arrow key or the keypad. Press ENTER when data entry is complete or ESCAPE to restore the previous value.
  - Back — Returns to the top-level SYS menu.
- Self Test — Start an instrument self test.
- Status — Displays the current instrument status, including calibration status, temperature, and battery charge state. Press ESCAPE to return to operation.
- Language — Pressing this soft key immediately changes the language used to display messages on the Site Master display. Choices are English, Portuguese, French, German, Spanish, Chinese, and Japanese. The default language is English.

Tune Mode

Tune Mode is used to tune the waveguide by adjusting the connectors quickly at both ends of the waveguide.

There are three levels of resolution available for tune mode, 65, 43 and 33 data points. The higher the number of data points, the more the measurement accuracy. Note that a higher number of data points will increase the time required to make each measurement.

Power Monitor Menu

Selecting Power Monitor from the Mode menu causes the soft keys, described below, to be displayed and the corresponding values shown in the message area.

- Units — Toggles between dBm and Watts.
- Rel — Turns relative mode OFF, if currently ON. If relative mode is currently OFF, turns it ON and causes the power level to be measured and saved as the base level. Subsequent measurements are then displayed relative to this saved value. With units of dBm, relative mode displays dBr; with units of Watts, relative mode displays % (percent).
- Offset — Turns Offset OFF, if currently ON. If Offset is currently OFF, turns it ON and opens the Offset parameter for data entry. Press ENTER when data entry is complete.
  Offset is the attenuation (in dB) inserted in the line between the DUT and the RF detector. The attenuation is added to the measured input level prior to display.
- Zero — Turns Zero OFF, if currently ON. If Zero is currently OFF, this softkey turns it ON and initiates collection of a series of power level samples, which are averaged and saved. This saved value is then subtracted from subsequent measurements prior to display.

Symbols

Table 2-1 provides a listing of the symbols used as condition indicators on the LCD display.

Table 2-1. LCD Icon Symbols

Icon	Symbol
	Site Master is in Hold for power conservation. To resume sweeping, press the RUN/HOLD key. After 10 minutes without a key press, the Site Master will automatically activate the power conservation mode.
	Integrator Failure. Intermittent integrator failure may be caused by interference from another antenna. Persistent integrator failure indicates a need to return the Site Master to the nearest Anritsu service center for repair.
	Lock fail indication. Check battery. (If the Site Master fails to lock with a fully charged battery, call your Anritsu Service Center.)
	When calibration is performed, the Site Master stores the ambient temperature. If the temperature drifts outside the specified range, this indicator will flash. A recalibration at the current temperature is recommended.
	Indicates the remaining charge on the battery. The inner white rectangle grows longer as the battery charge depletes.
	Indicates internal data processing.
CAL ON	The Site Master has been calibrated.
CALL OFF	The Site Master has not been calibrated.

Self Test

At turn-on, the Site Master runs through a series of quick checks to ensure the system is functioning properly. Note that the battery voltage and temperature are displayed in the lower left corner below the self test message. If the battery is low, or if the ambient temperature is not within the specified operational range, Self Test will fail. If Self Test fails and the battery is fully charged and the Site Master is within the specified operating range, call your Anritsu Service Center.

Error Codes

Self Test Errors

A listing of Self Test Error messages is given in Table 2-2.

Table 2-2. Self Test Error Messages

Error Message	Description
BATTERY LOW	Battery voltage is less than 10.0 volts. Charge battery. *If condition persists, call your Anritsu Service Center.*
EXTERNAL POWER LOW	External supply voltage is less than 10.0 volts. *Call your Anritsu Service Center.*
PLL FAILED	Phase-locked loops failed to lock. Charge battery. *If condition persists with a fully charged battery, call your Anritsu Service Center.*
INTEGRATOR FAILED	Integration circuit could not charge to a valid level. Charge battery. *If condition persists with a fully charged battery, call your Anritsu Service Center.*
EEPROM R/W FAILED	Non-volatile memory system has failed. *Call your Anritsu Service Center.*
OUT OF TEMP. RANGE	Ambient temperature is not within the specified operating range. *If the temperature is within the specified operating range and the condition persists, call your Anritsu Service Center.*
RTC BATTERY LOW	The internal real-time clock battery is low. A low or drained clock battery will affect the date stamp on saved traces. *Contact your nearest Anritsu Service Center.*
POWER MONITOR FAIL	Failure of the power monitor system board voltages. *If condition persists, call your Anritsu Service Center.*
BATTERY CAL LOST	Battery communication failed. The indicated battery charge status may be invalid. *If condition persists, call your Anritsu Service Center.*
MEMORY FAIL	The EEPROM test on the Site Master main board has failed. *If condition persists, call your Anritsu Service Center.*
The time and date Have not been set on this Site Master. To set it, after exiting here press the <SYS> [CLOCK] keys. Press ENTER or ESC to continue	The time and date are not properly set in the Site Master. *If condition persists, call your Anritsu Service Center.*

Note: *A listing of Anritsu Service Centers is provided in Table 1-2 , page 1-8.*

Range Errors

A listing of Range Error messages is given in Table 2-3.

Table 2-3. Range Error Messages (1 of 2)

Error Message	Description
RANGE ERROR:F1 > F2	The start (F1) frequency is greater than the stop (F2) frequency.
RANGE ERROR:D1 > D2	The start (D1) distance is greater than the stop (D2) distance.
RANGE ERROR:D2 > DMax=xx.x ft (m)	The stop distance (D2) exceeds the maximum unaliased range. This range is determined by the frequency span, number of points, and relative propagation velocity: $Maximum Unaliased\ Range = \frac{(1.5 \times 10^8)\,(dp-1)\,(V_f)}{F2-F1}$ Where: *dp is the number of data points (130, 259, or 517)*, *V_f is the relative propagation velocity*, *F2 is the stop frequency in Hz*, *F1 is the start frequency in Hz*, *Maximum Unaliased Range is in meters*
RANGE ERROR: TOP<=BOTTOM	The SWR scale parameter top value is less than or equal to its bottom value.
RANGE ERROR: TOP>=BOTTOM	The RL scale parameter top value is greater than or equal to its bottom value.
CAL INCOMPLETE	A complete open, short, and load calibration must be performed before calibration can be turned on.
DIST REQUIRES F1 < F2	Valid distance to fault plots require a non-zero frequency span.
DIST REQUIRES CAL	Distance-to-fault measurements cannot be performed with CAL OFF.
NO STORED SWEEP AT THIS LOCATION	Attempting to recall a display from a location that has not been previously written to. That is, the location does not contain stored sweep.
USE OPTIONS MENU TO SELECT A PRINTER	Attempting to print a display with no printer selected. Select a printer, then retry.
DISTANCE AND CABLE INSERTION LOSS MODE ARE INCOMPATIBLE	DTF measurements only display RL or SWR versus distance.

Table 2-3. Range Error Messages (2 of 2)

Error Message	Description
CANNOT ZERO NO DETECTOR INSTALLED	Attempting to perform a Power Monitor zero adjust function with no RF detector connected to the Site Master.
CANNOT ZERO INPUT SIGNAL TOO HIGH	Attempting to perform a Power Monitor zero adjust function with an input of greater than –20 dBm.
POWER MONITOR OPTION NOT INSTALLED	Attempting to enter Power Monitor mode with no Option 5 installed.

Battery Information

Charging a New Battery

The NiMH battery supplied with the Site Master has already completed three charge and discharge cycles at the factory and full battery performance should be realized after your first charge.

NOTE: The battery will not charge if the battery temperature is above 45° C or below 0° C.

Charging the Battery in the Site Master

The battery can be charged while installed in the Site Master.

Step 1. Turn the Site Master off.

Step 2. Connect the AC-DC adapter (Anritsu part number: 40-115) to the Site Master charging port.

Step 3. Connect the AC adapter to a 120 VAC or 240 VAC power source as appropriate for your application.

The green external power indicator on the Site Master will illuminate, indicating the presence of external DC power, the battery charge indicator will light, and the battery will begin fast charging. The charging indicator will remain lit as long as the battery is fast charging. Once the battery is fully charged, the fast charging indicator will turn off and a trickle charge will be started to maintain battery capacity. If the battery fails to charge, contact your nearest Anritsu service center.

NOTE: If a battery is excessively discharged, it may require several hours of trickle charging before the charger will allow a fast charge. Switching to fast charge mode is not automatic. You must either cycle the power on and off, or disconnect and reconnect the AC-DC adapter.

Charging the Battery in the Optional Charger

Up to two batteries can be charged simultaneously in the optional battery charger.

Step 1. Remove the NiMH battery from your Site Master and place it in the optional charger (Anritsu part number 2000-1029).

Step 2. Connect the lead from the AC-DC adapter to the charger.

Step 3. Connect the AC-DC adapter to a 120 VAC or 240 VAC power source as appropriate for your application.

Each battery holder in the optional charger has an LED charging status indicator. The LED color changes as the battery is charged:

Red indicates the battery is charging
Green indicates the battery is fully charged
Yellow indicates the battery is in a waiting state (see below).

A yellow light may occur because the battery became too warm during the charge cycle. The charger will allow the battery to cool off before continuing the charge. A yellow light may also indicate that the charger is alternating charge to each of the two batteries.

A blinking red light indicates less than 13 VDC is being supplied to the charger stand. Check that the correct AC charger adapter is connected to the charger stand. If the battery fails to charge, contact your nearest Anritsu Service Center.

Determining Remaining Battery Life

When the AC-DC adapter is unplugged from the Site Master, the battery indicator symbol will be continuously displayed at the top left corner of the Site Master display (Figure 2-8). A totally black bar within the battery icon indicates a fully charged battery. When LOW BATT replaces the battery indicator bar at the top left corner, a couple of minutes of measurement time remains. If a flashing LOW BATT is accompanied by an audio beep at the end of each trace, the battery has approximately one minute of useable time remaining

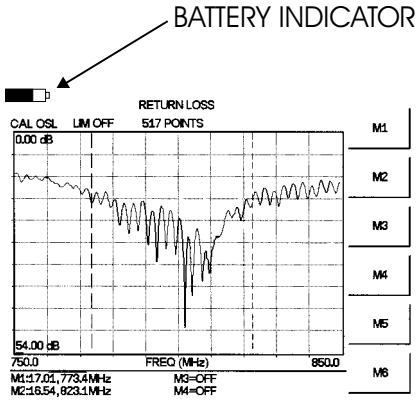


Figure 2-8. Site Master Battery Indicator

Once all the power has drained from the battery, the Site Master display will fade. At this point, your Site Master will switch itself off and the battery will need to be recharged.

During operation, the battery condition can be viewed by pressing the **SYS** key and selecting the Self Test soft key. The battery condition will be displayed as a percentage of charge remaining.

SELF TEST

Voltage	BATTERY	11.1V
Temperature	24°C	
Battery Cal	PASSED	
PLL	PASSED	
Integrator	PASSED	
Memory	PASSED	

Battery Charge = 84%

I = –175 mA

RTC Battery Voltage (2.9 to 3.1V) = 2.9V

Press ESCAPE to Continue

Figure 2-9. Self Test Battery Condition Display

Battery Life

The NiMH battery will last longer and perform better if allowed to completely discharge before recharging. For maximum battery life, it is recommended that the NiMH battery be completely discharged and recharged once every three months.

It is normal for NiMH batteries to self-discharge during storage, and to degrade to 80% of original capacity after 12 months of continuous use.

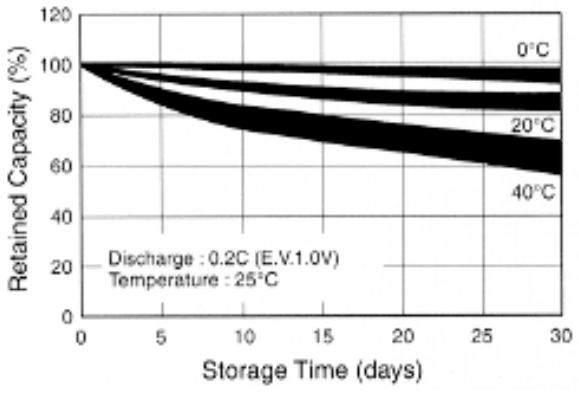


Figure 2-10. NiMH Battery Storage Characteristics

The battery can be charged and discharged 300 to 500 times, but it will eventually wear out. The battery may need to be replaced when the operating time between charging is noticeably shorter than normal.

Important Battery Information

- With a new NiMH battery, full performance is achieved after three to five complete charge and discharge cycles. The NiMH battery supplied with the Site Master has already completed three charge and discharge cycles at the factory.
- Recharge the battery only in the Site Master or in an Anritsu approved charger.
- 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. Storing the battery in extreme hot or cold places will reduce the capacity and lifetime of the battery. The battery will discharge faster at higher ambient temperatures.
- 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 is noticeably shorter than normal.
- If a battery is allowed to totally discharge, the smart-memory capability of the battery may be lost, resulting in incorrect battery capacity readings or loss of communication with the battery.
- Do not short-circuit the battery terminals.
- Do not drop, mutilate or attempt to disassemble the battery.
- Never use a damaged or worn out charger or battery.
- Always use the battery for its intended purpose only.
- 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.
- Batteries must be recycled or disposed of properly. Do not dispose of the batteries in the trash or a fire!

Chapter 3
Getting Started

Introduction

This chapter provides a brief overview of the Anritsu Site Master. The intent of this chapter is to provide the user with a starting point for making basic Return Loss measurements.

Power On Procedure

The Anritsu Site Master is capable of up to 2.5 hours of continuous operation from a fully charged, field-replaceable battery. Built-in energy conservation features allow battery life to be extended over an eight-hour workday.

The Site Master can also be operated from a 12.5 Vdc source (which will also simultaneously charge the battery). This can be achieved with either the Anritsu AC-DC Adapter (P/N 40-115) or 12.5 Vdc Automotive Cigarette Lighter Adapter (P/N 806-62). Both items are included as standard accessories (see Chapter 1).

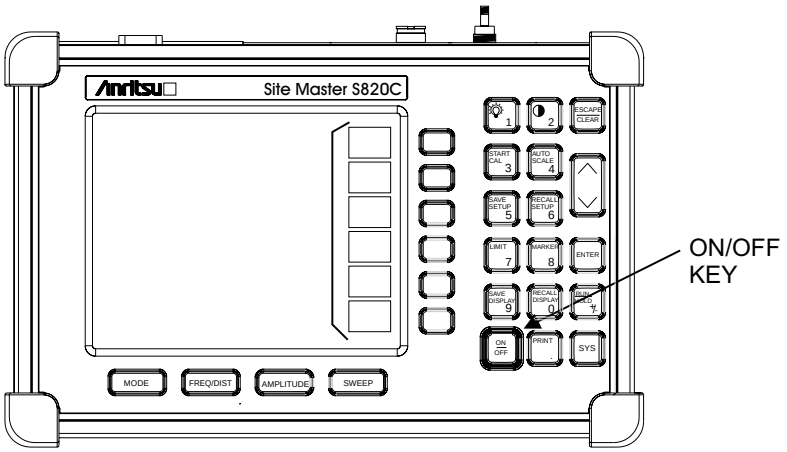


Figure 3-1. Site Master On/Off Key

To power on the Site Master:

Step 1. Press the **ON/OFF** front panel key (Figure 3-1).

The Site Master will display the model number, the firmware revision, the temperature and voltage, and then perform a five second self-test. At completion of the self-test, the screen displays a prompt to press **ENTER** to continue. If enter is not pressed, the Site Master will continue after a 5 second timeout:

Step 2. Press **ENTER** to continue.

The Site Master is now ready for operation.

Select the Frequency or Distance

Regardless of the calibration method used, the frequency range for the desired measurements must be set before calibrating the Site Master. The following procedure selects the frequency range for the calibration.

Step 1. Press the **FREQ/DIST** key.

Step 2. Press the F1 soft key.

Step 3. Enter the desired start frequency using the key pad or the Up/Down arrow key.

Step 4. Press **ENTER** to set F1 to the desired frequency.

Step 5. Press the F2 soft key.

Step 6. Enter the desired stop frequency using the keypad or the Up/Down arrow key.

Step 7. Press **ENTER** to set F2 to the desired frequency.

Check that the start and stop frequencies displayed match the desired measurement range.

Calibration

For accurate results, the Site Master must be calibrated before making any measurements. The Site Master must be re-calibrated whenever the setup frequency changes, the temperature exceeds the calibration temperature range or when the test port extension cable is removed or replaced.

If a Test Port Extension Cable is to be used, the Site Master must be calibrated with the Test Port Extension Cable in place. The Test Port Extension Cable is a phase stable cable and is used as an extension cable on the test port to ensure accurate and repeatable measurements. This phase stable cable can be moved and bent while making a measurement without causing errors in the measurement.

NOTE: The test port extension cable should have the appropriate connectors for the measurement. Use of additional connector adapters after the test port extension cable can contribute to measurement errors not compensated for during calibration.

Calibration Verification

During the calibration process in Return Loss mode, there are typical measurement levels expected. Verifying the measurement levels displayed on the screen during calibration can save valuable time in the field.

Trace Characteristics in Return Loss Mode

As the discrete calibration components are connected to the Site Master RF out port, the following measurement levels will be displayed on the screen:

- When an OPEN is connected, a trace will be displayed between 0-12 dB.
- When a SHORT is connected, a trace will be displayed between 0-12 dB.
- When a LOAD is connected, a trace will be displayed between 0-50 dB.

The following procedure explains manual calibration.

Calibration Procedure

If the "CAL OFF" message is displayed, or the test port cable has been changed, a new calibration is required. The following procedure details how to perform a calibration with either waveguide or coax media.

Step 1. Select the appropriate frequency range, as described in the procedure above.

Step 2. Press the **START CAL** key. The SELECT CALIBRATION MEDIA screen will appear in the display.

Step 3. Select either Media=Waveguide or Media=Coax and press **ENTER**.

If Media=Waveguide is selected

Step 4. If Media=Waveguide is selected, the following screen will appear:

SETUP CAL CALIBRATION
Abort Calibration
Start Calibration

Media = Waveguide
Compatible Flanges = None
1/8 Offset Len = 0.0000 mm
3/8 Offset Len = 0.0000 mm
Cutoff Freq = 1.0000 GHz

Step 5. Use the Up/Down arrow key to select Compatible Flanges = User Defined Values and press the **ENTER** key. A list of available flange types appears.

Step 6. Use the Up/Down arrow key to select the required flange type and press the **ENTER** key. The selection of the flange type automatically selects the 1/8 Offset Length, 3/8 Offset Length and cutoff frequency values.

Step 7. Use the Up/Down arrow key to select Exit - Start Calibration and press the **ENTER** key. The message Connect 1/8 OFFSET. Press ENTER will appear.

Step 8. Connect the 1/8 OFFSET and press the **ENTER** key. The message Measuring 1/8 OFFSET appears. After the Offset measurement is complete, the message Connect 3/8 OFFSET. Press ENTER appears.

Step 9. Remove the 1/8 OFFSET, connect the 3/8 OFFSET and press the **ENTER** key. The message Measuring 3/8 OFFSET appears. After the Offset measurement is complete, the message Connect LOAD. Press ENTER appears on the screen.

Step 10. Remove the 3/8 OFFSET, connect the LOAD and press the **ENTER** key. The message Measuring Load appears.

Step 11. Verify that the calibration has been properly performed by checking that the CAL ON message is now displayed in the upper left corner of the display.

If Media=Coax is selected:

Step 1. If Media=Coax is selected, the messages Media=Coax and DUT CONN TYPE = K MALE appear. Use the Up/Down arrow key to select DUT CONN TYPE and press the **ENTER** key. A screen of available connector types appears.

Step 2. Use the Up/Down arrow key to select the connector type, or select User Defined Values to enter the coax values if the coax is not listed in the standard cable list.

Step 3. Use the Up/Down arrow key to select Start Calibration and press the **ENTER** key. The message Connect OPEN. Press ENTER will appear.

Connector Type Cal Components	K male	K female	N male	N female	User Defined Values
Open	22K50	22KF50	22N50	22NF50	Open
Short	22K50	22KF50	22N50	22NF50	Short
Load	28K50	28KF50	28N50	28NF50	Load

Step 4. Connect the appropriate Open based on the connector type and press the **ENTER** key. The message Measuring OPEN will appear, followed by the message Connect SHORT. Press ENTER.

Step 5. Remove the Open, connect the appropriate Short based on the connector type and press the **ENTER** key. The messages Measuring SHORT and CONNECT LOAD. Press ENTER will appear.

Step 6. Remove the Short, connect the appropriate Load based on the connector type and press the **ENTER** key. The messages Measuring LOAD will appear.

Step 7. Verify that the calibration has been properly performed by checking that the CAL ON message is now displayed in the upper left corner of the display.

Calibration with the Test Port Extension Cable

If a Test Port Extension Cable is to be used, the Site Master must be calibrated with the Test Port Extension Cable in place. Follow the same calibration procedures as above with the 1/8 offset, 3/8 offset precision load or OSL components in place at the end of the test port extension cable.

Setting the Scale

Auto Scale

The Site Master can automatically set the scales to the minimum and maximum values of the measurement on the y-axis of the display. This function is particularly useful for measurements in SWR mode. To automatically set the scales:

Step 1. Press the **AUTO SCALE** key.
The Site Master will automatically set the top and bottom scales to the minimum and maximum values of the measurement on the y-axis of the display.

Amplitude Scale

The following procedure sets the top and bottom scale display.

Step 2. Press the **AMPLITUDE** key to call up the Scale Menu.

Step 3. Press the Top soft key and use the keypad or Up/Down arrow key to edit the top scale value.

Step 4. Press the Bottom soft key and use the keypad or Up/Down arrow key to edit the bottom scale value.

NOTE: Typically the y-axis scale of the display is 0-54 dB (return loss) but for some measurements (for example, insertion loss) the scale should be changed to 0-10 dB. If the scale is not changed, some measurement results may not be easily viewed on the screen.

Set the Distance and Waveguide or Cable Type

In Distance-To-Fault (DTF) mode, the length of the transmission line (distance) and the waveguide or cable type are selected. The waveguide type determines the cutoff frequency and waveguide loss, and the cable type determines the velocity propagation and cable attenuation factor. The following procedure can be used to set the distance and select the appropriate cable type.

NOTE: Selecting the correct waveguide or cable is very important for accurate measurements and for identifying faults in the transmission line. Selecting the incorrect waveguide or cable type will shift the DTF trace vertically and horizontally making it difficult to accurately locate faults.

Step 1. Press the **MODE** key.

Step 2. Select DTF Return Loss or DTF SWR mode. The Site Master automatically sets D1 to zero.

Step 3. Press the D2 soft key.

Step 4. Enter the appropriate D2 value for the maximum length of the transmission line and press the **ENTER** key to set the D2 value.

Step 5. Press the DTF Aid soft key.

Step 6. Using the Up/Down arrow key, select Media = Coax or Media = Waveguide and press **ENTER**.

Step 7. Select Cable Type = or Waveguide Type = and select the cable or waveguide from the Standard or Custom tables. Standard cable and waveguide types are stored in the Standard list, which cannot be edited. The Custom cable and waveguide lists can be edited.

Step 8. The Propagation Velocity and Cable loss for the selected Coax cable, or the Cutoff Frequency and Loss of the selected waveguide, will be displayed, and can be changed using the Up/Down arrow key to select the parameter. Press **ENTER** to edit, and **ENTER** again to accept the change.

Step 9. When all parameters have been set, press **ENTER** to start re-calibration.

Save and Recall a Setup

Saving a Setup

Saving a setup configuration in memory will preserve the calibration information.

Step 1. To save the configuration in one of the 10 available user setup locations, press **SAVE SETUP** .

Step 2. Use the key pad or the Up/Down arrow key to select a location (1 - 10).

Step 3. Press **ENTER** to save the setup.

NOTE: A coaxial cable calibration setup will be saved with an COAX designator. A waveguide calibration setup will be saved with a WG designation.

Recalling a Setup

The following procedure recalls a setup from memory.

Step 1. Press the **RECALL SETUP** key.

Step 2. Select the desired setup using the Up/Down arrow key.

Step 3. Press **ENTER** to recall the setup.

Save and Recall a Display

Saving a Display

The following procedure saves a display to memory.

Step 1. Press the **SAVE DISPLAY** key to activate the alphanumeric menu for trace storage.

Step 2. Use the soft keys to enter a label for the saved trace.

For example, to save a display with the name “TX1 RETURN LOSS” press the soft key group that contains the letter “T” then press the “T” soft key. Press the soft key group that contains the letter “X” then press the “X” soft key. Press the number “1” key on the numeric keypad. Use the softkeys and keypad as necessary to enter the entire name, then press **ENTER** to complete the process.

NOTE: More than one trace can be saved using the same alphanumeric name, as traces are stored chronologically, using the date/time stamp.

Recalling a Display

The following procedure recalls a previously saved display from memory.

Step 1. Press the **RECALL DISPLAY** key.

Step 2. Select the desired display using the Up/Down arrow key.

Step 3. Press **ENTER** to recall the display.

Changing the Units

By default, the Site Master displays information in metric units. Use the following procedure to change the display to English units.

Step 1. Press the **SYS** key.

Step 2. Select the Options soft key.

Step 3. Press Units to change from metric to English measurement units, or vice versa. The current selection is displayed at the bottom left corner of the screen.

Adjusting the Display Contrast

The contrast of the Site Master display can be adjusted to accommodate varying light conditions and to help discern traces when using the Trace Overlay feature (see page).

Step 1. Press the contrast key (numeric keypad number 2).

Step 2. Adjust the contrast using the Up/Down arrow key.

Step 3. Press **ENTER** to save the new setting.

Changing the Display Language

By default, the Site Master displays messages in English. To change the display language:

Step 1. Press the **SYS** key.

Step 2. Select the Language soft key.

Step 3. Select the desired language. Choices are English, Portuguese, French, German, Spanish, Chinese, and Japanese. The default language is English.

Adjusting Markers

Step 1. Press the **MARKER** key to call up the Markers menu.

Step 2. Press the M1 soft key and select the ON/OFF soft key to activate the M1 marker function.

Step 3. Press the Edit soft key and enter an appropriate value using the keypad or Up/Down arrow key. Press the **ENTER** key to accept the marker frequency input, or press **ESCAPE** to restore the previous value.

Step 4. Press the Back soft key to return to the Markers Menu.

Step 5. Repeat the above steps for markers M2, M3, and M4. Select the More soft key to edit markers M5 and M6.

Adjusting Limits

The Site Master offers two types of limits: a single horizontal limit line and segmented limits.

Adjusting a Single Limit

Step 1. Press the **LIMIT** key.

Step 2. Press the Single Limit soft key.

Step 3. Press the Edit soft key.

Step 4. Either enter the value using the numeric keypad or scroll the limit line using the Up/Down arrow key.

Step 5. Press **ENTER** to set the location of the limit line.

Adjusting Segmented Limits

Segmented limit lines are defined separately as five upper limit segments and five lower limit segments. This allows the definition of a spectral mask.

A limit segment is defined by its end points. That is, starting frequency, starting amplitude, ending frequency, and ending amplitude. This procedure describes the setting of two upper limit segments. The steps can be carried over to the other upper limit segments as well as to the lower limit segments.

Step 1. Press the **LIMIT** key.

Step 2. Press the Multiple Limits soft key.

Step 3. Press the Segment 1 soft key.

Step 4. Press the Edit soft key. The status window will display the value of the segment endpoints: Start Freq, Start Limit, End Freq, End Limit. The current parameter is highlighted. When you first press the Edit soft key, the value of the Start Frequency parameter is highlighted.

Step 5. Either enter the value using the numeric keypad or scroll the limit line using the Up/Down arrow key.

Step 6. Press the **ENTER** key to continue. The Start Limit parameter will now be highlighted.

Step 7. Either enter the value using the numeric keypad or scroll the limit line using the Up/Down arrow key.

Step 8. Press the **ENTER** key to continue.

Step 9. Repeat Steps 5 and 6 for the End Frequency.

Step 10. Repeat Step 7 for the End Limit.

Step 11. Press the Next Segment soft key to move on to segment 2 (If the Next Segment soft key is not available, press **ENTER**). If the status of segment 2 is OFF, pressing the Next Segment soft key will automatically set the start point of segment 2 equal to the end point of segment 1.

Step 12. Repeat Steps 4 through 11 for the remaining segments.

Step 13. When the final segment is defined, press the Edit soft key again to end the editing process.

NOTE: *The Site Master does not allow overlapping limit segments of the same type. That is, two upper limit segments cannot overlap and two lower limit segments cannot overlap.*

The Site Master also does not allow vertical limit segments. A limit segment in which the start and end frequencies are the same, but the limit values are different, cannot be specified.

Enabling the Limit Beep

Both limit types can indicate a limit violation by enabling the limit beep. An audible "beep" will sound at each data point that violates the defined limit.

Step 1. Press the **LIMIT** key.

Step 2. Press the Limit Beep soft key.

The status window will indicate that the status of the limit beep is ON, and the soft key will remain in the "down" state. Press the Limit Beep soft key again to disable the limit beep.

Printing

Printing is accomplished by selecting an available printer and pressing the print key as described below. Refer to the particular printer operating manual for specific printer settings.

Printing a Screen

Step 1. Connect the printer as shown in Figure 3-2.

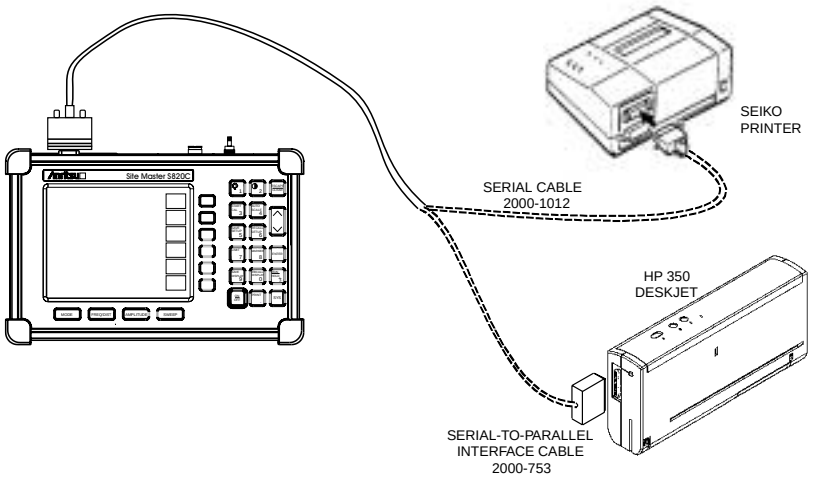


Figure 3-2. Site Master Printer Setup

Step 2. Obtain the desired measurement display

Step 3. Press the **SYS** key and the Options soft key (Figure 3-3) .

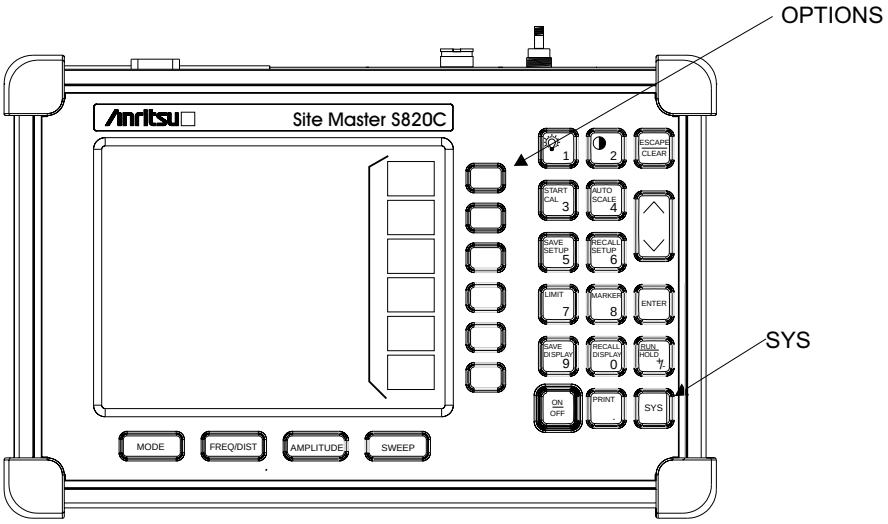


Figure 3-3. SYS Key and Options Soft Key

Step 4. Press the Printer soft key and select from the displayed menu of supported printers.

Step 5. Press the **PRINT** key. (Figure 3-4).

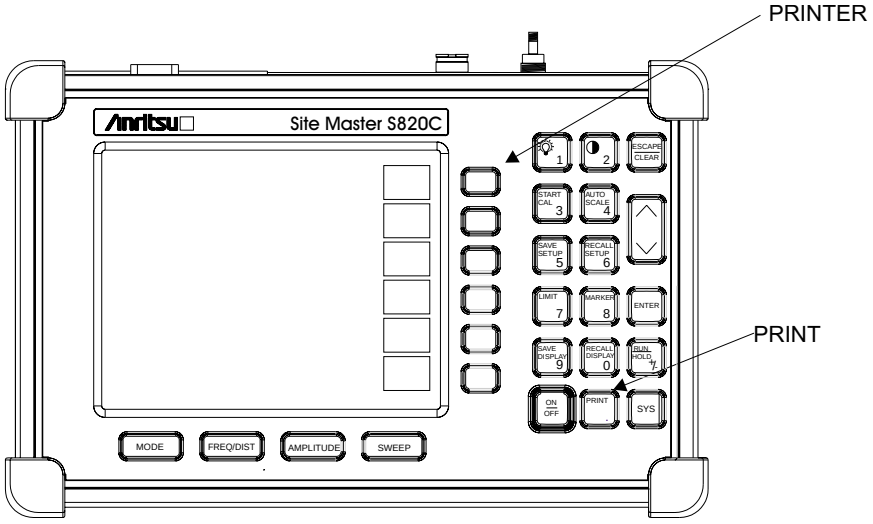


Figure 3-4. Printer Soft Key and PRINT Key

Using the Soft Carrying Case

The soft carrying case has been designed such that the strap can be unsnapped to allow the case to be easily oriented horizontally; thus allowing the controls to be more easily accessed (Figure 3-5).

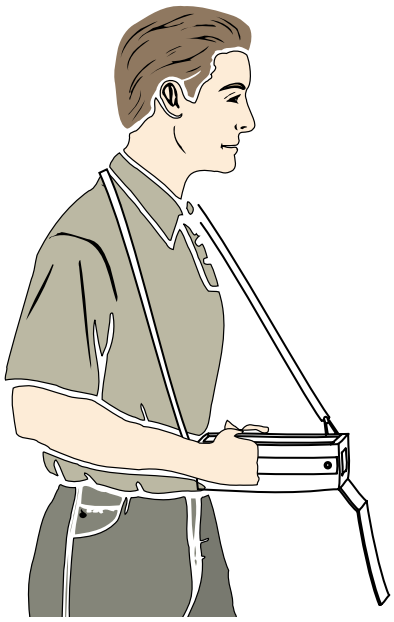


Figure 3-5. Using the Site Master Soft Carrying Case

Chapter 4
Cable & Antenna Measurements

Introduction

This chapter provides a description of cable and antenna measurements, including line sweeping fundamentals and line sweeping measurement procedures, available when the Site Master is in frequency or DTF mode.

Line Sweep Fundamentals

In wireless communication, the transmit and receive antennas are connected to the radio through a transmission line. This transmission line is a coaxial cable or waveguide. This connection system is referred to as a transmission feed line system. Figure 4-1 shows an example of a typical transmission feed line system.

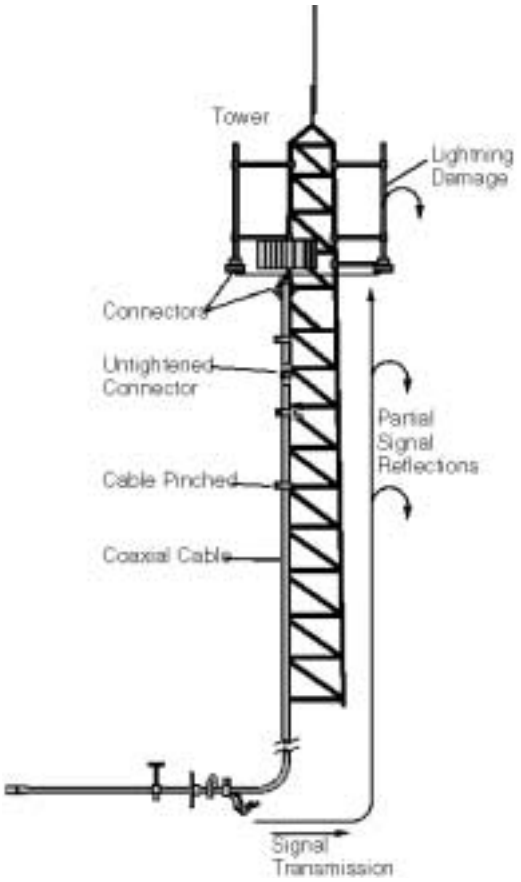


Figure 4-1. A Typical Transmission Feed Line System

The performance of a transmission feed line system may be effected by excessive signal reflection and cable loss. Signal reflection occurs when the RF signal reflects back due to an impedance mismatch or change in impedance caused by excessive kinking or bending of the transmission line. Cable loss is caused by attenuation of the signal as it passes through the transmission line and connectors.

To verify the performance of the transmission feed line system and analyze these problems, three types of line sweeps are required:

Return Loss Measurement—Measures the reflected power of the system in decibels (dB). This measurement can also be taken in the Voltage Standing Wave Ratio (VSWR) mode, which is the ratio of the transmitted power to the reflected power. However, the return loss measurement is typically used for most field applications.

Insertion Loss Measurement—Measures the energy absorbed, or lost, by the transmission line in dB/m or dB/ft. Different transmission lines have different losses, and the loss is frequency and distance specific. The higher the frequency or longer the distance, the greater the loss.

Distance-To-Fault (DTF) Measurement—Reveals the precise fault location of components in the transmission line system. This test helps to identify specific problems in the system, such as connector transitions, jumpers, kinks in the cable or moisture intrusion.

The different measurements are defined as:

Return Loss - System Sweep—A measurement made when the antenna is connected at the end of the transmission line. This measurement provides an analysis of how the various components of the system are interacting and provides an aggregate return loss of the entire system.

Distance To Fault - Load Sweep—A measurement made with the antenna disconnected and replaced with a 50Ω precision load at the end of the transmission line. This measurement allows analysis of the various components of the transmission feed line system in the DTF mode.

Cable Loss - Insertion Loss Sweep—A measurement made when a short is connected at the end of the transmission line. This condition allows analysis of the signal loss through the transmission line and identifies the problems in the system. High insertion loss in the feed line or jumpers can contribute to poor system performance and loss of coverage.

This whole process of measurements and testing the transmission line system is called Line Sweeping.

Information Required for a Line Sweep

The following information must be determined before attempting a line sweep measurement:

- ❑ System Frequency Range, to set the sweep frequency
- ❑ Cable Type, to set the cable characteristics for DTF measurements
- ❑ Distance of the Cable Run, to set the distance for DTF measurements

Typical Line Sweep Test Procedures

This section provides typical line sweep measurements used to analyze the performance of a transmission feed line system.

System Return Loss Measurement

System return loss measurement verifies the performance of the transmission feed line system with the antenna connected at the end of the transmission line. To measure the system return loss:

Required Equipment

Coaxial Cable	Waveguide
Site Master Model S810C or S820C	Site Master Model S810C or S820C
Precision Open/Short, Anritsu 22K50, 22KF50, 22N50 or 22NF50	1/8 Offset
Precision Load, Anritsu 28K50, 28KF50, 28N50-2 or 28NF50-2	3/8 Offset
Test Port Extension Cable, Anritsu 15NNF50-1.5C or 15KKF50-1.5C	Precision Waveguide Load
Optional 510-90 Adapter, DC to 7.5 GHz, 50 ohm, 7/16(F)-N(M)	Test Port Extension Cable, Anritsu 15NNF50-1.5C or 15KKF50-1.5C
Ruggedized Adapter, Precision RK (m) to N (f) Anritsu 34RKNF50	Optional 510-90 Adapter, DC to 3.5 GHz, 50 ohm, 7/16(F)-N(M)

Device Under Test

- ❑ Transmission Feed Line with Antenna

Procedure

Step 1. Press the MODE key.

Step 2. Select FREQ-RETURN LOSS using the Up/Down arrow key and press ENTER.

Step 3. Set the start and stop frequencies, F1 and F2, as described on page 3-2.

Step 4. Calibrate the Site Master as required for coaxial cable or waveguide .

Step 5. Connect the Device Under Test to the Site Master. A trace will be displayed on the screen when the Site Master is in the sweep mode.

Step 6. Press SAVE DISPLAY (page 3-7) name the trace, and press ENTER.

NOTES: The antenna must be connected at the end of the transmission feed line when conducting a System Return Loss measurement.

Coax/Waveguide Loss Measurement

The transmission feed line insertion loss test verifies the signal attenuation level of the system in reference to the specification. This test can be conducted with the Site Master in either FREQ–CABLE LOSS or FREQ–RETURN LOSS mode. In Cable Loss mode, the Site Master automatically considers the signal traveling in both directions when calculating the insertion loss, making the measurement easier for the user in the field. Both methods are explained below.

Required Equipment

Coaxial Cable	Waveguide
Site Master Model S810C or S820C	Site Master Model S810C or S820C
Precision Open/Short, Anritsu 22K50, 22KF50, 22N50 or 22NF50	1/8 Offset
Precision Load, Anritsu 28K50, 28KF50, 28N50-2 or 28NF50-2	3/8 Offset
Test Port Extension Cable, Anritsu 15NNF50-1.5C or 15KKF50-1.5C	Precision Waveguide Load
Optional 510-90 Adapter, DC to 7.5 GHz, 50 ohm, 7/16(F)-N(M)	Test Port Extension Cable, Anritsu 15NNF50-1.5C or 15KKF50-1.5C
Ruggedized Adapter, Precision RK (m) to N (f) Anritsu 34RKNF50	Optional 510-90 Adapter, DC to 7.5 GHz, 50 ohm, 7/16(F)-N(M)

Device Under Test

- ❑ Transmission Feed Line with Short

Procedure - Cable Loss Mode

Step 1. Press the MODE key.

Step 2. Select FREQ-CABLE LOSS using the Up/Down arrow key and press ENTER.

Step 3. Set the start and stop frequencies, F1 and F2, as described on page 3-2.

Step 4. Connect the Test Port Extension cable to the RF port and calibrate the Site Master as described on page 3-2.

Step 5. Save the calibration set up (page 3-7).

Step 6. Connect the Device Under Test to the Site Master phase stable Test Port Extension cable. A trace will be displayed on the screen as long as the Site Master is in sweep mode.

Step 7. Press the AMPLITUDE key and set the TOP and BOTTOM values of the display. In the example below, the TOP is set to 2, and the BOTTOM is set to 5.

Step 8. Press the MARKER key.

Step 9. Set M1 to MARKER TO PEAK.

Step 10. Set M2 to MARKER TO VALLEY.

Step 11. Calculate the measured insertion loss by averaging M1 (marker to peak) and M2 (marker to valley) as follows:

$$Insertion\ Loss = \frac{M1 + M2}{2}$$

Step 12. Press SAVE DISPLAY (page 3-7) name the trace, and press ENTER.

Step 13. Verify the measured insertion loss against the calculated insertion loss. For example:

	Type	Attenuation (dB/ft)	× Length (ft)	= Loss (dB)
First Jumper	LDF4-50A	0.0325	20	0.65
Main Feeder	LDF5-50A	0.0186	150	2.79
Top Jumper	LDF4-50A	0.0325	10	0.325

Number of connector pairs (3) times the loss per pair (in dB) equals the connector loss: $3 \times 0.28 = 0.84$.

The insertion loss of the transmission system is equal to:

First Jumper loss + Main Feeder Loss + Top Jumper Loss + Connector Loss:

0.65 + 2.79 + 0.325 + 0.84 = 4.61 dB

Procedure - Return Loss Mode

Step 1. Press the MODE key.

Step 2. Select FREQ-RETURN LOSS using the Up/Down arrow key and press ENTER.

Step 3. Set the start and stop frequencies, F1 and F2, as described on page 3-2.

Step 4. Connect the Test Port Extension cable to the RF port and calibrate the Site Master as described on page 3-2.

Step 5. Save the calibration set up (page 3-7).

Step 6. Connect the Device Under Test to the Site Master phase stable Test Port Extension cable. A trace will be displayed on the screen as long as the Site Master is in sweep mode.

Step 7. Press the AMPLITUDE key and set TOP and BOTTOM values of the display. In the example below, the TOP is set to 4, and the BOTTOM is set to 10.

Step 8. Press the MARKER key.

Step 9. Set M1 to MARKER TO PEAK.

Step 10. Set M2 to MARKER TO VALLEY.

Step 11. Calculate the insertion loss by averaging M1 (marker to peak) and M2 (marker to valley) and dividing by two as follows:

$$Insertion\ Loss = \frac{\frac{M1 + M2}{2}}{2}$$

Step 12. Press SAVE DISPLAY (page 3-7) name the trace, and press ENTER.

Distance-To-Fault (DTF) Transmission Line Test

The Distance-To-Fault transmission line test verifies the performance of the transmission line assembly and its components and identifies the fault locations in the transmission line system. This test determines the return loss value of each connector pair, cable component and cable or waveguide component and waveguide to identify the problem location. This test can be performed in the DTF–RETURN LOSS or DTF–SWR mode. Typically, for field applications, the DTF–RETURN LOSS mode is used. To perform this test, disconnect the antenna and connect the load at the end of the transmission line.

Required Equipment

Coaxial Cable	Waveguide
Site Master Model S810C or S820C	Site Master Model S810C or S820C
Precision Open/Short, Anritsu 22K50, 22KF50, 22N50 or 22NF50	1/8 Offset
Precision Load, Anritsu 28K50, 28KF50, 28N50-2 or 28NF50-2	3/8 Offset
Test Port Extension Cable, Anritsu 15NNF50-1.5C or 15KKF50-1.5C	Precision Waveguide Load
Optional 510-90 Adapter, DC to 7.5 GHz, 50 ohm, 7/16(F)-N(M)	Test Port Extension Cable, Anritsu 15NNF50-1.5C or 15KKF50-1.5C
Ruggedized Adapter, Precision RK (m) to N (f), Anritsu 34RKNF50	Optional 510-90 Adapter, DC to 7.5 GHz, 50 ohm, 7/16(F)-N(M)

Device Under Test

- Transmission Feed Line with Load

Procedure - Return Loss Mode

The following steps explain how to make a DTF measurement in return loss mode.

Step 1. Press the MODE key.

Step 2. Select DTF-RETURN LOSS using the Up/Down arrow key and press ENTER.

Step 3. Connect the Test Port Extension cable to the RF port and calibrate the Site Master as described on page 3-2.

Step 4. Save the calibration set up (page 3-7).

Step 5. Connect the Device Under Test to the Site Master phase stable Test Port Extension cable. A trace will be displayed on the screen as long as the Site Master is in sweep mode.

Step 6. Press the FREQ/DIST key.

Step 7. Set the D1 and D2 values. The Site Master default for D1 is zero.

If the media being tested is coaxial cable:

Step 8. Press the DTF AID soft key and select MEDIA=COAX and press ENTER.

NOTE: Selecting the right propagation velocity, attenuation factor and distance is very important for accurate measurements, otherwise the faults can not be identified accurately and insertion loss will be incorrect.

Step 9. Select CABLE=NONE and press ENTER. The available cable factor folders will appear.

Step 10. Select the appropriate folder and cable type to set the propagation velocity and attenuation factors.

Step 11. Press SAVE DISPLAY (page 3-7) name the trace, and press ENTER.

Step 12. Record the connector transitions.

If the media being tested is waveguide:

Step 13. Press the DTF AID soft key and select MEDIA=WAVEGUIDE and press ENTER.

Step 14. Select the Waveguide Type soft key and the available waveguide folders will appear.

NOTE: Selecting the right cutoff frequency and propagation loss is very important for accurate measurements, otherwise the faults can not be identified accurately and insertion loss will be incorrect.

Step 15. Select the appropriate waveguide type to set the cutoff frequency and loss factor.

Step 16. Press SAVE DISPLAY (page 3-7) name the trace, and press ENTER.

In the above example:

- Marker M1 marks the first connector, the end of the Site Master phase stable Test Port Extension cable.
- Marker M2 marks the first jumper cable.
- Marker M3 marks the end of the main feeder cable.
- Marker M4 is the load at the end of the entire transmission line.

Procedure - DTF-SWR Mode

The following steps explain how to measure DTF in SWR mode.

Step 1. Press the MODE key.

Step 2. Select the DTF-SWR using the Up/Down arrow key and press ENTER.

Step 3. Follow the same procedure as DTF-Return Loss Mode, above.

Antenna Subsystem Return Loss Test

Antenna Subsystem return loss measurement verifies the performance of the transmit and receive antennas. This measurement can be used to analyze the performance of the antenna before installation. The antenna can be tested for the entire frequency band, or tested to a specific frequency range. Transmit and receive frequency measurements are conducted separately. The following steps explain how to measure the antenna loss in return loss mode.

Required Equipment

Coaxial Cable	Waveguide
Site Master Model S810C or S820C	Site Master Model S810C or S820C
Precision Open/Short, Anritsu 22K50, 22KF50, 22N50 or 22NF50	1/8 Offset
Precision Load, Anritsu 28K50, 28KF50, 28N50-2 or 28NF50-2	3/8 Offset
Test Port Extension Cable, Anritsu 15NNF50-1.5C or 15KKF50-1.5C	Precision Waveguide Load
Optional 510-90 Adapter, DC to 7.5 GHz, 50 ohm, 7/16(F)-N(M)	Test Port Extension Cable, Anritsu 15NNF50-1.5C or 15KKF50-1.5C
Ruggedized Adapter, Precision RK (m) to N (f) Anritsu 34RKNF50	Optional 510-90 Adapter, DC to 7.5 GHz, 50 ohm, 7/16(F)-N(M)

Device Under Test

- ❑ Antenna Sub Assembly

Procedure

Step 1. Press the MODE key.

Step 2. Select FREQ-RETURN LOSS using the Up/Down arrow key and press ENTER.

Step 3. Connect the Test Port Extension cable to the RF port and calibrate the Site Master as described on page 3-2.

Step 4. Press SAVE SETUP and save the calibration set up (page 3-7).

Step 5. Connect the Device Under Test to the Site Master phase stable Test Port Extension cable.

Step 6. Press the MARKER key.

Step 7. Set markers M1 and M2 to the desired frequency.

Step 8. Record the lowest return loss over the specified frequency.

Step 9. Press SAVE DISPLAY (page 3-7) name the trace, and press ENTER.

Calculate the threshold value and compare the recorded Lowest Return Loss to the calculated threshold value.

$$\text{Maximum Return Loss} = \frac{-20\log\left(VSWR-1\right)}{\left(VSWR+1\right)}$$

NOTE: VSWR is the antenna manufacturer's specified VSWR.

If the measured return loss is less than the calculated threshold value, the test fails and the antenna must be replaced.

Waveguide Tune Mode

Tune mode can be used to tune the waveguide in either SWR or Return Loss mode. The resolution can be set to 65, 43 or 33 data points. To set the Tune Mode resolution:

Required Equipment

Coaxial Cable	Waveguide
Site Master Model S810C or S820C	Site Master Model S810C or S820C
Precision Open/Short, Anritsu 22K50, 22KF50, 22N50 or 22NF50	1/8 Offset
Precision Load, Anritsu 28K50 or 28KF50	3/8 Offset
Test Port Extension Cable, Anritsu 15NNF50-1.5C or 15KKF50-1.5C	Precision Waveguide Load
Optional 510-90 Adapter, DC to 7.5 GHz, 50 ohm, 7/16(F)-N(M)	Test Port Extension Cable, Anritsu 15NNF50-1.5C or 15KKF50-1.5C
Ruggedized Adapter, Precision RK (m) to N (f) Anritsu 34RKNF50	Optional 510-90 Adapter, DC to 7.5 GHz, 50 ohm, 7/16(F)-N(M)

Procedure

Step 1. Select the **MODE** key.

Step 2. Select the Tune-SWR or Tune-Return Loss Mode soft key.

Step 3. Press the **SWEEP** key.

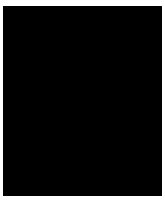
Step 4. Select the Resolution soft key.

Step 5. Select the appropriate resolution.

Step 6. Select the FREQ/DIST key and select F1 and F2 to set the frequencies.

Step 7. Connect the measurement device to the Site Master extension cable.

Step 8. Connect the precision termination at the other end of the waveguide.



Chapter 5
Power Measurement

Introduction

The Site Master with Option 5 installed can be used for making power measurements with a broadband (10 MHz to 20 GHz) RF detector, Anritsu P/N 560-7N50B. The power monitor displays the measured power results in dBm or Watts.

Power Measurement

Required Equipment

- Site Master Model S810C or S820C with Power Monitor option
- Broadband RF detector, Anritsu P/N 560-7N50B
- 30 dB, 50 Watt, bi-directional, DC –18 GHz, N(m) – N(f), Attenuator, 42N50A-30

Procedure

Step 1. Press the ON/OFF key on the Site Master.

Step 2. Press the MODE key.

Step 3. Use the Up/Down arrow key to select the Power Monitor mode and press ENTER.

Zeroing the Power Monitor

Step 4. With no power applied to the DUT, press the ZERO soft key from the Power menu. Wait for a few seconds while the Site Master accumulates data samples of the quiescent power. When complete, ZERO ADJ: On is displayed in the message area.

Measuring High Input Power Levels

Step 5. Insert an attenuator between the DUT and the RF detector to protect the Site Master so that the input power level is less than or equal to 20 dBm.

Step 6. Press the OFFSET soft key.

Step 7. Enter the attenuation in dB using the keypad. Press the ENTER key to complete the entry. The message area will show REL: ON along with the entered value in dB.

Displaying Power in dBm and Watts

Step 8. Press the UNITS soft key to display power in Watts.

Displaying Relative Power

Step 9. With the desired base power level input to the Site Master, press the REL soft key. The message area will show REL: ON and the power reading will indicate 100%.

Step 10. Press the UNITS soft key to display power in dBm. Since REL is ON, the power reading will be in dBr, relative to the base power level.

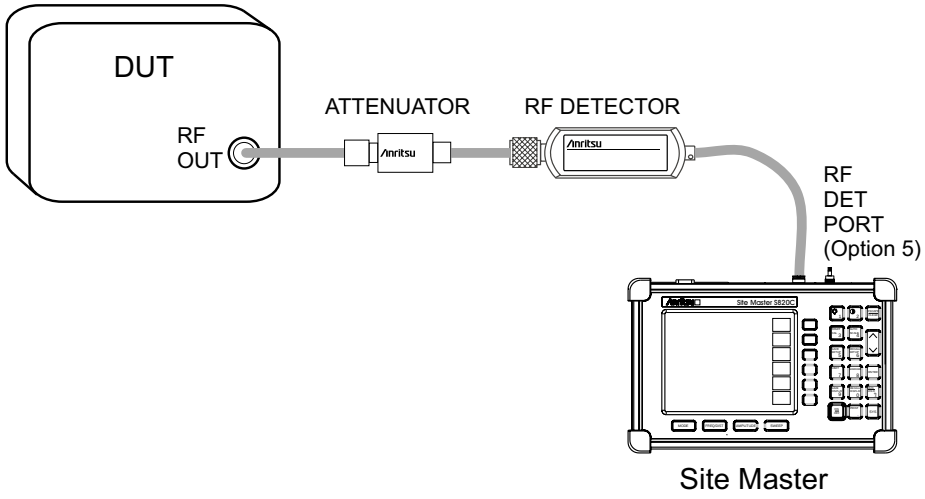


Figure 5-1. Power Monitor Measurement Setup

Chapter 6
Software Tools

Introduction

This chapter provides a description of the Anritsu Software Tools program. Software Tools is a Windows 95/98/NT4/2000/ME/XP program for transferring measured traces, along with markers and limit lines, to the PC display. The program help function provides on screen instructions on display modification, trace overlay, uploading and downloading traces, and multiple plot printing.

Features

Software Tools provides the following features:

- ❒ Download traces saved in the instrument memory to the PC for storage and analysis
- ❒ Upload traces from the PC to the instrument memory
- ❒ Trace Overlay allows the viewing of three plots simultaneously
- ❒ Ability to save captured plots as data files (.dat file format) or as records representing site information in a database file
- ❒ Ability to export plot data as text files for use in a spreadsheet (.txt file format)
- ❒ Ability to save captured plots as graphic files (.wmf file format)
- ❒ Ability to zoom in or out to analyze a particular region of the plot
- ❒ Ability to modify Plot Properties
- ❒ Ability to output plots to a printer for hard copy records
- ❒ Capture the current trace on the unit

System Requirements

The Software Tools program will run on most any computer running Windows 95/98/NT4/2000/ME/XP. Minimum requirements and recommendations are:

- ❒ Intel Pentium 100 MHz microprocessor (Pentium II 350 MHz or better recommended)
- ❒ 16 MB of RAM (64 MB or above recommended)
- ❒ Hard disk drive with approximately 15 MB of available space (An additional 20 MB free space for storage of captured plots is recommended.)
- ❒ A serial (COM) port or a USB port and USB power adapter cable for communication with the instrument

NOTE: It is recommended that Windows NT 4.0 users install NT 4.0 Service Pack 3 (SP3) or above. In addition, Windows 2000 and Windows ME may require installation of the latest Service Pack. Please contact Microsoft Corporation for further information on obtaining and installing service packs.

Installation

To install the Software Tools program:

Step 1. Insert the Anritsu Software Tools disk in the CDROM drive.

Step 2. From the Windows Start menu, select **Run** .

Step 3. Type: **X:\Setup.exe** where X is the drive letter of your CDROM drive.

Step 4. When prompted, press the **Enter** key to accept the default directory C:\Program Files\ Software Tools and the installation will begin.

The *readme.doc* file on the disk provides updated information about the program, and the Help function provides detailed operating information.

Communication Port Setting

The Software Tools communicates with the instrument through a standard serial COM port on the PC. Set the baud rate of the COM port to 115200.

Step 1. Select **Start**, **Programs** and select **Software Tools**.

Step 2. When the program has loaded, select **Settings**, **Communication**.

Step 3. Select the appropriate PC COM port and Transfer Baud Rate for your system, and click **OK**.

Figure 6-1. Communication Setting Dialog Box

Interface Cable Installation

Communication between the instrument and the PC is accomplished over a null modem serial cable provided with the instrument (Anritsu part number 800-441, and optional USB to serial adaptor, part number 551-1691, if required).

Step 1. Install the null modem serial interface cable to the Serial Interface connector on the test connector panel.

Step 2. Connect the other end of the serial interface cable to the appropriate COM port connector on the PC.

Step 3. Turn on both the instrument and the PC.

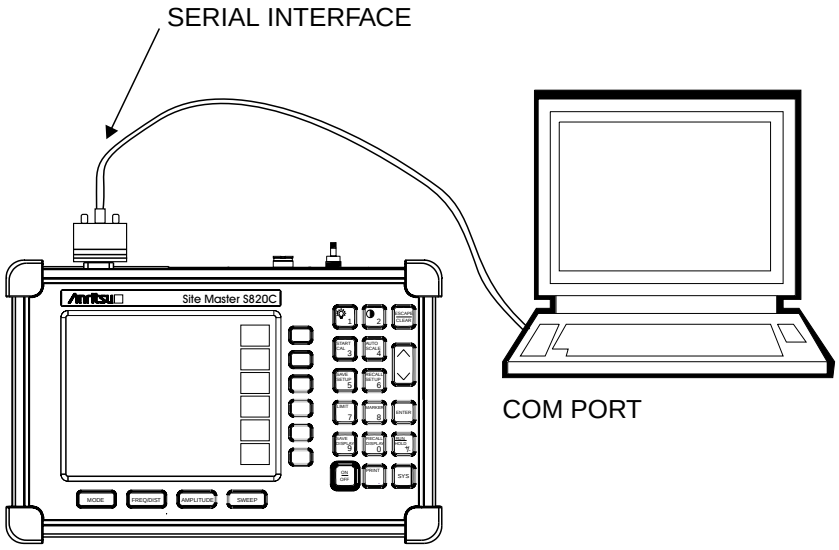


Figure 6-2. Serial Cable Connection

Using Software Tools

Select **Start**, **Programs** and select **Software Tools**.

Downloading Traces

Traces that can be downloaded from the instrument are grouped by the date on which they were saved. They are further organized in chronological order for each date, with the oldest trace at the top of the list. Each trace listing displays the trace name (see page) and measurement type for that trace. Available measurement types are:

Return Loss	Insertion Gain
VSWR	Tune Mode

NOTE: Not all selections apply to every Anritsu Hand Held instrument.

Plot Capture to the PC

To open the plot capture menus, select the capture icon on the button bar, or select the **Capture** drop down menu from the menu bar.

Select **Capture to Screen** to download traces to the PC.

Select a folder, or individual traces within a folder, to be downloaded to the PC. The traces will appear on the PC display as they are downloaded.

When Software Tools is communicating with the instrument, REMOTE will be displayed to the left of the graph.

Plot Upload to the Instrument

Open a plot to be uploaded to the instrument. Plot properties can be modified on the PC before it is uploaded if desired.

Select the **Capture** drop down menu from the menu bar.

Select **Upload the Current Plot** to upload the plot to the instrument. The plot will be stored in the instrument non-volatile memory with the original date and time that the plot was saved. The uploaded trace can be viewed on the instrument by pressing the **RECALL DISPLAY** button on the instrument keypad.

Plot Properties

After downloading, certain plot properties and information can be modified. Select the Plot Properties or Plot Information icon.

Plot Properties that can be changed include:
- Graph Titles
- Display Mode
- Scale/Limit
- Markers
- Misc. (Plot Display Parameters)

Graph Titles

After downloading the plot, the **Main Title** can be changed to reflect the site name or other descriptive information. The **Sub Title** field can be used to describe the specifics of the measurement and configuration.

Scale/Limit

The scale of the displayed plot can be modified to help analyze whether the plot meets pass/fail criteria. The Scale/Limit sub menu activates options to manually enter the scale limits, or to use the Auto Scale mode.

Manual adjustment sets the upper and lower limits of the display under the Scale/Limit Submenu.

Auto Scale automatically adjusts the scale for maximum and minimum measurement readings.

Limit Line Off turns off all limit lines.

Single Limit Line can be activated to help identify faults.

Multi-Segment Limit Lines can be activated to set different limits within the same measurement display for specification requirements.

Markers

Markers M1 through M6 can be activated from the Plot Properties menu.

The six active markers can be displayed on the plot to help identify faults from the line sweep data.

Misc.

The Miscellaneous tab allows adjustment of the Plot/Limit Line Width, the setting of the Plot Footer, and the date format.

Plot/Limit Line Width can be used when preparing reports for the carrier, service providers, and network operators where the trace data must be visible and legible for documentation. The line density of the trace can be set to **Normal (Thin Line)** or **Thick Line** to make the data appear easily when copies are made.

Plot Footer allows selection of information to be displayed in the trace display. Selections are:

- ❑ Time/Date
- ❑ Model and Serial Number
- ❑ Date Format:
  - mm/dd/yyy
  - dd/mm/yyyy
  - yyyy/mm/dd
- ❑ Measurements
- ❑ DTF Parameters
- ❑ Bias Tee

NOTE: While all possible selections are displayed, some of these selections apply only to specific models of Anritsu hand held instruments.

Trace Overlay or Plot Overlay

Trace Overlay is activated by the Mouse Function icon. Single-click on the Mouse Function icon to toggle. Toggling this icon switches the mouse function between Marker/Limit/Zoom and Plot Overlaying.

To overlay two plots, click-and-drag from one plot to the other plot. The final display will be the two plots superimposed on one another.

Refer to the Software Tools **HELP** function for more information on the steps necessary to perform a trace overlay.

Saving Traces

Once the plots are captured to the PC they can be saved as individual files or as a block of files to a database.

Saving a Plot as a Windows Metafile or to a Spreadsheet

Plots can be saved as a Windows metafile (.wmf), a SMST .dat file, a text file (.txt) or .mdb database. The metafile may be imported into graphic programs and the text file can be imported into spreadsheet. The .dat and .mdb files are used exclusively by the Software Tools.

To save a plot as a Windows metafile, click on the **File** menu and select **Save as Metafile** from the pull down menu. Once the trace is saved as a metafile, it can be copied and transferred into other applications as a picture or graphic file.

To copy a metafile:

Step 1. Select the trace to be copied with the mouse cursor.

Step 2. Select **Edit** and then **Copy**. The file will copied to the clipboard, or select **File** and then **Export** to a Windows metafile.

Step 3. Open the target application (Microsoft Word, etc.).

Step 4. Select **Edit** and then **Paste**. The file will be inserted as a graphic file or a bitmap.

Saving a Plot to a Spreadsheet

Plots can be saved as a text file (.txt) which can then be imported into a spreadsheet program.

To save a plot as a text file:

Step 1. Select the trace to be copied with the mouse cursor.

Step 2. Click on the **File** menu and select **Export to Text File for a Spreadsheet** from the pull down menu.

Step 3. Save the file to a local directory.

Step 4. Exit the Software Tools program and open the spreadsheet application.

Step 5. Import the .txt file into the spreadsheet program.

Creating a Database

A single trace or a block of traces can be transferred from the instrument to the PC. A separate database can be created for each cellular site. The site name can be used as the database name.

Step 1. Select the **File** menu and select the **Database**.

Step 2. Open an existing database or create a new database with a descriptive filename that represents the site name.

Once the database has been created, files can be saved and site information can be added, such as Plot Description, Date/Time, Operator, record/trace number and session description (Transmitter type etc.)

Individual plots will be labeled with the Database Site Name. Each record has its own plot description and measurement type.

Printing Formats

One to multiple plots per page can be set up under the print format in Software Tools. Orientation of how the plots are printed on the page can be changed from vertical to horizontal.

Appendix A
Reference Data

Calibration Components

The calibration components part numbers in the following table are broken down as follows:

xx: 23 = 1/8 Offset Short
24 = 3/8 Offset Short
26 = Precision Load

Table A-1. Precision Waveguide Calibration Components

Part Number	Freq. Range	Waveguide Type	Compatible Flanges
xxUM70	5.85 to 8.20 GHz	WR137, WG14	CAR70, PAR70, UAR 70, PDR70
xxUM84	7.05 to 10.00 GHz	WR112, WG15	CBR84, UBR84, PBR84, PDR84
xxUM100	8.20 to 12.40 GHz	WR90, WG16	CBR100, UBR100, PBR100, PDR100
xxUM120	10.00 to 15.00 GHz	WR75, WG17	CBR120, UBR120, PBR120, PDR120
xxUA187	3.95 to 5.85 GHz	WR187, WG12	CPR187F, CPR187G, UG-1352/U, UG-1353/U, UG-1728/U, UG-1729/U, UG-148/U, UG-149A/U
xxUA137	5.85 to 8.20 GHz	WR137, WG14	CPR137F, CPR137G, UG-1356/U, UG-1357/U, UG-1732/U, UG-1733/U, UG-343B/U, UG-344/U, UG-440B/U, UG-441/U
xxUA112	7.05 to 10.00 GHz	WR112, WG15	CPR112F, CPR112G, UG-1358/U, UG-1359/U, UG-1734/U, UG-1735/U, UG-52B/U, UG-51/U, UG-137B/U, UG-138/U
xxUA90	8.20 to 12.40 GHz	WR90, WG16	CPR90F, CPR90G, UG-1360/U, UG-1361/U, UG-1736/U, UG-1737/U, UG-40B/U, UG-39/U, UG-135/U, UG-136B/U
xxUA62	12.40 to 18.00 GHz	WR62, WG18	UG-541A/U, UG-419/U, UG-1665/U, UG1666/U
xxUA42	17.00 to 26.50 GHz	WR42, WG20	UG-596A/U, UG-595/U, UG-597/U, UG-598A/U

Waveguide-to-Coaxial Adapters

Part numbers that end with N = N type connector, part numbers that end with K = K type connectors.

Table A-2. Coaxial to Universal Waveguide Adapters

Part Number	Freq. Range	Waveguide Type	Compatible Flanges
35UM70N	5.85 to 8.20 GHz	WR137, WG14	CAR70, PAR70, UAR 70, PDR70
35UM84N	7.05 to 10.00 GHz	WR112, WG15	CBR84, UBR84, PBR84, PDR84
35UM100N	8.20 to 12.40 GHz	WR90, WG16	CBR100, UBR100, PBR100, PDR100
35UM120N	10.00 to 15.00 GHz	WR75, WG17	CBR120, UBR120, PBR120, PDR120
35UA187N	3.95 to 5.85 GHz	WR187, WG12	CPR187F, CPR187G, UG-1352/U, UG-1353/U, UG-1728/U, UG-1729/U, UG-148/U, UG-149A/U
35UA137N	5.85 to 8.20 GHz	WR137, WG14	CPR137F, CPR137G, UG-1356/U, UG-1357/U, UG-1732/U, UG-1733/U, UG-343B/U, UG-344/U, UG-440B/U, UG-441/U
35UA112N	7.05 to 10.00 GHz	WR112, WG15	CPR112F, CPR112G, UG-1358/U, UG-1359/U, UG-1734/U, UG-1735/U, UG-52B/U, UG-51/U, UG-137B/U, UG-138/U
35UA90N	8.20 to 12.40 GHz	WR90, WG16	CPR90F, CPR90G, UG-1360/U, UG-1361/U, UG-1736/U, UG-1737/U, UG-40B/U, UG-39/U, UG-135/U, UG-136B/U
35UA62N	12.40 to 18.00 GHz	WR62, WG18	UG-541A/U, UG-419/U, UG-1665/U, UG1666/U
35UA42K	7.00 to 26.50 GHz	WR42, WG20	UG-596A/U, UG-595/U, UG-597/U, UG-598A/U

Flange Compatibility

Table A-3. Universal Flange Compatibility (1 of 3)

Calibration Component Part Number	Start Frequency (GHz)	Stop Frequency (GHz)	Waveguide Type	Flange Type	Compatible Flanges
xxUM40	3.300	4.900	WR229 WG11A	UnivM-229	PDR40
xxUM48	3.950	5.850	WR187 WG12	UnivM-187	CAR48 PAR48 UAR48 PDR48
xxUM58	4.900	7.050	WR159 WG13	UnivM-159	CAR58 PAR58 UAR58 PDR58
xxUM70	5.850	8.200	WR137 WG14	UnivM-137	CAR70 PAR70 UAR70 PDR70
xxUM84	7.050	10.000	WR112 WG15	UnivM-112	CBR84 UBR84 PBR84 PDR84
xxUM100	8.200	12.400	WR90 WG16	UnivM-90	CBR100 UBR100 PBR100 PDR100
xxUM120	10.000	15.000	WR75 WG17	UnivM-75	CBR120 UBR120 PBR120 PDR120
xxUM140	12.400	18.000	WR62 WG18	UnivM-62	CBR140 UBR140 PBR140 PDR140
xxUM220	17.000	26.500	WR42 WG20	UnivM-42	CBR220 UBR220 PBR220 PDR220
xxUA229	3.300	4.900	WR229 WG11A	UnivUS-229	CPR229F CPR229G UG-1350/U UG-1351/U UG-1726/U UG-1727/U

Table A-3. Universal Flange Compatibility (2 of 3)

Calibration Component Part Number	Start Frequency (GHz)	Stop Frequency (GHz)	Waveguide Type	Flange Type	Compatible Flanges
xxUA187	3.950	5.850	WR187 WG12	UnivUS-187	CPR187F CPR187G UG-1352/U UG-1353/U UG-1728/U UG-1729/U UG-148/U UG-149A/U
xxUA159	4.900	7.050	WR159 WG13	UnivUS-159	CPR159F CPR159G UG-1354/U UG-1355/U UG-1730/U UG-1731/U
xxUA137	5.850	8.200	WR137 WG14	UnivUS-137	CPR137F CPR137G UG-1356/U UG-1357/U UG-1732/U UG-1733/U UG-343B/U UG-344/U UG-440B/U UG-441/U
xxUA112	7.050	10.00	WR112 WG15	UnivUS-112	CPR112F CPR112G UG-1358/U UG-1359/U UG-1734/U UG-1735/U UG-52B/U UG-51/U UG-137B/U UG-138/U
xxUA90	8.200	12.400	WR90 WG16	UnivUS-90	CPR90F CPR90G UG-1360/U UG-1361/U UG-1736/U UG-1737/U UG-40B/U UG-39/U UG-135/U UG-136B/U
xxUA75	10.000	15.000	WR75 WG17	UnivUS-75	WR75

Table A-3. Universal Flange Compatibility (3 of 3)

Calibration Component Part Number	Start Frequency (GHz)	Stop Frequency (GHz)	Waveguide Type	Flange Type	Compatible Flanges
xxUA62	12.400	18.000	WR62 WG18	UnivUS-62	UG-541A/U UG-419/U UG-1665/U UG-1666/U
xxUA42	17.000	26.500	WR42 WG20	UnivUS-42	UG-596A/U UG-595/U UG-597/U UG-598A/U
xxCMR229	3.300	4.900	WR229 WG11A	CMR229	CMR229
xxCMR187	3.950	5.850	WR187 WG12	CMR187	CMR187 UG-1475/U UG-1480/U
xxCMR159	4.900	7.050	WR159 WG13	CMR159	CMR159
xxCMR137	5.850	8.200	WR137 WG14	CMR137	CMR137 UG-1476/U UG-1481/U
xxCMR112	7.050	10.000	WR112 WG15	CMR112	CMR112 UG-1477/U UG-1482/U
xxCMR90	8.200	12.400	WR90 WG16	CMR90	CMR90 UG-1478/U UG-1483/U
xxUER40	3.300	4.900	WR229 WG11A	UER40	UER40
xxUER48	3.950	5.850	WR187 WG12	UER48	UER48
xxUER58	4.900	7.050	WR159 WG13	UER58	UER58
xxUER70	5.850	8.200	WR137 WG14	UER70	UER70
xxUER84	7.050	10.000	WR112 WG15	UER84	UER84
xxUER100	8.200	12.400	WR90 WG16	UER100	UER100

Table A-4. Waveguide Offset Short Specifications*

Offset Short P/N	Frequency (GHz)	Length (mm)
24UM70	6.926	20,710 ± 0.08
24UM84	8.396	17,040 ± 0.05
24UM100	10.084	14,675 ± 0.05
24UM120	12.247	11,978 ± 0.04
24UA187	4.807	30,979 ± 0.11
24UA137	6.926	20,710 ± 0.08
24UA112	8.396	17,040 ± 0.05
24UA90	10.084	14,675 ± 0.05
24UA62	14.940	9,742 ± 0.04
24UA42	21.225	7,067 ± 0.03
24CMR187	4.807	30,979 ± 0.11
24CMR137	6.926	20,710 ± 0.08
24CMR112	8.396	17,040 ± 0.05
24CMR90	10.084	14,675 ± 0.05
24UER70	6.926	20,710 ± 0.08
24UER84	8.396	17,040 ± 0.05
24UER100	10.084	14,675 ± 0.05

* Offset shorts are 3/8 wave at the geometric mean frequency waveguide band and dimensionally accurate to <0.5 degree at the maximum operating frequency of the corresponding wavelength.

Table A-5. Waveguide Technical Data (1 of 2)

Waveguide Type/Model	Start Frequency (GHz)	Stop Frequency (GHz)	Cutoff Frequency (GHz)	Mid-Band Loss (dB/ft, GHz)
WR229 WG11A	3.300	4.900	2.577	0.0114
WR187 WG12	3.950	5.850	3.156	0.0157
WR159 WG13	4.900	7.050	3.705	0.0180
WR137 WG14	5.850	8.200	4.285	0.0225
WR112 WG15	7.050	10.000	5.260	0.0312
WR102	7.000	11.000	5.786	0.0330
WR90 WG16	8.200	12.400	6.560	0.0481
WR75 WG17	10.000	15.000	7.847	0.0583
WR67	11.000	17.000	8.578	0.0658
WR62 WG18	12.400	18.000	9.490	0.0735
WR51	15.000	22.000	11.540	0.1125
WR42 WG20	17.000	26.500	14.080	0.1585
Andrew				
EW34	3.100	4.200	2.376	0.0068
EW37	3.300	4.300	2.790	0.0089
EW43	4.400	5.000	2.780	0.0088
EW52	4.600	6.425	3.650	0.0120
EW63	5.580	7.125	4.000	0.0138
EW64	5.300	7.750	4.320	0.0146
EW77	6.100	8.500	4.720	0.0178
EW85	7.700	9.800	6.460	0.0331
EW90	8.300	11.700	6.500	0.0308
EW127	10.000	13.250	7.670	0.0385
EW132	11.000	15.350	9.220	0.0482
EW180	14.000	19.700	11.150	0.0591
EW220	17.000	23.600	13.340	0.0860

Table A-5. Waveguide Technical Data (2 of 2)

Waveguide Type/Model	Start Frequency (GHz)	Stop Frequency (GHz)	Cutoff Frequency (GHz)	Mid-Band Loss (dB/ft, GHz)
Cablewave				
WE37	3.600	4.200	2.830	0.0082
WE46	4.400	5.000	3.000	0.0108
WE61	5.925	6.425	3.600	0.0119
WE65	6.425	7.125	4.000	0.0138
WE70	7.125	7.750	4.300	0.0123
WE78	7.125	8.500	4.670	0.0136
WE108	10.500	11.700	6.570	0.0298
WE130	11.700	13.250	7.430	0.0348
WE150	14.000	15.350	8.600	0.0426
WE191	17.700	19.700	10.680	0.0595
Hanover				
E38	3.100	4.200	2.320	0.0074, 3.6
EH36	4.400	5.000	3.080	0.0110
E54	5.000	6.000	3.870	0.0143, 5.4
E60	5.600	6.425	3.600	0.0108
E65	5.925	7.125	3.990	0.0139
E70	6.425	7.750	4.290	0.0146
EH78	7.700	8.500	4.650	0.0211, 8.2
E100	8.500	10.000	6.440	0.0271, 9.5
E105	10.700	11.700	6.600	0.0277
E130	10.950	13.250	8.400	0.0344
E150	14.000	15.350	10.490	0.0422
E185	17.300	19.700	11.100	0.0588
E220	21.200	23.600	12.900	0.0915, 22.5

Table A-6. Coaxial Cable Technical Data

Cable Type	Maximum Frequency (GHz)	Relative Propagation Velocity (V_f)	Nominal Attenuation dB/100ft @ 6 GHz
FSJ1-50A	20.4	0.84	16.2
FSJ2-50	13.4	0.83	11.4
FSJ4-50B	10.2	0.81	10.6
EFX2-50	13.5	0.85	10.4
LDF1-50	15.8	0.86	9.34
LDF2-50	13.5	0.88	9.85
LDF4-50A	8.8	0.88	6.64
HJ4-50	10.9	0.914	7.84
HJ4.5-50	6.6	0.92	4.5

Appendix B
Windowing

Introduction

The Distance sub-menu (page 2-11) provides for setting the cable loss and relative propagation velocity of the coaxial cable. The WINDOW key opens a menu of FFT windowing types for the DTF calculation.

The theoretical requirement for inverse FFT is for the data to extend from zero frequency to infinity. Side lobes appear around a discontinuity due to the fact that the spectrum is cut off at a finite frequency. Windowing reduces the side lobes by smoothing out the sharp transitions at the beginning and at the end of the frequency sweep. As the side lobes are reduced the main lobe widens thereby reducing the resolution.

In situations where there may be a small discontinuity close to a large one, side lobe reduction windowing should be used. When distance resolution is critical windowing can be reduced.

Examples

The types of windowing in order of increasing side lobe reduction are: rectangular, nominal side lobe, low side lobe, and minimum side lobe. Figures B-1 thru B-4 show examples of the types of windowing.

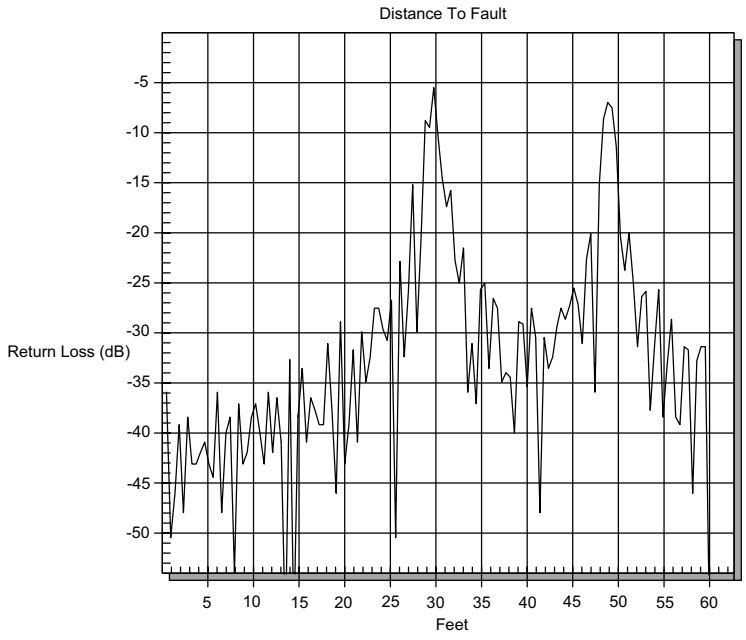


Figure B-1. Rectangular Windowing Example

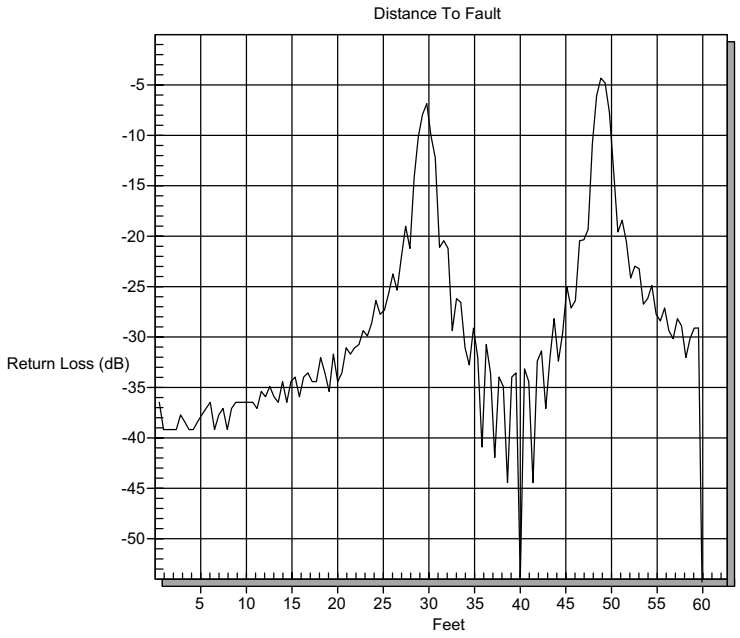


Figure B-2. Nominal Side Lobe Windowing Example

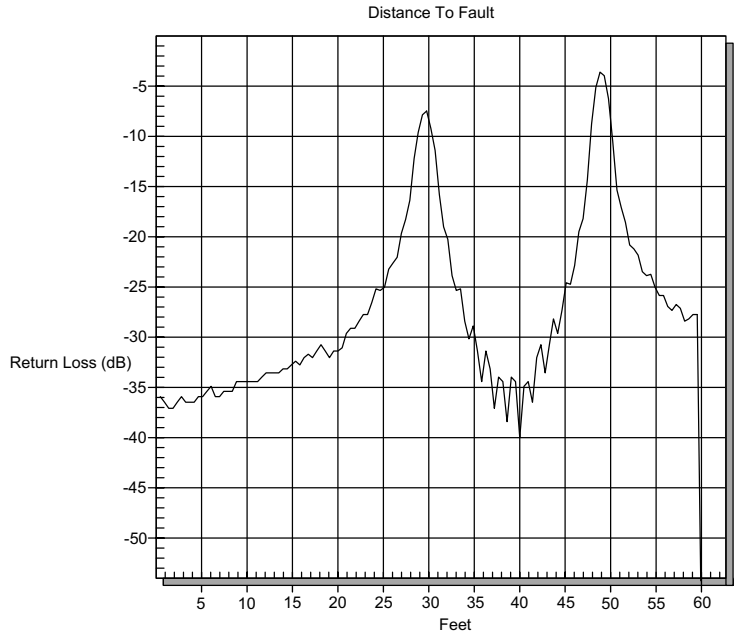


Figure B-3. Low Side Lobe Windowing Example

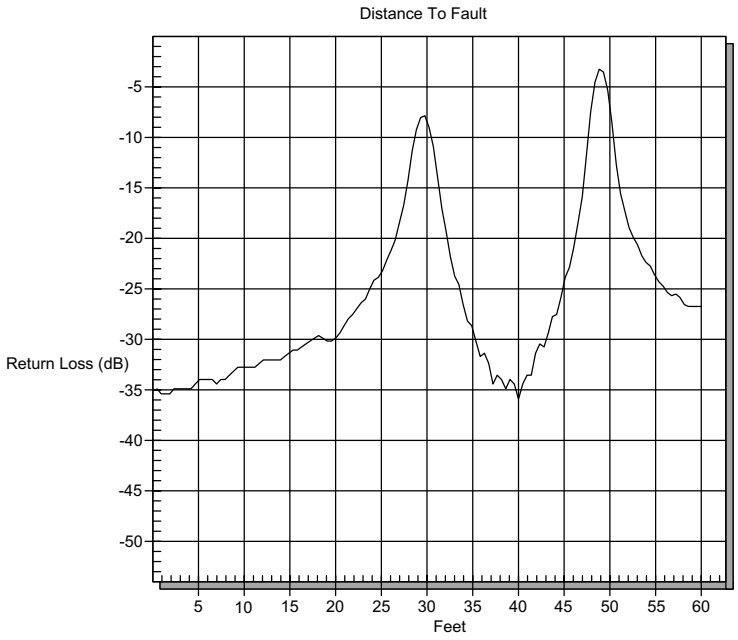


Figure B-4. Minimum Side Lobe Windowing Example

Subject Index

L

M

O

P

R

S

T

U

V

W

Anritsu