Preface

Thank you for choosing our product, our products are manufactured in compliance with ISO 9000. You are assured of a quick, expert help with any product of Tianjin Wenhao. A team of highly qualified engineers provides telephone support and will work with you to find a solution to your query on any aspect of the operation, programming or application with our equipment.

The manual will give you a detailed introduction of how to operate and maintain this instrument, so, please acquainted yourself with it at first.

Contents

Chapter 1 Overview

1 Applications

Digital Television Integrated Analyzer is wildly applied in many different fields, including DTV transmission device R&D, manufacture and maintenance, construction and acceptance of DTV network. To meet the demand of the rapid growth of DTV industry, Tianjin Wenhao designed a new generation analyzer AV5462 based on several instruments into a cabinet of only four height units in compliance with DVB-C, DVB-S, DMB-TH. It covers three layers test functions as follows: RF measurement, protocol analysis and video/audio monitoring.

2 Attention

Please check it as follows before the first startup, if you have any problem, contact us at your convenience and we will provide you with help in time.

2.1 Checking Packaging and Order List

a） Inspect the shipping container to examine whether it’s damaged.

b) Unpack it and make sure the standard accessories and the ordered options contained.

50Ω N—BNC Calibration Cable	1
75Ω/50Ω Convertor	1
AC Power Cord	1
User’s Manual	1
Checklist	1

2.2 Checking Power Supply

The requirements of power supply are:

Table 1-1 Operation Power

Parameters	Range
Voltage Rated Output Current Frequency	220V±10% AC >1.8A 50Hz±5%

To minimize or prevent interference from sharing the same power supply with other devices, particularly devices with large power, power supply with regulating function is recommended.

The instrument is equipped with a three-wire power cord, in accordance with international safety standards, which is used to ground the instrument.

Caution：Incorrect grounding will be harmful to instrument and danger to operator.

2.3 Electrostatic Discharge Precautions

This analyzer was constructed in an electrostatic protected environment, because most of the semiconductor devices used in the instrument are susceptible to be damaged by static discharge.

a) ESD desk & wristlet

b) ESD floor & anklet

Caution：The precautions above is not applied when voltage exceeds 500V.

Chapter 2 Instrument Functions

Section 1 First Startup

Caution：Please check the voltage of power supply and make sure the appropriate fuse installed before connect the plug to the power supply unit.

Caution： Make sure a good aeration when the instrument is operated in a cabinet.

a） After the instrument is correctly connected to power supply, press the power switch on the rear panel and the yellow led above “Power” button on the front panel, which indicates the instrument is in standby status, is turned on, then press the “Power” button on the front panel to startup the instrument, if the green led above it is lit, the instrument succeed in operating status, press this button again will shutdown the instrument, but it’s highly recommended to shutdown it through its OS.

b） The initialization of initialization will cost about 2 minutes.

c） The normal warn-up will take 5 minutes, while a more precise measurement will cost at least 30 minutes.

d) Calibration will be done before verifying characteristics.

Section 2 Front Panel

Caution： The maximum RF input level is +30dBm with a programmable 50dB input attenuation in 10dB step.
The maximum DC voltage to RF input is 30V, to input a signal of voltage exceeding this value will damage the input attenuator and mixer after that.

The front panel contains power button, reset button, TFT LCD, interfaces, mini-keyboard, touch panel, etc. as shown below:

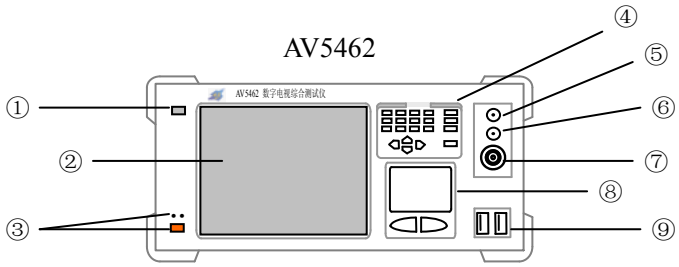

Figure 2-1 Front Panel

① Reset button：To reset the instrument.

② LCD：8.4-inch TFT with resolution 1024×768pixels.

③ Power button and LEDs：Yellow LED indicates standby status and the green one for operating status.

④ Mini-keyboard：Number keys, Arrow keys and etc.

⑤ TS output：Transport Stream Output Interface.

⑥ TS input：Transport Stream Input Interface.

⑦ RF input：RF Input Interface.

⑧ Touch Panel：Instead the act of mouse.

⑨ USB Interface：To plug external USB device.

Section 3 Outlook and Rear Panel

The instrument has a dimension of 520×390×202mm, weight about 12 kg，aluminium alloy shell and fans for cooling.

Figure 2-2 Outlook

The rear panel is shown as below:

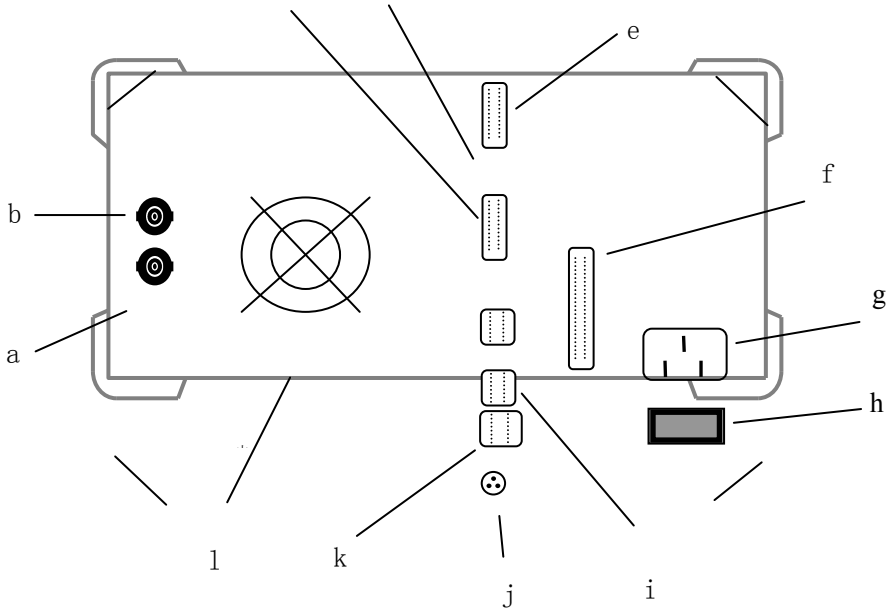

Figure 2-3 Rear Panel

a） Calibration Output BNC Interface

b） 10MHz Reference Clock Input/Output BNC Interface

c） Ethernet Interface 1

d） RS232 Interface

e） VGA Output Interface

f） SPI

g） Power Inlet

h） Power Switch

i） Ethernet Interface 1

j） PS/2

k） USB Interfaces

l） Fan

Section 4 Spectrum Analysis

1 Connection

As below:

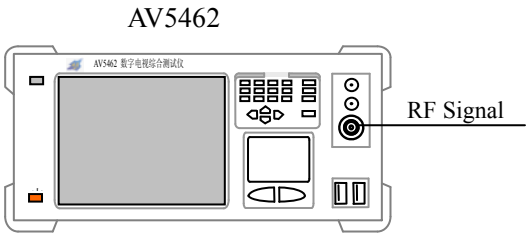

Figure 2-4 Connection for Spectrum Analysis

2 Screen Layout

As shown in Figure 2-5，spectrum analysis screen can be divided into three parts, control panel on the right, display area in the center and parameters information display area in the south.

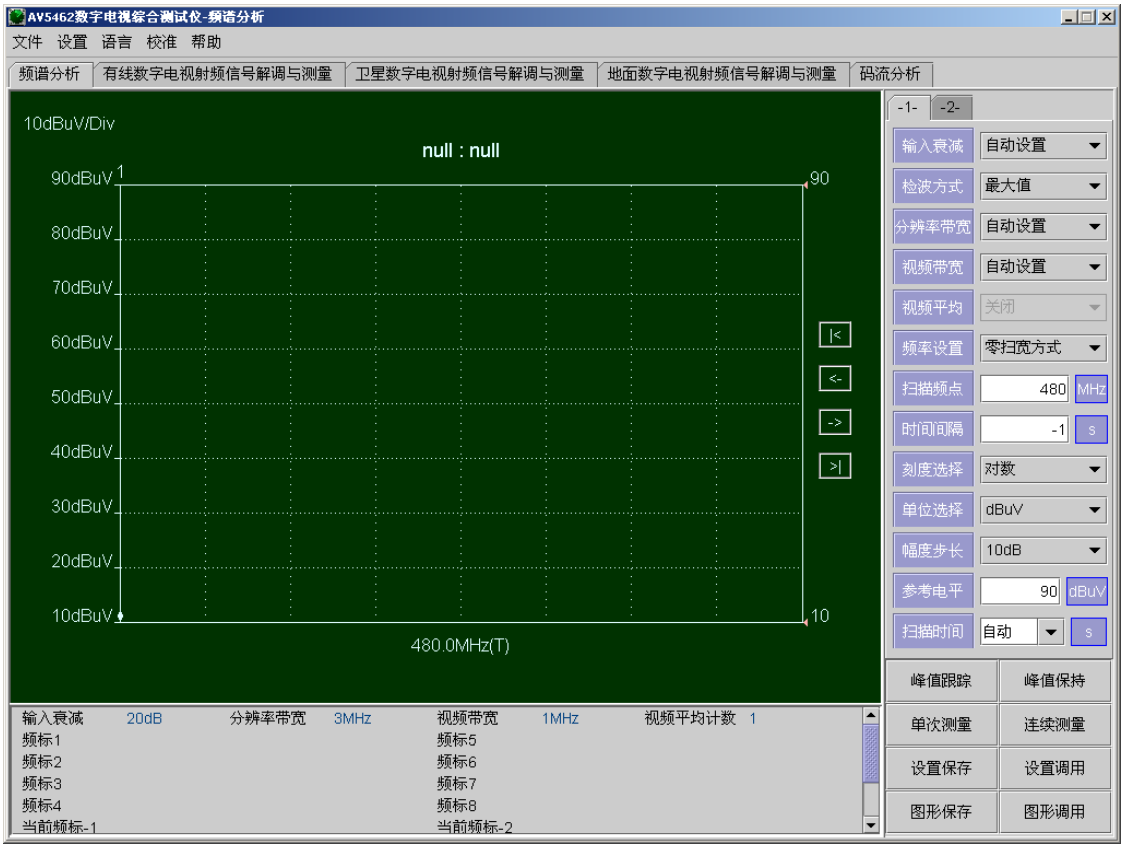

Figure 2-5 Spectrum Analysis Screen

3 Spectrum Sweep

3.1 Settings

1) Input Attenuation(InputAtt)

Use mouse or touch panel to set RF input attenuation from follows: Auto, 0dB, 10dB, 20dB, 30dB, 40dB, 50dB.

Input attenuation is determined by current reference level in auto mode.

2) Detect

Use mouse or touch panel to select detection mode from follows: Maximum, Minimum, Sample, Average.

3) Resolution Bandwidth(RBW)

Use mouse or touch panel to set RBW from follows: Auto, 1KHz, 3KHz, 10KHz, 30KHz, 100KHz, 300KHz, 1MHz, 3MHz.

In auto mode, RBW is determined by current span as shown in the following table:

Table 2-1 Relations between Span, RBW and VBW

Span	RBW	VBW
Span>50MHz	3MHz	1MHz
15MHz<Span<=50MHz	1MHz	300KHz
5MHz<Span<=15MHz	300KHz	100KHz
1.5MHz<Span<=5MHz	100KHz	30KHz
500KHz<Span<=1.5MHz	30KHz	30KHz
150KHz<Span<=500KHz	10KHz	10KHz
50KHz<Span<=150KHz	3KHz	3KHz
Span<=50KHz	1KHz	1KHz

4) Video Bandwidth(VBW)

Use mouse or touch panel to set VBW from follows: Auto, Off, 10Hz, 30Hz, 100Hz, 300Hz, 1KHz, 3KHz, 10KHz, 30KHz, 100KHz, 300KHz, 1MHz, 3MHz.

In auto mode, VBW is determined by span as shown in table 2-1.

5) Average

Select a average number from the drop list to determine the display curve's average times.

6) Reference Level(RefLevel)

Use mouse and keyboard to set the reference level of the sweep, the invalid value input will cause a warning.

7) Frequency Setting(FreqSet)

The unit of frequency is MHz, with up to 3 decimal digits. Use mouse or touch panel to select

current frequency setting mode from follows:

a. Start+End

b. Center+Span

c. Zero Span

In this mode, only one frequency value is to set and the measurement curve is in time domain.

8) Interval

This parameter is only available to Zero Span mode, with second as its unit. It is the blanking time between any two consecutive measurement points. If it is 0, the instrument will measure as fast as possible.

9) Power Measurement Setting

Only available to nonzero span mode. With the two parameters, start frequency and end frequency, set appropriately, the power value of the specified bandwidth will be displayed above the grid border.

3.2 Display Setting

1) Grid

Select “Visible” to display grid, while “Invisible” not to display it.

2) Markers

Use mouse or touch panel to set how many markers to display. There is up to 8 for selection.

3) Active Marker(ActiveMkr)

Use mouse or touch panel to select the active marker, which can be moved with arrow keys on keyboard, mouse or touch panel to view each measurement point information.

Note: Make sure the cursor is in spectrum display area before moving the active marker.

4) Scale

Use mouse or touch panel to set current display scale from follows: Logarithm, Linear.

5) Unit

Use mouse or touch panel to select the display unit of level from follows:

Logarithm Scale: dBuV, dBmV, dBm;

Linear Scale: uV, mV, mW.

6) Y-Div.

Use mouse or touch panel to select the level per divider of Y-Axis from follows:

Logarithm Scale: 10dB, 9dB, 8dB, 7dB, 6dB, 5dB, 4dB, 3dB, 2dB, 1dB；

Linear Scale: max.x1, max.x1/2, max.x1/4, max.x1/8. (max = reference level)

3.3 MaxTrace

Press this button down to enable the active marker trace the maximum level in current spectrum curve.

3.4 MaxHold

In Cont. Sweep mode without averaging, press this button down to maintain the active marker displayed at the point where the maximum level is. A trace point is updated if a new maximum level is detected in successive sweeps.

3.5 Single Sweep(Single)

Press this button down to make the analyzer sweep once. The measurement will only be repeated if you press it again.

3.6 Continuous Sweep(Cont.)

Press this button down to make the analyzer performs sweep repeatedly, press it again will to stop it.

4 To view zero span continuous measurement results

After this measurement stopped, use four buttons on the right to the view, |◁ to view the first screen, ▷| to the last, ← to the previous and → to the next.

5 Limit Lines

The limit lines, used to examine whether the level is in the specified range or not, are set by moving the tiny solid triangle arrow outside the grid's right border in vertical.

6 Setup Save/Load

6.1 Setup Save(SaveSetup)

Left click "SaveSetup" button to open a pop-up dialog, input a character string as the name of file to save the setup and then click the "Save" button to confirm it.

6.2 Setup Load(LoadSetup)

Left click "LoadSetup" button to open a pop-up dialog, select the file to load and then click the "Open" button to import the setup in this file.

7 Results Save/Load

7.1 Results Save(SaveResults)

Left click “SaveResults” button to open a pop-up dialog, input a character string as the name of file to save the measurement results and then click the ”Save” button to confirm it.

7.2 Results Load(LoadResults)

Left click “LoadResults” button to open a pop-up dialog, select the file to load and then click the ”Open” button to import the measurement results in this file.

Section 5 DVB-C RF Demodulation and Measurement

1 Connection

As below:

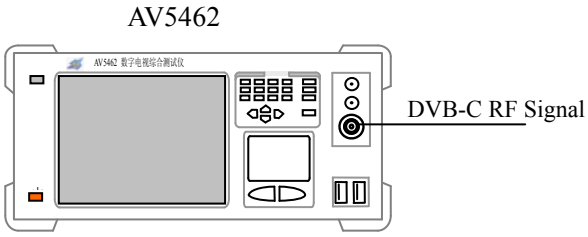

Figure 2-6 Connection for DVB-C RF Demodulation and Measurement

2 Screen Layout

As shown in Figure 2-7, the screen of DVB-C RF demodulation and measurement can be divided into control panel on the right and the results display area on the left. The results display area contains 5 parts: channel-scan display area, channel spectrum display area, constellation display area, lock status display area and key parameters measurement values display area.

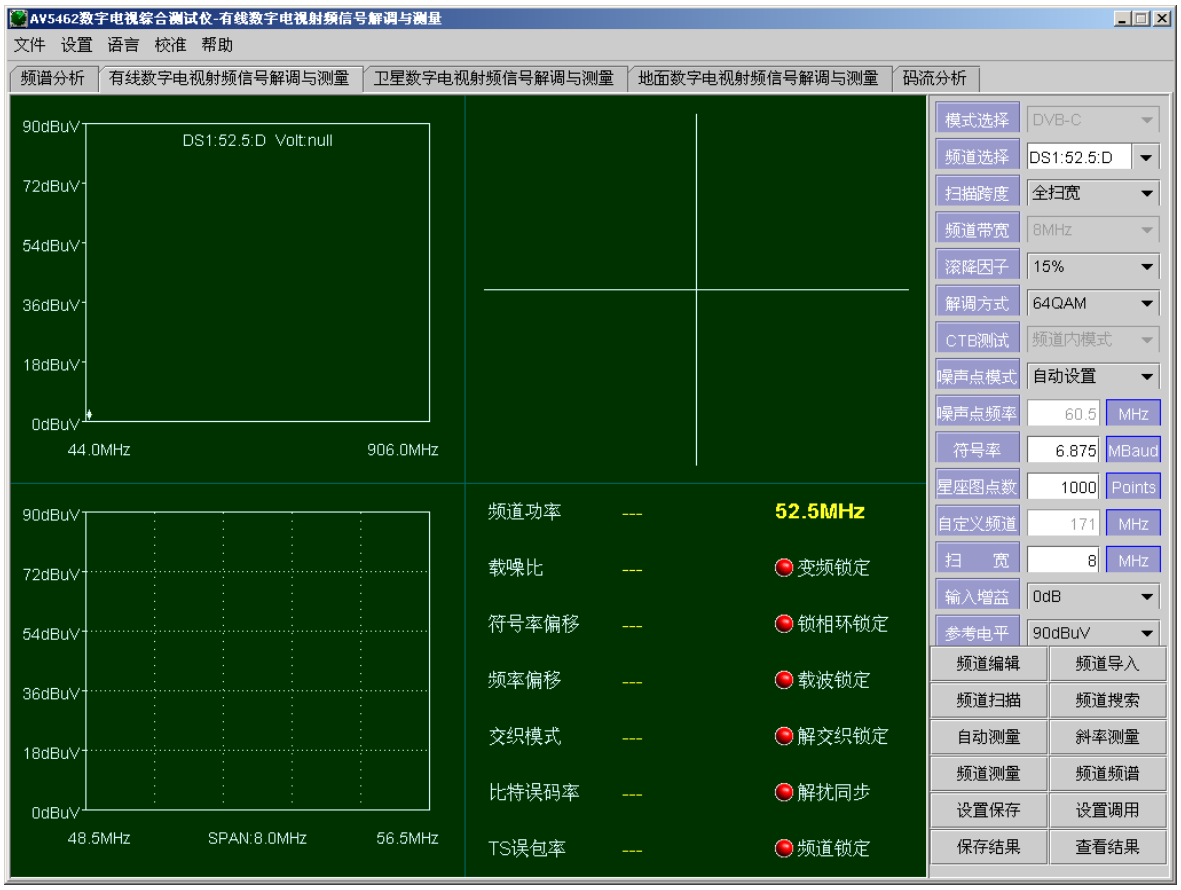

Figure 2-7 Screen of DVB-C RF Demodulation and Measurement

3 Channels Edit(ChEdit)

Click this button to open the dialog for channel edit.

See Figure 2-8:

Figure 2-8 Dialog for Channels Edit of DVB-C

3.1 Channel Number(ChNum)

Double click a cell in this column into editing state, insert a character string, then press “Enter” /”OK” key to commit it.

3.2 Center Frequency

Double click a cell in this column into editing state, input a number, then press “Enter”/”OK” key to commit it, the video carrier frequency and audio carrier frequency (useful in analog mode) will be updated automatically. If the frequency set already exists in the default channel-table, its default channel number will be displayed in the right adjacent cell.

3.3 Digital/Analog Select

Left click a cell in this column, a pop-up list will open, use mouse or touch panel to select the channel mode from follows: Digital, Analog.

3.4 Demodulation

Left click a cell in this column, a pop-up list will open, use mouse or touch panel to set the

demodulation type from follows: 4QAM, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM。

3.5 Symbol Rate(SR)

Only available to digital channel.

Double click one cell in the column into edit state, input a number, then press “Enter”/”OK” key to commit it.

3.6 Enable

Left click any cell in the column to select or unselect the channel represented by the row for saving or download operation.

3.7 Select All

To select all the valid channels in current table.

3.8 Unselect All

To unselect all the channels selected.

3.9 Ascending

To sort channels in the table in ascending order according to center frequency.

3.10 Open File

Left click “OpenFile” button to open a pop-up dialog, select the file to load and then click the ”Open” button to import the channel table in this file.

3.11 Save File

Left click “SaveFile” button to open a pop-up dialog, input a character string as the name of file to save the channel table and then click the ”Save” button to confirm it.

3.12 Channels Import(ImportChTbl)

Download the channel table into current control panel’s setup.

4 Channels Import(ImportChTbl)

Left click “ImportChTbl” button to open a pop-up dialog, select the file to load and then click the ”Open” button to import the channel table in this file.

5 Channel Scan(ChScan)

5.1 Span

Use mouse or touch panel to select the span from follows: Full Span, 10MHz, 30MHz, 100MHz, 300MHz. The center frequency of scan is the current channel’s center frequency, which is ignored in full span.

5.2 Scan

Click “ChScan” button to start channel scan, the level at each channel’s center frequency will be measured and displayed in the graph to assist in distinguishing valid channels from invalid ones, digital channel or analog. Click this button again will stop the scan. After moving the cursor into its display area, the marker can be moved by arrow keys to view the level at each channel’s center frequency. To zoom it in or out, just double click in its display area.

6 Channel Search

6.1 Thresholds

Left click “Set” menu and select “Channel Scan Configuration” item to open the setting dialog:

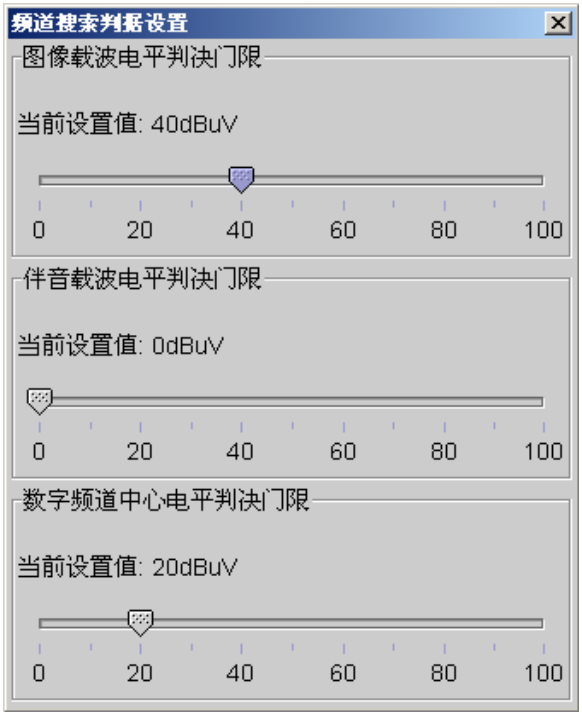

Figure 2-9 Channel Scan Configuration Dialog

Drag the sliders to set video, audio carrier level thresholds for analog channel, center frequency level threshold for digital channel.

6.2 Operation

Press “ChSearch” button down to start channel search, a pop-up window with the searching result will open when it’s done.

Note: The channel search is according to current channel-table.

7 Auto Measurement(AutoMeas)

Measure every channel in current channel-table with their parameters set in the table.

A pop-up window of the results table will display when the measurement is done.

8 Tilt Measurement(TiltMeas)

Click “TiltMeas” button to open the dialog for tilt measurement.

See Figure 2-10:

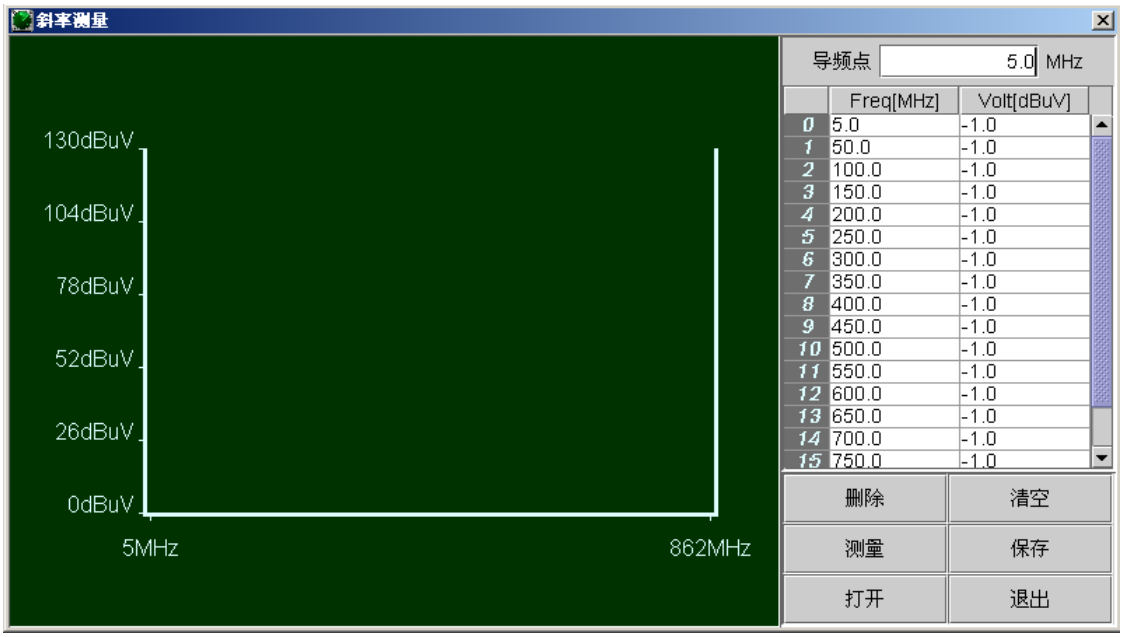

Figure 2-10 Dialog for Tilt Measurement

8.1 Frequency Setting

It’s able to measure up to 20 frequency points in the range of [5，862]MHz.

1) To add a measurement point

Input a frequency value in the textbox above the table on the left, press ”Enter”/”Ok” key to commit it, if the value is valid, it will be added into the table immediately.

2) To modify the measurement points in the table

Left click on the row in which the frequency to be modified resides, the value will be displayed in the textbox, modify it and press “Enter”/”OK” to commit, if the input is valid, the value in the table will be updated immediately.

3) To remove a measurement point from the table

Left click the row in which the point value resides and then press the “Delete” button to remove it.

4) To remove all measurement points in table

Left click “Clear” button to remove all measurement points in table.

8.2 Measurement

Click “Meas” button to start tilt measurement, the results will be displayed in the left graph area and the levels of each frequency points will be shown in the setting table.

8.3 Save

Left click “Save” button to open a pop-up dialog, input a character string as the name of file to save the setup and measurement results and then click the ”Save” button to confirm.

8.4 Open

Left click “Open” button to open a pop-up dialog, select the file to load and click the “Open” button to import measurement points set and its measurement results.

8.5 Exit

Left click “Exit” to close the dialog of tilt measurement, if the measurement is not completed yet, it will be stopped at first.

Note: The tilt measurement’s setup will be saved into a default file automatically while the dialog is about to close. Next time, when the dialog is open, the setup saved in the default file will be imported automatically.

9 Channel Measurement(ChMeas)

The results of channel measurement including:

1) Digital channel:

Channel Power, CNR, Lock Status, SR Offset, Frequency Offset, Interleaver Mode, MSE, BER, Uncorrected TS Packets Count;

2) Analog channel:

Video Carrier Level, Audio Carrier Level, AV Carrier Level Ratio, Video Carrier Offset, AV Carrier Offset, Adjacent Channel Suppression, HUM, CSO CTB.

For digital channel, after it’s locked, the “TS Analysis” module can be brought up to do protocol analysis on the demodulated transport stream.

9.1 Settings

1) Channel Setting

a. User-defined

Select “UserDefCh” in the “ChSel” drop list, input a value in “UserDefCh” textbox below as the channel’s center frequency.

Unit: MHz

Range: [44, 906]

Decimal digits: Up to 3

b. To select from channel-table

The “ChSel” drop list contains all the channels from channel-table, click any channel item to set it as current channel.

c. Quick Input

Use the number key to select the channel in the drop list. For example, “1” represents standard channel “DS1:52.5” and “101” for the supplemental channel “Z1:115.0”.

Note: A three digits number with “1” at its left end is for supplemental channel selection.

Available only when the default channel-table is used.

2) Roll-off

Use mouse or touch panel to select a roll-off factor for current channel demodulation from follows:

a. 12%(For J.83B & 256QAM)

b. 13%(For J.83C)

c. 15%(For J.83A)

d. 18%(For J.83B & 64QAM)

3) Modulation

Use mouse or touch panel to select the modulation type of current channel from follows: 4QAM, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM.

4) Composite Triple Beat(CTB) Measurement

The instrument provides two methods of reference channel setting for CTB measurement:

a. Self Mode

Use current channel as the reference. During tip “<! To turn off ch carrier.!>” show, the current channel carrier should be turn off.

b. Another Channel

To select another channel from the “CTBMeas” drop list as the reference, which should be blank.

Only available to analog channel.

5) Noise Reference Point Setting

Use mouse or touch panel to select the setting mode from follows:

a. Auto

$F_{noise} = F_{ch} + BW_{ch}$

F_{noise}: The frequency of noise reference point

F_{ch}: The center frequency of current channel

BW_{ch}: The bandwidth of current channel

b. Manual

To set the noise reference point in the “NoiseFreq” textbox and press the “Enter”/”OK” key to commit it.

Unit: MHz

Range: [1, 2200]

Decimal digits: Up to 3

6) Symbol Rate(SR)

Used to set the SR for current channel demodulation.

Unit: MBaud

Range: (0，6.875)

Decimal digits: Up to 3

7) Constellation Display Points(ConstPts)

To set the maximum points displayed in constellation display area.

Range: [1000，5000]

9.2 Measurement

Press “ChMeas’ button down to start channel measurement. To stop current measurement, press this button again.

Double click in constellation display area to zoom in or out the display.

10 Channel Spectrum Sweep(ChSpect)

10.1 Settings

1) Center frequency

i.e. the center Frequency of current channel.

2) Span

a) Set in “Span” textbox (MHz);

Or

b) To change the span with up/down arrow keys at a 8MHz step when the cursor is in channel spectrum display area.

10.2 To Sweep

Press “ChSpect” button to start channel spectrum sweep, to stop it, just press the button again.

Move the cursor into channel spectrum display area and double click it to zoom in the display or zoom out it, left click the mouse in this area or press left/right arrow keys to view the information of each measured point.

11 Input Gain Select(InputGain)

Amplify or attenuate the DVB-C RF signal to a proper level range before it is fed into demodulation module.

12 Reference Level Select(RefLevel)

The reference level is shared by channel scan, channel spectrum sweep and tilt measurement.

To achieve a better performance, the reference level should be set above the maximum level detected with 5-10dB margin.

13 Setup Save/Load

Left click “SaveSetup” button to open a pop-up dialog, input a character string as the name of file to save the setup and then click the ”Save” button to confirm it.

Left click “LoadSetup” button to open a pop-up dialog, select the file to load and then click the ”Open” button to import the setup in this file.

14 Results Save/Load

Left click “SaveResults” button to open a pop-up dialog, input a character string as the name of file to save the measurement results and then click the ”Save” button to confirm it.

Left click “LoadResults” button to open a pop-up dialog, select the file to load and then click the ”Open” button to import the measurement results in this file.

Section 6 DVB-S RF Demodulation and Measurement

1 Connection

As below:

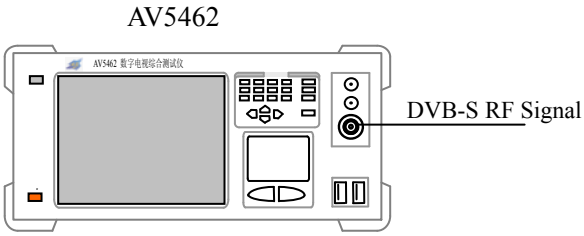

Figure 2-11 Connection for DVB-S RF Demodulation and Measurement

2 Screen Layout

As shown in figure 2-12, the screen of DVB-S RF demodulation and measurement can be divided into control panel, channel edit and scan panel, channel spectrum display area, constellation display area, lock status display area and key parameters measurement results display area.

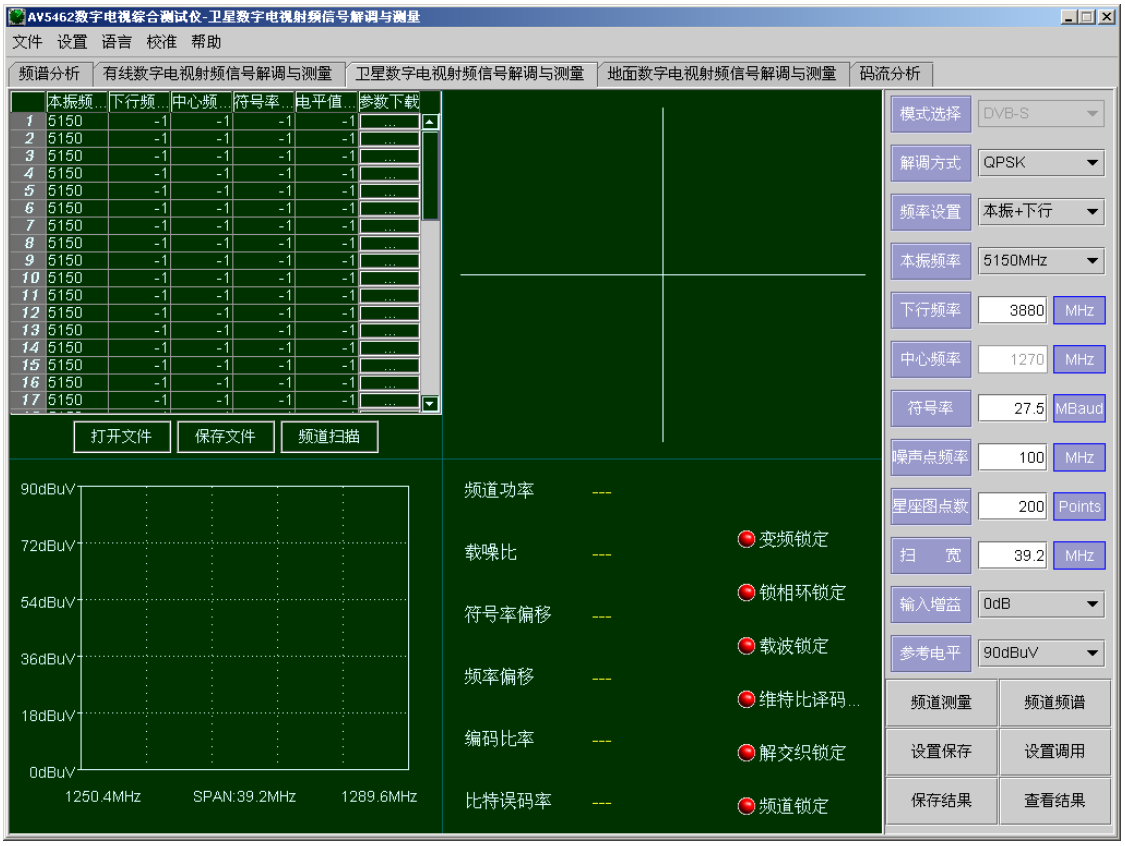

Figure 2-12 Screen of DVB-S RF Test and Measurement

3 Channel Edit and Scan

To build a channel-table, save it into a specified file, download any valid channel in the table into control panel or do channel scan.

3.1 Center Frequency

Two ways provided to set center frequency:

1) Down Link Frequency(DL)+Local Oscillator Frequency(LO)

In this mode, the LO should be set at first and then is the DL.

a. LO Select

Left click a LO cell, select the LO frequency from the pop-up drop list.

Unit: MHz

b. DL Set

Double click a DL cell to enter editing state, input a number and press “Enter”/”OK” key to commit. If the value is valid, the center frequency will be updated according to LO.

Unit: MHz

Range: [3000,4200] @ LO 5150

[3020，4220] @ LO 5170

[1170，12900] @ LO 10750

2） Direct Mode

Double click a Center Frequency cell to enter editing state, input a number and press “Enter”/”OK” to commit. If the value is valid, the input will be accepted and the DL is updated automatically.

Unit: MHz

Range: [950, 2150]MHz

3.2 Symbol Rate(SR)

Double click a SR cell to enter editing state, input a number and press “Enter”/”OK” key to commit.

Unit: MBaud

Range: [1, 45]

Decimal digits: Up to 3

3.3 Save Channel-table

Left click “SaveChTbl” button to open a pop-up dialog, input a character string as the name of file to save the channel-table and then click the ”Save” button to confirm.

3.4 Open Channel-table

Left click “OpenChTbl” button to open a pop-up dialog, select a file to load and click the “Open” button to import the channel table from this file.

3.5 Channel Scan

Left click “ChScan” button to start channel scan, the level at each channel’s center frequency will be measured and displayed in the table.

Level Unit: dBuV

3.6 Parameters Download

Left click “Download” button at the right of a row, in which a channel’s parameters reside, to download this channel into the control panel.

4 Channel Measurement

The measurement results contains Channel Power, CNR, SR Offset, Frequency Offset, Code Rate, BER and Uncorrected TS Packets Count.

After the channel is locked, TS module can be brought up to do the TS analysis on current stream demodulated.

4.1 Settings

1) Center Frequency and Symbol Rate

Two methods provided to set center frequency and symbol rate respectively.

a. Auto

Download from channel table;

b. Manual

Refer to channel edit.

2) Noise Reference Point Setting

To set the noise reference frequency in the “NoiseFreq” textbox and press the “Enter”/”OK” key to commit.

Unit: MHz

Range: [1, 2200]

Decimal digits: Up to 3

3) Constellation Display Points(ConstPts)

To set the maximum points displayed in constellation display area.

Range: [100，1000]

4.2 Measurement

Press “ChMeas" button down to start channel measurement. To stop it, just press this button again.

Double click in constellation display area to zoom in/out the display.

5 Channel Spectrum Sweep(ChSpect)

5.1 Settings

1) Center Frequency

i.e. the center Frequency of current channel.

3) Span

The span is determined by the center frequency of current channel and its symbol rate.

$BW_{ch} = SR \times 1.35$

$F_{start} = F_c - BW_{ch} /2$

$F_{end} = F_c + BW_{ch} /2$

BW_{ch}: the bandwidth of current channel

F_{start}: the start frequency of sweep

F_{end}: the end frequency of sweep

F_c: the center frequency of current channel

a) Set in “Span” textbox (MHz);

Or

b) To change the span with up/down arrow keys at a BW_{ch} step when the cursor is in channel spectrum display area.

5.2 To Sweep

Press “ChSpect” button to start channel spectrum sweep, to stop it, just press the button again.

Move the cursor into channel spectrum display area and double click it to zoom in the display or zoom out it, left click the mouse in this area or press left/right arrow keys to view the information of each measured point.

6 Input Gain Select(InputGain)

Amplify or attenuate the DVB-S RF signal to a proper level range before it is fed into demodulation module.

7 Reference Level Select(RefLevel)

The reference level is shared by channel scan, channel spectrum sweep and tilt measurement.

To achieve a better performance, the reference level should be set above the maximum level detected with 5-10dB margin.

8 Setup Save/Load

Left click “SaveSetup” button to open a pop-up dialog, input a character string as the name of file to save the setup and then click the ”Save” button to confirm it.

Left click “LoadSetup” button to open a pop-up dialog, select the file to load and then click the ”Open” button to import the setup in this file.

9 Results Save/Load

Left click “SaveResults” button to open a pop-up dialog, input a character string as the name of file to save the measurement results and then click the ”Save” button to confirm it.

Left click “LoadResults” button to open a pop-up dialog, select the file to load and then click the ”Open” button to import the measurement results in this file.

Section 7 DMB-TH RF Demodulation and Measurement

1 Connection

As below:

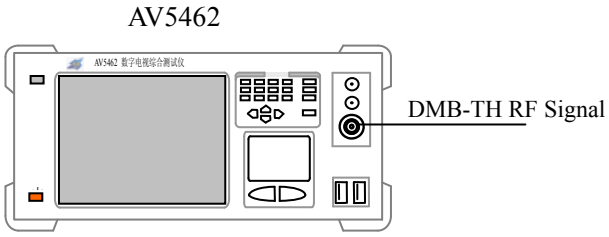

Figure 2-13 Connection for DMB-TH RF Demodulation and Measurement

2 Screen Layout

As shown in figure 2-14, the screen of DMB-TH RF demodulation and measurement can be divided into control panel, channel scan display area, channel spectrum display area, lock status display area and key parameters measurement results display area.

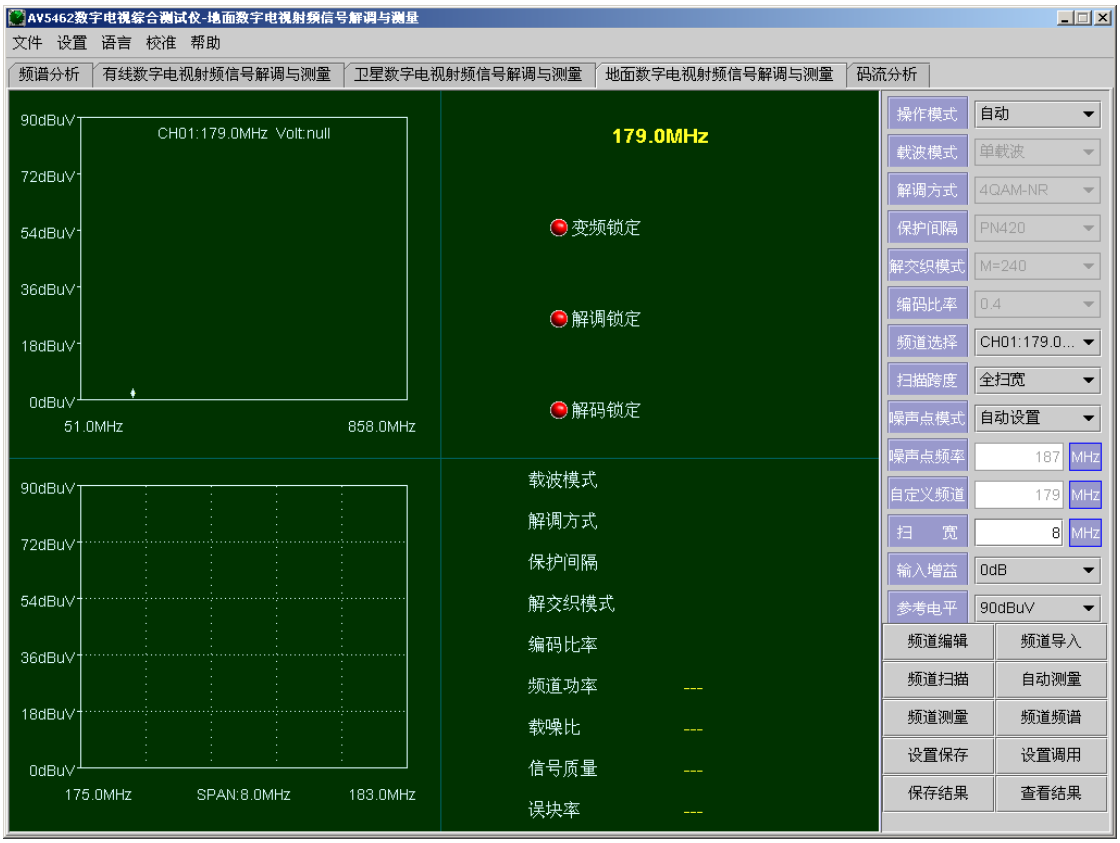

Figure 2-14 Screen of DMB-TH RF Demodulation and Measurement

3 Channels Edit(ChEdit)

Left click “ChEdit” button to open the pop-up dialog for channel edit, to add a new channel, the channel’s center frequency, demodulation and decoding parameters should be set.

4 Channels Import(ChImport)

Left click “ImportChTbl” button to open a pop-up dialog, select the file to load and then click the ”Open” button to import the channel table in this file.

5 Channel Scan

5.1 Span

Use mouse or touch panel to select the span from follows: Full Span, 10MHz, 30MHz, 100MHz, 300MHz. The center frequency of scan is the current channel’s center frequency, which is ignored in full span.

5.2 Scan

Left clicks the “ChScan” button to start channel scan, the level at each channel’s center frequency will be measured and displayed in the graph to assist in distinguishing between valid channels and invalid ones, digital channel or analog one. Click this button again will stop the scan. After moving the cursor

into its display area, the marker can be moved by arrow keys to view the level at each channel's center frequency. To zoom it in or out, just double click in its display area.

6 Auto Measurement(AutoMeas)

Measure every channel in current channel table with their parameters set in the table.

A pop-up window of the results table will display when the measurement is done.

7 Channel Measurement(ChMeas)

The measurement results contains Channel Power, CNR, SNR, Error Block Ratio. If it is in auto operation mode, Carrier Mode, Demodulation, PN, Interleaver Mode and Code Rate will be detected automatically. As soon as the channel is full locked, the TS module can be brought up to do the TS analysis on stream decoded.

7.1 Settings

1) Operation Mode(OperMode)

a. Auto

In this mode, step 2）to 6）will be ignored, the parameters related is to be detected automatically in channel measurement process.

b. Manual

In this mode, step 2）to 6）will be set appropriately，refer all valid sets to 《GB20600-2006 Framing structure, channel coding and modulation for digital television terrestrial broadcasting system》.

2) Carrier Mode

Use mouse or touch panel to select the carrier mode from follows: Single Carrier, Multi-Carrier.

3) Modulation

User mouse or touch panel to select the modulation type from follows: 4QAM-NR, 4QAM, 16QAM, 32QAM, 64QAM.

4) Frame Header Mode(FrameHeader)

User mouse or touch panel to select the frame header mode from follows: PN420, PN595, PN945.

5) Interleaver Mode

Use mouse or touch panel to select the interleaver mode from follows: M=240, M=720.

6) Code Rate

Use mouse or touch panel to select the code rate from follows: 0.4, 0.6, 0.8.

7) Channel Setting

a. User-defined

Select “UserDefCh” in the “ChSel” drop list, input a value in “UserDefCh” textbox below as the channel’s center frequency.

Unit: MHz

Range: [44, 906]

Decimal digits: Up to 3

b. To select from channel-table

The “ChSel” drop list contains all the channels from channel-table, click any channel item to set it as current channel.

8) Noise Reference Point Setting

Two methods provided to set noise reference point as below:

a. Auto

$F_{noise} = F_{ch} + BW_{ch}$

F_{noise}: The frequency of noise reference point

F_{ch}: The center frequency of current channel

BW_{ch}: The bandwidth of current channel

b. Manual

To set the noise reference frequency in the “NoiseFreq” textbox and press the “Enter”/”OK” key to commit it.

Unit: MHz

Range: [1, 2200]

Decimal digits: Up to 3

7.2 Measurement

Press “ChMeas’ button down to start channel measurement. To stop it, press this button again.

8 Channel Spectrum Sweep(ChSpect)

8.1 Settings

1) Center frequency

i.e. the center Frequency of current channel.

2) Span

a) Set in “Span” textbox (MHz);

Or

b) To change the span with up/down arrow keys at a 8MHz step when the cursor is in channel spectrum display area.

8.2 To Sweep

Press “ChSpect” button to start channel spectrum sweep, to stop it, just press the button again.

Move the cursor into channel spectrum display area and double click it to zoom in the display or zoom out it, left click the mouse in this area or press left/right arrow keys to view the information of each measured point.

9 Input Gain Select(InputGain)

Amplify or attenuate the DVB-C RF signal to a proper level range before it is fed into demodulation module.

10 Reference Level Select(RefLevel)

The reference level is shared by channel scan, channel spectrum sweep and tilt measurement.

To achieve a better performance, the reference level should be set above the maximum level detected with 5-10dB margin.

11 Setup Save/Load

Left click “SaveSetup” button to open a pop-up dialog, input a character string as the name of file to save the setup and then click the ”Save” button to confirm it.

Left click “LoadSetup” button to open a pop-up dialog, select the file to load and then click the ”Open” button to import the setup in this file.

12 Results Save/Load

Left click “SaveResults” button to open a pop-up dialog, input a character string as the name of file to save the measurement results and then click the ”Save” button to confirm it.

Left click “LoadResults” button to open a pop-up dialog, select the file to load and then click the ”Open” button to import the measurement results in this file.

Section 8 TS Analysis

1 Connection

The connection for transport stream(TS) real-time analysis is shown in Figure 2-15. To monitoring the TS

demodulated, decoded from DTV RF input, the “Internal TS” item in “Set“ menu should be selected, while select the “External TS” item to analyze TS input directly from outside.

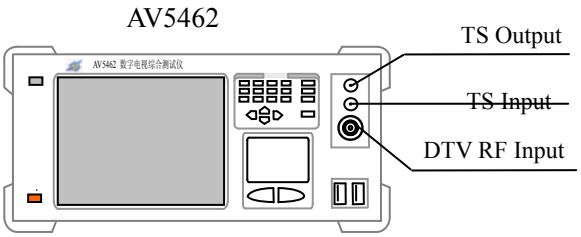

Figure 2-15 Connection for TS Real-Time Analysis

2 Screen Layout

The main window of TS analysis is shown as below:

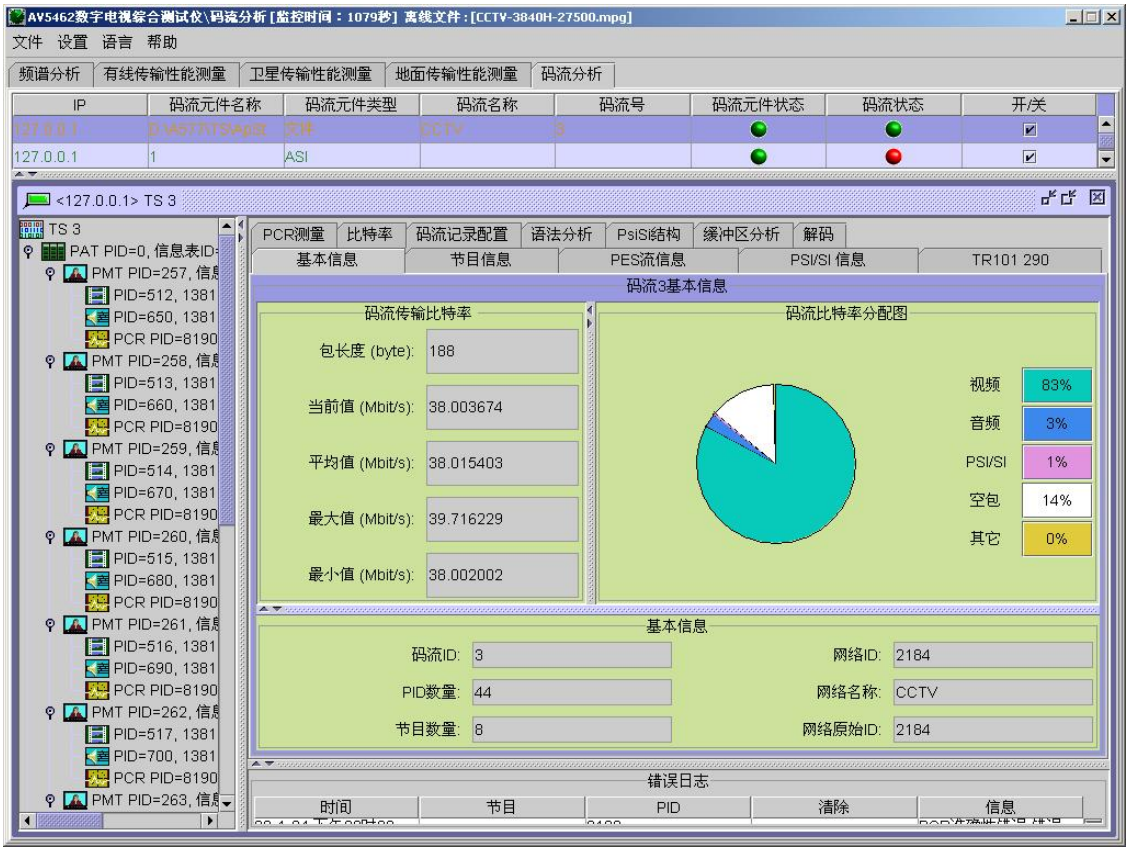

Figure 2-16 Main Window of TS Analysis

3 Analysis of Live TS

To analyze the live TS input from outside or demodulated from the DTV RF input.

4 Analysis of Offline TS

To analyze the TS data saved in disk, it’s helpful to review the TS content and locate errors.

1) As shown below, use mouse or touch panel to right click the row whose “Device Type” is “File”, select the “Select Offline File” item in the popup menu to open the dialog for “Select Offline File”.

Figure 2-17 Streams Status Window

2) Select the file to analyze and then click the “Start” button.

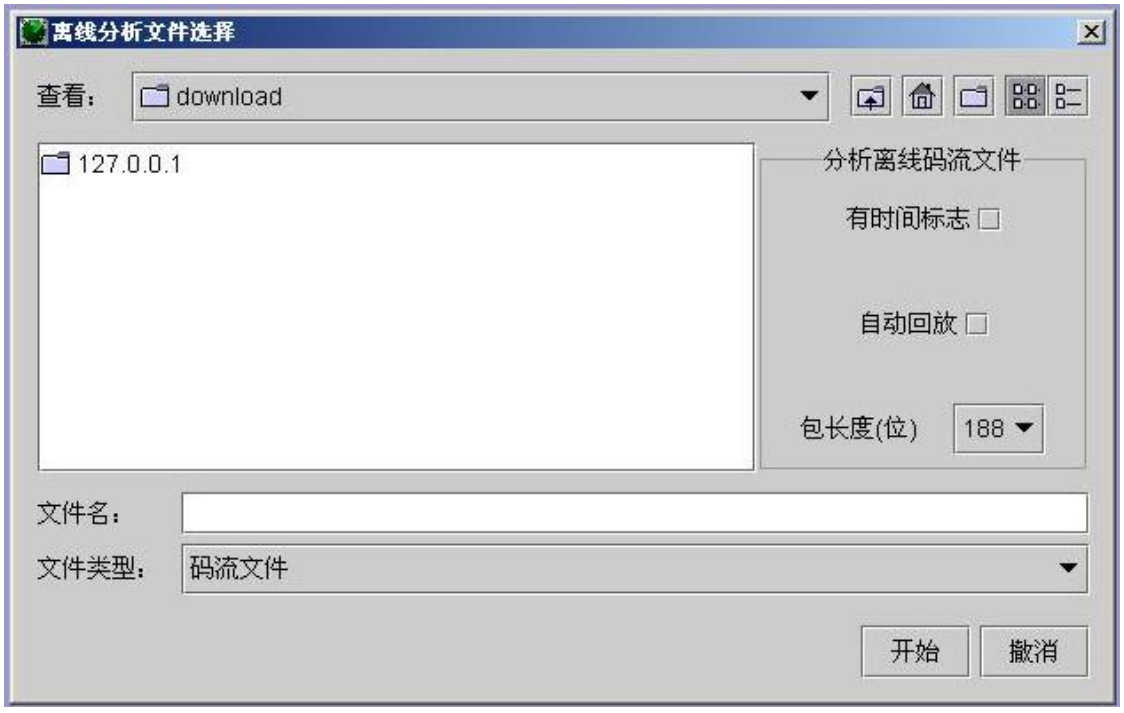

Figure 2-18 Dialog for “Select Offline File”

Note:

a) If TS recorded with timestamp, “Timestamp” item must be selected.

b) Make sure the packet length select is in compliance with the TS recorded.

c) Usually, the file recorded is of a short time, so the “Auto Repeat” item should be selected.

5 Analysis Modules

5.1 Streams Status

As shown in figure 2-17, each row in the table represents a stream’s status, which is indicated by icons with different colors, green for normal, red for abnormal and yellow for unknown.

The “On/Off” switch on the right is used to enable TS analysis or disable it.

When the initialization of TS analysis is done, the background of the row in which the TS reside will turn to a brighter color, double click the row to open the window of monitoring as shown in Figure

2-16.

5.2 TS Tree Structure

The TS tree structure is on the left of transport stream analysis main window, click the solid right arrow ▸ on its right border to expand as below:

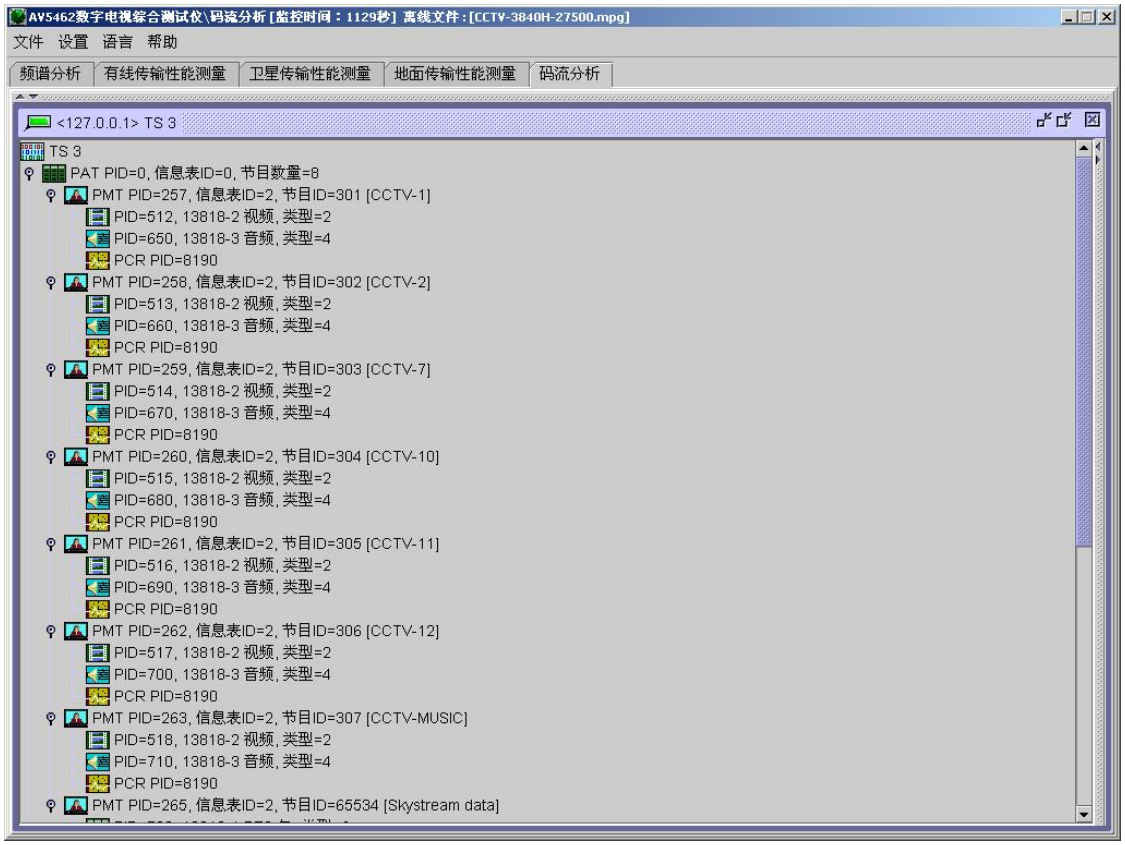

Figure 2-19 TS Multiplexed Structure

Showing information:

1) Transport Stream Identifier(TS ID) and program number;
2) Program Map Table Packet Identifier(PMT PID), program ID, program name, elementary stream(ES) type and its PID, Program Clock Reference(PCR) PID and (entitlement control message)ECM PID;
3) Program Specific Information/Service Information(PSI/SI) type, PSI/SI PID and its table_id;
4) Unreferenced PID, which is contained in current TS but unidentified.

By clicking the  icon at the left side of the TS tree one of its branch will open or close. If there is more than one program stream in the TS, it is very easy to display the information about any one of the program streams.

Video icon  ,

Audio icon  ,

Data icon  ,

PCR PID icon  ,

ECM PID icon 

5.3 Basic Information

See Figure 2-20.

Showing information:

1) Bitrate

Bitrate of Transport Stream

Package Length: Identifying 188/204 bytes TS package;

Current Value: Current transport stream bitrate (Mbps);

Average Value: Average transport stream bitrate (Mbps);

Max. Value: Maximum transport stream bitrate (Mbps);

Min. Value: Minimum transport stream bitrate (Mbps).

2) TS Bitrate pie chart displaying whole bitrate components with one hundred percent occupation.

Video with cyan show

Audio with blue show

PSI/SI tables with powder show

Null package with white show

Others with yellow show

3) TS Basic Information

TS ID: A unique number to identify the TS.

PID number: The number of PIDs contained in current TS.

Program number: The number of programs carried in current TS.

Network ID: The unique number to identify the delivery system.

Network name: The name of the delivery system.

Original Network ID: The unique number to identify the originating delivery system.

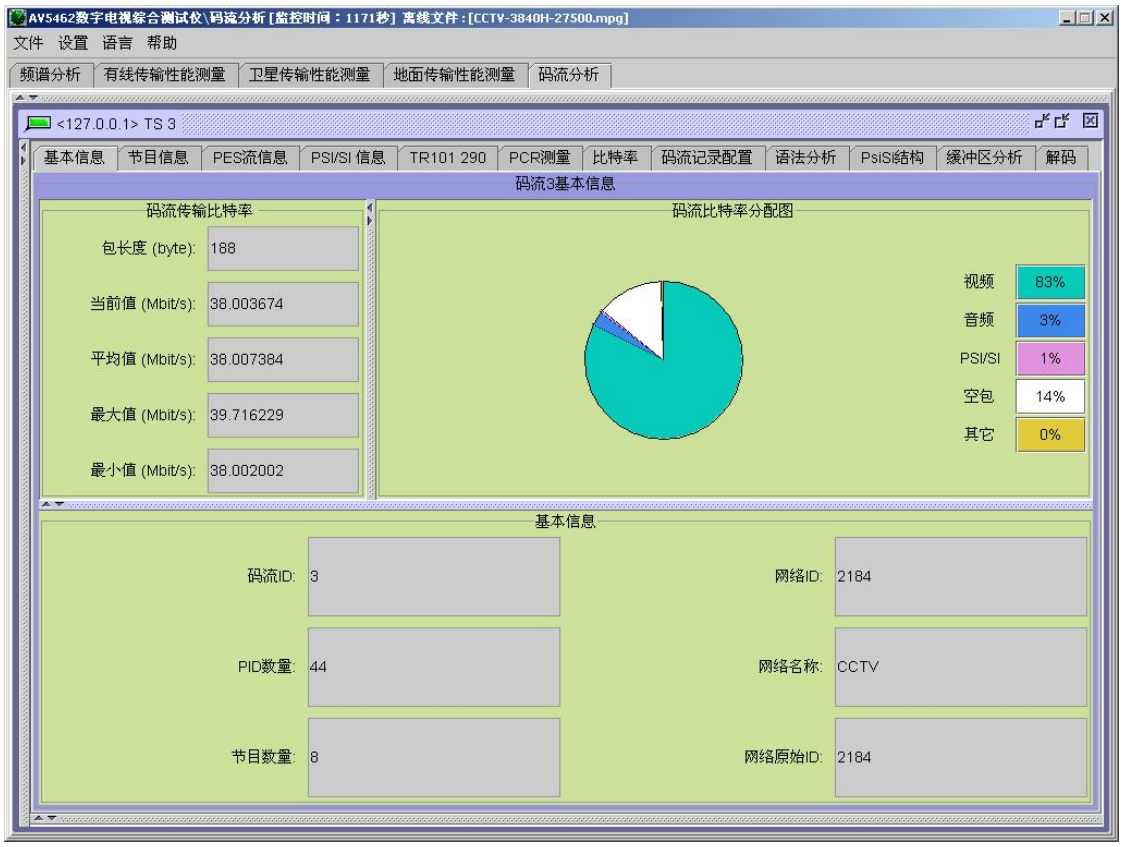

Figure 2-20 Basic Information of TS

5.4 Program Information

The program information window contains all of the program information that is contained in a transport stream. Click the "Program" tab to display detailed information in the "Program Information" window below:

Figure 2-21 Programs Information of TS

Showing information can be divided into:

1) Program information

Program ID, program name, provider name, PMT PID, PCR PID, rate(Mbit/s), encryption, running status and program type;

Click on any row in the table to view the events information of the program in the window below it.

2) Events information

Event ID, encryption, start time, duration, running status, language, event name, and event description.

For example：

Event ID：101

Encryption：No

Start time：2008/12/23 19:30:00

Duration：00:30:00

Running status：running

Language：eng

Event name：Dialogue

Event description：The brief recommendation of program

5.5 Packeted Elementary Stream(PES) Information

See Figure 2-22.

Figure 2-22 PES Information of TS

Showing information:

1) PES Basic Information

PES PID: To identify the packets assigned to the PES;

Type: PES type;

Service ID: The ID of service this PES belongs to;

Packets: Current number of PES packets received;

Bandwidth(%): The occupation of PES packets in current TS;

Rate(Mbit/s): The bit rate of data used to carry the PES;

Left click any row in the table to view the PES header information in the south window below.

2) PES Header Information

PID: To identify the packets to carry the PES;

Program Number: The ID of program this PES belongs to;

PacketStartCodePrefix: 0x000001, used to identify the start of PES packet;

Stream ID: The ID used to identify the stream type;

Packet Length: To specify the number of bytes in the PES packet following the last byte of the field. "variable length" is only used to video elementary stream because its length is not fixed;

Scramble Ctrl: To indicate the scrambling mode of the PES packet payload;

Priority Flag: To indicate the priority of the payload in this PES packet;

Align Ind.: To indicate that the PES packet header is immediately followed by the video start code or audio syncword indicated in the data_stream_alignment_descriptor if this descriptor is present;

Copyright: To indicate whether the payload contained in the PES is protected by copyright or not;

Original: To indicate PES packet payload is an original or a copy.

5.6 PSI/SI Information

See Figure 2-23.

Figure 2-23 PSI/SI of TS

Showing Information:

Type: PSI(such as PAT, PMT, CAT, TSDT); SI(such as BAT, DIT, EIT, NIT, RST, SDT, SIT, ST, TDT and TOT);

PID: The PID assigned to PSI/SI;

Table ID : Identification number of PSI or SI table;

Packets: The current total number of packets received with a PID and Table ID;

Bitrate (Mbit/s): The transport bit rate of the a PID and TableID.

5.7 TR 101 290 Error Monitoring

According to ETSI TR 101 290 standard of error monitoring for DVB for detection of cable, satellite, and terrestrial delivery systems of an MPEG-2 transport stream, and evaluation of its quality in transportation. Three error priorities, including 27 errors, are defined by the standard for monitoring MPEG-2/PSI, DVB/SI and PCR.

1) First priority: basic error monitoring which must ensure the proper decode of a transport stream.
2) Second priority: Continuous or periodic monitoring of transport stream, mostly of PCR (Program Clock Reference).
3) Third priority: application dependant monitoring used in some applications such as DVB/SI to ensure service information which is passed to end user.

See Figure 2-24.

Figure 2-24 TR101 290 Error Monitoring Window

5.7.1 Error Statistics

The Error Statistics report is displayed in a first priority, second priority and third priority window. Every error includes three parts: error name, choice box, and counter. The error counter has three colors, which are:

- The green means no error;
- The red means error;
- The yellow means an error in that "error name category" but the system is unable to define an exact counter number.

The error counter begins counting with the first error found and continues until the transport stream is shut off. To clear the error report count within a particular transport stream, right-click on the transport stream ID (in the Transport stream tree window) and a pop-up window will open displaying all three priorities. You may clear each error count individually.

5.7.2 Monitoring Errors Selection

The user can enable any one of 27 errors in three priorities. The default is all 27 errors selected. When the user wants to change the default setting, press the “ChangeTesting” button in the window (the three

priorities will be changed to white backgrounds in the errors statistic window). Click one or more choice box and press the “OK” button to exit.

5.7.3 PID Monitoring Select

To view or change individual "PID" tests, click the “PID Testing” button at the bottom of the "Statistics Report" window and a pop-up "PID Test Table" window will open. Select each desired PID testing parameter, and then click “OK” to exit. The default configuration is that all of the error categories are selected except the PID error testing. When the PID error category is selected the user needs to input a maximum value for the testing interval, the default is 5.0 second.

See Figure 2-25.

Figure 2-25 PID Monitoring Selection Dialog

5.7.4 The Configuration of TS Testing Parameters

To view or change the "TS Test configuration", click the "TS Testing" button at the bottom of the "Statistics Report" window and a pop-up window will open. To change the default configuration the user only need to enter the desired testing parameters (Attr Value) into right column. Click “Commit” to exit. Press "Cancel" to cancel changes and exit.

See Figure 2-26.

Figure 2-26 The Configuration Dialog of TS Testing Parameters

5.8 PCR Measurement

1) The measurement of the Program Clock Reference (PCR) includes :

- PCR Accuracy (PCR_AC): The PCR Accuracy is the difference of real PCR value and PCR value carried in the transport stream. Its tolerance is 500 ns in ISO/IEC 13818-1[1].
- PCR Frequency Offset: The PCR Frequency Offset is the difference of the original program clock frequency and the received program clock frequency. Its tolerance is 810 Hz or 30 ppm in ISO/IEC 13818-1[1].
- PCR Overall Jitter: The PCR Overall Jitter is the difference between the real PCR arrival time (at the measurement point and the supposed PCR arrival time. Its tolerance is 25s in ISO/IEC 13818-1[1]. The PCR overall jitter (PCR_OJ) should be zero if the value of PCR_AC is inside 500 ns.
- PCR Drift Rate: The PCR drift rate measures the low frequency component of the PCR frequency

offset (the high frequency component is measured by PCR overall jitter). Its tolerance is 75 mHz/s@27MHz or 10 ppm/hour.

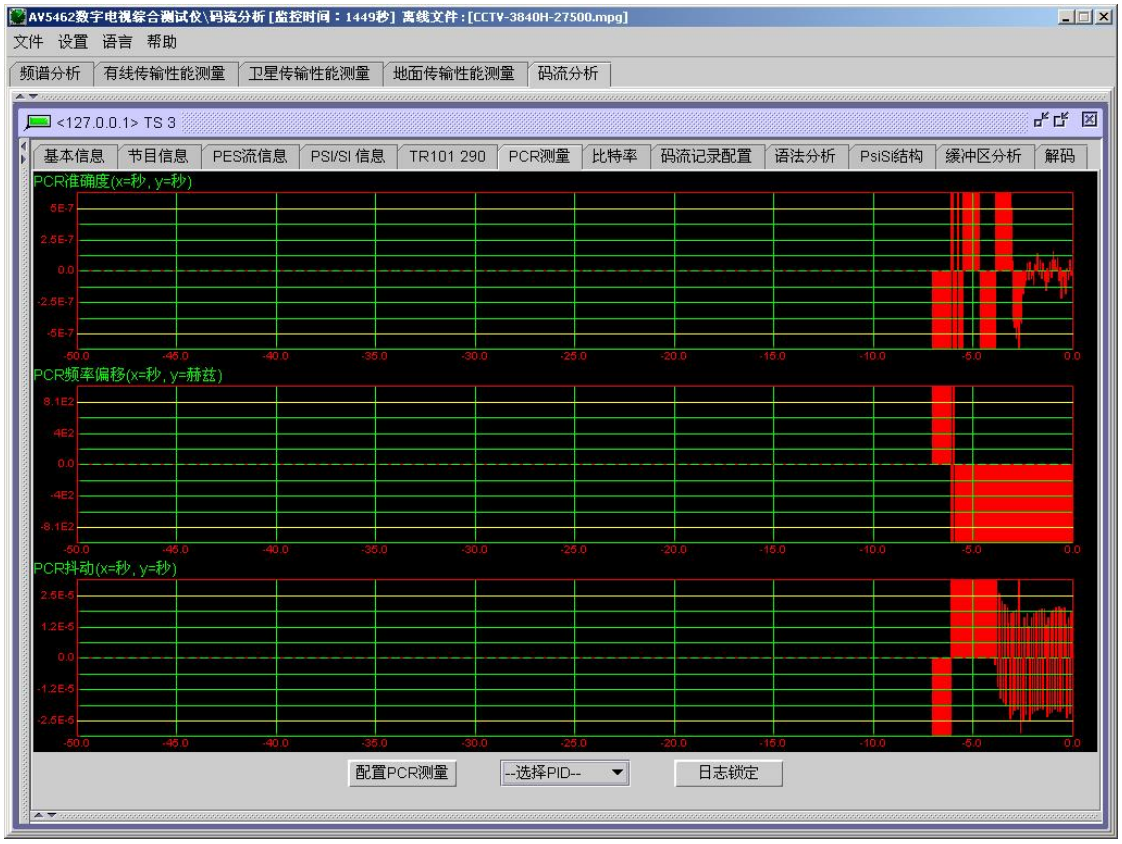

Figure 2-27 PCR Measurement Window

2) PCR Measurement Chart:

See Figure 2-27 above.

The PCR measurement chart is divided to three sub-windows, which display PCR_AC, PCR_FO, PCR_OJ . In each sub-window the X-axis is the time coordinate (unit = one second), and the Y-axis is value coordinate. The measurement unit of PCR_AC is the nanosecond (ns). The measurement unit of PCR_FO is Hertz (Hz). The measurement unit of PCR_OJ is microsecond (s). Every sub-window is divided into two parts, upper and lower. The vertical middle point on each display is the zero point. The upper half is positive and the lower half is negative. There are two yellow limit lines in every window, one in the upper half (positive limit) and one in the lower half (negative limit). Each display should be centered on the zero reference line in each window.

3) PCR Monitoring Choice

Left click the "Select PID" button to open a pop-up window with a list of PID's, select a PID of which the PCR is to monitor.

4) PCR Monitoring Parameters Configuration

To display the PCR Measurement Configuration, left click the "Config PCR" button. A pop-up window will display a list of the PCR names and values to choose from.

Figure 2-28 PCR Monitoring Parameters Configuration Dialog

PCRDemarcationFrequency: the default is 1Hz;

PCRFOMax: the default is 810Hz;

PCRDRMax: the default is 0.075Hz;

PCROJMax: the default is 0.000025 second;

ExpectedTSID: the default is –1;

{PCRACMax: the default is 500ns}

5.9 Biterate

1) Bitrate Information

The "Bitrate" information window displays all program PID's, bit rates, and bandwidth percentages, including a graph of bandwidth percentage in the right hand column of the display. The "Value" column displays the bit rate for the selected PID. The "Percentage" column displays the percentage total of the selected PID of the total, and the "%Bar" displays a graphic representation of the preceding "Percentage" column.

See Figure 2-29:

Figure 2-29 Bitrate Window

2) Bitrate Configuration

Left clicking the "Config Bitrate " button on the bottom of the "Bitrate Information" window will open the Bitrate Configuration window. TS bit rate, Service bit rate, and PID bit rate can be accessed via this window. Below are five parameters you need to know well before attempting configuration.

Tau, Width of time slice, the default is 0.100000001second;

N, Number of time slice, the default is 10;

Element, Measurement unit, the default is packet;

Min, minimum bit rate, the default is 0 MHz;

Max, maximum bit rate, the default is 65535 MHz。

- TS Bitrate:

  See Figure 2-30:

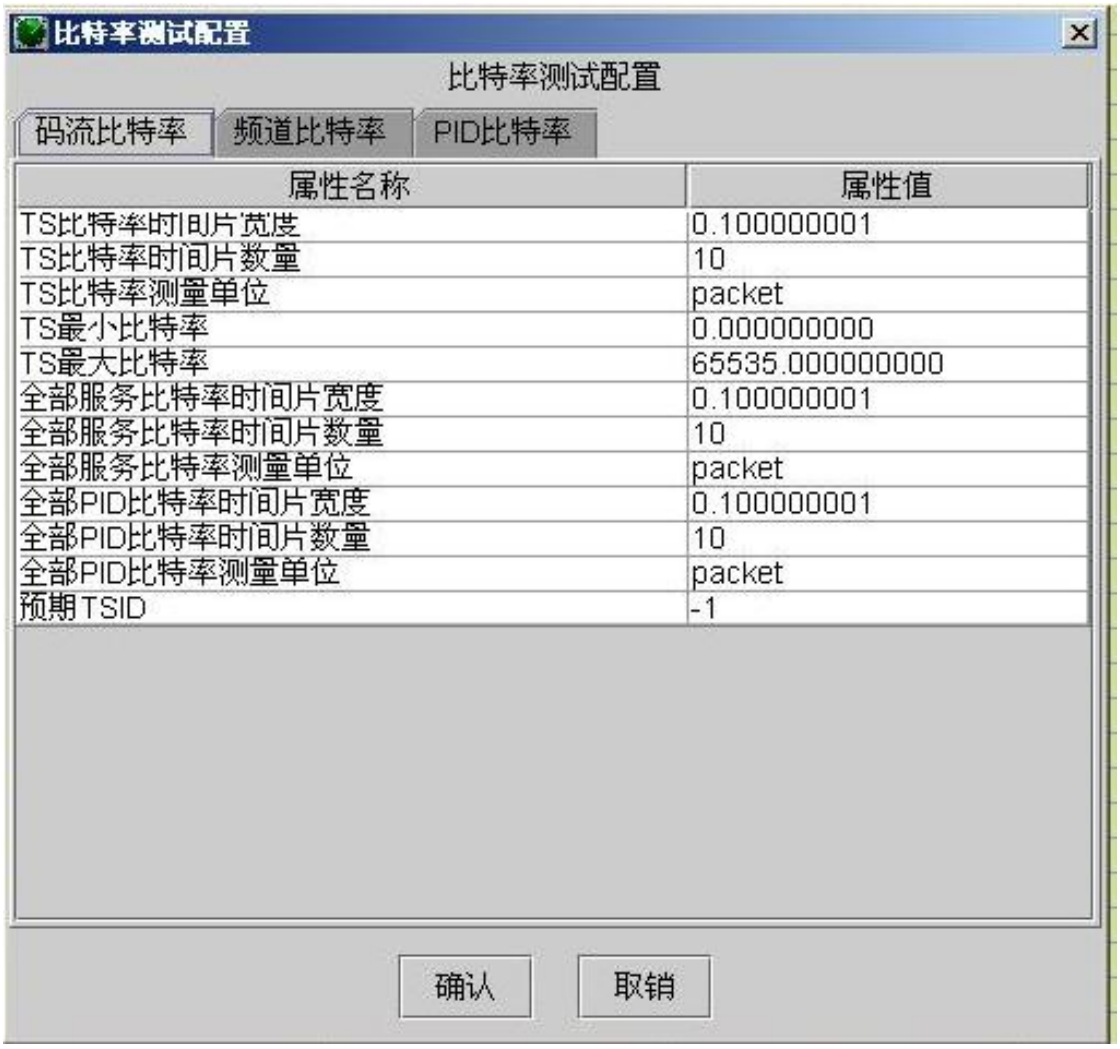

Figure 2-30 TS Bitrate Configuration Dialog

TSBitRateTau;

TSBitRateN;

TSBitRateElement;

TSBitRateMin;

TSBitRateMax;

AllServiceBitRateTau;

AllServiceBitRateN;

AllServiceBitRateElement;

AllPIDBitRateTau;

AllPIDBitRateN;

AllPIDBitRateElement;

ExpectedTSID.

- Program Bitrate :

  See Figure 2-31:

Figure 2-31 Program Bitrate Configuration Dialog

ServiceID;

BitRateTau;

BitRateN;

BitRateElement;

BitRateMin;

BitRateMax.

- PIDBitrate：

  See Figure 2-31:

Figure 2-32 PID Bitrate Configuration Dialog

PID;

BitRateTau;

BitRateN;

BitRateElement;

BitRateMin;

BitRateMax.

5.10 TS Recording

Two different methods provided to record the TS:

1.Recording trigger by time

2.Recording trigger by events

Figure 2-33 TS Recording Selection

5.10.1 Recording trigger by time

This function allows the user to delay recording time (Recording starts After). The time entered here is the current time which is compared to the time of the actual beginning of the recording. The user can select the timestamp during the recording which aids the offline analysis.

The time trigger is the user's first choice in most situations. To operate, drag the recording size slider to change file size, set delay time, check the timestamp option, then click "OK" button below to start recording.

See Figure 2-34:

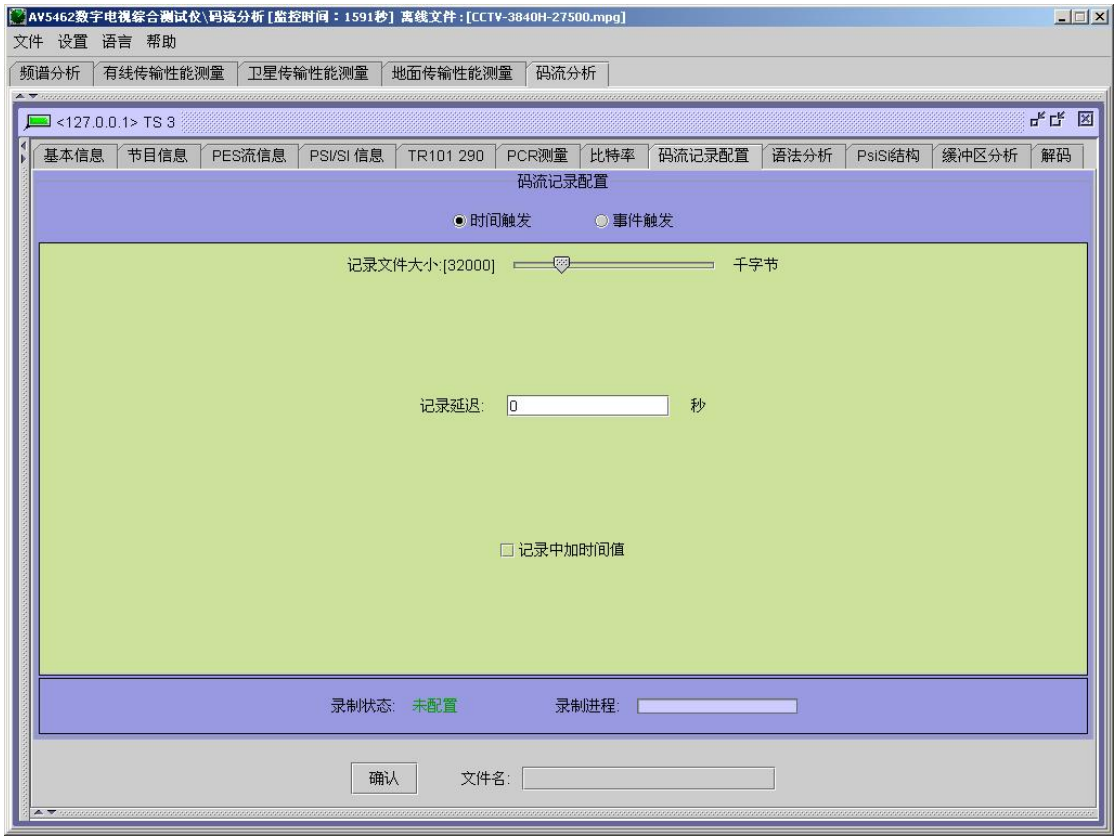

Figure 2-34 Dialog of Recording Trigger by Time

5.10.2 Recording trigger by events

Some errors will appear more frequently than others prompting the need for further analysis. By selecting an event trigger the user will be able to record these specific error events.

See

Figure:2-35:

Figure 2-35 Dialog of Recording Trigger by Events

The user clicks the “TS recording configuration” window and selects the event trigger. Drag the file size icon to set the recording size. Drag the Pre-recording icon to set the time of the event trigger. When an error occurs the analyzer will start recording TS.

There are two types of recording start points for the event trigger.

1.When an error occurs the analyzer starts recording the TS. Pre-recording time is zero.

2.Recording starts before errors occurs.

For example: with the advanced recording slider dragged to the 50% position the errors will be recorded in the middle of the recording file. In another example, if the file size has 10,000 packets and the pre-recording setting is 50%, then the recording start point will be at the 5,000 packets position.

The time stamp can be added into the recording file.

Trigger by event allows all three priority errors and any logical combination of these (AND, OR) errors, for example: the user checks PMT errors and PCR repetition errors, then selects Logic “AND”. When PMT and PCR error happen at the same time, the analyzer will start recording.

After completing the settings, click “OK” button, then the recording is now ready.

5.11 Grammar Analysis

5.11.1 TS Packets Capture

See Figure 2-36:

Figure 2-36 Grammar Analyze Configuration Dialog

First, select the "PID Type" and then select the "Number of Packets to Capture and Analyze" in the current transport stream.

Most PID choices are PSI/SI tables which have only one PID number. If the selected packet type is a PES_PKT basic stream, then there are many kinds of PID numbers: video PID, audio PID and other data PID of different types. To determine which one is a video PID, audio PID, or data PID, the TS multiplex structure tree on left side of the main window needs to be checked (Example: If the PES_PKT type and PID=600 are selected, then the selected program is a video of program ID=4161 [CCTV 1]).

After selecting your choices, click the "Capture" button. There is a visual display graph that allows you to see the progress of capturing packets. When the green bar graph completes a small popup window with the caption "Finished" is displayed. Click the "Analyze" button to enter the "Packet Structure Window" for grammar analysis.

5.11.2 Expanded Packet of Transport Stream

Clicking the "Analyze" button enters the "Grammar Analysis" window.

Figure 2-37 Grammar Analysis Window

1) Bit Value Table of Transport Stream Packet

The top half of the window shows the bit value of packets captured. Each single packet is displayed as one row of Bytes (188 bytes) expressed as hex (Example: 0x47 and 0xA9). Drag the slide bar at the bottom of the "Packet Byte Value Table" window to see the whole content of the 188 bytes.

2) Grammar Analysis

When one of the "Selected" check boxes is checked in the upper window the lower window displays an analysis in the TS bit value table. Clicking '+' or '+/-' above each of the Grammar Analysis" cells will expand the head of packet and payload. There are three colors to differentiate head of packet, payload and null (or stuffing bytes).

Expanding the "Grammar Analysis" display reveals four rows of information. The first row is the field name. In DVB standard, every field is defined including field name, field length and the signification of the bit value which are at the head of the packet, PSI/SI table carrying in payload, packet elementary stream (PES) and so on. The second row shows the content field (such as 0x0 which is PID=0x0 (hex) or PID=0 (decimalization)). The third row shows the length of field such as 13, which expresses thirteen bits. The fourth row shows the combination location of field such as 1.11-13 which means the start bit beginning in first byte (1.), the field located from eleventh bit to twenty-third bit which occupy 13 bits (.11-13). It is very easy to locate a PID in data packet according to the combination location.

Drag the slide bar under the window to see all fields. If the field name is not completely displayed, drag the column divider bars above the field name and between the columns to enlarge

or shrink the field display size.

5.12 PSI/SI Structure

See Figure 2-38:

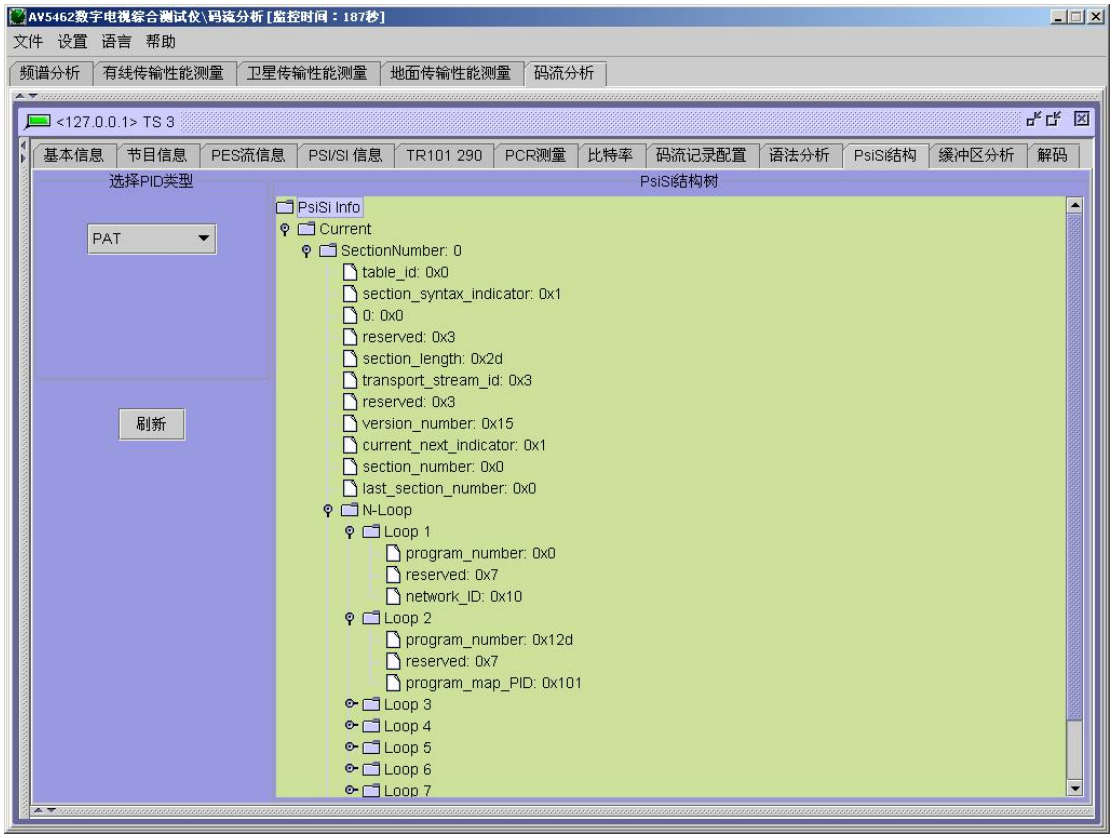

Figure 2-38 PSI/SI Structure

Open the page “PsiSi Structure” to see the window like Figure 2-38 above. First select the PID type in “Select PID Type” list located in the left, and then press “Refresh” to display the info table displayed in right window (unexpanded). The structure of whole table will be expanded step by step as you double click each table name. Every row is displayed with the field name and hex value such as table_id: 0x0.

5.13 Buffer Analysis

The every buffers are defined by ISO/IEC 13818-1 in detail.

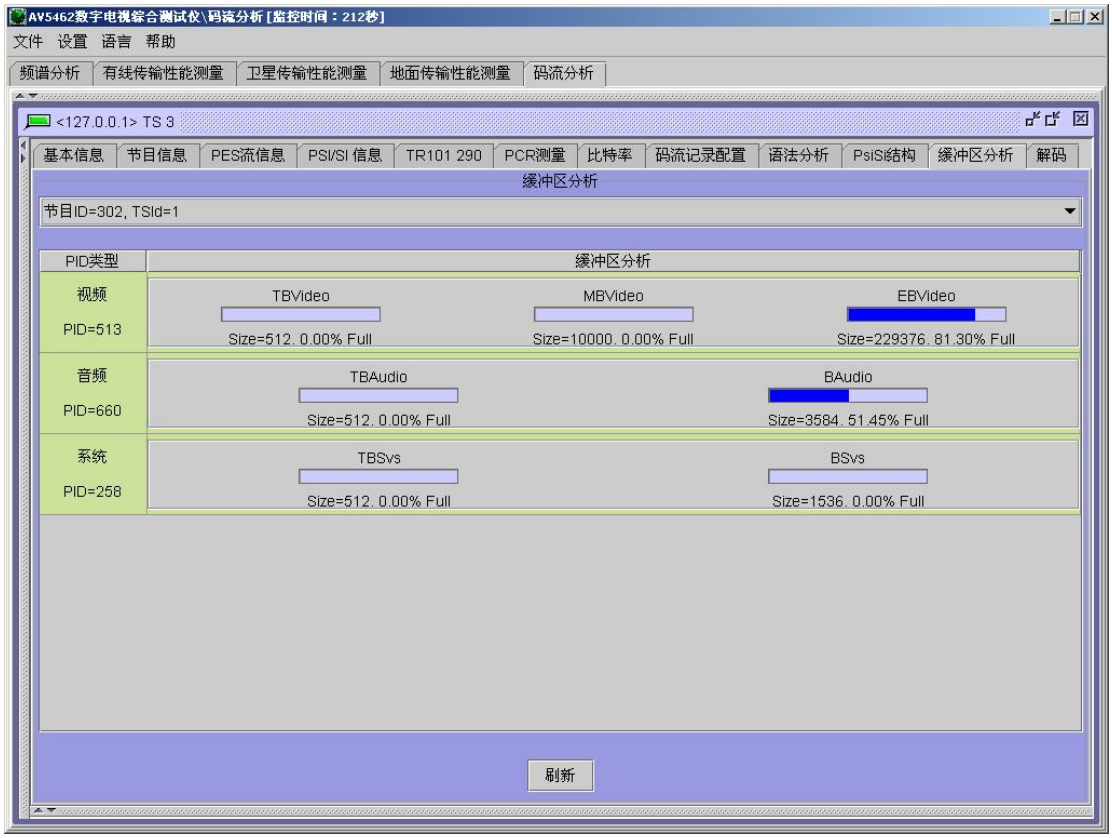

Figure 2-39 Buffer Analysis

When the “Buffer Analysis” page is opened, select a program ID from the list at the top of the window. After a few seconds each buffer display (blue) will be filled by dark blue color according to the percent of the buffer occupied. The exact amount can be clearly seen by the size number shown under each buffer display.

These buffers are divided into three categories: video buffers, audio buffers, and system buffers. In reality there are two buffers: transport buffers and main buffers. The main buffer is made up of the multiplexing buffer and the elementary stream buffer.

1) Transport Buffer:

The transport buffer includes the transport buffer for video (TBVideo), the transport buffers for audio (TBAudio0~n) and the transport buffer for the system (TBsys). The TS packets, including elementary stream packets, are delivered to the transport buffers. These also include duplicate transport stream packets and packets with no payload. Bytes that are part of the PES packet or its contents are delivered to the main buffer B for the audio elementary stream and the system data, and to the multiplexing buffer MB for video elementary streams. Other bytes are not, and may be used to control the system. Duplicate transport stream packets are not delivered to TB, MB, or TBsys.

The transport buffer (TB) size is fixed at 512 bytes.

2) The main Buffer:

The main buffer is used for the audio buffer and system buffer. For ISO/IEC 13818-7 ADTS audio, the audio buffer size is defined as follows.

Number of Channels	Buffer Size（bytes）
1-2	3584
3-8	8976
9-12	12804
13-48	51216

For other audio, the buffer size is 3584 bytes. The system buffer (Bsys) is used to put system data. Its size is 1536 bytes.

3) Multiplexing Buffer:

The multiplexing buffer (MB) is only used in the video elementary stream. If there is a PES payload packet in MB buffer and when the elementary stream buffer (EB) is not full, the PES packet is delivered to multiplexing buffer (MB). But if the elementary stream buffer (EB) is full the PES packet in transport buffer (TB) is not moved. When the last byte in some PES payload is moved from the multiplexing buffer (MB) and delivered to the elementary stream buffer (EB), all the bytes of the PES header in the multiplexing buffer are moved and discarded.

4) Elementary Stream Buffer:

The elementary stream buffer is only used for video (EBVideo).

5.14 Decode

The decode module is provided for playing the program without encryption.

See Figure 2-40.

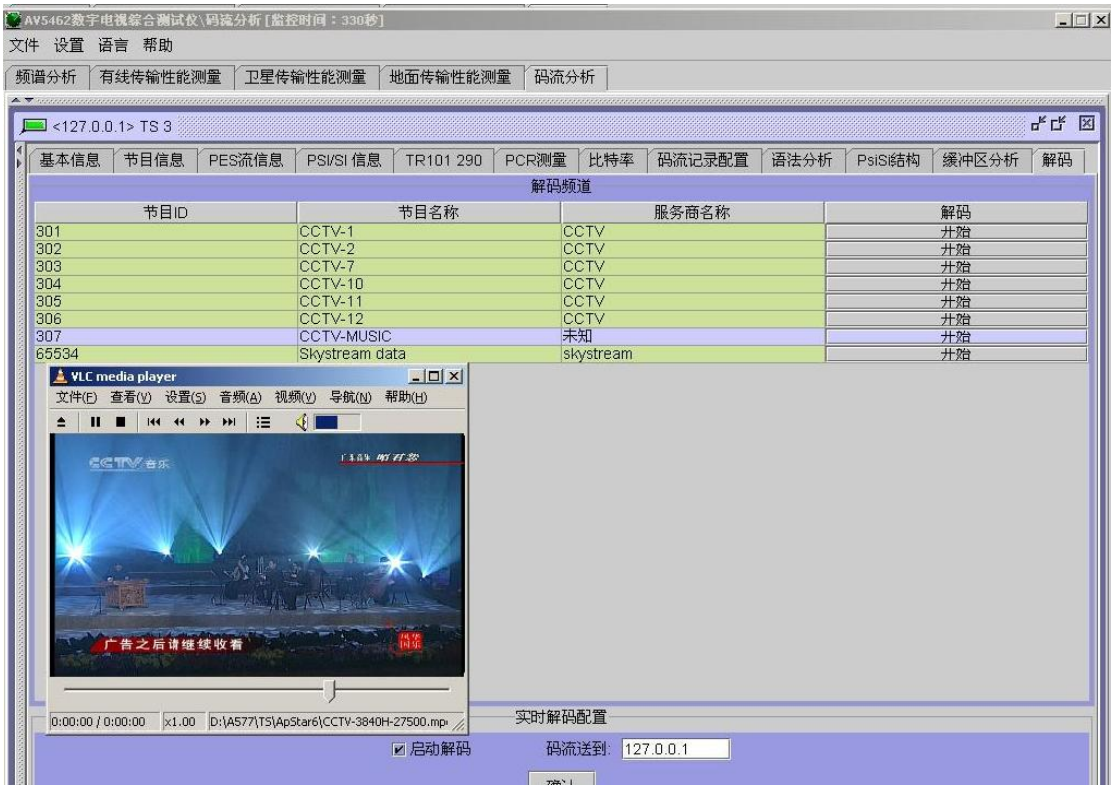

Figure 2-40 Decode

1) Select the “Decoding Enabled”, make sure the “Stream Sent to:” set with “127.0.0.1” and click “OK” button to confirm it;

2) Click “Start” button in a row in which the program to play is shown.

Section 9 Calibration

1 Connection

As below:

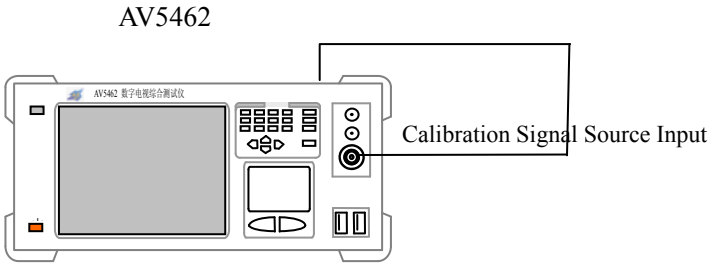

Figure 2-41 Connection for Calibration

2 Window Layout

See Figure 2-42:

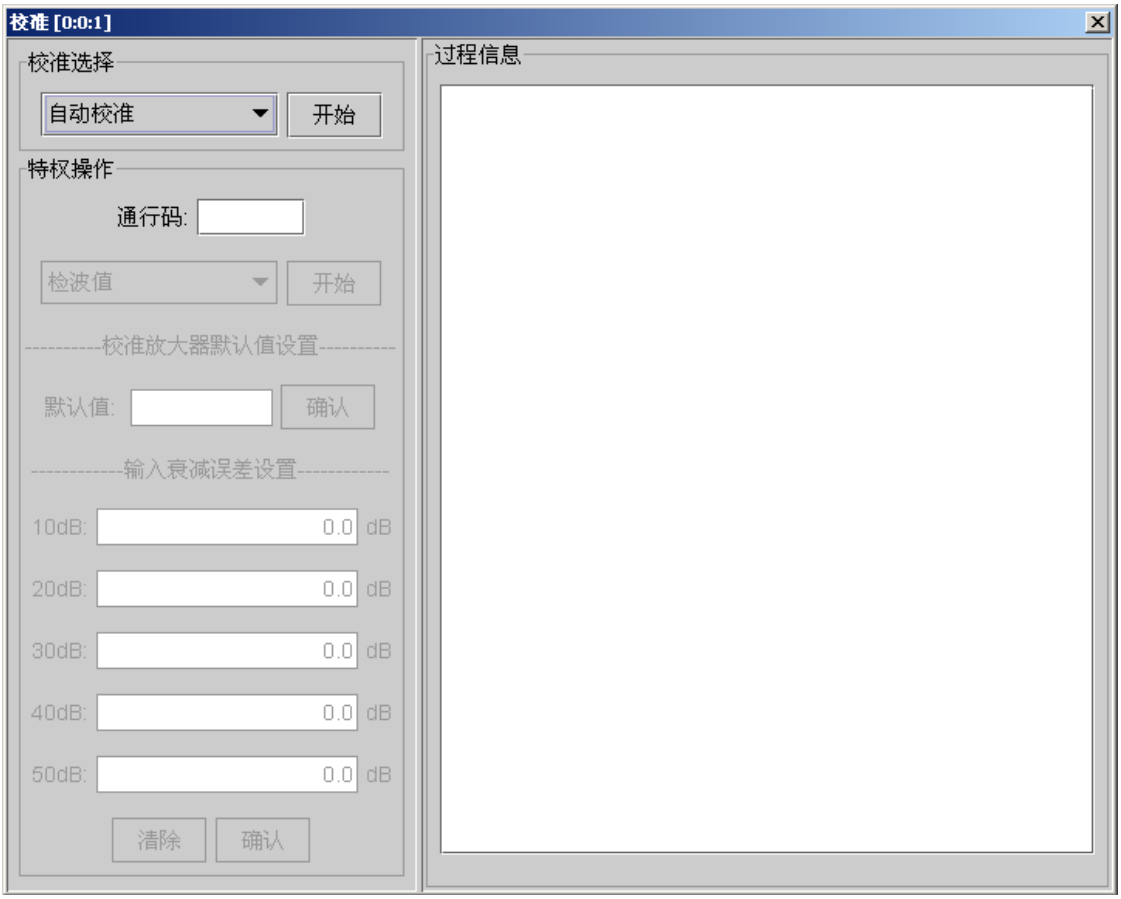

Figure 2-42 Calibration Window

3 Calibration Operation

3.1 Auto Calibrating

Select the “Auto Calibrating” item in the “To Cablibrate” drop list and click the “Start” button to start it, the messages of calibration progress will be displayed in the left window.

3.2 Individual Calibrating

Select one calibrating item in the “To Cablibrate” drop list other than “Auto Calibrating” or “Reset”, then click the “Start” button to start it.

3.3 Reset

Select this item in the “To Cablibrate” drop list and click the “Start” button to reset calibration data to original.

Section 10 Others Operation

1 Menu

1.1 File

1) Open

To select the file for offline TS analysis.

2) File Download

To download the measurement setup and results from AV5462 Analyzer through Ethernet.

3) Print

To print current screen.

4) Exit

To stop measurement process and close the main window.

1.2 Set

1) Internal 10MHz Reference Clock

Select this item to take the internal 10MHz clock as the reference clock of mixer module.

2) External 10MHz Reference Clock

Select this item to take the 10MHz clock input from outside as the reference clock of mixer module.

3) 50Ω RF Input

If characteristic impedance of the RF input cable is 50Ω, this item should be selected.

4) 75Ω RF Input

If characteristic impedance of the RF input cable is 70Ω and the 75Ω/50Ω converter is used, this item should be selected.

5) Internal TS

If the user is to make TS analysis on the TS demodulated and decoded from the RF input, select this item.

6) External TS

If the user is to make TS analysis on the TS from outside input directly, select this item.

7) Channel Scan Configuration

To configure the thresholds used in channel scan as described in Section 5 Clause 6.1 for DVB-C demodulation and measurement module.

8) TS Background Color Configuration

Click this item to open a pop-up window to configure the background color of TS table.

1.3 Language

Selected by the analyzer automatically.

1.4 Calibration

As described in Section 9.

1.5 Help

1) Content

Click it to open the User's Manual.

2) About

Click it to check the instrument brief information.

2 To load the setup automatically

When the application is about to exit, a small pop-up dialog will open to prompt the user to set current setup loaded automatically at next startup or not.

3 Log Lock

Click the "Log Lock" button at the bottom of the main window of TS Analysis to stop refreshing Error Log, Click it again to restart the refreshing.

This function is helpful to view the error log without stop analyzing process.

4 TrapView

TrapView is a tool provided to review the Error Log recorded.

4.1 Click the "TrapViewer" icon on the desktop to bring up the operation dialog as below:

Figure 2-43 Configuration Dialog of TrapView

4.2 Select the date of the log to view, click "Display" button to open the Log Information Window as below:

Figure 2-44 Log Information Window

5 Mpeg2Recorder

To record a TS file over 100Mbytes, use the tool Mpeg2Recorder under %InstallRoot%\Mpeg2Server\bin.

See Figure 2-45:

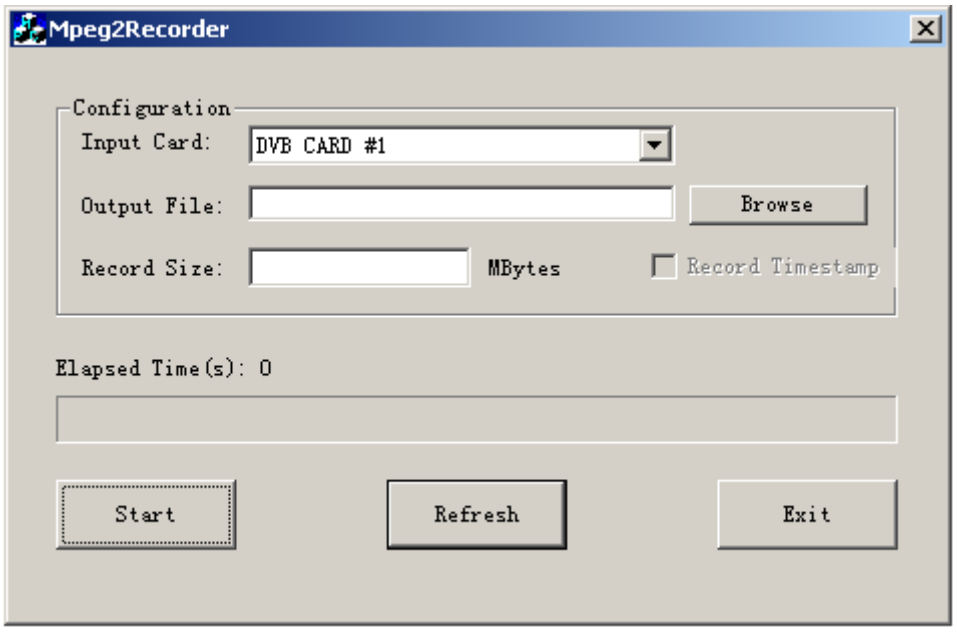

Figure 2-45 Mpeg2Recorder Window

Part 2 Technologies

Chapter 3 Specifications and Fundamentals

Section 1 Specifications

	AV5462A/B	AV5462
Spectrum Analysis		
Frequency		
Range	1MHz～1000MHz	1MHz～2200MHz
Resolution of setting	1kHz	
Span	0Hz(zero span) 10KHz～999MHz	0Hz(zero span) 10KHz～2199MHz
Reference frequency		
Accuracy	$\pm 0.5\times10^{-6}$	
Temperature effect	$\pm 2\times10^{-6}$（0℃～50℃）	
Sweep Time & Mode		
Sweep Time	auto	
Mode	single, cont.	
RBW	1KHz～3MHz in 1-3-10 sequence	
VBW	10Hz~1MHz in 1-3-10 sequence	
Phase noise	typ. < -90dBc/Hz @10KHz	
Input attenuation		
Range	0dB～50dB	0dB～50dB
Step	10dB	10dB
Internal amplifier		
Frequency range	1MHz～1000MHz	1MHz～2200MHz
Gain	14dB	
Noise factor	typ.4dB	
Maximum level input	137dBμV	137dBμV

Three order intermodulation (TOI) Intercept Point	typ.>+125dBμV	
Average noise level (No input signal, no input attenuation, span 20KHz, RBW 1KHz)	＜-116dBm	＜-116dBm (5MHz ～1.6GHz) ＜-110dBm (1.6GHz～2.2GHz)
Harmonics		
2nd harmonics	< -70dBc	
TOI	< -70dBc	
Residual Response	< -80dBm	
Level		
Logarithm scale	80dB(10dB/div) 40dB(5dB/div) 16dB(2dB/div) 8dB(1dB/div)	
Linear scale	8 divs	
Unit	dBm, dBmv, dBμV, μV, mV, μW	
Resolution of display	0.1dB	
Detecting model	sample, positive max, negative max, average	
Range	-100dBm～+20dBm	
Accuracy	typ.±1.5dB@25±5℃	
CATV Measurement		
Channel setting mode	select from channel-table or user-defined	
Standard	PAL	
Level range	20dBμV～127dBμV	
Accuracy of V/A carrier frequency offset	±1kHz	
Accuracy of the ratio of V/A carrier level	±1dB（SNR>30dB）	
Accuracy of video carrier frequency offset	±1KHz	
CNR	>60dB, resolution 0.1dB	
Prev. adjacent channel carrier suppression	>60dB, resolution 0.1dB	

Next adjacent channel carrier suppression	>60dB, resolution 0.1dB
Composite Second order Interference(CSO)	>60dB, resolution 0.1dB
Composite Triple Beat(CTB)	>60dB, resolution 0.1dB
HUM	resolution 0.01%
Tilt measurement	up to 20 measurement points
DVB-C	
Modulation	
Mode	4/16/32/64/128/256QAM ITU-T J.83 Annex A,B&C DOCSIS, EuroDOCSIS
Constellation display	4/16/32/64/128/256QAM, zoom in/out
Equalizer	auto
Digital channel power measurement	
Range	30dBμV～140dBμV
Resolution	0.1dB
Accuracy	typ.±1.0dB@(25±5℃，C/N>20dB)
Modulation error	
MER range	22dB～40dB
MER resolution	typ.±0.5dB 22dB～30dB typ.±1.0dB 30dB～35dB typ.±1.5dB 35dB～40dB
EVM	0.65％～4.1％
BER	0～1.0×10^{-8}
BER statistics	accumulative
SR	1～7MS/s
QAM analysis	
(Amplitude Imbalance)AI	0~10.0%
(Quadrature Error)QE	0~15°
(Phase Jitter)PJ	0~1.85°
(System Target Error)STE	0~0.01

(Residual Target Error)RTE	0~0.01	
DVB-S		
Frequency range		1MHz～2200MHz
Frequency resolution		1KHz
Channel set		user-defined
Channel power measurement		
Range		30dBμV ～ 120dBμV(at 8MHz BW)
Resolution		±0.1dB
Accuracy		typ.±1.0dB@(25±5℃)
Modulation		QPSK
Constellation display		QPSK
SR offset range		±960ppm
Frequency offset range		±12％×SR
Code rate		1/2, 2/3, 3/4, 5/6, 7/8, auto detect
CNR measurement		√
BER measurement		√
Uncorrected packet ratio measurement		√
DMB-TH		
Frequency range		1MHz～1000MHz
Frequency resolution		1KHz
Channel set		select from channel-table or user-defined
Carrier mode		single-carrier, multi-carrier auto detect
Modulation		4, 4-NR, 16, 32, 64QAM auto detect
Frame header mode		PN420, PN595, PN945 auto detect
Code rate		0.4, 0.6, 0.8 auto detect
Interleaver mode		240, 720 auto detect

Channel power measurement		
Range		30dBμV～120dBμV
Resolution		±0.1dB
Accuracy		typ.±1.0dB@(25±5℃)
CNR measurement		√
SNR measurement		√
Uncorrected block ratio measurement		√
Transport Stream Analysis		
	Only available to AV5462A	√
TS monitoring		
TS tree structure	To display multiplexed TS structure in a tree	
Basic information	Contains the brief statistics information of current transport stream	
Program information	Contains all of the program information that is carried in a transport stream and events information for each program	
PES information	Contains the brief information of each PES carried in a transport stream.	
PSI/SI information	Contains the brief information of all PSI/SI carried in a transport stream.	
TR101 290	Error monitoring according to ETSI TR101 290	
PCR measurement	PCR-AC, PCR-FO and PCR-OJ measurement in compliance with TR101 290	
Bitrate	Bite rate statistics	
PSI/SI structure	To display PSI/SI information in a tree structure	
TS output	ASI, BNC, 75Ω	
TS(External) Analysis		
Interface	ASI, BNC, 75Ω	
Bitrate	1～56Mbps	
Packet length	188B/204B, auto detect	
Video/Audio monitoring		
Video	Displayed on the screen	
Audio	Fed to speaker	
Front Panel		
RF input		
Interface	BNC	N
Impedance	50Ω	
VSWR	typ.<1.5	
TS input/output		

	Only available to AV5462A	√
Identify	packet length auto detect	
Interface	BNC	
Impedance	75Ω	
Input devices		
Keyboard and mouse(KM)	touch panel, mini keyboard	
USB interfaces	1xUSB2.0	
Side Panel		
Speaker	1 stereo speaker each side	
Rear Panel		
Calibration output		
Frequency	480MHz	
Level	-20dBm±0.5dB@25℃	
Internal reference clock		
Frequency	10MHz	
Accuracy	±0.5ppm	
VGA		
RS 232	9pin D-SUB	
Ethernet	2x100Mbps	
USB	2x, ver.2.0	
PS/2	shared by mouse and keyboard	
SPI	25pin D-SUB	
Power inlet	220V±10％， 50Hz	
Others		
Operating temperature	0℃～+40℃	0℃～+40℃
Storage temperature	-20℃～+60℃	
Dimension(L×W×H)	520×390×202(mm)	
Weight	10Kg	12Kg
LCD	8.4 inches, 1024 x 768 pixels, TFT	

Section 2 Fundamentals

The block diagram below shows how the instrument works.

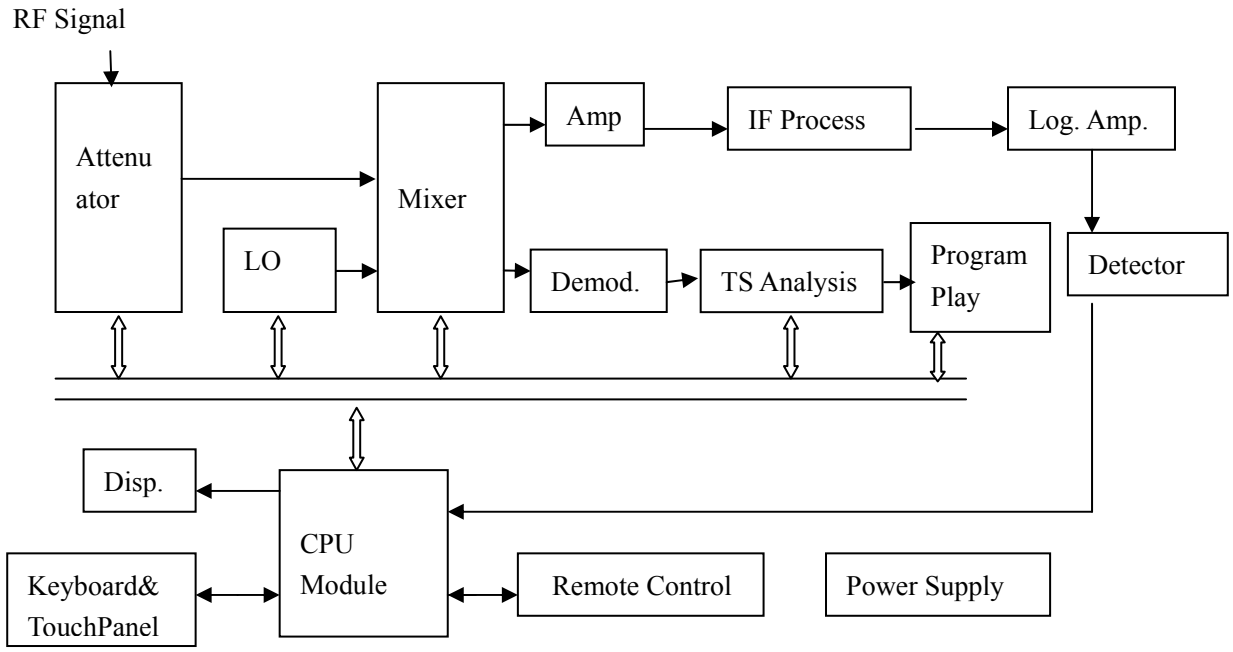

Figure 3-1 Block Diagram of AV5462

The attenuator at the input of the instrument adjusts the level of the measurement signal to the level range that the mixer can handle without overdriving it. With the input from LO(local oscillator), the mixer converts the RF input to IF signal. After the amplification, IF process and

logarithmic amplification, the IF signal is fed into the detector, then the detecting value is read and display on the screen.

Another path of input RF signal comes to the demodulation module. After demodulation and decoding, the signal is converted a ASI standard format, which is put into the next module to do TS analysis. With the information from TS analysis, the program without encryption is ready for playing.

The CPU module takes charge of controlling all the modules connected with it through buses.

Any desktop computer can remote control the analyzer with the help of VNC through ethernet.

Part 3 Maintenance

Chapter 4 Maintenance and Troubleshooting

Section 1 Maintenance

1 Maintenance

As a precision instrument, please follow the operating process strictly in operating. The shell should be keep clean from tiny substances to get inside. Keep a good draught is also necessary in operating and a cover of certain cloth to protect it from dust is needed.

The connectors on the front panel and the rear panel should be masked to keep them clean because the measurement accuracy will suffer from dirty interfaces.

2 Power Supply and ESD Requirements

Refer the details to Chapter 1.

Caution：Make sure the instrument is grounded before it is powered.

Use the power socket with ground terminal and well grounded.

If autotransformer is used, please make sure its common end is connected to the ground terminal of power plug.

Section 2 Troubleshooting

1 Troubleshooting

1.1 Black Screen

Checking flow:

a) To check if the power cord is correctly connected or not and whether the power supply is in compliance with requirement in Table 1-1;

b) Make sure the power switch on the rear panel is turnned on;

c) To check if there is a beep sound in one minute after the power button is pressed on the front panel;

d) To check the fan is working or not

If all the checks above passed, it's may be the main board' s fault;

If the fan is not work, maybe the power module has some problem;

If there is beep sound heard as c) described, the LCD may be damaged

1.2 Exceptions

If some exception occurs, the following steps will be helpful to isolate the problem:

a) If there are some external devices connected with this instrument, please make sure all the connections are correct;

b) Deal with the frequent problems with successful solutions applied before;

c) Review the operations before the exception occur to make sure all the settings is right;

d) To check all the test and measurements completed or not and the measurement results in compliance with the specification or not.

Table 4-1 Phenomena and Causes Maybe

Phenomenon	To check
Level measurement error is out of range.	To check whether the 10MHz reference clock is shared or not; To check whether the reference level is set correctly or not; To check whether the DTV input signal is accordant with the measurement module selected.
No signal	To check whether the LO signal at 0Hz is right or not; To check whether the signal is blurred or not in narrow RBW mode.
The signal's amplitude detected is not correct.	Increase the input attenuation to check whether the signal is suppressed or not; Recalibrate it, refer the details to section 9 in part 1.
The setting value is not changed.	The value input is committed only after the "Enter"/"OK" key is pressed.; The value input is invalid because it's out of range.
The indicating icon for offline TS analysis doesn't turn green.	To check the "Device Name" item in "Streams Table", if it is "ts.unknown" always, then the previous setting doesn't work, please try it again; Otherwise, to make sure the file format is right set and the "Auto Repeat" is selected.

1.3 Hardware Faults

If the analyzer works abnormally even after the steps described above having been done, it may be the hardware fault. We don't recommend the user to unpack the instrument to repair it on himself/herself because of the complexity of its circuits inside, especially during the warranty period. Instead, contact us at first time and we'll assist you to resolve the problem in time.

2 Return to Factory

When some severe problem happens and cannot be solved with telephone assistance, we recommend you sending the instrument back to factory with the cautions below:

a) Deliver it with a detailed description of the fault phenomenon;

b) Pack the instrument with ESD plastic bag to prevent damage from electrostatic discharge;

c) To put the instrument into a outer package padded with foam cushion;

d) Seal the outer package with adhesive tape and make sure it is bundled firmly;

e) Put some caution mark such as “Frangible” on the package;

f) To deliver it on precision instrument standard;

g) Reserve the delivering bill.

Caution：Don’t use other cushion material such as polystyrene globule in shipment because it will get into the instrument easily and causes some damage.