Design of a Low Cost Color Remote Unit for CATV

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We believe that cable television can presently fill a need in the home that the networks and the big independent TV stations have long ago forgotten even existed. Each of us wants to feel that we belong to our own local community, that we know the people, the mayor, the police chief or school principal, the minister or the Boy Scout leader. We are interested in what's going on at Little League because our kid pitches on a team. We want to know about the "sit-in" at the high school because our Number One Girl is in the senior class now.

There is no commercial advantage to the TV station for this type of programming, but the CATV operator can supply a channel for this public service at low cost and at a profit too!! Now to do it, he has to be able to run almost any type of audio-visual material available today from 16mm sound movies to picture post cards! He has to be able to interview the horseshoe champ or the beauty queen and run it all back two or three times for those who missed it the first time through!!

He has to generate almost any type of programming from almost any type of location in relatively little time and at a very low cost. One of the most appropriate ways to accommodate these goals is through the use of a self-powered remote unit (Figure #1). However, the criteria for most broadcast style mobile color television cruisers places them well out of the financing capability of even the larger CATV operations. We would like to steal a page from some of the early broadcasters and discuss with you the design of a low cost color remote unit for CATV use.

Many users will have differing requirements depending upon their location, size and climate. We will concentrate on the reasons for the selection of specific equipments and design goals so that individual companies may select those concepts which most nearly meet their needs.

Vehicle Selection:

Vehicle selection is perhaps the most critical aspect in the design of a television remote unit. This is the one subject about which even the uninitiated is an expert because of familiarity with the family car or the local installation truck. A good "rule of thumb" to use when selecting the chassis or van body is that the vehicle should cost about ten percent of the total cost of the finished unit, which includes all equipment and labor for installation. A first look at the problem usually results in a decision to procure an "off-the-shelf" truck, van, or bus because of the obvious financial savings over a "custom designed" body. However attractive, this decision does not insure the lowest total cost when operating costs, maintenance costs, and depreciation of equipment are considered over a five-year period.

Critical design factors to be considered are:

1. Sub-floor space for routing cables and wires
2. Overhead space for lighting
3. Air conditioning ducts and insulation
4. Cable storage and handling
5. Camera storage including tripods, dollys, and pan heads
6. Lighting storage
7. Audio, cue, video and intercom exit ports

8. Heat load
9. Power input and stability
10. Legal restraints
11. Load factors

When all of these factors are considered, the "custom designed" body often turns out to be the least expensive option.

System Design:

The design goals must first be established by the user: what he wants to do, how many men will staff the productions, the quality and complexity of the expected programming, budget requirements, and other pertinent data. Great economies are achieved and many uncertainties overcome if a graphic representation of the vehicle and the total system is derived before purchases start. Five schematics or wiring diagrams and two drawings will establish what is wanted.

#1 -- Video Single Line

The video single line drawing is a much simplified schematic diagram. This typical drawing (Figure 2) indicates the flow of video information throughout the system. It shows all the video sources including live cameras, TV tuners, tape recorders, special effects units, film chains, and test signals. It also shows all the switching points, distribution amplifiers, patching provisions, and monitoring requirements. When such a schematic diagram is generated on paper, it allows the designer and the owner to be sure that no vital elements have been inadvertently left out of the system.

#2 -- Audio Single Line

The audio "single line" drawing (Figure 3) establishes the flow diagram for audio functions. It also shows all audio sources, the audio levels anticipated at each point, monitoring provisions, amplifiers, patch points, filtering provisio echo, special effects, talkback, and audience reinforcement requirements. This diagram allows one to very accurately determine audio costs by indicating each point and piece of equipment in the flow diagram. Cables, switches, patches, and routing requirements are easily defined.

#3 -- Pulse Single Line

Figure 4 identifies the third requirement for successful system design by defining the pulse generation and distribution system. The same form of simplified schematic is employed to indicate the source and distribution of all pulses required to operate each piece of equipment. Since the number of distribution amplifiers are clearly shown, all guess-work is removed from cost analysis.

#4 -- Communications and Control Schematic

The Communications and Control schematic (Figure 5) shows the routing of all telephone, intercom, interphone, remote control and radio circuits which are required to operate the vehicle. Although these circuits are often considered as an afterthought, they are probably the most important aspect of the design. Since program production depends on humans, and humans depend upon communication, a breakdown in the intercom most assuredly means downtime for the show. No shortcuts should be taken in this area of construction.

#5 -- The Power Schematic

The power input, switching arrangements, auxiliary generator, lighting, air conditioning, auxiliary power, and equipment power distribution system are clearly defined in the power schematic (Figure 6) in order that all breakers may be identified and emergency power conditions remedied. Selection of power transformers, meters, and switchers to accommodate various voltages and transmission characteristics must be considered in a properly designed vehicle. Often, for the small NCTA type of vehicle, 110 volt power will be all that is utilized.

#6 -- Equipment Layout

Once the system has been fairly well defined by generation of the five basic schematics previously discussed, the designer and operator can cooperate in making an equipment layout which is much like a house plan. Both a top view (Figure 7) and a side view (Figure 8) are desired. Usually a scale drawing of the intended vehicle is prepared on the drawing board. Cutouts, also made to scale, representing each major piece of equipment, each console, each rack, and piece of furniture may then be fixed on to the vehicle drawing in several trial configurations. When a satisfactory arrangement is conceived, it is good practice to locate a large studio, barn, or loft where the vehicle floor plan can be simulated by using masking tape placed on the floor. Full scale mockup models of equipment, racks, and furniture can be fabricated from cardboard cartons and placed in the tape layout to effectively simulate the design. Some surprises are usually uncovered by this technique with respect to operator convenience and human factors. Upon final selection of the equipment configurations, a finished floor plan and elevation plan can be completed by the draftsman.

#7 -- Equipment Schedule

A specialized equipment schedule must then be prepared which lists each item to be utilized in the vehicle by type number, manufacturer, description, and price. We believe it is most appropriate to subdivide the equipment list into several subsections, including one on live cameras, one on the telecine system, one on the terminal and monitoring equipment, one on the audio equipment, one on the video tape recorder subsystem, one on the lighting subsystem, one to cover the vehicle itself with appendant cable reels, storage compartments, furniture, power system, and accessory items, one on specified test equipments, and one to cover an auxiliary power plant and trailer if desired.

#8 -- Interior Layout

Although a broadcast mobile unit is usually compartmented into three or more separate compartments involving production, engineering, audio and tape recording, the compartment of a small CATV type van will necessarily be limited due to the lack of personnel for fragmented operation. It is desirable to design the unit such that one individual can operate all of the necessary technical equipments from a control location except for strictly manual operations, such as film loading, slide loading, and tape loading of the machines.

We feel it is desirable for the vehicle to be useful for a variety of purposes Therefore, most equipments should be designed so that consoles, recorders, and test equipment can be moved into the compartment or removed from the compartment with a minimum of interference. The Norelco LDH-1 three-tube Plumbicon camera is exceptionally well suited for remote vehicle operation because it is built up from subsystem modules. A simplified version of the camera may be

used as a film chain. Addition of selected items will form a complete light-weight viewfinder camera. Thus, all components, electronics modules, tubes, preamplifiers, and controls remain identical for both film and live cameras. This reduces maintenance costs and provides for simple training procedures. In addition, either one of the live cameras can be used as an independent remote unit by installing a separate plug-in color sync generator. Thus, one complete camera system can be removed from the vehicle and used for separate remote operations without interfering with the operation of the vehicle. The sync generator supplied with the camera control unit may be used to provide pulses for all other video requirements in the vehicle. A simple audio mixing system is also built up from dual modules to provide eight in-put channels switchable to sixteen in-puts with two out-puts. One half of the audio mixer can be removed from the vehicle to serve as a mixer amplifier for use with the self-contained color television camera.

The technical console is so arranged that the operator has relatively free access to the video tape recorders and the telecine system as well as to all the panels for control of live cameras, film camera, and switching equipment. All monitors, patch bays, switchers, and operational controls are located on the monitor wall in front of the console.

Telecine System

The telecine complex operates primarily in an automatic or remote control mode. Start, stop, and run facilities are located at the telecine console but are normally remoted to the technical director console. The industry has experienced considerable difficulty in maintaining optical alignment on telecine systems in-

stalled in remote vehicles. This is primarily due to vibration and shifting of the optical alignment axis. It has been found desirable to reduce the moment arms of the optical subassemblies to a minimum in order to reduce this effect. When subassemblies are mounted to the floor of the vehicle, even though they are attached to a heavy mounting base, they tend to twist and bend, thus emphasizing this drift situation. To help alleviate this problem, a unitized modular cabinet is constructed with an optical base plate attached to the top and located a very short distance from the optical center line. Each piece of telecine equipment is attached to the base plate and also attached by a mounting pin to a steel plate inserted in the side wall, thus giving two-point suspension to each component.

The telecine system may consist of a 16mm projector, a three in-put one output prism multiplexer, a turret slide projector, a precision optical periscope assembly for transferring the slides to the multiplexer, and a special housing assembly to contain the field lens and automatic light control device. The LDH-1 mobile color television camera will be mounted to the base plate by the use of a wedge adapter in order that the camera may be removed from the telecine system when it is desirable to use it as a third live camera. The system is designed so that the entire console assembly can be removed from the vehicle if desired. Storage space for film, slides, and tape is located beneath the optical base plate. A slide mounted drawer contains rewind arms and film editing equipment. Additional storage space is also provided for spare parts, microphone, and cable storage.

Video Tape Recording Subsystem

Two helical scan one-inch portable color video tape recorders are mounted on benches at the side of the tape compartment. Monitoring functions are built

in over the tops of the tape machines. Remote control facilities are remoted to the switching console. The machines should be supplied with editing equipment in order that program content can be edited after field pickup. Storage for tape and supplies is provided beneath the tape recorders in a wooden storage cabinet. Additional storage space is located beneath the recorders for storage of camera cable, power cable, and microphone cable.

Power In-put Cabinet

This cabinet is found in the rear of the compartment and contains metering devices, voltage stabilization equipment, and a power transfer switch.

External and Internal Storage Concepts

A. Camera Storage

Cameras are stored in special cases provided with each camera. The cases will be mounted to clamp pins situated in the floor of the control compartment. Special shelves with springloaded hinges will be mounted on each door of the vehicle. Two doors will be adjusted so that tripods can be strapped one to either door. The rear doors will be arranged so that dollys can be strapped one to either door. Pan heads for the camera will be stored in compartments beneath the tape recorders. Microphones, field cabinet monitors, intercom boxes, and speakers, all will have divided storage space assigned to them.

B. Access Hatches

Water repellant access hatches will be provided on the sides of the vehicle for audio and video in-puts with all necessary cable connectors installed for program and test functions. Audio, video, and communcation jacks are compatible with broadcast standards.

SUMMARY

As previously stated, all users will have a different actual requirement to be concerned with when a mobile color television van is constructed. The object of this paper has been to discuss the design considerations of a small CATV color van which will help to eliminate problems for the user when he places such a van in operation. We have attempted to show several different configurations that might be considered by various CATV operators. It is believed that utilization of the design techniques offered will result in most satisfactory program origination. Complete drawings and specifications for several sizes of CATV vans are available from various manufacturers. Philips Broadcast Equipment Corporation is pleased to provide copies of sample designs for your evaluation. Please contact us at any time to arrange for your free copy.

Thank you very much for your kind attention.

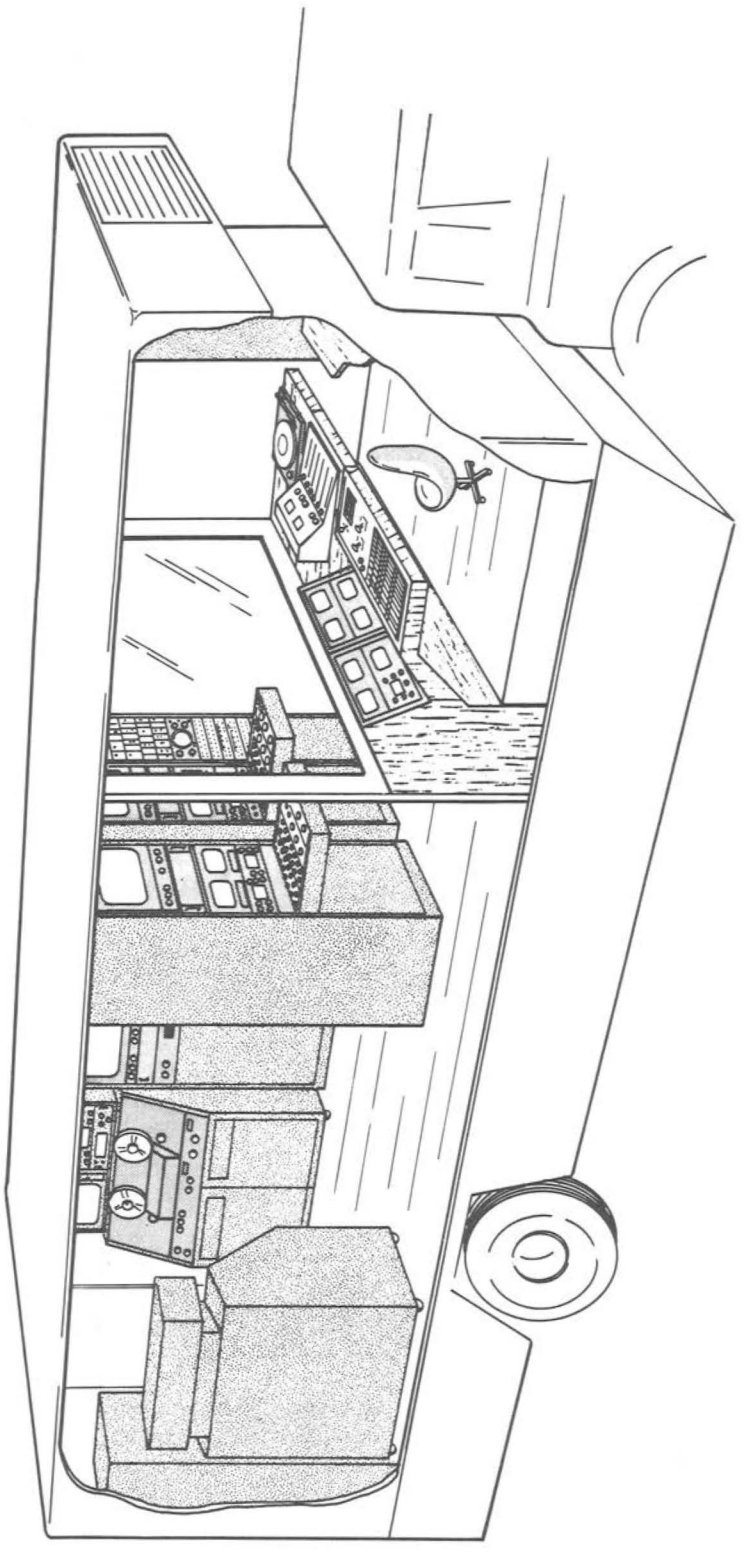

Figure. 1 24 FT MOBILE COLOR UNIT
PHILIPS BROADCAST EQUIP. CORP.

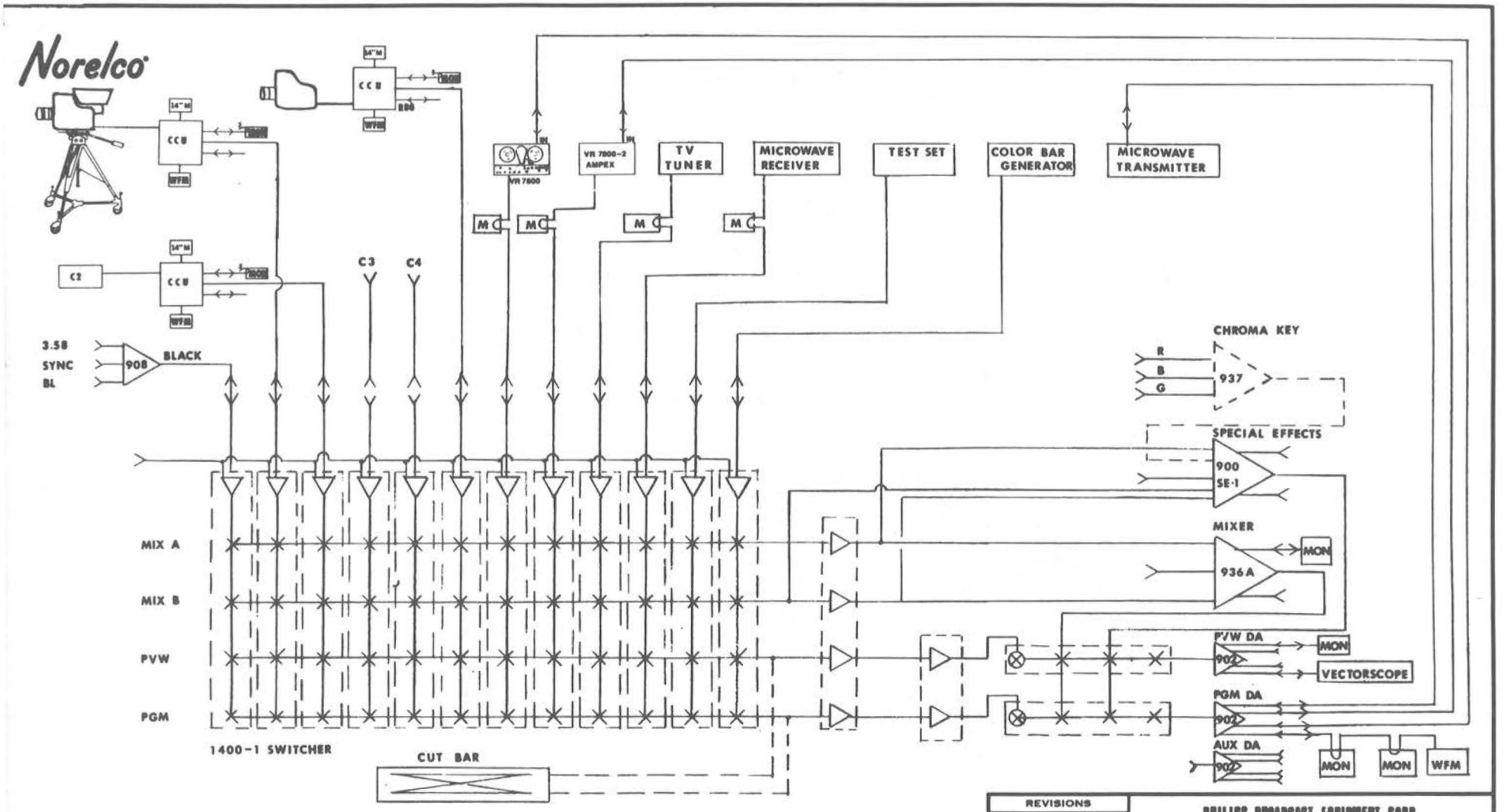

FIG. 2

REVISIONS		
NO.	DATE	BY
1		
2		
3		
4		
5		

PHILIPS BROADCAST EQUIPMENT CORP.

REMOTE UNIT VIDEO SINGLE LINE

DRAWN BY JA	SCALE	MATERIAL
CHK'D K3	DATE 1/06/70	DRAWING NO. 700105 C
TRACED	APP'D	

1x17 (1850-64)

Norelco

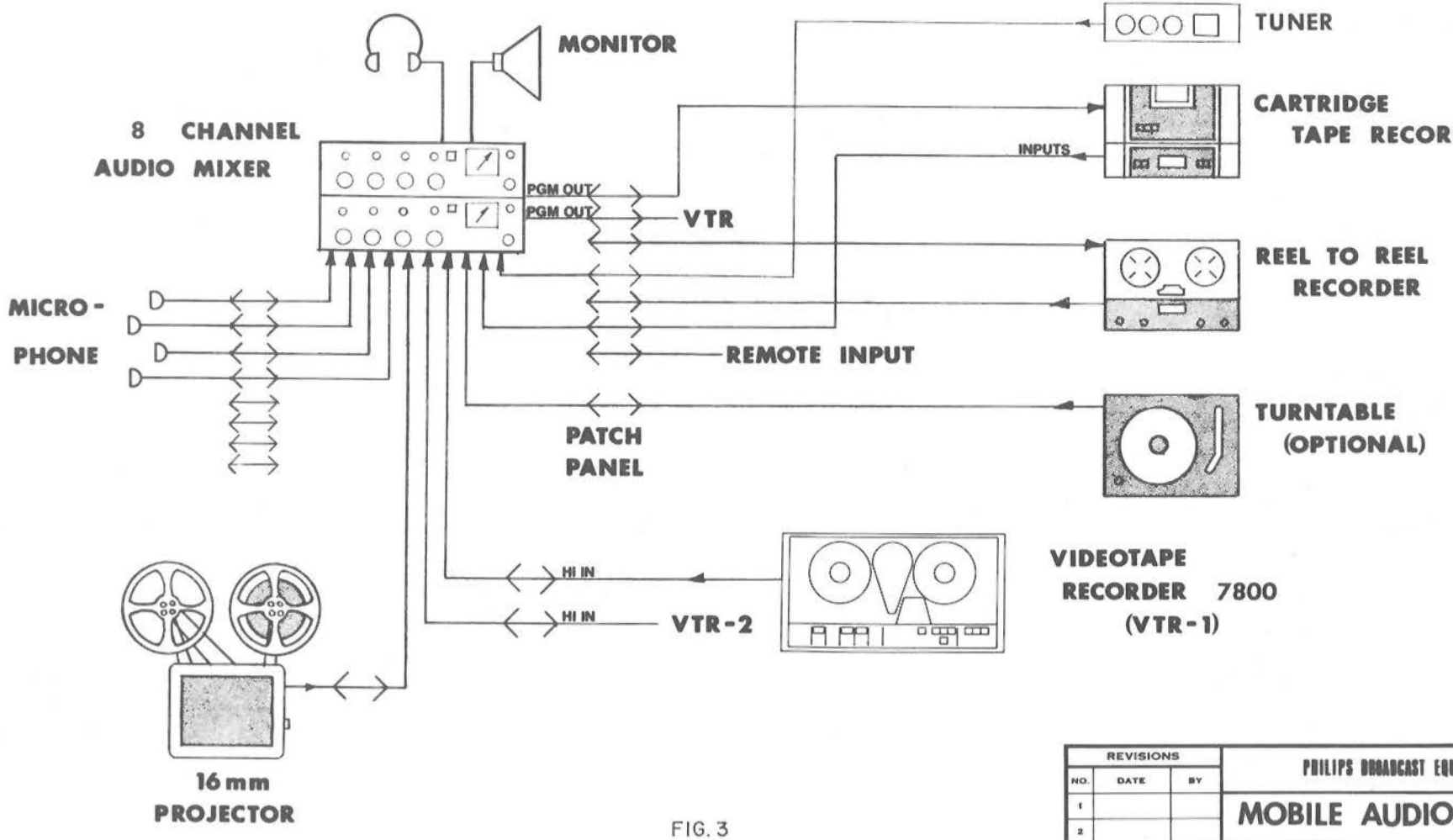

FIG. 3

REVISIONS		
NO.	DATE	BY
1		
2		
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5		

PHILIPS BROADCAST EQUIPMENT CORP.

MOBILE AUDIO DIAGRAM

DRAWN BY D.A.V.	SCALE NONE	MATERIAL	
CHK'D	1/14/70	DRAWING NO.	700115-A
TRACED	APP'D K3		

XETZ 185-11x17 (1050-64)

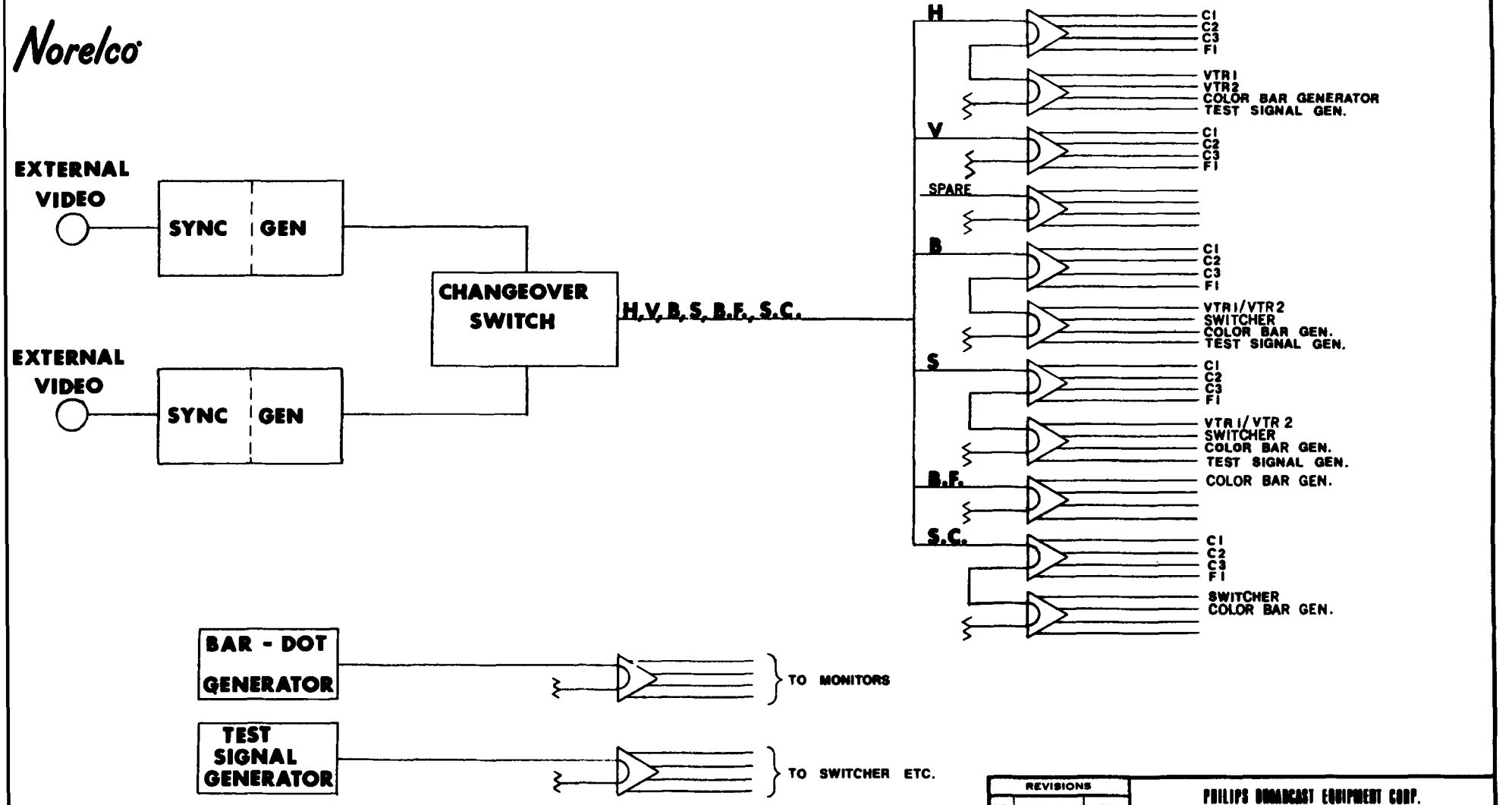

FIG. 4

REVISIONS		
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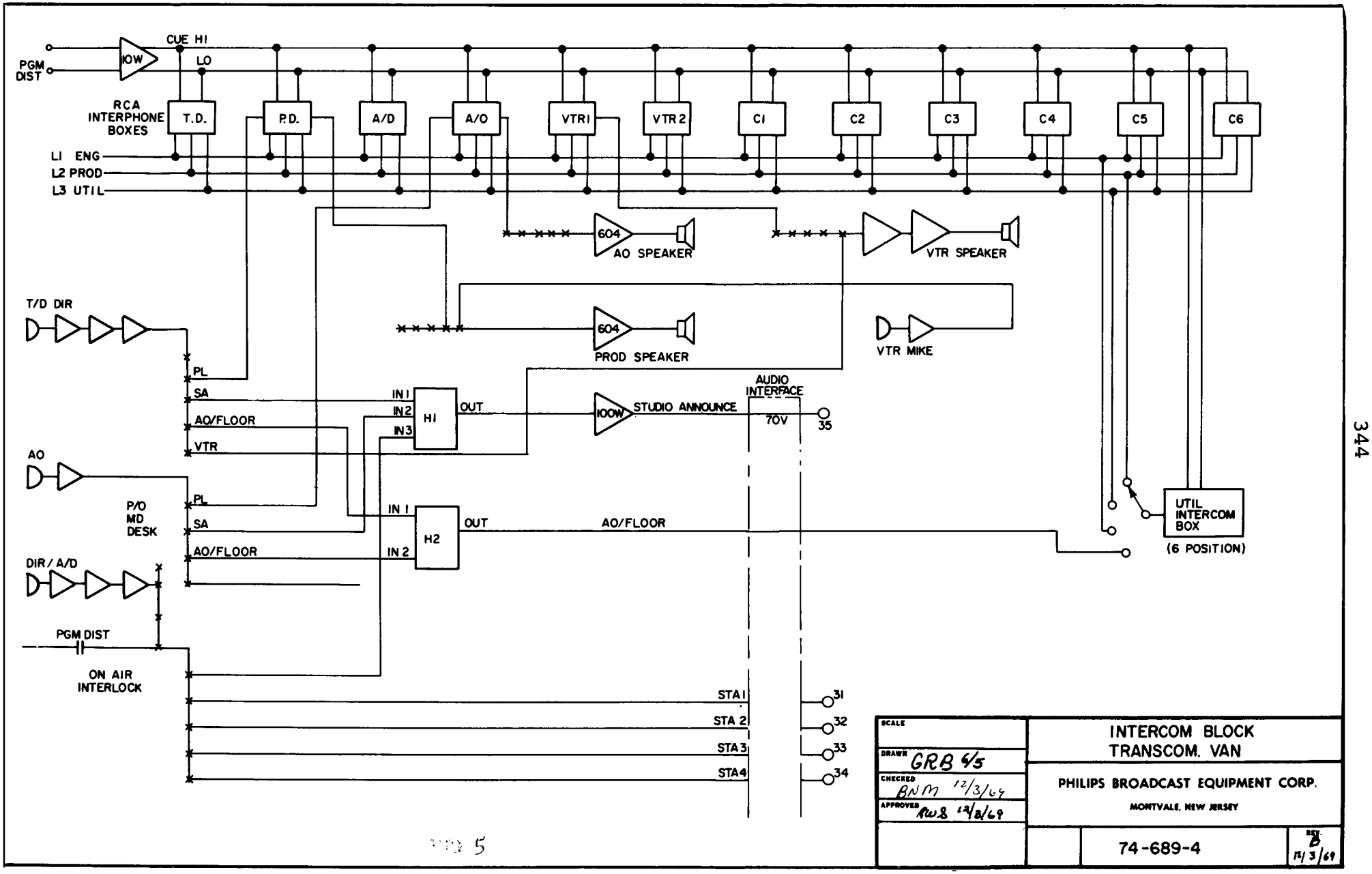
PHILIPS BROADCAST EQUIPMENT CORP.

MOBILE PULSE DIAGRAM

DRAWN BY D.A.V.	SCALE NONE	MATERIAL	
CHK'D	1-14-70	DRAWING NO.	700114-A
TRACED	APP'D K3		


CUE HI
PGM DIST
10W
LO
RCA INTERPHONE BOXES
T.D.
P.D.
A/D
A/O
VTR1
VTR2
C1
C2
C3
C4
C5
C6
L1 ENG
L2 PROD
L3 UTIL
604
AO SPEAKER
VTR SPEAKER
T/D DIR
604
PROD SPEAKER
VTR MIKE
PL
SA
AO/FLOOR
VTR
IN1
IN2
IN3
H1
OUT
AUDIO INTERFACE
100W
STUDIO ANNOUNCE
70V
35
AO
P/O MD DESK
PL
SA
AO/FLOOR
IN 1
IN 2
H2
OUT
AO/FLOOR
UTIL INTERCOM BOX
(6 POSITION)
DIR/A/D
PGM DIST
ON AIR INTERLOCK
STA1
STA 2
STA3
STA4
31
32
33
34
SCALE
DRAWN GRB 6/5
CHECKED BNM 12/3/64
APPROVED RWB 12/8/69
INTERCOM BLOCK
TRANSCOM. VAN
PHILIPS BROADCAST EQUIPMENT CORP.
MONTVALE, NEW JERSEY
74-689-4
REV. B 11/3/69

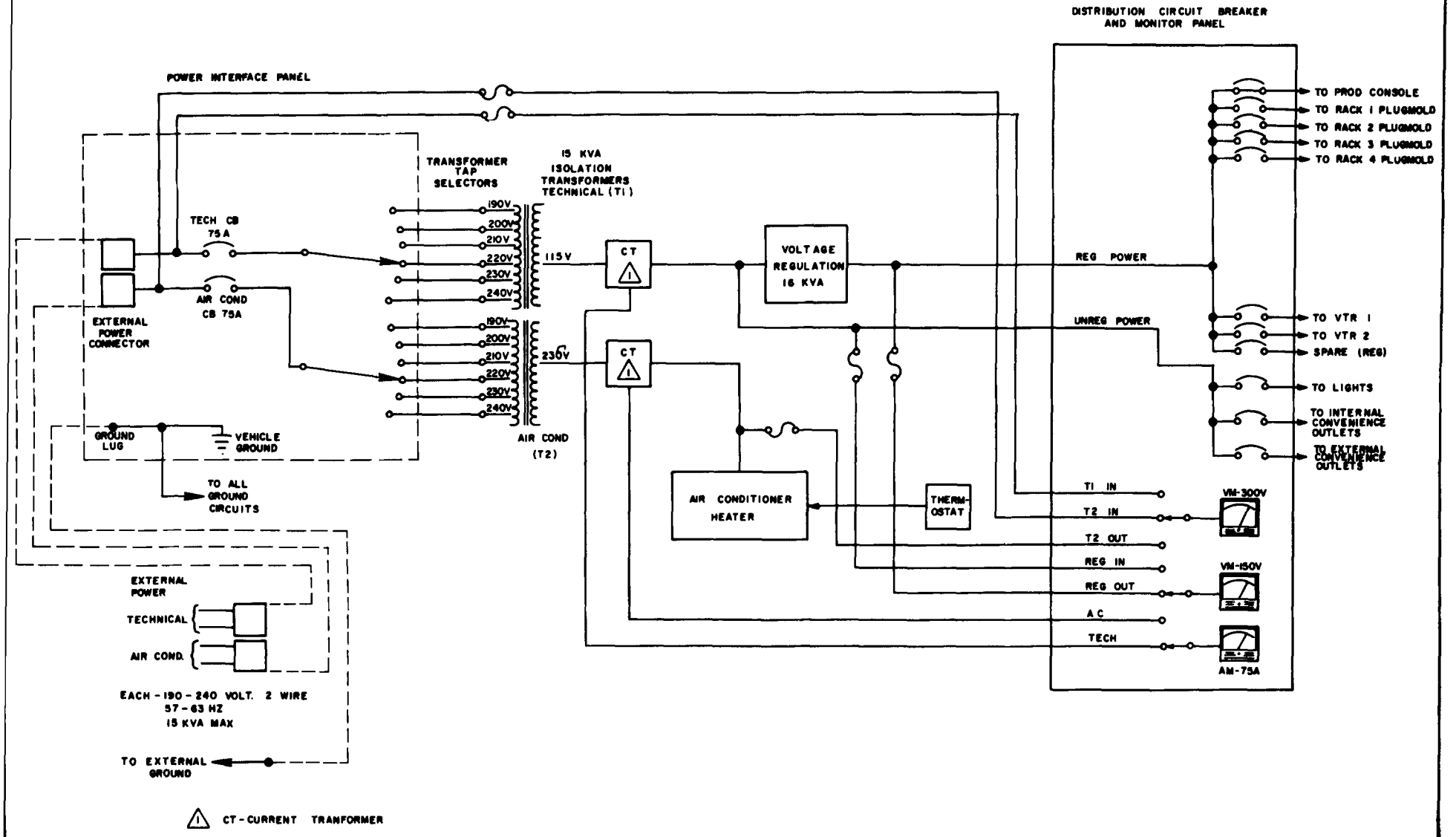


FIG. 6

AC POWER SYSTEM

PHILIPS BROADCAST EQUIPMENT CORP.

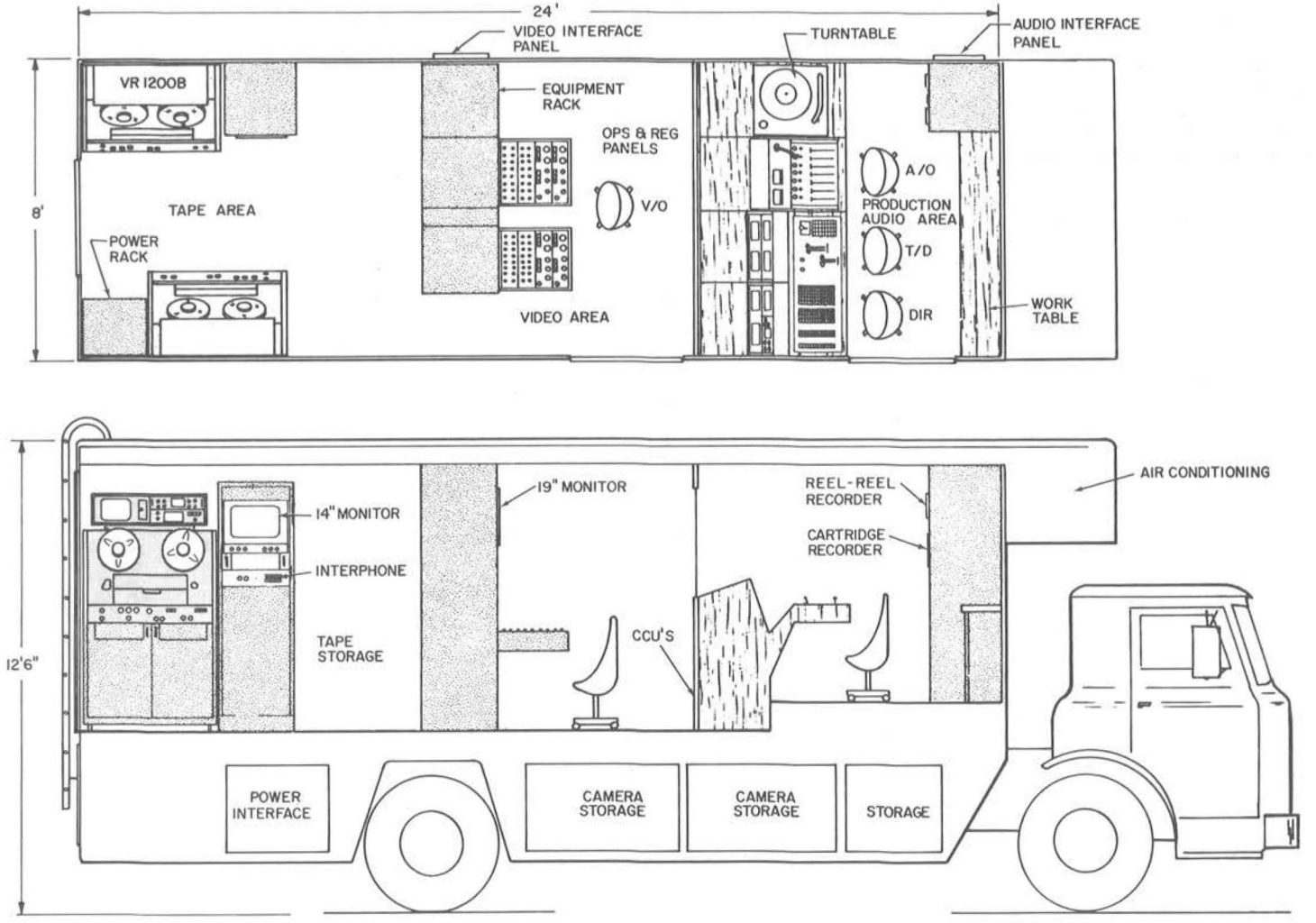
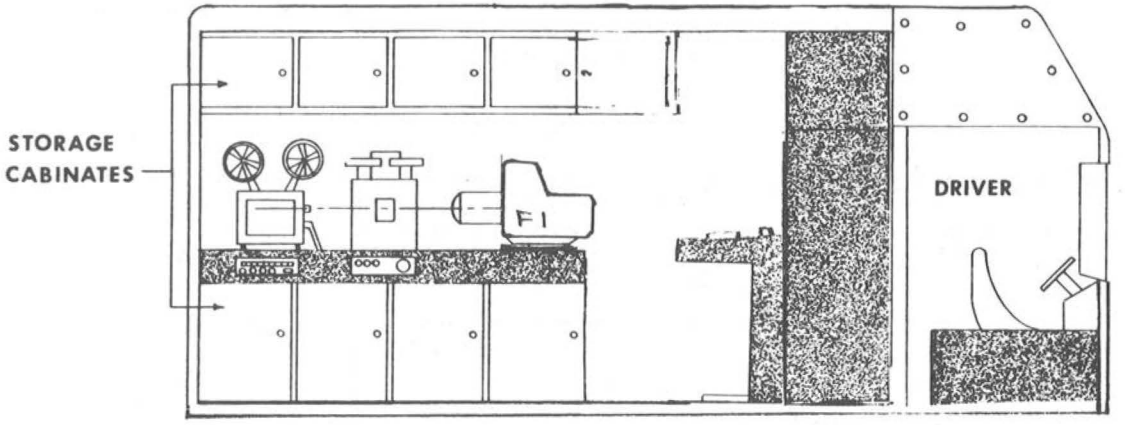


Figure 7 24 FT MOBILE COLOR UNIT
PHILIPS BROADCAST EQUIP. CORP.

Norelco



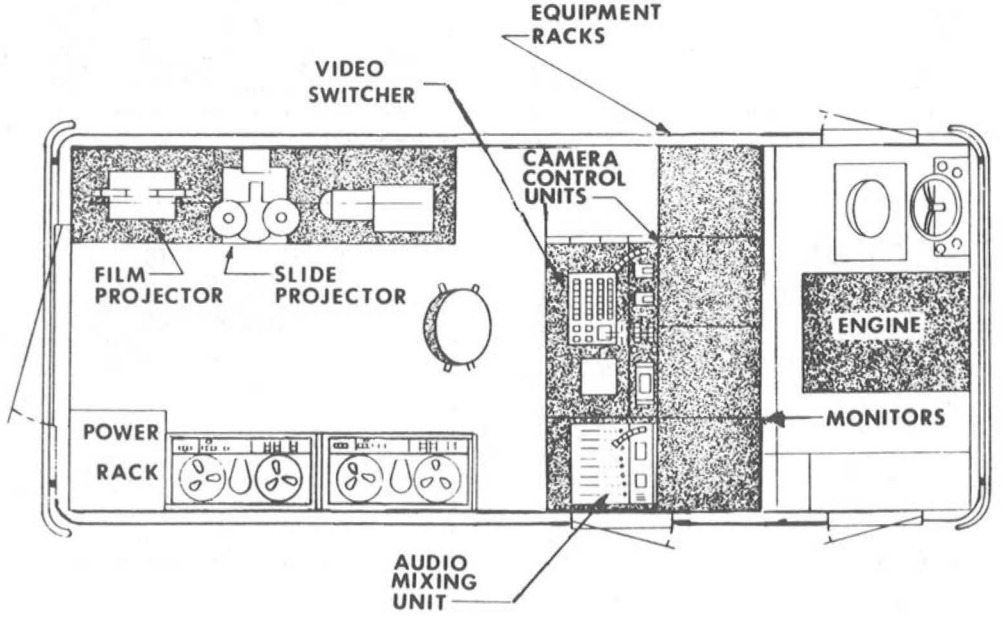


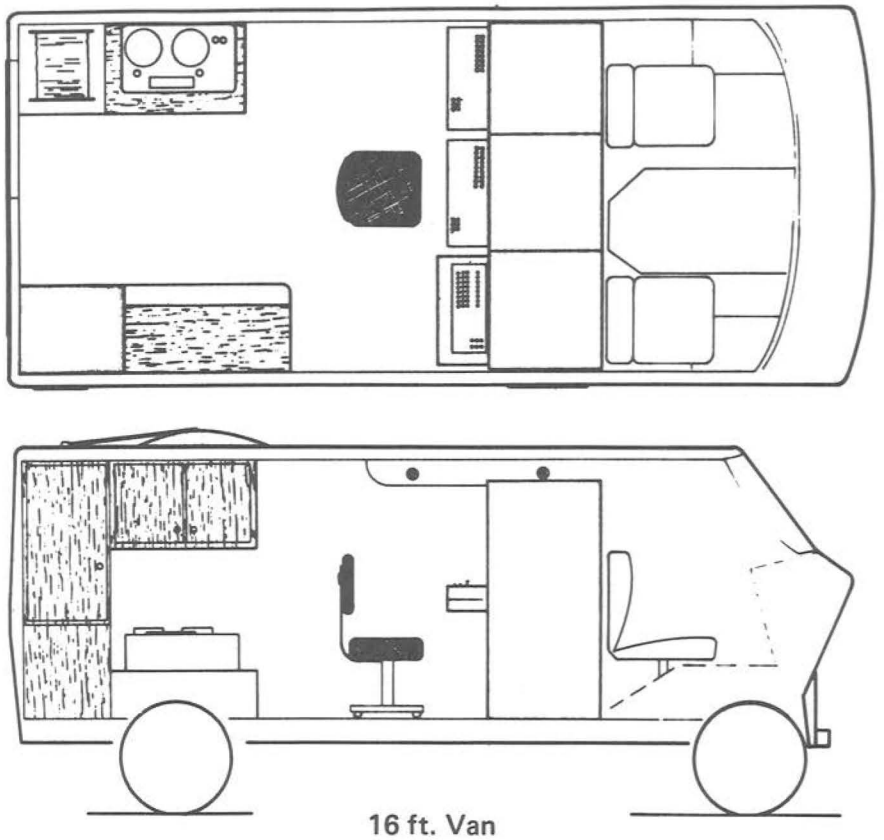
FIG. 8

CATV MOBILE VAN

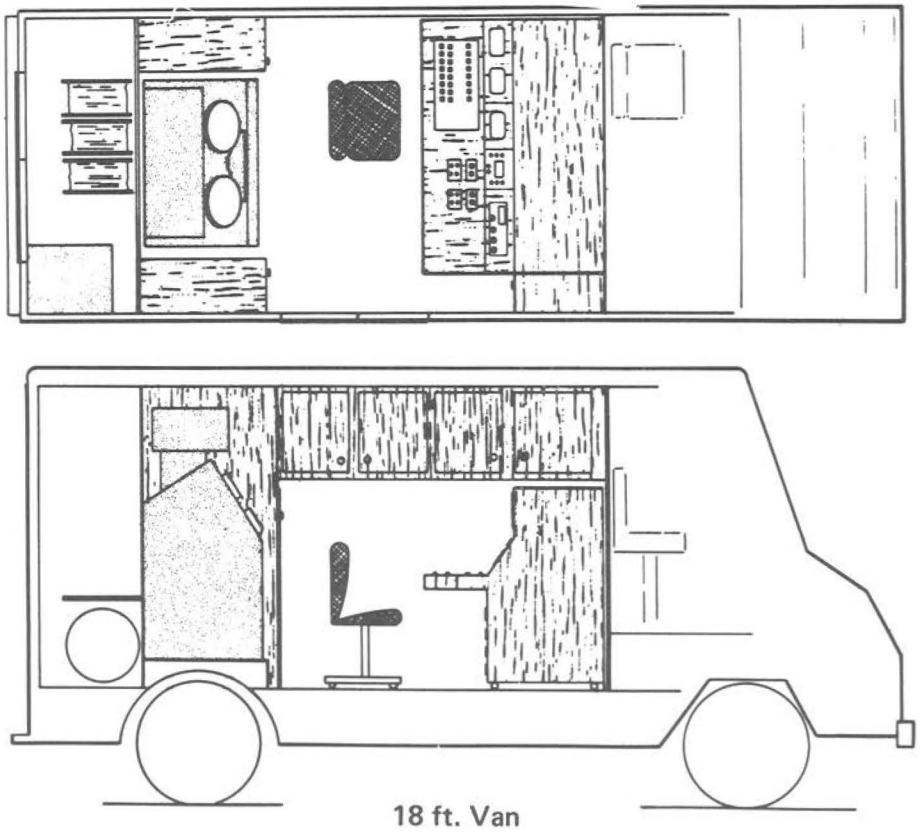
PHILIPS BROADCAST EQUIPMENT CORP.

MONTVALE, NEW JERSEY

REV.



16 ft. Van



18 ft. Van

FIG. 9