DESIGN OF THE LOCAL ORIGINATION STUDIO

Larry E. Nelson
National T. V. Sales Manager
Century-Strand Inc.

Due to the recent rulings by the Federal Communications Commission, many CATV systems will now be required to provide local origination programming.

Because of these requirements, a studio facility to produce this programming must be provided. In many cases, a studio facility is already in use or is in the process of being converted from an existing facility.

In some instances, a complete studio must be designed and built from scratch. In order to either build a completely new studio or to convert an existing facility, there are many major areas which must be delt with. These areas of concern are such items as physical size, electrical power, and air conditioning from the construction stand point and fixture suspension, fixtures and dimming systems from the production standpoint.

Even though the end use of the studio is for production purposes, many engineering considerations must be studied so that the studio will truly function as an efficient production center.

The first areas of discussion will be concerned with the construction area of the studio design.

PHYSICAL REQUIREMENTS

In the design of a completely new studio facility, one of the most important single items is physical size. The physical size of the studio determines the amount of production that can be done in this studio. The smallest sized studio that will still allow a certain amount of production flexibility is approximately 20' x 30' or 600 sq. ft. A studio of this size will allow two or three individual areas to be used without having to remove one set area in order to utilize the other area. It will also allow for permanent sets that are used day after day.

When designing your studio, ceiling height is also a very important consideration. Twelve to 14 feet of ceiling height is optimum for production studios up to 2400 sq. ft. If the ceiling height is any lower than 10', it is very difficult to properly light the subjects due to the poor angles. Any height over 14 ft. would require higher wattage fixtures to give sufficient ft. candle intensity.

In most cases, the 12 ft. ceiling is very easy to obtain, but if the ceiling height is restricted to less than this certain lighting tricks can be utilized to remedy this situation.

If at all possible, the studio should have an entrance to a roadway or alley with doors sufficiently sized so that an automobile can be driven into the studio. This will allow production of automobile commercials and other revenue producing sidelines. Under no circumstances should the studio have any glass windows that would allow outside light to enter the studio.

A larger studio, of course, will provide more production capability. The average CATV origination studio is in the area of 20 X 30 feet.

ELECTRICAL POWER

A very important consideration, and sometimes a limiting factor for studio design, is electrical power. Approximately 60% of electrical power for a studio is used for the lighting. Since there is a direct relationship with power required and square footage, sufficient power must be made available to adequately light the studio. As a rule of thumb, 60W per sq. ft. of studio area is required. This is for color but should also be used in black-and-white conditions since eventually color will most likely be used. As an example, for a 20 X 30 studio, 36,000 watts of electrical power is required for lighting purposes alone. No matter how large the production area, if there is not sufficient power to properly light it, the production area is useless.

It should be noted that in all cases, such services as electrical power and air conditioning should be sized so as to take into account ultimate requirements. It is very costly to increase these services at a later date.

The most desirable AC power service for studio purposes is 3 phase 4 wire, 120/208V AC 60 cycles. This type of power service is available in most areas and is normally the most economical power service that can be provided for the studio. Since there are three phases, each carrying equal loads, each phase is only required to carry one-third of your total connected load. In the above example, the 36KW service required for the 20 X 30 studio would be 300 AMPS total. By using a 3 phase 4 wire power feed, each of the phases would only have to carry 100 AMPS. This will keep the size of feed wire and therefore, cost, to a minimum.

Another very common power feed that is available in older facilities is single phase, 3 wire service more commonly known as 120/240. This type of service uses 3 wires each of which carry ½ of the total load. In the avove example, the 36KW load will be broken down into two feeders of 150 Amps each.

It is most desirable to have a separate service provided for the studio lighting loads. In this way, there will be no fluctuation in your electrical equipment when the heavy loads of the lighting equipment are turned on.

AIR CONDITIONING

Since almost all of the electrical power used for lighting is converted to heat, sufficient air conditioning must be available to keep the studio within a reasonable temperature range that will not advdrsly effect other studio equipment or personnel. Due to the inefficiencies of lamps, either quartz, iodine or standard incandescent, all power applied must be considered as heat.

It takes approximately .14 tons of air conditioning for every 1KW (1000 Watts) of lighting. These figures may vary from one geographical location to another, but may be used generally as a starting point. For the 20 x 30 studio previously discussed, the air conditioning for the studio lighting alone would be five tons. It must be noted that this figure of .14 ton per Kilowatt is for the lighting fixtures only, and does not take into consideration any other air conditioning requirements such as electrical equipment, talent, or general illumination.

Now that the construction area has been discussed, let us proceed to the design of the actual production facilities. The first section of the design has been aimed at the engineering staff. The remainder of the discussion is concerned with the production staff.

STUDIO FIXTURES

In order to do any production work, light is required. If the production is to be done outdoors on a sunny day the light is there and free for the taking. On the other hand, since most work is done indoors, artifical lighting must be provided.

They types of lights, correctly called fixtures, as well as the number of fixtures is important. There are four basic types of illumination required. They are:

> Key Light, which is the main apparent source of illumination on the set. It is the job of this light to highlight or "key" the subject.

Back Light, which is used to give your subject depth and dimension by separating the subject from the background.

Base/Fill Light, which is used to provide an overall light level and fill the shadows cast by the key light.

Set Light, which is used strictly for background illumination.

For most simple one camera, one subject sets, one each of the above lights is required. Fortunately, only two different styles of fixtures are required. A 750-1000 Watt quartz fresnel is the most commonly used studio fixture for both back and key lighting purposes. On the other hand, a quartz scoop is most commonly used studio fixture for base/fill and set lighting.

FIXTURE MOUNTING

In order to use the lighting fixtures in the studio, some method of fixture mounting must be used. For temporary usage in small set areas, floor stands provide a very convenient method for fixture mounting. The fixtures that are mounted on these stands are then plugged into the wall circuits in the studio. This method allows the fixtures to be rapidly moved from one location to another. This method is undesirable due to the fact that these stands take up much of the available floor space on the studio floor and therefore, restrict camera movement. There is also great danger of knocking over these stand mounted fixtures.

It is more desirable to use some sort of ceiling mounted fixture support to get these fixtures off the studio floor and out of the way of the cameras and other equipment. The most desirable way to overhead mount the lighting fixtures is through the use of a pipe grid. This pipe grid is made up of sections of 1-½" I.D. black pipe and is hung from the ceiling at the desired height. As was previously mentioned, approximately 60W per square ft. are required to provide sufficient lighting for the studio. Because of this, a spacing of 4 ft. on center is used. To light the set area, the fixture is mounted to this pipe grid by the use of a fixture mounted C-clamp and is then plugged in to the electrical outlet. These electrical outlets which will be discussed in detail later, can either be ceiling mounted or can be around the perimeter of the studio on the wall. In the later case, extension cables must be provided to bring the electrical power from the floor up to the mounted fixture.

If the grid configuration is not desired, then pipes running in only one direction can be utilized. In this case, these pipes should be mounted on 4 foot centers with the pipes perpendicular to the longest studio walls. In place of pipe, uni-strut can be utilized. This is a three-sided steel channel that is mounted from the ceiling. Special mounting brackets are required to mount the fixtures to the uni-strut. The C-clamp is a much faster and more secure way to mount the fixtures to the pipe and is therefore a more desirable material.

Another type of fixture mounting hardware is the Century Strand system called MobilRail. MobilRail is extruded aluminum I-rail that is mounted to the ceiling. This system is designed so that the rail can be moved from one studio area to another from the floor. This method of fixture mounting is more expensive than the pipe grid method but its flexibility in a small studio more than justifies the additional cost.

ELECTRICAL DISTRIBUTION

Once the fixture is mounted, some method of getting electrical power to it must be designed in order to use the fixtures. If wall circuits are to be utilized, then a large number of extension cables are required. This method of power distribution is very cumbersome and sloppy and is undesirable for all but the smallest studio area. A more desirable way for power distribution is to mount the receptacles into the ceiling directly above the grid. In this way, a minimum amount of extra power cable is required.

In all cases, one 20 AMP outlet should provide for every 16 sq. ft. of studio area due to the 60 Watts/sq. foot requirements. The most desirable way to provide electrical distribution is through the use of plugging strips with pigtails. These plugging strips, usually constructed of 4" x 4" conduit, have 18 to 36 inch pigtails. The fixtures are then plugged into these pigtails for electrical power. These plugging strips are designed to be mounted directly above the pipes or hung from the ceiling. If the plugging strips are ceiling mounted, the pipes or grid can be directly mounted to strips. Through the use of 36" pigtails, one plugging strip every 8' can provide sufficient electrical circuits for the studio.

All of the circuits that are installed in the television studio should have a current rating of at least 20 Amps. In addition, one 50 Amp circuit should be provided for every ten-20 Amp circuits. These 50 Amp circuits would be used to provide power for several cyclorama lights.

The ceiling mounted circuits or plugging strip pigtails must be supplied with electrical power. This electrical power can come via circuit breaker panel or from a dimming system. In the case of a dimming system, all of the overhead and wall circuits would terminate in a cross-connection or patch panel which would then be fed in turn by a dimmer system. The dimming system capacity would depend upon studio size and requirements. Fig. 1 shows the central console for a small electronic dimming system, the Century Strand Edkotron.

BACKGROUND AND SETS

In all studio installations, it is desirable to have a variety of backgrounds. A very common background is a cyclorama curtain. This curtail is a muslin curtain that is mounted on a roller track so that it can be moved into position anywhere in the studio. This curtain can be lighted with special lights with a colored gelatin in front of them to give any desired color. In this way, the single cyclorama curtain can be made any number of colors for day to day variety. The color of the cyclorama curtain should be an off-white or beige so that full color saturation may be realized.

If background flats are to be used, they should be a fairly light neutral color so that they will not absorb too much of the lighting.

For reference purposes, two complete studio lighting packages are included. Fig. 2 is a temporary lighting package for a 10 x 15 area. This package would be designed to light a temporary set area, such as an office. The fixtures are designed for stand mounting.

Fig. 3 is a complete lighting package including electrical distribution and dimming control. This package will completely outfit the 20 x 30 foot studio.

Both packages feature quartz lights.

SUMMARY

It must be kept in mind in the design of the studio that many of the decisions made will be based on budget requirements. It should be remembered certain items cannot be economically added later and should therefore be treated as a one-time cost whereas some items such as fixtures, can be implemented at any time.

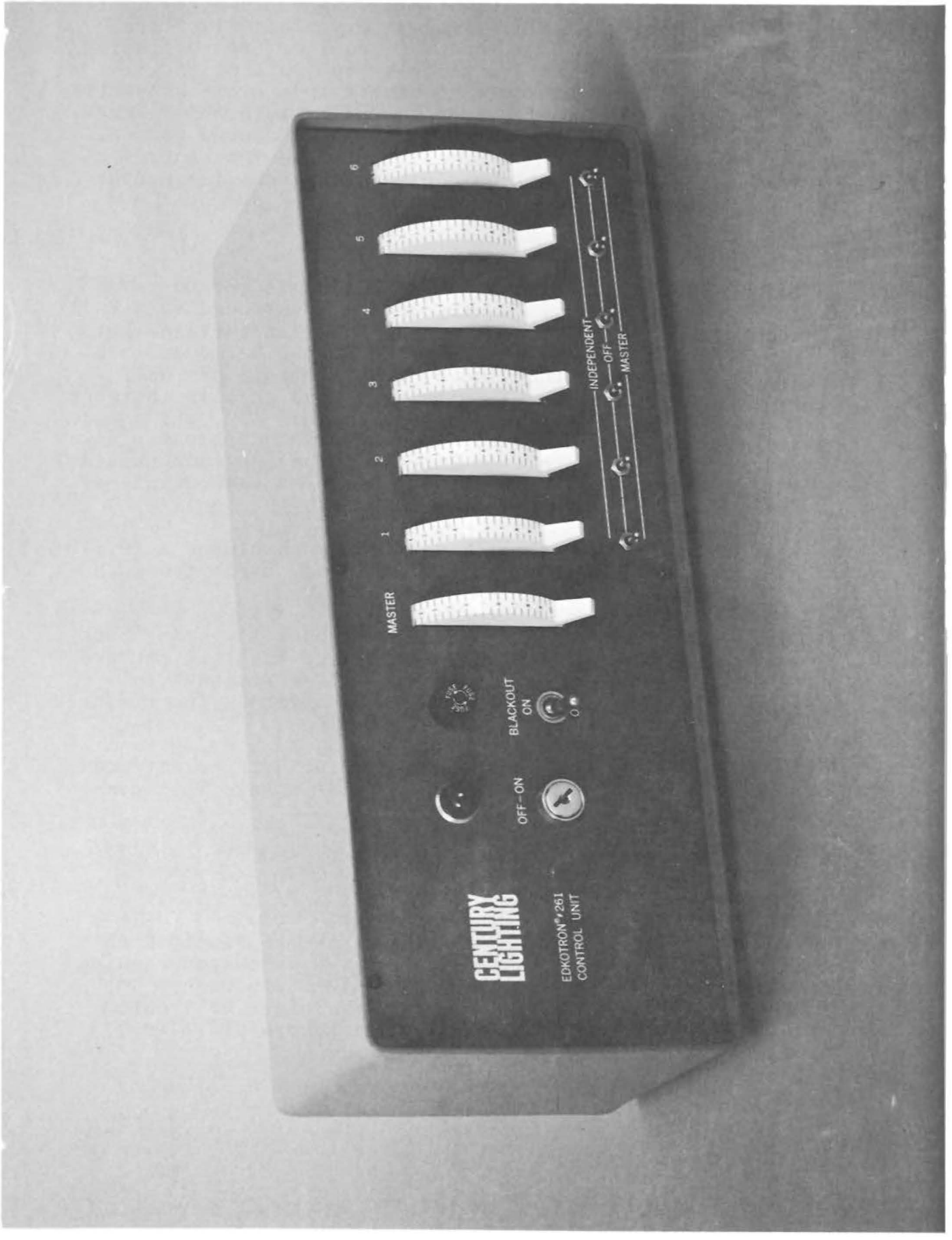
CENTURY LIGHTING
EDKOTRON® 261
CONTROL UNIT
OFF – ON
BLACKOUT
ON
MASTER
1
2
3
4
5
6
INDEPENDENT
OFF
MASTER

FIG. 2

10' x 15' "PORTA-PAC" STUDIO PACKAGE

KEY AND BACK LIGHTS

Quant.	Century-Strand Cat. No.	Description
4	33420GR	6" 750W Quartz Fresnel with stand bracket
4	13220	4-Way Barndoor
4	BTP	750W Quartz Lamp, 3200°K
4	25RCCGR	25' Extension Cable
BASE/FILL LIGHT		
4	4271GR	14" 1000W Quartz Scoop with stand bracket
4	11160	Diffusion/Gel Frame
4	EGK	1000W Quartz Lamp, Frosted, 3200°K
4	25RCCGR	25' Extension Cable
MOUNTING EQUIPMENT		
6	C691035	Channel Leg Stands
2	3256	"Grabber-Grip"
DIMMING SYSTEM (OPTIONAL)		
1	280GR	6-2kw Edkotron Dimmer Pack
1	281	Control Unit
1	283	25' Cable

FIG. 3

20' x 30' STUDIO PACKAGE

BACK AND KEY LIGHTS		
10	33420GP	Century-Strand 6" 750W Quartz Fresnel
10	13220	4-Way Barndoor, Adjustable
10	11080	Diffuser/Gel Frame
10	BTP	750W Quartz Lamp, 3200°K
4	14410	7' Pantograph
4	10RCCGP	10' Extention Cable
4	3413GP	Century-Strand 8" 1000/2000W Quartz Fresnel
4	13230	4-Way Barndoor, Adjustable
4	11100	Diffuser/Gel Frame
4	BVV	1000W Quartz Lamp, 3200°K
2	14410	7' Pantograph
2	10RCCGP	10' Extension Cable

FIG. 3 (cont.)

Quant.	Century-Strand Cat. No.	Description
BASE AND FILL LIGHTS		
4	4271GP	Century-Strand 14" 1000W Quartz Scoop
8	4291GP	Century-Strand 14" 1000W Quartz Scoop, Focusing
12	11160	Diffuser/Gel Frames
12	EGK	1000W Frosted Quartz Lamp, 3200°K
6	14410	7' Pantograph
6	10RCCGP	10' Extension Cable
EFFECTS LIGHT		
1	2324GP	Century-Strand 750W Quartz Pattern Projector with Pattern Holder, Pattern Set and Gel Holder
1	EGF	750W Quartz Lamp, 3100°K
6	MS1000GP	Century-Strand 1000W Quartz Set Lights
6	FHM	1000W Quartz Lamp, Frosted
SPECIAL EQUIPMENT		
1	SGD	Spun Glass Diffusion Material
3	14340	Adjustable Stands, 5' - 8'
3	25RCCGP	25' Extension Cable
DISTRIBUTION EQUIPMENT		
6	6312-5-2P	12' Plugging Strip with 5-18" Pigtails terminated in 3 Pin Grounding Connectors
4	64620-20GP	Wall Box with 2-18" Pigtails terminated in 3 pin grounding connectors
CONTROL EQUIPMENT		
1	C70003	Dimmer Rack containing: 6 - 6KW Century-Strand Dimmers 1 - 100 Amp 3 pole Main Circuit Breaker Hanging Cord Patch Panel with: 38-20 Amp Load Cords and Breakers 42-50A Saf-T-Jacks, 6 per Dimmer & 6 Jacks/1-50A Hot Circuit

FIG 3 (cont.)

Remote Control Consolette
Containing:
6 - Controllers (1/Dimmer)
6 - Master-Off-Independent
Switches
1 - Master Control
1 - System Key Switch
1 - System Blackout Switch
1 - 25' Control Cable

Norelco

DISCUSSION

Mr. Robert Loos: Thank you, Larry. Do we have any questions?

Question: I have a question. What happens to the color temperature as you vary the lighting?

Mr. Nelson: The color temperature varies, of course, with your applied voltage. The lower the voltage the lower the color temperature, but I think you'll find that in television operations such as your big networks, the television color cameras aren't really as sensitive to color temperature as they were a few years ago. There are certain lights that should not be dimmed such as your key light and your film base light, but your background lights and your back lights are commonly dimmed sometimes with desired effects. Dimmers in studio useage now is more for production than strictly for light control. In other words, a man who wants to start off with a silhouette opening his news show can pan in close to a newsman sitting just back lit and as this man starts talking and you bring up the spotlights and all of a sudden the man is there in perspective--or he wants his business man off and his film chain on--this is what your dimmers are used for--production for church and schools rather than actual intensity controls. That's why you put focus handles on fixtures.