

Effective Use of Courtroom Technology: A Judge's Guide to Pretrial and Trial

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Acknowledgments

This book is a joint project of the Federal Judicial Center and the National Institute for Trial Advocacy. The project was commissioned by Hon. Fern Smith (N.D. Cal.), director, Federal Judicial Center. The book was written by the National Institute for Trial Advocacy. Research and collection of source materials was done by the Federal Judicial Center. Both organizations reviewed and edited the manuscript and worked on the design of the book and its cover.

The Federal Judicial Center assembled an advisory committee for this project. Its members are Hon. Jon O. Newman (Ct. App. 2d Cir.); Hon. Paul J. Barbadoro (D. N.H.); Hon. Frank W. Bullock, Jr. (M.D. N.C.); Hon. Edward C. Prado (W.D. Tex.); Hon. James M. Rosenbaum (D. Minn.); Hon. Roger G. Strand (D. Ariz.); Hon. Donald E. Walter (W.D. La.); Hon. Samuel G. Wilson (W.D. Va.); Hon. Larry E. Kelly (Bankruptcy Court, W.D. Tex.); Prof. Stephen P. Saltzburg, George Washington University Law School, Washington, D.C.; J. Ric Gass, Kravit, Gass, Hovel & Leitner, Milwaukee, Wis.; and Gregory P. Joseph, Fried Frank, Harris, Shriver & Jacobson, New York, N.Y.

FJC staff members Dr. Elizabeth Wiggins and Dr. Meghan Dunn coordinated the project, reviewed and edited the manuscript, and integrated the work of the advisory committee. David Marshall and Deborah Von Drak supervised the production of the book. Russell R. Wheeler and Kenneth J. Withers reviewed and commented on the manuscript, and Shannon Wheatman helped compile background information.

The National Institute for Trial Advocacy's work on this project was directed by Deanne C. Siemer. NITA's editorial board members are Prof. Kenneth S. Broun, chair, University of North Carolina Law School, Chapel Hill, N.C.; Joseph R. Bankoff, King & Spaulding, Atlanta, Ga.; Prof. Jo Ann Harris, Pace University School of Law, White Plains, N.Y.; James J. Brosnahan, Morrison & Foerster, San Francisco, Cal.; Deanne C. Siemer, Wilsie Co. LLC, Washington, D.C. NITA's

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The NITA program directors, faculty, and others who contributed are Hon. Ann C. Williams (Ct. App. 7th Cir.); Hon. Jim R. Carrigan (D. Colo., ret.); Hon. Richard M. Markus (8th Cir. Ct. App. Ohio, ret.); Hon. Frank D. Rothschild (Haw. State Court, 5th Judicial District); Prof. Paul J. Zwier, University of Tennessee, Knoxville, Tenn.; Prof. Frederick C. Moss, Southern Methodist University Law School, Dallas, Tex.; Donald H. Beskind, Twiggs, Abrams, Strickland & Trehy, Raleigh, N.C.; Mark L. Austrian, Collier Shannon Scott, Washington, D.C.; Robert J. Wayne, Seattle, Wash.; Howard P. Willens, Wilsie Co. LLC, Washington, D.C.; Prof. Peter Hoffman, University of Nebraska Law School, Lincoln, Neb.; and Lee R. Marks, Greenberg Traurig, LLP, Tysons Corners, Va. NITA's editorial supervisor Barbara Van Holsbeke edited the manuscript. Brenda Faith worked on the glossary.

NITA was assisted in this project by DOAR Communications, Inc., Lynbrook, N.Y., and its CEO Samuel H. Solomon whose insights, experience, and contributions to NITA's teaching materials, courses, and instructional methods in courtroom technology have been invaluable. DOAR staff prepared most of the graphics for this book, reviewed and commented on the manuscript, and gave time generously over the past year to make the project a success. NITA was also assisted by the Video Bureau LLC, New York, N.Y., and its CEO David Brenner who provided their white paper, sample protocol, and other information on courtroom videoconferencing; and by Fredric I. Lederer, chancellor professor of law at the Marshall-Wythe School of Law of the College of William and Mary in Williamsburg, Va., who is the director of the Courtroom 21 project and a pioneer responsible for much of the learning about courtroom technology. NITA also acknowledges the very helpful contribution of David A. Saraceno and Mark A. Johnson with their practice pointers for supporting and attacking computer-generated evidence.

Others who contributed their time and advice to the FJC during the drafting and review process are Hon. Louise DeCarl Adler (Bankruptcy Court, S.D. Cal.), Prof. Jim Blascovich (Dept. of Psychology, Univ. of California at Santa Barbara), Hon. Wade Brorby (Ct. App. 10th Cir.), Prof. Daniel J. Capra (Fordham University School of Law, New York, N.Y.), Carol E. Darnell (Courtroom Deputy, W.D. La.), Hon. David M. Ebel (Ct. App. 10th Cir.), Patrick J. Fisher, Clerk (Ct. App. 10th Cir.), Hon. John J. Hughes (D. N.J.), Hon. Paul J. Kelly, Jr. (Ct. App. 10th Cir.), Hon. Michael M. Mihm (C.D. Ill.), Marilyn A. Sanchez, R.M.R., C.R.R., and from the Administrative Office of U.S. Courts, Gary L. Bockweg, Terry A. Cain, Steven D. Eiserman, J. Michael Greenwood, Michel Ishakian, Kathleen Keeley, William J. Lehman, Abel J. Mattos, William M. Moran, Jr., David Rickerson, Carol Smith, and Roch J. Turco. In addition, the following members, staff, and advisors of the Joint Administrative Office/Department of Justice Working Group on Electronic Technology in the Criminal Justice System reviewed the manuscript: Steven G. Asin (AO), Frederick H. Cohn (CJA panel attorney, New York City), Jeff Flax (national systems support analyst, Office of the Federal Public Defender), Anthony R. Gallagher (executive director, Federal Defenders of Montana), Ronald Levine (chief, criminal division, U.S. Attorney's Office, E.D. Pa.), Judith Mroczka (AO), Jeanette Plante (Executive Office for U.S. Attorneys), Michele Reed (AO), and David Shannon (chief assistant federal defender, Tucson, AZ).

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Address for comments

Send comments and suggestions for the next edition to court_technology@fjc.gov.

Additional examples, new material, updates of current material, and proposed revisions to make the information more readily understandable are welcome.

Preface

This guide describes the substantive and procedural considerations that may arise when lawyers bring electronic equipment to the courtroom or use court-provided equipment for displaying or playing evidentiary exhibits or illustrative aids during trial. The guide sets out what lawyers are normally trying to accomplish, the objections opposing counsel may raise, and the considerations of fairness that may attend the various uses of courtroom technology. The materials cover issues that are raised with some frequency as well as more arcane matters that may arise only in special circumstances. The organization of the materials is intended to facilitate quick reference without any need to read the entire volume, and to assist in the conduct of trials using technology from the initial phases of discovery through posttrial briefing.

The Federal Judicial Center, which provides research and educational programs for federal judges and court personnel, joined with the National Institute for Trial Advocacy, a nonprofit organization that has provided trial advocacy training for lawyers for nearly 30 years, to produce this book. The book draws upon the expertise of judges who work in courtrooms equipped with technology, law professors who teach trial advocacy and evidence, and practitioners who have trial experience using technology in civil and criminal cases.

This book collects practical experience and expert judgments, but does not purport to test these observations empirically or analyze case law. Although various forms of courtroom technology have been around since the 1970s, and model courtrooms equipped with technology began appearing in law schools in 1990, little scientific research has been done in the field and relatively little case law exists. This book is part of a larger Federal Judicial Center project examining the impact of technology on the adversary process.

This book focuses on trials and deals extensively with the pretrial work that shapes much of what goes on at trial. It covers all of the equipment now used in courtrooms, the effects to be expected when

the equipment is used under various circumstances, and uncertainties judges may want to anticipate. The book does not cover integrated databases of records shared with other agencies (police records, social service records, and other court cases), back office functions in the clerk's office (electronic filing, computerized docketing, Case Management/Electronic Case Filing (CM/ECF) system), operations in the judges' chambers (word processing, E-mail and instant messaging, scheduling, or computer-assisted or Internet-based legal research), the court's relations with the press (cameras in the courtroom), or outreach to the public (court kiosks and Web sites). These important subjects can affect the overall efficiency of the court but are less directly relevant to trials.

As a guide for judges, this book points out the reasons (articulated or not) why lawyers take particular positions with respect to the use of technology, the options for resolving disputes, and some of the consequences of not resolving them at an early point in the proceedings. It suggests that judges actively manage technology matters—raising points for consideration by the parties—rather than awaiting the parties' identification and argument of the matters. The disparity can be large between an advocate who is skilled in the use of technology and understands how and when to raise technology issues and an advocate who relies exclusively on traditional presentations. The court's management can help ensure fairness and an expeditious trial.

The central objective of this guide is to make it easier for judges and parties to benefit from courtroom technology without unduly complicating the pretrial and trial processes and without tilting the playing field. Sample pretrial order provisions are set out in an appendix that collects specific items of advice for judges and offers language to implement the advice. Many judges and lawyers who have worked with courtroom technology report that, if properly controlled by the court, use of technology makes it easier for the trier of fact to understand the evidence. They also report that use of the most common evidence-display equipment can save trial time (some

estimate 30% or more) compared to traditional methods, primarily because all exhibits are maintained electronically and can be called up instantaneously, and real-time reporting decreases the amount of time spent referring back in the record.

Part I of the book provides an overview of the equipment, the general ways in which technology topics arise during the pretrial and trial proceedings, and a summary of the experience to date. Part II deals with certain aspects of discovery that affect trials using technology. Part III covers pretrial proceedings. Part IV covers trials. A CD, located at the back of the book, contains the entire text of the book together with samples of the kinds of exhibits that may be used by lawyers in conjunction with courtroom technology. The samples contain transitions, animations, color, sound, and special effects (which cannot be captured in a black and white printed book) as a preview of the good and the bad, the appropriate and inappropriate, and the admissible and inadmissible evidence that may arrive in the courtroom.

This is a practical guide for trial judges, not an exhaustive treatment of any of the subjects involved in the use of technology in the courtroom. The purpose of the authors and advisers who put this book together is to offer helpful methods for a new era of courtroom presentation and to provide a forum, in future editions, for collecting advice, suggestions, and practices to assist judges in providing fair and expeditious trials for the parties that appear before them. It may also serve as a reference for appellate judges who encounter trial-level technology issues on appeal. This guide was edited in February 2001. An update is planned in the relatively near future to include technology changes, current equipment and software references, and contributions from the many judges who will be presiding in newly equipped courtrooms.

Part I

Courtroom Technology: An Overview

Appropriate use of technology to display or play evidentiary exhibits or illustrative aids changes the dynamic in a courtroom in productive and helpful ways. For judges, technology can increase opportunities to control the proceedings, set time limits, and decide matters expeditiously. For jurors, it can increase the sense of participation and improve the understanding of the facts. For lawyers, the faster pace, coupled with the need to respond to visual cues for objections as well as the traditional oral cues, puts a premium on a concise case theory and thorough preparation; there is less and less time for “making it up” as one goes along.

At its foundation, courtroom technology is a means for putting evidence before everyone in the courtroom—the judge, the jurors, the opposing lawyers, the courtroom support staff, and even onlookers—at the same time. The displays—usually on monitors or projection screens—convey many kinds of information more efficiently. Most lay people can look at a display and follow along with an explanation more readily than they can find the place in a hard copy document and try to read the small type while also trying to listen. Because lawyers are accustomed to handling documents and practice doing that every day, they often fail to appreciate that lay jurors often have no similar experience.

Courtroom technology is also a means to draw attention to particular points, to emphasize certain aspects of the evidence, and to make visible that which otherwise would exist only as a mental picture formed from words spoken by an advocate or a witness. It is these enhancements and their messages that form the basis for objections concerning the limits of technological displays and new considerations with respect to the control that judges exercise in the courtroom and in creating the record.

This part of the book provides an overview with respect to the kinds of equipment being used in courtrooms, the nature of the ques-

tions most often raised in pretrial and trial proceedings, and a summary of the experience to date. Later parts cover the discovery, pretrial, and trial phases of litigation in more detail.

Three levels of technology

Most display equipment used in federal courts is quite standard. The makes, models, and positioning of particular items may differ, and the amount of equipment available in any particular courtroom may vary from other courtrooms, but the general approaches have settled into definable patterns.

Courtroom technology, for purposes of this guide, includes any analog or digital means for displaying (or playing) evidentiary exhibits or illustrative aids during trial.

The most significant thing one needs to know about the difference between analog and digital equipment is that they are compatible only with special converter equipment. Otherwise, analog equipment cannot transmit successfully to digital display devices, and digital equipment cannot transmit successfully to analog display devices. In the near term, most courtrooms will wind up with both kinds of equipment, although in the longer term nearly all equipment will be digital. As digital equipment is adopted, compatibility problems will decrease and maintenance should become less difficult.

Analog and digital equipment used in courtrooms can be divided into three categories or levels. Level One includes equipment that any trial lawyer can bring to the courtroom regardless of whether the courtroom is equipped in any way. Level Two includes capability normally available only if the courtroom has been equipped before trial. Level Three includes special equipment brought to the courtroom by one of the parties and is usually reserved for a limited class of trials. The difference in the equipment in Levels Two and Three is generally not qualitative, but characterized by the extent to which the equipment is used and on its funding. Level Three equipment is

Digital means electronic transmission using discrete units (ones and zeros) representing two states: positive and non-positive. Computers, CD players, DVD players, digital cameras, computer monitors, computer printers, some newer evidence cameras, and projectors that operate with computers are digital equipment.

Analog means electronic transmission using signals of varying frequency or amplitude. Television sets, standard telephone sets, assisted listening headsets, video conferencing equipment, video monitors, standard video cameras, VCRs, video and audio tape players, and most evidence cameras are analog equipment.

Part One: Courtroom Technology: An Overview

useful in fewer, more specialized cases than Level One and Two equipment, and therefore is not generally funded by the judiciary. The skills required, barriers to entry, and overall impact on the proceedings increase as the courtroom environment moves from Level One to Level Two to Level Three. This categorization is not a suggestion that courtrooms should be equipped in some particular way or in a standard progression. Each court needs to determine the equipment it requires and the procedures it will adopt for the kinds of trials it handles. In addition, in each individual case, the level of technology needed will depend upon the evidence to be presented.

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	LEVEL ONE	LEVEL TWO	LEVEL THREE
Equipment included	Evidence camera Laptop computer Digital monitors outside jury box Digital projector and projection screen Color video printer Annotation equipment Sound (audio) reinforcement system Telephone interpreting system Kill switch & control system	Digital monitors built into the jury box Electronic whiteboard Integrated lectern Videoconferencing Real-time reporting of proceedings Digital audio recording of proceedings Internet connections Enhanced sound system	IPIX Virtual reality displays Holograms Large-scale video
Court participation	Lawyers may bring all of this equipment into an unequipped courtroom on short notice, or the courtroom may have some or all of this equipment.	Normally provided by the court. Can be brought in by lawyers with sufficient advance planning.	Always brought in by lawyers.
Skills required for setup	Relatively low. Standard electrical connections, fairly simple cabling. Most operating controls not difficult and in lawyers' hands.	Need expert skills to set up. When something goes wrong, a knowledgeable technician is usually required. Most controls out of lawyers' hands.	Need expert skills to set up and operate the equipment.
Advocacy skills required for effective use	Substantial changes from traditional methods but relatively close analogies to more traditional methods make the transition not very difficult.	Specialized knowledge and practice required to use these tools well. More distant from the analogies supplied by traditional methods.	New methods; only tenuous analogies to traditional methods. Considerable practice with expert guidance may be necessary.
Control issues for judges	Kill switch required to blank screens; displays raise additional types of objections; pretrial time may be increased.	More extensive control panel required; real-time reporting makes responding to objections easier; videoconferencing makes scheduling easier.	Can be more disruptive of courtroom decorum, but not necessarily so.
Impacts on jurors	Displays have a substantial impact on understanding; much easier transmission of information than speech alone.	Increased efficiency during trial means less juror downtime.	Displays can become the focus of juror attention to the exclusion of less interesting forms of presenting information.

The complexity of the technology for courtroom use is determined by six factors:

- **The visual display devices.** These are the screens or monitors on which the exhibit is displayed for everyone in the courtroom. Digital monitors and projection screens come in various sizes, types, and capabilities and can be placed in whatever position in the courtroom that best accommodates the needs of the viewers.
- **The audio output devices.** Audio output devices include speakers, earphone headsets, and infrared transmitters that allow everyone in the courtroom to hear the judge, lawyers, and witnesses and to hear the audio from audiotapes, videotapes, or videoconferences used in the proceedings.
- **The cabling.** Cables provide the connections between the visual display devices and the equipment (like evidence cameras and computers) transmitting to them; and also provide the separate connections between the audio output devices and the equipment (such as microphones, computers, and tape players) transmitting to them.
- **The equipment transmitting to the visual display devices.** These are usually evidence cameras, computers, and projectors. This equipment, as controlled by the operator, transmits the image to the monitor or projection screen. In some configurations an evidence camera or a computer transmits images directly to a monitor or set of monitors. In other configurations, the evidence camera or computer transmits to a projector which, in turn, puts the image on a large projection screen.
- **The equipment transmitting to the audio output devices.** Audio input usually comes from microphones at the bench, witness stand, and counsel table; from audio and videotape players; from computers playing digital audio and video sources; and from videoconferencing equipment.
- **The system controls.** The system controls include a kill switch at the bench so that the court can control the monitors within

view of the jury. The controls may also include a touch panel to switch various inputs on and off. For example, if both the evidence camera and a laptop computer are used to display exhibits, the control panel will switch from one of these inputs to the other as required.

This section includes an overview as the basis for the discussion in Parts II, III, and IV with respect to the applications of technology during discovery, pretrial, and trial. A more thorough discussion of the best uses, setup, operation, and techniques for successful use of each of the principal items of equipment is set out in Appendix A. A list of federal courts where this equipment is installed is set out in Appendix B; this list is correct as of February 2001. A glossary of technical terms is included at the end of the book.

Level One technologies

Level One includes equipment that for most jurors is familiar and readily understandable, for most lawyers is inexpensive and easy to use, and for most courts saves substantial time and facilitates control. If something goes wrong, it is usually relatively easy for non-technical people to fix and will not cause significant delays (as long as the equipment has been tested before trial and some thought has been given to a reasonable backup plan). All of the Level One technology may be provided by the court or is readily available for rent or purchase by a lawyer.

Evidence camera

An evidence camera uses a very small video camera to capture high quality images of documents, photos, or objects placed within the camera's field of vision. When the evidence camera is cabled to external monitors or a digital projector, it can transmit the images it has retrieved for display on the distant monitors or projector. The material to be displayed is put on a flat surface that is usually lighted

from above or below. The evidence camera is the successor to (and much more effective and versatile than) an overhead projector. See discussion of legacy equipment below.

These units are very popular for nonlitigation uses and are made by a number of manufacturers. In some models, as the one illustrated here, the camera is mounted in a head above the flat display surface and is focused directly on what is below it. In others, the camera is mounted in the base and is focused on a mirror in the head that reflects what is on the flat surface below it. Most manufacturers call this unit a “document camera,” although it displays many types of evidence other (and better) than documents.

Wolfvision calls their unit a “visualizer,” and DOAR calls their unit a “presenter.” They are all the same thing. The unit is about 12 inches wide and 16 inches high, and it sits comfortably on a desktop or small table.

The evidence camera works very well with photographs, diagrams, maps, small objects, Xrays, CAT scans, and drawings. The camera has a zoom capability that allows easy enlargements. The lights above the base help produce a good image of a photo, a diagram, or an object placed on the base. The lights below the base enhance the projection of transparencies or Xrays. The evidence camera is helpful in cases involving security problems, such as exhibits that are handguns or drugs, as they can be displayed without being passed among the jurors. The evidence camera may also be used to enlarge portions of documents to which the fact finder’s attention is being drawn. Any marking made directly on the document or other exhibit (for example, coloring with a yellow highlighter) while it is being displayed is also shown on the monitor or projector.



Laptop computer with retrieval and presentation software

The laptop is the most convenient personal computer for courtroom use because of its portability and built-in monitor. Many laptops have just as much storage (also called memory, disk drive, hard disk, floppy disk, or external disk) and retrieval capacity as ordinary desktop models and provide all of the necessary connections to external devices. A laptop displays images on its own built-in monitor as well as on any external monitors to which it is connected.

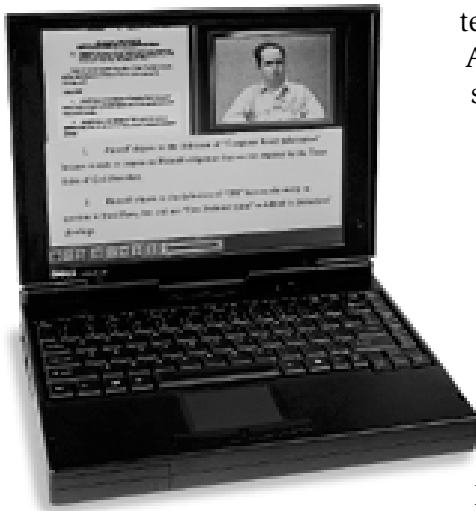
The most basic use of a computer in a courtroom setting is for retrieval of documentary exhibits to be displayed on the monitors or projector to which the computer is connected. Every exhibit is stored in a named file, and when the proper name is entered, the computer's operating system software locates the correct file and displays the first page of its content. If the file names match the exhibit numbers, a software search program can be implemented so that, for example,

when the designation PX113 is typed on the computer keyboard, Plaintiff's Exhibit 113 will be displayed. Alternatively, a touch screen retrieval system can be used.

A touch screen is a special computer monitor with a surface that is sensitive to touch. The exhibits are listed on the display on this monitor, usually by number, and when the lawyer wants a particular exhibit, he or she touches the number of the exhibit, and it appears. A third method is the bar code reader, a small handheld device that translates a bar code—on a sticker placed on counsel's notes, an exhibit list, or a duplicate set of exhibits—into the necessary commands to the computer to locate and display the correct file. When the lawyer wants a particular document on the screen, he or she passes the bar code reader over the bar code, and

the document appears.

Computers also create and display illustrative aids by combining an exhibit with enhancements that make the content of the exhibit



easier to understand or by producing bullet lists, charts, graphs, and diagrams. This is done with presentation software that generates, as well as retrieves and displays, visual displays. This kind of software can highlight and enlarge relevant portions of documents or photos, juxtapose text from two or more pages, and add explanatory titles and labels. Two categories are used in courts: standard presentation software that has sufficient capability for courtroom use; and high-end software developed specially for courtroom use. The standard software is usually Microsoft's PowerPoint or Corel's Corel Presentations. Lawyers often use the terms "PowerPoint slides" or "slide show" to describe the visual displays they plan to present (even if the software is something other than Microsoft's). This software creates visual displays that can be changed readily, but generally the changes must be done before the display is used and cannot be done "on the fly." The high-end specialized software includes ANIX from DOAR Communications, Inc.; Sanction, from Verdict Systems; Trial Pro, from Idea, Inc.; and Trial Director, from InData Corp. Other proprietary systems are provided by litigation consulting firms as a part of their package of services. The high-end software includes all of the capabilities of the standard presentation software but also allows changes to be made as the exhibit is being displayed. For example, if the display includes a segment of document text, but does not include any enlargement of the text, the high-end software allows the user to pull the text out and enlarge it on the spot.

A laptop computer can be used to display digitized videotaped transcripts of depositions, to play digitized audio files, and to present complex animations. These displays typically involve very large files that were created on much larger systems. Newer laptops have the storage capability to accommodate these files and to get them to the monitors or projection screen in the courtroom without undue delay.

A laptop computer can operate either independently or with the courtroom audio and video system. If the lawyer brings equipment to a courtroom that has no audio-video system, the laptop can be cabled to high-performance speakers and external monitors that have

been brought to the courtroom. If the laptop is operating within a courtroom audio or video system, a computer interface plug is provided by the court. This plug may be located at counsel table or at an integrated lectern. The interface, which varies depending on how the courtroom is equipped and cabled, connects to the court's amplified sound system and amplifies the video signals as necessary to deliver quality images to the court's display devices.

Monitors outside the jury box

The computer monitors used in a courtroom can be CRT (cathode ray tube) monitors, which have a case for the tube jutting out 12 inches or more in the back; or LCD (liquid crystal display) monitors, which are only a few inches deep (also called "flat panel" monitors); or plasma monitors, which are also only a few inches deep but come in much larger sizes. Any of these monitors obtained from a major manufacturer will produce a good image.

In a standard setup in a trial court, monitors are usually placed on the bench, at the witness stand, on counsel table, and at some point visible from the jury box. (Monitors may also be built into the jury box. See discussion below.) Small flat-panel LCD monitors are usually used at the bench, at the witness stand, at a lectern, and on counsel table where space is a premium. A 15-inch display is ad-



CRT monitor



LCD monitor



Plasma monitor

equate at close distances. Large CRT monitors are usually used when the jury's monitors are outside the jury box in the well of the courtroom. The minimum size depends on the distance from the jurors, but 37 to 42 inch monitors or larger are usually required. Specialized large flat-panel plasma monitors may be used behind the witness stand to display videotapes and videoconferences because the display is especially sharp. They have a different ratio of width to height than other screens (16 to 9 instead of 4 to 3) and can cause distortion of displays set for regular screens. These plasma monitors also require more care and attention than other types of monitors because if left on too long with one image displayed they can have a permanent image "burned" onto the screen.

Digital projector and projection screen

The projector used with a laptop is digital equipment. It can be a portable unit (3 to 5 pounds) or a standard unit (larger and heavier). Either kind, so long as it is sufficiently powerful, can handle courtroom requirements. The projector should have sufficient lighting power to put clear images on the projection screen without dimming any courtroom lights. Lighting power is measured in lumens, and a projector with a rating of 1,000 lumens or more is needed. The requirements for lighting power vary with the distance between the projector and the screen. Permanent installations in which the projector is quite far from the screen require more lighting power (and a higher lumens rating). Temporary installations in which the projector and screen are only 10 to 20 feet apart produce very clear images with only 1,000 lumens. The projector should also have a quiet fan (needed to dissipate heat) so that no distracting noise accompanies its operation. Most newer digital projectors have built-in converters so they can display the output from analog as well as digital devices.



Digital projectors are designed to accept data coming from a computer at a particular resolution. This refers generally to the amount of information to be displayed at one time by the projector. The resolution of the projector and the computer must match, otherwise the projector cannot display the image. A mismatch is not usually a difficult problem to overcome. If the resolution of the computer is higher than that of the projector, there is a control on most laptop computers that allows them to decrease their output to match that of the projector. If the resolution of the projector is higher than that of the computer, there is a control on most projectors that allows it to match the computer.



The projection screen is normally a 6' x 8' or an 8' x 10' unit. It can be wall mounted (pulled down as needed) or stand mounted (folded up when not needed). In some courtrooms, the projection screen is recessed into the ceiling and retracts when not in use. The screen should be matte white and its surface should be specially treated (ultra-reflective high gain) to reflect light efficiently. A screen used in a fully lighted courtroom needs to provide about 50% more brightness than a conventional projection screen designed for video or slide shows done under dimmed lighting conditions.

A digital projector and screen setup in a courtroom requires quite a lot of room, which may not be available in smaller courtrooms. It also is best used in a configuration in which the screen is set up fairly near the witness stand, opposite the jury box, so the jury can take in the displays and the witness who is supporting them at the same time. Some courtrooms cannot accommodate this layout. Another cautionary note about large screens: occasionally, with some kinds of particularly gory exhibits, the "larger

than life” displays can be overwhelming and, for that reason, objectionable.

Annotation equipment

Annotation equipment makes a low-key but substantial contribution by allowing a lawyer or witness to mark up images being generated by an evidence camera or laptop computer and displayed on a monitor or projection screen. This facilitates pointing out what is significant in the display, directing attention to a particular aspect, or drawing connecting lines to compare or contrast features so that the presentation of opening statements, witness testimony, and closing arguments can move along more expeditiously. Monitors and projection screens are not particularly hospitable to the traditional method of walking up to a paper enlargement of the exhibit and pointing with a finger or special pointer to the significant portion. Pointing at something displayed on one monitor leaves the viewers of all the other monitors unable to see. Pointing at a projection screen usually creates a large shadow that blocks the view of part of the screen.

Three kinds of equipment are available to direct attention to particular aspects of the images on monitors and projection screens: the touch screen, the light pen and the telestrator. Each device produces essentially the same output. The “draw” capability creates an overlay that appears on top of the image but does not change it. The overlay may be a line or a static pointer arrow. The color and size of the overlay can be changed using the annotation equipment controls, and the overlay can be erased in whole or in part as the explanation proceeds.

A touch screen monitor is a computer monitor with a surface that responds to touch by a finger or stylus. It is cabled so that the drawing on its surface can be projected to all other monitors or to the projector to which the computer generating the image is con-



nected. The touch screen is the most intuitive of the annotation alternatives because the user is interacting directly with the image on the monitor. This capability can be added to either a CRT (traditional) monitor or an LCD (flat panel) monitor.



A light pen enables the user to move a special stylus device across the surface of a full-sized computer monitor to create the overlay. This type of annotation tool is often known as the “John Madden pen” after the well-known television sports commentator who highlights and diagrams football plays on the fly as an aid to his game commentary. The light pen sometimes causes difficulty because it must be held almost exactly at right angles to the surface of the monitor in order to work properly, and requires practice because most

people do not write that way. This annotation tool can be used only with a CRT monitor.

A telestrator is a tablet with a stylus and touch controls; the tablet is connected between the computer generating the image and the monitors or projector displaying the image. Any motion of the stylus on the tablet is translated into an overlay on the image transmitted to the monitors or projector. This equipment is more difficult to operate because the user must look at the monitor while marking on the tablet. The eye-hand coordination necessary to accomplish this comes quite easily, but it feels counter-intuitive at the outset and requires some practice. The telestrator can be used with a CRT (traditional) monitor or an LCD (flat panel) monitor, as well with as a projector.



Presentation software, discussed above with laptop computers, usually has an annotation capability that works in the same general manner as the annotation equipment described above. The software alternative is limited to illustrative aids being presented with that

software and can be operated only from the computer that is controlling the presentation.

Color video printer

The use of annotation options necessitates being able to make a record of the annotation, when necessary. A verbal description is both cumbersome and inadequate. A printout of anything that is currently being displayed on a monitor or projection screen can be made conveniently with a video printer that is specially adapted for this purpose. The printout includes the image itself and any annotations from the touch screen, light pen, or telestrator.

The output from the printer is usually 3.5 inches by 5 inches, which is sufficient to record what was before the jury. A specialized video printer works better in a courtroom environment than an ordinary computer printer because the controls are simplified, all three annotation tools (touch screen, light pen, and telestrator) are supported, and the delay between the request for a printout and the appearance of the finished product is much shorter. Making a print this way requires pushing only one button and waiting about 45 seconds. The output of this printer is not a good permanent record and a copy should be made on a regular copier to preserve colors and details.



Audio system

High quality audio is an essential component of all courtroom technology—computers, videoconference equipment, laser disk players, VCRs, and audiotape players—that relies on auditory presentation in the courtroom. Audio is also important for telephone conferencing,

telephone and infrared interpreting systems, and electronic sound recording.

A court's audio system usually includes built-in speakers located to maximize clarity of sound given the acoustic characteristics of the room. The audio system also includes microphones at the bench, witness stand, and counsel table to reinforce the oral exchanges in the courtroom. The type and placement of microphones is particularly important for an effective audio system. Some courts have upgraded audio including microphones equipped with mute buttons at the bench and counsel table, a white or pink noise generator at the bench to muffle the conversation during bench conferences, a connection between the sidebar area of the bench and the court reporter (so that the reporter does not have to move the steno equipment in order to record bench conferences), infrared transmitters to deliver enhanced audio for the hearing impaired or those needing translations, and connections into the audio system for laptops and CD and DVD players.

Telephone interpreting system

The telephone interpreting system provides interpreting services from English to foreign languages and vice versa for short proceedings such as pretrial hearings, initial appearances, arraignments, motion hearings, and probation and pretrial services interviews. Defendants and witnesses hear the foreign language translation through telephone handsets or headsets. Others in the courtroom hear the English translation of foreign language testimony through a speaker telephone or the court's audio system.

Two telephone lines are used. One line is connected to a digital conference phone. The second is connected to a conventional telephone handset or headset. On one line, the interpreter listens to the English or the foreign language from the courtroom via the conference phone. The interpreter then interprets into the foreign language or English, whichever is required, and directs by way of a hand switch

the interpretation to either the conventional receiver or the conference phone, whichever is required. Good courtroom audio is important to this system so that the interpreter and all participants can hear all of the relevant speech.

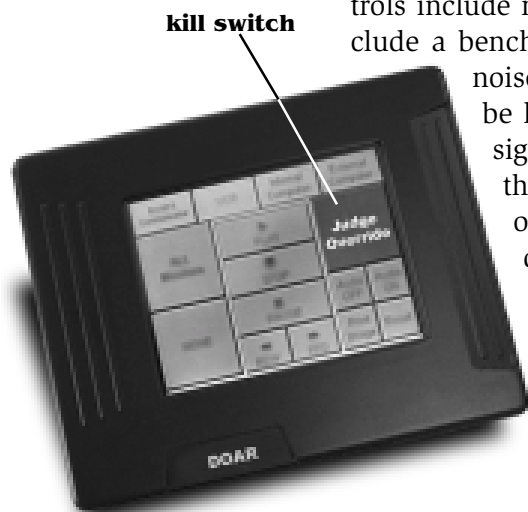
System controls

The basic control for courtroom technology is a “kill switch” or cut-off switch at the bench. This is usually a “toggle” switch that has two positions: on and off. When the switch is in the “on” position, all of the monitors visible to the jury and the witness are receiving images from the evidence camera or computer used by the lawyer to display visuals. When the switch is in the “off” position, all the monitors visible to the jury and the witness are black, although all the other monitors (bench, counsel table, and court reporter) are still receiving images. When objections are raised, the switch can be used so that the jury and the witness do not peruse the exhibit while the attorneys are stating their positions. Practice differs as to whether monitors visible only to the audience in the public space of the courtroom are on or off during objections.

If the audio system is designed so that the court reporter does not have to change locations during bench conferences, the basic control also usually incorporates an on-off switch for the courtroom audio. This allows the output of microphones at the bench to be directed only to a set of earphones that the court reporter uses at the customary desk to record short conferences while the jury is still in the room.

If the lawyers will be using both an evidence camera and a computer to transmit images to the monitors or to a projector, the control system will include a switch to select between these two inputs. They cannot both be active at once, and the switch determines which input will be shown on the screen. If a video printer is available to print out markings made by the annotation equipment, the control system will usually have a switch to activate the printer.

Most integrated control systems are incorporated in a small touch screen that uses different colored boxes for the various controls. Controls include muting buttons for audio and video. Audio mutes include a bench conference function. Most courtrooms have a pink noise generator to mask bench conferences so they cannot be heard by the jury and audience. Video mutes are designed to allow the judge to black out the monitors for the jury and audience as well as an overall mute to black out all monitors except the one on the bench. Newer designs add a function to enable the muting of the witness monitor separately. The judge touches the control and the command is sent instantaneously to the system. These controls can be reprogrammed as more equipment (e.g., videoconferencing) is added to the courtroom.



Legacy equipment

In today's technological world, "legacy" equipment is something "old," although perhaps not very old in terms of elapsed years. Digital equipment has replaced much analog equipment (and, as this happens, analog equipment goes into the legacy category) and newer forms of digital equipment have replaced older forms (putting the older digital forms also in the legacy category). Legacy equipment often causes problems for the design, installation, and maintenance experts because it is no longer supported extensively by the manufacturer or is not compatible with newer components. This category include:

- **Analog audiotape players:** used to play analog (traditional) audio or music tapes.
- **Analog videotape players:** used to play analog (traditional) videotapes.
- **Laser disk players:** used for large platters that preceded high capacity CDs.

- **Traditional slide projectors:** usually used with cassettes of film slides.
- **Overhead projectors:** used with page-sized transparencies.
- **Television sets:** usually used to display the output of analog videotape players.
- **Low resolution sound system components:** transmit output from microphones.

This equipment has been used in courtrooms for the past 30 years. For the most part, these units are reliable, easy to operate, inexpensive, and readily available.

Some legacy equipment can be used in conjunction with newer equipment, although special converters may be required. Audiotape players can be plugged into the court's sound system and will then be played over the speakers in the courtroom. Videotape players can be connected through an evidence camera's auxiliary input jacks and the players' output will then appear on monitors in the courtroom in the same manner as the evidence camera's own output does. Videotape players can also be connected to most newer digital projectors which have built-in converters to deal with analog input. Evidence cameras with an analog output can display output on a television set.

Legacy equipment can serve as backup to state of the art equipment. The overhead projector, for example, can provide short-term backup to an evidence camera or digital projector that does not work. The overhead projector operates well in a fully lighted room. The slides (created to be presented by a digital projector) can be printed directly onto plastic sheets, which can be kept in reserve with the overhead projector in case of emergencies. Audio and videotapes and tape players can provide backup to computer equipment that is being used to present audio or video clips.

Newer digital equipment provides significant performance enhancements compared to the legacy equipment. Analog audio and videotape players are more difficult to control and take more time to queue up than the newer digital equipment. Laser disk players have limited

capacity (about half of a CD). Traditional slide projectors usually require dimming of the lights in the courtroom to get good contrast, which detracts from the ability of the jury to pay attention. Overhead projectors have limited capacity to zoom in on detail and are used with transparent plastic sheets that can easily be put on the projector upside down or backwards. Television sets display a less clear image than digital computer monitors. For these reasons, legacy equipment is replaced, as funding permits, by the newer digital technology. Digital technology is generally more reliable, has better controls, is more compatible, and offers more flexibility across the wide variety of cases that show up in federal courtrooms. When courtrooms have only legacy equipment available, or have mostly legacy equipment in combination with some newer digital equipment, some lawyers will want to bring in their own equipment to gain the advantages that their equipment offers.

Level Two technologies

Level Two consists of technology that is readily understandable although less commonly used, involves significant expense, and requires an expert to set up and to fix if anything goes wrong. Level Two equipment is not necessarily better or more advanced than Level One. Level One equipment is the technological foundation at the trial level; it is useful even if Level Two equipment is available. Level Two technology adds capability, but also adds cost. It saves time in particular situations and, while it involves more effort, is not particularly difficult for lawyers to learn to use or for judges to control. In most cases, the same kind of touch screen control, shown with respect to Level One above, is used when Level Two equipment is added. The screen display is reprogrammed to show the additional controls. Most of the technologies that fall in the Level Two category are typically included in a courtroom system provided by the Administrative Office. The actual configuration of the courtroom technology system depends upon a number of factors. If not available in a particular courtroom, everything included in Level Two can also be provided by a lawyer.

Small monitors built into the jury box

Some courtrooms have small flat panel monitors installed in the jury box, usually one for every two jurors. This setup makes the courtroom less cluttered. It also increases efficiency because the reading distance and display capability is uniform for each juror. Lawyers can come into the courtroom, plug a laptop into the connection at the lectern, and all the displays light up. With a monitor in front of each two chairs in the jury box, each juror has almost exactly the same viewing angle, which is not true when large monitors outside the jury box are used. Lawyers creating displays on an office monitor know that those displays will look approximately the same on the small monitors in front of the jury, also not true with a large monitor or projector and screen. No wiring, taping, testing, or positioning of the furniture is required. The displays are not subject to the “larger than life” problem in some displays on large monitors and projection screens.



The effect of motion and color on small monitors inside the jury box may be different from larger monitors or a projection screen outside the jury box. The eye has a limited span within which it can accurately perceive motion. If the motion is across a larger distance, the viewer first moves his or her eyes and then moves the head to follow the motion. With a very small monitor, much of the motion on the screen is within the eye’s normal span at that distance, so it is perceived more accurately and with less effort. Somewhat the same effect occurs with large swatches of color.

Small monitors present a special challenge to the advocate because of the tendency to lose group focus. Jurors look down at the

monitor instead of out into the courtroom at the advocate. When jurors are looking down, they may be paying attention only peripherally to what the advocate is saying. If the message is in what is being said, they may miss most of it. The lawyer loses the ability to communicate directly with the jurors as compared to when the display is in the same view as the lawyer—a communication style that can be very effective, in part, because it is used by television commentators and thus is within the experience of virtually every juror.

Timing, communication style, and presentation skills are much more important when the lawyer is using small monitors. Lawyers can control the “look down” factor by putting black slides into their presentations at appropriate points or using a software control that blanks the screen. The lawyer has to pause, blank the screen to get the jury to look back at the lawyer, and then go on.

Good use of the annotation equipment is also important. With small monitors, the lawyer cannot simply walk up to the screen and point out some feature of what is being displayed, as is possible with a setup that uses a large monitor outside the jury box or a projector and large projection screen. To point something out on a small screen setup, the lawyer must be able to use a touch screen, telestrator, or light pen to mark the point of emphasis on the screen.

Electronic whiteboard

The electronic whiteboard has two sets of functions: first, it replaces the traditional blackboard as a surface that can be written on and erased; second, it replaces the touch screen as a surface that can both display computer images and direct commands to the computer. Electric whiteboard equipment has one or both functions.

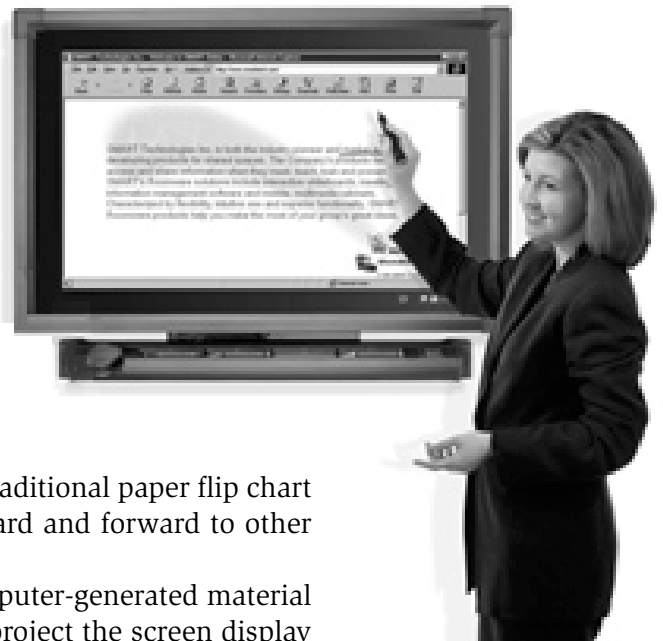
When the white board is used as a writing surface, dry-erase marking pens in black, blue, green, and red produce diagrams, drawings, lists of points, and any other function of a blackboard or flip chart. It is more functional than those older alternatives because marks can be erased and changed at any time. Marks can also be saved on a

computer and printed out for the record. The whiteboard may have a pressure sensitive surface on which the user writes. Or it may use markers that are embedded with tracking devices. With either kind of board, sensors in or around the board pick up and track the position, movement, and color of the pen. A personal computer records what is written on the whiteboard (including what has been erased), so the information can be saved for later use. A color printer attached to the system can provide printouts.

The image displayed on the whiteboard can also be transmitted simultaneously to all of the monitors in the courtroom. This permits the witness to step down from the stand and draw with the markers without having to reposition the whiteboard so everyone in the courtroom can see it. The witness does not have to stand in a particular place so as not to block the view of the drawing. A whiteboard can be used like a traditional paper flip chart to go from one “page” of markings backward and forward to other pages.

If the content of a Web site or other computer-generated material is at issue, an interactive white board can project the screen display shown on a laptop or other computer and, with touch screen capability, can operate the display as if it were the computer. For example, if it is necessary to “press” a particular button to get a Web site to go to a location, the lawyer can touch the image of the button on the whiteboard, and the button will be activated in the same way as if it had been “clicked” on using a mouse. Similarly, if a series of slides is to be shown, the lawyer can touch the controls for forward and back to move through the slides.

The screen is typically 4 feet high and 5 feet wide and rests on a

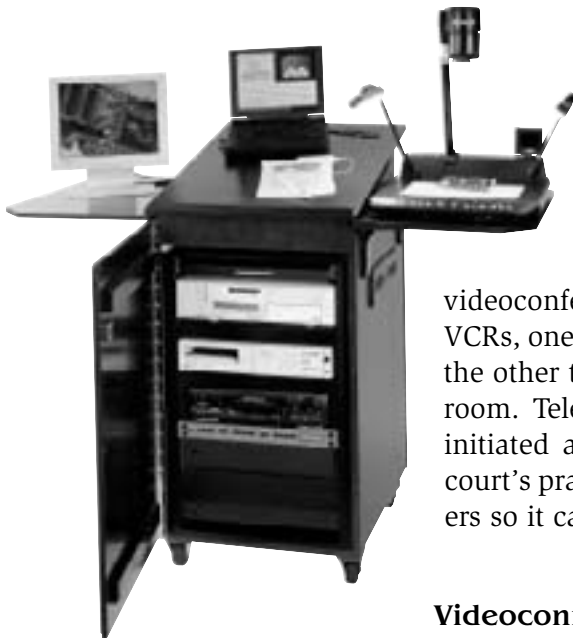


stand. This equipment is designed to work with computers. It does not work with directly connected evidence cameras.

Currently available models include the Ideaboard from 3M's Visual Systems Division and the SmartBoard made by Smart Technologies, Inc.

Integrated lectern

An integrated lectern for use by counsel incorporates the equipment, connections, and controls necessary for a lawyer to operate most of the courtroom technology from one position. The lectern usually includes an evidence camera, connections for the lawyer's laptop computer to drive displays on the courtroom's monitors or projection screen, annotation equipment, a color video printer, a microphone, and connections to the court's sound system and videoconference system. The lectern may also include two VCRs, one to view exhibits that are VHS and S-VHS tapes, and the other to record the displays on the monitors in the courtroom. Telephone conferences and videoconferences can be initiated and controlled from the lectern depending on the court's practice in these regards. The lectern may ride on casters so it can face the bench or the jury box.



Videoconference equipment

A videoconference is a televised telephone conference call. In a regular telephone conference call, only audio signals are sent back and forth on the telephone lines connecting the two parties. In a video conference call, both audio and video signals are sent back and forth on the data transmission lines together with the information necessary to synchronize the audio with the video. Video signals require

more transmission capacity than audio signals, so higher capacity lines are needed to carry them successfully.

In videoconferencing terms, there is a “near side” or “local site,” in this case the courtroom, and a “far side” or “remote site,” which is the room or office from which the participant who is not in the courtroom will be appearing. The far side may be a federal courtroom in another jurisdiction, a prison, a university, a private office equipped for videoconferencing, or a commercial center where a videoconference room has been rented on an hourly basis. Like a telephone conference call, a videoconference can be conducted between two points or many points.

- **Cameras.** The video signals at each end are generated by one or more video cameras. In the courtroom, the video camera or cameras are usually in fixed locations. At the remote location (or “far side”), the video camera usually is a small portable model placed on top of the monitor. In the courtroom, the cameras may have a fixed focus, or they may be voice-activated and focus on whomever is speaking. At the far side, the camera may have a fixed focus, or it may be under the control of the courtroom so that its focus can be shifted around the room as the court directs.
- **Monitors.** The video signals at each end are displayed on one or more monitors. There may be a single large monitor in the courtroom, placed near or above the witness stand where everyone in the courtroom can see it, or the video may be displayed on small, built-in monitors in the jury box and the other monitors at the bench and on counsel table. The monitor at the far side is generally placed opposite the witness. The participants in the courtroom can see the witness, usually a head shot; and the witness can see the courtroom, usually a head shot of the lawyer who is doing the questioning. Both ends of the videoconference are more comfortable when equipped with a picture-in-picture capability (supplied by the codec; see next page) so that each end can see itself (in the small inset picture)

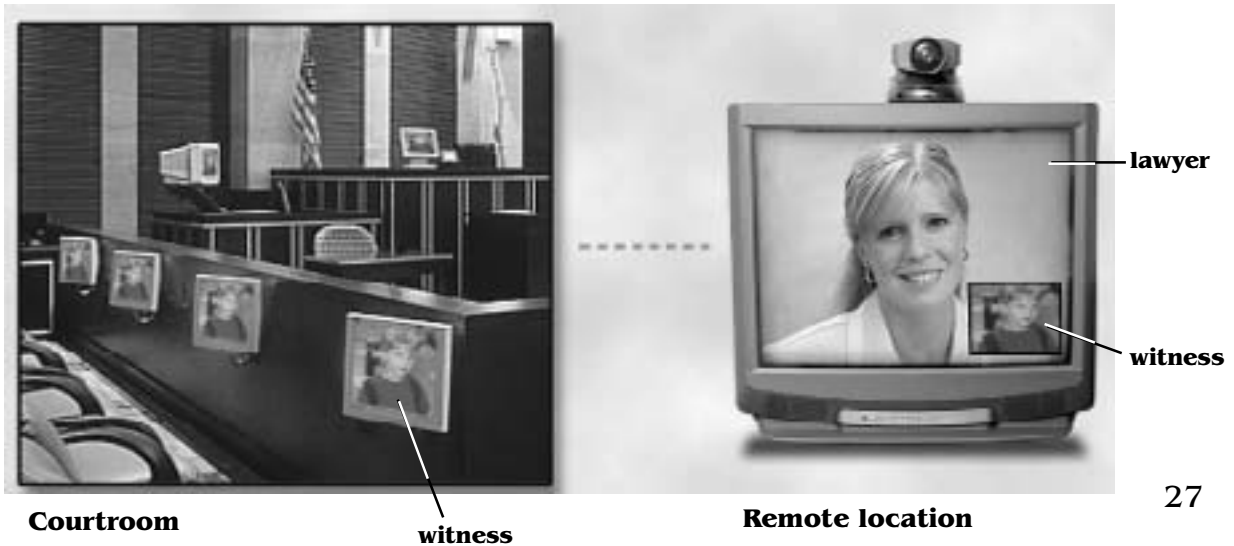
as well as the other end (in the larger picture on the main screen). Most portable units are equipped with 32-inch display monitors. In situations where the camera and monitors are built-in, large plasma displays are often used.

- **Microphones.** The audio signals at each end are generated by microphones. The type and placement of microphones is particularly important as poor audio quality is often the most aggravating aspect of the use of videoconference systems. Each courtroom or videoconference room has acoustic characteristics that need to be taken into account. Microphones come in many sizes and shapes—lapel clip-on, arm-mounted, and desktop—to accommodate these problems. Positioning is also important. The microphones should be placed so that shuffling of papers and other random noises at counsel table or on the bench are not transmitted.
- **Speakers.** The audio signals at each end are delivered by speakers. The audio for the courtroom end is usually directed into the courtroom audio system with fixed speakers, but can be directed to any speakers. The audio for the far end usually is delivered through speakers in the monitor or small auxiliary speakers. The participants in the courtroom can hear the witness; and the witness can hear whomever is speaking in the courtroom.
- **Data lines.** The connection between the two ends of the conference—the courtroom and the distant location—is through special high speed telephone lines. These may be ISDN (Integrated Services Digital Network) lines, cable, DSL (Digital Subscriber Line), or the higher capacity T1 or fiber optic lines. Satellite transmission may also be used. Higher capacity costs more, but delivers the transmission with less delay, more lifelike motion, and better audio.
- **Codec.** The video and audio signals at each end are directed to a codec (coder-decoder) that processes the signals going to and coming from the telephone lines into a format that the telephone lines and display equipment can accept. The codec coor-

dinates video signals and audio signals so that viewers at both ends see video that matches the audio they hear.

- **Enhanced audio.** Videoconferencing almost always requires enhancement of the court's audio system. The most significant addition is echo cancellation equipment. When sound from the far side, for example, is broadcast in the courtroom, the courtroom's audio equipment will pick up that sound and send it back through the codec to the far side. All codecs have built-in echo cancellation, but in larger rooms an external echo canceller is required. (If the courtroom is equipped with a built-in audio conferencing unit, the codec audio can be routed through that.) Echo cancellation equipment detects duplicates in the sound transmissions (the echo back to one side or the other of the sound they are sending out) and cancels them out. Without good echo cancellation, the pause in the courtroom (after the person on the far side has spoken) must be longer before the effects of the "echo" in the courtroom are overcome. Long pauses make the effective communication between the courtroom and the remote location more difficult. Echo cancellation equipment is relatively costly, but highly necessary for high-quality videoconferencing.

Most systems also have picture-in-picture capability shown here.



In this instance, the lawyer is examining a child witness who is testifying from a remote location. All of the participants in the court proceeding can see, hear, and interact as appropriate with the witness. In the courtroom, the judge, jury, and counsel may view the remote witness on a special large plasma screen or on their individual screens. At the remote location, the child is looking at a screen showing the examining lawyer. The small camera on top of the monitor is transmitting the video picture of the child. The small inset at the lower right corner is the picture-in-picture feature so that those at the child's location can see how the child appears on the screens in the courtroom. If the child moved out of the range of the camera, for example, the picture-in-picture would show that.

In more sophisticated systems, the displays on both ends can be segmented so that the output from several video cameras can be seen on one monitor. For example, if the courtroom is outfitted with multiple cameras, on the far side the witness can see the judge, the jury, and both counsel. In the courtroom, the participants can see most of the room where the witness is located. This requires additional equipment, training of courtroom personnel to operate, and risk of malfunction.

Videoconferencing is a relatively easy option when both the near side and the far side are federal court or other government facilities that already have equipment installed. Because special telephone lines need to be run into the court building, one-time videoconference setups (in which lawyers install their own videoconference equipment) may run into administrative difficulties.

Once set up, videoconference equipment is not difficult to operate. Some court facilities include a videoconference room with equipment set up in a standard configuration. When lawyers need to use it, they just get the key from the clerk and operate everything themselves from instructions on a single sheet of paper. In a situation where the videoconference is connecting only two points, the basic action is just dialing a call. When the call is completed, the other end becomes visible on the monitor and audio is heard from the other

end. When the videoconference is multipoint (connecting more than two sites), a “bridge” service may be needed, depending on the capability of the system, and under these circumstances videoconferencing may work better when someone who is familiar with the equipment is available for assistance at the site that makes the call. Alternatively, many manufacturers offer a global management support so that a remote party monitors the status of each call.

Commercial videoconferencing centers exist in most urban areas and can be rented for \$100 to \$150 per hour. They provide the equipment necessary to connect to the court’s system and the data lines for transmission. It is also possible to rent videoconferencing equipment to set up in any private location, but the telephone company will take several weeks to install the necessary data lines.

In March 1996, the Judicial Conference authorized use of videoconferencing in prisoner civil rights pretrial proceedings. Also, the Prison Litigation Reform Act of 1995 required federal courts “to the extent practicable,” to conduct prison condition pretrial proceedings “in which the prisoner’s participation is required or permitted” by telephone, videoconference, or other telecommunications technology, without removing the petitioner from the prison facility. There is, however, no judiciary-wide policy endorsing or prohibiting the use of videoconferencing in other types of judicial proceedings. Its use is subject to case law and rules considerations, and the appropriateness of its use in specific proceedings is determined by judges.

Real-time reporting

Real-time reporting is a service provided by specially trained court reporters who use software that matches the keystrokes on a stenograph machine to corresponding entries in a database and thereby “translates” the keystrokes into words. This software is marketed to court reporters by several competing software publishers. The court reporter’s computer assembles the product of these software operations and dispatches them immediately to any connected

monitors. Real-time reporters take extensive training in order to be able to produce relatively clean transcripts using this technology.



Voice writer reporters who record proceedings by speaking into a stenomask can also produce real-time transcripts. Speech recognition software translates the voice input to digital format, the digital signals are matched to entries in a database, and the resulting English words are brought to the monitors in the courtroom in a transcript format.

Real-time reporting requires cabling from the reporter's computer to a junction box that routes the signals. Cabling from the junction box reaches all the receiving monitors or computers.

There are two levels of real-time service. Either of these levels of service may be made available only to the court, which is currently more common, or may be provided in other locations in the courtroom. Extending the availability of real-time to counsel tables involves some additional cabling. Real-time services are available to lawyers in federal courts upon payment of the fees authorized by the

Judicial Conference. These fees can substantially increase the cost of the transcript and may be cost effective only in larger cases.

The first level of service delivers the transcript to any authorized computer monitor as it comes from the reporter's computer. In some courtrooms, monitors for the basic service are provided by the court. The transcript scrolls down the screen as the reporter proceeds. The transcript is stored on the reporter's computer and the controls remain with the reporter. Anyone with access to a monitor can see as much of the previous and current transcript as fits on the screen. No viewer can stop, start, or affect the transcript. If a judge or lawyer needs to refer to earlier testimony, the reporter must scroll back to that spot in order for it to be displayed on the monitors.

The second level of service delivers the court reporter's output to a laptop computer loaded with special software designed to make the displayed text more usable. In nearly all courtrooms, to gain access to this level of service, lawyers must provide their own laptops and real-time "receiving" software. The transcript is delivered to the receiving computer (and displayed on that computer's monitor) as it comes from the reporter's computer. However, in this case, the transcript is stored on the receiving computer. The controls are with the user of the receiving computer. This user can now scroll backward to prior testimony, add private notes directly to his or her copy of the transcript, add color to portions of the testimony that are useful with respect to certain topics, highlight portions of the witness's testimony for later reference, and search the transcript for particular words or phrases. This level of service also makes an unedited written transcript available immediately because any receiving laptop can copy the file to a disk, print out the file, or send the file via E-mail to some distant computer. The current software packages used by lawyers with this level of service are: Summation Realtime (used with Summation Blaze) from Summation Legal Technologies Inc.; LiveNote from LiveNote Inc.; CaseView from Stenograph LLC; and e-Binder from RealLegal, Inc.

In September 1994, the Judicial Conference endorsed the use of real-time reporting in the district courts, to the extent that funding is

available, but disapproved it in March 1994 for use in bankruptcy courts because it did not appear to be cost effective. The Guide to Judiciary Policies and Procedures (Vol. VI, Chap. VIII) provides additional information about the use of real-time reporting in federal courts.

Digital audio reporting

Digital audio recording uses a computer-based system, working with sound system components, to create digital files representing spoken words. This is similar to making a tape recording of the proceeding, except that the sound is stored in digital form on computers and can be transferred to CDs. The principal systems are FTR Gold manufactured by FTR Ltd.; CourtSmart from CourtSmart Digital Systems Inc.; and CourtFlow from BCB Voice Systems, a division of Voice IQ, Inc.

The system is monitored by an electronic court recorder operator who creates a log including the name of the case, the names and addresses of the lawyers, and the name of each speaker. The operator may also record keywords in an examination. The log entries are keyed to the numeric count on the recorder and are synchronized to time stamps on the digital audio recording. The operator makes an index of the entries. All of the entries by the operator can be searched.

This system also has two levels of service. The first is simply a replacement for traditional analog audiotape recording systems and creates a more useful record. Storage of the record is easier, access to the record and playback takes less time, the system can be integrated with other digital systems, and the record can be transmitted electronically to court offices and transcriptionists. If operating correctly, the audio quality is higher than four-channel audio recording. This first level of service creates only an audio record, not a written transcript. However, it allows judges and counsel to take personal notes which are hidden and not published when the official transcript is prepared. These notes are searchable by the author along with the operator's notes.

In September 1999, the Judicial Conference approved digital audio recording as a means for taking the official record with the stipulation that funds over the cost of analog equipment would not be provided to the courts. This action was based on the recommendation of the Committee on Court Administration and Case Management and the findings of a 1999 Federal Judicial Center study of digital audio recording. The Guide to Judiciary Policies and Procedures (Vol. VI, Chap. XVI) includes guidance for courts in deciding whether to purchase a digital audio recording system and other information about its use.

The second level of service is in the experimental stage. It combines digital audio with speech recognition technology to produce a written record as well as an audio record. The output works in the same way as real-time reporting. As the testimony is given, the transcript scrolls down the monitors authorized to receive the output so that viewers can see the transcript as it is being created. A printed transcript can be created at any time that, like an unedited real-time transcript, contains errors made by the software in recognizing certain words. Speech recognition technology is currently not as accurate as real-time stenographic transcriptions because of software limitations in dealing with the speed at which people speak in a courtroom, the unusual terms they use in speaking about specialized subjects, and the various accents and dialects that may be present. However, lawyers may request permission from the court to bring this equipment into the courtroom for the purpose of having a real-time transcript available during trial, either because no certified real-time reporter is available or because the client cannot afford the currently-scheduled court reporter fees. The court should consider whether such a request is consistent with any local rule concerning the use of recording devices in the courtroom by parties and non-parties to the litigation, and if the court allows the parties to bring in the equipment, it should establish ground rules about the appropriate uses of the transcript and about who should have access to it. See the discussion about transcript uses on page 167.

Internet connections

Internet connections allow computers used in the courtroom to reach the Internet through an Internet service provider.

Court staff who work in the courtroom typically access the Internet through their building LAN connections. If these connections have been provided, the bench and staff locations will have been wired for this purpose.

Lawyers access the Internet through telephone lines at counsel table. For security reasons, lawyers cannot connect to the court's internal network and use the court's gateway to get to the Internet. The telephone lines may be standard lines of the kind that would also be used for voice communications, or special digital subscriber lines (DSL) optimized to carry data at high volumes. These connections may also be through cable or satellite depending on the particular circumstances of the court's location and wiring. The visible part of the connection is a small plug outlet (that may be built into the walls or furniture) like the standard outlets used in homes and offices. Some courts require that these lines be activated by the lawyer so that the lawyer is charged per minute by the telephone company for using the lines.

With an Internet connection at counsel table, lawyers can use E-mail and instant messaging for communications to and from their offices, do research, provide real-time transcripts to colleagues and co-counsel in distant locations, and receive needed materials from other lawyers, investigators, or experts. For example, an expert in an office in a distant city may watch the real-time transcript as the trial unfolds and communicate with the lawyer in the courtroom via instant messaging. The ability to tap into Internet-accessed legal research databases may be of assistance to the court as well.

Court reporters may use the internal system to communicate from the courtroom to their staff in another room in the courthouse, but use the same kind of external system as the lawyers use to reach their offices outside the courthouse. With an Internet connection at the reporter's table, the court reporter can transmit real-time tran-

scripts to support staff who are cleaning up words and phrases that the real-time database could not locate, and the Internet connection allows this process to move faster. The support staff can also communicate with the reporter in the courtroom to make adjustments to the vocabulary stored in the database so that the output will become even more accurate.

At times, courts have made Internet connections available so that media and legal Web sites can carry real-time transcripts to inform the public when the press of public inquiry requires. Judges need to consider the privacy interests of witnesses and parties when providing such access.

Level Three technologies

Level Three technology involves more esoteric (although not necessarily newer) equipment that can be enormously effective for certain kinds of presentations. It is often quite expensive, and its use needs to be examined carefully to determine if its benefits outweigh any negative impact on the courtroom and trial proceedings and the cost. Level Three technology is almost always brought in by a lawyer after securing permission from the court. This technology is not a part of court-funded programs.

IPIX displays

IPIX is a brand name for a system that produces a 360-degree photograph that can be rotated around a center point. It is one way to provide a panoramic view of a scene, place, or location. The display is usually shown on a computer monitor, and accompanies testimony about what the witness saw.

Virtual reality displays



Immersive virtual reality equipment can be configured cost effectively using a headmounted display permitting stereoscopic (i.e., 3-D) viewing of immersive virtual worlds.

When professionally produced animations are displayed using virtual reality equipment, the viewer feels as if he or she is “there.” By bringing the action so close to the eye, and cutting out most of the reference points that make the viewer feel separate from the action, the motion becomes “real.”

This kind of equipment is used for recreating scenes where it is important for the viewer to feel a part of the action. If compensation for fear, anxiety, peril, or the like are at issue, lawyers may want the jury to feel what the plaintiff or defendant felt. Virtual reality equipment comes the closest to that goal. Unfortunately it is so realistic that occasionally it induces motion sickness. Because a full recreation of the relevant scene (from the point of view of the people involved) is usually impossible, there remains a good deal of possibility for unfair prejudice.

Holograms

A hologram of the kind used as an evidentiary exhibit or illustrative aid in a courtroom is a three-dimensional image created by specially manipulated laser beams. The image seems to hang in midair. If done correctly, it is an exact replica of the real thing, shown in three dimensions. Motion can also be reproduced exactly. Equipment for producing this kind of hologram is bought primarily by the medical education market so that medical students can see parts of the body in full color and three dimensions without the need for an actual body.

An interesting aspect of the use of a three-dimensional display is the extent to which it makes clear that a two-dimensional display,

like a photograph or illustration, is in fact not an “accurate” representation of the real thing. Three-dimensional displays correspond closely to real life experiences because the human eye perceives three dimensions easily. Two-dimensional displays require interpretation to imagine what the thing being displayed looks like in real life. Much can be lost in this interpretation, so that two people looking at a single diagram may have different perceptions of the object portrayed in the diagram. That rarely happens when viewing the object itself because the third dimension adds considerably more information. This is the reason lawyers prefer, in most instances, to bring the real thing to the courtroom.

Large-scale video

Several types of special large-scale video setups may be brought to the courtroom for cases involving images of very large unfamiliar objects that need to be shown to the jury in large-scale in order to convey important concepts. The most common of these is a coordinated set of high definition television monitors usually called a video wall. These monitors are manufactured in cube shape with very little edge. They can be placed side-by-side and stacked one on top of the other. A video wall might consist of four rows and four columns but, given the modular connections, they can be any size. A computer controlled unit splits the image into the required number of pieces—sixteen in the example of an installation four cubes wide and four cubes high. Because the special casings have very little edge, the image on each cube combines with the images on all the other cubes to produce a very large single image.

A video wall can also be used for segmented displays. It might be



important to show what was going on at three or four locations at the same time in order to make a point about the effect that one action is claimed to have had on another. For example, one location can be shown on the first segment of the wall, another location can be shown on the second segment of the wall, a third location can be shown on a third segment, and explanatory material can be shown on a fourth. The screens at military war rooms and large security installations monitoring many entrances are examples of this type of large-scale video.

These are very large displays that will raise safety and esthetic concerns in a courtroom installation. They have been used successfully for very specialized purposes, but the court would want to understand from the installation specialist exactly how the setup is proposed.

Common problems

As lawyers become more knowledgeable about the effects of technology on the ability to present facts and arguments to judges and jurors, they raise more issues that may need to be resolved by the court. Almost all problems related to technology can be worked out informally following relatively well-accepted practices. The court's willingness to manage the process usually leads even the more contentious and less well-informed lawyers to find common ground. This section outlines the questions likely to arise. Parts II, III, and IV provide more detail about uses of technology during discovery, pretrial, and trial. Appendix C collects existing local rules with respect to courtroom technology, and Appendix D sets out sample pretrial order provisions for civil and criminal cases.

Discovery issues

During discovery, the principal issues revolve around one party's demands or the court's requirements for exchange of discovery materials in digital format. Counsel who is looking ahead to the pretrial and trial phases of the case will appreciate that obtaining documents, photographs, and video in digital format is a substantial advantage. This will minimize costs, increase efficiency, and allow more time for focus on the theory of the case and its presentation.

When demands are made for materials in digital format, subsidiary questions can arise out of the differing approaches of the parties to the use of technology.

- **Format.** Documents and photos can be put into a number of different digital formats—each of which have special characteristics that may make it easier or considerably more difficult for the opposing party to use. Videos have no format problem because one format is both the industry standard and the heavily dominant format in the field.
- **Compression.** Digital files are typically compressed so that they take up less storage space. Because there are a number of methods for compression, in some cases closely associated with the format used, objections may be raised to the choice made by one lawyer or another. Some compression methods discard data; others retain all data. Sometimes this has importance for litigation, but ordinarily it does not. As with format, these problems relate to documents and photos, but not to video, as all digital video uses the same compression method.
- **Resolution.** Digital versions of documents and photos can be produced at different resolutions. This may make it easier or harder to process documents so that they can be searched, and to display clear versions of documents and photos in the courtroom.

A second set of potential problems arises out of the ease with which digital documents, photos, and videos can be altered in ways that are very difficult to detect without an expert's examination. Some

alterations occur during normal processing and are usually unimportant for litigation purposes. Other alterations occur because a party wants to demonstrate a particular point. This is generally significant only if the alteration remains undisclosed.

A third set of questions involves the discovery of materials that are used in digital format—databases, CAD/CAM files, fax server files, PDA files, and digital voice mail files. Beyond the willingness and ability of the responding party to produce these materials lie issues about copying the data, access to the software necessary to search the data, and access to the data *in situ*.

Internet discovery repositories offer relatively low cost storage for large volumes of materials that will be accessed by numerous lawyers. When objections with respect to time limits and cost arise, the court may want to consider this alternative.

Part II contains additional details on these discovery matters.

Pretrial issues

In order to gain the benefits from the use of technology while maintaining fairness and a relatively level playing field, counsel may raise or the court may require counsel to consider questions with respect to disclosure, shared use of equipment, and making an adequate record with respect to electronic displays. Technology may also be involved in hearings by videoconference to save time and expense, using visual displays in presentations to the court during hearings, and educating the court on complicated scientific or technical matters.

Adequate disclosure is usually necessary to ensure that potential problems are disposed of well before trial.

- **Equipment.** The court needs to know about any equipment that lawyers plan to bring into the courtroom; and both sides should know about the plans the other has to make use of equipment already in the courtroom.
- **Software.** Most courtroom displays are powered by presenta-

tion software. There are a number of different software packages, most of which have some incompatibilities. To guard against problems with exchanges of digital exhibits at trial, each side needs to know what software the other is using. There is no lawyer work product involved in this information.

- **Exhibits.** Exchanges of exhibits in the format they will be used in the courtroom is essential to avoid squabbles about admissibility or use at trial. This is particularly true of photos and videos that can be digitally altered and animations that take a considerable amount of time to analyze in order to create a defense.

Shared use of equipment minimizes clutter in the courtroom and is usually easily accomplished if planning is done in advance. Cost sharing may also be important if one side brings equipment to the courtroom that the other side wishes to use.

When lawyers adopt display technology, the number of exhibits, particularly illustrative aids, often increases dramatically. Because many kinds of illustrative aids are drawn from evidentiary exhibits, but will not go to the jury room, the court will want to ensure an adequate method for making the record with respect to all the visual displays.

Part III has more information on these and other pretrial matters.

Trial issues

When the trial begins, the court will want to consider some additional steps to accommodate the use of technology.

- **Preliminary matters.** Representations from counsel as to testing, compatibility, and positioning of the equipment protect against appeal. Representations about the availability of backup in case of equipment failure avoids problems when the court insists on continuing with the trial even though some of the equipment is out of commission.
- **Jury selection.** The court may want to give attention to visual

acuity on the part of jurors (some may not be able to see the displays) and color blindness (even if they can see the displays, they may not be able to make out significant differences).

- **Jury instructions.** Putting preliminary jury instructions onto the display screens makes it easier for the jurors to understand and remember the instructions. The court's instructions can be presented from a word processing file or can be put on a set of simple presentation slides for use with a laptop. Another alternative is to have the instructions copied onto sheets for use with the evidence camera.

The distinction between evidentiary exhibits and illustrative aids becomes more important because the use of courtroom display equipment usually causes illustrative aids to proliferate. In some trials, more than half of the things shown to the jury will be illustrative aids. Considerable importance attaches to the principles applied to deciding what is an evidentiary exhibit and goes to the jury room when the jury retires and what is an illustrative aid that is not "evidence" and does not go to the jury room.

Objections may be made to evidentiary exhibits shown with digital displays.

- **Completeness.** Parts of documents may be deleted, photos may be cropped, and digital video may have parts excised.
- **Unfairness.** Documents and photos may be resized and reshaped, and still frames may be extracted inappropriately from videos.

Objections to illustrative aids shown with digital displays are likely to be somewhat different from those made when illustrative aids are used in hard copy.

- **Unfairness.** Labels, text treatments, colors, motion, sound, positioning, intervals, and repetition may give rise to sustainable objections based on unfairness.
- **Leading.** Displays may have content or markings that will lead the witness in reciting testimony.
- **Argumentative.** Illustrative aids that support an opening state-

ment or lay witness testimony may be argumentative either in wording or in the design of the graphic.

- **Narrative testimony.** Presentation software can embed in a single slide or group of slides an “autoplay” function that, once the slide is activated, continues to reveal new material as the witness goes along.
- **Assuming facts not in evidence.** Under the changes made to Rule 703, effective in December 2000, the court should rule on the admissibility of facts or data relied on by an expert before the facts are displayed in an illustrative aid.
- **Foundation (unsupported opinion).** The displays used by experts may stray from the basis the expert has to offer testimony.
- **Lay opinion.** The titles, labels, or text on slides used with lay witnesses may be objectionable under Rule 701.

Digitally altered photos and complicated computer animations, when offered as illustrative aids, may raise other objections.

Part IV provides detailed supplemental information on these items and information on final jury instructions, jury review of computer-generated materials, computer-generated illustrations in briefs, and digital format briefs.

Summary of experience to date

A great deal has been learned about courtroom technology, particularly in the past 10 years as it gradually emerged in more and more places. Some of the early concerns about the use of display equipment in the courtroom have diminished as more judges and lawyers have gained first-hand experience. This section summarizes the experience to date with respect to the most frequently asked questions about the impact of new equipment in courtrooms. Appendix E lists resources for more information, and the bibliography lists publications relevant to this experience and court Web sites containing information about courts’ equipment and practices.

Court-provided equipment vs. lawyer-provided equipment

Courtroom technology installations can be either court-provided or lawyer-provided. Some installations are court-provided in part, supplemented by equipment that is lawyer-provided. Any judge, regardless of whether he or she is sitting in a technology-equipped courtroom, may be faced with any of the questions, concerns, issues, problems, and uncertainties described in this book. There are no significant differences in technical capability for a given trial between court-provided equipment and equipment that one side or the other rents (or owns) and brings to the courtroom. Everything that a court might provide can also be rented and set up efficiently in a courtroom that has no technical capability beyond electrical outlets (although permanent, custom audio-visual systems may be better suited to specific courtrooms and more desirable from a systemic point of view). A court that does not have its own equipment may decide to encourage lawyers to bring in equipment from the outside in order to cut a projected four-month trial to a two-month trial. Judges faced with a trial that promises hundreds of documentary exhibits may urge lawyers to cooperate and share in the rental of the necessary equipment from a local audio-visual equipment vendor. Even in smaller cities, these vendors normally will have all the necessary equipment or can get it from elsewhere on short notice.

Mandatory use vs. optional use

Some courts with technology installations require lawyers to use the equipment. Estimates vary, and no scientific research has been completed, but nearly all judges who use technology agree that it cuts trial time by a significant amount. Most also agree that it helps juror comprehension of complicated issues. With these benefits available, some judges believe that lawyers should not be allowed an election to use older methods in document-heavy cases. One judge uses a 10-document cutoff—if the case involves more than 10 documentary

exhibits, lawyers are required to use the display equipment for these exhibits. The judges who impose these rules report that after the initial “mandatory” use, lawyers become believers because the technology is so much more efficient than older methods.

Other courts with equally capable technology installations allow lawyers to select either newer or older methods, or a mix. These courts reason that some lawyers, particularly those who have been in practice for many years, may be disadvantaged by a requirement to use technology. Their personal styles may not fit with the electronic displays, and they may be more comfortable relying on oral persuasion. Some cases do not require many visual displays or documentary exhibits, and the lawyers are in the best position to know which cases would benefit from technology and which would not.

Court control vs. lawyer control of equipment

In some technology-equipped courtrooms, a court official—the deputy or bailiff—controls the equipment that presents displays. The lawyer indicates which exhibit should be displayed, and the court official operates the controls to make the display appear. In other courtrooms, the lawyer controls all of the equipment except the kill switch used by the court when an objection is raised. The lawyer may use an equipment operator to keep track of exhibits and bring the right one to the screen at the proper moment, or the lawyer may operate the controls directly. Some judges have a middle approach in which the court and its personnel control some equipment, such as video cameras and the sound system, while lawyers control other equipment, such as the evidence camera, the displays driven by computers, and the video printer.

Some judges who require lawyers to use the court-owned equipment in order to gain the benefits of shorter trial time and better juror understanding believe that court control of the equipment is a fairer way to overcome the inevitable disparities in the ability of counsel to cope with these new circumstances. Having court personnel

operate the equipment eliminates certain advantages that knowledgeable counsel may have, and the jury may have a more neutral view about the use of equipment if someone under the control of the court operates it. One judge who uses this method requires lawyers to provide the courtroom deputy with a CD containing the exhibit files and a bar coded sheet listing each of the exhibits. During trial, the lawyer tells the courtroom deputy what exhibit should be displayed, and the deputy uses the court's presentation software to bring it up, highlight the relevant sections, or to zoom in when necessary. Usually lawyers consult with the deputy ahead of time to give a sense of what is important and what they expect to be done in presenting the exhibits. The deputy estimated about 16 hours of training is required for courtroom deputies to learn the basics of the presentation software to be able to support this capability.

On the other hand, lawyer control of the equipment allows more personalized timing in the presentation of exhibits. Such timing is important as displays become more sophisticated, particularly in opening statements and the direct and cross-examination of expert witnesses. The controls are relatively easy to learn and, if the courtroom is made available for after-hours practice, most lawyers should have no trouble learning how to operate the equipment effectively.

Criminal vs. civil proceedings

Most of what appears in this guide applies to criminal and civil cases in the same ways. As courtroom technology becomes more widespread, criminal cases are increasingly likely to be managed in the same way as civil cases. Discovery issues are different, but the pre-trial and trial considerations are largely the same. Two areas (other than discovery) require different considerations in criminal cases.

First, videoconferencing raises concerns among criminal defense lawyers. When clients are appearing via videoconference from a prison on arraignment or sentencing matters, defense lawyers believe they need to be with the client but also need to be in the courtroom if the

prosecutor is appearing in person. This raises the prospect of a manpower drain on defenders because two lawyers are needed instead of one. Defenders are also concerned about the possible “dehumanizing” effect of having defendants appear by videoconference from a prison facility. Having witnesses (other than those called by the defense) appear via videoconference at trial, they believe, raises constitutional concerns. The Judicial Conference is currently considering amendments to the Federal Rules of Criminal Procedure related to the use of videoconferencing.

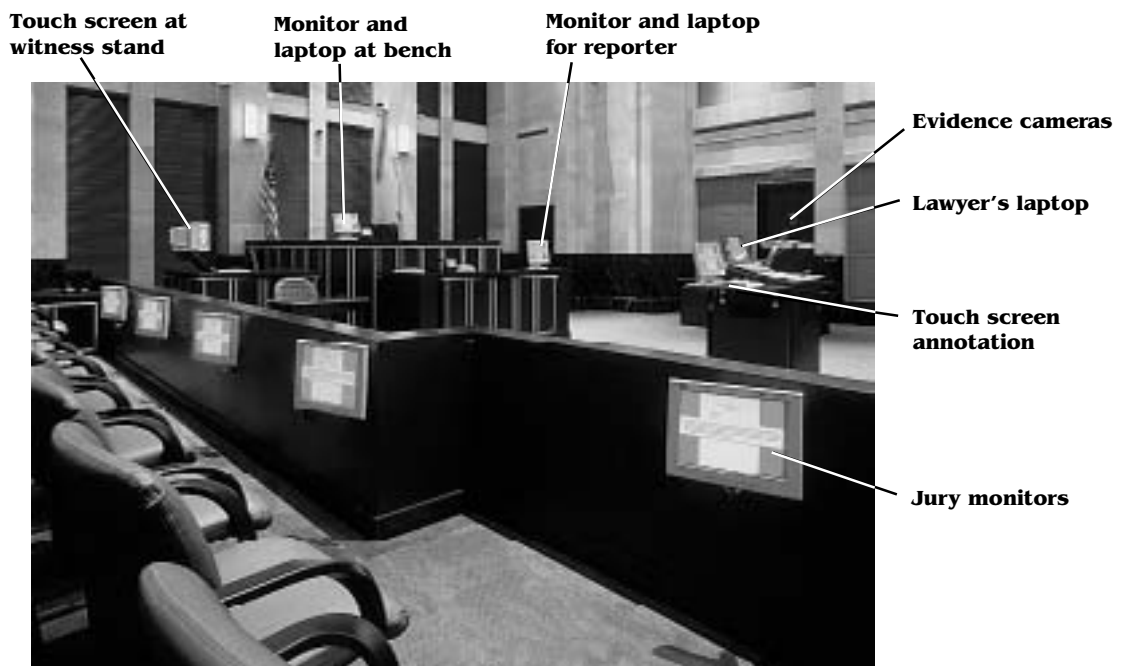
Second, when prosecutors have hardware and software to present the government’s case, Criminal Justice Act panel lawyers may need equivalent hardware and software, and may request the court to order the government to provide it. In cases in which these requests include hardware and software costing more than \$300 or computer systems and automation litigation support personnel and experts estimated to have a combined cost of more than \$10,000, the CJA Guidelines require panel attorneys to consult with the Administrative Office’s Defender Services Division prior to applying to the court. The division makes recommendations to the court (to be included in the panel lawyer’s motion) to ensure that the equipment and services purchased by the government are suitable and cost effective. A model order is included in the Guidelines.

Appearance of the courtroom

Courtrooms should project a certain gravitas. The space should maintain the atmosphere of a serious and contemplative undertaking. The use of technology can accommodate these requirements. Technology fits reasonably well into most courtrooms. If properly installed, the equipment and wiring can advance, rather than detract from, the traditional look and spirit of the courtroom by making the space more functional.

Each configuration of bench, witness stand, jury box, and counsel tables presents some design challenges for incorporating monitors or

projection screens, but the dignified and functional atmosphere of the courtroom need not change at all. Very small courtrooms usually do not have space for large monitors or a projection screen outside the jury box, and they will be better served by small monitors inside



the jury box. On the other hand, very large courtrooms may be well served by a projection screen placed near the witness stand so that jurors' attention is more focused. Most of the technology components have sufficient flexibility to accommodate design requirements across quite a wide spectrum while maintaining the essential decorum of the courtroom.

Cost considerations

As technology began to appear in more and more courtrooms, many lawyers and judges were concerned about the David vs. Goliath situation in which the financial resources of one side might weigh too heavily on the outcome of the trial. However, the cost barriers to successful use of courtroom technology have become readily surmountable. Even if the court has no equipment of its own, the basic Level One technology components are available for a relatively low cost, either through rental for one-time use or purchase if the advocate reasonably expects to participate in more than one trial per year in which equipment will be used. The training and experience barriers to using the basic technology components are also relatively low. Computer technology is an important part of most law practices for writing, research, filing, and communication. Extending the lawyer's grasp of technology to the equipment required for courtroom presentations is not a long stretch. For example, for a lawyer who has used an overhead projector, the orientation to the use of an evidence camera is quite short. Even for a person who has never used equipment of any kind in a courtroom, the evidence camera's controls are not hard to master. For a lawyer who uses a computer in the office, the orientation to the use of a laptop computer to control the display of exhibits in court is also quite short. Once displays using presentation software have been loaded on a laptop computer, finding and displaying a particular exhibit requires pressing only one or two keys or other controls.

Courts may assist in the training process by making the courtroom available for practice sessions either with the court's installed equipment or equipment that the lawyer plans to bring to the courtroom. For first-time users, regardless of how much trial experience they have, practice is the key to success. Using the equipment in a law office setting is invariably quite different from the demands of the courtroom setting. This is particularly true if the court-installed equipment has different controls. Courts should work with the bar so that lawyers are comfortable with the technology. Knowledgeable court

personnel can help with a general orientation for the bar to the equipment and instructions on its use. The court can put instructional information on its Web site. Some courts have produced training videos to help lawyers understand what is involved in using the technology effectively and at pretrial conferences give copies of the video to lawyers who have trials scheduled in the courtroom. General court-sponsored training in courtroom presentation systems is useful.

Attorneys who invest more time and effort to acquire courtroom technology skills will have more capabilities; this is no different from any other trial skill. The National Institute for Trial Advocacy provides training courses in particular federal courts for those who will practice there, and also provides public training programs covering the use of common courtroom technology. In both types of courses, lawyers can work with equipment in presenting arguments and examining witnesses. A list of these courses is available on NITA's Web site, www.nita.com. Books are also available for help in acquiring the skills to use courtroom technology effectively.

A level playing field

In one sense, there has never been a guaranteed level playing field in a courtroom. An experienced, able lawyer is likely to do a better job for the client than a recently minted law school graduate who has never tried a case. A lawyer with an excellent command of the language probably can explain things to a jury more effectively than someone with poor language skills. Technology has not changed this situation; it has only made the variations occur across a wider spectrum.

In another sense, technology leads almost inevitably to a democratization of the profession. As costs come down, there are fewer "have nots." The retail availability of most components for creating and displaying courtroom visuals means good access across the profession to the necessary tools. The Internet offers online graphics and technical services for most kinds of displays that lawyers use.

Access to technology is only partly a function of financial resources. It is also directly related to the initiative of the lawyer in gaining the education and training needed to use technology effectively. Access is also related to diligent research to find inexpensive alternatives that serve as functional equivalents to what the opposing lawyer may be using. Initiative and research have always been thought to be the responsibility of individual lawyers in offering quality representation to clients. These factors permeate the practice and affect facility with technology just like they affect facility with writing, speaking, arguing, and examination.

Most aspects of the level playing field can be handled readily by judicial management. An effective pretrial conference can introduce all parties to the idea of the use of technology, overcoming the problem that lawyers may have had little or no experience with the use of these valuable resources. Judicial management at this point might result in the parties using technology for document production, depositions, pretrial hearings, and trial displays. The court also has the opportunity to keep the playing field level by advising the parties with respect to the availability and use of equipment and how it would be shared during trial preparation and at the trial. Well-understood ground rules motivate lawyers to use courtroom technology.

Juror perceptions

Jurors who come into a technology-equipped courtroom are usually comfortable with the surroundings and do not find the environment unusual at all. Some jurors have large-screen enhanced television receivers at home and have no difficulty accepting high-quality equipment for the purpose of displaying important evidence. Although the equipment in the courtroom is different from the home and office electronics with which most jurors are most familiar, the analogies are apparent and easy to understand. The equipment for visual displays makes it appear to jurors that what is about to go on in the courtroom will be informative and easy to understand. Moreover,

extensive use of courtroom technology is often the norm in highly publicized trials, so the jurors may have seen exhibits being displayed on monitors and projection screens, computerized playback of video depositions, evidence cameras, and real-time reporting in action.

An interesting parallel to the use of courtroom technology occurred at the *New York Times* in the late 1980s as its editors began to wonder how to compete over the din of television. A study revealed that readers did not actually read the *Times* the way everyone at the paper assumed they did. As recounted with amazement by Max Frankel, then serving as executive editor, rather than plowing through the erudite and lengthy stories that began on page 1, *Times* readers “thumbing through the paper stopped primarily for eye-catching elements like photos, maps, graphics, and headlines. Only if seized by one of these distinctive elements might they then glance at a related article.” Frankel’s autobiography goes on to recount how “computer graphics could often portray events more succinctly and vividly than either words or photos,” a realization that led to the use of graphics displays even on page 1, such as when Interstate 880 collapsed during the San Francisco earthquake of 1989 and the World Trade Center was bombed in 1993. The rationale for the use of graphics by the *Times* for its readers mirrors the reasons why jurors gravitate toward graphics when they survey the evidence that is presented to them.

Jurors become more involved in the proceedings when they can see the exhibits clearly and follow the lawyers’ presentations more easily. Properly presented displays on monitors allow jurors to read at their own pace without embarrassment rather than passing an exhibit from hand to hand without time to study it. Jurors also appreciate the generally faster pace of trials using technology. They become impatient when lawyers spend time digging through piles of paper looking for exhibits. Some experts believe that jurors who have seen electronic displays work better as a group because they all experienced the trial “together” and are more likely to have a common understanding of the evidence. Oral presentations unaided by visual

displays require jurors to develop a mental picture of key facts, and those mental pictures may vary widely depending on juror experience and education. In addition, some jurors can deal with descriptions like “the location at the northeast corner of Fifth and Main,” or “proceeding in a direction from southwest to northeast,” but others find these verbal descriptions confusing. When visual displays are used, deliberations in the jury room may be more focused and less likely to result in irrevocable splits among factions.

One negative factor about juror perceptions with respect to the use of technology is that they may expect more than the lawyers on either side can deliver and may view some of the court’s equipment as outdated. Television watchers are accustomed to slick graphics displays. Even the weather commentator usually has better, or at least more interesting, graphics than one sees in a courtroom.

Efficiency for the court

Good technology installations make court proceedings more efficient. Judges have more flexibility to impose time limits on lawyers because technology assists in making presentations move along more predictably. Lawyers can complete openings, closings, and direct and cross examinations in less time than it would take using paper documents supplemented by enlargements or illustrations propped on an easel. Electronic display allows exhibits to be previewed quickly on the monitor at the bench when objections are raised. If an exhibit is needed, the judge can ask to have it brought up on the monitors. That happens very quickly because the computer search to find a particular exhibit is many times faster than a manual search among pieces of paper. Technology installations also can make cross examinations go faster because there are no long pauses to find the page and line in deposition transcripts, and video clips eliminate quarrels about whether what appears in print captures what was actually said.

Each piece of equipment makes a contribution to efficiency. The

court's kill switch makes interactions with the jurors more efficient because the juror monitors can be turned off instantly, and the exhibit will not be displayed for the jurors again until the monitors are switched back on. Real-time transcription frees judges from detailed note taking so that full attention can be focused on what is taking place with the witnesses, lawyers, and jurors. In the event of a contested objection, it also allows the court to look at the pending question or just-uttered answer to see exactly what was said. Videoconferencing gives judges the flexibility to conduct pretrial hearings from remote locations or to schedule the testimony of witnesses at remote locations to fit the trial schedule.

Faster pace for the lawyers

A trial in a technology-enabled courtroom moves at a faster pace and usually takes less time than a trial by traditional methods. Explanations in opening statements and closing arguments can be shorter when accompanied by illustrations and graphics displayed without effort by tapping computer keys or putting materials on the evidence camera. The CD that comes with this book includes examples of illustrative aids on slides that dramatically cut the amount of time needed to explain a concept or fact situation. In the courtroom, exhibits are displayed without the sometimes lengthy pauses for approaching the bench, handing copies to opposing counsel, and passing the exhibit hand-to-hand among the jurors. Examination and cross-examination of witnesses move faster because the annotation tools allow lawyers and witnesses to point to and mark images on the computer monitors without leaving the podium or witness stand. With exhibits displayed readily and the capability to mark the point of focus in a question or answer, there is less unproductive back and forth between lawyer and witness.

With real-time reporting, objections are heard without waiting for the reporter to go back through steno notes to find the place where the relevant passage begins and then reading it aloud. The audio

system can direct the conversation between the judge and lawyers to earphones at the reporter's workstation, so the reporter does not have to get up and move the steno equipment to the bench for conferences out of the hearing of the jury.

This faster pace puts a premium on lawyers' preparation because there are fewer lulls in which to catch up. The case theory needs to be clear and well defined. A fuzzy case theory does not fare well when the focus is on efficient displays and explanations. All of the exhibits must be identified and organized before trial so that digital files can be assembled and stored on the laptop computer to be taken to court. Most of the illustrative aids to be used with the opening statement and the direct examination of witnesses need to be prepared before trial so that they are consistent with and support the case theory.

Effects of technology failures

When electronic equipment is installed in a courtroom, every component is subject to some chance of failure. Most components provide thousands of hours of trouble-free service, but the prospect of failures causes concerns. In fact, electronic equipment failures are very similar to every other kind of failure that occurs in a courtroom—failure of a witness to show up, failure of a lawyer to find the right exhibit, failure of communication between a lawyer and a witness, excusing a juror and seating an alternate, and so on. Nothing spectacular occurs when electronic equipment fails. If backup equipment is available, the proceeding goes on as before. If not, the traditional methods using paper copies reappear.

Jurors are not particularly affected by technology failures unless the court and lawyers are anxious about it. Everyone knows that occasionally equipment does not function, and the normal expectation is that after the proper repairs the equipment will start functioning again, so there is nothing to worry about.

The effects of most equipment failures are ameliorated immedi-

ately by either backup or redundancy. The most important factor in this regard is adequate planning. Management by the court can ensure this happens. For example, one of the very few components that can fail on an evidence camera or projector is a light bulb. If this is courtroom equipment, the court staff should have a spare on hand. If it is equipment brought to the courtroom by a lawyer, the prudent lawyer will have a spare bulb within reach. Another common occurrence is an occasional computer crash. A backup of all the files on an external disk assures that the lawyer will be able to recover quickly. A less likely example is a monitor failure, in which case a standard overhead projector on which the lawyers put acetate transparencies can serve as a temporary backup. This is also a potential backup if the evidence camera or projector goes down.

Many potential failures can be avoided, particularly when lawyers bring equipment to the courtroom, by allowing adequate time for set up and testing. Sometimes equipment does not work when connected to other equipment. A laptop may fail to transmit images to a projector that is different from the one the lawyer customarily uses. Pretrial testing and practice in the courtroom should overcome most of these difficulties. Obtaining representations from the lawyers about installation, testing, compatibility, reliability, and positioning of equipment also helps focus the lawyers on preparation.

Rule 102 – Purpose and Construction

These rules shall be construed to secure fairness in administration, elimination of unjustifiable expense and delay, and promotion of growth and development of the law of evidence to the end that the truth may be ascertained and proceedings justly determined.

Rule 611(a) – Control by court

The court shall exercise reasonable control over the mode and order of interrogating witnesses and presenting evidence so as to (1) make the interrogation and presentation effective for the ascertainment of truth, (2) avoid needless consumption of time, and (3) protect witnesses from harassment or undue embarrassment.

Guidance from the rules

The Federal Rules of Evidence offer only the broadest guidance with respect to the new methods and techniques brought to the courts along with new technology. The policy requirements most often applied to illustrative aids are found in Rule 102 and Rule 611(a). Rule 102 invites judges to allow new forms of displays that help develop better juror understanding of the evidence and move trials along more efficiently. Rule 611(a) asks only that in exercising their discretion, judges be mindful of whether the illustrative aids brought to the courtroom by lawyers are effective for the ascertainment of truth. As the use of illustrative aids grew enormously, the rules remained

focused on evidence, not illustrative aids, and the use of the new technology remained committed to the court's broad discretion.

In the early 1950s, California lawyers first brought blackboards into the courtroom and created instant visuals by writing with chalk as they talked. Flip charts balanced precariously on three-legged easels soon followed. Large exhibits propped on easels began to make substantial contributions by the mid-1970s when developments in the technology for printing enlargements in full color brought these exhibits into a reasonable price range. And in the 1980s large screen television monitors made available video presentations on laser disks controlled by bar codes.

The concept of the "illustrative aid" expanded generously alongside these developments. It came to be defined as a visual display for the purpose of assisting a witness in presenting or the jury in understanding the testimony. The requirements under Rule 901, when used by analogy for illustrative aids, generally posed no barrier to their use. The standard foundation came to be an exchange between lawyer and witness along these lines.

Question: "Directing your attention to what has been marked as Exhibit 17, do you recognize that?"

Answer: "Yes, it is a series of slides about my work on the project."

Question: "Would the use of Exhibit 17 assist you in explaining your work on the project to the jury?"

Answer: "Yes."

The illustrative aid would then be brought out, put on the easel or television screen, and the witness would explain it. Because these illustrative aids were "set pieces," so to speak, and could not be readily altered, they had to be prepared well in advance of trial and usually involved considerable time and expense. They rested relatively demurely in one place in the courtroom, and attention was directed at them from time to time. The circumstances dictated restraint.

Digital technology changed all that. The new digital monitors attract, and indeed demand, attention for the same reasons most ju-

Rule 901 – Requirement of authentication or identification

(a) General provision. The requirement of authentication or identification as a condition precedent to admissibility is satisfied by evidence sufficient to support a finding that the matter in question is what its proponent claims.

rors like to watch television. The new powerful laptops meant that hundreds of potential illustrative aids could be brought to court in one small box. Advances in presentation software gave lawyers the capability to create illustrative aids at very low cost and to change them at any time with virtually no attendant expense. The vastly expanded capacity to display concepts, themes, and theories on brilliantly colored and attention-demanding screens caused lawyers to focus considerable ingenuity on illustrative aids, and these exhibits muscled their way to the front lines. Documents are still admitted in evidence. But jurors learn what they mean through illustrative aids. A page of text is enlarged, colored boxes appear to focus attention on the point to be made, callouts pull the relevant lines from their setting in a paragraph and enlarge them even more. Photographs are still admitted in evidence. But when they appear on the screen, they are cropped, labeled, outfitted with directional arrows, and meshed into the proponent's case theory.

Rule 403. Although relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence.

Courts sometimes use the formulation of Rule 403 in dealing with objections to illustrative aids. Rule 403 allows the exclusion of otherwise admissible evidence. Illustrative aids normally cannot qualify as evidence; they have nothing to do with whether the existence of any fact of consequence to the determination of the action is more or less probable. They are solely for the purpose of helping the witness convey information to the jury in an understandable fashion. If an illustrative aid could be excluded under Rule 403 because its prejudicial effect substantially outweighs its value, then it should be excluded. However, illustrative aids can be excluded, even if the prejudicial effect is not so substantial as to reach the traditional threshold of Rule 403, because they are supposed to be useful and cannot serve that purpose if they do not convey information clearly without attendant distraction, unnecessary emphasis, or needless cumulative display.

Other rules give judges few benchmarks on how to apply principles of fairness to labels, text treatments, colors, motion, sound, positioning, intervals, and repetition in illustrative aids—all of which

Part One: Courtroom Technology: An Overview

can be made a legitimate part of the jurors' task of learning about the case facts, and all of which can also be stretched well beyond the bounds of fairness.

Parts II, III, and IV of this guide offer practical suggestions with respect to judicial management of courtroom technology and its many manifestations in the discovery, pretrial, and trial processes.

Part II

Discovery

Technology decisions permeate the discovery process. For that reason, this part deals with technology implications for discovery separately from technology considerations that can be important during the remainder of the pretrial process. This part covers the following:

- **General problems in discovery involving technology:** the factors of cost, lack of knowledge, time, and flexibility that may cause parties to fail to reach voluntary agreement on discovery matters.
- **Discovery of documents:** factors to consider in requiring parties to exchange documents in digital format; questions that may arise with respect to the various types of formats available; and the alteration of documents that may occur when they are converted to digital formats.
- **Discovery of photographs:** factors to consider in requiring parties to exchange photographs in digital format; questions that may arise with respect to the various types of formats available; and the alteration of photographs that may occur when they are converted to digital formats.
- **Discovery of video:** factors to consider in requiring parties to create and exchange video in digital format; concerns with respect to synchronization of deposition videos; and alteration of digital video as it is being created.
- **Discovery of digital format materials:** databases, CAD/CAM files, fax server files, PDA files, and digital voicemail; and the alteration of digital format materials that occurs in normal business processes.
- **Internet discovery repositories:** methods for making exchanges of discovery materials in digital format less costly and time consuming.

This part is intended to serve as a resource with respect to the matters that may be raised at a Fed. R. Civ. P. 16 conference and, for

that reason, the discussion goes into detail at some points where generalizations do not help judges understand or resolve the questions presented in a particular case. Each section is designed to stand alone so that a judge who, for example, is faced with decisions about text documents but not photos or videos, can use the section on documents without needing to refer to other sections.

General problems in discovery involving technology

Judges should explore the uses of technology for discovery with the parties and lawyers at an early pretrial conference. Most differences can be resolved by the lawyers or their technical staff if they tackle the problems at an early point in the proceedings, before either side is heavily invested in one approach over another. In the absence of control by the court, problems may arise down the road. For example, in some cases, technology issues surface during discovery when one side finds out that the other side is not going to deliver digital files or that the digital files have been delivered in a format not readily usable by the recipient. In other cases, the technology questions remain submerged until later in the pretrial process when one side accuses the other of spoliation because routine digital file management practices remained in place after the complaint was received, and computer files have been deleted. Technology disputes that could have been resolved at an early stage may appear at trial when one side accuses the other of having changed a document by using software that removes marks, or objects to the use of a duplicate because of the computer processing steps between the original and the version that appears on the screen. Most of these problems have common roots.

- **Cost.** Some of these problems are simply matters of cost. The advocate who needs to minimize costs will try to anticipate

Part Two: Discovery

technology needs that will arise later in the case and obtain discovery in digital formats that are less expensive overall. The advocate whose client wishes to settle may seek to make it as costly as possible for the other side to pursue the litigation. The advocate who is risk averse may seek out all possible information in order to make the best possible assessment of the legal risks to the client. These are very familiar considerations for the courts even when no technology is involved. Technology simply adds more cost considerations for both lawyers and courts.

- **Knowledge.** Other problems are caused by a lack of knowledge, which may occur on one or both sides. Lawyers often do not know how their clients actually use computers on a daily basis, so the lawyers do not know what is available in digital format. Similarly, lawyers usually do not know about the difference between a digital document and its printed version. Both of these factors can lead to accusations that the lawyer is trying to hide discoverable information. Lawyers who do not know how ordinary software processing of documents changes them may not have any ready answer to an opponent who objects down the line. Lawyers who are not on notice about disclosure of digital alteration of photographs may not give sufficient instructions to experts and others who work with photographic displays for the case. Experts may tape over the original “takes” of a key videotape, thus destroying the prior version. In any of these instances, an opponent may later claim spoliation.
- **Time.** Some concerns involve speed and efficiency. Courts may want to set out ground rules governing the use of technology simply to make the pretrial and trial processes move more efficiently. Pretrial rules or procedures may place considerable premium on the ability to meet deadlines. The advocate who can use technology to meet these deadlines with ease is less readily put on the defensive before the court during the discovery phase and has more time to prepare for trial.
- **Flexibility.** A smaller segment of problems relates to the usabil-

ity of material for courtroom displays. The format in which something is produced during discovery may affect the flexibility with which it can be used at trial. A digital photo that is delivered in a relatively small file may appear very fuzzy when it is projected onto a 10-foot screen. A computer animation that is delivered on a videotape without the underlying computer files cannot be revised to illustrate the effect of assumptions different from those that governed the creation of the animation.

Missteps by lawyers using technology during discovery can cause the court to waste time hearing and resolving disputes that could have been avoided entirely. In nearly every case, if the court either mandates a particular approach in a pretrial order or raises potential problems in order to obtain representations from the parties, the downstream problems disappear.

Discovery of documents

More on documents

Part III, page 106, Disclosure of digital alteration of documents

Part III, page 120, Evidentiary exhibits and illustrative aids

Part IV, page 180, Objections to evidentiary exhibits

Documents must be in digital format to be used with a computer retrieval and display system. This requirement leads parties to try to get the documents in the most efficient digital format during discovery and, in turn, sometimes generates arguments about format, compression, sharing expenses, and alteration of documents during normal digital processing. The gain in efficiency is very great, so the court may want to spend some time at the early discovery stage anticipating and avoiding later disputes. The principal aspects of these subjects are set out below.

Requiring parties to exchange documents in digital format

When a case involves discovery of a significant number of documents, lawyers likely will consider exchanging the documents in digital format. For some lawyers, this threshold is 1,000 pages of useful

documents; others may go as low as 100 pages. If the parties do not agree to such an exchange themselves, the court may want to require it.

Most documents, over 90% by some estimates, originate in digital form. Lawyers have a propensity to ask for, and to look for, paper documents. Their clients obligingly print out paper copies of digital documents for review and production. This creates a wasteful and time-consuming paradigm: digital material is printed into hard copy, reviewed and produced; then both sides may turn the hard copy into digital format again so it can be searched and presented using display equipment at trial. If digital materials will be used at trial, then every effort should be made at the dawn of discovery to seek out and exchange the true “originals,” which are digital files rather than their paper manifestations. Discovery may proceed more smoothly, with fewer disputes and requiring less time overall, if documents are exchanged in their “original” digital format at the outset. This reduces cost and reduces the opportunities for problems arising out of conversion. Digital files can be searched without further processing, thus eliminating the substantial cost of processing with optical character recognition (OCR) software. The most common categories of documents that originated in digital format and may also exist as paper copies are the following:

- **Word processing files.** Copying text files is a straightforward task under most circumstances. In addition to the text, word processing files may include the edit, control, and version histories of each document.
- **Spreadsheets.** The electronic versions reveal the formulas that make the spreadsheets work (which the paper copies do not) and may also reveal links to underlying raw data. These are usually in a format that is relatively easy to identify and copy.
- **Presentations.** “Slide shows” used for various purposes contain quite a bit of corporate information. Marketing presentations can be particularly good sources to learn about what a company says a product does, how it is unique, or what its

specialty in the market is supposed to be. These are easy to copy.

- **Electronic mail files.** In corporate settings, E-mail is often stored in a database that contains individual mailboxes for dozens or hundreds of users. Extracting individual messages from backup tapes may not be a function normally supported by the software. Typically entire mailboxes are restored and produced.

Occasionally lawyers seek to turn these documents into paper copies and to produce the paper copies rather than digital copies because the digital versions have what is called “meta data” associated with them. Meta data include information such as the identity of the creator of the document, the date on which it was created, the contributions that were made to the document by others, and similar information that would not accompany a paper copy.

Other categories of digital materials—those typically used in digital format and not reduced to paper copies—present somewhat different problems and are discussed at page 93 below.

Even if the parties agree on (or the court requires) production of word processing files, spreadsheets, presentations, and E-mail files in digital format, lawyers will demand production of non-identical paper copies because they are looking for handwritten notations, underlining, routing notes indicating who received the paper copy, and other marginalia. There will also be some documents that originated in hard copy. This is usually a much smaller subset of the documents, and searches for this subset can be done relatively expeditiously.

These documents raise another issue for the parties and the court, which is whether these paper copies will also be delivered in digital format. When paper copies are produced, the process for putting documents into digital format (called “scanning”) is very similar to the process for making paper copies. The documents must be prepared by removing staples and paper clips, smoothing ruffled pages, and putting separator sheets between the end of one document and the beginning of another. Once prepared, pages are run through a

scanner (which often looks and operates like a small copier). The time for the preparation and scanning is normally the same as the time for preparation and copying a set of documents. No lawyer work product is involved in this process. Demands to inspect originals can then be dealt with later if adequate justification is presented.

The principal benefits of using documents in digital format are:

- **Storage and handling efficiency.** One CD holds approximately 18,000 pages, depending on the format in which the documents are stored. The normal storage box holds about 2,000 pages, so each 4 ounce CD takes the place of nine boxes of paper that can weigh a total of 320 lbs. Paper records stored in boxes may be lost, damaged, misfiled, and restapled incorrectly. Using a CD minimizes these errors, errors which often lead to time-consuming disputes during litigation.
- **Document numbering.** Although the traditional hand stamping of numbers (also known as “Bates stamping” after the inventor of the device) on each page of discovery documents is not necessary in a digital process, some lawyers still find document numbering helpful. Documents in digital format can be numbered using software. Using this method to “stamp” documents with identification numbers is very fast, much less expensive, always produces a legible number, and does not change the originals. The automated process prevents duplicate numbers. It also eliminates gaps in the production numbering because privileged documents can be pulled after the electronic numbering process and the images can be renumbered sequentially.
- **Copying.** Documents in digital format can be copied quickly, less expensively, and with better quality. It can take days or weeks to make multiple paper copies of large numbers of documents. Even if paper copies must be converted to digital format, the benefits of working with digital documents are substantial. When a copy of a full CD is made, for example, about 18,000 pages are copied for about \$2.50 in 15 minutes or less.

Every copy is as good as the scan of the original because digital copies do not degrade as copies of copies are made. The hardware and software for making and copying CDs is inexpensive (in the \$300 range), and, for those who do not own the capability, commercial services are widely available.

- **Documenting exchanges.** The exchange of documents can be “frozen” and documented. A “read-only” CD, sometimes designated CD-R, can be created with files containing discovery documents. Once made, it cannot be altered. (Note that there is another kind of CD, called “rewritable,” or CD-RW, that can be altered.) The material on a read-only CD can be copied and transferred elsewhere, but the CD and its contents remain in the original state. When documents are delivered on a read-only CD, there is rarely a question about whether a particular page was turned over. The page is either on the CD or it is not. The court can inspect the CD as readily as the parties can.
- **Foundation and authenticity.** Some litigation support vendors will “digitally notarize” each image (or key images) so that any later version can be compared to the notarized version for authenticity.
- **Searches.** Documents in digital format can be searched for the occurrence of particular words or phrases and other information associated with these words or phrases. Electronic searches of printed text materials are faster and often more reliable than human searches. (Note, however, OCR software cannot read the content of handwriting or graphics. This has to be done with pattern recognition software.) Document files that originated in digital format and have been delivered without conversion to paper can be searched directly. Documents that have been scanned into digital format must be processed further so that they can be searched. Optical character recognition (OCR) software turns the graphic file produced by scanning (which is essentially a picture of the document) into a text file (like a WordPerfect or a Word document) that can be “read” by search

software. (See discussion under “Sharing Expenses” below.) Documents located electronically can be retrieved almost instantly and printed when necessary. Lawyers in different parts of the same office or in different locations can use the documents simultaneously without making extra copies of the entire set.

- **Locating duplicates.** Duplicates can be culled from the document collection very efficiently by searching for a reasonably unique phrase that occurs somewhere at the beginning of the document. This will locate all instances of the phrase and, after inspection for marginalia or other significant information, duplicates can be transferred to a separate storage area so they do not clog up the main database.
- **Asserting privilege claims.** The process of extracting documents for which there will be a claim of attorney–client privilege can be done expeditiously. When documents are in digital format (and processed with OCR software if they were scanned), they can be searched for the names, initials, and titles of all of the lawyers involved in the matter. All of the documents responsive to the search can be printed out and then examined by a lawyer to determine if the content is privileged. This process leaves only documents containing handwriting to be examined manually. A log of the documents for which privilege is claimed can be constructed from computer-generated records. This process, in which a computer picks out potentially privileged documents in the first instance, sometimes also assists in defending against allegations of inappropriate withholding of documents.
- **Trial preparation.** Many of the necessary elements of organizing for trial—witness lists, exhibit lists, deposition excerpts, facts that support certain positions, and witness examinations—can be completed more efficiently using digital files.
- **Trial displays.** Documents in digital format can be displayed using courtroom technology, which may produce considerable savings in trial time. It is not necessary for the court to own the

equipment; the parties can bring their own equipment to the courtroom.

- **Trial logistics.** Judges who have experience with document-intensive cases note that the large number of exhibit binders for paper copies and the daily task of unpacking all the boxes of exhibits then packing them up again at the end of the day are hidden, but substantial, costs that can be avoided by using documentary exhibits in digital format. These hidden costs extend to the court as well. Security personnel may have to come in early or stay overtime while the lawyers unpack in the morning and pack up after the court session is completed, otherwise the court can lose two hours of trial time each day. And the judge may not have enough room in chambers for all the exhibit binders.

In considering discovery disputes, the court may also benefit from having parties submit a CD containing the text of their motion, memorandum in support of the motion, and the discovery materials in issue. References to the discovery materials can be linked to the documents themselves (and also to cases cited, statutes, and court rules) so that the court only has to click on the reference and the document appears in full text. This may be particularly helpful for judges who are traveling or working at home. No voluminous paper appendices or attachments are needed.

Cost issues

It would be a rare case involving discovery of more than 1,000 pages of useful documents that, if handled competently, was not substantially cheaper to conduct with documents in digital format rather than using paper copies. Lawyers may argue to the contrary, perhaps without an adequate appreciation of the facts, but cost is not a barrier to obtaining documents in (or scanning documents into) digital format. If there are a significant number of documents, and their content must be examined in order to conduct the case competently, the cost of doing whatever is going to be done with these documents

Part Two: Discovery

will be cheaper in digital format than the manual alternatives. As to timing, it is nearly always cheaper from the perspective of the overall costs to put documents into digital format at the outset of the case, rather than waiting until mid-discovery or shortly before trial.

When paper documents are at issue, lawyers' arguments about the cost of exchanging discovery materials in digital format often focus on two different parts of the process: copying and searching. The cost of copying is covered here. The cost of searching is primarily the optical character recognition (OCR) operation that puts digitally formatted documents into a form that can be "read" by search software and is discussed in the section on "Sharing Expenses" below.

Lawyers sometimes assert that it costs more to scan documents and deliver them in digital format than to copy the same documents and deliver them in paper copies. That may be true (although by a very small margin) if one considers only the exchange of documents itself. It is almost always not true if one considers more broadly the costs of storage, shipping, and use of documents in the trial preparation process.

Copying documents costs between 7 cents and 10 cents per page at commercial copying services, perhaps considerably more if the documents are old, odd-sized, bound, bent or folded, double-sided, or on very light or heavy paper. It generally costs more than the commercial rate (in real terms) to do copying in-house if the law firm or government office accounts for the time of the people standing at the copier. Every copy costs the same 7 cents to 10 cents per page.

Scanning documents costs between 15 cents and 25 cents per page at commercial services, depending on volume and turnaround demands. Non-standard documents cost more. Scanning one page into digital format takes about the same time and involves the same operations (removing paperclips and staples, inserting separator sheets, manually operating the equipment) as copying one page on a regular copy machine. (Indeed, many newer, high-speed copiers are also scan-

ners and can produce digital files along with hard copies.) Printing paper copies of documents (on a laser printer connected to a computer) from the digital files produced by scanning costs between 2 cents and 5 cents per page depending on the make and model of the printer. The quality of a copy made on a laser printer is almost always significantly better than a copy made on a copy machine

In most paper document exchanges, a number of copies are made of each document—a set for opposing counsel, a set for producing counsel, a set for the client, and so on. If three to four copies will be made, it is cheaper to put the documents into digital format (by scanning them) and to make the necessary printed copies from the digital files. (This is done by storing the digital files on a computer, calling them up in large batches, and sending them to a high speed laser printer to make the required number of copies.) More typically, lawyers wind up making eight to ten copies of documents during the trial preparation process. By the time the number of copies gets beyond four, the digital process is significantly cheaper than conventional copying even without considering the associated costs of storage, shipping, and trial preparation.

The software to perform the OCR may be bundled with the software that comes with the scanner, or it can be purchased separately for under \$200. The software to perform search operations may be bundled with office suite software, or it can be purchased separately for under \$100. The cost of the equipment to use documents in a digital format is no longer a significant barrier, although it may be a factor in indigent criminal cases. A new desktop personal computer with a CD drive and adequate power to deal with document files in the office costs less than \$1,000. A monitor suitable for document work costs another \$500. (A laptop suitable for this work as well as courtroom use will cost a little more, but not much.) There is little variation in costs between urban and rural areas because of the availability of online and paper catalog services. Even if an inexperienced lawyer must take these tasks to a contractor, the cost for this kind of litigation support is not overly burdensome.

Format issues

File formats in the digital world have to do with efficiency. File formats are defined by size (amount of storage required to hold them), ease of transfer, and other technical characteristics.

All documents that are created in digital format (word processing files, spreadsheets, presentations, and E-mail) have a native file format—that is, a format designed specifically for the most efficient use of the information in which this kind of software specializes. When these documents are exchanged in digital format (without being converted to paper and subsequently scanned into digital format) the first option is to produce them in their native format. That is, word processing documents can be produced “as is” in Word or WordPerfect or another word processing format; spreadsheets can be produced “as is” in Excel or Quattro or another spreadsheet format, and so on. The only format issue that arises in this kind of exchange is adequate disclosure about the native file format.

In most exchanges of large numbers of documents in digital format, the parties agree to convert all of the files to a common format and to produce them in that format. The use of a common format means that the recipient only needs the viewer software for the format selected (which is usually free) rather than all of the different software (Word, WordPerfect, Excel, Quattro Pro) in which the original files were created.

TIFF is the most common choice (see discussion below) because it can be used directly by all of the presentation software packages that are used to display images in the courtroom. The principal alternative when digital files of documents are produced directly is to produce them all in PDF (Portable Document Format). PDF is a format that is typically viewed with free software called Adobe Acrobat. For that reason this format is sometimes called “Acrobat format” or “Adobe format.” PDF was developed for uses where documents with a wide variety of styles (newsletters with columns, photo essays, books, artwork) are transmitted on the Internet and archived. PDF is designed to ensure that the electronic text documents will be dis-

played and printed exactly as they looked on the original author's screen, even though the author and the viewer may use very different computers and different word processors. This is an important feature when dealing with pagination, footnotes, and similar formatting. PDF has been adopted by the federal government as a standard for electronic document exchanges. The CM/ECF (Case Management/Electronic Case Filing) system requires that all filed documents be submitted in PDF. Many state courts and commercial electronic filing systems also specify PDF.

When documents exist as paper copies, and are scanned into digital form, the software used with scanners can select one of several available formats. The principal formats used for documents when they are being converted from paper to digital format are summarized in the table below.

BMP	Windows Bitmapped File Format	Format developed by Microsoft.
EPS	Encapsulated PostScript	Format developed by Adobe.
PDF	Portable Document Format	Format developed by Adobe.
TIFF	Tag Image File Format	Industry standard format developed by an independent group of experts.

Format issues can arise because, although there is an industry standard format for scanned (or imaged) documents, there are other formats designed specifically for these files, and some of the file formats for photos will also accommodate text documents.

When the court and counsel define their mutual goals for particular documents, they normally reach common ground on defining the most appropriate digital format for the documents as well. Defining

these goals at the outset will help avoid confusion and possible format conflicts later.

- **Filing.** For documents that are intended to be filed electronically with the court, the choice should be PDF, as that is the format required by the federal CM/ECF system and by most state courts.
- **Viewed and read.** For documents that are intended to be exchanged by the parties to be viewed and read, the parties can agree on either TIFF or PDF or any other common format. The important point is to reach agreement before any exchanges take place.
- **Litigation support.** For documents that are to be integrated into a commercially available litigation support system and prepared for electronic presentation in the courtroom, TIFF will be the most likely choice. If an outside vendor is used for these functions, the vendor will likely recommend TIFF.
- **Presentation at trial.** For the purposes of presenting and projecting images in a courtroom, TIFF will be the most likely choice. PDF documents using Adobe Acrobat are relatively slow to appear. Because of this, most courtroom presentation software systems use TIFF documents.

The primary considerations with discovery documents are document management and trial presentation. Few are filed with the court. On the occasion when they are attached to a pleading or motion to be filed, they can easily be scanned from original paper into PDF or converted from TIFF to PDF.

Compression issues

Compression is a way of packing data into a smaller storage space than it would normally occupy. This is accomplished using special software that processes files using mathematical algorithms. It is usually done in order to store and transmit data more efficiently. The usual compression ratio applicable to documents is 2:1, which means

that a compressed file takes up half the space of an uncompressed file. This is usually more than adequate because text does not create very large files.

There are two kinds of compression software relevant to text documents. *General purpose file compression utilities* are free-standing software packages that compress document files as well as other types of files. PKZIP is an example of this category. It creates compressed zip files which can be unzipped by anyone who also has the utility. *File format compression standards* are compression capabilities built into a file format. For example, the TIFF format incorporates the LZW (Lempel-Ziv-Welch) compression algorithm which usually achieves a 2:1 compression.

Compression issues rarely arise with respect to text documents because the methods used to compress them do not involve any loss of data. When a compressed file is uncompressed, it is unchanged from the "original." Although there are different compression methods, the differences do not have effects that are important for litigation.

Resolution issues

Resolution defines the clarity with which text can be reproduced. Resolution is generally defined as dots per inch (or dpi), and the more dots per inch, the better the clarity. Resolution also has a cost side. The more dots per inch, the bigger the digital file (and therefore the more storage is required for files) and the more time and computer power it takes to process the file. If a document will be displayed on a computer monitor, the resolution of the monitor affects the clarity with which the image appears. If the document will be printed out in order to create a paper copy from the image, then the resolution of the printer matters.

Resolution is a fairly simple matter with respect to text documents, and few problems arise. The resolution of the image of a text document is determined by the setting on the scanner that created the

image. Scanners have a wide range of settings because they are used for photos, diagrams, maps, charts, and other documents in addition to text documents. The usual setting for text documents is between 200 and 300 dots per inch.

A standard resolution of 300 dpi is usually specified for text documents that will be processed with optical character reader software so that the documents may be searched. Vendors that provide files at 200 dpi often also offer image cleanup software processing that makes the image the quality equivalent of a 300 dpi file. They use the lower resolution because they can process the documents faster. Resolution higher than 300 dpi is not necessary for text documents. It adds expense with no significant attendant benefits. Resolution lower than 200 dpi often means that the image from the file cannot be processed successfully with OCR software, but a resolution of 150 dpi is satisfactory for making printed copies of documents when no OCR is needed.

Sharing expenses

The question of cost sharing usually arises with respect to the processing that is done to the digital files with optical character recognition software so that the documents can be “read” by search software. Scanning and optical character recognition (OCR) processing are normally done together for efficiency reasons. Some lawyers will request that the court, in addition to requiring discovery documents to be exchanged in digital format, order delivery of OCR files or order that all digital files of text documents be processed by a neutral OCR vendor with expenses shared by the parties. Both sides will use OCR, they argue, so why should they have to pay again for something that the other side has and involves no work product? If one party is at a substantial disadvantage in terms of resources to support the litigation, ordering delivery of OCR files or sharing of OCR expenses can help level the playing field. The capability to conduct sophisticated searches of huge volumes of documents within minutes is enormously

valuable. However, requiring lawyers to share OCR files or to share OCR expenses involves considerations different from exchanging documents in digital format.

First, the need for OCR varies: (1) OCR is not needed at all if the parties exchange digital files for documents that originated as digital files without converting them to paper. OCR is needed only when paper documents have been scanned or when digital files are image files (pictures, not text) in their native form. (2) OCR is not needed at all unless the documents must be searched. Some lawyers use digital files only for copying and courtroom display purposes, so they do not need OCR processing. (This non-OCR approach would be unusual in a case involving more than 1,000 pages of useful discoverable documents.) (3) Indexing is an alternative to OCR processing. Parties may agree to have the scanned images indexed by recording bibliographic information (e.g. date, author, addressee, document type, document number, copy recipients) in a database linked to the images. This costs more than OCR (because it is done manually), but in some cases is more useful and reliable than OCR (depending on the nature of the documents). (4) Coding for document type often precedes OCR processing. In this way, OCR can be applied only to text documents where it is likely to produce usable results, thus saving the cost of OCR processing of other types of non-text documents like spreadsheets, maps, and drawings. Coding for document type is usually not controversial and can also be a shared cost.

Second, there are different types of OCR software. The basic function of OCR software is to match the image of an individual letter or punctuation mark with a database that identifies the digital equivalent so that a new version of the document containing these digital equivalents can be constructed by the computer. A scanner creates a "picture" of a document that can be transmitted and copied electronically. Its output is like a fax document in that respect. This picture cannot be searched for words in the text. OCR software translates the picture of each letter into a digital form of that letter like a

word processing document. This puts the information into a format that can be searched.

General purpose OCR software is optimized to read a wide variety of materials but does not read any of them exceptionally well. This means it will have a somewhat higher error rate. Some type of general purpose OCR software is supplied with every scanner. The more widely used brands currently are OmniPage Pro and PaxisPro from ScanSoft, Inc., PageKeeperPro from Caere Co., and TextBridge from Xerox Corp.

Special purpose OCR software is optimized for a particular kind of output, such as documents, faxes, cards, or screen prints from Web pages. Within the document category, some specialize in reading *printed* documents such as newspapers and magazines where special fonts are often used to give the printed matter a special look. Others specialize in reading *word processing* documents such as memos and letters for which most users fall back on a few standard fonts like Times New Roman or Courier. Still others are optimized for particularly large or small fonts so they can read headlines or the fine print in a contract.

OCR software may also operate differently. Lower-end OCR software typically uses only one algorithm (or “engine”) and it makes one pass at each page, applying its algorithm to each letter as it goes along. Higher-end OCR software incorporates more than one algorithm and may make several passes at a page, each time optimized for a different task so it can do more than one thing well. This means that it will have a much lower error rate.

Third, OCR charges are not standard. OCR charges are typically levied on top of the scanning charges. If scanning costs 25 cents per page, OCR may cost an additional 25 to 50 cents per page. While scanning charges are fairly standard because scanning services, like copying services, are a commodity, OCR charges vary substantially because the sophistication and capability of the OCR software can vary, thus producing a more or less reliable output. These charges are also subject to rush charges for processing within short time

frames, volume discounts, and the bargaining ability of the person who negotiates the deal.

Fourth, there are choices to be made about quality. The quality of output of OCR is measured by the error rate. The OCR output may be from 80% to 95% accurate depending on the capability of the software and the quality of the original paper document. For example, if there are 50 lines on a page, each line being composed of an average of 10 words, and each word being composed of an average of five letters, there are 2,500 letters on that page. An OCR system that has 95% accuracy will miss 125 out of those 2,500 letters (identify them incorrectly or fail to identify them at all). If each of those 125 letters is in a separate word, then 125 of 500 words are affected.

Some lawyers will opt for very high quality OCR, either because they do not know enough to do otherwise or because of the nature of the documents. Others will be satisfied with a higher error rate (and lower cost) because they intend to use search software (sometimes also called a “search engine”) that can make allowances for OCR errors and still find what is requested by making educated guesses from context and usage patterns in the document. (Note that OCR has nothing to do with the presentation of visual displays of documents in the courtroom, so OCR errors are not relevant to any evidence requirements. OCR is for locating documents. The presentation of documents (once located) is made with the scanned “picture” of each document which is an exact duplicate of the original except for the factors discussed in the next section.)

Alteration of documents as they become digital files

Documents undergo changes from the time that paper copies are pulled from the files and the time that digital files are made available to the opposing party. In most cases, these changes are acceptable for evidentiary purposes. However, it is important at the outset to have a clear understanding of what may or may not be done to docu-

ments that will be represented to be originals under Rule 1001(3) or duplicates under Rule 1001(4) and offered in evidence.

- **De-specking.** Copying may cause small stray marks, or “specks,” on the copy that were not on the original. This usually happens when there is dust on the glass plate of the copier. Each small dust speck is copied and appears on the document. Scanning will pick up these stray marks and record them as a part of the digital file representing the document. These specks may confuse the analysis of letters or numbers or otherwise detract from the utility of the image when it is processed further. For this reason, software that is used to enhance images during the scanning process often removes these specks. This is called de-specking. This process will remove both specks that were caused by copying and specks that were on the original because the software cannot distinguish between the two. If specks on the original have been removed, the document has been changed, but this change is usually of no concern for evidentiary purposes. De-specking does not affect handwriting or other significant marks on a document.
- **De-skewing.** Scanning sometimes produces an image that is skewed, or not squarely oriented up and down. Skewed images are more difficult for software to handle, so most high-quality systems have a de-skewing capability to, in effect, straighten up the image. This process will also straighten up documents that were skewed as they came from the files (perhaps bad copies) and, in this respect, changes the “original.” Like de-specking, this change is usually of no concern for evidentiary purposes.
- **OCR preparation.** Image enhancement software is used to make optical character reader software work better. Image enhancement software changes the text portion of the document (not marginalia) using hole-fill, de-shading, line removal, character reconstruction, and scale to grey operations. The changes are very small, usually affecting only parts of letters, and they are made to allow the OCR software to recognize letters that it might

Rule 1001(3) – Original.

An “original” of a writing or recording is the writing or recording itself or any counterpart intended to have the same effect by a person executing or issuing it. An “original” of a photograph includes the negative or any print therefrom. If data are stored in a computer or similar device, any printout or other output readable by sight, shown to reflect the data accurately, is an “original.”

Rule 1001(4) – Duplicate.

A “duplicate” is a counterpart produced by the same impression as the original, or from the same matrix, or by means of photography, including enlargements and miniatures, or by mechanical or electronic recording, or by chemical reproduction, or by other equivalent techniques which accurately reproduces the original.

otherwise miss. However, this process can also remove small stray lines drawn on documents, small check marks, and other things that appear to the software to be non-text distractions. In most cases, this should have no evidentiary impact.

- **Attachments.** When documents are processed for copying or scanning, all staples, paper clips, and other binders are removed. The end of one document and the beginning of another is indicated by a separator sheet that is placed at the correct spot. If the person doing this processing makes a mistake, then the party receiving the computer files will not know that the beginning and end points are incorrect. When paper copies of proposed exhibits are printed out, the computer will follow the directions from the separator sheet. So, for example, a document that had three attachments in its original form may wind up with only two attachments because the computer thinks the third attachment is a separate document. Problems may not come to light until exhibits are exchanged. This occasionally causes disputes, although there is almost never anything substantive at stake.

Lawyers who understand how the technical processes work usually have no difficulty reaching agreement about what kinds of “changes” to a document are permissible and will not challenge its status as a duplicate. Brief guidance from the court may assist this process when counsel are less knowledgeable or more contentious. One way to deal with this problem is to allow de-specking, de-skewing, and OCR preparation when done with commercially available software used for imaging purposes, but to caution about taking care to avoid changes to attachments.

Discovery of photographs

In some cases, no issues arise with respect to the use of technology to display photographs. If lawyers choose to use an evidence camera for this purpose (because it is often the best technology tool for dis-

playing photographs in the courtroom), and if the photo was taken with a film camera rather than a digital camera, they will be using the “original” photo in its physical form. The evidence camera produces its display by projecting an enlarged image of the photographic print.

However, lawyers may choose to use a laptop computer to drive the visual displays of photographs and this requires that the photographs be in digital format. The ease of management and display using computer resources and the lower cost of producing enlargements will lead lawyers in this direction. In cases involving intense scrutiny of one or more photos, it is also more likely that a digital format will provide more flexibility for examining the photo in great detail. Photographs taken with a digital camera exist in a digital file from the outset. Photographs taken with film cameras are converted to digital files using the same type of scanning process described above with respect to documents.

Requiring parties to exchange photographs in digital format

The considerations with respect to exchanging digital files of photographs are somewhat different from text documents. They depend on the nature of the case, the original format of the photos, and the economic tilt of the playing field.

If a photo was taken with a digital camera, exchange of these digital files should not be burdensome. This allows the side doing the discovery to have the same flexibility in using the photo as the side producing the files. If photos taken with a film camera (or existing in the files as paper copies) have been scanned into digital format for database purposes in order to be able to keep track of all the discovery files in one place, it would ordinarily make sense to exchange these files in digital format. However, the governing consideration may be the format in which the photos will be used at trial. If the proponent of a photo intends to use it at trial only in hard copy

More on photographs

Part III, page 107, Disclosure as to digital alteration of photos

Part IV, pages 186 and 189, Completeness objections to photos; unfairness objections to photos

Part IV, page 204, Objections to digitally altered photos

format, then the opponent may not be disadvantaged if the digital file is not produced. If the proponent has scanned the photo into digital format for the purpose of using it at trial in digital format, then the opponent should also receive it in digital format.

If the playing field is tilted against one of the parties because of limited financial resources, delivery of photos in both hard copy format and digital format enables that party to more readily produce the kind of visual displays that may be needed.

Cost issues

Photographs in digital format are usually exchanged on CDs, which is a low-cost convenient medium as discussed above with respect to documents. Using photographs for which digital files have been produced requires special software (in the range of \$300 to \$500) to print paper copies of the photos or to work with the photos to produce courtroom displays. Commercial photo shops and litigation vendors can also work with these files.

Using photographs that exist as paper copies requires that they be scanned into digital format. Scanning photographs involves different considerations and more skill than scanning documents. Scanning for most discovery purposes can be done on modestly endowed equipment that is relatively inexpensive (about \$300), working in conjunction with entry-level image capture software. If a scanner has been purchased, the cost of scanning photos includes the time of the operator and the cost of the storage media. Commercial services generally charge \$25 per photo for professional-quality scans. Photo-developing services charge \$1.00 to \$2.50 per scan.

Format issues

When photos are taken with a digital camera, the digital files can be delivered in the native format in which they were produced by the camera, and no format disputes arise.

Part Two: Discovery

When photos are taken with a film camera, or exist only in paper form, or have been stored by a computer in a different format from that in which they were taken, format problems may arise. When photos are scanned, the software used with scanners can select one of several available formats depending on how the material will be used. Although there is an industry standard format, there are also six other special formats designed specifically for this purpose, as described in the table below. It is common to store the same photo in more than one format depending on how the photo may be used. In addition, the formats for documents also accommodate photos, as some text documents have embedded photos.

GIF	Graphics Interchange Format	Format developed by CompuServe (an online service) to save screen-oriented low file size graphics. Widely used by Internet Web sites.
JPEG	Joint Photographic Experts Group	Format developed by an independent standards group to allow efficient storage and transmission of photos.
PDD	PhotoDeluxe	Format developed by Adobe; lower end, easy photo and image manipulation.
PDF	Portable Document Format	Format developed by Adobe; can be read on Mac, Windows, UNIX, and DOS platforms; often used in electronic publishing.
PICT	Picture File Format	Format developed by Apple as the graphics format for Macintosh systems. Supports every size and resolution.
PNG	Portable Network Graphics	Format developed by the Internet Engineering Task Force led by Thomas Boutell. Designed to replace the GIF format for some applications.
TGA	Targa	Format developed by TrueVision Corp. to combine Macintosh graphics with live video

If exchanges were being made for commercial and not litigation purposes, the normal format for photographs would be the JPEG (Joint Photographic Experts Group). This is a well-established format that can be used for many purposes and its files are recognized by most commercial software packages that use photographs. Files stored in this format have the .jpg suffix.

Any file format can be changed to any other file format using conversion utilities embedded in most scanner software, presentation software, and photo work software. This is done using the standard "save as" process and specifying the format to which the file is to be saved. The conversion is done automatically as the file is saved. The original format is not destroyed, thus a single photo can be saved in a number of different formats.

Disagreements about format are usually about file size and the amount of information in the file. It may be alleged that one side has given the other photographs in huge files in order to require expensive conversion or large amounts of storage. Conversely, it may be alleged that one side has converted photo formats from a large size and delivered them in a more limited size in order to obscure detail available in the large file (or the original of the photo) but not in the smaller, more compact file.

One way to resolve these problems is to require that photographs be maintained by each party in the largest, most detailed file format in which they have ever been available, but that they be delivered in the first instance in JPEG format (which is a compact format specialized for photos and usually containing enough detail for litigation purposes) or some other agreed upon format. If the party receiving a photo needs the file in a more detailed format, it can be requested upon reasonable cause shown.

Compression issues

Disputes may arise about the compression methods used with photographs because there are a number of different compression tech-

niques, some of which store all the original data and some of which throw away some of the data. File formats designed for photos all have built-in compression methods because photographs in digital form often occupy very large files. Compression is almost always needed in order to store, transmit, and work with these files more efficiently.

Courtroom applications require compression because very large files take a long time for the computer to retrieve and display. If large files are uncompressed, everyone sits and waits while the computer clicks along assembling the information it needs to complete the display. Compressed files come onto the screen much more rapidly. If a lawyer is having difficulty with a presentation because of long delays before slides appear on the screen, it is most likely because he or she is working with uncompressed files.

The standard compression methods used for photos may create litigation issues because they almost all involve what is known as *lossy compression* in which some data are discarded. When a file that has been compressed with this kind of software is uncompressed, it has less data than it did before it was compressed. This sounds more radical than it is. Most of the data that have been dropped are redundant—that is, not necessary to a complete image. The overriding objective of the industry standards group that publishes the JPEG standard, and the commercial software vendors who develop other file formats for photos, is to devise methods that compress files with changes that are not detectable by the human eye.

This is how JPEG, the industry standard compression, works. The user chooses a compression ratio between 2:1 and 40:1. When an image is saved, compression takes place within 8 x 8 pixel cells. The algorithm compares the similarity of color values within each cell and stores only those values that are relatively dissimilar. The higher the level of compression, the broader the range of color values that are considered similar, and the higher the number of color values that are thrown out. When the image is uncompressed, the algo-

Lossless compression:

Every single bit of data that was originally in the file remains after the file is uncompressed. Saving all data limits the amount of compression to about 2:1. Lossless compression is generally used for text and spreadsheet files for which a 2:1 ratio is sufficient.

Lossy compression:

Certain information is permanently eliminated when the file is compressed. This is usually redundant information that does not affect the quality of the image. Eliminating information allows compression of 10:1 and up to 40:1. Lossy compression is generally used for photo and video files for which lower compression ratios are not sufficient.

rithm assigns a single color value to all the pixels in each cell that had similar color values before.

Three things are important to understand about lossy compression. First, as the compression ratio increases and the resulting file becomes smaller, more data is thrown away. Industry professionals usually regard a compression ratio of 10:1 as the threshold under which loss of quality is not apparent to the human eye. Second, an image scanned at a high resolution can withstand a higher level of compression (without any noticeable change) than one scanned at a low resolution. Third, if the details of interest in a photo are blocks of solid color, then a fairly high compression ratio will not produce a noticeable change. However, if the image has smoothly continuous tones, a high compression ratio can wipe out important gradations and result in noticeably jagged edges.

Resolution issues

Resolution is a more complicated matter with respect to photographs than for text documents, and litigation issues may arise because the quality of a photo displayed or printed from a digital file is highly dependent upon a number of factors.

If a photograph has been created with a digital camera, its native (or original) resolution will depend on the capability of the camera—usually expressed in megapixels. When the image is changed from one format to another, the resolution may also be changed. (See the discussion of compression.)

If a photograph has been created with a film camera, the native resolution of that photo in a digital file will depend on the setting of the scanner with which the digital file was created. A scanner senses or samples the visual information that it is going to reproduce in digital form. It does this at frequent intervals, and checks the grayscale or color value at each sample point. The scanner's input resolution (also called scanning resolution) is the density at which the scanner samples information within a given amount of space, usually per

inch. The measure is usually expressed in dots per inch, but is sometimes also referred to as pixels per inch (or ppi).

Unlike the situation with respect to text documents, there is no rule of thumb for the resolution of photographs. In order to get a high quality image, the input resolution must be correct for the size of the original and the size of the output. If the original is relatively small, for example 4 x 5, and the scan is being made for purposes of using the photo in a much enlarged form, the resolution needs to be much higher than if the scan were for the purpose of producing another 4 x 5 or a smaller 2 x 3. Disputes sometimes arise when one side suspects that the other has produced photos of deliberately low resolution so that enlargements will be less effective in the courtroom.

Alteration of photographs as they become digital files

The selection of a format and resolution (see above) affects a photograph in small ways, and other parts of the scanning process may also alter the photograph. It is useful to have a clear understanding from the outset of what may and may not be done to photographs that will be represented to be originals under Rule 1001(3) or duplicates under Rule 1001(4).

- **De-skewing.** Photographs that have been copied or scanned may be skewed slightly if the original was not placed on the copier or scanner equipment correctly. De-skewing is a software process that “straightens up” the photo. It does not change the content of the photo.
- **De-coloring.** Photographs taken in color may be scanned in black and white so that all colors appear as shades of gray.
- **Adjusting color and exposure.** The software used with scanners has the capability to apply either automatic or manual adjustments to color and lightness or darkness. This can remove the “red eye” phenomenon in photos of people, remove the green

Rule 1001(3) – Original.

An “original” of a writing or recording is the writing or recording itself or any counterpart intended to have the same effect by a person executing or issuing it. An “original” of a photograph includes the negative or any print therefrom. If data are stored in a computer or similar device, any printout or other output readable by sight, shown to reflect the data accurately, is an “original.”

Rule 1001(4) – Duplicate.

A “duplicate” is a counterpart produced by the same impression as the original, or from the same matrix, or by means of photography, including enlargements and miniatures, or by mechanical or electronic re-recording, or by chemical reproduction, or by other equivalent techniques which accurately reproduces the original.

effect of photos taken in fluorescent lighting, and fix over- or under-exposed photos.

- **Adjusting focus.** The software used with scanners has the capability to sharpen the focus on particular objects in a photo by selecting and blurring slightly the background.

All of these capabilities have rough equivalents in a traditional process for developing standard camera film. The foundation for a hard copy photo does not require qualification of the photographer or the processing technician, and generally the digital equivalents are treated in the same way.

Discovery of video

Video comes in two types: regular video and digitized video. The differences have important effects in cases where any substantial amount of video evidence will be used.

Regular or analog video is the product of an analog video camera. Regular video degrades when it is copied and is time-consuming to edit well. Regular video is typically played on a VCR that has mechanical start, stop, play, and freeze-frame controls. It takes some time to locate (by winding or rewinding the tape) a particular segment of the video, and the counter numbers (identifying the particular frames to be shown) may be inaccurate, which means that more or less of the desired video clip comes up at the start.

Digital video is either the product of a digital video camera or of a conversion process that digitizes regular video. Digitized video does not degrade when it is copied and is easy to edit. Digitized video is also easier to use in a courtroom because it is controlled like any other digital file. Specified portions are located by software nearly instantaneously; the controls are precise; and the frames that are to be shown are identified exactly.

More on video

Part III, page 112, Disclosure of digital alteration of video

Part III, page 113, Disclosure of animations

Part IV, pages 187, 191, Completeness and unfairness objections: video

Part IV, page 205, Objections to computer animations

Requiring parties to exchange video in digital format

If digital video cameras are readily available for deposition, site visit, or other videos that may become evidence, they should be used. This saves time and money for both sides. Shooting a video in analog format and then digitizing it for use at trial is less efficient and more expensive. The side that holds the original of the analog videotape will make an analog copy for the other side. A copy of an analog videotape is not quite as good as the original, and the more times that copies of copies are made, the more degraded the quality becomes. The side that holds the original may now digitize its (better) copy. Knowledgeable counsel will request a copy of the digitized version rather than the analog version.

Format issues

No significant format issues arise with respect to digital video because one format, called MPEG (Motion Picture Experts Group), is both the industry standard and the heavily dominant format in the field. Files stored in this format have a suffix of .mpg.

There are currently two operational MPEG standards. MPEG-1 is used for video that will be played from CDs. It codes video at a transmission rate of up to 1.5 million bits per second. MPEG-2 is used for video that will be played from DVDs and for digital TV broadcasts. It codes images at transmission rates above 4 million bits per second. MPEG-3 was developed as a standard for high definition television, but has been merged into MPEG-2.

Compression issues

There are no significant compression issues with respect to video because all digital video is compressed, and the industry standard MPEG format incorporates the method used in nearly all cases.

Digital video produces very large files. Digitized video is usually stored on CDs, DVDs, or external hard disk drives. Using this MPEG-1

compression, about an hour of low resolution video will fit on one CD. Using MPEG-2 compression, about two hours of video will fit on one DVD. External hard disk drives have significantly higher capacity. Because of the way the compression is done, special software called an MPEG viewer is necessary to retrieve and play files that have been compressed. This software is either free or very low cost, and can be downloaded from a number of Web sites.

MPEG is a lossy compression technique—it does not preserve all of the data presented to it. MPEG uses three of the techniques devised for the JPEG method and adds two forms of predictive coding in which the differences in what has changed between an image and its preceding image are calculated and only the differences are encoded. It is designed so that the compression does not affect what the human eye can see, and a viewer can not tell the difference between an uncompressed video and one that had been compressed.

Synchronization of deposition video to digitized text

The digital video record of a deposition can be synchronized to the digital transcript so that the user can search the transcript to find particular segments of video. The synchronizing process links the transcript to the precise location on the video where the witness said each of the words in the transcript. This is accomplished in a two-step process. First, the court reporter time-stamps the transcript. This is a software process that is done automatically by the court reporter's computer, and the reporters levy an extra charge for the service. Then the time-stamped transcript is matched to the video and linked. This is also an automated process done with software. The entire linked file is then loaded onto a computer where it can be used in the same way as any other digital file.

If one side has a "synched" video of a deposition that it took, the other side may demand the synched version when its copy of the video is delivered, arguing that there is no work product involved

and it makes no sense to spend the money to synch the video all over again. Using synchronized video will also smooth the hearing of motions regarding the use of portions of deposition transcripts because all parties and the court can refer instantly to the same piece of transcript. A lawyer with this kind of search capability for video has a very substantial advantage over a lawyer who has to do searches manually. Trying to find a particular segment of video using a hard copy transcript is a very long, tedious process. If something unexpected comes up on cross-examination, and there is a need to find a new portion of the video for impeachment, the lawyer without the automated capability may not be able to do it in time, whereas the lawyer with the synchronized video will probably be able to find and display the passage in seconds.

Alteration of digital video as it is created

When video is created with a digital camera, it can, in effect, be edited as it is being taken. The digital video camera has a small screen on its back or side on which the video is shown as it is being taken. Any video can be erased by the camera in whole or in part and done over again. Unless agreement of counsel or court orders provide otherwise, there will be no “outtakes” of the kind that exist when analog video is edited. The digital file will contain only the material selected by the camera operator at the time the video was being created. If video is taken to preserve evidence, a counter can be added to the images showing that no portions of the video have been eliminated during shooting.

Digital format materials

Some kinds of materials are used primarily in digital format by the party that generated them. They are found on computer hard drives, network servers, or storage tapes and disks under the control or cus-

tody of a party. Usually there are no paper copies of these records in the files of the party that generated or used them. The common discovery requests for digital format materials include:

- **Databases.** When databases reside on large servers with complex software, production of the required information may require a special report that includes the relevant portions in a way that the requester can use. Government agencies as well as private companies maintain their database files in proprietary formats that cannot be used with normal commercial software.
- **CAD/CAM files.** Designs and schedules put together with computer-assisted design and manufacturing software usually contain information not available in a printed format. These files cannot be restored or used without the software that created them.
- **Fax servers.** In high-volume fax operations, the fax file containing the graphic image may be stored on a server while awaiting an open phone line for transmission, and the content of the server may be backed up to tape. The stored fax will have an associated log listing the sender, recipient, time, and date.
- **Personal digital assistants (PDAs).** Hand-held PDAs are in the same category as desktop and laptop computers except that they have much less storage. They can dump their current contents to a report file in the same way as other computers. Many users back up their PDAs on their office desktop computers, so the PDAs' files may be available from there as well.
- **Digital voicemail.** Some voicemail systems are now digital instead of analog and the content of voicemail messages is in digital files. These digital files may be backed up to servers or tape storage.

Increasingly, third parties, usually Internet companies who provide public E-mail, chat room, and other services, are being turned to for discovery materials. These companies are of two types: online service providers (OSPs) such as America Online, Compuserve, and Prodigy; or Internet service providers (ISPs) such as AT&T WorldNet

Part Two: Discovery

and Earthlink. An OSP may provide a chat room, discussion group, news group, or electronic bulletin board where people “converse” with one another through typed messages, as well as E-mail and other services. These interchanges may be either synchronous (in real time) or asynchronous (by signing on occasionally and looking over what others have posted). The OSP knows the real identity (or can provide information that will lead to the real identity) of participants even if they use pseudonyms for their online identities. An ISP provides access to the Internet and may provide E-mail services. It usually has very limited information that would be relevant to litigation but may have records of incoming and outgoing messages that will give counsel a checklist for obtaining the actual messages from the party’s computers.

OSPs and ISPs provide services primarily to individuals, so discovery aimed at them may be after the personal account information of a witness or employee of a party. Once a person’s name is associated with an E-mail address or alias, a search of the Internet can be conducted to see if this person participated in any discussions of interest. A company’s account currently may be located by searching a database maintained by Network Solutions, a company that dispenses domain names (Internet addresses). If a company acts as its own ISP, the database will indicate that. If the company contracts with a third-party ISP for these services, the database will identify that ISP. In commercial litigation, parties may be interested in records of common daily transactions to demonstrate patterns of communication or to locate dates or times at which activity took place.

Cost issues

In a corporate setting, most digital format materials beyond the ordinary word processing, spreadsheet, and presentation files require specialized software to retrieve and use. This software is owned or licensed by the company and resides on the computer equipment

that serves the whole enterprise. This situation may raise three broad issues:

- **Copying the data.** The first request is generally for the data itself. Under some circumstances, the owner of the database may be able to do a search according to parameters reasonably calculated to return the requested data, and to provide those data in a separate file. In the case of a large specialized database, it may not be feasible to separate the relevant data from valuable trade secrets or other confidential data not relevant to the case.
- **Access to the software necessary to search the data.** If the relevant portions of the database are turned over, the receiving party may not be able to use the data because it does not have the necessary software to search the database. When that party demands a copy of the software in order to uncover the content of the electronic files, the responding party may claim that access would expose confidential information in its computer system not relevant to the litigation and that copying is not permitted under the company's software license.
- **Access to the data in situ.** When delivery of the data and access to the software are not sufficient, the requesting party may demand access to the database itself, on the premises of the responding party, in order to have its expert perform the necessary searches.

In these situations, if the parties cannot agree, it may be useful for the court to consider consulting with the systems experts employed by courts within the circuit or appointing a neutral expert to recommend fair terms for access either to the database itself or to the software and a fair assessment of costs to each side.

Alteration of digital format materials during discovery

Normal business processes regularly wipe out data kept in digital format. Otherwise the available digital storage capacity would be

quickly overwhelmed. These practices create a challenge for counsel with respect to the duty to preserve evidence, which arises once there is notice of its relevance. Maintaining reasonable business and computer operations may not permit endless backup of information from the date that a complaint is served. In fashioning discovery orders, the court may want to be informed about the expense and burden of altering normal backup and retention procedures as well as the likelihood of relevant evidence being discovered from the backed-up files. Because the facts vary enormously from case to case, and the actual danger of deleting relevant data may be difficult to assess without technical help, the court may want to appoint an expert early in the case to work out acceptable procedures and ground rules.

Normal data retention practices also affect the ability to obtain digital format materials from third parties. For example, neither OSPs nor ISPs are regulated with respect to record-keeping, so their backup or retention policies may differ considerably. OSPs have the technical capability to keep both records of communications and a copy of the content, although they may elect not to keep either.

Internet discovery repositories

Service companies offer storage capacity for digital files that can be accessed through the Internet at very low monthly rates compared to the cost of buying the equivalent hard disk or DVD storage. This is a much more efficient equivalent of the repositories for hard copy documents that have been used in cases involving high volumes of documents.

Each party transmits the digital files of its discovery materials to the storage site using file-naming conventions agreed by the parties. Thereafter, anyone with a password can search and download files as needed.

Storage made available by these Internet companies can be pro-

tected against incursions by outsiders in a number of effective ways beyond simple passwords. The access to this storage can be by virtual private net (VPN) connections that are insulated from the public connections in the Internet channels of communication. The content of the storage can be encrypted with keys issued only to authorized users. Security is an important concern with respect to any discovery repository. Many knowledgeable lawyers regard the technical security available for Internet repositories far more reliable than the human security that protects physical repositories.

This is the way that some lawyers representing plaintiffs sell their document collections to other lawyers who have similar cases. The lawyer who first obtained the documents in discovery scans them into digital format and stores them on an Internet repository. That lawyer can then sell access to this repository and deliver an appropriate password to those who pay the fee. With the password, there is complete access to the repository so that files can be downloaded and printed out for those who like to work with hard copy, or can be processed with optical character recognition software for those who want to do searches. The lawyer who put the documents into the repository never needs to make another set.

Part III

Pretrial

After discovery is completed, other important aspects of the effective use of courtroom technology should be considered at a pretrial conference or in a pretrial order. This part covers the following:

- **Disclosure issues:** disclosure by the parties as to the equipment and software they will use in the courtroom at trial; exhibits to be used at trial; any digital alteration of documents, photos, and videos (other than that which occurred in the process of creating the files); and completed animations and their underlying files.
- **Equipment issues:** consideration of shared use of equipment, shared use of equipment operators, and making the courtroom available so that lawyers can practice with the equipment before trial.
- **Making the record:** establishing the distinction between evidentiary exhibits and illustrative aids, numbering exhibits, and premarking exhibits.
- **Videoconferencing:** use of videoconference equipment for pretrial hearings and conferences.
- **Other uses of technology by the court during pretrial:** visual displays in presentations to the court during hearings on motions; pretrial educational materials for the court; and expert assistance for the court.

Management by the court can help counteract imbalances in the technological capability of counsel. One side's lawyer may be well in command of technology when the other side's is not. One side may have considerable financial resources and the other side may not. The government, with persuasive, large-scale displays, may be opposing an indigent defendant. Or a well-heeled, high-profile defendant may have available technically knowledgeable lawyers who face prosecutors without similar resources. The courts have good pretrial tools for dealing with technological imbalances that may substan-

tially affect a fair hearing: court-mandated disclosures so that the ill-informed are not sandbagged; shared use and thoughtful positioning of equipment, and the opportunity to practice with it so that some of the more significant barriers faced by newcomers are removed; clear rules about making the record when technology is used; and equalizing opportunities for educating the court. Each of these considerations is discussed below. Tools that can be used at trial are discussed in Part IV.

Disclosure by the parties

Placing disclosure requirements on the parties helps prevent trial-by-ambush and allows rational planning so that the case can be tried expeditiously. It is very difficult to deal with technology disputes on the morning of trial when one side starts lugging large boxes of equipment into the courtroom or during trial when one side starts to lay the foundation for an unexpected exhibit.

More on equipment

Part I, page 2, three levels of technology

Part III, page 115–119, shared use and opportunity for practice

Part IV, page 138, representations as to equipment and testing

Part IV, page 212, equipment for jury review of computer-generated materials

App A, best uses, setup, operation and techniques for using equipment

Disclosure as to equipment

Each side should be required to disclose the equipment to be used in the courtroom in the same manner as disclosure is required with respect to witnesses—with enough information to allow opposing counsel and the court to understand what is going to be used.

At the pretrial stage, each side should list the equipment supplied by the court that it may use. One easy way to do this is for the court to hand out a checklist of all the equipment available in the courtroom so that each side can check off items that it plans to use. The checklist might also briefly describe the uses to which the equipment might be put. This process will help highlight potential technical demands on the court staff. For example, if the court has videoconference equipment and one side plans to use it, the court staff that sets up the videoconference can be alerted.

Part Three: Pretrial

Each side should list separately all of the equipment that it plans to bring into the courtroom. The list of imported equipment should include all the supporting switches, converters, cabling, and controls that will be used. This will highlight potential practical problems and will also help spot duplication so that sharing can be considered (see below). At this point, the court will discover if one side is using Apple computers and the other side is using IBM-compatible computers. If this is the case, the operating systems of the computers will be different, and there may be problems of compatibility if the court orders disclosure of illustrative aids.

When a courtroom does not have its own equipment, several key considerations affect the practicality of what lawyers may propose.

- **Physical space:** The available space in the courtroom may foreclose certain options. For example, a projection screen normally needs to be at least 10 feet from the jury box and placed where all jurors have an almost straight-on viewing angle. If the courtroom does not have the requisite space, then this alternative is not available and large monitors at either end of the jury box might be considered.
- **Positioning:** When lawyers bring equipment into the courtroom, they may have unrealistic expectations about where it can be placed and how it can be used. The court will need to give some attention in advance to their proposals for positioning the equipment. Even if the use of proposed equipment is acceptable to the court, and the physical space will accommodate the equipment, the positioning of the equipment in the courtroom may be disadvantageous to the other party. For example, the images appearing on large monitors that face the jury box head on will not be visible from the far counsel table although they may be readily visible to the counsel table nearest the jury box. The positioning of equipment may also be disadvantageous to the jury. For example, a projection screen that is set up far away from the witness box may make it harder for the jury to focus

on information delivered by an expert witness. The court, counsel, witnesses, and jury all should have unobstructed sight lines. It is useful to get these issues worked out well before trial. A brief pretrial session may be required in which the parties appear with the equipment they intend to use, hook it up in a temporary fashion, and display either real or test exhibits so the court or the courtroom deputy can see how it is intended to operate. The court can help counsel come up with a good plan by making available in hard copy or on the court's Web site a floor plan of the courtroom showing the furniture, outlets, doors, and windows.

- **Lighting:** Strong natural daylight coming through windows facing a monitor may make large monitors impractical because they will be too hard to see. Small individual monitors in the jury box may be the only practical alternative. Overhead lighting directly above a projection screen will wash out the image on the screen. If that lighting cannot be turned off selectively (while maintaining the rest of the lighting in the courtroom), the large screen may not work. Turning off all the lights in the courtroom is generally a bad idea as people doze in the dark, and witnesses cannot be observed to determine credibility.
- **Audio.** Some equipment that the lawyers want to use will likely involve audio. The court should emphasize that the parties need to have equipment that is compatible with the court's audio system and need to test out all audio installations before trial. In historic buildings particularly, the audio environment will be difficult and the court's systems may not work well with the commercial equipment the lawyers plan to use. Additional speakers may be needed, and backup equipment should be considered in the event of the failure of audio components.
- **Infrastructure:** The nature and quantity of the electrical outlets in the courtroom may be a limiting factor. The outlets cannot be overloaded or fuses will be blown. Most of the equipment—e.g., monitors, evidence cameras, projectors, laptops—have in-

dependent power cords that need to be plugged into an outlet. The court may want to remind the parties about the need for power strips to provide additional connections.

- **Cabling.** The amount of special cabling required for a proposed installation may lead the court to consider alternatives. For example, the cabling necessary for a temporary installation of small monitors in the jury box may be too much for the practical use of the jury box day in and day out.
- **Safety:** All of the equipment brought into the courtroom needs solid support on a table or stand so that it does not tip over on someone or cause disruption. The cabling and electrical power cords need to be taped to the floor to ensure no one trips and falls. Gaffing tape (not duct tape) is useful for this as it does not leave a residue on the floor or carpet.
- **Esthetics.** Whatever the lawyers want to bring into the courtroom should not unduly disturb the appearance of the courtroom as a dignified place where serious matters are considered. The court may not be able to make a decision about this factor without seeing the actual equipment in the courtroom as the lawyers propose to set it up. Most vendors will bring the equipment to the courtroom for a practice setup before trial so that the court can provide guidance on appropriate positioning.

Disclosure as to software

Each side should be required to disclose the presentation software that it intends to use in court. Presentation software calls up and transmits the images that are displayed for the jury, and is analogous to equipment in this situation. Lawyers sometimes object to disclosing the software they are using on the ground that it involves work product. However, it is easy to distinguish between software used back at the office for analytical purposes and software used in the courtroom for presentation purposes. A disclosure requirement aimed at in-court operations is reasonable because it allows the court to

More on software

Part I, pages 8, 14, 29, 32, software for displaying exhibits in a courtroom, real time reporting, digital audio reporting

Part II, pages 64–93, software for OCR, document searches, scanning, synchronization of deposition videos

know what is being used in trial so difficulties may be anticipated and objections assessed knowledgeably. Counsel need not disclose the identity of consultants used in connection with in-court presentations or other non-discoverable information, such as work product documents exchanged by lawyers and consultants regarding technology presentations.

Microsoft's PowerPoint is one of the most common presentation software packages used for visual displays in courtrooms. If both sides plan to use PowerPoint 2000, for example, then the court knows that there should be no compatibility problems when one side delivers its slides to the other. Both sides will be able to play the slides because both are using the same version of this software. If one side is using PowerPoint 2000 (which was released in 1999) and the other is using PowerPoint 97 (which was released in 1997), the side using PowerPoint 97 is on notice that unless it has a computer loaded with the upgraded PowerPoint 2000, it may not be able to display some features of the slides that the opponent may produce. If one side is using Microsoft software and the other side is using Corel software, the court can request the parties to work out any problems in advance so that, if the court orders one side to provide digital copies to the other (see discussion at page 179), there will be no compatibility problems that could waste time once trial commences.

If one side is using proprietary software and the other side is using commercially available software, then it is important to establish that the proprietary software can produce digital files that can be read by the commercially available software. If not, then the user of the proprietary software should obtain the necessary conversion capability. Litigants should not be able to make exchanges of digital files difficult by hiding behind proprietary software. There are always small problems involved in these exchanges, even if there is a good conversion utility, because the proprietary software was designed to incorporate more capability than its commercial counterpart. These differences rarely involve anything central to conducting a fair examination. Because proprietary presentation software used for litigation pur-

poses almost always is provided by a litigation consultant who works for one side, the software is not readily available to an opponent. However, there is no work product involved so, as a last resort, the court can order a copy of the software to be made available to the opponent if fairness requires.

Disclosure as to exhibits

Disclosure should be considered with respect to everything that will be shown to the jury. The timing of disclosure may be different with respect to evidentiary exhibits, expert materials, and illustrative aids.

Normally all prospective evidentiary exhibits should be disclosed relatively early and listed in the normal course of pretrial preparation under the court's standard pretrial order. The objections to evidentiary exhibits are usually not changed much in a trial using courtroom technology. The additional objections to completeness and unfairness of displays of evidentiary exhibits is covered in Part IV, page 180, Objections to evidentiary exhibits.

In civil cases, most visual displays used by an expert for the jury should be treated as part of the expert's report for disclosure purposes, and most pretrial orders contain explicit provisions in this regard that are more detailed than the rules. Rule 26(a)(2)(B) provides that the expert's "report shall contain ... any exhibits to be used as a summary of or support for the opinions" The term "exhibits" includes any illustrative aids to be used by the expert in explaining the opinion. Rule 26(a)(2)(C) requires disclosures of expert exhibits to be made at least 90 days before trial, unless the court directs or the parties stipulate otherwise. Rule 26(e)(1) provides that the duty to supplement extends to expert reports (and therefore exhibits) and allows supplementation up until the time the party's disclosures under Rule 26(a)(3) are due, usually 30 days before trial. Simple bullet point lists of items covered in the expert's report, for example the materials reviewed by the expert, are often not con-

structed until shortly before trial and usually would not prejudice the other side if disclosed before the expert's testimony.

Illustrative aids, other than those used with experts, present a more diverse problem with respect to disclosure. Illustrative aids may appear in opening statements, direct examination, cross examination, and closing arguments. Suggestions for judges with respect to opening statements are on page 153, and those for closing argument are at page 209. Approaches with respect to direct and cross examination are on pages 174 and 178. The objections to illustrative aids often increase substantially when courtroom technology is used, principally because the technology invites increased use of illustrative aids and tempts some lawyers to excess. The most common objections are explained in Part IV, page 192, Objections to illustrative aids.

It is often useful to mandate disclosure in the form and format that will be used at trial. In other words, the exchange should provide the materials in a way that allows the opponent to see what is coming. For example, disclosure via black and white paper copies of slides that are in digital format does not disclose any color, sound, or motion that may be involved in the slide. A slide that contains an acceptable statement of fact may become objectionable if introduced with a drum roll or the sound effect of screeching brakes. For another example, disclosure by analog video of material that also exists (or will by time of trial exist) in digital format makes it more difficult for the lawyer receiving the analog video to use it for trial displays. Disclosure in the format that will be used at trial makes the pretrial process move more expeditiously and minimizes surprise.

Disclosure of digital alteration of documents

Parties sometimes "clean up" documents by removing marginalia that they believe are not relevant to the issues in the case. This can include stray marks such as lines or check marks, deposition exhibit identification numbers, tears from stapling, and similar marks in the margins or non-text portion of a document. This sometimes occurs

because the “clean” copy of the document is not as legible as some other copy that has extraneous marks on it. It also occurs when marks have mistakenly been made on originals by a paralegal or other processing personnel. These changes may be of concern for evidentiary purposes and should be disclosed.

Disclosure of digital alteration of photographs

Digital alteration does not necessarily affect the admissibility of a photograph if a qualified witness testifies that it is an accurate representation of what the witness saw. Just as an artist’s rendering may leave out details and still be admissible, a photograph can be edited to focus on things material to the case and still be admissible. However, regardless of the evidentiary status, disclosure should be made. A lawyer, cross-examining a witness using a drawing, knows that it was created by an artist and is alert to the possibility that it may not include significant details. A photograph carries with it a different assumption—that the camera recorded what was there and the photograph is an accurate reproduction of what the camera recorded.

It has always been possible to alter photos. Negatives can be retouched; positives can be altered and rephotographed. But the advent of digitized photos—that is, photographs that have been scanned and processed into digital files or photographs that have been taken with digital cameras—has made alteration quick, easy, and inexpensive. It can be done with near-professional quality by anyone with a \$200 software package.

The phrase “digital alteration” means different things to different people. It is useful to establish some ground rules about digital alteration of photos at a fairly early point in the pretrial proceedings if photos are of any importance to the issues in the case. One way to deal with this is to get agreement of counsel or specify the elements that might be included in a definition of the term digital alteration and to require disclosure if any of these techniques are used. A brief description of the principal elements is set out here.

More on photographs

Part II, page 82, discovery of photographs

Part IV pages 186 and 189, completeness and unfairness objections to photographs

Part IV page 204, objections to digitally altered photographs

- **Changing format.** Changing the format of an image (for example, from GIF to JPEG) may discard some of the data in the file. Some formats have a data-compression method that throws away certain types of data to decrease file size. Other formats do not discard any data in exchanges. Unless the very fine details of the photograph are at issue, data loss resulting from compression by standard accepted means is not usually a legitimate concern.
- **Changing color.** Software can convert black and white photos to color by estimating from the pattern of grays what colors should be added. Any color in any photo can be changed to any other color. (Note: the scanning process may also convert color photos to black and white by discarding all color information and generating a grayscale image from the luminosity values of the color image. See discussion in Part II, page 82, Discovery of photographs.)
- **Filtering.** Software allows an image to be sharpened, blurred, lightened, darkened, highlighted, shadowed, made to glow, repaired (to remove dust and scratches), and changed with hundreds of other special effects. The use of a filter is often not immediately apparent just by looking at the photo and often cannot be spotted, even by a qualified expert, unless the original is available for comparison.
- **Interpolation.** When an image is enlarged substantially, it may lose quality because each dot (pixel) is now farther away from its neighbor and the blank space in between is more apparent. Interpolation fills in data based on the software's guess as to what should be in blank spaces.
- **Cropping.** Cropping cuts out parts of an image without changing the content of the portion of the image that remains.



In this example, the photo of the woman standing with the man has been cropped to eliminate three quarters of the content. The cropped portion focuses solely on the man's upper body and face. However, the content of that portion—how his face looks—is unchanged.

- **Resizing.** When an image is resized, its size is increased or decreased (for example from 8 x 10 to 4 x 5) without cutting out any of its visual content. Although a smaller image (4 x 5) may include all of the same visual details as the larger image (8 x 10), when the digital file is downsized to produce the smaller image, sometimes data are discarded.



In this example, the small version at the right has been created by resizing the original version on the left. The ratio of height to width remains the same. Nothing about the visual scene is changed except the size. The data necessary to produce a very small

compact image may be much less than the data necessary for a larger image, and the software will discard automatically any data it does not need to support the current image. Therefore, if only the smaller image is saved, data may be lost.

- **Reshaping.** Reshaping changes the content of the image by stretching or condensing it in a top-bottom or left-right direction. Reshaping distorts the original image.



In this example, the photo has been stretched horizontally making the subjects look heavier than they are.

- **Masking, cloning, and touchup.** Software allows objects to be removed from photos (masking), objects to be added to photos (cloning), and many smaller changes to be made to objects and their background (touchup). Objects can be moved from one part of a photo to another. If masking and cloning are done skillfully, these effects can be nearly impossible to see by just looking at the photo. However, they can usually be spotted by a qualified expert.

Part Three: Pretrial



In this example above of cloning, an object (the lectern) is taken from one photo and inserted into another. After being inserted into the different background, the object can be moved around for optimum placement and then the photo can be cropped and resized to show as much of the new background as desired.

Photos are very persuasive evidence. Jurors almost uniformly credit photos that are admitted in evidence as being accurate in all respects. A cross-examiner who is faced with a photo is entitled to know whether it has been changed. Often the witness on the stand did not work on the photo and does not know. And presented with a photo, a witness may testify that it is accurate even if some details do not comport with the witness's memory. The lawyer offering the photo is in the best position to ensure that there is no inadvertent or intentional alteration. This may have been uncovered in discovery, but digital alteration can occur anywhere along the line and a standard disclosure at some point in the pretrial process should be required.

People who work with photos in a computer context are accustomed to doing "clean up" to make them look better. They may not know that evidentiary photos must not be changed. In commercial work, it is also quite common to "erase" what are regarded as "unnecessary" files—some of which a trial lawyer might regard as the "original." The digital files involved with photos take up a lot of disk space and may crowd out space required for other work. For this

reason, once a photo has been tweaked into the size and shape desired for a particular exhibit, other versions of it may disappear. Of course, the ultimate exercise of digital power in this regard lies in the ability of digital cameras to “erase” unwanted photos (after first viewing on a small screen at the back of the camera) and to record over the initial file so that no trace of the prior photo remains.

At some point, if there are any photographs used in materials presented to the jury—either illustrative aids or evidentiary exhibits—it is useful to get on the record a representation about any digital alteration. The representation should be that there has been no alteration, except as permitted by the court’s ground rules or as disclosed to the other side. Digital alteration of photos is easy to do and sometimes difficult to detect. The foundation requirements for photos have been pared back steadily so that no chain of custody need be shown, the photographer need not be called, and nothing need be proved about the history or accuracy of the photo at all if a competent witness will testify that it is an accurate representation of something relevant to an issue in the case.

When the proponent of a digitized photograph represents that it has not been altered except in ways permitted by the court’s ground rules (for example, resizing), but the opponent contends that it has been altered in ways that required disclosure, the challenger will usually demand exhaustive discovery that may or may not be practical. The fastest way to resolve the dispute often is to order the production of the digital file that is closest to the “source” of the image (that is, the available file with the fewest changes of any kind) and to turn the question over to an expert to advise the court in a prompt fashion, assessing costs as may be appropriate.

Disclosure of digital alteration of video

Everything that can be done to a photo can also be done to a video, and the considerations discussed above also apply to digital video.

Part Three: Pretrial

Videos of site visits, expert inspections, tests, and other matters usually run too long to be used in the courtroom, so excerpts will be prepared. This kind of editing does not affect individual frames. It simply edits out large groups of frames that involve material deemed irrelevant. The principal problem with this kind of editing is preserving the outtakes. The original video, including the outtakes (or discarded material), may not be preserved unless counsel serves a written request on the other side before the outtakes are gone. This can be a serious disadvantage for inexperienced counsel. A pretrial order might comment that admissibility of excerpts could be affected if outtakes are not preserved.

Digital video can also be edited on a frame-by-frame basis. This kind of editing changes the nature of the video because it is no longer what the camera recorded. It can have the same kinds of effects as the alteration of photos, and should be required to be disclosed for the same reasons discussed there.

Disclosure as to animations

Special consideration should be given to the disclosure of computer animations. These are normally complex displays, constructed by experts, that can have enormous impact on jurors. They may have been put together to sell a particular theme, case theory, or point of view and may be based on considerable jury and market research. A good animation that is played on a large monitor or projection screen often has a presence in a courtroom akin to a separate witness. Even if the cross-examiner does a good job in discrediting the expert witness who sponsored the exhibit, the animation itself may “testify” well—that is, it may make sense to jurors and be given significant weight regardless of the status of its foundation.

For these reasons, the cross-examiner needs a fair opportunity to deal with the animation itself. All of the factors with respect to photos and videos explained above are also present with animations, and the cross-examiner needs time to examine these possibilities.

More on video

Part II, page 90, discovery of video

Part IV, pages 187 and 191, completeness and unfairness objections to video

More on animations

Part IV, page 205, objections to computer animations

The cross-examiner may need to construct a counter-animation, or de-construct and modify the animation to show its weaknesses. If an expert has already been retained and has cleared the necessary time, it takes four to eight weeks to deal with a complex animation, depending on the nature of the assumptions and how they are expressed.

A schedule for disclosure of the animation, its underlying digital files, its outtakes, and the data on which it was based should be set up to allow ample time for examination of the animation and depositions of the experts who made it. Sufficient time is key to the cross-examiner's ability to get at the fairness of the animation. Disclosure shortly before trial is tantamount to no disclosure at all. Disclosure of the intent to use an animation needs to be made long before trial so that the opposing party has a fair opportunity to line up the necessary expert. Disclosure of the completed animation should be made at least 90 days before trial so that a motion in limine seeking to bar use of all or parts of the animation can be supported with the necessary analysis.

Regular analog videotapes are the customary format for the initial disclosure of computer animations. Unless the animation is truly of no consequence to the action, an analog videotape of a computer animation conceals nearly all of the useful information for cross-examination about the animation. The computer files that constitute the actual animation (not just a video representation of it) are needed to get at how the animation was made, to expose the assumptions that have been made, and to construct an effective cross-examination.

Disclosure of the underlying digital files conveys a substantial benefit. If the animation cost a significant amount, perhaps \$100,000 or more, the opposing side gets a free ride because the files that they receive contain all of the work that they would have had to pay a similar amount to create. They do not have to pay to input the data, or to create the animation's structures and motion, or to edit the animation into a usable piece. For a much smaller amount, in most cases, they can alter the animation by changing a few key data ele-

ments to illustrate their own theory of the case. Lawyers sometimes argue that conveying this benefit is unfair and therefore the video should be sufficient. However, the party that built the animation incurs these costs in any event, and any lawyer who commissions a computer animation knows that it is likely the digital files will be turned over in discovery unless the other side is not sufficiently vigilant on this point.

Equipment issues

Once it is clear through disclosures whether courtroom technology will be used in a case, and whether either side is bringing to the courtroom equipment for the display of exhibits and illustrative aids, three kinds of questions about equipment issues may arise. They have to do with sharing of equipment brought to the courtroom by one of the parties, sharing of equipment operators, and opportunity to practice with the equipment.

More on equipment

Part I, page 2, three levels of technology

Part IV, page 138, representations as to equipment and testing

App. A, best uses, setup, operation, and techniques for using equipment.

Shared use of equipment

Most equipment brought into the courtroom involves matters within the court's discretion under Rule 611(a) to "exercise reasonable control over the mode ... of ... presenting evidence so as to (1) make the interrogation and presentation effective for the ascertainment of truth, [and] (2) avoid needless consumption of time" If the court permits one party to bring equipment into the courtroom, the other party should not be denied the same opportunity to have access to these means of displaying exhibits. Having two evidence cameras, two sets of monitors, or two projection screens is usually disadvantageous to the court because of the clutter and waste of time that may occur, and the court may wish to require sharing where practicable.

The court may need to raise this matter sua sponte. Lawyers who

have not done trials using display equipment may not raise the sharing question. They may be unaware that the court may be willing to order shared use of any display mechanism that is brought into the courtroom, or they may be prepared to use dueling equipment sets.

The matter may also come up in a contested way—one party will ask that any equipment being brought into the courtroom be available to both sides, and the other party will refuse. Some lawyers refuse as a reflex action. If they are not familiar with the equipment, they may not appreciate circumstances under which there is no work product involved or they may believe the court has no basis to order sharing.

In considering sharing, it is useful to separate equipment into three categories:

- **The laptop computer.** The laptop typically contains files and software used to retrieve exhibits and transmit them to the monitor or projector, to receive input from real time reporting, and to communicate back to the office. Generally, laptops are not shared because they contain work product and may crash if misused.
- **Display devices.** Equipment to display exhibits includes evidence cameras, projectors, projection screens, monitors, annotation tools, converters, switches, controls, and cabling. This equipment can be shared because it contains no work product and is unlikely to sustain any damage. Sharing promotes efficiency and good order in the courtroom by avoiding dueling sets of the same equipment.
- **Equipment brought in by an expert witness.** Experts occasionally bring equipment to the courtroom for purposes of demonstrating some aspect of their testimony. Equipment brought in by experts needs to be considered on a case-by-case basis. If it is more like a laptop, and contains identifiable work product or requires special expertise to operate, perhaps it should not be shared. If it is more like the normal display equipment, containing no work product and requiring no special expertise to operate, normally it should be shared.

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Cost-sharing may be important if the equipment is not already available in the courtroom. There are commercial rental rates for all of the equipment used in courtroom presentations, so it is relatively easy to determine fair shares.

An additional consideration is whether the court should order the use of “better” equipment in order to save time and provide the best displays for the jury. For example, the digital projector selected by one side may be adequate for displaying one kind of exhibit but the other side may want to use a better projector to display different kinds of exhibits. This occurs primarily when the projector has a rating of below 1,000 lumens and the exhibits contain a lot of text. Projectors with lower ratings work relatively well with brightly colored photos, but they do not produce as distinct an image of dense text documents, and they may produce quite a bit of distracting noise from the fan that cools the unit.

Shared use of equipment operators

The question of shared access to an equipment operator may come up when one side is well equipped and the other is not. Ordering shared use of an operator may put the operator in a difficult position. Operators and technicians often work with the trial lawyers outside the courtroom and may know information that is privileged or confidential. Operators may “practice” with the lead lawyer or the expert witness for the party that retained them. Requiring them to work with opponents other than in merely ministerial ways (plugging in the equipment, finding a spare bulb) usually makes these nonlawyers very uncomfortable.

For example, one side may bring in an evidence camera, a projector, and a large projection screen so that photographs and other exhibits can be shown to the jury in enlarged format. If there are a large number of exhibits, the lead lawyer may have a technician or paralegal handle the evidence camera during trial. Now the other side wants to use both the evidence camera and the technician. One

of the other side's exhibits is put on the evidence camera. The technician knows that this exhibit would look better if the zoom function were used to focus on the area of the exhibit about which the witness is currently testifying, but the opposing lawyer has not requested this. The technician is pulled between helping the other side to perform better and loyalty to the trial lawyer for whom he or she works. If an operator is necessary, a better option may be to have the opposing lawyer provide a paralegal who can spend the short time necessary to learn how to operate the evidence camera.

Occasionally it may make sense for the parties to retain a neutral equipment operator. This sometimes arises out of a situation in which the parties have agreed on a vendor to bring the necessary equipment to the courtroom and install it temporarily for purposes of their trial. However, in most trials the central control for displaying exhibits is a laptop computer that also contains a great deal of lawyer work product. Shared operators for computers usually are not a practical alternative.

Practice with the equipment

Lawyers make the best use of the equipment when they are allowed to practice with it in the courtroom where it will be used. Especially for first-time users, regardless of trial experience, practice is a key to success. Use of the equipment in an office conference room often fails to simulate, in a realistic fashion, the situation the lawyer will face in the courtroom. Making the courtroom available, even for short periods of time when the court is not sitting, should meet this need.

Beginners may not understand the difference between an orientation session at a vendor's office or in their own facilities, and the demands of using the equipment in the courtroom setting. It may be useful to offer a suggestion in this regard. All of the courtroom equipment, particularly at Level One, is quite easy to operate. But one could offer three cautions:

- **Different controls.** The controls are not always immediately

intuitive. In particular, the control panels (if any) in the courtroom used to integrate the court's equipment may be different from the controls used elsewhere. Witnesses may be frustrated with the annotation equipment unless they have had a chance to try it out ahead of time. The touch screen, telestrator, and light pen all work quite logically, with only a few simple steps. But, like most computer equipment, if the steps are not in the right order, the equipment simply refuses to do what is expected of it.

- **Different effects.** The effect of particular displays on small monitors or a large projection screen in the courtroom space may be quite different from the image on a regular desktop computer monitor. A visual display that looks just fine on a desktop monitor in the lawyer's office may look washed out and quite illegible on the large screen in the courtroom. Projectors treat colors differently than monitors do, with variations among projectors as well, and a particular projector's settings may have been changed so that red may not look like red, and green may look slightly yellow.
- **Impact of blackouts.** The court might want to mention to counsel that the court's kill switch is cabled so that it can blank the jury's monitors, but it does not reach, and therefore does not affect, the equipment that is transmitting images to the display equipment. The lawyer operating that equipment must stop the action as soon as the court uses its kill switch. Otherwise, a video, or slide show, or audio will keep on running even though it is not displayed on certain of the monitors. When the blackout is over, and the court reactivates the jury's monitors, the display will be far beyond the point where the blackout occurred. The lawyer will have to spend time locating the place where the blackout occurred before continuing with the witness's testimony.

Making the record

The record in a proceeding in which the parties make extensive use of courtroom technology can be just as clean as the record in any other proceeding. The mechanics of distinguishing clearly between evidentiary exhibits and illustrative aids, numbering exhibits, and dealing with exhibits that have motion or markings made during testimony are easily accomplished.

Evidentiary exhibit: An evidentiary exhibit, before being displayed to the jury, must be admitted in evidence. To be admitted, it must have a foundation that includes the competence of the witness to testify about the exhibit, the relevance of the exhibit to an issue in the case, the identification of the exhibit distinguishing it from all other things; and the trustworthiness or authentication of the exhibit. Evidentiary exhibits may be used by the jury during its deliberations.

Illustrative aid: An illustrative aid, before being displayed to the jury, must be qualified as useful. This foundation includes either its utility in assisting the witness to present testimony, or its utility in assisting the jury to understand the testimony being presented. Illustrative aids are not evidence and typically are not used by the jury during its deliberations.

However, judges may allow such use in the interests of a fair determination of the case.

Evidentiary exhibits and illustrative aids

The term “exhibit” is usually used with respect to everything that is proposed to be shown to a jury, regardless of whether it qualifies as evidence. Each exhibit has a number so that the court can keep track of objections and rulings. Ensuring that exhibits admitted in evidence are distinguished clearly from exhibits that are only illustrative aids (and not qualified as evidence) takes on increasing importance as the number of illustrative aids increase.

An evidentiary exhibit may be in hard copy form as well as in electronic visual display form. For example, a photograph that has been admitted in evidence as an 8 inch by 10 inch glossy black and white print may be placed on the evidence camera, transmitted by the evidence camera to a projector, and displayed on a projection screen as an 8 foot by 10 foot black and white image. Similarly, the photograph that has been admitted in evidence may be scanned into digital form, inserted onto a slide without any change, transmitted by a computer to a projector, and displayed on a projection screen as an 8 foot by 10 foot black and white image. In both cases, the enlargement is a duplicate of the exhibit. It needs no additional exhibit number or qualification just because it has been enlarged.

The need for clarity arises because the same photograph may be an evidentiary exhibit or an illustrative aid, depending on how it is used. For example, an expert constructs a flow chart to show how she proceeded with her work on the case. This exhibit might not be

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admitted in evidence because it was not in existence at the time the issues in the case arose, does not qualify as a summary under Fed. R. Evid. 1006, and was prepared specifically for litigation purposes. But it might be allowed as an aid to the giving of the expert's testimony. The expert's flow chart may include a photo of the factory where the incident at issue occurred because a part of the expert's work was to go to the factory and make an inspection. The fact that the photo has been admitted in evidence does not transform the flow chart into an evidentiary exhibit.

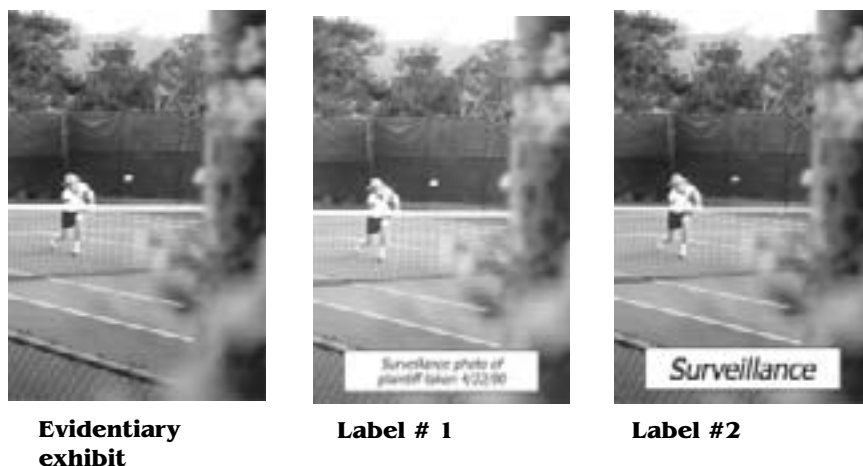
An evidentiary exhibit may become an illustrative aid depending on what has been done to it. Evidentiary exhibits such as documents and photos are frequently enhanced with labels, arrows, boxes, circles, bulleted lists, annotations with motion, or other special effects. Any significant enhancement to an evidentiary exhibit may turn the enhanced version into an illustrative aid that needs a separate exhibit number to keep it apart from the unadorned exhibit that was admitted in evidence. This is so when the enhancement is merely an aid to testimony and has no independent admissible purpose. As such, the enhanced exhibit should have its own exhibit number, be allowed as an aid to testimony, not be admitted in evidence, and not be available for jury use.

Lawyers want their enhanced exhibits to go to the jury room. Labels, marks, and annotations can have powerful persuasive effect. For that reason, proposed evidentiary exhibits may arrive in the courtroom already labeled. If a photo is scanned and a label added, a printout of that photo will include the label. For example:

More on evidentiary exhibits and illustrative aids

Part IV, page 180, objections to evidentiary exhibits

Part IV, page 192, objections to illustrative aids



The photo on the left was listed by the defense as an exhibit and admitted during pretrial proceedings. At trial, defense counsel uses the photo with label #1 as the witness testifies on direct examination about how the supposedly injured plaintiff was playing tennis. The cross-examiner, emphasizing that someone other than the witness took the photo, uses the photo with label #2. At the close of the witness's testimony, defense counsel offers into evidence the photo with label #1. Plaintiff's counsel objects on the ground that although the photo itself may be an accurate representation of what was observed, the label was not there at the time and is an enhancement of the photo; the changed photo cannot be admitted in evidence and is an illustrative aid so long as the label remains. Defense counsel argues that the label represents a fact to which the witness has testified under oath. Plaintiff's counsel then offers into evidence the photo with label #2. Defense counsel objects that the word "surveillance" was counsel's characterization, not the witness's, and is an illustrative aid.

The court may want to provide some ground rules in advance of trial as to how the line will be drawn between evidentiary exhibits and illustrative aids in the context of the particular trial. Labels added to evidentiary exhibits can be hearsay and witness-coaching devices

or they can help the jury distinguish one exhibit from another. Labels affixed by experts may be a legitimate part of the expert's work product, or they may be an effort to sell the theory of the case. If the lawyers know in advance that labels or other additions or enhancements to an evidentiary exhibit may change it into an illustrative aid, they can plan accordingly and avoid squabbles at trial.

Numbering exhibits

Two related problems arise with respect to numbering exhibits: the first is whether and to what extent there will be joint exhibits; the second is how the numbering system will work to accommodate both evidentiary exhibits and illustrative aids. The goal is an inexpensive system in which file names match exhibit numbers so that if, in deposition or in court, a lawyer wants to display plaintiff's exhibit 105, he or she need only type PX105 on the computer keyboard and it will appear.

Dealing with exhibit numbers can be an expensive part of getting ready for trial in a case in which courtroom technology will be used. Each exhibit must have its own file name in order to be retrieved from computer storage. If the parties have not agreed on (or the court has not ordered) an exhibit numbering system that accommodates computer file naming conventions, all of the names will have to be redone as trial approaches.

Ideally, a given document or photo should have only one number in the computer system of both plaintiffs and defendants. This not only makes it easier for the computer system, but it promotes juror understanding as well. If the exhibit will be used by both sides, it should be a joint exhibit (JX) so that every time it is used, its number is the same. If the exhibit will be used only by the plaintiff, then it should be given a plaintiff's exhibit number (PX) and if only used by a defendant, a defendant's exhibit number (DX).

In many cases, the numbering system becomes burdensome and expensive because there is a "Bates number" stamped on the docu-

ment at the time it is delivered in discovery, a deposition exhibit number assigned when the document is used in depositions—and perhaps multiple deposition exhibit numbers if the same document is used in more than one deposition—and then a trial exhibit number assigned when the parties begin to construct their exhibit lists for the court. This means that the data-input staff will first record the Bates number, then all the deposition exhibit numbers, and finally will change all the file names (or create a whole new set of files) for trial.

If the JX, PX, and DX numbering system is used from the outset, then (with minor adjustments) a given document will always bear the same number. Preparing for depositions is easier because the documents to be shown to the deponent will all bear a unique number and there will be no number overlaps. Computer searches of deposition transcripts are much easier because all references to the document identified as PX-23 will be retrieved without having to search as well for its Bates number and numbers in various depositions. Some documents will move from the category of PX or DX into the category of JX as the pretrial process goes along, but that is not difficult to accommodate.

Numbering of exhibits is further complicated when many of the exhibits are illustrative aids drawn from a page or paragraph of an evidentiary exhibit. These illustrative aids may show the document in the background and then extract words or phrases for emphasis. The document has its own exhibit number, but the illustrative aid needs an identifying number as well. One convention for numbering exhibits that works reasonably well is a three-step approach outlined below. It can be adapted to incorporate other district or judge-specific requirements.

- **Step 1.** Number all the proposed evidentiary exhibits—the documents, photographs, maps, diagrams, drawings, and physical objects that each party expects to offer in evidence. These exhibits have the number designation as PX1, PX2, PX3 and so

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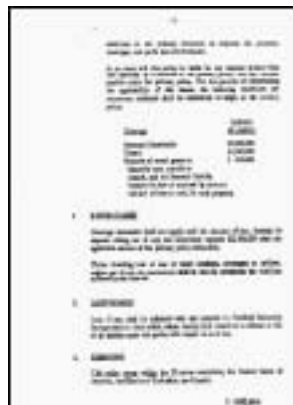
on, or DX1, DX2, DX3 and so on—whatever system the court customarily uses for numbering.

- **Step 2.** Designate evidentiary exhibits to which titles, labels, marks, and other enhancements have been added and assign related exhibit numbers. This kind of numbering scheme is helpful when a witness uses a touch screen, telestrator, or light pen to mark on an exhibit, and one party or the other demands a printout from the video color printer of the marks that have been made. The printout can be numbered quickly without disturbing the established order.

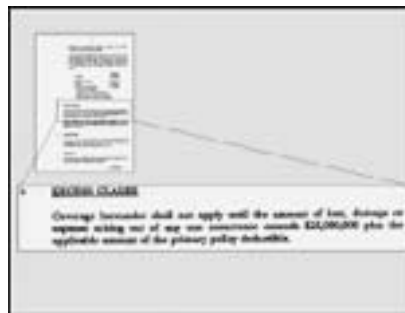
For example, Defendant’s Exhibit 12 is a multi-page document admitted in evidence as DX12.



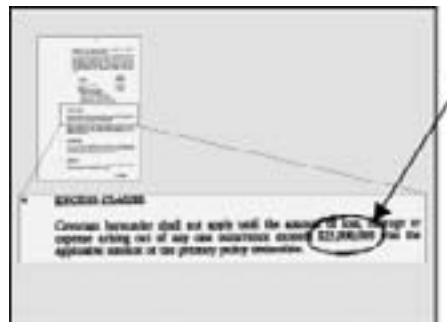
Below is an enlargement of page 4 of Defendant’s Exhibit 12, unchanged in any way. It is still DX12.



Below is an illustrative aid that puts a box on a paragraph of page 4 of Defendant's Exhibit 12 for emphasis, and then enlarges that paragraph into a callout placed below the image of the page. This might be DX12-4A, with the designation signifying that this display is the first enhancement of page 4 of Defendant's Exhibit 12.



If the witness has drawn a circle around a number indicating that she paid particular attention to this when reading the document, and opposing counsel wants to make a record, the print-out could be numbered DX12-4B or some other letter at the end of the currently numbered displays about page 4 of Defendant's Exhibit 12.



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- **Step 3.** Number illustrative aids that (a) do not incorporate any evidentiary exhibits (such as bullet-point slides), or (b) incorporate more than one evidentiary exhibit. Each of these exhibits would get a number in the sequence following the number for the last evidentiary exhibit.

This is an illustrative aid that combines four photographs, each one an exhibit that has been admitted in evidence, with a title describing the action that the photographs depict. This would become PX54, assuming that the last exhibit was numbered PX53.



Premarking exhibits

All exhibits that exist in physical form—the paper copies of documents and photos, and the tape copies of analog audio and video—can be marked and assembled for the clerk in the normal course. As exhibits are introduced at trial, they can become part of the record without the lawyers submitting additional hard copies.

The photos taken with digital cameras that are generated and used in electronic form can be printed out, numbered, and assembled for the clerk in the same manner as other paper copies.

If illustrative aids must be premarked (for example, slides to be

used by an expert), computer-generated materials can be printed out in letter size and marked. Some slides likely will incorporate motion and sound. For marking purposes, it is usually adequate to make a single printout that represents each slide. In fact, the slide may have 5 or 10 different “reveals” as the user clicks on the controls and displays additional features. The single printout of the final appearance of the slide (after all the “reveals” have been shown) cannot capture the slide’s motion or sound. To make an adequate record with respect to these, a CD is needed. (See discussion at p. 180 with respect to the trial record.) However, for numbering (identification) purposes, the single printout is sufficient.

The court will find it useful to require parties using computer-generated illustrative aids in slide format to put the exhibit numbers directly on the slides. This is done with a software operation that creates a small text box containing the exhibit number and embeds it on the slide. That way, every time the slide is shown, its exhibit number is on the screen. Because illustrative aids of documents or photos often include in the upper right corner the exhibit number of the underlying evidentiary exhibit (see example on page 193), illustrative aid exhibit numbers are often put in the lower right corner of the document. This has the additional benefit that a search on the computer for this exhibit number will locate the individual slide within a slide show.

Videoconferencing for pretrial matters

A videoconference may be a practical way for the court to work on pretrial matters if the court or one or more of the lawyers is in a distant location. The federal courts with videoconference facilities are listed in Appendix B. Appearances, hearings, motions, and conferences have been done successfully by videoconference in both civil and criminal cases for the past 10 years. During discovery, depositions of fact witnesses may be done by videoconferencing under a variety of procedural arrangements. This may be one way to break deadlocks over scheduling and travel arrangements. This is also convenient if a magistrate must monitor the deposition to ameliorate disputes.

Judges with experience using videoconferences in pretrial matters suggest that the following considerations be taken into account.

- **Judge in a remote location.** If the judge is in a distant courtroom and not available in the courtroom where the case will be tried, the judge can appear by videoconference, and the lawyers for both sides can appear in the courtroom as usual. Judges who are working in distant courtrooms also may want to have their regular court staff participate by videoconference. In this way, law clerks and other staff can work on matters with the judge without having to travel. Communication between judge and staff can go back and forth through the separate channel of E-mail or instant messaging while the videoconference proceeds.
- **Lawyer in a remote location.** If one of the lawyers needs to appear by videoconference, some judges order all lawyers to appear by videoconference so that no lawyer feels disadvantaged. If one lawyer is at the courthouse, face-to-face with the judge, the lawyer who is appearing by videoconference may not have the same advantage in making his or her presentation.
- **Special considerations in criminal cases.** Criminal defense counsel are concerned when they must be with the client at a remote videoconference location (usually at the prison) and the

More on videoconferencing

Part I, page 24, description of videoconferencing equipment

Part I, page 46, Criminal vs civil proceedings

Part IV, page 168, videoconferencing witness testimony

App. A, best uses, setup, operation, and techniques for use in videoconferencing

prosecutor is in court with the judge. They are also concerned about the possible dehumanizing effect on criminal defendants who are not permitted to appear in court during pretrial proceedings. Some judges use videoconference equipment for arraignments and other pretrial criminal proceedings and do not find any constitutional issue inherent in this procedure. Other judges have found that the use of videoconferencing for arraignments and sentencing does not comply with the federal rules.

- **Use of nonpublic facilities.** Some judges do not allow the use of nonpublic facilities (usually law office conference rooms that have been equipped for videoconferencing) and require that all lawyers appear in a public facility. These judges are concerned that appearing in a comfortable and well-appointed private facility may create some advantage. Different lawyers may be using different public facilities—one lawyer may be in a federal courthouse in another state while the other lawyer may be in a state courthouse in his home jurisdiction.
- **Security issues in noncourt public facilities.** Some judges have experienced difficulty when lawyers use public videoconference facilities and members of the public come into the space, bring signs or banners to hold up before the camera, and otherwise disrupt the proceedings. When videoconferences are held in courthouses, security personnel are available to deal with these problems, but in public libraries, universities, other educational institutions, and commercial establishments no security measures are available.
- **Cost.** Three kinds of variable costs are incurred when videoconferencing is used for court hearings. First, court personnel are usually involved with arrangements, setup, and operation of the videoconference at the court's end and the court incurs indirect costs in these regards. Second, the telephone company charges the cost of using the lines while the videoconference is in session to the party that initiates the videoconference call. Third, if the party at the remote end is not

using a court or government facility, there is usually a per-hour charge for the use of the videoconference room. An additional cost consideration may arise when parties want to use court facilities for videoconferencing depositions, which would involve a fee if done at a commercial facility. Practice varies as to imposing these costs on the parties appearing before the court and may depend on the circumstances requiring the videoconference.

The general guidelines for lawyers and judges working together by videoconference are set out below.

- **Questions from the court.** The short delay between the time words are spoken and the time they are heard at the other end is one of the most annoying features of videoconferencing. If a judge interrupts a lawyer to ask a question, the lawyer may continue speaking (before realizing the judge has interrupted) and miss the first few words of the question. This problem is minimized if the court prefaces questions with a warning remark, such as “Counsel, I have a question.” When the lawyer hears that phrase, he or she should immediately stop speaking and listen for the question. This will ensure that the lawyer hears the entire question.
- **Voice level.** Another difficulty with some videoconference setups is the quality of the audio. If the audio equipment is high quality, as is the case with newer installations, a normal voice level is sufficient. The microphones on either end will pick up and transmit normal voices very clearly, and the speakers on either end will provide good audio. With good equipment, there is no need to speak any louder or slower than one would in person in any courtroom proceeding. However, it is necessary to do a short test if working with unfamiliar equipment to determine the voice level necessary to communicate clearly with the other side.
- **Unnecessary movement.** On both ends of the video conference, participants should avoid exaggerated gestures or move-

ment. Participants must stay within the viewing angle of the camera which, in most instances, is in a fixed position. Rapid or continuous arm and hand movements are more noticeable in a video setting and may be distracting.

- **Random background noise.** The noise from tapping, shuffling papers, or taking notes on the bench, at the lectern, or at counsel table is transmitted through the system. This background noise makes it difficult for a person on the other end to hear what is being said and to concentrate on the substance.
- **Mute button.** Both sides have a mute button to turn off the audio transmission. When two lawyers appear together at counsel table, they need to understand that the microphone will pick up whispered conversations between them and transmit them clearly to the other participants unless they use the mute button. Sometimes the mute button is inadvertently left on at one side or the other. Each side needs a flash card to hold up before the camera indicating there is no audio transmission coming through.
- **Dress.** Participants should avoid white and vivid colors. Bold patterns may cause a strobe effect.

Other uses of technology by the court during pretrial

The court may benefit from several other uses of courtroom technology during pretrial proceedings in order to increase efficiency and the effectiveness of presentations.

Visual displays during pretrial proceedings

Pretrial proceedings such as discovery hearings, motions, and pretrial conferences offer significant opportunities to use courtroom technology to shorten and focus presentations to the court. Visual com-

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munication, even of matters primarily involving documents, can be expedited if the court and parties bring the documents to the screen so that the court does not have to hunt through a pile of materials.

Judges who have access to CM/ECF (Case Management/Electronic Case Filing) systems can bring electronically filed documents to the monitor at the bench (and in other monitors in the courtroom if the requisite cabling exists) to look at particular passages that may be relevant to an ongoing hearing. In the CM/ECF system, lawyers “print” their briefs, motion papers, and other submissions to the court as PDF files, connect to the court’s computer via the Internet, log on with a password, and transmit the file. Once filed, the judge can log on to the system, specify the case name, and gain access to all of the filings. Images and audio clips can be attached to the PDF files, and documents and attachments within the file can be hyperlinked. With these links, the court can click on the reference in the text of the document, and the supporting material appears on the screen automatically. This reduces substantially the amount of paper carried from chambers to court and the amount of time to find a particular page. The court can fully search any PDF text file (e.g., a brief transmitted electronically) but not PDF-image files (e.g., a copy of a promissory note or some other document attached as an exhibit) without OCR processing.

Lawyers can use presentation software to display documents on the monitors in the courtroom and annotation tools to point out, highlight, or enlarge significant passages rather than reciting that the offending sentence is on the 14th line from the top of the 42nd page. This capability is available regardless of whether the court has a CM/ECF system. Lawyers can also hand up CDs containing digital files of relevant materials for the court’s use at or after the hearing. It is less costly for the parties and more convenient for the court to view color photos, graphics, and charts on the screen. When objections to exhibits are being discussed, the parties can put the exhibit on the screen the way it would appear in the court and hand up thumbnail outline sheets (see illustration at p. 177) on which the court can take notes.

Pretrial educational materials

In cases involving complicated facts, the court may want to have the parties use courtroom technology to support submissions for the purpose of educating the court about scientific or technical matters that are necessary background for deciding matters ultimately at issue in the case. Traditionally, these presentations have been in the form of written submissions with attached exhibits. Encouraging the use of visual displays often reduces the amount of time and work the court must expend to digest the necessary information.

Computer-generated slide presentations can work better than written briefs in explaining technical matters because they can incorporate photos and videos with the necessary labels and text. Slides encourage brevity and feature the visual aspects that may be more clear than descriptive paragraphs. Any necessary videos or photographs can be incorporated. In addition, the cost for developing a slide show might be considerably less than the cost for preparing and editing a complicated written presentation. Most presentation software packages make available a free viewer that can be submitted on a CD together with the slide show so that the court's computer can run the slide show.

Videos may be easier for the court to use than a computer-generated slide presentation because the controls for a VCR are more familiar. Both video presentations and computer-generated slides can be put onto a videotape and played in the traditional manner.

Expert assistance in analyzing complex technology or visual displays

Most circuits have expert systems personnel at one or more locations who can be called upon for assistance in analyzing complex technology that lawyers propose to bring into the court, or to assist with the technology behind visual displays.

Fed. R. Evid. 706 permits the court to "appoint expert witnesses of its own selection." Under Fed. R. Evid. 104 and precedent with re-

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spect to inherent authority, courts can appoint non-testifying experts to aid the court. Either of these avenues may be of assistance in assessing complex visual displays offered either as evidentiary exhibits or illustrative aids.

For example, if one party has prepared a detailed computer animation purporting to assist an expert in testifying about an important issue in the case, and the other party has objected, drawing the court's attention to perceived shortcomings in the input for or preparation of the animation, the court may wish to have an independent assessment of the animation before deciding whether it may be used.

Part IV

Trial

At the opening session of trial, as the court takes care of preliminary matters, jury selection, preliminary jury instructions, and opening statements, a few matters with respect to the use of courtroom technology may require attention. The aspects of courtroom technology that affect the remainder of the trial are straightforward. This part of the guide covers the following:

- **Preliminary matters:** representations by counsel about equipment (inspection, testing, compatibility, reliability, and positioning) help avoid possible issues on appeal; judges need to know about arrangements for backup to the equipment to avoid delays.
- **Jury issues:** voir dire questions that would seem unusual in the traditional context are necessary to determine how technology-driven exhibits must be created or changed to accommodate the needs of jurors. Visual acuity is important as jurors may not be able to read displays at a distance; colorblindness may affect jurors' ability to understand colored displays. The court may want to include preliminary instructions explaining the courtroom technology. The court may also want to use the technology to display instructions—showing the instructions on courtroom monitors or screens.
- **Opening statements:** previewing displays to be used in opening can prevent time-consuming interruptions and objections when trial starts.
- **Real-time reporting:** which monitors in the courtroom will have access to real-time reporting output; what uses will be permitted for the unedited transcript.
- **Videoconference for witness testimony:** guidelines for taking witness testimony from a remote location and problems that may arise.

- **Use of illustrative aids:** issues that arise when illustrative aids are presented in direct examination and cross examination; issues as to delivery of copies to opposing counsel and record copies.
- **Objections:** issues raised by objections to evidentiary exhibits and illustrative aids created and displayed electronically.
- **Briefs:** computer-generated illustrations in briefs and digital format briefs.

Preliminary matters

At the beginning of a trial using courtroom technology, representations from counsel, review of backup arrangements, identification of equipment operators, and testing the kill switch are useful for the appellate record and for saving time later in trial.

Representations about equipment and testing

Representations from counsel at the outset of trial are a useful way to create a record as to the equipment that might be used during trial and a way to deal with some potential appellate issues arising out of its use. This is not a substitute for disclosure, discussed in Part III, but the creation of the necessary record about what is taking place in the courtroom. It takes less than five minutes to get the standard representations on the record if counsel have been notified ahead of time that such representations will be required.

- **Equipment.** Each party can be asked to describe the equipment that they will be using. This may be the court's equipment or supplemental devices brought to the courtroom especially for trial. A typical representation with respect to Level One equipment might go something like this: "Your Honor, we have a laptop computer that contains the files for the exhibits we will

be displaying. The computer output will be displayed on the monitors in the courtroom. We may also use a projector to display information on a large screen here in the courtroom. We plan to use a light pen so that counsel or the witness can mark on any screen display. We have a video printer to record any of those marks if necessary. We will use the evidence camera. The output of this equipment is also displayed on the monitors in the courtroom and on the large screen through the projector. The court has videoconference equipment, and we may use that to present witnesses who are in remote locations.” Once this representation is completed, the court can inquire of the opposing party if they have any objection to the use of the equipment as described.

- **Inspection.** Each party can be asked to state that they have had an opportunity to inspect any projection or display equipment present in the courtroom. This includes the monitors, screens, projectors, printers, evidence cameras, cables, switches, wiring, and the like—probably everything except the contents of the opposing lawyer’s personal laptop computer. There are no legitimate work product issues with projection and display equipment.
- **Testing.** If the court supplies equipment, a party who uses that equipment should represent that it has had an opportunity to test the equipment and that it works satisfactorily. Most difficulties with Level One equipment can be spotted with a simple pretrial check. This will avoid the inevitable request for a break if the equipment fails to work the first time someone tries to use it during the trial. If a party plans to bring equipment to the courtroom, to use either standing alone or in conjunction with the court’s equipment, it is useful to get a representation about compatibility and reliability. Projectors, evidence cameras, laptops, monitors, and annotation tools all have little quirks that may prevent them from working together on the

first try. Just because they worked fine in the lawyer's office is no guarantee that they will work fine in the courtroom.

- **Sufficient audio.** Good audio is fundamental. If there are any sound tracks to be played (e.g., video depositions) supplemental speakers may be necessary for adequate sound. These speakers must be compatible with the court's audio system and should have been tested before trial. If there are hearing-impaired jurors, the wireless headsets should be tested to be sure they work.
- **Positioning of equipment.** If one side or the other has brought equipment to the courtroom, each side should represent that they are satisfied with the positioning of the equipment in the courtroom. This obviates later arguments that a line of sight to the court, jury, or an exhibit is blocked in which case the court may have to consider a request that the equipment be moved.
- **Kill switch.** The kill switch that takes an image off all the monitors or projection screens within the view of jurors can be tested by having counsel put an image on the screen and pressing the switch. If equipment has been brought to the courtroom, either to supplement the court's equipment or to stand alone, it is important to establish at the outset that the images projected anywhere a juror can see them can be controlled by the court. Judges who work in courtrooms with small monitors in the jury box need to be sure to turn the jurors' monitors back on if the kill switch is used during trial. The lawyers will not know that the jurors' monitors are still off because the images will be showing on their monitors (which would not have been turned off). This usually comes to light only when a lawyer refers to something that should be appearing on the screen, and the jurors are all looking up wondering what is happening.
- **Real-time reporting.** If real-time reporting is being used, each party should represent that the output of the court reporter's equipment appears on counsel's monitor or computer as it should. If there are monitors for display of real-time reporting

output to the public, it may be helpful to have a representation that counsel is satisfied with the positioning of those monitors.

- **Computer sound signals.** The court may want to require that counsel turn off all the sound signals on the computers that will be used in the courtroom. Microsoft provides a number of sound signals for the start of various operations that can be quite annoying in a quiet courtroom. Fortunately, Microsoft also provides an easy way to turn them off. (Tell the lawyers to go to START, Settings, Control Panel, Sounds, and then select the “No Sounds” option.)

Identification of operators

Each party should be asked to identify anyone who will be operating the party’s equipment in the courtroom. These equipment operators may need to be in the well of the court, and it is useful to know who they are.

Backup in case of equipment failure

Requiring lawyers to state for the record the backup that they have for their equipment helps everyone focus on what will happen if the equipment fails, and it minimizes confusion and delay if failure does occur.

Normal backup arrangements are straight forward:

- **Evidence camera.** Backup is usually either acetate transparencies on an overhead projector or paper copies of exhibits handed to the jurors.
- **Laptop.** Backup may be (1) a second laptop loaded with the same files that can be substituted in event of failure; (2) paper copies used on the evidence camera; (3) acetate transparencies used on an overhead projector; or (4) paper copies used in the traditional manner.
- **Projector.** The most likely failure on a projector is a burned out

bulb, so having a backup bulb is prudent. Projector bulbs now have an extended lifetime of around 1,000 hours. If the projector is part of the court's equipment, a member of the court staff should be trained on accessing the projector clock. Periodic checking will enable the staff to order these bulbs in advance. If the projector goes out for some other reason, and the courtroom has monitors, the evidence camera and laptops can be cabled to the monitors. Another backup is to use acetate transparencies on an overhead projector. The ultimate fallback is paper copies used in the traditional manner.

- **Projection screen.** If the courtroom uses a rear projection system, a separate screen will need to be brought in for any backup materials.
- **Monitors.** Rental monitors are usually available immediately from local audio-visual suppliers.
- **Annotation equipment (touch screen, telestrator, or light pen).** There is a software alternative (the drawing function) built into presentation software that works, but less flexibly. Any laptop that has presentation software on it will have this capability.

Equipment failures are not usually a problem once the equipment is running. One judge reports that in four years of using this equipment for most trials, he has had only one total collapse of the equipment. Almost all failures occur on the first day the equipment is used, generally because someone failed to connect cabling properly. However, as one court has pointed out in its guidance on the use of presentation technology, Murphy was an optimist.

Jury selection issues

More extensive use of projection and display equipment in the courtroom raises a few additional matters to be addressed during jury selection. Questions that would seem unusual in the traditional context are, in fact, necessary to determine how technology-driven ex-

hibits must be created or changed to accommodate the needs of jurors.

Visual acuity

Visual displays on large monitors outside the jury box or on projection screens require that jurors have the capability to read at a distance. Some people who cannot see well wear glasses for close-up reading but do not get the bifocals or second set of glasses that they would need to read at a distance. They find that their distance vision is good enough for most things, and they are not concerned about reading at a distance because they are rarely called upon to do that. When they arrive for jury duty, they may have their regular glasses but, when a visual display shows up on a monitor or screen some distance away, they cannot read it. This is a serious problem in a trial in which the parties rely on visual displays to help make key points. For that reason, it is usually a good idea to put something up on the screen that will be used for exhibits and inquire whether anyone has any difficulty reading it. Alternatively the court might ask jurors who wear glasses for any purpose whether they have prescriptions to correct distance vision. If they do, they can be asked to bring that set of glasses when they come to court the next day and can be told why this is necessary.

Small monitors inside the jury box can be seen very well with ordinary correction for close-up vision and generally are less problematic because people tend to carry with them any glasses needed for close-up reading. Nevertheless, the court may also want to remind far-sighted jurors to bring their glasses to court.

Color blindness

Some significant portion of the population, perhaps one person in five, is color blind. Scientists seem to disagree about the exact percentage, but because of the hereditary nature of color blindness, it

afflicts a larger number of males than females. Genetic color blindness generally does not involve a complete inability to see colors. It is usually an inability to distinguish reds and greens and differentiate small tonal variations of other colors. Color blindness resulting from age usually occurs after about age 50 and is typically an inability to discern variations of blue.

Some kinds of visual displays that depend on color to make a point can be misleading to color blind jurors. These people will have trouble, for example, with a bar chart that uses red and green to compare amounts, or a pie chart that uses shades of blue to differentiate shares of some given amount. Other aspects of visual displays may also be perceived differently to color blind jurors than to other jurors. Deliberations may be difficult if jurors saw different things.

It is useful to inquire, as a routine item during jury selection, whether anyone is color blind. Most people who are color blind know about their condition because it affects many small aspects of everyday life. This information gives the lawyers an opportunity to adjust the colors on their exhibits or to make sure that their oral explanations take account of the fact that some jurors cannot see certain color differences on the screen.

Hearing impairment

Jurors often think that a hearing impairment will disqualify them from jury duty, so they will answer a direct question in the negative, or fail to raise their hand if a general question is addressed to the panel. They rationalize that they can hear well enough and their impairment is too slight to be worth mentioning.

Most courts have an amplification system with assisted listening devices to help hearing-impaired jurors. This is usually an infrared emitter mounted somewhere on the wall at the front of the courtroom which sends low frequency lightwave (infrared) signals to headsets. The battery-operated headsets produce amplified sound. These devices are also used for simultaneous translation.

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One alternative is for the court to hold up a sample of the headset offered for sound amplification, explain that the acoustics may not be perfect under all conditions, mention that it is battery-operated so that there are no wires or plugs to be concerned about, and ask the jurors if anyone wishes to have one. This seems to work a little better than a general question about hearing impairment.

It is Judicial Conference policy that all federal courts provide reasonable accommodation to trial participants (parties, attorneys, and witnesses) with communication disabilities. For the hearing impaired, this may be a sign language interpreter, an assisted listening device like the headset, or access to a real-time transcript during trial. If a trial judge finds a prospective juror with a communications disability legally qualified to serve under the Jury Selection and Service Act, that juror should also be so accommodated. See the Guide to Judiciary Policies and Procedures (Vol. I, Chap. III, Part H) for more information about implementing this policy.

Tolerance for television

Jury science consultants advise lawyers that the amount of television watched by a prospective juror affects how quickly he or she is ready to absorb the content of a visual display and move on. People who watch a lot of television, consultants find, feel comfortable with a pace that is considerably faster than people who get most of their information or entertainment by reading newspapers and books or listening to radio. In making presentations, lawyers often regard it as important to know if there are “paper-oriented” people on the jury so that the timing of the displays can be adjusted. Readers get impatient and annoyed if they are not allowed enough time to examine all aspects of a display thoroughly, and it disappears before they are finished considering it. Watchers are accustomed to looking at displays in a more general way and assume that if they didn’t get the message the first time, more will be coming.

Preliminary jury instructions

The use of courtroom technology raises two points with respect to jury instructions. The first is whether the court should include in the preliminary instructions a brief introduction or orientation to the equipment. The second is whether the court should use the equipment to put the jury instructions on the screen in the courtroom as they are being read.

Orientation for jurors on the equipment

For the same reason that courts have traditionally introduced court personnel—the clerks, bailiffs, and reporters – it is helpful for the court to provide a short orientation to the equipment in the courtroom. Most jurors are very comfortable with the equipment, and do not need a lot of information about how it is going to work. However, a brief introduction ensures that all jurors are informed. If the court does an introduction, the lawyers do not have to introduce the equipment during opening statement, and the court's statement makes clear that the equipment (even if brought in by one side) is a part of the court's regular proceedings and does not favor one side or the other.

The following short orientation statements can be used depending on what is in the courtroom and what the lawyers have said they will use during trial:

- **Monitors.** “Our courtroom is wired so that the lawyers can display on monitors the documents or photographs or other things that are involved in the case. I have a monitor here at the bench. Each lawyer has a monitor. There is a monitor for the witness.” [Add a sentence on juror monitors if they are used. If the monitors for the jury are outside the jury box, ask if everyone can see the monitor. If the monitors for the jury are inside the jury box, describe the extent to which jurors can control the brightness or contrast on their monitors.]

- **Evidence camera.** “We have an evidence camera next to the lectern. It is the device with the small box on top of an arm, and two lights on arms above its base. The evidence camera is a stationary video camera. It works like any other video camera. If you put something in front of its lens, it transmits a picture. In this case, the video camera is hooked up to display its pictures on the monitors in the courtroom.”
- **Laptop computer.** “Each lawyer can use a laptop computer at the counsel tables located in front of me, and at the lectern located over there. Those computers are plugged into a cabling system that is connected to the monitors in the courtroom. When the lawyers are at the lectern, whatever they bring up on the screen of their computer is also displayed for all of us to see.”
- **Projector and projection screen.** “We have a projector located over there. That projector is cabled to receive input from the computers and from the evidence camera. It displays enlarged pictures of what it receives on the projection screen over there.”
- **Annotation tools.** “We have what is known as a [touch screen or telestrator or light pen]. This works on the same general principles as the “John Madden” pen that television sportscasters use to draw Xs and Os on the screen during football games. The lawyers and witnesses may use this equipment to draw your attention to a particular place on something that is displayed on a monitor [or on the big screen].”
- **Videoconferencing equipment.** “We may need to use the court’s videoconferencing equipment. This is a way to allow us to receive testimony from a witness who is at some distance from us. If we do, we will hook up by special telephone lines with an office that has the same equipment. We will use our video cameras to project what is going on here in court, and we will use the video cameras at the office where the witness is located to project what is going on there. You will be able to see both sides—the lawyer here in court and the witness on the screen.”
- **Real-time reporting.** “Our court reporter works at a steno ma-

chine that puts a written transcript of what people say on my monitor on the bench and on the monitors that the lawyers have. Occasionally you will see us referring to that transcript. It is for purposes of checking what has been said. We use this in the courtroom so we can be more efficient, but you will not have this transcript in the jury room when you deliberate, so it is important to listen carefully to the evidence.”

- **Kill switch.** “I have a control switch, or cutoff switch, here on the bench. This permits me to control the presentation of evidence to you so that if there is an objection, I can press the cutoff switch and your screens will go blank while I discuss with the lawyers whether the item is appropriate for viewing. That is normal and standard procedure, and you should not draw any inference one way or the other when I use the cutoff switch.”

These explanations help jurors who may have less familiarity with the technology and might feel at a disadvantage in discussions with a juror who has a good deal of knowledge about electronics or computer equipment. It also helps avoid speculation among the jurors about the equipment by making it all just a part of the courtroom environment. The instruction about real-time reporting equipment helps head off the expectation that a transcript will be available in the jury room which may cause some jurors to listen less closely.

Because the practice of allowing evidentiary exhibits to go to the jury room but withholding illustrative aids is a mystery to most jurors, it is useful to explain how this works at the outset in the preliminary instructions if the case is likely to involve a substantial number of illustrative aids. For example:

“Because this courtroom is equipped as I have described, the lawyers may use illustrative aids in their opening statements and at other times during trial to assist you in understanding the evidence. However, illustrative aids are not evidence. They are presented so that you can focus more efficiently on the evidence during the trial. They are very similar to the verbal comments of lawyers in opening state-

ments and closing arguments: comments that are not evidence but which should be helpful to you in understanding the evidence. Just like the verbal comments of lawyers, you will not have the illustrative aids in the jury room when you retire to deliberate. At that time, you will use only sworn testimony of the witnesses and the exhibits that have been admitted into evidence.”

In jurisdictions where juror note taking is permitted, the court might consider adding: “If you find that an illustrative aid is helpful to you in understanding or organizing the evidence, you are allowed, but not required, to describe it in your personal notes.”

Jury instructions on the screen

Reading along while jury instructions are given orally makes it easier for jurors to understand and remember the instructions. Preliminary jury instructions are usually standard, so only two sets of visual displays are needed—one set of slides for criminal cases and another set for civil cases. A court might experiment with displaying preliminary jury instructions and leave the decision about displaying the more complicated final jury instructions to the end of the trial. One additional benefit from putting preliminary jury instructions on the jurors’ monitors or on the projection screen is that the courtroom technology is demonstrated to be a regular part of the court’s proceedings under the court’s control, not special to one side or the other.

One simple way to put preliminary instructions on the jury’s monitors or projection screen is to use a Microsoft Word or Corel WordPerfect file. The jury instructions are typed into a word processing file, perhaps with explanatory titles. The word processing file is brought to the screen using the court’s computer at the bench, and the court simply scrolls through the file as the instructions are read.

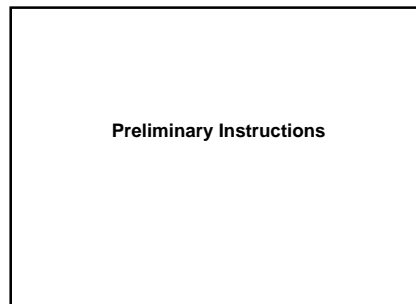
A more polished presentation can be created using presentation software such as PowerPoint (see explanation at page 8). The slides

are stored in a file on the court's computer and can be retrieved at any time. Once the file containing these slides is opened on a laptop computer at the bench, only two actions are necessary to display them: (1) pressing the button on the control at the bench that switches the input to the monitors in the courtroom from the lawyers' lectern to the court's computer, and (2) tapping the space bar on the court's computer to move from one sentence to the next as the instructions are read aloud.

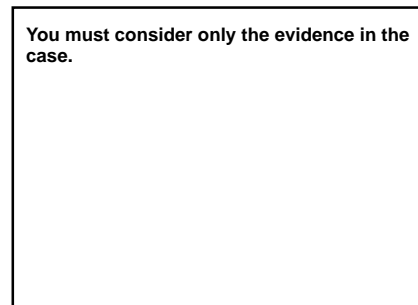
A single slide has a limited amount of space, and it is important that the letters be large enough to be read easily. For that reason, a series of slides will be needed to accommodate all of the preliminary instructions. To promote understanding, jurors should not be able to read ahead of the oral presentation. This objective is achieved using a technique known as a "reveal," which allows portions of the slide to be revealed one at a time. As the court begins, the first sentence comes up on the screen. When the court finishes reading that sentence, the next sentence comes up on the screen, and so on. The timing of the appearance of each new line of text and each new slide can be controlled by the judge or a designee such as a law clerk. The command for a new line is given by simply tapping the space bar on the laptop computer at the bench.

For example:

Slide 1



Slide 2, reveal 1



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Slide 2, reveal 2

You must consider only the evidence in the case.

However, you may draw such reasonable inferences from the testimony and the exhibits as you believe are justified in the light of common experience.

Slide 2, reveal 3

You must consider only the evidence in the case.

However, you may draw such reasonable inferences from the testimony and the exhibits as you believe are justified in the light of common experience.

You may make deductions and reach conclusions that reason and common sense lead you to make from the testimony and the exhibits.

Slide 3, reveal 1

There are rules of evidence which control what can be presented to you and what can be received in evidence.

Slide 3, reveal 2

There are rules of evidence which control what can be presented to you and what can be received in evidence.

When a lawyer makes a statement, or asks a question, or offers an exhibit in evidence and a lawyer for the other side thinks it is not permitted by the rules of evidence, that lawyer may object.

A recommended additional step dims the previous sentence (although it is still visible) as each new sentence comes up on the screen, so that each juror is focused on exactly what the court is saying.

Getting instructions onto visual displays is not a significant obstacle. A secretary or administrative assistant can learn to do this in short order using a standard instructional manual such as *PowerPoint for Litigators* or *Corel Presentations for Litigators* (see Bibliography), or a contractor can be obtained from an online service to produce finished slides from the text provided by the court.

There are only a few guidelines for producing successful jury instructions on slides. Unless the courtroom is equipped with small monitors in the jury box, the jury is at least ten feet away from the monitor or screen where the slides will appear. To be read at that

distance, the letters need to be crisp and clear with sufficient spacing. If the courtroom screen on which the jury instruction slides are displayed is bigger than the computer screen on which they were designed, the big screen may corrupt the stylistic choices that look great on paper or on a normal computer monitor.

The typeface and type size used on the slides affect how readable the slides are. The typeface for preliminary jury instructions should be one of the clean sans serif typefaces. Arial and Tahoma are a good choices. These typefaces scale up well, so that at very large sizes they are still easy to read. Other typefaces such as Times New Roman or Courier may look good on paper, but are not crisp enough when they are enlarged many times on the display screen in the courtroom.

The type size should be readable at the distance the courtroom display screen will be from the jury. Type size is measured in points, and there are 72 points in an inch.

- **Projection screen.** If the courtroom is equipped with a 10-foot projection screen, the right size may be 44 points or larger, depending on the distance between the jurors and the screen.
- **Large monitors.** If the jurors will be looking at a fifty-inch digital monitor outside the jury box, the right type size might be 36 points. An easy rule of thumb is that if you can read the text 8 feet away from a 15-inch monitor in chambers, the size probably will be adequate in the courtroom.
- **Small monitors inside the jury box.** If the courtroom is equipped with individual small monitors in the jury box, then the type size might be 20, 22, or 24 points. The flat-panel monitors in the jury box likely will be smaller than the computer monitor on which the jury instructions are viewed in chambers. Smaller monitors make the type appear smaller, so a type size substantially larger than for ordinary word processing should be used.

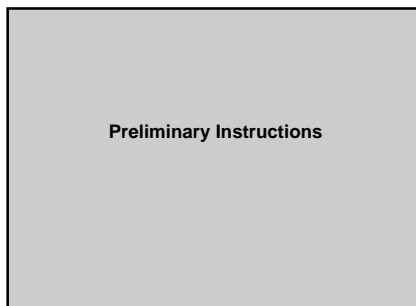
Some courts use headers to make the instructions more understandable. If that is the case, the type sizes for the headers and the text should be proportional to each other.

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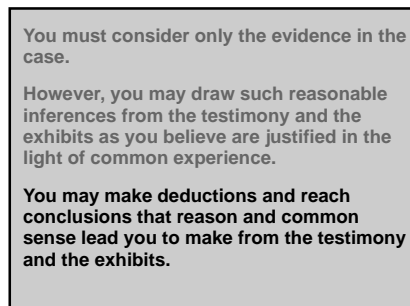
The slides can use a background color to make them more attractive. The lettering can also be colored if that is useful. Colors wash out quickly as the size of the display is enlarged; what looks good on a 21-inch computer monitor will be much less bright on a 42-inch courtroom display monitor and quite faded on a 10-foot projection screen.

With a gray background added, slide 1 and slide 2 (at reveal 3) would look like this:

Slide 1



Slide 2, reveal 3



The shade of gray used for the prior sentences can be made darker or lighter depending on the courtroom viewing conditions and individual preferences. Alternatively, all of the text can appear in the same black type.

Opening statements

Most litigation consultants urge lawyers to include computer-driven graphics in their opening statements. Trial practice courses deliver the same message. And lawyers are quick to see the advantages in making opening statements more interesting, compelling, and expeditious. For these reasons, even if there are very few uses of court-

room technology in other parts of the case, counsel may want to use some visuals during opening statement. They are likely to include bullet-point slides as well as some of the exhibits that have been admitted during the pretrial conference.

A lawyer's approach to computer-driven displays is usually apparent from what is proposed for use in the opening statement. For that reason, the court should ask what will be used during the opening and ask to see any display that involves more than simple bullet-point slides or enlargements of admitted exhibits. If there is objectionable material in the opening, it will likely come up again during trial and almost certainly will be on display during the closing. An illustrative aid that is objectionable for opening may not be objectionable with a witness on the stand, or in closing. If ground rules are going to be needed in the case because a large number of illustrative aids may be used, it is useful to express them early. A review of the visual displays proposed for opening statement provides that opportunity. The range of potential objections is explained below in Objections to evidentiary exhibits, page 180 and Objections to illustrative aids, page 192.

Some courts routinely require counsel to show each other what will be used in opening at a set time (perhaps several days) before trial and to submit any objections. However, lawyers may be tinkering with their opening statements at the last moment and the "final" versions of the supporting slides may not be created until shortly before they are used. It is often administratively easier (and serves the purpose of checking out the equipment as well) to just run quickly through the illustrative aids for opening statement as a preliminary matter at trial so that the court knows what is coming.

Use of bullet-point slides

Simple bullet-point slides that outline the opening statement provide a very effective way for new users of courtroom technology to stay focused and get away from notes on a yellow pad. The court may want to encourage lawyers to use this method because opening state-

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ments guided by slides are often shorter and more to the point. Inexperienced lawyers sometimes fear objections if they use displays during an opening statement. The court can overcome this concern by advising during pretrial proceedings of the general rule governing bullet-point slides: the words on the slide are not objectionable if they could be spoken by the lawyer without objection during the opening statement.

If properly constructed, bullet-point slides are helpful during opening statements because they have short pithy statements that “reveal” on the monitor or screen one after another.

<p>Quinlan must prove:</p> <ol style="list-style-type: none">1. A contract2. An agreed amount (or reasonable value)3. Performance	<p>A contract?</p> <ul style="list-style-type: none">• No broker agreement• No fax• No certified mailing• No delivery	<p>An agreed amount?</p> <ul style="list-style-type: none">• Between 3-5 percent<ul style="list-style-type: none">• closing value• To be decided later• At least 3 percent<ul style="list-style-type: none">• net closing value
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In this example, the defense lawyer will be able to explain what the plaintiff must prove in order to succeed. When the slide with the lawyer’s four arguments about why there was no contract is brought to the screen, the first tap on the spacebar on the laptop (or other control) will bring up the question “A contract?” The next tap will bring up the point that there was no standard-form broker agreement signed by both parties. The lawyer can explain the principal facts with respect to that point. The next tap will bring up the point that there was no fax sent between the parties, and so on. This outline of points on the screen helps the lawyer to present the argument and helps the jury to follow it.

Preview of graphics with motion or sound

The most significant risk with respect to graphics used in an opening statement is posed by the generic category of things that “move.” This includes videotapes, animations, working models, and even PowerPoint slides that incorporate transitions or animation. Many of these displays can be argument and thus are inappropriate for opening statement. However, it may be difficult to decide at the particular point an objection is raised whether the display, in its entirety, should be classified as an argument or is objectionable on some other ground. One safe course is to ask counsel to display for the court, before opening statements begin, “anything that moves.” Even if opposing counsel has not asked the court to review all of the graphics to be displayed in opening statement (see below), the court may want to inquire in this regard just to guard against surprise. It is often the case that aspects of a display that are objectionable as argument can be deleted or fixed on the spot. Unlike foamboard displays that cannot readily be altered, computer-driven displays are easy to edit.

Displays that have sound pose another considerable risk when used in an opening statement. Lawyers may intend to play videotapes with soundtracks during opening statement. These may be videotapes of depositions, or fact videotapes of the scene or activity at issue in the case. Soundtracks that include human speech may raise hearsay questions that are better considered before the opening statement is given. Soundtracks that include background noises, music, or other sound effects should be examined for relevance and prejudicial effect. The court always has the option to allow a videotape of a scene or activity relevant to the case to be played without its soundtrack. To deal with the problem that lawyers want to play their favorite videotapes as many times during trial as possible, and thus will use them at opening statement as well as with every possible witness, some judges rule that this kind of exhibit cannot be shown twice.

Lawyers may also intend to use slides accompanied by sounds. Presentation software (such as PowerPoint or Corel Presentations)

provides dozens of sound effects (for example, typing, telephone rings, brakes screeching, drum rolls, whoosh effects) that are easily incorporated into the slide. The sound effects will play automatically on the laptop speakers (and the entire courtroom audio system if the laptop is cabled to it) when the slide is presented. This type of display may not be appropriate for use in an opening statement, and examining these slides prior to the opening is a good idea. If the slides are objectionable, the sound effects can be edited out of the slide on the spot with a few keystrokes.

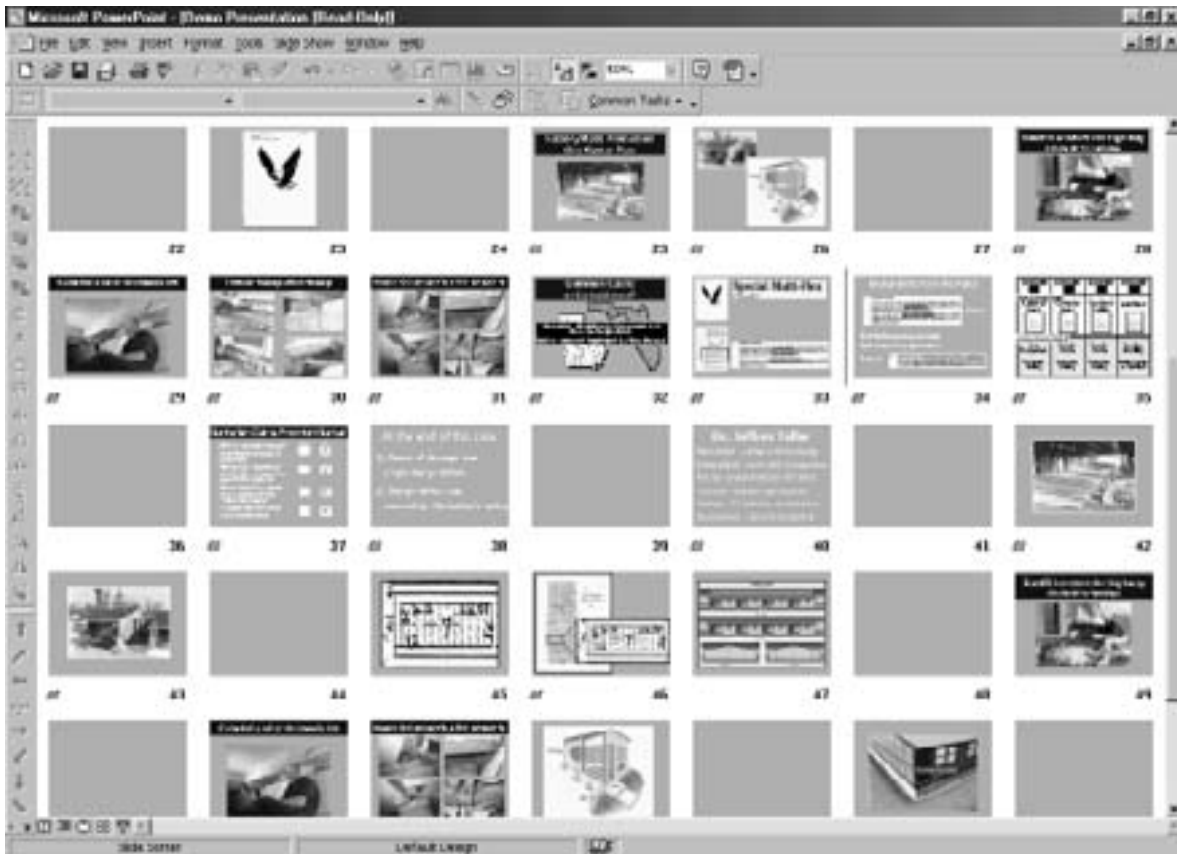
Preview of static graphics

Knowledgeable counsel will almost always request that the court review all graphics displays (not just those with motion and sound) to be used in opening statement. The most frequent exception occurs when counsel is planning to sandbag an unsuspecting opponent with graphics that might draw an objection if a less-prepared opponent has time to think about the basis for an objection.

Reviewing opening statement graphics takes time, although not as much as one might think. The opening statement displays typically are all in one file and can be displayed one after another in efficient fashion. If they have been done by someone with experience, not more than one or two should draw an objection. There are five arguments typically raised by counsel against this kind of preview, and these arguments fall within a narrow range and are usually quite easy to deal with.

Argument #1: Counsel may argue that reviewing the opening statement graphics will “give away” the content of the opening statement and thus create an unfair advantage. The court can note that the graphics do not have to be presented in any particular order, nor does counsel have to state the purpose to which the graphics will be put during opening unless there is an objection that calls for this information by way of justification. The graphics that will be pre-

sented through computer-driven displays are easy to access. The file will have a summary page (called “thumbnails”) that looks like this:



This display shows a miniature of each slide and its number. The lawyer can call up the slides in any order.

Argument #2: Counsel may argue that the displays include only admitted exhibits and any admitted exhibit is fair game in opening statement. This is certainly true if the exhibit is used in exactly the same format as it was admitted. However, computer-driven displays

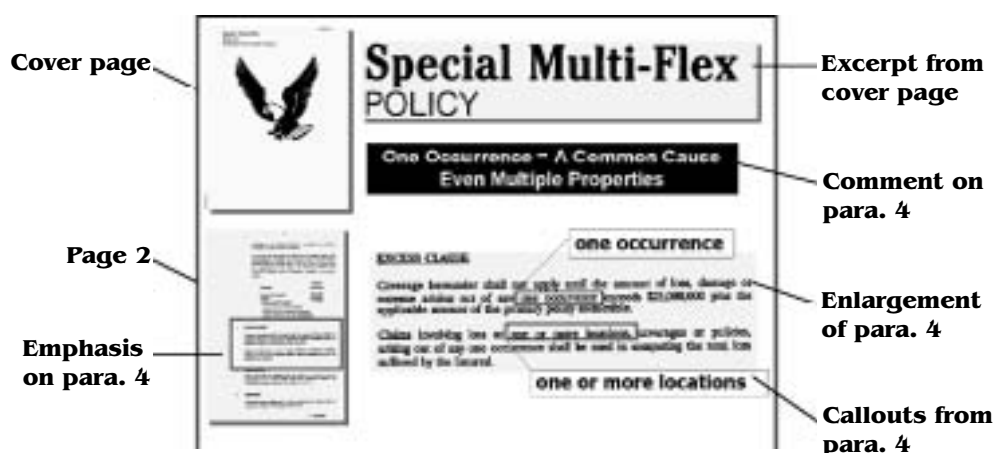
may change the exhibit in ways that may or may not be objectionable. For example:

- Titles or headers may have been added. Adjectives or adverbs sometimes make these titles argumentative. An inaccurate title is usually objectionable.
- Labels that were not a part of the exhibit when it was admitted may have been added. The labels may be argumentative. See e.g., the illustration on page 122.
- Photographs may have been cropped, resized, or combined with other displays. See the discussion on pages 107–112.
- Videotapes may have been segmented or individual frames may have been extracted. See the discussion on pages 112–113.
- Text documents may have been enhanced with callouts, boxes, lines, and other means of emphasizing or isolating particular words or phrases. See the examples on pages 125–26 and 183.
- Color may have been added to black and white exhibits, although the substantive content has not changed.
- Motion may have been added to static exhibits making certain parts of the exhibit look more or less important.
- Sound may have been incorporated to emphasize a point.

It can be quite difficult for the court, or opposing counsel, to deal with these changes as the opening statement proceeds, and occasionally the result can be quite prejudicial. The safer course is to have a quick look at the proposed displays.

Argument #3: Counsel may argue that it would be burdensome to change the graphics once they have been made. This is almost never true. Unlike static foamboard exhibits, computer-driven graphic displays are very easy to change. Each graphic has a background and a number of objects pasted onto that background. Some objects may be pasted one on top of another. Any object can be deleted or modified with a few keystrokes, and the rest of the display will remain unchanged.

For example, this is a slide which has a number of things pasted on it.



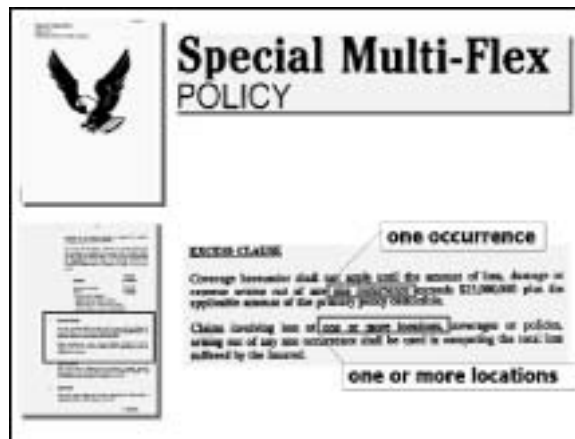
- At the top left is the cover page from an insurance policy.
- At the top right is an enlargement of the title on the cover page.
- At the bottom left is a copy of page 2 of the policy, on which paragraph 4 has been marked for emphasis.
- At the bottom right is an enlargement of paragraph 4 on which two phrases have been marked for emphasis and “called out” or printed in enlarged type in boxes.
- In the center is a strongly highlighted box containing a comment on paragraph 4.

When the lawyer uses this slide in opening statement, each of these parts will appear separately as it is discussed.

Normally there would be no objection to the pages from the policy, the enlargements of parts of those pages, the boxes marking particular language, or the callouts enlarging the words. Those are all standard techniques for explaining a document.

Part Four: Trial

However, the comment box in the center should draw an objection as argument that is inappropriate for opening statement. If the objection is sustained, counsel (or an assistant) can remove the comment box on the spot. It is a separate object that has been pasted onto the slide and its presence or absence does not affect the structure of the rest of the slide. With two mouse clicks, the slide now looks like this.



The box containing the comment is gone, but the rest of the slide is unchanged and ready to be used.

In the same way, anything else that has been typed and pasted onto the slide or any color that has been added to the slide can be changed. When the slide is retrieved and displayed, with only a few keystrokes any word can be deleted or a different word can be substituted in the same general way that word processing software or E-mail software makes changes and corrections. Any color can be selected, and by clicking on another color in the palette presented by the software the color can be changed. The change can be done quickly, and the remainder of the slide is unchanged.

In the case shown above, counsel might argue that the comment could be turned into a rhetorical question and, as such, would not be

objectionable. Counsel might propose amending the comment box to look like this.

**One Occurrence = A Common Cause Even
Multiple Properties?**

Counsel now suggests to the court that the comment box just raises an issue. It does not argue the point. The flexibility afforded by these kinds of displays allows the court to avoid the situation in which counsel has clearly spent a lot of time and money preparing exhibits that the court may be reluctant to require be abandoned.

Argument #4: Counsel may argue that the only graphics to be used in the opening statement are bullet-point slides. Traditionally, writing on a blackboard during opening statement has been permitted without preview by the court and, counsel may argue, bullet-point slides are the functional equivalent of writing on a blackboard—so, by analogy, the slides should not have to be disclosed.

Traditional bullet-point slides look like this.

Access to the Design

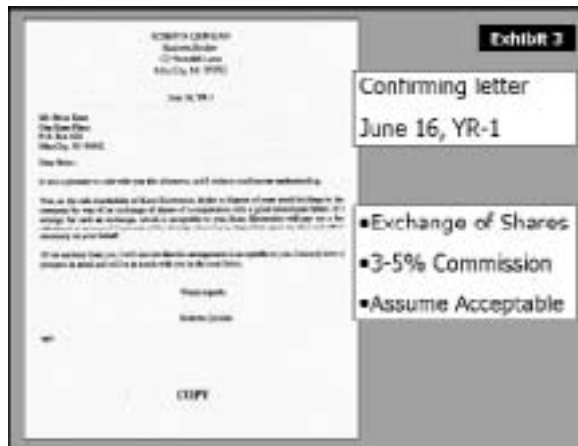
- Design is on Apex's computer system
- Only password holder's can sign on
- Jack Williams holds a valid password
- In Nov., Upwinger hires Williams
- By Dec., design is on Upwinger's system

It is certainly true that counsel is usually permitted to write on a blackboard. But that unfolds relatively slowly, with ample time for opposing counsel to object or for the court to head off improper argument. Computer-driven displays are quite different. They ap-

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pear on the screen very rapidly and, if well done, transmit their message almost instantaneously. The basic function of transmitting short written statements can be enhanced readily with photos, documents, and other graphics.

What is described as a “simple bullet-point slide” may wind up looking like this.



Everything on the slide may be acceptable, but it is difficult to know until one sees it. In the illustration here, the image on the left may be the full page (as it is in this case) or some parts of it may have been cut away. The label for the document at the top right may be argumentative or not. Suppose this label said “Smoking Gun” instead of “Confirming letter.” The bullet-points to the right of the document may be a fair characterization of (or direct quotes from) the document, or they may not. Because this label has initial capital letters, it is probably not a direct quote. It is quite difficult for opposing counsel to absorb all the visual information and to make objections quickly enough to prevent damage if the bullet-point slide is not made available in advance.

Argument #5: Counsel may argue that the request for the court to preview displays to be used in opening statement should have been

made earlier in the pretrial proceeding. That may be true enough, but in almost every case counsel will be working on the graphics for the opening statement up to a point shortly before it is given. The software is very flexible and it is easy to make changes, which tempts lawyers to edit until the very last minute. For this reason it is usually most practical to look at these displays shortly before trial. The court can indicate, in advance, that it may take this approach.

Real-time reporting

Real-time reporting at trial saves time in important ways that are defined largely by how it is used.

More on real-time reporting

Part I, page 29, general description of real time reporting hardware and software

Judge monitor vs. participant monitors

Some judges have real-time displays only at the bench. This permits the court to use the transcript, but lawyers do not have access to it. Because real-time reporting is so valuable, knowledgeable lawyers will request access at counsel table in cases where the additional fees are justified.

Witness access may also be raised. Some lawyers like to have the real-time transcript showing on the witness's monitor when the witness is being cross-examined by opposing counsel. That way, the witness can glance at the transcript to read a question that he or she did not understand or to check what he or she said. Opposing counsel may ask the court to turn off the witness monitor during cross-examination as it interferes with the classic cross-examination dynamic between lawyer and witness. However, if the cross-examination is of an expert witness, especially if it consists of lengthy hypotheticals, the transcript of the question on the monitor helps move the examination along and avoids quibbles over words. Because lay witnesses usually look at the monitor only when directed

to do so, the display of the transcript is unlikely to be a negative factor.

Jury reaction is also a concern. When the jurors understand that a transcript is available that the court and lawyers have been looking at throughout the trial, the more adventuresome jurors will ask for the transcript as soon as they retire to the jury room. Even when the court declines, they may be more likely to ask for portions of the transcript when they differ with other jurors about what was said. This is also the case if the court permits jurors to take notes, and their notes differ about what was said.

Providing access to the real-time transcript is one way to accommodate hearing-impaired attorneys, witnesses, and jurors. If the court chooses to use this method it is at judiciary expense.

Untranslates

When real-time reporting is used at trial, it is very helpful for the court to require each side to provide to the reporter a list of all names, places, and special terms that will be involved in the examination and testimony. The instantaneous translation of steno equipment keystrokes into English words appearing on the computer monitor is possible only if the software can match the current keystroke set with the same stroking already stored in the reporter's "dictionary." This dictionary stroking is associated with an English word. When a match occurs, the English word appears on the monitor. If a match does not occur, an "untranslate" appears on the screen either phonetically or in the form of the stenographic keystrokes. These are unreadable, but can later be corrected by the reporter. Ordinarily, "untranslates" occur when the reporter is faced with a new word. With a list in hand in advance, the dictionary can be primed for the particular case.

Basic service uses

With the basic level of service, the output of the reporter's computer is fed to monitors in the courtroom, and the transcript scrolls down the monitor as it is created. This basic level of service permits second-chair lawyers, paralegals, and parties to be present at bench conferences by enabling them to read the content of the conference. Hearing-impaired litigants and jurors may be assisted by reading the transcript as the trial proceeds. Interpreters are able to refer to the real-time transcript on a monitor in order to confirm what they have heard and to enhance their recall. This can be particularly useful with testimony that involves a great deal of numbers. When working in the simultaneous mode, the interpreter is always working a few words behind the actual statements, and numbers can easily be transposed.

Enhanced service uses

The enhanced service allows the user to scroll backward to earlier statements and permits annotation of the transcript as it arrives from the reporter or upon review after the testimony is given. This capability to move the screen display back to a prior portion of the transcript often eliminates the need for "readbacks" from the reporter because the lawyer or the court can get to the correct place without assistance from the reporter. If the court or the lawyers do not hear a portion of the proceedings because of crosstalk, a muffled statement, or ambient noise, they can look at the monitor and scroll back to see if the record is clear. In considering an objection, the court has the benefit of referring to the precise formulation of the question or statement before making a ruling. This is of considerable benefit when the content of a lengthy question or statement is at issue. In dealing with inconsistent statements made during direct and cross-examination, the cross-examiner has instant access to the prior statement and an easy way to display it for the jury. The annotation capability can substitute, in part, for notetaking at the bench or counsel table.

The court can add notes to the court's private electronic copy of the transcript, and lawyers can do the same with their electronic copies. The notes are maintained by the software in separate files but can be viewed, searched, and printed out with the transcript.

Transcript uses

The enhanced service makes printed versions of the real-time transcript available almost immediately for use in cross-examination, creating a written order from the court's orally announced decision, and preparing motions or appeals. The record prepared in this fashion is referred to as unedited or "dirty" copy because it has not been proofread to eliminate the "untranslates." The court needs to establish ground rules with respect to the appropriate uses of the unedited transcript. Generally, the unedited, uncertified real-time transcript should not be used for any purpose other than the lawyer's notes. It should not be cited in any pleading because formatting changes may occur and the page and line numbers will not match the certified copy.

The court should also establish ground rules for access to the unedited transcript. Absent court rule, when lawyers are permitted to use the second-level service, the real-time transcript can be sent by E-mail or other telecommunications during the court proceeding or immediately thereafter to expert witnesses, co-counsel, or party representatives who are not in the courtroom. This may be a concern if some witnesses have been excluded from the courtroom before their testimony, but gain access to the transcript from Internet sources. There may also be privacy issues in connection with the wide broadcast of the testimony of private citizens. During some high-profile cases, real-time transcripts of the proceedings created during each day of the trial have been made available world-wide via posting on Web sites, but this may not be appropriate for disputes between small private parties.

Cost sharing

Cost is often a concern with real-time reporting. Reporters attend additional training to become certified in real-time reporting, and are permitted to charge counsel for a real-time hookup. The maximum fees, as currently set by the Judicial Conference, are \$2.50 per page plus the requirement of a certified copy at \$3.00 per page. See the Guide to Judiciary Policies and Procedures (Vol. VI, Chap. XX) for more information about the cost of transcription. The overall cost of using real-time is usually significantly higher than the cost of using regular transcription. If one party wants to use real-time reporting, the other party is likely to want access to the real-time transcript, leading to requests to split the costs.

Videoconferencing witness testimony

A videoconference may be used at trial under Fed. R. Civ. P. 43(a). Courts have found good cause shown in instances where it was necessary to obtain the testimony of witnesses who are incarcerated, medically incapacitated or otherwise unable to travel to the courtroom, or who are located at a distance and only peripherally involved in the trial. A peripheral fact witness or a witness who supplies a part of the foundation for an exhibit might be inconvenienced considerably by traveling a significant distance to participate in a trial for only a brief interval. Courts have allowed child witnesses to appear by videoconference to avoid the emotional trauma that might be experienced if a courtroom appearance were required.

The Advisory Committee notes to Fed. R. Civ. P. 43 point out that the appearance of a witness by videoconference “cannot be justified merely by showing that it is inconvenient for the witness to attend the trial.” More is required, unless both parties consent. “The most persuasive showings of good cause and compelling circumstances are likely to arise when a witness is unable to attend trial for unex-

Fed. R. Civ. P. 43(a): In every trial, the testimony of witnesses shall be taken in open court, unless a federal law, these rules, the Federal Rules of Evidence, or other rules adopted by the Supreme Court provide otherwise. The court may, for good cause shown in compelling circumstances and upon appropriate safeguards, permit presentation of testimony in open court by contemporaneous transmission from a different location.

pected reasons, such as accident or illness, but remains able to testify from a different place.” The Advisory Committee points out that “ordinarily depositions, including video depositions, provide a superior means of securing the testimony of a witness who is beyond the reach of a trial subpoena, or of resolving difficulties in scheduling a trial that can be attended by all witnesses. . . . An unforeseen need for the testimony of a remote witness that arises during trial, however, may establish good cause and compelling circumstances. Justification is particularly likely if the need arises from the interjection of new issues during trial or from the unexpected inability to present testimony as planned from a different witness.”

Special considerations pertain in criminal cases where the defendant has the constitutional right to confront witnesses against him or her. Some courts have found, when witnesses are located in foreign countries, for example, that the defense can interact with the witness via videoconferencing in all the same meaningful ways as are provided in the courtroom. Most judges would also allow witnesses for the defense to be called by videoconferencing.

The general guidelines for lawyers and judges using videoconferencing for witness testimony are well established.

- **Ground rules.** Determine which end will make the call. The party placing the call will be charged for the videoconference by the telephone company. The calling party needs the voice phone number and the videoconference phone number for the receiving party. Determine whether the remote party will be allowed to view court proceedings before and after their participation, or if the remote party will be allowed to view proceedings only when participating.
- **Test the connection.** The remote site must have appropriate bandwidth capacity (384K is preferred), standards-compliant equipment, and a quiet well-lit room. If the remote site has not recently been connected with the court, a test call will confirm that the audio and video quality are adequate.
- **Preliminary steps.** The lawyer doing the direct examination

More on videoconferencing
Part I, page 24, description of equipment
Part I, page 46, Criminal vs civil proceedings
Part III, page 129, videoconferencing pretrial matters
App. A, best uses, setup, operation, and techniques for use

makes a record with respect to the location of the witness, the dial-up number connection, and any ground rules that have been established. The call is made, the connection is established, and the lawyer or court clerk switches on the monitors so the witness can now be seen by everyone in the courtroom. The witness is sworn in, and the examination proceeds.

- **In the courtroom.** The lawyer who is to examine the witness addresses questions to the witness's image on the monitor. Often the camera in the courtroom will be located directly above and behind the monitor so that the lawyer appears to be looking directly at the witness. This setup takes away some of the artificiality of the communication between the lawyer and the witness that might hinder effective examination.
- **At the remote location.** The witness watches the lawyer on the monitor at the remote location. The witness answers, looking directly at the monitor at the remote location. Typically the video camera at the remote location is sitting on the top of the monitor so that the witness appears to be facing the questioner and making eye contact.

The field of vision on both ends is restricted. Usually the camera at the remote location (also called the far side or far end) is focused on a head shot or an upper body shot of the witness, and the camera in the courtroom is focused on a head shot of the lawyer who is doing the examination. The ground rules with respect to these setups are usually governed by pretrial order or local practice. Some courts follow the general rules with respect to placement of cameras and view of the witness that are used in videotaping depositions. It is likely, however, that a closer head shot will work better for transmitting testimony than the upper body shot usually used at depositions, even though some nonverbal information is lost. Jurors have an easier time focusing on the witness with a closer view, and the witness at the other end has an easier time following the questions with a closer view of the lawyer.



Plasma monitor behind witness stand for witness testimony by videoconference

Small monitors in jury box for displays of exhibits

Judges and lawyers with experience using videoconferences in trial matters suggest that the following considerations be taken into account.

- **Control of the camera.** Courtrooms vary as to the controls available for videoconferencing and the number of cameras involved. Some courtrooms have more than one camera and the control is automatic—that is, the camera is voice activated and switches to focus on the microphone that is active. Some judges require the courtroom deputy to control the camera. If the courtroom is equipped with an integrated lectern, the lawyers will have access to controls for the camera. Many systems are also equipped so that the courtroom controls can operate the camera at the remote location as well.
- **Record as to the far side.** The witness should be asked by the court to identify anyone present in the room at the remote location, and should be instructed to notify the court if anyone else enters the room during the videoconference. If the courtroom

system can “take control” of the camera at the remote location, it can look around the room beyond the witness. The Administrative Office recommends purchasing videoconferencing systems that have standards-based far-end camera control. This can help assure those who are nervous about unseen assistance to the witness. If concerns about any of the conditions at the far end need to be addressed, the court can appoint a referee to monitor the testimony at that end.

- **Picture-in-picture at both ends.** The picture-in-picture is a small inset at the bottom right corner of the screen that lets the person whose image is being broadcast see how he or she looks. This feature, available on all systems manufactured within the last few years, lessens the concerns of witnesses or lawyers about how they look on the screen, whether they are out of camera range, and whether gestures are appropriate.
- **One speaker at a time.** Video can be transmitted both ways simultaneously, and theoretically audio could be as well, but in practice it does not work that way. Microphones and speakers loop back causing interference. The parties to a videoconference cannot converse back and forth with their remarks overlapping at times the way parties to a telephone conference can. Even though the video makes it appear that both parties are interacting simultaneously, the audio cannot keep up. Only one person can speak at a time, otherwise the audio will be muddled.
- **Slower pace.** When videoconferencing is used, the participants need to think in terms of the signals going out and the signals coming back. When one person speaks, the video and audio signals go out over the telephone lines to the far side. It takes a very short amount of time for the signals to get to their destination, but there will be a pause after the end of the lawyer's question and the beginning of the response. There will also be a short pause between the end of the response and the beginning of the next question. It is reminiscent of the old days when

radio operators said “over” at the end of their transmissions, signaling that it was the recipient’s turn to speak.

- **Kill switch.** The court’s kill switch (see page 17) allows the monitors in the courtroom to be blanked during bench conferences, regular breaks and recesses, and any other times when the jury should not be looking at the witness. The video camera in the courtroom can be turned off to stop transmissions to the far side when there is something going on in the courtroom, such as a hearing out of the presence of the jury, that would be inappropriate for the witness to see. It is important to make sure that the audio is also turned off when the kill switch is used so that the hearing is not broadcast to the far side for the witness to hear.
- **Use of exhibits.** Managing documents and other exhibits at a distance can be frustrating. For example, even if there is a set of paper exhibits at the remote site (as there should be), when a witness says he or she does not have a particular document, no one can walk over and hand up another copy. Sometimes documents have been marked as deposition exhibits and have a different number as trial exhibits. If the witness is confused, the testimony may come to a halt even if the exhibit number makes no difference. For this reason, it is a good idea to have an evidence camera available at each end to display exhibits. In the courtroom, the video output is switched from the video camera trained on the lawyer to the evidence camera. When that is done, the evidence camera’s output appears on the monitor at the far side. With more sophisticated videoconference equipment, the computers in the courtroom can also be connected directly to the codec so that the output of the computer (an exhibit or illustrative aid) can be shown to the far side. The video incorporated in these systems is not designed for documents, and for that reason, plus the compression used in transmitting the signals, documents will not look very good on the screen. Annotation tools also help make the use of exhibits easier.

The touch screen, telestrator, or light pen can be used to draw the witness's attention to a particular passage or location on the exhibit.

- **Making a record.** When using videoconferencing, the court reporter will make a record in the normal course as the examination proceeds. Usually no separate recording is required, although the videoconference equipment allows a recording of video and audio. The audio quality may make it marginally more difficult for the court reporter to transcribe accurately during a videoconferencing session. A wireless headset can be provided so that the court reporter has direct access without ambient noise. If the system is installed correctly, and the audio is integrated correctly, the headset should not be necessary.

Use of illustrative aids during trial

The requirements attending the use of illustrative aids at trial may vary depending on the type and complexity of the trial, the nature of the illustrative aids, and whether they are being used for direct or cross-examination. The principal requirements that judges may want to impose are summarized in this section.

Direct examination

If no pretrial disclosure has been required, knowledgeable lawyers will generally inquire at some point, perhaps when exhibits for a particular witness are listed or when the witness is called, whether the direct examiner will use any illustrative aids. This question can be directed to illustrative aids in hard copy form (such as those propped on an easel) or in a computer slide show. Mention will be made of "trial by ambush." If examining counsel has illustrative aids,

More on illustrative aids

Part III, page 120,
making a record

Part IV, page 153,
illustrative aids during
opening statement

Part IV, page 192,
objections to illustrative
aids

then opposing counsel is likely to ask for disclosure prior to use so that objections may be made in an informed and timely fashion.

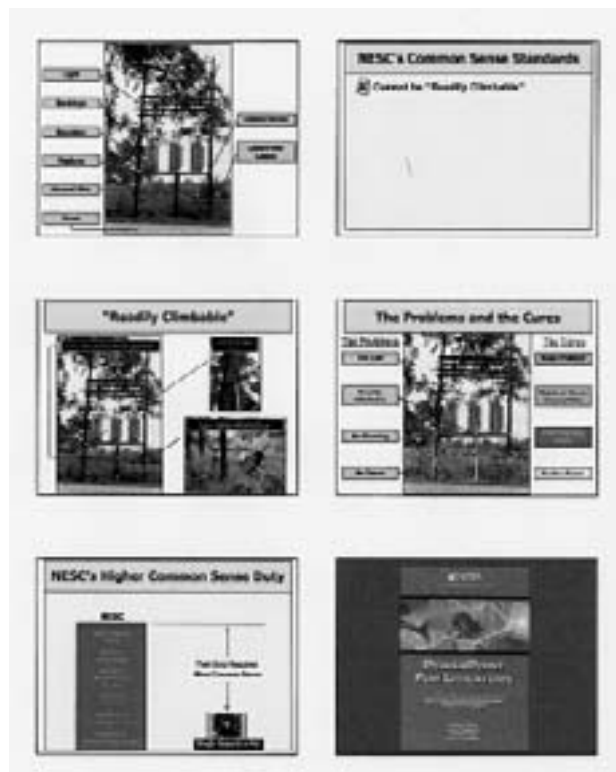
When technology is used to display illustrative aids, it is often difficult for opposing counsel to get objections out in a timely manner. A display that is put up on the big screen is usually designed to deliver a message instantly. The foundation may be: "Have you prepared some materials that would assist you in presenting your testimony and assist the jury in understanding the testimony?" This foundation, although adequate under the practice in most courts, gives opposing counsel no clue as to what the materials might be. An objection can be raised only after counsel has seen the display. However, at that point, the jury has also seen the display. The instruction, in the event of a successful objection, to disregard the display may not be effective. Many of these graphics are designed to convey a theme, which may in fact be argument, and to make the theme appear as fact. Argument should, of course, wait until the closing and be kept out of the examination of witnesses to the extent possible.

The court should consider the following disclosure alternatives when technology-driven illustrative aids are to be used:

- **Before trial.** Require disclosure, in advance of trial, of the more complicated illustrative aids such as computer animations (see page 113), displays with interrelated photos or documents, and displays with motion or sound. These are the exhibits most likely to require time for opposing counsel to identify and describe objectionable aspects.
- **Before examination.** Require disclosure of all of the illustrative aids that may be used with the witness at some specified time before the examination of the witness, perhaps in connection with the listing of exhibits to be used with the witness. The actual illustrative aids can be provided on a CD. The court may require, for its own use, "thumbnails" in hard copy form. These are reduced-size pictures of slides that the software arranges

Effective Use of Courtroom Technology: A Judge's Guide to Pretrial & Trial

and prints automatically with two, four, or six images per page. They look like this:



These sheets are convenient for use at the bench in tracking objections and changes.

If the court's procedure contemplates written objections to exhibits at some point in the process, the objecting party can include the thumbnail of the slide together with the objection in a format like this. This format, which has lines for notes alongside the thumbnail

Part Four: Trial

of each slide, makes it quicker to review most objections. Although the paper copy does not show sound or motion, a review of the text is facilitated. If the objection goes to sound or motion, using the thumbnail will help locate the slide on the CD.



- **At time of use.** Require disclosure at the time of use of the illustrative aid by posing the foundation question, blanking the

screen or monitors within the jury's view (while keeping the monitors for the court and counsel active), numbering the illustrative aids for the record, and displaying them so that the court can rule on objections before the witness testimony proceeds.

Use of any of these alternatives makes it less likely that improper illustrative aids will influence jury determinations.

Cross-examination

Lawyers will sometimes request, perhaps early in pretrial proceedings, a ruling that requires disclosure of illustrative aids prior to their use in cross-examination. The practice in most jurisdictions allows cross-examiners to proceed without disclosure of anything with respect to the anticipated mode of examination. As a result, such requests are routinely denied by judges. For reasons previously discussed concerning the persuasiveness of such illustrative aids, judges may want to consider some disclosure alternative that occurs out of the hearing of the witness to be cross-examined.

Expert witnesses present special problems regarding the use of technology-driven illustrative aids on cross-examination. A decision about prior disclosure for cross-examination purposes necessarily involves consideration of the reality that it is often very difficult to expose the biases and weaknesses of the testimony of a well-prepared expert witness. Given advance notice of the cross-examiner's approach, most experts can arm themselves sufficiently to blunt the attack. On the other hand, craftily prepared illustrative aids can include assumptions and methods of displaying information that the expert cannot handle fairly if the displays are seen by the witness for the first time under cross-examination.

One way of dealing with this problem is to offer counsel (or for the court to make) a choice of one of the following alternatives. First, if the illustrative aids are disclosed to opposing counsel prior to or at the outset of the cross-examination, then rebuttal examination will proceed as usual immediately upon the conclusion of cross-exami-

nation. Second, if illustrative aids are not disclosed and if surprise is reasonably claimed, then an appropriate recess will be granted at the end of cross-examination, so that counsel can prepare any necessary illustrative aids for rebuttal. In the meantime, the trial can proceed with the next witness.

Delivery of copies

Assuming a court order to disclose illustrative aids is in place, the manner of disclosing may also need attention.

Illustrative aids that are presented with an evidence camera can be delivered in hard copy so long as anything that will be in color on the screen is in color on the paper copy. With an evidence camera, what is on paper is what will appear on screen. The evidence camera has no capability to do anything but zoom in on a display.

Illustrative aids that are presented with a laptop computer are adequately represented by color paper copies only if there is (1) no motion as the slide show progresses from one slide to the next (usually called a *transition*), (2) no motion within individual slides (usually called an *animation* or *reveal* or *morph*), and (3) no sound effects. If any of these three factors are present, the slide show should be delivered on a labeled CD in a format retrievable using commercially available retail software. In that way, counsel can view the exhibit as it will be seen in court and can make appropriate objections. The court may want to order that a separate CD containing illustrative aids be presented to the court for use in ruling on objections.

Illustrative aids coming from one computer and going to another computer need to be in a format that the receiving computer can “read.” Some lawyers use software provided by litigation support vendors that is proprietary and not available on the retail market. This type of software usually has a translation capability that will put its files into a format that can be read by retail presentation software. Most lawyers currently use widely available retail software such

as Microsoft's PowerPoint or Corel's Corel Presentations. According to the manufacturers, both of these software packages can read each other's files.

Record copies

Preserving illustrative aids adequately for the record is very difficult unless the record includes a CD that contains digital copies. The usual options are a CD for each day or week of trial, a CD for each witness, or a CD for the entire trial.

A CD is a stable, reliable form of storage for computer files. Making a CD is a simple and inexpensive process. A CD writer, the equipment that copies computer files onto a CD, plugs into any computer and costs about \$300. A blank CD costs less than a dollar. Commercial copying services also make CDs. Transferring 600 megabytes (MB) of files to a CD—about the capacity of most CDs—takes less than 20 minutes with a reasonably fast CD writer. A typical slide contains less than 1 MB of data, so the transfer of 10 or 20 slides can be done very quickly.

The CD label should identify by number and by witness the illustrative aids that are on the CD, and the label should state the format in which the files have been transferred to the disk. CD labels are pasted directly on to the disk. The labels can be purchased at any office supply store for 10 to 30 cents apiece; they can be fed into any laser or inkjet printer.

Objections to evidentiary exhibits

Each evidentiary exhibit has a foundation that qualifies the exhibit as an appropriate basis for deciding the case. This foundation includes the competence of the witness to testify about the exhibit; the relevance of the exhibit to an issue in the case; the identification of the exhibit distinguishing it from all other things; and the trustwor-

thiness or authentication of the exhibit, sometimes including compliance with the hearsay and original documents rules.

If the exhibit being displayed has been admitted in evidence but has been enhanced in some way, such as with labels, superimposed images, or callouts, it may become an illustrative aid. Even if the underlying exhibit has been admitted, the illustrative aid based on that exhibit can be excluded on grounds explained below (page 192, Objections to illustrative aids).

More on evidentiary exhibits and illustrative aids

Part III, page 120, making the record

Part IV, page 153, illustrative aids during opening statement

Part IV page 192, objections to illustrative aids

Evidence shown electronically vs. evidence that is electronic in nature

It is sometimes useful to distinguish between (1) evidence that exists in the first instance in physical form (e.g., a handwritten document or standard photo) and is then presented electronically, and (2) evidence that exists in the first instance in electronic form (e.g., documents created with word processing software, E-mails, photos or video created with digital cameras, and digital audio recordings) and is presented electronically.

Evidence that exists in physical form should present no problem under the original documents rule (Fed. R. Evid. 1001–1008) when that evidence is displayed electronically. Lawyers may point out in an objection that the electronic display of the physical writing is almost always different from the original because the color and resolution of the original cannot be reproduced with absolute accuracy on the monitor or projection screen. For example, in the Unabomber trial, the defense sought to keep the prosecution from displaying the defendant’s writings electronically, citing the small differences in color and resolution of the images on the screen (as compared to the paper copies). The objection failed because the purpose of the electronic display was an examination of the textual content of the writings, not their authentication. Once a sufficient foundation is laid, and the exhibit is admitted in evidence, it can be shown electronically in any way the court determines promotes a fair trial. Any enlargement or

display of the exhibit itself using courtroom technology should require nothing further by way of exhibit numbering or qualification. The display on the projection screen or monitor is treated the same as the exhibit that has been admitted.

Evidence created in electronic form (for example, a photo taken with a digital camera) and converted to physical form (a printed copy of the photo) for purposes of being admitted in evidence may cause lawyers to raise objections based on the original documents rule. A similar objection may be raised if the evidence created in electronic form is displayed electronically for purposes of being admitted in evidence. Such objections require the proponent to jump through the hoops of Rules 1001, 1002, and 1003. This is usually done readily, but inexperienced counsel may be unprepared.

Under Rule 1002, if the exhibit is a writing or a photograph, then the original is required unless, under Rule 1003, a duplicate may be used instead of the original. Electronic files are the “originals” of writings created with word processing software, E-mails, and photographs or videos created with digital cameras. In the case of printouts, Rule 1001(3) defines them as originals. For other uses of digital files, Rule 1001(4) defines a duplicate as anything produced by a process or technique that accurately reproduces the original. The duplicate is admitted under Rule 1003 unless some unfairness can be demonstrated. The burden in that regard is on the opponent. If the digital file is copied to a CD, then the duplicate is the file on the CD. The operating system software process that “copies” digital files is uniformly accepted as accurately reproducing the original. Indeed, it is almost never done any other way.

Rule 106 – Remainder of or Related Writings or Recorded Statements.

When a writing or recorded statement or part thereof is introduced by a party, an adverse party may require the introduction at that time of any other part or any other writing or recorded statement which ought in fairness to be considered contemporaneously with it.

Rule 611(a) – Control by court.

The court shall exercise reasonable control over the mode and order of interrogating witnesses and presenting evidence so as to (1) make the interrogation and presentation effective for the ascertainment of the truth, (2) avoid needless consumption of time, and (3) protect witnesses from harassment or undue embarrassment.

Completeness objection

Lawyers are usually referring to Fed. R. Evid. 106 when they object to a visual display on the grounds of completeness. That rule covers writings and recorded statements, including documents and audio and videotapes in lieu of transcriptions. It generally does not apply to photographs and videotapes of scenes or locations relevant to the

Part Four: Trial

case or anything else not intended to have the same effect as a writing. However, courts can use their general powers under Rule 611(a) to achieve the same result for materials not covered by Rule 106.

Completeness objection: documents

Presentation software provides enormous flexibility for lawyers to display documents for the fact-finder, whether judge or jury. Pages of documents can be cropped and resized in the same way as photographs. One standard and fair way that documents are presented by experienced lawyers “anchors” the viewer by showing the whole page and the document’s exhibit number, and then presents the enhancement of the page that calls attention to its important part.

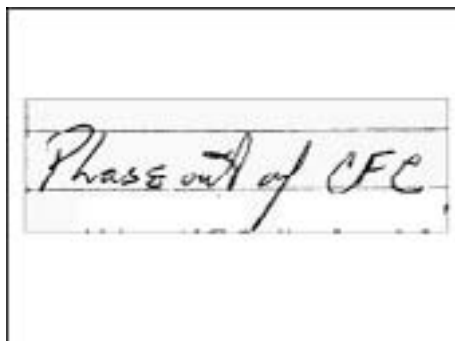
For example—the document below on the left is a page of handwritten notes. The page is fairly difficult to read and is typical of a large class of documents that benefit from enhancement and specialized display. This document is a “writing” under Rule 1001(1).



The lawyer wants the jury to focus on the notation about a “phase out of CFC.” The usual way to do that would be to put the page on a slide and display it with the document’s exhibit number, as shown on the top right of the illustration on the preceding page. Then the relevant portion is “called out” by enlarging it and connecting the enlargement with lines showing the place, in the original page, from which it was taken, as shown on the bottom right.

An issue may arise if counsel elects to show just the portion of the document that the witness is about to explain. The slide now looks like this when it comes up on the screen.

Opposing counsel may object because what is being shown to the jury is just a part of the document. The objection typically has three parts.



First, counsel will argue that the document is a writing and, under Rule 106, the entire page should be displayed and not just a part of it. Counsel may urge that without the whole page in view, there is a danger of confusing or misleading the jury. That is not an insignificant problem. Jurors who are not accustomed to dealing with the kind of paper records at issue in the case may have trouble focusing on segments of documents. By the time they figure out what is being shown, the testimony has already passed to another point.

Second, under Rule 611(a), counsel may argue that this excerpt is intended to limit cross-examination. If the only exhibit available to show on the screen is a portion of the document, then the cross-examiner cannot use the same mode (that is, an enlargement on the screen) as the direct examiner did. In this case, the cross-examiner is limited to the paper copy of the record that may be much less effective than the big screen image. There are some obvious ways around this problem. Effective preparation is one, so that the cross-examiner has digital versions of all the documents. Using the evidence camera to display the paper copy of the entire page on the large screen and

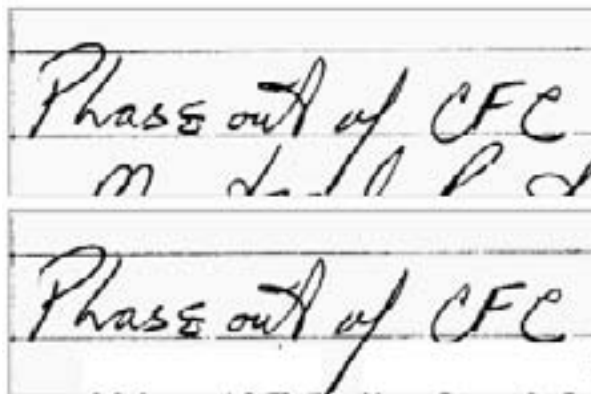
zoom in on the relevant portion is another. However, it certainly is true that in direct examination counsel would not normally be allowed to approach the witness with a scissored up portion of a paper copy of a document just to bamboozle an opponent. Using just a portion of a document on a digital exhibit is about the same thing.

If the standard method is used, with the whole page displayed, it is a simple operation for opposing counsel to use that slide, with or without the callout, for cross-examination and this problem is obviated. A basic knowledge of presentation software on the part of anyone on the trial team will allow instant enlargement of other portions of the page and competing callouts, and will allow emphasis on whatever aspects the cross-examining counsel believes is necessary. See discussion above with respect to disclosure of illustrative aids prior to use with a witness.

Third, counsel may argue that this excerpt has been changed from the original and should not be allowed in its changed condition.

The top excerpt is cropped directly from the document. It shows loops from the handwriting on the next line just below the phrase that has been called out for emphasis. The excerpt below it has been changed by blocking out the extraneous loops. This is accomplished by putting white rectangular shapes over the portions to be blocked out. In this example, the white added by the presentation software is slightly different from the white background of the document, so the rectangles are more readily visible. When done professionally, a portion of the document background itself would be copied for the blocking rectangles and the match would be exact.

One reason that judges sometimes sustain an objection to this kind of alteration of a cropped segment of a document, even if they are disposed to allow the segment itself, is that some



sharp-eyed juror will spot the change and argue about its significance. This wastes time and diverts the jury from its charge.

Completeness objection: photos

A completeness objection may also arise when photos are cropped.



Cropping has always been possible during the enlargement process with regular photos, but digital photos are very easy to change, so more cropping shows up in exhibits prepared with digital files. For example, the photo of the courtroom can be cropped to show just one desk with one monitor on it, or to show a portion of the courtroom in which there are no monitors at all.

There is nothing inherently unfair about cropping, but cropping can be used to create images that are, in fact, unfair given the context in which they are used. For example, if the issue is whether the courtroom is up-to-date, and the photo showing no computer equipment at all were presented as a depiction of the courtroom, then the excision of all the computer equipment probably would be unfair.



A completeness objection to a photograph may be considered by the court pursuant to Rule 611. In response, the court may require that the cropped photo be displayed first in its original state to show the context from which the cropped image was taken. The proponent of the cropped photo can achieve the same display effect (a focus on a small part of the photo) using the zoom capability of the evidence camera.



Completeness objection: video

Most videotapes are too long to be shown to a jury with any hope that they will absorb all of the information presented. For this reason, excerpts are prepared and information on several videotapes may be combined. A disclosure rule will allow opposing counsel to consider the editing that has been done to determine if the result is unfair. If the videotape is the recording of a statement, such as a deposition, under Rule 106 the court may decide whether additional portions should be shown in order to give the proper context for a fair consideration of the statement.

Counsel may argue about the expense of adding portions to their prepared video clips, but expense is typically not significant. If the video was shot with a digital camera, adding portions is akin to copying and adding paragraphs in word processing and can be done very quickly. If the video was shot with a regular camera, digitizing (changing it from analog to digital format) is an automated process offered by many vendors. However, timing can be a problem because it is not always possible to get this done overnight. For this reason, most knowledgeable lawyers digitize much more of the videotape than they plan to use, or shoot the entire videotape with a digital camera.

Counsel often want to show segments of video in a different order than the order in which the video was filmed. For example, there may be a question on a particular safety practice in the first hour of the deposition, another question in the second hour, and a definition of the safety practice in the third hour. Counsel may want the testimony about the definition to be shown to the jury first, followed by the other two segments on this topic. This may cause objections with respect to completeness as well.

Unfairness objection

An objection phrased as “unfairness” may arise when a document or photo is displayed differently than it would appear in the original for the purpose of influencing the jury. Similarly, an unfairness objec-

tion may be posed when a video is played at a speed different from the normal speed.

Unfairness objection: documents

Unfairness objections sometimes arise when documents are displayed without the full margin or color that appears in the original. For example, an insurance policy may have ample white space around its margins although the print is fairly small. If the margins are cropped when the document is displayed, it may give the impression of being more dense and harder to read. The text of the document is complete, but the overall aspect of the document is changed. Normally the reason for cropping the margins of documents is not to create an unfair impression, but to fit more of the document on the screen. Documents are usually 8 1/2 x 11 inches and monitors usually have a height-to-width ratio of 3:4. This means that the full length of the document does not fit well on the typical monitor and cropping the margins, where no text appears, makes the fit somewhat better.



Unfairness objection: photos

Objections may arise when photos have been resized, reshaped, displayed with misleading lighting, or displayed much larger than life.

Resizing is a process in which the photo is made bigger or smaller, perhaps in relation to some other photo, without changing the content of the photo.



There is nothing inherently unfair about resizing a photo, but photos of different dimensions can be used to present facts unfairly. A large photo of a small object placed next to a small photo of a large object may suggest unfairly that the two are nearly the same size.

Reshaping is a process in which the photo is stretched vertically to make the things it depicts appear “taller,” or horizontally to make the things it depicts appear “wider.”

Reshaping is almost always inherently unfair if size, shape, or distances are in issue. The resulting photo is not an accurate representation of the real thing. In the example below, the reshaped photo makes it appear that the distance between the defense counsel and the jury is greater than it is.



Every presentation software or photo editing software package provides a means to resize photos without distorting them, but when photos are resized they frequently are also distorted. Lawyers often bark about deceit and fraud when they find that a photo has been

distorted. In fact, distortion is usually inadvertent because, when presentation software is being used, the tool for resizing a photo is very similar in appearance on the screen to the tool for reshaping the photo. The fact that distortion can be inadvertent does not diminish its seriousness, but lawyers may not recognize a distorted photo that has been worked on by someone else, so distortion does not always equate with intentional wrongdoing by the lawyer.

The lighting portrayed by nighttime photos may be displayed in a misleading way if an evidence camera is used to show the photo with the wrong contrast and iris settings. Re-creation of nighttime visibility is challenging under most litigation circumstances. When the photo is put on the evidence camera with the iris wide open, the amount of light reaching the camera is maximized. When the contrast is also high, the evidence camera dramatically changes the appearance of what is visible.

Occasionally an unfairness objection is raised about a photo that is enlarged to a size much larger than life. For example, by enlarging a photo of wounds many times more than the actual size of the wound, the importance or effect of the wound might be exaggerated.

Unfairness objection: video

The motion in videotapes may be objectionable if a tape is played at a speed faster or slower than normal so that the people or objects depicted on the tape are not moving at the speed they were when the tape was made. The motion in videotapes may also be objectionable if frames have been removed or edited with the effect of distorting the motion shown on the tape.

Still frames extracted from video may also present a problem. Digital technology makes it much easier to pick one frame from hours of video and to enlarge and use that frame as a still photo. Because video involves so many frames, normally seen in context, taking one frame out of context may be unfair. For example, a witness who appeared perfectly composed for hours of video might sneeze once.

The facial expression from one of the sneezing frames might not be a fair representation of the witness for use at trial. A disclosure rule will allow counsel to know from what portion of the video the still photo came and to decide if it is potentially unfair.

Counsel occasionally want to put labels or subtitles on videos to show changing topics. Subtitles on videos are well within the bounds of the rules under most circumstances (although they may change the video into an illustrative aid), but the combination of the video editing and the labels may create an unfair representation of what the deposition testimony or site inspection showed.

Objections to illustrative aids

The most common objections—unfairness, leading, argumentative, narrative testimony, assumes facts not in evidence, unsupported opinion, and lay opinion—are logical extensions of the objections that have been directed in the past at large boards displayed on easels or other illustrative aids displayed in courtrooms. One useful axiom with respect to objections to visual displays that contain words: What is on the screen is appropriate (and not objectionable) if the lawyer or witness could say those words orally under the circumstances in which the display is introduced. However, it is often necessary to “play” the illustrative aid—that is, to see it as it will unfold when shown to the jury—in order to understand the objection in context.

Unfairness objection

Rule 403. Although relevant, evidence may be excluded if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury, or by considerations of undue delay, waste of time, or needless presentation of cumulative evidence.

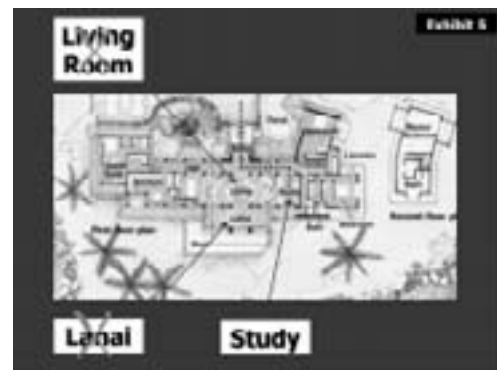
An objection based on “unfairness” may arise when an illustrative aid is inaccurate or suggestive in inappropriate ways. Courts sometimes use the benchmarks of Fed. R. Evid. 403—unfair prejudice, confusion of the issues, misleading the jury—in dealing with objections to illustrative aids. If an illustrative aid could be excluded under Rule 403 because the aid’s prejudicial effect substantially out-

weighs its value, then it should be excluded. However, illustrative aids can be excluded, even if the prejudicial effect is not so substantial as to reach the traditional threshold of Rule 403, because they are supposed to be useful, and they cannot be useful if they do not convey information clearly without attendant distraction, unnecessary emphasis, or needless cumulative display.

- **Unfairness: labels.** Labels can show up over a portion of the exhibit, as a title for the exhibit, or in the margins indicating some aspect of the exhibit. Labels are the first place lawyers generally look for objectionable material.

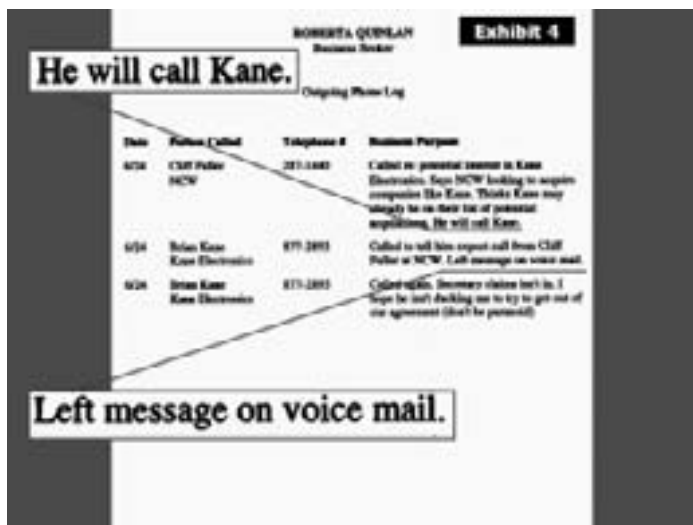
Labels that are opinion belong only on exhibits that show an appropriate lay opinion pursuant to Fed. R. Evid. 701 or on exhibits sponsored by an expert who is qualified to give the opinion as shown by an appropriate foundation under Rule 702. Labels that state facts should appear only after the fact is in evidence and should not misquote or mischaracterize the evidence. Labels may contain hearsay and be objectionable on that ground. Labels including adjectives and adverbs may be inaccurate because they overstate the facts. Sometimes labels are displayed and then crossed out, indicating an alternative rejected or a path not taken.

Sustainable objections to labels are highly dependent upon the context in which the illustrative aid is offered. Under one set of facts or at one stage of the trial the label may be objectionable, and under another set of facts or later in the trial the same label may be entirely proper.



- **Unfairness: text treatments.** Text treatments are methods for emphasizing particularly relevant portions of text embedded in a relatively long text document. Treatments are usually boxes, underlines, circles, bold and italic typefaces, and callouts added to a page of text.

This example shows standard callouts. Text treatments can



be unfair if used in a way that might mislead or confuse the jury about the original document. For example, words in very fine print may be enlarged and put in large bold capital letters. This may be done to give the impression that the information was emphasized in the original document when in fact it was not. This problem is largely avoided if the original document is displayed at the same time as the text treatment, and standard methods for emphasis or callouts are followed.

- **Unfairness: colors.** Color usually appears on the background of the slide (behind all of the objects or writing on the slide), or on an object on the slide as a way of setting off or emphasizing the content (such as a rectangle or circle on which words have been written), or as a screen that makes objects on the slide appear or disappear. Examples of each of these uses are on the CD that accompanies this book.

Background color, even if lacking in taste or articulated purpose, is rarely objectionable in and of itself. Lawyers sometimes use background color to indicate the subject matter of the slide. For example, the slides that have to do with liability might have a dark blue background and the slides that have to do with

damages might have a dark green background. Background color may indicate the relative importance of a slide. The most important slides may have no background color at all.

Color used on objects or screens may be objectionable when the purpose is to suggest linkages that may not exist in fact and for which there is no foundation. For example, a photo of a piece of equipment painted yellow may be admitted in evidence and displayed on a large screen. The lawyer may then have slides that use the color yellow, displayed immediately following the display of the enlarged photo, to suggest that other things are a part of this equipment when there is no foundation for that link. Similarly, a company may be labeled with a color and then a person not connected to the company may be labeled with the same color to suggest a conspiracy or identity of purpose.

Unlike permanent foamboard exhibits that were their predecessors in the courtroom, slides can be changed very readily, even on the spot, usually with only a few keystrokes. If there is a problem with a particular color, the slide can be retrieved, a color palette with many shades can be displayed, and the offending color can be changed instantly without changing anything else on the slide. It is an unusual case, therefore, where a party will be prejudiced by last-minute changes in color required by the court.

- **Unfairness: motion.** The motion in individual slides shown in a courtroom is usually one of three types. A *transition* is the motion that you see on the screen when the lawyer moves from one slide to the next. For example, the new slide may appear out of a tiny point at the center of the screen and expand to fill the entire screen, or it may fly in from the left margin of the screen, or horizontal blinds may close to reveal the slide. Transitions are usually unhelpful (because they can distract focus) but not unfair.

An *animation* (in the context of individual slides) is the motion that you see on the screen when an object appears on the slide. For example, a slide may have a title, a photograph, and some arrows or labels explaining the photograph. All of these objects may be on the slide when it first appears, or they may be “revealed” one at a time. When objects are revealed, they may zoom out, fly in, or have other motion associated with their appearance. Animations, while often annoying to the opposing lawyer (and perhaps also to the jury), are usually not objectionable. Occasionally this kind of animation suggests that one thing came from or originated in another and is unfair for that reason.

A *morph* is a motion that turns one thing into another. For example, a description in a document may morph into a photo of the thing described. The words meld together into a blob that gradually transforms itself into the photo. Morphing may be objectionable as confusing or overly suggestive as it is often the case that the two things being compared by the morph are not as closely related as the action suggests. In other words, one thing does not produce or come from the other.

Movements that appear in slides are produced by tools that come with presentation software. Any one of a long list of movements can be applied to any slide or any object on the slide very easily, indeed almost automatically. Examples of the most common types of motion are on the CD that accompanies this book. Sometimes movement, like a swirling spiral bringing words to the screen, is included on a slide for no reason other than the software made it possible, and it was fun to do. Lawyers who have only recently begun to use these displays or overeager consultants may include movement where none is necessary, or worse, in a manner that distracts from the message sought to be conveyed. Suspicious opposing counsel may see unfairness where there is merely lack of taste or good sense. In any case,

movement that has been added to a slide can be turned off readily (a few keystrokes) without affecting anything else on the slide.

- **Unfairness: sound.** The sound in visual aids shown in a courtroom is usually produced by the same kind of tools described above with respect to motion. The standard sounds provided by the software include typing, telephone rings, glass breaking, applause, doorbell rings, camera clicks, cash register rings, chimes, drive by, drum roll, explosion, gunshot, screeching brakes, and whoosh. These sounds rarely contribute anything useful to a jury's understanding as they are all manufactured sounds that have nothing to do with the facts of the case. Sounds that have been added to a slide can be turned off very easily (a few keystrokes) without affecting anything else on the slide.
- **Unfairness: position.** Presentation software tools make it possible to position photos and other images anywhere in relation to one another. One can *flip* any image so as to make it appear back-to-front or upside-down.



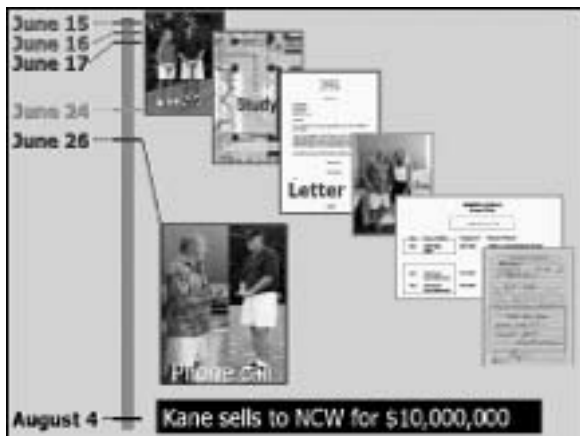
Images can also be *rotated* to angles that are different from real life.



In addition, images or objects may be overlapped on the slide when in real life they could not be in that position. Any of these positioning techniques can create an objectionable display because the purported goal of helping the jury to understand the witness's testimony or the information being presented by the witness is not achieved in a fair manner and results in nothing more than persuasion on irrelevant grounds.

- **Unfairness: intervals.** Time lines are frequently used in cases in which a sequence of dates or times is important to the case theory. Most time lines include intervals, marked off in some way, representing the amount of time that passed between events. If the intervals on the time line, when measured, do not accurately (that is, proportionally) represent the amount of time that actually passed, then there may be an objection based on presenting misleading and possibly confusing information to the jury.

In this example, the dates June 15, June 16, June 17, June 24, June 26, and August 4 are important to the case. In this case, a



business broker is suing to collect a fee and her case theory is that her actions were instrumental in the sale of a business. The time line shows the actions. But the intervals shown on the time line are not exactly proportional to the amount of time that passed between one event and another. The intervals between June 15 and June 26 are reasonably accurate but, if measured, the interval between June 26 and August 4 is compressed. If the August 4 mark were placed in proper proportion, it would be almost half again the distance depicted here between June 26 and August

4. The unfairness objection will be based on the impression given the jurors that this time interval was shorter than it actually was.

This time line is an illustrative aid, and therefore will not be sent to the jury room during deliberations. For that reason, a relaxed standard about accuracy may be appropriate so long as the distortions are not large or the exact time interval between events is not at issue. In this case, it would be difficult for the designer of this slide to get all the information on one slide with

a type size that could be read. However, the use of a computer in design work makes it very easy to get time intervals exactly correct. If the intervals are not a true representation, it might be better to indicate that with a break in the line that is the axis on which the dates are indicated.

- **Unfairness: repetition.** Visual displays offer an opportunity to repeat testimony or themes, and some lawyers use this opportunity to repeat material in ways that would be objectionable if done orally by the lawyer (in a question that has been asked and answered) or by a witness.

A series of slides that repeats a quote from deposition testimony is one example. Another example is the playing of an annotated segment of deposition testimony repeatedly. A third example occurs when a lawyer introduces an animation with one eyewitness and then seeks to play the entire animation with every eyewitness no matter how minor the contribution of the witness's observation. The objective is to ingrain the animation in jurors' minds, perhaps before the other side's animation appears or to play their animation more frequently than the other side's. Some repetition in displays is usually tolerated, just as some repetition in testimony is allowed, but judges should take into account the power of visual displays when determining how much repetition to allow.

Leading objection

The traditional objection to leading questions is directed at lawyers' statements that suggest the desired answer to the witness. Slides may have content or markings that will lead the witness in reciting testimony. Slides that accompany expert testimony are often prepared for this very purpose, so that the expert provides an explanation that is organized and well paced. They are less objectionable on these grounds, however, if the expert prepared the slides and determined their content. The expert cannot improperly suggest the answer to

himself or herself, and the leading of an expert in his or her area of expertise may be allowed if for the purpose of clarifying the testimony.

Argumentative objection

Objections that illustrative aids are argumentative (and therefore should not be displayed to the jury) can arise during opening statements, expert testimony, and direct and cross-examination of fact witnesses. With respect to opening statement, the prohibition against argument is inherent in the purpose of creating a context for the jury's understanding. Argument does not further that purpose, and therefore is improper during opening statement. With respect to witness examination, the objection is generally grounded in the proposition that testimony is for the purpose of eliciting information, not for arguing the case to the jury.



Illustrative aids that support an opening or witness examination may be argumentative in the same general ways as oral statements. The objection is most often directed to the wording on a label. Labels including adjectives and adverbs may be argumentative. Labels stating relationships (something happened *because* something else occurred

first; the problem was *due to* a particular circumstance) may also draw this objection.

The design of a graphic display may also draw an objection as argumentative. For example, the typical relationship chart (as illustrated at right) shows a flow from one event to another by having the arrows appear one after another before reaching the bottom-line conclusion. This design is appropriate for final argument, but occasionally finds its way into the examination of an expert witness under the guise of explaining the expert's work.



Narrative testimony objection

The traditional objection to narrative testimony seeks to prevent the type of question that does not put counsel on notice as to potential objectionable testimony by a witness. The same can be true of a slide show. Presentation software can embed in a single slide or group of slides an “autoplay” function that, once the slide is activated, continues to reveal new material as the witness goes along. The witness may wind up simply narrating what is appearing on the screen. The narrative of the slide show can contain inadmissible evidence that, once heard, can cause problems that will be difficult to fix with a motion to strike.

Assuming facts not in evidence objection

The traditional objection in this area seeks to disqualify a question that assumes a fact not in evidence. The basis for the objection is that the answer given by the witness to such a question cannot be fairly used by a jury in arriving at a decision in the case. Slides used

in the direct examination of witnesses sometimes cross into this area. This may happen when a statement, photo, or other material is displayed that purports to present a fact that has not already been admitted in evidence or at least is not within the competence or knowledge of the witness with whom the slides are used.

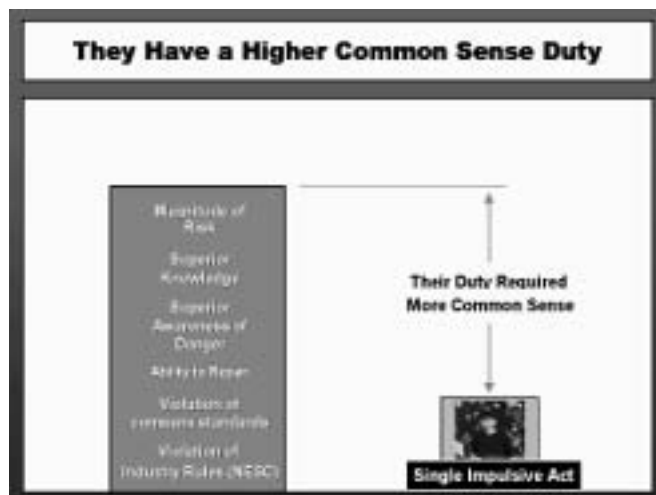
Experts are allowed, under Fed. R. Evid. 703, to rely on facts or data not admissible in evidence. The question arises, with respect to displays used by an expert to explain his or her opinion, whether a slide can include statements, photos, or other data not admissible in evidence as a helpful means of presenting the expert's opinion to the jury or assisting the jury in understanding the expert's opinion. Pursuant to the December 2000 changes in Rule 703, while these facts may be used as a basis for the expert's opinion, if the data or facts are not otherwise admissible, they may not be communicated to the jury "unless the court determines that their probative value in assisting the jury to evaluate the expert's opinion substantially outweighs their prejudicial effect." As a result, such facts or data should not normally appear on an illustrative aid until the court has ruled on their admissibility.

Foundation (unsupported opinion) objection

Expert witnesses are the most frequent users of illustrative aids presented with courtroom technology. Lawyers who prepare well for a complicated case will use jury research to identify the case themes that are likely to cause a representative jury to decide issues in the client's favor. Sometimes these themes show up in the displays that the expert sponsors even though the expert has no facts at hand or knowledge, skill, experience, training, or education that would provide a foundation for direct testimony. An objection to this kind of display is often stated as "argument," because the display is in effect arguing the client's cause.

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For example, the display below argues an ultimate issue in the case (permitted under Rule 704(a)) by building on a series of opinions. The expert is prepared to testify that the defendant corporation violated industry rules, violated company standards, had the ability to do repairs that would have prevented plaintiff's injury, had an awareness of the danger, and knew the magnitude of the risk.



This display builds each of these points, part by part, in a bar on the left, suggesting an amount of fault for the company. It may be unclear to opposing counsel where this is going, until the rest of the pieces of the slide are displayed showing a much smaller bar, suggesting very little fault on the part of the individual plaintiff. Finally, a title bar is displayed with the conclusion that "They (the defendant company) have a higher common sense duty." (See the CD that comes with this book to play this slide as it builds to a conclusion.) The objection to this slide likely will be lack of foundation because the

expert has no basis for making a determination as to comparative fault. This objection might be obviated by removing the title bar and the commentary, and merely showing the elements of contributory negligence by the respective parties. However, implicit in the size of the bars is an opinion by the expert about the size of the contribution by each party which may be found to be inappropriate. In all likelihood, this illustrative aid, while perhaps permissible in closing argument, would be unavailable for use in the examination of the expert witness.

Lay opinion objection

The titles, labels, or other text on a slide used with a lay witness may be objectionable under Rule 701 if the slide includes words or phrases that are fairly characterized as opinion or inference and do not meet the requirements in the rule that the opinion be: “(a) rationally based on the perception of the witness [*and*] (b) helpful to a clear understanding of the witness’ testimony or the determination of a fact in issue....”

Objections to digitally altered photographs

Digitally altered photographs have been changed in some respect from the “original” using software tools. (See discussion at pages 89 and 107.) Such photos may be offered in evidence, in which case a witness usually will testify that the photograph is an accurate representation of something about which the witness has personal knowledge. Occasionally this kind of photo is offered as an illustrative aid, to assist in the presentation of the testimony.

If the altered photo is offered in evidence, the proponent will argue that it makes no difference if alterations have been made as long as the witness testifies that the photo in its current state is an accurate representation of what the witness observed. Under Rule 901, if the witness has the necessary personal knowledge, that foundation

will suffice. The cross-examiner then has the burden to point out the effects of the alterations.

The opponent may argue that the traditional Rule 901 formulation is not sufficient with respect to a photograph that has been digitally altered. When the witness looks at a photo, the witness does not (and perhaps cannot) verify all of the component parts of the photo. The witness confirms some of the major components and assumes that all of the remaining components are all right. With traditional photos, that foundation sufficed because, although it has always been possible to alter photos, it was unlikely that part of the photo would be right and part of it would be wrong. In addition, most changes to a photo, such as airbrushing, required specialized professional equipment and occurred in ways that could be detected. With digital photos, any part of the image can be changed electronically in ways that are quite hard for the unaided eye to detect. The changes can be made with software that is commercially available at very low cost, and both small and large changes can be made by anyone who can read an instruction manual. Therefore, the argument goes, unless the witness can verify every aspect of the photo from personal knowledge, the foundation is insufficient. And such verification would take up too much time to be worthwhile.

Many digitally altered photos are just as useful as drawings, some more so, in orienting the jurors to the scene of an accident, the layout of an industrial plant, certain environmental impacts, and many other purposes for which they have been permitted as illustrative aids. The fact of the digital alteration, standing alone, is not enough to prohibit their use.

Objections to computer animations

Computer animations, simulations, reconstructions, and reenactments often are full-featured video productions that purport to represent the operation of some scientific principle or the recreation of events at issue in the case. They may be offered in evidence with the usual

foundation as to competence of the witness, relevance of the animation, identification of all of the elements that went into the animation, and evidence of the trustworthiness of the animation. More often, they are offered as illustrative aids with the bare foundation that they will assist an expert in presenting testimony or assist the jury in understanding the testimony.

If the animation is offered as an illustrative aid, the first objection generally is to the foundation, demanding adequate testimony to establish the accuracy of the data, structures, motion, sound, and other aspects of the animation. Although this is more akin to an objection to an exhibit offered in evidence, the impact of animated exhibits is so great, that if there are insufficient indicia of reliability under Rule 901, then Rule 403 and Rule 611 considerations will weigh against use of the animation as an illustrative aid.

Voir dire of the expert, or prior deposition testimony of the persons who prepared the animation, will lead to a series of other technical bases for what is basically an objection to unfair inferences being drawn from or depicted with relation to the evidence. These bases for the unfairness objection tend to fall into the following categories:

- **Viewpoint.** Animators can choose both the point of view and the field of view portrayed in the animation. A computer can frame the animation from a point at the scene where no witness was (or could be) located. A computer can also use a wider field of view than the human eye could possibly see. So the animation may show more of the scene than could have been seen by any eyewitness. This may be misleading if an issue in the case is what was seen or should have been seen from a particular vantage point.
- **Speed.** Animators can choose the speed at which the animation runs. But the rate chosen for the animation may differ substantially from the rate at which things happened in real life. The motion in computer animations may be objectionable when there is no foundation to show that the motion depicted is accurate.

For example, if an animation shows a truck approaching an intersection, and there is no foundation that the speed (motion) depicted on the screen is accurate, then the animation may be disqualified.

- **Timing.** When the computer work is done, animations usually are transferred to videotape for delivery to the other side (although they may be transferred to a CD, DVD, or hard disk for playing in court). The method used to transfer the animation to the videotape may result in timing errors. The action portrayed on the video may be speeded up or slowed down. Making copies of a videotape can also result in timing errors.
- **Frame flaws.** An animation is a series of still images played one after another at a speed that makes it appear, to the human eye, that motion is involved. When the animation is viewed on a frame-by-frame basis, there may be flaws (such as an object missing or an object in the wrong place) that make individual frames inaccurate. These flaws may not be detectable by viewing the animation, even if it is running at slow speed.
- **Motion flaws.** The software used to create animations often requires the animator to set a beginning location and an ending location for each object that moves. When there are only two points, the software will create an image of the object moving smoothly along a straight line. When the animator wants to depict a path that is not a straight line, or motion that speeds up and slows down, intermediate locations (called key frames) must be created for each change in direction or speed. The animation will be accurate only if enough key frames have been provided and their locations are accurate. In addition, the software may specify or the animator may choose the mathematical algorithm to decide all the intermediate spots (interpolation) along the path that the object follows. That choice may also lead to inaccuracy of motion.
- **Terrain flaws.** Most diagrams and aerial photos that are used as a basis for “earth-bound” animations show a flat terrain. The

actual terrain at the place the events took place may not be perfectly flat, and this may affect the accuracy of what is shown in the animation.

- **Sound.** The sound in computer animations may be objectionable when there is no foundation to show that the sound is accurate.

It may be useful for the court to have the assistance of a court-appointed expert or advisor in resolving these points. See discussion at page 134.

A different set of objections focuses on information in the animation that is not in evidence. Animations often support or illustrate the testimony of an expert and, under revised Rule 703, while the data relied on by an expert in reaching an opinion need not be admissible in evidence, evidence normally inadmissible may not be communicated to the jury. If the animation is nothing more than a visual representation of inadmissible bases for the expert's opinion, it can be excluded on Rule 703 grounds. See discussion of the facts-not-in-evidence objection above.

Another set of objections involving animations arises when plaintiff's counsel proposes to use a defense animation before the animation has been introduced by the defense. This tactic usually anticipates a strategy often employed by the defense. Experienced lawyers know that one very effective way to defend against an animation is to create a counter animation. When it comes time for the defense witnesses to testify, defense counsel plays not only the counter animation, but the plaintiff's animation as well, sometimes even simultaneously in split screen on one monitor. Eyewitnesses or expert witnesses will testify that the defense animation is accurate and the plaintiff's animation, by contrast, is not accurate. To guard against this possibility, plaintiff's counsel may want to play the defense animation (as well as the plaintiff's animation) in the plaintiff's case-in-chief. Then, plaintiff has first strike by having its witnesses testify that the plaintiff's animation is accurate and the defense's animation is not accurate. Defense counsel predictably will object to this be-

cause no foundation has yet been laid for the defense animation, and will argue that the jury cannot understand the animation until the foundation has been laid. Plaintiff's counsel will argue that the plaintiff's expert has reviewed the defendant's animation, that she disagrees with the conclusions of the report and therefore the depictions in the animation, and that she should be permitted to testify to this work on direct examination. To avoid spending time at trial on these matters, the court may want to address at pretrial when and how the animations will be used at trial. Rule 611 allows the court discretion to determine whether plaintiff must wait for rebuttal.

Closing argument

Closing argument can be made much shorter and better with the use of good illustrative aids. Lawyers tend to stay on point when guided by an organized presentation of the evidence and arguments. Fewer illustrative aids are objectionable in the context of a closing.

Occasionally lawyers are swept up in the enthusiasm of the moment and go beyond appropriate uses. In the early days of multimedia, plaintiffs' lawyers in a 1988 Arizona case used a \$17,000 18-minute video production entitled "The Titanic" which illustrated plaintiff's point that the defendant accounting firm's faulty audit sank the plaintiff bank. The video used scenes from the 1960s *Titanic* film "A Night to Remember." Part of the film included the bank's logo superimposed on a segment where water was pouring into the *Titanic's* engine room. The final scenes showed empty life jackets floating on the water as the ship disappeared beneath the waves and the narrator intoned, "[the accounting firm] had numerous warnings [the bank] was in troubled water but also chose not to listen. ... Perhaps they too thought they were invincible." The jury awarded a \$388 million verdict that was overturned by the trial judge for what appeared to be as many reasons as he could muster.

The court may want to look at a few kinds of displays in advance of closing arguments to protect against potential inappropriate uses.

- **New material.** Video, photographic, or graphics materials that have not been marked as exhibits in the case are at the head of the list of things that might usefully be disclosed so that the court can consider objections before closing argument starts. Lawyers occasionally get carried away with the possibilities for analogies. The standard bullet-point slides that lawyers use in closing argument also occasionally overstep the bounds of what is permitted, but the principal dangers of irretrievable prejudicial effect on the jury come from video, photo, or graphics materials. The *Titanic* film clip is an example in this category. Another example in this category (that can go either way) is using photos of witnesses that are single frames picked off deposition videos in order to remind the jury, in closing argument, about the witness testimony. Many jurors have more personal reactions to witnesses they liked and did not like when reminded by a photo.
- **New sound, motion, or color.** Exhibits in the case to which sound, motion, or color have been added for purposes of closing argument should also be reviewed in advance. Occasionally superimposing one exhibit on another falls into this category, although if both images are in evidence, superimposing one over the other would not usually be a problem. The principal danger, indeed often the objective, is that jurors will confuse the closing argument display with the real exhibit. This technique may be the only practical way for one side to tackle the other side's most persuasive exhibit, but the court might want to see the proposed visual display in advance.
- **Digitally altered photos.** Although no digitally altered photos may have been used at trial, occasionally a point on closing argument can be made effectively by altering a photo to illustrate the point. Lawyers may want to change the photo to illustrate the persuasive nature of their own argument or the gaps in

logic in their opponent's argument. If it is not made very clear to the jury that the photo has been changed, there may be confusion in the jurors' minds about the exhibits.

- **Testimony from the transcript.** It may be useful to a lawyer to invite close jury scrutiny of the testimony of a particular witness. One technique for doing this is to use portions of the transcript, enlarged on the projection screen or monitors, with underlining and labels as to page and line numbers. This is usually a suggestion to the jurors that they ask for the transcript and study it themselves. If the court does not plan to allow jurors to examine the written transcript, then it might be useful to review this type of display in advance and, at a minimum, require counsel to preface these remarks with the admonition that the trial transcript is not available in the jury room during deliberations.

Even though counsel are now presenting arguments, and the narrower rules governing opening statements no longer apply, some displays may be so manipulative as to be unduly prejudicial or present a significant danger of confusing the jury.

Final jury instructions

The final instructions may be quite lengthy and may require changes at the end of trial to accommodate rulings made during trial. Experienced lawyers often will try to get from the court at least preliminary decisions on the final jury instructions well before trial so that the visual displays of the lawyers' case theory will fit with the most important portions of the final instructions.

Some courts require the parties to submit a jointly prepared set of proposed jury instructions on disk to facilitate editing and final preparation.

Final instructions may be easier to understand if they are presented on the screen as they are read. The sentence and paragraph

More on instructions
Part IV, p. 146, preliminary instructions

structure of the instructions helps make sense of them because one can see, in the kinds of instructions that have many parts, when one part ends and another part begins. The process of giving final instructions should not emphasize or cause jurors to focus on one part of the law rather than another. The risk of this happening increases if instructions are lengthy and given only orally because the instructions that are readily understood are given emphasis over those that deal with unfamiliar concepts.

The evidence camera is an efficient and easy way to present the jury instructions on the screen as they are being read by the court. Computer displays also work well for this purpose. Either of these technologies treat every concept in an even-handed manner. Every sentence appears the same way, stays on the screen as it is read, and moves off the screen in the same way. The visual imprint enhances the concept that the instructions are to be treated as a whole.

Jury review of computer-generated materials

When jurors see computer-generated displays used in court during testimony, they will likely request access to the same display techniques in the jury room. This often happens when one or more of the jurors is computer-literate and understands that the controls for these displays are very easy. Some juror is bound to know that all the displays are on a CD somewhere so that, if a computer and monitor are available, the jury can leaf through the displays one by one.

If the jury requests evidentiary exhibits, the court has several alternatives. If the exhibit exists in paper copy, using the paper copy may be satisfactory. Jurors will be less disgruntled about this if in the instructions the court mentioned that although displays used in the courtroom allow everyone to see the same thing at the same time, in the jury room they will be working with paper copies.

If the exhibit is a video, audio, or other digital file that does not have a paper counterpart, a monitor can be put in the jury room and access to the exhibits can be made available through several alternatives, each of which has analogies in the audio and videotape players that have been allowed in jury rooms over the years.

- **Touch screens.** Touch screens work well for use in a jury room. The display on the touch screen monitor in the jury room shows small gray bars, each of which is labeled with an exhibit number. This display can be prepared quickly and easily by a vendor acceptable to both parties. When the jurors want to see an exhibit for which there is no paper copy, one of them touches the gray bar with the appropriate exhibit number and the exhibit appears on the screen. The computer that responds to the touch screen controls can remain in the courtroom under the control of the clerk or other court personnel.
- **Bar codes.** The admitted exhibits can be bar coded as the trial proceeds. The jury is provided with a hand-held bar code reader and a list of exhibits, each of which shows the bar code that will access it. When the jurors want to see an exhibit, one of them passes the bar code reader over the appropriate bar code and the exhibit appears on the monitor. The computer that responds to the bar code commands can remain in the courtroom.
- **CD.** The admitted exhibits can be consolidated on a CD that has been reviewed by counsel for the parties. Each exhibit has a file name that includes its exhibit number. A laptop computer connected to a monitor is placed in the jury room with the CD. When the jurors want to see an exhibit, one of them opens the list of files on the CD and selects the correct file name, bringing the exhibit to the screen.
- **One-way communication to the courtroom.** A monitor is placed in the jury room, but all of the controls remain in the courtroom with the courtroom deputy or other staff. When the jury wants to see a particular exhibit, they ask the clerk to display it. If the exhibit is an illustrative aid, the message “Not Available” ap-

pears on the screen in the jury room. If the exhibit has been admitted, the clerk activates it for display on the monitor in the jury room.

- **Courtroom equipment.** Another alternative is to bring the jurors back into the courtroom and repeat the requested displays using the courtroom equipment.

Posttrial briefs

Software and hardware that draw on the same technology used in courtroom visuals can be used to make posttrial briefs and memoranda more effective. With the use of commercially available software, the techniques for briefs are only a modest step from normal word processing and should not create any lack of parity in the parties' ability to make effective presentations to the court.

Computer-generated illustrations in briefs

In its opinion in *Kumho Tire Co. Ltd. v. Carmichael*, 526 U.S. 137 (1999), the U.S. Supreme Court used a black and white illustration in the text of its opinion to supplement its explanation of the facts of the case. The illustration was taken from an exhibit in the case, and the opinion commented on how useful it was in understanding the facts. In many cases involving technical, scientific, or financial matters, illustrations in briefs provide a valuable supplement to the written word. Illustrations can be created inexpensively using the same presentation software that generates illustrative aids for trial. These illustrations are imported into word processing documents with only a few keystrokes. Briefs printed on color printers can include color illustrations without any adjustments for the black and white text.

Digital format briefs

Digital format briefs are electronic, multimedia submissions usually on CD that accompany the traditional paper filing. The CD contains the full text of counsel's brief, the full text of every case cited in the brief, the full transcript in the case, and all of the exhibits including video clips of depositions (with audio), PowerPoint slide shows, and other illustrative aids in full motion and color. The references in counsel's brief to cases, statutes, rules, transcript passages, or exhibits are hyperlinked. This means that a link is established between the point in the brief at which the reference occurs and the point on the CD where the reference material is located. A person reading the brief can click on the link and the full text of the material being cited will appear on the screen. No reference to law books, paper transcripts, or the court's file of exhibits is required. Similarly, the CD provides indexed access to materials that are not cited in the brief.

Digital format briefs have been around for more than five years. The first appellate case, *Yukiyo, Ltd. v. Watanabe*, 111 F.3d 883 (Fed. Cir. 1997), rejected the CD in favor of the traditional paper filing, but laid out notice requirements under which briefs on CD could be submitted. That court subsequently received digital format briefs. *E.g. Rodime P.C. v. Seagate Technology, Inc.*, 45 U.S.P.Q.2d 2023 (Fed. Cir. 1998). Other courts have accepted briefs in this format, usually with two caveats: (1) notice to the other side of the intent to file in this format; and (2) an accompanying paper copy. Major legal suppliers such as West, Lexis, and Pubnetics now assist lawyers in producing such briefs.

Briefs on CD are, in part, compilations of materials generated or presented at trial. The lawyer looking ahead to brief-writing in this fashion will want to have as much material as possible in digital form before trial. Real-time reporting, digitized video of depositions, and scanned images used as exhibits are important factors in making possible the speedy and inexpensive preparation of a brief in digital format.

Briefs on CD allow posttrial oral arguments to move more quickly.

Effective Use of Courtroom Technology: A Judge's Guide to Pretrial & Trial

Both the advocate and the court can click on the link to read pertinent portions of statutes, cases, or transcripts. No hunting through papers is necessary. The advocate can display quoted sections for the court on a monitor at the bench, and can indicate or mark passages with annotation equipment. For the court, the posttrial review of a case with a long record may be expedited.

Appendix A

More Details About Using the Equipment

This appendix is an effort to make the handbook useful across a wide swath of the bench and bar. Courtroom technology is in varying stages of preparation, installation, and use in the nation's federal courts. Some judges have a knack for computer equipment; others regard it as fundamentally uninteresting. Some bar groups actively promote education about visual presentations; others have nothing available to members. For those reasons, Parts I through IV of the handbook may miss the target with respect to the needs of some.

Here you will find information about the best uses, setup, operation, and techniques for using the most common courtroom equipment:

- evidence camera
- laptop computer and presentation software
- projector and projection screen
- monitors
- annotation tools
- color video printer
- audio systems
- videoconference systems

If the court knows what is likely to go wrong with the equipment, it is easier to make an assessment of how and when the equipment may be useful and how long it is likely to take to fix it if something does happen. If the court knows what is likely to go wrong with the lawyer's use of the equipment, it is easier to help extricate those who get themselves mired in mistakes, thereby keeping the trial on track.

This section uses common equipment as a model in showing the best uses, operation, setup, and techniques for use. There are small variations from manufacturer to manufacturer, and the labels on some of the equipment may be slightly different. The court may want to modify this section if it is published for the bar's use or direct lawyers to the court clerk for explanations of the peculiarities of the

system installed in the courtroom to be used for a particular trial. If the court needs materials to distribute to the bar, a special reprint of this appendix, beginning with the background section below, is available from NITA and can be handed out or can be downloaded from the FJC Web site and posted on the court's Web site together with court-specific information.

Thoughtful use of visual material, coupled with clear oral statements, helps the fact finder move expeditiously through the case with a good understanding of the facts. Lawyers do not necessarily need to know how to prepare the visual aids themselves in order to use them well. However, they must understand what information should be contained in a visual aid and how it should be presented. To that end, it is necessary to know about the available presentation techniques and their purposes. And, of course, an effective visual presentation is dependent upon a workable case theory. Technology helps make points effectively, but does not substitute for a persuasive case theory. A technically perfect presentation of an unpersuasive case theory will still be unpersuasive.

Background

The use of courtroom technology began in the 1970s when slide projectors, overhead projectors, and videotape players made appearances in trials. They were followed in the early 1980s by the more sophisticated laser disk players that did the same work but more reliably and with better quality. In the early 1990s, CD players began to offer more versatility, evidence cameras were often seen in big trials, and telestrator units provided the capability to “draw” on the computer screen. In the mid-1990s, the laptop computer gradually began to supplant much that had gone before it, and, with the most recent boosts in chip capacity and storage media, the laptop can now do almost all of the courtroom tasks involved in the presentation of exhibits. Everything lawyers use as exhibits—photos, documents, lists,

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quotes, transcripts, video clips, maps, diagrams, drawings, time lines, graphs, relationship charts, spreadsheets, organizational charts—can now be created, ordered, animated, and projected with surprising ease, and at a fraction of the cost of older methods.

As laptop computers were adding enormous amounts of capacity, digital projectors began losing weight, increasing in power, and operating well in fully lighted rooms. Because many courtrooms have nothing friendlier to presentation technology than an electrical outlet, these small, lightweight, reliable projectors brought into the courtroom by lawyers quickly became mainstream equipment for courtroom use. They solved a principal problem with earlier technology. Slide projectors and overhead projectors require dimming of the lights in the courtroom. Newer digital projectors that take images from a computer have the projection strength to work well in full daylight. Similarly, ten-foot projection screens began appearing that are easily set up, quickly dismantled, and well suited to displaying exhibits. Some have light enhancing surfaces that produce sharp images. Projectors and screens remain the most user friendly, inexpensive, and widely available equipment.

For much of the 1990s, monitor technology did not keep up with the developments in laptops and projectors. CRT (cathode ray tube) monitors became larger with sharper displays, but their weight and bulk increased in proportion to their screen size, so they took up a lot of space in a courtroom. Flat panel LCD monitors solved some of the weight and bulk problems, but for some years were available only in very small sizes. They became the monitors of choice for the bench, counsel table, lectern, court personnel, and began to appear inside jury boxes in some court installations. Some courtrooms continued to use very large CRT monitors outside the jury box for common viewing, rather than install the smaller monitors inside jury boxes.

The laptop computer, used with either courtroom monitors or a projector and screen, solved most of the problems inherent in older methods. The blackboard presents a difficult problem in adequately

preserving for the record what was drawn on it. A computer preserves a precise record of every action. Hand-drawn flip charts are sometimes hard to read and favor the lawyer with good handwriting and an eye for perspective in drawing. A computer provides clear type and elegant design capabilities. Document blowups and photographic enlargements are time consuming and expensive to create; and once completed, they cannot be changed. A computer can produce blowups and enlargements virtually cost-free with the flexibility to change at any time.

A lawyer with a laptop can walk up, plug in, and the display monitors or projection screen light up with presentations driven by the computer. When this happens, the advocate with the technology-enhanced displays often has a significant advantage in holding jurors' attention and creating a faster understanding of the facts, themes, and images that drive the case. Armed with technology, advocates who may not be as oratorically gifted as their opponents can level the playing field of persuasion. The images on the screen speak for themselves, but they can only communicate what they are programmed to do. They are an aid to persuasion, not a substitute for it.

Evidence Camera

The evidence camera consists of a small TV camera mounted so that it can focus on materials placed on a light box that serves as a base. The base is connected via cable to a projector or to one or more monitors. When plugged in and connected by cable, the evidence camera will display an image of anything placed on its base. It has the capability to zoom in to enlarge the image of items not easily displayed otherwise.

It is also known as a "document camera," although it is actually not very good at displaying many types of documents; it is also called a "visualizer" and a "visual presenter." Many manufacturers, including Elmo, DOAR, Wolfvision, Samsung, Toshiba, and Canon, sell

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evidence cameras because these units have applications in business and sales beyond their uses in litigation.

The evidence camera enhances the lawyer's presentation by focusing everyone in the courtroom on the point being explained. Everyone is on the same page, so to speak, as the lawyer proceeds. Other means can achieve this objective. Enlarged graphics on an easel or transparencies on an overhead projector also present details and focus attention, but the evidence camera is faster, more flexible, and more efficient.

The evidence camera unit is about 18 inches square, has no special mounting requirements, and will sit on any table or other level surface. It has an AC plug outlet on the back panel and is connected to a standard electrical outlet through a power strip to guard against unusual spikes in the electrical current. Power cords must be taped down to avoid tripping over the cords and toppling the equipment.

The evidence camera travels well. It weighs about 9 lbs and folds up into a convenient carrying case. The arm that supports the camera head retracts (with a release button on the side of the arm) so that it fits within the footprint of the base. The arm also folds down (with a release button next to the point where the arm joins the base) to put the head on the surface of the base.



Best uses

The evidence camera works best with material that, once enlarged sufficiently, is quite clear without much additional highlighting or other marking. The camera enlarges very well, but it does not support complicated additions to an enlarged exhibit. Newer models have 12-to-1 zoom lenses which allow a one inch by one inch por-

tion of a photo to be displayed full screen on a large monitor or projection screen. Its best uses are photos (and similar materials such as maps and drawings), small objects, and uncomplicated material from documents.

Photos: The evidence camera is an inexpensive and flexible way to enlarge and display photographs, particularly those in color. Some photos are best presented simply by placing them on the base under the camera so an enlarged version appears on the screen. No adjustments or other actions are required. Particular portions of a photo can be easily highlighted using the focus and zoom capabilities of the evidence camera. For example, suppose the witness testifies that a particular railroad crossing is in a commercial area. The witness has several photos of the crossing used to support this conclusion. If the cross-examiner spots cows grazing in one tiny area in the upper left corner of the photo, the photo can be placed on the evidence camera base, the lawyer can zoom in until just the area featuring the cows occupies the entire display screen, and the cross-examination can proceed from there. The evidence camera produces the necessary enlargement instantly and electronically. In contrast, a hard-copy enlargement from the photo might take days to get and the resolution likely would not be as good.

Xrays, MRI images and CAT scans: The evidence camera does an excellent job of displaying Xrays, MRI images, and CAT scans. These exhibits need light pushed up from the base, and the evidence camera has a light in its base that can be turned on when displaying negatives. The iris adjustment knob, located on the camera head, provides the best possible contrast for Xrays, and the positive/negative switch, located on the front control panel, provides flexibility in the way the image is displayed. Xrays can be shown either in "negative" (which is their normal state) or "positive." As a negative, the Xray displays its subject on a black background. Sometimes it is easier for jurors to understand the image if it is presented as a positive (black on a white background), and the evidence camera can switch immediately to this mode.

35 mm slides, regular film negatives, and other transparencies:

The evidence camera will enlarge 35 mm slides and other transparencies to whatever size is needed. Simply put the slide on the base of the camera, turn on the base light, zoom in, and adjust the focus. Regular film negatives can be enlarged and turned into photos using the positive/negative switch. The operator puts the negative on the base, turns the positive/negative switch to positive, and zooms in to create the enlargement needed.

Small objects: Enlargement of small objects, such as computer chips or mechanical parts, allows witnesses to testify about them while showing the “real thing” on the screen. Using the evidence camera, the object can be moved around to provide any necessary viewing angle for understanding the testimony about the object. The lawyer or witness can pick up the object, rotate it on the evidence camera base so that a different side is showing, or turn it upside down. They can point out relevant aspects of the object either by standing next to the screen and indicating a location on the image or by standing at the evidence camera and using a pointer directed at the object itself. The camera will show on the screen all of these actions, so long as they are within its field of view.

Simple documents: No evidence camera can project a full page of readable text, despite advertising claims to the contrary. The best digital cameras can manage about three-fourths of a normal text page. However, an enlarged display of words or small sections of text helps direct the jury’s attention to the point to be extracted from a document. The evidence camera provides a limited capability to work with documents in this way, allowing the lawyer to interact with the document by highlighting passages and zooming in to enlarge small portions of text.

Excerpts from books: The evidence camera allows a lawyer to show the entire book that a witness is using to bolster testimony, then turn to the section of the book in which the material to be discussed is located, and finally to arrive at the page on which the

material appears. The jury can follow this sequence easily with the enlarged images on the screen.

Narrow columns of text: Because the focus of the camera is limited to a span about 5 inches wide, the evidence camera works best with narrow columns of text. Columns of about two inches, such as newspaper format, are ideal. The columns of condensed print on “minuscrypt” transcripts also work well on the evidence camera. To display columns of text, the lawyers can put the page down on the base under the camera, and use the zoom feature to get to the particular text about which the witness will testify. The witness can then work directly with the image of the text on the screen and point to it with a finger or pen.

Operation

Operating an evidence camera involves simply placing the evidence on the base under the camera and operating the zoom button to get to the proper enlargement. The zoom feature on the evidence camera is like the zoom on a 35 mm camera or video camera. It allows the operator to change the focus of the lens to make the field of vision smaller and to enlarge every detail being viewed. The zoom controls are simple to operate. Press and hold down the zoom in button (sometimes called “tele”) until the amount of enlargement is sufficient, then stop pressing the button. To retreat from the enlargement and get back to normal size, press the zoom out button (sometimes called “wide”) that changes the lens focus until the button is released. In nearly every case, the user will zoom *in* while the jury is watching and zoom *out* while nothing is being displayed and therefore the jury is not watching.

Zooming in is a natural action that is easily followed visually. The best technique for most exhibits is to show the whole exhibit for identification, zoom in to show a section of the exhibit and finish the point with the witness while the evidence camera remains zoomed in. In that way, the jury sees the exhibit as a whole and understands

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the context of the part that is being explained. For example, a lawyer might have an aerial photo of a city block and want to show the group of buildings that were damaged when the city's water main broke. She would start with the hard copy of the photo and have the witness identify it. Next, she would put the hard copy on the evidence camera and have the witness identify it again, preferably with its exhibit number showing. She would then ask the witness to point to the area where buildings were affected by the flood and to identify the cross streets. Finally, she would zoom in on that point until the camera frames only the buildings about which the witness will testify.

Using the evidence camera to zoom in and frame part of an exhibit is a modest exercise in eye-hand coordination.

- **Step 1:** Establish the visual anchor. Put the photo or other exhibit down on the base, and put a finger on the photo at a point a little below where the center of the image should be after the zoom-in is completed.
- **Step 2:** Press the zoom in (or “tele”) button. This will start the camera zooming in.
- **Step 3:** Watch the monitor, not the photo.
- **Step 4:** Move the photo. Use the finger on the photo to move the photo so that the portion to be featured is centered under the camera. This is less difficult to do than it may sound. The finger on the photo is the visual anchor, and it will not be necessary to look down at the photo to see the move.
- **Step 5:** Finish the zoom. Pressing the zoom in (or “tele”) button will keep the camera zooming in (focusing on a smaller and smaller area of the photo). Move the photo (gradually centering the area of interest directly under the camera) at the same time.

DO NOT zoom in randomly and then move the photo to get the zoom focused on the area of interest. The motion of the photo crossing under the camera creates a confusing visual effect and detracts from the exhibit. More importantly, the effect is likely to be disorienting to the operator and make it very difficult to get back to the

portion of the photo that is of interest. If a mistake is made, it is better to back out a little, get oriented again, and then zoom back in.

After the testimony about an exhibit is completed and it is taken off the base, and before the next exhibit is put on the base, press the zoom out (or “wide”) button to get back to where the camera started. The evidence camera is now in its “base” position, and ready to zoom in again if the next exhibit calls for that action. Zooming out can be confusing and disorienting. If the operator zooms in for one exhibit and forgets to zoom out after finishing with that exhibit, the camera will be zoomed in on some very small portion of the next exhibit put on the base. There will be no smooth flow from one exhibit to the next because the operator will need to stop and zoom out to get the current exhibit into proper focus. For this reason, some of the newer evidence cameras are equipped with pre-sets, which take the place of holding the zoom out button to get back to the base position.

In a few instances, one might want to start with the evidence camera zoomed in and then zoom out to a broader view. For example, if the purpose is to show a family relationship, a lawyer or witness might start with the evidence camera zoomed in on an inset photo of the individual and then zoom out to show that individual's place in the family group or family tree. In a loss of consortium case, one might start zoomed in on the child alone and then zoom back to an extended family.

Zoom out can also be used to deal with photos that are out of context. Suppose that opposing counsel has a photo tightly focused on subject matter favorable to his case. Examining counsel needs to show that, in a wider context, the photo would show details favorable to her case. She could start in a zoomed in position with the photo, then put behind the photo a piece of paper containing a drawing or illustration of the missing details and zoom out to show the broader context. Zoom out can also occasionally be used with documents. If opposing counsel has focused on one or two words in the fine print, it may be useful to take the jury from those words back to

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the mass of fine print that faced the person who agreed to the insurance contract.

Newer equipment has more court-friendly features such as a freeze-frame setting that allows the lawyer to move the exhibit without showing the moving frame on the monitor. This helps avoid distraction of the jury.

To work with the evidence camera in a courtroom, the user needs to master only a few controls in addition to the two zoom buttons.

On-off: The evidence camera is an electronic device that needs to be plugged into a standard electrical outlet as a power source. When plugged in and turned on, the camera is activated. It stays activated until turned off or unplugged from the power source.

Aim: The evidence camera is aimed in two basic ways. The standard “aim” is straight down, so that the camera is looking at whatever is placed on the base below it. Alternatively, the head can be turned to face outward, either to the front or the back, and in that position it will look at whatever is in front of it.

Lens and lens cap: The camera lens is protected by a lens cap that needs to be removed before the unit is operated. In older units, the camera has a closeup lens which must be on when the camera is aimed down at its base, and must be off when the head is rotated to the front or back to focus on something at a distance. Most newer cameras do not include a removable closeup lens as almost all courtroom work is done with the lens in the standard position.



Focus: Like any camera, the evidence camera needs to be focused in order to display a crisp, clear image. It has two focus controls, manual and automatic. Manual focus is needed for any three-dimensional object because of the different depths of field presented by the object, and is operated by two buttons labeled “N” (near) and “F” (far). Autofocus is most useful with documents, photographs, and other exhibits that lie flat on the base, and it is operated by a single button located next to the manual focus buttons. Press it once, and it figures out where to focus.

Iris knob: The iris control knob, which darkens or lightens the image, is located on the camera head; generally the setting is kept in the middle. The evidence camera has an auto iris that will adjust for the best contrast under most circumstances.

Light: The evidence camera works well in natural light, and most black and white exhibits need no additional light. For special exhibits, the evidence camera comes with two light sources: high intensity overhead lights contained in the arms above the base, and a light contained in the base. The overhead lights are used to increase the contrast when presenting materials in color, whereas the base light is used when light needs to come up through the material being presented—such as an Xray or a transparency. Each set of lights (the one in the base and the ones in the arms) has a separate on/off switch; in normal operation, both sets of lights are off.

Black & white vs. color switch: In older evidence cameras, the black & white switch is on for normal operation with documents and the color switch activates an automated enhancement for color images. If the camera is aimed at something that has color in or on it, the color switch should be on. Color images can be turned to black and white by using the black & white switch also located on the control console. In newer cameras, the color switch can be left on at all times unless it is necessary to change a color image to black and white. There is no longer a discernible difference in image quality when displaying text documents in the color mode vs. the black and white mode.

Positive/negative switch: In normal operation, the positive/nega-

tive switch is set to positive. The negative switch is used with photographic negatives and Xrays when they should appear in their original condition and not as positives.

Setup

If there is a lectern in the courtroom from which the lawyers address the court, the witnesses, and the jury, the evidence camera normally is placed on a small table to one side of the lectern. If there is no lectern, the evidence camera may be located on a small table between counsel tables. The camera is usually shared equipment that both sides will use, and it needs to be in a place convenient for both lawyers. Normally when a witness uses the evidence camera, he or she comes down from the witness stand to the equipment. Occasionally an evidence camera will be on a small table at the witness stand as well.

There are two basic layouts or designs for evidence cameras. One has a direct pickup of the image by a camera positioned over the base. The lamps are also positioned over the base. This unit projects text documents well, but is not as strong with three dimensional images. The Elmo and the DOAR cameras, for example, are of this type. The other design has the camera and lamp in the back of the base focused on a mirror located above the base. This camera is very good at projecting three-dimensional images, but does not do as well on text documents. The Wolfvision product is in this category.

There are two types of evidence cameras being installed in courtrooms today. Most evidence cameras are electronic devices. Their normal output is to a television monitor. In order to transmit images to computer monitors, a switching device is required between the evidence camera and the monitors to turn the camera's analog signals into digital signals that the monitors can accept. All digital projectors of recent vintage have an on-board converter for video output.

Newer evidence cameras are digital devices and send digital signals to computer monitors or digital projectors. A digital projector is

the easiest, cheapest, and most reliable setup. This makes the lowest demands on the technical skill of the person who does the courtroom setup. The direct connection between the evidence camera and the projector offers the least complexity and the lowest opportunity for failure.

An evidence camera is a sturdy, simple, and extraordinarily reliable unit. Once it is hooked up and operating, very few things can go wrong.

Bulb broken: If someone drops the unit while running up the courthouse steps, a bulb may break. Normally bulbs have a life of 2,000 to 3,000 hours, and they are not a problem in regular use. Make sure there is a spare.

Lens cover on: The camera lens has a cover to protect it when not in use. If the lens cover is on, no light will reach the camera and the screen will be black. Take the lens cover off.

Iris knob turned down: The camera has a control, called an iris knob, that adjusts the amount of light reaching the camera. If the iris knob is turned down, thus reducing the amount of light reaching the camera, the screen looks black. Turn the iris knob back up.

Nonfunctioning electrical outlet: Courtroom electrical outlets may be nonfunctioning or only partially functioning. Sometimes courtroom maintenance is so poor that one outlet after another has become nonfunctioning over the years until the entire courtroom is down to just one operational outlet. In some instances, outlets have been turned off for some purpose and never turned on again.

Closeup lens gone: On older models, there is a lens located at the aperture of the camera. If it is missing, the projected image will be out of focus. Put the lens back on. Newer models do not have this problem.

Color switch on: On older models, if an exhibit is black and white—such as a document that has only black type on white paper—the color switch should be off. This will produce a sharper image. When an exhibit is in color—such as a photo or chart—the color switch needs to be turned back on. Newer models operate with the color switch on and do not have this problem.

Line in/line out problems: Video devices have a very simple pattern for hookup and the labels are clear. The evidence camera is putting OUT video signals to the projector where they are going to be displayed. Therefore the cable from the evidence camera should be connected to the jack on the evidence camera labeled “line out.” The projector or video monitor is taking IN video signals from the evidence camera; therefore the cable should be connected to the jack on the projector labeled “line in.”

Techniques for use

The evidence camera’s simple operation and observable connection between object and display on the screen make it a good choice for personal operation by the trial lawyer. When the lawyer picks up a document and puts it down on the evidence camera base, the enlarged image of the document appears immediately on the screen. Jurors see exactly how the operation works. When a lawyer says, “Directing your attention to the portion of this photograph above the first floor of the house,” and puts the photo on the evidence camera base and presses the zoom button to bring an enlarged image of this area to the screen, the natural flow between the lawyer’s words and the screen display enhances the appearance of competence and control.

The principal techniques for making the evidence presentation more effective with an evidence camera are set out below.

Identification: Normally it is not important for the jurors to focus on an entire page because their attention will be directed to just a small portion of the page. When the page is put on the evidence camera base, counsel should focus initially (for at least five seconds) on something that reassures the jurors that this page is what it is supposed to be, such as the exhibit number in the lower right corner, the title, a page number, or some other anchoring mark. Counsel should then move immediately to the words, sentences, or other portion on which the jurors should focus. After a full page has been identified, zoom right up against the edges of the margins of the text

to eliminate all the white space around the edges of the document. This maneuver may take some practice before being able to get to the margins directly without eye-wobbling zooms in and out.

Occasionally, a persuasive point will be enhanced by focusing first on a word or phrase on a page and then zooming out to the full page in order to show that word in context. This technique should be used very sparingly as jurors have a difficult time focusing on a zoom out and may not be able to follow the point at all.

Highlighting: A standard yellow highlighter can be used to draw attention to the precise text to which the witness's attention is being directed. Other colors are available to make related or contrasting points, but yellow is generally most effective for highlighting. It is usually a good practice to premark the exhibit with the highlighting to be used, but occasionally the lawyer may want to mark the text as the witness proceeds. This technique, however, should be reserved for unusual occasions where this method of emphasis is needed because the lawyer is responding to an unexpected point. The action of highlighting distracts the jury's attention from the substance of what is being said.

A photo can be highlighted by marking directly on the surface with a colored marker if there are a number of copies of the photo. An easier technique is to put the photo in a plastic sleeve and use a grease pencil to mark on the plastic. This way, the sleeve can be marked as a separate exhibit if necessary, and the original photo escapes unscathed. Use a sleeve with a matte finish, not a shiny finish, to avoid glare.

Covers: One way to get the jury to follow text line-by-line is to put a blank piece of paper on top of the text document and pull it down the page one line at a time. Sometimes there is a need to highlight text by blocking out other, irrelevant, text. This can be done by laying a blank piece of paper over the portions to be blanked out. This technique often works better than displaying a prepared exhibit with the irrelevant sections already removed because the jury can see that the material has not really been removed, just covered up to assist

their focus. Jurors may assume that lawyers have done something sneaky when redacted documents appear on the screen. The evidence camera gets around this problem.

Sizing: When a small object is put on the base of the evidence camera, put a normal ruler next to the object. When the zoom is used to enlarge the object, the tick marks on the ruler will also enlarge and keep the size of the object in perspective.

Pointing: Using a pencil, pen tip, or special-purpose pointer is more effective than pointing with a finger. The enlarged image of the fingertip may obliterate the view of the object, and viewers may concentrate on the display of the fingernail rather than the exhibit.

Background: A white object on the base does not produce a good image on the screen. Use a piece of colored construction paper on the base and set the white object on top of it to create the necessary contrast. Blue or green paper is usually a good background. Light colors, and particularly yellow, do not work well as a background because they mislead the iris on the camera. The auto-iris decreases the amount of light to compensate for the light background and the image gets darker. Darker colors like dark brown or black also may cause problems because they absorb light. Try out the color scheme to be used in order to ensure that the resulting image is clear and sharp.

Exhibits in color: The color switch on the evidence camera activates an automatic enhancement for color images. In rare cases, an exhibit that contains color might be displayed as a black and white image. For example, if color photos of injuries are deemed too gory, and therefore unduly prejudicial, to display to a jury, one option is to display the photo in black and white. To do this, use the black & white switch.

Order of presentation: When presenting an object, it is useful for the jury to see the object in “real life size” first, perhaps accompanied by an introductory explanation from the witness before the object is put on the evidence camera unit. If the “real thing” is totally unfamiliar to the average juror, and it is important to the case, use a

large board with a blowup of a photo or a diagram before introducing the “real thing.” After these initial steps, go to the evidence camera for the explanation of the details.

For example, if the issue is the failure of a small unremarkable switch that is part of a large piece of machinery, the lawyer might want to start out with a large diagram or photo mounted on a board illustrating the major features of the machine and the location of the switch and its connections. After the witness explains this overview, the machine can be brought in and identified so the switch can be pointed out. Then, for a detailed explanation of the elements making up the switch, this very small part can be put under the evidence camera so an enlarged view appears on the screen. As the expert explains, the evidence camera operator (or the expert) can rotate the switch on its side to display a different angle, turn it over to display the underside, and flick it on and off. The jury watches the action and, with this orientation, even the least technically proficient juror will feel comfortable with the presentation. This “live action” capability to display an object makes the evidence camera a better choice than a static blowup of a photo taken from one angle or even a series of photos taken from different angles.

Orientation in opening statement: The opening statement should introduce the technology and any operator who will be assisting in its use. The opening should cover each item of equipment and inform the jury briefly how it will be used in presenting the client's case. Using the equipment to display visuals that are a part of the opening is a good platform for this explanation. Reassure jurors that they will have hard copy of every exhibit when they go to the jury room, and tell them that the equipment is primarily for the purpose of saving time.

The more technology to be used in the trial, the more the beginning of the opening statement should be kept low tech and personal. Jurors will only accept what is presented on a screen or monitor if they accept the lawyer as a credible, understandable person who is delivering the display. An evidence camera is very low tech and can

be made quite personal if the lawyer delivering the opening operates the equipment directly. It is particularly effective against an opponent who uses PowerPoint slides a great deal. The evidence camera shows the “real thing” (e.g., an enlargement of a photo, a good view of a small object, a portion of text from a document) and contrasts well against bullet-point summaries.

Relation to the witness: The evidence camera is a supporting prop, not the star of the show. Except for witnesses called only to authenticate exhibits, the camera should make very limited appearance until the witness has firmly established credibility through presentation of material.

Individual witnesses relate to an evidence camera differently. Some are most effective if they concentrate on testifying, while the lawyer controls the display and points to the items the witness is explaining. Others are at their best when they come down off the stand, walk to the evidence camera, and put on their own displays pointing to significant items so that the pointer appears with the image on the screen. The witness as an operator is a very effective way to present evidence, and some courtrooms are equipped with evidence cameras at the witness stand for this purpose. When the person with the information (not the lawyer advocate) is at the controls, jurors may be significantly more receptive and interested. However, controlling the display while talking in the high-stress environment of a courtroom is more than some witnesses can handle.

Objections: If the court has a kill switch at the bench that can blank the monitors visible to the jury, then when an objection is made, the court will use that switch to take the exhibit off the monitors. If there is no kill switch available, the normal way to deal with objections is to remove the exhibit from under the exhibit camera as soon as an objection is made. If the court overrules the objection, the exhibit can be put back under the exhibit camera as the examination of the witness proceeds.

Laptop Computer and Presentation Software

Computer-based presentations in the courtroom draw from the same strength as older methods like the blackboard, the flip chart, and the overhead projector. The purpose is to create a visually strong and persuasive way to convey information. Getting points across visually is usually considerably more powerful than relying solely on oral means.

The most basic courtroom setup includes a laptop computer loaded with entry-level presentation software like PowerPoint or Corel Presentations. The computer is plugged into an electrical outlet and connected via a cable to the display devices—either monitors or a digital projector. Standard desktop computers do not work well in a courtroom because of their size, but a laptop computer can be set up quickly and folded up when not needed. It travels in a small carrying case and generally weighs less than seven pounds. The cost of purchase or lease is within reach for nearly all lawyers.

Best uses

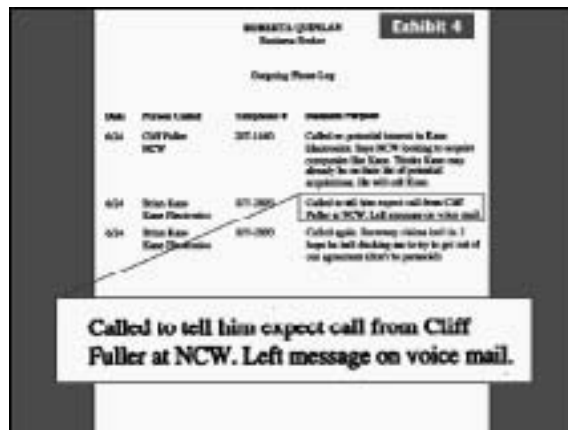
The laptop computer with presentation software is usually the best method for presenting material that needs to build a display, component by component, so that as the lawyer explains, the jury sees things one point or one part at a time. The computer builds graphics display, plays video excerpts, adds highlights and labels, and keeps track of a large number of exhibits.

Bullet-point lists: Bulleted lists work well when driven by a computer because they can be revealed one at a time as the lawyer speaks. That way, the jury is not reading ahead. When an appropriate type size is used, the computer screen can accommodate only five or six one-line points, which imposes a useful design limitation. Bulleted lists are the easiest materials to present using a laptop computer because, once the slide show is loaded, the lawyer need only tap the

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space bar or click a mouse to move from one point to the next. Learning the timing is easy with practice. The controls for bullet-point slides can be operated by a lawyer at the laptop, a lawyer using a remote control, or by an assistant. Bullet-point lists are typically used during opening statements and closing arguments, but can be helpful in illustrating witness testimony, in particular the testimony of expert witnesses.

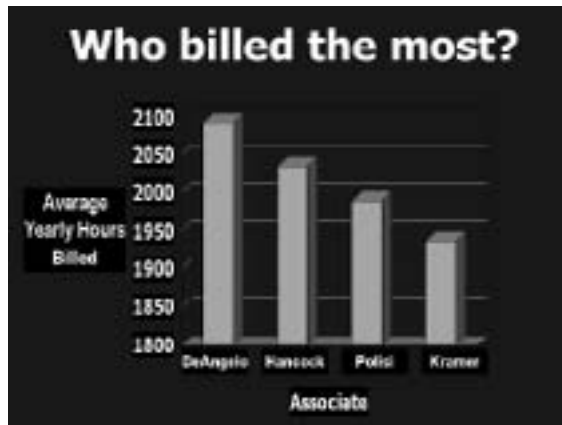
Text documents: The computer is usually the best alternative for working with text documents in a courtroom. Computer graphics, such as boxes or circles around key words, callouts emphasizing important text, and even simple enlargements of cropped portions of



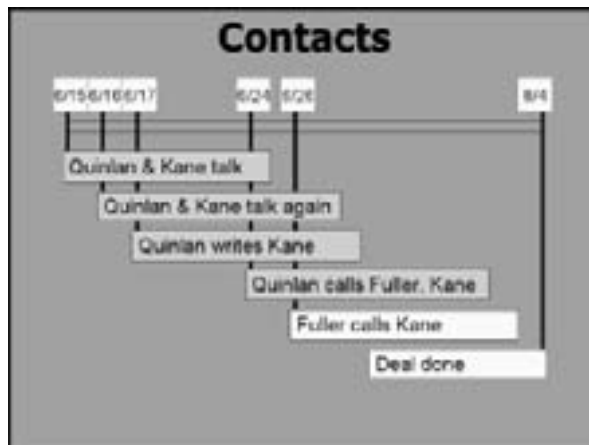
text, allow the lawyer to keep the jury's focus on the point at hand. The ability to reveal one item at a time is important in progressing smoothly and persuasively through an explanation or an examination about a text document. These displays help both in lawyer speeches and in witness explanations.

Charts and graphs: Statistical charts, organization charts, relationship charts, diagrams, and maps do well on a computer-driven display. Charts benefit from the ability to reveal one item at a time, and maps and diagrams often need labels, arrows, and explanations that are best provided with computer graphics. Charts are used in all

phases of trial, but are best used to make quantitative points, most typically in the examination of expert witnesses.



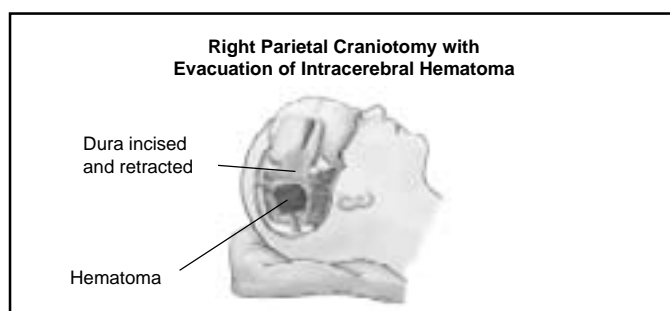
Time lines: If the passage of time, in either minutes, days, or years, or the juxtaposition of events is significant, then a time line can be very effective to explain the meaning given by the time reference. When the state of the art in graphics was the use of “big boards,”



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time lines were often too long, too large, the print too small, and the data points too many. The more flexible technique of computer-generated graphics allows for time lines that build entry by entry. This enables the lawyer to focus the jury on the single entry that best serves a particular point. Additional data points and expanded explanations can be added as an opening statement or witness testimony moves on.

Scientific, medical, or technical graphics: In most cases, the jury must learn at least some measure of scientific, medical, or technical information in order to decide the case. Often these areas are complex and the subject of extensive expert testimony.



It may be useful to introduce complex information early, even in opening statement, to teach the jury enough science to understand the issues in the case. Evidence from the case, such as Xrays, CAT scans, diagrams, and other explanatory material can be incorporated and displayed through the same presentation software. Beyond simply displaying technical graphics, these exhibits can be labeled, highlighted, or annotated to underscore their significance.

Video clips: Videotaped deposition snippets of parties provide excellent opportunities for high-impact use in opening statement and for impeachment. When the deposition has been videotaped with a digital video camera, or the output of a regular video camera has been digitized, all of this can be easily and dramatically portrayed through the computer. A typical display includes both the video and the soundtrack. Alternatively, the video can be displayed at the top

of the screen with the transcript scrolling below as the witness speaks. The video can be stopped and started again to assist in impeachment during cross-examination or to emphasize particularly important parts of the testimony during closing argument.



Operation

The laptop computers made by most of the major manufacturers—IBM, Dell, Gateway, Compaq, Acer, and others—are suitable for courtroom use. (Apple and Mac users will have compatibility issues in most courtrooms.) All have models that sell for under \$1,500 or lease for under \$75 per month. The more rugged 4 to 7 lb models tend to be better than the ultralight 2 to 4 pound models. The laptop will work well in the courtroom if it has a 12-inch screen, 64 MB of RAM, a 2 GB hard disk drive, a CD drive, and an external mouse. These features ensure easy viewing from a distance when standing at a

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lectern, easy controls, adequate storage and quick retrieval for large files, and flexibility to accept new files provided on CDs. Security for the computer and its contents is important; locks for the computer and encryption for its files should be used when the computer is in a public place.

The two principal presentation software packages are PowerPoint for users of the Microsoft office suite of applications programs and Corel Presentations for users of the WordPerfect office suite of similar programs. Either one can be used for courtroom presentations, and both accept files generated by the other. PowerPoint is more common. There are also higher-end, more specialized presentation software packages available commercially or provided by vendors of litigation consulting services. These include Sanction, from Verdict Systems; Trial Pro, from Idea, Inc.; and Trial Director, from InData Corp.

Entry-level presentation software uses the slide show metaphor—individual visual displays are “slides” and groups of related visuals are “slide shows.” Once prepared, the slide show is transferred to the laptop that will be used in court.

The operation of the laptop computer to present these visual displays involves opening the slide show where the exhibits and illustrative aids are stored, starting the show, and using the computer keyboard to move forward or backward within the slide show. The mouse has comparable controls, and special remote controls are available for most projectors as alternatives to using the laptop’s keyboard.

Using PowerPoint, the basic operations are as follows:

- **To open the slide show:** Turn on the computer, click on the START button at the bottom left corner of the screen, click on the Programs option on the first menu, then click on the PowerPoint option on the second menu. With the PowerPoint software opened, click on the option on the initial dialog box labeled “Open an existing presentation.” Find the file and open it.

- **To start the slide show:** Go to the View bar at the lower left corner of the screen which has five buttons. Click on the Slide Show button, which is the last one on the right.
 - **To move from one slide to the next within the show:** Press the SPACEBAR on the keyboard once to move forward to the next slide. Press the BACKSPACE key on the keyboard once to move back to the previous slide.
 - **To stop the slide show:** Press the ESC key on the keyboard.
- For more information, consult *PowerPoint for Litigators* (NITA 2000).

Complimentary copies are available from NITA for federal judges.

Using Corel Presentations, the basic operations are as follows:

- **To open the slide show:** Turn on the computer, click on the START button at the bottom left corner of the screen, click on the Programs option on the first menu, then click on the Corel Presentations (or WordPerfect Office suite) option on the second menu. With the Corel Presentations software opened, go to the Menu Bar, click on the File button, and select the Open option on the menu. Find the file and open it.
- **To start the slide show:** Go to the tabs at the far right side of the screen. Click on the QuickPlay tab which is the last one toward the bottom.
- **To move from one side to the next within the show:** Press the SPACEBAR on the keyboard once to move forward to the next slide. Press the BACKSPACE key on the keyboard once to move back to the previous slide.
- **To stop the slide show:** Press the ESC key on the keyboard.

For more information, consult *Corel Presentations for Litigators* (NITA 2000). Complimentary copies are available from NITA for federal judges.

Setup

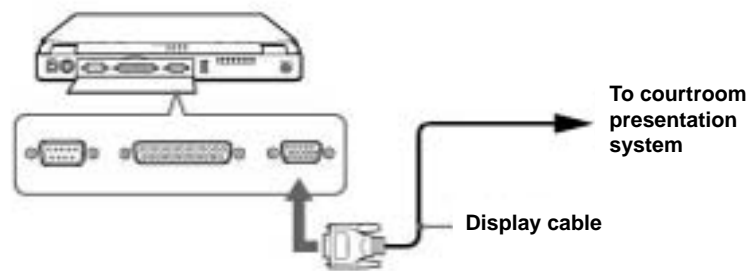
If there is a lectern in the courtroom, lawyers generally take their laptops to the lectern and connect to the monitors or projector there. If there is no lectern, the laptops generally reside on the counsel table.

A computer is a digital device. A laptop's normal output is to its internal digital monitor that is an integral part of the unit. Laptops can be set up to display visuals in two ways.

- **External computer monitor or monitors:** This is an extension of the computer's "native" setup. Laptops have a switch that allows them to display output on the laptop's own monitor, on an external monitor, or both. Large monitors can be used at either end of the jury box or individual monitors may be placed inside the jury box.
- **Digital projector:** This is the easiest, cheapest, and most reliable setup for a laptop computer. Digital projectors are made to be used with laptops, and the controls are excellent for courtroom use. A digital projector makes relatively low demands on the technical skill of the person who does the courtroom setup. The direct connection between the laptop and the projector offers the least complexity and the lowest opportunity for failure.

A laptop setup has one additional complication. The resolution of the laptop's output needs to match the resolution of the monitor or projector's display. Resolution is the number of pixels (individual points of color) contained on a display monitor, expressed in terms of the number of pixels on the horizontal axis and the number on the vertical axis. Resolutions of 640 x 480 (VGA), 800 x 600 (SVGA), 1024 x 768 (XGA), 1280 x 1024 (SXGA), and 1600 x 1280 (UXGA) are common. If the computer has a higher resolution than the monitor or projector, then the computer's "pixel down" controls can be used to get a match. (See page 255 below.) If the computer has a lower resolution than the monitor or projector, the input will generally be accepted and displayed at the lower resolution.

A laptop computer is very easy to set up in a courtroom. Its back connector panel looks like this.



Computer monitor: When a single large computer monitor is used for the display, the monitor's cable will usually have a 15-pin connector at one end. That connector is plugged to the 15-hole connector at the back of the laptop. When the laptop display is to be projected on more than one monitor, a switch box is used. The laptop is cabled to the switch box and that is cabled in turn to all the monitors.

Digital projector: When a projector and screen are used for the display, the laptop is cabled directly to the projector using a special cable provided by the projector manufacturer. The projector's cable will usually have a 15-pin connector at one end. That connector is plugged to the 15-hole connector at the back of the laptop. The projector usually has a separate connection for the mouse. This connection is sometimes bundled in the projector cable so that there is one plug on the end that connects to the projector and two ends that connect to the laptop.

A laptop computer generally has excellent reliability. Once it is hooked up and operating, very few things can go wrong.

Standby timer on: The power management feature on a laptop will put the laptop to sleep if the lawyer takes breaks that are longer than its default settings. To be safe, the power management feature

should be turned off during trial. To do this, use START—> Settings—> Control Panel—> Power Management. When the dialog box appears, check to see that the Power Schemes tab is active. This shows options for System Standby, Turn Off Monitor, and Turn Off Hard Disks. Select the Never option for each one.

Loose cable connection: The connectors for laptops have screws that ensure that the connection, once made, cannot come apart. Sometimes the connectors are plugged in but the screws are not turned to hold the connection in place. If the laptop is bumped, the connection may come apart.

Low battery: Laptop batteries power the computer for two to four hours depending on activity. When a laptop is operated at counsel table, it generally should be plugged in so that the battery does not run down. When the laptop is taken to the lectern, it is generally running on its battery so that the power cable does not have to be stretched from counsel table to the lectern. Lawyers should have a spare battery on hand so that, if the battery runs out, a spare can be snapped in place within a minute or two.

Loose power connection: If the laptop is being operated from a wall outlet (rather than from its battery), the plug to the outlet may work loose. For safety reasons, all power cords should be taped to the floor. This keeps people from tripping over the cords as they walk around in the well of the courtroom and helps ensure against loose connections.

Toggle switch in wrong position: Most laptop computers have a toggle switch that controls the screen display by permitting three alternatives: display only on the computer's screen, display only on the external screen (monitor or projector), or display on both screens at once. Each manufacturer places these controls somewhat differently, but they are usually operated by a combination of keys. One of the keys will usually have a small icon representing a large screen together with a computer screen. Be sure that the computer setting is for both screens at once. Toggle through the alternatives until the right one comes up.

Devices turned on in the wrong order: Many laptops have a built-in preference for whether they are turned on first or the device to which they are connected is turned on first. The preference can be either way. If the computer is turned on before the projector is turned on, for example, it may not send images to the projector until all the equipment is shut down and turned on in the opposite order.

Low audio: Most laptops cannot provide enough audio power to be heard in a courtroom. It is usually possible to connect the laptop's audio system through its headphone jack to the courtroom's audio system using a cable. This enables the laptop output to be amplified by the courtroom system. Another alternative is to put a courtroom microphone next to the laptop speaker and project the sound that way.

Techniques in using a laptop

A laptop is just a tool in a courtroom. It should not be a center of attention. The controls for presenting visual displays using a computer are very simple and almost foolproof. The most difficult part of using the equipment is having enough confidence so that the focus is on what is being said, not what is being done at the controls.

Focus on the jury: When a trial lawyer speaks, it should be to the fact finder. A lawyer should not speak to or read material from the computer's screen. The temptation to look at the screen is strong because it is there and because its color and brightness demand attention. However, the image for the jury is shown on their monitors or on the projection screen. The lawyer needs to focus on the jury and not on the laptop or the projected exhibit.

Timing and pauses: Lawyers need to give attention to the order in which the oral point and the visual point are made. Sometimes it is useful to display the visual before the oral explanation starts. For example, the trial lawyer displays the enlarged and labeled photo of the office building on Main Street, pauses while the jury looks at the photo, and then says: "This is the office building that burned down

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on the night of January 12.” More often, the timing works better if the lawyer makes the oral point first, shows the visual, pauses while the visual is absorbed, and then explains the point. This way, the visual reinforces counsel’s statement. In an opening statement, when using bullet-point lists to help set the chronology, the trial lawyer might state the first point, then display the first point on the screen, then go on to explain it.

Pauses are important in making presentations using significant visuals. The jury becomes frustrated, and ultimately inattentive, if the lawyer rushes along, not giving them a chance to absorb what is on the screen.

Black slides: A slide that is colored entirely black will cause the screen to go blank. There are always times during any presentation that the lawyer needs to have the focus be entirely on the oral presentation. To make the screen’s competition disappear, a black slide can be used to turn off the image. These slides can be placed strategically throughout the slide show. The black slide prevents the jurors from losing focus on the lawyer or witness. Left to their own devices, people tend to look at a television-type picture when it is available. The black slide brings them back to the oral statements. If PowerPoint is being used, tapping the B key on the computer keyboard will also turn off the image and keep the screen dark until the B key is tapped again to turn the image back on.

Black slides are especially important at the beginning and at the end of any slide show. A black slide at the beginning of the slide show allows the lawyer to set up the computer and projector and keep all the equipment on until it is ready to be used, but without anything on the screen. A black slide at the end of the slide show is a crisp way to end. If the last slide is left on the screen, it may not match the ending that is planned. If the lawyer goes beyond the last slide, with no black slide in place, the laptop will display the thumbnails of all the slides for the jury to see. The black slide is a fail-safe mechanism.

Light hand on the controls: A trial lawyer’s angst at using pre-

sentation technology is often expressed most clearly in the mannerisms accompanying the use of the controls. Whether tapping the spacebar, clicking the left mouse button, or pressing a button on a hand-held remote, the lawyer needs to appear to be at ease with the task. Twitching, clutching, and nervous glances at the equipment expecting imminent failure makes the jurors aware that the lawyer is uncomfortable with the equipment. They expect the kind of seamless ease that they see on television, and they are distracted by anything less. Comfort at the controls comes with practice.

Backup: Any laptop presentation should include backup plans in the event that the equipment fails. One way to deal with backup is to have available a second laptop loaded with all the same files. Another method is to have printouts of the thumbnails of the slides to be presented. These are miniature versions of the slide showing its contents. If the computer fails, the evidence camera can be used to display the thumbnails suitably enlarged.

Objections: If the court has no kill switch to blank the screens that the jury can see, the normal way to deal with objections is to remove the exhibit from the screen by using the B key, as explained above, as soon as an objection is made. After the court rules, if the objection is overruled, the B key can be tapped again to bring the exhibit back. If the objection is sustained, the lawyer can move to the next slide and then tap the B key so that the offending exhibit will not appear on the screen again.

Projector and Projection Screen

Presentations originating from a videotape player, an evidence camera, or a laptop computer can be displayed using a projector and projection screen. The most basic courtroom setup includes a portable digital projector and a large portable projection screen with a special surface that can be used in daylight situations. The projector is set up on a table in front of the jury box and plugged into an electrical outlet and connected via a cable to the source of the image. The projection screen is set up directly in front of the projector about 10 feet away. A portable digital projector can be set up quickly and folded up when not needed. It travels in a small carrying case and generally weighs less than seven pounds. The cost of purchase or lease is within reach for nearly all lawyers.

Best uses

Digital projectors were designed to display the output from portable computers. Most have a built-in converter so that they can also display output from evidence cameras and videotape players.

Projectors produce a large, vibrant image and can be used for photos, documents, charts, maps, and other visual displays that require good resolution.

A projector's best use is in a space where there is adequate room so that the projector can be placed the required distance from the projection screen with no intervening obstacles, the viewing angle from all points in the jury box is adequate, and the lighting does not produce a glare in the area between the projector and the screen.

Operation

The portable digital projectors made by most of the major manufacturers—InFocus (which also makes Proxima), LightWare, Sony, Toshiba, Epson, NEC, and others—are suitable for courtroom use.

All have models that sell for under \$5,000, and audio-visual suppliers rent suitable models with a daily rate. The personal portable models that weigh 3 to 7 pounds work well. The commercial portable models that weigh 7 to 10 pounds are a little more rugged. Models for fixed installations are more powerful in order to handle projection over greater distances.

Projection strength is the key factor. This is measured in lumens, which represent the total amount of light that reaches the screen. A projector for courtroom use should have at least 1,000 lumens. When a projector is set up on a table or stand in the well of the courtroom and is operating at a relatively short distance from the projection screen, the courtroom lights do not have to be dimmed or turned off. Projectors in permanent installations are often located farther from the projection screen and need a higher lumens rating in order to project successfully without dimming the courtroom's lights. Both principal technologies, either LCD (liquid crystal display) or DLP (digital light processing), can produce the necessary lumens. A portable projector with this capability will have been manufactured relatively recently. An older portable projector is likely to project a dim image in a lighted room and have other drawbacks.

Contrast ratio is important because it determines how well colors are separated. The contrast ratio should meet or exceed 300:1. If the contrast ratio is high, each color will have a sharp border when it comes up against another color. When there is a lower contrast ratio, colors may blur into one another.

Resolution is also important. A projector will work well in the courtroom if it has a native 1024 x 768 resolution or better. (All conversion devices in newer courtrooms are set for 1024 x 768.) The resolution of the computer's display must match the resolution of the projector. If the projector has a relatively low resolution and the computer has a higher resolution, the projector will be unable to display all of the information that the computer is transmitting.

Noise is also a factor. Most digital projectors have small fans to dissipate the heat generated by their electronics. A quiet-running fan

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will not cause any distraction in the courtroom, but the hum of a noisy fan used over a long period of time can become annoying. Projector fan noise is listed in the specifications. Look for a projector that has a rating of about 35 db.

Other useful features for courtroom use include an adjustable zoom lens (either manual or motorized) and a remote control.

The distance between the projector and the screen controls the size of the image. The optics of the particular projector affect these sizes, but typically they are within a range as shown in the following table.

Distance to the screen*	Image size width*	Image size height	Image size diagonal
8	4.2	3.1	5.2
12	6.3	4.7	7.8
16	8.3	6.3	10.4
20	10.4	7.8	13.0
30	15.6	11.7	19.5

*NOTE: All figures are measured in feet.

The operation of the projector involves only four steps.

- **Step 1:** Turn the equipment on, and make sure the connections to the computer work so that an image appears on the screen. Be careful not to look into the projection lens when the light is on. The bright light can harm eyes.
- **Step 2:** Adjust the foot (or feet), which tilt the projector upward, so that the image is centered on the screen.
- **Step 3:** Adjust the focus controls (usually a ring on the lens) so that the image is sharp.
- **Step 4:** Use the controls on the computer or the remote control for the projector to advance from one slide to the next.

Whenever there is an extended break, it is best to turn off the bulb on the projector because bulbs have a limited life and are expensive to replace. Simply push the Standby button on the projector and within a minute or two the bulb will turn off, but the machine will stay on. Then when work resumes, press the Standby button again

and within a minute or so the bulb will be as bright as before. This is a far better and easier way to handle breaks than turning off the computer and projector, for this then requires a time-consuming reboot sequence.

Most newer projectors come with remote controls. These small, hand-held, battery-operated devices have buttons that are akin to the left and right buttons and the motion control on a mouse hardwired to the computer. The remote can move the display forward one slide, back one slide, display a pointer arrow on the screen, and operate the projector's menu-driven controls.

The remote control sends a signal to the projector in one of two ways—by a beam of infrared light or by a radio frequency. The principal difference is that when using an infrared model, there must be a clear line of sight between the remote and the projector. If something comes between the two, the signal will be blocked. The signal from an RF model is not blocked by intervening objects. Both types of remote must be within operating distance and angle of the port on the projector. The operating distance is usually 25 to 30 feet. The angle depends on how many ports the projector has. If it has four ports, one located on each side, then the user can aim the remote from anywhere in the room that is within the operating distance. If the projector has only one port, on the side facing away from the screen, then the user has to be in back of the projector within about a 50 degree angle from either side of the center of the port.

Setup

A projector and projection screen work together and need to be set up together. The projection screen is set up in a location where everyone can see it, and the projector is positioned 16 to 20 feet away from and directly in front of the projection screen. The projector receives signals from an evidence camera or a laptop computer, to which it is cabled, and projects images on a large projection screen. The objective is to get evidentiary exhibits and illustrative aids onto the screen efficiently without dimming the lights in the courtroom.

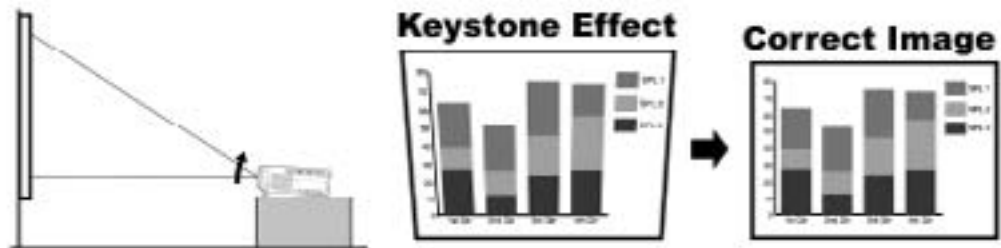
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A typical setup with a digital projector and projection screen is illustrated above. A digital projector can take input from both an evidence camera and a laptop (although not at the same time). Both devices can share the cabling to the projector if a switcher is included to allow the user to go back and forth between the input devices as needed.

The projector should be on a hard, level surface because a soft surface may block the vents and cause the projector to overheat. The projector should be at a height that is not too far below the bottom edge of the projection screen. If the projector has to be pointed up at

an angle toward the projection screen, the image on the screen may have a “keystone” effect. Instead of being rectangular, it will look like this:



This will distort the image and make lettering harder to read. The projector probably will have to be within 10 feet of a power source and within 6 feet of the laptop computer. Otherwise, special cabling will be necessary.

A projector demands considerable space in a courtroom. If possible, the screen should be located straight across from the jury box. The location should be about twice the distance from the first row of seats as the size of the screen. A 6-foot screen will be about 12 feet from the jury; an 8-foot screen will be about 16 feet away; and a 10-foot screen needs about 20 feet. Most experts think that the 10-foot screen is the best choice because the smaller screens do not produce the necessary visual impact. As a practical matter, the courtroom has to have a relatively high ceiling and an area 35 to 40 feet wide and 40 to 50 feet deep to use a 10-foot screen effectively.

Once the projector is on and operating, very little can go wrong. Here are a few things to consider.

Bulb replacement: The bulbs on most projectors are rated for 1,000 to 2,000 hours or more, but occasionally they burn out or break. Have a replacement on hand.

Lens cap: If the lens cap is on, no image will show up on the screen. Take the lens cap off.

Resolution mismatch: Newer laptop computers produce displays at a high resolution, typically 1024 x 768 pixels and beyond. The projector must be able to display images at the same high resolution and, if it cannot, then the resolution of the laptop must be reduced. Check the manual that comes with the projector to see the optimum pixel setting it can handle. If, for example, the laptop normally displays at 1024 x 768 but the projector will only accommodate 800 x 600, the laptop controls must be used to “pixel down” the laptop for compatibility. To do this click Start, select “Settings” and then “Display.” From the Display Properties box, click on the “Settings” tab. The current resolution will be shown at the bottom right below where it says “Screen area.” Below that will be a little arrow. Slide that arrow to the left to reduce the resolution to equal that of the projector, then click Apply and OK. Restart the computer so that the projector can properly “read” the new resolution setting.

Turn on the equipment in the right order: Most projectors are set up so that, once connected with a laptop computer, they must be turned on first before the laptop is turned on. Without this sequence, the projector cannot “read” the incoming signal. Check the manual that comes with the projector to be sure because some newer projectors require the opposite order.

Toggle the display: The laptop computer will have a toggle option for displaying the image just on the laptop screen, just on the projector screen, or on both the laptop and projector screens. The toggle (switch) usually involves a combination of keys, including the function key that has a picture of a screen and a computer monitor on it. Press the required keys (for example, on IBM laptops it is the Fn key and the F7 key together; on Dell laptops it is Fn plus F8) and the display switches from one mode to another. If the laptop is set to display just the laptop screen (often the default mode), it will not send an image to the projector. The screen will be blank. This problem is resolved easily by toggling until the image shows on both screens.

Batteries in the remote control: Most remotes run on batteries. If the batteries are low, the remote will not work properly. Have spare batteries on hand.

Loose power connection: The plug to the wall outlet may work loose. For safety reasons, all power cords should be taped to the floor. This keeps people from tripping over the cords as they walk around in the well of the courtroom and helps ensure against loose connections.

Position with respect to the ports: The remote control sends signals to ports on the projector. It is important to know where those ports are. Most new projectors have ports on three or all four sides. If the remote is aimed at a side of the projector where there is no port, no signals will be received and nothing will happen.

Power surges: Minor power surges can cause the lamp to go off. Unplug the projector, wait at least a minute, and then plug it back in. Better yet, plug the projector into a power strip that controls surges.

Techniques for using a projector and projection screen

A very large projection screen displaying compelling images competes effectively for the attention of the jury. If jurors are watching the screen, they are not watching the lawyer who is speaking. If they are not watching the lawyer, it may be that they are not listening to the lawyer either. Therefore, when a large screen is used, the lawyer needs to be mindful of this competition for the jury's attention and use the screen in a way that complements the oral presentation. The same considerations regarding black slides discussed earlier apply when using a projector setup. The display should be used only when it emphasizes the point being made orally.

Position in relation to the screen: The lawyer should stand somewhere in front of the screen, but should not block the jury's view of the screen. He or she should look directly at the jury in the same way as if there were no visuals on the screen. The visuals reinforce the

oral presentation; they do not replace it. Remember not to walk in front of the projector as this will block the image from reaching the screen.

Pointing to things on the screen: The lawyer can point to things that are on the screen in several ways. The lawyer can walk to the screen, reach out, and point. This method has the advantage of being immediate and easy, but it will cause a shadow on the screen and block some of the image.

A 5-foot long wooden or plastic pointer rod can be used to point at objects on the screen from a location to one side of the screen. This method causes a smaller and more manageable shadow on the screen, but walking around the courtroom with a 5-foot stick in hand may not generate a positive image.

Most projectors come with a remote control that includes a pointer. The pointer is an arrow that shows up on the screen and is moved around the screen with a control on the remote that works like a mouse. Many of these pointers are ineffective because they are difficult to see.

A better solution is the touch screen, telestrator, or light pen (or one of the alternatives), which puts overlays on the image that appears on the screen. See pages 264–274 below.

Monitors

In computer terms, a monitor is a computer display and related parts packaged in a physical unit that is separate from other parts of the computer. Laptop computers do not have monitors because all the display and related parts are integrated into the same physical unit with the rest of the computer. In video terms, a monitor is a video display packaged with controls and connectors for various input sources. A television set is a form of video monitor.

Best uses

Many types of monitors are available for courtroom use. In some cases, the optimum monitor for the circumstances will depend on the type of material being displayed. Rough black and white sketches, for example, do not require high-quality displays, although in general higher display quality and larger size work better in a courtroom.

CRT monitors

A cathode ray tube (CRT) is a specialized vacuum tube in which images are produced when an electron beam strikes a phosphorescent surface. The CRT in a computer monitor is similar to the picture

tube in a television receiver. CRT monitors are large and heavy. The tube requires a boxy or oblong shape; the larger the screen, the longer the box. CRT monitors are the least expensive alternative, and they are generally highly reliable.

Most CRT monitors have a slightly concave surface. Newer models have a flat surface which reduces glare and is a better option for courtroom use. They are known as “flat-screen” monitors (not to be confused with “flat-panel” monitors.)

A CRT monitor can accommodate either a light pen or a touch screen.



LCD monitors

Liquid crystal display (LCD) technology allows monitors to be much thinner than CRT technology. An LCD is constructed with a grid of conductors with a pixel located at each intersection in the grid. A current is sent across two conductors in the grid to control the light for any pixel. These monitors are also known as “flat-panel displays.” This technology, in high-quality equipment, produces image clarity that is as good or better than a CRT monitor.

One problem with flat panels is that they need to be viewed straight on because all the liquid crystals are directed toward the front of the display. If the viewer is to one side, the picture loses contrast and the lines may appear grainy. For this reason, flat panels are usually constructed so they can be rotated 90 degrees on their base. There are several ways to provide wider angle viewing.

The least expensive involves adding a diffuser film to the top layer of the display, which redirects the light coming out of the panel so that it leaves the screen in all directions. In-plane switching (IPS) technology changes the path that the electricity takes through the liquid crystal layer which results in an increased viewing angle. This diminishes brightness to some extent. Multidomain vertical aligned (MVA) technology uses special liquid crystal materials that produce an increased viewing angle without sacrificing brightness.

LCD monitors come in two main types: active matrix and passive matrix. The active matrix is faster and more colorful, but also more expensive.



An LCD monitor can accommodate a touch screen, but not a light pen.

Multiscan monitors

These monitors accept input from a number of different devices and have a built-in converter to maximize the resolution of the display.

Touch screen monitors

These monitors have a special screen that is sensitive to touch, allowing the user to “draw” an overlay to the image that has been projected on the monitor. A special stylus or, more commonly, a finger



can be used to draw lines or shapes on the screen. Touch screen capability can be added to either a CRT or an LCD monitor. The controls are located in the corners of the screen and do not have visible signals. One corner controls the undo function, another controls the erase function, and a third changes the color of the marks that will be made using the touch screen. It is useful to put small stickers labeling these controls on the frame of the monitor near each corner.

Plasma monitors

A plasma monitor creates images by running electricity through superheated gas. It is a large flat panel video display, which generates its own light, offering film quality images through a palette of 16.7 million colors. Plasma technology automatically resizes and focuses input from computers, VCRs, and television broadcasts. It has a viewing angle of 160 degrees horizontally and vertically enabling an excellent view from all points in the jury box. Plasma units are only 3 to 6 inches deep, so they can be



mounted on a wall or a floor stand. They are now available in screen sizes that range from 37 inches to 50 inches; the most popular size is 42 inches. These monitors weigh from 65 to 100 pounds. The native resolution of most plasma monitors is 852 x 480, but some of the newer models offer 1280 x 768. These units cost from \$6,000 to \$18,000.

Quality of display

The quality of display on a computer monitor is usually described by four factors described below.

Resolution: Resolution is the number of pixels (individual points of color) contained in a display. It is expressed in the number of pixels on the horizontal axis and the number on the vertical axis. A monitor running at a higher resolution tends to show more detail. Monitors may offer a range of resolution settings.

Horizontal x vertical (pixels)	Technical name
640 x 480	VGA (Video Graphics Array)
800 x 600	SVGA (Super VGA)
1024 x 768	XGA (Extended Graphics Array)
1280 x 1024	SXGA (Super XGA)

In general, the larger the monitor the more pixels it can display horizontally and vertically. Most monitors now have a resolution of 1024 x 768 and can display lower and higher resolutions with built-in mechanisms to adjust to the incoming resolution. The same resolution will be sharper on a smaller monitor and will gradually lose sharpness on larger monitors because the same number of pixels are being spread over a larger number of inches.

Refresh rate: CRTs require a high refresh rate (the number of times per second that the image is redrawn on the screen) to avoid flickering. Flat panels are not affected by refresh rate. Refresh rates are measured in hertz (Hz), usually 75 Hz or higher. The larger size monitors may need a higher refresh rate to produce equivalent quality.

Dot pitch: This is the spacing between pixels. Dot pitch is measured in millimeters, usually 0.28 mm or smaller. A smaller dot pitch produces a more detailed image, subject to numerous caveats.

Image controls: CRTs have controls for brightness and contrast. Most also have controls for color balance and distortion. Flat panels may have color settings that can be adjusted only when they are receiving analog (video) and not digital (computer) input. The color ratings on monitors are typically 256 colors, 64,000 colors, or 16 million colors. The amount of video memory on a computer may affect the actual number of displayed colors regardless of the monitor's capability.

Monitors may also have composite video inputs for viewing the output from a VCR, and may have built-in microphones and speakers.

Operation

No operation of a monitor is needed in the ordinary sense in which that term is used in this appendix. A monitor is either on or off. If it is on, it is either displaying the image being sent to it or it is not. The latter problem has to do with setup difficulties.

Setup

The setup for monitors in the courtroom usually involves one monitor each for the court, witness, clerk, and counsel, and a number of monitors for the jury. The jury may have one or more large monitors in front of the jury box (and occasionally on either end of the jury box).

Alternatively the jury box may be outfitted with one small monitor for every two jurors as shown in the photo below.



Placement of the monitors in the courtroom is very important, and normally the court will control this.

Annotation Tools

Annotation tools are hardware devices that work with the evidence camera and with a laptop to allow the user to mark the image on the screen in various ways. A touch screen monitor responds to any pressure on its surface, so a finger or simple stylus of any kind can be moved across its surface to illustrate a point. The telestrator requires the user to “draw” on the surface of a tablet on its control panel. The light pen “draws” on the surface of the monitor. All three devices have the same general kind of controls, and provide the capability to draw directional arrows, circles, shading, or even to label objects. Both the telestrator and light pen devices provide the capability for the lawyer or witness to put pointers on the screen.

Annotation tools enhance the control that the lawyer or witness has in explaining the image on the screen. If a part of a photo might be difficult for the jury to find from a verbal description (e.g., the northwest corner of the second intersection), the lawyer or witness can draw an arrow or create a pointer (e.g., this point on the photo that I have marked, which is the northwest corner . . .). When the explanation has been completed, the marks can be erased instantly leaving the exhibit unchanged.

The use of an annotation tool requires that the courtroom setup also have a means for recording the marks made on the images displayed on the screen. See discussion of video printer below.

A touch screen is a CRT monitor or LCD monitor (see discussion above) to which the capability to respond to touch has been added. The monitors look exactly as they do without this capability. The touch-responsive controls are not labeled, and reside in the corners of the screen. For example, when the user touches one corner, the undo function is activated. The last action (one move back) is erased, but the other annotations remain on the screen. Another corner contains the erase function, which takes out all of the annotations on the screen. A third corner contains the color function that changes the annotation (for example, from blue to red).

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The telestrator tablet is about 9 inches square. It has no special mounting requirements and will sit on any table or other level surface. Its supporting hardware box is about the size of a small laptop and connects to a standard electrical outlet through a power strip to guard against unusual spikes in the electrical current.



The light pen unit is about the same size as the telestrator tablet and has most of the same controls. It usually sits under the monitor with the “pen” part of the unit in a holster mounted on the side of the monitor. A light pen works only with a CRT monitor (not with an LCD “flat-panel” monitor).

In some courtroom setups, there is a telestrator unit at the lawyer’s lectern (where the lawyer is using a laptop) and there is a light pen unit at the witness stand with a regular CRT monitor. Other setups include touch screens for both the lawyer’s lectern and the witness stand, or a touch screen at the lectern and a light pen at the witness stand.



Best uses

These annotation tools are most effective when used to make simple, definitive marks on the image for the purpose of making introductory or subordinate points. The marks usually will be erased as the presentation proceeds. They will not appear on the exhibit and, unless a timely demand is made by opposing counsel for a printout (see discussion of video printer below), annotations are usually not preserved in the record. The use of the annotation tools is similar to the

witness stepping down from the witness stand to point to something on a hard copy enlargement that has been propped up on an easel.

Annotation tools are advantageous regardless of the kind of displays used in the courtroom. They are essential if the displays for the jurors are small monitors built into the jury box because the lawyer cannot physically point to anything on those monitors without crawling inside the jury box. When a lawyer is using a projector and screen, it is also better to put electronically generated marks on the screen than to use the traditional methods. If the witness comes down from the witness stand to point to something on the screen, he or she will usually get between the projector and the screen and a portion of the screen will be occupied by the shadow of the witness or the witness's arm or hand. This is distracting to the viewer. Similarly, when displays for jurors are on one or more large monitors outside the jury box, it is difficult for the lawyer or witness to point to anything on the screen without partially blocking the jury's view of the screen.

In general, annotation tools are used to draw simple lines and circles. Labels such as A, B, or C can also be added to an image in order to link the point being made by the witness's testimony to the image at hand. Because annotation tools are sensitive to small variations in motion, it takes a steady hand to create a readable letter. More complicated annotations such as words or illustrations are best done in advance with the presentation software.

The telestrator and light pen have additional functionality not present in the touch screen.

Markers or pointers: The telestrator has twelve types of markers or pointers that can be placed on the image. These shapes can be used in any one of seven colors that appear on the color pad on the tablet. The controls are quite flexible. The pointer is placed on the image with a tap of the pen, and several pointers can be used on the same image. They can be removed one by one or all pointers can be cleared at the same time. The light pen also has a variety of markers. The touch screen does not have this capability.

Colors: The telestrator's tablet has controls to vary the width of

the line, and the seven colors on the color pad can be used for individual lines or arrows. Like pointers, lines and arrows can be removed one by one or all can be cleared at the same time. The light pen also has some of these controls. The touch screen can change colors within a range of two or three colors.

Operation

The operation of the touch screen is very straightforward. When the monitor is on, the touch sensitivity is also on. Any time the screen is touched, a mark will appear at the place where it was touched.

The operation of the light pen is also quite easy. When the monitor is on, the light pen is also on. The pen must be held at right angles to the screen in order to transmit properly. When it is moved over the surface of the screen, it will create marks in exactly the place where it moved.

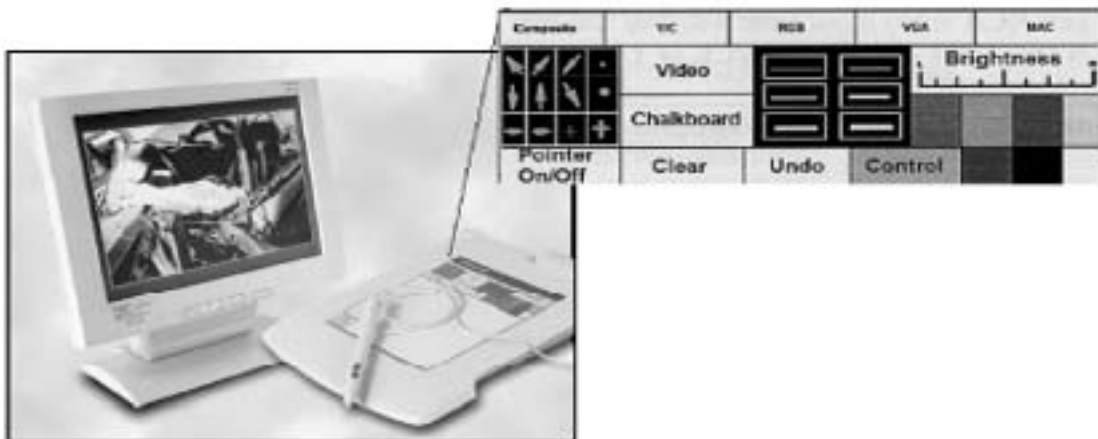
The operation of the telestrator is more complicated. It involves placing the unit's pen on the drawing space on the tablet, pressing gently, and moving the pen to make the desired marks. To get a visual anchor, look at the image on the screen, not the tablet. Make a small initial mark to see where the pen is in relation to the image on the screen, and then move the pen and make the necessary marks, keeping an eye on the screen. Normal eye-hand coordination will get the pen to the right place.

The telestrator has five components.

- **Hardware box:** The electronics that produce the marks on the screen are contained in a box about the size of a laptop computer.
- **Tablet pad:** The tablet contains the surface on which the user makes the marks that are replicated on top of the image on the screen. It also contains the switches for the various pointer shapes and line widths and colors available with the system.
- **Pen:** The pen is the control for the unit. By moving its point across the tablet, the user creates the marks to be put on the

image that is being projected by the evidence camera or the laptop. The hardware converts the position and movements of the pen into marks on the screen.

- **Converter:** The telestrator is an analog device so its output cannot be used directly by digital projectors. The analog signal must be converted to digital format by a converter.
- **Cables:** The pen is cabled to the tablet, and the tablet is cabled to the hardware box. The hardware box, in turn, is cabled between the output unit (either the evidence camera or the laptop) on one side and the display on the other side. The telestrator is what is known as an in-line overlay component. That means that the unit is placed between an input source and an output display to overlay the annotations onto the images.



The controls are simple and straightforward. They are located on the top section of the tablet and appear in the illustration above.

Image on/off: The boxes marked Video and Chalkboard turn the image from the evidence camera or laptop on and off. Tap Video to

turn the image on. Tap Chalkboard to turn the image off. When the image is turned off, the display screen is blue. The off switch is called “Chalkboard” because this option allows the user to write words or phrases in the same manner as a blackboard might be used. This technique is sometimes used for business and commercial purposes, but it is generally not used for litigation because handwriting on a large screen is too shaky. The words are full of unintended squiggles, which is distracting in a courtroom.

Pointers on/off: The unit produces either a pointer shape or a line. When the pointer is on, the line is off. To switch between these two options, use the Pointer On/Off box in the lower left corner of the control panel. Tap the box with the pen, and the unit will switch from one mode to the other.

Pointer shape: When the pointer is turned on, the user can choose among twelve pointer shapes. The pointer shapes are in the box at the upper left of the control pad. Tap the desired shape with the pen. When the pen is used to put a pointer on the screen, this shape will be used until it is changed. The pointer shape can be changed as many times as necessary.

Stationary pointer on/off: The pointer may be used in a mobile mode (moving wherever the pen moves), or in a stationary mode (inserted onto an image and staying put). To make the pointer remain in one place, place the tip of the pen at the place where the pointer is supposed to be and press the button on the side of the pen.

Line width: When the pointer is turned off, the pen will produce a line when moved across the tablet. The line width controls are in the center of the control pad. Tap the desired width with the pen. The line width will remain set until it is tapped for a different width.

Color: The telestrator has seven colors, which can be applied either to pointers or to lines. Tap the box of the desired color in the color palette at the right side of the control pad. That color will remain set until a different color is chosen.

Brightness: The brightness scale is at the upper right corner of the control pad. The left side of the scale is the darkest and the right side

of the scale is the brightest. Choose the degree of brightness by tapping the pen at a point on the scale.

Erase: The Clear and Undo boxes at the bottom center of the control pad take marks off the screen. Undo takes the last mark off the screen. Clear takes all marks off the screen at once. The two erase functions affect only the marks made on the image. The underlying image is not affected.

Control on/off: The telestrator hardware box will support two tablets. For instance, one tablet could be at the witness stand and another tablet at the lawyer's lectern. When the lawyer wants to mark on the image, the lawyer's tablet must take "control" of the telestrator unit. The lawyer taps the control box to do this. When the witness wants to mark on the image, the witness's tablet must take "control." The witness taps on the control box on the tablet at the witness stand in order to do this.

Input sources: The input from an evidence camera going to a digital projector or from a laptop going to a digital projector uses the composite setting at the top left corner of the control panel.

The telestrator unit is designed to be used in commercial and sales presentations. For this reason, it accommodates the three main types of video input: VGA, S-video (Y/C), and NTSC (RCA). Switches for these various inputs are at the top of the control pad. In order to use these settings, the video signal from the input device has to be the same as the video signal that is accepted by the output device. (If the telestrator receives a VGA signal from the input, it can only output a VGA signal to the display.) If the display device (projector or monitor) requires a different type of signal, then a converter is needed. The telestrator is also designed to be used with Macintosh computers; the MAC in and MAC out connections are for this purpose.

Setup

The telestrator fits into the setup for the evidence camera (page 229) or the laptop computer (page 243). It does not affect the placement

Appendix A: More Details About Using the Equipment

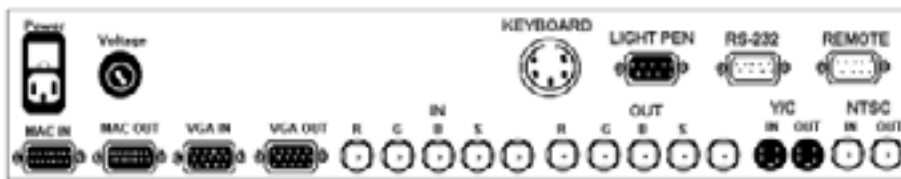
of these input devices or the output devices (projector and screen) in the courtroom.

The telestrator is an in-line overlay device. That means it is placed “in line” between the input device and the output device, and it overlays its marks (pointers, lines, circles, arrows, letters) on the image going from the input device to the output device. For this reason, it has two types of cabling: cabling between the parts of the telestrator (hardware unit, tablet, and pen); and cabling between the telestrator unit and the input (evidence camera or laptop) and output (projector or monitor) equipment.

The cabling for the parts of the telestrator unit is straightforward.

- **Power:** The power cable connects the telestrator to the electrical outlet in the courtroom.
- **Voltage:** The voltage selector switch should always be set at 110 volts.
- **Tablet:** The cable from the tablet is connected to the keyboard connection and to the RS-232 connection.
- **Pen:** The cable from the pen to the tablet is permanently affixed.

The cabling between the telestrator and the input and output devices requires care but is easy to accomplish. If the input is from an evidence camera, the input cable coming from the evidence camera is connected to the NTSC IN jack. The output to the projector is connected from the NTSC OUT jack.



If the input is from a laptop, the input cable coming from the laptop is connected to the VGA IN jack. The output to the projector is connected from the VGA OUT jack.

Newer portable projectors have a setting to accommodate the telestrator. With older projectors, a converter called a line doubler is used between the telestrator and the projector. The line doubler processes the signal coming from the telestrator so the projector can utilize it.

If the courtroom setup includes both an evidence camera and a laptop as potential input sources, a switch device is put in line from the two inputs that allows switching from one input to another.

Once cabled properly, there is relatively little that can go wrong with the telestrator.

Blue screen display: If the input device (evidence camera or laptop) is operating, the telestrator unit is operating, the screen display is blue (rather than projecting the image that has been selected), and the Chalkboard option is active, press the Video option on the control pad to restore the image.

White screen display: If the input device is operating, the telestrator unit is operating, and the screen display is white (rather than projecting the image that has been selected), then the signal is not reaching the projector. Check the cabling between the input device and the telestrator and between the telestrator and the projector, and check the setting on the projector.

Loose power connection: The plug to the wall outlet may work loose. For safety reasons, all power cords should be taped to the floor. This keeps people from tripping over the cords as they walk around in the well of the courtroom and helps ensure against loose connections.

Techniques for use

Steady hand: The annotation tool will transmit to the screen any motion it receives. If the hand controlling the tool is unsteady, the line on the screen will have wiggles in it. To prevent this with a telestrator or light pen, grasp the pen in a comfortable position, but

gently. For a touch screen, use an index finger in a comfortable position. Move the pen or finger in relatively swift, decisive strokes.

Gentle pressure: The tip of the telestrator pen is designed both to choose options from the control pad and to transmit motion to the tablet. It requires only a gentle press on the tip to select an option from the control pad. Pressing harder may confuse the unit into duplicating a command several times.

Simple annotations: Annotation tools work best in a litigation setting when used for relatively simple annotations. An arrow to point out the particular aspect of the exhibit being discussed by the lawyer or the witness, a circle to highlight a critical number, or pointers at several places to help draw conclusions are all useful annotations. Try to avoid writing words, drawing shapes more complicated than a circle or an arrow, or using large numbers.

Capture: The marks made on the screen can be captured in a printout using a video printer. See discussion at p. 275 below.

Alternatives

There are software alternatives for annotation of exhibits displayed on monitors.

Entry-level presentation software provides an annotation pen feature that offers a more limited drawing capability. The pen feature turns the mouse pointer into a pen so that when the user holds down the left mouse button and moves the mouse, a line appears on the screen. The width and color of the line can be changed as with the telestrator. This software, however, works only with input from a laptop. To get drawing capability for an image generated by an evidence camera, a telestrator is necessary.

The two principal entry-level presentation software packages are Microsoft's PowerPoint and Corel's Presentations. Each has a pen feature readily accessible.

In PowerPoint: Press CTRL + P to change the mouse pointer into draw mode. The mouse pointer shape will change to a pen. Hold

down the left mouse button and move the mouse on the screen. The mouse pointer will draw lines. Let up on the left mouse button at the end of the line. Press the E key on the keyboard to erase the mouse drawings from the screen while still keeping the pen feature active. Press CTRL + A to move the mouse pointer back to its normal arrow shape. The next mouse click will remove the mouse drawings from the screen. To change the pen color before the show, go the Menu Bar, click on the Slide Show option, click on the Set Up Show option, then go to the Pen Color box in the lower left corner of the dialog box and set the color. To change the color during the show, right click with the mouse, click on the Pointer Options choice, then click on the Pen Color option.

In Corel Presentations: In Slide Show mode (the QuickPlay tab has been activated), the mouse has a draw capability. Hold down the left mouse button. The mouse pointer shape turns to a crayon. When the user moves the mouse around the screen (while still holding down the left mouse button) it will draw lines. Click once to take the drawings off the screen while keeping the slide on the screen. To change the color of the pen feature, go to the Menu Bar, click on the View button, then click on the Play Slide Show option. The Play Slide Show dialog box will appear. Click on the Highlighter Color button. A color palette will appear. Click on the color to be used. The width of the line can also be changed using the Width button at the same location.

The more advanced trial presentation software packages also provide drawing and pointer capabilities.

Color Video Printer

Best uses

A color video printer is necessary whenever a telestrator, light pen, software annotation, or touch screen will be used to create marks on the screen during the presentation of witness testimony. If a demand is made to preserve the marks for the record, and the court so orders, the most practical way to accomplish this objective is the use of this specialized printer. It operates without disturbing the flow of the witness examination in the courtroom, and produces a copy within 60 to 75 seconds that can be marked with an exhibit number. A normal printer can be used, but only if the lawyer or equipment operator stops to capture a “print screen” image, transfers that image to a blank page (typically in word processing software), and then prints out the resulting page.

Operation

A printer optimized for printing images as they appear on the screen has a one-touch control—normally a button that activates the printer. Once activated, the printer makes a 3-inch by 5-inch print of the image currently appearing on the screen.

The printer is about 14 inches wide, 5 inches high, 16 inches deep, and weighs about 20 pounds. If there is a special lectern in the courtroom wired for various dis-



play connections, the printer probably will be located on a shelf inside the lectern.

The only operational considerations with respect to the printer have to do with its paper and ink supplies. Both paper and ink are special varieties for this particular printer.

The printer has a cartridge in which the paper supply (up to 200 sheets) is placed. It is a good idea to check the paper supply before trial. Push in the paper tray, located at the front of the unit, and then release to eject the cartridge. Place the paper flat in the paper tray with the polished side up. The paper should fit securely under the tabs at either corner. Slide the paper tray back into the printer until it clicks in place.

The printer also has an ink cartridge located behind the front panel door. Press the top right hand button on the printer to open the door. Pull down the eject lever near the ink cartridge and it will pop out. Wind the replacement ink cartridge to take up any slack in the ribbon, then insert the new ink cartridge firmly until it stops. Close the front panel door.

Setup

This kind of printer is usually part of a courtroom lectern or visual-presentation cart containing the hookups for cabling to monitors and other courtroom equipment.

Techniques for use

The printer takes a little time to generate the hard copy printout, so it is best to continue with the examination after pressing the button to activate the printer.

Audio Systems

Best Uses

An audio system accommodates poor acoustics in the courtroom, persons who need assisted listening devices, persons who need translations, telephone conferencing, and video conferencing.

Operation

The courtroom may have microphones at counsel table, the witness stand, and the bench to counter poor acoustics in the courtroom. Speakers located at key places in the courtroom amplify the sound from the microphones.

Microphones may have mute buttons. This enables the person within the sound pickup pattern of the microphone to block any sound transmissions while the mute button is held down, so that private conferences may be held.

There may be microphones at the bench for sidebar conferences. These are normally used in conjunction with a pink noise generator so that the sidebar conferences cannot be heard by the jury.

Setup

The courtroom audio system is usually installed as a part of the outfitting of the courtroom.

Techniques for use

Microphones and speakers: It is important to make clear the sound pickup pattern of the microphones to those who will be using them. Normally, a commercial microphone picks up sound from an angle of about 50 degrees from its center—or 100 degrees total. The speaker needs to be well within this zone in order for the microphone to maximize the sound pickup while eliminating unwanted noise and

feedback. The speaker also needs to be within 10 to 20 inches of the microphone in order to have optimum sound. If a witness turns to speak to the jury, he or she may move out of the sound pickup zone unless the microphone is moved at the same time.

Connections for sound on computer-generated exhibits: A laptop computer normally works with the courtroom audio system by means of a standard cable connection from the headset jack on the laptop (usually marked with an icon of a small headset) to the line in jack on the audio system control panel. When a lectern has been outfitted with equipment for visual displays, there is usually a jack for the audio connection on the lectern's control panel. The laptop keyboard has controls for increasing or decreasing the level of sound.

Telephone conference call: The audio system is also used for telephone conference calls. The courtroom microphones are used by speakers present in the courtroom, and their output is routed through a special panel so that it can be heard both in the courtroom and at the other end of the conference call. The system also routes the incoming signals from the other end of the conference call through the courtroom speakers so that this part of the conference can be heard everywhere in the courtroom.

Assisted listening system: An amplification system is often used in courtrooms to assist hearing impaired jurors. This system is usually an infrared emitter mounted somewhere on the wall at the front of the courtroom which sends low frequency lightwave (infrared) signals to headsets. The battery-operated headsets produce amplified sound.

Language interpreter system: Persons in the courtroom who need the assistance of a language interpreter can use headsets that receive signals from a microphone headset used by the interpreter. The headsets are often the same ones used for listening assistance. Each headset has a switch for an A channel, which is the assisted-listening mode, and a B channel, which is the interpreter mode. The interpreter's headset is plugged into a connection to the infrared emitter.

Videoconference

Best uses

A videoconference makes the fewest demands on the equipment and the capacity of the transmission lines if the person at each end is seated or standing at a lectern, engaged in relatively little motion other than talking, and has no exhibits to handle.

If motion is important to the lawyer's presentation (working with a display) or to a witness's participation (using an object to demonstrate how something occurred), then the transmission lines need to have the capacity to deal with full motion (30 frames per second). For example, an expert who uses a skeleton to show the motion that caused a particular injury will not be able to communicate well with a videoconference setup that has one ISDN line (one-third full motion). The motion will appear jerky and the sound will be scratchy. If the expert moves very deliberately in an uncomplicated way, the presentation can be delivered well on two ISDN lines (two-thirds full motion).

Videoconferences of witness testimony have worked satisfactorily with the following:

- catastrophically injured witnesses whose presence in the courtroom might overwhelm jurors and interfere with their ability to focus on the issues in the case
- bedridden, infirm, or handicapped witnesses
- experts or specialists located a significant distance from the courtroom or in a location with little convenient transportation
- witnesses who provide a part of the foundation for an exhibit
- child witnesses who may be intimidated by the courtroom setting
- experts who have been deposed but, in the interim, the testimony on which the expert relied at deposition has changed, been excluded, or been attacked in unanticipated ways

- witnesses in foreign countries who are unwilling or unable to come to the courtroom in the United States
- witnesses for whom there is a legitimate concern about health and safety that require remaining in a remote and undisclosed location
- witnesses who are incarcerated or in mental institutions

Although the Advisory Committee to Fed. R. Civ. P. 43 notes point to videotaped depositions as a preferred alternative, live testimony via videoconference is often much more effective from a litigant's point of view. Conditions may have changed since the date of the deposition; an expert may need to take account of factors that have arisen since the deposition; and the foundation requirements for an exhibit may not have been anticipated adequately.

Operation

The connection between the near side and the remote location is made by dialing a special number provided by the telephone company. One side dials up the other side and establishes the connection. The side that dials pays for the call, so it is important to establish how this will happen. Once the connection is made, the video and audio will appear automatically on both ends.

The least capable end of the call will dictate the speed of the transmissions. If the courtroom has a very fast broadcast system (perhaps three ISDN lines with a capability of 384 KB per second), and the far end has only a copper telephone line with a capability of 56 KB per second, then both ends will see a jerky, blurred video and hear scratchy sound.

Depending on the sophistication of the system, the controls may have the capability to

- connect multiple points to the videoconference
- make a videotape record of the videoconference
- adjust the audio in the courtroom

Appendix A: More Details About Using the Equipment

- focus the cameras in the courtroom
- control the output to monitors in the courtroom
- take control of the camera at the far end and focus it on various parts of the room at the far end
- put the output of several video cameras in the courtroom on the monitor at the far end
- switch to an evidence camera in the courtroom to show documents, photographs, or objects to the far side

If the courtroom is equipped with an integrated lectern, these controls will be on the control panel at the lectern. In other courtrooms, these controls may be with the courtroom deputy clerk or other staff person.

Setup

If videoconferencing equipment has been made a part of the courtroom operations, it is usually in one of three configurations.

- **Conference room system:** One room in the courthouse is equipped with videoconference equipment, and all users come to this room. Oral arguments, hearings, depositions, arraignments, and other proceedings requiring videoconferencing are conducted from this location. This configuration avoids the problems of getting transmission lines into courtrooms and the lack of space in the courtroom to accommodate videoconference equipment.
- **Roll-about system:** A cart or other roll-about rack is equipped with videoconference equipment, stored in a central place, and rolled into each courtroom where it is needed. Normally the cart has a large monitor with a video camera mounted just over the monitor, and connections to the court's data lines and audio system. This configuration allows judges to use videoconference equipment in their own courtrooms, but requires additional manpower to roll the equipment in and out of the courtroom and to set it up. A roll-about system usually provides only one

monitor, so everyone in the courtroom who needs to see what is happening at the other remote location must be able to see this monitor. Additionally, the roll-about requires a connection for transmission to the remote site, so each courtroom must have the necessary wiring. Different courtrooms may have different lighting and acoustics that will require adjustments to the roll-about system. When the court uses a roll-about system, the videoconference call must be made while the court is in session; it cannot be made in advance to be ready when the judge turns to the next witness.

- **Hub-based system:** A centrally located hub contains all of the network transmission and video switching and mixing equipment. The hub has extensions to each courtroom, judge's chamber, or conference room that needs videoconference service. These end points have only the audio, video, and control equipment. This configuration allows the codecs, multiplexers, echo-cancellation equipment, and other sophisticated and expensive network transmission equipment to be put in one secure location. ISDN (integrated services digital network), DSL (digital subscriber line), cable, or T1 lines come only to the hub, and all of the courtrooms can make use of the videoconference capability as needed. One advantage of a hub-based system is the ability to prepare the remote end and connect the call while the court is in session working with some other witness. Then, when the judge is ready, the system is turned on in the courtroom with the remote end already connected and ready to go.

If the court does not have a system, it is possible to set one up for a single case. Desktop videoconference systems have been available since the early 1990s. This kind of installation would require permission from the court because of the additional telephone lines to be run into the courtroom, a process that could take three to four weeks after the order is placed with the telephone company. The cost would be approximately \$5,000 for a 128K, one-ISDN line system (camera,

Appendix A: More Details About Using the Equipment

microphone, monitor, and codec), and \$7,500 for a 384K, three-ISDN line unit. ISDN line installation and fees are separate.

Locating a videoconference room at the remote location is usually not difficult. Many federal courts have videoconference facilities that can be used for federal cases pending in other jurisdictions. Public installations where videoconferencing can be done for an hourly fee (usually \$100 to \$150) are located in nearly every city. The Yellow Pages and other service directories will provide leads in locating them. National chain copy stores have public rooms for videoconferencing at some of their sites. Court reporters have public rooms for remote depositions. Colleges and television stations often have these facilities. In addition, many private offices are equipped with videoconference facilities that are used for sales and technical meetings.

The data lines between the near and far sides are commercial lines provided by telephone companies. The most common data lines are called ISDN. They are digital phone lines. A data transmission setup may have one, two, or three ISDN lines. A one-line setup has a capacity of 128 Kbs (128,000 bits per second); a two-line setup is 256 Kbs; and a three-line setup is 384 Kbs. The fundamental difference is the quality of the images of motion that are transmitted. One ISDN line transmits at a level that is one-third of full motion (10 frames per second). The video appears somewhat jerky, although, for a seated witness who is talking, this level of motion is quite acceptable. Two lines are better (20 frames per second); and three lines transmit full television-quality motion (30 frames per second). More ISDN lines also improve audio quality. Even larger data transmission lines, T1 (1.5 Mbs, or 1.5 million bits per second) and T3, are also available. These are dedicated digital connections. Videoconference signals can also be carried by DSL and cable connections, which should be less expensive.

Both near and far sides must have the same data transmission capability or the systems will adjust to the capacity at the end with the lowest transmission capability. If the court has three ISDN lines

and the remote site turns out to have only one line, the court's videoconferencing equipment will automatically switch down to one line. A disparity in this capacity between the two sites generally will not be a problem. For a variety of reasons, when glitches occur, audio transmission is more often the culprit than video transmission.

The near and far sides also each have a codec unit. "Codec" stands for coder-decoder. This device packages (or encodes) the video signal from the cameras and the audio signal from the microphones so they can go out together over the ISDN line(s). It also receives (or decodes) the video and audio signals coming in and splits them apart so that the video goes to the monitor and the audio goes to the speakers. The codecs at either end must be the same in order for two-way transmission to work. Codecs are manufactured to comply with one of the industry standards. The H.320 standard is most often used for courtroom videoconferencing, and applies to ISDN lines and T1 lines. The H.323 standard applies to Internet connections. The H.324 standard applies to small personal computer video setups.

Some systems have built-in multipoint capability, which means that more than one remote location can be connected to the videoconference. For systems without this capability, a third-party "bridge" service is necessary to connect more than one remote location.

The connection between the near and far sides needs to be tested every time the system is used. The equipment should be turned on and tested at least 15 minutes before the videoconferencing segment is to begin, and the dial-up connection should be made and tested at least five minutes before starting time. Scheduling this kind of activity during a regular break in the trial proceedings works well.

Techniques for use

Background at the remote location: The lawyer arguing a motion or the witness at the far side should be sitting in a comfortable chair, usually at a table or desk so that any exhibits can be handled easily.

Appendix A: More Details About Using the Equipment

The background should be dignified and should not detract from the focus on the witness. A patterned background or a large seal will make it more difficult to see the witness clearly.

Style: For both oral arguments and witness questioning, the lawyer needs to adopt a deliberate style. Statements and questions must end precisely. Added phrases or run-on sentences will confuse the person at the remote site because they may start to respond while the lawyer is still talking. Then the signals get muddled and no one can follow the exchange. The lawyer should pay close attention to the image of the judge or the witness on the screen to see when they have finished speaking and the lawyer can begin again.

Mannerisms: Both lawyers arguing motions and witnesses answering questions need to be aware that small mannerisms, such as tapping fingers, scratching, or wiggling in the seat will be magnified on the monitor. In the courtroom, jurors are looking at the whole person and these mannerisms are somewhat less obvious. In addition, jurors will expect the kind of polished communication they experience when watching television. This too will cause distracting mannerisms to receive undue attention.

Objections: During witness testimony, if the direct examiner asks a question, there is an objection, and the witness keeps on talking, the court needs to use a cut-off switch. The witness may not have heard the objection; if two people talk at the same time, one on either end, the equipment sends whichever audio signals get there first. Video can be transmitted both ways simultaneously, and theoretically audio could be as well, but in practice it does not work that way. Microphones and speakers loop back causing interference. Even though the video makes it appear that both parties are interacting simultaneously, the audio cannot keep up.

Recording the session: When using videoconferencing, the court reporter should make a record in the normal course as the hearing or examination proceeds regardless of whether a separate recording is being made. The videoconference equipment allows a recording of video and audio on a VCR. The audio quality may make it margin-

ally more difficult for the court reporter to transcribe accurately during a videoconferencing session. Earphones can be provided so that the court reporter has direct access without the ambient noise.

Backup plan: An audio conference call through standard telephone services provides the same information for the record. This may be an option for continuing if only a short segment of the videoconference remains when the equipment goes down.

Appendix B Federal Courts with Courtroom Technology

Evidence Presentation Equipment

The following courts have evidence presentation equipment in one or more courtrooms.

District Courts

Alabama Northern	Missouri Western
Arkansas Eastern	Nebraska
Arkansas Western	New Hampshire
Arizona	New Jersey
California Central	New Mexico
California Eastern	New York Eastern
Colorado	North Dakota
District of Columbia	Ohio Northern
Florida Middle	Oklahoma Eastern
Florida Northern	Oklahoma Northern
Georgia Middle	Pennsylvania Eastern
Guam	Pennsylvania Middle
Idaho	Pennsylvania Western
Illinois Central	South Carolina
Illinois Northern	South Dakota
Iowa Northern	Tennessee Western
Kansas	Texas Eastern
Kentucky Eastern	Texas Northern
Louisiana Eastern	Texas Southern
Louisiana Western	Texas Western
Maryland	Virginia Western
Massachusetts	Washington Eastern
Minnesota	Washington Western
Mississippi Northern	West Virginia Northern
Mississippi Southern	Wisconsin Eastern
Missouri Eastern	Wisconsin Western
	West Virginia Southern

Bankruptcy Courts

Iowa Southern
Kentucky Eastern
Texas Western
West Virginia Northern

Videoconferencing

Federal court personnel can obtain an up-to-date list and the names of court contacts on the J-net at <http://jnet.ao.dcn/it/infotech/vclist.html> or by searching the Administrative Office J-net site for "videoconferencing courts." The following list was compiled in February 2001 and updated using the Web site in April 2001.

Courts of Appeals

Second Circuit
Third Circuit
Ninth Circuit
Tenth Circuit
D.C. Circuit

District Courts

Arizona	Illinois Southern
Arkansas Eastern	Indiana Northern
Arkansas Western	Indiana Southern
California Central	Iowa Northern
California Eastern	Iowa Southern
California Southern	Kansas
Colorado	Kentucky Western
Connecticut	Louisiana Eastern
District of Columbia	Louisiana Middle
Florida Middle	Louisiana Western
Florida Northern	Maine
Guam	Maryland
Hawaii	Massachusetts
Idaho	Michigan Western
Illinois Central	Minnesota
Illinois Northern	Mississippi Northern

Appendix B: Federal Courts with Courtroom Technology

(district courts, continued)

Mississippi Southern (pending)
Missouri Eastern
Missouri Western
Montana
Nebraska
Nevada
New Hampshire
New Jersey
New Mexico
New York Eastern
New York Northern
New York Western
North Carolina Eastern
North Dakota
Ohio Northern
Ohio Southern
Oklahoma Northern
Oklahoma Western
Oregon
Pennsylvania Eastern
Pennsylvania Middle
Pennsylvania Western
Rhode Island (pending)
South Carolina
Tennessee Eastern
Tennessee Middle
Tennessee Western
Texas Eastern
Texas Northern
Texas Southern
Texas Western
Vermont
Virginia Eastern
Virginia Western
Washington Eastern
Wisconsin Western
Wyoming

Bankruptcy Courts

Alabama Northern
Arkansas Eastern
Arkansas Western
California Central
California Eastern
California Southern (pending)
Florida Middle
Florida Northern
Georgia Middle
Idaho
Iowa Southern
Maine
Massachusetts
Michigan Western
Montana
New Jersey
New Mexico (pending)
Ohio Northern
Ohio Southern
Pennsylvania Eastern
Pennsylvania Middle
Pennsylvania Western
South Carolina
Tennessee Western
Texas Eastern
Texas Western
Vermont
Virginia Eastern
Virginia Western
West Virginia Northern
Wisconsin Western
Wyoming

Other

Court of International Trade
Ninth Circuit – Circuit Executive
D.C. Circuit – Circuit Executive
Administrative Office of the United States Courts
Federal Judicial Center

Real-time Court Reporting

The following district courts have one or more certified real-time court reporters.

Alabama Middle	Missouri Western
Alabama Northern	Nebraska
Alabama Southern	New Hampshire
Alaska	New Jersey
Arizona	New York Eastern
Arkansas Eastern	New York Northern
California Eastern	New York Southern
California Northern	New York Western
California Southern	North Carolina Middle
Colorado	Ohio Northern
Connecticut	Oregon
District of Columbia	Pennsylvania Eastern
Florida Middle	Pennsylvania Middle
Florida Northern	South Carolina
Florida Southern	Tennessee Middle
Georgia Northern	Texas Eastern
Hawaii	Texas Northern
Illinois Central	Texas Western
Iowa Northern	Vermont
Kentucky Eastern	Virginia Eastern
Kentucky Western	Virginia Western
Louisiana Western	Washington Eastern
Maine	Washington Western
Massachusetts	West Virginia Northern
Michigan Eastern	Wisconsin Eastern
Mississippi Northern	Wyoming
Missouri Eastern	

Digital Audio Recording

The following courts participated in the Judicial Conference pilot project on digital audio recording technology. Since the Judicial Conference approved this method of taking the record, additional courts are using the technology.

District Courts

Arizona
California Central
Connecticut
Missouri Eastern
Nevada
Pennsylvania Eastern

Bankruptcy Courts

California Northern
Nevada
New Jersey
South Carolina
Texas Western
Washington Eastern

Case Management/Electronic Case Filing (CM/ECF)

CM/ECF will replace the existing case-management systems in the federal courts. The new system will provide the courts with updated tools for managing their cases and enable the courts to create electronic case files and accept filings via the Internet. The following list, compiled in February 2001, shows which courts are currently using CM/ECF, are in the process of implementing CM/ECF, or will begin the process within the next six months.

Courts Currently Using CM/ECF

District Courts

District of Columbia
Missouri Western
New York Eastern
Ohio Northern
Oregon

Bankruptcy Courts

Arizona
California Southern
Georgia Northern
Louisiana Middle
New York Southern
Virginia Eastern

Courts Currently in the Process of Implementing CM/ECF

District Courts

California Northern
Michigan Western

Bankruptcy Courts

Georgia Middle
Missouri Western
New York Eastern
North Carolina Western
Tennessee Middle
Texas Western
Washington Western
Wyoming

Courts Beginning Implementation of CM/ECF Within the Next Six Months

District

Indiana Southern
Nebraska
New York Southern
Pennsylvania Eastern
Texas Northern
Wisconsin Eastern

Bankruptcy

Alaska
Arkansas
Colorado
Delaware
Iowa Southern
Louisiana Eastern
Montana
New Hampshire
New Jersey
Ohio Northern
Oregon
South Carolina
South Dakota
Utah
Vermont
West Virginia Northern
Wisconsin Eastern
Wisconsin Western

Appendix C

Local Rules with Respect to Courtroom Technology

District Courts

Eastern District of California: (only one to directly address computer animation)

E.D. Cal., Civ. L.R. 16-281(b)(5): Pretrial statements.

“Disputed Evidentiary Issues: A plain, concise summary of any reasonably anticipated disputes concerning admissibility of live and deposition testimony, physical and demonstrative evidence and the use of special technology at trial, including computer animation, video discs, and other high technology.”

Middle District of Florida

M.D. Fla., L.R. 3.03(f): Exchange of discovery request by computer disk.

Northern District of Florida

N.D. Fla., Gen. R. 77.2: Video or telephone transmissions in civil cases.

Idaho

D. Idaho L.R., App. V: Transcript fees (includes real-time transcript).

Eastern and Western Districts of Kentucky

Ky. L.R. 5.7: Electronic filing.

District of Maine

D. Me. L.R. 30(a): Video depositions.

District of Minnesota

D. Minn. L.R. 16.4(c)(2): Minimize travel expenses through use of videoconferencing for recording deposition testimony.

Northern and Southern Districts of Mississippi

D. Miss., L.R. 30.1: Videotaped depositions.

District of New Mexico

D. N.M. L.R. Civ. 5 Admin. Order 97-26: Electronic filing.

Eastern District of New York

E.D.N.Y., L.R. App. M: Electronic filing procedures.

Western District of New York

W.D.N.Y. Civ. L.R. 30: Depositions by other than stenographic means.

Northern District of Ohio

N.D. Ohio, Civ. L.R. 32.1: Videotape depositions.

N.D. Ohio, Civ. L.R. 39.2: Video and telephone conferences, trials, and hearings.

N.D. Ohio, Civ. L.R., App. G.: Transcript order (includes real-time transcript).

Middle District of Pennsylvania

M.D. Pa., L.R. 30.3: Videotape depositions, subpoena and notices of.

M.D. Pa., L.R. 30.8: Videotape depositions, custody and copies.

Western District of Pennsylvania

W.D. Pa., L.R. 30.1: Videotape depositions.

District of South Carolina

D.S.C., Civ. R. 30.03: Videotape depositions.

Eastern District of Texas

E.D. Tex., L.R. Cr. 49(e): Electronic filing.

Southern District of Texas

S.D. Tex., L.R. 5(e): Discovery of videotape depositions.

Western District of Texas

W.D. Tex., L.R. App. I: Guidelines for nonstenographic deposition.

Eastern District of Washington

E.D. Wash., L.R. 32.1: Use of depositions at trial.

Bankruptcy Courts

Southern District of California

S.D. Cal., Bankr. Ct. Rules, Order 162: Electronic case filing.

Middle District of Georgia

M.D. Ga., L. Bankr. R., Rule 5005-4: Electronic filing.

Appendix C: Local Rules with Respect to Courtroom Technology

Northern District of Georgia

N.D. Ga., Bankr. R., Order 99-1: Electronic filing.

N.D. Ga., L. Bankr. R., 5005-5: Electronic filing.

District of Iowa

D. Iowa U.S. Bankr. Ct. Rules L.R. 5005-4: Electronic filing.

District of Maine

D. Me., L. Bankr. R., Rule 5005-4: Electronic filing.

D. Me., L. Bankr. R., Rule 9036-1: Notice by electronic transmission.

District of Minnesota

D. Minn., Bankr. Ct. Rules, Order 99-101: Electronic filing.

District of Nebraska

D. Neb., R. Bankr. P., L.R. 5005-4: Electronic filing.

District of New Mexico

D. N.M., Bankr. Ct. Rules, L. Bankr. R. 5005-4: Electronic filing.

D. N.M., Bankr. Ct. Rules, L. Bankr. R. 7005-1: Notice by electronic transmission.

Northern District of New York

N.D.N.Y., Bankr., L. Bankr. R. 5005-4: Electronic filing.

Southern District of New York

S.D.N.Y., Bankr. Ct. Rules, L. Bankr. R. 5005-2: Filing by electronic means

S.D.N.Y., Bankr. Rules, Order M-182: Electronic filing.

Southern District of Ohio

S.D. Ohio, L. Bankr. R. 5005-4: Electronic filings.

Eastern District of Oklahoma

E.D. Okla., U.S. Bankr. Ct. Rules, L. Bankr. R. 5005-4: Electronic filing.

District of Rhode Island

D.R.I., L. Bankr. R. 9036-1: Notice by electronic transmission.

Eastern District of Tennessee

E.D.Tenn., L. Bankr. R. 5005-4: Electronic filing.

Northern District of Texas

N.D. Tex., L. Bankr. R. 5005-4: Electronic filing and noticing.

Southern District of West Virginia

S.D. W.Va., U.S. Bankr. Ct. Rules, Rule 5005-4: Electronic filing.

Courts of Appeals

First Circuit

U.S. Ct. of App. 1st Cir. Rule 31.1, 28 U.S.C.A.: Computer-generated briefs.

Eighth Circuit

U.S. Ct. of App. 8th Cir. Rule 25A, 28 U.S.C.A.: Electronic filing and noticing.

Eleventh Circuit

U.S. Ct. of App. 11th Cir. Rule 25-3, 28 U.S.C.A.: Electronic filing of emergency papers.

U.S. Ct. of App. 11th Cir. Rule 31-4, 28 U.S.C.A.: Electronic briefs.

Appendix D

Sample Pretrial Order Provisions

In order to accommodate the different approaches to pretrial orders arising out of different docket situations and individual preferences of judges, this appendix suggests language for a number of the circumstances, discussed in the book, that may arise when technology is used for a trial. Pretrial orders for trials to be conducted in fully equipped courtrooms may be different from the orders for trials in which lawyers plan to bring equipment to the courtroom. The timing of orders may vary depending on the type of case and the practice in particular courts.

Notice to lawyers about equipment in the courtroom

The courtroom in which this case will be tried has certain equipment to assist in the expeditious presentation of the case and making of the record. Descriptions of the equipment and training resources for lawyers are available [from the deputy, on the court's Web site, from another source]. Lawyers are expected to use this equipment, as appropriate, and time limits imposed by the court will assume the efficiencies made available by the use of this equipment.

Discovery of documents, photos, and videos in digital format

The parties will meet and confer at least __ days before the initial pretrial conference in order to be fully prepared to advise the court of the following matters:

1. Whether, during discovery, the parties will exchange documents in digital format; whether there are any issues as to the format to be used; and whether there are any issues as to the alteration of documents that may routinely occur when paper documents are converted to digital format.
2. Whether the parties contemplate the use of any photographs in

digital format; and whether there are any issues as to how and when digital alteration of photos is to be disclosed.

3. Whether the parties plan to create and exchange video in digital format; arrangements for the synchronization of the audio and video for any videotaped depositions in digital format that may be shown at trial.
4. Whether there are any issues as to the discovery of digital materials other than those identified in paragraphs 1 through 3 above (such as databases), and whether the parties have agreed on ground rules for the routine business practices that affect the retention of these digital materials.

Pretrial disclosures with respect to courtroom technology

The parties will file a joint pretrial disclosure memorandum at least ___ days before the final pretrial conference that will advise the court fully with respect to the following:

1. The equipment to be used by each party during trial, if any, including equipment already installed in the courtroom and equipment to be brought to the courtroom, and any arrangements for shared use of equipment.
2. The presentation software to be used by each party during trial, if any, and whether each party is able to receive and use digital files of presentation materials prepared by the other.
3. Any expected use of videoconferencing.
4. The testing, inspection, compatibility, reliability, positioning, and backup for any equipment to be brought to the courtroom for trial. Each party will have adequate opportunity to inspect any equipment, except a computer containing privileged and work product materials, brought into the courtroom by the other party for use in making presentations during trial. Counsel will be expected to represent to the court at the outset of trial that these matters have been dealt with satisfactorily. The court expects

no delays resulting from equipment failures that could have been anticipated.

Exhibits

- 1. Classification:** Each exhibit will be identified on the exhibit list as an evidentiary exhibit (expected to be offered in evidence) or an illustrative aid (to be used to assist the jury but not offered in evidence).
- 2. Exchange:** The parties will exchange evidentiary exhibits at least ___ days before trial, and will exchange illustrative aids at least ___ days before they will be used at trial in opening statement, with a witness, or in closing argument. Exhibits will be exchanged in the form and format in which they will be used at trial, unless the parties agree otherwise. This means, for example, that illustrative aids to be presented using a laptop computer will be exchanged in digital format that discloses any color, motion, or sound exactly as it will be used at trial.
- 3. Numbering:** All exhibits, whether evidentiary exhibits or illustrative aids, will be numbered. Exhibits to be used by both parties will be numbered [JX, or other method]. Exhibits to be used by plaintiff will be numbered [PX, or other method]. Exhibits to be used by defendant will be numbered [DX, or other method]. Illustrative aids shall be numbered as follows –
 - a. Enlargements:** An enlargement of an evidentiary exhibit, unchanged in any way except its enlargement, shall have the same number as the underlying evidentiary exhibit.
 - b. Enhancements:** An enhancement of an evidentiary exhibit (or part of a multipage evidentiary exhibit) shall have the same number as the underlying evidentiary exhibit followed by the letter designation A, B, C, and so on. For example, if PX12 is a multipage document and plaintiff wishes to enhance one of the pages by boxes, lines, arrows, callouts or other means for calling attention to a particular part of the page, the first illustrative aid based on that page would be

numbered PX12-A, the second one based on that page would be numbered PX12-B, and so on.

- c. **Independent illustrative aids:** Illustrative aids that do not incorporate an evidentiary exhibit (such as bullet-point slides) or incorporate more than one evidentiary exhibit shall have a separate number in the exhibit series.

Computer animations

If any party intends to offer a computer-generated animation either as an evidentiary exhibit or an illustrative aid, the party shall disclose that intention at the time expert disclosures are made pursuant to Fed. R. Civ. P. 26(a)(2). A copy of the animation shall be furnished to all other parties not later than 45 days prior to the filing of pretrial disclosures pursuant to Fed. R. Civ. P. 26(a)(3) or the close of expert discovery if that is earlier. By agreement of the parties, the date of delivery of the animation may be adjourned to no later than the date on which the pretrial order is filed. Disclosure with respect to animations shall include copies of the underlying digital files as well as of the completed animation.

Recording of proceedings

[If applicable] The record for trials and evidentiary hearings will be made by a real-time court reporter. Questions about the use of real-time reporting, the various levels of real-time service available, and the charges for each level should be directed to the reporter, [INSERT NAME] at [INSERT PHONE NUMBER].

[If applicable] The record for short, routine scheduling or pretrial conferences will be done by [digital] audiotape. Questions about the use of audio recording should be directed to [INSERT NAME] at [INSERT PHONE NUMBER].

In order to assist in making the record as useful as possible, counsel should provide the reporter or audiotape operator before the proceedings with: (1) a business card; (2) a complete list of witnesses;

(3) a complete list of any unusual names or terms that will come up during testimony.

If counsel intends to present more than ___ exhibits, either exhibits offered in evidence or exhibits used as illustrative aids, copies of all exhibits will be placed on a CD and copies of the CD will be provided to the court, the reporter, and counsel.

Appendix E

Helpful Resources

Administrative Office Points of Contact

Questions about courtroom technologies should be directed to the AO staff listed in Appendix B to the Procedures for Using Courtroom Technologies Contracts. The appendix is on the J-net at <http://jnet.ao.dcn/adminservices/procur/dectrees/courttech/index.html>.

Administrative Office Audio-Visual Design and Installation Contractors

The Administrative Office has contracts with several vendors for the installation of courtroom technologies. Each vendor can provide information about the equipment described in this book in both portable and permanent installations. Court staff can obtain an updated list of these contractors and contact information on the J-net. See Appendix A to the Procedures for Using Courtroom Technologies Contracts at <http://jnet.ao.dcn/adminservices/procur/dectrees/courttech/index.html>. Appendix A also lists companies with whom the Administrative Office has contracts for audio-visual design services.

Other Resources

Demonstrative Evidence Specialists Association (DESA)

901 Old Metairie Place

Metairie, LA 70001

Phone: (888) 224-DESA

Fax: (504) 828-6889

E-mail: desaorg@aol.com

DESA is a nationwide association of graphic art providers whose members can provide graphics for display on courtroom systems.

Also, see the Acknowledgements section for several other sources that were helpful in the production of this book.

Bibliography

Selected Judicial Conference policies about courtroom technology

Real-time court reporting

On recommendation of the Committee on Court Administration and Case Management, in September 1994 the Judicial Conference endorsed the use of real-time reporting technologies by official court reporters in the district courts to the extent funding is available to support their use (Report of the Proceedings of the Judicial Conference, September 1994, p. 49). At its March 1994 session, the Judicial Conference disapproved the use of real-time reporting systems in the bankruptcy courts because they did not appear to be cost effective (Report of the Proceedings of the Judicial Conference, March 1994, p. 16). The Guide to Judiciary Policies and Procedures provides additional information about the use of real-time court reporting in the federal courts (Vol. VI, Chap. VIII) and the cost of transcription (Vol. VI, Chap. XX).

Deaf or hearing-impaired persons and real-time court reporting

To improve access for persons who are deaf or hearing-impaired and persons with other communication difficulties, in September 1995 the Judicial Conference adopted a policy that all federal courts should provide reasonable accommodations to persons with communication disabilities. The Conference further agreed to require courts to provide, at judiciary expense, sign language interpreters or other appropriate auxiliary aids to deaf and hearing-impaired participants in federal court proceedings in accordance with guidelines prepared by the Administrative Office. This requirement does not apply to spectators, nor does it apply to jurors, whose qualifications for service are determined under other provisions of the law (Report of the Proceedings of the Judicial Conference, September 1995, p.75).

The guidelines for implementing these policies state that the determination of whether a prospective juror with a communications dis-

ability is legally qualified to serve as a juror is one for the judgment of the trial court under the Jury Selection and Service Act, but that where an individual with a communications disability is found so qualified, a sign language interpreter or other appropriate auxiliary aid should be provided under the guidelines.

Real-time court reporting may be one of the services provided to assist persons with communication disorders. The guidelines provide that real-time court reporting should be (1) provided only for as long as and for the specific purpose required by a participant; (2) used solely to assist in communication and not in lieu of conventional means of producing the official record; and (3) limited to a video display of spoken words, and should not include enhancements such as key word searching or the provision of unedited daily transcripts. Moreover, courts may not use this policy as an authorization to purchase and install real-time court reporting equipment in the courtroom. Such purchase is controlled by Judicial Conference policy relating to methods of court reporting. See the Guide to Judiciary Policies and Procedures (Vol. I, Chap. III, Part H).

Videoconferencing

On the recommendation of the Committee on Court Administration and Case Management, in March 1996 the Judicial Conference endorsed videoconferencing as a viable optional case-management tool in prisoner civil rights pretrial proceedings (Report of the Proceedings of the Judicial Conference, March 1996, p. 14).

Courtroom technologies

In March 1999 the Judicial Conference approved the following recommendation of the Committee on Automation and Technology: that the Judicial Conference endorse the use of technologies in the courtroom and, subject to the availability of funds and priorities set by the committee, urge that (a) courtroom technologies—including video evidence presentation systems, videoconferencing systems, and electronic means of taking the record—be considered as necessary and integral parts of courtrooms undergoing construction or major renovation; and (b) the same courtroom technologies be retrofitted into existing courtrooms or those undergoing tenant alterations as appro-

Bibliography

priate (Report of the Proceedings of the Judicial Conference, March 1999, p. 8; see also the March 1999 and September 1998 reports of the Committee on Automation and Technology to the Judicial Conference).

Digital audio recording

On recommendation of the Committee on Court Administration and Case Management, in September 1999 the Judicial Conference approved digital audio recording technology as a method of taking the official record in federal court, to be implemented upon the development of guidelines by the director of the Administrative Office. Additional funds beyond the cost of analog systems will not be provided (Report of the Proceedings of the Judicial Conference, September 1999, p. 57). The Guide to Judiciary Policies and Procedures (Vol. VI, Chap. XVI) provides additional information about the use of digital audio recording in the federal courts.

Use of technology by CJA panel attorneys

In March 2001 the Judicial Conference approved the following policy on recommendation of the Committee on Defender Services: In cases in which requests by Criminal Justice Act panel attorneys include hardware and software costing more than \$300, or computer systems and automation litigation support personnel and experts estimated to have a combined cost of more than \$10,000, the CJA Guidelines require panel attorneys to consult with the Administrative Office's Defender Services Division prior to applying to the court. The division can then make recommendations to the court (to be included in the panel lawyer's motion) to ensure that the equipment and services purchased by the government are suitable and cost effective. A model order is included in the guidelines. (See the March 2001 report of the Committee on Defender Services to the Judicial Conference.)

Federal Web sites posting information about courtroom technology

Federal Judicial Center Web site

<http://jnet.fjc.dcn:8081/coe/resource.nsf/ResourceBySubject?OpenView>

This Web site, provided by the Court Education Division of the Federal Judicial Center, includes links to, and brief descriptions of, available instructional material dealing with courtroom technology. A link to the 1999 Courtroom Technology Manual from the Administrative Office of the U.S. Courts can be found at this site, as well as descriptions of the electronic courtrooms in the Districts of New Mexico and Idaho, the Middle District of Pennsylvania, and the Western District of Wisconsin.

Administrative Office of the U.S. Courts Web site

<http://jnet.fjc.dcn>
<http://www.uscourts.gov>

The Administrative Office's Internet and intranet sites contain much useful information about courtroom technology. This information can be located using the sites' search capabilities.

<http://www.privacy.uscourts.gov>

This Web site has been established by the Subcommittee on Privacy and Electronic Access to Case Files of the Court Administration and Case Management Committee of the Judicial Conference of the United States for the purpose of soliciting comments regarding proposed policy options for the U.S. Courts on privacy and electronic access to case files. These policy options are articulated in the document entitled "Request for Comment on Privacy and Public Access to Electronic Case Files" available at the site.

Bibliography

Court Web sites

The courts with technology installations are listed in Appendix B. Many of these courts have information about technology on their Web sites. These addresses are listed below by circuit. Some sites can be accessed only through the courts' intranet, which is available only to court staff.

Second Circuit

District Courts:

New York Eastern

http://www.nyed.uscourts.gov/CM_ECF/cm_ecf.html
(information about Electronic Case Filing system)

New York Southern

<http://www.nysd.uscourts.gov/reporter.htm>
(rates for real-time reporting)

Bankruptcy Courts:

New York Southern

<http://www.nysb.uscourts.gov>
(information about Electronic Case Filing system)

Third Circuit

District Courts:

New Jersey

<http://pacer.njd.uscourts.gov> (click on < attorney services >)
(photographs and descriptions of evidence camera, LCD projector, projection screen, shadow box, VCR)

Pennsylvania Eastern

<http://www.paed.uscourts.gov/us01011.shtml>
(videoconferencing pilot program)

Pennsylvania Middle

<http://www.pamd.uscourts.gov/docs/elec-cr.pdf>
(photographs and descriptions of evidence camera, VCR, telestrator, color video printer, monitor, videoconferencing, digital whiteboard, real-time reporting)

<http://www.pamd.uscourts.gov/docs/elmo.pdf>
(evidence camera presentation guide for lawyers)

Pennsylvania Western

<http://www.pawd.uscourts.gov/Documents/courttech.pdf>
(photographs and descriptions of videoconferencing, visual evidence presentation system, whiteboard)

Bankruptcy Courts:

Delaware

<http://www.deb.uscourts.gov>
(frequently asked questions about Electronic Case Filing system)

Fourth Circuit

Bankruptcy Courts:

Virginia Eastern

<http://www.vaeb.uscourts.gov/ecf/ecffaq.html>
(frequently asked questions about Electronic Case Filing system)

Fifth Circuit

District Courts:

Louisiana Eastern

<http://www.laed.uscourts.gov/Attorney/atysrvc.htm>
(description of electronic evidence presentation system)

Mississippi Northern

http://www.msnd.circ5.dcn/ecourtroom/courtroom_technology.htm
(photographs and descriptions of evidence cart, video printer, flat panel displays, videoconferencing, real-time reporting)

Texas Western

<http://156.124.10.215/cotf>
(photographs and descriptions of electronic courtroom)

Bankruptcy Courts:

Texas Western

<http://www.txwb.uscourts.gov/pdf/overview.pdf>
<http://www.txwb.uscourts.gov/pdf/uslawart.pdf>
(overview of Electronic Case Filing, article from US Law Week about ECF)

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Sixth Circuit

District Courts:

Ohio Northern

[http://www.ohnd.uscourts.gov/Clerk_s_Office/
Courtroom_Technology/courtroom_technology.html](http://www.ohnd.uscourts.gov/Clerk_s_Office/Courtroom_Technology/courtroom_technology.html)

Bankruptcy Courts:

Kentucky Eastern

<http://www.kyeb.uscourts.gov/kyeb/courtroomtech.htm>
(descriptions of electronic courtroom including video evidence
system, printer, VCR, instant translation services)

Seventh Circuit

District Courts:

Wisconsin Western

[http://www.wiw.uscourts.gov/pub_district/
electronic_courtroom](http://www.wiw.uscourts.gov/pub_district/electronic_courtroom)
(user's manual)

Bankruptcy Courts:

Wisconsin Eastern

<http://www.wieb.uscourts.gov>
(introduction and technology requirements for Electronic
Case Filing system)

Eighth Circuit

District Courts:

Iowa Northern

<http://www.iand.uscourts.gov/iand/welcome.nsf>
(training guide for projection screen, evidence camera, touch
screen annotation, color video printer, VCR, monitors, real-
time reporting)

Minnesota

http://www.mnd.uscourts.gov/courtroom_technology.htm
(photographs and description of monitors, evidence camera,
VCR, real-time reporting)

North Dakota

<http://www.ndd.uscourts.gov/FargoPP/sld001.htm>
(PowerPoint slide show of courtroom technology)

Bankruptcy Courts:

Minnesota

<http://www.mnb.uscourts.gov/BankWeb1/Html/ef2.html>
(necessary steps and tips for electronic filing)

Ninth Circuit

District Courts:

Arizona

<http://www.azd.uscourts.gov/azd/courtinfo.nsf> (click on
< public notices >)
(explanation of videoconferencing policy)

Idaho

http://www.id.uscourts.gov/atty_resource.htm
(user's manual for electronic courtroom, information about
videoconferencing, information about electronic filing)

Oregon

<http://ord.uscourts.gov/ecf/ecf.html>
(tutorial and user's manual for Electronic Case Filing system)

Washington Eastern

<http://www.waed.uscourts.gov/electcrt/default.htm>
(photographs and descriptions of VCR, evidence camera, color
printer, flat-screen monitors, light pen)

Bankruptcy Courts:

Idaho

http://www.id.uscourts.gov/atty_resource.htm
(user's manual for electronic courtroom, information about
videoconferencing, information about electronic filing)

Tenth Circuit

Appeals Court:

<http://www.ck10.uscourts.gov/circuit/video.htm>
(instructions for using videoconferencing system)

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District Courts:

New Mexico

<http://www.nmcourt.fed.us>

(photographs and descriptions of real-time reporting, evidence camera, video printer, light pen, videoconferencing, VCR, frequently asked questions about Electronic Case Filing system)

Eleventh Circuit

District Courts:

Florida Middle

<http://156.130.40.199/automat/venu13un.PDF>

(100-page instruction manual for videoconferencing)

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Gordon Bermant & Pam White, *Federal Court Technology: The Automation Plan and Beyond*, 1996 Workshop for District and Circuit Judges of the Tenth Circuit (March 1996) 3011-A/96 (one audiotape) (available only to federal judges)

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Electronic Evidence Presentation in the Minneapolis Federal Courthouse with Hon. James M. Rosenbaum and Hon. David S. Doty (Administrative Office of the U.S. Courts, August 1999) (videotape)

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Introduction to Courtroom 4 (U.S. District Court, Concord, NH, February 1998) (videotape)

Fern M. Smith, et al., *Computer-Generated Visual Evidence* (Federal Judicial Center 1998) 3551-V/98 (two videotapes)

Donna Stienstra, et al., *Digital Audio Recording Technology: A Report on a Pilot Project in Twelve Federal Courts* (Federal Judicial Center 1999)

The Courtroom of the Here and Now (U.S. District Court, Shreveport, La., April 1997) (videotape)

The Courtroom Technology Manual (Administrative Office of the U.S. Courts 1999)

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Gregory T. Jones, *Lex, Lies & Videotape*, 18 U. Ark. Little Rock L.J. 613–644 (1996)

Saul M. Kassin & Meghan A. Dunn, *Computer-Animated Displays and the Jury: Facilitative and Prejudicial Effects*, 21 Law & Hum. Behav. 269–281 (1997)

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Edward R. Tufte, *The Visual Display of Quantitative Information* (1983)

Glossary

This glossary includes the technical terms used in this handbook, but may not cover the necessary techno-speak for dealing with all the pieces of courtroom technology in its many variations. One helpful Web site is www.whatis.com, which contains comprehensive definitions and explanations about the Internet, computers, and information technology.

Acrobat Reader Software published by Adobe used to view, navigate, and print Portable Document Format (PDF) files. Acrobat Reader can be downloaded free of charge from the Adobe Web site, www.adobe.com.

Adobe Software publisher. See *Acrobat Reader*.

Analog Electronic transmission by means of signals of varying frequency or amplitude. In terms of courtroom technology, analog is generally something not generated by computer. Television sets, standard telephone sets, assisted listening headsets, videoconference equipment, standard video cameras, VCRs, video and audiotape players are analog equipment. Distinguished from *digital*.

Animation With respect to slides, the way that photos, or boxes containing text, or other design elements come into view once the slide has been displayed. There are a variety of types of motion (like rolling down from the top or out from the middle) that can be used for animating a slide.

With respect to videos, a computer rendering of a sequence of events taking account of available data and descriptions of witnesses. As used in this handbook, the term “animation” also includes simulation, reconstruction, and demonstration when accomplished using computer processes.

ANIX	Presentation software published by DOAR Communications, Inc.
Annotation equipment	Provides the capability to highlight or mark any display on a monitor or projection screen using electronic means. See <i>touch screen</i> , <i>light pen</i> , and <i>telestrator</i> .
Assisted listening	Amplification of sound for the hearing impaired. Usually accomplished through an infrared transmitter and battery-operated headsets.
Background	The color behind all the areas on a display. Distinguish from <i>fill</i> , which is the area within specified areas on a display
Bar code reader	A hand-held laser scanner that reads a group of characters to call up a specified piece of information. The bar code reader, when activated, translates information from bar codes into commands to software, usually to locate an exhibit.
Bit	The smallest unit of measure for computer data; its value is 0 or 1.
Bitmap	A graphic that is made up of thousands of small dots.
BMP	Windows Bitmapped File Format. A file format developed by Microsoft, usually used for documents, charts, and graphs.
Byte	A unit of measure for computer data. A byte is like a letter in a word.
CAD/CAM	Computer Assisted Design/Computer Assisted Manufacturing. Software that creates specialized design files.

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Callout	A box on a display that enlarges words or phrases in documents for easy reference. The callout box is usually connected visually by a thin line to the spot in the document from which the words or phrases came. A “direct callout” is a callout box that copies and enlarges a portion of the text. A “re-keyed callout” is a callout box into which the portion of text has been typed, usually for emphasis.
Case sensitive	Software that knows the difference between upper case and lower case letters.
CD	Compact disk. A storage medium for data. Usually stores about 650 megabytes (MB) of data. Also used for music. See <i>storage media</i> .
CD drive	A mechanism on a computer that “plays” the CD and allows the computer to use the data stored on the CD. Usually the “D” drive.
CD writer	Equipment that transfers data from a computer onto a CD for storage.
CD-R	CD-Recordable. A CD that can be recorded only once. See <i>CD-RW</i> .
CD-ROM	CD-Read Only Memory. Technically, this term means a CD that can be recorded only once, but in the days when all CDs could be recorded only once, it sometimes had a more generic meaning of a CD that contained data rather than music. See <i>CD</i> , <i>CD-R</i> , and <i>CD-RW</i> .
CD-RW	CD-Rewritable. A CD that can be recorded and rerecorded in whole or part.

Chat room	An Internet site at which people in different locations can exchange written messages in real time. Many users can access the chat room at the same time and contribute messages. Distinguish from a <i>discussion board</i> , which is a similar type of site but the message exchange is not in real time.
Cloning	A digital process for copying part of a photograph and placing the copy into another photograph. Implemented through specialized image-handling software.
Codec	Coder-decoder. Used at each end of a videoconferencing to compress and decompress audio and video signals to aid in transmission.
Compression	A process for reducing file size. <i>Lossless compression</i> retains all data when the file size is reduced. <i>Lossy compression</i> discards some data, usually redundant data, when file size is reduced.
Conversion	Usually a software process for changing from one file format to another.
Converter	Usually a piece of hardware that converts analog signals into a format that can be displayed on digital devices or that converts digital signals into a format that can be displayed on analog devices.
Corel Presentations	Well-known presentation software produced by Corel. It is sold as a part of the WordPerfect Office suite and as a stand-alone product.
Crop	A method for cutting down photos and other images to focus on a particular part by eliminating unwanted parts. Distinguished from <i>re-size</i> in which the entire photo is reduced in size without eliminating any parts.

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CRT	Cathode ray tube. Type of monitor.
De-coloring	Process for turning color photographs or documents into black and white. Software discards all color information and generates a grayscale image from the luminosity values of the color image.
Default	The settings of the various components and buttons in a software package as it comes out of the box. This is what the software will do if you don't tell it to do something else.
Demonstrative evidence	An exhibit that is offered in evidence because it demonstrates something at issue (e.g., a photo, a document, a map). The standard for admitting the exhibit is whether it is fair and accurate. A principal objection is that it is not accurate (because something has been added or removed) or that it is unduly prejudicial. Distinguished from <i>illustrative aid</i> which is offered for use in trial (and not in evidence) on the basis that it helps illuminate the testimony.
Demonstrative exhibit	An exhibit, which could be an <i>evidentiary exhibit</i> , <i>demonstrative evidence</i> , or an <i>illustrative aid</i> . The term has become imprecise over the years but usually means an exhibit that "demonstrates" or shows something at issue in the case, such as a photo.
De-skewing	A software process by which a document is straightened if the original that was scanned has been turned slightly (or skewed) to one side or another.

De-specking	A software process by which small specks are removed from a document during imaging. These specks usually result from using a copier that has dust or dirt on the plate. The specks, once on the copy, will also appear on all subsequent copies and images.
Digital	A means of representing information as a series of 0s and 1s.
Digital audio recording	A means for recording audio directly to a computer drive. The resulting file can be transferred easily to any other storage media.
Digital display	A display on a monitor or projection screen created and transmitted by digital means.
Digitize	To create a digital file from analog information. Most commonly used to describe the process of changing regular video and audio to digital format.
Directory	A storage area for files.
Discussion board	An Internet site at which people in different locations can exchange messages. Distinguish from <i>chat room</i> , which is a similar type of site but the message exchange is in real time.
Disk drive	See <i>hard disk drive</i> .
Diskette	See <i>floppy disk</i> .
Display	A visual aid that may be shown in a courtroom on a small monitor, a large monitor, or a large projection screen.
Display equipment	Any of a variety of devices used to show evidentiary exhibits or illustrative aids to the court, jury, witness, counsel, and the public. The equipment

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- includes monitors, projectors, projection screens, and specialized screens.
- DOAR Presenter Brand name of an *evidence camera*.
- Document camera See *evidence camera*.
- DOS Disk Operating System. An older version of the operating system from Microsoft. Replaced by Windows.
- DPI Dots per inch. A measure of *resolution* for printers.
- DVD Digital video disk (sometimes also digital versatile disk). One of the storage media for digital files. Well suited for videos and other very large files.
- Effect The motion from one bullet point to the next or from one object to the next within one slide. See also *animation*. Distinguished from *transitions*, which involve motion when moving from one slide to the next.
- Electronic whiteboard A display device. Used in a courtroom as a writing surface. May be interactive and include touch screen capability to control computer commands.
- Elmo Brand name of an *evidence camera*.
- EPS Encapsulated PostScript. See *file format*.
- Evidence camera A small video camera mounted on an adjustable arm over a base; used to enlarge images of small objects, marks, and portions of documents and display the images on a monitor or through a projector to a projection screen. Also commonly called a *document camera*. Also known as a *visualizer*, *DOAR Presenter*, or *Elmo*.

Evidentiary exhibit	An exhibit that has been admitted in evidence or will be offered in evidence. Distinguished from <i>illustrative aid</i> .
External disk	See <i>hard disk drive</i> .
Fax server	Server that stores graphic images of fax transmissions in high-volume fax operations.
File	A collection of information that can be named and stored by a computer for future retrieval in the same form.
File format	A standard method by which a file is stored. For example, TIFF (Tag Image File Format) is a file format commonly used for documents, and JPEG (Joint Photographic Experts Group) is a file format commonly used for photographs.
File name	The description of a file that is put into a computer so that the file can be found again.
Fill	The color within specified areas on a display, such as the area containing bullet points. Distinguished from <i>background</i> , which is the color behind all the areas on a display.
Filters	Software methods to sharpen, blur, lighten, darken, highlight, shadow, and repair photo images.
Flat-screen monitor	A CRT (cathode ray tube) monitor that has a flat (rather than slightly concave) screen. Older monitors usually have a concave screen. A flat screen is somewhat easier to read.
Flat-panel monitor	An LCD (liquid crystal display) monitor that has a thin silhouette so that it takes up relatively little space from front to back.

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Floppy disk	A 3 1/2 inch disk with a plastic cover used to store information. It fits in a disk drive on a computer and is removable so that it can be used on different computers. It operates in the same manner as a hard disk, but has a much smaller capacity (usually 1.4 megabytes of data). See <i>storage media</i> .
Floppy disk drive	A mechanism on the computer that “plays” a floppy disk and allows the computer to use the data stored on the floppy disk. Usually the “A” drive.
Folder	A collection of files, usually related to one topic. Folders have names so that they can be distinguished from one another.
Font	A combination of typeface (e.g., Arial) and type size (e.g., 24) usually expressed in “points.” So, “24 point Arial” is the name of a font.
Format	See <i>file format</i> .
GB	Gigabyte. One thousand megabytes (MB). Unit of measure usually applied to the size of computer files and the capacity of storage media. See also <i>byte</i> , <i>KB</i> , <i>MB</i> .
Hard disk drive	A mechanism that stores information on a disk that is rigid in structure. A hard disk drive can be an internal disk drive (usually the “C” drive), which is fixed in a computer, or an external disk drive, which plugs into a computer. May have a capacity from 2 to 200 GB. See <i>storage media</i> .
Hole fill	A software process to repair small defects in document images.

Hologram	A three-dimensional image created by specially manipulated laser beams.
Hyperlink	A connection between a phrase or word in a computer file and the content of another computer file.
Illustrative aid	An exhibit that is offered for use before a jury (but not to be admitted in evidence) because it is helpful in or an aid to testimony (e.g., a bullet-point list, a labeled photo, a text document treatment, a relationship chart, or an annotated diagram). The standard for using an illustrative aid before a jury is whether it is helpful in presenting or understanding the testimony. A principal objection is that it is misleading or argumentative and therefore not helpful. Distinguished from <i>evidentiary exhibit</i> which is an exhibit admitted in evidence.
Imaging	The process of creating an “image” or digital copy of a document, photograph, chart, graph, or other paper copy. See also <i>scanning</i> .
Import	Bring a file or part of a file into another file. Usually for the purpose of adding a photo or other graphic or avoiding doing word processing work over again.
IMAX	Large segmented display that play coordinated videos.
Interpolation	A software process for enhancing a photograph by filling in pixels based on analysis of neighboring pixels.
IPIX	Software process for producing a 360-degree photo.

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ISDN	Integrated Services Digital Network. High-capacity telephone lines suitable for transmitting data. Capable of transmitting data at speeds between 56 Kbps and 1.54 Mbps.
ISP	Internet service provider.
JPEG	Joint Photographic Experts Group. An industry standard file format for photographs.
KB	Kilobyte. One thousand bytes. Unit of measure usually applied to the size of computer files. A page of double-spaced text is usually about one kilobyte, also expressed as 1K. See also <i>byte</i> , <i>MB</i> , <i>GB</i> .
LAN	Local area network. A group of computers and associated devices that share a common communication line and typically share the resources of a single processor or server within a small geographic area (e.g., within a courthouse).
Laser disk player	Hardware that accesses and plays material on laser disks.
LCD	Liquid crystal display. Technology used in digital monitors and digital projectors.
Legacy equipment	Usually refers to equipment (such as audiotape players, videotape players, laser disk players) used before the installation of digital equipment and that continues to be used, at times, with the current digital equipment.
Light pen	Equipment that allows tracings by a stylus on the monitor surface to appear as an overlay on the image on the monitor. A <i>telestrator</i> or <i>touch screen</i> performs the same function.

Lossless compression	See <i>compression</i> .
Lossy compression	See <i>compression</i> .
Lumen	A measure of light output. Used in measuring the capability of a projector.
LZW	Lempel-Ziv-Welch. A compression formula used for text documents.
Masking	A software method for taking elements out of a photograph.
MB	Megabyte. One thousand KB, or one million bytes. Unit of measure usually applied to the size of computer files or the capacity of storage media. See also <i>byte</i> , <i>KB</i> , <i>GB</i> .
Media	See <i>storage media</i> .
Megapixel	A measure of capability of digital cameras.
Memory	A storage capacity that the computer uses for quick, on-the-fly calculations when programs are up and running. Desktop and laptop computers usually have memory in the range from 32 megabytes to 128 megabytes. Memory is wiped clean when the computer is turned off. See also <i>RAM</i> , <i>ROM</i> . Different from the <i>storage media</i> that the computer uses to store files and programs. Storage media retain files when the computer is turned off.
Morph	A type of motion used in displays. Turns one thing into another.
MPEG	Motion Picture Experts Group. An industry standard file format for video.

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OCR	Optical character recognition. The process of turning an image (or picture) of a document in digital format that search software cannot “read” into a file in digital format that search software can “read.” The OCR software does this by “recognizing” the shape of each letter.
Operating system	Software that controls the computer’s basic functions of displaying images on monitors, storing files, and sending files to printers.
Optical disk drive	A type of disk that is a storage medium for personal computer data. Also called a magneto-optical disk drive. Uses both laser and magnetic technologies to write data onto the disk. Obtains very high data density and therefore high storage capacity. Typical cartridge is slightly larger than a <i>floppy disk</i> but stores from 100 MB to several GB. See <i>storage media</i> .
Optical rewritable	An optical disk that can be recorded and rerecorded in whole or part. Comes in 3 1/2 inch and 5 1/4 inch sizes. Capacity from 128 MB to 5.2 GB.
Optical WORM	Write once, read many. A type of optical disk that can be recorded only once. Typically 1.3 GB to 5.2 GB.
OSP	Online service provider. Companies such as America Online, CompuServe, and Prodigy.
Outtake	A portion of a video deleted during editing.
Path	A set of directions that tells a computer exactly where to find a file.

PDA	Personal digital assistant. A small, hand-held computer usually used to schedule appointments, maintain lists of telephone numbers and addresses, and take notes.
PDD	PhotoDeluxe. A format developed by Adobe for use with photographs.
PDF	Portable Document Format. Format used by Adobe Acrobat; can be read on Mac, Windows, UNIX, and DOS platforms; often used in electronic publishing.
PICT	Picture File Format. Format developed by Apple as the graphics format for Macintosh computers.
Picture-in-picture	A screen display in which a small portion of the screen is devoted to a display separate from the main display appearing on the rest of the screen. In videoconferencing, the picture-in-picture feature may be used on the monitors at both ends to show the image that the other side is receiving.
Plasma monitor	A type of flat panel monitor. Creates images by running electricity through superheated gas. Plasma monitors offer larger screen sizes than LCD flat-panel monitors, usually 37 inches to 50 inches.
PNG	Portable Network Graphics. A file format designed to replace the GIF format for some applications. Used with photographs.
Point	A unit of measurement used for type size. 72 points equal (approximately) one inch; 32 points equal (approximately) one-half inch; 12 points equals (approximately) one-sixth inch.

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PowerPoint	Well-known presentation software produced by Microsoft; sold as part of the Microsoft Office suite and as a stand-alone product.
PPI	Pixels per inch. A measure of resolution.
Presentation	A series of slides. See also <i>slide show</i> .
Presentation software	Specialized software for making visual displays usually described as slides. See also <i>PowerPoint</i> , <i>Corel Presentations</i>
Program	A set of tools for working with a computer. Word processors, spreadsheets, and databases are programs.
Projection screen	Usually a 6' x 8' or 8' x 10' screen with a matte white finish specially treated to reflect light efficiently.
RAM	Random access memory. See <i>memory</i> .
Real-time reporting	A software system that translates a court reporter's stenographic notes or voice dictation into words that are distributed immediately by the court reporter's computer to other computers or monitors in the courtroom.
Remote control	A handheld device for running a projector and moving from slide to slide in a slide show. (Generally like a remote control for a TV set.)
Remote site	In videoconferencing, the location from which a witness will testify who is not in the courtroom.
Reshape	Affect the relationship between the height and width of a document, photo, or other image. Distinguished from <i>resizing</i> in which size is changed without affecting the relationship between height and width.

Resize	Make a document, photo, or other image larger or smaller without changing it in any other respect. Distinguished from <i>cropping</i> in which parts are cut out.
Resolution	Describes the clarity of output. The resolution of scanners and printers is usually measured in dots per inch (dpi). The resolution of computer monitors is measured in pixels and expressed as the number of pixels displayed horizontally and vertically. Input resolution is the resolution available on the scanner. Image resolution is the total number of pixels in a photo. Output resolution is usually the resolution of a printer.
Reveal	Used as a noun, as in “the reveal for that object or slide.” The action used to bring the object or the slide to the screen. See <i>effect</i> and <i>transition</i> .
ROM	Read-only memory. Built-in computer memory containing data that normally can only be read, not written to. ROM contains the programming that allows a computer to be “booted up” or re-generated each time it is turned on. Unlike <i>RAM</i> , the data in ROM is not lost when the computer power is turned off. ROM is sustained by a small long-life battery in the computer.
Sans serif	A kind of typeface design without flourishes. It looks like this and not like this . Good for litigation uses.
Scanning	Scanning is the process of turning paper copies (photos, documents, diagrams, charts, and graphs) into digital files. The digital files are often called images and the process is sometimes called <i>imaging</i> .

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Search engine	Software used to locate a particular word or phrase and to retrieve each document in which the word or phrase appears.
Slide	A visual aid.
Slide show	A collection of slides related to one another and intended for presentation in a particular order one after another. See also <i>presentation</i> .
Split screen	A type of text treatment that has a photo or document on one side and explanatory bullet points on the other, or a document on one side and an explanatory photo on the other, or two documents or photos side-by-side. See also <i>picture-in-picture</i> .
Storage media	Storage containers for digital files. Includes floppy disks, hard disks, external disks, CDs, DVDs, optical disks, zip disks, data tapes.
Stylus	A special pointer used with annotation equipment.
Switch	Usually a hardware device that allows one of several inputs (for example, from a laptop computer, an evidence camera, or a VCR) to be displayed on one output device (such as a monitor or set of monitors). The switch allows the user to change from one input to another.
T1 line	A high-speed digital line used to transmit data. Capable of transmitting at 1.54 Mbps.
Telestrator	Equipment that allows markings on a tablet to appear as an overlay on an image on a monitor. A <i>light pen</i> or <i>touch screen</i> performs the same function.

Template	A preselected set of background and fill colors, text fonts, and other design features that are used in creating slides.
Text treatment	See <i>treatment</i> .
TGA	Targa format. Developed by TrueVision Corp. to combine Macintosh graphics with live video.
Thumbnail	Miniature pictures or thumbnail sketches of the slides in a slide show. This allows the user to locate a particular slide or to edit the slide show.
TIFF	Tag Image File Format.
Touchscreen	A computer monitor that allows annotations to the image appearing on it by drawing on the screen with a finger or stylus; the annotations are projected to all other monitors to which the computer generating the image is connected. A <i>light pen</i> or <i>telestrator</i> performs the same function.
Transition	Motion that appears when moving from one slide to the next in a slide show. Distinguished from <i>effect</i> or <i>animation</i> which is the motion that is added to make objects within one slide appear one after another.
Treatment	Additions to a display, usually a document, for emphasis. Box, circle, line, callout, and split screen are examples of treatments.
Typeface	The name of a particular design for type. Times New Roman and Arial are examples.
Type size	The sizes available for a particular typeface. Usually expressed in points.
UNIX	A computer operating system.

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VCR	Video cassette recorder. Although it is called a “recorder,” it is in fact a unit that is most often used to play pre-recorded videotape cassettes. Usually has controls for play, pause, stop, rewind, fast forward, and slow.
Vector graphic	A graphic that is made by connecting dots with straight lines. Compare to bitmap graphic.
Video clip	A segment of digital video.
Visual aid	Something used in a courtroom to help the jury understand the testimony. See also <i>illustrative aid</i> .
Visualizer	See <i>evidence camera</i> .
Visual presenter	See <i>evidence camera</i> .
VPN	Virtual private network.
Wireless mouse	A mouse that operates by radio signals.
Wireless remote	A remote control that operates by infrared signals.
Word	Word processing software published by Microsoft.
WordPerfect	Word processing software published by Corel.
Zip file	A file that has been compressed using one of the versions of the Zip software such as PKZIP or WINZIP.

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HOW TO USE THE CD

Using the book from the CD

The contents of the book are in one Adobe Acrobat file named cttechno.pdf on the CD. Using Acrobat or Acrobat Reader (free from Adobe Systems at www.adobe.com) you can open and print the contents of the book or read it on screen.

Playing the PowerPoint show

Hardware and Software Requirements

- An IBM-compatible laptop or other computer, with at least 16 MB of RAM (PowerPoint runs faster with 32 MB of RAM);
- A CD drive in your computer or attached to it; and
- PowerPoint 2000 or PowerPoint 97.

If you would like a version of the PowerPoint show for a Macintosh computer, please send an e-mail to court_technology@fjc.gov.

Starting the PowerPoint Slide Show

After inserting the CD, you must open the slide show in PowerPoint. To do this:

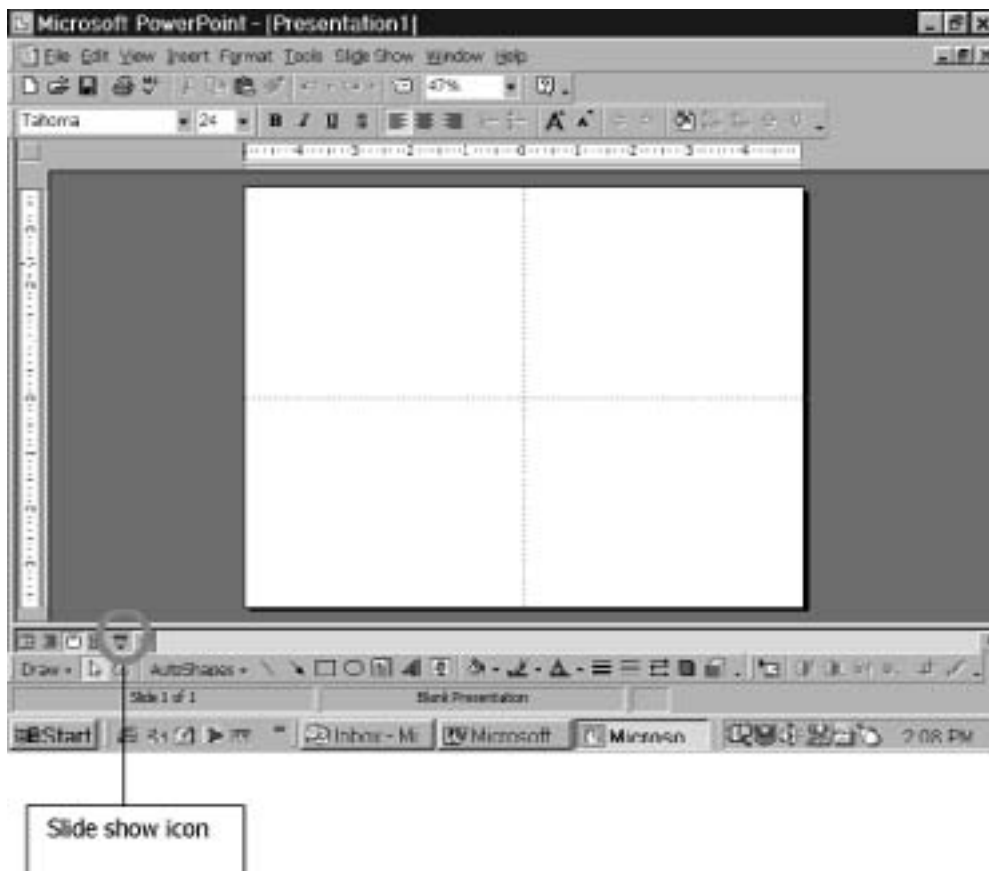
- Double click on the “My Computer” icon located on the desktop. In the window that opens, locate the CD icon and double click on it. This will open a new window that will include “Judge’s Guide Slideshow.” Double click on the icon for this file, and PowerPoint will automatically start and load the slide show.

Or

- Start PowerPoint. On the opening screen, click on the option “Open an Existing Presentation.” Use the dialog boxes to locate the CD drive, and then open “Judge’s Guide Slideshow.”

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The entire show contains about 100 slides that illustrate how presentations can be used at trial. Most of the slides contain anima-

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The slides are organized in 13 major sections. If you would like to jump quickly to beginning of one of these sections or to any particular slide, simply type the slide number and then press the “Enter” key. The beginning slide numbers for each major section are:

Bulleted Lists	Slide 2
Exhibit Treatments	Slide 13
Side-by-Side Comparisons	Slide 25
Timelines	Slide 29
Charts	Slide 35
Diagrams	Slide 40
Photographs	Slide 48
Illustrations	Slide 58
Anatomical Illustrations	Slide 65
Video	Slide 77
Deposition Treatments (included video)	Slide 79
Jury Instructions	Slide 85
Argument Slides	Slide 92

To look at “thumbnail” images of the entire slide show, select “View” on the PowerPoint menu bar, and then select “Slide Sorter,” or click on the icon immediately to the left of the Slide Show icon located near the bottom left of the PowerPoint screen (see diagram above). Small images of the slides will appear in their order of appearance in the slide show, along with their slide number. If you would like to jump quickly to any particular slide in the show, simply start the show and then type the slide number and press the “Enter” key.

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