S3101 Cable & Antenna Analyzer

Quick Start Guide

Saluki Technology Inc.

The quick guide applies to the cable & antenna analyzer of the following models:

- S3101A Cable & Antenna Analyzer (1MHz - 4GHz)
- S3101B Cable & Antenna Analyzer (1MHz - 8GHz)

Standard Accessories of S3101 cable & antenna analyzer:

No.	Name	Qty.
1	Handheld Cable & Antenna Analyzer	1 Set
2	AC Adaptor	1 PC
3	Standard Three-phase Power Cord	1 PC
4	Built-in Rechargeable Battery	1 PC
5	USB Cable	1 PC
6	Car-mount Charger	1 PC
7	CD (PC software and User Manual)	1 PC
8	Certificate of Calibration	1 PC

Options of the S3101 cable & antenna analyzer:

Option No.	Item
S3101-01	USB Power Measurement Software
S3101-02	Backup Rechargeable Li-ion Battery
S3101-03	GPS Cable
S3101-04	S87230 USB Continuous Wave Power Sensor (9kHz - 6GHz)
S3101-05	S87231 USB Continuous Wave Power Sensor (10MHz - 18GHz)
S3101-06	S87232 USB Continuous Wave Power Sensor (50MHz - 26.5GHz)
S3101-07	S87233 USB Continuous Wave Power Sensor (50MHz - 40GHz)
S3101-10	SAV20201A Type N Male Calibration Kit DC - 9GHz
S3101-11	SAV20201B Type N Female Calibration Kit DC - 9GHz
S3101-12	N-DIN Adaptor L29/N-KJ-T
S3101-13	N-DIN Adaptor L29/N-JJ-T
S3101-14	Low Loss Test Cable N-JK (80cm)

Option No.	Item
S3101-15	Low Loss Test Cable N-JJ (80cm)
S3101-16	Functional Soft Case
S3101-18	Hard Case (Carrying Case)

Preface

Thanks for choosing S3101 Cable & Antenna Analyzer produced by Saluki Technology Inc. Please read this quick start guide carefully for your convenience.

Manual No.

S3101-03-03

Version

Rev01 2019.06

Manual Authorization

The information contained in this User Manual is subject to change without notice. The power to interpret the contents of and terms used in this Manual rests with Saluki.

Product Quality Assurance

The warranty period of the product is 36 months from the date of delivery.

Product Quality Certificate

The product meets the indicator requirements of the manual at the time of delivery. Calibration and measurement are completed by the measuring organization with qualifications specified by the state, and relevant data are provided for reference.

Quality/Environment Management

Research, development, manufacturing and testing of the product comply with the requirements of the quality and environmental management system.

Precautions

Warning

"Warning" indicates danger. It reminds the user to pay attention to a certain operation process, operation method or similar situations. Noncompliance with the rules or improper operation may result in personal injuries. You must fully understand the warning and all the conditions in it shall be met before the next step

Attention

"Attention" indicates important prompts and no danger. It reminds the user to pay attention to a certain operation process, operation method or similar situations. Noncompliance with the rules or improper operation may result in damage to the instrument or loss of important data. You must fully understand the caution and all the conditions in it shall be met before the next step.

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1. Overview

S3101 is a new Cable and Antenna Analyzer that boosts your troubleshooting and testing speed while optimizing usability. Utilizing the latest advancements in technology, the S3101 has been optimized for field conditions, ease of use, and efficient sweep management capabilities. It delivers 8 hours of continuous battery operation, the most ever offered in a handheld cable and antenna analyzer. With its large outdoor viewable 7" LCD touch screen display, new intuitive GUI, and classic mode, the S3101 is not only easy to use, but also significantly increases a user's efficiency in the field.

This guide makes an all-round and three-dimensional introduction on the structure and use of S3101A/B Cable & Antenna Analyzer (hereinafter referred to as S3101A/B or the Analyzer), from several aspects, including instrument panel, power supply, startup, typical application, after-sales services, etc. Through this guide, the reader can have a more systematic understanding on the Analyzer, and quickly grasp some basic operations. For your proficiency of the instrument, please read the guide carefully and operate properly upon instructions in the guide before operation.

Quick Start Guide for s3101A/B Cable and Antenna Analyzer contains chapters as follows:

- **Ready for Use**

This Chapter introduces preparations before operation, startup, panel introduction, battery replacement, etc., of S3101A/B. Through this chapter, you can acquire perceptual knowledge on S3101A/B on the whole, and make a well preparation for appropriate and safe operation.

- **Typical Application**

It introduces the calibration of S3101A/B in detail, and describes operating steps for basic measurement formats of S3101A/B and gives a brief description on techniques used in the test, through test cases such as cable testing, antenna testing, etc. By reading this chapter, you can use S3101A/B to finish some typical DUT test by yourself.

- **Ask for Help**

This Chapter contains two parts named after-sale maintenance and repair method, which emphatically introduces the problem solving in the process of operation, maintenance, and repair of the instrument.

2. Ready to Use

S3101 Cable and Antenna Analyzer is designed with exquisite appearance and comfortable operation. It has smaller volume, with the largest overall dimension being only 205mm (H) × 295mm (W) × 70mm (D); and lighter weight, with the single unit weighing totally about 2.5kg (including battery), which is easy to carry for field test. This Chapter will emphatically introduce the instrument's test environment, power supply, structure and battery replacement.

2. 1. Pre-operation Preparation

This section will describe the precautions before initial use of S3101A/B Cable & Antenna Analyzer. It meets the requirements of security specified in GJB3947A-2009, please read the following safety instructions carefully to avoid damage to the instrument or unnecessary personal injury.

Warning

To prevent damage to the instrument, avoid electric shock, fire and personal injury:

- Do not open up the instrument without authorization
- Do not attempt to disassemble or modify any part not described in this guide. If disassemble it at your own discretion, it may cause various consequences such as degradation of electromagnetic shielding performance and damage to internal parts, thus affecting product reliability. If disassemble it without authorization, even during the warranty period, we will no longer provide free maintenance.

2. 1. 1. Environmental Requirements

To ensure the service life and validity and accuracy of S3101A/B, please conduct testing under the following conditions:

- Temperature range: Storage temperature range: -40℃ to +70℃; operating temperature range: -10℃ to +50℃
- Low pressure (altitude): 0 - 4600m

2. 1. 2. Power Supply Requirements

S3101A/B can be powered in three ways:

1. Powered by AC power supply and adapter

AC-DC adapter provided together with the instrument must be used if adopting AC power supply. Input of adapter is AC power supply with 100~240V, 50/60Hz.

When transported and carried by a backpack, the AC-DC adapter should not be connected with the Analyzer in order to avoid overheating of the instrument. AC-DC adapter has a wide range of input voltage; therefore when using, it should ensure the power supply voltage should be within the scope required in Table 2.1.

Table 2.1 Power Supply Requirements

Power Supply Parameter	Applicable Range

Input Voltage	100V - 240VAC
Rated Input Voltage	1.7A
Operating Frequency	50/60Hz
Output Voltage/Current	15.0V/4.0A

Warning

Operating voltage and frequency is subject to that indicated in the nameplate of supplied power adaptor.

2. Powered by DC power supply

Voltage: 12V - 18V (with battery uninstalled), 15V - 18V (with battery installed)

Current: 2A (at minimum)

3. Powered by built-in battery

S3101A/B can be powered by rechargeable lithium-ion batteries. If left unused for a long time, the battery will self discharge, so it must first charge the battery before using it again. Refer to Section 2.6 for battery usage details. The basic parameters of batteries provided together with the instrument are as follows:

Nominal voltage: 10.8V

Nominal volume: ≥7000mAh

Warning

Rechargeable battery shall not be exposed to fire and high temperatures (above 70℃), or thrown into the fresh or salt water, and wetted, and shall keep away from children.

Rechargeable batteries can be reused, and shall be placed in a suitable container to avoid short circuit. The heavy metals such as nickel and chromium contained in the battery may pollute the environment, so waste batteries should be placed in a dedicated battery recycling bins.

2.1.3. Electro-Static Discharge (ESD)

When using instrument, please pay attention to ESD protection. Take the following precautions to prevent static electricity if possible:

1. Before connecting the cable to the instrument for testing, the center conductor of the cable must be grounded first. It can be achieved by following these steps: connect one end of cable with short circuit and make the center conductor and outer conductor of the cable be short-circuited. When wearing an antistatic wrist strap, please grasp the casing of cable connector, connect the other end of cable and then remove the short circuit.

2. Ground yourself before cleaning test port of inspection instrument or connecting. It may be achieved by grasping the metal casing of instrument grounded or the casing of connector of testing cable.

2. 2. Startup and Utilization

Prior to powering S3101A/B, please perform power supply instrument inspection following “Power Requirements” in Section 2.1.2. Power for testing is allowed only after checked to be faultless.

Press the power ON/OFF key (key) for about three seconds and then release the ON/OFF key after hearing a sound of “beep”. It might take the Analyzer 20s to enter mainframe program. A warm-up for 15min is recommended before testing to keep the performance of internal components of instrument stable for better testing results.

Attention

In this guide, the keys on the front panel are expressed with 【XXX】, XXX is the key name; the menu button on the touch screen is expressed with [XXX], XXX is menu name.

2. 3. Front Panel

This section provides a detailed introduction of the front panel of S3101A/B. Figure 2.1 is the front panel of S3101A/B.

Figure 2.1 Front Panel of S3101 Cable & Antenna Analyzer

The features of common keys are described as below:

- 【Freq/Dist】: Used to set the measurement parameters, including frequency parameter, signal standard, distance parameter and speed factor.
- 【Sweep/Setup】: Used to set the measurement parameters, including trigger mode, sweep mode, sweep time, sweep points and intermediate frequency band width.
- 【Trace】: Used to realize the comparison between reference trace and current data, including the digital operation of difference value division; or store the current data as a reference trace. Reference trace can also load the saved traces by 【Save/Recall】.
- 【Ampt】: Used to set the display range of Y-axis.

- 【Marker】: Used to set the marker functions, including marker ON/OFF, marker mode, peak search and marker dragging mode.
- 【Cal】: Used to realize the calibration functions, including calibration method, calibration status ON/OFF and selection of calibration kit model.
- 【Save/Recall】: Used to realize the file operations, including save and load measurement status and measurement trace, screen capture, storage position and file copy.
- 【Limit】: Used to realize limit test functions, including limit test ON/OFF, alarm ON/OFF as well as the compilation, saving and loading of limit traces.
- 【Run/Hold】: Used to switch the results between continuous sweep and holding current sweep of the Analyzer.
- 【Meas】: used to set the measurement mode and single-dual window switch
- 【System/Local】: When in local operating mode, it is used for the settings of system mode, such as the switch of modes between antenna test and power test, setting of system date, time, power save mode, and view of product serial number and internal program version number of the Analyzer; when in remote control mode, it is used to return the Analyzer to local function.
- 【↑】&【↓】: Mean increase and decrease respectively and used to control step or select current options.
- 【←】Backspace Key: Used to delete the last entered number or character.
- 【Esc】: Used to invalidate the entered values and close the input label when entering parameters.
- 【Enter】: Used to validate the entered values when entering parameters.

LED indicator: with yellow and green two colors, the physical state of the instrument corresponding to the color is as shown in the following table.

Table 2.2 LED Status Descriptions

Instrument Status	LED status	Physical state of Analyzer
Off state	Off	a) The battery has been installed; not connected to the power supply. b) The battery has not been installed; not connected to the power supply.
	Constant yellow	a) Battery has not been installed; connected to power supply. b) The battery has been installed and full; connected to power supply.
	Flashing yellow	The battery has been installed and not full; connected to power supply.
On state	Constant green	a) The battery has not been installed; connected to power supply. b) The battery has been installed and full; connected to power supply. c) The battery has been installed battery; not connected to power supply.
	Flashing green	The battery has been installed and not full; connected to power supply.

2. 4. Operating Interface

S3101 series is provided with a 7-inch HB TFT true color LED with the function of touch screen and supports soft-key operations of applications through touch screen. The operating interface is as shown in Figure 2.2. S3101A/B provides different interfaces with different color contrast corresponding to different testing environment such as outdoor, nighttime, and normal testing environment; In addition, this instrument also supports automatic adjustment of brightness, hibernation, and automatic shutdown.

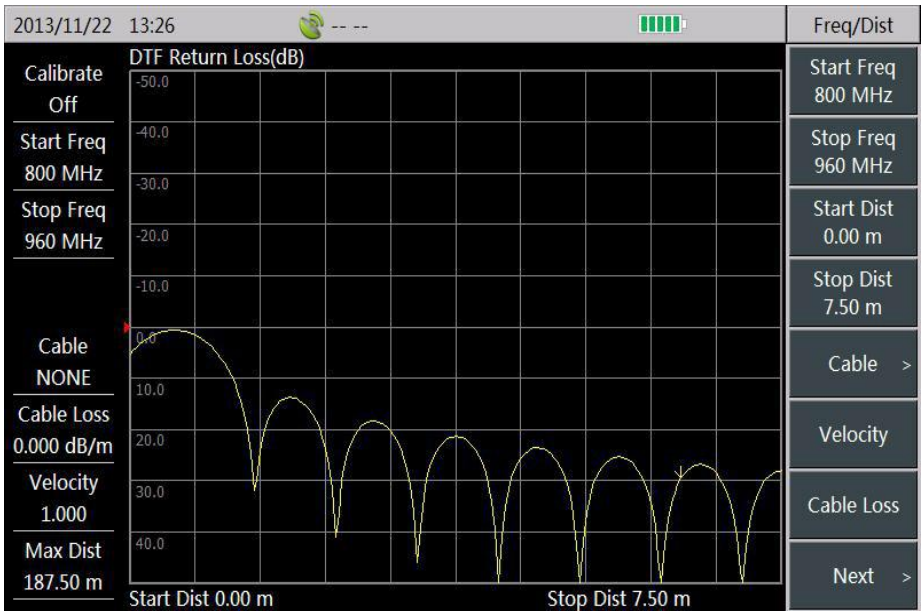


Figure 2.2 Operating Interface

2. 5. Top Interface

S3101 series top panel is composed of three parts, including power interface, digital interface and the test port.

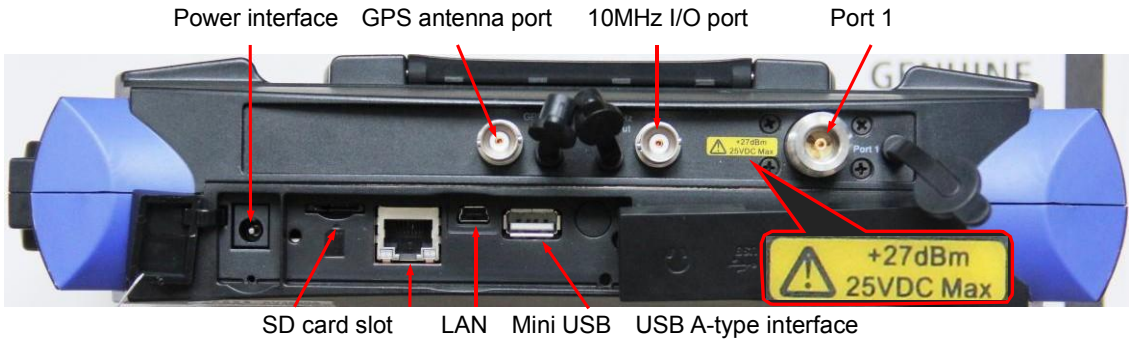


Figure 2.3 Top Interface

2. 5. 1. Power Interface

Used for external DC power input. DC output from AC-DC adapter is used to power the Analyzer. The conductor inside external power interface is positive, with external conductor grounded.

Figure 2.4 Power interface

2. 5. 2. Digital Interface

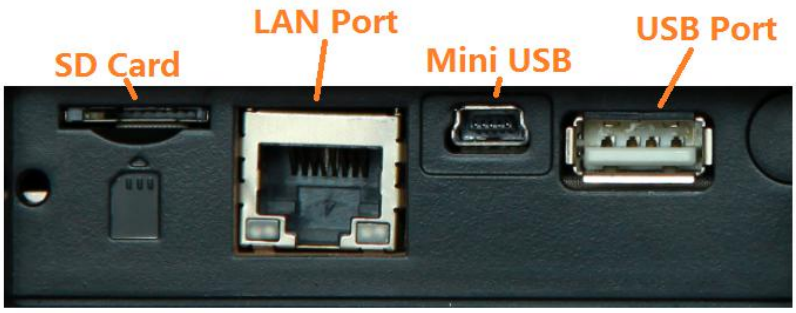


Figure 2.5 Digital Interface

1) SD card slot: Micro SD card can be used in memory space extension of the instrument, or copy of relevant data and documents of the instrument.
2) LAN (network) interface: a 10/100Mbps network interface, featured by standard 8-pin structure, can be used to select automatically from two data rates, and also connect to PC via a network cable, related tools and software then can be operated by PC to perform program control and data transmission to S3101 Cable & Antenna Analyzer.
3) Mini USB interface: used to connect an external PC and then related tools and software can be operated by PC to perform program control and data transmission to S3101 Cable & Antenna Feeder.
4) USB A-type port: used to connect external USB instrument, such as USB storage device, USB mouse and USB keyboard.

2. 5. 3. Test Port

Figure 2.6 Test Port

1) GPS antenna: used to connect GPS antenna instrument and support positioning of the current location of Analyzer.
2) 10MHz I/O port: used to input/output the 10MHz signals, and can also be used to provide 10MHz signal for the Analyzer as reference signal by connecting with other external instrument; output 10MHz inner signal to external instrument as reference clock.
3) Port 1: test port, with characteristic impedance of 50Ω and N-type female port.

2. 5. 4. Instrument Symbol

Instrument symbol shown in the picture (yellow label) means that the maximum input power of test port 1 is +27dBm; the maximum input DC level is 25VDC. Do not connect signals beyond this range to the port in use, which could burn the instrument!

2. 6. Battery

S3101 Cable & Antenna Analyzer is equipped with a rechargeable lithium-ion battery with a large capacity with operating time of up to more than 8 hours for S3101A and 4 hours for S3101B (typ.). In order to assure the service life, the battery shall be taken out of the battery compartment in transport and long-term storage. Buying stand-by batteries of the same model with the original one is recommended to avoid test interrupt owing to low battery if long-time field test is performed.

S3101 Cable & Antenna Analyzer is easy to install or replace the battery, which is as shown in the below figures.

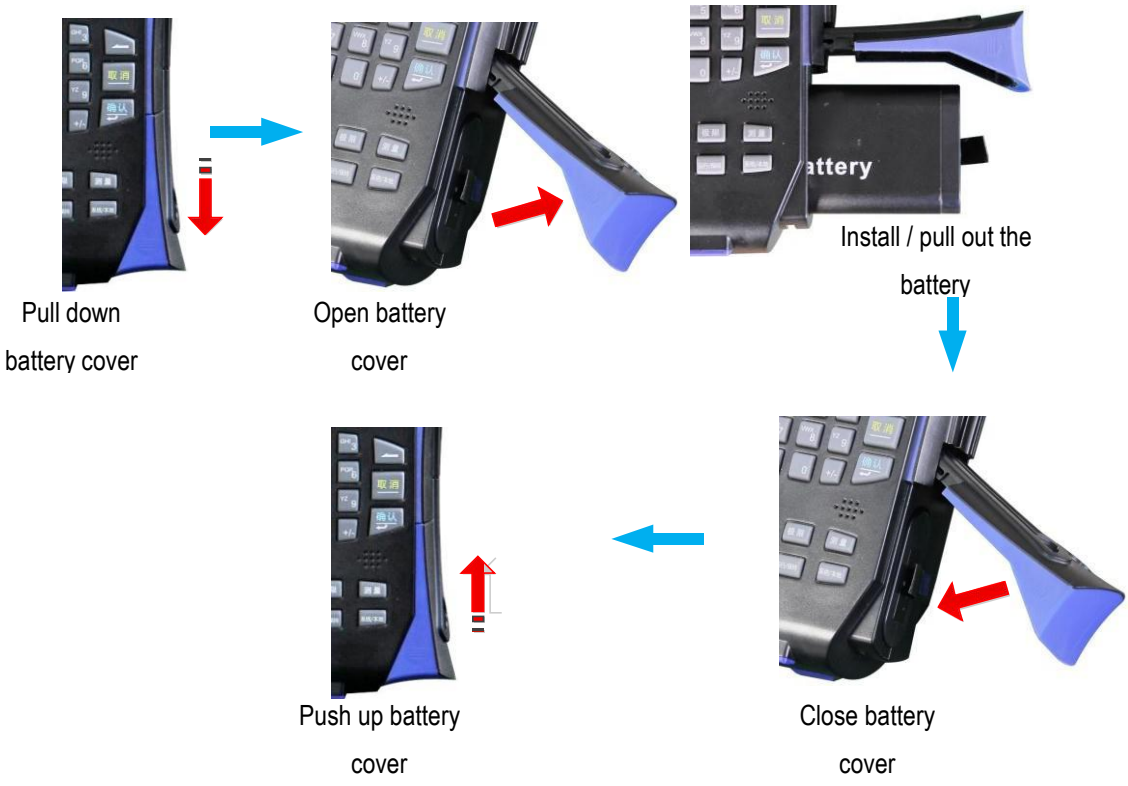


Figure 2.7 Battery Installation or Replacement Procedures

Moreover, the charging time for a fully depleted battery is approximately 4h.

2. 7. Turn On/Off

Press the yellow power switch [⏻] at lower left corner of the front panel of S3101 Cable & Antenna Analyzer for about three seconds, after beep from the buzzer, release it, the Analyzer displays startup screen.

S3101 will take about 20 seconds to boot the start system and perform a series of self-test program, then the instrument enters the

main program initialization interface and displays “Initializing, please wait……” After the main program starts, it will show an internal self-test report, and the user can observe whether the instrument is working properly. In order to make the internal components achieve a stable performance indicator, the S3101 should be warmed up for 15 minutes before starting measurement.

Press the yellow power switch  at lower left corner of the front panel for about 3s, the Analyzer will automatically exit from the measurement application program and cut the power supply off.

3. Typical Application

S3101 Cable & Antenna Analyzer offers many measurement formats, and this Chapter will make a detailed instruction on operation steps of several basic measurement formats by three test cases.

3. 1. Calibration

To ensure accuracy of test results, the instrument needs to be calibrated before test to eliminate the errors. S3101A/B adopts mechanical calibration method, whose calibration process is as follows:

1) Press 【Cal】 key, click [Cal Kit] menu to select the calibration kit model and then click Enter;
2) Click [M Cal], and the calibration wizard will prompt saying "Please connect [OPEN], and start calibrating by pressing corresponding soft key！";
3) Connect the open standard to the calibration port, press [Open] key and then the prompt massage saying "[OPEN] Measuring..." as shown in Figure 3.1:

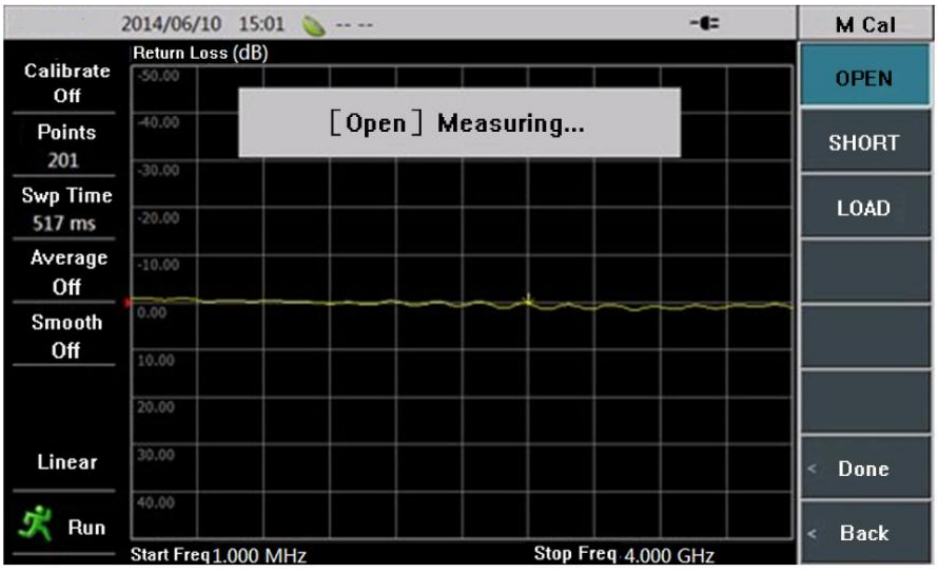


Figure 3.1 Calibration Open Standard

After completing open circuit measurement, the [Open] button on the right side of the menu bar is underlined as [Open], and the prompt massage saying "Please connect [SHORT], and start calibrating by pressing corresponding soft key!" as shown in Figure 3.2:

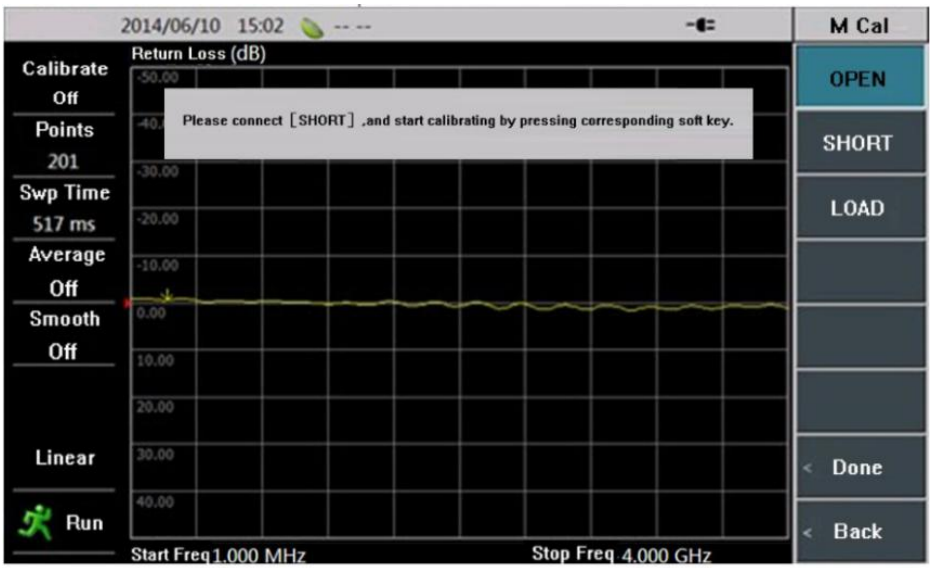


Figure 3.2 Calibration Short Standard

4) Disconnect the open standard with the calibration port, connect the short standard, and press [Short] button, then the screen will prompt "[SHORT] Measuring...". After completing short standard measurement, the [Short] button on the right side of the menu bar is underlined as [Short], and the prompt massage saying ""Please connect [LOAD], and start calibrating by pressing corresponding soft key".

5) Disconnect the short standard with the calibration port, connect the load, and press [Load] key, then the screen will prompt "[LOAD] Measuring...". After completing the load measurement, the [Load] item on the right side of the menu bar is underlined as [Load], and the prompt massage saying "Please Press "Done" soft key to finish the calibration" is popped up on the display screen as shown in Figure 3.3. Then press the [Done] key to complete the calibration.

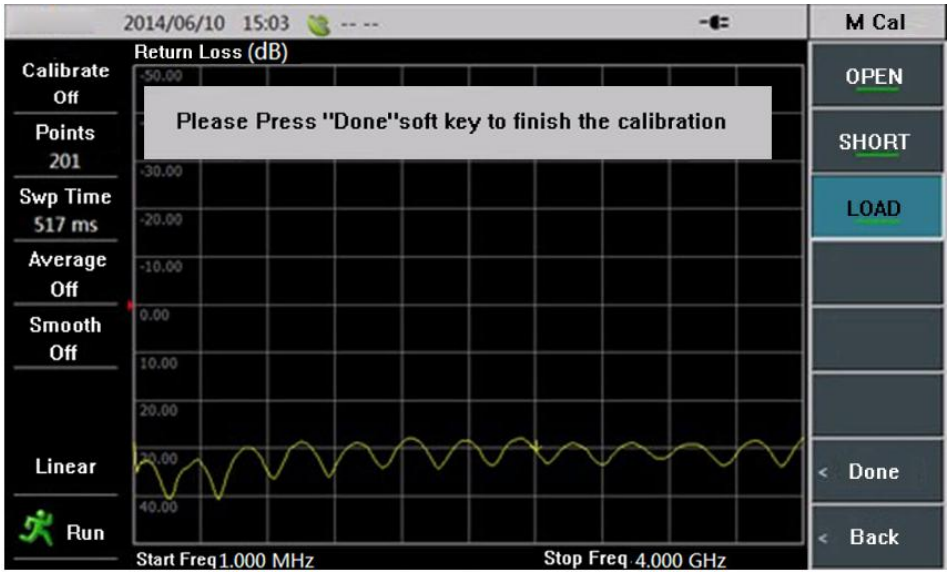


Figure 3.3 Complete Mechanical Calibration

3. 2. Cable Test

3. 2. 1. Return Loss/VSWR Measurement

Return Loss/Voltage Standing Wave Ratio (VSWR) is a representation of the reflection characteristic. In engineering applications, this Analyzer can test the return loss or VSWR of single-port or double-port devices, which is separately shown as (1) and (2) in Figure 3.4.

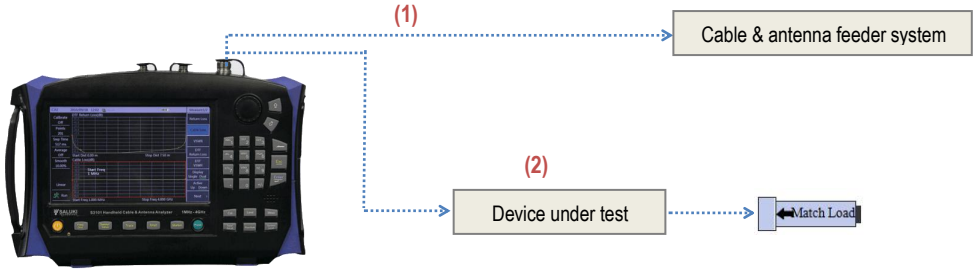


Figure 3.4 Connection method for Return Loss/VSWR Measurement

S3101 series mainly tests RF cable. Take the cable with length of 25m, radio frequency of 2.1GHz and VSWR of 1.05 as an example, this part makes a detailed instruction on test steps of return loss (Measurement steps of return loss and VSWR test are the same, therefore, it only takes return loss measurement as example here).

1. Press【MEAS】to enter the measurement menu;
2. Select [Return Loss] menu to set the current measurement format of instrument as “Return Loss”, as shown in Figure 3.5.

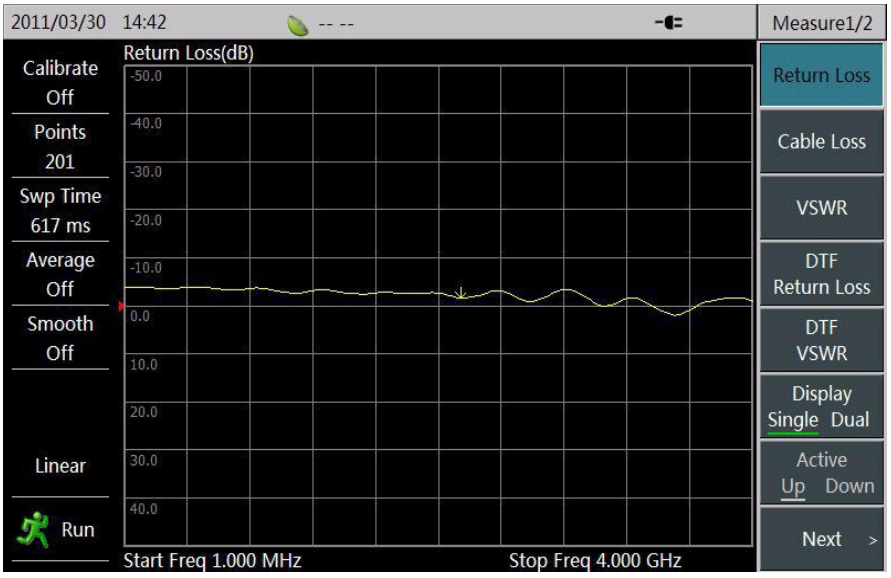


Figure 3.5 Selection of Measurement Format

3. Press 【FREQ】 to enter the frequency menu; select [Start Freq] menu, then use the numeric keys, knob or arrow keys to input the start frequency value and select the corresponding unit menu to complete the input; the frequency in this example is set to 1MHz.
4. Similar to step 3, set the stop frequency needed by the measurement; the frequency in this example is set to 4GHz.
5. According to the Section 3.1 in this Chapter, calibrate at port 1 of the instrument;
6. After the Port 1 is calibrated, connect the measured cable to the Analyzer and link match load to other end of the cable, as shown in Figure 3.6. The Analyzer will display the measured return loss curve.

Figure 3.6 Return Loss or VSWR Test Connection Diagram

7. You can adjust the the amplitude display for easy observation by methods implied in Section 3.5; then, press 【Marker】 to turn on marker function, so that you can check the return loss conditions of the cable at each frequency.

Attention

Return loss or VSWR is the matching degree of DUT at each frequency point in the whole frequency band. Sweep span can be specifically set according to operating frequency of the measured cable or DUT during measurement.

3. 2. 2. Cable Loss Measurement

Cable Loss refers to the energy consumed by cable in the process of signal transmission, which is generally represented by average value. During the test, the cable loss is usually measured by the following connection, as shown in Figure 3.7.

Figure 3.7 Cable Loss Measurement Connections

Now, this part takes the cable with length of 25m, frequency of 2.1GHz and cable loss of 0.36dB/m to introduce the cable loss test steps.

1. Press 【Meas】 to enter measurement menu;
2. Select [Cable Loss] menu to set the current measurement format of instrument as “Cable Loss”.
3. Press 【Freq】 to enter the frequency menu; select [Start Freq] menu, then use the numeric keys, knob or arrow keys to input the start frequency value and select the corresponding unit menu to complete the input; the frequency in this example is set to 1MHz.
4. Similar to step 3, set the stop frequency needed by the measurement; the frequency in this example is set to 4GHz.
5. According to the section 1 in chapter 3, calibrate at port 1 of the instrument;

6. After the Port 1 is calibrated, connect the measured cable to the Analyzer to ensure the accuracy of cable loss measurement. Terminal of the measured cable shall connect to the open circuit or short circuit, as shown in Figure 3.8.

Figure 3.8 Cable Loss Test Connection Diagram

Cable loss curve of the measured cable can be obtained through above steps. The so-called average loss refers to average the measured extreme values of loss. Users can use 【Marker】 to find peak value and valley value of the loss curve, then average them, and finally obtain the average loss of the cable. Limit value search process is as follows:

- Press 【Marker】 to enter the marker menu, and the Marker 1 defaults to be in open state at this time;
- Select [Peak] menu to place Marker 1 onto the peak position of the cable loss curve;
- Select [Marker 1 2 3 4 5 6] menu again, the menu becomes into [Marker 1 2 3 4 5 6] at this time, and then select [Marker Off On] menu to open Marker 2;
- Select [Valley] menu to place Marker 2 onto the peak position of the cable loss curve;
- Upon the cable loss values shown by Marker 1 and Marker 2, sum and average them to obtain average loss of the cable.

3. 2. 3. DTF Measurement

DTF (Distance To Fault) measurement, also called fault point location measurement, is a kind of performance verification and fault analysis tool in the maintenance and repair process of antenna and transmission line. DTF function of S3101A/B is realized by adopting the measurement technique named Frequency-Domain Reflectometry. In engineering applications, DTF measurement usually adopts the connection type shown in Figure 3.9 to measure the fault point status of connection cables of devices such as base stations, etc.

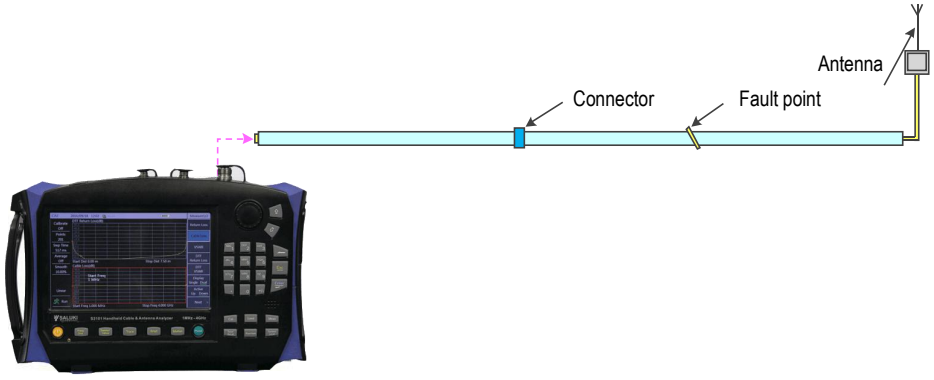


Figure 3.9 DTF Measurement Connection

S3101A/B provides two measurement formats including DTF return loss and DTF VSWR. As for their difference, we will not explain here again for it is similar to the difference between return loss and VSWR. We will make a detailed introduction for measurement steps on cable length and return loss at each point, through taking the cable with length of 25m, velocity factor of 0.76 and cable loss of 0.26dB/m.

1. Press 【Meas】 to enter the measurement menu;
2. Select [DTF Return Loss] menu to set the current measurement format to “DTF Return Loss”.
3. Press 【Freq】 to enter the frequency menu; select [Start Freq] menu, then use the numeric keys, knob or arrow keys to input the start frequency value and select the corresponding unit menu to complete the input; the frequency in this example is set to 1GHz.
4. Similar to step 3, set the stop frequency needed by the measurement; the frequency in this example is set to 2GHz.
5. Press 【Sweep】to enter Sweep menu; select [Point] to set the required sweep point, which is set to 401 here.
6. Select [Start Distance] menu, input appropriate measurement start distance by the numeric keys, knob or arrow keys, and then select the unit menu [Meter] to finish the setting.
7. Similar to step 6, set the measurement stop distance. Once the test points and frequency are set, the current maximal test distance of Analyzer is determined (it is displayed in the lower left corner of the screen) too. Users can adjust stop distance based on this value and estimated position of measured fault points. If the current maximum distance is less than the measurement distance, sweep span and points can be properly adjusted. Detailed explanation can be found in “DTF Measurement Distance & Resolution” part in Section 3.5 of this chapter.
8. According to Section 3.1 in this Chapter, calibrate port 1 of Analyzer;
9. Press 【Freq】->[Velo Factor] to set velocity factor of DUT, which is the transmission speed and light speed of electromagnetic wave in the cable, is between 0-1.
10. Select [Cable Loss] menu, and set cable loss of the measured cable according to the known parameters of DUT.

Attention

Velocity factor and cable loss are inherent parameters of cable, if any further questions, please check the cable instructions or consult the cable manufacturer.

11. DTF return loss curve can be measured and obtained by connecting DUT to Analyzer and then link the mismatch load or open circuit to the end of the cable (as fault point). DTF return loss test connection is as shown in Figure 3.10.

Figure 3.10 DTF Return Loss Test Connection Diagram

12. Press 【Marker】 to enter the marker menu, Marker 1 has been turned on at this time. Select [Peak] menu to place Marker 1 onto peak value (namely fault point), in order to read out the location of fault point, that is the distance from fault point to measurement port of Analyzer. At 25m length of this cable exampled here, we measure that DTF return loss is 2.359 which indicates that the length of cable is 25m. Or, you can check DTF return loss at each position by moving the marker. Fault points measured here are shown in Figure 3.11.

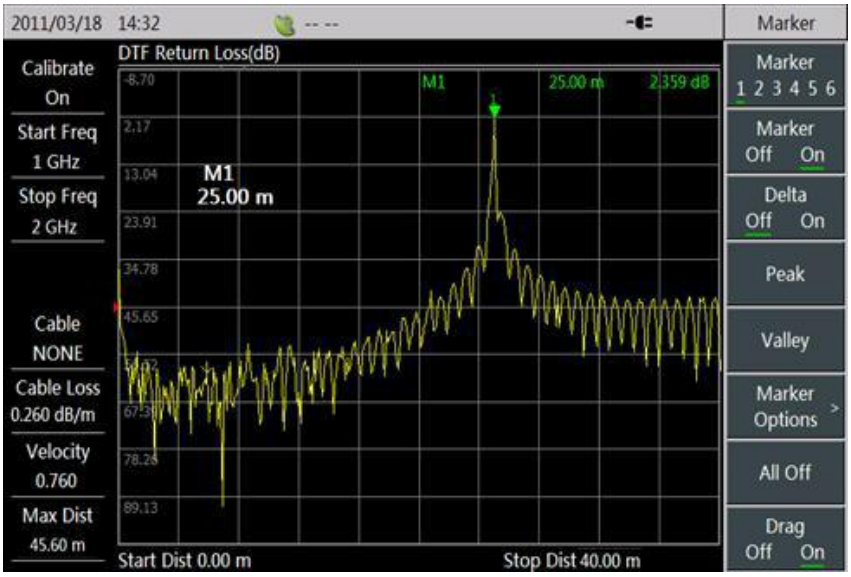


Figure 3.11 Measurement on Length of Cable

3. 3. Antenna Test

S3101 series can test the return loss/VSWR of general passive receiving antenna. This part will introduce the measurement process of passive antenna by taking terminal antenna TZD-P021Z05-195 as an example. Terminal antenna TZD-P021Z05-195 is kind of receiving antenna with frequency of 2,100MHz, whose standing wave is minimum at 2,100MHz in theory.

1. Press 【Meas】 to choose “Return Loss” or “VSWR” as the measurement format of Analyzer.
2. Press【Freq】to set instrument frequency measurement range by contrasting with receiving frequency range of the antenna to be received; if the frequency range of antenna is not clear, users can measure return loss/VSWR according to system default measurement range (1MHz - 4MHz), which is set to 2GHz - 2.2GHz here.

3. As the antenna has interface with diameter of 3.5mm, N-3.5mm adapter needs to be connected to the test port of Analyzer, and then use the calibration kit (option) with diameter of 3.5mm to calibrate the Analyzer as described in section 3.1.
4. After calibration, connect the measured antenna to Analyzer as shown in Figure 3.12.

Figure 3.12 Antenna Measurement Connection Diagram

Make corresponding adjustment on the displayed amplitude according to amplitude set-method described in section 3.5; then press 【Marker】 to turn on the marker function, so that you can see the VSWR situation of antenna at each frequency. Through observation we can find that VSWR of antenna is smaller near 2,100MHz, with minimum at 2,104MHz.

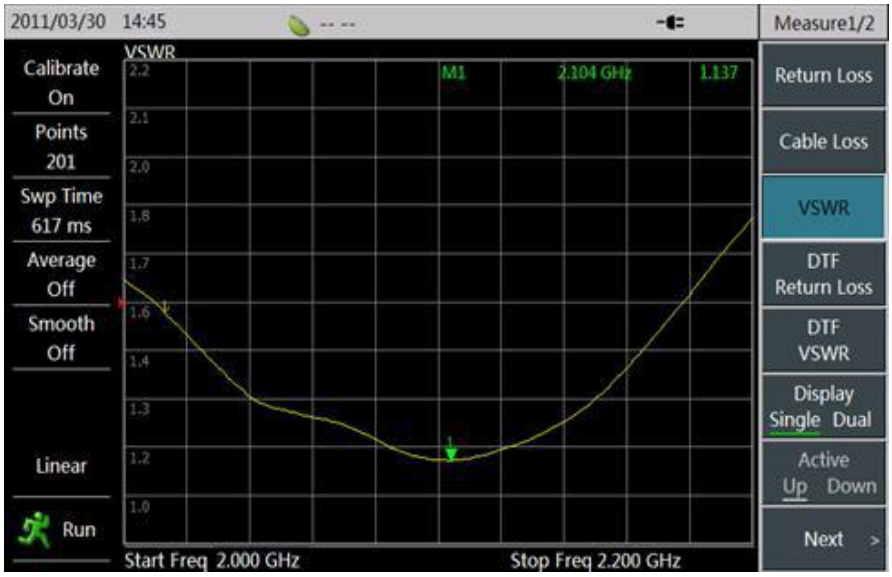


Figure 3.13 VSWR Test of Terminal Antenna TZD-P021Z05-195

3. 4. Universal Devices and Parts Test

Addition to cable and antenna test, S3101A/B can also be used for testing the attenuation, cable connectors, cable joints, etc. This part will measure the return loss of 10dB attenuation, as an example, with operations as follows:

1. Press 【Meas】 to choose “Return Loss” as the measurement format of Analyzer.
2. Press 【Freq】 to set measurement range of Analyzer according to the working frequency range of attenuator; if the frequency range of attenuator is not clear, users can measure the return loss/ VSWR according to the system default frequency range (1MHz - 4GHz).

3. As the attenuator to be measured has interface with diameter of 3.5mm, N-3.5mm adapter needs to be connected to the test poet of Analyzer, and then use the calibration kit (option) with diameter of 3.5mm to calibrate the Analyzer as described in section 3.1.
4. After calibration, connect the measured attenuator to Analyzer and the match load to the terminal of attenuator as shown in Figure 3.14.

Figure 3.14 Attenuator Measurement Connection Diagram

Make some corresponding adjustments on the displayed amplitude according to amplitude set-method described in Section 3.5; we can find that the return losses of attenuator are all below 30dB. Based on the test data, designer can confirm attenuator index by contrasting with design index, as shown in Figure 3.15.

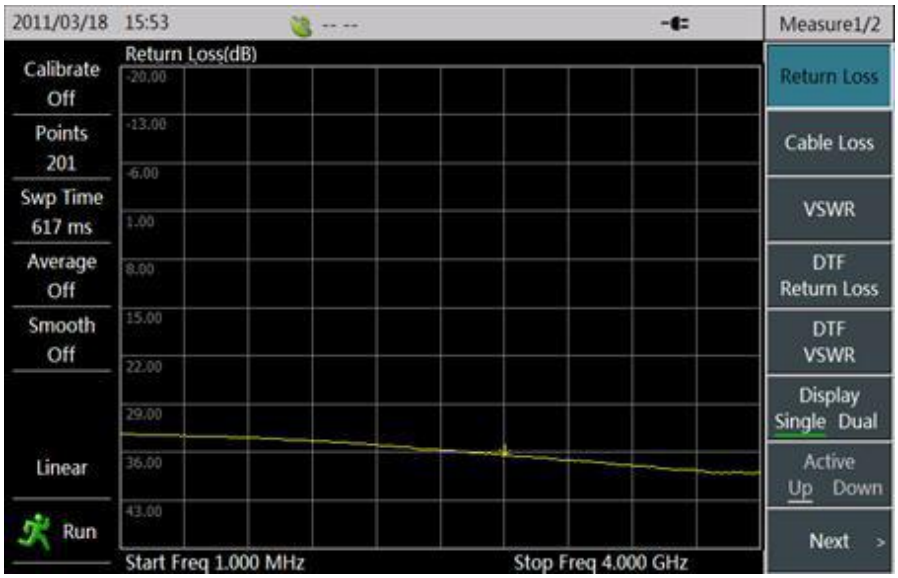


Figure 3.15 Return Loss Test of 10dB Attenuator

3. 5. Test Skills

As there have given a detailed description to the test steps for several test formats, this part will make a brief introduction on some common skills used in the measurement process.

1. **Amplitude:** S3101A/B provides three ways for amplitude adjustment: First, through the top and bottom adjustment; Second, through automatic ratio adjustment; Third, through the adjustment on reference value, location and ratio. In order to make a clearer and more intuitive observation on the measured curve, the amplitude of displayed curve can be adjusted by adopting any ways

under 【Amptd】. After automatic radio adjustment of default scale and amplitude, the measured return loss curve exampled in Section 3.2 is displayed as in Figure 3.16 and Figure 3.17.

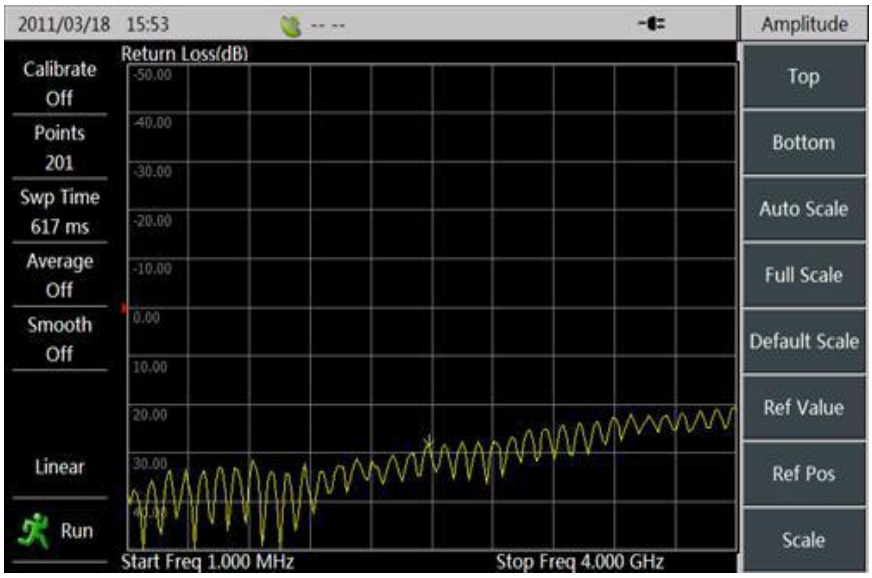


Figure 3.16 Return Loss Curve under Default Scale

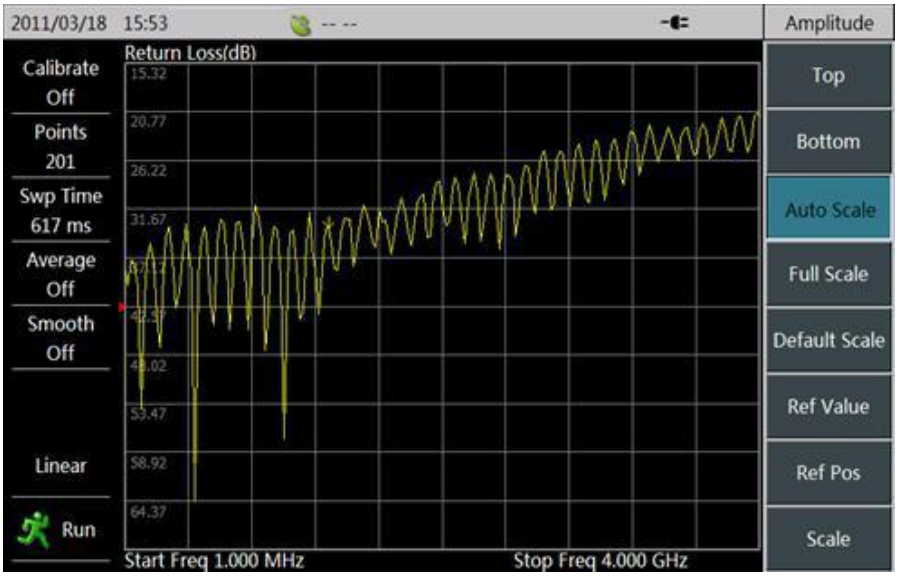


Figure 3.17 Return Loss Curve after Automatic Ratio Adjustment

2. **Limit line:** Users have their own eligibility criteria in batch test. In this regard, S3101A/B provides【Limit】function for the setting of limit line, making it easier to test products. Thus, when large quantities of products need to be tested, it only needs to replace DUT and observe limit line to judge whether the product is qualified or not. If the limit line is red, DUT is disqualified; if the limit line is green, DUT is qualified. What's more, it can avoid repetitive edit by saving/recalling the limit line. Limit line in Figure 3.18 has been edited.

Figure 3.18 Limit Line in Use

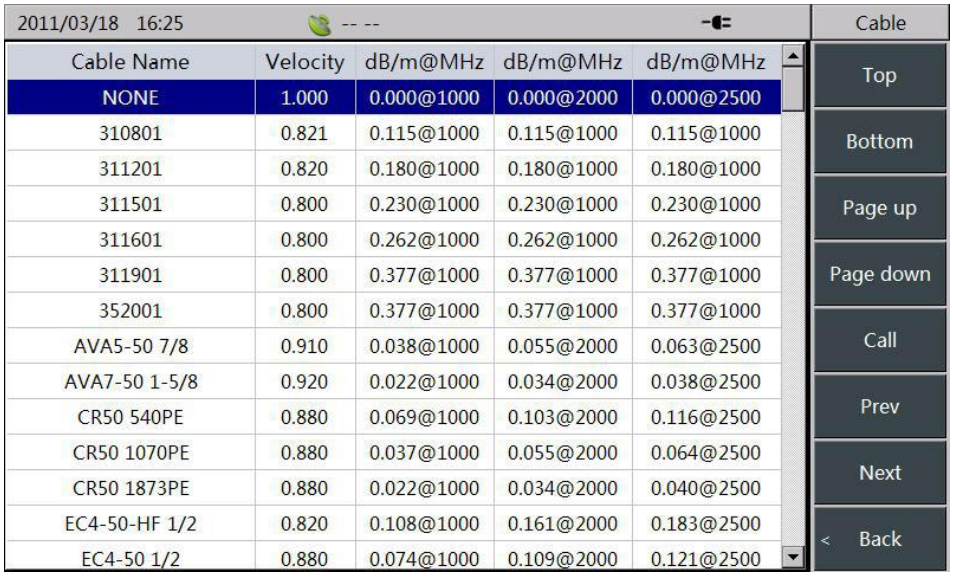
3. **Alarm:** The Analyzer also has alarm function that users can turn on or off this function by [Alarm Off On] when limit line is in use. If test curve of DUT exceeds the set limit line when the alarm function is turned on, Analyzer will raise a "beep ... beep" alarm, through which users can judge whether the product is qualified or not. Test curve in Figure 3.19 has exceeded the set limit line.

Figure 3.19 Alarm for Limit Line When Overstepping the Boundary

4. **Store/Recall:** S3101A/B provides store/recall function, for saving and recalling the measurement state, trace and pictures to meet the requirements of users when they writing the subsequent report, checking the state, analyzing the data, etc.

Figure 3.20 Return Loss Curve Measured Store

5. **Cable Model:** It has given detailed steps for setting velocity factor and cable loss in DTF test. To make it easier to test and set parameters, S3101A/B offers a series of common cable models for user's recall. Users can directly use [Cable Model] menu in the menu bar of 【FREQ】 to enter the interface for cable model selection. Then select the corresponding cable model through the touch screen, knob or arrow keys, choose [Recall] menu or press 【Enter】 key to complete recall of cable models. Thus, Analyzer will automatically match parameters for the selected cable based on its model, including velocity factor, cable loss, etc. Cable model recall interface is shown in Figure 3.21.



Cable Name	Velocity	dB/m@MHz	dB/m@MHz	dB/m@MHz
NONE	1.000	0.000@1000	0.000@2000	0.000@2500
310801	0.821	0.115@1000	0.115@1000	0.115@1000
311201	0.820	0.180@1000	0.180@1000	0.180@1000
311501	0.800	0.230@1000	0.230@1000	0.230@1000
311601	0.800	0.262@1000	0.262@1000	0.262@1000
311901	0.800	0.377@1000	0.377@1000	0.377@1000
352001	0.800	0.377@1000	0.377@1000	0.377@1000
AVA5-50 7/8	0.910	0.038@1000	0.055@2000	0.063@2500
AVA7-50 1-5/8	0.920	0.022@1000	0.034@2000	0.038@2500
CR50 540PE	0.880	0.069@1000	0.103@2000	0.116@2500
CR50 1070PE	0.880	0.037@1000	0.055@2000	0.064@2500
CR50 1873PE	0.880	0.022@1000	0.034@2000	0.040@2500
EC4-50-HF 1/2	0.820	0.108@1000	0.161@2000	0.183@2500
EC4-50 1/2	0.880	0.074@1000	0.109@2000	0.121@2500

Figure 3.21 Cable Model Select

In addition, in the menu of cable models, this Analyzer also provides [Head], [Foot], [Page Up] and [Page Down] menu to make it easier to search cable model.

6. **DTF measurement distance and resolution:** In DTF analysis, measurement distance is influenced by sweep span and sweep points of frequency as well as transmission speed of electromagnetic wave in the cable to be measured. The smaller the sweep span is, the longer the

measured maximum distance will be. The more the sweep points are, the longer the measured maximum distance will be.

In terms of cable loss, nominal value of effective directionality of S3101A/B is equal to or more than 42dB. If the reflected signal energy is less than the effective directionality, the valid test result is not available.

DTF measurement resolution is related to frequency sweep span. The wider the sweep span is, the higher the resolution will be.

4. Getting Help

Under normal circumstances, problems are caused by hardware, software, or improper operation of users. If there are any problems, first observe error messages and store them; analyze the possible reasons and use the methods provided in "4.1 Basic check" as reference and perform primary check to solve the problems. You can also contact our customer service center and provide error messages collected. We will assist you in solving problems as fast as we can. Please check 4.2 for detailed contact information or via **www.salukitec.com** online for the nearest technical support contact information.

4. 1. Basic Check

- If any problem occurs in the S3101A/B you are using. You can check them yourself in accordance with the following guidance. If the problem persists, please contact us.
- If S3101A/B cannot be started after pressing startup key, please check whether the power supply is normal. Check whether the indicators of adapter are powered on, or whether the power of battery is with electricity. If nothing wrong with the aforementioned problems, then it might be an instrument failure, please contact us for return-to-factory repair.
- Please press 【Reset】 key and return to a known state, if you cannot enter into the system or application programs after S3101A starts up. If it still cannot work normally, then it might be an instrument failure, please contact us for return-to-factory repair.
- If S3101A/B fails to start up and self test, please press 【Reset】 key, which makes S3101A/B return to a known state. If the self test still fails then it might be an instrument failure, please contact for return- to-factory repair.
- If the touch screen of S3101A/B does not respond, please use the key combination (【System/Local】+ 【↑】) and perform recalibration towards the touch screen (【System/Local】 → [Settings] → [Touch Screen Calibration]), if the problem on touch screen response persists then it might be an instrument failure, please contact for return-to factory repair.
- If S3101A/B performance index is not normal, please check whether the testing tools and testing environment meet the requirements; whether the test port connectors are worn out; whether the performance index of calibration kits are normal. If nothing wrong with the aforementioned problems, then it might be an instrument failure, please contact for return-to factory repair.
- If S3101A/B cannot communicate via LAN, first confirm the IP address setting of Analyzer and then check the yellow LED indicator next to LAN interface on the rear panel. If this indicator does not flash then check LAN cable and connection.

4. 2. Help Information

S3101A/B provides "Error log" function, when a problem occurs, the instrument will automatically generate "Error log", which records the abnormities of hardware, file deletions, program control etc.; it is composed of three levels, including message, warning, and error and used for assisting in analyzing instrument failure. Users can view "Error log" via 【System/Local】→ [Page Down] → [Error log].

If you still have problems, please contact us, the contact information is as below:

Service Tel:	886.909 602 109
Website:	www.salukitec.com
Email:	sales@salukitec.com
Address:	No. 367 Fuxing N Road, Taipei 105, Taiwan (R.O.C.)

In addition, please contact us in time if instrument failure occurs, we will provide assistance required. Return-to-factory repair is also supported if necessary. Users are forbidden to disassemble the instrument by themselves in case damages to internal circuits and parts caused by misoperation.

4. 3. Repair Method

When your problems with S3101A/B appear difficult to solve, you can contact us by email or phone. If you confirm that the instrument needs to be repaired, please follow the steps below to package the instrument:

(1) Write a paper document describing the instrument failure and put it in a packing case with the Analyzer;
(2) Package the instrument with original packaging materials to reduce potential damage;
(3) Place gaskets in the four corners of the outer carton and place the instrument inside the outer packaging case;
(4) Seal the mouth of packaging case with glue and reinforce the packaging case with nylon tape;
(5) Mark “Fragile! Do not touch! Handle with care!” on the box;
(6) Consign this instrument in conformity with precision instrument and keep all copies of transport document.

-End of Document-