3680A/B Cable & Antenna Analyzer

User Manual

China Electronics Technology Instruments Co., Ltd

Preface

Thank you for choosing and using 3680A/B Cable & Antenna Analyzer developed and produced by China Electronics Technology Instruments Co., Ltd. 3680A/B Cable & Antenna Tester has a small volume and light weight, and can be operated via the touch screen; otherwise, it is featured by high measurement accuracy, high measurement speed with high cost performance, and flexible power supply mode, etc. Please read this manual carefully for enhancement your understanding of and operation of this analyzer.

We will assume trying our best to meet your needs as our responsibility to provide high quality instruments for you and also bring you first-class after-sale service. We always persist in “Good Quality, Satisfied Service” and promise to offer satisfactory products and service for you. Welcome to inquire by:

Tel:	**+86-0532-868896691**
Web:	**www.ceyear.com**
Email:	**sales@ceyear.com.com**
Address:	**No. 98 Xiangjiang Road, Qingdao City, China**
Zip:	**266555**

This Manual mainly introduces the applications, menu structures, using methods and precautions of 3680A/B Cable & Antenna Tester, to help you get familiar with the operation methods and master the points in use as soon as possible.

Because of short time and the limited knowledge, some mistakes and shortcomings are inevitable. Welcome your criticism and correction. And apologize for your possible inconvenience when you use our instruments.

STATEMENT:	This is the first version of user manual of 3680A/B Cable & Antenna Analyzer, with the version number of AV2.733.1040SSCN. The information contained in this manual is subject to change without notice. And the explanation right of all the content and the terms in this manual belongs to China Electronics Technology Instruments Co., Ltd. The copyright of the manual belongs to China Electronics Technology Instruments Co., Ltd. Other entities and individuals can’t change or juggle it without our permission, and can’t copy and spread for earn business benefits. If discovered, we have the right for the legal action.

Editor

Contents

Chapter I Operating Guide 1

1.1 Open-box Self-check 1

1.2 Safety Precautions 2

1.2.1 Environment Requirements 2

1.2.2 Selection of Power Cord 2

1.2.3 Requirements of Power Supply 2

1.2.4 Protection against Electro-Static Discharge (ESD) 3

1.3 After-sales Maintenance 4

1.4 Signs 4

Chapter II 3680A/B Analyzer 5

2.1 Startup 5

2.2 Front Panel Overview 5

2.2.1 ON/OFF, Reset Key 6

2.2.2 Function Key Area 6

2.2.3 Numeric (Character) Key Area 7

2.2.4 Other Keys 8

2.2.5 LED Indicators 9

2.2.6 Knob 9

2.2.7 Touch Screen Display Area 9

2.3 Touch Screen Display Area Overview 10

2.3.1 System Status Bar 10

2.3.2 Information Display Area 11

2.3.3 Drawing Area 11

2.3.4 Menu Bar 12

2.4 Top Panel Overview 12

2.4.1 Power Interface 13

2.4.2 Digital Interface 13

2.4.3 Test Port 14

2.5 Battery 14

2.5.1 Battery Installation & Replacement 14

2.5.2 Viewing Battery Status 15

2.5.3 Charging a Battery 15

2.6 Instrument Symbols 16

Chapter III Antenna Feeder Test 17

3.1 Typical Measurement Formats 17

3.1.1Return Loss 17

3.1.2Cable Loss 17

3.1.3Fault Location (DTF) 17
3.2 Calibration 21
3.2.1 What is calibration? 21
3.2.2 Why should we perform calibration? 22
3.2.3 Calibration 23
3.3 Typical Measurement Setting 27
3.3.1 Return Loss Measurement Setting 27
3.3.2 Cable Loss Measurement Setting 28
3.3.3 Distance-To-Fault (DTF) Measurement 29
3.4 Measurement Parameter Setting 30
3.4.1 Frequency 30
3.4.2 Distance 31
3.4.3 Amplitude 32
3.4.4 Sweep 33
3.4.5 Limit 38
3.4.6 Marker 40
3.4.7 Display 43
3.5 Trace 44
3.5.1 Obtain a Reference Trace 44
3.5.2 Trace Operation 44
3.5.3 Trace Display 45
3.6 Menu Structure of Cable & Antenna Tester 45
3.6.1 Freq 45
3.6.2 Sweep 47
3.6.3 Trace 47
3.6.4 Amplitude 47
3.6.5 Marker 48
3.6.6 Calibration 48
3.6.7 Limit 49
3.6.8 Measurement 49
3.6.9 Save/Recall, Run/Hold and System/Local 50
3.7 Freq Menu 50
3.8 Sweep Menu 52
3.9 Trace Menu 53
3.10 Amplitude Menu 54
3.11 Marker Menu 55
3.12 Calibration Menu 56

3.3.13 Limit Menu 56
3.14 Measurement Menu 57
Chapter IV Power Measurement 59
4.1 Introduction 59
4.2 Power Meter Interface Introduction 59
4.2.1 System Status Bar 60
4.2.2 Information Display Area 60
4.2.3 Plot Area 61
4.2.4 Menu Bar 61
4.3 Measurement Parameters Setting 62
4.3.1 Frequency 62
4.3.2 Sweep 62
4.3.3 Amplitude 63
4.3.4 Calibration 64
4.3.5 Save/Recall, Run/Hold and System/Local 65
4.4 Power Meter Menu Structure 65
4.5 Freq Menu 66
4.6 Sweep Menu 66
4.7 Amplitude Menu 66
4.8 Calibration Menu 67
Chapter V Document operation 68
5.1 Introduction 68
5.2 Set Save Location 68
5.3 Status Save Recall 69
5.4 Trace Save Recall 70
5.5 Screen Capture 71
5.6 Document Management 72
5.7 Default Status 73
5.8 Menu Structure 73
Chapter VI System Management 75
6.1 Introduction 75
6.2 Measurement Mode 75
6.3 Label 76
6.4 Power Saving Mode 77
6.5 Display 78
6.6 GPS Function 81
6.7 Config 81

6.7.1 Date & Time 81
6.7.2 LAN 82
6.7.3 Touch Screen Calibration 84
6.7.4 Software Update 85
6.7.5 Management 86
6.8 Serial No. 86
6.9 Self-test 86
6.10 Frequency Reference (10MHz) 88
6.11 Measurement Guide 88
6.12 Menu Structure 89
Chapter VII Software Toolkit 91
7.1 Software Description 91
7.2 Instructions for Use 91
7.2.1 Communication Connection 91
7.2.2 Trace Collection & Storage 92
7.2.3 Setting of Sweeping Parameters 94
7.2.4 Remote Calibration 95
7.2.5 Trace Analysis 96
7.2.6 File Transfer 100
7.2.7 Check the Software Version 100
7.2.8 Drawing Printing 101
7.2.9 Generate the Test Report 101
Appendix I: Instructions for Basic Measuring Formats 103
1. Return Loss/VSWR Measurement 103
1.1 Measurement Procedures 103
1.2 Test Skills 106
2. Cable Loss Measurement 110
2.1 Measurement Procedures 110
2.2 Test Skills 114
3. DTF Measurement 116
3.1 Measurement Procedures 116
3.2 Test Skills 123
Appendix II: Introductions for Technical Index 126

Chapter I Operating Guide

Thank you for choosing and using 3680A/B Cable & Antenna Analyzer developed and produced by China Electronics Technology Instruments Co., Ltd. This product is featured by high performance with high cost performance. It is capable of comprehensive measurement of network reflectance parameters, including the measurement of network standing-wave ratio, return loss, characteristic impedance and phase positions, as well as the accurate positioning of cable faults. The Tester can work more than 8 hours continuously before requiring another charge, to meet the needs of outdoor field tests; it has GPS positioning function and can accurately display the current geographic location information after externally connected with GPS antenna. Also 3680A/B Cable & Antenna Analyzer adopts touch-screen operation. For the purpose of better adapting to the illumination changes in measuring environment, the Tester also provides a backlight adjustment function.

This Chapter details the precautions for open-box inspection, check before power-up, instrument startup-stop, and routine maintenance and repairs. Please read this Chapter carefully before using, to prevent damages to the Tester caused by improper operation and occurrence of accidents. In case of any problems, please contact us as soon as possible for solving them.

1.1 Open-box Self-check

When receiving the instrument, please be sure to check the goods packaging and check the packing list with reference to the following steps:

1. Inspect whether the goods packages and cushioning materials have extrusion or tear signs, and if any, please further open the box for inspecting whether the instrument has appearance damages.

2. Carefully remove the goods inside the packaging box, and check the attached documents against the packing list. The necessary accessories and documents include:

- Power cord 1
- Battery 1
- AC-DC adaptor 1
- USB interface cable 1
- Software tool CD 1
- *Quick Start Guide for 3680 AB Cable & Antenna Analyzer* 1
- “Packing List” 1

Inspect the instrument, accessories and documents inside the box are complete and in good condition, before using Tester for electric performance test.

3. If you have any questions or require goods-related consulting services, please contact us according to the contact information provided in Preface or Section 1.3, and we will reply any queries and conduct repair or exchange as soon as possible.

STATEMENT: The packaging and shipping materials of the Tester belong to recyclable materials, and can be treated as recyclable garbage when the shipping materials are damaged or destroyed beyond use.

1.2 Safety Precautions

The security of 3680A/B Cable & Antenna Analyzer complies with the requirements of GJB3947A-2009. The instrument has no internal components available for operation by the users, so please do not open the instrument closure without authorization to avoid unnecessary personal injuries.

1.2.1 Environment Requirements

To guarantee the service life of 3680A/B Cable & Antenna Analyzer and the effectiveness and accuracy of measurement, please perform the test and store data under the following environmental conditions:

1. Temperature range

Storage temperature range: -40℃～+70℃

Operating temperature range: -10℃～+50℃

2. Low pressure:

Low pressure (altitude): 0～4600m

1.2.2 Selection of Power Cord

3680A/B Cable & Antenna Analyzer is provided with a three-core power cord in accordance with international safety standard. This cable grounds the Tester cabinet when it is connected to an appropriate power line outlet with protective ground wire. It is recommended to use the power cord provided with the instrument. During power cord replacement, it is better to use 250V/10A power cord of the same type.

1.2.3 Requirements of Power Supply

3680A/B Cable & Antenna Analyzer can be powered up in three ways:

1. Powered by AC power supply through adaptor

When adopting AC power, do use the provided AC-DC adapter. The input of the adaptor is 100-240V /50/60Hz AC. To avoid or reduce the possible hardware damage of the Tester caused by the intervention between the powers of more than one device, especially the peak pulse intervention of high-power devices, it is suggested to use AC voltage-stabilized power supply to power on the Tester.

When transported and carried with a pack-bag, please do not connect the AC-DC adapter to the Tester to avoid overheating. Since AC-DC adapter has a wider liner voltage input range, the power supply should be assured to within the range required by Table 1-1 when in use.

The power supply required by the adaptor under normal operations:

Table 1-1 Power Supply Requirements

Power Supply Parameters	Applicable Range
Input voltage Rated input current Operating frequency	100V～240VAC 1.7A 50/60Hz

STATEMENT: The operating voltage and frequency range are subject to specifications in the nameplate of the provided power adaptor.

2. Power by DC Power Supply

Voltage: 12V～18V (without a battery), 15V～18V (with a battery)
Current: 2A (at minimum)

3. Powered by Built-in Battery

3680A/B Cable & Antenna Analyzer can be powered by rechargeable lithium batteries. If left unused for a long time, the batteries will discharge, so it must first charge the batteries before using it again. Refer to Section 2.5 for battery replacement details. The basic parameters of batteries provided with the instrument are as follows:

Nominal voltage: 10.8V

Nominal volume: >7000mAH

WARNING: The rechargeable battery shall not be exposed to fire and high temperature environment (above 70℃), or thrown into the fresh or salt water, and wetted, and shall be kept away from children. Rechargeable batteries can be reused, and shall be placed in an appropriate 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 rather than disposed at will.

1.2.4 Protection against Electro-Static Discharge (ESD)

Protection against ESD is usually ignored by users. Once the electrostatic accumulated in the human body discharges, it is prone to damage the sensitive circuit elements in instrument and significantly lower the reliability of instrument, even the insensible little electrostatic discharge may result in permanent damage to the sensitive devices. Thus, users should try their best to take the following electrostatic protection measures if possible:

1. Clean and check the electrostatic discharge sensitive (ESDS) and testing port of instrument, or ground yourself before connection by holding testing port of instrument or casing of testing cable connector which have already been grounded.
2. First do ground the central conductor of the cable before connecting it to the testing port of instrument or ESDS, which can be realized by the following steps: connect short circuit to one end of the cable to short its central conductor and outer conductor. When you wear the anti-electrostatic strap, grasp the casing of cable connector, connect well the other end of the cable and then remove the short circuit.

1.3 After-sales Maintenance

China Electronics Technology Instruments Co., Ltd has set up point-of-sale and offices, technical support staff from each point-of-sale and office can reach the user-site for technical exchanges, training and product maintenance, to provide comprehensive and convenient technical support and after-sales service for your easies use of instrument. In addition, you can also visit www.ceyear.com to counsel the QQ online customer services for help.

Our instruments are qualified through the inspection of Quality Dept., and guaranteed for 18 months since the date of original shipmen and long-term maintenance; if there is instrument failure caused by non-human factors in the warranty period, we will provide maintenance for free; depending on the different instrument failures, we will adopt various ways, such as telephone explanation or on-site repairs, to solve your problems.

Moreover, if case of any instrument failures, please contact us in time, we will provide you with the required assistance, and if necessary, the instrument can also be returned for repair. Users are forbidden to disassemble it, in order to avoid damages to internal circuits and devices due to incorrect operations.

1.4 Signs

During writing, some signs concerning additional instructions, warnings and cautions are given in the User Manual. The users should try to operate and use the instrument in accordance with these warnings and precautions, in order to avoid permanent damages to the Tester caused by improper operations. The main signs are as shown in the following table:

Table 1-2 Signs

Signs	Explanations
	Statement of the operation, precautions and safety precautions to remind the users of the attentive general operation information or instructions.
	Warning: remind the users of the important notes during operation. In case of improper operation, it may cause damages to the instrument or human injuries.
	Some key cautions in the operation of the instrument.

Chapter II 3680A/B Analyzer

This Chapter describes the 3680A/B Cable & Antenna Analyzer on the whole. By reading this Chapter, you can become more familiar with the structure and basic test functions of the instrument. Additionally, the Chapter III will introduce to you the detailed antenna test functions; the Chapter IV will give a thorough introduction to the Power Measurement function of 3680A/B Cable & Antenna Analyzer; and the last three chapters (Chapter V, VI and VII) will describe the three parts respectively including document management, system management and software tools of the Tester.

2.1 Startup

Before power on the 3680A/B Cable & Antenna Analyzer, please inspect the power supply unit in accordance with “Power Supply Requirements” contained in the Chapter I. The Tester can be powered up after confirm the power supply is correct.

STATEMENT:	The security of Cable & Antenna Tester complies with the requirements of GJB3947A-2009: AC effective value being 1.5kV, 1min and 10mA without arcing and breakthrough; input voltage being AC 242V and leakage current ≤3.5mA. Therefore, the operation and maintenance of the Tester in accordance with the provisions of the rules will not cause personal danger or injuries, nor will it cause any damage to the DUT.

Press the yellow power switch 【⏻】 at lower left corner of the front panel of 3680 A/B Cable & Antenna Analyzer for about three seconds, after beep from the buzzer, release it, the Tester displays startup screen.

Tester 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……” 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 tester 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 Tester will automatically exit from the measurement application program and cut the power supply off.

STATEMENT:	In this Manual, keys on the front panel are expressed with **【XXX】**, among which XXX is the key name; the menu items corresponded with menu keys (herein after referred to as menu) on the touch screen are expressed with [XXX], among which XXX is the menu name.

2.2 Front Panel Overview

This Section will give a detailed introduction to the front panel of 3680A/B. You can get generally familiar with the basic application of the panel keyboard of the instrument by reading it. The front panel of 3680A/B Cable & Antenna Analyzer is as shown below:

Figure 2-1 Front Panel of 3680A/B Cable & Antenna Analyzer

The front panel of 3680A/B Cable & Antenna Tester is composed of various parts, including ON/OFF key, reset key, function key area, number pad (character key) area and LED indicator.

2.2.1 ON/OFF, Reset Key

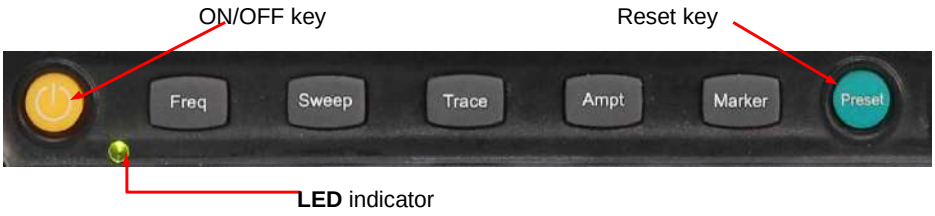


Figure 2-2 Schematic Diagram of ON/OFF & Reset Key

- 【⏻】: Used to start up or shut down the instrument.
- 【RESET】: Used to reset and restore the system to default initial state.

2.2.2 Function Key Area

Figure 2-3 Schematic Diagram of Function Key Area

- 【Freq】: Used to set the measurement parameters, including frequency parameter, signal standard, distance parameter and speed factor.

- 【Sweep】: Used to set the measurement parameters, including trigger mode, sweep mode, sweep time, sweep points and intermediate frequency band.
- 【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 Tester.
- 【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 feeder 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 Tester; when in remote control mode, it is used to return the Tester to local function.

2.2.3 Numeric (Character) Key Area

The numeric keys can be used to enter an exact value or to quickly switch from one value to another value, for changing the measurement setup of the Tester. The keys can also be used to enter characters, mainly to save the instrument settings or input of file names of measurement traces.

Figure 2-4 Numeric Key Area

Numeric (character) keys are used to input the values while setting frequency, marker, distance, amplitude and other parameters, and then press the corresponding unit key or Enter key to complete the input. There are 2 or 3 characters printed on the upper left corner of each numerical key and when the user intends to input characters, press them in quick succession to switch between numbers and characters. The correspondence relationship between entered character and press times is as shown below in Table 2-1:

Table 2-1 Instruction to Keys on the Keyboard

Press Times / Figure Key	*1*	*2*	*3*	*4*
1	*1*	*A*	*B*	*C*
2	*2*	*D*	*E*	*F*
3	*3*	*G*	*H*	*I*
4	*4*	*J*	*K*	*L*
5	*5*	*M*	*N*	*O*
6	*6*	*P*	*Q*	*R*
7	*7*	*S*	*T*	*U*
8	*8*	*V*	*W*	*X*
9	*9*	*Y*	*Z*	*9*
0	*0*			

- 【•】Decimal Point Key: Used to enter the decimals points when entering a decimal value with decimal places; used to enter the character "." When entering characters.
- 【+/-】Plus/Minus Sign: Used to trigger a positive or negative value input before figure input; used to enter the characters "+" or "-" when entering characters.

2.2.4 Other Keys

Figure 2-5 Other Keys

- 【↑】&【↓】: 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.

2.2.5 LED Indicators

The indicators have two colors, yellow and green, corresponded with the physical conditions of the instrument as shown in the below table:

Table **2-2 Indicator Instructions**

Instrument State	Indicator State	Physical State of Tester
OFF	Out	a) The Testers is not connected to the external power, with a battery inside. b) The Testers is not connected to the external power, without a battery inside.
	Constant yellow	a) The Testers is connected to the external power, without a battery inside. b) The Testers is connected to the external power, with a battery of 100% electric quantity inside.
	Flash yellow	The Testers is connected to the external power, with a battery less than 100% electric quantity inside.
ON	Constant green	a) The Testers is connected to the external power, without a battery inside. b) The Testers is connected to the external power, with a battery of 100% electric quantity inside. c) The Tester is not connected to the external power, without a battery inside.
	Flash green	The Tester is connected to the external power, with a battery less than 100% electric quantity inside.

2.2.6 Knob

It is mainly used to move the marker and change the value of current parameters, such as adjust the frequency, distance and amplitude according to a certain proportion; in addition, the knob can also be used to switch the currently selected item when operating the list box. The knob supporting point is located in the center of the knob, shaped like “umbrella”. Therefore, do not try to hold down on side with a single finger to rotate the knob when using, which will increase the friction between the knob and shell. Users can use four fingers to grip the side or top of the machine to form a pivot, and then use the thumb to complete the rotation. As the picture shows:

Not recommended

Not recommended

Recommended

Figure 2-6 Knob Operation

2.2.7 Touch Screen Display Area

Touch screen display area includes system status bar, information display area, drawing area, and the menu bar, etc., which will be introduced in Section 2.3 respectively.

2.3 Touch Screen Display Area Overview

3680A/B are 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 touch screen display area is as shown in Figure 2-7. Additionally, it provides different settings with different color contrast corresponding to different testing environment such as outdoor, nighttime, and normal testing environment, please refer to Section 6.5 for detailed setting procedures.

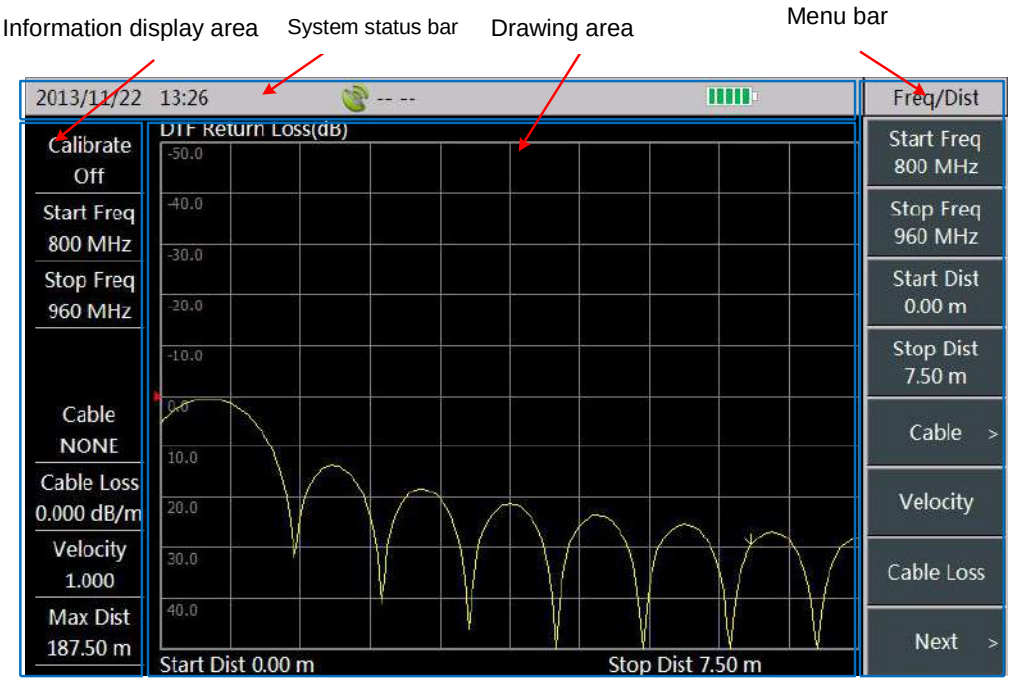


Figure 2-7 Touch Screen Display Area

2.3.1 System Status Bar

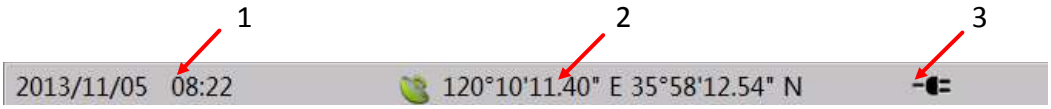


Figure 2-8 System Status Bar

1. Special brand of manufacturer.
2. Tester system date and time: Users can set or change through 【System/Local】→[Config]→[Date&Time].
3. GPS display area: Users can connect the GPS antenna and then turn on GPS through 【System/Local】→[GPS]→[GPS Off On]. GPS information will be displayed in this area.
4. Power supply identification area: This area includes the following three display status, as shown in Figure 2-9: a) when the battery is not installed, it displays the external power supply pattern; b) when the battery is installed and external power supply is not connected, it displays the current status of electric quantity; c) when the battery is installed and external power supply is connected, it displays the charging status.

a) External power supply b) Display of electric quantity c) Charging status

Figure 2-9 Power Supply Identification

2.3.2 Information Display Area

Figure 2-10 Information Display Area

Information display area mainly includes calibration On/Off, sweep point, sweep time and run/hold, etc. The area is mainly to provide users with setting information about the sweep traces in the current drawing area; and users can click the appropriate area to reset those information. For example: the sweep point is displayed as 201, the user can click the touch screen to sweep the area corresponding to the points, then the label information set of those point will be displayed in the drawing area in the middle of the display screen, and the trace sweep points can be reset via numeric keys and 【Enter】keys, knob or【↑】【↓】.

2.3.3 Drawing Area

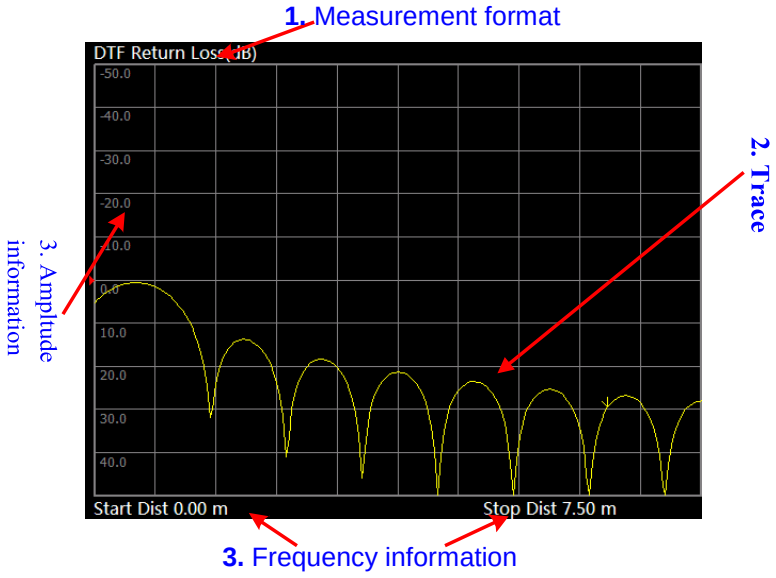


Figure 2-11 Drawing Area

The drawing area mainly presents the measurement data traces in a manner of two-dimensional images to the user, for easy and intuitive observance of measurement results. It mainly includes the measurement format, traces and X/Y-axis logo.

1. Measurement format names of two-dimensional traces displayed on the screen, such as return loss, cable loss and DTF;
2. Measurement data trace obtained on the basis of different measurement formats;
3. Y-axis: amplitude information; X-axis: frequency or distance information.

STATEMENT:	The bottom X-axis sign of the drawing area has the function of information display, and it can set the X-axis frequency or distance information via clicking on the corresponding areas on the screen.

2.3.4 Menu Bar

Located at the menu area on the right corner of the touch screen, the menu bar includes menu bar title and menu item. Click any function keys on the front panel of the Tester, the right touch screen expands the menu corresponding to the title, and then the user can click the menu to select the corresponding menu items and sett measurement parameters. The menu bar corresponding to the 【Meas】 is as shown in Figure 2-12.

Figure 2-12【MEAS】 Menu Bar

2.4 Top Panel Overview

The top panel of 3680A/B Cable & Antenna Analyzer is as shown in Figure 2-13, including power interface, digital interface and test port.

Figure 2-13 Top Panels

2.4.1 Power Interface

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

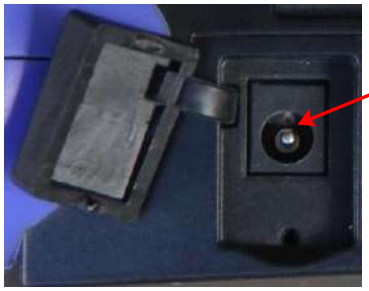


Figure 2-14 Power interface

2.4.2 Digital Interface

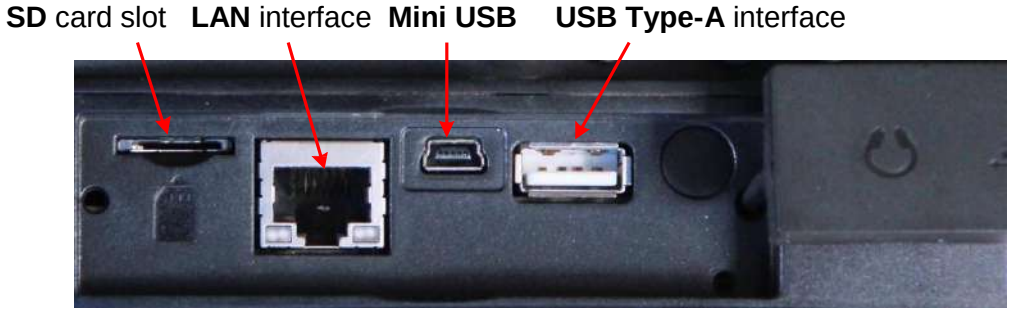


Figure 2-15 Digital Interface

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 3680A/B Cable & Antenna Feeder.

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 3680A/B Cable & Antenna Feeder.

4. USB A-type port: used to connect external USB instrument, such as USB storage device, USB mouse and USB keyboard.

2.4.3 Test Port

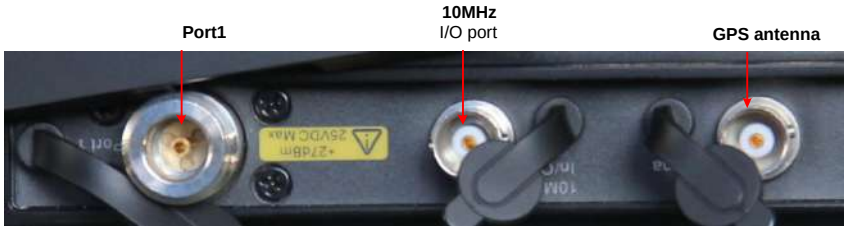


Figure 2-16 Test Port

1. GPS antenna: used to connect GPS antenna instrument and support positioning of the current location of Tester.

2. 10MHz I/O port: used to input/output the 10MHz signals, and can also be used to provide 10MHz signal for the Tester as reference signal by connecting with other external instrument; output 10MHz inner signal to external instrument as reference clock.

3. Port 1: or known as test port, with characteristic impedance of 50Ω and N-type female port.

	Warning:	The damage limit level at the test port: **+27dBm** RF power or **±25V** DC voltage, and it may burn down the instrument in case of exceeding the above range.

2.5 Battery

3680A/B 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(3680A), 4hours(3680B). **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.

2.5.1 Battery Installation & Replacement

3680 A/B Cable & Antenna Analyzer is easy to install or replace the battery, which is as shown in the below figures.

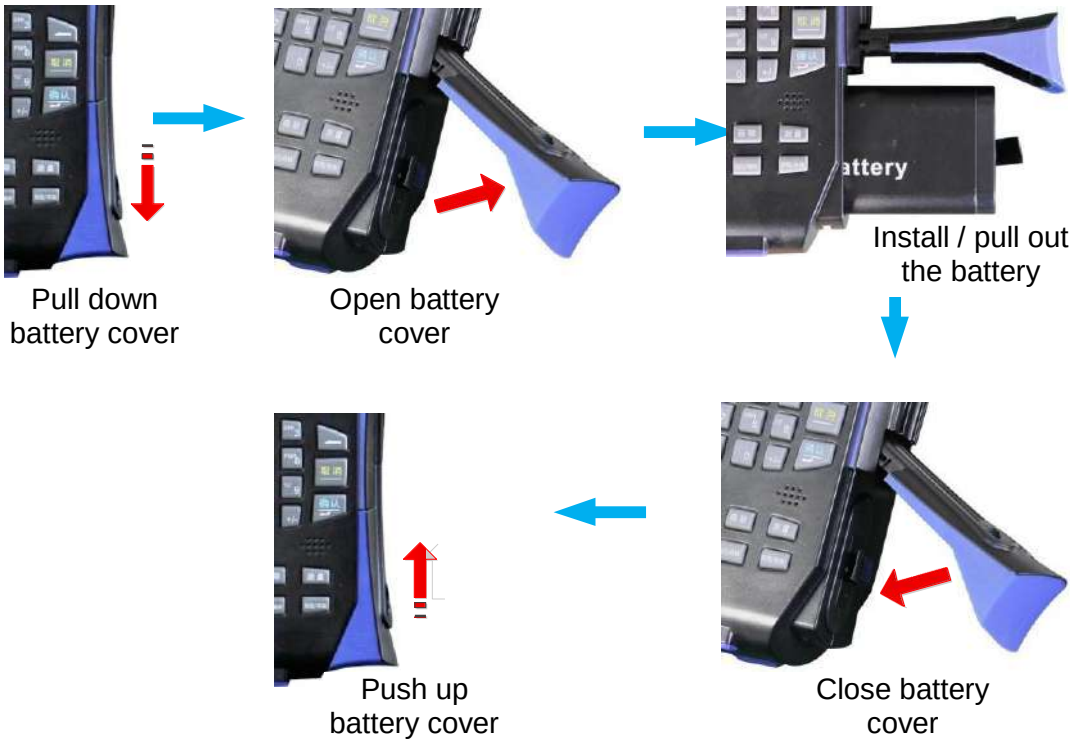


Figure 2-17 Battery Installation or Replacement Procedures

2.5.2 Viewing Battery Status

3680A/B Cable & Antenna Analyzer is supplied with a battery, which can achieve the standby time at full capacity battery as shown in Table 2-3:

Table **2-3** Battery Standby Time

Screen Display / Ambient Temperature	Auto Brightness	
	3680A	3680B
Normal temperature (25℃)	≥ 8h	≥ 4h
Low temperature (-10℃)	≥ 7h	≥ 4h

The user can view the battery status in either of the following methods:

1. Check the battery icon in the system status bar, which indicates the approximate level of charge. If only 1 bar left, please timely replace or charge the battery.
2. Press 【System/Local 】 to enter system menu, click [Next]→[Self test] to check the current battery remaining power in the power supply item.
3. Remove the battery, and press the key with a white point on the battery end, the indicator on the battery will light to indicate the current remaining battery power. If only 1 bar left, please timely charge the battery.

2.5.3 Charging a Battery

You may recharge the battery in the 3680A/B Cable & Antenna Feeder while the Tester is operating or when it is turned off. The charging procedures are as follows:

1. Install the battery in the Tester.

2. Plug in the supplied AC-DC adapter and switch external power on.

3. The yellow LED on the left bottom corner of the front panel lights and flashes when charging with power off, indicating that the battery is charging, and the constant yellow LED indicates complete charge; the green LED lights and flashes when charging with power on, indicating that the battery is charging, and the constant green LED indicates complete charge. At that time, the battery icon on the right of touch screen system status bar will show the battery is fully charged.

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

2.6 Instrument Symbols

In order to better protect the Tester, some identification symbols are provided on the test port for reminding the users of important issues to be noted, as shown in Figure 2-18:

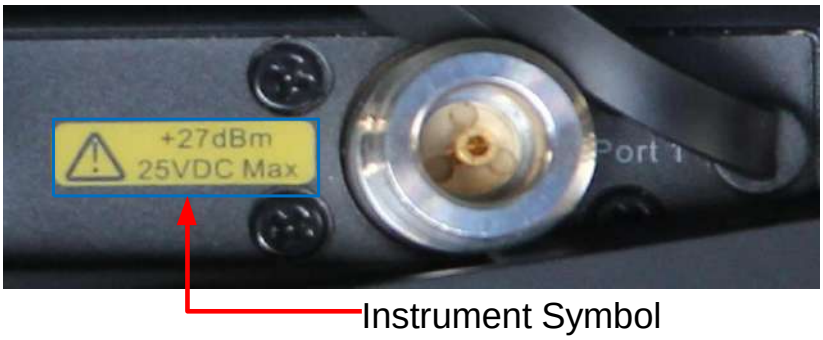


Figure 2-18 Instrument Symbols

The yellow tag indicates the maximum input power of test port is +27dBm, the maximum input DC level is 25VDC. When using, the users shall not connect the signals exceeding the above ranges to the port, so as not to cause permanent damage to the Tester.

Chapter III Antenna Feeder Test

3680A/B Cable & Antenna Analyzer is provided with antenna feeder test function and Power Measurement function. This Chapter will introduce the operating procedures for antenna feeder test in detail.

After power on the 3680A/B Cable & Antenna Analyzer, the application program enters the antenna feeder test function by default. If the users have entered the power meter test function, press [Measure Mode] menu under 【System/Local 】 to switch to the antenna feeder test function.

3.1 Typical Measurement Formats

In order to understand the performance of the transmission system and solve the common problems in the transmission line system, it is often determined based on the measurement of transmission line on return loss, cable loss and Distance-To-Fault (DTF). This Section focuses on the meaning of these types of measurement formats.

3.1.1Return Loss

Return Loss is used to reflect the signal reflection characteristics for antenna system, mainly for detecting the problems existing in antenna and feeder system. If case of the antenna or a transmission line failure, when the signals are transmitted therein, there will be a part of the transmission power reflected back to the signal source. By measuring the return loss, it can judge the performance of the transmission line or feeder. Ratio of the reflected voltage and emission voltage is called the reflection coefficient, a complex number, the measurement on amplitude and phase information of which is denoted by S parameters. Return loss belongs to S_{11} measurement, during which process the ends of the transmission line are connected to the load (e.g., antenna, etc.). Return loss provides a basis for the analysis on the interaction of the various components of the system and return loss of the entire system.

3.1.2Cable Loss

Cable loss is used to test the consistency or loss of energy on the transmission line, being a method which is derived from the return loss measurement. Different transmission lines have different cable loss, and are influenced by distance or frequency, usually the greater the distance is or the higher the frequency is, the more significant cable losses are. During measurement, the ends of the transmission line are connected to the short circuit. At this moment, it can analyze the energy loss caused when the signal passes through the transmission line and confirm the system problem. High insertion loss or bridging loss would worsen the system performance, and diminish the signal coverage.

3.1.3Fault Location (DTF)

Fault location test is a test method to pinpoint the components fault location in the transmission line system. In the measurement, the ends of transmission line are connected to the exact 50Ω load. According DTF measurement curve, the user can detailed analyze in detail whether the various components of transmission line system have failed, e.g., transmission connector, jumper, transmission line bend as well as transmission line damage affected with damp.

DTF (Distance-To-Fault) measurement, also known as fault location measurement, shows the size of response signal at different signal path locations on DUT, to provide a basis for judging the impedance change of the transmission path.

DTF measurement in some vector network analyzer is also known as time domain measurement, where the X-axis shows the time while X-axis shows the distance in DTF measurement. These two displays can be converted by the following formula:
Distance = time × velocity of light × rate factor (1)

For DUT, the rate factor is a constant greater than zero and less than 1; the velocity of light means the light propagation velocity in a vacuum; there is direct proportional linear correlation between distance and time.

In a typical measurement, the vector network analyzer displays the DUT response varied with frequency, called frequency domain measurement. Modern vector network analyzer obtains the time-domain data by means of Fourier inverse transformation of frequency domain data. The measurement results are displayed on X-axis with time, and the response value shows at the discrete time point to do analysis on the DUT impedance change point. The following figure shows the frequency domain and time domain reflectometry measurements with a cable having two bends, and each bend point will cause the transmission line mismatch or impedance changes.

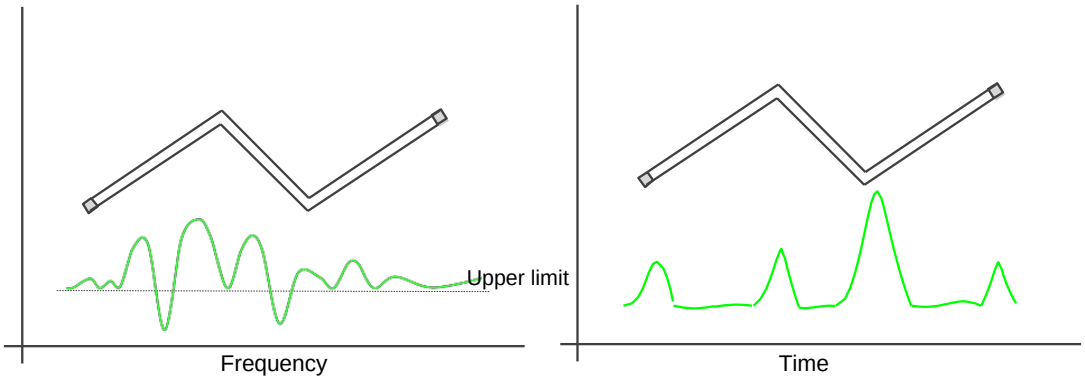


Figure 3-1 Frequency Domain & Time Domain Measurement

As can be seen from the chart, S_{11} frequency response measured in the output port shows a combination of reflex response due to the interaction of multiple cable mismatch points, but it is difficult to determine the exact physical location of cable mismatch occurred. Time domain response shows the location and size of each impedance mismatch point, and from the response, we can see the second bend of the cable has undergone an obvious mismatch.

DTF measurement function of 3680A/B Cable & Antenna Analyzer simulates the traditional Time Domain Reflectometry (TDR). TDR launches an impulse or step signal to the DUT, and then observe the energy of the reflected signal, and thus the changes in the impedance of the DUT can be determined by analyzing the amplitude of the reflected signal, duration and waveform.

During DTF measurement, 3680A/B DTF Cable & Antenna Tester does not use the incident impulse or step signal, but rather a sweep measurement, and then applies Fourier algorithm to calculate the time domain information on the basis of frequency domain measurements, which is also known as frequency domain reflectometry. That is performing time transformation measurement after measuring S_{11}. S_{11} reflectance measurement is not a simple display of the size of the reflected signal received by Receiver A or B, which shows the ratio of the measurements of the measurement receiver and the reference receiver.

S_{11} ratio measurement can remove the systematic errors through calibration, which is particularly important for DTF measurements because the measurement reference surface was established via calibration, calibration point became the zero point on X-axis, which serves as a reference point for all the time and distance data, thus time and amplitude data become very precise due to calibration. DTF measurements by the Tester usually include the following steps:

a) Collect raw data from receiver (reflected signal A and reference signal R) and do ratio operation;
b) Perform error correction;
c) Transform frequency domain data into time domain;
d) Display the measurement results.

After understanding of the mechanism of production of DTF, how to make settings to observe the effective DTF data of DUT and to obtain the highest resolution and the largest measurement range? Detailed descriptions are made here from two aspects:

1. Response resolution

DTF response resolution of the Tester refers to the ability to distinguish between the two adjacent responses. Same amplitude response equals to the width of the impulse response defined by 50% (6dB) amplitude point, or the rise time of the step response defined by 10% to 90% amplitude point, as shown in below figure

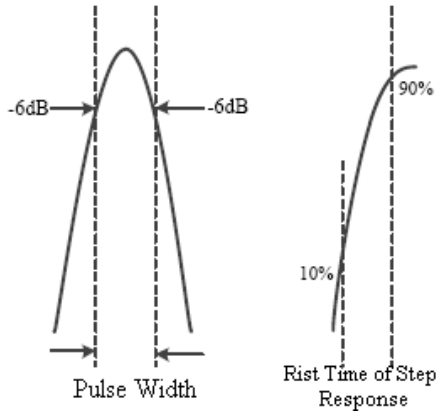


Figure 3-2 Time Domain Response Resolution

Time domain response resolution is affected by the several factors:
1) Frequency span: the below figure shows the effluence of frequency span on response resolution:

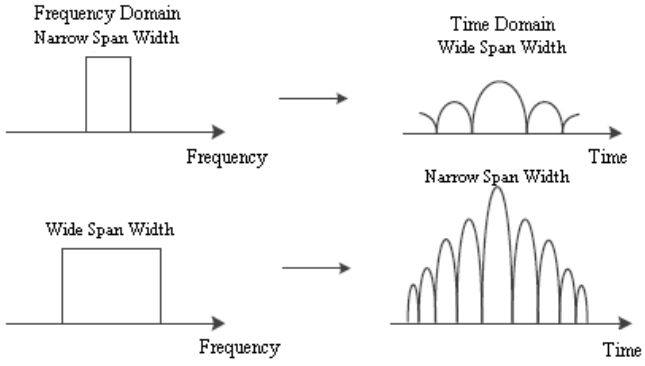


Figure 3-3 Effluence of Frequency Span on Response Resolution

Frequency span is inversely proportional to pulse width, where the wider the frequency span is, the narrower the pulse response impulse is, and the shorter the step response rising time is, the higher the response measurement resolution is. Time domain measurement response under narrow frequency span shows impulse response pulse overlapping with each other which should be separate. The Tester can distinguish between different pulse responses when the time domain measurement is performed under wide frequency span.

2) Window function S-1

When the Tester converts from frequency domain to time domain, the data length processed is limited, and for the purpose of reducing ringing effects caused by data truncation, the Tester usually offers the windowing option. Windowing reduces the ringing effect and side lobe, but leads to the increase of the main lobe width and the decrease of the resolution.

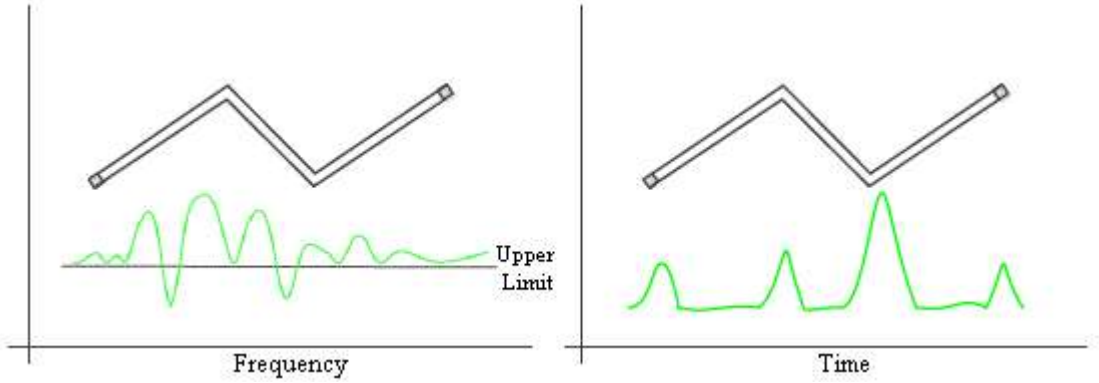


Figure 3-4 Window Filtering is used to Suppress Side Lobe

3680A/B Cable & Antenna Analyzer offers four kinds of window function, respectively, rectangular, normal edge smoothing, low edge smoothing and minimum edge smoothing; the main lobe width of which increases in turn while side lobe height decreases in turn. A different window is selected depending on the specific test.

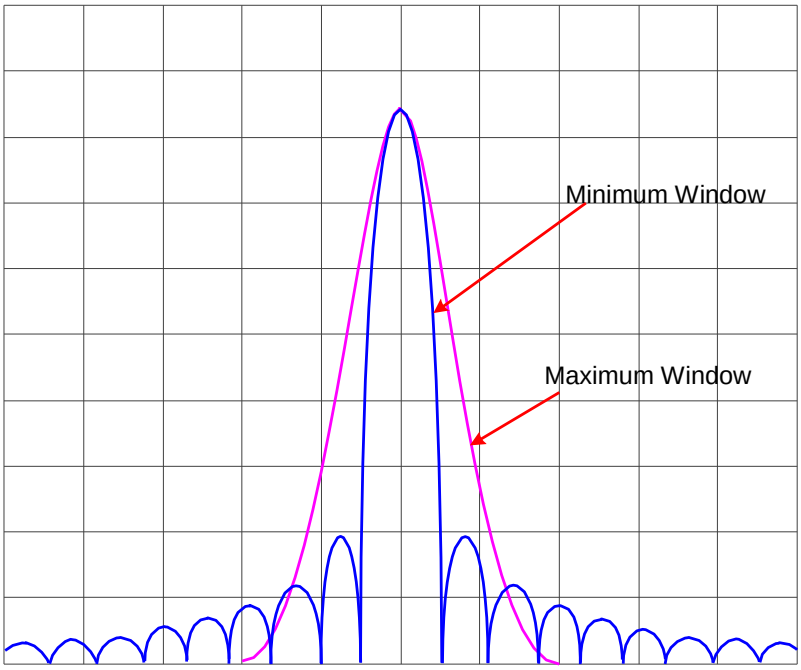


Figure 3-5 Effluences of Different Windows

2. Measurement range

In a time domain measurement, the measurement range is defined as the maximum length of time that can be set, where duplicate responses will not occur when performing measurement.

Measurement range is inversely proportional to the response resolution, where the higher the former is, the lower the later is, and vice versa.

Since time domain waveform is a periodic signal repeated over time, duplicate responses occur. Duplicate responses (spurious responses) are not the real response of the DUT, which only occur at a specific time interval (1/sweep point frequency interval), thus the measurement range is determined by the frequency interval ∆F of sweep point:

For domain measurement, the maximum measurable termination time is 1/∆F. In reflectance measurement, the signal has to travel to and from between the DUT, thus the maximum measurement distance is:

$$\text{Distance} = 0.5 \times \frac{\text{Sweep point -1}}{\text{Sweep width}} \times \frac{\text{Velocity}}{\text{of light}} \times \textit{Velocity factor} \qquad (2)$$

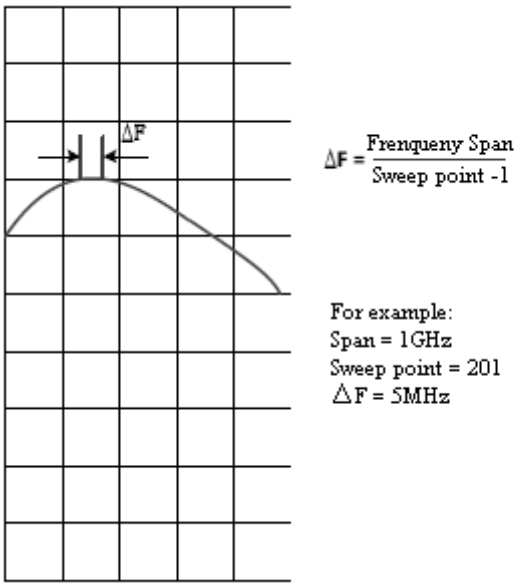


Figure 3-6 Definition of Frequency Interval of Sweep Point

From the above equation, the measurement range is proportional to the sweep points, and inversely proportional to the sweep width. For the purpose of increasing the measurement range, it may modify the following two settings:

- Increase sweep points;
- Decrease frequency span.

NOTES:	3680A/B will automatically calculate the maximum measurement range based on the frequency span, sweep points and velocity factors, and will not limit the user to input the value greater than the maximum range.

3.2 Calibration

Measurement calibration is to determine the systematic error based on the measurement of already-known standard of characteristics, and then use the software computation to eliminate the impact of these errors during DUT measurement. Calibration can reduce the measurement error and improve the measurement accuracy of the Tester.

3.2.1 What is calibration?

Calibration utilizes error models to eliminate one or more systematic errors, the Tester solves the error term in the error model through the measurement on the high quality of calibration standard (such as open circuit, short circuit and load).

Accuracy after calibration depends on the quality of calibration standard and definition precision of calibration standard model in calibration kit definition file. The file is stored in the Tester, and for the purpose of ensuring the accuracy of measurement, the calibration kit actually used must match the definition in the calibration kit definition file.

3.2.2 Why should we perform calibration?

It is impossible to manufacture an ideal Tester hardware circuit without any error correction; even if the hardware circuits can be good enough to ignore the need for error correction, the costs would be extremely expensive. In addition, the measurement accuracy of the Tester is largely influenced by the external accessories of the Tester, for example an integral part of the Tester, such as the amplitude and phase changes in connecting cables and adapters, will mask real response of the DUT, and such influences needs to be calibrated for eliminating. Therefore, the best way is to weigh the hardware performance and cost to manufacture the hardware as good as possible, and to improve the measurement accuracy through calibration.

In addition, no matter how careful the measurement process is, there is still a degree of uncertainty. Users can improve the measurement accuracy through understanding the source of measurement errors and methods to error correction. Here are three major errors existed in the measurement by network analyzer:

1. Drift error: drift error is produced due to performance changes in the instrument or test system after calibration. The thermal expansion and contraction of interconnect cables inside the Tester and changes in characteristics the receiver are the main cause of the drift error, which can be eliminated by recalibration. Test environment determines the precise calibration time, and stable environment temperature can minimize the drift errors.

2. Random error: random error is unpredictable and unlikely to be eliminated through calibration, but the impact of which on the measurement results can be reduced by some methods. The random error mainly includes the following three types:

1) Random noise error of Tester is the random noise generated through electric disturbance by the internal components of the Tester. The error can be reduced by increasing the input power source to the DUT, reducing the IF bandwidth and using sweep average.

2) Switch repeatability error is the setting to switch the source attenuator via RF switch, and can affect the measurement accuracy if the contact closure is different from the last closed state when the switch operates. Therefore, in high-precision measurement, it should avoid changing the attenuator setting to reduce switch repeatability error.

3) Connector repeatability error is produced due to different connection status of the connector each time. Connector wear can lead to changes in electrical properties, and can be reduced by connecting the corrector correctly and applying the appropriate maintenance methods.

3. Systematic error: systematic error is produced due to the undesirable hardware characteristics of the Tester, which is repeatable (thus predictable) and assumed to be unchanged over time. Systematic error can be determined by calibration and eliminated by mathematical calculation during measurement. Owing to the limitations of the calibration process, the systematic error cannot be completely eliminated, always having some residual errors. For reflectance measurement, the relative residual errors have the following three types:

1) Effective directivity: the Tester separates the positive-going incident signal and the reverse reflected signal via a directional coupler or a bridge. The coupling end of an ideal coupler only have reflected signal transferred to the receiver for measurement, and in fact, a small amount of the incident signal leak through the main load of coupler to the coupling port, which can cause directivity errors in the measurement.

2) Effective source matching: in a reflectance measurement, the receiver receives all signals reflected back from the DUT ideally. In fact, the errors generated through multiple reflections of a portion of signals between the measurement port and the DUT reflected back from the DUT owing to the imperfection of source matching. Source matching errors have a greater impact on the DUT with a large reflection coefficient.

3) Effective reflection tracking: reflectance measurement, also known as ratio measurement, is performed by comparing the signals in Receiver A and Receiver R. For an ideal reflectance measurement, frequency response in Receiver A and Receiver R should be exactly the same but impossible actually, which will cause the reflection tracking error. Reflection tracking error is the vector error caused by a variety of test errors, the amplitude and phase of which will vary with frequency.

3.2.3 Calibration

3680A/B Cable & Antenna Analyzer can measure the DUT reflectance parameters, and shall be calibrated before measurement.

1. Mechanical calibration

1) Press 【Cal】 key, click [Cal Kit] menu to select the calibration kit model and then click Enter;

2) Click [M Cal], and the prompt massage saying “Pease connect [OPEN],and start calibrating by pressing corresponding soft key.” will be popped up on the display screen;

3) Connect the open circuit to the calibration port, press [OPEN] key and then the prompt massage saying “[OPEN] Measuring...” will be popped up on the display screen as shown in Figure 3-7:

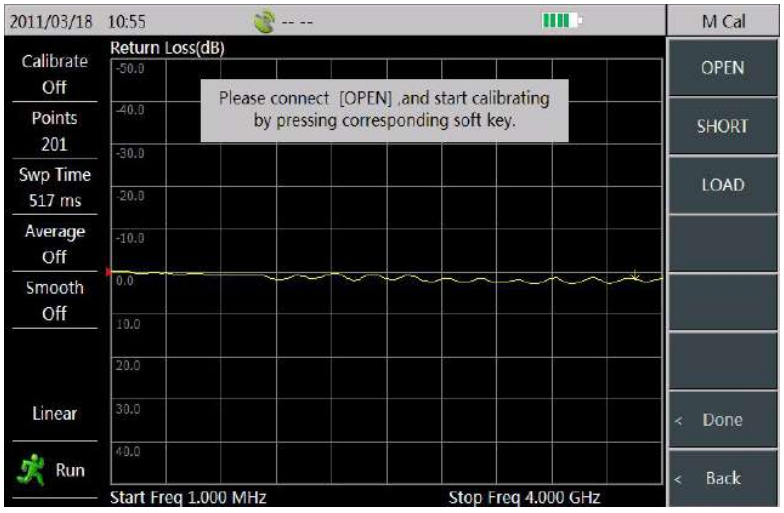


Figure 3-7 Measure Open Circuit/OPEN

After completing open circuit measurement, the [OPENitem on the right side of the menu bar changes into [OPEN], and the prompt massage saying “Pease connect [SHORT],and start calibrating by pressing corresponding soft key.” is popped up on the display screen, as shown in Figure 3-8:

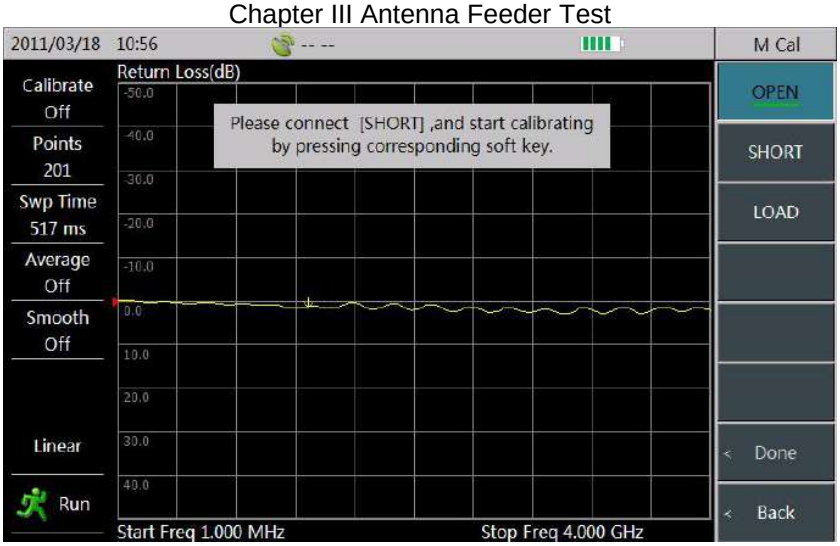


Figure 3-8 Complete Open Circuit/OPEN Measurement

4) Disconnect the open circuit with the calibration port, connect the short circuit, and press [Short] menu, then the screen will prompt “[SHORT] Measuring...”. After completing short circuit measurement, the [Short] item on the right side of the menu bar changes into [SHORT], and the prompt massage saying “Pease connect [LOAD],and start calibrating by pressing corresponding soft key.” is popped up on the display screen;

5) Disconnect the short circuit 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 changes into [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 3-9. Then press the [Done] key to complete the calibration.

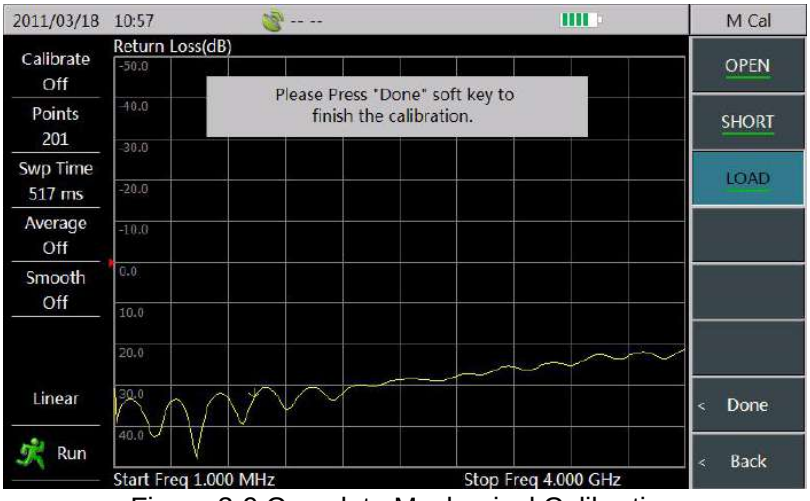


Figure 3-9 Complete Mechanical Calibration

6) After completing calibration, the top of information display area and the top of menu bar on the left side show “Calibrate On.” As shown in Figure 3-10. Connect the load with the port, observe the curve displayed in the screen, which indicates a proper calibration if the curve value is under 42dB (return loss measurement format) and instructions for proper calibration. After disconnecting the load with the port, connect DUT for measurement.

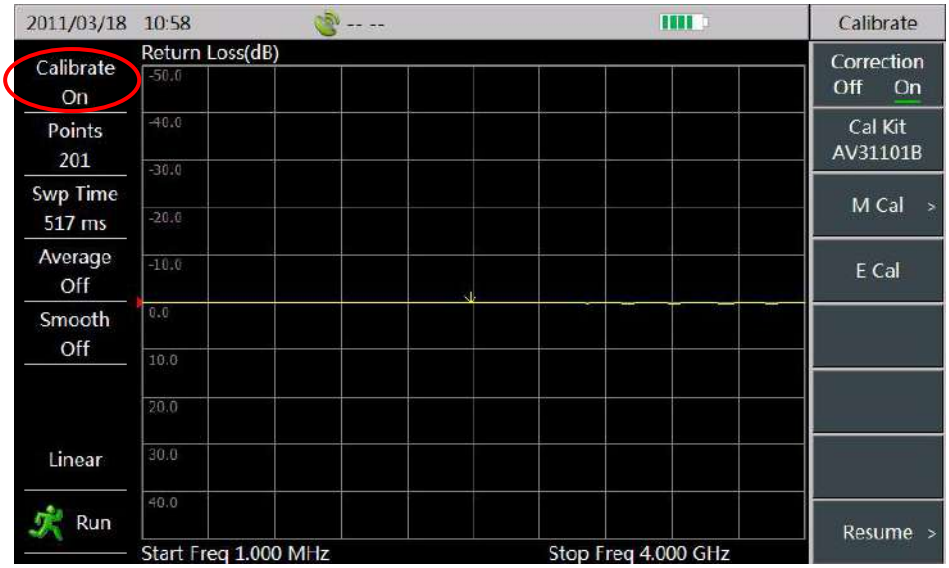


Figure 3-10 Calibration Switch is on

NOTES:	1. During calibration, the sequence of calibration standards which are connected to the port can be arbitrary, not necessarily in the sequence of open circuit → short circuit → broadband load. During calibration process, the calibration standard can be measured repeatedly, and the Tester calculates the error coefficients based on the last measurement data. 2. Calibration will be affected by temperature changes, so it shall recalibrate the 3680A/B Cable & Antenna Analyzer when the test temperature ranges about ±10℃.

2. Embedded calibration kit(Option, Only for 3680A)

Users can quickly perform “one-click” single-port calibration by embedded electronic calibration options, which is not only of simple operation and high precision calibration, but also able to adapt to the environment temperature of 0℃ ~ +50℃, significantly improving the test efficiency. Meanwhile, the configuration of embedded electronic calibration options of the Tester does not affect the use and performance of mechanical calibration kits, but better meets the testing requirements of a variety of occasions.

The embedded calibration process is as follows:

1) Before performing embedded calibration, please keep the measurement port suspending in midair;

2) After setting the frequency and sweep points, etc. other parameters, press 【Cal】 key, click [Embedded Calibration] menu item as shown in Figure 3-11, then the instrument will automatically perform a calibration procedure with a prompt saying “Doning E Cal…” displayed in the interface.

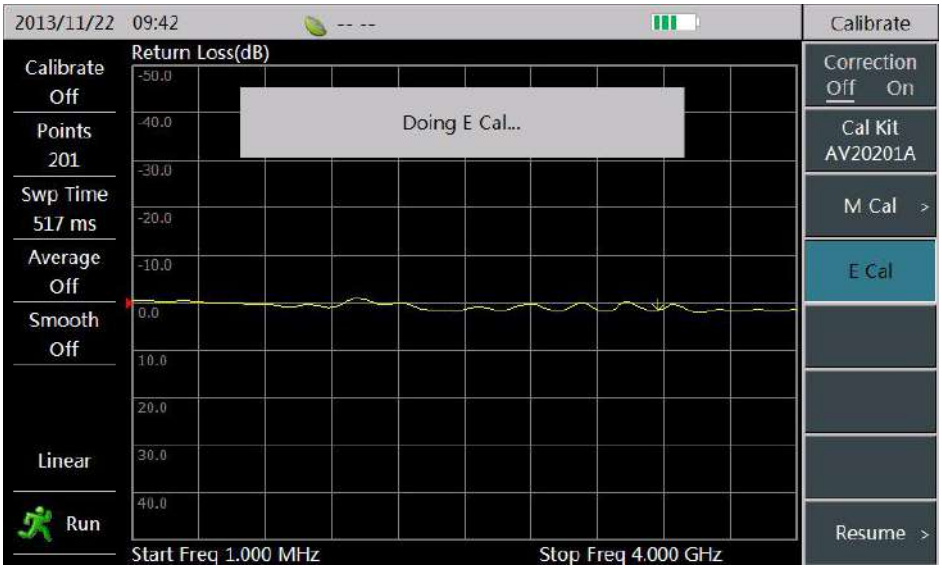


Figure 3-11 Start to Perform Embedded Calibration

3) After completing calibration, the display interface shows the prompt saying “E Cal Finish!” and the calibration status automatically displays from “Off” to “On” as shown in Figure 3-12.

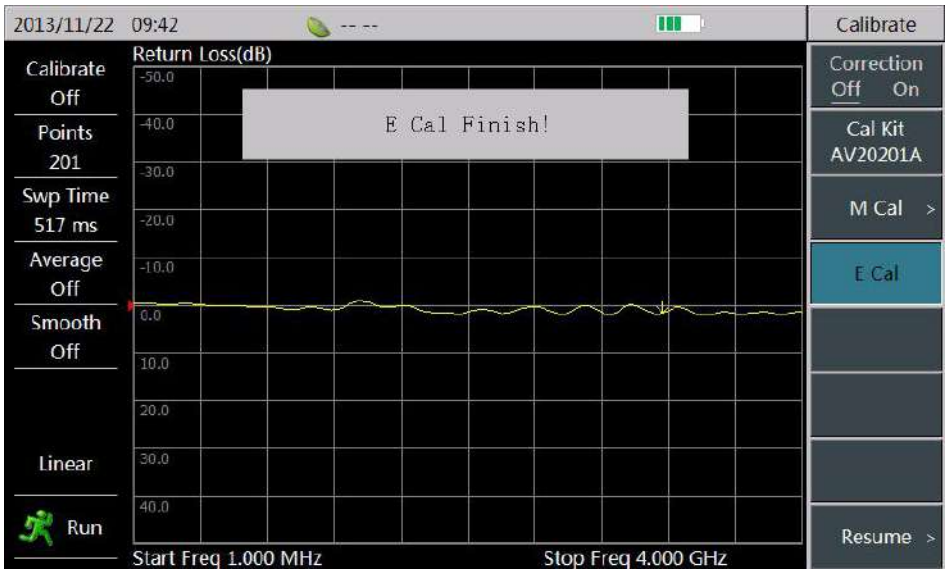


Figure 3-12 Complete Embedded Calibration

3. Increase calibration accuracy

1) Measurement reference surface

The vast majority of measurement is connected through test fixture or cables other than directly connected the DUT to the Tester's port. For the purpose of getting the highest measurement accuracy, the calibration must be performed at the DUT connection point, which is called the measurement reference surface. The errors related to the test system (such as cable, test fixture, and adapter between the Tester port and the reference surface) can be eliminated through calibration in the measurement reference surface.

2) Impact of incorrect calibration kits

Under normal circumstances, the calibration standards of calibration kit and the DUT connector type shall be the same. However, in some cases, it may not have the same calibration kit. If the DUT port is 3.5mm, then the tester and calibration kit connector type should be N. If N-type calibration kit is used for calibration, and then connect N/3.5mm adapter for measurement, it will introduce significant measurement errors because the adapter is not included in the calibration, the impact of which depends on the performance of the adapter.

If the calibration kit used is different from the one specified in the calibration process, it will also reduce the calibration accuracy, the reduce degree of which depends on the difference between the designated kit and actually used one.

NOTES: In the single-port calibration, in order to improve the reflectance measurement accuracy of two-port devices, especially low-loss bidirectional devices such as filter transmission and cable, it should connect high-quality load to the DUT non-measurement port to reduce the load matching error.

3.3 Typical Measurement Setting

This Section describes the setup process for a few basic parameters of different measurement formats. Users can read this Section to understand the basic settings of the instrument measurement parameters under different measurement formats.

3.3.1 Return Loss Measurement Setting

1. Press 【Meas】 key, click [Return Loss] menu to set the instrument measurement format as return loss.

2. Press 【Freq】 key and input the frequency range to be measured, that is start frequency and stop frequency.

3. Press 【Cal】 key to select the appropriate calibration kit to complete the calibration in accordance with the calibration process described in 3.2.3.

4. Connect the Tester to the DUT of which the terminal is antenna (in return loss measurement, DUT shall connect the load).

5. Press 【Ampt】 key and input the top-bottom coordinate figure or directly select the auto scale, to facilitate a better observation of measurement curve.

6. Press 【Marker】 key to set the appropriate marker in accordance with the “Marker” paragraph in Section 3.4.6.

7. Press 【Limit】 key to set a appropriate limit line in accordance with the “Trace” paragraph in Section 3.4.5.

8. Press 【Save/Recall】 key to store the current measurement results to the memory to facilitate later recall. Please refer to “Document Management” in Chapter V for detailed storage process.

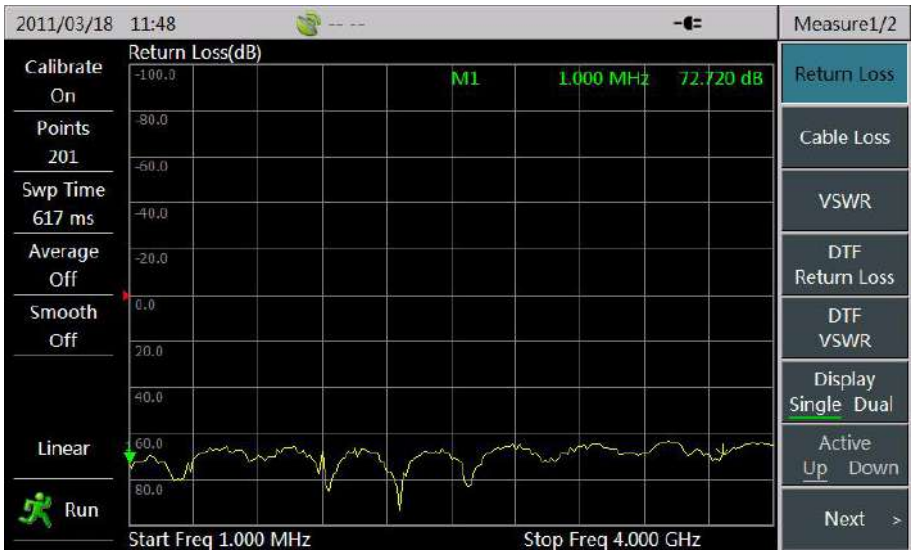


Figure 3-13 Return Loss Measurement

3.3.2 Cable Loss Measurement Setting

1. Press 【Meas】 key, click [Cable Loss] menu to set the instrument measurement format as cable loss.

2. Press 【Freq】 key and input the frequency range to be measured, that is start frequency and stop frequency.

3. Press 【Cal】 key to select the appropriate calibration kit to complete the calibration in accordance with the calibration process described in 3.2.3.

4. Connect the Tester to the DUT of which the terminal is antenna (in cable loss measurement, DUT shall connect the short circuit).

5. Press 【Ampt】 key and input the top-bottom coordinate figure or directly select the auto scale, to facilitate a better observation of measurement curve.

6. Press 【Marker】 key to set the appropriate marker in accordance with the “Marker” paragraph in Section 3.4.6.

7. Press 【Limit】 key to set a appropriate limit line in accordance with the “Trace” paragraph in Section 3.4.5.

8. Press 【Save/Recall】 key to store the current measurement results to the memory to facilitate later recall. Please refer to “Document Management” in Chapter V for detailed storage process.

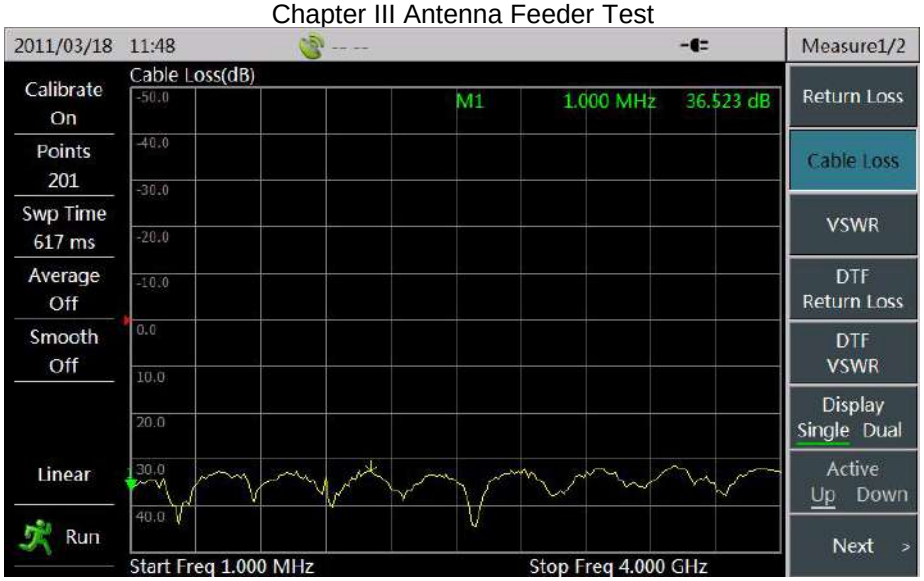


Figure 3-14 Cable Loss Measurement

3.3.3 Distance-To-Fault (DTF) Measurement

In 3680A/B Cable & Antenna Analyzer, DTF measurement has two different display formats: DTF Return Loss and DTF VSWR. For the two same measurement processes, follow these steps to set.

1. Press 【Meas】 key to set the instrument measurement format as DTF Return Loss or DTF VSWR.

2. Press 【Freq】 key to first input the frequency range to be measured, that is start frequency and stop frequency; and then the distance range to be measured, that is start distance and stop distance; and also select the model of cable measured or input the cable velocity factor and cable loss.

STATEMENT:	When using DTF measurement, the users are suggested to first set frequency range, and then the distance. The maximum measurement distance of the instrument varies with the frequency. The lower left corner of the instrument shows the maximum distance, and users can make setting based on the prompts and estimated distance.

3. Press 【Cal】 key to select the appropriate calibration kit to complete the calibration in accordance with the calibration process described in 3.2.3.

4. Connect the Tester to the DUT of which the terminal is antenna.

5. Press【Ampt】 key and input the top-bottom coordinate figure or directly select the auto scale, to facilitate a better observation of measurement curve.

6. Press 【Marker】 key to set the appropriate marker in accordance with the “Marker” paragraph in Section 3.4.6.

7. Press 【Save/Recall】 key to store the current measurement results to the memory to facilitate later recall. Please refer to “Document Management” in Chapter V for detailed storage process.

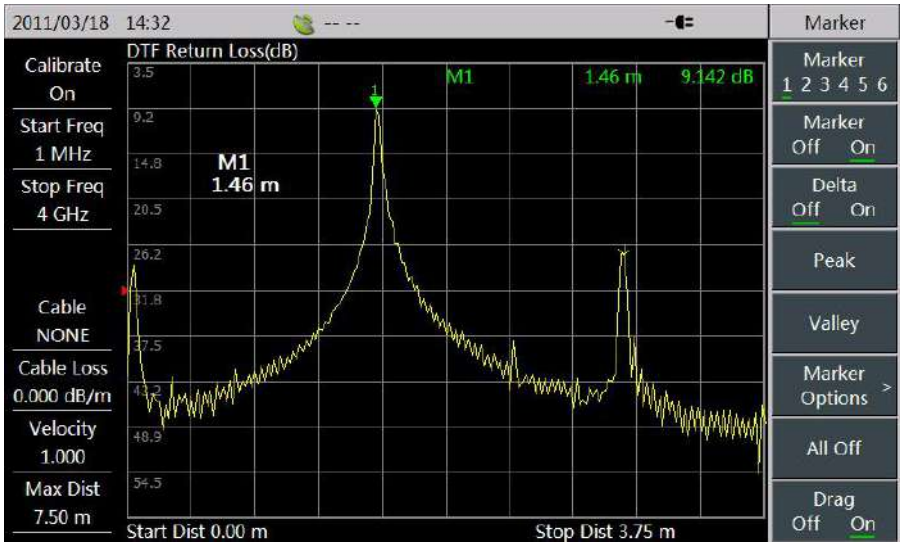


Figure 3-15 DTF Return Loss Measurement

3.4 Measurement Parameter Setting

This Section gives a simple description of how to set the frequency, marker and limit, etc. parameters of 3680A/B Cable & Antenna Analyzer, to facilitate users to understand the basic operation of the Tester.

3.4.1 Frequency

When the measurement format of the Tester is return loss, cable loss and phase, during Smith chart, press 【Freq】 key and the right side of the screen will display the frequency menu bar.

1. Set the measurement frequency range by start and stop frequencies:

- Press 【Freq】 key to enter frequency menu bar;
- Click the touch screen [Start Freq] menu to input start frequency by turning the knob, 【↑】 or 【↓】 or numeric keys. When numeric keys are used to input the frequency value, the menu area changes to [GHz], [MHz], [kHz] and [Hz] four units menu, and then select the appropriate frequency unit to complete the start frequency setting;

Figure 3-16 Input Start Frequency

- Click the touch screen [Stop Freq] menu to input the appropriate stop frequency.

2. Set the measurement frequency range by center frequency and sweep width.

- Press 【Freq】 key to enter the frequency menu bar;
- Click the touch screen [Center Frequency] menu to input center frequency by turning the knob, 【↑】 or 【↓】 or numeric keys. When numeric keys are used to input the frequency value, the menu area changes to [GHz], [MHz], [kHz] and [Hz] four units menu, and then select the appropriate frequency unit to complete the center frequency setting;
- Click the touch screen [Span] menu to input the appropriate sweep width frequency.

3.4.2 Distance

When the measurement format of the Tester is DTF Return Loss and DTF VSWR, press 【Freq】 key to display the Freq menu bar. Wherein the frequency setting is consistent with the instruction in Part 1 of Section 3.4.1, and the distance setting steps are as follows:

- Press 【Freq】 key to enter Freq menu bar;
- Click the touch screen [Start Dist] menu to input start distance by turning the knob, 【↑】 or 【↓】 or numeric keys. When numeric keys are used to input the frequency value, the menu area displays the unit menu [M], and then click menu [M] or press 【Enter】 key to complete inputting the start distance;

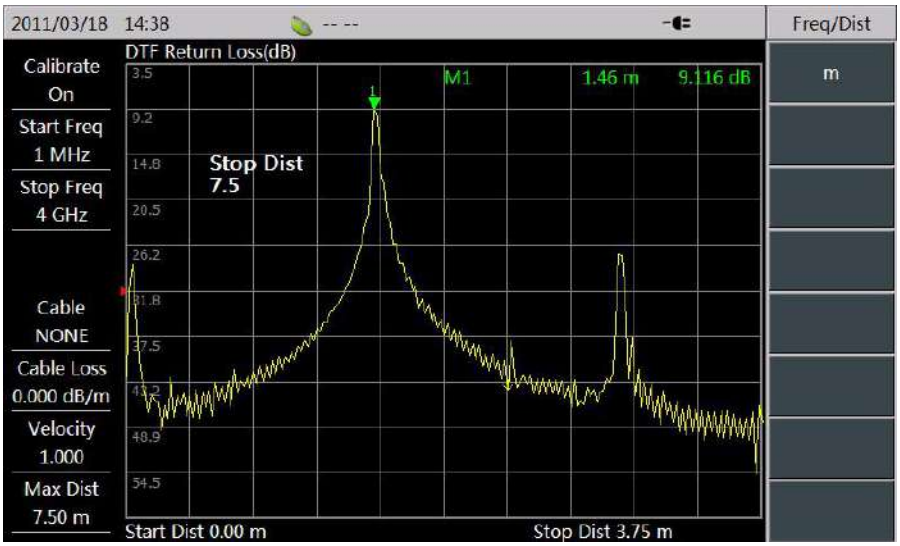


Figure 3-17 Input Stop Distance

- Click the touch screen [Stop Dist] menu to input the appropriate stop distance.

3.4.3 Amplitude

1. Manually set the displayed frequency range by the top, middle and bottom values of the Amplitude menu:

- Press 【Ampt】 key to enter amplitude menu;
- Click the touch screen [Top] menu to input the appropriate top amplitude value by turning the knob, 【↑】 or 【↓】 or numeric keys, and then press 【Enter】 key to complete inputting the value;

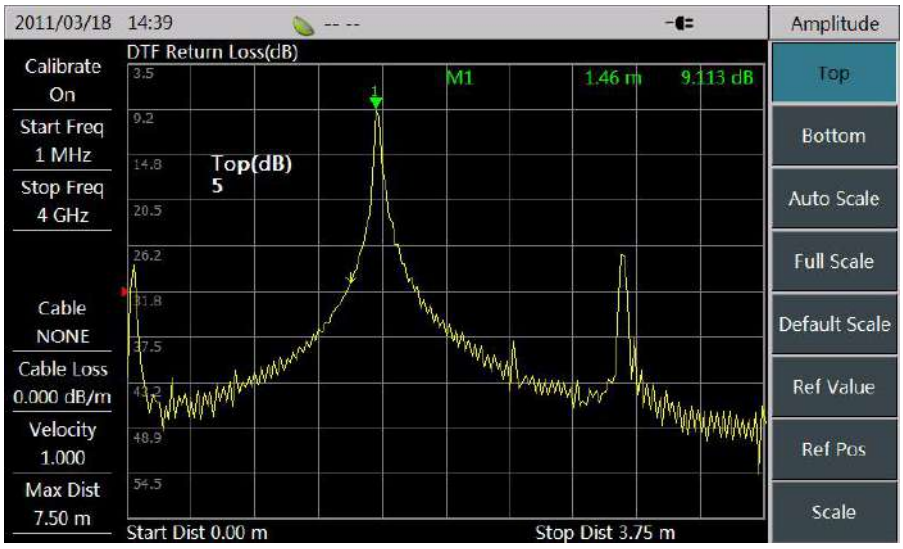


Figure 3-18 Input Top Amplitude Value

- Click the touch screen [Bottom] menu to input the appropriate bottom amplitude value.

2. Set the amplitude via auto mode:

For ease of operation, the Tester offers three automatic amplitude setting modes for the current measurement data, including auto scale, full scale, and default scale. At the auto scale mode, the Tester will automatically adjust the top and bottom amplitude values based on the maximum and minimum values of the current measurement data; at the full scale mode, the Tester will automatically set the top and bottom amplitude values as 100dB and -100dB or 450º and -450º; at the default scale mode, the Test will automatically set the top and bottom amplitude values as 50dB and -50dB or 450º and -450º. The specific steps for amplitude settings via these three automatic modes are as follows:

- Press 【Ampt】 key to enter amplitude menu;
- Click the touch screen [Auto Scale], [Full Scale] or [Default Scale] menu, and then the application software will automatically set to the corresponding amplitude value.

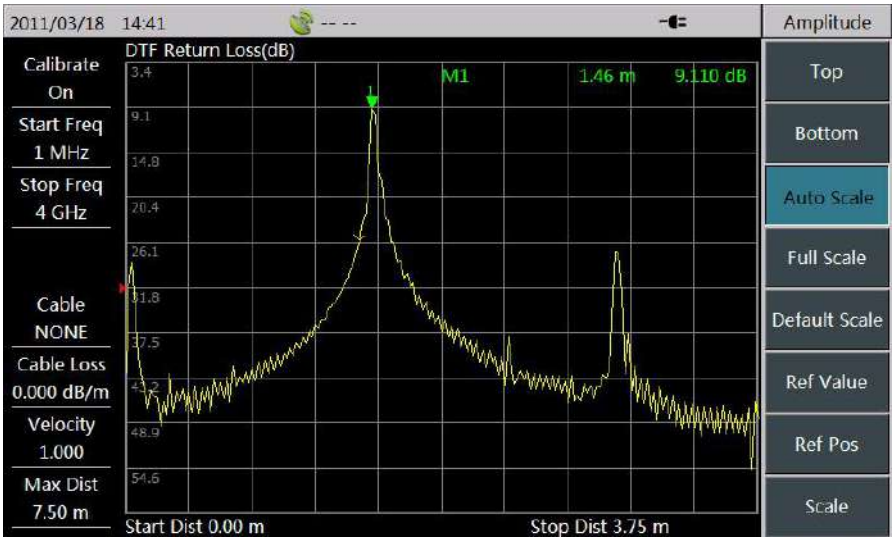


Figure 3-19 Auto Scale of Amplitude

3. Use the amplitude reference value, reference position and scale setting: In order to better observe the measurement curve, the Tester supplies users with reference value, reference position or scale settings. The specific settings are as follows:

- Press 【Ampt】 key to enter amplitude menu;
- Click the touch screen [Ref Value], [Ref Position] or [Scale] menu to input the appropriate amplitude reference value, reference position or scale by turning the knob, 【↑】 or 【↓】 or numeric keys, and then press 【Enter】 key to complete inputting such items.

3.4.4 Sweep

Sweep mainly focuses on the settings of auxiliary parameters of the current test, including sweep time, sweep points, average smooth and IF bandwidth.

1. Set trigger mode:

- Press 【Sweep】 key to enter Sweep menu bar;
- Press the touch screen [Trigger Cont Single] menu to complete the switching of the current trigger mode. When switched to “Single”, the Tester will finish the sweep after completing primary sweep at the set frequency range.

2. Set sweep mode:

3680A/B Cable & Antenna Analyzer provides two sweeping modes including linear sweep and list sweep, and users can realize the switching of sweep modes by [Swp Mode Lin List] menu. Before realizing the list sweep, first edit the list to build a list of information to be swept, and then use [Swp Mode Lin List] to do switching. The list sweep steps are as follows:

- Press 【Sweep】 key to enter Sweep menu bar;
- Click the touch screen [Edit List] menu, and the menu bar will switch to the Edit List menu bar, as shown in Figure 3-18. Click the [Add Seg] to add a waveband to be swept in the list box; in this case, users can set this segment of list by [Start Freq], [Stop Freq] and [Points]. If the list is already exited, users can set the parameters with correspondence to the segments by [Seg ID] or click the relevant segment number on the touch screen;

Figure 3-20 Edit Sweep List

- After completing editing, click [Back] menu to return to the Sweep menu bar; in this case, it can use [Sweep Mode Lin List] menu to switch to the list sweep mode, as shown in Figure 3-21:

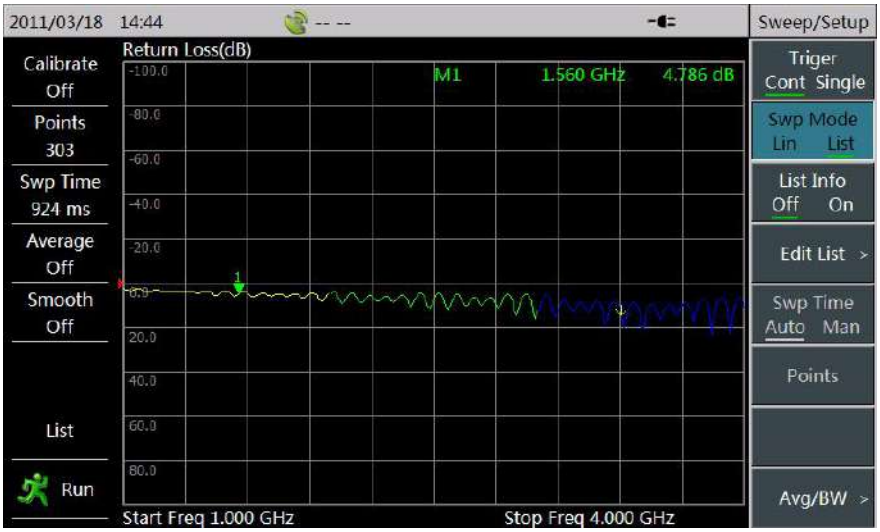


Figure 3-21 Sweep List

- Click [List Info Off On] menu, users can observe the list information edited.

3. Set sweep time:

The sweep time of 3680A/B Cable & Antenna Analyzer provides two modes, automatic and manual modes. In automatic mode, the Tester calculates the minimum time required for sweeping one screen based on the current state of the instrument. Users can click [Swp Time Auto Man] menu to switch to manual mode, and in this case complete sweep settings as needed. The specific setting process is as follows:

- Press 【Sweep】 key to enter Sweep menu bar;
- Click [Swp Time Auto Man] menu to switch the sweep time to manual mode, and the menu will display [Sweep Time Auto Man]. Input the appropriate sweep time by turning the knob, 【↑】 or 【↓】 or numeric keys, and then press 【Enter】 key to complete inputting such items.

4. Set sweep points:

The default sweep point of 3680A/B Cable & Antenna Analyzer is 201, and users can set the desired sweep points arbitrarily within 2 to 4001 according to the testing requirements. The specific sweep steps are as follows:

- Press 【Sweep】 key to enter Sweep menu bar;
- Click the touch screen [Sweep Point] menu, to input the appropriate sweep points by turning the knob, 【↑】 or 【↓】 or numeric keys, and then press 【Enter】 key to complete setting such items.

5. Set Avg/BW: The random noise in Tester receiving path degrade the measurement accuracy. To reduce the trace noise and lower noise floor, 3680A/B Cable & Antenna Analyzer provides three functions including average, smooth and adjust IF bandwidth in order to obtain more accurate results and greater dynamic range.

1) Reduce IF bandwidth

IF bandwidth can be reduced to reduce the noise of the Tester, thereby reducing the impact of noise on the measurement results and reducing trace noise. The noise floor can reduce by 10dB with each reduce of 10 times of IF bandwidth. 3680A/B Cable & Antenna Analyzer supports variable bandwidth IF filter, wherein the frequency bandwidth can be set from 10 KHz down to 1Hz at minimum, with step changes in 1, 2, 5 and 10. But note that the IF bandwidth reduce will elongate the sweep time. IF bandwidth setting steps are as follows:

- Press 【Sweep】 key to enter Sweep menu bar;
- Click [Avg/BW] menu to enter Avg/BW menu bar;
- Click [IF BW] to pop up the “Set IF BW” list. Select the desired IF bandwidth by turning the knob, 【↑】 or 【↓】 or touching the selected items, and then click [OK] key on the IF bandwidth dialogue box or 【Enter】 key to complete setting, as shown in Figure 3-22:

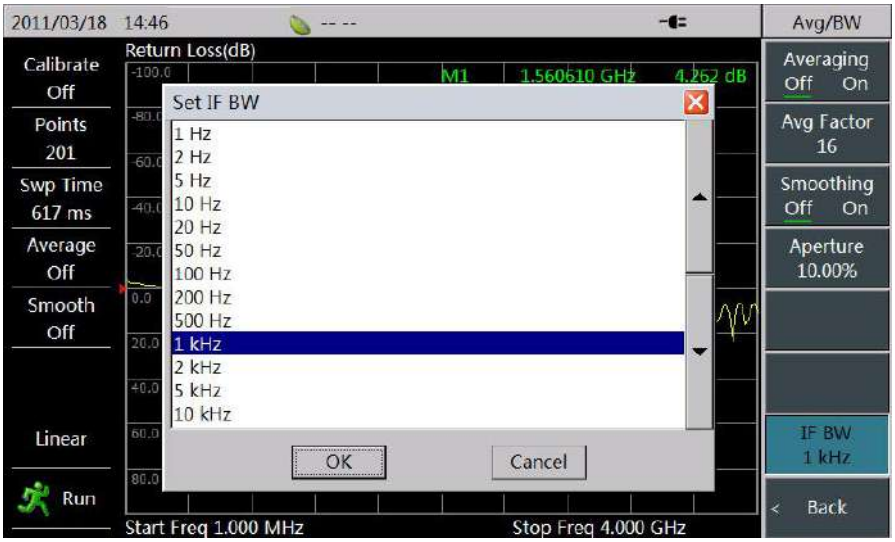


Figure 3-22 Set IF BW

2) Sweep average

Through several successive sweeps, the Tester takes the average value on the same measurement point for each measurement to calculate each measurement value. The setting of average factors determines the times of constant sweeps. The larger the average factor is, the more effective the decrease of impact of noise on the measurement will be.

- When activate the sweep average, the average counter shows the average times of sweeps carried out, and the observance of trace changes and average times carried out help to select the best average factor.
- While sweep average can be used in non-scale measurement, it will get the desired results.
- Sweep average and IF bandwidth reduce can reduce the noise, but if a very low noise is needed, sweep average is the better choice. Typically, the time required by sweep average for noises reduce is longer than IF bandwidth, especially when having more average times needed. Sweep average settings are as follows:

➢ Press 【Sweep】 key to enter Sweep menu bar;
➢ Click the touch screen [Avg/BW] menu to enter Avg/BW menu bar;
➢ Click the touch screen [Avg Factor] menu to input the appropriate average factor (1000 at a maximum) by turning the knob, 【↑】or【↓】or numeric keys, and then press【Enter】key to complete setting;
➢ Click the touch screen [Averaging Off On] menu, the Tester will average the average factors set by users and display the averaged trace on the screen, as shown in the below figure:

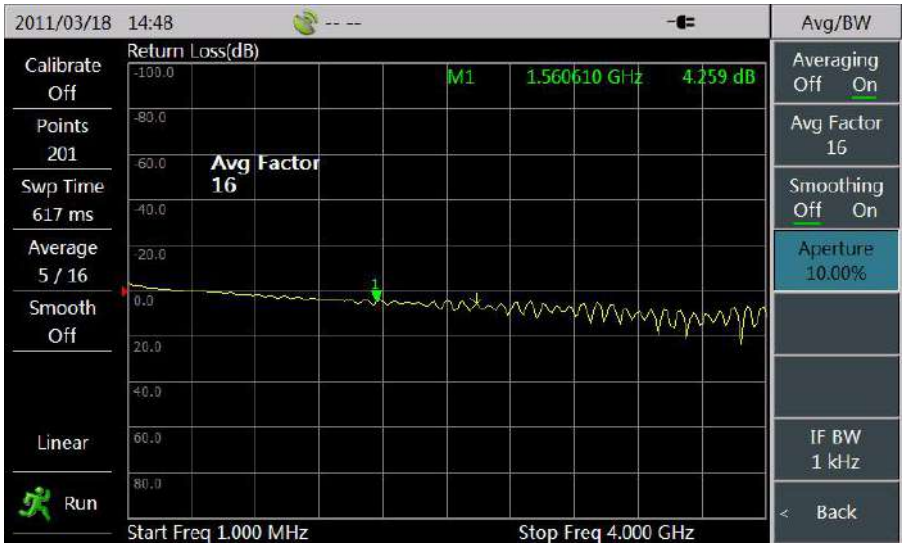
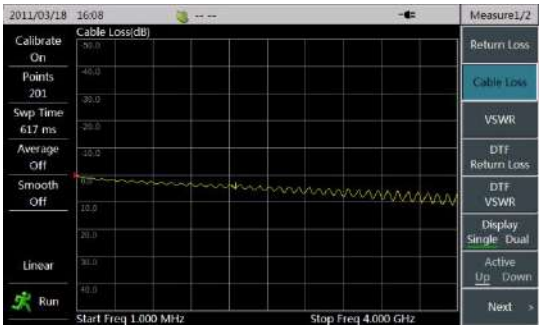


Figure 3-23 Set Average Factors

3) Trace Smoothing

Trace smoothing is displayed through the average of adjacent data points, and the ratio of adjacent data points to be averaged and total points is called smooth aperture. 3680 Serials Cable & Antenna Analyzer sets the smooth aperture in a manner of percentage. Smoothing function can reduce the noise peak-peak value on the measurement data track without significantly increasing the sweep time. The effect of taking smoothing on the trace is as shown in the following figure:

Before smoothing



After smoothing

Figure 3-24 Effect of Smoothing on Measurement Results

The smoothing setting steps are as follows:

- Press 【Sweep】 key to enter Sweep menu bar;
- Click the touch screen [Avg/BW] menu to enter Avg/BW menu bar;
- Click the touch screen [Aperture] menu to input the smooth aperture (20% at a maximum) by numeric keys, and then press 【Enter】 key to complete setting;
- Click the touch screen [Smoothing Off On] menu to turn on or off the smoothing function, as shown in Figure 3-25:

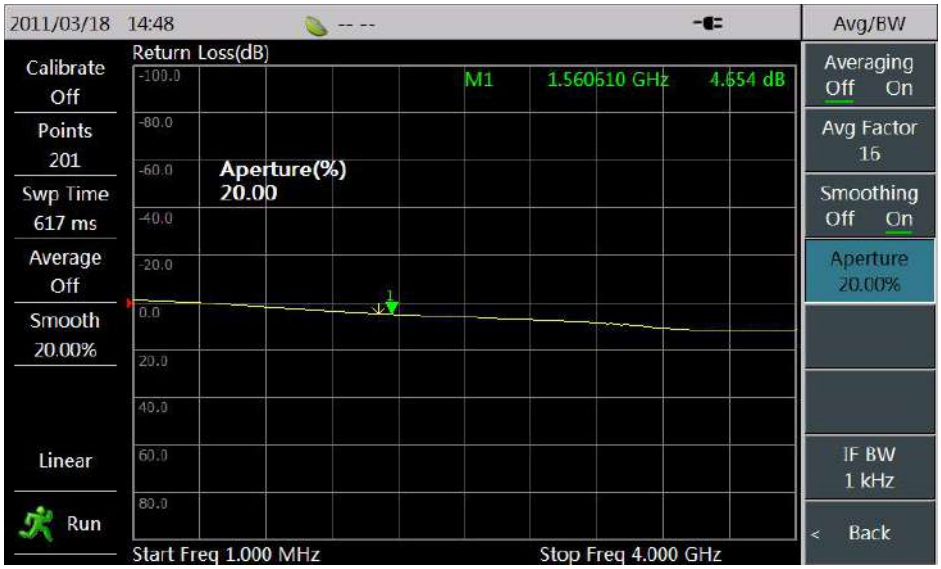


Figure 3-25 Set Smooth Apertures

3.4.5 Limit

Limit function is available only for the measurement formats of return loss, DTF, cable loss and phase, and the sweep mode of linear sweep.

Limit test function can visually show whether the measured data exceeds the amplitude range represented by limit lines. Joined by multi-segments, limit line is edited via editing the limit value. If there is no data point exceeding the position limit value, then the limit test passes and the limit line is in green; as long as there is a data point exceeding the value, then the test fails and the limit line is in red. Turn the alarm function on to make beeps to warn the users when the limit test fails.

1. Limit line: Editing of limit line is achieved by increasing the limit point, and adjusting the frequency and amplitude of limit point. The limit point can only be edited under activated state, and the current activated limit points are shown as open circles in the limit line, while inactivated ones as solid circles. Specific editing may follow the steps as follows:

- Press 【Limt】 key to enter limit menu bar;
- Click the touch screen [Mode Up Low] menu to select the type of edited limit line——upper or lower limit line;
- Click the touch screen [Edit] menu to enter Limit Line Edit menu bar. If there is no limit point at the present, add a limit point with value of 0 respectively to the start and stop frequencies, and the limit switch is automatically open;
- Click the touch screen [Add Point] menu to add the limit point, which is the midpoint between the current activated point and adjacent limit point at right side;
- Click the touch screen [Freq] menu to adjust the frequency of the current activated point;
- Click the touch screen [Value] menu to adjust the amplitude of the current activated point;

- Click the touch screen [Sel Point] menu, the activated limit point is represented by a hollow circle; it may also input the serial number before press 【Enter】 to activate the corresponding limit point; and also click again on [Sel Point] to switch to the next limit point at the right side of the limit point;
- Repeat the above steps to edit and complete editing the limit line, as shown in the below figure:

Figure 3-26 Edit Limit Line

2. Open limit test

Press 【Limit】 key and click the touch screen [Alarm Off On] menu to open or close the alarm function.

Additionally, during editing process, the limit test function has opened automatically, a single or all limit point can be deleted by clicking on [Delete All] or [Del Point]; when there is no limit point, the limit test will automatically close. Figure 3-27 shows the limit line test fails.

Figure 3-27 Limit Test

3. Limit Line Save & Recall

The specific limit line store and recall steps are shown as follows:

- Press 【Limit】 key to enter the limit menu bar. Then click the touch screen [Save] menu to input the file name in the popped out box and then press 【Enter】 key to complete limit line store.

- Press 【Limit】 key to enter the limit menu bar. Then click the touch screen [Recall] menu to select the limit line in the popped out limit line file list and then press 【Enter】 key to complete limit line recall.

NOTES:

- If press [Limit Off On] to open the limit test under the condition of no limit point, then it will automatically add a limit point with amplitude value of zero to start and stop frequencies at each;
- If there is a limit point at present, regardless of whether the limit test is open, if the frequency sweep or distance range is changed in 【Freq】, then the limit line will be automatically deleted, not falling within the scope of X-axis.

3.4.6 Marker

In order to facilitate the measurement data reading, and search for specific measurement values, the Tester provides six separate markers for each window.

1. Open marker

- Press 【Marker】 key to enter marker menu bar;
- Click the touch screen [Marker 1 2 3 4 5 6] menu to select the corresponded markers, and then click [Marker Off On] menu to separately open the corresponded marker.

Figure 3-28 Marker Switch & Setting

2. Move marker

- Use the above “Open Marker” method to select the marker to be moved, making it the currently activated marker;
- Input the marker frequency value (or distance value) directly via numeric keys, press the appropriate units menu to complete marker movement; or to move the marker by turning the knob or press 【↑】 and 【↓】 keys; it can also press and hold the trace marker and then drag to move the marker after the marker turns red (only available when dragging mode is on).

3. Marker peak and valley

- After opening the marker, click [Peak] or [Valley] menu, it can search for a peak or valley on this measured trace.

- Click [Marker Options] to enter quick marker menu bar, and by clicking on the appropriate quick marker menu, it can search for a peak or valley between the two markers range, or quickly set M1 to peak and M2 to valley, as shown in below figure:

Figure 3-29 Peak & Valley Search

4. Marker mode

- The Tester provides two marker modes - Standard Mode and Differential Mode. Click [Delta Off On] menu to switch between them.
- Under standard mode, marker shows the frequency and amplitude value of data points, being the default mode of Tester marker; under differential mode, it displays the differential between the current marker and standard marker as well as frequency (or distance).

5. Marker operation

- Press 【Marker】 key to enter marker menu bar, and then it opens Marker 1 by default;
- Click [Marker 1 2 3 4 5 6] menu to select the marker number, it can activate the corresponding marker;
- Click [Peak] or [Valley] menu to execute marker peak or valley search function;
- Click [Delta Off On] menu to switch marker mode;
- Click [Marker Off On] menu to close the currently active marker;
- Click [All Off] menu to close all open markers in the current active window.

Marker function is as shown in Figure 3-30:

Figure 3-30 Marker Function Schematic Diagram

6. Quick marker operation

- Press 【Marker】 key to enter marker menu bar, it opens Marker 1 by default;
- Click [Marker 1 2 3 4 5 6] menu to select Marker 2, and then press [Marker Off On] to activate Marker M2;
- Click [Marker Options] menu to select [M5 Peak [M1, M2]], then M5 executes the peak search between M1 and M2; select [M5 Valley [M1, M2]], then M5 executes the valley search between M1 and M2;

Figure 3-31 Use of Quick Marker

- Click [M1 Peak M2 Valley] menu, then M1 executes peak search and M2 executes valley search;
- Click [M1 ToEdge] menu, then M1 executes search to the last sweep point of trace; and press [M1 ToEdge] again, then M1 executes search to the first sweep point; the setting of M2 To Edge is same as M1;

- Click [All Off] menu to close all the open markers in the currently active window.

7. Switch of marker position under list sweep

Under list sweep, for the standard marker, if more than one segment contains the marker frequency to be set, press 【Enter】 to switch between different segments. For differential marker, it should always be in the same segment with corresponding reference marker, and the maximum and minimum value search is also focusing on the sweep segment where the standard marker is located.

3.4.7 Display

3680A/B Cable & Antenna Analyzer enables simultaneous display of two data windows, and each window can display data in different formats.

1. Open dual window

- Press【Meas】to enter the measurement menu bar;
- Click [Display Single Dual] menu to switch window display mode, the switch of windows numbers can be seen on the screen correspondingly.

2. Activate window

- Press【Meas】to enter the measurement menu bar;
- Click [Current Window Up Down] menu click the corresponding window on the touch screen to activate the corresponded window; the activated window is surrounded by a red box on the screen information display area, and the inactive window is surrounded by a non-red box.

3. Change the data format of the active window

- Press【Meas】to enter the measurement menu bar;
- Click the appropriate menu in the menu bar to select the appropriate measurement data format to change the measurement format of the current display screen drawing area; or drag the screen drawing area left or right to switch the corresponding measurement data format. Data formats include:

- [Return Loss] is to select the return loss parameters and display them in the format of log;
- [Cable Loss] is to directly measure the insertion loss of the cable;
- [VSWR] is to select test parameters as VSWR;
- [DTF Return Loss] is to select the return loss parameters under DTF mode and display them in the format of log;
- [DTF VSWR] is to select the test parameters as VSWR under DTF mode;
- [Phase] is to select test parameters as the reflection phase;
- [Smith] is select test parameters as impedance, and the coordinate system serves as the Smith Chart.

In Figure 3-32, Window 1 is shown in the format of return loss; Window 2 is shown as Smith chart, and is active.

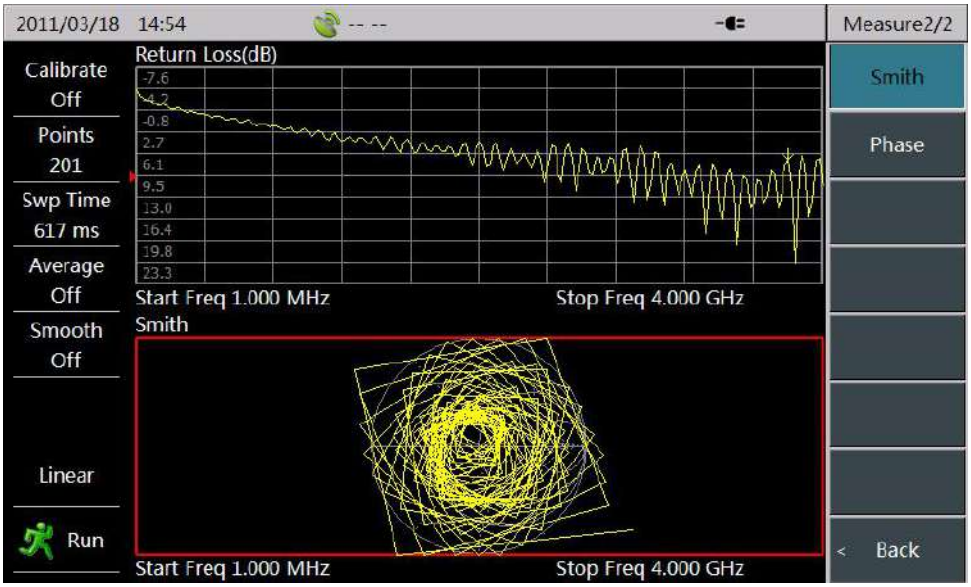


Figure 3-32 Simultaneous Display of Two Data Formats

NOTES:

- Each window can set separately the track marker.
- Frequency setting of the two windows is in synchronized association
- DTF parameters of the two windows are in synchronized association.

3.5 Trace

The Tester provides two types of mathematical operations for the currently active traces and reference traces; and provides three kinds of trace display methods.

3.5.1 Obtain a Reference Trace

Before performing any type of trace operation, it must store a reference trace in memory, which can be obtained through recall of trace file and as which the current trace is set.

1. Steps to set the current trace as reference trace:

- Press【Trace】 key to enter trace menu bar;
- Click the [Data → Mem] menu, to store the current measurement trace in memory as a reference trace.

2. Steps to recall a trace from a file:

- Press【Save/Recall】key to enter Store/Recall menu bar;
- Click [Recall Trace] menu to select the trace in the file list popped up, and then click [Call] or press【Enter】to recall the selected trace.

3.5.2 Trace Operation

The Tester provides two kinds of operation mode, which are the differential and ratio Steps to achieve trace operation are as follows:

- Press 【Save/Recall】 to enter Store/Recall menu bar;
- Obtain a reference trace with reference to 3.5.1;
- Click [Data/Mem] key, then the drawing area shows the corresponding traces by subtracting the stored data from the current measured data to realize the differential operation; or press [Data/Mem] key, then the drawing area displays the corresponding traces by divorcing store data from the measured data to achieve the ratio operation.

3.5.3 Trace Display

Each window can display up to two traces, and if a reference trace has been obtained, the traces can be displayed through the following steps:

- Press【Trace】to enter Trace menu bar;
- Click the [Data] menu, then the trace corresponded with the current measured data is displayed on the screen;
- Click [Memory] menu, then the trace corresponded with the current stored data is displayed on the screen;
- Press [Data & Mem] key, then two traces corresponded with the measured data and stored data are displayed on the screen. As shown in Figure 3-33, the stored trace is in green, and the current sweep trace is yellow:

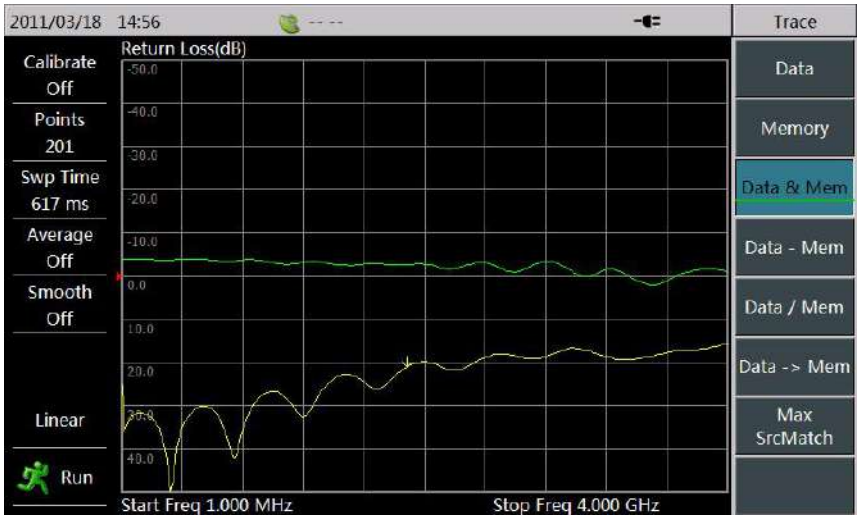


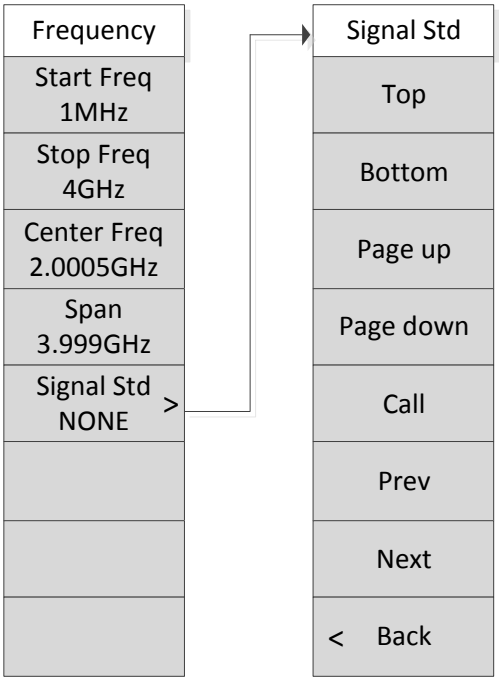
Figure 3-33 Trace Display

3.6 Menu Structure of Cable & Antenna Tester

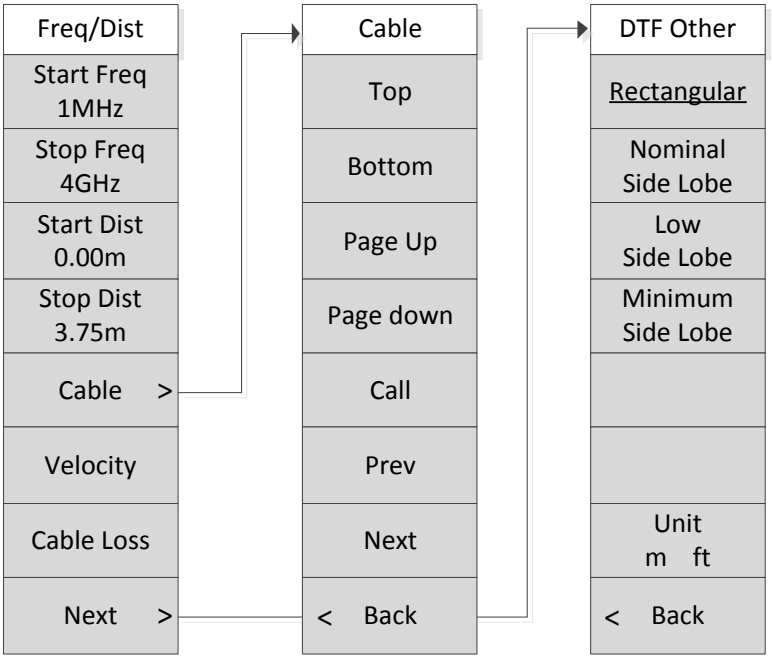
For the convenience of users to understand the function keys and the functions of their corresponding menus, this Section describes the tree structure of key menu in detail:

3.6.1 Freq

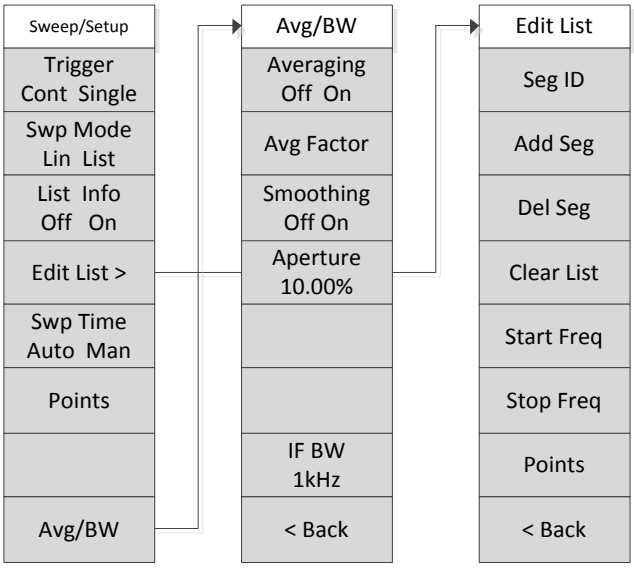
When in the measurement formats of return loss, VSWR, cable loss, phase and Smith Chart, the menu structure of 【Freq】is as follows:



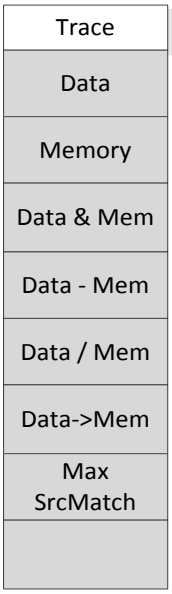
when in the measurement formats of DTF return loss and DTF VSWR, the menu structure of 【Freq】is as follows:



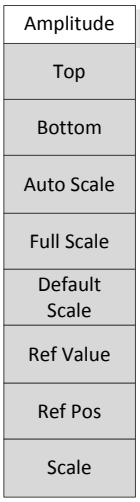
3.6.2 Sweep



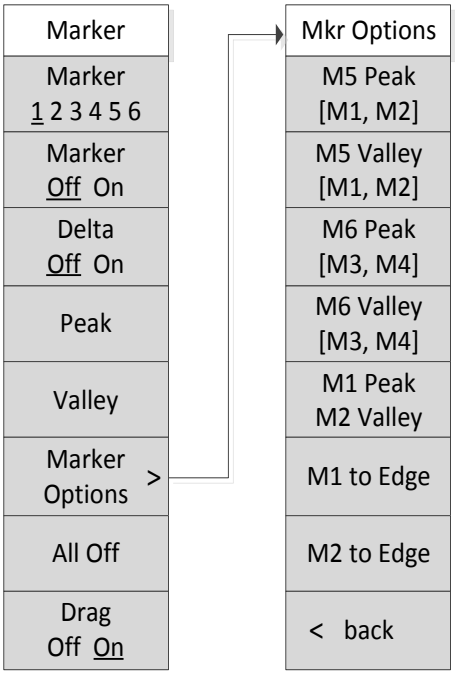
3.6.3 Trace



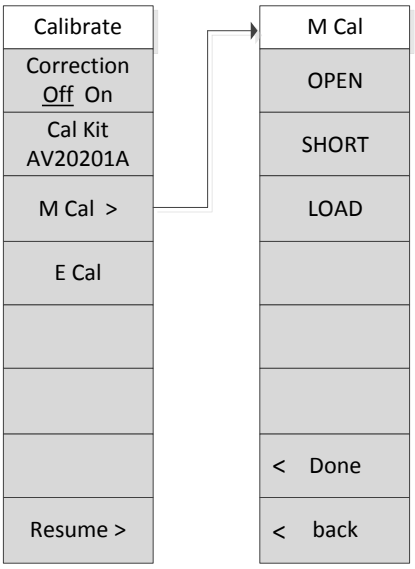
3.6.4 Amplitude



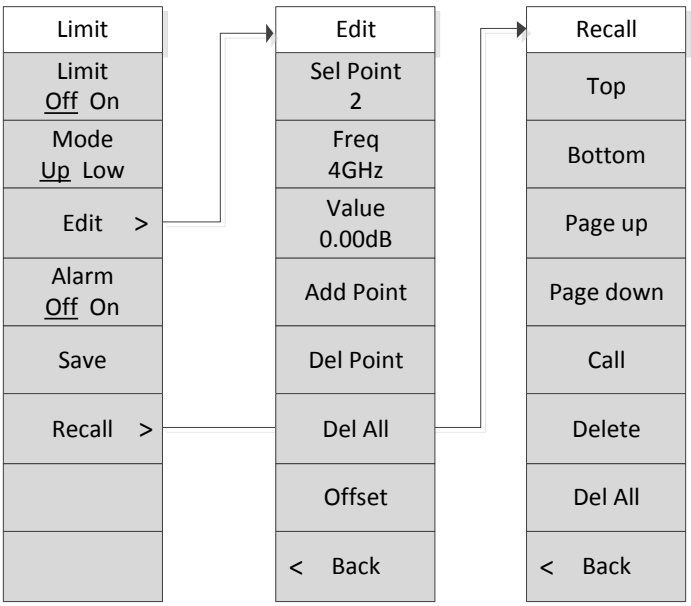
3.6.5 Marker



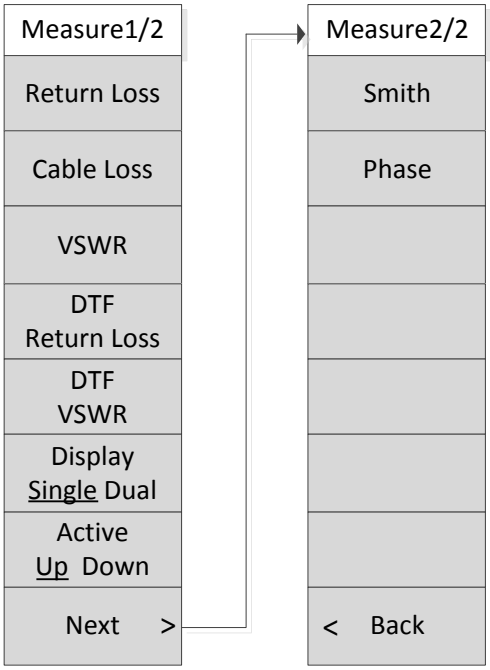
3.6.6 Calibration



3.6.7 Limit



3.6.8 Measurement



3.6.9 Save/Recall, Run/Hold and System/Local

The menu structures of【Save/Recall】and【System/Local】will be described in Section 5.8 and Section 6.15 respectively in detail, not explained here.

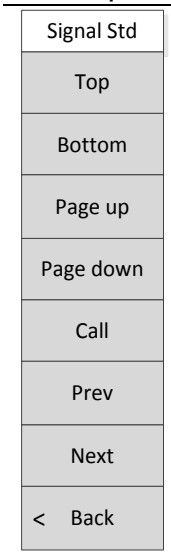
【Run/Hold】key is used to suspend the sweep and hold the current sweep trace, for the convenience of better viewing of the current sweep results, with no corresponding menus.

3.7 Freq Menu

Freq menu: in the measurement formats of return loss, cable loss, VSWR, Smith Chart and Phase, the menu of【Freq】is as follows:

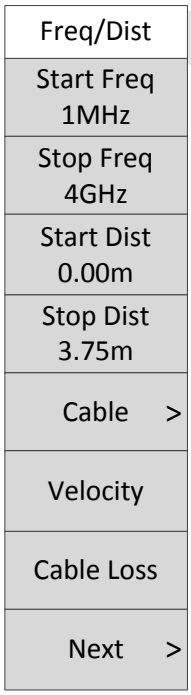
Frequency Start Freq 1MHz Stop Freq 4GHz Center Freq 2.0005GHz Span 3.999GHz Signal Std NONE >	● [Start Freq]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the start frequency. When using the numeric keys to enter the value, click the corresponding units on the menu bar. ● [Stop Freq]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the stop frequency. When using the numeric keys to enter the value, click the corresponding units on the menu bar. ● [Center Freq]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the center frequency. When using the numeric keys to enter the value, click the corresponding units on the menu bar. ● [Span]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the sweep width. When using the numeric keys to enter the value, click the corresponding units on the menu bar. ● [Signal Std]: Click the menu, the screen will display the menu bar under “Signal Standard” and drawing area will display the all kinds of signal standards. The user can select the signal standard on the menu under “Signal Standard” to set the frequency.

【Freq】→ [Signal Std].



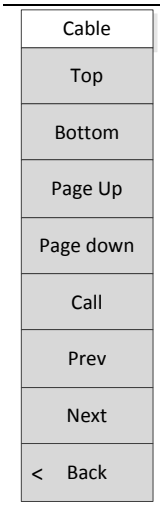
- [Top]: Click the menu, the signal standard list on the screen will return to the head position, namely the first row of signal standard list.
- [Bottom]: Click the menu, the signal standard list on the screen will return to the table foot position, namely the last row of signal standard list.
- [Page up]: Click the menu, the signal standard list will turn to the previous page.
- [Page down]: Click the menu, the signal standard list will turn to the next page.
- [Call]: Select the desired signal standard in the signal standard list on the screen; click the menu to set the frequency parameters of the signal standard.
- [Back]: Click the menu, the menu will return to “Frequency” menu bar.

Freq menu: in the measurement formats of DTF return loss and DTF VSWR, the menu under【Freq】is shown as follows:



- [Start Freq]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the start frequency. When using the numeric keys to enter the value, click the corresponding units on the menu bar.
- [Stop Freq]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the stop frequency. When using the numeric keys to enter the value, click the corresponding units on the menu bar.
- [Start Dist]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the start distance. When using the numeric keys to enter the value, click the unit menu “M” on the menu bar.
- [Stop Dist]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the stop distance. When using the numeric keys to enter the value, click the unit menu “M” on the menu bar.
- [Cable]: Click the menu, the menu bar will display the menu under “Cable Model” and the middle of the screen will display a variety of cable model name. Users can select different cable models under “Cable Model” menu to set the velocity factor and cable loss.
- [Velocity]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the cable velocity factor, and then press 【Enter】.
- [Cable Loss]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the cable loss, and then press 【Enter】.
- [Next >]: Click the menu, the menu will enter the “DTF Other” menu bar.

【Freq】 → [Cable]



- [Top]: Click the menu, the cable model list on the screen will return to the head position, namely the first row of table model list.
- [Bottom]: Click the menu, the cable model list on the screen will return to the table foot position, namely the last row of cable model list.
- [Page up]: Click the menu, the cable model list will turn to the previous page.
- [Page down]: Click the menu, the cable model list will turn to the next page.
- [call]: Select the desired cable model in the signal standard list on the screen; click the menu to recall the parameters of the cable model.
- [Back]: Click the menu, the menu will return to “Freq” software menu.

【Freq】 → [Next]

- [Rectangular]: Click the menu, rectangle window function can be used to realize data conversion during transformation from frequency domain to time domain.
- [Nominal Side Lobe]: Click the menu, normal edge smoothing window function can be use to realize data conversion during transformation from frequency domain to time domain.
- [Low Side Lobe]: Click the menu, low edge smoothing window function can be use to realize data conversion during transformation from frequency domain to time domain.
- [Minimum]: Click the menu, minimum edge smoothing window function can be use to realize data conversion during transformation from frequency domain to time domain.
- [Unit British System Metric System]: Press the key to switch between the British System and Metric System of distance unit.
- [Return]: Click the menu, the menu will return to “Freq” software menu bar.

3.8 Sweep Menu

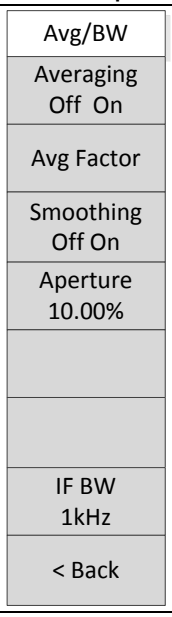
Sweep menu:【Sweep】

- [Trigger Cont Single]: Click the menu to switch between continue sweep and single sweep.
- [Swp Lin List]: Click the menu to switch between linear sweep and list sweep. When switched to the list sweep, it should first set the list information to be swept, otherwise it will fail.
- [List Info Off On]: Click the menu to switch between the on-off state of detailed list information display. When the list information display is on, such information will be displayed on the middle screen.
- [Edit List]: Click the menu to enter Edit List menu bar, and the users can complete the desired sweep list editing.
- [Swp Time Auto Man]: Click the menu to switch between auto setting and manual setting of sweep time. The sweep time under auto mode is designed to be the minimum sweep time under the operation of the Tester; under manual mode, it can input the desired sweep time by knob, 【↑】or【↓】and numeric keys, and then press 【Enter】. Note that the sweep time should not be less than that under auto mode.
- [Point]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the sweep point (the total sweep points of all segments should be 2 to 4001), and then press 【Enter】.
- [Avg/BW]: Click the menu, the menu will enter “Avg/BW” menu bar.

【SWEEP】 → [Edit List]

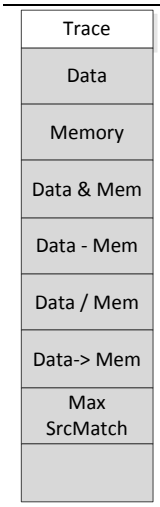
- [Seg ID]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the segment number to be edited, and then press 【Enter】 to select it.
- [Add Seg]: Click the menu to add a segment in the segment list. Other parameters within the segment can be set by the other menus.
- [Del Seg]: Click the menu delete the sweep parameter segments selected via segment number or touch screen by user. At the same time, the Tester will pop up a “Check” dialog box for user to confirm whether delete it or not.
- [Del All]: Click the menu delete the edited sweep parameter segments in memory. At the same time, the Tester will pop up a “Check” dialog box for user to confirm whether delete it or not.
- [Start Freq]: Click the menu, and it can edit the start frequency of sweep parameter segments selected via segment number or touch screen by user.
- [Stop Freq]: Click the menu, and it can edit the stop frequency of sweep parameter segments selected via segment number or touch screen by user.
- [Point]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the sweep point (2 to 4001), and then press 【Enter】.
- [Return]: Click the menu, the menu will return to “Sweep” menu bar.

【Sweep】 → [Avg/BW]



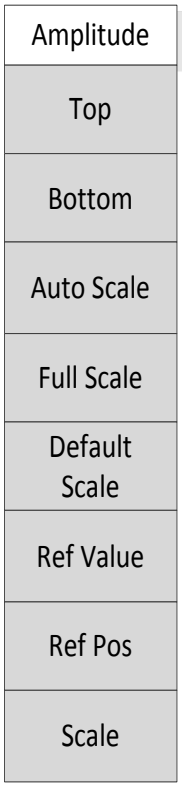
- [Averaging Off On]: Click the menu, and it can control the on-off state of trace sweep average function. When it is on, the trace data will be averaged by the average factor set by user, and then displayed.
- [Avg Factor]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the average factor (1 to 1000), and then press 【Enter】.
- [Smoothing Off On]: Click the menu, and it can control the on-off state of trace sweep average function. When it is on, the trace data will be averaged by the average factor set by user, and then displayed.
- [Aperture]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the smooth aperture (0.01% to 20%), and then press 【Enter】.
- [IF BW]: Click the menu, the display screen will pop up a “Set IF BW” prompt box, and the user can select the desired IF bandwidth by touch screen, rotary knob or 【↑】or【↓】and then click “OK” in the box to complete the setting.
- [Back]: Click the menu, the menu will return to “Sweep” menu bar.

3.9 Trace Menu



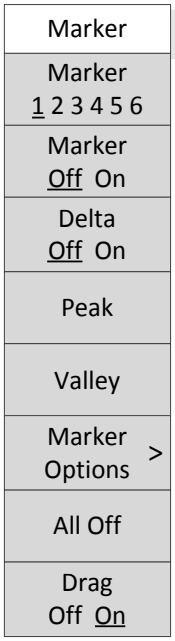
- [Data]: Click the menu, and the screen can display the traces as the current sweep data.
- [Memory]: Click the menu, and the screen can display the traces as the current stored sweep data.
- [Data & Mem]: Click the menu, and the screen can display the two traces of the current sweep data and the stored one.
- [Data-Mem]: Click the menu, the currently swept trace data will subtract the stored trace data and then display the results on the screen.
- [Data/Mem]: Click the menu, the currently swept trace data will divorce the stored trace data and then display the results on the screen.
- [Data->Mem]: Click the menu, and it can store the currently swept data to the memory for the convenience of “Data-Mem” and “Data/Mem”.
- [Max SrcMatch]: The port is connected to the open circuit after calibration to store the measured data to the memory, and then switch to the short circuit. It will pop up the dialog box concerning the max source match value and location information after pressing the menu.

3.10 Amplitude Menu



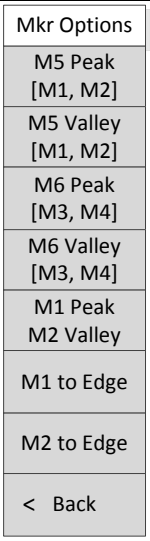
- [Top]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the Y-axis top coordinate value in the drawing area, and then press【Enter】.
- [Bottom]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the Y-axis bottom coordinate value in the drawing area, and then press【Enter】.
- [Auto Scale]: Click the menu, and the Tester will determine the Y-axis top-bottom coordinate values based on the max-min values on the currently swept traces, for the convenience of users to better view the test trace.
- [Full Scale]: Click the menu, the Tester will set the Y-axis as the max scale ranges, which are -100~100, -100dB~100dB, -450º~450º, based on the current Y-axis unit.
- [Default Scale]: Click the menu, the Tester will set the Y-axis as the max scale ranges, which are -6.11~65, -50dB~50dB, -450º~450º, based on the current Y-axis unit.
- [Ref Value]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the reference value of reference position in the drawing area, and then press【Enter】.
- [Ref Pos]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the reference position of the drawing area, and then press【Enter】. It has ten grids in the drawing area from up to bottom, wherein the top is defined as 0, go downward in turn, bottom as 10; therefore the reference position range is from 1 to 10.
- [Scale]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the Y-axis (power value) expressed by each grid in the drawing area, and then press【Enter】.

3.11 Marker Menu



- [Marker **1 2 3 4 5 6**]: Click the menu, and it can circularly switch the selected marker between six markers, and if open, the marker is displayed in green, otherwise in red.
- [Marker Off On]: Click the menu, and it can switch on or off the currently selected marker.
- [Delta Off On]: Click the menu, and it can select the currently selected marker mode. Under standard mode, a marker appears on the screen; under referential mode, there will be a differential marker (∆marker) of a standard and relatively standard marker displayed on the screen.
- [Peak]: Click the menu, and it can position the currently selected marker to the sweep trace peak.
- [Valley]: Click the menu, and it can position the currently selected marker to the sweep trace valley.
- [Marker Options]: Click the menu, the menu bar will be switched to the “Marker Options” menu.
- [All Off]: Click the menu, and it can close all the active markers, including standard marker and referential marker.
- [Drag Off On]: Click the menu, and it can switch on or off the marker dragging function. When the drag mode is on, users can click the marker to be edited for a long time on the touch screen, and then drag it to the desired position from left to right after turning red.

【Marker】 → [Marker Options]



- [M5 Peak [M1, M2]]: Click the menu, and it can position M5 to the peak between M1 and M2 under Freq on sweep trace.
- [M5 Valley [M1, M2]]: Click the menu, and it can position M5 to the valley between M1 and M2 under Freq on sweep trace.
- [M6 Peak [M3, M4]]: Click the menu, and it can position M6 to the peak between M3 and M4 under Freq on sweep trace.
- [M6 Valley [M3, M4]]: Click the menu, and it can position M6 to the valley between M3 and M4 under Freq on sweep trace.
- [M1 Peak M2 Valley]: Click the menu, and it can separately position M1 and M2 to the peak and valley on sweep trace.
- [M1 To Edge]: Click the menu, and it can set M1 to the drawing area boundary, and can realize the switching between two boundaries by different click times.
- [M2 To Edge]: Click the menu, and it can set M2 to the drawing area boundary, and can realize the switching between two boundaries by different click times.
- [back]: Click the menu, the menu will return to “Marker” menu bar.

3.12 Calibration Menu

Calibrate Correction Off On Cal Kit AV20201A M Cal >E Cal Resume >	● [Correction Off On]: The menu is deemed as a passive key in default, which cannot be clicked before calibration by the user. The error correction can be switched on or off through the menu after calibration by the user. ● [Cal Kit]: Click the menu, and it will pop up a “Select Cal Kit” prompt dialog box, then users can select the appropriate calibration kits from the dialog box via the touch screen, and then click the “OK” key to complete the selection. ● [M Cal]: Click the menu, and it will enter the mechanical calibration interface and pop up “Please connect [OPEN], and start calibrating by pressing corresponding soft key” on the screen. ● [E Cal]: Click the menu, the Tester will enter the embedded calibration. ● [Resume]: Click the menu, the Tester will also enter the mechanical calibration interface .

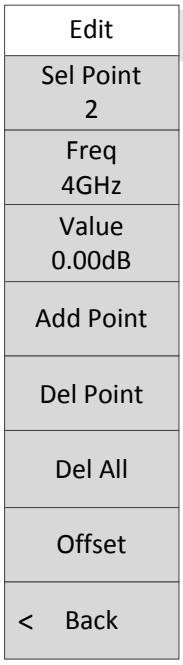
【Cal】 → [M Cal]

M Cal OPEN SHORT LOAD < Done < back	● [OPEN]: Based on the prompts, connect the calibration kit OPEN to the test port, and then click the menu, the screen will prompt “[OPEN] Measuring……”, When the open calibration is completed the [Open Circuit] menu displays [Open Circuit]. ● [SHORT]: Based on the prompts, connect the calibration kit SHORT to the test port, and then click the menu, the screen will prompt “[SHORT] Measuring……”. When The short calibration is completed the [Short Circuit] menu displays [Short Circuit]. ● [Load]: Based on the prompts, connect the calibration kit OPEN to the test port, and then click the menu, the screen will prompt “[LOAD] Measuring……”. When the load calibration is completed the [LOAD] menu displays [Load]. ● [Done]: The menu is deemed as a passive key in default, which cannot be clicked before calibration by the user. After calibration, click the menu to complete the calibration and return to “Cal” Menu. ● [Back]: Click the menu, the menu will return to “Cal” menu bar.

3.3.13 Limit Menu

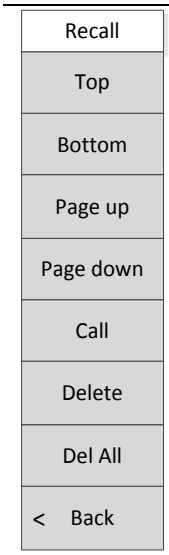
Limit Limit Off On Mode Up Low Edit >Alarm Off On Save Recall >	● [Limit Off On]: Click the menu, and it can select the on-off state of limit line function; defaults to limit off. ● [Mode Up Low]: Click the menu, and it can select the upper mode or lower mode of the limit line. Defaults to upper mode. ● [Edit]: Click the menu, and it will enter the “Edit” menu bar. ● [Alarm Off On]: Click the menu, and it can turn on or off the alarm function of the set limit line. Defaults to alarm off. ● [Save]: Click the menu, the screen will pop up “Input Limit Line Name” dialog box, then the user can input the appropriate name and click the “OK” key or press 【Enter】. ● [Recall]: Click the menu, and it will enter the “Recall” menu bar and display the limit line list information.

【Limit】 → [Edit]



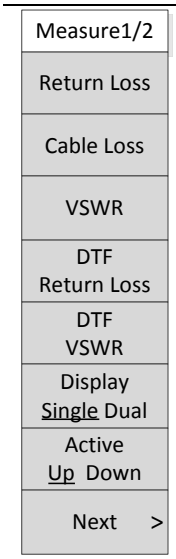
- [Sel Point]: Click the menu, and it can select each limit point in turn. It also cal click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the limit point to be edited, and then press 【Enter】.
- [Freq]: The menu will be displayed as either frequency or distance under different measurement formats respectively. Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the Freq value of the limit point to be edited.
- [Value]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the limit value of the limit point to be edited.
- [Add Point]: Click the menu, and it can add a new limit point on the limit line. The newly added limit point is the center point of the currently selected limit point and its next limit point.
- [Del Point]: Click the menu, and it can delete the selected limit point on the limit line.
- [Delete All]: Click the menu, and it can delete all the limit points as well as the limit line.
- [Offset]: Click the menu, followed by using knob, 【↑】or【↓】and numeric keys to input the offset value to realize the whole offset of the entire limit line.
- [Back]: Click the menu, the menu will return to “Limit” menu bar.

【Limit】 → [Recall]



- [Top]: Click the menu, limit line list on the screen will return to the head position, namely the first row of limit line list.
- [Bottom]: Click the menu, limit line list on the screen will return to the foot position, namely the last row of limit line list.
- [Page Up]: Click the menu, the limit line list will turn to the previous page.
- [Page Down]: Click the menu, the limit line list will turn to the next page.
- [Call]: Select the desired limit line in the limit line list on the screen; click the menu to complete recalling the parameters of the limit line.
- [Delete]: Click the menu, and it will delete the selected limit line.
- [Del All]: Click the menu, and it can delete all the limit lines in the limit line list.
- [Back]: Click the menu, the menu will return to “Limit” menu bar.

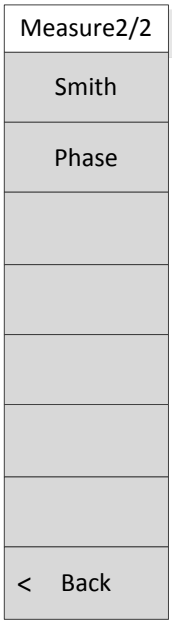
3.14 Measurement Menu



- [Return Loss]: Click the menu to set the current measurement format as return loss.
- [Cable Loss]: Click the menu to set the current measurement format as cable loss.
- [VSWR]: Click the menu to set the current measurement format as VSWR.
- [DTF Return Loss]: Click the menu to set the current measurement format as DTF return loss.
- [DTF VSWR]: Click the menu to set the current measurement format as DTF VSWR.
- [Display Single Dual]: Click the menu, set the number of window displayed in the drawing area. The Tester provides two modes which are single and dual.
- [Active Window Up Down]: The menu is deemed as a passive key in default, which is unavailable when the display window selected by user is “Single”, which can be selected by clicking on the menu when the display window selected by user is “Dual”.

	● [Next]: Click the menu, and it will enter the second page “Measure 1/2” of the “Measure” menu bar.

【Meas】 → [Next]

	● [Smith]: Click the menu to set the current measurement format as Smith Chart. ● [Phase]: Click the menu to set the current measurement format as phase. ● [Back]: Click the menu, and it will return to the “Measure 1/2” menu bar.

Chapter IV Power Measurement

4.1 Introduction

3680A/B Cable & Antenna Feeder Tester connects external AV87230 series USB power probe, which supports precise Power Measurement. Power Measurement is a function of options. It is necessary to purchase associated measurement software and power probe if this function is required. This chapter provides a detailed description of Power Measurement function and related operation of 3680A/B Cable & Antenna Feeder Tester. The tester displays power of signal tested, which is connected through power probe, with units of dBm and W or dB and %. Frequency range of Power Measurement is determined by measurement frequency range of power probe.

4.2 Power Meter Interface Introduction

Application programs automatically loaded by 3680A/B Cable & Antenna Feeder Tester are antenna feeder testing application programs. You may switch to Power Measurement mode following the steps below:

- Press 【System/Local】key and enter system menu bar;
- Click [Measure Mode] menu and select “Power Meter” in the pop-up “Measure Mode” dialog box;
- Click "OK" key on dialog box or press【Enter】to enter Power Measurement interface.

Connect test port on power probe and signal source during measurement. USB interface of power probe is connected to USB A type connector of tester with USB cable. Please connect the power probe before selecting “Power meter” function, otherwise the tester will call up a warning of “Device is not connected”, as shown in Figure 4-1:

Figure 4-1 Power Test Interface

3680A/B Cable & Antenna Feeder Tester mainly displays power data obtained by power probe through A/D conversion via design and mainframe software and completes some parameters setting of power display. This chapter provides an introduction of power meter interface emphasizing on touch screen interface and Power Measurement operation.

4.2.1 System Status Bar

System status bar under Power Measurement mode is consistent with the one under antenna feeder measurement. Please refer to 2.3.1 for reference, no more tautology here.

4.2.2 Information Display Area

Information display area mainly includes several information displays such as zero correction, the maximum scale, the minimum scale, average Off/On, offset Off/On, relative measurement Off/On, and Run /Hold. This area mainly provides configuration information of power meter measurement inside current plot area for users. You may reset the information by clicking corresponding areas on touch screen. For example: the maximum scale displayed is 30.00. You may click maximum scale area on touch screen then information setting of maximum scale will be displayed in plot area. The information can be reset with knobs, 【↑】【↓】 keys, or numeric keys, as shown in Figure 4-2:

Figure 4-2 Information Display Area

4.2.3 Plot Area

Plot area, mainly displaying power values obtained in measurement with dials and data for direct observation of measurement results for users, is mainly composed of measurement mode, meter display area, and power data display area etc. As shown in Figure 4-3:

1. Measurement mode of current tester
2. Power dial and pointer, used for indicating power value.
3. Power data display area displays specific values of current power level.

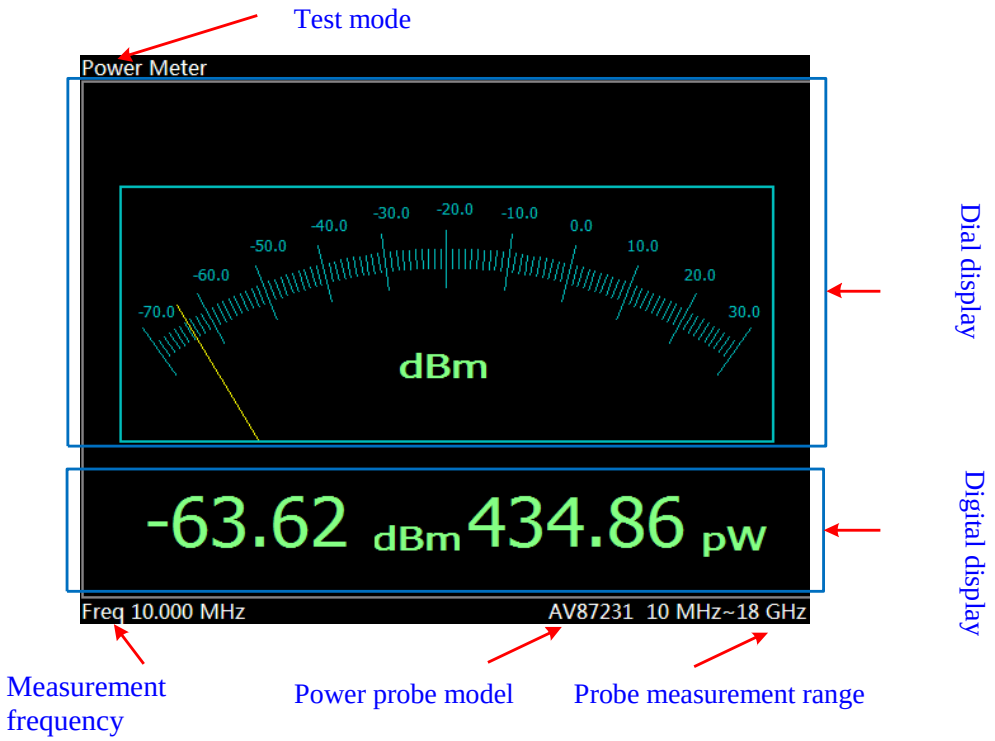


Figure 4-3 Plot Area

4.2.4 Menu Bar

Menu bar is menu area in the right side of touch screen including two parts, menu bar title and menu items. Click function keys on front panel of tester then menu bar of corresponding title will be spread in the right side of touch screen. You may select menu items and set measurement parameters through clicking menu on menu bar. For example, when 【Sweep】is clicked, corresponding menu bar is as shown in Figure 4-4.

Figure 4-4 Sweep /Setup Menu Bar

4.3 Measurement Parameters Setting

4.3.1 Frequency

To obtain more convenient observation, you may set corresponding frequency range according to testing requirements for more accurate observation over power value of frequency point tested. Specific steps are as follows:

- Press 【Freq】to enter menu bar of frequency software;
- Click [Frequency] menu (selected by default as there is only one drop-down menu in the menu), then input measurement frequency of power meter using knob, 【↑】【↓】keys, and numeric keys. Press corresponding menu and select frequency unit to complete frequency setting when numeric keys are used in inputting frequency values.

4.3.2 Sweep

1. Average function

Average function covers average operation on results obtained from several continuous measurements and displays average result as measured values. Average factor setting determines continuous measurement times. The greater the average factor is, the lower the external interference of measured power will be obtained, which will lead to more accurate measured values.

2. Offset function

When power of source under test is beyond measurement range, it is required to attenuate or enlarge signal tested. At this time, actual power value of source under test without being attenuated or amplified could be easily obtained through offset function.

In offset function, value displayed is current measured value deducting offset value set. Offset function is in operation when signal channel is connected with power amplifier or attenuator. Therefore, offset value shall be set to negative number when connecting external attenuator; positive value when connecting external amplifier.

3. Relative measurement function

When turning on relative measurement function, it will save the power value of current measurement and then display the comparative value of each value measured with respect to power value saved. At the same time, units of comparative power value displayed will changed from dBm to dB and from Watt to %. As shown in Figure 4-5.

Figure 4-5 SWEEP Menu Bar

4.3.3 Amplitude

To obtain more accurate observation over signal tested, you may readjust amplitude setting of tester according to frequency range displayed. As shown in Figure 4-6:

Figure 4-6 Amplitude Setting

There are two amplitude setting methods as shown below:

1. Manual setting: users set the maximum value and the minimum value on power meter dial by themselves. Detailed operation is as below:

- Press 【Ampt】 key and enter amplitude menu bar;
- Press [Max Scale] menu, input the maximum scale value of power meter using knobs,【↑】【↓】keys or numeric keys, and press 【Enter】key to complete the maximum value setting;
- Press [Min Scale] menu, input the minimum scale value of power meter using knobs,【↑】【↓】keys or numeric keys, and press 【Enter】key to complete the minimum value setting.

2. Automatic setting: users do not have to set the maximum scale or the minimum scale by themselves. By clicking [Auto Scale] or [Full Scale] menu only based on requirements, application programs will automatically adjust the maximum value and the minimum value of dial in accordance with power data measured. The operation is as below:

- Press 【Ampt】key and enter amplitude menu bar;
- Click [Auto scale] on menu bar, application programs will automatically set the maximum values and the minimum values on dial according to power fluctuation range;
- Click [Full Scale] on menu bar, application programs will automatically set the maximum value on dial to 30dBm, the minimum value to -70dBm.

4.3.4 Calibration

To obtain better Power Measurement over current signal and improve testing accuracy of power meter, it is required to perform zero calibration to power meter of tester when necessary. During zero calibration, please turn off signal source first if power detector is connected with signal source; detailed steps of zero calibration are as follows:

- Connect power probe with signal source and turn off signal source;
- Press 【Cal】key and enter calibration menu bar;
- Click [Zero] menu, the screen will indicate “Zeroing…”; “Zero Success!” in a few seconds to indicate zero calibration is completed. As shown in Figure 4-7:

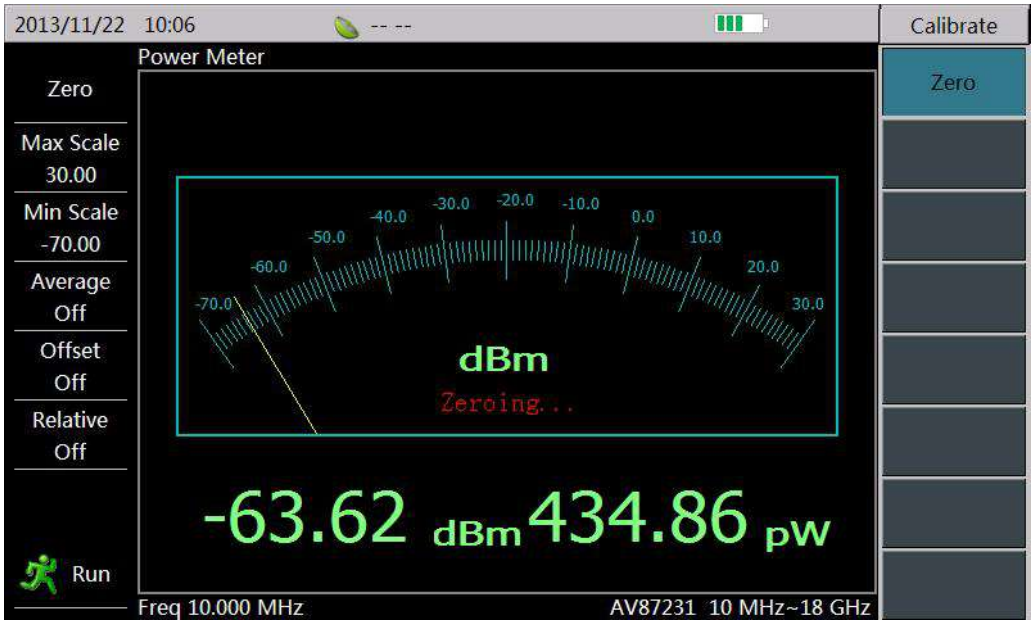


Figure 4-7 Power Meter Calibration

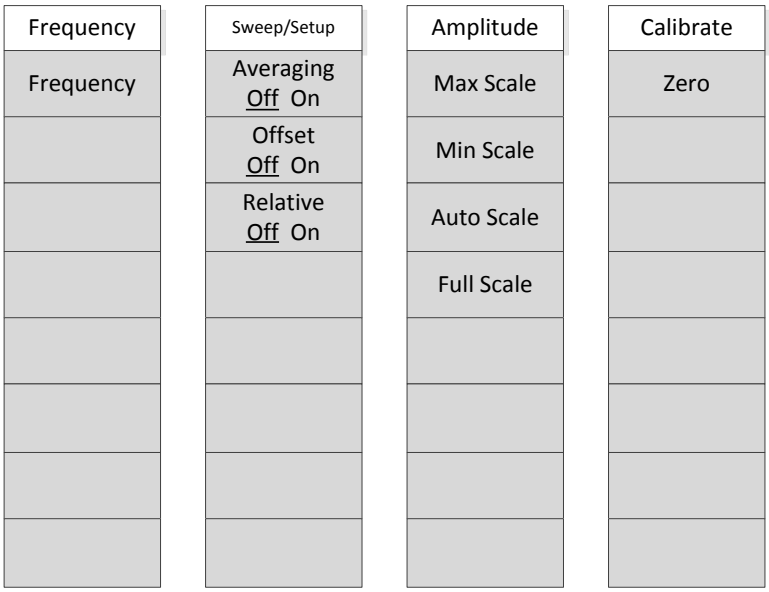
4.3.5 Save/Recall, Run/Hold and System/Local

The menu structures of 【Save/Recall】 and 【System/Local】keys will be introduced in details in 5.8 and 6.15 below, no more tautology here.

【Run/Hold】key is used to switch between holding current measurement result and continuous measurement without corresponding menu.

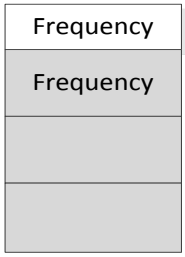
4.4 Power Meter Menu Structure

Operation of power meter test is comparatively simpler compared with antenna feeder test. Please refer to 4.5~4.8 as reference for specific setting of menu. Its menu structure is as below:



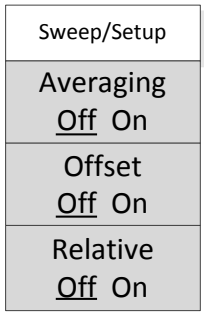
STATEMENT:	The menu structure here does not include 【Save/Recall】and 【System/Local】keys. These two sections will be introduced in the next two chapters (Chapter V and VI).

4.5 Freq Menu



• **Frequency:** Click this menu and input frequency measured by power meter using knobs, 【↑】【↓】keys, and numeric keys. Click corresponding frequency unit menu in menu area to complete testing frequency setting when numeric keys are used to input values.

4.6 Sweep Menu

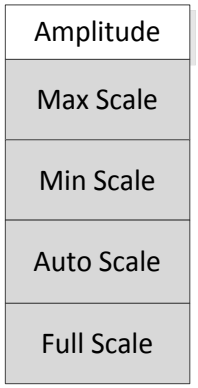


Averaging Off On: Click this menu and On/Off control over average function during measurement process of power meter can be realized. When turned on, average factors can be set using numeric keys.

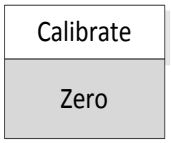
Offset Off On: Click this menu and On/Off control over offset function during measurement process of power meter can be realized. When turned on, offset value can be set using numeric keys.

Relative - Off On: Click this menu and realize switch over On/Off of relative measurement.

4.7 Amplitude Menu

	**Max Scale:** click this menu and input maximum scale value of power on measurement meter dial using knobs, 【↑】【↓】keys, and numeric keys. Press 【Enter】to complete setting. **Min Scale:** click this menu and input minimum scale value of power on measurement meter dial using knobs, 【↑】【↓】keys, and numeric keys. Press 【Enter】to complete setting. **Auto Scale:** Click this menu, power meter software will provide an appropriate maximum scale and minimum scale based on maximum and minimum values of measured power value. **Full Scale:** Click this menu and set the maximum scale to 30dBm and the minimum scale to -70dBm.

4.8 Calibration Menu

	**Zero:** Click this menu and perform zero calibration before power meter measurement.

Chapter V Document operation

5.1 Introduction

This chapter mainly introduces document management function and menu structure of corresponding 【Save/Recall】key of 3680A/B Cable & Antenna Feeder Tester. You may perform operations such as storing, recalling, copying, and deleting etc. to internal memory of tester, external extension storage devices and documents between them via submenu.

The tester provides a fast access to internal memory with large capacity, while supports external Mini SD card and USB external storage devices connecting. It is used for setting store status and measured data etc. of tester. Storage/Recall function set by instrument saves a lot of operating time on parameters setting and accelerates measurement speed. Store/Recall function supports comparative analysis over measured data or storing data in specific format for the convenience of analyzing and processing in externally controlled software.

Storage medium is internal memory in default mode. Instrument setting and measured date will be saved into internal memory of tester by default.

5.2 Set Save Location

You may pay attention to the storage location of documents first if you want to store Sweep Trace or status during usage. Tester is set by default to store in internal memory of system, which is also displayed as [Internal] on screen. If you want to edit storage location, you may operate as follows:

- Press 【Save/Recall】key and enter Store/Recall menu bar;
- Press [Location] menu and enter storage location menu bar;
- Click corresponding storage location menu on storage location menu bar and complete storage location setting, as shown in Figure 5-1:

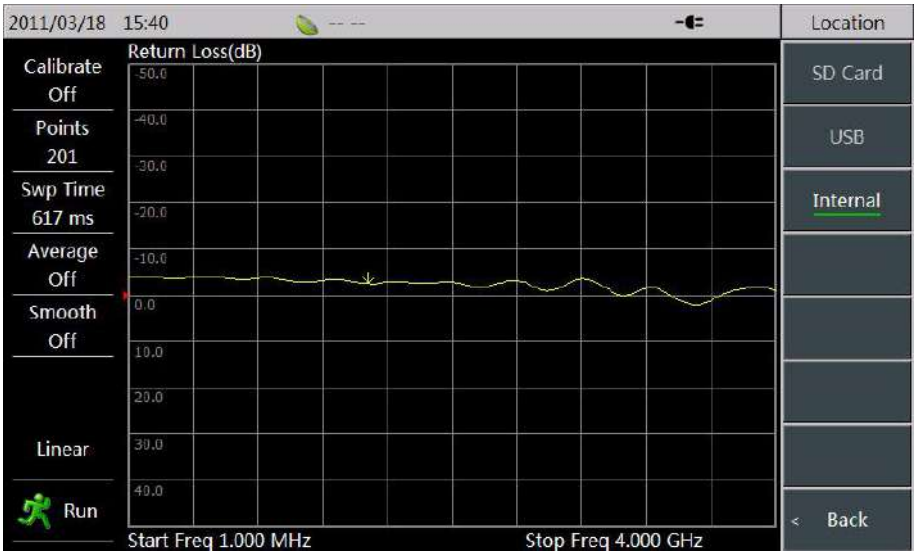


Figure 5-1 Storage Location Selection

STATEMENT:	[SD Card] and [USB] menus of storage location, when SD card is not placed in or external USB memory is not connected, are inactive and cannot be selected. Corresponding menus can be set and operated when SD card or USB storage devices are added.

5.3 Status Save Recall

You may complete corresponding documents storage based on your needs after selecting document storage location. This part mainly introduces status storage and recall. Detailed steps are as follows:

- Press 【Save/Recall】key and enter Store/Recall menu bar;
- Click [Save State] menu on Store/Recall menu bar on touch screen to bring up a dialog box “Input State Name”. You may input an appropriate status name in dialog box and click “OK” key on screen or press【Enter】key and complete status storage. As shown in the following figure:

Figure 5-2 Status Storage

For more convenient operation, you may recall previous status stored. Status recalling steps are as follows:

- Press 【Save/Recall】key and enter Save/Recall menu bar;
- Click [Recall State] menu to bring up a status list of storage; while menu bar enters “Recall” menu bar, as shown in the following figure:

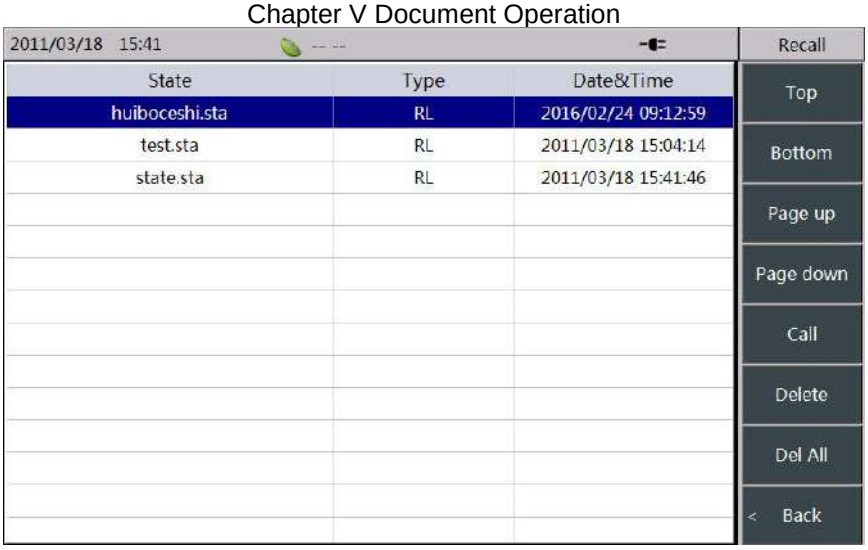


Figure 5-3 Recall Status

Select appropriate status via touch screen and click [Recall] menu on the right menu bar to complete recalling over pervious-stored status. In addition, you may use [Top], [Bottom], [Page Down], and [Page Up] in order to look for required status in status list conveniently. You may also select some certain status and delete it by clicking [Del] menu; you may click [Del all] menu to delete all status.

5.4 Trace Save Recall

You may complete corresponding documents storage according to your own needs after selecting document storage location. This part mainly introduces trace storage and recall. Trace storage steps are as below:

- Press 【Save/Recall】key and enter Store/Recall menu bar;
- Click [Save Trace] menu to bring up a dialog box “Input Trace Name”. You may input an appropriate trace name in the dialog box and click “OK” key on screen or 【Enter】key to complete storage of trace. As shown in the following picture:

Figure 5-4 Trace Storage

You may also recall previous-stored status as status recalling. Trace recalling steps are as follows:

- Press 【Save/Recall】key and enter Save/Recall menu bar;
- Click [Recall Trace] menu on Save/Recall menu bar on touch screen to bring up a trace storage list, while menu bar will switch to menu bar of “Call”. As shown in Figure 5-5.

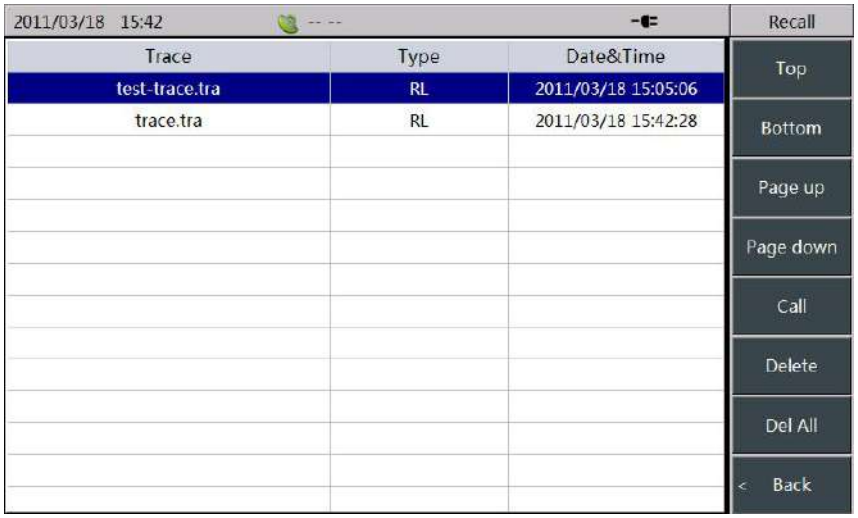


Figure 5-5 Recall Trace

Select trace required recalling via touch screen and click [Call] menu and complete previous-stored status recalling. In addition, you may use [Top], [Bottom], [Page Down], and [Page Up] to look for required traces in order to look for required trace in trace list conveniently; you may also click [Del] menu to delete some trace. You may click [Del all] menu to delete all traces. You may recall previous-stored traces (Traces recalled displayed are green in color) and perform comparison with currently measured trace via menu under 【Trace】key. The figure below shows the ratio between trace recalled and current tested trace.

Figure 5-6 Current Trace/Recalled Trace

5.5 Screen Capture

You may observe testing data under some circumstances more directly or use image

data while drafting documents in the future as tester provides Screen Capture function. You may get an easy access to obtain data results of current testing and restore it in image format. If you want to take a Screen Capture for display interface of current testing data, you may operate as follows:

- Press 【Save/Recall】key and enter Store/Recall menu bar;
- Click [Save Pic]，then click [Print Screen] menu to bring up a dialog box of “Input Picture Name”. You may input an appropriate name for Screen Capture and click “OK” key on screen or 【Enter】key to complete trace storage. The Screen Capture will be stored in location set in Section 5.2.

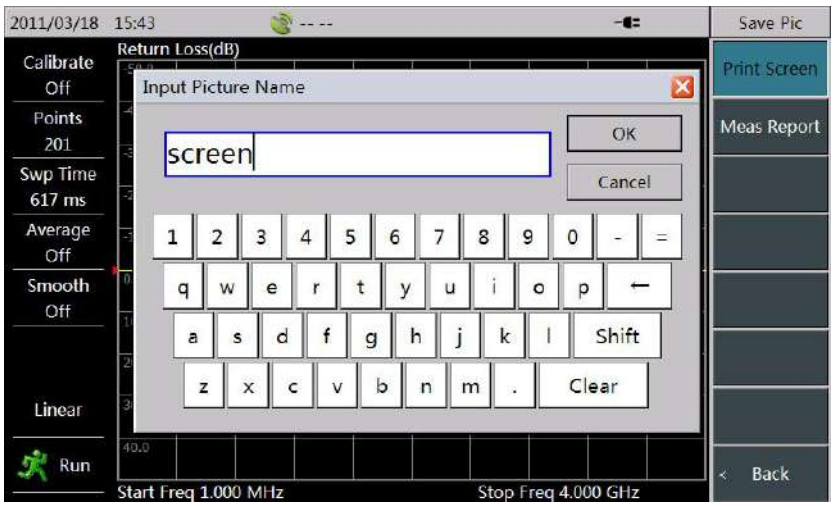


Figure 5-7 Screen Capture

5.6 Document Management

Document management function is used to transfer, delete, or archive stored testing data, documents or images. Corresponding operation steps are as follows:

- Press 【Save/Recall】key and enter Save/Recall menu bar;
- Click [File Mgmnt] menu item to bring up a dialog box of document management; menu bar will enter “File Mgmnt” menu, as shown in Figure 5-8.
- Click [Source File] menu item to activate the left part of dialog box and press【↑】【↓】keys or use knobs to select source documents or folders; or directly select documents or folders to be copied in the left side via touch screen.
- Click [Destination] menu item to activate the right side of dialog box and press 【↑】【↓】keys or use knobs to select destination path; or directly click file paths where copied documents or folders located on the right side of touch screen.
- Click [Start Copy] menu item to copy documents. Successful copy message brought out indicates completion of copy.
- Click [Delete Source File] menu bar to delete source documents. Successful deletion message brought out indicates completion of delete operation.

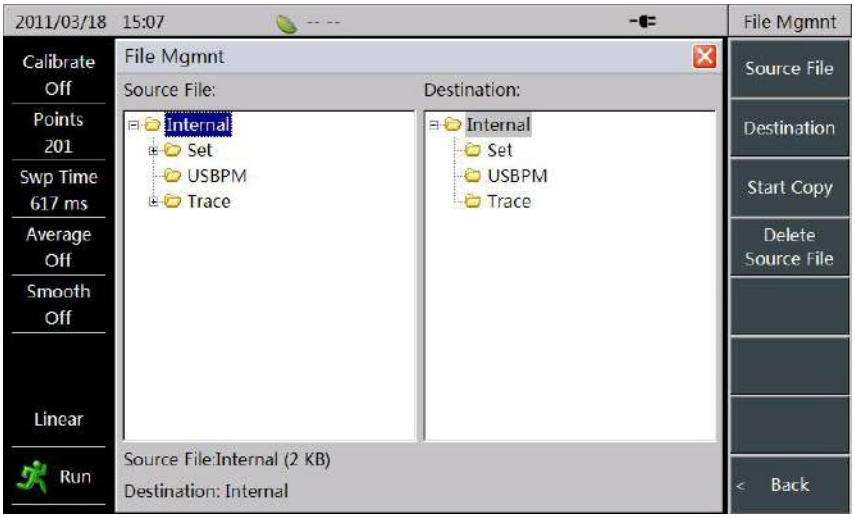


Figure 5-8 Document Management Dialog Box

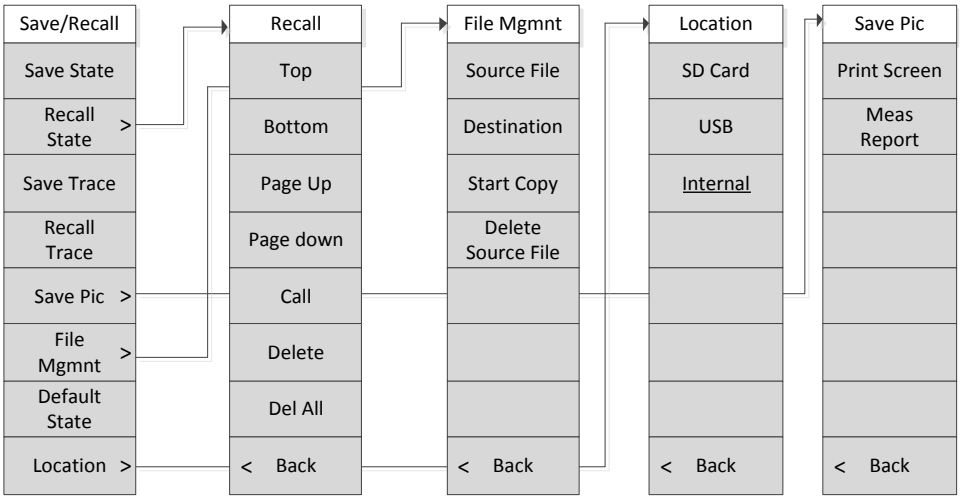
5.7 Default Status

Default status is also original status after each startup of tester. It is advised to use [Default status] menu to restore initial status if you want to restore to initial status after completing plenty of parameters setting as it will be comparatively simpler than resetting through parameters. You may also use 【Preset】to perform this function, however, it is not recommended for too much time taken.

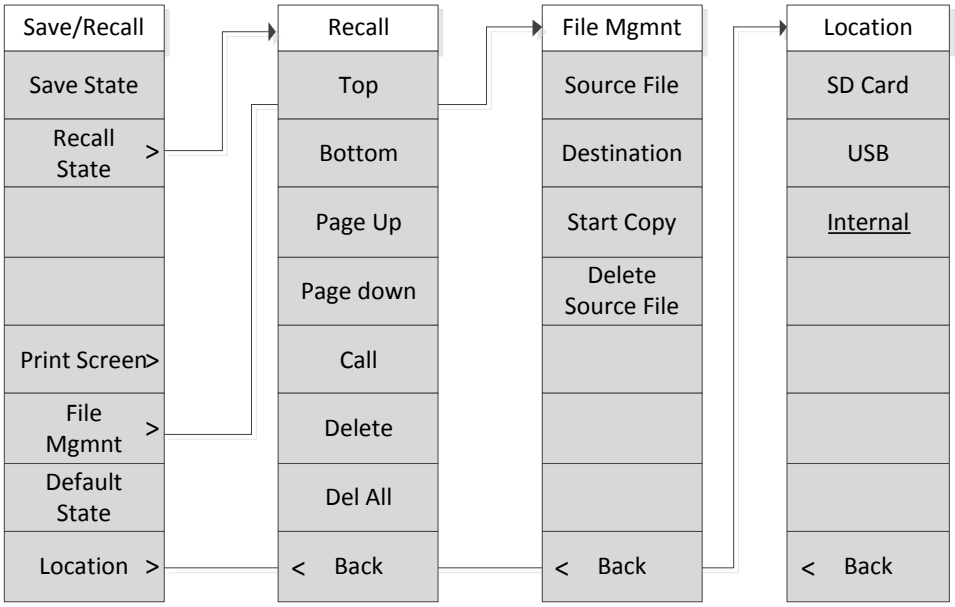
5.8 Menu Structure

To decrease operational complexity, 3680A/B Cable & Antenna Feeder Tester tries to maximize the conformity between structures and operation of 【Save/Recall】menu bar under two measurement modes, Antenna Feeder Tester and Power Meter. The 【Save/Recall】menu structure diagrams of these two modes are as follows. Operation of each menu of power meter is in consistent with that of antenna feeder tester. No more tautology here.

Under Antenna Feeder Tester mode, 【Save/Recall】menu structure:



Under Power Meter mode, 【STORE/RECALL】menu structure:



Chapter VI System Management

6.1 Introduction

This chapter mainly introduces system management operation of 3680A/B Cable & Antenna Feeder Tester including functions such as measurement mode selection, power saving mode selection, self-test, display and system language etc. System setting operation has no direct relation with testing process, method or result. It mainly performs self-test of instrument, power saving or screen setting under different circumstances for better observation. One by one introduction on system function is as follows.

Display interface of tester is as shown in Figure 6-1 when tool software introduced in Chapter 7 are used to perform distance control over tester. A “Remote” control notice is called up next to power notice, while tester does not respond to keyboard keys any more. You may press 【System/Local】key to switch instrument system to “Local” status if you want to operate via keyboard.

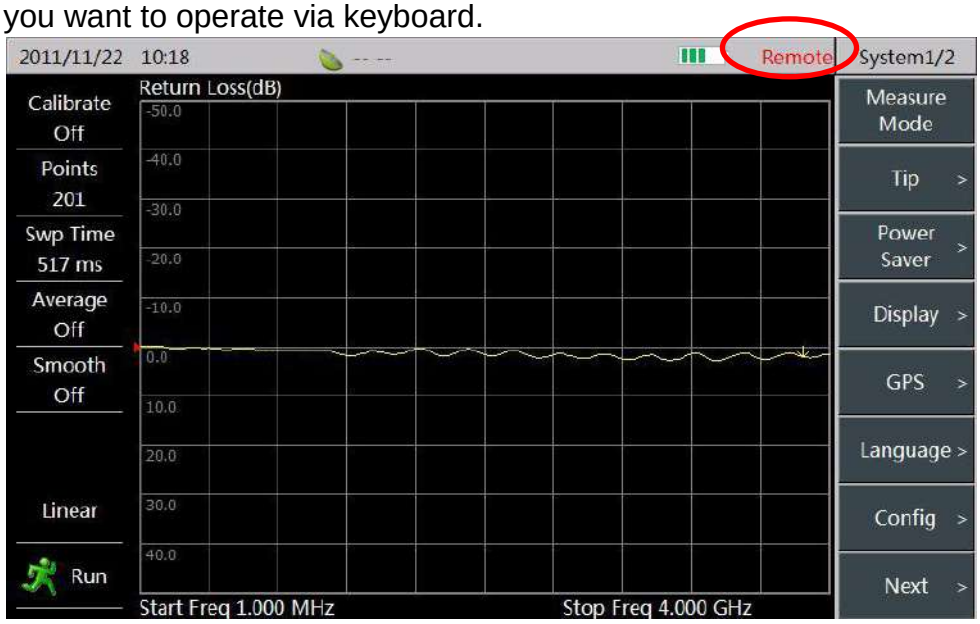


Figure 6-1 Equipment Remote Control TEST

6.2 Measurement Mode

3680A/B Cable & Antenna Feeder Tester supports two measurement modes, antenna feeder test and power meter test. You may select testing mode according to your needs. Measurement mode selection steps are as follows:

- Press 【System/Local】key and enter system menu bar;
- Click [Measure Mode] menu to call up a “Measure Mode” selection dialog box;
- Select measurement mode needed with 【↑】【↓】keys or knobs or by clicking on touch screen directly. Click “OK” key on dialog box or press 【Enter】and complete measurement mode selection. As shown in the following figure:

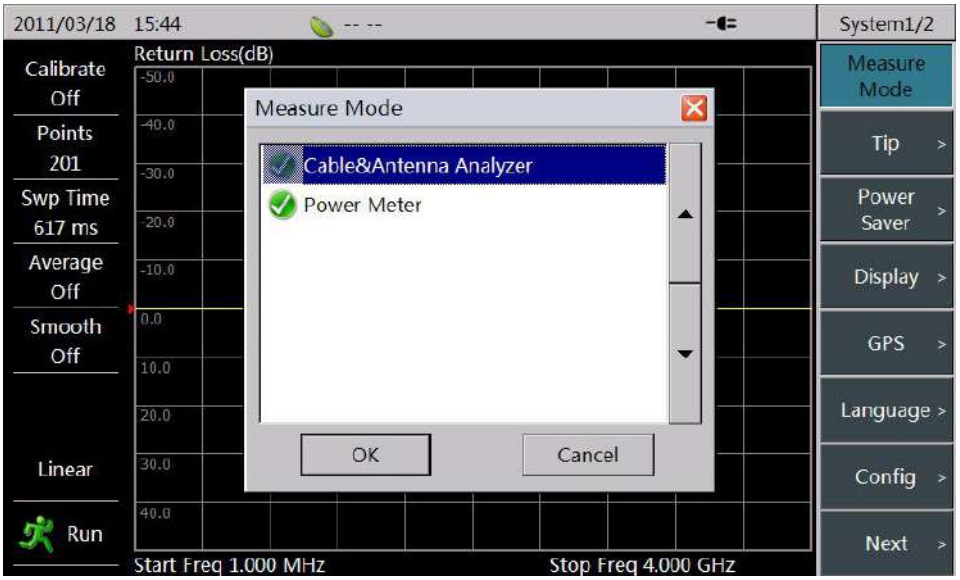


Figure 6-2 Measurement Mode Selection

6.3 Label

Tester supports label function. You may add an appropriate label for current measured result in order to mark pictures when taking Screen Captures. Label setting steps are as follows:

- Press 【System/Local】and enter system menu bar;
- Click [Tip] menu and enter label menu bar;
- Label switch and editing operation:

(1) If labeling function is off, you may click [Tip Off On] menu to bring up a dialog box of “Input Tip”. Input label content in the dialog box and click “OK” key on dialog box or press 【Enter】 key to complete label setting. You may also click [Edit Tip] menu directly to bring up dialog box of “Input Tip” and input label content. Click “OK” key on dialog box or press 【Enter】to complete label setting, while label switch will be automatically switched to [Label Off On] status .

(2) If labeling function is on and required to edit, you may click [Edit Tip] menu to bring up a dialog box of “Input Tip” and input it with new label content. Click “OK” key on dialog box or press【Enter】 key to reedit label. As shown in the following figure:

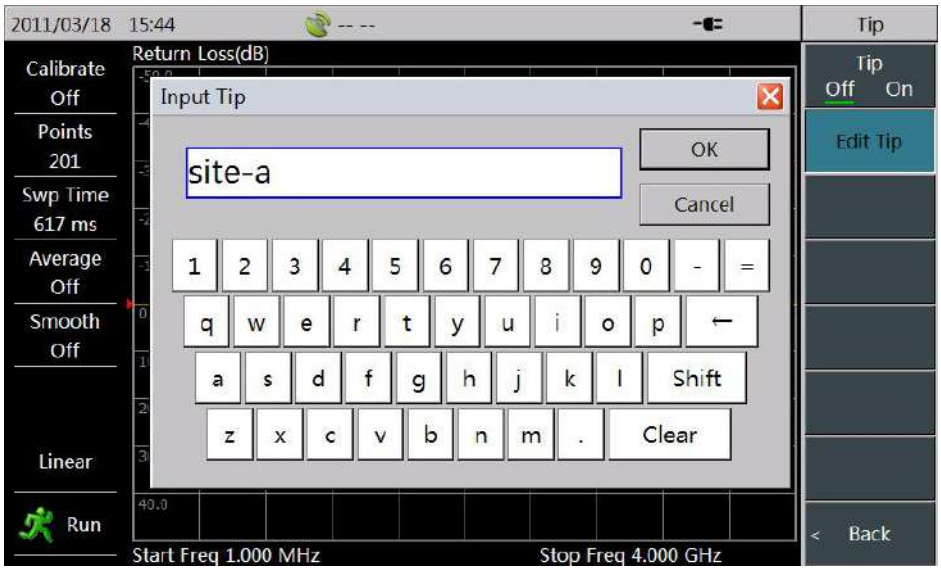


Figure 6-3 Label Editing

- Press 【Enter】key or “OK” key on dialog box. After editing label, measurement mode name of plot area will display label being edited by users.

6.4 Power Saving Mode

Considering LCD screen service life and power saving principle, 3680A/B Cable & Antenna Feeder Tester provides two power-saving modes, sleep mode and timing shutdown. You may select appropriate power saving mode according to self-test outcome. So-called sleep mode refers to a status, which will be automatically set by system according to time period set by users if long time no operation occurred. In sleep mode, instrument screen will be off, while system is still on. The time period set by users is sleep time. Sleep time setting steps are as follows:

- Press 【System/Local】key and enter system menu bar;
- Click [Power Saver] menu and enter power saving mode menu bar;
- Click power saving mode menu bar [Sleep Time] and set system sleep time with 【↑】【↓】keys, knobs, and numeric keys. Press 【Enter】key and complete sleep time setting. 30s before system enters sleep mode, a “Notice” dialog box will be brought up and indicate system will enter sleep mode soon, as shown in Figure 6-4. You may click anywhere on screen or any keys (excluding On/Off key and Reset key) on keyboard to cancel this sleep when the instrument is in sleep mode or countdown to sleep mode. System will then perform timing operation of the next round according to sleep time. You may also click [Sleep Time] menu again and turn off sleeping.

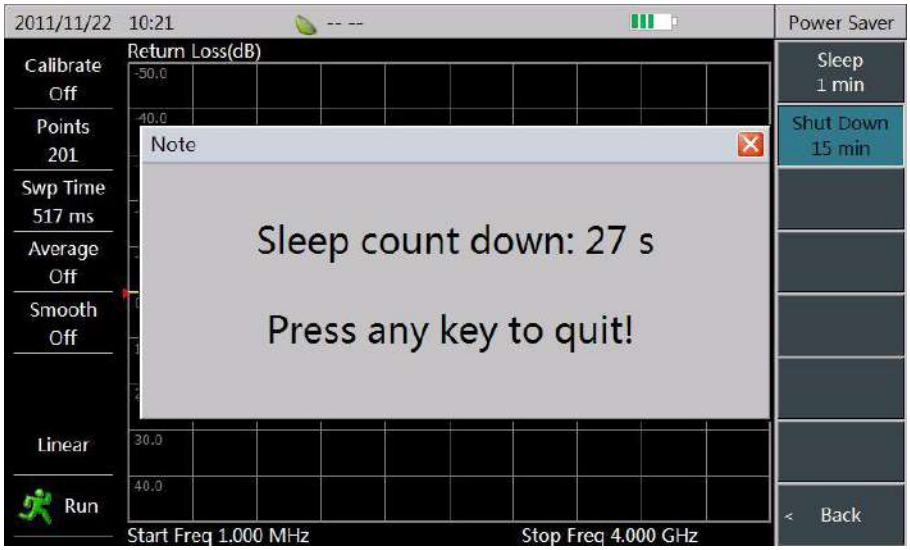


Figure 6-4 System Sleeping Function

Timing shutdown refers to shutdown of tester in according to time period set by users. Timing shutdown setting steps are as follows:

- Press 【System/Local】key and enter system menu bar;
- Click [Power Saver] menu and enter power saving mode menu bar;
- Click power saving mode menu bar [Shut down] and set system shutdown time with 【↑】【↓】keys, knobs and numeric keys. Press 【Enter】key and complete shutdown time setting. 10 minutes before system shutdown, a “Note” dialog box will be brought up and inform shutdown soon. You may cancel automatic shutdown by clicking anywhere on screen or using any keys on keyboard (excluding On/Off key and Reset key).

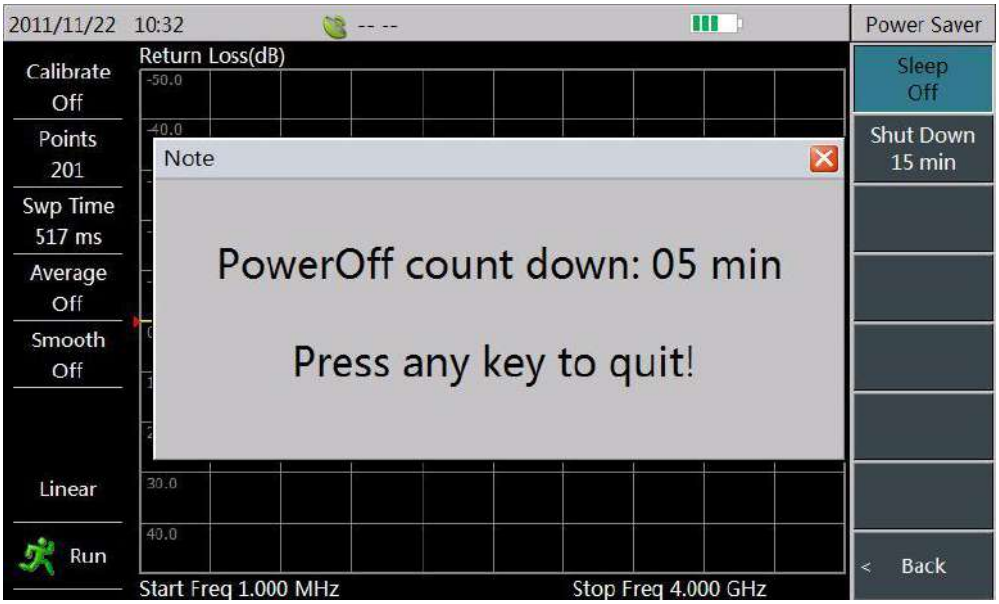


Figure 6-5 System Timing Shutdown Function

6.5 Display

To better handle different testing scenarios for users, 3680A/B Cable & Antenna Feeder Tester provides several kinds of display functions and backlight brightness adjustment function. You may adjust display and brightness of instrument according to testing environment. Setting steps of instrument display mode are as follows:

- Press 【System/Local】key and enter system menu bar;
- Click [Display] menu and enter menu bar;
- Click display mode on corresponding display menu bar according to testing environment.

Display mode of tester is set to be normal mode by default, you may select appropriate testing environment. If testing outdoor, you may click [Outdoor Mode] menu on menu bar; if testing at night, you may click [Night Mode] menu on menu bar. Several kinds of screen display modes are as below separately:

Figure 6-6 Normal Mode

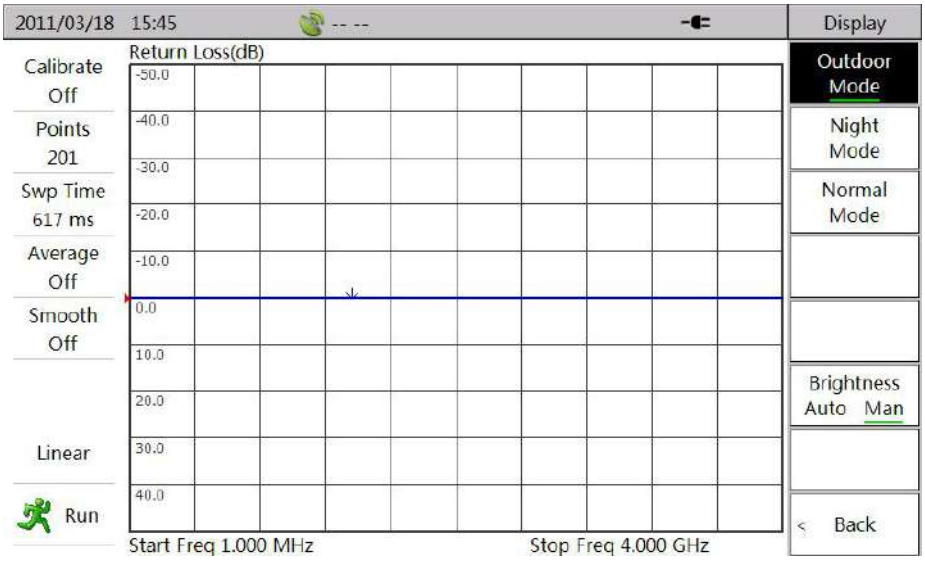


Figure 6-7 Outdoor Mode

Figure 6-8 Night Mode

Apart from display mode selection, tester also provides screen brightness adjustment function. You may adjust screen brightness using this function under the same display mode. Detailed operating steps are as follows:

- Press 【System/Local】key and enter system menu bar;
- Click [Display] menu and enter display menu bar;
- Click [Brightness Auto Man] menu:

a) Menu displayed as [Brightness Auto Man] indicates tester can automatically adjust screen display brightness via light sensor. Screen brightness varies as ambient light varies;

b) Menu displayed as [Brightness Auto Man] will bring up a dialog box of “Adjust Lightness”. You may select appropriate brightness grade with 【↑】【↓】keys , knobs, or directly clicking dialog box.

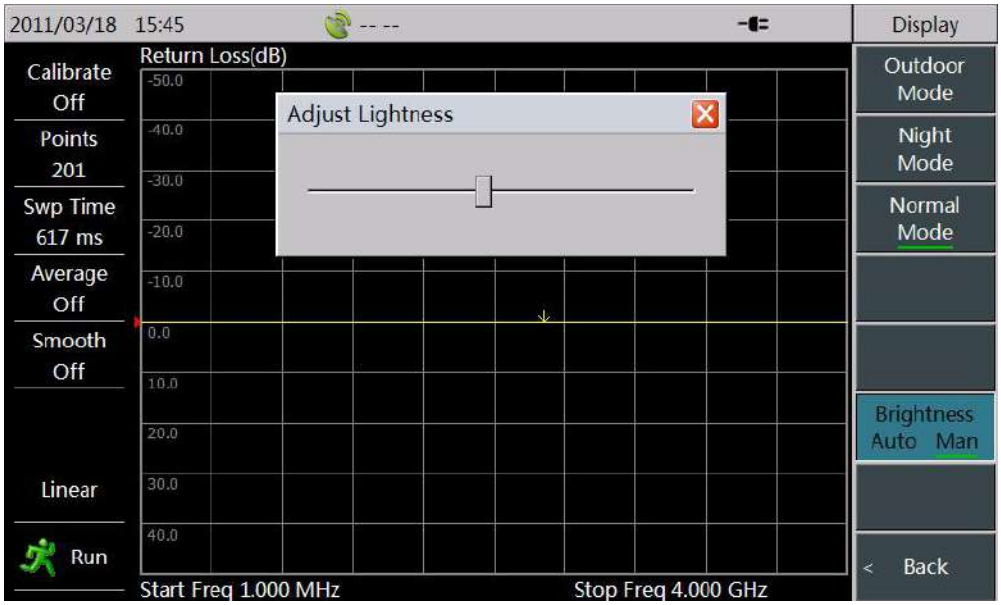


Figure 6-9 Screen Brightness Adjustment

6.6 GPS Function

3680A/B Cable & Antenna Feeder Tester adds GPS function and supports connecting external GPS antenna to check geographical position where tester locates. It includes information such as latitude, latitudinal hemisphere, longitude, longitudinal hemisphere, altitude, date, and time etc. Detailed operating steps of GPS function are as follows:

- Connect GPS antenna and tester;
- Press【System/Local】key and enter system menu bar;
- Click [GPS] menu and enter GPS menu bar;
- Click [GPS Off On] menu on GPS menu bar; Surface GPS function is on when the menu displayed as [GPS Off On]. The latitudinal and longitudinal information of instrument's location will be displayed in system status bar of tester after a while.
- You may click [GPS Info] on GPS menu bar and check relevant detailed information of GPS. As shown in Figure 6-10:

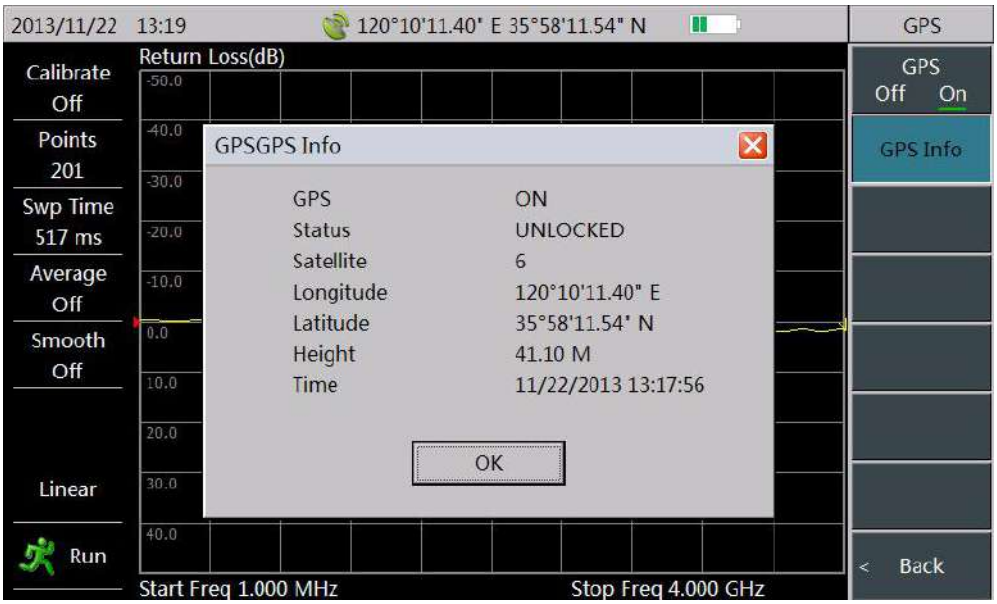


Figure 6-10 Detailed GPS Information

6.7 Config

6.7.1 Date & Time

3680A/B Cable & Antenna Feeder Tester provides system time setting function. System time setting steps of tester are as follows:

- Press【System/Recall】key and enter system menu bar;
- Click [Config] menu and enter setup menu bar;

- Click [Date & Time] menu to bring up a dialog box of “Set Date&Time”. You may edit it with [Prev], [Next], knobs or selecting the content to be edited by clicking directly. Input modified value via keypad,【↑】【↓】keys, or numeric keys. Click “OK” key on dialog box or press 【Enter】to complete date and time setting. As shown in Figure 6-11:

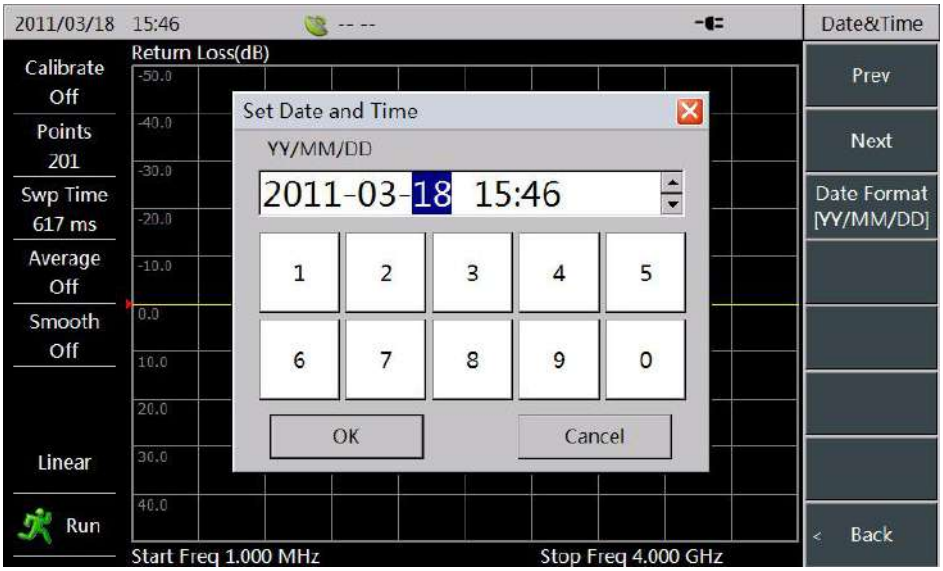


Figure 6-11 Date and Time Setting

In addition, you may also switch display method of date by clicking [Date Format] menu in “Data&Time” menu bar.

6.7.2 LAN

Similar to common PC system, you may need to reconfigure network of tester system when using computer to interconnect instrument or performing distance control with tool software in Chapter 7 in order to maintain mainframe computer and tester in the same network segment. LAN setting steps are as follows:

- Press 【System/Recall】key and enter system menu bar;
- Click [Config] menu and enter setting menu bar;
- Click [LAN] menu to bring up “LAN” dialog box on the screen;
- Click [IP] menu on menu bar and switch cursor to IP address configuration column and input IP address of each segment with numeric keys. You may switch to each segment via [Next] and [Prev]. As shown in Figure 6-12:

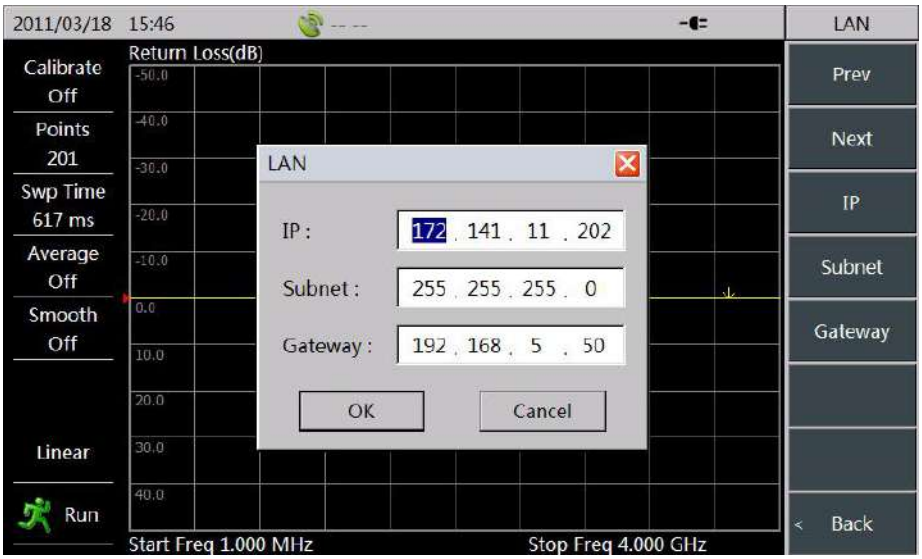


Figure 6-12 LAN—IP Configuration

- Click [Subnet] menu on menu bar and switch cursor to subnet mask configuration column. Set subnet mask of instrument with numeric keys; as shown in the following figure:

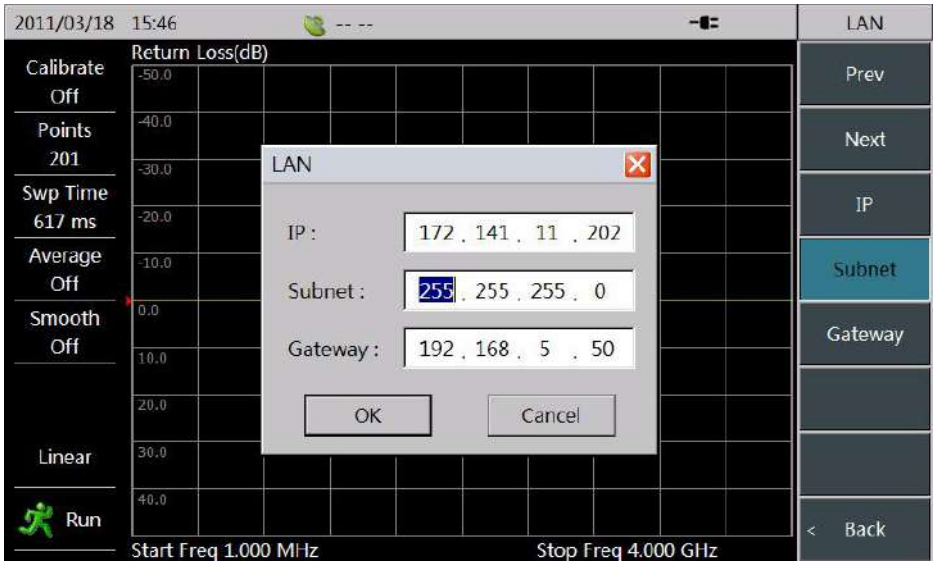


Figure 6-13 LAN—Subnet Mask

- Click [Gateway] menu on menu bar and switch setting cursor to Gateway column; set default gateways of the instrument separately with numeric keys. As shown in the figure below:

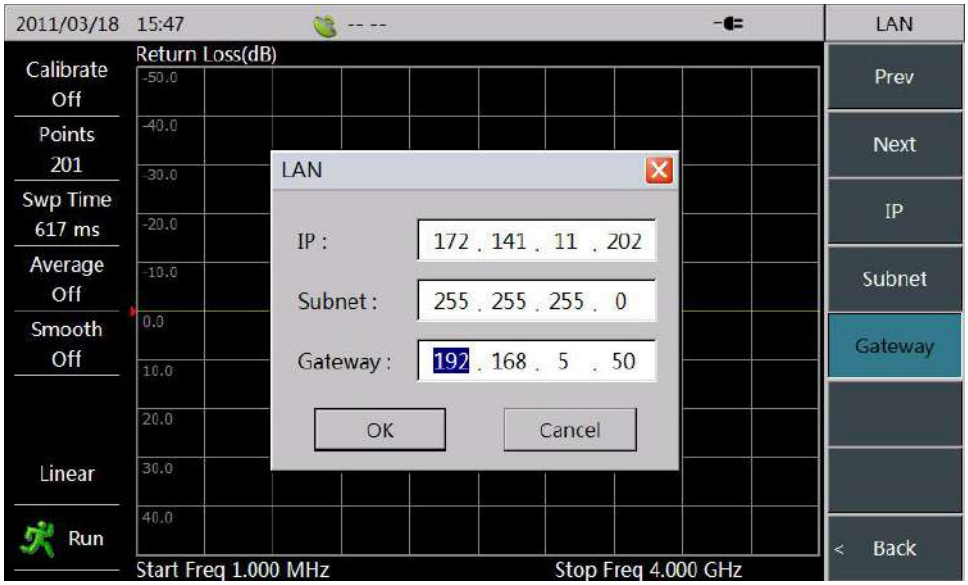


Figure 6-14 LAN—Gateway

- After configuration is completed, click “OK” key or 【Enter】key to complete LAN setting.

6.7.3 Touch Screen Calibration

Touch precision of touch screen will be calibrated before delivery. However, you may recalibrate touch screen for low precision of touch screen response caused by accident. You may recalibrate touch screen using these two methods below:

1. Calibration with mouse: connect mouse to USB A type interface of digital interface and perform Touch Screen Calibration following the steps below:

- Press 【System/Local】key and enter system menu bar;
- Click [Config] menu with mouse and enter setting menu bar;
- Click [Touch Calibrate] menu with mouse to bring up Touch Screen Calibration page

2. Calibration with combination key: switch menu and complete Touch Screen Calibration with combination keys provided by instrument. Detailed operating steps are as follows:

- Press 【System/Local】and 【↑】keys simultaneously then a menu in menu bar will be circled by red frame, as shown in Figure 6-15:

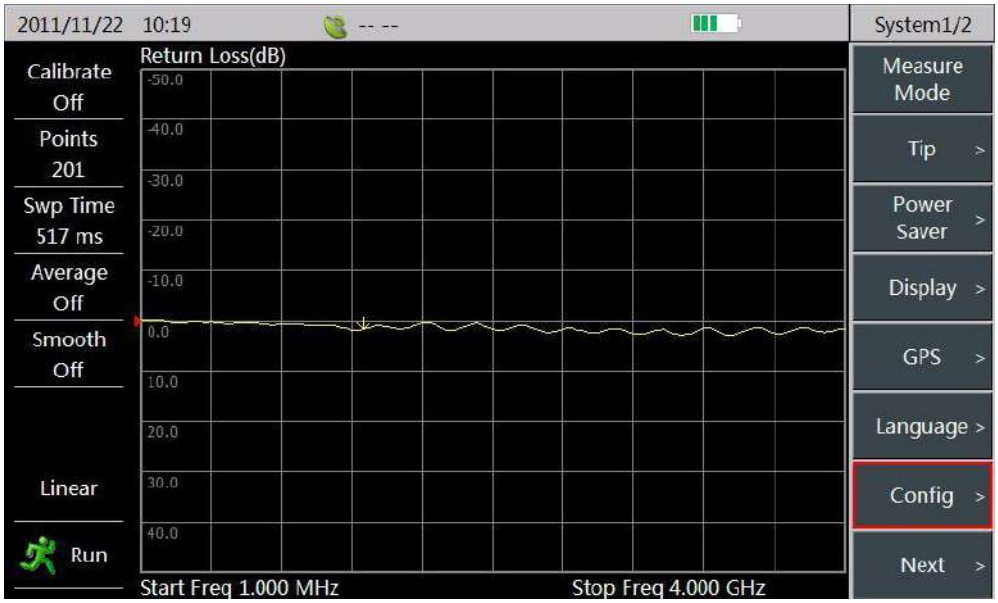


Figure 6-15 Combination Key

- You may switch the menu circled by red frame with【↑】【↓】keys and locate it to [Set] menu. Press【Enter】 key and enter setting menu bar;
- Circle the red frame to [Touch Calibrate] menu according to similar operation in Step 2. Press【Enter】key to bring up calibration page of touch screen.

You may click "+" with sharp pen needle in turn in calibration page. Perform Touch Screen Calibration according to notice on screen. Press 【Enter】key after completing calibration of 5 points. Then calibration is completed.

⚠	**NOTES:**	Do not use too sharp pen needles such as pins, studs etc. when calibrating touch screen to prevent scratching screen; it is recommended to use less sharper objects such as gel pen, ballpoint pen etc. to perform calibration.

6.7.4 Software Update

Internal application software of tester is latest corresponding process when delivered. The software might be upgraded in the future development and maintenance. You may choose to upgrade some software according to your needs. Please contact us in advance if process update is needed. If you already have an upgrade package, you may place it under root directory of external USB memory or SD card, or insert it into external memory (thumb drive etc.) Click [Software Update] menu. Applications software will automatically look up and install upgrade process. Software Update steps are as follows:

- Press【System/Local】key and enter system menu bar;
- Click [Config] menu and enter setting menu bar;
- Click [Update] menu; tester will automatically look up and upgrade software package. Click OK in turn in the following two dialog boxes. Wait until new

processes are automatically installed. Reboot the instrument and run new processes after installation is completed.

6.7.5 Management

Management function of tester provides interfaces for application process, function debugging, and signal passageway indicators checking. They are not open to users. Therefore, we encrypt to [Manage] menu to prevent unnecessary system errors occurred by misoperation of users. No more tautology here.

6.8 Serial No.

Serial No. mainly displays edition and serial number of each element of current tester directly to users. Please refer to 6.7.4 to upgrade when new editions are released. Operating steps of checking Edition Serial No. are as below:

- Press 【System/Local】key and enter system menu bar;
- Click [Next] menu and enter the second page of system menu bar;
- Click [Info] menu to call up dialog box of “Info”. You may check edition information such as instrument product model, serial number, and FPGA and application process in this dialog box. As shown in the following figure:

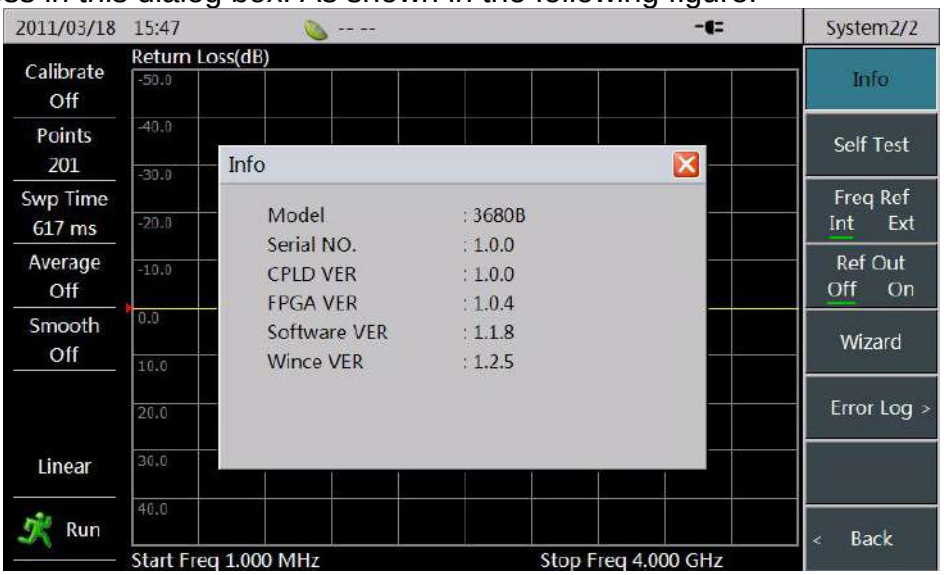


Figure 6-16 Edition Serial No. Check

6.9 Self-test

Tester will perform testing over each functional component by running a series of testing processes to make sure the instrument runs properly. You may also check current status via [Self test]. Please contact us if self-test does not pass. Contact information is provided in 1.3. Operating steps of running self-test are as below:

- Press 【System/Local】key and enter system menu bar;
- Click [Next] menu and enter the second page of system menu bar;
- Click [Self test] menu to call up a selection dialog box of “Self test”; in this dialog box, you may check self-test results of each item such as EEPROM, FPGA, CPLD, internal temperature and power supplying condition etc. As shown in Figure 6-17:

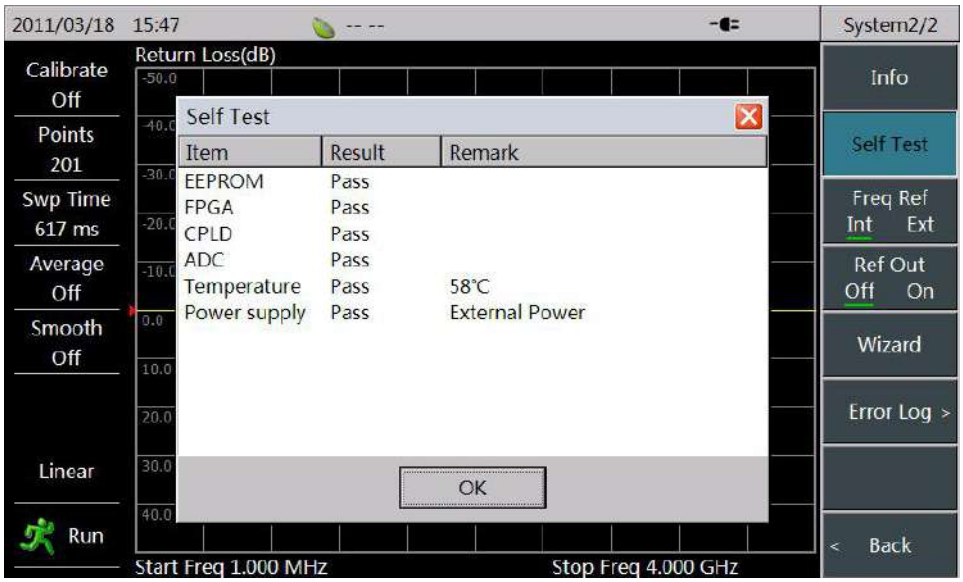


Figure 6-17 Self-test of Instrument

6.10 Frequency Reference (10MHz)

3680A/B Cable & Antenna Feeder Tester provides input/output interface for 10MHz reference clock. You may use tester to provide 10MHz reference clock for other testers. You may also use external 10MHz clock for this instrument. Operating steps of 10MHz reference clock input/output function are as below:

- Press 【System/Local】key and enter system menu bar;
- Click [Next] menu and enter the second page of system menu;
- Click [Freq Ref Int Ext] menu on system menu; tester utilizes self-produced 10MHz clock reference when displayed as [Freq Ref Int Ext]; you may need to connect external 10MHz clock reference through port to make tester run properly.

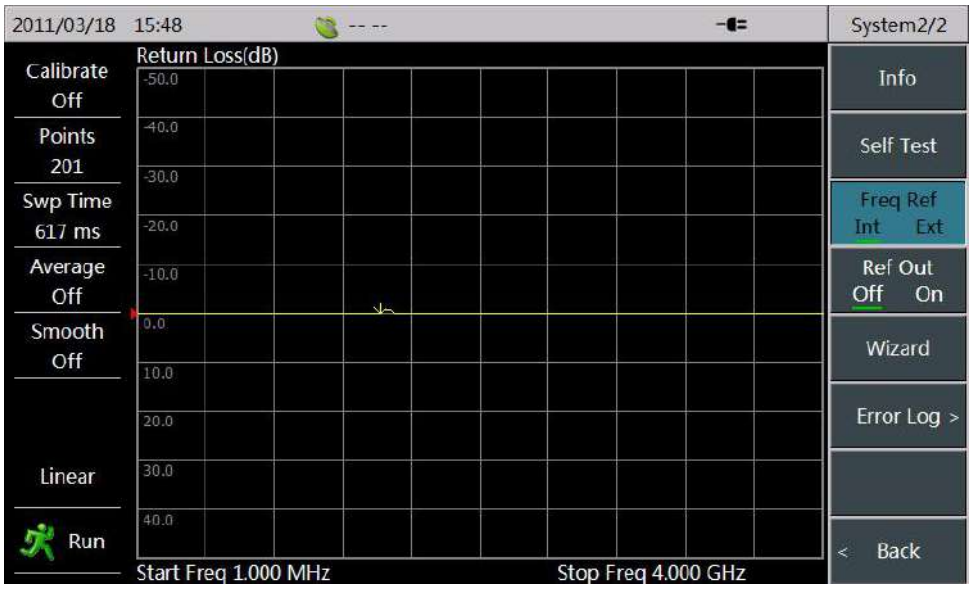


Figure 6-18 10MHz Reference Internal and External Input

- When Frequency Reference is as [Freq ref Int Ext], 10MHz reference clock can be externally output via 10MHz port. Click [Ref Output Off On] menu on system menu. 10MHz clock reference outputs externally through port when it is displayed as [Ref Output Off On]. Tester can provide 10MHz clock reference for other testing equipment.

6.11 Measurement Guide

3680A/B Cable & Antenna Feeder Tester provides measurement guide function (This function is not applicable under power meter measurement mode.) for faster and more convenient master of basic operation of several measurement format. You may get the knowledge of basic measurement setting etc. of measurement with the three basic measurement types provided in measurement guide. Steps of entering measurement guide function are as follows:

- Press 【System/Local】key and enter system menu bar;
- Click [Next] menu and enter the second page of system menu bar;

- Click [Wizaard] menu to bring up “Wizard” on the top of plot area;
- You may select measurement mode you need to know on element brought up and click “OK” key to check its measurement process. As shown in Figure 6-19:

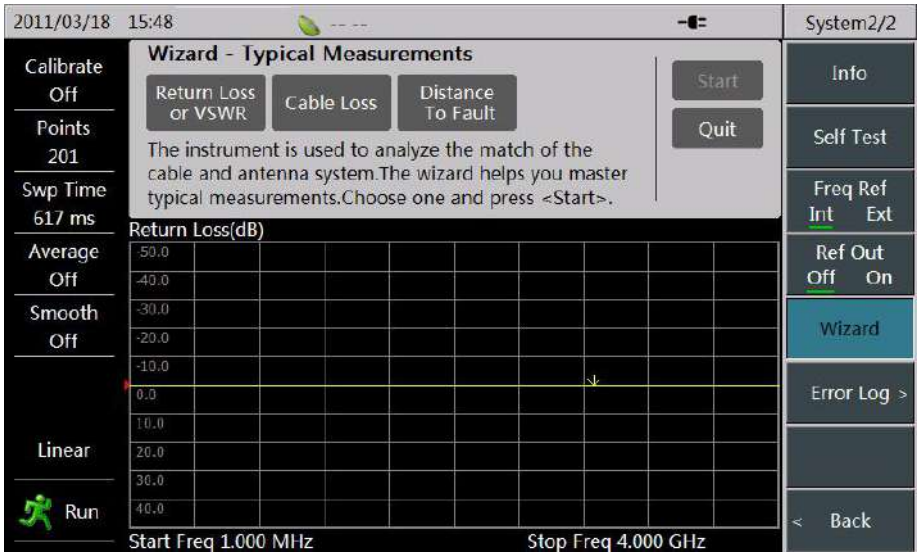
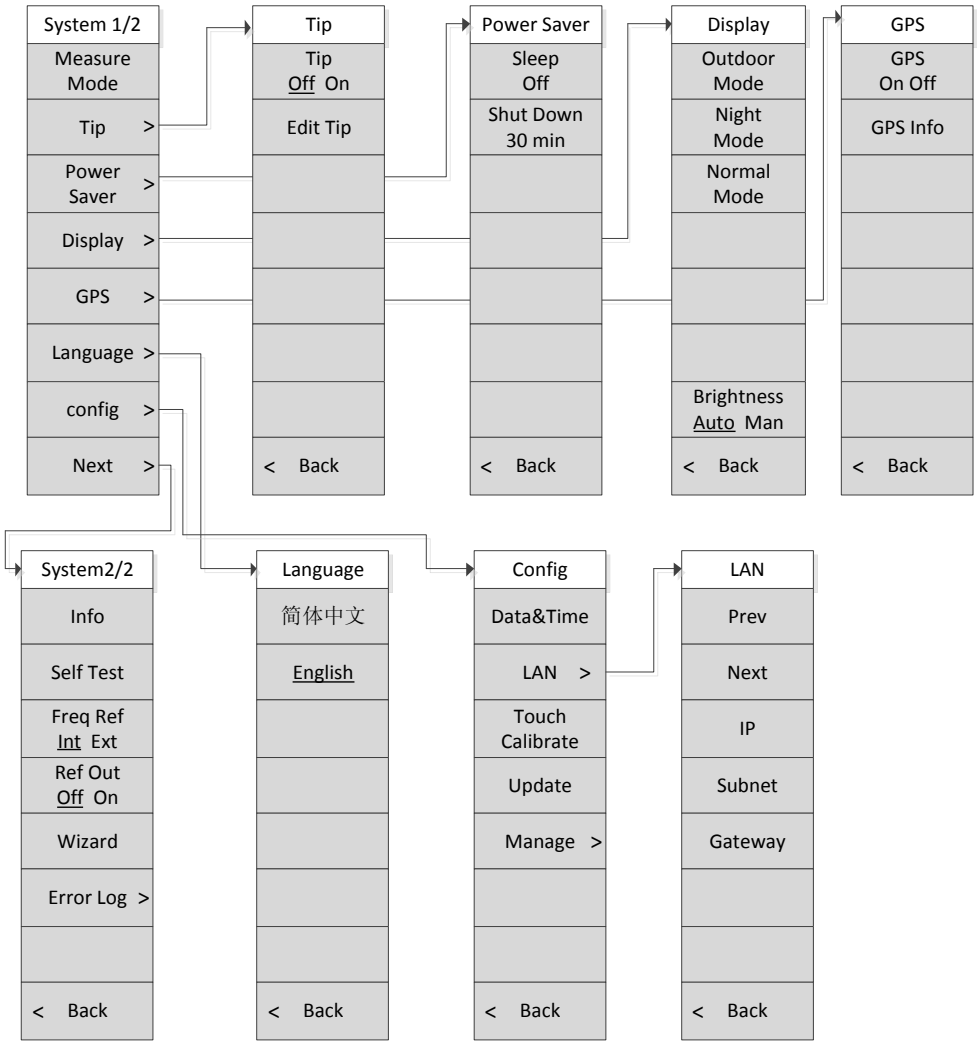


Figure 6-19 Measurement Guide

6.12 Menu Structure


System 1/2
Measure Mode
Tip >
Power Saver >
Display >
GPS >
Language >
config >
Next >
Tip
Tip Off On
Edit Tip
< Back
Power Saver
Sleep Off
Shut Down 30 min
< Back
Display
Outdoor Mode
Night Mode
Normal Mode
Brightness Auto Man
< Back
GPS
GPS On Off
GPS Info
< Back
System2/2
Info
Self Test
Freq Ref Int Ext
Ref Out Off On
Wizard
Error Log >
< Back
Language
简体中文
English
< Back
Config
Data&Time
LAN >
Touch Calibrate
Update
Manage >
< Back
LAN
Prev
Next
IP
Subnet
Gateway
< Back

Chapter VII Software Toolkit

7.1 Software Description

The software toolkit of 3680A/B Cable & Antenna Feeder Tester is mainly applied to control 3680A/B through computer, and realize reading, saving and comparing of the curve. All of those are convenient for operators to analyze the remote data, and for analyzers to monitor and maintain system effectively on PC.

Software toolkit of 3680A/B Cable & Antenna Feeder Tester mainly provides the following functions:

- Recall the curve, open the curve data files stored in PC or within the instrument, which are displayed as graphs;
- Collect the curves, gather the sweeping curves of 3680A/B in real time;
- Save the current acquisition curve to the PC;
- Curve comparison and operation;
- Set the parameters, such as frequency, sweeping points, measuring format, DTF parameters, etc.

Requirements on system configuration of the computer:

- Processor of Inter Pentium 4 or higher
- Operating system of Window2000/xp
- Memory of 512 Mbytes
- Hard-disk space of 500Mbytes
- USB or LAN interface

7.2 Instructions for Use

7.2.1 Communication Connection

Connect the device to computer with USB or network cables, and select the communication mode once the software is started. Click the【Remote Ctrl】key as shown in Figure 7-1, and then select the【USB】or 【LAN】 check box in the【Communication】group. If the【LAN】network communication is selected, it needs IP address of the specified equipment, with the method: click the【IP】key to pop up an IP dialog box as shown in Figure 7-2, and then input IP address of instrument, press the “OK” key to complete input of the specified IP.

Figure 7-1【COMMUNICATION INTERFACE】 Group

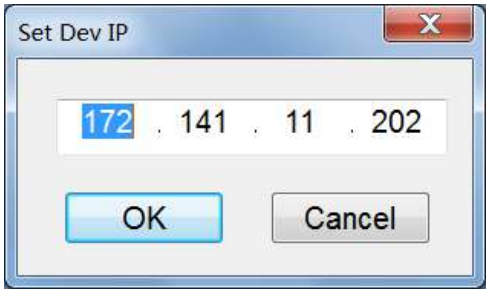


Figure 7-2 IP Address Dialog Box

After the communication interface has been selected, click【Connect】as shown in Figure 7-1. If this key becomes into 【Discon】, it means that the instrument has been successfully connected, as shown in Figure 7-3.

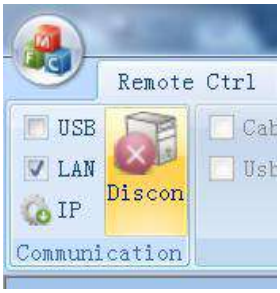


Figure 7-3 Change of the Key after Successful Connection

7.2.2 Trace Collection & Storage

Trace collection refers to gather the test curves of 3680A/B in real time, which are then displayed in window of the software toolkit. Click the 【Remote Ctrl】tab, and then select the【Start】key in the【Trace Capture】group to start to collect traces, as shown in Figure 7-4. Software will display the trace collection window with title of “Trace Capture”, and then the【Start】key become into 【Stop】, as shown in Figure 7-5.

Figure 7-4 【TRACE COLLECTION】 Group

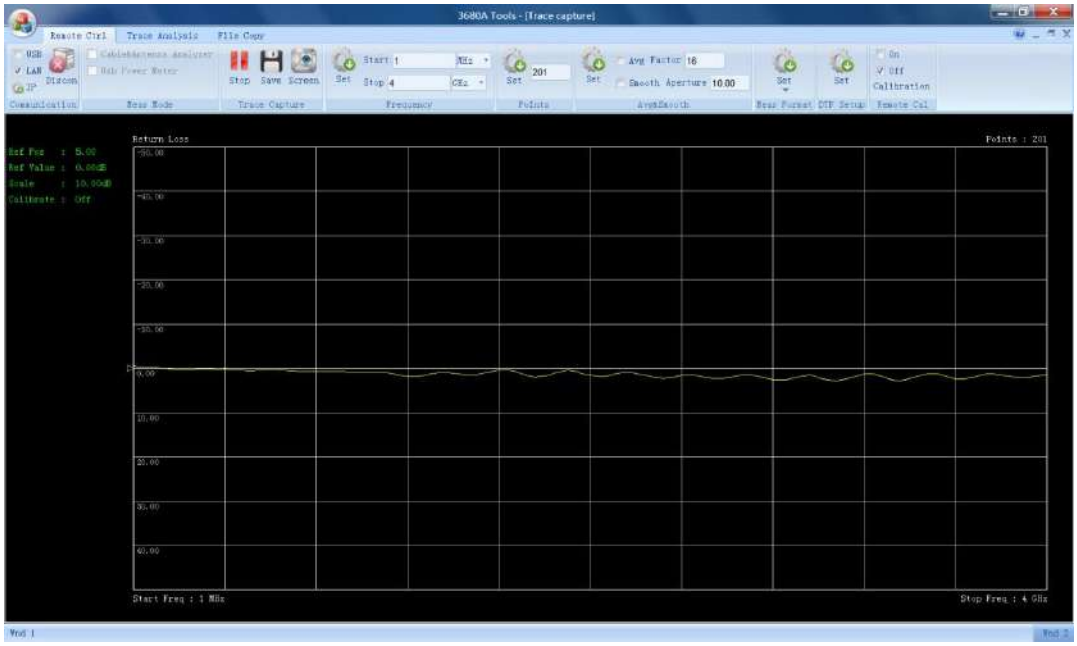


Figure 7-5 Trace Capture Window

Click the【Stop】key, or directly close the trace collection window to stop the collection.

【Save】can realize the storage of the collected current trace data. Click this key, and then select the destination folder and input the file name in the popped-up dialog box of “Save As…”. After that, click the “Save” key to save this trace in “.tra” format.

“Remote Screen Capture”can realize screenshot towards the display interface of instrument. Click this key, and then select the destination folder and input the file name in the popped-up dialog box of “Save as…”. After that, click the “Save” key to save this screenshot in “.jpg” format.

7.2.3 Setting of Sweeping Parameters

Parameters which can be set include sweep frequency, points, average/smooth set, measuring format, DTF parameters, etc. Click the 【Remote Ctrl】tab, the parameter setting area contains 【Frequency】, 【Points】, 【Avg&Smooth】, 【Meas Format】, 【DTF】and so on, as shown in Figure 7-6.

Figure 7-6Parameter Setting Column

The method of setting is shown as follows:

- Input the start and stop frequency values in the【Frequency】group and select units for them, and then click the【Set】key to set the frequency.
- Input points in the【Points】group, and then click the【Set】key to set the points.
- In the【Avg&Smooth】group, click the【Avg】check box to open or close the average; similarly, click the【Smooth】check box to open or close the smoothness. Input the average factor and smooth aperture, and then click【Set】to set them.
- In the【Meas Format】group, click【Set】to pop up the measuring format menu, as shown in Figure 7-7. After that, click the format menu you need to finish setting.

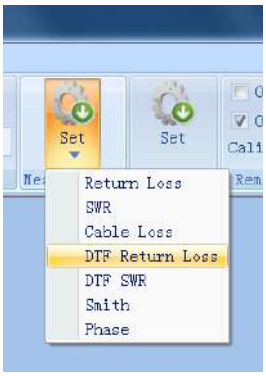


Figure 7-7 Measurement Format Set

- In the【DTF】group, click【Set】to pop up the dialog box of “DTF Setting”, as shown in Figure 7-8, and input the corresponding parameters and then press the【OK】key to finish the setting.

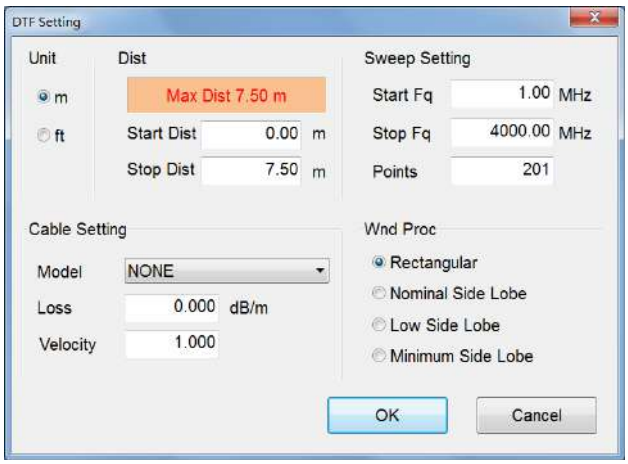


Figure 7-8 Dialog Box of DTF Parameter Setting

7.2.4 Remote Calibration

Remote calibration refers to control the mechanical calibration of instrument by computer. Click the 【Remote Ctrl】tab, and then select【Calibration】in the【Remote Cal】group to pop up the dialog box of “Calibrate”. Operating procedures of remote calibration are shown as follows:

1. In the “Set Cal Kit” column of the dialog box, click the corresponding key to select model of calibration kit;
2. Connect the “Open Circuit” of calibration kit to test port of instrument, after that, click the【OPEN】key in the dialog box. After the open circuit has been tested, the key text will be marked with green underline;
3. Complete the test of short circuit and load by referring to Step 2;
4. After all calibration standards have been tested, the【Finish】key in the dialog box will become into normal state. And then press this key to close the dialog box to complete the calibration.

Figure 7-9【Remote Cal】 Group

Figure 7-10 Dialog Box of “Calibrate

7.2.5 Trace Analysis

Trace analysis mainly realizes functions such as the reading of measured values, details observation of trace, trace operations, etc. As for trace analysis function, click the【Trace Analysis】tab, which includes【File】,【Scale】,【Enlarge Drawing】, 【Trace Math】and【Marker】, as shown in Figure 7-11.

Figure 7-11 Trace Analysis Tab

1. Read the trace

Click the【Read】key to pop up the drop-down menu, which includes “Local Trace File” and “Dev Trace File”, as shown in Figure 7-12.

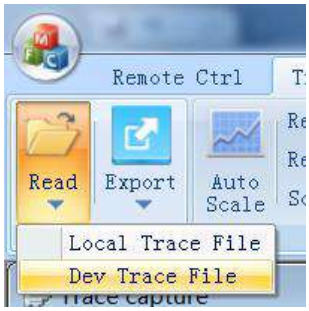


Figure 7-12【File】Group

“Local Trace File” is used for opening the trace files in the computer. Click this menu item to pop up the dialog box of “Open trace file”, as shown in Figure 7-13, and then select the trace file which you want to open. After that, click【OPEN】 and the selected trace will be displayed in the trace window of software.

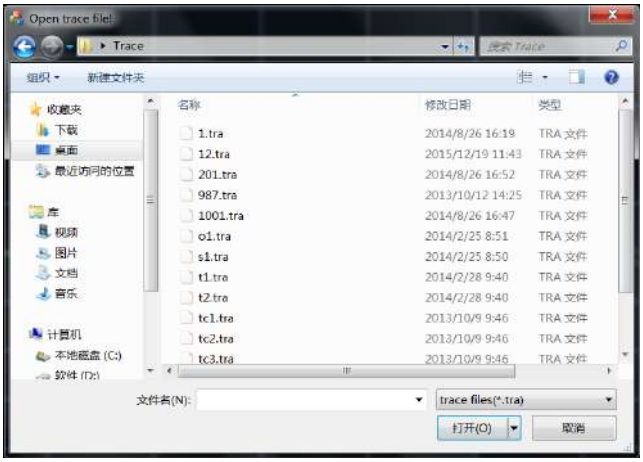


Figure 7-13 Dialog Box of “Open trace file”

“Dev Trace File” is used for opening the trace files stored in the file. Click this menu item to pop up the dialog box of “Open Dev Trace File”, as shown in Figure 7-14. This dialog box displays the trace file list stored in the instrument, select the file and then click the【OPEN】key to open this file on the computer.

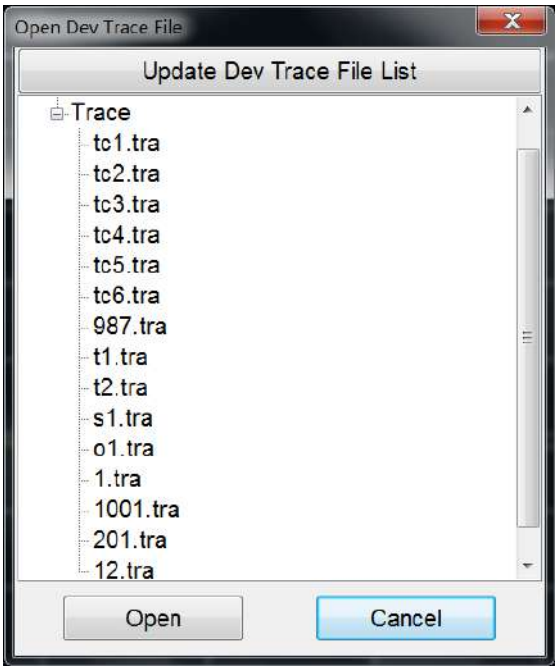


Figure 7-14 Dialog Box of “Open Dev Trace File”

2. Set the Ruler

Ruler of trace window can be set in the【Scale】group, which include reference position, reference value and scale. You can also click【Auto Scale】, then software will automatically adjust the ruler according to the measured maximum and minimum.

3. Magnify the Drawing

Drawing magnification is used for observing the details of trace. The【Enlarger Drawing】group includes two keys:【Enlarge】and【Restore】, as shown in Figure 7-16. Click 【Enlarge】, this key becomes highlighted, which means trace can be magnified through dragging mouse, as shown in Figure 7-15. After magnification, the trace can be restored to the unmagnified state by clicking the【Restore】key.

Figure 7-15 【Enlarge Drawing】 Group

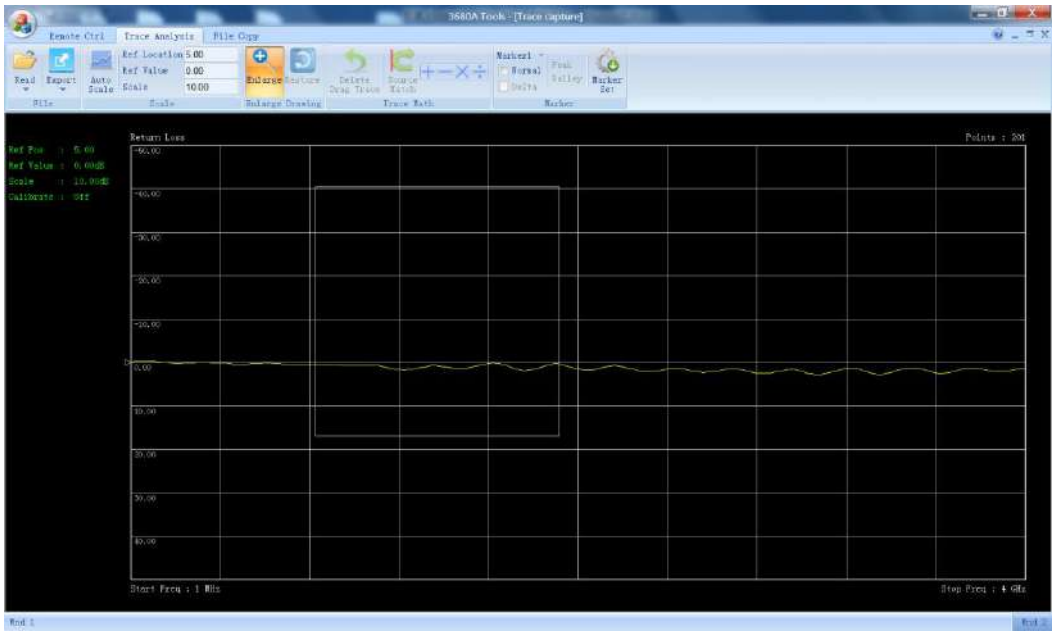


Figure 7-16 Use of Drawing Magnification Function

4. Trace Operation

Trace operation needs to be carried out between two traces. When using this function, it needs to open two trace files, and then drag your mouse in a trace window to another one in order to make two traces stay within the same window, as shown in Figure 7-17.

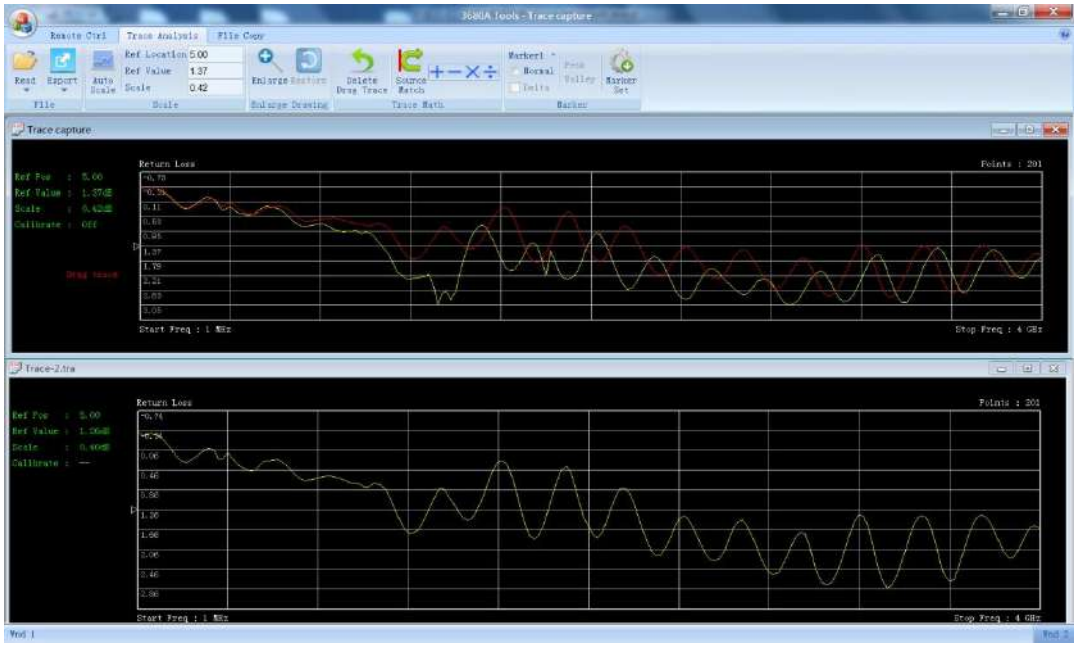


Figure 7-17 Diagrams for Dragging the Trace

In the Figure 7-17, the trace in the top window is dragged into the bottom window, and displayed as red curve. The dragged-in trace can be deleted by clicking the 【Delete Drag Trace】key.

After the trace is dragged in (or when the trace is directly deleted), it can calculate the two traces in the top window in the Figure 7-17: make the top window activated, and click the addition, subtraction, multiplication, and division keys in the【Trace Math】group to realize the corresponding operation, with calculation result displayed as blue curve, as shown in Figure 7-18.

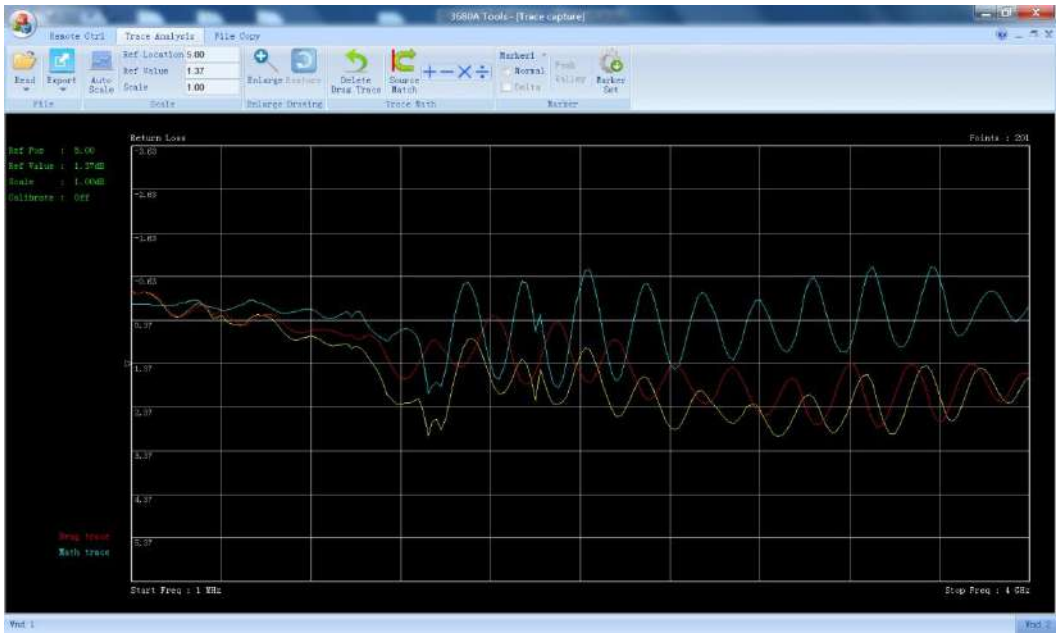


Figure 7-18 Trace Math Diagram

5. Marker Function

Marker function is used for reading the measuring values on the trace, with 6 groups of markers in total provided by the instrument. The【Marker】group includes three groups of keys: left key is used for selecting the current marker and opening and closing the marker; two keys in the middle are used for setting the current marker at extreme value; as for the right【Marker Set】, click it to edit the marker position or conduct the local extreme value searching function in the popped-up dialog box of “Marker Setting”. After the marker is opened, the marker can also be moved by dragging the mouse or pressing the arrow keys.

Figure 7-19 【Marker】Group

7.2.6 File Transfer

File transfer function is used for copying the internal documents of instrument to the computer, including the state, trace and image files. Click the【File Copy】tab, as shown in Figure 7-20, and then select【Copy Dev File】in the【Copy File】group to pop up the dialog box of copying the device files, as shown in Figure 7-21. This dialog box lists the files can be copied inside of the device. Select the file, and the click the【Copy】key to pop up the dialog box of “Save as…”. After that, select the storage path, and click “Save” to store the file.

Figure 7-20 【FILE TRANS】 Tab

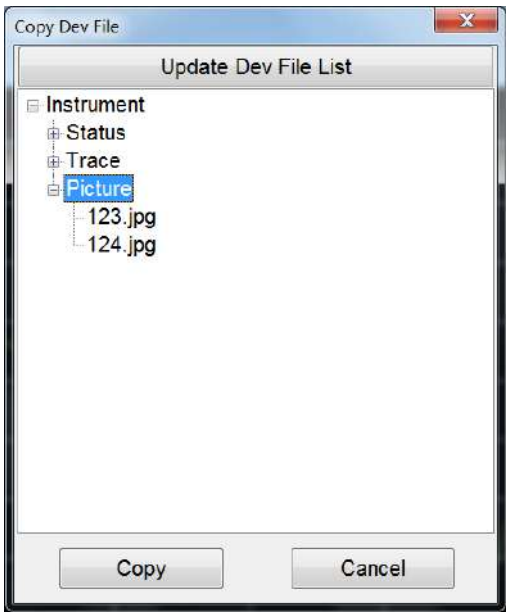


Figure 7-21 Dialog Box of Copy Document

7.2.7 Check the Software Version

Click the “About” key, namely question mark key, in the upper right corner of the software to check its version and copyright information, as shown in Figure 7-22.

Figure 7-22 Key of “About”

7.2.8 Drawing Printing

Software toolkit provides the printing function for trace window activated currently. Click the “Recent List” key in the upper left corner of the software, to select the Printing Setting and Print in the drop-down list, as shown in Figure 7-23.

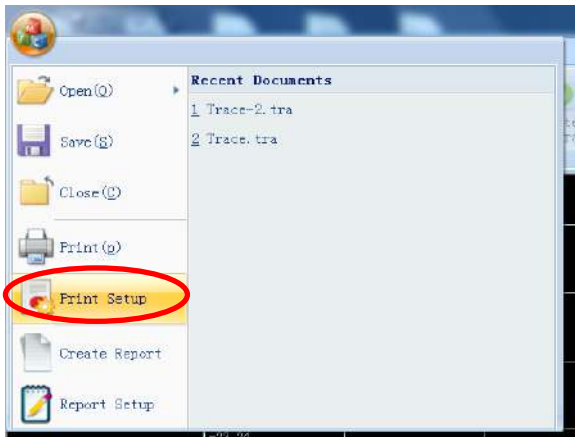


Figure 7-23 Key of Printing Function

7.2.9 Generate the Test Report

Software toolkit can generate the test reports in “pdf” format, which include some common items besides the drawing of current trace window. Click the “Recent List” key in the upper left corner of software, to select the Report Setting and Report Generation in the drop-down list, as shown in Figure 7-24. The display and content of report item can be set through the dialog box of “Report”, as shown in Figure 7-25.

Figure 7-24 “Create Report” Function

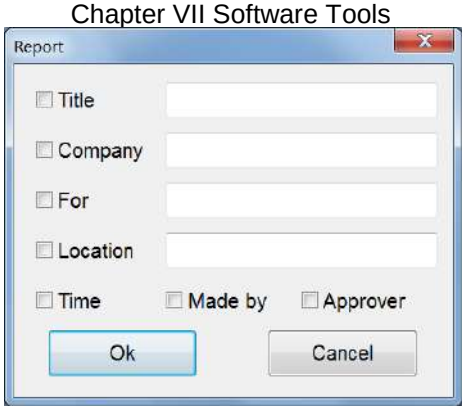


Figure 7-25 Dialog Box of “Report Setup”

Appendix I: Instructions for Basic Measuring Formats

This section makes a detailed introduction on measurement procedures of three basic measuring formats during operation of 3680A/B Cable & Antenna Feeder Tester. Before that, we would like to give you a reminder for the connection of test port at first. When 3680A/B is used for testing, there needs frequent screwing for calibration kit and DUT, regardless of what kind of test format is measured. You must pay a lot of attention to avoid twisting the calibration kit or DUT too loose or tight also. If calibration kit is screwed too loose, it may cause errors of calibration data; similarly, for DUT, if DUT is vibrated or bumped, they may reduce accuracy of the measurement. On the contrary, if the calibration kit or DUT is screwed too tight, it may cause permanent damage to test port of tester (port 1, hereinafter referred to as test port) and port of calibration kit.

1. Return Loss/VSWR Measurement

Return Loss and VSWR tests all reflect the matching degree of system, but only in different ways. Among which, return loss reflects the matching degree through the ratio of reflected energy and reference energy. To pursue a more legible matching degree, it usually evaluates the logarithm of this ratio. As different cables or antenna systems have different standards on return loss, generally speaking, the return loss of cable or antenna system shall be greater than 15dB, that is, the reflected energy is less than 3% of the reference energy.

VSWR measures the matching degree of system by the ratio of voltage peak and its valley. If the matching degree of system is not good, peak value and valley value of the reflected signal show a large fluctuation comparing to the curve of transmission signal. What's more, the larger the fluctuation is, the worse the matching degree will be. Under the VSWR measurement mode, ideal VSWR of cable or antenna system shall be 1:1, but during practical applications it is generally believed that the system VSWR which is less than 1.43: 1 (return loss is 15dB) can be accepted.

In practical application process, the return loss/VSWR is measured by the following two kinds of connections in general, as shown in Figure 1-1. Users can test SUT, DUT and BSS through the first kind of connection; the test on return loss of cable is carried out through the second test mode. For the measurement procedures of return loss/ VSWR, detailed description for measurement procedures of VSWR will been given later.

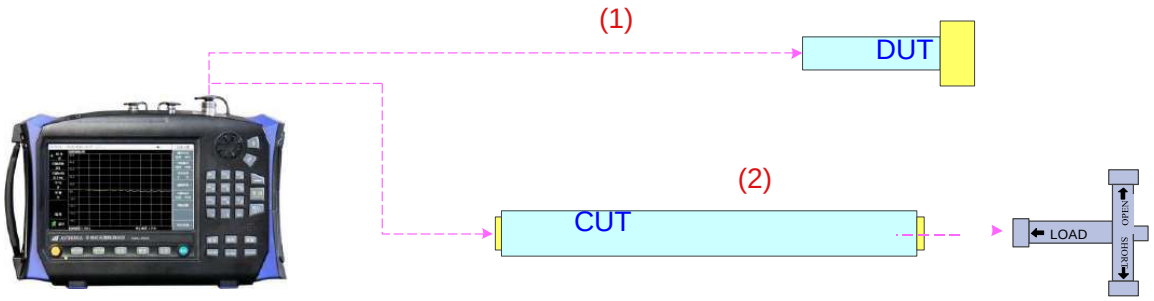


Figure 1-1 Connection Type for Return Loss/ VSWR Measurement

1.1 Measurement Procedures

Then measurement procedures of return loss are same as VSWR, which will be specified by measurement procedures of return loss below:

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

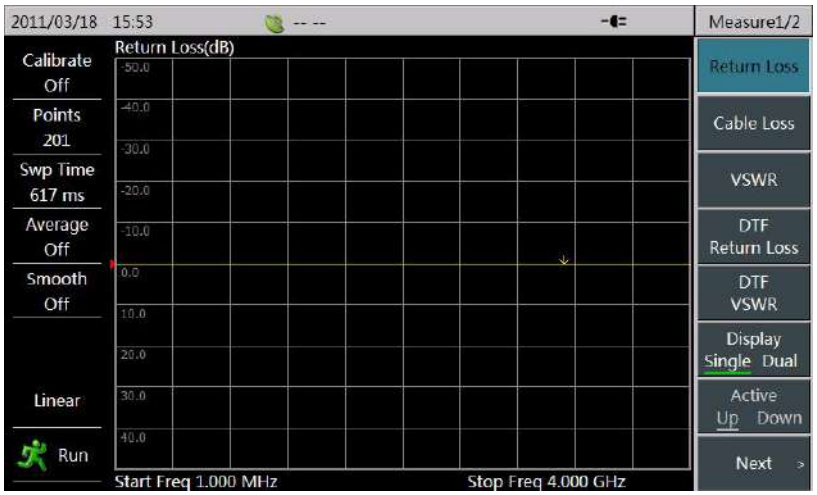


Figure 1-2 Measuring format Select

3) Press 【Freq】 to enter the frequency menu bar;
4) 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;
5) Similar to Step 4), complete the input of stop frequency value when the measurement is finished. Return loss is the loss matching degree of DUT at each frequency point of the entire frequency band, which can be set by user according to operating frequency of the measured cable or DUT when being tested. This test adopts the default frequency range of 1MHz ~ 4GHz to test the DUT.
6) Press 【Cal】 to enter the calibration menu;
7) Select [Cal Kit] menu, then choose the matched model of calibration kit from “Select Cal Kit” list popped up in the screen, and select the “OK” key or 【Enter】 to finish the calibration kit selection, as shown in Figure 1-3:

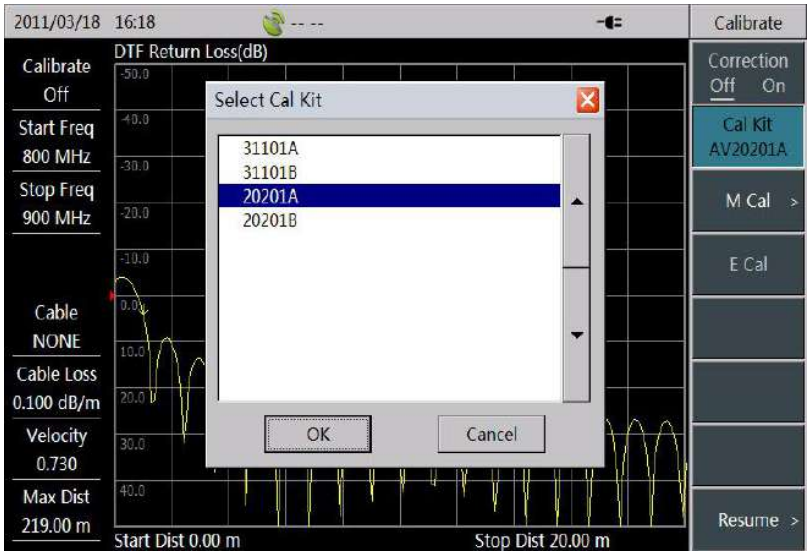


Figure 1-3 Calibration Kit Model Select

8) Select [M Cal] menu to calibrate the tester according to the calibration process described in 3.2.3. Specific mechanical calibration procedure is as follows:

- Following by screen tips, connect the open circuit to the test port and select the [Open] menu. At this time, the screen will automatically prompt "[OPEN]Measuring……". When the [Open] menu becomes into [Open], it indicates the completion of the open circuit calibration, and then connect the calibration kit to calibrate other items according to screen tips. After [M Cal] is selected, tester's software will give calibration prompt instructions, as shown in Figure 1-4.

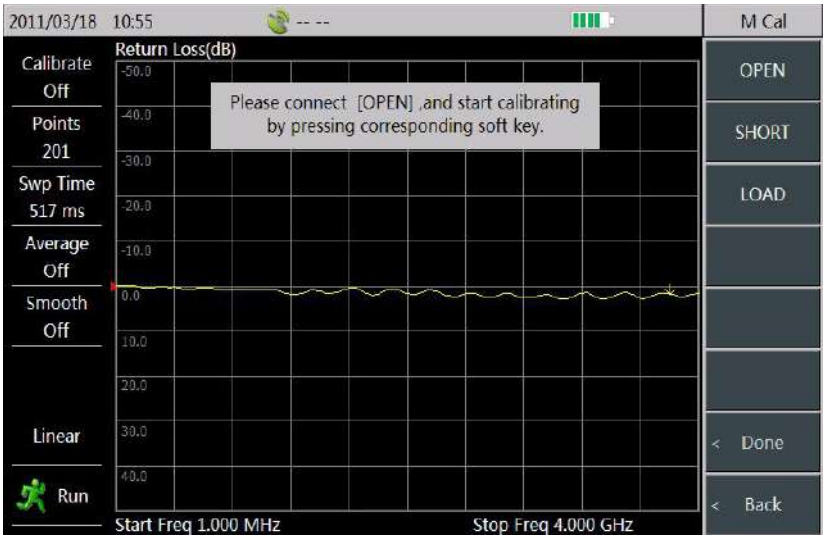


Figure 1-4 Mechanical Calibration Prompt

- Following by screen tips, connect the short circuit to the test port and select the [Short] menu. At this time, the screen will automatically prompt "[SHORT]Measuring……". When the [SHORT] menu becomes into [SHORT], it indicates the completion of the short circuit calibration, and then connect the calibration kit to calibrate other items according to screen tips. Figure 1-5 shows the short circuit is in the process of calibration and measurement.

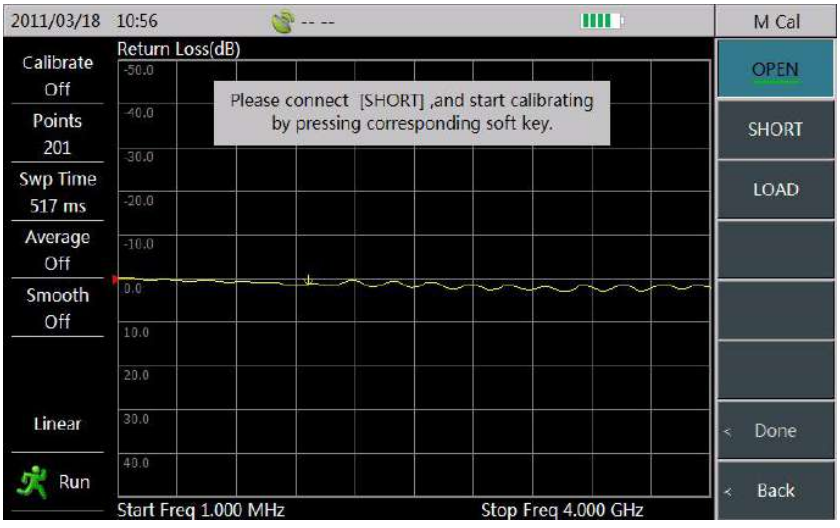


Figure 1-5 Short Circuit Calibration and Measurement

- Following by screen tips, connect the load to the test port. Then, select the [Load] menu, at this time, the screen will automatically prompt "[LOAD]Measuring……". When the [LOAD] menu becomes into [LOAD], it indicates completion of the load calibration, as shown in Figure 1-6. At this moment, select the [DONE] menu to finish the mechanical calibration process.

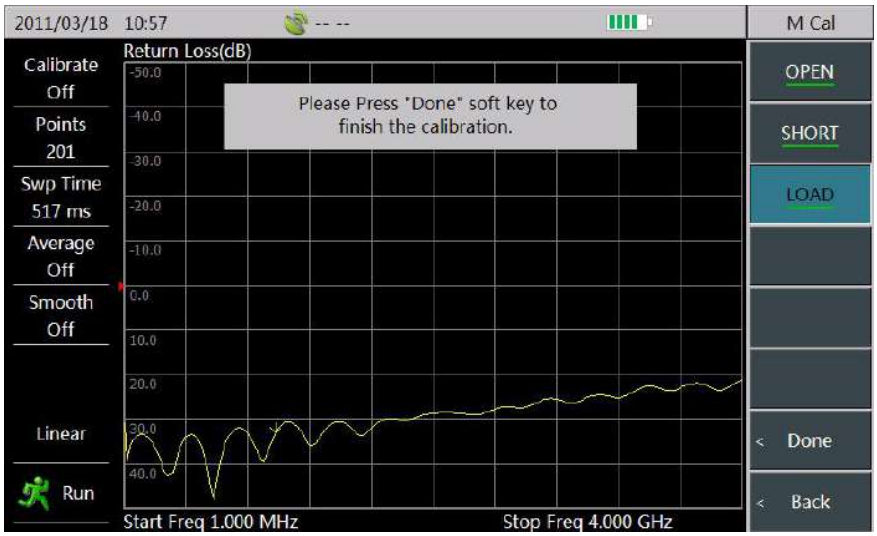


Figure 1-6 Calibration Completion

9) After the calibration, the cable to be measured can be connected to the instrument for test, with connection type as shown in Figure 1-7. This test case is carried out by connecting 50Ω load to the cable to be measured.

Figure 1-7 Connection Diagram for Return Loss Test of Cable

1.2 Test Skills

As there have given a detailed description to the test steps in the last section for return loss/ VSWR, this part will make a brief introduction on some test skills.

1) According to the operating steps in Section 1.1, the measured return loss curve can be observed in screen of the instrument. In order to observe the details of the return loss curve more clearly, user can press 【Ampt】, and then click [Top] and [Bottom] menu in the menu bar to set the amplitude value displayed in the screen, or directly select the [Auto Scale] adjustment to set the value, as shown in Figure 1-8 and 1-9:

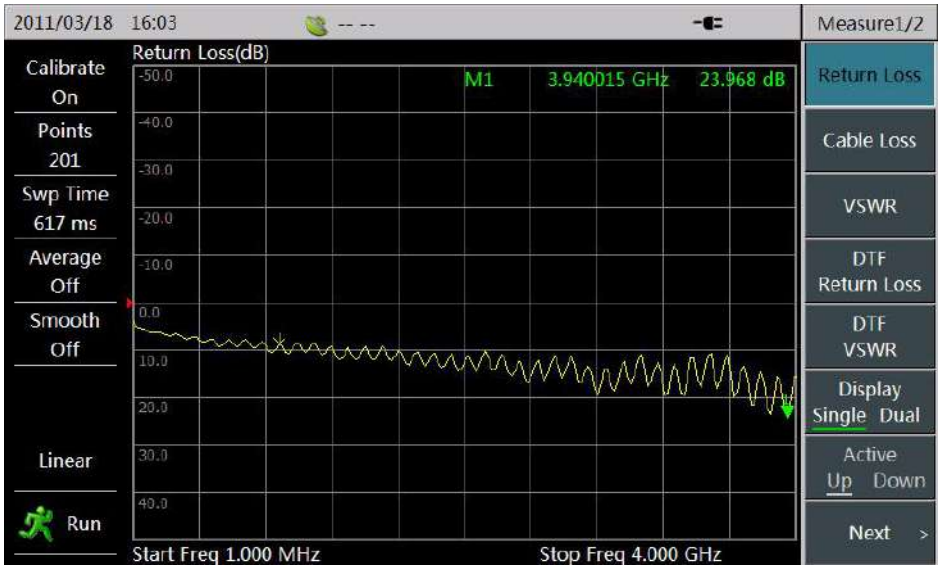


Figure 1-8 Return Loss Curve under Default Scale

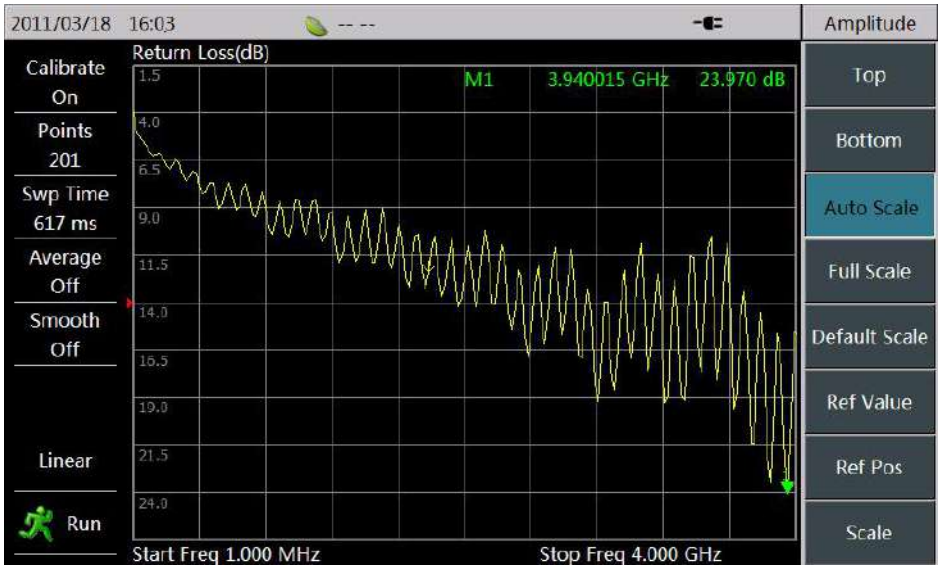


Figure 1-9 Return Loss Curve after Automatic Ratio Adjustment

2) During the mechanical calibration process in Step 8 of Section 1.1, the calibration is carried out in order of open circuit, short circuit and load. There is no sequence for calibration process in practice, so that user can carry out the calibration in any sequence. After those calibration items above have been finished, click [Done] to end the calibration.

3) After the return loss curve has been obtained through measurement, user can mark the measured peak (matching the worst case) by 【Marker】. Generally, the match in the antenna feeder system, whose return loss is greater than 15dB or VSWR is less than 1.43, is regarded as the normal match. The maximum of return loss in this case is 20.84dB as shown in Figure 1-10, thus the return loss of cable therefore is qualified.

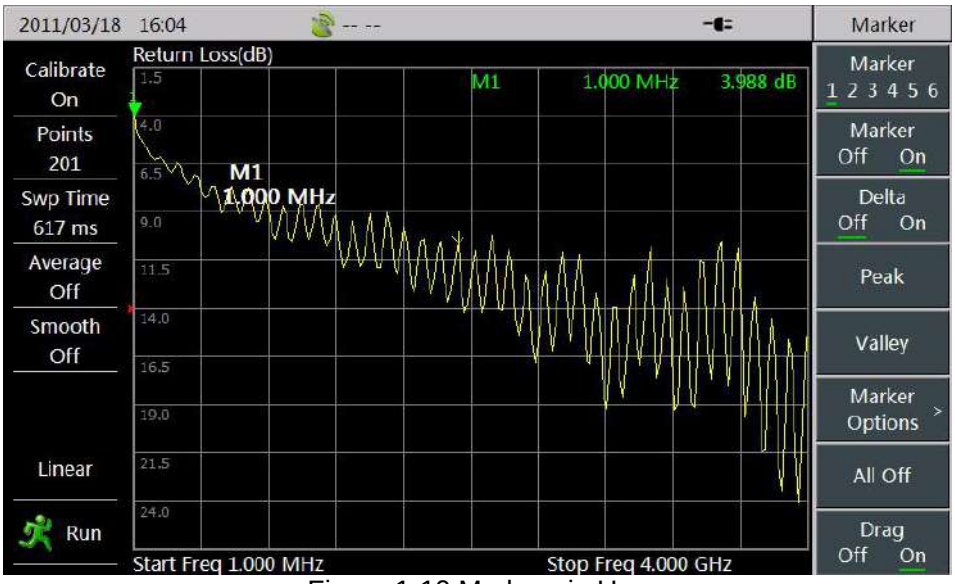


Figure 1-10 Markers in Use

4) In the industrial batch test, users can refer to the eligibility criteria of their own company, and then set limit line of return loss through【Limit】function of the tester. 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. In order to reduce the editing process of limit line, users can also save the limit line for future direct recalling when measuring the same products. Limit line in Figure 1-11 has been edited.

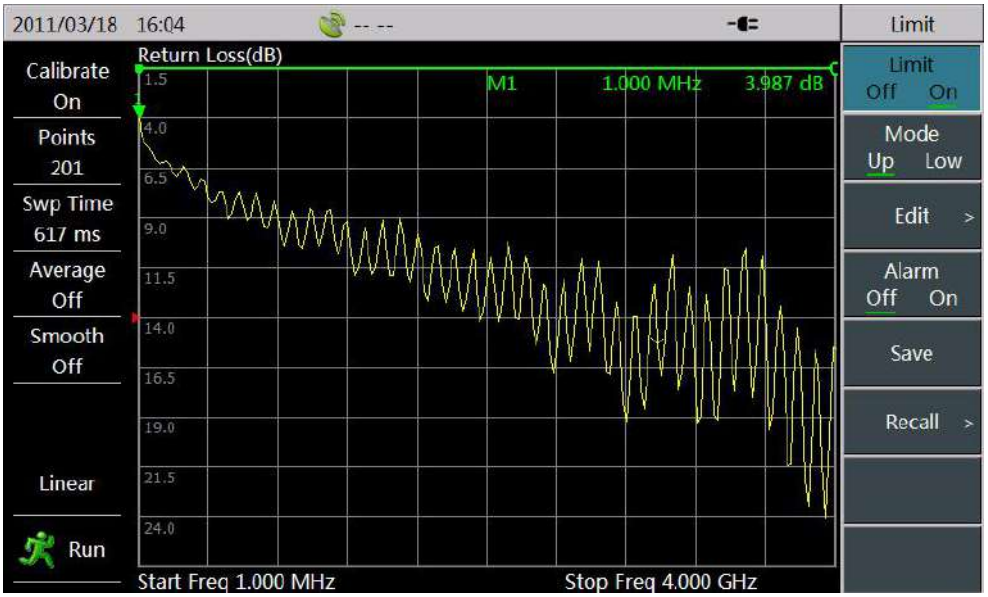


Figure 1-11 Limit Line in Use

In addition, the tester 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, Tester will raise a “beep ... beep” alarm, through which users can judge that the measured cable is disqualified; if not, the cable is qualified.

Figure 1-12 Alarm for Limit Line When Overstepping the Boundary

5) During the test, if DUT is found disqualified, user can save its trace and status via 【Save/Recall】function for its subsequent analysis.

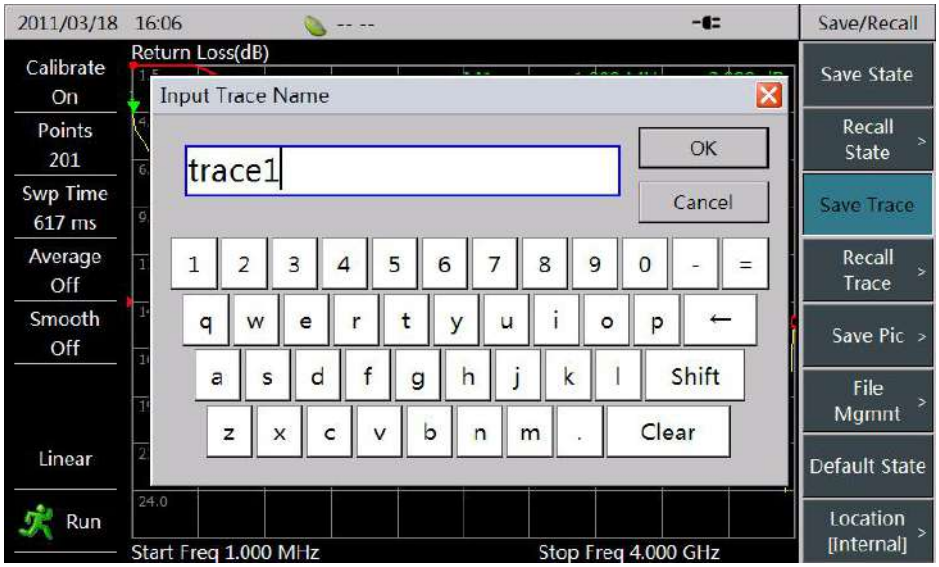


Figure 1-13 Return Loss Curve Measured Store

2. Cable Loss Measurement

Cable loss refers to the energy loss generated when signals go through the transmission line or components on the cable in the process of transmission. Cable loss measurement is generally used in equipment installation phase, in order to ensure the efficiency of signal transmission.

Cable loss measurement reflects the consumption of energy transmission by cable. It can calculate the loss of signal in the transmission line through reflected signal and outgoing signal power. Cable loss measured by the test device is generally represented with average loss, namely peak and valley values over the entire measurement frequency range. In addition, the increase of length and radio frequency will extend the insertion loss of cable; insertion loss of the cable with a large diameter is lower than that with a small diameter, and has a better energy transmission capacity.

In the course of practical application, the cable loss is usually measured in the following connection type, as shown in Figure 2-1. The measurement procedures of cable loss will be given a detailed description later.

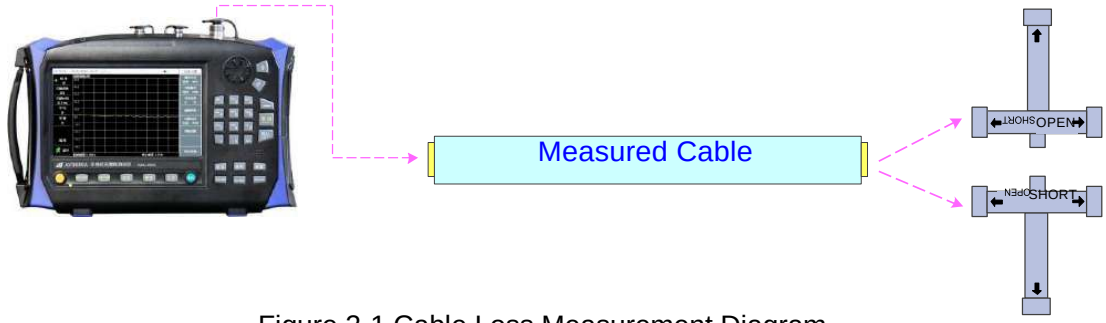


Figure 2-1 Cable Loss Measurement Diagram

2.1 Measurement Procedures

Specific operating steps of cable loss test that carried out by the 3680A/B Cable & Antenna Feeder Tester are shown as follows:

1) Press 【Meas】 to enter measurement menu;
2) Select [Cable Loss] menu to set the current measuring format of instrument as “Cable Loss”, as shown in Figure 2-2:

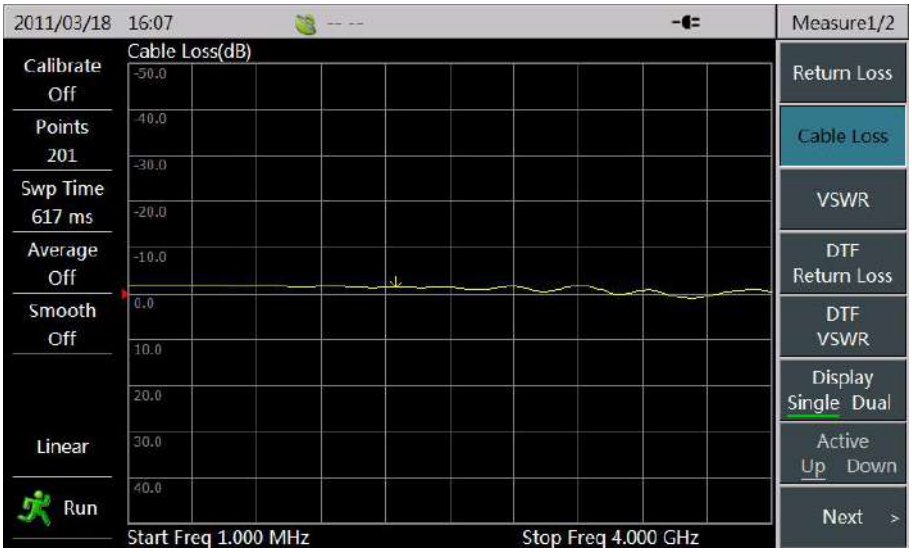


Figure 2-2 Measuring format Select

3) Press 【Freq】 to enter the frequency menu bar;
4) 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;
5) Similar to Step d), stop to input the stop frequency value when the measurement is stopped. Cable loss is the loss degree of the measured cable at each frequency point of the entire frequency band, which can be set by user according to operating frequency of the measured cable or DUT when being tested. This test adopts the default frequency range of 1MHz ~ 4GHz to test the DUT.
6) Press 【Cal】 to enter the menu bar.
7) Click [Cal Kit] menu, then choose the matched model of calibration kit from "Select Cal Kit" list popped up in the screen, and select the "OK" key or 【Enter】 to finish the calibration kit selection, as shown in Figure 2-3:

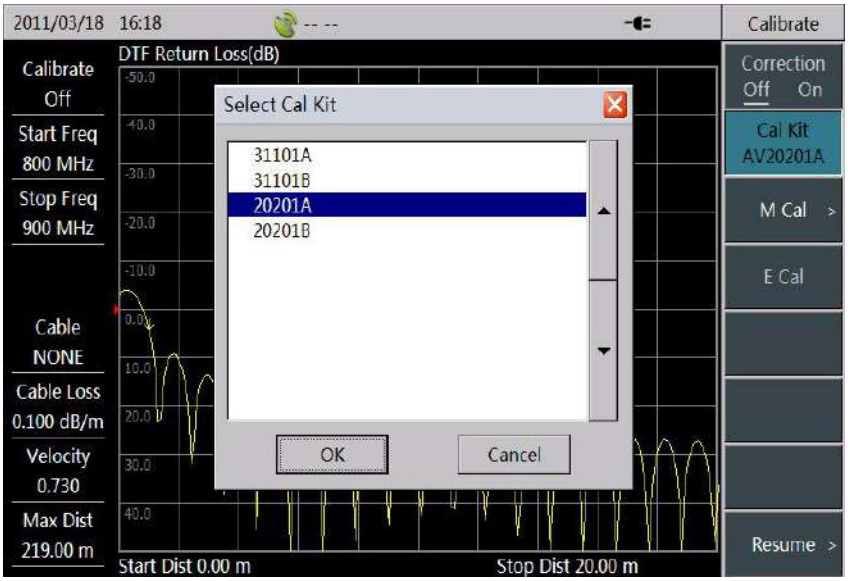


Figure 2-3 Calibration Kit Select

8) Select [M Cal] menu to calibrate the tester according to the calibration process described in 3.2.3. Specific mechanical calibration procedures are as follows:

- Following by screen tips, connect the open circuit to the test port and select the [Open] menu. At this time, the screen will automatically prompt "[OPEN] Measuring……". When the [OPEN] menu becomes into [OPEN], it indicates the completion of the open circuit calibration, and then connect the calibration kit to calibrate other items according to screen tips. After [OPEN] is selected, tester's software will give calibration prompt instructions, as shown in Figure 2-4.

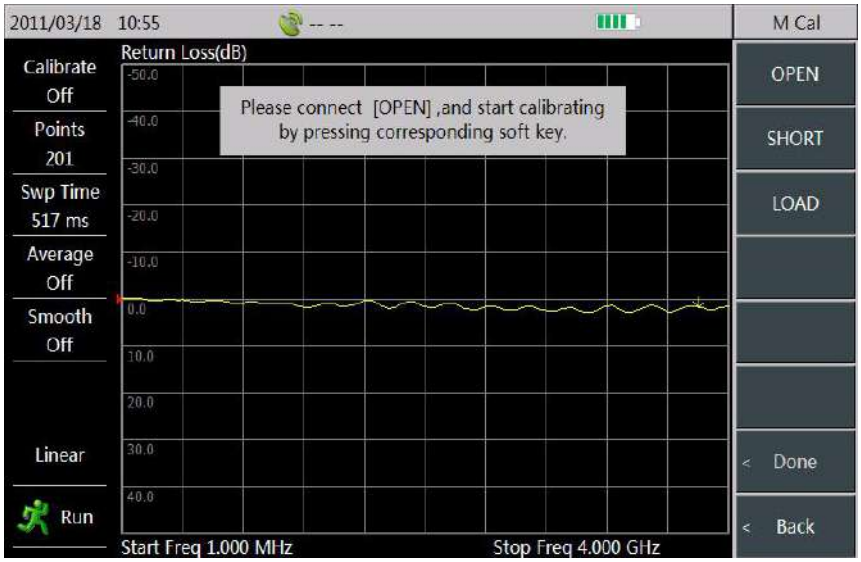


Figure 2-4 Mechanical Calibration Prompt

- Following by screen tips, connect the short circuit to the test port and select the [SHORT] menu. At this time, the screen will automatically prompt "[SHORT] Measuring……". When the [SHORT] menu becomes into [SHORT], it indicates the completion of the short circuit calibration, and then connect the calibration kit to calibrate other items according to screen tips. Figure 2-5 shows the short circuit is in the process of calibration and measurement.

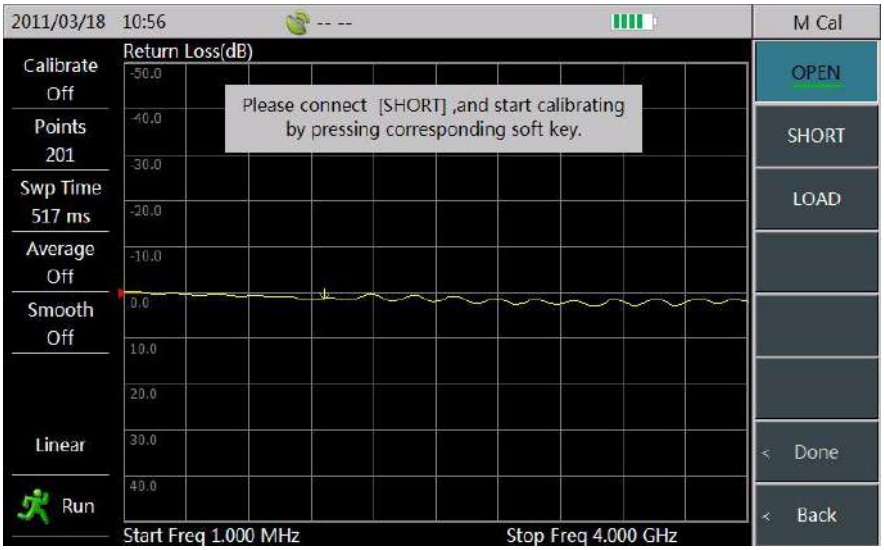


Figure 2-5 Short Circuit Calibration and Measurement

- Following by screen tips, connect the load to the test port. Then, select the [LOAD] menu, at this time, the screen will automatically prompt "[LOAD]Measuring……". When the [LOAD] menu becomes into [LOAD], it indicates completion of the load calibration, as shown in Figure 2-5. At this moment, select the [DONE] menu to finish the mechanical calibration process.

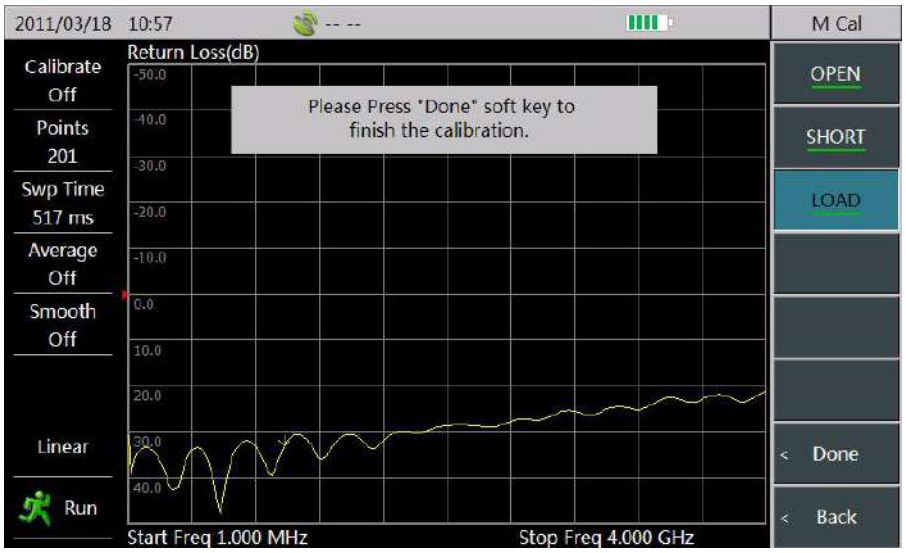


Figure 2-6 Calibration Completion

9) After the calibration, the cable to be measured can be connected to the instrument for test. In order to ensure the accuracy of cable loss measurement, terminal of the cable to be measured shall be connected to open circuit or short circuit, as shown in Figure 2-7. This test case adopts the measured cable and open circuit for test.

Figure 2-7 Connection Types for Cable Loss Test

10) At this moment, the curve displayed by instrument is cable loss curve of the measured cable. Press 【Marker】, find limit value of cable loss according to Section 3.4.6, and then average the sum of peak value and valley value to obtain the average loss.

Limit value search process is as follows:

- Press 【Marker】 to enter the marker menu bar, 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;
- Figure average loss of the cable out upon the cable loss values shown by Marker 1 and Marker 2.

2.2 Test Skills

As there have given a detailed description to the test steps in the last section for cable loss, this part will make a brief introduction on some test skills for it.

a) During the mechanical calibration process in Step h), the calibration is carried out in order of open circuit, short circuit and load. There is no sequence for calibration process in practice, so that user can carry out the calibration in any sequence. After those calibration items above have been finished, click [Done] to end the calibration.

b) In order to observe the details of the return loss curve more clearly, user can press 【Ampt】, and then click [Top] and [Bottom] menu in the menu bar to set the amplitude value displayed in the screen, or directly select the [Auto Scale] adjustment to set the value, as shown in the figure below:

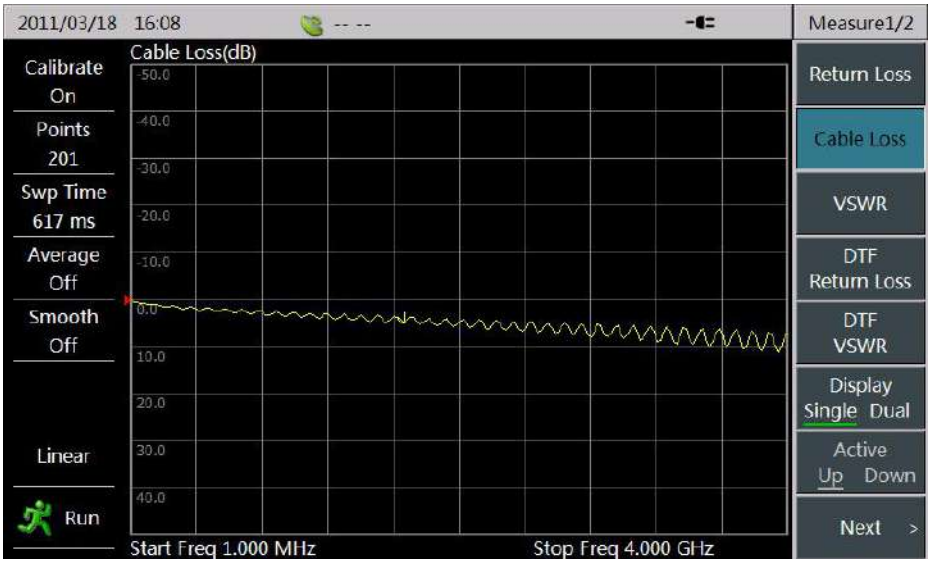


Figure 2-8 Return Loss Curve under Default Scale

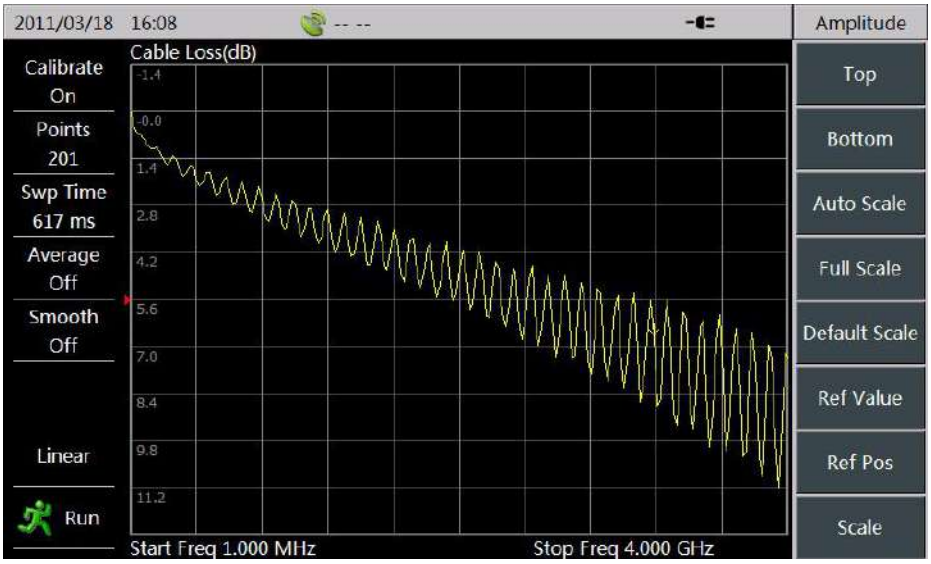


Fig 2-9 Return Loss Curve after Automatic Ratio Adjustment

c) During the test, if DUT is found disqualified, user can save its trace and state via 【Save/Recall】function for its subsequent analysis.

Figure 2-10 Cable Loss Curve Measured Store

3. DTF Measurement

DTF (Distance To Fault) measurement is a kind of verification and failure analysis tool in the maintenance and repair process of the antenna and transmission line. DTF function of 3680A/B Cable & Antenna Feeder Tester is realized by adopting the measuring technique of frequency domain reflectometry. Frequency Domain Reflectometry (FDR) is a kind of separation method for fault points of transmission line, which can accurately identify the fault point of signal path in the cable and waveguide transmission line. It is similar to the traditional time domain reflectometry, with differences that FDR adopts a RF signal of sweep frequency instead of the traditional DC pulse of TDR. FDR measurement technique can locate the faults and aging points in the system more sensitively and accurately. It needs to input a swept-frequency signal into the transmission line to be measured, and then convert the frequency domain information of reflected signal of this sweep frequency signal to time domain through Fast Fourier Transform (FFT). Therefore, distance of fault point can be correctly calculated by the known propagation speed of signal in cable.

During the practical application, DTF measurements are usually carried out in the following connection types, to locate and measure the fault points of the equipment, such as base station, as shown in Figure 3-1. DTF measurement procedures will be given a detailed description later.

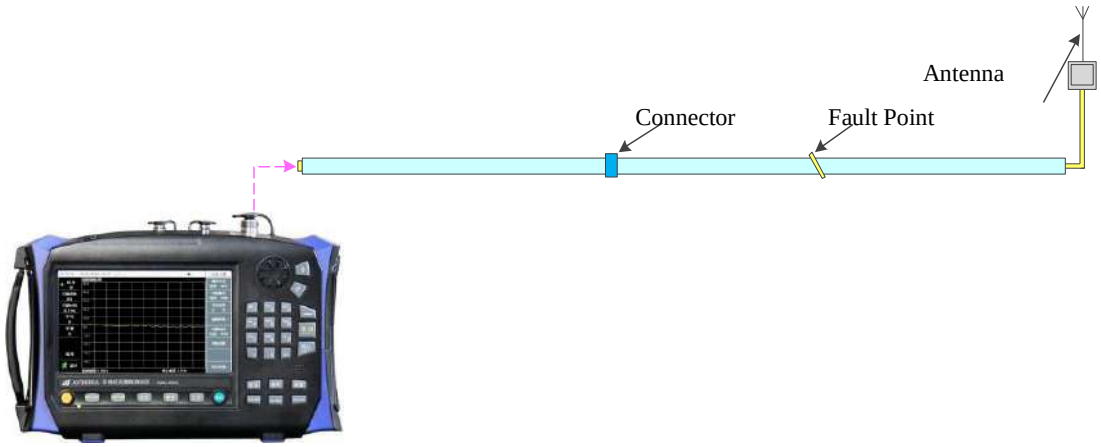


Figure 3-1 Connection Diagram for DTF Measurement

3.1 Measurement Procedures

3680A/B provides two measuring formats including DTF return loss and DTF VSWR, so that users can select the mode according to their needs. As for their difference, we will not explain here again for it is similar to the difference between return loss and VSWR. Taking DTF return loss measurement as an example, this part will make a detailed introduction for its specific measurement procedures.

1) Press 【Meas】 to enter the measurement menu;

2) Select [DTF Return Loss] menu to set the current measuring format to DTF Return Loss, as shown in Figure 3-2:

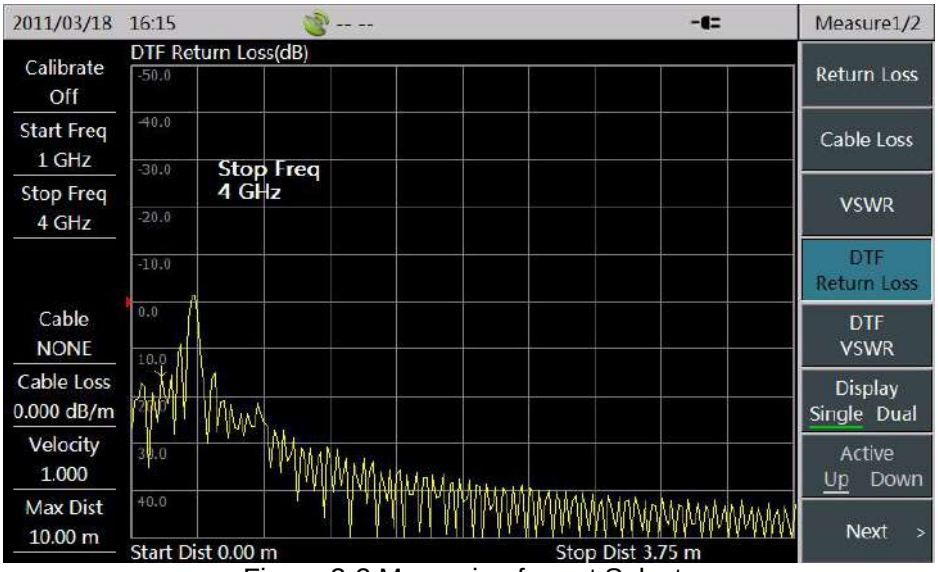


Figure 3-2 Measuring format Select

3) Press 【Freq】 to enter the frequency/distance menu bar;
4) 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 set; the frequency in this example is set to 800MHz.
5) Similar to Step 4), set [Stop Frequency] of the measurement, which is set to 900MHz in this example.

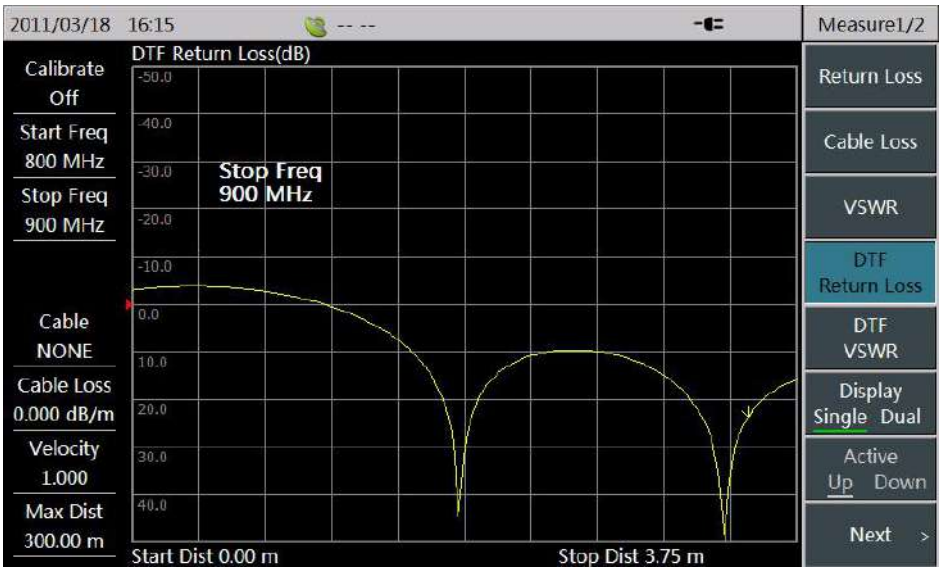


Figure 3-3 Start Frequency and Stop Frequency Set

6) Select [Start Dist] 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. User can make an appropriate estimate on fault position, according to which, to set the start distance of tester. The start distance is generally set as 0m, where in this example it is set as 0m.
7) Similar to Step 6), set the stop distance of measurement. The maximum of stop distance, which is set to 20m in this case, is within a certain range. Please see the suggestions and instructions of test for more details.

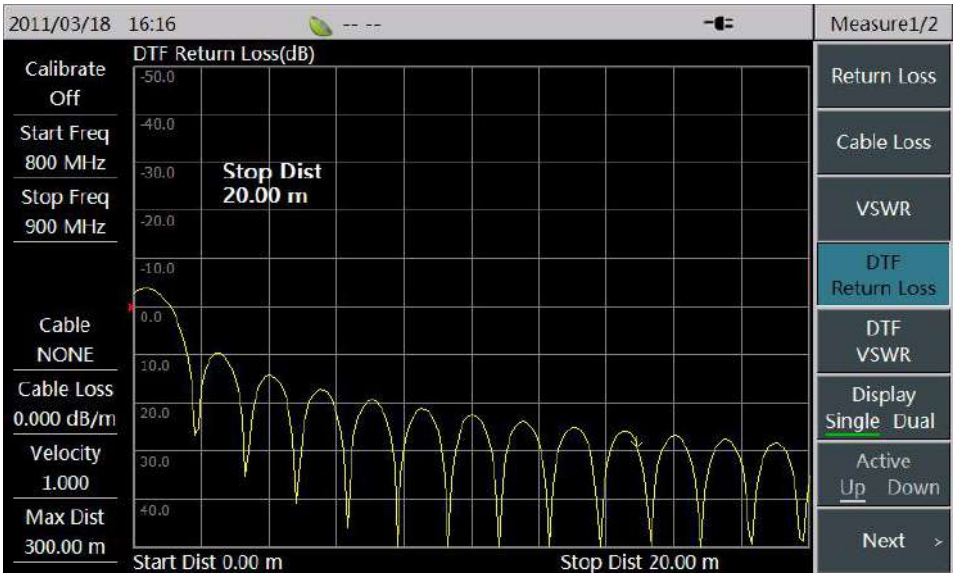


Figure 3-4 Start Distance & Stop Distance Set

8) Select the [Velocity] menu to set the velocity factor of the measured cable. Velocity factor, which is the ratio of transmission speed and light speed of electromagnetic wave in the cable, is set as 0.730 here, as shown in Figure 3-5.

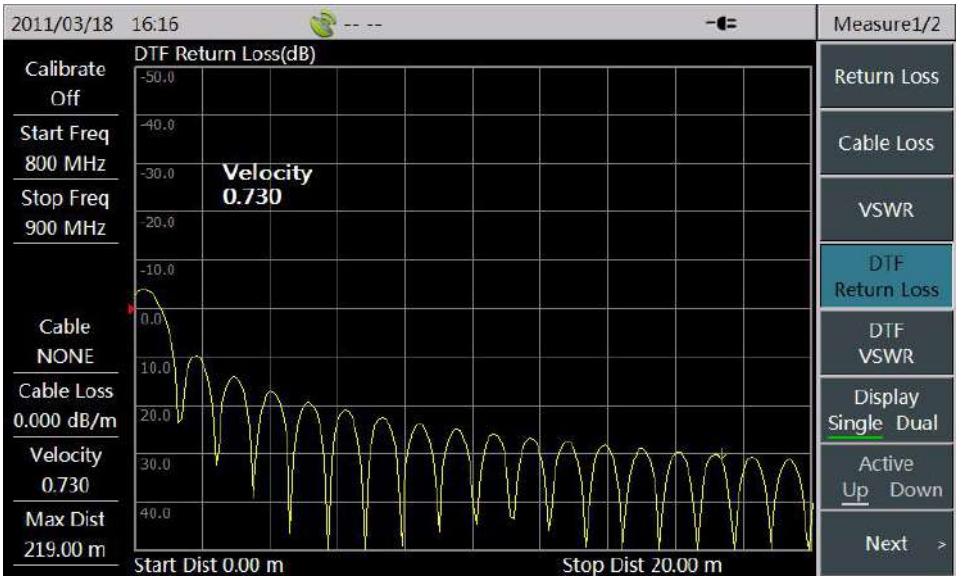


Figure 3-5 Velocity Factor Set

9) Select the [Cable Loss] menu to set the power loss lost per meter in the cable (energy), according to the known parameters of measured cable, which is set as 0.1dB/m here.

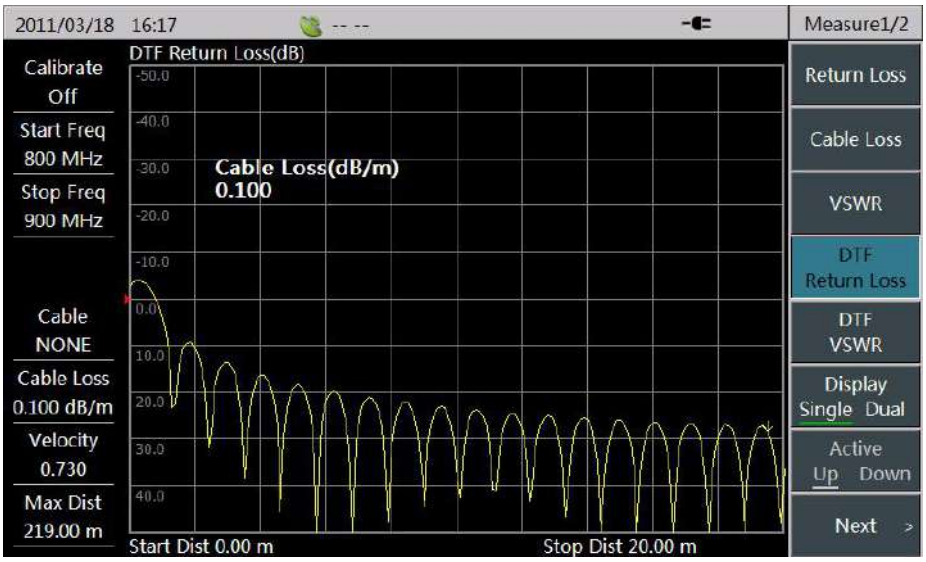


Figure 3-6 Cable Loss Set

10) Click [Next] software, and enter the second page of frequency/distance menu bar, to set the window function adopted in the process of time domain conversion. And rectangle window function is taken in this example, without any modification.

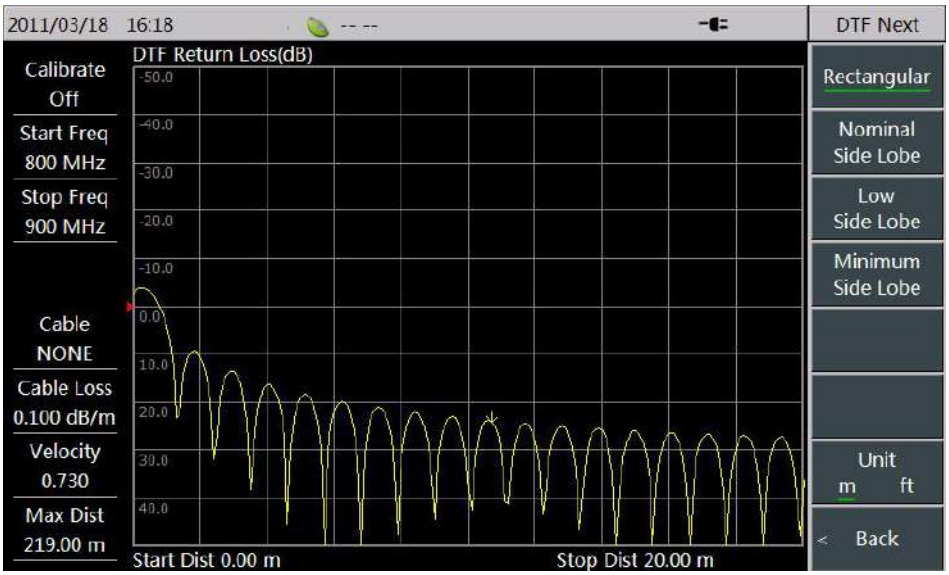


Figure 3-7 Window Function Select

11) Press 【Cal】 to enter the calibration menu bar;
12) Select [Cal Kit] menu, then the prompt box of “Select Cal Kit” will be popped up in the screen. According to the model of calibration kit at hand, select the corresponding model in the tooltip, and then click “OK” key or press 【Enter】 to finish the calibration kit selection, as shown in Figure 3-7:

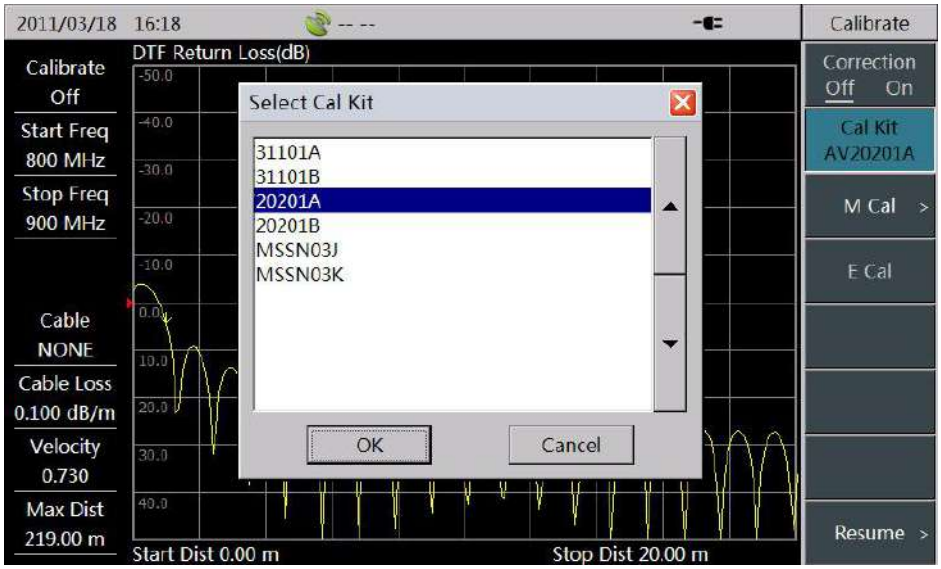


Figure 3-8 Calibration Kit Model Select

13) Select [M Cal] menu to enter the mechanical calibration menu bar. At this time, users can connect calibration kit to port and click the corresponding menu in the menu bar to finish the port calibration, following by tips popped up in the screen.

- Connect the calibration kit of open circuit, and then select the [Open] menu. At this time, the screen will automatically prompt "[OPEN]Measuring……", as shown in Figure 3-9; When the [OPEN] menu becomes into [OPEN] and tips of connecting other calibration kits are shown in the screen, the calibration of this calibration kit has been finished.

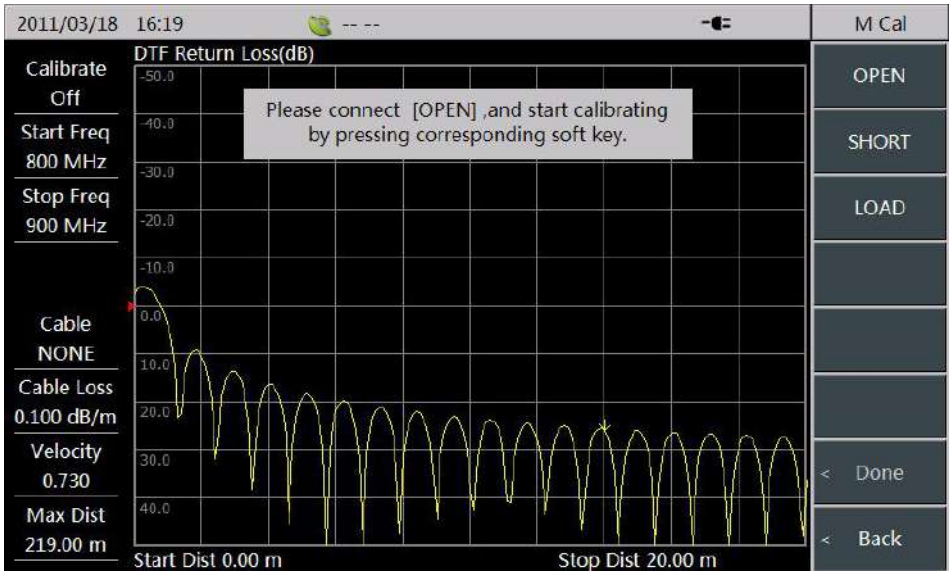


Figure 3-9 Open circuit under Calibration

- Connect calibration kit of the short circuit, and then calibrate the short circuit according to the calibration procedures of short circuit, as shown in Figure 3-10.

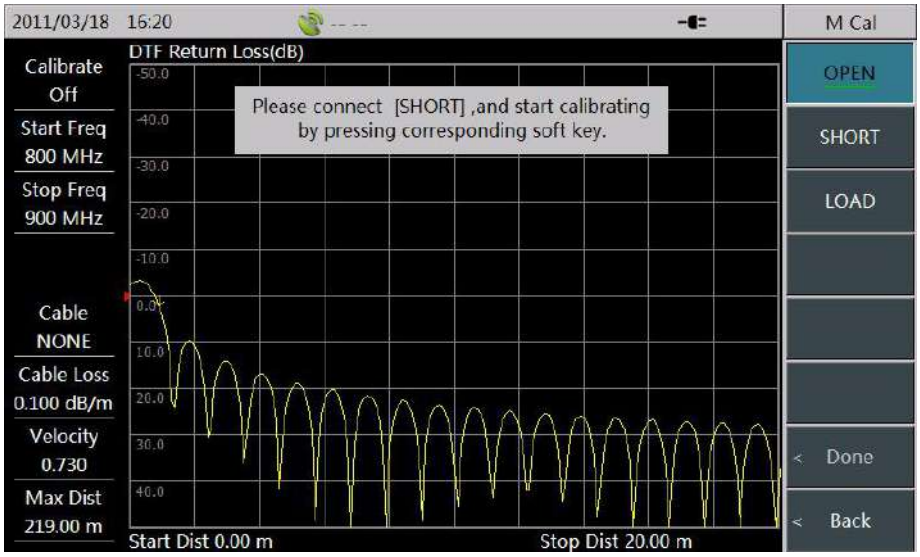


Figure 3-10 Short Circuit Calibration

- Connect the calibration kit of load, and then calibrate the load according to calibration procedures of open circuit. Click [DONE] to finish the calibration operation.

Figure 3-11 Calibration Completion

14) After the calibration, connect the instrument to the measured cable for test, and then link the open circuit to the end of the cable (as fault point), as shown in Figure 3-12.

Figure 3-12 Connection for DTF Return Loss Test

15) Press 【Ampt】to enter the amplitude menu bar, and then click the [Auto Scale] menu or set the amplitude values of [Top] and [Bottom] displayed in the screen, to make them stay within proper range.

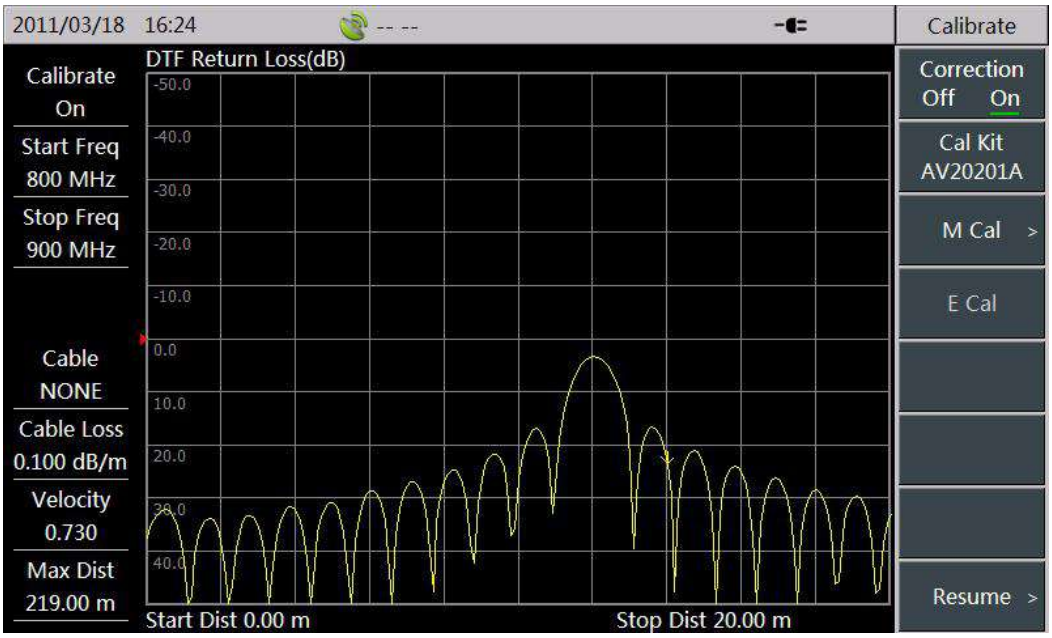


Figure 3-13 Default Amplitude Value Curve

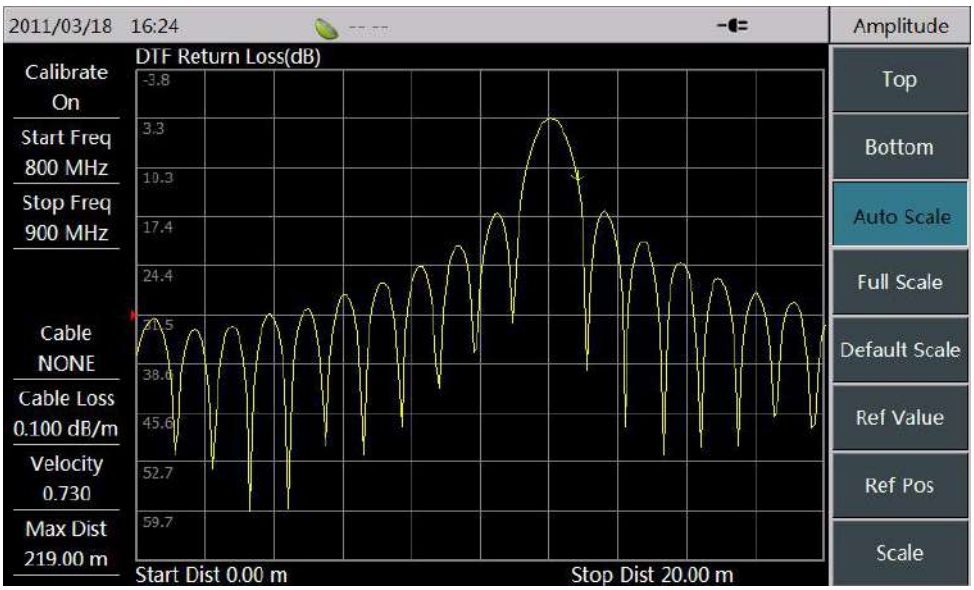


Figure 3-14 Curve of Amplitude Value after Auto-scaling

16) Press 【Marker】 to enter the marker menu bar, 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, which is the distance from fault point to measurement port of Tester, as shown in the figure below:

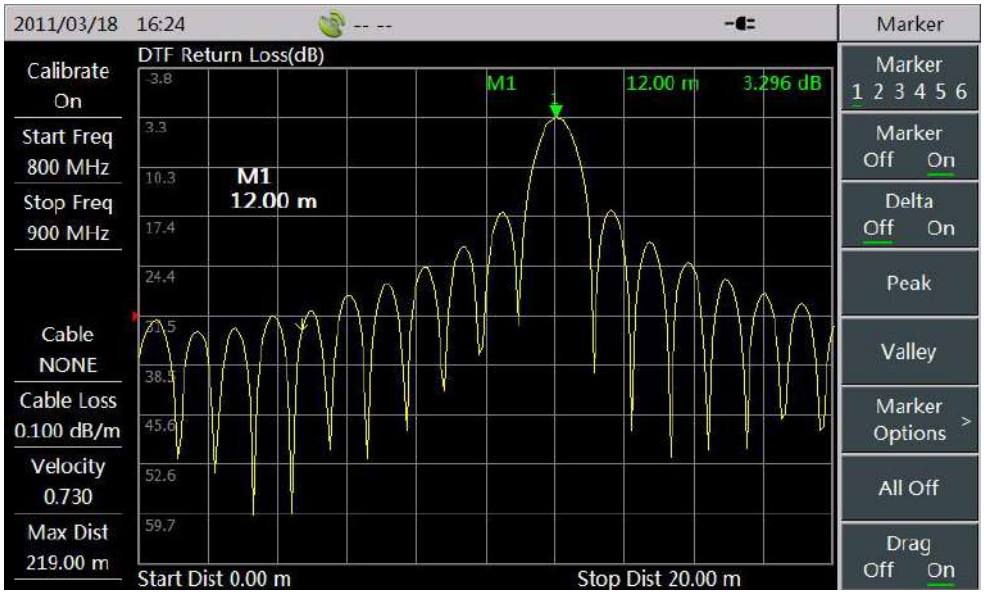


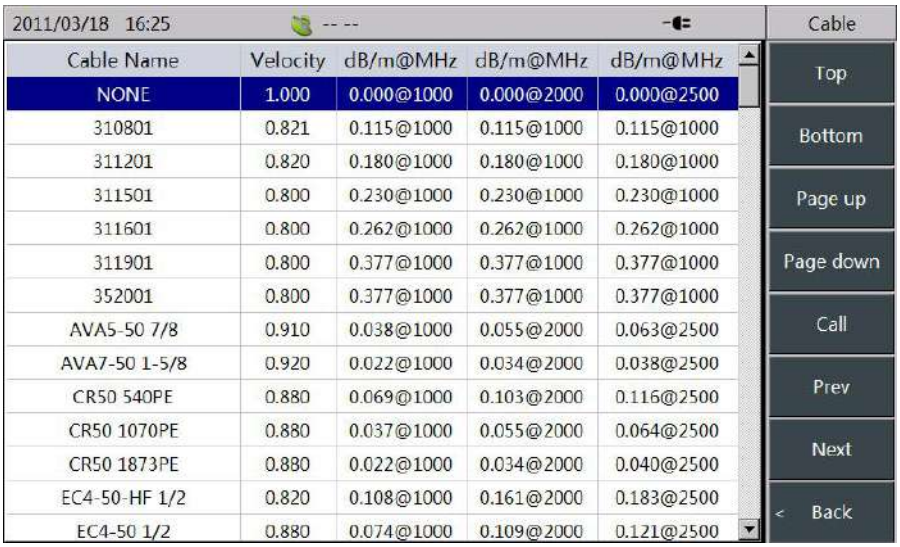
Figure 3-15 Fault Points Location

3.2 Test Skills

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

1) In the last measurement procedure, there have been given a detailed setting process for velocity factor and cable loss. If the model of cable used currently has been already known, user can directly select [Cable Model] in 【Freq】menu bar 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 selection of cable model. At this moment, system will automatically match velocity factor and cable loss upon the selected model of cable.

In addition, in the menu bar of cable models, this Tester also provides [Top], [Bottom], [Page Up] and [Page Down] menu to make it easier to search cable model, as shown in the figure below:



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 3-16 Cable Model Select

In addition, in the menu bar of cable models, this Tester also provides [Head], [Foot], [Page Up] and [Page Down] menu to make it easier to search cable model, as shown in the figure below:

2) Among the above steps, the calibration is carried out in the operating order of open device→ short device→ load. There is no sequence for the connections of three kinds of DUT above in the curse of practical operation process, so that they can be connected at random, if only DUT which is connected corresponds to the name selected in the calibration menu bar.

3) A small note on frequency and distance ranges:
During the DTF test, it is not easy to select an appropriate frequency range, for that relates to the accuracy of instrument and distance range of fault location. During the DTF analysis, the measuring distance is affected by the frequency sweep width and points as well as the propagation velocity of electromagnetic waves in the cable to be measured.
When detecting the transmission lines, large sweep width is desirable, in order to preferably measure the potential points of failure or performance degradation positions. However, this frequency range has the following constraint conditions, for the maximum distance is in inverse proportion to the sweep width.

$$S'_{max} = \frac{1.5 \times 10^8 \times V_p \times (point - 1)}{f_{stop} - f_{start}} \qquad (1)$$

Where:
S'_{max} indicates the maximum distance of measurement, in units of (m);
Vp indicates the transmission speed of signal in the cable under test, in units of (m/s);
point indicates the set sweep points which need finishing by instrument during this measurement;
f_{stop}, f_{start} respectively represent the set stop frequency and start frequency, in units of (Hz).
From the above formula you can see: the larger the sweep width is, the shorter the maximum distance of measurement (measuring distance) will be.

And now we analyze the maximum distance of measurement in the aspect of cable loss, where the nominal value of effective directionality given by 3680A/B is equal to or more than 42dB. That is, when energy of the reflected signal is greater than the effective directionality, this tester cannot make a valid measurement. Therefore:

$$S''_{max} = \frac{42}{C_l} \qquad (2)$$

Where:
S''_{max} indicates the maximum distance of measurement, in units of (m);
C_l indicates the cable loss of transmission cable, in units of (dB/m);
As you can see from equation (1) and (2): when the frequency range and sweep points have been set already, the maximum distance of measurement for this tester is $S_{max} = min\ (S'_{max}, S''_{max})$.
Similar to the relationship between measurement distance and sweep width, the measurement resolution is also affected by sweep width. The wider the sweep width is, the higher the resolution will be.
In the coaxial cable:

$$R = \frac{1.5 \times 10^8 \times V_p}{f_{stop} - f_{start}}$$

Where:
R represents the distance resolution of the instrument's measurement, in units of (m);
V□ indicates the transmission speed of signal in the cable under test, in units of (m/s);
f_{stop}, f_{start} respectively represent the set stop frequency and start frequency, in units of (Hz);

Appendix II: Introductions for Technical Index

Mode	3680A	3680B
Frequency Range	1MHz～4GHz	1MHz～8GHz
Initial Frequency Accuracy	±2×10^{-6} (23℃)	±2.5×10^{-6} (23℃)
Frequency stability	±1×10^{-6}/10℃（@23℃）	±1×10^{-6}/10℃（@23℃）
Frequency Resolution	1kHz	1kHz
Effective Directionality	≥42dB（M Cal） ≥35dB（Embedded E Cal）	≥42dB（1MHz～6GHz） ≥36dB（6GHz～8GHz）
Source Match	≥31dB（M Cal）	≥31dB
Reflection Tracking	±0.08dB（M Cal）	±0.08dB
Battery	8h （without Embedded E Cal，70% light） 6h （with Embedded E Cal）	≥4h
Power	≤15W（Not Charging） ≤54W（Charging）	≤18W（No Charging） ≤54W（Charging）
Measurement Speed	1ms/point（10kHz IFBW）	
Power Supply	AC： 110V（1±10％）或 220V（1±10％），50Hz（1±5％）	
Size	295mm（width）×205mm（high）×70mm（deep）	
Weight	2.5kg（including battery）	
Operating Temperature	-10℃～+50℃	
Storage Temperature	-40℃～+70℃	
EMI	Compliant for the 3.9.1 section in GJB3947A-2009	
Test Port	Type N female	
10MHz In/Out Port	BNC	
GPS Port	BNC	