LABGEAR

DATTools v1.0.0
for DAT102, DAT103

Operating Manual

Table of Contents

1 General information

DATTools Software is intended for controlling the operation of DAT102 and DAT103. This software allows the following:

- Measuring Channel Power for Digital channels, Carrier to Noise ratios, Video Carrier levels and Vision to Audio ratios for Analog channels;
- Measuring Spectrum with scaleable Span within 45-900MHz; limits;
- Viewing Data Log pages;
- Creating and Editing Channel Plans;
- Creating and Editing Channel Templates;
- Documenting measurement results;
- Measuring Modulation Error Ratio (MER), Bit Error Ratio (BER) before and after Viterbi decoder, counting damaged packets after Reed-Solomon decoder and Constellation Diagram;
- Updating DAT102, DAT103 Analyzers firmware if necessary.

2 Installation and Launching

2.1 System requirements

- Microsoft Windows XP, Vista, or Windows 7 operating system;
- 17MB of free hard disk drive space (35 MB after installed);
- USB 2.0 Host port.

2.2 Software installation

The installation of the software is executed by **Install DATTools vX.X.X.exe** program (X.X. X - software version), which performs all the actions necessary for allocation the program to the computer hard drive.

Before installation, close all applications active on your P.C. To proceed with installation you should log in under administrator's rights.

After you have started installation, the Install Wizard window will appear. Choose the required language and click **Next** button. In the welcome window click **Next** to execute installation.

Select the folder where you will store the program files. By default, the files are saved into **C:\Program Files\LABGEAR\DATTools**. To save the files into a different folder, click the **Browse ...** button. Select the required path and click **OK**.

The following steps will action automatically. If everything is correct, the information window indicating successful installation will appear on the screen. Click **Finish** to complete the installation.

Once installation is complete, a new folder **DATTools** containing a shortcut for accessing the program will be created in the Windows **Start** menu.

2.3 Application launching

Decide how to run **DATTools** software:

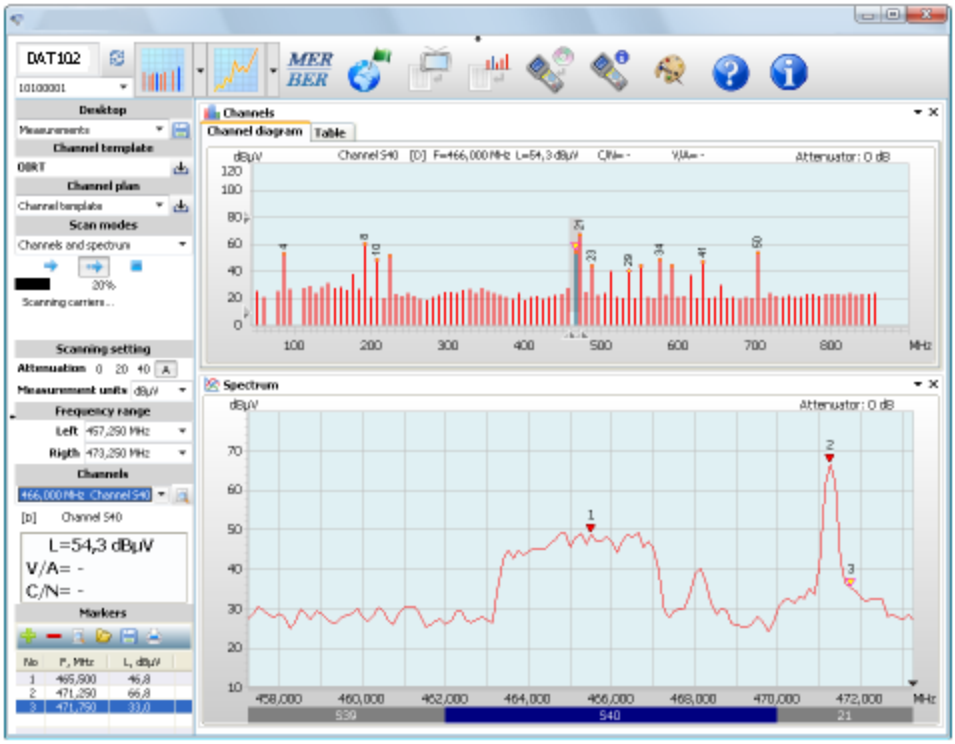
- From the Start button menu: choose **Start -> All programs -> LABGEAR -> DATTools**.
- From the desktop: choose the **DATTools** icon.

NOTE! Before you start the program, make sure that your device is connected to the computer securely, it's power is switched on, and it is in PC connection mode.

3 Main window

3.1 Main window overview

After starting the program, the main **DATTools** window will appear on your PC's display. Location of the window depends on the user settings. The Default looks like:



The main window consists of 3 parts:

1. Navigation bar;
2. Control panel;
3. Workspace.

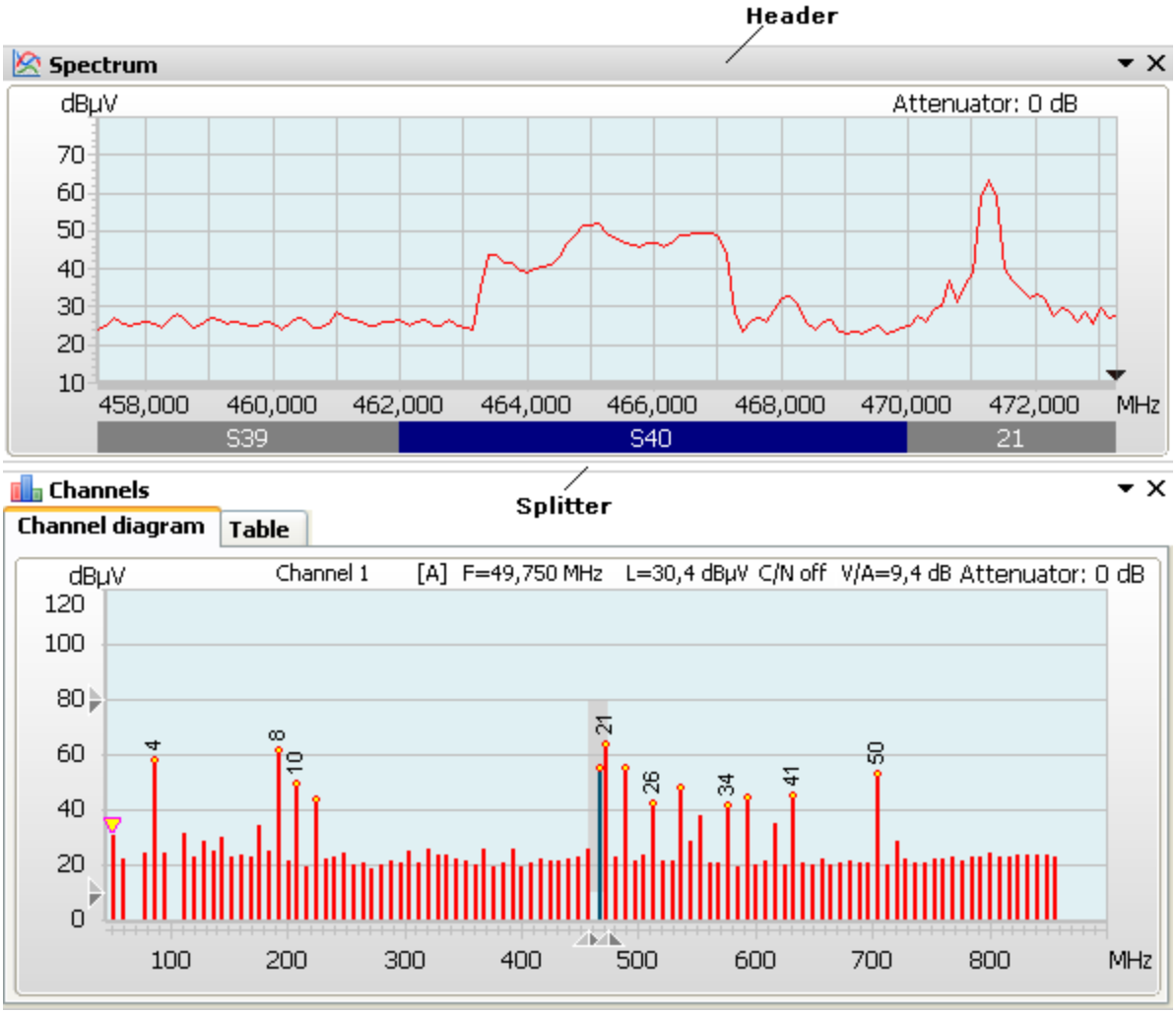
The following components can be placed in the workspace:

- Spectrum diagram;
- Channels diagram;
- Channel plan manager;
- Channel template manager;
- Data log manager.

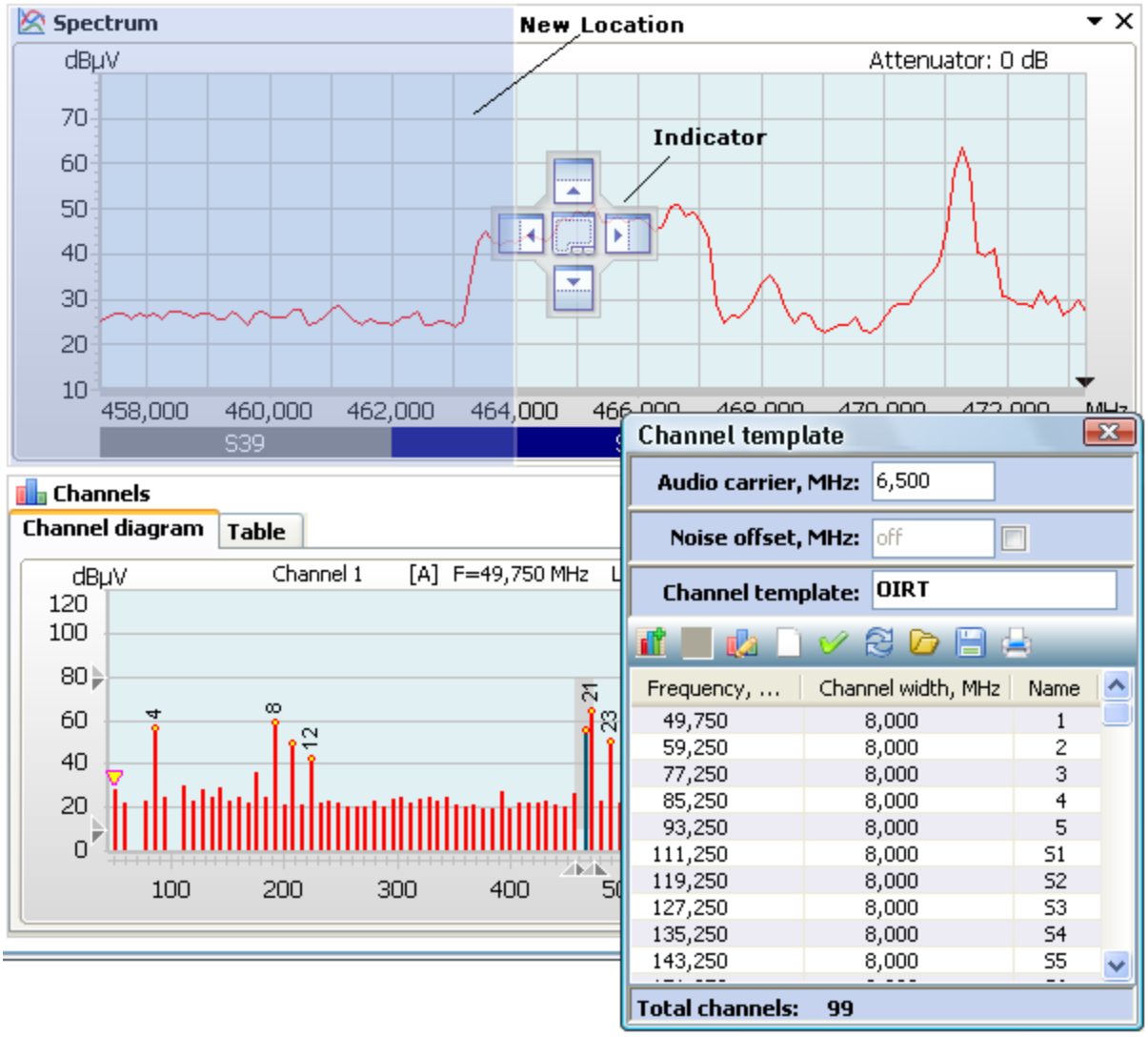
3.2 Workspace operating

The main window contains the workspace, which is used to allocate function windows: channels diagram, spectrum diagram, channel plan manager, channel template manager and data log manager. Drag & drop to implement each function. Each function window in the workspace has a header which can be moved by clicking with your left mouse button and holding whilst dragging to

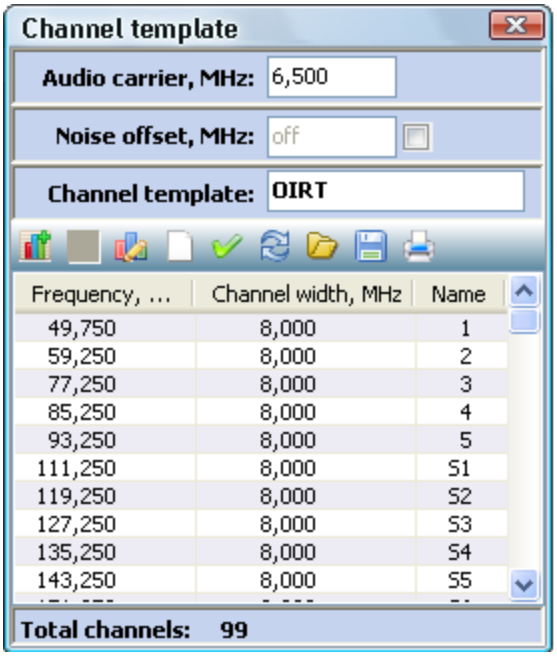
the position you want it and releasing. Fine tune Window size by clicking and dragging the splitter between windows.



To place a window in a particular location, select a window and hold the left mouse button on the title, move your pointer on the desired area. You will see an indicator, with several allocation options. Choose one of the options by cursor and release the mouse button.



Each window can be pushed out of the working area to look like a floating window:

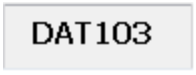


3.3 Navigation Bar

The navigation bar provides access to all the features of the program and looks like this:

Navigation bar can be hidden by clicking the left mouse button with the pointer on the top boundary of the navigation bar. Elements of navigation bar, which control communication with device:

- The drop down list of devices which is plugged to the PC. Each element of list has the meaning of device's serial number.



- Represents the device communicating with DATTools.

- This button reconnects the device and reloads devices list.

The navigation bar has 11 buttons:

- Shows or hides the channels diagram window. Also available with F2 shortcut key.

- Shows or hides the spectrum diagram window. Also available with F3 shortcut key.

- Open DVB-T measurement window. Also available with F4 shortcut key.

 - Shows or hides channel template manager window. Also available with F5 shortcut key.

 - Shows or hides channel plans manager window. Also available with F6 shortcut key.

 - Shows or hides the data log manager window. Also available with F7 shortcut key.

 - Opens Firmware Update Manager. Also available with F9 shortcut key.

 - Opens Device Information. Also available with F8 shortcut key.

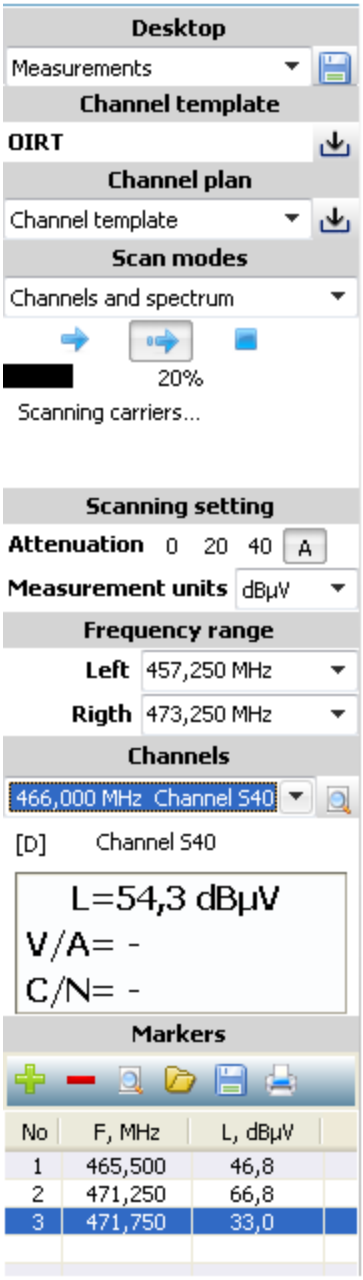
 - Opens Color Settings window.

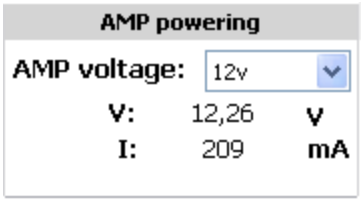
 - Opens Help files. Also available with F1 shortcut key.

 - Shows DATTools software information. Also available with F11 shortcut key.

3.4 Control panel

The Control panel permits access to measurement parameters including Attenuator, Channel Plan, Level Unit, Spectrum Span etc. Control panel contains the following elements:





- **Desktop**: the drop down list of desktop configurations;
- **Channel template**: the name of the channel template;
- **Channel plan**: channel plan, using for measuring;
- **Scan modes**: allows you to set a scanning mode: channels and spectrum, channels only, spectrum only. Also there are 3 buttons for controlling measurement:
  - - a single scan,
  - - continuous scan,
  - - stop scanning.

"Channels and the spectrum"- "- measures channel diagram, spectrum diagram windows and frequency markers;

"Channels only" - program will measure only channel diagram and frequency markers;

"Spectrum only" - measures only spectrum diagram and frequency markers.

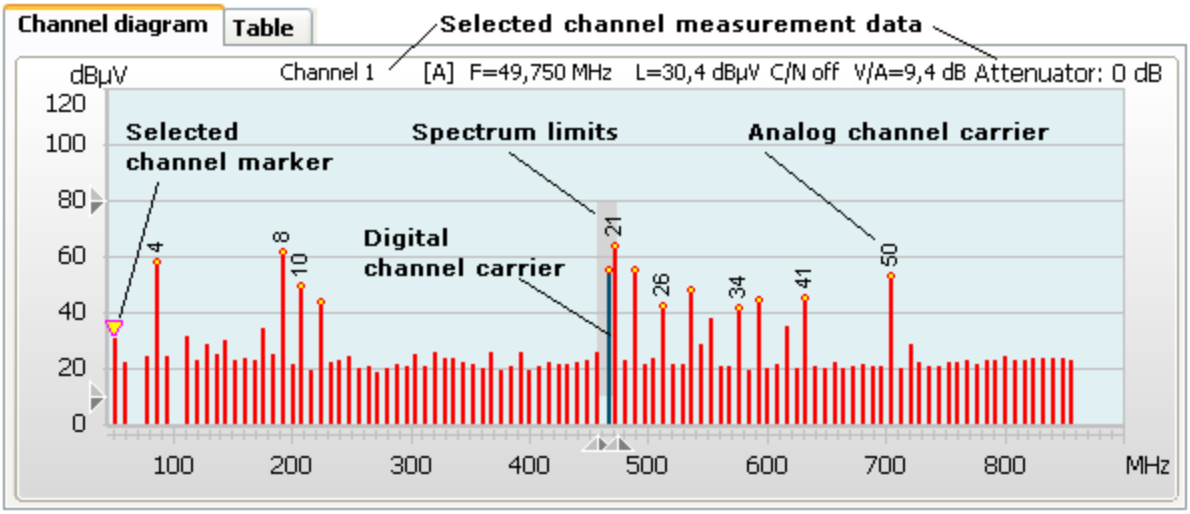
operation progress and information messages also display;

- **Scanning setting:** select attenuator value and measurement unit;
- **Frequency range:** spectrum diagram Left and Right frequency range;
- **Channels:** drop-down list of channels, which represents the frequency and channel number of channel, chosen on the channel diagram. Below you can see Level, V/A and C/N ration of chosen channel;
- **Markers:** Markers panel represents table of frequency point and their levels. You can see these frequency point on the spectrum diagram.
- **AMP powering:** - contains elements for control the AMP voltage. Also, in AMP powering panel displays information messages about error.

Control panel can be hidden by pressing left mouse button on the left boundary of the panel.

4 Channel Diagram

4.1 General information



The channel diagram shows a signal level bar display of the selected channel plan or template. The height of the bars corresponds to the signal level (channel power for digital, video carrier for analog channels) and and their position corresponds to frequency in MHz. Digital and analog channel bars differentiate by colour.

4.2 Channel plan selecting

DAT102 and DAT103 can holds up to 16 channel plans from which one plan can be selected at a time. When working with a particular channel plan you can see only the channels saved within in that plan, measuring only the channels in that channel template.

The drop down Channel plan list in the control panel is used to select a channel plan.

4.3 Channel parameters measuring

When you select a channel on the channel diagram, you can see its Signal Level, V/A ratio and

C/N ratio values in the left top corner of the diagram or in the control panel.

The following detailed data shows:

- Channel number;
- Name of the channel if saved (when working with a channel plan);
- Video carrier level for analog channels or channel power for digital channels;
- V/A ratio. This field is not displayed for digital channels;
- C/N ratio. When marked as off, then C/N measurement is switched off for the channel.

4.4 Spectrum diagram observation window

Channel diagram can also be used to select spectrum diagram observation ranges. You can set observation ranges in 45 to 900 MHz in frequency, and 0 to 120 dB in Level.

To adjust one of the level observation limits, drag the corresponding scale slider by mouse. To set frequency observation limits, drag the scale sliders along the frequency axis.

To adjust both limits simultaneously, press and hold the Shift key whilst dragging.

The selected spectrum observation window will show as the square highlighted with a color other than channel diagram background color.

4.5 Channel Diagram Report

4.5.1 Channel diagram report (table)

Channel diagram report is represented as a table, which contains a set of channel parameter measurement values. The table includes the following fields:

No. - frequency point number;
Channel - channel number according to the channel template;
Name - channel name (when working with a channel plan);
Frequency, MHz - centre frequency for digital channels, or video carrier frequency for analog;
Level, dBµV - channel power for digital channels or video carrier level for analog channels;
Video/Audio, dB - V/A ratio for analog channels;
Carrier/Noise, dB - C/N ratio for analog channels.

To view and print out the channel diagram report, proceed as follows:

Select ***Channels -> Report -> Table*** in the navigation bar (you can also access this command from the channel diagram menu). The preview window will appear. From this window you can view

the report, add some text comments and print it out. For details, see Report Viewing and Printout.

4.5.2 Channel diagram report (graph)

To view and print out the report on the channel diagram in the form of the diagram, proceed as follows:

Select **Channels -> Report -> Graph** in the navigation bar (you can also access from the channel diagram menu). The preview window will appear. Using this window you can view the report, add some text comments and print it out. For details, see Report Viewing and Printout.

4.6 Channel Diagram Saving

4.6.1 How to save channel diagram

DATTools can export channel diagram data into three standard file formats:

- Text file (*.txt);
- Comma-separated values file (*.csv);
- Image file (*.bmp).

This data can then be pasted into electronic documents and calculations made automatically.

To save a channel diagram, proceed as follows:

- Select **Channels** submenu from the navigation bar. Select **Save as**... command.
- In the dialog window enter the file name, select file type and location for the file to be saved.
- Click **OK**.

The Save as... command can also be accessed through the channel diagram context menu.

4.6.2 *.txt file format

.txt is a convenient way to paste channel diagram data into text documents, like Microsoft Word. The data is saved in a table format similar to channel diagram report in table format. Columns in the table are divided by tabulation symbol.

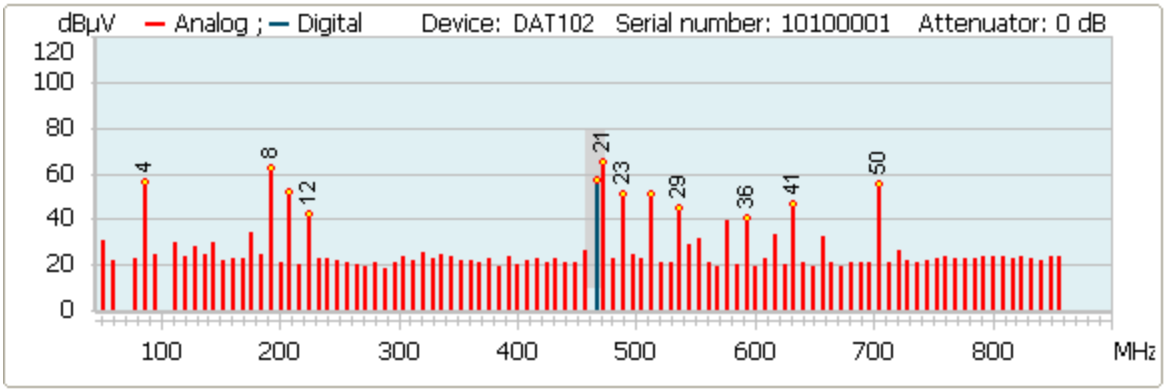
4.6.3 *.csv file format

.csv format is a convenient way to paste channel diagram data into electronic spreadsheets like Microsoft Excel. Data is saved in a table format similar to channel diagram report in table format. Field values in the table are divided by semicolons. Here is an example of a .csv file opened in Excel:

	A	B	C	D	E	F	G	H
1	DAT Tools							
2	TV channels level table 30/11/2010 15.15.46							
3	Device:DAT102 Serial number: 10100001							
4	Channel plan: 'New 6'							
5								
6	Channel template: 'OIRT'							
7	Attenuation: 0 dB							
8								
9	No.	Channel	Name	Frequency	Type	Level	Video/Aud	Carrier/Noise
10				MHz		dBµV	dB	dB
11	1	4	4 Ch	85,25	A	56,1	5,7	-
12	2	6	6 Ch	175,25	A	37,1	6,1	-
13	3	8	8 Ch	191,25	A	66,1	8,3	-
14	4	10	10 Ch	207,25	A	58,7	10,7	-
15	5	12	12 Ch	223,25	A	56,1	17,8	-
16	6	S40	S40 C	466	D	56,3	-	9,2
17	7	21	21 Ch	471,25	A	64,3	22,1	-
18	8	23	23 Ch	487,25	A	42	5,7	-
19	9	26	26 Ch	511,25	A	54,7	22,4	-
20	10	29	29 Ch	535,25	A	40,3	12	-
21	11	31	31 Ch	551,25	A	41,7	7,7	-
22	12	34	34 Ch	575,25	A	45,6	12,1	-
23	13	36	36 Ch	591,25	A	44,2	11,3	-
24	14	41	41 Ch	631,25	A	44,3	14,8	-
25	15	50	50 Ch	703,25	A	53,5	21	-

4.6.4 *.bmp file format

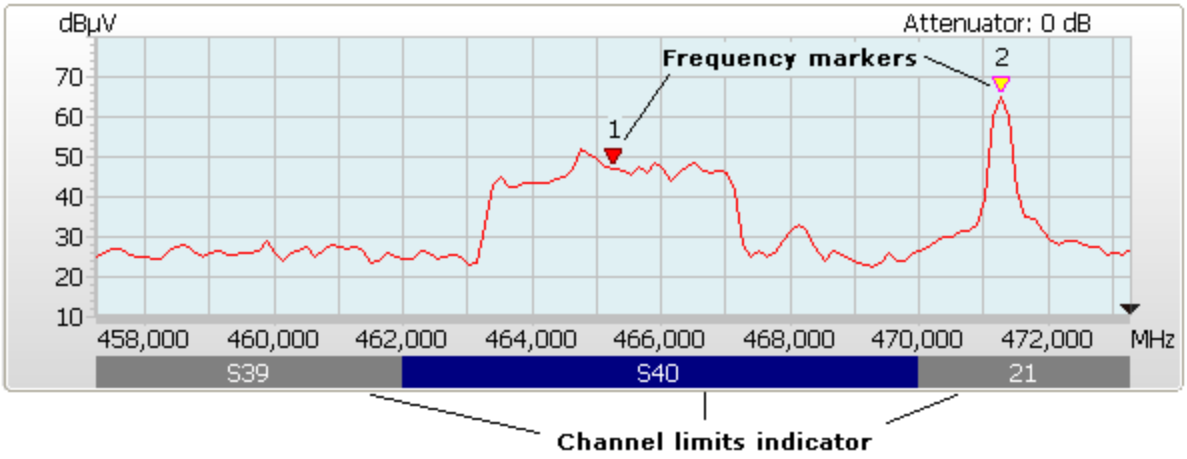
.bmp is an uncompressed graphical format that can be pasted into many presentation programs as it is or, saved in almost any other graphical format with a graphical program like Photoshop, CorelDraw or PaintShop. A .bmp file looks like:



5 Spectrum Diagram

5.1 General information

Spectrum diagram panel represents the amplitude-frequency graph (signal spectrum) for the measured signal and frequency markers.



Panel Elements

Spectrum Diagram

Spectrum diagram shows the spectrum within selected frequency and level limits. The maximum frequency resolution is 125 kHz. The maximum level resolution is 0.1 dB.

Level and Frequency Scales

Viewing area frequency and level limits are defined by channel diagram or control panel controls.

Cursor Position Indicator

When the cursor is moved over the trace, frequency and level of that point is displayed on the top left.

Channel Limits Indicator

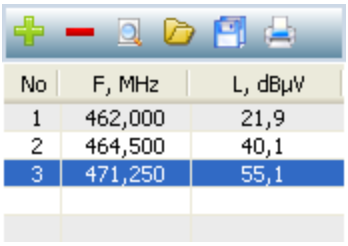
Under the frequency scale at the bottom of the diagram, you will see a color banded bar which indicates channel positions in accordance with the channel template. Each band displays a channel number, if the scale of the diagram allows that.

Frequency Markers

Frequency markers are an additional helpful element of the spectrum diagram panel, which allows the signal level to be seem at specified frequency points. See Frequency markers for more information

5.2 Markers panel

5.2.1 General information



The marker panel shows data for three frequency markers in columns. It shows:

- Frequency marker number. Each marker has a unique number assigned to it;
- Marker frequency in MHz;
- Signal level at each marker frequency, displayed in the selected measurement unit.

Markers in the table are arranged in frequency ascending order. Markers table updates each scan cycle. Located in the control panel, it automatically appears when at least one marker is active and hides when the last marker is deleted. Controls are in the upper part of the marker panel, allowing markers to be added or deleted , showing the selected marker on spectrum, saving or loading a marker list, viewing marker report, and closing the panel.

The list of markers in a table can be edited, saved to a file, opened from a file, or even printed out as a measurement result report.

5.2.2 How to add marker

To add a new frequency marker, press the **F10** key or select **Add marker** command from the spectrum diagram menu. The program will switch to marker adding mode and the mouse pointer change. Move the cursor to select the position for the new marker on the curve, with the mouse. A left-mouse click creates the new marker. Adjust marker position by dragging it with the mouse.

5.2.3 Deleting a frequency marker

To delete a frequency marker:

· highlight the marker to delete by clicking on the corresponding row in the marker table or on the marker in spectrum diagram with the left-mouse button.

· from the spectrum diagram menu select **Delete marker** command. Click the button on the marker panel, or press the **Delete** key.

5.2.4 Adjusting a marker position

You can adjust the position of a frequency marker in two ways:

Change the frequency by dragging the marker along the spectrum diagram

Find a marker on the spectrum diagram, the Show marker command may assist. Use your mouse to move the pointer over the marker. Then press and hold left mouse button. Now drag the marker to the new position and release the button.

Change frequency by direct frequency value entry

Find and highlight the required marker (as above). Then select

5.2.5 Showing markers

To display markers on a spectrum diagram, click on the corresponding marker in the table with your mouse and select the Show marker command in the menu on the marker panel.

5.2.6 Saving markers to file

To save markers to file, select the **Save as...** command in the markers table menu. The file saving dialogue box will appear. In the drop-down list **Save as type** select **File with markers (*. ITL)** file type. Then enter the file name, select the location of the file to be saved, and click **OK**.

You can also save markers by clicking **Save markers...** button.

5.2.7 Loading markers from file

To open markers from a file, select the **Open...** command in spectrum diagram menu. Standard open dialogue box will appear. From the drop-down list **File type** select **File with markers (*.ITL)** file type. Select the required file and click **OK**. The markers in that file will load and display in the markers panel.

You can also access this function by clicking the **Open...** button from the markers panel.

5.2.8 Frequency markers report

The frequency marker report presents a table similar to marker panel table.

To view and print out the marker report, click **Frequency marker report** button on the marker panel. The preview window will appear on screen. Using this window you can view the report, add some text comments and print it out. For details, see Report Viewing and Printout..

5.3 Spectrum Diagram Report

5.3.1 Table spectrum diagram report

Spectrum diagram report can be presented as a table, which contains a number of lines with frequency points and their levels. The frequency tuning step is 125 kHz. range is determined by the spectrum diagram frequency range.

To view and print out the report on the spectrum diagram, proceed as follows:

Select **Spectrum -> Report -> Table** in the navigation bar (you can also access this command from the spectrum diagram menu). The preview window will appear. Using this

window you can view the report, add some text comments and print it out. For details, see Report Viewing and Printout.

5.3.2 Graph spectrum diagram report

The spectrum diagram report can also be presented as a graph of the frequency range of spectrum within the spectrum diagram.

To view and print out the report of the spectrum diagram, proceed as follows:

Select **Spectrum -> Report -> Graph** in the navigation bar (you can also access this command from the spectrum diagram menu). The preview window will appear. Using this window you can view the report, add some text comments and print it out. For details, see Report Viewing and Printout.

5.4 Spectrum Diagram Saving

5.4.1 How to save spectrum diagram

You can also export the spectrum diagram data into standard format files. You can use this data to paste into other electronic documents and perform calculations.

You can save spectrum diagram in one of three formats:

- Text file (*.txt);
- Comma-separated values file (*.csv);
- Image file (*.bmp).

To save the spectrum diagram into a file, proceed as follows:

- Select Spectrum submenu from the navigation bar. Select Save as... command.
- In the dialog window enter the file name, select file type and location of the file to be saved.
- Click OK.

The Save as... command can be accessed through the spectrum diagram menu.

5.4.2 *.txt file format

.txt is convenient for further pasting of the spectrum diagram data into text documents. For example, into a Microsoft Word file. The data is saved in a table of two columns:

Frequency, MHz and Level, dBμV. Frequency and level values are divided by tabulation symbol. Below you can see an example of file contents:

DATTools
RF spectrum table from 10/09/2011 15.29.33
Device: DAT102 Serial number: 10100001
Attenuation: 0 dB

Frequency range: from 457,250 MHz to 473,250 MHz

Channel template: 'OIRT'

Frequency MHz	Level dBµV
457,250	24,3
457,375	24,4
457,500	25,0
457,625	24,3
457,750	24,2
457,875	24,0
458,000	25,0

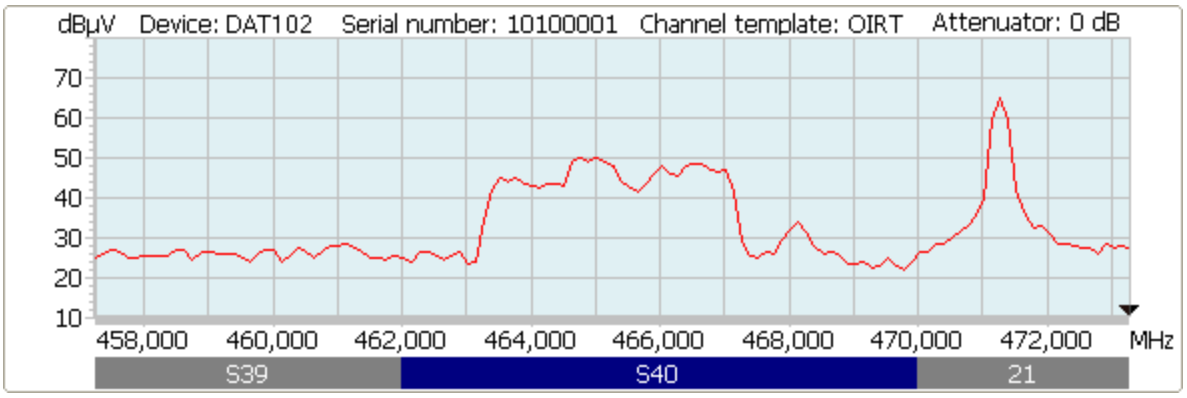
5.4.3 *.csv file format

.csv is useful for pasting of the channel diagram data into electronic tables so you can make calculations automatically with an application like Microsoft Excel. The data is saved in the form of a two column table that shows: Frequency, MHz and Level, dBµV. Values are divided by semicolon. An example of file opened in Microsoft Excel shows below:

	A	B	C	D	E
1	DATTools				
2	RF spectrum table from 10/09/2011 15.29.52				
3	Device: DAT102 Serial number: 10100001				
4	Attenuation: 0 dB				
5					
6					
7					
8	Frequency range: from 457,250 MHz to 473,250 MHz				
9					
10	Channel template: 'OIRT'				
11					
12	Frequency	Level			
13	MHz	dBµV			
14	457,25	23,5			
15	457,375	24,4			
16	457,5	25,6			
17	457,625	23,9			
18	457,75	25			
19	457,875	25,9			
20	458	25,3			

5.4.4 *.bmp file format

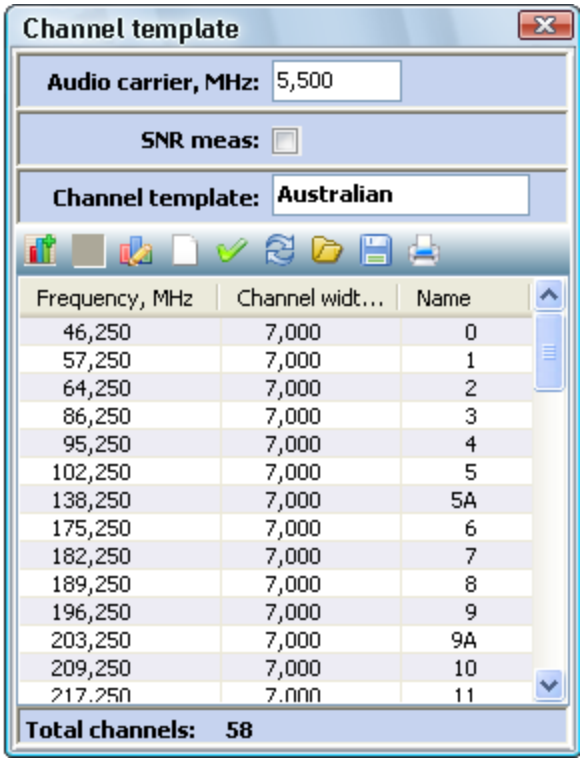
The .bmp option saves a spectrum diagram as an image in Bitmap format, for pasting into graphic editing or publishing applications. .bmp is a raster graphic digital image file format.



6 Channel Template Manager

6.1 General information

A channel template is a list of frequencies which includes the channels within a regional channel allocation plan.



Channel template manager allows:

- channel template data to be viewed in the form of a table;
- saving or loading channel templates to file;
- loading a channel template from a device;
- editing channel template:

  video carrier frequencies, channel bandwidth, channel name, adding or deleting channels;
- creating new channel templates;
- viewing the channel template report.

Channel template have the following parameters:

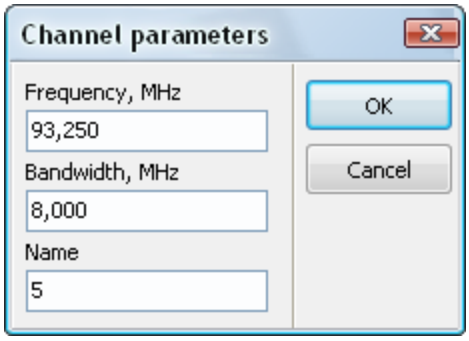
a) **Audio carrier.** Audio carrier frequency difference or delta from the video carrier. Uses for V/A ratio measurement.

b) **SNR meas:** on/off measurement SNR.

c) **Channel template.** The name of the channel template, visible in all measurement modes.

6.2 Edit or add a channel

To edit the channel parameters, select the required channel from the list and click the **Edit channel** parameters button in the Channel template manager control panel, or double click on the required channel. The Channel parameters window will appear on the screen:



Enter frequency, bandwidth and channel name values and click **OK** .

To add a new channel, click **Add channel** button. Enter carrier frequency, bandwidth and channel name values in the Channel parameters window.

You can select the following parameters:

a) **Frequency.** Video carrier frequency;

b) **Width.** Channel bandwidth, important for measuring digital channel power and determining centre frequency so your meter can lock signal properly;

c) **Name**. The channel number, which shows in measurement modes.

6.3 Write/Read Channel Template to/from file

To save a channel template into a file, use **Save channel template** to file command. The standard file saving dialog box will open. Enter file name and its location. Click **OK** to confirm.

To open a previously saved channel template, click the **Open channel template from file** button. Select a previously saved channel template file from the dialogue box. Then click **OK**, and the file should open. Channels from the selected channel template will show as a list and will be available for editing.

6.4 Write/Read Channel Template to/from Device

To load a channel template to device, click the **Save to device** button on the Channel template manager control panel. A window will show progress,

do not interrupt this process.

To copy a channel template from device, click the **Load from device** button on the Channel template manager control panel. Channel template will be copied from the device, do not interrupt this process.

6.5 Creating a new channel template

To create a new channel template, click the **Clear channels list** button on the Channel template manager control panel. A warning message will appear on screen advising all unsaved data will be lost. Click **Cancel** to maintain current channel template data. Alternatively, click **OK**, and the channel template list will be cleared. Now you can create a new channel template.

6.6 Channel template report

To view or print the channel template report, click the **View and print report...** button. The preview window will appear on screen. In this window you can view, add text comments, and print

out the report. For details, see the section Report Viewing and Printout.

7 Channel plans Manager

7.1 General information

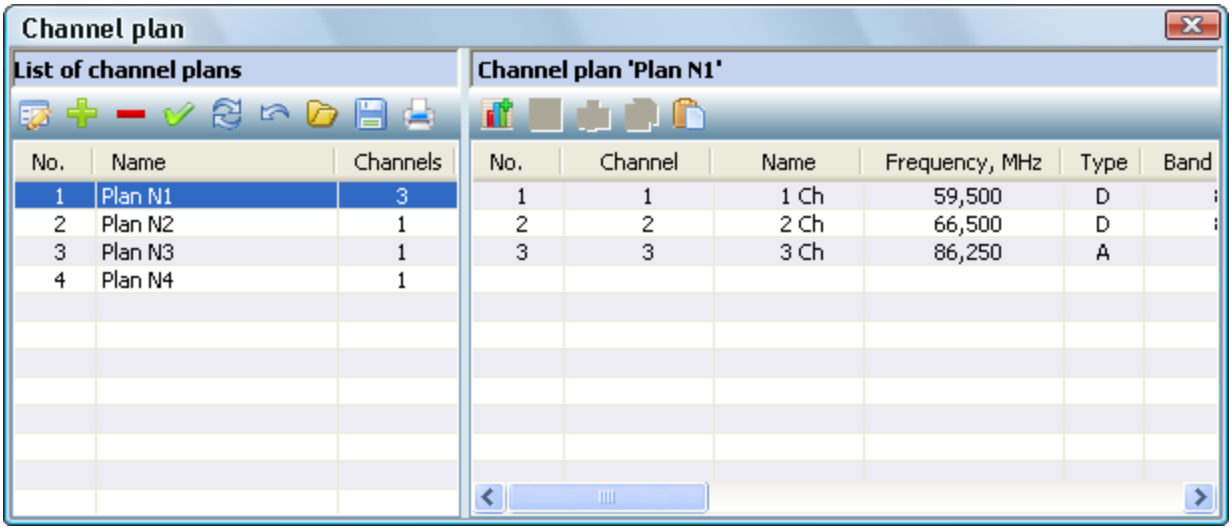
Channel plan is a list of frequency points used by the device for channel scanning and data logging. DAT102, DAT103 and DATTools can operate with up to 16 channel plans, with an unlimited number stored in your computer.

There are two available modes of viewing and editing the channel plans list produced using the channel plans manager:

Operating with device. This mode provides access to all editing functions for both channel plans of the device and channel plans saved in files.

Operating without device. This mode has less functionality and allows editing of channel plans only, which are saved in files.

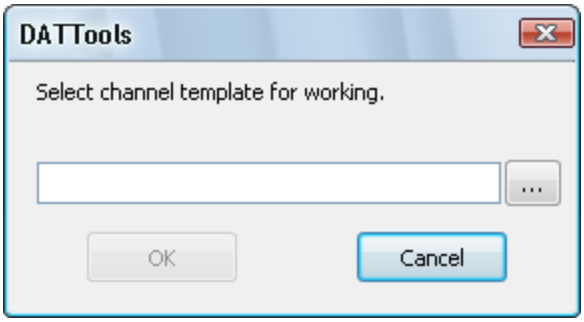
Channel plan manager looks like this on your computer:



7.2 Operating without device

This mode is similar to normal mode, except for creating, deleting, editing and viewing the device channel plans.

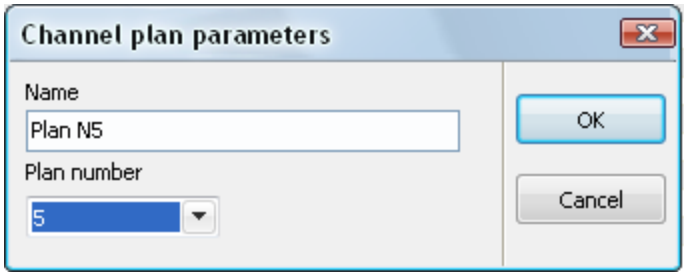
Before operating, select a channel template. The dialog box for selecting channel template is shows below:



You can open either one of the default channel templates or one of the prepared templates, which have been saved with Channel Template Manager.

7.3 Adding a new Channel plan

To add a new channel plan, click the **Add plan** button, or select the corresponding command in the right-click menu in the channel plan list. The dialog for entering new plan parameters will appear on screen:



Enter a name for your channel plan and select a free plan number from the drop-down list. Then click

OK, and the plan will be added. New plans include only one frequency point, which corresponds to the first channel from the selected channel template, by default.

7.4 Open a Channel plan from file

To view the previously saved plan file, you must add it to the list of installed channel plans. Click the **Open** button, or select the corresponding command in the right-click menu of the channel plan list. Select a previously saved channel plan file in the file opening dialog box. Click **OK**. The selected file will be added to the list and made available for editing and saving.

7.5 Deleting Channel plans

To delete a channel plan or a number of plans, you must select them in one of the following ways:

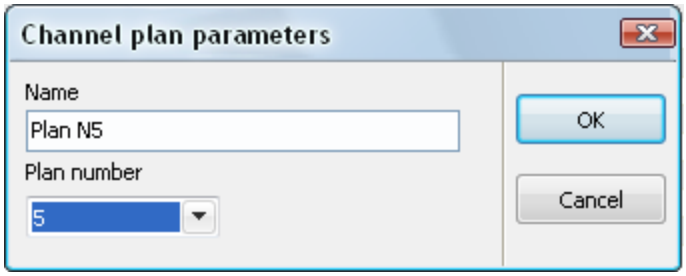
Make a left-mouse click on the required channel plan in the list; Select plans to delete by clicking the mouse button and dragging; Press the **Ctrl** key on the keyboard and select a number of plans for deleting by left-mouse click.

Click the **Delete (Del)** button, or use the corresponding command in the mouse right-click menu list. You can also delete plans by pressing the **Del** key on the keyboard.

NOTE! When you delete a channel plan, all data log pages which related to the selected channel plan, will also be deleted.

7.6 Edit Channel plan name

Select the required plan name from the plans list and click the **Channel plan parameters** button in the channel plan editing dialog box (or use the corresponding command in the mouse right-click menu list). The **Channel plan parameters** dialog box will appear on screen.



Edit the name and click **OK**.

Channel plans should be loaded to the Plan number most suitable, as Plan numbers are fixed.

7.7 Saving changes

Adding, Deleting or Editing the Channel plan list is automatically saved to your PC. To save this information onto the device, select the **Apply changes** button on the Channel plan list panel or in the mouse right-click menu.

7.8 Saving a plan to file

Click the **Save** button on the control panel. The file saving dialog box will open. Select file name and location. Click **OK** to confirm.

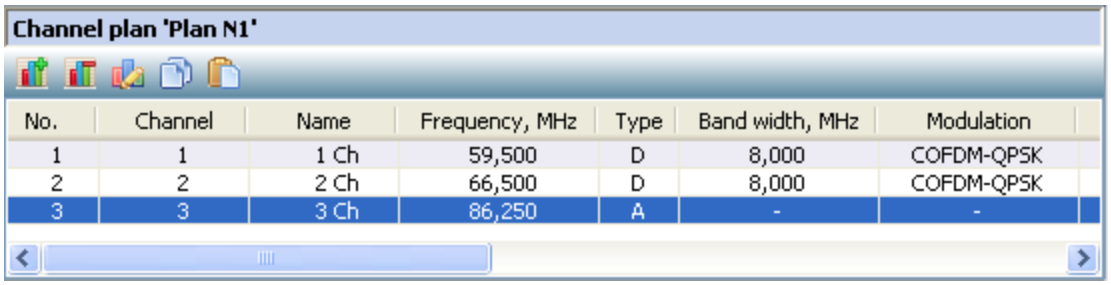
When saving several channel plans, there is no need to set the file names in the saving dialog. The files will be saved under the names of channel plans you have selected.

7.9 Cancelling Plan list changes

Changes to the Plan list are automatically saved to PC memory. To cancel changes since the last channel plans were Saved, click **Cancel changes**.

7.10 Channels

7.10.1 List of channels



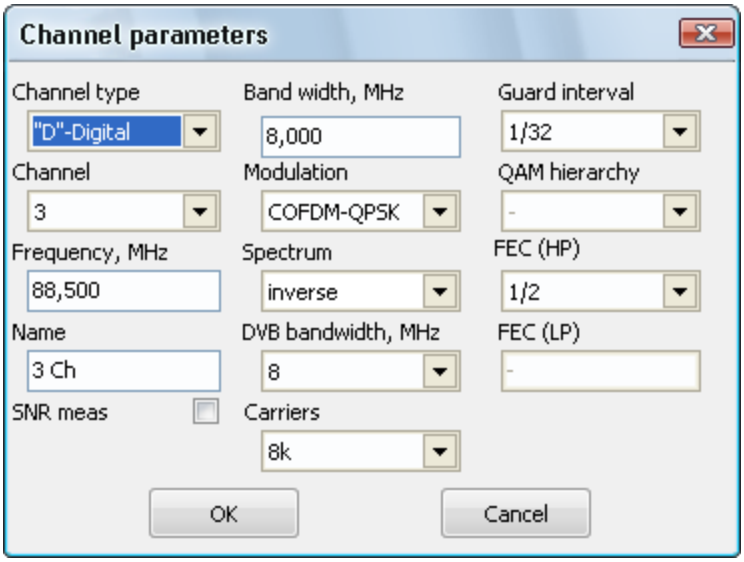
The left side of the channel plans manager window contains a table of channels included in the selected channel plan. The upper part of this window contains a toolbar for managing channels:

The following operations are available for channels:

- editing the channel;
- creating a new channel;
- deleting selected channel;
- copy the selected channels to the clipboard;
- paste the channels from the clipboard.

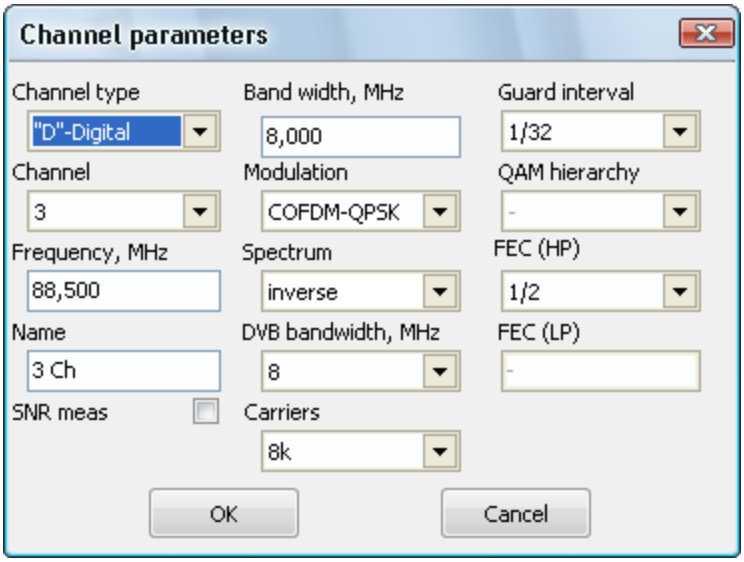
7.10.2 Create a new channel

Select a channel plan from the list and click the **Create channel** button in the channel toolbar. The **Channel parameters** window will appear on screen:



After editing the parameters, click the **OK** button .

7.10.3 Edit channel parameters



Channel parameters can be edited in the frequency point parameters window depending on **channel type** and **modulation**:

1. Basic parameters:

Type: is the channel: Digital or Analogue;

Channel: the number of the channel within this template;

Name: a channel name of up to 15 characters may be assigned;

Frequency, MHz: Digital channel centre frequency or Analogue video carrier frequency;

SNR meas: on /off selectable measurement of SNR;

2. Digital channel parameters:

Bandwidth, MHz: select from 1 to 8 MHz to measure Channel Power correctly;

Modulation: select **COFDM-QPSK, QAM16, QAM64** according to broadcaster;

Spectrum: spectrum type. The values available: normal, inverted;

Channel bandwidth, MHz: DVB-T channel bandwidth. The values available: 6MHz, 7MHz,8MHz;

Subcarriers: number of subcarriers in the DVB-T channel. The values available: 2k, 4k, 8k;

Guard interval: the value of guard interval of DVB-T channel. The values available: 1/32, 1/16, 1/8, 1/4;

QAM hierarchy: the type of QAM carriers hierarchy. The values available: -, alpha=1, alpha=2, alpha=4;

FEC (HP): forward error correction of the high-priority data stream. The values available: 1/2, 2/3, 3/4, 5/6, 7/8;

FEC (LP): forward error correction of the low-priority data stream. The values available: 1/2, 2/3, 3/4, 5/6, 7/8.

7.10.4 Deleting channel

To delete a channel, select the required one from the table and click button of the toolbar. The selected channel will be deleted from the list, but it will remain in the analyzer channel plan. To save the changes in the analyzer, click **Apply changes**.

7.11 Channel plan report

Channel plan report is a table containing a list of channels. The table fields are similar to channels parameters table.

To view and print out the channel plan report, click **View and print report** button on the channel editor window. The preview window will appear on the screen. Using this window you can view the report, add some text comments and print it out. For details, see Report Viewing and Printout.

8 Data log Manager

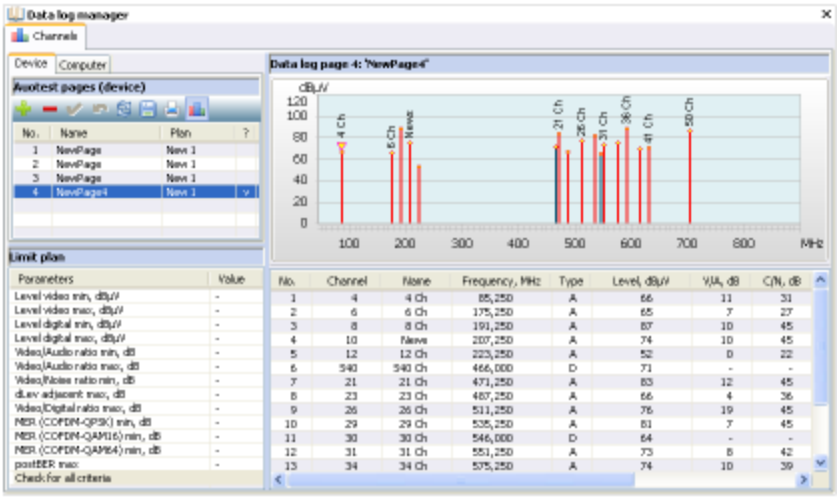
8.1 General information

DAT102 and DAT103 Analyzers allows recording the measurement results using Data Log manager. Measurement results are stored in the form of data log pages. Data Log pages include measurement results of the selected channel plan. DAT102 and DAT103 allows saving up to 130 data log pages with maximum number of channels.

Data logger manager has two operating modes:

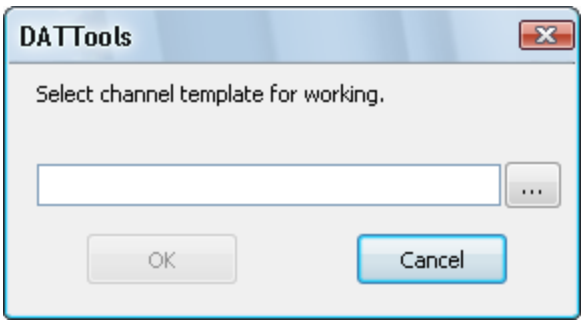
Operating without device. This mode provides access to all editing functions for both Data Log pages of the device and Data Log pages saved in files.

The view of the Data Log manager window is shown in figure below:



8.2 Operating without device

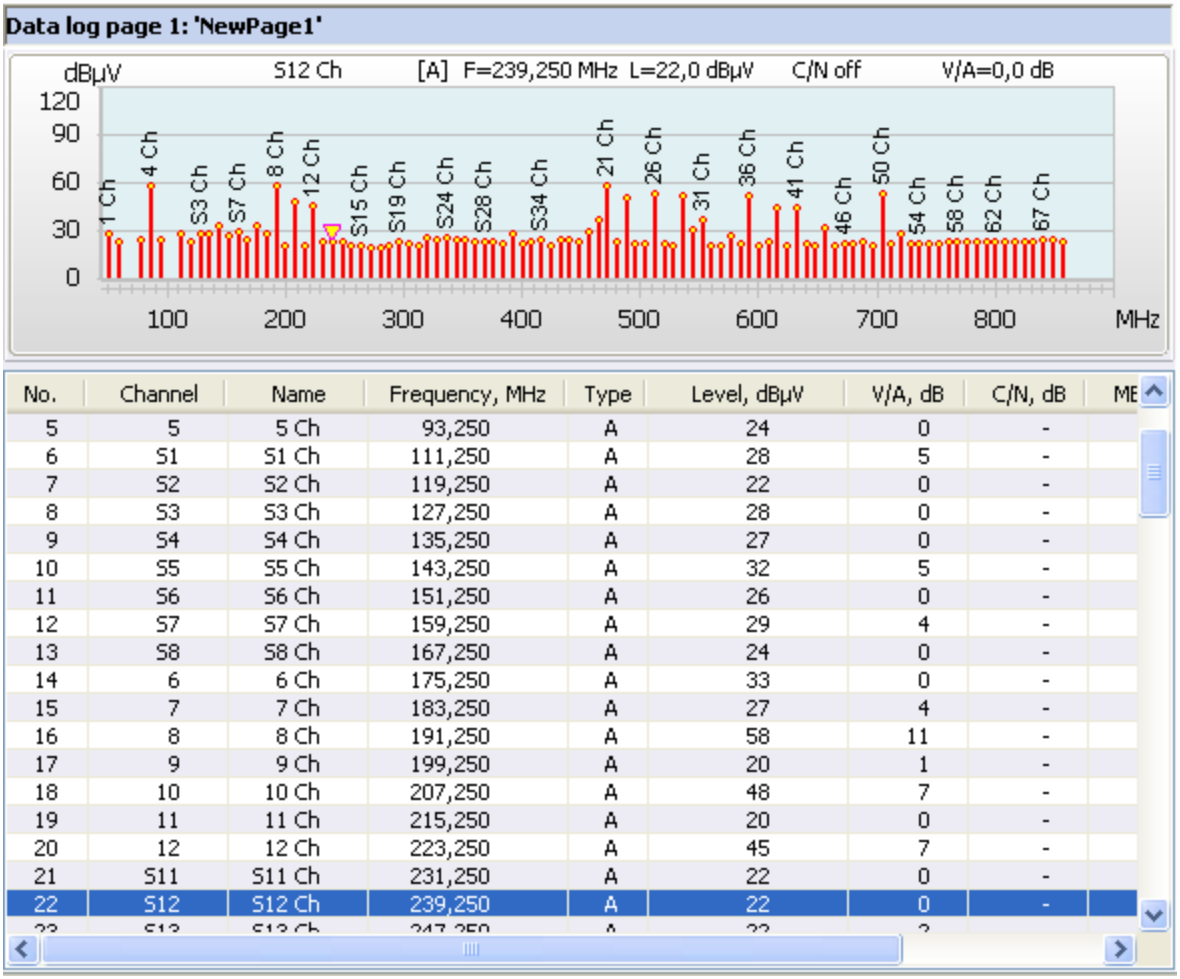
This mode is similar to normal mode in all its functions, except for creating, deleting, and viewing the device channel data logger pages. Before operating, select the channel template. The dialog box for selecting the channel template is shown in figure below:



You can open either one of the default channel templates or one of the prepared templates, which have been saved with Channel Template Manager.

8.3 Data log pages

8.3.1 General information



No.	Channel	Name	Frequency, MHz	Type	Level, dBµV	V/A, dB	C/N, dB	ME
5	5	5 Ch	93,250	A	24	0	-	
6	S1	S1 Ch	111,250	A	28	5	-	
7	S2	S2 Ch	119,250	A	22	0	-	
8	S3	S3 Ch	127,250	A	28	0	-	
9	S4	S4 Ch	135,250	A	27	0	-	
10	S5	S5 Ch	143,250	A	32	5	-	
11	S6	S6 Ch	151,250	A	26	0	-	
12	S7	S7 Ch	159,250	A	29	4	-	
13	S8	S8 Ch	167,250	A	24	0	-	
14	6	6 Ch	175,250	A	33	0	-	
15	7	7 Ch	183,250	A	27	4	-	
16	8	8 Ch	191,250	A	58	11	-	
17	9	9 Ch	199,250	A	20	1	-	
18	10	10 Ch	207,250	A	48	7	-	
19	11	11 Ch	215,250	A	20	0	-	
20	12	12 Ch	223,250	A	45	7	-	
21	S11	S11 Ch	231,250	A	22	0	-	
22	S12	S12 Ch	239,250	A	22	0	-	

The Data log manager window contains the following control elements:

Channels tab contains two lists of the log pages:

Channel data logs (device) and **Channel data logs (computer)**.

Channel data logs (device) panel contains the list of the log pages opened directly from the Analyzer. The list of pages is updated every time you click the **Refresh list (Ctrl+R)** button, or at the opening of the Data Log window. To operate this list, it is necessary to maintain communication with the Analyzer.

Channel data logs (computer) panel contains the list of log pages opened from files. This list can contain up to 255 files. You can access this list even if the Analyzer is not connected to the computer. To add a new page to the data log manager, open it from file.

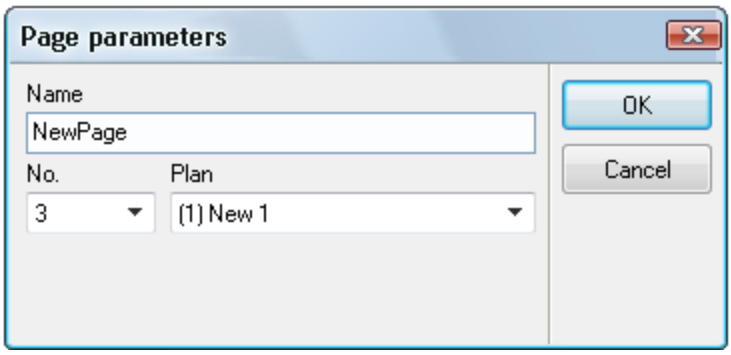
To view a data log page, select its name in the log page list with the mouse or keyboard arrows. The selected page will be read from the Analyzer and displayed on screen. A data log page contains the following fields:

- **No:** page number;
- **Channel:** TV channel containing the current point;
- **Type:** channel modulation type (D – digital or A – analogue);
- **Frequency, MHz:** tuned frequency point;
- **Level, dBµV:** signal level at the tuned frequency;
- **V/A, dB:** Video to Audio level difference ratio;
- **C/N, dB:** Carrier to Noise ratio;
- **MER, dB:** measured MER value;
- **postBER:** BER value after the Viterbi decoder.

8.3.2 How to add new page

To add a new page to the data log manager, click on ***Add page*** button and enter the following parameters in the pop-up dialog:

page number (**Number**), its name (**Name**), channel plan (**Plan**).



After you click ***OK*** button in the dialog box, the new page will appear in the list, but will not be uploaded to the Analyzer yet. To save a page into the Analyzer, select ***Apply changes*** button. To abort saving a page into the device, click ***Cancel changes*** button.

8.3.3 Delete pages

To delete log pages from the Analyzer, highlight the pages in one of the following ways:

a) Left-mouse click and select the plans to delete by holding the mouse button and dragging;

b) Press the keyboard **Ctrl** key and select a number of plans for deleting by left-mouse click.

Now click the **Delete page** button. In the dialog box click **OK** to confirm deletion. If necessary, you can abort deleting by clicking the **Cancel changes** button.

8.3.4 Open a Log page from file

To view a previously saved log page, you should add it to the **data log pages (computer)** list. To add a new page to the data log manager, open it from file by clicking on the **Open page from file (Ctrl+O)** button or from the mouse right-click menu. In the standard dialog box for opening files, select the required file and click **OK**. The selected file will be added to the list of log pages and will be available to view.

You can open up to 255 files simultaneously. The Channel data logs (computer) list is automatically cleared after you close the data log manager. To delete a page from the list of opened log pages, click the **Delete page (Ctrl+Del)** button or select the corresponding command in the right-click menu.

8.3.5 Limit plan

The program can compare the contents of a page against a template with standard value parameters. Parameter values are stored in each data log page and are available for editing from device. To check a page against a parameter, choose it from the template's list.

List of parameters in the template:

- **Level Video min, dBµV**

  The minimum value of video carrier level for analog channel. Default value: 48dBµV. Available values: 45 to 95 dBµV;

- **Level Video max, dBµV**

  The maximum value of video carrier level for analog channel. Default value: 85 dBµV. Available values: 45 to 95 dBµV;

- **Level digital min, dBµV**

  The minimum value of digital channel level. Default value: 48 dBµV. Available values: 45 to 95 dBµV;

- **Level digital max, dBµV**

  The maximum value of digital channel level. Default value: 85 dBµV. Available values: 45 to 95 dBµV;

- **Video/Audio ratio min, dB**

  The minimum value of V/A ratio. Default value: off. Available values: 5 to 20 dB;

- **Video/Audio ratio max, dB**

  The maximum value of V/A ratio. Default value: off. Available values: 5 to 20 dB;

- **Video/Noise ratio min, dB**

  The minimum value of C/N ratio. Default value: off. Available values: 15 to 55 dB;

- **dLev adjacent, dB**

  The maximum value of ratio between the adjacent channel levels. Default value:10 dB. Available values: 2 to 10 dB;

- **Video/Digital ratio max, dB**

  The maximum value of ratio between analog and digital channel levels. Default value: 25 dB. Available values: 5 to 30 dB;

- **MER (COFDM-QPSK) min, dB**

  The minimum value of MER for DVB-T channels with QPSK subcarriers modulation. Default value: 12 dB. Available values: 2 to 35 dB;

- **MER (COFDM-QAM16) min, dB**

  The minimum value of MER for DVB-T channels with QAM16 subcarriers modulation. Default value: 27 dB. Available values: 6 to 35 dB;

- **MER (COFDM-QAM64) min, dB**

  The minimum value of MER for DVB-T channels with QAM64 subcarriers modulation. Default value: 30 dB. Available values: 10 to 35 dB;

- **preBER max**

  The maximum value of preBER. Default value: off. Values available: 1E-4, 1E-5, 1E-6, 1E-7, 1E-8, off. If you select **off**, preBER parameter will not be measured when the data log page is measured.

- **postBER max**

  The maximum value of postBER. Default value: off. Values available: 1E-4, 1E-5, 1E-6, 1E-7, 1E-8, off. If you select **off**, postBER parameter will not be measured when the

data log page is measured.

- **Digital SNR min, dB**

The minimum value of C/N ratio. Default value: off. Available values: 15 to 55 dB;

- **check for all criteria**

When you choose this option, page is checked against all template parameters.

The channels, which do not match the template will be highlighted with red color in the table. When you create new page, the parameters of the template are set to their default values.

8.3.6 Data log report

Channel data log report is a table containing fields similar to channel data log manager table.. To view and print out the report on a log page click the ***View and print report...*** button.

The preview window will appear on screen. In this window you can view, add text comments, and print out the report. For details, see Report Viewing and Printout.

8.3.7 Page Saving

8.3.7.1 Formats for saving pages

Data log page can be saved in **.nbc** format file for further viewing. It also can be exported in files of standard formats. The data from the data log files can be inserted into other electronic documents and used for automatic calculations.

The selected data log page can be saved into a file in one of the following formats:

- *.nbc file;
- *.txt text file;
- *.csv comma-separated values file ;

Saving in txt and csv formats is similar to saving channel diagram table in these formats.

8.3.7.2 Save pages to file

- Select the page name from the list;
- Click the **Save as...** button on panel, or select the same command in the menu.

In the file saving dialog box, enter file name and select the location of the file to be saved. If you select several pages to save, there is no need to set the file names in the saving dialog. The files will

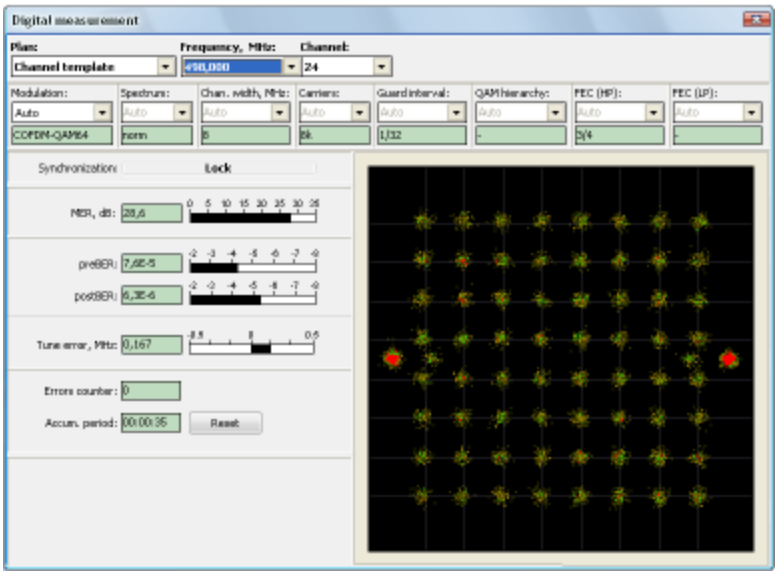
be saved under the names of channel data log pages you have selected;

- Click **OK**.

9 DVB-T measurements

To enter the DVB-T channel parameters measurement mode, select MER BER in the navigation bar.

The Digital measurements window displays the device settings when the DVB-T signal measurements are performed and the measured values:



If an error is detected during startup, the error message **"Demodulator error!"** will show on screen, and the mode will close. Reasons and methods of error correction are given in they device operating manual.

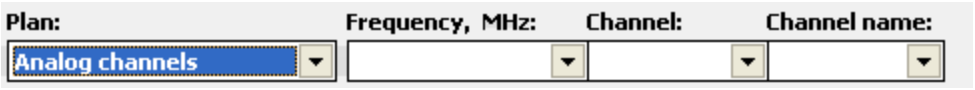
The frequency and modulation parameter settings panel is located in the upper part of the window. If you select **channel template** in **Plan**: field, the panel will change to:

In this mode you can select one of the digital channels from the selected channel template using Frequency, MHz: or Channel: fields.

Modulation parameters are set in the special field:

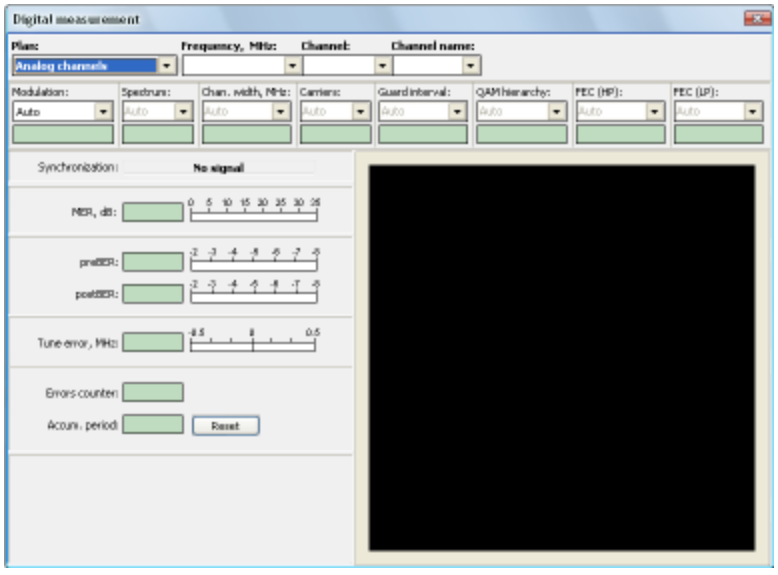
These parameters are similar to those required for frequency points of a channel plan with COFDM modulation (see channel parameters). If you set **Auto** value in the **Modulation**: field, all modulation parameters will be determined automatically. If you set a particular modulation type, it will be necessary to set all other parameters. Each field has a drop-down list of available values for the determined channel. These fields remain empty until Lock is achieved.

If you select a particular channel plan in the **Plan**: field, you will see:



In this mode you can select one of the digital channels from the channel template using **Frequency, MHz:**, **Channel:** or **Channel name** fields. Modulation parameters will automatically take the values defined in the channel plan for this channel. If this channel has a modulation type other than COFDM-QPSK, QAM16, or QAM64, the device will automaticlly detect channel parameters.

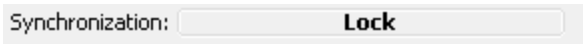
If there are no digital channels in the selected channel plan, you will see the Digital measurements window represented below:



In this case you cannot select a channel and further operation in this mode is not available.

Synchronization panel represents the state of demodulator. The possible states are:

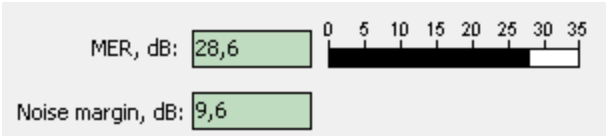
The channel has been synchronized and its quality parameters are being measured:



Low input signal amplitude:

Channel synchronization is in process:

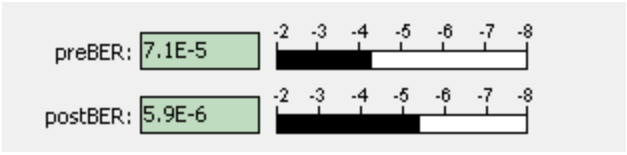
The ***MER, dB*** data field displays the measured modulation error ratio:



The indicator to the right from the MER data field gives the graphic representation of the MER measured value.

Noise margin, dB value shows the margin in dB of MER parameter to postBER threshold value ($2x10^{-4}$). If MER value indicates the presence of margin, but postBER value is more than $2x10^{-4}$ a "<" sign will be indicated in ***Noise margin, dB*** field.

The **BER** data fields displays the bit error rate in the input data stream before Viterbi decoder (**preBER**) and after Viterbi decoder (**postBER**). The preBER and postBER values are also represented on the graphic indicator:



The ***Tune error, MHz*** data field displays the frequency tuning error between the defined and the real values with a 167 kHz step. The tuning error is also represented on the graphic indicator.

The ***Error counter*** data field displays the number of erroneous packets after Reed-Solomon decoder detected during the time indicated in the ***Accum. period*** field:

Reset button allows to zero the error counter and restart the counting process.

In the right part of the screen you can see the constellation diagram representation of the signal with Quadrature Amplitude Modulation COFDM, a graphical representation of vector diagram.

The diagram is divided into four quadrants, each containing dots made by the peaks of the vectors of demodulated signals quadratures. The diagram shows a number of dots or nodes on the phase plane. For COFDM-QAM64 there will be 64 dots. The influence of noise and distortions make the dots 'spread' and take particular shapes. Analysis of the shape of the dot patterns and their distribution on the phase plane can be a useful tool comparing signals. The color of the diagram parts depends on how often the dots fall within these parts. As long as the dots remain within their quadrants or zones, the signal can be repaired automatically. Areas with less dots are light yellow, intermediate areas have yellow and green colors but the areas with the highest number of dots are colored red.

10 AMP powering

This function available only for devices supporting AMP powering function (DAT103). It allows set output voltage.

At the start working with PC, output voltage always is off. To be enable output voltage, select value in AMP voltage combo box:

off - output voltage off;

18v - output voltage sets 18v;

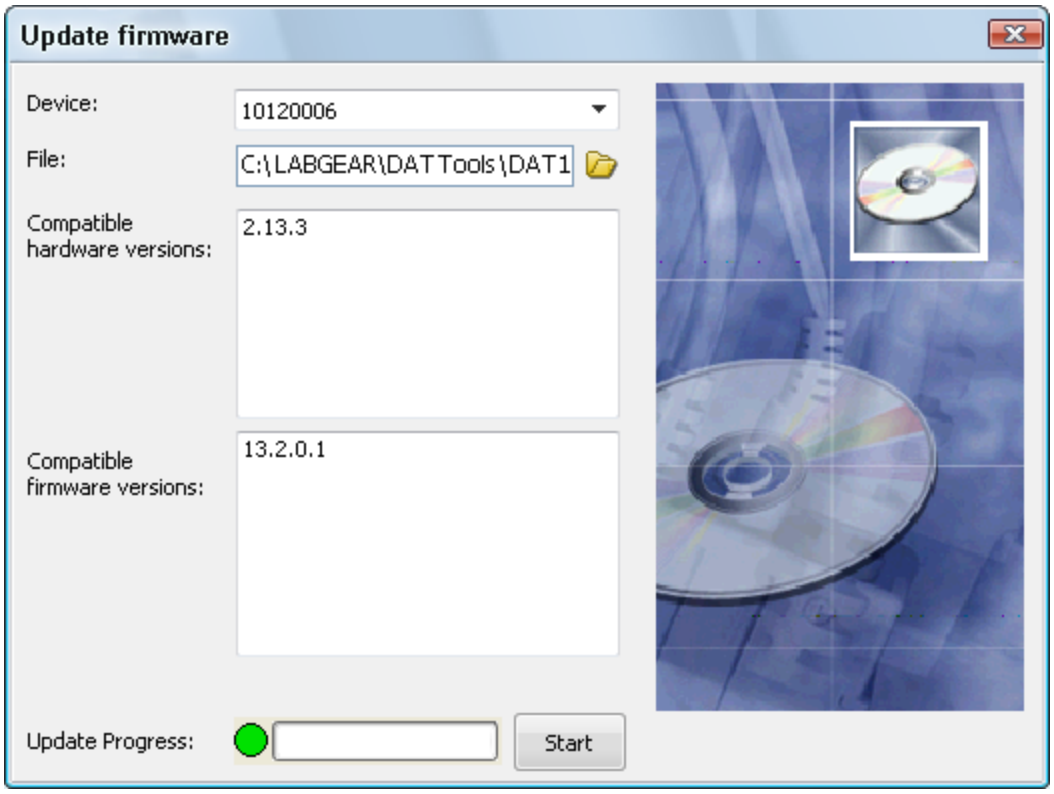
24v - output voltage sets 24v.

Also, in AMP powering panel displays information messages about error. Types of errors:

1. **External voltage**. This error display when external voltage detected on RF input of device.
2. **Overload**. This error display on electrical short.
3. **Voltage error**. This error display when voltage lower of set.

11 Updating Firmware

To update your DAT102 or DAT103 firmware, select the  icon in the navigation bar. **Firmware updating manager** window will appear:



Firmware update manager window includes the following elements:

- List of devices. Choose a device from the list by serial number.

- full file name. Select a file to load by clicking the button.

  In the file opening dialog box, select the required file. It will have a ***.bsk** extension.

- check device's hardware versions are compatible with the selected update file;

- check device's software versions are compatible with the selected update file;

- note location of update progress indicator.

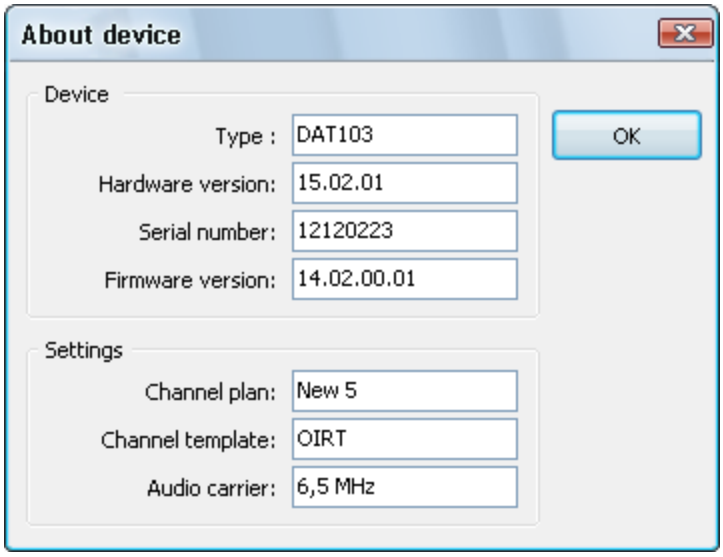
To update device's firmware, perform the following steps: select the device, select the firmware file, click **Start** button, and follow the step-by-step instructions, which appear on screen during update.

The Analyzer must be powered from an external power source. If your Analyzer functions properly, USB port cable connected correctly and firmware update file compatible, the process of updating Analyzer firmware will start automatically. When update is complete a pop-up window will confirm the operation has been successfully completed. The device will reboot and start operating.

CAUTION! Do not interrupt the firmware updating process as this can lead to analyzer malfunction. Should this occur, repeat the firmware update process.

12 Device Information

You can access information about the connected device by pressing the  button in the navigation bar. About device information window will appear on screen:



Device - field contains information about the connected Analyzer;

Type - device type;

Modification - hardware version of the device; Serial number - of the device;

Firmware version - or software version of the device;

Settings - field contains current device settings information;

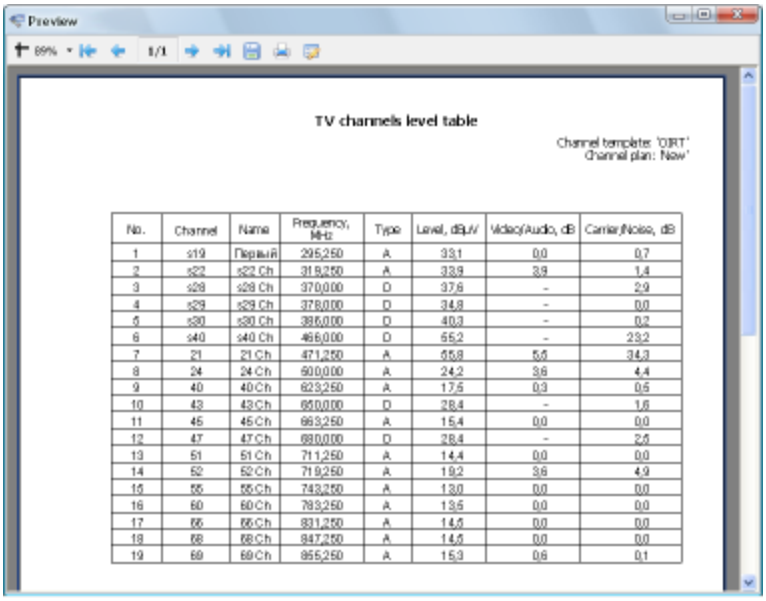
Channel plan - the current channel plan;

Channel template - the current channel template;

Audio carrier - frequency offset of Analogue audio carrier in MHz.

13 Viewing and Printing Reports

The preview window allows viewing and preparing a report for printing:



No.	Channel	Name	Frequency, MHz	Type	Level, dBµV	Video/Audio, dB	Carrier/Noise, dB
1	s19	Перший	295,250	A	33,1	0,0	0,7
2	s22	s22 Ch	319,250	A	33,9	3,9	1,4
3	s28	s28 Ch	370,000	D	37,6	-	2,9
4	s29	s29 Ch	378,000	D	34,8	-	0,0
5	s30	s30 Ch	386,000	D	40,3	-	0,2
6	s40	s40 Ch	466,000	D	55,2	-	23,2
7	21	21 Ch	471,250	A	55,8	5,6	34,3
8	24	24 Ch	500,000	A	24,2	3,6	4,4
9	40	40 Ch	623,250	A	17,5	0,3	0,5
10	43	43 Ch	650,000	D	28,4	-	1,6
11	45	45 Ch	663,250	A	15,4	0,0	0,0
12	47	47 Ch	680,000	D	28,4	-	2,6
13	51	51 Ch	711,250	A	14,4	0,0	0,0
14	52	52 Ch	719,250	A	19,2	3,6	4,9
15	55	55 Ch	743,250	A	13,0	0,0	0,0
16	60	60 Ch	783,250	A	13,5	0,0	0,0
17	65	65 Ch	831,250	A	14,6	0,0	0,0
18	68	68 Ch	847,250	A	14,6	0,0	0,0
19	69	69 Ch	855,250	A	15,3	0,6	0,1

Navigating report pages

Select the page to view using **First page**, **Last page**, **Previous page** and **Next page** buttons.

You can also navigate between pages using the scroll box on the right of the window, PageUp and PageDown keys. The number of the page being viewed and the total number of pages are displayed in the lower left corner of the preview window.

Changing the scale of report viewing

To change the scale of the report page view, click on the 74% **Scale** button and select the required scale from the drop-down menu. You can also change the scale using the right-click menu in the view area.

Enter or Edit text comments

Each report has room for additional text comments, which will appear on the first page under the heading. Comments are entered through the dialog box accessed by clicking the **Edit text comments** button. Comments can be edited in the same dialog box. Close by clicking **OK**.

Printing the report

To print out a report, click the **Print report...** button. The standard printing wizard will appear on screen. Click **OK** to print all the pages of the report with the default printer settings.

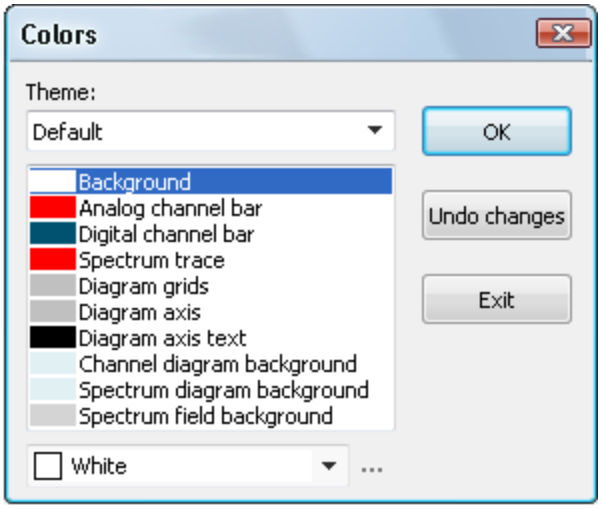
If necessary to select a printer other than the default, select the pages to print, or choose some other settings with the printing wizard.

Black-and-white report

Pages in graphical format can be printed in black-and-white. To print a black-and-white report, check the corresponding box in the report preview and print window.

14 Display color settings

You can select the colors of backgrounds, curves, grids, scales, and fonts. The program provides one **Default** non-editable color profile, and one **Custom** user-editable color profile. The view of the color display settings page is shown below:



Select the required profile from the **Theme** drop-down list. To preview the color of any

element, select this element name in the list. If you select the **Custom** profile, you will be able to define the color for any element. Select an element by name and then select one of the standard colors from the list, or set another color using the dialog, which you can access using the "..." button or by double clicking the left mouse button on the item from the list.