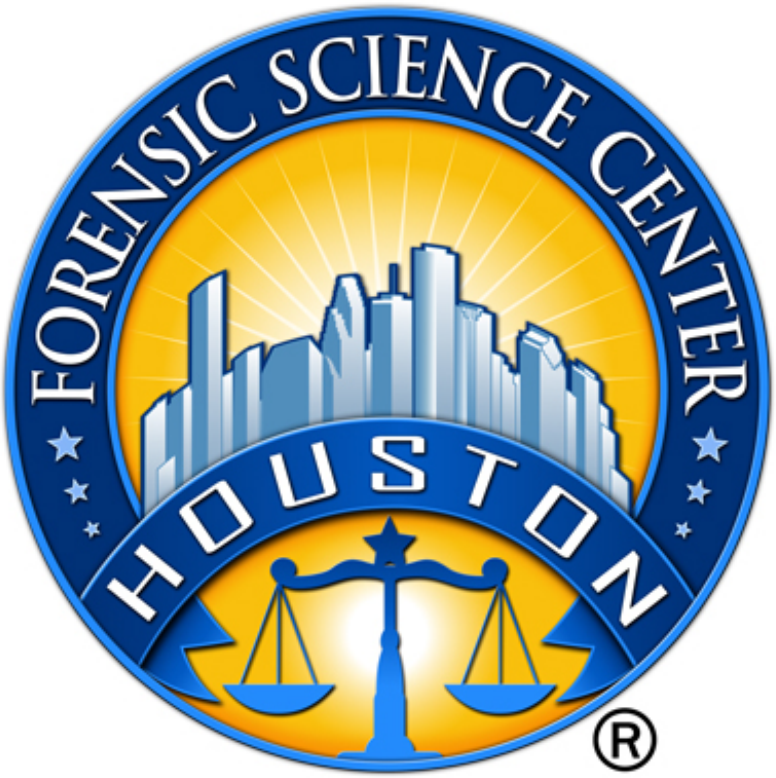

Multimedia Section
Training Program Manual
Forensic Audio/Video Analysis

Digital and Multimedia Evidence Division

1. Overview

The Multimedia Section strives to ensure that the Houston Forensic Science Center (HFSC) mission statement "To receive, analyze and preserve physical and digital evidence while adhering to the highest standards of quality, objectivity and ethics" is carried out on a daily basis.

Forensic Video Analysis, as defined by the Law Enforcement & Emergency Services Video Association (LEVA), is the scientific examination, comparison and/or evaluation of video evidence in legal matters. Forensic Audio Analysis, as defined by the Scientific Working Group for Digital Evidence (SWGDE), is the scientific examination, analysis, comparison, and/or evaluation of audio.

The Multimedia Section provides forensic audio and video analysis of crime related evidence. The section's purpose is to serve the community by assisting in investigations and by presenting results of analysis in court. Multimedia analysts may testify in local, state, and federal courts concerning the procedures followed to preserve, analyze, duplicate, enhance, repair, and produce results.

This training manual is designed to introduce and/or refresh Forensic Video and Forensic Audio fundamentals and concepts to new hires or existing analysts cross-training in the discipline. The analyst (whether experienced or not experienced) will be referred to as "trainee" throughout this training manual. They have been employed by HFSC after meeting the requirements of education, experience, and skills listed in the job description and who have passed the required background check and drug screen. This manual also establishes a competency benchmark for the section. This manual is broken up into modules with checklists of key knowledge benchmarks at the end of most modules. Once the checklist for the module has been completed and the trainer is satisfied with the trainee's progress during the module, a written and/or practical exam will be administered, when applicable.

1.1. Training Program

As the trainee progresses toward independent casework, the training program will remain specific to the trainee's forensic sub-discipline. In situations involving newly-hired analysts who have already been performing casework for other laboratories or organizations, the newly-hired analyst's competency will be assessed, and the training program modified accordingly. At a minimum, new analysts will complete a competency test prior to performing casework. In any training program, additional training tasks and mock casework may be included at the discretion of the trainer or supervisor/lead.

This training manual along with other materials generated during the training program shall be retained in a binder and/or electronically. All training checklists, authorization memos, and module completion dates will be documented.

1.2. Trainers

Trainers are qualified analysts who are assigned by section management to provide direct day-to-day training and guidance to multimedia forensic trainees. They have been authorized to perform the tasks described in the module(s). Refer to the trainer's Q-file to see the specific areas the trainer is authorized in. The trainer's primary goal is to guide trainees in performing their technical and administrative responsibilities. Trainers strive to facilitate professional and technical development of the trainee. They work closely with the section's supervisor/lead and manager to ensure that the training program is effective and relevant, offering suggestions for improvement as needed.

The development of a trainee's knowledge, skills, and abilities under the guidance of their trainer(s) are documented in this training manual which serves as an official record of the progress for each trainee undergoing development. The trainer is responsible for verifying the trainee's skills and abilities to perform specific administrative and technical tasks as documented in this record. The trainee may have more than one trainer through the training program.

1.3. Performance Verification of Hardware/Software

In certain modules the trainee will be performing verifications of hardware and software that is assigned to him/her. In order to verify the hardware/software, the trainee will use the section's data sets and the procedures will mimic casework.

1.4. Competency

All analysts must successfully pass a comprehensive competency test which will be referred to as practical exams in this manual. Competency testing can be conducted in a modular format throughout the course of training. At any point when an analyst learns a new technique, process, and/or software to perform their duties, their competency in that area should be tested:

- These levels are driven by the requirements established in the forensic community for the specific tasks to be accomplished.
- This curriculum is designed to provide the skills and information necessary for the analyst to attain competency in audio and/or video analysis.

1.5. Practical Competency Exam

The practical competency exam consists of conducting analysis on known evidence with a known outcome predetermined by the trainer/supervisor. The trainee is required to: correctly identify the relevant issue(s), select appropriate software and/or hardware tools to conduct the analysis, and produce an appropriately processed output result. If the trainee does not meet all three of the criteria, then a second competency exam will be administered. The trainee will produce case notes and any other required documentation for the exam. A report will be issued by the trainee to the findings of the examination. All work must be conducted in compliance with current section and HFSC Quality Manual policies and procedures. If deemed necessary, an oral examination will be provided to test the trainees' ability to define technical processes and terms logically and professionally. A minimum score of 80% is required. The questions included

in the oral examination will be documented by the trainer as well as whether or not the trainee's responses were acceptable.

1.6. Written Competency Test

The written test covers general principles of forensic audio or video analysis terms and definitions, technologies, standards, and hardware and software applications used in the processing of evidence. Both analog and digital topics will be covered to insure the trainee has acquired the necessary base knowledge needed to process all forms of evidence. A minimum score of 80% is required to pass the test.

1.7. Remedial Training

If a trainee fails to pass a written , oral, or practical exam, then they will repeat the training module and have one opportunity to retake the test. If the trainee is still not successful, the supervisor/lead, in conjunction with the manager, will determine the best course of action. The trainee may be required to take additional training courses prior to repeating modules or competency tests.

If a trainee fails to pass a mock trial, the trainee may redo the mock trial up to two times. If the trainee is still not successful, the supervisor/lead, in conjunction with the manager, will determine the best course of action.

1.8. Certification

Certifications can be comprehensive or topic specific and can be an added tool in verifying analysts' technical skills and abilities. Certifying bodies generally require training and a minimum amount of experience in the discipline in order to sit for an exam. LEVA and IAI certification of digital and multimedia evidence analysts in all sub-disciplines in which they conduct casework is encouraged. Maintaining certification may require retesting and meeting specific continuing education requirements. Certification is not required to begin casework but is highly encouraged while employed at HFSC.

1.9. Continuing Education

Forensic continuing education provides an analyst with the skills and knowledge of evolving technology in digital and multimedia forensics. Training in specific sub-disciplines and specialized areas may be dictated by the forensic discipline, accreditation status, and/or the requirements of the Houston Forensic Science Center.

Continuing education should be obtained annually from training conferences, trade shows, professional organizational memberships, professional publications, current literature, or specialized courses. Training should address updates and the use of new technologies as it relates to:

- Hardware and equipment
- Software
- Techniques, procedures, and methods

1.10. Proficiency

Once they are authorized to conduct casework, analysts must successfully pass an annual discipline-specific proficiency test. Proficiency testing is the continual evaluation of section personnel in the performance of tasks relating to their discipline. If compliance with proficiency testing is not achieved, independent casework must cease until proficiency is demonstrated. Refer to the HFSC Quality Manual for information regarding proficiency tests.

1.11 Casework Authorization

Trainees who fulfill all the requirements in the training program and pass the practical and written competency exams will be issued an authorization memo. The authorization memo will delineate the areas in which the trainee is qualified and authorized to perform analysis. It will also include the software the trainee is authorized to use in that area of analysis.

1.12. Mock Trial

Testimony is an important aspect of forensic science and is something that a Forensic Audio or Video Analyst may be requested to give. A mock trial shall be used to determine the trainee's ability to provide effective expert witness testimony. The mock trial will be completed prior to being authorized to perform independent casework.

1.13. Limitations

It is widely acknowledged in the digital and multimedia forensic scientific communities that data storage and systems used to create, store, and manage data varies. Variables include types of hardware, software, versions, and sometimes alternate use of the equipment's original intent. Analysts should apply their education, training, skills, knowledge, ability, and experience to formulate a plan for examination.

1.14. Resources

- How Video Works, Weiss/Weynard
- CCTV- From Light to Pixels, Vlado Damjanovski
- Digital Video Compression, Peter Symes
- Photoshop CS3 for Forensic Professionals, George Reis, ISBN 978-0-470-11454-4
- Principles of Digital Audio, Ken C. Pohlmann
- Modern Recording Techniques, Huber & Runstein
- The Audio Dictionary, Glenn D. White & Gary J. Louie
- www.dmeresources.com
- SWGDE/SWGIT
- Spreadys.wordpress.com

2. Modules

Module 1 – Administrative and Evidence Handling

Required Readings:
HFSC Evidence Handbook
HFSC Quality Manual
Administrative/Quality SOP
Terminology and Abbreviations SOP
TFSC Evidence Handling Readings
HFSC Policies and Procedures
HFSC Health and Safety Manual
HFSC Security Manual
Multimedia Section SOPs
How Video Works – Chapters 1, 11, 12, and 15

Training Objectives:

- The trainee will learn the ways items can be submitted to the section.
- The trainee will learn how to create cases in LIMS and how to add items to already created cases.
- The trainee will learn the best practices for submission of evidence.
- The trainee will learn how to properly package and seal evidence.
- The trainee will learn to photograph evidence items for the case record.
- Trainee will read all applicable OSAC standards in the Audio/Video discipline.

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
Required Readings			
Evidence Handling			

Module 2 – Quality Boot Camp

Required Readings:
HFSC Quality Manual
TFSC Root Cause Analysis Readings

Training Objectives:

- The trainee will attend a quality training course that will be conducted by a member of the Quality Division.
- The trainee will learn about the Quality Management System and ISO/IEC 17025 requirements.
- The following items will be discussed in this training:
    - Accreditation/Scope of Accreditation
    - Document Control
    - Audits
    - Nonconforming Work
    - Root Cause Analysis
    - Personnel
    - Equipment
    - Validations
    - Technical Records
    - Technical/Administrative Reviews
    - Evidence Handling
    - Testimony Monitoring
- The trainee will gain a better understanding of documentation in case records.
- The trainee will gain more understanding of how the Quality Management System is managed including the use of Qualtrax to achieve and maintain document control.

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
Required Reading			
Quality Boot Camp			

Module 3 - Media File Analysis

Required Readings:
Best Practices for Forensic Video Analysis, SWGIT/SWGDE
Related Validations/Performance Verifications

Training Objectives:

- The trainee will gain the skills required to effectively complete an analysis of digital and analog media in order to identify the best technical procedures to satisfy a customer's request.
- The trainee will complete the Media File Analysis checklist.

- This module must be completed before modules 4-8.

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
Required Reading			
Media File Analysis			

Module 4 - Media Repair and Recovery

Required Readings:
Media Repair and Recovery SOP
How Video Works – Chapters 3, 4, 7, 8, 10, 16, 20, and 21

Training Objectives:

- The trainee will learn different techniques of repairing analog evidence that includes video and/or audio media.
- The trainee will learn ways to examine digital evidence and how to repair and/or recover evidence.
- Trainee will complete checklist and practice repairing analog and digital media.

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
Required Reading			
Performance Verification of Hardware/Software			
Media Repair and Recovery			

Module 5 - Media Duplication-Format Conversion

Required Readings:
Media Duplication-Format Conversion SOP

Training Objectives:

- The trainee will learn the most optimal ways to convert/duplicate analog and digital media.

- The trainee will demonstrate knowledge of analog and digital video compression and the pros and cons to it.
- The trainee will complete the checklist and practical exam to show competency.

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
Required Reading			
Performance Verification of Hardware/Software			
Media Duplication/Format Conversion			

Module 6 - Forensic Audio Analysis

Required Readings:
Forensic Audio Analysis SOP
Best Practices for Forensic Audio, SWGDE
Core Competencies for Forensic Audio, SWGDE
Related Validations/Performance Verifications

Training Objectives:

- Trainee will learn general knowledge and skills related to audio analysis.
- Trainee will learn software specific for audio analysis including filters.
- Trainee will learn about analog audio and the proper equipment to use when examining analog evidence.
- Trainee will learn when and how to repair audio evidence (e.g. media housings)

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
Required Reading			
Performance Verification of Hardware/Software			
Forensic Audio Analysis			

Module 7 - Forensic Video/Image Enhancement

Required Readings:
Forensic Video/Image Enhancement SOP
Related Validations/Performance Verifications

Training Objectives:

- Trainee must complete Module 3 Media File Analysis prior to this module.
- Trainee will learn proper methods of examining files and deciding what process to take.
- Trainee will learn software specific for video and image analysis including filters.
- Trainee will learn proper methods of exporting/converting enhanced files.
- Trainee will develop a workflow for video analysis casework.

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
Required Reading			
Performance Verification of Hardware/Software			
Forensic Video/image Enhancement			

Module 8 - DVR Extraction

Required Readings:
DVR Extraction SOP
Best Practices for the Analysis of Digital Video Recorders, SWGDE
Related Validations/Performance Verifications

Training Objectives:

- Trainee will learn the types of Digital Video Recorders.
- Trainee will be able to troubleshoot the best method of extracting from a DVR.
- Trainee will learn the different formats used by DVRs.
- Trainee will learn how to set up a DVR and properly play back video.

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
Required Reading			
Performance Verification of Hardware/Software			
DVR Extraction			

Module 9 - Scene Response

Required Readings:
Scene Response SOP
Best Practices for the Retrieval of Video Evidence from Digital CCTV Systems
LEVA Best Practices for the Acquisition of Digital and Multimedia Evidence Version: 3.0 (4/14/10)

Training Objectives:

- Trainee must complete and pass the Module 8 DVR Extraction written and practical exams prior to completing this module.
- Trainee will learn how to take what was learned in Module 8 and apply it at a scene.
- Trainee will learn how to prepare for call outs and learn protocols for them.
- Trainee will learn safety procedures and protocols to follow while at a scene.

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
Required Reading			
Scene Response			

Module 10 – Legal, Testimony, and Ethics

Required Readings:
HFSC Code of Ethics
LEVA Code of Ethics
TFSC Human Factors Reading
TFSC Brady MMA Readings
TFSC Professional Responsibility Readings

Training Objectives:

- Trainee will study important court cases and learn how they pertain to the Audio/Video discipline.
- Trainee will learn how to present him or herself in court and be able to explain concepts and analysis in a clear and concise manner.

Forensic Science and the Law:

Video evidence is classified as a form of photographic evidence under Federal Rules of Evidence 1001 and falls into one of three categories: illustrative, event recording, or surveillance. Forensic Science and the Law training provides the analyst ability to present clear and non-technical digital and multimedia evidence-based testimony in court. It also provides the analyst an ability to prepare accurate and reliable documentation and/or visual aids (i.e. notes, reports, printouts, audio recordings). This training should address the use of techniques such as:

- Lecture-type presentation relevant to court testimony
- Court monitoring
- Moot court
- Ethics training

Test for Relevant Evidence- Texas Rules of Evidence 401/FRE 401:

Evidence is relevant if:

- It has any tendency to make a fact more or less probable than it would be without the evidence; and
- The fact is of consequence in determining the action.

General Admissibility of Relevant Evidence- Texas Rules of Evidence 402/FRE 402:

Relevant evidence is admissible unless any of the following provides otherwise:

- the United States or Texas Constitution;
- a statute;
- these rules; or
- other rules prescribed under statutory authority

1993, United States Supreme Court, Daubert v Merrell Dow Pharmaceuticals, Inc.:

The judge is the "gatekeeper" to expert testimony and will only allow expert testimony to be presented to the jury if specific requirements are met. The current rules on experts were created by the United States Supreme Court in the case of Daubert v Merrill Dow Pharmaceuticals.

Judge is gatekeeper: The trial judge has the job of gatekeeping or guaranteeing that expert testimony is actually "scientific knowledge".

Relevance and reliability: The trial judge must make sure that the expert's testimony is relevant to the task at hand and rests on a reliable foundation. Any concerns about expert testimony cannot be given to the jury as a question of the weight of the

evidence. Also, the Judge must find it more likely than not that the expert's methods are reliable and reliably applied.
Scientific method/methodology: A conclusion will qualify as scientific knowledge if the proponent can show that it is the product of sound scientific methodology that uses the scientific method.
Factors: Scientific methodology is the process of formulating hypotheses and conducting experiments to prove or disprove the hypothesis. It is necessary to provide a no dispositive, nonexclusive, flexible set of observations considered relevant in order to determine the "validity" of any scientific testimony.
Empirical testing: Whether the theory or technique is falsifiable, refutable, and/or testable, whether it has been subjected to peer review and publication, the known or potential error rate, the existence and maintenance of standards and controls concerning its operation and the degree to which the theory and technique is generally accepted by a relevant scientific community.

Testimony by Expert Witnesses- FRE 702:
A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:
(a) The expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
(b) The testimony is based on sufficient facts or data;
(c) The testimony is the product of reliable principles and methods; and
(d) The expert has reliably applied the principles and methods to the facts of the case.

Authenticating or Identifying Evidence- Texas Rules of Evidence 901/FRE 901:
In general, to satisfy the requirement of authenticating or identifying an item of evidence, the proponent must produce evidence sufficient to support a finding that the item is what the proponent claims it is.

Authentication of evidence generally focuses on location, date, time, reliability, and integrity.

Contents of Writings, Recordings, and Photographs- Texas Rules of Evidence 1001/FRE 1001:
In this article:
(a) A "writing" consists of letters, words, numbers, or their equivalent set down in any form.
(b) A "recording" consists of letters, words, numbers, or their equivalent recorded in any manner.
(c) A "photograph" means a photographic image or its equivalent stored in any form.
(d) An "original" of a writing or recording means the writing or recording itself or any counterpart intended to have the same effect by the person who executed or issued it. For electronically stored information, "original" means any printout—or other output readable by sight—if it accurately reflects the information. An "original" of a photograph includes the negative or a print from it.

(e) A "duplicate" means a counterpart produced by a mechanical, photographic, chemical, electronic, or other equivalent process or technique that accurately reproduces the original.

Requirement of the Original- Texas Rules of Evidence 1002/FRE 1002:
An original writing, recording, or photograph is required in order to prove its content unless these rules or other law/federal statute provides otherwise.

Admissibility of Duplicates- Texas Rules of Evidence 1003/FRE 1003:
A duplicate is admissible to the same extent as the original unless a question is raised about the original's authenticity or the circumstances make it unfair to admit the duplicate.

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
Required Reading			
Legal, Testimony, and Ethics			

Module 11 – Comparative Analysis

Required Reading:
Comparative Analysis SOP
SWGDE Best Practices for Photographic Comparison for All Disciplines
SWGIT Best Practices for Forensic Photographic Comparison

Training Objectives:

- Trainee must complete Modules 1, 2, 3, 5, 7, 8, and 9 prior to this module.
- Trainee will learn proper methods of examining both unknown and known videos/images and deciding what process to take.
- Trainee will learn software specific for video and image analysis including filters that will aid in comparisons.
- Trainee will learn proper methods of creating composites.
- Trainee will develop an effective workflow for comparative analysis.
- Trainee will learn the difference between a demonstrative comparison and an opinion-based comparison.
- Trainee will learn the conclusions for opinion-based comparisons and to effectively use them in casework.

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
Required Reading			
Comparative Analysis			

Module 12 – Practical Competency Exam(s)

Upon successful completion of technical training, the section supervisor/lead or manager will administer a competency exam to the trainee. The competency exam is a test case and includes a practical application of technical skills and the quality management system requirements (i.e., required level of detail for forensic reporting, and using approved technical methods), and, if deemed necessary, an oral examination of the trainees' ability to define technical processes and terms logically and professionally.

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
DVR/Scene Response Competency Exam			
Format Conversion Competency Exam			
Video Analysis Competency Exam			
Audio Analysis Competency Exam			
Comparative Analysis Competency Exam			

Module 13 – Written Competency Test(s)

In conjunction with the practical competency exam, a written test will be given to the trainee. The written test covers general principles of forensic audio or video analysis terms and definitions, technologies, standards, and hardware and software applications used in the processing of evidence. A minimum score of 80% is required to pass.

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
DVR/Scene Response Written Test			
Format Conversion Written Test			
Video Analysis Written Test			
Audio Analysis Written Test			
Comparative Analysis Written Test			

Module 14 – Supervised Casework

After successful completion of a competency test, the trainee must complete supervised examinations (i.e. processing & analysis). The number of supervised cases completed will based on the trainee's experience and knowledge. A minimum of 3 supervised cases is required for trainees with previous experience in audio/video or digital casework. A minimum of 6 supervised cases is required for trainees with no previous experience in audio/video or digital casework. These minimum numbers may be adjusted by the trainer due to what casework is available and any adjustments will be noted in the comments section. The trainee will conduct the work under the trainer and the trainer will sign the reports. The trainee's work must be assessed by the trainer and section supervisor/manager based on quality of work product and complexity of cases. Comparative Analysis does not require supervised casework

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
DVR Supervised Casework			
Scene Response Supervised Casework			
Format Conversion Supervised Casework			
Video Analysis Supervised Casework			
Audio Analysis Supervised Casework			

Module 15 – Mock Trial(s)

The trainee will complete a mock trial for each area of analysis he/she will be authorized in. This will be arranged by the Multimedia Section. Multiple areas of analysis can be combined in one mock trial if needed (i.e. trainee can do both format conversion and video analysis in one mock trial).

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
DVR Mock Trial			
Scene Response Mock Trail			
Format Conversion Mock Trial			

Video Analysis Mock Trial			
Audio Analysis Mock Trial			
Comparative Analysis Mock Trial			

Module 16 – Technical Reviews

The Multimedia Section performs technical reviews on all casework. Authorization of technical reviews will depend on the trainee's prior experience. Trainees with no prior audio/video or digital casework experience will have to complete at least 5 independent cases prior to starting supervised technical reviews. Trainees with previous comparable audio/video or digital casework experience can perform supervised technical reviews after supervised casework is completed. Trainees with no experience will complete a minimum of 10 supervised technical reviews. Trainees with previous experience will complete at least 5 supervised technical reviews.

Requirement Category	Trainer Comments	Date Accomplished	Verified By:
DVR Supervised Technical Reviews			
Scene Response Supervised Technical Reviews			
Format Conversion Supervised Technical Reviews			
Video Analysis Supervised			

Technical Reviews			
Audio Analysis Supervised Technical Reviews			
Comparative Analysis Supervised Technical Reviews			