SITE ANALYZER™

CABLE AND ANTENNA TESTER
FOR WIRELESS SYSTEMS

OPERATING INSTRUCTIONS

FOR MODELS
SA-1700EX, SA-1700EXP
SA-2500EX, SA-6000EX

Electronic Corporation
Cleveland (Solon) Ohio USA

©*Copyright 2006* by Bird Electronic Corporation
Instruction Book Part Number 920-7002A600S Rev. D

Site Analyzer is a trademark of Bird Electronic Corporation
Microsoft® and Windows® are registered trademarks
of the Microsoft Corporation

Remove Power

Observe general safety precautions. Do not open the instrument with the power on.

Safety Earth Ground

An uninterruptible safety earth ground must be supplied from the main power source to the instrument. Grounding one conductor of a two conductor power cable is not sufficient protection. Serious injury or death can occur if this grounding is not properly installed.

Safety Symbols

WARNING
Warning notes call attention to a procedure, which if not correctly performed, could result in personal injury.

CAUTION
Caution notes call attention to a procedure, which if not correctly performed, could result in damage to the instrument.

The caution symbol appears on the equipment indicating there is important information in the instruction manual regarding that particular area

☞ NOTE: Calls attention to supplemental information.

Warning Statements

The following safety warnings appear in the text where there is danger to operating and maintenance personnel, and are repeated here for emphasis.

WARNING
The SA-BATPAK is shipped charged. Be careful when removing the safety cap, 12Vdc @ 2.0 AH/20 hour rate can be present inside the receptacle. Do not touch the inside of the receptacle.
The possibility of an electric shock exists.

WARNING
This equipment should not be connected to an antenna or operated during a storm that has the potential to produce lightning.
The possibility exists for electrical shock.

WARNING
When using the ac adapter, only connect the plug to a properly grounded receptacle. Serious injury or death can occur if grounding is not properly installed.

Caution Statements

The following equipment cautions appear in the text and are repeated here for emphasis.

CAUTION
Harsh or abrasive detergents, and some solvents, can damage the display unit and information on the labels.

CAUTION
Always turn off the SA before connecting or disconnecting a sensor.

CAUTION
When using a Bird 5011 or 5011-EF, do not exceed 2 W average or 125 W peak power for 5 µs.
Doing so will render the sensor inoperative.

CAUTION
+22 dBm max. input
Do not apply RF power to Antenna Test Port. Exceeding the maximum input will damage the Site Analyzer.

CAUTION
Long-term storage of the external battery pack can affect battery performance and reduce battery life. Do not store the external battery pack for long periods of time without proper storage maintenance (refer to External Battery Pack (Optional), Long-term Storage Maintenance, page 135). Failure to comply may result in reduced battery charge and shortened battery life.

Safety Statements

USAGE

ANY USE OF THIS INSTRUMENT IN A MANNER NOT SPECIFIED BY THE MANUFACTURER MAY IMPAIR THE INSTRUMENT'S SAFETY PROTECTION.

USO

EL USO DE ESTE INSTRUMENTO DE MANERA NO ESPECIFICADA POR EL FABRICANTE, PUEDE ANULAR LA PROTECCIÓN DE SEGURIDAD DEL INSTRUMENTO.

BENUTZUNG

WIRD DAS GERÄT AUF ANDERE WEISE VERWENDET ALS VOM HERSTELLER BESCHRIEBEN, KANN DIE GERÄTESICHERHEIT BEEINTRÄCHTIGT WERDEN.

UTILISATION

TOUTE UTILISATION DE CET INSTRUMENT QUI N'EST PAS EXPLICITEMENT PRÉVUE PAR LE FABRICANT PEUT ENDOMMAGER LE DISPOSITIF DE PROTECTION DE L'INSTRUMENT.

IMPIEGO

QUALORA QUESTO STRUMENTO VENISSE UTILIZZATO IN MODO DIVERSO DA COME SPECIFICATO DAL PRODUTTORE LA PROZIONE DI SICUREZZA POTREBBE VENIRNE COMPROMESSA.

SERVICE

SERVICING INSTRUCTIONS ARE FOR USE BY SERVICE - TRAINED PERSONNEL ONLY. TO AVOID DANGEROUS ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING UNLESS QUALIFIED TO DO SO.

SERVICIO

LAS INSTRUCCIONES DE SERVICIO SON PARA USO EXCLUSIVO DEL PERSONAL DE SERVICIO CAPACITADO. PARA EVITAR EL PELIGRO DE DESCARGAS ELÉCTRICAS, NO REALICE NINGÚN SERVICIO A MENOS QUE ESTÉ CAPACITADO PARA HACERIO.

WARTUNG

ANWEISUNGEN FÜR DIE WARTUNG DES GERÄTES GELTEN NUR FÜR GESCHULTES FACHPERSONAL.

ZUR VERMEIDUNG GEFÄHRLICHE, ELEKTRISCHE SCHOCKS, SIND WARTUNGSARBEITEN AUSSCHLIEßLICH VON QUALIFIZIERTEM SERVICEPERSONAL DURCHZUFÜHREN.

ENTRENTIEN

L'EMPLOI DES INSTRUCTIONS D'ENTRETIEN DOIT ÊTRE RÉSERVÉ AU PERSONNEL FORMÉ AUX OPÉRATIONS D'ENTRETIEN. POUR PRÉVENIR UN CHOC ÉLECTRIQUE DANGEREUX, NE PAS EFFECTUER D'ENTRETIEN SI L'ON N'A PAS ÉTÉ QUALIFIÉ POUR CE FAIRE.

ASSISTENZA TECNICA

LE ISTRUZIONI RELATIVE ALL'ASSISTENZA SONO PREVISTE ESCLUSIVAMENTE PER IL PERSONALE OPPORTUNAMENTE ADDESTRATO. PER EVITARE PERICOLOSE SCOSSE ELETTRICHE NON EFFETTUARRE ALCUNA RIPARAZIONE A MENO CHE QUALIFICATI A FARLA.

Changes to This Manual

We have made every effort to ensure this manual is accurate. If you discover any errors, or if you have suggestions for improving this manual, please send your comments to our Solon, Ohio factory. This manual may be periodically updated. When inquiring about updates to this manual refer to the part number and revision on the title page.

Reference Card

The Reference Card contains minimum operational steps and the order they should be performed. Use this manual for reference or if further explanation of any step is required.

Chapter Layout

Introduction — Describes the features of the Bird Site Analyzer and provides power-up instructions.

Calibration — Lists the steps to calibrate the Site Analyzer, which must be done before using Measure Match or Fault Location modes.

Measure Match Mode — Lists the steps to make match measurements, as well as providing instructions for all functions available in Measure Match mode.

Fault Location Mode — Lists the steps to make distance to fault measurements, as well as providing instructions for all functions available in Fault Location mode.

Save and Recall — Describes how to save and recall traces and setups in Measure Match or Fault Location modes.

Measure Power Mode — Lists the steps to make power measurements, as well as providing instructions for all functions available in Measure Power mode.

Utilities — Describes utilities to set up the Site Analyzer.

Computer Software — Provides installation instructions and lists the features of the Bird Site Analyzer PC Software.

Maintenance — Lists routine maintenance tasks for the Site Analyzer, as well as troubleshooting for common problems. Specifications and parts information are also included.

Step By Step Guide — Identifies buttons and connectors on the Site Analyzer, and explains the display. Also provides step by step instructions for making the most common measurements.

Table of Contents

Chapter 1 Introduction

The Bird Site Analyzer is a multifunction test instrument for use in installation and maintenance of wireless systems. Utilizing a universal hardware and firmware concept, the same unit can be configured into five model types that include both existing and new Bird Technology site analyzer models. The current product designation adds the letters EX after the model number.

- SA1700EX (25 MHz - 1700 MHz, no power measurement capability)
- SA-1700EXP (25 MHz - 1700 MHz, with power measurement capability)
- SA-2500EX (780 MHz - 2500 MHz, with power measurement capability)
- SA-6000EX (25 MHz - 6000 MHz, with power measurement capability)

Antenna systems are tested by using a Site Analyzer to measure match conditions. Data points measured across a user-specified frequency band or distance range are graphed on a 238 pixel display area. Transmitter systems are tested by using a Site Analyzer and a Bird power sensor to measure RF power. Data is displayed as power or match efficiency, depending upon the sensor.

Items Supplied

1. Site Analyzer (configured to one of the model types described earlier)
2. Soft-Sided Carrying Case
3. PCTool Software
4. AC Power Adapter
5. Automobile Cigarette Lighter Adapter
6. 9-Pin Serial Communications Cable

7. Instruction Manual (Not Shown)
8. Reference Card (Not Shown)

Items Not Supplied

- Calibration Combination (Cal Combo)

Site Analyzer Features

General

- Easy to operate and field ready for first-time, occasional, and experienced users.
- Step by step guide shows how to make some of the most common immurements.
- High-resolution color display.
- Field replaceable Li-ion battery.

- Automatic power down conserves battery life.
- Operates in temperatures as low as 14°F (–10°C).

Antenna Test

- Rejects on-channel interfering signals to +13 dBm.
- Three user-selectable trace capture options, 238 data points per sweep, 475 data points per sweep, 949 data points per sweep.
- Three graphic display formats, envelope, maximum, minimum.
- Sweep measurement progress bar - indicates status of measurement being taken.
- Stores up to 15 setups.
- Adjustable pass/fail limit with visual indicator.
- Stores up to 500 sets of measurement data (traces) at the default setting of 238 data points to facilitate conversion between Measure Match (Sweep) and Fault Location (DTF).
- Measurement data can be transferred to the Anritsu Site Master Software Tools.
- On-screen comparison between current measurement trace and stored data traces – no PC required.
- Pop-up menus contain over 70 cable types and up to 80 frequency band presets depending upon the instrument model number.
- X and Y scales and units are user adjustable.
- Six markers for either direct or difference measurements. Can also measure relative to limit line or recalled trace.
- Measurement hold to temporarily store a trace.
- Printing capability. The Bird Site Analyzer is compatible with all printers that use HP PCL Level 3 printer language, including most HP printers.

Measure Match Mode

- Fast swept measurement.
- Frequency can be set using either Start/Stop or Center/Span frequencies.
- Measurement units can be either return loss [dB], cable loss [dB], or VSWR [ratio].

Fault Location Mode

- Transform Algorithm - Fast Fourier Transform (FFT) with three levels of smoothing.
- Distance units can be either feet or meters.
- Measurement units can be either return loss [dB] or VSWR [ratio].

Transmitter Test

Measure Power Mode

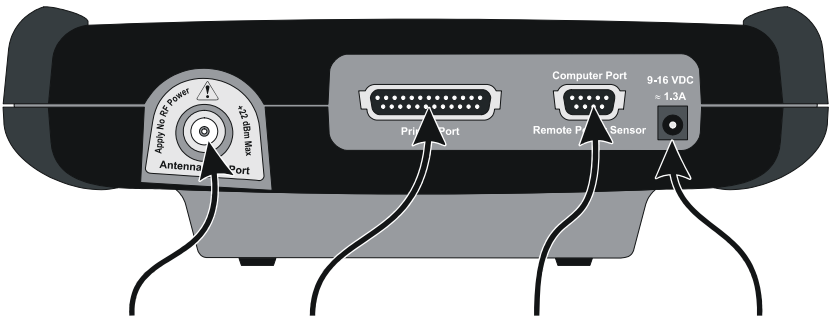
- Numerical readout and analog dial.
- Can display either forward power, reflected power, or match efficiency depending upon the sensor.
- Power measurement units can be either Watts or dBm. Match units can be either VSWR, return loss, or % match efficiency.
- Compatible with the Bird Directional Power Sensor, Terminating Power Sensors, VSWR Alarms, and Broadcast Power Monitors.

Bird 5010B Directional Power Sensor

Bird 5011 or 5011-EF Terminating Power Sensor

Bird 5012 Wideband Power Sensor

Connectors



CAUTION
+22 dBm max. input
Do not apply RF power to Antenna Test Port. Exceeding the maximum input will damage the Site Analyzer.

Antenna Test Port	Female N connector for connecting to the antenna. Use a phase-stable cable for best results.
Parallel Printer Port	25-pin (DB25) parallel connector for connecting to HP-type inkjet printers. A printer cable is not included.
Computer/Power Sensor Port	9-pin RS-232 (DB9) serial connector for connecting to a PC or to Bird power sensors.
DC Input	Input for external power supplies. Plug either the ac power supply or the cigarette lighter adapter into the dc input. The external supplies operate the unit and charge the internal battery.

Power Supply

Internal Battery

The Bird Site Analyzer has an internal, rechargeable, lithium-ion battery pack. This will operate the unit for a minimum of 3 hours of continuous usage. Recharging time, from a full discharge, is approximately 4 hours.

☞ **Note:** When the unit is received the battery may not be fully charged. An ac adapter should be used when operating the unit for the first time.

The battery symbol gauge indicates the approximate battery life remaining. At ¼ charge the gauge also displays "LO". When using an external power source, a power cord symbol replaces the battery symbol gauge.

Adapters

The Bird Site Analyzer can be operated using an ac adapter or a 12V automobile cigarette lighter adapter. Using these adapters will also charge the internal battery.

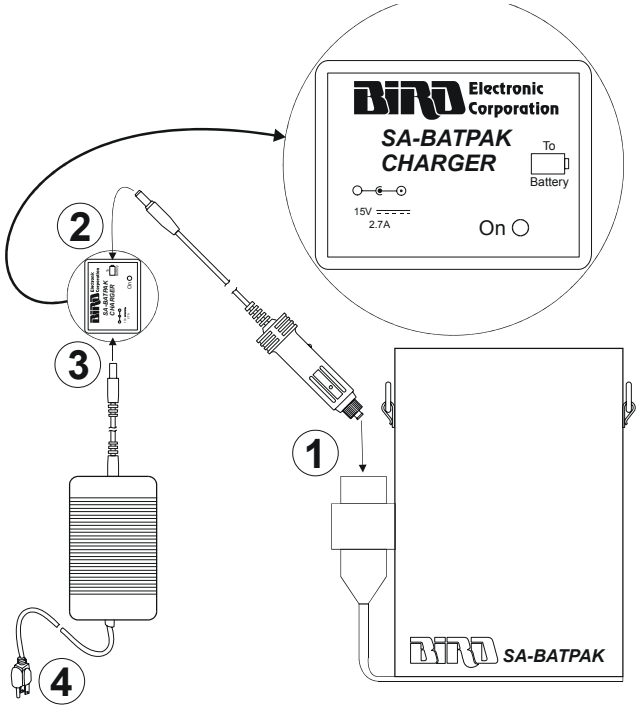
WARNING
When using the ac adapter, connect the ac plug only to a properly grounded receptacle. Serious injury or death can occur if not properly grounded.

External Battery Pack (Optional)

The SA-BATPAK is an optional external battery pack. This will operate the unit for approximately 1 to 2 hours. The liquid acid gel battery will fully charge, from a full discharge, in about 6-8 hours.

WARNING
The SA-BATPAK is shipped charged. Be careful when removing the safety cap, 12Vdc @ 2.0 AH/20 hour rate can be present inside the receptacle. Do not touch the inside of the receptacle. The possibility of an electric shock exists.

CAUTION
Long-term storage of the external battery pack can affect battery performance and reduce battery life. Do not store the external battery pack for long periods of time without proper storage maintenance (refer to External Battery Pack (Optional), Long-term Storage Maintenance, page 135). Failure to comply may result in reduced battery charge and shortened battery life.



To charge the external battery pack:

1. Plug the automobile cigarette lighter adapter into the external battery pack on the side that says “To Battery”. Refer to the figure above.
2. Plug the other end of the cigarette lighter adapter into the charger adapter.
3. Plug the ac adapter into the charger adapter.
4. Plug the ac adapter into a properly grounded outlet. The charger’s “On” LED comes on and stays on until the charger is disconnected.

To use the external battery pack with a Site Analyzer:

1. Plug the automobile cigarette lighter adapter into the charged external battery pack.
2. Plug the other end of the cigarette lighter adapter into the dc input of the Site Analyzer.

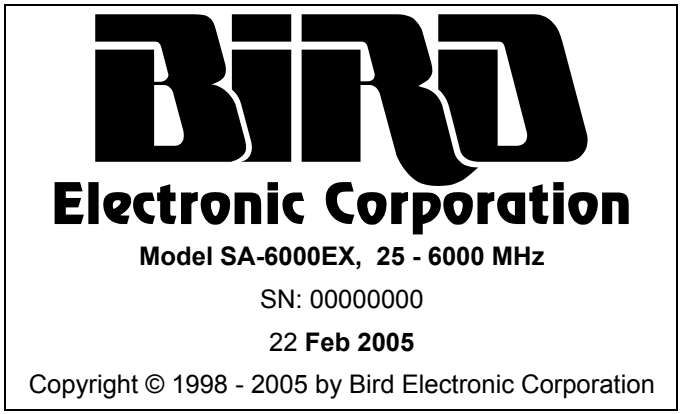
Power Up

For the first power-up and after a failure, reset the unit (refer to Return to Defaults, page 130).

Self Test

The unit performs an automatic self test at power up. If the self test fails, refer to Troubleshooting, page 136 for possible causes and corrective action. If the problem persists, return the unit for service.

The self test screen also displays the software revision information as shown below.



System Information

Before you use the Site Analyzer, record the following system information:

- **Frequency Span** — ex: 824-894 MHz (cellular band)
- **Cable Type** — ex: LDF 7-50A
- **Approximate Cable Length** — ex: 300 feet
- **Transmitter Power** — ex: 50 W

WARNING
This equipment should not be connected to an antenna or operated during a storm that has the potential to produce lightning.
The possibility exists for electrical shock.

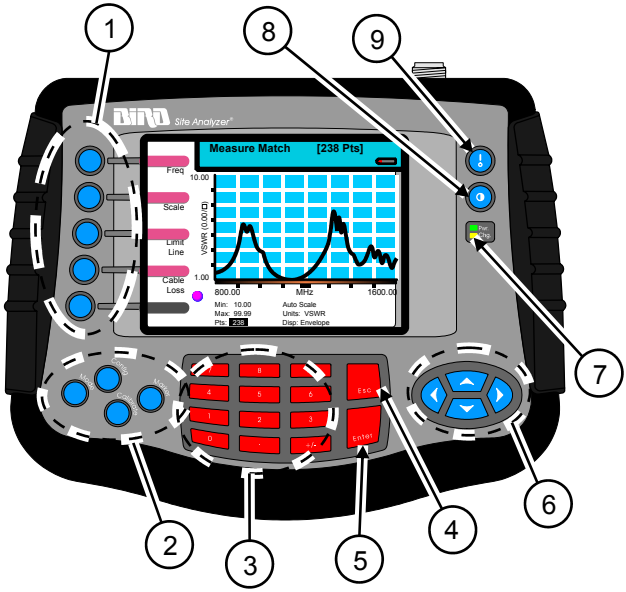
Site Analyzer User Keys

There are two types of keys on the Site Analyzer. The first type, referred to as a hard key, always has a particular function. The function of the key does not change and is printed on the unit surface or on the key itself.

The second type is referred to as a soft key. The five keys at the left of the display are soft keys. Each soft key has a function which can vary depending upon the operational mode. The function of the key will be identified at the left of the display, next to the key.

See to Figure 1 and its accompanying table for a description of user keys.

Figure 1 User Key Identification



1.	**Soft Keys**	Activates the function described directly to the right of the key.
2.	**Hard Keys**	
	Mode	Activates the mode menu. Use this to select Measure Match, Fault Location, Measure Power, or Utilities mode.
	Config	Activates the configuration menu for the current mode. Use this to set variable parameters (e.g. frequency band, distance, and units).
	Calibrate	Activates the calibration menu.
	Marker	Activates the marker menu. Use this to turn markers on or off and to move the active marker.

3.	**Numeric Keys**	Enters numeric data into the selected item, or as defined by the function description.
4.	**Escape Key**	
	During:	
	Menu Use	Backs up one menu level.
	Data Entry	Exits data entry without changing the value.
5.	**Enter Key**	
	During	
	List Selection	Selects the highlighted item in the list.
	Data Entry	Exits data entry, changing the value.
6.	**Cursor Keys**	
	Left Arrow	
	During:	
	Data Entry	Deletes previously entered data one character at a time.
	Marker Use	Moves active marker left one point at a time.
	All other times	As defined by the function description.
	Right Arrow	
	During:	
	Marker Use	Moves active marker right one point at a time.
	All other times	As defined by the function description.
	Up Arrow	
	During:	
	Data Entry	Increases the numeric value.
	Marker Use	Moves the marker to the maximum trace value.
	While pressing the Contrast key	Increases the display contrast.
	All other times	As defined by the function description.

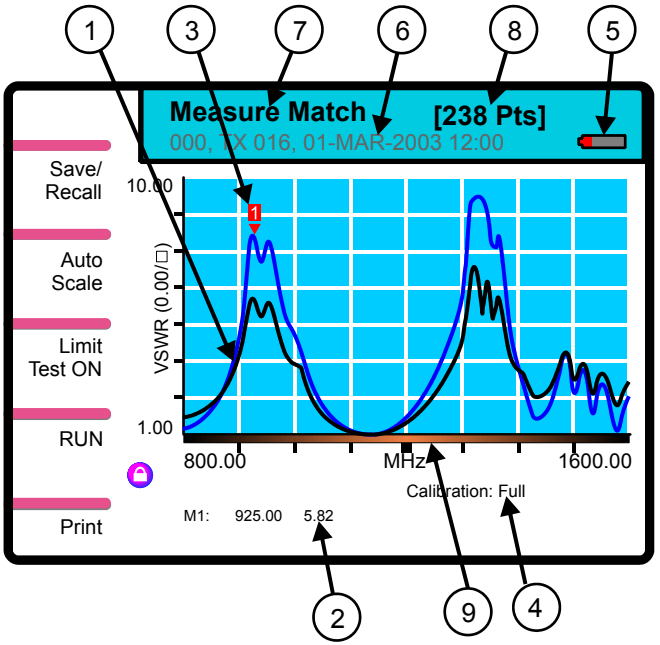
	Down Arrow During:	
	Data Entry	Decreases the numeric value.
	Marker Use	Moves the marker to the minimum trace value.
	While pressing the Contrast key	Decreases the display contrast.
	All other times	As defined by the function description.
7.	**Battery LED**	The yellow LED lights when the unit is powered from an external dc power source. It blinks while charging the internal battery. Once the battery is fully charged the yellow LED stops blinking. The green LED lights whenever the unit is on.
8.	**Contrast Key**	Hold while pressing the up/down arrow keys to adjust the contrast of the display.
9.	**I/0 (On/Off)**	Turns the instrument on and off. The key must be pressed for at least one-half (½) second.

Site Analyzer Display Screen

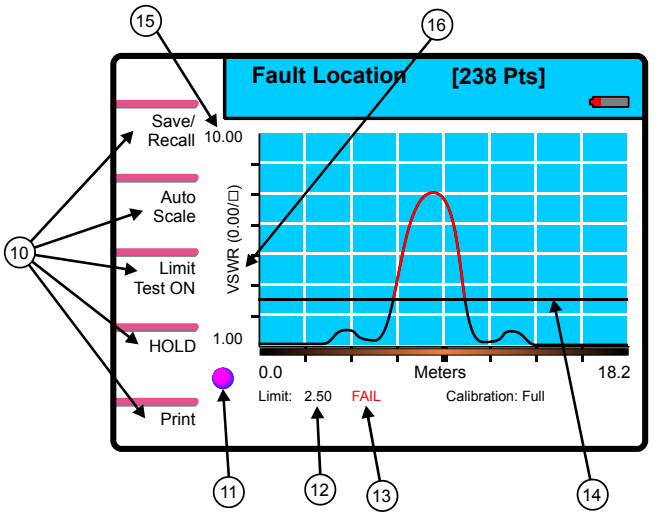
See the following two figures and the accompanying table for a description of the display screen components for Measure Match mode and for Fault Location mode.

Display Description

Measure Match Sample Display



Fault Location Sample Display



1. Trace	Graphic display of the measurement.
2. Marker Value	Indicates the position and value of a trace point.
3. Marker Cursor	Identifies the trace point displayed in the marker value.
4. Calibration Indicator	Indicates the calibration status.
5. Battery Gauge	Indicates whether the Site Analyzer is using the internal battery or an external power supply, and indicates the amount of battery life remaining.
6. Recalled Trace Name	Indicates the name of a recalled trace.
7. Mode Indicator	Name of the current mode.
8. Measurement Data Points	Indicates the amount of data points collected for each trace, 238 = standard, 475 = twice as many data points as 238, 949 = four times as many data points as 238.
9. Progress Bar	Indicates data collection progress
10. Soft Key Description	Describes the function of the soft key to the left of the description.
11. Indicator Ball	Indicates if the trace is sweeping.
12. Limit Line Value	Indicates the limit value.
13. Limit Test Indicator	Displays FAIL if any part of the trace exceeds the limit value.
14. Limit Line	A horizontal line that graphically displays the limit value.
15. Scale	Indicates the minimum and maximum values displayed on that axis.
16. Units	Indicates the measurement units for that axis.

Chapter 2 Calibration

Calibration Accessories

- Calibration Combination (Cal Combo) which contains:
  - One 50 ohm load
  - One Open standard
  - One Short standard
- Test Cable (optional) – A phase-stable cable will provide consistent, reliable results.

☞ **Note:** When using a test cable connected to the Site Analyzer, attach the Cal Combo to the end of the cable during calibration.

Calibrating

For best results, set the frequency and calibrate the Bird Site Analyzer immediately before taking measurements.

Follow the numbered steps in Figure 2, page 18 to calibrate the Site Analyzer.

☞ **Note:** When calibrated, the Site Analyzer's main screen will display "Calibration: FULL". When uncalibrated, the Site Analyzer's main screen will display "Calibration: OFF".

☞ **Note:** Calibration is performed at the highest number of data points (949 points) and the calibration graphs are displayed using the currently selected display method (envelope, maximum, or minimum).

Figure 2 Calibrating the Site Analyzer

Step	Action
1	Press the Calibrate key
2	Connect the Cal Combo “Open” connector to the unit antenna port
3	Press the Open soft key then wait for the unit to beep and display Done
4	Connect the Cal Combo “Short” connector to the unit antenna port
5	Press the Short soft key then wait for the unit to beep and display Done
6	Connect the Cal Combo “Load” connector to the unit antenna port
7	Press the Load soft key then wait for the unit to beep and display Done
8	Remove the Cal Combo from the unit

Chapter 3 Measure Match Mode

Match measurement verifies and monitors the match conditions in the antenna system at various frequencies. The results are shown on an x-y graph. Frequency is shown on the x-axis and return loss, cable loss, or VSWR is shown on the y-axis.

Before you make a match measurement, be sure that you have a Bird Calibration Combination (Cal Combo) and all necessary cables and adapters of the correct size and connector type.

This chapter describes how to make a match measurement and provides step by step instructions. In addition, this chapter describes how to set and move markers. For information and instructions to save and recall traces, refer to Save and Recall, page 91.

To make a match measurement, follow the procedures in this chapter in the order they are presented.

Determine the Power of the Component Being Tested

Use a service monitor, power meter, or spectrum analyzer to check that the component being tested does not have power greater than +22 dBm.

> CAUTION
> +22 dBm max. input
> Do not apply RF power to Antenna Test Port.
> Exceeding the maximum input will damage the Site Analyzer.

Select the Measure Match Mode

Follow the numbered steps in Figure 3 to turn ON the Site Analyzer and select the Measure Match mode.

Figure 3 Selecting the Measure Match Mode

Step	Action
1	Turn On the Site Analyzer. Press ON/ OFF key for ½ second.
2	Press the MODE key
3	Press the Measure Match key

Setting the Measurement Frequency

You must be in the Measure Match mode to set a frequency.

Frequencies can be set manually or chosen from a list of presets (band list). If the start, stop, center, or span frequency is manually set, the band list will indicate "Custom". Be sure to set the frequency to a value that is well beyond the normal range of the antenna. For example, for a 450 MHz antenna, set the start frequency at 400 and the stop frequency at 500 MHz, for an 800 MHz antenna, set the start frequency at 700 and the stop frequency at 1,100 MHz.

☞ **Note:** Changing the frequency settings will automatically turn calibration off. Always set the frequency before calibrating the unit.

☞ **Note:** If you enter a frequency that is outside of the range of the Site Analyzer, the Site Analyzer will override your entry and set the minimum or maximum frequency of the model.

1. Make sure that the unit is turned on and in the Measure Match mode (refer to Select the Measure Match Mode, page 19).
2. Follow the numbered steps in Figure 4 on page 22 to set a custom frequency or follow the steps in Figure 5 on page 23 to select from a preset band list.

Figure 4 Setting a Custom Sweep Frequency

Step	Action
1	Press the Config key
2	Press the Freq soft key
3	Use the left or right scroll keys to select Start, Stop, Center, or Span
4	Use the keypad keys to enter a value and press Enter when finished.
5	Press the Esc key to exit the configuration screen

Figure 5 Selecting a Sweep Frequency from a Band List

Step	Action
1	Press the Config key
2	Press the Freq soft key
3	Use the left or right scroll keys to select Start, Stop, Center, or Span
4	Use the up or down scroll keys to open the band list menu
5	Use the up or down scroll keys to select the desired band
6	Press the Enter key to accept the selection
7	Press the Esc key to exit the configure screen

Calibrate the Site Analyzer

If you need to use an extension cable to connect the Site Analyzer to the system, connect the extension cable to the antenna test port on the Site Analyzer and then connect the Bird Cal Combo to the end of the extension cable. Follow the calibration procedure in Chapter 2, Calibration, page 17.

☞ **Note:** When using an extension cable, you should use a phase stable cable to ensure performance and accuracy. Bird offers optional phase stable cables that will not degrade the performance of your Site Analyzer. Using a non-Bird phase stable cable may decrease and degrade the accuracy of the system.

Select the Measurement Units

You can select units before or after making a measurement. When making a match measurement, you can select one of three units for the Y (vertical) scale,

- VSWR (ratio)
- Rtn Loss (dB)
- Cbl Loss (dB)

1. Make sure that the instrument is turned on and in the Measure Match mode (refer to Select the Measure Match Mode, page 19)
2. Select Frequency (refer to Setting the Measurement Frequency, page 20)
3. Make sure that the instrument is calibrated (refer to Calibration, page 17).
4. Follow the numbered steps in Figure 6, page 25 to set measurement units.

Figure 6 Setting Match Mode Measurement Units

Step	Action
1	Press the Config key
2	Press the Scale soft key
3	Press the left or right scroll keys to select Units
4	Press the up or down scroll keys to open the units list menu
5	Press the up or down scroll keys to select the desired units
6	Press the Enter key to accept the selection.
7	Press the Esc key to exit the configure screen

Set the Measurement Scale Limits

You can manually set the minimum and maximum values on the Y (vertical) scale or you can choose Auto Scale and let the instrument select values that will display the entire trace. You cannot enter values that are outside of the limits of the instrument (-60 and 0). If you are unsure of the expected results, set the minimum to –60 dB and maximum to 0 dB or choose Auto Scale. Auto Scale is available on the main screen as

well as on the mode configure screens. The table below lists typical worst case values for selected measurements.

Component Return Loss Limits

Antenna at Resonance	–14 dB
Connectors	–25 dB
Jumpers	–35 dB
Lightning Protector	–25 dB
Transmission Lines	–30 dB

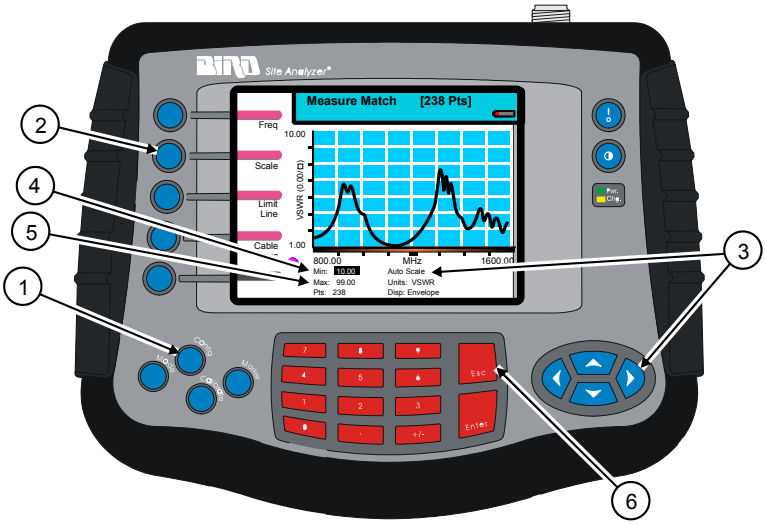
1. Turn on the instrument and enter the Measure Match mode (refer to Select the Measure Match Mode, page 19).

2. Select Frequency (Setting the Measurement Frequency, page 20)

3. Make sure that the instrument is calibrated (refer to Calibration, page 17).

4. Follow the numbered steps in Fig. 7 to set the scale limits.

Figure 7 Setting Match Mode Scale Limits



Step	Action
1	Press the Config key
2	Press the Scale soft key
3	To enter a manual value, skip this step. Use the left or right scroll keys to select Auto Scale then press Enter
4	If you selected Auto Scale, skip this step. Use the left or right scroll keys to select Min then enter your value or enter -60 and press Enter
5	If you selected Auto Scale, skip this step. Use the left or right scroll keys to select Max then enter your value or enter 0 and press Enter.
6	Press the Esc key to exit the configure screen.

Set the Measurement Data Points

You can select the number of data points to take during a measurement. There are three data point options, 238 points, 475 points, and 949 points. Increasing the number of data points increases the measurable distance in distance-to-fault measurements and increases the detail in Measure Match mode measurements. When you save a trace, the number of data points collected (238, 475, or 949) are saved.

The default number of data points is 238. Selecting 475 data points provides twice as many measurement points as 238, but it takes approximately twice as long for the trace to sweep and display. Selecting 949 data points provides four times as many measurement points as 238, but it takes approximately four times as long for the trace to sweep and display.

A progress bar, just below the x-axis, moves from left to right indicating the progress of the sweep. When the progress bar reaches the right side of the screen, the sweep is finished.

When you change the number of measurement data points, the current trace is erased and the Save soft key is disabled until the sweep finishes and the screen displays the first new trace. If you press the Save soft key before the first sweep has completed, the Save soft key icon (the red bar) will blink until the sweep finishes and then the display will change to the Save and Recall screen (in response to you pressing the Save soft key).

1. Turn on the instrument and enter the Measure Match mode (refer to Select the Measure Match Mode, page 19).

2. Select Frequency (refer to Setting the Measurement Frequency, page 20)

3. Make sure that the instrument is calibrated (refer to Calibration, page 17).

4. Follow the numbered steps in Figure 8, page 29 to set the number of measurement data points.

Figure 8 Setting the Number of Measurement Data Points

Step	Action
1	Press the Config key
2	Press the Scale soft key
3	Press the left or right scroll key to select Pts
4	Press the up scroll key to open the selection list
5	Press the up or down scroll key to select a data point option (238, 475, 949)
6	Press the Enter key to accept the selection and return to the configuration screen

Set the Graph Display Type

When the Site Analyzer collects data during a sweep, you can specify that it measure 238 data points, 475 data points, or 949 data points. Selecting 475 data points takes twice as much time to sweep as 238 points, and 949 points takes four times as much time to sweep as 238 points.

The Site Analyzer display screen graph area can display only 238 points because of its physical pixel limitations. However, if the trace contains 475 points or 949 points, all points are represented on the display. There are three modes available to display the data points for the trace - envelope, maximum, and minimum. For 238 data points, there is no difference in the display for each of the three modes because each data point occupies a separate pixel. For 475 data points and 949 data points, the envelope mode displays all data points, the maximum mode displays only the highest (peak) magnitude data point for each pixel, and the minimum mode displays only the lowest (minimum) magnitude data point for each pixel.

☞ **Note:** When you save (or download) a trace, all measured data points (238, 475, 949) are saved (or downloaded). The display modes (envelope, maximum, minimum) are for the Site Analyzer display only and are not saved (or downloaded) with your trace.

1. Turn on the instrument and enter the Measure Match mode (refer to Select the Measure Match Mode, page 19).

2. Select Frequency (refer to Setting the Measurement Frequency, page 20)

3. Calibrate the instrument (refer to Calibration, page 17).

4. Follow the numbered steps in Figure 9, page 31 to set the graph display.

Figure 9 Setting the Graph Display

Step	Action
1	Press the Config key
2	Press the Scale soft key
3	Press the left or right scroll key to select Disp
4	Press the up scroll key to open the selection list
5	Press the up or down scroll key to select a display type (envelope, maximum, minimum)
6	Press the Enter key to accept the selection and return to the configuration screen

Set and Activate Acceptance Limits

The limit line helps you see failures. It appears as a horizontal line at the value you select.

You can set an acceptance limit line to help visualize what part of the measurement trace is not acceptable. The part of the trace that is not acceptable will display in red. To view the limit line, you must have the limit test ON. This feature is available only in the Measure Match mode and the Fault Location mode.

1. Turn on the instrument and enter the Measure Match mode (refer to Select the Measure Match Mode, page 19).

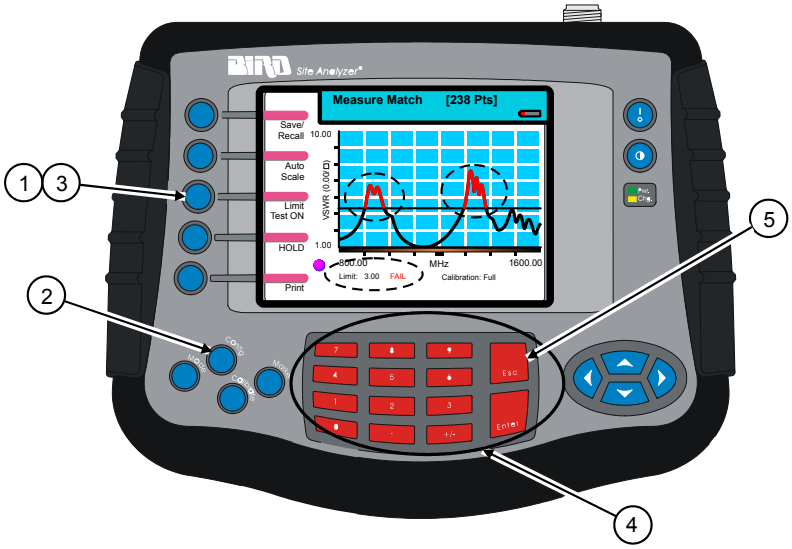
2. Select the frequency (refer to Setting the Measurement Frequency, page 20).

3. Calibrate the unit (refer to Calibrate the Site Analyzer, page 24).

4. Follow the numbered steps in Figure 10, page 33 to turn ON the limit test and set the limit line value.

   ☞ **Note:** You can set a limit line value with the limit test turned OFF, but you will not see a line displayed on the screen.

Figure 10 Setting a Limit Line



Step	Action
1	While in the Measure Match mode or the Fault Location mode, press the Limit Test key: First press - Test ON Aud (line and sound) Second press - Test ON (line only) Third press - Test OFF
2	Press the Config key
3	Press the Limit Line soft key
4	Use the keyboard to enter a limit value of your choice or use the suggested limits listed below (use the +/- key to enter a negative value) then press the Enter key. Antenna at resonance -14 dB Connectors -25 dB Jumpers -35 dB Lightning protector -25 dB Transmission lines -30 dB
5	Press the Esc key to exit the configure screen

Measure the Match of the Component

1. Connect the Site Analyzer to the component being tested as follows:

- **ANTENNA –** (if used) Connect the Phase Stable Cable directly to the coaxial connector of the antenna. There should be no other transmission lines or jumpers connected.
- **OTHER COMPONENTS –** (Including Jumpers, Transmission Lines, Lightning Protectors, and RF Filters) Connect the Phase Stable Cable to one end of the component. Connect the Calibration Combination Load to the other end of the component.

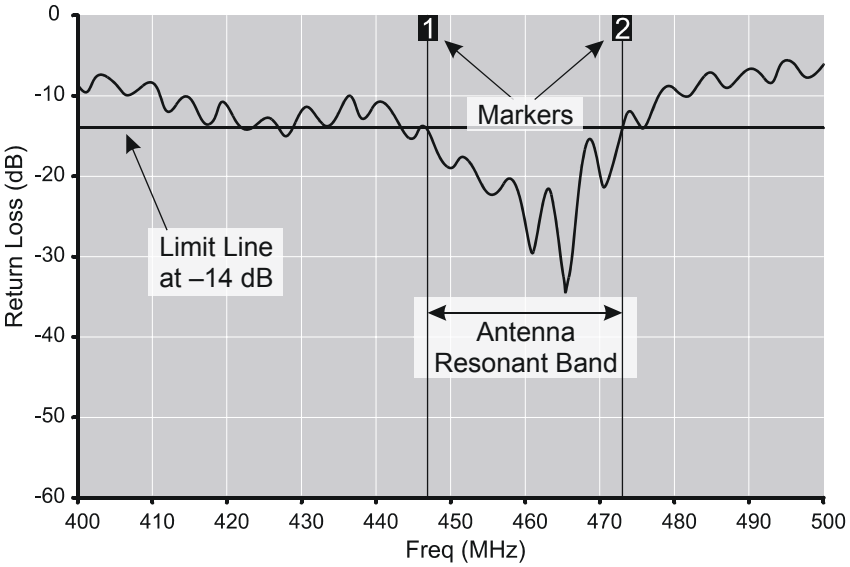
2. Wait at least 10 seconds for the sweep to update.

When you have a trace on the screen, you can do any of the following:

- Hold the trace (refer to Measurement Hold, page 35)
- Add markers to the trace (refer to Markers, page 79)
- Save the trace (refer to Save Trace, page 92)
- Print the trace (refer to Printing, page 89)

Interpreting the Measurement

The graph below shows a typical Match Measurement for an antenna system.



1. Parts of the sweep below the limit line are better than the limit.
2. Antennas and filters should be below the limit line for the entire band, and above the limit line outside the band.
3. Other components should be flat and below the limit line across the entire band.

Measurement Hold

You must be in either Measure Match mode or Fault Location mode to hold a trace.

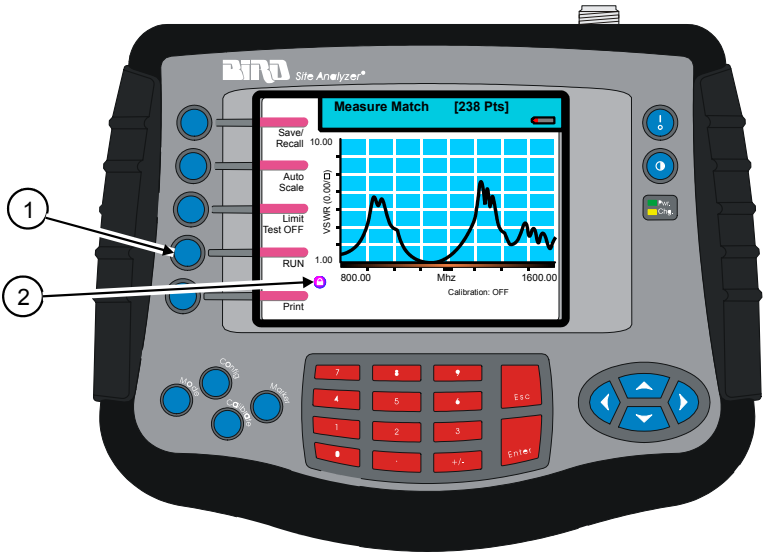
The hold feature stops updating the display at the end of the current sweep. Press the Hold soft key to hold the displayed trace and press the Run soft key (the same key) to resume taking measurements. A measurement is being held when there is a lock icon in the

indicator ball and the Hold soft key changes its name to Run.

If you press the Hold soft key while the unit is in the process of acquiring data (sweeping), it will not hold the trace until the sweep has finished.

Follow the numbered steps in Figure 11, page 36 to activate or deactivate measurement hold.

Figure 11 Measurement Hold



Step	Action
1	Press Hold key to hold the measurement; press Run key to resume sweeping
2	Lock symbol indicates measurement is held

Markers

You must be in either Measure Match mode or Fault Location mode to use markers.

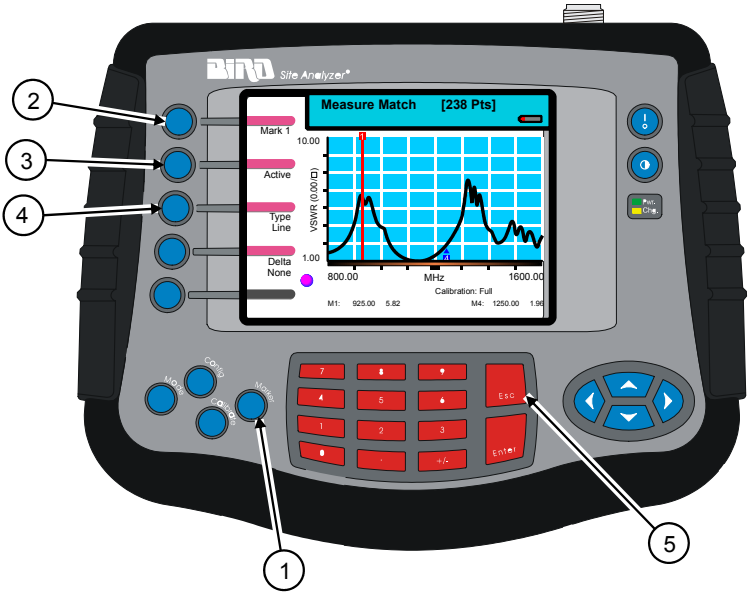
You can activate and use up to six markers to visually indicate the trace value at specific frequency points. All markers follow the current trace only. The site analyzer displays the frequency and signal value for each marker at the bottom of the screen. You can display each marker as a triangle pointer or a vertical line through the trace. You can also display the difference (delta) in frequency between two markers. Markers indicate VSWR to 0.01, and Return Loss or Cable Loss to 0.1 dB.

When you display both a recalled trace and the current measurement trace at the same time, there is an additional marker option, single mode and dual mode. In single mode, the markers function normally (indicating the frequency and value at the marker). In dual marker mode, you select a marker using the Mark soft key and, at the bottom of the screen, the site analyzer displays the marker number, the frequency and value of the current trace at the marker, and the difference in frequency and value between the current trace and the recalled trace. The difference in frequency is always 0.00 (zero). Only the first three markers (M1, M2, M3) are available in dual mode.

Activate Markers and Set Marker Style

1. Be sure that you are in either Measure Match mode or Fault Location mode.
2. Follow the numbered steps in Figure 12, page 38 to activate markers and set their style.

Figure 12 Activate Marker and Set Style



Step	Action
1	Press the Marker key to enter marker setup
2	Press the Mark soft key to select a marker (1-6)
3	Press the Active / Off soft key to turn ON the selected marker (active) or turn OFF the selected marker (off)
4	Press the Type soft key to select triangle marker (4 in figure) or line marker (1 in figure) Repeat Step 2 through Step 4 to select and activate up to six markers and set the mark style
5	Press the Esc key to return to the test screen

Move Markers

You can move the active marker along the trace (frequency axis) by using the left and right scroll keys or by entering a frequency with the numeric key pad. All markers follow the current trace only.

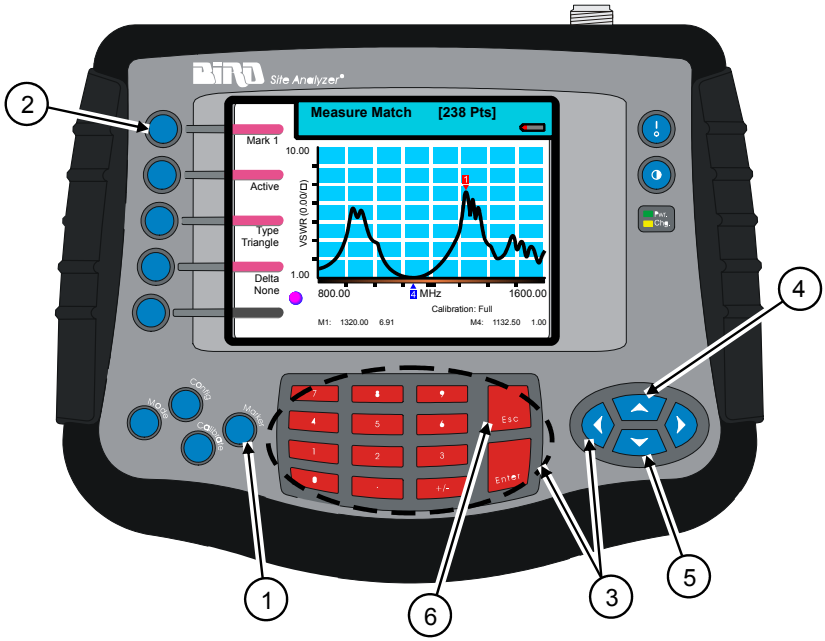
If you have recalled a trace and you want to use markers to compare it to the current trace, you need to select the dual mode (refer to Using Markers with Recalled Traces, page 42). The marker will move along the current trace (as described in the following paragraph) and compare *each* data point at the marker frequency (on the current trace) to the *first* saved data point in the recalled trace (other data points in the recalled trace are not compared). For more information about comparing data points, refer to Using Markers with Recalled Traces, page 42.

Since traces can be created using different numbers of data points (238, 475, 949), moving a marker along a 475 data point or 949 data point trace will appear different from how the marker moves along a 238 data point trace. In a 238 data point trace, when you press the right or left scroll keys, the marker moves with each key press. In a trace with 475 data points, there are two data points at each pixel. When you first move to a new pixel, the screen displays the value of the first data point that was saved and when you press the right scroll key the marker does not "move" but the screen displays the value of the second data point. Pressing the right scroll key a third time moves to the next frequency. Similarly in a trace with 949 data points, there are four data points at each marker pixel. When you first move to a new frequency, the screen displays the value of the first data point that was saved and each time you press the right scroll key the marker does not "move" but the screen displays the value of the next data point (in the order saved). Pressing the right scroll key a fourth time moves to the next frequency.

1. Be sure that you are in either Measure Match mode or Fault Location mode.

2. Follow the numbered steps in Figure 13, page 40 to select and move markers.

Figure 13 Moving Markers



Step	Action
1	Press the Marker key to enter marker setup
2	Press the Mark soft key to select a marker (1-6)
3	Press the right or left arrow keys to move the marker right or left, or enter a frequency value on the keypad and press Enter
4	Press the up arrow keys to move the marker to the highest point on the trace
5	Press the down arrow key to move the marker to the lowest point on the trace
6	Press Esc to return to the test screen

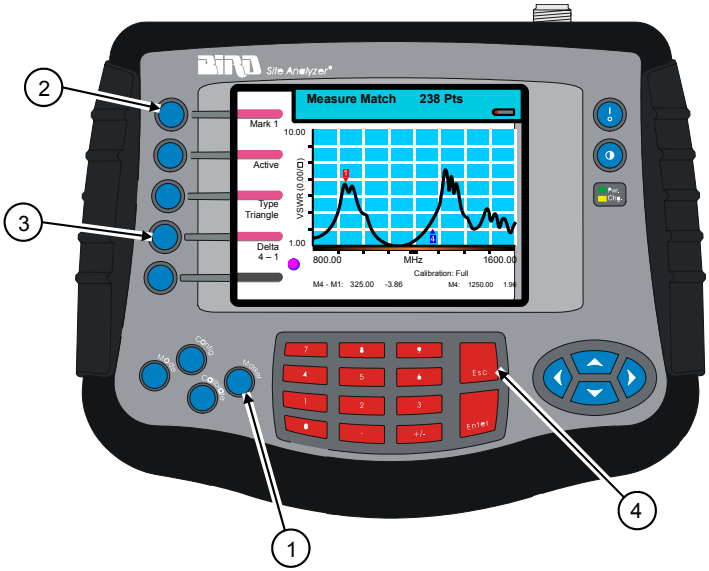
Using Delta Markers

In the delta marker mode, only active markers will be visible. The delta marker feature displays the difference (delta) in both frequency and value between the selected marker and each of the other active marker. If the limit line is active, you will also see the difference between the selected marker and the limit line. The frequency difference between the selected marker and the limit line will always be the frequency at the marker. All markers follow the current trace only.

Note: The delta marker feature compares points only on one trace, and you must have at least two active markers for the delta option to work.

To select and use delta markers, follow the numbered steps in Figure 14 on page 42.

Figure 14 Delta Markers



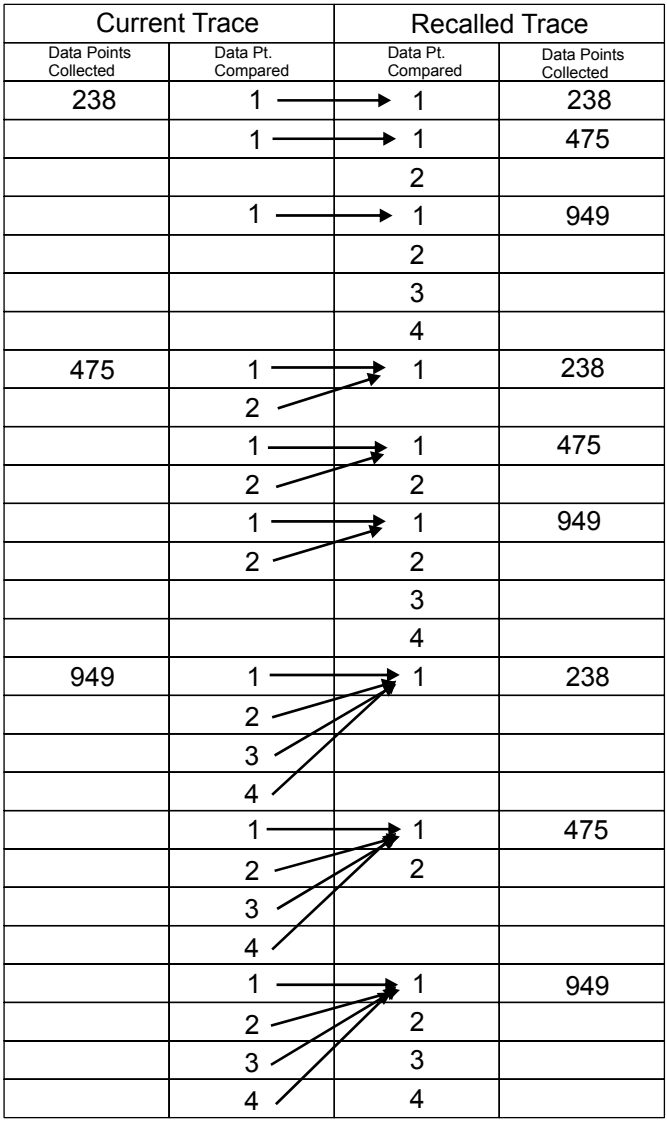
Step	Action
1	Press the Marker key to enter marker setup
2	Press the Mark soft key to select an active marker (1-6)
3	Press the Delta soft key to cycle through the active markers and limit line (if active)
4	Press Esc to return to the test screen

Using Markers with Recalled Traces

When a trace is recalled, the screen displays both the current trace and the recalled trace and there is an additional marker option, Single Mode / Dual Mode. In single mode, the markers function normally; the site analyzer displays the frequency and trace value at each marker.

In dual mode, the markers show the actual value of both traces and the difference in value between the recalled trace and the current trace. All markers follow the current trace only, and only three markers are available in dual mode, M1, M2, and M3. When you select dual mode, the markers move as described in Move Markers, page 39. Each time you press the right scroll key, the screen displays the next saved data point of the current trace and compares it to the first data point of the recalled trace (other data points of the recalled trace are ignored). Figure 15 on page 44 shows the data comparison graphically.

Figure 15 Comparing Data Points in Dual Mode



1. Be sure that you are in either Measure Match mode or Fault Location mode.

2. Recall a trace (refer to Recall a Saved Trace, page 104).

3. Follow the numbered steps in Figure 16 on page 45 to set markers on a recalled trace.

Figure 16 Using Markers with Recalled Traces

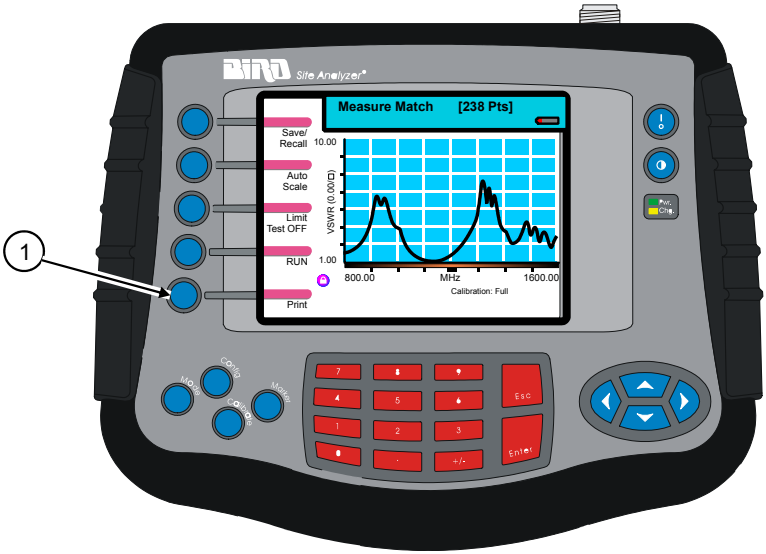
Step	Action
1	Press the Marker key
2	Select single mode or dual mode
3	Select a marker
4	Press the left or right scroll key to move the marker
5	Press Esc to return to the test screen

Printing

The Bird Site Analyzer can print the information displayed on the screen to any HP Deskjet printer that supports the PCL Level 3 protocol. To print the screen image, first hold the image (Measurement Hold, page 35) then press the Print key (Figure 17, item 1).

☞ **Note:** If you press the Print soft key when there is no printer connected, the unit will try to print and then display the word ERROR beside the Print soft key. To clear the error, select Mode>Utility>Printer, then press the Printer soft key a second time to reset the system.

Figure 17 Print the Screen Image



Cable Loss Measurement

To measure cable loss, make sure that the cable being tested is unterminated (not connected to anything at the far end).

☞ **Note:** Cable loss is a measurement choice that is available in Measure Match (Configuration). It can also can be selected by choosing Cbl Loss from Units when you are setting the Scale in Measure Match (Configure).

1. Check the power of cable to be tested (refer to Determine the Power of the Component Being Tested, page 19). Make sure that the cable does not have power grater than +22 dBm.
2. Make sure that you have the correct adaptors and connectors and a Bird Calibration Combination (cal combo). Also make sure that you know the frequency band of the system
3. Turn on the Site Analyzer and enter the Measure Match mode (refer to Select the Measure Match Mode, page 19).
4. Follow the numbered steps in Figure 18 on page 48 to set up the Site Analyzer to measure cable loss.

Figure 18 Set Up for Cable Loss Measurement

Step	Action
1	Press the Config key
2	Press the Scale soft key
3	Press the right or left scroll keys to select Units
4	Press the up scroll key to open the units list
5	Press the up or down scroll key to select Cbl Loss then press Enter to accept the selection

5. Select the Freq soft key and set the frequency start and stop to a range that is well beyond the normal range of the antenna (refer to Setting the Measurement Frequency, page 20).

☞ **Note:** For example, for a 450 MHz antenna, set the start frequency at 400 and the stop frequency at 500 MHz, for an 800 MHz antenna, set the start frequency at 700 and the stop frequency at 1,100 MHz.

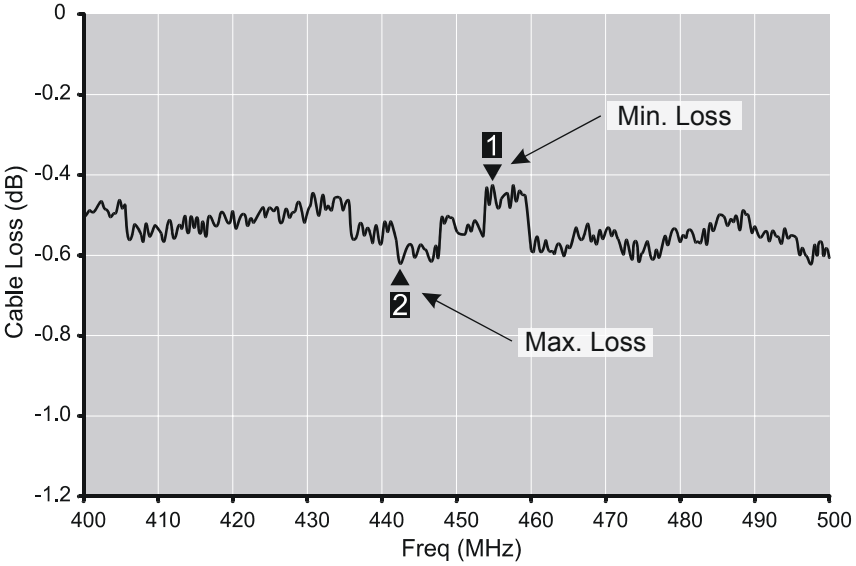
6. Connect a phase stable cable to the Site Analyzer antenna test port and connect a Cal Combo to the other end of the cable.
7. Calibrate the Site Analyzer (refer to Calibrate the Site Analyzer, page 24)

   ☞ **Note:** After calibration, with the load still connected, the output must below -25 dB. If it is not, there is a problem.

8. Remove the Cal Combo unit from the cable. Do not disconnect the phase stable cable from the Site Analyzer.
9. Connect the phase stable cable to one end of the cable being tested.
10. Connect the Short connection on the Cal Combo unit to the other end of the cable being tested.
11. Wait at least 10 seconds to allow the trace to update.
12. Hold the trace that is on the screen (refer to Measurement Hold, page 35).
13. Place a triangle-style marker (mark 1) at the minimum loss point within the frequency band on the trace (refer to Markers, page 36).
14. Place a triangle-style marker (mark 2) at the maximum loss point within the frequency band on the trace.
15. If appropriate, save and label the trace (refer to Save Trace, page 92).

Interpreting the Cable Loss Measurement

The graph below shows a typical cable loss measurement. Note that the scale is greatly reduced to show the cable's variation across frequency.



1. Take the average of M1 and M2. This is the average cable loss across the frequency band.
2. Compare the loss with the manufacturer's specified loss for a cable of this length. If they do not correspond, retake the measurement, then check the cable for problems.
3. The Cable Loss for a good cable should be flat across the frequency band.

Chapter 4 Fault Location Mode

Fault location identifies the position of impedance discontinuities (reflections) within the antenna/feeder system. The measurement results are displayed on an x-y graph. Distance from the Site Analyzer is shown on the x-axis, while relative magnitude of the discontinuity is shown on the y-axis.

Before you make a fault location measurement, be sure that you have the following items and information:

- A Bird Calibration Combination (Cal Combo) calibration unit
- All necessary cables and adapters of the correct size and connector type.
- The velocity of propagation for the cable type you will measure (obtain from the cable manufacturer)
- Number of data points to use in making the distance to fault measurement (user choice)

This chapter describes how to make a fault location measurement and provides step by step instructions. In addition, this chapter also describes how to set and move markers. For information and instructions to save and recall traces, refer to Save and Recall, page 91.

To make a fault location measurement, follow the procedures in this chapter in the order they are presented.

Determine the Power of the Component Being Tested

Use a service monitor, power meter, or spectrum analyzer to check that the component being tested does not have power greater than +22 dBm.

CAUTION
+22 dBm max. input
Do not apply RF power to the Antenna Test Port. Exceeding the maximum input will damage the Site Analyzer.

☞ **Note:** Changing the frequency settings will automatically turn calibration off. Always set the frequency before calibrating the unit.

☞ **Note:** If you enter a frequency that is outside of the range of the Site Analyzer, the Site Analyzer will override your entry and set the minimum or maximum frequency of the model.

Select Fault Location Mode

1. Apply power to the Site Analyzer. Press and hold the ON/OFF key for at least 1/2 second then wait for the unit to go through its power-on initialization.
2. To select the Fault Location mode, follow the numbered steps in Figure 19 on page 53.

Figure 19 Select Fault Location Mode

Step	Action
1	Press the Mode key
2	Press the Fault Location soft key

What You Need to Know About Setting the Frequency Span and Max Distance

☞ Note: Changing the frequency span or the max distance will automatically turn calibration off. Always set the frequency span or max distance *before* calibrating the unit.

The *maximum distance* you can measure is determined by the *frequency span*, the *velocity of propagation* of the cable (V_p), and the number of *data points* to measure (238, 475, or 949). These factors are discussed in the following paragraphs.

Max Distance When you specify a frequency span, the Site Analyzer calculates the maximum measurable distance. If you know the maximum distance you want to measure, you can enter it instead of the frequency

span; the Site Analyzer calculates the frequency span for you. If you manually enter a maximum distance, be sure to select the data points *before* entering the max distance

☞ **Note:** If you select a maximum distance that is less than the total length of the cable system, the trace might show a spike that is not really a fault, but rather an echo from the remaining portion of the cable that is beyond the length you chose. Such a spike is known as an alias. To avoid aliasing, you should always set the maximum distance to a value that is a few feet or meters greater than the entire length of your cable system.

Data Points If you increase the number of data points you will increase the measurable distance (475 points results in twice the distance of 238 points, and 949 points results in four times the distance of 238 points) (refer to Equations, page 152). When you change the number of data points measured, the software automatically recomputes the new maximum measurable distance. If you manually enter a maximum distance, be sure to select the data points *before* entering the max distance. Changing data points *does not* turn calibration off.

Frequency Span If you narrow the frequency span you will increase the measurable distance (refer to the Fault Location Distance Tables, page 152).

Velocity of Propagation The velocity of propagation is a characteristic of the cable and is expressed as a percentage. Contact the cable manufacturer to get the velocity of propagation value for the cable you are using.

Setting the Frequency Span

For a given number of data points (238, 475, 949), entering a frequency span causes the Site Analyzer to calculate and enter the maximum measurable distance and, conversely, entering a maximum distance

causes the Site Analyzer to calculate and enter the required frequency span.

There are two methods you can use to determine the frequency span (for both methods, you need to know the maximum distance, velocity of propagation, and number of data points). Instructions for both methods are in Step 2 below:

- Use the Fault Location Distance Tables, page 152.
- Calculate the frequency span.

1. Select Measure Match Mode (refer to Select the Measure Match Mode, page 19).
2. Determine the frequency span. Choose how many data points you want to measure then, from the appropriate Fault Location Distance and Resolution table (page 152), choose a velocity propagation percentage that is closest to the cable in your system. Read down the Vel Prop percentage column to determine the frequency span or the maximum distance. When choosing a distance, choose one that is approximately 25% more than your tower height (or length of the cable system to be tested).

   For example, for a cable with a dielectric constant of 2.296, the velocity percentage is 66%. If the cable system is 100 feet long, and you choose 238 data points, then the Site Analyzer should be set to a frequency span of 700 MHz. The resolution of the graph will be 5.6 inches.

   ☞ **Note:** To avoid potential false "spikes" (aliases) on the trace, be sure to select a distance that is at least 25% greater than the length of your cable system.

   If you know your cable's velocity of propagation and its length but they are not on one of the tables, you can either enter the max distance into the Site Analyzer or you can determine the approximate

frequency span required by using the following equation:

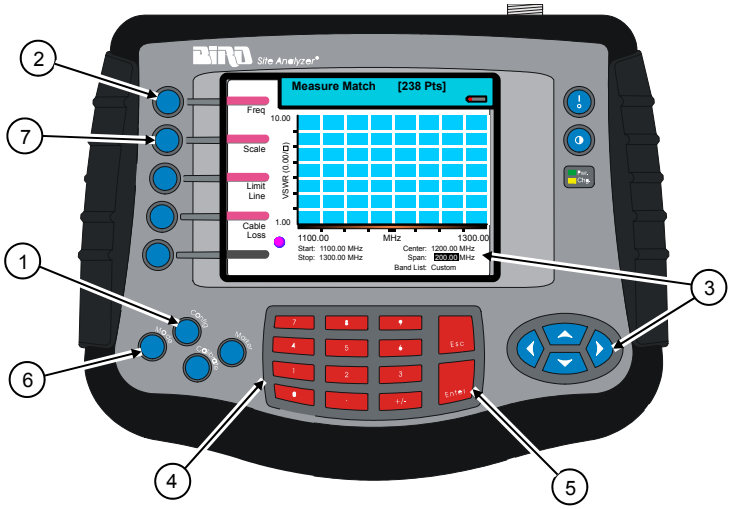
$$\text{Freq Span} = \frac{(150) \times \text{relative velocity (\%)} \times (\text{\# points} - 1)}{\text{test length (m)}}$$

where (# points - 1) is 237, 474, or 948

If you enter a span greater than the current settings permit, the span will be set to the maximum allowable value.

3. Enter the frequency span. Follow the numbered steps in Figure 20 on page 57 to enter the values you determined in Step 2.
4. Enter the center frequency. The center frequency is the center of the antenna's frequency range. To set the max distance, follow the numbered steps in Figure 20 on page 57.

Figure 20 Setting the Frequency Span and the Center Frequency



Step	Action
1	Press the Config key
2	Press the Freq soft key
3	For both Span and Center, scroll to select the item (Span or Center)
4	Enter the Span value determined from the table earlier. Enter the value for the center frequency as determined in instruction Step 3.
5	After you enter the Span value, press the Enter key. After you enter the Center value, press Enter.
6	Press the Mode key
7	Press the Fault Location soft key

Setting the Maximum Distance

☞ Note: Changing the frequency span or the max distance will automatically turn calibration off. Always set the frequency span or max distance *before* calibrating the unit.

1. Select the Fault Location mode (Figure 19 on page 53).

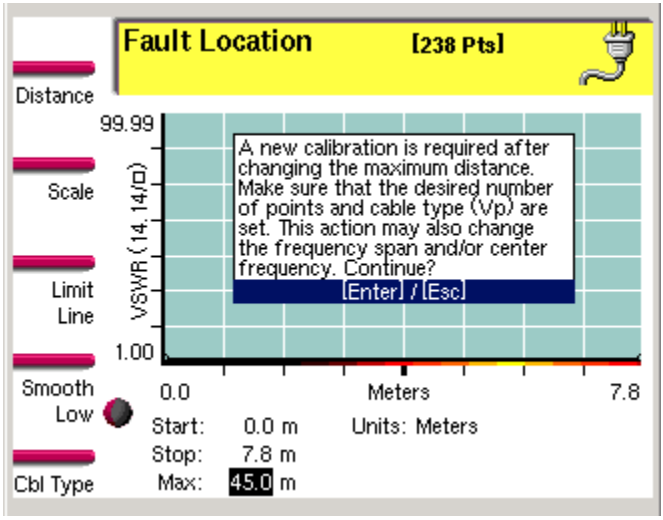
2. Follow the numbered steps in Figure 21 on page 58 to enter the maximum distance value.

3. At the warning message (Figure 22, page 59) press Enter to accept your entry or Esc to cancel your entry. When you press Enter, the Site Analyzer will display the Calibration screen so you can begin the calibration process.

Figure 21 Setting the Maximum Distance

Step	Action
1	Press the Config key
2	Press the Distance soft key
3	Press the right or left arrow keys to scroll to Max
4	Numeric key pad - enter a maximum distance value
5	Press the Enter key after entering a value
6	Press the Esc key to exit the configuration screen

Figure 22 Changed Max Distance Warning Message



Calibrate the Site Analyzer

If you need to use an extension cable or a phase stable cable, connect that cable to the antenna test port on the Site Analyzer and then connect the Bird Calibration Combination to the end of the extension cable. Follow the procedure in Chapter 2, Calibration, page 17.

☞ **Note:** After calibration, with the load still connected, the output must be below –45 dB. If it is not, there is a problem. It is common to see spikes from –60 to –45 dB. These can be ignored.

Remove the Cal Combo from the cable.

Setting the Cable Type

Setting the cable type means that you enter values for the velocity of propagation and the cable loss. You can set the cable type manually or choose from a list of preset values. When you manually enter a value for the velocity of propagation or cable loss, the Cable List entry becomes “Custom”.

☞ **Note:** Changing the cable type or velocity of propagation will reset the distance scale to the maximum possible distance. Always set the cable type before setting the distance scale.

1. Make sure that Fault Location mode is selected (refer to Select Fault Location Mode, page 52).
2. To manually set the cable type, follow the numbered steps in Figure 23. To select the cable type from a predefined list, follow the steps in Figure 24.

Figure 23 Select Cable Type Manually

Step	Value
1	Press the Config key
2	Press the Cbl Type soft key
3	For both Vel Prop and Loss, scroll to select the item (Vel Prop or Loss)
4	Enter the Vel Prop value or enter the Loss value
5	After you enter the Vel Prop value, press the Enter key. After you enter the Loss value, press the Enter key.
6	Press the Esc key to exit the configuration screen

Figure 24 Select Cable Type from List

Step	Action
1	Press the Config key
2	Press the Cbl Type soft key
3	Press the right or left scroll keys to select Cable List
4	Press the up or down scroll keys to open the cable list
5	Press the up or down scroll keys to select an item on the list
6	Press the Enter key to accept the selection
7	Press the Esc key to exit the configuration screen

3. Continue to the next topic in this section (Setting the Distance and Units, page 63)

Setting the Distance and Units

Distance to Display on the Trace (start, stop)

The trace can display the entire length (distance) of the cable system you are measuring or a smaller portion of the length for better detail.

If you suspect that there might be a fault at a known distance along a cable, you can set the display to show only that area by using the start and stop points. Think of this as zooming in on a section of the cable. You can set both the start point (where to begin the trace display) and the stop point (where to end the trace display).

☞ **Note:** You cannot set the stop point to a value that is greater than the maximum distance you are measuring. For example, if you have selected a data point option, frequency span, and V_p that results in a maximum distance of 100 feet, you cannot set a stop point to a value greater than 100 feet.

Follow the numbered steps in Figure 25, page 64 to set the start distance and the stop distance. For an antenna lead, you will typically set the start distance at 0, and the stop distance at a few feet or meters greater than the tower height.

Follow the numbered steps in Figure 26, page 65 to set the distance units.

Figure 25 Setting the Start and Stop Distance

Step	Action
1	Press the Config key
2	Press the Distance soft key
3	Press the right or left arrow keys to scroll to Start or Stop
4	Use the numeric key pad to enter a value for Start or Stop.
5	Press the Enter key after entering a value.
6	Press the Esc key to exit the configuration screen

Figure 26 Setting the Distance Units

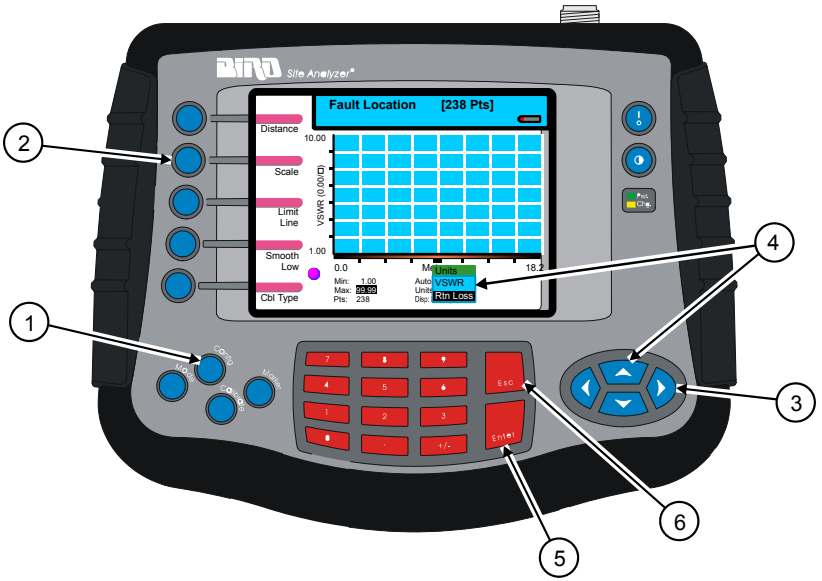
Step	Action
1	Press the Config key
2	Press the Distance soft key
3	Press the left or right arrow keys to select Units
4	Press the up or down arrow keys to select a unit from the list
5	Press the Enter key
6	Press the Esc key to exit the configuration screen

Setting the Scale & Unit of Measure

You can set the display scale manually or by using Auto Scale. The display trace can be in units of return loss [dB] or VSWR [ratio]. You can activate Auto Scale from the configuration screen or from the main Fault Location screen.

1. Follow the numbered steps in Figure 27 on page 67 to set the scale units.
2. Follow the numbered steps in Figure 28 on page 68 to set the scale limits.
3. Follow the numbered steps in Figure 29 on page 69 to set Auto Scale from the Configuration screen

Figure 27 Setting Fault Location Scale Units

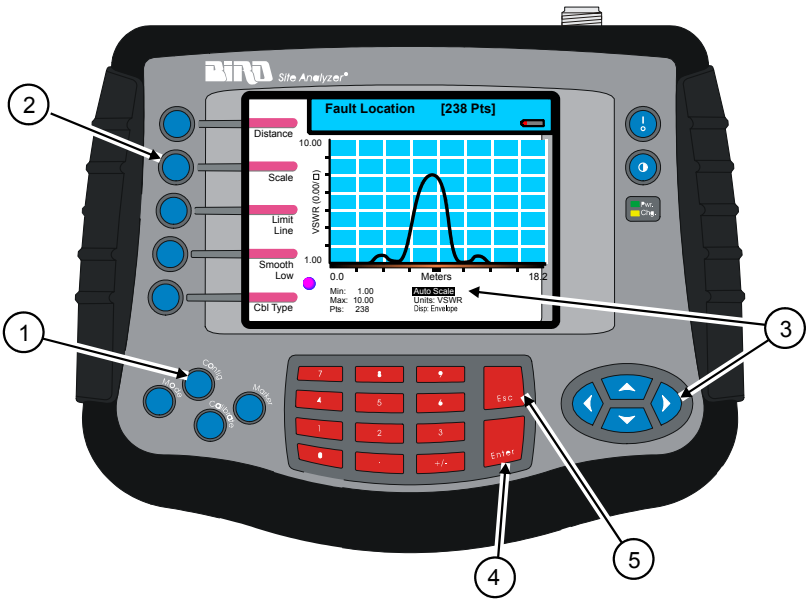


Step	Action
1	Press the Config key
2	Press the Scale soft key
3	Use the left or right scroll keys to select Units
4	Use the up or down scroll keys to activate the units menu and to select the units you want.
5	Press the Enter key.
6	Press the Esc key to exit the configure screen

Figure 28 Setting Fault Location Scale Limits Manually

Step	Action
1	Press the Config key
2	Press the Scale soft key
3	Use the left or right scroll keys to select Min.
4	Use the keypad to enter your value or use -60 as a limit.
5	Press the Enter key
6	Use the left or right scroll keys to select Max.
7	Use the keypad to enter your value or use 0 as a limit.
8	Press the Enter key
9	Press the Esc key to exit the configure screen

Figure 29 Setting Fault Location Auto Scale



Step	Action
1	Press the Config key
2	Press the Scale soft key
3	Use the left or right scroll keys to select Auto Scale
4	Press the Enter key
5	Press the Esc key to exit the configure screen

Set the Measurement Data Points

You can select the number of data points to take during a measurement. There are three data point options, 238 points, 475 points, and 949 points. Increasing the number of data points increases the measurable distance in distance-to-fault measurements and increases the detail in Measure Match mode measurements. When you save a trace, the num-

ber of data points collected (238, 475, or 949) are saved.

The default number of data points is 238. Selecting 475 data points provides twice as many measurement points as 238, but it takes approximately twice as long for the trace to sweep and display. Selecting 949 data points provides four times as many measurement points as 238, but it takes approximately four times as long for the trace to sweep and display.

A progress bar, just below the x-axis, moves from left to right indicating the progress of the sweep. When the progress bar reaches the right side of the screen, the sweep is finished.

When you change the number of measurement data points, the current trace is erased and the Save soft key is disabled until the sweep finishes and the screen displays the first new trace. If you press the Save soft key before the first sweep has completed, the Save soft key icon (the red bar) will blink until the sweep finishes and then the display will change to the Save and Recall screen (in response to you pressing the Save soft key).

1. Turn on the instrument and enter the Measure Match mode (refer to Select the Measure Match Mode, page 19).

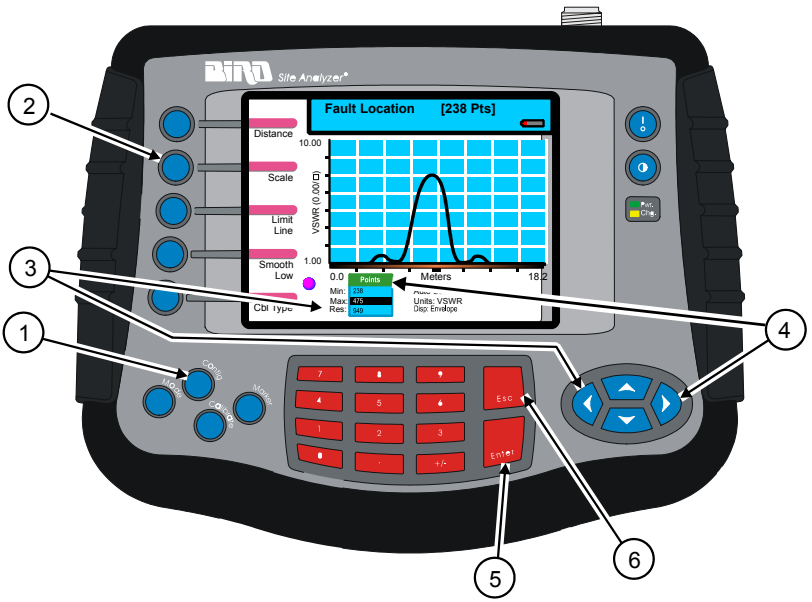
2. Select Frequency (refer to Setting the Measurement Frequency, page 20)

3. Make sure that the instrument is calibrated (refer to Calibration, page 17).

4. Select the Fault Location mode (refer to Select Fault Location Mode, page 52).

5. Follow the numbered steps in Fig. 30 to set the measurement resolution.

Figure 30 Setting the Measurement Resolution



Step	Action
1	Press the Config key
2	Press the Scale soft key
3	Use the left or right scroll keys to select Res
4	Press the up scroll key to open the list
5	Press up or down scroll key to select a data point option (238, 475, 949)
6	Press the Enter key to accept the selection and return to the configure screen

Set the Graph Display Type

When the Site Analyzer collects data during a sweep, you can specify that it measure 238 data points, 475 data points, or 949 data points. Selecting 475 data points takes twice as much time to sweep as 238

points, and 949 points takes four times as much time to sweep as 238 points.

The Site Analyzer display screen graph area can display only 238 data points because of its physical pixel limitations. However, if the trace contains 475 data points or 949 data points, all points are represented on the display. There are three modes available to display the data points for the trace - envelope, maximum, and minimum. For 238 data points, there is no difference in the display for each of the three modes because each data point occupies a separate pixel. For 475 data points and 949 data points, the envelope mode displays all data points, the maximum mode displays only the highest (peak) magnitude data point for each pixel, and the minimum mode displays only the lowest (minimum) magnitude data point for each pixel.

☞ **Note:** When you save (or download) a trace, all measured data points (238, 475, or 949) are saved (or downloaded). The display modes (envelope, maximum, minimum) are for the Site Analyzer display only and are not saved (or downloaded) with your trace.

1. Turn on the instrument and enter the Measure Match mode (refer to Select the Measure Match Mode, page 19).

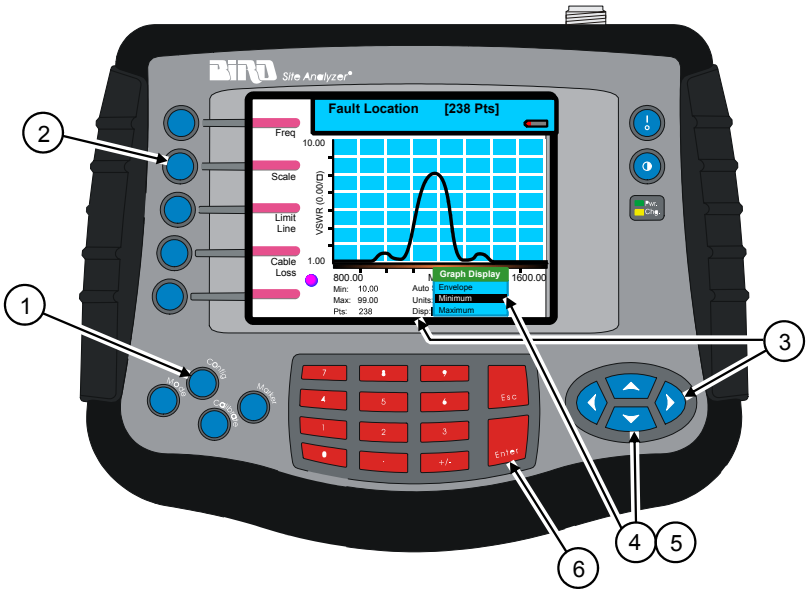
2. Select Frequency (refer to Setting the Measurement Frequency, page 20)

3. Make sure that the instrument is calibrated (refer to Calibration, page 17).

4. Select the Fault Location mode (refer to Select Fault Location Mode, page 52).

5. Follow the steps in Figure 31, page 73 to set the graph display.

Figure 31 Setting the Graph Display



Step	Action
1	Press the Config key
2	Press the Scale soft key
3	Press the left or right scroll key to select Disp
4	Press the up scroll key to open the selection list
5	Press the up or down scroll key to select a display type (envelope, maximum, minimum)
6	Press the Enter key to accept the selection and return to the configuration screen

Set and Activate Acceptance Limits

The limit line helps to set off those parts of a trace that are outside of the acceptance (limit) values. It appears as a horizontal line at the limit line value.

You can set an acceptance limit line to help visualize what part of the measurement trace is not acceptable. The part of the trace that is not acceptable will display in red. To view the limit line, you must have the limit test ON. This feature is available only in the Measure Match mode and the Fault Location mode.

1. If needed, turn the unit on and select the Measure Match mode (refer to Figure 3 on page 20).

2. If needed, select the frequency (refer to Figure 4 on page 22 or Figure 5 on page 23)

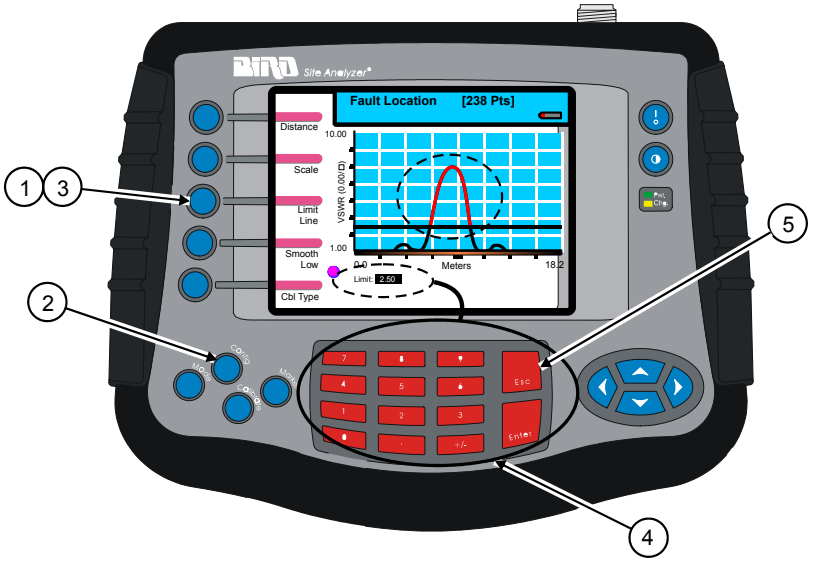
3. Make sure that the instrument is calibrated (refer to Calibration, page 17).

4. Select the Fault Location mode (refer to Select Fault Location Mode, page 52).

5. Follow the numbered steps in Figure 32, page 75 to turn ON the limit test and set the limit line value.

   ☞ **Note:** You can set a limit line value with the limit test turned OFF, but you will not see the line displayed.

Figure 32 Setting a Limit Line



Step	Action
1	While in the Fault Location mode, press the Limit Test key to activate the limit line: First press - Test ON Aud (line and sound) Second press - Test ON (line only) Third press - Test OFF
2	Press the Config key
3	Press the Limit Line soft key
4	Use the keyboard to enter a limit value of your choice then press the Enter key.
5	Press the Esc key to exit the configuration screen

Test for Fault Location

1. Connect the Site Analyzer to the cable being tested.

   ☞ **Note:** If you calibrated the Site Analyzer with a phase stable cable connected to its antenna port, do not remove the cable. Connect it to the cable to be tested.

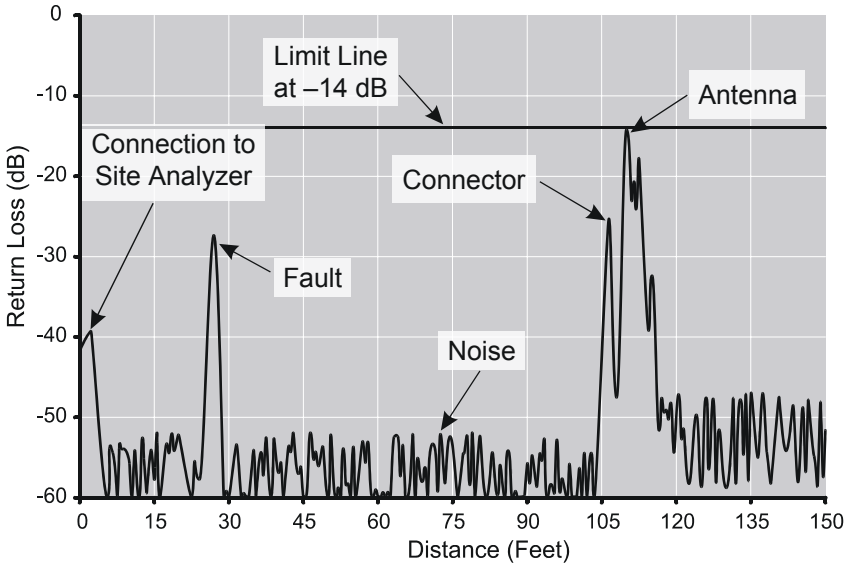
2. Wait at least 10 seconds for the sweep to update.

When you have a trace on the screen, you can do any of the following:

- Hold the trace (refer to Measurement Hold, page 78)
- Add markers to the trace (refer to Markers, page 79)
- Save the trace (refer to Save Trace, page 92)
- Print the trace (refer to Printing, page 89)

Interpreting the Fault Location Measurement

The graph below shows a typical Fault Location measurement for an antenna system. The table lists typical component return losses.



Typical Component Return Loss

Antenna	–14 dB
Connectors	–25 dB
Jumpers	–35 dB
Lightning Protector	–25 dB
Transmission Lines	–30 dB

1. Each connector or jumper will show up as a spike. If it is larger than the typical value, check the connector for damage.
2. Spikes where there are no components represent faults. Note the distance and check the line at that point for damage.
3. The largest spike is usually due to the antenna. Typically the trace after the antenna can be ignored.

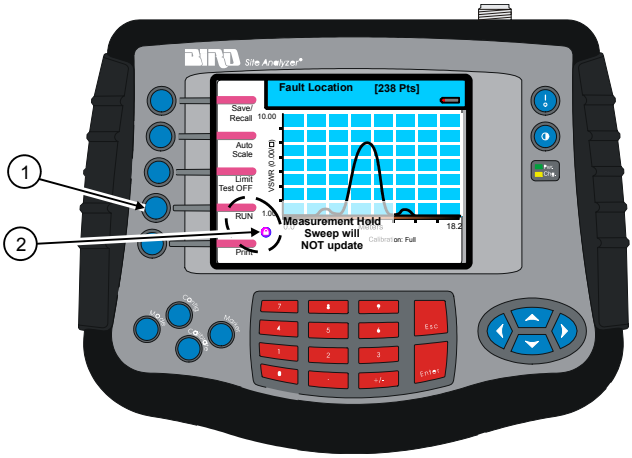
4. If you have selected a cable length that is less than the total length of the cable system, the trace might show a spike that is not really a fault, but rather an echo from the remaining portion of the cable that is beyond the length you chose. Such a spike is known as an alias. To avoid aliasing, you should always set the measurement distance to a value that is a few feet or meters greater than the entire length of your cable system.
5. A large spike (fault) near the Site Analyzer will mask other faults farther away. When you find a large spike near the Site Analyzer, fix it and then repeat the Fault Location measurement.

Measurement Hold

Measurement Hold stops updating the display at the end of the current sweep. Press the Hold key to toggle the sweep hold off and on. A measurement is held when there is a lock icon in the indicator ball. Measurement hold is available in Measure Match mode and Fault Location mode.

Follow the numbered steps in Figure 33, page 79 to turn measurement hold on or off.

Figure 33 Measurement Hold



Step	Action
1	Press the Hold soft key to hold the measurement; press the Run soft key to resume sweeping
2	The lock symbol indicates that the measurement is held

Markers

You must be in either Measure Match mode or Fault Location mode to use markers.

You can activate and use up to six markers to visually indicate the trace value at specific frequency points. All markers follow the current trace only. The site analyzer displays the frequency and signal value for each marker at the bottom of the screen. You can display each marker as a triangle pointer or a vertical line through the trace. You can also display the difference (delta) in frequency between two markers.

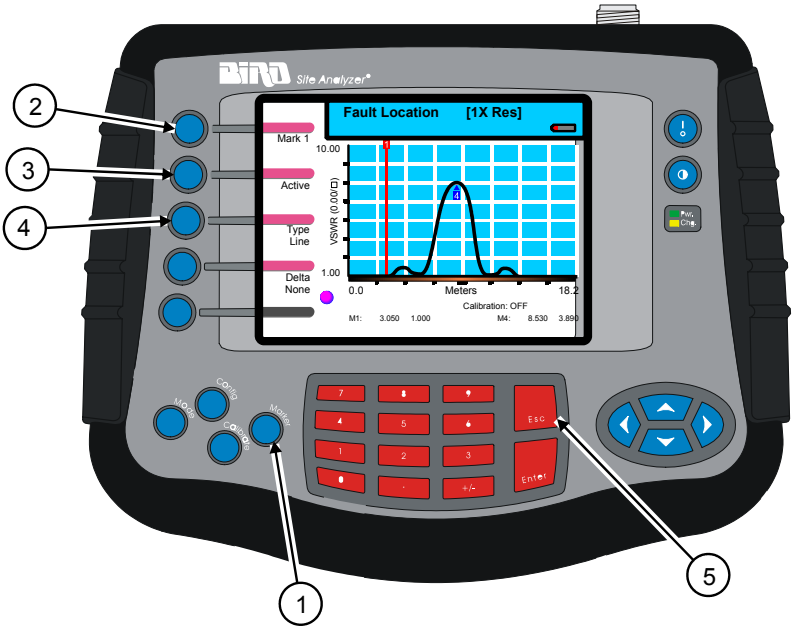
Markers indicate VSWR to 0.01, and Return Loss or Cable Loss to 0.1 dB.

When you display both a recalled trace and the current measurement trace at the same time, there is an additional marker option, single mode and dual mode. In single mode, the markers function normally (indicating the frequency and value at the marker). In dual marker mode, you select a marker using the Mark soft key and, at the bottom of the screen, the site analyzer displays the marker number, the frequency and value of the current trace at the marker, and the difference in frequency and value between the current trace and the recalled trace. The difference in frequency is always 0.00 (zero). Only the first three markers (M1, M2, M3) are available in dual mode.

Activate Markers and Set Marker Style

1. Be sure that you are in either Measure Match mode or Fault Location mode.
2. Follow the numbered steps in Figure 34 on page 81 to select and activate markers.

Figure 34 Activate Marker and Set Style



Step	Action
1	Press the Marker key to enter marker setup
2	Press the Mark soft key to select a marker (1-6)
3	Press the Active / Off key to turn ON the selected marker (active) or turn OFF the selected marker (off)
4	Press the Type soft key to select triangle marker (mark 4 in the figure) or line marker (mark 1 in the figure) Repeat Step 2 through Step 4 to select and activate up to six markers and set the mark style
5	Press the Esc key to return to the test screen

Move Markers

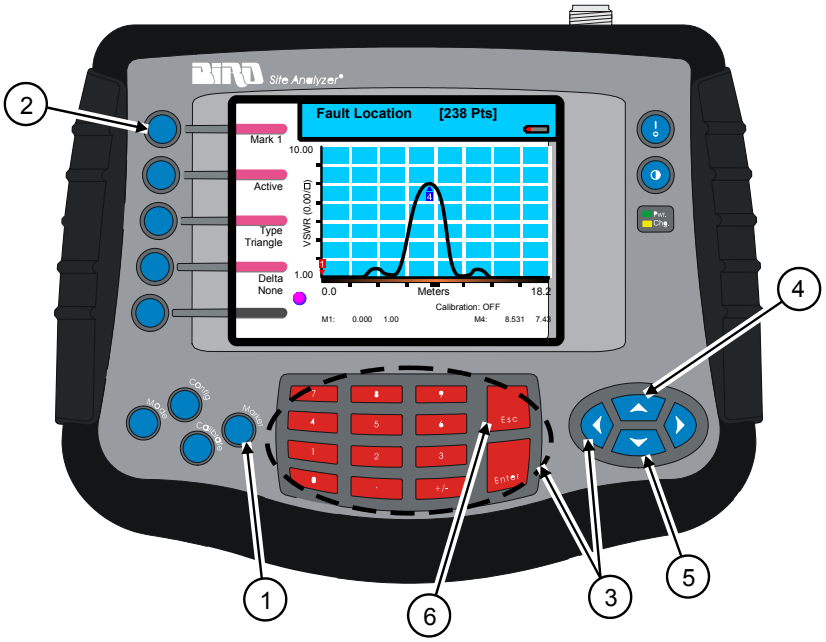
You can move the active marker by using the arrow scroll keys or by entering a distance with the numeric key pad. All markers follow the current trace only.

If you have recalled a trace and you want to use markers to compare it to the current trace, you need to select the dual mode (refer to Using Markers with Recalled Traces, page 42). The marker will move along the current trace (as described in the following paragraph) and compare *each* data point at the marker frequency (on the current trace) to the *first* saved data point in the recalled trace (other data points in the recalled trace are not compared).

Since traces can be created using different numbers of data points (238, 475, 949), moving a marker along a 475 data point or 949 data point trace will appear different from how the marker moves along a 238 data point trace. In a 238 data point trace, when you press the right or left scroll keys, the marker moves with each key press. In a trace with 475 data points, there are two data points at each pixel. When you first move to a new pixel, the screen displays the value of the first data point that was saved and when you press the right scroll key the marker does not “move” but the screen displays the value of the second data point. Pressing the right scroll key a third time moves to the next frequency. Similarly in a trace with 949 data points, there are four data points at each marker pixel. When you first move to a new frequency, the screen displays the value of the first data point that was saved and each time you press the right scroll key the marker does not “move” but the screen displays the value of the next data point (in the order saved). Pressing the right scroll key a fourth time moves to the next frequency.

1. Be sure that you are in either Measure Match mode or Fault Location mode.
2. Follow the numbered steps in Figure 35 on page 83 to select and move markers

Figure 35 Moving Markers



Step	Action
1	Press the Marker key to enter marker setup
2	Press the Mark soft key to select a marker (1-6)
3	Press the right or left arrow keys to move the marker right or left, or enter a frequency value on the keypad and press Enter
4	Press the up arrow key to move the marker to the highest point on the trace
5	Press the down arrow key to move the marker to the lowest point on the trace
6	Press the Esc key to return to the test screen

Using Delta Markers

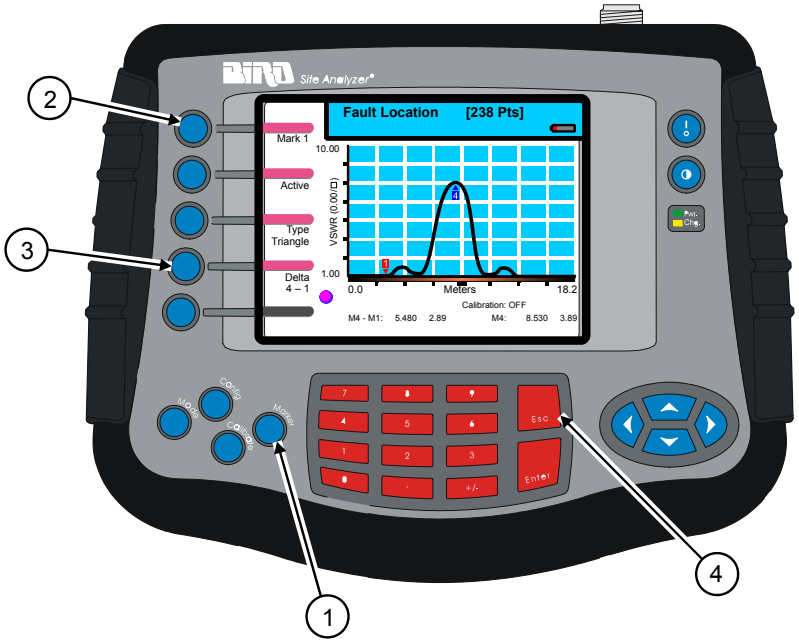
In the delta marker mode, only active markers will be visible. The delta marker feature displays the difference (delta) in both frequency and value between the selected marker and each active marker. If the limit line is active, you will also see the difference between the selected marker and the limit line. The frequency difference between the selected marker and the limit line will always be the frequency of the marker. All markers follow the current trace only.

Note: The delta marker feature compares points only on one trace, and you must have at least two active markers for the delta option to work.

1. Make sure that you are in either Measure Match mode or Fault Location mode
2. To select and use delta markers, follow the numbered steps in Figure 36 on page 85.

Figure 36 Delta Markers

Using Markers with Recalled Traces



Step	Action
1	Press the Marker key to enter marker setup
2	Press the Mark soft key to select an active marker (1-6)
3	Press the Delta soft key to cycle through the active markers and limit line (if active)
4	Press the Esc key to return to the test screen

When a trace is recalled, the screen displays both the current trace and the recalled trace and there is an additional marker option, single / dual mode. In single mode, the markers function normally; the site analyzer displays the frequency and trace magnitude at each marker. In dual mode, the markers show the actual magnitude of both traces and the difference in magnitude between the recalled trace and the current

reading. All markers follow the current trace only, and only three markers are available in dual mode, M1, M2, and M3. When you select dual mode, the markers move as described in Move Markers, page 82.

1. Be sure that you are in either Measure Match mode or Fault Location mode.

2. Recall a trace (refer to Recalling a Saved Trace, page 105).

3. Follow the numbered steps in Figure 37 on page 87.

Figure 37 Using Markers with Recalled Traces

Step	Action
1	Press the Marker key
2	Press the Mode soft key to select single mode or dual mode
3	Select a marker to move
4	Press the left or right scroll keys to move the marker
5	Press the Esc key to return to the test screen

Smooth

Smooth is an option that will digitally average the displayed trace. There are three levels of smoothing, low medium, and high.

Follow the steps in Figure 38 to set smoothing. Figure 39, page 89 shows the same trace with high smoothing selected.

Figure 38 Set Display Smoothing

Step	Action
1	Press the Config key
2	Press the Smooth key First press - smooth averaging is Low Second press - smooth averaging is Medium Third press - smooth averaging is High Fourth press - smooth averaging is None (off)
3	Press the Esc key to exit the configuration screen

Figure 39 Display with High Smoothing Selected

Saving The Measurement

You can save the trace and recall and review it at a later time (refer to Save Trace, page 92).

Printing

The Bird Site Analyzer can print the information displayed on the screen to any HP Deskjet printer that supports the PCL Level 3 protocol. To print the screen image, first hold the image (Figure 33, page 79) then press the Print soft key (Figure 40, item 1).

☞ **Note:** If you press the Print soft key when there is no printer connected, the unit will try to print and

then display the word ERROR beside the Print soft key. To clear the error, select Mode>Utility>Printer, then press the Printer soft key a second time to reset the system.

Figure 40 Print the Screen Image

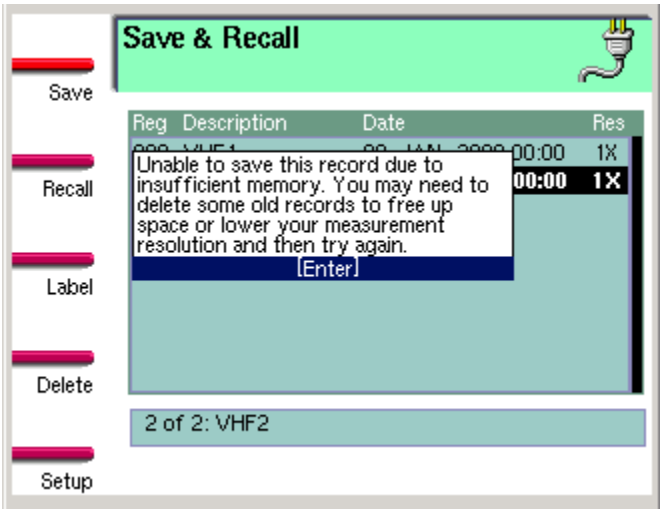
Chapter 5 Save and Recall

Traces and instrument setups can be saved to and recalled from the nonvolatile memory in the unit. The Site Analyzer identifies saved items with a sequentially generated number, a time-date stamp, and the number of data measurement points. For example, a trace might be identified as `010 13-DEC-2004 10:47 475` where `010` is the sequential number, `13-DEC-2004 10:47` is the time-date stamp, and `475` is the number of data points measured.

You can also add descriptive labels (text and numbers) to the items. This section discusses saving and recalling traces, and creating and editing labels. Refer to Save a Setup, page 106 for information about saving instrument setups.

The memory available for storing traces and setups is limited. You can store up to 15 custom instrument setups. The maximum number of traces that you can store is limited to 500 at 238 data points or 250 at 475 data points or 125 at 949 data points. All of the stored traces do not need to be of the same number of data points, therefore, the actual maximum number of traces you can save varies depending upon the number of data points in the traces. For example, you could store 140 traces with 238 data points plus 60 traces with 475 data (which equals approximately the same capacity as 120 traces with 238 data points) plus 60 traces with 949 data points (which equals approximately the same capacity as 240 traces with 238 data points). When the storage memory is full or cannot hold the trace you are trying to save, the system displays a message (Figure 41, page 92) stating that there is no more space and that you need to save the trace at a lower number of data points (i.e. change the number of data points in the Config menu) or free space by deleting some traces.

Figure 41 Out of Memory Message



Save Trace

To save a trace, you must be in either Measure Match mode or Fault Location mode

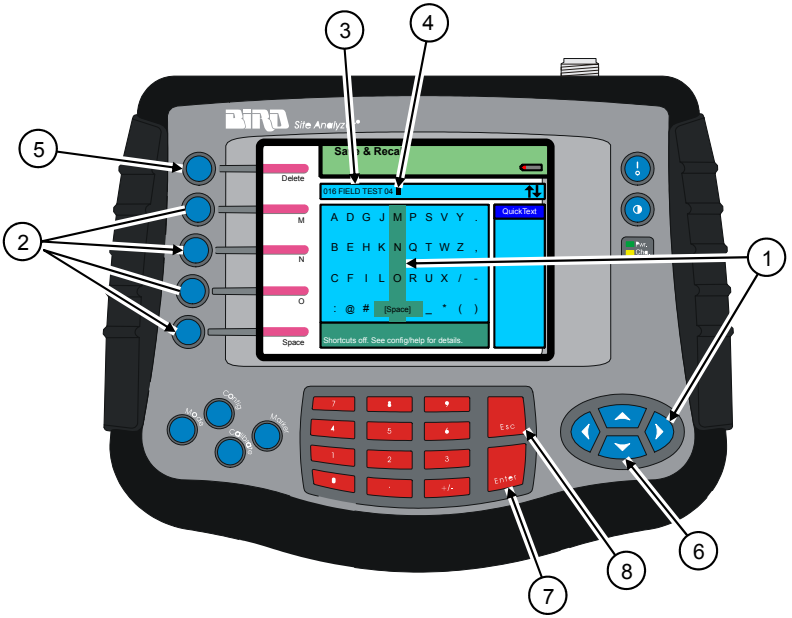
1. Press the Save/Recall soft key.
2. Press the Save soft key (Figure 42, page 93, item 1) which automatically opens the text label screen (Figure 43, page 93).
3. Follow the numbered steps in Figure 43 on page 93 to enter a label (file name) for the trace.

☞ **Note:** If the numeric shortcuts are off, press a number key once to enter a number. If the shortcuts are on, press the key twice. Shortcuts are turned off by default. Refer to Label Text Shortcuts, page 94 for more information about numeric shortcuts.

☞ **Note:** The items on the Save and Recall list are automatically sorted by the text field using the order blank, numeric, alpha characters.

Figure 42 Save Trace Screen

Figure 43 Text Label Screen



Step	Action
1	Press the right and left scroll keys to select a character column
2	Press a soft key to enter the letter indicated at its right
3	Label name appears as characters are entered
4	Text cursor indicates where next character will be entered
5	Press the Delete key to remove the character immediately at the left of the text cursor
6	Press the up and down scroll keys to move the text cursor to select a character in the label text (type over function)
7	Press the Enter key to accept the label text
8	Press the Esc key to exit Save and Recall mode

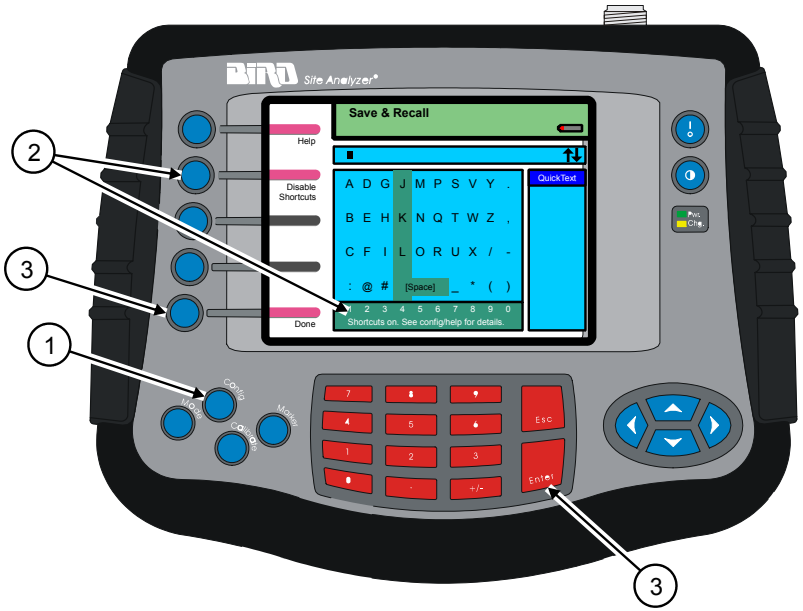
Label Text Shortcuts

Typically when you enter or edit label text, you use the right and left scroll keys to select columns of letters. Using shortcuts allows you to select a column of letters by pressing a number on the key pad. When you enable shortcuts, each column is identified by a number at the bottom. When shortcuts are enabled, press the number key once to select the column, and twice to enter a number.

To enable or disable shortcut keys, you must be in either Measure Match mode or Fault Location mode.

1. Press the Save/Recall soft key.
2. Press the Save soft key.
3. Press the Config key.
4. Follow the numbered steps in Figure 44, page 95 to enable or disable the label shortcuts.

Figure 44 Text Label Configuration



Step	Action
1	Press Config key to enter text label setup
2	Press soft key to enable or disable short-cuts
3	Press the Done soft key or Enter key to exit configure screen
4	Press the Esc key two times to return to the test mode screen

Label Text Help

The Site Analyzer has a built-in help screen that describes how to use the label text feature. To access the label text help, you must be in either Measure Match mode or Fault Location mode.

1. Press the Save/Recall soft key.
2. Press the Save soft key.

3. Press the Config key.
4. Follow the numbered steps in Figure 45, page 96 to display the label text help screen.

Figure 45 Text Label Help

Step	Action
1	Press the Help soft key to open Help screen
2	Press the Enter key to close Help screen
3	Press the Esc key two times to exit the configure screen

Changing (editing) Label Text

You can change the label text on a saved item. You must be in either Measure Match mode or Fault Location mode to edit a label text.

1. Press the Save/Recall soft key to display the list of saved items.
2. Press the up or down scroll key to select an item to edit.
3. Press the Label soft key (Figure 46, item 1) to enter the label text screen.
4. Follow the numbered steps in Figure 43 on page 93 to select, delete, and enter characters then press the Enter key to save the changes.

   ☞ **Note:** When you make changes to label text, the only typing option is overstrike. You can type over any character or space, but you cannot insert characters and have the remaining text move to the right.

   ☞ **Note:** You cannot edit the system generated sequential number or the date-time stamp and the resolution setting.

5. Press the Esc key to exit the Save and Recall screen.

Figure 46 Edit Label Text

Quicktext for Trace Labels

You can store commonly used label text elements (strings of characters) in Quicktext. When you are

entering text into a label, you can select pre-stored text elements from the QuickText area instead of typing each letter.

You must be in either Measure Match mode or Fault Location mode to use QuickText.

View Quicktext Elements

The Quicktext column in the normal text entry screen displays only 15 characters. To view all characters in each QuickText element, you must use the View QText option.

1. Press the Save/Recall soft key
2. Press the Label soft key
3. Follow the numbered steps in Figure 47, page 99 to view the full width QuickText list and to exit the view mode.

Figure 47 View Quicktext List

Step	Action
1	Press the right scroll key to select the QuickText column
2	Press the View QText soft key to open the full width Quick Text list
3	Press the Enter key to close the full list
4	Press the Esc key to exit QuickText

Create Quicktext

You must be in either Measure Match mode or Fault Location mode to create QuickText.

1. Press the Save/Recall soft key
2. Press the Label soft key
3. Use the keypad to create text on the edit line (see Figure 43 on page 93)

4. Follow the numbered steps in Figure 48, page 100 to add the edit line text to the QuickText list.

Figure 48 Creating QuickText

Step	Action
1	Press right scroll key to select the QuickText column
2	Press the Add to QText key to add the text to the QuickText list
3	Press the Esc key to exit QuickText

Use Quicktext

You must be in either Measure Match mode or Fault Location mode to use QuickText. QuickText text elements are appended to the text on the edit line.

1. Press the Save/Recall soft key
2. Press the Label soft key

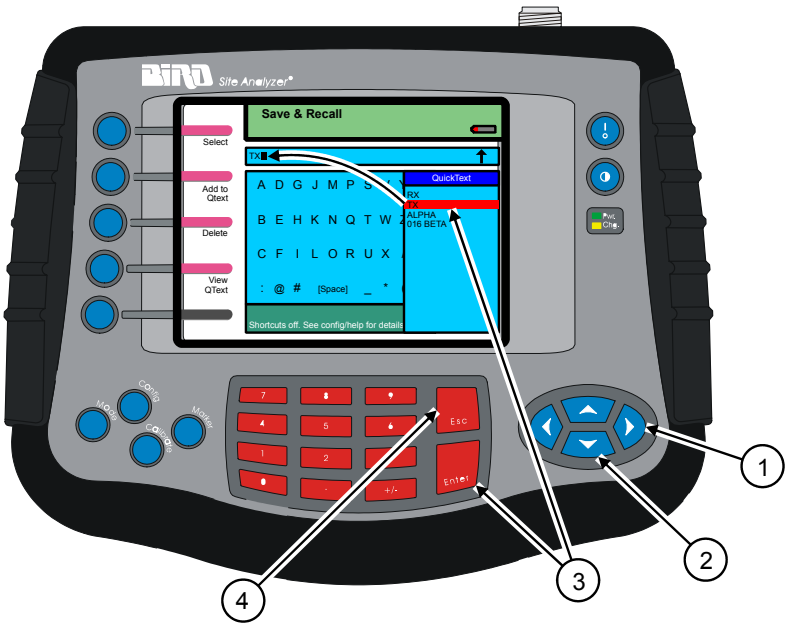
3. Use the Delete soft key to delete unwanted text from the edit line.
4. Use the up or down scroll keys to position the text cursor where you want to insert a QuickText element.

   ☞ **Note:** QuickText elements overwrite existing text from the insert cursor location to the right. QuickText characters will overwrite only the number of existing text characters that equals the number of characters in the QuickText element.

   For example, if the existing text on the edit line is 005 ANTENNA SITE THREE and you want to insert the QuickText element TOWER starting at the "S" in the word SITE, you would position the insert cursor on the "S" in SITE and then select and add TOWER from the QuickText list. The resulting text on the edit line would be
   005 ANTENNA TOWERTHREE (five characters were replaced starting at the cursor position).

5. Follow the numbered steps in Figure 49, page 102 to select and insert QuickText text elements into the text on the edit line.

Figure 49 Inserting QuickText Elements



Step	Action
1	Press the right scroll key to select the QuickText column
2	Press the up or down scroll keys to select a QuickText text element
3	Press the Enter key to insert the text element into the text on the edit line
4	Press the Esc key to exit the label screen

Delete Quicktext

You must be in either Measure Match mode or Fault Location mode to delete QuickText elements.

1. Press the Save/Recall soft key
2. Press the Label soft key

3. Follow the numbered steps in Figure 50, page 103 to select and delete QuickText text elements.

Figure 50 Delete a QuickText Element

Step	Action
1	Press the right scroll key to select the QuickText column
2	Press the up or down scroll keys to select a QuickText text element
3	Press the Delete soft key to delete the selected text element from the list.
4	Press the Esc key to exit the QuickText list.

Recall a Saved Trace

When you recall a saved trace, it is displayed along with the trace currently being measured (two traces on the screen). To remove a recalled trace from the display, press the Save/Recall soft key then press the Esc key. With a current and recalled trace, the display behaves as follows:

- The frequency range will change to the settings of the recalled trace.
- Recalled traces adopt the display type of the current trace (envelope, maximum, minimum).
- The resolution of the recalled trace does not affect the resolution of the current trace.
- Markers always follow the current trace not the recalled trace.
- When comparing the current trace to a recalled trace, each data point on the current trace is compared to only the first data point on the recalled trace (at the frequency of the marker).
- The status box at the top of the screen displays the resolution and display type of the current trace on the top line and the label text of the recalled trace on the bottom line.

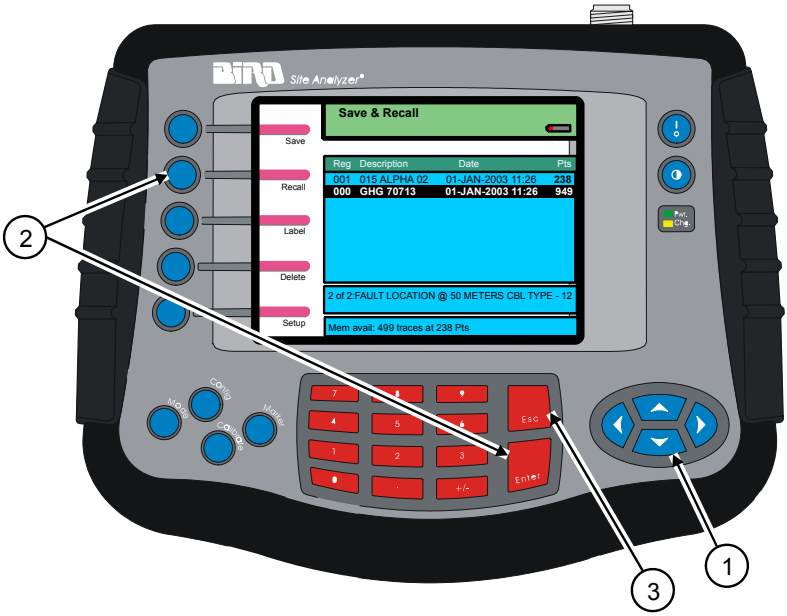
☞ **Note:** Calibration is automatically turned off if the recalled trace has a different frequency range from the trace currently being measured.

The recalled a trace is drawn using the same display type (envelope, maximum, minimum) as the trace currently being measured.

You must be in either Measure Match mode or Fault Location mode to recall a saved trace.

1. Press the Save/Recall soft key
2. Follow the numbered steps in Figure 51, page 105 to select and recall a saved trace.

Figure 51 Recalling a Saved Trace



Step	Action
1	Press the up and down scroll keys to select a saved trace
2	Press the Recall soft key or the Enter key to recall the selected trace
3	To remove a recalled trace from the display, press the Save/Recall soft key then press the Esc key

Delete a Saved Trace

You must be in either Measure Match mode or Fault Location mode to delete a saved trace.

1. Press the Save/Recall soft key
2. Follow the numbered steps in Figure 52, page 106 to select and delete a saved trace.

Figure 52 Deleting a Saved Trace

Step	Action
1	Press the up and down scroll keys to select an item to delete
2	Press the Delete soft key to delete the selected item. The message “Are Your Sure?” appears beside the soft key. Press the Delete soft key a second time to confirm the delete or press the Esc key to cancel the delete.
3	Press the Esc key to exit the Save and Recall list.

Save a Setup

You can save the current setup parameters and recall them at a later time. When you recall a saved setup,

the saved values replace the current parameters. Saving a setup captures the following values:

Scale Min	Start Frequency	Center Frequency
Scale Max	Stop Frequency	Span Frequency
Start Distance	Units	Calibration Coeff.
Stop Distance	FM Status	Limit Line

Saving a setup also includes the internal temperature of the Site Analyzer and the date and time of the save.

You must be in either Measure Match mode or Fault Location mode to save a setup.

1. Press the Save/Recall soft key
2. Follow the numbered steps in Figure 53, page 108 to save a setup.

☞ **Note:** Each entry on the saved setup list is identified by a setup sequence number, the span frequency, the date and time, and the internal temperature of the Site Analyzer. The sequence number is automatically generated by the software. The save setup list can have up to 14 items.

☞ **Note:** The items on the Save and Recall list are automatically sorted by the text field using the order blank, numeric, alpha characters.

Figure 53 Saving a Setup

Step	Action
1	Press the Setup soft key
2	Press the Save soft key. The newly saved setup appears on the list.
3	Press the Esc key to exit the Save and Recall screen

Recall Setup

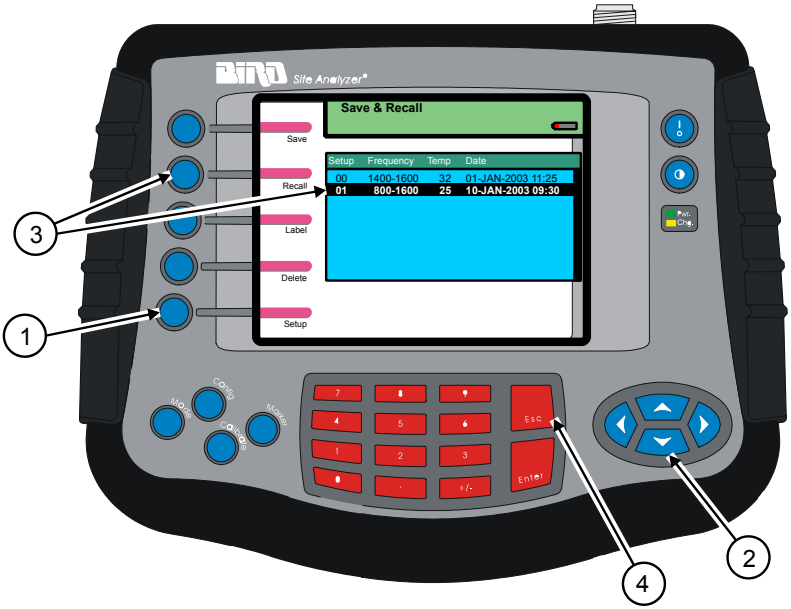
You must be in either Measure Match mode or Fault Location mode to recall a setup.

☞ **Note:** Since a new setup may change the frequency (which cancels calibration), calibrate the Bird Site Analyzer immediately after recalling a setup.

1. Press the Save/Recall soft key

2. Follow the numbered steps in Figure 54, page 109 to recall a setup.

Figure 54 Recalling a Setup



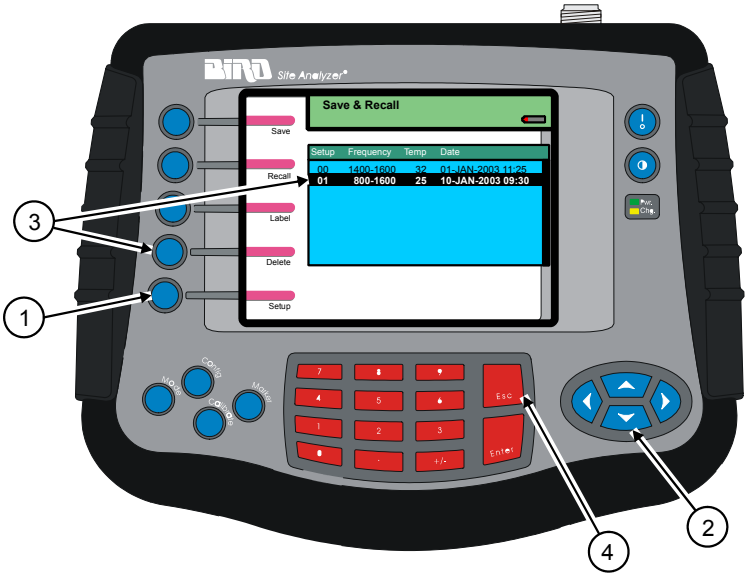
Step	Action
1	Press the Setup soft key
2	Press the up and down scroll keys to select a setup to recall.
3	Press the Recall soft key. The selected setup parameters are recalled and replace the current setup in the unit
4	Press the Esc key to exit the Save and Recall screen

Delete Setup

You must be in either Measure Match mode or Fault Location mode to delete a setup.

1. Press the Save/Recall soft key
2. Follow the numbered steps in Figure 54, page 109 to delete a setup.

Figure 55 Deleting a Setup



Step	Action
1	Press the Setup soft key
2	Press the up and down scroll keys to select a setup to delete.
3	Press the Delete soft key. The message “Are Your Sure?” appears beside the soft key. Press the Delete soft key a second time to confirm the delete or press the Esc key to cancel the delete.
4	Press the Esc key to exit the Save and Recall screen

Chapter 6 Measure Power Mode

☞ **Note:** The figures in this chapter do not show the entire Site Analyzer. The figures show only the screen image and the keys you press to accomplish a setup or measurement.

☞ **Note:** Power measurement comes standard on all models *except* the SA-1700EX. To upgrade a SA-1700EX to aN SA-6000EX, which has power measurement capability, please contact Customer Service.

This measurement verifies and monitors the condition of the transmitter system. Multiple measurement values can be simultaneously displayed, depending on the sensor. One measurement is also displayed on an analog dial. Sensors compatible with the Bird Site Analyzer include Bird VSWR Monitors and Broadcast Power Monitors, as well as the Bird 5010B, 5011, and 5012.

Press the keys indicated in the following figure to enter the Measure Power mode.

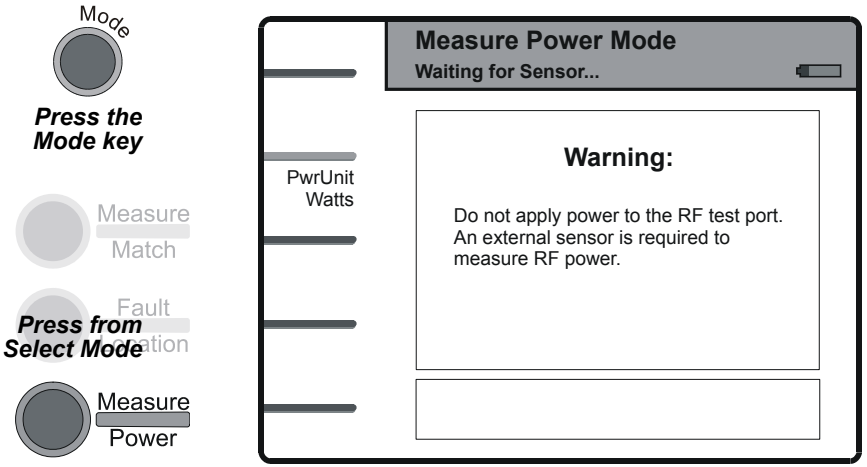
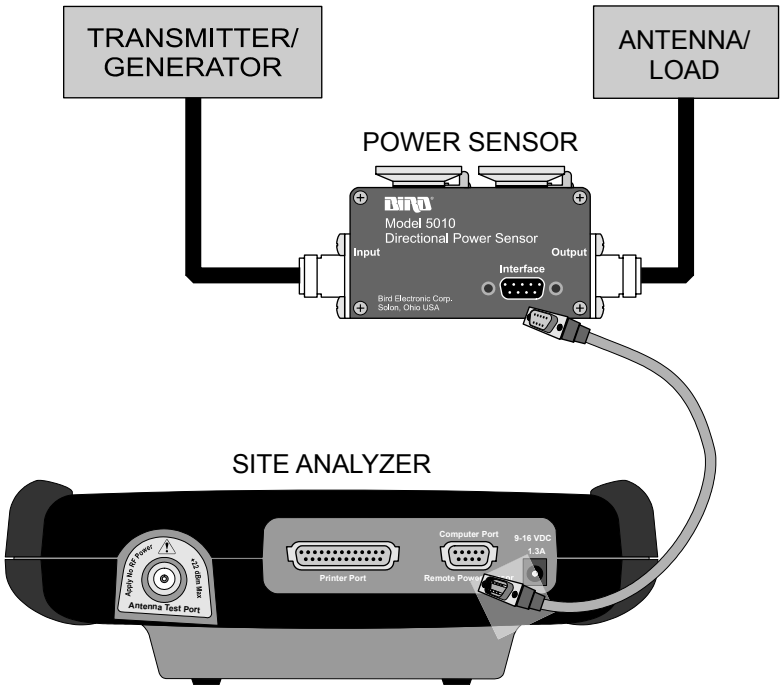


Figure 56 Connecting the Site Analyzer to Measure Power



Connecting a Sensor

> CAUTION
> Always turn off the SA before connecting or disconnecting a sensor.

Although unlikely, it is possible to corrupt the power sensor firmware by connecting it to the Site Analyzer while the SA is on. To prevent this, turn the SA off before connecting or disconnecting a sensor.

Use a 9-pin serial cable to connect a power sensor to the Site Analyzer's serial port, labeled "Remote Power Sensor" (Figure 56 on page 112). When a sensor is properly connected, the status message (at the top of the screen) will change from "Waiting for Sensor" to

"Sensor Connected". The warning screen will be replaced by the main display.

CAUTION
+22 dBm max. input
Do not apply RF power to Antenna Test Port. Exceeding the maximum input will damage the Site Analyzer.

The antenna test port is used only for testing unpowered systems. For power measurement, you *must* connect an external power sensor to the "Remote Power Sensor" port *(*see Figure 56 on page 112).

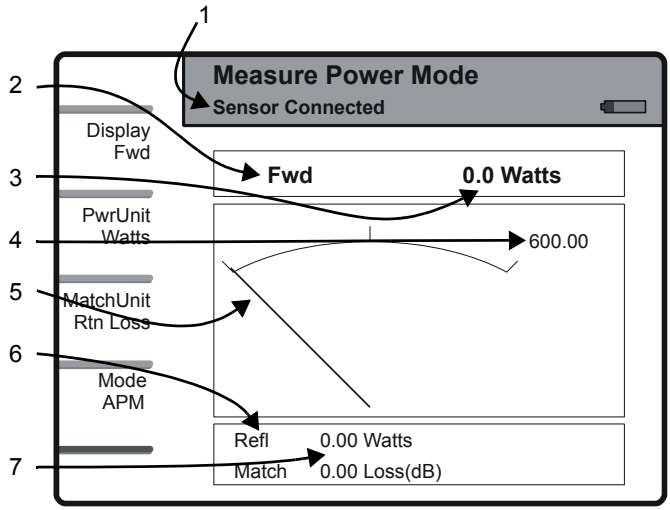
CAUTION
When using a Bird 5011 or 5011-EF, do not exceed 2 W average or 125 W peak power for 5 µs. Doing so will render the sensor inoperative.

For best results with element-based sensors such as the Bird 5010B, connect the sensor and enter the forward element's power rating before taking any data (refer to Setting the Full Scale Power, page 115).

Display Description

Figure 57 Measure Power Screen Features

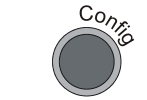
Measure Power Sample Display, with a sensor properly connected



Item	Description	Explanation
1	Sensor Status	Indicates the connection status of the power sensor.
2	Primary Measurement	Identifies the measurement displayed on the analog dial.
3	Primary Value	Numeric display of the primary value.
4	Measurement Scale	Indicates the dial's full scale.
5	Dial	Graphic display of the primary measurement.
6	Secondary Measurements	Identifies measurements not displayed on the dial.
7	Secondary Value	Numeric display of secondary values.

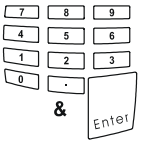
Setting the Full Scale Power

For element-based sensors, enter the power rating listed on the forward element before making any measurements. Also, check that the reflected element's rating is 10% of the forward element's.

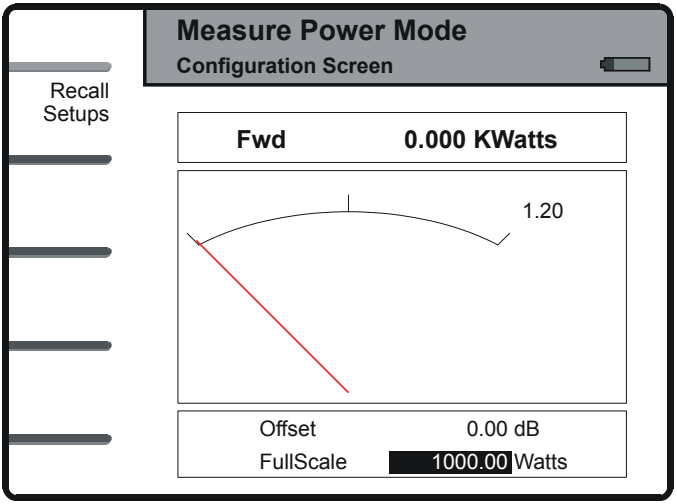


Press from Measure Power Mode

Scroll to Full Scale



Enter the forward element power



The Bird Site Analyzer will automatically set the full scale power for sensors that do not use elements, such as the Bird 5011 or 5012.

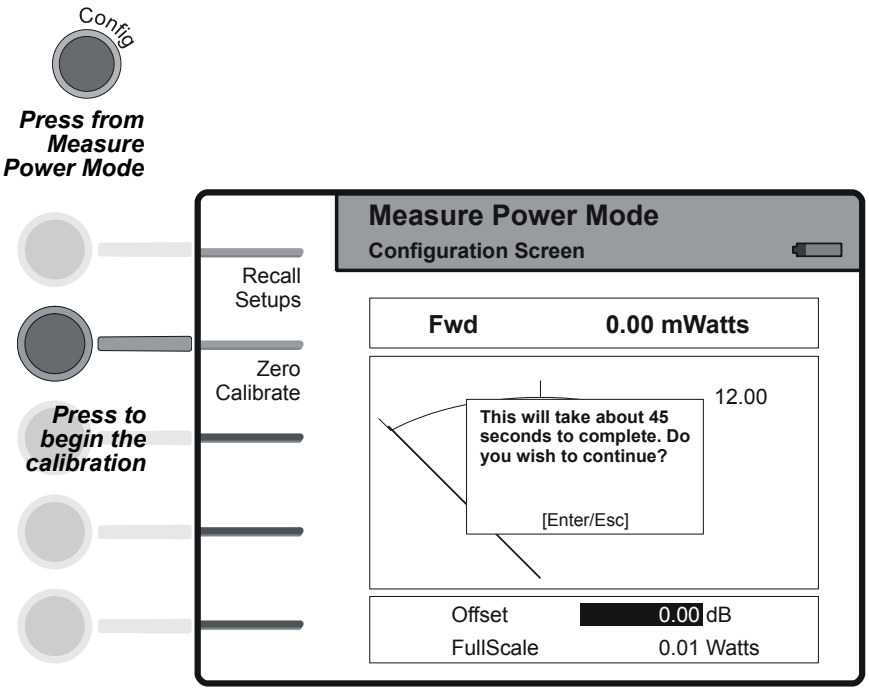
Zeroing Bird Power Sensors

> CAUTION
> When using a Bird 5011 or 5011-EF, do not exceed 2 W average or 125 W peak power for 5 µs. Doing so will render the sensor inoperative.

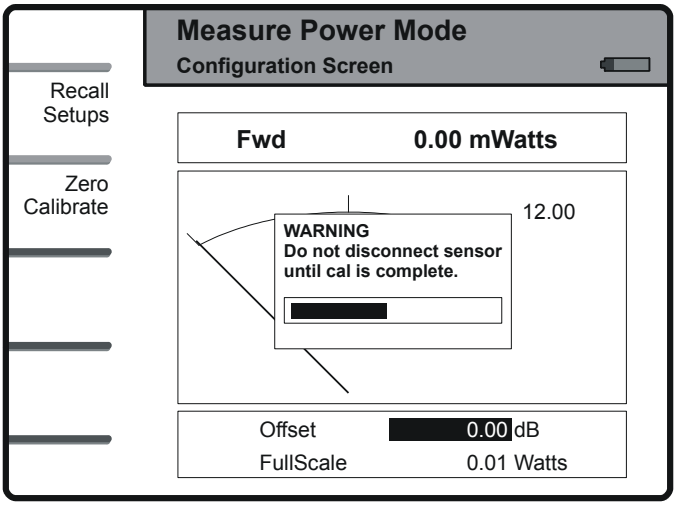
Over time, the sensor's "zero value" (reading with no applied RF power) can drift, making all readings inaccurate by this value. For example, if the zero value is –2 µW, measuring a 5 mW signal will give a reading of

4.998 mW, a 0.04% error. Periodically rezero the sensor. This applies to 5011 and 5012 power sensors.

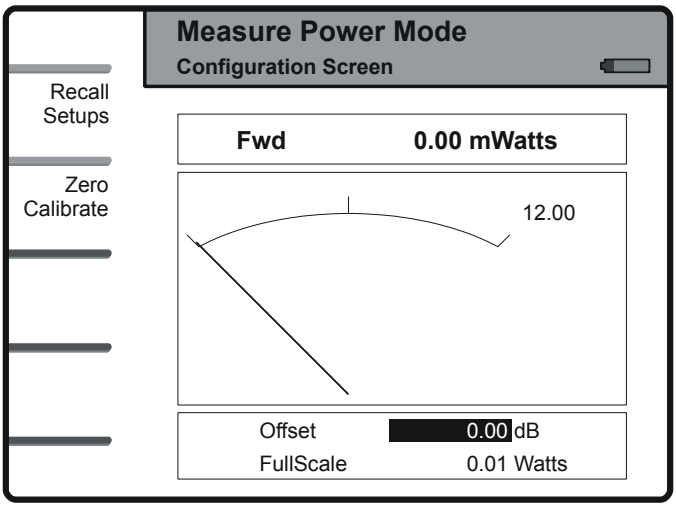
☞ **Note:** For best results, make sure the sensor has been connected to the Site Analyzer and the SA turned on for at least 5 minutes. Do not apply RF power to the sensor during calibration.



Press to accept the warning



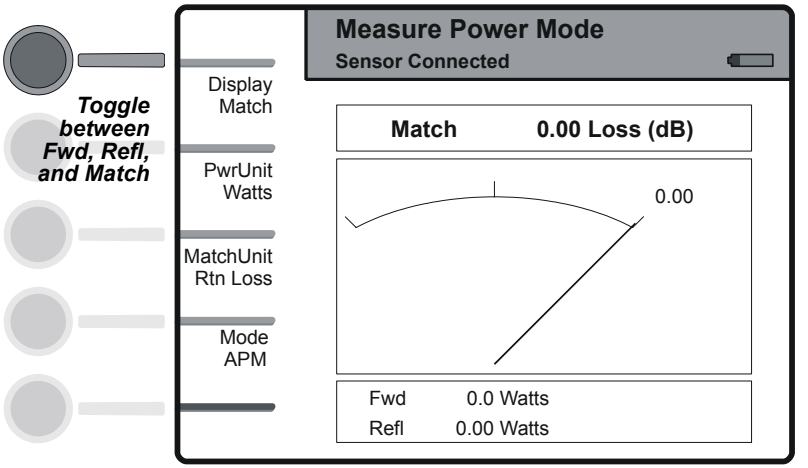
Wait for calibration to finish



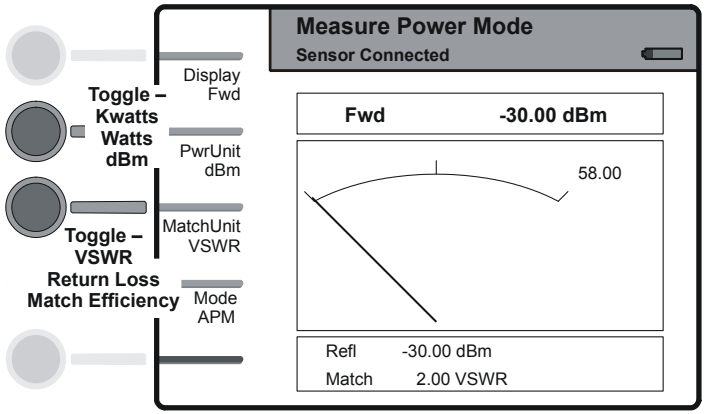
Choosing the Displayed Measurement

The primary display shows one value on the large numerical display and the pointer. Other measurements are displayed numerically below the dial.

☞ **Note:** When using a terminating power sensor, only forward power can be measured. Reflected power and match will not be displayed.

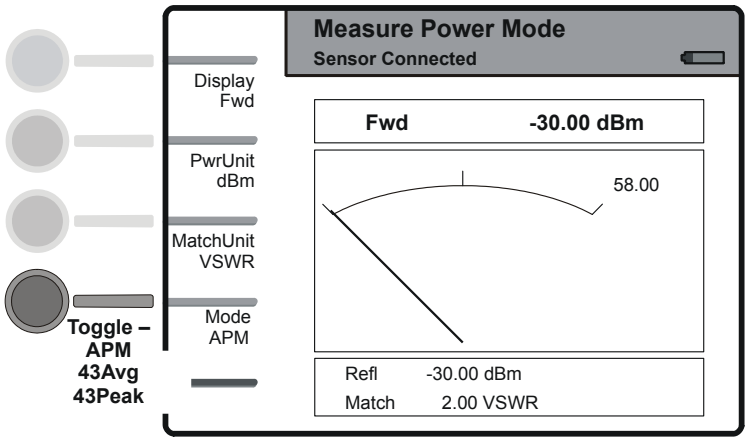


Setting Units



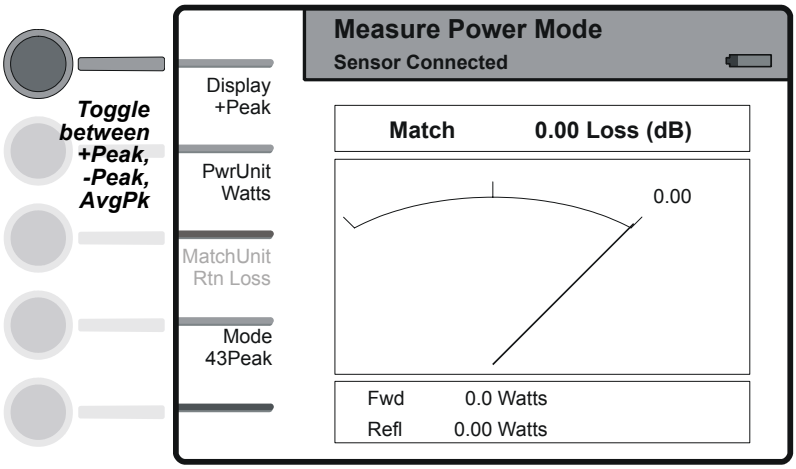
Changing the mode for the 5010B

The 5010B has three modes of operations, APM, 43Avg, and 43Peak. Bird 43 Elements can measure average, peak, and average of max. and min. power. Bird APM Elements can only measure average power.



The 43Peak Mode

When the 5010B is in the 43Peak mode, the measurements change as shown below.

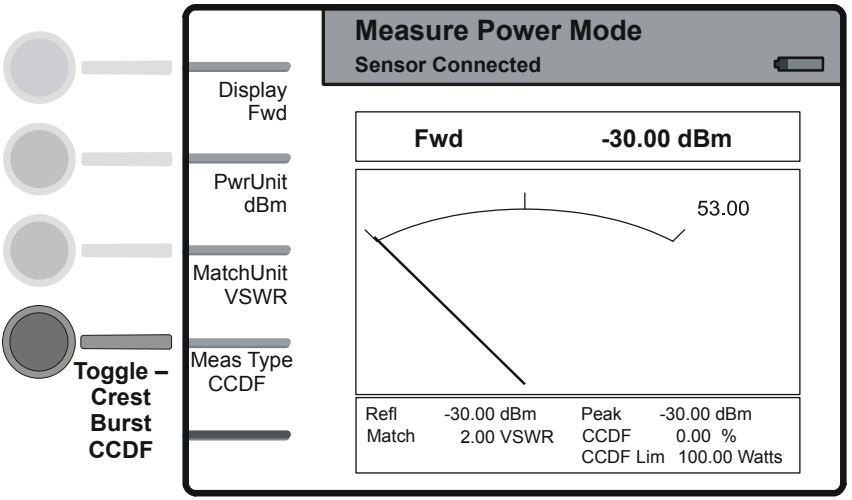


☞ **Note:** When using the 5010B in the 43Peak mode, the match units are no longer needed and are greyed out.

Using the 5012 Wideband Power Sensor

Changing the Measurement Type

The 5012 has three different measurement modes, Create, Burst, and CCDF.



Choosing the Displayed Measurement

There are five measurements that can be displayed in each measurement type. FWD, REFL and MATCH are common to all of the measurement types. The other two depend on the measurement type as show in the table below.

Meas. Type	Crest	Burst	CCDF
Displayed Meas.	Peak	Burst	Peak
	Crest	Duty	CCDF

Function Descriptions

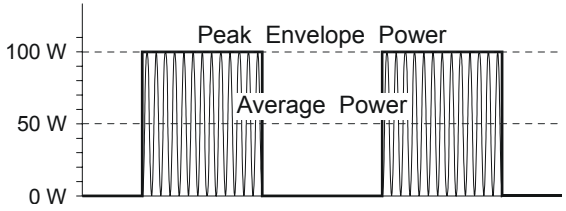
Average Power

Average power is a measure of the equivalent "heating" power of a signal, as measured with a calorimeter. It measures the total RF power in the system, and does not depend on number of carriers or modulation scheme. The WPS is a broadband sensor that mea-

sures power across its entire frequency range. Its diodes operate in their 'square law' region so that the detector output is directly proportional to the average power, without any additional error correction.

Average and Peak Envelope Power

Square Wave Signal



VSWR

VSWR measures the relation between forward and reflected average power. The Bird Wideband Power Sensor calculates the VSWR from the Forward and Reflected Average Power measurements. Rho and Return Loss are also the same measurement, but in different units:

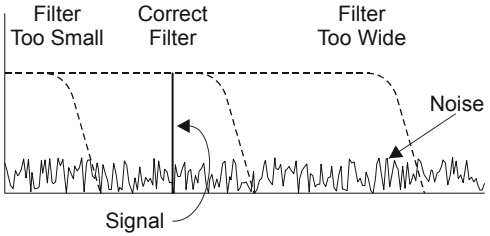
$$\text{Rho } (\rho) = \sqrt{P_F / P_R} \quad , \quad \text{VSWR} = \frac{1+\rho}{1-\rho} \quad \text{, and}$$

$$\text{Return Loss (dB)} = 20 \times \log \rho$$

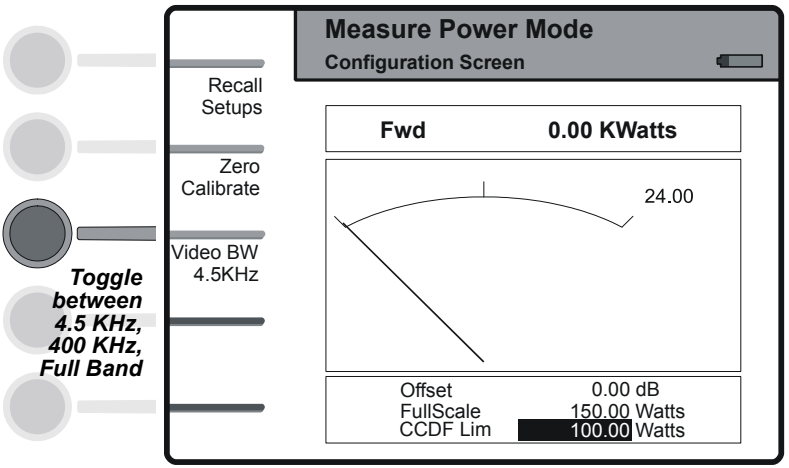
Video Filter

Except for average power and VSWR measurements, all WPS measurements rely on a variable video filter to improve accuracy. This filter can be set to either 4.5 kHz, 400 kHz, or full bandwidth. It should be as narrow as possible while still being larger than the demodulated signal bandwidth (video bandwidth). Narrowing the filter limits the noise contribution caused by interfering signals. Listed below are some common modulation schemes and the appropriate video filter.

Video Filter Settings, 300 kHz Signal



Video Filter	Modulation Type
4.5 kHz	CW Burst (Burst width > 150 µs), Voice Band AM, FM, Phase Modulation, Tetra
400 kHz	CW Burst (b.w. > 3 µs), GSM, 50 kHz AM, DQPSK
Full Band-width	CW Burst (b.w. > 200 ns), CDMA, WCDMA, DQPSK, DAB/DVB-T



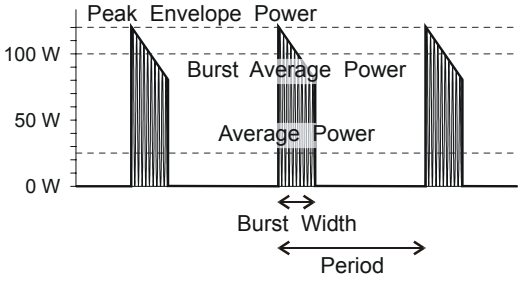
Peak Envelope Power

Peak power measurements detect amplitude changes as a signal modulates the carrier envelope. The WPS operates in an asynchronous cycle: 300 ms of waveform sampling followed by a 50 ms reset period. The peak power is then displayed and the cycle repeats. The display therefore updates about three times per second.

Burst Average Power

Burst width (BW) is the duration of a pulse. Period (P) is the time from the start of one pulse to the start of the next pulse. Duty cycle (D) is the percentage of time that the transmitter is on. To calculate the duty cycle simply divide the burst width by the period (D = BW / P). Low duty cycles mean that the burst width is much less than the period; a large amount of dead time surrounds each burst. For low duty cycles, the burst average power will be much larger than the average power.

Burst Average Power



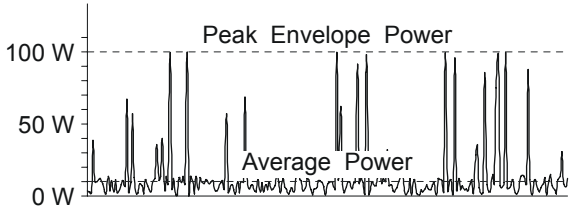
After peak power is measured, a threshold of ½ the peak is set. The sampled power crosses that threshold at the beginning and end of each burst. The time between crossings is used to calculate the duty cycle. Burst Average Power is calculated by dividing the Average Power by the Duty Cycle.

Crest Factor

Crest factor (CF) is the ratio of the peak and average powers, in dB. The WPS calculates the Crest Factor from the Forward Peak and Average Power measurements.

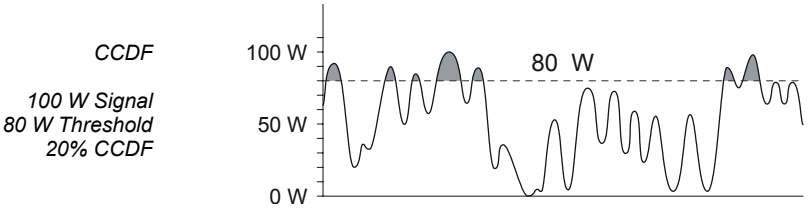
Crest Factor

10 dB CDMA Signal
100 W Peak
10 W Ave

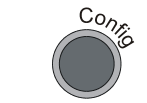


Complementary Cumulative Distribution Function (CCDF)

CCDF measures the amount of time the power is above a threshold. Equivalently, it is the probability that any single measurement will be above the threshold. The WPS samples the power over a 300 ms window and compares it to a user-specified threshold, in Watts. The time above the threshold relative to the total time is the CCDF.

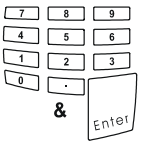


Setting the CCDF Limit

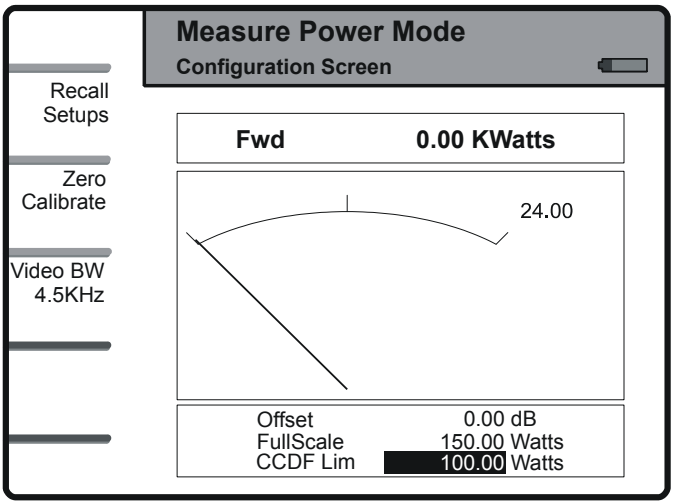


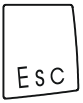
Press from Measure Power Mode

Scroll to CCDF Lim

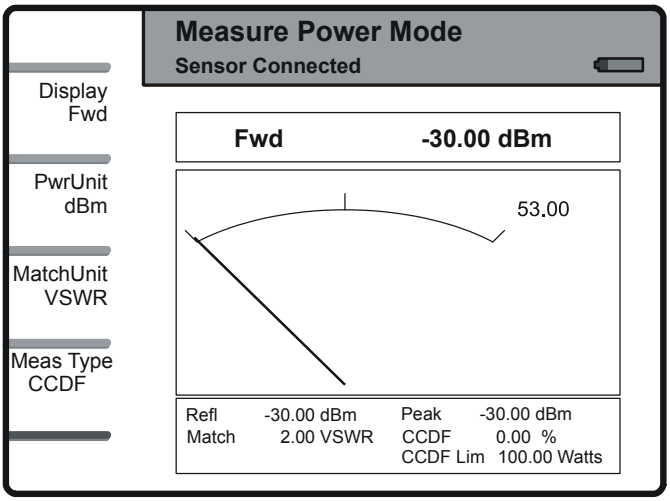


Enter the new value





The CCDF Limit is displayed at the bottom of the main display



Setting the Offset

To read unattenuated power when using a coupler or attenuator, enter (in dB) the attenuation or coupling factor. To convert percentages to dB, use the equation:

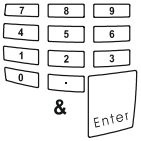
$$\text{Attenuation (dB)} = 10 \times \text{Log}_{10}[\text{Attenuation (\%)} / 100]$$

5011-EF

The Bird 5011-EF uses frequency-dependent correction factors to provide more accurate measurements. To use these, look at the label on the side of the sensor and find the correction factor at the frequency being measured. Add the correction factor to the other attenuation or coupling factors, and enter this as an offset in the Site Analyzer.

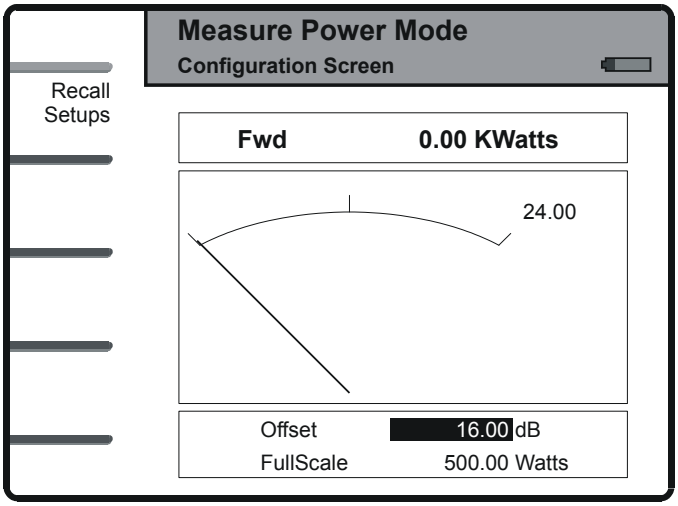
Press from Measure Power Mode

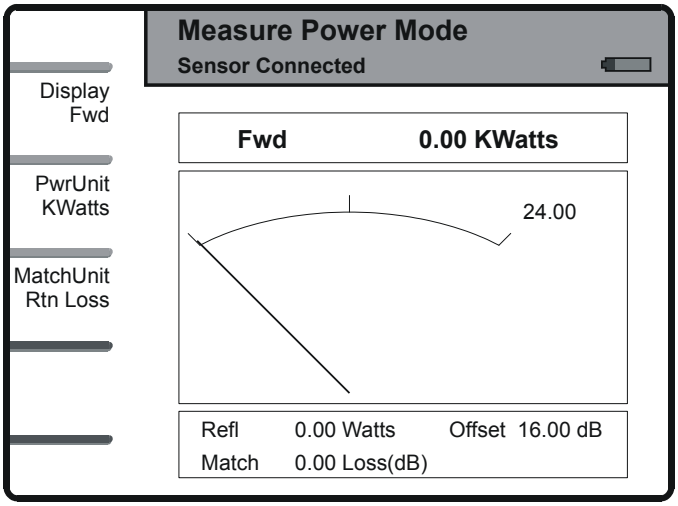
Scroll to Offset



Enter the new value

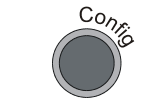
The offset is displayed at the bottom of the main display





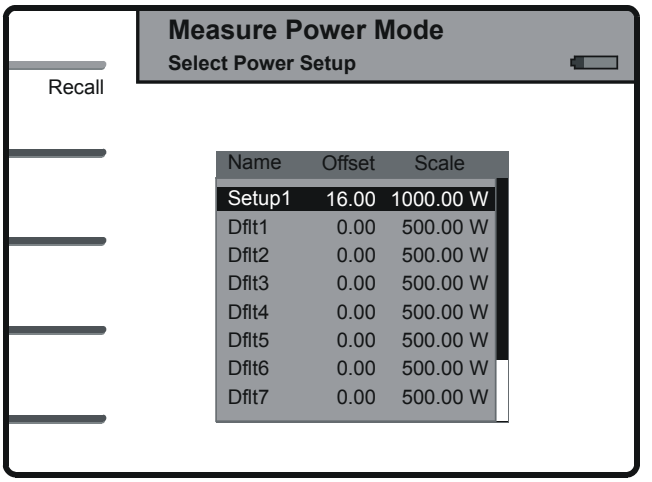
Recall Setups

Power measurement setups can be created using the Bird Site Analyzer PCTool Software, then stored in the Site Analyzer's nonvolatile memory. These setups store both the offset and the full scale power.



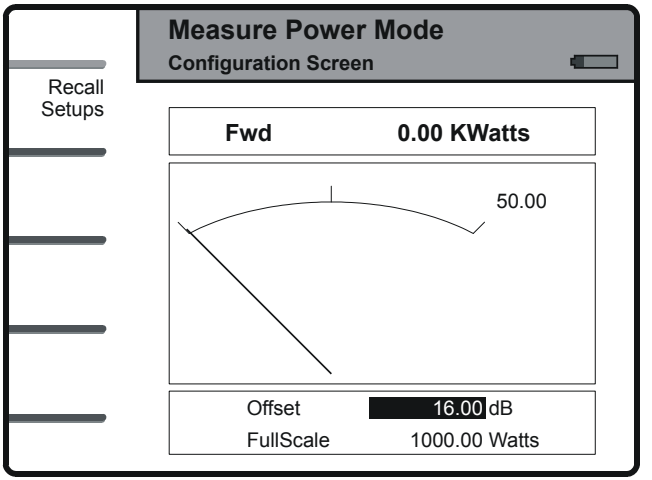
Press from Measure Power Mode

Press to display the Power Setup menu



Scroll to the setup to be recalled

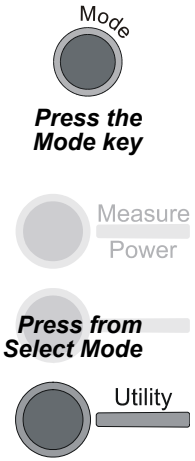
The setup is recalled

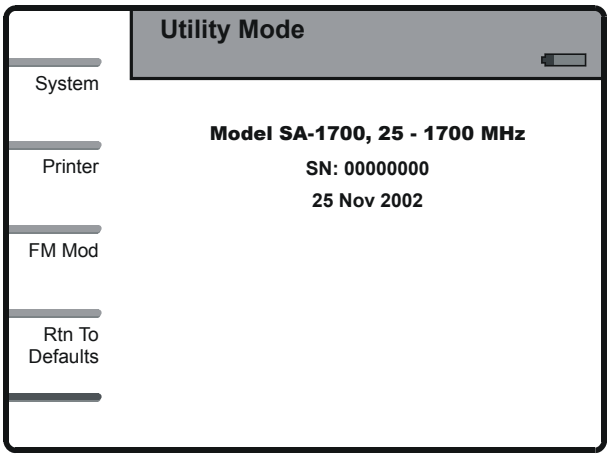


Chapter 7 Utilities

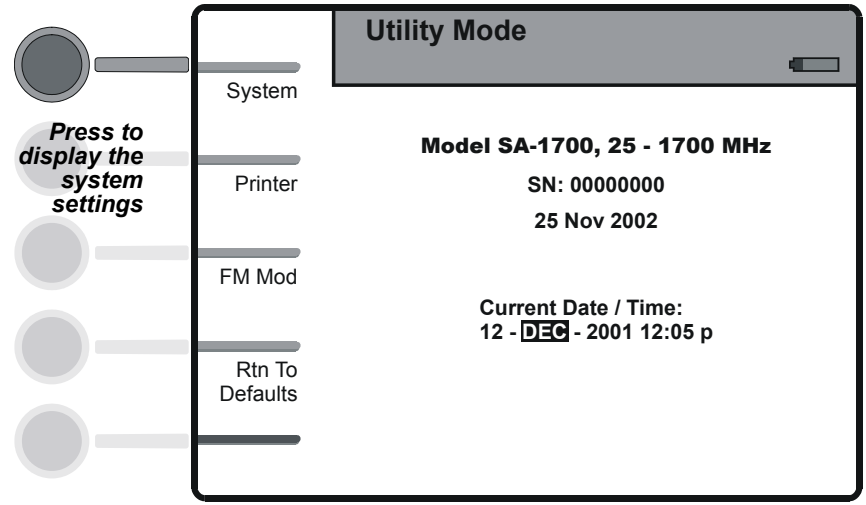
☞ **Note:** The figures in this chapter do not show the entire Site Analyzer. For increased clarity, the figures show only the screen image and the keys you press to accomplish a setup or measurement.

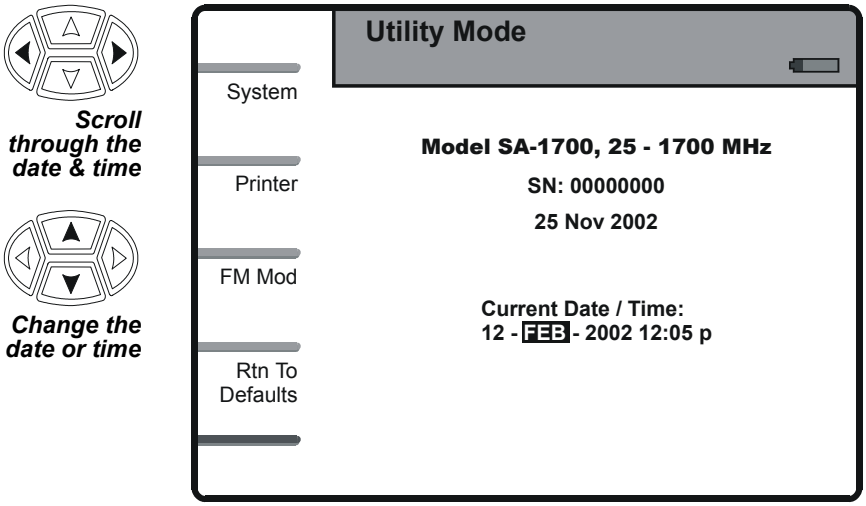
These utilities adjust the Bird Site Analyzer's date and time, return the unit to default settings, and check the printer status. To exit the Utility mode, press the Esc key or press the Mode key.





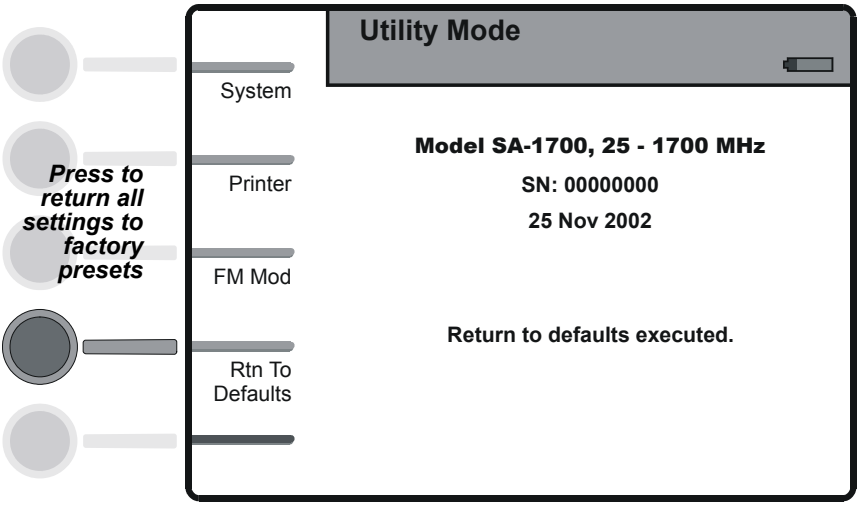
Adjust Date and Time





Return to Defaults

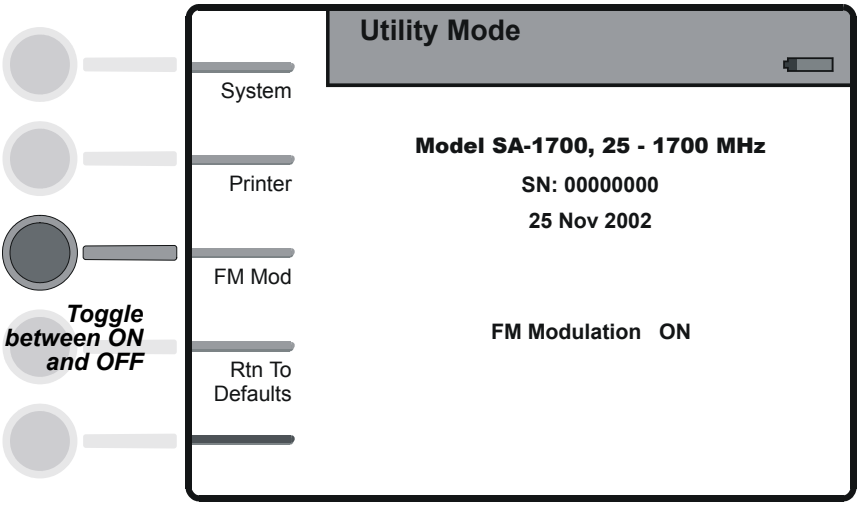
All settings will be returned to the factory presets. Saved traces and setups will not be affected. This function should be used after a unit failure and on the first power up after a firmware upgrade.



FM Modulation

The Bird Site Analyzer uses FM modulation to improve its immunity to interfering signals. Under certain circumstances, such as while making cable loss or other high reflection measurements with long cables, FM modulation may reduce signal quality. In that case, the modulation should be turned off.

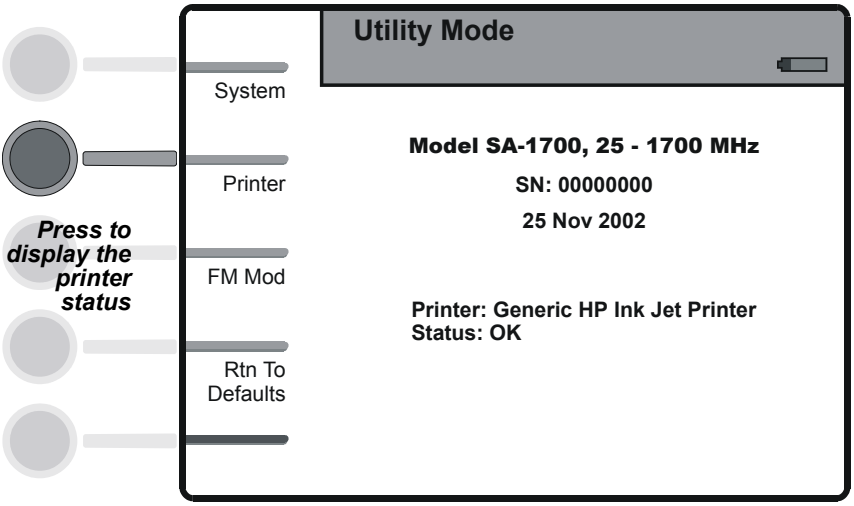
- FM modulation is on by default, and will be turned back on whenever the unit is reset to defaults.
- FM modulation is automatically turned off while the unit is in Cable Loss Mode and returned to its previous state on exiting Cable Loss Mode.
- Saving a setup saves the status of the FM modulation.



Printer

The Bird Site Analyzer is compatible with all printers that use HP PCL Level 3, including most HP printers.

When a printer error occurs, this screen will display an error message describing the printer problem.



Chapter 8 Computer Software

The Bird Site Analyzer Software is designed to help you use the Site Analyzer more effectively. It allows you to use a PC for archiving and analyzing measurement data. For complete instructions refer to the help files included with the software.

☞ **Note:** With the new Bird Serial to USB adapter (P/N DC-DB9-U) you can convert the supplied serial cable to USB.

Features

- Multiple Document Interface - allows any number of trace documents to be open simultaneously.
- Intelligent drag-and-drop automatically converts traces to a common scale for precise and reliable comparisons.
- Documents can be viewed in the frequency or distance domains, or as a Smith chart.
- Data values can be read off the status bar as the mouse is moved along the trace.
- Compatible with other cable and antenna testers including the Bird AT Series.
- Automatic cursor calibration maintains accurate readouts of trace data even if the x-axis changes.
- Supports long file names for easy identification.

Computer Requirements

Your computer system must meet the following requirements:

- Windows 95 or later operating system
- 486, 66 MHz, or better processor
- Hard disk with 3 MB of free space
- CD-ROM Drive

Chapter 9 Maintenance

Cleaning

> CAUTION
> Harsh or abrasive detergents, and some solvents, can damage the display unit and labels.

Clean the Bird Site Analyzer only with a soft cloth dampened with mild detergent and water. Do not use any other type of cleaning solution.

Charging the Battery

The internal battery pack will automatically recharge when the Site Analyzer is powered from the ac or cigarette lighter adapter. Recharging time, from a full discharge, is approximately 4 hours.

External Battery Pack (Optional), Long-term Storage Maintenance

When the external battery pack is stored for long periods of time without proper maintenance, it will loose its charge and also loose its ability to reach full charge when put into service.

The maintenance procedure is to apply a one-hour "top off" charge at three month intervals. Follow the battery charge procedures on page 8 for one hour only. Do not over charge the battery in storage.

☞ **Note:** If a battery has been stored for an extended period of time without "top off" charging, perform a full charge followed by a full discharge. Repeat this cycle if necessary up to three times. If the battery does not remain charged after three charge-discharge cycles, replace the battery.

Troubleshooting

Any service procedure not covered in this manual should be referred to an authorized service facility.

Locate the problem, review the possible causes, and perform the action listed. If the problem is not corrected, give us a call or return the unit for service.

Problem	Possible Cause	Possible Correction
Unit will not power up	Battery pack drained	Charge the battery pack.
	Battery pack unable to keep a charge	Replace the battery pack.
	AC adapter is damaged	Replace the ac adapter.
Self test fails	Error condition	Turn the unit off and then back on. If the problem persists, return the unit for service.
Date and time appear, hiding the display	Internal error	Press **Mode**, **Utility**, and then **Escape**.
Fault Location trace appears incorrect	Scale too large	Press **Auto Scale** to make the scale smaller.
	Incorrect cable loss or velocity of propagation	Check the cable loss and V_p settings.
Erratic antenna test measurements	Bad calibration combo	Use a different calibration combo.
Soft keys beep when pressed without performing any function	Context switching operations taking place	Wait for screen changes to complete before.
Keys do not respond	Unit is “Locked Up”	Turn the unit off and then back on.
		Perform a full system initialization. Disconnect the AC adapter, hold down the Contrast key and turn the unit off. Turn the unit back on.

Problem	Possible Cause	Possible Correction
Limit line disappears in Fault Location	Limit line not drawing	Turn the limit line off and then back on.
Recalled fault location trace is invalid	No fault location measurement made since last full system initialization	Change to Measure Match Mode and then back to Fault Location Mode.
Unit beeps and turns off	Internal error	Turn the unit back on and continue.
	Unit was last shut down because the battery was too low to operate the unit	Operate the unit from the AC adapter
Unit is unable to print. "Error" is displayed after pressing **PRINT**	Printer error	Check the error condition in Utility Mode (**Mode**, **Utility**, **Printer**). Correct the error.
Trace drifts outside of specifications	Calibration lost	Calibrate the unit immediately before making a measurement.

Battery Replacement

1. Lay the Site Analyzer, display side down, on a clean surface.
2. Remove the four screws and the battery cover. Refer to the picture below.

   ☞ **Note:** Check the direction of the notch in the battery cover. It is important to replace the cover the same way it was removed.

.

3. Disconnect and remove the old battery pack from the battery compartment.
4. Install the new battery. Make sure the battery connector is firmly connected to the circuit board connector.
5. Place the battery in the battery compartment. Make sure the battery is flat in the compartment, and will not damage any wires when the cover is installed.
6. Replace the battery cover and the screws.
7. Connect the AC adapter to the unit.
8. Apply power to the unit and verify that it operates properly
9. Charge the battery if required

Firmware Update

The Site Analyzer uses flash-programmable ROM to store its operating program. To update the instrument, you will need to install the SA Updater software on your PC. The SA Updater software is available on the Bird web site.

☞ **Note:** The update process will erase the memory of the Site Analyzer, including all saved traces and setups. Use the PC software to save all traces to a PC before updating the flash ROM.

1. Install the SA Updater program on a PC.
2. Run the program and follow the on-screen instructions.

Upgrade to Model SA6000EX

All models of the SAxxxxEX series can be upgraded to an SA6000EX. Contact Bird Technology Customer Service to purchase an upgrade license then download and run the upgrade software and enter the license key provided with your purchase.

All saved traces and saved custom setups are preserved and are not affected by upgrading. After upgrading, the unit settings are automatically set to factory defaults.

Customer Service

If you need to return the unit for any reason, contact the Bird Service Center for a return authorization. All instruments returned must be shipped prepaid and to the attention of Bird Service Center.

Service Facility

Bird Service Center
30303 Aurora Road
Cleveland (Solon), Ohio 44139-2794
Phone: (440) 519-2298
Fax: (440) 519-2326
E-mail: *bsc@bird-technologies.com*

Sales Facilities

For the location of the Sales Office nearest you, give us a call or visit our Web site at:

http://www.bird-electronic.com

Specifications

Antenna Testing

Test Port

Connectors	Female N normally supplied
Impedance	50 Ohms

Directivity, After Calibration

Connector	Frequency	Directivity
N	25 – 2500 MHz	– 42 dB
N	2.5 – 6.0 GHz	– 38 dB
7/16	25 – 2500 MHz	– 40 dB
7/16	2.5 – 6.0 GHz	– 35 dB

Source VSWR

All models	< 300 MHz	2.00:1
	300 - 6000 MHz	1.25:1

Measurement Speed < 4 seconds / sweep, test port open, Y-axis set to full scale

238 data points	< 2 seconds / sweep
475 data points	< 3.5 seconds / sweep
949 data points	< 6 seconds / sweep

Immunity to Interfering Signals ≥ 13 dB interferer at desired measurement frequency.

Maximum Input Signal (Damage Level) ≥ 22 dBm

Output Power < 0 dBm

Match Measurement

Frequency Range

SA-2500A	780 – 2500 MHz
SA-1700, SA-1700-P	25 – 1700 MHz
SA-6000	25 – 6000 MHz

Frequency Resolution

SA-2500A	50 kHz
All other models	
25 – 800 MHz	25 kHz
800 – 2500 MHz	50 kHz
2500 – 6000 MHz	100 kHz

Frequency Accuracy ± 150 kHz (75 ppm)

Number of Data Points 238 (default), 475, 949

Measurement Range and Resolution

	Range	Resolution
Return Loss	0.0 to –60.0 dB	0.1 dB
VSWR	1.00 to 99.99	0.01

Measurement Uncertainty (after 1 display refresh)*

Return Loss	Determined graphically from composite of source VSWR, instrumentation error, and directivity. Refer to the figures on page 144, page 146, and page 147.
VSWR	Calculated from Return Loss

* Accuracy only guaranteed when using the Bird Calibration Combo listed in this manual (See page 149).

Distance to Fault (DTF) Measurement

Mode Internal

Resolution [R]

X-Axis

$$R \equiv 150 \times \frac{V_p}{\Delta F}$$

Where R=Resolution (meters), V_p=Velocity of Propagation, ΔF= Frequency Span (MHz)

Y-Axis — 0.1 dB, 0.01 VSWR

Range

X-Axis — number of data points (238, 475, or 949) x R
Y-Axis — 0 to –60 dB

Accuracy

X-Axis — ± 2% of full-scale range with V_p = 1
Y-Axis — Same as for Return Loss Measurements

V_p Range — 0.20 to 1.00, or 1 to 99%

Power Measure Mode

Function	Displays power from Bird 5010B, 5011, 5011-EF, VSWR Alarm, and ACM power sensors (specifications determined by sensor)

General

Data Storage	Non-volatile internal memory can store 500 traces (250 for SA-1700 and SA-1700-P) in 238 data point format, 250 traces in 475 data point format, or 125 traces in 949 data point format. Traces may be recalled and displayed in any of the display formats.

PC/Remote Power Sensor Interface Port

Connector	Female DB-9, compatible with PC serial port
Protocol	Serial RS-232, 9600 baud, 8 data bits, 1 stop bit, no parity, and no handshake

Printer Interface Port

Connector	Female DB-25, compatible with PC parallel port
Compatibility	HP Deskjet printers with PCL Level 3 protocol

Power Requirements

Internal	Lithium-ion rechargeable battery 3 hours minimum operating time
External DC	9 to 16 Vdc, < 3 A
External AC	90 to 264 Vac @ 45 to 66 Hz, AC/DC adapter required

Physical Specifications

Dimensions	10.5" x 8.4" x 3.3" (265 x 212 x 83 mm)
Weight	5.5 lbs. (2.5 kg)

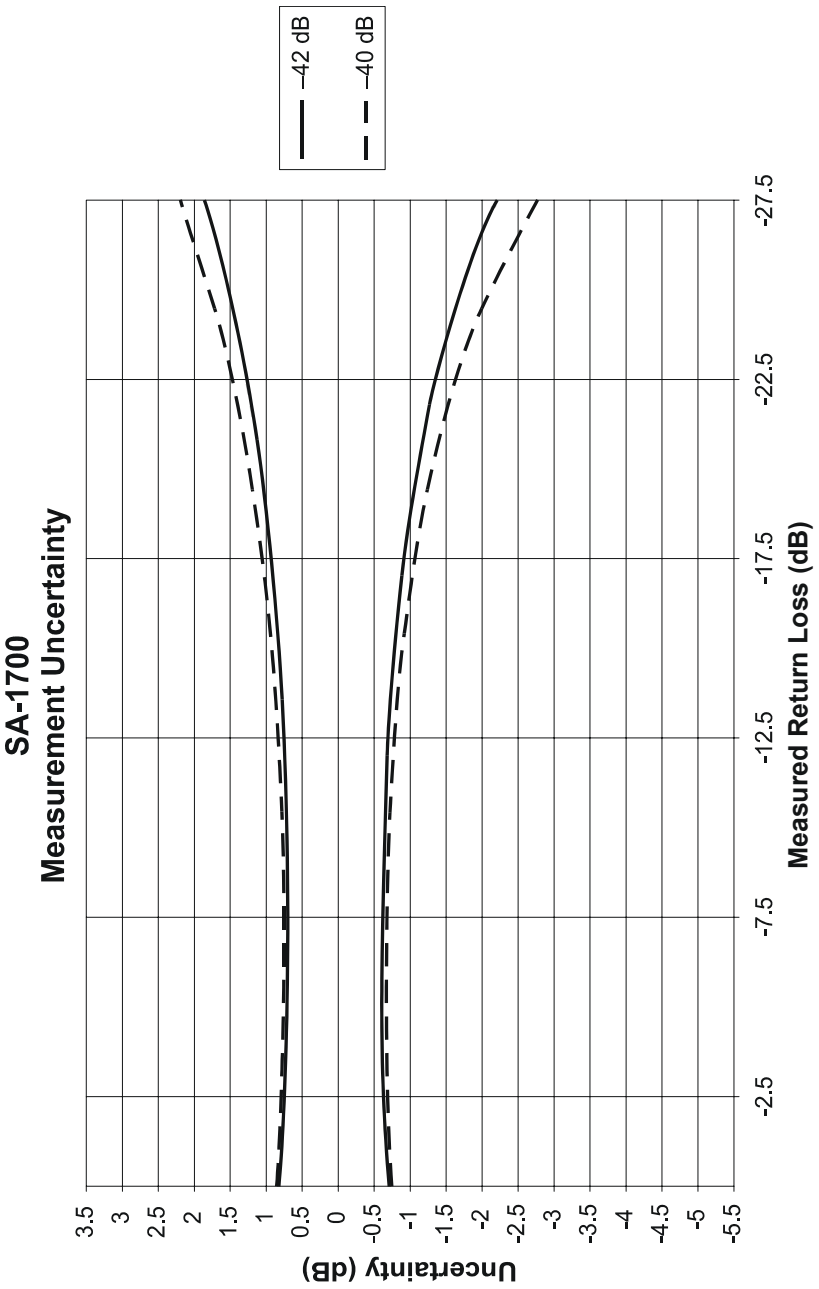
Environmental Specifications

Operating Temp	–10 to +50°C (14 to 122°F)
Storage Temp	–40 to +80°C (–40 to +176°F)
Humidity	95% maximum (non-condensing)
Altitude	15,000 feet (4,500 m) max

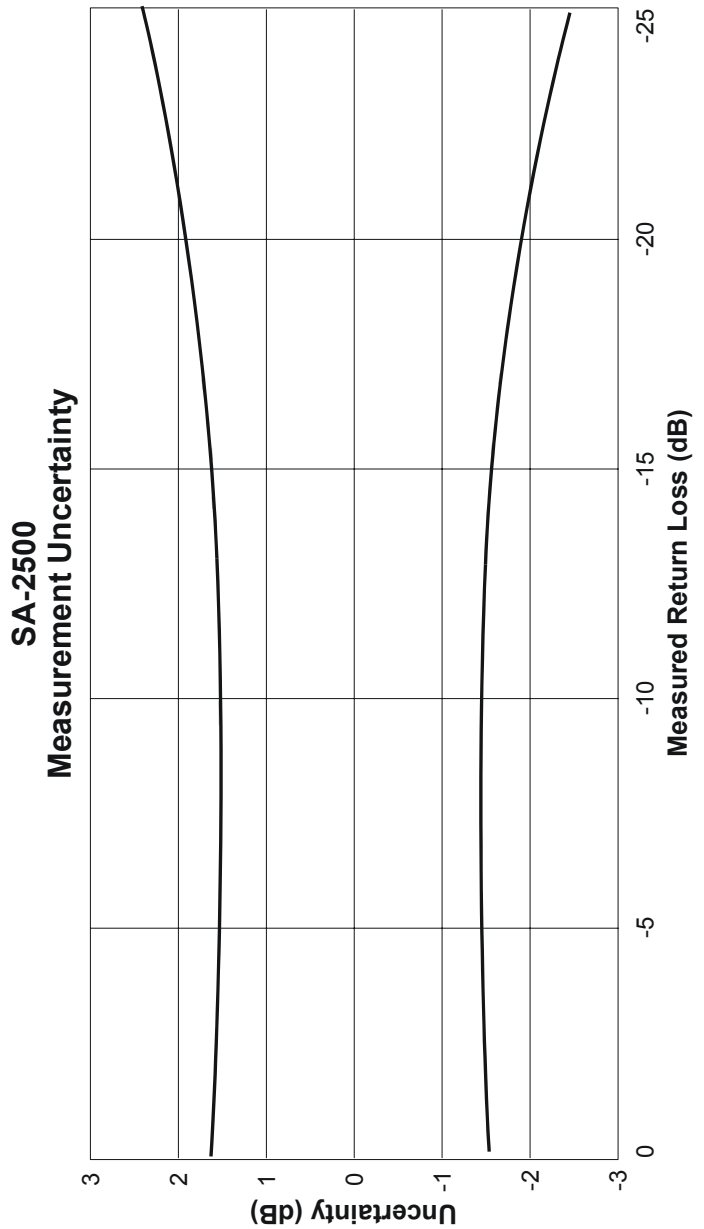
Calibration

Calibration Cycle	User Defined
Recommended Calibration Interval	12 months

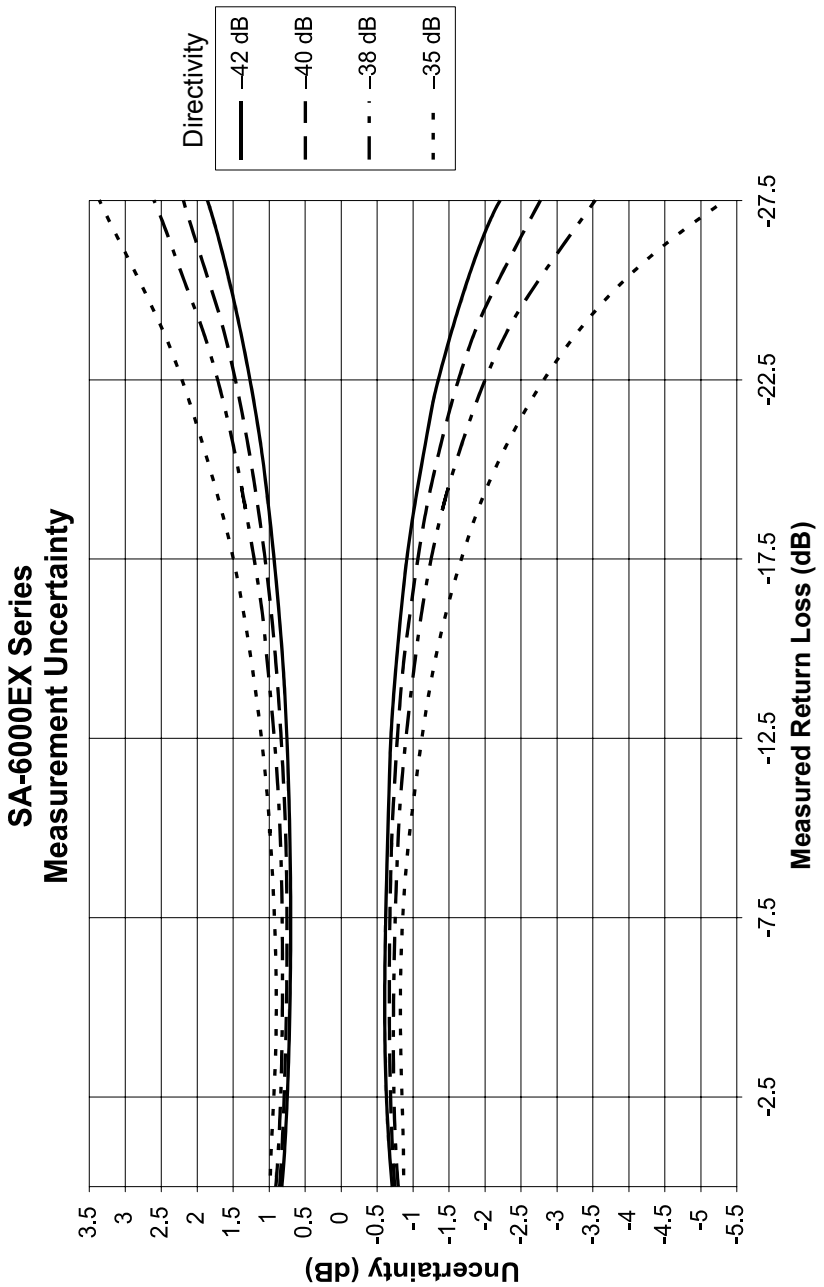
SA-1700 Measurement Uncertainty (Return Loss after one refresh)


SA-1700
Measurement Uncertainty
–42 dB
–40 dB
Uncertainty (dB)
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-4
-4.5
-5
-5.5
-2.5
-7.5
-12.5
-17.5
-22.5
-27.5
Measured Return Loss (dB)

SA-2500A Measurement Uncertainty (Return Loss after one refresh)



SA-6000 Measurement Uncertainty (Return Loss after one refresh)



Parts List

Part Name	Part Number
Site Analyzer - Complete	
780 – 2500 MHz	SA-2500A
25 – 1700 MHz	
With Power Measure	SA-1700-P
Without Power Measure	SA-1700
25 - 6000 MHz	SA-6000
AC adapter (15 Vdc output)	5A2436
Automobile cigarette lighter adapter	5A2238-2
Soft Carrying case	7002A850
9-pin Serial interface cable	5A2264-09-MF-10
PC interface software kit	7002A844
Instruction manual	920-7002A400
Internal Battery Pack	5A2431

Optional Equipment Available

Precision Adapters:

Connectors	Part Number	Connectors	Part Number
Male N to Male 7/16 DIN	PA-MNME	Female 7/16 DIN to Male 7/16 DIN Right Angle	PA-FEME-R
Female N to Male 7/16 DIN	PA-FNME	Female N to Female N	4240-500-1
Male N to Female 7/16 DIN	PA-MNFE	Female N to Male N, Right Angle	4240-500-3
Female N to Female 7/16 DIN	PA-FNFE	Female N to Female SMA	4240-500-4
Female 7/16 DIN to Female 7/16 DIN	PA-FEFE	Female N to Male SMA	4240-500-4
Serial to USB Adapter	DC-DB9-U		

Armored (Phase Stable) Test Cables:

Connector Types	Length	Part Number
Male N to Male N	1.5 meter	TC-MNMN-1.5
Male N to Male N	3.0 meter	TC-MNMN-3.0
Male N to Female N	1.5 meter	TC-MNFN-1.5
Male N to Female N	3.0 meter	TC-MNFN-3.0
Male N to Female 7/16 DIN	1.5 meter	TC-MNFE-1.5
Male N to Female 7/16 DIN	3.0 meter	TC-MNFE-3.0

Precision Open/Short/Load Combinations:

Connector Type	Part Number
Male N	CAL-MN-C
Female N	CAL-FN-C
Male 7/16 DIN	CAL-ME-C
Female 7/16 DIN	CAL-FE-C

Hard Transit Case

P/N: 7002C870
Holds Site Analyzer, standard accessories, calibration combo, armored cable assembly, and adapters.

External Battery Pack

P/N: SA–BATPAK
Includes ac adapter and dc power cord.

Directional Power Sensor

P/N: 5010B
Sensor for Thruline power measurement. Requires two Bird DPM elements. Refer to DPM Element Guide, P/N 871-DPM-019-901, for a complete list of elements.

Terminating Power Sensor

P/N: 5011 or 5011-EF
Sensor for terminating power measurement.

The Bird 5011 frequency range is 40 MHz – 4 GHz.
The 5011-EF frequency range is 40 MHz – 12 GHz.

Wideband Power Sensor

P/N: 5012
Sensor for Thruline power measurement.

Terminating Power Sensor Accessories:

Description	Part Number
Female N to Male N Attenuators (RF power range using TPS)	
30 dB (10 mW – 10 W)	8353A030–10
40 dB (100 mW – 50 W)	8353A040–50
DC Block	5011A035–1
General Purpose Test Cable, Male N to Female N, 1.5 m	TC-MNFN-1.5-G
Calibration Data	5011–CALDATA
Recommended for attenuators, test cables, and dc block	

Appendix

This appendix provides general information about the Site Analyzer including term definitions, fault location equations, and fault location distance tables.

Definitions

Measure Match Mode

The Match Measurement mode shows the resonant frequencies for an antenna or filter. It also confirms that there are no impedance problems in the nonresonant components such as cables, connectors, lightning protectors, and jumpers.

Fault Location Mode

The Fault Location mode shows the location of any problems in the antenna system. This is shown in either feet or meters from the cable end connected to the Site Analyzer.

Cable Loss Mode

The Cable Loss mode shows the insertion loss of a coaxial cable. By comparing this with the manufacturer's specs, it confirms that there are no problems with the cable.

VSWR

VSWR units used to be the preferred way to measure an antenna system. A good antenna has a VSWR of less than 1.5:1 at its operating frequency.

Return Loss

Return Loss measures, in dB, how much of a wave is reflected back to the source. It is now the preferred method for measuring antenna systems. A good antenna will have a return loss of –14 dB or less at the operating frequency. The more negative the reading, the better the antenna.

Markers

Markers are used to show the exact value at one point on the graph. In Measure Match and Cable Loss modes, the marker displays the frequency and loss (or VSWR). In Fault Location mode, the marker displays the distance and loss.

Run / Hold

When **HOLD** is displayed, the unit makes a new sweep every few seconds, and displays the latest sweep.

When **RUN** is displayed, the unit will only make a single sweep. The display will not update if the Site Analyzer is disconnected or if the cable is jiggled. This is usually preferred.

Equations

Fault Location

Resolution

$$\text{Resolution} = \frac{C}{\text{freq span} \times 2}$$

where C = speed of light (300×10^6 m / sec) or (9.84252×10^8 feet / sec)

Maximum Distance

$$\text{Max distance} = \text{resolution} \times (\text{data points} - 1)$$

Fault Location Distance Tables

The tables on the next pages will help you select the frequency span, measurable distance, and resolution for fault location measurements. Select the table for

the number of data points you wish measure (238, 475, 949).

Fault Location Distance - 238 Data Points

Fault Location Distance and Resolution - 238 Data Points								
Vel Prop	**0.66**				**0.88**			
Freq Span	**Max Distance**		**Resolution**		**Max Distance**		**Resolution**	
(MHz)	**ft**	**m**	**in**	**cm**	**ft**	**m**	**in**	**cm**
25	999.9	937.9	155.8	395.7	999.9	999.9	207.7	527.6
50	999.9	468.9	77.9	197.9	999.9	625.2	103.9	263.8
75	999.9	312.6	51.9	131.9	999.9	416.8	69.2	175.9
100	769.2	234.5	38.9	98.9	999.9	312.6	51.9	131.9
200	384.6	117.2	19.5	49.5	512.8	156.3	26.0	66.0
300	256.4	78.2	13.0	33.0	341.9	104.2	17.3	44.0
400	192.3	58.6	9.7	24.7	256.4	78.2	13.0	33.0
500	153.8	46.9	7.8	19.8	205.1	62.5	10.4	26.4
600	128.2	39.1	6.5	16.5	170.9	52.1	8.7	22.0
700	109.9	33.5	5.6	14.1	146.5	44.7	7.4	18.8
800	96.2	29.3	4.9	12.4	128.2	39.1	6.5	16.5
900	85.5	26.1	4.3	11.0	114.0	34.7	5.8	14.7
1000	76.9	23.4	3.9	9.9	102.6	31.3	5.2	13.2
1500	51.3	15.6	2.6	6.6	68.4	20.8	3.5	8.8
2000	38.5	11.7	1.9	4.9	51.3	15.6	2.6	6.6
2500	30.8	9.4	1.6	4.0	41.0	12.5	2.1	5.3
3000	25.6	7.8	1.3	3.3	34.2	10.4	1.7	4.4
3500	22.0	6.7	1.1	2.8	29.3	8.9	1.5	3.8
4000	19.2	5.9	1.0	2.5	25.6	7.8	1.3	3.3
4500	17.1	5.2	0.9	2.2	22.8	6.9	1.2	2.9
5000	15.4	4.7	0.8	2.0	20.5	6.3	1.0	2.6
5500	14.0	4.3	0.7	1.8	18.6	5.7	0.9	2.4
5975	12.9	3.9	0.7	1.7	17.2	5.2	0.9	2.2

Fault Location Distance - 475 Data Points

Fault Location Distance and Resolution - 475 Data Points								
Vel Prop	**0.66**				**0.88**			
Freq Span	**Max Distance**		**Resolution**		**Max Distance**		**Resolution**	
(MHz)	**ft**	**m**	**in**	**cm**	**ft**	**m**	**in**	**cm**
25	999.9	999.9	155.8	395.7	999.9	999.9	207.7	527.6
50	999.9	937.9	77.9	197.9	999.9	999.9	103.9	263.8
75	999.9	625.2	51.9	131.9	999.9	833.7	69.2	175.9
100	999.9	468.9	39.0	98.9	999.9	625.2	51.9	131.9
200	769.2	234.5	19.5	49.5	999.9	312.6	26.0	66.0
300	512.8	156.3	13.0	33.0	683.8	208.4	17.3	44.0
400	384.6	117.2	9.7	24.7	512.8	156.3	13.0	33.0
500	307.7	93.8	7.8	19.8	410.3	125.0	10.4	26.4
600	256.4	78.2	6.5	16.5	341.9	104.2	8.7	22.0
700	219.8	67.0	5.6	14.1	293.0	89.3	7.4	18.8
800	192.3	58.6	4.9	12.4	256.4	78.2	6.5	16.5
900	170.9	52.1	4.3	11.0	227.9	69.5	5.8	14.7
1000	153.8	46.9	3.9	9.9	205.1	62.5	5.2	13.2
1500	102.6	31.3	2.6	6.6	136.8	41.7	3.5	8.8
2000	76.9	23.4	1.9	4.9	102.6	31.3	2.6	6.6
2500	61.5	18.8	1.6	4.0	82.1	25.0	2.1	5.3
3000	51.3	15.6	1.3	3.3	68.4	20.8	1.7	4.4
3500	44.0	13.4	1.1	2.8	58.6	17.9	1.5	3.8
4000	38.5	11.7	1.0	2.5	51.3	15.6	1.3	3.3
4500	34.2	10.4	0.9	2.2	45.6	13.9	1.2	2.9
5000	30.8	9.4	0.8	2.0	41.0	12.5	1.0	2.6
5500	28.0	8.5	0.7	1.8	37.3	11.4	0.9	2.4
5975	25.7	7.8	0.7	1.7	34.3	10.5	0.9	2.2

Fault Location Distance - 949 Data Points

Fault Location Distance and Resolution - 949 Data Pts								
Vel Prop	0.66				0.88			
Freq Span	Max Distance		Resolution		Max Distance		Resolution	
(MHz)	ft	m	in	cm	ft	m	in	cm
25	999.9	999.9	155.8	395.7	999.9	999.9	207.7	527.6
50	999.9	999.9	77.9	197.9	999.9	999.9	103.9	263.8
75	999.9	999.9	51.9	131.9	999.9	999.9	69.2	175.9
100	999.9	937.9	39.0	98.9	999.9	999.9	51.9	131.9
200	999.9	468.9	19.5	49.5	999.9	625.2	26.0	66.0
300	999.9	312.6	13.0	33.0	999.9	416.8	17.3	44.0
400	769.2	234.5	9.7	24.7	999.9	312.6	13.0	33.0
500	615.4	187.6	7.8	19.8	820.5	250.1	10.4	26.4
600	512.8	156.3	6.5	16.5	683.8	208.4	8.7	22.0
700	439.6	134.0	5.6	14.1	586.1	178.6	7.4	18.8
800	384.6	117.2	4.9	12.4	512.8	156.3	6.5	16.5
900	341.9	104.2	4.3	11.0	455.8	138.9	5.8	14.7
1000	307.7	93.8	3.9	9.9	410.3	125.0	5.2	13.2
1500	205.1	62.5	2.6	6.6	273.5	83.4	3.5	8.8
2000	153.8	46.9	1.9	4.9	205.1	62.5	2.6	6.6
2500	123.1	37.5	1.6	4.0	164.1	50.0	2.1	5.3
3000	102.6	31.3	1.3	3.3	136.8	41.7	1.7	4.4
3500	87.9	26.8	1.1	2.8	117.2	35.7	1.5	3.8
4000	76.9	23.4	1.0	2.5	102.6	31.3	1.3	3.3
4500	68.4	20.8	0.9	2.2	91.2	27.8	1.2	2.9
5000	61.5	18.8	0.8	2.0	82.1	25.0	1.0	2.6
5500	55.9	17.1	0.7	1.8	74.6	22.7	0.9	2.4
5975	51.5	15.7	0.7	1.7	68.7	20.9	0.9	2.2

Limited Warranty

ucts manufactured by Seller are warranted to be free from defects in material and
nship for a period of two (2) years, unless otherwise specified, from date of shipment a
to applicable specifications, drawings, blueprints and/or samples. Seller's sole obligat
ese warranties shall be to issue credit, repair or replace any item or part thereof whic
o be other than as warranted; no allowance shall be made for any labor charges of Bu
ment of parts, adjustment or repairs, or any other work, unless such charges are autho
by Seller.

's products are claimed to be defective in material or work-manship or not to conform
ations, drawings, blueprints and/or samples, Seller shall, upon prompt notice thereof,
the products where they are located or issue shipping instructions for return to Selle
rtation-charges prepaid by Buyer). In the event any of our products are proved to be d
warranted, transportation costs (cheapest way) to and from Seller's plant, will be born
nd reimbursement or credit will be made for amounts so expended by Buyer. Every suc
ch of these warranties shall be deemed to be waived by Buyer unless made in writing
days from the date of discovery of the defect.

ve warranties shall not extend to any products or parts thereof which have been subje
use or neglect, damaged by accident, rendered defective by reason of improper installa
erformance of repairs or alterations outside of our plant, and shall not apply to any go
ereof furnished by Buyer or acquired from others at Buyer's request and/or to Buyer's
ations. Routine (regularly required) calibration is not covered under this limited warra
, Seller's warranties do not extend to the failure of tubes, transistors, fuses and batter
equipment and parts manufactured by others except to the extent of the original
cturer's warranty to Seller.

igations under the foregoing warranties are limited to the precise terms thereof. These
ies provide exclusive remedies, expressly in lieu of all other remedies including claims
or consequential damages. SELLER NEITHER MAKES NOR ASSUMES ANY OTHE
ANTY WHATSOEVER, WHETHER EXPRESS, STATUTORY, OR IMPLIED, INCLUD
ANTIES OF MERCHANTABILITY AND FITNESS, AND NO PERSON IS AUTHORIZ
E FOR SELLER ANY OBLIGATION OR LIABILITY NOT STRICTLY IN ACCORDA
THE FOREGOING.