TFN

User Guide

TFN FMT715C/760C RF Analyzer

TFN

Ver: 1.00
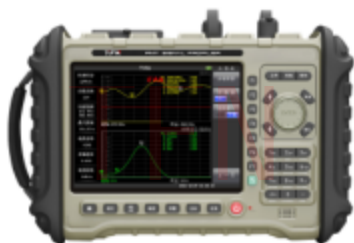
Conventions

This manual has the following conventions for presenting information.

WARNING: A warning alerts you to any condition that could cause personal injury.

CAUTION: A caution alerts you to any condition that could cause a mechanical failure or potential loss of data.

Make sure the AC power supply voltage meet the equipment requirements, otherwise it will cause an equipment failure.

Make sure plugging the power cable into an electrical outlet that has safety grounding before turning on the power switch.

Touch the internal circuit may cause a mechanical failure or personnel injury, so only trained engineers can remove the instrument cover and maintain the instrument..

Warranty

This equipment is guaranteed for a period of 18 months from the date of selling. The producer or distributors have the responsibility of necessary calibration and test. The device could be packed and sent back to users only after it passing the test.

Users must use and check the equipment according to the manual. If maintenance is needed, please send back to our company our authorized maintenance stations.

Generally, in the warranty period all faults which are not caused by improper use would be repaired by our company free. Users need to pay for the freight and insurance to send the product back. The freight sending the product back to users would pay by our company or authorized maintenance stations.

The device would execute the programming command after installing all software and hardware correctly. But we do not guarantee the operation continuity and absence of faults.

The guarantee is limited only to the equipment and does not involve any damage of equipment, personnel and property caused by improper use of the equipment.

Limitation of Guarantee

The warranty is not applicable for the faults resulted by improper use or inadequate maintenance (including software or interface), and unauthorized disassembling the instrument. Within the 18 months warranty period, calibration, maintenance service and consultation shall be free. After the 18 months warranty period, fees for material, repair and verification will be charged appropriately. Internal battery 12 months warranty.

The following items are not under warranty:

①Damage caused by improper voltage or AC/DC currency input.

②Deformation or damage of panel, switches, devices and case as well as defects involving interval parts caused by external mechanical force (shocking and dropping, etc.).

③Defects caused by unauthorized repair.

④ When users pick up the device, please check it on the nail. If there is any damage, please contact with the transuiasdport company. Only receivers (the person and department of receiving the product) have the right to ask for compensation for the transportation damages.

⑤Defects caused by the equipment worked beyond the required technology specification.

All specifications and operations might change that we would not inform individually. For any other needs, please ask our company.

Our company has all the copy rights. No copy, edition or translation is allowed without written approval.

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1   General Information

This chapter provides information about the following items.

- **Introduction**
- **Available Models**
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- **Calibration Requirements&Annual Verification**
- **ESD Caution**
- **Battery Replacement**
- **Soft Carrying Case**
- **Technical Support and Service Information**

1.1   Introduction

FMT715C/760C RF Analyzer is a handheld antenna, feeder and cable testing and spectrum analysis. FMT715C/760C RF Analyzer is applied to field measuring return loss, VSWR, cable loss and fault location of cable network project to ensure the performance of the cable network when installing, and fast located fault point when maintaining.

FMT715C/760C RF Analyzer has functions of reflection and transmission measurement. It collects multiple measurement modes that make it an ideal measurement tool for linear and nonlinear parts of RF system (including radio station, cable TV, communication receipt devices and other wireless application system).

6.5inch TFT color LCD could be easily used in hard light. The built-in lithium battery could work 6h continuously.

The built-in 1G Flash storage could save up to 2000 pieces of measurement trace data and configuration file. The measurement data and configuration files could also be saved in U disks or uploaded to PC.

This equipment is produced by TFN strictly according to the standard of ISO9001 international quality management system. The ISO9001 quality management system is registered and verified in 1996.

1.2　Available Functional Options

Available functional options of the equipment are listed in Chart 1-1.

Model	Instruction
E7042-200	Transmission measurement
DS2500-704	GPS receiver
E7000A-0040	Terminal power meter
HYLC-A1213-DC2.5	battery charger

Chart 1-1 Tester Options

1.3　Standard Accessories

Open the box carefully. Check all standard accessories and information according to chart 1-2. If they are not complete, please contact with TFN, and show the packing & shipping list. Extra paid options would also be sent to users. If they are not complete, please contact with TFN, and show the packing & shipping list as well.

Model	Instruction
E7042-001	User guide
E7042-002	Quick operation guide
C50N-P （OR E7000-1000）	N(male) type standard calibration kits （Or ECAL electronic calibration kits）
NP-DL01-NJ-150	1.5m,N(male))-N(female),6GHz,50Ω cable
E7042-000	Workbench software CD
E7000-0300	Lithium battery group
FSP065-RAB	Power adaptor
E7000-0400	Vehicle adaptor 12V/DC (＜0.5Ω)
E7000-0500	USB line
P.310015000	1.5m network line
E7000-0600	Carrying bag

Chart 1-2 Standard Accessories

1.4   Preventive Maintenance

The preventive maintenance includes the unit surface cleaning, RF connectors and all accessories cleaning. Clean unit surface with a soft, lint-free cloth dampened with water.

> **NOTICE:** To avoid damaging the display or case, do not use solvents or abrasive cleaners.

Clear the RF connectors and center pins with a cotton swab dampened with denatured alcohol. The fingers of the N(f) connectors and the pins of the N(m) connectors should be unbroken and uniform in appearance. If you are unsure whether the connectors are undamaged, gauge the connectors to confirm that the dimensions are correct. The test port cable should be uniform in appearance, and not stretched, kinked, dented, or broken.

1.5   Annual Verification & Calibration Requirements

Local service centers are responsible for equipment maintenance and calibration once a year. To ensure performance conformity. TFN recommends a periodical maintenance and calibration.

In fault location and reflection measurement, the device is calibrated with OPEN, SHORT, LOAD calibration components. It is also a method that is used in field measurement to correct measurement errors. It is especially important to verify the OSL calibration components periodically to ensure performance conformity.

1.6 Protection of ESD

The same as lots of high performance equipments, FMT715C/760C RF Analyzer is also easily damaged by ESD.The coaxial cable always accumulates plenty of ESD. If we discharge the equipment, it might damage the inner circuit. Users should be convinced of the potential danger of ESD, and adopt cooresponding prevention.

Before connecting the equipment with the cable, it is recommended to discharge the static by connecting a short or load device to the cable. It is important to remember that the operator may also carry a static charge

When you remove components or connecting line in the equipment, ground connection should be done well.

Please master all operation methods to ensure the safety of personnel and equipments.

1.7 Battery Replacement

The battery can be replaced without the use of any tool. The battery compartment is located on lower side of rear (when you are facing the measurement display). Wring out two screws, slide the cover down and remove the battery.

Installation is the opposite of removal.

Tip: the order of connecting the battery ports and power lines must be correct, otherwise connection fails.

Fig. 1-1 Battery Replacement

The battery of FMT715C/760C RF Analyzer should be charged before using. It could be done with AC-DC power adaptor or vehicle cigarette lighter 12VDC to charge in the equipment.

NOTE: Use only batteries, adapters, and chargers provided by TFN.

Warning: Please make sure the supply 12VDC is over 60W before using the vehicle cigeratte lighter, and the outlet is clean. Please disconnect immediately if the adaptor plug is too hot when charging.

NOTE: TFN recommends removing the battery for long-term storage of the equipment.

1.8   Soft Carrying Bag

FMT715C/760C RF Analyzer could be operated in the soft carrying bag. The bag at the back could store accessories and batteries.

To install the equipment into the soft carrying case:

1.   Make sure the front panel of the bag is tight and connecting well.

2.   Cover the front of the bag, and face it down on a table.

3.   Open the bag from the top.

4.   Put the equipment in with attention on the position of the connector.

5.   Close the back cover.

Fig. 1-2 Soft Carrying Bag

1.9　Relevant Technical Support & Service Info

After the equipment being sold, TFN provides 18-month warranty. Meanwhile, every user would receive application training from our engineers. Users could master the using of the equipment through face-to-face communication.

For users' special applications, our company provides technical supports, including special applications programmed for the secondary development and design (TFN would charge reasonably according to the specific items of technical support). Furthermore, application engineers could answer questions and provide technical support in software development at any time for operators.

Our company would improve and upgrade the measurement software according to the development of application field and users' needs continuously. The equipment also provides the upgrade methods. Meanwhile, we would keep publishing application information aiming at different fields, so that most of the measurements could be guided in detail. If there are any needs of software and information, please contact with our company or authorized distributors.

Both parties bear the expense of freightage for product repairing.

2　Equipment Overview

This chapter provides a brief overview of the FMT715C/760C RF Analyzer to acquaint the user with the equipment. Detailed measurement information would be given in other documents.

This chapter provides information about the following items

- Turning on FMT715C/760C RF Analyzer

- Front Panel Overview

- Test Panel Connector Overview

- Display Information Overview

- Symbols and Indicators

- Data Entry

- Mode Selector Menu

2.1 Turning on FMT715C/760C RF Analyzer

Under the condition of full battery charge, the antenna feeder part can work continuously for 6 hours, and the spectrum part can work continuously for 4 hours. This can be achieved with either the AC-DC Adapter or Automotive Cigarette Lighter Adapter

CAUTION: When using the Vehicle charger, Make sure that the supply is rated for a minimum of 60 Watts at 12 VDC, and the socket is clean without any dirt or debris. If the adapter plug becomes hot to the touch during charging, Please discontinue use immediately.

To turn on FMT715C/760C RF Analyzer, press the red ON/OFF key on the front panel for 2 seconds, wait for about 20 seconds, and the equipment would enter the measurement interface and ready to use.
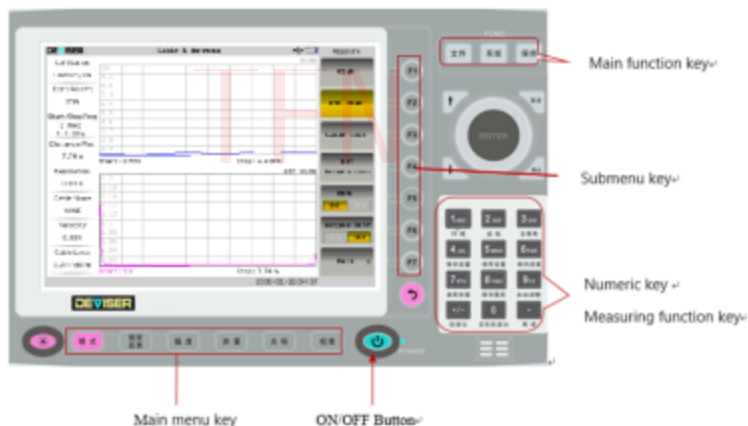

Fig.2-1 FMT715C/760C RF Analyzer Appearance

2.2　　Front Panel Overvies

The FMT715C/760C RF Analyzer menu-driven interface is easy to use and requires little training. The six main menu keys below the screen and eight sub-menu keys on the right side compose the menu key. Function keys on the right, consist of five main function keys and twelve measurement function keys.The twelve measurement function keys are dual purpose, depending upon the current mode of operation.

Numeric keys are activate in parameter edit mode, otherwise measurement function keys are activate. If users want to use measurement function keys directly in parameter edit mode, press cancel, main function key or menu key to return.

Main Menu Keys

Six main menu keys are below the display screen.

> **MODE**

Mode: activate mode menu; select measurement mode

> **FREQ/DIST**

Frequency distance: activate frequency or distance menu; set measurement frequency or distance

> **AMPTD**

Amplitude: activate amplitude menu; set display amplitude

> **MEAS**

Measurement: activate measurement menu; select measurement type

> **MARK**

Mark: activate marker menu; observe measurement result through markers; provide marker search function

> **CAL**

Calibration: activate calibration menu; complete the calibration function of the equipment

Sub-Menu Keys

There are 8 sub-menu keys at the right hand side of the screen shown as figure 2-1. The settings could be changed with those keys and other keys.

Main Function Keys

There are six main function keys on the top of the key area.

FILE

File: activate file menu which could be used to save or recall setting, measurement and image files.

SYS

System: activate system menu which could be used to set system parameters, display system information, complete system update, print and etc.

HOLD

Hold: switch the sweep status between operating and hold. When the equipment is in single sweep mode, press the key to start a single sweep.

ESC

Cancel: used as backspace key in parameter edit status or stop an operation.

ENTER

Enter: used to confirm the edited parameters and current operation.

Measurement Function Keys

Measurement function keys are at the right of the screen and the bottom of the key area shown as figure 2-1. They are used with number and symbol keys together, and valid when the equipment is not in parameter edit mode..

```
SWEEP
```

Sweep: activate sweep menu; set sweep type, time, points, interference rejection and output power.

```
TRACE
```

Trace: activate trace menu; complete trace comparison and data calculation function

```
LIMIT
```

Limit: activate limit measurement menu; complete limit measurement operation

```
SAVE STP
```

Save setup files

```
RECALL STP
```

Recall setup files

```
SAVE MEAS
```

Save measurement files

```
RECALL MEAS
```

Recall measurement files

```
SAVE BMP
```

Save image files

<div style="border:1px solid black; display:inline-block; padding:4px 12px;">**Auto Scale**</div>

Adjust the scale automatically to make the displayed measurement trace at

the best position

<div style="border:1px solid black; display:inline-block; padding:4px 12px;">**VSWR**</div>

Enter VSWR measurement

<div style="border:1px solid black; display:inline-block; padding:4px 12px;">**DTF VSWR**</div>

Enter DTF-VSWR measurement

<div style="border:1px solid black; display:inline-block; padding:4px 12px;">**Spectrum**</div>

Enter spectrum analysis mode

'↑ ↓' Arrow Keys
'↑ ↓' keys are at the center of the key area. They are used to change a value, change a selection from a list, or move markers.

Knob
The knob is at the center of the key area. It is used to change a value, change a selection from a list, or move markers. Pressing the knob is the same as pressing the ENTER key.

Number Keys
'0～9' number keys, '+/-' and '.' Symbol keys are at the bottom of the key area, and used with measurement function keys together. They are valid when the equipment are in the status of parameter edit status to complete parameter editing.

> **Tip:** Detailed operations and applications of every key would be explained in the following chapters.

LED Indication Light
The light is at the very bottom of the key area. Turn on the equipment, and the green light lights up.

2.3   Test Panel Overview

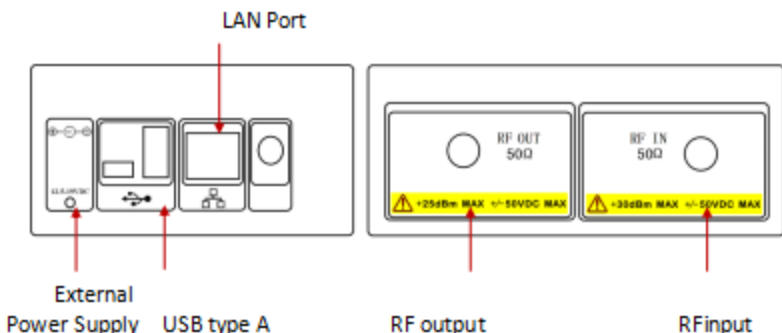Figure 2-2 shows the test panel of FMT715C/760C RF Analyzer

Fig. 2-2 Test Panel Connector

External Power

The external power supply is used for supplying power directly or charging the battery. Input DC 12~19V, power ＞ 60w. When the battery is being charging with AC-DC adaptor or vehicle cigarette lighter 12VDC adaptor, the red light is on. The green light means fully charged.

USB Port Type A

The FMT715C/760C RF Analyzer has one USB Type A port for plugging U disks in order to store measurement trace data, setting files and image files.

LAN Port

10M/100M self-adaption. The equipment connects with PC through the LAN port.

RF Input

50ΩN female connector, maximum input +30dBm, ±50VDC, the signal input port of Spectrum and transmission measurement option
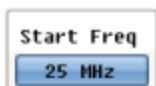
RF Output/ Reflection Input

50ΩN female connector, maximum input +25dBm, ±50VDC, fault location and reflection measurement port, the signal input port of transmission measurement option

2.4　Menu Operation

There are 7 typical menus and each is described below in detail.

➢　Parameter Input

Start Freq
25 MHz

Press the corresponding menu, and the parameter shows in the middle of the screen. Use the numeric keys, arrow keys or Rotary Knob to set the parameter, and press the Enter key to exit.
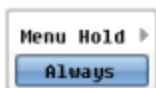
➢　Switch between 2 functions

GPS
ON　**OFF**

Press the corresponding menu button to switch between the two functions.

➢　Enter the next sub-menu (no parameter)

SYS Setup▶

Press the corresponding menu key to enter the next sub-menu.

➢　Enter the next sub-menu (with parameters)

Menu Hold ▶
Always

Press the corresponding menu key, enter the next sub-menu to change an option, then return to the previous menu automatically, and change the type of parameters of the menu. Refresh to display.

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➢   Implement the menu function directly

| Data To Memory | Press the menu key to implement the corresponding function. The menu displaying in animation means complete.implement. |

➢   Select the status

| Always | Press the menu key to select the function. Return to the previous menu if it is available. |

➢   No operation allowed

| Data & Mem | Some of the menu is available only if some status is fulfilled. Otherwise it is grey showing that it is invalid. For example if there is no data saved in the storage, the saved trace could not be shown. |

2.5 Symbols and Indicators

The following symbols and indicators indicate the equipment status or condition on the display.

Calibration Status

✧ Calibration status OFF

It has not been calibrate, or calibration is turned off.

✧ Calibration status Full Span ON

The approximate calibration is complete. When the measurement frequency or sweep points are changed, the calibration data is still valid. The data is almost the same.

✧ Calibration status Standard ON

The standard calibration is complete. When the measurement frequency or sweep points are changed, the calibration data is invalid that the calibration has to be done again.

Battery Symbols

✧ Green: Battery is 30% to 100% charged

✧ Yellow: Battery is 10% to 30% charged

✧ Red: Battery 0% to 10% charged

✧ Lightning Bolt: Battery is being charged

Other Symbols

✧ Network Connection: The equipment is communicating via the LAN port

✧   USB connection: The usb device is recognized.

✧   Sweep Hold: Hold current measurement trace.

When either the AC-DC adapter or the 12 VDC adapter is connected, the battery starts to charge. Meanwhile, the battery symbol will shows in progress bar, and the indicator lights up in red. It turns to green when the battery is fully charged.

Caution: Use only batteries, adapters, and chargers authorized by TFN.

When external adaptor is used without installing the battery, the battery symbol disappears, whereas the power plug symbol shows up as figure 2-4.

Fig. 2-3 No Battery Installed

2.6   Data Entry

1) Parameter Editing

You can edit parameters with the numeric keys, the arrow keys and the rotary knob. It is simple to change the parameters quickly with the a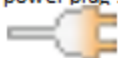rrow keys. The change rule is increasing/decreasing in 1, 2 and 5 steps. Press it continuously to change it to expectation. You can change the parameter continuously with the rotary knob. The change rule is linear. The coordination of the knob and arrow keys could reduce users' work load dramatically to make the work more efficient.

2) Edit in the Measurement Interface Directly

On the main measurement interface, main parameters related to the measurement such as frequency, distance, sweep point, cable parameter and etc. are listed on the screen and could be edited directly so that the operation efficiency is high.

Use arrow keys and the knob to select the item which is going to be edited. The selected item is shown highlightly in the color of current measurement channel trace. Press enter to start to edit. Use number keys, arrow keys and the knob to change the parameter. Press enter again to exit.

3) Press Corresponding Sub-Menu to Edit

Press the corresponding sub-menu key, and parameters show on the upper left corner of the display. You can change the parameter using the numeric keys, arrow keys or the rotary knob, and press Enter to exit.

4) Confirm Selection

The saved files (measurement trace data files, setting files and image files) of FMT715C/760C RF Analyzer, standard cable and etc. are shown in list. Use

arrow keys and the knob to select. The selected item is highlighted. Press enter to complete selecting.

5) Text Entry

To save a measurement, a setup or a BMP file, enter the file name with characters and numbers.

2.7   Measurement Mode Selection

Press the 'MODE' key to enter the measurement mode selection interface (Figure 2-5). Press the sub-menu key to select the needed measurement mode, or enter the next level menu to select needed measurement item. You can also press the shortcut measurement function keys at the bottom of the keypad to enter the needed measurement item.

NOTICE: The applied measurement mode depends on the model and installed options. Refere to Table 1-1 and Table 1-2.
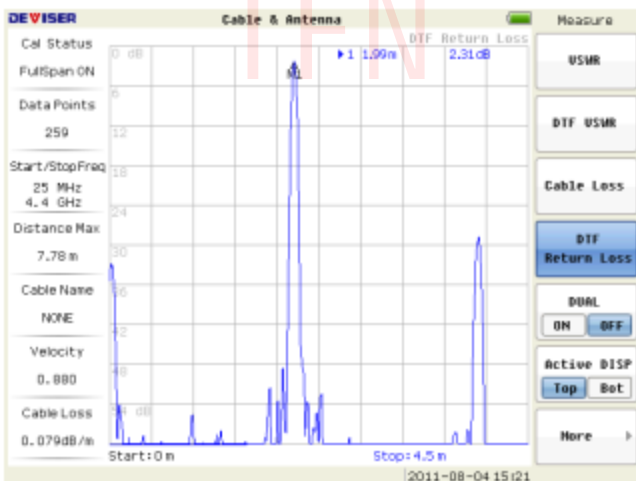
Fig. 2-4 Measurement Mode Selection

3 Quick Start Guide

3.1 Overview

This chapter provides a brief overview of FMT715C/760C RF Analyzer introcuding basic measurement settings.

3.2 Antenna & Feeder Mode

1. **Selecter Measurement Type**

Press the main menu key MEAS to select the measurement type shown as Figure 3-1
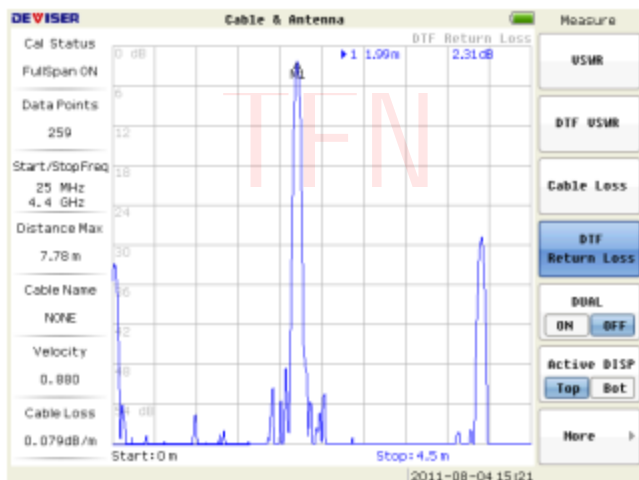
Fig. 3-1 Antenna & Feeder measurement Type

2. Set Frequency

1) Press the main menu key FREQ DIST to enter the frequency menu.

2) Press the submenu key Start Freq, and use the keypad, rotary knob, or the

arrow keys to enter the start frequency.

3) Press the submenu key Stop Freq, and use the keypad, rotary knob, or the arrow keys to enter the stop frequency.

3. Set Displayed Amplitude

1) Press the main menu key AMPTD to enter the amplitude menu.

2) Press the submenu key Top, and use the keypad, rotary knob, or the arrow keys to edit the top scale value.

3) Press the submenu key Bottom, and use the keypad, rotary knob, or the arrow keys to edit the bottom scale value.

4. Auto Adjust Displayed Amplitude

The device could adjust the scale from the top to the bottom automatically to make the trace display at the best position.

1) Press the main menu key AMPTD to enter the amplitude menu.

2) Press Auto Scale key.

5. Use Markers

1) Press the main menu key MARK to enter the marker menu.

2) Press the submenu key Marker1 and Marker2 to switch on/off the markers or switch the activate marker. Press the submenu key More Marker to enter the next submenu, and switch on/off or switch the activate marker among Marker 3, Marker 4, Marker 5 and Marker 6.

3) Use the arrow keys or the rotary knob to move the marker. You can also enter the frequency or distance value of the marker via the numeric keys directly.

4) Delta Markers are available for each marker. Press the submenu key Next Page, and then submenu key Delta Mark to turn on/off the delta marker.

6. Marker Auto Search

When the measurement type is DTF, the auto search function would start to search fault points according to the set searching threshold, and rank them from small to large. When the measurement type is VSWR, return loss, cable loss, phase and smith diagram, the auto search function would place marker 1 to the maximum value and marker 2 to the minimum value automatically.

1) Press the main menu key MARK to enter the marker menu.

2) When the measurement type is DTF:

Press the submenu key Auto Search Fault Points .

When the measurement type is not DTF:

Press the submenu key Auto Search Max./Min.

7. Single Limit Line

1) Press the measurement function key LIMIT to enter the limit menu.

2) Press the Limit Test key to turn on the limit test.

3) Press the Sngl Limit key to select the type of the limit test

4) Press the submenu key Sngl Value, and then use numeric keys, arrow keys, or the rotary knob to enter the limit value.

8. Set the Distance & Cable Type

In Distance-To-Fault (DTF) mode, the measurement distance and cable type should be set. The cable type determines the transmission speed and cable loss. We would introduce how to set distance and select suitable cable type

in the following.

> **NOTE:** Selecting the correct cable is very important for accurate measurements and locating faults. Selecting the incorrect cable, or using the correct cable out of its proper frequency range will shift the DTF trace vertically and horizontally that makes it difficult to locate faults accurately.

1). Press the main menu key MEAS to enter the measurement menu.

2). Select DTF VSWR or DTF Return Loss measurement mode.

3). Press the main menu key FREQ DIST to enter the distance menu.

4). Press the submenu key Start Freq, and use the keypad, rotary knob, or the arrow keys to enter the start frequency.

5). Press the submenu key Stop Freq, and use the keypad, rotary knob, or the arrow keys to enter the stop frequency.

6).Press Cable key to enter the cable selection screen. Select the appropriate cable with the knob or arrow keys. Press Enter to call in a kind of cable parameter. Set the cable loss and transmission soeed automatically, and then return to the measurement interface.

9. Calibration

1) Press the main menu key FREQ DIST to set the frequency range.

2) Press the main function key CAL to enter the calibration menu.

OSL calibration:

a) Press the Cal Type key to select Standard or FullSpan Cal

b) Press the submenu key Start Cal to enter the calibration guide screen.

c) Connect Open to RF Out and press the ENTER key

d) Connect short to RF Out and press the ENTER key.

e) Connect load to RF Out and press the ENTER key.

f) The system would return to the measurement interface automatically. If the calibration succeeds, the calibration status at the upper left corner of the screen would show as 'Standard ON' or 'FullBand ON'.

3.3   Spectrum Analysis Mode

1.   Select Measurement Type

Press the main menu key MEAS to select the measurement type shown as figure 3-2.
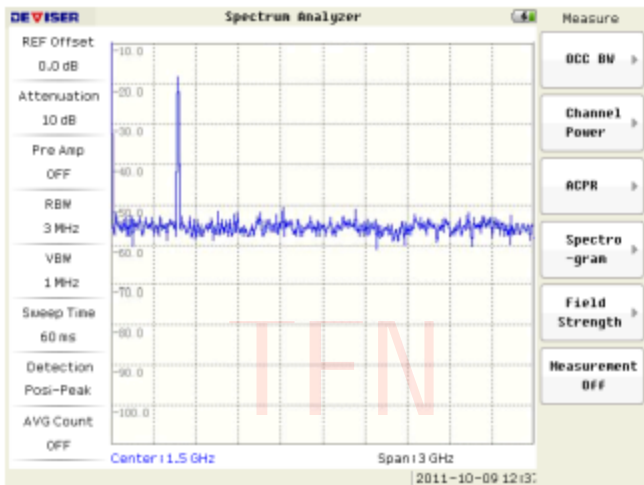
Fig. 3-2 Spectrum Analysis Measurement Type

2. Set Frequency

1) Press the main menu key FREQ DIST to enter the frequency menu.

2) Press the submenu key Start Freq, and use the keypad, rotary knob, or the arrow keys to enter the start frequency.

3) Press the submenu key Stop Freq, and use the keypad, rotary knob, or the arrow keys to enter the stop frequency.

3. Set Displayed Amplitude

1) Press the main menu key AMPTD to enter the amplitude menu.

2) Press the submenu key Ref Level , and use the keypad, rotary knob, or the arrow keys to enter the reference level. After pressing number keys to enter the frequency, the unit submenu would pop up dBm , dBmv , dBµv or mV . Select the suitable one to complete entering.

3) Press the submenu key Sacle/Div , and use the keypad, rotary knob, or the arrow keys to enter the change of each division.

4) Press the submenu key Level Offset , and use the keypad, rotary knob, or the arrow keys to enter the value of level offset.

4. Set Attenuation Level

In auto attenuation, the system would provide a suitable attenuator automatically. To change the attenuator, the auto attenuation must be turned off with the soft-key.

1) Press the main menu key AMPTD to enter the amplitude menu.

2) Press the submenu key ATT , and use the keypad, rotary knob, or the arrow keys to enter the attenuation level.

5. Use Markers

1) Press the main menu key MARK to enter the marker menu.

2) Press the key Select Mark to switch Marker 1 to Marker 6

3) Use the arrow keys or the rotary knob to move the marker. You can also enter the frequency or distance value of the marker via the numeric keys directly.

4) Delta Markers are available for each marker. Press the submenu key Next Page , and then submenu key Delta Mark to turn on/off the delta marker.

6. Set Marker Peak Function

1) Press the main menu key Measure to enter the menu.

2) Press the submenu key Peak to activate the next level peak submenu.

3) Press the submenu key Next Peak Left, and the system would find the maximum amplitude and mark the frequency after current sweep automatically.

4) Press the submenu key Next Peak Left , and the system would find a peak again at the left of the current marker.

5) Press the submenu key Next Peak Right, and the system would find a peak again at the right of the current marker.

6) Switch on the submenu key Peak Track , and the system would find a new peak after every sweep automatically.

7) Press the submenu key Next Page to activate the next level submenu.

8) Press the submenu key Peak-Peak to display the frequency difference and amplitude difference of the maximum and minimum amplitude of the current sweep.

9) Press the submenu key Min Search to display the frequency and amplitude of the minimum amplitude point of the current sweep.

7. Marker Table Setting

The marker table is convenient for observing multipal markers and delta markers.

1) Press the main menu key Measure.

2) Press the submenu key Peak.

3) Press the submenu key Next Page to activate the next level submenu.

4) Press the submenu key Mkr Table to turn on/off the marker table.

8. Delta Marker Setting

The delta marker function is mainly used for comparing 2 signals.

1) Press the main menu key MARK.

2) Press the submenu key Delta to turn on/off the delta marker.

9. Noise Marker Setting

Users could measure the average power of noise after turning on the noise marker function.

1) Press the main menu key MARK.

2) Press the submenu key Next Page.

3) Press the submenu key Mkr Noise to turn on/off the noise marker.

10. Frequency Counter Setting

The frequency count function could count the frequency of the maximum amplitude point of the current field accurately to Hz, which is equivalent to a frequency meter.

1) Press the main menu key MARK.

2) Press the submenu key Next Page.

3) Press the submenu key Counter to turn on/off the frequency counter.

11. Single Limit Line

1) Press the measurement function key MEA SET to enter the submenu.

2) Press the submenu key Limit to enter the submenu.

3) Press the submenu key to select limit test type.

4) Press the Limit to select key Edit, and use number keys, arrow keys and the knob to change the signle limit value.

12. IFBW Setting

1) Press the main menu key Measure.

2) Press the submenu key CPL.

3) Press the submenu key FBW to set resolution bandwidth, video bandwidth and corresponding parameters of video average. When the item is set as auto, the system would provide a suitable parameter to measure automatically.

13. Calibration

1) Press the main function key CAL to enter the calibration menu.

2) Press the submenu key Cal Amp to start amplitude calibration.

3) Set Cal Amp as reserved if users want to keep the data after amplitude calibration.

3.4　Interference Analysis Mode

In the interference analysis mode, the spectrum of the access signal in a certain period of time can be recorded in the form of spectrogram. Measure access signal strength; Received signal strength indication, signal ID, interference positioning measurement, differential spectrum, digital afterglow, load dry ratio, shoulder test, etc.

Press the Mode key to switch the spectrum analysis measurement mode, and then press the Mode key to select the interference analysis measurement mode.
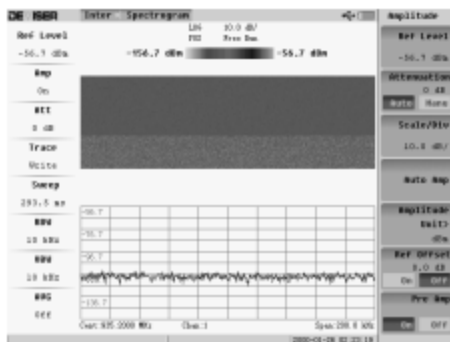
Fig. 3-3 Interference Analysis

- spectrogram

A spectrogram is a way of recording the spectrum using a three-dimensional display: the horizontal coordinate represents the frequency, the vertical coordinate represents the time, and the use of different colors to represent the amplitude of the signal. The spectrogram can be used to analyze the temporal stability of the signal or to find intermittent interference signals.
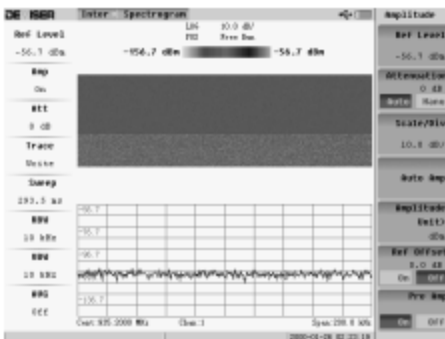
Fig. 3-4 spectrogram

You can press the record soft key to set the record period, time interval, record type, and record location. The recorded spectrogram file name system will automatically save the start time of the record in the "year - month - day - hour - minute - second" format.

The setting of frequency and amplitude and other basic parameters in spectral pattern mode is basically the same as that in spectrum scanning.

Display mode It is used to switch between the two modes of display spectrogram in double window and spectrogram and full-screen display spectrogram.

The peak level and valley level are used to set the maximum and minimum values of the signal amplitude recorded in the current spectrogram, which can be set automatically or manually respectively.

Press Restart to re-record the spectrogram.

The playback function is used to view the recorded spectrogram file.

Open the qualified line to set the upper limit and lower limit of the signal for automatically judging whether the current signal is qualified. When opening the qualified line and in the spectrogram recording type you can choose to record all spectrum or record only unqualified data.

● **signal strength**

Press the measurement button to select signal strength：
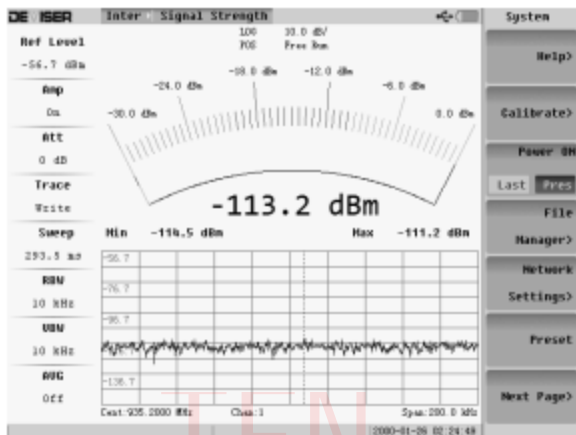
Fig. 3-5 signal strength

Signal strength is used to measure the signal strength of a certain point frequency, wherein the maximum scale and minimum scale are used to set the range of signal strength that can be displayed at present. Turn on the sound within the current signal strength display range. As the signal strength gradually increases, the frequency of the prompt sound will gradually increase.

Press the frequency, amplitude, measurement function key can be respectively frequency, amplitude and some other basic Settings.

● DPS

Press Select DPS to enter test function：
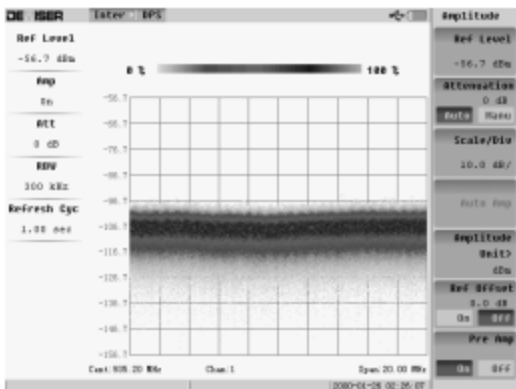
Fig. 3-6 DPS

The digital afterglow feature uses a specific algorithm to see small signals hidden beneath large signals, as shown in the image.

Select Refresh Period to set the fluorescence image refresh time. The value ranges from 1ms to 100 seconds. Quick Capture is enabled. The sweep width is fixed at 20MHz and cannot be changed.
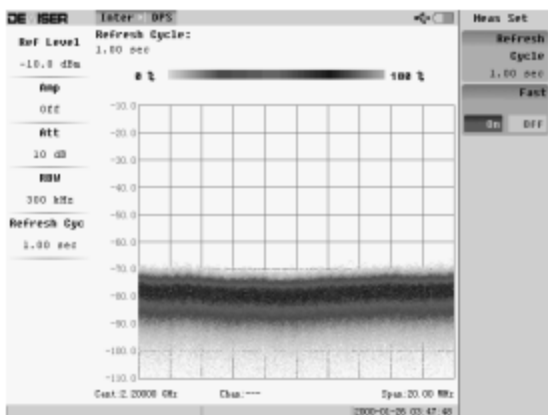
Fig. 3-7 fast opening

Turn off Quick Capture to change the sweep width
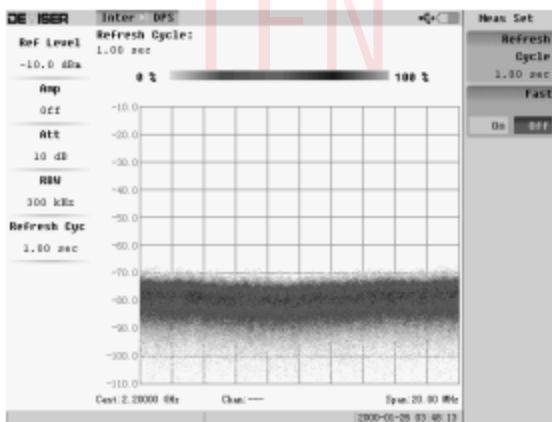
Fig. 3-8 fast off

Press the frequency amplitude cursor CPL function key can respectively frequency, peak, amplitude, frequency mark and other some basic Settings.

The cursor operates differently under the digital afterglow than it does under the spectrum. Pressing the cursor key will pop up the menu as shown in the figure, and open the common frequency label 1 at the same time to provide the corresponding operation of the cursor.
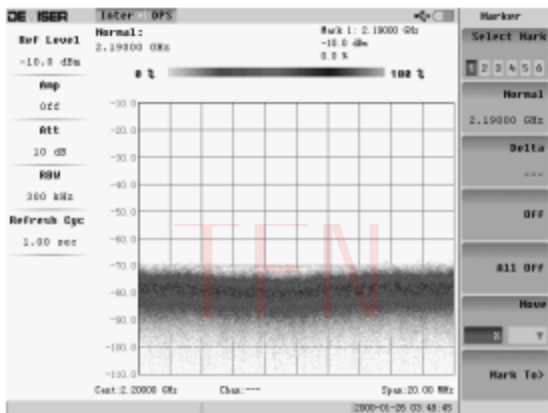
Fig. 3-9 mark

Select "Moving direction" as horizontal (vertical), turn the scroll wheel or press the up and down button to move the frequency label horizontally (vertical), as shown in the figure.
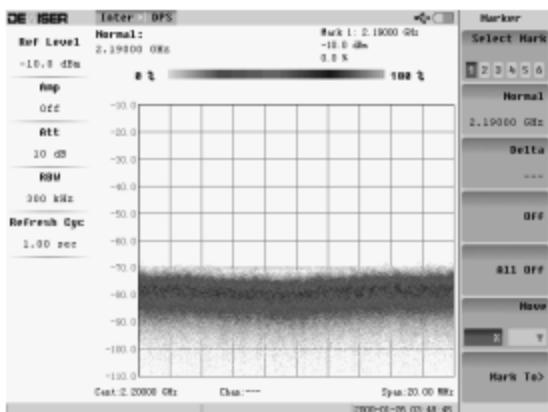
Fig. 3-10 Move frequency mark

Press the peak key cursor below the measurement key to automatically select the frequency point with the greatest amplitude.
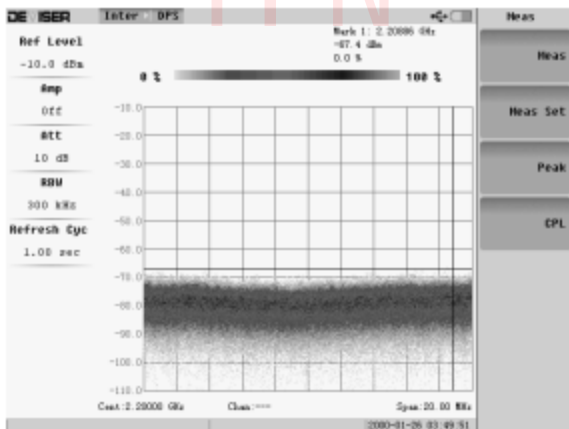
Fig. 3-11 mark

3.5　Base station analyzer Mode

FMT715C/760C RF Analyzer provides users with rich base station analysis functions. The built-in base station analysis function can carry out a more comprehensive demodulation analysis on 2G/3G/4G communication system, and can carry out a comprehensive demodulation analysis on GSM,TDD-LTE,FDD-LTE, WCDMA,TD-SCDMA and other base stations are analyzed for Power and resource blocks, constellation diagram, measurement summary, OTA, Power vs Time, same frequency interference, spectrum radiation template, TDD-LTE uplink interference, multi-antenna test, channel power, occupied bandwidth, adjacent channel power, etc., in order to improve the efficiency of base station maintenance.

Click the Mode button and press the soft key corresponding to "Base Station Analysis" to enter the base station detection menu：
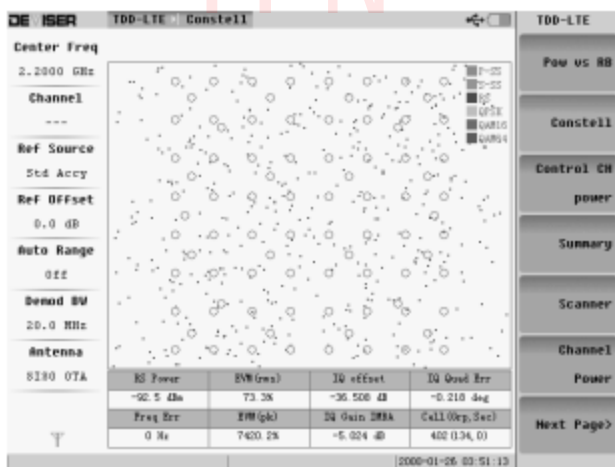
Fig. 3-12 Base station analysis

3.5.1   Constell

By demodulation of signal, aggregation and discretization of noise points in constellation diagram, the error vector amplitude (EVM) of each current subframe can be directly judged to meet the test requirements.

Select Constellation Map to access its menu:
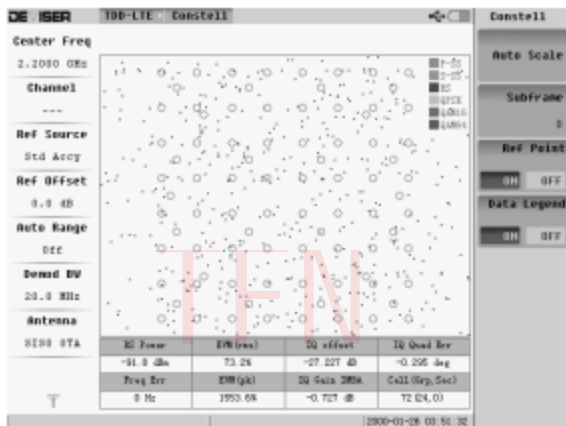
Fig. 3-13 Constell

The table at the bottom of the screen can be used to test the current LTE system "RS Power", each reference signal EVM (rms), transmitter DC bias, gain balance, IQ Quad Err, CELL ID and other test indicators

Auto Scale

Press the soft key corresponding to "Scale Auto" to automatically adjust the size of the constellation display interface according to the demodulation symbol

Subframe

Press the soft key corresponding to the sub-frame and select sub-frames 0 to 9 using the up and down keys or the scroll wheel.

Reference points

You can press the soft key corresponding to the reference point to display or disable the reference point.

3.5.2 TDD-LTE UL interference

For the special frame structure of TDD-LTE, it is difficult to determine the upstream or downstream interference, or in-band interference at present.

The uplink interference tool can convert the uplink subframe or each down-line subframe into a spectral mode, and visually see the spectrum state of each subframe. It can also amplify the frequency points that users pay more attention to, and clearly distinguish whether it is the user's data access or interference. Through the spectrum tool, the amplitude and spectrum characteristics of in-band interference can be distinguished.

Select Uplink Interference to go to the submenu
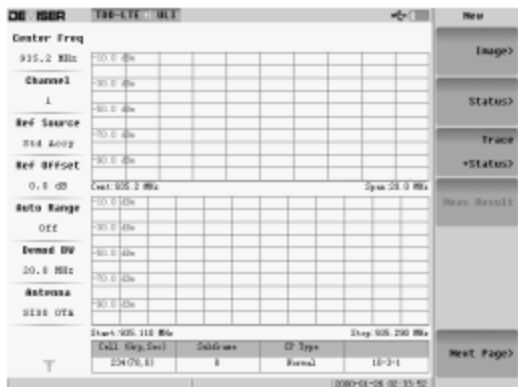
Fig. 3-14 UL interference

(1) Frequency setting

Under the uplink interference measurement, click the menu [Frequency] to set the frequency-related parameters;

Center frequency: Click the < center frequency > button, and you can set and operate with the center frequency of the current LTE signal by stepping through the keyboard or rotating wheel.

Frequency stepping: The frequency stepping range is set through "automatic" and "manual" modes. In automatic mode, the default is 8MHz stepping center frequency. Select "Manual" and enter the corresponding stepping frequency. Then the center frequency will step according to the entered "stepping frequency".

Channel table: Click < channel table > and set to "on", click < Select Channel Table >, the user can automatically load the center frequency according to the channel number of the communication system prefabricated in an instrument.

(2) amplitude setting

Level offset: Used to compensate the positive and negative compensation values of the attenuator or amplifier external to the input port. The user enters the compensation value under < level offset >, and the instrument defaults to 0dB compensation.

Unit: Click the < unit > button, the user can choose <dBm> and <mW> two units.

Range automatic: Set "on" state, the instrument will automatically switch between "attenuator" and "amplifier" according to the current signal strength.

Amplifier: With the preamplifier turned on, the sensitivity can be improved by about 20dB.

Attenuator: Attenuation range is 0dB ~ 55dB, users can manually attenuate the signal according to the current measurement signal.

(3) bandwidth

According to the 3GPP standard TD-LTE standard, the bandwidth of TD-LTE can be set to 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz, and the user can manually select according to the current bandwidth.

(4) frequency label

Frequency label selection: Click the menu of [frequency label] and click < frequency label > to activate any frequency label from M1 to M6 as the current active frequency label.

Common frequency scale: Users can refer to the common frequency scale operation under the spectrum sweep measurement.

Difference frequency scale: users can refer to the difference frequency scale operation under [spectrum sweep] measurement.

Select trajectory: Click < Select trajectory > to select the active trajectory of the current frequency icon:

Close: Click < Close > and the system will display the current active frequency label.

All off: Click < All Off > and the system will close all active and inactive frequency tags opened by the current user.

(5) Mode setting

Bandwidth: same as [bandwidth] menu button;

EVM Maximum Hold: Enables EVM maximum hold to maintain the maximum value of the EVM test item.

EVM mode: The EVM mode can be set to BTS or OTA mode

Freq Err Avg: Set the average number of times using the up and down keys or the scroll wheel.

Channel: Select the corresponding option to turn P-SS, S-SS, RS on or off. Select PDSCH to set the modulation mode (QPSK, 16QAM,64QAM).

Cell ID: You can set the cell ID to automatic or manual. If it is set to manual, select the cell ID and set the cell ID through the keyboard.

If the CELL ID of the specified cell cannot be found in the current spatial signal, the message "the specified cell does not exist" will be displayed:

Up-and-down subframe: Users can set the up-and-down subframe matching mode of TD-LTE in 3GPP according to the current signal (please refer to 3GPP specification for relevant information)

Special sub-frame: Users can set the special sub-frame matching mode of TD-LTE in 3GPP according to the current signal (please refer to the 3GPP specification for relevant information)

(6) Measurement setting:

Automatic calibration: Click "Automatic calibration" to automatically set < maximum >, < range >, < threshold > and other parameters according to the power value of the current test signal.

Maximum: The user can set the upper limit of RB power maximum by manual setting

Range: You can set the range manually.

Threshold: Manually sets the minimum threshold for the current RB resource block salary.

3.6 Transmission Measurement Mode

1. Select Measurement Type

Press the main menu key MEAS to select the transmission measurement shown as figure 3-3.
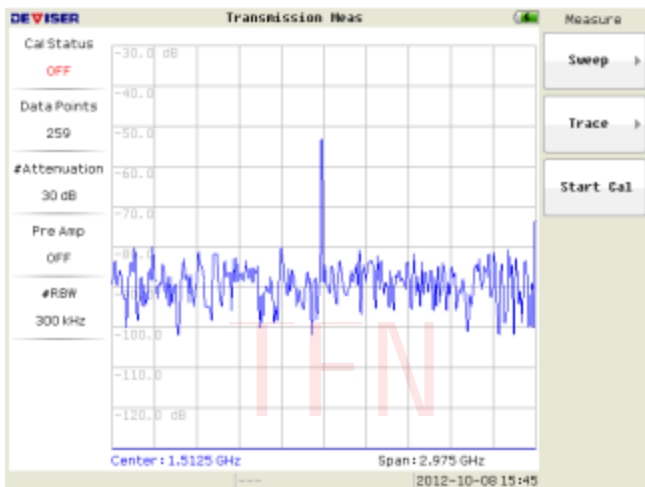
Fig. 3-15 Transmission Measurement

2. Set Frequency

1) Press the main menu key FREQ DIST to enter the frequency menu.

2) Press the submenu key Start Freq, and use the keypad, rotary knob, or the arrow keys to enter the start frequency.

3) Press the submenu key Stop Freq, and use the keypad, rotary knob, or the arrow keys to enter the stop frequency.

3. Set Displayed Amplitude

1) Press the main menu key AMPTD to enter the amplitude menu.

2) Press the submenu key Ref Level, and use the keypad, rotary knob, or the arrow keys to enter the reference level. After pressing number keys to enter the frequency, the unit submenu would pop up dBm, dBmv, dBμv or mV. Select the suitable one to complete entering.

3) Press the submenu key Sacle/Div, and use the keypad, rotary knob, or the arrow keys to enter the change of each division.

4. Set Attenuation Level

In auto attenuation, the system would provide a suitable attenuator automatically. To change the attenuator, the auto attenuation must be turned off with the soft-key.

1) Press the main menu key AMPTD to enter the amplitude menu.

2) Press the submenu key ATT, and use the keypad, rotary knob, or the arrow keys to enter the attenuation level.

5. Use Markers

1) Press the main menu key MARK to enter the marker menu.

2) Press the submenu key Marker 1 and Marker 2 to switch on/off the markers or switch the activate marker. Press the submenu key More Marker to enter the next submenu, and switch on/off or switch the activate marker among Marker 3 ,　Marker 4 ,　Marker 5 and 　Marker 6 .

3) Use the arrow keys or the rotary knob to move the marker. You can also enter the frequency or distance value of the marker via the numeric keys directly.

4) Delta Markers are available for each marker. Press the submenu key

Next Page, and then submenu key Delta Mark to turn on/off the delta marker.

6. Set Marker Peak Function

1) Press the main menu key MARK to enter the marker menu.

2) Press the submenu key More to activate the next level peak submenu.

3) Press the submenu key Peak Search, and the system would find the maximum amplitude and mark the frequency after current sweep automatically.

4) Press the submenu key Next Peak Left, and the system would find a peak again at the left of the current marker.

5) Press the submenu key Next Peak Right, and the system would find a peak again at the right of the current marker.

6) Press the submenu key Min Search to display the frequency and amplitude of the minimum amplitude point of the current sweep.

7) Press the submenu key Peak Excurse, and use number keys, arrow keys and the knob to set the peak offset value. The minimum is 0.1 dB, whereas the maximum is 100 dB.

7. Marker Table Setting

The marker table is convenient for observing multipal markers and delta markers.

1) Press the main menu key MARK.

2) Press the submenu key More.

3) Press the submenu key Mkr Table to turn on/off the marker table.

8. Calibration

　　1) Press the main function key CAL , and complete calibration according to the system prompt.

　　2) Press the Cal Type key to select Standard or FullSpan Cal

　　3) After calibration completes, the Cal Corr function would be on automatically. Users could turn it off manually.

3.7   Terminal Power Meter Mode

Press the main menu key MODE, and select power meter –Terminal shown as figure 3-4.

Fig. 3-16 Power Meter –Terminal

1. Set Frequency

1) Press the main menu key FREQ DIST to enter the frequency menu.

2) Press the submenu key Center Freq, and use the keypad, rotary knob, or the arrow keys to enter the center frequency.

2. Set Displayed Amplitude

1) Press the main menu key AMPTD to enter the amplitude menu.

2) Press the submenu key Max, and use the keypad, rotary knob, or the arrow keys to enter the maximum scale value of the dial.

3) Press the submenu key Min, and use the keypad, rotary knob, or the arrow keys to enter the minimum scale value of the dial.

3. Auto Adjust Displayed Amplitude

The device could adjust the scale from the top to the bottom automatically to make the trace display at the best position.

1) Press the main menu key AMPTD to enter the amplitude menu.

2) Press Auto Scale key.

4. Full Scale Display Amplitude

The equipment could make the dial show as full scale.

1) Press the main menu key AMPTD to enter the amplitude menu.

2) Press the submenu key Full Scale.

5. Limit Test

1) Switch the submenu key Limit Test ON/OFF to turn on limit auto-judgement function.

2) Press the submenu key Upper Limit, and use the keypad, rotary knob, or the arrow keys to enter the upper limit value.

3) Press the submenu key Lower Limit, and use the keypad, rotary knob, or the arrow keys to enter the lower limit value.

6. Calibration

1) Press the main function key CAL, and complete calibration according to the system prompt.

2) Press the following menu key to zero the power meter. Ensure that no signal is input.

4   File Management
4.1   Overview

The equipment has auto-storage function. Every time users turn on the equipment, it will automatically recover the pre-shutdown state, which simplifies the setting work. The users can also save and recall setting files manually. The configuration file contains: the measurement mode of the equipment, frequency/distance, parameter settings such as markers and calibration data. In this case, when users use those kinds of measurement working statuses, they can just recall the recall the saved configuration file, so that it avoids setting and calibrating repeatedly and improve work efficiency.

The function of saving measure files is convenient for users to check and manage measurement results, and store files into the memory to achieve a compatative analysis and data calculation.

The equipment supports functions such as saving the bitmap pictures, preview, importing to the U disk, and etc. It is convenient to check and manage to save the measurement screen as picture.

4.2   File Management

File Manager
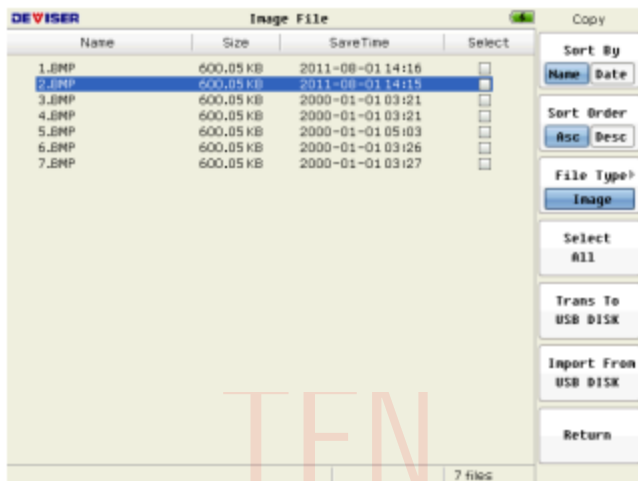
Fig. 4-1 File Manager

File Type

File Type	Suffix	File Type	Suffix
Measurement files - VSWR	.SWR	Measurement files - Phase	.PHA
Measurement files - Return loss	.RTL	Measurement files - Smith Chart	.SMI
Measurement files - Cable Loss	.CBL	Graphics files	.BMP
Measurement files – DTF-VSWR	.DVS	Setup files	.STP
Measurement files – DTF-Return Loss	.DRL		

File Name

The file name can only be formed by letters, numbers and spaces. Use the numeric keys to input the file name. The file name can be set up to 12 characters.

4.3   File Menu Structure

Press the function key FILE to activate the file menu.
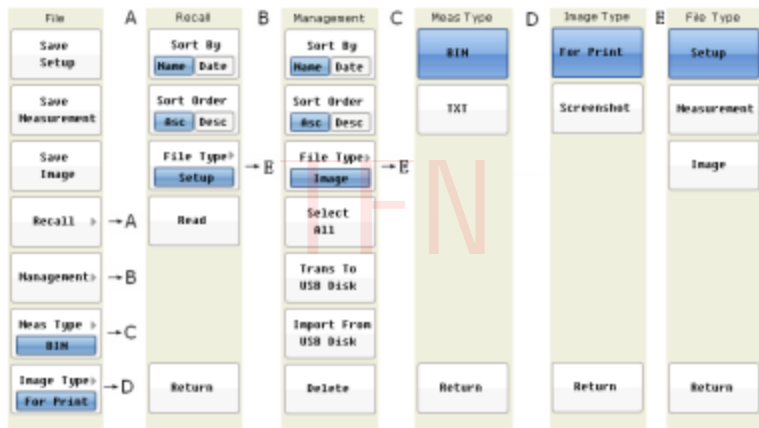
4.4 File Menu

Key Sequence: | FILE |

Save setup: press the menu, and the system would prompt to enter the file name. The file name can only be formed by leeters, numbers and spaces. After entering the file name with numbers, press ENTER to save. If the name has already existed, system would prompt whether to cover or not.

Save measurement: press the menu to save measurement files.

Save image: press the menu to save image files. The format is BMP.

Recall: press the menu to enter the 'recall' menu.

Management: press the menu to enter the 'management' menu.

Measurement type: press the menu to enter the 'measurement file type' menu.

Image type: press the menu to enter the 'image file type' menu.

4.5 Recall Menu

Key Sequence: FILE > Recall

Sort By: the file sort display method, by the file name, or by the saving date

Sort Order: the file display method, ascending or descending order

File Type: select displayed file type: setup files, measurement files, image files

Setup files include parameter setups such as measurement mode, frequency, distance, marker and etc. and calibration data.

The measurement file saves measurement data of one field

It is easy to check and mange to save the measurement screen as image file

Recall: recall saved files. There are different processes for different file types.

Recall saved setup files.

Save the measurement files into the memory for measurement trace comparing analysis and data calculation.

Preview saved image files.

4.6   Management Menu

Key Sequence: FILE >   Management

Sort By: refer to the section 'Recall Menu'

Sort Order: refer to the section 'Recall Menu'

File Type: refer to the section 'Recall Menu'

Select All: select all files for copying or deleting. Selecting or deselecting one file could be done with ENTER key.

Transfer to U Disk: transfer the selected files to the root directory of the U disk.

Import from U Disk: import the corresponding files from the root directory of the U disk according to the current file type

Delete: delete selected files

4.7   Measurement File Type Menu

Key Sequence: FILE >   Measurement file type

Binary Data: save selected files as binary data

Text: save measurement files as text

> **Notice:** the format of binary data files is BIN, while the format of text files is TXT. They could be opened with editors such as Excel or Notepad.

4.8   Image File Type Menu

Key Sequence: [FILE] > Image file type

For Print: Set the saved picture to be state that adapt to printing. It automatically make the color to opposite.Because that can save the ink and increase efficiency.

Screenshot : Set the current interface as picture, Without considering the inverse color problem.

4.9   File Type

Key Sequence:

[FILE] > Recall > File type

[FILE] > Copy > File type

[FILE] > Delete > File type

Setup File: Setup files include parameter setups such as measurement mode, frequency, distance, marker and etc. and calibration data. Therefore, next time when users work in the same measurement status, they can only recall the configuration file. The work efficieny is improved without repeated setup and calibrations.

Measurement file: save measurement data of one field

Image file: It is easy to check and mange to save the measurement screen as image file

5 System Operation

5.1 Overview

System operations include system configuration , service functions and other operations, such as language and clock setup, network setup, system testing, system information,system upgrade, and etc.

System menu has six options which are system setup, system testing, system upgrades, help, print and restore factory setup. When the users select a function option, it will activate a sub-menu to set the parameters or select functions.

5.2 System Menu Structure

Press the main function key SYS on the panel to activate system menu. The main structure of system menuis as below:
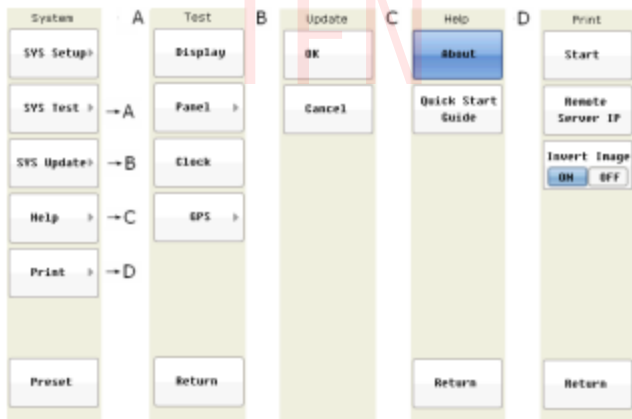
Setup	A	Language	B	Date/Time	C	Network	D	Beeper	E	Setup	G	Confirm	H	Power Save	F	Date Format
Language ▸	→A	English		Year		IP Address		Beep CAUT ON OFF		Confirm ▸	→G	Preset ON OFF		1 Minute		YY-MM-DD
GPS ON OFF		中文		Month		Subnet Mask		Test Beep CAUT		Expert Mode ON OFF		Reset Color ON OFF		2 Minutes		MM-DD-YY
Date/Time ▸	→B	French		Day		Gateway		Beep Alarm ON OFF		Input Mode TMP PRO		Delete File ON OFF		5 Minutes		DD-MM-YY
Network ▸	→C			Hour				Test Beep Alarm		Power Save 10 Minutes	→H			10 Minutes		
Beeper ▸	→D			Minute						Format Flash Disk				20 Minutes		
Display ▸				Format YY-MM-DD	→F					Dist Units Ft m				OFF		
More ▸	→E	Return		Return		Return		Return		Return		Return		Return		Return

Display	A	DISP Style	B	Menu Hold
DISP Style ▸ Salubrious	→A	Modern		3 Seconds
Menu Hold ▸ Always	→B	Salubrious		5 Seconds
Title Label		High Contrast		10 Seconds
		Night		30 Seconds
				Always
		Return		Return

5.3   System Menu

Key Sequence: SYS

System
SYS Setup▷
SYS Test ▷
SYS Update▷
Help ▷
Print ▷
Preset

SYS Setup: Press this submenu key to go to the next level of "System Setup" submenu. See 5.4.

SYS Test: Press this submenu key to go to the next level of "System Test" submenu, see 5.6.

SYS Update: Press this submenu key to go to the next level of "System Update" submenu, see 5.7.

Help: Press this submenu key to go to the next level of "Help" submenu, see 5.8

Print: Press this submenu key to go to the next level of "Print" submenu, see 5.9.

Preset: Press this submenu key, and the system will run an initialization program and restore factory setting.

5.4　System Setup Menu

Key Sequence:　SYS　> System Setup

Setup

Language ▶

GPS
ON　OFF

Date/Time ▶

Network ▶

Beeper ▶

Display ▶

More ▶

Language: press this menu to enter the language selection menu to select supported language, which are English and Chinese.

GPS: turn on/off the GPS function. The location information would be shown in the status bar at the bottom of the screen after turning on the function. If you do not receive the GPS location information, it is displayed three gray horizontal line "---". Please make sure the GPS antenna access to the equipment and the outdoor antenna is not blocked by other objects.

Date & Time: press this menu to enter the clock menu to set year, month, date, hour, minute and display format. The time is shown in the status bar at the bottom of the screen. Use the knob or number keys to enter the number after pressing the submenu of year, month, date, hour and minute, and then press ENTER to see the change. The clock will start to operate even the power is running out.

Network: press this menu to enter the network setup menu to set IP address, subnet mask and gateway of the network. Enter the IP address with the number keys and the decimal point key, and press ENTER key to complete setup.

For example: Press keys　1　9　2　.　1　6　8　.　0　.　2　2　ENTER

The IP address here is 192.168.0.22

Beeper: press this menu to enter the beeper setup menu. It supports 2 beeper types: CAUT & Alarm.

Beep CAUT: after some specific actions complete (such as the auto adjustment of amplitude menu), the system will issue a

Confirm ▶

Expert Mode
ON   OFF

Input Mode
SMP   PRO

Power Save ▶
10 Minutes

Format
Flash Disk ▶

Dist Units
Ft   m

Return

short beep to prompt the users. Users could choose to turn on or off this function.

Beep Alarm: In limit test, if the the test is over the threshold, the system would issue an alarm beep. Users could choose to turn on or off this function.

Display: See 5.5 **display setup menu**

Confirm: Some important irrevocable operations need users'confirmation to avoid misoperation. When the confirm setup is turned on, next level of 'confirm menu' would pop up if selecting corresponding function for a further confirmation. Skilled users could turn off the function for higher efficiency. Press the menu to enter the confirmation setup menu. There are 3 confirmation setups:

Preset: whether users need to confirm for restoring factory setup.

Reset Color: whether users need to confirm for reseting colors.

Delete File: whether users need to confirm for deleting files.

Expert Mode: To facilitate the professional test, you can turn off the expert mode completely in the daily basic test. Some menus of the unique features can be activated in the expert mode. For example: In expert mode, the system setup in the display menu increases the three functions, namely: grid (on / off), Prompt (on / off), and Sweep Lines (on / off). The menu is for professional use with the current test case, in order to achieve the purpose of convenient test.

Input: it is used for changing the position of prompt information while typing. 2 modes are available: simple and professional. In simple mode, the prompt information would show up at the upper left corner of the grid frame; while in professional mode, it would show up as an input box at the

center of the grid frame.

Power Save: there are 6 choices: 1, 2, 5, 10min and OFF. The backlight of the screen would always be on if choosing OFF. For other choices, when no operation is done over the set time, the backlight would dim to save power.

Formatting Memory: the function could format users' memory. All files would be deleted after formatting.

Distance Unit: select 'feet' or 'meter'

5.5   Display Setup Menu

Key Sequence: SYS > System Setup > Display

DISP Style: Press this submenu to enter the display style submenu and set the display style.

Three display style: modern, salubrious, high contrast and night.

1 **Modern**: The style is default style of the system.

2 **Salubrious:** The basic background is white in order to save ink when are printing graphics and improve efficiency.

3 **High Contrast**: The display style of the instrument increases displays contrast and the level of the display for more clearly, for observing in outdoor environment.

4 **Night**: The style of the instrument will be used to display all the red lines, in order to overcome the problems by the light at night testing. Optimization of the night viewing.

Menu Hold: it is used to set the time of menu hold. There are 5 choices: 3, 5, 10, 30sec and always. The menu would always be on the screen after choosing always. For other choices, when no option is done over the set time, the menu would autohide in order to get a large display area.

Title Text: press this menu to set the title tex. Input the title with number keys. It only supports space, numbers and letters of 8 characters maximum. Press ENTER to complete. The title text would show up in the title bar at the top of the screen.

Display

DISP Style ▷
Salubrious

Menu Hold ▷
Always

Title Label

5.6   System Test Menu

Key Sequence: [SYS] > System Test

Test

Display

Panel ▶

Clock

GPS ▶

Display: after selecting the option, the color of the screen will turn all white, all black, all red, all green, and all blue, which can detect the existence of the dead pixels.

Panel: Press the submenu button to enter the test screen providing measurement for all the panel buttons and the knob except the power button. Press the corresponding button on the panel, and the measurement succeed of the button on the interface respond, otherwise the button is out of action. Exit the test screen with double pressing F7 key.

Clock: after selecting the option, the system would adjust the clock automatically.

GPS: press the menu to enter the GPS measurement interface, showing GPS status, satellite quantiy, longitude, latitude, altitude, UTC time, and etc.

5.7   System Upgrade Menu

Key Sequence: [SYS] > System Upgrade

Update

OK

Cancel

Copy the upgrade file into the root directory of the U disk. Plug the U disk in the equipment. Press the menu to enter the system upgrade menu to select to upgrade or not.

OK: press it to upgrade. Prompt information would show in the status bar at the lower left corner of the screen. Please do not pull out the U disk until the upgrade completes. Users need to restart the equipment after upgrading.

Cancle: press it to cancle upgrade.

When the software needs to be upgraded, users can ask our company for the latest program or frequency upgrade extention password by the electronic letter.

5.8   Help Menu

Key Sequence: SYS   > Help

Press the submenu key About to see the information of the equipment system, including: version information, serial number, frequency range, battery capacity, current temperature of the system storage details, and etc.
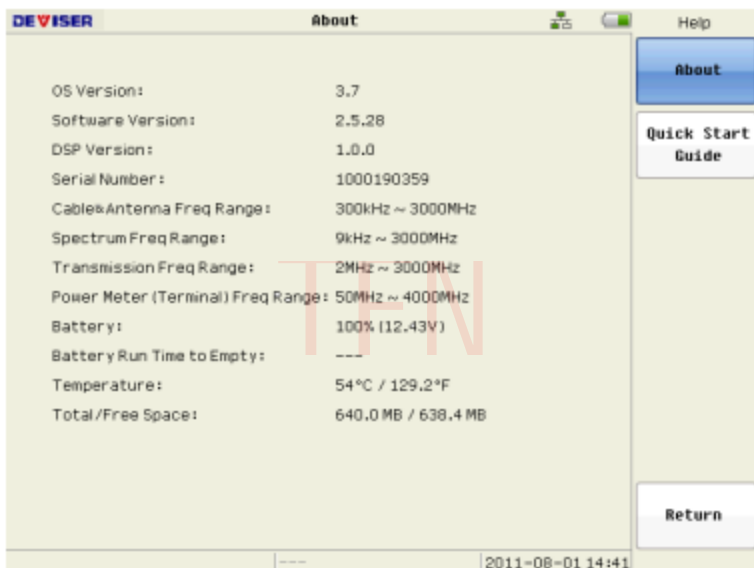
Press the submenu key Quick Start Guide to display the Quick Start Guide describing the basic steps of measurement.

```
DEVISER                 Quick Start Guide              🔋      Help
Set the Frequency
  1.Press the "FREQ DIST" main menu key.                        About
  2.Press the "Start Freq" submenu key and use the keypad,rotary knob,
    or the arrow keys to enter the start frequency.
  3.Press the "Stop Freq" submenu key and use the keypad,rotary knob,
    or the arrow keys to enter the stop frequency.          Quick Start
                                                               Guide
Set the Amplitude
  1.Press the "AMPTD" main menu key.
  2.Press the "Top" submenu key and use the keypad,rotary knob,
    or the arrow keys to edit the top scale value.
  3.Press the "Bottom" submenu key and use the keypad,rotary knob,
    or the arrow keys to edit the Bottom scale value.

Auto Scale
The auto scale function is used to tailor top and bottom automatically in such
a way that traces will appear in the proper sizes on the screen for easy
observation.
  1.Press the "AMPTD" main menu key.
  2.Press the "Auto Scale" submenu key.

Turn on Markers
  1.Press the "MARK" main menu key.                           Return
  2.Press the "Marker 1","Marker 2","Marker 3","Marker 4","Marker 5",
                                                 2011-08-01 16:21
```

5.9   Print Menu

Key Sequence: | SYS | > Print

```
    Print
   _____
   |  Start  |
   |_____|
   _____
   | Remote  |
   |Server IP|
   |_____|
   _____
   |Invert Image|
   | ON   OFF  |
   |_____|
```

Start: Press the submenu to print the current displayed screen. Before you start printing, make sure that the equipment is connect to the LAN, and the remote printing service is available.

Remote Server IP: press it to set the IP address of the server executing printing. After setting successfully, press start, and the equipment would connect with the corresponding server automatically for the relevant operation.

INV Image: set the status of INV image. Users could set measurement background, text, grid, channel measurement data trace and storage line as inverse color in order to save ink and improve efficiency in printing.

6 Site Workbench Management Software

6.1 Overview

The Site Workbench management software is a Microsoft Windows 2000, Windows XP and Windows 7 compatible program for transferring data, analyzing, generating report, editing saved data, editing Marker point, limit edition, and etc.

This chapter provides a brief overview of Site Workbench. For detailed information, refer to the "Site WorkBench" Manual

6.2 Features Overview

➢ **Display and Analyze Traces Data**

The management software can recall files which are saved in the measurement equipments to the PC. It can display the measurement traces and analyze the measurement data. The main features are: changing the scale of the trace, editing Marker points and display limit line editing.

➢ **Context Menu**

The context menus are accessed by right-clicking the mouse on an active measurement screen in the graphic display editor window. The main functions include some common features, mainly for editing and analyzing image of the current window.

➢ **Editor Features**

Provide the cable editor, the signal standard editor and other commonly used editor. You can upload and download data from the equipment.

➢ **Remote Control Software**

When PC management software connects to the equipment properly, it can control the equipment through relevant procedures, and complete functions which are the same as equipment panel in order to implement remote control.

➢ **Superimposed Trace**

This feature allows multiple traces compared.

6.3 Install the Software

Site Workbench is provided on the CD-ROM attached with the equipment. Insert the CD-ROM into a PC to run the installer.Follow the onscreen instruction.

6.4 Connect with the Instrument

Connect the instrument with the PC network through network port;

Turn on the instrument, and set an legal IP address;

Run Site Workbench, and input the IP address of the instrument;

Press the connection menu, and then the option of connecting to appointed IP address. The connection is established.

7 Specifications

7.1 Cable Analyzer

Frequency	
Frequency Range	2MHz～4400MHz
Frequency Stability	± 2ppm (0～50°C)
Frequency Accuracy	± 2ppm (25±5°C)
Frequency Resolution	1kHz
Level	
Output Level Range	≥0dBm
System	
Sweep Point	130, 259, 517, 1033, 2065
Measurement Speed	1mS/point (return loss) 1.25mS/point (DTF)
Interference Immunity	Frequency: 13dBm (within±10kHz) Channel: 20dBm (>1MHz)
Port Characteristic	Return Loss ≤ -10dB
Directivity	≤-42dB(after standard calibration) ≤-38dB(after approximate calibration)
Loss Level	+25dBm (RF signal) ±50V (DCV)
Return Loss	MeasurementRange: 0dB～60dB Resolution: 0.01dB
VSWR	MeasurementRange: 1～65 Resolution: 0.0001

Cable Loss	MeasurementRange: 0dB～30dB Resolution: 0.01dB
DTF	Return Loss Measurement Range: 0dB～60dB VSWR MeasurementRange: 1～65 Measurement Distance Range: (point-1)/(span*2)*Vf (speed factor of cable)*C(speed of light)
Phase	MeasurementRange: -180^0～$+180^0$ Resolution: 0.01^0
Smith Chart	Resolution: 0.01
Input/Output Port	
RF Input Port	50ΩN female
RF Output Port	50ΩN female
USB Port	USB1.1 4pin
Mini USB Port	USB2.0 4pin
LAN Port	10/100M RJ45
Power & Display	
AC-DC Power Adaptor	Input 100-240VAC, 50-60Hz Output 19VDC/3.42A
Lithium Battery	11.1V/5.2Ah
Charging Time	＜5h
Continuous Working Time	＞4.5h typical > 6h
LCD	6.5" TFT LCD, 640*480
SupportedLanguage	English, Chinese
ESD	

Port Static Immunity	≥8KV (contact discharge)
	15KV(air discharge)
Others	
Humidity	95% at 40°C
Working Temperature	-10°C～55°C
Storage Temperature	-40°C～80°C
Weight	< 2.2kg
Size (L×W×H)	260 × 196 ×77mm

7.2 Spectrum Analyzer

Frequency Parameters	
FrequencyRange:	9kHz～4.4GHz
Aging Speed	$\pm 0.5 \times 10^{-6}$/year
Stability	$\pm 1 \times 10^{-6}$
Temperature Stability	$\pm 0.5 \times 10^{-6}$ (0 - 50)°C
Marker Counter Accuracy	(SNR 25 dB, Resolution Bandwidth (RBW) /Span = 0.01)
Counter Accuracy	$\pm 0.5 \times 10^{-6} \pm 1$
Resolution	1Hz
Sweep & Bandwidth	
Range	0Hz(0 span), 1kHz- 4400MHz
Sweep Time & Trigger Mode	
Sweep Time Range:	20ms – 250s (Frequency Sweep Span ≥ 200Hz)
	10μs –1000s (Frequency Sweep Span = 0 Hz)

	1ms – 250s (Frequency Sweep Span , Fast scan mode)
Time Accuracy	<±0.2%
Trigger Type	Free, signal, video, line
Resolution Bandwidth	
Range	1Hz - 3 MHz about 10%
Bandwidth Accuracy:	<±10%
selectivity	(60dB/3dB Bandwidth ratio) : <5: 1
Video Bandwidth	
Range	1Hz - 3 MHz about 10%
Stability	
Phase Noise	Typical＜ -110dBc/Hz @ continuous signal offset 100 kHz

Typical＜ -100 dBc/Hz @ continuous signal offset 10 kHz

Typical＜ -90 dBc/Hz @ continuous signal offset 1 kHz |
Amplitude	
Attenuator	
Range	0dB - 55dB
Step	5dB/(1dB Options)
Built-in Amplifier	
Frequency Range:	1MHz – 4.4GHz
Gain	25dB (Typical)
Noise Factor	4dB (Typical)

Max. Safe Input Level	+30dBm (peak power /entrance Attenuation>15dB)
	50VDC
TOI	Typical >12dBm
Display Average Noise Level: (No Signal Input,0dBAttenuation,100Hz RBW, 3 Hz VBW, Sample Detection)	
Amplifier OFF	≤-128dBm,2MHz~1GHz
	≤-122dBm,1GHz~3GHz
	≤-128dBm,3GHz~4.4GHz
Amplifier ON	≤-145dBm,2MHz~1GHz
	≤-140dBm,1GHz~3GHz
	≤-142dBm,3GHz~4.4GHz
Spurious Signal Response Range	
Second Harmonics	<-70 dBc -20dBm mono mixer Input, Amplifier OFF
Residual Responses	(no signal input,Attenuator is 0)
	≤-80dBm 1MHz - 4400MHz
DisplayRange	
Lgo Scale:	0.1 -0.9 dB/div,0.1dB Step;
	1-40dB/div, 1dB Step
Linear Scale:	10div
Scale Unit	dBm, dBmV, dBμV, mV
Marker Readout Resolution:	0.03 dB under log
	0.03% of reference level under linear

Trace	3 traces output
Detection Mode	Sample, posi-peak, neg-peak, normal, average
Marker Function	peak, next peak, marker to center, marker to ref, and etc.
Marker Display	normal, delta, fix, frequency counter
Reference Level:	-167 dBm— +35dBm
Level Accuracy:	Typical≤±1.0dB@+25±5℃
RBW Switching accuracy	Typical≤±0.1dB
Input attenuator Switching accuracy	Typical≤±0.3dB

7.3   Transmission Measurement Sweeper

Frequency	
Frequency Range:	2 MHz～4.4GHz
Frequency Resolution	1kHz
Range	
Dynamic Range	95dB (RBW 3kHz)
Output power	0dBm
Measurement resolution	0.01dB

7.4 Terminal Power Meter

Main Specifications	
Frequency Range	50MHz～4GHz
Width Dynamic Range	-35dBm～+20dBm
VSWR	1.1:1 typ.
Display resolution	1dB，0.1dB，0.01dB，0.001dB
Uncertainty	Typical±0.2dB
Resolution	Typical±0.01dB
Measurement Speed	Typical: 100 mSec
Size	124*44*24
Weight	250g