Anritsu

Site Master ™
S820A
Microwave Transmission Line and Antenna Analyzer

User's Guide

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

Color Cover P/N: 00986-00029

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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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: S820A

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

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

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

Jul 8, 99
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

July 1999
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Revision: A

How to Use this Manual

The operation of the **Site Master** ™ is straightforward and intuitive. However, you may find it helpful to review the operation of the keys and menus prior to first-time use.

Descriptions of the keys and menus are provided in Chapter 2; measurement procedures are provided in Chapter 3.

First-time users and maintenance supervisors will benefit from perusing the material in Chapter 1. This chapter describes the instrument and provides listings of options and performance specifications.

Please Recycle

This product contains a rechargeable nickel-cadmium battery. Spent nickel-cadium batteries are valuable resources, do not throw them away. Arrange for proper return for recycling in your locality. If you do not have access to proper disposal methods, return the battery to your Anritsu service center. Service centers will dispose of the unit at no charge. Anritsu service centers are listed in Table 1-2 (page 1-10).

NiCd

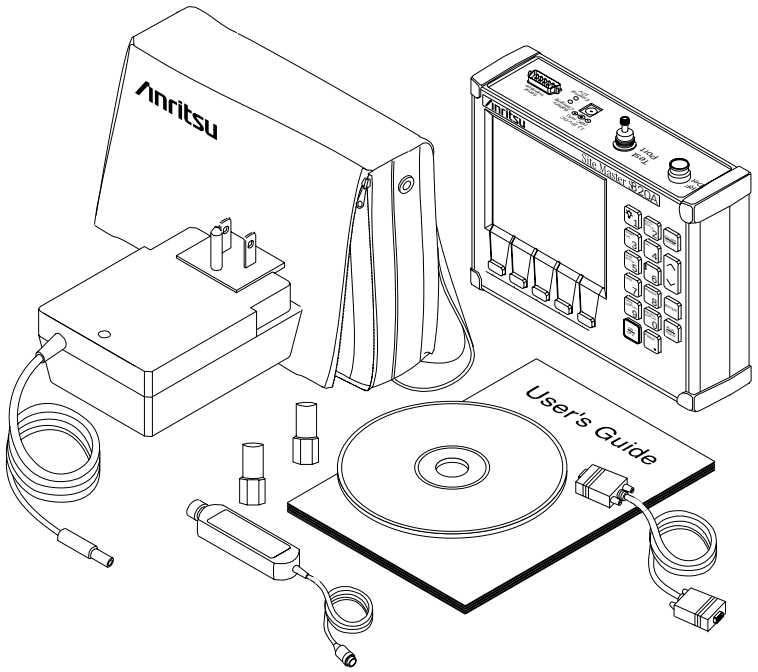


Figure 1-1. **Site Master** *System*

Chapter 1
General Information

1

Introduction

This chapter provides a description, performance specifications, optional accessories, preventive maintenance, and calibration requirements for the **Site Master** model **S820A**. Throughout this manual, the term **Site Master** will refer to the model **S820A**.

Model	**Frequency Range**
S820A	3.3 to 20.0 GHz

Description

The **Site Master** (Figure 1-1) is a hand held SWR/RL (standing wave ratio/return loss) and Distance-To-Fault measurement instrument that includes a built-in synthesized signal source and an optional power monitor. It uses a keypad to enter data and a liquid crystal display (LCD) to provide a graphical indication of SWR or RL over the selected frequency range.

The **Site Master** has a built-in distance-to-fault capability, and is capable of up to two hours of continuous operation from a fully charged internal battery. It can also be operated from a 12.5 dc source (which will also simultaneously charge the battery). 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, or coax/ waveguide insertion loss and locating faulty RF components in antenna systems. Power monitoring capability is available as an option.

The displayed trace can be scaled and enhanced with settable frequency markers and a limit line. 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.

Standard Accessories

The Software Tools PC-based software program provides an on-line database record for storing measurement data. **Site Master** Software Tools can also convert the **Site Maste**r display to a Microsoft Windows 95/98/NT graphic. Measurements stored in the **Site Master** internal memory are down-loaded to the PC using the included serial cable. This null-modem serial cable connects between the Serial Interface connector on the **Site Master** and a COM port on a DOS/ Windows-based PC. Once stored, the graphic trace can then be displayed, scaled, or enhanced with markers and limit lines. Historical graphs can be overlaid with current data using the PC mouse in “drag-n-drop” fashion. The underlying data can be extracted and used in spreadsheets or for other analytical tasks.

The following items are supplied with the basic hardware.

- Soft Carrying Case
- AC-DC Adapter
- Automotive Cigarette Lighter 12 Volt DC Adapter
- CD ROM containing the Software Tools program. This program contains Fault Location (DTF) and Smith Chart functions
- Serial Interface Cable (Null Modem Type)
- One year Warranty (includes battery, firmware, and software)
- User’s Guide
- Adapter, Ruggedized Precision K (m) to N (f), Part No. 34RKNF50

Options

- Option 5 — Add RF Wattmeter Power Monitor

Optional Accessories

- Precision N (m) 18 GHz Short/Open, Part No. 22N50
- Precision N (m) 18 GHz Load, 40 dB, Part No. 28N50-2
- Adapter, Precision N (m) to N (m), 18 GHz, Part No. 34NN50A
- Precision K (m) 40 GHz Short/Open, Part No. 22K50
- Precision K (m) 40 GHz Load, Part No. 28K50
- Adapter, Ruggedized Precision K (m) to N (f), Part No. 34RKNF50
- Adapter, Precision K (m) to K (m), Part No. K220B
- Adapter, N (m) to SMA (f), Part No. 1091-27
- Armored Test Port Extension Cable, 1.5 meter, 20 GHz, K(m) to K(f), Part No. 15KKF5-1.5A
- Armored Test Port Extension Cable, 1.5 meter, 18 GHz, N(m) to N(f), Part No. 15NNF50-1.5B
- Precision Universal Waveguide Calibration Components, see Tables A-1 and A-3
- Precision Coaxial-to-Universal Waveguide Adapters, see Tables A-2
- RF Detector, 10 MHz to 20 GHz, N(m) input connector, 50 Ohms, Part No. 560-7N50B
- Transit Case for Site Master, Part No. 760-213

- HP Deskjet 340 Printer, Part No. 2000-766
- Serial-to-Parallel Converter Cable (use with the HP 340 Printer), Part No. 2000-753
- Black Print Cartridge (use with the HP 340 Printer), Part No. 2000-661
- Rechargeable Battery for the HP 340 Printer, Part No. 2000-662
- Power Cable (Europe) for the HP 340 Printer, Part No. 2000-663
- Power Cable (Australia) for the HP 340 Printer, Part No. 2000-664
- Power Cable (U.K.) for the HP 340 Printer, Part No. 2000-665
- Power Cable (So. Africa) for the HP 340 Printer, Part No. 2000-667
- Seiko DPU-414-30B Thermal Printer, Part No. 2000-754 (U.S.) or 2000-761 (Europe)
- US Adapter (use with Seiko DPU-414 Printer) Part No. 2000-1002
- Europe Adapter (use with Seiko DPU-414 Printer) Part No. 2000-1003
- Battery Pack (use with Seiko DPU-414 Printer) Part No. 2000-1004
- Serial Interface Cable 9-pin (male) to 9-pin (female), Part No. 2000-1012
- Thermal Paper (use with the DPU-414 Printer), Part No. 2000-755

Performance Specifications

Performance specifications are provided in Table 1-1.

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 S820A	3.3 to 20.0 GHz
Frequency Accuracy	75 parts per million @ 25°C*
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):	
Range (meters)	0 to (resolution x 128)
Coax:	
Resolution (in meters) (Rectangular Windowing)	$\frac{(15 \times 10^8)(V_f)}{\Delta Frequency}$ *Where V_f is the cable's relative propagation velocity.*
Waveguide:	
Resolution (in meters) (Rectangular Windowing)	$\frac{(15 \times 10^8)(\sqrt{1-(f_c/f_1)^2})}{\Delta F}$ *Where f_c is the waveguide cutoff frequency in Hz, and f_1 is the start frequency of the sweep, also in Hz.* ΔF is the stop frequency (f_2) minus the start frequency (f_1) in Hz.

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

Wattmeter Power Monitor:	
Range	–50.0 to +20 dBm *or* 10.0 nW to 100.0 mW
Offset Range	0 to +60.0 dB
Resolution	0.1 dB *or* 0.1 xW
Test Port, Type K	50 Ohms
***Immunity to Interfering signals up to the level of	–15 dBm
Maximum Input (Damage Level):	
Test Port, Type K	+22 dBm
RF Detector	+20 dBm
Measurement Accuracy:	
Measurement accuracy depends on calibration components. Precision calibration components have a directivity of 40 dB.	
Temperature:	
Storage	–4° to 167° F (–20° C to 75° C)
Operation	32° to 122° F (0° C to 50° C)
Weight:	3.0 pounds (1.36 kg)
Size:	8 x 7 x 2¼ inches (20.3 x 17.8 x 5.71 cm)

** ±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 connector 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 of the K (f) connectors and the pins of the K (m) connectors should be unbroken and uniform in appearance. If you are unsure whether the connectors are good, gauge the connectors to confirm that their 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 **Site Master** is a field portable unit operating in the rigors of the test environment. An Open-Short-Load (OSL) or an Offset Shorts-Load calibration should be performed prior to making a measurement in the field. A built-in temperature sensor in the **Site Master** advises the user, via an icon located on the left side of the LCD screen, that the internal temperature has exceeded a safety window, and the user is advised to perform another 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, or that the Offset Shorts/Load is at the waveguide adapter; 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 beginning on the following page.

The **Site Master** itself is “self calibrating”, meaning that there are no field-adjustable components. However, the OSL calibration components and the waveguide calibration 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 calibration components have been accidentally dropped or over-torqued, or the waveguide load has been accidentally dropped.

Anritsu Service Centers

Table 1-2 provides a listing of the Anritsu Service Centers.

Table 1-2. Anritsu Service Centers (1 of 2)

UNITED STATES

ANRITSU COMPANY
685 Jarvis Drive
Morgan Hill, CA 95037-2809
Telephone: (408) 776-8300,
1-800-ANRITSU
FAX: 408-776-1744

ANRITSU COMPANY
10 New Maple Ave., Unit 305
Pine Brook, NJ 07058
Telephone: (201) 227-8999,
1-800-ANRITSU
FAX: 201-575-0092

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

AUSTRALIA

ANRITSU PTY. LTD.
Unit 3, 170 Foster Road
Mt. Waverley, VIC 3149
Australia
Telephone: 03-9558-8177
Fax: 03-9558-8255

BRAZIL

ANRITSU ELECTRONICA LTDA.
Praia de Botafogo 440, Sala 2401
CEP 22250-040,Rio de Janeiro,RJ, Brasil
Telephone: 021-28-69-141
Fax: 021-53-71-456

CANADA

ANRITSU INSTRUMENTS LTD.
215 Stafford Road, Unit 102
Nepean, Ontario K2H 9C1
Telephone: (613) 828-4090
FAX: (613) 828-5400

CHINA

INSTRIMPEX ANRITSU PRODUCT
SERVICE CENTER
No. 1515
Beijing Fortune Building
5 Dong San Huan Bei Lu
Chao Yang-qu
Beijing 100004, China
Telephone: 010-6590-9230
FAX: 010-6590-9235

FRANCE

ANRITSU S.A
9 Avenue du Quebec
Zone de Courtaboeuf
91951 Les Ulis Cedex
Telephone: 016-44-66-546
FAX: 016-44-61-065

GERMANY

ANRITSU GmbH
Grafenberger Allee 54-56
D-40237 Dusseldorf, Germany
Telephone: 0211-68550
FAX: 0211-685555

INDIA

MEERA AGENCIES (P) LTD
A-23 Hauz Khas
New Delhi 110 016
Telephone: 011-685-3959
FAX: 011-686-6720

Table 2-1. Anritsu Service Centers (2 of 2)

ISRAEL
TECH-CENT, LTD
Haarad St. No. 7, Ramat Haahayal
Tel-Aviv 69701
Telephone: (03) 64-78-563
FAX: (03) 64-78-334

ITALY
ANRITSU Sp.A
Rome Office
Via E. Vittorini, 129
00144 Roma EUR
Telephone: (06) 50-22-666
FAX: (06) 50-22-4252

JAPAN
ANRITSU CORPORATION
1800 Onna Atsugi-shi
Kanagawa-Prf. 243 Japan
Telephone: 0462-23-1111
FAX: 0462-25-8379

KOREA
ANRITSU CORPORATION
#901 Daeo Bldg. 26-5
Yeoido Dong, Youngdeungpo
Seoul Korea 150 010
Telephone: 02-782-7156
FAX: 02-782-4590

SINGAPORE
ANRITSU (SINGAPORE) PTE LTD
3 Shenton Way #24-03
Shenton House
Singapore 0106
Telephone: 022-65-206
FAX: 022-65-207

SOUTH AFRICA
ETESCSA
12 Surrey Square Office Park
330 Surrey Avenue
Ferndale, Randburt, 2194
South Africa
Telephone: 011-787-7200
Fax: 011-787-0446

SWEDEN
ANRITSU AB
Botvid Center
S-145 84
Stockholm, Sweden
Telephone: (08) 534-717-00
FAX: (08)534-717-30

TAIWAN
ANRITSU CO., LTD.
8F, No. 96, Section 3
Chien Kuo N. Road
Taipei, Taiwan, R.O.C.
Telephone: (02) 515-6050
FAX: (02) 509-5519

UNITED KINGDOM
ANRITSU LTD.
200 Capability Green
Luton, Bedfordshire
LU1 3LU, England
Telephone: 015-82-41-88-53
FAX: 015-82-31-303

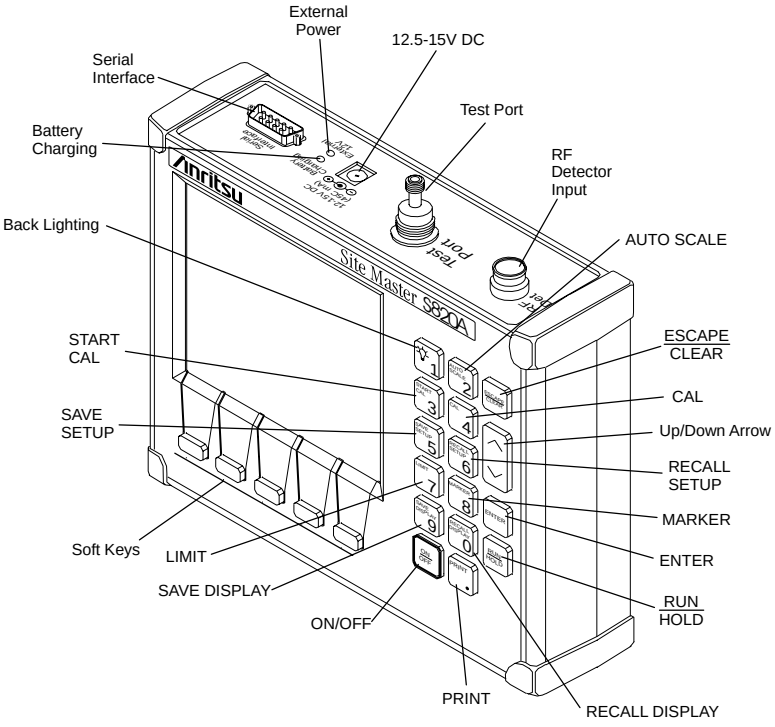


Figure 2-1. **Site Master** *Controls and Connectors*

Chapter 2 Functions and Operations

Introduction

This chapter provides a brief overview of the **Site Master** functions and operations, providing the user with a starting point for making basic measurements. For more detailed information, refer to Chapter 3, *Measurements* and Chapter 4, *Software Tools*.

2

Test Connector Panel

The connectors and indicators located on the test panel are listed and described below.

12.5-15VDC (600 mA) Provides input for battery charging the unit. Input is 12.5 to 15 Vdc @ 600 mA.

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 Indicator light to show that the battery is being charged. (Indicator automatically shuts off when the battery is fully charged.)

External Power Indicator light to show that the **Site Master** is being powered by the external charging unit.

Serial Interface Provides an RS232 DB9 interface with a Com Port on a personal computer (for use with the Anritsu Software Tools program). Also provides an interface to a HP Deskjet 340 printer or a Seiko DPU-414 Thermal printer.

Test Port Provides RF output, 50Ω impedance.

RF Det Provides RF detector input for the Power Monitor.

Keypad Controls

This section contains an alphabetical listing of the Site Master front panel keypad controls (Figure 2-2) along with a brief description of each.

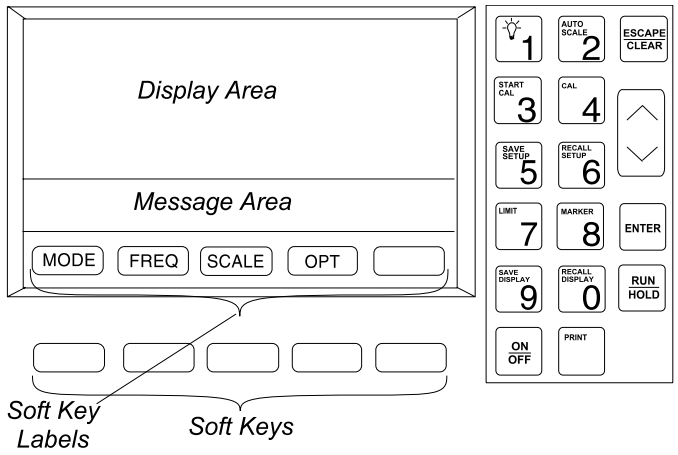


Figure 2-2. ***Site Master*** *Front Panel Layout*

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

AUTO SCALE Automatically scales the display for optimum resolution.

CAL Displays the calibration configuration—the type of calibration, the frequency range, the valid temperature range of the calibration, and the current temperature.

ENTER Implements certain menu and key selections.

ESCAPE CLEAR Exits the present operation and/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.

LIMIT Calls up the Scale Menu, described on page 2-12.

MARKER Calls up the Markers Menu, described on page 2-21.

ON OFF Turns the **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, the factory preset state is restored.

PRINT Prints the current display to the selected printer.

RECALL DISPLAY Recalls a previously saved trace from memory location 1 through 70. When the key is pressed, "Recall display:" appears on the display. Select an appropriate number from the keypad and press the ENTER key to implement.

RECALL SETUP Recalls a previously saved setup from memory location 0 through 6. When the key is pressed, "Recall Setup:" appears on the display. Select an appropriate number 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 (Table 2-1, page 2-54) appears on the left side of the LCD. (HOLD conserves considerable battery power.)

SAVE DISPLAY Saves the displayed trace to 1 of 70 internal non-volatile memory locations. When the key is pressed, the next available empty memory location appears on the display (i.e."Save display 3"). Press ENTER to save to the current empty memory location or select an appropriate number from the keyboard or use the Up/Down Arrow key and press the ENTER key to implement.

To erase saved displays select 0 and press ENTER. Individual displays may be selected and erased by entering the display number and pressing ENTER. Selecting display 0 will erase all saved displays.

CAUTION: *The selected memory location will be overwritten by the SAVE DISPLAY operation. No warning is given.*
When the **Site Master** *is cycled on/off, the memory location increment resets to the lowest memory location (1).*

SAVE SETUP Saves the current system setup to 1 of 6 internal non-volatile memory locations. When the key is pressed, "Save Setup:" appears on the display. Select an appropriate number using the Up/Down Arrow key and press the ENTER key to implement.

CAUTION: *The selected memory location will be overwritten by the SAVE SETUP operation. No warning is given.*

START CAL

Opens a calibration menu. Use the Up/Down Arrow key and ENTER key to select either COAX or WAVEGUIDE calibration. Then select the desired setup configuration from the next menu screen.

For Coax Calibration, follow the text in the message area that instructs you to do the following:

- Connect OPEN, Press ENTER.
  The **Site Master** will measure the calibration "open" that you must attach to the end of the test port .
- Connect SHORT, Press ENTER
  The **Site Master** will measure the calibration "short" that you must attach to the end of the test port.
- Connect LOAD, Press ENTER
  The **Site Master** then measures the 50Ω termination (load) that you must attach to the end of the test port.

For Waveguide Calibration, follow the text in the message area that instructs you to do the following:

- Connect 1/8 OFFSET, Press ENTER
  The **Site Master** will measure the calibration "short" that you must attach to the end of the test port or waveguide adapter.
- Connect 3/8 OFFSET, Press ENTER
  The **Site Master** will measure the calibration "short" that you must attach to the end of the test port or waveguide adapter.
- Connect LOAD, Press ENTER
  The **Site Master** will measure the 50Ω termination (load) that you must attach to the end of the test port or waveguide adapter.

NOTE:
The combined measurements of an open, a short, and a known-impedance load in coax calibration and of known-offset shorts and known-impedance load in waveguide calibration normalizes the measurement system, to account for uncertainties introduced by measurement-system components (e.g., cables, connectors, etc.).

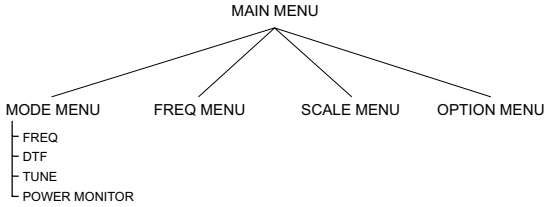
Up/Down Arrow Key Increments or decrements a parameter value.

NOTE:
At turn on, before any other keys are pressed, the Up/Down Arrow Key may be used to adjust display contrast.

Soft Keys

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 menu selection.

Figure 2-3 shows the menu structure, the soft key labels for each menu selection, and the page where a description of the menu can be found.



MODE	MENU TITLE	SOFT KEY LABELS	PAGE
FREQ	MAIN MENU	MODE FREQ SCALE OPT	2-8
	FREQUENCY MENU	F1 F2 MAIN	2-10
	SCALE MENU	TOP BOTTOM LIMIT MAIN	2-11
	OPTION MENU	B1 B2 B3 B4 MORE	2-12
	OPTION SUB MENU	B5 B6 B7 B8 MAIN	2-13
DTF	MAIN MENU	MODE DIST SCALE OPT	2-9
	DISTANCE MENU	D1 D2 DTF AID MORE	2-14
	DISTANCE SUB MENU 1	LOSS PROP V CABLE WINDW MAIN	2-15
	DISTANCE SUB MENU 2	LOSS CUTOFF WAVE G WINDW MAIN	2-16
	SCALE MENU	TOP BOTTOM LIMIT MAIN	2-11
	OPTION MENU	B1 B2 B3 B4 MORE	2-12
	OPTION SUB MENU	B5 B6 B7 B8 MAIN	2-13
TUNE	MAIN MENU		2-23
POWER MONITOR	MAIN MENU	UNITS REL OFFSET ZERO MAIN	2-24

Figure 2-3. ***Site Master*** *Menu Structure*

Main Menu At turn on, the Main Menu soft keys, below, are displayed, and the Marker status is shown in the message area.

These soft keys provide the following menu selections:

- MODE — Selects the type of measurement. Use the Up/Down Arrow key and ENTER key to select the type of measurement in the FREQ, DTF, POWER MONITOR, and TUNE measurement modes.
- FREQ — Selects the Frequency Menu, described on page 2-12.
- SCALE —Selects the Scale Menu, described on page 2-13.
- OPT — Selects the Option Menu, described on page 2-14.

DTF Main Menu

When the DTF measurement mode is selected, the Main Menu soft keys, below, are displayed, and the Marker status is shown in the message area.

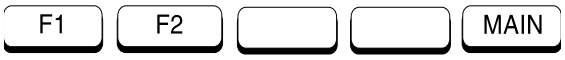
These soft keys provide the following menu selections:

- MODE — Selects the type of measurement. Use the Up/Down Arrow key and ENTER key to select the type of measurement in the FREQ, DTF, POWER MONITOR, and TUNE measurement modes.
- DIST — Selects the Distance Menu, described on page 2-16.
- SCALE — Selects the Scale Menu, described on page 2-13.
- OPT — Selects the Option Menu, described on page 2-14.

Frequency Menu (FREQ)

Provides for setting sweep frequency end-points. Selected frequency values may be changed using the keypad or Up/Down Arrow key. All frequency entries are in GHz.

Choosing FREQ causes the soft keys, below, to be displayed and the corresponding values to be shown in the message area.



- 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.
- MAIN — Returns to the Main Menu.

Scale Menu (SCALE)

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

Choosing SCALE causes the soft keys, below, to be displayed and the corresponding values to be shown in the message area.

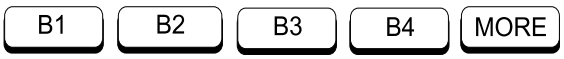
Pressing the LIMIT key on the keypad will also call up this menu.

- 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.
- LIMIT — Turns Limit OFF, if currently ON. If Limit is currently OFF, turns it ON and opens the Limit parameter for data entry. Press ENTER when data entry is complete.
- MAIN — Returns to the Main Menu.

Option Menu (OPT)

Provides for selecting **Site Master** options.

Choosing OPT causes the soft keys, below, to be displayed and the corresponding values to be shown in the message area.



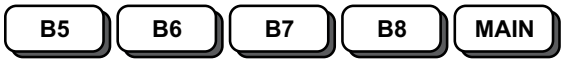
- B1 MATH — Opens a menu of trace math operation modes; OFF, TRACE - MEMORY. Use the Up/Down Arrow key and ENTER key to make a selection. (Not available in TUNE mode.)
- B2 LIMIT BEEP ON/OFF — Toggles the limit beeping sound on or off. When on, the **Site Master** sounds a beep when the measured value is above the limit line.
- B3 KEYBD LOCK ON/OFF — Toggles the keyboard locking feature on or off. When on, the keyboard (except for the keys listed below) is locked to prevent inadvertent data entry.

  When locked, pressing any key (except ON/OFF, RUN/HOLD, MORE, MAIN, OPT, and B3) will cause the lock-out symbol (Table 2-1, page 2-53) to display along the left edge of the LCD and an error beep to sound.
- B4 SINGLE SWP ON/ OFF — Toggles the single sweep function on or off. When on, the **Site Master** will have to be manually triggered using the RUN/HOLD key on the keypad for each sweep.
- MORE — Selects the Option Sub-Menu, described below.

Option Sub-Menu

Provides for selecting additional **Site Master** options.

Choosing MORE causes the soft keys, below, to be displayed and the corresponding values to be shown in the message area.



- B5 UNITS — Toggles between ENGLISH and METRIC units.
- B6 FIXED CW — Toggles the FIXED CW function on or off.
- B7 PRINTER — Displays a menu of supported printers—None, Seiko DPU-414, and HP Deskjet 340. Use the Up/Down Arrow key and **ENTER** key to make the selection.
- B8 CONTRAST — Enables adjustment of the LCD contrast. Use the Up/Down Arrow key and **ENTER** key to set the contrast.
- MAIN — Returns to the Main Menu.

Distance Menu (DIST)

Provides for setting Distance to Fault parameters. Selected distance values may be changed using the keypad or Up/Down Arrow key. Entry can be in feet or meters, depending on the setting of the B5 soft key in the Option Sub-Menu (page 2-15).

Choosing DIST causes the soft keys, below, to be displayed and the corresponding values to be shown in the message area.

- D1 — Opens the start distance (D1) parameter for data entry. This is the start value for the distance range. 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. User is prompted for system parameter values of maximum distance, center frequency, cable or waveguide type, or propagation velocity or group velocity. Frequency parameters are then calculated to optimize both range and resolution.
- MORE — For coaxial cable, selects the Distance Sub-Menu 1, described on page 2-15. For waveguide, selects the Distance Sub-Menu 2, described on page 2-16.

NOTE: Refer to Appendix A for coaxial cable and waveguide technical data.

Distance Sub-Menu 1

Provides for setting the cable loss and relative propagation velocity of the coaxial cable. Selected values may be changed using the keypad or Up/Down Arrow key.

Choosing MORE causes the soft keys, below, to be displayed and the corresponding values to be shown in the message area.

- 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 0.000 to 5.000 dB/m)
- PROP V (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 menu of common coaxial cables. Use the Up/Down Arrow key and ENTER key to make a selection. This feature is provided as a rapid means of setting both cable loss and propagation velocity.
- WINDW — Opens a menu of FFT windowing types for the DTF calculation. Use the Up/Down Arrow key and ENTER key to make a selection.
- MAIN — Returns to the Main Menu.

Distance Sub-Menu 2

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

Choosing MORE causes the soft keys, below, to be displayed and the corresponding values to be shown in the message area.

- LOSS — Opens the Waveguide Loss parameter for data entry. Enter the loss per foot (or meter) for the type of waveguide being tested. Press ENTER when data entry is complete. (Range is 0.000 to 5.000 dB/m)
- CUTOFF — Opens the Cutoff Frequency parameter for data entry. Enter the cutoff frequency for the type of waveguide being tested. Press ENTER when data entry is complete.
- WAVE G — Opens a menu of common waveguides. Use the Up/Down Arrow key and ENTER key to make a selection. This feature is provided as a rapid means of setting both waveguide loss and cutoff frequency.
- WINDW — Opens a menu of FFT windowing types for DTF calculation. Use the Up/Down Arrow key and ENTER key to make a selection.
- MAIN — Returns to the Main Menu.

NOTE: Using Windowing
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 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. The types of Windowing in order of increasing side lobe reduction are: rectangular, nominal side lobe, low side lobe, minimum side lobe. Figures 2-4 thru 2-7, on pages 2-18 and 2-19, are examples of the types of Windowing.

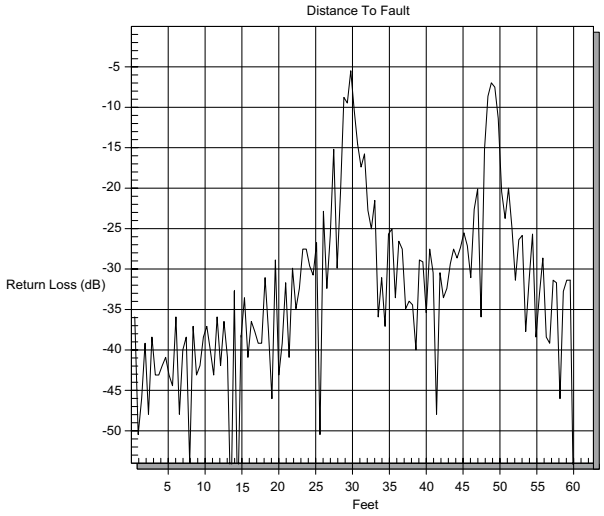


Figure 2-4. Rectangular Windowing Example

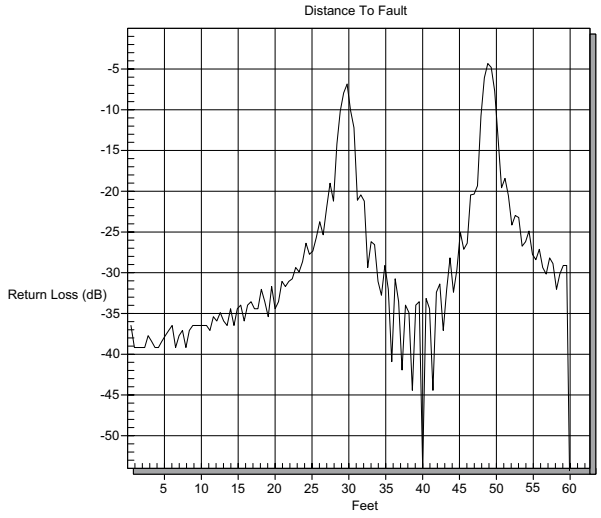


Figure 2-5. Nominal Side Lobe Windowing Example

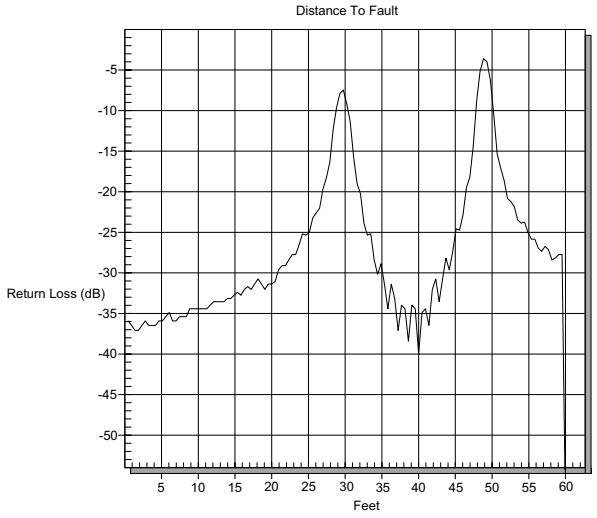


Figure 2-6. Low Side Lobe Windowing Example

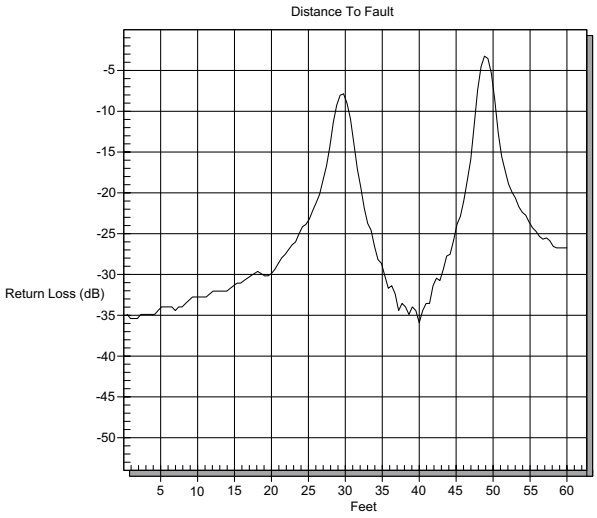
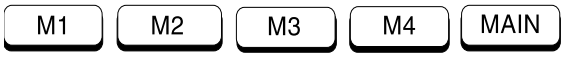


Figure 2-7. Minimum Side Lobe Windowing Example

Markers Menu (MKRS)

Provides for setting marker values. Selected frequency marker or distance marker values may be changed using the keypad or Up/Down Arrow key.

Pressing the MARKER key causes the soft keys, below, to be displayed and the corresponding values to be shown in the message area.

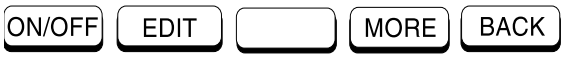


- M1 — Selects the M1 marker parameter, displaying either frequency or distance and the corresponding SWR, RL, or CWL and opens the Markers 2nd Level Menu, described on page 2-23.
- M2 — Selects the M2 marker parameter, displaying either frequency or distance and the corresponding SWR, RL, or CWL and opens the Markers 2nd Level Menu, described on page 2-23.
- M3 — Selects the M3 marker parameter, displaying either frequency or distance and the corresponding SWR, RL, or CWL and opens the Markers 2nd Level Menu, described on page 2-23.
- M4 — Selects the M4 marker parameter, displaying either frequency or distance and the corresponding SWR, RL, or CWL and opens the Markers 2nd Level Menu, described on page 2-23.
- MAIN — Returns to the Main Menu.

Markers Menu (2nd Level)

Provides for turning the selected marker on and off and for setting marker values. Selected frequency marker and distance marker values can be changed using the keypad or Up/Down Arrow key.

Choosing M1 causes the soft keys, below, to be displayed and the corresponding values to be shown in the message area.



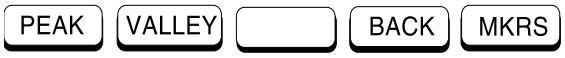
Choosing M2, M3, or M4 causes the soft keys, below, to be displayed and the corresponding values to be shown in the message area.

- 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.
- DELTA — Displays delta SWR, RL, or CWL as well as delta frequency or distance for the selected marker with respect to the M1 marker.
- MORE — Selects the Markers 3rd Level Menu, described on page 2-24.
- BACK — Returns to Main Markers Menu.

Markers Menu (3rd Level)

Provides selections for placing the selected marker at the frequency or distance with the maximum or minimum SWR, RL or CWL.

Choosing MORE causes the soft keys, below, to be displayed and the corresponding values to be shown in the message area.



- PEAK — Places the selected marker at the frequency or distance with the maximum SWR, RL, or CWL.
- VALLEY — Places the selected marker at the frequency or distance with the minimum SWR, RL, or CWL.
- BACK — Returns to the Markers 2nd Level Menu.
- MKRS — Returns to the Main Markers Menu.

Tune Menu Tune mode allows for field testing of waveguide flange and other system components. The rapid one second sweeps allow easy adjustment of tunable BPF filters and waveguide adapters.

- TUNE - SWR—Provides rapid SWR measurement.
- TUNE - RETURN LOSS—Provides rapid Return Loss measurement.

Tune mode is intended to be used as a quick alignment and evaluation where absolute accuracy is not critical.

The following functions do not operate in Tune mode:

SAVE DISPLAY
SAVE SETUP
TRACE - MATH.

Power Monitor Main Menu

When the Power Monitor measurement mode is selected, the Main Menu soft keys, below, are displayed, and the units, relative, offset, and zero adjust status are 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, 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.
- MAIN — Returns to the Main Menu.

Determining Remaining Battery Life

When the AC-DC adapter is disengaged from the Site Master, a battery indicator symbol is continuously displayed at the top-right corner of the display (Figure 2-8). A totally black bar indicates a fully charged battery.

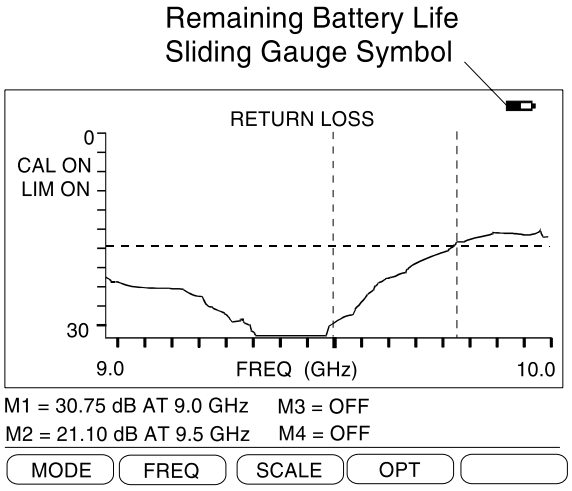


Figure 2-8. Battery Monitor

Printing

Printing is accomplished with either of two printers: the Seiko DPU-414 thermal printer or the Hewlett Packard DeskJet 340 ink jet printer. Figure 2-9 shows a setup diagram for these two printers. Refer to the printer manual for setup details.

Printer Switch Settings

Set the switches, SW1, SW2, and SW3, on the Seiko DPU-414 thermal printer as follows:

Switch	1	2	3	4	5	6	7	8
SW1	OFF	ON	ON	ON	ON	OFF	ON	ON
SW2	ON	ON	ON	ON	ON	ON	ON	OFF
SW3	ON	ON	ON	OFF	OFF	ON	ON	ON

Set the switches on the serial-to-parallel interface cable to the HP Deskjet 340 ink jet printer as follows:

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF

Printing a Screen

Step 1. Connect the printer as shown in Figure 2-9.

Step 2. Obtain a SWR, RL, CWL, or Distance-to-Fault measurement display.

Step 3. Select the printer using the **B7** soft key from the Option Sub-Menu.

Step 4. Press the **PRINT** key (Figure 2-1. page 2-0).

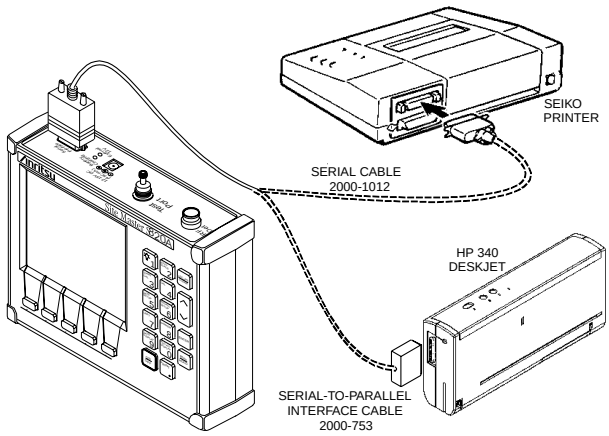


Figure 2-9. Printer Setup

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 or Power Conservation mode. To resume sweeping, press the RUN/HOLD key. After 10 minutes without a key press, the **Site Master** will automatically enter into its power conservation mode.
	**Site Master** is in keypad lockout mode. To turn off keypad lockout, use the **B3** soft key (page 2-13).
	Lock fail indication. Check battery. (If **Site Master** fails to lock with a fully charged battery, call your ANRITSU Service Center.)
	Processor timeout failure. Symbol appears at the frequency that causes an input RF overload; it then disappears as the sweep continues past that point.
	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.

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.

Range Errors

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

Table 2-2. Self Test Error Messages

Error Message	Description
BATTERY LOW	Battery voltage is less than 12.5 volts. Charge battery. If condition persists, call your ANRITSU Service Center.
EXTERNAL POWER LOW	External supply voltage is less than 12.5 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. Return temperature to specified operating range. If condition persists, call your ANRITSU Service Center.

Note: A list of ANRITSU service centers is provided in Table 1-2, page 1-10.

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 or group velocity: **COAX:** $Max\,Unaliased\ Range\ (meters) = \frac{(1.5 \times 10^8)\,(128)\,(V_f)}{F2 - F1}$ **WAVEGUIDE:** $Max\,Unaliased\ Range\ (meters) = \frac{(1.5 \times 10^8)\,(128)\,(V_g)}{F2 - F1}$ *Where: F1 is start frequency (in Hz)* *F2 is stop frequency (in Hz)* *Vf is relative propagation velocity* *Vg is group velocity.* $Vg = \sqrt{1 - \left(\frac{fc}{f1}\right)^2}$ *fc is the waveguide cutoff frequency (Hz).*
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 or offset, short, and load calibration must be performed before calibration can be turned on.
CAL VALID FROM: xxxx.x to xxxx.x MHz	The calibration was performed at a frequency range that is different from the current range.

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

Error Message	Description
DIST REQUIRES F1 < F2	Valid distance to fault plots require a non-zero frequency span.
DIST REQUIRES CAL	Distance-to-fault measurements do not provide usable data 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 COAX/WAVEGUIDE LOSS MODE ARE INCOMPATIBLE	DTF measurements only display RL or SWR versus distance.
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.

Replacing the Battery

Replacing the battery is the only recommended field-level maintenance action. If your battery fails, contact your ANRITSU Sales Office or Service Center. Table 1-2, on page 1-10, provides a listing of current service centers.

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 **Site Master** controls to be more easily accessed (Figure 2-10).

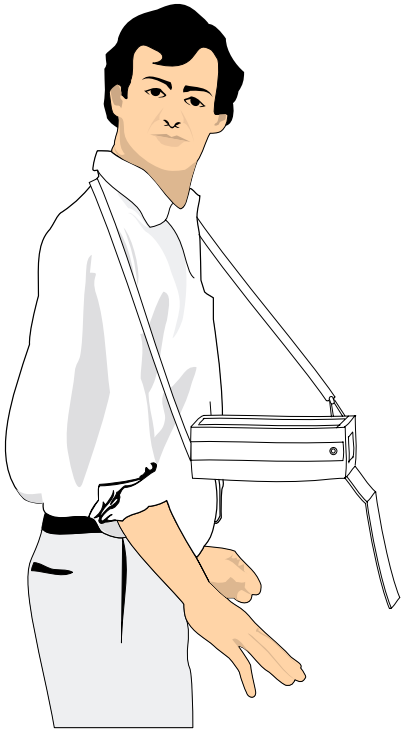


Figure 2-10. Using Soft Carrying Case

Chapter 3
Measurements

Introduction

This chapter provides a description of the Site Master measurement functions and examples of frequency domain, distance domain, and power monitor measurements.

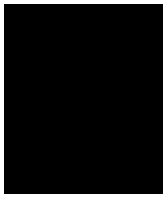
Measurement Functions

Site Master operation is divided into common operating procedures and three measurement modes: frequency domain, distance domain, and power monitor.

- The common operating procedures consist of calibration, saving and recalling test setups, and saving and recalling displays. Use of other common operating functions, such as markers, scaling, and limit lines, are explained in the measurement examples.
- Frequency domain measurements consist of Return Loss (RL), Standing Wave Ratio (SWR), and Cable/Waveguide Loss (CWL) made over a selectable frequency range. SWR and RL characterize the magnitude of reflections present in a device or transmission line. CWL measurements display the insertion loss of a transmission line over frequency. Tune provides quick measurements of bandpass filters and wave guide adapters in SWR and RL.
- Distance domain measurements—commonly known as distance-to-fault (DTF)—are made over a selectable distance range. They include RL or SWR, but they also return information that can help locate discontinuities in a transmission line. CWL cannot be measured in the distance domain.

- Power monitor measurements can be either absolute or relative to some base power level, and can be displayed in either dBm or Watts. To allow measurement and display of power levels above the unit's specified input, the user may attenuate the signal and enter the corresponding offset. The offset is added to the measured input power prior to display. Finally, a zero adjust function is provided to allow subtraction of an inherent “noise” level prior to display.

CAUTION: *The measurement system MUST be calibrated at the ambient temperature prior to making a measurement. You must calibrate when the setup frequency is changed. Calibrations are stored with each of the six setups.*



It is recommended that open, short, load calibration or offset shorts, and load calibration be performed on the Site Master prior to measurements. This gives confidence to the operator that the measurement performed is accurate and system uncertainties have been minimized.

Common Operating Procedures

The following procedures are necessary to make valid measurements or to save and recall setups or displays.

Power On Procedure

The 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 two 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) provided.

Step 1. Press the **ON/OFF** key.

The Site Master takes about five seconds to perform a series of self-diagnostic and adjustment routines. At completion, the screen displays the Anritsu logo, the model number, and the version of firmware installed.

Step 2. Press **ENTER** to continue, or wait for one minute.

The Site Master is now ready for operation.

Calibration Procedure

The following procedure provides the steps necessary to perform an Open-Short-Load (OSL) calibration for coax cables and Offset Shorts-Load calibration for waveguides.

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

Step 2. Use the Up/Down arrow key to scroll to **FREQ - SWR** or **RETURN LOSS**.

Step 3. Press the **ENTER** key to select the SWR or Return Loss measurement mode (Figure 3-1).

MEASUREMENT MODE	
FREQ -	SWR
	RETURN LOSS
	COAX/WAVEGUIDE LOSS
DTF -	SWR
	RETURN LOSS
POWER MONITOR	
TUNE -	SWR
	RETURN LOSS

Figure 3-1. Mode Selection Box showing FREQ - RETURN LOSS selection

Selecting the Frequency Range

The following procedure selects the frequency range for the calibration.

Step 4. Press the **FREQ** soft key.

Step 5. Press the **F1** soft key.

Step 6. Enter 3, ., 3 or a user-defined start frequency using the key pad or the Up/Down arrow key.

Step 7. Press **ENTER** to set F1 to 3.300 GHz or the user-defined start frequency.

Step 8. Press the **F2** soft key.

Step 9. Enter 2, 0 or a user-defined stop frequency using the keypad or the Up/Down arrow key.

Step 10. Press **ENTER** to set F2 to 20.000 GHz or the user-defined stop frequency.

Step 11. Check that the scale in the display area indicates the new frequency start and stop values (F1 = 3.300 GHz, F2 = 20.000 GHz for example).

Performing a Calibration

To perform a measurement calibration:

Step 12. Press the **START CAL** key.

Step 13. Select either **TYPE = WAVEGUIDE** or **TYPE = COAX** calibration and press **ENTER**.

Step 14. If **WAVEGUIDE** is selected, select the **FLANGE** type from the list provided.

If **COAX** is selected, select the **DUT CONN TYPE** from the list provided, and press **ENTER**.

Step 15. Select **EXIT - START CALIBRATION** from the menu and press **ENTER**.

Step 16. If **WAVEGUIDE** is selected, follow the instructions in the message area and connect the 1/8 offset, 3/8 offset, and load when prompted. Refer to Figure 3-2.

Step 17. If **COAX** is selected, follow the instructions in the message area and connect the open, short, and load when prompted. Connect the k to n-type adapter as needed for your particular configuration. Refer to Figure 3-3. Figures 3-4 and 3-5 show a typical response after calibration with the load still attached to the test port.

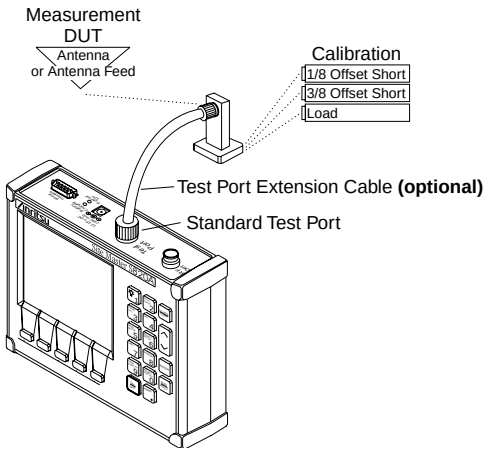


Figure 3-2. Waveguide Measurement/Calibration Test Setup

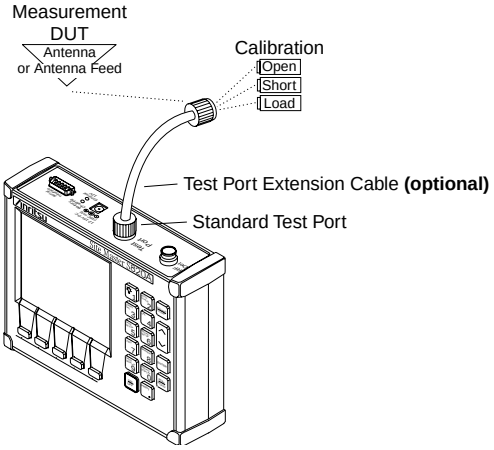


Figure 3-3. Coax Measurement/Calibration Test Setup

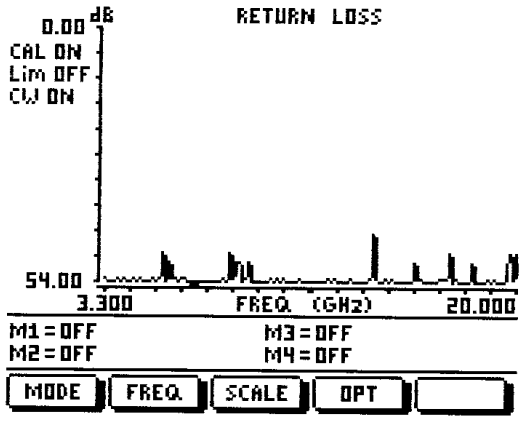


Figure 3-4. Return Loss Measurement Mode Calibration Results

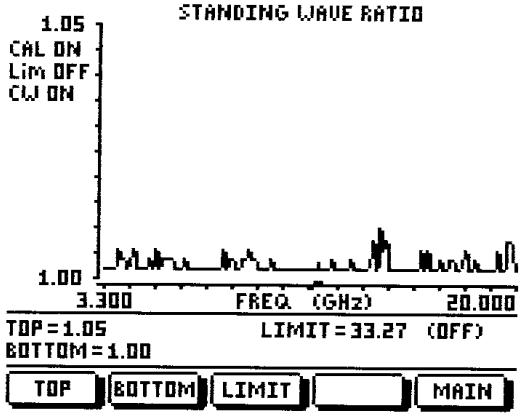


Figure 3-5. SWR Measurement Mode Calibration Results

NOTES:
For best calibration results—compensation for all measurement system uncertainties—ensure that the Open/Short/Load (Short 1/Short 2/Load for waveguide) is at the end of the test port or optional extension cable or at the coax-to-waveguide adapter; this is 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 Open/Short/Load calibration will cause uncompensated phase reflections inside the cable. 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.

Saving a Setup

To save a setup to the non-volatile memory:

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

Step 2. Use the Up/Down arrow key to select the location (1-6).

Step 3. Press **ENTER** to save the current setup in the selected location.

Recalling a Setup

To recall a previously saved setup:

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

Step 2. Use the Up/Down arrow key to select the location (1-6).

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

Saving a Display

To save a display to memory:

Step 1. Press the **SAVE DISPLAY** key. The next available memory location will display. Press **ENTER** to accept the location indicated, or use the keypad or the Up/Down arrow key to enter a location number (1-70), then press **ENTER**.

Step 2. Enter the current time in *HHMM* format and press **ENTER**.

Step 3. Enter the current date in *DDMMYY* format and press **ENTER**.

Step 4. Enter an 8-digit reference designator and press **ENTER**.

Recalling a Display

To recall a previously stored display:

Step 1. Press the RECALL DISPLAY key.

Step 2. Use the keypad or the Up/Down arrow key to enter a location number (1-70), then press **ENTER**.

Return Loss (SWR) and Coax/Waveguide Loss Measurement

The following frequency domain measurement is an example of a Return Loss (or Standing Wave Ratio) and Coax/Waveguide Loss measurement made over a selectable frequency range using the test port cable as the device under test (DUT).

Required Equipment

- Site Master Model S820A
- Precision Open/Short, Anritsu 22K50
- Precision Load, Anritsu 28K50
- Test Port Extension Cable, Anritsu 15KKF50-1.5A

Device-Under-Test Specification

Type	Typical Loss @ 1.5m	Vg
15KKF50-1.5A	1.9 dB @ 17 GHz 2.3 dB @ 20 GHz	0.85

Selecting the Measurement Mode

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

Step 2. Press the **MODE** soft key.

Step 3. Use the Up/Down arrow key to scroll to **FREQ-SWR** or **FREQ-RETURN LOSS.**

Step 4. Press the **ENTER** key to select Frequency SWR or Return Loss measurement mode (Figure 3-1).

Selecting the Frequency Range

To select the Frequency Range for the measurement:

Step 5. Press the **FREQ** soft key.

Step 6. Press the **F1** soft key.

Step 7. Enter 1, 7 using the key pad or the Up/Down arrow key.

Step 8. Press **ENTER** to set F1 to 17 GHz.

Step 9. Press the **F2** soft key.

Step 10. Enter 2, 0 using the keypad or the Up/Down arrow key.

Step 11. Press **ENTER** to set F2 to 20 GHz.

Step 12. Check that the FREQ (GHz) scale in the display area indicates the new frequency start and stop values (F1 = 17 GHz, F2 = 20 GHz).

Performing a Calibration

To perform a measurement calibration:

Step 13. Press the **START CAL** key.

Step 14. Select **TYPE = COAX** calibration and press **ENTER**.

Step 15. Select the **DUT CONN TYPE = K MALE** and press **ENTER**.

Step 16. Select **EXIT - START CALIBRATION** from the menu and press **ENTER**.

Step 17. Follow the instructions in the message area and connect the open, short, and load when prompted.

Return Loss (SWR) Measurement

The following determines the quality of the DUT (cable).

Step 18. Disconnect the load and connect the test port extension cable to the Site Master test port.

Step 19. Connect the load to the open end of the test port extension cable as shown in Figure 3-6.

Step 20. Observe the display measurement. Figures 3-7 and 3-8 show the typical Return Loss and SWR measurement results. (Note that markers and limit lines are activated in the example displays.)

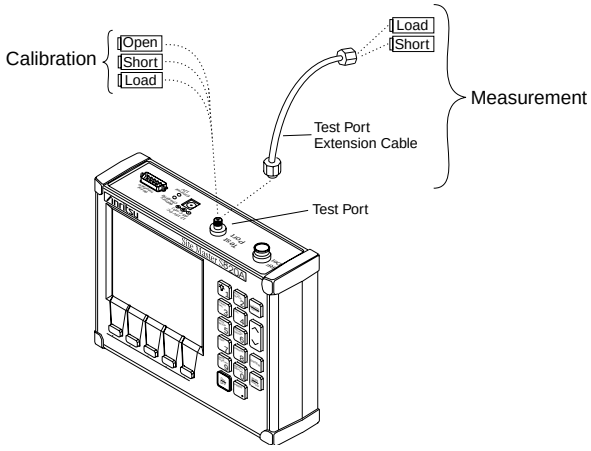


Figure 3-6. Calibration Measurement Setup

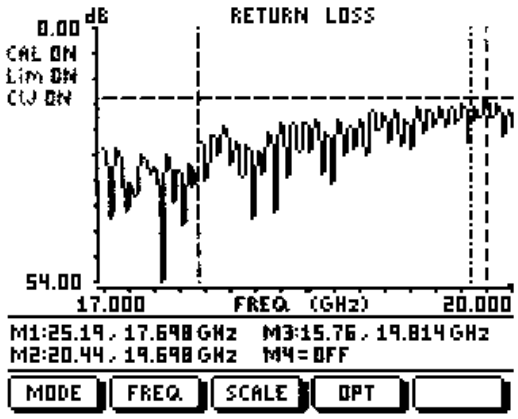


Figure 3-7. Cable Return Loss Measurement Results

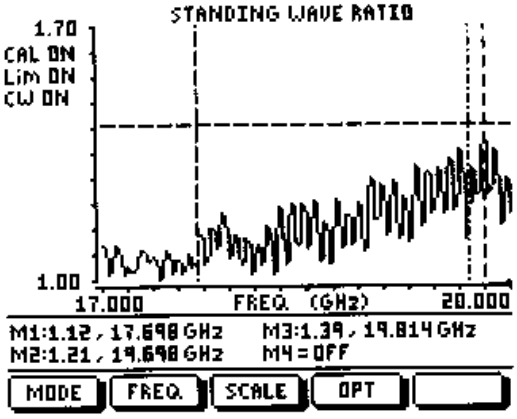


Figure 3-8. Cable SWR Measurement Results

Setting the Display Scale and the Limit Line

The display can be scaled using either of the following methods:

Step 21. To automatically scale the display, press the **AUTO SCALE** key.

Step 22. To manually scale the display, press the **SCALE** soft key from the Main Menu or the **LIMIT** key on the keypad.

Step 23. In SWR mode, press the **TOP** soft key and enter 1, ., 7 using the keypad or the Up/Down arrow key (in Return Loss mode, enter 0). Press **ENTER** to set the top scale value.

Step 24. In SWR mode, press the **BOTTOM** soft key and enter 1 using the keypad or the Up/Down arrow key (in r Return Loss mode, enter 5, 4). Press **ENTER** to set the bottom scale value.

Step 25. Press the **LIMIT** softkey to edit the limit line values. Enter the value using the keypad or the Up/Down arrow key (for SWR, enter 1, ., 4, 3; for Return Loss, enter 1, 5). Press **ENTER** to set the Limit Line value.

NOTE:
Pressing the LIMIT soft key toggles Limit Line on and off.

Step 26. OPTIONAL—Audible Alarm. From the Main menu, press the **OPT** soft key. Option soft key **B2** toggles the limit beep on or off.

Adjusting Markers

To set or adjust the four available markers:

Step 27. Press the **MARKER** key on the keypad to display the Marker Menu.

Step 28. Press the **M1** soft key to select the Marker 1 marker function. (The on/off soft key toggles the M1 marker function on and off.)

Step 29. Press the **EDIT** soft key and use the keypad or the Up/Down arrow key to enter 1, 7, ., 7. Press **ENTER** to set M1 to 17.7 GHz.

Step 30. Press the **BACK** softkey to return to the Markers Menu.

Step 31. Press the **M2** soft key to select the Marker 2 marker function.

Step 32. Press the **EDIT** soft key and use the keypad or the Up/Down arrow key to enter 1, 9, ., 7. Press **ENTER** to set the M2 to 19.7 GHz.

Step 33. Press the **M3** soft key to select the Marker 3 marker function.

Step 34. Press the **MORE** soft key and select **PEAK** to determine the worst SWR or Return Loss value between 17.0 and 20.0 GHz.

Step 35. Press the **BACK** soft keys and the **MAIN** soft key to return to the Main Menu.

Figures 3-7 and 3-8 (page 3-13) show the typical Return Loss and SWR measurement results with Markers and Limit Line activated.

NOTE:
Refer to page 3-8 for instructions on saving and recalling setups and displays.

Cable Loss Measurement

The following describes the cable loss measurement using the one-port loss method. This method gives a quick and relatively accurate cable loss measurement without resorting to the two-port "thru" insertion loss method.

Step 36. Press the **MODE** soft key.

Step 37. Use the Up/Down arrow key to scroll to **FREQ-COAX/WAVEGUIDE**.

Step 38. Press the **ENTER** key to select Coax/Waveguide loss measurement mode (Figure 3-1).

Step 39. Disconnect the load from the end of the test port extension cable and replace it with the short termination.

NOTE:
If CAL ON is not shown in the upper left of the display or return loss (SWR) measurement steps were not implemented, refer to the calibration procedure (page 3-11) to calibrate the unit before continuing.

Setting the Display Scale and the Limit Line

Step 40. To automatically scale the display, press the **AUTO SCALE** key.

Step 41. To manually scale the display, press the **SCALE** soft key from the Main Menu or the **LIMIT** key on the keypad.

Step 42. Press the **TOP** soft key and enter 0 using the keypad or the Up/Down arrow key. Press **ENTER** to set the top scale value.

Press the **BOTTOM** soft key and enter 3, ., 5 using the keypad or the Up/Down arrow key. Press **ENTER** to set the bottom scale value.

Step 43. Press the **LIMIT** softkey to edit the Limit Line value. Enter 2, ., 9 using the keypad or the Up/Down arrow key. Press **ENTER** to set the limit line value.

NOTE:
Pressing the LIMIT soft key will toggle the limit line on and off.

Adjusting Markers

Step 44. Press the **MARKER** key on the keypad to display the Marker Menu.

Step 45. Press the **M1** soft key to select the Marker 1 marker function.

Step 46. Press the **EDIT** soft key and use the keypad or the Up/Down arrow key to enter 1, 7. Press **ENTER** to set M1 to 17 GHz.

NOTE:
Pressing the on/off soft key toggles the M1 marker function on and off.

Step 47. Press the **BACK** softkey to return to the Markers Menu.

Step 48. Press the **M2** soft key to select the Marker 2 marker function.

Step 49. Press the **EDIT** soft key and use the keypad or the Up/Down arrow key to enter 2, 0. Press **ENTER** to set the M2 to 20 GHz.

Step 50. Press the **BACK** softkey to return to the Markers Menu.

Step 51. Press the ON/OFF soft key to deactivate the Marker 3 marker function.

Figure 3-9 depicts the typical response of a one-port cable loss measurement.

> *NOTE:*
> *Typical cable loss is the average between the adjacent peak and valley.*

Step 52. Press the **BACK** soft keys and the **MAIN** soft key to return to the Main Menu.

> *NOTE:*
> *Refer to page 3-8 for instructions on saving and recalling setups and displays.*

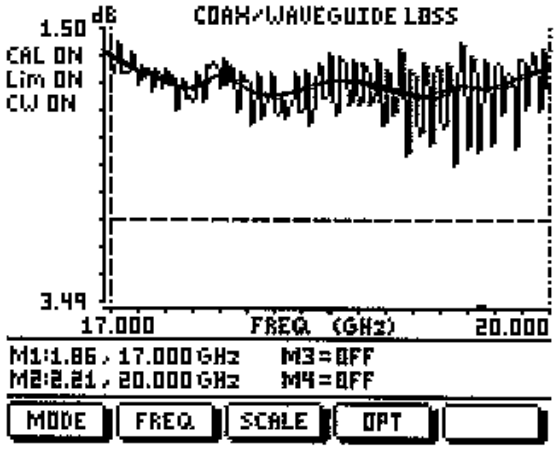


Figure 3-9. One-port Cable Loss Measurement Results

Making Distance-Domain Measurements

Distance domain measurements—commonly known as distance-to-fault (DTF)—are made over a selectable distance range. The information can help locate discontinuities in a transmission line and determine the quality of the transmission line.

The following is an example of a DTF measurement with respect to return loss and SWR using the test port cable as the Device Under Test (DUT).

NOTE FOR COAX:
The maximum distance range is determined by the frequency span, number of data points, and relative propagation velocity:

$$\text{Maximum Unaliased Range (meters)} = \frac{(15 \times 10^8)\,(128)\,(V_f)}{F2 - F1}$$

Where: F1 is start frequency (in Hz)
F2 is stop frequency (in Hz)
Vf is relative propagation velocity

NOTE FOR WAVEGUIDE:
The maximum distance range is determined by the frequency span, number of data points, and group velocity:

$$\text{Maximum Unaliased Range (meters)} = \frac{(15 \times 10^8)\,(128)\,(V_G)}{F2 - F1}$$

Where: F1 is start frequency (in Hz)
F2 is stop frequency (in Hz)
VG is group velocity

$$V_G = \sqrt{1 - (F_C / F_1)^2}$$

FC is the waveguide cutoff frequency (in Hz)

Required Equipment

- Site Master Model S820A
- Precision Open/Short, Anritsu 22K50
- Precision Load, Anritsu 28K50
- Test Port Extension Cable, Anritsu 15KKF50-1.5A

Device-Under-Test Specification

Type	Typical Loss @ 1.5m	Vg
15KKF50-1.5A	1.9 dB @ 17 GHz 2.3 dB @ 20 GHz	0.85

Selecting the Measurement Mode

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

Step 2. Press the **MODE** soft key.

Step 3. Use the Up/Down arrow key to scroll to **DTF-RETURN LOSS** or **DTF-SWR** .

Step 4. Press the **ENTER** key to select **DTF-SWR** or **DTF-RETURN LOSS** measurement mode (Figure 3-1).

Selecting the Distance Parameters

The DTF Parameters table will automatically display if calibration has not been done for the current display setup.

If calibration is current, press the **DIST** and the **DTF AID** soft keys to display the DTF Parameters table.

NOTE:
*Select the units of measure (METRIC or ENGLISH) by pressing the **OPT** - **MORE** - **B5** softkeys. The following example procedure assumes metric measurements.*

Step 5. Use the Up/Down arrow key to scroll to **MEDIA** and press **ENTER** to select **MEDIA=COAX**.

Step 6. Use the Up/Down arrow key to scroll to **PROP VEL**. Press **ENTER** to edit propagation velocity and enter ., 8, 5 to set the propagation velocity to 0.85.

NOTE:
*Propagation velocity and cable loss must be entered manually as the cable used is not in the cable list (i.e., **CABLE=NONE**). Propagation velocity and cable loss are automatically established if the cable type is selected from the cable list.*

Step 7. Use the Up/Down arrow key to scroll to **CABLE LOSS=**. Press **ENTER** to edit the cable loss value and enter 0 to set the cable loss value to 0 dB/m.

Step 8. Use the Up/Down arrow key to scroll to **D2**. Press **ENTER** to edit the D2 value and enter 2 to set D2 to 2 meters.

Step 9. Use the Up/Down arrow key to scroll to **CF**. Press **ENTER** to edit the center frequency value and enter 2, 0 to set the center frequency to 20 GHz.

NOTES:
CF is actually set at 16.509 GHz. Since CF is selected at the maximum frequency range, DTF AID optimizes the frequency span F1 and F2 to provide the best resolution and resets the CF to 16.509 GHz.

NOTE:
*Where **CAL ON** is indicated on the Site Master, pressing the **DIST** soft key will activate DTF measurement. However, distance resolution, cable or waveguide type has not been optimized. DTF measurement is valid for D2 ≤ D_{max} (as defined by F2 and F1).*
*Where **CAL OFF** is indicated on the Site Master, the **CALIBRATION REQUIRED** menu (below) will appear.*

Performing a Calibration

Step 10. Select **EXIT-START CALIBRATION** and press **ENTER** to accept the changes in the DTF AID table and begin calibration.

Step 11. Use the Up/Down arrow key to scroll to **DUT CONN TYPE=** and press **ENTER**. Use the Up/Down arrow key to scroll to **K MALE** and press **ENTER**.

Step 12. Use the Up/Down arrow key to scroll to **EXIT-START CALIBRATION** and press **ENTER** to begin the calibration. Follow the instructions in the message area and connect the open, short, and load as directed.

DTF Measurement (Determining the Length of the Cable)

Step 13. Disconnect the Load and connect the test port extension cable to the Site Master test port.

Step 14. Connect the Short to the open end of the test port extension cable.

Setting the Display Scale

Step 15. Press the **SCALE** key to call up the Scale Menu. *Optional:* Press the **AUTO SCALE** key to optimize the amplitude scale.

Step 16. In SWR mode, press the **TOP** soft key and enter 4 using the keypad or Up/Down arrow key. (In Return Loss mode, enter 0.) Press **ENTER** to set the top scale value.

Step 17. In SWR mode, press the **BOTTOM** soft key and enter 1 using the keypad or Up/Down arrow key. (In Return Loss mode, enter 5, 4.) Press **ENTER** to set the bottom scale value.

Setting the Marker

Step 18. Press the **MARKER** key to call up the Markers menu.

Step 19. Press the **M1** soft key to select the M1 marker function. (Note: pressing the **ON/OFF** soft key activates or deactivates the M1 marker function.)

Step 20. Press the **MORE** soft key, then the **PEAK** soft key to find the cable length.

Step 21. Press the **MKRS** and **MAIN** soft keys to return to the main menu.

Figures 3-10 and 3-11 show the length of the cable in SWR and Return Loss modes.

NOTE:
Refer to page 3-8 for instructions on saving and recalling setups and displays.

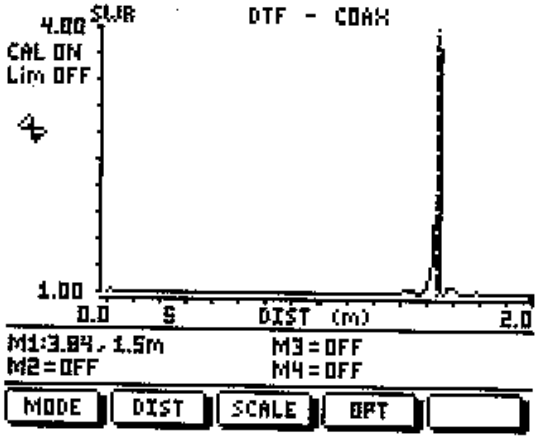


Figure 3-10. DTF-SWR Measurement Results (cable length)

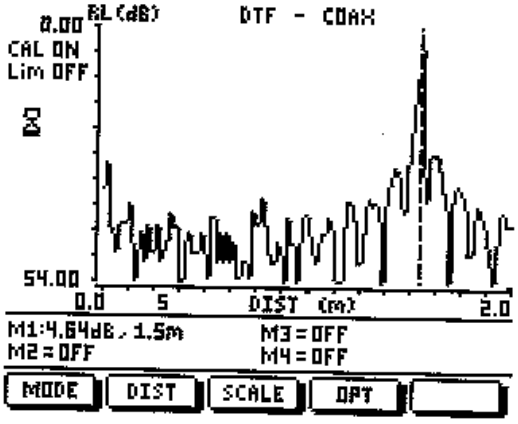


Figure 3-11. DTF-RETURN LOSS Measurement Results (cable length)

DTF Measurement (Determining the quality of the cable)

> *NOTE:*
> *If cable length measurement has not been done, calibration must be done before determining the quality of the cable (steps 1-14).*

Step 22. Disconnect the Short and connect the Load to the test port extension cable.

Setting the Display Scale

Step 23. Press the **SCALE** soft key to call up the Scale Menu. *Optional:* Press the **AUTO SCALE** key to optimize the amplitude scale.

Step 24. In SWR mode, press the **TOP** soft key and enter 1, ., 1 using the keypad or Up/Down arrow key. (In Return Loss mode, enter 0.) Press **ENTER** to set the top scale value.

Step 25. In SWR mode, press the **BOTTOM** soft key and enter 1 using the keypad or Up/Down arrow key. (In Return Loss mode, enter 5, 4.) Press **ENTER** to set the bottom scale value.

Setting the Markers

Step 26. Press the **MARKER** key to call up the Markers menu.

Step 27. Press the **M2** soft key to select the M2 marker function. (Note: pressing the **ON/OFF** soft key activates or deactivates the M2 marker function.)

Step 28. Press the **MORE** soft key and then the **PEAK** soft key to find the worst case Return Loss (or SWR) reading. (See Figures 3-12 and 3-13.)

Step 29. Press the **MKRS** soft key and the MAIN soft key to return to the main menu.

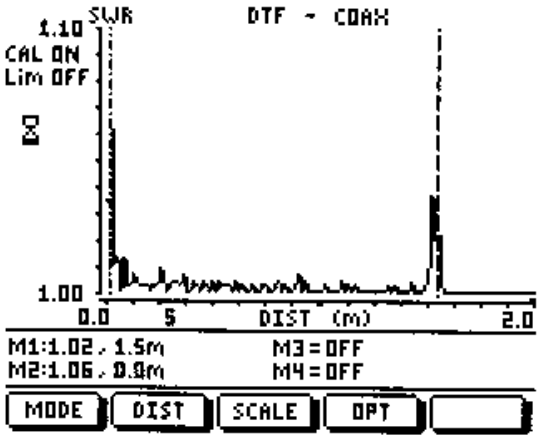


Figure 3-12. DTF-SWR Measurement Results (cable quality)

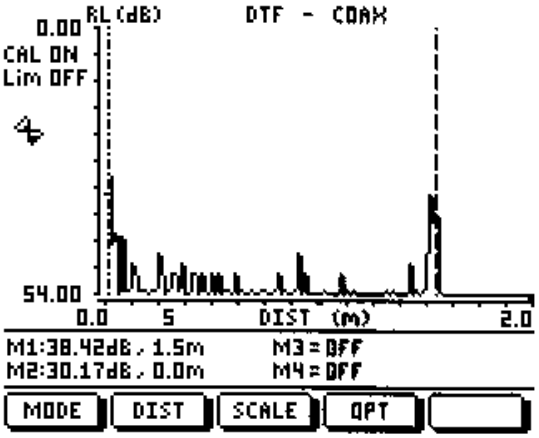


Figure 3-13. DTF-RETURN LOSS Measurement Results (cable quality)

NOTE:
Refer to page 3-8 for instructions on saving and recalling setups and displays.

NOTES:
Changing D1, D2, Cable Type, Waveguide, Cutoff Frequency, Propagation Velocity, and Loss within the valid range will not invalidate the calibration. However; changing CF and/or D2 beyond its maximum calibrated range or changing media type will require a new calibration.

*Press the **B5** soft key from the Option Sub-Menu to toggle between feet and meters. Values entered in either will freely convert to the other.*

Loss and relative propagation velocity values for many common cable types and cutoff frequency and mid-band loss for many common waveguide types are listed in the tables in Appendix A.

Tune Measurement Mode

- Tune mode allows field adjustment of waveguide tunable connectors and other microwave components, such as tunable bandpass filters in the frequency domain measurement mode.
- Tune mode is intended to be used as a quick alignment and evaluation where accuracy is not critical.
- Tune mode can be used in uncalibrated or calibrated mode. In uncalibrated mode, the display shows the relative change between pre-tune and post-tune operation up to 15 dB dynamic range. In calibrated mode, the display shows the relative change and the measured value of the pre-tune and post-tune operation up to 40 dB dynamic range.
- The following functions do not operate in TUNE mode:
  SAVE DISPLAY
  SAVE SETUP
  TRACE MATH.

Procedure

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

Step 2. Use the Up/Down arrow key to scroll to **TUNE - SWR** or **RETURN LOSS**.

Step 3. Press the **ENTER** key to select the SWR or Return Loss measurement mode

Selecting the Frequency Range

The following procedure selects the frequency range for the Tune mode.

Step 4. Press the **FREQ** soft key.

Step 5. Press the **F1** soft key.

Step 6. Enter a user-defined start frequency using the key pad or the Up/Down arrow key.

Step 7. Press **ENTER** to set F1 to the user-defined start frequency.

Step 8. Press the **F2** soft key and enter the user-defined stop frequency.

Step 9. Press **ENTER** to set F2 to the user-defined stop frequency.

NOTE:
Optionally, refer to Calibration procedure on page 3-4 to tune the DUT in calibrated mode.

Step 10. Tune the DUT while observing the relative change on the display.

Making Power Measurements

Power measurement is accomplished using an ANRITSU broadband (10 MHz to 20 GHz) RF detector, P/N 560-7N50B. The power monitor displays the measured power in dBm or Watts.

Entering Power Monitor Mode

Step 1. Press the **MODE** soft key, from the Main Menu (page 2-8)

Step 2. Select POWER MONITOR using the Up/Down Arrow key. Press ENTER when selection is complete.

Zeroing the Power Monitor

Step 3. With no power applied to the DUT, press the **ZERO** soft key from the Power Monitor menu (page 2-10). Wait a few seconds while the **Site Master** accumulates samples of the quiescent power level. When complete, ZERO ADJ: ON is displayed in the message area.

Measuring High Input Power Levels

Step 4. Insert an attenuator between the DUT and the RF detector, sufficient to insure that the input power to the **Site Master** is no greater than 20 dBm.

Step 5. Press the **OFFSET** soft key.

Step 6. Enter the attenuation in dB using the keypad. Press ENTER to complete the entry. The message area will show OFFSET is ON along with the entered value in dB.

Displaying Power in dBm and Watts

Step 7. Press the **UNITS** soft key to display power in Watts.

Displaying Relative Power

Step 8. 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 9. 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.

Chapter 4
Software Tools Program

Description

The **Site Master** Software Tools program provides the means for transferring the measured trace, along with any applied markers and/or a limit, to the screen of an MS-DOS based personal computer (PC) running Windows 95, Windows 98, or Windows NT.

Requirements

The **Site Master** Software Tools program is a standard Windows program and will run on any computer that will run Windows 95/98/NT. Typically, this means having a PC with the following characteristics:

- Pentium™ or better microprocessor (100 MHz or better, recommended)
- Windows 95/98/NT
- 32 MBytes of memory, minimum
- Approximately 15 MBytes of available hard disk space

4

Communication Port Setting

The **Site Master** Software Tools communicates with the **Site Master** through a standard COM port on the PC. It is important that your Windows COM port settings conform to the actual hardware settings.

Since various add-in devices such as sound cards, modems, and network cards use IRQ (Interrupts), it is possible that your computer has non-standard COM port settings. Please consult your computer vendor for COM port address and IRQ information.

Changing COM Port Settings–Windows 95/98/NT

Refer to Figure 4-1 while performing the following procedure.

Step 1. Open the **Windows Control Panel**.

Step 2. Double click on the **SYSTEM** icon. The System Properties window appears.

Step 3. Select **Device Manager**. The Device List appears.

Step 4. Double click on the item **Ports (COM & LPT)** in the device list.

Step 5. Double click on the **Communications Port** you want to set. The Communications Port Properties window appears.

NOTE:
If Windows doesn't show any available COM Ports, consult your computer manufacturer.

Step 6. Choose **Port Settings**, then change to the following settings if necessary.

Baud Rate:	9600
Data Bits:	8
Parity:	None
Stop Bits:	1
Flow Control:	None

Step 7. Choose **Resource** and verify the COM Port Base Address and IRQ. Click **OK** when done.

Step 8. Click **OK** again to close the System Properties window.

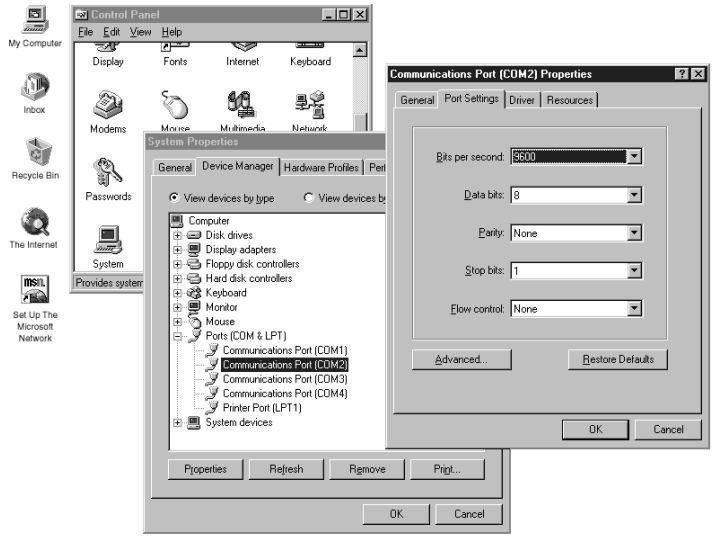


Figure 4-1. Windows 95/98/NT COM Port Setting Dialog Boxes

Note:
If you changed the COM Port Base Address or IRQ, you will need to restart Windows.

Software Installation

The **Site Master** Software Tools program is a conventional Microsoft Windows 95/98/NT program. Installation is similar to all other such programs. For users new to Windows 95/98/NT, a detailed procedure is given below.

Step 1. Insert the ANRITSU **Site Master** Software Tools For Windows CDROM.

Step 2. Select Run from the Start menu.

Step 3. Type **x:\SETUP**, where x = the drive letter of the CDROM drive.

Step 4. Press the **Enter** key to select the default directory and begin the Setup routine.

Step 5. When the Setup program prompts, select "OK" or press the **Enter** key to restart Windows.

NOTE: The Setup routine will create a new Program Manager Group named "Site Master Software Tools." This group will contain three file icons, "Read Me," "Site Master Help," and "Site Master Software Tools."

Step 6. Double-click on the "Read Me" icon to read about recent changes that did not get into this manual and important new features that you should know about.

Step 7. Double-click on the "Site Master Help" icon to acquaint yourself with the comprehensive on-line manual. This manual provides descriptive narrative for the various program features and controls.

Step 8. Double-click on the "Site Master Software Tools " icon to open the Software Tools program.

Step 9. Click on Settings, in the top menu bar, and select COM Port. Enter the appropriate COM port number for the serial interface cable (null modem type).

Plot Capture

Plots (traces) can be captured either singly from the **Site Master** display or in multiples from one or more stored-display locations. Both methods are described below.

The recommended method is the **Capture Plots to Database** In one operation, all data plots residing in the **Site Master** can be downloaded to a database for easy data management. As an alternative, **Capture Plots to Screen** will display all traces in cascade on the PC screen.

NOTE: Trace scale can be captured as per **Site Master** *or as autoscale by the capture program. To select per* **Site Master** *or autoscaling, click on* ***Settings*** *and* ***Default Plot Settings*** *from the top menu bar and pull-down menu.*

Capture multiple traces to a database

Step 1. Connect the supplied cable as shown in Figure 4-2.

Step 2. Open the "**Site Master Software Tools**" program.

Step 3. Click on **Capture**, in the top menu bar, and select **Capture Plots To Database** from the drop-down menu.

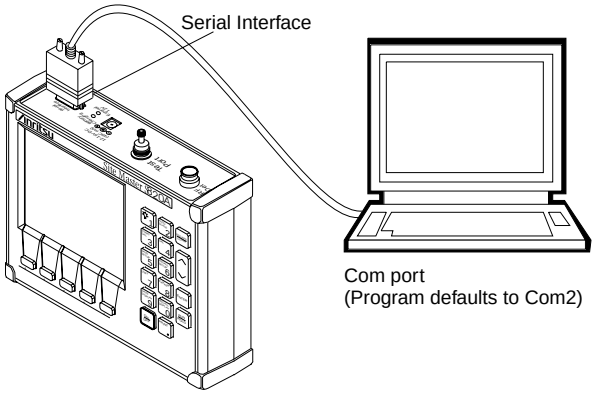


Figure 4-2. Equipment Setup for Site Master Tools Operation

Step 4. Follow the database instructions to download the plot(s) to either a new database or an existing database.

Step 5. Enter the number(s) of the stored-display memory location(s) (1 to 70) from which you wish to store to the database, and click “OK.”

Step 6. Observe that the “Acquiring Control” box appears on the screen, then disappears as traces are automatically acquired. The “Database” box appears when the plot(s) has been completely captured into the database.

Capture single or multiple traces to PC screen

Step 1. Perform steps 1, 2, and 3 of the capture-multiple-to-database procedure.

Step 2. Click on **Start Plot Capture** icon or click on **Capture**, in the top menu bar, and select **Capture Plots to Screen** from the drop-down menu.

Step 3. Enter the number (or numbers) of the stored-display memory location(s) (1 to 70) from which you wish to display traces in **Site Master Software Tools**.

Step 4. Select "OK."

Step 5. Observe that the "Acquiring Control" box appears on the screen, then disappears as the traces are automatically acquired.

Program Operation

The captured trace on the PC can be scaled and have its limit line, markers, and properties changed. (Click on the **Plot Properties** icon, or select **Plot Properties** under the **View** menu to make these changes.) The operation of the various menus that allow these operations to be accomplished is straightforward. To read about the operation of the menus, refer to the on-line help screens, accessed from the **Help** menu in the top menu bar.

Fault Location Software

A captured RL or SWR trace can be transformed to a Distance to Fault display. This is useful for determining the location of faults, connections, and other discontinuities within the cable.

To transform a plot, select **Distance to Fault** from the **Tools** menu (or click on the **Distance to Fault** icon in the toolbar). A drop down menu will appear that asks you if the DUT is coaxial cable or waveguide.

If coaxial cable is selected, it asks you to supply start and stop distances along with the cable type or propagation velocity and insertion loss values.

If waveguide, it asks you to supply start and stop distances along with waveguide type or cutoff frequency and insertion loss values. Tables in Appendix A provide these values for some of the more popular coaxial cables (@ 6 GHz) and waveguides.

If values are needed at a different frequency, or if you need the exact values for more accurate measurement, please contact the coaxial cable or waveguide manufacturer. Coaxial cables may be added to the list be editing the `cables.lst` file; waveguides may be added to the list by editing the `wvguides.lst` file. Follow the existing format to enter the data to the list. Loss is entered in dB/m only.

The distance may be entered in feet or meters. Propagation velocity is used for coaxial cable. The units may be changed by selecting **Default Plot Settings** under the **Settings** menu and changing "Measurement Units."

After supplying the needed information and clicking OK, a new plot will open showing coax/waveguide match vs. distance.

Smith Chart Software

After obtaining a frequency SWR or RL plot on the computer display, click the Smith Chart icon. Read the Help file to see how this feature functions (under Smith Chart and Data Readout).

Saving a Plot as a Windows Metafile or as a Spreadsheet File

Plots can be saved as Windows metafile (.wmf) or as a text file (.txt). The metafile may be imported into graphic programs and a text file can be imported into a spreadsheet program, but they cannot be reloaded into the Site Master Software Tools program.

To save a plot as a Windows Metafile, click on **File**, in the top menu bar, and select **Save as Metafile** from the drop down menu.

To save a plot as a text file to use in a spreadsheet, click on **File** in the top menu bar and select **Export to text file for Spreadsheet** from the drop down menu.

Pasting a Plot in Graphic or Spreadsheet Format

The data points from a plot can be exported to a graphic application or a spreadsheet via the clipboard. To transfer data to the Windows clipboard:

Step 1. Select **Settings** and **Clipboard Format** from the top menu bar and pull-down menu and choose either Graphical format or tabular format.

Step 2. Capture or load the desired plot.

Step 3. Copy the data to the clipboard by selecting the **Copy Plot Data** icon or **Copy** from the Edit menu.

Step 4. To paste to a graphic application, open the application and select **Paste** from the application's **Edit** menu.

Step 5. To paste to a spreadsheet, open the spreadsheet program and place the cursor where the first data point should appear.

Step 6. Select **Paste** from the spreadsheet program's **Edit** menu.

Saving Data to a Data Base

Plots can be saved to a database. Comments can be added to the plot data saved. Queries of the data base provide a means of comparing plots in the data base. Refer to the on-line help screens for operating instructions.

To save a plot to a database, click on **File**, in the top menu bar, and select **Save Plot to Database** from the drop-down menu.

Drag-n-Drop

Site Master Software Tools is Windows based. Graphs can "Drag-n-Drop" onto each other. Site Master **Software Tools** allows quick comparison of "before" and "after" Distance-To-Fault measurements. Recent data is compared to a historical PC database record, which is usually recorded during site installation/commissioning.

Each cable/antenna tends to have a unique Distance-To-Fault (DTF) "Signature" because differing cable electrical lengths, cable types, dielectric thickness variations, and the positions of components (connectors, adapters, and lightning arresters) will cause different reflections at differing positions in the transmission line. Variations in the "signature" between maintenance intervals offer a good indication of damage or damage causing conditions.

Printing

Captured traces may be printed from a PC using **Site Master** Software Tools. Once a captured trace has been downloaded choose **Print** under the **File** menu for printing options. The printer setup can be altered, plots can be scaled, and multiple plots can be printed from the Print dialog box.

Appendix A
Reference Data

Description

The following pages contain tables of waveguide and coaxial cable reference data that are necessary for proper operation of the **Site Master**. The data tables are organized as follows:

Table A-1. Universal Waveguide Calibration Component Part Numbers

⅛ Offset Short	⅜ Offset Short	Precision Load	Flange Type
23UM40	24UM40	26UM40	UnivM-229
23UM48	24UM48	26UM48	UnivM-187
23UM58	24UM58	26UM58	UnivM-159
23UM70	24UM70	26UM70	UnivM-137
23UM84	24UM84	26UM84	UnivM-112
23UM100	24UM100	26UM100	UnivM-90
23UM120	24UM120	26UM120	UnivM-75
23UM140	24UM140	26UM140	UnivM-62
23UM220	24UM220	26UM220	UnivM-42
23UA229	24UA229	26UA229	UnivUS-229
23UA187	24UA187	26UA187	UnivUS-187
23UA159	24UA159	26UA159	UnivUS-159
23UA137	24UA137	26UA137	UnivUS-137
23UA112	24UA112	26UA112	UnivUS-112
23UA90	24UA90	26UA90	UnivUS-90
23UA75	24UA75	26UA75	UnivUS-75
23UA62	24UA62	26UA62	UnivUS-62
23UA42	24UA42	26UA42	UnivUS-42
23CMR229	24CMR229	26CMR229	CMR229
23CMR187	24CMR187	26CMR187	CMR187
23CMR159	24CMR159	26CMR159	CMR159
23CMR137	24CMR137	26CMR137	CMR137
23CMR112	24CMR112	26CMR112	CMR112
23CMR90	24CMR90	26CMR90	CMR90
23UER40	24UER40	26UER40	UER40
23UER48	24UER48	26UER48	UER48
23UER58	24UER58	26UER58	UER58
23UER70	24UER70	26UER70	UER70
23UER84	24UER84	26UER84	UER84
23UER100	24UER100	26UER100	UER100

Table A-2. Coaxial to Universal Waveguide Adapters (1 of 2)

Coaxial Adapter P/N	Start Frequency (GHz)	Stop Frequency (GHz)	Flange Type	Coaxial Connector	Waveguide Type
35UM40N	3.300	4.900	UnivM-229	Nm	WR229 WG11A
35UM48N	3.950	5.850	UnivM-187	Nm	WR187 WG12
35UM58N	4.900	7.050	UnivM-159	Nm	WR159 WG13
35UM70N	5.850	8.200	UnivM-137	Nm	WR137 WG14
35UM84N	7.050	10.000	UnivM-112	Nm	WR112 WG15
35UM100N	8.200	12.400	UnivM-90	Nm	WR90 WG16
35UM120N	10.000	15.000	UnivM-75	Nm	WR75 WG17
35UM140N	12.400	18.000	UnivM-62	Nm	WR62 WG18
35UM220K	17.000	26.500	UnivM-42	Km	WR42 WG20
35UA229N	3.300	4.900	UnivUS-229	Nm	WR229 WG11A
35UA187N	3.950	5.850	UnivUS-187	Nm	WR187 WG12
35UA159N	4.900	7.050	UnivUS-159	Nm	WR159 WG13
35UA137N	5.850	8.200	UnivUS-137	Nm	WR137 WG14
35UA112N	7.050	10.000	UnivUS-112	Nm	WR112 WG15
35UA90N	8.200	12.400	UnivUS-90	Nm	WR90 WG16
35UA75N	10.000	15.000	UnivUS-75	Nm	WR75 WG17
35UA62N	12.400	18.000	UnivUS-62	Nm	WR62 WG18
35UA42K	17.000	26.500	UnivUS-42	Km	WR42 WG20
35CMR229N	3.300	4.900	CMR229	Nm	WR229 WG11A
35CMR187N	3.950	5.850	CMR187	Nm	WR187 WG12
35CMR159N	4.900	7.050	CMR159	Nm	WR159 WG13

Table A-2. Coaxial to Universal Waveguide Adapters (2 of 2)

Coaxial Adapter P/N	Start Frequency (GHz)	Stop Frequency (GHz)	Flange Type	Coaxial Connector	Waveguide Type
35CMR137N	5.850	8.200	CMR137	Nm	WR137 WG14
35CMR112N	7.050	10.000	CMR112	Nm	WR112 WG15
35CMR90N	8.200	12.400	CMR90	Nm	WR90 WG16
35UER40N	3.300	4.900	UER40	Nm	WR229 WG11A
35UER48N	3.950	5.850	UER48	Nm	WR187 WG12
35UER58N	4.900	7.050	UER58	Nm	WR159 WG13
35UER70N	5.850	8.200	UER70	Nm	WR137 WG14
35UER84N	7.050	10.000	UER84	Nm	WR112 WG15
35UER100N	8.200	12.400	UER100	Nm	WR90 WG16

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

Calibration Component P/N	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
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

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

Calibration Component P/N	Start Frequency (GHz)	Stop Frequency (GHz)	Waveguide Type	Flange Type	Compatible Flanges
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
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

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

Calibration Component P/N	Start Frequency (GHz)	Stop Frequency (GHz)	Waveguide Type	Flange Type	Compatible Flanges
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)
24UM40	4.021	36,419 ±.14
24UM48	4.807	30,979 ±.11
24UM58	5.878	24,664 ±.09
24UM70	6.926	20,710 ±.08
24UM84	8.396	17,040 ±.05
24UM100	10.084	14,675 ±.05
24UM120	12.247	11,978 ±.04
24UM140	14.940	9,742 ±.04
24UM220	21.225	7,067 ±.03
24UA229	4.021	36,419 ±.14
24UA187	4.807	30,979 ±.11
24UA159	5.878	24,664 ±.09
24UA137	6.926	20,710 ±.08
24UA112	8.396	17,040 ±.05
24UA90	10.084	14,675 ±.05
24UA75	12.247	11,978 ±.04
24UA62	14.940	9,742 ±.04
24UA42	21.225	7,067 ±.03
24CMR229	4.021	36,419 ±.14
24CMR187	4.807	30,979 ±.11
24CMR159	5.878	24,664 ±.09
24CMR137	6.926	20,710 ±.08
24CMR112	8.396	17,040 ±.05
24CMR90	10.084	14,675 ±.05
24UER40	4.021	36,419 ±.14
24UER48	4.807	30,979 ±.11
24UER58	5.878	24,664 ±.09
24 UER70	6.926	20,710 ±.08
24UER84	8.396	17,040 ±.05
24UER100	10.084	14,675 ±.05

À Offset Shorts are ⅜ wave at the geometric mean frequency of the waveguide band; dimensionally accurate to <0.5 degree at the maximum operating frequency of the corresponding waveguide.

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

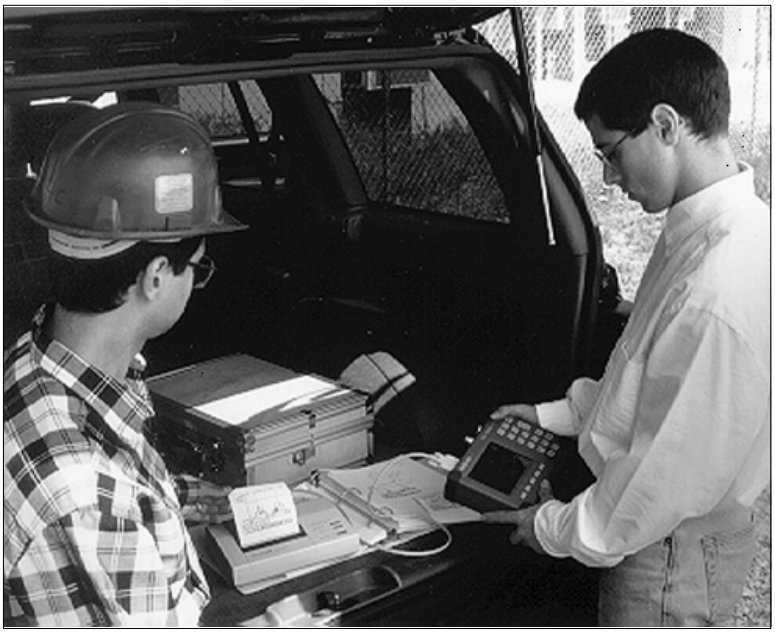
Waveguide Type/Model	Start Frequency (GHz)	Stop Frequency (GHz)	Cutoff Frequency (GHz)	Mid-Band Loss (dB/ft, GHz)
WR229 WG11A	3.300	4.900	2.577	0.0114
WR187 WG12	3.950	5.850	3.156	0.0157
WR159 WG13	4.900	7.050	3.705	0.0180
WR137 WG14	5.850	8.200	4.285	0.0225
WR112 WG15	7.050	10.000	5.260	0.0312
WR102	7.000	11.000	5.786	0.0330
WR90 WG16	8.200	12.400	6.560	0.0481
WR75 WG17	10.000	15.000	7.869	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	5.100	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	0.086

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
EH46	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/100 ft @ 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



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