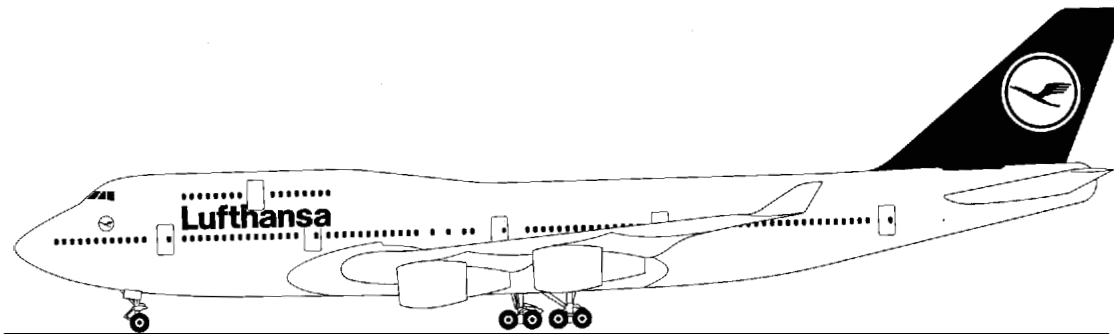




Lufthansa Technical Training

Training Manual B 747-400

**ATA 23-34
PES Audio**
ATA Spec. 104 Level 3



Book No:

Lufthansa
Technical Training GmbH
Lufthansa Base

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ATA 23-34 PASSENGER ENTERTAINMENT SYSTEM AUDIO

PESD AUDIO



PES AUDIO SYSTEM - INTRODUCTION

The purpose of the passenger entertainment audio system (PES audio) is to send recorded entertainment audio to each passenger seat location. Each passenger can make a selection to hear one of many available audio channels.



Figure 1 PASSENGER ENTERTAINMENT AUDIO SYSTEM - INTRODUCTION

PES AUDIO



PASSENGER ENTERTAINMENT AUDIO SYSTEM

General

The main components of PES audio are:

- Audio entertainment tape reproducer (ENT T/R)
- Audio entertainment multiplexer (AEM)
- Entertainment/service controller (ESC)
- Four local area controllers (LAC)
- One seat electronics unit (SEU)/interseat cable for each seat group
- One SEU termination plug for each column
- One digital passenger control unit (DPCU) for each seat
- Cabin configuration test module (CCTM)

The components which interface with the PES are the:

- Cabin system modules (CSMs)
- Video system control unit (VSCU)
- Passenger address controller (PAC)

Audio Interface

The AEM:

- Gets analog audio inputs from the ENT T/R and the video entertainment system
- Converts the audio to a digital audio signal
- Sends the multiplexed digital audio to the ESC

The ESC sends the multiplexed digital audio to each of the four LACs. During a passenger address announcement, an input from the PAC replaces the entertainment/video audio, and passenger address audio goes to all passenger headsets.

LAC 1, 2 and 3 each interfaces with three columns of up to 31 SEUs in the main passenger cabin. LAC 4 interfaces with two columns of SEUs in the upper deck.

LAC 1 has a typical interface in the PES audio. Multiplexed digital audio goes to three columns with up to 31 SEUs each. One SEU can operate up to four DPCUs (one seat group).

The DPCU on each passenger seat armrest sends volume level and channel selection data to the SEU. The SEU then converts the selected channel to analog audio, and sends the audio to the DPCU for the headsets. An SEU termination plug is at the end of a column to maintain proper impedance characteristics of the transmission cable.

The CSM controls power to the SEUs and ENT T/R.

Alternate Circuit Selection

The ESC has a normal and an alternate circuit. Either circuit can do all the ESC functions. The CCTM has a switch which lets the cabin crew use the alternate circuit in the ESC if the normal circuit fails.

PES AUDIO

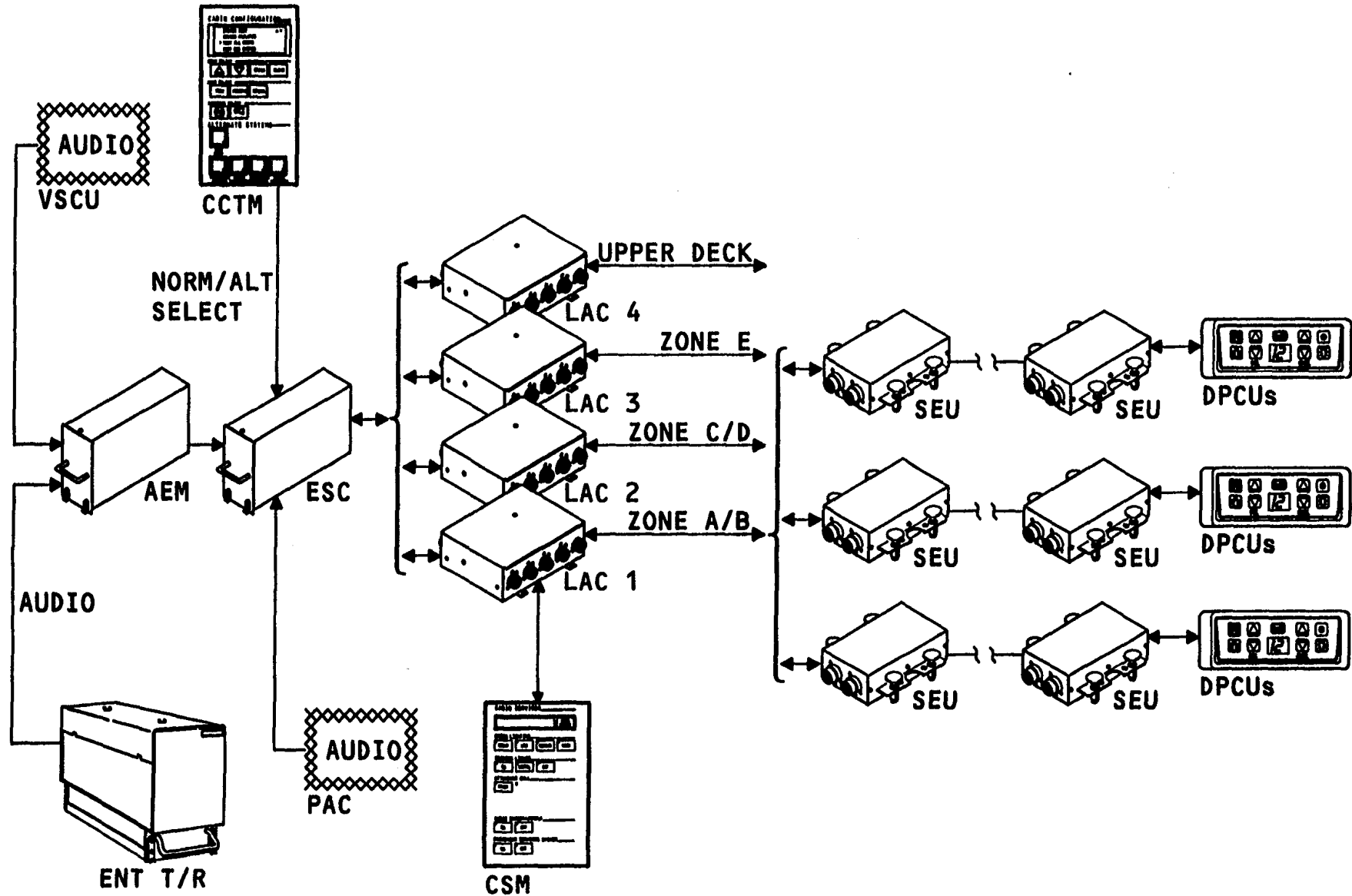


Figure 2 PASSENGER ENTERTAINMENT AUDIO SYSTEM

PES AUDIO



COMPONENT LOCATIONS - MEC

The PES components and interface components in the main equipment center are:

- Audio entertainment multiplexer (AEM)
- Audio entertainment tape reproducer (ENT T/R)
- Entertainment/service controller (ESC)
- AUDIO ENT - TAPE/MUX circuit breaker
- ENT/SERV-DC circuit breaker
- ENT/SERV-AC circuit breaker
- SEAT ELEX ZONE A/B circuit breaker
- SEAT ELEX ZONE C/D circuit breaker
- SEAT ELEX ZONE E circuit breaker
- SEAT ELEX UPR DX circuit breaker
- Audio entertainment relay, R7578
- Reading light relay - 11 R7575
- Seat electronics unit relay, R7574

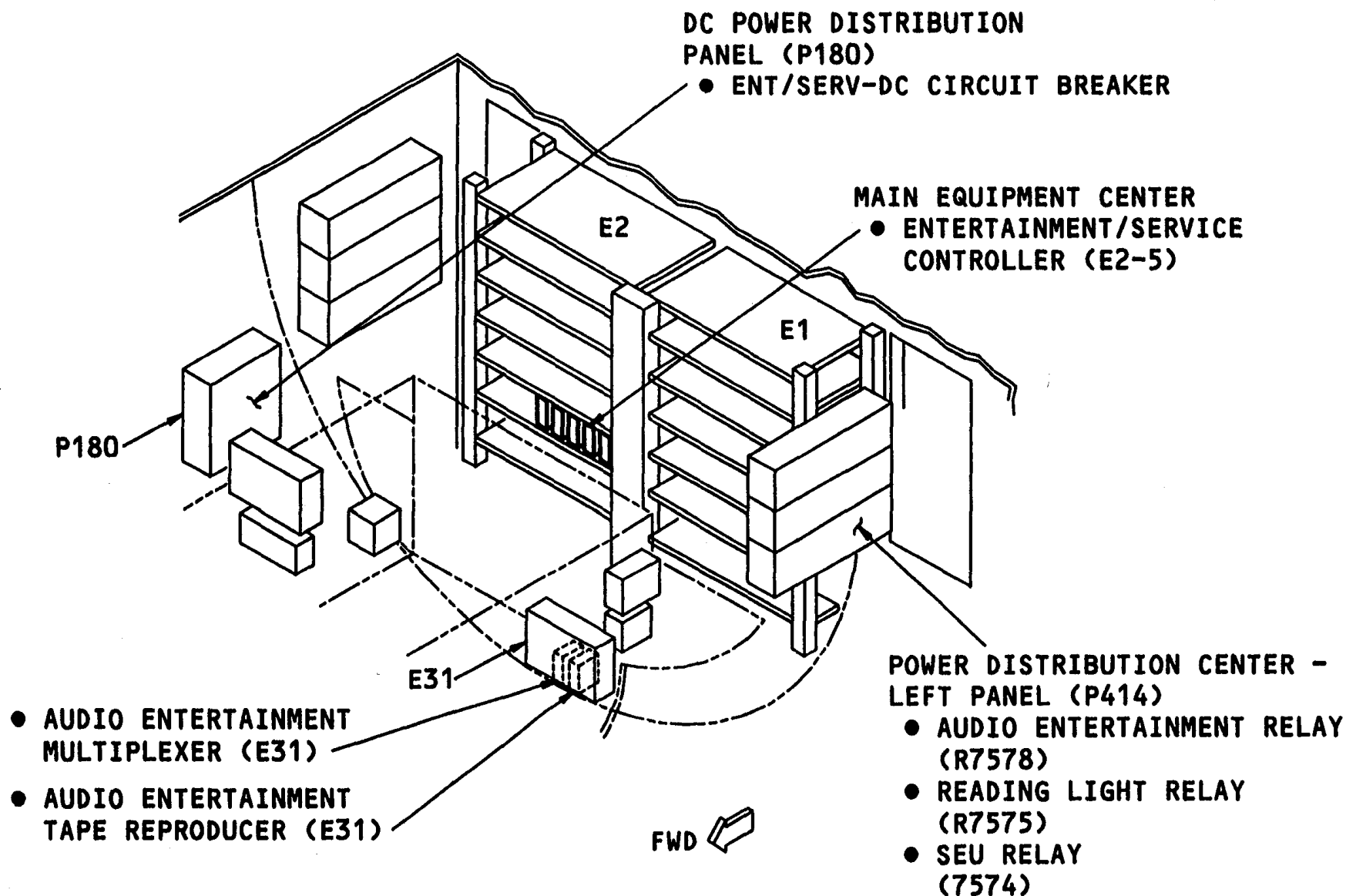


Figure 3 COMPONENT LOCATIONS - MEC

PES AUDIO



COMPONENT LOCATIONS - CABIN

The PES components and interface components in the passenger cabin are:

- Local area controllers
- Seat electronics unit/interseat cable (one for each seat group)
- Digital passenger control unit (one for each seat)
- Cabin configuration test module
- Cabin system modules

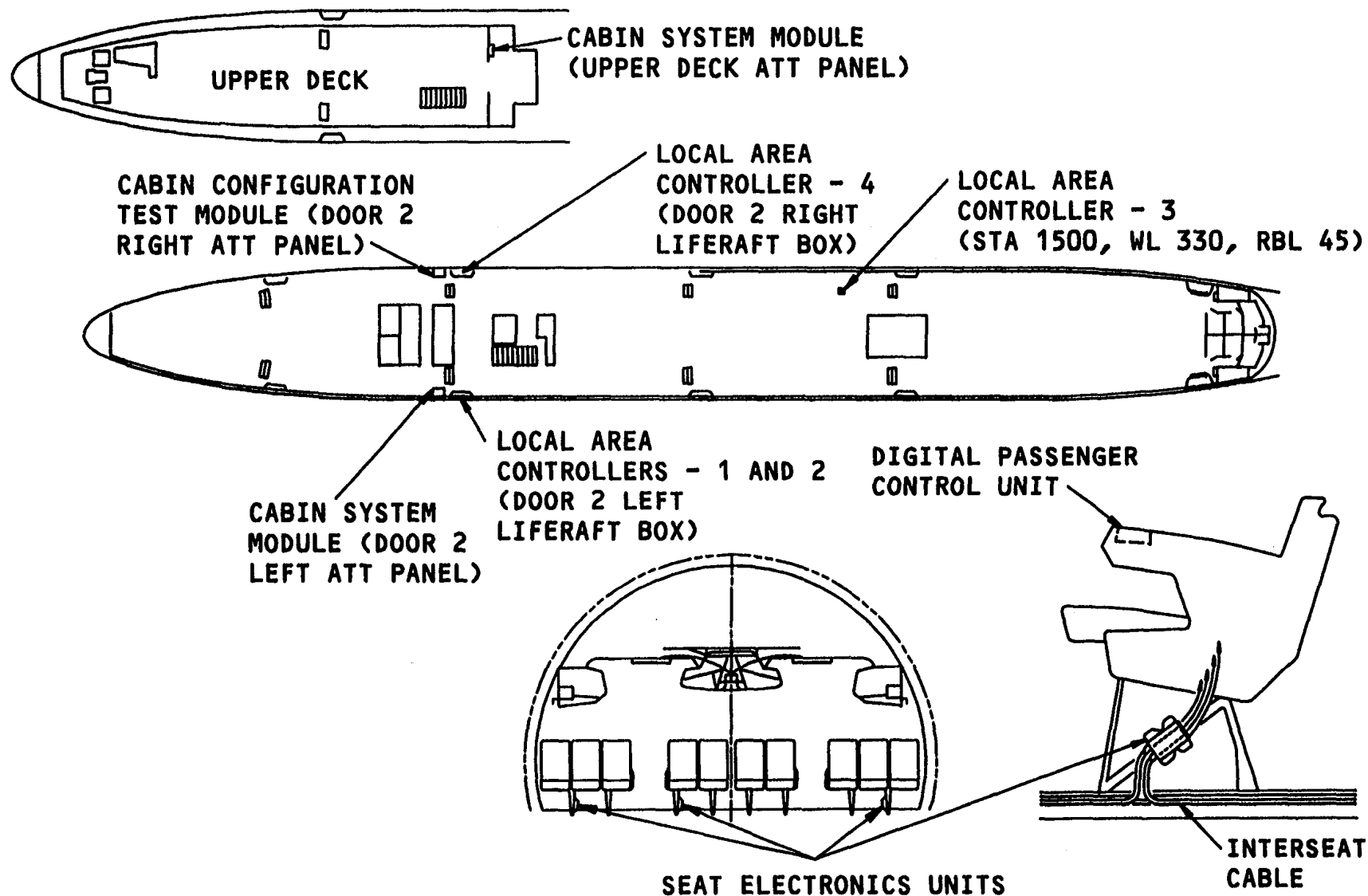


Figure 4 COMPONENT LOCATIONS - CABIN

PES AUDIO

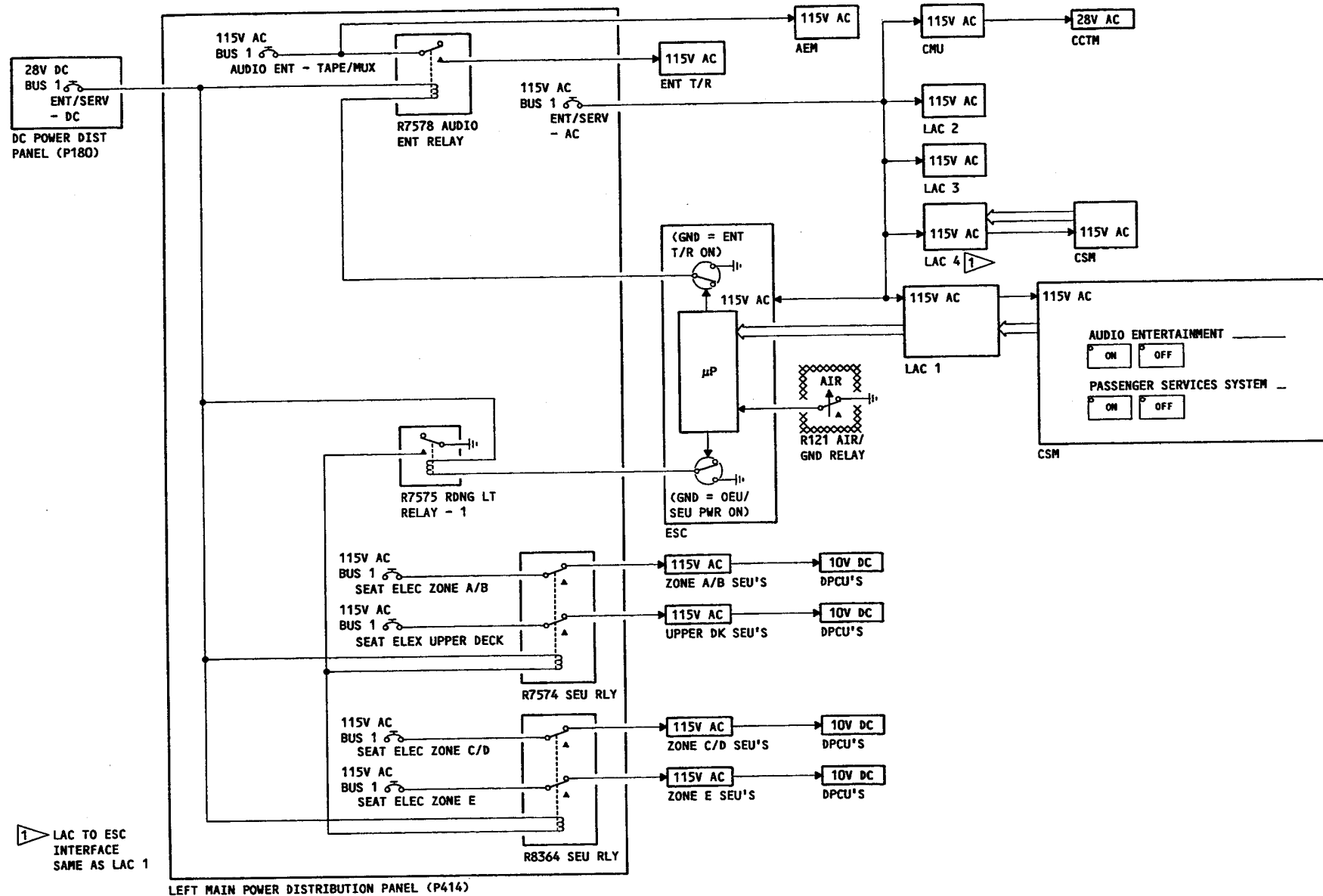


Figure 5 PES AUDIO - INTERFACE DIAGRAM - 1

PES AUDIO

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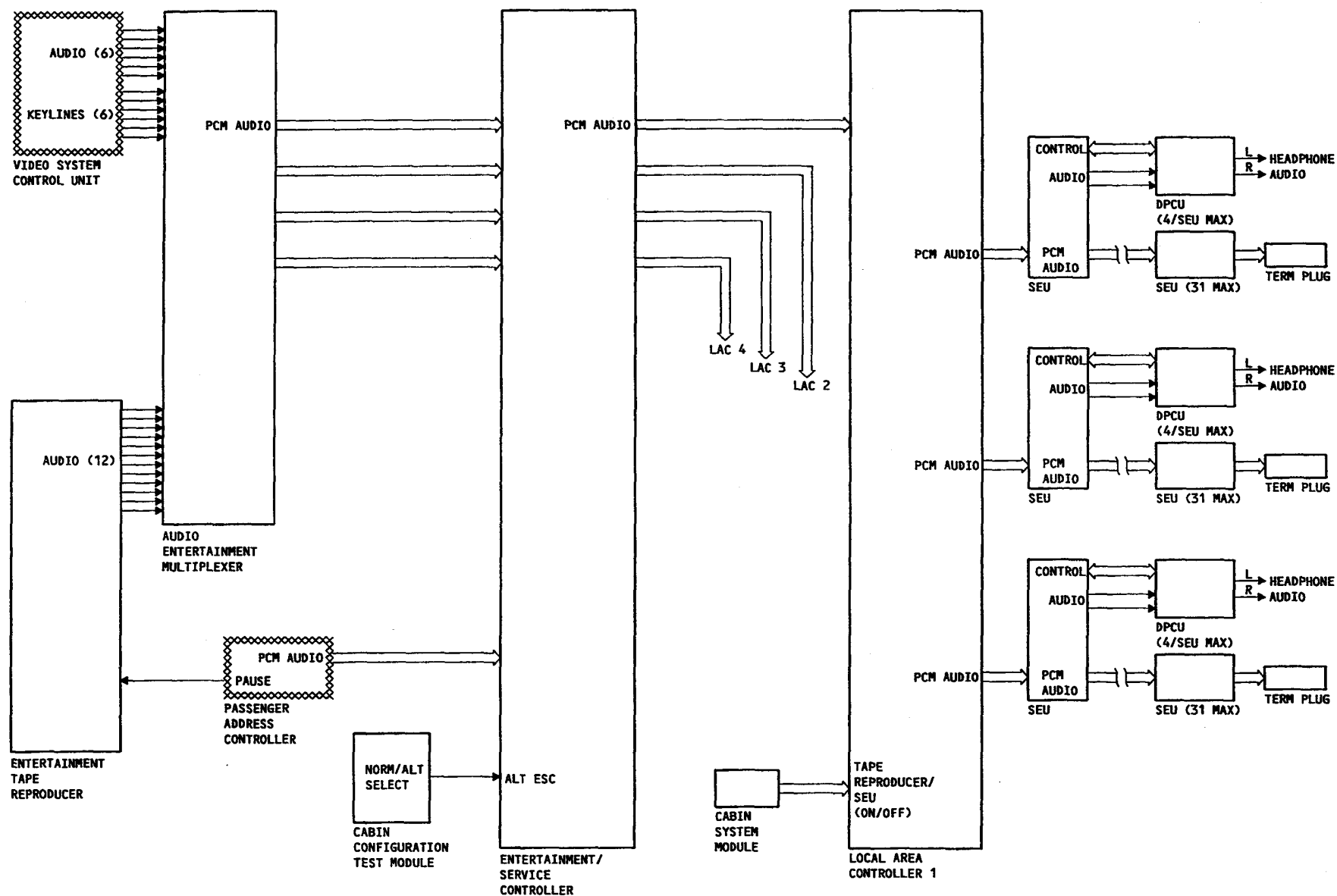


Figure 6 PES AUDIO - INTERFACE DIAGRAM - 2

PES AUDIO



POWER INTERFACE - 1

The ENT/SERV-AC circuit breaker supplies 115v ac to the entertainment/service controller (ESC) and each local area controller (LAC).

The cabin system modules (CSMs) get 115v ac from the LACs.

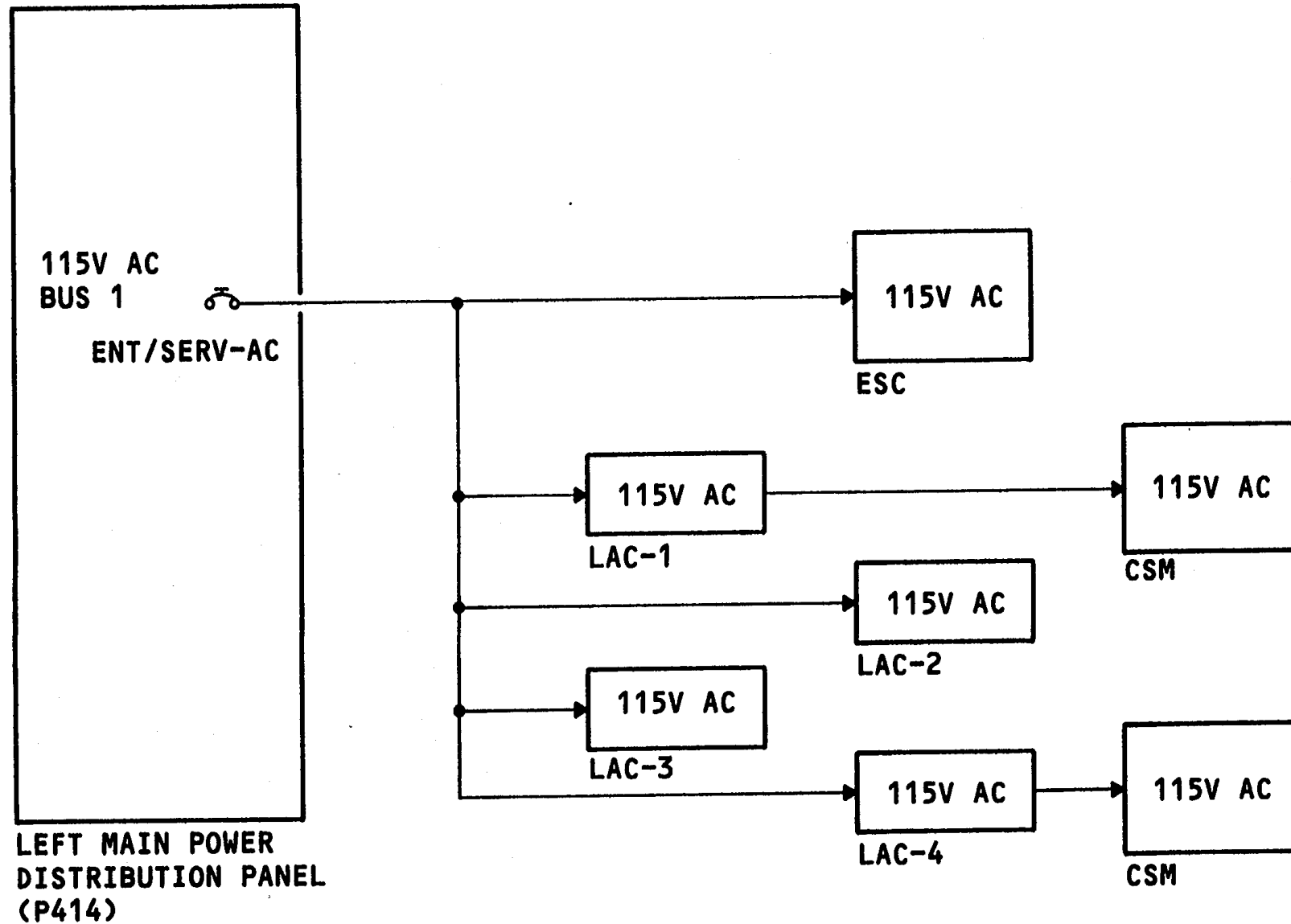


Figure 7 POWER INTERFACE - 1

PES AUDIO



POWER INTERFACE - 2

The AUDIO ENT-TAPE/MUX circuit breaker supplies 115v ac to the audio entertainment multiplexer (AEM).

The AUDIO ENTERTAINMENT ON and OFF switches on any cabin system module (CSM) control the AUDIO ENT relay, which sends 115v ac from the AUDIO ENT-TAPE/MUX circuit breaker to the entertainment tape reproducer (ENT T/R).

The PASSENGER SERVICES SYSTEM ON and OFF switches on any CSM control the SEU relays, which send 115v ac from the SEAT ELEX circuit breakers to the seat electronics units (SEUs).

The digital passenger control units (DPCUs) use 10v dc from the SEUs.

PES AUDIO

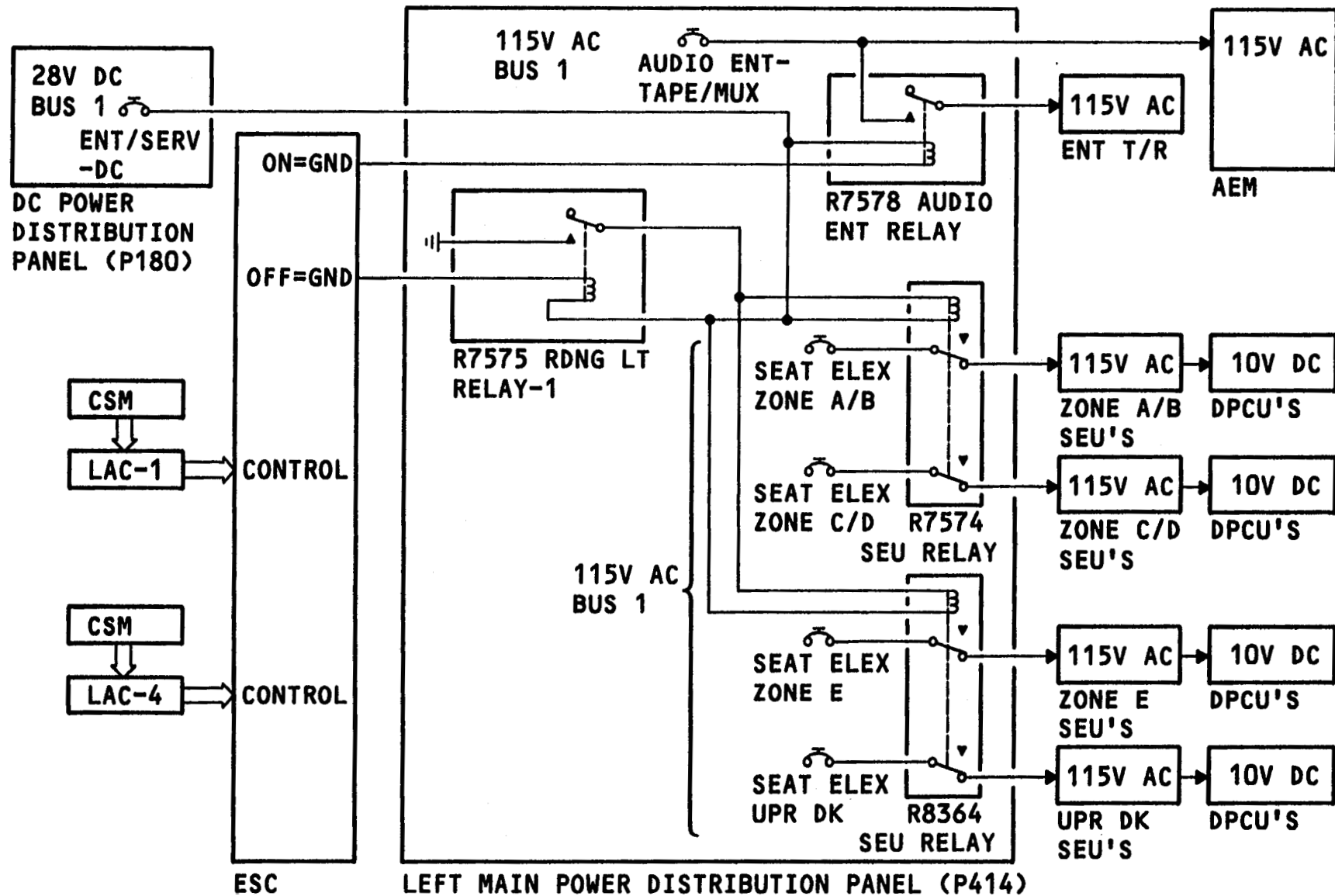


Figure 8 POWER INTERFACE - 2

PES AUDIO



AUDIO INTERFACE - 1

AEM Interface

The audio entertainment multiplexer (AEM) gets 12 channels of audio from the entertainment tape reproducer (ENT T/R), and six channels of audio from the video entertainment system. Keylines from the video entertainment system put the soundtrack mode into the AEM so it correctly processes the audio as monaural, stereo or bi-lingual.

The AEM converts the audio to a digital format, multiplexes the channels into their program sequence and sends the digital audio to the entertainment/service controller (ESC).

ESC Interface

The ESC gets digital audio from the AEM and the passenger address controller (PAC). When there is a passenger address (PA) announcement, the PA digital audio overrides the entertainment digital audio on all channels. The PAC also sends a pause control signal to the ENT T/R which stops the entertainment tape during the PA announcement.

The ESC sends the digital audio (entertainment or passenger address) to the local area controllers (LACs).

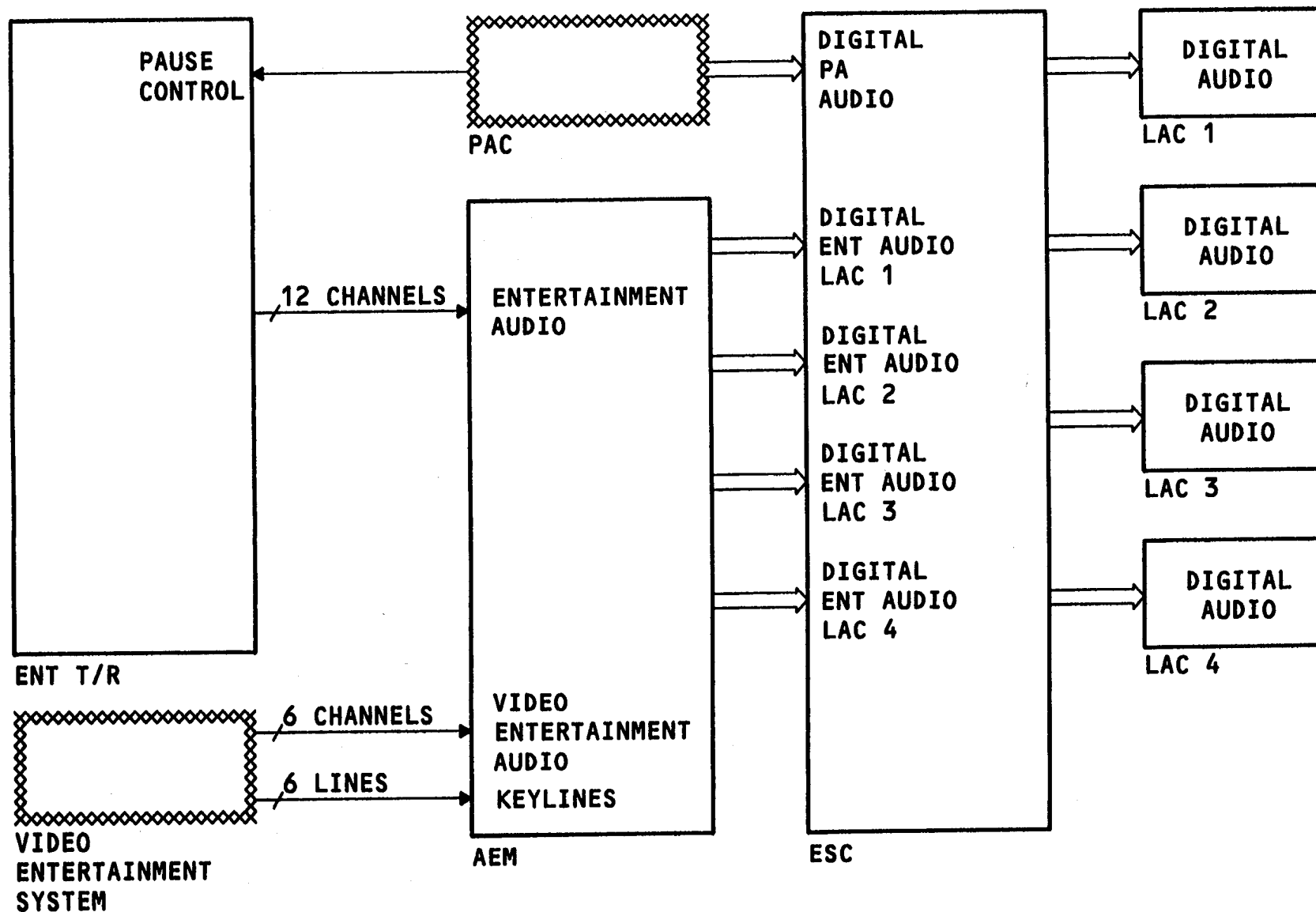


Figure 9 AUDIO INTERFACE - 1

PES AUDIO



AUDIO INTERFACE - 2

LAC-1 Interface

Digital audio from the ESC goes through the LAC to the area it controls. The digital audio goes to the left, center and right columns. A column can have up to 31 seat groups with one seat electronics unit (SEU) for each seat group.

SEU Interface

The SEU gets a digital input from each digital passenger control unit (DPCU) in its seat group.

The input gives channel selection and volume control to the circuits in the SEU. The SEU gets digital audio signals from the LAC or the previous SEU, demultiplexes the selected channels, amplifies the audio to the proper levels and sends the audio outputs to the DPCUs. The passenger can monitor the audio with a headset connected to a Jack near the DPCU.

A SEU termination plug connects to the last SEU in a column to give an impedance match to the transmission cable.

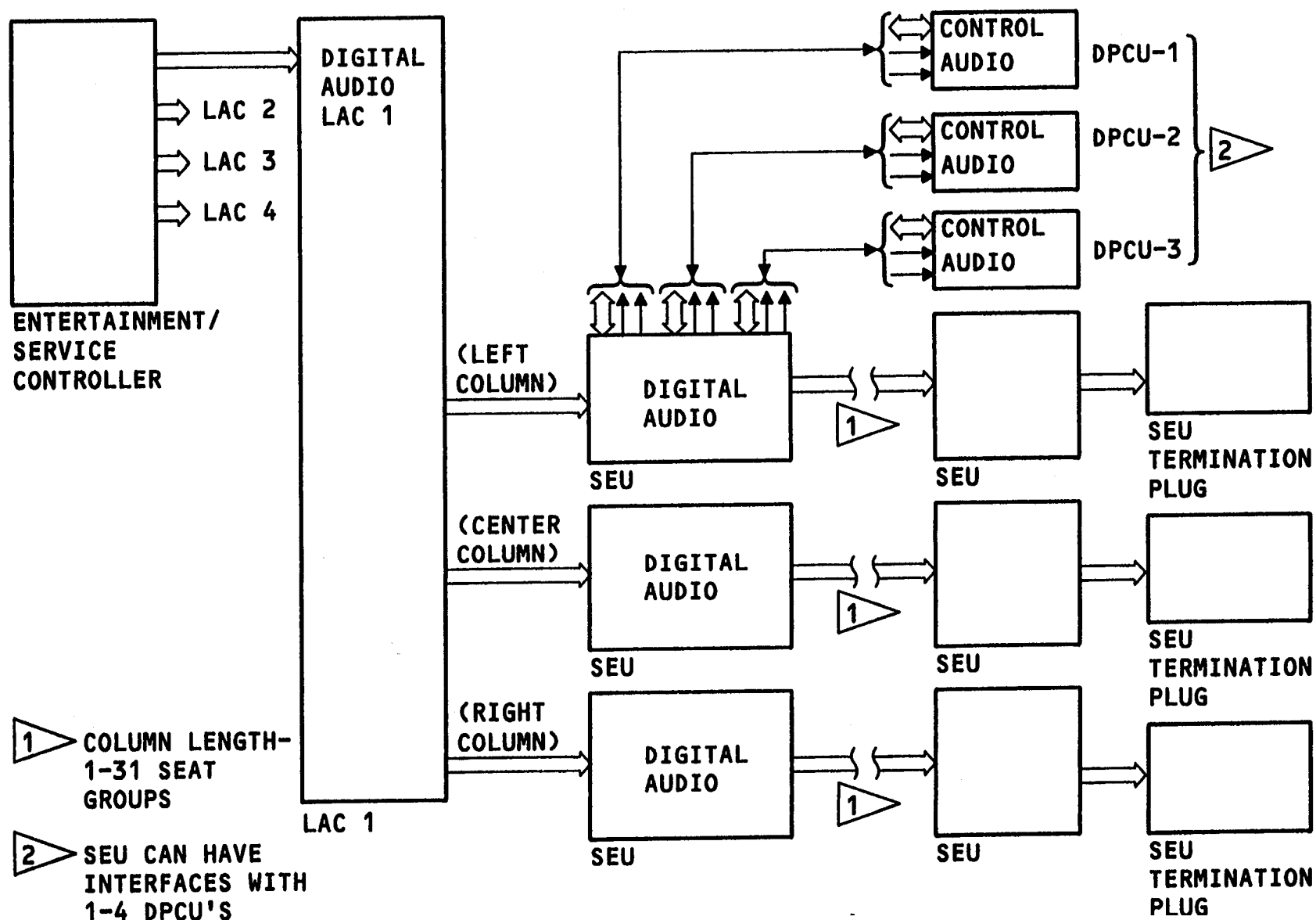


Figure 10 AUDIO INTERFACE - 2

PES AUDIO



LAC PASSENGER ZONE INTERFACES

Each local area controller (LAC) has interfaces with seat electronics units (SEUs) in one or two passenger zones through interface cables. Each LAC has interfaces with these passenger zones:

- LAC 1: Zones A and B
- LAC 2: Zones C and D
- LAC 3: Zone E
- LAC 4: Upper deck.

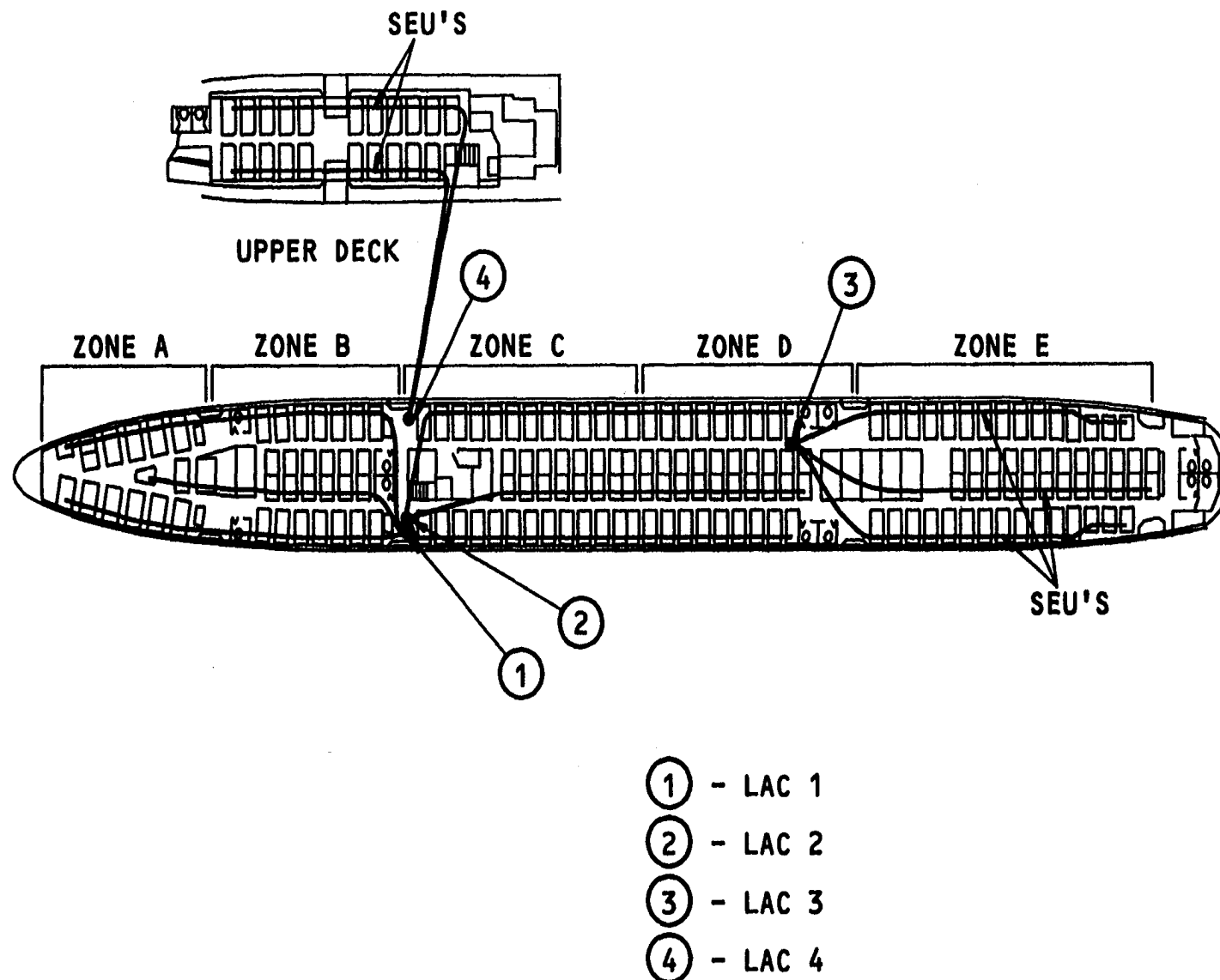


Figure 11 LAC PASSENGER ZONE INTERFACES

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ENTERTAINMENT TAPE REPRODUCER

Purpose

The entertainment tape reproducer (ENT T/R) sends pre-recorded music to the passengers through the passenger entertainment system.

General

The ENT T/R has six identical tape decks (players), which are microprocessor controlled. Six phillips-type cassette tapes are in the tape reproducer. Each tape has four tracks which play in one direction only.

The cassette tapes operate in pairs such that tapes 1A and 1B are a pair, 2A and 2B are a pair, and 3A and 3B are a pair. Tape A has the first half of an audio program, and tape B has the second half.

The cassette tape positions on the tape reproducer have the labels 1A and 1B, 2A and 2B, and 3A and 3B. The tapes and ENT T/R fold-down doors have color-coded labels so that the tapes go into the correct tape decks. Solid red, yellow, and blue labels are for tapes 1A, 2A and 3A. Striped red# yellow, and blue labels (front to back) are for side B.

The unit has two fold-down doors that open down.

Tape Format

Any tape pair can have four monaural (MONO) programs, two stereo programs, or one stereo and two mono programs. Therefore, all three tape pairs may provide twelve mono programs, six stereo programs, or one of many combinations of the two.

The tapes use dbx type II encoding, and must therefore play back in a tape deck designed with dbx decoding. (dbx or decilinear noise reduction is a state-of-the-art noise reduction system). Tracks 1 and 3 of each tape have a 1.4 second, 30 Hz tone (cue signal) to indicate the start and end of the track. The tape reproducer uses the cue signals in the play and rewind modes.

Power

The AUDIO ENTERTAINMENT switches on the cabin system module (CSM) control power to the ENT T/R.

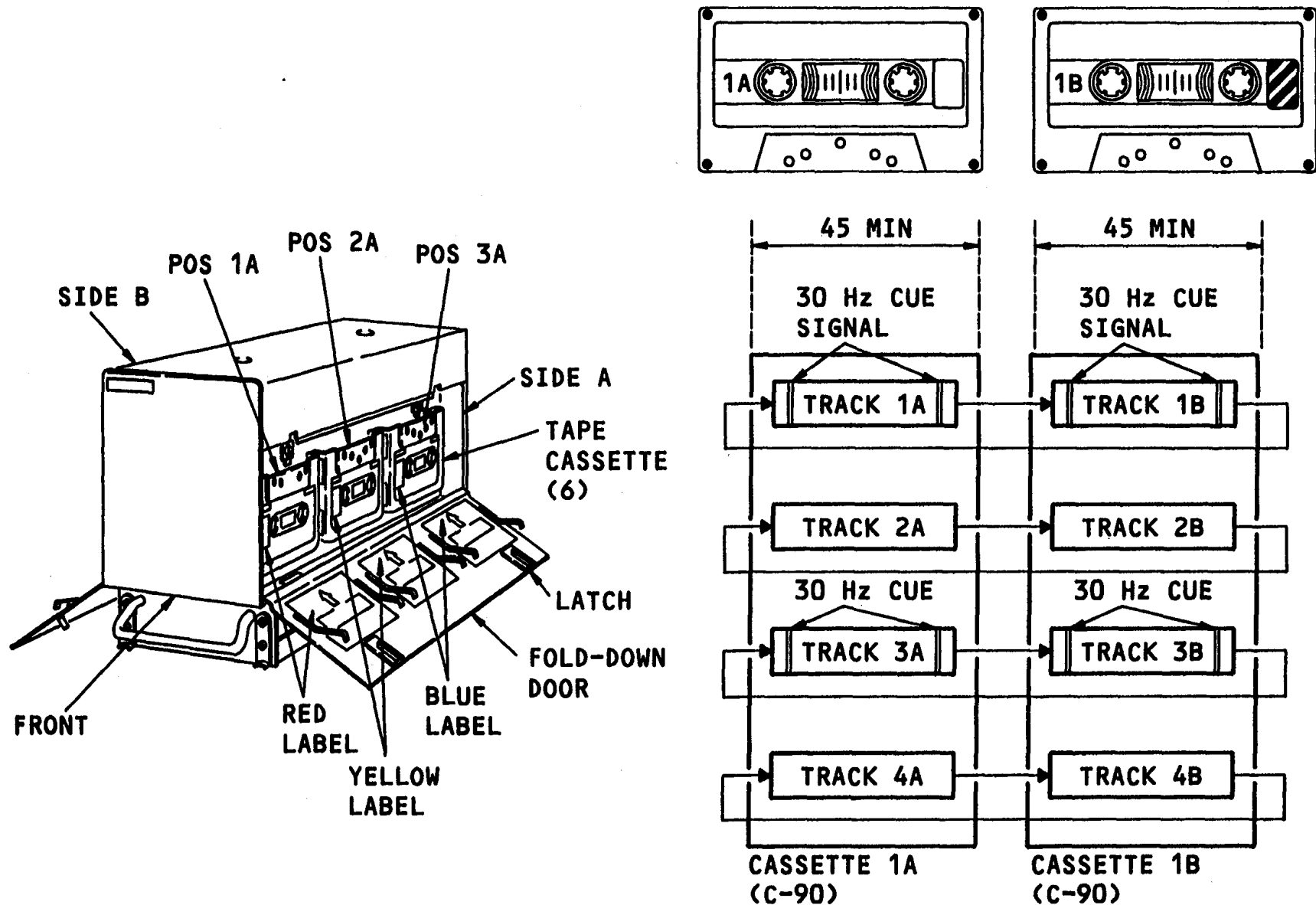


Figure 12 ENTERTAINMENT TAPE REPRODUCER

PES AUDIO



AUDIO ENTERTAINMENT MULTIPLEXER

General Description

The audio entertainment multiplexer (AEM) gets audio from the entertainment tape reproducer (ENT T/R) and the video entertainment system. It converts the audio to digital audio. The AEM then multiplexes these signals and sends them to the entertainment/service controller (ESC).

Characteristics

The AEM can have 18 audio inputs from the ENT T/R and 6 audio inputs from the video entertainment system. The AEM needs the configuration database to operate correctly.

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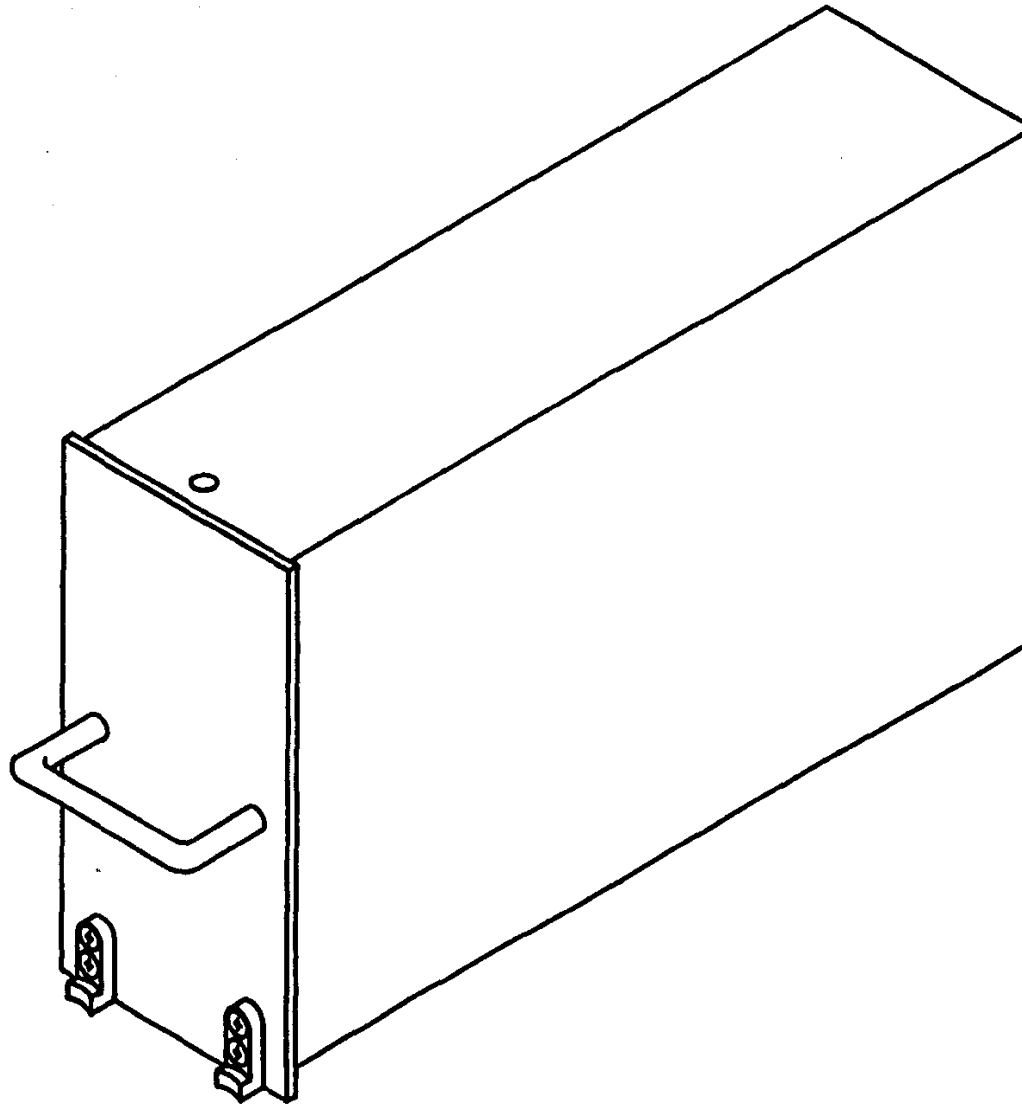


Figure 13 AUDIO ENTERTAINMENT MULTIPLEXER

PES AUDIO



ENTERTAINMENT / SERVICE CONTROLLER

Purpose

The purpose of the entertainment/ service controller (ESC) is to get and distribute data to the local area controllers (LACs). The ESC gets:

- System configuration data from the central management unit (CMU)
- Digital audio from the audio entertainment multiplexer (AEM)
- Digital audio from the passenger address controller (PAC)

General Description

The ESC has two controller circuits, which are the same, called normal and alternate. One controller circuit does all the functions of the ESC. Only one controller circuit is on at a time. If there is a failure of the normal controller, use the switch on the cabin configuration test module (CCTM) to make the alternate controller come on. The ESC needs the configuration database to operate correctly.

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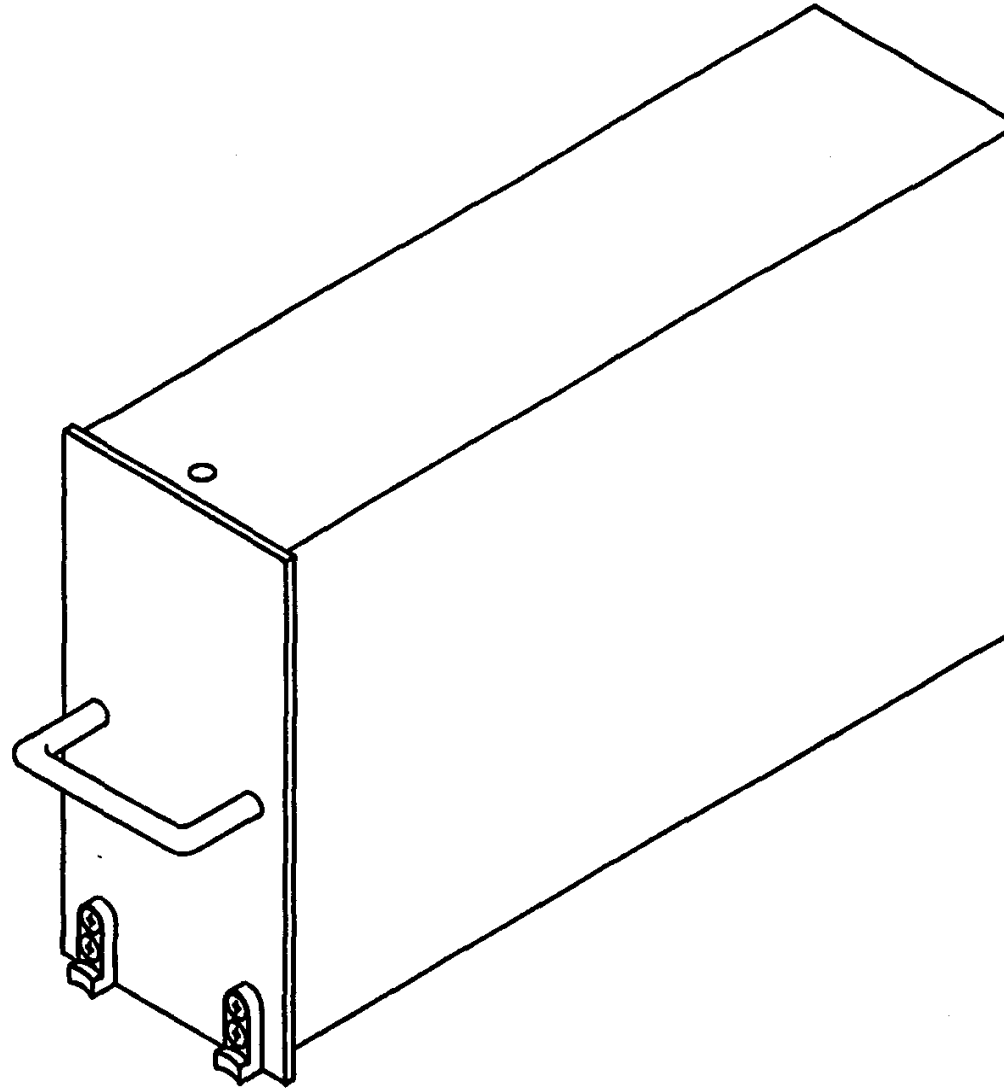


Figure 14 ENTERTAINMENT / SERVICE CONTROLLER

PES AUDIO



LOCAL AREA CONTROLLER

General Description

The local area controllers (LACs) send digital audio to the seat electronic units (SEUs) within the area it controls. Each of the LACs gets multiplexed digital audio from the entertainment/service controller (ESC).

Characteristics

The local area controller has three independent assemblies.

One assembly does only functions of the passenger address system, one does only functions of the cabin interphone system, and one does only functions of passenger entertainment, passenger service and cabin lighting systems.

The LAC needs the configuration database to operate correctly.

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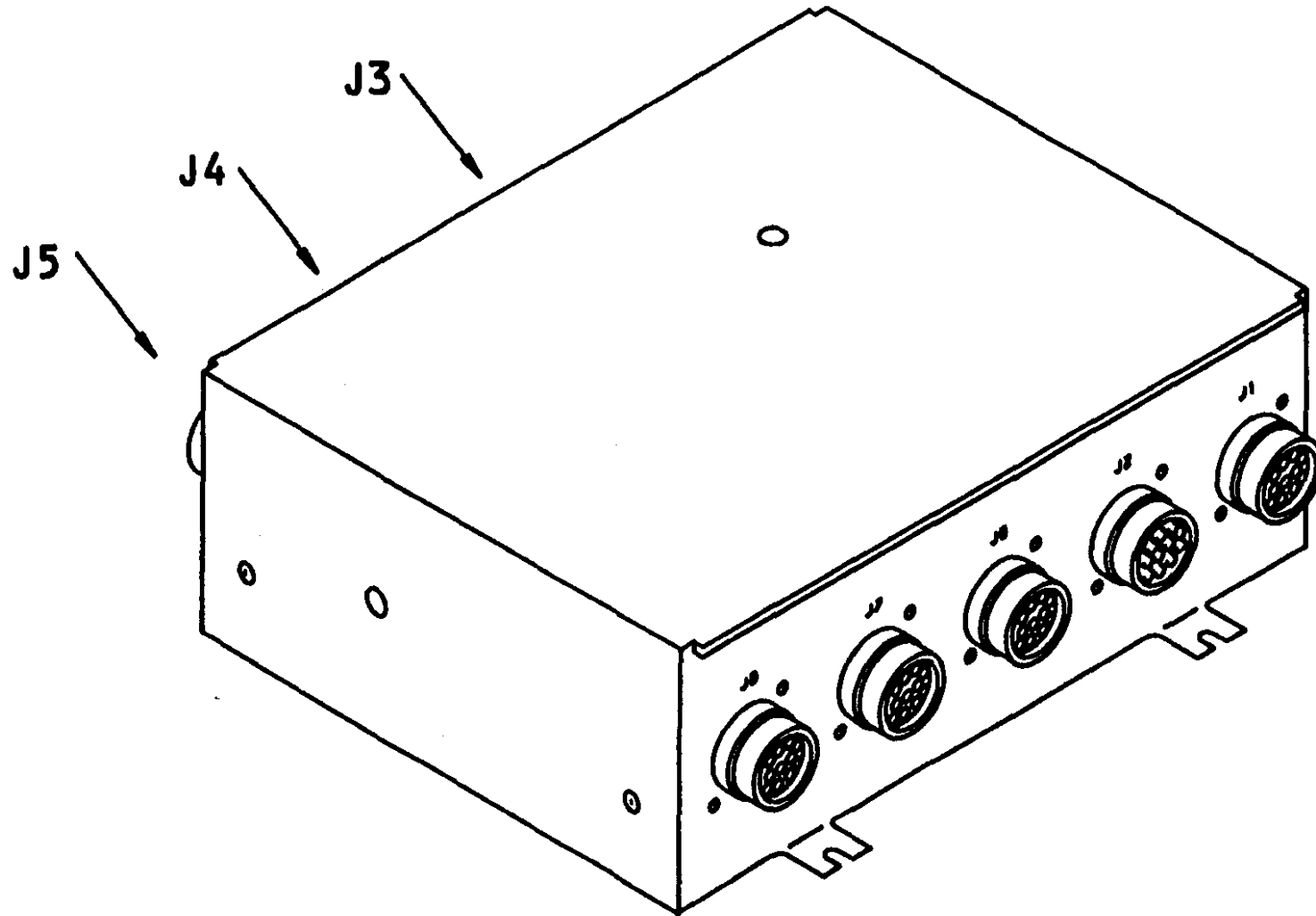


Figure 15 LOCAL AREA CONTROLLER

PES AUDIO



SEAT ELECTRONICS UNIT

General Description

The seat electronics unit (SEU) gets a multiplexed digital audio signal from its local area controller (LAC). Each digital passenger control unit (DPCU) within the seat group sends volume control and channel selection data to the SEU. The SEU decodes the selections, and for the selected channels only, converts the digital audio to its original analog form. The SEU then amplifies the audio to the desired level and sends it to the DPCUs for monitoring.

There is one SEU for each seat group. (A seat group may have from one to four seats.)

The SEU needs the configuration database to operate correctly.

Power

The PASSENGER SERVICES SYSTEM ON and OFF switches on the cabin system module (CSM) control the power to the SEU.

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**J1 -
INPUT FROM LOCAL
AREA CONTROLLER (LAC)
OR PREVIOUS SEAT
ELECTRONICS UNIT (SEU)**

**J2 -
OUTPUT TO NEXT
SEAT ELECTRONICS UNIT (SEU)
OR SEU TERMINATION PLUG**

**DIGITAL PASSENGER CONTROL
UNIT (DPCU) INTERFACE**

**J3 - DPCU #1
J4 - DPCU #2
J5 - DPCU #3
J6 - DPCU #4**

J7 - NOT USED

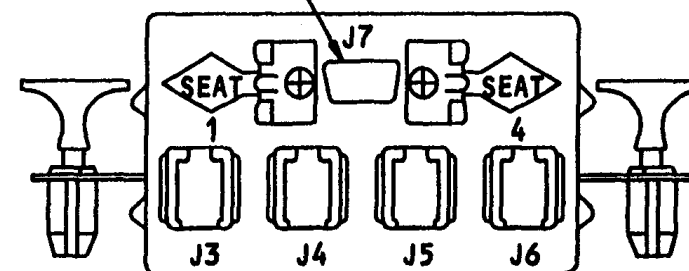


Figure 16 SEAT ELECTRONICS UNIT

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SEAT ELECTRONICS UNIT INSTALLATION

The seat electronics unit (SEU) mounts on the structure of the seat group as shown. Location may differ slightly with different seat groups. Four fasteners allow quick removal and installation of the SEU. A SEU cover protects the SEU and its connection cables from damage.

The interseat cable goes into a channel that is parallel with the seat track, which has a rigid plastic seat track cover.

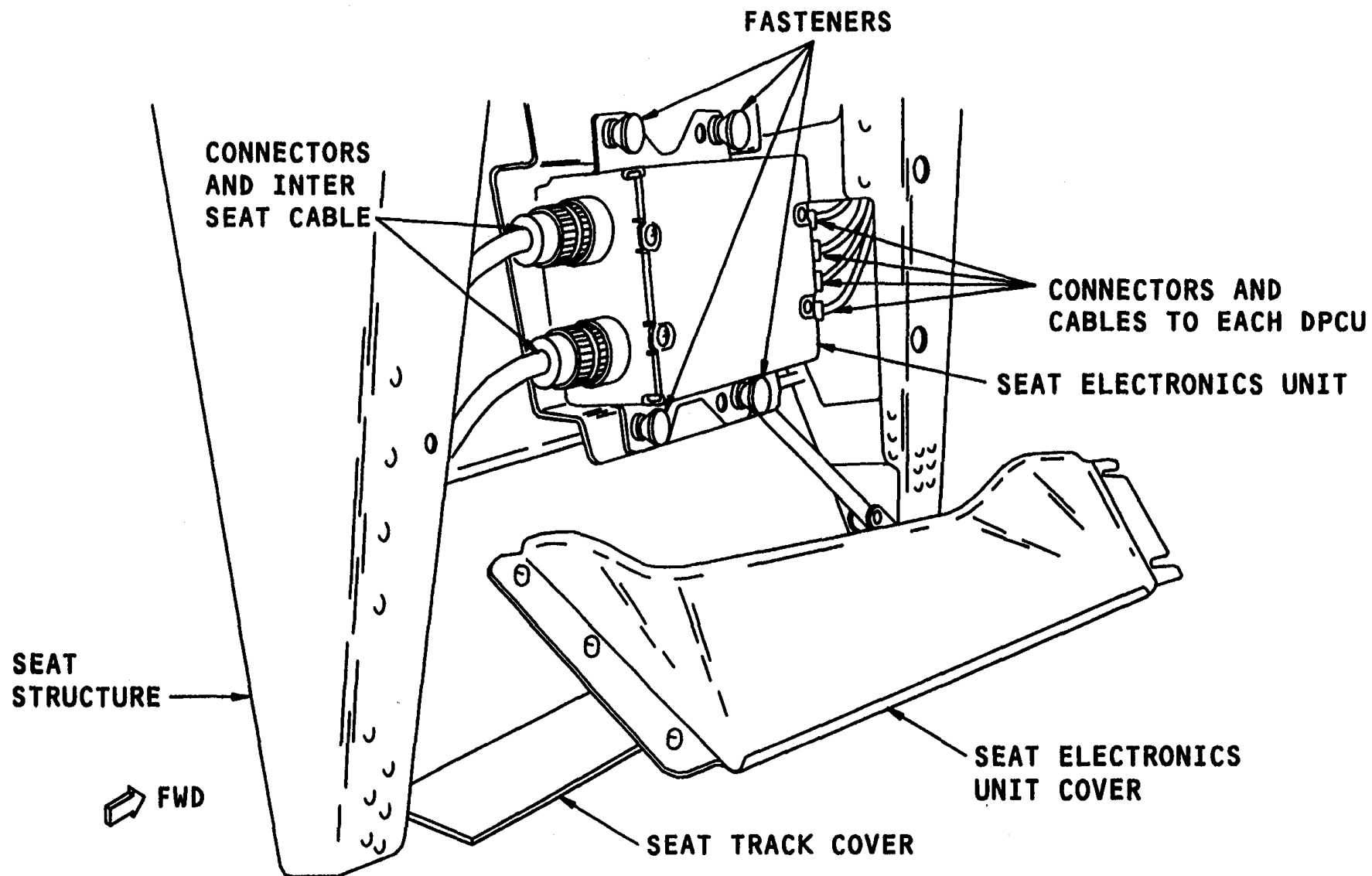


Figure 17 SEAT ELECTRONICS UNIT INSTALLATION



SEU INTERSEAT CABLE INSTALLATION

The SEU interseat cable is in a cable raceway that is next to the seat track.

The seat track and cable raceway has a seat track cover for protection. Remove the cover to access the SEU interseat cable.

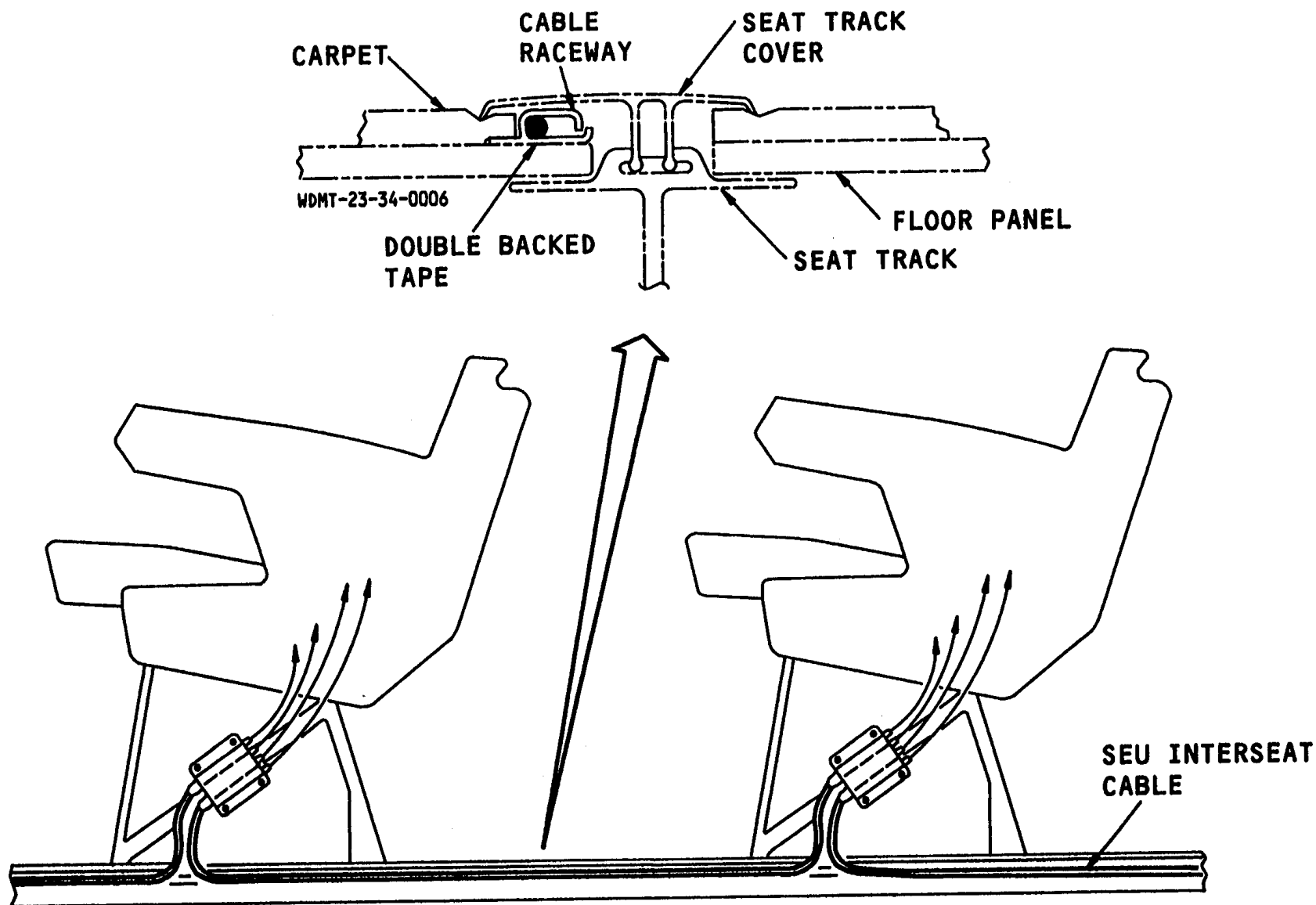


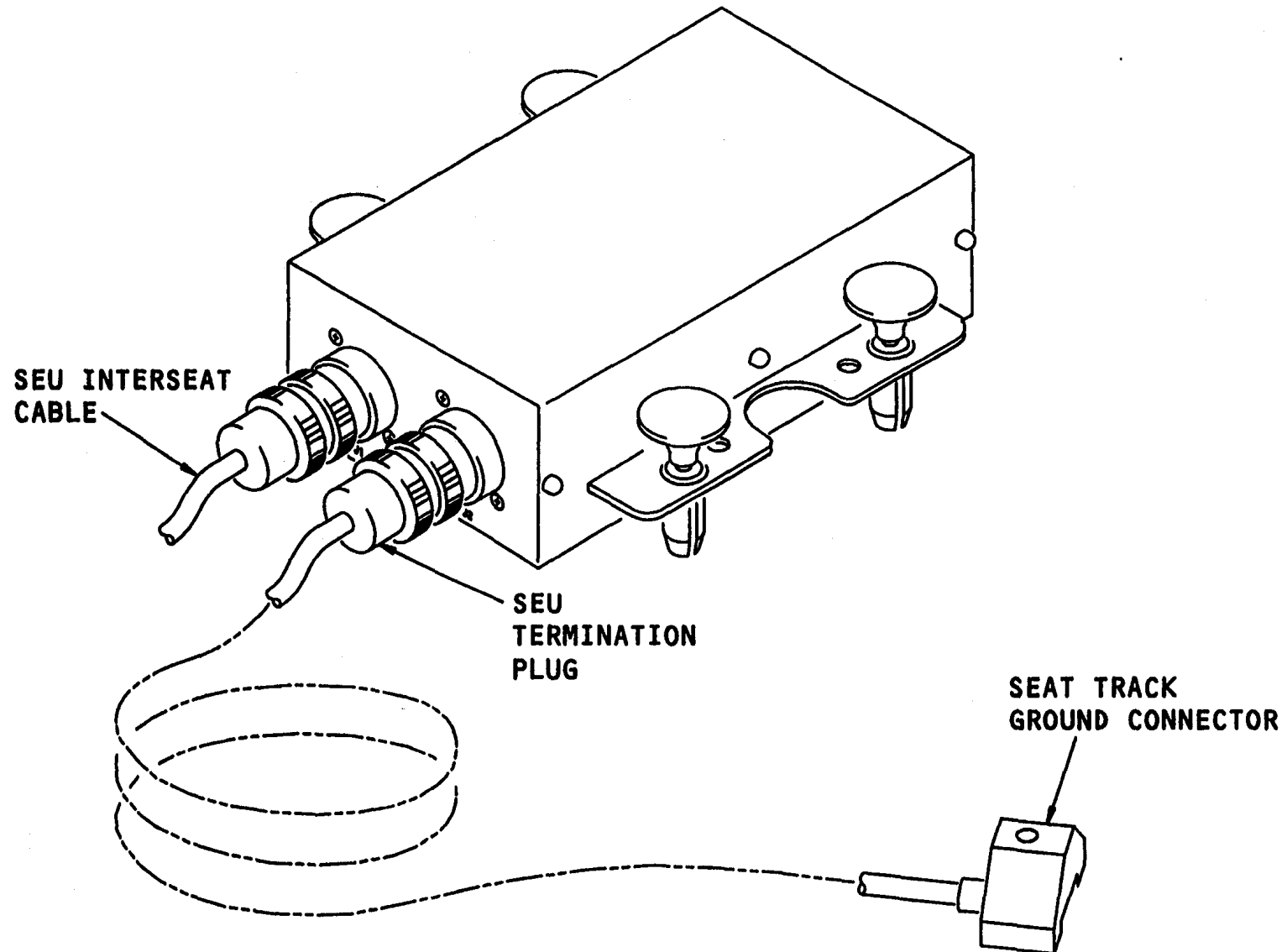
Figure 18 SEU INTERSEAT CABLE INSTALLATION

PES AUDIO



SEU TERMINATION PLUG

The last seat electronics unit (SEU) in a column must have the J2 connector terminated. The SEU termination plug contains a 75 ohm resistor which matches the characteristic impedance of the transmission cable. The SEU termination plug also has a wire attached to a lug that fits in the seat track. It is the power ground for the SEU column.

**Figure 19 SEU TERMINATION PLUG**

PES AUDIO



DIGITAL PASSENGER CONTROL UNIT

Purpose

The digital passenger control unit (DPCU) provides the passengers with controls that let a passenger choose an audio program and adjust its volume level.

Operation

Two momentary-action channel select switches allow selection of audio programs. The selected channel number shows on two LEDs. Two momentary-action volume control switches let the passenger adjust the audio volume level.

Operation of the other switches on the DPCU are for use with the passenger service system.

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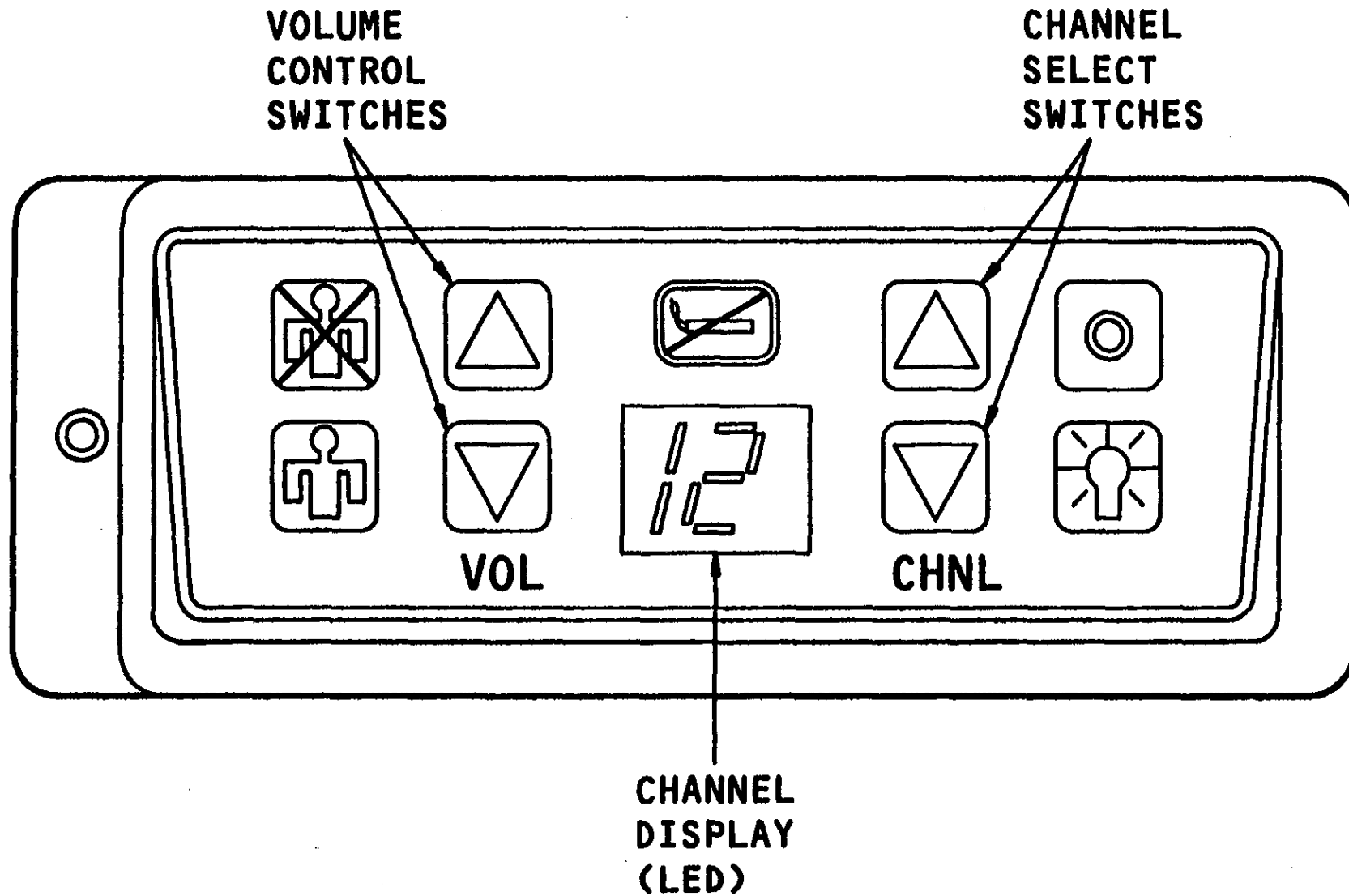


Figure 20 DIGITAL PASSENGER CONTROL UNIT

PES AUDIO



CABIN SYSTEM MODULE

Purpose

The cabin system module (CSM) controls the power to the:

- Entertainment tape reproducer (ENT T/R)
- Seat electronics units (SEUs)

Operation

The AUDIO ENTERTAINMENT ON and OFF switches control power to the ENT T/R.

The PASSENGER SERVICES SYSTEM ON and OFF switches control power to the SEUs.

A light at the top left corner of each switch shows its selection.

Any CSM can do these functions.

Power,

The CSM gets 115v ac from the local area controller (LAC) with which it has interfaces.

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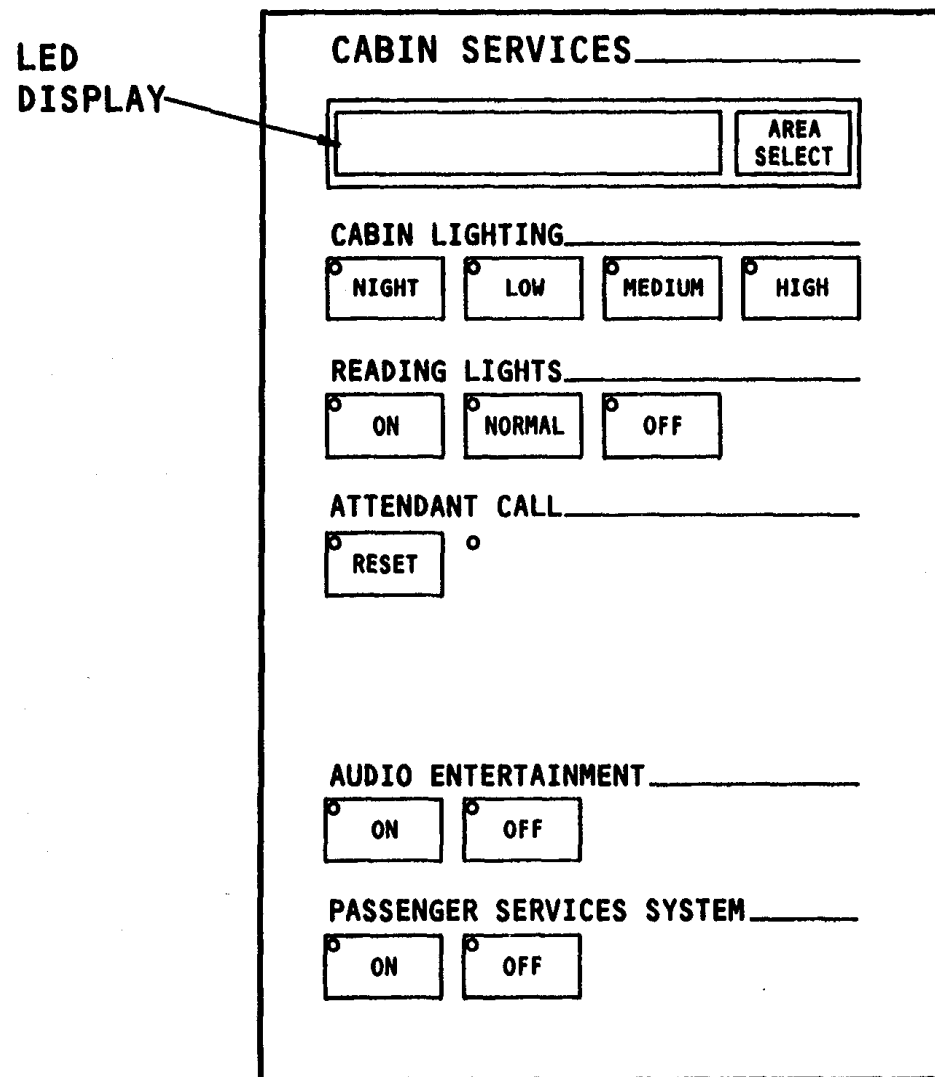


Figure 21 CABIN SYSTEM MODULE

PES AUDIO



CABIN CONFIGURATION TEST MODULE

General Description

For the passenger entertainment audio system (PES audio) the cabin configuration test module (CCTM) has switches to:

- Do a PES test
- Install the configuration database
- Install operational software
- Make the alternate circuit in the entertainment/service controller (ESC) come on

Normal / Alternate Circuit Selection

The CCTM has a passenger services alternate system switch. The switch sends a discrete to the ESC to make either the normal or the alternate controller circuits come-on.

Usually, the normal circuit in the ESC is on. Push the PASSENGER SERVICES switch to:

- Make the alternate circuit come on
- Make the normal circuit go off
- Make a light in the switch come on

When this occurs, the alternate circuit does all ESC functions.

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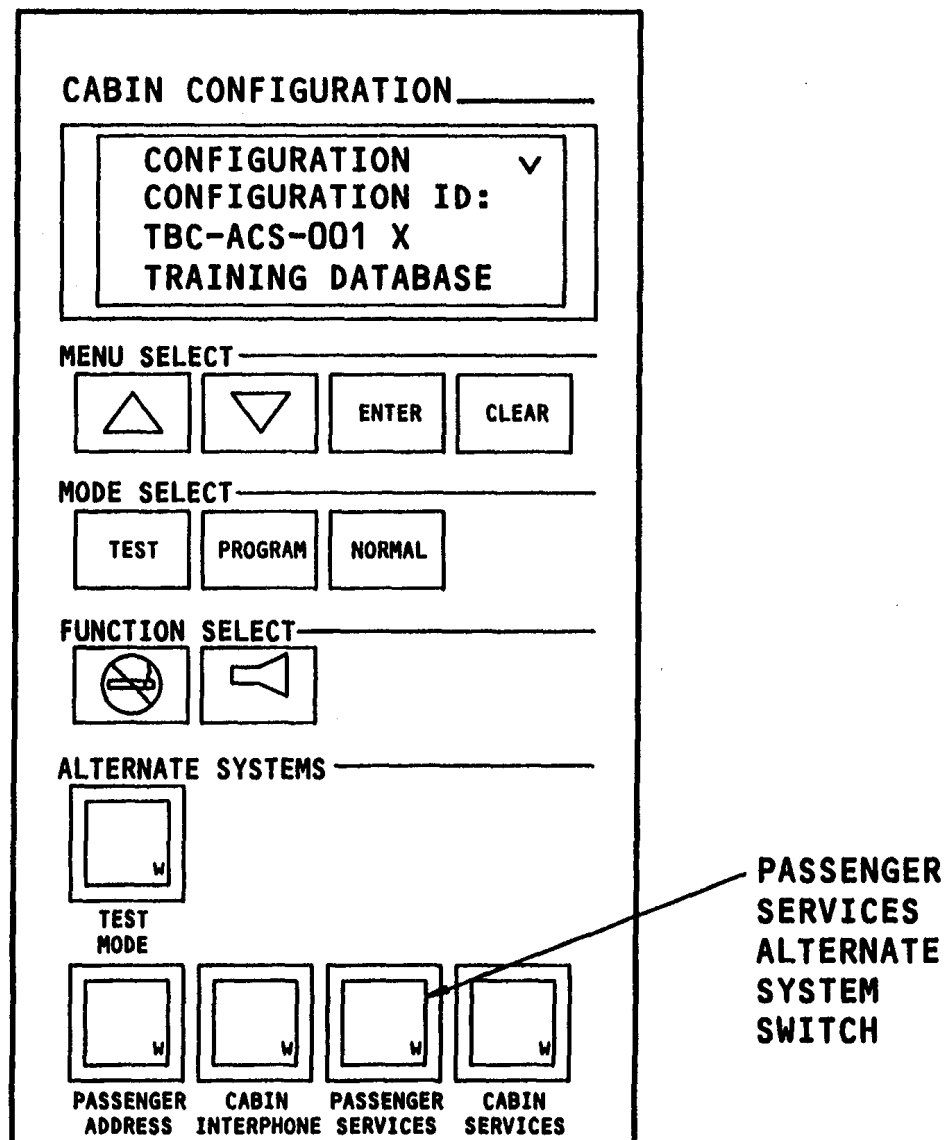


Figure 22 CABIN CONFIGURATION TEST MODULE

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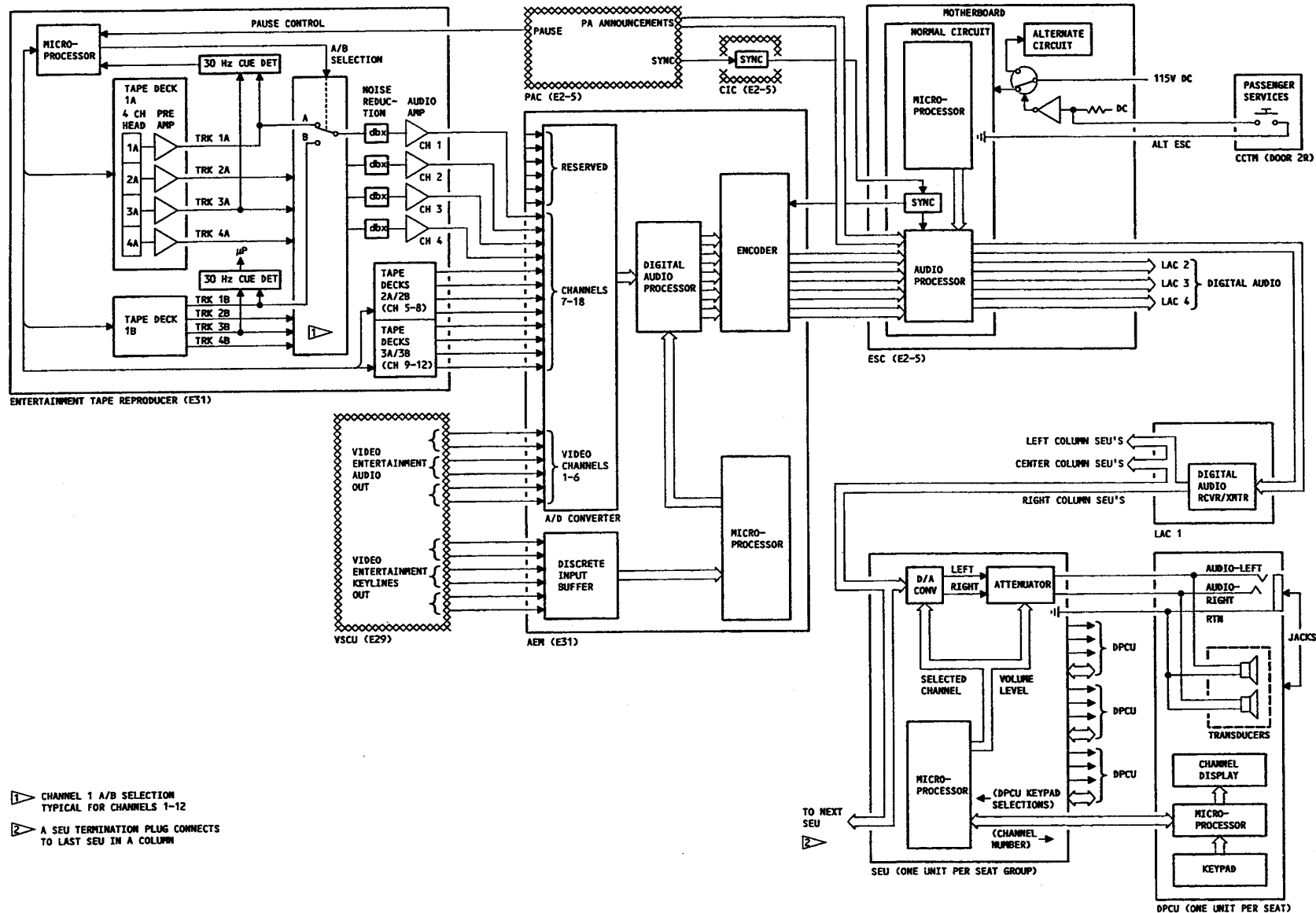


Figure 23 PES AUDIO - SCHEMATIC DIAGRAM

PES AUDIO



ENTERTAINMENT TAPE REPRODUCER OPERATION

Operation

The entertainment tape reproducer (ENT T/R) has five modes of operation. The modes are:

- Play
- Rewind
- Cue search
- Standby
- Pause

A microprocessor controls selection of the five modes.

When power is first applied, tape decks 1A, 2A and 3A go into the play mode. Tape decks 1B, 2B and 3B go into a rewind mode.

When the B tapes fully rewind, they go into the cue search mode. This is the same as the play mode except that the audio from these tapes does not go to the audio entertainment multiplexer (AEM). The cue search mode continues until the 30 Hz cue detect circuit gets the 30 Hz cue signal. When this occurs, the B tape is at the start of its first program. The B decks now wait in the standby mode until signaled to start play.

The A decks stay in the play mode until the 30 Hz cue signal plays at the end of the tape. When the cue circuit gets the cue signal:

The A decks go into the rewind mode.

The B decks go into the play mode.

The microprocessor selects the B decks' audio outputs.

Audio Outputs

All of the tape decks are the same. Tape deck 1A is discussed as an example.

When tape deck 1A is in the play mode, a 4-channel playback head sends each track of audio through a preamplifier to the A/B selection switches. Tracks 1 and 3 also go to the 30 Hz cue detector.

Audio then goes through the A/B select switches to the dbx noise reduction circuits. From the dbx circuits, the audio goes through an amplifier to the A/D converter in the audio entertainment multiplexer (AEM).

The 30 Hz cue detector gets samples of audio from track 1 and track 3. When the detector gets both cues at the same time, an output goes to the microprocessor. The microprocessor makes tape deck 1A rewind and 1B play. The audio output from tape deck 1B goes to the AEM.

Pause Mode

When there is a passenger address announcement, the passenger address controller (PAC) sends a pause control signal to the microprocessor. The microprocessor then stops the three tape decks that are in the play mode at the time. If the other tape decks are in the rewind or cue search mode, the mode continues until the cue signal plays, and then the decks go to the standby mode.

The pause mode continues until the passenger address announcement stops.

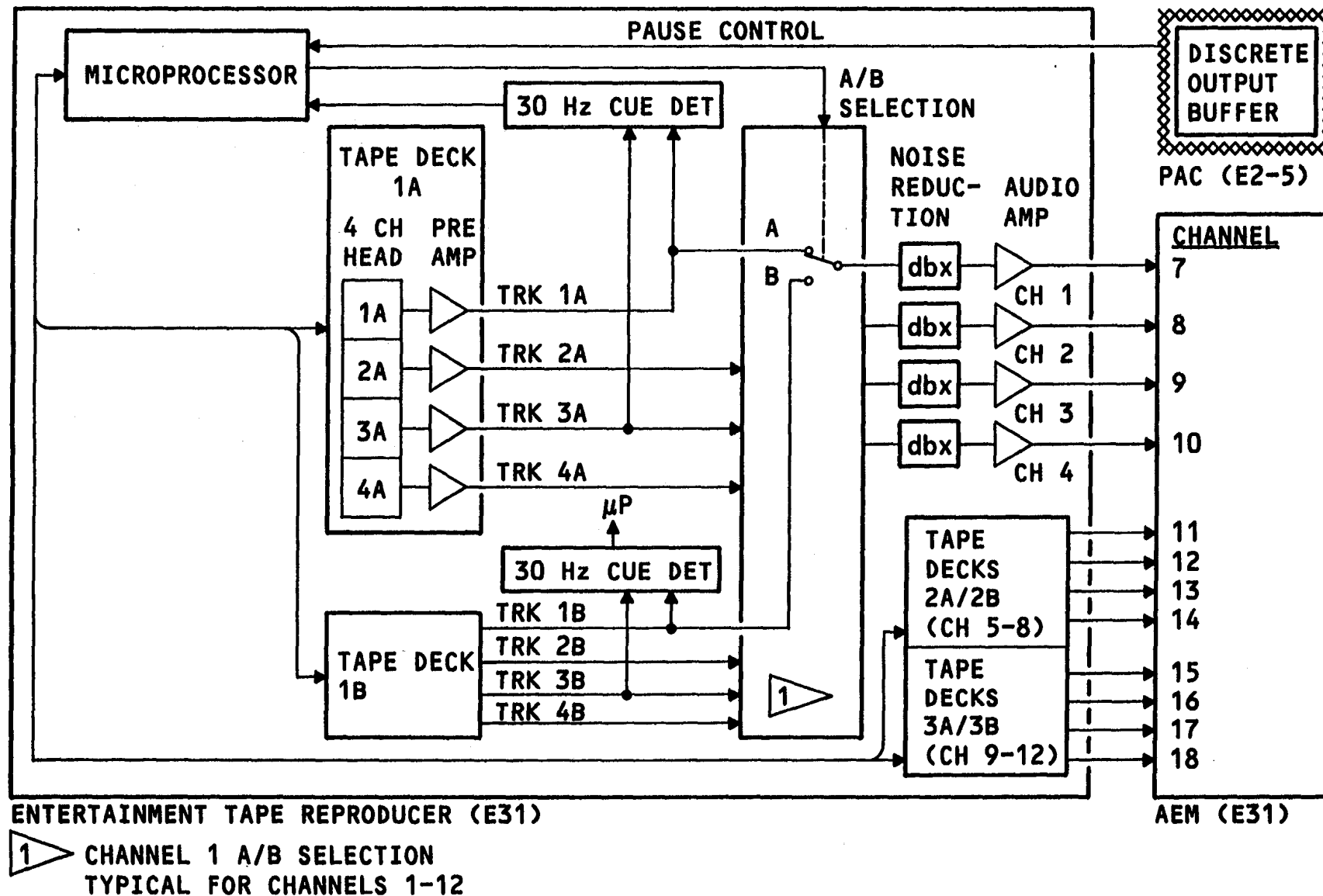


Figure 24 ENTERTAIN. TAPE REPRODUCER OPERATION

PES AUDIO



VIDEO SYSTEM - AUDIO AND KEYLINES

The video system control unit (VSCU) supplies three audio programs to the audio entertainment multiplexer (AEM). A video program can have mono, stereo or bi-lingual audio outputs. A mono program uses only channel A for audio, a stereo or bi-lingual program uses both channels A and B for audio.

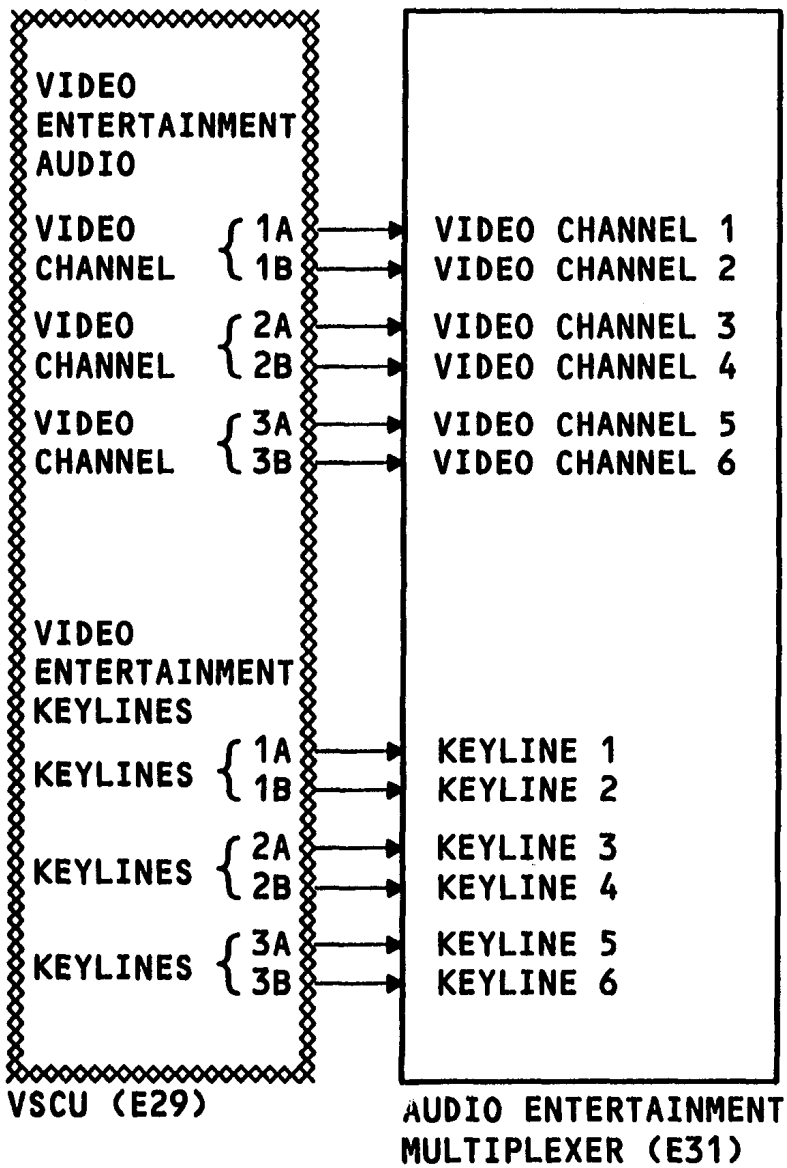
All audio goes to the A/D converter within the AEM, which converts it to digital audio.

The AEM gets video entertainment keylines. They tell the AEM if the soundtrack mode of video audio inputs are mono, stereo, bi-lingual, or if there are audio signals present.

The keylines are grouped into three pairs, one pair for each video program. The combination of ground and open discretes on the keylines tells the AEM the soundtrack mode.

The table shows an example of the audio output and keyline states for the different soundtrack modes. An example is channels 1A and 1B.

PES AUDIO



VIDEO PROGRAM SOUNDTRACK MODE-CH 1	ENTERTAINMENT AUDIO		
	AUDIO OUTPUT CHANNELS		KEYLINE STATE
OFF, NO SOUNDTRACK	CH A INACTIVE	CH B INACTIVE	A AND B = OPEN
MONO	CH 1 A	CH 1 B INACTIVE	A = GND B = OPEN
DUAL LANGUAGE	PRIMARY LANGUAGE CH 1 A	SECONDARY LANGUAGE CH 1 B	A = OPEN B = GND
STEREO	LEFT CH 1 A	RIGHT CH 1 B	A AND B = GND

Figure 25 VIDEO SYSTEM - AUDIO AND KEYLINES



AUDIO ENTERTAINMENT MULTIPLEXER OPERATION

Operation

The audio entertainment multiplexer (AEM) can get up to eighteen channels of audio from the entertainment tape reproducer (ENT T/R), and six channels of audio from the video system control unit (VSCU), through the video junction box. In this configuration the ENT T/R sends twelve channels of audio to the AEM.

All audio inputs go to an A/D converter which converts the audio inputs into digital audio, and sends it to a digital audio processor.

The microprocessor tells the digital audio processor to:

- Put the entertainment audio into the correct sequence. The audio sequence is the same for each of the outputs (one output per local area controller).
- Replace any of the first six entertainment audio channels with video entertainment audio. The video audio can go into a different sequence for each of the outputs.

Also, each output can have a different number of video audio channels.

The digital audio processor outputs are manchester encoded. They go to the ESC.

Video Keylines

The VSCU supplies six channels of audio from up to three separate video sources (two channels for each source).

Video entertainment keylines to the AEM discrete input buffer represent the video audio soundtrack mode (mono, stereo, bilingual or no audio). The keyline data goes to the AEM microprocessor. The microprocessor sends the data to the digital audio processor, which arranges the video audio on each output to match the selections in the configuration database.

Synchronization

When it gets a set of sync pulses from the ESC the AEM sends a frame of digital audio data. This allows the ESC to put PA audio into the correct part of the data sequence when there is a PA announcement.

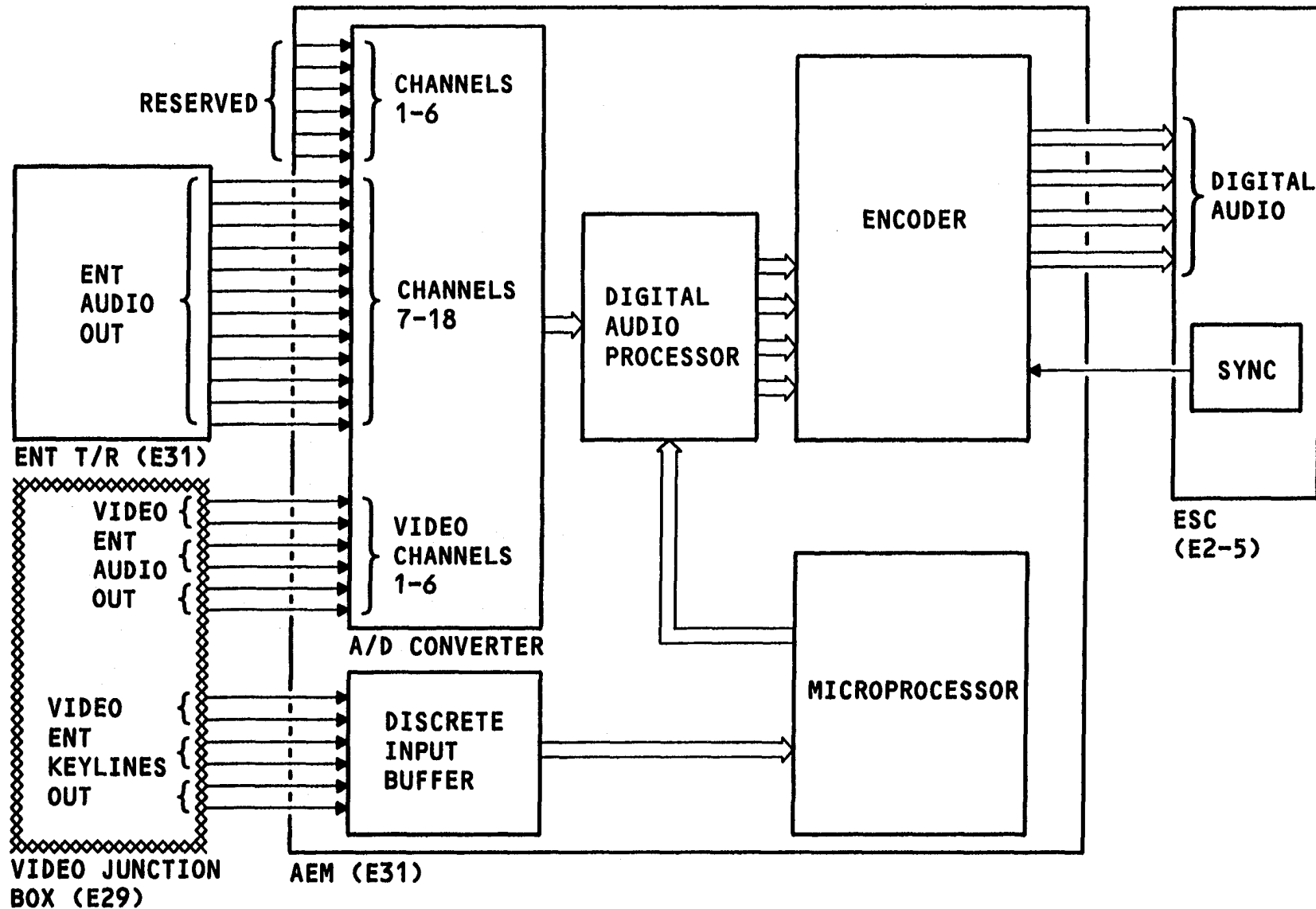


Figure 26 AEM OPERATION

PES AUDIO

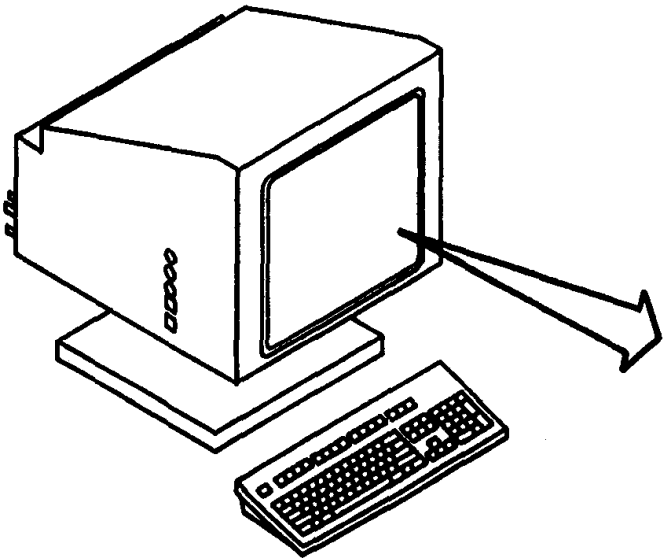


AUDIO CHANNEL ASSIGNMENTS

The airplane configuration system (ACS) tells the audio entertainment multiplexer (AEM) which audio inputs to assign to the channel selections on the digital passenger control units (DPCUs).

The graphic shows an example of the channel assignments. For each monaural DPCU selection, there must be one input. There must be two inputs for each stereo channel. In the example, when channel number 6 is on a DPCU display, entertainment tape reproducer audio channels eight and ten go to that DPCU as a stereo audio signal.

If the video system is on, the AEM replaces one or more of the audio channels with video audio.



**AIRPLANE
CONFIGURATION
SYSTEM**

AIRPLANE CONFIGURATION SYSTEM Editing: TRAINING DATABASE

Audio Channel Assignments

DPCU Channel	Stereo/ Mono	Input 1	Input 2	DPCU Channel	Stereo/ Mono	Input 1	Input 2
1	<input type="checkbox"/> M	<input type="checkbox"/> 1	<input type="checkbox"/>	2	<input type="checkbox"/> M	<input type="checkbox"/> 2	<input type="checkbox"/>
3	<input type="checkbox"/> S	<input type="checkbox"/> 3	<input type="checkbox"/> 5	4	<input type="checkbox"/> M	<input type="checkbox"/> 4	<input type="checkbox"/>
5	<input type="checkbox"/> S	<input type="checkbox"/> 7	<input type="checkbox"/> 9	6	<input type="checkbox"/> S	<input type="checkbox"/> 8	<input type="checkbox"/> 10
7	<input type="checkbox"/> M	<input type="checkbox"/> 11	<input type="checkbox"/>	8	<input type="checkbox"/> M	<input type="checkbox"/> 12	<input type="checkbox"/>
9	<input type="checkbox"/> M	<input type="checkbox"/> 6	<input type="checkbox"/>	10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	14	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	16	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	18	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

F1=Help, F2=Restore Original, F10=Save, ESC=Quit

Figure 27 AUDIO CHANNEL ASSIGNMENTS

PES AUDIO

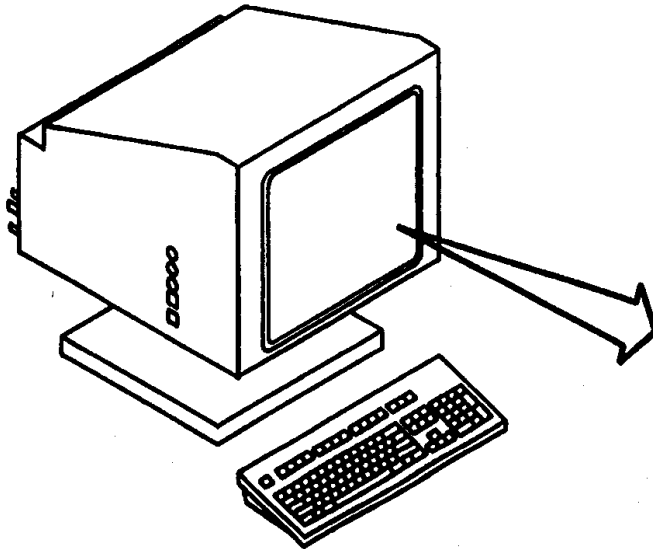


VIDEO AUDIO CHANNEL ASSIGNMENTS

The airplane configuration system (ACS) tells the audio entertainment multiplexer (AEM) which video audio inputs to assign to the channel selections on the digital passenger control units (DPCUs).

The graphic shows an example of the channel assignments. In the example, when channel number 4 is on a DPCU display in zone E (connected to LAC 3), video audio channel three (MOVIE 3) goes to that DPCU as a monaural audio signal. Also in the example, video audio source one (MOVIE 1) supplies dual language audio. This audio goes to DPCU channels one and two for the DPCUs which interface with LACs 1 and 4.

If the video system is off, the AEM sends entertainment audio on all DPCU channels.



AIRPLANE CONFIGURATION SYSTEM

AIRPLANE CONFIGURATION SYSTEM Editing: TRAINING DATABASE

Movie Audio Channel Assignments

	Movie Format	LAC 1	LAC 2	LAC 3	LAC 4	LAC 5
Movie 1	D	1	-	-	1	-
Movie 2	S		3			
Movie 3	M		4	4		

Enter the DPCU Channel for each movie used. Blank or 0 means movie not used for that LAC.

Movie Automatic Level Control (Y/N): N

Movie Format: M = Monaural, S = Stereo, D = Dual Language

Note: A Dual Language Movie uses the DPCU channel entered for language # 1, and reserves the next higher channel for language # 2.

F1=Help, F2=Restore Original, F10=Save, ESC=Quit

Figure 28 VIDEO AUDIO CHANNEL ASSIGNMENTS

PES AUDIO



ESC NORMAL AND ALTERNATE CIRCUITS

The entertainment/service controller (ESC) has these two fully redundant controller circuits:

- Normal
- Alternate

Each circuit can do all ESC functions. All interfaces with the ESC connect in parallel to both circuits.

Normally, the passenger services switch on the cabin configuration test module (CCTM) is open. When it is open, it sends an open discrete to an inverter on the motherboard of the ESC (an open is a logic one). This sends a logic zero to switch S1. The switch sends 28v dc to the normal controller circuit.

When the passenger services switch closes, it sends a ground discrete from the ESC back to the ESC to an inverter on the motherboard (a ground is a logic zero). This sends a logic one to switch S1. The switch sends 28v dc to the alternate controller and removes power from the normal circuit. Thus, the alternate circuit now does all the ESC functions.

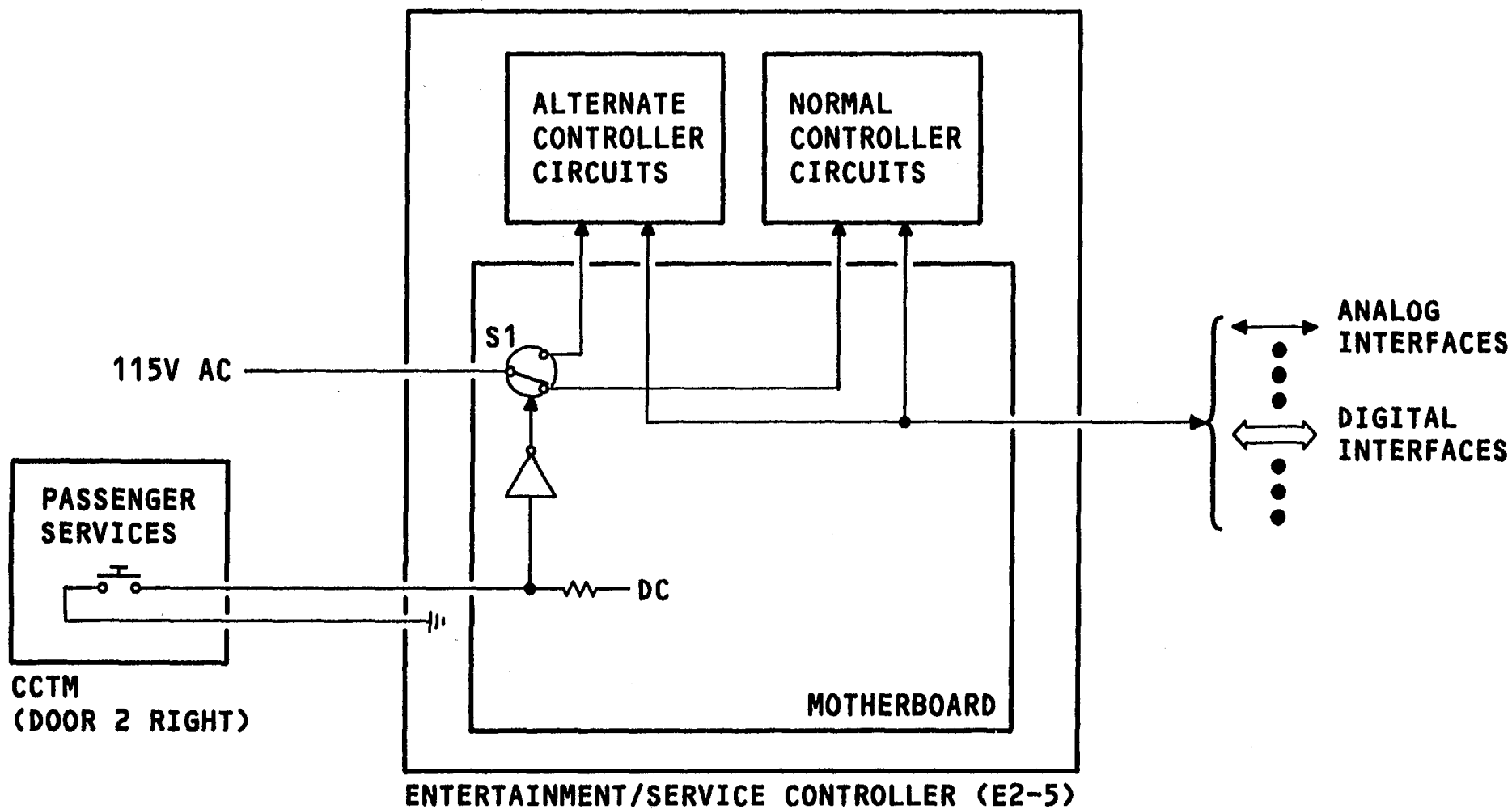


Figure 29 ESC NORMAL AND ALTERNATE CIRCUITS

PES AUDIO



ESC OPERATION

General

The entertainment/service controller (ESC) gets digital audio from the audio entertainment multiplexer (AEM) and the passenger address controller (PAC). It sends these signals to the local area controllers (LACs).

ESC Audio Processor

The audio processor gets digital audio from the AEM and the PAC. The AEM sends four inputs. Each input has entertainment audio and video audio. The PAC supplies PA announcements which override audio on all channels within the area of the announcement.

The audio processor processes the digital audio inputs and sends the processed digital audio to the four local area controllers (LACs).

Synchronization between the AEM and ESC comes from a sync signal from the passenger address controller (PAC) via the cabin interphone controller (CIC).

ESC Controller Operation

The normal and alternate circuit are identical in their operation, however, only one circuit operates at a time. The motherboard connects all controller inputs and outputs. Usually, the normal circuit is active. The alternate circuit operates in the same way as the normal circuit.

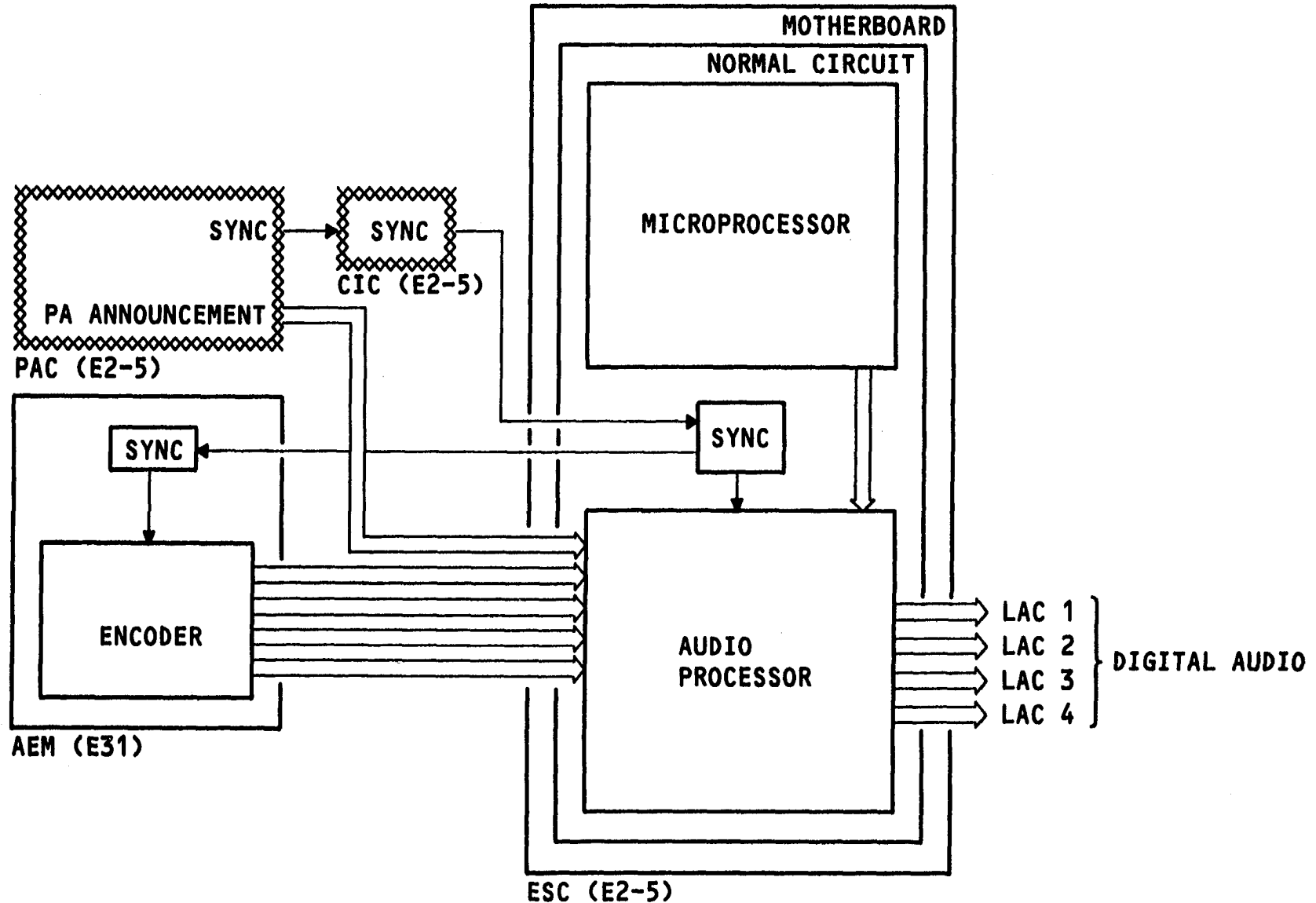


Figure 30 ESC OPERATION

PES AUDIO



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LOCAL AREA CONTROLLER OPERATION

Each local area controller (LAC) does the same basic functions, so only LAC 1 operation is discussed.

Digital audio from the entertainment/service controller (ESC) goes to the digital audio receiver/transmitter circuit in the LAC. The LAC then sends the digital audio to each column of seat electronics units (SEUs) in the LAC's area of control.

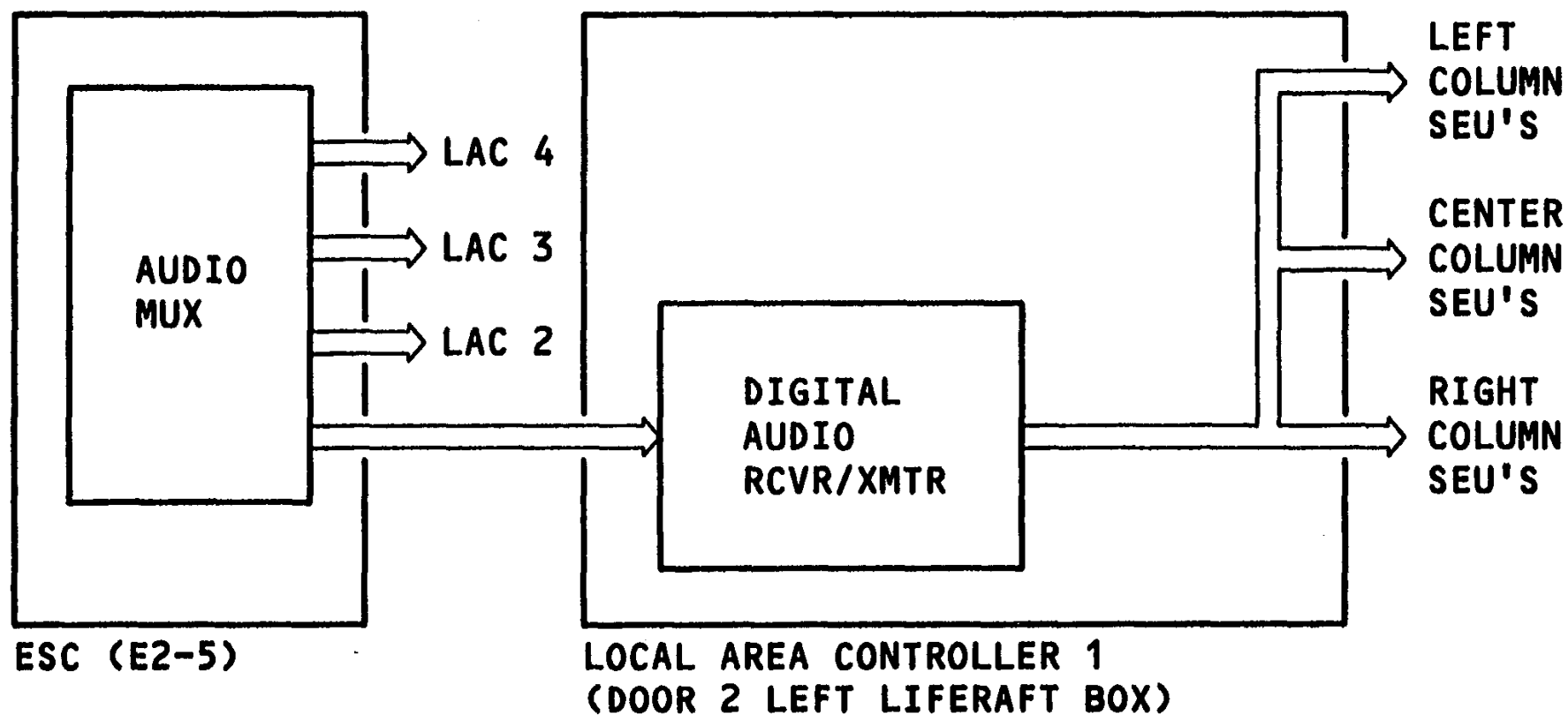


Figure 31 LOCAL AREA CONTROLLER OPERATION

PES AUDIO



SEAT SCHEMATIC

Digital audio from the local area controller (LAC) goes to the seat electronics units (SEUs). The digital audio and configuration data input also goes to the next SEU in the column.

Use the keypad on the digital passenger control unit (DPCU) to:

- Make an audio channel selection
- Set the volume of the audio

The keypad sends the data to the DPCU microprocessor which sends the selections to the SEU microprocessor.

The LAC sends the SEU microprocessor data with the number of channels available and the soundtrack mode. This data goes to the:

- DPCU microprocessor to make the channel display.
- SEU microprocessor so that it knows which channel or channels the SEU D/A converter should convert to analog audio.

After the digital audio becomes an analog signal, the audio goes to an attenuator which adjusts the volume level. The audio then goes to the electrical and/or pneumatic jacks in or near the DPCU.

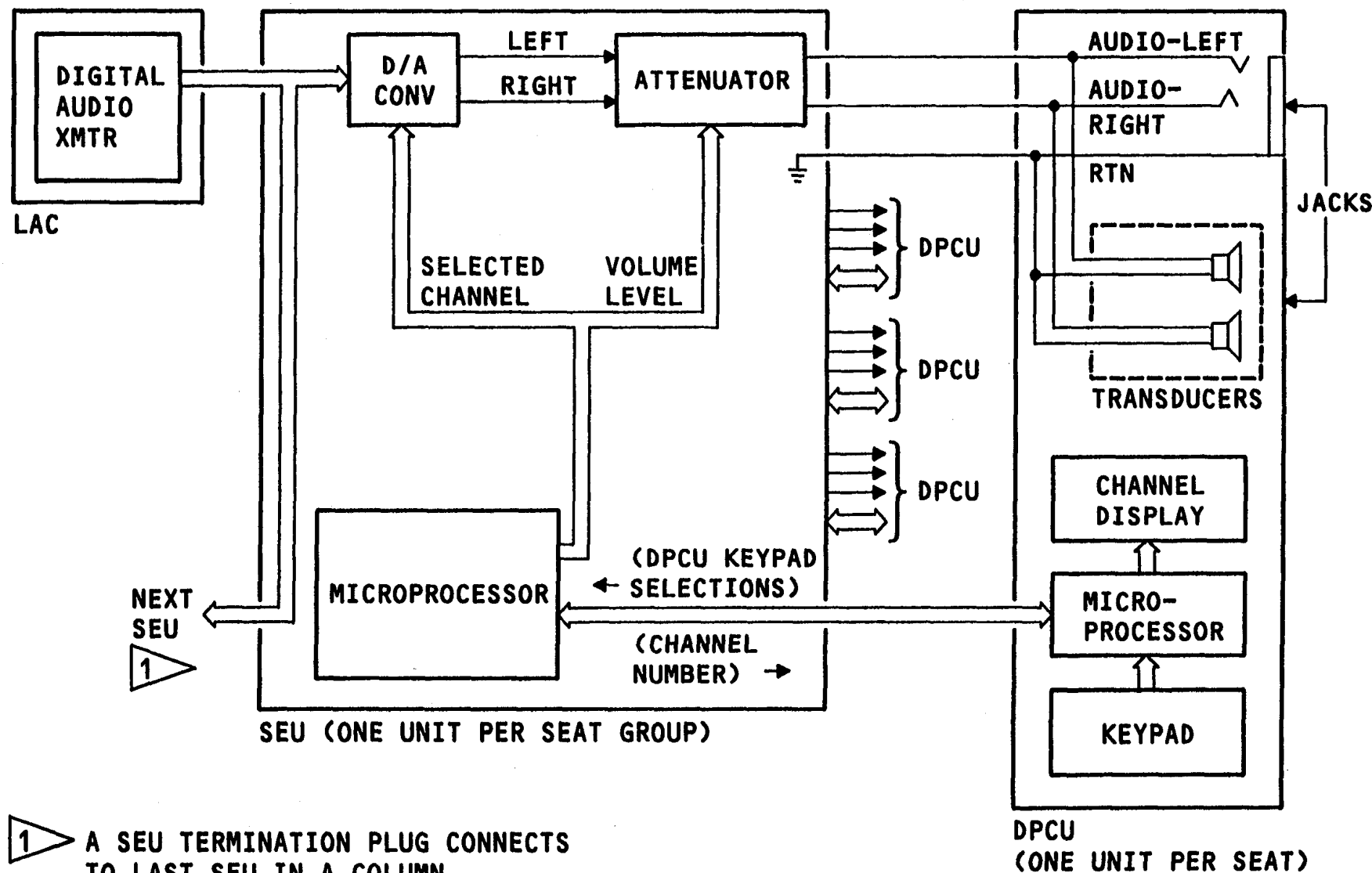


Figure 32 SEU / DPCU OPERATION

PES AUDIO



PROGRAMMABLE FEATURES

The passenger entertainment audio system (PES audio) uses the ACESS configuration database to control some PES audio functions.

All ACESS systems use part of the configuration database. For PES audio, this database has data for:

- Entertainment audio channel assignments
- Video audio channel assignments

**PROGRAMMABLE FEATURES**

- ENTERTAINMENT AUDIO CHANNEL ASSIGNMENTS
- VIDEO AUDIO CHANNEL ASSIGNMENTS

Figure 33 PROGRAMMABLE FEATURES

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