
Technical Procedure for Integrated Ballistics Identification System (IBIS)

- 1.0 Purpose** – To outline the procedures for use of the Integrated Ballistics Identification System (IBIS).
- 2.0 Scope** – This procedure applies to IBIS users, questioned evidence items, and known test fired items chosen for entry into IBIS.
- 3.0 Definitions**
- **Cartridge case** – The container for all other components which comprise a cartridge.
 - **Correlation** – An automatic process whereby two images are compared to determine their similarity.
 - **Primer** – The ignition component of a cartridge.
- 4.0 Equipment, Materials, and Reagents**
- IBIS BRASSTRAX™ System
 - IBIS Backup Media
 - NIST Standard Cartridge Case, Serial Number 166
- 5.0 Procedure**
- 5.1 Integrated Ballistics Identification System (IBIS) BRASSTRAX™**
- 5.1.1** IBIS BRASSTRAX™ is a computerized system for acquiring and storing the images of cartridge cases of questioned origin and those fired from known firearms. IBIS captures digital images of the primer/firing pin area of fired cartridge cases using state-of-the-art optical and electronic technology. These images are then stored in databases and sophisticated algorithms are used to correlate the images against each other using filters such as caliber, rifling specifications, date of crime and date of entry. These correlations produce lists of possible associations with the highest scoring correlations at the top of the list. The IBIS Technician and/or Coordinator may then call up the images and compare side by side on a monitor. If a possible association is confirmed, the actual evidence items are compared by a Forensic Scientist on a comparison microscope for final determination. The IBIS BRASSTRAX™ system in operation at the North Carolina State Crime Laboratory does not have the capability to enter fired bullets.
- 5.1.2** The IBIS Technician shall have the following responsibilities:
- 5.1.2.1** Enter and correlate all IBIS entries.
- 5.1.2.1.1** These procedures may be found in the IBIS Training Guide and Quick Reference Guide for IBIS Users. Copies of both guides are kept in the IBIS room of the Firearms Unit.
- 5.1.2.1.2** For submissions containing multiple evidence cartridge cases, group cartridge cases by class characteristics to reduce redundant images being entered into the system.

- All copies of this document are uncontrolled when printed.***

5.1.3.2.2 Any information about the identification of evidence cartridge cases to each other and the selection of certain specimens for entry into IBIS shall be noted in the case notes.

If there are more than one matching evidence cartridge case suitable for entry into IBIS, the Forensic Scientist shall select the one bearing the most or the clearest individual characteristics for entry or more than one if different individual characteristics are found to have reproduced better on different evidence items.

5.1.3.3 Screen test fired cartridge cases to determine suitability for IBIS. This information shall be noted in the case notes. If found suitable for entry according to the specifications herein, test fired cartridge cases shall be entered into IBIS. If a questioned cartridge case has been identified to a firearm for which a test fire will be entered, the Forensic Scientist may choose to also enter the questioned cartridge case into IBIS based on the Forensic Scientist's training and experience.

5.1.3.4 Import the IBIS Correlation Results page into the case file for cases in which the confirmation of a possible IBIS association has been requested.

5.2 IBIS Protocol

5.2.1 All evidence shall be submitted according to Laboratory policy.

5.2.2 Test fired cartridge cases created by the submitting agency, which are not considered evidence, shall be submitted on an IBIS Test-Fire Submission Form. All mandatory fields shall be completed. Multiple cases may be submitted on one IBIS Test-Fire Submission Form.

5.2.3 A firearm submitted as an "IBIS only" case that does not function and cannot be quickly repaired shall not be test fired for IBIS entry.

5.2.4 Entry of older cases

5.2.4.1 If the date of offense is older than one (1) year, it shall be left to the discretion of the IBIS Coordinator or Section Forensic Scientist Manager/Unit Supervisor as to whether evidence cartridge cases are entered into IBIS.

5.2.4.2 If the seizure date of a firearm is older than one (1) year, it shall be left to the discretion of the IBIS Coordinator or Section Forensic Scientist Manager/Unit Supervisor as to whether test fires from that firearm are entered into IBIS.

5.2.5 Only the following shall be routinely entered:

5.2.5.1 Calibers:

- 25 Auto Pistol
- 7.62 x 39mm Rifle

- 223 Remington/5.56 NATO
- 32 Pistol
- 9mm Pistol
- 380 Pistol
- 357 Sig
- 40 S&W Pistol
- 10mm Pistol
- 44 Pistol
- 45 Pistol

5.2.5.2 At the discretion of the IBIS Coordinator or Section Forensic Scientist Manager, any unspecified caliber fired from a semiautomatic firearm may be entered.

5.2.5.3 Fired shotshells and cartridge cases fired in revolvers, derringers, rimfire firearms, or any other firearm that does not automatically eject fired cartridge cases are not currently being entered into IBIS/BRASSTRAX™. Specific cartridge case entries may be made for unique forensic circumstances or at the request of a court or a federal agency.

5.3 IBIS Report Wording

5.3.1 The suggested report wording listed below may be modified at the Forensic Scientist's or IBIS Technician's discretion to reflect more accurately his/her conclusions. Any such modifications to report wording shall be reviewed and approved with the technical review.

5.3.2 Test Fired Cartridge Case Entered

- A cartridge case test fired in the K-1 firearm was entered into the Integrated Ballistics Identification System (IBIS). Your agency will be notified if any forensic leads are developed.

5.3.3 Test Fired Cartridge Cases Unsuitable for Entry

- No test items were entered into the Integrated Ballistics Identification System (IBIS). Cartridge cases test fired in the K-1 firearm were unsuitable for IBIS entry.

5.3.4 Test Fired Cartridge Cases Not Entered, Unacceptable Caliber

- No test items fired by the K-1 firearm were entered into the Integrated Ballistics Identification System (IBIS). Cartridge cases fired in caliber 22 Long Rifle firearms are not currently being entered into IBIS.

5.3.5 Revolvers

- No test items were entered into the Integrated Ballistics Identification System (IBIS). Cartridge cases fired in revolvers are not entered into IBIS.

5.3.6 Evidence Cartridge Case Entered

- The Q-1 fired cartridge case was entered into the Integrated Ballistics Identification System (IBIS). Your agency will be notified if any forensic leads are developed.

5.3.7 Evidence Cartridge Case Not Entered, Unsuitable

- The Q-1 fired cartridge case was unsuitable for entry into the Integrated Ballistics Identification System (IBIS).

5.3.8 Evidence Cartridge Case Not Entered, Unacceptable Caliber

- The Q-1 fired cartridge case was not entered into the Integrated Ballistics Identification System (IBIS). Cartridge cases fired in caliber 38 Special firearms are not currently being entered into IBIS.

5.3.9 IBIS Indicated a Possible Association

- Based on the acquisition and correlation review of digital images, the Integrated Ballistics Identification System (IBIS) has indicated a possible association between the following cases:
 1. North Carolina State Crime Laboratory case R201199999 (Anywhere Sheriff's Office Case 11-88888), and
 2. North Carolina State Crime Laboratory case R201299999 (Anytown PD Case 12-88888)

This information is to be used only as an investigative lead as this possible association has NOT BEEN CONFIRMED. If confirmation is required for court proceedings, please coordinate with Anytown PD and resubmit the items in the above paragraph for microscopic comparison under the original North Carolina State Crime Laboratory case numbers.

5.4 IBIS Quality Control

- 5.4.1** The following describes the IBIS proficiency test program that shall be administered annually to each employee authorized to make entries into the IBIS system. This proficiency test program shall adhere to the Laboratory Procedure for Ensuring the Quality of Test Results.
- 5.4.2** The purpose of acquiring images of a National Institute of Standards and Technology (NIST) Standard Cartridge Case, minimally on a yearly basis (calendar year), is to address two issues: (1) ensuring that the IBIS hardware and software is calibrated and performing properly, and (2) ensuring that authorized personnel are acquiring data according to established training and protocols. Over a period of time, the correlation scores of the NIST Standard Cartridge Case may be evaluated for trends in performance of the technician and IBIS system.

- 5.4.3 The NIST Standard Cartridge Case shall be entered into IBIS on a yearly basis according to the NIST Standard Reference Material 2461 Certificate titled “User Guide for NIST SRM 2461 Standard Cartridge Cases” (see Attachment A). The correlation results of this entry shall be maintained in the employee’s proficiency test file.
- 5.4.4 Having obtained the NIST Standard Cartridge Case, the cartridge case shall be entered into IBIS as the IBIS “Benchmark” Cartridge Case. The entry shall be completed by all personnel authorized to use IBIS.
- 5.4.5 Having entered the “Benchmark” cartridge case into IBIS, the NIST Standard Cartridge Case shall be correlated against other BATFE IBIS sites.
- 5.4.6 The correlation results shall then be evaluated to determine the success of the entry. A successful proficiency test entry is one for which the previous year’s QC entry appears in the top ten of the correlation result list. An unsuccessful proficiency test shall be discussed with the IBIS Coordinator and possible solutions shall be agreed upon prior to any further data acquisitions. If, upon assessing the entry, the IBIS Coordinator determines that the problem arose from the entering employee, the IBIS Coordinator shall inform the employee of the issue and the employee shall reenter the QC sample. If it is determined that the problem arose from a system change or failure, Forensic Technology Inc. (FTI) shall be contacted and made aware of any issue.
- 5.4.7 For the purpose of proficiency testing, the IBIS Coordinator shall do the following:
 - 5.4.7.1 Review the entry of the NIST Standard Cartridge Case to ensure that proper Laboratory and IBIS (user manual) procedures are followed.
 - 5.4.7.2 Evaluate the image quality and correlation results of each item entered.
 - 5.4.7.3 Review documentation and results with the IBIS Technician.
- 5.4.8 Results of the proficiency test shall be documented and maintained in the appropriate proficiency test file.

5.5 IBIS Computer Security and Incident Response Procedures

- 5.5.1 The IBIS system is part of a computer network run and maintained by the Bureau of Alcohol, Tobacco, Firearms and Explosives as part of the National Integrated Ballistics Information Network (NIBIN). Because of this participation in the NIBIN network all possible precautions shall be exercised in preventing any unauthorized access of the IBIS system and any damage to the system that could affect the network. These precautions include reporting any security incidents to the BATFE as soon as possible. Access to the Database is limited to the IBIS Technician and those Forensic Scientists who have current IBIS Certification through the BATFE.
- 5.5.2 The IBIS Technician shall have the following responsibilities:

5.5.2.1 Notifying the IBIS Coordinator of any security problems or suspected security problems as well as any problems with the IBIS equipment, especially any equipment involved in network communications.

5.5.3 The IBIS Coordinator shall be the designated IBIS security officer and shall have the following responsibilities:

5.5.3.1 Notifying BATFE of any security issues or problems through the use of a Computer Security Incident Report Form. The form shall be forwarded to the appropriate BATFE representative. The IBIS Coordinator shall keep a copy of any security form submitted to BATFE. The IBIS coordinator shall be responsible for following up with BATFE on any security incidents.

5.5.3.2 Notifying BATFE of all IBIS users through the use of a BATFE Information Access form. This form shall be completed for each user of the IBIS system and faxed to BATFE for processing. The original of each form shall be kept on file with the IBIS Coordinator.

5.6 Standards and Controls – N/A

5.7 Calibration – N/A

5.8 Maintenance – For NIST Standard Cartridge Case maintenance information, see the Firearms Unit Technical Procedure for Instrument Calibration and Maintenance.

5.9 Sampling – N/A

5.10 Calculations – N/A

5.11 Uncertainty of Measurement – N/A

6.0 Limitations – N/A

7.0 Safety – Examinations performed in the Firearms Unit are inherently dangerous. These procedures involve hazardous chemicals, firearms, and ammunition. All hazardous procedures shall be performed in compliance with the State Crime Laboratory Safety Manual. If the examination involves a biohazard, the Forensic Scientist shall use proper personal protective equipment, such as eye protection, a lab coat, and/or gloves.

8.0 References

Association of Firearm and Tool Mark Examiners. *Procedures Manual*. 2001.

IBIS Training Guide

IBIS Quick Reference Guide

IBIS Procedures Manual

9.0 Records

- FA Worksheets
- Report from report writer module
- IBIS Maintenance Log
- Computer Security Incident Report Form
- Information Access Form

10.0 Attachments

- User Guide for NIST SRM 2461 Standard Cartridge Cases

Revision History		
Effective Date	Version Number	Reason
09/17/2012	1	Original Document
02/15/2013	2	Removed Raleigh from the header; 4.0 – added text in parentheses
11/15/2013	3	Added issuing authority to header; removed references to SBI-5 and SBI-21
02/26/2014	4	5.4.3 – added a reference to the “User Guide for NIST SRM 2461 Standard Cartridge Cases”; 10.0 – added attachment; added Attachment A
09/05/2014	5	Header and various subsections – corrected to reflect organizational change; 5.1.2 – changed “confirmed” to “made” in first line and changed procedure to reflect updated ATF protocol; added new 5.1.3 ; 5.1.6.2.2 – changed “found” to “made and the pertinent items are in the custody of the Laboratory”; 5.1.6.4 – changed procedure to reflect updated ATF protocol; 5.3.9 – changed suggested report wording to reflect updated ATF protocol; removed various suggested report wording regarding bullet entry
02/27/2015	6	5.1.5.1.1 – clarified items not currently entered into IBIS; 5.1.6.4 – changed “hit” to “possible association”; added new 5.1.6.5 ; 5.3.2 and 5.3.6 – replaced “Additional reports will follow” with “Your agency will be notified”; corrected Revision History entry for Version 5 – 5.3.9 was listed incorrectly as 5.3.10
04/17/2015	7	3.0 – removed definitions for bullet, land impression, and rifling; 4.0 – changed location for IBIS Backup tapes; 5.1.1 – added last sentence; removed old 5.1.2 and 5.1.3 ; new 5.1.2.3 – removed “off-site” from the location from the fourth sentence; removed old 5.1.5.2 ; old 5.1.5.2.1 became new 5.1.3.1.2 ; new 5.1.3.4 – reworded to reflect the request for confirmation; removed old 5.1.6.2.2 and 5.1.6.4 ; new 5.1.4.4 – added first sentence and removed object repository; 5.2.2 – added “or the Laboratory’s IBIS Test-Fire Submission Form”; 5.2.3 – removed other conditions limiting IBIS firearms and the requirement for an official request for an exception; 5.2.6 – removed “38/357 Pistol” and “41 Pistol” from the list; 5.3.9 – removed item numbers from suggested report wording. 5.1.3.1 - removed caliber list and referenced 5.2.6
12/11/2015	8	4.0 – removed located in Raleigh Laboratory, changed tapes to media; Added – 5.1.2.1.2 5.1.2.5 – removed tape, removed designated location statements, removed final statement 5.1.3.1 – replaced which calibers with what is, removed caliber

		statement Removed old 5.1.3.1.2 5.1.3.2.2 – removed FA Removed old 5.1.3.2.3 5.1.3.3 – reworded 1st sentence 5.1.3.4 – CROR to case file Removed old 5.1.4 Moved old 5.1.4.1 (now 5.1.2.1.3) Removed old 5.1.4.2 5.1.2.3 – reworded first two sentences to require only one report be generated to notify an agency of a possible IBIS association, changed “associated” to “entered” in next to last sentence Moved old 5.1.4.2.1 to new 5.1.2.1.3.1, old 5.1.4.3 to new 5.1.2.2.4, old 5.1.4.4 to new 5.1.2.3; Added 5.1.2.1.3.2 5.2.1 – changed to according to lab policy 5.2.2 – added not considered evidence, removed SBI-21, remove list of mandatory fields 5.2.4.1 and 5.2.4.2 – changed from 2 years to 1 year, moved to under new 5.2.4 header 5.2.6 moved to 5.2.5.1 Moved old 5.1.3.1.1 to new 5.2.5.3 Removed old 5.2.7, 5.2.8, 5.2.8.1, 5.2.8.2 5.3.1 – added IBIS Technician Removed quotation marks from all conclusions 5.4.3 – removed page numbers 5.5.3.1 – changed faxed to forwarded 5.5.3.2 – removed Appendix I reference 9.0 – removed specific worksheets, added Information Access Form
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Attachment A: User Guide for NIST SRM 2461 Standard Cartridge Cases

APPENDIX

USER GUIDE FOR NIST SRM 2461 STANDARD CARTRIDGE CASES

A Draft Data Acquisition Procedure for the Integrated Ballistics Identification System (IBIS)

1. The NIST SRM standard cartridge case is intended for quality testing of automated ballistics signature acquisitions. It is recommended that an acquisition of the standard cartridge cases be entered into IBIS once a month to verify the proper operation of the system. However, you should refer to your own laboratory's policy and procedure guidelines (PPG's) for the frequency of acquisition. The cartridge case should also be entered into the system during each software and hardware upgrade as well as after any scheduled or unscheduled maintenance. All entries and results should be documented.
2. Follow standard procedures from the manufacturer for maintenance and setup of the system and for calibration check at turn on.
3. Procedure for establishing Case Maintenance:
(EXAMPLE)
Case ID: Smith/QA/2012-07
Event Type: Test Fire "TF"
Law Agency: Unknown
Date of Occurrence: Date entered into system
(All other categories may be left blank.)

Under Case ID, the "Smith" represents the last name of the IBIS user, the "QA" indicates that it is a Quality Assurance test and the "2012-07" represents the year and month that the case is entered into the system. The rest of the case information should be self explanatory.

Procedure for establishing an Exhibit:
(EXAMPLE)
Exhibit ID: SRM 2461-103/TF
Caliber: 9 mm Luger
Event Type: "TF"
(All other categories can be left blank.)

Under Exhibit info "SRM 2461" indicates the SRM Model, the "103" represents the three-digit serial number associated with the SRM 2461 cartridge case and the "TF" indicates that it is a test fire.

4. Follow the manufacturer's procedure for acquiring a cartridge case. For most conditions, use the same procedure as that for automated imaging of ordinary cartridge cases. However, the following actions are recommended:
5. Breech Face:
 - Make sure that the breech face images are optimally focused. Images out-of-focus will likely cause the correlation to drop.
 - The inner and outer diameters of the rings need to be within 0.001 inch (0.0254 mm) of the corresponding diameters for the Golden Image, which are 0.062 inch (inner red ring in Figure A1) and 0.146 inch (outer blue ring), respectively. The ring centering with respect to the inner and outer circumferences is also important.

(Attachment A continued)

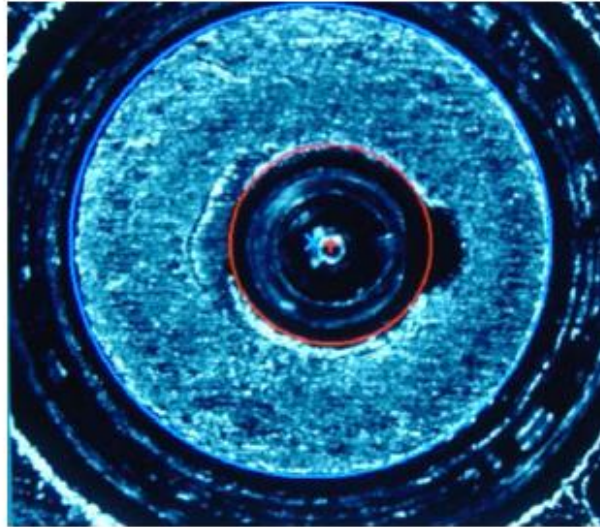


Figure A1. Suggested outer and inner ring placement for breech face. Golden Image ring diameters:
Outer ring: 0.146 inch, inner ring: 0.062 inch.

Firing Pin:

- The diameter of the selected area needs to be within 0.001 inch of the corresponding diameter for the Golden Image ring placement, which is 0.062 inch (see Figure A2), that is, in the range 0.061 inch to 0.063 inch. Avoid the mismatch in sizes shown in Figure A3.

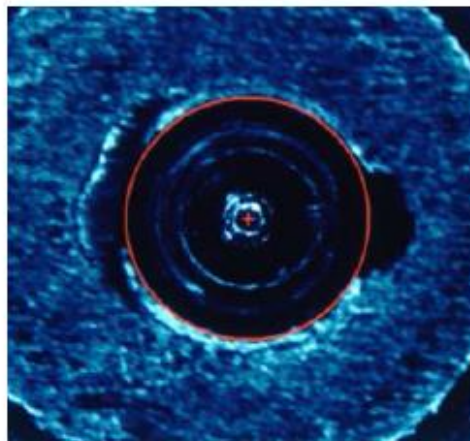


Figure A2. Suggested ring placement for firing pin; diameter: 0.062 inch $\pm$ 0.001 inch.

(Attachment A continued)

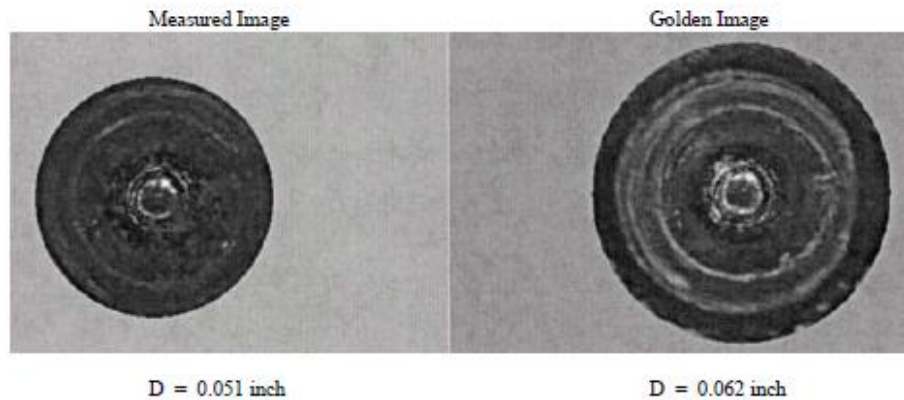


Figure A3. Diameter difference in the firing pin correlation may result in a low correlation score.

Ejector Mark:

- Make sure the ejector mark is vertically centered during the measurement and that the rotation is correct. In Figure A4, the ejector mark in the left hand image is positioned too low.

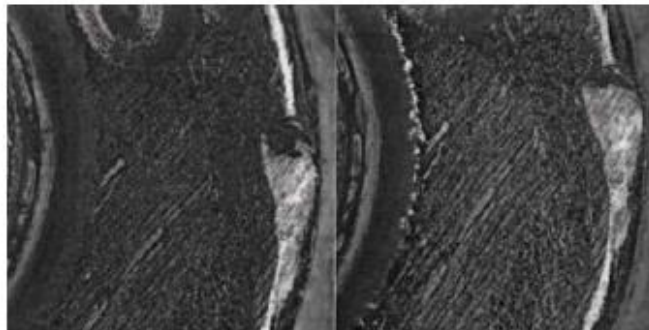


Figure A4. The image on the left shows an ejector mark that is not positioned in the center.

(Attachment A continued)

- After acquisition, follow as reasonably closely as possible the outline shown below (see Figure A5).



Figure A5. Ejector mark Golden Image.

- Try to set the focus position in the middle of the ejector mark (see Figure A6).

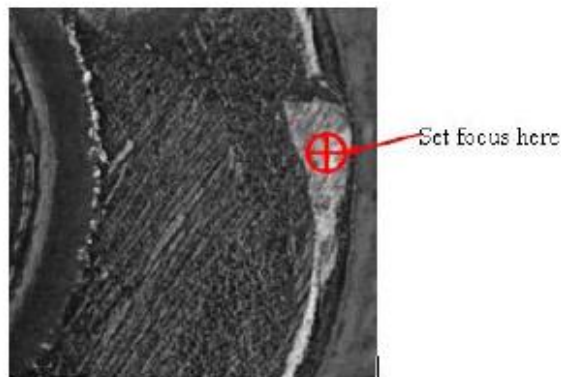


Figure A6. Focus point for ejector mark imaging.

(Attachment A continued)

- Make sure to pull the stopper back when measuring the ejector mark (Figure A7).

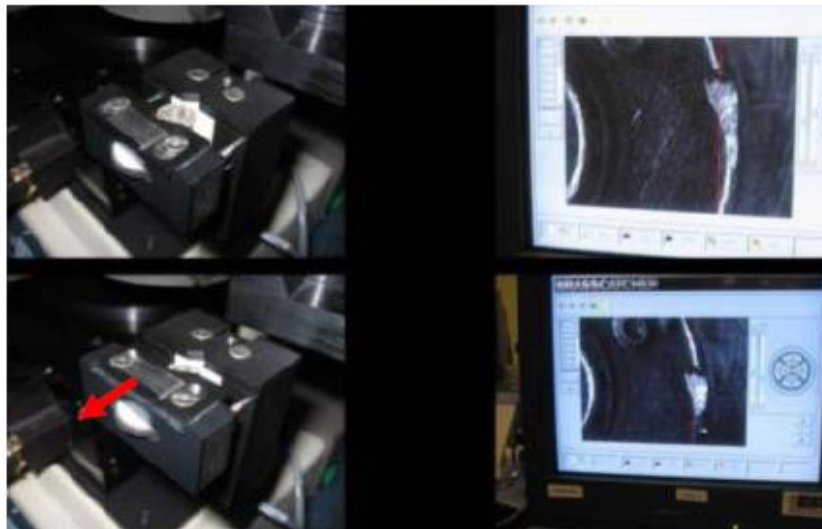


Figure A7. The image on the right, bottom shows the shadowed portion. The stopper needs to be pulled back in this case. The image on the right, top shows the Golden Image with the stopper pulled back and no shadowing.

7. Once the acquisition is completed, a manual correlation of that exhibit needs to be conducted with the region 6 server, where the "Golden Image" resides. Once the correlation has been completed, record the result in the archival records for the laboratory. Once that has been done, delete the Case ID from the system. This will ensure that your case does not get correlated against any future evidence-type cases entered into the system.
8. The correlation scores for the breech face impression, firing pin impression, and ejector mark must all be higher than minimum control values, C_{BF} (SRM 2461), C_{FP} (SRM 2461), C_{EM} (SRM 2461), when compared with the master entry, as calculated with IBIS Software Rev. 3.6. The control value may change in the future as the IBIS software or hardware changes. Start with trial common control values of 214 for breech face, 171 for firing pin, and 400 for ejector mark. Once the local laboratory has established a history of control values, the user may wish to set a control value that is higher than these, consistent with, for example, a 95 % confidence level of achieving the control value.
9. Plot the correlation scores on control charts along with previous scores to indicate the uniformity of the high correlation. If any of the correlation scores drops below the C value, flag the results and the date, then double check the alignment and reacquire the cartridge case images.
10. If the correlation score still remains below the C value, you may want to have another trained IBIS user enter the cartridge case into the system. If the cartridge case scores at or above the C value, then you may have a user issue. If the score is still low, then you may be observing a change in the system performance that needs to be diagnosed. Check the image acquisition procedure. This may include checking the calibration of the IBIS system, as well as the alignment of the cartridge case.

Handling and Cleaning Procedure

The standard cartridge cases are expected to be robust and maintain their quality over many years. However, it is a good procedure to avoid handling the surface of the head in order to avoid unnecessary scratches and finger contamination from marring it. Likewise, cleaning should also be avoided as much as possible because the cleaning process itself can introduce irreversible changes in the surface topography of the cartridge case. If it is clear that contamination has been introduced on the surface to the extent that it has been visibly changed, then a mild cleaning procedure may be used. The suggested procedure is to clean only the contaminated area with a lab swab/cotton tip applicator moistened with ethyl alcohol.