

**FLIGHT INFORMATION ANALYSIS
GROUND STATION "WinArm32™"**

**SOFTWARE
(VERSION 1.6)**

User's manual

**Moscow
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INTRODUCTION

Flight Information Analysis Ground Station **WinArm32™** is a software/hardware complex for FDR information read out, processing and presentation. The program works on IBM-compatible PC under MS Windows 98/ME/NT/XP. The **WinArm32™** program has clear user-friendly interface and context tips that make the work easy and comfortable.

Using **WinArm32™** you are able:

- To read out information from MSRP-64, MSRP-64M5, MSRP-128, MSRP-256, MSRP-A-01, MSRP-A-02, BUR-1, BUR-2, BUR-3, Tester-U3 (all series) FDRs using BVS-3, UVZ-5M, Uvs-3M, OBZOR-MS ground playback recorders. Information read out is done with the help of small-size, portable input device with standard USB interface. There is now no need to install interface boards inside the computer. "Tester-U3" FDR (all series) information read out is now available directly from board of an aircraft into a notebook;
- To import flight information that was read out by third party programs (including western made recorders) with subsequent full-scale processing and presentation;
- To perform automatic FDR information processing and analysis;
- To print flight information in graphical and tabular format on arbitrary time interval;
- To perform flight path calculation in vertical and horizontal planes and to recover not registered parameters;
- To make express-analysis of the flight information and to present the results in graphical, tabular or electronic format;
- To view real time 3D express demonstration of the flight synchronized with the CVR record;
- To keep and maintain database of flight parametric information with the ability to sort, to backup and to look for the necessary information;
- To work with one data file on many computers at the same time keeping the original file unchanged in the server database;
- To change calculations and express analysis algorithms, to add user-defined modules for express analysis and to create standard tasks for fast information viewing and printing.

While reading out the information with the help of **WinArm32™** program a user has the ability to look for desired information in fast and

evident manner, to preview the values of the registered parameters in codes or engineering units, to copy selected part of the information into separate file. Information read out is done with the help of small-size, portable input device with standard USB interface. There is now no need to install interface boards inside the computer. "Tester-U3" FDR (all series) information read out is now available directly from board of a aircraft into a notebook.

Frame failures may be set (marked) automatically during read out process. The program gives the ability of remote controlling of playback devices from the PC if those devices support this kind of control.

The **WinArm32™** program may import the information that was read out on the third party equipment (including western made). You don not need to install any hardware for this. Special add-on could be designed to import information from any kind of recorders. You will have no limitations while working with imported data comparing to the data that were read out with the help of **WinArm32™**.

While working with parametric information the user has the ability:

- To select, to sort and to display desired analog parameters and On/Off signals (events) in fast and evident manner;
- To go to the desired part of the flight in one mouse click;
- To select **any** scale of the parameter axis and time axis (up to particular frame);
- To select parameter's color;
- To display data in codes or engineering units;
- To view parameter values exactly at the registration instants and to move a scale of any parameter along the screen.

You may set and remove frame and parameter failure marks in different ways to exclude them from calculations and analysis with the possibility to save original information and to return to it at any time.

You can customize appearance of many parts of the program interface and to select language (English or Russian).

Graphic forms and standard tasks system gives you the ability to share results of your work with other users and to use them while processing newly created data files.

Specially designed format of **WinArm32™** data file makes any data file fully independent and useable on any computer with **WinArm32™** installed. All the results of your work are now saved directly in the data file.

You are able to add a lot of different information while printing a graph: short name and/or full name of the parameter, parameter values in any position, graph name, service information, transcript of crew members communication and so on. The program has the ability of automatic scale management while printing and supports any print device installed in the MS Windows which makes information printing evident and fast. Now you are able to print (save) your results unto .emf file with the ability of sharing it via E-mail or additional processing using third party graphical tools.

The **WinArm32™** program contains built in function that helps you to calculate flight path in horizontal and vertical planes on any stage of the flight. While calculating you are able to correct calculation results on wind influence and take into account the instants of flying through fixed points (VOR and so on). Flight path calculations results may be synchronized with geographical/radio-navigational maps or with Jeppesen charts. Visualization utility provides you with the ability of 3D express demonstration of the flight in real time mode with CVR record synchronization and selected parameters monitoring.

The **WinArm32™** database is based on client-server architecture. You keep your database (data files archive) on the server and client workstations receive selected files via local area network with the ability either to save them in local databases or transferring back to the server after some corrections were done. The last function is enabled only for users with the highest level of access. High density of the flight parametric information (500Kb on 1 hour) makes data transfer quick for different types of networks.

The changes to the ciclograms (set of the parameters and their addresses) so as to the calibration tables may be made directly during the work with the help of user-friendly interface.

The program has built in interpreter of the logical and arithmetical equations that provides users with the ability to change existed and to compile new algorithms of the express analysis.

The program guarantees information protection from unauthorized access through four different levels of access.

Developing, technical support, guarantee and post-guarantee maintenance as well as personnel training is done by the specialists of Scientific and Technical Commission of the Interstate Aviation Committee which have great experience of flight information read out, recovering and analysis including aviation accidents and incidents investigation.

1. What is new

This chapter is for WinArm16 users and contains short description of the new features of **WinArm32™** in comparison with previous versions. **WinArm32™** is fully 32-bit software that significantly increases its performance comparing to WinArm16. To guarantee backwards compatibility WinArm16 files could be converted into **WinArm32™** format.

FDR read out is now done using small-size, portable input device with standard USB interface. There is now no need to install interface boards inside the computer.

Program supports now client-server architecture and is convenient to use in companies with branchy structure of departments connected to each other using LAN.

User can now select language (Russian or English) of the program interface dynamically.

New format of data file makes it self-sufficient and moveable to any computer with installed **WinArm32™** with saving of all the changes that were made on another computer.

Add-on converters let you convert the data file from any type of FDR (including western made) in **WinArm32™** format.

The following features were significantly amended:

- Graphs printing is now fast and handy. You can now print the graph to file of Enhanced Windows Metafile (*.emf) format or JPEG format or BMP format.
- Work with graphic forms and standard tasks is now greatly simplified.
- Work with calibration tables and header files is now simplified.
- Frame and parameter failure marking is amended.
- User's interface customization and parameters attribute changing is now simple and fast.
- New possibilities to select desired time interval are now available.
- "Tester" FDR (all types) information read out is now available directly from board.
- Data viewing during read out is now available in engineering units.
- Program interface became more user friendly with great amount of hints and advices that appear depending on user's action.

2. INITIAL KNOWLEDGE

2.1. Introducing **WinArm32™**

The **WinArm32™** program has clear user-friendly interface and context tips so you can start your work with the program without reading the manual.

To get the knowledge about all the features of the program it is enough to get acquainted with the present manual. It should be noted that **the present manual assumes that the user has basic knowledge about flight data recording and FDR types, flight dynamics and computer under Windows™ operating system.**

To get the above-mentioned basic or advanced knowledge refer to the appropriate manuals.

2.2. Components installed

The **WinArm32™** system consists of the following major components:

- Executable file **winarm32.exe**.
- Auxiliary dynamic link libraries, configuration and initialization files.
- The file with the predefined parameters list.
- Help files.
- Examples of data files, headers and flight path files.

Installation program automatically places above-mentioned files into the appropriate folders.

2.3. Technical requirements

To install the flight information analysis ground station **WinArm32™** your computer should meet the following minimum requirements:

- Pentium 2 or higher;
- Operating system **Windows'98 (Windows XP is highly recommended)**;
- Screen resolution at least 1024x768, High color (16 bits);
- RAM at least 64 Mb (128 Mb recommended);
- Free space on hard disk at least 50 Mb;
- USB interface to connect protection unit;

-
- CD-ROM drive.

To read out FDR information you need second USB 1.1 connector or external USB divider. To work in client-server mode you need network adapter.

To work with graphic forms and in the «**Plot for printing**» mode (chapter 10.11) you need to have at least one printer installed.

To speed the work it is highly recommended to have a mouse with the scrolling wheel.

3. Getting HELP

Press F1 to get context dependent help at any moment.

Possible actions, advices and tips are continuously appearing in the status bar while user is working with the program.

4. Program installation and removing

Before installing **WinArm32™** it is recommended to close all applications and to make sure that system configuration meets the minimum requirements mentioned in the chapter 2.3. If another version of the **WinArm32™** is already installed, it has to be deleted using **Add and remove program** application of the **Windows™** control panel.

***Attention:** It is not recommended to remove the previous version manually because it may cause some difficulties while installing a new version.*

***Note:** If previous version is **WinArm16**, you do not need to remove it. Both versions may work at the same time.*

Uninstall wizard will remove from the hard disk only files that were copied by the setup program. Data files that were created by users during program operation will not be deleted automatically and may be used in the future. Those files if needed should be removed manually. After old version removing the new version may be installed.

The **WinArm32™** program is shipped on CD that has autorun.exe file. If your computer supports CD autorun option you have just to put the disk into CD-ROM drive and setup window will appear automatically. If your system does not support CD autorun option or you want to start setup manually just open the root CD folder and start **setup.exe**.

Follow the installation program instructions. During installation user is able to select program installation folder and the type of setup: full or custom. If full setup type is selected all the files are copied onto the hard disk. Custom setup type is recommended for the advanced users and allows skipping installation of some components.

Installation program creates shortcuts on the desktop and in the **Start** menu and registers in the **Windows™** system new file types (chapter 5).

4.1. Data input device driver installation

To read out the information from ground based recorders you have to install the driver of the data input device.

To install the driver you have to connect the data input device to the computer (through USB slot). The system will recognize new equipment and install wizard will be started automatically (Figure 4.1). Select **Install from a list or specific location** switch and click **Next**.



Figure 4.1

In the next window (Figure 4.2) check the switch **Include this location in the search** and select the **Drivers** folder from **WinArm32™** installation folder.

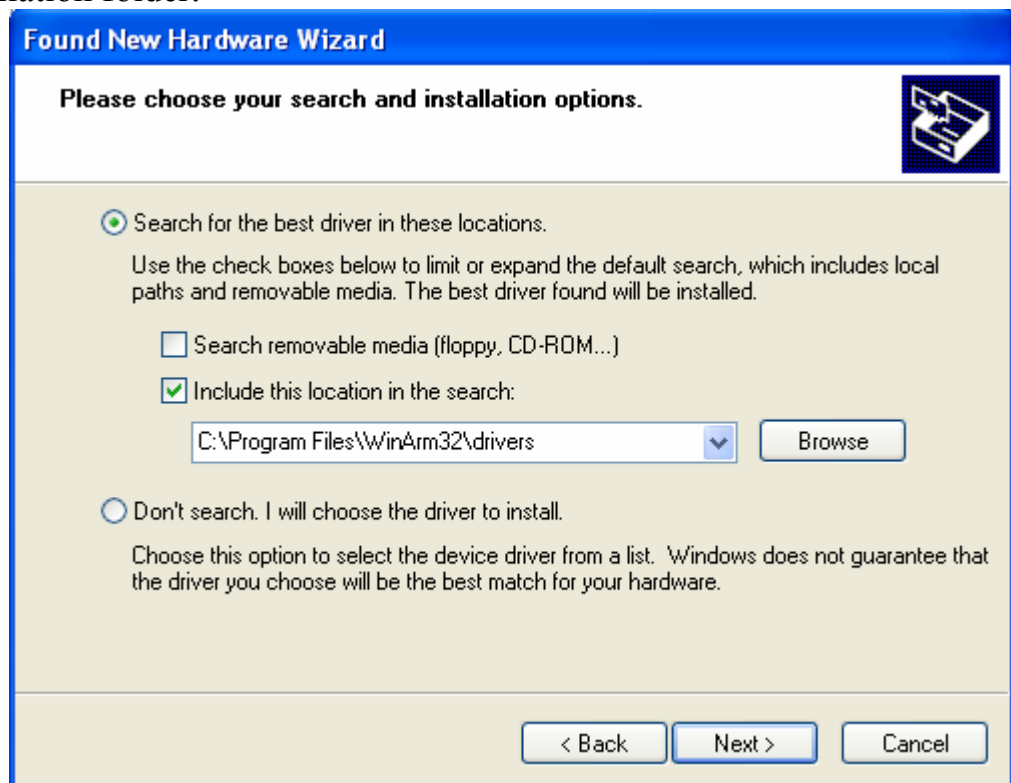


Figure 4.2

After clicking the **Next** button the system will find and install the driver and data input device will be ready for read out. If you work with

Windows XP™ operating system a warning may be popped up. It will inform you that the driver was not tested on compliance with operating system. Just continue the installation in this case.

Use standard **Windows™** procedure to remove data input device driver. Select **Add/Remove programs** from **Windows™** Control Panel and remove FTDI FTD2XX USB Drivers entry.

4.2. Protection key driver installation

The **WinArm32™** program is protected from unauthorized access with the help of USB protection key named HASP which is included in standard distribution package. If this key is not connected to the computer while program is being started it will continue to work in demo mode with the lowest level of access. All the recourses described in chapter 6 won't be available. The appropriate message (Figure 4.3) will be shown to inform user about working in restriction mode.

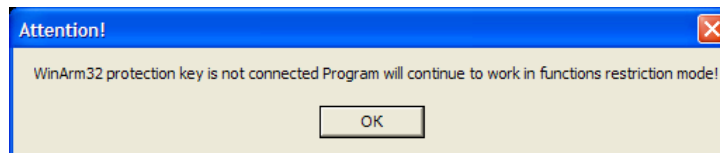


Figure 4.3

Protection key driver has to be activated after program installation. Using **Start/Run** menu item run the **hinstall.exe** program with the **-I** switch from the **WinArm32™** main folder. If program was installed in the default folder the command line will be "**C:\Program Files\WinArm32\HINSTALL.EXE**" **-I**. A message with driver installation results will be shown. If everything is installed properly the red light switches on inside a protection key.

5. Starting the program and working with files

5.1. First start of the program

Before starting the program at first time it is recommended to make sure that protection key (HASP) is plugged into the USB slot and its driver is properly (red light is on) installed (chapter 4.2). To start **WinArm32™** follow the standard procedure that is double click by the left mouse button on the executable file (**winarm32.exe**) or on shortcuts that were placed by the setup program on the desktop and in the **Start** menu. The **Input password** window appears (Figure 5.1), which prompts the user to register and to select program work mode: client (chapter 7) or server (chapter 8).

The **WinArm32** setup program has the default user with the name **WinArm32**, password - **100** and system administrator access level. During first start of the program you **must** specify these user name and password (Figure 5.1).






Figure 5.1

After logging into the program the system administrator adds new users and specifies their levels of access (chapter 6).

5.2. Normal start of the program

During following starts of the program the **Input password** window will contain by default the name of the user that worked with the program last time.

***Note:** While inputting user name and password you have to check keyboard language layout and to remember that program differentiates capital and ordinary characters.*

The **WinArm32™** setup program registers in the **Windows™** system register new file types with the following extensions: **arm** (data file) , **hdr** (header file)  and **tra** (flight path file) . To start the program opening a particular file you have to double click on the desired file name or its shortcut by the left mouse button.

5.3. Starting the program in client mode

After entering correct user's name and password or after pressing **Cancel** button the program begins to work in the client mode (chapter 7) with the specified resources access level.

5.4. Starting the program in server mode

To start the program in server mode you have to enter correct user's name and password and also to check the **Server** box. The program begins to work in server mode (chapter 8).

5.5. Selecting the language

The program provides the ability to select interface and help files language. To select the language close all the child windows including database window and open popup menu by right button clicking inside program's main window (Figure 5.2).

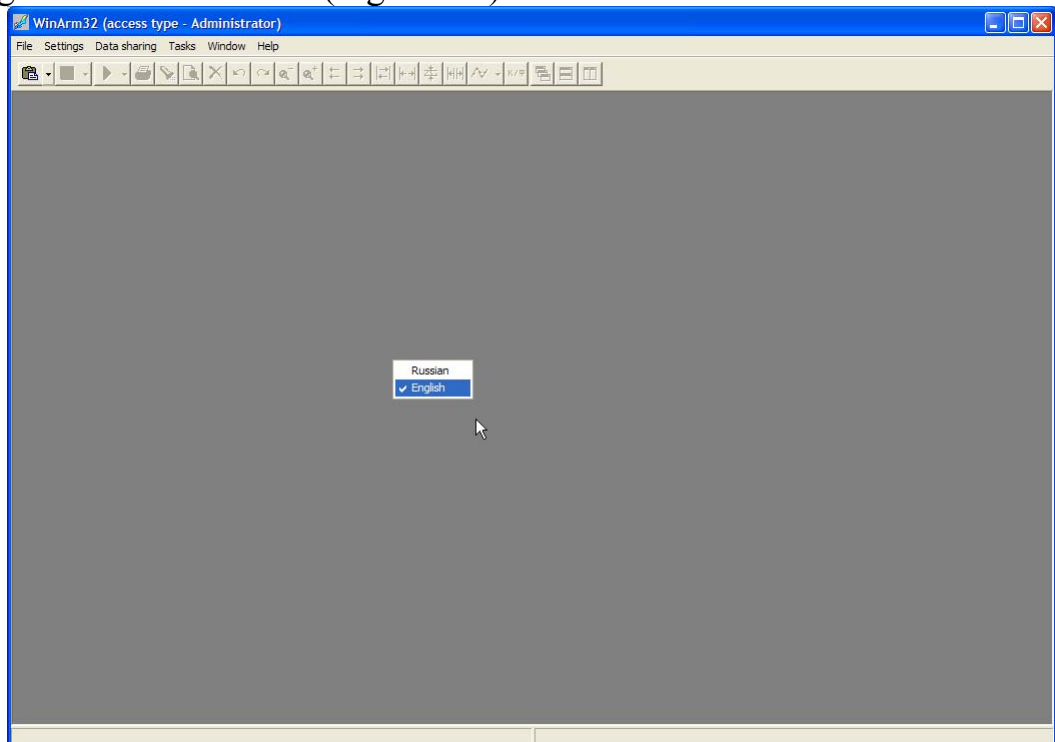


Figure 5.2

6. DATA PROTECTION

To protect the data and to authorize access to the data the program provides four different levels of access:

- System administrator;
- Advanced user;
- User;
- Guest.

User's name and password that are inputted while logging into the program (Figure 5.1) specify the level of access. The program will give a special warning if user's name and/or password are incorrect. After that the program invites an user to repeat password input. You have to remember that program differentiates **capital and ordinary characters**. If password input is incorrect three times on end or **Cancel** button is pressed the program logs on with the lowest level of access – **Guest**. Current level of access is indicated in the caption of the program's main window.

Only system administrator may add new users or change their level of access using **Change password** window (Figure 6.1) that appears after selecting the **File/Password** menu item.

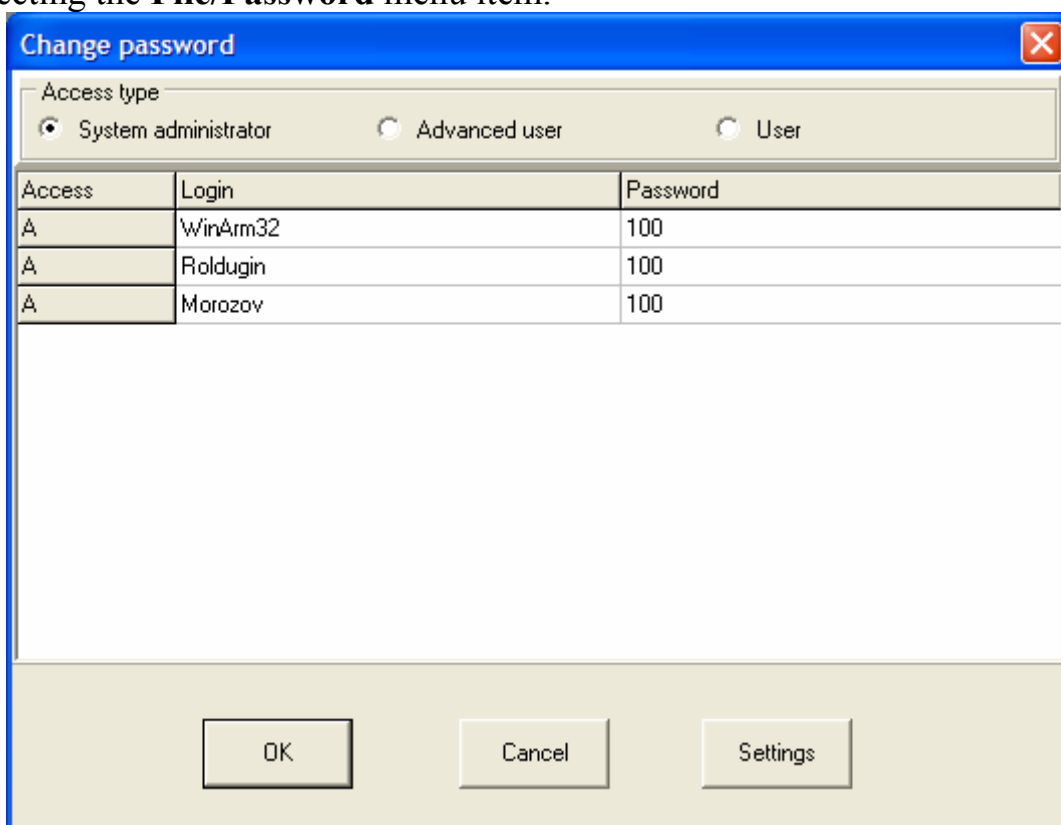


Figure 6.1

Press **Ins** key while list field is active to add a new user. To delete the line with the user name press **Del** key. To change user's level of access select the appropriate switch of the **Access type** field. Current level of access is indicated in the **Access** column: A – system administrator, AU – advanced

user and U – user. To specify resources accessibility for different levels use **Winarm32 security settings** dialog (Figure 6.2) that appears after clicking the **Settings** button.

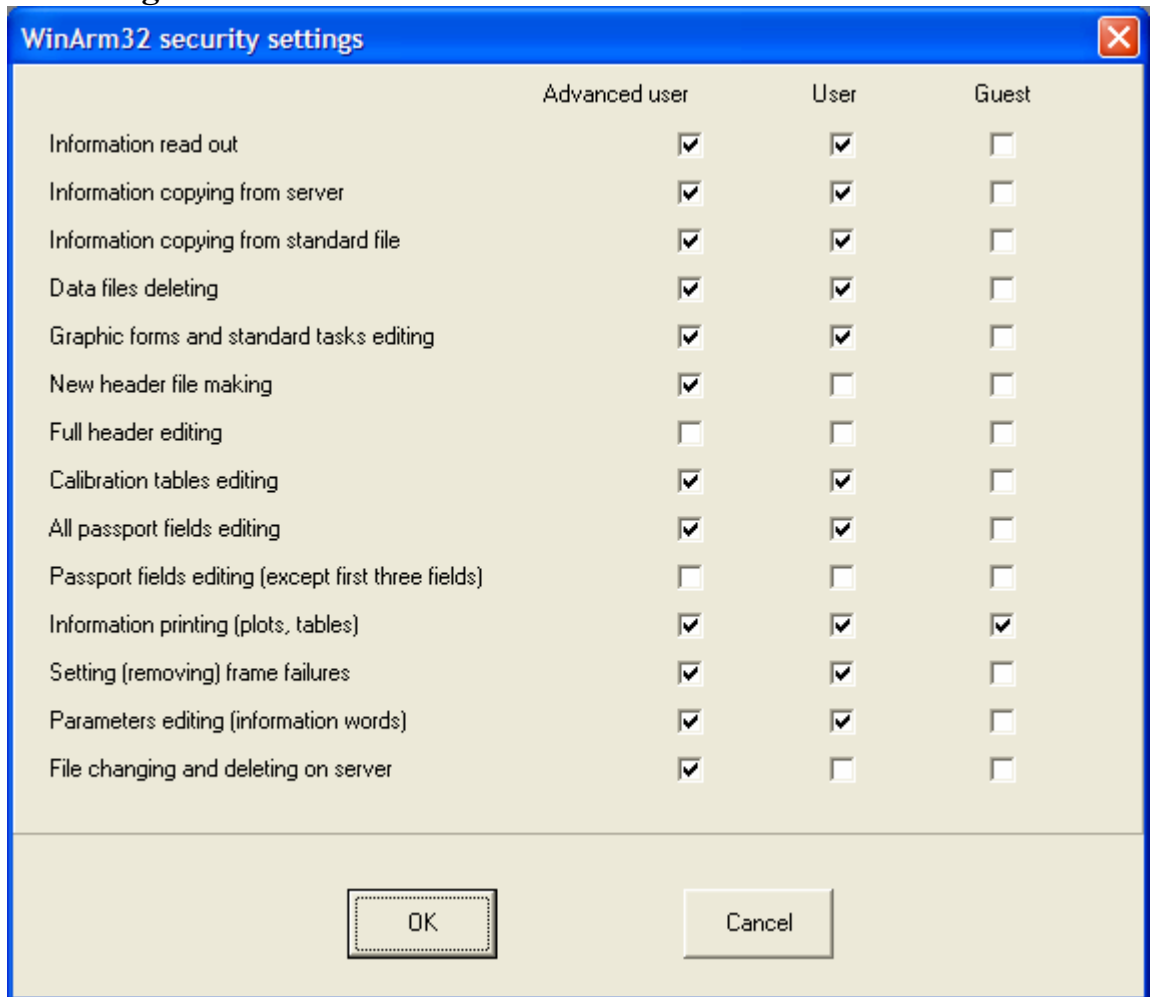




Figure 6.2

You can open or restrict access to the following program's resources:

- Information read out.
- Information copying from server.
- Information copying from standard file.
- Data files deleting.
- Graphic forms and standard tasks editing.
- New header files making.
- Full header editing.
- Calibration tables editing.
- All passport fields editing.
- Passport fields editing (except first three fields).
- Information printing (plots, tables).
- Setting (removing) frame failures.
- Parameters (information words) editing.
- File changing and deleting on server.

Advanced user may change only his own user's name and password.

7. DATABASE WINDOW IN CLIENT MODE

The database window of the **WinArm32™** program appears immediately after program starting or after  button clicking or after **File/Database/WinArm32 database** menu item selecting. The database window is shown on the Figure 7.1. The name of current data folder is indicated in the top middle part of the window. To select a new data folder press  button.

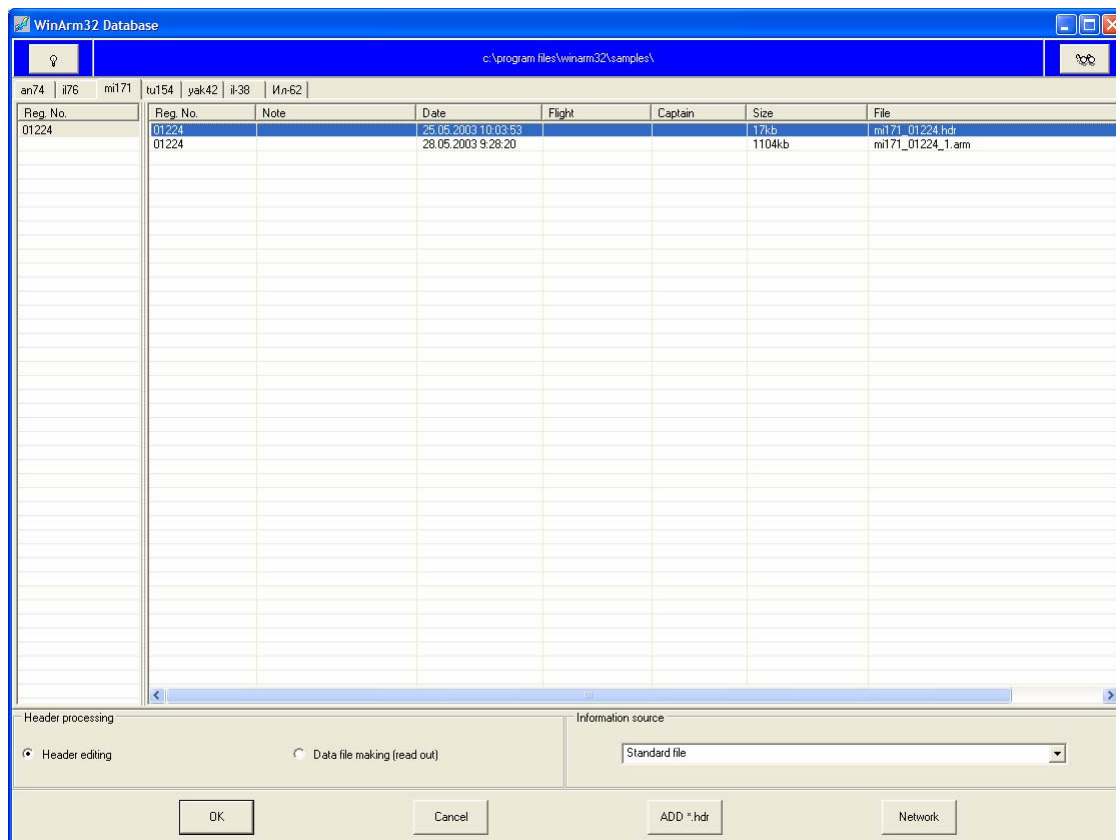


Figure 7.1

After data folder is changed the program searches for the data files and header files. On the top level, the program sorts the files using aircraft type specified in the first field of the passport (chapter 9.1). Next sorting is done using any of the six passport fields: Reg.No, Note, Date, Flight, Captain and Size. To select a field for sorting click by the left mouse button on the field's caption. The field **Reg.No.** is used by default for the second-level sorting.

To select a file from the database just left click on the desired line in the list. Attributes of the selected file are shown on blue background. If **OK** button is pressed and data file is selected the program window will change to represent registered information on the screen (chapter **Ошибка! Источник ссылки не найден.**). If header file is selected (chapter 9.1) then, depending on **Header processing** switch position the program will change either to the header editing mode (chapter 9) or to the data read out mode (chapter 9.4).

Popup menu (Figure 7.2) appears after right clicking on the list of the files.

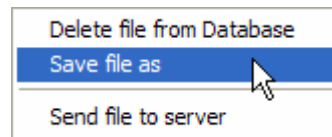




Figure 7.2

Using this menu you can delete the selected file from the database, save it with a different name and, if network connection is established and server is active, you may send it to the database on server. It should be noted that after a file is deleted it will be placed into the Recycle Bin and may be recovered using **Windows™** standard procedure.

The  button allows you to connect to the server database. This button becomes enabled after connecting computer to network. Network configuration parameters are set in the dialog window (Figure 7.3), that appears after clicking the  button.

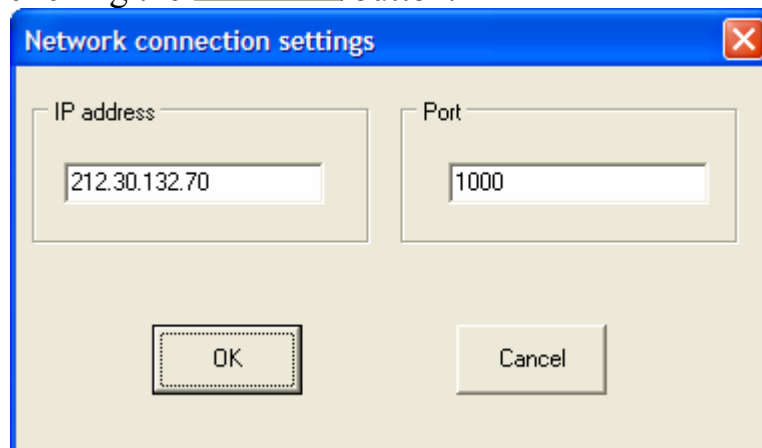




Figure 7.3


Server IP address (chapter 8) and port number have to be set. The program uses port number 1000 by default.

If server is active and network settings are properly installed the server database window will appear on the screen. Server IP address will be indicated in this window and the appearance of the button will change to . The appropriate warning will be shown if the program is not able to establish the connection to the server. In this case, check network configuration parameters at first and consult your administrator if server is currently active.

After choosing a data file the program invites an user to select a local folder to save the file in. The file will be automatically loaded into the program and server connection will be terminated.

8. DATABASE WINDOW IN SERVER MODE



The program starts to work in server mode after the appropriate switch was selected in the **Input password** window. A word **Server** will appear in the caption of the main window indicating that the program is ready to work as a server. It should be noted that before clicking the  button in the database window the program will work in normal (client) mode (chapter 7), but is ready to work as a server.

To configure server network parameters (port number) press the  button. The program uses a port with the number of 1000 by default. It is not recommended to change this number. In case this number is changed you have to restart the program to activate changes.

The current server IP address is also indicated in the window. This value has to be set to configure the client part of the network connection (chapter 7).

To start working as a server press the  button.

***Note:** This button becomes enabled after connecting computer to network.*

The button appearance will change to  if the program successfully enters the server mode and the list of network events will be shown on the screen. All the client's functions become disabled after entering the server mode. To stop working as a server and resume work in the client mode click the  button once again.

Log file is created in the **LOG** folder if the program works in server mode. Network events are saved in this file. Log file is a simple ASCII file. A name of the file is the current date in dd-mm-yyyy format. It means that a new file will be created every day. Using log files a system administrator can monitor access to the data files.

It is recommended to delete or to make archives of the log files every month.

9. Preparation for read out and reading out the flight parametric information

Data file creation procedure is described in this chapter. There are two different types of files in the **WinArm32™** program:

- Header file with **.hdr** extension;
- Data file with **.arm** extension.

Normal procedure to create data file consists of the following basic steps:

- Parameters list (cyclogram) preparation;
- Calibration tables input;
- Flight information read out.

The first two items are combined together in the **WinArm32™** and correspond to a header file creation. Registered flight information and graphic forms created by users will be attached to a header file after that. The combination of registered data together with information from header file and graphic forms will make a data file. A header file is a key for registered data interpretation. It contains information about FDR type (model, format, frame length and so on), set of registered parameters (type of the parameter, addresses inside a frame, calibration table or equation) and different display settings (color, position on the screen, scale and so on). Thus, data file creation starts from preparation of an appropriate header file.

9.1. Header file preparation

You may create a new header either from the beginning or on the base of the existing header for similar type of aircraft (chapter 10.10). The second way is more preferable because saves time and protects from many failures for example in address assigning.

To create a new header press the **Add .hdr** button in the database window (Figure 7.1). To edit an existing header file select it in the list of files, check **Header editing** switch and press **OK**. The **Header editor** window (Figure 9.1) will appear in both cases.

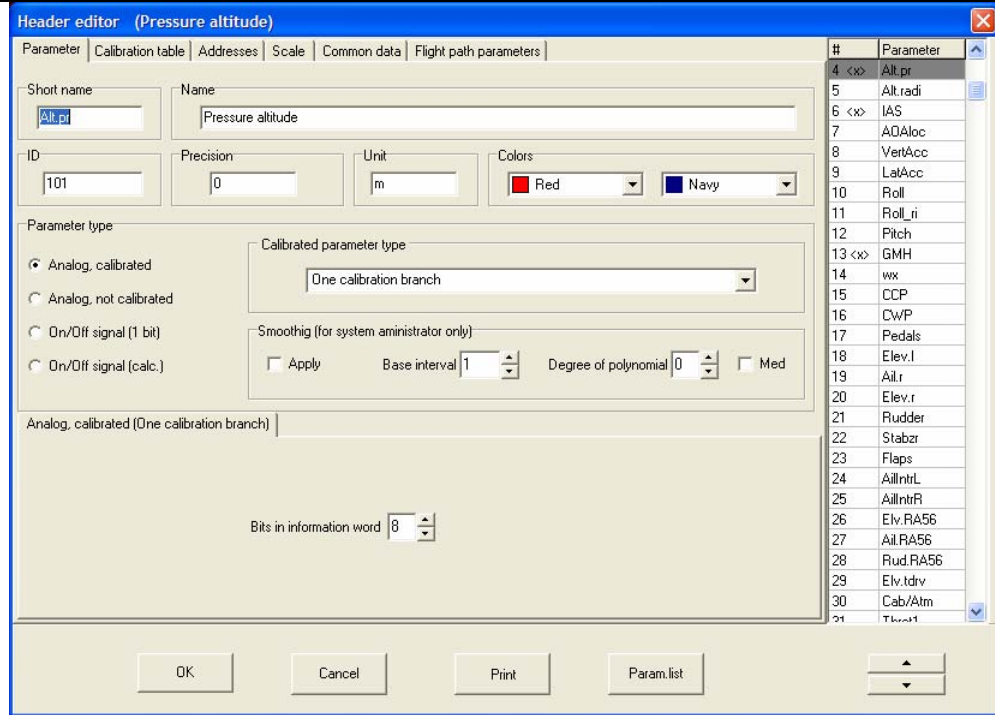


Figure 9.1

The window consists of the list located in the right part of the window that contains the short names of the parameters from the current header and number of pages which quantity and type depend on the currently selected parameter.

9.1.1. Common Data page

The **Common data** page (Figure 9.2) provides the ability to set up general FDR parameters and to fill in passport fields.

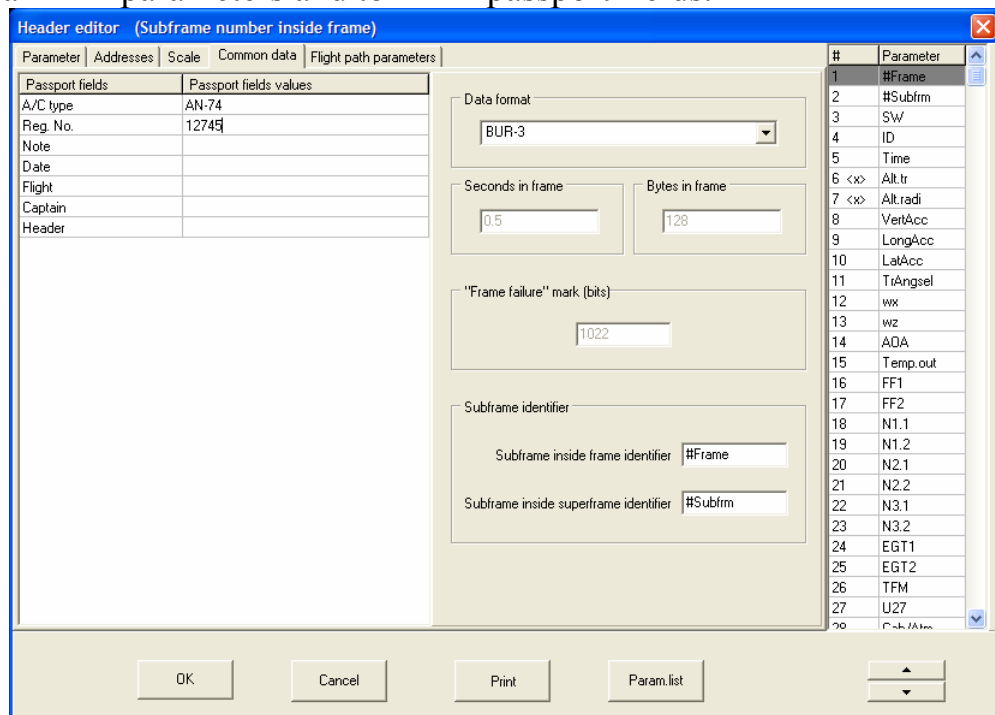


Figure 9.2

FDR type has to be selected in the **Data format** field. If data file format do not comply with any FDR type **arbitrary** data format should be selected. If FDR type is selected all other fields are filled in automatically and could not be changed. The exception is recording systems (for example BUR-3) which requires additional parameters (**Subframe inside frame identifier** and **Subframe inside superframe identifier**) to be specified. These fields define the order number of a subframe inside a frame or superframe. These parameters have to be selected from the list (Figure 9.3), that appears after left clicking on the appropriate field.

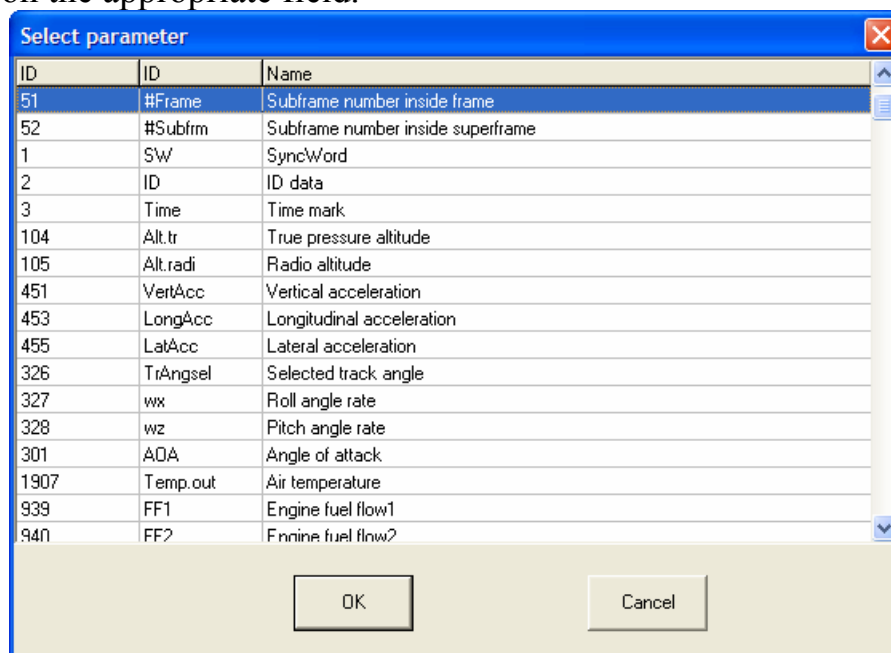


Figure 9.3

Note: The list is made from the parameters that are already added to the current header. Thus, desirable parameters have to be included in the header in advance.

These fields are used to determine the values of the parameter in case it is not registered in every subframe and to present the service information as an analog parameter. If these fields are left blank the program assumes by default that all the parameters are registered in each subframe. For BUR system these parameters are included in the predefined parameters list (file **param.txt**) under identification numbers 50 and 51 respectively.

To present service information as analog parameter (Figure 9.24 and Figure 9.25) you must fill in **Subframe inside superframe identifier** field.

Arbitrary data format selection gives you ability to specify data structure manually.

The program specifies seven passport fields by default. You can return to default passport at any time after right clicking on passport field and selecting **Standard passport** item from the popup menu. To add or remove passport fields use the appropriate commands from popup menu.

The program uses the passport fields to sort the files in the database window (see also chapter 7).

9.1.2. Parameter page

The **Parameter** page is shown on the Figure 9.1. The short names of the parameters already added to the current header are shown in the list. Analog parameters are on the top of the list and On/Off signals are below. You can move the selected parameter up and down using the buttons located just under the list. Analog parameters and On/Off signals may be moved only inside their groups.

You can add a new parameter to the header either manually or selecting it from the predefined list of the parameters. The second way is highly recommended. The predefined list of the parameters (Figure 9.4) appears after clicking the **Param.List** button.

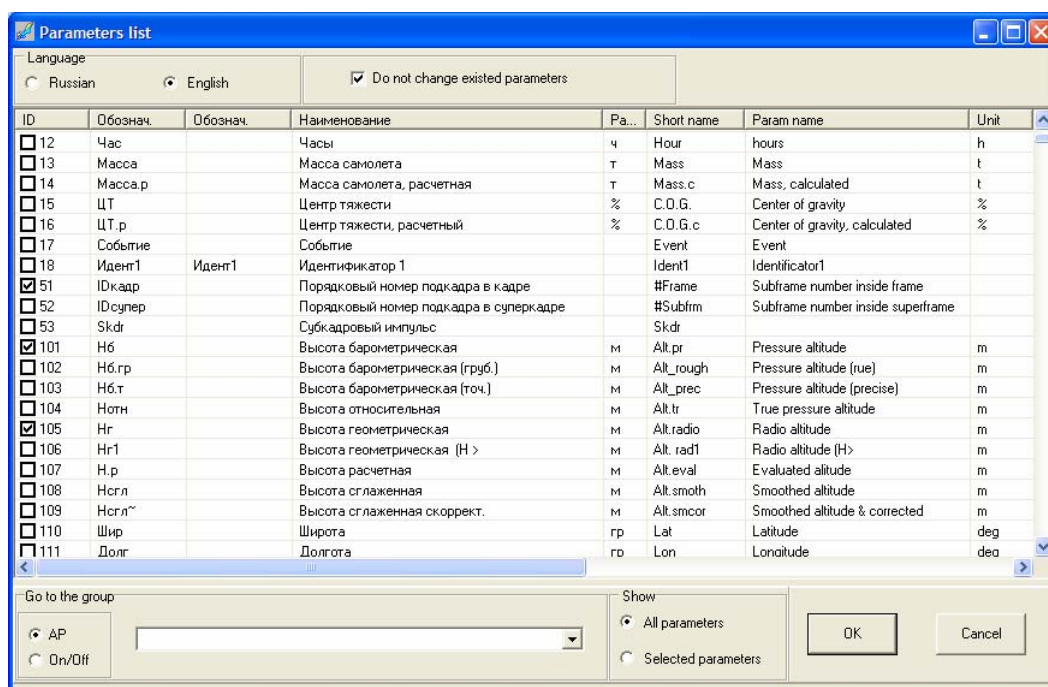


Figure 9.4

User can select the language (Russian or English) that will be used to describe parameters. The parameters already added to the header are checked.

Select the appropriate checkbox in the left part of the list to add a new parameter to the header. Remove the mark if you want to delete a parameter from the header. Check **Selected parameters** switch to see only parameters that are already added to the header. To navigate through the list use the **Go to the group** filed. You will be moved to the selected group of analog parameters or On/Off signals depending on the switch position.

Each parameter has the **unique** identification number. The program uses this number to identify parameters in graphic forms, standard tasks, express analysis and so on. You **must not change** the ID numbers of the


parameters included in the predefined parameters list. But you can change contents of all other fields (name, short name and so on).

***Note:** Each time you press the **OK** button in **Parameters list** window the program restores all the attributes of the parameters using the predefined list. If you want for example to change names of some parameters you have at first to complete the header and after that make your changes. You may also check the field **Do not change existed parameters**. In this case the program will not change the attributes of the parameters that were added before.*

To add a new parameter manually press **Ins** key while cursor (input focus) is in the list of the short names of the parameters in the right part of the **Header editor** (Figure 9.1) window. A new parameter will be added before the selected one. Unique identification number will be assigned automatically. It is recommended do not change this number. If you yet want to change it you have to guarantee the number to be unique. Remember that user's number must be more than 7000. You have also to define short name, name, unit and all other attributes of the parameter.

To remove currently selected parameter from the header press **Del** key.

At the highest level all the parameters are divided onto two groups: analog parameters (AP) and On/Off signals (Events). In turn analog parameters are divided onto "analog calibrated" and "analog not calibrated". On/Off signals are divided onto "1-bit" and "calculated". Select a type of the parameter in **Parameter type** field. Regardless of type every parameter has short name (no more than 8 symbols), full name and unique identifier. The colors to represent parameter in "**Plot for analysis**" (chapter 10.2) and "**Plot for printing**" (chapter 10.11) modes are set using **Colors** field.

Regardless of parameter type its values will be smoothed or differentiated if **Apply** switch (Figure 9.1) is selected. To select between smoothing and differentiation left click the caption of the field after cursor changes to . The current mode is indicated in the caption of the field. Smoothing or differentiation will be applied to the parameter values just before plotting. It makes no sense to plot parameter in codes when smoothing or differentiation is activated.

Smoothing or differentiation is done on moving symmetrical base interval with the help of a polynomial of the given degree. The width of base interval and the degree of a polynomial are to be specified by user in the appropriate fields.

***Note:** The specified value determines a half of the base interval width that is if 10 is set smoothing or differentiation in the target point will be done using 21 points (including the target point) or 10 samples from both sides (before and after) of the target point.*

***Recommendation:** Width of base interval determines how many **samples** of the parameter (**not seconds or frames**) will be used. It means that*

registration frequency (how many times per second) must be taken into account if base interval is to be specified in seconds.

If smoothing is set and polynomial degree is zero then arithmetic average on the given base interval will be calculated. If the appropriate switch is checked then median will be calculated instead of arithmetic average. Median is a value with a property that on a selected interval number of values smaller it is equal to number of values larger it.

***Note:** median is usually used to plot slowly changing parameters (amount of fuel) and helps to avoid random registration failures of different kinds.*

9.2. Analog parameter types

9.2.1. Analog calibrated

The **Header editor** window changes to the view represented on the Figure 9.5 if this parameter type is selected.

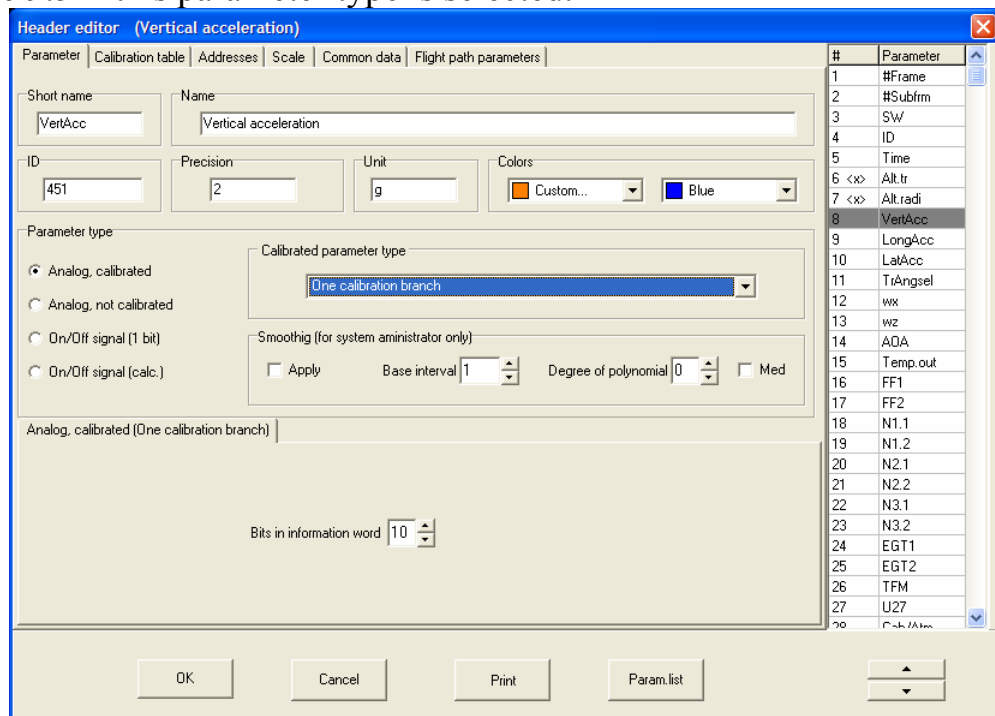


Figure 9.5

First of all a type of the ***analog calibrated parameter*** has to be selected from the drop down list. Also the number of bits in information word has to be specified. This value depends on the type of FDR and is 8 for MSRP-64, MSRP-256 and Tester FDRs. For BUR and MSRP-A-02 FDRs it may be from 9 up to 12 depending on a parameter. It is recommended to check this value for every parameter in FDR documentation.

9.2.1.1. One calibration branch

This is the mostly used type of analog parameter (Figure 9.5).

Calibration points have to be specified on the **Calibration table** page (Figure 9.6). Service information about by whom and when last changes to the calibration were made is presented in the top part of the window. To add a line (a new calibration point) to the list press **Ins** key when cursor (input focus) is in the list of the calibration points. To delete the current line (the current calibration point) from the list press **Del** key.

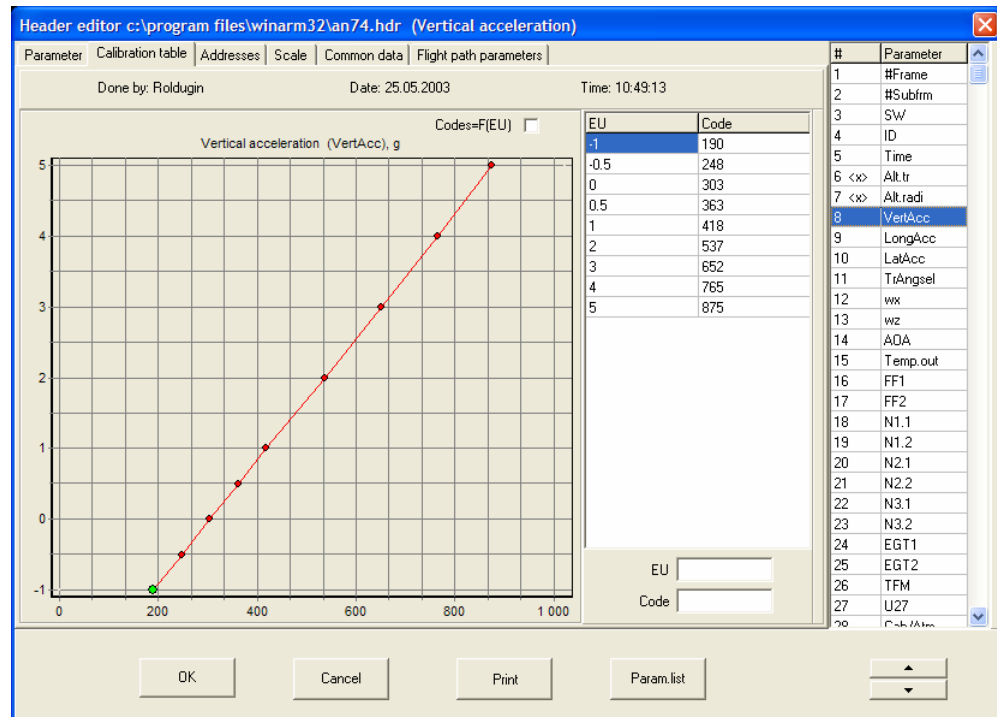


Figure 9.6

Graphical representation of the calibration table will be changing in accordance with adding or modification of the calibration points. The current point is plotted in green color. By default, engineering unit values are presented as a function of code values. Using **Codes=F(EU)** switch you can change it vice versa that is EU values will be along X-axis and code values will be along Y-axis.

To print a header along with all calibration tables click **Print** button. Standard **Windows™** word processor **WordPad** will appear to help you in printing. The legend of all the conventions is located at the end of the file. See chapter 9.6 for instructions how to print a standard calibration table blank.

The program allows a user to calculate the code value from the engineering unit value and vice versa using the current calibration. You have just to input a value in **Code** or **EU** field. The program will calculate the corresponding value and plot it in blue color.

Registration addresses of the parameter and failure mark location are set on the **Addresses** page (Figure 9.7). In case a parameter is registered more

than one time per frame (for example vertical overloading) each sample must be set (Figure 9.8). Press **Ins** key to add a string and **Del** key to delete.

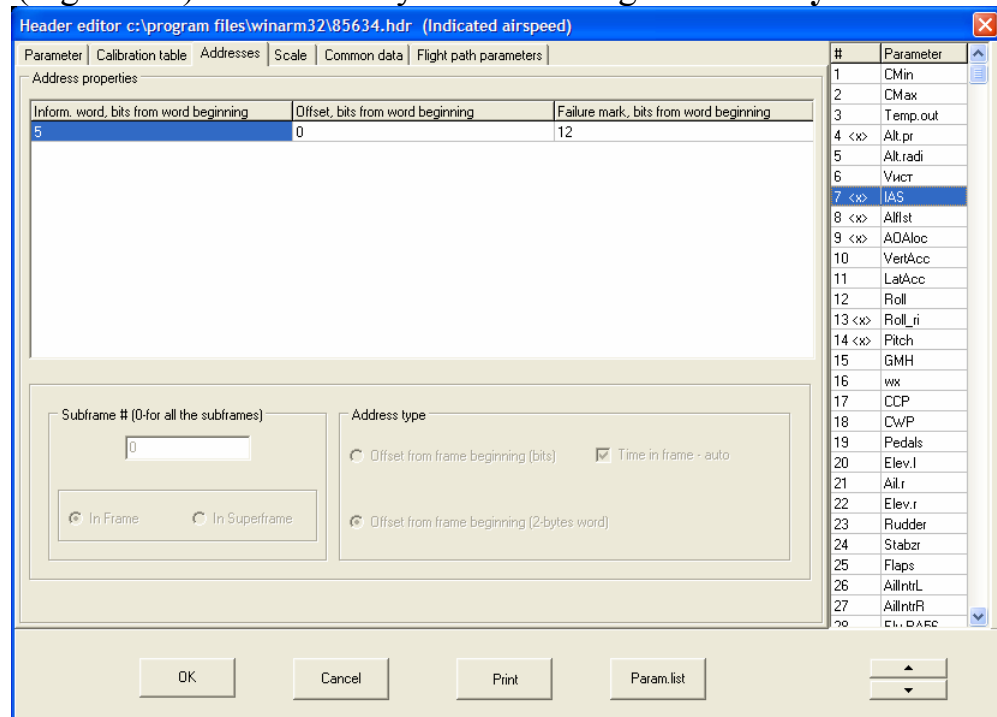


Figure 9.7

You can specify an address either by actual offset in bits from frame beginning or by address stated in frame structure map (**ciclogram**) which is measured in 16-bits words. The way you specify an address depends on the **Address type** switch position.

*Note: The **Address type** switch is disabled for predefined FDR types with regular frame structure. Addresses must be set in 16-bits words for those types.*

The first information word has an address 1, the second – address 2 and so on. Thus, an address is to be taken directly from a ciclogram for MSRP-A-02, BUR and Tester FDRs. Some FDR types (MSRP-64 or MSRP-256) use registration channel indexing starting from 0. You have to plus 1 to the addresses stated in a ciclogram for those FDR types.

The first way to specify an address (offset in bits) is used for data files with **arbitrary** frame structure if this type is selected on the **Common data** page. If you change the **Address type** switch the program recalculates addresses from one form to another automatically.

The next column (**Offset, bits from word beginning**) contains an order number of the first information bit inside the information word for the current parameter. Indexing starts from zero. The value of this field must be zero for MSRP-64 and Tester FDRs that is **n** lower bits are used for value coding, where **n** is a value specified in the **Bits in information word** field on the **Parameter** page. This value may be 2 for some FDR types (BUR or MSRP-

A-02) if a parameter is coded using only 10 bits and first two bits are used for On/Off signals registration (Figure 9.8).

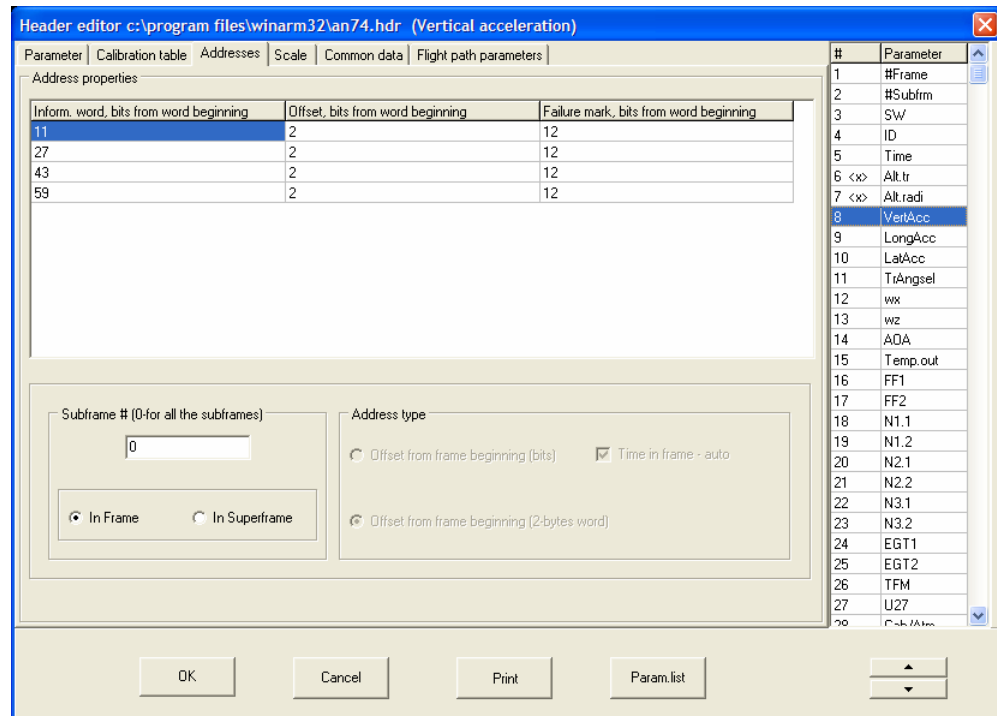


Figure 9.8

The next column contains an offset (location) of the parameter **failure mark**. The offset is counted in bits from the information word beginning. The value of each parameter in a data file is coded in two bytes word. First **n** bits contain a code value of the parameter where **n** is a value specified in the **Bits in information word** field on the **Parameter** page and other **16-n** bits may be used to store service information for example parameter failure mark. Today the maximum length of information word is 12 bits thus bits from 13 till 16 are free and may be used for some special tasks. Only for the purpose of data file structure standardization it is recommended to use bits number 13 and 16 for setting **failure** marks for analog parameters and On/Off signals correspondingly. It means that for analog parameter the recommended value of this column is 12 (Figure 9.8) that is the 13-th bit will be used if necessary to set a failure mark.

There are FDR types (for example BUR-3) that register some parameters not every subframe. The number of a subframe (**subframe #** field) where a parameter is registered must be specified in those cases. For the parameters that are registered in **every** subframe the value of this field must be **0**. Additionally, you have to specify for indexing inside frame or superframe belongs this value. Registration of the relative height and right slats position on An-74 aircraft may be an example. Both parameters are registered using the same address (49) but in different subframes (Figure 9.9 and Figure 9.10).

If selected FDR type does not require subframe specification the field becomes disabled.

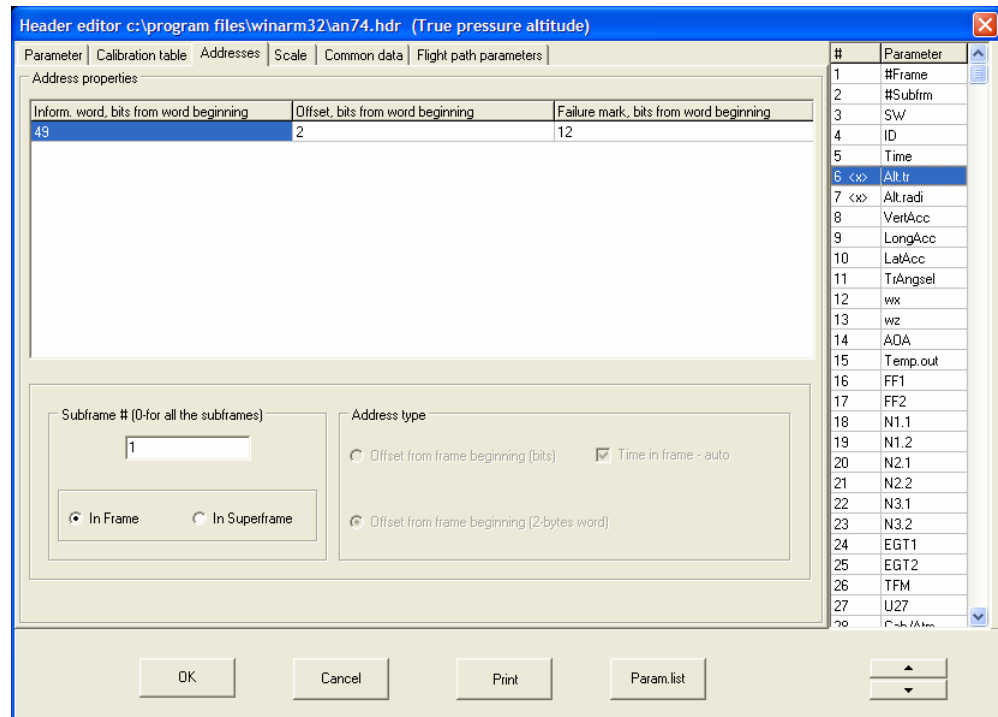


Figure 9.9

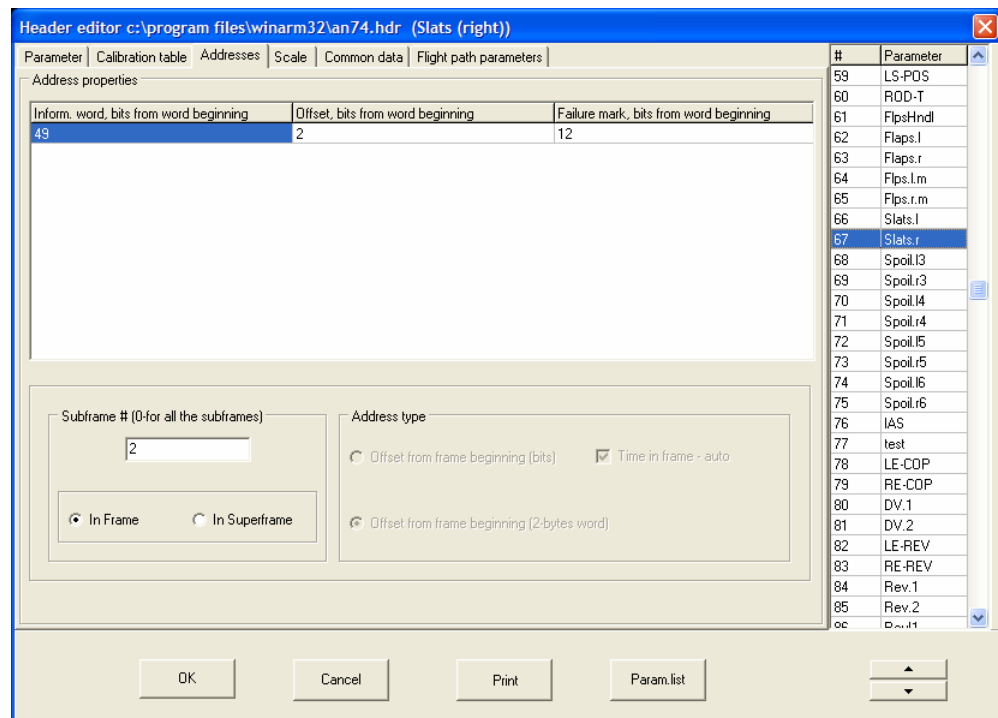


Figure 9.10

The **Scale** page (Figure 9.11) lets the user to set correction factors of a parameter and a way it is presented on the screen. Correction factors are applied to the value received after calibration table applying before plotting the parameter on the screen. They let to change a parameter by multiplication on any value (coefficient **K**) and to move a parameter by addition of any

value (coefficient **D**). The **K** coefficient is 1 and the **D** coefficient is 0 by default that is a parameter value is not changed. The **D** coefficient may be used to eliminate constant error of the parameter. The **K** coefficient may be used to change a slope of the calibration or to convert for example speed values from km/h into m/sec or knots. Together the coefficients may be used for calculating the true angle of attack values from the local angle of attack values (Figure 9.11).

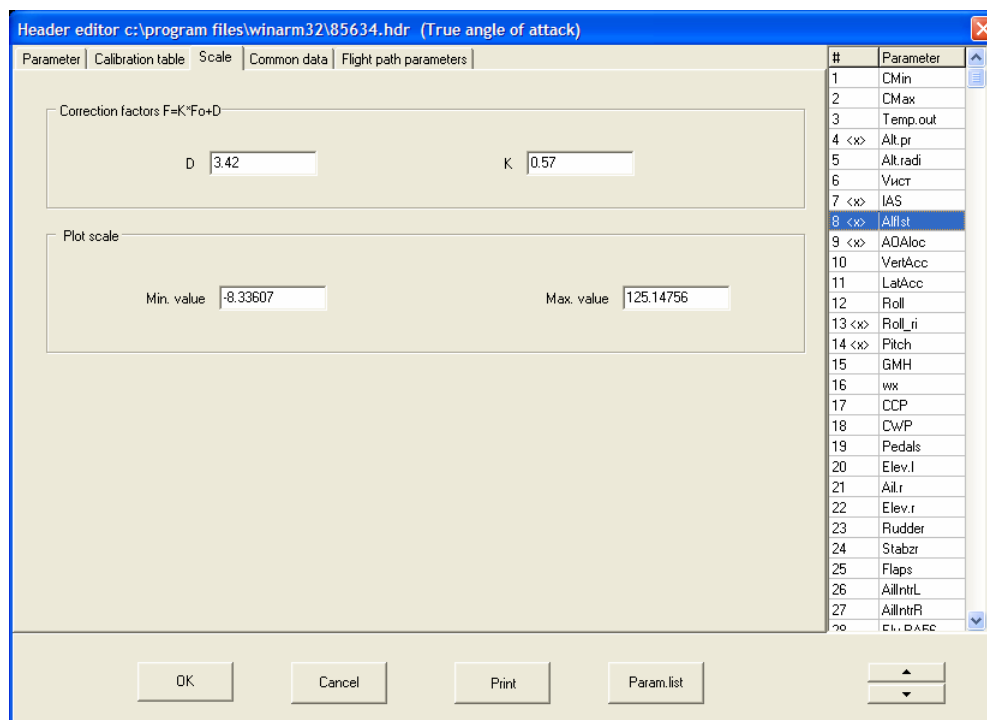


Figure 9.11

Additionally this page allows a user to set the minimum and maximum values of the parameter (in engineering units) that will be shown on the screen that is to determine vertical scale of the parameter. The given function has actually an information character because it is better to use the other methods (chapter 10.2.6) to change the scale of the parameter. Those fields may be used to customize parameter appearance for first output on the screen when you make a new header file or to precise manual adjustment of the scale of the parameter.

9.2.1.2. Several calibration branches and branch number

An example of this type of parameter is magnetic heading (with octants) on An-74 airplane or Mi-171 helicopter. The value of the **bits in information word** field on the **Parameter** page will be **9** in this case.

The **Calibration table** page appearance for this type is presented on Figure 9.12. The user has to specify a number of calibration branches and

calibration points for each branch (first branch has number 0). In case not all branches are used for calibration (for example pitch attitude registration on Mi-171 helicopter) the amount of branches must be nevertheless 8 and it is recommended to specify two arbitrary points (for example 0->0, 1->1) for all the branches that are not used. Select the appropriate switch to view all the branches at the same time. The current branch will be plotted in red color.

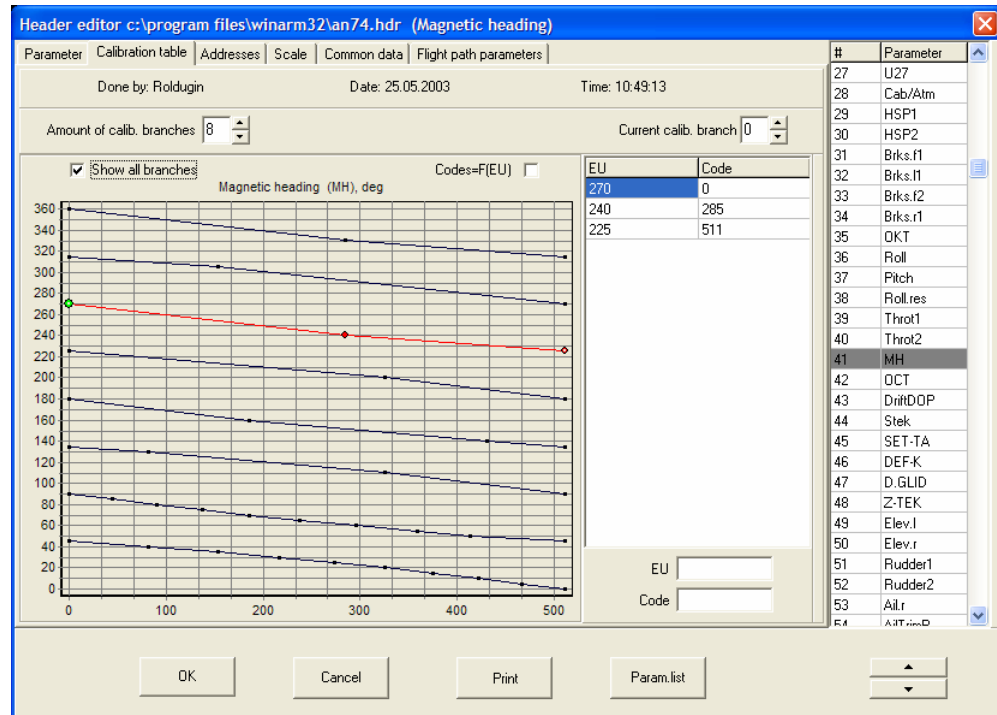


Figure 9.12

Recommendation: You have to assure correct switching from one calibration branch (octant) to another. It is very often that documents with the calibration tables do not contain engineering unit values for the boundaries of the octants (codes 0 and 511) but those values **must be** specified in calibration. If those values are not specified the physical values won't be calculated correctly on octants boundaries. For example presented on figure 9.12 (the current branch is 0) calibration for the branch 1 must look like it is shown on figure 9.13.

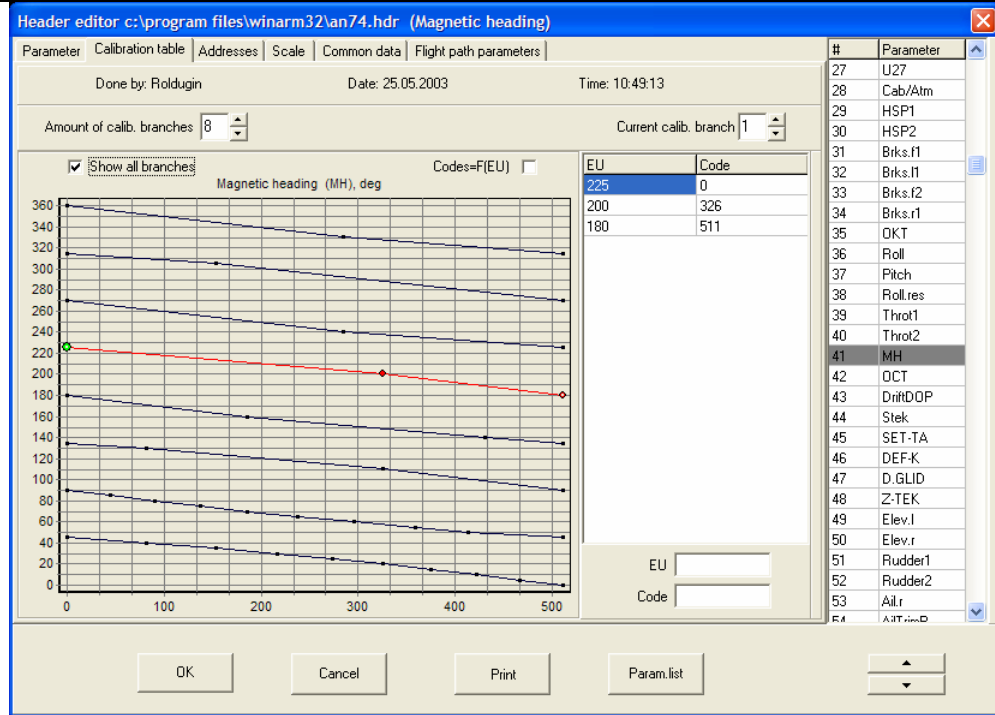


Figure 9.13

There will be one new column on the **Addresses** page (Figure 9.14) which contains an offset (in bits from the information word beginning) of the field where the current calibration branch number is registered. For considered aircraft type (Mi-171) and parameter (magnetic heading) this value will be 9 because the current calibration branch number is registered starting from bit 10.

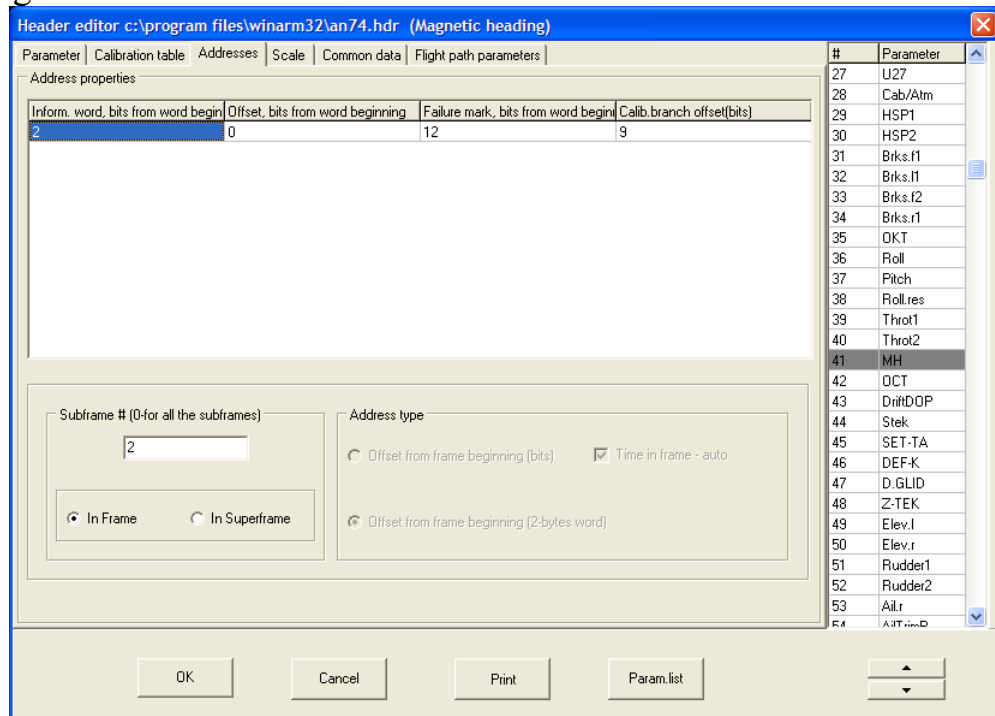


Figure 9.14

9.2.1.3. Several calibration branches and rough parameter

An example of this type of parameter is precise pressure altitude registration on the Il-86 aircraft. The short name of the rough parameter has to be specified on the **Parameter** page (Figure 9.15). It is selected from the **Select parameter** list (Figure 9.16) that appears after left clicking on the **Rough parameter** field.

Note: The list is made from the parameters that are already added to the header. Thus, desired parameter has to be included in the header in advance.

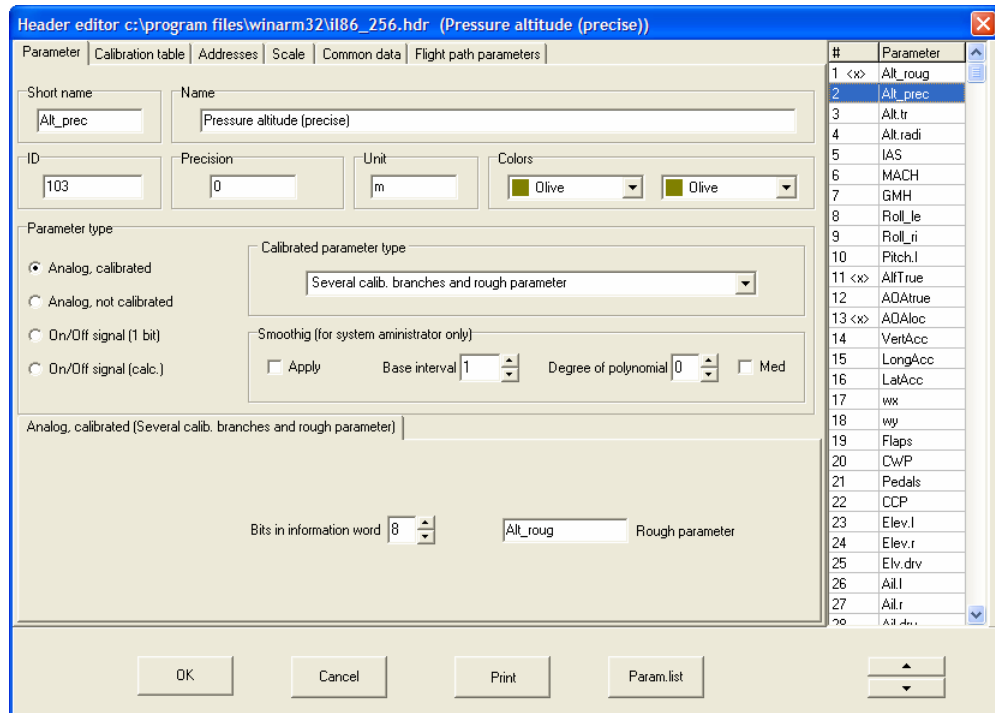


Figure 9.15

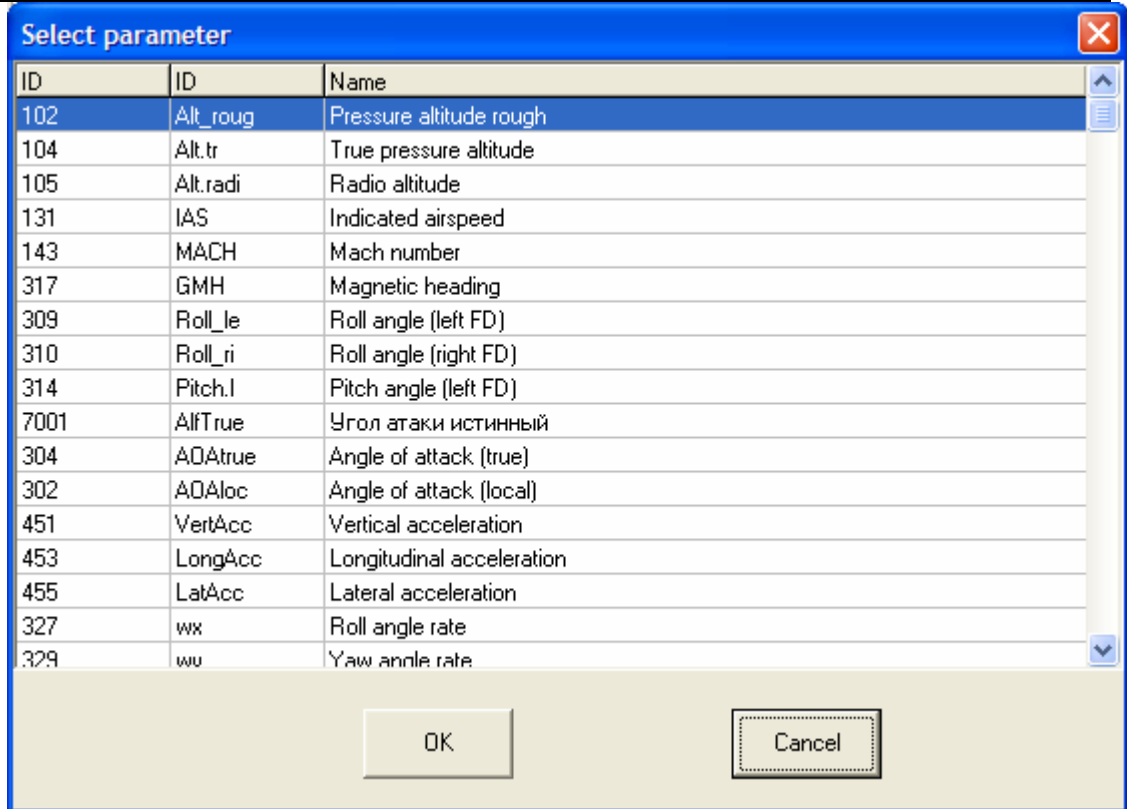


Figure 9.16

The **Calibration table** page for this type is shown on Figure 9.17. The amount of calibration branches and calibration points for each branch has to be specified (first branch has number 0). Select the appropriate switch to view all the branches at the same time. The current branch will be plotted in red color.

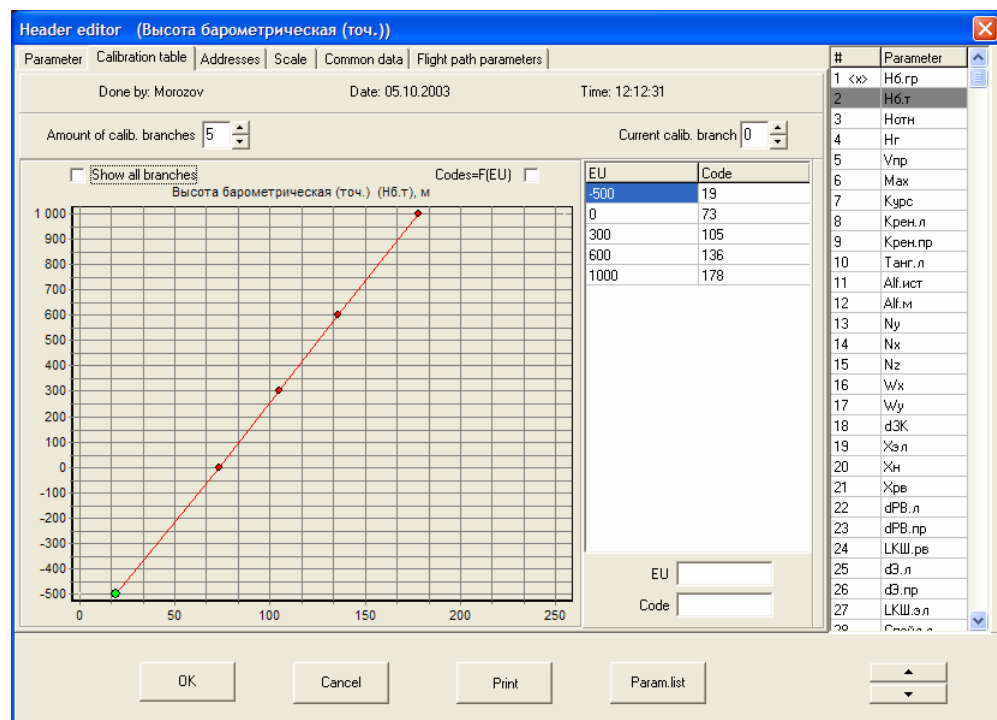


Figure 9.17

9.2.1.4. Two calibration branches and On/Off signal

An example of this type of parameter is indicated airspeed registration on Il-86 and Il-76 aircrafts and also magnetic heading registration on Yak-42 and Tu-134 aircrafts. Short name of the appropriate On/Off signal has to be specified on the **Parameter** page (Figure 9.18). It is selected from the **Select parameter** list (Figure 9.16) that appears after left clicking on the **On/Off signal** field.

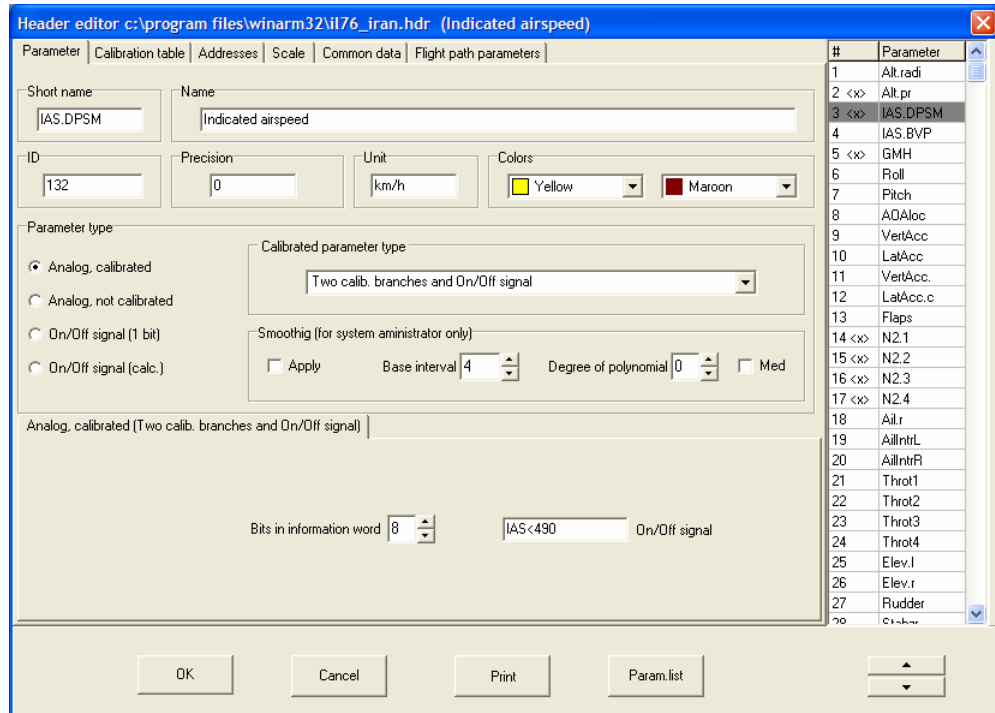


Figure 9.18

Note: The list is made from the parameters that are already added to the header. Thus, the desired On/Off signal has to be included in the header in advance.

The **Calibration table** page for this type is shown on the Figure 9.19. The amount of the calibration branches will be set automatically and the user has only to specify calibration points for each brunch. Select the appropriate switch to view both branches at the same time. The current branch will be plotted in red color.

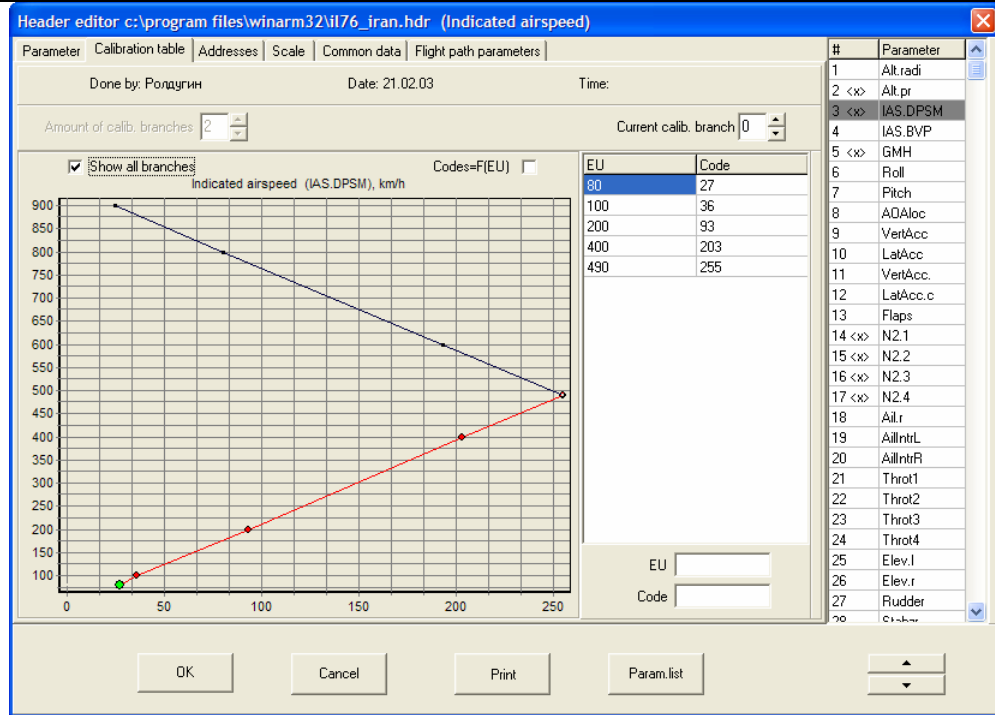


Figure 9.19

There is a feature in entering calibration points for two branches magnetic heading (for example on Tu-134 aircraft) when the calibration point for 360° is located inside a branch. A virtual calibration point of 0° has to be created in this case with corresponding code value differing on small (Figure 9.20 и Figure 9.21).

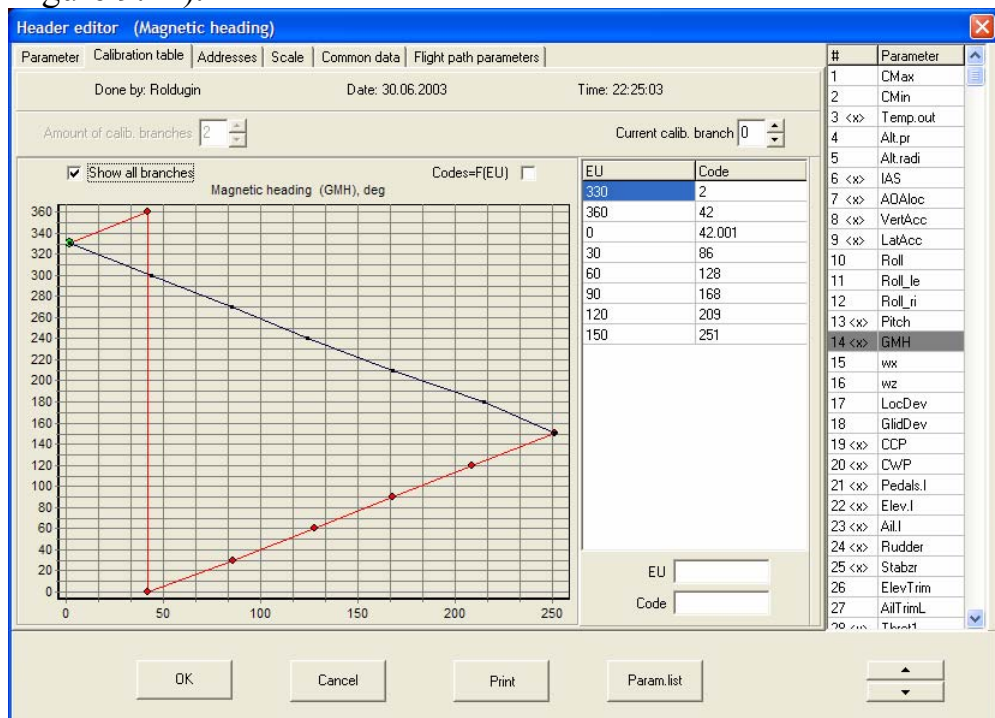


Figure 9.20

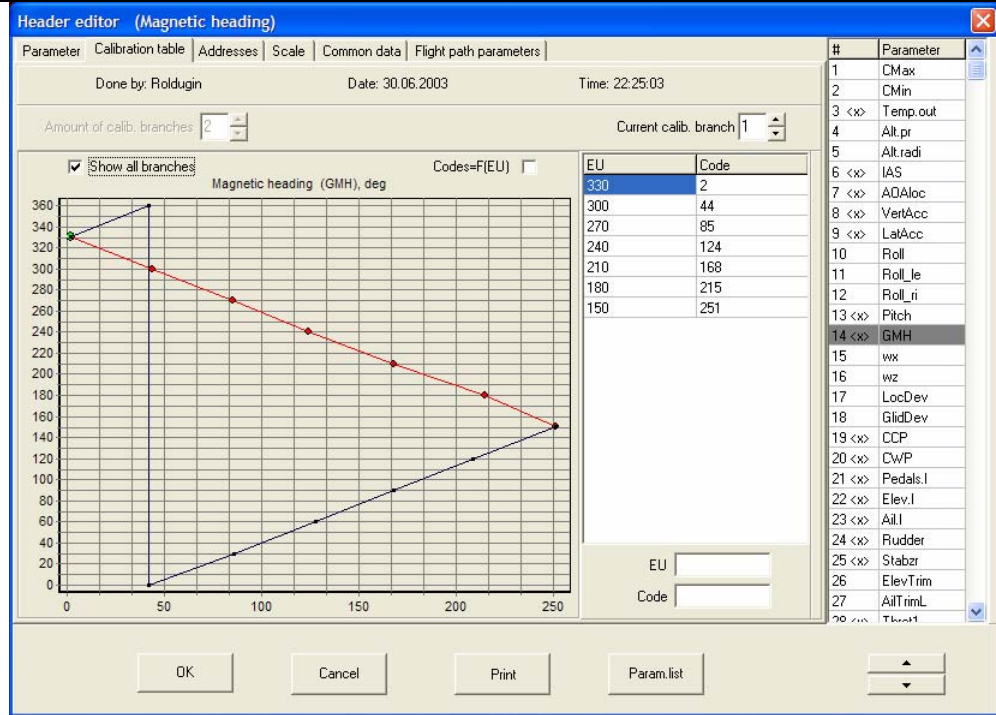


Figure 9.21

9.2.1.5. Piecewise linear function of one argument

This type should be set for parameters that are linear or piecewise linear functions of another parameter. Select short name of the parameter that will be an argument on the **Parameter** page (Figure 9.22). The **Addresses** page will be removed because corresponding values are already set up for a parameter that will be an argument.

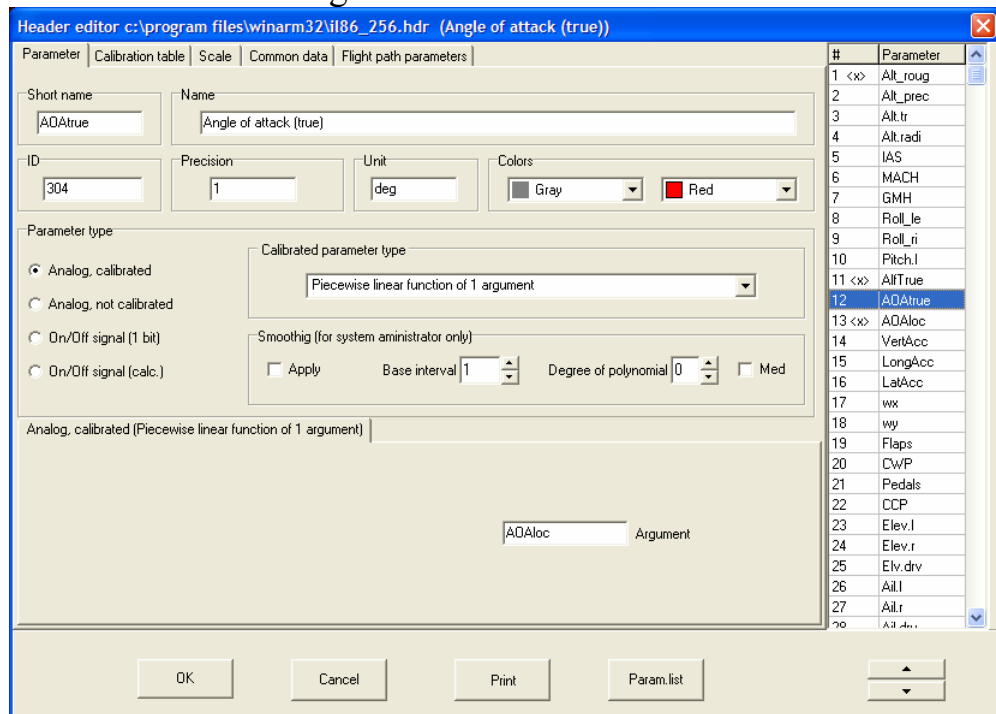


Figure 9.22

If there is a simple linear function (for example true angle of attack as a function of local angle of attack) the linear calibration (for example 0->0, 1->1) should be set on the **Calibration table** page and corresponding coefficients are to be set on the **Scale** page.

If there is a piecewise linear function the argument values in engineering units are to be specified in **Code** column of the **Calibration** page and the corresponding function values are to be specified in **EU** column.

9.2.1.6. Piecewise linear function of two arguments

This type differs from the previous one only by number of arguments. Select short names of two parameters on the **Parameter** page that will be used as arguments.

On the **Calibration table** page set amount of calibration points (**amount of calib. branches** field) for the second argument. After that defining **current calibration branch** and the values of the calibration points of the second argument in the appropriate field (**2-nd argument value** field) set functional dependence from the first argument with the given value of the second argument. Select the appropriate switch to view all the branches at the same time. The current branch will be plotted in red color.

This type of parameter may be used for example to define aerodynamical error of airspeed registration as a function of altitude and airspeed.

9.2.2. Analog not calibrated

9.2.2.1. Real number

This is simply a real number of 4-bytes length. This type is used to process information from FDRs that are usually used during test flights or for other special tasks. Parameters are presented in engineering units so there is no need to specify calibration and the **Calibration table** page is absent.

9.2.2.2. Digital code

The **Parameter** page will look like it is shown on Figure 9.23 after selecting this type of parameter.

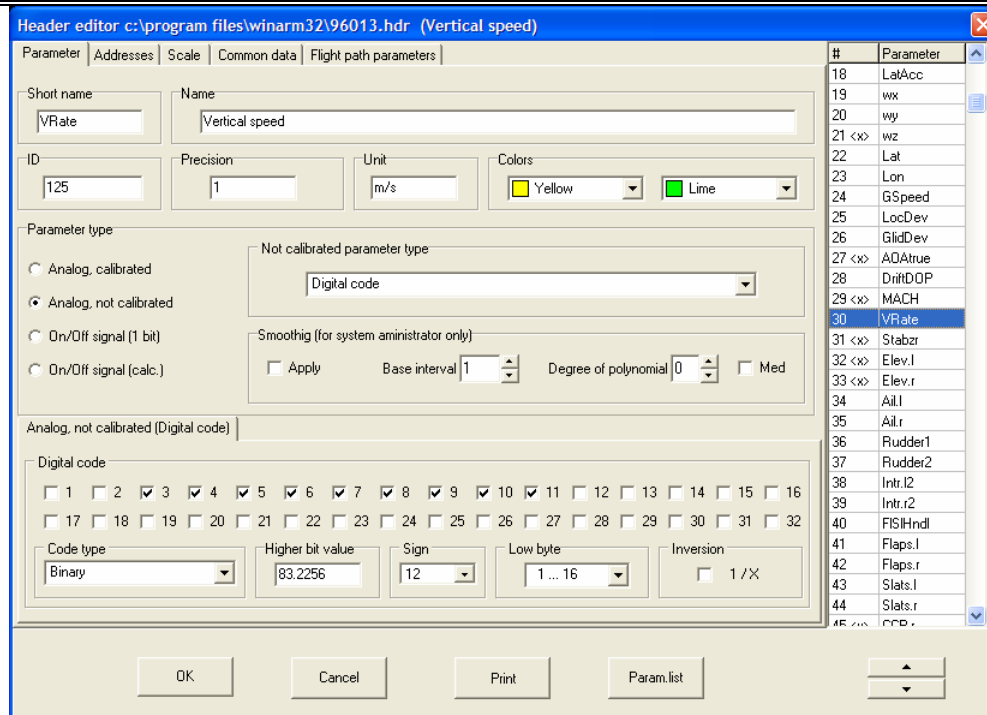


Figure 9.23

This type is widely used for example on MSRP-A-02 FDR. Vertical speed or pitch rate registration on Il-96 aircraft are examples of this type. (Figure 9.23). The bits from 16-bit information word that will make code value of the parameter have to be checked in the **Digital code** field. The value of the **Code type** field should be set to **binary**. To include a particular bit just check the appropriate box. After selecting all the significant bits the value of the least significant bit **or** most significant bit has to be set. For example, the value of the most significant bit is specified on the Figure 9.23. To change from the least significant bit to the most significant bit just click on the caption of the field. A bit where the sign is coded has to be specified in the **Sign** field. If the current parameter has no sign (for example radio altitude) **none** item must be selected.

***Note:** If the current parameter has the sign this bit should be excluded from number of bits that make code value of the parameter. It means that if any parameter is described as 10-bits parameter with the sign bits from 3 till 11 must be checked and value of the **sign** field must be 12 (Figure 9.23).*

Right click on the **Digital code** field to display the popup menu which allows to select one of the frequently used combinations of bits to automatically fill in all the checkboxes.

Addresses of the parameter have to be set on the **Addresses** page after all the significant bits are specified.

The digital code type may also be used to display subframe numbers and service information of BUR FDR as analog parameters (Figure 9.24 and Figure 9.25). Parameter address should be 33 in both cases.

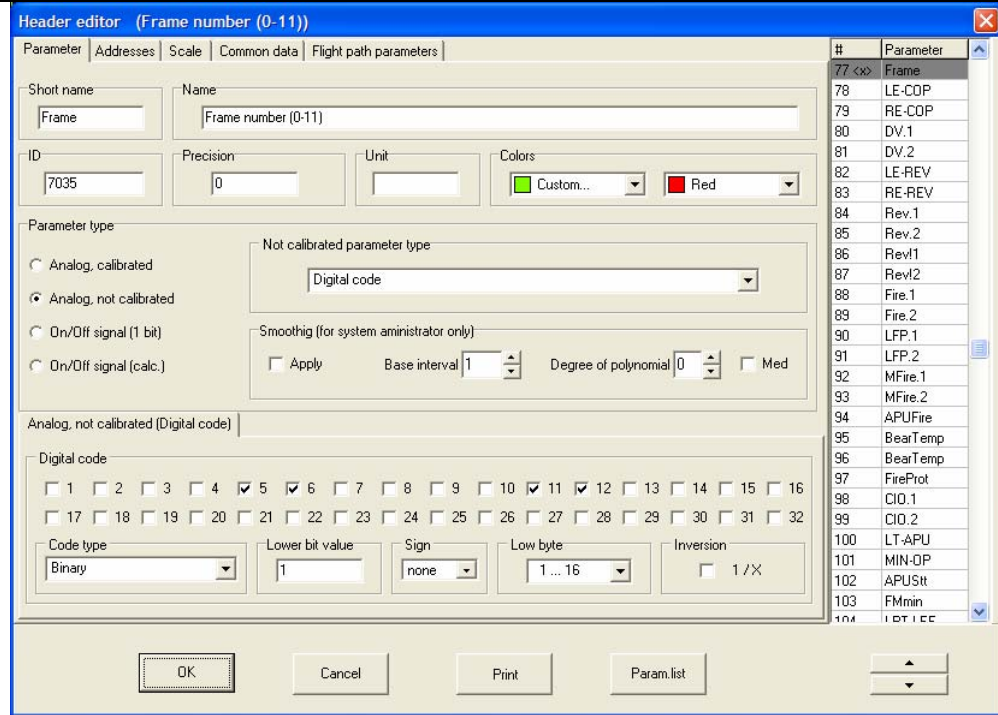


Figure 9.24

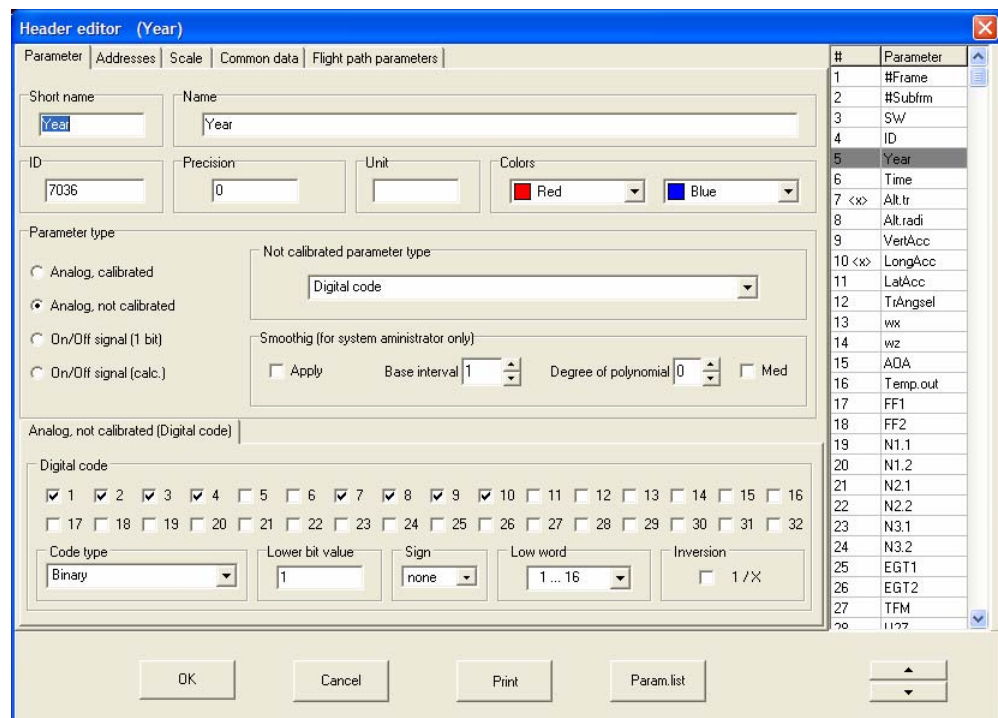


Figure 9.25

Sometimes parameter is coded in two adjacent words. Compressor rate registration on Tester FDR is an example of this type of registration (Figure 9.26). Significant bits are to be selected from 32-bits word. Additionally a word that will be considered as lower (first) must be specified. This is important because some systems register at first most significant word and then least significant word. The address of the information word that is registered **first** according to the ciclogram must be specified on the

Addresses page. If necessary you can invert calculated value and specify the appropriate correction factor on the **Scale** page in the **K** field. (Figure 9.27).

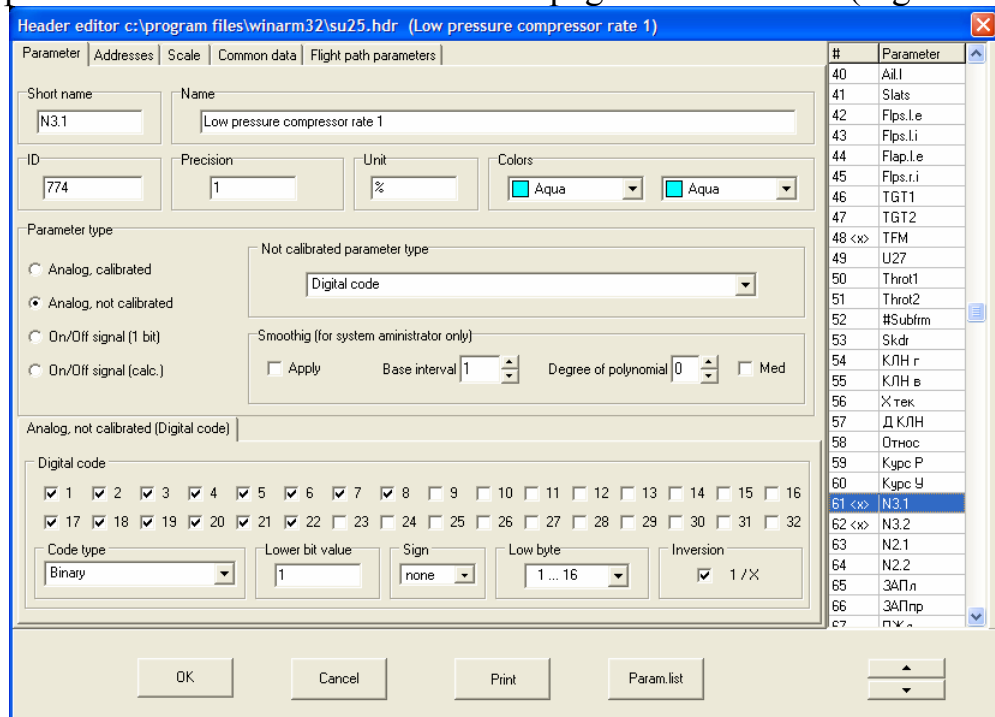


Figure 9.26

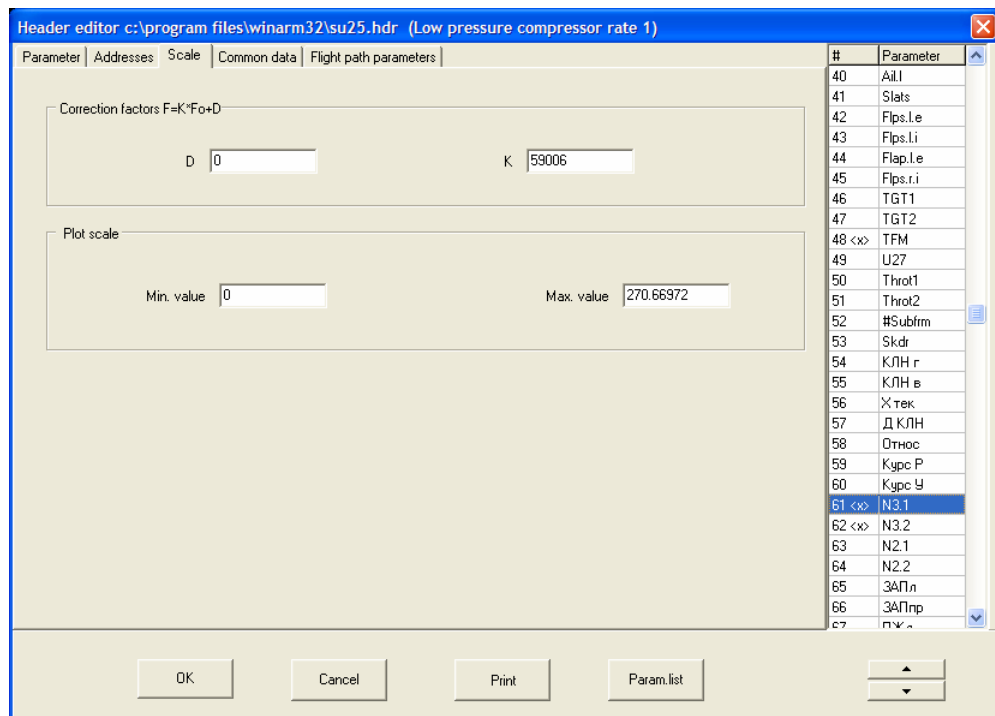


Figure 9.27

You may plot service information as analog parameter by selecting **Dec-Bin (1-2-4-2)** or **Dec-Bin (1-2-4-8)** in the **Code type** field. An example for MSRP-64 FDR is shown on Figure 9.28.

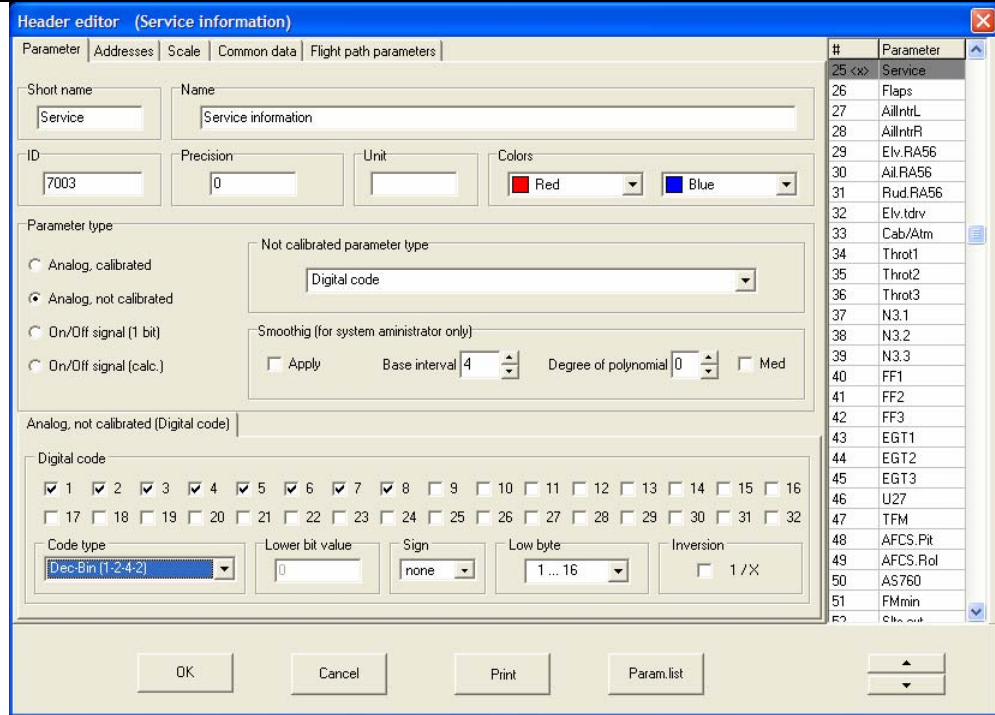


Figure 9.28

9.2.2.3. Predefined function

This type is a function predefined by program author which arguments should be specified by user. True airspeed calculation may be an example of this type. Indicated airspeed, pressure altitude and aerodynamic correction are arguments of this function (Figure 9.29).

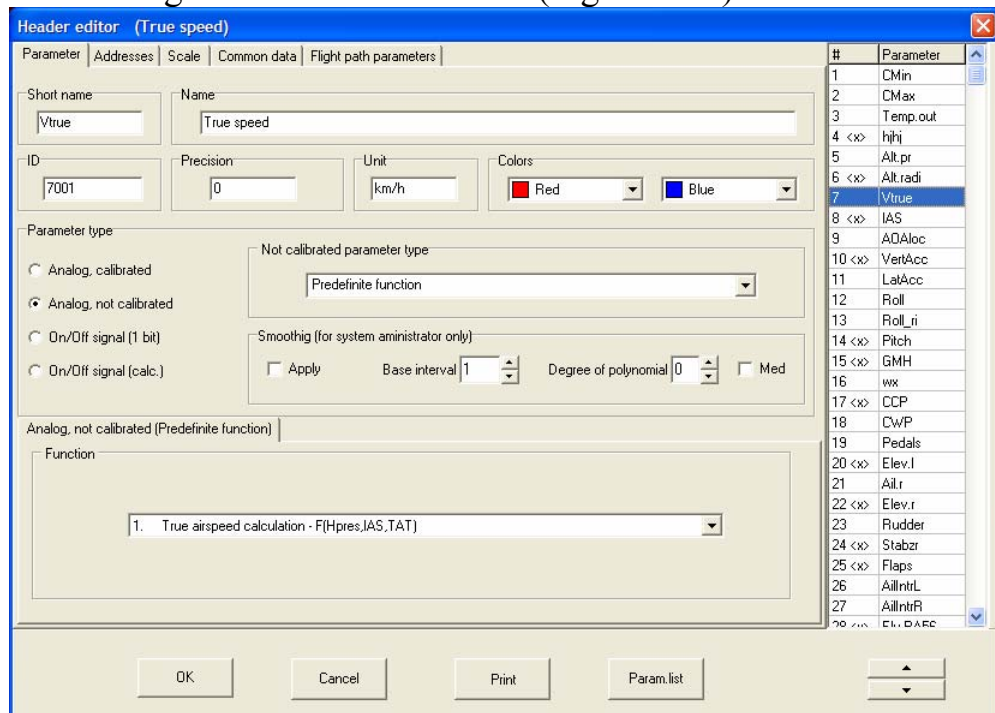


Figure 9.29

The short names of the arguments and values of the appropriate constants must be specified on the **Addresses** page (Figure 9.30).

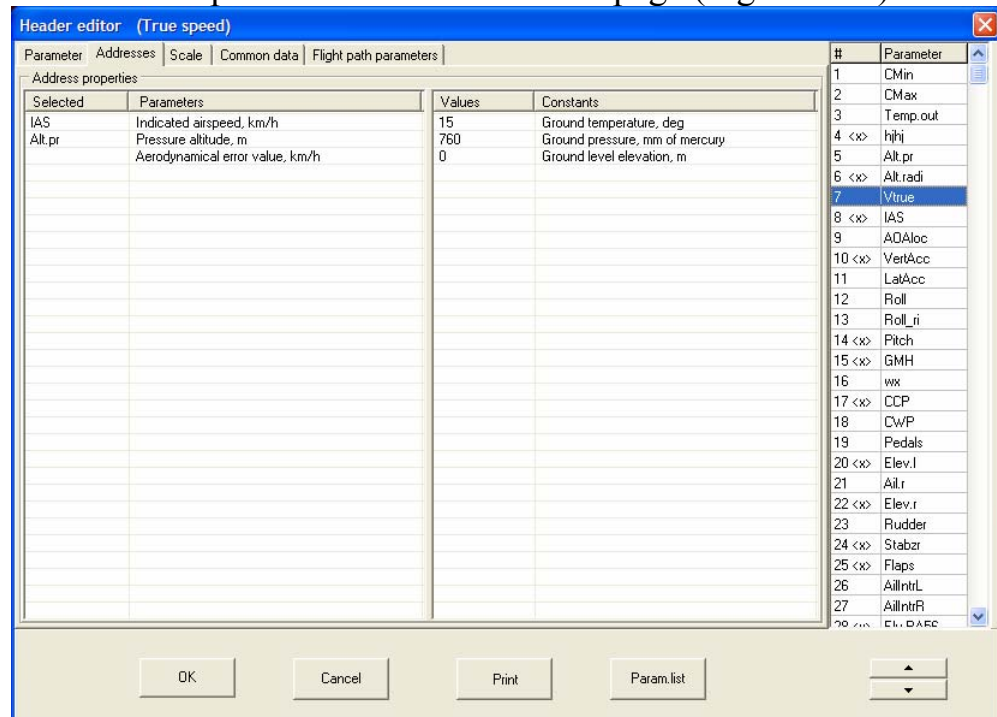



Figure 9.30

To select short name of the parameters left click on the appropriate line of the **Parameters** column after cursor changes to . The **Select parameter** dialog (Figure 9.16) will be shown on the screen.

The values of the constants should be set directly in the **Values** column.

9.2.2.4. Algorithm interpreter

This type is used to describe parameters which values are results of logical and/or arithmetical calculations. The **Parameter** page is presented on Figure 9.31.

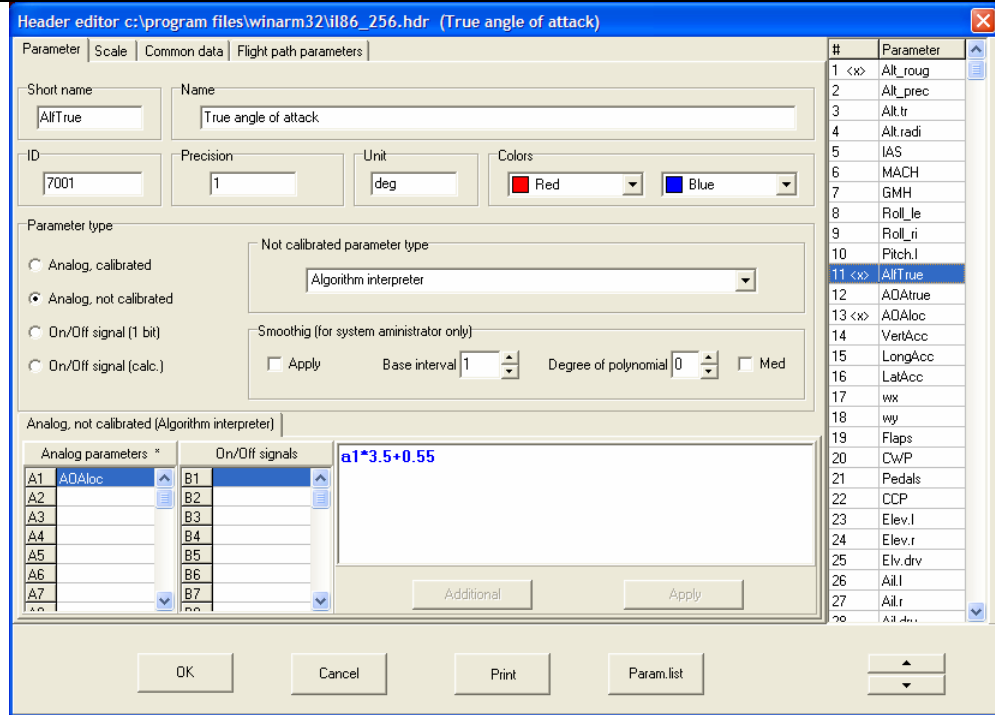


Figure 9.31

Short names of the parameters that will be used in the calculations have to be specified in **Analog parameters** and **On/Off signals** columns. The names are selected from **Select parameter** dialog (Figure 9.3) that appears after double clicking on the appropriate field. Left click on the header of the column adds or removes a “*” sign. This sign is shown in the **Analog parameter** column header on the Figure 9.31. If this sign is shown the addresses of the calculated parameter will be the same as the addresses of the first parameter in this column. If this sign is absent the calculated parameter will be “registered” one time per frame with relative time of 0.

After adding of all the necessary parameters you have to define the equation. You have to use the appropriate identifiers (a1, a2, b1 et cetera) instead of short names of the parameters.

The interpreter supports as many nested brackets as you want and the following logical and arithmetical operations:

Operator	Meaning
+,-,*,/	Arithmetical operations
abs()	Absolute value calculation
sin()	Sine, argument is in radians
sin_g()	Sine, argument is in degrees
cos()	Cosine, argument is in radians
cos_g()	Cosine, argument is in rdegrees
round()	Rounding of number
trunc()	Decimal casting-out
=, <>, >, <, >=, <=	Logical operations

&	Logical «AND»
v	Logical «OR»
!	Logical denial

The interpreter supports the multiplication on the logical value. The result of this operation will be the value of the second multiplier if logical value is “true” and 0 – otherwise.

Press the **Apply** button to save the equation.

The program will show a warning message if it is unable to interpret the entered equation. The syntax of the equation must be checked in this case.

9.2.2.5. Relative time

This type of parameter is just the current value of the relative time. Adding parameter of this type to the header assumes its further using as an argument in piecewise linear functions. Displaying flaps position as an analog parameter in case only On/Off signal that indicates flaps going up or down is registered may be example of using this type of parameter.

9.3. On/Off signals types

Selecting the On/Off signal of any type in the **Parameter type** field changes the **Parameter** page to the view presented on Figure 9.32.

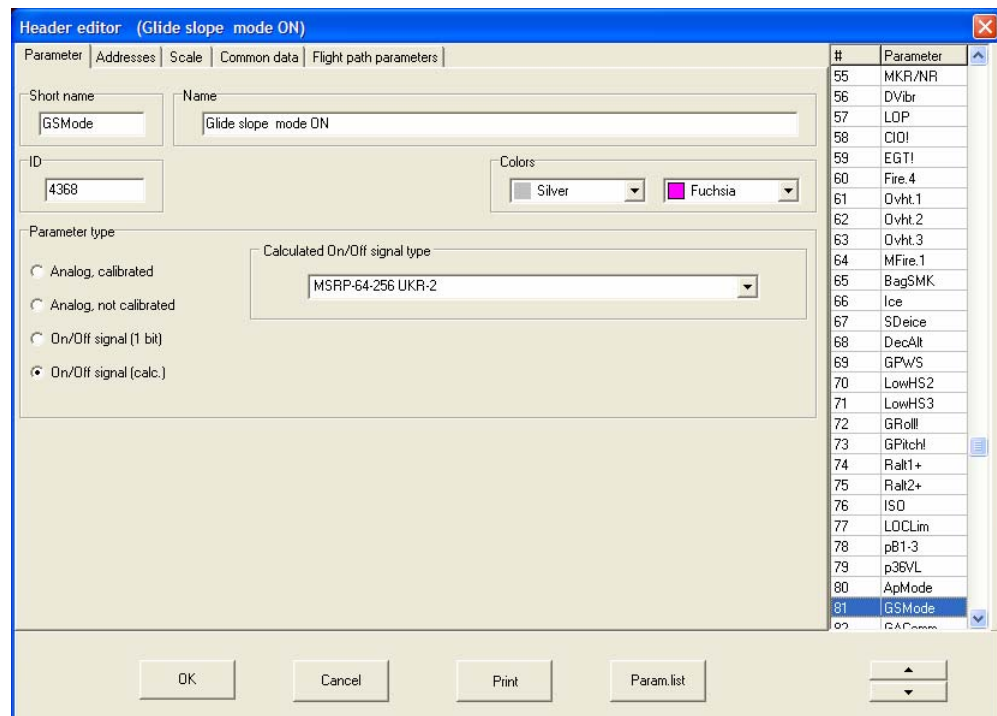


Figure 9.32

Addresses of the On/Off signal are to be set on the **Addresses** page (Figure 9.33) the same way as for analog parameters. Recommended offset

for failure mark is 15 that is the 16-th bit will be used to place a failure mark if necessary (chapter 9.2.1.1).

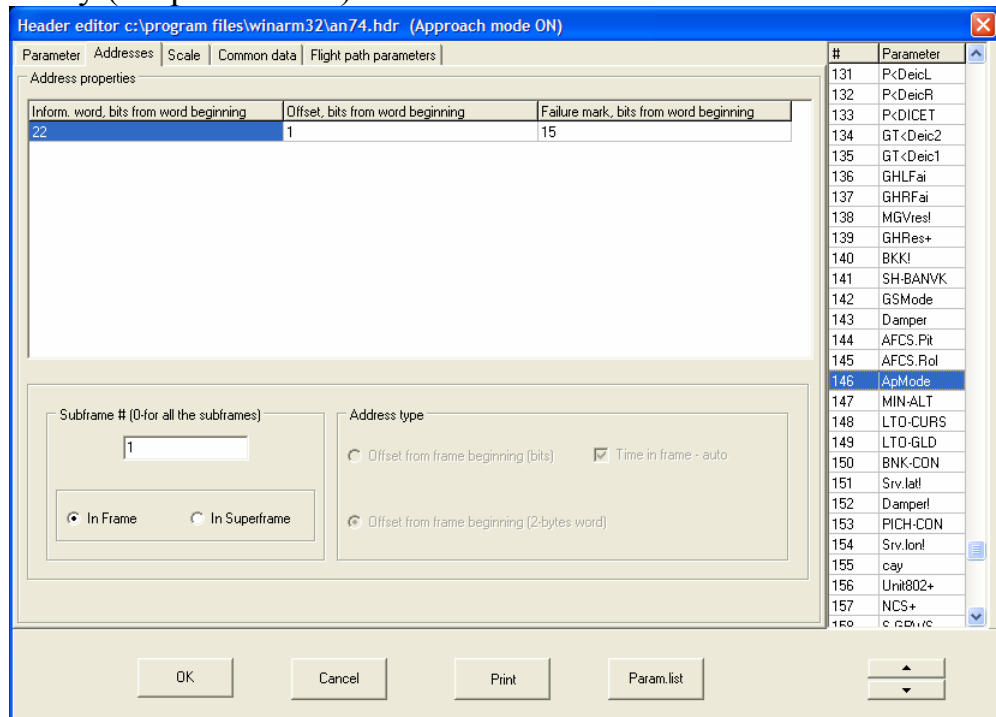


Figure 9.33

On the **Scale** page (Figure 9.34) the exact position of the On/Off signal may be specified. This value is set in percent of the graph field height and is used only when On/Off signals have to be plotted on the analog parameters field (chapter 10.1).

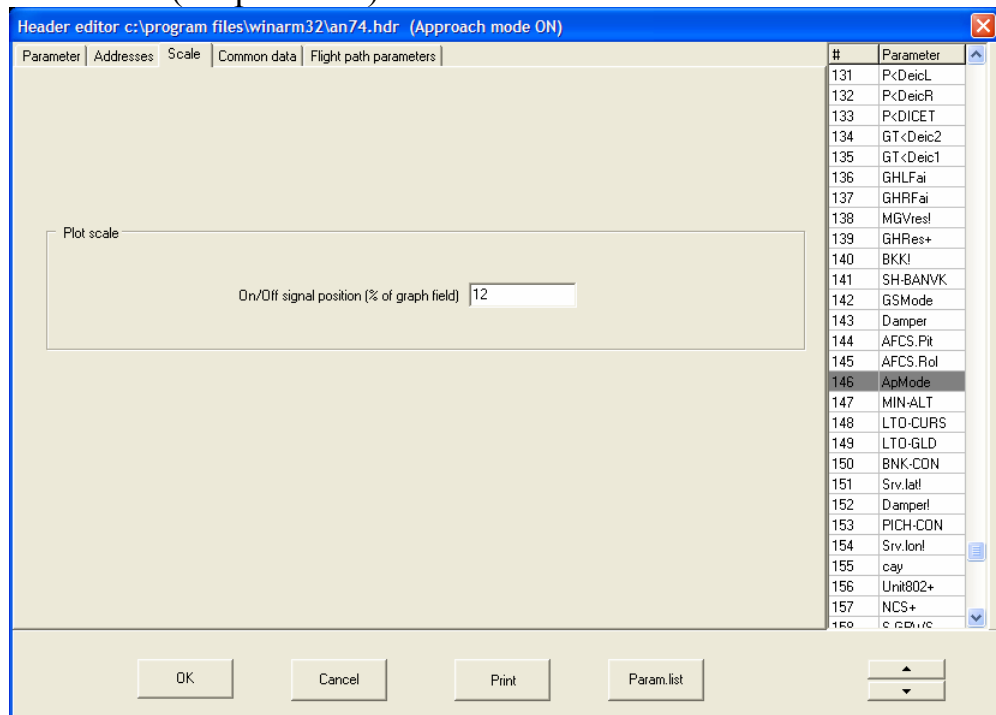


Figure 9.34

9.3.1. On/Off signal (1 bit)

This type of On/Off signal (Figure 9.35) has two subtypes: without inversion (mostly used) and with inversion. On/Off signal “with inversion” means that registration of the On/Off signal stops if monitored event appears. VHF communication On/Off signal on the IL-62 aircraft is an example of this subtype. It is very difficult to spot such a command while viewing plots on the long time interval therefore it is recommended to invert a signal. Selecting On/Off signal **with inversion** leads to the normal appearance that is On/Off signal is registered when corresponding event appears.

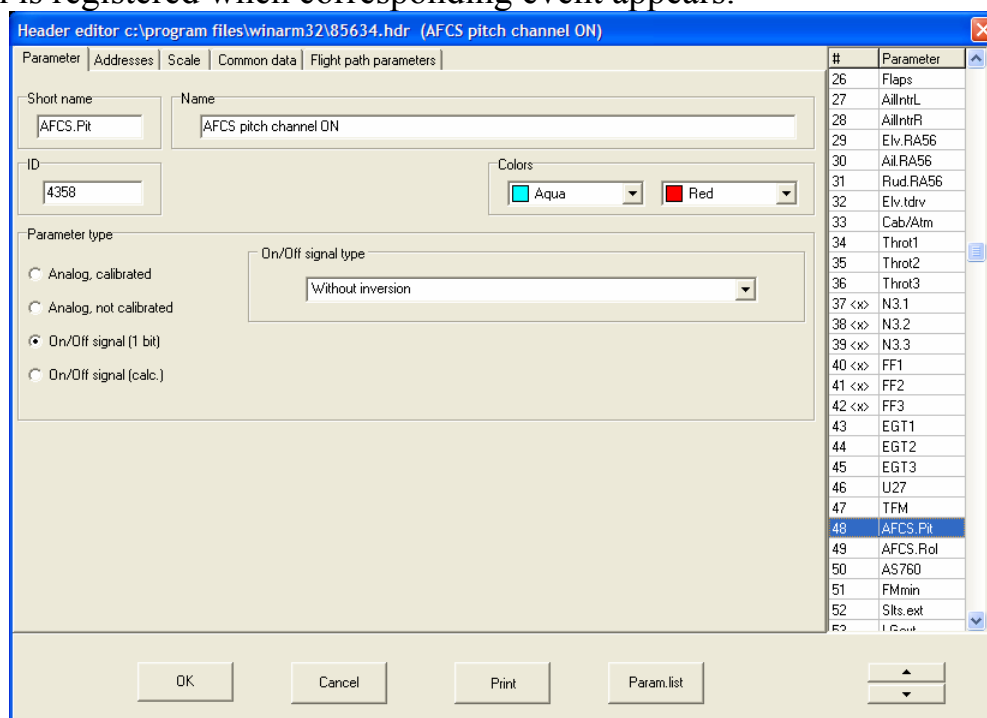


Figure 9.35

9.3.2. On/Off signal (calculated)

The UKR On/Off signals that are used on different type of MSRP FDRs are examples of this type. Additionally the number of UKR has to be specified in this case (Figure 9.33).

9.3.3. Some features of On/Off signals registering in Tester system

Tester-U3 series 2 system registers On/Off signals in a separate information words. If On/Off signal is present there will be 1 in the highest-order bit (number 8) of the first byte of the appropriate information word. To display this kind of On/Off signal, select **On/Off signal (1 bit)** in the

Parameter type filed and specify the value of 7 in the **Offset** column of the **Addresses** page (Figure 9.36).

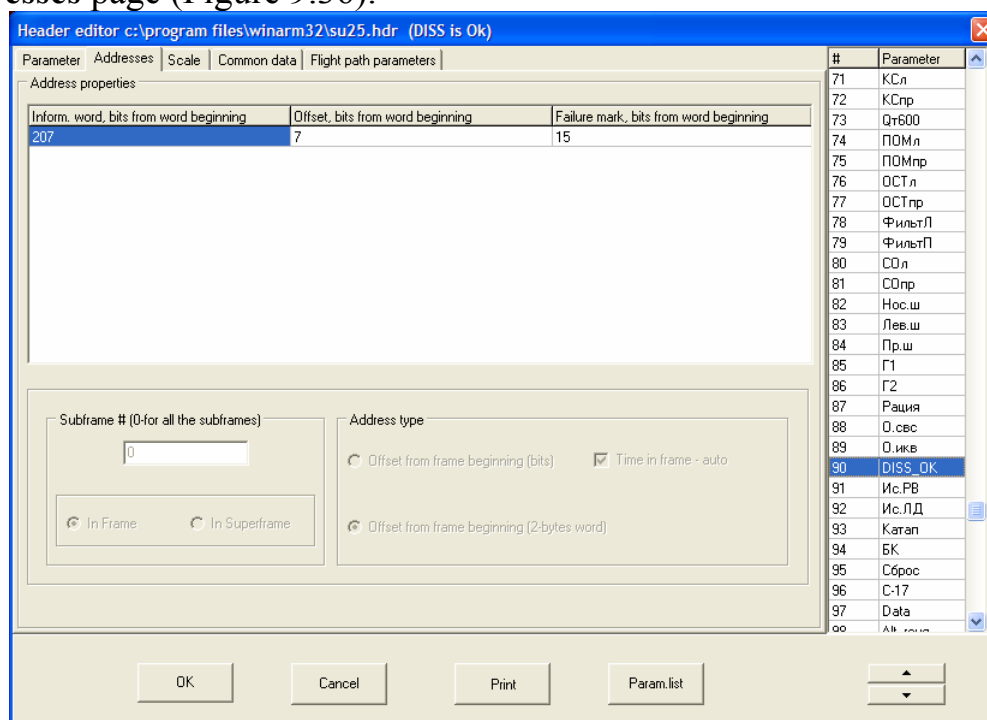


Figure 9.36

Tester-U3 series L, 3 and M system registers most of the On/Off signals together with the analog parameter (in the same information word). First eight bits are used to register analog parameter value and there will be 1 in **ninth** bit of the information word if the On/Off signal is present. To display this kind of On/Off signal, select **On/Off signal (1 bit)** in the **Parameter type** filed and specify the value of **8** in the **Offset** column of the **Addresses** page.

9.3.4. Algorithm interpreter

This type is used to describe parameters which values are results of logical calculations. The only difference from the analog parameter of the same type (chapter 9.2.2.4) is the requirement that only logical value may be result of the calculations.

9.4. Data file creation

As soon as a header file is created the data file could be made. There are two different ways to create a data file either by reading out from ground playback recorders or by attaching a data that were read out and saved in a file of the standard format by another program. To create a data file you have to select an appropriate header file in the database window (Figure 9.37) and to check the **Data file making (read out)** switch of the **Header processing** field. Specify the name of the playback device or a file of the standard format in the **Information source** listbox and press **OK** button.

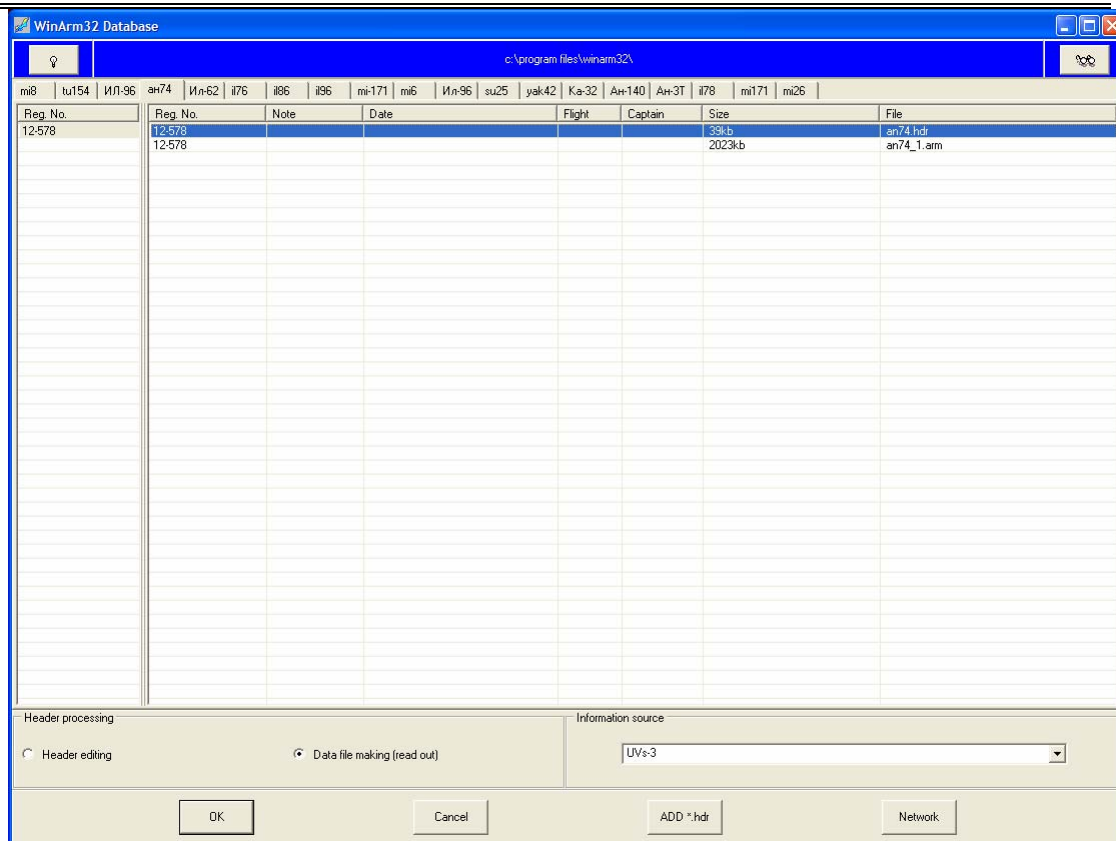


Figure 9.37

9.4.1. Data file creation from a file of the standard format

The standard file open dialog of the **Windows™** system will be shown if you selected **Standard file** item from the **Information source** list. You have to select a name of the file that contains the data and press **OK**. The **WinArm32™** program will create a new data file and ask you for the name for this file. By default the program creates a name of the new data file from the name of the header file and first free number. The user is able to change this name or agree with it. The newly created file will be automatically shown on the screen.

The appropriate message will be shown if the program determines that the format of the standard file does not correspond to the format of the header file. The check is done by dividing the file length in bytes onto the frame length of the selected FDR. If residue of division is not zero the file format is not correct. The user will have the ability to continue or to abort data file creation. If he selects to continue the program will automatically truncate the superfluous bytes in the end of file.

9.4.2. Reading out from ground playback devices

Before reading out the information from any playback device you have to connect it to the data input device (MVD) or to the universal data input device (MVD-U) with the appropriate cable. The input device should be in turn connected to the USB slot of the computer. The appearance of the MVD device and of the connection sequence is shown on the figures 9.38 and 9.39.



Figure 9.38



Figure 9.39

Note: The MVD-U unit differs from MVD unit with the ability to copy the data registered by “Tester” FDR directly from board of the aircraft.

The connection scheme of different playback devices is shown on the Figure 9.40.

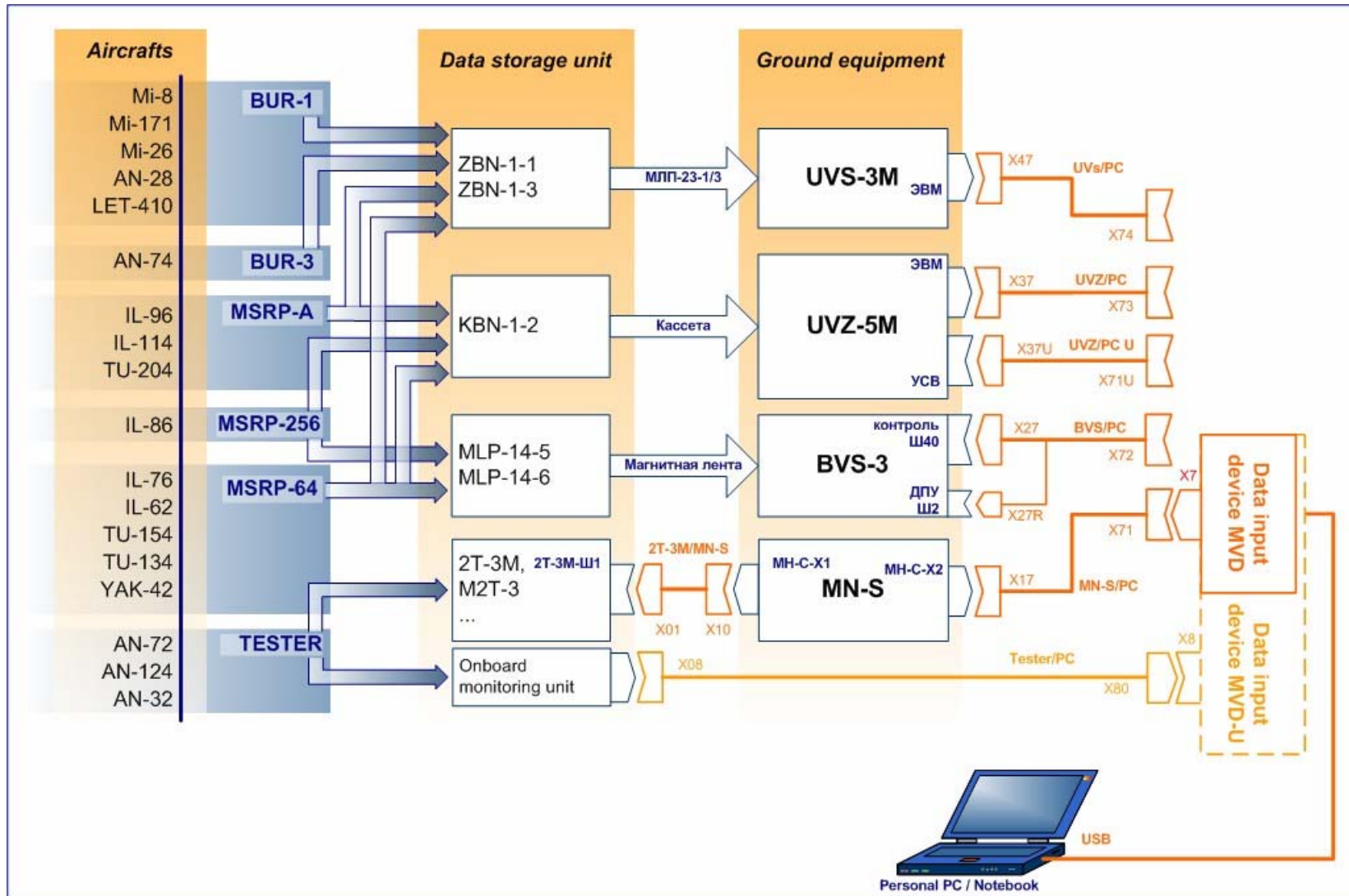


Figure 9.40

It is recommended to make sure before data input device using that it is not damaged mechanically.

Connect the data input device to the playback recorder with the appropriate interface cable (Figure 9.40).

ATTENTION! All the connections must be made when playback device electricity is switched off and after connecting the ground cleat of the playback device with the PC frame.

Connect the data input device with the computer using USB cable.

Switch on the computer if necessary.

The optimum temperature for data input device operation is $5\div+50^{\circ}$. Temperature limits are: $-20\div+75^{\circ}$.

In order the driver of the data input device to be correctly initialized, you have to load the **WinArm32™** program **only after** all the connections are made. Switch on the electricity of the playback equipment only after the program is loaded. After you finish reading out the data switch off the playback equipment and after that close the program.

After having been connected the data input device does the self test. If everything is OK the indicator flickers for three times and becomes to light constantly after that. The indicator flickers when flight data are being received.

If you connected the data input device after the **WinArm32™** program was loaded the Windows™ setup window may appear offering to install a driver of new equipment. Refuse from installing the driver and reload the **WinArm32™**.

Select the playback device from the **Information source** list of the **WinArm32 Database** window (Figure 9.37) and press **OK** button. The information read out window appears. Instrument panel appearance depends on functions supported by the selected playback device. Screen appearance for the UVs-3 playback device is shown on the Figure 9.41.

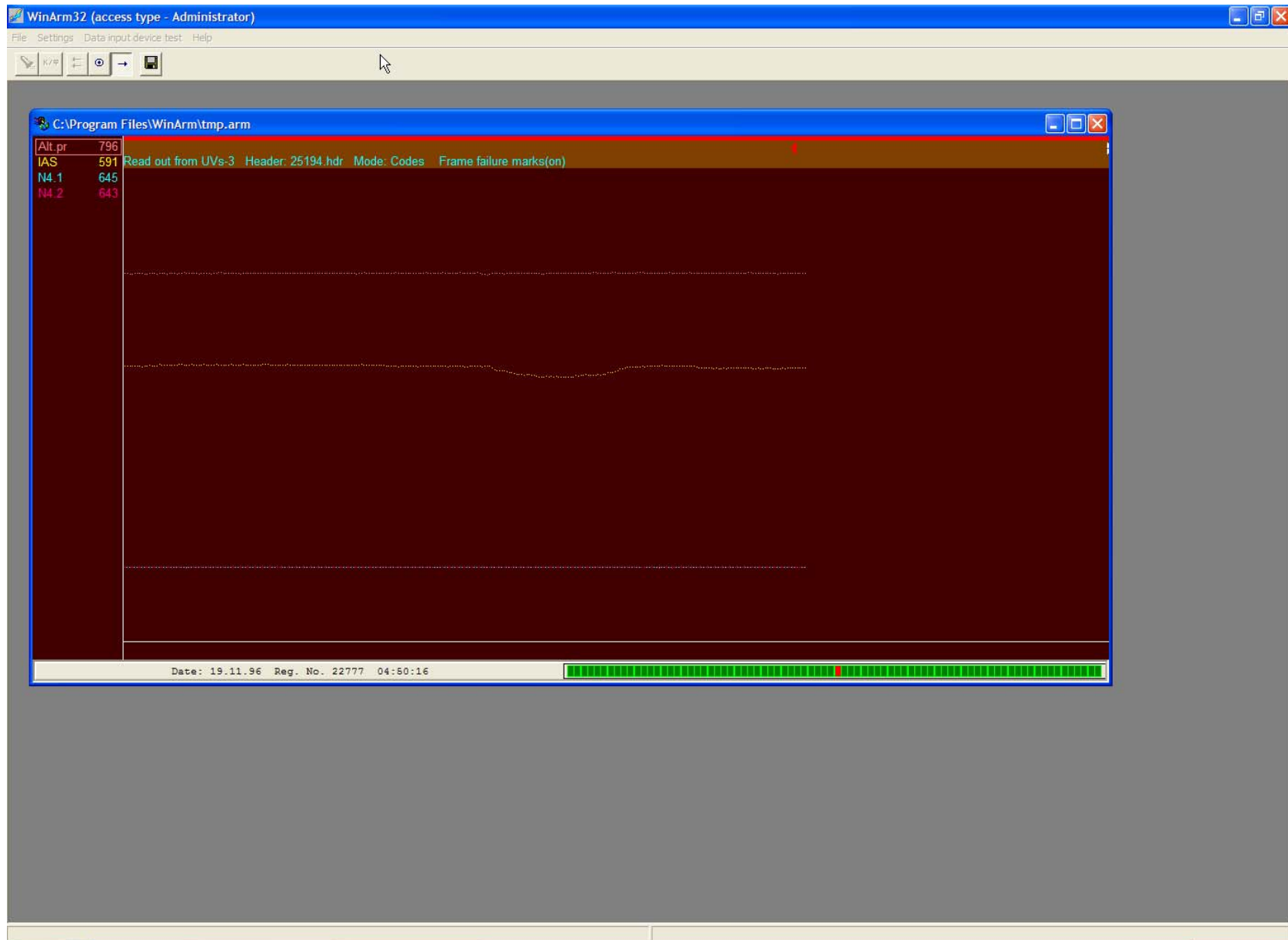










Figure 9.41

Description of the control buttons and corresponding hot keys are presented in the following table.

	➤ Selects parameters to be shown on the screen.
	➤ Changes output mode from engineering units to codes and vice versa.
 Ctrl+Left	➤ Rewind.
 Ctrl+Right	➤ Forward.
 Left and Right	➤ Information playback.
	➤ Reverse read out feature (heads switching).
 Space	➤ Information saving.
 Enter	➤ Stop.

The read out window consists of the same main parts as the window in the "Plot for analysis" mode (chapter **Ошибка! Источник ссылки не найден.**). Appearance of the parts of the window is also the same as in the "Plot for analysis" mode. The type of the selected playback device, header file name, parameters output mode (codes or EU) and status of the automatic frame failure marking function is shown in the indicator field.

All the functions except information saving and playback stopping will be blocked during information playback therefore all the settings must be done when playback is stopped.

The user is able to select parameters that will be shown on the screen during information playback and customize their appearance (color) as well as output mode (codes or EU).

Recommendation: To find the desired flight or part of the flight it is recommended to display on the screen the most factual parameters: altitude,

airspeed, throttles position, gears position and so on. It is recommended to output the parameters in code values to eliminate possible errors because of incorrect calibration tables inputting.

The popup menu (Figure 9.42) is shown after right clicking on the graph field. Using the items of this menu you can change the status of the automatic frame failure marking function and to select the resolution of the graph field during playback. Resolution is measured in **information frames**.

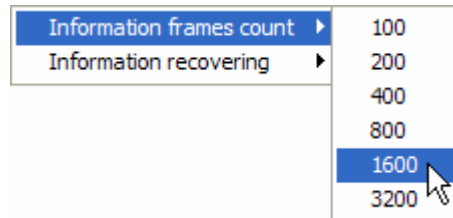






Figure 9.42




The user can check the data input device before information read out with the help of the special testing module. The testing module should be connected to the data input device instead of the interface cable and the **data input device test** item should be selected from the main window menu. The program will inform the user about workability of the input device or, in case of finding any errors, the error number will be shown. It is better to write down this number and to inform the manufacturer. It should be noted that in many cases information about an error does not mean that read out process is impossible and flight information copying may be continued.


Press  button to start information playback. If playback device supports remote control and this mode is switched on playback will start and flight information (in case of existence) will be entered into the computer and shown on the screen. If playback device does not support remote control or this mode is switched off you have to start playback equipment manually and after pressing the  button the flight information will be entered into the computer. Service information registered on the tape as well as FDR time will be indicated in the left part of the status bar during playback. Record quality indicator is located in the right part of the status bar. The height of the indicator will be momentarily decreased if frame failure will be encountered. In case of parallel record type the frame failure is set if number of information words in the frame does not correspond to the normal for the particular FDR type. In case of serial record type the frame failure is set if synchronization is broken.

Press the  button to stop playback.

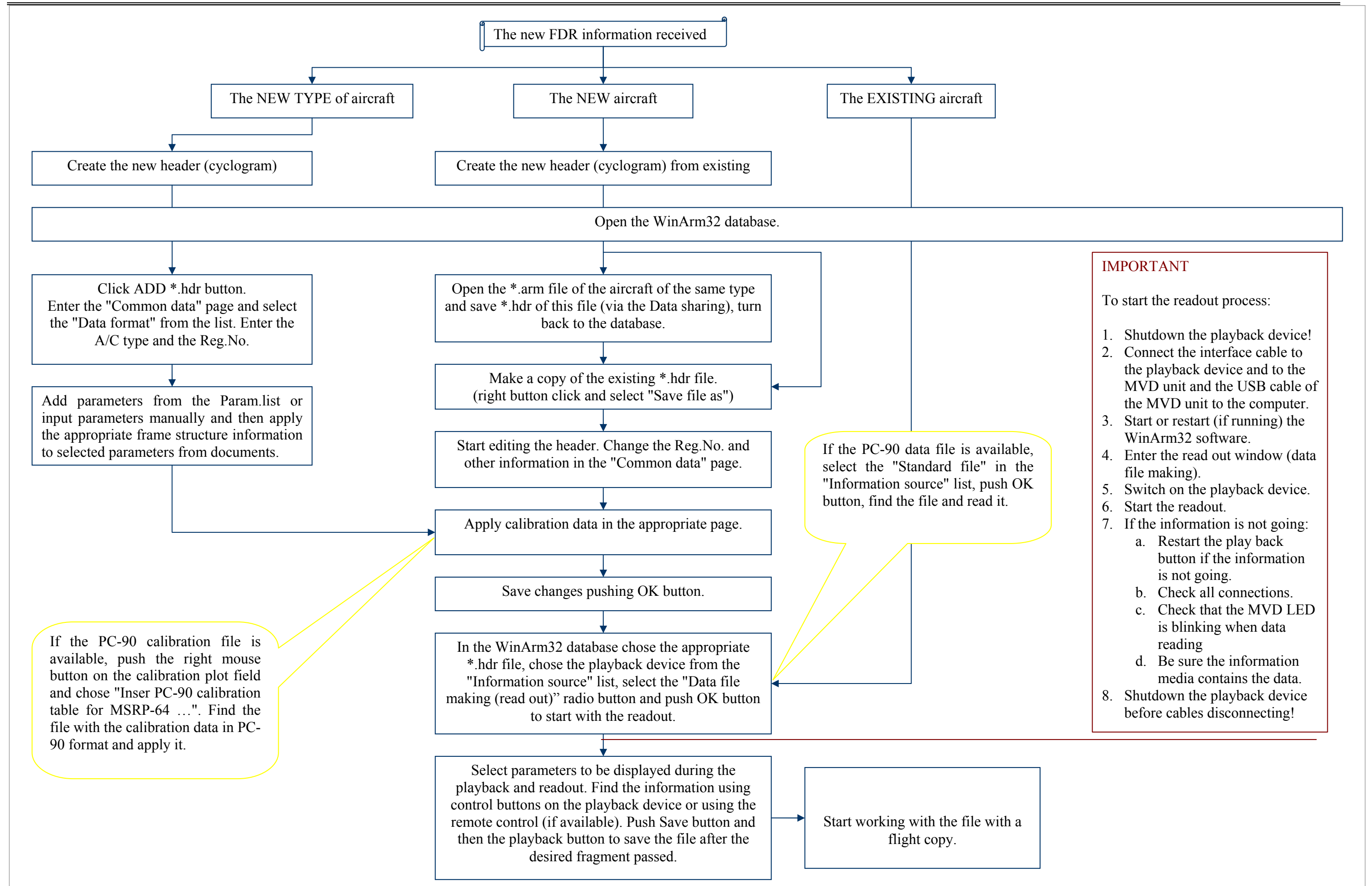
To copy (save) the part of information onto the hard disk press the  button along with the  button. It should be noted that program always saved all the data copied from the moment of last playback beginning in a temporary file. The pressed condition of the record button when playback is going to be stopped tells the program that it should save all the copied data

onto the hard disk. After playback stops the program invites the user to input a file name for the copied information. The user may refuse to save the information by pressing **Cancel** button.



There are some features concerning reverse playback (in time decreasing direction) while copying the information directly from board for the “Tester” system. “Tester” FDR stores the information about tape moving direction. The tape will continue to move forward after pressing the  button and will return to the stop instant after 3 hours. To read out the information in reverse direction (in time decreasing direction) press the  button. The “Tester” system will be reversed that is tape moving direction will be changed and heads will be switched. To read out the last registered information in this case it is necessary to switch heads once again but without tape moving direction changing. This operation will be done by  button pressing. The program will automatically press this button after reverse read out starts.

If the  button is pressed and tape is moving in forward direction (time is increasing) the program will read out the information that was registered 1 hour and a half before tape stop instant.

The following diagram illustrates the recommended user’s action to create flight information data file depending on disposable data.



9.4.3. WinArm16 data file import

To import a data file created with the WinArm16 you have to open the WinArm16 database window and select the folder which contains the WinArm16 executable file (**winarm.exe**). Select the **WinArm16 database** item from the  dropdown list or the **File/Database/WinArm16 database** menu item to display the window presented on the Figure 9.43. The current folder is indicated in the top middle part of the window. Use the  button to change the folder.

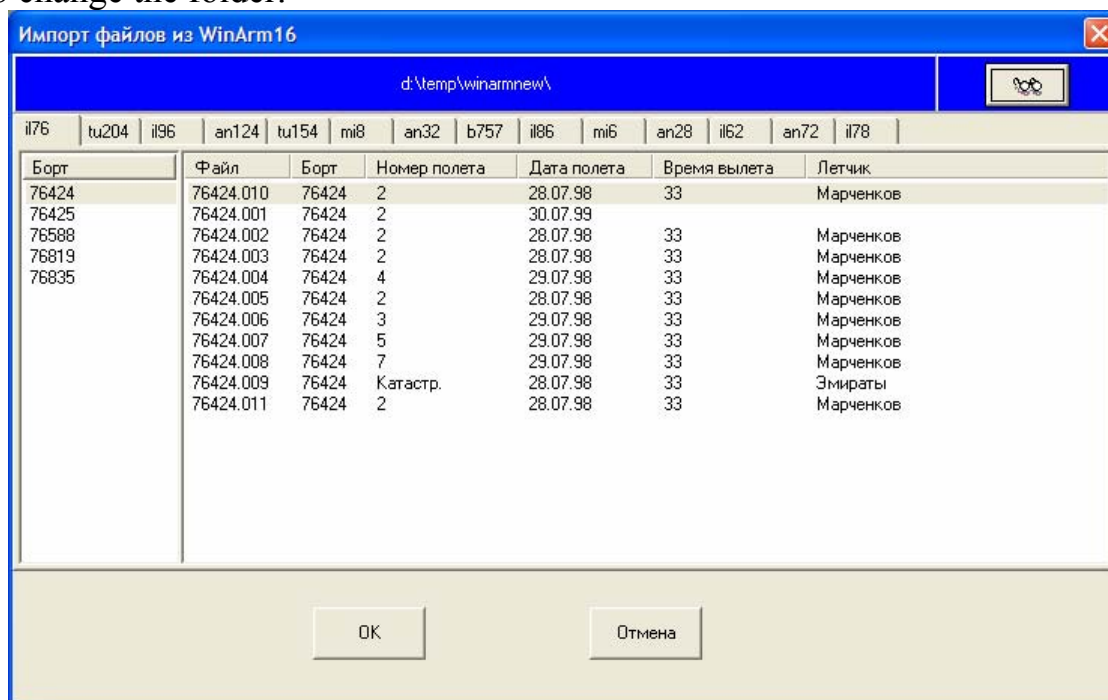


Figure 9.43

Select a file and press **OK** button. Specify the file name and a folder to save the file in. The newly created file will be automatically loaded into the graph viewing window.

9.5. Calibration tables changing

Sometimes, after a header or data file creation, you need to change calibration tables of some parameters or when a header for the new aircraft is created to change the calibration tables of all the parameters.

If a standard calibration tables file or a file with the calibration tables in the PC-90 format are available you can import those data into the **WinArm32™** program. To bind calibration tables the program compares the addresses and parameter types. The correctness of the addresses and types of the parameters (one calibration branch, two calibration branches and so on) should be checked by the user. It is strongly recommended to check the results after calibration tables import is completed.

To import calibration tables go to the **calibration table** page of the **Header editor** window and right click on the field of graphical representation of the calibration tables. Popup menu (Figure 9.44) will appear. Select the type of the file that has to be imported. Select the name of the file in the standard **file open** dialog. To complete the import answer **Yes** on the question about calibration tables changing.

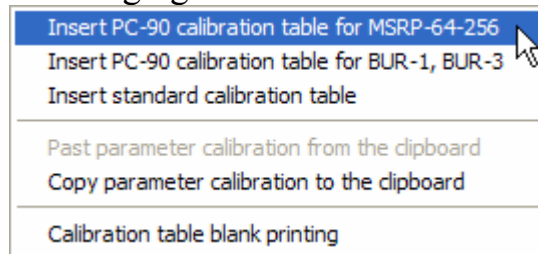


Figure 9.44

The program also gives you the ability to change the calibration table of the particular parameter by pasting it from clipboard.

Note: The WinArm32™ program uses its own clipboard, so all the data copied to the clipboard will be lost after program closing.

You may want to use this function in order to apply the modified calibration table of the particular parameter to all the flights (files) of this aircraft in case it was changed in one of the files. You have to save the calibration table to the clipboard from the file where it was changed and after that you may past it into the all other files. The program will compare the type of the parameter which calibration table was saved with the type of the parameter that will receive the calibration table. If they are different an error message will be popped up. Both operations (saving to the clipboard and pasting from it) are available from the popup menu (Figure 9.44).

9.6. Calibration table blank printing

Select the **calibration table blank printing** popup menu item (Figure 9.46) to print the calibration table of the selected parameter on a standard blank (Figure 9.45). The printing will be done on the currently selected printer or into the file depending on the settings selected in the **Print settings** dialog (Figure 10.24).

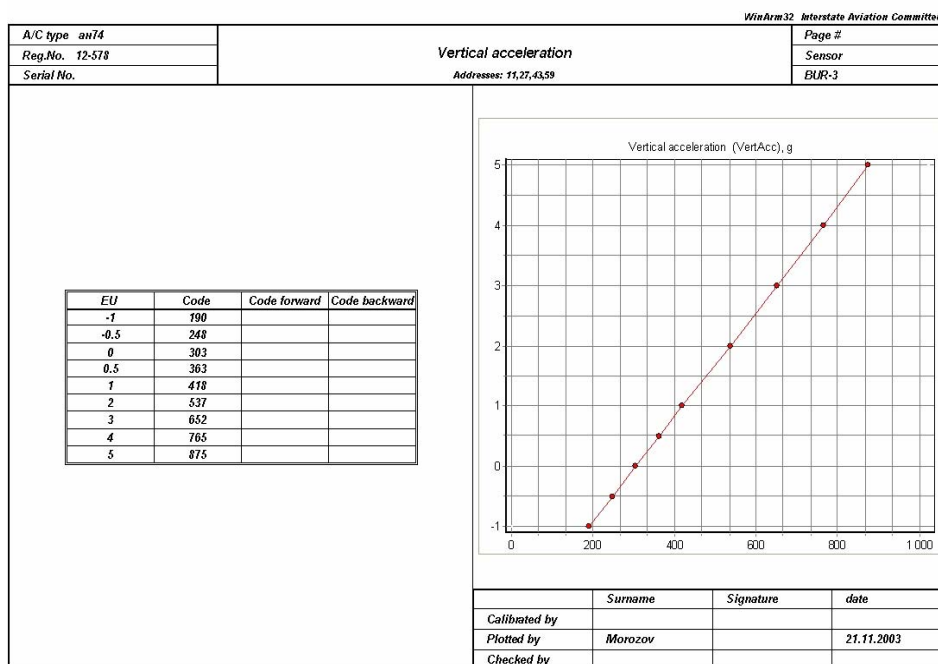


Figure 9.45

Insert PC-90 calibration table for MSRP-64-256
 Insert PC-90 calibration table for BUR-1, BUR-3
 Insert standard calibration table


Past parameter calibration from the dipboard
 Copy parameter calibration to the dipboard

Calibration table blank printing

Figure 9.46

10. Flight information processing

The program supports the screen and printers installed in the Windows™ operating system as output devices. Printing may also be done into the file of *.emf, *.bmp or *.jpg format. Flight data may also be saved in tabular format in a plain ASCII file.

”**Plot for analysis**” mode is used to work with the data on the screen. ”**Plot for printing**” mode is used to prepare the information for printing, to adjust scales of the parameters, to set current values and names of the parameters and to print the graphs. Press **Shift-Space** or select the appropriate menu item from the dropdown list of the  button to switch between those modes. The program saves the last used mode and will switch to it by default during next loading.

To display the data you have to open the database window, select a data file and press OK button. The information viewing window will appear. The main parts of this window for the ”**Plot for analysis**” mode are described on the Figure 10.1 and for the ”**Plot for printing**” mode – on the Figure 10.2. Only elements that are absent in the ”**Plot for analysis**” mode are shown on the Figure 10.2.

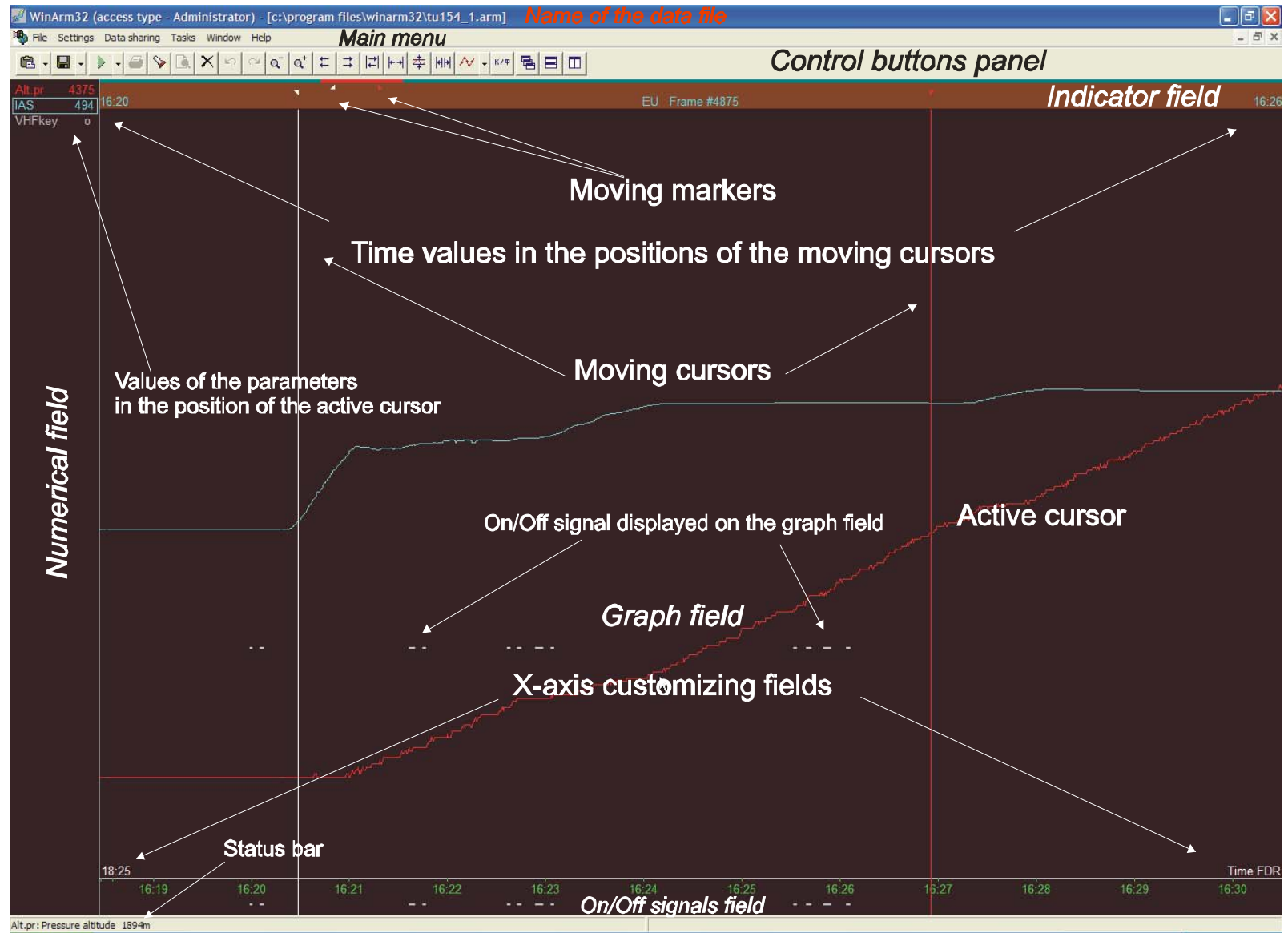


Figure 10.1

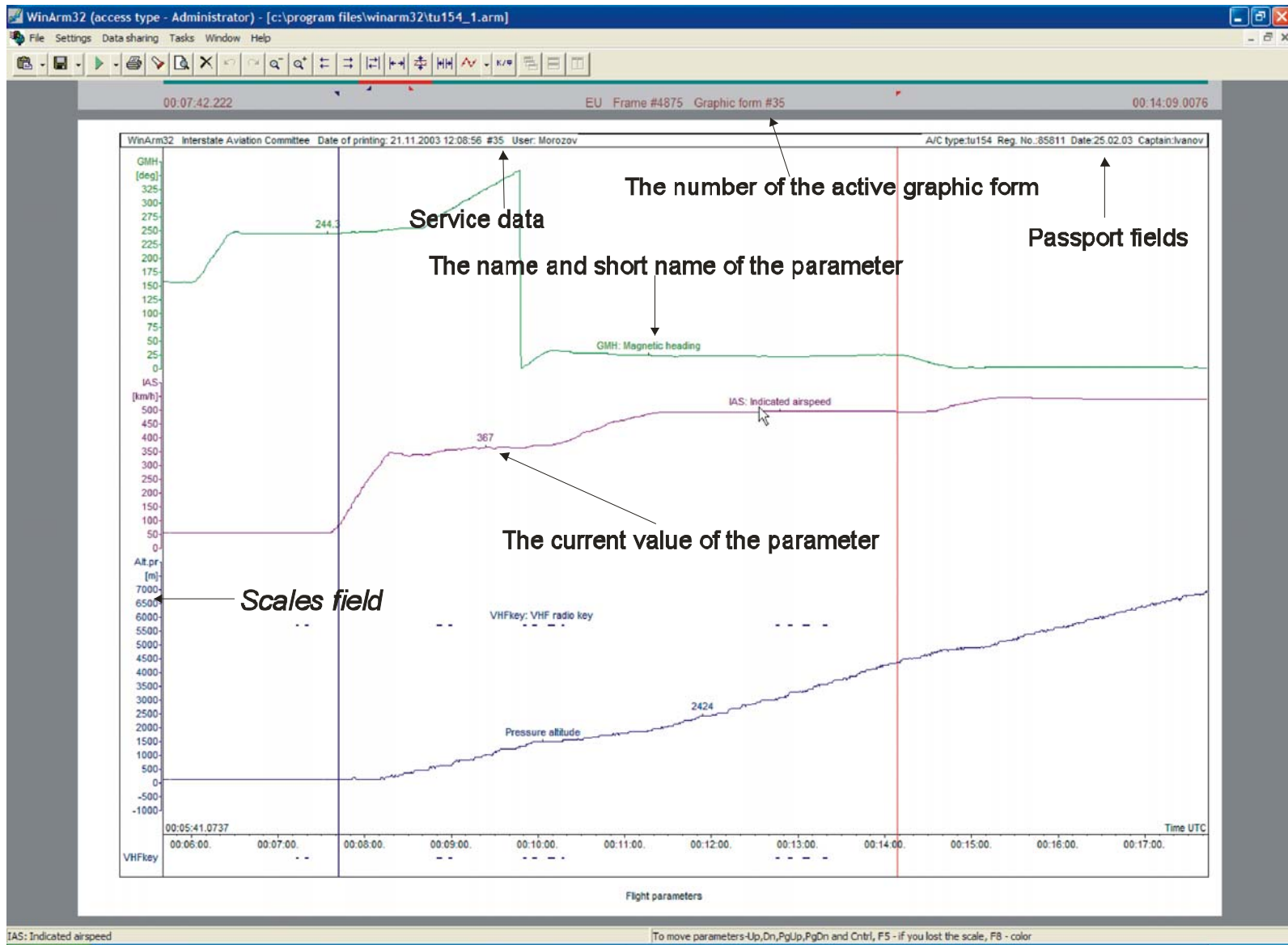


Figure 10.2

The user can change the size of the indicator field by selecting the corresponding items of the popup menu that appears after right clicking on the indicator field (Figure 10.3).

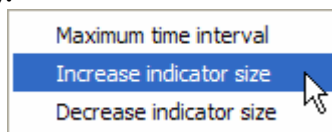


Figure 10.3

Both modes have the same main menu, indicator panel and control buttons. The user can change the size of the buttons using the popup menu that will appear after right clicking on the control buttons panel (Figure 10.4).

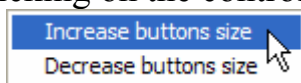
























Figure 10.4

The following table contains description of the control buttons. The second level list describes the items of the buttons that have dropdown list.

	<ul style="list-style-type: none"> ➤ Opens WinArm32™ database window. <ul style="list-style-type: none"> ○ WinArm32™ database. ○ WinArm16 database. ○ Data files. ○ Header files. ○ Flight path files.
	<ul style="list-style-type: none"> ➤ Save the current data file with a new name. <ul style="list-style-type: none"> ○ Header saving in a separate file. ○ Data saving in a file of the standard format.
	<ul style="list-style-type: none"> ➤ Output the plot. <ul style="list-style-type: none"> ○ «Plot for analysis». ○ «Plot for printing».
	<ul style="list-style-type: none"> ➤ Selects the parameters to be displayed.
	<ul style="list-style-type: none"> ➤ Prints the graph (disabled in the “Graph for analysis” mode).
	<ul style="list-style-type: none"> ➤ Switches to the real size (label setting) mode (disabled in the “Graph for analysis” mode).

	➤ Switches to the failure setting and removing mode.
	➤ Scrolls the graph to the left.
	➤ Scrolls the graph to the right.
	➤ Switches to the previous time interval.
	➤ Switches to the next time interval.
	➤ Increases time interval.
	➤ Decreases time interval.
	➤ Toggles active cursor.
	➤ Sets the maximum time interval.
	➤ Adjusts scales of all the parameters automatically.
	➤ Moves cursors to the boundaries of the graph field.
	➤ Shows/hides measuring instants. <ul style="list-style-type: none"> ○ For analog parameters. ○ For On/Off signals.
	➤ Switches between codes and engineering units.
	➤ Arranges windows as cascade.

	➤ Arranges windows horizontally.
	➤ Arranges windows vertically.

Before description of all the functions available in graph displaying mode it is necessary to understand some basic terms.


Active parameter – all the actions (moving, scale changing and so on) will be done with this parameter. In the "Plot for analysis" mode the active parameter is marked by the rectangle around its short name on the numerical field (Figure 10.1). The boundary of the rectangle is solid if all the measures of the parameter are plotted on the screen. The boundary is dash otherwise. In the "Plot for printing" mode the information about the parameter that is currently active is indicated in the left part of the status bar (Figure 10.2).

To make any parameter active in the "Plot for analysis" mode use one of the following procedures. Left click close to the desired parameter graph if the system cursor is located on the graph field. Left click on the short name of the parameter if the system cursor is located on the numerical field. If the short name of the parameter is selected the graph of this parameter will flicker two times showing its location.

Note: here and after the terms «graph field» and «analog parameters field» have to be considered as synonyms.

If the system cursor is located on the numerical field press **Up** and **Down** keys for sequential choice of the active parameter from the parameters currently selected for showing on the screen. Press the same keys but keeping **Ctrl** key pressed if the system cursor is located in any other position of the program window.

To make a parameter active in the "Plot for printing" mode just place the system cursor (no need to click) close to the desired parameter graph. If the system cursor is located on the scales field – the corresponding scale becomes active.

Active cursor – is one of the two program's cursors (Figure 10.1) which position is used to read the current values of the parameters as well as to perform data copying and pasting operations. A cursor becomes active after it was selected by the left mouse button. To toggle the activeness between cursors use Tab or F4 keys as well as the  button. Colors of the active and passive cursors may be changed by the user (chapter 10.2.1). To move the active cursor to the next frame use **Left/Right** keys. To move the active cursor to the next measure instant of the active parameter use the same keys but keeping **Ctrl** key pressed. Any transition of the active cursor is carried out

by its grabbing with the mouse pointer. To set up cursor's behavior use the popup menu that appears after right clicking on the graph field (Figure 10.5).

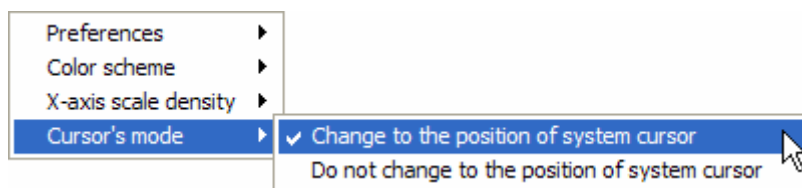


Figure 10.5

If **Change to the position of the system cursor** item is selected then after clicking by the left mouse button on the indicator field a program's cursor that is closer to the clicking point will be moved to this position and, if the left mouse button is keeping pressed, will move along the indicator together with the system cursor. Otherwise program's cursor will be moved from the current position after being grabbed by the mouse pointer.

The **"Plot for analysis"** mode provides the following functions:

- * Selecting the parameters to be displayed on the screen from the file header, graphic form or standard task;
- * Customizing appearance of the graphs of the parameters;
- * Displaying graphs as a function of the registered or relative time;
- * Changing the scales of the parameters, moving graphs along the screen and selecting desired time interval;
- * Outputting parameters in codes or engineering units;
- * Determining the values of the parameters in the active cursor position;
- * Setting zero-time mark to any position when viewing graphs in the relative time mode;
- * Information frames inserting and deleting;
- * Text labels inserting and deleting;
- * Frame and parameter failure marks setting and removing;
- * Saving a set of the parameters as a graphic form or standard task;
- * Service information (identification data) viewing;
- * Saving the header or the data from the current file in a file of the standard format;
- * Printing the values of the parameters in tabular format;
- * Flight path calculation in horizontal and vertical planes;
- * Setting up printer options.

The **«Plot for printing»** mode additionally provides the following functions:

- * Customizing scales and appearance of the parameters before printing;
- * Adding name, short name and the current values of the parameters before printing;


- * Print preview;
- * Printing of the graph.

The principal difference of those two modes is that the **”Plot for analysis”** mode uses the whole screen to represent registered information evidently in order to analyze it quickly and qualitatively. This mode may also be used for presentations with the help of the multimedia projectors.

The second mode provides the ability to view the information exactly in the same way as it will be printed (chapter 10.11).

The following chapters contain the detailed description of the above mentioned functions.

10.1. Parameters selection. Working with graphic forms and standard tasks.

To select parameters to be displayed on the screen press  or select the **Settings/Select Parameters** menu item. The **Select parameters** dialog box will appear (Figure 10.6).

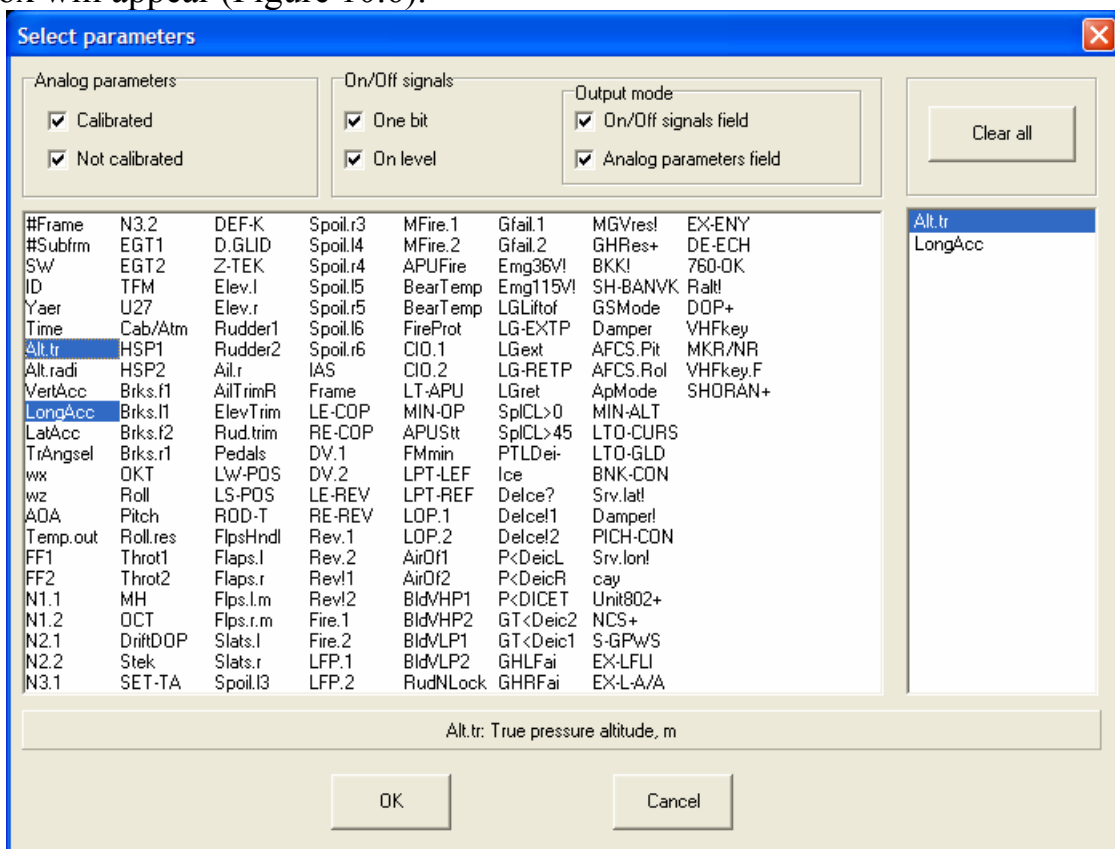


Figure 10.6

To display a graph of the parameter on the screen just select it in the list with the mouse pointer. To exclude the selected parameter click it once again. To exclude all the parameters use the **Clear all** button.

Note: You are able to remove the active parameter from the screen directly while viewing the graphs. Just press the **Del** key to do it.

The short names of the currently selected parameters will be displayed on the blue background. The name of the lastly selected parameter will be shown in the status bar just below the list of the parameters. After selecting all the necessary parameters press **OK** button, to avoid changes press **Cancel**.

The switches in the top part of the window determine what kind of the analog parameters and On/Off signals will be present (shown) in the list as well as the output mode for On/Off signals. Select the appropriate switches in the **analog parameters** field to show in the list calibrated analog parameters and/or parameters without calibration. Select the appropriate switches in the **On/Off signals** field to show in the list 1-bit and/or calculated On/Off signals. Select the appropriate switches in the **Output mode** field to display On/Off signals on the analog parameters field or On/Off signals field or on both fields simultaneously. On/Off signals will not be displayed on the screen if both switches are not selected.

10.1.1. Standard tasks

You may display the graphs with the help of the predefined list of the parameters so called standard task. Select the **Settings/Standard tasks** menu item to display the list of the currently existed tasks (Figure 10.7).

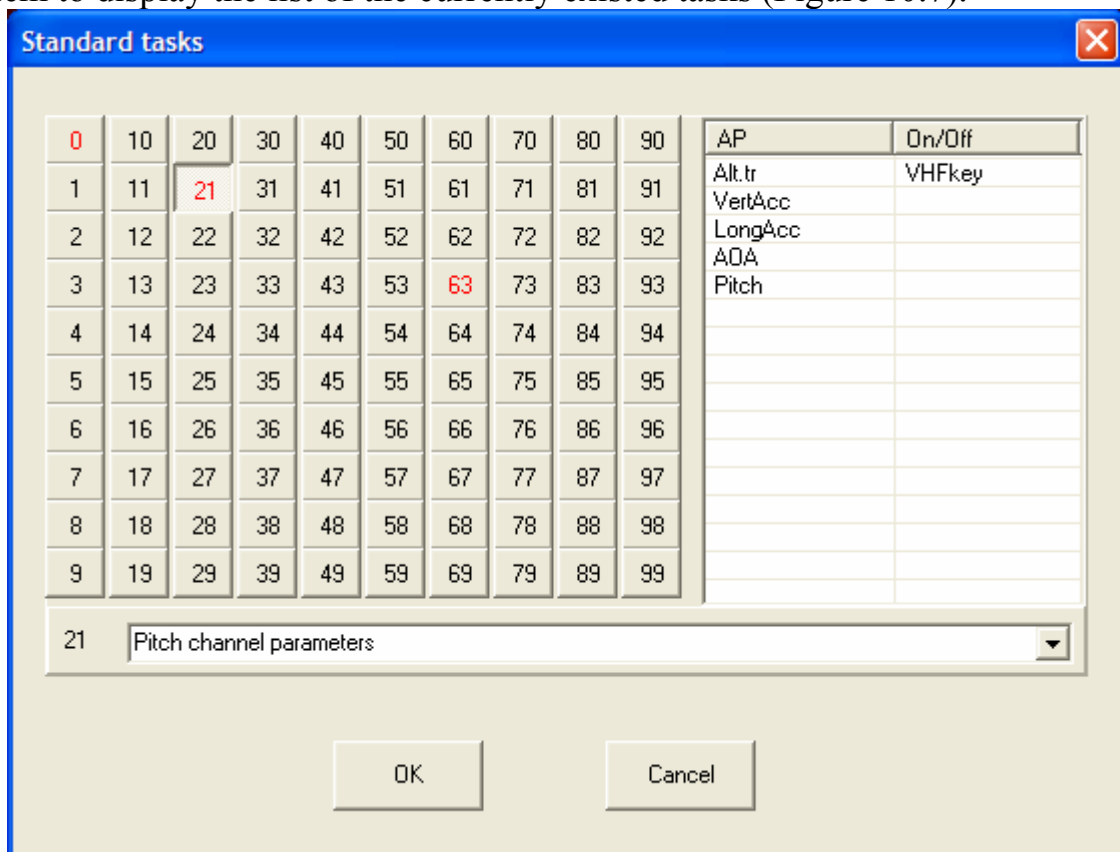


Figure 10.7

The numbers that contain a predefined list of the parameters are displayed in red color. The numbers that do not contain parameters (free numbers) are displayed in grey color. The names of the existed standard tasks are also contained in the editable dropdown list. The currently active task is marked by the pressed state of the corresponding button. Its name and number are shown in the dropdown list. The task with the number of 0 is always active when you display the **Standard tasks** window. The list of the analog parameters and On/Off signals from the active task is shown in the right part of the window. To make a task active just click on the appropriate button or select its name from the list.

To save the set of the parameters that is currently displayed on the screen as a standard task just left click any free number keeping **Ctrl** key pressed. The program will assign a default name to the newly created task. The user is able to change the name. To assign a new name to the task type it in the edit box of the dropdown list and click the active (selected) number once again keeping **Ctrl** key pressed or just press **OK** button.

To delete a standard task left click on its number keeping **Shift** key pressed and confirm deleting.

***Attention:** Selecting **OK** button in the **Standard tasks** window outputs the parameters from the active (selected) task on the screen and saves the new name of the task (if it was changed) but does not save currently displayed parameters as a standard task. To save currently displayed parameters as a standard task left click on the desired button keeping **Ctrl** key pressed.*

Standard tasks are saved in a separate file and may be used with any data file including files of the different type of aircraft. The standard task contains not only the list of the parameters that are identified using their unique number (field **ID** in the **Header editor** window) but also the information about their scales and attributes (color etc.) as well as the information about the current printer and its settings. To select a printer use the **File/Print settings** menu item.

Before using a standard task the program checks the system if the printer for which this task was saved is installed or not. If the printer is not installed the program will offer the user to select another printer (Figure 10.8). If the answer is **Yes** the standard Windows™ printer setup dialog will appear. It is recommended to select a printer with similar paper size and orientation. If the answer is **No** the printer will be selected by the program automatically but matching of the parameters of the page is **not guaranteed** in this case.

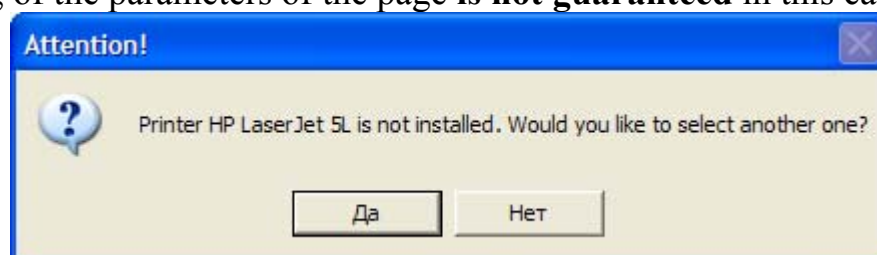


Figure 10.8

It is recommended to use standard tasks for comparison of the same data (parameters) registered during different flights. The time interval is not saved in a standard task and each time should be adjusted by the user. If the header of the current data file does not contain the parameter with **ID** number that is saved in a standard task the program will omit this **ID** and no errors will occur.

10.1.2. Graphic forms

You can also use predefined graphic forms for displaying parameters on the screen. Graphic forms like standard tasks are predefined sets of the parameters along with their attributes for displaying on the screen and printing. Unlike a standard task a graphic form contains also a time interval, text labels and other settings that belong to a particular file (flight). Graphic forms are saved inside a data file and may be used only with the data from this file. Graphic forms may be used to save the results of work in order to use them in the future for example for printing or transferring to another computer.

***Recommendation:** Graphic forms may be used to print the graphs on different languages (English or Russian). After preparing and saving a graphic form you may change the language in a file header (chapter 9.1.2) and the changes will be automatically applied to the graphic form when it will be used next time.*

To display the **Graphic forms** dialog box select the **Settings/Graphic forms** menu item. The window (Figure 10.9) will appear:

- Main window background;
- Indicator background;
- Indicator font;
- Active cursor;
- Passive cursor;
- Second ticks;
- Minute ticks;
- Hour ticks;
- Failure marks.

Right click on the graph field to display popup menu (Figure 10.10) and select the item which color has to be adjusted.

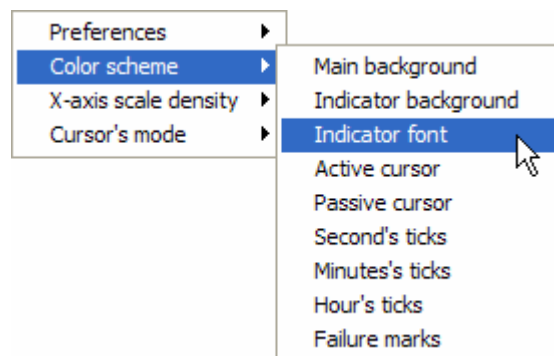


Figure 10.10

The standard **Color** dialog (Figure 10.11) will appear.

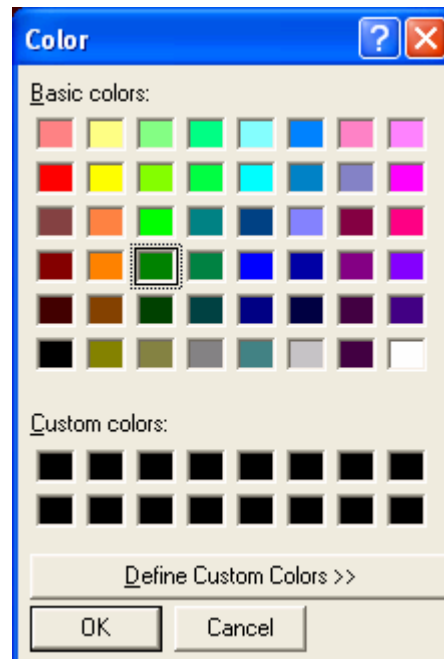


Figure 10.11

Press **F6** key to invert the background color of the graph field. Press **F7** key to invert the colors of all the parameters that are currently displayed on the screen.

***Recommendation:** You may use colors inversion when one or some parameters are not clearly seen against existed background and you need quickly (without changing their colors)) to look at their graphs or values.*

10.2.2. Selecting the color of the active parameter

Press **F8** key to select the color of the active parameter (marked by the rectangle on the numerical field). The color selection dialog box will appear (Figure 10.11).

You may also select the color of the parameter using the **Header editor** (Figure 9.2) dialog box that appears after pressing **F2** key. This window allows you to select different colors to display the graph of the parameter in the "Plot for analysis" and "Plot for printing" modes. However, in case of using the **Header editor** window, the program will rebuild the data file after pressing the **OK** button that will significantly increase the work time. Additionally, you may accidentally change some other attributes of the parameters, so to guarantee yourself from such kind of troubles it is **recommended** to use **F8** key for color changing.

Press **F7** key to invert the colors of all the parameters that are currently displayed on the screen.

10.2.3. Font changing

The **Font** dialog (Figure 10.12) of the **Windows™** system is used to select font name and parameters. The dialog box appears after selection of the **Settings/Font** menu item.

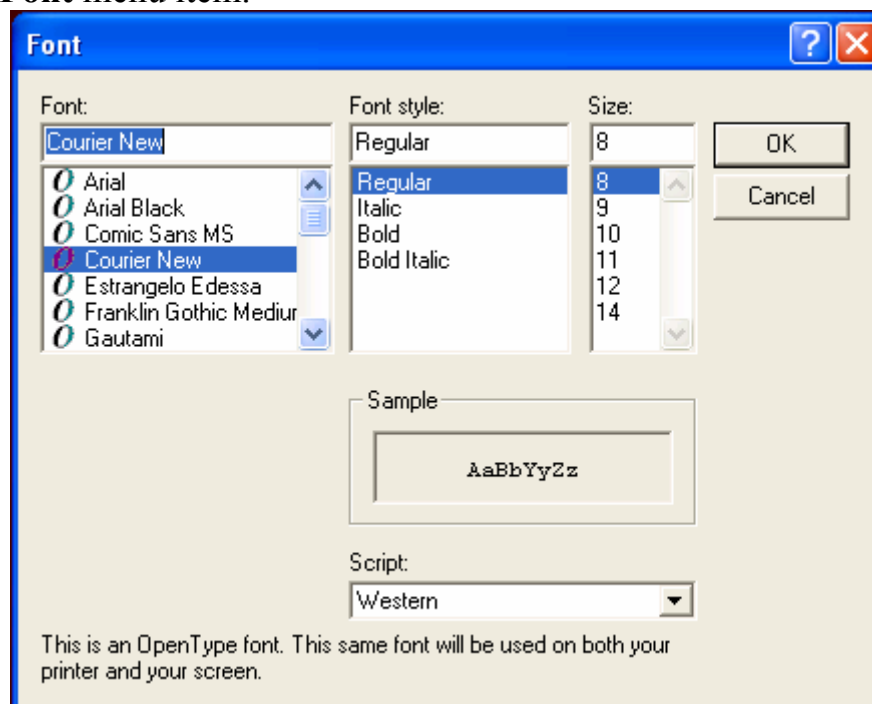

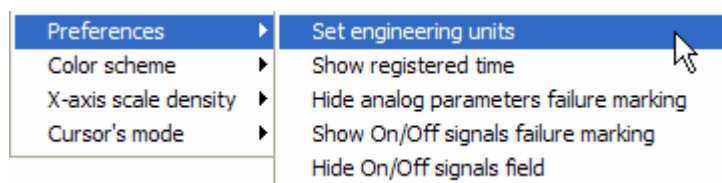


Figure 10.12

Selected font will be used to print all the objects that contain text. The user may additionally specify fonts for text labels (chapter 10.7).



10.2.4. Parameters output mode (codes-engineering units)

The program is able to output parameters either in engineering units or in code (registered) values. To switch between those modes use the  button or the appropriate item from the popup menu (Figure 10.13) that appears after right clicking on the graph field.

**Figure 10.13**

The information about current mode is presented on the indicator field.

10.2.5. Registration instants viewing

Click the  button to display or hide the marks (points) that show registration instants of the parameters. Select the type (analog parameter or On/Off signals) from the dropdown list of the  button to which this function will be applied.

To move the active cursor through the registration instants of the active parameter use **Left/Right** keys keeping **Ctrl** key pressed.

10.2.6. Parameters moving and scale changing

To move the graph of the parameter along the screen you have to click it with the left mouse button and keeping the button pressed move the graph to the new position. The active parameter can be moved by pressing **Up/Down** keys or rotating the scrolling wheel of the mouse. Each time you press the keys the graph will be moved on 1/15 of the graph field height being in the **"Plot for analysis"** mode or one point of the scale being in the **"Plot for printing"** (chapter 10.11).

Note: You are not able to move the graphs of the parameters if they are displayed in code values.

To move the graph of the analog parameter as well as to change its scale you may use the **Min. value** and **Max. value** fields on the **Scale** page of the **Header editor** window (Figure 10.14). Use the **On/Off signal position**

field to specify the precise position of the On/Off signal in percent of the graph field height (Figure 10.15).

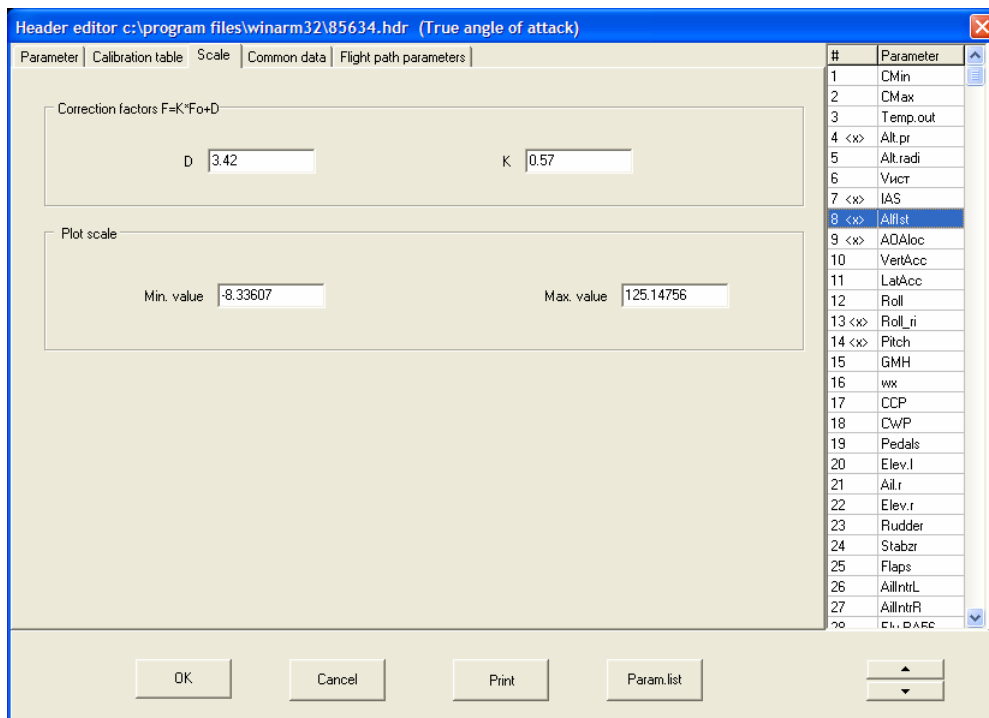


Figure 10.14

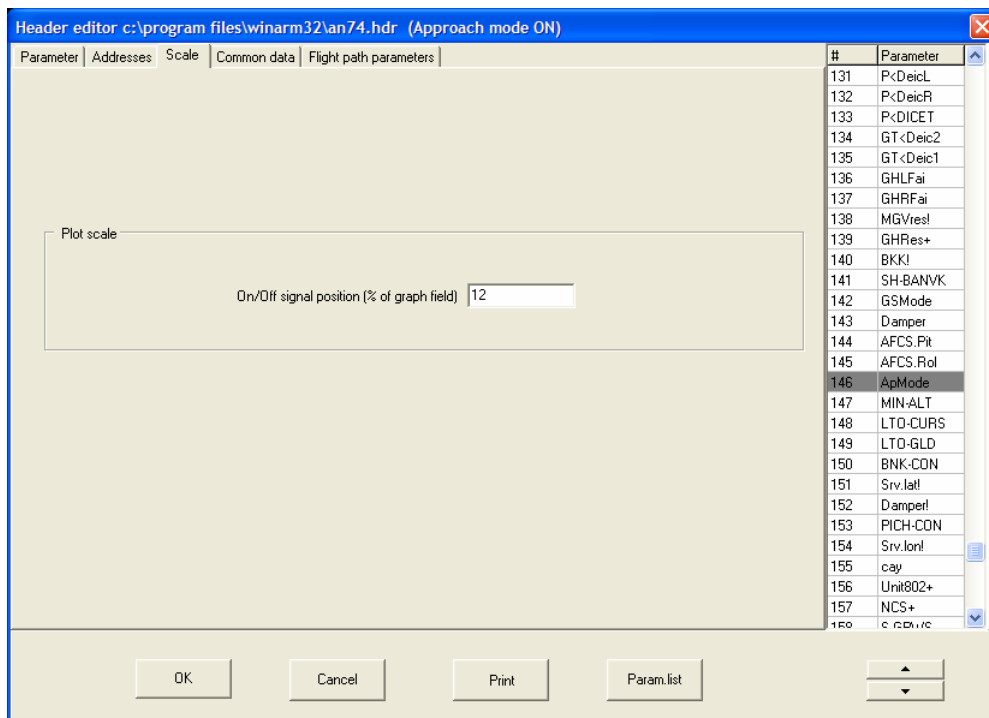







Figure 10.15

To change the scale of the analog parameter double click its graph with the left mouse button and, keeping the left button pressed, move the mouse pointer until the desired scale will be set. The scale will be increased if the mouse pointer is moving up. The scale will be decreased if the mouse pointer is moving down.


middle point of the scale, the lower part of the scale will be changed otherwise (see detailed information in chapter 10.11).


10.3. Selecting the time interval

Use one of the following methods in order to select the time interval for viewing the graphs:

- Move the markers on the indicator field;
- Move the cursors through the graph field;
- Select the desired interval with the mouse pointer;
- Select the maximum time interval button ;
- Select time scale changing buttons  and ;
- Select time interval moving buttons  and .

Below are some recommendations of how to use the mentioned methods to select the time interval.


The moving markers give you the ability to select the time interval from the whole file. The markers are set to the boundaries of the indicator if the part of the information bounded to them, is completely represented on the screen. Move the markers to any desired position by grabbing them with the left mouse button. To output the part of information located between the markers after they were moved to the new position press **Enter** key or click the  button (button itself but not the dropdown list). To output the information without changing the time interval, press the **Space** key.


The moving cursors give you the ability to select the time interval **but only from the part of information that is currently represented on the screen**. The moving markers will be moved correspondingly when cursors are being moved across the screen. To output the part of information located between the cursors after they were moved to the new position press **Enter** key or click the  button (button itself but not the dropdown list). To output the information without changing the time interval, press the **Space** key.


Press **Left/Right** keys to move the active cursor *on one frame* along the record. Move the cursor to any desired position by grabbing it with the left mouse button. The popup menu (Figure 10.5) that appears after right clicking on the graph field let you to select between two possible modes of the cursors' behavior when you click on the indicator field.


The currently active mode is checked. If the first item is checked the moving cursor that is located closer to the clicking point will be moved in the system's cursor position after left clicking on the indicator field. Both cursors will be moved together after that. If the second item is checked the moving cursor grabbed by the left mouse button remains in starting position and moves from it proportionally to transition of a system cursor.



The fastest method of choice of time interval is the selection with the help of the mouse pointer. Transfer the moving cursor to the beginning of the desirable interval. Not releasing the left mouse button, press the right mouse button or **Shift** key and move the cursor to the end of the desirable interval. Current selection will be indicated by color inversion. After releasing the buttons the program will output the information on the selected interval automatically. If the described procedure is done with the moving markers the choice of an interval will happen on a range of all registered information.

Scaling buttons  let you change the time interval so, that while increasing the duration is changed on the current width of the interval from both sides and while decreasing the middle of the interval, width 1/3 from current, is displayed.

The scrolling buttons  scrolls the time interval approximately on 1/15 of screen width each time. Just click (press and release) the appropriate button to scroll the interval to the left or to the right. The interval will be scrolling until the mouse pointer stays above the button. Remove the pointer from the button to stop scrolling.

Press the  button to display all the registered information. The same action could be done with the help of the appropriate item of the popup menu that appears after right clicking on the indicator field (Figure 10.3).

Press the  button to move the cursors to the boundaries of the graph field. The moving markers will be moved proportionally.

The program keeps in memory the information about last 100 intervals. Click the  button to return to the previous interval, click the  button to go to the next interval.

10.4. Time axis options

The time axis may be displayed either in registered or in relative time. Left click on the time axis label (Figure 10.1) in the right bottom corner of the graph field to switch between those two modes. You may also select the appropriate switch in the **Type** field of the **time axis properties** (Figure 10.17) dialog box that appears after selecting the **Settings/X-axis properties** menu item. The same dialog appears after right clicking on the time axis label.

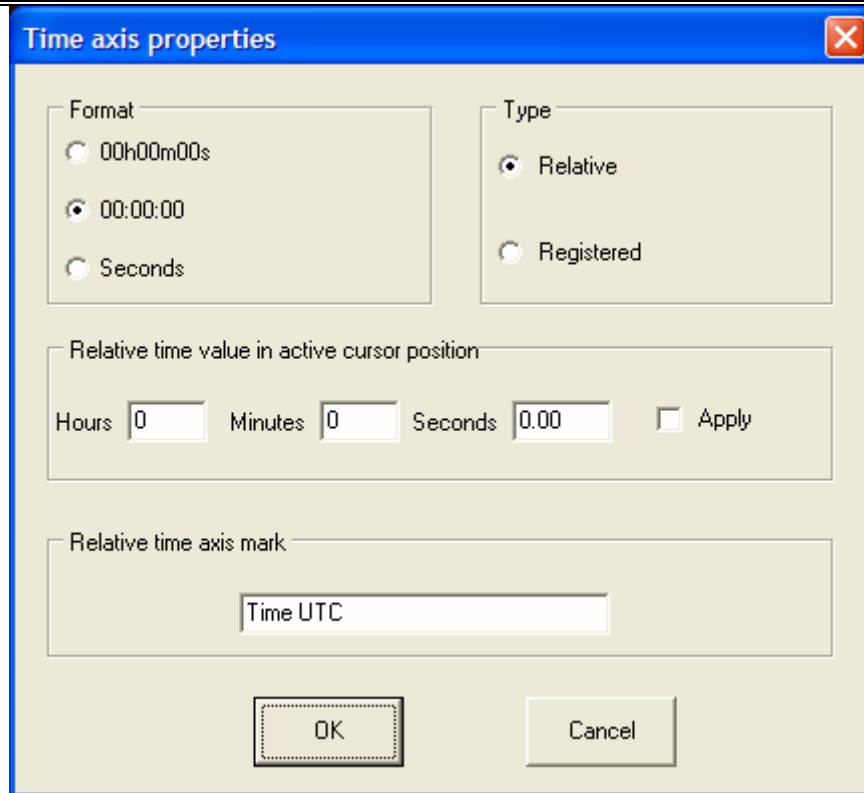


Figure 10.17

Sometimes it is necessary to calculate the time elapsed from the particular moment that is selected by the user. The dialog box presented on the Figure 10.17 provides you the ability to set the relative time value in the active cursor position. Select also the corresponding check box to apply the changes after clicking **OK** button. To view the graphs in the relative time mode select also the appropriate switch in the **Type** field.


Additionally you may adjust the appearance of the time marks and specify axis label that will appear in the relative time mode.

Recommendation: You may output the graphs in the relative time mode for example to calculate the time elapsed from the beginning of take off run until the aircraft left the runway. Set zero value of the relative time at the moment of take off run beginning and change the scale label for example to “time elapsed from take off beginning”. The results could be saved as a graphic form for future using.

Some FDRs (MSRP-64 and so on) do not register the seconds of the current time. The program will display only hours and minutes for those FDRs while viewing the graphs in registered time mode. In this case it is recommended to set (at any instant) the relative time equal to the registered time and to view plots in the relative time mode. This action provides you also with the ability to check were some information frames lost during read out or not. If minute changing instants of the relative and registered time will correspond to each other at any position in the data file all the information was read out correctly. Otherwise it is necessary to find parts of the file where

some frames were lost (or added) and to correct them by information frames inserting or removing (chapter 10.8).

Note: There are also some special methods to recover the information (in case of read out failures) registered by different type of FDRs. The description of those methods is provided in special literature.

The time scale density could be adjusted by clicking on the time label (Figure 10.1) in the left bottom part of the graph field after mouse pointer will change to the  form. Click with the left mouse button to increase time scale density or right click to decrease time scale density. The same actions could be done with the help of the popup menu items that appear after right clicking on the graph field (Figure 10.18).

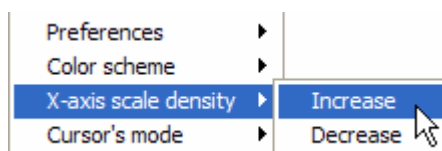


Figure 10.18

The time values at the positions of the cursors are indicated in the left and right parts of the indicator field just above the graph field (Figure 10.1).

10.5. Reading the current values of the parameters

The values of all the parameters currently displayed on the screen are listed in the numerical field. The values are read in the position of the active cursor. A “+” sign for On/Off signals means that a signal is present, a “0” sign means that a signal is absent. The preciseness of the analog parameters (how many decimals) is set in the **Precision** field of the **Header editor** window (Figure 9.1).

The time values at the positions of the cursors are indicated in the left and right parts of the indicator field just above the graph field.

The status bar will display the name of the parameter and its value in the system cursor position if the mouse pointer is located close to the graph of the parameter.

You are able to display a scale of the active parameter by left clicking on the graph field keeping **Shift** key pressed. Do not release the mouse button if you want to move the scale along the screen. Only scale of the active parameter may be displayed on the screen at the given time in the “**Plot for analysis**” mode. This function does not work if parameters are displayed in code values.

10.6. Information failures marking

The parts of the record with erroneous information may be marked in order to be excluded from further processing. Record quality should be analyzed by the user. The program is also able to set failure marks automatically during read out if the appropriate mode is switched on (chapter 9.4.2). The information is considered incorrect if the actual frame structure does not comply with the frame structure of the current FDR type. The **frame failure** mark is set for those frames. The parts of the information with the failure marks will be plotted in the color defined by the user (in white color by default). To define the color right click on the graph field and use the appropriate item (**Color scheme/Failure marks**) of the popup menu (Figure 10.19).

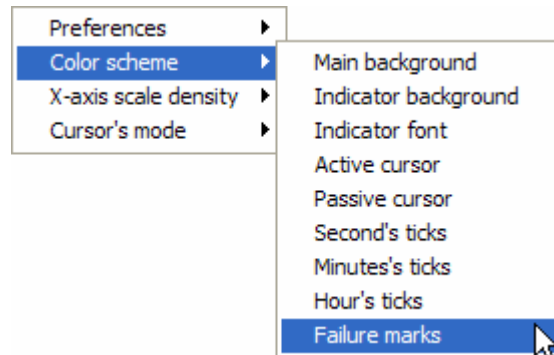


Figure 10.19

The program allows to not display parts of the information, marked as failure. This function is applied separately to analog parameters and/or On/Off signals. To select the type of the parameters this function will be applied to use the popup menu items (Figure 10.20).

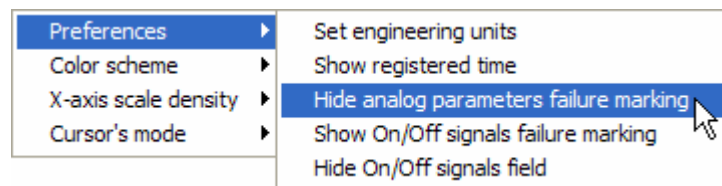





Figure 10.20




Note: While creating the table of the parameters the linear interpolation will be used to determine the values of the parameters for the parts of information marked as failures if those parts are displayed on the screen. Otherwise, the values will not be calculated at all.

Follow the procedure below to set the **Frame failure** mark manually:




1. Place the moving cursors on the boundaries of the desirable interval.

2. Press the  button to enter into the failure setting/removing mode. The shape of the cursor will change to .
3. Press **Insert** key.
4. Press the  button once again to exit from the failure setting/removing mode.




To mark extended parts of the information the following procedure may be used:



1. Press the  button to enter into the failure setting/removing mode. The shape of the cursor will change to .
2. Move the cursor to the beginning of the desirable interval and, not releasing the left mouse button, press also the right mouse button or **Shift** key and move the mouse pointer to the end of the desirable interval.
3. Press the  button once again to exit from the failure setting/removing mode.

To remove the **Frame failure** mark:


1. Place the moving cursors on the boundaries of the desirable interval.
2. Press the  button to enter into the failure setting/removing mode. The shape of the cursor will change to .
3. Press **Delete** key.
4. Press the  button once again to exit from the failure setting/removing mode.

If only **particular analog parameter or On/Off signal** has registration failures it is recommended to exclude it from further processing by setting a **Parameter failure** mark. Follow the procedure below to set the **Parameter failure** mark:

1. Determine the part of the record with the incorrect information.
2. Display analog parameter or On/Off signal.
3. Press the  button to enter into the failure setting/removing mode. The shape of the cursor will change to .
4. Place the cursor above the registration instants that have to be marked as failures and click with the left mouse button.
5. Repeat item 4 for all desirable registration instants.
6. Press the  button once again to exit from the failure setting/removing mode.




 All the registration instants of any parameter that are located inside the  cursor will be marked as failures. During cursor moving the status bar will

contain the short names as well as the numbers of frames and registration instants that are inside the cursor and, therefore, could be marked as failures.

Recommendation: To set/remove failure marks it is highly recommended to display the graphs of the parameters showing registration instants (button , chapter 10.2.5).

Note: The On/Off signal **must** be displayed on the field of the analog parameters (chapter 10.1) if you want to set a failure mark on it.




There is the second way to set a **Parameter failure** mark:

1. Determine the part of the record with the incorrect information.
2. Display analog parameter or On/Off signal.
3. Press the  button to enter into the failure setting/removing mode. The shape of the cursor will change to .
4. Draw the rectangle with the help of the left mouse button keeping pressed **Shift** key. All the registration instants that are inside the rectangle will be marked as failures.
5. Repeat item 4 for all desirable registration instants.
6. Press the  button once again to exit from the failure setting/removing mode.

All the registration instants that are inside the rectangle will be marked as failures.

There is one feature while setting the **Parameter failure** mark. This feature exists because of the limited screen resolution and consists in that the program does not output registration instants that coincide with the instants that are already plotted on the screen. The **Parameter failure** mark is set only for the registration instants that are currently displayed on the screen. Therefore, it is possible that after some failure marks were set and **Enter** (**Space**) key was pressed hidden registration instants will be displayed and require the failure marks to be set on them also. This feature also exists when you remove **Parameter failure** marks (see below).




To remove the **Parameter failure** mark:

1. Press the  button to enter into the failure setting/removing mode. The shape of the cursor will change to .
2. Place the cursor on the part of information marked as failures and click with the right mouse button.
3. Repeat item 2 for all desirable parts of information.
4. Press the  button once again to exit from the failure setting/removing mode.

Failure marks will be removed from the registration instants that are located inside the cursor.

***Note:** To remove the failure marks you **must** display the information showing the registration instants (the  button, chapter 10.2.5).*


The second way to remove **Parameters failure** mark is as follows:


1. Press the  button to enter into the failure setting/removing mode. The shape of the cursor will change to .
2. Draw the rectangle with the help of the left mouse button keeping pressed the right mouse button and **Shift** key. Failure marks will be removed from all the registration instants that are inside the rectangle.
3. Repeat item 2 for all desirable parts of information.
4. Press the  button once again to exit from the failure setting/removing mode.


***Note:** If you will do the procedure that removes **Parameter failure** mark from the part of information that has **Frame failure** mark installed then only registration instants that are located inside the cursor or rectangle will be cleared.*

It should be noted that setting failure marks **does not change** the registered information, and only excludes marked parts from further consideration and analysis. To view the information without failure marks press **Ctrl+Enter** keys, to return to the previous view – press **Enter** key.

10.7. Text labels setting and removing

Press **Insert** key to set a text label in the active cursor position. Move the cursor a bit aside and a vertical dot line (called base line) will appear showing text label location. The shape of the cursor will change to  after placing above the base line. You can move the text label along the X-axis by grabbing it with the left mouse button.

If the label contains text it could be moved up and down after the shape of the cursor changes to vertical arrow  .

Right click after the shape of the cursor will change to  form to display **Text label properties** dialog box (Figure 10.21).

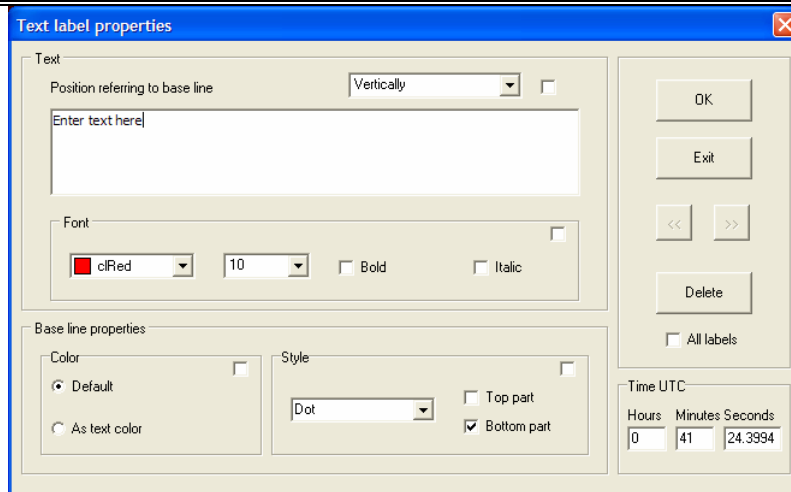




Figure 10.21

Using this window you may specify:

- Text of the label;
- Position regarding to the base line;
- Font and its properties;
- Style and color of the base line;
- The exact position of the label in relative time.

To set the exact position of the label specify desirable values of hours, minutes and seconds and change to the relative time mode.

Check the box in the upper right corner of any field if you want to apply the given settings to all the labels.

To scroll through the existed labels use   buttons.

Press the **Delete** button to delete the current label. If the **All labels** box is checked all the labels will be deleted from the file.

Another way (most recommended) to insert text labels is import from the simple ASCII (text) file. Select the **Data sharing/Text labels/Import** menu item to display the file open dialog box.

Each line in the file should contain the information about one text label. The simplest line consists of two fields: time in **hh:mm:ss** format (delimiter “:” is mandatory) and, **after space**, the text of the label. For example:

10:41:09 Cap: Turn right, heading 250.

Additionally the line may contain information about position of the label as well as font and color. This format is received for example after exporting the labels using the **Data sharing/Text labels/Export** menu item.

10:41:43 Cap: Engines idle;0.13207547;0;8388608;8;0;0

Additional information is as follows: vertical position of the label (in units of the graph field height), orientation regarding the base line, color, font size, bold or not, italic or not. The fields delimiter is «;». It is **not recommended** to adjust these parameters manually in a text file. Use **Text label properties** dialog box (Figure 10.21) instead to customize appearance of the labels.

It is recommended to use labels export function if you need to change the content of some labels without changing their position and appearance. After all the changes are made and saved use the import function (see above) to activate the changes in the **WinArm32™** file.

The program could help you to arrange existed labels vertically. This function will be applied only to the labels that are displayed horizontally (left or right from the base line). Select the part of information with the labels that need to be arranged using the moving cursors and right click to display the popup menu (Figure 10.22).

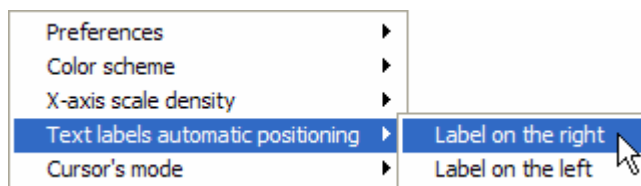



Figure 10.22

Select arranging direction: to the left or to right from base line.

You have to remember that the text labels may be saved **only** in graphic forms (chapter 10.1.2) or a text file. **If the current set of the displayed parameters along with the text labels is not saved as a graphic form all the labels will be lost after file closing.**

10.8. Information frames adding and removing

You may add or remove information frames using this function. You have to remember that both operations results in **changing of the original file**, so it is recommended before you start the work to make a copy of the original file using the  button.

To delete the current frame in the position of the active cursor you have to press **D** key and confirm deleting.

To delete all the frames between the moving cursors you have to press **Shift+D** keys and, again, confirm deleting.

It is recommended to delete waste frames before transferring the information file to another computer or before sending it through LAN or E-mail.

Press **I+Shift(left)** to insert an empty frame (all codes will be 0) before the frame in the active cursor position. Press **I+Shift(right)** if you need to insert a frame after the frame in the active cursor position. It is

recommended to insert empty frames in cases when it was determined that some frames were lost during read out process (chapter 10.4) which resulted in the incorrect decoding of the registered time and other service information.

You may also insert information frames that were previously saved from another data file. Press **O+Shift(left)** or **O+Shift(right)** depending on to the left or right from the frame in the active cursor position you want to insert additional frames. The frames will be inserted from the text file with the **hex.txt** name located in the program's main folder. This file may be created by copying the frames from another file (**O** key) or manually. You have to be the extremely experienced user to create this file manually. Press **O** key being in the "Graph for analysis" mode to get the example of the frame structure of the current FDR type. Each frame consists of the header line and code values of the parameters in hex notation. The value of each parameter consists of two bytes and lower byte is coming first.

10.9. Table of parameters creation

To create a table of the values of the currently displayed parameters you have to place the moving cursors on the boundaries of the desirable interval and select the **Data sharing/Table of parameters** menu item. The window shown on the Figure 10.23 will appear.

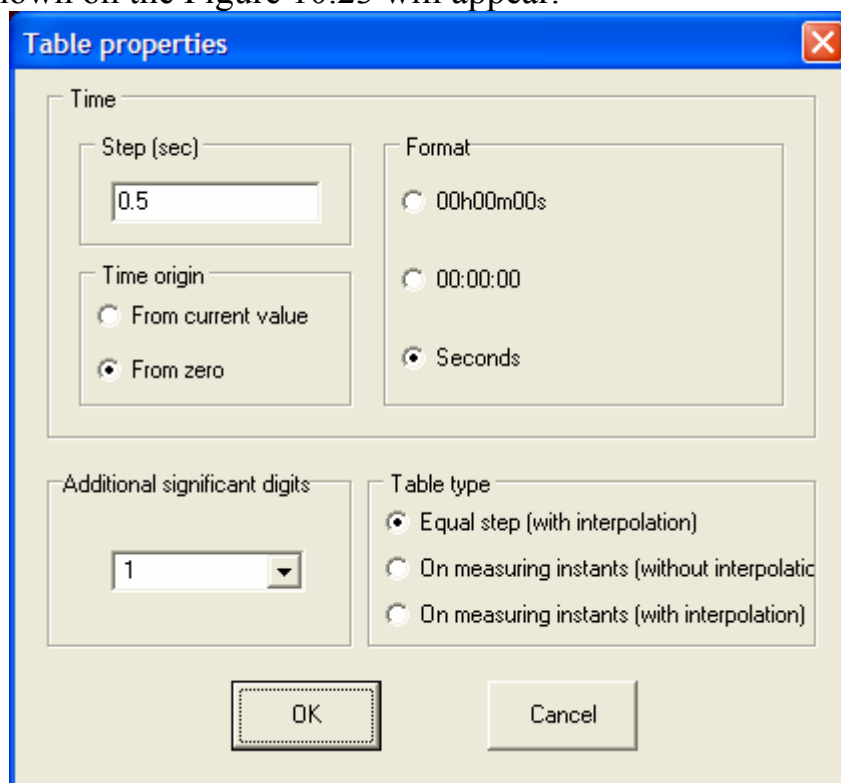


Figure 10.23

There are three different modes of reading the data:

- Through equal steps with interpolation. The table of the values of the parameters linearly interpolated with the equal step will be created. The value of the step is set in the **Step (sec)** field.
- Through registration instants without interpolation. The table of the values of the parameters that were read out exactly at the registration instants will be created.
- Through registration instants with interpolation. The table of the values of the parameters that were read out exactly at the registration instants will be created. The values of the other parameters in the given time instants will be received as a result of linear interpolation.


Using the window presented on the Figure 10.23 you may also customize time format, time origin and number of additional decimals that should be added to the value specified in the file header.

The standard **WordPad** text processor will be started after you press the **OK** button. The file **tabl.txt** from the **WinArm32™** main folder will be opened. It contains description and the values of the parameters that are currently displayed on the screen. The file header contains the type of the aircraft and registration number as well as the short name, name, unit and number of decimals for each parameter presented in the file. This file will be **automatically rewritten** without confirmation when you compile the table of parameters next time. So you need to save it with a new name if you want to use it in the future.


***Note:** Regardless to the reading mode the text files (separate for each parameter) with the values of the displayed parameters will be created in the **TXT** folder of the **WinArm32™** main folder. The names of the files will be the same as the short names of the parameters. All the values of the parameters will be read out at their registration instants. It is recommended to use those files for transferring the data to the third-party programs e.g. **Microcal Origin**. These files will be **automatically rewritten** without confirmation when you compile the table of parameters next time. So you need to save them in a different folder if you want to use them in the future.*

10.10. File header saving and changing. Standard data file creation.

At any moment you are able to save the header of the current data file as a separate header file in order to use it with other data. You are also able to change the header of the current data file with another one. To use these functions select the appropriate items of the **Data sharing** menu. Additionally you have to specify a file name to save a header or to read a header from.

Use the **Data sharing/Save data** menu item or the appropriate item of the dropdown menu of the  button to export the binary (raw) data to the third-party flight data processing systems. The binary file will be created as a result. This file will contain only raw data that were registered on the FDR (without any header). Each information word consists of two bytes.

10.11. Graphs printing and printer setup. Features of the “Plot for printing” mode.

Before printing the graphs you have to make sure that the information is correct. Also you have to remove all the registration failures (chapter 10.6) because they may negatively affect automatic adjustment of scales of the parameters. Press the **Shift-Space** keys or select the appropriate item from the dropdown menu of the  button to switch to the **”Plot for printing”** mode (Figure 10.2).

First of all you must select a printer as well as page size and orientation. Selection has to be made in the **Print settings** dialog box (Figure 10.24), that appears after selecting the **File/Print settings** menu item.

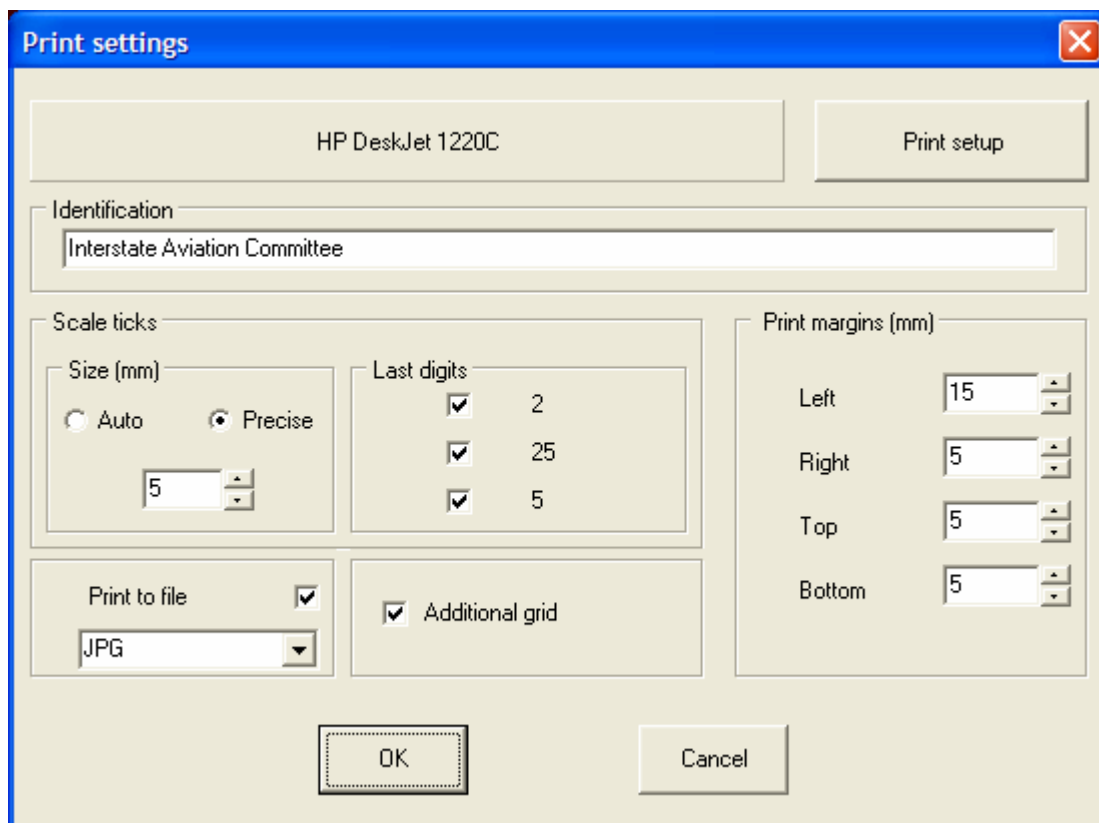


Figure 10.24

Using this window you may also specify some other options. Fill in the **Identification** field with any information (the name of your organization etc.) you want to appear in the upper left corner of the page (Figure 10.2). The date and time of printing as well as the number of the current graphic form and user’s name will be outputted after that. The contents of the first six fields of

the passport (except **Note** field) will be printed in the upper right corner of the page. If some of those fields are empty they will be omitted.

The user is able to customize margins of the page. If the values outside printer's capability are specified the program shows the warning and correct the values automatically.

By default the program prints only those grid lines that come through the X-axis ticks that have numerical labels. To print additional grid lines check the **Additional grid** box.

The program automatically adjusts grid lines of the scales that are on the same level. Set the distance between adjacent ticks in the **Size** field. You are able to set either the precise value (in millimeters) or automatic adjustment. It is recommended to use automatic scales adjustment which is done on the basis of the current font size. In this case the program guarantees that adjacent ticks and their labels will not be overlapped. Sometimes it is important to specify the exact distance between the ticks for example in order 1 meter of altitude corresponds to 1 mm of scale. Select the **precise** switch in those cases and specify the value in the **Size** field. It is up to the user to monitor ticks and labels not to be overlapped.

The program changes the step of the scale while performing the automatic scale adjustment. Specify the possible last digits of the scale points (ticks) in the **Last digits** field. For example if only the digit «5» is selected the scale points (ticks) may be 0.5, 1, 1.5 but not 1.2 or 1.25.

After adjusting all the settings you have to **save your work as a graphic form** (chapter 10.1.2).

After you saved a graphic form it (the form) becomes the current one and its number appears in the indicator field. Now after pressing the **Ctrl+S** keys all the changes will be saved in this form. The only exception is the figure name. To change the name of the figure you have to open the **Graphic forms** window (Figure 10.9), make the desirable form active, type the new name and save it by clicking **Ctrl+button number or OK**.


On the next step you have to select analog parameters and On/Off signals which graphs have to be printed. You have to decide will On/Off signals be printed on the graph field or on On/Off signals field or on both of them.


After displaying all the parameters you may begin to format the plot. You have to remember that in the **Plot for printing** mode active is that parameter near to which graph system cursor is located in the given moment. If cursor is located on the scales field then the scale of the parameter is active but not the parameter itself. The name of the currently active parameter is displayed in the status bar. It is recommended to use the keyboard instead of the mouse for more comfortable formatting.


To move separately the graph of the active parameter (the system cursor is on the graph field) or the scale of the active parameter (the system cursor is on the scales field) you have to use the **Up/Down** keys. To change separately


the scale of the active parameter (the system cursor is on the graph field) or the range of the scale of the active parameter (the system cursor is on the scales field) you have to use **Page Up/Page Dn** keys. If the system cursor is located in the upper part of the scale then pressing **Page Up** will increase the range (upper boundary) of the scale and pressing **Page Dn** will decrease the range (upper boundary) of the scale. If the system cursor is located in the lower part of the scale then pressing **Page Up** will decrease the range (lower boundary) of the scale and pressing **Page Dn** will increase the range (lower boundary) of the scale.

To move the graph of the parameter together with the scale you have to use **Up/Down** keys keeping the **Ctrl** key pressed. The program automatically adjusts the grid lines of the scales located on the same level.


The user has the ability to pack the On/Off signals vertically if they are displayed on the On/Off signals field. To pack the On/Off signals you have to move the system cursor to the On/Off signals short names area (the shape of the cursor will change to ) and left click. There are three different levels of packing that will change in sequence after each click.

After scales and positions of all the parameters are adjusted and **saved** in the current graphic form you may add the names of the parameters and their current values. This procedure is done in the **real size mode**. Press the  button to enter this mode.

To move through the graph in this mode you have to click with the middle mouse button or if it is absent with the left mouse button keeping **Ctrl** key pressed. The shape of the cursor will change to the . After that, just move the mouse to go to the desirable position. Left click to exit from the moving mode.

Rotate the scrolling wheel of the mouse to zoom the graph. To exit from the **real size mode** click the  button once again.

To insert the current value of the parameter right click close to its graph in the desirable position. To insert the full name of the parameter right click close to its graph keeping the **Shift** key pressed. To insert the short name of the parameter right click close to its graph keeping the **Ctrl** key pressed. Keep pressed both keys to insert the full and short names together. Regardless of the type the label is inserted in the way when the center of the circumscribed rectangle is located at the click point. Right click close to the center of the rectangle to remove a label of any type.

Select the  button or **File/Print** menu item to print the graph on the current printer. If the **Print to file** box of the **Print settings** dialog box is checked the program prompts you to enter a name of the file. This file will be automatically opened in the standard Image Viewer of the **Windows™** system.

Note: The system warning dialog will appear if the Image Viewer is not installed. Just close it and continue to work.

10.12. Identification data viewing

Select the **File/Identification data** menu item to view service information that is registered by the FDR. The window (Figure 10.25) will appear showing the list with the identification data the number and type of which depend on the FDR type. The service information for the BUR FDR is shown on the Figure 10.25.

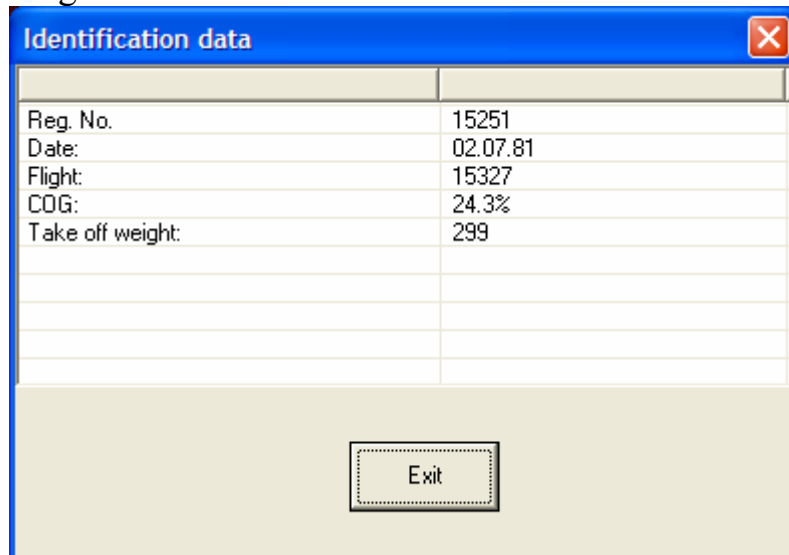


Figure 10.25

The identification data are read “on the fly” in the active cursor position. If the data are absent or incorrect you have to close the window, move the moving cursor to another location and open the window once again.

The incorrectness of the identification data may be caused either by the incorrect setting them by the crew or by registration or read out failures (frames adding or missing and so on). In any case it is recommended to check the received information.

11. MENU ITEM DESCRIPTION

11.1. The main menu

File

Open	Displays the standard Windows™ “Open” dialog.
Close	Closes the current file.
Database	Switches to the WinArm32™ or WinArm16 database window.
• WinArm32	
• WinArm16	
Print settings	Displays Print settings dialog box.
Print	Prints the plot to the selected printer or into the file.
Identification data	Displays the service information registered on the given type of FDR
Password	Specifying users’ login, password and access type.
Exits	Finishes the work with the program.

Settings

Select parameters	Displays the Select parameters dialog box.
Network connection	Displays the Network connection settings dialog box.
Font	Program font selection.
X-axis properties	Displays the X-axis properties dialog box.
Header editor... F2	Displays the Header editor window.
Standard tasks	Displays the window to work with standard tasks.
Graphic forms	Displays the window to work with graphic forms.

Data sharing

Change header	Changes the header in the current data file.
Save header	Saves the header from the current data file as a separate file with the hdr extension.
Save data	Saves the data from the current file as a file of the standard format.
Text labels	Import and export of the text labels.
• Import	
• Export	
Table of parameters	Saves the values of the displayed parameters in a text file.

Window

The standard functions of the **Windows™** that organize the windows

Help

Opens the help file