AUDIO EQUIPMENT FOR CATV

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CATV has come of age. The combination of normal aggressiveness on the part of CATV operators together with FCC suggestions towards origination of programming has motivated CATV technical personnel to update their technical facilities to incorporate the latest techniques in both visual aural production and reproduction equipment.

The purpose of this presentation is to summarize the conventional audio techniques that are being utilized in the AM-FM broadcast industries and noting their application in the CATV industry.

CCA Electronics is one of the leaders in the manufacture and distribution of AM and FM broadcast and studio equipment. The purpose of this presentation is to familiarize the CATV operator with the state of the audio art in the AM - FM area with the hope that possibly these techniques are applicable to your area.

Audio equipment for CATV must be classified into two general areas. The first area relates to programming material in which both the audio and video are non-separable from each other. For example, this is true in the area of films and video tape in where both the aural and the visual intelligence is on the same program source. The second general classification of audio equipment for CATV can be described as that type of programming in which the video and audio are separable from each other. This can be exemplified in the production area where slide and separate audio sources may be used as background for the slides.

Figure 2 describes a representative block diagram of the first class of audio equipment, namely the non-separable audio-visual programming. Here you will note that a conventional switcher is used to serve as the master control between three representative program sources. Video switchers are designed today to incorporate the feature of audio follow. However, in many installations the audio rather than being fed directly from the video switcher to the transmitter is fed to an audio console in order to obtain additional master control.

Figure 3 is representative of an audio control center for CATV with suggested audio sources relating to CATV production and on air programming. Here you will note that a master audio console with six independent channels is used to mix, fade and control the audio sources from six independent program sources. The output of this audio console is fed through

appropriate compressing and limiting equipment to the transmitter as well as to the monitor, audition outputs and cue outputs. The balance of this presentation will relate to the various audio equipments described in this block diagram with the purpose again, of summarizing the existing techniques that relate to these various audio sources.

Reel to Reel Tape Equipment (Figure 4)

There exists a host of reel to reel tape equipment that do have application in CATV operations. It is our suggestion that before selecting a reel to reel tape machine that the following considerations be given:

Playback or Record Play: It is not necessary to have a combination record/play unit in every studio. Many broadcasters find it more economically attractive to utilize only playback machines in the programming studio and utilizing a combination record/play device in the production area. In addition to the economic saving, it tends to prevent inexperienced operators from erasing valuable program material.

Reel Capacity: Tape machines are available with many reel capacities. The most popular size is the tape machine with the capability of handling $10\frac{1}{2}$" reels. A $10\frac{1}{2}$" reel with 1 mil mylar is capable of storing $1\frac{1}{2}$ hours of tape when operating at $7\frac{1}{2}$" per second and 3 hours of tape when operating at 3 3/4 IPS. It is important to know the time capacity required for your operation in order to be sure that you do not purchase a reel to reel tape machine without adequate size.

Speed Requirements: The frequency response requirements of CATV are not as stringent as stereo FM, and thus, the speed capacity of the reel to reel tape machine should incorporate the features of 3 3/4 IPS and $7\frac{1}{2}$" IPS. The former could be used for local program origination and to be sure of substantial capacity, while the fact that it does have the facility for playing back $7\frac{1}{2}$ IPS would permit the reel to reel tape machine to be used with playing back sources recorded at external production areas in which this more popular recording speed might have been made.

Mounting Requirements: Reel to reel tape machines are available in various mounting formfactors. The two most popular formfactors are 19" relay rack mounting, while the second is a conventional desk top mounting. For proper utilization of your facility it is important that the device you purchase is capable of fitting the formfactor of your physical arrangement. Some desk top units cannot be rack mounted.

Number of Tracks: Since CATV operation is monaural in nature, there may appear to be little reason for using tape machines other than full track. However, since so much material is recorded in stereo, it is suggested that careful consideration be given to purchasing a two track device with facilities of combining both the left and the right to obtain a monaural output. In addition, the second track can be used as a cueing source or additional control channel. The utilization of two track reel to reel tape machine for monaural operation does very little in practice, to affect the signal to noise of the system.

Cost: Professional, reliable, high quality reel to reel tape machines are available in both the record/play and the playback formfactor at selling prices of $700 to $3,000. It is important that the optimum compromise be made between cost and utilization in selecting your reel to reel tape equipment.

Audio Cartridge Equipment: The endless tape cartridge utilized in broadcast audio cartridge equipment has proven itself to be the most reliable, highest quality program source for commercials and short program material. It has tremendous application where flexibility and reasonably fast access is required. In broadcast operation it appears at present, that audio cartridge equipment represents the most important audio program source in a broadcast facility. When purchasing audio cartridge equipment, it is suggested that you make the following considerations:

Playback or Record/Play: Generally, it is not necessary to invest in many Record/Play devices. One or possibly two record/play units for production is more than adequate, while two or three playback cartridge machines generally will meet the normal requirements of a CATV studio operation.

Cartridge Capacity: There exists three standard cartridges. The more popular cartridge, the series 300, has a maximum time capacity of $10\frac{1}{2}$ minutes. The 600 and 1200 series can achieve capacities of 31 minutes. There has been recently a number of cartridge machines introduced which are designed only to accept the smaller cartridges. They are very compact and three units, whose width is less than 5 3/4", can be used in a 19" rack. If the larger cartridges are intended to be used in your CATV operation, these smaller cartridge machines will not be as attractive. Therefore, it is important to know the cartridge requirements you will have in your CATV operation.

Auxiliary Tones: Cartridge machines are available with additional options which include secondary and tertiary control generators and detectors. These tones are generated and recorded on the control track and may be used to obtain an extremely fast format with back to back cartridge plays by having these auxiliary tones triggering other machines. Thus, while the first cartridge machine is playing to its original cue position, the other machines in the operation may be automatically turned on by the auxiliary tones on the cue tracks. If this is the ultimate application of your facility, it is important that the cartridge machines that you purchase either incorporate the auxiliary tones or have the capability of having these tones installed at a future date.

Operational Features: Machines are available with various operating controls. The older style units incorporated lever type actions before the cartridge could be installed and set for operation. Newer units are available in which just the application of the cartridge in the machine turns on the start motor and has the device ready for instant operation. Depending on your application, one particular formfactor may have an advantage over the other.

Cost: Monaural playback machines vary in cost from $395 to $795. A combination record/play unit sells for approximately $200 more than the playback only machine.

Microphone Equipment: A host of microphones are available for the CATV industry. The considerations that should be given before selecting a microphone are suggested to be as follows:

Pattern Requirements: The most important requirement of a professional microphone is that the pattern of the microphone is consistent with the application. If the microphone is intended for close-up operation, a specific pattern and sensitivity should be used. On the other hand, if there exists noise in the recording studio or operation plant, a directive pattern could substantially reduce the effect of this noise. A microphone intended for a group activity should have an omni-directional pattern. The pattern of a microphone is extremely important.

Impedance: Microphones are available with both low and high impedance. To reduce the complexity of the overall system it is suggested that the low impedance balanced microphone be used. This tends to reduce the complexity of station installation and many times eliminates the requirement for custom matching transformers.

Cost: Professional microphones with the frequency response and fidelity necessary for CATV are available at the professional user's cost from $50 to $200. A host of microphones are available in each and every operators requirements.

Turntable Equipment: CCA's subsidiaries QRK and Rek-O-Kut are two of the major manufacturers of turntable, tonearms and turntable accessories. As a result of our experience in this area, we recommend that before purchasing turntable equipment that you make the following considerations:

Instant Start: We feel that it is important that a professional CATV operation have a turntable which after the application of the start switch achieves its final speed within a very minimum time. Turntables are available which can achieve its final speed in less than 1/6th of a revoluation.

Reliability: Many turntables are being used in the CATV industry which are manufactured for the consumer industry. Although these turntables are very useful in the Hi-Fi area, the ruggedness required for professional use insists on the fewest number of moving parts and trouble-free operation. The simplicity of professional turntables is such that the majority have no more than three moving parts. These units can be expected to operate trouble-free for many, many years, with a minimum of maintenance.

Preamplifier "Head Level": It is important when considering the purchase of preamplifiers for turntables that one purchases a preamplifier with sufficient head room such that when there is a very loud passage on the record, that the electronics has sufficient head room to pass this loud passage without "flat-topping" and introducing distortion. Preamplifiers are available such that flat-topping does not occur until at least +10 dbm is achieved. This is approximately 30 db more than the normal -20 dbm output required of conventional turntable preamplifiers.

Record Wear: With the advent of Hi-Fi stereo and the extremely high expense of these records, it is imperative that tonearms and cartridges be used which not only can reproduce these records, but also not destroy these records. Tonearms in the past which incorporated viscus damping had a tendency to require substantial loading to assure tracking. It is recommended that tonearms which require a maximum of 2.5 grams be used with present day state of the art records. Under this loading little record wear, if any, will be affected by the tonearm.

Cost: Turntables are available to meet the stringent requirements of CATV operation from $175 to $200. Tonearms are available from $50 to $75. Preamplifiers are available from $150 to $175, and appropriate furniture to meet the requirements of the application from a table tope base at $25 to a free standing furniture with record storage capacity at $150.

Automation Equipment:

Perhaps the major advance in audio in the broadcast field has been in the area of automation. There exists today a number of field proven automation equipment packages which can achieve unattended, flexible operation for your CATV operation. However, since so many formfactors exist, it is imperative that careful considerations be given of your program requirements before selecting automation equipment. We suggest that you investigate the following:

Format Requirement: First analyze what the application of your equipment will be. It is important that you also understand what variations you may possibly introduce in the event that your format requires modifications. The equipment that you consider must be capable of having this flexibility.

Access Requirement: It is imperative that the automation equipment that you purchase have the facility of access consistent with your requirements.

Priority Requirement: In many program formats, it is necessary to interrupt the normal sequence of events on a time or a priority basis. In some program formats the interruption is only done on an hour and half hour basis for station identification. In others it is done with some frequency to introduce spots. However, it is important that whatever equipment you purchase has the capacity to accept the number of inter ruptions of the normal preset sequence approach consistent with your requirements.

Unattended Time Requirement: The function of an automation system in addition to providing management with absolute control is hopefully, to reduce the cost of personnel operation. Thus, it is important to understand the requirements for unattended operation of your facility. This in turn would influence the time capacity of the automation equipment that you are seeking.

Expansion: It is important that you carefully consider automation equipment which not only will provide your immediate requirement but also have the facility for being expanded at a future date without superseding the existing equipment.

Cost: Automation equipment is available at realistic prices as low as $6,000 and as high as $50,000. The Mini Automation described in Figure 8 which incorporates a 24 cartridge carousel, two reel to reel record/playback tape machines, and one outboard cartridge playback machine with 150 cycle detection and of course, the master four source brain is available through CCA Electronics at $6,300.

Audio Consoles:

The heart of your complete audio facility is the studio console. The purpose of this console is to switch, fade and control all of the audio sources in your facility. Pictured in Figure 9 are two representative audio consoles. The first is the CCA "Futura Six", a Six Channel, modern audio console with slide faders and facilities for cue, monitor and audition in addition to the normal program channel. The second unit is the popular Shure M67 Mixer. Both of these units or variations thereof have applications in a CATV system. It is suggested that before purchasing an audio console that you investigate the following considerations:

Capacity: Each CATV operation has a different number of audio sources. Each CATV operation has a different modus of operandum. Some organizations require independent controls for each of their program sources. Some operations would be content to have three sources being applied to the same channel and switching between the three sources. There are commercially available audio consoles with facilities from six to twenty independent audio channels. Each of these audio channels may have as much as three to five audio inputs. Thus, it is possible to have control of as many as eighteen to one hundred audio sources.

Cue, Audition, Monitoring: If it is required to cue, audition and/or monitor programming in addition to the normal function of mixing, fading, etc., it is important that you consider conventional, professional broadcast audio consoles. If these requirements are not necessary for the application, conventional audio mixers as exemplified by the Shure Mixer could more than do the application.

Mechanical Requirements: It is important that the unit meet the physical requirements of the CATV scene. For example, at remote locations or "man in the street" operations where mixing and fading of various audio sources are required for recording or for relay, it might be preferable

to use lightweight, battery operated Shure Mixer than the more prestigious, bulky "Futura Six" audio console.

Cost: Audio consoles vary from the $150 of the Shure Mixer to the $1,000 of the CCA Futura Six to the $5, 000 CCA Automatic Ten console. Within this range there exists a host of audio console formfactors, one of which can meet the requirements of your CATV facility.

Figures 10 and 11 refer to CCA prewired audio systems. In Figure 11 we have a prewired turntable audio console microphone all mounted on transportable furniture. This unit can be set up and installed in operation in a matter of minutes. It has Cannon plugs on its skirt to which can be connected conventional audio program sources. This unit is ideal for local originations at athletic events or for rapidly setting up a studio or production room. This unit sells for less than $2, 000. The more complex prewired system pictured in Figure sells for approximately $7, 000 and in addition contains substantial furniture, a more sophisticated audio console, a dual turntable system and a dual cartridge system. It is also prewired and has facilities for plug-in program sources. Obviously, this system is not transportable, but it can still be installed and set up in an operating area within several hours.

In summary, I am sure that all knowledgeable industry personnel recognize the importance of having a flexible, reliable and professional audio facility as an intrigal part of every CATV operation. I trust that this presentation will provide you with an introduction to the present state of the field proven audio program equipment and systems for the broadcast and CATV industry.

Thank you.

CLASSIFICATIONS OF AUDIO EQUIPMENT FOR CATV

CLASS №1- NON-SEPARABLE AUDIO/VIDEO

ie.- Films, Videotape

CLASS №2- INDEPENDENT VIDEO AND AUDIO

ie.- Production, Slides, Weather Channel

FIGURE 1

AUDIO BLOCK DIAGRAM OF NON-SEPARABLE AUDIO/VIDEO (CLASS Nº I)

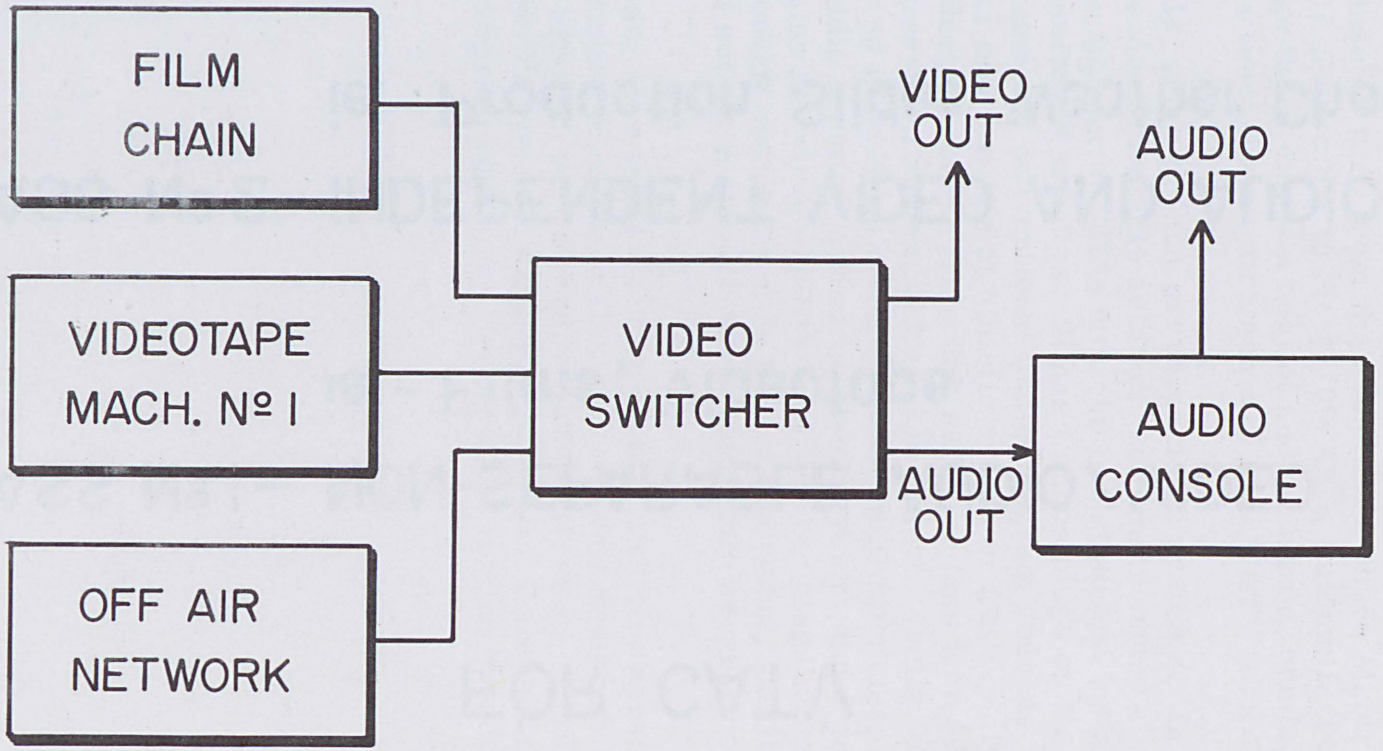
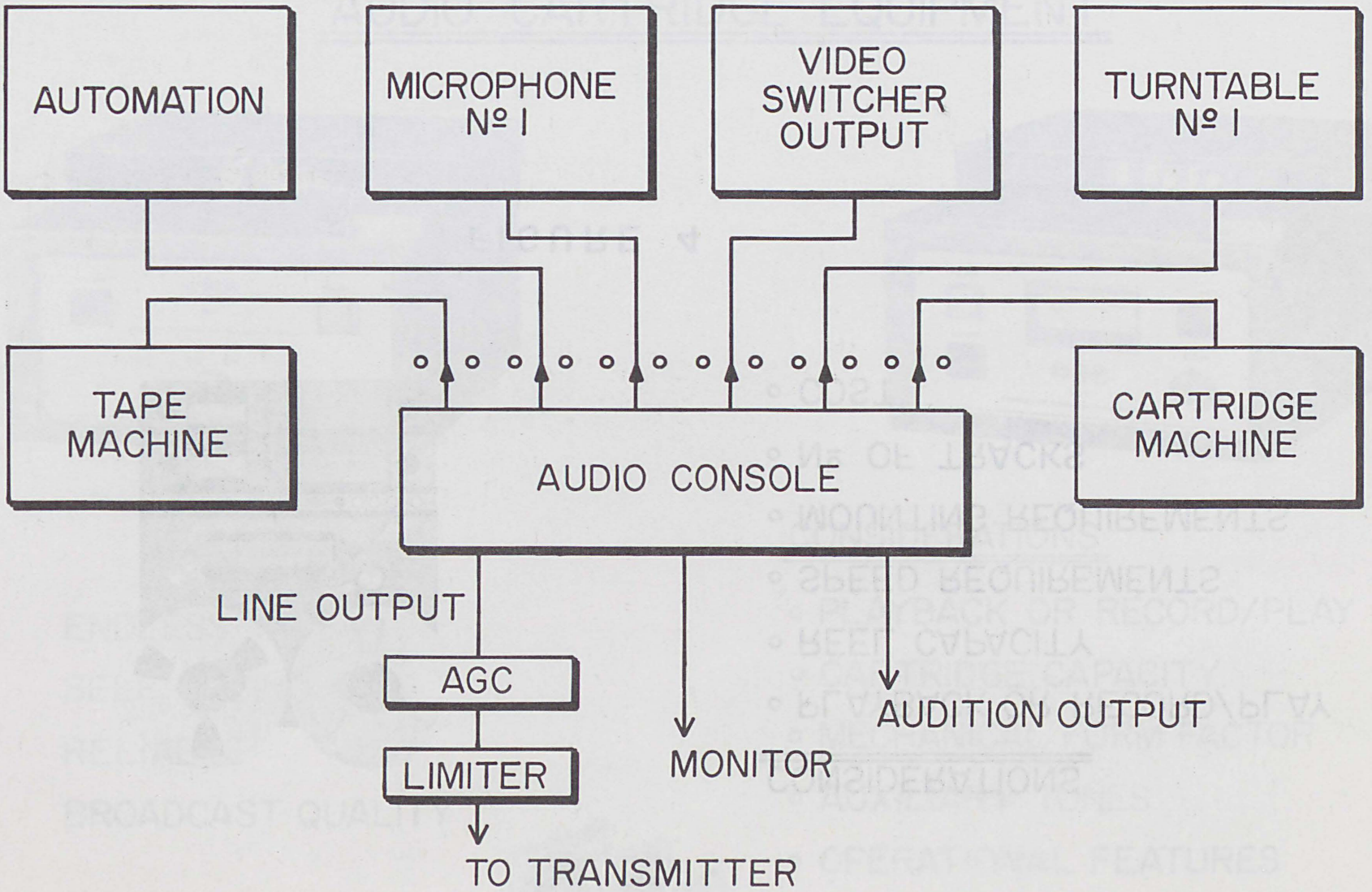


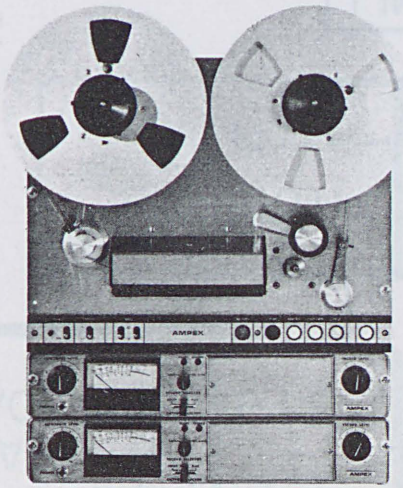
FIGURE 2



AUDIO CONTROL CENTER FOR CATV

FIGURE 3

REEL TO REEL TAPE EQUIPMENT

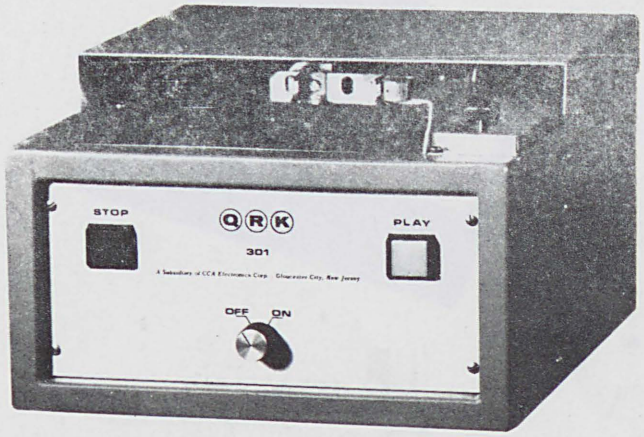


CONSIDERATIONS

- PLAYBACK OR RECORD/PLAY
- REEL CAPACITY
- SPEED REQUIREMENTS
- MOUNTING REQUIREMENTS
- Nº OF TRACKS
- COST

FIGURE 4

AUDIO CARTRIDGE EQUIPMENT

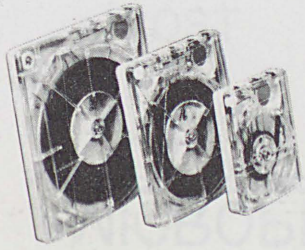


ENDLESS TAPE

SELF CUEING

RELIABLE

BROADCAST QUALITY



CONSIDERATIONS

- PLAYBACK OR RECORD/PLAY
- CARTRIDGE CAPACITY
- MECHANICAL FORM FACTOR
- AUXILIARY TONES
- OPERATIONAL FEATURES
- COST

FIGURE 5

MICROPHONES

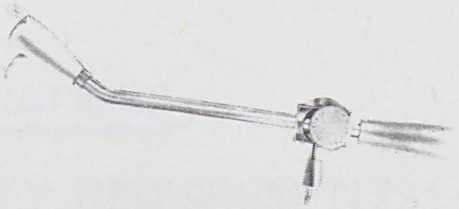
CONSIDERATIONS

- PATTERN REQUIREMENTS FOR
  - REMOTES
  - CLOSE-UPS
  - GROUPS
- IMPEDANCE
- COST

FIGURE 6

TURNTABLE EQUIPMENT

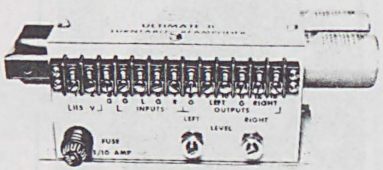
TURNTABLES



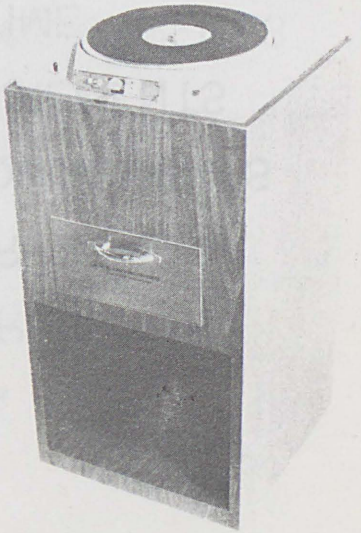
TONEARMS

CONSIDERATIONS

- INSTANT START
- RELIABLE
- HEAD LEVEL
- RECORD WEAR
- COST



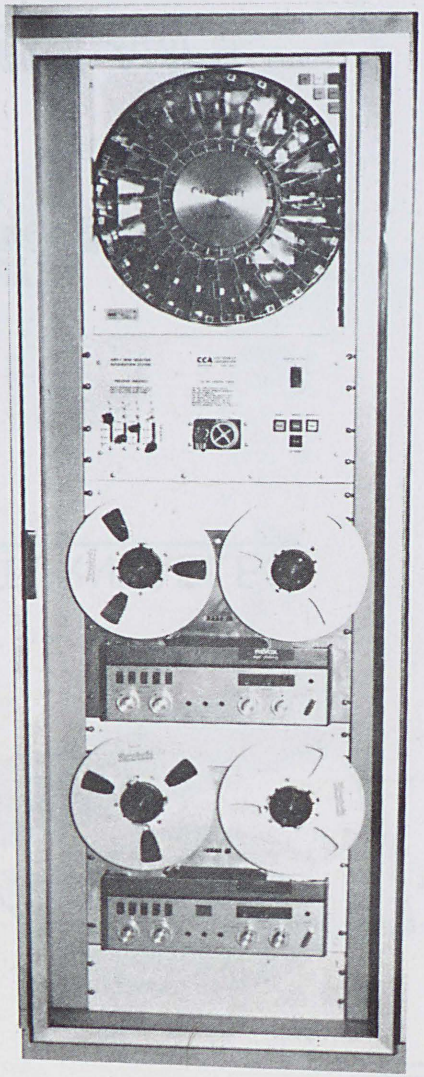
PRE-AMPS



FURNITURE

FIGURE 7

AUTOMATION EQUIPMENT

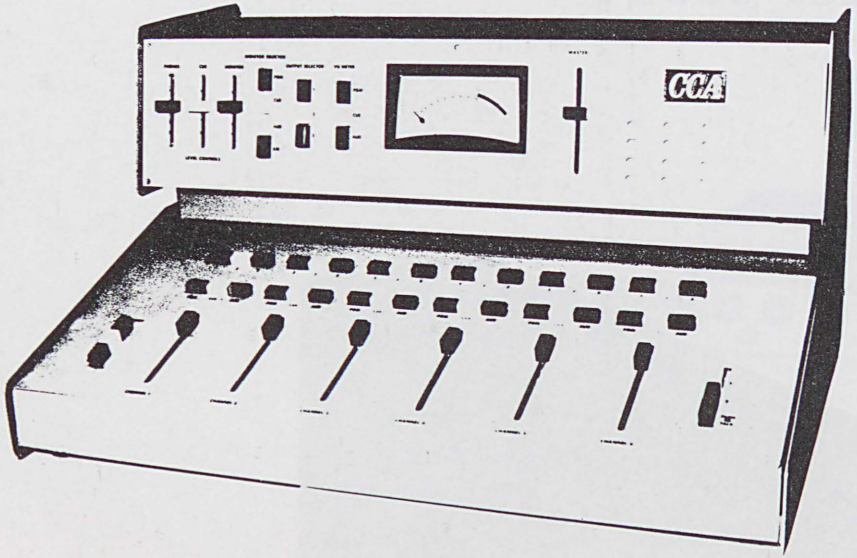


CONSIDERATIONS

- FORMAT REQUIREMENTS
- ACCESS REQUIREMENTS
- SEQUENCE REQUIREMENTS
- PRIORITY REQUIREMENTS
- UNATTENDED TIME REQUIREMENTS
- COST

FIGURE 8

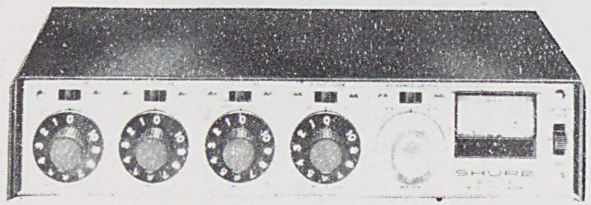
AUDIO CONSOLES



CCA FUTURA 6

CONSIDERATIONS

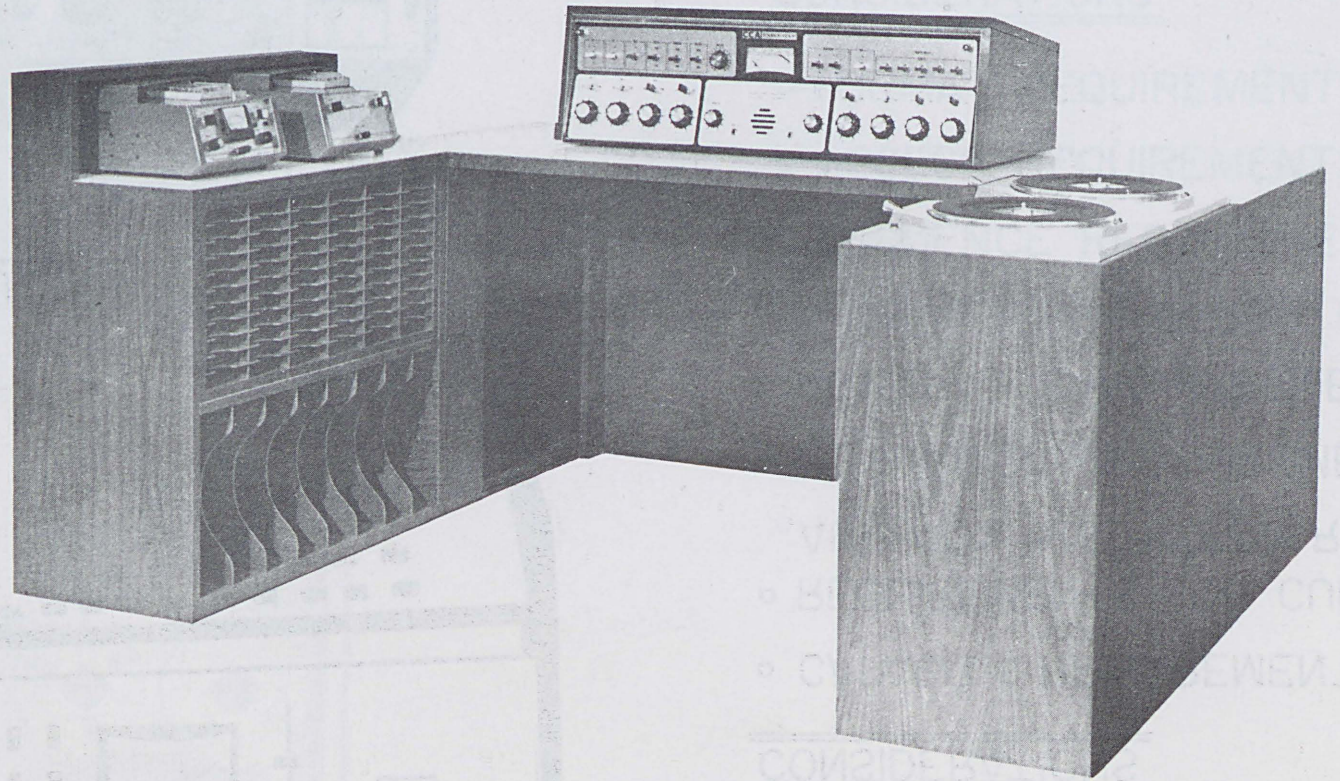
- CAPACITY REQUIREMENTS
- REQUIREMENTS FOR CUE, AUDITION AND MONITORING
- MECHANICAL REQUIREMENTS
- POWER LINE REQUIREMENTS
- FLEXIBILITY
- COST



SHURE MIXER

FIGURE 9

CCA PRE-WIRED AUDIO SYSTEM



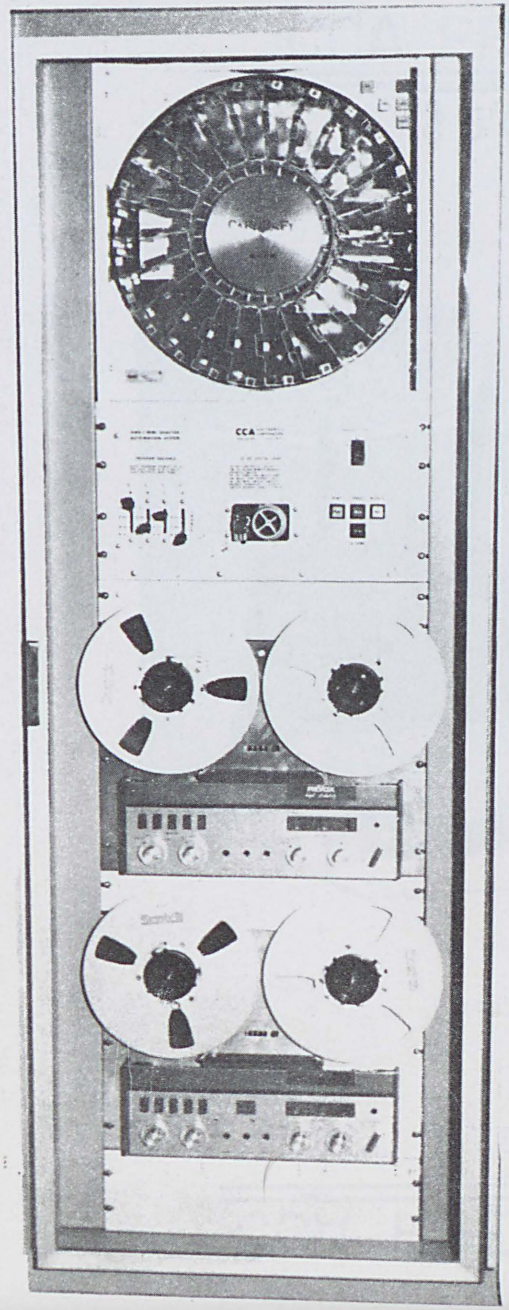
$7,000 APPROXIMATE

FIGURE 10

CCA PRE-WIRED AUDIO SYSTEM

$2,000 APPROXIMATE

FIGURE II



BACKGROUND MUSIC

CONSIDERATIONS

- FORMAT REQUIREMENTS
- UNATTENDED TIME REQUIREMENTS
- NON REPETITIVE REQUIREMENTS
- COST

FIGURE 12