Operation Manual

DS2400T DVB-T2 Signal Analysis Meter

Ver：1.10

Deviser Part No.: 2400T2-DL

Printed in CHINA. Dec. 2012.

Warranty

The instrument is warranted for 12 months under normal operating conditions (except batteries and LCD). Users should read manual carefully before first use and operate correctly according to the manual.

Deviser shall have no responsibility for any defect or damage caused by improper use and maintenance or for any product which has been repaired or altered by any one others not DEVISER or our authorized service center.

When the meter need to be repaired or calibrated, Please contact Deviser or our local distributors in your territory.

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1. General Introduction

DS2400T is an ideal meter for DVB-T/T2 and DVB-C signals testing, which is a new model with color screen and high performance. It demodulates and accurately measure the COFDM signals carried through the terrestrial TV system. Also it supports main function of CATV system measurement, including digital TV and analog TV. This model can measure and display most indexes of Digital TV (Channel Power, MER, BER, Constellation Diagram); Analog TV(Single-frequency Level, Carrier Level of Full Channels Spectrum, HUM). Also DS2400T can measure Frequency Spectrum Scanning, Trunk Voltage and Battery Voltage.

DS2400T has RS-232 port for communicating with PC software – TOOLBOX which can manage and analyze the testing result file.

Configuration:

DS2400T	**Standard**	**DVB-T**
	Option	**DVB-C**
		DVB-T2

Features:

* QAM and QPSK Test
* Level Test
* Constellation Diagram
* Channel Scanning
* Spectrum Scanning
* Tilt Test
* Limit Test
* HUM
* Voltage Measurement
* Multiple User Channel Plan Setup
* File Management
* Multi languages support
* BER Statistics (Optional)

Basic Functions Overview

1.1 Channel Measurement

DS2400T supports accurate signal level test in analogue TV, DVB-T/T2 signals and single frequency modes.

For Analogue channels, you can get video level, audio level and △V/A etc.

For DVB-T channels, DS2400T supports modulation modes of QAM and QPSK. Here, you can get Channel Power, MER and BER and Constellation Diagram.

NOTE: For DVB-T channels, MER and BER test is only in QPSK and QAM (16/64QAM) Modulation Mode.

1.2 Constellation Diagram

For DVB-T channels, Constellation diagram function supports modulation modes of 16QAM, 64QAM and QPSK. Here, you can get Channel Power, MER, CBER, VBER, CARRIER and Constellation diagram.

1.3 Tilt/Level List

Tilt/Level list test is the effective solution to check the flatness and amplitude, and DS2400T support 12

channels tilt max.

1.4 Hum Measurement

HUM is also named as power supply hum modulation distortion, which comes from the low-frequency interference of power supply.

1.5 Channel Scanning

DS2400T supports video and audio level display of all channels, which could up to 160 channels most. Also 5 steps zoom in/out and marker function make your observation easier.

1.6 Spectrum Scanning

DS2400T has spectrum function which provides several spans, and two sample modes (AVG and PEAK).In order to detect and know the interference, it has peak-hold function which shows the difference between peak spectrum and current spectrum by marker and double-marker function.

1.7 Limit Measurement

DS2400T can fast check the cable system by the limit test function. Each enabled channel will be tested according to the limits setup by user, and after the

testing, pass/fail indicator can be viewed.

1.8 Voltage Measurement

DS2400T can measure battery voltage, trunk voltage and identify AC or DC automatically of the cable system.

1.9 Multiple User Channel

DS2400T can create five user channel plans max, which contains digital channels or analog channels or mixed channels. Also they can be switched easily. So it is very suitable for multi-network maintenance.

1.10 File Management

DS2400T can store the results of channel level test, constellation test, tilt test, channel scanning, spectrum scanning and HUM test for analogue TV channel. User can manage and analyze these files via meter or PC.

1.11 Intelligent Power Management

DS2400T with full charged is able to work over 5 hours. The power supply monitoring system will monitor the status of power and ensure the instrument in power saving mode.

NOTE: Charge the battery before first use. Refer to 5.2

DVB-C Optional Functions Overview

Note: The DVB-C option includes DVB-C signal test and BER Statistics functions. These two functions will not be installed on DS2400T as default. In order to use them, you have to contact DEVISER to order DVB-C option.

1.12 DVB-C Channel Measurement

DS2400T supports accurate signal level test in DVB-C signals mode.

For DVB-C channels, DS2400T supports modulation mode of QAM. Here, you can get Channel Power, MER and BER and Constellation Diagram.

NOTE: For DVB-C channels, MER and BER test is only in QAM (16/32/64/128/256QAM) Modulation Mode.

1.13 BER Statistics

For DVB-C channels, you can get MER, BER, ES, SES, COR, UNCOR and etc…

DVB-T2 Optional Functions Overview

Note: The DVB-T2 option includes DVB-T2 signal test function. This function will not be installed on DS2400T as default. In order to use that, you have to contact DEVISER to order DVB-T2 option.

1.14 DVB-T2 Channel Measurement

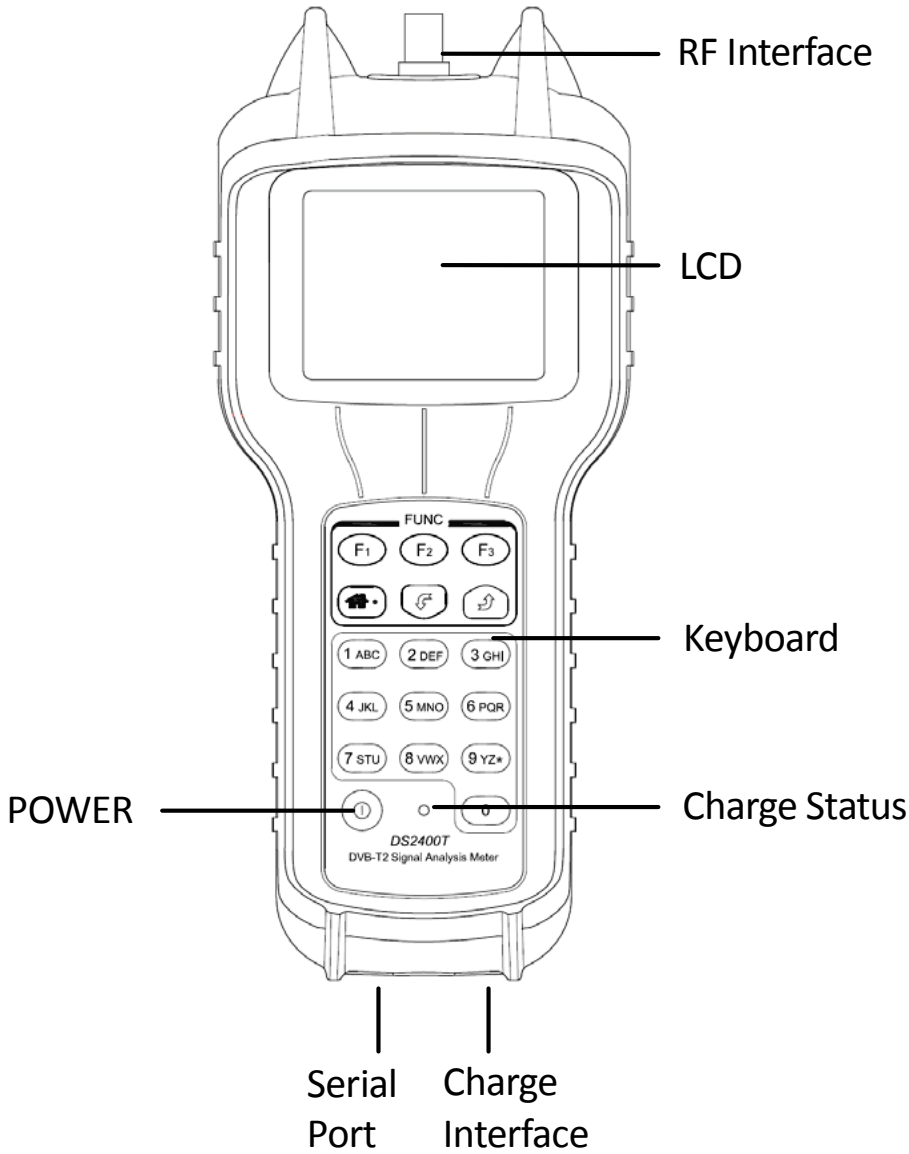
DS2400T supports accurate signal level test in DVB-T2 signals mode.

For DVB-T2 channels, DS2400T supports modulation mode of QAM. Here, you can get Channel Power, MER and BER and Constellation Diagram.

2. Introduction

2.1 Appearance

Get acquainted with the appearance before use：



2.2 Keypad

2.2.1 Soft Keys

There are three soft keys (F1, F2 and F3) located under the screen. They are used to access the functions represented by the icons displayed on the bottom of screen.

2.2.2 Shortcut Keys

There are three keys below the three soft keys including  .

Press  key can directly back to menu screen.

 and  key is used as different functions in different screen.

2.2.3 Character/Digit Input

<u>Entering Numeric Values:</u>

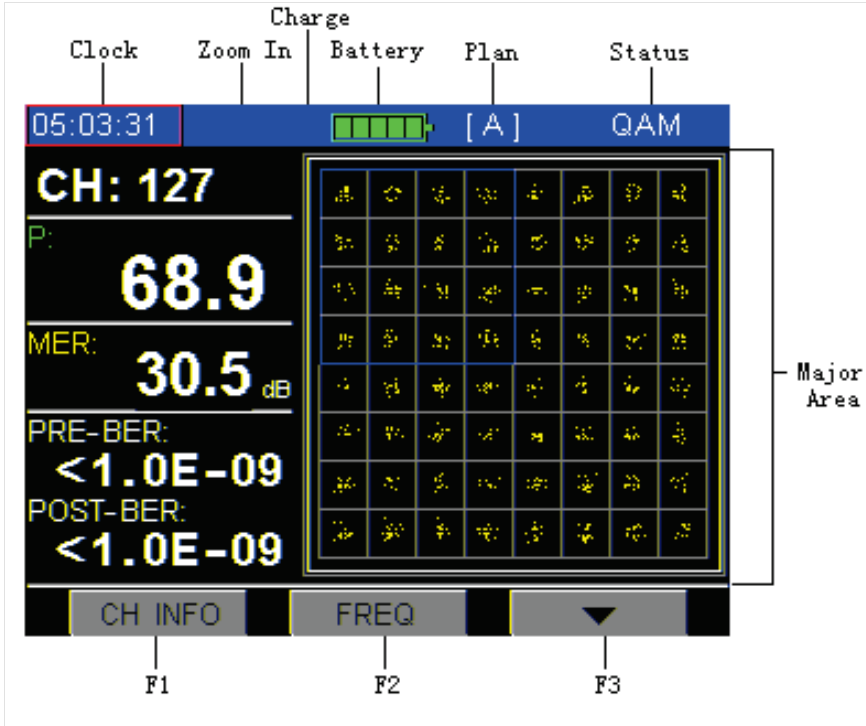
Within several displays, you must enter numeric values. Here, press the number buttons to enter the desired value directly. Then press ENTER (F1) key to enter the value into the DS2400T.

Entering Alphanumeric Characters:

Similarly, you must enter alphanumeric data on several screens, such as file names, Channel labels and the password of DVB-C option. As before, you press the buttons to enter the desired value directly. When you press a button, the first entry is the number associated with the button, after which you press the same button repeatedly to scroll through the letters associated with the button. To enter a second letter or number using a different button, you can go directly to the second button for entry. If you want to enter a second letter or number using the same button as the preceding character, you must press the  key to shift the DS2400T control to a new number or letter.

NOTE: If you make an error when entering a number or a name, you can press BACK (F2) key to go back and then re-enter it. Press ESC (F3) key to escape from the operation.

2.3 Display Description



3. Using the Instrument

3.1 Function Menu Display

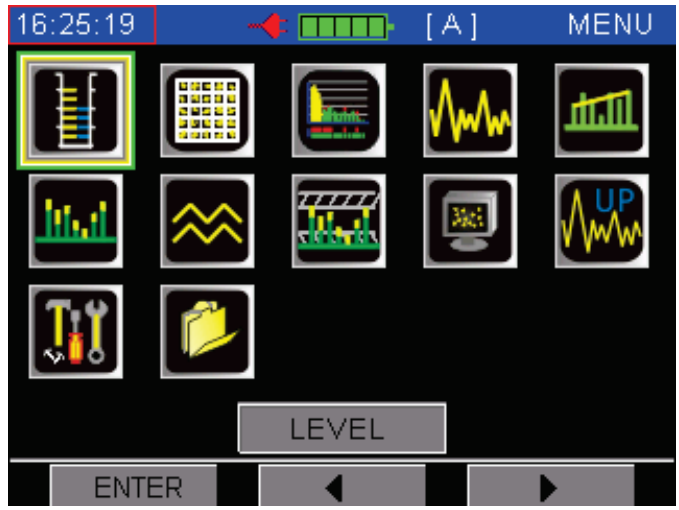


Figure3-1-1

The Figure 3-1-1 Display the Main Menu which include all of the function icons.

Soft Keys:

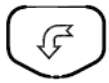
ENTER: Enter the selected shortcut interface.

◄: Switch the selected shortcut on the left direction circularly.

►: Switch the selected shortcut on the right direction circularly.

Function keys:

 : Switch the selected shortcut on the up direction circularly.

 : Switch the selected shortcut on the down direction circularly.

The selected shortcut will displays in highlight.

3.2 Learn User Channel Plan

In order to enhance your work efficiency, please create user channel plan before measurement. DS2400T will choose all effective channels in the cable system automatically and save in this channel plan.

The User Channel Plan includes three elements as follows:

* Channel number

* Channel format (TV, DIGI)

* Carriers frequency (video and audio)

The following is the step of setup user channel plan.

1. Connect the instrument with the cable system or signal receiving antenna.

2. Press  return to main menu, and select the Setup shortcut like Figure3-2-1, then press  into Setup Menu.

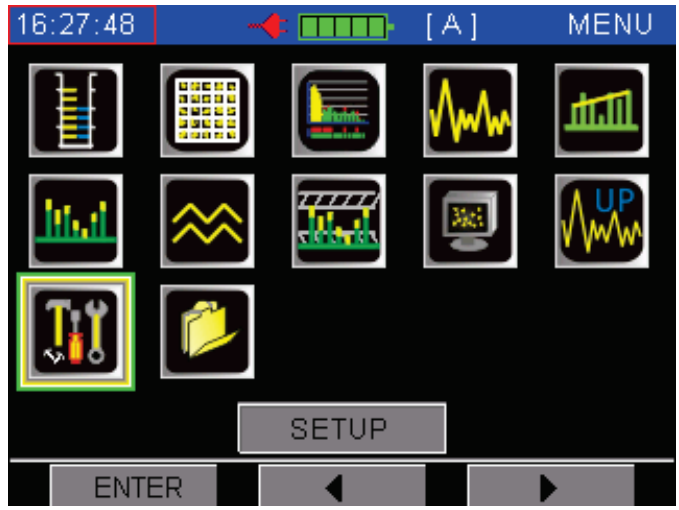


Figure3-2-1

Then press the F2 or F3 select the CHANNEL PLAN item, as Figure3-2-2.

Figure3-2-2

Now press F1 into Figure3-2-3 CHANNEL PLAN, then press F1 select the user channel plan.

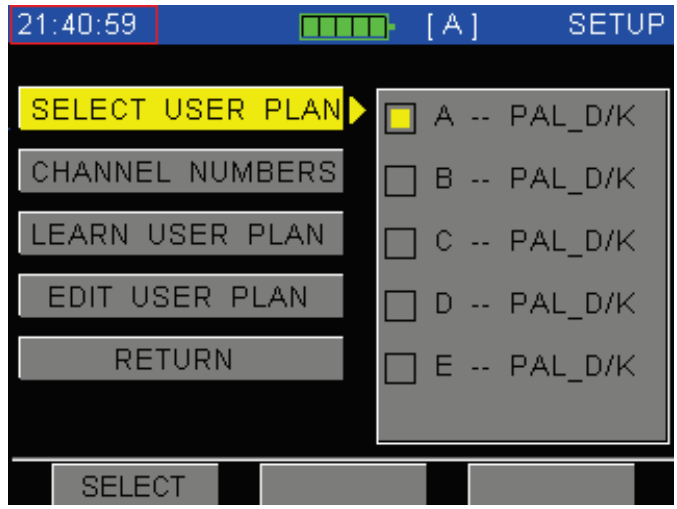


Figure3-2-3

3. Press  or  to select the LEARN CHANNEL PLAN item, and press  , the LEARN CHANNEL PLAN function displays as Figure 3-2-4.

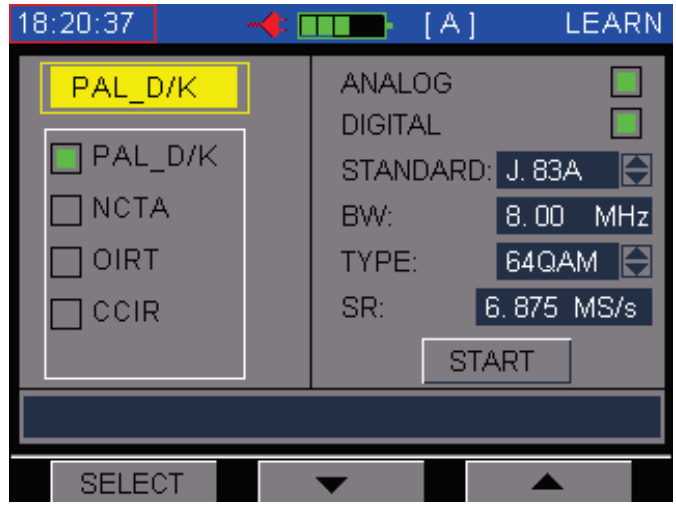


Figure3-2-4

Press  to select one channel type.

3. Press F2 or F3 into Parameter setting, you can define the channel plan as Analogue channel plan, digital channel plan or analog/digital mixed channel plan. Also you can edit “Bandwidth, Modulation type, Symbol Rate” in digital channel plan. When your setup is completed, please press F2 or F3 to START, then press F1 to creat your user channel plan. For a while, new user plan will be saved automatically.

NOTE: The analog channels with level higher than 45dBμV and digital channel with power level higher than 32dBμV will be enabled in standard channel plan. Only the enabled channels will be displayed in each measurement interface. After setup your user channel plan, you can also enable or disable channels.

When the learning the channel plan, please keep the power on and don’t interrupt the process, otherwise it will create a wrong channel plan.

3.3 Level Measurement

Press (home) return to main menu, press the F2 or F3 to select the LEVEL shortcut as Figure3-3-1. Then press F1.

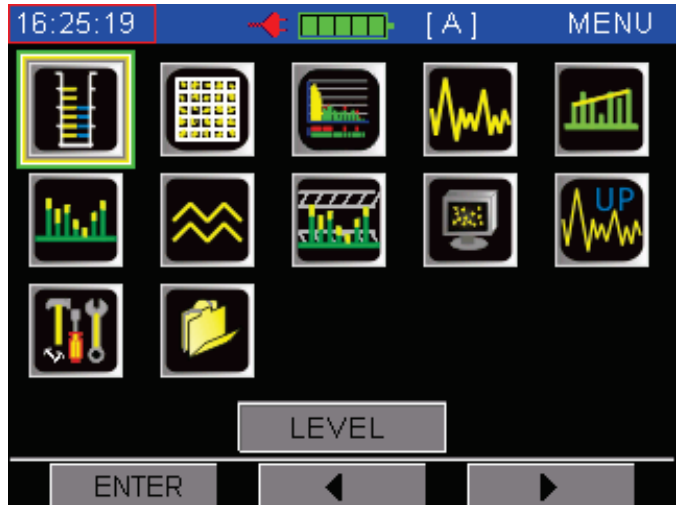


Figure3-3-1

If there is no valid channel to test, the screen will display as figure 3-3-2. Now, if you want to do any test in this function, you have to create a valid channel with press F1.

Figure3-3-2

The channel list will display as figure 3-3-3. Press F2 or F3 to select the channel, and here, Press or will page up or page down the channel list. Then press F1 into channel information as figure 3-3-4.

Figure 3-3-3

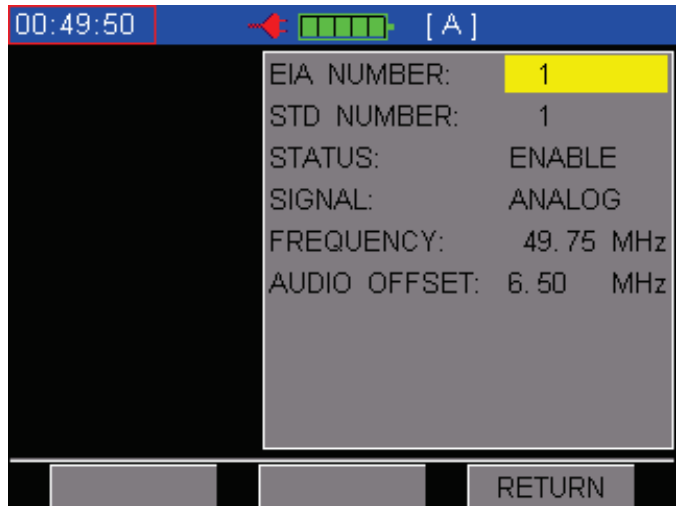


Figure 3-3-4

Press F2 or F3 to select the channel parameters, if the selected parameter could be changed, press F1 to change. As the figure 3-3-4, ensuring the STATUS is enable, the channel will be enabled.

3.3.1 Analogue channel measurement

If the current channel is a valid analogue channel, The Level function will display as Figure3-3-5, three test results are displayed in the screen, include Video, audio and V/A.

 : Video Level

 : Audio Level

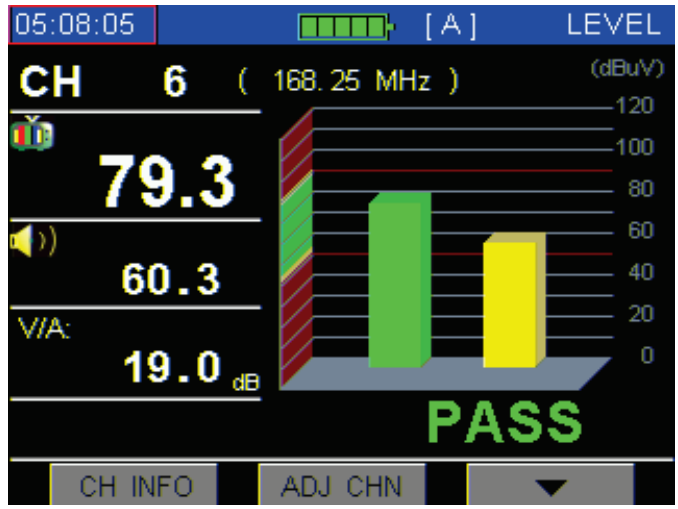


Figure3-3-5

CH INFO (F1): Press this button will display the channel information of this analogue channel as figure 3-3-6. The channel parameters also can be modified in this screen.

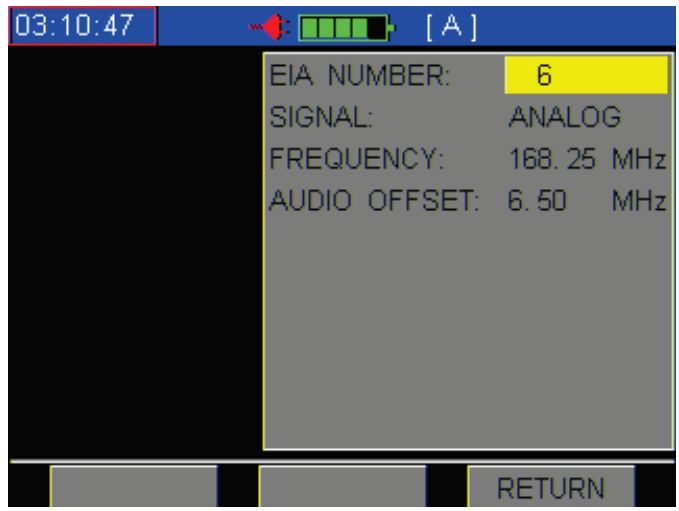


Figure 3-3-6

ONE CHN/ADJ CHN (F2): The user can switch display mode between ***One Channel*** and ***ADJ Channel***.

One Channel Mode: The histogram shows the video and audio of current channel only, as figure 3-3-5

ADJ Channel Mode: The histogram shows the video and audio of current channel, and also show the level of two adjacent channels with gray color, if the adjacent channels are valid. Refer to figure 3-3-7.

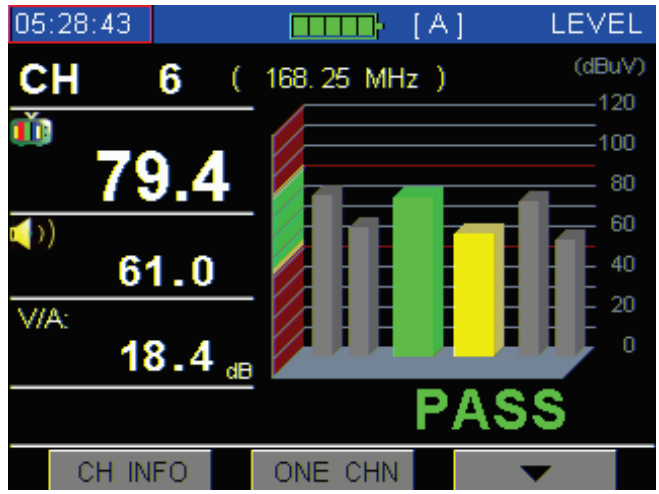


Figure 3-3-7

and is used for switch channels circularly. If the next channel is digital channel, the screen will be changed. (Refer to *chapter 3.3.2.*)

(F3): Press this button to next page as figure 3-3-8, the user can press this button again to return.

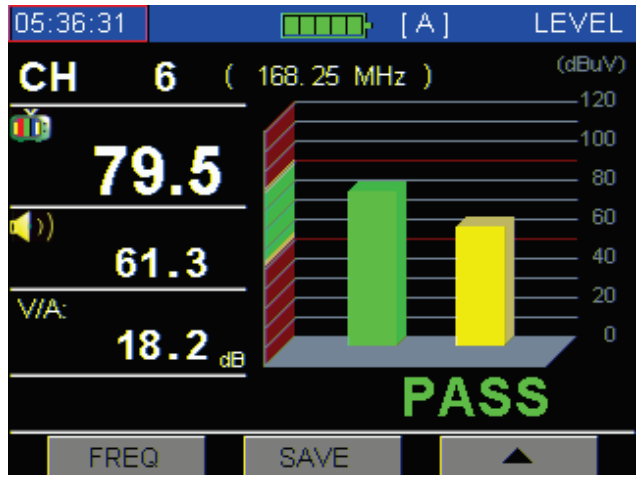


Figure 3-3-8

FREQ(F1 **)**: Press this button to show single frequency measurement interface as figure 3-3-9, the user can modify the frequency, press this button again to return. and is used for switch frequency circularly.

SAVE(F2 **)**: Press this button to save the result of level test.

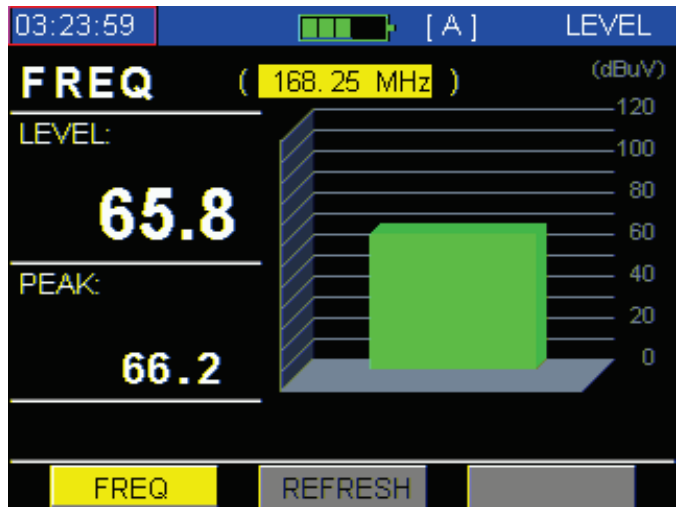


Figure 3-3-9

REFRESH(F2 **):** Press this button can test again.

3.3.2 Digital channel measurement

DS2400T is able to measure POWER, MER and BER. As figure 3-3-10.

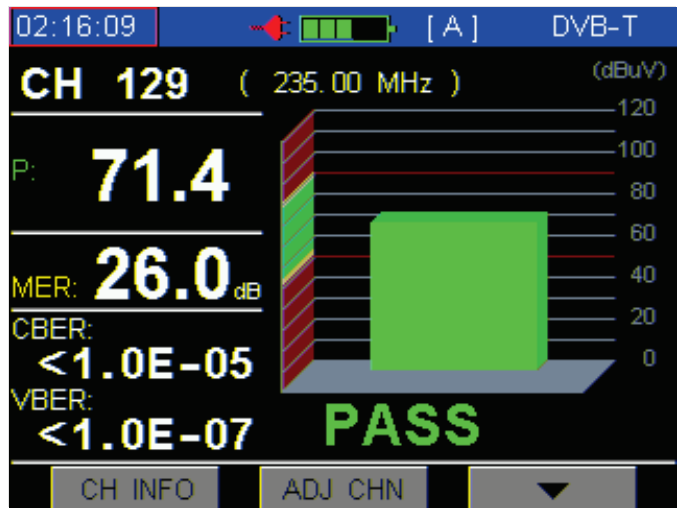


Figure3-3-10

CH INFO (F1): Press this button will display the channel information of the current channel, as figure 3-3-11. The channel parameters also can be modified in this screen.

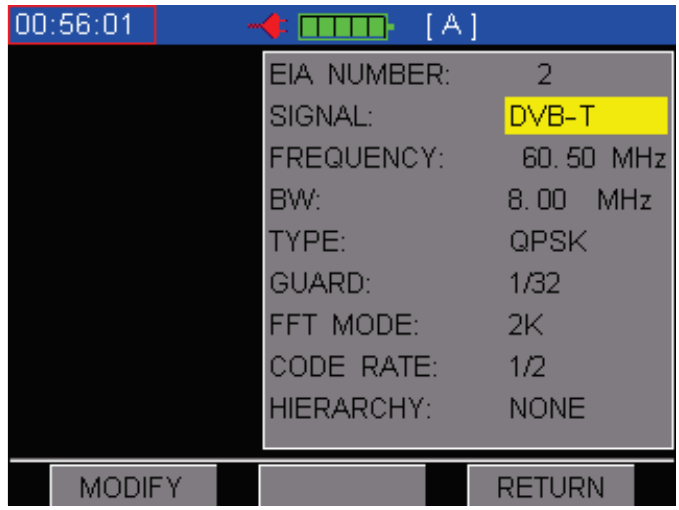


Figure 3-3-11

ONE CHN/ADJ CHN (F2): The user can switch display mode between ***One channel*** and ***ADJ channel***.

One channel mode: The histogram shows the Power of current channel only.

ADJ channel mode: The histogram shows the Power of current channel, and also show the Power of two adjacent channels with gray color, if the adjacent channels are valid. Refer to figure 3-3-12.

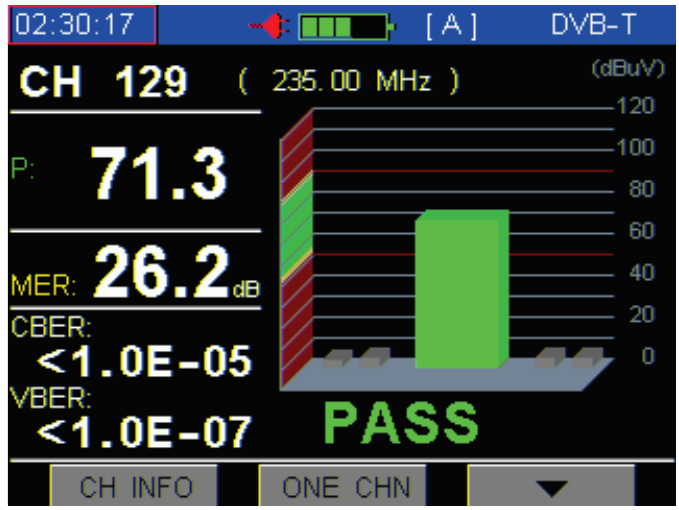


Figure 3-3-12

(F3): Press this button to next page as figure 3-3-13, the user can press this button again to return.

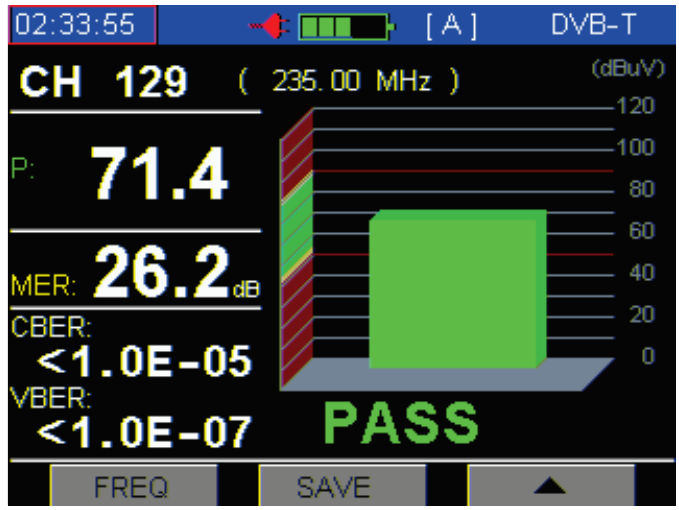


Figure 3-3-13

and are used for switching channels circularly. If the next channel is analogue channel, the screen will be displayed as figure 3-3-5, and if the next channel is digital channel, the screen will be display as figure 3-3-10.

FREQ(F1): Press this button into frequency measurement interface as figure 3-3-14, In this mode, the user can easily modify the central frequency, but the other parameters of digital channel will be the same as channel mode, press this button again to return.

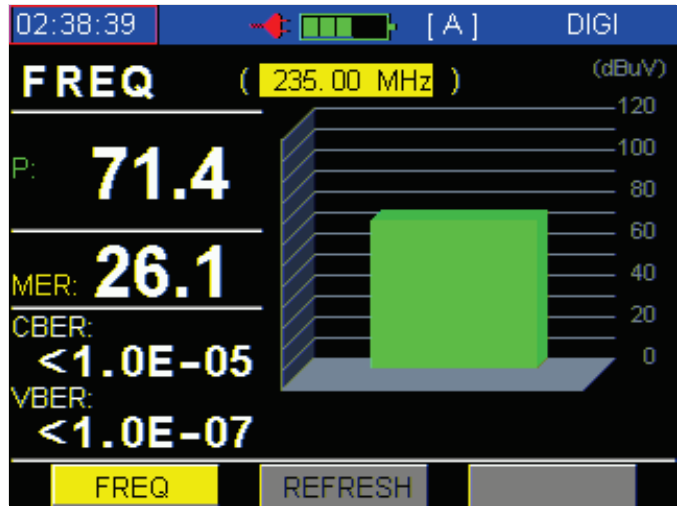


Figure 3-3-14

SAVE(F2): Press this button to save the result of level test.

REFRESH(F2): Press this button can test again.

3.3.3 Limit Display

A **PASS** or **FAIL** in big font is displayed in the screen to indicate the quality of current channel as the figure 3-3-5 and figure 3-3-10, the limit value to judge the quality of channel can be showed in the measurement setup menu, and also can be modified.

And also it can disable the judge of channel quality of in the measurement setup menu.

3.4 Constellation Diagram

Press  to return to main menu interface, and press F2 or F3 choose **CONSTEL** icon, and then press F1 to enter constellation measurement.

DS2400T constellation diagram function supports modes of QAM and QPSK. Here, you can get channel POWER, MER, BER (CBER and VBER) and constellation diagram, Constellation diagram shows as figure 3-4-1.

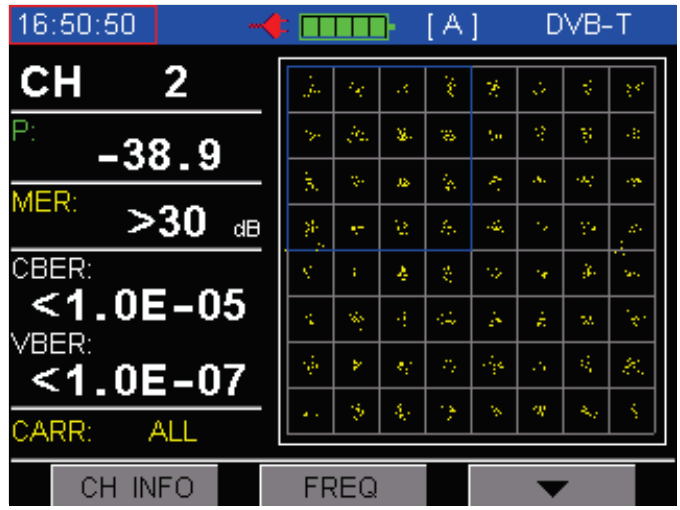


Figure 3-4-1

Soft Keys Operation:

CH INFO (F1): Press this button to display the current channel information as figure 3-4-2,and user can modify all of the parameters in this menu.

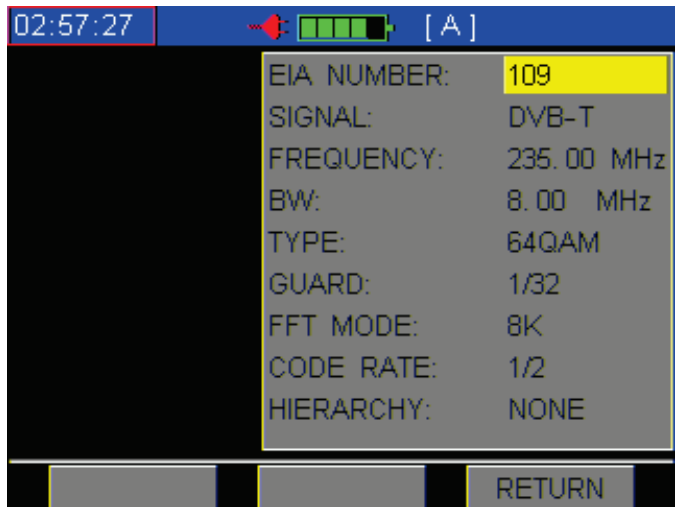


Figure 3-4-2

FREQ (F2): Press this button to display the current frequency POWER, MER, BER (CBER and VBER) and constellation diagram as figure 3-4-3, press this button again to return.

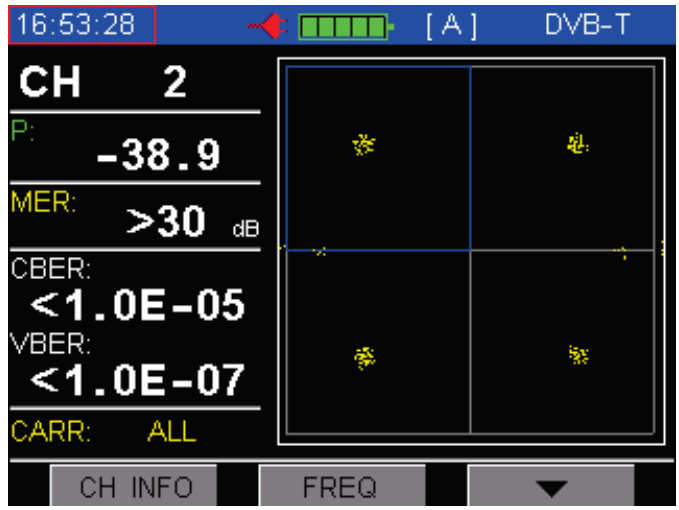


Figure 3-4-3

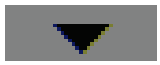
 **(F3):**Press this button to next page as figure 3-4-4,

Figure 3-4-4

CARRIER(F2): Press this button, user can modify the carrier number by keyboard as figure 3-4-5.

Note: Here, the MER just measure one carrier which you modified by the keyboard.

Or it is the average MER for all carriers when the "CARR" display "ALL" as figure 3-4-4.

Press this button again to return to figure 3-4-4.

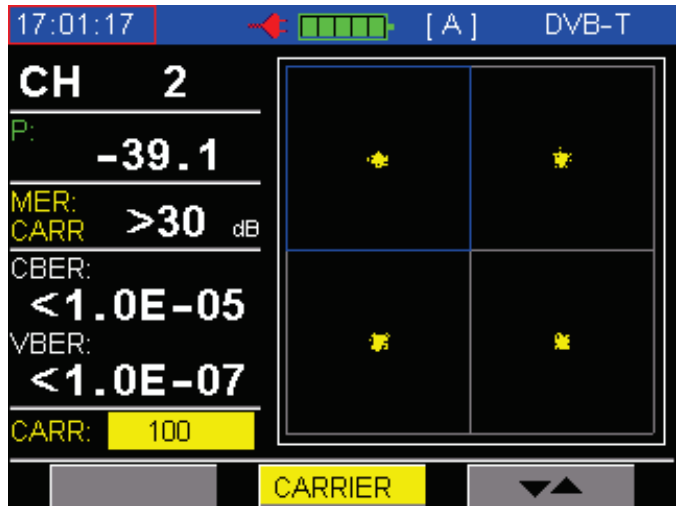


Figure 3-4-5

(F3): Press this button to next page as figure 3-4-6.

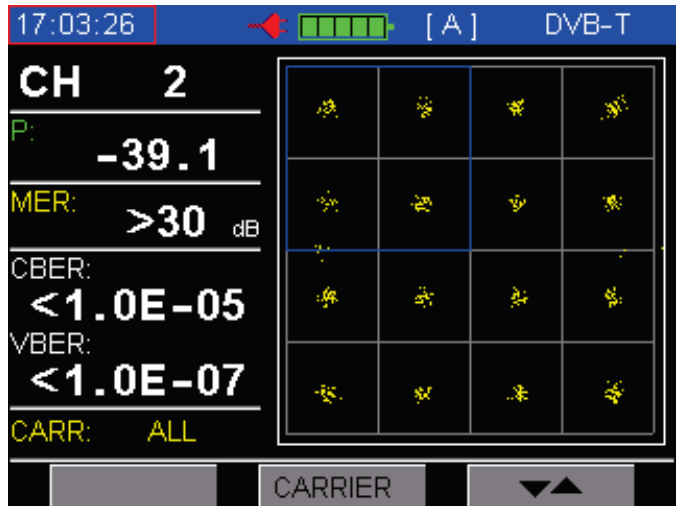


Figure 3-4-6

QUADRANT (F1): Press this button, switch the select quadrant on clockwise direction.

ZOOM IN/ZOOM OUT (F2): Press this button and switch the status of constellation diagram between zoom in and normal mode. Press zoom in key again, the selected quadrant will be zoom in, and the zoom in flag will be displayed on the top of the screen as figure 3-4-7.

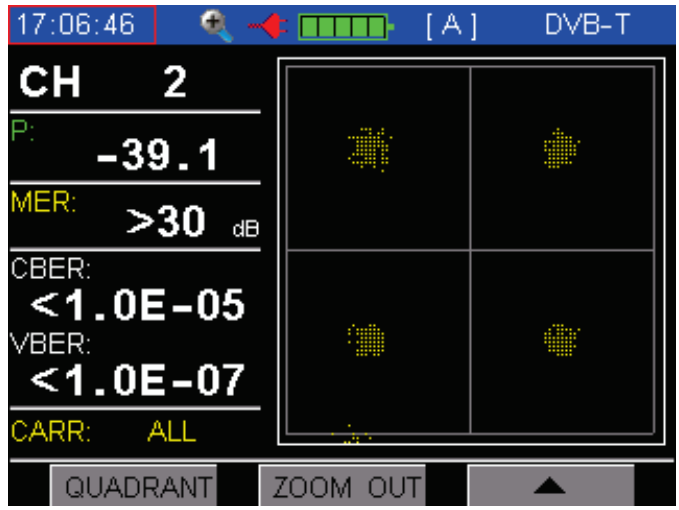


Figure3-4-7

and are used for switching digital channels circularly.

Note: This function only supports digital channels, if the current user plan doesn't have any digital channels, the screen will show as figure 3-4-8.

Figure 3-4-8

3.5 BER Statistics Measurement

Press  to return to main menu interface, and press F2 or F3 choose **BER** statistics icon, and then press F1 to enter statistics measurement.

DS2400T is able to make BER statistics during set time, the user can get MER, BER, ES, SES, COR, UNCOR, SUM bits and TOTAL BER as figure 3-5-1.

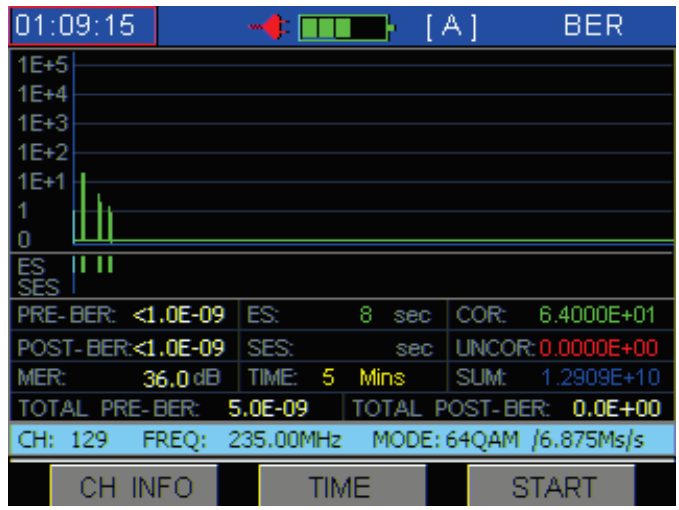


Figure 3-5-1

3.5.1 Parameter Description

abbreviations	meaning
ES	Error seconds During 1s, there are one or more mistakes which can be corrected or not be corrected, and then ES plus1
SES	Serious error seconds, During 1s, if the result of the number of errors that can not be correct divided the total bits > 1.1E-3, SES plus1
COR	Corrected error bits
UNCOR	Uncorrected error bits
SUM	Total bits
TOTAL PRE-BER	(COR+UNCOR)/SUM
TOTAL POST-BER	UNCOR/SUM

3.5.2 Soft Keys Operations

CH INFO (F1): Press this button can check the current channel information, and user can modify all of the parameters in this menu.

TIME (F2): Press this button to set the statistics time, DS2400T supports several fixed time(5 minutes, 15 minutes, 30 minutes, 60 minutes, 2 hours, 6 hours, 12 hours, 24 hours, and 48hours).

START/STOP (F3): Press this button will start or stop the statistics process and the screen will show as figure 3-5-2. Now any key pressed can not be respond except **HOME**、**F3** and **POWER**, until the end of the statistics time.

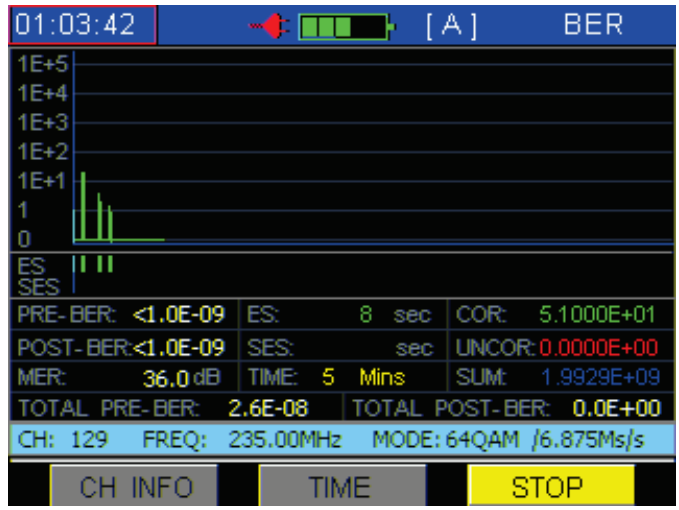


Figure 3-5-2

3.6 Spectrum Scanning

Press (⌂) to return to main menu interface and press (F2) or (F3) to select the **SPECT** icon, and then press (F1) to enter spectrum function.

DS2400T's spectrum function supports double-marker display and peak-hold function as Figure 3-6-1. Here, you can set up span, frequency(5MHz~1052MHz), sampling mode and etc…. Press (F1) can modify the cursor location.

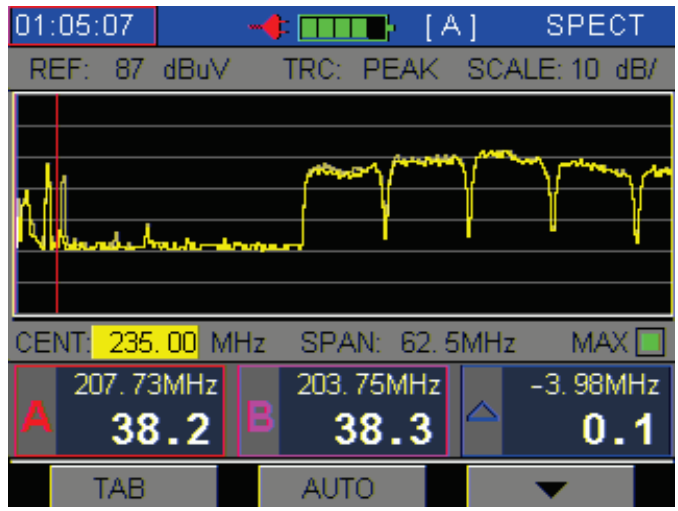
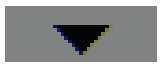


Figure3-6-1

3.6.1 Soft Keys Operation

TAB (F1): Press F1 to modify the cursor location, and the selected parameter can be modified by press  or  ,or by figure Input directly.

AUTO (F2): Press **AUTO** soft key to adjust reference level and scale quickly. The meter will automatically adjust them to most optimal state.

 **(F3):**Press this button to change the soft menu as figure 3-6-2, the user can press this button again to return.

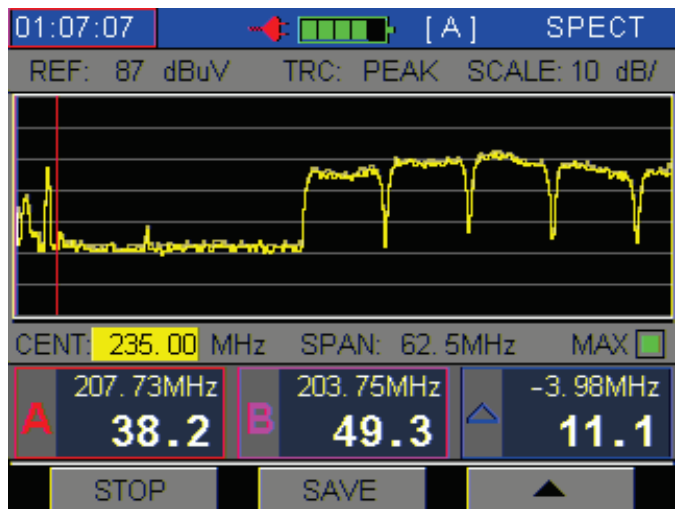


Figure 3-6-2

STOP (F1): Pressing STOP soft key, the scanning will be stopped, and you can continue the scanning by press it again.

SAVE (F2): Press **SAVE** soft key to save the result of scan test.

3.6.2 Parameter Setting

You can modify or adjust measurement parameter. Press F1 can highlight the selected parameter and then press ⇧ or ⇩, or press the character/digit keys directly.

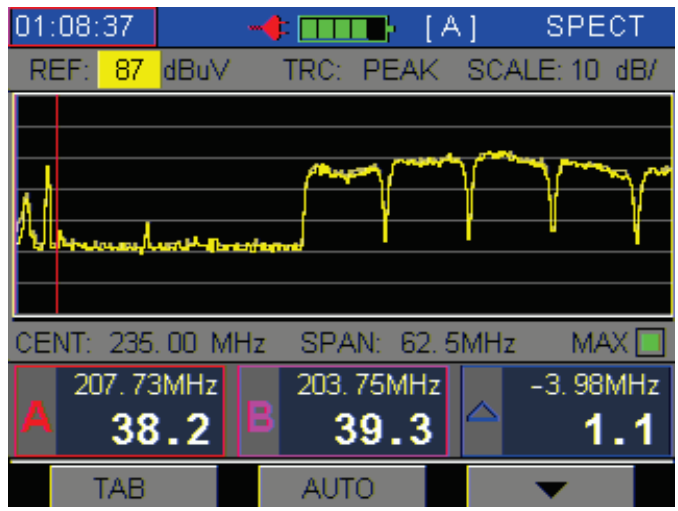


Figure3-6-3

REF(REFERENCE LEVEL): After selecting the REF parameter, show as figure 3-6-3, press ⇧ or ⇩ to adjust the reference level.

Note: The character/digit keys input is not support in REF term.

TRC: After selecting the TRC parameter, press  or  to select the sampling mode (AVG or PEAK),

AVG: sample average mode, the display result of each point will be an average of several sample value. It will be faster than the PEAK mode, and also if you want to measure the noise of the system, you need to select this mode.

PEAK: positive-peak mode, the display result of each point will be peak value of several sample value. It will be necessary to select this mode to measure the video or audio level of analogue channels. Show as figure 3-6-4.

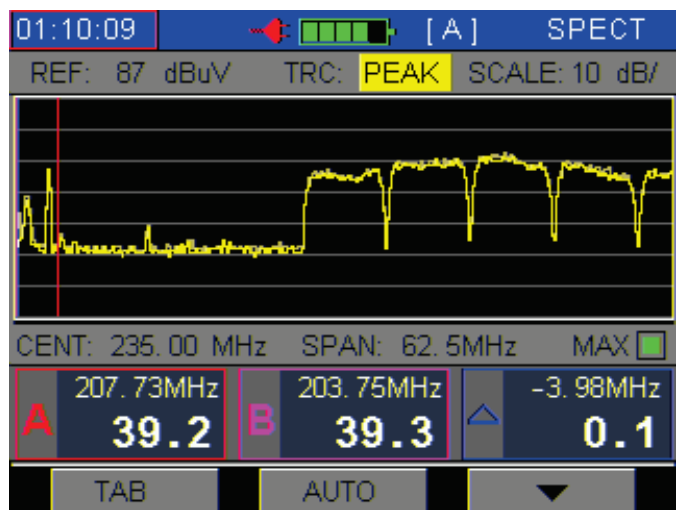


Figure 3-6-4

SCALE: After selecting the SCALE parameter, press  or  to choose one scale from 1dB/, 2dB/, 5dB/ and 10dB/.

CENT(CENTER FREQUENCY): After selecting the CENT parameter, you can input the center frequency by the character/digit keys.

Note: In Spectrum Scanning function, any frequency from 5 to 1052MHz can be input.

SPAN: After selecting the SPAN parameter, press  or  to adjust the span among 2.5MHz, 6.25MHz, 12.5MHz, 25MHz, 62.5MHz and FullBand.

MAX: After selecting the MAX-HOLD parameter, if you select the MAX-HOLD by pressing  or  , the screen will display both the max value and the real-time value of each point.

MARKER A: After selecting the MARKER A parameter, the red marker A becomes active marker, pressing  or  can move the red marker to the wanted view point.

MARKER B: After selecting the MARKER B parameter, the purple marker B becomes active marker, pressing  or  can move the purple marker to the wanted view point.

3.7 Tilt/Level List Measurement

Tilt/Level list test is the effective solution to check the flatness and splitter's gain of cable system, DS2400T can get levels of 12 channels and observe the measurement result and graph easily.

Press  to return to main menu interface, and press F2 or F3 and choose **FAV/TILT** icon, then press F1 to enter Tilt/Level List measurement.

Please select at least four channels to do tilt test, otherwise it will pop-up one dialog box as Figure 3-7-1.

Figure 3-7-1

In Figure 3-7-1, press F3 to enter the tilt channels setup menu, select the channels that you want to do tilt test as Figure 3-7-2; press F2 or F3 to change the highlight line, and then press the F1 to select or unselect the channel,

Here, the ⇧ and ⇩ button have been defined to page up and page down.

The "√" means this channel is selected. If you want to cancel this selection, please press F1 again and "√" will disappeared. The channel No. of all channels selected will be saved and displayed at the left blocks

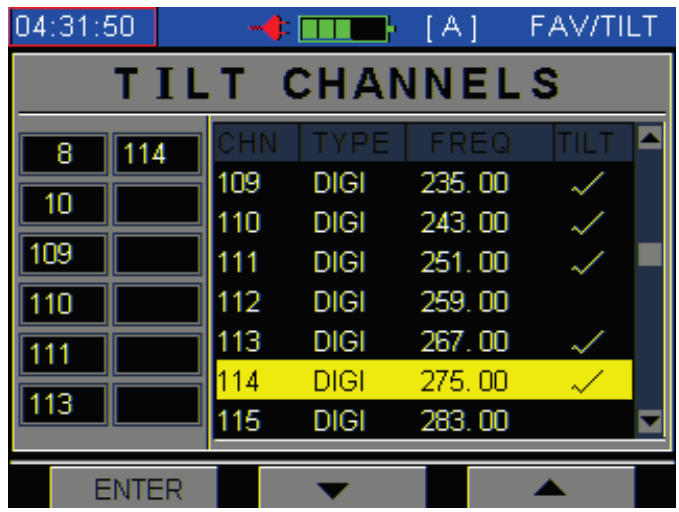


Figure3-7-2

After selected，Press  to return to main menu interface, and press the  again to enter the Tilt/Level List measurement. Now the Tilt measurement can be continued.

3.7.1 Tilt Graph Mode

In tilt test interface, the channels will be displayed as histogram, and test result will be displayed at the bottom of screen as Figure 3-7-3.

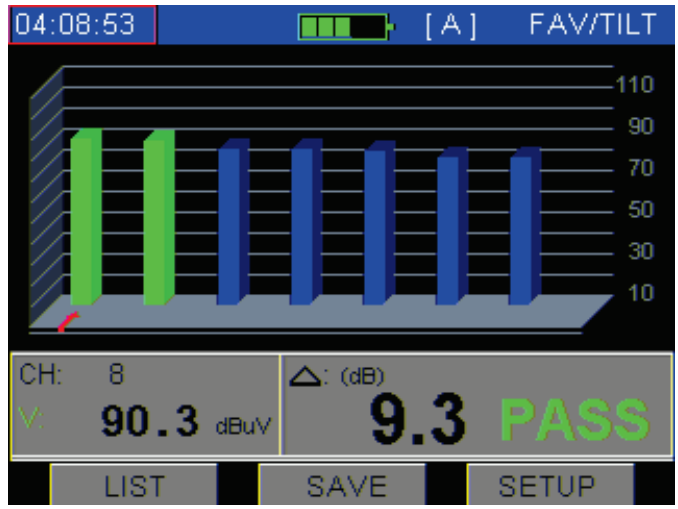


Figure 3-7-3

3.7.1.1 Soft Keys Operation

LIST (F1): Press **LIST** soft key to enter level list mode, as Figure 3-7-4.

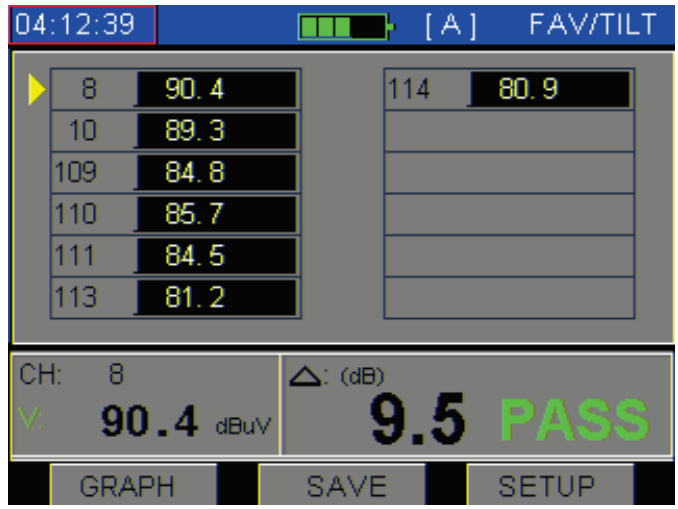


Figure 3-7-4

SAVE (F2): Press this button to save the result of tilt test.

SETUP (F3): When testing, press this button to enter into Figure 3-7-2 to re-select tested channels.

3.7.2 Tilt List Mode

In figure 3-7-4, you press F1 to switch the modes between **Tilt Graph** and **Tilt List**. In Tilt List mode, you can easily get level value of the channels tested.

3.7.2.1 Soft Keys Operation

GRAPH(F1): Press this button to enter Tilt mode, as Figure 3-7-3.

SAVE (F2): Press this button to save the result of level test.

SETUP (F3): When testing, press this button to enter into Figure 3-7-2 to re-select tested channels.

Here, the  and  button is defined to switch the tilt channel which's test result will be displayed at the bottom of screen.

A **PASS** or **FAIL** will be displayed at the bottom of the screen, the Limit value can be modified in Measurement Setup（Refer to 4.4.3）.

And also we can disable the judge of quality of channel in the Measurement Setup.

3.8 Channel Scanning

DS2400T support channel scanning function in order to test the flatness and amplitude of cable TV system quickly.

Press  to return to main menu interface and press F2 or F3 to select the **SCAN** icon, and then press F1 to enter Channel Scanning function as Figure 3-8-1.

The scanning graph of current user plan is displayed on the screen, a slider in red color shows the current scanning channel.

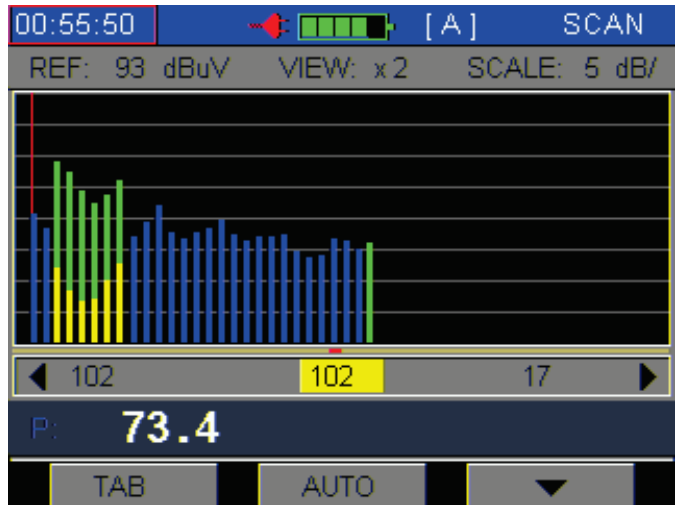


Figure 3-8-1

Green color represents video level of analogue channels.

Yellow color represents audio level of analogue channels.

Blue color represents power of digital channels.

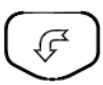
The scan function also display the channel number of scanning start channel and end channel.

3.8.1 Soft Keys Operation

TAB (F1): Press this button can modify the cursor location. Then the parameter which highlighted on the yellow color background can be modified by  or  .

MARK: In figure 3-8-1, press the  or  and the marker with red color will move left or right. And the test result of channel at the position of marker will be displayed on the bottom of the screen.

REFERENCE LEVEL: Press TAB to select the REF, and then it can be modified by press  or  , the range of reference level: 0-120 dBuV .

VIEW: Press TAB to select the VIEW and switch between ×1, ×2, ×3, ×4 and ×5 by pressing  or  .

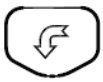
×1: Max display 30 channels in the screen.

×2: Max display 50 channels in the screen.

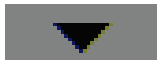
×3: Max display 75 channels in the screen.

×4: Max display 150 channels in the screen.

×5: Max display 255 channels in the screen.

SCALE: Press **TAB** to select the **SCALE** , and switch between 1dB, 2dB, 5dB and 10dB by pressing  or  .

AUTO (F2): Press AUTO soft key to adjust reference level and scale quickly . The meter will automatically adjust them to most optimal state.

 **(F3):**Press this button to next page as figure 3-8-2, the user can press this button again to return.

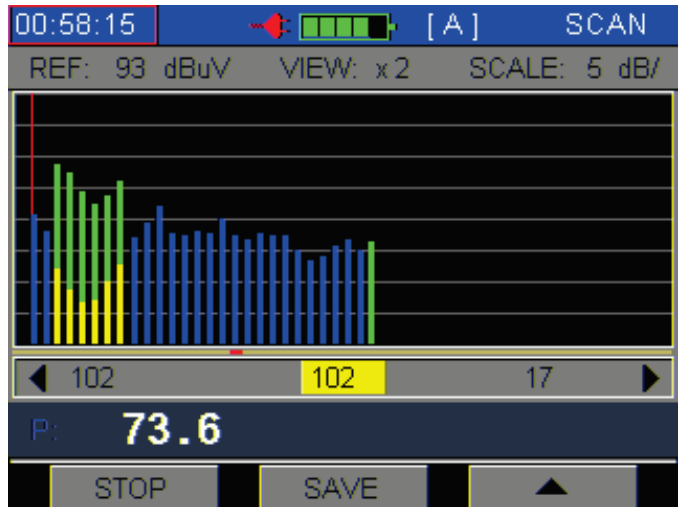


Figure 3-8-2

STOP (F1): Press STOP soft key, the scanning will stop, and you can continue the scanning by pressing it again.

SAVE (F2): Press this button to save the result of scan test.

3.9 HUM Measurement

DS2400T support HUM measurement to analogue channel.

Press  to return to main menu interface and press F2 or F3 to select the **HUM** icon, and then press F1 to enter HUM function. Show as Figure 3-9-1.

HUM modulation is also named power hum modulation distortion, which caused by low-frequency interference of the power. (It is 50Hz in China)

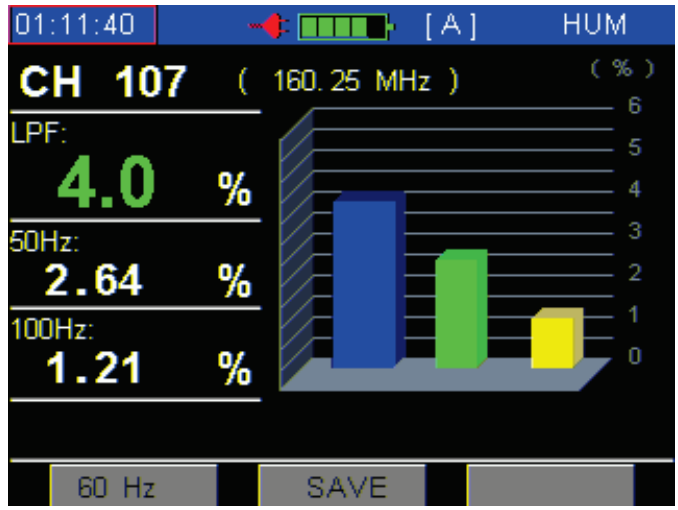


Figure 3-9-1

3.9.1 Soft Keys Operation

50Hz/ 60Hz (F1): Press F1 to switch the frequency of system power between 50Hz and 60Hz, as figure 3-9-2.

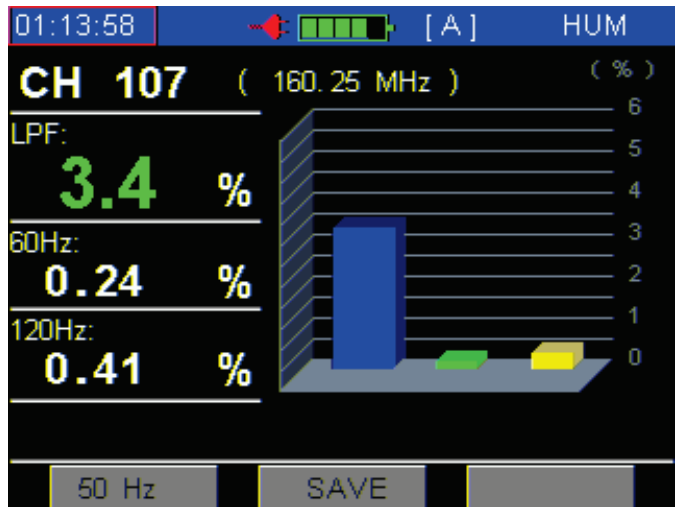


Figure 3-9-2

SAVE (F2): Press this button to save the result of HUM test .

or are used to switch analogue channels circularly. Also you can input the channel number using the character/digit keys.

3.10 Limit Measurement

Press  to return to main menu interface and press F2 or F3 to select the **LIMIT** icon, and then press F1 to enter LIMIT function. As shown in figure 3-10-1,

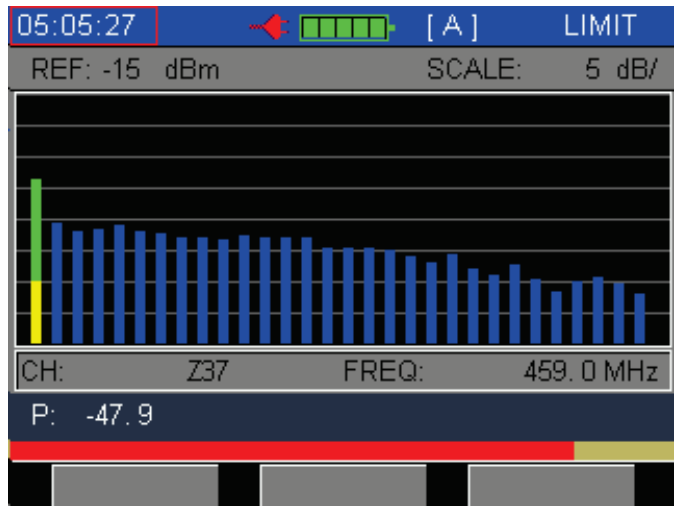


Figure 3-10-1

DS2400T is able to detect cable TV system rapidly, and check out the number of unqualified channels and the reason of unqualified channels. The amplitude of each channel of selected user plan is checked one by one. The channel number, video level and audio level whether or not acceptable will be shown.

NOTE: DS2400T checks the analog channel only in Limit Test mode.

3.10.1 Test Results List

After the limit test scanning, the general test results of cable system will be listed. The test items are consist of minimum video level, maximum video level, maximum delta video level, minimum △V/A, maximum △V/A and maximum △ADJ channels. Refer to figure 3-10-2.

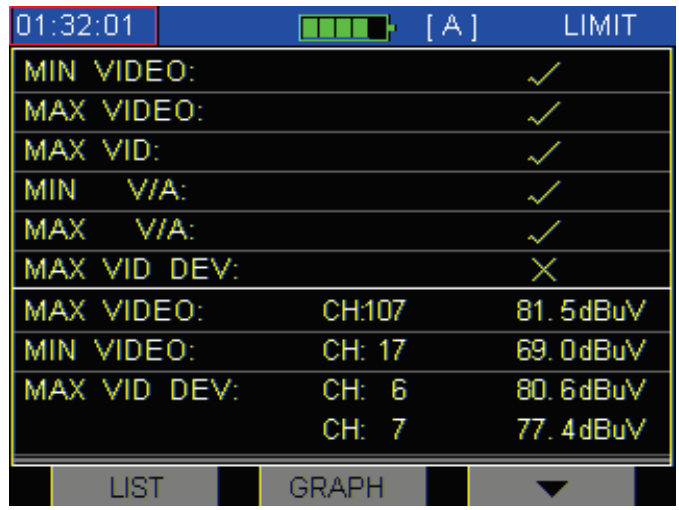


Figure 3-10-2

Press F1 to list as figure 3-10-3.

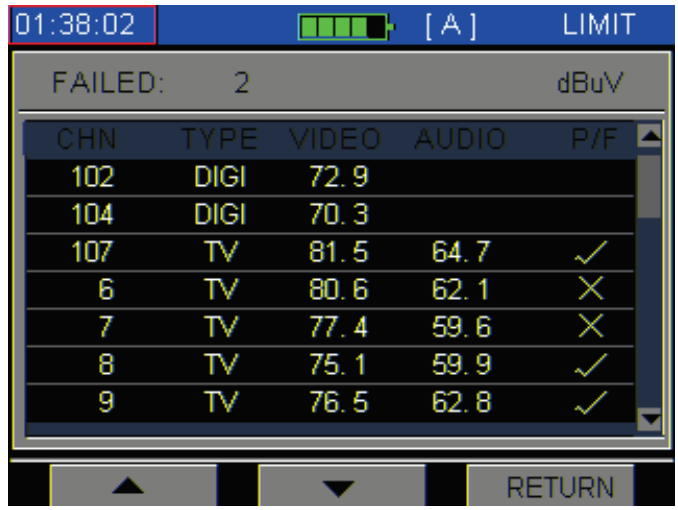


Figure 3-10-3

Press F2 to view the graph as figure 3-10-4.

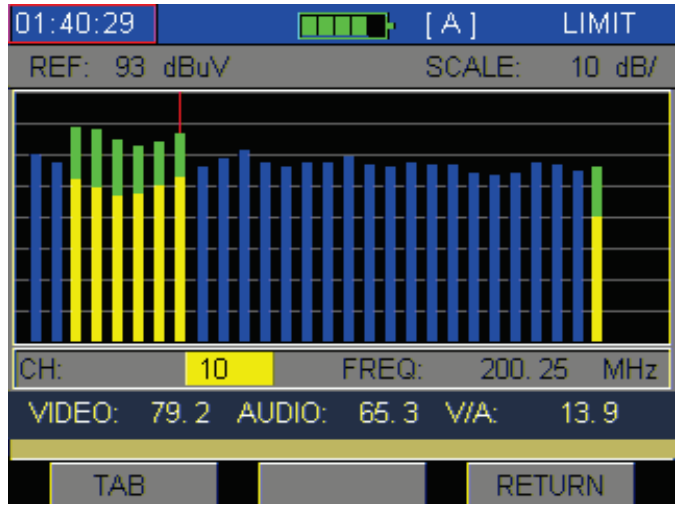
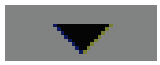


Figure 3-10-4

 (F3):Press this button to next page as figure 3-10-5, the user can press this button again to return.

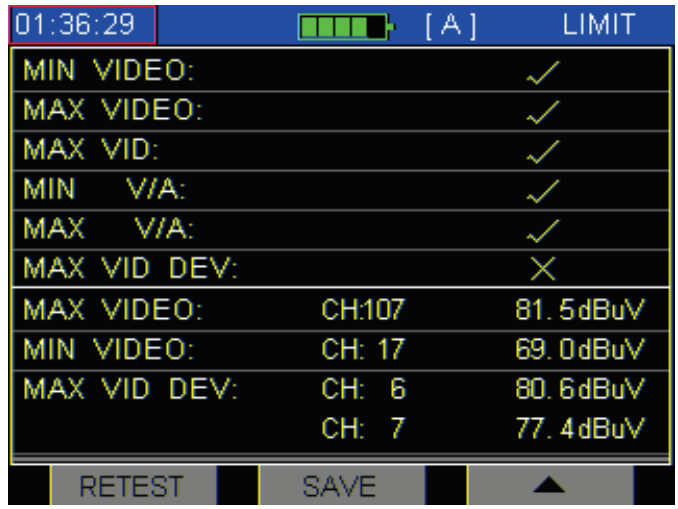


Figure 3-10-5

RETEST (F1): Press **RETEST** to retest.

SAVE (F2): Press **SAVE** soft key to save the result of Limit test .

3.10.2 Limit Edit

You can edit the limit setup in **SETUP**. First enter into **SETUP** menu, press F1 into **MEASUREMENT** Setting, highlight **LIMIT SETUP** by or , the screen displays as figure 3-10-6.

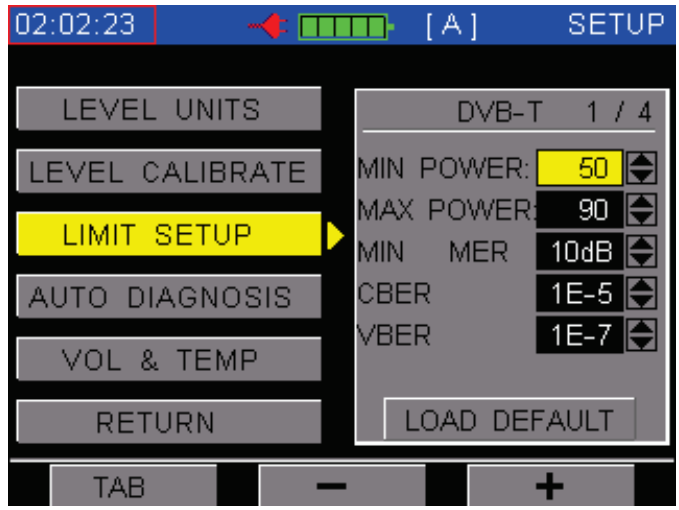


Figure 3-10-6

If you want to change a parameter ,press F1 to select the parameter, press F2 or F3 to change. Press F1 to **LOAD DEFAULT** ,and then press F3 you can select the default. (To view the detailed setting,please refer to **4.4.3**)

3.11 Return Path Spectrum

Press  to return to main menu interface and press F2 or F3 to select the **R-PATH** icon, and then press F1 to enter R-PATH function, as Figure 3-11-1.

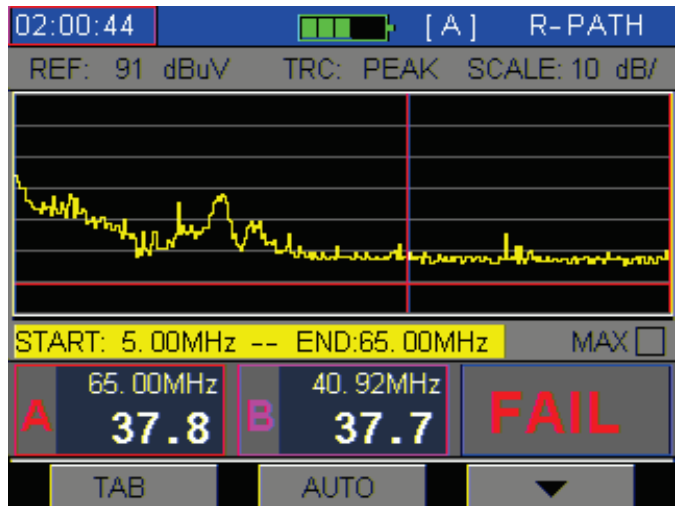


Figure3-11-1

In the interface of the R-PATH function, the default parameter set is Start frequency: 5MHz, Stop frequency: 45MHz, Reference: 40dBuV, Scale: 5dB/div, Demodulation mode: peak mode.

In this function， to view the detailed soft key instruction, please refer to **3.6.1 and 3.6.2.**

Note: In Return Path Spectrum function, you can only setup the range of return path frequency by 5MHz~45MHz and 5MHz~65MHz.

3.12 File Management

Press  to return to main menu interface and press F2 or F3 to select the **FILES** icon, and then press F1 to enter FILE management function as Figure 3-12-1.

Figure 3-12-1

DS2400T has independent memory space to store the measurement data, which includes level, scan, tilt, limit, spectrum and HUM test results.

3.12.1 File Directory

In file list menu, All saved files was list with file names, date and time.

3.12.2 Save File

If you have made measurements in LEVEL, TILT, SCAN, SPECT, LIMIT and HUM (at least one of them), Press  and select the **FILE** icon and then press F1, the file list menu will display as figure3-12-2.

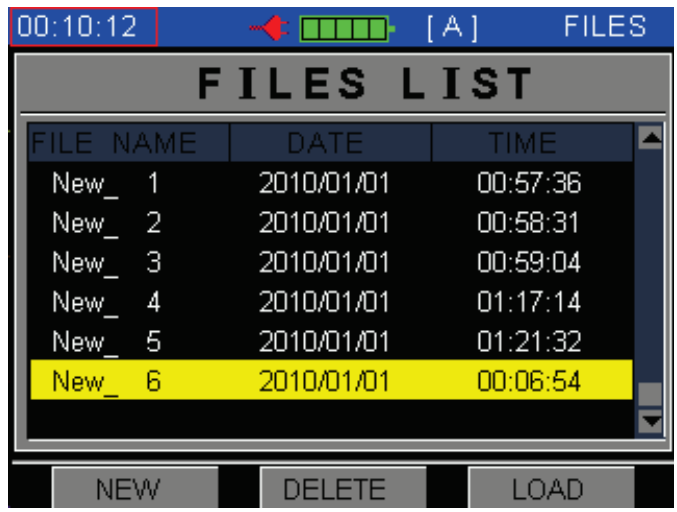


Figure 3-12-2

NEW(F1) : press this button, a "**SAVE THE FILE**" dialog show as figure 3-12-3.

DS2400T will give a default name for new file, also you can rename it using the character/digit keys.

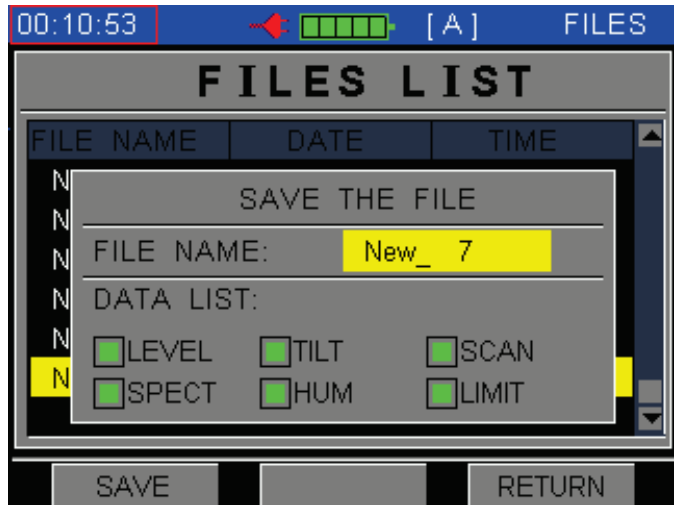


Figure 3-12-3

After rename the new file, press  or  to **DATA LIST**, all the parameters could be saved have been listed, and the default status is that all parameters have been selected as figure 3-12-4.

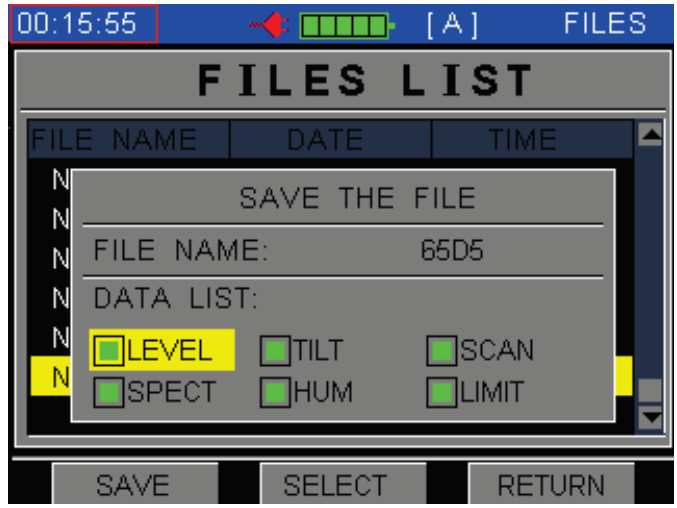


Figure 3-12-4

Press ⇧ or ⇩ to modify the cursor location, and then press F2 to select or unselect the data item as figure 3-12-5.

Figure 3-12-5

SAVE(F1): Press this button to finish saving a file, after finished save file, the screen will return file list menu. as figure 3-12-2.

3.12.3 Read File

Press ⇧ or ⇩ to select the file you would like to read, and then press F3 to Load the file. "**LOAD THE FILE** " dialog will display as figure 3-12-6.

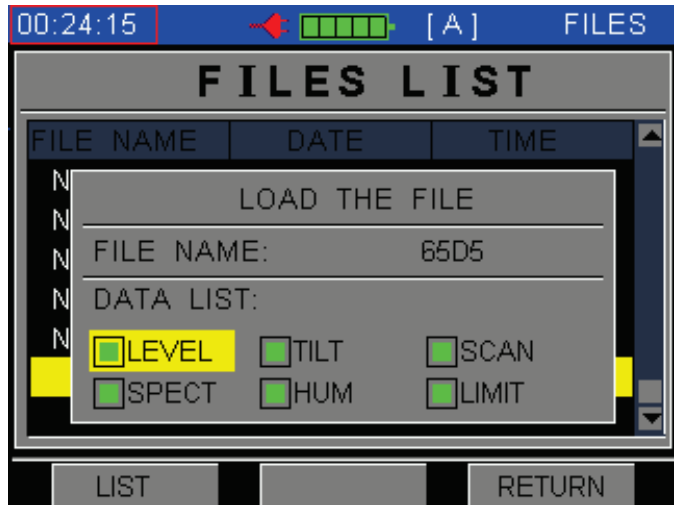


Figure 3-12-6

Normally, the data items can be opened using LIST mode(F1),

Press ⇧ or ⇩ to select the data item, and then press F1 (LIST) to list a data item in LIST mode as figure 3-12-7, 3-12-8, 3-12-9, 3-12-10, 3-12-11, 3-12-12.

Figure 3-12-7 is Level measurement results List.

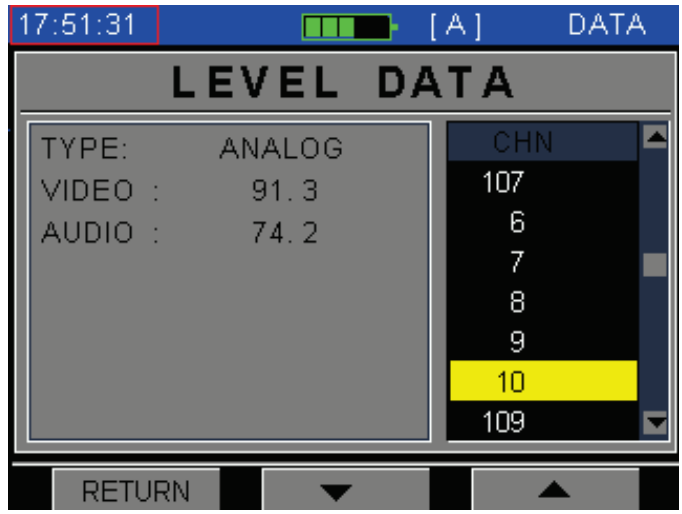


Figure 3-12-7

Figure 3-14-8 is Tilt measurement results List.

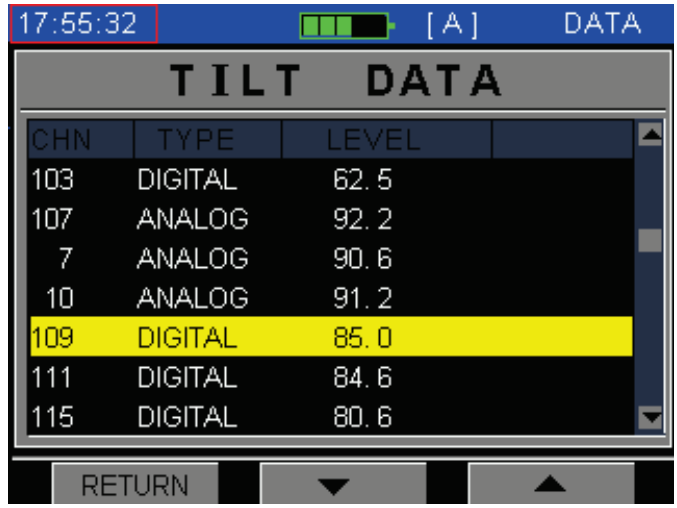


Figure 3-12-8

Figure 3-12-9 is Scan measurement results List.

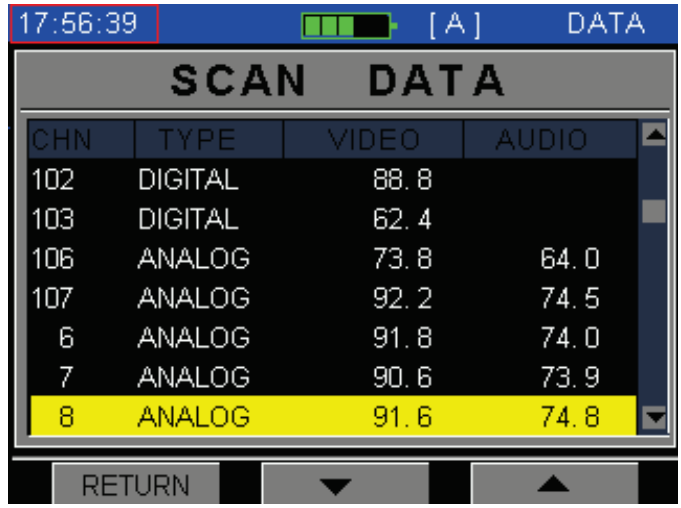


Figure 3-12-9

Figure 3-12-10 is spectrum measurement results List.

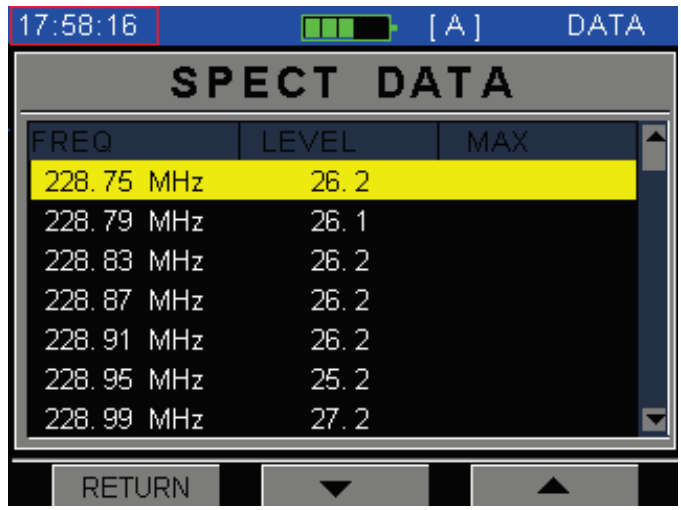


Figure 3-12-10

Figure 3-12-11 is HUM measurement results List.

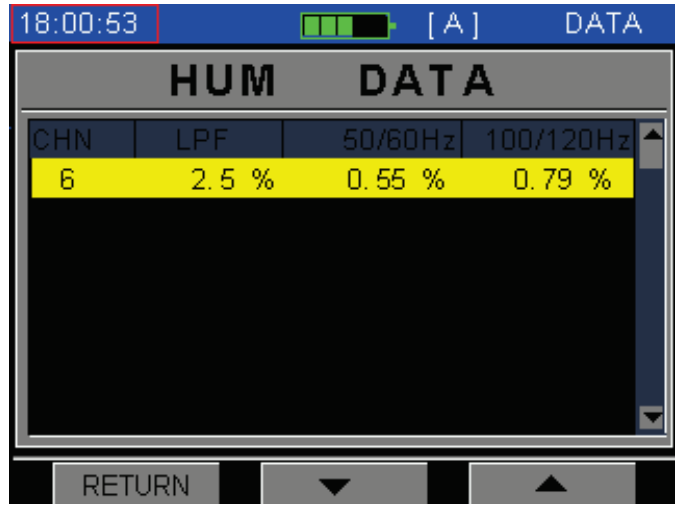


Figure 3-12-11

Figure 3-12-12 is Limit measurement results List.

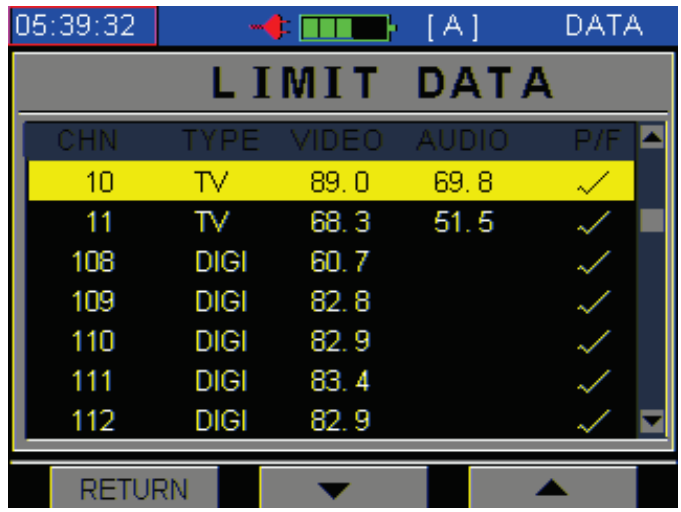


Figure 3-12-12

3.12.4 Delete File

In file list menu as figure 3-12-2, Select one file by press  or  and press DELETE(F2) to delete this selected file, the “DELETE FILE” dialog will display as figure 3-12-13.

Figure 3-12-13

Press (YES) F1 in figure 3-12-13 to return file list menu with delete select file.

Press (NO) F2 in figure 3-12-13 to return file list menu without delete file.

4. Setup

4.1 Brief Introduction

Press  to return to main interface and press F2 or F3 to select the **SETUP** icon, and then press F1 to enter SETUP menu as Figure 4-1-1.

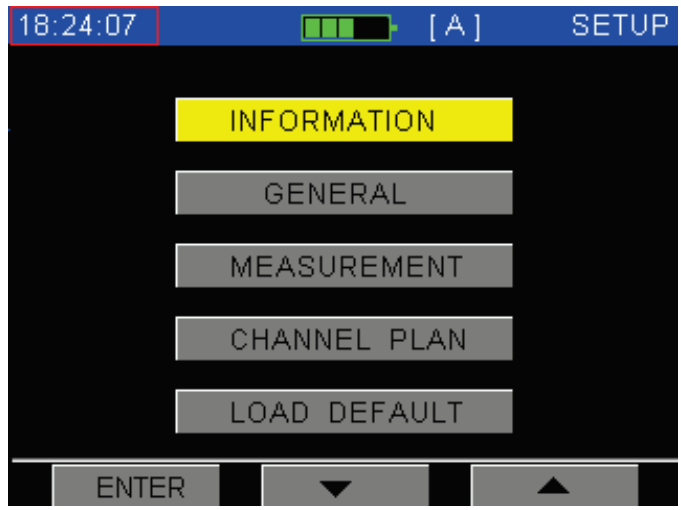


Figure 4-1-1

*__INFORMATION__: General information of the DS2400T, includes manufacturer information, version and so on.

*__GENERAL__: The setup includes auto shutdown time setting, language selection, date and time setting, files status and option selection(__Select the DVB-C /DVB-T2 option__).

*__MEASUREMENT__: Level unit, Level Calibrate, Limit setup, Auto Diagnosis and Voltage & temperature measurement.

*__CHANNEL PLAN__ : The setup for channel plan includes user plan selection, learn and edit user plan.

*__LOAD DEFAULT__ : Load the default values of system configuration.

4.2 INFORMATION

This is the information of the instrument, Refer to Figure 4-2-1. It includes serial number, software version, hardware version, calibration date and so on.

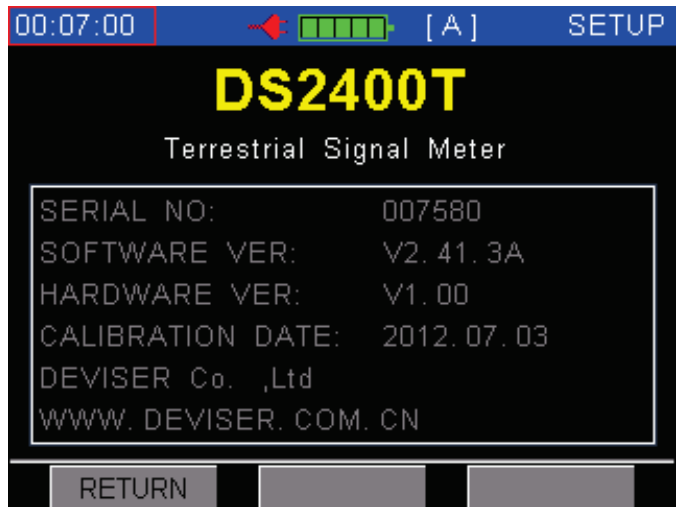


Figure 4-2-1

4.3 GENERAL

4.3.1 Shutdown Time

To save the power, the instrument can be set to shutdown automatically for inactive keypad after 3 minutes, 5 minutes, 10 minutes ,30 minutes and ON(never shutdown mode), as Figure 4-3-1.

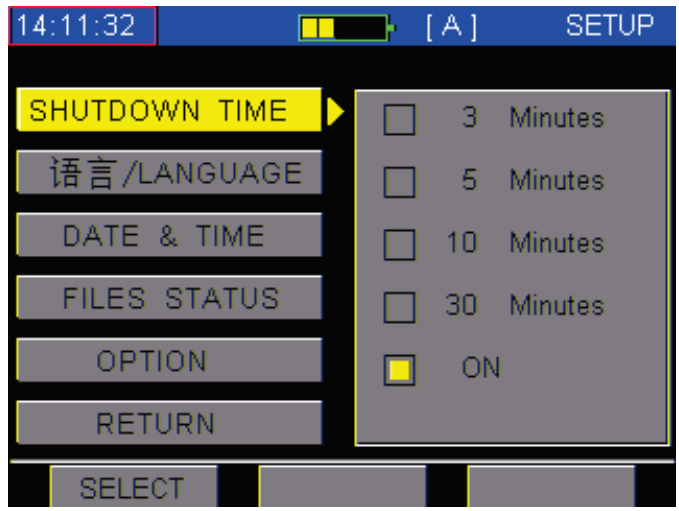


Figure 4-3-1

4.3.2 Language Selection

The language of DS2400T can switch among English, Turkish, Spanish and Chinese as figure 4-3-2. After choose, instrument will transform menu automatically.

Figure 4-3-2

Note： Contact Deviser for more languages.

4.3.3 Date and Time

When there is something wrong in system date or clock, user can calibrate new date or time, as Figure 4-3-3.

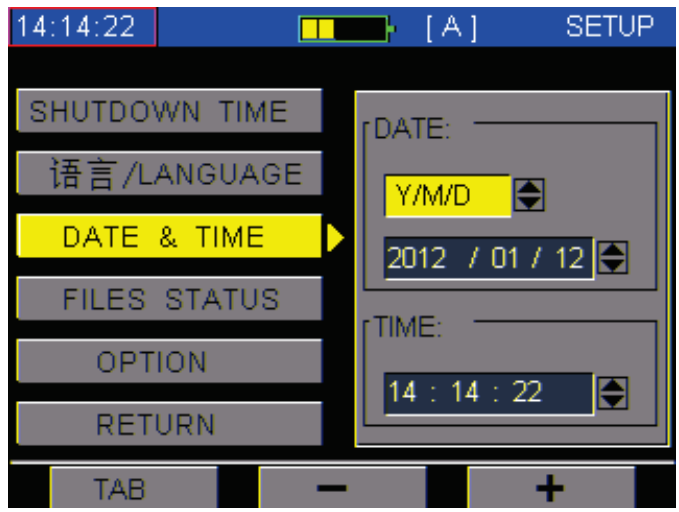


Figure 4-3-3

4.3.4 Files Status

This interface shows the number of files have been saved, and also show the Memory status as figure 4-3-4.

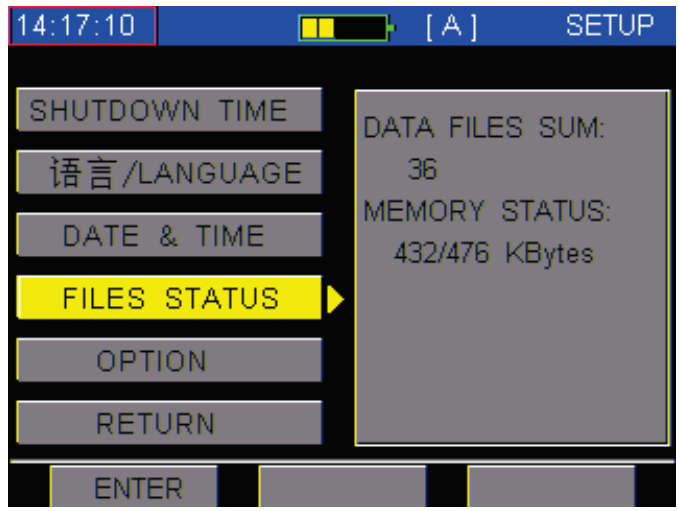


Figure 4-3-4

4.3.5 Option

This section is used for user to enable or disable the optional functions by grant authorization. as figure 4-3-5.

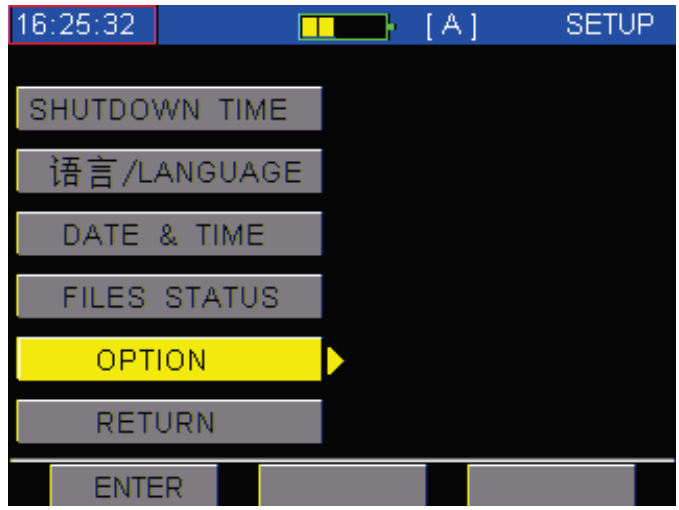


Figure 4-3-5

In figure 4-3-5, press ENTER(F1) and input correct code to enter the option interface, as figure 4-3-6,4-3-7.

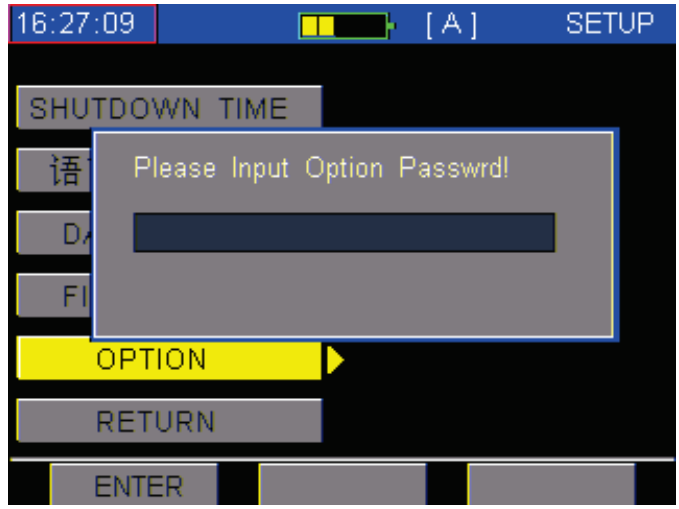


Figure 4-3-6

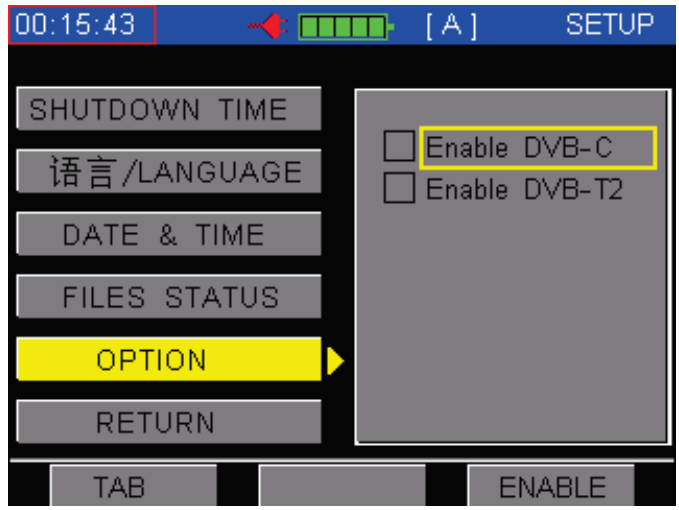


Figure 4-3-7

Note： Please contact Deviser or our local distributor to buy the option password.

Enable/Disable(F3): In figure 4-3-7, user can press F3 to enable or disable the DVB-C option.

4.3.5.1 Enable Optional Function

Press ENABLE (F3), screen will display a dialogue to ask for the corresponding password. as figure 4-3-8

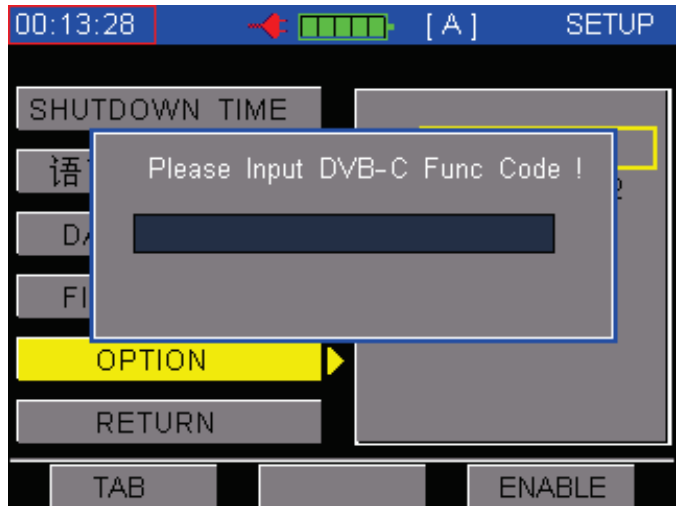


Figure 4-3-8

Note: Please contact Deviser or our local distributor to buy the DVB-C/T2 function code.

Here user need to input password by character/digit,  and  keys, as figure 4-3-9.

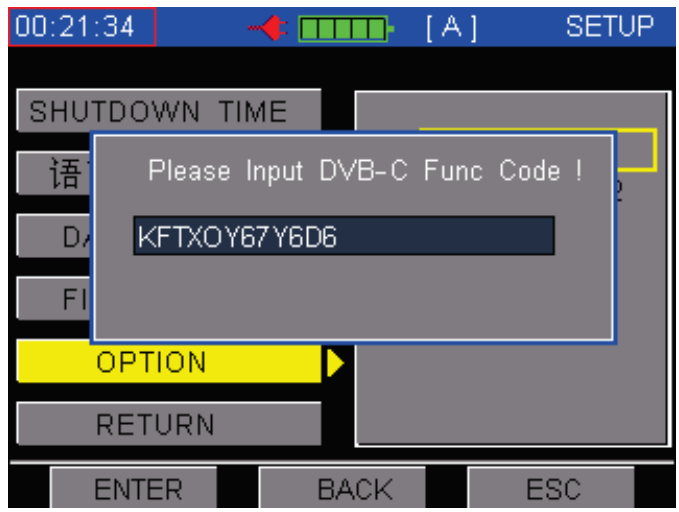


Figure 4-3-9

After inputting correct password and press ENTER(F1), the corresponding optional function will be enabled, in figure 4-3-10.

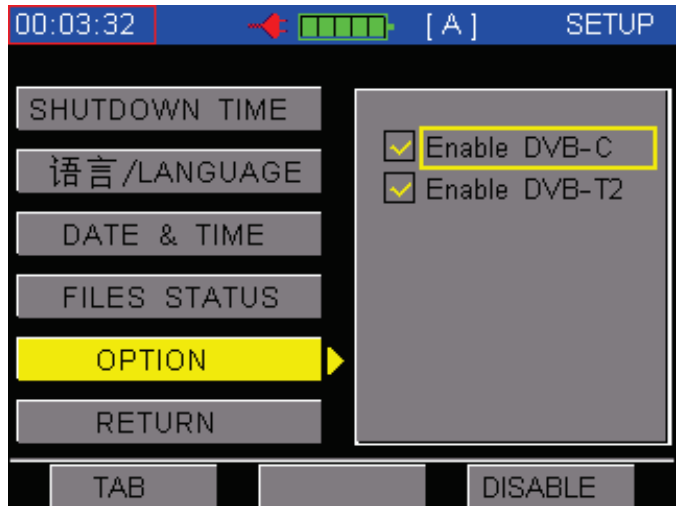


Figure 4-3-10

4.3.5.2 Disable Optional Function

In figure 4-3-10, press DISABLE (F3) to disable the optional function, screen will display as figure 4-3-11.

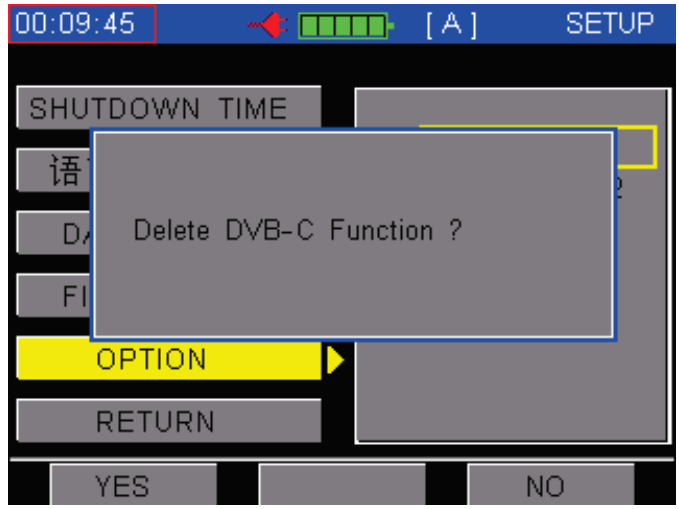


Figure 4-3-11

In figure 4-3-11, if press YES (F1), the corresponding optional function will be disabled, but if press NO (F3), the disable command will be canceled and screen will still display as figure 4-3-10.

4.4 Measurement Parameter Setup

4.4.1 Level Unit

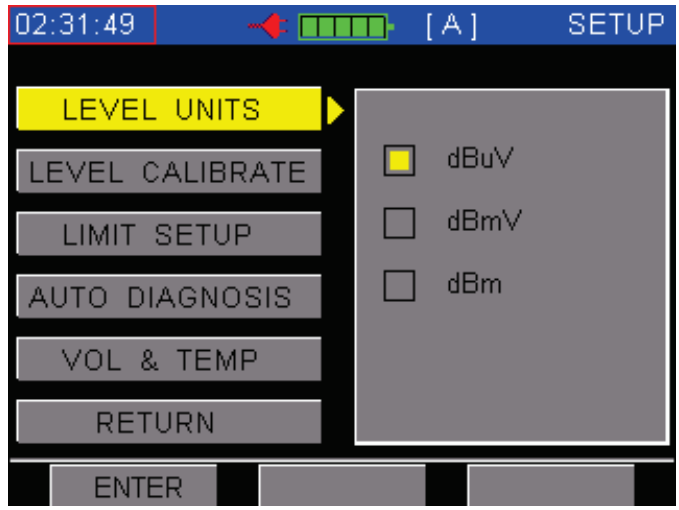


Figure 4-4-1

4.4.2 Level Calibrate

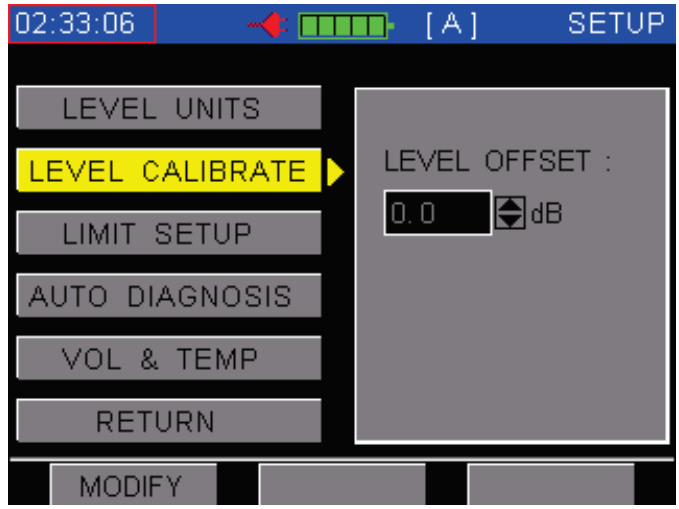


Figure 4-4-2

User can make amendment and compensation of the measure data in all level measurement function, press MODIFY(F1) to highlight the level offset box and then press F2 or F3 to adjust it and press ENTER(F1) to enable the input data.

4.4.3 Limit Setup

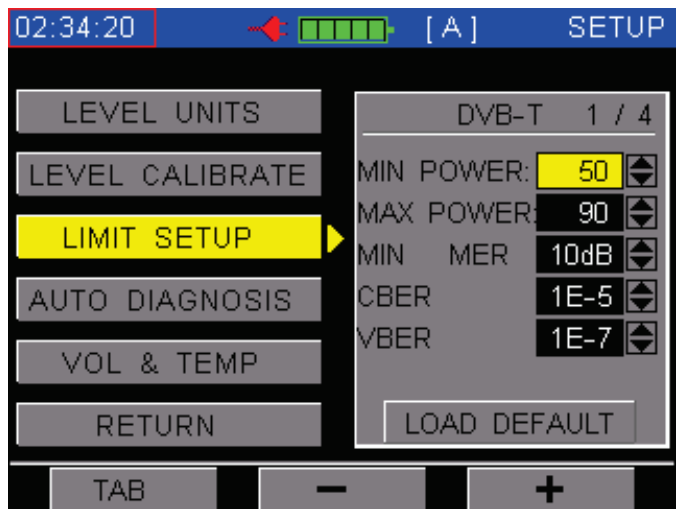


Figure 4-4-3

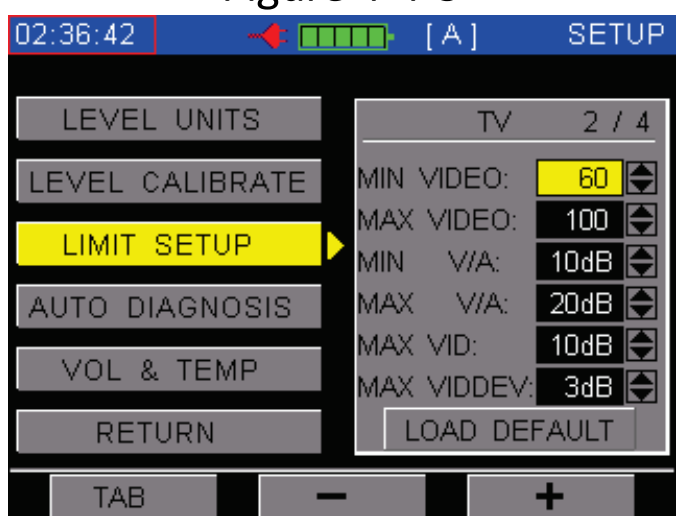


Figure 4-4-4

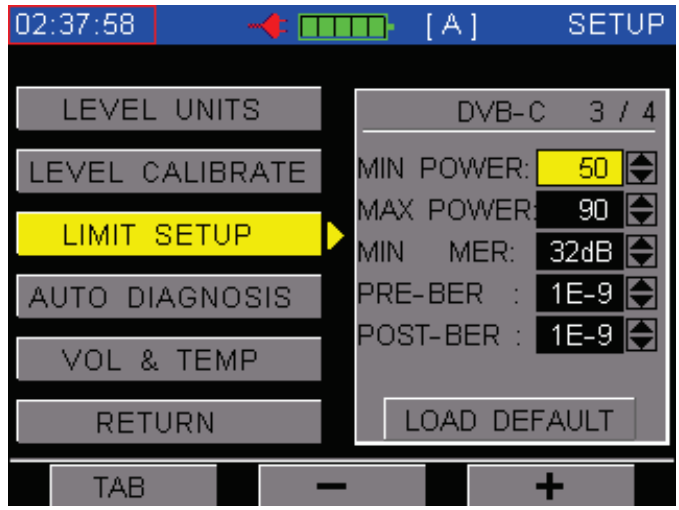


Figure 4-4-5

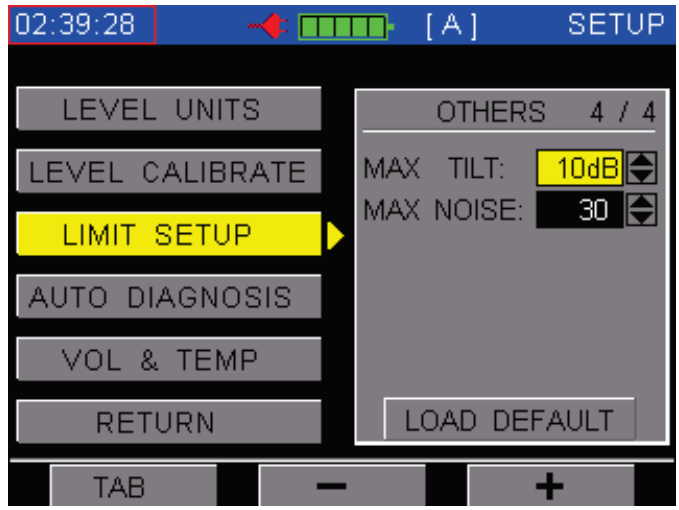


Figure 4-4-6

Four pages of Limit setting have been provided as Figure 4-4-3, Figure 4-4-4, Figure 4-4-5 and Figure 4-4-6. Five Limit items included in page one(1⁄4) , which is used for DVB-T singles test. The default value of these Limit items are list as Table 4-4-1. The difference between MAX POWER and MIN POWER

must be larger than six dB.

Table 4-4-1

Item	Limit
Minimum Power	50dBμV
Maximum Power	90dBμV
MIN MER	10dB
CBER	1E-5
VBER	1E-7

Page two(2/4) is used for analog TV test.

The default value of these Limit items are list as Table 4-4-2. The difference between MAX VIDEO and MIN VIDEO must be larger than six dB.

Table 4-4-2

Item	Limit
Minimum Video level	60dBμV
Maximum Video level	100dBμV
Minimum Δ V/A	10dB
Maximum Δ V/A	20dB
Maximum VID	10dB
Maximum VID DEV	3dB

Page three(3⁄4) is used for DVB-C singles test. five limit items list include of MIN POWER, MAX POWER, MIN MER, MAX PRE-BER and MAX POST-BER. The default value of these Limit items are list as Table 4-4-3. The difference between MAX POWER and MIN POWER must be larger than six dB.

Table 4-4-3

Item	Limit
Minimum Power level	50dBμV
Maximum Power level	90dBμV
Minimum MER	32dB
Maximum PRE-BER	1.0E-7
Maximum POST-BER	1.0E-9

Page three(4⁄4) is used for tilt measurement, two limit items list including of MIN TILT and MAX NOISE. The default value of these Limit items are list as Table 4-4-4.

Table 4-4-4

Item	Limit
MAX TILT	10dBμV
MAX NOISE	30 dBμV

To set the test limit, you can choose limit item by press TAB(F1), and then press F2 or F3 to adjust it. If you want to load default values of all limit items on each page, please press the TAB(F1) to choose the LOAD DEFAULT button on the bottom of that page, and then press F3 to confirm.

NOTE: If the digital channels have been included in tilt measurement with analogue channels, the power of digital channels will be add a fixed offset so that it can be compare with video of analogue channels.

4.4.4 Auto Diagnosis

You can enable the auto diagnosis function(PASS and FAIL, refer to 3.3.3) as figure 4-4-7.

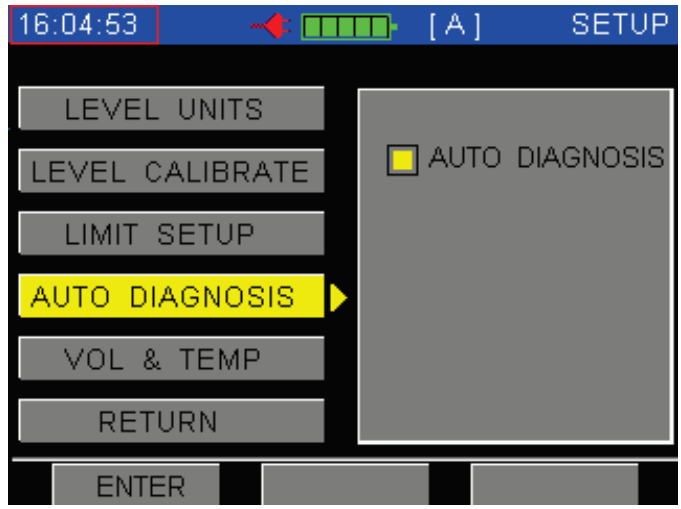


Figure 4-4-7

NOTE: Before the auto diagnosis function can be work correctly, the Limit items in section 4-4-3 must be set the valid values.

4.4.5 Voltage and temperature

The button "VOL & TEMP" here is used to enter the measurement interface Figure 4-4-8.

4.4.5.1 Battery Voltage

As Figure 4-4-8, battery voltage will be displayed on the screen. When it is lower than 10.6V, this meter will remind that it will shut down automatically soon.

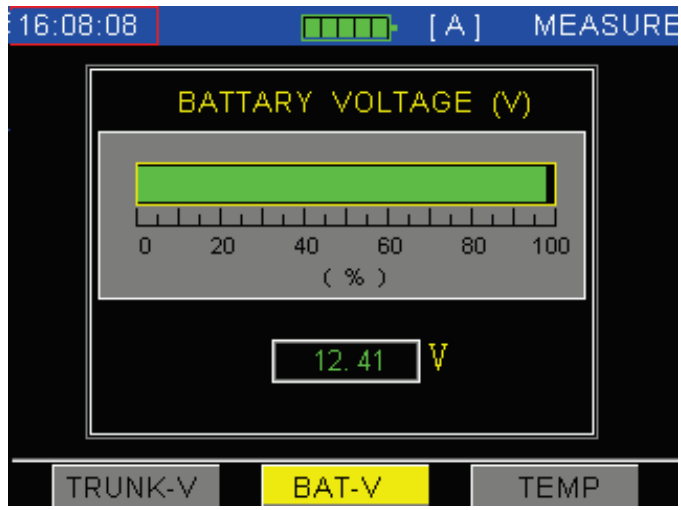


Figure 4-4-8

4.4.5.2 Trunk Voltage(AC LINE)

This meter will automatically judge whether it is AC or DC in the trunk, and display the trunk voltage on the screen as Figure 4-4-9.

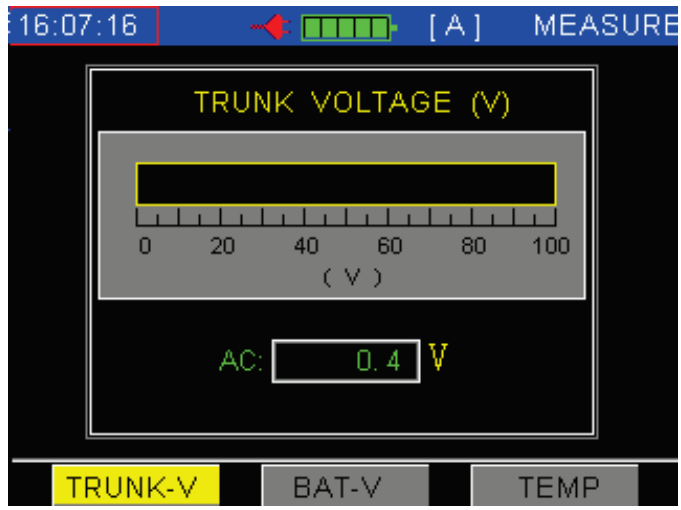


Figure 4-4-9

4.4.5.3 Temperature Inside

DS2400T can monitor inside temperature itself, and you can press  or  to choose the display unit: **Celsius or Fahrenheit**, refer to Figure 4-4-10 and Figure 4-4-11.

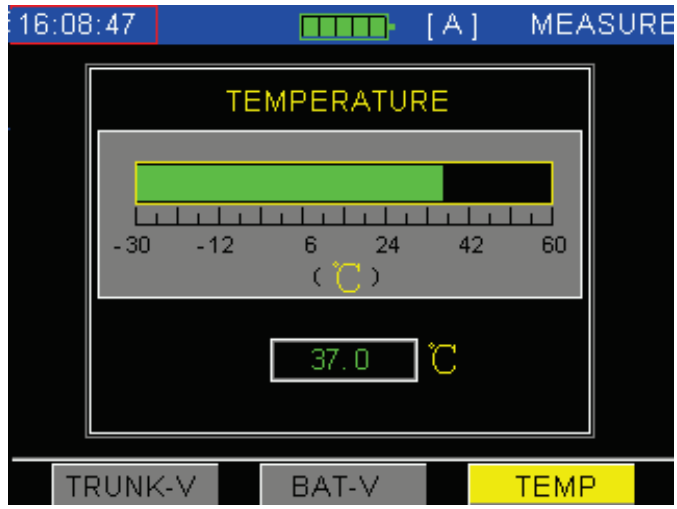


Figure 4-4-10

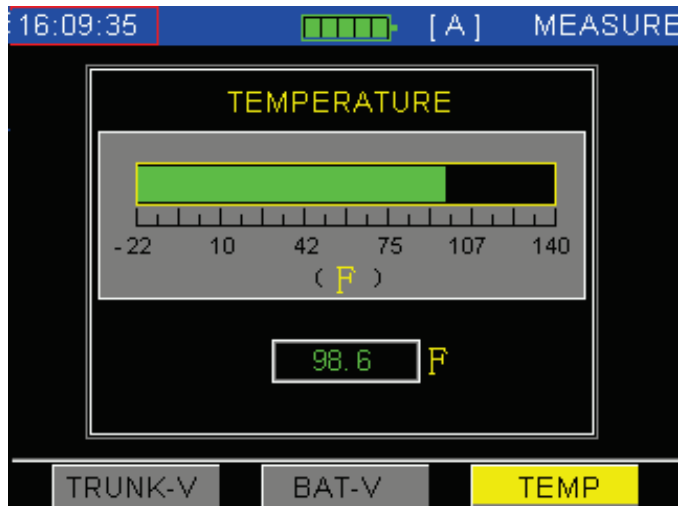


Figure 4-4-11

4.5 Channel Plan

4.5.1 Select User Plan

Up to five user plans can be built and saved. The user plans are labeled as A, B, C, D, and E. User can choose one as current user plan as Figure 4-5-1. Then, the meter will measure according to the selected the user plan.

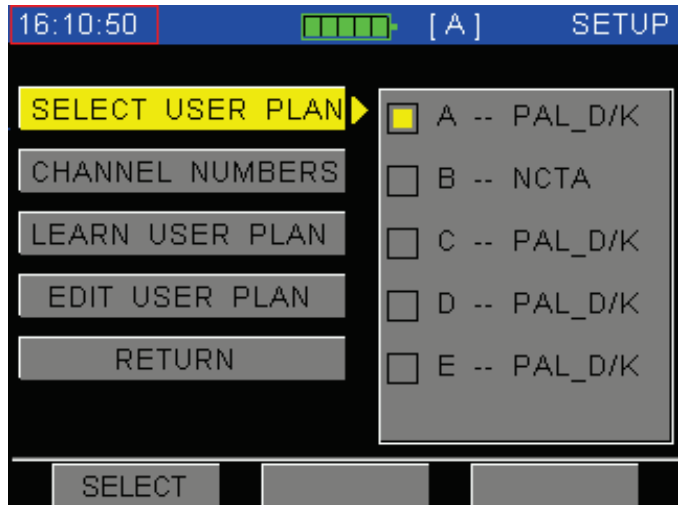


Figure 4-5-1

NOTE: DS2400T has five default user plans.

4.5.2 Channel Number Type

You can set the channel number to be displayed in digital (numeric) mode or standard (alphanumeric) mode. After choose, the meter will show the channel number as you desired in any measurement mode. Refer to Figure 4-5-2.

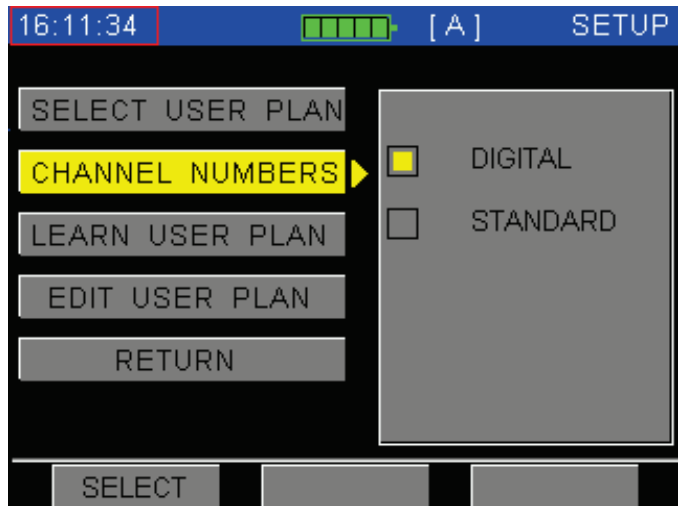


Figure 4-5-2

4.5.3 Learn User Plan

You can build and store up to five user plans in meter. Before first measurement, you should build the user plan to make the meter be compatible with your cable system.

NOTE: The LEARN USER PLAN will build the new user plan and replace the current selected user plan. If build other user plans, you can enter into SELECT USER PLAN and then make the LEARN USER PLAN operation.

Detailed operation refer to 3.2.

4.5.4 Edit User Plan

The user plan is combined by following:

* Digital (numeric) channel number
* Standard (alphanumeric) channel number
* Channel type (Analogue, DIGI, Single Freq, DUAL）
* Carrier frequency
* Audio offset
* Activation status
* Modulation
* SR (Symbol rate)

Figure 4-5-3

EDIT CHANNEL PLAN will show the channels list on the screen as Figure4-5-3 , you can only exit this function by press the HOME ( ) key, press F2 or F3 to highlight one channel, and press F1 to edit status as Figure 4-5-4.

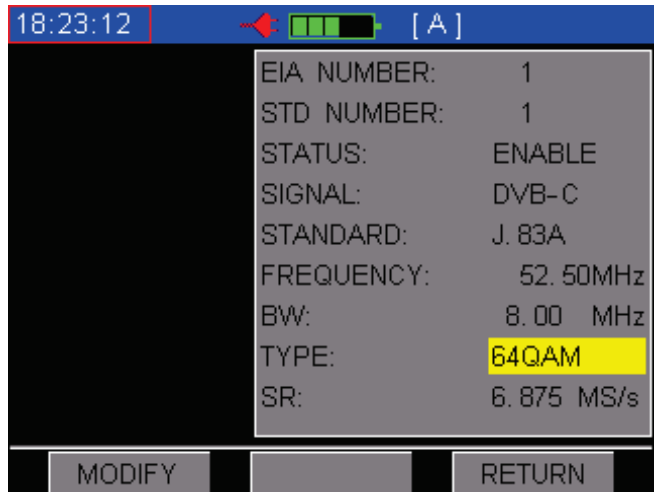


Figure 4-5-4

NOTE： Any edit here will be saved when you exit the screen.

5. Power Supply

5.1 Battery

DS2400T uses built-in 12.6V 1.5AH Li-Polymer battery and works over 5 when fully charged. When the voltage of the battery drops below 11V, the battery icon flashes in screen. Once the voltage of the battery is lower than 10.6V, the instrument will shut down automatically. The charge time is about 3 hours.

NOTE：

1.The meter can be only charged by the charger provided together with DS2400T.

2.When upgrading the software, please keep the power on and don’t interrupt the process, otherwise it will cause the meter frozen.

3.Low temperature may reduce the capability of the battery, but the battery will not be damaged.

4.Please replace the battery when its working hours shorten distinctly.

5.2 Charging

Please charge the instrument as following charging process:

1. Insert the charger output plug to DS2400T' DC charge socket.
2. Connect the charger to AC 100V-240V Power and the charger indicator will light with red.
3. When indicator become to green, the instrument has been fully charged (It is suggested to charge another one hour after indicator change to green. This way can extend the battery life). Then you can disconnect the charger input plug with power and pull out the charger output plug.

NOTE: The instrument can not be charged in the temperature beyond 10℃~35℃, otherwise the battery life will be shorten.

6. Port

The instrument can communicate with a PC through the 5 Pin communication port. Refer to figure 6-1.

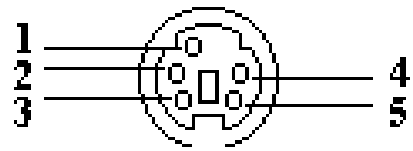


Figure 6-1

1 ---- TXD 2 ---- RXD 3 ---- NC

4 ----+5V 5 ---- GND

Management PC software- Toolbox is provided as standard. You can remotely control the instrument to do the measurement and the measurement data will be displayed as graph on the PC monitor for analysis and printing.

7. Specification

DVB-T

Frequency Range	5~1052MHz	
Function	Power, MER, CBER, VBER	
DVB-T Signal Parameters	Carriers	2K/8K
	Guard Interval	1/4、1/8、1/16、1/32
	Code Rate	1/2、2/3、3/4、5/6、7/8
	Modulation	QPSK、16QAM、64QAM
	Spectral Inversion	Automatic
	Bandwidth	6/7/8MHz
Channel Power	Range	30~100dBuV
	Accuracy	±2.0dB
MER	Range	~30dB
	Accuracy	±2.0dB
BER		CBER,VBER

DVB-T2

Frequency Range	5~1052MHz	
Function	Power, MER, CBER, LBER	
DVB-T2 Signal Parameters	Carriers	2K/8K/4K/1K/16K/ 32K
	Guard Interval	1/32、1/16、1/8、1/4 、 1/128 、 19/128、19/256
	Code Rate	1/2、3/5、2/3、3/4、4/5、5/6
	Modulation	QPSK、16QAM、64QAM、256QAM
	Spectral Inversion	automatic
	Bandwidth	5/6/7/8MHz
Channel Power	Range	30~100dBuV
	Accuracy	±2.0dB
MER	Range	~32dB
	Accuracy	±2.0dB
BER		CBER,LBER

DVB-C

Frequency：	
Range:	5MHz to 1052MHz
Accuracy:	±50×10^{-6} (20℃±5℃)
Resolution:	10 KHz
Receive Bandwidth:	280 KHz
Channel Type:	
Analogue TV:	TV
Digital TV:	16/32/64/128/256 QAM
Analog Level Measurement:	
Range:	30dBμV to 120dBμV
Accuracy:	±1.5dB
Resolution:	0.1dB
Input Impedance：	75Ω
Digital Channel:	
Demodulation Type:	standard： ITU-T J.83 Annex A/B/C standard.
Support：	16/32/64/128/256 QAM
SR:	1MS/S-7MS/S
Bandwidth：	6/8MHz
MER:	～39dB（representative）

Accuracy：	±2dB
BER:	1E-3 to 1E-9 before and after R-S decoding
Power Measure Type:	QAM
Average Power:	
Level Range:	30dBμV to 110dBμV
Accuracy：	±2.0dB
Resolution：	0.1dB
Channel Scan：	
Number of Channels:	160 channels max.
Scanning Speed:	5 channels/ s
Scale:	1, 2, 5, 10 dB/div
Zoom:	1X, 2X, 3X, 4X, 5X five levels of magnification
Frequency spectrum：	
Bandwidth:	2.5MHz, 6.25MHz, 12.5MHz, 25MHz, 62.5MHz, fullband
Scale:	1, 2, 5, 10 dB/ div
Tilt measurement:	
Number of Channels:	4 to 12
Resolution:	0.1dB

Trunk Voltage Measurement:	
Input Range:	0V to 100V (AC/DC)
Accuracy:	±2V
Resolution:	0.1V
Other Function:	
Storage:	512K byte
Communication Port:	RS 232C
Store Temperature:	-20℃～50℃
Dimensions:	Handset about 218mm×95mm×49mm
Weight:	Handset about 700g
Display:	320×240 OLED
Power Supply:	
Battery:	12.6V 1.6AH LiIon battery
Charger:	AC 100 V to 240V 50-60Hz
Work Time:	4 .5hours(full charged battery)
Charge Time:	～3hours

8. Standard Accessories

Standard Accessories	Quantity
DS2400T	1
AC-DC Power Adapter/Charger	1
Data Cable(Serial to USB)	1
Carrying Bag	1
F connector	2
Manual and Toolbox software CD	1

Add:No.8, Haitai Chuangxin 3rd Road, Hi-Tech Industrial Development Area, Tianjin, China 300392

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