



SITE ANALYZER™ XT

CABLE AND ANTENNA TESTER
FOR WIRELESS SYSTEMS

OPERATION MANUAL

This is a preliminary manual. Specifications, limits, and text are subject to change without notice. The information within this manual was as complete as possible at the time of printing. Bird Electronic Corporation is not liable for errors.

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INSTRUCTION BOOK PART NUMBER 920-SA-XT REV. P3

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Safety Precautions

The following are general safety precautions that are not necessarily related to any specific part or procedure, and do not necessarily appear elsewhere in this publication. These precautions must be thoroughly understood and apply to all phases of operation and maintenance.

WARNING

Keep Away From Live Circuits

Operating Personnel must at all times observe general safety precautions. Do not replace components or make adjustments to the inside of the test equipment with the high voltage supply turned on. To avoid casualties, always remove power.

WARNING

Shock Hazard

Do not attempt to remove the RF transmission line while RF power is present.

WARNING

Do Not Service Or Adjust Alone

Under no circumstances should any person reach into an enclosure for the purpose of service or adjustment of equipment except in the presence of someone who is capable of rendering aid.

WARNING

Safety Earth Ground

An uninterruptible earth safety ground must be supplied from the main power source to test instruments. 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 supplied.

WARNING

Resuscitation

Personnel working with or near high voltages should be familiar with modern methods of resuscitation.

WARNING

Remove Power

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

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.

On page 7.

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.

On page 7.

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.

On page 9.

Caution Statements

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

CAUTION

+22 dBm max. input

Do not apply RF power to Antenna Test Port. Exceeding the maximum input will damage the Site Analyzer.

On page 6, 15, 27, and 45.

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. Failure to comply may result in reduced battery charge and shortened battery life.

On page 7.

CAUTION

When using a terminating power sensors, do not exceed 2 W average or 125 W peak power for 5 μ s.
Doing so will render the sensor inoperative.

On page 45 and 48.

CAUTION

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

On page 79.

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 HACERLO.

WARTUNG

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

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

ENTRETIEN

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 EFFETTUARE ALCUNA RIPARAZIONE A MENO CHE QUALIFICATI A FARLA.

UNITS ARE EQUIPPED WITH RECHARGEABLE BATTERIES.

THESE ARE TO BE REPLACED BY AUTHORIZED SERVICE PERSONNEL ONLY!!!

LAS UNIDADES VIENEN EQUIPADAS CON BATERIAS RECARGABLES.

¡¡¡Y SOLAMENTE EL PERSONAL DE SERVICIO AUTORIZADO PUEDE REEMPLAZARLAS!!!

GERÄTE SIND MIT WIEDER AUFLADBAREN BATTERIEN BESTÜCKT.

BATTERIEN SIND NUR VON QUALIFIZIERTEM SERVICE PERSONAL AUSZUWECHSELN!!!

CES DISPOSITIFS SONT ÉQUIPÉS DE BATTERIES RECHARGEABLES.

SEUL LE PERSONNEL D'ENTRETIEN AUTORISÉ EST HABILITÉ À LES REMPLACER !

LE UNITÀ SONO DOTATE DI BATTERIE RICARICABILI,

CHE DEVONO DA COME SPECIFICATO DAL PRODUTTORE LA PROTEZIONE DI SICUREZZA POTREBBE VENIRNE COMPROMESSA.

USE CORRECT VOLTAGE SETTING AND FUSE - SEE MANUAL.

UTILISER UNE TENSION ET UN FUSIBLE CORRECTS - CONSULTER LE MODE D'EMPLOI.

USE LA INSTALACION Y FUSIBLE DE VOLTAJE CORRECTO - VEA EL MANUAL.

**AUSSCHLIESSLICH VORSCHRIFTSMÄSSIGE
WECHSELSPANNUNGS-EINSTELLUNG UND SICHERUNG
BENUTZEN - SIEHE DAZU HANDBUCH.**

UTILIZZARE TENSIONE E FUSIBLE ADATTI - FARE RIFERIMENTO AL MANUALE.

BE SURE THE 115/230V AC VOLTAGE SELECTOR IS SET TO THE PROPER LINE VOLTAGE, AND THE CORRECT AC LINE FUSE IS INSTALLED BEFORE AC POWER IS APPLIED.

S'ASSURER QUE LE SÉLECTEUR DE TENSION 115/230V C.A. EST BIEN RÉGLÉ POUR LA TENSION DU RÉSEAU ET QUE LE FUSIBLE DE LIGNE C.A. CORRECT EST EN PLACE AVANT DE METTRE SOUS TENSION C.A.

CERCIORESE QUE EL SELECTOR DE VOLTAJE DE 115/230V CA ESTE COLOCADO A LA LINEA DE VOLTAJE APROPIADA Y QUE EL FUSIBLE ESTE INSTALADO A LA LINEA CA ANTES DE APLICAR LA CORRIENTE ALTERNA.

VOR EINSCHALTEN DER WECHSELSTROMZUFUHR SICHERSTELLEN, DASS DER 115/230V WECHSELSPANNUNGS-SELEKTOR AUF DIE VORSCHRIFTSMÄSSIGE LEITUNGSSPANNUNG EINGESTELLT UND DIE RICHTIGE WECHSELSTROM-HAUPTSICHERUNG EINGESETZT IST.

PRIMA DI EROGARE CORRENTE, ASSICURARSI CHE IL SELETTORE DI VOLTAGGIO 115/230 V.C.A. SIA REGOLATO CORRETTAMENTE E CHE IL FUSIBLE ADATTO ALLA LINEA DI ALIMENTAZIONE C.A. SIA INSTALLATO.

About This Manual

This manual covers the operating and maintenance instructions for the following models:

SA-3600XT

SA-6000XT

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.

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 non-resonant 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

Max distance = resolution \times (data points - 1)

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.

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

General Operation — Describes how to save and recall traces, set limit lines, and other basic functions common to all modes of the Site Analyzer.

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.

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The Bird Site Analyzer is a multifunction test instrument for use in installation and maintenance of wireless systems. The current product designation adds the letters XT after the model number.

- SA-3600XT
25 MHz – 3600 MHz
- SA-6000XT
25 MHz – 6000 MHz

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 320 x 240 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

Figure 1 Hardware and Software Supplied



Item	Description
1	Site Analyzer (configured as one of the models described earlier).
2	Soft-Sided Carrying Case
3	PCTool Software
4	AC Power Adapter
5	Automobile Cigarette Lighter Adapter
6	USB Communications Cable
7	Instruction Manual CD (Not Shown)

Items Not Supplied

Figure 2 Hardware Not Supplied



Item	Description
1	Calibration Combination (Cal Combo).

Site Analyzer Features

General

- Easy to operate and field ready for first-time, occasional, and experienced users.
- 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.
- Adjustable pass/fail limit with visual indicator.
- 64 MB of internal flash memory for storing thousands of traces and setups.
- On-screen comparison between current measurement trace and stored data traces – no PC required.
- Pop-up menus contain over 70 cable types and 90 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.

Measure Match Mode

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

Fault Location Mode

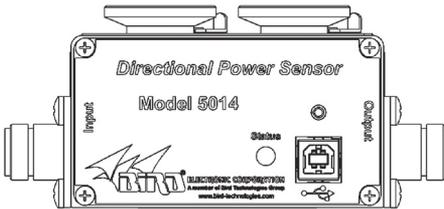
- Transform Algorithm - Fast Fourier Transform (FFT) with three levels of smoothing.
- Distance units can be either feet or meters.
- Measurement units can be Return Loss [dB] or VSWR [ratio].

Transmitter Test

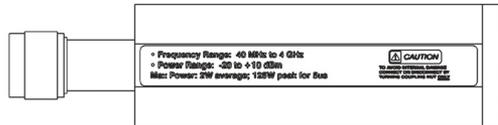
Measure Power Mode

- 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 VSWR, return loss, or % match efficiency.
- Compatible with Bird Directional Power Sensors, Terminating Power Sensors, and Wideband Power Sensors.

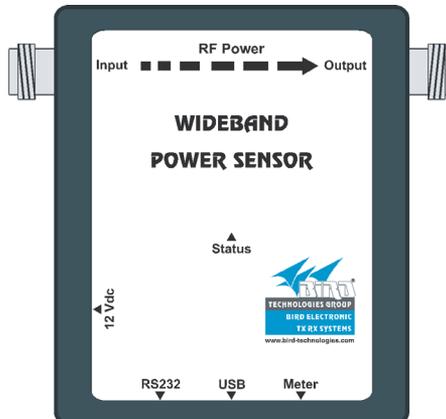
Figure 3 Bird Power Sensors



Directional Power Sensor



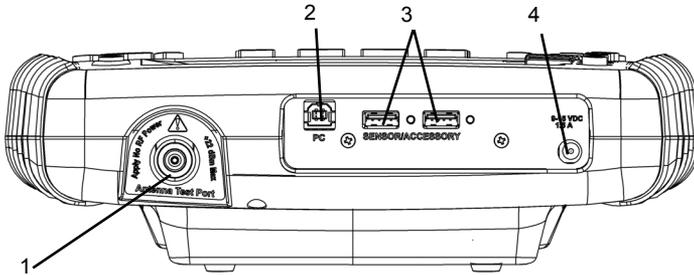
Terminating Power Sensor



Wideband Power Sensor

Connectors

Figure 4 Connector Diagram



CAUTION

+22 dBm max. input

Do not apply RF power to Antenna Test Port. Exceeding the maximum input will damage the Site Analyzer.

1	Antenna Test Port	Female N connector for connecting to the antenna. Use a phase-stable cable for best results.
2	USB 2.0 B Type	There is one USB device port for connection to a PC.
3	USB 2.0 A Type	There are two USB host ports.
4	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 5 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

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.

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.

External Battery Pack (Optional)

WARNING

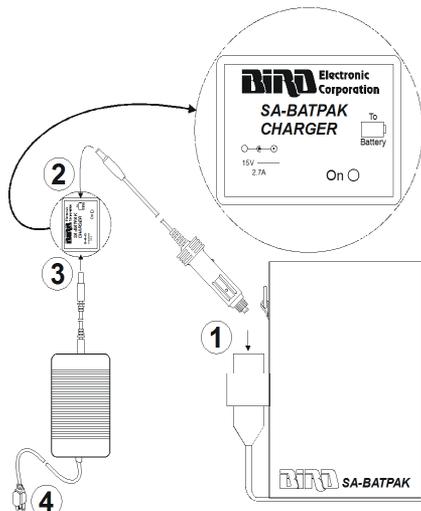
The SA-BATPAK is shipped charged. Be careful when removing the safety cap, 12VDC @ 2.0 AH/20 hour rate can be present inside the receptacle. Do not touch the inside of the receptacle. The possibility of an electric shock exists.

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. Failure to comply may result in reduced battery charge and shortened battery life.

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.

Figure 5 External Battery Pack



Charging the External Battery Pack

1. Plug the automobile cigarette lighter adapter into the external battery pack on the side that says “To Battery”. See [Figure 5 on page 6](#).
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.

Note: *The charger’s “On” LED comes on and stays on until the charger is disconnected.*

Using the External Battery Pack

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. See ["Return to Defaults" on page 71](#).

System Information

Before using 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.

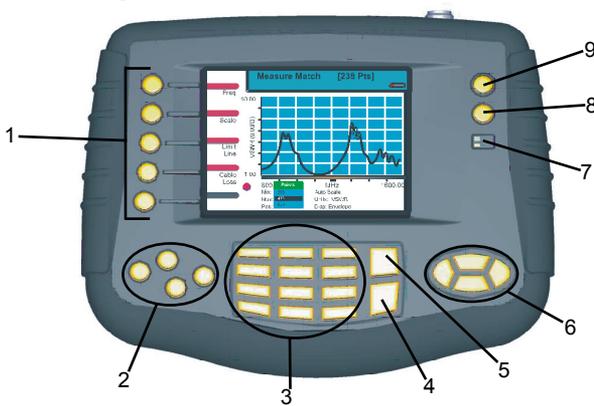
Site Analyzer User Keys

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 softkey. The five keys at the left of the display are softkeys. Each softkey 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 [Figure 6 on page 8](#) and its accompanying table for a description of user keys.

Figure 6 User Key Identification



1	Softkeys	Activates the function described directly to the right of the key.
2	Hard Keys Mode Config Calibrate Marker	Activates the mode menu. Use this to select Measure Match, Fault Location, Measure Power, or Utilities mode. Activates the configuration menu for the current mode. Use this to set variable parameters (e.g. frequency band, distance, and units). Activates the calibration menu. 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	Enter Key During List Selection Data Entry	Selects the highlighted item in the list. Exits data entry, changing the value.
5	Escape Key During Menu Use Data Entry	Backs up one menu level. Exits data entry without changing the value.

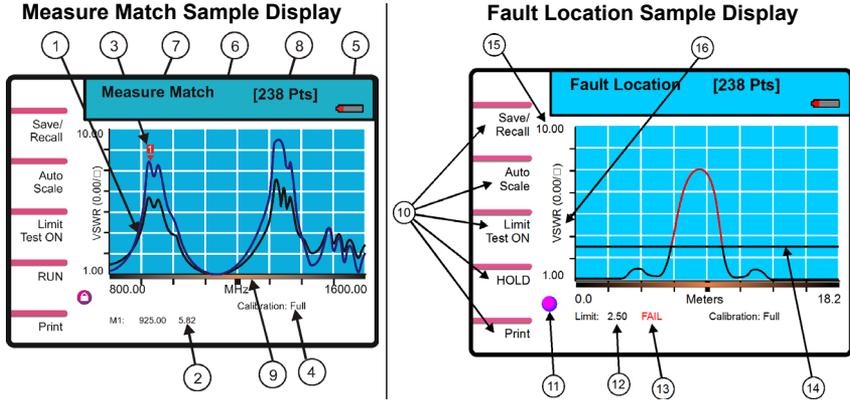
<p>6</p>	<p>Cursor Keys <i>Left Arrow During</i> Data Entry</p> <p>Marker Use All other times</p> <p><i>Right Arrow During</i> Marker Use All other times</p> <p><i>Up Arrow During</i> Data Entry Marker Use Pressing the Contrast Key All other times</p> <p><i>Down Arrow During</i> Data Entry Marker Use Pressing the Contrast Key All other times</p>	<p>Deletes previously entered data one character at a time.</p> <p>Moves active marker left one point at a time. As defined by the function description.</p> <p>Moves active marker right one point at a time. As defined by the function description.</p> <p>Increases the numeric value. Moves the marker to the maximum trace value.</p> <p>Increases the display contrast. As defined by the function description.</p> <p>Decreases the numeric value. Moves the marker to the minimum trace value.</p> <p>Decreases the display contrast. As defined by the function description.</p>
<p>7</p>	<p>Battery LED</p>	<p>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.</p> <p>The green LED lights whenever the unit is on.</p>
<p>8</p>	<p>Contrast Key</p>	<p>Hold while pressing the up/down arrow keys to adjust the contrast of the display.</p>
<p>9</p>	<p>I/O (On/Off)</p>	<p>Turns the instrument on and off. The key must be pressed for at least one-half (½) second.</p>

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

Figure 7 Displays



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 number of datapoints 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	Softkey Description	Describes the function of the softkey 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.

Calibration Accessories

- **Calibration Combination (Cal Combo) which contains:**

- One 50 ohm load
- One Open standard
- One Short standard

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

- **Test Cable (optional)** – A phase-stable cable will provide consistent, reliable results.

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

Calibrating the Site Analyzer

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

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).*

1. Press the Calibrate key.
2. Connect the Cal Combo "Open" connector to the unit antenna port.
3. Press the Open softkey 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 softkey 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 softkey then wait for the unit to beep and display Done.
8. Remove the Cal Combo from the unit.

Figure 8 Calibrating the Site Analyzer



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 making a match measurement, be sure to 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 "[Saving and Recalling Traces](#)" on page 55.

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.

Selecting the Measure Match Mode

1. Press ON/OFF key for ½ second.
2. Press the **Mode** key.
3. Press the **Measure Match** key.

Figure 9 *Selecting the Measure Match Mode*



Setting the Measurement 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.

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 a frequency that is outside of the range of the Site Analyzer is entered, the Site Analyzer will override the entry and set the minimum or maximum frequency of the model.

1. Enable the Measure Match Mode. See "[Selecting the Measure Match Mode](#)" on page 13.
2. Do one of the following:
 - **To set a Custom Sweep Frequency:** See "[Setting a Custom Sweep Frequency](#)" on page 14.
 - **To select a Sweep Frequency:** See "[Selecting a Sweep Frequency from a Band List](#)" on page 15.

Setting a Custom Sweep Frequency

1. Press the **Config** key.
2. Press the **Freq** softkey.
3. Select Start, Stop, Center, or Span using the left or right scroll keys.
4. Enter a value.
5. Press **Enter**.
6. Press the **Esc** key to exit the configuration screen.

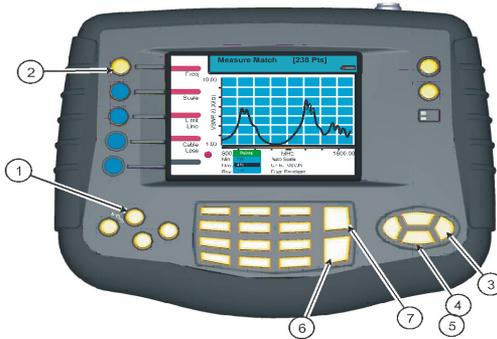
Figure 10 Setting a Custom Sweep Frequency



Selecting a Sweep Frequency from a Band List

1. Press the **Config** key.
2. Press the **Freq** softkey.
3. Select Start, Stop, Center, or Span using the left or right scroll keys.
4. Open the band list menu using the up or down scroll keys.
5. Select the desired band using the up or down scroll keys.
6. Press the **Enter** key to accept the selection.
7. Press the **Esc** key to exit the configure screen.

Figure 11 Selecting a Sweep Frequency from a Band List



Selecting the Measurement Units

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

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

1. Enable the Measure Match Mode. See "[Selecting the Measure Match Mode](#)" on page 13.
2. Set the frequency. See "[Setting the Measurement Frequency](#)" on page 14.
3. Calibrate the Site Analyzer. See "[Calibration](#)" on page 11.
4. Press the **Config** key.
5. Press the **Scale** softkey.
6. Select units by pressing the left or right scroll keys.
7. Open the units list menu by pressing the up or down scroll keys.
8. Select the desired units by pressing the up or down scroll keys.
9. Press the **Enter** key to accept the selection.
10. Press the **Esc** key to exit the configure screen.

Figure 12 Setting Match Mode Measurement Units



Setting the Measurement Scale Limits

The minimum and maximum values on the Y (vertical) scale can be set manually or choose Auto Scale and let the instrument select values that will display the entire trace. Values cannot be entered that are outside of the limits of the instrument (-60 and 0). If the expected results are unsure, 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
Connector	-25 dB
Jumper	-35 dB
Lightning Protector	-25 dB
Transmission Line	-30 dB

1. Enable the Measure Match Mode. See "[Selecting the Measure Match Mode](#)" on page 13.
2. Set the frequency. See "[Setting the Measurement Frequency](#)" on page 14.
3. Calibrate the Site Analyzer. See "[Calibration](#)" on page 11.
4. Press the **Config** key.
5. Press the **Scale** softkey.

Note: To enter a manual value, skip this step.

6. Use the left or right scroll keys to select Auto Scale then press **Enter**.
7. Select Min, using the left or right scroll keys, then enter the value or enter -60 and press **Enter**.

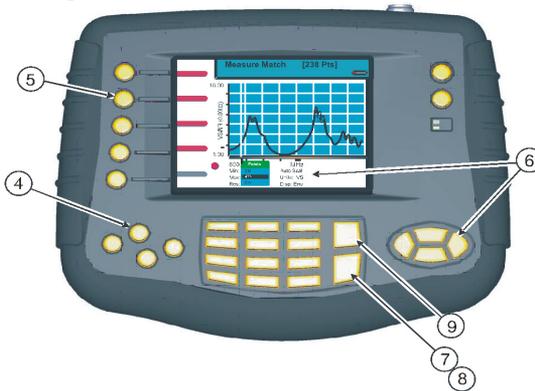
Note: If Auto Scale is selected, skip this step.

8. Select Max, using the left or right scroll keys, then enter the value or enter -60 and press **Enter**.

Note: If Auto Scale is selected, skip this step.

9. Press the **Esc** key to exit the configure screen.

Figure 13 Setting Match Mode Scale Limits



Setting the Measurement Data Points

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 saving a trace, the number of data points collected (238, 475, or 949) are saved.

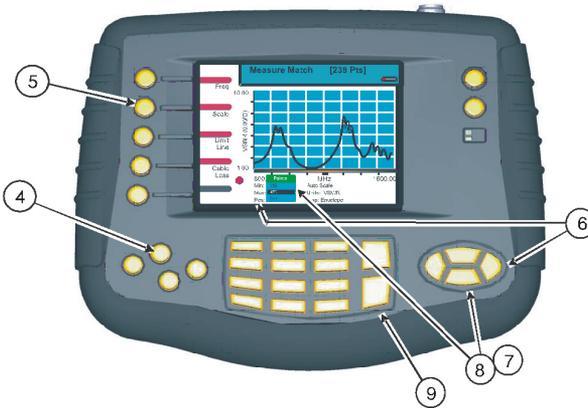
The default number of data points is 238. Selecting 475 data points provides twice as many measurement points as 238, but it takes approximately twice as long for the trace to sweep and display. Selecting 949 data points provides four times as many measurement points as 238, but it takes approximately 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 the number of measurement data points are changed, the current trace is erased and the Save softkey is disabled until the sweep finishes and the screen displays the first new trace. If the Save softkey is pressed before the first sweep has completed, the Save softkey 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 pressing the Save softkey).

1. Enable the Measure Match Mode. See ["Selecting the Measure Match Mode" on page 13](#).
2. Set the frequency. See ["Setting the Measurement Frequency" on page 14](#).
3. Calibrate the Site Analyzer. See ["Calibration" on page 11](#).
4. Press the **Config** key.
5. Press the **Scale** softkey.
6. Press the left or right scroll key to select Pts.
7. Press the up scroll key to open the selection list.
8. Press the up or down scroll key to select a data point option (238, 475, 949).
9. Press the **Enter** key to accept the selection and return to the configuration screen.

Figure 14 Setting the Number of Measurement Data Points



Setting the Graph Display Type

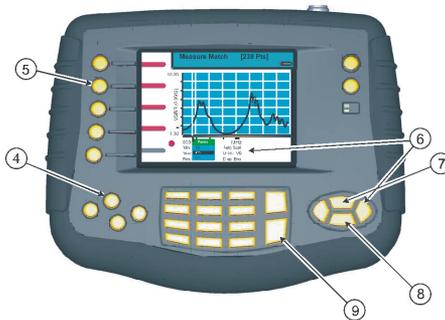
When the Site Analyzer collects data during a sweep, the unit can specify that it measure 238 data points, 475 data points, or 949 data points. Selecting 475 data points takes twice as much time to sweep as 238 points, and 949 points takes four times as much time to sweep as 238 points.

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 saving (or downloading) 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 the trace.*

1. Enable the Measure Match Mode. See "[Selecting the Measure Match Mode](#)" on page 13.
2. Set the frequency. See "[Setting the Measurement Frequency](#)" on page 14.
3. Calibrate the Site Analyzer. See "[Calibration](#)" on page 11.
4. Press the **Config** key.
5. Press the **Scale** softkey.
6. Press the left or right scroll key to select Disp.
7. Press the up scroll key to open the selection list.
8. Press the up or down scroll key to select a display type (envelope, maximum, minimum).
9. Press the **Enter** key to accept the selection and return to the configuration screen.

Figure 15 Setting the Graph Display



Set and Activate Acceptance Limits

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

An acceptance limit line can be set 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, the limit test must be ON. This feature is available only in the Measure Match mode and the Fault Location mode.

1. Enable the Measure Match Mode. See ["Selecting the Measure Match Mode" on page 13](#).
2. Set the frequency. See ["Setting the Measurement Frequency" on page 14](#).
3. Calibrate the Site Analyzer. See ["Calibration" on page 11](#).
4. Follow the numbered steps in [Figure 46 on page 50](#) to turn ON the limit test and set the limit line value.

Note: *When setting a limit line value with the Limit Test turned OFF, a line will not be displayed on the screen.*

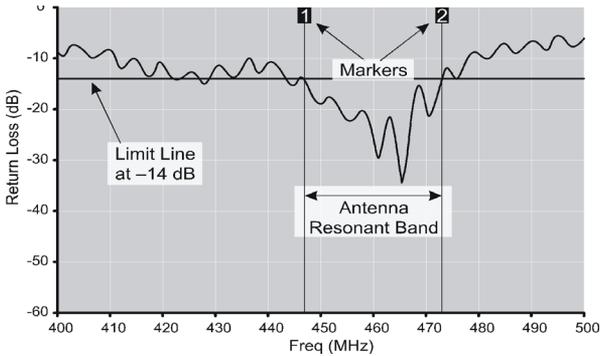
Measure the Match of the Component

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.
3. When a trace is displayed on the screen, any of the following can be done:
 - Hold the trace. See ["Measurement Hold" on page 50](#).
 - Add markers to the trace. See ["Markers" on page 51](#).
 - Save the trace. See ["Saving a Trace" on page 57](#).

Interpreting the Measurement

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

Figure 16 Measurement Screen



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

Cable Loss Measurement

- Ensure 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 be selected by choosing Cbl Loss from Units when setting the Scale in Measure Match (Configure).

- Check the power of cable to be tested. See "[Determine the Power of the Component Being Tested](#)" on page 13.

Note: Ensure that the cable does not have power greater than +22 dBm.

Note: Ensure the unit is in either Measure Match or Fault Location mode. Also ensure that the frequency band of the system is known.

Setting Up a Cable Loss Measurement

1. Press the **Config** key.
2. Press the **Scale** softkey.
3. Press the right or left scroll keys to select Units.
4. Press the up key to open the units list.
5. Press the up or down keys to select Cbl Loss.
6. Press **Enter**.

Figure 17 Set Up for Cable Loss Measurement



Performing a Cable Loss Measurement

1. Enable the Measure Match Mode. See "[Selecting the Measure Match Mode](#)" on page 13.
2. Select the **Freq** softkey.
3. Set the frequency start and stop to a range that is well beyond the normal range of the antenna. See "[Setting the Measurement Frequency](#)" on page 14.

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.

4. Connect a phase stable cable to the Site Analyzer antenna test port.
5. Connect a Cal Combo to the other end of the cable.
6. Calibrate the Site Analyzer. See "[Calibration](#)" on page 11.

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

7. Remove the Cal Combo unit from the cable.

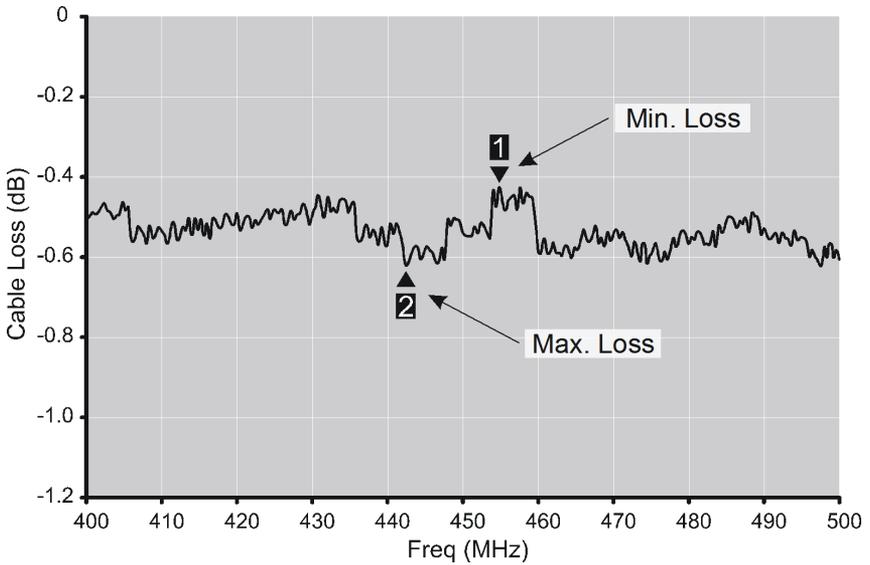
Note: Do not disconnect the phase stable cable from the Site Analyzer.

8. Connect the phase stable cable to one end of the cable under test.
9. Connect the Short connection on the Cal Combo unit to the other end of the cable being tested.
10. Wait at least 10 seconds to allow the trace to update.
11. Hold the trace on the screen. See "[Measurement Hold](#)" on page 50.
12. Place a triangle-style marker (mark 1) at the minimum loss point within the frequency band on the trace. See "[Markers](#)" on page 51.
13. Place a triangle-style marker (mark 2) at the maximum loss point within the frequency band on the trace.
14. Save and label the trace, if appropriate. See "[Saving a Trace](#)" on page 57.

Interpreting a 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.

Figure 18 Cable Loss Measurement Screen



1. Take the average of M1 and M2.

Note: 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.

Note: If they do not correspond, retake the measurement, then check the cable for problems.

Note: Cable Loss for a good cable should be flat across the frequency band.

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 making a fault location measurement, ensure that the following items and information is present:

- 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 being measured (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 "[Saving and Recalling Traces](#)" on page 55.

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

Selecting Fault Location Mode

1. Press ON/OFF key for ½ second.
2. Press the **MODE** key.
3. Press the **Fault Location** softkey.

Figure 19 Select Fault Location Mode



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 measured 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 specifying a frequency span, the Site Analyzer calculates the maximum measurable distance. If the maximum distance being measured is known, it can be entered instead of the frequency span; the Site Analyzer calculates the frequency span. If a maximum distance is manually entered, select the data points before entering the max distance

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

Data Points — Increasing the number of data points increases 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). When changing the number of data points measured, the software automatically recomputes the new maximum measurable distance. If a maximum distance is entered manually, be sure to select the data points before entering the max distance. Changing data points does not turn calibration off.

Frequency Span — Narrowing the frequency span increases the measurable distance (refer to the "[Fault Location Distance Tables](#)" on page 87).

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 being used.

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 to determine the frequency span (for both methods, the maximum distance, velocity of propagation, and number of data points need to be known). Instructions for both methods are in Step 2 below:

- See "[Fault Location Distance Tables](#)" on page 87.
 - Calculate the frequency span.
1. Enable the Measure Match Mode. See "[Selecting the Measure Match Mode](#)" on page 13.
 2. Determine the frequency span.
 3. Choose how many data points are wanted to measure.
 4. Choose a velocity propagation percentage that is closest to the cable in the system. "[Fault Location Distance Tables](#)" on page 87.
 - a. Read down the Vel Prop percentage column to determine the frequency span or the maximum distance.

Note: *When choosing a distance, choose one that is approximately 25% more than the tower height (or length of the cable system to be tested).*

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 238 data points are chosen, 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 the cable system being tested.*

b. Do one of the following:

- If the cable's velocity of propagation and its length are known but they are not on one of the tables, either enter the max distance into the Site Analyzer or 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

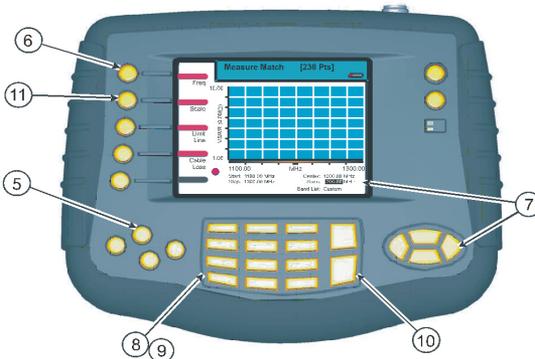
- If a span greater than the current settings permit is entered, the span will be set to the maximum allowable value.

Note: The center frequency is the center of the antenna's frequency range.

Note: To set the max distance, follow the numbered steps in [Figure 20 on page 27](#).

5. Press the **Config** key.
6. Press the **Freq** softkey.
7. For both Span and Center, scroll to select the item (Span or Center).
8. Enter the Span value determined from the table earlier.
9. Enter the value for the center frequency as determined in instruction Step 3.
10. Do one of the following:
 - After entering the Span value, press **Enter**.
 - After entering the Center value, press **Enter**.
11. Enable the Fault Location Mode. See "[Selecting Fault Location Mode](#)" on [page 25](#).

Figure 20 Setting the Frequency Span and the Center Frequency



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. Enable the Fault Location Mode. See "[Selecting Fault Location Mode](#)" on [page 25](#).
2. Press **Enter**, at the warning message, to accept the entry or **Esc** to cancel the entry.

Note: When pressing **Enter**, the Site Analyzer will display the Calibration screen so the calibration process can begin.

3. Press the **Config** key.
4. Press the **Distance** softkey.
5. Press the right or left arrow keys to scroll to Max.
6. Enter a maximum distance value.
7. Press the **Enter** key after entering a value.
8. Press the **Esc** key to exit the configuration screen.

Figure 21 Setting the Maximum Distance

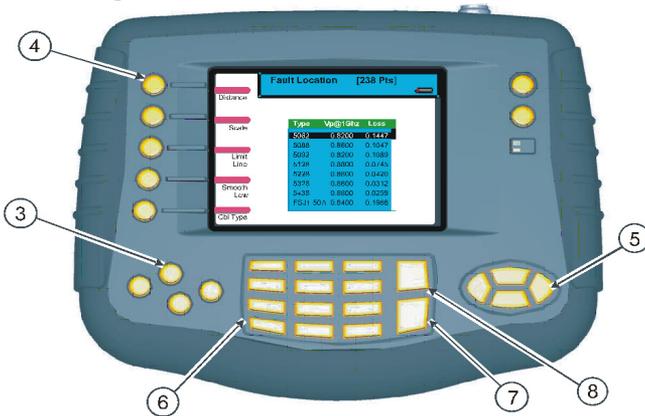
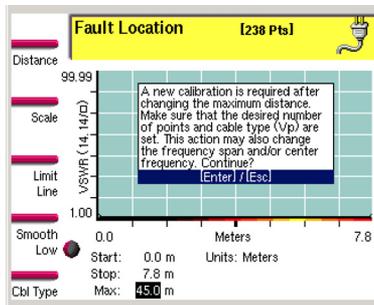


Figure 22 Changed Max Distance Warning Message



Setting the Cable Type

Setting the cable type means that values for the velocity of propagation and the cable loss are entered. The cable type can be set manually or choose from a list of preset values. When manually entering 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.*

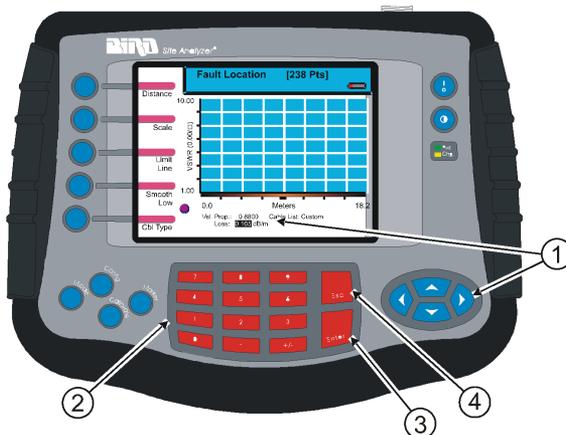
1. Enable the Fault Location Mode. See ["Selecting Fault Location Mode" on page 25](#).
2. Press the **Config** button.
3. Press the **Cbl Type** softkey.
4. Do one of the following:
 - **To set a Custom Cable Type:** See ["Setting a Custom Cable Type" on page 29](#).
 - **To select a Sweep Frequency:** See ["Selecting a Cable Type from a Cable Type List" on page 30](#).

Setting a Custom Cable Type

1. Scroll to the item (Vel Prop or Loss).

Note: *For both Vel Prop and Loss.*
2. Enter the Vel Prop value or enter the Loss value.
3. Do one of the following:
 - Press **Enter** after entering the Vel Prop value.
 - Press **Enter** after entering the Loss value.
4. Press the **Esc** key to exit the configuration screen.

Figure 23 *Setting a Custom Cable Type*



Selecting a Cable Type from a Cable Type List

1. Press the right or left scroll keys to select and open Cable List.
2. Press the up or down scroll keys to select an item on the list.
3. Press the **Enter** key to accept the selection.
4. Press the **Esc** key to exit the configuration screen.

Figure 24 Selecting the Cable Type from List



Setting the Distance and Units

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

If it is suspected that there might be a fault at a known distance along a cable, 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. Both the start point (where to begin the trace display) and the stop point (where to end the trace display) can be set.

Note: The stop point cannot be set to a value that is greater than the maximum distance being measured.

Example - If a data point option, frequency span, and Vp are selected and it results in a maximum distance of 100, a stop point cannot be set to a value greater than 100 feet.

Follow the numbered steps in [Figure 25 on page 31](#) to set the start and stop distance. For an antenna lead, typically set the start distance at 0, and the stop distance at a few feet or meters greater than the tower height.

1. Press the **Config** key.
2. Press the **Distance** softkey.

Setting the Start and Stop Distance

1. Press the right or left arrow keys to scroll to Start or Stop.
2. Enter a value for Start or Stop using the numeric key pad.
3. Press the **Enter** key after entering a value.
4. Press the **Esc** key to exit the configuration screen.

Figure 25 Setting the Start and Stop Distance



Setting the Distance Units

1. Press the left or right arrow keys to select **Units**.
2. Press the up or down arrow keys to select a unit from the list.
3. Press the **Enter** key.
4. Press the **Esc** key to exit the configuration screen.

Figure 26 Setting the Distance Units



Setting the Scale & Unit of Measure

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

Setting Fault Location Scale Units

1. Press the **Config** key.
2. Press the **Scale** softkey.
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 desired.
5. Press the **Enter** key.
6. Press the **Esc** key to exit the configure screen.

Figure 27 Setting Fault Location Scale Units



Setting Fault Location Scale Limits Manually

1. Press the **Config** key.
2. Press the **Scale** softkey.
3. Use the left or right scroll keys to select Min.
4. Use the keypad to enter the 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 the value or use 0 as a limit.
8. Press the **Enter** key.
9. Press the **Esc** key to exit the configure screen.

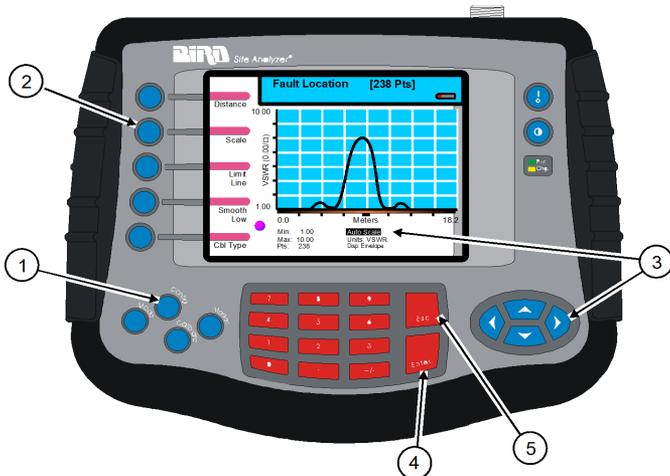
Figure 28 Setting Fault Location Scale Limits Manually



Setting Fault Location Auto Scale

1. Press the **Config** key.
2. Press the **Scale** softkey.
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.

Figure 29 Setting Fault Location Auto Scale



Set the Measurement Data Points

The SA-XT 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 saving 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.

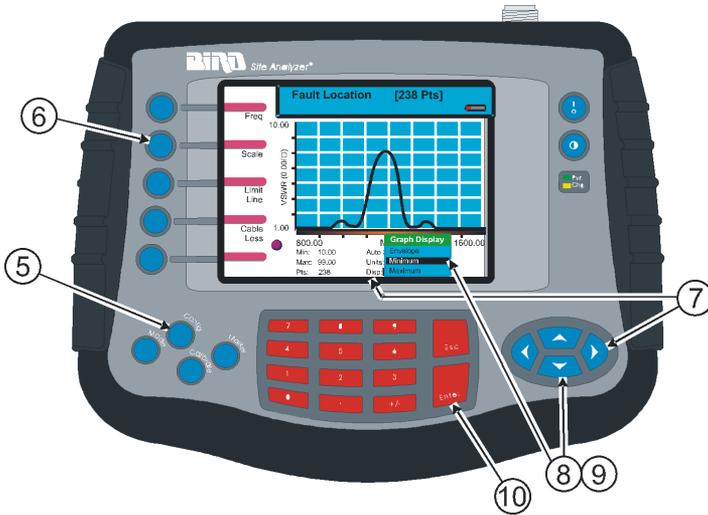
A progress bar, just below the x-axis, moves from left to right indicating the progress of the sweep. When the progress bar reaches the right side of the screen, the sweep is finished.

When changing the number of measurement data points, the current trace is erased and the Save softkey is disabled until the sweep finishes and the screen displays the first new trace. If the Save softkey is pressed before the first sweep has completed, the Save softkey 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 pressing the Save softkey).

Setting the Measurement Resolution

1. Enable the Measure Match Mode. See "[Selecting the Measure Match Mode](#)" on page 13.
2. Set the frequency. See "[Setting the Measurement Frequency](#)" on page 14.
3. Calibrate the Site Analyzer. See "[Calibration](#)" on page 11.
4. Enable the Fault Location Mode. See "[Selecting Fault Location Mode](#)" on page 25.
5. Press the **Config** key.
6. Press the **Scale** softkey.
7. Use the left or right scroll keys to select Res.
8. Press the up scroll key to open the list.
9. Press up or down scroll key to select a data point option (238, 475, 949).
10. Press the **Enter** key to accept the selection and return to the configure screen.

Figure 30 Setting the Measurement Resolution



Set the Graph Display Type

When the Site Analyzer collects data during a sweep, it can be set to 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.

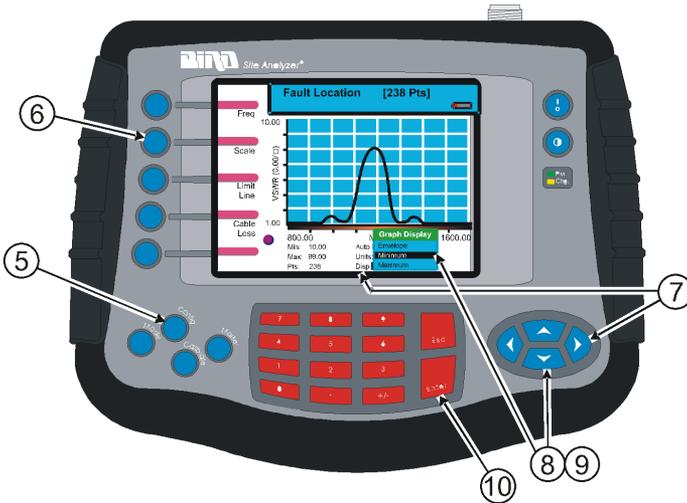
The Site Analyzer display screen graph area can display only 238 data points because of its physical pixel limitations. However, if the trace contains 475 data points or 949 data points, all points are represented on the display. There are three modes available to display the data points for the trace - 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 saving (or downloading) 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 the trace.

Setting the Graph Display

1. Enable the Measure Match Mode. See "[Selecting the Measure Match Mode](#)" on page 13.
2. Set the frequency. See "[Setting the Measurement Frequency](#)" on page 14.
3. Calibrate the Site Analyzer. See "[Calibration](#)" on page 11.
4. Enable the Fault Location Mode. See "[Selecting Fault Location Mode](#)" on page 25.
5. Press the **Config** key.
6. Press the **Scale** softkey.
7. Press the left or right scroll key to select Disp.
8. Press the up scroll key to open the selection list.
9. Press the up or down scroll key to select a display type (envelope, maximum, minimum).
10. Press the **Enter** key to accept the selection and return to the configuration screen.

Figure 31 Setting the Graph Display



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.

An acceptance limit line can be set 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, the limit test must be ON. This feature is available only in the Measure Match mode and the Fault Location mode.

1. Enable either the Measure Match Mode, See "[Selecting the Measure Match Mode](#)" on page 13.
2. Set the frequency. See "[Setting the Measurement Frequency](#)" on page 14.
3. Calibrate the Site Analyzer. See "[Calibration](#)" on page 11.
4. Enable the Fault Location Mode, if necessary. See "[Selecting Fault Location Mode](#)" on page 25.
5. Press the **Limit Test** key to activate the limit line:
 - a. Test ON Aud (line and sound)
 - b. Test ON (line only)
 - c. Test OFF

Note: A limit line value can be set with the limit test turned OFF, but will not see the line displayed.
6. Press the **Config** key.
7. Press the **Limit Line** softkey.
8. Use the keyboard to enter a limit value then press the **Enter** key.
9. Press the **Esc** key to exit the configuration screen.

Figure 32 Setting a Limit Line



Test for Fault Location

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

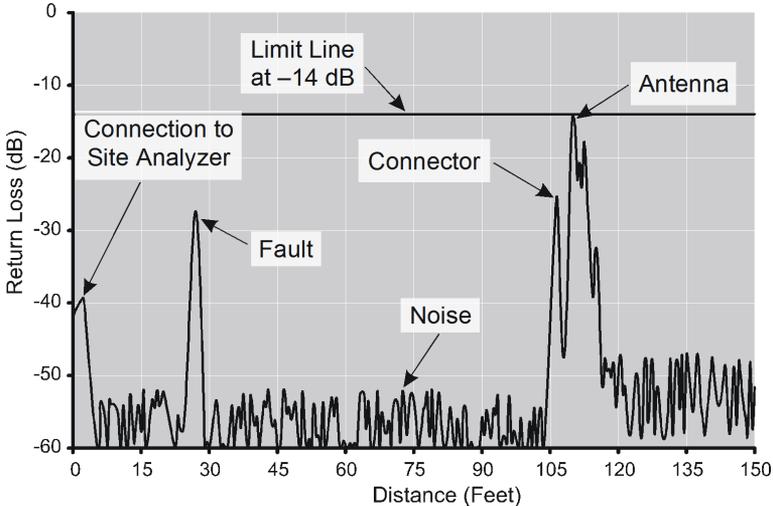
Note: If the Site Analyzer is calibrated with a phase stable cable connected to its antenna port, do not remove the cable. Connect it to the cable to be tested.

2. Wait at least 10 seconds for the sweep to update.
3. When a trace is on the screen, do any of the following:
 - Hold the trace. See "[Measurement Hold](#)" on page 50.
 - Add markers to the trace. See "[Markers](#)" on page 51.
 - Save the trace. See "[Saving a Trace](#)" on page 57.

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.

Figure 33 Fault Location Measurement Screen



Typical Component Return Loss	
Antenna at Resonance	-14 dB
Connector	-25 dB
Jumper	-35 dB
Lightning Protector	-25 dB
Transmission Line	-30 dB

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

Note: *To avoid aliasing, always set the measurement distance to a value that is a few feet or meters greater than the entire length of the cable system.*

- A large spike (fault) near the Site Analyzer will mask other faults farther away. When a large spike near the Site Analyzer is found, fix it and then repeat the Fault Location measurement.

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

Note: *Power measurement comes standard on all models.*

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 Directional Power Sensors, Terminating Power Sensors, and Wideband Power Sensors.

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

Figure 34 *Power Measure Mode*

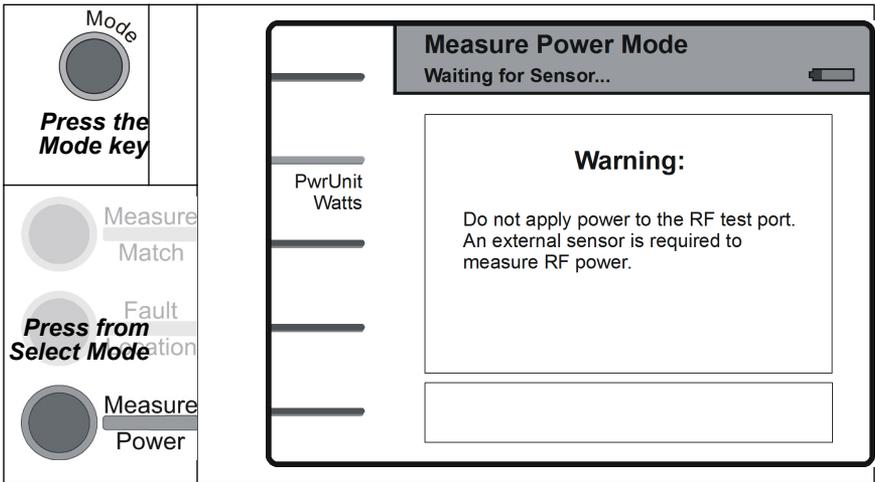
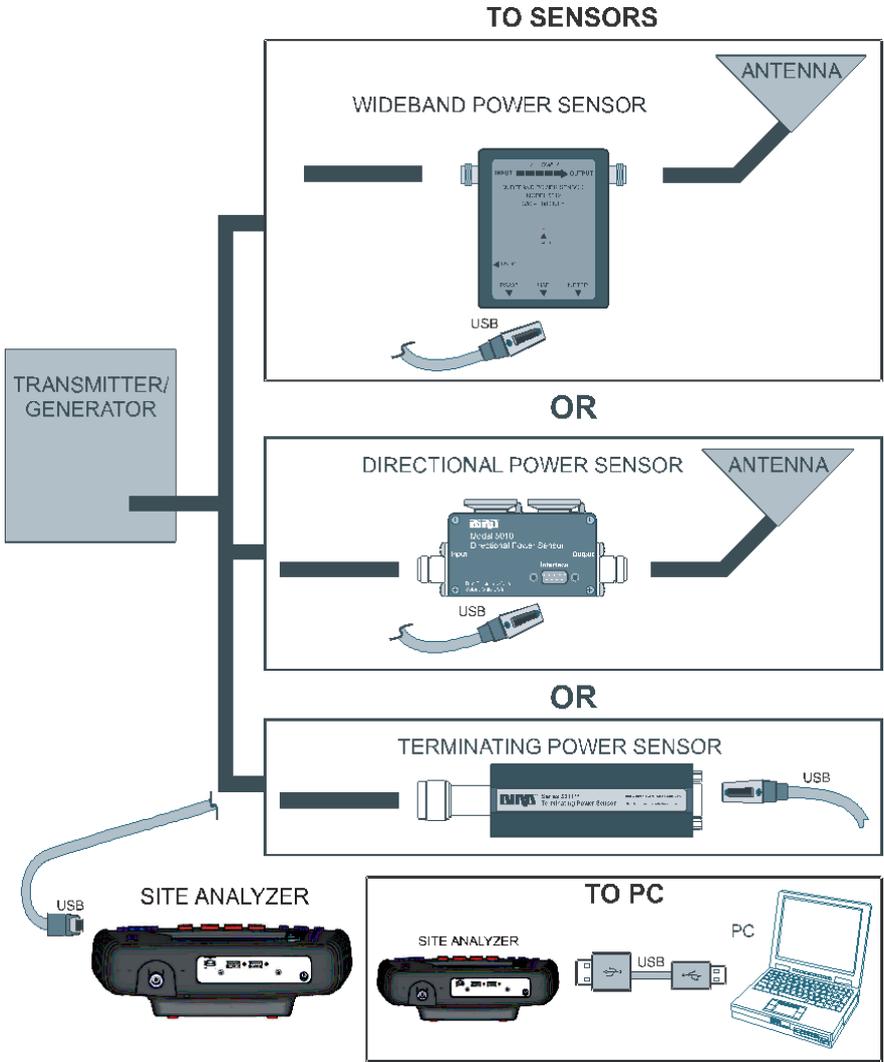


Figure 35 Connecting the SA to Measure Power



Connecting a Sensor

See [Figure 35 on page 41](#). 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, an external power sensor must be connected to the “Remote Power Sensor” port. See [Figure 35 on page 41](#).

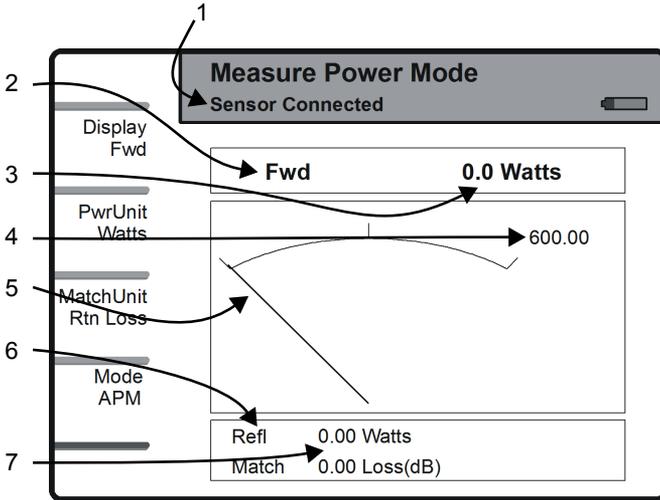
CAUTION

When using a terminating power sensor, do not exceed 2 W average or 125 W peak power for 5 μ s. Doing so will render the sensor inoperative.

For best results with element-based sensors, connect the sensor and enter the forward element’s power rating before taking any data. See ["Setting the Full Scale Power" on page 44](#).

Display Description

Figure 36 Measure Power Screen Features



Note: 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 rating of the reflected element is 10% of the forward element.

Figure 37 Full Scale Power Meter

The diagram illustrates the configuration screen for the Full Scale Power Meter. On the left, there are three instructions with corresponding icons:

- Press from Measure Power Mode:** A circular icon with the word "Config" above it.
- Scroll to Full Scale:** A directional pad icon with arrows pointing up, down, left, and right.
- Enter the forward element power:** A numeric keypad icon with digits 0-9, a decimal point, and an "Enter" key.

The main configuration screen, titled "Measure Power Mode Configuration Screen", displays the following information:

- Recall Setups:** A vertical list of five horizontal bars on the left side of the screen.
- Forward Element:** A box labeled "Fwd" showing a reading of "0.000 KWatts".
- Graph:** A semi-circular scale with a red needle pointing to a value of "1.20".
- Offset:** A box labeled "Offset" showing a reading of "0.00 dB".
- Full Scale:** A box labeled "FullScale" showing a reading of "1000.00 Watts".

Note: The Bird Site Analyzer will automatically set the full scale power for sensors that do not use elements, such as the TPS or WPS sensors.

Zeroing Bird Power Sensors

CAUTION

When using terminating power sensors do not exceed 2 W average or 125 W peak power for 5 μ s. 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.

Example - If the zero value is -2μ W, measuring a 5 mW signal will give a reading of 4.998 mW, a 0.04% error. Periodically re-zero the sensor.

Note: This applies to TPS and WPS 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.

Figure 38 Zeroing, Message 1

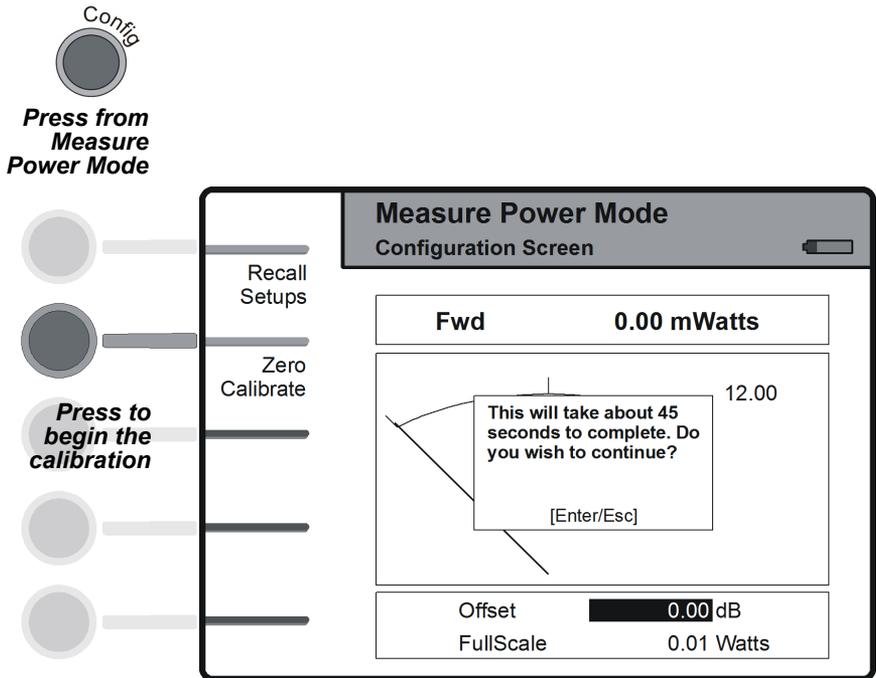


Figure 39 Zeroing, Message 2


**Press to
 accept the
 warning**

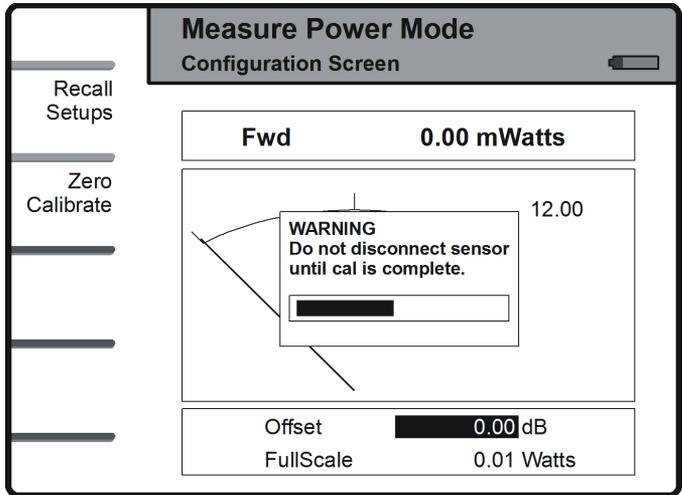
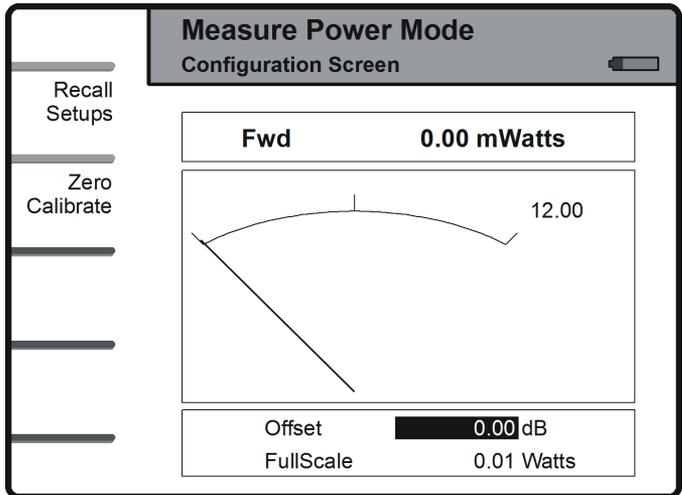


Figure 40 Zeroing, Power Meter

**Wait for
 calibration
 to finish**

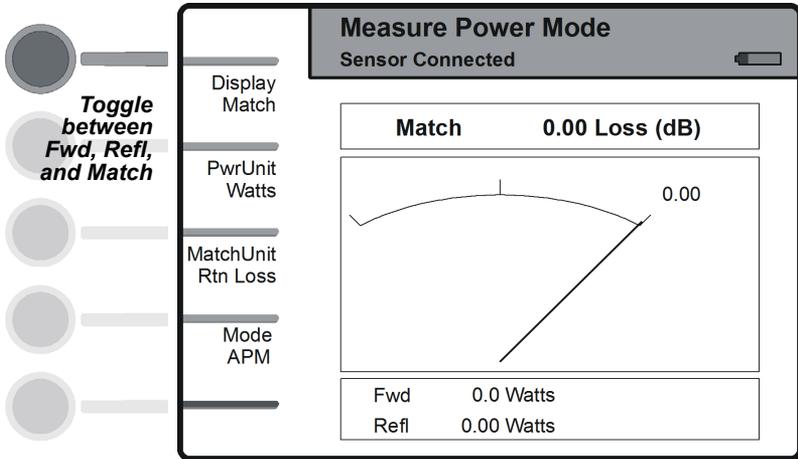


Choosing the Displayed Measurement

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

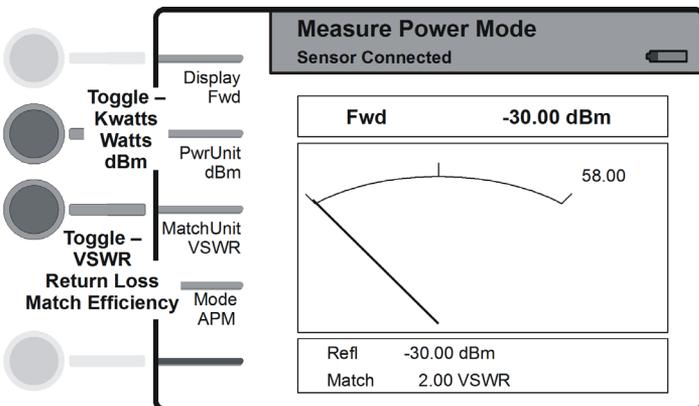
Note: When using a terminating power sensor, only forward power can be measured. Reflected power and match will not be displayed.

Figure 41 Match Screen



Setting Units

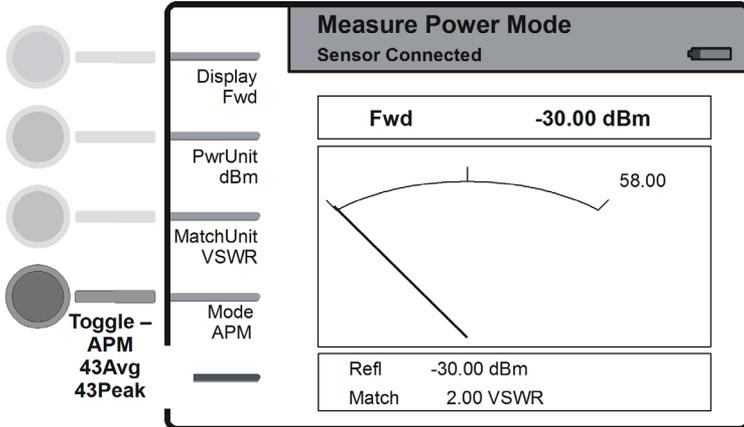
Figure 42 Forward Screen



Changing the Mode for the Directional Power Sensor

The DPS has three modes of operation: APM, 43Avg, and 43Peak. Bird 43 Elements can measure average, peak, and average of max. and min. power. Bird APM Elements only measure average power.

Figure 43 *DPS, Forward Screen*

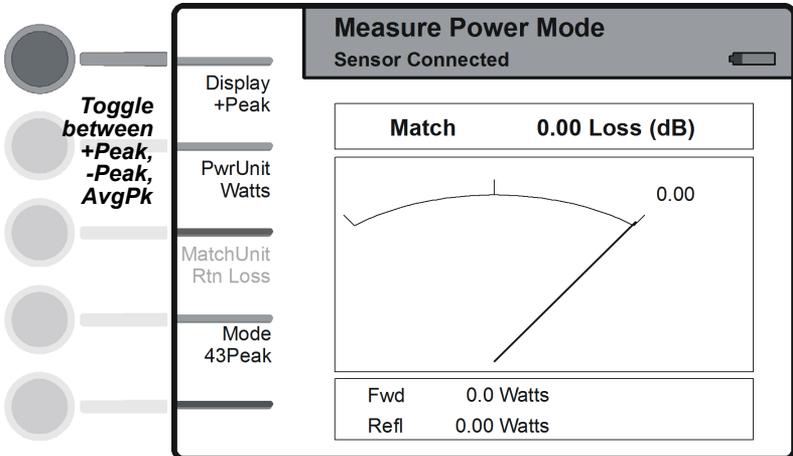


The 43 Peak Mode

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

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

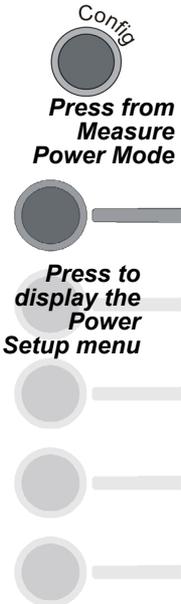
Figure 44 *DPS, Match Screen*



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.

Figure 45 Setup Screens



Recall

Measure Power Mode

Select Power Setup

Name	Offset	Scale
Setup1	16.00	1000.00 W
Dflt1	0.00	500.00 W
Dflt2	0.00	500.00 W
Dflt3	0.00	500.00 W
Dflt4	0.00	500.00 W
Dflt5	0.00	500.00 W
Dflt6	0.00	500.00 W
Dflt7	0.00	500.00 W



Scroll to the setup to be recalled



The setup is recalled

Recall Setups

Measure Power Mode

Configuration Screen

Fwd 0.00 KWatts

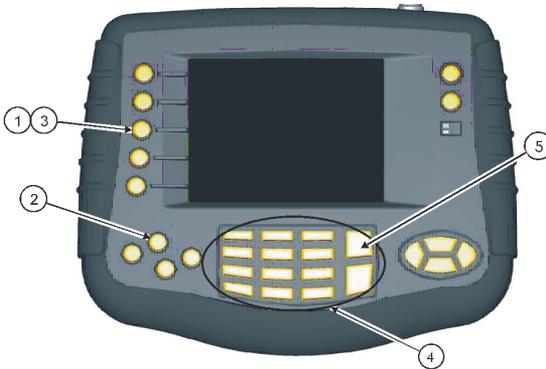
Offset 16.00 dB

FullScale 1000.00 Watts

Setting a Limit Line

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** softkey.
4. Use the keyboard to enter a limit value of the 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

Figure 46 Setting a Limit Line

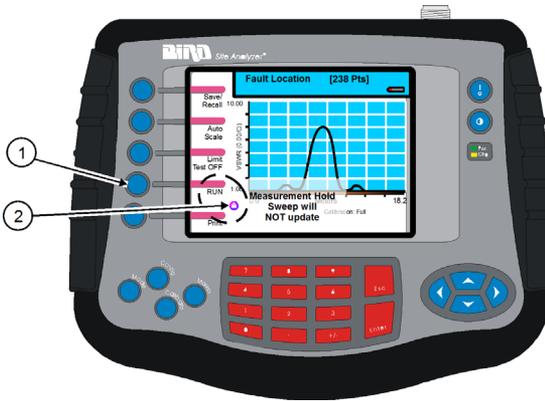


Measurement Hold

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.

1. Press the Hold softkey to hold the measurement.
2. Press the Run softkey to resume sweeping.
3. The lock symbol indicates that the measurement is held.

Figure 47 Measurement Hold



Markers

Up to six markers can be used and activated 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. Each marker is displayed as a triangle pointer or a vertical line through the trace. The difference (delta) in frequency between two markers can also be displayed. Markers indicate VSWR to 0.01, and Return Loss or Cable Loss to 0.1 dB.

When both a recalled trace and the current measurement trace is both displayed 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, select a marker using the Mark softkey. At the bottom of the screen, the site analyzer will display the marker number, the frequency, and the value of the current trace at the marker. The difference in frequency and value between the current trace and the recalled trace is also displayed. 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. Press the **Marker** key to enter marker setup.
2. Press the **Mark** softkey 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** softkey to select triangle marker (mark 4 in the figure) or line marker (mark 1 in the figure).
5. Repeat Step 2 through Step 4 to select and activate up to six markers and set the mark style.
6. Press the **Esc** key to return to the test screen.

Figure 48 Activate Marker and Set Style



Move Markers

The active markers can be moved by using the arrow scroll keys or by entering a distance with the numeric key pad. All markers follow the current trace only.

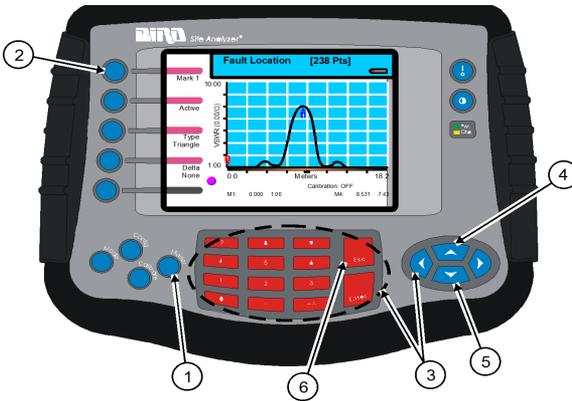
If a trace is recalled and markers are desired to compare it to the current trace, select the dual mode (see ["Using Markers with Recalled Traces" on page 54](#)). The marker will move along the current trace (as described in the following paragraph) and compare *each* data point at the marker frequency (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 the right or left scroll keys are pressed, the marker moves with each key press. In a trace with 475 data points, there are two data points at each pixel. When first moving to a new pixel, the screen displays the value of the first data point that was saved and when pressing 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 first moving to a new frequency, the screen displays the value of the first data point that was saved and each time the right scroll key is pressed 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.

Moving Markers

1. Press the **Marker** key to enter marker setup.
2. Press the **Mark** softkey 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.

Figure 49 Moving Markers



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, the difference between the selected marker and the limit line will be evident. 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 must have at least two active markers for the delta option to work.

Note: Ensure that unit is in either Measure Match mode or Fault Location mode.

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

Figure 50 Delta Markers



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 / 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 dual mode is selected, the markers move as described in ["Move Markers" on page 52](#).

1. Recall a trace. See ["Recalling a Saved Setup" on page 62](#).
2. Press the **Marker** key.
3. Press the **Mode** softkey to select single mode or dual mode.
4. Select a marker to move.
5. Press the left or right scroll keys to move the marker.
6. Press the **Esc** key to return to the test screen.

Figure 51 Using Markers with Recalled Traces



Setting Display Smoothing

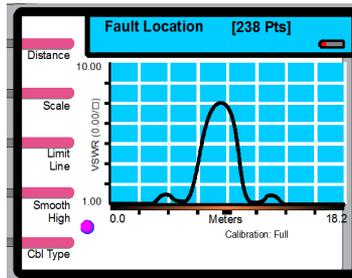
Smooth is an option that will digitally average the displayed trace. There are three levels of smoothing: low, medium, and high. [Figure 53 on page 55](#) a trace with high smoothing selected.

1. Press the **Config** key
2. Press the **Smooth** key:
 - First press - sets smoothing to Low
 - Second press - sets smoothing to Medium
 - Third press - sets smoothing to High
 - Fourth press - sets smoothing to None (off)
3. Press the **Esc** key to exit the configuration screen

Figure 52 Setting Display Smoothing



Figure 53 Display with High Smoothing Selected



Saving and Recalling Traces

Note: This feature is only available if the unit is NOT connected to a PC. If the unit is connected to a PC, this feature will be disabled.

Traces and instrument setups can be saved to and recalled from the memory in the unit or on an external USB thumb drive. The Site Analyzer identifies saved files with the frequency range used, a time-date stamp, and the number of data measurement points.

Example - A trace filename might be labeled as "25-6000_07-JUN-2011_084413_475", where 25-6000 is the frequency range, 07-JUN-2011_084413 is the time-date stamp, and 475 is the number of datapoints measured.

Descriptive labels (text and numbers) can also be added to the items. This section discusses saving and recalling traces, and creating and editing labels. Refer to "[Saving a Setup](#)" on page 61 for information about saving instrument setups.

- The trace files are approximately 26 KB for a 238 point sweep. Since the SA-XT trace files are stored in a text-based CSV format they vary in size a little from file to file.
- Saved set ups are approximately 23 KB each.

The internal memory available for storing traces and setups is limited. The 64 MB internal flash memory can store:

- Up to 2,800 custom instrument setups
- Up to 2,500 traces at 238 data points
- Up to 1,250 at 475 data points
- Up to 650 at 949 data points

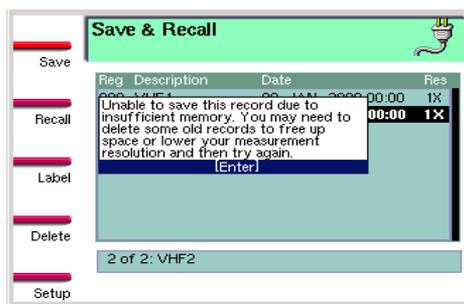
Note: All of the stored traces do not need to be of the same number of data points, therefore, the actual maximum number of traces saved varies depending upon the number of data points in the traces.

Example - The Site Analyzer could store 140 traces with 238 data points plus 60 traces with 475 data points (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 being saved, the system displays a message stating that there is no more space and that the trace needs to be saved at a lower number of data points (i.e. change the number of data points in the Config menu), free space by deleting some traces, or connect an external flash drive (see "[Connecting a USB Flash Drive](#)" on page 56).

Note: The amount of available storage is displayed at the bottom of the Save/Recall screen.

Figure 54 Out of Memory Message



Connecting a USB Flash Drive

In addition to internal memory, a USB flash drive can also be connected to the unit and utilized. The number of instrument setups and data traces able to be stored is dependent on the available memory on the flash drive.

1. Ensure the site analyzer is not connected to a PC.
2. Connect the flash drive to one of the type A USB ports.
3. Press the Save/Recall key.

4. Do one of the following:
 - **To save a trace**, see ["Saving a Trace" on page 57](#).
 - **To recall a trace**, see ["Viewing a Recalled Trace" on page 59](#).
5. Press the Eject soft key to end USB operation.
6. Remove the USB drive.

Note: *the light on the USB drive might still be lit after EJECT and it is ok to remove it from the SA-XT.*

Saving a Trace

Note: *This feature is only available if the unit is NOT connected to a PC. If the unit is connected to a PC, this feature will be disabled.*

1. Press the Save/Recall softkey.
2. Press the Save softkey which automatically opens the text label screen.

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" on page 63](#) 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.*

3. Enter the name of file.
 - Use the right and left scroll keys to select a character column.
 - Press the up and down scroll keys to move the text cursor to select a character in the label text (type over function).
 - Press the softkey to enter the letter indicated at its right.
 - Press the **Delete** key to remove the character immediately at the left of the text cursor.
4. Press the **Enter** key to accept the label text.
5. Press the **Esc** key to exit Save and Recall mode.

Figure 55 Save Trace Screen



Figure 56 Text Label Screen



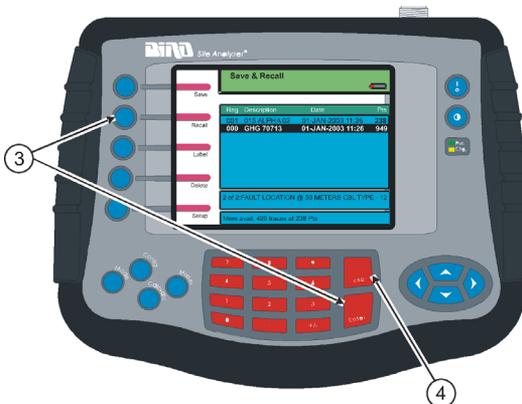
Recalling a Saved Trace

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

Ensure that the unit is in either Measure Match mode or Fault Location mode to recall a saved trace.

1. Press the **Save/Recall** softkey
2. Press the up and down scroll keys to select a saved trace.
3. Press the **Recall** softkey or the **Enter** key to recall the selected trace.
4. Press the **Save/Recall** softkey then press the **Esc** key to remove a recalled trace from the display.

Figure 57 Selecting and Recalling a Saved Trace



Viewing a Recalled Trace

When a saved trace is recalled, it is displayed along with the trace currently being measured (two traces on the screen). 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.*

To remove a recalled trace from the display:

1. Press the Save/Recall softkey.
2. Press the Esc key.

Figure 58 Comparing Data Points in Dual Mode

Current Trace		Recalled Trace	
Data Points Collected	Data Pt. Compared	Data Pt. Compared	Data Points Collected
238	1	→ 1	238
	1	→ 1	
		2	475
	1	→ 1	
	2	949	
	3		
	4		
475	1		→ 1
	2	→ 1	
	1	→ 1	475
	2	→ 2	
	1	949	
	2		
	3		
	4		
949	1	→ 1	238
	2	→ 1	
	3	→ 1	
	4	→ 1	
	1	475	
	2		
	3		
	4		
	1	949	
	2		
	3		
	4		

Deleting a Saved Trace

Note: Ensure that the unit is in either Measure Match mode or Fault Location mode.

1. Press the **Save/Recall** softkey.
2. Press the up and down scroll keys to select an item to delete.
3. Press the **Delete** softkey to delete the selected item.

Note: The message “Are You Sure?” appears beside the softkey. Press the **Delete** softkey 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 list.

Figure 59 Selecting and Deleting a Saved Trace



Instrument Setups

Saving a Setup

The current setup parameters can be saved and recalled at a later time. When recalling a saved setup, the saved values replace the current parameters. Saving a setup captures the following values:

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

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

1. Press the **Save/Recall** softkey.

Note: Each entry on the saved setup list is identified by the frequency range used, a time-date stamp, and the number of data measurement points.

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

2. Press the **Setup** softkey.

3. Press the **Save** softkey.

Note: The newly saved setup appears on the list.

4. Press the **Esc** key to exit the Save and Recall screen.

Figure 60 Saving a Setup



Recalling a Saved Setup

Ensure that the unit is in either Measure Match mode or Fault Location mode to recall a setup.

1. Press the **Save/Recall** softkey
2. Press the **Setup** softkey.
3. Press the up and down scroll keys to select a setup to recall.
4. Press the **Recall** softkey.

Note: The selected setup parameters are recalled and replace the current setup in the unit.

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

Figure 61 Recalling a Saved Setup



Deleting a Saved Setup

Note: Only in Measure Match mode or Fault Location mode can a setup be deleted.

1. Press the **Save/Recall** softkey.
2. Press the **Setup** softkey.
3. Press the up and down scroll keys to select a setup to delete.
4. Press the **Delete** softkey.

Note: The message “Are Your Sure?” appears beside the softkey. Press the **Delete** softkey a second time to confirm the delete or press the **Esc** key to cancel the delete.

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

Figure 62 Deleting a Saved Setup



Label Text

Label Text Shortcuts

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

1. Press the **Save/Recall** softkey.
2. Press the **Save** softkey.
3. Press **Config** key to enter text label setup.
4. Press softkey to enable or disable shortcuts.
5. Press the **Done** softkey or **Enter** key to exit configure screen.
6. Press the **Esc** key two times to return to the test mode screen.

Figure 63 Text Label Configuration



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, ensure that the unit is in either Measure Match mode or Fault Location mode.

1. Press the **Save/Recall** softkey.
2. Press the **Save** softkey.
3. Press the **Config** key.
4. Press the **Help** softkey to open Help screen.
5. Press the **Enter** key to close Help screen.
6. Press the **Esc** key two times to exit the configure screen.

Figure 64 Text Label Help



Editing Label Text

The label text can be changed on a saved item. Ensure that the unit is in either Measure Match mode or Fault Location mode.

1. Press the **Save/Recall** softkey 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** softkey (Figure 65, item 1) to enter the label text screen.
4. Follow the numbered steps in "[Label Text Shortcuts](#)" on page 63 to select, delete, and enter characters.
5. Press the **Enter** key to save the changes.

Note: When changes to label text are made, the only typing option is overstrike. The user can type over any character or space, but cannot insert characters and have the remaining text move to the right.

Note: The system generated sequential number or the date-time stamp and the resolution setting cannot be edited.

6. Press the **Esc** key to exit the Save and Recall screen.

Figure 65 Editing Label Text



Quicktext for Trace Labels

Commonly used text elements (strings of characters) can be stored in Quicktext. When entering a label, select pre-stored text elements from the Quicktext area instead of typing each letter. Ensure that the unit is in either Measure Match mode or Fault Location mode to use Quicktext.

Adding Quicktext Elements

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

1. Press the **Save/Recall** softkey.
2. Press the **Label** softkey.
3. Press the right scroll key to select the Quicktext column.
4. Press Enter to add the text in the edit line to the Quicktext list.
5. Select a Quicktext element to enter into the Label.
6. Press the **Enter** key when finished entering letters.
7. Press the **Esc** key to exit Quicktext.

Figure 66 Adding the Edit Line Text



Using Quicktext

Ensure that the unit is in either Measure Match mode or Fault Location mode to use Quicktext. Quicktext text elements are appended to the text on the edit line.

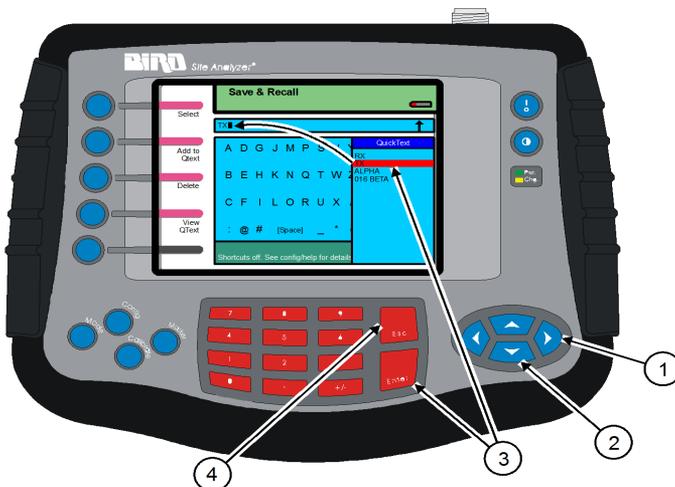
1. Press the **Save/Recall** softkey.
2. Press the **Label** softkey.
3. Use the **Delete** softkey to delete unwanted text from the edit line.
4. Use the up or down scroll keys to position the text cursor where a Quicktext element is to be inserted.

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.

Example - If the existing text on the edit line is “005 ANTENNA SITE THREE” and the user wants to insert the Quicktext element TOWER starting at the “S” in the word SITE, the user 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. Press the right scroll key to select the Quicktext column.
6. Press the up or down scroll keys to select a Quicktext text element.
7. Press the **Enter** key to insert the text element into the text on the edit line.
8. Press the **Esc** key to exit the label screen.

Figure 67 Inserting Quicktext Elements



Deleting Quicktext Elements

1. Press the **Save/Recall** softkey.
2. Press the **Label** softkey.
3. Press the right scroll key to select the Quicktext column.
4. Press the up or down scroll keys to select a Quicktext text element.
5. Press the **Delete** softkey to delete the selected text element from the list.
6. Press the **Esc** key to exit the Quicktext list.

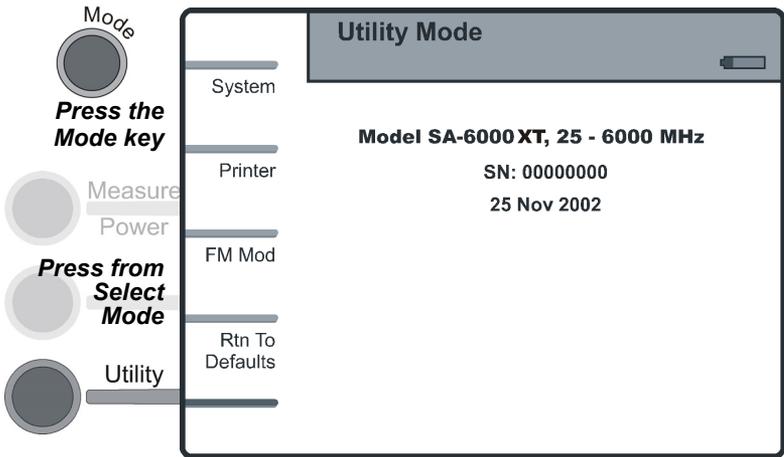
Figure 68 *Selecting and Deleting Quicktext Elements*



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 used to accomplish a setup or measurement.*

These utilities adjust the Bird Site Analyzer’s date & time and return the unit to default settings. To exit the Utility mode, press the **Esc** key or press the **Mode** key.

Figure 69 Utility Screen



Adjust Date and Time

Figure 70 System Settings Screen

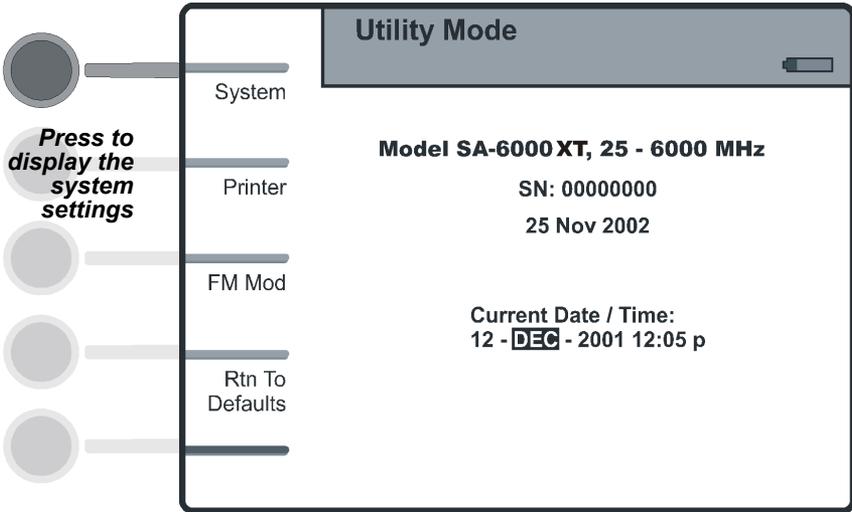
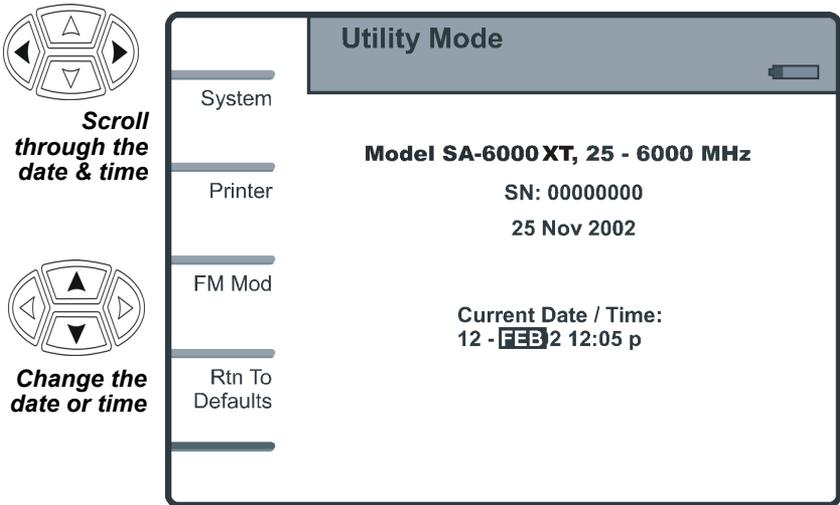


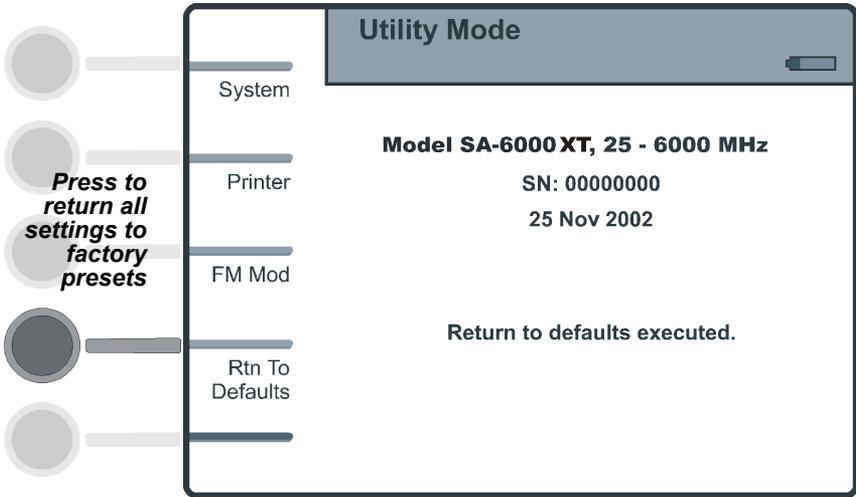
Figure 71 Date Screen



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.

Figure 72 Defaults Option Screen

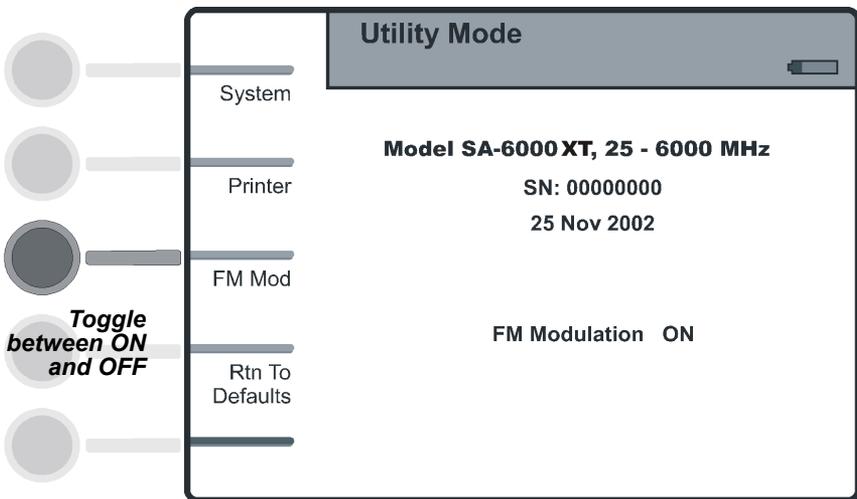


FM Modulation

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.

Figure 73 *FM Modulation Screen*



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

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

The computer system must meet the following requirements:

- Windows XP or later operating system

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 lose its charge and also lose 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 procedure "[Charging the External Battery Pack](#)" on [page 7](#) 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.

Problem	Possible Cause	Possible Correction
Unit will not power up.	Battery pack drained.	Charge the battery pack. See "Charging the Battery" on page 74.
	Battery pack unable to keep a charge.	Replace the battery pack. See "External Battery Pack (Optional), Long-term Storage Maintenance" on page 74.
	AC adapter is damaged.	Replace the AC adapter.
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. See "Cable Loss Measurement" on page 21.
Erratic antenna test measurements.	Bad calibration combo.	Use a different calibration combo.
Softkeys 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 by holding down the power button for at least 5 seconds and then releasing it. Once the unit has powered down, turn it back on.
		Do a full system initialization: a. Disconnect the AC adapter b. Hold down the Contrast key while turning the unit off. c. Turn the unit back on.
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 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.
Trace drifts outside of specifications.	Calibration lost.	Calibrate the unit immediately. See "Calibrating the Site Analyzer" on page 11.

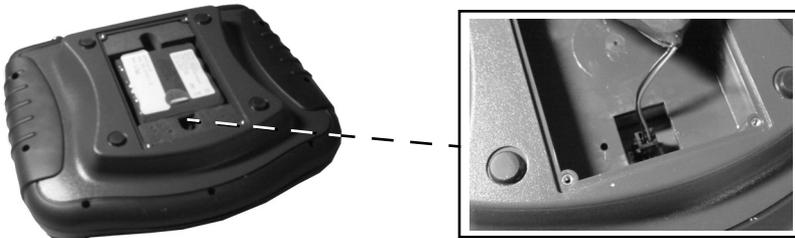
Replacing the Battery

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

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. Remove the foam battery pad to access the battery wire.

Figure 74 Replacing the Battery



4. Disconnect and remove the old battery pack from the compartment.
5. Install the new battery.

Note: Ensure the battery connector is firmly connected to the circuit board connector.

6. Place the battery in the battery compartment.

Note: Ensure the battery is flat in the compartment, and will not damage any wires when the cover is installed.

7. Replace the battery cover and the screws.
8. Connect the AC adapter to the unit.
9. Apply power to the unit and verify that it operates properly.
10. Charge the battery if required.

Firmware Update

The Site Analyzer uses flash-programmable ROM to store its operating program. To update the instrument, SA Updater software must be installed on the PC. The SA Updater software is available on the Bird web site.

Note: *The firmware update process will restore default system settings. Setups and traces stored internally on the SA-XT will not be erased, but as a precaution save your traces and setups to a PC before updating the SA-XT firmware.*

1. Turn the SA-XT off.
2. Attach the AC external power supply.
3. Connect the SA-XT to a PC via type A/B USB cable.
4. Hold down the power button for 6 seconds or more.

Note: *The SA-XT will enumerate as a Mass Storage Device. It will appear as a drive in Windows explorer with a drive label "SA-XT Update". The SA-XT LCD display will indicate that it is in firmware update mode.*

5. Go to the PC.
6. Copy the firmware image file to the SA-XT drive.
7. Disconnect the SA-XT from the PC.

Note: *The SA-XT will now apply the firmware update.*

8. Turn the SA-XT on.

Note: *The SA-XT should power off automatically after the update has been applied. If this does not happen, disconnect the external power supply.*

Customer Service

Any maintenance or service procedure beyond the scope of those in this chapter should be referred to a qualified service center.

If the unit needs to be returned for any reason, request an Return Material Authorization (RMA) through the Bird Technologies website. All instruments returned must be shipped prepaid and to the attention of the RMA number.

Bird Service Center

30303 Aurora Road
Cleveland (Solon), Ohio 44139-2794
Fax: (440) 248-5426
E-mail: bsc@birdrf.com

For the location of the Sales Office nearest you, visit our Web site at:

<http://www.birdrf.com>

Specifications

Antenna Testing

Frequency Range SA-3600XT SA-6000XT	25 - 3600 MHz 25 - 6000 MHz
Frequency Resolution 25 – 800 MHz 800 – 3600 MHz 3600 – 6000 MHz	25 kHz 50 kHz 150 kHz
Number of Data Points	238 (default), 475, 949
Measurement Range and Resolution Return Loss VSWR	<i>RangeResolution</i> 0.0 to -60.0 dB0.1 dB 1.00 to 99.990.01
Sweep Speed 238 data points 475 data points 949 data points	2.1 seconds / sweep 3.6 seconds / sweep 6.8 seconds / sweep

Measurement Uncertainty * (after 1 display refresh, 95% c.l.)

Return Loss	Determined graphically from composite of source VSWR, instrumentation error, & directivity.
VSWR	Calculated from Return Loss.
Test Port Connectors Impedance VSWR, Max <300 MHz 300 - 6000 MHz	Female N normally supplied 50 Ohms 2.10:1 1.35:1
Maximum Input Signal (Damage Level)	+22 dBm
Output Power	0 dBm, nominal
Immunity to Interfering Signals	≤ 13 dB interferer at desired measurement frequency

* When using Bird-specified calibration kit.

Measurement Accuracy (after 1 display refresh)

Return Loss Connector	Determined Graphically from composite of:				
	Frequency	Directivity	Phase	Instrumentation	Open/Short
N	25-3600 MHz	-42 dB	3 deg	-35 dB	≤ 0.09 dB
N	3600 -6000 MHz	-38 dB	3 deg		
7/16 DIN	25-3600 MHz	-40 dB	3 deg		
7/16 DIN	3600 -6000 MHz	-35 dB	3 deg		

Match Measurement

Frequency Range SA-3600XT SA-6000XT	25 – 3600 MHz 25 – 6000 MHz
Frequency Resolution 25 – 800 MHz 800 – 3600 MHz 3600 – 6000 MHz	25 kHz 50 kHz 150 kHz
Frequency Accuracy *	± 100 kHz (25 MHz to 1 GHz) ± 50 ppm (1 GHz to 6 GHz)
Number of Data Points	238 (default), 475, 949
Measurement Range and Resolution Range Return Loss VSWR Resolution Return Loss VSWR	0.0 to –60.0 dB 1.00 to 99.99 0.1 dB 0.01
Measurement Uncertainty (after 1 display refresh) * Return Loss VSWR	Determined graphically from composite of source VSWR, instrumentation error, and directivity. See Figure 75 on page 83 . Calculated from Return Loss

* Accuracy only guaranteed when using the Bird Calibration Combo listed in this manual (see ["Items Not Supplied" on page 2](#)).

Distance to Fault (DTF) Measurement

Mode	Internal
Resolution [R] X-Axis Y-Axis	$R = 150 \times \frac{V_p}{\Delta F}$ Where R=Resolution (meters) V _p =Velocity of Propagation ΔF= Frequency Span (MHz) 0.1 dB, 0.01 VSWR
Range X-Axis Y-Axis	number of data points (238, 475, or 949) x R 0 to –60 dB
Accuracy X-Axis Y-Axis	± 2% of full-scale range with V _p = 1 Same as for Return Loss Measurements
V _p Range	0.20 to 1.00, or 1 to 99%
Max Distance	1000 meters

Power Measure Mode

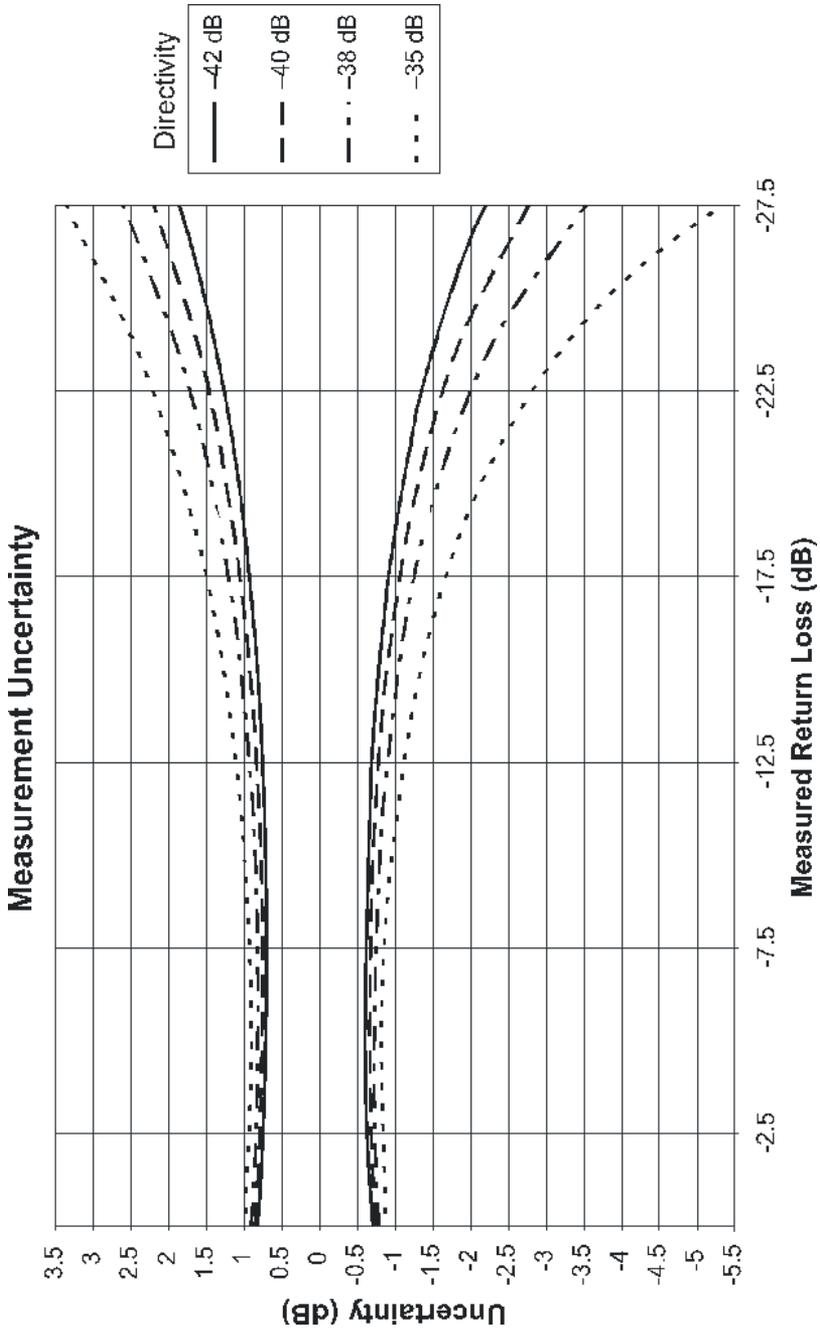
Function	Displays readings from Power Sensors
Specifications	Determined by sensor.
Sensor Detection	Automatically detect which sensor is connected and display the appropriate measurement screen.

General

Model Numbers	SA-3600XT (25 to 3600 MHz) SA-6000XT (25 to 6000 MHz)
Data Storage Internal <i>64 Mb storage capable of:</i> 238 point traces 475 point traces 949 point traces External	2,500 1,250 650 USB drive
Display	5.7" QVGA, Color with backlight, Indoor/Outdoor viewable, sunlight readable
General Display Requirements	Include all functionality of existing SA product
IFBW	Fixed
Interconnects / Interfaces Antenna Sensor PC	N (F) USB 2.0 Type A USB 2.0 Type B
Power Requirements Internal External DC External AC	Lithium-ion rechargeable battery 5 hours minimum operating time 9 to 16 VDC, < 3 A 90 to 264 VAC @ 45 to 66 Hz, AC/DC adapter required
Housing	PC/ABS housing, color is the same as existing SA-6000EX for both models.
Dimensions, Nominal	10.5" x 8.4" x 3.3"
Weight, Max	5.05 lbs.
Environmental Specifications Operating Temp Storage Temp Battery Charging Temp Humidity Altitude	-10 to +50°C (14 to 122°F) -40 to +80°C (-40 to +176°F) 0° to +35° C (32° to 95° F) 95% maximum (non-condensing) 15,000 feet (4,500 m) max
Drop Test	1 meter drop in most severe position per EN 61010-1
Transit Drop	10 drops on corners and faces per MIL-PRF-28800F, Class 2
Bench Handling	4 drops on each face per MIL-PRF-28800F, Class 2
Vibration	Random 10 to 500 Hz per MIL-PRF-28800F, Class 2

Shock, Functional	30 G half-sine shock pulse per MIL-PRF-28800F, Class 2
RoHS Compliance	Components & assembly must meet European RoHS Directive 2002/95/EC, without utilizing exemption.
CE Compliance	EN 61326-1-2:2006 Electrical equipment for measurement and control use. EMC 61010-1:2001 - Safety 89/336/EEC - EMC 73/23/EEC and Amendment 93/68/EEC - Low Voltage
Fungus Resistance	5 species for 28 days at 30°C and 95% humidity per MIL-PRF-28800F, Class 2
Calibration Cycle	User Defined
Calibration/Measurement	SOL cal only (calibration can be saved and recalled, user must ensure that cal is still valid)
MTBF	Designed for 10 years MTBF
Firmware Updating	Field firmware updated via USB port.
Upgradability	The SA-3600XT is field upgradable to the SA-6000XT
Languages	English
Serviceability	Only serviceable in an approved Bird Service Center.
Markers and Limits	6 markers, 1 flat limit line

Figure 75 Measurement Uncertainty (Return Loss after one refresh)



Parts List

Part Name	Part Number
Site Analyzer - Complete	
25 MHz – 3600 MHz	SA-3600XT
With Power Measure	
25 MHz – 6000 MHz	SA-6000XT
With Power Measure	
Soft Carrying case	7002A850
PC interface software kit	7002A840
AC adapter (15 VDC output)	5B2229-1224G-1
Automobile cigarette lighter adapter	5A2238-2
USB interface cable	5A2653-10
Instruction manual	920-SA-XT

Optional Equipment Available

Precision Adapters

Connectors	Part Number
N(M) to 7/16(M)	PA-MNME
N(F) to 7/16(M)	PA-FNME
N(M) to 7/16(F)	PA-MNFE
N(F) to 7/16(F)	PA-FNFE
7/16(F) to 7/16(F)	PA-FEFE
7/16(F) to 7/16(M) right angle	PA-FEME-R

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

Accessories

Note: Contact Bird Service Center for parts information.

Description	Part No.
External Battery Pack	SA-BATPAK-1
Spare Battery	RPK5C2431-2
Hard Transit Case	7002C870
Operations Manual*	920-SA-XT
USB Cable, 10 ft, USB 2.0 certified, USB A male to USB B male	5A2653-10
Power Sensors and Monitors	See " Power Sensors Supported " on page 85.

* Manuals, software, and firmware updates are available at: www.birdrf.com.

Power Sensors Supported

Sensor	Description
5012B	<p>Frequency Range 350 MHz - 4.0 GHz</p> <p>Power Range 150 mW - 150 Watts Avg. 400 Watts Peak</p> <p>Measurements performed: Peak power, true average power and Duty Cycle.</p> <p>Calculations Performed: VSWR, Return Loss, Reflection Coefficient, Crest Factor, Average Burst Power and CCDF.</p> <p>Duty Cycle (D) .001 to 1.0</p> <p>Accuracy Average Power = ±4% of reading, + 0.05 Watts Burst Average Power = ±6% of reading, +0.05/D Watts Peak Envelope Power = ±7% of reading, +0.20 Watts CCDF = ±0.2% typical</p>
5014	<p>Frequency Range Element dependent, 2 MHz to 2.7 GHz</p> <p>Power Range Element dependent, 125 mW to 1 kW full scale</p> <p>Measurements performed: True Average Power, Peak Forward Power (element dependent).</p> <p>Calculations Performed: VSWR, Return Loss, Reflection Coefficient</p> <p>Accuracy True Average Power, ± 5% of reading (15 °C to 35°C), ± 7% of reading (-10 °C to 50°C), Peak Power, ±8% of full scale Requires two Bird elements</p>

5015	<p>Frequency Range 40 MHz - 4.0 GHz Power Range -20.000 to +10.000 dBm (10.0010 μW to 10.000 mW) Measurements performed: True average power. Accuracy \pm 5% of Reading. When operating below 100 MHz and above 40 °C, add 1%.</p>
5015-EF	<p>Frequency Range 40 MHz - 12 GHz Power Range -20.000 to +10.000 dBm (10.0010 μW to 10.000 mW) Measurements performed: True average power. Accuracy \pm 5% of Reading. When operating below 100 MHz and above 40 °C, add 1%</p>
5016B	<p>Frequency Range 350 MHz - 4.0 GHz Power Range 25 mW - 25 Watts Avg. 60 Watts Peak Measurements performed: Peak power, true average power and Duty Cycle. Calculations Performed: VSWR, Return Loss, Reflection Coefficient, Crest Factor, Average Burst Power and CCDF. Duty Cycle (D) .001 to 1.0 Accuracy Average Power = \pm4% of reading, + 0.008 Watts Burst Average Power = \pm6% of reading, +0.008/D Watts Peak Envelope Power = \pm7% of reading, +0.05 Watts CCDF = \pm0.2% typical</p>
5017B	<p>Frequency Range 25 MHz - 1.0 GHz Power Range 500 mW - 500 Watts Avg. 1300 Watts Peak Measurements performed: Peak power, true average power and Duty Cycle. Calculations Performed: VSWR, Return Loss, Reflection Coefficient, Crest Factor, Average Burst Power and CCDF. Duty Cycle (D) .001 to 1.0 Accuracy Average Power = \pm4% of reading, + 0.17 Watts Burst Average Power = \pm6% of reading, +0.17/D Watts Peak Envelope Power = \pm7% of reading, +0.70 Watts CCDF = \pm0.2% typical</p>
5018B	<p>Frequency Range 150 MHz - 4.0 GHz Power Range 100 mW - 25 Watts Avg. 60 Watts Peak Measurements performed: Peak power, true average power and Duty Cycle. Calculations Performed: VSWR, Return Loss, Reflection Coefficient, Crest Factor, Average Burst Power and CCDF. Duty Cycle (D) .001 to 1.0 Accuracy Average Power = \pm4% of reading, + 0.008 Watts Burst Average Power = \pm6% of reading, +0.008/D Watts Peak Envelope Power = \pm7% of reading, +0.05 Watts CCDF = \pm0.2% typical</p>
5019B	<p>Frequency Range 25 MHz -1.0 GHz Power Range 100 mW - 100 Watts Avg. 260 Watts Peak Measurements performed: Peak power, true average power and Duty Cycle. Calculations Performed: VSWR, Return Loss, Reflection Coefficient, Crest Factor, Average Burst Power and CCDF. Duty Cycle (D) .001 to 1.0 Accuracy Average Power = \pm4% of reading, + 0.04 Watts Burst Average Power = \pm6% of reading, +0.04/D Watts Peak Envelope Power = \pm7% of reading, +0.13 Watts CCDF = \pm0.2% typical</p>

APPENDIX I FAULT LOCATION DISTANCE TABLES

The tables on the next pages will help with selecting the frequency span, measurable distance, and resolution for fault location measurements. Select the table for the number of data points measured (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 (MHz)	Max Distance		Resolution		Max Distance		Resolution	
	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 (MHz)	Max Distance		Resolution		Max Distance		Resolution	
	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 (MHz)	Max Distance		Resolution		Max Distance		Resolution	
	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

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