Anritsu

Site Master™

Transmission Line and Antenna Analyzer

5 MHz - 20 GHz

Improve Quality and Reduce Maintenance Expense
With Frequency Domain Reflectometry and Spectrum Analysis

Linking the World

PREVENTIVE MAINTENANCE SAVES MAINTENANCE EXPENSE

Anritsu's Site Master cable and antenna analyzer performs return loss/SWR and fault identification in Cellular, PCS/DCS, paging, WLAN/WPBX and other communication system applications. Designed to withstand the rigors of field use, Site Master provides easy-to-use, accurate, repeatable performance in lightweight, battery-operated units covering the 5 MHz to 20 GHz range.

Used widely in installation, deployment and periodic maintenance of cellular communication sites, Site Master is the preferred choice of many network operators.

Easy-to-Use

Site Master's menu driven interface requires little training and simplifies the field engineers and technicians task of site-to-site deployment and maintenance by identifying, recording and solving problems without sacrificing measurement accuracy. Users are able to store ten test setups and up to 200 measurement traces in nonvolatile memory. A notebook computer can be used with the RS-232 interface for automated control and data collection in the field.

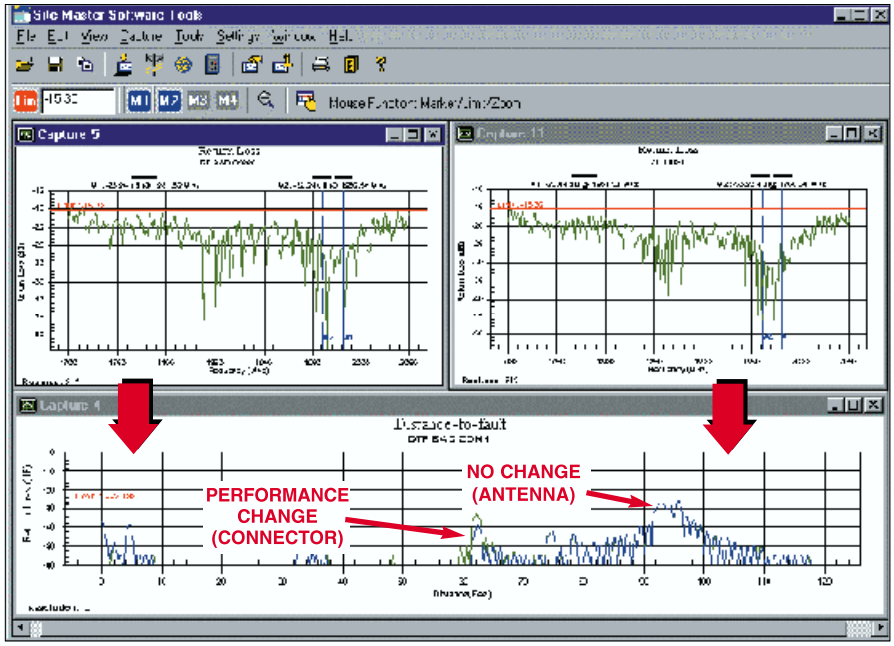
Reporting software for PC use is Windows 95/98, NT workstation compatible and supports long alpha-numeric file names for descriptive data labeling. The software can store an unlimited number of data traces for comparison to historical performance. Data traces can be easily and quickly downloaded from the Site Master to a PC database with a single menu selection or a printer via an RS-232 serial cable for analysis.

Accurate, Repeatable Measurements

Utilizing vector error correction, Site Master delivers accurate, reliable and repeatable return loss/SWR and fault location measurements. Site Master's high immunity to interference allows users to conduct measurements of an active site without the loss of accuracy.

Rugged and Reliable

Designed specifically for field environments, Site Master withstands harsh environments and rough handling. Built-in energy conservation combined with a rechargeable battery pack allows users to extend battery life beyond an eight hour work day. Site Master can also be operated from a 12.5 Vdc source such as an AC-DC adapter or automotive cigarette lighter adapter, which also simultaneously charges the battery.



Site Master Software Tools provides a data base to compare maintenance interval performance to site commissioning data. The Distance-To-Fault display pinpoints problem areas before they degenerate into failures. In the graph above, a loosened connector changes the return loss characteristic from 38 dB to 33 dB (< 0.05 SWR increase). It meets SWR specifications, but is indicative of a probable loose weather seal which will eventually allow water intrusion.

AND IMPROVES QUALITY.

Cost Savings and Quality Improvement

Wireless market competition requires operators to reduce per site maintenance expense. Site Master's Frequency Domain Reflectometry (FDR) techniques break away from the traditional fix-after-failure maintenance process by finding small, hard to identify problems before major failures occur.

Site Master's approach to preventive maintenance pays for itself quickly. A poorly installed weather seal will corrode connectors and, if undetected, will eventually damage expensive coaxial cable. Only Site Master has the sensitivity to identify the connector problem before the cable is damaged. Distance-To-Fault provides the clearest indication of trouble areas (screen display on page 2).

Where antenna system performance remains stable, Site Master's excellent repeatability shows a nearly identical Distance-To-Fault (DTF) display. Climbing to the antenna becomes unnecessary; Site Master verifies antenna characteristics from ground level.

FDR Technique

Frequency Domain Reflectometry, (FDR), and Time Domain Reflectometry, (TDR), have similar acronyms, and both techniques are used to test transmission lines.

But, that's where the similarities end. TDRs are not sensitive to RF problems: the stimulus is a DC pulse, not RF. Thus, TDRs are primarily used after antenna system failures – *a Fix-After-Failure* maintenance philosophy.

The *Failure Prevention* approach inherent to FDR techniques saves the expense of trouble shooting time and cable replacement. FDR techniques enhance quality because the system isn't allowed to degrade into a failure. Deficient connectors, lightning arrestors, cables, jumpers, or antennas are replaced before call quality is compromised.

TDRs are unable to evaluate antenna quality. Since FDR technique uses an RF sweep, antennas are tested at their correct operating frequency. Site Master sweeps the antenna accurately with Distance-To-Fault, by compensating for the RF insertion losses in the cable. Thus, tower climbing is rarely necessary.

Site Master's sweep signal can pass through quarter-wave lightning arrestors – providing an accurate display of the subsequent transmission line's characteristics. DC pulses from a TDR can't "see" beyond band limiting devices such as filters, quarter-wave lightning arrestors, or duplexers.

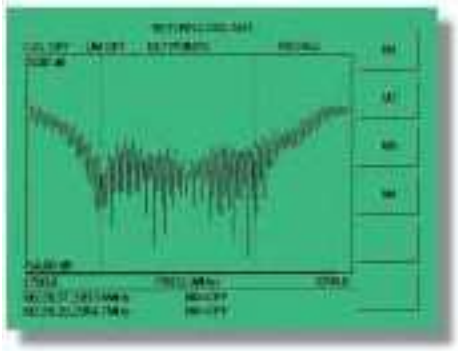
Weather degrades antenna systems. Regular maintenance using Frequency Domain Reflectometry dramatically improves harsh weather survival.

LABORATORY PERFORMANCE IN A HANDHELD RF ANALYZER

Return Loss and SWR

Site Master's RF sweep display plots either SWR or Return Loss versus frequency. This display is used to ensure conformance to engineering specifications. Measurement easily toggles between SWR or return loss using the standard conversion formula.

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



The quality of calibration components can be spot checked on-site by comparing two precision loads in this frequency domain display. (Handy if someone drops a component accidentally). After calibrating with the open, short and the 42 dB precision load, connect another precision load. The return loss (SWR) trace should be better than 42 dB (1.016).

RF Wattmeter Power Monitor

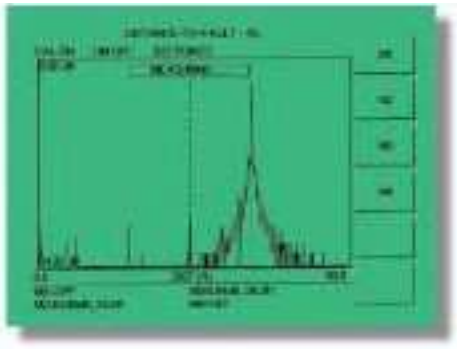
The optional RF Wattmeter features precision, high return loss (low SWR) detectors. This excellent impedance match drastically reduces the largest component of power measurement error, mismatch uncertainty. Display formats include absolute power (dBm or Watts) and relative power (dBr or %). Built-in Auto-Averaging automatically reduces the effects of noise. Zeroing control allows optimum measurement accuracy at low power levels.

Single detector range exceeds –50 to +20 dBm. The standard detector frequency range of 5 to 3,000 MHz can be extended to 20 GHz.

Distance-To-Fault

The Distance-To-Fault system is built into all the Site Master Models as a standard feature. Return loss (SWR) measurement data is processed with a specialized Fast Fourier Transform. The resulting data indicates return loss (SWR) versus distance.

The algorithm mathematics are identical to the "time domain" software in vector network analyzers. However, the operational controls and menus are simplified specifically for transmission line and antenna tests. A single softkey selection on the main menu activates the DTF mode.

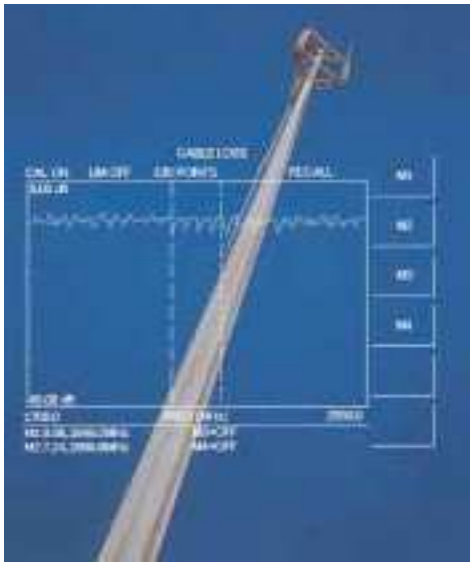


Distance-To-Fault pinpoints the location and reflection amplitude of transmission line components.

Cable Loss

The insertion loss performance of installed cables can be verified without access to the opposite end. This single ended measurement requires only that the opposite end of the cable be open or short circuited.

Cable loss can be checked without disconnecting the antenna or climbing the tower. The out of band characteristic of most antennas is approximately an open circuit. Simply calibrate Site Master below the antenna's frequency range and connect to the transmission line input. The cable loss measurement is valid for comparison measurements when tests are made at the same input connection. If the antenna or other line component is disconnected, always duplicate these disconnections to ensure comparable results.



Verify cable insertion loss from ground level.

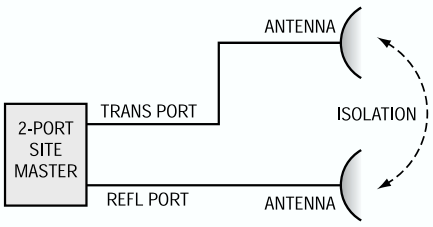
>90 dB DYNAMIC RANGE IN A TWO-PORT RF ANALYZER

New, higher performance antenna systems obsolete traditional installation and maintenance procedures. Performance enhancing design trends such as high sector-to-sector isolation, tower mounted amplifiers and duplexed antennas add new complexities to installation test.

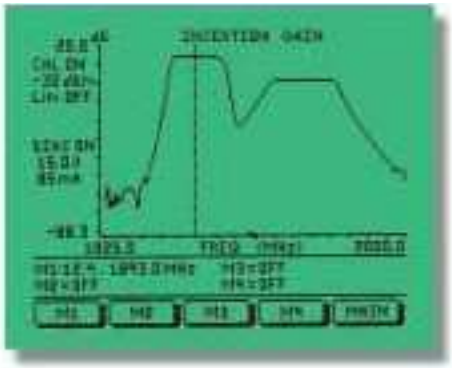
Two-port Site Master models simplify performance verification techniques. The S200 series includes a second test port for isolation, gain and insertion loss measurements.

Isolation

Improving isolation between antenna sectors can reduce cell-to-cell RF interference and improve system capacity. Site Master's high dynamic range ensures that antenna isolation is accurately measured - including the extremely high, >90 dB, isolation ranges required at RF-RF repeater sites. High interference immunity reduces the effects of ambient RF signals.



Accurately measure antenna isolation with Site Master's high dynamic range.



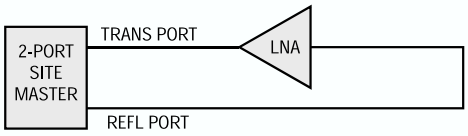
Measuring antenna isolation during periodic maintenance intervals conveniently verifies antenna position after harsh weather. If the antenna has been moved from the installed mounting angle, the change in side lobe and back lobe coupling magnitudes between the antennas causes a clear performance change.

Tx-Rx isolation of duplexers and filters is easily tested with Site Master's >90 dB dynamic range. Filters are easily aligned and verified to manufacturer's specifications.

Site Master automatically applies averaging when measuring low signal levels such as during Tx-Rx isolation tests or during antenna isolation path calibration, which can include 60 to 80 dB of insertion loss between sectorized antennas.

Gain

The S251A/S251B, with output power selectable at +6 dBm or –30 dBm and optional built-in Bias Tee, provides two-port insertion gain measurement of Tower Mounted Amplifiers (TMA) without the need of an external supply through the PDU (Power Distribution Unit) and an external attenuator. Thus, simplifying the technicians task of amplifier verification.

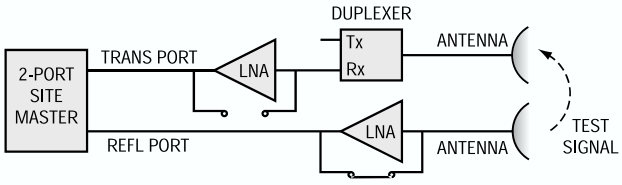


Amplifier Gain Test Measurement.

Most TMAs omit Tx-to-Rx bypass switching due to Tx-Rx isolation requirements.

TMA, consists of duplexers and LNAs (low noise amplifiers), improves receive side signal strength and reduces the number of antennas. The duplexer separates Tx and Rx signals from a single antenna feed and minimizes unwanted interference into the LNA. The LNA boosts signal-to-noise ratio by adding gain to reduce system noise figure. Performance improvement is maximized when the LNA is physically close to the antenna. Thus, mounting is usually at the top of the tower.

The system is easily tested during installation - when someone is at the top of the tower to interchange cable connections. Once the weather seals are in place, test signals must be coupled into the antenna. Site Master is designed to perform both installation and maintenance tests from ground level.



Site Master's high dynamic range enables LNA measurements at ground level.

Site Masters' industry leading high RF interference immunity allows test signal injection between antennas with a minimum of interference induced distortion.

EXTEND FREQUENCY MEASUREMENT WITH MICROWAVE SITE MASTER

Accurate and Repeatable

The Site Master S800 series, is the most accurate and convenient tool available for field installation, verification, troubleshooting and repair of microwave systems. Difficult test specifications are easy to verify. The S800 series improves quality and reduces maintenance expenses by providing vector corrected calibration and a convenient user interface. These new microwave Site Master models test waveguide and coaxial cables more conveniently than laboratory-sized scalar analyzers or microwave test sets.

Vector Error Correction

Vector error correction within the S800 series improves the quality and convenience of measurements compared to traditional scalar techniques. Accuracy and repeatability account for errors such as test port match and source match errors. Vector correction allows the test port to achieve the highest commercial directivity to 50 dB (frequency range dependent) using relatively small calibration components.

Waveguide Calibration

The test port interface to the waveguide under test is a small coaxial-to-waveguide adapter rather than a bulky precision coupler.

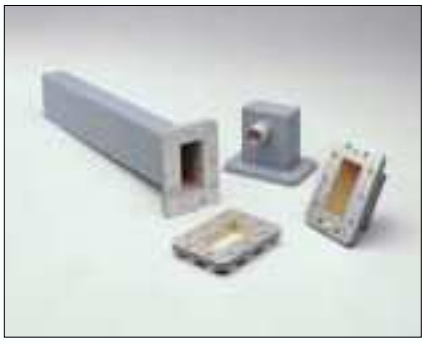
The calibration components include two offset shorts, 1/8 and 3/8 wavelength, and a precision load. The two offset shorts eliminates the reference error suffered by scalar systems when only a single waveguide short is used to determine the 0.0 dB reflection reference level.

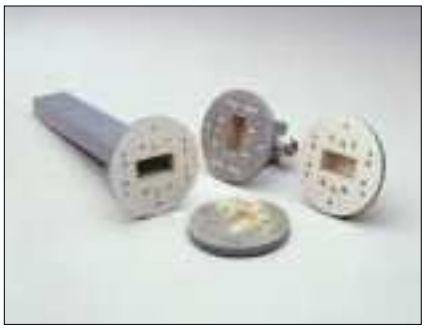
Site Master's innovative flange design mates to square, rectangular or circular flanges. For a given waveguide size, only one calibration set is required.

Site Master's waveguide calibration components are built with precision alignment pins which mate to the companion coaxial to waveguide adapters. Proper alignment of waveguide is fast and convenient.

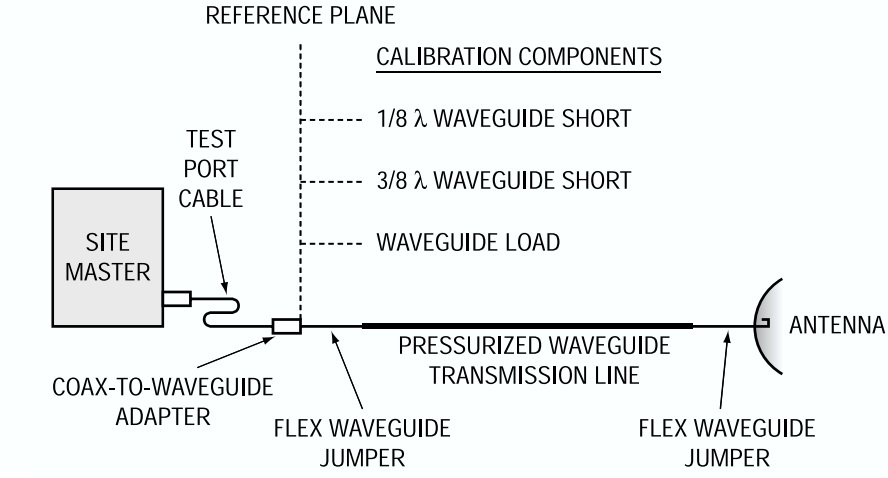
Waveguide Dispersion

Vector error correction also improves the quality of Distance-To-Fault data. Not only is the reflection magnitude more accurate, but also the waveguide dispersion correction for fault distance (different frequencies propagate at different speeds) is more accurate and repeatable. The post-vector corrected data accounts for the non-dispersive length of coaxial cable preceding the input of the waveguide under test. Scalar based systems suffer reflection magnitude errors (a failure looks better than actual) and length inaccuracies in proportion to the relative lengths of the coaxial input cable and waveguide under test.





Calibration components mate directly to a variety of commercial and standard military flanges - eliminating the necessity of bulky, precision waveguide couplers. A few examples of waveguide adapters are 35UA187N, 35UM40N, and 35UM58.



Vector Correction Avoids Bulky Waveguide Coupler

SITE MASTER WITH SPECTRUM ANALYSIS CAPABILITY

Site Master Models S114B, and S332B add spectrum analysis capability to the standard cable and antenna analyzer.

Now technicians and field engineers can identify and solve RF system problems like coverage, interference, antenna alignment, in-band interference from unwanted sources, and other path related signal problems.

Signal Mapping

Ideal for site surveys and other signal mapping applications, the Site Master Models S114B, and S332B can optimize placement of antennas and access points in a WLAN or WPBX network. Identification of potential in-band interference as well as transmitted signal quality can be easily performed as the installer moves about the installation site.

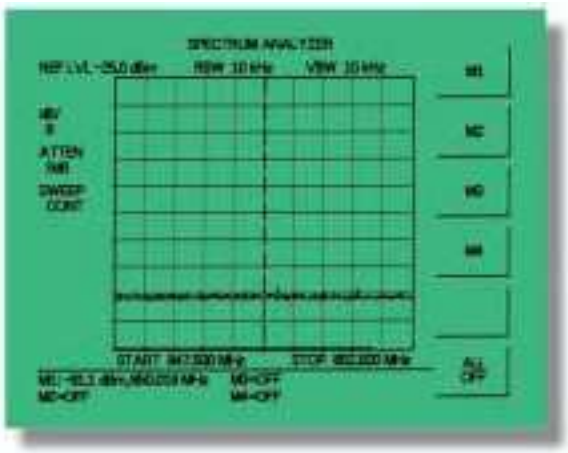
Field and Maintenance

Ideal for field maintenance, the Site Master S114B, S332B simplifies the task of going site-to-site identifying, recording and solving problems. Moreover, these tasks can be completed in a fraction of the time required to haul bench-top or “portable” equipment to the field.

Precision calibration, synthesizer-based design and built-in measurement functions allow for easy verification of system compliance. User-frequency menu functions, high sensitivity, and excellent repeatability pinpoint the smallest RF signal levels. Harmonics, Occupied Bandwidth, and potential interference can be measured before small problems grow into big, costly, time-consuming headaches and unwanted site down time.

RF Interference

Identifying the RF Interference problems can be very difficult. Site Master’s low noise floor (greater than –90 dBm) make small signals easily detectable.



NEVER BEFORE HAS ONE ANALYZER SOLVED SO MANY ANTENNA SYSTEM PROBLEMS

Anritsu Site Master Models	S113B	S114B	S251A	S251B	S331A	S331B	S332B	S400A	S810A	S818A	S820A
Frequency Range (MHz)	5-1200	5-1200	625-2500	625-2500	25-3300	25-3300	25-3300	25-4000	3.3-10.5 GHz	3.3-18 GHz	3.3-20 GHz
Frequency Accuracy	75	75	75	75	75	75	75	75	75	75	75
Resolution kHz	10	10	100	10	100	100	100	100	1 MHz	1 MHz	1 MHz
Markers	4	4	4	4	4	4	4	4	4	4	4
Display Point (Max.)	517	517	130	517	130	517	517	130	130	130	130
Sweep Rate ms/point	40	40	25	40	40	40	40	40	70	70	70
Interference Immunity	+10	+10	+10 Trans. +30 dBc	+10 Trans. +30 dBc	–15	–5	–5	–15	–10	–10	–10
Calibration: Instrument Configurations	10	10	4	10	9	10	10	9	6	6	6
Data Storage Reporting:											
Alpha Numeric	Yes	Yes		Yes	Yes	Yes					
Time/Date Stamp	Yes	Yes		Yes	Yes	Yes					
Numeric	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Memory Locations (Max.)	200	200	50	200	40	200	200	40	70	70	70
Measurement Characteristics	*	*	*	*	*	*	*	*	*	*	*
Gain/Insertion (Transmission)			625-2500	625-2500							
Spectrum Analysis		0.1-1200					0.1-3000				

*All Anritsu Site Master models include Return Loss, SWR, Cable Loss, and Distance-To-Fault.

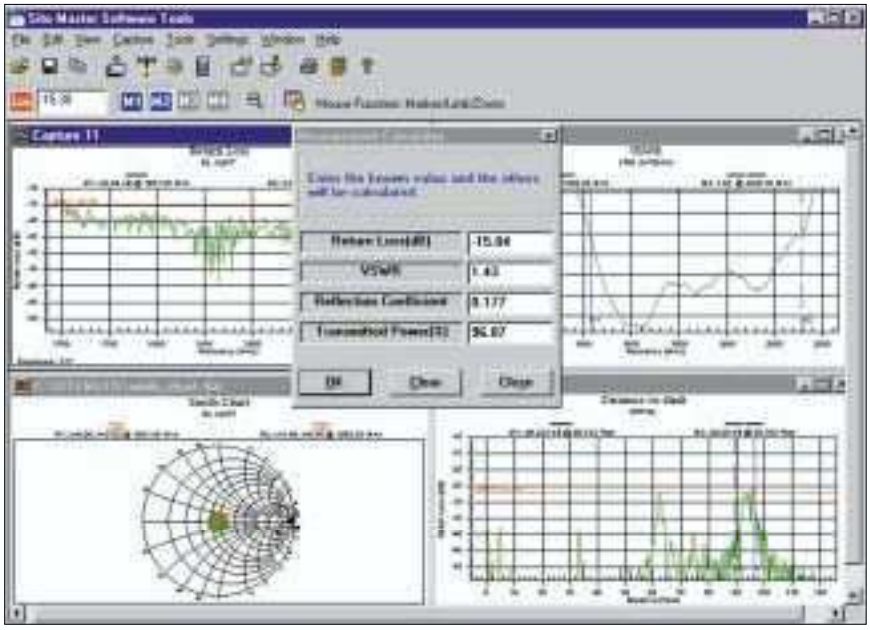
Site Master Applications	S113B	S114B	S251A	S251B	S331A	S331B	S332B	S400A	S810A	S818A	S820A
HF Comms	•	•									
Broadcast	•	•			•	•	•	•			
Paging	•	•	•	•	•	•	•	•			
Wireless Local Loop	•	•	•	•	•	•	•	•	•	•	•
SMR/ESMR	•	•	•	•	•	•	•	•			
Cellular	•	•	•	•	•	•	•	•			
GPS			•	•	•	•	•	•			
GSM 1800 GSM/PCS 1900			•	•	•	•	•	•			
ISM	•	•	•	•	•	•	•	•	•	•	•
WLAN/NII/Hyperlan					•	•	•	•	•	•	•
Avionics	•	•	•	•	•	•	•	•	•	•	•
µWave Pt-Pt									•	•	•

POWERFUL CONTROL AND ANALYSIS SOFTWARE

PC Software Tools

Site Master Software Tools is a Windows® program for cable and antenna analysis and will run on any computer with Windows 95, 98 or NT. Test data can be analyzed and compared to historical performance. Up to 200 Site Master trace memory locations can be down loaded with a single menu selection.

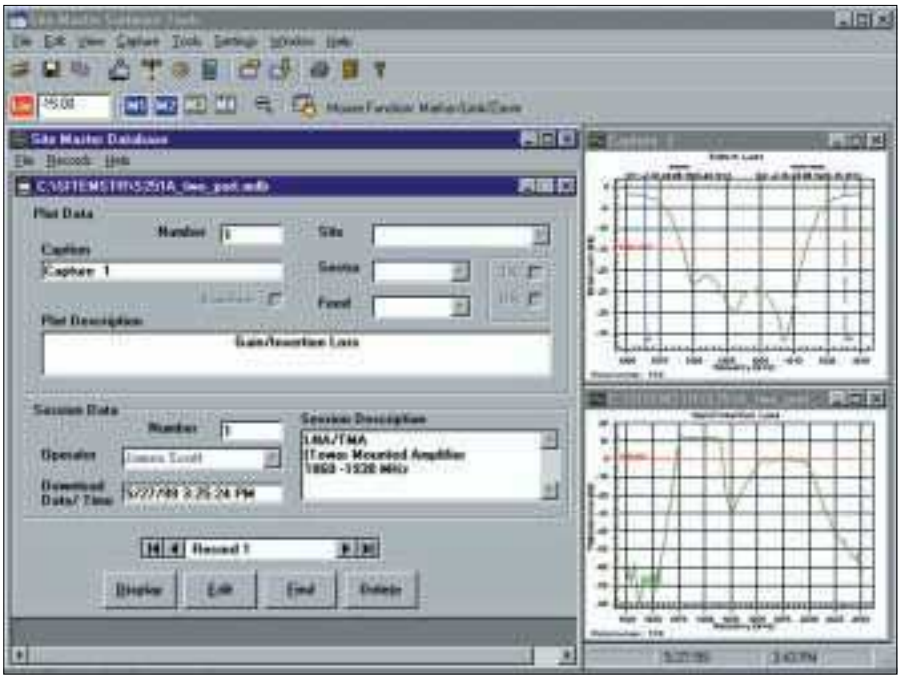
Return Loss data can be converted to Distance-To-Fault (DTF) and S_{11} information. DTF can be displayed as return loss versus distance, VSWR versus distance or milliRho versus distance. This allows problem connectors, adapter interfaces or cable and waveguide damage to be identified easily. S_{11} vector magnitude and phase data is displayed on a Smith Chart, allowing components to be impedance matched or optimum system performance.



Analysis displays include MilliRho (mρ) reflection coefficient data format or S_{11} Smith Chart. The on-screen measurement calculator now also includes Transmitted power percentage. Print outs support multiple plots per page.

The use of historical data reduces maintenance costs. During the site commissioning process, the antenna system's return loss (SWR), Gain/Insertion Loss and Distance-To-Fault "Signature" characteristics are down-loaded into the Site Master Software Tools database. Maintenance technicians recall the "Signature" characteristics during periodic maintenance verification. The Windows based "drag-n-drop" capability speeds fault identification.

Site Master data traces are transferred to an automated PC database with a single menu selection.



Create new database files or add to an existing database. Site Master Software Tools quickly stores antenna system test data to a single relational database file.

SPECIFICATIONS

Note: All specifications apply when calibrated at ambient temperature after a five minute warm up.

Return Loss
Range: 0.00 to 54.00 dB
Resolution: 0.01 dB

SWR
Range: 1.00 to 65.00
Resolution: 0.01

Distance-To-Fault
Vertical Range:
Return Loss: 0.00 to 54.00 dB
SWR : 1.00 to 65.00
Horizontal Range:
Range: 0 to (# of data pts. x Resolution) to a maximum of 1000 m (3281 ft.), # of data pts. = 129, 256, 516
Horizontal Resolution, Rectangular Windowing:
For Coax,
Resolution (meter) =
$1.5 \times 10^8 (v_p / \Delta \text{ Frequency})$
Where: v_p is the cable's relative propagation velocity.
Δ Frequency is the stop frequency minus the start frequency (in Hz).

For Waveguide,
Resolution (meter) =

$$\frac{1.5 \times 10^8 \left(\sqrt{1-(F_C / F_1)^2}\right)}{\Delta \text{ Frequency}}$$

Where: F_C is the waveguide's cutoff frequency (in Hz).
F_1 is the start frequency (in Hz).
Δ Frequency is the stop frequency minus the star frequency (in Hz).

Gain/Insertion Loss
Range: –120 to +100 dB
Resolution: 0.1 dB

Wattmeter (RF Power Monitor) Option
Display Range: –80.0 to +80.0 dBm
10.0 pW to 100.0 kW
Detector Range –50.0 to +20.0 dBm
10.0 µW to 100.0 mW
Offset Range: 0.0 to +60.0 dB
Resolution: 0.1 dB
0.1 x W

Transmission Line Loss (one-port)
Range: 0.00 to 20.00 dB
Resolution: 0.01 dB

Test Port Connector
Precision N female

Maximum Input Without Damage
N(f) Test Ports: +20 dBm, 50 Ω, +50 Vdc
RF Power Detector: +20 dBm, 50 Ω, +50 Vdc

SPECTRUM ANALYZER

Frequency

Frequency Range: 100 kHz to 1.2 GHz, S114B
100 kHz to 3.0 GHz, S332B

Frequency Reference: Aging: ±1 ppm/yr.
Accuracy: ±2 ppm

Frequency Span: 0 Hz (zero span)
100 kHz to 1.2 GHz, S114B
100 kHz to 3.0 GHz, S332B

Sweep Time: 0.5 sec.

Resolution Bandwidth (–3dB width): 10 kHz, 30 kHz, 100 kHz, 1 MHz

Video Bandwidth (Range –3dB):
3 kHz, 10 kHz, 30 kHz and 300 kHz

SSB Phase Noise
(1 GHz) @ 30 kHz Offset: ≤74 dBc/Hz

Spurious Responses
Input Related: ≤–45 dBc

Spurious
Residual Responses: ≤–80 dBm

Amplitude

Measurement Range: –90 dBm to +20 dBm

Dynamic Range: ≥60 dB

Maximum
Safe Input Level: +20 dBm max. measurement safe input
+27 dBm max. input (damage)
+27 dBm Peak Pulse Power
+50 Vdc

Displayed Average:
Noise Level: ≤–90 dBm (400 kHz span)

Display Range: 2 to 15 dB/div. In 1 dB steps.
Ten divisions displayed.

RF Input VSWR: 2.0:1
Amplitude Accuracy: ±1.5 dB
Total Level Accuracy: ±2 dB

GENERAL

RS-232: 9 pin D-sub, three wire serial

Electromagnetic Compatibility:
Meets European Community Requirements for CE marking.

Temperature:
Operating: –0°C to 50°C
Storage: –20°C to 75°C
Operation at temperatures to –10.0°C is normal. However, please note that the LCD display will fade at low temperature extremes.

Weight:
Site Master A Series, 1.36 kgs. (3.0 lbs.) nominal
Site Master B Series, 1.81 kgs. (4.0 lbs.) nominal

Size :
A Series: 20.3 x 17.8 x 5.72 cm (8 x 7 x 2.25 in.)
B Series: 25.4 x 17.8 x 6.10 cm (10 x 7 x 2.4 in.)

MEASUREMENT ACCURACY

Return Loss and SWR

Accuracy: < ± 0.9 dB, < ± 0.03 SWR typical worst case. Assumes measurement of a 22 dB return loss device with precision calibration components after 5 minute warm up. Accuracy improves when measuring devices with poorer return loss.

Directivity:
Precision 7/16 Components: ≥45 dB

N Components:
SM/PL, SM/PNFL, 4.0 GHz: ≥42dB
28N50A, 18.0 GHz: ≥40 dB

Precision Waveguide Load:
≥45 dB (frequency range dependent)

(Directivity is the largest source of return loss measurement uncertainty.)

Panel connections include a 9 pin D-sub RS-232, precision test port connector, DC power input, and an optional RF detector connection for the Wattmeter operation.

The protective softcase is designed to hold calibration components. Velcro adjustments on the shoulder strap allow convenient, one hand operation.

Typical Worst Case Accuracy Calculation (dB)
Accuracy = $\pm [0.04 + 20 \log (1+10^{-E\Delta/20})]$
where $E\Delta$ = Directivity - Measured Return Loss

The quality of the precision load used for calibration determines traceable directivity performance. Precision loads can be verified using a vector network analyzer calibrated with either sliding load or TRL.

Cable Loss Accuracy

Accuracy: <±1.0 dB typical, after calibration for insertion losses of <4.0 dB. Assumes cable return loss >26 dB.

Accuracy is improved using ripple averaging. Set the frequency sweep such that 5 to 6 ripple cycles are visible. Calibrate the Site Master and place markers at an adjacent peak and valley. Sum the marker values and divide by two. For cable loss greater than 4.0 dB, see formula in technical notes.

Repeatability: <± 0.05 dB, typical

Cable Loss is determined by measuring one end of the cable and disconnecting the opposite end from any antennas or other devices. This open circuit condition return loss is measured and divided by two. This test is excellent for trouble shooting or verifying previously installed cables. For best results comparing measurements to historic data, always disconnect the opposite cable end at the same position and avoid simultaneous tests of multiple cable or connector types.

Distance-To-Fault Accuracy:

The Fast Fourier Transform which calculates the DTF display provides an exact indication of electrical length. This relates to physical length through knowledge of the cable's propagation velocity, v_p:

$d = (c * n * v_p) / (2 * \Delta f)$

Distance is displayed according to the accuracy of v_p. In the equation above, c is the speed of light, n the number of ripples in the frequency domain display and Δf is frequency sweep range. Cable manufactures specify the v_p of cables. When this specification is not available, the v_p value is easily determined by measuring a known length of cable.

Non-phase stable cables will cause small measurement errors because bending of the cable changes the physical length of the cable's center conductor and outer ground shield. The Open, Short and Load components used during calibration create a phase "reference plane" from which Site Master bases the vector error correction formulas. The physical length of the cable is allowed to change as it flexes, the phase relationship of the calibrated reference plane position and the actual cable end position also changes - creating errors.

UNIVERSAL WAVEGUIDE COMPONENT ACCESSORIES

Precision Waveguide Calibration Components

Part Number	Description	Freq Range	Waveguide Type	Compatible Flanges
xxUM40	1/8, 3/8 λ Offset Short and Load, Metric	3.30 to 4.90 GHz	WR229, WG11A	PDR40
xxUM48	1/8, 3/8 λ Offset Short and Load, Metric	3.95 to 5.85 GHz	WR187, WG12	CAR48, PAR48, UAR48, PDR48
xxUM58	1/8, 3/8 λ Offset Short and Load, Metric	4.90 to 7.05 GHz	WR159, WG13	CAR58, PAR58, UAR58, PDR58
xxUM70	1/8, 3/8 λ Offset Short and Load, Metric	5.85 to 8.20 GHz	WR137, WG14	CAR70, PAR70, UAR 70, PDR70
xxUM84	1/8, 3/8 λ Offset Short and Load, Metric	7.05 to 10.00 GHz	WR112, WG15	CBR84, UBR84, PBR84, PDR84
xxUM100	1/8, 3/8 λ Offset Short and Load, Metric	8.20 to 12.40 GHz	WR90, WG16	CBR100, UBR100, PBR100, PDR100
xxUM120	1/8, 3/8 λ Offset Short and Load, Metric	10.00 to 15.00 GHz	WR75, WG17	CBR120, UBR120, PBR120, PDR120
xxUM140	1/8, 3/8 λ Offset Short and Load, Metric	12.40 to 18.00 GHz	WR62, WG18	CBR140, UBR140, PBR140, PDR140
xxUM220	1/8, 3/8 λ Offset Short and Load, Metric	17.00 to 26.50 GHz	WR42, WG20	CBR220, UBR220, PBR220, PDR220
xxUA229	1/8, 3/8 λ Offset Short and Load, US	3.30 to 4.90 GHz	WR229, WG11A	CPR229F, CPR229G, UG-1350/U, UG-1351/U, UG-1726/U, UG-1727/U
xxUA187	1/8, 3/8 λ Offset Short and Load, US	3.95 to 5.85 GHz	WR187, WG12	CPR187F, CPR187G, UG-1352/U, UG-1353/U, UG-1728/U, UG-1729/U, UG-148/U, UG-149A/U
xxUA159	1/8, 3/8 λ Offset Short and Load, US	4.90 to 7.05 GHz	WR159, WG13	CPR159F, CPR159G, UG-1354/U, UG-1355/U, UG-1730/U, UG-1731/U
xxUA137	1/8, 3/8 λ Offset Short and Load, US	5.85 to 8.20 GHz	WR137, WG14	CPR137F, CPR137G, UG-1356/U, UG-1357/U, UG-1732/U, UG-1733/U, UG-343B/U, UG-344/U, UG-440B/U, UG-441/U
xxUA112	1/8, 3/8 λ Offset Short and Load, US	7.05 to 10.00 GHz	WR112, WG15	CPR112F, CPR112G, UG-1358/U, UG-1359/U, UG-1734/U, UG-1735/U, UG-52B/U, UG-51/U, UG-137B/U, UG-138/U
xxUA90	1/8, 3/8 λ Offset Short and Load, US”	8.20 to 12.40 GHz	WR90, WG16	CPR90F, CPR90G, UG-1360/U, UG-1361/U, UG-1736/U, UG-1737/U, UG-40B/U, UG-39/U, UG-135/U, UG-136B/U
xxUA75	1/8, 3/8 λ Offset Short and Load, US	10.00 to 15.00 GHz	WR75, WG17	WR75
xxUA62	1/8, 3/8 λ Offset Short and Load, US	12.40 to 18.00 GHz	WR62, WG18	UG-541A/U, UG-419/U, UG-1665/U, UG1666/U
xxUA42	1/8, 3/8 λ Offset Short and Load, US	17.00 to 26.50 GHz	WR42, WG20	UG-596A/U, UG-595/U, UG-597/U, UG-598A/U
xxCMR229	1/8, 3/8 λ Offset Short and Load, CMR	3.30 to 4.90 GHz	WR229, WG11A	CMR229
xxCMR187	1/8, 3/8 λ Offset Short and Load, CMR	3.95 to 5.85 GHz	WR187, WG12	CMR187, UG1475/U, UG1480/U
xxCMR159	1/8, 3/8 λ Offset Short and Load, CMR	4.90 to 7.05 GHz	WR159, WG13	CMR159
xxCMR137	1/8, 3/8 λ Offset Short and Load, CMR	5.85 to 8.20 GHz	WR137, WG14	CMR137, UG1476/U, UG1481/U
xxCMR112	1/8, 3/8 λ Offset Short and Load, CMR	7.05 to 10.00 GHz	WR112, WG15	CMR112, UG1477/U, UG1482/U
xxCMR90	1/8, 3/8 λ Offset Short and Load, CMR	8.2 to 12.4 GHz	WR90, WG16	CMR90, UG1478/U, UG1483/U
xxUER40	1/8, 3/8 λ Short and Load, UER	3.30 to 4.90 GHz	WR229, WG11A	UER40
xxUER48	1/8, 3/8 λ Short and Load, UER	3.95 to 5.85 GHz	WR187, WG12	UER48
xxUER58	1/8, 3/8 λ Short and Load, UER	4.90 to 7.05 GHz	WR159, WG13	UER58
xxUER70	1/8, 3/8 λ Short and Load, UER	5.85 to 8.20 GHz	WR137, WG14	UER70
xxUER84	1/8, 3/8 λ Short and Load, UER	7.05 to 10.00 GHz	WR112, WG15	UER84
xxUER100	1/8, 3/8 λ Short and Load, UER	8.2 to 12.4 GHz	WR90, WG16	UER100

Note: Part Number Ordering Information Prefix (xx) - 23 for 1/8 λ Offset Short
- 24 for 3/8 λ Offset Short
- 26 for Precision Waveguide Load

Precision Waveguide-to-Coaxial Adapters

35UM40N	Coaxial Adapter, N(m), Metric	3.30 to 4.90 GHz	WR229, WG11A	PDR40
35UM48N	Coaxial Adapter, N(m), Metric	3.95 to 5.85 GHz	WR187, WG12	CAR48, PAR48, UAR48, PDR48
35UM58N	Coaxial Adapter, N(m), Metric	4.90 to 7.05 GHz	WR159, WG13	CAR58, PAR58, UAR58, PDR58
35UM70N	Coaxial Adapter, N(m), Metric	5.85 to 8.20 GHz	WR137, WG14	CAR70, PAR70, UAR 70, PDR70
35UM84N	Coaxial Adapter, N(m), Metric	7.05 to 10.00 GHz	WR112, WG15	CBR84, UBR84, PBR84, PDR84
35UM100N	Coaxial Adapter, N(m), Metric	8.20 to 12.40 GHz	WR90, WG16	CBR100, UBR100, PBR100, PDR100
35UM120N	Coaxial Adapter, N(m), Metric	10.00 to 15.00 GHz	WR75, WG17	CBR120, UBR120, PBR120, PDR120
35UM140N	Coaxial Adapter, N(m), Metric	12.40 to 18.00 GHz	WR62, WG18	CBR140, UBR140, PBR140, PDR140
35UM220K	Coaxial Adapter, K(m), Metric	17.00 to 26.50 GHz	WR42, WG20	CBR220, UBR220, PBR220, PDR220
35UA229N	Coaxial Adapter, N(m), US	3.30 to 4.90 GHz	WR229, WG11A	CPR229F, CPR229G, UG-1350/U, UG-1351/U, UG-1726/U, UG-1727/U
35UA187N	Coaxial Adapter, N(m),US	3.95 to 5.85 GHz	WR187, WG12	CPR187F, CPR187G, UG-1352/U, UG-1353/U, UG-1728/U, UG-1729/U, UG-148/U, UG-149A/U
35UA159N	Coaxial Adapter, N(m), US	4.90 to 7.05 GHz	WR159, WG13	CPR159F, CPR159G, UG-1354/U, UG-1355/U, UG-1730/U, UG-1731/U
35UA137N	Coaxial Adapter, N(m), US	5.85 to 8.20 GHz	WR137, WG14	CPR137F, CPR137G, UG-1356/U, UG-1357/U, UG-1732/U, UG-1733/U, UG-343B/U, UG-344/U, UG-440B/U, UG-441/U
35UA112N	Coaxial Adapter, N(m),US	7.05 to 10.00 GHz	WR112, WG15	CPR112F, CPR112G, UG-1358/U, UG-1359/U, UG-1734/U, UG-1735/U, UG-52B/U, UG-51/U, UG-137B/U, UG-138/U
35UA90N	Coaxial Adapter, N(m),US	8.20 to 12.40 GHz	WR90, WG16	CPR90F, CPR90G, UG-1360/U, UG-1361/U, UG-1736/U, UG-1737/U, UG-40B/U, UG-39/U, UG-135/U, UG-136B/U
35UA75N	Coaxial Adapter, N(m), US	10.00 to 15.00 GHz	WR75, WG17	WR75
35UA62N	Coaxial Adapter, N(m), US	12.40 to 18.00 GHz	WR62, WG18	UG-541A/U, UG-419/U, UG-1665/U, UG1666/U
35UA42K	Coaxial Adapter, K(m), US	17.00 to 26.50 GHz	WR42, WG20	UG-596A/U, UG-595/U, UG-597/U, UG-598A/U
35CMR229N	Coaxial Adapter, N(m), CMR	3.30 to 4.90 GHz	WR229, WG11A	CMR229
35CMR187N	Coaxial Adapter, N(m), CMR	3.95 to 5.85 GHz	WR187, WG12	CMR187, UG1475/U, UG1480/U
35CMR159N	Coaxial Adapter, N(m), CMR	4.90 to 7.05 GHz	WR159, WG13	CMR159
35CMR137N	Coaxial Adapter, N(m), CMR	5.85 to 8.20 GHz	WR137, WG14	CMR137, UG1476/U, UG1481/U
35CMR112N	Coaxial Adapter, N(m), CMR	7.05 to 10.00 GHz	WR112, WG15	CMR112, UG1477/U, UG1482/U
35CMR90N	Coaxial Adapter, N(m), CMR	8.2 to 12.4 GHz	WR90, WG16	CMR90, UG1478/U, UG1483/U
35UER40N	Coaxial Adapter, N(m), UER	3.30 to 4.90 GHz	WR229, WG11A	UER40
35UER48N	Coaxial Adapter, N(m), UER	3.95 to 5.85 GHz	WR187, WG12	UER48
35UER58N	Coaxial Adapter, N(m), UER	4.90 to 7.05 GHz	WR159, WG13	UER58
35UER70N	Coaxial Adapter, N(m), UER	5.85 to 8.20 GHz	WR137, WG14	UER70
35UER84N	Coaxial Adapter, N(m), UER	7.05 to 10.00 GHz	WR112, WG15	UER84
35UER100N	Coaxial Adapter, N(m) UER	8.2 to 12.4 GHz	WR90, WG16	UER100

ORDERING INFORMATION

Model S113B	(5 MHz to 1200 MHz), Built in DTF
Model S114B	(5 MHz to 1200 MHz), Built in DTF, Spectrum Analysis
Model S251A	(625 MHz to 2500 MHz), Built in DTF
Model S251B	(625 MHz to 2500 MHz), Built in DTF
Model S331A	(25 MHz to 3300 MHz), Built in DTF
Model S331B	(25 MHz to 3300 MHz), Built in DTF
Model S332B	(25 MHz to 3300 MHz), Built in DTF, Spectrum Analysis
Model S400A	(25 MHz to 4000 MHz), Built in DTF
Model S810A	(3.3 GHz to 10.5 GHz), Built in DTF
Model S818A	(3.3 GHz to 18.0 GHz), Built in DTF
Model S820A	(3.3 GHz to 20.0 GHz), Built in DTF

Standard Accessories Includes

User's Guide
Soft Carrying Case
AC-DC Adapter
Automotive Cigarette Lighter/12 Volt DC Adapter
One Year Warranty
CD ROM containing Fault Location (DTF),
Smith Chart and Software Management Tools
Serial Interface Cable
Rechargeable Battery, NiMH (S113B, S114B, S251B, S331B and S332B Only)

Optional Accessories

Option 5	RF Watt Meter Power Monitor (RF Detector not included)
5400-71N50	RF Detector, N(m), 50 Ohm, 1 to 3000 MHz
42N50A-30	Attenuator, 30 dB, 50 Watt, Bi-directional, DC to 18 GHz, N(m) to N(f)
560-7N50B	RF Detector, N(m), 50 Ohm, 10 MHz to 20 GHz
560-7K50	RF Detector, K(m), 50 Ohm, 10 MHz to 40 GHz
560-7VA50	RF Detector, V(m), 50 Ohm, 10 MHz to 50 GHz
IN50C	5W Limiter, N(m)-N(f), 18 GHz
22N50	Precision N(m) Short/Open, 18 GHz
22NF50	Precision N(f) Short/Open, 18 GHz
22K50	Precision K(m) Short/Open, 40 GHz
22KF50	Precision K(f) Short/Open, 40 GHz
28K50	Precision Termination, DC to 40 GHz, 50 Ohm, K(m)
28KF50	Precision Termination, DC to 40 GHz, 50 Ohm, K(f)
42N50-20	5W Attenuator, N(m) to N(f), 18 GHz
SM/STS	Standard N(m) Short, 3.5 GHz
SM/PL	Precision N(m) Load, 42 dB, 4.0 GHz
SM/PLNF	Precision N(f) Load, 42 dB, 4.0 GHz
28N50-2	Precision N(m) Load, 40 dB, 18 GHz
28NF50-2	Precision N(f) Load, 40 dB, 18 GHz
2000-767	Precision Open/Short/Load, 7/16 (m), 3.5 GHz
2000-768	Precision Open/Short/Load, 7/16 (f), 3.5 GHz
15NN50-1.5A	Test Port Cable Armored, 1.5 meter, N(m) to N(m), 3.5 GHz
15NN50-3.0A	Test Port Cable Armored, 3.0 meter, N(m) to N(m), 3.5 GHz
15NN50-5.0A	Test Port Cable Armored, 5.0 meter, N(m) to N(m), 3.5 GHz
15NNF50-1.5A	Test Port Cable Armored, 1.5 meter, N(m) to N(f), 3.5 GHz
15NNF50-3.0A	Test Port Cable Armored, 3.0 meter, N(m) to N(f), 3.5 GHz
15NNF50-5.0A	Test Port Cable Armored, 5.0 meter, N(m) to N(f), 3.5 GHz
15ND50-1.5A	Test Port Cable Armored, 1.5 meter, N(m) to 7/16 DIN(m), 3.5 GHz
15NDF50-1.5A	Test Port Cable Armored, 1.5 meter, N(m) to 7/16 DIN(f), 3.5 GHz
15NNF50-1.5B	Test Port Cable Armored, 1.5 meter, N(m) to N(f), 20 GHz
15NNF50-1.5C	Test Port Cable Armored, 1.5 meter, N(m) to N(f), 6 GHz
15NNF50-3.0C	Test Port Cable Armored, 3.0 meter, N(m) to N(f), 6 GHz
15NNF50-3.0C	Test Port Cable Armored, 3.0 meter, N(m) to N(f), 6 GHz
15NNF50-5.0C	Test Port Cable Armored, 5.0 meter, N(m) to N(f), 6 GHz
15KKF50-1.5B	Test Port Cable Armored, 1.5 meter, K(m) to K(f), 20 GHz
510-96	Adapter 7/16 DIN (m) to 7/16 DIN (m), 3.5 GHz
800-109	Detector Extender Cable, 7.6 m (25 ft.)
800-110	Detector Extender Cable,15.2 m (50 ft.)
800-111	Detector Extender Cable, 30.5 m (100 ft.)
800-112	Detector Extender Cable, 61 m (200 ft.)
1091-26	Adapter, DC to 18 GHz, 50 Ohm, N(m) to SMA(m)
1091-27	Adapter, DC to 18 GHz, 50 Ohm, N(m) to SMA(f)
1091-80	Adapter N(f) to SMA(m), 18 GHz
1091-81	Adapter N(f) to SMA(f), 18 GHz
1091-172	Adapter, DC to 1.3 GHz, 50 Ohm, N(m) to BNC(f)
34NN50A	Precision N(m) to N(m) Adapter, 18 GHz
34NFNF50	Precision N(f) to N(f) Adapter, 18 GHz
34RKNF50	Precision Ruggedized K(m) to N(f) Adapter, 20 GHz
34RSN50	Precision Ruggedized WSMA(m) to N(m) Adapter, 20 GHz
K220B	Precision K(m)-K(m) Adapter, 40 GHz
K222B	Precision K(f)-K(f) Adapter, 40 GHz
510-90	Adapter 7/16(f) to N(m), 3.5 GHz
510-91	Adapter 7/16(f) to N(f), 3.5 GHz
510-92	Adapter 7/16(m) to N(m), 3.5 GHz
510-93	Adapter 7/16(m) to N(f), 3.5 GHz
510-97	Adapter 7/16 DIN(f) to 7/16 DIN (f), 3.5 GHz
D41955	Spare Soft Carrying Case
48258	Spare Soft Carrying Case for S113B, S114B, S321B, and S332B
40-115	Spare AC/DC Adapter
806-62	Spare Automotive Cigarette Lighter/12 Volts DC adapter
800-441	Spare Serial Interface Cable
760-215A	Transit Cases for Anritsu Site Master
760-213	Transit Case for S800 Series Site Master
2300-347	Anritsu Site Master Software Tools
10580-00029	Anritsu Site Master S113B, S331B Maintenance Manual
10580-00044	Anritsu Site Master S114B, S332B Maintenance Manual
10580-00035	Anritsu Site Master S113B, S114B, S331B, S332B Programming Manual
10580-00020	Anritsu Site Master S251A User's Guide
10580-00028	Anritsu Site Master S113B, S114B, S331B, S332B User's Guide
10580-00019	Anritsu Site Master S235A Maintenance Manual
10580-00017	Anritsu Site Master S330A, S331A User's Guide
10580-00016	Anritsu Site Master S235A User's Guide
10580-00032	Anritsu Site Master S251B User's Guide
10580-00033	Anritsu Site Master S251B Maintenance Manual
10580-00043	Anritsu Site Master S251B Programming Manual
10580-00014	Anritsu Site Master S810A, S818A User's Guide
10580-00030	Anritsu Site Master S820A User's Guide
10580-00031	Anritsu Site Master S820A Maintenance Manual
10580-00008	Anritsu Site Master Maintenance Manual, one port
633-27	Rechargeable Battery, NiMH (B Series only)
2000-1029	Battery Charger, NiMH with Universal Power Supply
2000-1030	Portable Antenna, 50 Ohm, SMA(m), 1.71-1.88 GHz
2000-1031	Portable Antenna, 50 Ohm, SMA (m), 1.85-1.99 GHz
2000-1032	Portable Antenna, 50 Ohm, SMA (m), 2.4-2.5 GHz
2000-1034	Portable Antenna, 50 Ohm, SMA (m), 806-869 MHz
2000-1035	Portable Antenna, 50 Ohm, SMA (m), 902-960 MHz

Printers

2000-766	HP DeskJet Printer Includes: Interface Cable, Black Print Cartridge, and US Power Cable
2000-753	Spare Serial-to-Parallel Converter Cable
2000-661	Black Print Cartridge
2000-662	Rechargeable Battery for DeskJet Printer
2000-663	Power Cable (Europe) for DeskJet Printer
2000-664	Power Cable (Australia) for DeskJet Printer
2000-665	Power Cable (U.K.) for DeskJet Printer
2000-667	Power Cable (So. Africa) for DeskJet Printer
2000-1008	Seiko DPU-414-30B Thermal Printer (120VAC) Includes: Internal Battery, Thermal Printer Paper, Serial Cable, U.S. Power Cable
2000-761	Seiko DPU-414-30B Thermal Printer (220VAC) Includes: Internal Battery, Thermal Printer Paper, Serial Cable, Euro Power Cable
2000-1002	Spare Serial 9 pin (male) to 9 pin (female) cable (for Seiko DPU-414-30B)
2000-755	Five (5) rolls of Thermal Paper

Compatible printers include battery powered Seiko models (pictured) and Deskjet models. A serial (null modem) cable is required for the serial printers. A serial to parallel interface cable is required for the Deskjet parallel printers.

Sales Centers:
United States (800) ANRITSU
Canada (800) ANRITSU
South America 55 (21) 286-9141

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