TFN 100L/H

Cable and Antenna Analyzer

User's Manual

Notices

Warranty

The material contained in this document is subject to change without notice.

TFN makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. TFN shall not be liable for errors contained herein or for incidental or consequential damages in connection with furnishing, performance, or use of this material.

The battery is a consumable part and is not subject to the 100L/H cable and antenna analyzer warranty.

ISO9001 Certification

Produced to ISO9001 International Quality System Standard as part of TFN, objective of continually increasing customer satisfaction through improved process control.

Safety Instructions

During each stage of operation of this instrument, please always observe the following safety instructions. Not taking any safety precautions or following the instructions will violate the safety standards of design, manufacturing and application of these instruments. In no case will TFN Technologies bear the responsibilities for consequences incurred by violation of the following instructions.

General

This product is a Safety Class 1 instrument. The protective features of this product may be impaired if it is used in a manner not specified in the operation instrument.

Environmental Conditions

It is designed to operate at a maximum relative humidity of 95% and at altitudes of up to 2000 meters. Refer to the specifications tables.

Before Applying Power

Verify that the product is set to match the available line voltage, the correct fuse is installed, and all safety precautions are taken. Note the instrument's external markings described under symbols.

Do not operate in an explosive atmosphere

Do not operate the instrument in the presence of flammable gases or fumes.

Do not remove the instrument cover

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified service personnel. Instrument that appears damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

Safety Terms Used in This Manual

WARNING! The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personnel injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION! The CAUTION sign denotes a hazard. It calls attention to an operating procedure, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or the entire product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

NOTE The NOTE sign information that may be beneficial during the use and maintenance of the instrument.

Electrical Safety Precautions

If you need to ensure that the equipment completely off, unplug the power line and remove the battery.

WARNING!

Only using the AC/DC power adapter in the room.

The equipment should be placed where the surrounding air can flow freely.

Do not operate equipment in the flammable gas or near the smoke .

Do not operate equipment if any part of outer surface(upper cover panel, etc.)damaged, To avoid the electric shock,

Only approved professional personnel can open and debug and maintenance or repair the equipment when its power supply is turned on.

Even turn off the power supply ,equipment still be in a charged state over a period of time due to internal capacitor

CONTENTS

1. General Information

1.1 Scope of this Manual

Thank you for purchasing TFN instrument. Please read this manual carefully before using any of TFN instrument. Always observe the warnings and cautions appearing throughout this manual.

This manual contains the information necessary for proper operation and maintenance of 100L/H instrument, troubleshooting instructions as well as information regarding obtaining services.

1.2 Unpacking and Inspection

This instrument has been carefully packed in accordance with standard shipping procedures. Examine the instrument for damage that may have occurred during shipment. If you find any damage or the instrument is not working, or if any of the following items are not included, please contact your representative of TFN Technologies, Inc.

If necessary, you may contact TFN Technologies, Inc via this email: fattsales1@163.com

NOTE

When returns, please:

Packing meter with soft material; Use original case. If not, please fill at least 3cm soft material around the meter; Correctly fill out and return the product repair card, including company name, address, postal code, contact person, telephone, e-mail, problem description; Tape the box; Deliver to agents nearby or embranchment in Chinese mainland.

1.3 Product Introduction

100L/H product is portable, easy to learn and use, Has the characteristics of powerful function, fast operation, integrated intelligent etc..

100L/H product is equipped with a large and easy to read color LCD which can display the measurement data, trace and figure. This product has rich peripheral interface, users can easily backup or upload data. It is also equipped with a special PC software with which users can analyze, print ,record and archive measuring data and report.

1.4 Features

7 inch color LCD touch screen, support 4 level brightness, touch screen operation, supplemented by the keyboard operation, convenient and easy to use

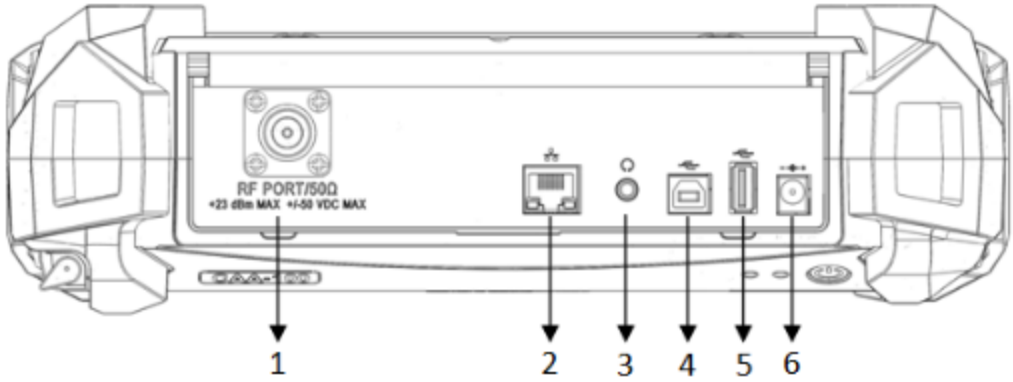
high-capacity data storage , support backup almost unlimited data and curve

with PC management and analysis software, users can analyzer and manage measurement data freely.

large capacity battery, support more than 8 hours of continuous work if charged fully

2. The Appearance Introduction of Equipment

2.1 The head cover



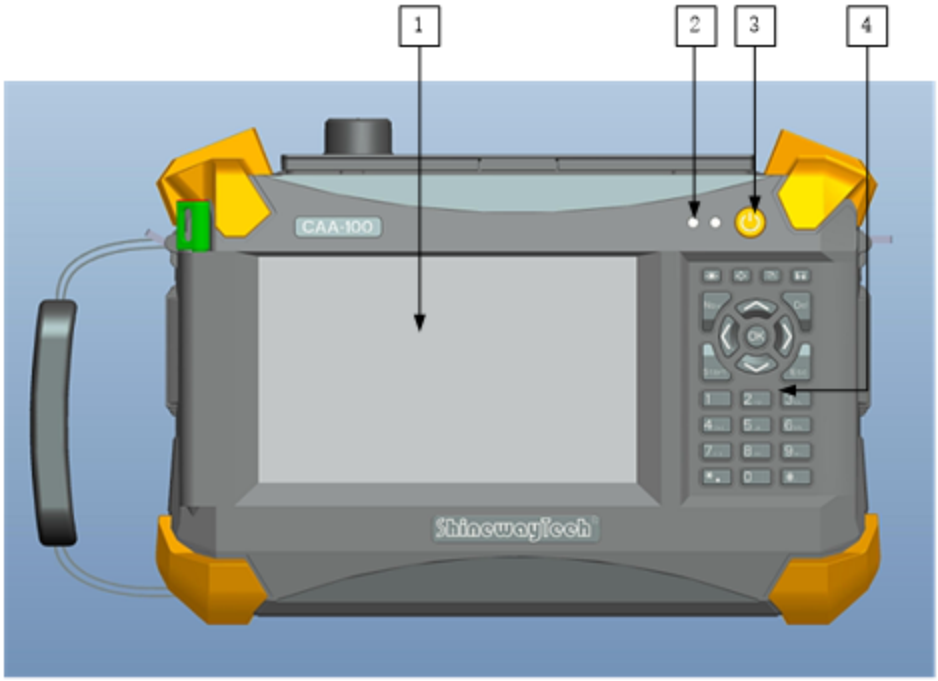
The head cover contains a variety of interface. A detailed description of the following

No.	Name	Icon	Function and Description
1	RF connector		To connect cable and antenna unit to be tested
2	RJ45 LAN		Reserved
3	Ear socket		Reserved
4	USB Device port		To connect PC, then users can run special software to analyze and manage measurement data
5	USB host port		To connect flash disk
6	Adapter socket		To connect external AC-DC adapter

2.2 Front panel

1. Screen display area;
2. indicator lights;
3. power button;

4. hard keyboard



Note: Press the power button shortly to open the instrument, and press it for a while to turn off the instrument;

Description for indicator lights:

Position	State	Meaning
Left	Red	Battery Charging …
	green	Battery Charge fully
Right	Off	Power off
	green	Power on
	red	Measuring …

Description for hard keyboard:

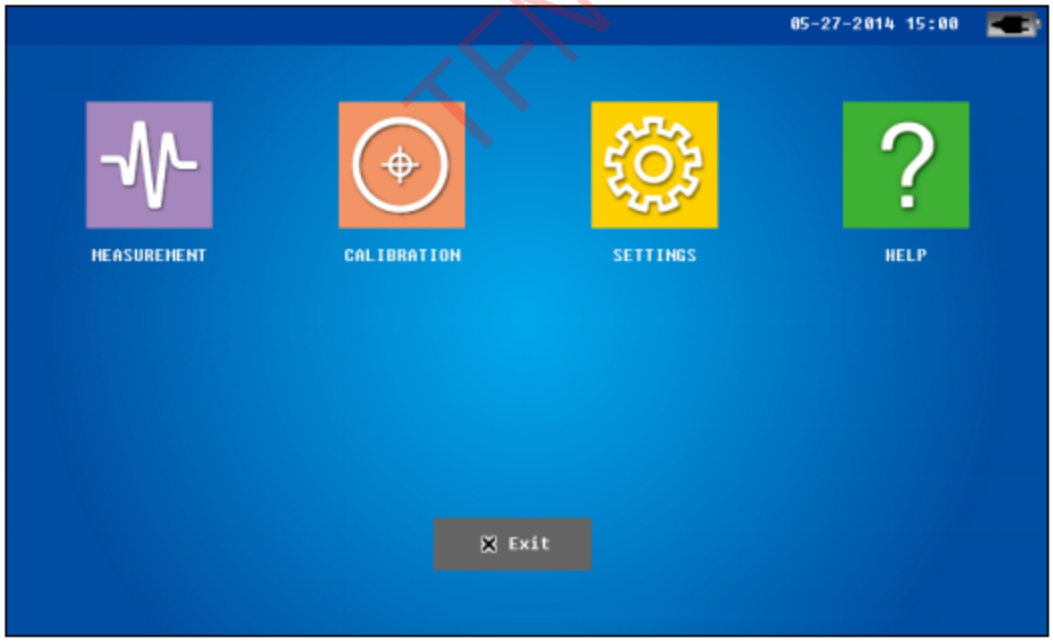
Icon	Function and Description
	Adjust the display screen brightness, there are four levels
	Switch display mode (black and white, normal, night vision, and high contrast)
	Preview, save the measurement picture
	Save calibration and measurement curve
Nav	popup or down the right menu
Start	Quick start measurement

Del	Backspace
Esc	Return to the previous interface
‹ ›	left and right move marker line
^ v	Up and down move limit line
OK	Enter key
	Digital key, input 0-9
* key	decimal point
#key	Minus sign

3.User Interface and Menu Instructions

3.1 Turn-on the instrument

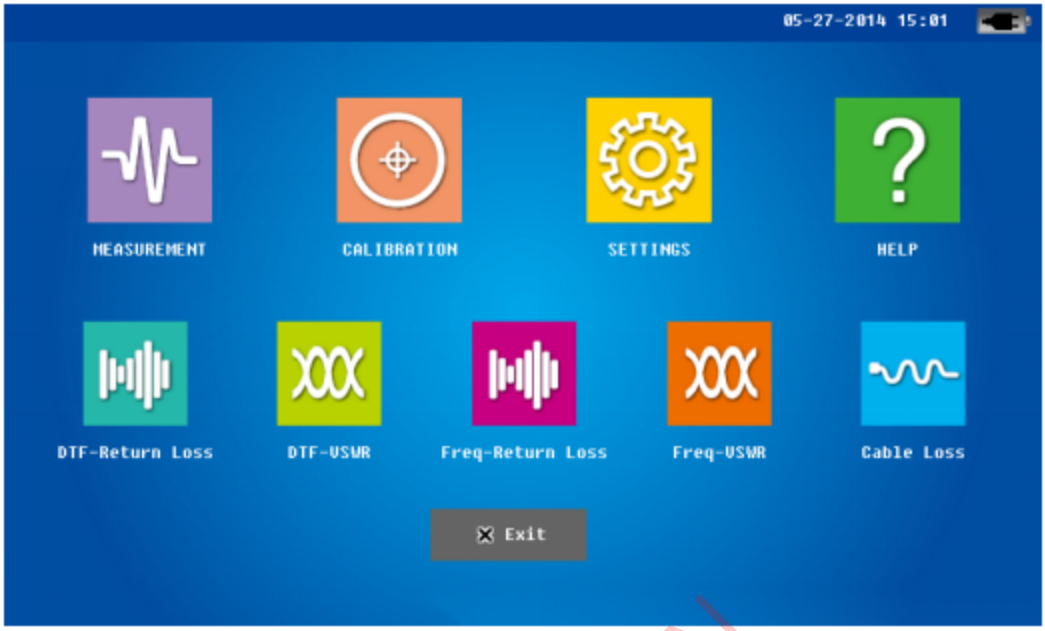
Press ⏻, equipment will display the boot picture. During startup, the right light turns red, the system will initialize DSP system, self check system state, etc. When main interface appear, the boot process end, the right light turns green.



Main interface

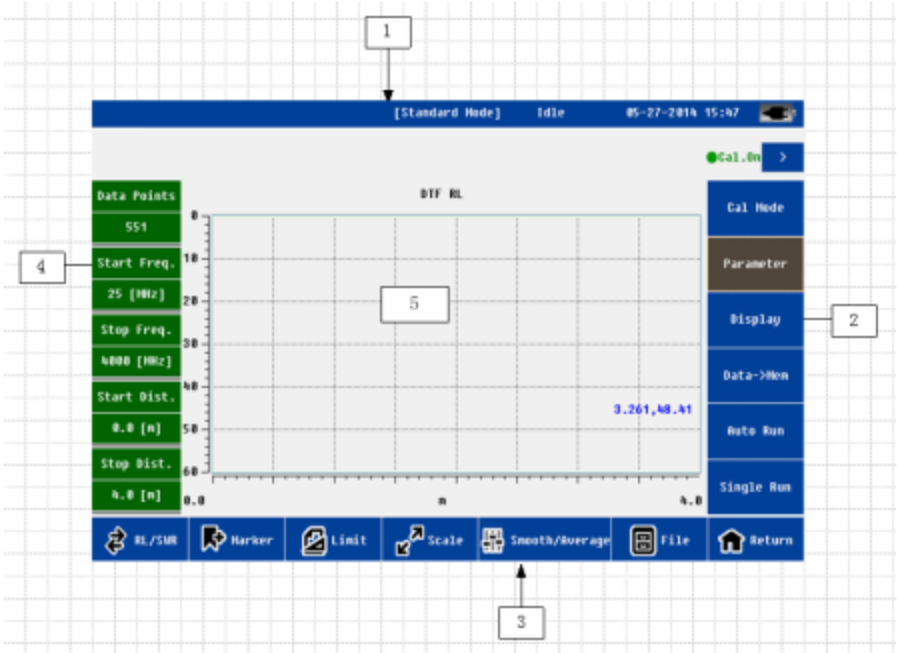
3.2 Main interface

Click "MEASUREMENT" Icon, 5 sub-icons appear, Corresponding to the five measurement modes: DTF(distance fault)return loss, DTF-VSWR, Frequency return loss, Frequency-VSWR, cable loss. Click the icon, the system will go into the corresponding measurement interface.



Note: Click other icons in the main interface (CALIBRATION, SETTINGS, HELP), system will enter the corresponding operation interface.

3.3 Measurement Interface



Measurement interface mainly consists of the following parts:

No.	Name	Position	Function and Description
1	status bar	Top	Display the system status and measurement information
2	function menu	Right	For details, see the later chapter Note: If some menu are selected, this part may will refresh.
3	function menu	Bottom	For details see later chapter
4	Message bar	Left	Frequency, distance, measuring points etc.
5	Display area	Middle	For details see later chapter

If the user wants to zoom in the display area, can click the arrow › or "Nav" key. Click again the area will zoom out.

Detailed Description:

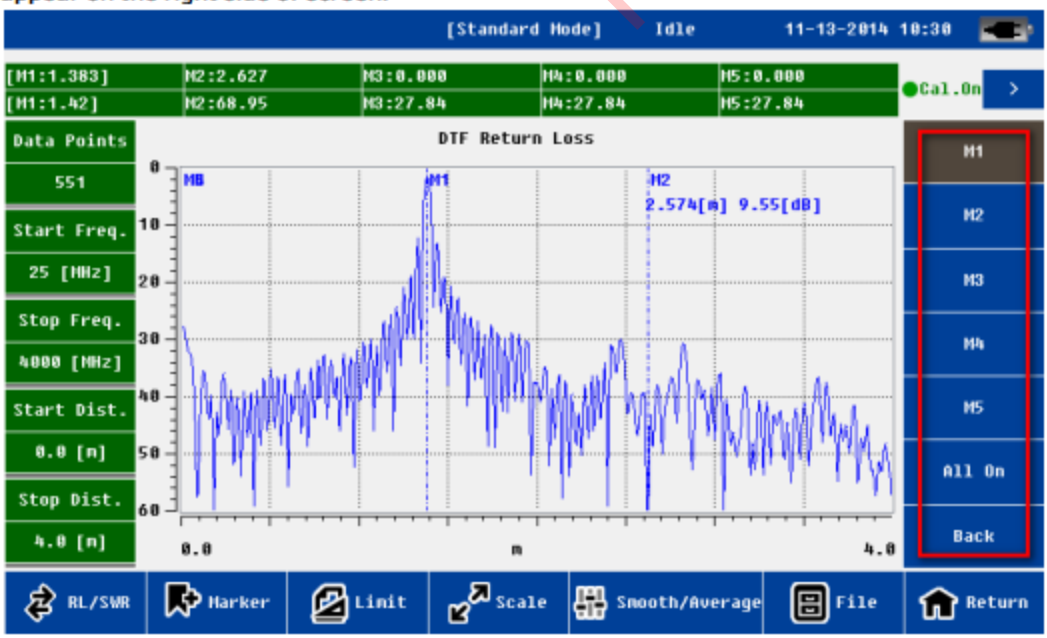
Function	Function and Description
Status bar	Power management mode: standard and power saving mode
	Measurement state: idle and measuring
	Time: year/month/date/hour/minute
	The adapter and battery state: Connect an external adapter, without battery - display adapter icon; Connect an external adapter, with battery charging - display charging icon; Connect an external adapter, with battery full - display adapter icon; Without adapter, only battery - display battery icon, divided into 5 levels. If battery is low voltage system will alarm
	Calibration state: (valid)On or (unvalid) off Note: Only when calibration is valid(on), user can start measurement.
	Marker information
	Limit line information
Measurement information	Measurement points: 137、275、551、1103
	Start and stop frequency and distance
Function menu 1	Cal mode: enter calibration interface
	Parameter: enter parameter setting menu. If user in the freq-return loss/ freq-VSWR/cable loss measurement mode, it will go into frequency parameter setting menu; If user in the DTF-return loss/DTF-VSWR measurement mode ,it will go into DTF parameters menu, more parameters and information will be included in this menu.
	Display: For details see later chapter
	Data-> Mem : Save current data to memory Note: only one data can be save to the memory
	Auto Run: Start continuous measurement, clicks again to stop.

	Note: while measuring and Auto Run state is on, some functions are prohibited. If users want to use these function again, need to click the menu once again and check the state is off.
	Single run: Start single measurement, the system enters the idle state after measurement
Function menu 2	RL/SWR: fast switching between the return loss and VSWR measurement
	Marker: For details see later chapter
	Limit: For details see later chapter
	Scale: For details see later chapter
	Smooth/Average: turn on/off Smooth/Average function.User can utilize these function to observe and analyze measurement dat.
	File: For details see later chapter
Main display area	Display the measurement results and other information.

3.4 The function menu description

3.4.1 Marker

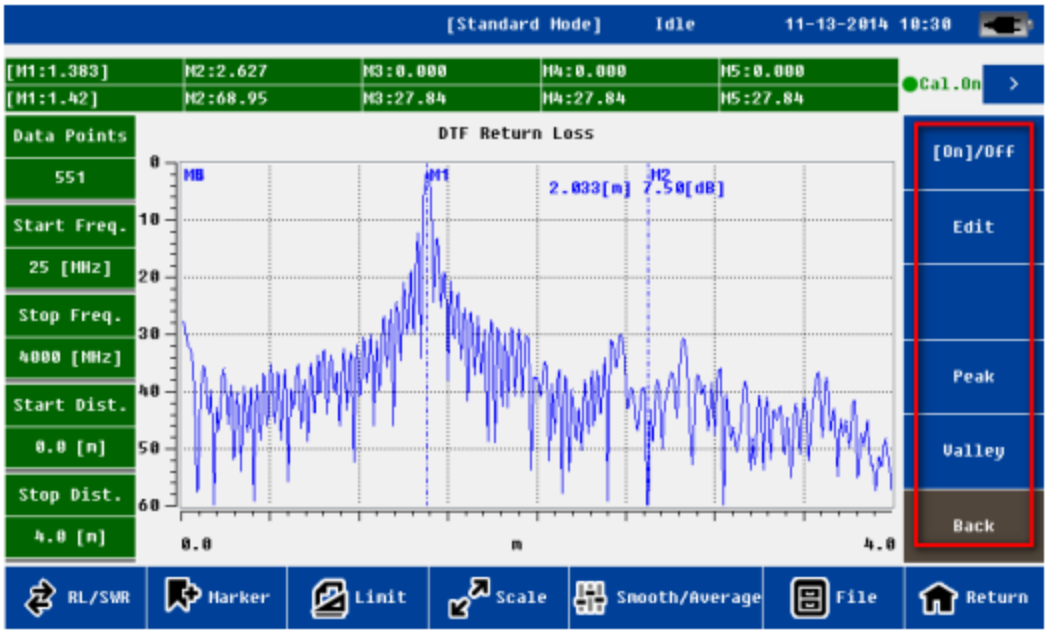
In all five measurement mode users can use mark function. The user click "marker" menu, new mark menu will appear on the right side of screen.



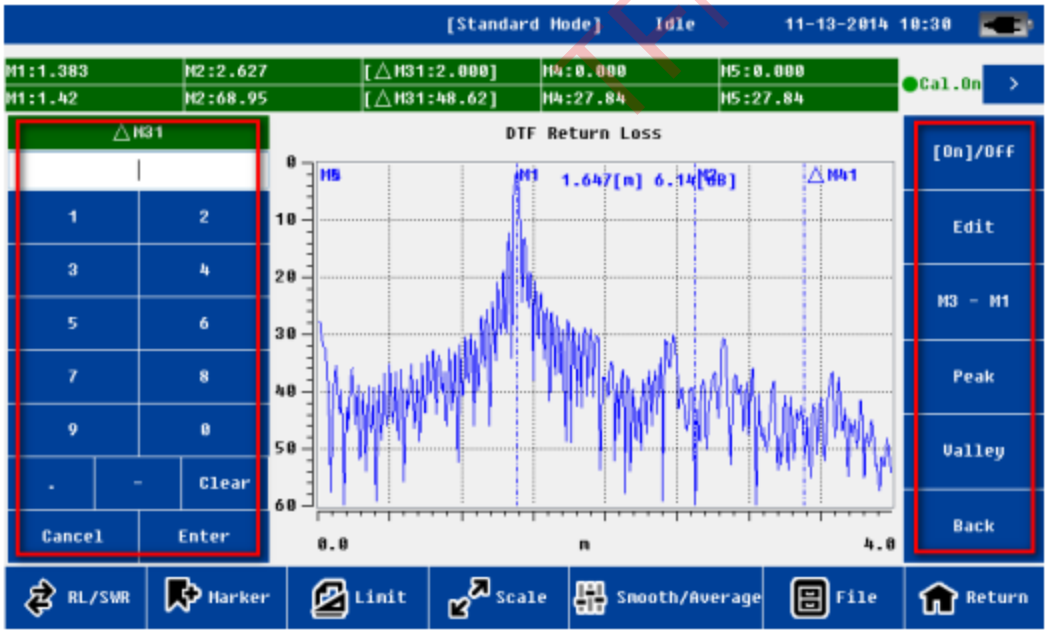
The system supports 5 marker lines(M1, M2, M3, M4, M5), each marker can be independent turn on/off and edited. The user can also close all markers.

The user clicks on "MX", the MX marker automatically is activated. The status will be shown on the top status bar.

Users click on the "Edit" menu, the edit menu will show on the left side of the main display area.



Marker setting menu



Marker setting menu

The user can define the position of marker line by the following ways:

- The soft keyboard to enter digital value
- The hard keyboard to enter digital value
- Touch screen directly with touch pen to move and define the location
- Left and right arrow key of hard keyboard to fine adjust and define the location

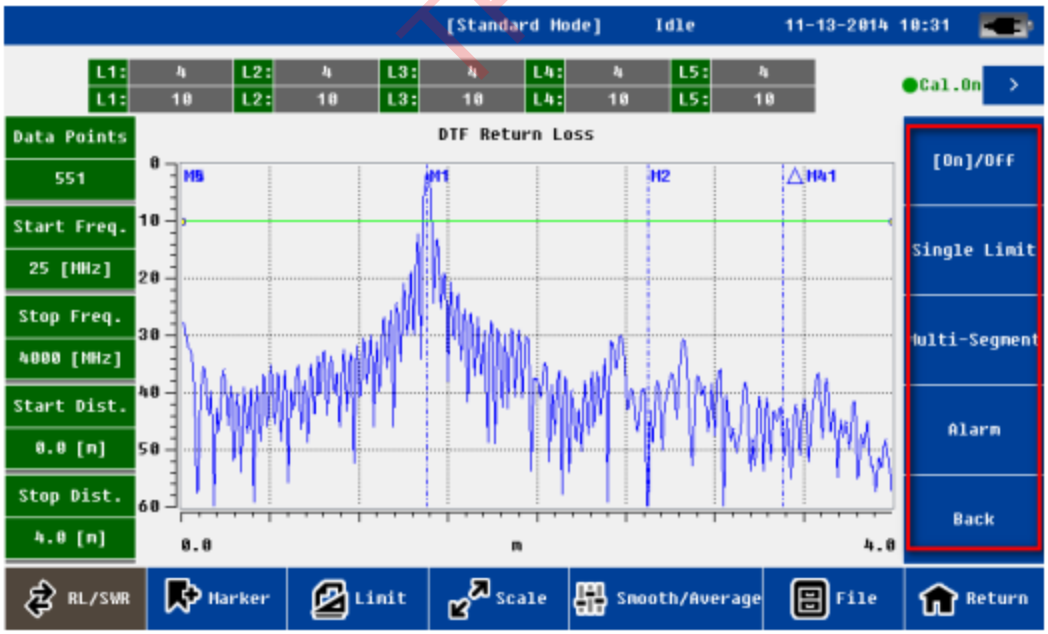
After the location of the mark line is determined , users need to confirm the operation (soft keyboard "Enter" key or hard keyboard "OK" key).

Users also can click on the "mark to the peak" or "mark to the valley" to determine the location of the mark line

For M2~M5, the system also supports difference marker relative to M1 . users click on the "MX-M1" ,the system will go into the difference marker mode. The status displayed in the status bar is the difference between X and Y direction, i.e. (MX2~5-MX1; MY2~5-MY1).

3.4.2 Limit Line

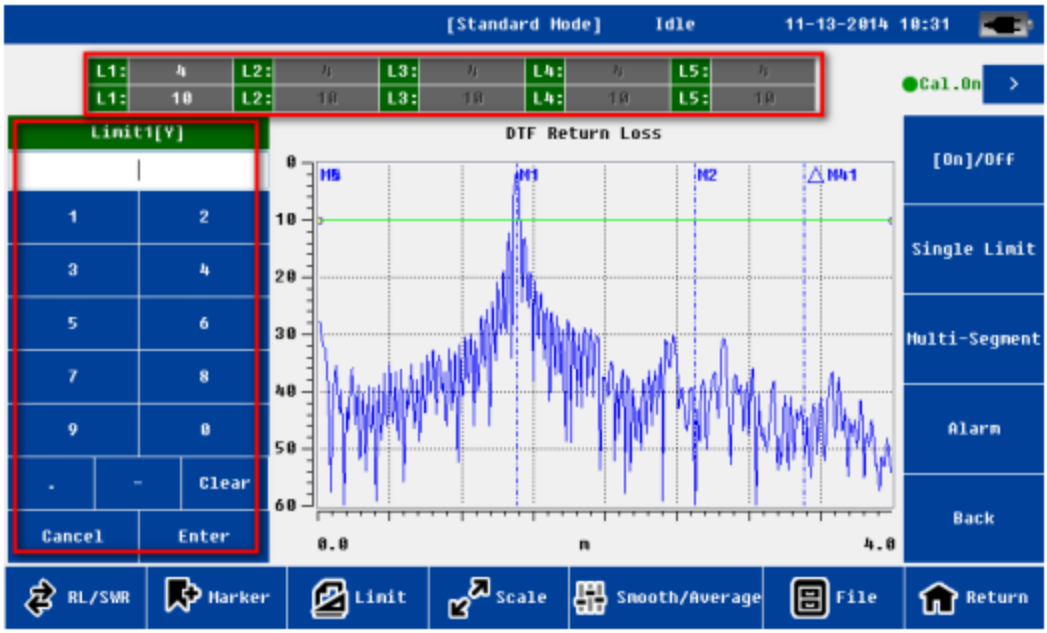
In all five measurement mode users can use limit line function. The user click on the "limit "menu, the limit menu will appear on the right side of screen. The user click on the "[On]/off" menu and activate this function. the limit line status information will display on the top of the screen.



Limit menu

System supports single section and multi section limit line.

The user clicks on edit box of limit line status(x, y independently), the new edit menu will pop-up on the left of the screen.



Limit setting menu

The user can define the limit line position by the following ways

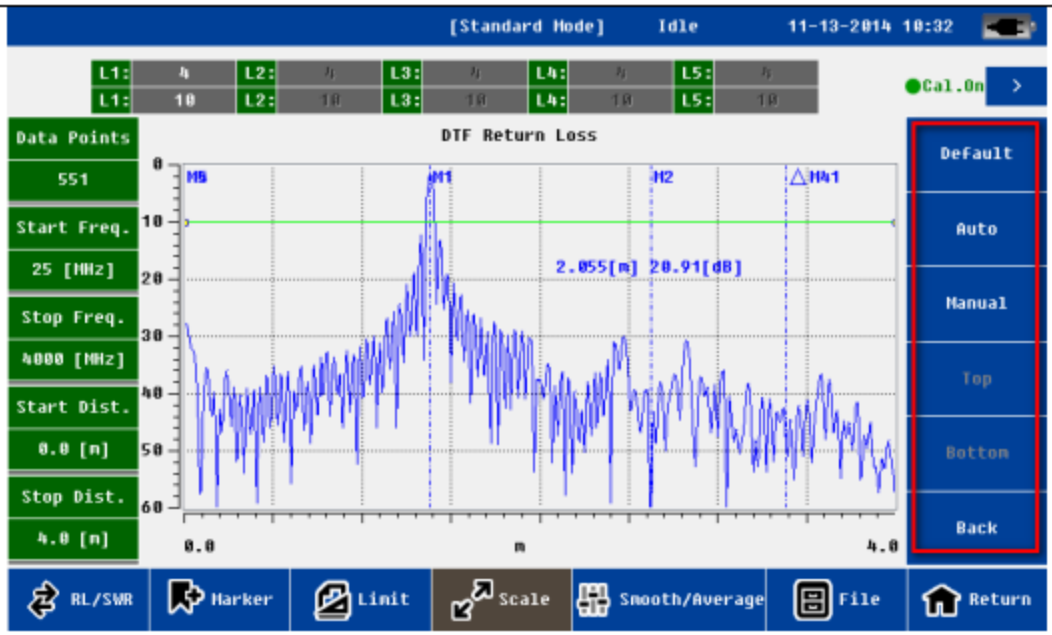
- The soft keyboard to enter digital value
- The hard keyboard to enter digital value
- Touch screen directly with touch pen to move and define the location
- Up and down arrow key of hard keyboard to fine adjust and define the location

After the location of the limit line is determined , users need to confirm the operation (soft keyboard "Enter" key or hard keyboard "OK" key).

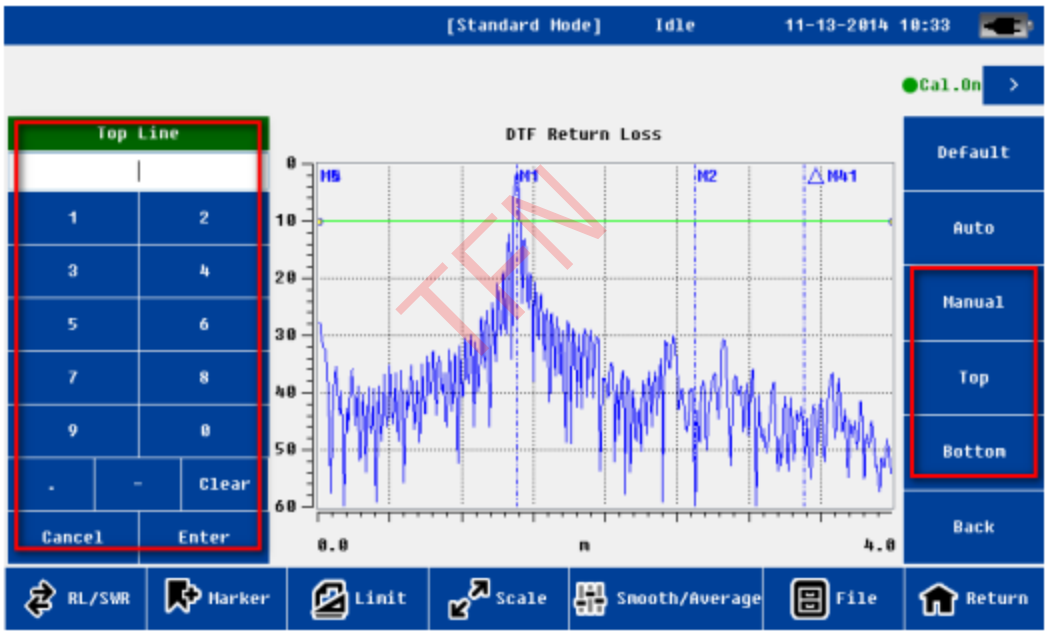
Users can also enable the limit line alarm function. If this function is enabled, once the measurement data exceeds the limit line, limit line color will turn red (the default is green).

3.4.3 Scale

Scale function is mainly used to adjust the Y axis, convenient for users to view data.



Scale menu



Manual scale setting menu

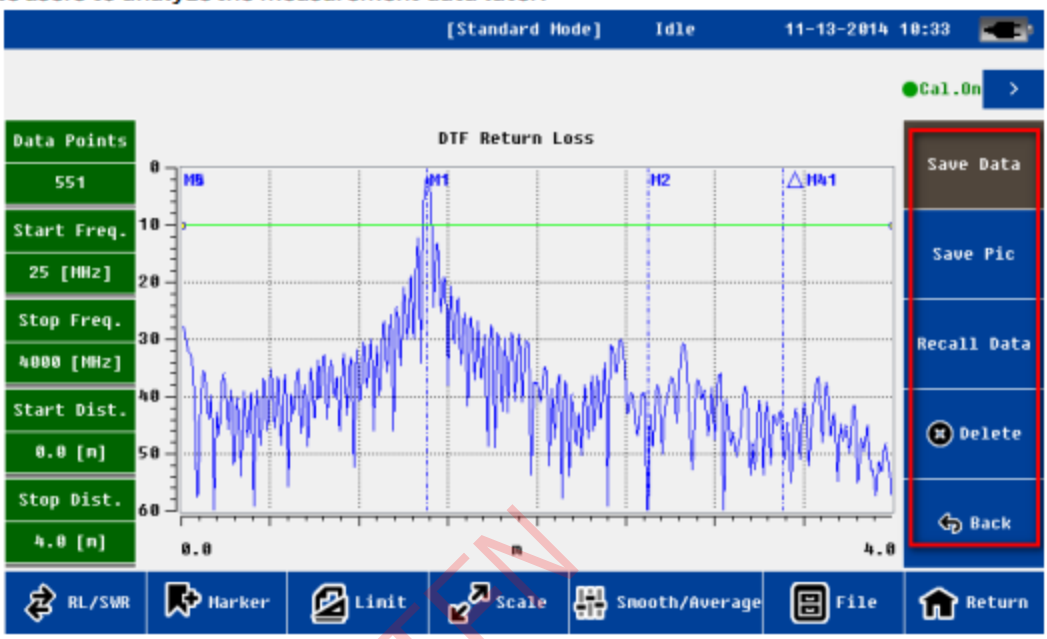
Name	Function and Description
Default	Y axis coordinate go back to the default value Return Loss: 0~60; VSWR: 1~65; Cable Loss: 0~30
Auto	Adjust Y axis automatically to adapt current measurement data
Manual	Users can edit upper and lower line of Y axis coordinate manually.

NOTE

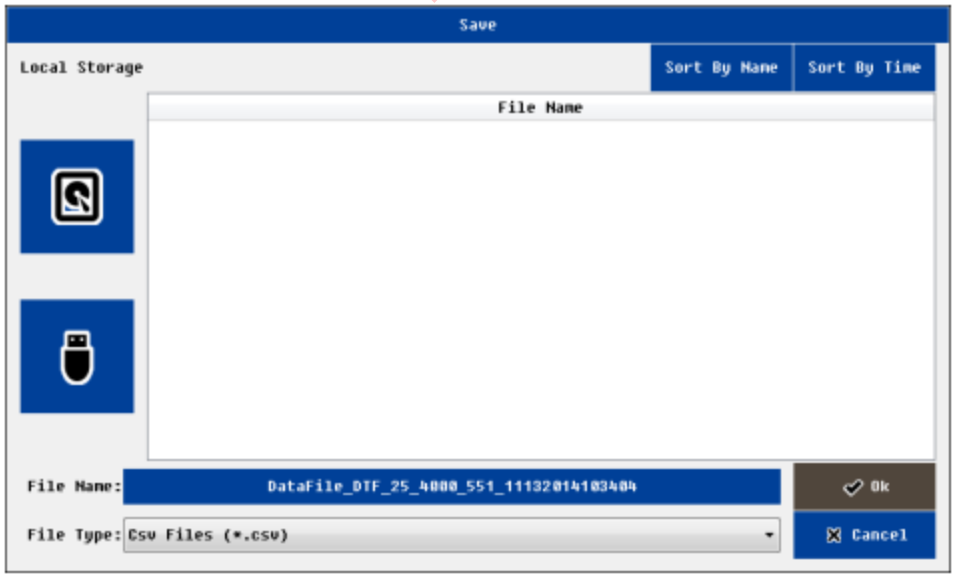
The upper and lower coordinate can only be edited if "manual" menu is activated.

3.4.4 File

The user can save measurement data or picture to PC; also can recall measurement data from PC to 100L/H . This function facilitate users to analyze the measurement data later.



File menu



Save file interface

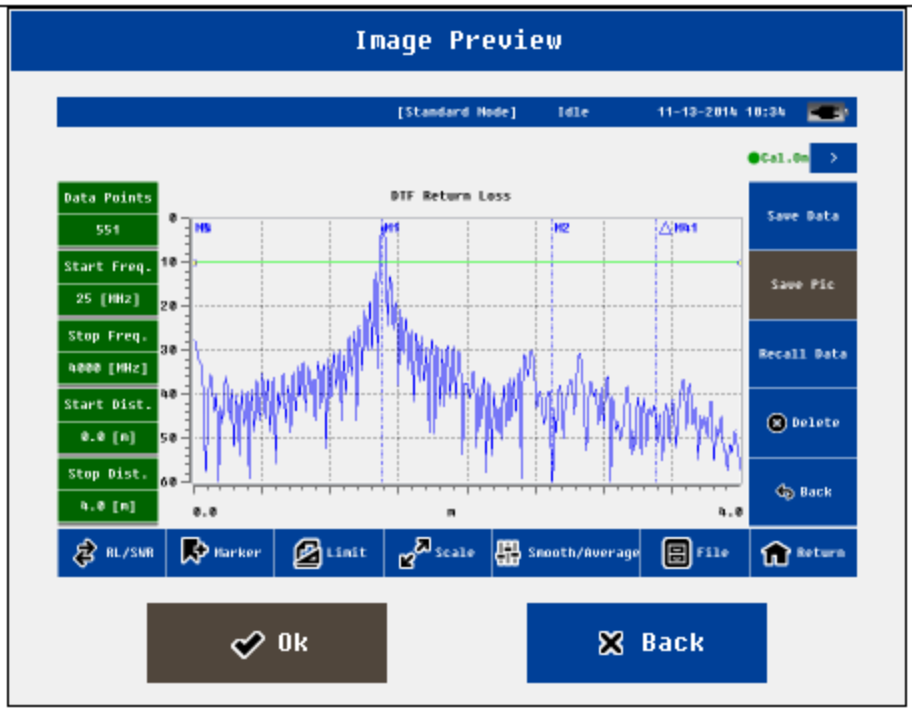
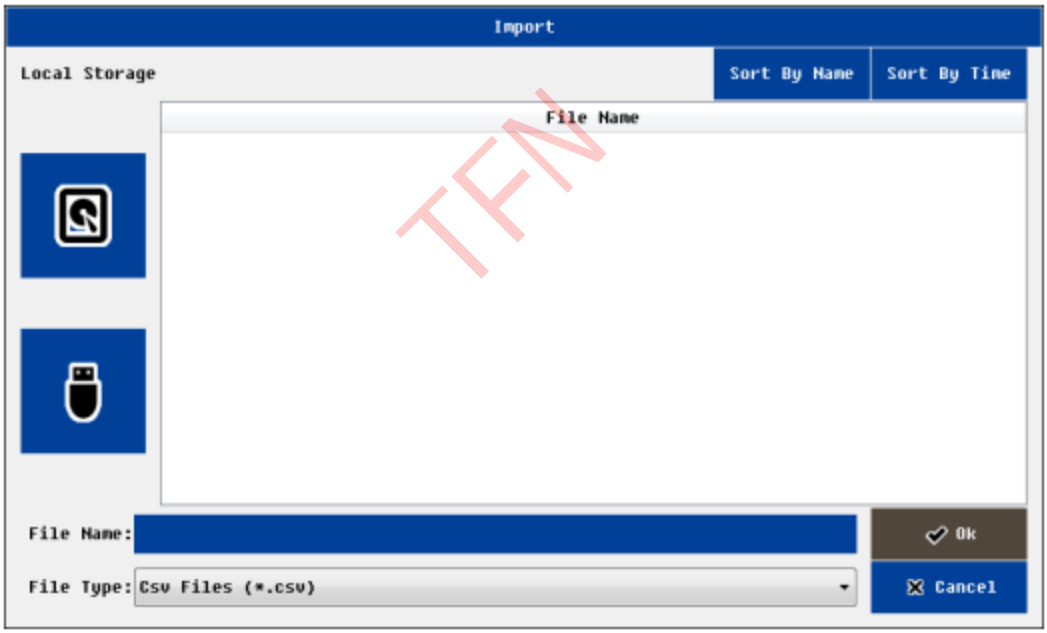


Image preview interface



File import interface

File delete interface

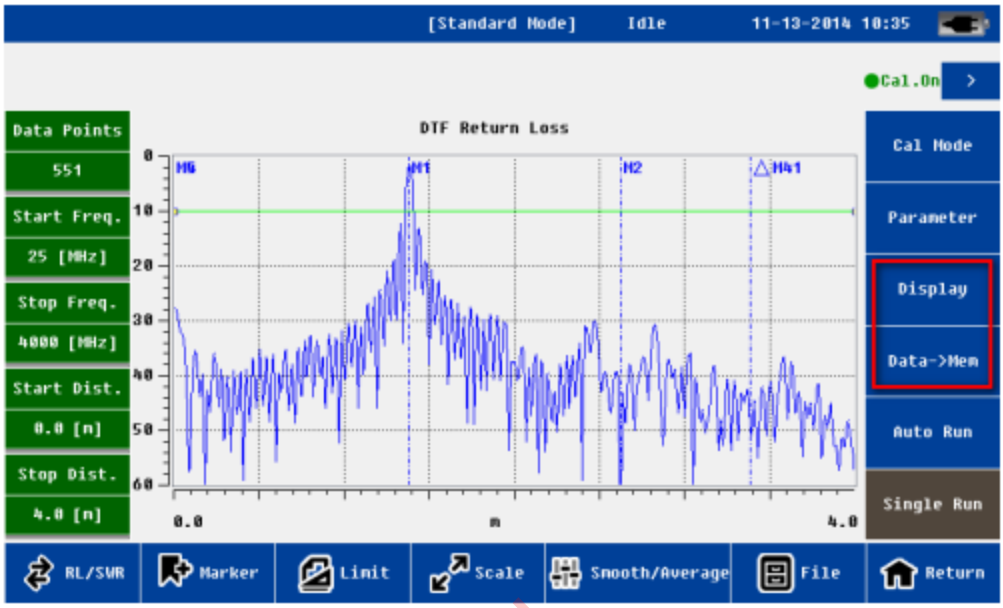
Name	Function and Description
Save Data	The default file type is .csv format The default file name includes the measurement mode, frequency, measuring points, the time information users can choose to save in the local memory or external memory Only support measurement and calibration data
Save Picture	The default file type is the.JPG format The default file name includes the measurement mode, frequency, measuring points, the time information users can choose to save in the local memory or external memory Only support measurement data Screenshot only support the curve of measurement data
Recall Data	The target file can be stored in the local memory or external memory Import file must be.csv type and the format must be correct
Delete	Delete the files

NOTE

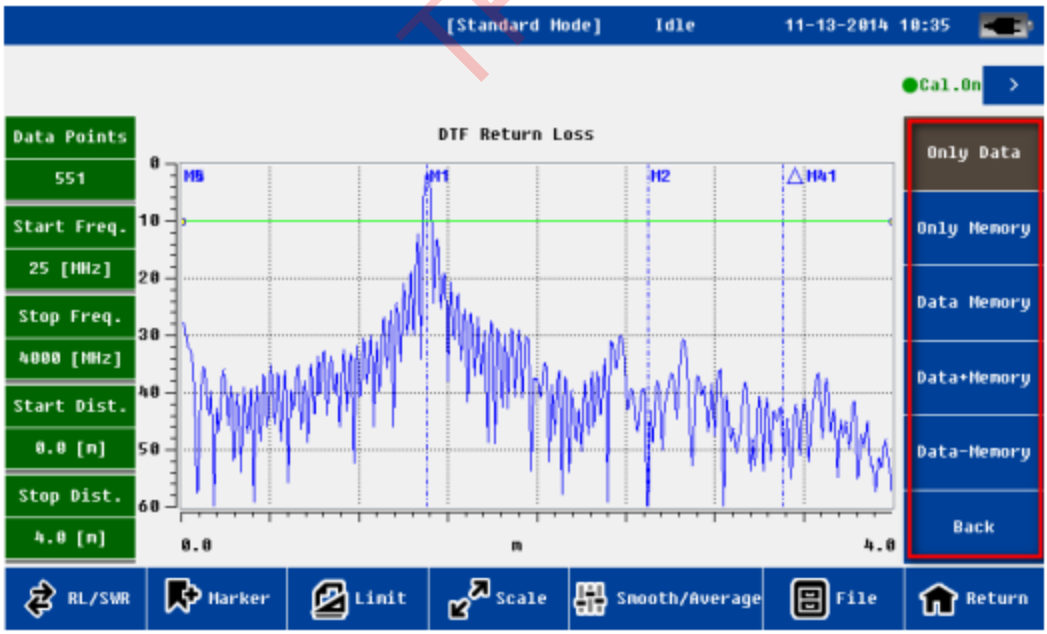
User must return to the superior interface before removing the external disk.

3.4.5 Display

The display menu is mainly used for data analysis. Users can save current data(either current measurement data or recalled history data) to the memory , then compare the current measured data and memory data.



Display menu

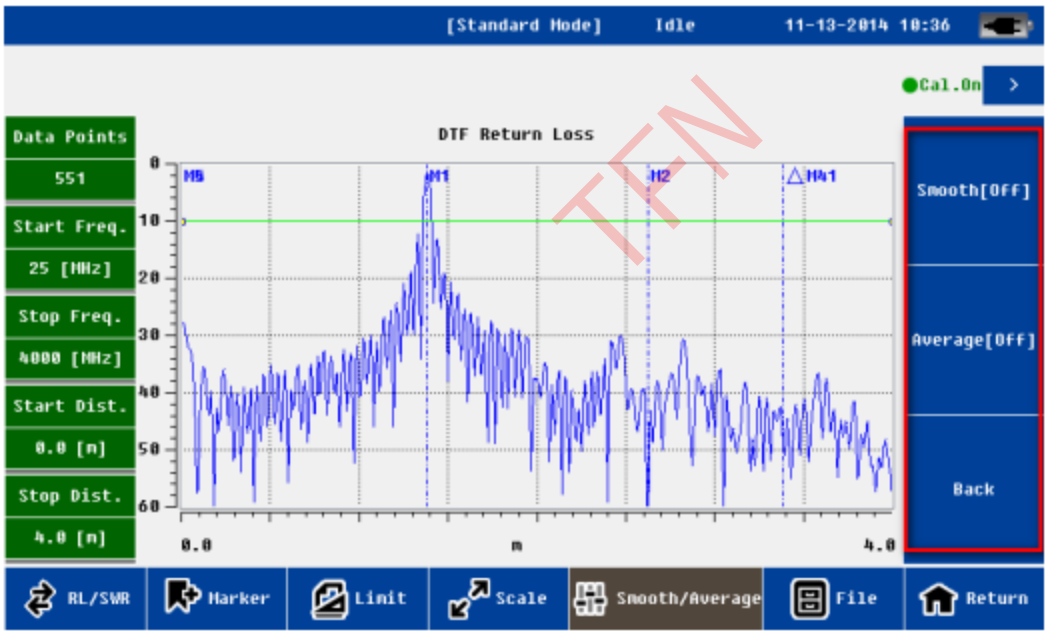


Display setting menu

Name	Function and Description
Data->Mem	Save current data to memory Note: Only one data can save

	The data can be the current measurement data, can also be a historical data. It can recall from local or external disk
Only Data	Display the current measurement data
Only Memory	Display the memory data
Data & Memory	Display the current measuring data and memory data at the same time Note: the format of two data must be same , such as the mode of measurement, frequency, measuring points, the distance information etc.
Data + Memory	Display "the current measuring data plus the memory data" Note: the format of two data must be same , such as the mode of measurement, frequency, measuring points, the distance information etc.
Data - Memory	Display "the current measuring data - the memory data" Note: the format of two data must be same , such as the mode of measurement, frequency, measuring points, the distance information etc.

3.4.6 Average/Smooth

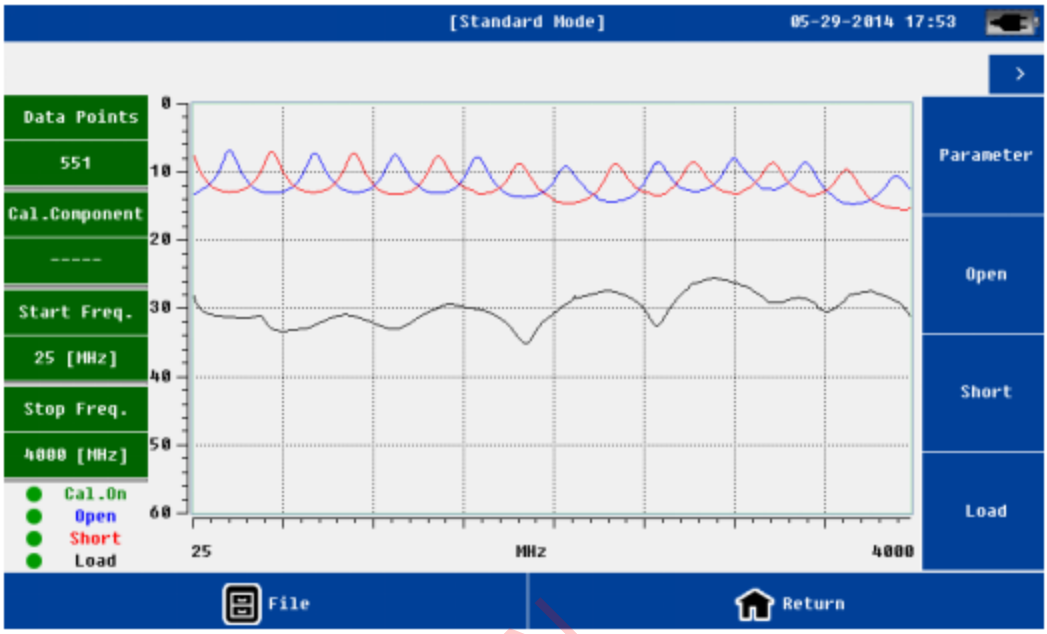


Average/Smooth menu

Name	Function and Description
Smooth	For a single curve do smooth operation
Average	For 2 relative curve do average operation。

3.5 Calibration interface

The user need to calibrate before the measurement. This instrument use open short load (OSL) calibration. Users need to follow the instruction and connect open / short/50 Ohm load respectively to the RF port and do calibration.



Calibration interface

The calibration interface is similar to measurement interface. On the left-top of screen including frequency information, On the left-bottom of screen including calibration information.

The user can save current calibration data to the local or external disk, or Import history calibration data to 100L/H.

Before calibration, the user need to set the correct parameters, Mainly refer to the frequency and measurement points. The completion calibration, the corresponding curve will display on the screen. If calibration is valid, the status on the left-bottom will become "cal On". If calibration is invalid or unfinished, the status will be "cal off".

After the calibration, the user can return directly to the measurement interface for measurement.

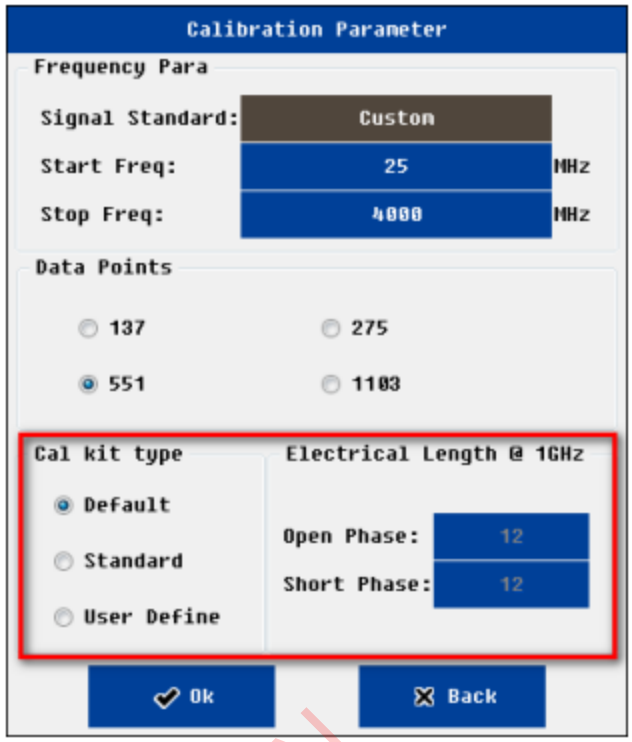
System support different calibration kit only if user know the exact electrical length of open/short load. Users can input this parameters in the e parameter menu.

Is the electrical length of open and short cal kit same?	Is the exact electrical length of open and short cal kit known?	Return Loss/VSWR/cable Loss measurement	Phase/Impedenc-e measurement
Yes	unknown	support	Do not support
Yes	know	support	Support
	know	support	support

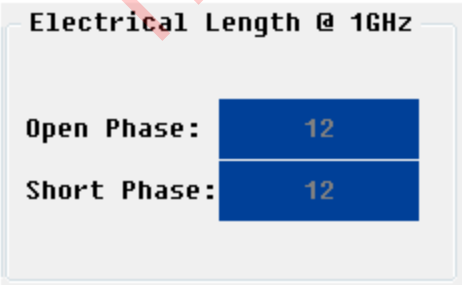
The return loss of 50 ohms cal kit need to be > 42.

The VSWR of open/short cal kit need to be >100.

If the user does not focus on phase and impedance characteristics, cal kit from other manufacturers can be directly used (usually short and open cal kit have same electrical length).



Calibration setting menu

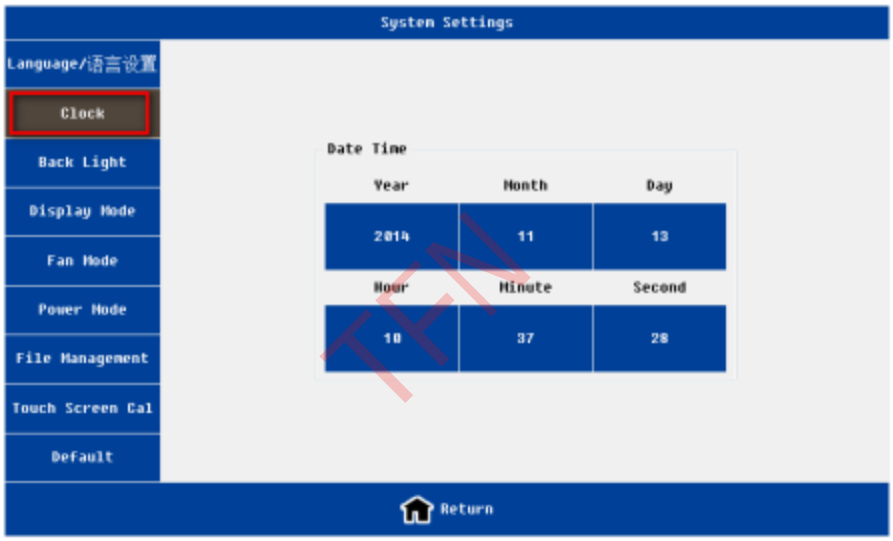


Note: the electric length is measured at 1GHz frequency, the unit is degree.

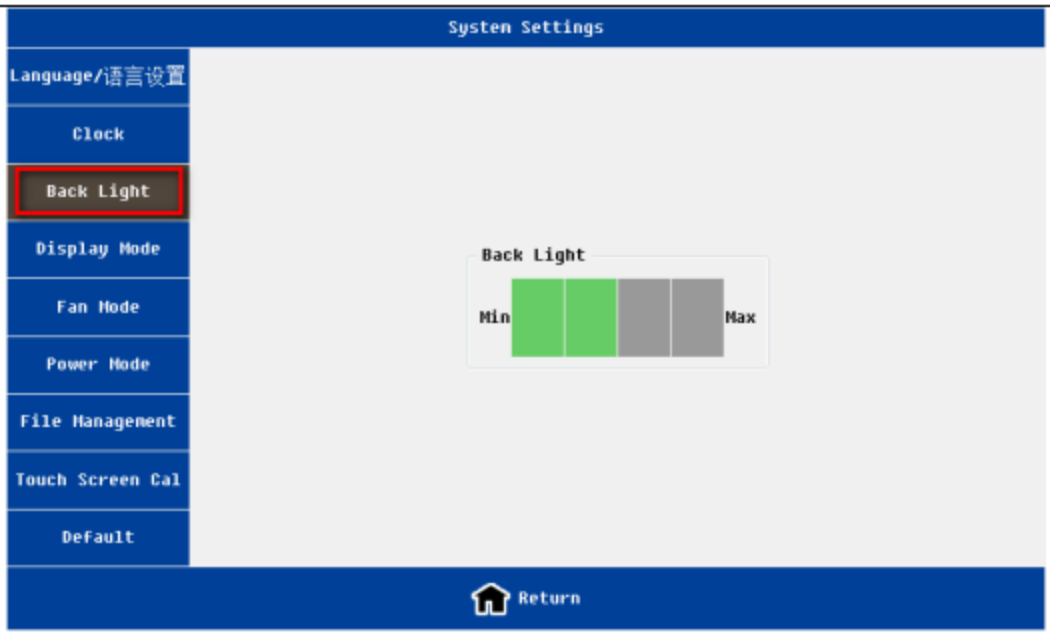
3.6 System Settings Interface

In the system settings interface, users can do all kinds of system configuration.

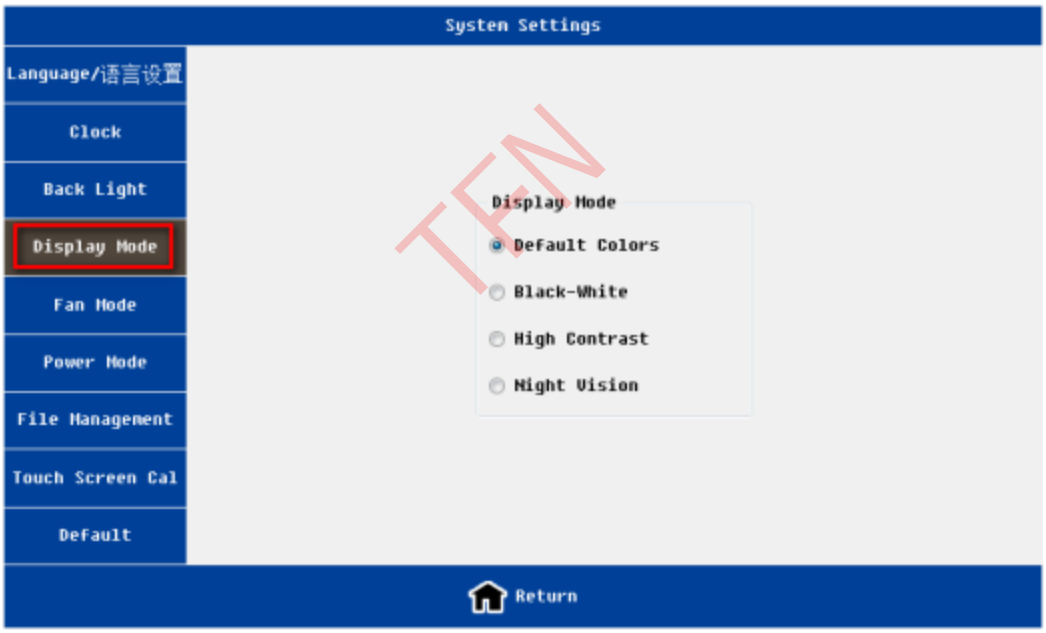
Language setting interface



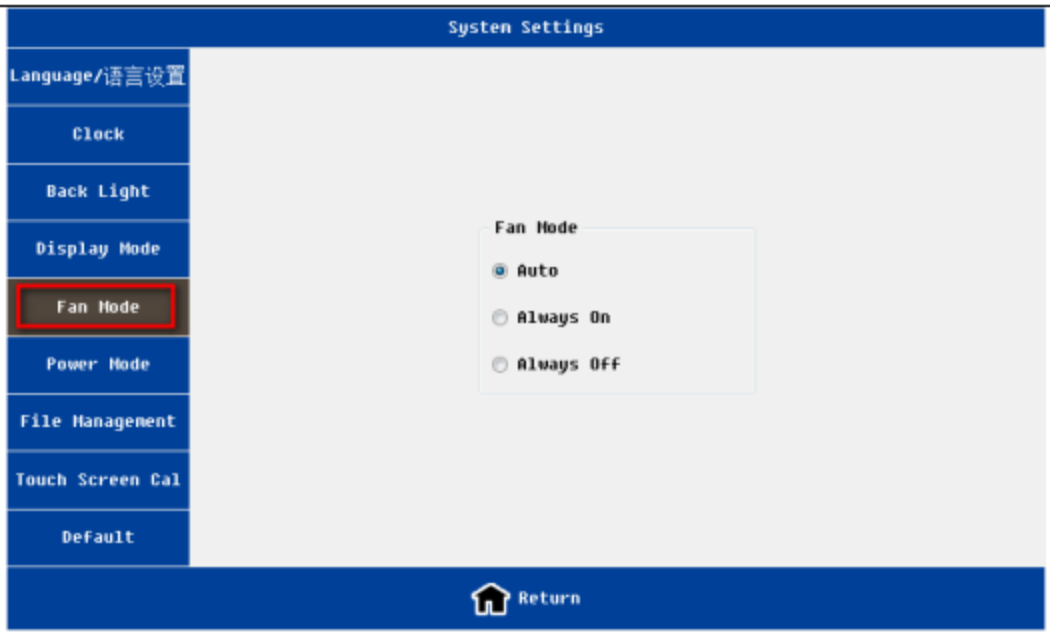
Clock setting interface



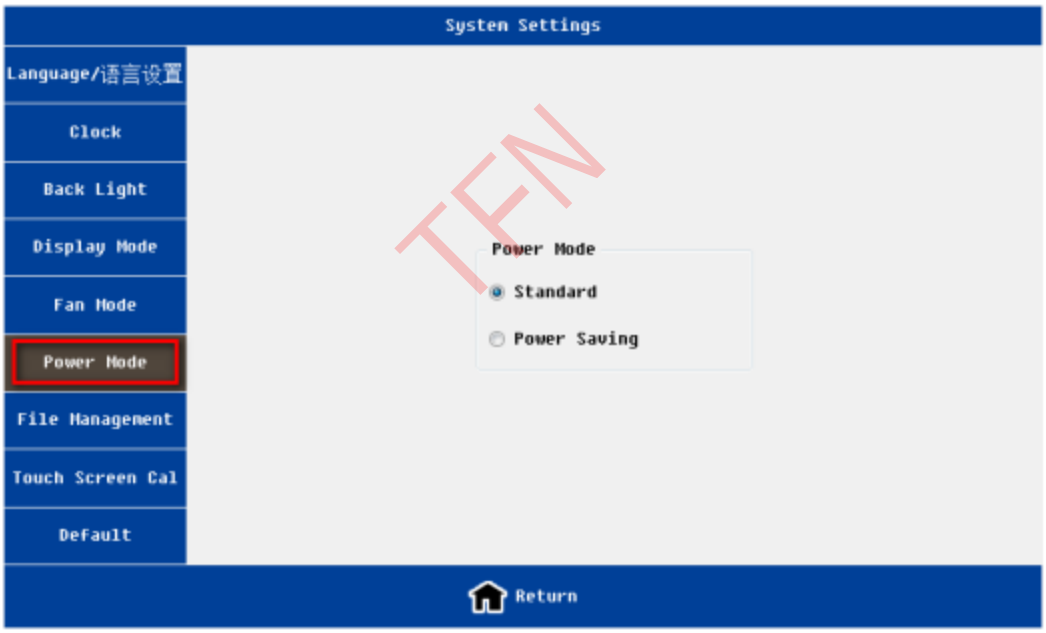
Back light setting interface



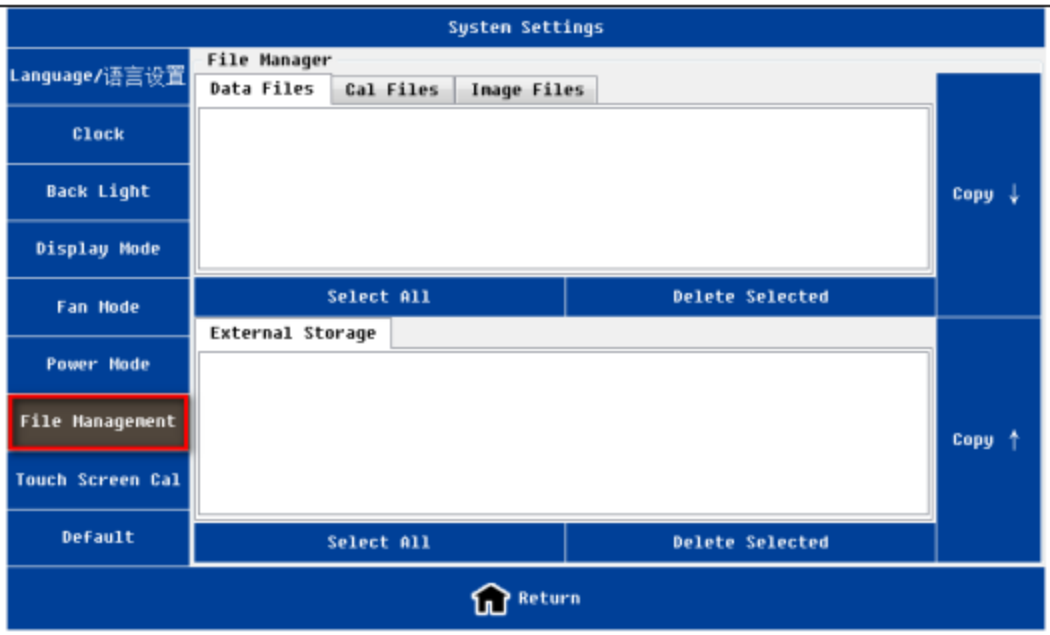
Display mode setting interface



Fan mode setting interface



Power mode setting interface

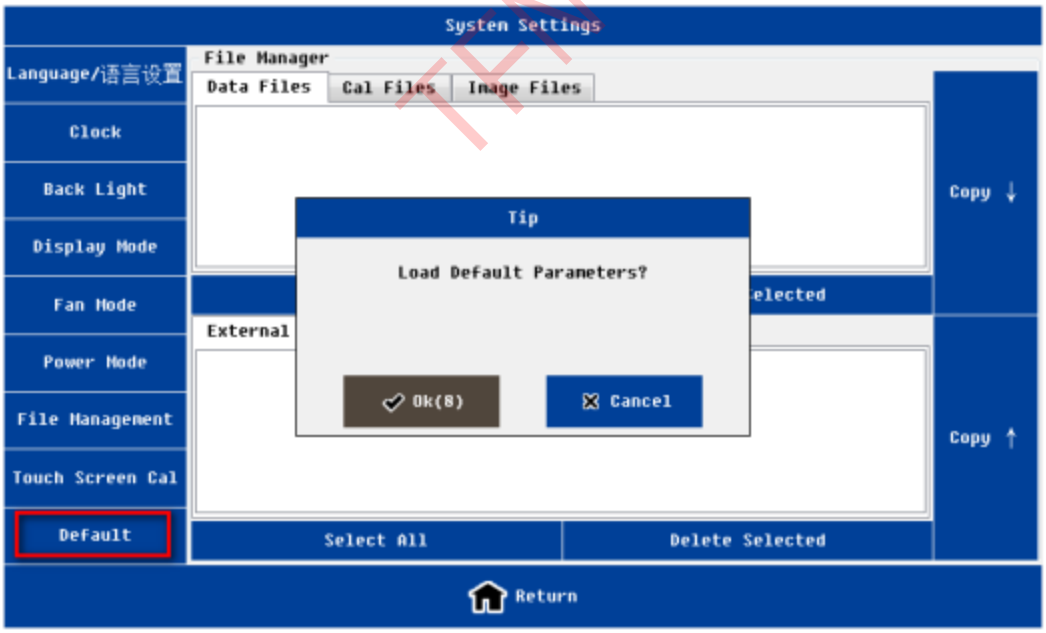


File manager interface

NOTE:

Please make sure that the external memory has been inserted before operating "File Management";

User must return to the superior interface before removing the external disk to make sure files performed.

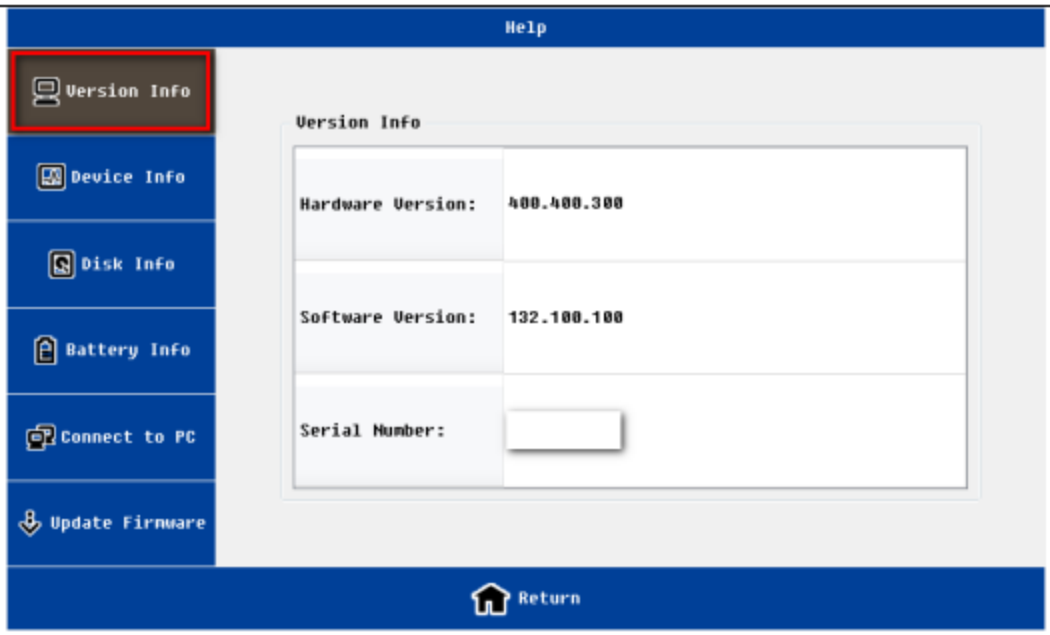


Load default setting interface

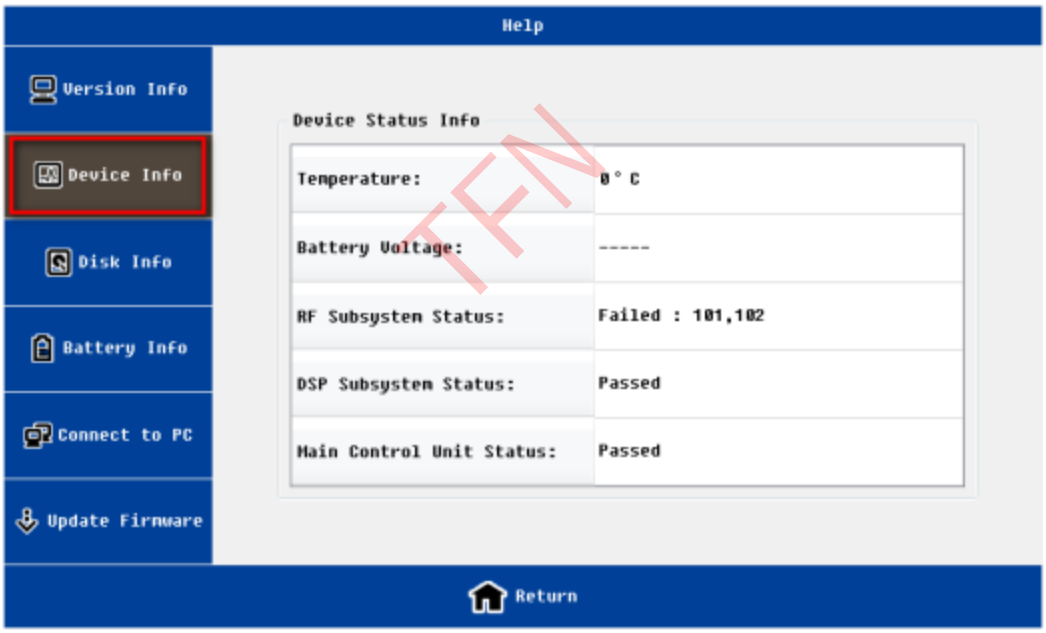
Name	function and description
Language	Support English /Chinese
Clock	year, month, date, hour, minute and second
Back Light	Support 4 levels brightness adjustment

Display Mode	4 modes: Default: Black-white: used for printing High-contrast: Night vision: used in night environment
Fan Mode	**Three modes:** Auto; Always On; Always Off. The default is Auto mode. If temperature higher than 45 degrees ,fan is turned on; if below 35 degrees fan is turned off.
Power Mode	**Two modes:** standard modes(default); power saving mode If working in the power saving mode, the relative RF circuits will be power on until measurement . It can save power's consumption and protect circuits, but its disadvantage is the measurement time will be a little long.
File management	For file management of both local disk and the external disk Support file copy and delete functions Support following file type :measurement data(.csv), measurement image (.Jpg), calibration data (.csv)
Touch screen Cal	To calibrate the touch screen. Users Can exit by pushing any hard key
Default	Restore to default value

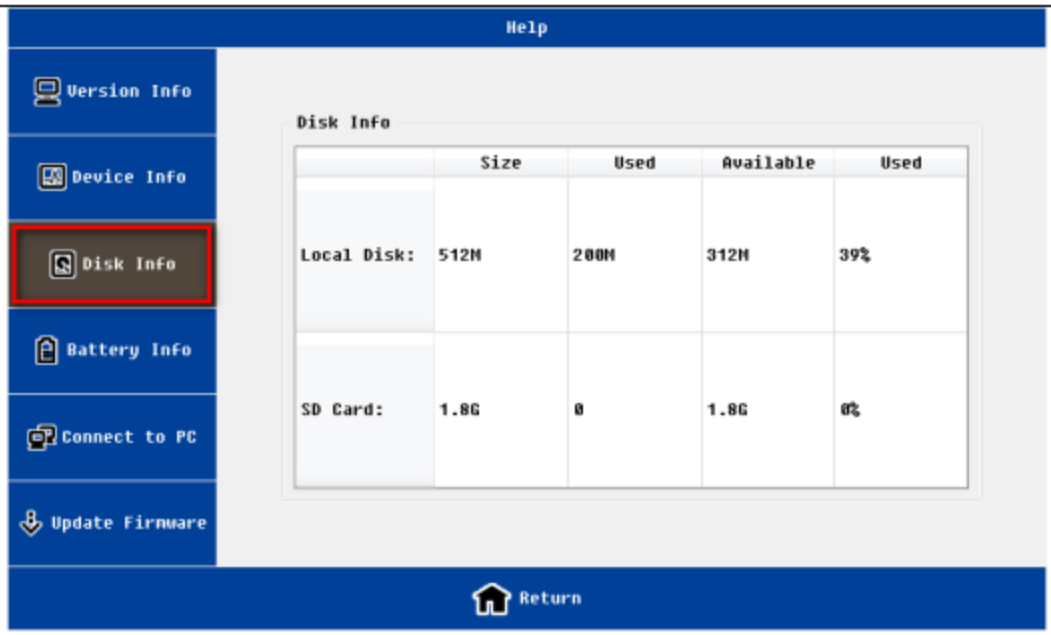
3.7 Help interface



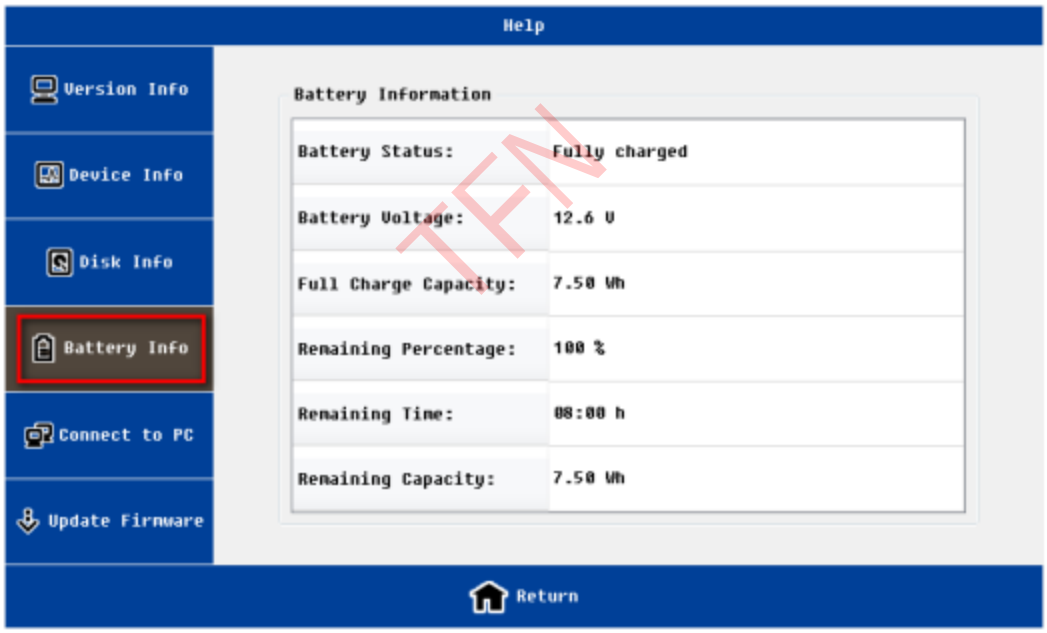
Version information interface



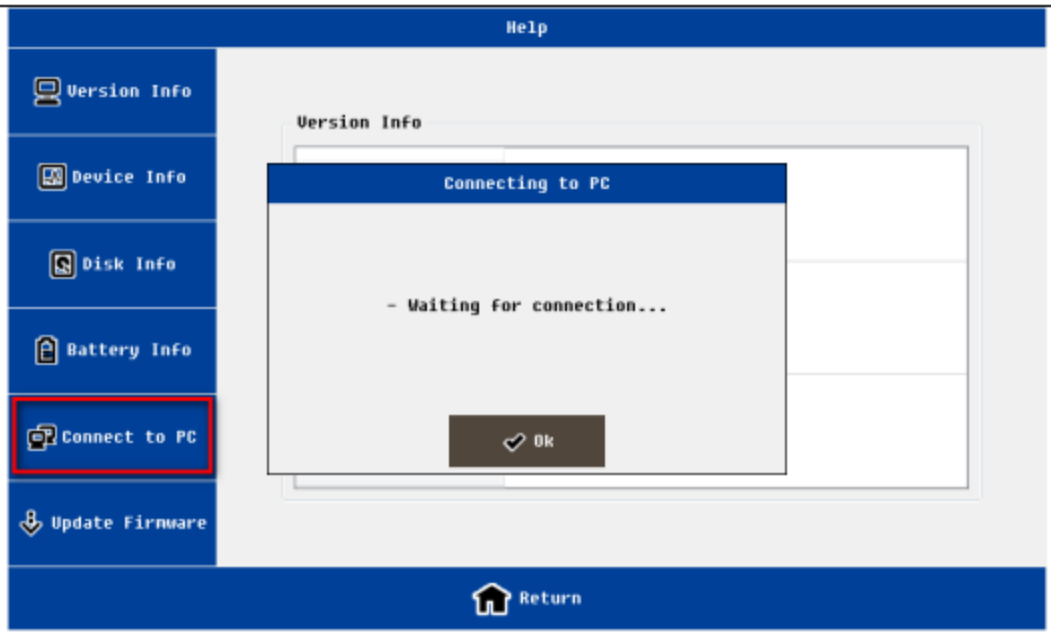
Device information interface



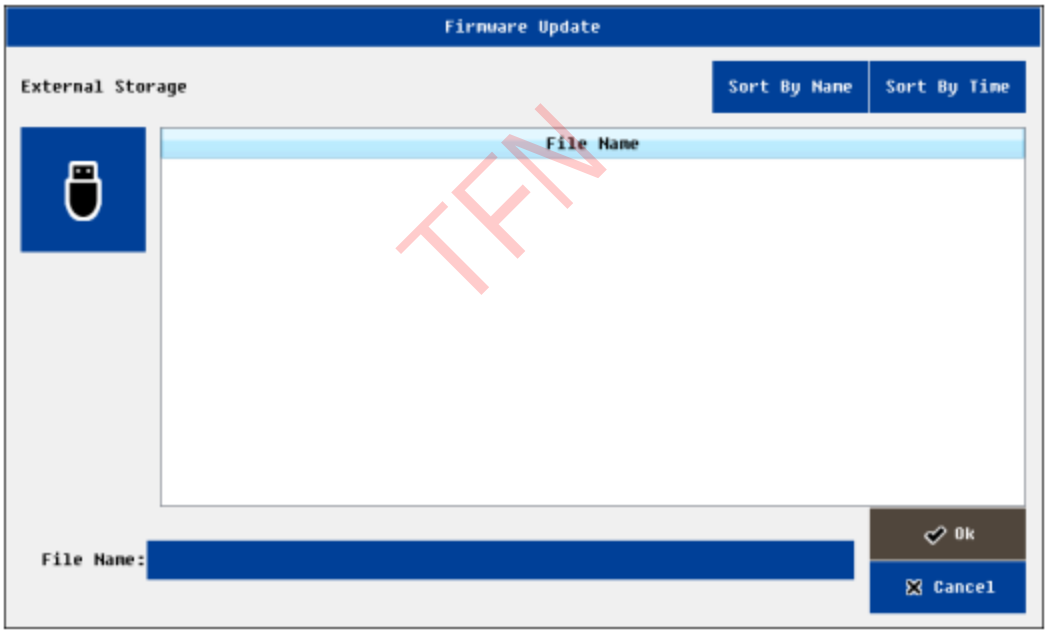
Disk information interface



Battery information interface



Connect to PC interface



Firmware update interface

On the help menu, the user can view a variety of instruments information; meanwhile users can upgrade the firmware.

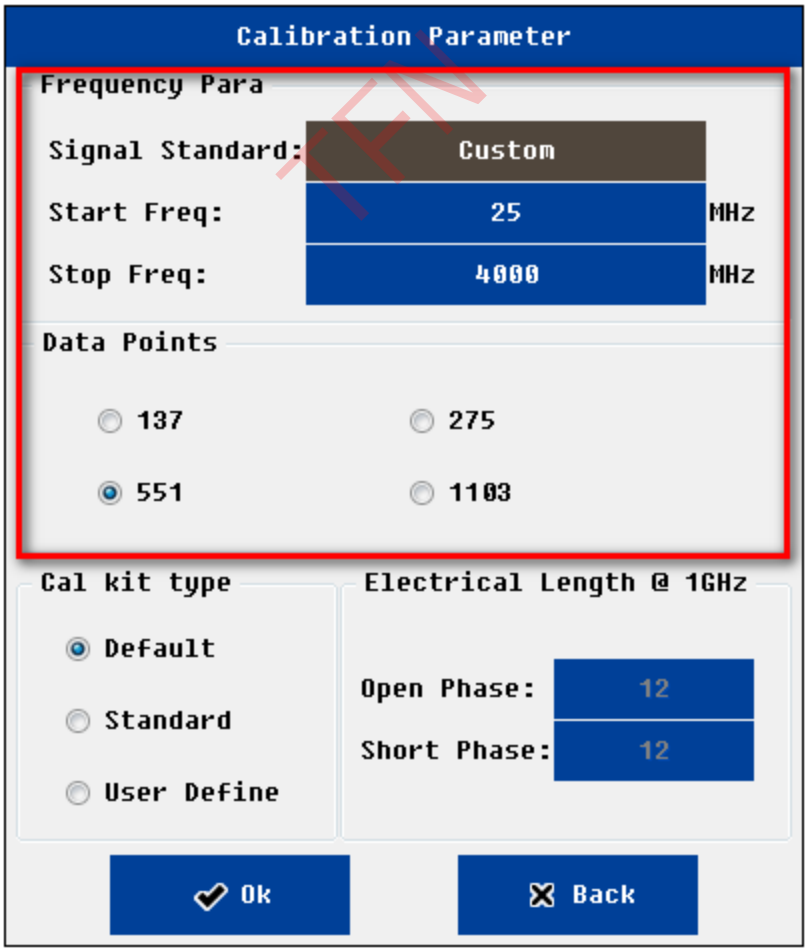
Name	Function and Description
Version Info	Includes: hardware version, software version, instrument serial number, etc.
Device Info	Includes: board temperature, battery voltage and instrument subsystems statue, etc.
	Includes: the information of local disk and a built-in SD card.

Disk Info	Note: the local disk refer to flash memory, the different version of the program will have different residual space
Battery Info	Showing the working status and residual power of the battery and other information
Connect to pc	Connect device to PC, upload data files to config files
Update Firmware	The user insert the U-disk to the instrument, select the correct version file; the instrument will automatically upgrade. After the upgrade is complete, the instrument automatically restart.

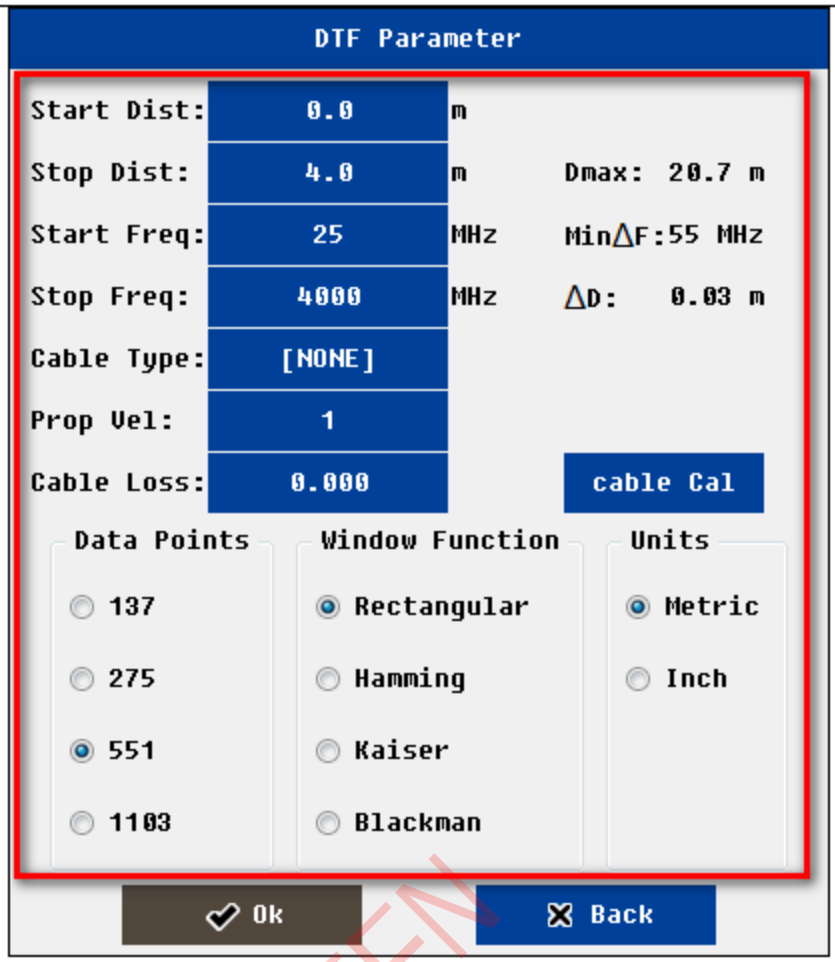
4. Common Operating Instructions

4.1 Set frequency parameter

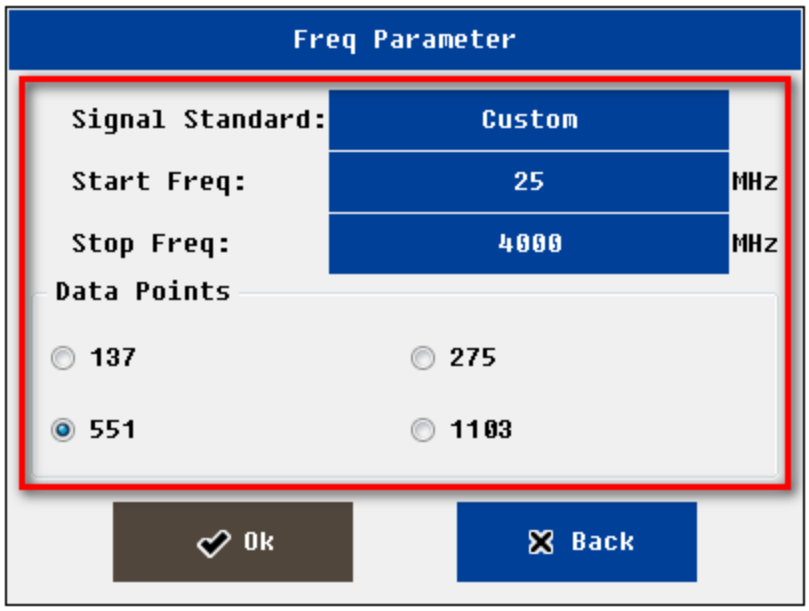
The user needs to properly set the frequency parameter before testing. In the following ways users can enter the frequency setting interface.



Calibration setting interface



DTF setting interface



Frequency setting interface

- In the "calibration" interface, click on the "parameter" button
- In the "frequency return loss" or "frequency VSWR" or "cable loss "measurement interface, click on the

"parameter" button

- The user can also input frequency parameters in "DTF parameter setting" interface

After entering frequency setting interface, the user can set start frequency and stop frequency through the following ways

- Select pre-defined Signal standard
- Manual input frequency parameter

Users can click on edit box to edit the parameter of frequency , system will pop up the soft keyboard. The user also can directly press the digital keys of hard keyboard .

The users need to select measurement points . System supports 4 options: 137,275,551,1103.

If the measurement point is set to 1103, compared with the set to 551, it will take about 2 times longer measurement time. And so on.

NOTE

The minimum frequency interval is 1MHz.

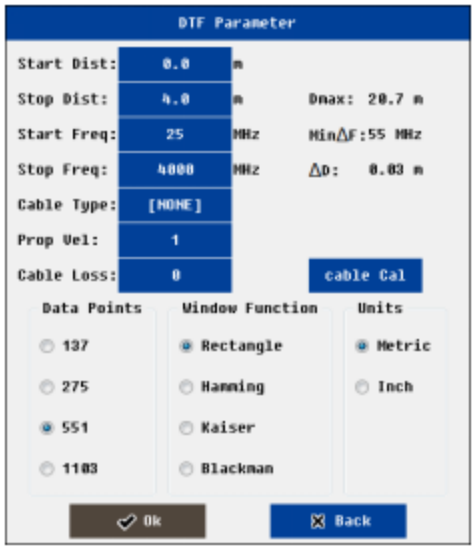
The start frequency range is 25~3999MHz;The stop frequency range is 26~4000MHz.

The user can modify the pre-defined signal standard through PC software .

4.2 Set DTF parameter

The user needs to properly set the DTF parameter before DTF testing. In the following ways users can enter the DTF setting interface.

Enter the "DTF-return loss" or "DTF-VSWR" measurement interface, select "parameter" menu.



DTF setting interface

The user can complete the following functions at the DTF parameter setting interface

- Enter frequency information and measure points
- Enter the distance information
- Enter the cable parameters
- Select the window function
- Set unit (support metric and Imperial)

NOTE

The user can modify the pre-defined cable parameters through PC software.

4.2.1 Set Distance parameter

Distance parameters need to satisfy the testing needs, but also associated with the following parameters

- The operating frequency range (F1, F2)
- The number of measured points (N)
- Cable propagation velocity (Vp)

Once the user set the operating frequency, the number of measured points, cable propagation velocity, the maximum allowed cable length (Dmax) has be decided.

$$D\max = N*150*10\text{^}8*Vp*\frac{1}{F2-F1}$$

For the convenience of users, the system will automatically display the relevant information (the maximum allowed cable length: Dmax; resolution Δ D) in the upper right corner.

For example: N=551; Vp=0.85; F1=25MHz, F2=4000MHz. The corresponding Dmax is 17.64 meters, Δ D is 0.03 meters;

Do not change the frequency, if users want to increase the allowed cable length , can increase the number of measuring points, the corresponding test time can also be longer

NOTE

Due to the calculation of DTF, the minimum frequency interval is (N-1) *100kHz. If the measurement points is 551, corresponding minimum frequency interval is 55MHz.

The minimum distance interval is 1 meters (inch) or 1 feet (inch)

Start distance range is : 0~Max-1;stop distance range is 1~Dmax

4.2.2 Set Cable parameter

Users can manually input cable parameters (velocity; cable loss) or select the type of cable known.

the propagation velocity of electromagnetic wave in the cable is less than the vacuum speed (300M meters /second).

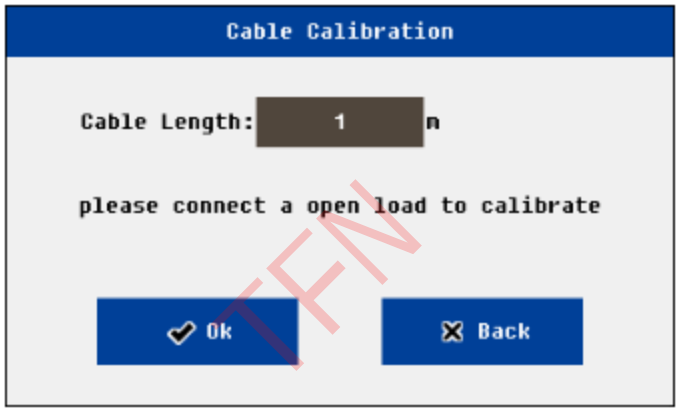
Propagation constant is 0.85, meaning that the actual propagation velocity of the electromagnetic wave in the cable is the 0.85*300M meters / second.

When the user in the fault distance analysis, often want to know the return loss or VSWR of one exact connector . At that position, the cable loss and connector return loss will be mixed together, systems need to remove cable loss impact in the calculation connector return loss. The unit of cable loss is dB/ meter.

Users can select cable from pre-defined cable list. Usually the cable loss will vary with frequency .System will automatically calculate the cable parameters According to the cable parameters and working frequency.

If the user does not know any cable information and parameters, but have a cable at hand, users can use the system tools("cable" cal)to get these parameters.

Click on the "cable cal" button in the DTF parameter interface, system will pop up one window. Users enter the measured actual length of cable (0.5~10 m); one end of the cable is connected to the RF port, the other end connected to open load or connected to nothing;. Once the calibration is completed, the cable parameters will automatically refresh in DTF parameter interface.



4.2.3 Set Window Function

In the distance to the fault analysis, if the location of the two connectors are close, because of the influence of spectral leakage, two connectors will be influenced each other. If return loss of one connector is much smaller than another one , most probably it will be lost and can' t be recognized. In this case users should choose to use the window function.

System support four types window function: rectangle window, Hamming window, Keyser window, Blackman window .

4.3 OSL Calibration

The user needs to confirm the system is in "calibration valid" state before a test.

Before one test, system need to know beforehand the 3 known load (open /short/50Ohm) test results. The user can

import the previous calibration data; or do OSL calibration before test.

The user can enter the calibration interface by the following ways.

- In the main interface, click on "calibration" mode icon
- In the measurement of interface, click on the button "cal mode"

The OSL calibration procedure is as follows,

- Set the frequency parameter
- Set up calibration parameters (optional)
- Calibrate the first load

  Connect the load to the RF ports, click on the corresponding button.

  The system will pop up a small window, click on the "OK".

  System start calibration.

  Once calibration is completed the screen will display the curve.
- Calibrate other loads

If all calibration of three loads completed, the green "cal on" will shown at the lower left corner of the screen.

Users can directly calibrate at the RF port, also can calibrate with a high performance cable connected to RF port. If the former, usually, the calibration curve of 50 ohm load will be significantly lower than the other two.

If calibration is completed, the user can start measurement .

The user can also select the file menu to save the calibration data in the local or external disk.

After the system boot, the default calibration data will be recent one.

The user clicks on the "file" menu, click "import", can recall previous calibration data. If the environment is similar, the previous calibration data can be used directly.

NOTE

Need to re calibration if frequency changed or measurement points increased

Need to re calibration if temperature changes a lot

Do not need re calibration if measuring points reduced.

Do not need re calibration if distance, cable parameters, window function changed.

4.4 Freq-Return Loss, Freq-VSWR, Cable-Loss measurement

The measurement can be used to verify the power matching of the port or the loss of the cable .X axis coordinate is frequency, Y axis coordinate are VSWR, or the return loss, or loss of cable separately.

In the following ways users can enter the measurement interface.

In the main interface, click on the "measurement" icon, and then click the corresponding icon

In the measurement interface, the user can do a variety of measuring operation.

NOTE

Need to set proper frequency parameters before test

Need to confirm that the system is in "calibration valid" state before test

The minimum frequency interval is 1MHz

4.5 DTF-VSWR,DTF-Return Loss measurement

The measurement can be used to verify the power matching performance of different position of cable and antenna system, then user know a certain position joint connection quality. X axis coordinate is distance, Y axis coordinate is VSWR, or return loss

In the following ways users can enter the measurement interface.

In the main interface, click on the "measurement" icon, and then click the corresponding icon

At the measurement interface, the user can do a variety of measuring operation.

NOTE

Need to set proper frequency ,distance, cable parameters and window function before test

Need to confirm that the system is in "calibration valid" state before test

The maximum measuring range and accuracy associated with frequency parameters, the propagation velocity of cable

The minimum frequency interval :(N-1) *100kHz (N: measurement points)

The user can set the unit in the DTF parameters window units (metric and Imperial)

5.100L/H Performance

Model	100L/H
Specification	
Frequency Range	25-4000MHz
Frequency Resolution	100kHz
Frequency Accuracy	+/-25ppm
Output signal level	0dbm （typical）
Measurement speed	2,3,6 seconds
Measurement point	137,251,551,1103
Directivity	42dB（after calibration）
Interference Immunity	On-channel 17dBm， >1MHz away from carrier freq On-frequency -5dBm,within +/-10kHz of the carrier freq
Freq-RL range	0~60dB
Freq-RL Resolution	0.01dB
Freq-VSWR range	1~65

Freq-VSWR resolution	0.01
Cable Loss range	0~30dB
Cable Loss Resolution	0.01dB
DTF- return loss range	0~60dB
DTF-VSWR range	1~65dB
Distance-to-Fault range	1500 meters
Distance-to-Fault Resolution	1.5*10^8*Vp/(F2-F1) Vp: velocity propagation constant; F1, F2: start and stop frequency
Others	
RF Connector	Type N, female
Input impedance	50 Ohm
Display	7 inch resistor touch LCD,, 800*480 resolution
Data interface	1 USB Host 1 USB Device 1 10M/100M adaptive LAN
Storage	>2000 curve
Language	Chinese, English
General Information	
Battery	Type: Li-Ion 11.1V 7800mA
External Adaptor	110~240 50~60Hz AC input, 16V 3.75A DC output
Working temperature	-10℃~ 50℃
Storage temperature	-40℃~ 70℃
Humid	0~85% (no condensation)
Weight	2.5kg (net weight)
Size	290 × 175 × 75 mm

*Specifications subject to change without notice.

6 Warranty Information

6.1 Warranty period

For all TFN products, due to the fault caused by the material or production reasons, the company provide free warranty for one year from product delivery. In the warranty period, any failure of the product can provide a warranty or replaced by the company, but in any case, the company to assume the responsibility of all limits the original price range in the purchase of the product.

This warranty does not include the company providing products accessories or selected parts.

6.2 Exclusions

The warranty on your equipment shall not apply to defects resulting from the following:

Unauthorized repair or modification

Misuse, negligence, or accident

TFN Technologies, Inc. reserves the right to make changes to any of its products at any time without having to replace or change previously purchased units.

6.3 Warranty Registration

A warranty registration card is included with the original shipment of equipment. Please take a few moments to fill out the card and mail or fax it to the local Customer Service Center of TFN Technologies, Inc. to ensure proper initiation of your warranty term and scope of your warranty.

6.4 Returning Instruments

To return instrument for reasons of yearly calibration or other, please contact the local Customer Service Center of TFN Technologies, Inc. to obtain additional information and a RMA# (Return Materials Authorization number). And describe briefly reasons for the return of the equipment, to allow us offer you more efficient service.

6.5 Contacting Customer Service

Please check our web site (www.tfngj.com) for updates to this manual and additional application information. If you need technical or sales support, please contact local TFN

Technologies Customer Service.

TFN Technologies (China), Inc.:

Address:

Postal code:

Tel:

Fax:

Email:

WEB:

THANK YOU FOR CHOOSING

TFN TECHNOLOGIES!