**DEPARTMENT OF THE ARMY TECHNICAL BULLETIN**

# AUDIO-VISUAL SERVICES

**Headquarters, Department of the Army, Washington, D.C.**
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**1. Introduction.** This is the first in a series of bulletins entitled Audio-Visual Services. These bulletins will be applicable to photographic services, television services, audio-visual support center services, and related subjects. Its intent is to enable and encourage the exchange and dissemination of audio-visual information. It, will assist all interested persons to stay abreast of Army policy, new techniques, and latest industry developments. Suggestions and proposals for future bulletins and subject material are encouraged. Inquiries, formal and informal, for additional information and/or guidance are also encouraged and should be addressed to Headquarters, Department of Army, Office of the Chief of Communications-Electronics, ATTN : Chief, Audio-Visual Division, Washington, D.C. 20315.

**2. Responsibilities of Chief of Communications-Electronics.** The Chief of Staff, U.S. Army, has charged the Chief of Communications-Electronics with the responsibility for reviewing, coordinating, and supervising all Army audio-visual activities. In fulfilling these new responsibilities greater efficiency and economy is sought within the functional areas of photographic, television and film distribution/utilization services and in the support of these functions.

**3. Opportunities for Improvement in Certain Audio-Visual Activities.** A number of opportunities for improvements in management and conduct of these audio-visual activities exist. Surveys, liaison valid reports have surfaced certain needs for further attention to the prevention or elimination of deficiencies. Specific types of deficiencies or potential deficiencies are listed below. Action by commanders to determine current, status within their jurisdiction and to initiate appropriate action is a matter of importance.

*a.* Valid requirements must exist as basis for all requests for authorization for expansion of existing photographic, television and audio-visual support center (film distribution and utilization) facilities, or activation of new facilities.

*b.* Duplication of facilities is unjustifiable except in those few cases where unusual mission requirements make it necessary for an organization to maintain a "sole-user': facility even if another exists in the same area. Action should be taken by commanders to initiate consolidation where appropriate.

*c*. The various portions of a single facility; i.e., the studio, maintenance, and supervisory portions of a television facility, should all be together as opposed to location in separate areas.

*d.* All facilities should be fully utilized in meeting bona fide, valid requirements for services. For instance, coverage of civilian activities, social events, parades, presentation of awards, and visiting dignitaries will be limited to justified official requirements.

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*e.* The complementary capabilities of the various elements of audio-visual services (television, photographic, and film distribution and utilization centers) need further integration and central supervision of utilization from the overall audiovisual services standpoint.

*f.* Loan of high cost equipment from pools is encouraged in situations where equipment is not constantly used; i.e., certain instrumentation photography activities.

*g.* The professional qualifications of specialists, especially those newly entering the field as serve school graduates or from other sources must be further improved by comprehensive on-the-job and related training.

h . Orientation on supervision and management of audio-visual activities, and on optimum utilization of audio-visual media is required for officers, noncommissioned officers, and DA civilians in management positions.

*i.* Peak efficiency in employment of resources and in technical operations, and the management thereof is essential.

*j*. Technical quality of photographic and television output must be constantly monitored.

*k*. Efficient television production procedures emphasizing rapidity, simplicity, and low costs must be followed.

*l*. Additional coordination with other Services in technical applications and cross servicing is encouraged.

*m*. Users of photographic and television services must ensure validity of their requests.

*n*. In some cases the diverse logistical requirements of photographic service and maintenance are not fulfilled responsively, thereby hindering responsive audio-visual service to users.

*o.* The Defense General Supply Center should be utilized to the greatest extent practicable to obtain audio-visual expendable materials.

*p*. Users should forward Equipment Improvement Reports DA Form 2407 (maintenance Request) in accordance with TM 38-750 in order to justify modification and improvements of equipment.

*q.* There should be optimum use of staff pictorial and audio-visual personnel.

**4. Television Recordings To Fulfill Certain U.S. Army Military Training Requirements.**

The following describes and recommends procedures which will facilitate the conversion of military training requirements into television recordings. The procedures to be described emphasize fast responsiveness in preparation of audio-visual aids by television means.

*a.* The major source of training requirements for conversion to television recording lies in ongoing U.S. Army instruction. This instruction is based upon an approved lesson plan which outlines the major points to be taught. This outline is followed by the instructor presenting his lesson. During his presentation, he may, depending upon their availability and his resourcefulness, use charts, mock-ups, actual pieces of equipment, and similar training aids.

*b.* The criteria for selecting suitable on-going units of instruction for subsequent conversion to television recordings are simple and straightforward. They are as follows:

(1) The opportunity to record the presentation made by the best instructor. When completed, this recording can be used to upgrade the effectiveness of other instructors of lesser ability and to lessen the effects upon the course effectiveness when this outstanding instructor departs.

(2) The need to provide students with closeups of equipment, devices, actions, inaccessible areas, and similar requirements. In this application the close-up advantages of the television camera will be utilized.

(3) As an aid to teaching of manual skills. In these applications the television recording shows the student the correct way of disassembling, repairing, putting together, or manipulating tools and equipment. The aim is to improve subsequent, performance upon the skill and not to substitute for actual student practice on tile equipment.

*c.* From the pool of on-going military instruction, various hours of instruction can be selected using these criteria. The next requirement is the conversion of the selected subject matters into television recordings. The recommended procedures are as follows:

(1) The lesson plan should be regarded as the framework or "preliminary script"' for producing the television presentation.

(2) In coordination ,with a training specialist, a television production specialist should view the instruction as it is going oil in the classroom with a view to identifying critical training incidents.

For example, with the aid of the training specialist, all requirements for television closeups of the equipment, devices and actions can he identified. This will aid the television production specialist in the use of closeups for demonstrating these actions. Any additional suggestions for the improvement. of the classroom instruction can be of fairly simple and inexpensive nature.

(3) In .addition to the closeup, there is the "split screen" which permits the television presentation to be divided in half so that the correct way of doing things call 'be demonstrated on the left side of the screen and the incorrect way on the right side. Superimposures, which describe the placement upon the television pictures of titles, names, nomenclatures, and similar ways of reinforcing student learning by converting picture and words can be used.

(4) Following this preliminary run through, the television production specialist can then arrange for the instructor to rehearse before the television cameras and present his material as he had in the classroom. .At this stage he may note the adequacy of classroom aids, the effects of closeups as they appear on the screen, as well as any special techniques he may have desired to use. The television production specialist also gains information about the placement of his camera or other television equipment.

*d.* One more rehearsal may be required before the cameras to take into account any subsequent, changes in aids, camera placement procedures, and lighting. Following this the final recording of the instruction can take place.

*e.* In this procedure the instructor is not required to develop any written scripts. He relies on the approved lesson plan and what. he ordinarily teaches ill the classroom. The television production specialist may also use this classroom outline to make notes as to camera placement and other activities related to the use of the television equipment.

*f.* The net effect of this procedure is to make available quickly many hours of effective Army instruction. Extensive research has shown that the presentation of effective classroom instruction via television does not reduce the effectiveness of this instruction. Therefore the employment of an effective classroom instructor in the manner described above should serve to enhance the training mission of an installation. Later, if required, steps may be taken to further improve the presentation. These improvements should reflect demonstrated inadequacies in student learning rather than unsupported opinion. Unnecessary, complicated, and expensive TV production procedures which involve lengthy detailed scripts, expensive training aids, and other special items should be avoided. While there is a proper use for this more complex approach in the preparation of certain special subjects, an important, segment of Army training can be quickly and effectively adapted to television production by adherence of techniques described in 4 above.

*g.* Following the procedures discussed above, a production rate by a television production team of one fifty-minute completed recording per day is a realistic capability.

**5. Television Projectors.** *a.* The capability to display dynamic information on large size projection screens has many applications. The ability to reproduce displays of rapidly changing information is an inherent advantage of projected television displays.

*b.* Applications of this capability exist in the areas of Data Display, Traffic Control, Briefing Conferences, Educational Environments, and many others.

*c.* The selection of projection equipments available to meet these requirements is limited. They fall into two price categories, projectors that cost less than $5,000 and those that, cost approximately $49,000.

*d.* The lower cost units employ a, Schmidt optical system for projection of picture information. The higher cost units utilize a light amplifier technique.

(1) *Schmidt optical system projectors*. The Schmidt system employs a .cathode-ray tube (CRT) so positioned that the light from its displayed image is reflected from the surface of a concave mirror, through a correction lens and through a suitable projection lens to a display screen.

(a) The brightness of the Schmidt system is limited by the maximum brightness of the CRT, less the losses that take place within the light transmission path .

(b) Manufacturers claim satisfactory pictures varying in width of 6 feet to sizes employed in motion picture theaters for large audience viewing. Equipment brochures general rate the light output from these projectors in foot candles per square foot, based on a screen from 6 to 8 feet wide.

(c) The high-light brightness reproduced on the screen will be in the magnitude of 5-foot candles per square foot.. This high-light. brightness will represent the brightest area within a projected picture therefore, other shades of gray will be represented by lesser amounts of light. The range for contrast reproduction from black to white, will be in the order of 10 to 1.

(d) In order to obtain maximum light output from these projectors the electron beam current within the CRT normally is increased to its upper operating limit. Brightness (light output) is dependent solely upon the quantity of electron beam current and the residing time of the electron beam on a phosphor area.

(e) Operational history of these units includes such occurrences as CRT imploding. This has occurred when the vertical and horizontal protection circuits in the deflection system have failed simultaneously. The high beam current required to develop maximum CRT light output can penetrate the glass face plate of the CRT. A common cause for CRT replacement is phosphor burning as the result of particle deflection failures.

(f) The brightness or light intensity of a projected television picture from a CRT source is relatively low in brightness when compared with other types of projection equipment that utilize incandescent light sources.

(g) Operational experience has shown it is necessary to reduce the normal ambient room lighting to a negligible level (less than 10 percent of projected high-light brightness; room light in excess of this quantity will reduce the necessary 10 to 1 contrast range) and utilize front screen projection techniques. Rear screen projection would further reduce the picture light available, due to the transmission loss of light through the projection screen.

(h) In order to permit maximum available light to reach the projection screen, the optical system must be kept surgically clean. Television projectors require high voltage supplies that attract dust particles from the air. Since optical paths are in the immediate location of these supplies, constant cleaning becomes a necessity. Numerous innovations have been fabricated to eliminate this problem, but current solutions still leave much to be desired.

(i) Projection screens are available with effective gain factors; these normally are rated on front projection techniques. The screen surface collects and reflects focused light toward the audience.

(2) *Light amplifier projectors*.. The lighter cost units which utilize a light amplifier technique, sometimes referred to as controlled layer projectors, or light valves, have application where the requirement is of such magnitude that properly trained personnel can be provided to perform operations and the necessary routine maintenance.

(a) The projected light obtainable from a light valve is derived from a xenon arc lamp. This light is controlled by passing it through a layer of oil modulated by electrons from an electron gun similar to the one used in a conventional cathode ray tube. The incoming video signal is applied to the electron gun, hence the modulation is impressed by electrostatic action upon the surface of the film of oil. It is the disturbance of the oil surface that permits the xenon source light to be reflected through a proper combination of lens, onto a projection screen. This is an oversimplification of the operating principle of controlled layer projections, but will suffice for the purpose of this Technical Bulletin.

(b) Major operational problems associated with light valve projection are cathode failures and leaky vacuum systems. Major overhaul requirements would require extraordinary procedures and necessitate returning the equipment to the manufacturer for such services.

(c) In contrast to the routine maintenance problems associated with the Schmidt projection systems, the controlled layer projections present maintenance requirements that are foreign to military trained television personnel. Additional training of technicians would be necessary to permit maximum utilization of light valve systems.

(d) The general size (two cabinets, 70 x 28 x 50-in. and 38 x 14 x 18-in.) and weight involved (approx. 1,200 lb) requires special handling when utilized as a portable unit.

(e) In consideration of problems encountered in the areas of CRT phosphor burning, imploding CRT's, limited high output, cleaning, and the unstable picture size obtainable from low cost television projectors of the Schmidt Optics variety, potential requirements must be carefully evaluated by the requesting agency. The high cost., and requirements for highly trained operational and maintenance personnel for light amplified television projectors, requires careful evaluation by the requesting agency as to whether there is a bona fide requirement. The multiple utilization of television monitors at most effective positions within audiences is recommended in lien of television projections. Department of Army policy is not to authorize the purchase of these projectors unless the proposed applications are fully justified.

**6. Replacement Items for TV Systems Previously Approved as a Class IV Project (DEV).**
Once a Class IV project has been approved and is operational, it is the responsibility of the commander to initiate action to modify the TDA (AR 310-49) to reflect the television items. Therefore, when an item an item of TV equipment must be replaced due to Fair Wear and Tear (FWT), a Class IV Project (Dev) is not required since the authorization is contained in the TDA.

**7. Test Equipment**. Within a television facility, on of the most versatile pieces of test equipment is a general purpose television waveform monitor. It should have as a minimum the following characteristics:

*a.* The television waveform monitor should consist, of a self-contained cathode ray tube oscilloscope designed primarily for the monitoring- and measuring of video waveforms. It should be capable of displaying any portion of a composite or noncomposite television signal. In general, this type of monitor is available in either a standard 19-inch rack or a field case configuration.

*b*. The monitor should be capable of operating at the system standard--525 lines at 160 cycles, or other if necessary. Instruments of this nature must be designed for continuous duty operation and expedient maintenance. All operating controls should be located on the front panel for ease of operation. The graticule (scale) covering the scope tube should be marked in Institute of Radio Engineers units, and easily changeable to other scales, if required. Engraved graticules and adjustable edge lighting should be available. Input cable connectors should be located on the rear of the chassis; however, it will prove an additional convenience to have one additional input located on the front panel. The type of connectors should be in line with those used throughout the system.

*c.* The necessary inputs to this device normally are the following: Video inputs, synchronizing inputs, and a calibration input. It should be kept in mind that the necessary impedances and signal level capabilities must exist at these inputs. Normally, it is desirable to have the input signal circuits available on a selector switch. This capability should have switchable impedances to permit self-termination or a bridging mode of operation. Under certain operation conditions, it is advantageous for the instrument to have internal calibration signals. This requirement usually does not exist if the facility is operation from one single system standard for calibration. The necessary controls should be available for the cathode ray tube display. These should be mounted on the front panel for operator convenience. Sweep displays, horizontal and vertical, should be defined along with system scan requirements, including the signal expansion needs, if any.

d. Within the television facilities, it is required to view either odd or even fields and, on occasion, view a line; this would require the necessary field shift control and the proper output terminal for feeding a picture to a monitor for line identification. The scope should provide the necessary frequency response characteristics selectable on a front panel control.

**8. Supplies**. Video tape, quadruplex ;transverse scan laterally oriented is now available from the Federal supply schedule. Pertinent information can be obtained from the FSC Group 58, Part V, Communications Equipment, Class 5835, Catalog.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
*General, United States Army,*
*Chief of Staff.*

Official:

KENN:ETH G. WICKHAM,
Major General, United States Army,
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# The Metric System and Equivalents

### *Linear Measure*

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

### *Weights*

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

### *Liquid Measure*

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

### *Square Measure*

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

### *Cubic Measure*

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

## Approximate Conversion Factors

| *To change* | *To* | *Multiply by* | *To change* | *To* | *Multiply by* |
|---|---|---|---|---|---|
| inches | centimeters | 2.540 | ounce-inches | Newton-meters | .007062 |
| feet | meters | .305 | centimeters | inches | .394 |
| yards | meters | .914 | meters | feet | 3.280 |
| miles | kilometers | 1.609 | meters | yards | 1.094 |
| square inches | square centimeters | 6.451 | kilometers | miles | .621 |
| square feet | square meters | .093 | square centimeters | square inches | .155 |
| square yards | square meters | .836 | square meters | square feet | 10.764 |
| square miles | square kilometers | 2.590 | square meters | square yards | 1.196 |
| acres | square hectometers | .405 | square kilometers | square miles | .386 |
| cubic feet | cubic meters | .028 | square hectometers | acres | 2.471 |
| cubic yards | cubic meters | .765 | cubic meters | cubic feet | 35.315 |
| fluid ounces | milliliters | 29,573 | cubic meters | cubic yards | 1.308 |
| pints | liters | .473 | milliliters | fluid ounces | .034 |
| quarts | liters | .946 | liters | pints | 2.113 |
| gallons | liters | 3.785 | liters | quarts | 1.057 |
| ounces | grams | 28.349 | liters | gallons | .264 |
| pounds | kilograms | .454 | grams | ounces | .035 |
| short tons | metric tons | .907 | kilograms | pounds | 2.205 |
| pound-feet | Newton-meters | 1.356 | metric tons | short tons | 1.102 |
| pound-inches | Newton-meters | .11296 | | | |

## Temperature (Exact)

| | | | | |
|---|---|---|---|---|
| °F | Fahrenheit temperature | 5/9 (after subtracting 32) | Celsius temperature | °C |

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