

150H ANTENNA FEEDER VSWR TESTER

OPERATION INSTRUCTIONS



SAFETY REQUIREMENTS

SECURITY LEVEL

The following safety warning symbols will be used in this manual

WARNING

This prompt specifically refers to certain hazards that require attention to the operating methods. Do not operate or handle until the conditions indicated by this symbol are fully understood and met, otherwise improper operation or handling may cause personal injury.

BE CAREFUL

This prompt specifically refers to certain dangerous items that require attention to the operating methods. Do not operate or handle until the conditions indicated by this symbol are fully understood and met, otherwise improper operation or handling may damage the instrument.

Before turning on the power switch of the instrument, it is necessary to confirm whether the AC power supply voltage of the external AC-DC power adapter or the power supply of the steam charging adapter meets the requirements for the use of the instrument. Otherwise, non compliant power supply may damage the adapter or the instrument

Due to the multiple circuit connectors inside the instrument, touching them may cause minor personal injury or damage to the instrument. Therefore, only personnel who have received maintenance training can remove the outer shell of the instrument to maintain it.

WARRANTY

This instrument comes with an 18 month warranty after sale, and can be purchased for an additional 12 months before expiration. The internal battery is covered for 12 months, and the manufacturer or agent is responsible for necessary calibration or inspection of the instrument. The instrument can only be packed and returned to use after passing the approved inspection

Users need to inspect and use this instrument according to the instructions. If maintenance is required, please promptly send it to our company or designated repair station.

Generally speaking, during the warranty period, any malfunctions that are not caused by human error or improper use will be repaired free of charge by our company. The user needs to pay for the shipping and insurance costs of returning the product to the repair department, while the cost of delivering the repaired product to the user is paid by our company or designated agent repair station.

After the software and hardware designed by our company for this product are correctly installed on the instrument, the instrument will execute its programming instructions. However, our company does not guarantee uninterrupted or error free operation of the instrument. The warranty is only applicable to the instrument and does not cover any other equipment, personal or property damage caused by improper use.

WARRANTY LIMITATIONS

For incorrect use or improper maintenance (including user added software or interfaces), as well as user initiated disassembly, our company will not provide warranty. During the 18 month warranty period, verification, repair services, and consultation are free of charge. After 18 months, material and repair service fees, as well as verification fees, will be charged.

The following items are also not covered by the warranty:

- ① Damage to the instrument caused by overvoltage due to external AC or DC power sources that do not meet the rated voltage requirements of the instrument.
- ② Due to mechanical external forces (such as impact, drop, etc.) causing deformation and damage to the LCD, panel, switch, device, and chassis, and involving internal component failures.
- ③ Damage caused by attempting to repair the instrument without authorization.
- ④ When the user picks up the goods, they should conduct on-site inspection. If the instrument is damaged, please negotiate with the relevant department of the freight company. Only the consignee (the individual or unit receiving the instrument) has the right to claim compensation from the carrier for transportation damage.
- ⑤ Damage caused by the instrument operating outside of the product's environmental technical specifications.

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1 GENERAL DESCRIPTION

THIS CHAPTER WILL FOCUS ON INTRODUCING THE FOLLOWING MAIN CONTENTS:

- **INTRODUCTION TO THE MAIN FUNCTIONS OF THE INSTRUMENT**
- **SELECT MODEL INTRODUCTION**
- **INTRODUCTION TO OPTIONAL FUNCTIONAL ACCESSORIES**
- **DESCRIPTION OF RANDOM STANDARD CONFIGURATION**
- **PREVENTIVE CARE**
- **ANNUAL INSPECTION AND CALIBRATION INSTRUCTIONS**
- **PROTECTION METHODS FOR ELECTROSTATIC DISCHARGE (ESD)**
- **BATTERY REPLACEMENT**
- **RELEVANT TECHNICAL SUPPORT AND SERVICE INFORMATION**

1.1 INTRODUCTION TO THE MAIN FUNCTIONS OF THE INSTRUMENT

The 150H Antenna feeder VSWR tester is a handheld device used for testing antennas, feeders, and cables. Used for measuring "return loss", "standing wave ratio", "cable loss", "fault location", "reflection phase" and "Smith chart" on engineering sites.

150H is a multifunctional and highly integrated testing instrument that is easy to transport and carry. In addition to cable and antenna testing, it also comes with multiple options, including power meters and other options. External USB power meter to meet high-precision power measurement requirements.

The 6.5-inch TFT LCD color display is also easy to observe test results under strong light, and the machine is equipped with a lithium battery that can work continuously for 6 hours.

The built-in 1G Flash memory can store 5000 test curve data and configuration files. Test data and configuration files can also be stored on a USB flash drive or transmitted to a computer via Ethernet cable.

Site Workbench software is based on the PC platform and can generate test reports, manage data, analyze historical data, set cursor and qualification lines, analyze test curves, etc.

1.2 INTRODUCTION TO OPTIONAL FUNCTIONAL ACCESSORIES

Table 1-1 lists the optional functional accessories for the Antenna feeder VSWR tester

SERIAL NUMBER	EXPLAIN
1	GPS RECEIVER
2	TERMINAL POWER METER
3	THROUGH TYPE POWER METER
4	LITHIUM BATTERY CHARGER

TABLE 1-1 FUNCTIONAL ACCESSORIES OF ANTENNA FEEDER VSWR TESTER

1.3 DESCRIPTION OF RANDOM STANDARD CONFIGURATION ACCESSORIES

Carefully open the packaging box and check the standard configuration accessories and information for each random shipment according to Table 1-2. If the standard random accessories and information are incomplete, please contact the manufacturer and provide the random packaging and shipping list at the same time. The additional paid options selected according to the requirements will also be randomly shipped to the user. If the options are incomplete, please contact the manufacturer and provide a random packaging and shipping list at the same time.

SERIAL NUMBER	explain
1	User Manual CD
2	N-type integrated calibration component (or ECAL electronic calibration parts)
3	1.5m N-type RF cable
4	11.1V/5.2Ah lithium battery
5	The power adapter
6	Instrument backpack

Table 1-2 Standard Configuration Accessories

1.4 PREVENTIVE CARE

Preventive care includes cleaning of instrument surfaces, RF connectors, and random accessories. The surface of the instrument can be cleaned with a soft cotton cloth or cotton ball dipped in water.

Attention: To prevent damage to the display screen, do not use solvents or corrosive liquids for cleaning.

Please clean the RF connector and inner conductor with a cotton ball dipped in anhydrous alcohol. The inner conductor of the N-type connector should be undamaged and have a smooth surface. The test cable should be free from tension, distortion, and damage.

1.5 ANNUAL INSPECTION AND CALIBRATION INSTRUCTIONS

Branches or offices in various regions are responsible for the annual maintenance and calibration of instruments. To ensure the normal operation of instruments, it is recommended that customers perform periodic maintenance and calibration.

In the testing method of feeder lines, calibration is carried out using circuit breakers, short circuit breakers, and load standard components, which are also commonly used measurement error correction methods during on-site testing. The performance of calibration parts is directly related to the final measurement results, so customers should regularly maintain and calibrate calibration parts to ensure measurement consistency.

1.6 PROTECTION METHODS FOR ELECTROSTATIC DISCHARGE (ESD)

Like many high-performance instruments, the Antenna feeder VSWR tester is susceptible to static electricity damage. Coaxial cables and antennas often accumulate a large amount of static charge, and if the instrument is discharged, it may damage the internal circuit of the instrument. Staff should be aware of the potential hazards of static electricity and take corresponding preventive measures.

Before connecting the instrument to the cable or antenna, static electricity can be released by simply connecting it to the cable or antenna with a short circuit or load. Remember that staff may also carry static electricity.

When disassembling components or removing connecting wires from the instrument, maintenance personnel should use certain measures to ensure good grounding.

Proficient in these operating methods to ensure a safe environment for personnel and equipment,

1.7 BATTERY REPLACEMENT

The replacement of the battery does not require the use of any tools. The battery compartment is located behind and below the instrument (facing the display screen). Remove the two screws and slide the cover down to remove the battery.

The installation of the battery can be carried out by reversing the above steps.

Tip: The battery connector must be connected in the correct order to the power cord, otherwise it cannot be connected

Before use, the battery attached to the Antenna feeder VSWR tester should be charged. It can be charged inside the machine using an AC-DC power adapter or a 12VDC adapter.

Tip: Only use batteries, power adapters, and chargers licensed by the instrument manufacturer

Warning: When using a 12VDC adapter, ensure that the power supply is greater than 60W and the power socket is clean. During use, if the adapter plug overheats, it should be disconnected immediately.

Tip: When storing the instrument for a long time, it is recommended that you remove the battery.

1.8 RELEVANT TECHNICAL SUPPORT AND SERVICE INFORMATION

After the instrument is sold, our company provides an 18 month warranty, and each user will receive application training from our application engineers. Users can quickly master and use the instrument through face-to-face communication.

For users' special applications, our company also provides technical support, including the development and design of special application software for the product's secondary development (appropriate fees will be charged according to the specific project of technical support). In addition, application engineers can also answer operators' questions or provide technical support for software development at any time.

Our company will continuously improve and upgrade the versions of instrument measurement software according to the development of application fields and user requirements, and the instruments also provide users with operation methods for software upgrades. At the same time, we will continuously publish application materials for various occasions, providing specific application guidance for most measurement work. If you have any requirements regarding software and materials, please contact our company or the nearest designated agent.

When repairing the product, both parties shall jointly bear the corresponding shipping costs

2 FAMILIAR WITH INSTRUMENTS

This chapter will introduce the main overview of the Antenna feeder VSWR tester enabling users to become familiar with the instrument. As for the detailed measurement content, it will be provided in other corresponding documents.

THIS CHAPTER WILL FOCUS ON INTRODUCING THE FOLLOWING MAIN CONTENTS:

- **TURN ON THE ANTENNA FEEDER VSWR TESTER**
- **INTRODUCTION TO FRONT PANEL**
- **INTRODUCTION TO TEST PANEL CONNECTORS**
- **INTRODUCTION TO SCREEN DISPLAY INFORMATION**
- **SYMBOLS AND INDICATIONS**
- **DATA EDITING**
- **MEASUREMENT MODE SELECTION MENU**

2.1 ACTIVATE THE ANTENNA FEEDER VSWR TESTER

150H can work continuously for 6 hours when the battery is fully charged.

The tester can also work while charging through an AC-DC power adapter or a gas charging adapter.

Warning: When using a 12VDC adapter, ensure that the power supply is greater than 60W and the power socket is clean. During use, if the adapter plug overheats, it should be disconnected immediately.

Press the red ON/OFF button on the front panel for 2 seconds, turn on the device after 150H, wait for a few tens of seconds, and the instrument will enter the measurement screen to start measuring.

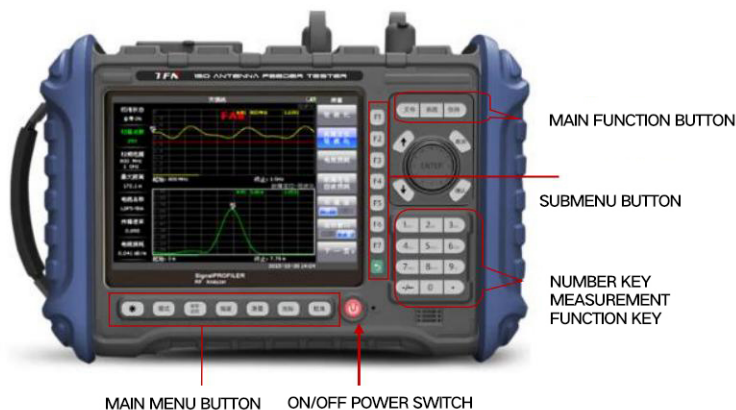


FIGURE 2-1 APPEARANCE OF THE ANTENNA FEEDER VSWR TESTER

2.2 INTRODUCTION TO THE FRONT PANEL OF THE ANTENNA FEEDER VSWR TESTER

The menu operation of the antenna feeder VSWR tester is very easy and only requires a little practice. The menu button consists of six main menu buttons at the bottom of the screen and eight sub menu buttons on the right side of the screen. The function buttons are located on the right side of the screen, consisting of five main function buttons at the top and twelve measurement function buttons at the bottom. The twelve measurement function buttons are printed on the panel and are used in combination with the number keys, symbol keys, and decimal point keys.

When the instrument is in parameter editing mode, the number keys, symbol keys, and decimal point keys are valid. Conversely, if the instrument is not in parameter editing mode, the measurement function keys are valid. If you want to directly operate the measurement function key while in parameter editing mode, press the cancel key, main function key, or menu key to exit.

MAIN MENU BUTTON

There are six main menu buttons located at the bottom of the screen.

MODE

Mode: Activate the mode menu and select the measurement mode.

FREQUENCY/DISTANCE

Frequency distance: Activate the frequency or distance menu, set the measurement frequency or distance

AMPLITUDE

Amplitude: Activate the amplitude menu and set the display amplitude

MEASURE

Measurement: Activate the measurement menu and select the measurement type

CURSOR

Cursor: Activate the cursor menu, observe the measurement results through the cursor, and provide cursor search function

CALIBRATION

Calibration: Activate the calibration menu to make the instrument test results more accurate through calibration.

Submenu button

There are a total of eight submenu buttons, as shown in Figure 2-1, located on the right side of the screen, which can be used in conjunction with other buttons to change the instrument settings.

Main function button

There are a total of five main function buttons, as shown in Figure 2-1, located above the keyboard area on the right side of the screen.

FILE

File: Activate the file menu to save or retrieve settings files, measurement files, and graphic files.

SYSTEM

System: Activate the system menu, set system parameters, display system information: complete system upgrade, printing and other operations.

MAINTAIN

Maintain: Switch between running and maintaining the scanning state. Pressing this key during a single scan will initiate a single scan.

CANCEL

Cancel: can be used as a backspace key when editing parameters, and can also be used to terminate an ongoing operation.

SURE

Confirm: Used to confirm the parameters being edited and to confirm the current operation.

MEASUREMENT FUNCTION KEY

The measurement function key, as shown in Figure 2-1, is located below the keyboard area on the right side of the screen and is used in combination with the number key, symbol key, and decimal point key. It is effective when the instrument is not being edited for parameters.

SCAN

Scan: Activate the scan menu, set the scan type, number of scan points, interference suppression, and data averaging.

TRACE

Trace: Activate trace single, complete trace comparison, data calculation function

QUALIFIED LIMIT

Qualification limit: Activate the qualification test menu and complete the qualification test operation.

SAVE SETTINGS

Save the settings file.

CALL SETTINGS

Import the settings file.

SAVE MEASUREMENT

Save the measurement file.

CALL MEASUREMENT

Import the measurement file.

SAVE DRAWING

Save the graphic file.

AUTOMATIC ADJUSTMENT

Automatically adjust the grid scale to adjust the displayed measurement trace to the optimal position

STANDING-WAVE RATIO

Enter the standing wave ratio measurement.

POSITIONING STANDING WAVE RATIO

Enter fault location - standing wave ratio measurement.

CABLE LOSS

Enter cable loss measurement.

“ ↑ ↓ ” DIRECTIONAL KEYS

“ ↑ ↓ ” The directional keys are located in the middle of the keyboard area on the right side of the screen, used to change the parameters being edited or move options in the list, as well as to move the cursor.

SPINNING WHEEL

The spinning wheel is located in the middle of the keyboard area on the right side of the screen, used to change the parameters being edited or move options in the list, as well as to move the cursor. Pressing the spinning wheel can be used as the "confirm" key.

NUMBER KEYS

The "0-9" numeric keys, "+/-" symbol keys, and "." keys are located below the keyboard area on the right side of the screen and are used in conjunction with the measurement function keys. Effective when the instrument is in parameter editing mode, completing the parameter editing work.

Tip: The specific operation and application of each button will be explained in detail in the following chapters.

LED INDICATOR LIGHT

The operation indicator light is located at the bottom of the keyboard area on the right side of the screen. Press the power button to turn on the device, and the green light will turn on.

2.3 INTRODUCTION TO TEST PANEL

Figure 2-2 illustrates the situation on the testing panel of the tester.

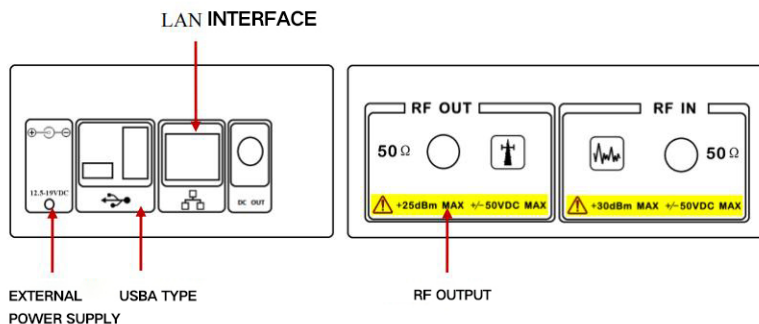


FIGURE 2-2 TEST PANEL CONNECTOR

EXTERNAL POWER SUPPLY

External power supply is used to directly power the instrument or charge the battery. Input DC voltage of 12.5V~19V, power greater than 60W. When the AC-DC power adapter or the 12VDC adapter is connected, the red light will turn on and the battery will start charging. When fully charged, it will display orange.

USB A-TYPE INTERFACE

The Antenna feeder VSWR tester has a USB A-type interface for inserting a USB flash drive to store measurement curve data, setting files, and graphic files.

LAN INTERFACE

The 10M/100M adaptive antenna feeder VSWR tester is connected to a PC through a LAN port for communication with the Site Workbench software. The Site Workbench management software can complete functions such as data transmission, analysis, editing and saving, report generation, remote control, etc.

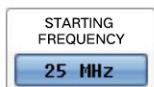
RF output

50 Ω N female connector, maximum input+25dBm, $\pm$ 50VDC. Antenna feeder measurement port, used for reflection measurement.

2.4 Menu Operation

The menu types can be divided into 7 types according to their execution methods. The following will provide a detailed introduction to each type and their operation methods.

➤ PARAMETER INPUT



Press the corresponding menu to enter the editing mode, and the parameters are displayed in the upper left corner of the screen. Use the number keys, directional keys, and rotary wheel to change the parameters, and press the confirm key to exit editing.

➤ SWITCHING BETWEEN TWO FUNCTIONS



Press the corresponding menu button to switch between two functions.

➤ ENTER THE NEXT LEVEL SUBMENU (NO PARAMETERS)



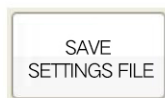
Press the corresponding menu key to enter the next level submenu.

➤ ENTER THE NEXT LEVEL SUBMENU (WITH PARAMETERS)



Press the corresponding menu key to enter the next level submenu, change the submenu options, automatically return to the previous level menu and change the type of parameters carried by this menu, refresh the display.

➤ DIRECTLY EXECUTE MENU FUNCTIONS



Press the corresponding menu key to execute the corresponding function once.

➤ CHECKED STATE



The menu animation display indicates completion of execution. Press the corresponding menu button, select this function, and if there is a previous menu, return to the previous menu.

➤ PROHIBITED OPERATION STATUS



Some menus are only effective when they meet certain states. Otherwise, it will be displayed in gray, indicating that this menu is invalid. For example, when there is no stored data in the memory, the memory curve cannot be displayed.

2. 5 SYMBOLS AND INDICATIONS

The symbols or indications used in the screen to describe the status and conditions of the instrument will be introduced below

CALIBRATION STATUS

✧ CALIBRATION STATUS OFF

Indicates no calibration or calibration turned off.

✧ CALIBRATION STATUS WITH FULL ON

Indicates that full band calibration has been completed, and the calibration data remains valid even when the measurement frequency or scanning point number changes, indicating approximate calibration data.

✧ CALIBRATION STATUS STANDARD ON

Indicates that the standard calibration has been completed, and the calibration data is invalid when the measurement frequency changes. Need to recalibrate.

BATTERY SYMBOL

✧  Green: battery remaining charge of 30%~100%;

✧  Yellow: battery remaining charge of 10%~30%;

✧  Red: Battery residual charge 0%~10%;

✧  Battery progress bar: The battery is charging.

OTHER SYMBOLS

✧  Network connection: The instrument is communicating through a network port;

✧  USB connection: The instrument has successfully recognized the USB drive;

✧  Scan hold: Keep the current measurement curve.

When the AC-DC power adapter or the 12VDC adapter is connected, the battery starts charging and the battery symbol is displayed in the form of a progress bar. The charging indicator light is red and green when fully charged.

Tip: Only use batteries, power adapters, and chargers licensed by the instrument manufacturer

When using an external adapter for power supply without installing a battery, the battery symbol disappears and the power plug symbol appears, as shown in Figure 2-3.

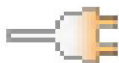


FIGURE 2-3: NO BATTERY INSTALLED

2.6 DATA INPUT

1) PARAMETER EDITING

During the parameter editing process, in addition to using numeric keys for input, directional keys and spinning wheels can also be used. The use of directional keys can quickly change parameters, saving the trouble of input. The change pattern increases or decreases in steps of 1, 2, and 5, and can be continuously held down to quickly change the parameters to the desired value. The use of a rotary wheel can continuously change parameters, with a linear variation pattern. The combination of a rotary wheel and a quick step key can greatly reduce the workload of users when changing parameters, achieving twice the result with half the effort.

2) DIRECTLY EDIT THE MEASUREMENT SCREEN

on the main measurement screen, and display the main parameters related to measurement such as frequency, distance, scanning points, cable parameters, etc. directly on the screen to improve operational efficiency

Use the directional keys or the rotary wheel to select the parameter item that needs to be edited. The selected item will be highlighted in the current measurement channel curve color. Press the confirm button, and an editing box will appear at the selected parameter to start editing; Use numeric keys, directional keys, and spinning wheels to change parameters; Press the confirm button again to exit editing.

3) PRESS THE CORRESPONDING SUBMENU TO ENTER EDITING MODE

Press the corresponding submenu to enter the editing mode, and the parameters will be displayed in the middle of the screen. Use the number keys, directional keys, and rotary wheel to change the parameters, and press the confirm key to exit the editing.

4) OPTION CONFIRMATION

The storage files (measurement curve data files, setting files, and graphic files), signal standards, and standard cables of the antenna feeder VSWR tester are presented in the form of a list, which can be selected using directional keys or spinning wheels. The selected items are highlighted, and the confirmation key is pressed to complete the selection.

5) TEXT INPUT

When saving a file, it is necessary to enter the file name and reuse character and number keys

2.7 MEASUREMENT MODE SELECTION

Press the main menu button "Mode" to enter the measurement mode selection screen (as shown in Figure 2-4). Press the submenu key to select the desired measurement mode, or enter the next level menu. Press the submenu key to select the desired measurement item, or use the measurement function key located below the keyboard area on the right side of the screen to quickly enter the desired measurement item.

Tip: The measurement mode of the application depends on the user's model and purchased options. Refer to Tables 1-1 and 1-2.

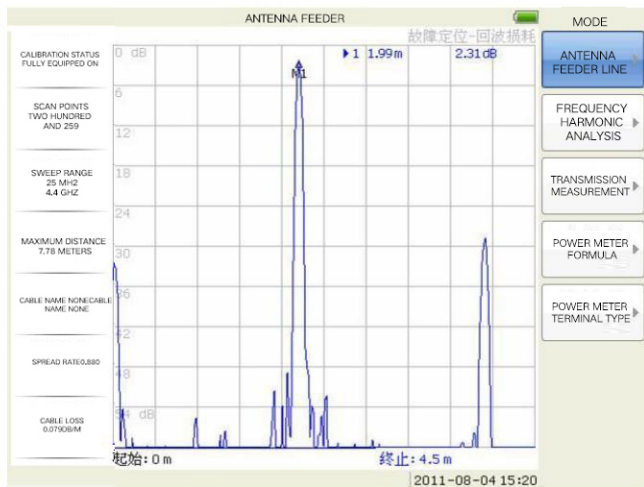


FIGURE 2-4 MEASUREMENT MODE SELECTION

3 QUICK START

3.1 OVERVIEW

This chapter provides a brief description of the 150H antenna feeder VSWR tester and introduces the basic measurement settings.

3.2 ANTENNA FEEDER MODE

1. SELECT MEASUREMENT TYPE

Press the main menu button to **measure** and select the measurement type. As shown in Figure 3-1

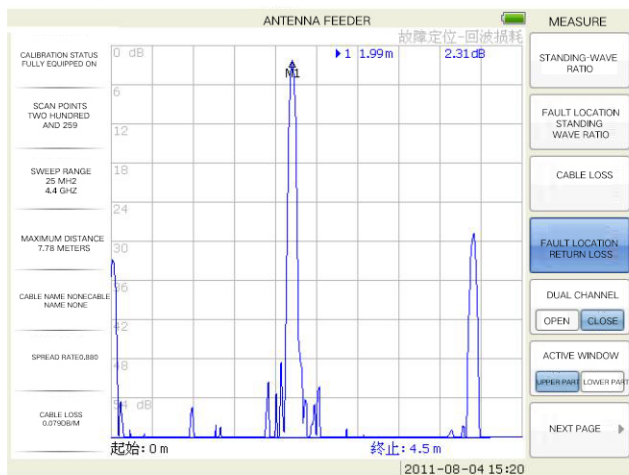


FIGURE 3-1 MEASUREMENT TYPES OF DAILY FEEDLINES

2. SET FREQUENCY

- 1) Press the main menu button to enter the frequency menu.
- 2) Press the submenu key to start frequency, use the number keys, directional keys, and spinning wheel to enter the start frequency
- 3) Press the submenu key to end the frequency, use the number keys, directional keys, and rotary wheel to enter the starting frequency

End frequency of wheel input

3. Set the display amplitude

- 1) Press the main menu key **amplitude** to enter the amplitude menu
- 2) Press the submenu and type **at the top**. Use the number keys, directional keys, and spinning wheel to enter the displayed scale value at the top.
- 3) Press the submenu and type **at the bottom**. Use the number keys, directional keys, and spinning wheel to enter the displayed scale value at the bottom.

4. Automatically adjust the display amplitude

The instrument can automatically adjust the top and bottom scale values. Automatically adjust the displayed measurement trace to the optimal position.

- 1) Press the main menu button to enter the **amplitude** menu.
- 2) Press the submenu key to **automatically adjust**

5. Use the cursor

- 1) Press the main menu key to enter the **cursor** menu,
- 2) Pressing the submenu key **cursor 1** and **cursor 2** can turn on and off the cursor and switch the active cursor. Pressing the submenu more cursor activates the next level of submenu, which can turn on or off the active cursor with **cursor 3**, **cursor 4**, **cursor 5**, and **cursor 6**.
- 3) Use the rotation or directional keys to move the active cursor. You can also input the cursor frequency or distance value directly through the number keys.
- 4) Each cursor corresponds to a difference cursor. Press the submenu key to **next page**, and press the submenu key to turn on or off the **difference cursor**

6. Automatic cursor search

When the measurement type is fault location, the automatic search function automatically searches for the fault point according to the set search threshold value, and arranges it in ascending order. When the measurement type is standing wave ratio, return loss, cable loss, phase, Smith chart, the automatic search function automatically marks cursor 1 to the maximum value and cursor 2 to the minimum value.

Enter the cursor menu.

1) Press the main menu key **cursor** to enter the cursor menu

2) When the measurement type is fault location:

Press the submenu key to **automatically search for the fault point**

When the measurement type is non fault location:

Press the submenu key to **automatically search for maximum and minimum**

7. Single qualification limit

1) Press the measurement function key to enter the **qualified test main menu.**

2) Press the submenu key to **initiate the qualification test.**

3) Press the submenu key to **select the qualified limit** and choose the qualified test type.

4) Press the submenu key to enter the **single limit value**, use the number keys, directional keys, and rotary wheel to input the single limit value.

8. Set distance and cable type

In fault location mode (DTF), measurement distance and cable type should be set. The cable type determines the propagation rate and cable loss value. Next, we will introduce how to set the distance and select the appropriate cable type.

Tip: Choosing the correct cable is crucial for precise measurement and location of fault points. If an incorrect cable is selected, or if the correct cable is selected but exceeds its appropriate frequency range, the DTF curve will shift vertically or horizontally, making it more difficult to locate the fault correctly.

- 1) Press the main menu button to **measure** and enter the measurement menu.
- 2) Select the measurement type of "fault location return loss" or "fault location standing wave ratio".
- 3) Press the **frequency/distance** key on the main menu to enter the distance menu.
- 4) Press the submenu key to enter **the starting distance** using the number keys, directional keys, and spinning wheel.
- 5) Press the submenu key wheel to enter the **termination distance**. Use the number keys, directional keys, and spinning wheel to input the starting distance.
- 6) Press the submenu key **Cable** to enter the cable selection screen. Select the cable through the rotary wheel or directional keys, confirm the input of a cable parameter by pressing the function key, automatically set the cable loss and propagation rate, and return to the measurement screen.

9. Calibration

- 1) Press the **frequency/distance** key on the main menu to set the frequency range.
- 2) Press the main menu button to **calibrate** and enter the calibration menu.
- 3) Press the **submenu key** to select OSL or ECAL calibration method.

OSL calibration:

- a) Press the **submenu key** to calibrate the type, select standard calibration or full band calibration.
 - b) Press the submenu key to **start calibration** and enter the calibration wizard screen
- Start calibration

- c) Connect the circuit breaker and press the **confirm** button.
- d) Connect the short-circuit device and press the **confirm** button.
- e) Connect the load and press the **confirm** button.
- f) The system automatically returns to the measurement screen. If the calibration is successful, the calibration status in the upper left corner of the screen will display "Standard ON" or "Full Band ON"

ECAL calibration:

ECAL calibration defaults to full band calibration

- Press the submenu key to **start calibration** and enter the calibration wizard screen.
- Connect the electronic calibration component and press the **confirm** button.
- The system automatically returns to the measurement screen. If the calibration is successful, the calibration status in the upper left corner of the screen will display "Full Band ON"

3.3 PASS THROUGH AND TERMINAL POWER METER MODES

1. SELECT POWER METER - PASS THROUGH TYPE

Press the main menu button mode and select the power meter through formula, as shown in Figure 3-12.

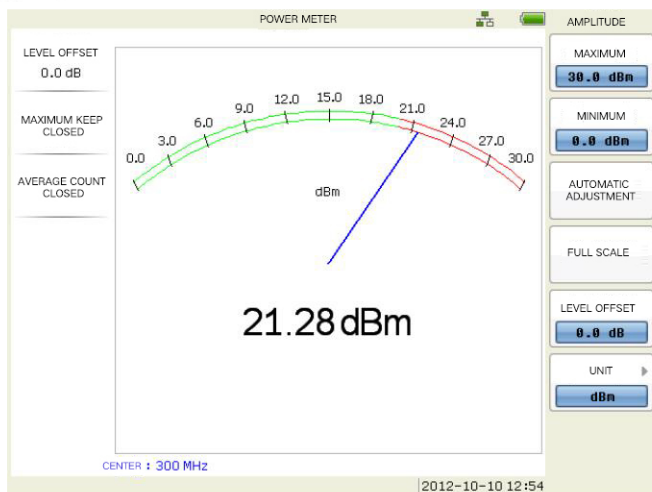


FIGURE 3-2 POWER METER - PASSING FORMULA

2. Set frequency

- 1) Press the main menu button for **frequency/distance**
- 2) Press the sub menu key wheel **center frequency**. Use the number keys, directional keys, and rotary wheel to input the center frequency

3. Set the display amplitude

- 1) Press the main menu button to enter the **amplitude** menu.
- 2) Press the submenu key to the **maximum**, use the numeric keys, directional keys, and rotary wheel to input the maximum scale value of the dial.
- 3) Press the **minimum** submenu key, use the number keys, directional keys, and rotary wheel to input the minimum scale value of the dial.

4. Automatically adjust the display amplitude

The instrument can automatically adjust the top and bottom scale values. Automatically adjust the displayed pointer to the optimal position.

- 1) Press the main menu button **amplitude** to enter the amplitude menu.
- 2) Press the submenu key amplitude to **automatically adjust**

5. Full scale display amplitude

The instrument can display the dial as full scale.

- 1) Press the amplitude key on the main menu to enter the **amplitude** menu,
- 2) Press the submenu key to **full scale**

6. Qualification testing

- 1) Switch the **submenu key to enable/disable** the qualification test, and turn on the automatic judgment function for the qualification limit.
- 2) Press the **upper limit** button on the submenu, use the number keys, directional keys, and rotary wheel to enter the upper limit value for the qualified test.

3) Press the lower limit button on the submenu, use the numeric keys, directional keys, and rotary wheel to enter the lower limit value for the qualified test.

7. Calibration

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

2) Press the submenu key to zero and calibrate the power meter. Please ensure that there is no signal input at this time.

4 FILE MANAGEMENT

4.1 OVERVIEW

This machine has an automatic parameter storage function, and the system enters the running state before the last shutdown every time it is turned on, simplifying the setup work. Users can also manually save and read instrument settings files. The settings file includes settings for the measurement mode, frequency, distance cursor, and calibration data of the instrument. In this way, the next time this measurement work status is used, only the configuration file needs to be retrieved, avoiding duplicate settings and calibration steps and improving work efficiency.

The storage of measurement files facilitates users' viewing and management of measurement results. Loading files into memory for comparative analysis and data computation: PC management software can import measurement files for detailed analysis, management, and report generation.

Support functions such as saving, previewing, and importing bitmap images into USB drives. Save the measurement screen as an image for easy viewing and management.

4.2 FILE MANAGEMENT

FILE MANAGER

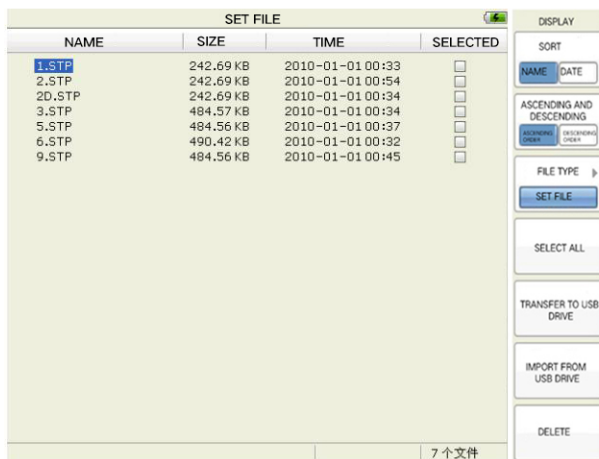


FIGURE 4-1 FILE MANAGER

FILE TYPE

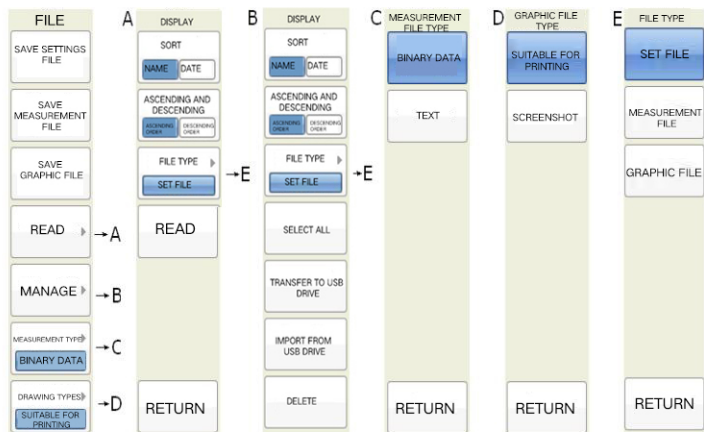
FILE TYPE	SUFFIX	FILE TYPE	SUFFIX
MEASUREMENT FILE - STANDING WAVE RATIO	.SWR	MEASUREMENT FILE - PHASE	.PHA
MEASUREMENT FILE - RETURN LOSS	.RTL	MEASUREMENT FILE - SMITH CHART	.SMI
MEASUREMENT FILE - CABLE LOSS	.CBL	SET FILE	.STP
MEASUREMENT FILE - FAULT LOCATION STANDING WAVE RATIO	.DVS	GRAPHIC FILE	.BMP
MEASUREMENT FILE - FAULT LOCATION RETURN LOSS	.DRL		

FILE NAME

The file name can only be a name composed of letters, numbers, and spaces. Enter the file name using the numeric keypad. The file name can be set to a maximum of 12 characters.

4.3 OVERALL STRUCTURE OF FILE MENU

PRESS DOWN **FILE** FUNCTION KEY ACTIVATES FILE MENU



4.4 FILE

KEY SEQUENCE:

FILE

Save settings file: Press this menu, the screen prompts for a file name, which can only be a name composed of letters, numbers, and spaces. Enter the file name using the numeric keypad, and end the input with the confirm key to save the file. If the input file name already exists, the system will prompt whether to overwrite the original file.

Save measurement file: Press this menu to save the measurement file. Save graphic file: Press this menu to save the graphic file in BMP format

Read: Press this menu to enter the "Read" menu.

Management: Press this menu to enter the "Management" menu.

Measurement Type: Press this menu to enter the "Measurement Type" menu.

Shape Type: Press this menu to enter the "Shape Type" menu.

4.5 READ MENU

KEY SEQUENCE: **FILE** > READ



Sorting: Select the file sorting display method, sorted by name or by storage date.

Ascending and Descending: The file sorting method is either ascending or descending. File type: Select display file type: Settings file, Measurement file, Graphics file.

The settings file contains settings and calibration data for the measurement mode, frequency, distance, cursor, and other parameters of the instrument.

The measurement file stores a set of measurement data.

Save the measurement screen as a graphic file for easy viewing and management

Reason.

Read: Read stored files. There are different treatments based on different file types.

Import the stored settings file,

Load the measurement file into memory to achieve comparative analysis of measurement curves and data computation.

Preview stored graphic files.

4.6 MANAGEMENT MENU

KEY SEQUENCE: **FILE** > **MANAGE**

The screenshot shows a vertical menu with the following options: DISPLAY, SORT (with sub-options NAME and DATE), ASCENDING AND DESCENDING (with sub-options ASCENDING ORDER and DESCENDING ORDER), FILE TYPE (with a right arrow and a SET FILE button), SELECT ALL, TRANSFER TO USB DRIVE, IMPORT FROM USB DRIVE, and DELETE.

Sorting: Refer to the section on reading menus.

Ascending and descending order: refer to the section on reading menus.

File type: Refer to the Reading Menu section.

Select All: Select all files for copying purposes. The selection and non selection of a single file can be achieved by pressing the confirm button.

Transfer to USB drive: Transfer the selected files to the root directory of the USB drive

Export to USB drive: Export the selected files to the root directory of the USB drive

Delete: Delete the selected file.

4.7 MEASUREMENT FILE TYPE MENU

KEY SEQUENCE: **FILE** > MEASUREMENT FILE TYPE



Binary data: Choose to save the measurement file in binary data format.

Text: Choose to save the measurement file in text format

Tip: Binary files are in BIN format, and text files are in TXT format, which can be opened with Excel or Notepad.

4.8 GRAPHIC FILE TYPE MENU

KEY SEQUENCE: **FILE** > GRAPHIC FILE TYPE



Suitable for printing: Set the saved image to a state suitable for printing. Automatically display the measurement background, display text, grid, channel measurement data traces, and storage lines in reverse color. Save ink and improve efficiency during graphic printing.

Screenshot: Capture and save the current interface as an image, without considering color reversal issues.

4.9 FILE TYPE

KEY SEQUENCE:

FILE > READ > **FILE TYPE**

FILE > COPY > **FILE TYPE**

FILE > DELETE > **FILE TYPE**



Settings file: The settings file includes settings for the measurement mode, frequency, distance, cursor, and calibration data of the instrument. In this way, the next time this measurement work status is used, only the configuration file needs to be retrieved, avoiding duplicate settings and calibration steps and improving work efficiency.

Measurement file: stores one measurement data.

Graphic file: Save the measurement screen as a graphic file for easy viewing and management.

5 SYSTEM OPERATION

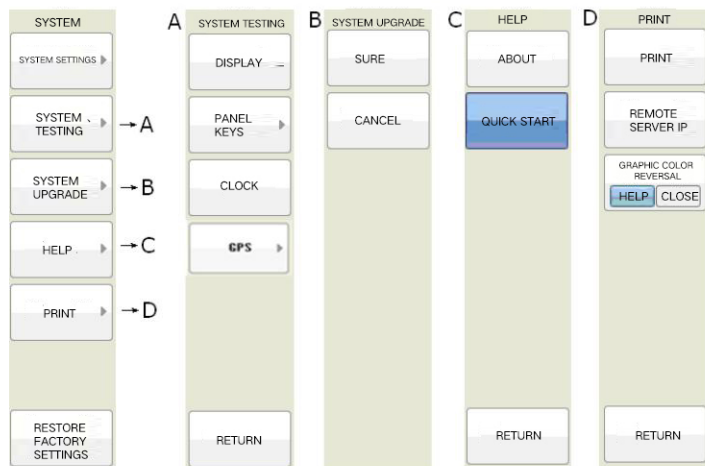
5.1 OVERVIEW

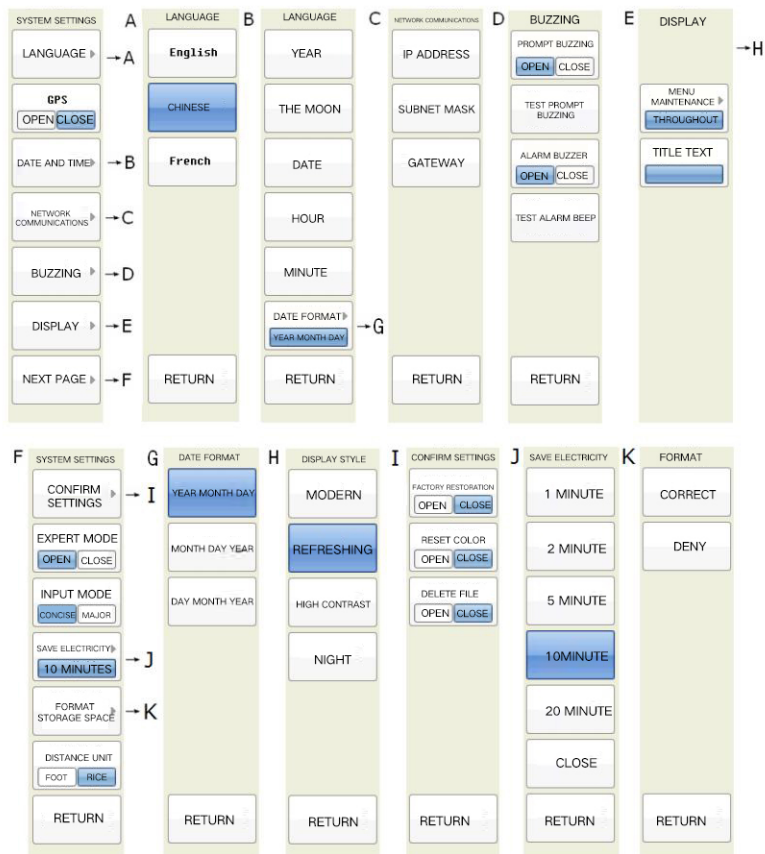
System operations include system configuration and service functions, such as setting instrument display language and clock, communication settings, system testing, system information, and system upgrades.

The system menu has six functional options: system settings, system testing, system upgrade, help, printing, and factory reset. Using the submenu buttons to select each function option will activate the next level submenu for parameter settings or function selection.

5.2 OVERALL STRUCTURE OF SYSTEM MENU

After pressing the main function key on the panel, the system menu is activated. The overall structure of the system menu is as follows:





5.3 SYSTEM MENU

KEY SEQUENCE: SYSTEM



System Settings: Press this menu to enter the next level "System Settings Menu". See 5.4.

System testing: Press this menu to enter the next level "System Testing" menu, see 5.6.

System Upgrade: Press this menu to enter the next level "System Upgrade Menu", see 5.7.

Help: Press this menu to enter the next level of "Help" menu, see 5.8.

Print: Press this menu to enter the next level of "Print" menu, see 5.9.

Factory reset: Press this menu to run the initialization program and restore the system to its factory settings.

5.4 SYSTEM SETTINGS MENU

KEY SEQUENCE: **SYSTEM** > SYSTEM SETTINGS



LANGUAGE SETTINGS: Press this menu to enter the language selection menu. Select the system language, which supports both English and Chinese.

GPS: Set whether the GPS function is enabled. After the GPS function is turned on, the status bar at the bottom of the screen displays location information. If the GPS module does not receive positioning information, three gray horizontal lines "----" will be displayed. Please ensure that the GPS antenna is connected and placed outdoors without any obstruction.

DATE AND TIME SETTINGS: Press this menu to enter the clock menu, set the year, month, day, hour, minute, and date display formats, and the time will be displayed in the status bar at the bottom of the screen. When you press the submenu corresponding to year, month, day, hour, or minute, use the scroll wheel or numeric keypad to enter the value, and press the **confirm** key to see the corresponding press change in the time display area. The real-time clock of the instrument will start running according to the adjusted value, and will not be affected even in the event of a power outage.

NETWORK COMMUNICATION SETTINGS: Press this menu to enter the network settings menu. Set the IP address, subnet mask, and gateway for network communication. Enter the address using the numeric and decimal keys, and press the **confirm** key to complete.

For example: pressing a button

1	9	2	.	1	6	8	.
0	.	2	2	confirm			

At this time, the IP address is **192.168.0.22**

BEEP SETTINGS: Press this menu to enter the Beep settings menu. Supports two types of buzzing: prompt buzzing and alarm buzzing. Reminder beep: After certain operations are completed (such as automatic adjustment of amplitude menu), the system will emit a brief beep to prompt the user. Users can turn on or off this feature as needed. Alarm beep: During qualified testing, if the test exceeds the limit, the system will emit an alarm beep prompt. This function can be turned on or off as needed.

5.4 SYSTEM SETTINGS MENU

KEY SEQUENCE: **SYSTEM** > SYSTEM SETTINGS



LANGUAGE SETTINGS: Press this menu to enter the language selection menu. Select the system language, which supports both English and Chinese.

GPS: Set whether the GPS function is enabled. After the GPS function is turned on, the status bar at the bottom of the screen displays location information. If the GPS module does not receive positioning information, three gray horizontal lines "----" will be displayed. Please ensure that the GPS antenna is connected and placed outdoors without any obstruction.

DATE AND TIME SETTINGS: Press this menu to enter the clock menu, set the year, month, day, hour, minute, and date display formats, and the time will be displayed in the status bar at the bottom of the screen. When you press the submenu corresponding to year, month, day, hour, or minute, use the scroll wheel or numeric keypad to enter the value, and press the **confirm** key to see the corresponding press change in the time display area. The real-time clock of the instrument will start running according to the adjusted value, and will not be affected even in the event of a power outage.

NETWORK COMMUNICATION SETTINGS: Press this menu to enter the network settings menu. Set the IP address, subnet mask, and gateway for network communication. Enter the address using the numeric and decimal keys, and press the **confirm** key to complete.

For example: pressing a button

1	9	2	.	1	6	8	.
0	.	2	2	confirm			

At this time, the IP address is **192.168.0.22**

BEEP SETTINGS: Press this menu to enter the Beep settings menu. Supports two types of buzzing: prompt buzzing and alarm buzzing. Reminder beep: After certain operations are completed (such as automatic adjustment of amplitude menu), the system will emit a brief beep to prompt the user. Users can turn on or off this feature as needed. Alarm beep: During qualified testing, if the test exceeds the limit, the system will emit an alarm beep prompt. This function can be turned on or off as needed.

Display settings: see 5.5 Display Settings menu for details.

Confirm settings: Some important irreversible operations require user confirmation to prevent accidental button presses. When the confirmation setting is enabled, selecting the corresponding function will pop up the next level "confirmation menu" for users to further confirm. Experienced users can also turn off the confirmation function to improve operation speed. Press this menu to enter the confirm settings menu. There are three confirmation settings, which are introduced as follows:

Factory reset: Does it require user confirmation when restoring factory settings. **Reset color:** Is user confirmation required when resetting the color. **Delete files:** Do users need to confirm when deleting files.

Expert mode: Provides convenience for professional testing, and can be turned off in some basic daily tests. When the expert mode is turned on, the instrument will activate some unique function menus. For example, in expert mode the display settings in the system settings will add three functional menus, namely: grid (on/off), scale text (on/off), and scanning line (on/off). These menus are intended for professionals to use in conjunction with the current testing situation for the purpose of facilitating testing.

Input mode: used to change the position of prompt information during input, providing users with both concise and professional modes. In concise mode, prompt information will appear in the upper left corner of the grid box; In professional mode, prompt information will appear in the form of an input box in the middle position of the grid box.

Power saving: Set the power saving mode with six options: 1 minute, 2 minutes, 5 minutes, 10 minutes, 20 minutes, and turn off. After selecting 'Off', the backlight of the screen will remain on. When selecting other options and the button free operation time exceeds the set time, the instrument will automatically dim the backlight brightness to achieve power saving.

Format storage space: The format storage space function formats the user's storage space. After formatting, all files stored by the user will be deleted.

5.5 DISPLAY SETTINGS MENU

KEY SEQUENCE: **SYSTEM** > SYSTEM SETTINGS > DISPLAY SETTINGS



MENU HOLD: Press this menu to set the menu hold type, which allows you to set the hold time of the menu on the screen. There are five options: 3 seconds, 5 seconds, 10 seconds, 30 seconds, and always. After selecting the 'always' state, the menu will remain displayed on the screen. When selecting other options, the menu will automatically hide after the button free operation time exceeds the set time to obtain a larger measurement display area.

TITLE TEXT: Press this menu to set the title text, enter the title name using the number keys, and only support spaces, numbers, and letters. Up to eight characters. Press the confirm button to complete. The title text is displayed in the title bar at the top of the screen.

5.6 SYSTEM TEST MENU

KEY SEQUENCE: **SYSTEM** > SYSTEM TESTING



Display screen: After selecting this option, the system will sequentially display the screen as all white, all black, all red, all green, and all blue, which can be used to detect whether there are any bad pixels on the display screen.

Panel button: Press this menu to enter the button testing screen, providing testing functions for all panel buttons and rotary wheels except for the power button. After pressing the panel button, the corresponding button icon animation prompt on the screen indicates that the test is successful, otherwise the button is faulty. Press the F7 key twice in a row to exit the test screen.

Clock: After selecting this option, the system automatically tests and adjusts the hardware clock of the instrument.

GPS: Press this menu to enter the button GPS test screen, which displays the GPS positioning status, number of satellites, latitude and longitude, altitude, etc

UTC time and other related information.

5.7 SYSTEM UPGRADE MENU

KEY SEQUENCE: **SYSTEM** > SYSTEM UPGRADE

Copy the upgrade folder to the root directory of the USB drive, and insert the USB drive into the USB port of the instrument. Press this menu to enter the system upgrade menu and select whether to upgrade. Press the 'OK' submenu to upgrade. Display the upgrade prompt message in the status bar at the bottom left of the screen. Do not plug or unplug the USB flash drive at this time and wait patiently until the prompt is complete. After the upgrade is completed, the instrument needs to be shut down and restarted.

When the software needs to be upgraded, you can request the latest program package from our company by email.

5.8 HELP MENU

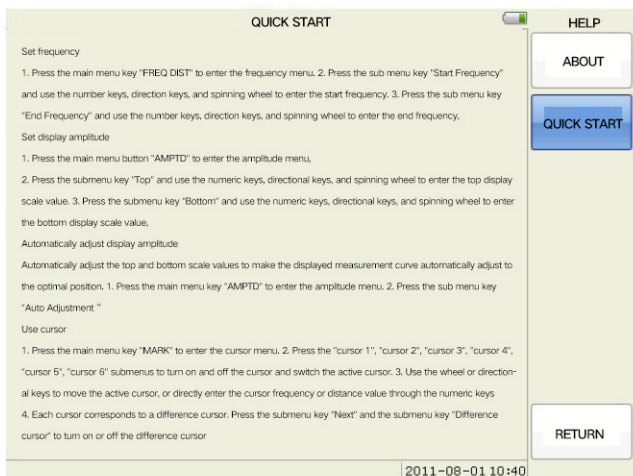
KEY SEQUENCE: **SYSTEM** > **HELP**

PRESS THE SUBMENU KEY **ABOUT** , THE SYSTEM INFORMATION DISPLAYED ON THE INSTRUMENT

INCLUDES VERSION INFORMATION, SERIAL NUMBER, FREQUENCY RANGE, BATTERY CAPACITY, SYSTEM TEMPERATURE, STORAGE DETAILS, ETC.



Pressing the submenu key for **Quick Start** will display the Quick Start manual. Describe the basic operational steps related to measurement.



5.9 PRINT MENU

KEY SEQUENCE: **SYSTEM** > **PRINT**



START PRINTING: Press this menu, and the instrument will print the content displayed on the current screen. Before starting printing, please ensure that the instrument is connected to the local area network and there is a remote printing server within the network.

REMOTE SERVER IP: Press this menu to set the IP address of the server that performs printing operations. After successful setting, press start printing, and the instrument will automatically connect to the corresponding server to perform the relevant printing operations.

SHAPE COLOR REVERSAL: Set the shape color reversal on or off. It is possible to display the measurement background, display text, grid, channel measurement data trace, and storage line colors in reverse. Save ink and improve efficiency during graphic printing.

6 SITE WORKBENCH MANAGEMENT SOFTWARE

6.1 OVERVIEW

Site Workbench management software is a management software compatible with Microsoft Windows 2000, Windows XP, Win7 and other operating systems. Data transmission, analysis, report generation, editing and saving, marker point editing, and qualification line editing can be performed in PC software.

This chapter provides a brief introduction to a software tool for analyzing data from a standing wave ratio testing instrument for antenna feeders. For detailed information, please refer to the Site Workbench management software operation manual.

6.2 FUNCTIONAL OVERVIEW

➤ DISPLAY ANALYSIS CURVE DATA

The management software can read the measurement files saved by the instrument to the PC, display the measurement curves, and analyze the measurement data in the management software. The main functions include: changing the display scale of curves, editing marker points, and editing and displaying qualified lines.

➤ CONTEXT MENU

The context menu can be opened by right clicking the mouse in the image display editing window. The context menu function mainly includes some commonly used functions, mainly for editing and analyzing the current window image.

➤ MATERIAL EDITOR FUNCTION

Provides commonly used editors such as cable editor and signal standard editor. You can upload and download relevant data.

➤ REMOTE CONTROL SOFTWARE

Under normal connection between the upper computer management software and the device, the instrument can be controlled through relevant commands to achieve the same functions as the instrument panel operation, achieving the purpose of remote control.

➤ OVERLAY COMPARISON CURVE

The curve overlay function allows for comparing multiple curves.

6.3 INSTALL SOFTWARE

Run the installation package on the PC and follow the prompts to complete the software installation.

6.4 CONNECTING INSTRUMENTS

Connect the instrument to the computer network through the network port; Open the instrument and set a valid IP address; Run the Site Workbench management software and enter the IP address of the connected device; Press the Connect menu and select the Connect to Specify IP Address option. This establishes communication with the instrument.

7 TECHNICAL INDEX

7.1 ANTENNA FEEDER STANDING WAVE RATIO TESTER SECTION

FREQUENCY	
FREQUENCY RANGE	2MHz~6100MHz
FREQUENCY STABILITY	$\pm 2\text{ppm}$ ($0\sim 50^{\circ}\text{C}$)
FREQUENCY ACCURACY	$\pm 5\text{ppm}$ ($25\pm 5^{\circ}\text{C}$)
FREQUENCY RESOLUTION	1kHz (2MHz~4.4GHz) 2kHz (4.4GHz~6.1GHz)
LEVEL	
OUTPUT LEVEL RANGE	$\geq 0\text{dBm}$ (2MHz~4.4GHz) $\geq -5\text{dBm}$ (4.4GHz~6.1GHz)
SYSTEM	
SCAN POINTS	130, 259, 517, 1033, 2065
MEASUREMENT SPEED	1mS/DROP (RETURN LOSS) 1.25mS/DROP (FAULT LOCATION)
INTERFERENCE SUPPRESSION	FREQUENCY 13dBm ($\text{BIAS} \pm 10\text{kHz}$ WITHIN) CHANNEL 20dBm ($\text{BIAS} > 1\text{MHz}$)
PORT CHARACTERISTICS	RETURN LOSS $\leq -10\text{dB}$
DIRECTIVITY	$\leq -42\text{dB}$ (AFTER STANDARD CALIBRATION) $\leq -38\text{dB}$ (AFTER FULL CALIBRATION)
DAMAGE LEVEL	+25dBm (RF SIGNAL) $\pm 50\text{V}$ (DC VOLTAGE)
RETURN LOSS	MEASURING RANGE: 0dB~60dB RESOLUTION: 0.01dB

STANDING-WAVE RATIO	measuring range: 1~65 resolution: 0.0001
CABLE LOSS	Measurement range: 0dB~30dB resolution: 0.01dB
FAULT LOCATION	Measurement range of return loss: 0dB~60dB Measurement range of standing wave ratio 1~65 Distance measurement range $(\text{points} - 1) / (\text{span} * 2) * V_f$ (Speed factor of cable) * C (speed of light) range resolution: Distance measurement range / (points - 1)
PHASE	Measurement range: $-180^{\circ} \sim +180^{\circ}$ resolution: 0.01°
SMITH CHART	resolution: 0.01
INPUT/OUTPUT PORTS	
RF INPUT PORT	50 Ω N NEGATIVE TYPE
RF OUTPUT PORT	50 Ω N NEGATIVE TYPE
Mini USB PORT	USB2.0 4pin
USB PORT	USB1.1 4pin
LAN PORT	10/100M RJ45
POWER SUPPLY AND DISPLAY	
AC-DC THE POWER ADAPTER	INPUT 100-240VAC, 50-60Hz OUTPUT 19VDC/3.42A
LITHIUM BATTERY	11.1V/5.2Ah
CHARGING TIME	< 5 HOUR
CONTINUOUS WORKING HOURS	> 4.5 HOUR, TYPICAL VALUES >6 HOUR
LIQUID CRYSTAL	6.5" TFT LCD, 640*480
SUPPORTING LANGUAGES	CHINESE, ENGLISH

ESD	
PORT ELECTROSTATIC IMMUNITY	$\geq 8KV$ (CONTACT DISCHARGE) $15KV$ (AIR DISCHARGE)
OTHER	
HUMIDITY	$40^{\circ}C \Rightarrow 95\%$
OPERATION TEMPERATURE	$-10^{\circ}C \sim 55^{\circ}C$
STORAGE TEMPERATURE	$-40^{\circ}C \sim 80^{\circ}C$
WEIGHT	$< 2.2kg$
VOLUME (LENGTH X WIDTH X HEIGHT)	$260 \times 196 \times 77mm$

7.2 DIRECTIONAL POWER METER

SPECIFICATION	
FREQUENCY RANGE	300MHz~4GHz
POWER RANGE	0.15W~150W Average power 4.0W~400W peak power
INPUT IMPEDANCE	50 Ω (nominal)
INSERTION LOSS	300MHz~1GHz maximum 0.05dB 1GHz~4GHz maximum 0.1dB
INSERT STANDING WAVE RATIO	300MHz~2.5GHz maximum 1.05 2.5GHz~4GHz maximum 1.10
DIRECTIVITY	300MHz~3GHz 30dB 3GHz~4GHz 28dB
AVERAGE POWER	
POWER MEASUREMENT RANGE	0.15W~150W
PEAK-TO-AVERAGE POWER RATIO	maximum 12dB
MEASUREMENT UNCERTAINTY	$\pm 4\% \pm 0.05W (+15 \sim +35^{\circ} C)$ $\pm 7\% \pm 0.05W (-10 \sim +50^{\circ} C)$
BURST POWER	
POWER MEASUREMENT RANGE	average 2W~150W
PULSE WIDTH	1 μ s~50ms
DUTY CYCLE	0.001~1
MEASUREMENT ACCURACY	$\pm (6\% + 0.05/D W)$ exceed $35^{\circ} C$ Or lower than $15^{\circ} C \Rightarrow$ Further increase 3%

PEAK POWER	
MEASURING RANGE	4W~400W
MEASUREMENT UNCERTAINTY	pulse width $>200 \mu\text{s} \Rightarrow \pm 7\% \pm 0.2\text{W}$; $1\mu\text{s} < \text{pulse width} < 200\mu\text{s} \Rightarrow$ $\pm 10\% \pm 0.4\text{W}$; <pulse <math="" width="">< 1 \mu\text{s} \Rightarrow \pm 15\% \pm 0.4\text{W}; <pulse <math="" width="">< 0.5 \mu\text{s} \Rightarrow \pm 20\% \pm 0.4\text{W}; exceed $+35^{\circ}\text{C}$ Or lower than $+15^{\circ}\text{C} \Rightarrow$ increase 3%; Duty cycle (D) < 0.1 exceed 0.1W cycle $> 0.1\text{s}$ exceed $(1.5\% + 0.15\text{W})$</pulse></pulse>
REFLECTION POWER MEASUREMENT CHARACTERISTICS	
MEASURING RANGE	0.0 ~ 23dB (Return Loss) 1.15 ~ 99.99 (standing-wave ratio) 0.07 ~ 1.0 (reflection coefficient)
ENVIRONMENTAL ADAPTABILITY	
OPERATION TEMPERATURE	-10 ~ +50 °C
STORAGE TEMPERATURE	-40 ~ +70 °C
HUMIDITY	Maximum 95%
ALTITUDE	Can run above 4600 meters
SIZE	112mm (D) × 96mm (W) × 32mm (H)
WEIGHT	≤ 0.6kg

7.3 TERMINAL POWER METER

SPECIFICATION	
FREQUENCY RANGE:	50MHz~4GHz (Visual power sensor options)
WIDE DYNAMIC RANGE:	55 dynamic range , -35~+20dBm
STANDING WAVE RATIO:	1.1:1
DISPLAY RESOLUTION:	1dB, 0.1dB, 0.01dB, 0.001dB
SIZE:	124*44*24 (Does not include a 1.8-meter USB cable)
WEIGHT:	250g
ELECTRICAL PERFORMANCE INDEX	
DYNAMIC RANGE:	-35dB~+20dB
POWER MEASUREMENT UNCERTAINTY:	Typical values: ± 0.2 dB maximum: ± 0.4 dB
MEASUREMENT RESOLUTION:	Typical values:0.01dB
MEASUREMENT SPEED:	Typical values:100 mSec