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ABSTRACT

The guide opens with a discussion of television's limitations: its initial blankness; its technical constraints; its need for studios; its relatively high costs; the need for extensive planning; and its need to be integrated into a broader program. A discussion of television's strengths follows: its flexibility; its ability to focus and magnify; its virtually universal availability; its complementarity with other media; and its economy, especially in terms of saving manpower. The bulk of the guide offers illustrated, easily-understood, technical and operational descriptions of television equipment (both video and audio), and similar discussions of such supporting activities as graphics and lighting. A concluding eight-page section outlines in some detail a method of preparing for and executing a television production that is applicable to most types of instructional production, and also deals with production personnel, conferences, materials, scripts, rehearsals, and actual telecasting. (JR)

TELEVISION BASICS

FOR

TV-ABE INSTITUTE

University of Maryland

July 1969

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THE MEDIUM AND ITS USES

Perhaps one of the greatest single problems to haunt educators seeking to use television has been a misconception of its purpose and its identity. To many, television has seemed a panacea, an entity which could revolutionize education, save large sums of money, and somehow take over many of the burdensome jobs of teaching. Nothing could be further from the truth; television is not an entity, particularly in education. Television is just a medium, like the textbook, the film, the overhead projector. To be sure, television is a rather flexible medium, and it can be used in a variety of ways and in a lot of varying situations, but it is still just a medium, subject to the limitations of all media.

The most important limitation of television as a medium of instruction would seem to be its essential emptiness. Like a blank page in a textbook or an unexposed frame of motion picture film, television contains nothing until some sort of stimulus is placed in the vacuum. What this means for the educator is that the bulk of the effort in producing any kind of educational television experience is involved in shaping the stimulus which will be captured by the camera and the microphone and eventually transformed into the sound and picture image which emanates from the television screen.

A second limitation of television as a medium of instruction is an outgrowth of the first; it deals with the limitations dictated by the medium of the structure of the stimuli to be carried. Just as a printer is limited by space as to the number of words or the size of the pictures he places on a page, the television producer-director is limited as to what he can show or what sounds he can expect to reproduce. Many of these limitations are of a technical nature. For instance, size, shape, and color are largely technical considerations. Remember that the effective end of the television system is the viewing screen and although there are means of large-screen projection, most people receiving instructional television are viewing receivers equipped from the small 8" personalized screen to the large 24" screen used on some home sets and many classroom receivers. But regardless of the size of the screen, the material presented must fit within the dimension limitations of the medium. We call this requirement aspect ratio, and it simply means that no matter how large a visual stimulus is, it will be reduced to the size of the viewer's screen in dimensions three parts high to four parts wide. In order to fill the viewer's screen, then, with an electronic reproduction of a painting fourteen inches high and fourteen inches wide it would be necessary to "crop" some of the painting so that it could be accomodated to television's aspect ratio of 3 X 4. On the other hand, if we wish to show an entire scene of a discussion involving four or five people, we would have to severely reduce the size of the individuals in the scene in order to accomodate them in the relatively small area of the television screen. If color is important to an educator, it is vital that he have access to high-quality color television production equipment and that the viewing students have access to high-quality and properly adjusted color television receiving sets. Even at this late date, a great many instructional television installations are not equipped for color production and only about 35% of the television households in the United States are equipped to receive color. There are many other manifestations of technical limitations of the medium, some involving sound, some involving producing and directing principles, and some simply involving availability of material, but these have been discussed elsewhere in the notebook and in your text.

A third limitation of television involves the restrictions of studio production. Since a great amount of light is needed for satisfactory television signal production, together with special outlets for such important equipment as microphones, camera cable, lighting instruments, and monitors, most television production takes place in specially designed structures known as studios, where production can be done in a carefully controlled environment and can be managed from a central control room. The obvious limitation here is that anything to be televised must be brought to the studio and placed in the space available. To be sure, there are ways of extending the environment, such as using 16mm film, 35mm slides, or actually taking the cameras to a distant point for a remote broadcast, but for all these things special equipment is required and in some cases the operation may be prohibitively expensive.

A fourth limitation of television in education is the cost of installation and maintenance. Although a very simple closed-circuit system may be installed for as little as $65,000, more sophisticated -- and hence more flexible -- systems will cost upwards of $500,000. Staffing and maintenance may run from a few thousand dollars to upwards of $40,000 per year. In closed-circuit instruction the rule of thumb seems to be that television is more expensive than traditional instruction for up to 200 students. Between 200-300 students, expenses are about the same, and when more than 300 students are involved, televised instruction becomes cheaper than face-to-face instruction.

A fifth limitation of television in education is the amount of planning required to make it work effectively. Not only does every lesson need to be planned carefully to achieve the desired goals, but the series of televised lessons need to be structured in the most effective manner. Beyond this, attention has to be given to the part of the day in which the lesson is to be viewed. In the case of school television, the televised lesson must fall at a convenient as well as appropriate time in the school day. In the case of the home viewer, the lesson must be scheduled at a time when the maximum number of potential viewers is available. All this is made especially difficult since the program in all likelihood hoes not exist by itself, but rather must fit into a schedule of numerous other televised presentations.

The last limitation of television as a medium of instruction to be mentioned here is that of the utilization of the program. Again, like the film strip, motion picture, or text book, television works best when it is integrated into a unified educational experience. Although it is true that in the absence of a school or a teacher, learning can take place with just a student and a television set (providing that the proper stimulus has been placed in the television system), it appears to be most effective when used as an enrichment experience to extend the horizon of the learner. For instance, when there is an opportunity to prepare the student for the program and then to discuss the program or to give the viewer an opportunity to practice what he has learned, the psychological experiences of expectation and reinforcement have been supplied and the learning situation improved.

Just as an understanding of the limitations of television is necessary to its effective utilization, so is an understanding of its strengths as a medium of instruction.

First of all, television can be an extremely flexible medium. With proper equipment almost any other medium may be translated into television. Television can become, in a sense, a text book, complete with text, photographs, and illustrations; where necessary the written text may be supplemented by an oral reading of the material. Virtually any film may be directly or indirectly shown on television, either in the 16mm form or on videotape. Thirty-five mm slides can be shown directly on most slide chain systems and larger slides may be projected on either front or rear projection screens and transmitted by the camera. Within the limitations of screen size and aspect ratio, any painting, graph, map, drawing or photograph may be shown on television. Dramatic presentations, concerts, meetings, discussions may be televised directly or filmed and shown on television later. In addition, through modern special effects systems it is possible to use several sources at the same time. For instance, it is an easy matter to have a film showing a close-up of a given procedure appearing in a portion of the television screen, while a more complete shot of the same operation occupies the remainder of the area.

Secondly, television has the ability to focus attention and to magnify. In many demonstrations it is important to let the viewer see exactly what is happening. The powerful lens of a television camera is useful in magnifying the important parts of a demonstration and excluding portions that may be distracting or non-essential. In simple lecture-type material, the camera can single out key words or portions of a schematic, in order to focus attention where it belongs.

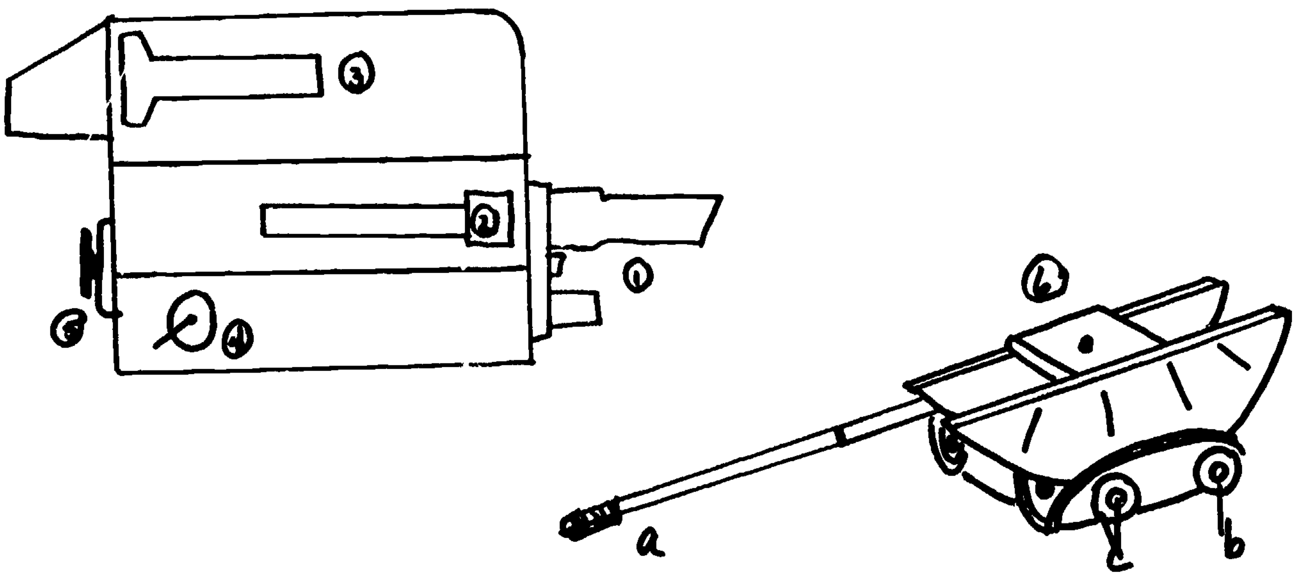
Third, although closed circuit television is limited to those receivers wired to the system, broadcast instructional television is almost universally available. Anyone with a receiver capable of receiving the signal has access to the lessons. There are not the problems attendant to film use of acquiring the film itself, a projector, and a screen or of acquiring sufficient copies of text books for everyone to use.

Fourth, television may be effectively used with other educational media. Television works well as a supplement to direct teaching, to text books, and to work experiences. Conversely, lectures, texts, demonstrations, workbooks, and films work well as supplemental material to television when it is used as the primary teaching device.

Finally, television can, when properly utilized, save both money and manpower by permitting maximum effort in the preparation of the televised lesson and lessening the need for many small-group instructors. The best people can be charged with the responsibility of presenting the material and the best available means can be explored to present the material.

An understanding of the basic strengths and limitations of television as a medium of instruction is an essential starting point in planning your instructional program. From that point, your own inventiveness, together with your own specific educational goals will furnish the best guidelines for using this exciting medium to best advantage.

THE CAMERA



1) Optical system. Lenses mounted on a rotating turret. The complement of lenses can be replaced by a zoom lens (variable focal length)

2) Television pick-up tube. Cameras are classified by the type of TV tube they contain

a) Vidicon: operating light level 150 to 200 candles
insensitive to burn-in
can handle high black & white contrast

b) Image-orthicon:
operating light level 75-100 foot candles
sensitive to burn-in
sensitive to high contrast. Picture quality improves with limited contrast range

c) Plumbicon:
modified vidicon tube
operating light level 75-100 foot candles
insensitive to burn-in
can handle high contrast range

3) Camera viewfinder. A small monitor that reproduces for the cameraman the exact picture his camera is picking up. It has its own set of controls (contrast, brightness). Adjustments of the viewfinder do not affect the picture being produced by the camera.

4) Focus knob. Knob is rotated to bring desired objects into focus. Rotation of the knob moves the TV pickup tube within the camera, not the lens.

5) Lens turret handle. Rotation of the lens turret handle changes the lens mounted on the front of the camera. There is a lock position for every lens on the turret.

6) Cradle head. The mounting device that connects the camera to the dolly or tripod.

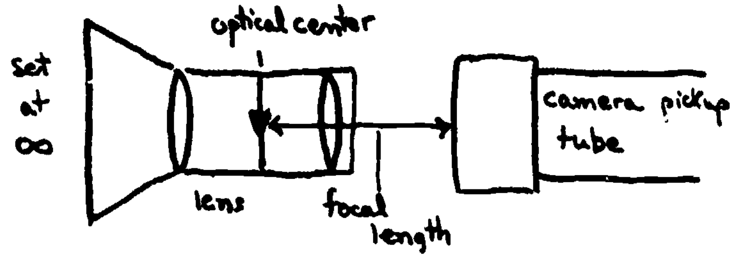
a) Panning handle. Adjustable to suit the camera operator
b) Horizontal control
c) Vertical control

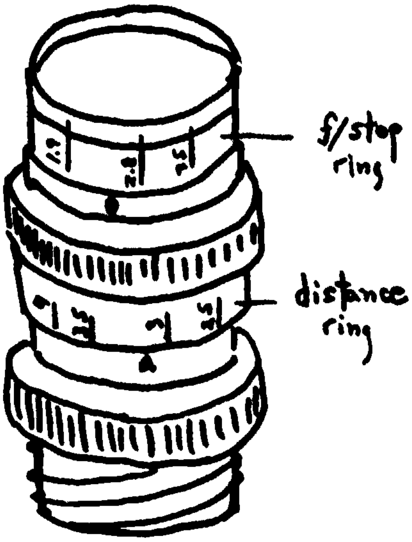
Color Camera

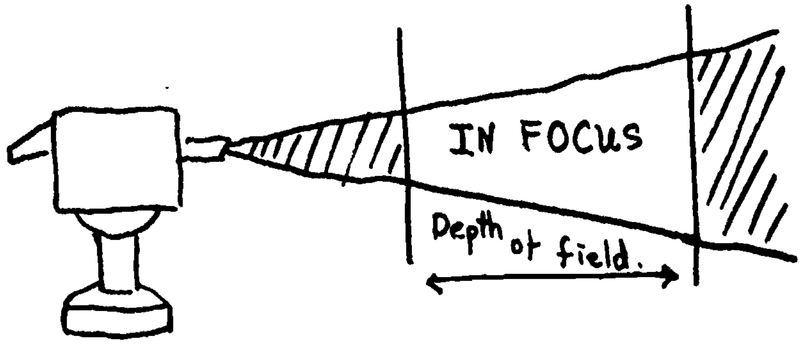
Basically, within the color camera, incoming light is broken up into its three additive primary colors (red, green, and blue) by a system of prisms, mirrors and relay lenses. Each primary color is directed into its own TV pickup tube, or chrominance channel. In some cameras a fourth channel, called the luminance channel is used to produce the black and white picture. The pickup tubes used are plumbicon, vidicon or in some cases image orthicon (I.O.) tubes.

Operating light level 250-500 ft. candles. Recent developments have enabled newer models to operate at light levels as low as 50 ft. candles
Relatively insensitive to burn-in
Good contrast range, but areas of extreme contrast make maintenance of true colors difficult.

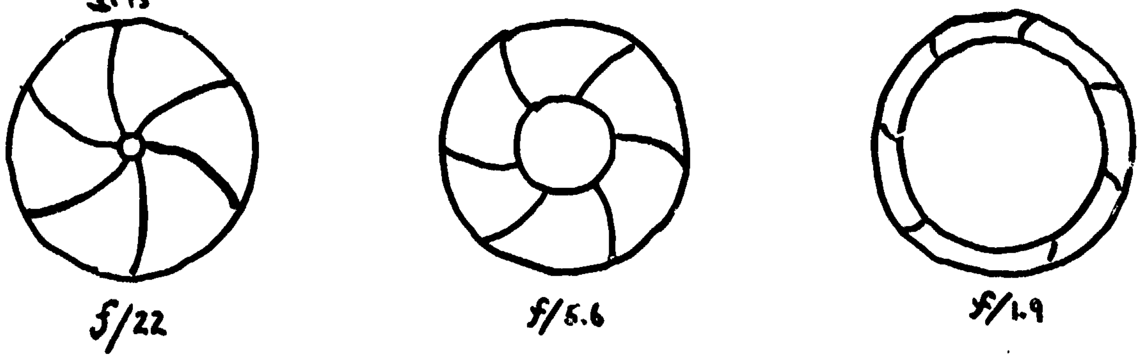
Optics







Iris



Optical Characteristics

Focal length: A specific optical measurement. It provides a means of classifying lenses: 35mm, 50mm, 1", 2", 12" etc. The shorter the focal length, the wider the angle of view. (A zoom lens has a variable focal length)

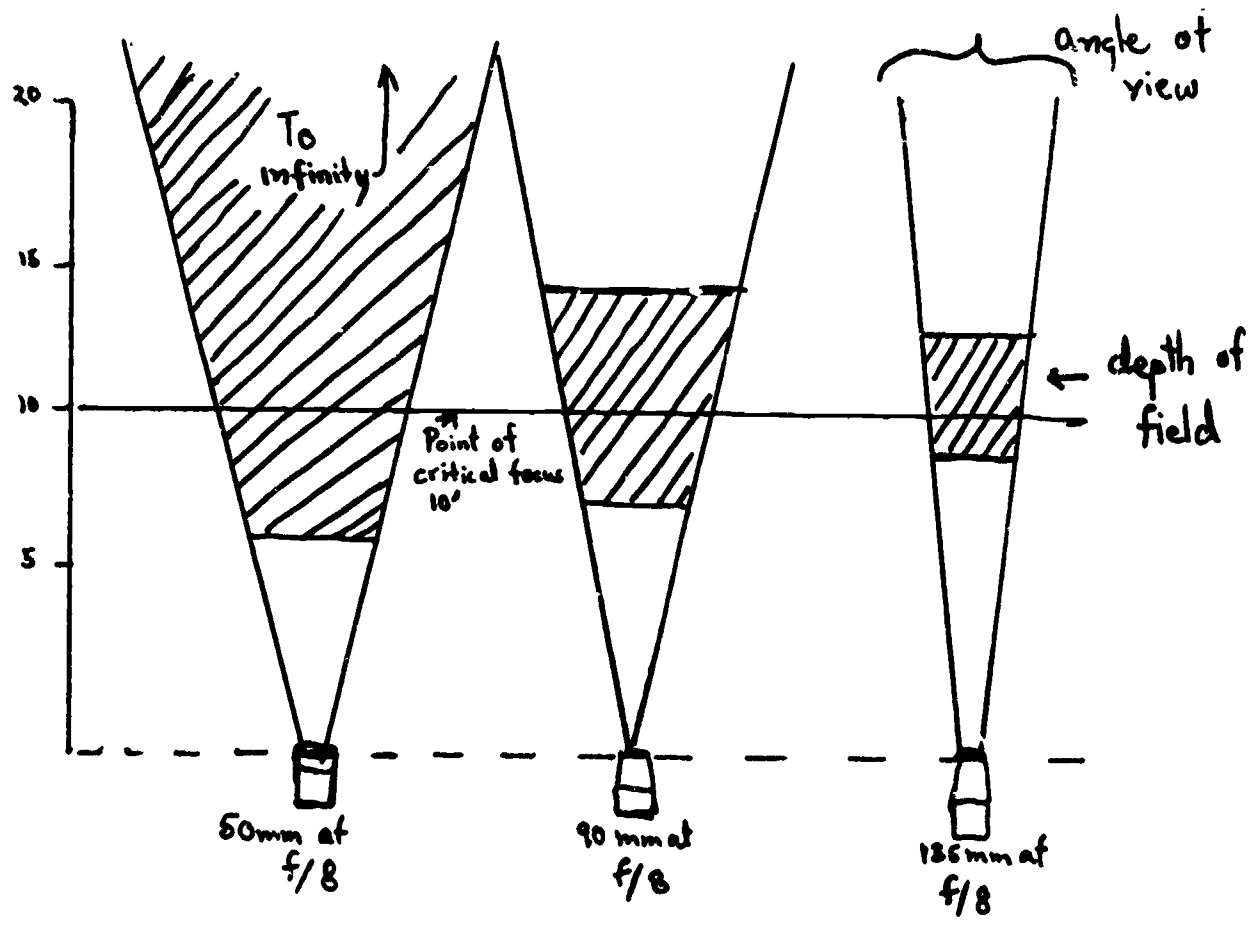
Focus: Sharpness of image, determined by distance from lens to surface of TV pickup tube. Adjustment can be made on distance ring of lens, focus knob on camera, or by changing distance from lens to subject. (Note: in zoom lenses, the optical elements within the lens are moved to obtain sharp focus)

Depth of field: Area in space in which objects are in focus. Area in front of and behind this space will be out of focus. Depth of field can be controlled by:

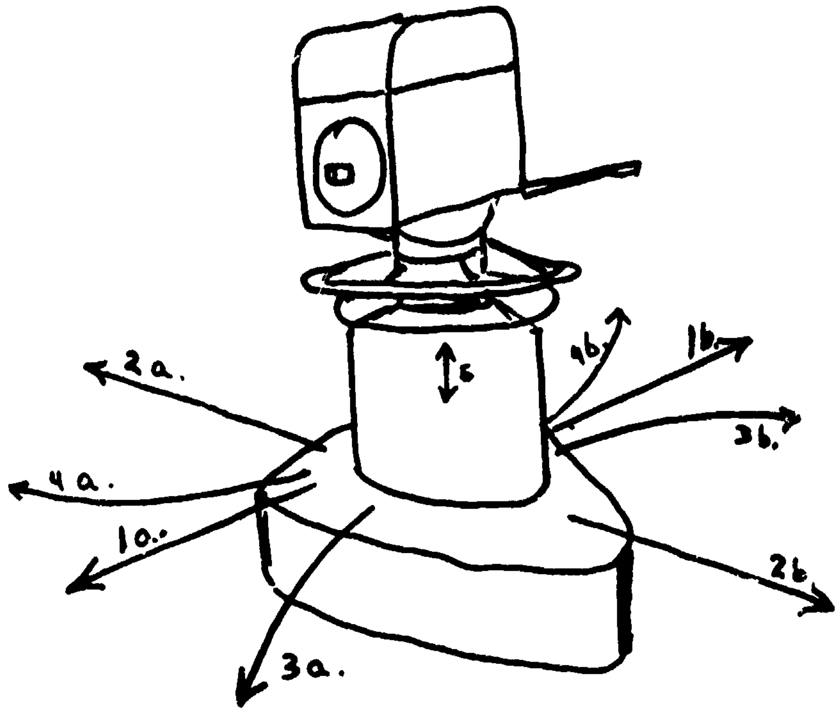
a) focal length (the shorter the focal length, the deeper the depth of field)

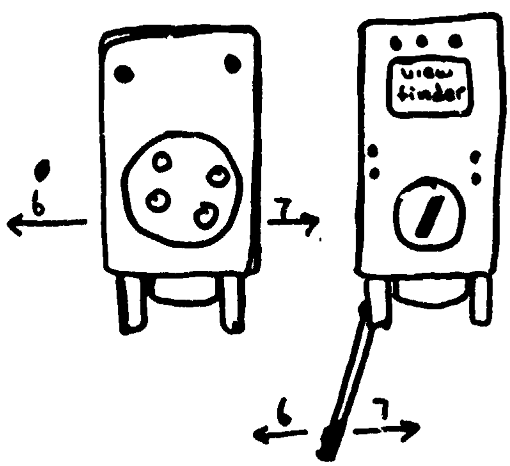
b) f/stop (the smaller the iris opening - large f/stop number - the deeper the depth of field)

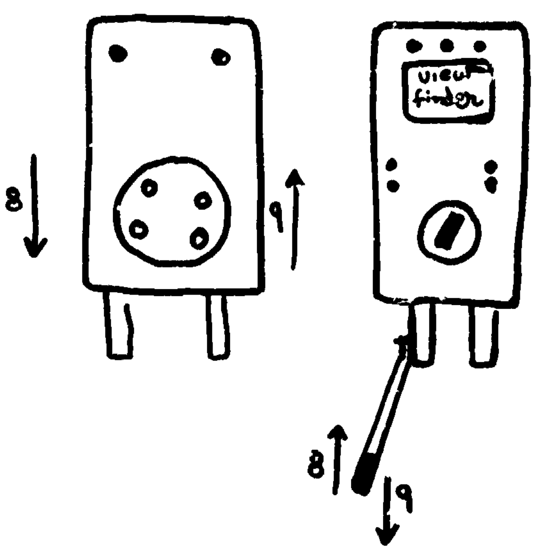
c) distance from camera to object (the farther an object is from the camera, the deeper the depth of field)



Camera Movement







Camera Movement (Con't)

Numbers refer to diagram.

The following are movements of the camera dolly or pedestal

1a. Dolly in (straight to subject)
1b. Dolly back or out (straight back)

2a. Truck right (parallel to subject)
2b. Truck left

3a. Arc in left
3b. Arc back left

4a. Arc in right
4b. Arc back right

5. Pedestal up or down

The following are movements of the camera on the cradle head

6. Pan right. Note: command refers to front of camera
7. Pan left

8. Tilt down
9. Tilt up

The drawings in this section were adapted from Television Production Handbook by Herbert Zettl.

AUDIO NOTES

I. Background

The average ear is sensitive to sounds of a wide band of frequencies: 50 cycles per second up to 15,000. All speech is contained within the first 2,000 cycles; the next 12,000 cycles contain overtones. It is not difficult to construct an apparatus capable of reproducing human speech, but it is a different matter to reproduce the overtones. Hence, a general idea of the quality of the microphone or apparatus used may be judged by identifying the high-frequency cutoff point of the instrument. The higher the cutoff point, the higher the fidelity of the instrument. The telephone cuts off at about 5,000 cycles. Small radio sets cut off at 4,000. The best AM sets can't handle more than 8,000 cycles. FM, on the other hand, readily carries the entire range of frequencies up as far as the ear can hear. Although FM audio accompanies the television picture, most small sets have low quality loudspeakers that are not capable of reproducing the high-fidelity FM audio signal. In short, the frequency response of first the microphone, then the amplifier and transmission circuits, and finally the method of transmission and reception will determine the quality of the resultant sound.

II. Microphones

A. Characteristics: Definition - a microphone is an instrument for translating sound vibrations in air to variations in electrical current.

1. Frequency response -- the first factor which contributes to the sound quality of a microphone is the range of frequencies it can pick up.

   a. Most standard broadcast quality mikes are capable of responding to frequencies up as high as the ear can hear (15,000 cps), but there is considerable variation in how well a microphone can respond to frequencies below 300 cycles.

   b. Even microphones with the same frequency response range can sound very different owing to fall off characteristics.

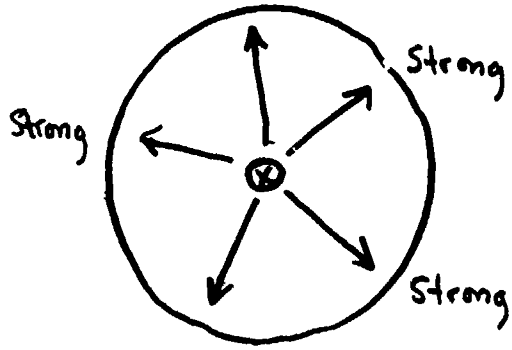
c. It is sometimes desirable to lower a microphone's sensitivity to low-frequency sounds. Voice, for instance, picks up better if these low frequencies are not well reproduced. Some microphones are equipped with an adjustment screw to alter the response. The RCA 77 DX, for instance, has settings for M and V. When M is set, the instrument responds fully to all bass notes and music is reproduced well. When set at V, it attenuates or cuts down these frequencies and allows the voice to pick up more directly and distinctly than when the bass notes are strong.

2. Pick-up pattern -- the second factor which contributes to the sound quality of a microphone is the direction of its pick-up pattern, the area in which sound can be reproduced.

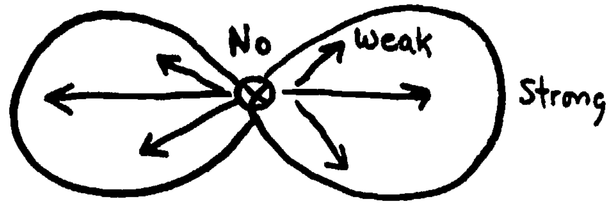
   a. omni-directional or non-directional pattern. This type of pattern picks up sound from all directions equally well. Non-directional microphones are useful for such things as on-the-street interviews or a round-table type of discussion. When used on a boom, however, the non-directional microphone is so unselective that it picks up reverberating sound from all over the studio, giving a "boomy" effect.
   b. bi-directional pattern. The bi-directional pick-up pattern picks up sound from two directions. This type of microphone is most often used in radio, where in dramatic programs various voice fades can be handled effectively. This pattern is rarely used in television.
   c. directional or uni-directional pattern. The directional microphone is capable of picking up sound from only one direction. The standard uni-directional pattern is very narrow, making it very useful for shutting out unwanted sounds, but there is another directional pattern -- the cardiod -- which is somewhat wider and heart-shaped. The cardioid pattern is excellent for overhead boom operation since it decreases the accuracy needed in aiming the microphone. For intensifying, the directional capabilities of a parabolic reflector may be used.

The patterns:

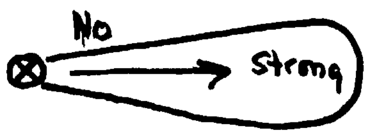
non-directional



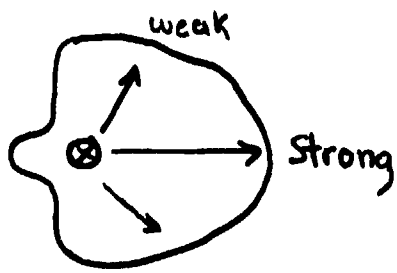
bi-directional



uni-directional



cardioid



3. Microphone types: microphones may be identified according to their construction characteristics. The types used in broadcasting are ribbon (or velocity) microphones, dynamic (or pressure) microphones, and sometimes condensor microphones.

   a. Velocity or ribbon microphone: operates on the principle of a metallic ribbon which is vibrated within a magnetic field. The "velocity" of the ribbon creates the microphone signal.

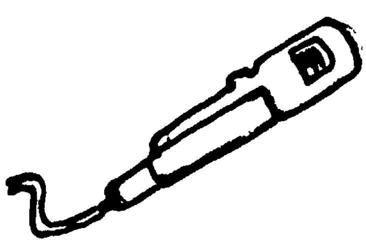
   b. Dynamic or pressure microphone: the basic element is a metal diaphragm attached to a metal coil. Sound waves striking the diaphragm cause it to vibrate, which in turn causes movement of the metal coil in a magnetic field, a process which produces the necessary electrical waves. The dynamic microphones are much more rugged than the ribbon mikes, making them valuable for general television usage. In addition, the dynamic mike lends itself well to miniturization.

c. Condensor microphone: the condensor also uses a metal diaphragm as a vibrating element, but instead of agitating a metal coil, it operates next to a metal plate which is charged with electrical voltage. As the diaphragm vibrates it causes voltage changes which create electric waves corresponding to the sound waves that agitated the diaphragm. Although the condensor microphone produces excellent quality sound it is very expensive and somewhat inconvenient to use since it requires a tube or transistor within the case and a special power supply and cables.

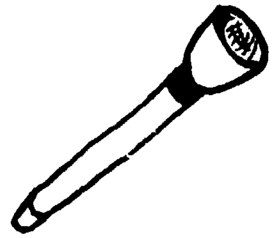
d. Wireless or FM microphone: although not yet perfected, the wireless microphone may become one of the more valuable tools in broadcasting. Basically, the wireless mike is a small FM transmitter which sends a signal a short distance (500-1,000 ft.) to a special receiving station which amplifies the signal and sends it to the master audio mixer.

B. Basic microphones available for production here.

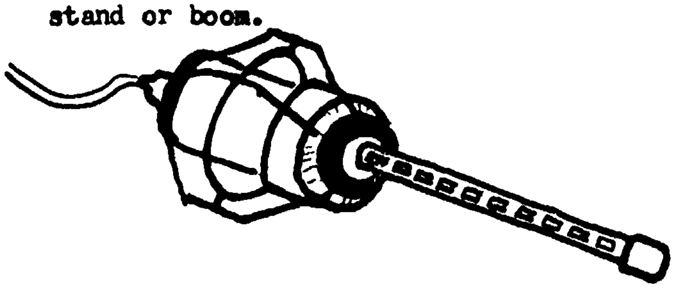
1. Electro-Voice 666: dynamic, cordioid microphone with only one moving element. Has three sound entrances which shape pattern. Considered an all-purpose microphone, it is especially useful where ambient noise and severe reverberation exist. The 666 has a wide frequency response and may be used as a stand mike, boom mike, desk mike, or hand mike. The microphone withstands high humidity, temperature extremes, and severe mechanical shock.



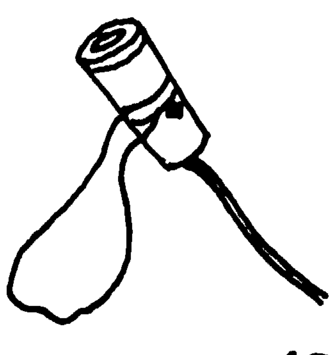
2. Electro-Voice 635A: dynamic, omnidirectional microphone that permits very smooth response over a wide frequency range. The mike has a four-stage pop and dust filter that virtually eliminates the need for a wind screen for outdoor use and eliminates popping of sounds such as "p". Extremely rugged, the 635A can best be used as a hand or stand microphone.



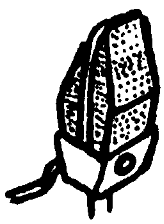
3. Electro-Voice 642: a highly directional dynamic microphone utilizing a combination of the characteristics of cardioid and distributed front opening characteristics. The cardioid action gives the microphone essentially unidirectional characteristics at frequencies up to 55 cps (Hz). At this point the distributed front opening takes over for the balance of the range to which it responds. May be used on stand or boom.



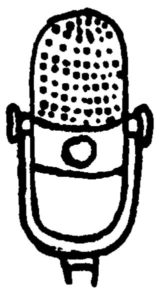
4. RCA BK 6B: a small dynamic microphone of the lavaliere type (designed to be worn around the neck). The directional characteristics are such that when the mike is suspended from the neck, resting on the chest, the low-pitched chest sounds are attenuated. The microphone may also be hand-held or mounted on a stand and talked across or into, depending on the response desired for a particular speaker's voice. The mike is designed for speech and is not recommended for music pickup. Frequency response: 80-12,000 cps.



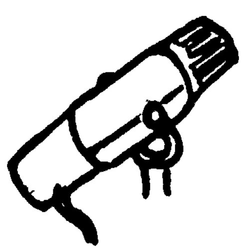
5. RCA BK-11A: a dependable, bi-directional, velocity (ribbon) microphone, specially designed for AM, FM, or TV where high quality reproduction is desired. This microphone is equipped with a three-position, screwdriver-operating switch to regulate response; M setting is for music, V1 is for voice pickup at approximately 12 inches, V2 is for voice pickup at approximately 7 inches. This microphone may be mounted on desk stand, floor stand or boom. It is an excellent microphone for radio dramatic work. Frequency response: 30-15,000 cps.



6. RCA 77D (77 DX): a high fidelity, polydirectional microphone of the ribbon type. As a uni-directional mike, the 77 DX has a wide pickup angle which makes it valuable as an announce mike or a boom mike. The 77 DX can also serve as a bi-directional mike for dramatic purposes or discussion with people on two sides of a table. When the shutter opening is completely closed, the instrument operates as a non-directional pressure microphone. A screw selects positions U, N, or B and three additional directional patterns designated L1, L2, L3. There is also a frequency attenuation screw in the base of the microphone.



7. RCA BK-5B: a uniaxial, high quality, uni-directional ribbon microphone designed for all types of broadcast use. Its excellent response and frequency range (50-15,000 cps) make it ideal for reproducing both speech and music. The microphone also contains a blast filter which makes it ideal for gun shots and other violent noises.



C. Some microphonic terminology

A. Balance: the objective is to make the listener feel that he is hearing all elements of the program at equal volume. Appropriate volume relationships may be achieved by either moving actors or performers in relation to the instrument, moving the instrument itself, or adjusting the VU meter reading by manipulating the appropriate potentiometer.

B. Perspective: refers to the impressions of space relationships that a program gives the listener. Make people who are at a distance from the focal point sound distant, etc.

C. Presence: a term which implies the relationship of performer to microphone, a function of balance.

D. On mike: performer is clearly in the microphone pickup pattern. Presence had been established.

E. Off mike: performer is out of the major area of pickup, either by intention or because of poor placement.

F. Phasing: some production personnel refer to the action of turning the head of the microphone in the direction of the performer as "phasing". The term, however, has a more precise definition for sound engineers. The RCA instruction booklet defines it thus:

> When the outputs of two or more microphones are fed into a common mixing circuit their individual outputs should be in phase with each other. If they are not, one will oppose the other, resulting in a reduction of output instead of a gain.
>
> To compare the phasing of two or more microphones, connect one microphone to the amplifier input and set the volume control to obtain the desired output level while talking into the microphone. Then connect the second microphone in parallel with the first and, without changing the volume control setting, hold the two microphones side by side and talk into them. If a decrease in volume results, reverse the connections of one of the microphones at the amplifier input terminals. Each additional microphone should be checked in like manner and, if necessary, the cable connections should be reversed to make the phasing agree with the microphone already connected.

G. Crack his mike: command given to audio engineer to open the mike of the appropriate performer.

H. Clip his mike: command given to the audio engineer to cut off the microphone of the appropriate performer.

D. Microphone placement

A. As a general rule, one can begin with the microphone about a foot away from the speaker and adjust the distance until the desired result is achieved.

B. Music is far more complicated. Sometimes one instrument can be placed so that it can pick up all of the musical instruments. More often additional mikes are needed in order to balance the sound of various instrments and vocalists.

TELEVISION GRAPHICS

The visual medium of television can often make more effective use of original, creative graphic work than can the classroom teacher. The verbal message, translated into visual form, can be artistically blended into a TV presentation to reinforce, to clarify and/or to enhance what is being said. The selective eye of the television camera can direct the viewer's attention to and from the graphic material. It can linger on a graphic, pick out portions of an illustration, skim over less important items, focus and defocus on specific areas; each move precisely directed by the television teacher.

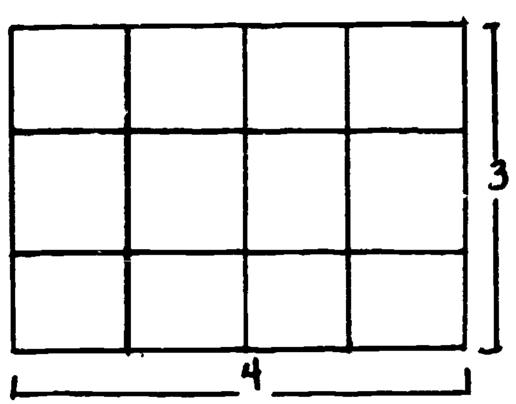
All two dimensional visual aids that are prepared for television can be considered TV graphics. Illustrations, charts, maps, animated art cards, etc. are graphic material.

All of the creativity and originality that goes into the preparation of classroom graphics can be employed in television as long as the graphic material complies with certain specific rules that have been predetermined by the optical characteristics of the television camera.

Assuming the graphic material complements the mood of the show, is neat and uncluttered, it must still meet other requirements.

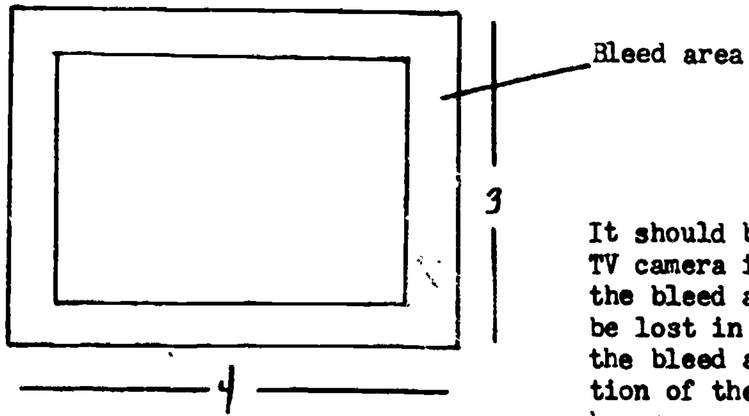
The television picture is not square. It is rectangular in shape, 3 units high and 4 units wide (this is referred to as the aspect ratio). All television graphic material should be of this ratio. If one attempted to fill the TV screen with a graphic of any other ratio, portions of the graphic would be cropped, or cut out.

In addition to the proper ratio, graphic material must compensate for some picture loss that occurs in transmission. There is a small degree of cropping that occurs on all edges of the TV picture by the time it is received in the home. Therefore no information is placed

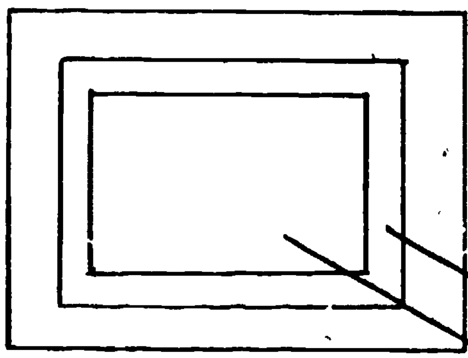


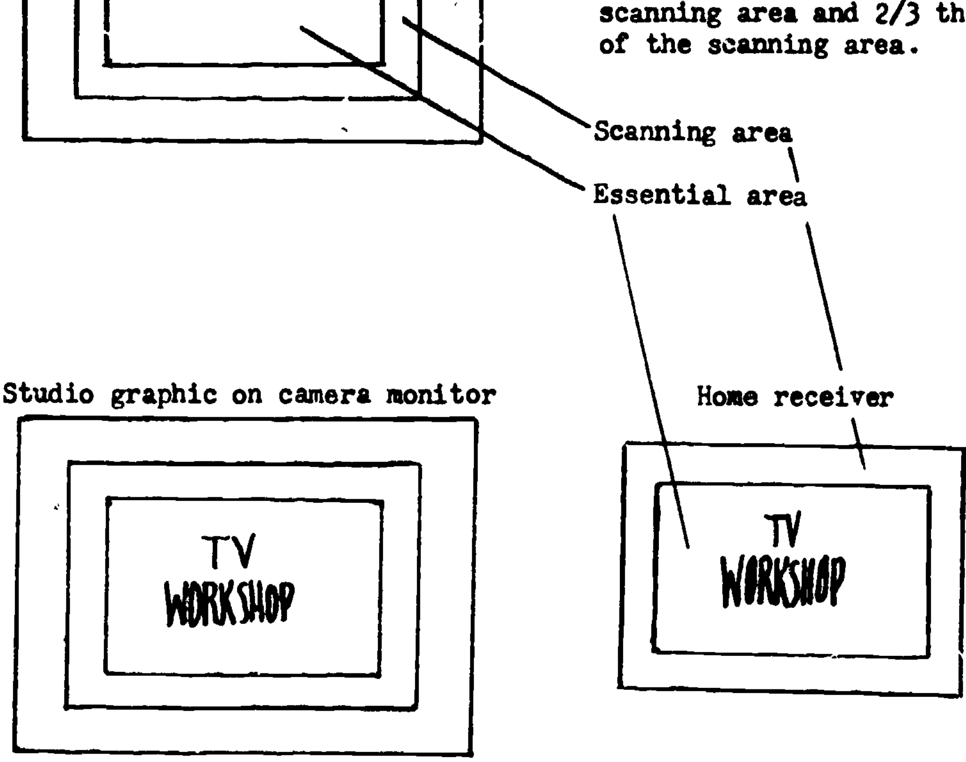
Proper 3X4 aspect ratio

on the outer one-tenth of the graphic. This is called the bleed area.

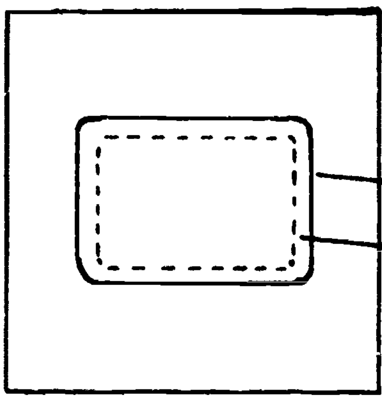


It should be remembered that the TV camera in the studio shoots the bleed area knowing it will be lost in transmission. Inside the bleed area we have the portion of the graphic we know will be seen on the home receiver. This is called the scanning area. For purposes of constructing TV graphics the scanning area may be considered as a border around the essential information contained on the graphic. This essential area is approximately 2/3 the width of the scanning area and 2/3 the height of the scanning area.





Although slides are not classified as TV graphics, they too must comply with the same rules dictated by the TV camera. Only TV slides of the 3X4 ratio can be used in television slide projectors.

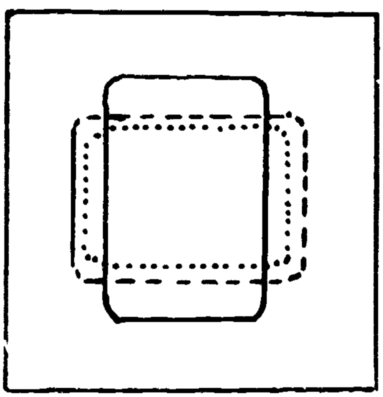


Actual frame

Bleed area

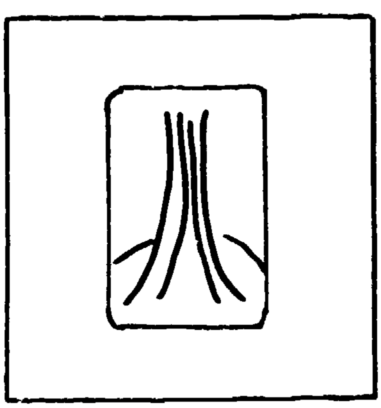
(2" X 2", 35mm double frame slide)

Though the standard 2X2 slide mount can be inserted into the television projector in an inverted position, the position of the picture cannot be so altered. Furthermore, severe cropping will occur in addition to a rather unattractive border on either side of the TV picture.

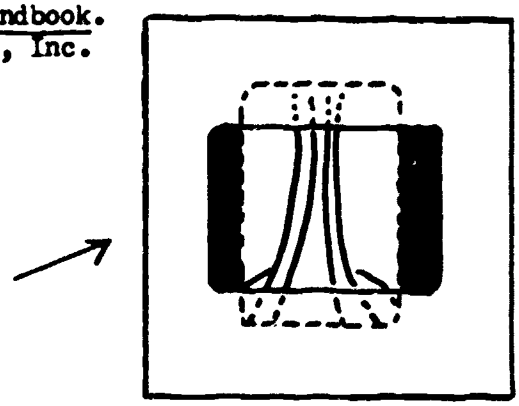


(2X2, 35mm DF in inverted position. Dash line is 35mm frame in proper position. Dotted line is essential area.)

Zettl, Television Production Handbook. 1968. Wadsworth Publishing Co., Inc. California.



Home receiver



TELEVISION LIGHTING

TECHNICAL ASPECTS

Operating principle of incandescent lamps: As a material is heated, it begins to glow and emit light; light emission by heated objects is called incandescence. The filament in an incandescent lamp is heated by passing an electric current through the resistance of the filament wire. If the filament were heated in air, it would rapidly oxidize, but if the air is pumped out of the lamp, the filament will not "burn up". The amount of light produced by incandescence increases as the filament temperature increases. Filaments are made of tungsten since it has the highest melting point of any material meeting the practical requirements for forming filaments. As the filament temperature is increased, atoms of tungsten evaporate or are "boiled off". This leads to the normal type of failure when some part of the filament becomes too thin. If the filament of an incandescent lamp fails when the lamp is burning, an arc usually forms within the lamp. This is why filaments often appear to be severely damaged when a lamp burns out. The arc can draw a very large current that could blow the fuse or circuit breaker in the lighting circuit. To prevent this, a fuse is built into the lamp.

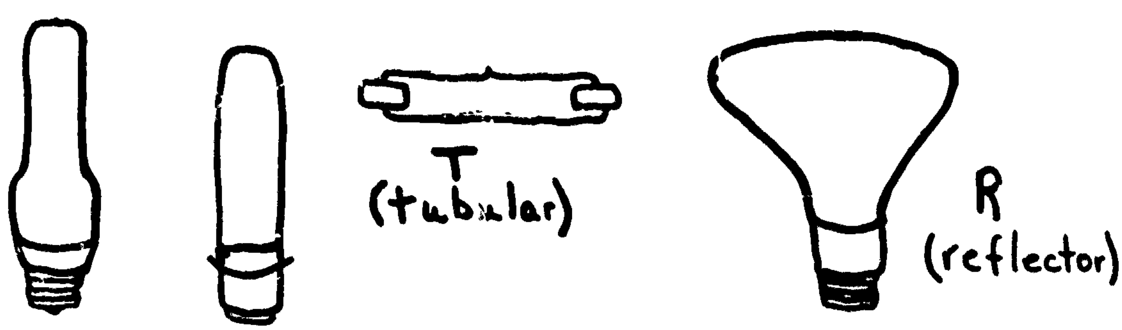
Operating principle of the Tungsten-Halogen lamps: Tungsten-Halogen lamps (formerly referred to as quartz-iodine lamps) are essentially the same as conventional incandescent lamps as far as the type of light emitted. Both lamps employ tungsten for the filament. In conventional incandescent lamps, tungsten evaporates from the filament and deposits on, and blackens, the bulb wall. This blackening leads to lumen (the basic quanity of light produced by one candle on one square foot) depreciation and to changes in color temperature (relative redness or blueness of incandescent light as measured in degrees of Kelvin; television lighting instruments have a range of 3,000-3,4000 degrees Kelvin). If iodine is added to the normal gas fill, it will chemically combine with the evaporated tungsten, providing the internal lamp temperatures are sufficiently high to induce this reaction. The resulting tungsten iodine migrates back to the filament where the extremely high temperature decomposes it into tungsten and iodine. The tungsten is deposited on the filament, and the iodine is free to enter this cycle again. This cycle keeps the bulb clean. In recent years other halogens (chemical elements related to iodine) particularly bromine, have been substituted for iodine.

Because high temperatures are required to sustain the chemical cycle of tungsten-halogen lamps, the lamp envelopes are made from quartz or other high temperature glass.

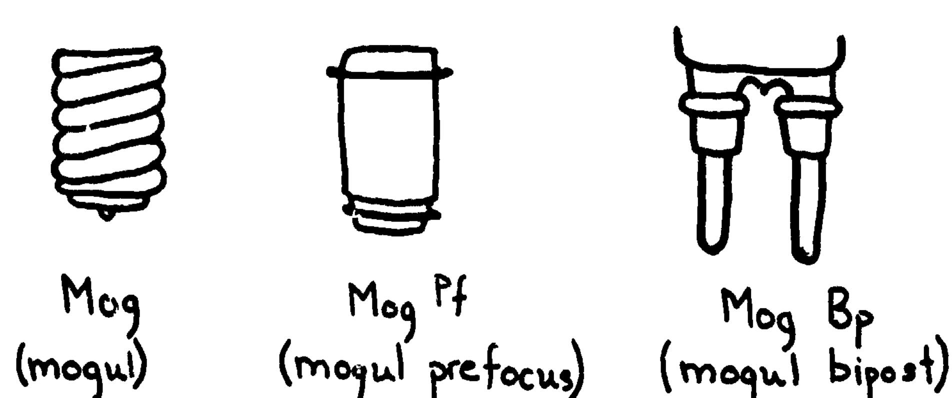
In almost every case, tungsten-halogen lamps may be dimmed without difficulty. At some point in the dimming, the temperatures drop to the point where the halogen cycle ceases to operate. However, the evaporation rate at this point is low enough that blackening problems do not occur.

Tungsten-halogen lamps have the same color rendering properties as conventional incandescent lamps, but they have increased efficiency both from a lumen output and a color temperature standpoint. The color temperature of tungsten-halogen lamps remains essentially constant throughout life; their life can be several times that of conventional incandescent lamps for equal lumen output and color temperature.

Lamp designations and forms: Bulb shapes normally are identified by a letter(s) describing the basic shape or some salient feature. Diagramed below are some of the more common bulb types and their designations



Diagramed below are a few lamp bases.



Color rendition: A light source may produce light at only a few wavelengths, at a great many wave lengths, or continuously throughout the visible spectrum. The distribution of energy throughout the spectrum determines the color of the light, the appearance of colored surfaces viewed under the light, the color response of color film and color TV cameras and even the response of black and white films and TV cameras.

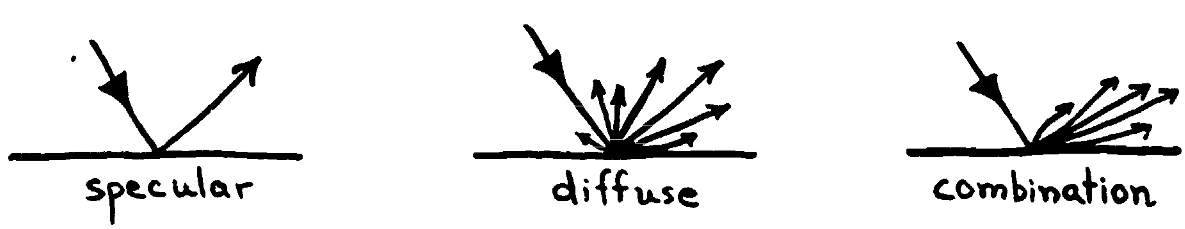
A theoretical incandescent light source, whose filament temperature completely specifies the total distribution (in wavelengths) of its light energy and its visible color (visual) is called a "black body". This light source establishes a color scale only in terms of temperature; the temperature commonly is given in degrees Kelvin. Color temperature is a convenient method of specifying the visual color of a light source. The color temperature (Kelvin degrees) of a light is the temperature of the "black body" which has the closest visual color match to that light.

Most real incandescent sources have light energy distributions that are close to the light energy distribution of black bodies and so the color temperature describes an incandescent source rather well.

The color rendering index (CRI) is a scale from 0 to 100 used to approximately describe the visual effect of light sources on colored surfaces. Eight standard pastel colors are viewed under light from the source to be rated and under a black body source of the same color temperature. The average difference in the appearance of these colors is used to determine the CRI. The CRI is often used as an approximate evaluation of camera and film effects.

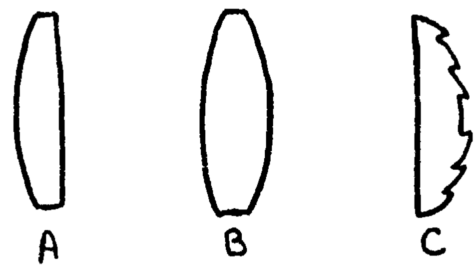
For color television, the illumination is kept within a 3,000 to 3,400 degrees Kelvin range. Nevertheless, THE FINAL JUDGE OF YOUR LIGHTING IS A CRITICAL LOOK AT YOUR COLOR AND BLACK & WHITE MONITORS.

Reflectors and lenses: There are three major types of reflection.



Most surfaces cause a combination of specular and diffuse reflection.

As a ray of light enters or leaves glass or other transparent material it will bend. Lenses are pieces of glass shaped to bend light in particular ways. The more common TV lighting instrument lenses are diagramed below:

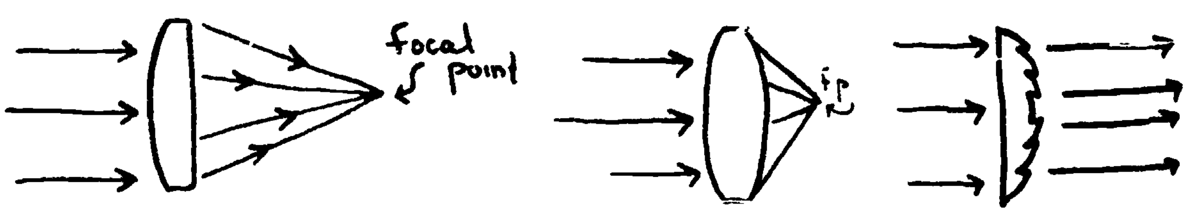


A- plano-convex

B- double convex
(or bi-convex)

C- Fresnel

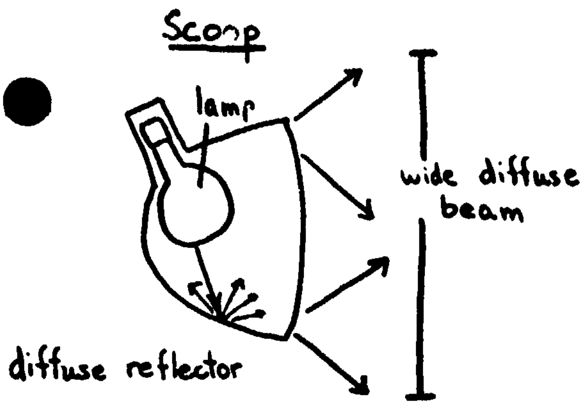
With the plano-convex and the double convex lens, if a light source illuminates the lens, the light on the opposite side of the lens is concentrated in a small region. This region is called the focal point. The plano-convex lens controls the light rays passing through in the same way as the Fresnel lens. However, because of a pattern on the flat surface of the Fresnel lens, the light rays are broken up slightly producing a smooth shaft of light rather than a sharp beam of light. This is the major characteristic of the Fresnel lens.

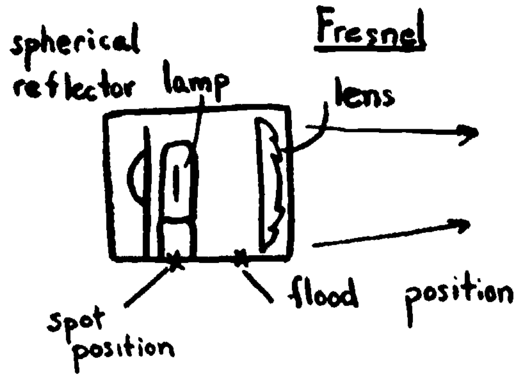


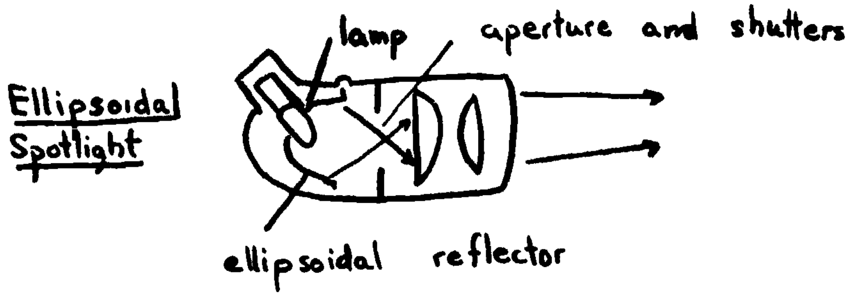
Diagramed below are the three major lighting instruments used in TV today. These instruments may carry either incandescent lamps or tungsten halogen lamps. Each instrument fulfills specific purposes in TV lighting. Efficient use of these instruments includes:

a. plotting lighting pattern before production time
b. using proper instrument for lighting source desired
c. getting the most out of each instrument

Extreme care should be taken when moving instruments. Proper adjustment of C clamps will insure everyone's safety in the studio. Lighted instruments can become quite hot and will burn the skin if not handled carefully. Burned out lamps are to be replaced by experienced personnel only.







Operating procedure

1. Select the light you wish to turn on. Note number of light (can be found on grid work).

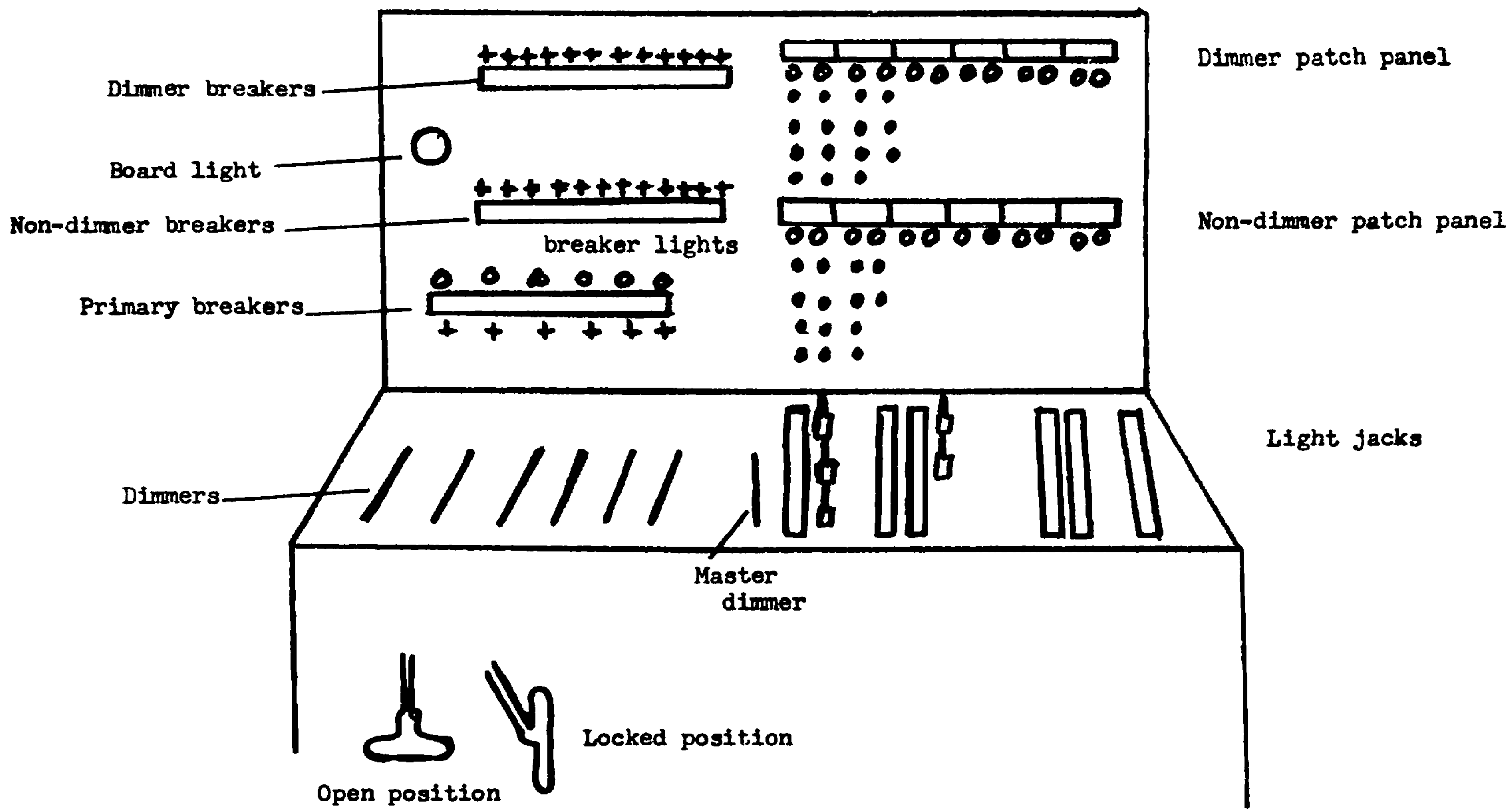
2. Find corresponding light jack on lighting board.

3. Take the selected jack and plug it into either a non-dimmer or dimmer patch panel.

4. Now, and only now, will you turn on the proper circuit. If you have plugged the light into a non-dimmer circuit, turn on the corresponding circuit breaker switch. If you have plugged the light into a dimmer, first turn on the corresponding primary circuit breaker and then turn on the proper dimmer breaker. Once this is done, bring up the dimmer to the desired level.

5. Dimmers can be controlled from the master dimmer handle <u>if</u> the dimmer handles are in the lock position. If the dimmer handles are in the open position, each handle will work independently.

LIGHTING BOARD



THE PRODUCTION

The following list of steps is intended in no way to be a complete and definitive statement of the method of preparing for and executing a television production. Rather, it is intended as a guide applicable to most types of instructional production.

1. The first step in understanding the production process is to gain an understanding of the roles of the various people involved in the production.

   a. The producer: the man in overall charge of the production; he is usually the person who originates the idea for the program, hires the personnel who will write, direct, and perform in the program, and handles budgetary matters during the course of the production.

   b. The director: the man who is in charge during the actual production of the program; he is responsible for issuing instructions involving construction of the set, graphic materials, audio materials, and he will aid in writing the final script. During the actual taping or telecasting of the program he will give orders directly to the cameramen, audio engineer, video engineer, floor director, announcer, and indirectly to the talent.

   c. The writer: the person responsible for collecting material and writing the initial script, which may be changed later as a result of conferences with the producer and director. The writer for television has to have a fine sense of the visual and be able to think and express himself in pictures as well as words. (Note: in many instances, particularly with small production, the jobs of producer, writer, and director may be found in various combinations such as producer-director, producer-writer, and sometimes producer-director-writer.)

   d. The talent: the people who actually appear before the television cameras, regardless of their capacity.

In dramatic programs, the actors are the talent; in commercials, the announcers are the talent; in instructional television, the teachers are the talent. In instructional television, the talent are more often than not also the writers and in some cases serve as producers as well.

e. The technical director or switcher: the person who is responsible for operating the video switcher in accordance with commands issued by the director. For instance, when the director calls for the activation of camera one, the T.D. (technical director) punches the button which places that camera on the air. In small operations, the director is likely to act as his own switcher. This is not recommended, however, since this mechanical operation distracts the director from his more important functions, such as maneuvering cameras and calling for more precise picture composition.

f. The cameraman: the people responsible for the operation of the television cameras during rehearsals and actual production. Following instructions from the director, which they receive through earphones, the cameramen get the type of shot requested. It is important that the cameramen have a thorough knowledge of camera operating procedure, a knowledge of lens characteristics, and understanding of television vocabulary, and a good sense of photographic composition.

g. The floor director: the man responsible for seeing to it that the set is complete before the program begins, for arranging graphics, and for relaying various cues to the talent during the program itself. These cues may indicate the amount of time remaining in the program, they may be directions relating to movement, or they may be cues requesting the talent to slow down or speed up. In small productions, the floor director may assist the cameramen in lighting the set as required by the director.

h. The audio engineer: the man responsible for handling all audio considerations before, during, and after the production. His duties before the production consist of finding appropriate microphones, patching them in and testing them, as well as locating necessary records and making tape or cartridge recordings. During the program he mans the audio console where he "rides gain" on all audio imputs such as microphones, turntables, and tape and cartridge recorders. He makes certain that the right microphone is activated at the right time. After the show, he sees to it that all material is returned to its proper place.

i. The video engineer: the man responsible for shading the camera monitors during recording or telecasting. He has to be a qualified technician with a thorough knowledge of camera controls. He may also be responsible for videotape recordings unless there is a special engineer designated for this purpose.

j. The assistant director: the man who works side-by-side with the director, running errands, helping him keep track of personnel, and keeping a careful record of the time of the various segments of the program during rehearsal so that he can give accurate backtime signals during actual taping or telecasting.

k. The photographer or film man: the man responsible for taking the still or motion pictures necessary to support the production. The director will usually tell the photographer generally what he wants, and leave it to the artistic judgement of the photographer to accomplish the task. In large operations, the jobs of still photographer and motion picture photographer will be separated. In very small operations another member of the production team will probably serve as photographer.

2. Once everyone understands his role, there should be an initial conference in which all key members of the team are present. This meeting should involve at least the producer, the director, the writer, and the talent. It is in this meeting that general plans for the production should be formulated. People should be able to leave this meeting understanding what kinds of things to look for in terms of materials, graphics, and perhaps additional talent.

3. The next step is the actual gathering of material, both visual and written. In the case of instructional television this may mean doing research on the subject,

reviewing available films, searching for still pictures, or actually going out and shooting film footage or still pictures. It may involve acquiring rights to certain kinds of material, and it might involve collecting various objects or props.

4. Once the materials have been collected, the producer will again confer with the director and the writer and on the basis of the visual and verbal materials collected a rundown sheet will be prepared. The rundown sheet is basically a partial script outline, including an outline of the verbal material to be covered together with a list of all visual elements in the program. These appear in standard script form, with visual material in the left hand column and audio material in the right hand column. It is often a good idea to place a third small column for segment time. The following sample rundown sheet indicates the procedure.

RUNDOWN SHEET #2

Production Date | Prin. of Eco-Haseltine
Instructor | Producer
Director

VISUAL	CONTENT OUTLINE	CUM TIME
TITLE SLIDES: 1. Principles of Economics 2. Bob Haseltine 3. Elasticity of Demand I	THEME: Cartridge tape #9	
	Q. Why is elasticity in Economics important?	0:20
Close up of Easel Pad	A. Because we want to know how buyers and sellers will react to change.	
	Elasticity of demand	2:30
SUPERS: Flip Chart 1. Elastic demand 2. Unitary demand 3. Inelastic demand		
	Discus-ion of arc and point elasticity	9:30
SUPER: Arc and point		
EASEL CARD: $\frac{PdQ}{QdP} = E$		
SUPER: Same easel card		
	Total Revenue = price X quanity	21:00
	FILM CUE: Now that we've discussed total revenue, let's look at a practical application.	
OVERHEAD: Develop w/ overlays and grease pencil	Total revenue curve	30:00

RUNDOWN SHEET #2

Production Date | Instructor | Producer / Director

Prin. of Eco-Haseltine

VISUAL	CONTENT OUTLINE	CUM TIME
	Discussion of factors	37:30
REVEAL CHART: inelastic - small, cheap elastic - large, expensive		
	Summary	42:00
SUPER CARDS (not supered) already used 1. elastic demand 2. unitary demand 3. inelastic demand 4. arc and point elast. 5. $\frac{PdQ}{QdP} = E$		
	Open ended question	
SLIDES: 1. Principles of Economics 2. GTV logo	THEME: Cartridge tape #9	
BLACK		

5. Most instructional television producer-directors only carry the script making process one step further than the run-down script, and that is the addition of specific camera directions. (See text examples.) However, in some particularly complicated programs it is necessary to prepare a full script in which every word of dialogue is written out as well as every camera shot, every picture, and every sound. This is a very time-consuming process and one that is not recommended unless the situation requires it.

6. Regardless of the form that the finished rundown sheet or script takes, there should be a final production conference before any work is done before the cameras. At this conference, the cameramen, floormen, audio engineer, and any other technical assistants should be present in addition to the director and the talent. It is likely that the producer -- if he is a separate person -- and the writer will not need to be present at this meeting, since their work has presumably been completed. The director takes charge of this meeting, explaining exactly what he wants to take place at what time. If he explains the program carefully at this time, he is likely to prevent embarrassing mistakes in the production itself. This is likely to be the only time when the individuals, who will be doing only one job in the production, get a chance to see the overall concept of the program. The final production conference shoul' take place shortly before the rehearsal.

7. If the script is clear and the final conference has been effective, the rehearsal should be a polishing process. If the program is to be a simple one, or one where spontaneity is important, the director may merely want to have a run-through in which major shots and transitions are practiced. An interview program, for instance, tends to lack the natural spontaneity of a good conversation if it is rehearsed before the actual performance. In either event, it is a good idea to have either a run-through or a complete rehearsal. It helps give everyone involved in the program a better idea of what to expect, including some problems that may not have been anticipated, and it also helps build the confidence of the talent.

8. After the rehearsal, the director will call cast and crew together to issue any final instructions which grew out of his experience with the rehearsal. This conference should be brief and informal, for if criticism is severe it is likely to undermine the confidence of those involved in the production.

9. The final stage of the production process is the taping or actual telecasting of the program. The director readies everyone involved in the production, waits for the precise moment and then sets everything in motion. From this point until the final second of the program the director functions like an orchestra conductor, telling everyone what to do at the proper moment. If things go awry, he must be able to recover quickly and make necessary judgements and changes.