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1. The Cartridge-case Repository Application

The application is designed to carry out the ballistic examination of used cartridge cases.

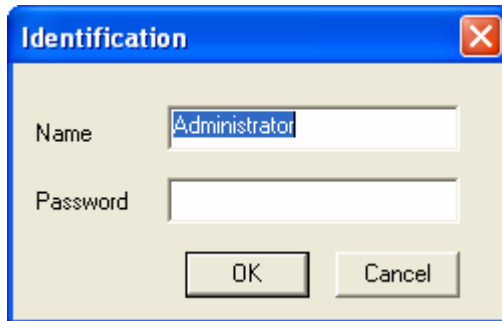
The window corresponding to the application can be opened in three ways:

- Directly while the application starts by selecting the menu item **Cartridge-case Repository** in the section **All Programs** of **Start Menu** or by means of the shortcut



on the **Active Desktop**;

NOTE. As the Application is started there shows the "**Identification**" form containing fields for entering the user identifier and password, as well as the buttons to confirm or cancel the user parameters input.



Upon pressing the **OK** button the system checks for the presence of the user with the entered identifier in the database and the correctness of the password entered. The user is allowed three attempts to correctly enter the system. Pressing the **Cancel** button cancels the start of the **Cartridge-case Repository** application.

specimens satisfying the preset criteria. By selecting a specimen identifier in the emerged list the information about the selected specimen will be displayed in the criteria fields.

On pressing the **Load** button the specimen will be loaded into the **List of Specimens Loaded from the Database** of the panel of the **Cartridge-Case Repository** application window.

- On pressing the corresponding **Switch to** button in the **TeleMicroscope** window;
- Automatically after recording the new image of the cartridge-case bottom (butt-end) by the scanner.

NOTE. The new image can be loaded into the **Cartridge-Case Repository** window in two ways:

- Automatically after scanner recording,
- Imported from the file formed by another Condor system.

NOTE. The new image is loaded into the **left** image-viewing window.

2. Interface Description

The main window of the **Cartridge-Case repository** application contains function buttons, the list of image scales, the list of firearm systems, the list of specimens for the selected firearm system, two "working" windows intended for the visualization of objects while carrying out an examination and a panel for displaying the selected specimens loaded into the application from the database.

The figure shows the appearance of the main window of the **Cartridge-Case Repository** application.

The main application window contains two "working" windows. The right window displays the specimens loaded from the database, while the left window shows the specimen under examination.



1. Heading of the **Cartridge-Case Repository** application's main window. It indicates the application name.
2. Main program menu. It contains commands activating the application's various operating modes.
3. Left part of the main application window's state line. It shows the identifier of the specimen under examination and its firearm system.
4. Execution indicator field for the selected operation. Once the operation is completed, the indicator disappears from the screen.
5. Right part of the line of the main application window's state line. It shows the identifier of the specimen loaded from the database and its firearm system.

14. Selection of Specimens according to a Preset Criterion

The mode is designed to form a list of objects from the DB satisfying the preset criteria.

The **Selection of Specimens by Criterion** form opens upon selecting the menu item "**Selection of specimens by criterion**" in the section "**File**":

It shows the main classification marks of the specimens by which they are stored in the DB.

To activate a selection criterion select the corresponding line from the opening list and flag the criterion field located nearby.

Having selected the criteria press the **Select** button. There will result in the left window displaying the identifiers of all the

The expert's explanations for the given couple are output in the **Comments** window.

The list of the experts who have drawn conclusions on the given couple is output in the **Operator** window.

The **Selected Couple** window contains the identifiers of the selected couple.

The editing field **Selected Specimen** is made accessible if the selected specimen is coupled with the specimen loaded into the left window.

The **Load** button loads the selected couple. The selected specimen is loaded into the right window, while the specimen located at the previous level is loaded into the left window.

The **Show All** button is accessible if the list is loaded not for all specimens. On pressing this button the list of all coupled specimens is loaded, and the name changes to **For Specimen under Examination**. On second pressing the former name returns. The **Delete** button becomes accessible if the expert currently working with the application is selected in the **Operator** window. On pressing the button the information about marking specimens as "coupled" is deleted from the DB.

By selecting the menu item "**File->Coupled specimens->Synchronize**" the specimens in the left and right windows marked as "coupled" are set in the position in which they were recorded in the DB as "coupled".

6. Common program tool bar. It contains the control buttons duplicating the program menu items. The main purpose of the tool bar is to facilitate the user access to the main program commands.

7. Opening the list of the image scales. It allows to select the specimen image scale for the left and right window. It is set simultaneously for both specimens.

8. Opening the list of the firearm systems. It allows to select the firearm system for a new (recorded) object under examination. One cannot change the firearm system for the specimens loaded from the database or read from the disk. The "active" right window displays the firearm system of the specimen loaded into it.

9. Opening the list of specimens related to the selected firearm system.

10. Tool bar to manage the left "working" program window.

11. Tool bar to manage the right program window.

12. Unit of lighting direction switches for the striker mark (see also point 18).

13. Unit of control buttons for the list of the specimens loaded into the application from the database. A specimen can be selected by the user on the panel and displayed in the right application window by double-clicking the left mouse button.

14. List of the specimens loaded into the application from the DB.

15. Rotation angle indicator of the object being displayed in the

left or right window respectively relative to the initial position by recording.

16. Image window for viewing in the tracing mode.
17. Tracing mode control panel.
18. Control panels for the **Striker Mark Lighting Direction** mode. By pressing the corresponding buttons one can emulate the switching on and off of corresponding lighters. At this, the striker mark image changes in both loaded images. By flagging the value "**Threshold**" the binary striker mark display mode will be activated.

Control buttons



Add Specimen to the Database *button*
Opens the **Add Specimen to the Database** form.

The form description is given below.



Autoidentification *button*
Activates the **Autoidentification** mode.
The description is given below.



Full Screen *button*
On pressing the button the "active" image expands over the entire screen, on repeated press it "contracts" to its original size.

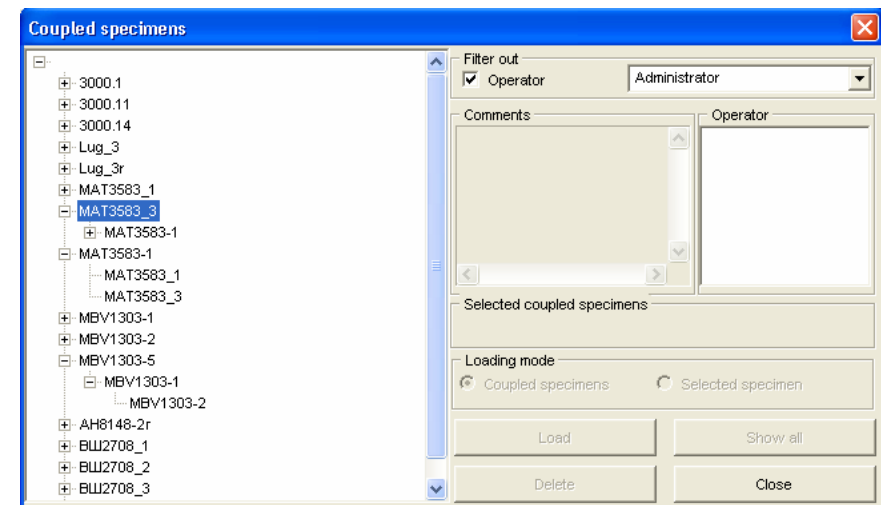


Rotation *button*
Activates the image rotation mode in the corresponding viewing window. The description is given below.

13. Coupled Specimens

The mode ensures the opportunity to mark objects as "coupled" by marking out and saving in the DB the most matching image areas to be automatically superposed. This mode is convenient to detect the interconnection between the objects related to different criminal cases.

The specimens marked as coupled can be loaded from the DB. To open the **Coupled Specimens** form select the menu item "**File->Coupled specimens->Show**".



A list of coupled specimens in the form of a "tree" is presented in the left form part. Either several specimens (in case there are no specimens coupled with the specimen loaded into the left window or in case there are no specimens in the left window) or one specimen currently loaded into the left viewing window can be presented in the tree root.

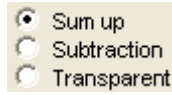
In the right part of the form there are the selection field and the opening list for the selection of the specimens checked by the corresponding operator.

transparency factor for windows. The field (sum up, subtract, transparent) presets the way of obtaining the final image in the "tracing" window from two initial images:

Sum up – every point of the image is calculated as the mean of the two values.

Subtraction – every image point is the difference of the two.

Transparent – the points of both images are output into the final image: one from the left image, next – from the right one.



Control buttons

Alternately - The right and left images are alternately output into the resultant window. The mode is cancelled by re-pressing the button.

Save Couple – One can mark specimens as "coupled" (see the **Coupled Specimens** mode) and save them in the DB.

Update Couple – If this couple was marked earlier as "coupled", the couple can be updated in the DB.



Angle Measurement *button*

Activates the angle measurement mode in the corresponding viewing window. The description is given below.

Mark Traces *button*

See the section **Marking of Cartridge-Case Bottom Image**.

Show Marking *button*

Displays the marking that has been carried out.

Activates the marking mode for a cartridge-case bottom image.

Lighting direction switching unit for a striker mark

Allows to visualize the striker mark by different lighting alternatives (since an image recording is made at four lighting direction alternatives). For this bring the cursor to the corresponding sector and press the right mouse button.

Button for switching over to the TeleMicroscope window

Opens the **TeleMicroscope** application window.

It is accessible only for the data acquisition station (DAS) operator.

Specimen import *button*

Opens the **Specimen import** form ("Open").

The form description is given below.

Cartridge-Case browser *button*

Opens the **Cartridge-Case Browser** form. The form description is given below.



Synchronize View *button*

Activates the mode of the simultaneous displacement of both images in the left and right windows.



Superposition of Striker Marks *button*

On pressing this button the specimens loaded into the right and left windows of the **Cartridge-Case Repository** application are set in the position corresponding to the optimal striker mark matching.

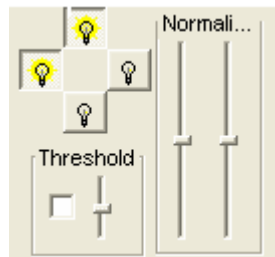


Striker Mark Lighting Direction *button*

Opens the **Lighting Direction** forms for the selection of the striker mark lighting direction in both windows.

By pressing appropriate buttons one can emulate switching on and off the corresponding lighters. At this, the striker mark image changes in both loaded images. The **Threshold** flag mark includes the binary striker mark display mode. The lighting intensity value 0 or 1 is assigned to each image pixel depending on whether its initial value is higher or lower than the "threshold" value. The threshold value can be adjusted for each viewing window by means of the corresponding slider. **Normalization** sliders change the brightness of a cartridge-case bottom image.

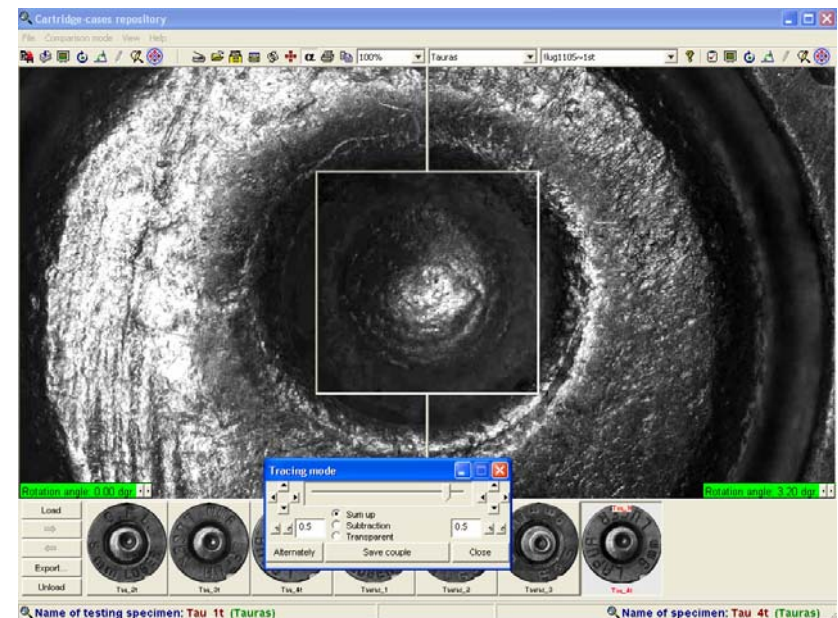
The form closes on re-pressing the button.



The **Close** button closes the form. The form "**Autoidentification. Specimen under examination:...**" remains on the screen.

12. Image Superposition Mode – Tracing Mode

The mode is activated by the **Tracing mode** button. At this in the screen center there appears a rectangular area with an image obtained by the mutual superposition of the images loaded into the left and right windows, with a different transparency factor – tracing.



The tracing mode control bar appears in the lower window part.

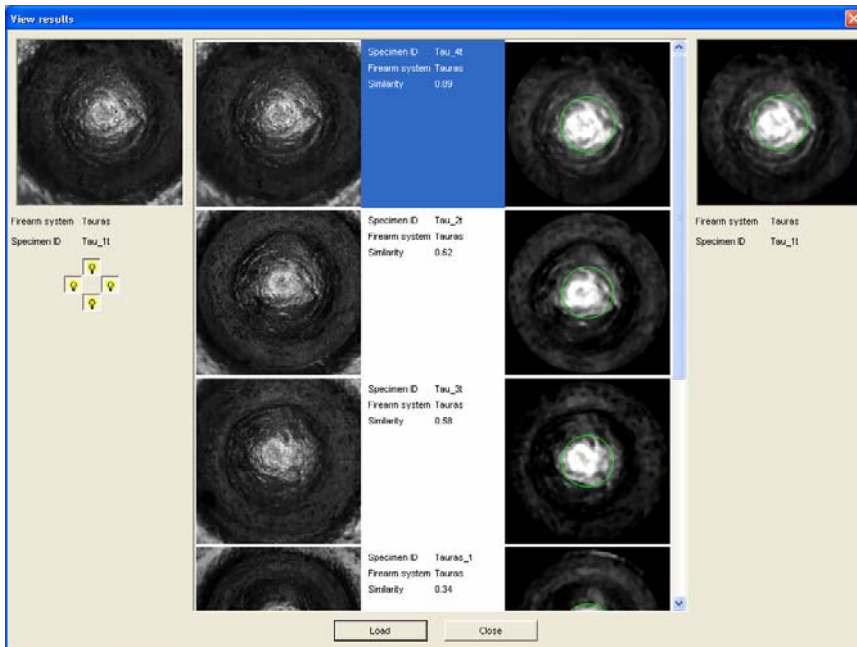


The buttons move the corresponding left and right images, the buttons rotate them. The slider sets the

11. Result viewing mode

The mode is designed to view marks images (striker mark and cartridge stop mark) located in the list corresponding to the list of the form "**Autoidentification. Specimen under examination:...**" after the autoidentification procedure.

It is activated by the **RT Viewing** button. There appears the **View results** form.



On the left are the real images obtained in the course of scanner recording, while on the right are the mathematically processed images corresponding to them (for the exclusion of interferences of artificial character such as metal drawing, manufacturing defects, etc.).

One can highlight a specimen in the form (by bringing the cursor to the image and clicking the left mouse button) and load it into the **List of Specimens Loaded from the DB** by pressing the **Load** button.

Tracing Mode (Superposition of Images) button

Activates the mode of the images superposition of the specimens loaded into the left and right viewing windows.

Print button

Calls the window of the image preparation for print. Depending on the type of the printer being used select the corresponding printing settings. Only the parts of images and specimen information forms visible in the windows are output for printing. If specimens are loaded into both viewing windows, a dividing white strip will be drawn between them by printing.

Copy button

Enables one to copy an image visible on the screen into the clipboard to be entered into the expert's file document.

About Program button

Opens the window showing information about the program. **Note.** Help is called by pressing the F1 key.

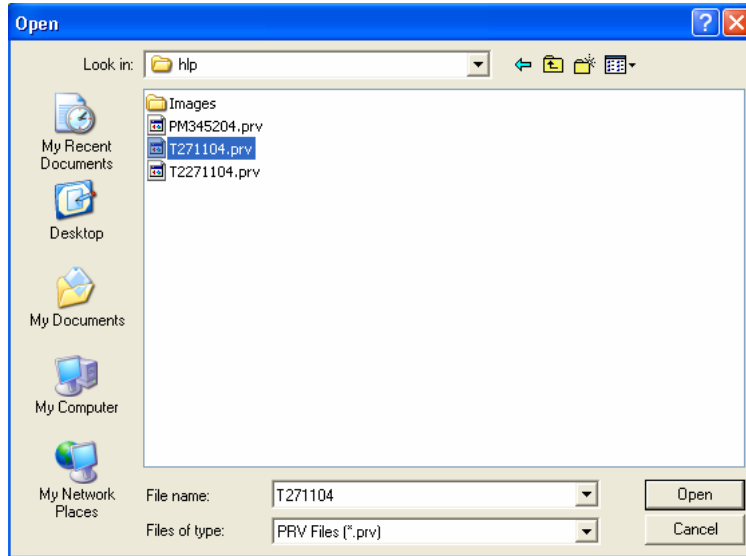
Assign Examined Status to the Specimen button

On pressing the button the image, which is located in the right window, is assigned the status of an object under examination. In this case the object image is transferred from the right window into the left one.



3. Specimen Import

This mode is designed to provide for the opportunity to enter into the DB specimens recorded by another Condor systems.



Select the file (only *.prv extension) to be imported and press the **Open** button. At this, the following data will be read out of the file:

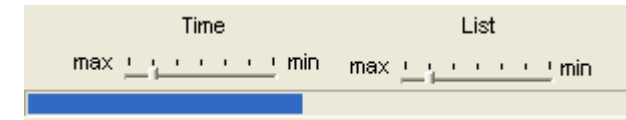
- Object image,
- Firearm system,
- Specimen identifier,
- Specimen record date,
- Operator having recorded the specimen,
- Object storage location,
- Number and name of the criminal case with a comment,
- Serial firearm number,
- Object type,
- Comment.

rigid (as regards striker center displacement and light spot brightness), and this may lead to discarding the right specimens.

If the sliders are in the extreme left position, all the specimens will be participating in the search. One should bear in mind that the search time will increase in this case.

NOTE: This function is used only in the process of autoidentification by the striker mark.

The autoidentification procedure starts by pressing the **Search** button. The percentage of its implementation is shown by the indicator.



Upon completing the operation the results are displayed in the form "**Autoidentification. Specimen under examination:...**".

NOTE. One can load the results of the previously made autoidentification with a specific specimen into the form by selecting the item "**File ->Load autoidentification results**" in the main program menu.

Auto identification. Specimen under examination: MPT2256-1

Breach mark Striker mark

| Spm id | Nr | Firear... | Simila... | Ex. max |
|-----------|----|-----------|-----------|---------|
| 3000.10 | | PM | | |
| 3000.12 | | PM | | |
| 3000.13 | | PM | | |
| 3000.14 | | PM | | |
| 3000.15 | | PM | | |
| 3000.16 | | PM | | |
| 3000.17 | | PM | | |
| 3000.18 | | PM | | |
| 3000.19 | | PM | | |
| 3000.2 | | PM | | |
| 3000.20 | | PM | | |
| 3000.3 | | PM | | |
| 3000.4 | | PM | | |
| 3000.5 | | PM | | |
| 3000.6 | | PM | | |
| 3000.7 | | PM | | |
| 3000.8 | | PM | | |
| 3000.9 | | PM | | |
| MOP3652-1 | | PM | | |
| MOP3652-2 | | PM | | |
| MPT0612-1 | | PM | | |
| MPT0612-2 | | PM | | |
| MPT2241-1 | | PM | | |
| MPT2241-2 | | PM | | |
| PM-051 | | PM | | |
| PM-052 | | PM | | |
| PM-053 | | PM | | |
| PM-054 | | PM | | |

Firearm system

☐ Makarov
☐ Makarov Huese schraeg
☒ PM

Spm in list: 37
Search time

Specimen ID

Operator: Unknown
Shape of striker: Unknown
☐ Bullet

Date of scanning
Storage place

Criminal case
File number: Unknown number
Date

Serial number
Object type: Criminal

Comments

Filter out
☒ Object type: Criminal
☐ Shape of striker: Unknown
☒ Operator: Administrator
☐ Date: From 29.11.2004 To 29.11.2004

Load RT view Search Now

Time max min List max min

Excel Load results Save results Hide Close Help

If the database does not contain information about the firearm system of the object being imported or about the criminal case related to the object, the user will be offered to confirm the entry of the corresponding information in the database. In case the operator refuses to enter this information in the database the specimen will not be imported. Following the successful file import the image will be displayed in the left viewing window (the "examined" status will be assigned to the specimen). To save the specimen in the database press the **Add Specimen to the Database** button on the tool bar of the main application window.

The "firearm system" list includes all the firearm systems from the DB that have the cartridge-case diameter coinciding with the diameter of the object under examination. Any item of the list can be checked, in which case the specimens of the selected firearm system will participate in the search.

To curtail the list of the specimens participating in the identification one can use selection criteria. For this check the corresponding criterion and select from the list: specimen type, striker shape, operator and the temporary specimen record range.

To speed up the search and reduce the resultant list one can

use the sliders (Time) and (List). But it needs to be kept in mind that this makes the specimen selection criteria for the search become more

4. “Cartridge-Case Repository Browser” form

The form opens by pressing the **Cartridge-Case Repository Browser** button or by selecting the corresponding menu item "**File->Cartridge-case repository browser**".

It allows to view the contents of the cartridge-case repository storing the images of the objects grouped by firearm system and the information cards accompanying them. The viewing of the contents is carried out by sorting out specimen identifiers.

The screenshot shows the 'Cartridge-cases repository browser' window. The left pane displays a list of specimen identifiers, including MAT3583-5, MPT2256-1, PM-017, PM-043, and many others. The right pane contains fields for 'Firearm system' (set to PM), 'Specimen ID' (3000.10), 'Operator' (Administrator), 'Shape of striker' (Unknown), 'Date of scanning' (04.07.2003), 'Storage place' (None), 'Criminal case' (File number: Unknown number, Date: 27.07.2003), 'Serial number' (None), 'Object type' (Criminal), and a 'Comments' text area containing 'Латвия А10'. At the bottom, there is a 'Filter out' section with checkboxes for 'Object type', 'Shape of striker', 'Operator' (checked), and 'Date' (From 29.11.2004 To 29.11.2004). Buttons at the bottom include 'Delete', 'Edit', 'Load', 'Close', and 'Help'. A 'Show deleted specimens' checkbox is also visible.

Control buttons:

Delete - allows to delete the file with an object image and an information card from the cartridge-case repository (upon confirmation),

RT View – opens the **View Results** form. The form description is given below;

Load Results- loads from DB the results of previously made autoidentifications with the specimen under examination;

Excel - displays autoidentification results in the MS Excel format;

Load – loads the selected specimen into the **List of Specimens Loaded from DB** or right viewing window;

Save Results - saves the result of the autoidentification in DB;

Hide – hides the form;


NOTE: In this mode some buttons of the main application window become inaccessible.

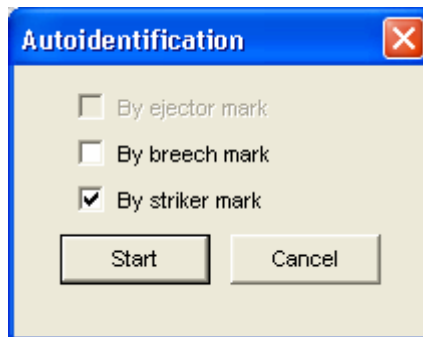
Close – closes the form;

Help - provides necessary information on the given form

10. Autoidentification

The mode is designed to carry out automatic ballistic examination. It enables one to form for the object under examination a list of cartridge-case specimens located in the DB and having similar parameters (diameter), and arrange this list in the descending order of the degree of matching with the cartridge-case under examination.

It is activated by the **Autoidentification** button  or by selecting the menu item "**File->Autoidentification**". This button is accessible in case the image of the object under examination is loaded in the left window. On pressing it there appears the **Autoidentification** form in which to select the trace types by which the search will be made.



If the marking of the ejector trace has not been carried out for the specimen under examination, the corresponding menu item is inaccessible.

On pressing the **Start** button there appears on the screen the form "**Autoidentification. Specimen under examination:...**"

Control buttons:

Search Now – starts the autoidentification procedure;

Edit - opens the text fields of the object information card for editing,

Load - loads the image selected from the database onto the panel containing the list of selected specimens,

NOTE: One can simultaneously select several images from the database.

Close - closes the **Cartridge-Case Repository Browser** form.

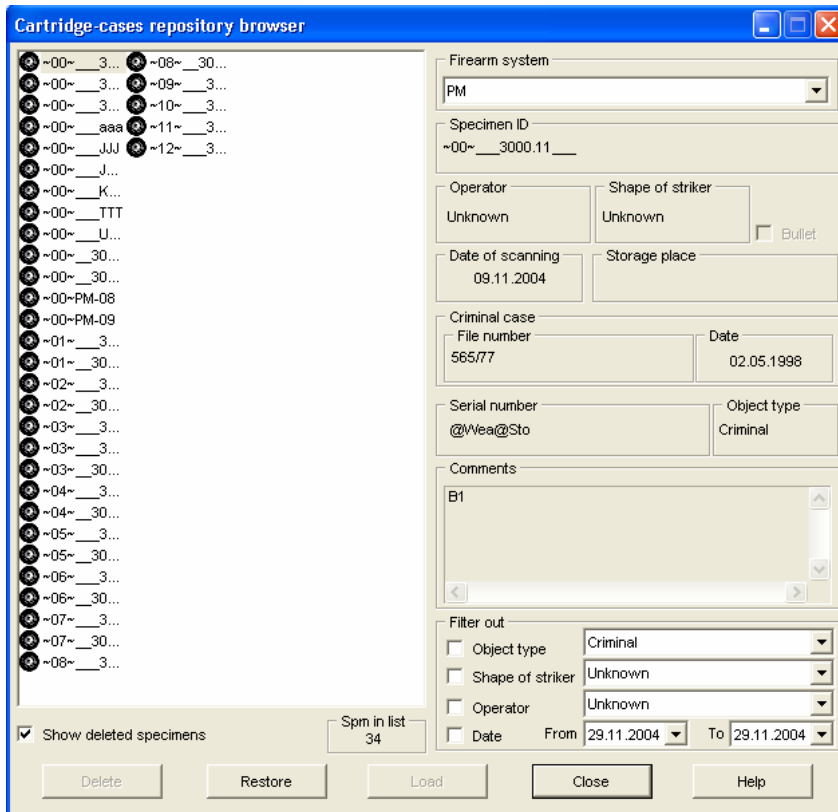
Help - provides necessary information on the given form.

The specimen list in the left viewing window can be curtailed by presetting selection criteria. The selection can be carried out according to one or several criteria listed below:

- Object type (object from the crime scene or test-fired in the laboratory).
- Striker shape.
- Operator having recorded the specimen in the DB.
- Date of entering the specimen in the DB (after setting the time interval).

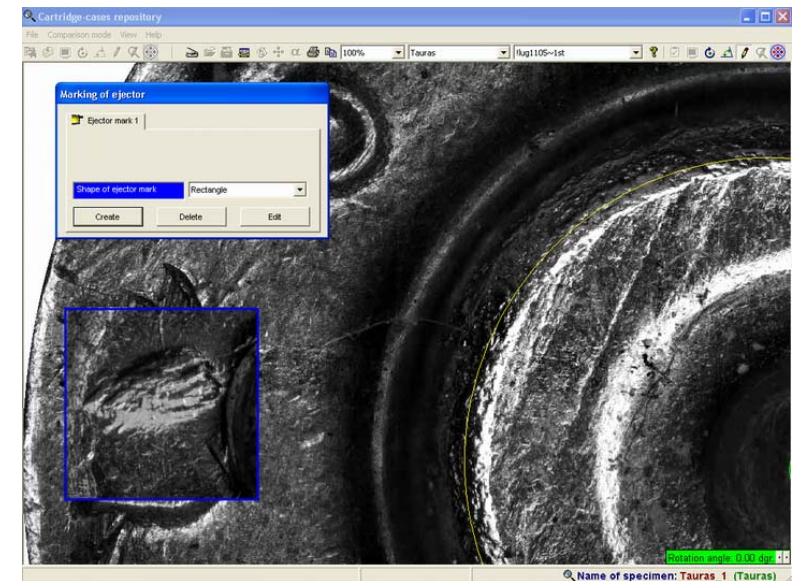
To set the selection criteria select a characteristic (by flagging it) and the corresponding line in the opening lists of the group of **Filter out** control elements. At this point the list of specimens to be displayed will be automatically re-formed.

The list of the specimens checked to be deleted but not yet physically removed from the storage servers can be displayed by checking the field "**Show deleted specimens**". The **Edit** button is substituted for the **Restore** button.



The user can select specimen to be restored and, by pressing the **Restore** button, change the information about it, then save this information in the DB (by pressing the **Update** button, which substitutes the **Restore** button). After restoration the form can be transferred into the mode of viewing the cartridge-case repository contents from which the user can load the restored specimen (by unselecting the field "Show deleted specimens").

Upon completing the marking and saving operations the outline turns blue.



NOTE. The marked trace can be corrected by pressing the **Edit** button. The editing procedure is similar to the one described by points 4 and 5.

Marking of the breech (a cartridge stop) trace

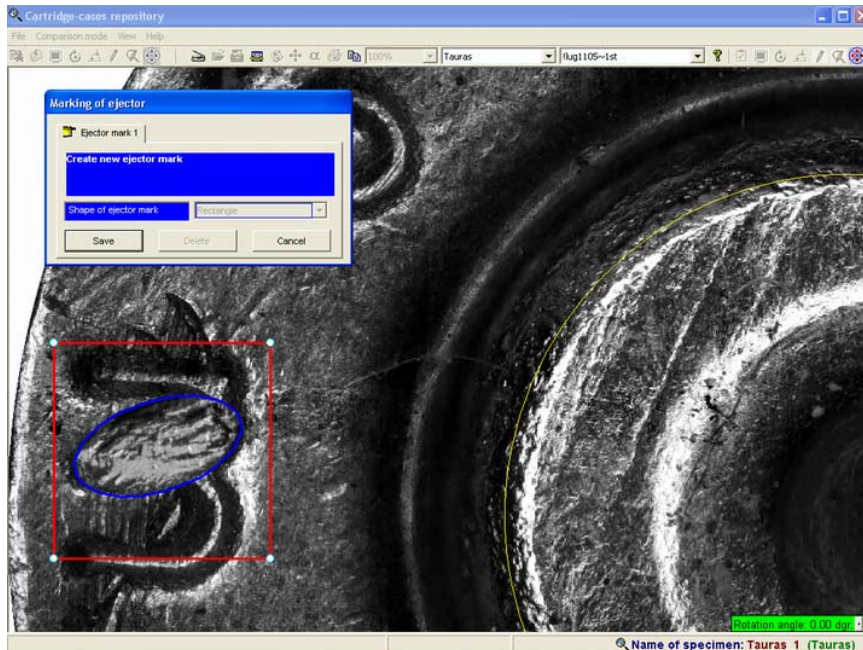
The marking is carried out automatically by recording a specimen in the DB or in the course of autoidentification. Remark is not recommended. The displayed circumference is yellow.

Striker trace marking mode

The marking is carried out automatically by recording a specimen in the DB or in the course of autoidentification. Remark is not recommended. The displayed circumference is green.

Marking the ejector trace

1. Press the **Show Marking** and **Mark Traces** buttons.
2. In the opening list select the ejector mark form.
3. Press the **Create** button. A red contour corresponding to the selected form will appear on the image.



4. Using the mouse cursor (bringing it to the highlighted point, pressing and holding down the left mouse button) move the highlighted points into the position of the outline's greatest matching with the trace form.
5. Press the **Save** button.
NOTE. The marking can also be saved by double-clicking the left mouse button.
6. In case the procedure of point 4 needs to be repeated press the **Cancel** button.
NOTE. The cancellation can also be made by pressing the right mouse button.

5. List of Specimens Loaded from DB



The identifiers of the specimens loaded into the application from the DB by means of the **Cartridge-Case Repository** form or from the list in the Bullet repository application main window are marked in black. The selected specimen is loaded into the right window. The specimen in the left window remains the same.

The identifiers of the specimens loaded into the application from the DB by means of the **Autoidentification** form are marked in red. The name of the specimen with which the autoidentification was carried out is given above. In this case, if the image of the specimen with which the autoidentification was made is loaded in the left window, then both images will be set in the position of the optimal image matching.

The identifiers of the specimens loaded into the application from DB by means of the **Coupled Specimens** form are marked in blue color. Above, the name of the specimen coupled with respect to it is output. The selected specimen is loaded into the right window. At this, if the coupled specimen image is loaded in the left window, both images will be set in the position in which the optimal image matching was determined.

Unit of control buttons for the list of the specimens loaded into the application from the database.



Control button


Load - The selected specimen is loaded into the right window. The left-window specimen remains unchanged.

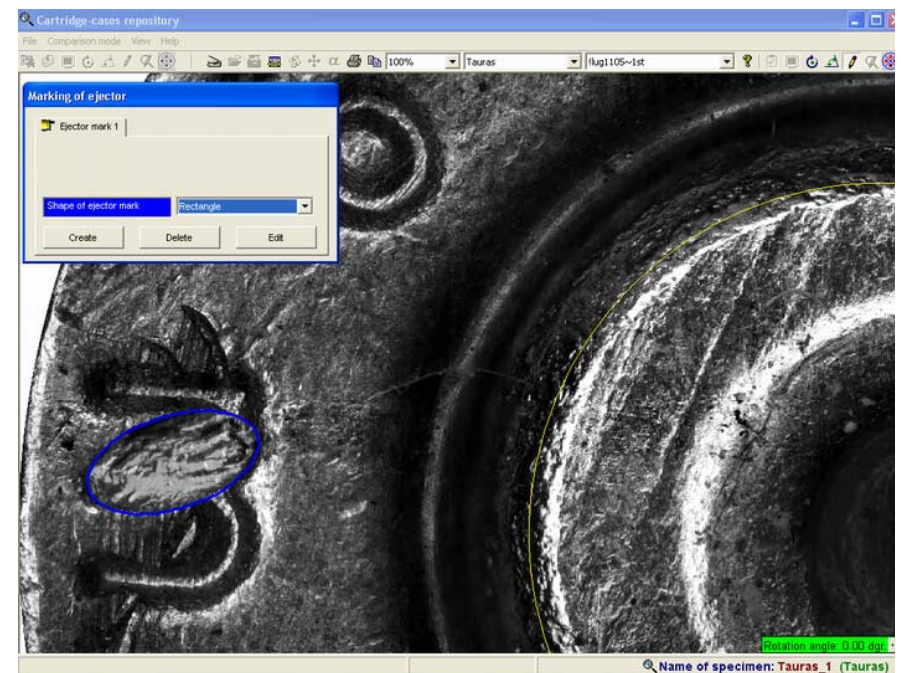
“Move the specimens list to the right” - The list of specimens moves one position to the right. The button is accessible if there is room for the operation.

“Move the specimens list to the left” - The list of specimens moves one position to the left. The button is accessible if there is room for the operation.

Export - This mode provides for the possibility of exporting the specimens formed at the given hardware/software complex to another database.

Close - Deletes the selected specimen form the list of specimen loaded to the Application from the database.

After pressing the **Mark Traces**  button the **Marking Cartridge-Case Bottom** form appears on the screen.



Ejector Mark is the mode of marking the ejector trace. Depending on the firearm system the number of specially recorded ejector traces (the traces are recorded at four mutually perpendicular lighting directions) may change from 0 to 3. Accordingly, the number of bookmarks changes. Each bookmark contains the name of the ejector mark form selected from the opening list of possible forms.

Control buttons:

Create – starts of the marking procedure.

Delete – deletes of preceding marking (accessible, if the marking already exists).

Edit – allows to edit the preceding marking.

The ejector mark is highlighted as a rectangle.

8. Angle Measurement Mode

The mode is designed to measure the angular distance between two points on an object image relative to the center of the cartridge-case bottom image.



1. Press the button .
2. Bring the cursor to 1st point, press the left mouse button and, holding it down, bring the cursor to 2nd point. Release the button.
3. The angle value will be displayed on the rotation angle indicator field.

9. Mode of Marking Traces on the Cartridge-Case Bottom Image

The mode is designed to mark ejector identification traces on cartridge-case butt-end image, which enables an automated ballistic examination to be carried out more effectively.

NOTE. Only in the case of the specimen belongs to the firearm system, which has very stable imprint of ejector (additional mark) and this imprint was recorded (the procedure of recording is the same as for striker mark). For such firearm system the parameter **Number of additional mark** should be preset (see Description of TeleMicroscope Application).

The mode becomes accessible on pressing the **Show**



Marking button.

There will appear the marking of identification traces on the image located under the given button (if it has been made).

6. “Add Specimen to the Database” form

It opens on pressing the **Add Specimen to the Database** button or by selecting the corresponding menu item **File-> Add specimen to the database**.

It allows to enter a new image into the cartridge-case repository and fill out an information card about it or to change the information about the specimen already existing in the DB.

Control buttons:

Add – allows to enter an object image with a filled out information card in the cartridge-case repository;

NOTE: If a specimen is called from the DB for introducing changes, the **Update** button is substituted for the **Add** button.

Cancel - closes the **Add Specimen to the Database** form without saving information in the DB;

Browse...: – opens the **Criminal Case** form. The form description is given below;


Help - provides necessary information on a given form.

7. Image Comparison Mode (Ballistic Examination)

The mode is designed to carry out the ballistic examination by comparing images of characteristic object traces on the monitor screen.


The image of an object under examination is always loaded into the left window (by transfer from the scanner or by importing the specimen from the file with the image recorded by another similar system).

An image being loaded from the cartridge-case repository can be made an "image under examination". In this case the image


is assigned the examined status by pressing the button  or selecting the menu item **"Comparison mode->Assign to the specimen examined status"** upon loading it from the database into the right window of the **Cartridge-Case Repository** application.

The images of the objects with which the object under examination is being compared are loaded from the cartridge-case repository into the right viewing window.

The images in the viewing windows are moved with the aid of the mouse. By moving the mouse cursor, with the left button being held down, the image in the window will move together with the cursor.

The button  ensures simultaneous viewing of two images. It means that the images will be simultaneously moved within the limits of their display windows.





The Rotation of the cartridge-case bottom image around the axis is achieved in the following way:


1. Press the button .

2. Press the left mouse button and hold it down. At this there will be displayed the radius from the center point of the cartridge-case rotation to the cursor.


3. Move the cursor by the required angle and release the button. At that the image will be rotated by the required angle. Upon completing the operation the rotation mode will be automatically switched off.

4. If necessary, repeat the procedure.


NOTE: The buttons     retain the status of the viewing window corresponding to them, i.e., the window under which they are located.

One can also directly rotate the image by setting the rotation angle. For this press the right mouse button by setting the cursor on the angle rotation indicator field **Rotation angle: 15.40 dgr.** .

There will appear the form:

A dialog box titled "Input rotation angle" with a blue header bar and a red close button. It contains a text input field with the value "15" and two buttons: "OK" and "Close".

Enter the angle value and press the **OK** button.

The image can be rotated at a step of 0.5 degrees by pressing the rotation buttons  on the rotation angle indicator field.