

**CHAPTER**

**23**

**Communications**



**CHAPTER 23  
COMMUNICATIONS**

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| 17               | May 15/2023 |     | 41               | Sep 15/2022 |     |
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| 32               | Sep 15/2022 |     | 9                | Sep 15/2021 |     |
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| 34               | Jan 15/2022 |     | 11               | Sep 15/2021 |     |
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| 3                | Sep 15/2021 |     | 3                | Sep 15/2021 |     |
| 4                | Sep 15/2021 |     | 4                | Sep 15/2021 |     |
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| 7                | Sep 15/2021 |     | 7                | Sep 15/2021 |     |
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| 13               | Sep 15/2021 |     | 13               | Sep 15/2021 |     |
| 14               | Sep 15/2021 |     | 14               | Sep 15/2021 |     |
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| 17               | Sep 15/2021 |     | 17               | Sep 15/2021 |     |
| 18               | Sep 15/2021 |     | 18               | Sep 15/2021 |     |
| 19               | Sep 15/2021 |     | 19               | Sep 15/2021 |     |
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| 28               | Jan 15/2022 |     | 4                | Sep 15/2021 |     |
| 29               | Jan 15/2022 |     | 5                | May 15/2022 |     |
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| 27               | Jan 15/2022 |     | 16               | Jan 15/2022 |     |
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## HIGH FREQUENCY COMMUNICATION SYSTEM -- INTRODUCTION

### General

The High Frequency (HF) communication system supplies voice and data communication over long distances. It gives communication between airplanes or between ground stations and airplanes.

The HF system operates in the aeronautical frequency range of 2 MHz to 29.999 MHz. The system uses the surface of the earth and an ionized layer to cause a reflection (skip) of the communication signal. The distance between skips changes due to the time of day, radio frequency, and airplane altitude.

### Abbreviations and Acronyms

- ACARS - aircraft communications addressing and reporting system
- ACP - audio control panel
- AM - amplitude modulated
- AME - amplitude modulation equivalent
- ARINC - Aeronautical Radio Incorporated
- BITE - built-in test equipment
- comm - communication
- DFDAU - digital flight data acquisition unit
- DFDR - digital flight data recorder
- EE - electronic equipment
- EEC - electronic equipment compartment
- FDRS - flight data recorder system
- freq - frequency
- HF - high frequency
- I/C - interphone communication
- LCD - liquid crystal display
- LED - light emitting diode
- LRU - line replaceable unit
- mic - microphone
- PSEU - proximity switch electronics unit

- PTT - push-to-talk
- RTP - radio tuning panel
- REU - remote electronics unit
- RF - radio frequency
- R/T - receive/transmit
- SELCAL - selective calling
- sq - squelch
- sql - squelch
- SSB - single side band
- USB - upper side band
- VSWR - voltage standing wave ratio
- xmit - transmit

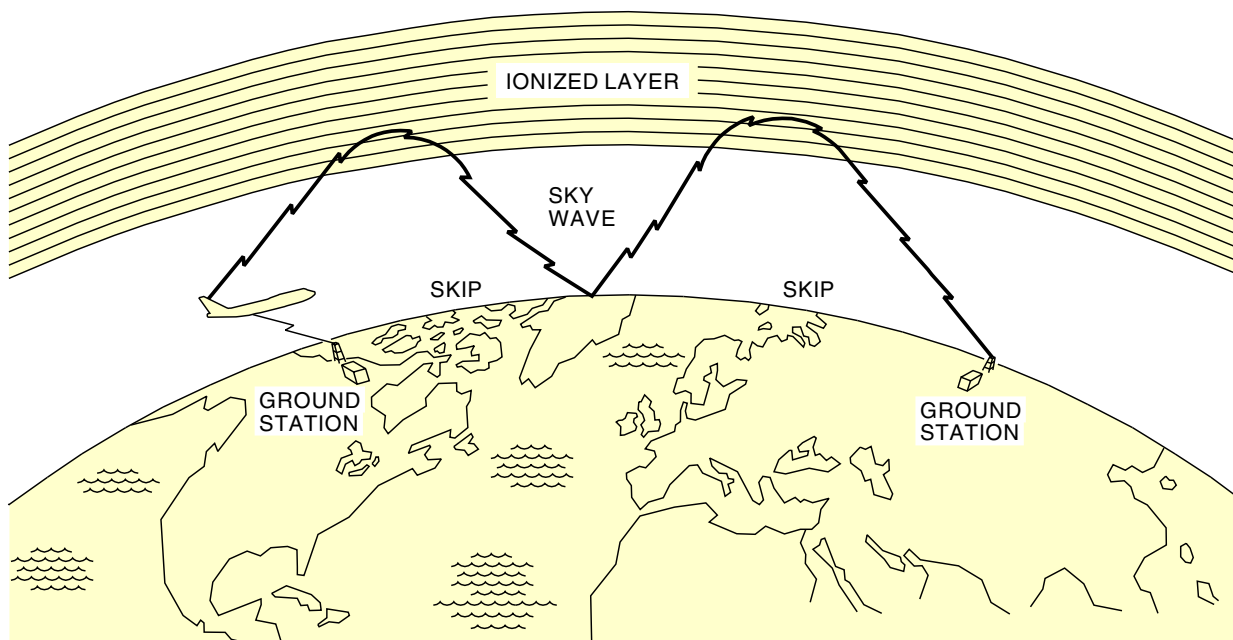
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## HIGH FREQUENCY COMMUNICATION SYSTEM -- INTRODUCTION



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## HIGH FREQUENCY COMMUNICATION SYSTEM -- INTRODUCTION

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## HIGH FREQUENCY COMMUNICATION SYSTEM -- GENERAL DESCRIPTION

### General

The High Frequency (HF) communication system supplies the flight crew with long range voice communication. The HF communication system can be used between airplanes and between airplanes and ground stations.

The HF communication radio uses frequency select and control signals to transmit and receive voice communication. The HF radio modulates an Radio Frequency (RF) carrier signal with voice audio from the flight interphone system. During the receive mode, the HF radio demodulates the RF carrier signal. This isolates the voice audio from the RF signal. The HF transceiver sends the audio to the flight interphone system.

The HF system operates in the frequency range of 2.000 MHz to 29.999 MHz.

### System Components

The HF communication system has one or two HF radios. These are the components:

- Radio Tuning Panel (RTP)
- HF transceiver
- HF antenna coupler
- Common or shared HF antenna.

The RTP supplies selected frequency data and control signals to tune the HF transceivers and make radio selections. You can use the control panel to select amplitude modulated (AM) or upper side-band (USB) operation. Use the HF sensitivity control to adjust HF reception. The RTPs can select and control the frequency of each HF communication radio.

The HF transceiver transmits and receives radio transmissions. The transceiver transmit circuits modulate the flight interphone audio and the RF carrier signal. This voice transmission goes to other airplanes and ground stations. The receive circuits demodulate the received RF carrier signal to isolate the audio. The flight crew and other airplane systems use received audio.

The HF antenna coupler sets the antenna impedance to the transceiver output in the HF frequency range. During the transmit mode, the antenna coupler receives modulated RF from the transceiver and sends it to the antenna. During the receive mode, the antenna coupler receives modulated RF from the antenna and sends it to the transceiver.

The HF antenna transmits and receives audio modulated RF signals.

### External Interface

The HF communication system connects with these components/systems:

- Remote Electronics Unit (REU)
- Proximity Switch Electronic Unit (PSEU)
- Selective Call System (SELCAL) decoder unit
- Air/ground relay
- Digital Flight Data Acquisition Unit (DFDAU).

### System Operation

The control panel sends selected frequency data and control signals to the transceiver. The audio control panel sends these signals to the REU:

- HF radio select signal
- Receive volume control
- Push-To-Talk (PTT).

During transmit, microphone audio and PTT signals go to the HF transceiver through the REU. The transceiver uses the microphone audio to modulate an RF carrier signal in the transceiver. The transceiver sends the modulated RF signal through the antenna coupler to the antenna for transmission to other airplanes and ground stations.

Also during transmit, the DFDAU receives a PTT signal from the transceiver. The DFDAU uses the PTT to identify a key event with the transmit event.



## HIGH FREQUENCY COMMUNICATION SYSTEM -- GENERAL DESCRIPTION

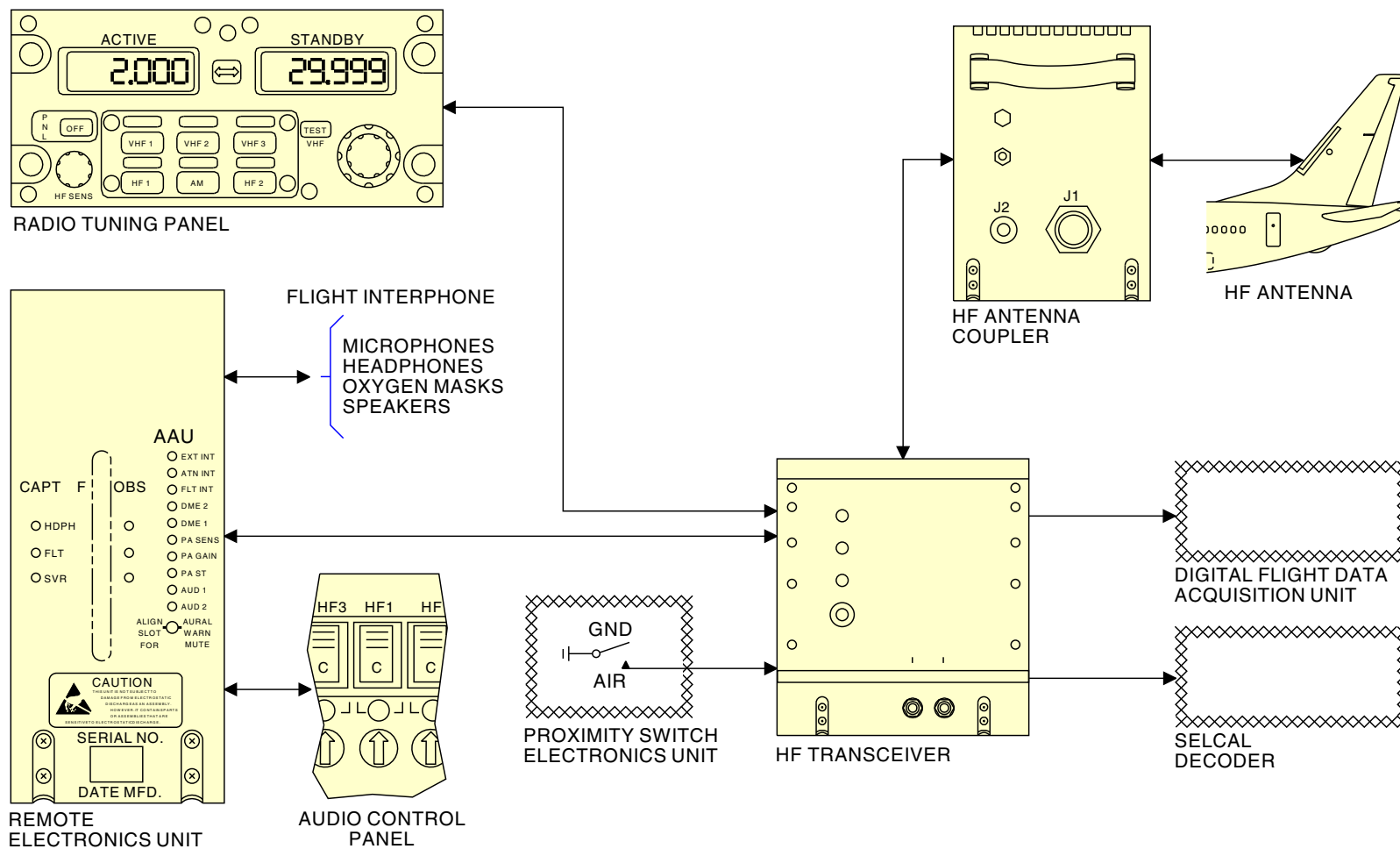
During receive, the antenna receives a modulated RF signal and sends it through the antenna coupler to the transceiver. The transceiver demodulates the signal and isolates the audio from the RF carrier. The received audio goes from the HF transceiver, through the REU, to the flight interphone speakers and headsets.

The SELCAL decoder unit receives audio from the HF transceiver. The SELCAL decoder unit monitors the audio for SELCAL calls that come from the ground station.

The HF transceiver receives an air/ground discrete. The HF transceiver uses the discrete to calculate flight legs for internal fault memory.

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## HIGH FREQUENCY COMMUNICATION SYSTEM -- GENERAL DESCRIPTION



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## HIGH FREQUENCY COMMUNICATION SYSTEM -- GENERAL DESCRIPTION

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## HIGH FREQUENCY COMMUNICATION SYSTEM -- COMPONENT LOCATION - FLIGHT COMPARTMENT

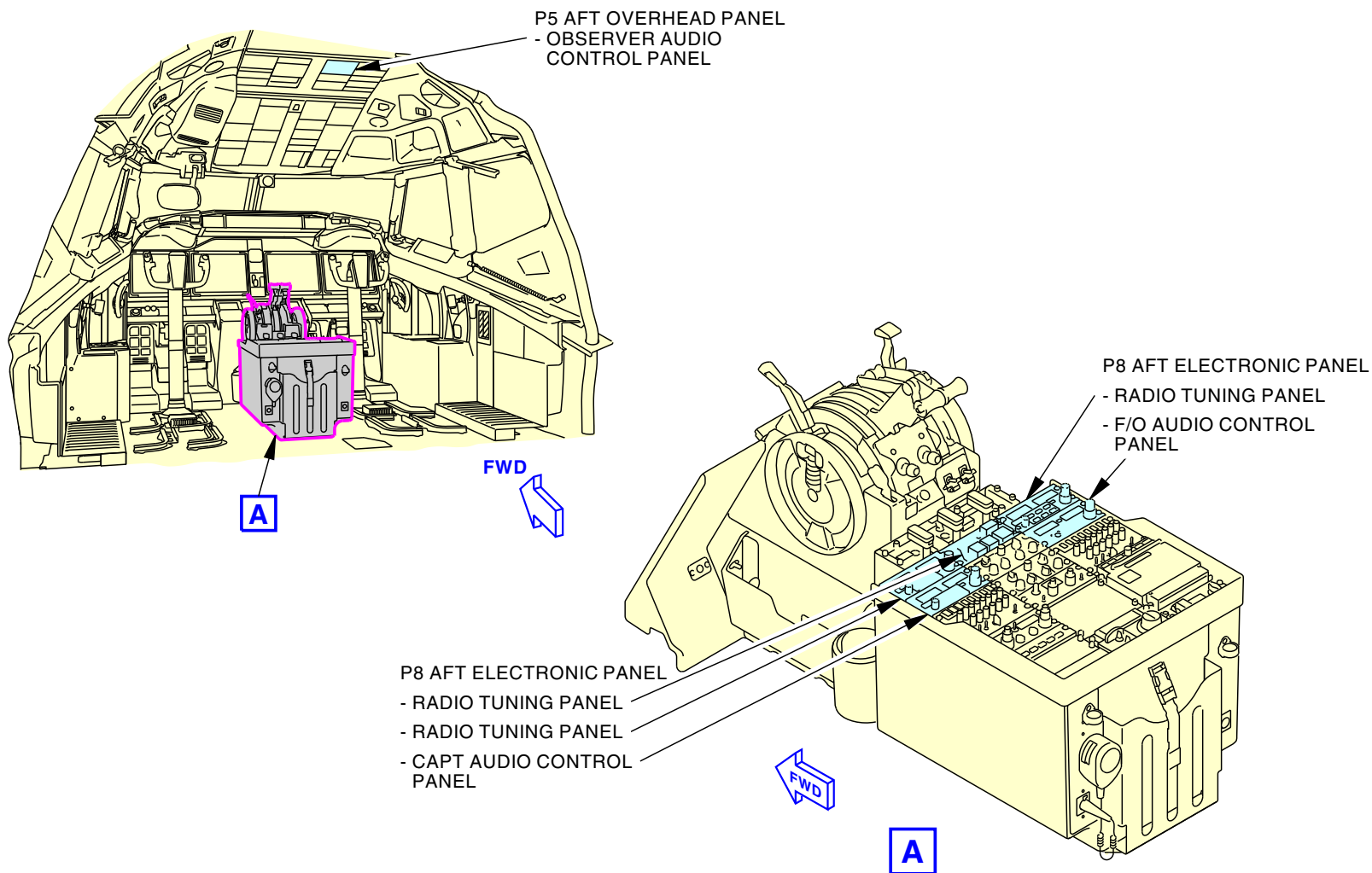
Flight Compartment

The Radio Tuning Panel (RTP)s are on the P8 aft electronics panel.

The Audio Control Panels (ACP) are part of the flight interphone system. The ACP has an interface with the High Frequency (HF) communication system through the Remote Electronics Unit (REU). The captain and first officer ACP is on the P8 aft electronics panel. The first observer ACP is on the P5 aft overhead panel.

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# HIGH FREQUENCY COMMUNICATION SYSTEM -- COMPONENT LOCATION - FLIGHT COMPARTMENT



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## HIGH FREQUENCY COMMUNICATION SYSTEM -- COMPONENT LOCATION - FLIGHT COMPARTMENT

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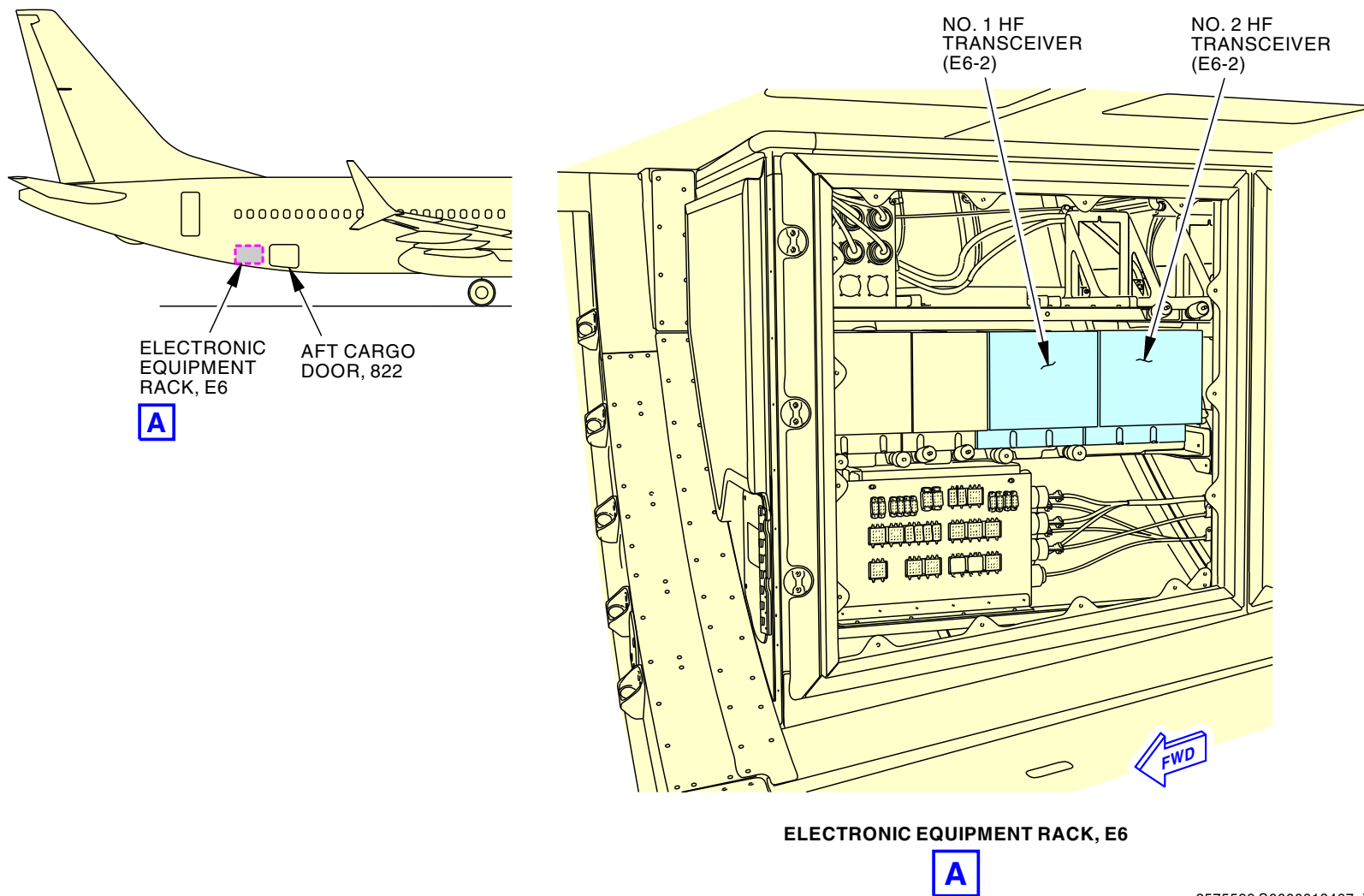
HIGH FREQUENCY COMMUNICATION SYSTEM -- COMPONENT LOCATION - TRANSCEIVER

HF Transceiver

The High Frequency (HF) transceivers are on the E6-2 shelf.

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# HIGH FREQUENCY COMMUNICATION SYSTEM -- COMPONENT LOCATION - TRANSCEIVER



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## HIGH FREQUENCY COMMUNICATION SYSTEM -- COMPONENT LOCATION - HF TRANSCEIVER

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## HIGH FREQUENCY COMMUNICATION SYSTEM -- COMPONENT LOCATION - VERTICAL STABILIZER

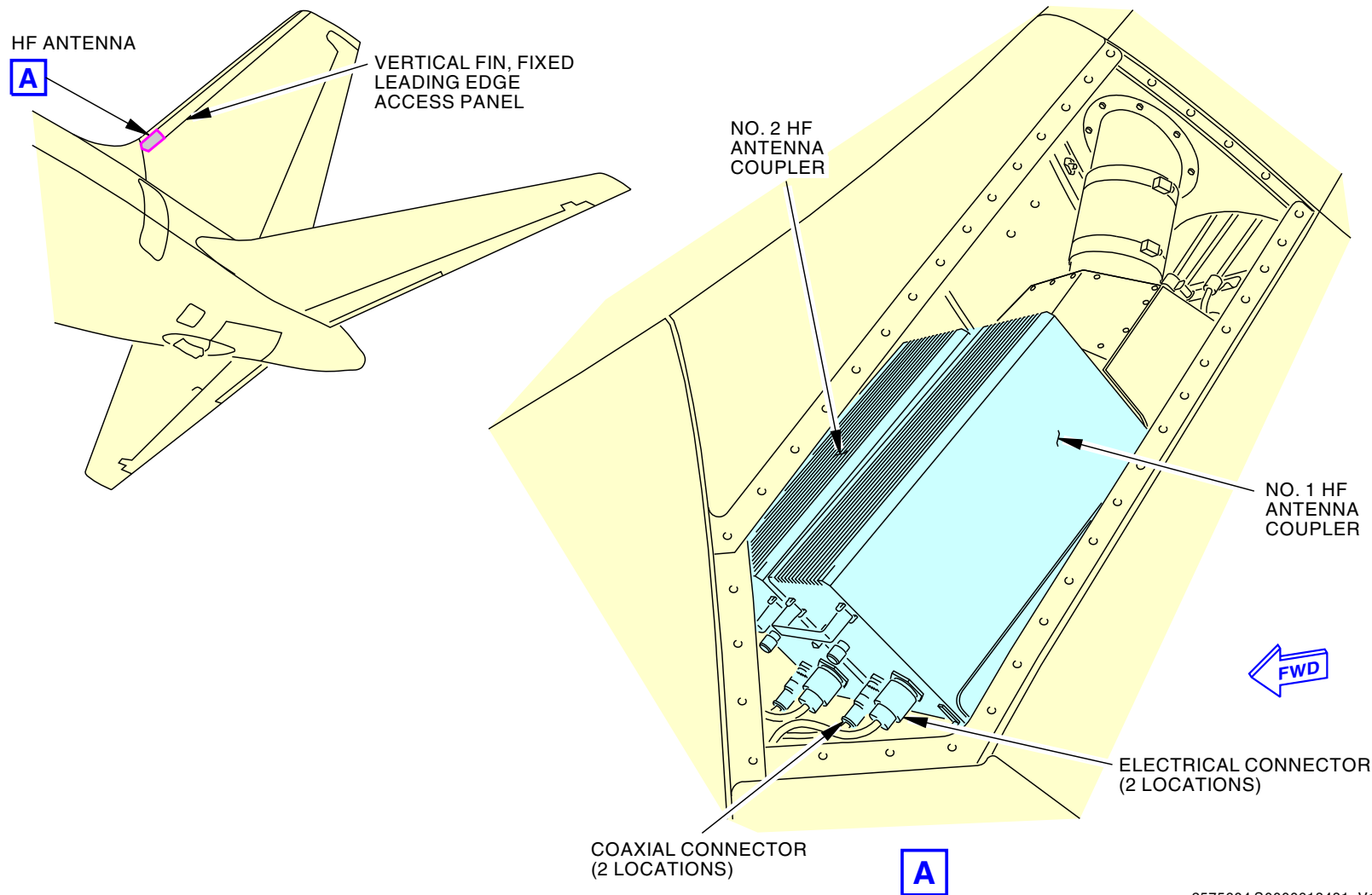
### General

The High Frequency (HF) antenna is on the leading edge of the vertical stabilizer.

The antenna couplers are inside the vertical stabilizer.

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**HIGH FREQUENCY COMMUNICATION SYSTEM -- COMPONENT LOCATION - VERTICAL STABILIZER**



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**HIGH FREQUENCY COMMUNICATION SYSTEM -- COMPONENT LOCATION - VERTICAL STABILIZER**

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## HIGH FREQUENCY COMMUNICATION SYSTEM -- INTERFACES

**Power**

The 115v ac transfer (XFR) bus supplies three-phase power to the High Frequency (HF) transceiver.

The transceiver supplies 115v ac power to the HF antenna coupler.

**HF Transceiver**

The HF transceiver has an interface with these components:

- Radio Tuning Panel (RTP) 1, 2, and 3
- Selective Call System (SELCAL) decoder
- Remote Electronics Unit (REU)
- HF antenna coupler
- Digital Flight Data Acquisition Unit (DFDAU)
- Proximity Switch Electronic Unit (PSEU).

**Radio Tuning Panel**

RTP 1 supplies frequency data to the HF 1 transceiver on an ARINC 719/753 bus to port A and to the HF 2 transceiver on port B. RTP 2 supplies frequency data to the HF 1 transceiver on an ARINC 719/753 bus to port B and to the HF 2 transceiver on port A. For more information about tuning interfaces, see HF Communication System - Tuning Interfaces.

The HF transceiver supplies the condition of the transceiver to the radio tuning panels. The condition of the transceiver is one of the two: OK or FAILED.

The radio tuning panel supplies these to the HF transceiver:

- HF sensitivity automatic gain control (AGC)
- Amplitude modulated or single side-band control
- Tuning data
- Port select discrete.

**Antenna Couplers**

The antenna couplers supply these to the transceivers:

- Key interlock
- Tune in progress
- Radio Frequency (RF) fault
- Coupler fault.

The antenna coupler opens the key interlock discrete to stop the transceiver transmit mode. The coupler sends the tune in progress discrete to request tuning power from the transceiver. The RF fault is sent to the transceiver when the coupler detects a fault external to the coupler. The coupler sends the coupler fault discrete to the transceiver when it detects an internal failure. Received RF from the antenna is sent to the transceiver during receive mode.

The antenna couplers share one common HF antenna. During the transmit mode, only one coupler has an electrical interface with the antenna. The on-side coupler sends the off-side coupler an inhibit discrete to prevent the off-side radio from transmitting. The couplers supply transmitted RF to the antenna. They receive Push-To-Talk (PTT) from the REU to enable the coupler tune mode.

The HF transceiver supplies this data to the antenna coupler:

- RF carrier during tune mode
- Rechannel pulse.

Modulated RF is sent to the antenna through the antenna coupler to be transmitted. During tune mode, a low wattage RF carrier signal goes to the coupler to match impedance between the transceiver and the antenna. The transceiver sends the rechannel pulse to start the coupler home sequence mode.



## HIGH FREQUENCY COMMUNICATION SYSTEM -- INTERFACES

### HF Antenna

The HF antenna receives an RF signal from the antenna coupler and transmits the RF signal to other airplane and ground HF communication systems. The antenna also receives incoming RF signals and sends the RF signals to the antenna coupler.

### External Interfaces

The HF transceiver has an interface with these components from other airplane systems:

- REU
- SELCAL decoder
- DFDAU
- PSEU.

The REU sends flight crew microphone (mic) audio to the transceiver for transmission. It also sends a PTT to start the transceivers transmit mode. The transceiver sends side tone and received audio to the REU for the flight interphone system.

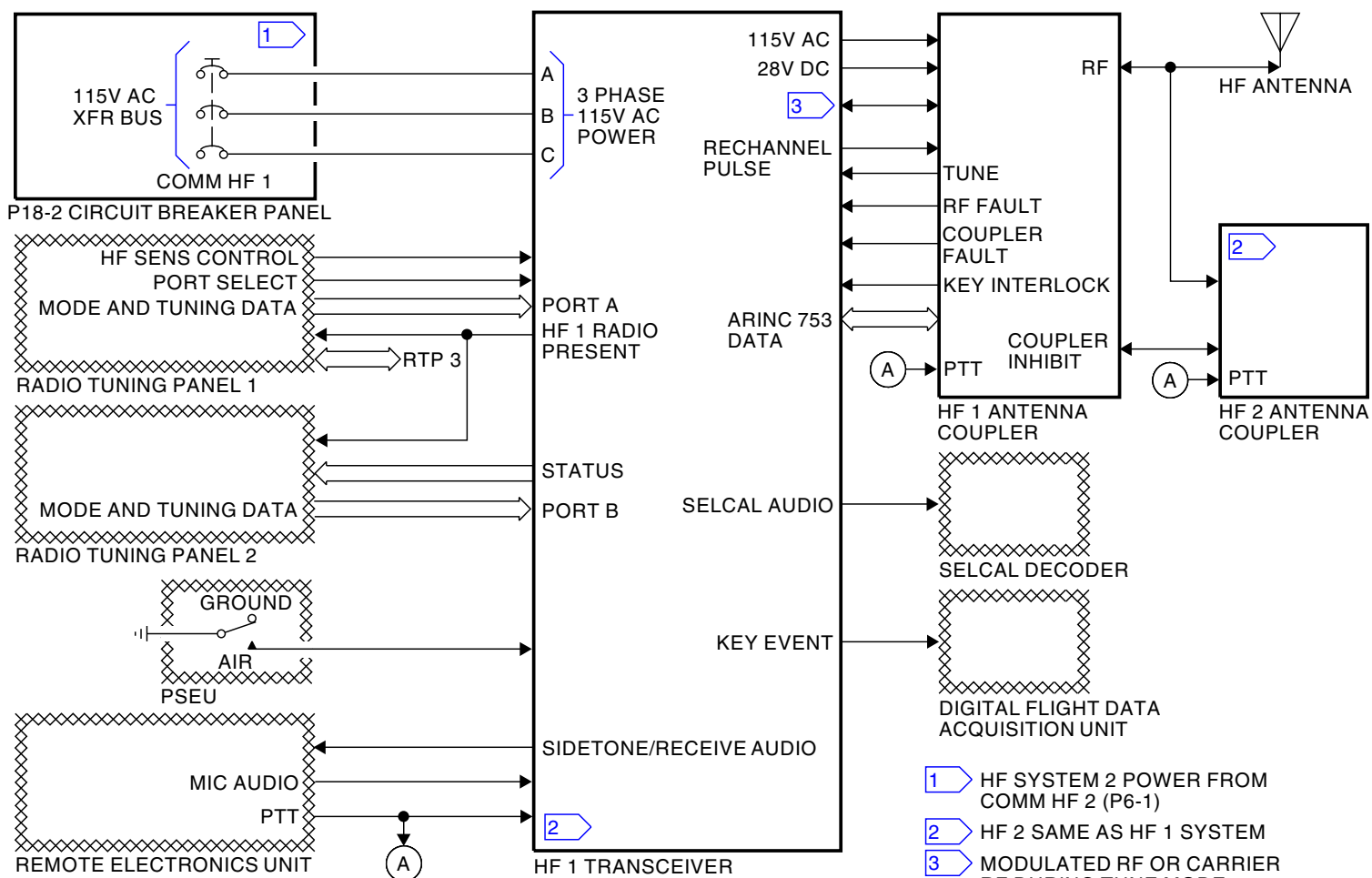
The HF transceiver sends received audio to the SELCAL decoder. The SELCAL decoder isolates the SELCAL code from voice audio.

The DFDAU receives a PTT from the transceiver for a key event.

The HF transceiver receives an air/ground discrete from the PSEU. The transceiver uses this discrete to monitor the flight leg count for fault recording.

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## HIGH FREQUENCY COMMUNICATION SYSTEM -- INTERFACES



HF COMMUNICATION SYSTEM -- INTERFACES

## HIGH FREQUENCY COMMUNICATION SYSTEM - INTERFACES

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## HIGH FREQUENCY COMMUNICATION SYSTEM -- TUNING INTERFACES

### General

The High Frequency (HF) communication system uses Radio Tuning Panel (RTP)s and data buses to send tuning information. Each RTP sends the tuning information to the other RTPs and to the communication transceivers.

### Tuning Ports

The RTPs send tuning data to the communication transceivers. Each transceiver has two tuning data input ports. They are port A and port B. For the HF 1 and 2 transceivers, port A connects to the onside RTP, and port B connects to the offside RTP. For example:

- The HF 1 transceiver port A connects to RTP 1, and port B connects to RTP 2
- The HF 2 transceiver port A connects to RTP 2, and port B connects to RTP 1.

### Port Select Discrete

Each HF transceiver has two tuning data input ports, port A and port B. The transceiver uses the port select discrete from its onside RTP to select input port A or input port B. RTP 1 sends a port select discrete to the HF 1 transceiver. RTP 2 sends a port select discrete to the HF 2 transceiver.

A grounded port select discrete causes the applicable transceiver to use port A. An open port select discrete causes the applicable transceiver to use port B. The port select discrete is a ground when the RTP is on and operates correctly.

### Normal Operation

Each RTP has one ARINC 429 output bus and two ARINC 429 crosstalk buses. The crosstalk buses let each RTP send tuning data to the other RTPs. This keeps the tuning data synchronized and lets any RTP tune any transceiver.

During normal operation, RTP 1 and RTP 2 send tuning data to their onside transceiver. For example:

- RTP 1 sends tuning data to HF 1 transceiver

- RTP 2 sends tuning data to HF 2 transceiver.

RTP 1 and RTP 2 normally tune the offside HF transceiver through a crosstalk bus to the offside RTP. For example:

- RTP 1 tunes the HF 2 transceiver through RTP 2
- RTP 2 tunes the HF 1 transceiver through RTP 1.

RTP 3 can tune the HF 1 transceiver and HF 2 transceiver through a crosstalk bus to applicable onside RTP.

### Single RTP Failure

During a failure of RTP 1 or RTP 2, or if the RTP is OFF, the applicable port select discrete changes from ground to open. The onside communication transceiver uses tuning data from the offside RTP to port B. For example:

- During a failure of RTP 1, the HF 1 transceiver uses tuning data from RTP 2 to input port B
- During a failure of RTP 2, the HF 2 transceiver uses tuning data from RTP 1 to input port B.

### Bypass Mode (RTP 1 Fail and RTP 2 Fail)

During the bypass mode, a relay in the RTP connects the crosstalk 1 bus directly to the output bus. The relay energizes during normal operation. The relay de-energizes to the bypass position if one of these conditions occur:

- RTP does not have power
- RTP is OFF
- RTP failure.

During a failure of one RTP, the bypass mode does not affect system operation, because the transceivers use tuning data from the offside RTP.

With RTP 1 and RTP 2 in the bypass mode RTP 3 can tune the HF transceivers. For example:

- RTP 3 sends tuning data to HF 2 transceiver port B through RTP 1

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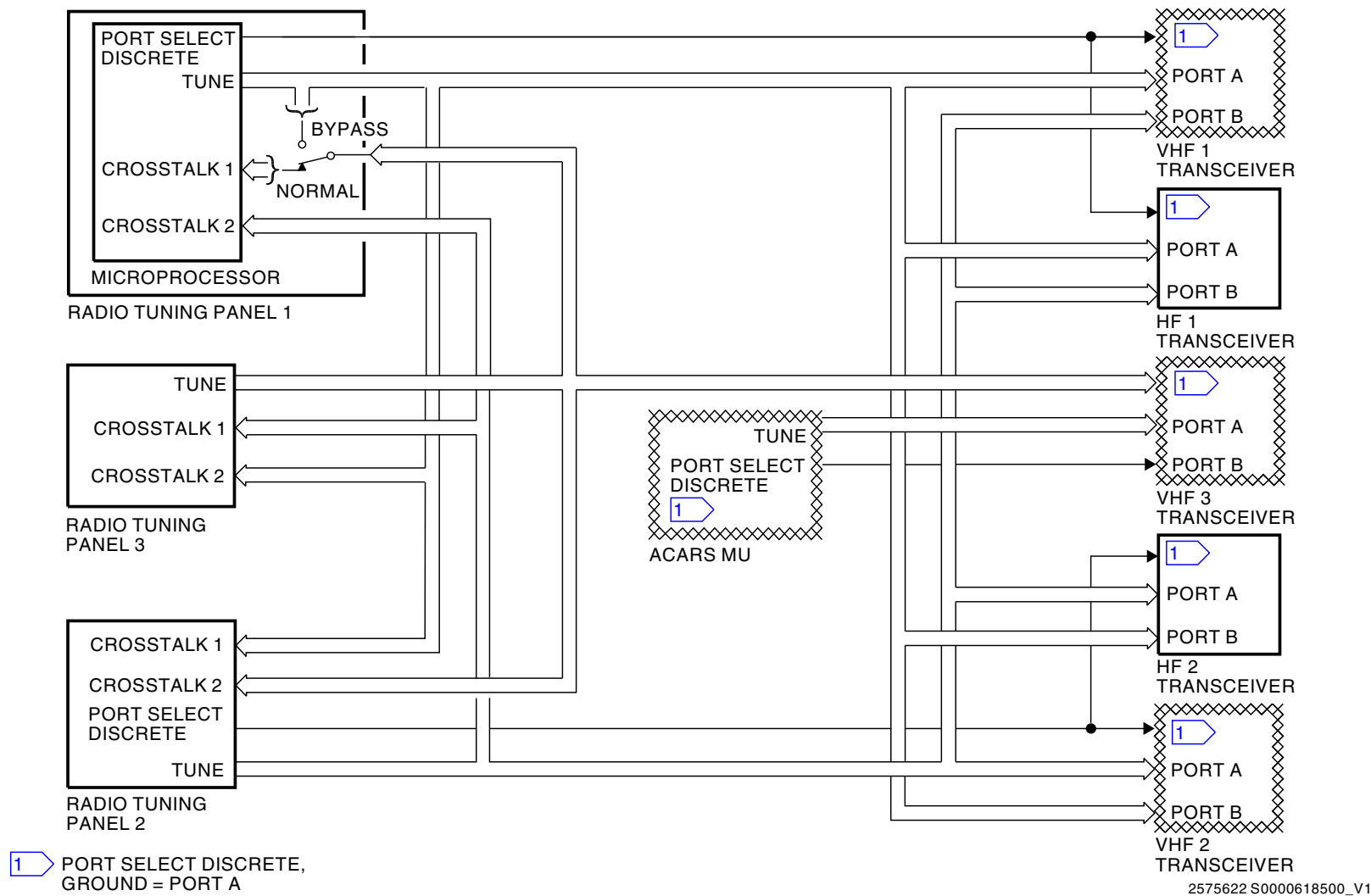


## HIGH FREQUENCY COMMUNICATION SYSTEM -- TUNING INTERFACES

- RTP 3 sends tuning data to HF 1 transceiver port B through RTP 1 and then RTP 2.

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# HIGH FREQUENCY COMMUNICATION SYSTEM -- TUNING INTERFACES



## HIGH FREQUENCY COMMUNICATIONS -- TUNING INTERFACES

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## HIGH FREQUENCY COMMUNICATION SYSTEM -- RADIO TUNING PANEL

**General**

The Radio Tuning Panel (RTP) is used to control the High Frequency (HF) radio.

**Radio Tuning Panel**

The RTP provides these functions:

- Very High Frequency (VHF) radio selection
- HF radio selection
- Active/standby frequency selection
- HF sensitivity control
- Test initiation for the VHF transceiver
- Mode selection for the HF transceiver
- Off switch

**Controls and Indicators**

When power is applied to the airplane, RTP 1 controls HF 1 and RTP 2 controls HF 2.

All radio tuning panels can control all VHF and HF transceivers. Push the radio tuning switch to select the transceiver for that radio tuning panel. The light above the switch comes on. Each radio tuning panel can tune one transceiver at a time.

When you select an off-side radio, two off-side tuning lights come on. One light is on the radio tuning panel that you use to make the selection. This is the off-side radio. The other light is on the radio tuning panel of the radio you select. This is the on-side radio.

Set the frequency in the standby frequency indicator. Turn the frequency selectors to set the frequency. The outer knob sets the first three numbers (10 MHz 1 MHz and 100 kHz) in 100 kHz increments. The inner knob sets the fourth and fifth numbers (10 kHz, 1 kHz) in 1 kHz increments.

Push the frequency transfer switch to change the active and standby frequencies.

Push the AM switch to select the amplitude modulation (AM) mode of operation. In the AM mode, the HF transceiver will transmit the amplitude modulated equivalent (AME). The AME is the carrier frequency plus the upper side band. The AM light comes on when the radio operates in the AM mode of operation. When the radio operates in the upper sideband mode, the light is extinguished.

The HF SENS control sets the Radio Frequency (RF) sensitivity level of the HF transceiver. Turn the control to adjust the sensitivity of the HF transceiver.

The standby frequency indicator shows a value between 0 and 99. Maximum sensitivity is 99. Minimum sensitivity is 0. After a time, the standby frequency indicator shows the standby frequency again.

Push the OFF switch to stop the operation of the radio communication panel. The switch shows white when it is off.

**BITE**

The radio tuning panel continuously does a self-test. The frequency indicators show PANEL FAIL when there is an internal failure of the radio tuning panel.

The radio tuning panel continuously monitors the condition of the transceiver. If the transceiver fails, the frequency indicators show FAIL FAIL.

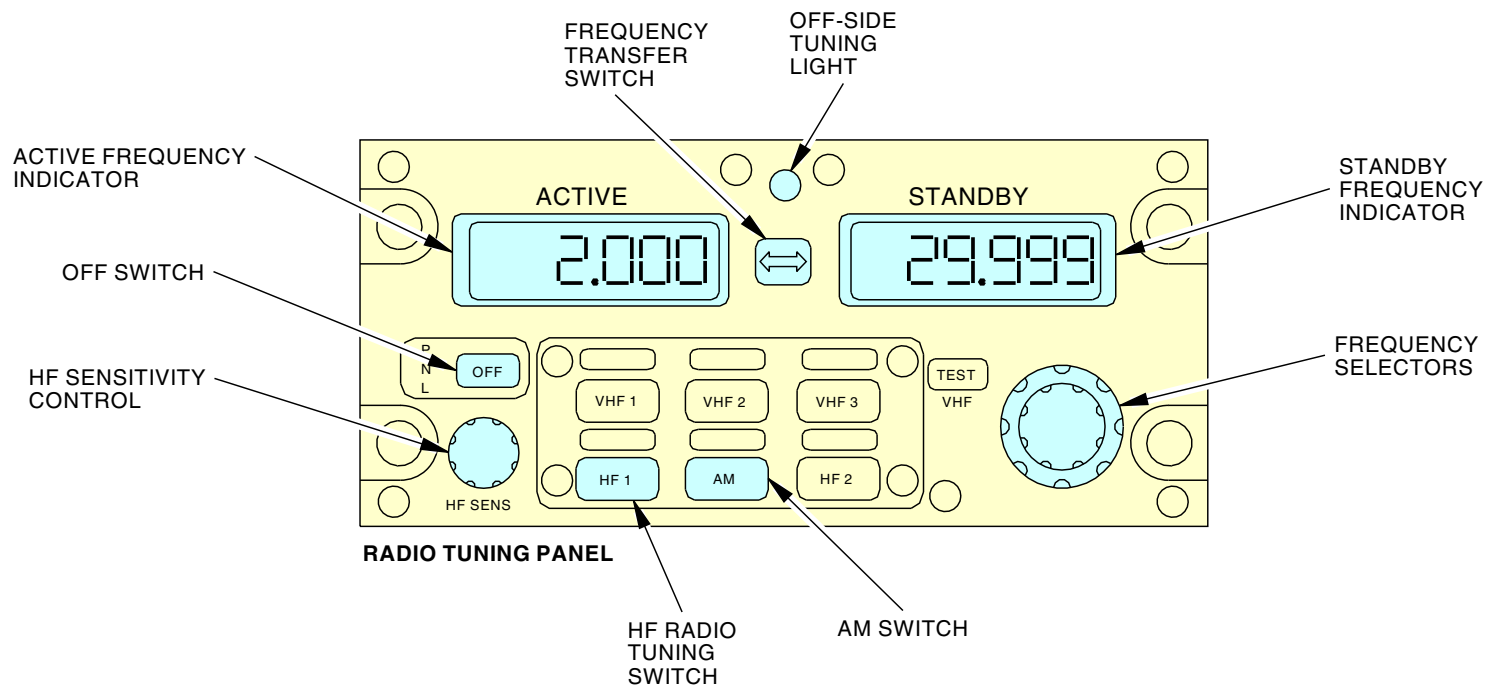
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## HIGH FREQUENCY COMMUNICATION SYSTEM -- RADIO TUNING PANEL



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## HIGH FREQUENCY COMMUNICATION SYSTEM -- RADIO TUNING PANEL

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## HIGH FREQUENCY COMMUNICATION SYSTEM -- HF COMMUNICATION TRANSCEIVER

**Purpose**

The High Frequency (HF) communication transceiver transmits and receives Radio Frequency (RF) signals for analog voice and data communication.

**Physical Description**

The front panel has these components:

- Three fault LEDs
- A TEST push-button
- A microphone jack
- A headphone jack.

All electrical connections are through connectors at the rear of the transceiver.

**Power**

The transceiver must have 115 volts, 400 Hz, 3 phase ac power to operate.

Transceiver RF output is 400 watts peak envelope power (PEP) in the single sideband (SSB) mode. It is 125 watts average in the amplitude modulated (AM) mode. In the AM mode the transceiver transmits the amplitude modulation equivalent (AME). AME is the carrier frequency plus the upper side band.

**Indications**

The LRU STATUS LED comes on red for a failure in the HF transceiver.

The KEY INTERLOCK LED comes on red when the transceiver keys and there is a failure in the HF coupler. Transmission is not possible at this time.

The CONTROL FAIL LED comes on red if there is no input from the control panel or if the control panel input goes invalid.

**BITE**

Push the TEST push button to test the transceiver front panel LEDs and to start a self-test. Connect a headphone to the transceiver front panel microphone jack to hear two short tones, and after one second, one additional tone through the audio system.

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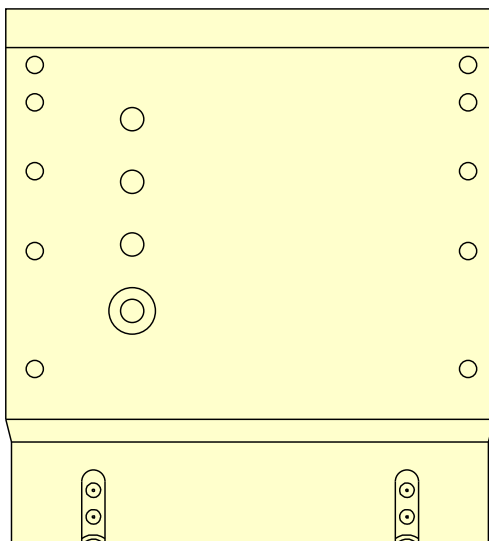
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HIGH FREQUENCY COMMUNICATION SYSTEM -- HF COMMUNICATION TRANSCEIVER



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HIGH FREQUENCY COMMUNICATION SYSTEM -- HF COMMUNICATION TRANSCEIVER

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**HIGH FREQUENCY COMMUNICATION SYSTEM -- HF ANTENNA COUPLER****Purpose**

The HF antenna coupler matches the transceiver 50 ohm impedance output to the antenna impedance at the set frequency. This decreases the voltage standing wave ratio (VSWR) to less than 1.3:1.

**Physical Description**

The coupler front panel has these components:

- Fill valve
- Electrical connector to transceiver
- Coaxial connector to transceiver
- Pressure nozzle.

The rear panel has the antenna feed line connector.

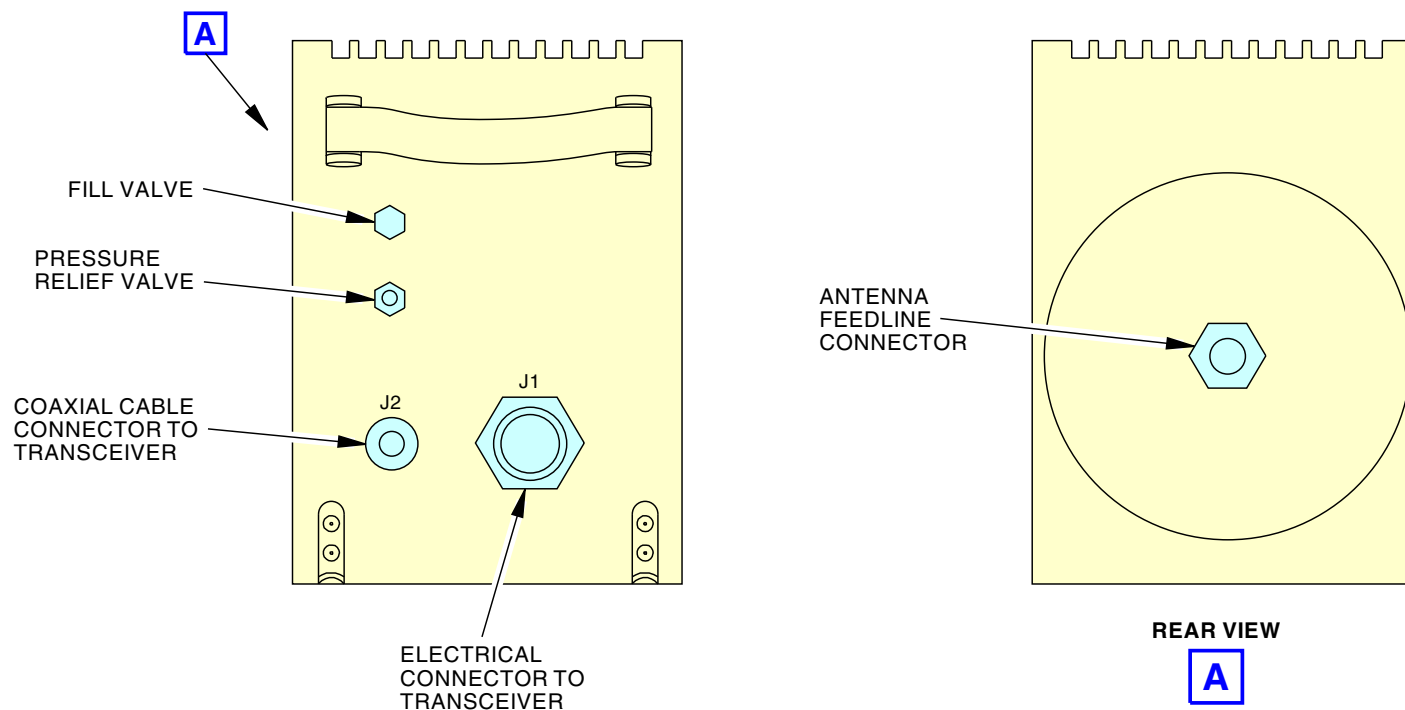
**Operation**

The coupler uses 115v ac and 28v dc to operate. It does not need special cooling.

The coupler tunes in the aeronautical frequency range of 2 to 29.999 MHz. This occurs in 2 to 4 seconds, 7 seconds maximum.

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# HIGH FREQUENCY COMMUNICATION SYSTEM -- HF ANTENNA COUPLER



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## HIGH FREQUENCY COMMUNICATION SYSTEM -- HF ANTENNA COUPLER

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## HIGH FREQUENCY COMMUNICATION SYSTEM -- HF ANTENNA

### Purpose

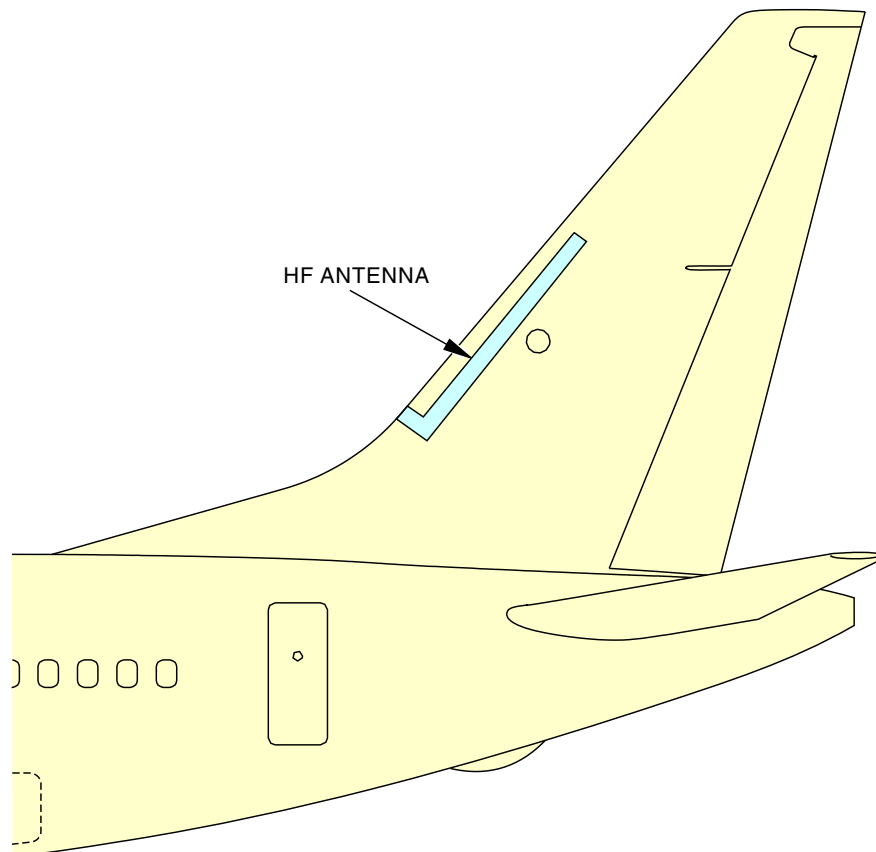
The High Frequency (HF) antenna radiates and receives the Radio Frequency (RF) signal.

### Physical Description

The HF antenna is a notch type antenna. It is u-shaped fiberglass material. The antenna is sealed within the leading edge of the vertical stabilizer.

The antenna receives the feed line from the antenna coupler.

HIGH FREQUENCY COMMUNICATION SYSTEM -- HF ANTENNA



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HIGH FREQUENCY COMMUNICATION SYSTEM -- HF ANTENNA

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## HIGH FREQUENCY COMMUNICATION SYSTEM -- OPERATION

**General**

You use these components to operate the HF radio:

- Hand microphone or headset
- Radio tuning panel (RTP)
- Control wheel mic switch
- Remote mic switch
- Audio control panel (ACP).

**Receive Operation**

You use the RTP and the ACP to receive transmissions on the HF radio.

On the ACP, push the receiver volume control for the HF radio. Turn the control to adjust the volume for the HF radio.

You hear audio on the headset and the flight interphone speakers. To hear sound from the flight interphone speakers, push the speaker (SPKR) volume control to operate the speaker. Turn the control to adjust the volume for the speaker.

On the radio tuning panel, use the on/off control to turn on the radio tuning panel. When you first turn it on, the radio tuning panel tunes the VHF radio. Push the HF 1 switch to make the radio tuning panel tune the HF radio. A light above the switch comes on to show which radio the panel controls. The frequency displays show HF radio frequencies (2.000 to 29.999 MHz). The HF radio uses the frequency in the active frequency display.

Use the frequency selectors on the RTP to tune the radio to a new frequency. The standby frequency display shows the new frequency. When you are sure the frequency is correct, push the frequency transfer switch. The active frequency display shows the new frequency. The HF radio uses the new frequency.

**NOTE:** When you select a new frequency, the HF coupler drives its tuning elements to the home position.

Listen for audio from the HF radio on the speaker or headset. Adjust the volume control switches on the audio control panel for a comfortable sound level.

Use the HF sensitivity (HF SENS) control on the radio communication panel to adjust the sensitivity of the HF radio receiver.

**Transmit Operation**

Make sure the active frequency display shows the frequency you want to transmit. Make sure the frequency you select is a valid transmit frequency.

Push the microphone selector switch on the audio control panel for the HF radio.

Listen for transmissions on the frequency you selected. When the frequency is clear, push and release the push-to-talk for the microphone. This causes the HF coupler to tune to the transmission frequency. While the coupler tunes, the HF transceiver supplies a 1 kHz tone. You hear this tone on the speaker and in the headset.

Normally, it takes several seconds for the coupler to tune. When the 1 kHz tone stops, the HF system is ready to transmit.

When the frequency is clear and you want to transmit a message, key the mic and speak into it. You hear sidetone in the headphone and muted sidetone from the flight interphone speaker. The flight interphone system mutes the sidetone to the speaker when you use the boom mic or the hand mic.

You can continue to transmit and receive on the frequency you selected.

When you select another frequency and key the mic to transmit, the HF coupler tunes again. You hear the 1 kHz tone while it tunes.

**Non-Normal Indications**

If you hear the 1 kHz tone for more than 15 seconds when the coupler tunes, there may be a coupler fault.

If the tone only lasts as long as you key the microphone, you may have tuned a frequency which is outside the frequency range for the HF transceiver.

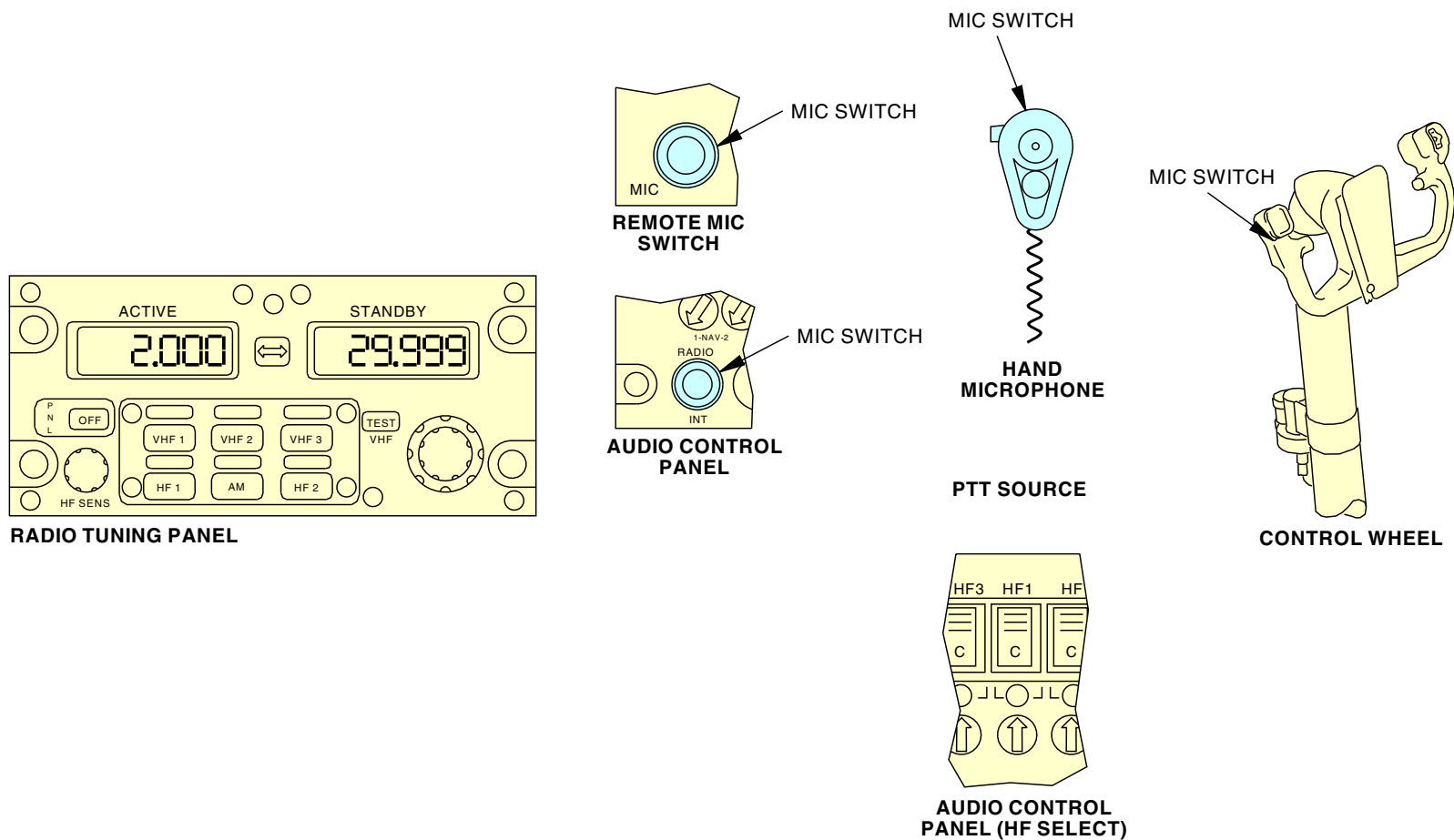
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## HIGH FREQUENCY COMMUNICATION SYSTEM -- OPERATION



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## HF COMMUNICATION SYSTEM -- OPERATION

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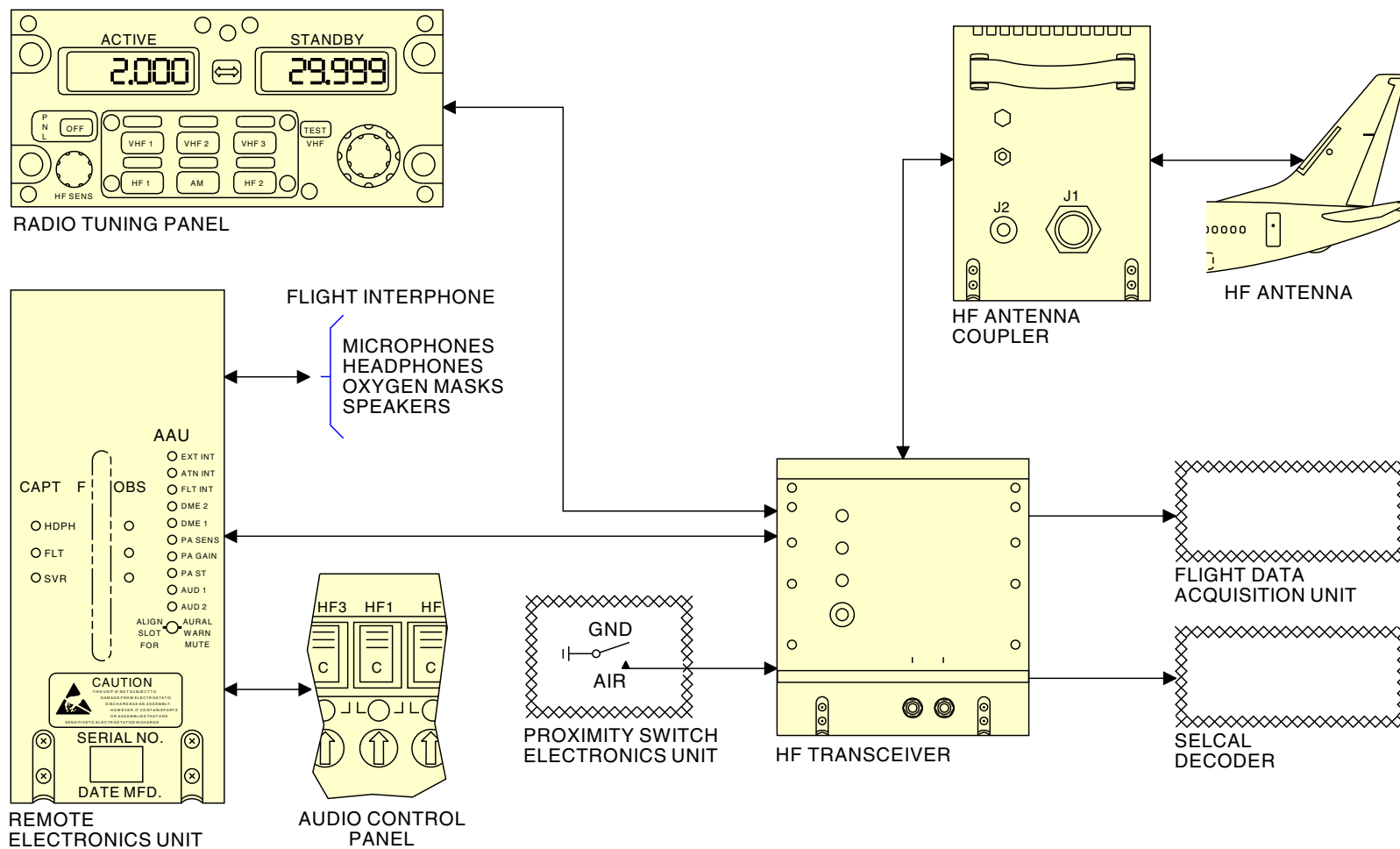
HIGH FREQUENCY COMMUNICATION SYSTEM -- SYSTEM SUMMARY

GENERAL

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## HIGH FREQUENCY COMMUNICATION SYSTEM -- SYSTEM SUMMARY



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## HF COMMUNICATION SYSTEM -- SYSTEM SUMMARY

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**VERY HIGH FREQUENCY COMMUNICATION SYSTEM - INTRODUCTION****General**

The very high frequency (VHF) communication system supplies communication over line-of-sight distances. It gives communication between airplanes or between ground stations and airplanes.

**Abbreviations and Acronyms**

- ACARS - aircraft communications addressing and reporting system
- ACP - audio control panel
- AM - amplitude modulation
- ARINC - Aeronautical Radio Incorporated
- BITE - built-in test equipment
- COMM - communication
- EEC - electronic equipment compartment
- FDAU - flight data acquisition unit
- FDR - flight data recorder
- FREQ - frequency
- I/C - interphone communication
- LCD - liquid crystal display
- LED - light emitting diode
- LRU - line replaceable unit
- mic - microphone
- MSEC - milli-second
- PSEU - proximity switch electronics unit
- PTT - push-to-talk
- RCP - radio communication panel
- REU - remote electronics unit
- RF - radio frequency
- R/T - receive/transmit
- SELCAL - selective calling
- SQL - squelch

- SSB - single side band
- SSFDR - solid state flight data recorder
- VHF - very high frequency
- VSWR - voltage standing wave ratio
- XMIT - transmit

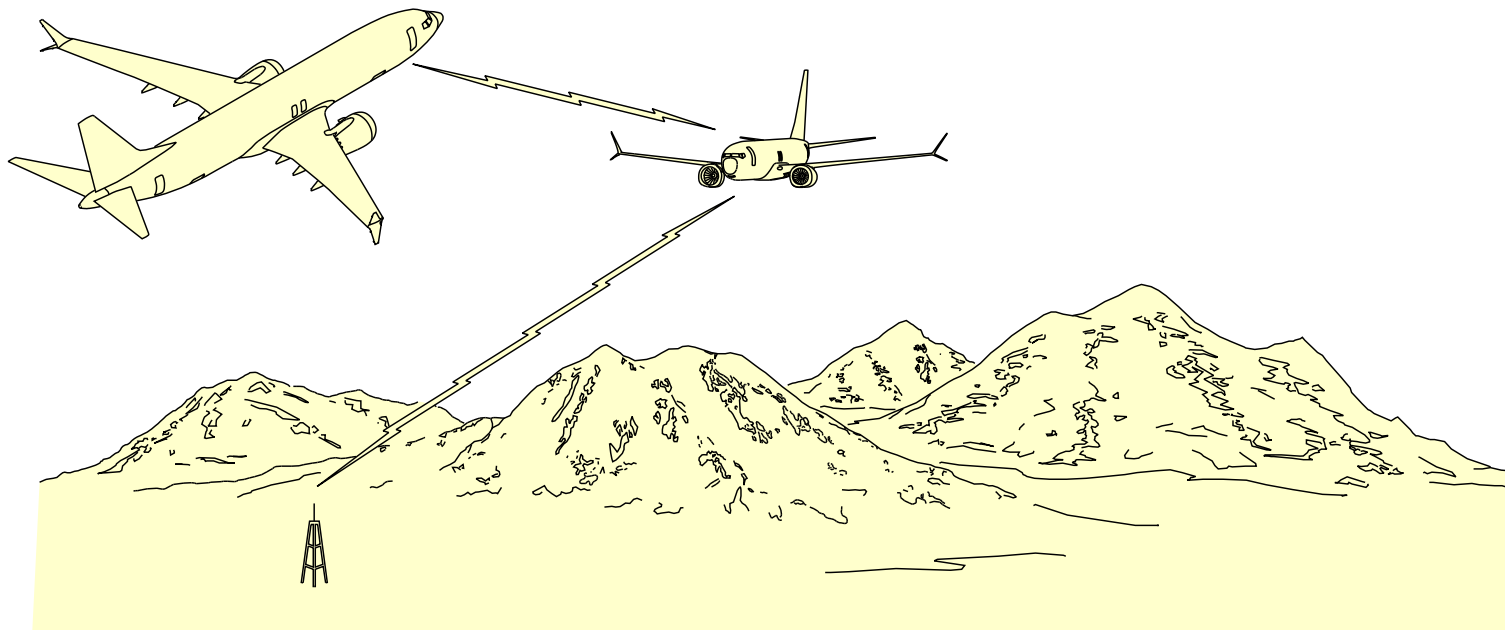
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## VERY HIGH FREQUENCY COMMUNICATION SYSTEM - INTRODUCTION



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## VERY HIGH FREQUENCY COMMUNICATION SYSTEM - INTRODUCTION

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## VHF COMMUNICATION SYSTEM - GENERAL DESCRIPTION

### General

The VHF communication system supplies the flight crew with voice and data line-of-sight communication. The VHF communication system can be used to communicate between airplanes and between airplanes and ground stations.

The VHF communication system operates in the frequency range of 118.000 MHz to 136.990 MHz. The 8.33 kHz spacing is only available for these frequency ranges:

- 118.000 to 121.400
- 121.600 to 123.050
- 123.150 to 136.475

### System Components

The VHF communication system has these components:

- Radio Communication Panel (RCP)
- VHF transceivers
- VHF antennas.

The RCP allows selection of the frequency used to tune the VHF transceivers.

The VHF transceiver transmit circuits modulate an RF carrier signal with voice or data audio. The receive circuits demodulate the received RF carrier signal to detect the audio from the RF carrier. The detected audio is used by the flight crew and other airplane systems.

The VHF antennas transmit and receive RF signals.

### External Interface

The VHF communication system connects with these components/systems:

- Remote Electronics Unit (REU)
- Proximity Switch Electronic Unit (PSEU)
- SELCAL decoder unit

- Flight Data Acquisition Unit (FDAU).

### System Operation

The control panel sends selected frequency signals to the transceiver. The audio control panel sends radio select signals and receive volume control to the REU.

During transmit, microphone audio and Push-To-Transmit (PTT) signals go to the selected VHF transceiver through the REU. The transceiver uses the microphone audio to modulate an RF carrier signal made in the transceiver. The transceiver sends the modulated RF signal to the antenna for transmission to other airplanes and ground stations.

During transmit, the flight data acquisition unit receives a PTT signal from the transceiver. The flight data acquisition unit uses the PTT for key event marking to record the transmit event.

During the receive operation, the antenna receives a modulated RF signal and sends it to the transceiver. The transceiver demodulates or removes the audio information from the RF carrier. The received audio goes from the VHF transceiver through the REU to the flight interphone speakers and headsets.

The SELCAL decoder unit receives audio from the VHF transceiver. The SELCAL decoder unit monitors the audio for SELCAL calls that come from the ground station.

The VHF transceiver receives an air/ground discrete from the PSEU. The VHF transceiver uses the discrete to calculate flight legs for internal fault memory.

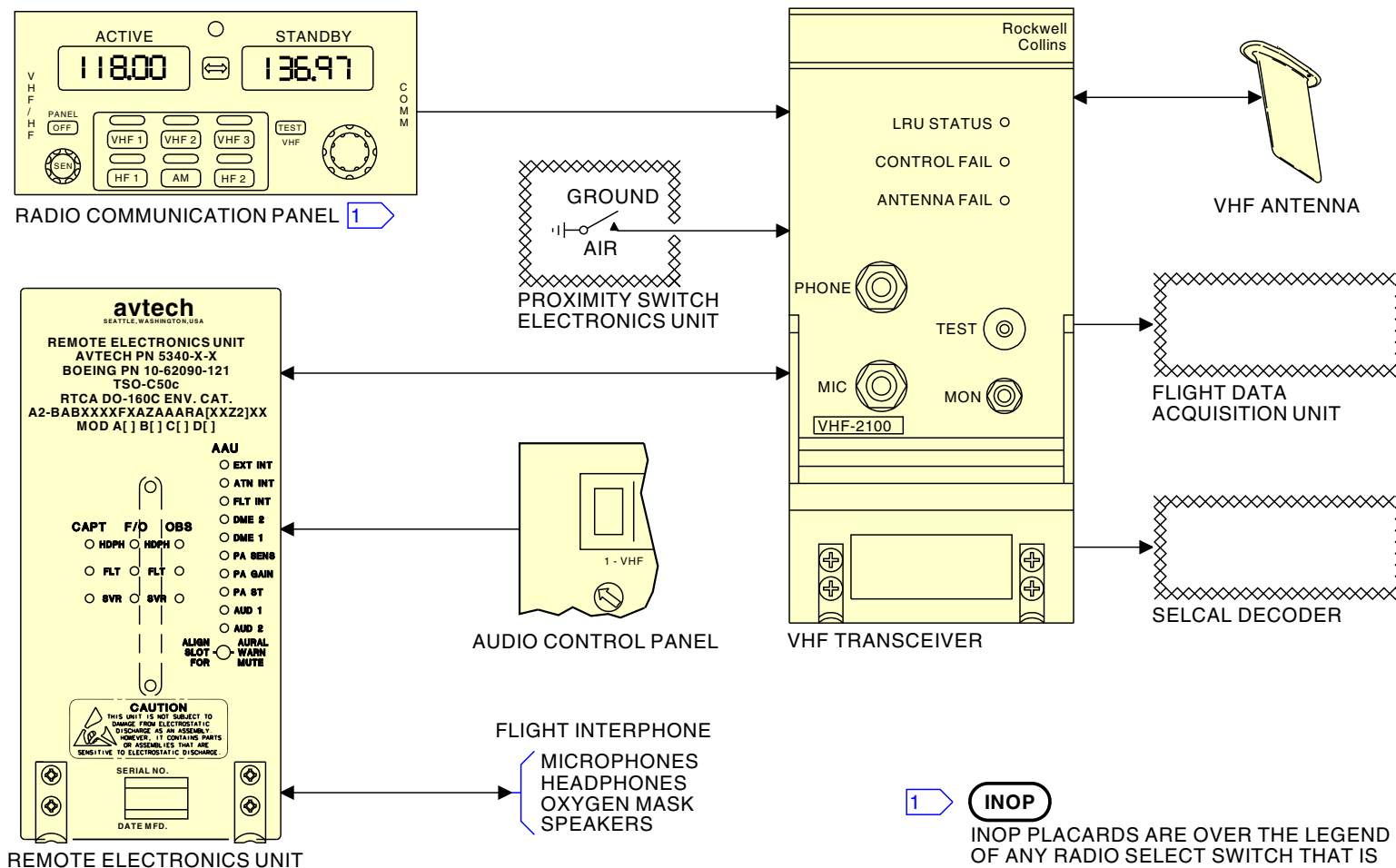
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# VHF COMMUNICATION SYSTEM - GENERAL DESCRIPTION



## VHF COMMUNICATION SYSTEM - GENERAL DESCRIPTION

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## VHF COMMUNICATION SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

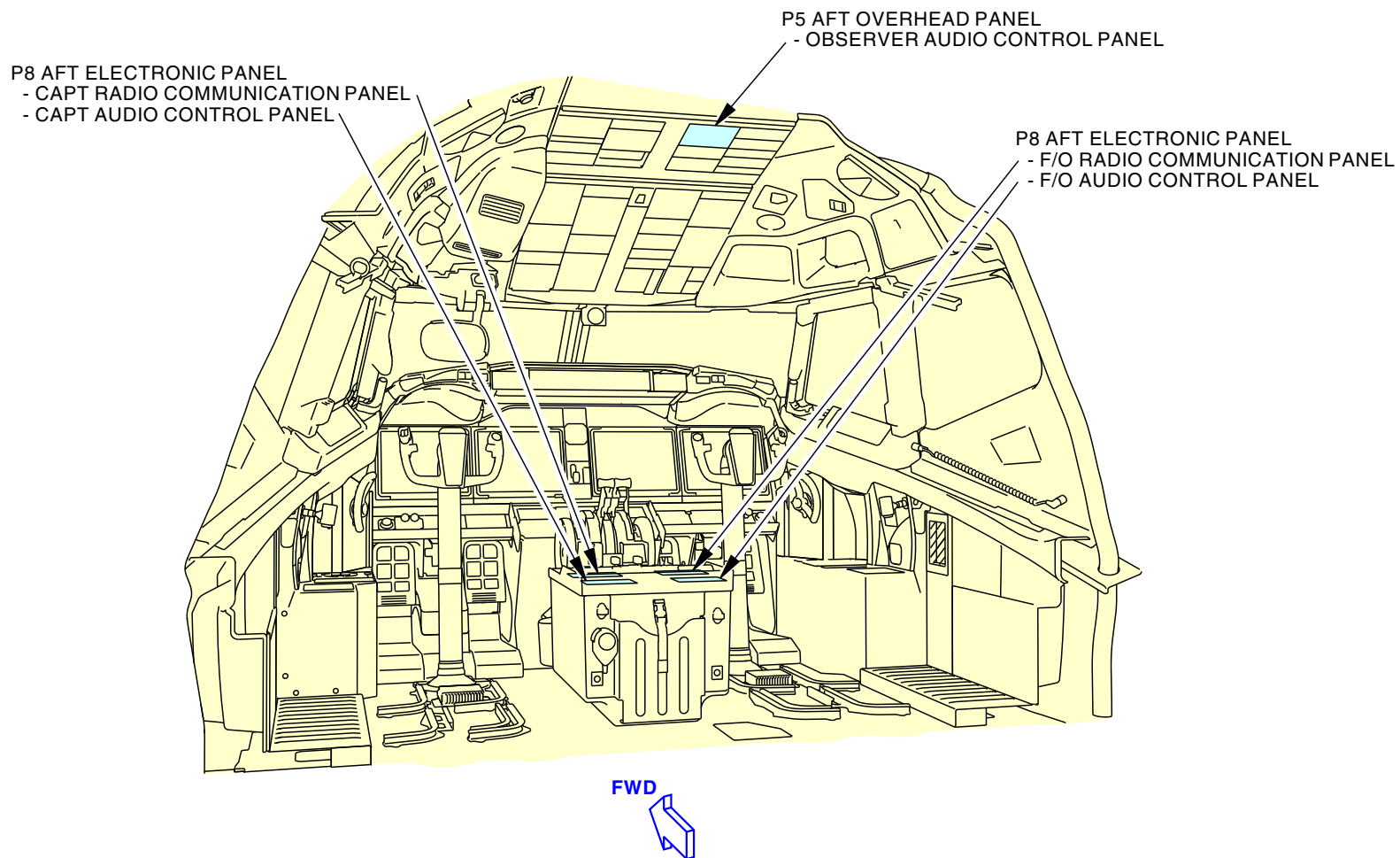
### Flight Compartment

The radio communication panels are on the P8 aft electronic panel.

The Audio Control Panels (ACP) are part of the flight interphone system. The ACPs have an interface with the Very High Frequency (VHF) communication system through the Remote Electronics Unit (REU). The captain and first officer ACPs are on the P8 aft electronics panel. The observer ACP is on the P5 aft overhead panel.

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## VHF COMMUNICATION SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS



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## VHF COMMUNICATION SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

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## VHF COMMUNICATION SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT (EEC) COMPONENT LOCATIONS

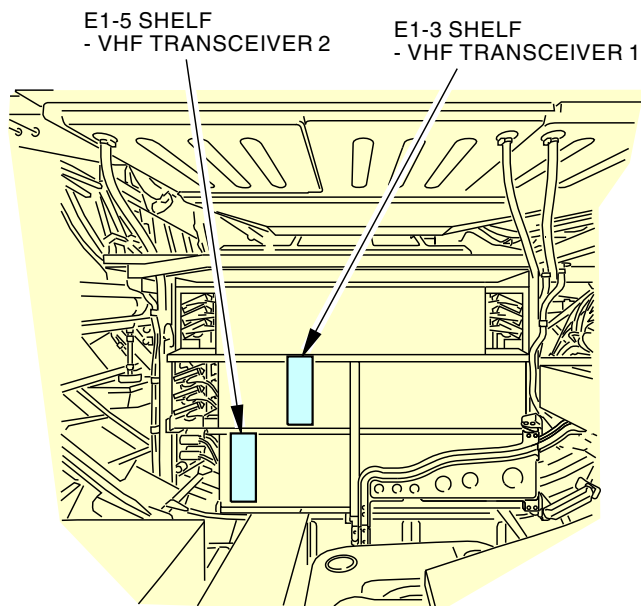
### Electronic Equipment Compartment

VHF transceiver 1 is on the E1-3 shelf.

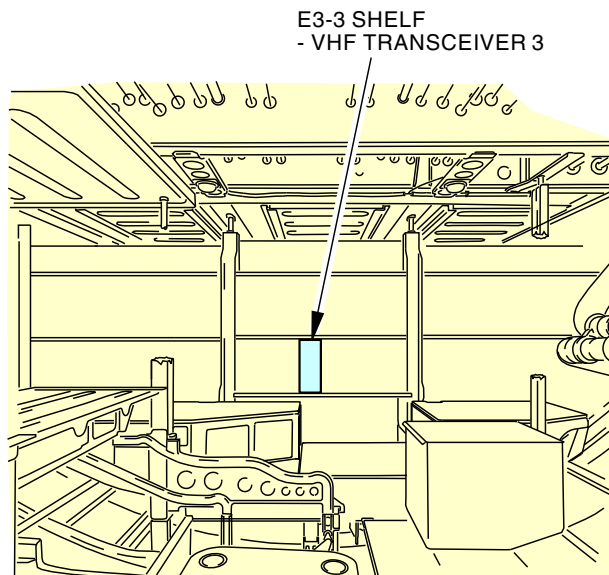
VHF transceiver 2 is on the E1-5 shelf.

VHF transceiver 3 is on the E3-3 shelf.

## VHF COMMUNICATION SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT (EEC) COMPONENT LOCATIONS



EE COMPARTMENT  
(VIEW IN THE FORWARD DIRECTION)



EE COMPARTMENT  
(VIEW IN THE AFT DIRECTION)

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## VHF COMMUNICATION SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT (EEC) COMPONENT LOCATIONS

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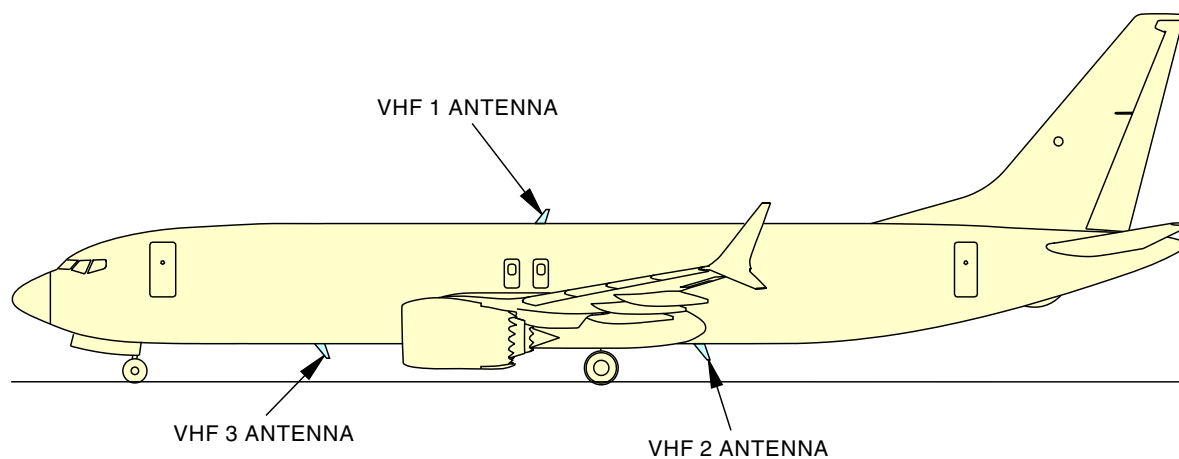
## VHF COMMUNICATION SYSTEM - ANTENNA COMPONENT LOCATIONS

### General

The VHF antennas are on the top and the bottom of the airplane fuselage on the centerline.

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## VHF COMMUNICATION SYSTEM - ANTENNA COMPONENT LOCATIONS



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## VHF COMMUNICATION SYSTEM - ANTENNA COMPONENT LOCATIONS

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**VHF COMMUNICATION SYSTEM - VHF 1 TRANSCEIVER INTERFACES****Power**

The 28v dc standby bus supplies power to the VHF 1 transceiver and radio communication panel (RCP) 1.

**VHF 1 Transceiver**

The VHF 1 transceiver has an interface with these components:

- RCP 1, 2 and 3.
- VHF antenna.
- Proximity switch electronics unit.
- Remote electronics unit.
- SELCAL decoder unit
- Flight data acquisition.

**Radio Communication Panel**

RCP 1 supplies frequency information to the VHF 1 transceiver on an ARINC 429 bus to port A. RCP 2 supplies frequency information to the VHF 1 transceiver on an ARINC 429 bus to port B. RCP 3 can supply frequency data to the VHF 1 transceiver through RCP 1 or 2. For more information about tuning interfaces, see VHF Communication System - Tuning Interfaces.

The VHF transceiver supplies the status of the transceiver to the RCPs.

The transceiver sends a ground to the control panel to provide the capability to tune VHF frequencies at 8.33 kHz spacing.

**VHF Antenna**

The VHF antenna receives an RF signal from the VHF transceiver and transmits the RF signal to other airplane and ground VHF communication systems. The antenna also receives incoming RF signals and sends the RF signals to the VHF transceiver. The transceiver demodulates or detects the audio from the RF carrier signal.

**External Interfaces**

The VHF 1 transceiver has an interface with components from other airplane systems.

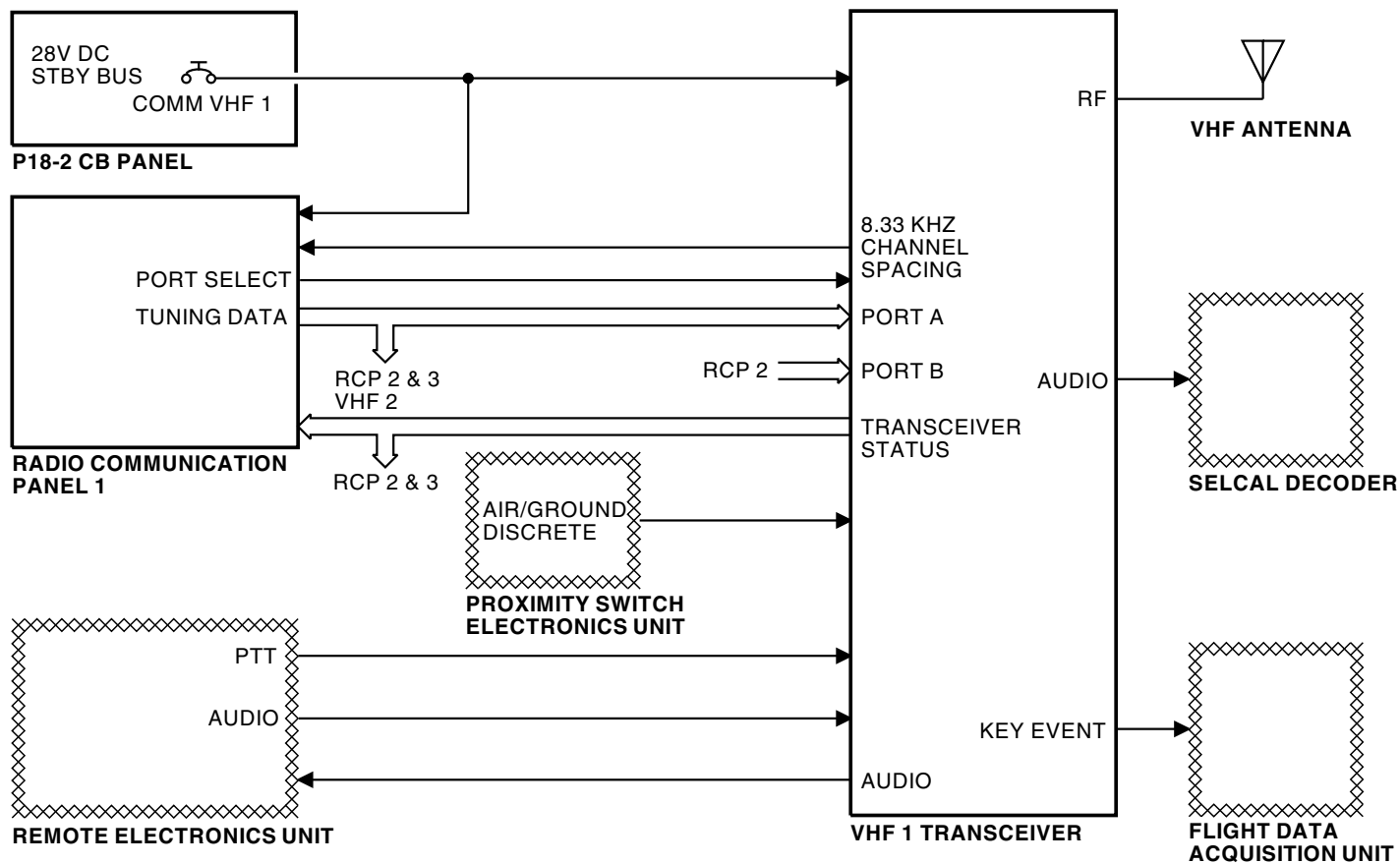
The proximity switch electronic unit sends a ground signal to increase the flight leg count to track fault history.

The remote electronics unit sends flight crew microphone (mic) audio to the transceiver to be transmitted. It also sends a PTT to start the transceiver transmit mode. The transceiver sends side tone and received audio to the REU for the flight interphone system.

The transceiver sends received audio to the SELCAL decoder. The SELCAL decoder isolates the SELCAL code from voice audio.

The flight data acquisition unit receives a PTT from the transceiver for key event marking.

## VHF COMMUNICATION SYSTEM - VHF 1 TRANSCEIVER INTERFACES



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## VHF COMMUNICATION SYSTEM - VHF 1 TRANSCEIVER INTERFACES

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**VHF COMMUNICATION SYSTEM - VHF 2 TRANSCEIVER INTERFACES****Power**

The dc bus 2 supplies 28v dc power to the VHF 2 transceiver and radio communication panel (RCP) 2.

**VHF 2 Transceiver**

The VHF 2 transceiver has an interface with these components:

- RCP 1, 2 and 3.
- VHF antenna.
- Proximity switch electronics unit.
- Remote electronics unit.
- SELCAL decoder unit.
- Flight data acquisition.

**Radio Communication Panel**

RCP 2 supplies frequency information to the VHF 2 transceiver on an ARINC 429 bus to port A. RCP 1 supplies frequency information to the VHF 2 transceiver on an ARINC 429 bus to port B. RCP 3 can supply frequency data to VHF 2 transceiver through RCP 1 or 2. For more information on tuning interfaces, see VHF Communication System - Tuning Interfaces

The VHF transceiver supplies the status of the transceiver to the RCPs.

The transceiver sends a ground to the RCP to provide the capability to tune VHF frequencies at 8.33 kHz spacing.

**VHF Antenna**

The VHF antenna receives an RF signal from the VHF transceiver and transmits the RF signal to other airplane and ground VHF communication systems. The antenna also receives incoming RF signals and sends the RF signals to the VHF transceiver. The transceiver demodulates or detects the audio from the RF carrier signal.

**External Interfaces**

The VHF 2 transceiver has an interface with components from other airplane systems.

The proximity switch electronic unit sends a ground signal to increase the flight leg count to track fault history.

The remote electronics unit sends flight crew audio to the transceiver to be transmitted. It also sends a PTT start the transceiver transmit mode. The transceiver sends side tone and received audio to the REU for the flight interphone system.

The transceiver sends received audio to the SELCAL decoder. The SELCAL decoder isolates the SELCAL code from voice audio.

The flight data acquisition unit receives a PTT from the transceiver for key event marking.

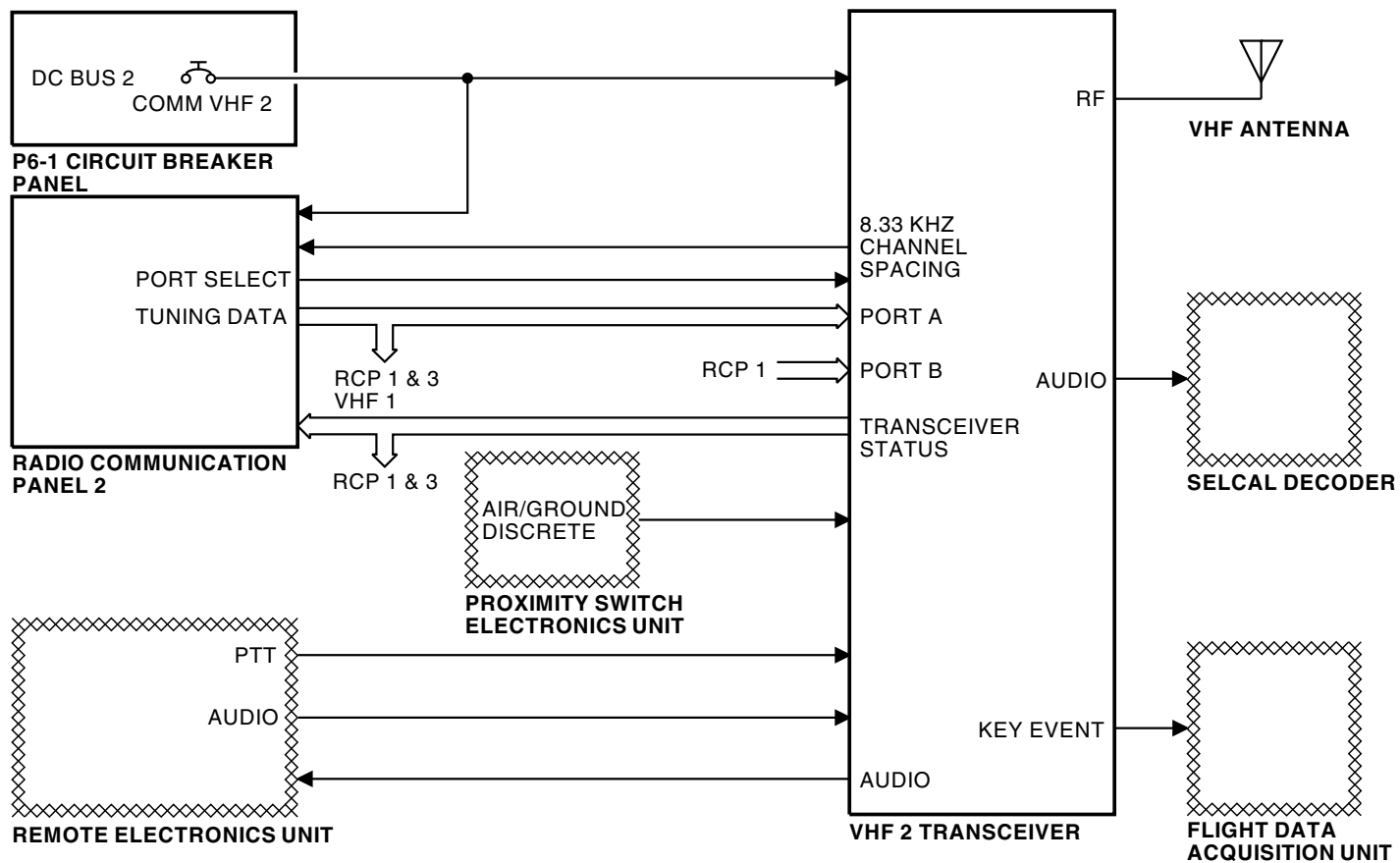
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## VHF COMMUNICATION SYSTEM - VHF 2 TRANSCEIVER INTERFACES



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## VHF COMMUNICATION SYSTEM - VHF 2 TRANSCEIVER INTERFACES

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**VHF COMMUNICATION SYSTEM - VHF 3 TRANSCEIVER INTERFACES****Power**

The DC bus 2 supplies 28v dc power to the VHF 3 transceiver and radio communication panel (RCP) 3.

**VHF 3 Transceiver**

The VHF 3 transceiver has an interface with these components:

- RCP 1, 2, and 3.
- VHF antenna.
- Proximity switch electronics unit.
- Remote electronics unit.
- SELCAL decoder unit.
- ACARS communications management unit
- Flight data acquisition unit.
- Voice protection relay (IDU controlled or RTP controlled).

**Radio Communication Panel**

RCP 3 supplies frequency information to the VHF 3 transceiver on an ARINC 429/750 bus to port B. The ACARS management unit (MU) sends tuning information to VHF 3 transceiver on an ARINC 429 bus to port A. For more information on tuning interfaces see VHF Communication System - Tuning Interfaces.

The VHF transceiver supplies the status of the transceiver to the RCPs.

The transceiver sends a ground to the radio control panel to give the capability to tune VHF frequencies at 8.33 kHz spacing.

**VHF Antenna**

The VHF antenna receives an RF signal from the VHF transceiver and transmits the RF signal to other airplane and ground VHF communication systems. The antenna also receives RF signals and sends the RF signals to the VHF transceiver. The transceiver demodulates or detects the audio from the RF carrier signal.

**External Interfaces**

The VHF 3 transceiver has an interface with components from other airplane systems.

The proximity switch electronic unit sends a ground signal to increase the flight leg count to track fault history.

The remote electronics unit sends flight crew audio to the transceiver to be transmitted. It also sends a PTT to start the transceivers transmit mode. The transceiver sends received audio to the REU for the flight interphone system.

The transceiver sends received audio to the SELCAL decoder. The SELCAL decoder isolates the SELCAL code from voice audio.

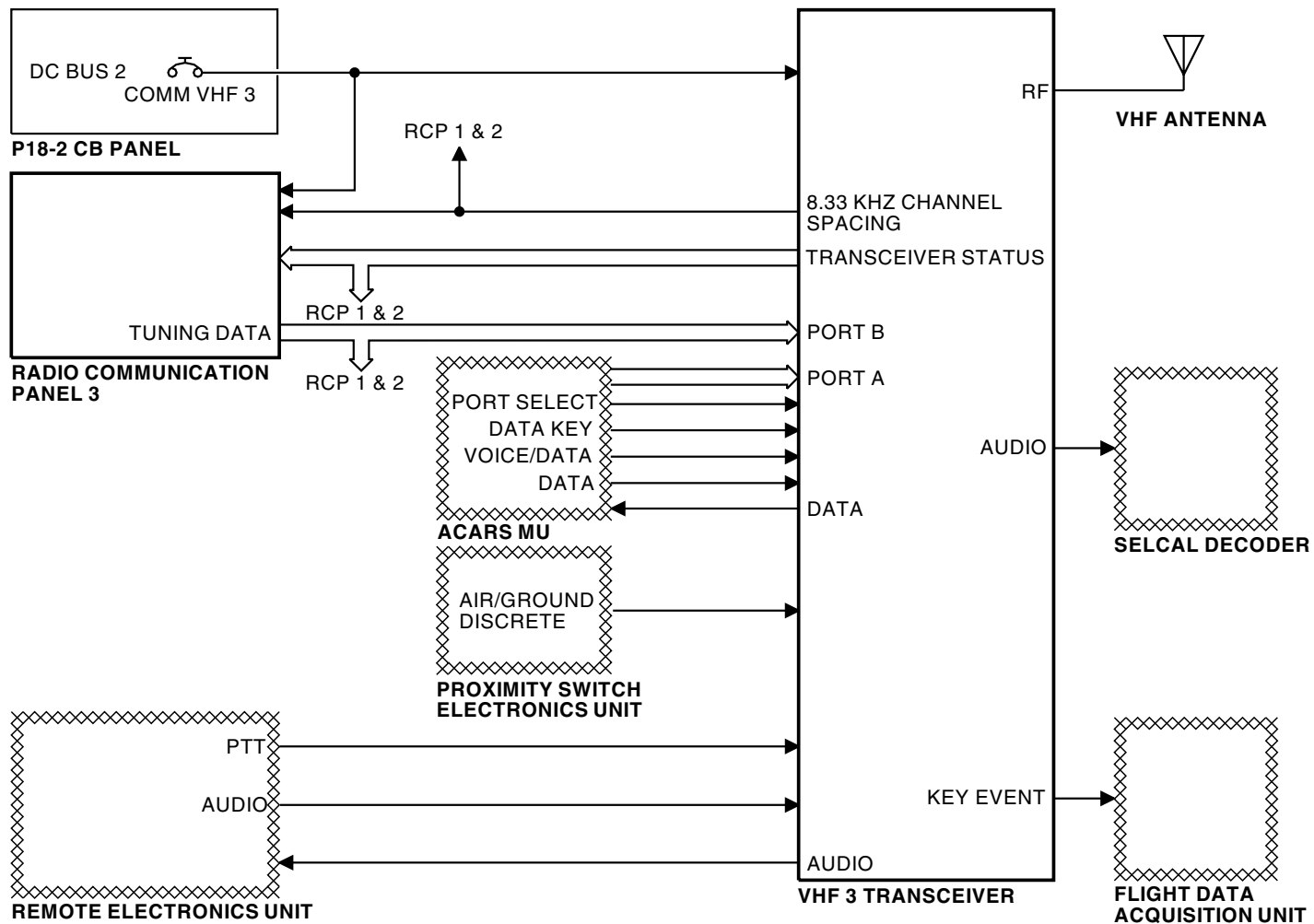
The flight data acquisition unit receives a PTT from the transceiver for key event marking.

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### VHF COMMUNICATION SYSTEM - VHF 3 TRANSCEIVER INTERFACES



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### VHF COMMUNICATION SYSTEM - VHF 3 TRANSCEIVER INTERFACES

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## VHF COMMUNICATION SYSTEM - TUNING INTERFACES

### General

The VHF communication system uses data buses to share tuning information between the radio communication panels (RCPs) and the communication transceivers.

### Tuning Bus

Each RCP has one ARINC 429 output bus.

The RCPs send tuning data to the communication transceivers. Any RCP can tune any transceiver.

Each RCP sends tuning data and status to the other radio communication panels. This keeps the tuning data synchronized and lets any RCP tune any transceiver.

The RCP keeps the tuning data in memory. Usually, the RCP uses the tuning data from its memory to send on the output bus.

The RCP can connect the CROSSTALK 1 bus directly to the output bus. This occurs for these RCP conditions:

- RCP does not have power
- RCP is OFF
- RCP is failed.

### Port Select Discrete

RCP 1 and 2 send the port select discretes to the transceivers.

Each transceiver has two tuning data input ports, port A and port B. The transceiver uses the port select discrete to select the input port. A grounded port select discrete causes the transceiver to use port A. An open port select discrete causes the transceiver to use port B.

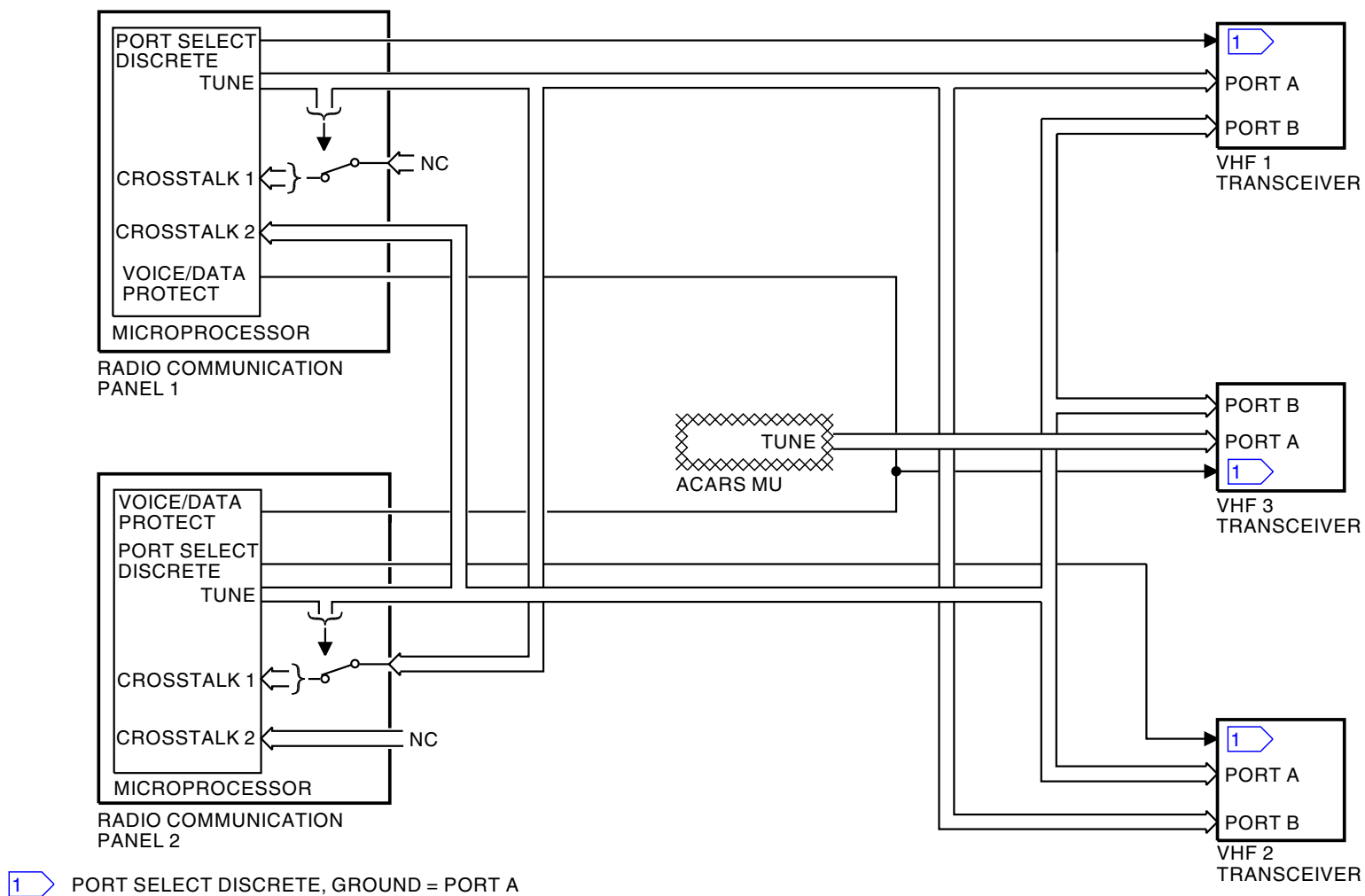
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### VHF COMMUNICATION SYSTEM - TUNING INTERFACES

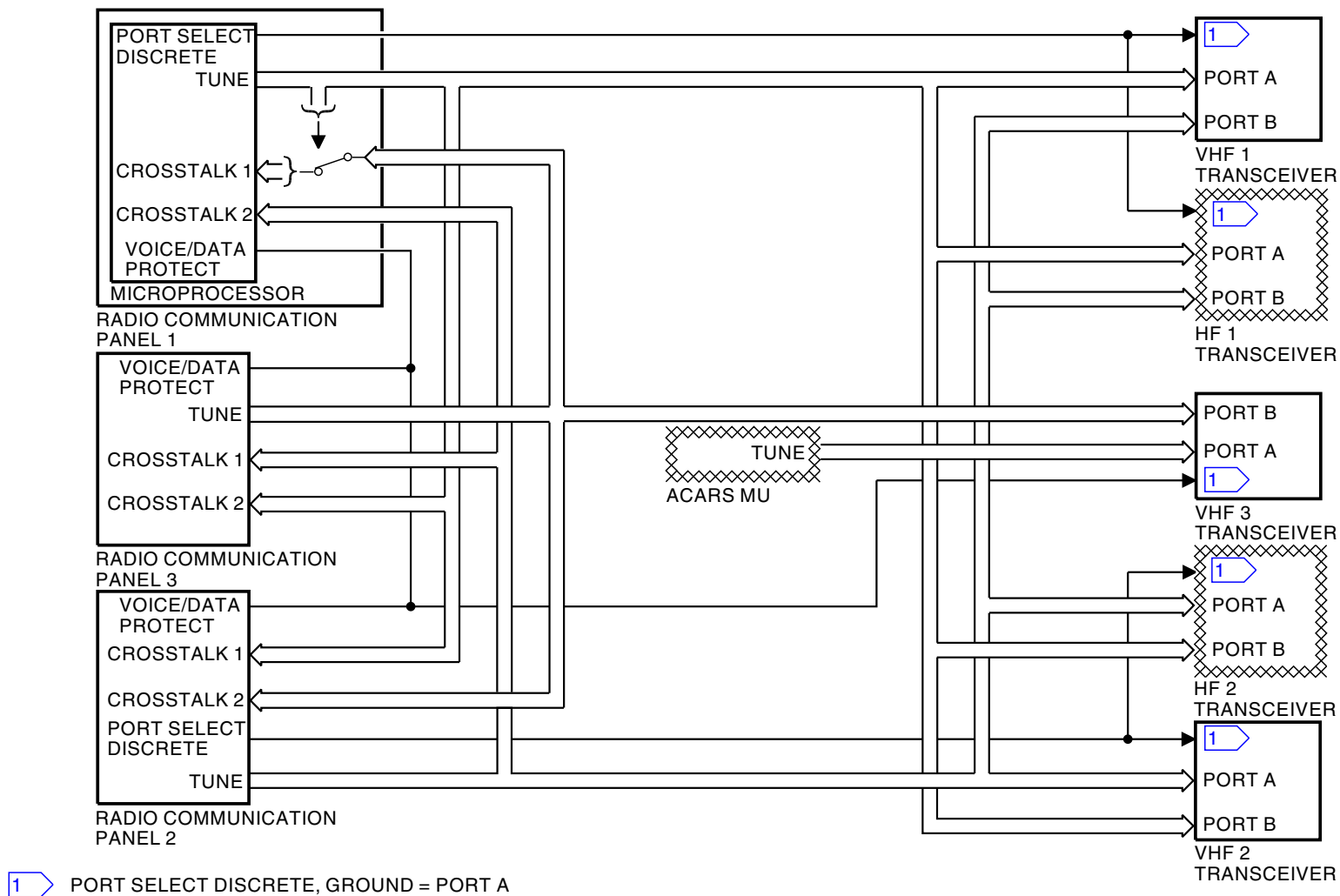


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### VHF COMMUNICATION SYSTEM - TUNING INTERFACES

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### VHF COMMUNICATION SYSTEM - TUNING INTERFACES



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### VHF COMMUNICATION SYSTEM - TUNING INTERFACES



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## VHF COMMUNICATION SYSTEM - RADIO COMMUNICATION PANEL

### General

The radio communication panel (RCP) provides these functions:

- VHF and HF radio selection
- Active/standby frequency selection
- HF sensitivity control
- Test initiation to the VHF transceiver
- Mode selection to the HF transceiver
- Off switch.

### Controls and Indicators

Any radio communication panel can control any transceiver. Push the radio tuning switch to select the transceiver for that radio communication panel. The light above the switch comes on. Each radio communication panel can tune only one transceiver at a time.

When you select an off-side radio, two off-side tuning lights come on. One light is on the radio communication panel that you use to make the selection. This is the off-side radio. The other light is on radio communication panel of the radio you select. This is the on-side radio.

Set the frequency in the standby frequency indicator. Turn the frequency selectors to set the frequency. The first digit is always 1. The outer knob sets the second two digits (10 MHz and 1MHz) in 1 MHz increments. The inner knob sets the fourth, fifth, and sixth digits (100 kHz, 10 kHz, and 1 kHz) in 8.33 kHz increments.

Push the frequency transfer switch to change the active and standby frequencies.

The HF SENS control sets the RF sensitivity level of the HF transceiver. Rotate the control to adjust the sensitivity of the HF transceiver.

The inactive frequency indicator shows a value between 0 and 99. Maximum sensitivity is 99. Minimum sensitivity is 0. After a delay, the inactive frequency indicator shows the inactive frequency again.

The VHF communication test switch starts a confidence check of the VHF transceiver. Push the VHF communication test switch to stop the squelch in the VHF transceiver. You hear static when you push the switch.

Push the OFF switch to stop the operation of the radio communication panel. The switch shows white when it is off.

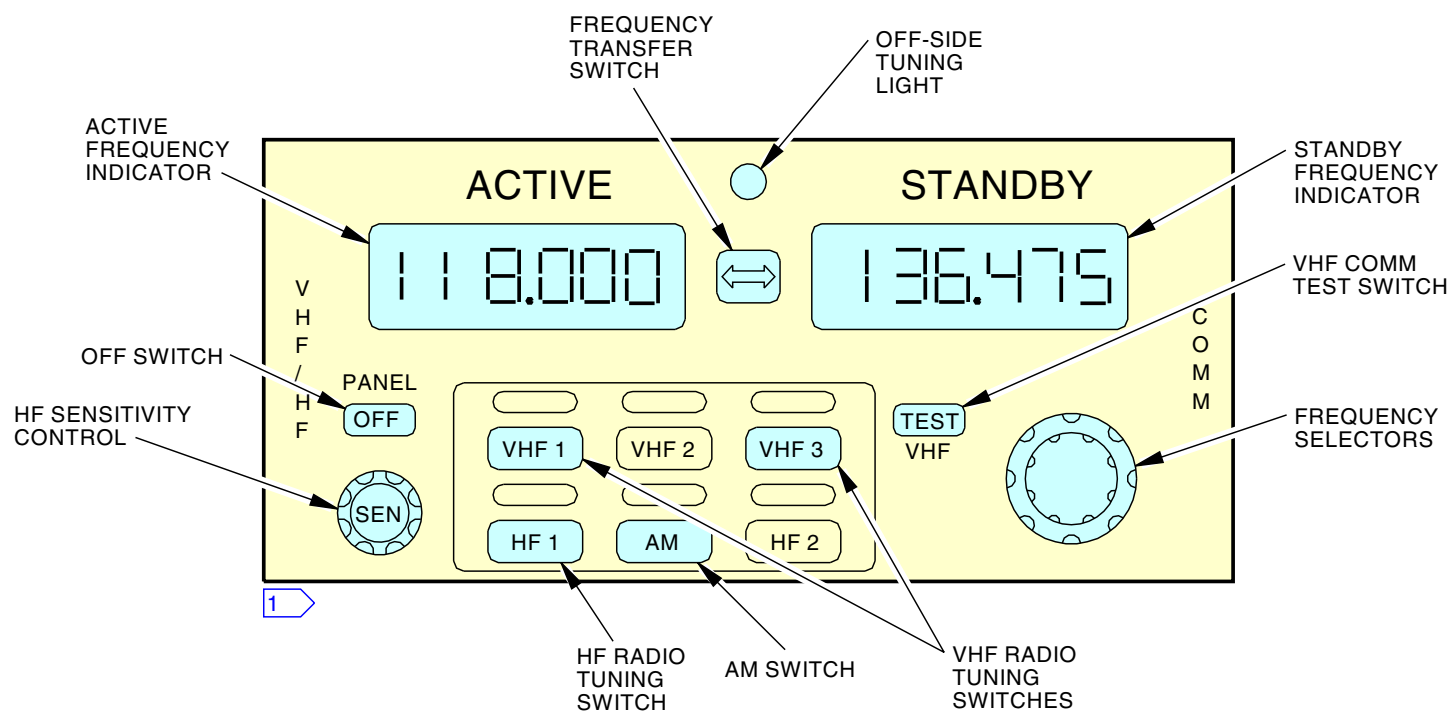
### BITE

The radio communication panel continuously does a self-test. The frequency indicators show PANEL FAIL when there is an internal failure of the radio communication panel.

The radio communication panel continuously monitors the condition of the transceiver. If the transceiver had failed, the two frequency indicators show FAIL.

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### VHF COMMUNICATION SYSTEM - RADIO COMMUNICATION PANEL



1 INOP

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### VHF COMMUNICATION SYSTEM - RADIO COMMUNICATION PANEL

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**VHF COMMUNICATION SYSTEM - VHF TRANSCEIVER****Purpose**

The purpose of the VHF transceiver is to transmit and receive information.

**Physical Description**

The transceiver is a solid state device. It has these components:

- Power supply
- Frequency synthesizer
- Receiver
- Modulator
- Transmitter
- Microprocessor.

**Functional Description**

The transceiver has these properties:

- 118.000 to 136.990 MHz frequency range
- 8.33 kHz frequency spacing
- Voice or data operation
- 25 watts output power
- Built-in fault detection and memory.

**Power**

The transceiver operates with +27.5v dc.

**Controls, Indicators, and BITE**

Push the TEST switch to start a system self-test. This includes these tests:

- Transceiver self-test
- Input serial tuning word test
- Antenna VSWR test.

The front panel LEDs show the results of the VHF self-test. These are the front panel LEDs:

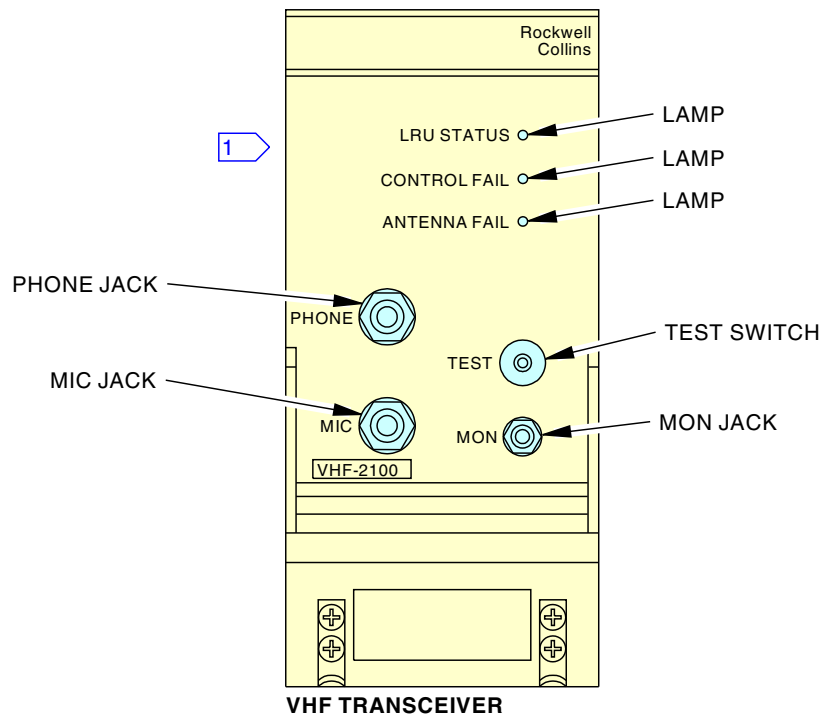
- LRU STATUS
- CONTROL FAIL
- ANTENNA FAIL.

The LRU STATUS lamp illuminates green to indicate pass and red to indicate failure of the unit. The CONTROL FAIL lamp illuminates to indicate control line failure. The ANTENNA FAIL lamp illuminates when there is an antenna line failure.

**Microphone and Headphone Jacks**

Microphone (mic) and headphone (phone) jacks give connection points for mic and phone use.

## VHF COMMUNICATION SYSTEM - VHF TRANSCEIVER



1 LRU STATUS LAMP SHOWS GREEN IF PASS OR RED IF UNIT FAILS.  
CONTROL FAIL LAMP ILLUMINATES TO INDICATE CONTROL LINE FAILURE.  
ANTENNA FAIL LAMP ILLUMINATES TO INDICATE ANTENNA LINE FAILURE.

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## VHF COMMUNICATION SYSTEM - VHF TRANSCEIVER

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**VHF COMMUNICATION SYSTEM - VHF ANTENNA****General Description**

The VHF antenna receives and transmits RF signals in the VHF frequency range.

There are three VHF antennas on the airplane. One at top of the fuselage and two at the bottom. Only the rear bottom antenna is connected to the VHF 2.

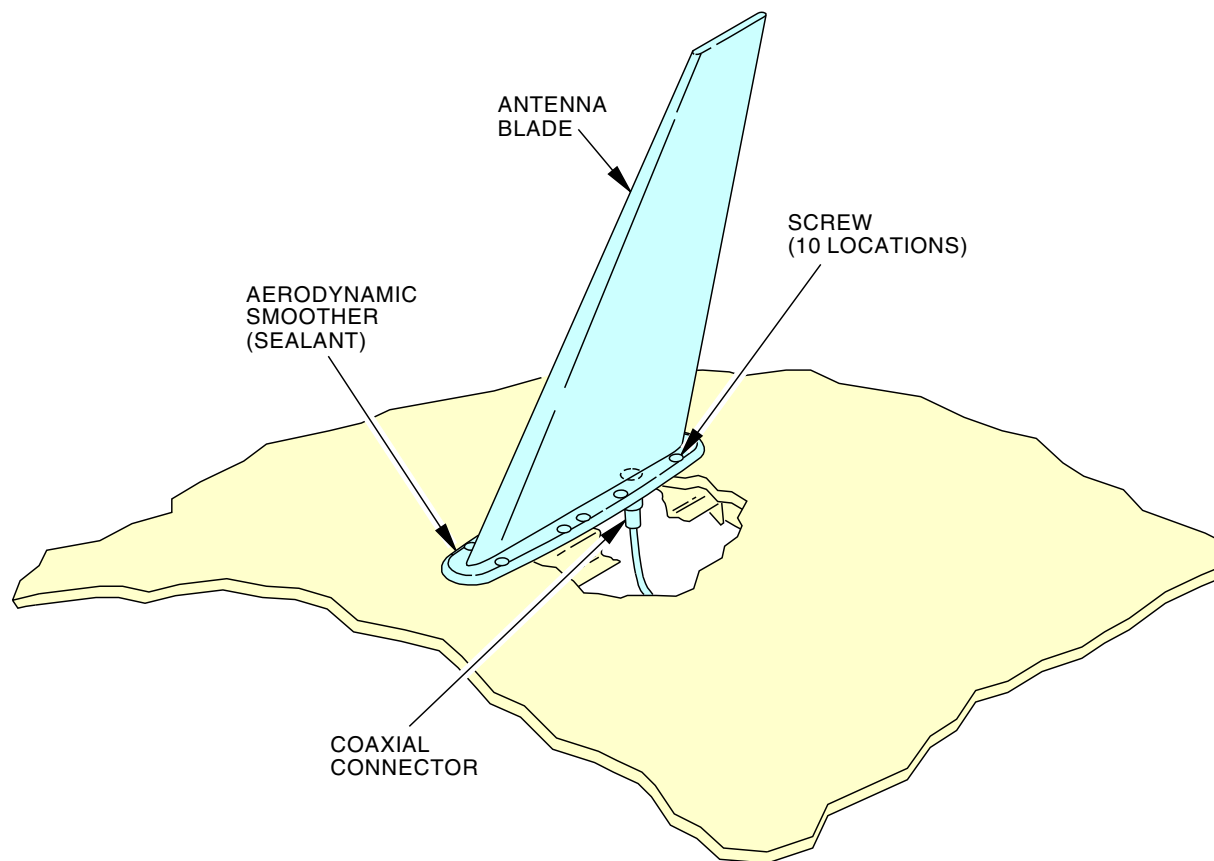
The forward bottom antenna is connected to VHF 3.

The antenna attaches with 10 screws. There is an aerodynamic smoother around the antenna base. This aerodynamic smoother is a sealant. An o-ring seals the coaxial connector.

**NOTE:** For the top antenna, the cable can fall through the hole. When you remove the top antenna, make sure that you attach the cable to a fix location to prevent this.

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VHF COMMUNICATION SYSTEM - VHF ANTENNA



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VHF COMMUNICATION SYSTEM - VHF ANTENNA

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## VHF COMMUNICATION SYSTEM - RECEIVE FUNCTIONAL DESCRIPTION

### Receive Operation

The VHF antennas receive RF signals and send them to the VHF communication transceivers through the coaxial cable. The transceivers send the RF signals through the receive circuits and then send the audio to the flight interphone system.

The transceivers also send data to the selective calling (SELCAL) decoder.

The microprocessor sends the receive frequency to the frequency synthesizer. The frequency synthesizer sets the frequency of the AM receiver.

The microprocessor also sends a logic 1 to the transfer switch when the transceiver is in the receive mode. This closes the transfer switch and sends the RF signal from the antenna to the AM receiver.

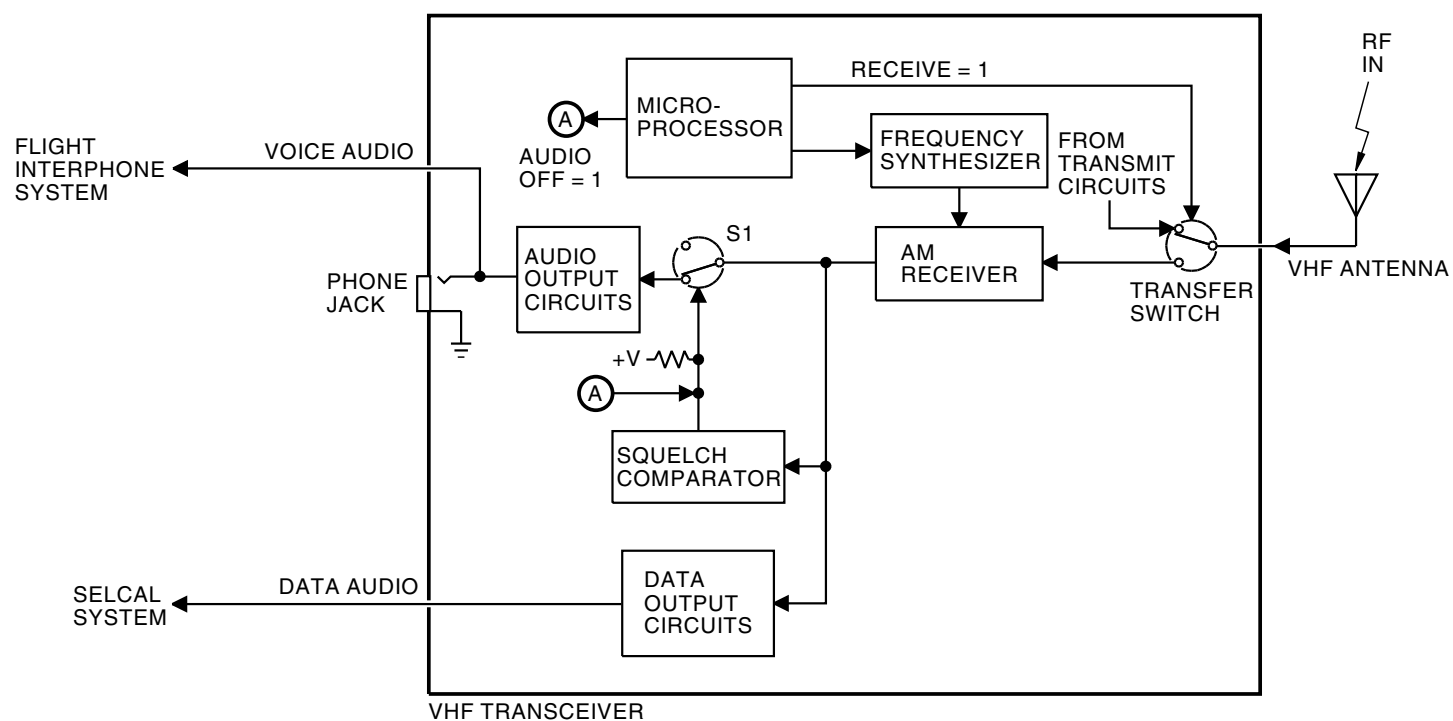
The AM receiver demodulates the RF input and detects the audio signal. The audio output from the AM receiver goes to these circuits:

- Switch S1
- Squelch comparator.

The audio output circuits send the audio signal to the flight interphone system and to the headphone jack.

The squelch comparator circuit compares the detected audio with a threshold value. If the level of the detected audio is larger than the threshold, the squelch circuit sends a ground to switch S1. Switch S1 closes and sends the audio to the audio output circuits.

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## VHF COMMUNICATION SYSTEM - RECEIVE FUNCTIONAL DESCRIPTION

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## VHF COMMUNICATION SYSTEM - TRANSMIT FUNCTIONAL DESCRIPTION

### Transmit Operation

The VHF transceivers receive audio from the remote electronics unit (REU). The transceivers send the signals through the transmit circuits and then to the antennas for transmission.

During transmission, the microprocessor receives a push-to-talk (PTT) signal from the REU. This causes the microprocessor to send a logic 0 to the transfer switch. The transfer switch connects the output of the transmit circuits to the VHF antenna.

Mic audio from the REU goes to the transmit circuits in the transceiver. The transmit circuits modulate the RF carrier with the mic audio. This makes an amplitude modulated RF signal. The signal goes to the directional coupler and transfer switch. The RF signal goes through the transfer switch and to the respective antenna. The antenna transmits the RF signal.

The RF output from the directional coupler also goes to the power monitor. The power monitor sends a logic 1 when the output power is larger than 15 watts.

The side tone switch closes when the output power is larger than 15 watts and the transceiver is in the voice mode. The microphone audio goes through the REU to the flight interphone speakers.

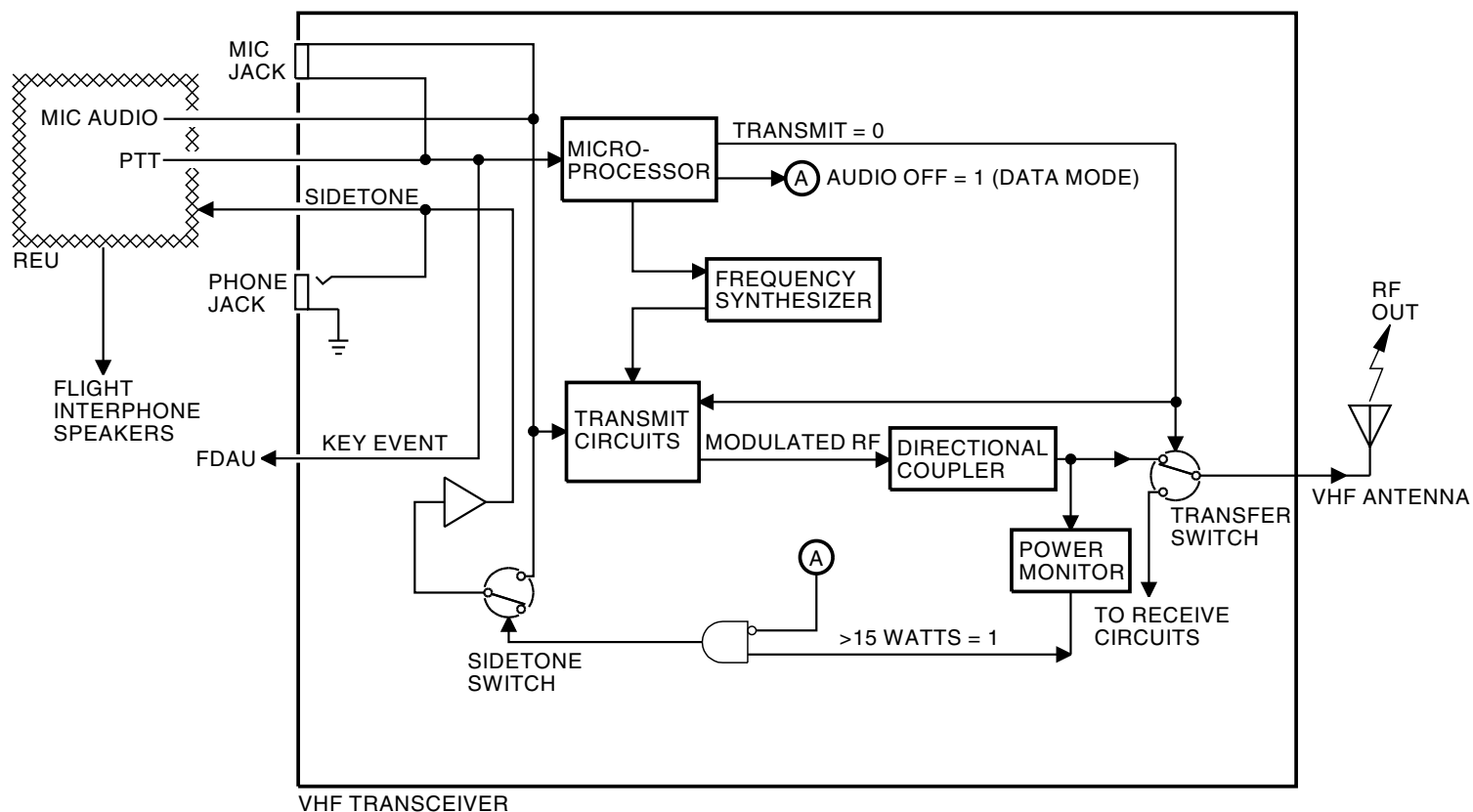
### Keyline Timer

The keyline timer is a function that limits VHF transmission to approximately 35 seconds. Approximately 25 to 30 seconds after PTT is selected, the transceiver makes an aural tone (or, side-tone) to the headset. This tone continues for approximately five seconds. When the tone stops, the RF transmission also stops, and the radio is set to receive mode automatically. The radio remains in receive mode until the PTT is released, and selected again.

The keyline timer function is serviceable when the side-tone, and RF transmission, stop within 33-36 seconds after PTT selection.

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## VHF COMMUNICATION SYSTEM - TRANSMIT FUNCTIONAL DESCRIPTION



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## VHF COMMUNICATION SYSTEM - TRANSMIT FUNCTIONAL DESCRIPTION

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## VHF COMMUNICATION SYSTEM - OPERATION

### General

You use these components to operate the VHF radios:

- Microphone or headset.
- Control wheel mic switch.
- Radio communication panel (RCP).
- Remote mic switch.
- Audio control panel.

### Receive Operation

You use the radio communication panel and the audio control panel to receive transmissions on the VHF radio.

On the audio control panel, push the receiver volume control for the VHF radio. Turn the control to adjust the volume from the VHF radio.

You hear audio on the headset and the flight interphone speakers. To hear sound from the flight interphone speakers, push the speaker (SPKR) volume control to turn on the speaker. Turn the control to adjust the volume of sound from the speaker.

When you apply power to the airplane, the radio communication panels (RCPs) are on. Initially, RCP 1 tunes VHF 1 and RCP 2 tunes VHF 2. Push the VHF microphone selector switch for the VHF radio you want to use. A light above the switch comes on to show which radio the panel controls. When you push the audio control panel microphone selector switch, the VHF receiver volume control is automatically selected. The frequency indicators show VHF radio frequencies. The VHF transceiver tunes to the frequency in the active frequency indicator.

Use the frequency selectors to tune the radio to a new frequency. The standby frequency display shows the new frequency.

When you are sure the frequency is correct, push the frequency transfer switch. The active frequency indicator shows the new frequency. The VHF radio uses the new frequency.

Listen to the audio from the VHF radio on the speaker or headset. Adjust the volume control switches on the audio control panel for a comfortable sound level.

### Transmit Operation

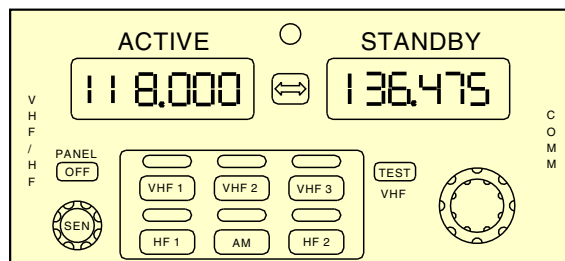
Make sure the active frequency indicator shows the frequency you want to transmit. Make sure the frequency you select is a valid transmit frequency.

Push the microphone selector switch on the audio control panel for the VHF radio.

Listen for transmissions on the frequency you selected. When the frequency is clear and you want to transmit a message, key the mic and speak into it. You hear sidetone in the headphone and muted sidetone from the speaker. The flight interphone system mutes the sidetone to the speaker when you use the boom mic or the hand mic.

You can continue to transmit and receive on the frequency you selected.

## VHF COMMUNICATION SYSTEM - OPERATION

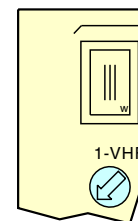
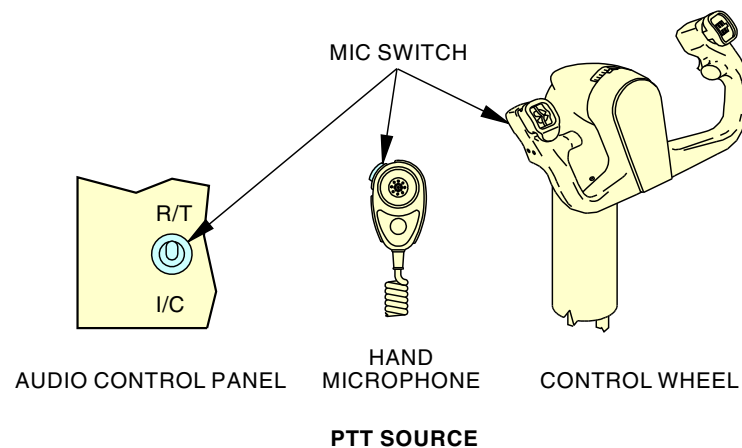


**RADIO COMMUNICATION PANEL**

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1 INOP

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**AUDIO CONTROL PANEL (VHF SELECT)**

## VHF COMMUNICATION SYSTEM - OPERATION

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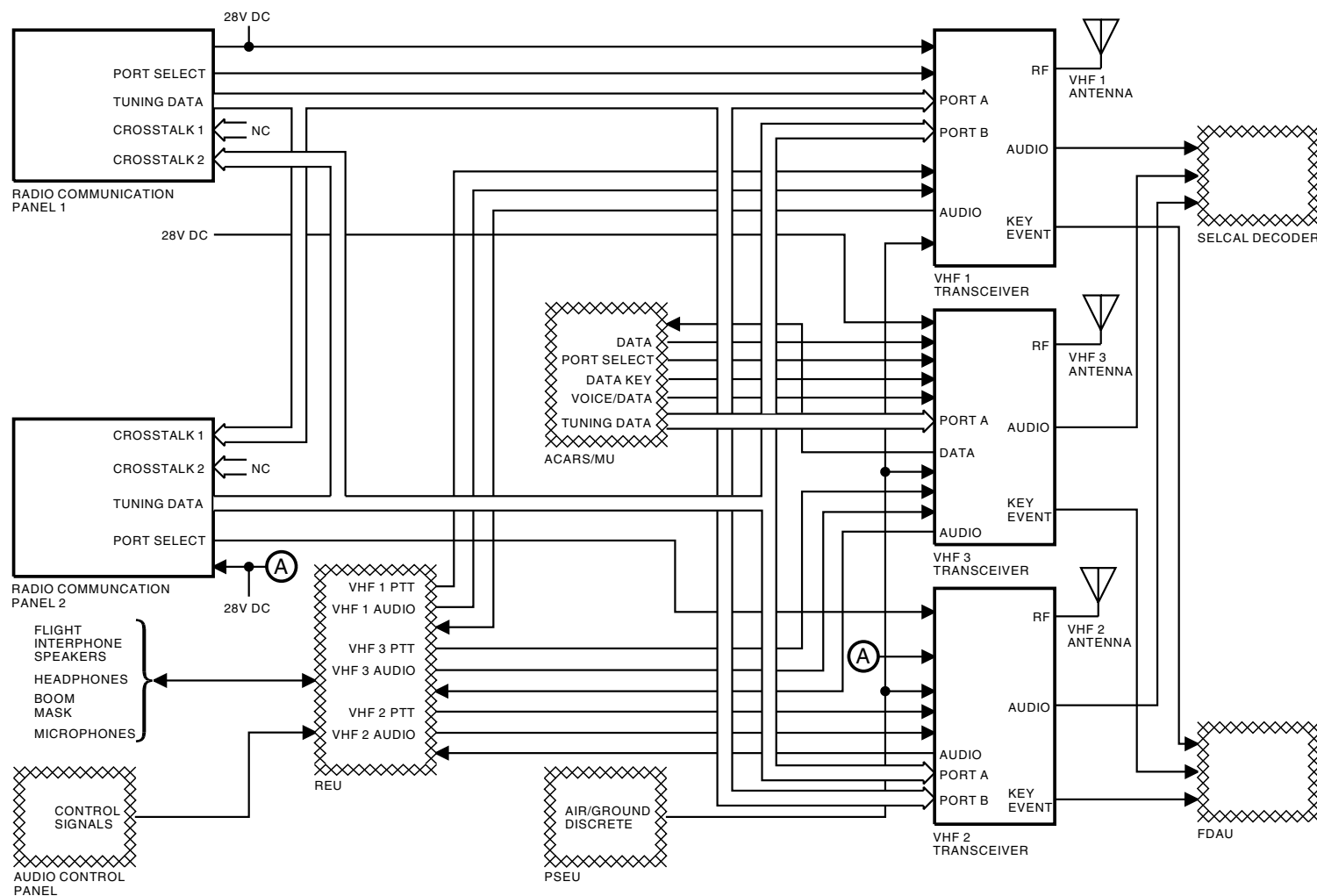
VHF COMMUNICATION SYSTEM - SYSTEM SUMMARY

General

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## VHF COMMUNICATION SYSTEM - SYSTEM SUMMARY



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## VHF COMMUNICATION SYSTEM - SYSTEM SUMMARY

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## SATCOM SYSTEM - INTRODUCTION

### Purpose

The satellite communication (SATCOM) system uses ground stations and satellites to transmit and receive data and voice messages. The SATCOM system supplies higher quality data and voice message signals for passengers and crew over longer distances than VHF and HF communication systems.

The SATCOM uses satellites in geosynchronous orbit as relay stations between the Aeronautical Earth Station (AES) and the Ground Earth Station (GES). The GES use telephone lines or microwave links to complete the communication link between the airplane and the selected GES.

The Iridium SATCOM uses a constellation of 66 Low Earth Orbit (LEO) satellites and ground infrastructure.

### Abbreviations and Acronyms

- ACARS - airplane communications addressing and reporting system
- ACMS - airplane condition and monitoring system
- ACP - audio control panel
- ADIRS - air data inertial reference system
- ADIRU - air data inertial reference unit
- AES - aeronautical earth station
- APM - avionics processor module
- APU - auxiliary power unit
- ARINC - Aeronautical Radio Incorporated
- ATA - Air Transport Association
- ATC - air traffic control
- ATTN - attenuator
- BGAN - broadband global area network
- BITE - built-in test equipment
- C - center
- capt - captain
- CDU - control display unit
- CH - channel
- cm - centimeter
- CM - continuous monitor
- CMU - communication management unit
- config - configuration
- CSDU - compact satellite data unit
- dc - direct current
- DPC - display processor computer
- DFDAU - digital flight data acquisition unit
- ECM - external configuration memory
- FCC - flight control computer
- FDAU - flight data acquisition unit
- FLTNO - flight number
- FMC - flight management computer
- F/O - first officer
- GES - ground earth station
- GHz - gigahertz
- gspd - ground speed
- HF - high frequency
- HELGA - HLD enhanced low gain antenna
- HLD - high-power amplifier/low noise amplifier/duplexer
- ICAO - International Civil Aviation Organization
- ident - identification
- IF - intermediate frequency
- IFC - intermittent fault count
- IGA - intermediate gain antenna
- I/O - input/output
- IRS - inertial reference system
- kg - kilogram
- L - left

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## SATCOM SYSTEM - INTRODUCTION

- LED - light emitting diode
- LSK - line select key
- LRU - line replaceable unit
- lwr - lower
- MCU - modular concept unit
- MHz - megahertz
- mic - microphone
- MU - management unit
- obs - observer
- ORT - owner requirement table
- PDL - portable data loader
- PAST - person-activate self-test
- PFIDS - passenger flight information distribution system
- P/N - part number
- POC - power-on count
- POST - power-on self-test
- pri - priority
- PSM - power supply module
- PTT - push-to-talk
- pwr - power
- R - right
- REU - remote electronics unit
- RF - radio frequency
- rx - receive
- SATCOM - satellite communication
- SBD - short-burst data
- SCM - SDU configuration module
- SDU - satellite data unit
- SIM - subscriber identity module
- temp - temperature
- TSPO - time since power-on
- tx - transmit
- UHF - ultra high frequency
- upr - upper
- USIM - universal subscriber identity module
- UTC - universal coordinated time
- v ac - volts alternating current
- v dc - volts direct current
- VHF - very high frequency
- W - Watt
- warn - warning
- xfr - transfer

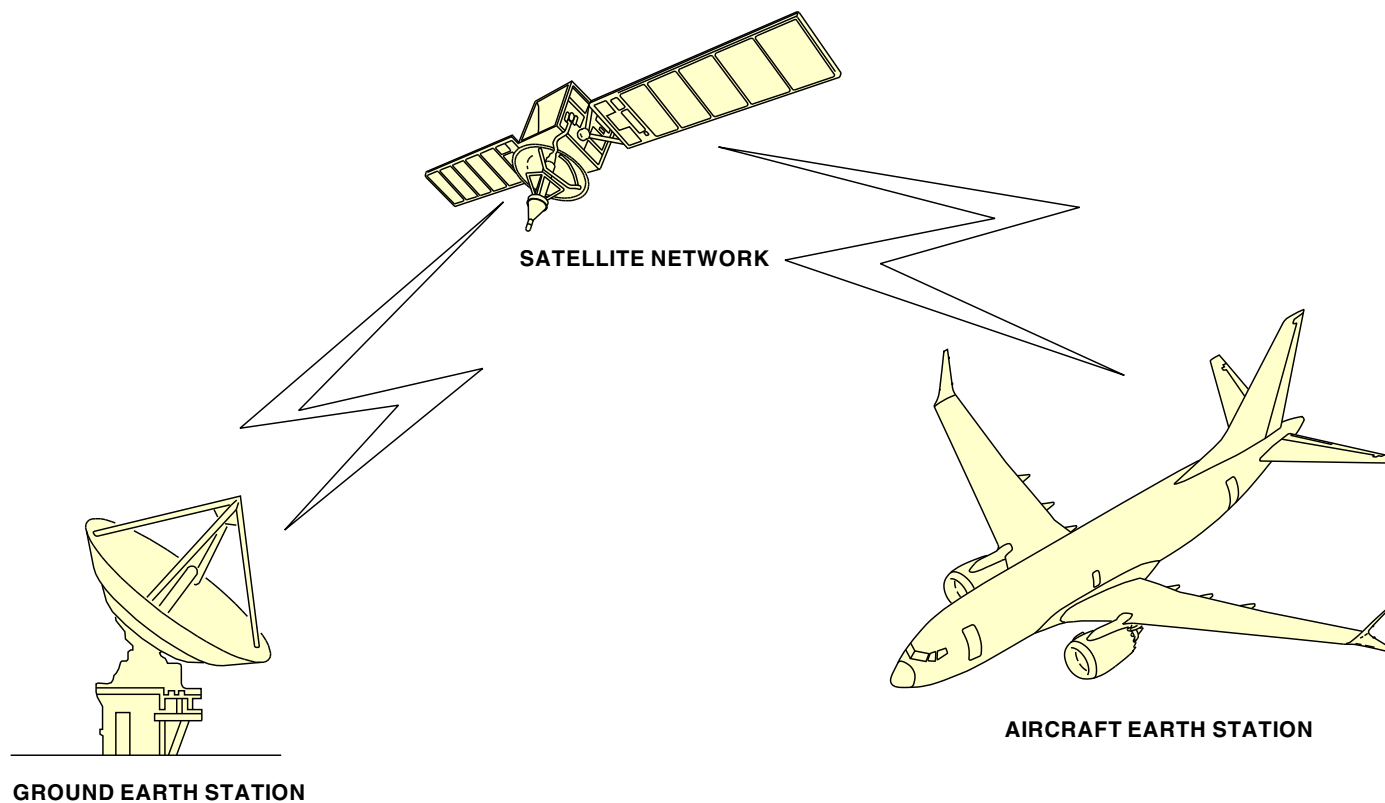
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**SATCOM SYSTEM - INTRODUCTION**



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**SATCOM SYSTEM - INTRODUCTION**

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## SATCOM SYSTEM - GENERAL DESCRIPTION

### General

The satellite communication (SATCOM) system is a mobile communication system which supplies long-range voice and data communication between the airplane and the ground communication networks.

The global satellite communication system includes global satellite networks, Aeronautical Earth Stations (AES) and Ground Earth Stations (GES).

The satellite network is the geostationary satellites orbit directly above the earth equator.

The AES is the part of the satellite communication system that is on the aircraft.

The GES is the part of the satellite communication system that is on the ground.

The Iridium SATCOM transceiver is available in a single voice channel or a dual voice channel version. Both units have a dedicated SBD transceiver. Other than the one-channel or two-channel voice capability, the two units provide the same feature set and physical connectivity and the units are interchangeable.

The SATCOM system uses a communication link between the airplane and ground earth stations (GESs) through a network of satellites.

### Satellite Network

The satellite network acts as a relay between the ground earth stations and the airplane. The satellites are part of the Iridium Communication System (ICS). The satellites are in geosynchronous orbit above the Earth.

There must be a line of sight between the airplane and the satellite in order to do operational tests of the SATCOM.

The ICS satellite network uses L-Band frequency to receive and transmit the SATCOM links to and from the GES.

### Ground Earth Station

The ground earth stations (GES) are the part of the satellite communication system that is on the ground. The GES are responsible for routing the voice and data calls from the AES to their destinations around the world.

The GES connects the SATCOM system to the ground-based ACARS and public telephone networks.

### Aeronautical Earth Station

The aeronautical earth station (AES) is the part of the satellite communication system that is on the aircraft.

The SATCOM system on the aircraft acts as an AES, which provides users with a data and voice communications link to the satellite network and global telecommunications system.

The AES uses L-band frequency to receive and transmit the SATCOM links to and from the satellites.

### Airplane SATCOM Equipment

These are the components for the SATCOM system on the airplane:

- Satellite data unit (SDU)
- SDU Configuration Module (SCM)
- Dual elements iridium antenna
- GPS notch filter

The satellite data unit (SDU) is the system interface and controller for the airplane SATCOM system.

The SDU Configuration Module (SCM) contains up to three USIM cards for the L-Band Transmitter (LBT) telephone identification number, and provides storage for the customer specific modifiable option data.

The Iridium Antenna contains two antenna elements. One antenna element supports two LBTs and the other element supports SBD. This antenna operates within the frequency spectrum between 1616.0-1626.5 MHz for both transmit and receiving signals.

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## SATCOM SYSTEM - GENERAL DESCRIPTION

The GPS Notch Filter is a ceramic filter with a compact size and light weight design for in-coaxial cable installation. This filter provides high rejection between 1570MHz and 1580MHz (75dB typical at 1575.42 MHz). It can substantially reduce, and in most cases eliminate, undesired Iridium Interference on the GPS L1 carrier frequency (1575.4MHz).

- Air traffic control (ATC) transponder - The ATC Transponder receives and transmits ICAO Code (24 bit ICAO address) to the SDU via AES ID interface.

### SATCOM System Connections

The airplane SATCOM has interfaces with these systems or components:

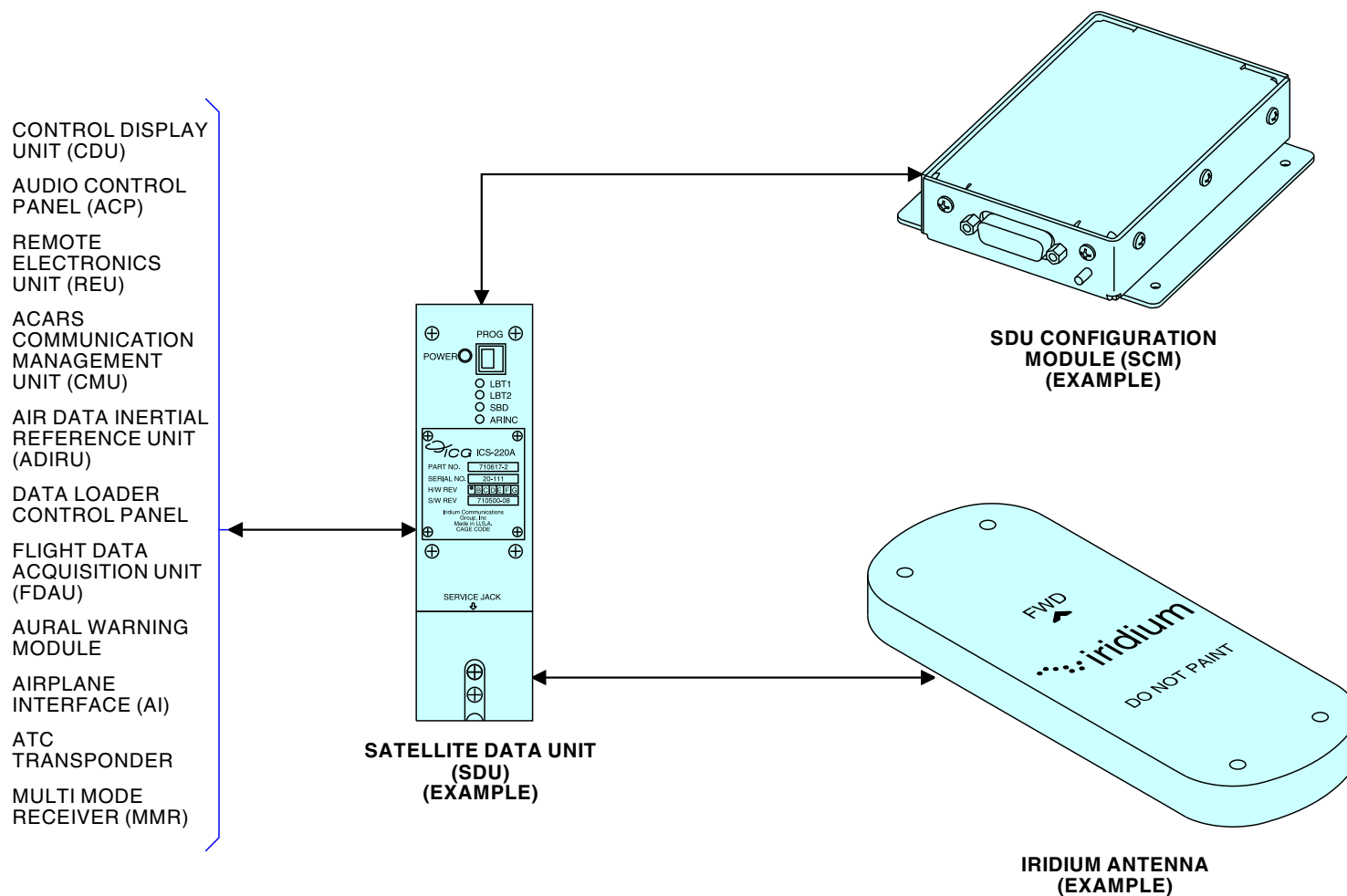
- Control display units (CDUs) - The SATCOM control and status pages on the CDU give control of the SATCOM system. These pages also show system status.
- Audio control panels (ACPs) - The SDU sends call light discrete signals to the ACPs. The ACPs send call cancel discrete signals to the SDU.
- Remote electronics unit (REU) - Microphone audio goes to the SDU through the REU. Receive audio goes from the SDU to the speakers and headsets through the REU.
- ACARS communication management unit (CMU) - The ACARS CMU sends and receives data to and from the SDU for datalink communication with ground stations.
- Air data inertial reference unit (ADIRU). The ADIRU sends inertial reference data to the SDU for beam steering.
- Multi-Mode Receiver (MMR) - The MMR contains a GPS sensor unit (GPSSU) for the GPS function. The SDU gets the GPS position data and time from the GPS sensor unit of the MMR. The SDU uses the GPS data during the SBB operation.
- Data loader control panel - The data loader control panel sends data from the data loader to the SDU. You use the data loader to load software into the SDU and to record built-in-test data from the SDU.
- Aural warning module - When the SDU receives a SATCOM call from the ground station, the SDU causes the aural warning module to make a high-low chime in the flight compartment.
- Flight data acquisition unit (FDAU) - The remote electronics unit (REU) sends a keyline signal to the SDU when a crew member wants to transmit on SATCOM channel 1 or 2. The keyline signals also go to the FDAU for recording.

**23-15-00**

| EFFECTIVITY |  |
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| SIA ALL     |  |

D633AM102-SIA

## SATCOM SYSTEM - GENERAL DESCRIPTION



2561294 S0000610804\_V2

## IRIDIUM SATCOM SYSTEM - GENERAL DESCRIPTION

23-15-00

| SIA ALL | EFFECTIVITY |
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D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details

**SATCOM SYSTEM - COMPONENT LOCATION****Flight Compartment Interface Components**

These flight compartment components interface with the SATCOM system:

- Captain and first officer Control Display Unit (CDU)s
- Captain, first officer, and first observer Audio Control Panels (ACP)s.

**Electronic Equipment Compartment**

These are the SATCOM components in the electronic equipment compartment:

- Satellite Data Unit (SDU) located on the E4-2 rack.
- Satellite Data Unit Configuration Module (SCM) located on the E5 rack.

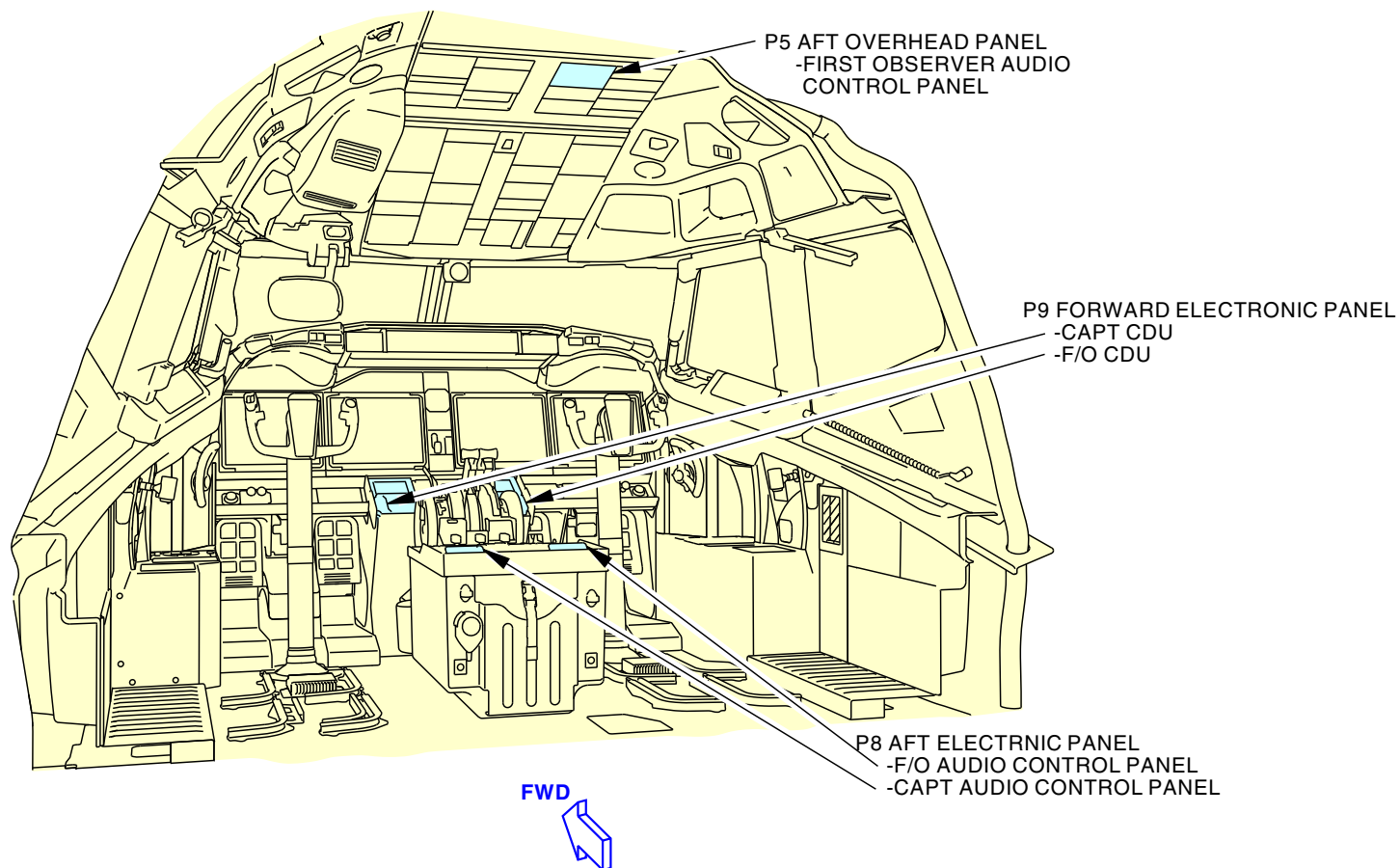
**Iridium Antenna System**

These are the components of the iridium antenna system:

- Dual element iridium antenna located on top of the fuselage at station 450.
- Two Global Positioning System (GPS) notch filters located in the EE bay E4-2 behind the SDU.

| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |

### SATCOM SYSTEM - COMPONENT LOCATION



2561325 S0000610950\_V1

### SATCOM SYSTEM - COMPONENT LOCATION - FLIGHT COMPARTMENT

23-15-00

23-15-00-011

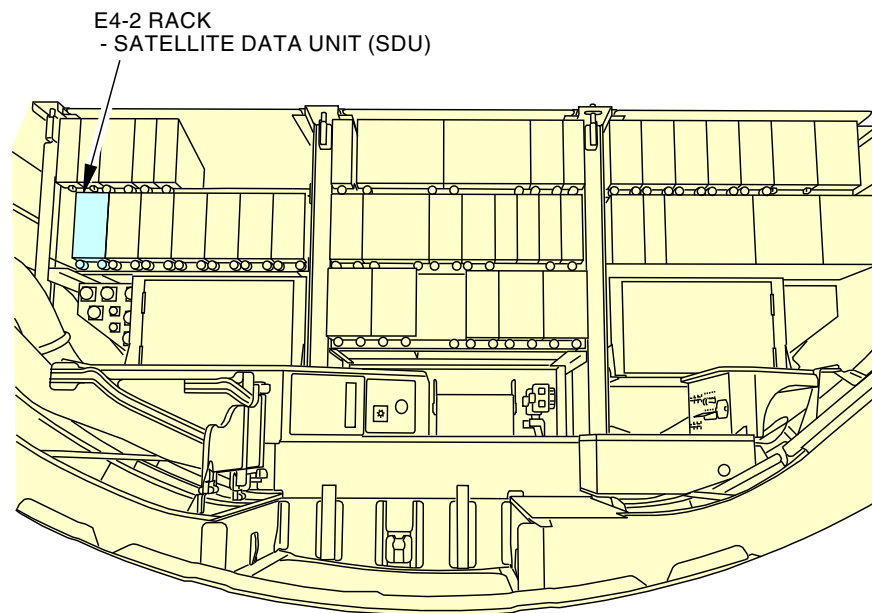
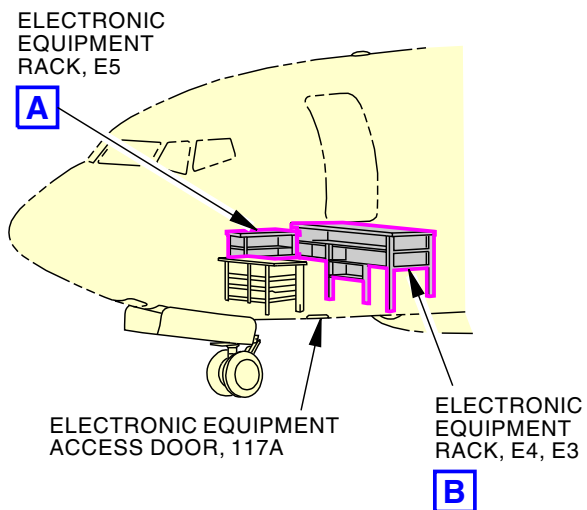
SIA ALL

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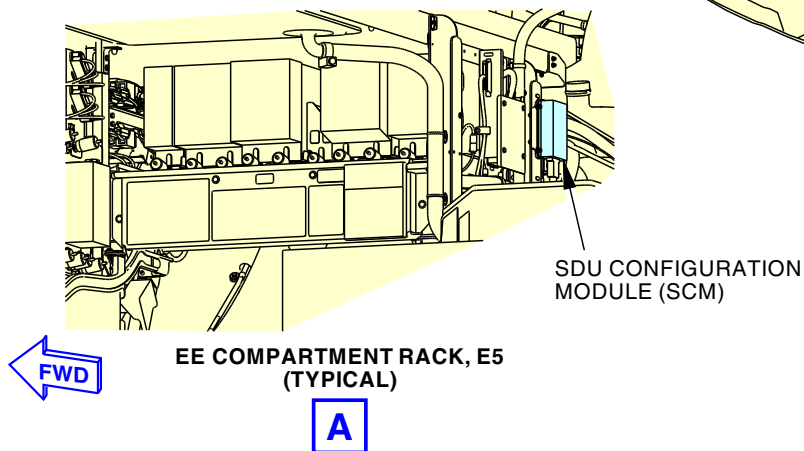
D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details

**SATCOM SYSTEM - COMPONENT LOCATION**



**EE COMPARTMENT  
(VIEW IN THE AFT DIRECTION)  
(TYPICAL)**

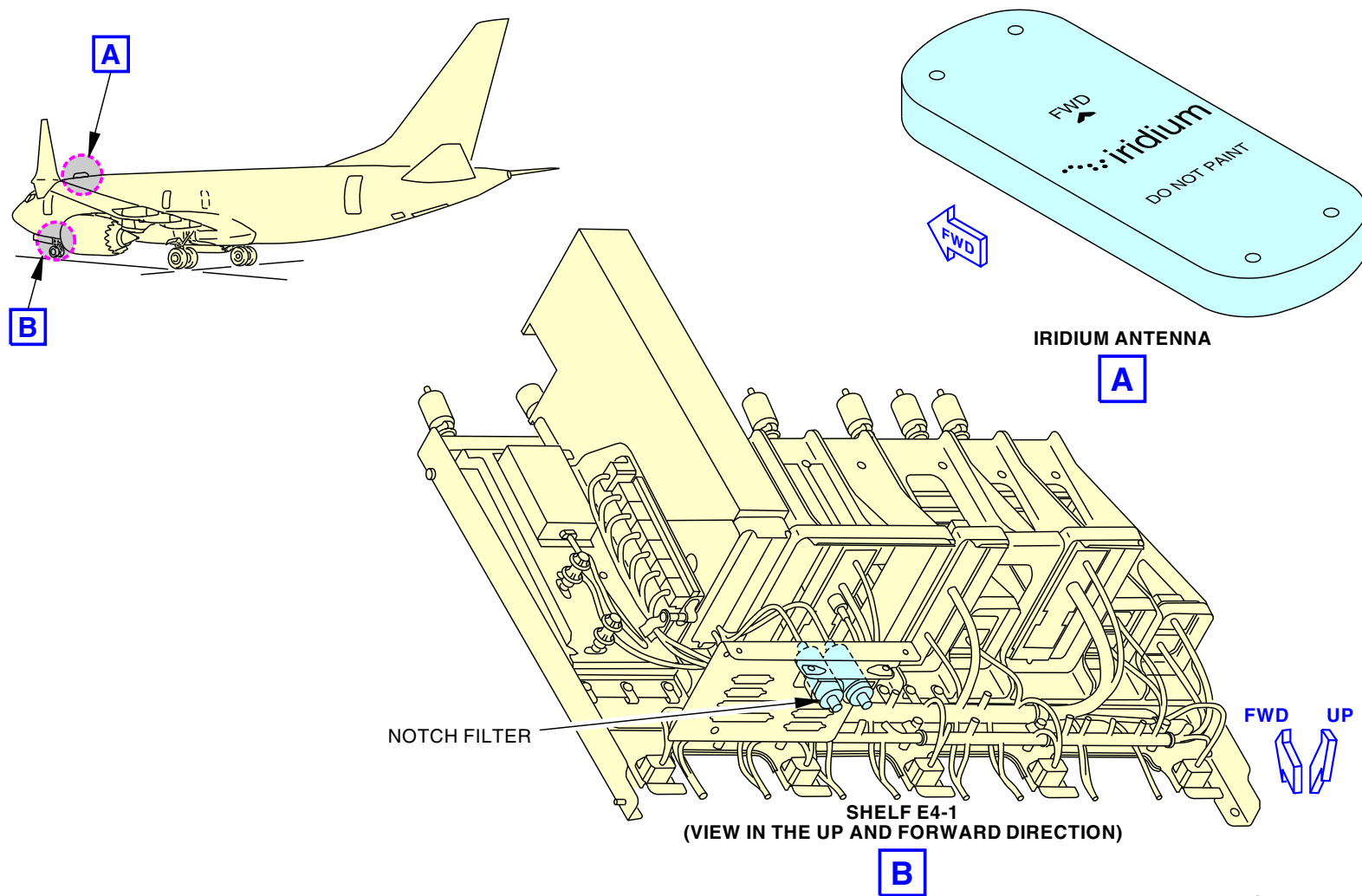


**SATCOM SYSTEM - COMPONENT LOCATION - EE COMPARTMENT**

2561397 S0000610955\_V3

**23-15-00**

**SATCOM SYSTEM - COMPONENT LOCATION**



2561463 S0000610760\_V1

**SATCOM SYSTEM - COMPONENT LOCATION - ANTENNA**

**23-15-00**



## SATCOM SYSTEM - INTERFACE - POWER

### Power

The SATCOM system is connected to these busses

- 28V DC BUS 2

The SATCOM system has these circuit breakers:

- SATCOM SDU

The SATCOM circuit breakers give power to these components:

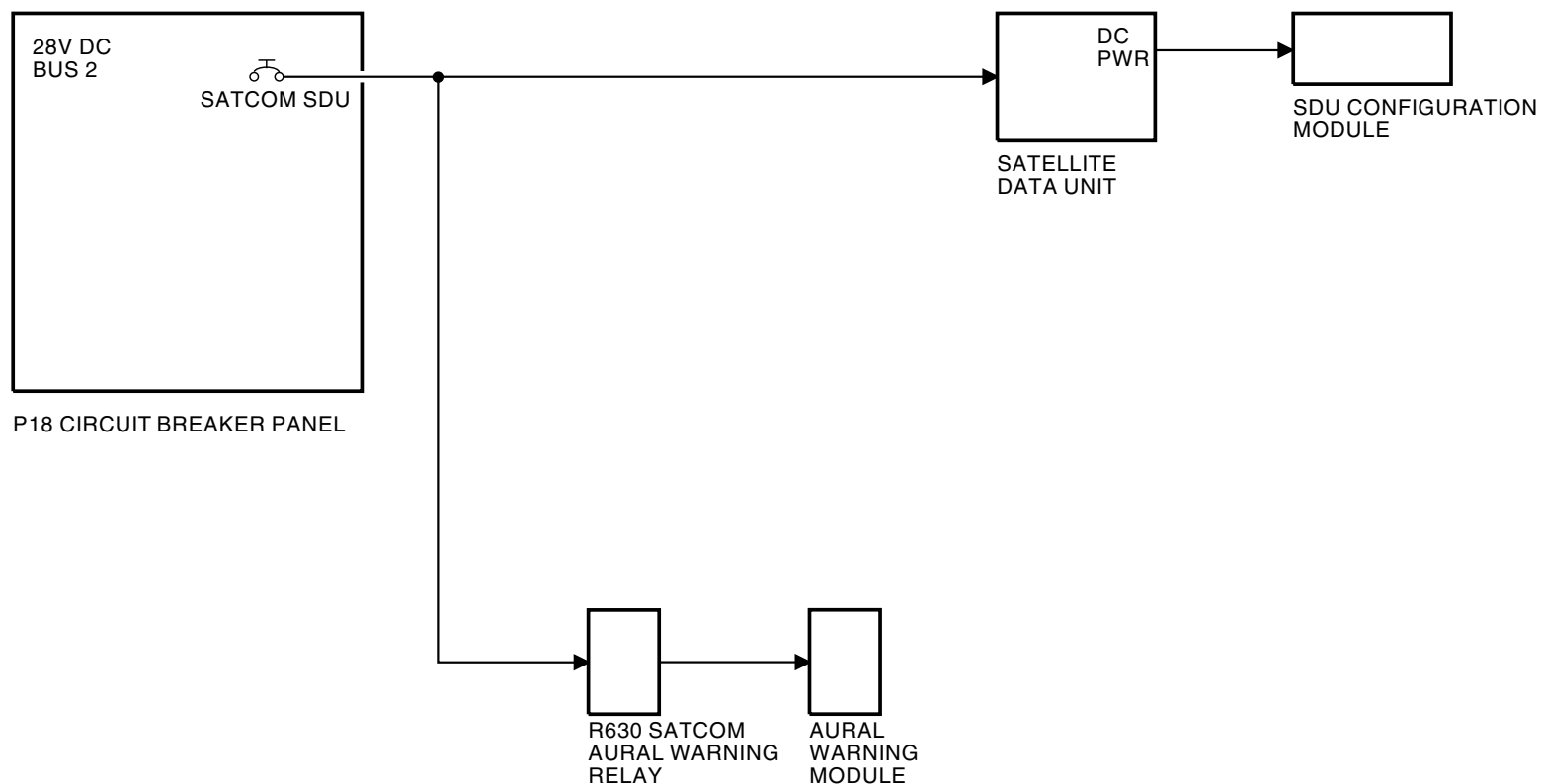
- Satellite Data Unit (SDU)
- Aural Warning Module

The Satellite Data Unit Configuration Module (SCM) receives 12 VDC power from the SDU.

The HLD Enhanced Low Gain Antenna (HELGA) receives 28 VDC power from the SDU.

| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |

### SATCOM SYSTEM - INTERFACE - POWER



2561472 S0000610957\_V3

### IRIDIUM SATCOM SYSTEM - INTERFACE - POWER

23-15-00-004

| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |

ECCN 9E991 BOEING PROPRIETARY - See title page for details

**23-15-00**

**SATCOM SYSTEM - INTERFACE - TRANSMIT/RECEIVE****General**

The Iridium SATCOM system gives voice and data communications capability for the flight crew. The Satellite Data Unit (SDU) contains two L-Band Transmitters (LBT) for the flight deck. Two voice and one Short-Burst Data (SBD) Transmitter for data (2.4Kbps), a main interface board, and a power supplier unit. The SDU can be configured for one voice channel or two voice channels. The Satellite Data Unit Configuration Module (SCM) contains up to three USIM cards. The cards keep the LBTs' telephone identification number, and the customer specified modifiable options data.

**Voice Operation**

The Audio Control Panels (ACP) connects to the Remote Electronics Unit (REU) to control the voice signals from the flight compartment to the SATCOM system.

The REU connects with the SDU to send and receive audio signals for the flight crew.

**Signal Flow - Receive**

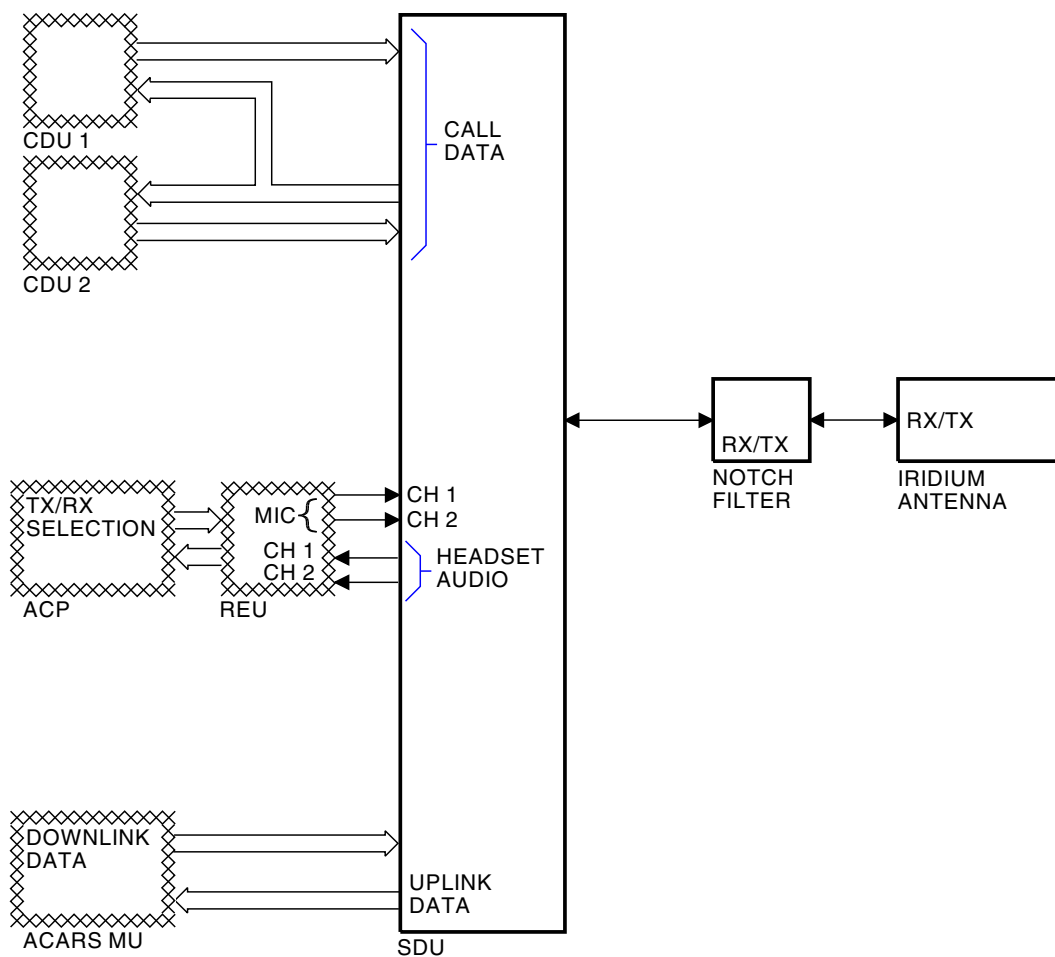
The Iridium antenna receives L-Band RF signals from the satellite. It sends the signal through the notch filters which decrease interference.

**Signal Flow - Transmit**

The SDU modulates the signals from the REU and Communications Management Unit (CMU). The SDU sends the L-band (1616–1626.5 MHz) RF signals through the notch filters to the Iridium antenna.

|         |             |
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| SIA ALL | EFFECTIVITY |
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# SATCOM SYSTEM - INTERFACE - TRANSMIT/RECEIVE



2561476 S0000610791\_V1

# IRIDIUM SATCOM SYSTEM - INTERFACE - TRANSMIT/RECEIVE

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| SIA ALL | EFFECTIVITY |
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ECCN 9E991 BOEING PROPRIETARY - See title page for details



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D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details

**SATCOM SYSTEM - INTERFACE - CONTROL AND STATUS****General**

The Satellite Data Unit (SDU) supplies control data and collects failure data for the SATCOM system.

These components have an interface with the SDU for control and status data:

- Satellite Data Unit Configuration Module (SCM)
- Dual Iridium Antenna
- Control Display Unit (CDU)
- Remote Electronics Unit (REU)
- Audio Control Panels (ACP)
- Air Data Inertial Reference Unit (ADIRU)
- Multi-Mode Receiver (MMR)
- Air Traffic Control (ATC) transponder
- Data loader control panel

**SIA 001-014**

- Communications Management Unit (CMU)

**SIA ALL**

- Digital Flight Data Acquisition Unit (DFDAU)
- Aural Warning Module

**SDU Configuration Module (SCM)**

The SDU reads the configuration from the SCM when the SCM is sensed by the system during system power-up.

The SCM keeps the ATS directory file and the AOC directory file.

The SCM is a USIM card reader that operates with the USIM cards kept externally in this module.

**Control Display Units**

The flight crew uses the CDUs to send control signals to the SDU for SATCOM system operation.

**Remote Electronics Unit**

The REU sends microphone audio from the captain and first officer stations to the SDU. SAT 1 connects to the captain station. SAT 2 connects to the first officer station.

The SDU sends the received audio from channels 1 and 2 (SAT1, SAT2) to the REU. SAT1 audio goes to the captain card in the REU. SAT 2 audio goes to the first officer card.

The REU sends keyline (PTT) signals to the SDU when the crew wants to transmit on the SATCOM system. The keyline signal also goes to the DFDAU for recording on the Flight Data Recorder (FDR).

**Audio Control Panels**

The ACPs receive call light signals from the SDU.

The ACPs send call cancel signals to the SDU when the crew pushes the call cancel switch on the ACP.

**Aural Warning Module**

The SDU sends a discrete signal to the aural warning module to make a high/low chime.

When the SDU receives a call from the satellite system, the SDU causes the R630 SATCOM aural warning relay to energize. The relay sends 28v dc to the aural warning module. The aural warning module gives the high/low chime in the flight compartment.

**Air Data Inertial Reference Unit (ADIRU)**

The left and the right ADIRU send these data to the SDU:

- Present position
- Ground speed
- Track angle
- True heading
- Pitch angle
- Roll angle

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| EFFECTIVITY |  |
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D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details

**SATCOM SYSTEM - INTERFACE - CONTROL AND STATUS**

- Inertial altitude

The SDU uses this data for location, attitude and computed Doppler correction. The SDU uses the data to compute beam steering commands for the antenna system.

**Multi Mode Receiver (MMR)**

The MMR of the Global Positioning System (GPS) sends the GPS navigational data to the SDU.

The SDU uses these GPS navigational data for SwiftBroadband high-speed data operation.

The MMR sends these data to the SDU:

- GPS present position (Latitude and Longitude)
- GPS ground speed
- GPS track angle
- True heading
- Pitch angle
- Roll angle
- GPS altitude.
- GPS UTC
- GPS date
- GPS sensor status
- GPS HDOP

**Air Traffic Control (ATC) Transponder**

The ATC transponder sends the airplane identification (AES ID) to the SDU through the general purpose data bus.

**Data Loader Control Panel**

The SDU can send SATCOM system status reports to the data loader. The SDU can receive system operation programs from a data loader. The data loader control panel sends a data load enable signal to the SDU.

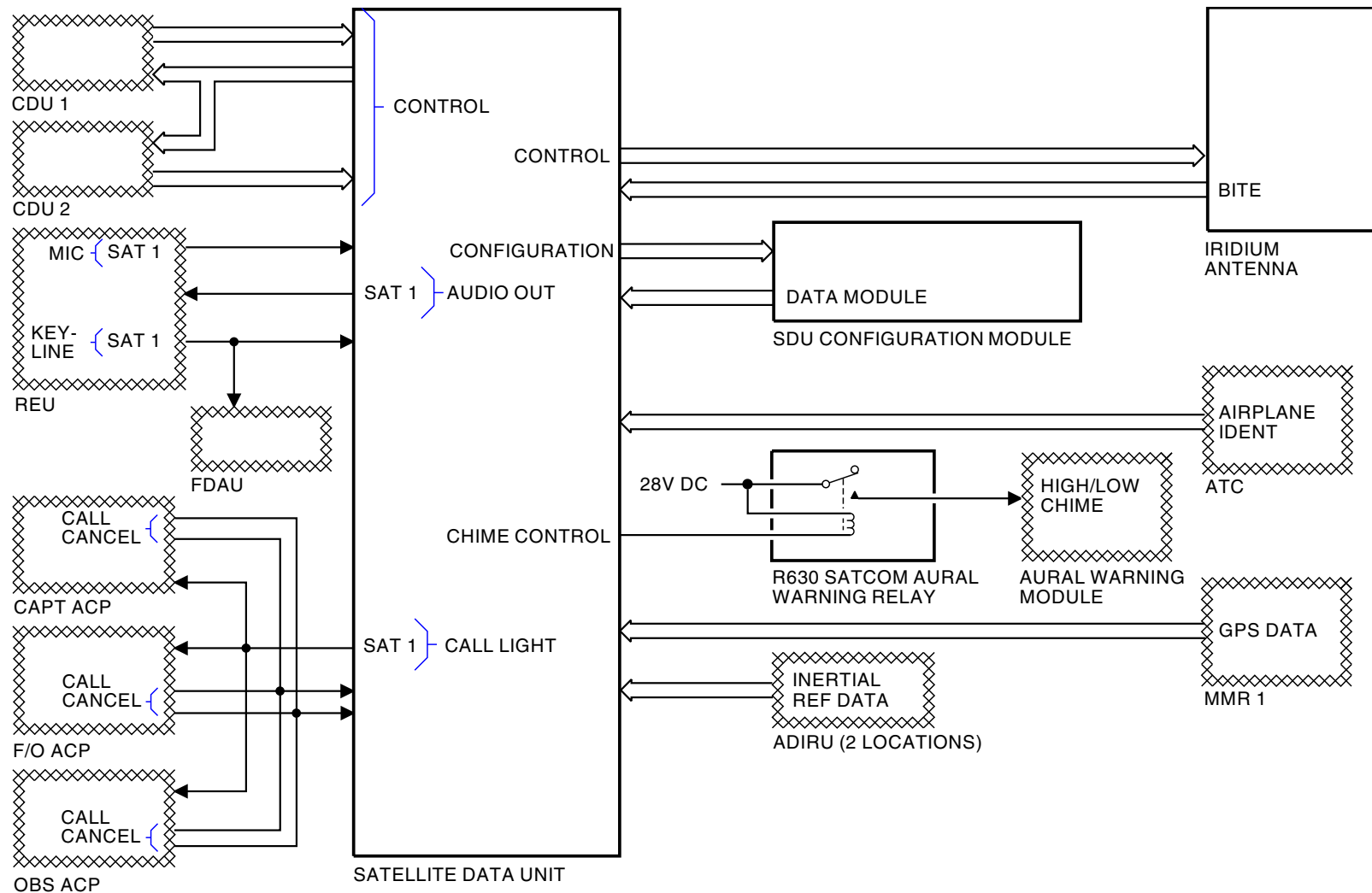
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D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details

### SATCOM SYSTEM - INTERFACE - CONTROL AND STATUS



2561482 S0000610995\_V2

### IRIDIUM SATCOM SYSTEM - INTERFACE - CONTROL AND STATUS

**SATCOM SYSTEM - SATELLITE DATA UNIT****Purpose**

The satellite data unit (SDU) is the system interface and controller for the SATCOM system. It contains the system operation software. The SDU also contains position and frequency data for each satellite.

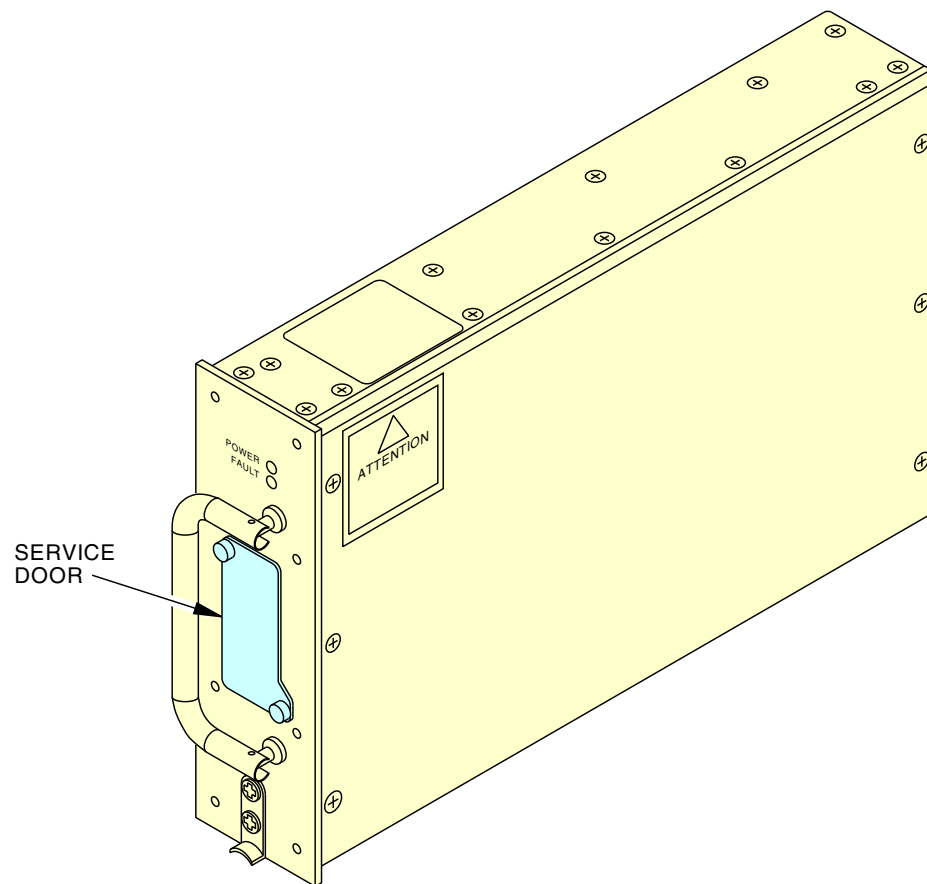
**Physical Description**

The SDU has two LEDs on the front of the unit and weighs 6.8 lb (3.1 kg). It has these front panel controls and indicator:

- Power - shows red at power-up and then displays green after approximately 40 seconds to show DC power is present. It turns off if DC power is not present.
- Fault - shows green for lamp test for five seconds upon power-up and then turns off. It turns red when SCM is not detected.
- There are two service ports, DB-15 and RJ-11, located on the front panel of the SDU, under the service door. The RJ-11 Service Jack can be used to test and troubleshoot the unit. The Service Jack has a 2-wire POTS interface and is paralleled internally to extension 11. The Service Jack is used to test for a dial tone, Station-to-station, GTA, and ATG calls. The High Density (HD) DB-15 port that is a male connector used to connect the PDL. The PDL can be used to load user-modifiable and operational software to the unit during service. The services ports may only be used when WOW is active.
- Width - 2.40 in. (6.10 cm)
- Length - 14.50 in. (36.83 cm)
- Height - 7.85 in. (19.94 cm)
- Weight - 6.8 lb (3.1 kg)

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|         | D633AM102-SIA |

SATCOM SYSTEM - SATELLITE DATA UNIT



2561718 S0000610939\_V2

IRIDIUM SATCOM SYSTEM - SATELLITE DATA UNIT

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23-15-00-014

SIA ALL

EFFECTIVITY

D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details



## SATCOM SYSTEM - SDU - FUNCTIONAL DESCRIPTION

### General

The satellite data unit (SDU) is the system interface and controller for the SATCOM system. It contains system operation programs.

The SDU has these components:

- Main PCB
- L-Band Transceivers
- SBD Modem
- Combiner/Divider
- Power Supply
- Capacitor Hold-Up assembly.

The SDU supplies two voice communication channels (second one is optional) and one data communication channel.

### ARINC 429 Input/Output Circuits

The ARINC 429 input/output (I/O) circuits control the interface between the SATCOM components and other systems.

The SDU gets airplane position data from the two ADIRUs. The SDU uses the airplane position data to select the antenna system nearest the antenna.

The data loader control panel controls the interface between a data loader and the SDU. This interface is used to load system operation programs. The data loader control panel sends a discrete to the SDU to enable the processor to accept new system operation programs through the ARINC 429 input/output circuits.

The SDU sends and gets BITE and control data from all associated SATCOM LRUs. The SDU processor controls the test. The system processor initiates each module test and collects the results.

### Audio Interface

The audio interface connects the SDU to the remote electronics unit (REU). It changes analog audio from the REU to digital data for the SDU.

The audio interface also changes the digital SDU data to analog voice signals for the REU.

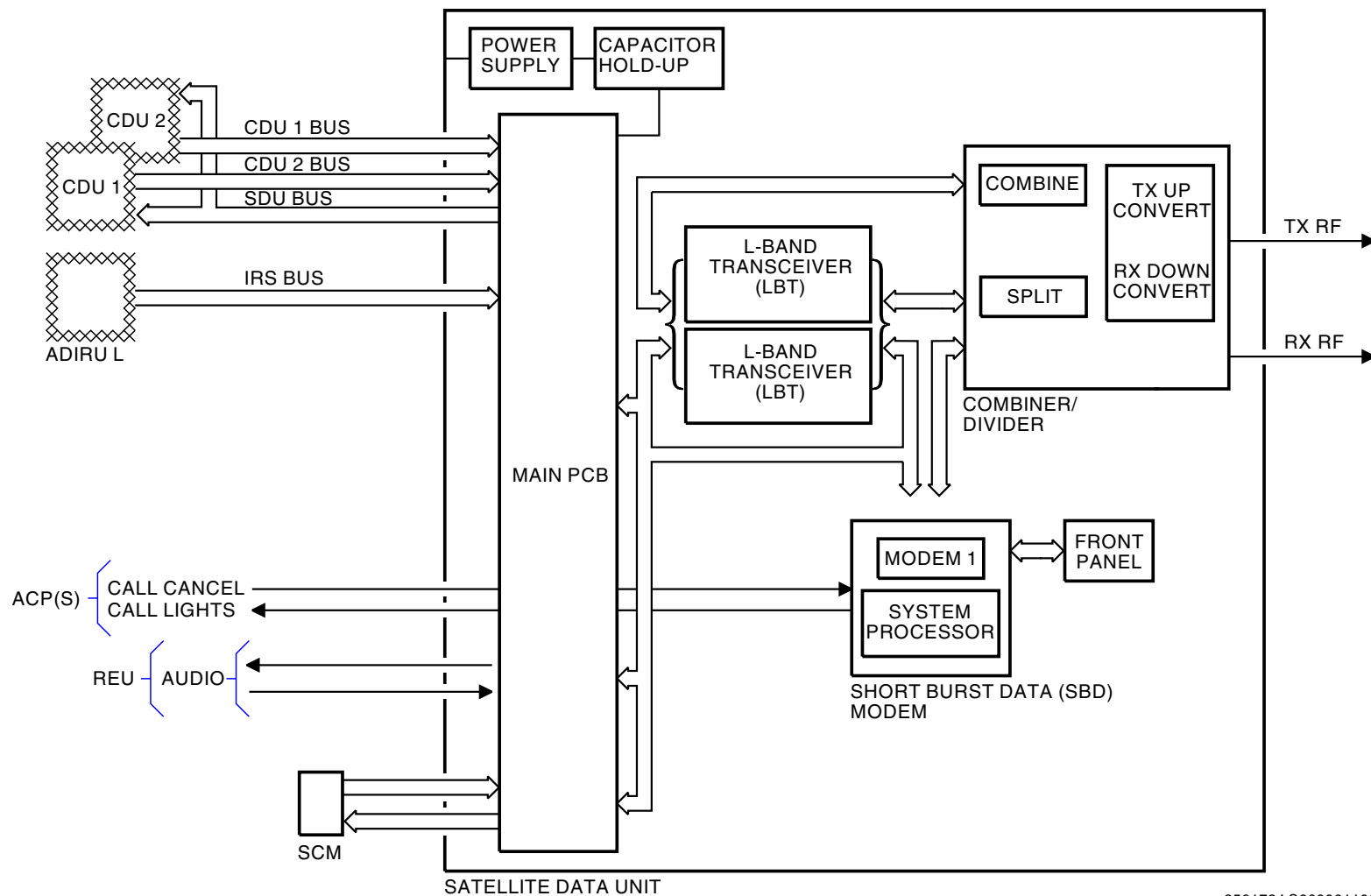
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ECCN 9E991 BOEING PROPRIETARY - See title page for details

# SATCOM SYSTEM - SDU - FUNCTIONAL DESCRIPTION



## IRIDIUM SATCOM SYSTEM - SDU - FUNCTIONAL DESCRIPTION

23-15-00



## SATCOM SYSTEM - SATCOM ANTENNA

### Purpose

The SATCOM antenna transmits and receives signals for the SATCOM system.

### Functional Description

The dual iridium antenna does transmit and receive functions for the SATCOM operation.

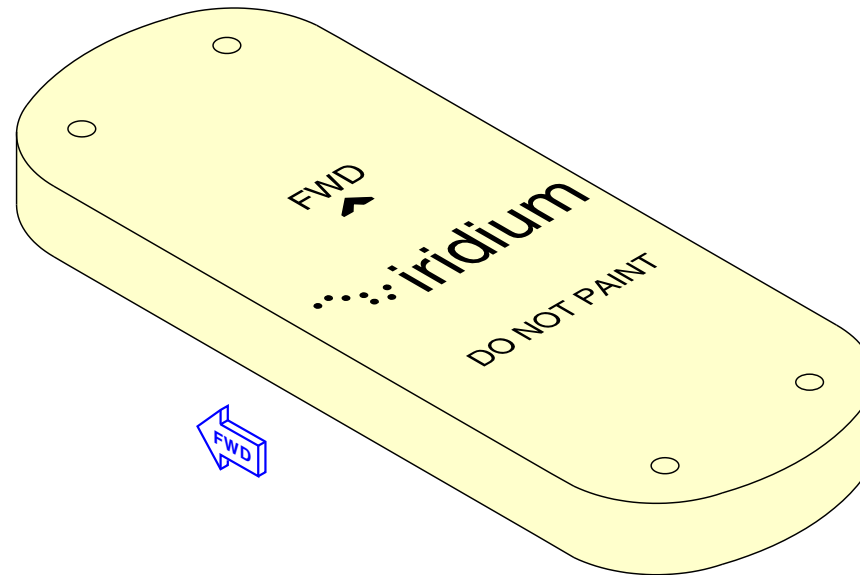
### Physical Description

The SATCOM antenna has these approximate physical properties:

- Length - 7.85 in. (19.94 cm)
- Width - 3.00 in. (7.62 cm)
- Height - 1.53 in. (3.89 cm)
- Weight - 1.10 lb (0.50 kg)

| EFFECTIVITY |  |
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SATCOM SYSTEM - SATCOM ANTENNA



2989185 S0000766237\_V1

SATCOM SYSTEM - DUAL IRIDIUM ANTENNA

**23-15-00**

23-15-00-009

| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |

ECCN 9E991 BOEING PROPRIETARY - See title page for details

**SATCOM SYSTEM - SDU CONFIGURATION MODULE****Purpose**

The Satellite Data Unit Configuration Module (SCM) gives a location to hold the Universal Subscriber Identity Module (USIM) cards (also referred to as the Subscriber Identity Module (SIM) cards). The USIM cards are smart cards that are necessary to get access to the Iridium satellite network. Three USIM cards are internal to the SCM. Replace the SCM if there is a USIM card issue. The SCM holds the configuration, ATS and AOC files for the Satellite Data Unit (SDU).

**Physical Description**

The SCM has one printed-circuit board (PCB) module that contains four USIM cards and one external configuration memory (ECM) (Nonvolatile Memory). The USIM cards hold the user registration data necessary for access to the Inmarsat services. The ECM holds the configuration data and the Owner Requirements Table (ORT).

The SCM has four LEDs on top of its front panel that serve as visual indicators and correspond with the two Voice lines, one Data communications line, and the SCM Status:

- STATUS
- SIM1
- SIM2
- SIM3

The LEDs show the condition of the configuration board and the USIM cards. The LEDs are power indicators for the Configuration Board for the USIM cards. The LEDs show three conditions, ON (green), OFF (no color) or RED (USIM card not installed) that show power is supplied to the unit.

The SCM has these approximate physical properties:

- Height: 1.10 in. (2.79 cm)
- Width: 4.00 in. (10.16 cm)
- Length: 4.75 in. (12.07 cm)
- Weight: 8.6 oz (243.8 g)

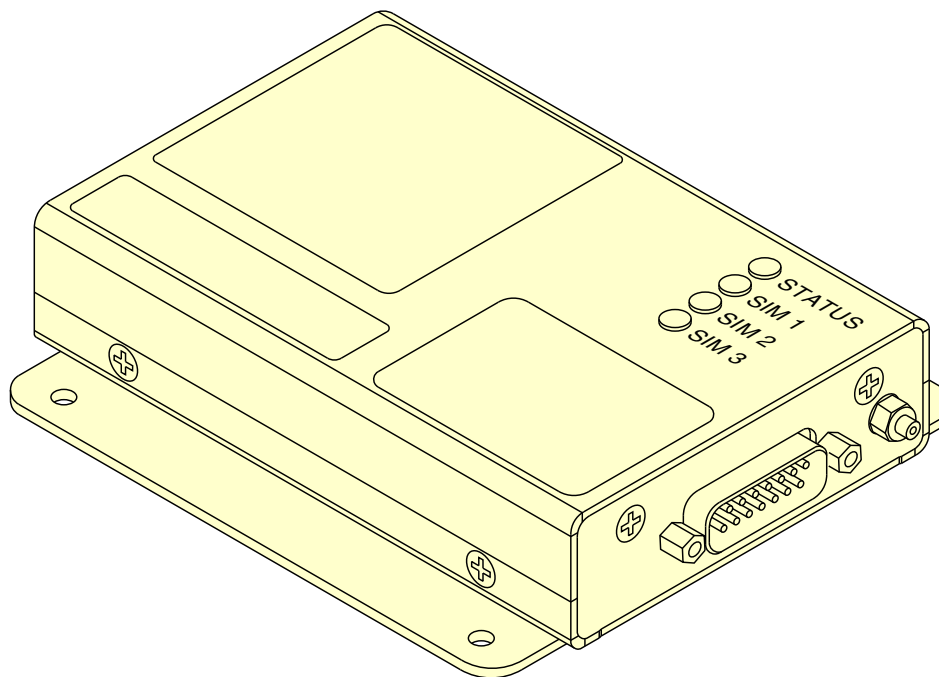
**23-15-00**

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SATCOM SYSTEM - SDU CONFIGURATION MODULE



SDU CONFIGURATION MODULE (SCM)  
(EXAMPLE)

2561778 S0000611032\_V2

SATCOM SYSTEM - SDU CONFIGURATION MODULE

23-15-00

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**SATCOM SYSTEM - SDU CONFIGURATION MODULE - FUNCTIONAL DESCRIPTION****General**

The SDU Configuration Module (SCM) is a part of the SATCOM system that allows voice and data services for the flight compartment.

The SCM holds the application to communicate at high speed with ground networks through the Iridium satellite links.

The SCM is an external peripheral of the SDU and supplies a dedicated interface to the SDU. It stores Secure and User ORTs (Owner Requirement Tables). The SCM installs the ATS directory file and the AOC directory file at power up. The SCM is a remote USIM card reader that lets the SDU access the three USIM cards that are kept in this module.

The SCM has these functions:

- Holds SDU configuration data and ORT parameters.
- Interfaces with the SDU.
- Functions as the remote USIM card reader
- Holds SDU configuration data, ATS and AOC parameters

**SCM Basic Operation**

The SCM interfaces with the SDU through the Communication Processor Module (CPM) inside the SDU. When it senses an input voltage signal from the SDU, the SCM starts operation.

At each power up, the SDU applies power to the SCM. The SDU reads the configuration files from the SCM.

Three USIM cards are internal to the SCM for the SDU to get access to the Iridium satellite network. Two USIM cards are for voice communication. The third USIM card is for data communication.

**SCM Internal Components**

The SCM has these primary components:

- A Printed Electronic circuit (PEC) card with a 15 way D-type connector attached.
- An external configuration memory (ECM).

- Three Universal Subscriber Identity Module (USIM) cards
- Programmable Logic Device (PLD).

**SCM External Interface**

The SCM has these external interfaces through the RS322 data bus with the SDU:

- The SCM data from SCM to SDU (2 lines).
- The configuration data from SDU to SCM (2 lines).

**SCM Power Supply**

The SDU supplies 12V dc electrical power to the SCM.

**Printed Electronic Card**

The PEC is a card that holds all the components for the SCM. The 15 way D-type connector also attached on the PEC. It is a main and only input/output interface for the SCM.

**External Configuration Memory**

The ECM is a non-volatile memory that stores the ORT database. The ORT database contains a set of configuration data for the exclusive use of the SDU. There are two types of parameters of the ORT partition:

- Secure ORT - The secure parameters are for aircraft specific configurations.
- User ORT - The user parameters are for operator use.

The ECM is a non-volatile electronically writable memory chip.

The ECM can be accessed through the external RS-232 serial port.

**Programmable Logic Device**

The PLD manages the internal and external interfaces. The PLD adapts the signals to the protocols used to interface to the USIM and the ECM interface.

**23-15-00**

SIA ALL EFFECTIVITY

D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details



## SATCOM SYSTEM - SDU CONFIGURATION MODULE - FUNCTIONAL DESCRIPTION

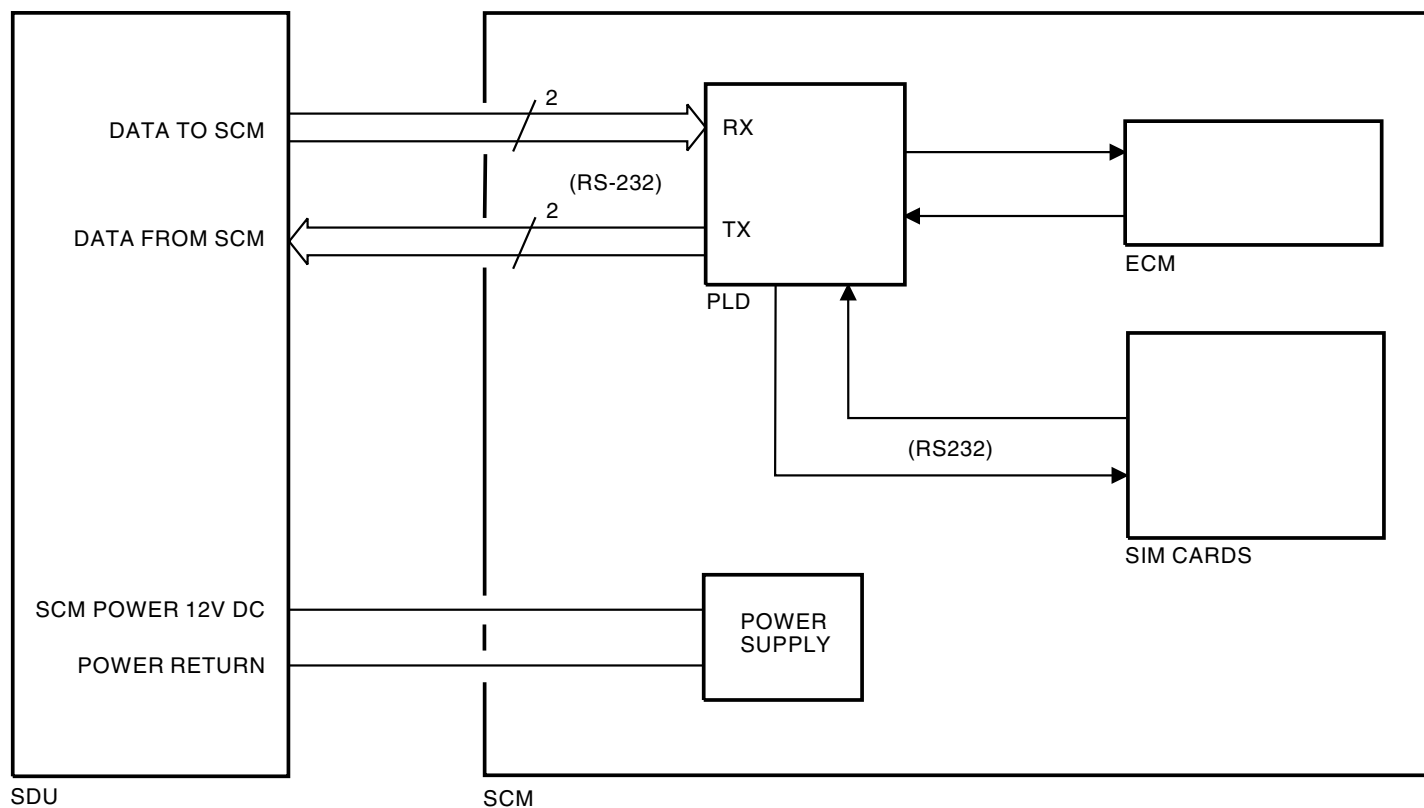
The PLD has these five multiplexed data internal interfaces:

- Air Traffic Service (ATS) USIMs (4 lines)
- External Configuration Memory (ECM) (1 line).

The PLD interfaces through the RS422 data bus with the SDU.

| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |

# SATCOM SYSTEM - SDU CONFIGURATION MODULE - FUNCTIONAL DESCRIPTION



2561779 S0000611062\_V2

## SATCOM SYSTEM - SDU CONFIGURATION MODULE FUNCTIONAL DESCRIPTION

23-15-00

| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |



## SATCOM SYSTEM - OPERATION - MAIN MENU

### General

The control display unit (CDU) has SATCOM pages that give control and status of the SATCOM system. You access the SATCOM pages from the MENU page on the CDU.

### SATCOM Main Menu

To show the SAT-PHONE menu, push the MENU key on the CDU and then push the line select key (LSK) adjacent to SAT.

The SAT-PHONE menu shows this data:

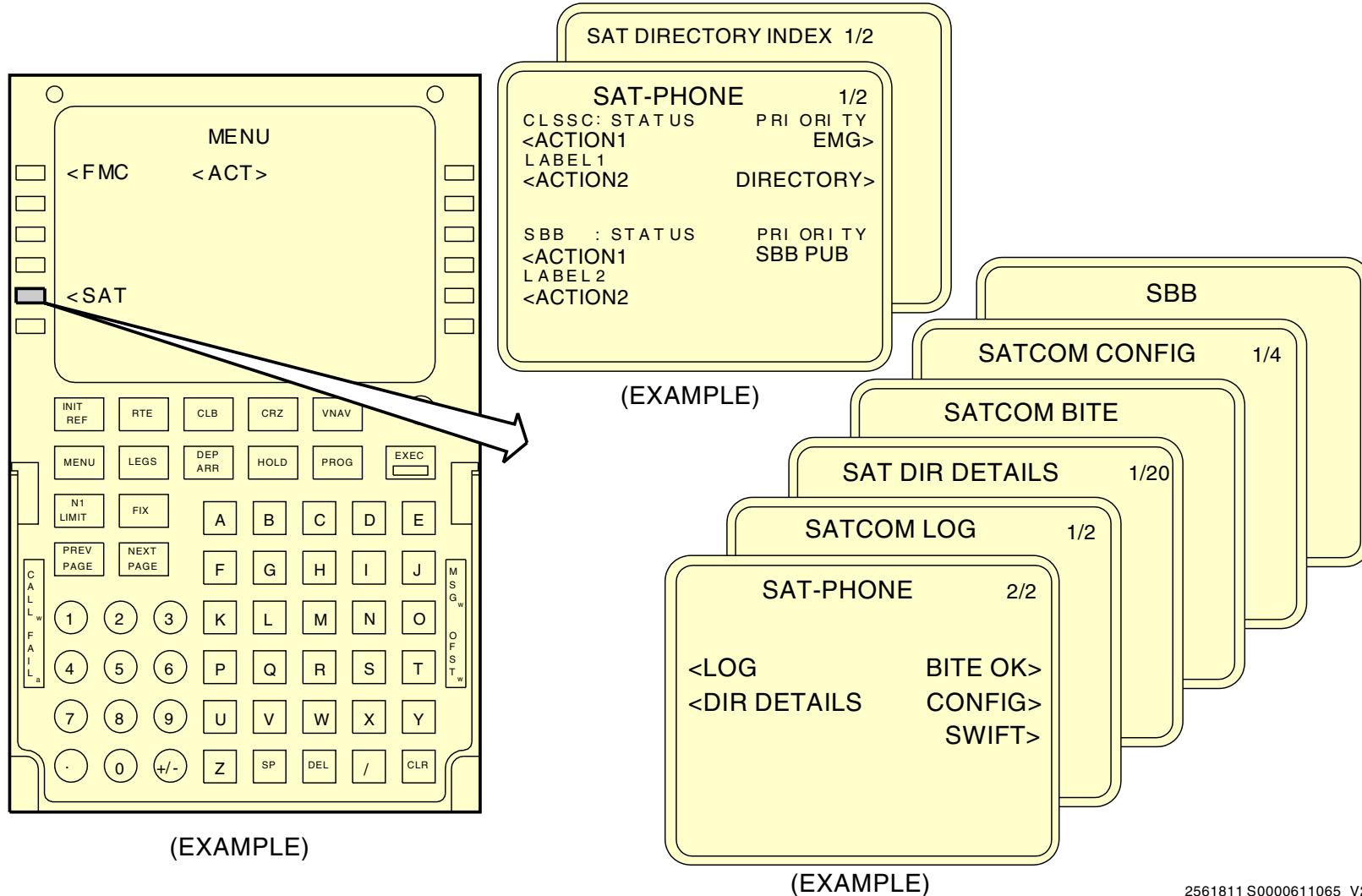
- Name selected for call on SAT-1 or SAT-2
- Call controls
- Readiness of SAT-1 and SAT-2
- Directory index access
- Log on access
- BITE access
- Configuration access.

For each channel, SATCOM shows this data:

- Channel status
- Call commands or status
- Call destination name chosen from the directory.

| EFFECTIVITY |  |
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| SIA ALL     |  |

SATCOM SYSTEM - OPERATION - MAIN MENU



SATCOM SYSTEM - OPERATION - MAIN MENU

2561811 S0000611065\_V2



## SATCOM SYSTEM - OPERATION - LOG ON

### General

SATCOM communication is possible when these three parts connect together with normal telephone equipment on the ground:

- Aircraft earth station (AES) - the SATCOM system on the airplane
- Space segment - the satellite
- Ground earth station (GES) - the ground based SATCOM system.

The SATCOM system on the airplane controls the connection of the aircraft earth station to the ground earth station. This process is called a log-on.

**NOTE:** SATCOM systems will require ADIRS to be aligned prior to log-on. However, the Collins ICS-300 does not require ADIRS alignment prior to log-on

### Automatic Log-On at Power-Up

An automatic log-on occurs when the airplane SATCOM system powers up.

The satellite data unit (SDU) uses satellite frequencies in memory to find a satellite transmit signal. When the SDU finds an active frequency from a satellite, it locks on to it. The SDU then uses the satellite as a relay to connect to a ground earth station.

### Auto Log-On

Use the control display unit (CDU) to see the SAT-PHONE page 2/2. Push the line select key (LSK) adjacent to LOG.

The SATCOM LOG page shows the log-on state (Example: LOGGED ON, LOGGED OFF, etc...).

An automatic log-on occurs when the system powers up. The SATCOM system uses satellite frequencies in memory to find a satellite transmit signal. When the SATCOM system finds an active frequency from the satellite, it locks on to it. The system then uses the satellite as a relay to log-on to a ground station.

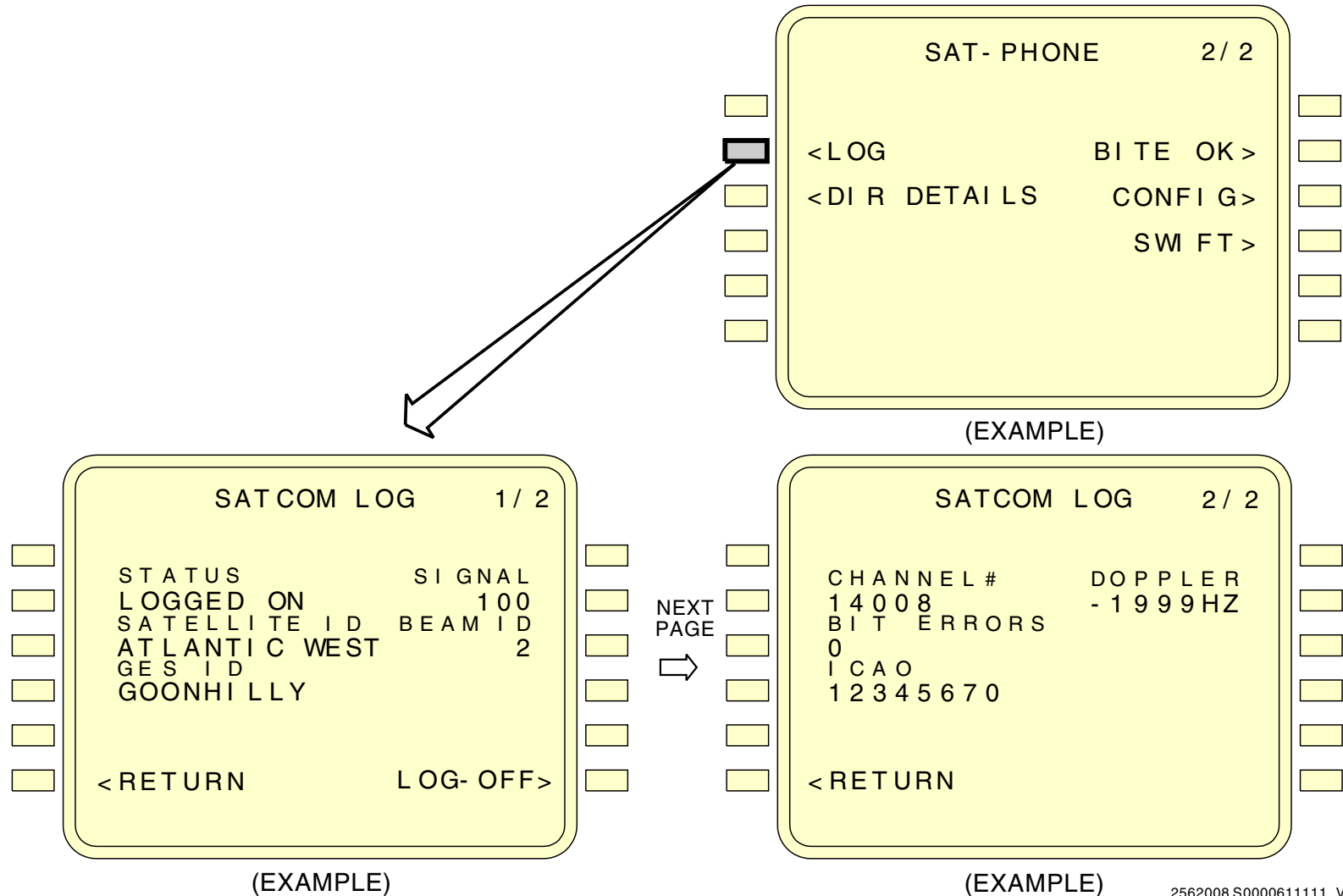
If the SATCOM System has logged-off, push the LSK adjacent to LOG-ON to make the system automatically log-on to a satellite and GES.

After the airplane logged on, the log-on data goes to all ground station networks so that any of the ground stations can locate a specified airplane SATCOM system.

**23-15-00**

| EFFECTIVITY |  |
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| SIA ALL     |  |

# SATCOM SYSTEM - OPERATION - LOG ON



2562008 S0000611111\_V1

# SATCOM SYSTEM - OPERATION - LOG ON

23-15-00



## SATCOM SYSTEM - OPERATION - DIRECTORY

### General

The DIRECTORY page allows you to access the lists of telephone numbers for making calls using SATCOM.

**NOTE:** These categories and lists of telephone numbers are examples. Each operator chooses the telephone numbers and directories to use for their operation. The satellite data unit (SDU) contains the specific telephone numbers and directories for the operator in the owner requirements table (ORT).

Push the line select key adjacent to the telephone number you want to call. The CDU screen changes to the SAT-PHONE page 1/2 and the name or telephone number that selected from the SAT DIRECTORY page is displayed under the selected channel.

### SATCOM Directory Index

The SAT DIRECTORY INDEX page lists the directories available to the SATCOM system.

Each directory contains a list of the telephone numbers. The operator defines the directory name and the telephone numbers in each directory

Select the line-select key (LSK) adjacent to the directory name to see the SAT DIRECTORY page.

### SATCOM Directory

The SAT DIRECTORY page shows a list of the telephone numbers in the directory.

The display shows the mnemonic identification and the priority for each telephone number. The mnemonic identification is a set of alphanumeric characters which identify a telephone number. For example, AOR CONTROL is a mnemonic identification. The priority can be EME, HGH, LOW, or SBB.

There are two types of telephone numbers: protected and unprotected. The display shows unprotected telephone numbers with brackets, [ ]. You can change unprotected telephone numbers. You can not change or delete protected telephone numbers.

The owner requirements table (ORT) defines whether you can MAKE CALL or SELECT NUMBER from this page.

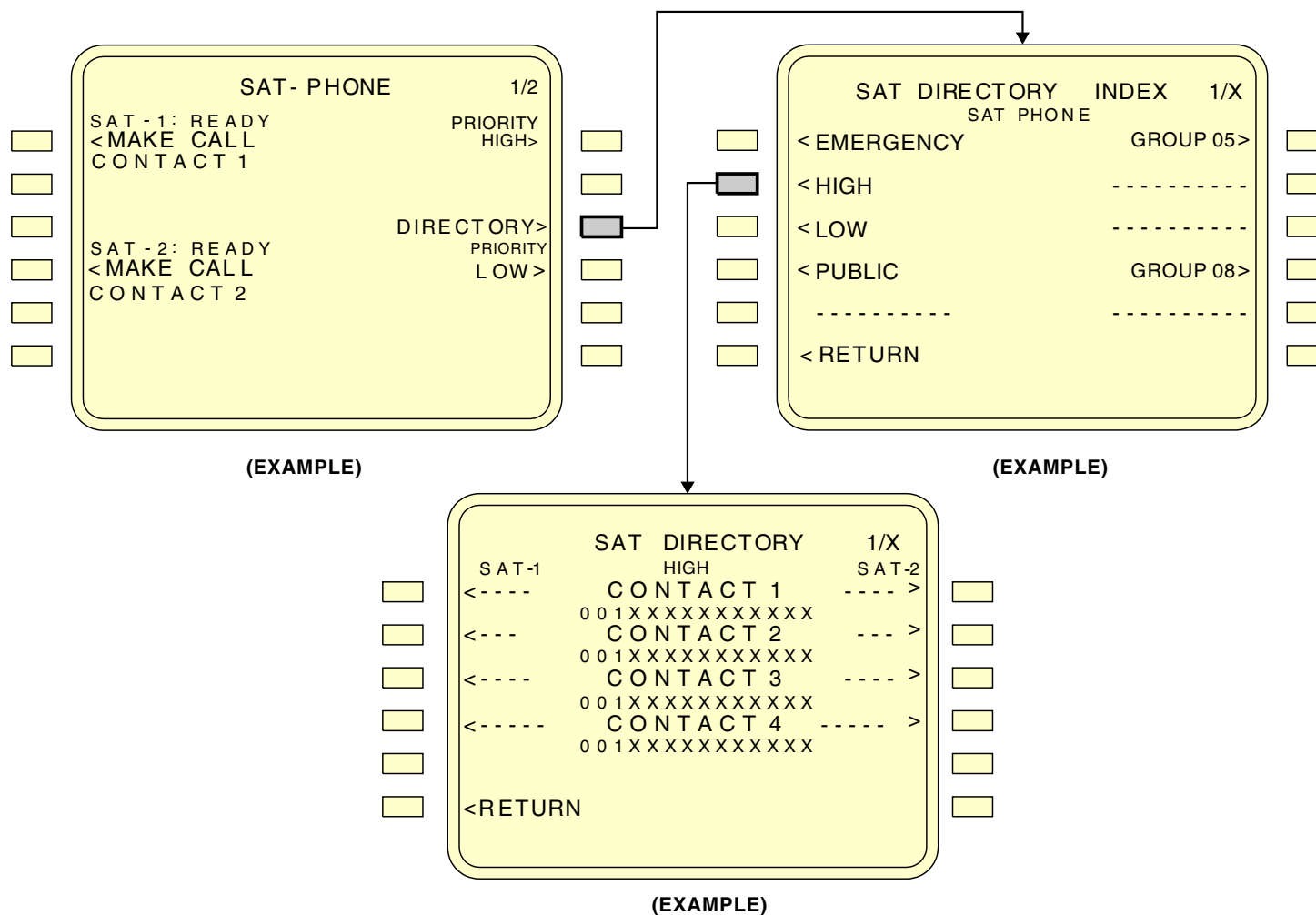
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ECCN 9E991 BOEING PROPRIETARY - See title page for details

### SATCOM SYSTEM - OPERATION - DIRECTORY



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### SATCOM SYSTEM - DIRECTORY

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## SATCOM SYSTEM - OPERATION - MAKE CALL

### General

The SAT-PHONE menu shows the status of the SAT 1 and SAT 2 channels. You can make calls, answer calls, and stop calls on this page.

### Make Call

Push a MIC select switch on the ACP for the applicable SATCOM channel.

Adjust the volume with the related SAT receiver control.

Do these steps at the CDU to make a call:

- Push the MENU key on the CDU to show the MENU page.
- Push the line select key (LSK) adjacent to SAT to show the SAT-PHONE page.
- Push the NEXT PAGE key on the CDU to show the SAT-PHONE page 2/2.
- Push the LSK adjacent to DIRECTORY to show the SAT DIRECTORY INDEX page.
- Push the LSK adjacent to a category selection to show the SAT DIRECTORY page.
- Push the LSK L or LSK R to select a ground station or telephone number to call (left LSK is for SAT 1 or right LSK is for SAT 2).
- On the SAT-PHONE page 1/2. Check that the name selected in the SAT DIRECTORY page shows below the applicable channel of SAT-1 or SAT-2.
- Push the LSK adjacent to MAKE CALL for SAT-1 or SAT-2 channel.

When the airplane SATCOM system starts to make the call, the channel status changes from READY to DIALING.

When the call is connected, the channel status changes from DIALING to CONNECTED and the related SAT CALL light comes on at the ACPs.

Push the transmitter select switch for SAT1 or SAT2 on one of the ACPs. The CALL lights on all the ACPs go off. Adjust the volume with the SAT 1 or SAT 2 receiver volume control. You hear the ringback tone in the headset.

When the person on the other end of the telephone line answers, push the PTT switch and speak into the microphone. You do not need to release the PTT switch to listen.

To complete the SATCOM call, do one of these steps:

- Push the LSK adjacent to the END CALL on the SAT-PHONE page 1/2.
- Push the related END CALL switch on the ACP.

### Channel Status

The SAT-PHONE page 1/2 shows the channel status adjacent to SAT 1 and SAT 2.

These indications show in the channel status:

- ANSWERED - The channel is connected. You can use the channel for voice communication.
- CALL FAIL - The call stops. For example, the connection between the airplane and the GES stops, another call with a higher priority causes this call to stop, or there is an equipment failure.
- DIALING - The call is in progress, but the circuit is not connected. When the circuit is connected, the status changes to CONNECTED.
- INCOMING CALL - Someone on the ground makes a call to the airplane. The ground station waits for you to answer or reject the call.
- NO RESOURCES - You can not use this channel because another call uses the equipment or power needed for this channel.
- NOT READY - The system is not ready to make call. The SATCOM system is not logged-on or there is an equipment failure.
- READY - The system is ready to make call.
- READY TO CONNECT - The system is ready to make call.

### Call Control

The SAT-PHONE page 1/2 lets you control the call. These are the controls:

- MAKE CALL - Starts a call from the airplane to the ground.
- ANSWER CALL - Answers a call from the ground to the airplane.

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SIA ALL EFFECTIVITY

D633AM102-SIA

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**SATCOM SYSTEM - OPERATION - MAKE CALL**

- REJECT - Rejects a call from the ground to the airplane.
- PREEMPT - Makes the SDU stop other calls so that there are resources available to make a call.
- CANCEL - Stops the SDU from waiting to make a call.
- END CALL - Stops a call.

**Air-to-ground Call Sequence**

When the channel status is READY, the crew may make a call to the ground.

Select MAKE CALL or PLACE CALL. The SDU starts to connect the call to the ground telephone network. The channel status shows DIALING.

When the call connects to the ground telephone network, these indications show:

- CONNECTED shows as channel status
- Call light comes on at the audio control panel (ACP) for the SATCOM channel

**Ground-to-air Call Sequence**

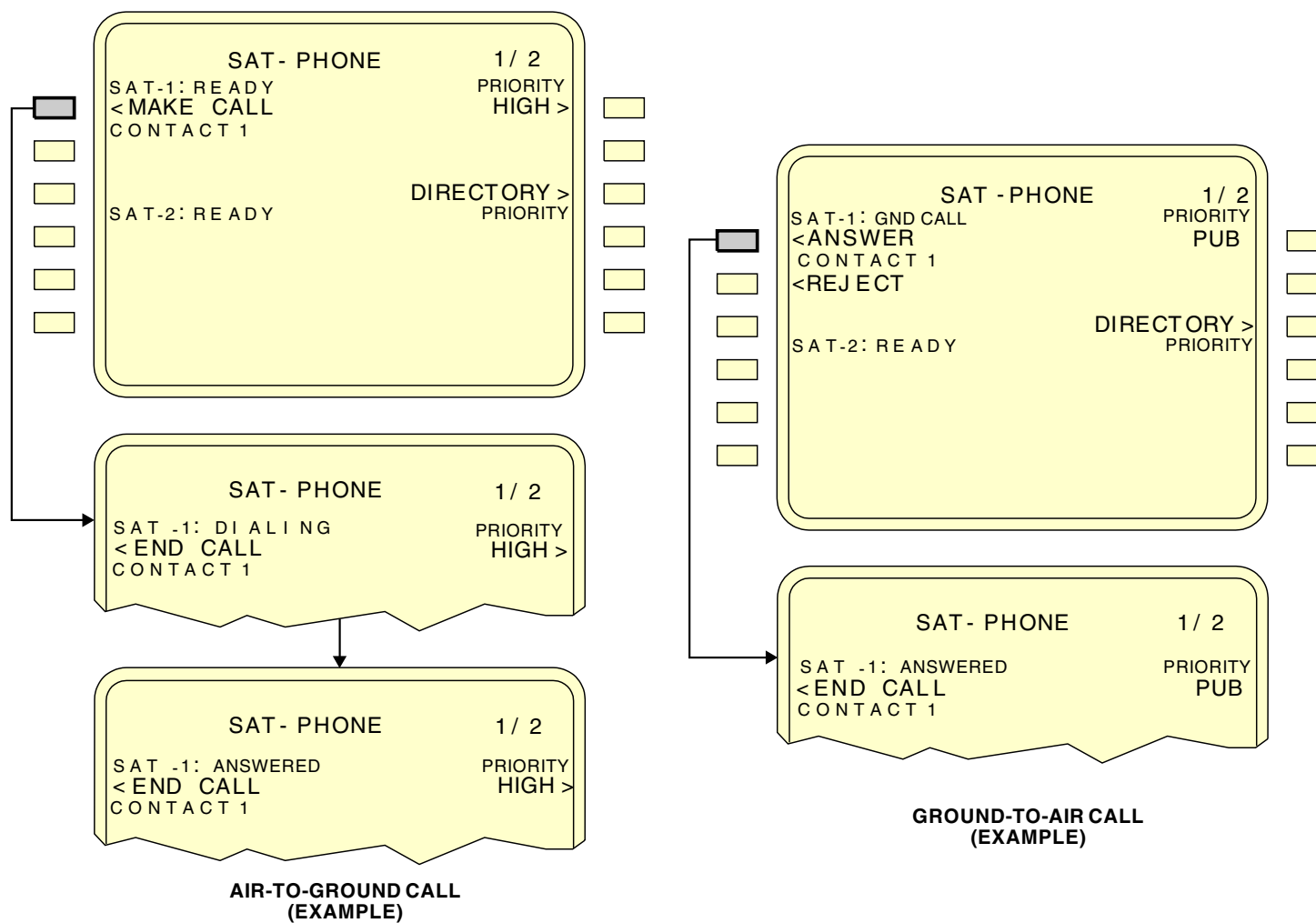
When someone on the ground makes a call to the airplane, these indications show:

- High/low chime from the aural warning module
- Call light comes on at the ACP for the SATCOM channel

To accept the call, select the MIC switch on the ACP to begin voice communication.

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# SATCOM SYSTEM - OPERATION - MAKE CALL



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# SATCOM SYSTEM - OPERATION - MAKE CALL

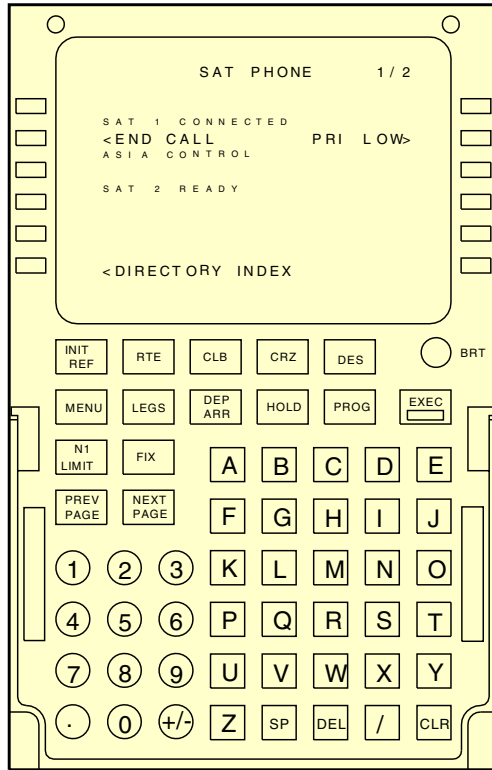
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SIA ALL EFFECTIVITY

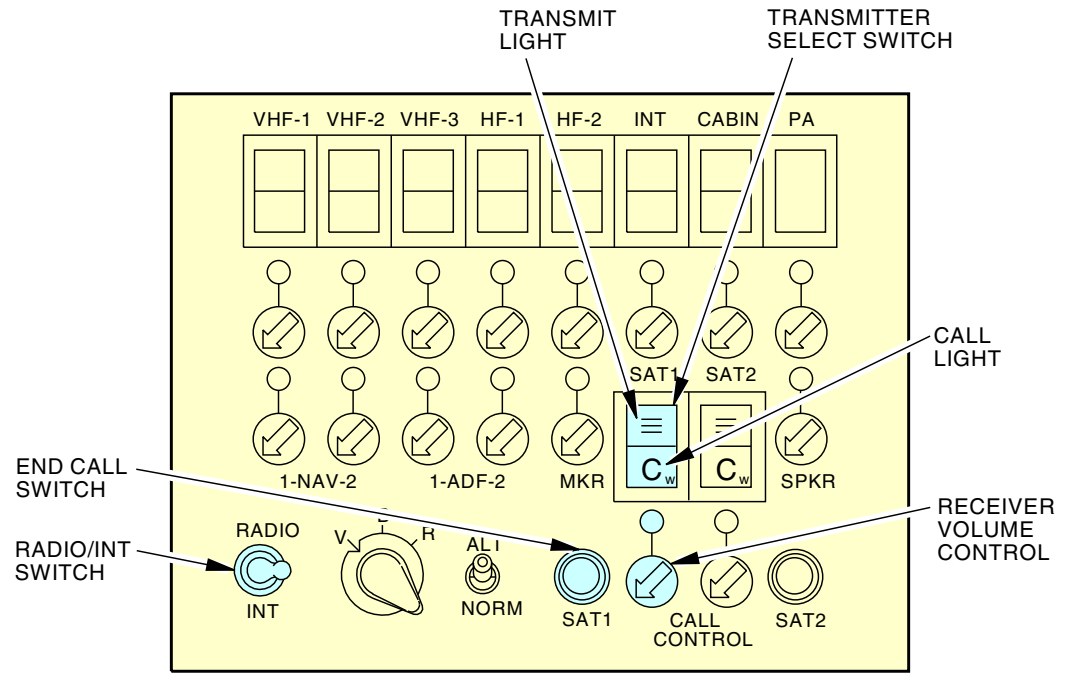
D633AM102-SIA

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### SATCOM SYSTEM - OPERATION - MAKE CALL



CONTROL DISPLAY UNIT  
(EXAMPLE)



AUDIO CONTROL PANEL

2562023 S0000611128\_V2

### SATCOM SYSTEM - OPERATION - VOICE COMMUNICATION

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## SATCOM SYSTEM - SUMMARY

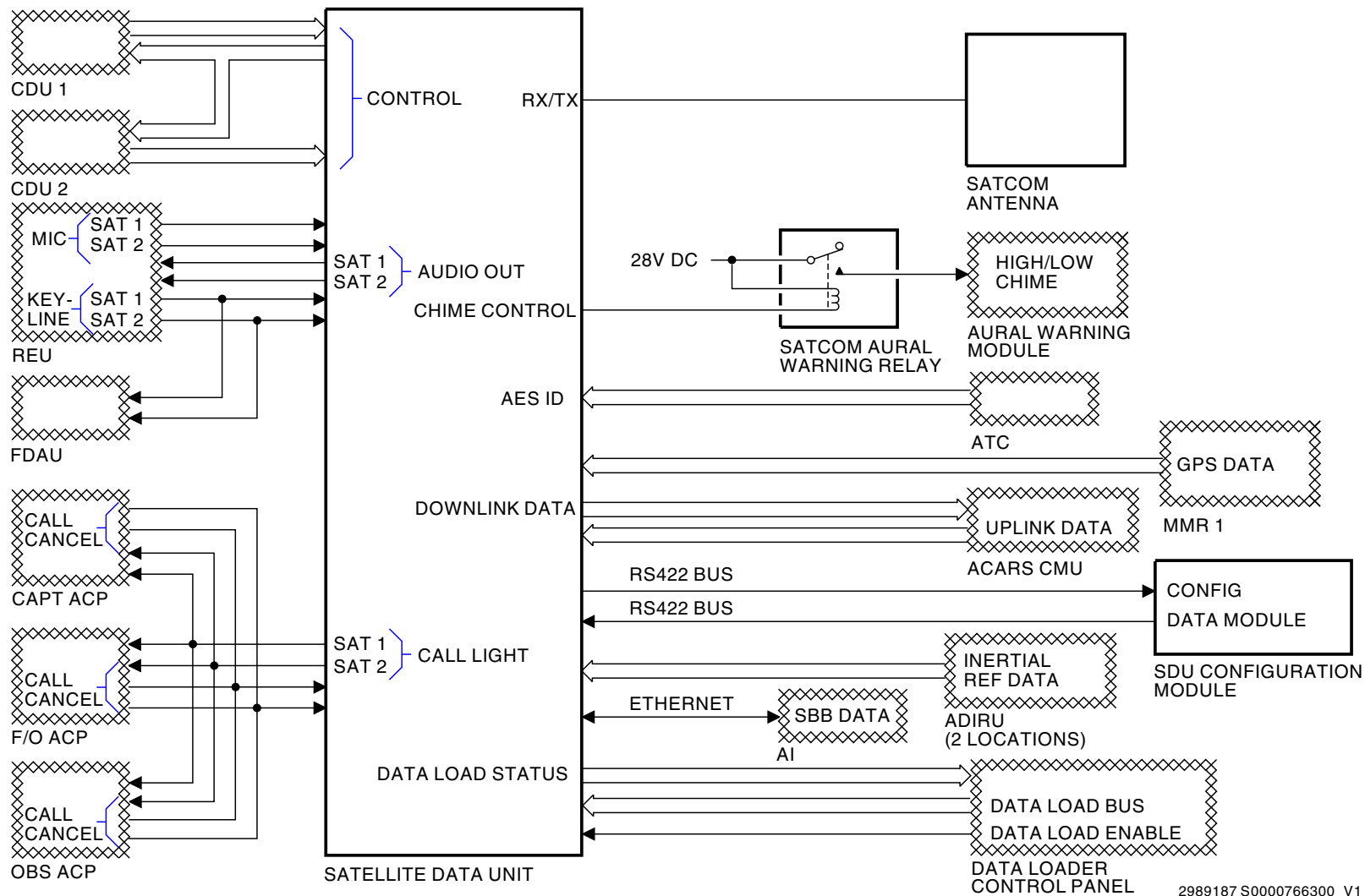
### General

This page is for reference.

For more details on the SATCOM System, refer to the wiring diagram and functional schematic manuals.

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# SATCOM SYSTEM - SUMMARY



2989187 S0000766300\_V1

# SATCOM SYSTEM - SUMMARY

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ECCN 9E991 BOEING PROPRIETARY - See title page for details



## EMERGENCY LOCATOR TRANSMITTER SYSTEM - INTRODUCTION

### Purpose

The Emergency Locator Transmitter (ELT) system automatically sends emergency signals when it senses a large change in the airplane velocity.

The flight crew can start the ELT manually at the flight deck with a switch on a control panel.

The ELT sends homing signals to search and rescue crews on the very high frequency (VHF) and ultra-high frequency (UHF) emergency channels.

The ELT also sends emergency signals to satellite receivers. The satellite receivers send this information to ground stations to calculate the location of the emergency signals.

### Abbreviations and Acronyms

- ANT - antenna
- C - Celsius
- cm - centimeter
- dc - direct current
- deg - degree
- ELT - emergency locator transmitter
- EXT - external
- in - inch
- kg - kilogram
- lb - pound
- MCC - mission control center
- MHz - megahertz
- mW - milliwatt
- UHF - ultra high frequency
- VHF - very high frequency
- v - volt

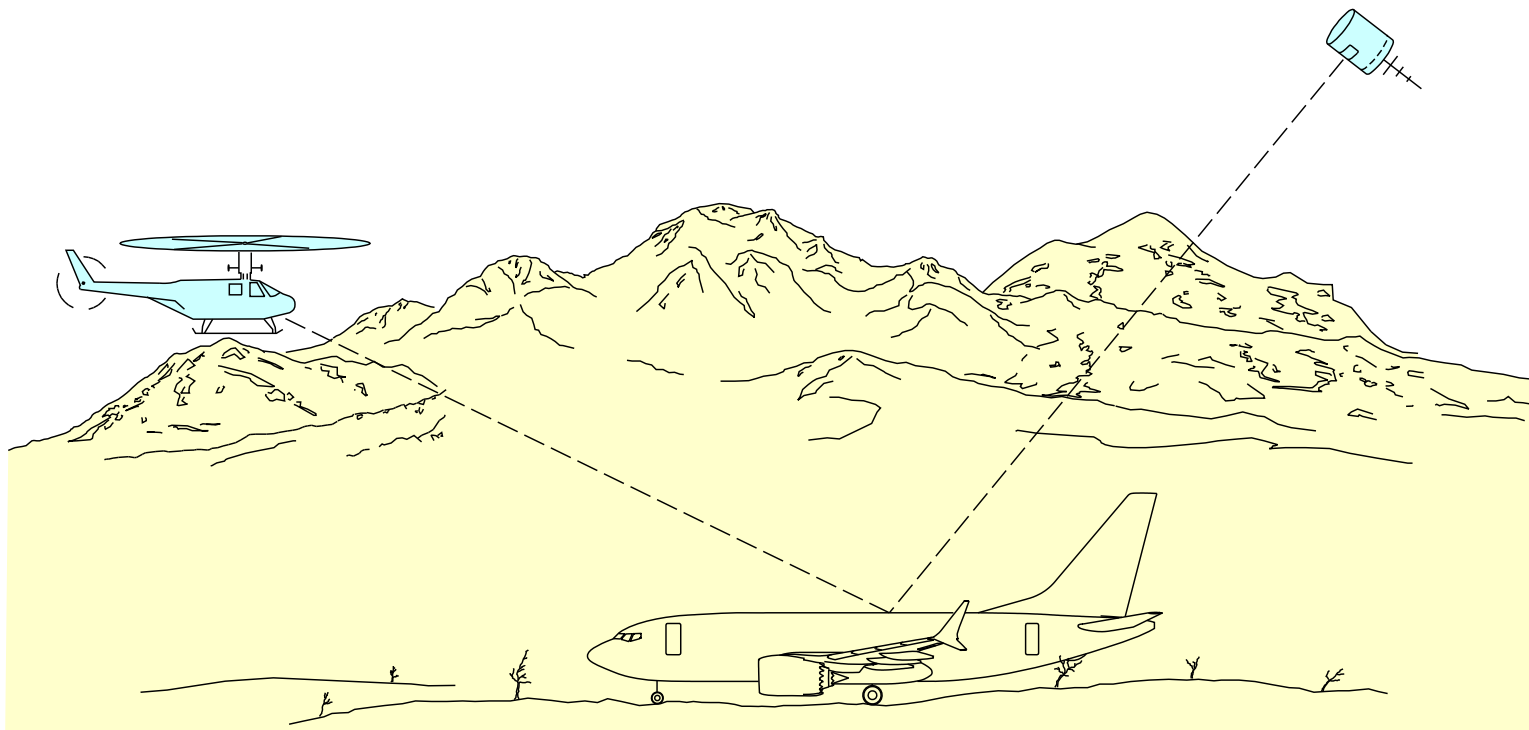
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ECCN 9E991 BOEING PROPRIETARY - See title page for details

## EMERGENCY LOCATOR TRANSMITTER SYSTEM - INTRODUCTION



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## EMERGENCY LOCATOR TRANSMITTER SYSTEM - INTRODUCTION

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ECCN 9E991 BOEING PROPRIETARY - See title page for details

**EMERGENCY LOCATOR TRANSMITTER SYSTEM - GENERAL DESCRIPTION****General**

The Emergency Locator Transmitter (ELT) system has these components:

- Control panel
- Transmitter
- Antenna.

The control panel has a switch that you use to start the ELT manually. It also has a light to show you that the ELT is in operation.

The ELT transmitter has two transmitter sections. One transmitter sends a swept tone on the VHF and UHF emergency channels (121.5 and 243.0 MHz). The other transmitter sends digital data every 50 seconds on the 406 MHz channel.

The ELT transmitter has two transmitter sections. One transmitter sends a swept tone on the VHF emergency channel (121.5 MHz). The other transmitter sends digital data every 50 seconds on the 406 MHz channel.

The antenna sends the 121.5/243.0 MHz and the 406 MHz transmit signals.

**ELT Connection**

The ELT gets control information from the ELT control panel. The control panel sends discrete signals to the ELT to turn the ELT on manually. It also sends a discrete signal to turn off the ELT if it starts to transmit accidentally. To start a self test of the ELT, move the RESET/ARMED/ON switch to the ON position for less than 15 seconds and then move it to the RESET position for approximately one (1) to three (3) seconds and then release it back to the ARMED position.

The ELT sends the frequency outputs to a blade antenna.

The antenna sends the 121.5/243.0 MHz or 406 MHz transmit signals.

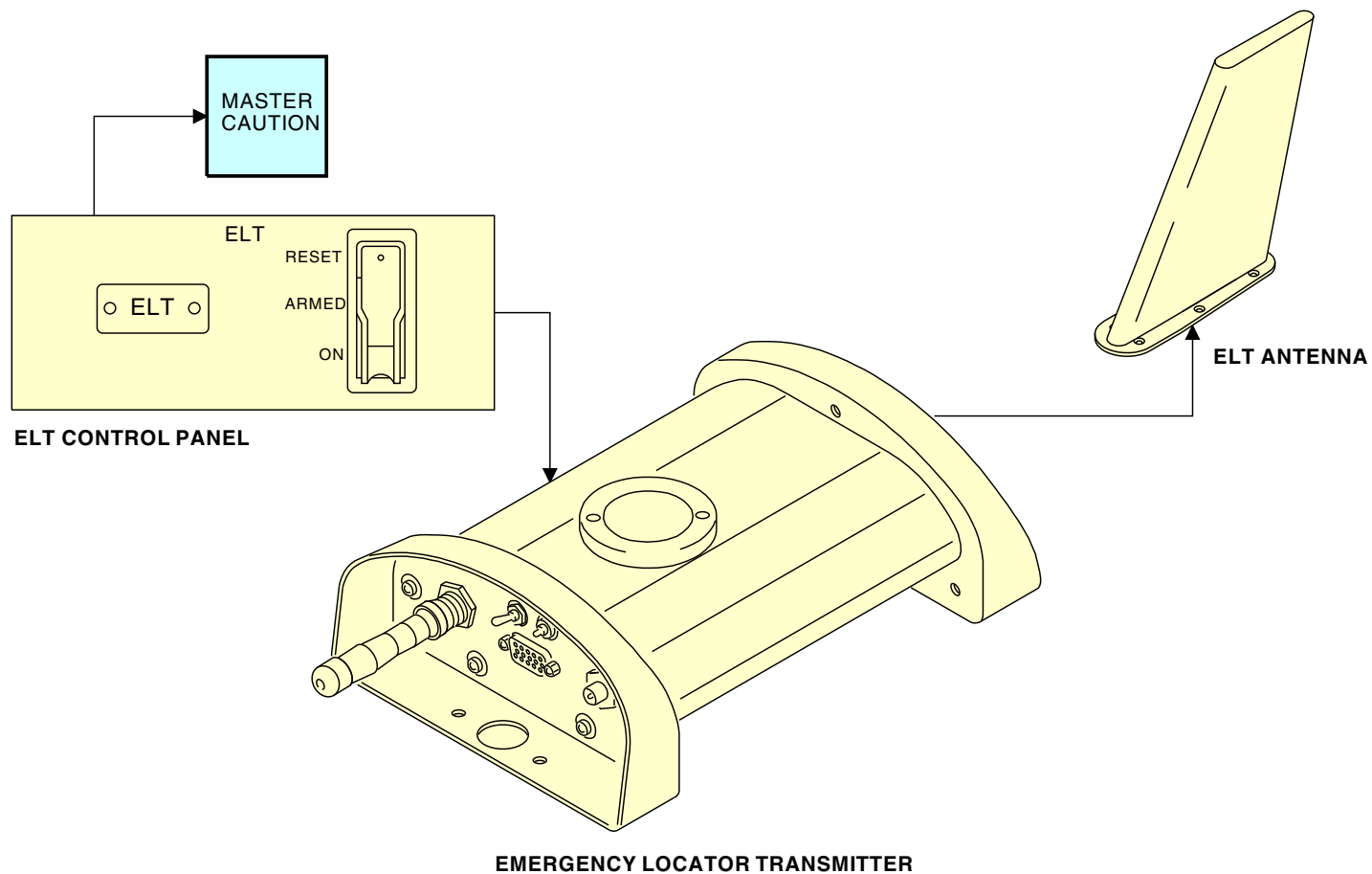
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## EMERGENCY LOCATOR TRANSMITTER SYSTEM - GENERAL DESCRIPTION



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## EMERGENCY LOCATOR TRANSMITTER SYSTEM - GENERAL DESCRIPTION

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## EMERGENCY LOCATOR TRANSMITTER SYSTEM - COMPONENT LOCATIONS

### Flight Compartment

The ELT control panel is on the P5 aft overhead panel.

### Passenger Cabin

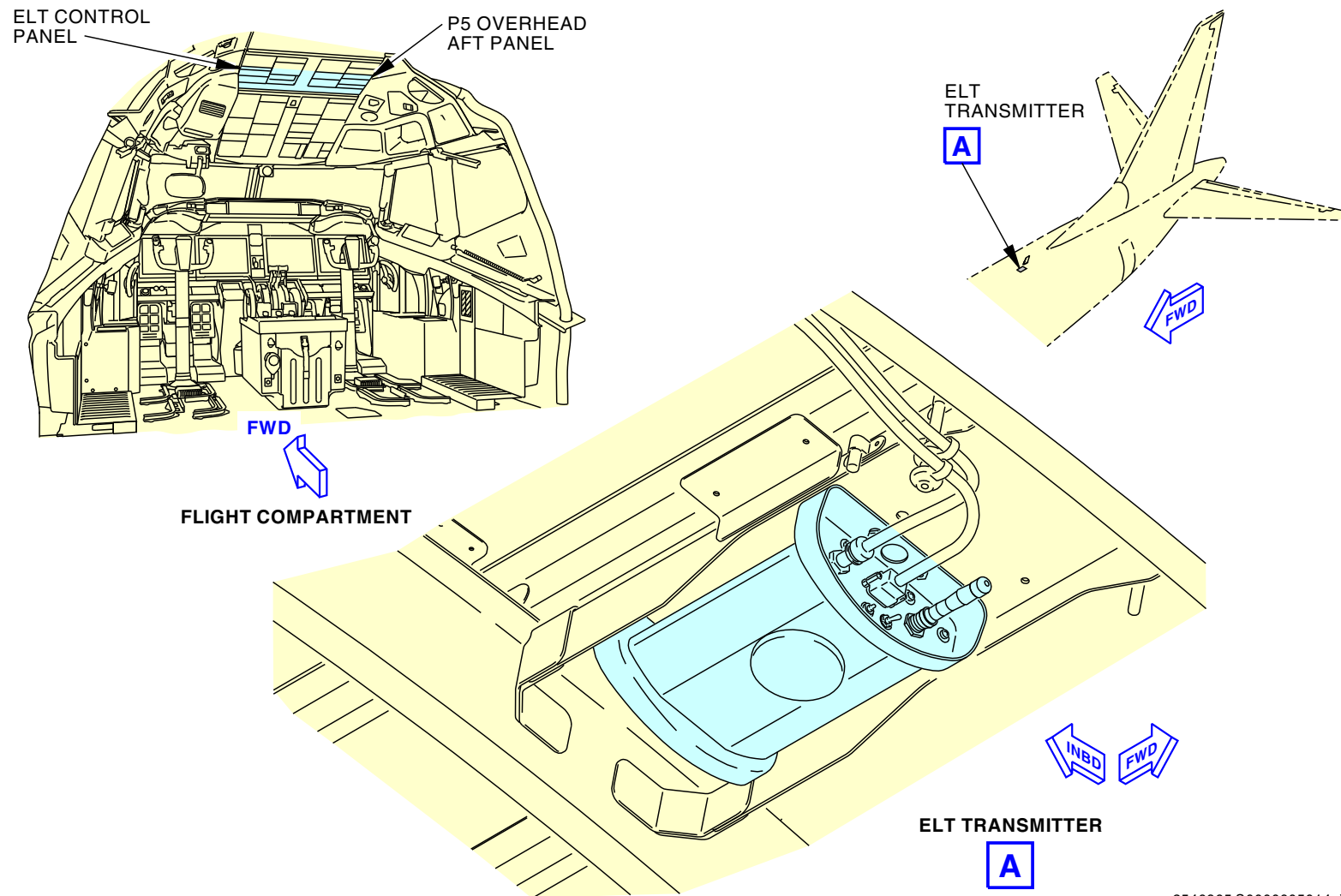
The ELT transmitter is above an access panel in the aft passenger cabin ceiling at station 794.

### Fuselage

The ELT antenna is on top of the fuselage, above and aft of the ELT transmitter at station 797.

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# EMERGENCY LOCATOR TRANSMITTER SYSTEM - COMPONENT LOCATIONS



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# EMERGENCY LOCATOR TRANSMITTER SYSTEM - COMPONENT LOCATIONS

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**EMERGENCY LOCATOR TRANSMITTER SYSTEM - INTERFACE****Power**

The Emergency Locator Transmitter (ELT) control panel gets 28v dc or 16v dc from the master dim and test (MD&T) circuit. This power is for the ELT light.

The ELT gets 12v dc from it's internal batteries.

The ELT control panel gets 0–5 v ac from the master dim and test for the panel lights.

The ELT uses an internal battery pack that supplies 12v dc to the ELT.

**ELT Control Panel**

The ELT control panel sends an EXT ON signal to the ELT to start the transmitter. It also sends reset signals to stop the transmitter if it accidentally starts.

The control panel gets the LIGHT signal from the ELT to control the ELT light. It also gets an ELT ON signal to turn on the master caution.

You use the ELT control panel to turn on the ELT or to reset it to the armed mode if there is an accidental activation.

**Emergency Locator Transmitter**

The ELT supplies these signals:

- ELT ON
- LIGHT

The ELT sends 12v dc to the ELT control panel. The ELT gets ON and RESET signals from the control panel.

The ELT ON and LIGHT signals go to the ELT control panel.

The EXT ON signal from the control panel manually starts the transmitter.

The reset signals stop the transmitter if it accidentally starts.

A G-switch enable jumper wire arms the ELT when you connect the front connector.

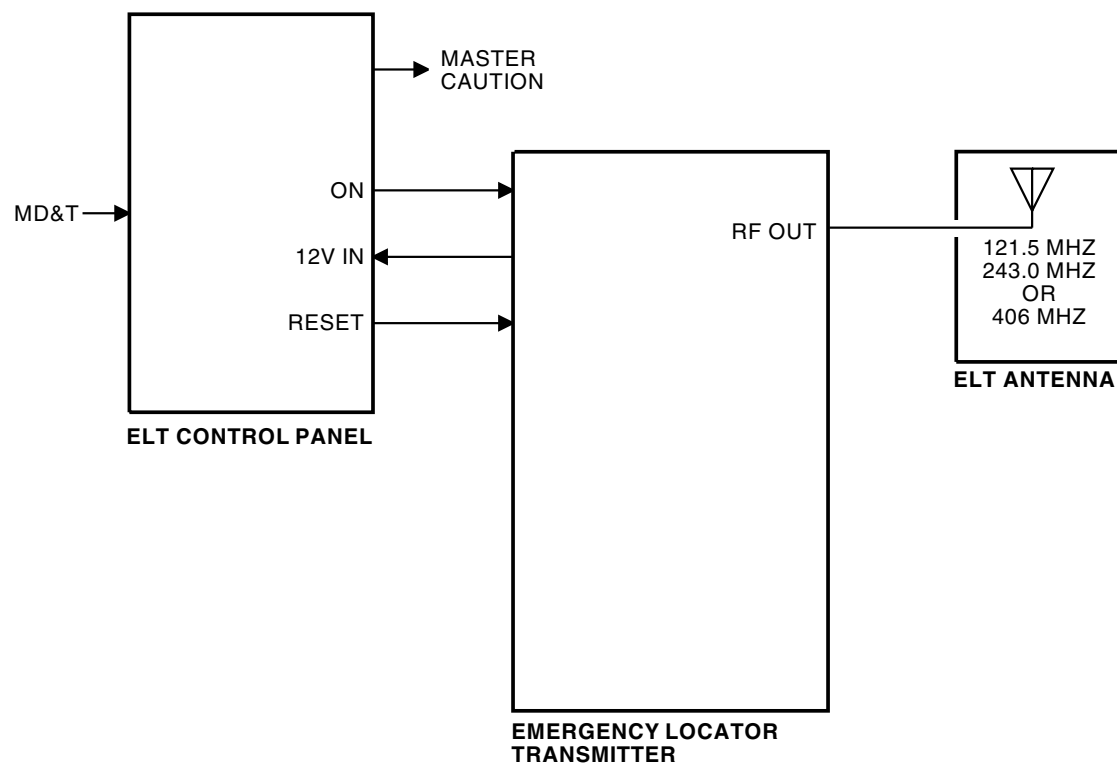
You can hardware select the G-switch to either the North American specification (FAA) or the European specification (EASA)

**ELT Antenna**

The ELT antenna sends the emergency signals on the VHF and UHF frequencies.

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## EMERGENCY LOCATOR TRANSMITTER SYSTEM - INTERFACE



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## EMERGENCY LOCATOR TRANSMITTER SYSTEM - INTERFACE

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ECCN 9E991 BOEING PROPRIETARY - See title page for details



## EMERGENCY LOCATOR TRANSMITTER SYSTEM - ELT CONTROL PANEL

### Purpose

The Emergency Locator Transmitter (ELT) control panel lets you monitor and do a test of the ELT.

You use the emergency locator transmitter (ELT) control panel for these purposes:

- Turn on the ELT
- Reset the ELT after activation
- Set the ELT for automatic operation.

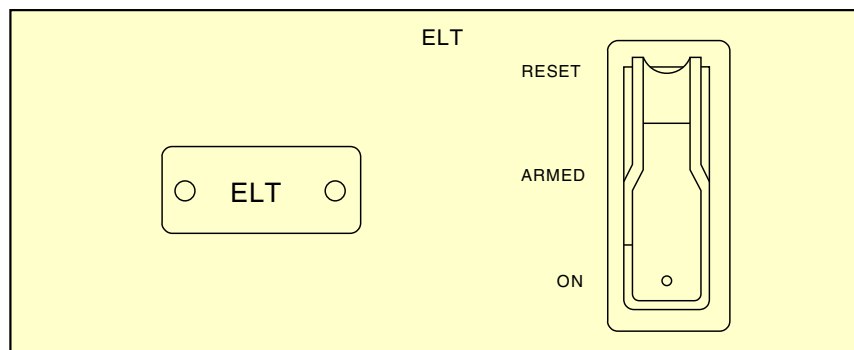
### Controls and Indications

The ELT control panel has a RESET/ARMED/ON switch guarded in the ARMED position.

Set the switch to ARMED for normal operation. In this mode, the ELT starts automatically if it senses a sudden and extreme decrease in speed.

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## EMERGENCY LOCATOR TRANSMITTER SYSTEM - ELT CONTROL PANEL



## EMERGENCY LOCATOR TRANSMITTER SYSTEM - ELT CONTROL PANEL

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## EMERGENCY LOCATOR TRANSMITTER SYSTEM - TRANSMITTER

### Purpose

The Emergency Locator Transmitter (ELT) sends emergency signals when it sense excessive change in velocity.

When manually or automatically activated, the ELT transmits this information:

- 121.5 MHz homing signal
- 243 MHz homing signal.
- 406 MHz aircraft data

The ELT also transmits on 121.5 MHz and 243 MHz continuously except during the 406 MHz transmission. It continues to transmit until the batteries can no longer supply power.

### Power

The transmitter does not use aircraft power but has two (2) internal battery packs. The battery packs have four lithium manganese batteries (2 per battery pack) connected in series.

### Physical Description

The ELT has these physical characteristics:

- Height - 2.88 in. (73 mm)
- Width - 6.3 in. (160 mm)
- Length - 9.21 in. (234 mm)
- Weight - 3.3 lb (1.5 kg)

There is a transmit LED (labeled TX) and an ARMED/OFF/ON switch on the ELT. This lets you manually control the ELT.

On the ELT body is an activation/identification module. The module can be programmed in one of two ways. The first is the identification module is programmed with the ELT serial number and the identification module stays with the ELT. The second is that the Aircraft registry or airplane 24-BIT address identification and the identification module stays with the airplane and gets installed on the new ELT.

### Front Panel

The ELT transmitter front panel has an LED and a toggle switch.

The toggle switch has these positions:

- ARMED
- OFF
- ON

When the switch is set to OFF, there is no power from the battery pack to the transmitter. The transmitter can not sense a crash or transmit a rescue signal. Also, the transmitter can not perform a self-test in this mode.

When the switch is set to ARMED, the transmitter can detect an activation signal from the G-switch or the ELT control panel. The transmitter can also perform a self-test from the ELT control panel.

When the switch is set to ON, the transmitter sends the 121.5/243.0 MHz and 406 MHz rescue signals to the antenna and the LED blinks continuously after an automatic self-test sequence during the first 50 seconds.

The EXT ANT connector connects the ELT to the external blade antenna.

The BACK UP ANT connector connects the ELT to the backup antenna.

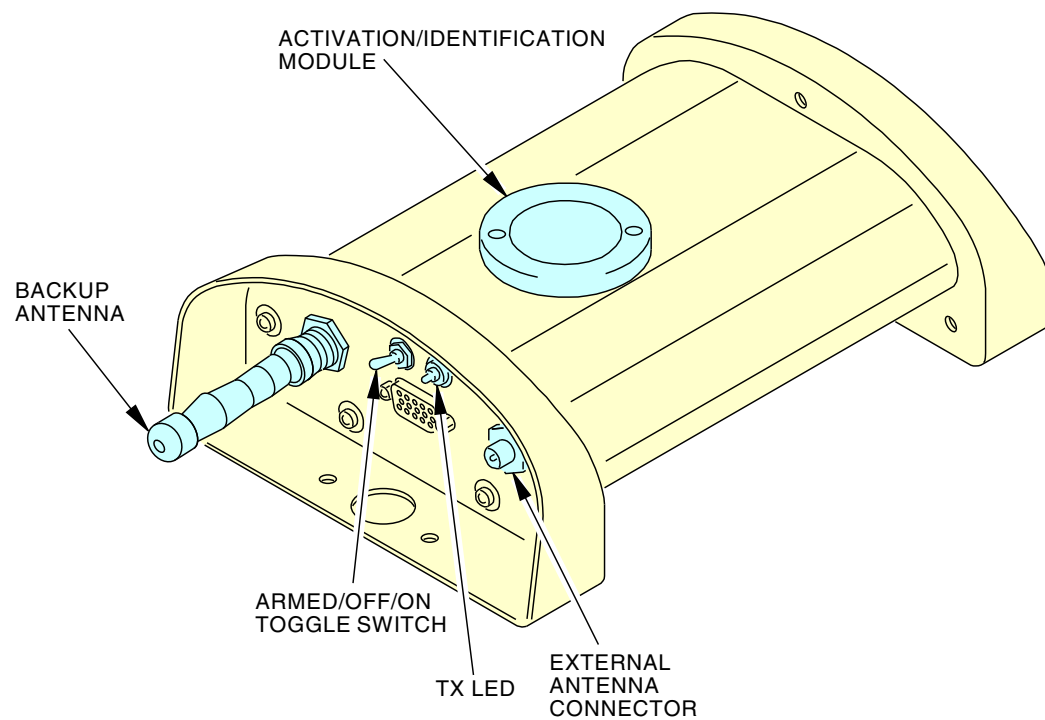
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## EMERGENCY LOCATOR TRANSMITTER SYSTEM - TRANSMITTER



2546974 S0000605079\_V1

## EMERGENCY LOCATOR TRANSMITTER SYSTEM - TRANSMITTER

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ECCN 9E991 BOEING PROPRIETARY - See title page for details

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## EMERGENCY LOCATOR TRANSMITTER SYSTEM - ANTENNA

### Purpose

The Emergency Locator Transmitter (ELT) antenna sends radio signals in the very high frequency (VHF) and ultra-high frequency (UHF) ranges.

The ELT antenna transmits 121.5 MHz, 243.0 MHz, and 406 MHz signals.

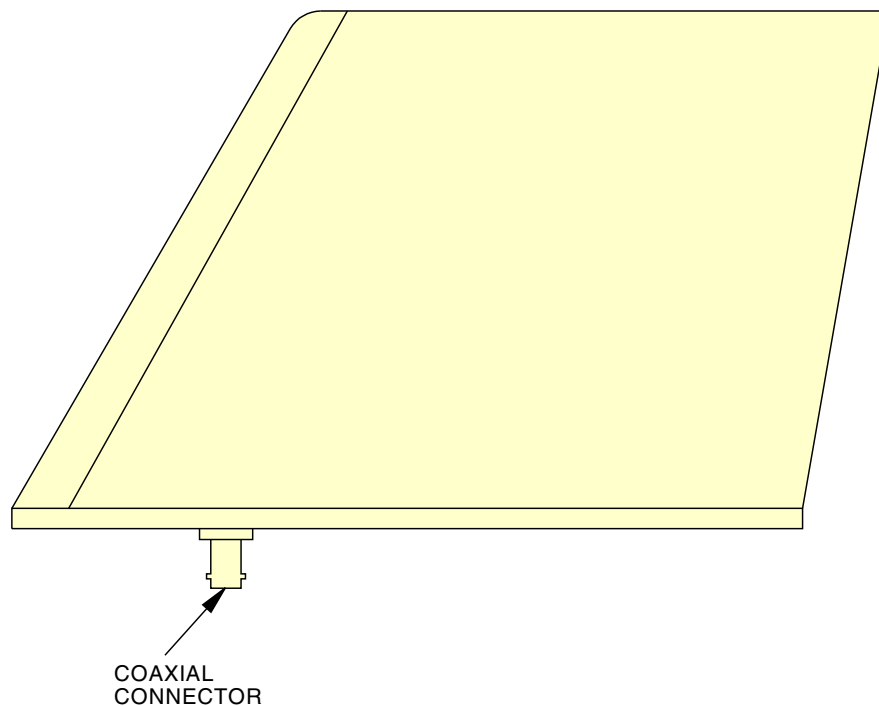
### Physical Properties

The ELT antenna is an external blade antenna.

The 121.5 MHz, 243.0 MHz, and 406 MHz transmissions come in on the coaxial connector.

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# EMERGENCY LOCATOR TRANSMITTER SYSTEM - ANTENNA



## EMERGENCY LOCATOR TRANSMITTER SYSTEM - ANTENNA

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**EMERGENCY LOCATOR TRANSMITTER SYSTEM - FUNCTIONAL DESCRIPTION****General**

The Emergency Locator Transmitter (ELT) transmits distress signals to satellites. The ELT has these modes of operation:

- On
- Armed
- Reset

The ELT has these components:

- 121.5/243.0 MHz transmitter
- 406 MHz transmitter
- G-switch
- ON light
- ELT switch
- Battery pack

**Normal Operation**

In normal operation, the ELT remote control switch in the Flight Compartment is set to the ARMED position and the ELT transmitter front panel ARMED/OFF/ON switch is set to the ARMED position. In this condition, the ELT is not active. The control panel, ELT front panel, and master caution lights are off. The ELT will automatically activate on impact.

**ON Operation**

To go from normal (ARM) to ON operation, the ELT needs a change of switch position from one of these sources:

- G-switch
- Control panel switch
- ELT front panel switch.

A G-switch jumper wire prevents the ELT from accidental operation while the unit is in transit to the airplane.

The jumper wire arms the G-switch only when the unit front connector is connected. When the switch is armed, the switch changes position when it senses a large change in velocity.

The ELT control panel switch lets you manually start ELT transmission. When you put the control panel switch to ON, an ON COMMAND signal goes from the control panel to the ELT. This signal manually starts the transmitter from the control panel.

The ELT front panel switch also lets you manually start the transmitter. You do this when you put the front panel switch to ON.

The transmitter board contains a micro controller. The controller generates the digital distress signal. It also operates a 406.028 MHz transmitter and 121.5 and 243 MHz homing transmitters.

The transmitter board receives inputs from the ELT control panel. These signals control the activation or reset of the ELT.

The transmitter board also receives information from the impact detection acceleration sensor located in the activation/identification module.

When the ELT is turned on manually, it starts a self-test of the transmitter. The self-test checks the output power of the UHF and VHF signals, the presence of the primary antenna, the presence of a valid identification signal and the proper software check-sum.

The 121.5/243.0 MHz transmitter operates until the battery pack becomes unserviceable. The battery pack power lasts for at least 60 hours.

The 406.0 MHz transmitter sends a digital distress signal to the satellites that are a part of the COSPAS/SARSAT system. This signal is used to accurately find and identify the ADT 406 Emergency Locator Transmitter beacon.

The processor synchronizes the operation of both transmitters. Only one transmitter is on at a time. Every 50 seconds, the processor turns off the 121.5/243.0 MHz transmission for a short time (440 msec) and commands the 406.0 MHz-transmitter to send its signal.

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SIA ALL EFFECTIVITY

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ECCN 9E991 BOEING PROPRIETARY - See title page for details

**EMERGENCY LOCATOR TRANSMITTER SYSTEM - FUNCTIONAL DESCRIPTION**

Satellites detect the emergency signals from the 406.0 MHz-transmitter and send this information to ground stations. The ground stations receive and process the emergency signals to find the location of the ELT. The 406.0 MHz-transmitter gives a location precision of approximately 2 Km.

The 406.0 MHz-transmitter also give this information for the search and rescue personnel:

- ELT Serial Number
- Aircraft operator designator and Serial Number
- Aircraft 24 BIT address
- Aircraft nationality and registration marking
- Country code

**Self-Test**

A self-test of the ELT is activated when you set the ELT control panel switch or the front panel switch to the ON position.

The self-test begins with three (3) seconds of silence while the ELT looks for a Navigation Interface or test tool connection.

Then, the TX LED on the ELT front panel comes on for six (6) seconds, along with a buzzer.

If the self-test passes, the buzzer and the TX LED remain on for an additional ten (10) seconds.

If the self-test fails, the buzzer stops and the TX LED flashes for ten (10) seconds to show the failure mode.

The flashing rate indicates the failure as follows:

- 4 Hz - ELT check-sum failure
- 2 Hz - ELT power failure (UHF and/or VHF)
- 1 Hz - external antenna connection failure or signal identification missing.

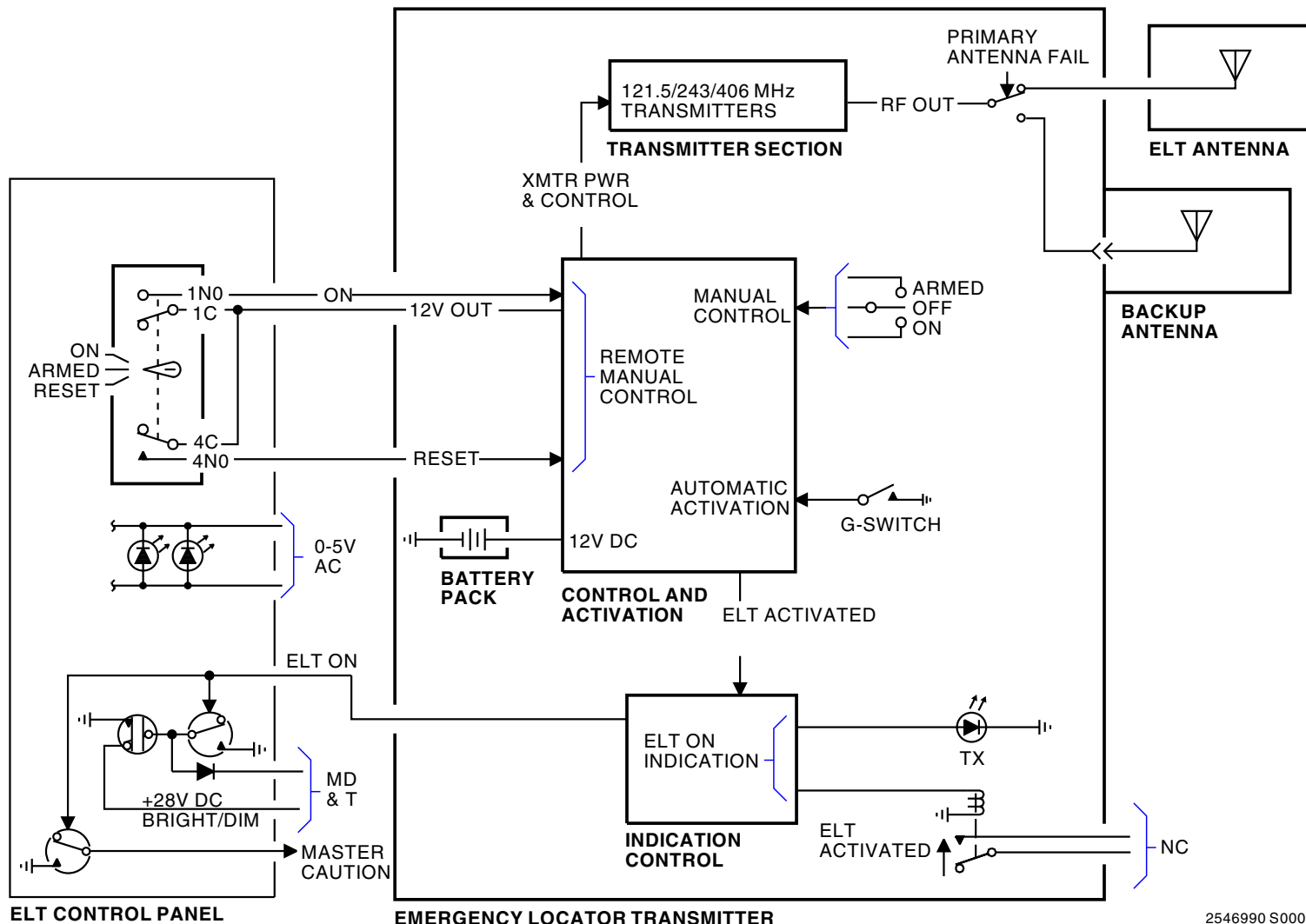
The ELT waits for approximately 30 seconds after the pass/fail indication to allow the ELT to be shutoff manually before the real distress signals are transmitted. Set the ELT control panel or front panel switch (whichever was used to initiate the self-test) to the OFF position.

**23-24-00****SIA ALL EFFECTIVITY**

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ECCN 9E991 BOEING PROPRIETARY - See title page for details

# EMERGENCY LOCATOR TRANSMITTER SYSTEM - FUNCTIONAL DESCRIPTION



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## EMERGENCY LOCATOR TRANSMITTER SYSTEM - FUNCTIONAL DESCRIPTION

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**LOW FREQUENCY UNDERWATER LOCATING DEVICE - INTRODUCTION****Purpose**

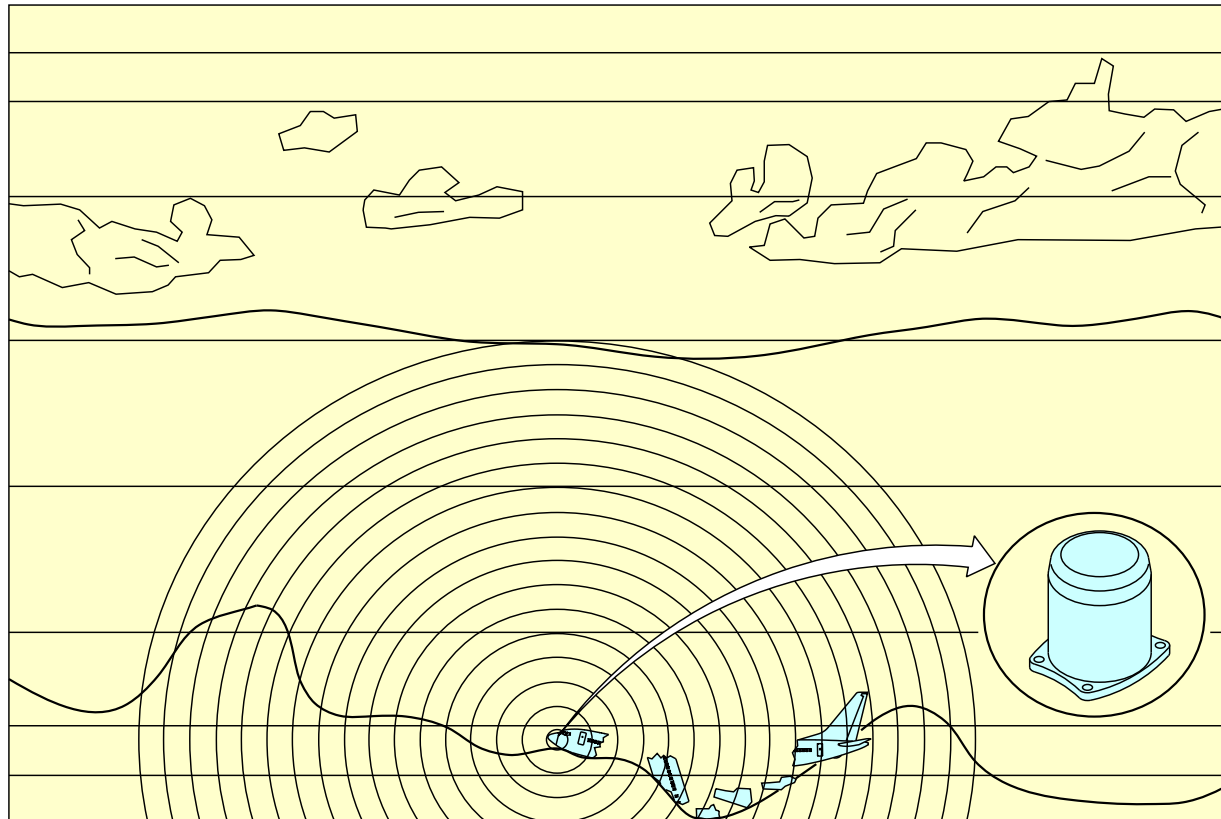
The low frequency Underwater Locating Device (ULD) is intended to operate only in the event of an accident over water. The ULD automatically activates when the unit is immersed into freshwater or saltwater then transmits a pulsed sonic signal for ninety days to aid in the location of the submerged airplane wreckage.

**Abbreviations and Acronyms**

- db - decibel
- kHz - kilohertz
- ms - millisecond
- ULD - underwater locating device

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LOW FREQUENCY UNDERWATER LOCATING DEVICE - INTRODUCTION



2788958 S0000633376\_V3

LOW FREQUENCY UNDERWATER LOCATOR DEVICE

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ECCN 9E991 BOEING PROPRIETARY - See title page for details

**LOW FREQUENCY UNDERWATER LOCATING DEVICE - GENERAL DESCRIPTION****General Description**

The low frequency Underwater Locating Device (ULD) is cylindrical, ruggedized, waterproof and weatherproof housing that can withstand extreme environmental conditions, high acceleration impact shock and deep-sea pressure up to 20,000 ft (6096 m) below sea level.

The ULD is in continuous standby mode until in an event that the unit is immersed in saltwater or freshwater, the unit automatically activates and transmits a pulsed sonic signal for ninety days.

The following table shows the operational characteristics:

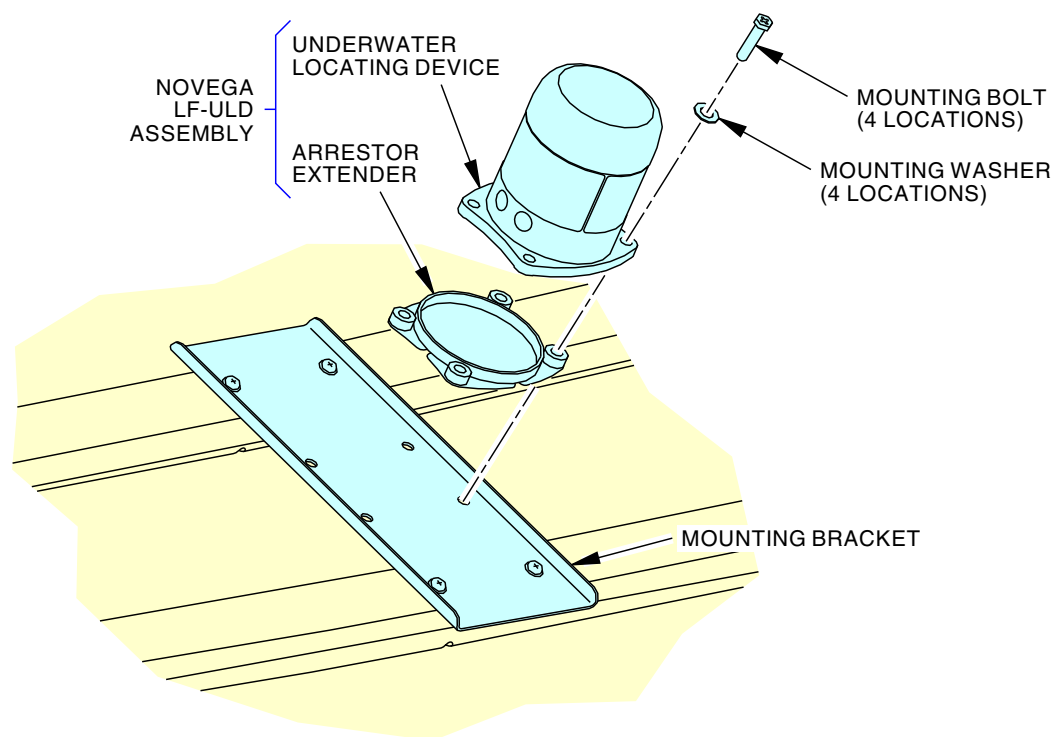
|                                 |                                                      |
|---------------------------------|------------------------------------------------------|
| Operating Range                 | Approximately 12 nmi (22 km)                         |
| Operating Frequency             | 8.8 kHz $\pm$ 1 kHz                                  |
| Operating Depth                 | ~20,000 ft (6096 m)                                  |
| Pulse Permanence                | 10 ms minimum                                        |
| Pulse Repetition Rate           | 1 pulse every 10 seconds                             |
| Operating Life                  | 90 days minimum                                      |
| Service Life (Battery)          | 6 years                                              |
| Acoustic Output - Initial       | 160 dB vs 1 $\mu$ Pa at 1 m (100 N/m <sup>2</sup> )  |
| Acoustic Output - After 90 Days | 157 dB vs 1 $\mu$ Pa at 1 m (70.8 N/m <sup>2</sup> ) |
| Radiation Pattern               | 80% of a sphere                                      |

The ULD is powered by a non-rechargeable 3.6VDC single C-size cell Lithium Thionyl Chloride (Li-SOCL<sub>2</sub>).

The ULD is mounted on a steel arrestor extender that will contain any ejected debris in the unlikely event of a lithium thermal runaway event.

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## LOW FREQUENCY UNDERWATER LOCATING DEVICE - GENERAL DESCRIPTION



2788960 S0000633470\_V1

## LOW FREQUENCY UNDERWATER LOCATING DEVICE - GENERAL DESCRIPTION

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ECCN 9E991 BOEING PROPRIETARY - See title page for details



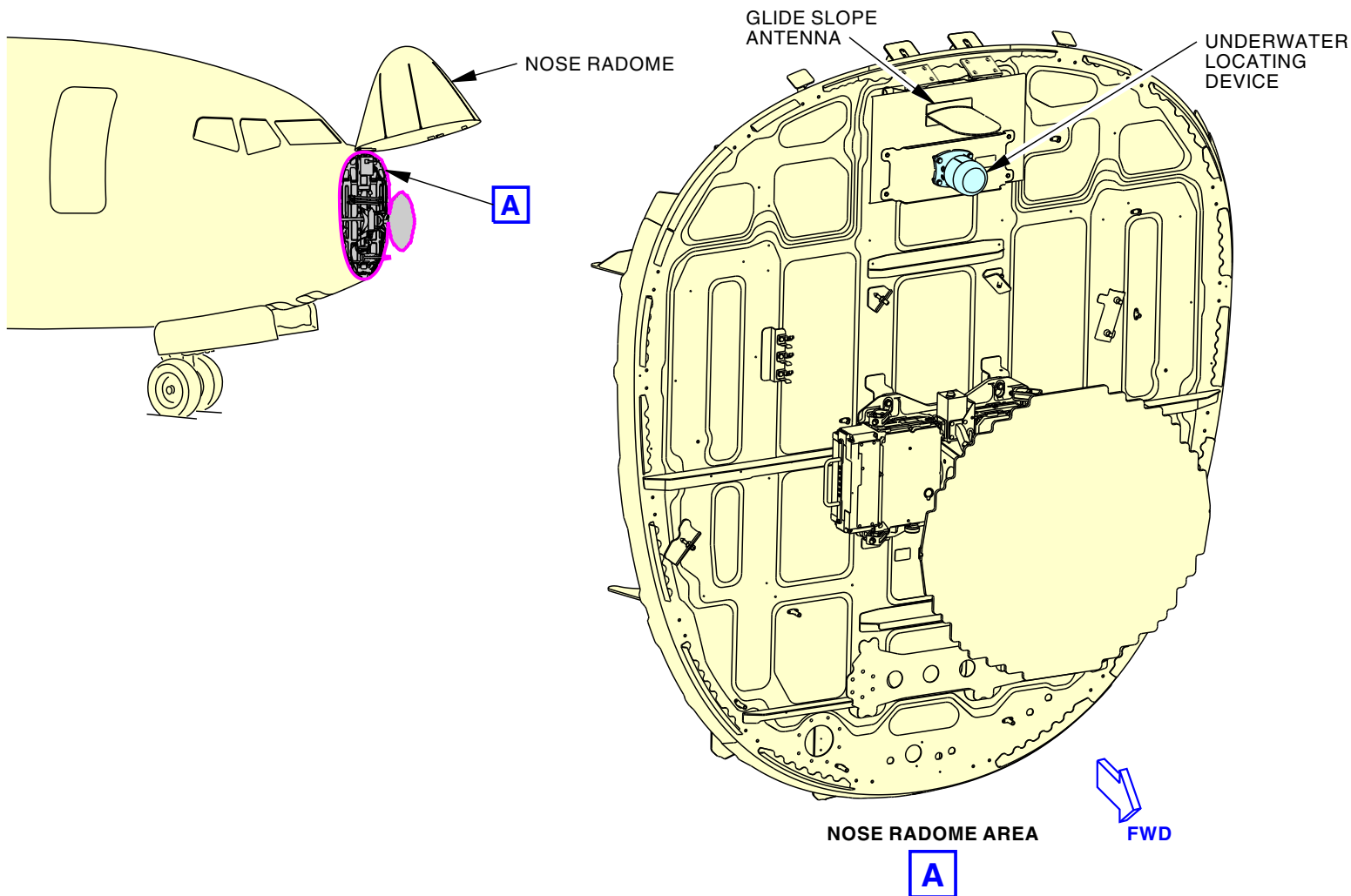
## LOW FREQUENCY UNDERWATER LOCATING DEVICE - COMPONENT LOCATION

### Nose Radome Area

The location of the Underwater Locating Device (ULD) and arrestor extender is in the nose radome area. It is mounted on the forward pressure bulkhead, a small distance below and centered on the glide slope antenna.

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LOW FREQUENCY UNDERWATER LOCATING DEVICE - COMPONENT LOCATION



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LOW FREQUENCY LOCATING DEVICE - COMPONENT LOCATION

**23-25-00**





## AIRCRAFT COMMUNICATIONS ADDRESSING AND REPORTING SYSTEM (ACARS) - INTRODUCTION

Purpose

The Aircraft Communications Addressing And Reporting System (ACARS) is a datalink communication system. It lets you transmit messages and reports between an airplane and an airline ground base.

A message or report from the airplane to the airline ground base is called a downlink. A message or report from the airline ground base to the airplane is called an uplink.

ACARS automatically sends reports when necessary and at scheduled times of the flight to reduce crew workload.

These are typical ACARS reports:

- Crew identification
- Out, off, on, in (OOOI) times
- Engine performance
- Flight status
- Maintenance items.

Abbreviations and Acronyms

- A - amber
- ACARS - aircraft communications addressing and reporting system
- A/C - aircraft
- ac - alternating current
- ACMS - aircraft condition monitoring system
- act - active
- ADL - airborne data loader
- ADS - automatic dependent surveillance
- AFN - air traffic control facilities notification
- AOC - airline operations control

**SIA 001-014**

- APM - airplane personality module

**SIA ALL**

- appl - application
- ARINC - Aeronautical Radio Incorporated
- ATC - air traffic control
- ATE - automatic test equipment
- ATN - aeronautical telecommunications network
- ATS - air traffic services
- bc - broadcast
- BITE - built-in test equipment
- capt - captain
- CDU - control display unit
- CMU - communications management unit
- comm - communication
- CPDLC - controller pilot data link communication
- curr - current
- D - day
- dc - direct current
- DPC - display processing computer
- DB - database
- DFDAU - digital flight data acquisition unit
- DIP - dual inline package
- disc - discrete
- DL - data link
- EE - electronic equipment
- ETA - estimated time of arrival
- FANS - future air navigation system
- FDAU - flight data acquisition unit
- FMC - flight management computer

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## AIRCRAFT COMMUNICATIONS ADDRESSING AND REPORTING SYSTEM (ACARS) - INTRODUCTION

- FMCS - flight management computer system
- F/O - first officer
- freq - frequency
- FTX - fast transmit
- GMT - Greenwich mean time
- GPS - global positioning system
- GND - ground
- H - hour
- H/W - hardware
- ID - identification
- ident - identification
- LCD - liquid crystal display
- LED - light emitting diode
- LRU - line replaceable unit
- M - month, minute
- maint - maintenance
- min - minute
- misc - miscellaneous
- msg - message
- NOTAMS - notice to airmen
- NVM - non-volatile memory
- OOOI - OUT, OFF, ON, IN
- PARAMS - parameters
- PCMCIA - personal computer memory card international association
- PGM - program
- P/N - part number
- PREFLT - preflight
- PROG - program
- RAM - random access memory
- RCP - radio communications panel
- rcv - receiver
- rec - receive
- req - request
- REU - remote electronics unit
- S - second
- sat - satellite
- SDU - satellite data unit
- SELCAL - selective calling
- SENS - sensor
- SW - software
- S/W - software
- tx - transmit
- V - volts
- VHF - very high frequency
- xcvr - transceiver
- xfr - transfer
- Y - year

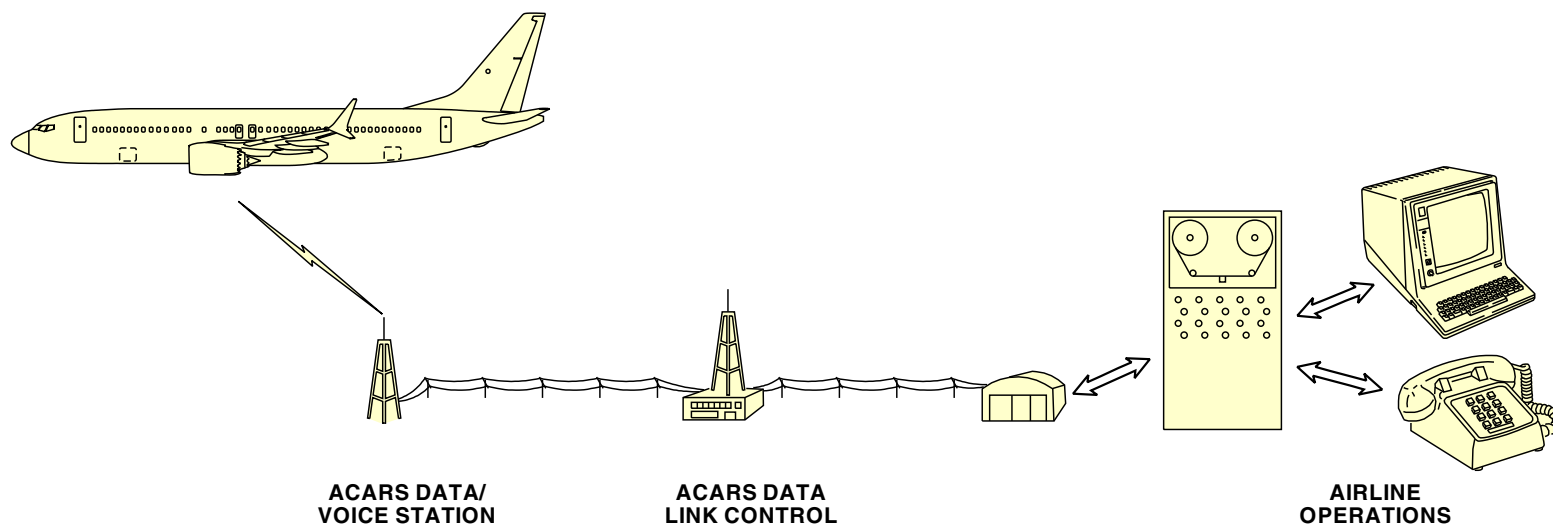
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## AIRCRAFT COMMUNICATIONS ADDRESSING AND REPORTING SYSTEM (ACARS) - INTRODUCTION



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## AIRCRAFT COMMUNICATIONS ADDRESSING AND REPORTING SYSTEM (ACARS) - INTRODUCTION

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## ACARS - GENERAL DESCRIPTION

### General

The ACARS is a voice and data communication system to manage flight plan data and maintenance data between the airplane and the airline.

These are the components of the ACARS:

- Airplane personality module (APM)
- Communications management unit (CMU)
- Control display unit (CDU)
- Multipurpose interactive display unit (MIDU).

You use the multipurpose interactive display unit (MIDU) to control the operation of the ACARS.

You use the control display unit (CDU) to control the operation of the ACARS and to show ACARS messages.

The ACARS airplane personality module (APM) provides logic tailoring, airplane identification code and airplane registration number code.

The ACARS CMU receives the ground-to-air digital messages (uplink) and controls the transmission of the air-to-ground digital messages (downlink).

The ACARS CMU is used to satisfy ATC airspace mandates. The CMU offers ATN CPDLC which meets European mandates. For North Atlantic mandates, the FMC FANS1 (ATS datalink) is used. FMC FANS1 is a CPDLC and ADS system which is in the FMC, but runs over the ACARS network. FMC FANS1 is mutually exclusive with CMU ATN CPDLC. For airplanes that fly in both mandated airspaces, the FMC FANS2 is used. FMC FANS2 combines FANS1 and ATN CPDLC into a system which is in the FMC, but runs over the ACARS network. The ATS datalink functions are carried out in the FMC. The ACARS and ATN functions are carried out in the CMU.

ACARS can connect to these components of other systems, if applicable:

- Audio control panel to signal the flight crew of incoming ACARS messages requiring flight crew attention.
- HF transceiver to transmit to and receive data from the ground.
- Printer to print ACARS reports and messages.

- Proximity switch electronics unit (PSEU) to send discrete signals for out, off, on and in (OOOI) events.
- Remote electronics unit (REU) to distribute the chime annunciation and/or light annunciation signals.
- Satellite data unit (SDU) to transmit to and receive data from the ground.
- VHF transceiver to transmit to and receive data from the ground.

ACARS can also connect to these systems to upload information from airline operations or download information to airline operations, if applicable:

- Data loader control panel
- Flight management computers
- Network file server.

The datalink activation occurs when the CMU connects to the CVR by ARINC 429 data buses. This lets the CVR record the datalink messages from the CMU.

### COMMUNICATIONS MANAGEMENT UNIT (CMU)

The communications management unit (CMU) is an ARINC 758 Characteristic Line Replaceable Unit (LRU) that receives the uplink data and controls the transmission of downlink data to and from the VHF transceiver.

The CMU does these tasks:

- Monitors input signals
- Formats uplink messages
- Monitors uplink and downlink data to make sure that they are correct
- Decodes downlink messages
- Controls the mode of operation
- Controls data transmission
- Gives acknowledged/not acknowledged response
- Tunes and controls a VHF radio
- Sends data to printer when commanded (if installed)

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## ACARS - GENERAL DESCRIPTION

- Monitors system operation.

The CMU processes only uplink messages that come with the airplane registration code. This same code also goes on all downlink messages to identify the airplane.

### AIRCRAFT PERSONALITY MODULE (APM)

The Aircraft Personality Module holds non-volatile aircraft configuration (ACARS installation configuration) data so that the CMU can be replaced without reprogramming or re-configuring the replacement CMU.

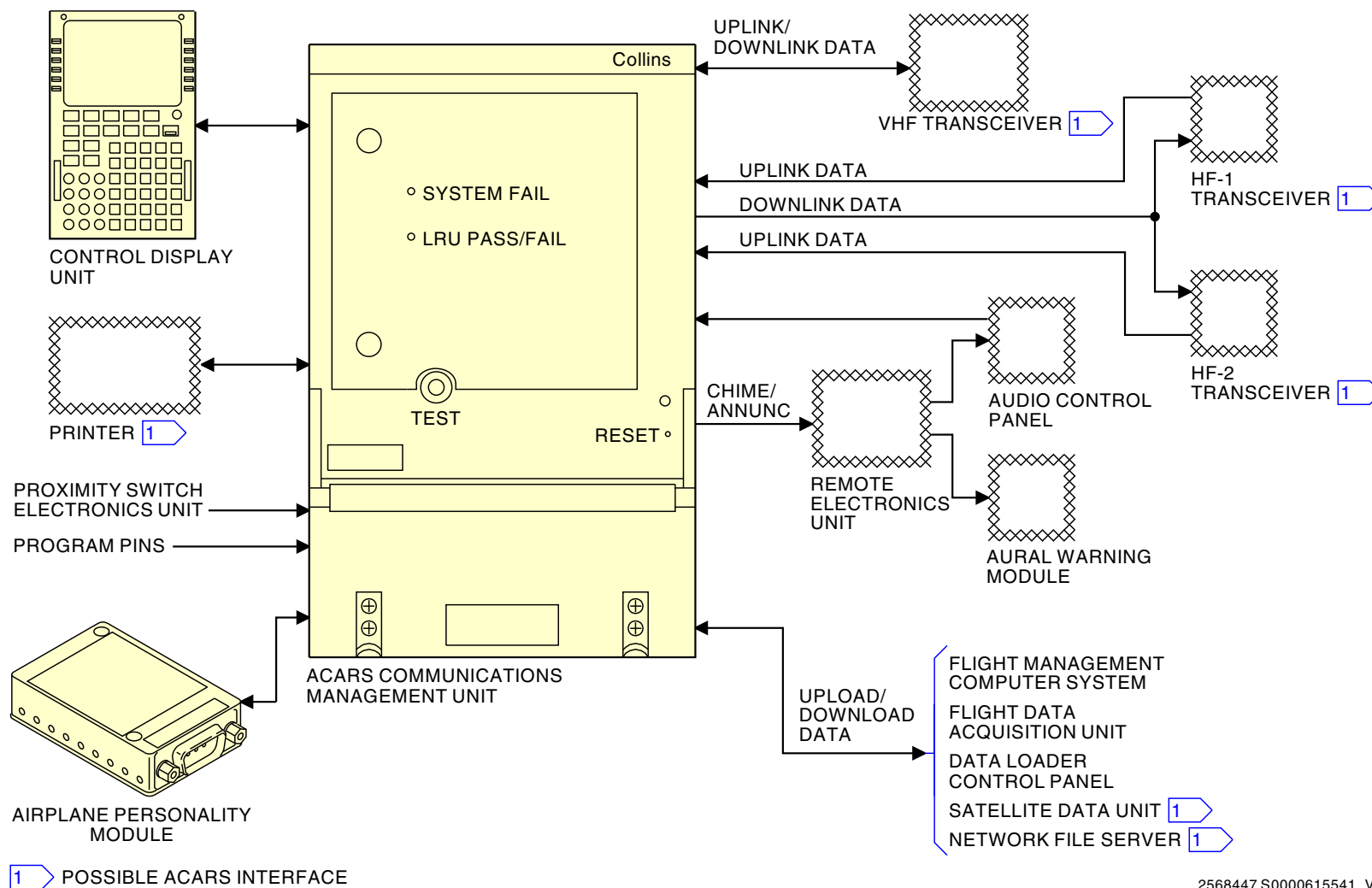
The APM has no external controls or indications. The APM can be programmed through the CDU, if required.

### ACARS-VHF 3

The VHF-3 radio provides the ACARS CMU the data communications link through a RF signal to ground stations.

The Frequency of the data communication is controlled by the CMU. The CMU automatically determines the communication frequency by the aircraft location data provided from the on board navigation system or the frequency can be manually selected by flight crew through CDU.

# ACARS - GENERAL DESCRIPTION



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## ACARS - GENERAL DESCRIPTION

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## ACARS - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS

### Electronic Equipment Compartment

The ACARS CMU is on the E4-1 shelf.

#### **SIA 001-014**

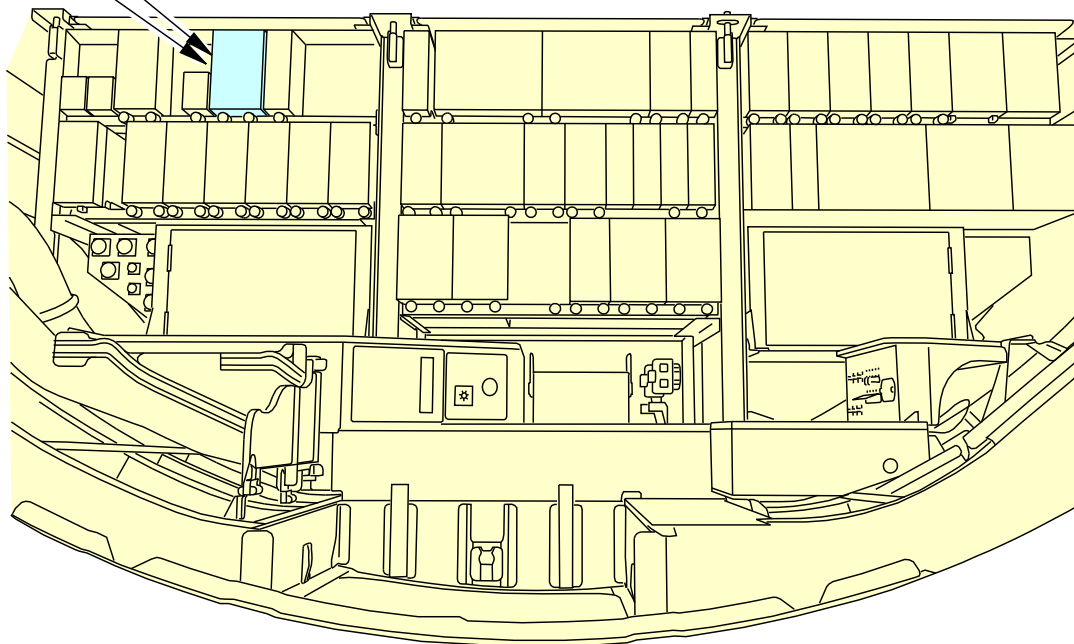
The ACARS airplane personality module (APM) is on the E4-1 shelf behind the ACARS CMU.

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## ACARS - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS

- E4-1 SHELF
- ACARS CMU
- APM  
(BEHIND CMU)



**ELECTRICAL AND ELECTRONICS COMPARTMENT  
(VIEW IN THE AFT DIRECTION)**

## ACARS - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS

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## ACARS - POWER, CALL, AND COMMUNICATION INTERFACES

### General

The ACARS CMU receives this data:

- Uplink data from ground stations
- Digital data from system components
- Discretes from sensors.

After the CMU processes the received data, the CMU sends this data:

- Downlink data to ground stations
- Digital data to user systems.
- When the CPDLC system receives a message, it decodes the data. The CPDLC determines the urgency of the message, the crew alert requirements, and the response requirements. The requirements determine system behavior such as the message display, queuing, visual and aural triggers, and response messages. The CPDLC system gives a means to encode messages for the transmission, a means to log and recall messages, and gives message condition indications.

### Power

The ACARS CMU receives 115v ac from transfer (XFR) bus 1.

The ACARS CMU also receives 28v dc from the hot battery bus.

### Call Interface

An uplink message tells the flight crew there is an ACARS message. When a message comes, the ACARS CMU gives these indications:

- Chime from the aural warning module
- VHF 3 call light on the audio control panels.

### Communications Interfaces

All datalink operation is controlled by ARINC 429 messages that the CMU transmits to, and receives from, the VHF-3 transceiver.

The ACARS CMU sends and receives this data from the VHF transceiver:

- Frequency to tune the VHF transceiver
- Downlink messages to the VHF transceiver
- Uplinked messages from the VHF transceiver.

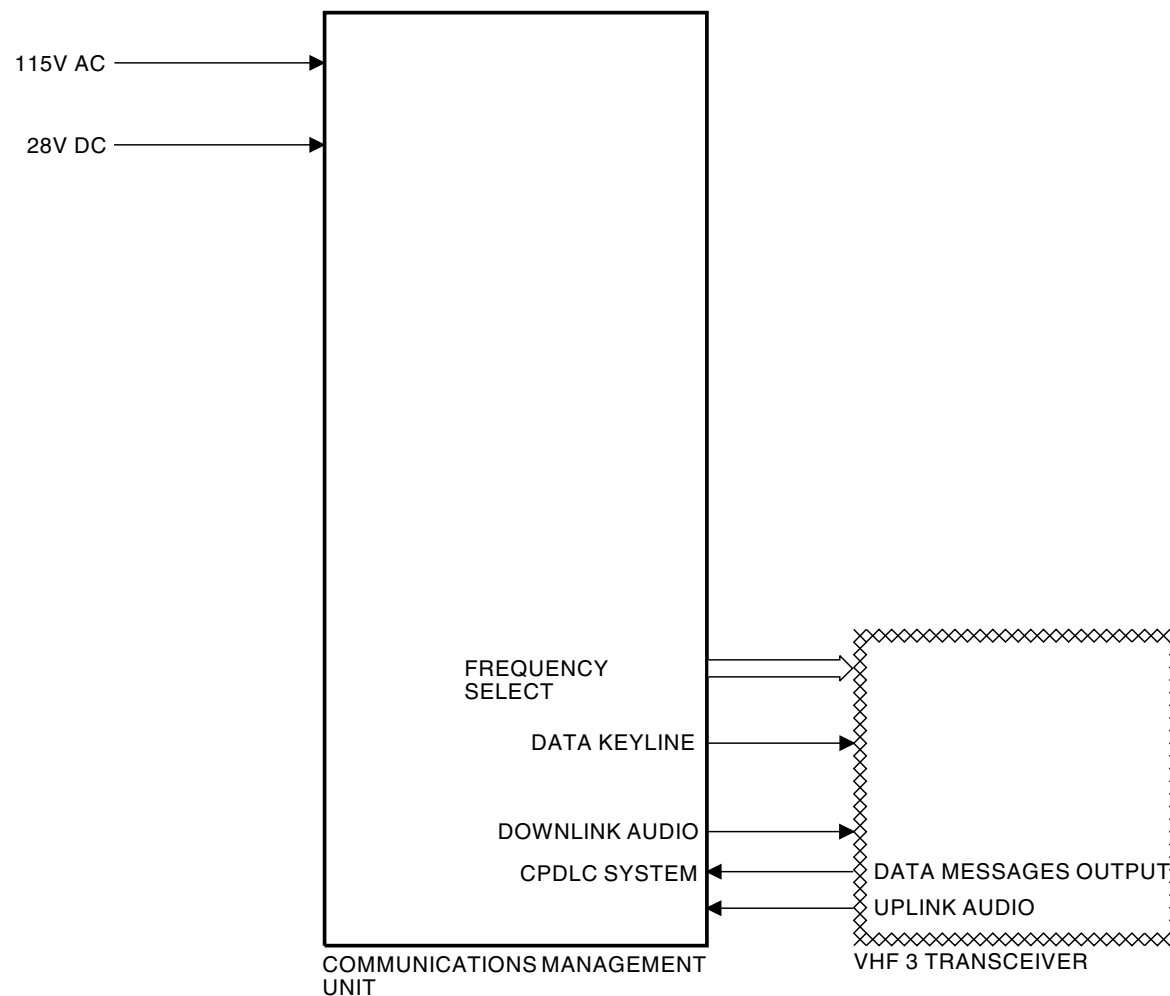
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## ACARS - POWER, CALL, AND COMMUNICATION INTERFACES



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## ACARS - POWER, CALL, AND COMMUNICATION INTERFACES

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**ACARS - DISCRETE INTERFACES****Proximity Switch Electronics Unit**

The ACARS CMU receives analog discretes from the proximity switch electronics unit (PSEU). These discretes determine the out, off, on, and in (OOOI) times. The ACARS sends standard reports at the OOOI times. These discretes supply the status for these components:

- Air/ground sensor
- Parking brake
- Electronics equipment compartment door
- Forward and aft cargo doors
- Forward and aft service doors
- Forward and aft entry doors.

**SIA 001-014****Airplane Personality Module**

The APM receives power from the ACARS CMU. The APM sends the registration code and airplane identification code to the CMU.

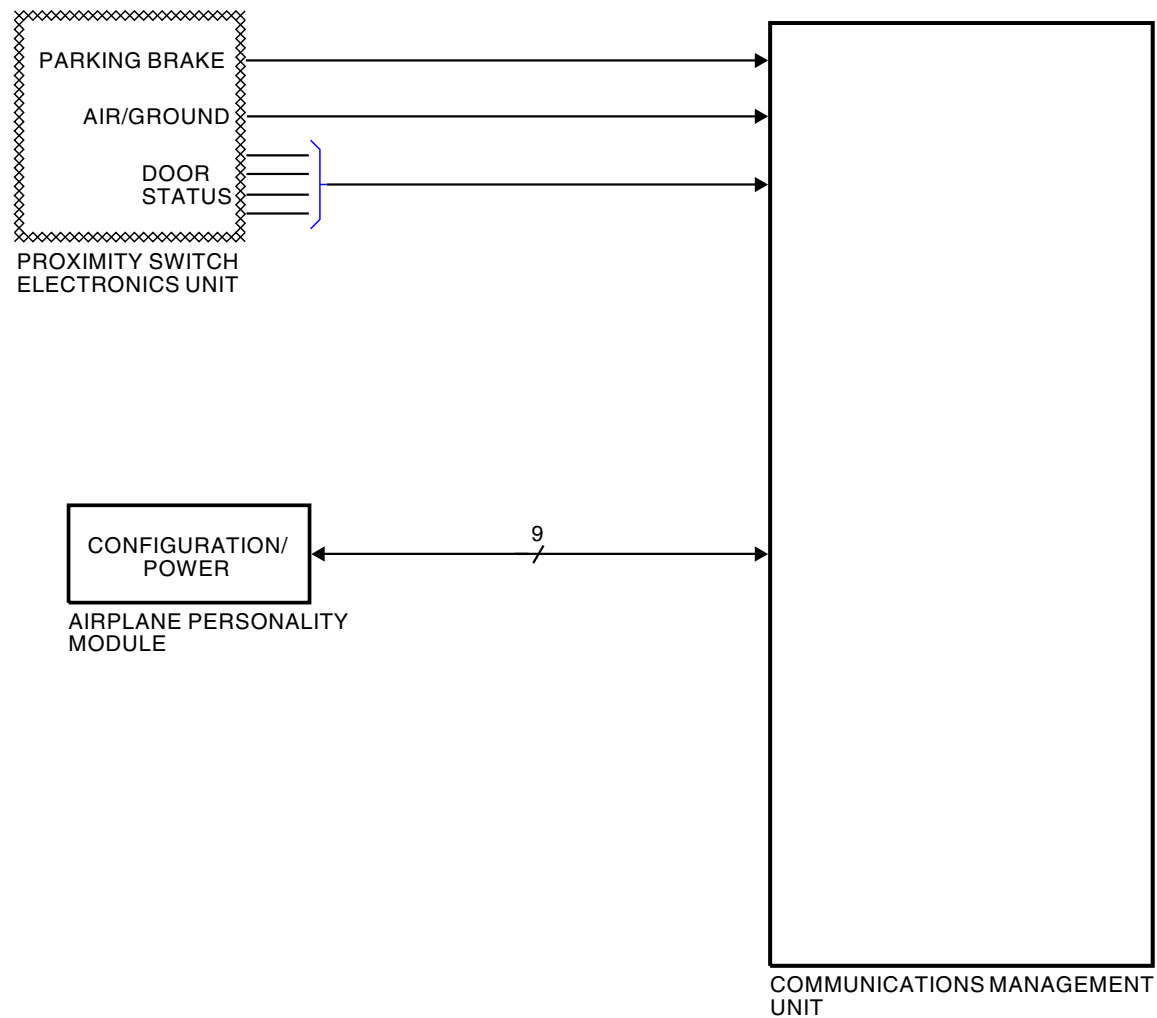
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### ACARS - DISCRETE INTERFACES



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### ACARS - DISCRETE INTERFACES

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## ACARS - DIGITAL INTERFACES

### Digital Inputs

The ACARS CMU gets these digital inputs:

- Data entries and menu selections from the CDUs
- Route and airplane flight data from the FMCS
- Status data from the printer
- Report data for downlink from the FDAU
- Software loads from the data loader control panel.

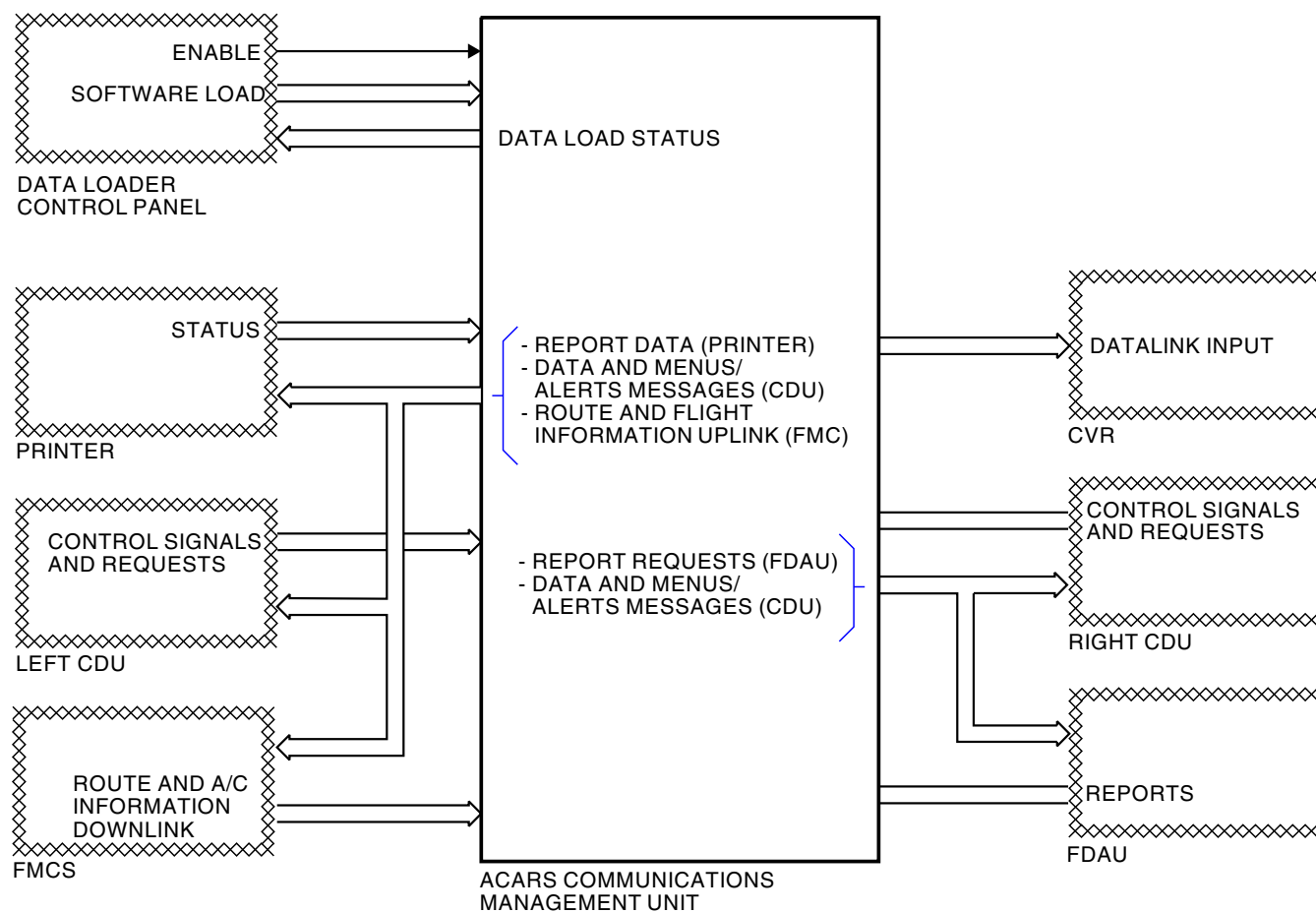
### Digital Outputs

The ACARS CMU supplies this digital data:

- Data and menus to the CDUs and alert messages for the scratch pad
- Route and flight data uplink to the FMC
- Report data to the printer
- Report request uplink to the FDAU
- Status to the data loader control panel.
- Datalink messages to the CVR.

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## ACARS - DIGITAL INTERFACES



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## ACARS - DIGITAL INTERFACES

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**ACARS - COMMUNICATIONS MANAGEMENT UNIT****Purpose**

The ACARS Communications Management Unit (CMU) receives the uplink data and controls the transmission of downlink data to and from the VHF transceiver.

You push a small rod through the RESET hole to push the reset switch. This causes the CMU to do a power up test.

**SIA ALL**

**General**

The CMU does these tasks:

- Monitors input signals
- Formats downlink messages
- Monitors downlink data to make sure it is correct
- Monitors uplink messages to make sure they are correct
- Decodes uplink messages
- Controls the mode of operation
- Controls data transmission
- Gives acknowledged/not acknowledged response
- Tunes and controls a VHF radio
- Sends data to printer when commanded
- Monitors system operation.
- Lets the CVR record the datalink messages that the CMU sends.

The CMU processes only uplink messages that come with the airplane registration code. This same code also goes on all downlink messages to identify the airplane.

**SIA 001-014**

**Front Panel Control and BITE Indications**

BITE operates continuously. The TEST switch causes the CMU to do a BITE test.

The SYSTEM FAIL LED comes on if the ACARS system fails.

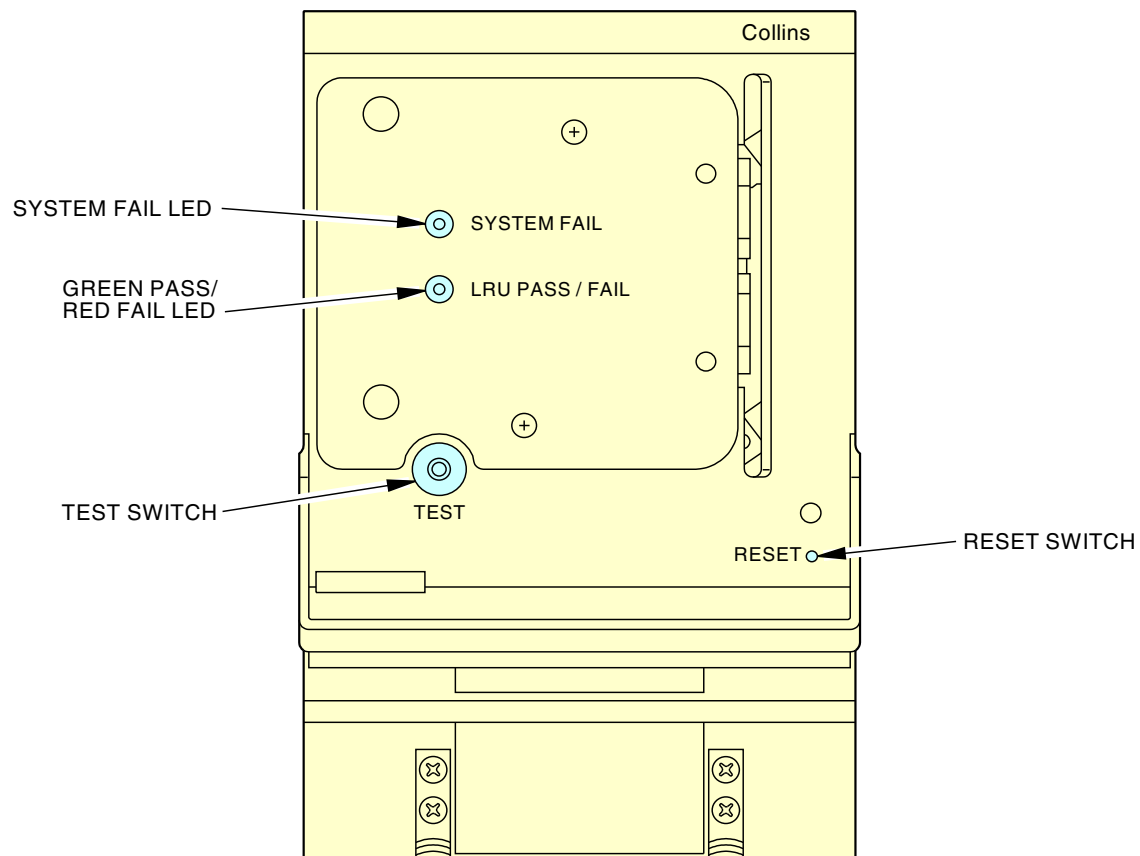
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## ACARS - COMMUNICATIONS MANAGEMENT UNIT



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## ACARS - COMMUNICATIONS MANAGEMENT UNIT

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## ACARS - AIRPLANE PERSONALITY MODULE

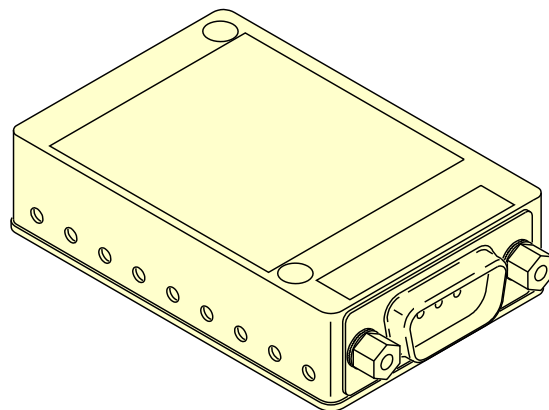
### Purpose

The ACARS APM has the airplane's identification and registration codes in memory.

### General

The APM sends the unique identification to the ACARS communication management unit when the CMU gets power. You load the airplane identification and registry into the APM with the control display unit.

# ACARS - AIRPLANE PERSONALITY MODULE



## ACARS - AIRPLANE PERSONALITY MODULE

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**EFFECTIVITY**  
**SIA 001-014**

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**ACARS - OPERATION - 1****Purpose**

The flight management computer system control display unit (CDU) gives you an interface with the ACARS system. It lets you enter, send, and review downlink/uplink data. The CDU shows ACARS messages in the scratch pad.

**Features**

The CDU has a MENU key that selects the menu. From the menu page, you can select the flight management computer system (FMC), ACARS, or the flight data acquisition unit (DFDAU). To make the system active on the CDU, push the line select key (LSK) adjacent to the system prompt.

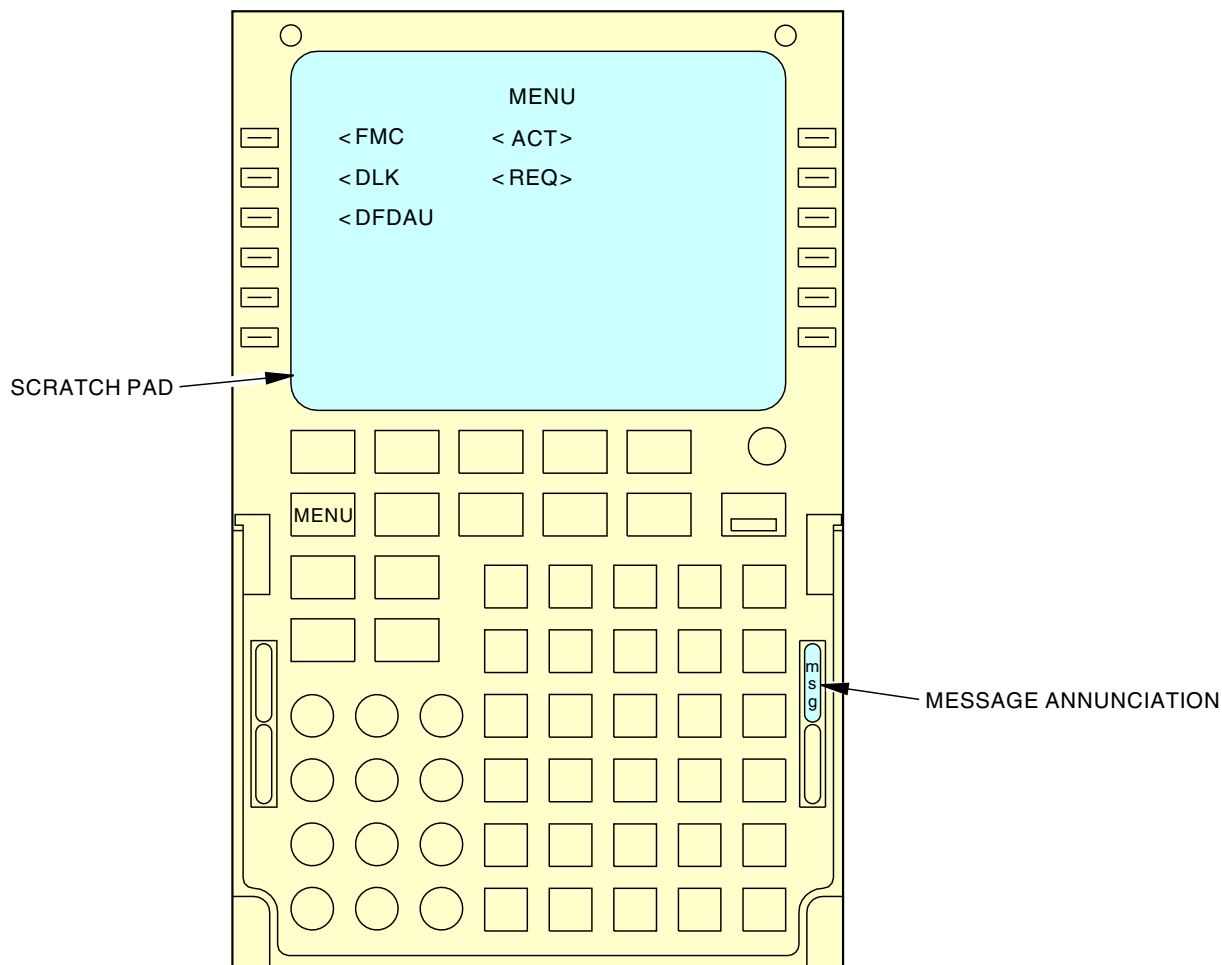
If the ACARS is in control of the CDU or if the FMC receives an ACARS message, the MSG annunciation comes on when the CDU receives an ACARS message. The message shows in the scratch pad.

These are the ACARS messages:

- ACARS UPLINK - ACARS has received an uplink message
- ACARS NO COMM - no ACARS link available
- ACARS VOICE - ACARS VHF radio set to voice
- ACARS CALL - ground station requests voice-go-ahead
- ACARS VOICE BUSY - ACARS VHF radio voice circuits are busy
- ACARS MU FAIL - ACARS management unit failure
- PRINTER UPLINK - uplink message for printer
- PRINTER FAIL - ACARS reports printer failure
- ACARS ALERT - ACARS requires flight crew action.

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# ACARS - OPERATION - 1



CONTROL DISPLAY UNIT

## ACARS - OPERATION - 1

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## ACARS - OPERATION - 2

MAIN MENU

**NOTE:** The ACARS menus and prompts described are examples. Airline specific ACARS database software may change or remove the prompts described.

Push the line select key (LSK) next to ACARS to connect the CDU to ACARS. These pages are available for maintenance:

**SIA 001-014**

- ACARS MENU
- TECHNICAL MENU.
- ACARS MAINTENANCE.

**SIA ALL**

To exit from ACARS, push the CDU MENU key.

**SIA 001-014**ACARS MENU

The ACARS menu shows when you push the ACARS LSK on the MENU page.

Use the ACARS menu to get access to other ACARS pages.

The flight crew use the air traffic services (ATS) and airline operations control (AOC) selections to operate ACARS.

ACARS TECHNICAL MENU

You use the technical menu page to get access to the maintenance functions. The flight crew can use the technical menu to change the VHF radio to voice or data and to tune the radio.

System Configuration

When you select LSK 1L <SYSTEM CONFIG, the CDU page shows this information on three pages:

- Hardware and software part numbers (page 1)
- Software module part numbers (page 2)
- Database module part numbers (page 3).

Link Status

When you select LSK 2L <LINK STATUS, the CDU shows the ACARS link status page. From this page you can perform the link tests on VHF, SATCOM (if installed) or HF (if HF is installed and HF datalink is enabled).

The VHF line shows the state and status of the VHF radio. You can do the link test when you select the LSK adjacent to the \*TEST prompt under the VHF line.

The SATCOM line shows the state and status of the SATCOM data link. You can do the link test when you select the LSK adjacent to the \*TEST prompt under the SATCOM line.

The HF line shows the state and status of the HF data link. You can do the link test when you select the LSK adjacent to the \*TEST prompt under the HF line.

The STATE area shows:

- VOICE - the VHF radio is in the voice mode
- SCAN - the MU is searching for a data link
- IN COMM - the system is in the data link mode
- AUTOTUNE - the system is automatically tuned to an alternate frequency.
- LOGD OFF - The airplane is not logged on to the SATCOM or HF networks.

The STATUS area shows:

- IDLE - no data link is available

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## ACARS - OPERATION - 2

## SIA 001-014 (Continued)

- UP MSG - processing uplink message
- DOWN MSG - transmitting downlink message.

When you push the LSK adjacent to the \*TEST prompt under the VHF, SATCOM or HF line, the link test starts. If the link test is good, you will see the VHF-C CALL lamp come on and a chime sound for the VHF link test. For the SATCOM and HF link tests, there may be a chime sound, but no lamp will come on.

When you select VHF DATA CNTRL, the CDU shows the radio control page. If the VHF radio is in the voice mode, the prompt shows as <VHF VOICE CNTRL.

Radio Control

You use the radio control page to change the VHF radio from the voice mode to the data mode or from the data mode to the voice mode. Use LSK 1R to change the mode. In the voice mode, use LSK 2R to tune the radio.

In the data mode, data link service providers (DSP) give the frequencies for ACARS coverage. The flight crew can select the DSP from this page or from the AOC pages. Line 2L shows the current data frequency.

Select LSK 4L to start the link test.

Select LSK 5L to select a data link service provider.

Technical Menu

You also use the technical menu to do a check of the status of LRUs connected to ACARS. The PERIPHERALS selection (LSK 3L) selects this check. There is a list of the LRUs and whether they are PRESENT (connected) or ABSENT (not connected) and the LRU status (OK or FAIL).

The CLOCK SET menu lets you set the ACARS clock. These are the page displays and the selections:

- Present ACARS time and date (line 1)
- SET TIME - SET DATE - put the time/date in the scratch pad and line select to the proper position

- GROUND REQ - requests an uplink message from the ground station with the time
- SHIP - updates the ACARS clock with the airplane clock time and date (if connected)
- GPS - updates the ACARS clock with the global positioning system clock time and date (if installed).

The RELAYS test menu lets you do a test of two relays in the ACARS MU. These are the relays:

- Relay 1 (LSK 3L) does a test of the chime signal from the aural warning module
- Relay 2 (LSK 3R) does a test of the call light on the SELCAL control panel.

The PGM PINS menu shows the program pins connected to the ACARS MU. The program pins selections come from the program switch module.

DISC IN (LSK 3R) and DISC OUT (LSK 4R) show the status of discretes coming in to ACARS and going out of ACARS.

Select PASSWORD to enter a password and to change/view protected menus. These are the protected menus:

- OVERRIDES - changes the registration number, airline and airline identification. This information comes from the program switch module.
- MSG TRACE - message trace - lets the user trace messages internal to the MU. This menu is used by shop maintenance personnel.
- VHF SCAN - lets the user change the data link service providers that the MU will use for ACARS.

Return

When you select RETURN from any menu, you go to the previous, higher level menu.

## SIA ALL

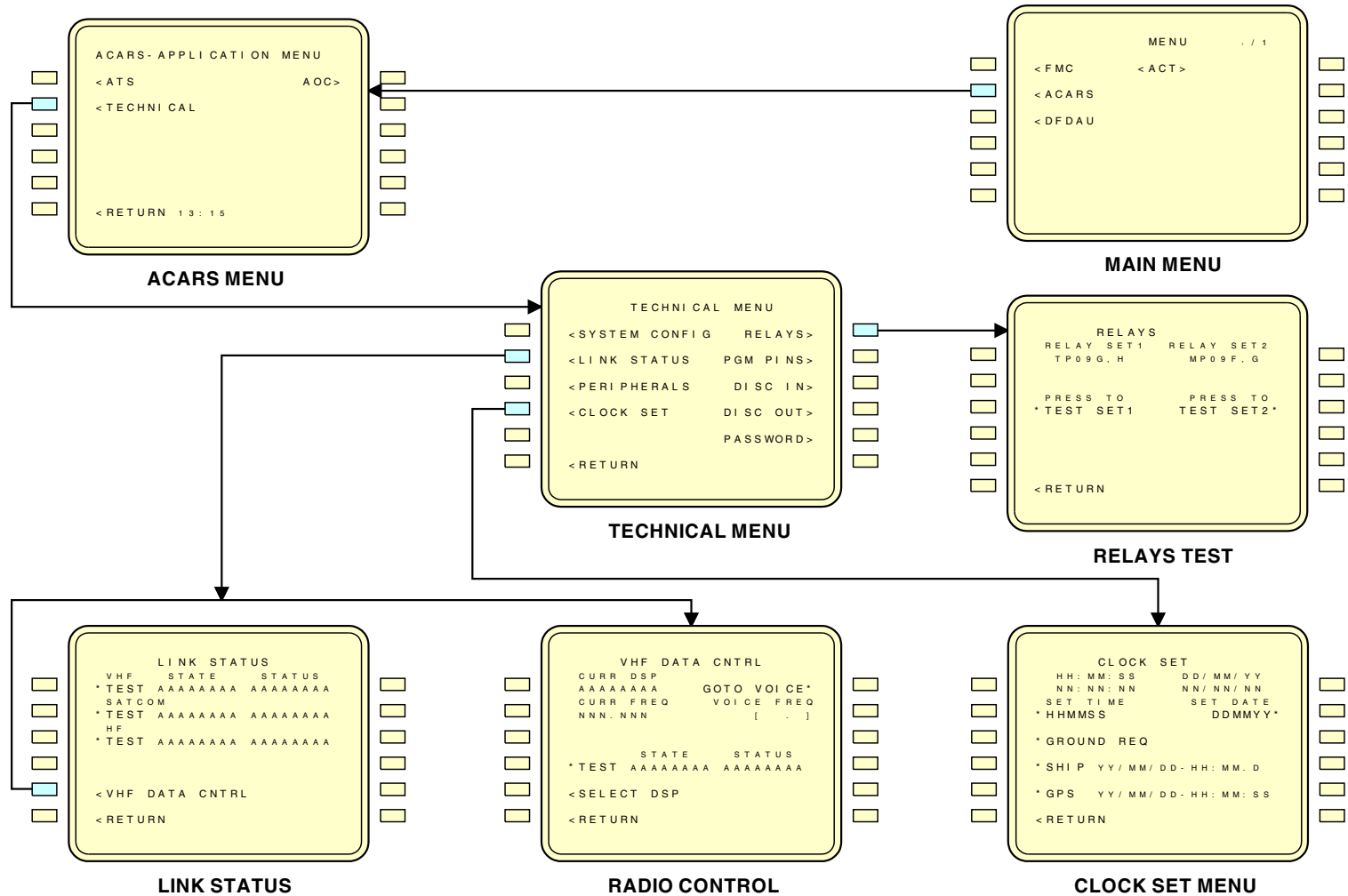
23-27-00

| EFFECTIVITY |  |
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| SIA ALL     |  |

D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details

## ACARS - OPERATION - 2



2547674 S0000606052\_V1

## ACARS - OPERATION - 2



## ACARS - OPERATION - DOWNLINK REPORTS

### General

There are many ACARS reports. Generally, these reports use short codes to decrease the cost of satellite or ground station use.

All ACARS reports have header information followed by the report data.

### Report Header

Typically, the header includes this information:

- Report type
- Flight number
- Flight origin and destination
- Registration number
- Date and time sent.

### Report Data

An example is the IN report. The ACARS MU automatically sends this report when the airplane gets to the gate.

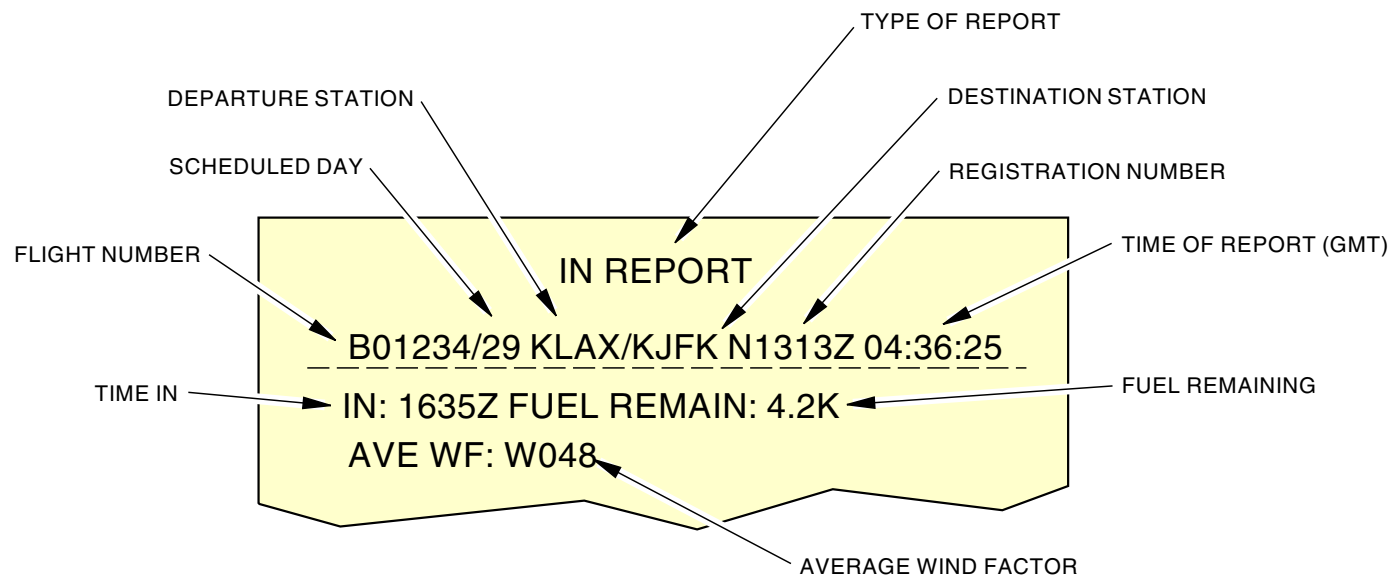
The IN report typically includes:

- IN event time
- Remaining fuel
- Average wind factor
- Optional scratchpad text.

| EFFECTIVITY |  |
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| SIA ALL     |  |



ACARS - OPERATION - DOWNLINK REPORTS



2368716 S00061517971\_V1

ACARS - OPERATION - DOWNLINK REPORTS

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23-27-00-013

SIA ALL

EFFECTIVITY

D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details

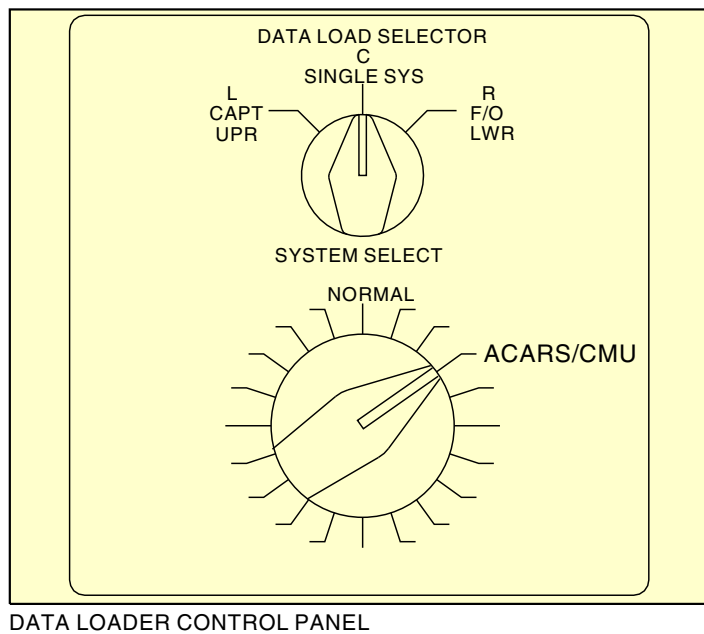
**ACARS - TRAINING INFORMATION POINT - SOFTWARE LOADING****ACARS Software**

You can load software and data base information into ACARS with an airborne data loader or a portable data loader. To load the software, do these tasks:

- Make sure the ACARS system has power
- Set the SYSTEM SELECT switch to ACARS/CMU
- If the ACARS communications management unit is in the left position, set the top switch to L
- If the ACARS communications management unit is in the right position, set the top switch to R
- Put the first data disk into the data loader disk drive
- After the last disk is complete, set the data loader control panel switch to NORM.

| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |

## ACARS - TRAINING INFORMATION POINT - SOFTWARE LOADING



## ACARS - TRAINING INFORMATION POINT - SOFTWARE LOADING

2368717 S00061517973\_V1

23-27-00-014

| SIA ALL | EFFECTIVITY   |
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ECCN 9E991 BOEING PROPRIETARY - See title page for details

**23-27-00**



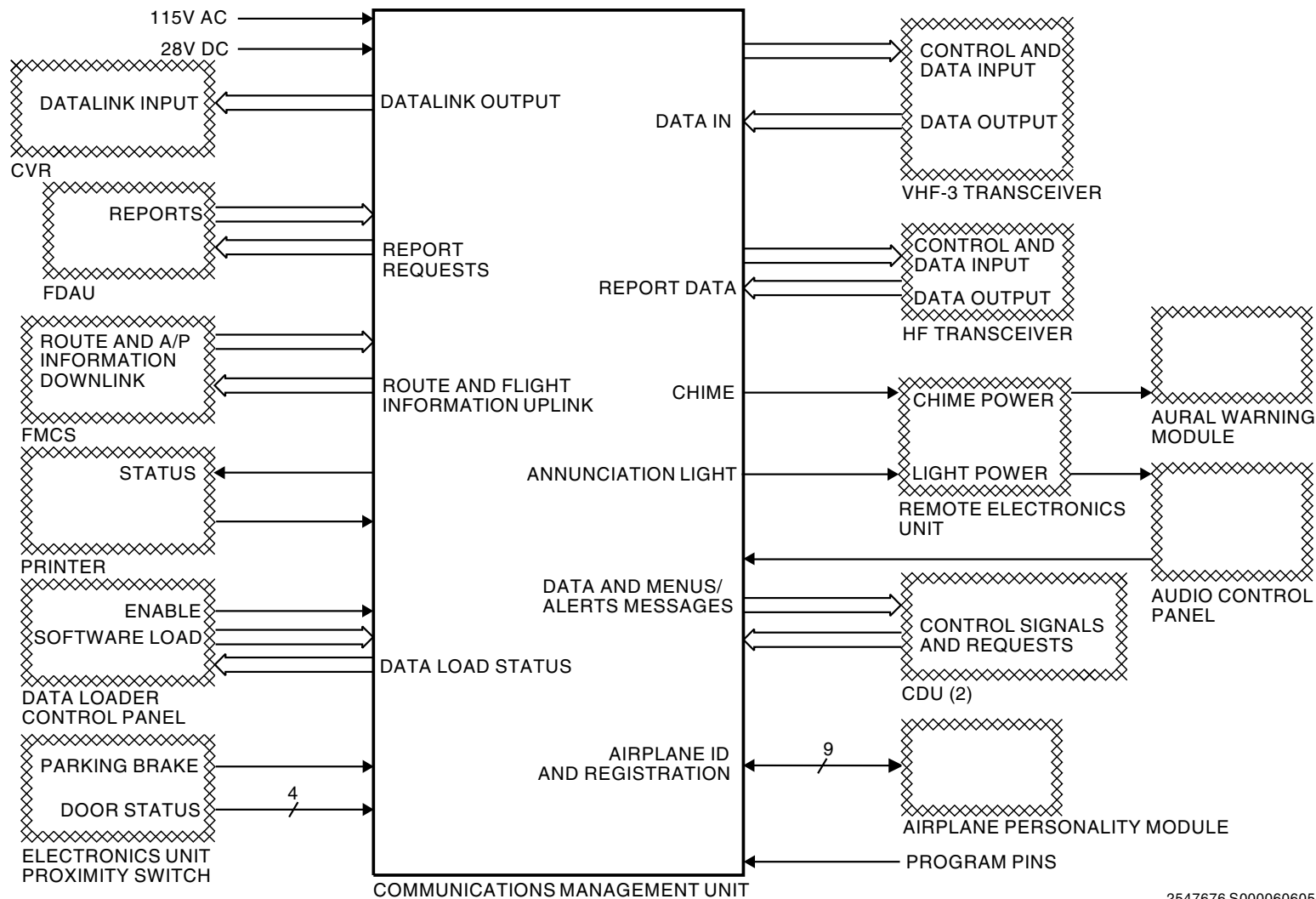
## ACARS - SYSTEM SUMMARY

### General

This page is for reference purposes.

| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |

# ACARS - SYSTEM SUMMARY



2547676 S0000606054\_V1

## ACARS - SYSTEM SUMMARY

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D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details



## SELECTIVE CALLING SYSTEM - INTRODUCTION

### Purpose

The Selective Call System (SELCAL) supplies the flight crew with indications of calls that come in from the airline ground stations. It is not necessary for the pilots to continuously monitor the company communications channels.

Airline radio networks supply communication between the ground stations and airplanes. For SELCAL operation, each airplane has a different four-letter code. Each letter in the code equals a different audio tone. The ground stations send the applicable tones to call an airplane.

### Abbreviations and Acronyms

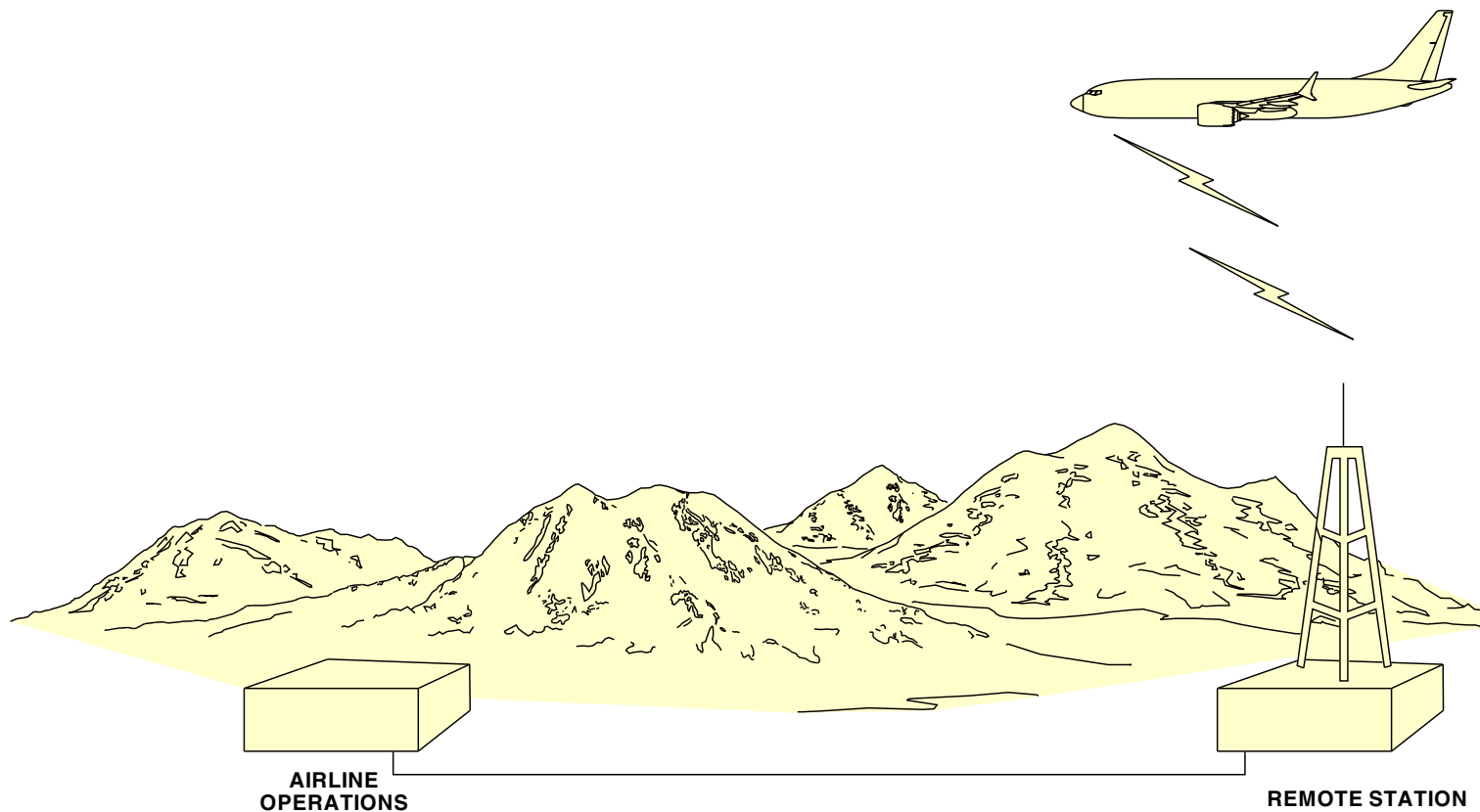
- ACP - Audio Control Panel
- comm - Communication
- REU - Remote Electronics Unit
- SELCAL - Selective Call System
- HF - High Frequency
- VHF - Very High Frequency

**23-28-00**

| EFFECTIVITY |  |
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| SIA ALL     |  |

D633AM102-SIA

## SELECTIVE CALLING SYSTEM - INTRODUCTION



2368719 S00061517979\_V1

## SELECTIVE CALLING SYSTEM - INTRODUCTION

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| SIA ALL | EFFECTIVITY   |
|---------|---------------|
|         | D633AM102-SIA |

ECCN 9E991 BOEING PROPRIETARY - See title page for details



## SELCAL SYSTEM - GENERAL DESCRIPTION

### General

Each airplane has a different Selective Call System (SELCAL) code. A ground station transmits this code to communicate with the airplane. When the airplane receives its SELCAL code, flight compartment indications come on to tell the flight crew.

### System Components

The selective calling system has these components:

- SELCAL decoder
- SELCAL program switch module
- SELCAL aural warning relay

The SELCAL decoder unit monitors the radio systems for audio tones. If the tones are the same as the code from the program switch module, the decoder sends a signal to the control panel to turn on the alert light.

The SELCAL decoder unit also sends a ground to energize the aural warning relay. The energized relay sends 28V DC to the aural warning module through the Remote Electronics Unit (REU). This tells the module to make the single high/low chime for the aural alert.

The SELCAL program switch module gives the airplane its SELCAL code. When power is applied to the airplane, the program switch module sends the SELCAL code to the SELCAL decoder.

### External Interface

The SELCAL connects with these components:

- Very High Frequency (VHF) transceivers
- High Frequency (HF) transceiver(s)
- Audio Control Panel
- REU
- Aural Warning Module

The transceivers receive the SELCAL audio tones from the ground station. The transceivers send the received audio to the SELCAL decoder.

When the SELCAL decoder unit receives a call, it sends ground signals to the Audio Control Panels (ACP). The ground signals turn on the call light for the transceiver that receives the call. Push the control wheel mic switch or the Audio Control Panels (ACP) RT/IC switch to send a reset signal from the REU to turn off the call light.

The SELCAL aural warning relay sends the REU 28V DC. The REU sends the 28V DC to the aural warning module. The aural warning module makes a high/low chime signal for the aural alert.

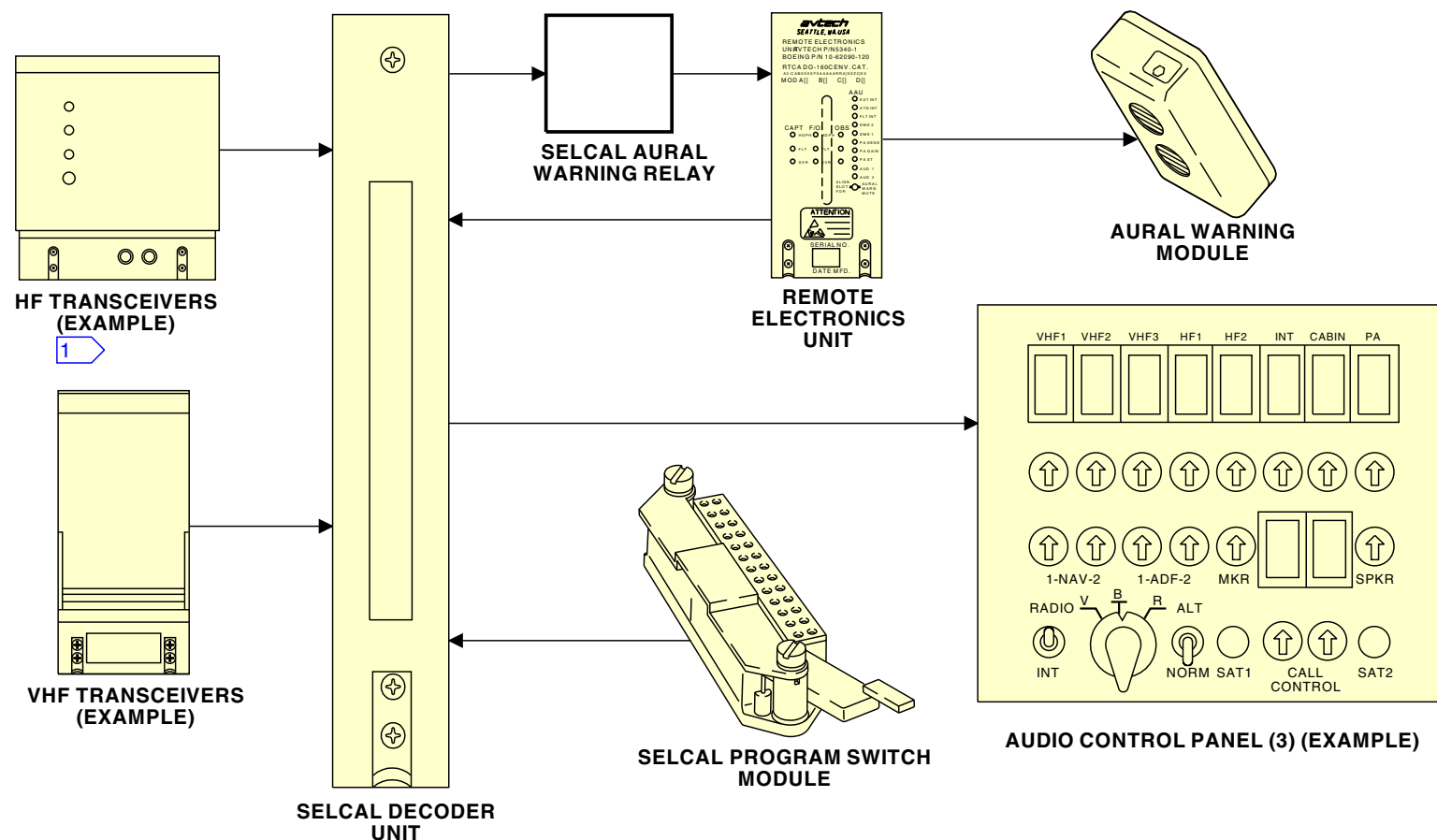
**23-28-00**

SIA ALL EFFECTIVITY

D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details

# SELCAL SYSTEM - GENERAL DESCRIPTION



## NOTE:

1 NOT INSTALLED ON ALL AIRCRAFT.

2368720 S00061517981\_V1

# SELCAL SYSTEM - GENERAL DESCRIPTION

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SIA ALL

EFFECTIVITY

D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details



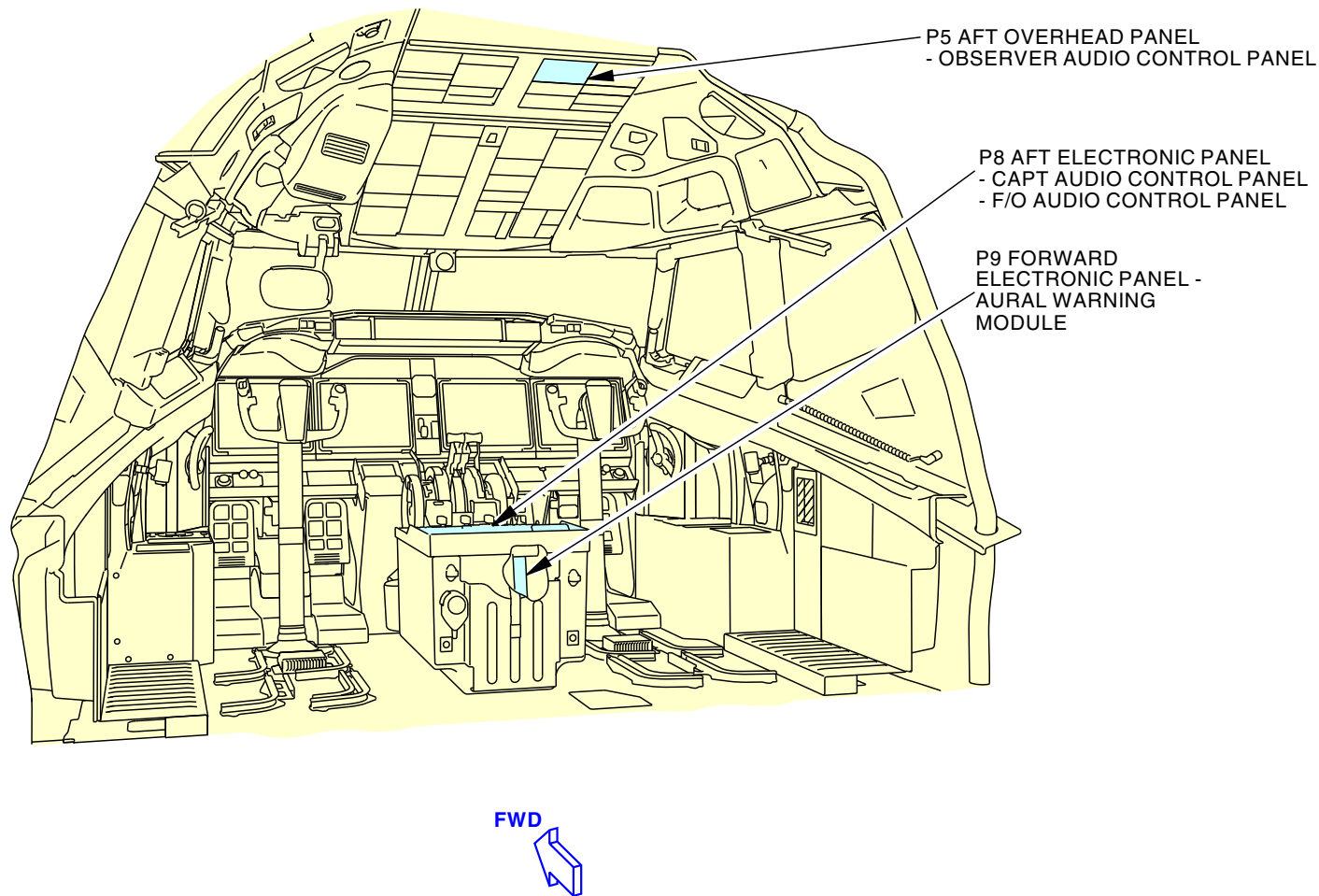
## SELCAL SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

### Audio Control Panel

The Audio Control Panels (ACP) are part of the flight interphone system. The captain and first officer Audio Control Panels (ACP) are on the P8 aft electronic panel. The observer Audio Control Panel (ACP) is on the P5 aft overhead panel.

| SIA ALL       | EFFECTIVITY |
|---------------|-------------|
| D633AM102-SIA |             |

## SELCAL SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS



2368721 S00061517983\_V3

## SELCAL SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

23-28-00-003

SIA ALL

EFFECTIVITY

**23-28-00**

D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details



## SELCAL SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS

### SELCAL Decoder

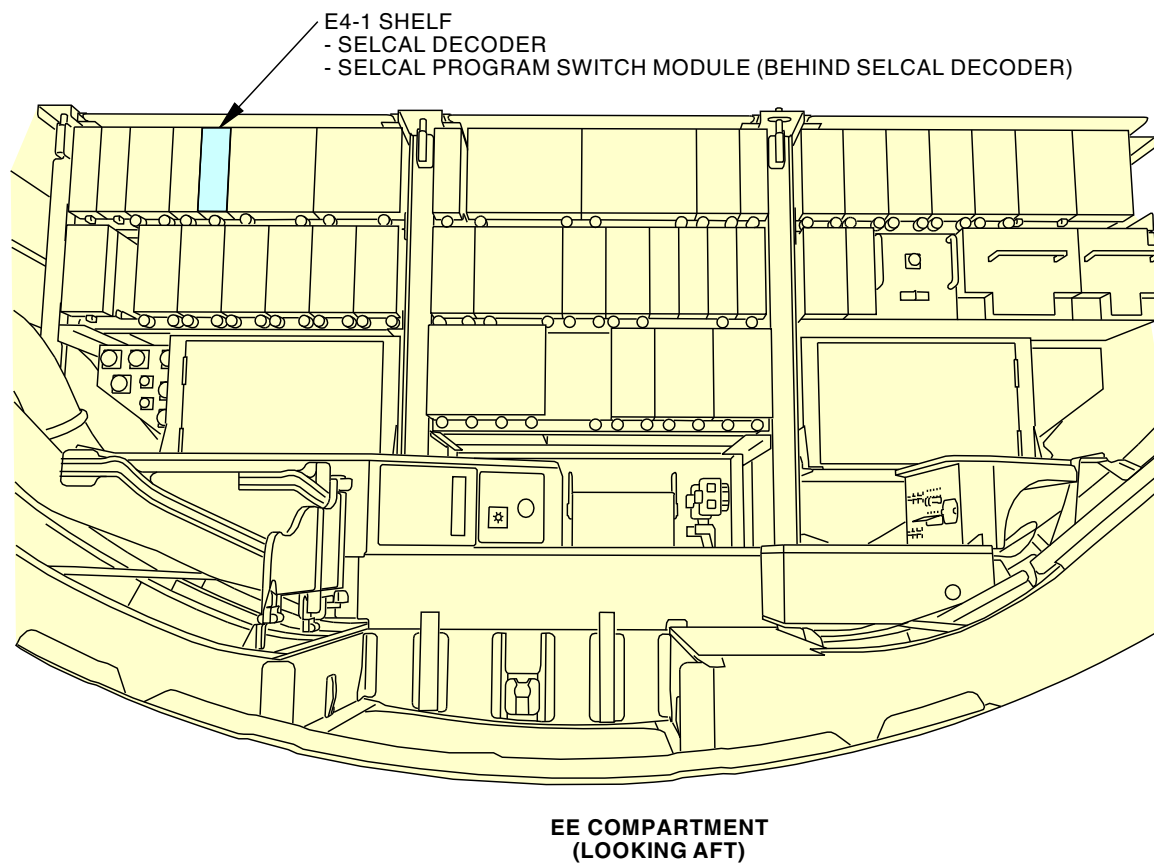
The Selective Call System (SELCAL) decoder is on the E-4 rack in the electronic equipment compartment.

### SELCAL Program Switch Module

The SELCAL program switch module is behind the SELCAL decoder on the E-4 rack.

| SIA ALL       | EFFECTIVITY |
|---------------|-------------|
| D633AM102-SIA |             |

## SELCAL SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS



2368722 S00061517985\_V1

## SELCAL SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS

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SIA ALL

EFFECTIVITY

**23-28-00**

D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details



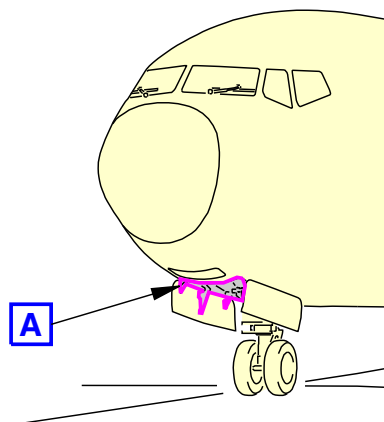
## SELCAL SYSTEM - NOSE WHEEL WELL COMPONENT LOCATION

### SELCAL AURAL WARNING Relay

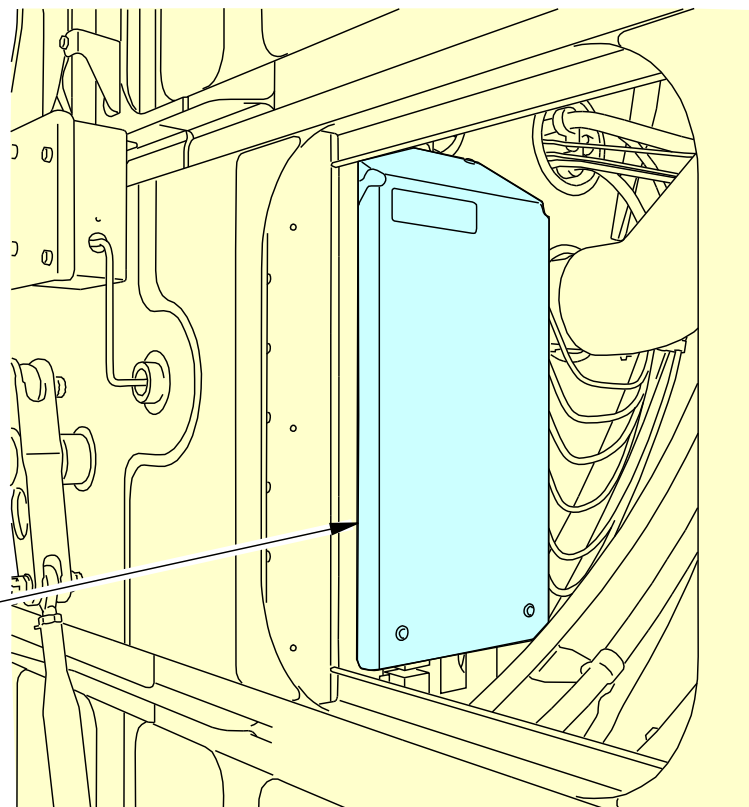
The Selective Call System (SELCAL) aural warning relay is on the left side of the nose wheel well on the J22 panel.

| SIA ALL | EFFECTIVITY   |
|---------|---------------|
|         | D633AM102-SIA |

## SELCAL SYSTEM - NOSE WHEEL WELL COMPONENT LOCATION



J22 PANEL  
- SELCAL AURAL WARNING RELAY



NOSE WHEEL WELL - LEFT SIDE  
(J22 ACCESS PANEL REMOVED)

**A**



2368723 S00061517987\_V1

## SELCAL SYSTEM - NOSE WHEEL WELL COMPONENT LOCATION

**23-28-00**



## SELCAL SYSTEM - INTERFACES

### Power

The 28V DC bus 1 supplies power to the Selective Call System (SELCAL) decoder.

### SELCAL Decoder Unit

The transceivers send received audio to the SELCAL decoder.

The SELCAL decoder unit tries to match the audio tones sent from the transceiver with the program switch module SELCAL code. If there is a match, then the decoder sends a call set discrete to the Audio Control Panels (ACP). The call set discrete is a ground signal that turns on the call light. There is a different call set discrete for each transceiver.

The Remote Electronics Unit (REU) sends a ground signal to the SELCAL decoder unit to reset the decoder channel. This ground signal is a call reset discrete. There is a different call reset discrete for each transceiver.

The SELCAL decoder unit supplies a ground signal to make a high/low chime in the flight compartment. The ground signal goes to the SELCAL aural warning relay. The energized relay sends a 28V DC signal through the REU to the aural warning module. The aural warning module makes a single high/low chime in the flight compartment.

### SELCAL Program Switch Module

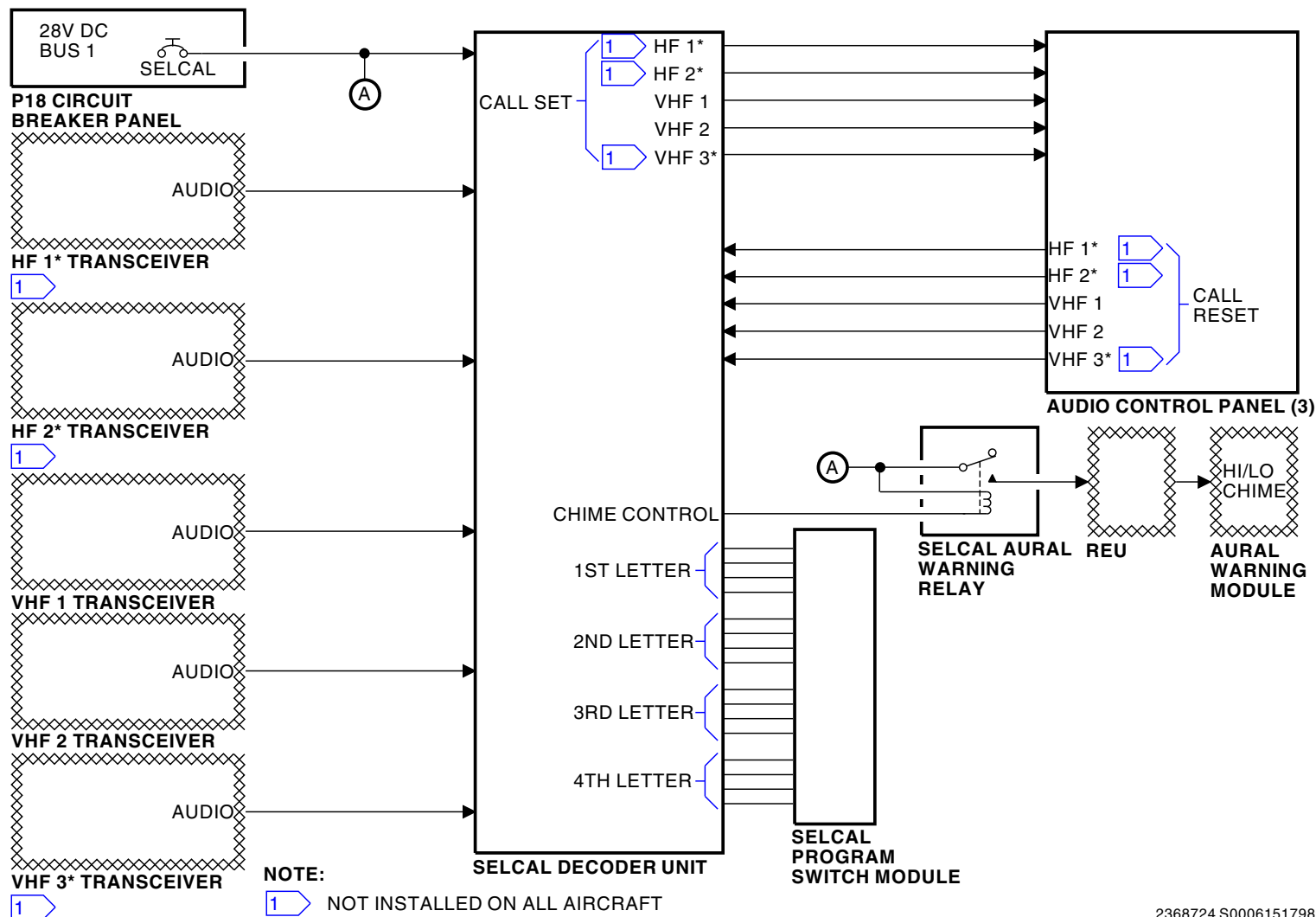
The SELCAL program switch module has 24 (16 active) switches. The switches are in groups of four. There are four letters in the SELCAL code. The position of the switches in each group identify one of the four SELCAL code letters. A switch in the ON position sends a ground signal to the decoder. A switch in the OFF position sends an open signal to the decoder.

**23-28-00**

| EFFECTIVITY |  |
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D633AM102-SIA

# SELCAL SYSTEM - INTERFACES



2368724 S00061517989\_V2

## SELCAL SYSTEM - INTERFACES

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| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |



## SELCAL SYSTEM - SELCAL DECODER UNIT

### Purpose

The Selective Call System (SELCAL) decoder unit does these functions:

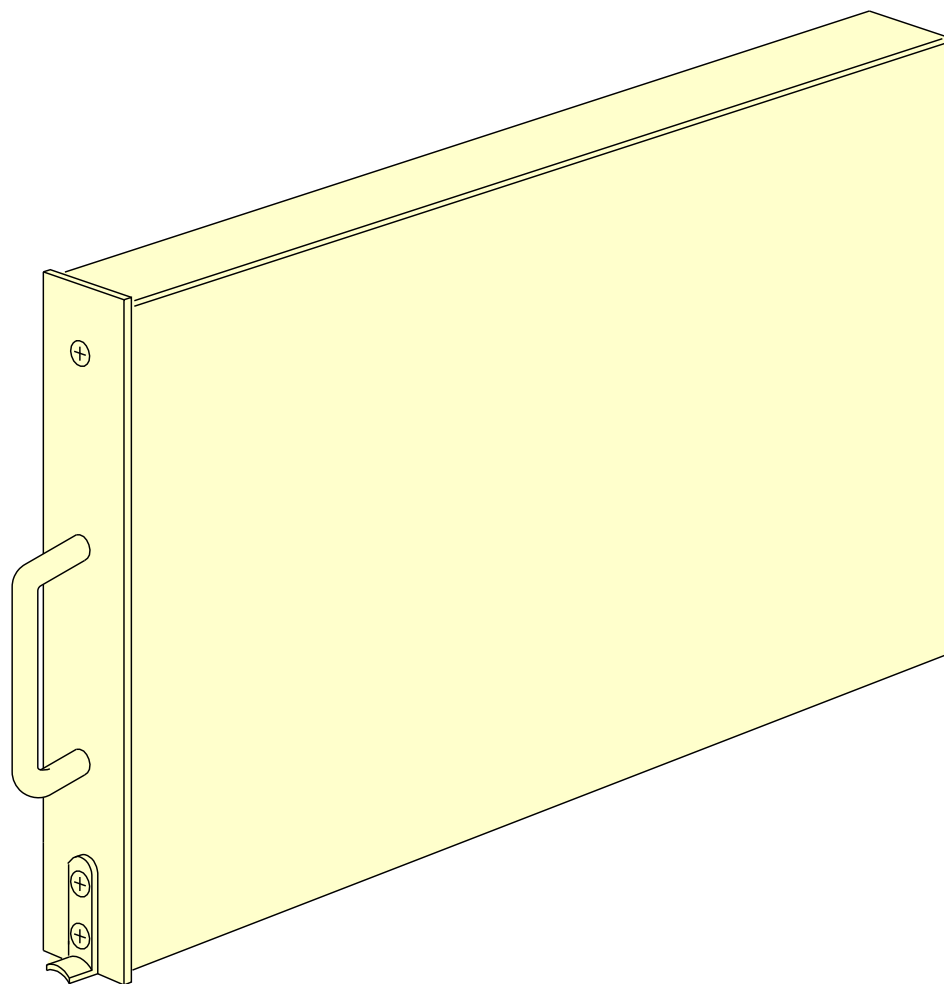
- Monitors audio from the Very High Frequency (VHF) communication transceivers
- Monitors audio from the High Frequency (HF) communication transceiver(s)
- Identifies the SELCAL signal that is the same as its code
- Causes flight compartment visual and aural indications when calls come in

### Controls

There are no lights or switches on the SELCAL decoder front panel.

| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |

# SELCAL SYSTEM - SELCAL DECODER UNIT



SELCAL SYSTEM - SELCAL DECODER UNIT

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| SIA ALL | EFFECTIVITY   |
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**23-28-00**



## SELCAL SYSTEM - SELCAL PROGRAM SWITCH MODULE

### Purpose

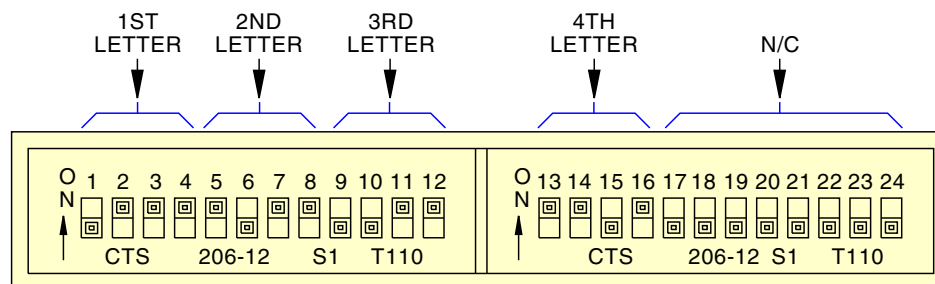
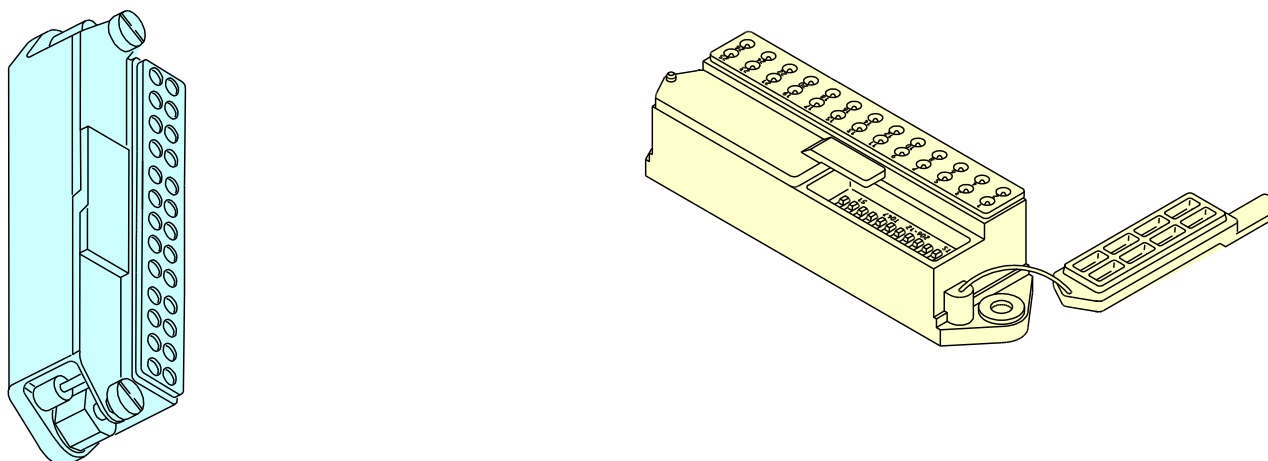
The Selective Call System (SELCAL) program switch module sets the airplane identification code.

Each dip switch that is up is in the ON position and sends a ground to the SELCAL decoder. Each dip switch that is down is in the OFF position and sends an open to the SELCAL decoder.

Each group of 4 dip switches sets one SELCAL letter. Four letters identify the airplane SELCAL code.

| EFFECTIVITY |  |
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| SIA ALL     |  |

### SELCAL SYSTEM - SELCAL PROGRAM SWITCH MODULE



2368726 S00061517993\_V1

### SELCAL SYSTEM - SELCAL PROGRAM SWITCH MODULE

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| SIA ALL | EFFECTIVITY |
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D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details



## SELCAL SYSTEM - FUNCTIONAL DESCRIPTION

### General

The SELCAL decoder unit has these components:

- Audio compressors
- Filter units
- Analog-to-digital converter
- Microprocessor
- Reset buffer
- Output driver

### Power-Up

At power-up, the Selective Call System (SELCAL) program switch module sends the microprocessor the airplane SELCAL code. The microprocessor controls the SELCAL decoder.

### Call Set

Each transceiver sends audio signals to the related audio compressor. The audio has a SELCAL tone signal. The SELCAL signal is a group of four tones. Each tone represents a letter in the SELCAL code. The audio compressor amplifies or limits the audio signal input to get a constant level. The audio compressor then sends the signal to the related filter unit.

In the filter unit, the signal goes to 16 different filters. Each filter passes only the audio signal that identifies one SELCAL tone or letter.

The filter outputs go to the analog-to-digital converter. The converter changes the analog audio signal to a digital signal and sends it to the microprocessor.

The microprocessor receives the SELCAL tone digital signals and compares them with the airplane SELCAL code from the program switch module. If the digital signals are the same as the airplane's code, then the microprocessor sends a command to the output driver.

The output driver energizes the output relay. When the relay energizes, the control panel receives a ground signal to turn on the call light.

### Call Reset

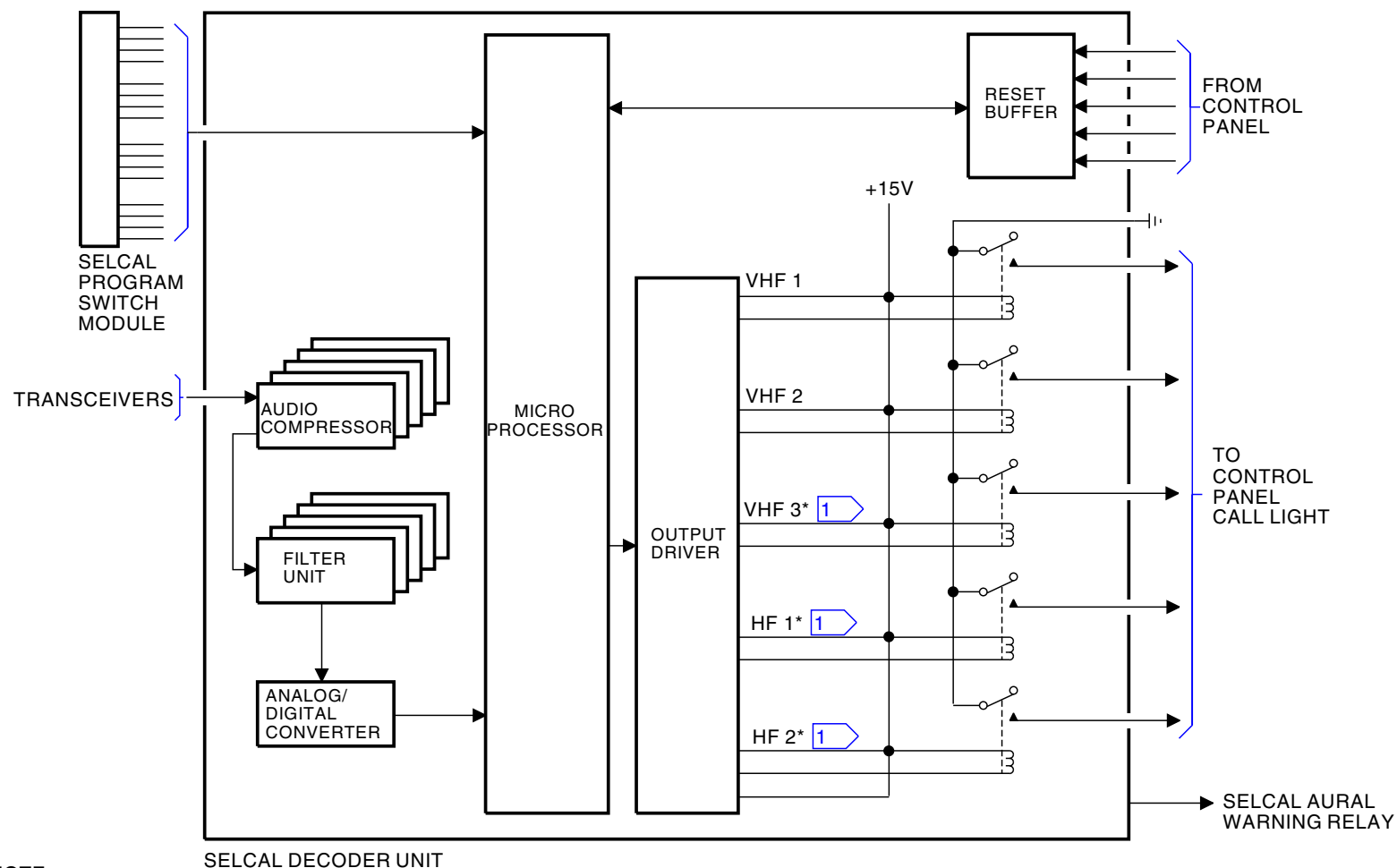
The Remote Electronics Unit (REU) sends a ground to the reset buffer in the SELCAL decoder. When the reset buffer receives the ground, it supplies a signal to the microprocessor to reset the command to the output driver. When the output driver is reset, all indications go off.

### Aural Warning

The SELCAL decoder unit supplies a ground discrete to the SELCAL aural warning relay. The energized relay sends 28V DC to the aural warning system through the REU. The aural warning system makes a single high/low chime that tells the flight crew when a call comes in.

| EFFECTIVITY |  |
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| SIA ALL     |  |

### SELCAL SYSTEM - FUNCTIONAL DESCRIPTION



2368727 S00061517995\_V1

### SELCAL SYSTEM - FUNCTIONAL DESCRIPTION

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SELCAL SYSTEM - SYSTEM SUMMARY

General

This graphic is for reference purposes only.

23-28-00-010

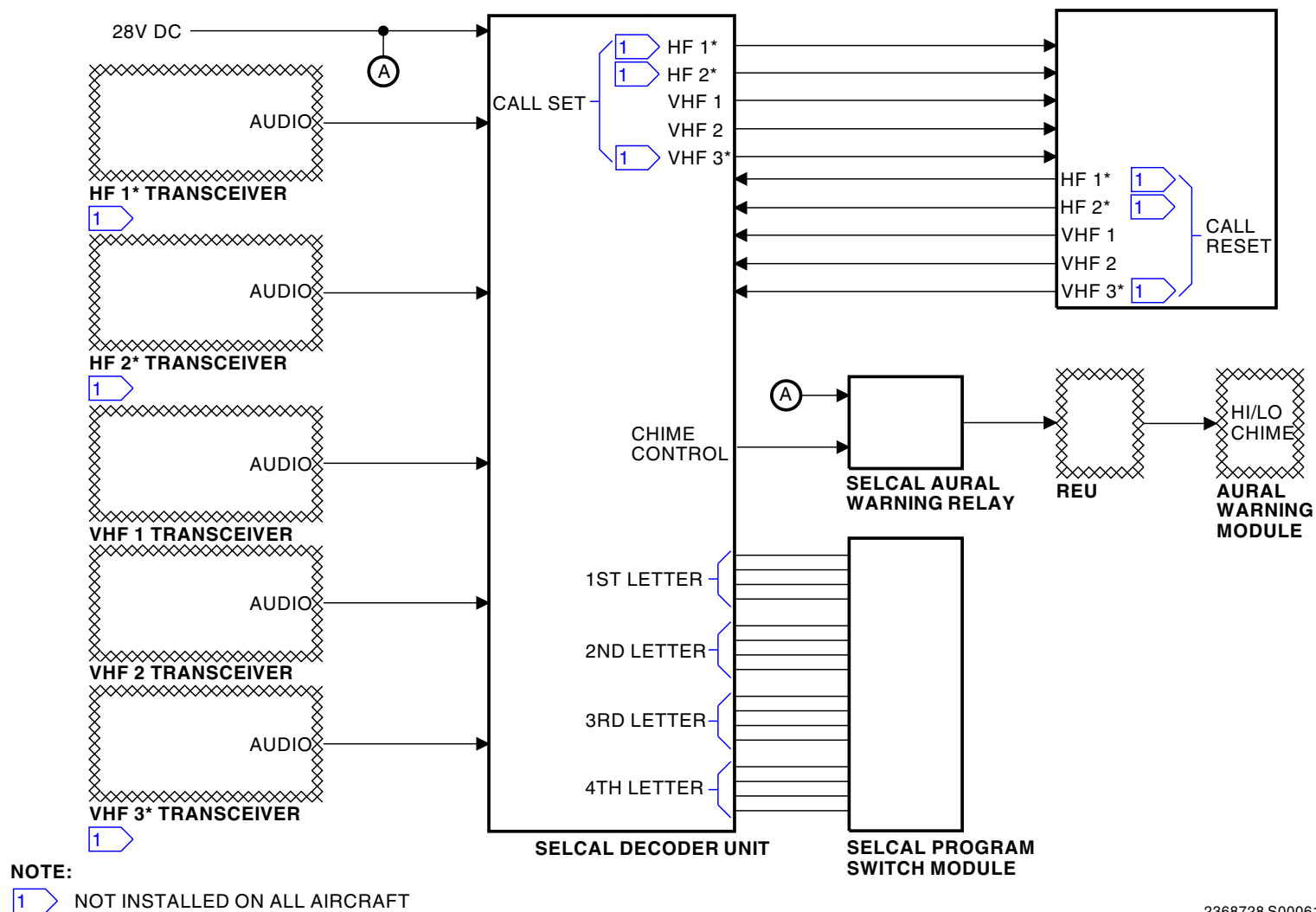
| EFFECTIVITY |  |
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| SIA ALL     |  |

D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details

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### SELCAL SYSTEM - SYSTEM SUMMARY



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### SELCAL SYSTEM - SYSTEM SUMMARY

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ECCN 9E991 BOEING PROPRIETARY - See title page for details

**PASSENGER ADDRESS SYSTEM - INTRODUCTION****Purpose**

The passenger address (PA) system supplies these to the passenger cabin:

- Passenger address announcements
- Chimes

**Abbreviations and Acronyms**

- ACP - audio control panel
- amp - amplifier
- annc - announcement
- att - attendant
- BGM - boarding music
- BITE - built-in test equipment
- MDS - MAX display system
- ckts - circuit
- db - decibel
- DIP - dual-in-line package
- DPC - display processing computer
- EEC - electronic equipment compartment
- eng - engine
- ent - entertainment
- fwd - forward
- ind - indication
- LCD - liquid crystal display
- LED - light emitting diode
- MCU - modular concept unit
- mic - microphone
- oxy - oxygen
- PA - passenger address
- PES - passenger entertainment system

- PSU - passenger service unit
- PTT - push to talk
- rly - relay
- repr - reproducer
- REU - remote electronics unit
- RV - rated voltage
- SSSV - solid state stored voice
- sw - switch
- typ - type; typical
- VRMS - voltage root mean square
- VSCU - video system control unit
- xfr - transfer

**23-31-00****SIA ALL EFFECTIVITY**

D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details

**PASSENGER ADDRESS SYSTEM - INTRODUCTION**



2368729 S00061518001\_V1

**PASSENGER ADDRESS SYSTEM - INTRODUCTION**

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ECCN 9E991 BOEING PROPRIETARY - See title page for details



## PA SYSTEM - GENERAL DESCRIPTION

### General

The passenger address (PA) system supplies this audio to the passenger cabin and flight compartment:

- Flight crew announcements
- Chimes

The PA amplifier sets the priority for the audio inputs. Only one audio input signal at a time is processed. The audio inputs come from these sources:

- Pilots
- Attendants

The PA amplifier sends the audio input that has the highest priority to these components/systems:

- Passenger cabin and lavatory speakers
- Remote electronics unit (REU)

### System Components

The PA system has these components:

- PA amplifier
- Passenger signs panel
- Attendant handset
- Cabin and lavatory speakers

The PA amplifier amplifies the audio input that has the highest priority. The PA amplifier also supplies the chime signals with the other PA audio.

The passenger signs panel has a light that gives the ATTEND call indication. The passenger signs panel has these switches to turn on annunciations and give chimes:

- FASTEN BELTS
- ATTEND
- GRD CALL

The attendants use the attendant handset to make PA announcements from the forward and aft attendant stations.

The cabin and lavatory speakers change the PA amplifier output signals to audio.

### External Interface

The PA system connects with these components:

- REU
- Lavatory speakers
- Passenger service unit speakers
- Pilot PA hand microphone

### System Operation

The PA system audio inputs come from these sources:

- Flight compartment microphone
- Attendant handsets

The PA amplifier selects the highest priority input. The amplifier amplifies the audio signal and sends it to these LRUs and systems:

- REU
- Cabin speakers
- Lavatory speakers

The amplified audio goes from the PA amplifier to the cabin and lavatory speakers. The audio also goes through muting circuits in the REU to the FWD and AFT attendant speakers. The on-side attendant speakers are muted during attendant announcements to prevent feedback.

The PA audio goes through the REU to the flight crew headsets as sidetone. It also goes to the flight compartment speakers.



## PA SYSTEM - GENERAL DESCRIPTION

The PA amplifier sets the priority of the input signal. These are the PA system audio priorities:

- Priority 1 - announcement from the flight compartment
- Priority 2 - announcement from an attendant
- Priority 3 - pre-recorded announcement
- Priority 4 - boarding music

Flight Compartment announcements done through the handset will not override Flight Attendant announcements.

The lavatories and passenger service units send discrete signals to the PA amplifier to make chime signals.

### **SIA ALL; AIRPLANES WITH INOP NO SMOKING SWITCH**

The PA amplifier supplies a chime signal when the flight crew puts the passenger sign panel FASTEN BELTS switch in the ON position or pushes the ATTEND switch.

### **SIA ALL**

The chime signals are superimposed on the other PA audio in the amplifier.

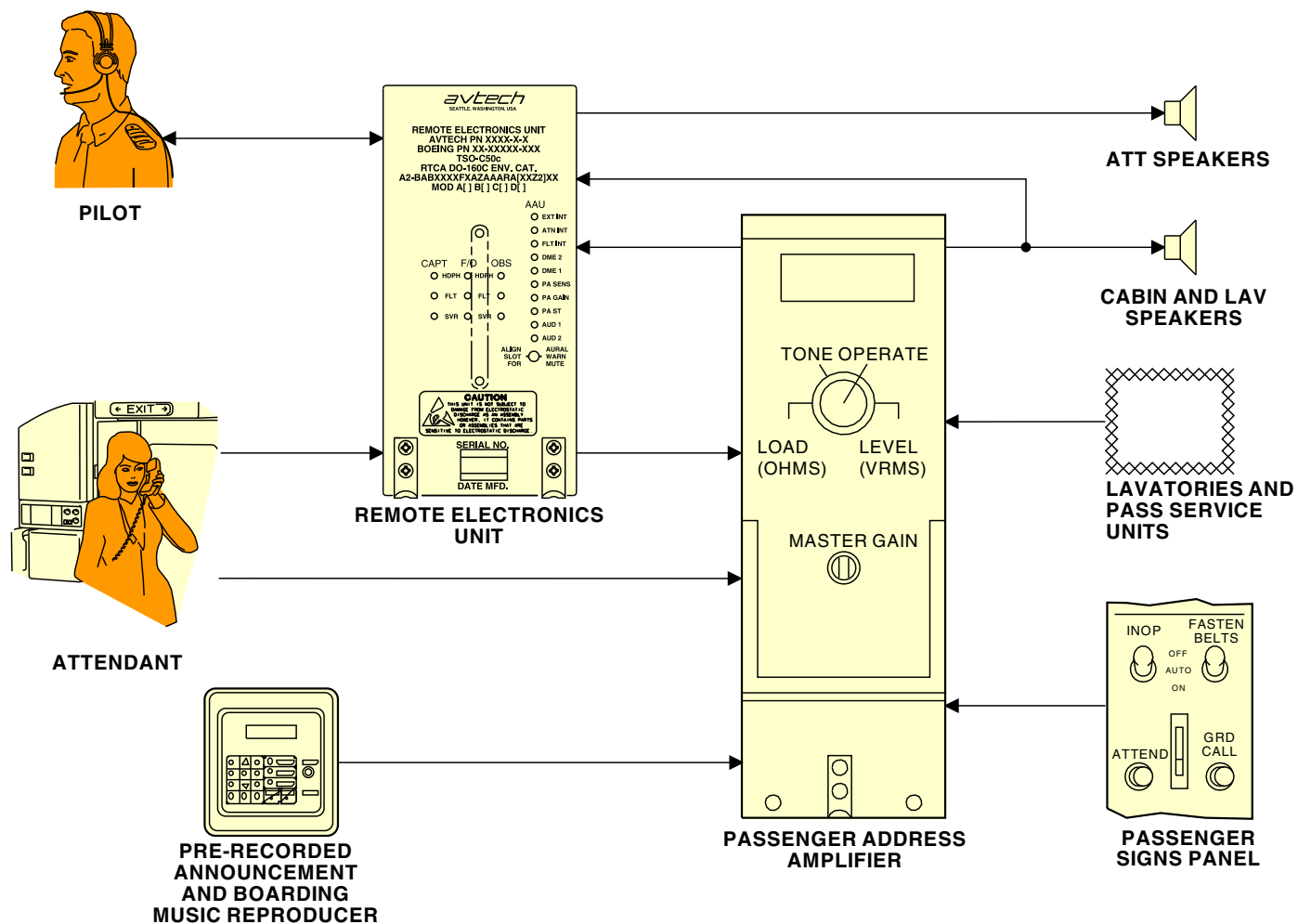
**23-31-00**

| SIA ALL | EFFECTIVITY |
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D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details

## PA SYSTEM - GENERAL DESCRIPTION



2548286 S0000606556\_V2

## PA SYSTEM - GENERAL DESCRIPTION

23-31-00

| SIA ALL | EFFECTIVITY |
|---------|-------------|
|         |             |

D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details



## PA SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATION

### Audio Control Panels

The audio control panels have an interface with the PA system.

The captain and first officer ACPs are on the P8 aft electronics panel.

The first observer ACP is on the P5 aft overhead panel.

### Passenger Signs Panel

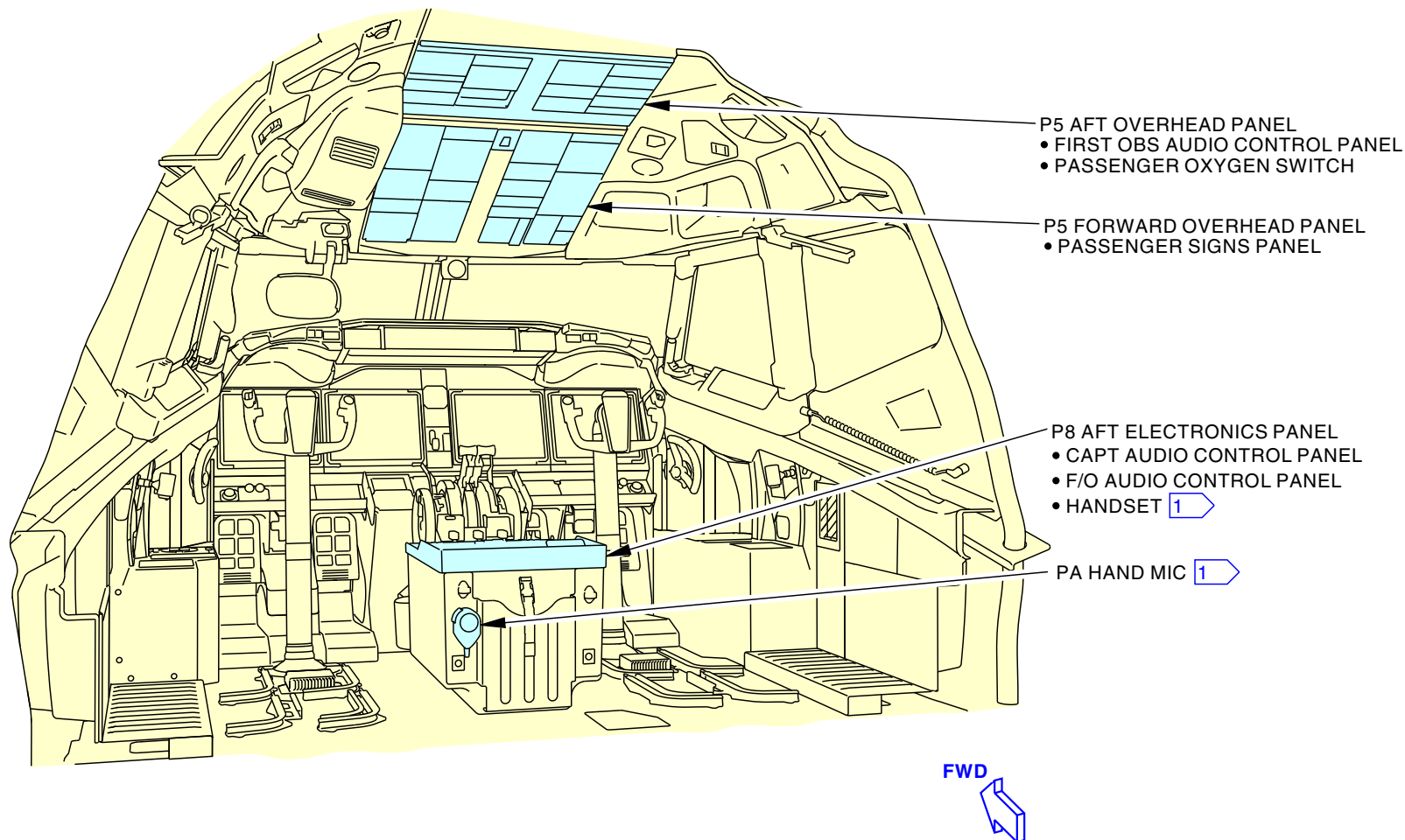
The passenger signs panel has an interface with the PA system. The panel is on the P5 forward overhead panel.

### PA Hand Mic

The PA hand mic is on the P8 aft electronics panel.

| SIA ALL | EFFECTIVITY   |
|---------|---------------|
|         | D633AM102-SIA |

## PA SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATION



1 IF INSTALLED

2937650 S0000713502\_V1

## PA SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATION

23-31-00

SIA ALL

EFFECTIVITY

D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details



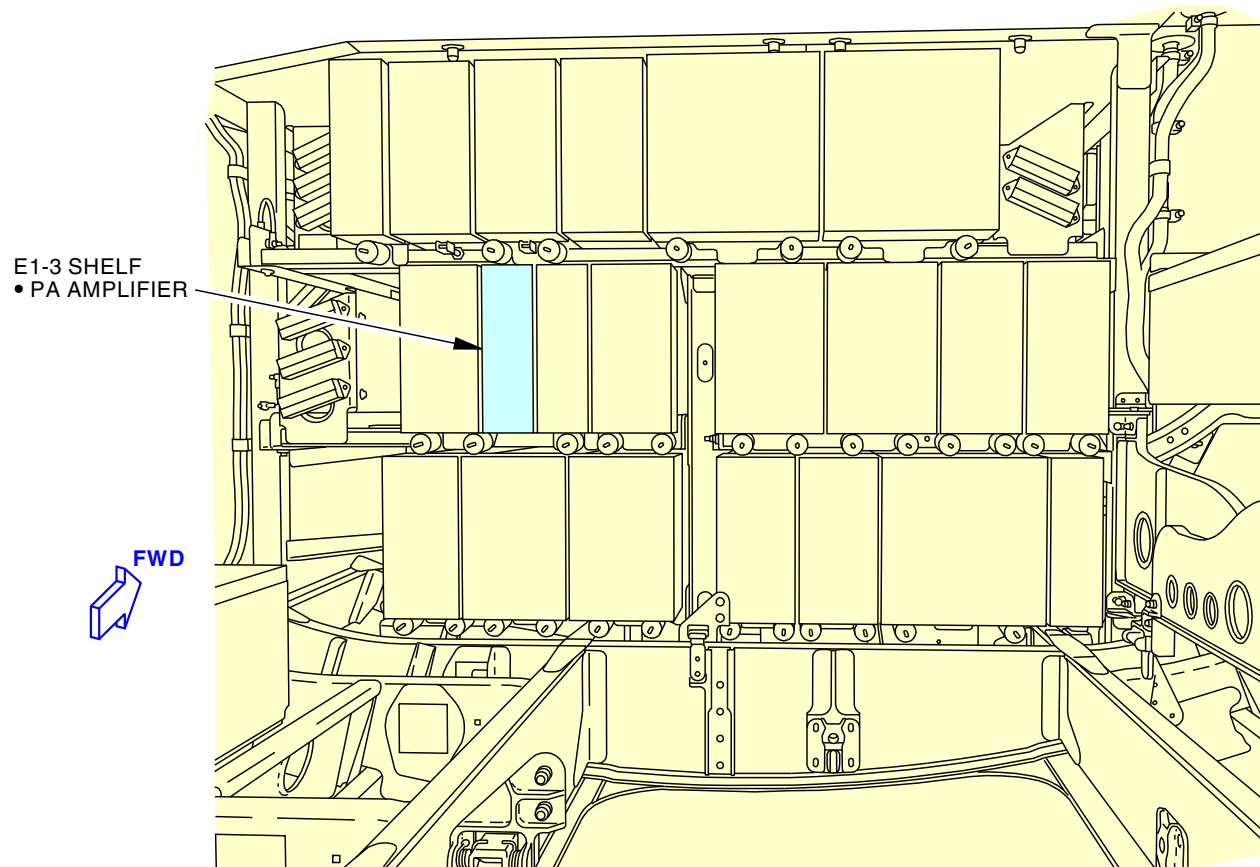
PA SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS

Electronic Equipment Compartment

The PA amplifier is on the E1-3 shelf.

| SIA ALL       | EFFECTIVITY |
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| D633AM102-SIA |             |

PA SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS



2368733 S00061518007\_V1

PA SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS

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23-31-00-004

SIA ALL

EFFECTIVITY

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ECCN 9E991 BOEING PROPRIETARY - See title page for details



## PA SYSTEM - PASSENGER COMPARTMENT COMPONENT LOCATION

### Speakers

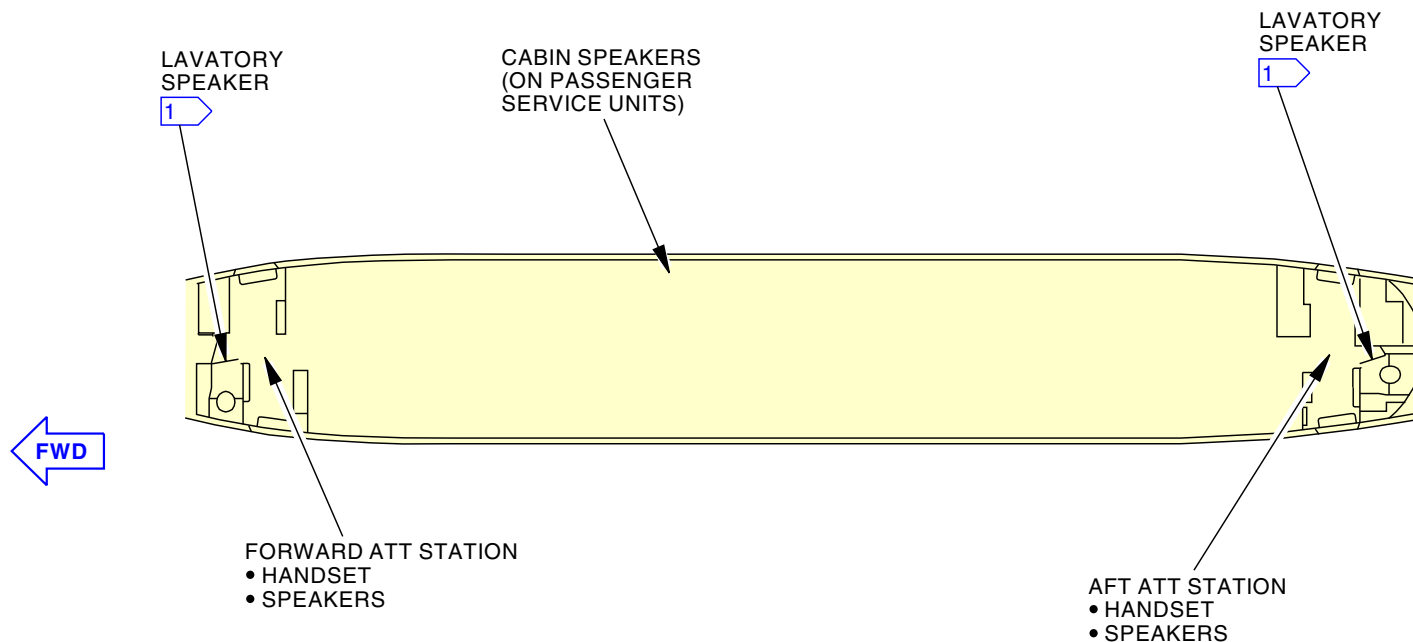
The attendant speakers are at each of the attendant stations and at the galleys. The cabin speakers are in the passenger service units.

### Handsets

The handsets are on the cabin attendant panels at each attendant station.

| SIA ALL | EFFECTIVITY   |
|---------|---------------|
|         | D633AM102-SIA |

## PA SYSTEM - PASSENGER COMPARTMENT COMPONENT LOCATION



1 WHEN LAVATORY INSTALLED

2548198 S0000605011\_V1

## PA SYSTEM - PASSENGER COMPARTMENT COMPONENT LOCATION

**23-31-00**

| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |

ECCN 9E991 BOEING PROPRIETARY - See title page for details



## PA SYSTEM - INTERFACES

### Power

The passenger address (PA) amplifier gets 28v dc from the 28v dc battery bus.

### Audio

The PA system receives audio from these sources:

- Flight compartment microphones
- Attendant microphones

Flight compartment audio has the first priority. The second priority is from the attendant microphones.

Priority circuits in the PA amplifier receive the audio inputs and set their priority. The audio with the highest priority is amplified and goes to the speakers.

The PA amplifier supplies the side tone to the remote electronics unit (REU). The REU supplies the side tone to the flight crew headsets.

The PA amplifier supplies audio to these components:

- REU mute relays
- Passenger and lavatory speakers

The REU supplies audio to the attendant speakers.

### Chimes

The PA amplifier supplies chimes for these conditions:

- FASTEN SEAT BELTS signs operate - low chime
- Attendant call switch operates - high chime from passenger service units and lavatories, high/low chime from the flight compartment and attendant stations

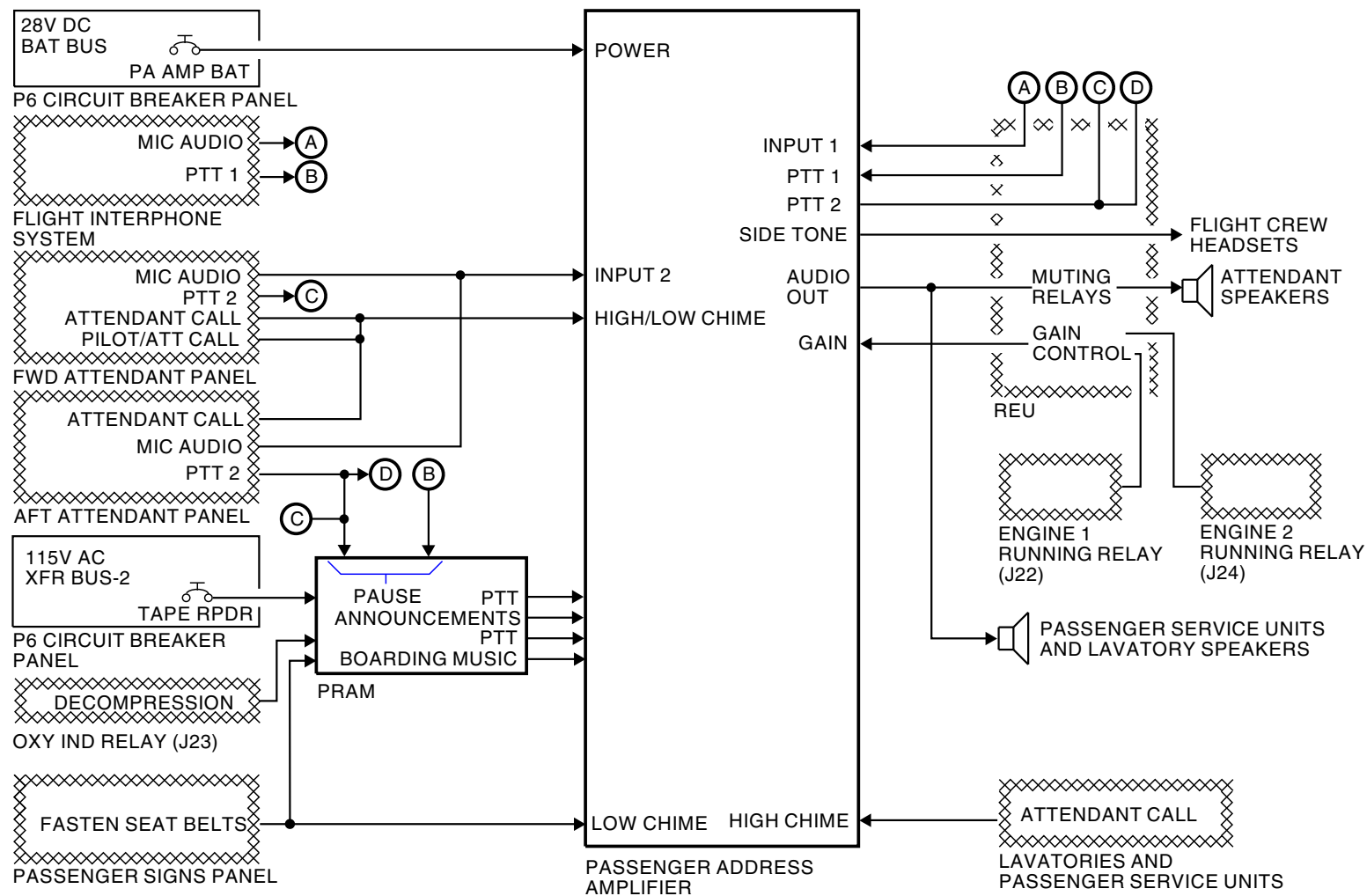
### Gain Control

The PA amplifier receives gain signals from the REU. The REU receives inputs from the engine running relays. When the engines operate, the PA amplifier gain increases to compensate for the increase in the ambient noise level.

### Fasten Seat Belts Audio Message

The passenger signs panel supplies a discrete to the announcement/boarding music reproducer when the aircrew turns on the FASTEN SEAT BELTS sign. This makes a pre-recorded fasten seat belts message operate.

## PA SYSTEM - INTERFACES



2539169 S0000602527\_V1

## PA SYSTEM - INTERFACES

23-31-00

SIA ALL

EFFECTIVITY

D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details

**PA SYSTEM - CREW ANNOUNCEMENT INTERFACE****Power**

The PA amplifier gets 28v dc from the battery bus.

**Audio**

For flight crew and attendant announcements, the PA system receives audio from these sources:

- Flight compartment microphones
- Attendant microphones

Priority circuits in the PA amplifier receive the audio and PTT inputs and set the priority. The PA amplifier amplifies the audio with the highest priority and sends the audio to the passenger service units and lavatory speakers.

The PA amplifier supplies a side tone through the remote electronics unit (REU) to the flight crew headsets.

Amplified audio goes through the REU mute relays to the attendant speakers.

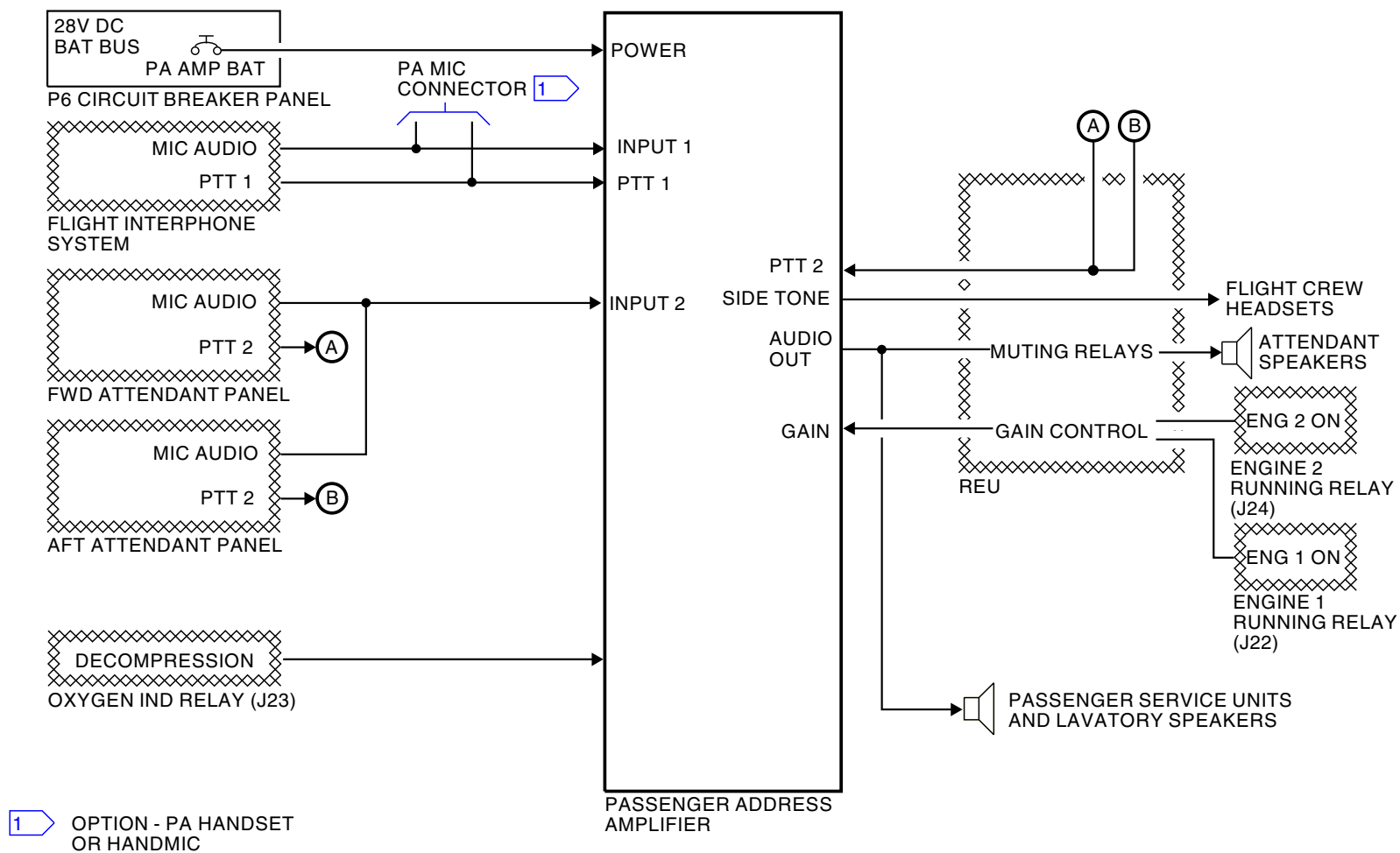
**Gain Control**

The PA amplifier receives gain signals from the REU. The REU receives inputs from the engine running relays. When engine number 1 or 2 operates, the PA amplifier gain increases by 6 db to compensate for the increase in the ambient noise level.

The oxygen indicator relay sends a signal to the PA amplifier when the cabin loses cabin pressure. This increases the amplifier gain by 3 db to adjust for the increase in cabin noise level.

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### PA SYSTEM - CREW ANNOUNCEMENT INTERFACE



2368736 S00061518013\_V1

### PA SYSTEM - CREW ANNOUNCEMENT INTERFACE



## PA SYSTEM - INDICATION INTERFACE

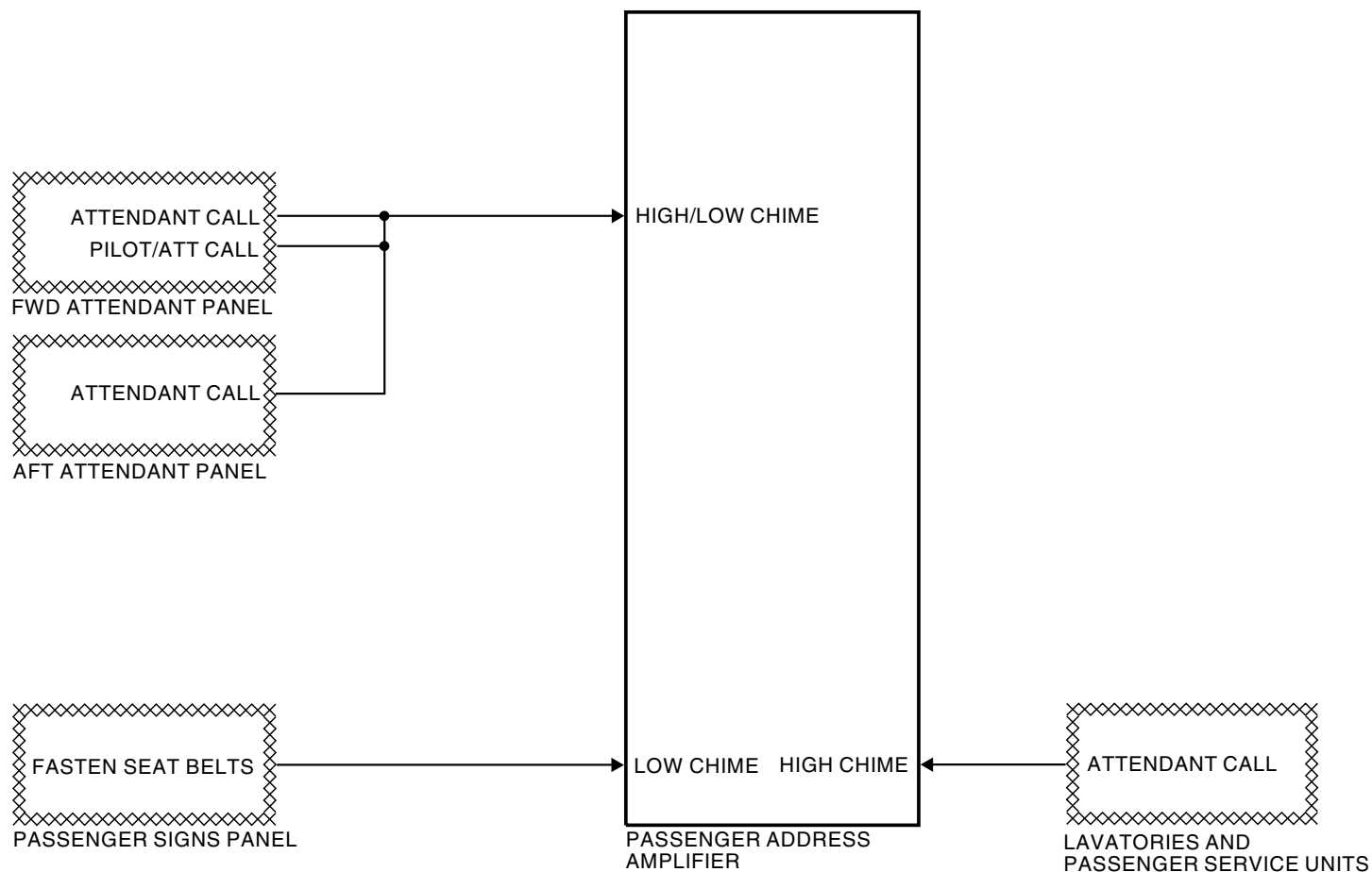
### Chimes

The PA amplifier supplies chimes for these conditions:

- FASTEN SEAT BELTS switch - low chime
- Attendant call switch from lavatories or passenger service units - high chime
- Attendant call switch from attendant panels or flight compartment - high/low chime

| SIA ALL | EFFECTIVITY   |
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### PA SYSTEM - INDICATION INTERFACE



2539172 S0000602548\_V1

### PA SYSTEM - INDICATION INTERFACE

**23-31-00**

23-31-00-008

| SIA ALL | EFFECTIVITY   |
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ECCN 9E991 BOEING PROPRIETARY - See title page for details

**PA SYSTEM - PASSENGER ADDRESS AMPLIFIER****Purpose**

The PA amplifier prioritizes, amplifies, and sends audio signals to airplane speakers and systems. It also supplies chimes to the attendants and passengers.

**Controls and Indications**

The function select switch has these positions:

- LOAD (OHMS)
- TONE
- OPERATE
- LEVEL (VRMS)

In the LOAD (OHMS) position, the PA amplifier measures the impedance of the speaker network. The value shows on the light emitting diode (LED) display. Normally, the impedance is more than 30 ohms. The switch is spring-loaded from the LOAD position to the TONE position.

In the TONE position, the PA amplifier does a functional check of all speakers. The high frequency chime is the audible test signal that goes to the speakers.

OPERATE is the normal switch position of the PA amplifier. In this position, the display is blank.

In the LEVEL (VRMS) position, the PA amplifier shows the output ac voltage level of the output audio. The LEVEL position disconnects the speakers from the amplifier circuits. It connects a dummy load to internal amplifier circuits. The voltage shows on the LED display. This switch is spring-loaded from the LEVEL position to the OPERATE position.

**Master Gain Control**

Turn this potentiometer to increase or decrease the gain of the PA amplifier. Normally, you will turn the potentiometer until the display shows 70.7 volts while the function select switch is in the LEVEL position.

**Characteristics**

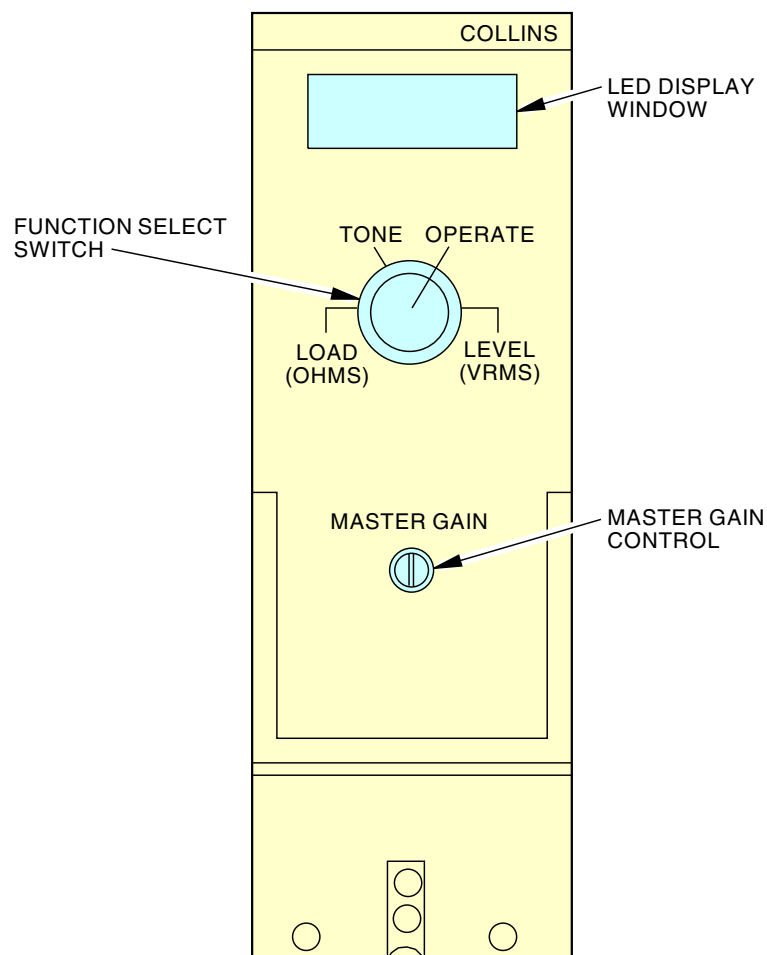
The PA amplifier is 2.43 in. (6.17 cm) wide, 7.88 in. (20.02 cm) high, and 15.26 in. (38.76 cm) long. It weighs 7.28 lb (3.3 kg).

**Chimes**

The chime circuits in the PA amplifier make two frequencies for the chimes.

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# PA SYSTEM - PASSENGER ADDRESS AMPLIFIER



2368738 S00061518017\_V1

## PA SYSTEM - PASSENGER ADDRESS AMPLIFIER

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| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |

ECCN 9E991 BOEING PROPRIETARY - See title page for details

**PA SYSTEM - PASSENGER SERVICE UNIT SPEAKERS****Purpose**

The PA system passenger service unit (PSU) speakers supply audio to the passenger cabin.

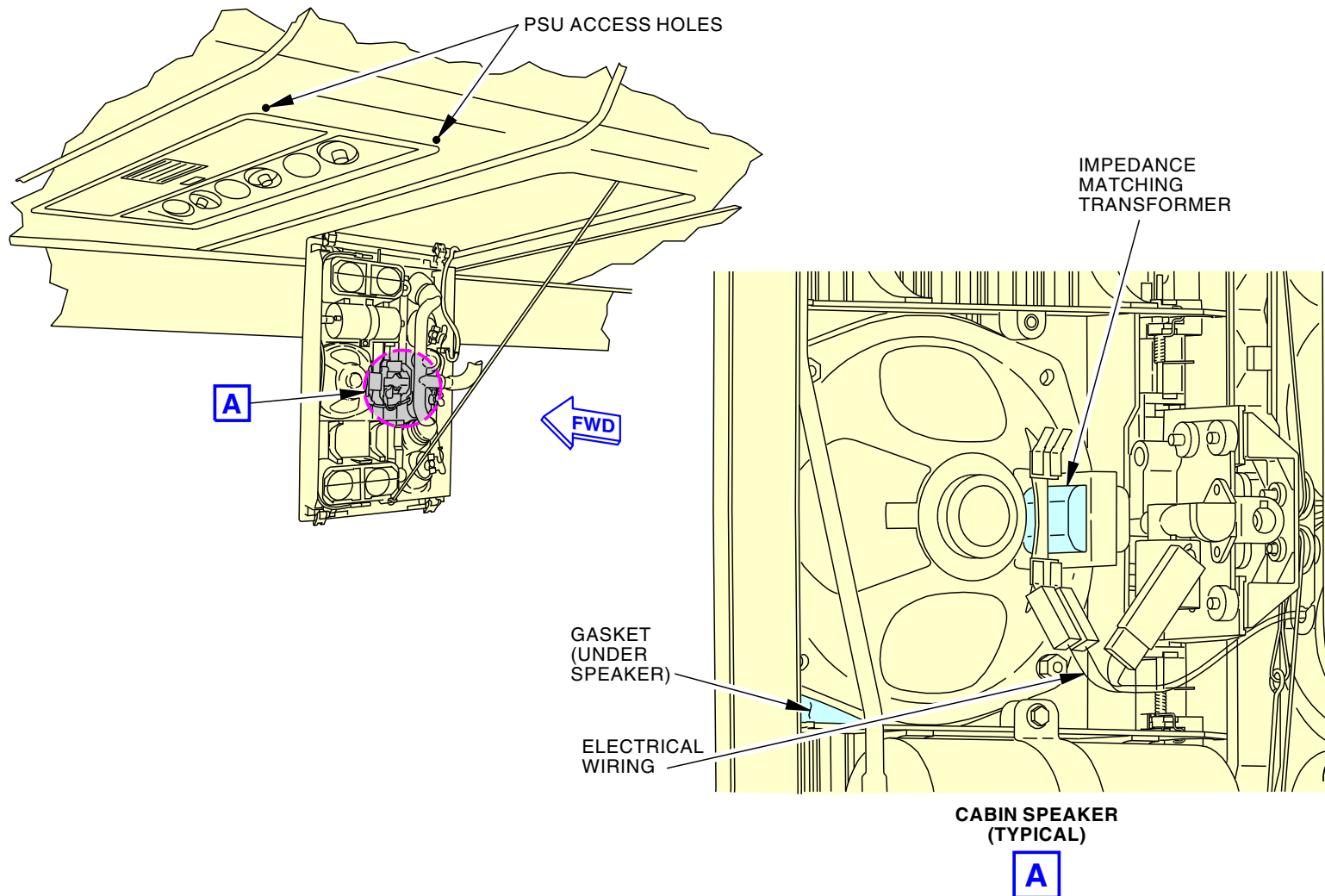
**Features**

Spring clips hold the PSU assembly closed. To open the assembly, push a small rod in the access holes. Hold the PSU panel and push the rod against the spring clips to open the assembly.

Each speaker has a transformer. The transformer matches the speaker impedance to the line impedance. Two electrical wires connect the speaker transformer terminals to the PA amplifier. Install and remove the speaker and transformer as one assembly.

| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |

**PA SYSTEM - PASSENGER SERVICE UNIT SPEAKERS**



2368739 S00061518019\_V1

**PA SYSTEM - PASSENGER SERVICE UNIT SPEAKERS**

**23-31-00**

**PA SYSTEM - LAVATORY SPEAKERS****Purpose**

The PA system lavatory speakers supply audio to the lavatories.

**Features**

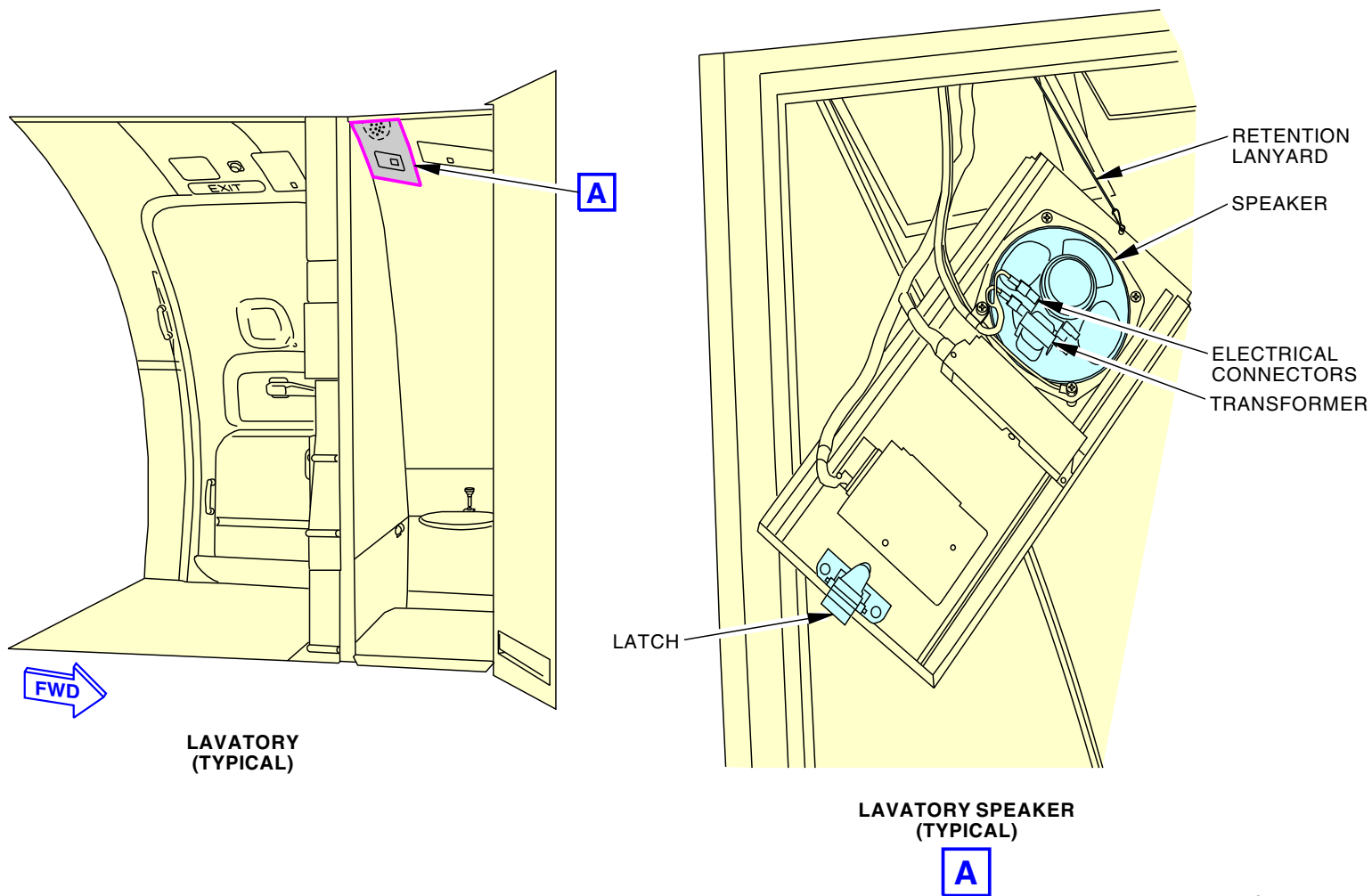
Each lavatory PSU has a 5-inch speaker.

Each lavatory PSU assemblies are held in place by quarter-turn fasteners.

Each speaker has a transformer. The transformer matches the speaker impedance to the line impedance. Two electrical wires connect the speaker transformer terminals to the PA amplifier. Install and remove the speaker and transformer as one assembly.

| SIA ALL | EFFECTIVITY   |
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PA SYSTEM - LAVATORY SPEAKERS



2368740 S00061518021\_V1

PA SYSTEM - LAVATORY SPEAKERS

**23-31-00**



## PA SYSTEM - ATTENDANT SPEAKERS

### Purpose

The PA system attendant speakers supply audio to the attendant stations and galleys.

### Features

There is a 5-inch speaker in each attendant station and galley. The audio signal for the attendant speakers goes through mute relays in the remote electronics unit. The mute relays stop the attendant speaker from operating during PA announcements. This prevents feedback through the speakers.

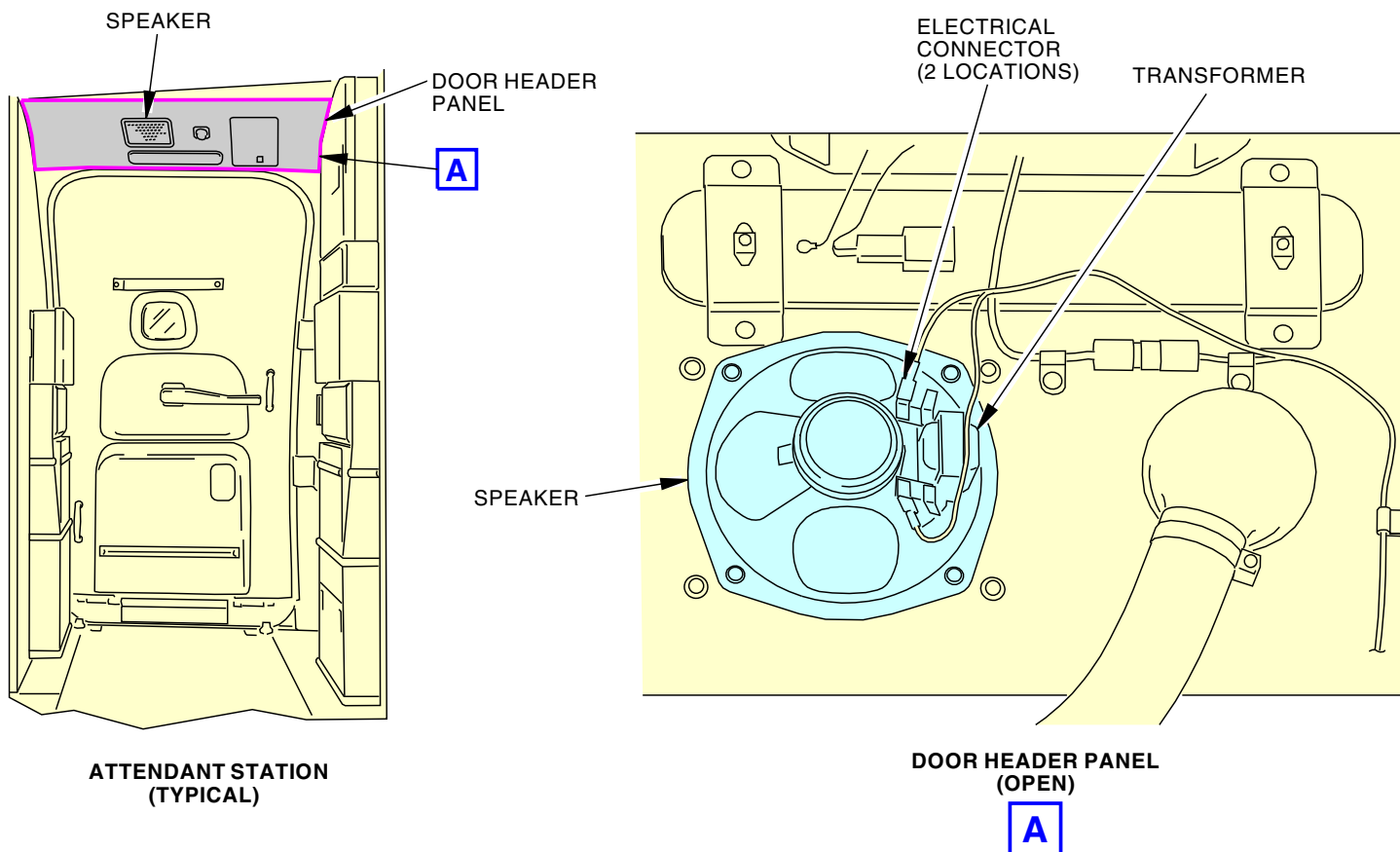
The attendant speaker is in the doorway header panel. To replace the speaker, first remove the doorway header panel. This panel is held by screws and bolts. Plug buttons and a seal depressor cover these retainers.

Each speaker has a transformer. The transformer matches the speaker impedance to the line impedance. Two electrical wires connect the speaker transformer terminals to the PA amplifier. Install and remove the speaker and transformer as one assembly.

Four screws hold the speaker to the doorway header panel.

| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |

## PA SYSTEM - ATTENDANT SPEAKERS



2368741 S00061518023\_V1

## PA SYSTEM - ATTENDANT SPEAKERS

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## PA SYSTEM - AMPLIFIER FUNCTIONAL DESCRIPTION

### Power

The PA amplifier receives 28v dc for power.

### General

The PA system supplies these outputs:

- Voice audio
- Chimes

Each audio output has this order of priority:

- Flight compartment announcements
- Flight attendant announcements

The chime audio operates at the same time as other audio. It has no effect on the priority logic.

The input circuits receive the input audio. The amplifier priority logic circuits get the PTT signals.

The priority logic circuits supply a signal to the input circuits. The signal lets the audio with the highest priority go out.

The amplifier and control circuits get the audio from the input circuits. The amplifier circuits amplify the audio and supply it through the REU to the attendant speakers. The audio also goes directly to the passenger service unit speakers and the lavatory speakers.

The amplifier and control circuits receive test signals from the test circuits. The control circuits supply output signals to the front panel LCD display.

### Gain Control

The gain control circuit increases the amplifier gain by 6 db when an engine is on. The engine 2 running relay controls the REU gain control relay and the engine 1 running relay controls the signal on the relay contact. With the engines off, the engine running relays send grounds to the REU. This energizes the REU gain control relay. The energized relay contact sends a ground from the engine 1 running relay to the PA amplifier.

The MDS display processing computers (DPCs) control the engine running relays. An engine running relay energizes when one of these occurs:

- The engine  $N2 \geq 50\%$
- The engine start lever is in idle, the fire switch is reset, and  $N2 \geq 50\%$
- The airplane is on the ground, and the start lever is in the idle position for five minutes

When either engine running relay energizes, the gain control relay removes the ground to the PA amplifier. This increases the amplifier gain by 6 db.

If decompression occurs, the oxygen indication relay energizes. At that time, the relay sends a ground to the amplifier and control circuits in the PA amplifier to increase the amplifier gain by an additional 3 db.

### Speaker Mute

The forward and aft muting relays, in the REU, receive audio signals from the PA amplifier. If the audio is from the flight compartment, the mute control relay energizes. This prevents operation of the forward and aft mute relays.

An announcement from an attendant station stops the operation of the speakers at that station. The PTT signal causes the forward or aft mute relay to energize. This stops the audio output to that speaker.

### Chimes

The chime circuits supply these chime signals:

- High chime
- Low chime
- High/low chime

High chimes operate when there is an attendant call signal from a passenger service unit or lavatory.

Low chimes operate when the fasten seat belts sign come on.

High/low chimes operate when there is an attendant call from the flight compartment or another attendant station.

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SIA ALL EFFECTIVITY

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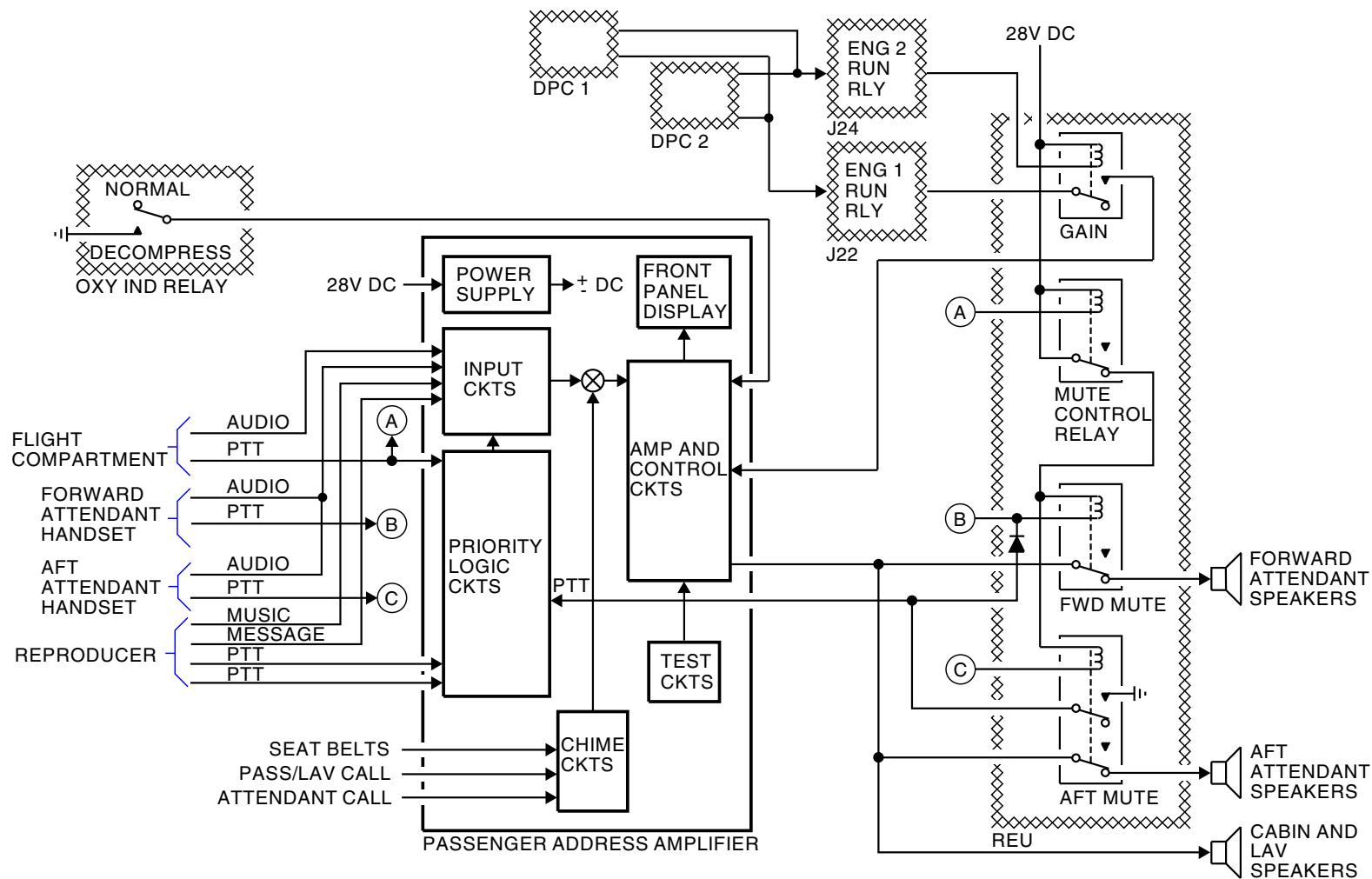
## PA SYSTEM - AMPLIFIER FUNCTIONAL DESCRIPTION

The high/low chime operates three times for alert calls from the pilots or attendants.

Chime signals operate at the same time as other audio signals.

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# PA SYSTEM - AMPLIFIER FUNCTIONAL DESCRIPTION



2368742 S00061518025\_V2

## PA SYSTEM - AMPLIFIER FUNCTIONAL DESCRIPTION

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ECCN 9E991 BOEING PROPRIETARY - See title page for details

**PA SYSTEM - OPERATION - ANNOUNCEMENTS****Crew Announcements**

Crew announcements are made from these locations:

- Flight compartment
- Flight attendant stations

**Flight Compartment**

The pilot can make PA announcements with these:

- Boom microphone (mic)
- Oxygen mask mic
- Flight interphone hand mic

To make an announcement with the boom mic or oxygen mask mic, you must first set the audio control panel. You select the microphone source (boom or mask), and set the microphone selector switch (PA). You adjust for received PA volume with the PA receiver volume control. To key the microphone, you use either the audio control panel PTT switch or the control wheel MIC switch.

With the audio control panel microphone selector switch set, you can also make an announcement with the flight interphone hand mic. Push the hand mic push to talk switch and speak through the microphone.

**Flight Attendant Stations**

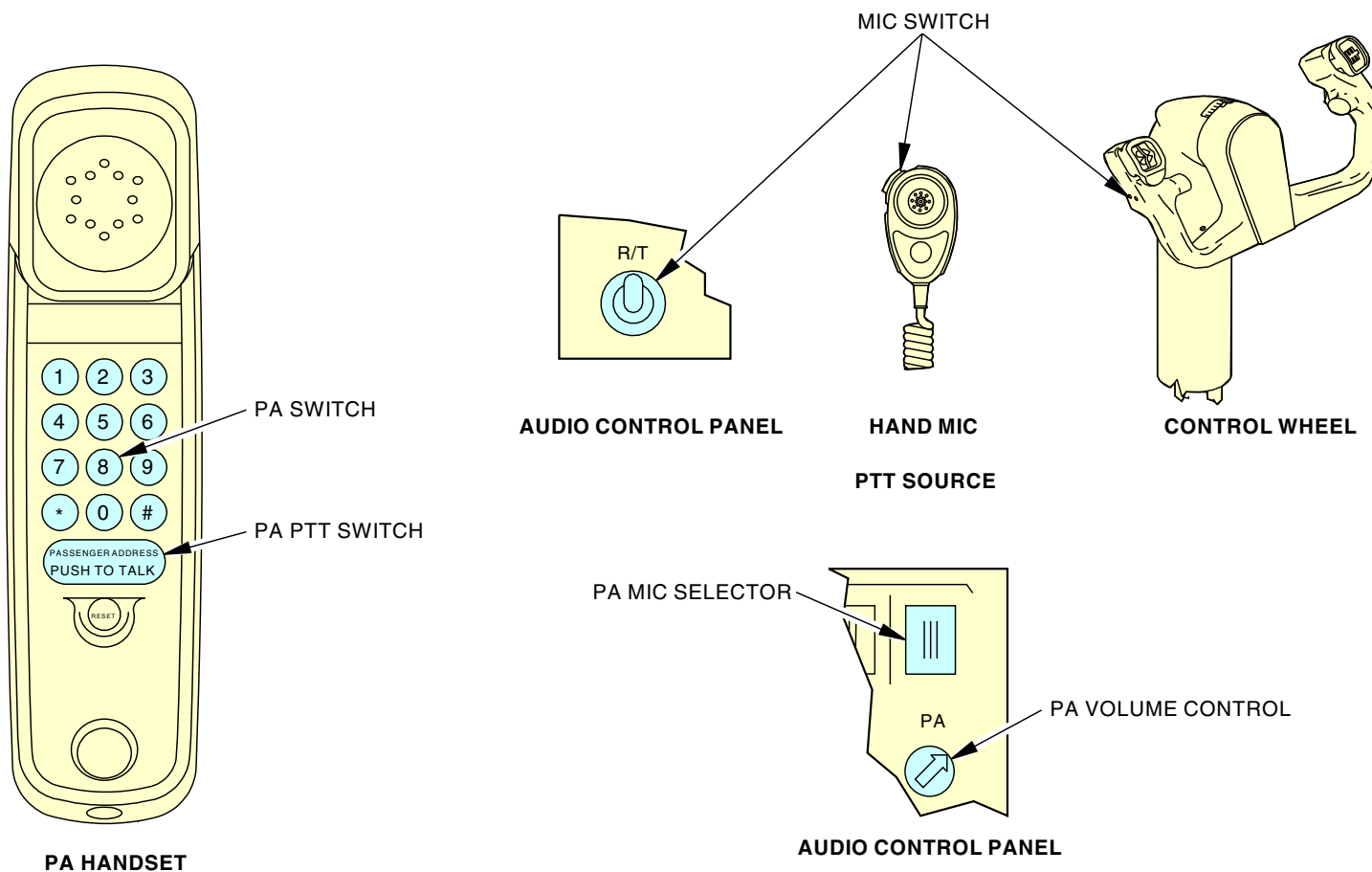
Flight attendant PA announcements come from the forward and the aft attendant PA handsets.

Do these steps to make a PA handset announcement:

- Push the PA switch on the handset
- Push and hold the PASSENGER ADDRESS PUSH TO TALK switch
- Speak through the handset mouth piece

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## PA SYSTEM - OPERATION - ANNOUNCEMENTS



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## PA SYSTEM - OPERATION - ANNOUNCEMENTS

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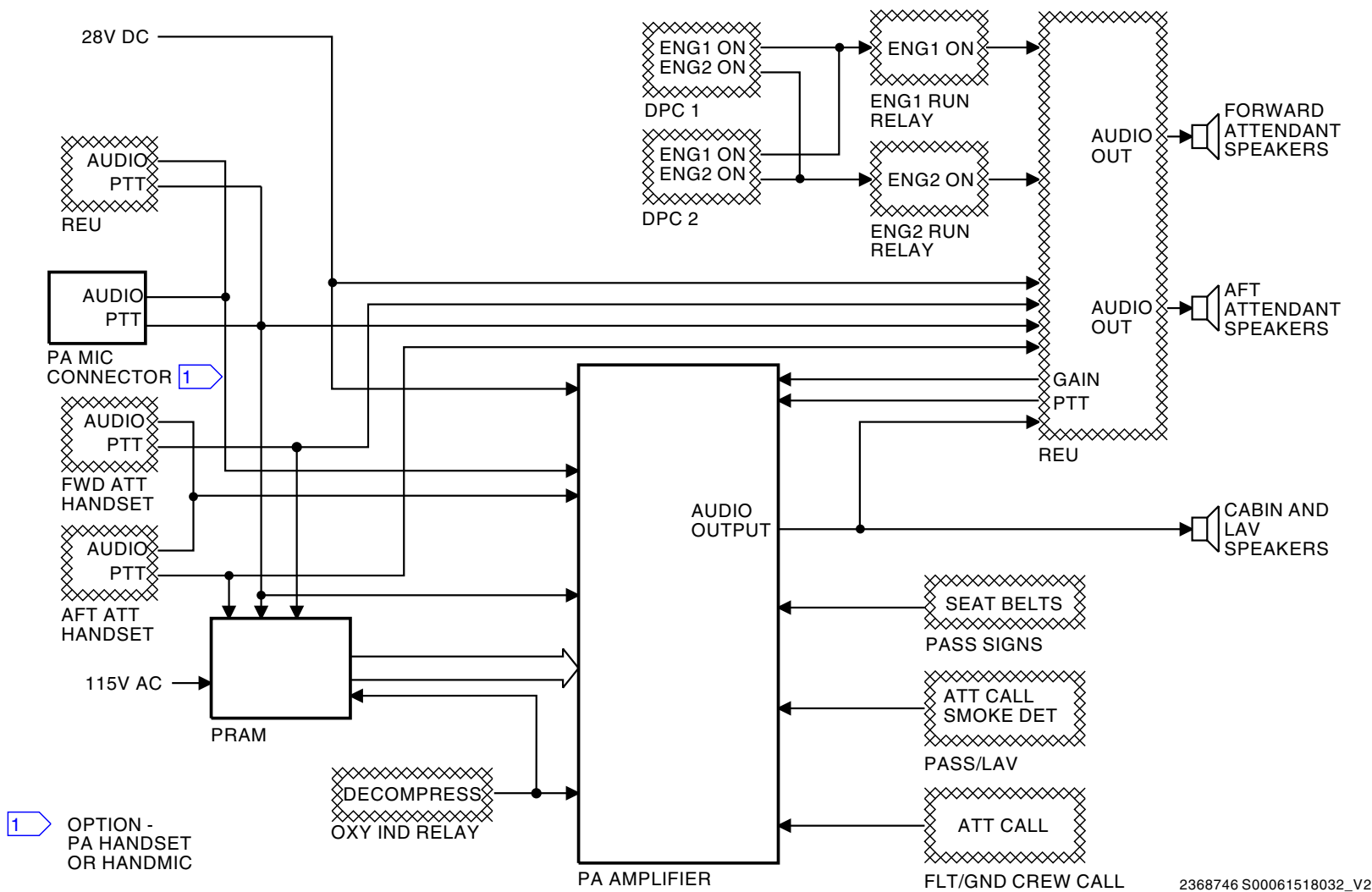
PA SYSTEM - SYSTEM SUMMARY

General

This graphic is for reference purposes only.

| SIA ALL | EFFECTIVITY   |
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### PA SYSTEM - SYSTEM SUMMARY



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### PA SYSTEM - SYSTEM SUMMARY

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ECCN 9E991 BOEING PROPRIETARY - See title page for details



## SERVICE INTERPHONE SYSTEM - INTRODUCTION

### General

The ground crew uses the service interphone system to talk to each other and to the flight crew. Service interphone jacks are at different locations on the airplane.

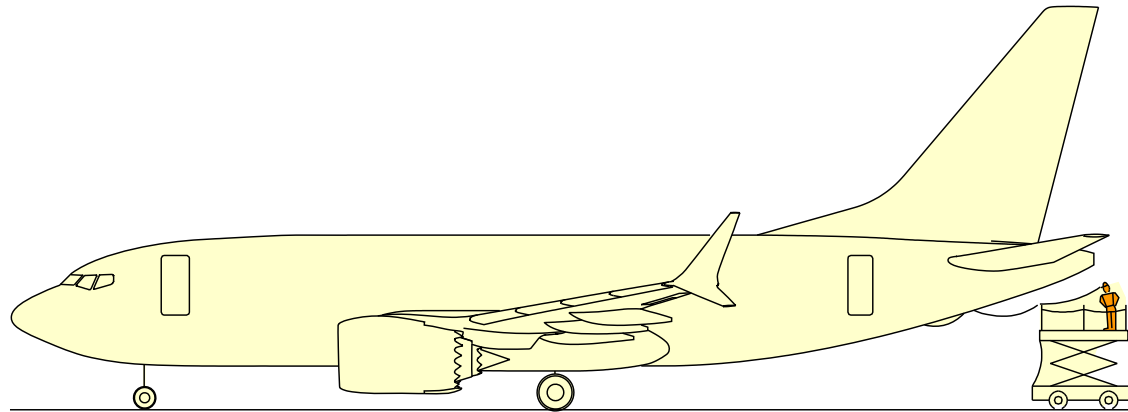
The flight attendants use the service interphone system to speak with each other and the pilots.

### Abbreviations and Acronyms

- AAU - audio accessory unit
- ACP - audio control panel
- ampl - amplifier
- APU - auxillary power unit
- att - attendant
- bat - battery
- capt - captain
- dc - direct current
- flt - flight
- fwd - forward
- inph - interphone
- lts - lights
- mic - microphone
- PA - passenger address
- PTT - push-to-talk
- REU - remote electronics unit
- v - volt
- warn - warning

| SIA ALL | EFFECTIVITY   |
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**SERVICE INTERPHONE SYSTEM - INTRODUCTION**



2368747 S00061518036\_V1

**SERVICE INTERPHONE SYSTEM - INTRODUCTION**

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23-41-00-001

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ECCN 9E991 BOEING PROPRIETARY - See title page for details

**SERVICE INTERPHONE SYSTEM - GENERAL DESCRIPTION****General**

The service interphone system is for these personnel:

- Flight crew
- Attendants
- Ground crew.

The flight crew selects the service interphone function from the audio control panel (ACP). Flight interphone microphones send audio to the remote electronics unit (REU). Flight interphone headsets and speakers get audio from the REU.

The flight crew can also use a handset to talk on the service interphone system. The interphone jack connects to the system without ACP control.

The attendants operate a handset to connect into the system. An attendant panel connects the handset to the REU.

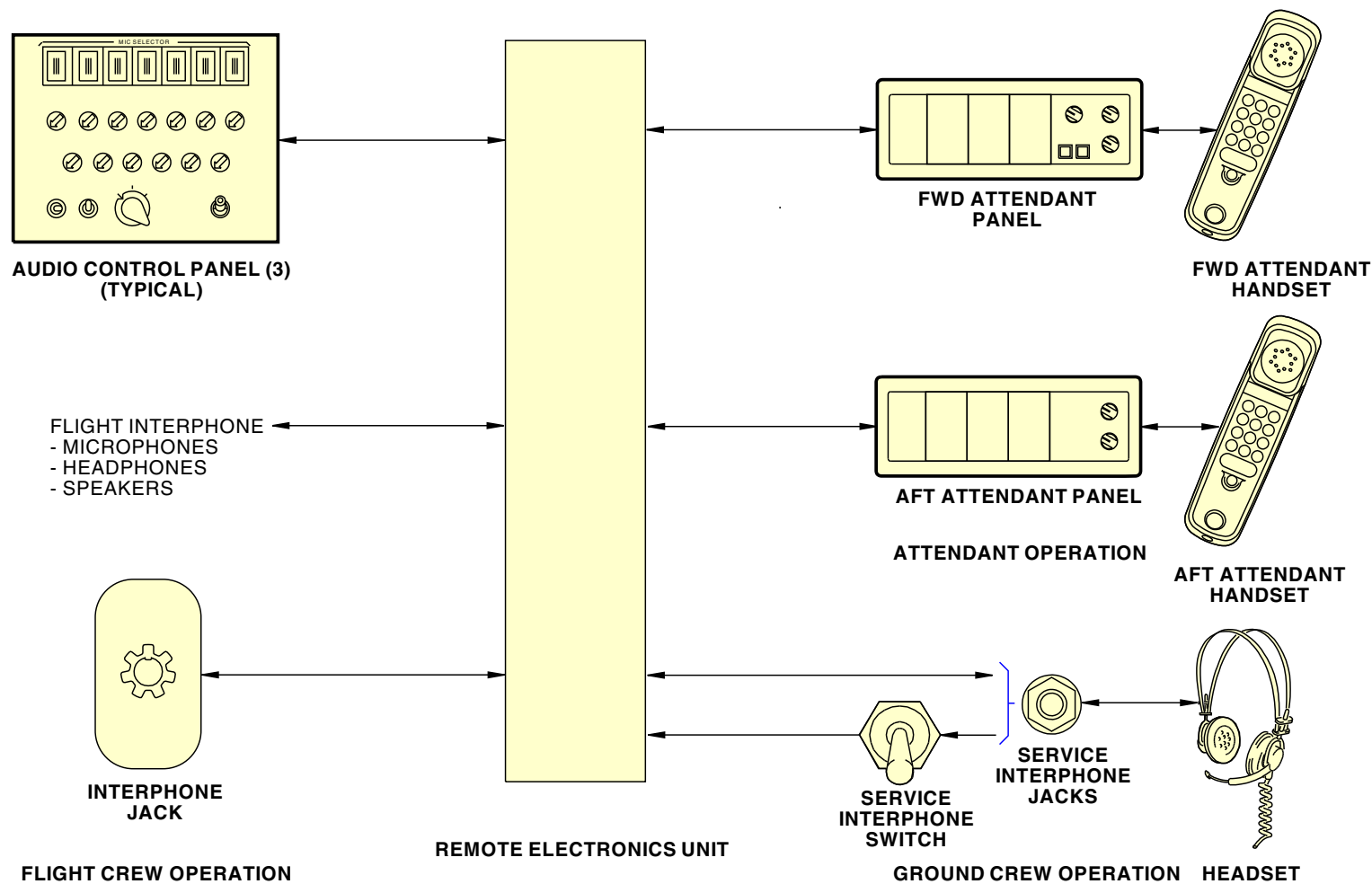
The ground crew microphones connect into the system through the service interphone switch. You must turn on the service interphone switch to operate the system from the service station jacks. The headset gets audio from the REU.

The REU does these functions:

- Combines audio from the microphones
- Amplifies the audio signal
- Sends audio to handsets, headsets, and speakers.

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# SERVICE INTERPHONE SYSTEM - GENERAL DESCRIPTION



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## SERVICE INTERPHONE SYSTEM - GENERAL DESCRIPTION

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## SERVICE INTERPHONE SYSTEM - COMPONENT LOCATIONS

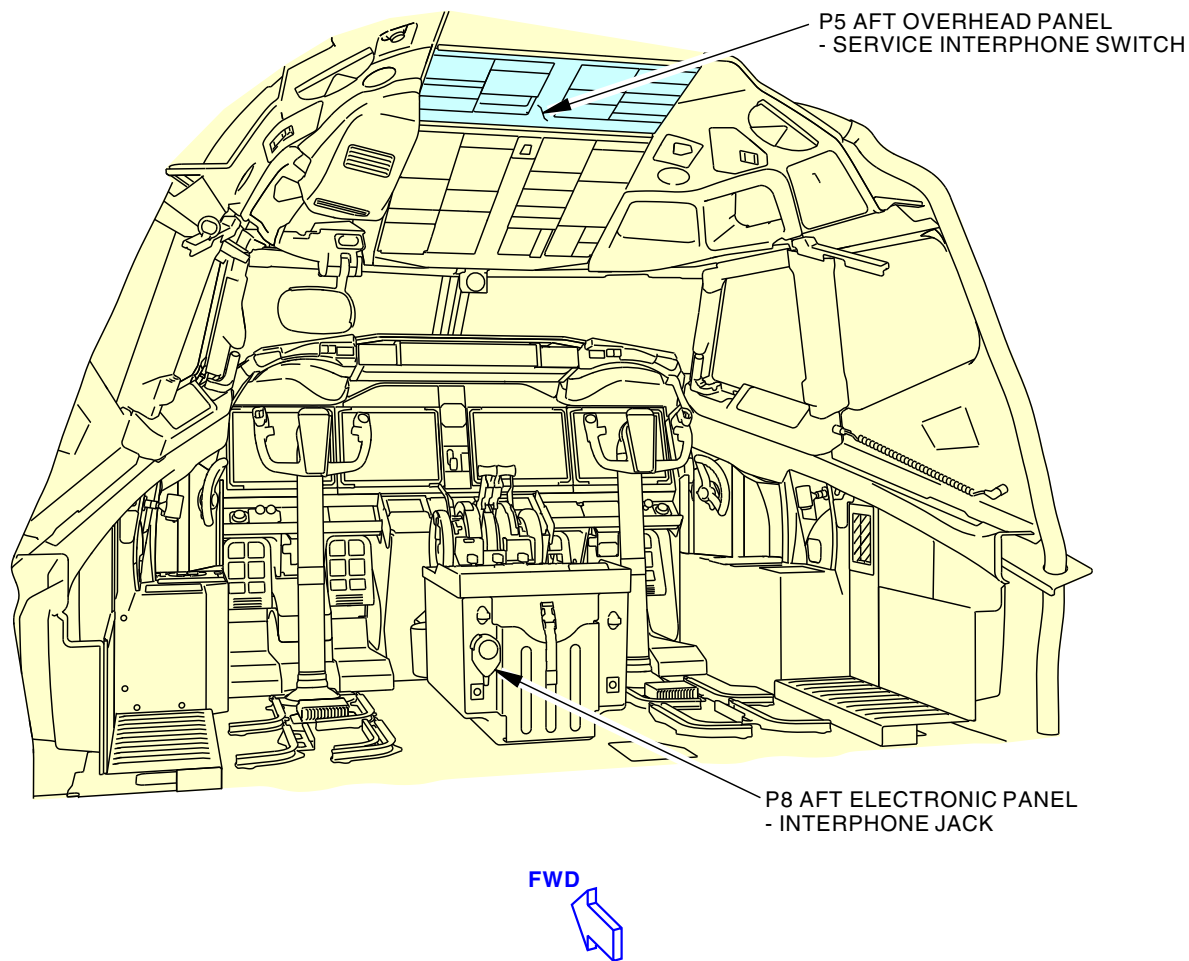
### Service Interphone Component Locations

The service interphone switch is on the P5 aft overhead panel.

The interphone jack for the handset is on the aft face of the P8 aft electronic panel.

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# SERVICE INTERPHONE SYSTEM - COMPONENT LOCATIONS



2368749 S00061518040\_V1

## SERVICE INTERPHONE SYSTEM - COMPONENT LOCATIONS

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## SERVICE INTERPHONE SYSTEM - HANDSET LOCATIONS

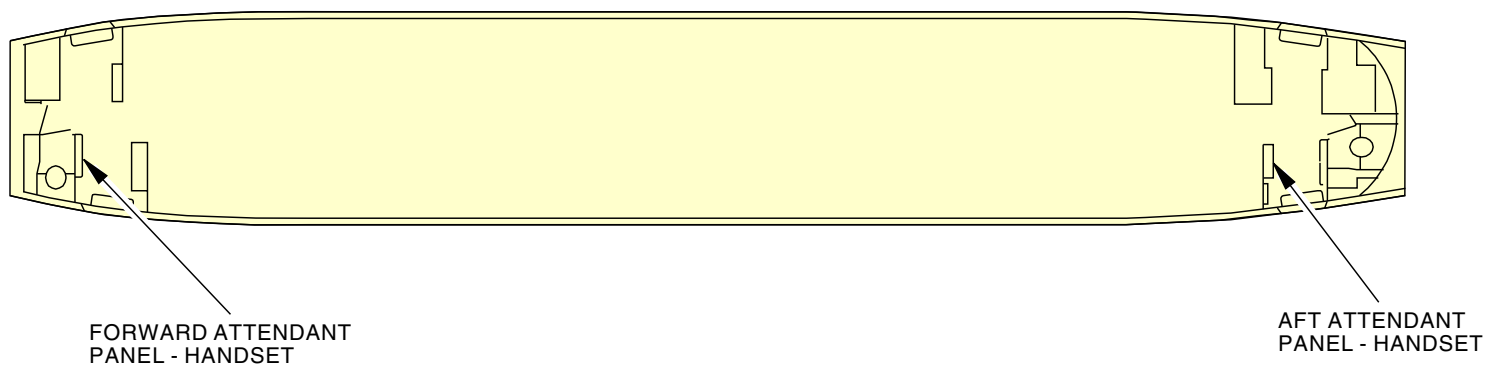
### Handset Locations

These locations have handsets:

- The forward attendant station - below the attendant panel, near the forward entry door.
- The aft attendant station - below the attendant panel, near the aft entry door.

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# SERVICE INTERPHONE SYSTEM - HANDSET LOCATIONS



2368750 S00061518042\_V2

## SERVICE INTERPHONE SYSTEM - HANDSET LOCATIONS

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## SERVICE INTERPHONE SYSTEM - JACK LOCATIONS

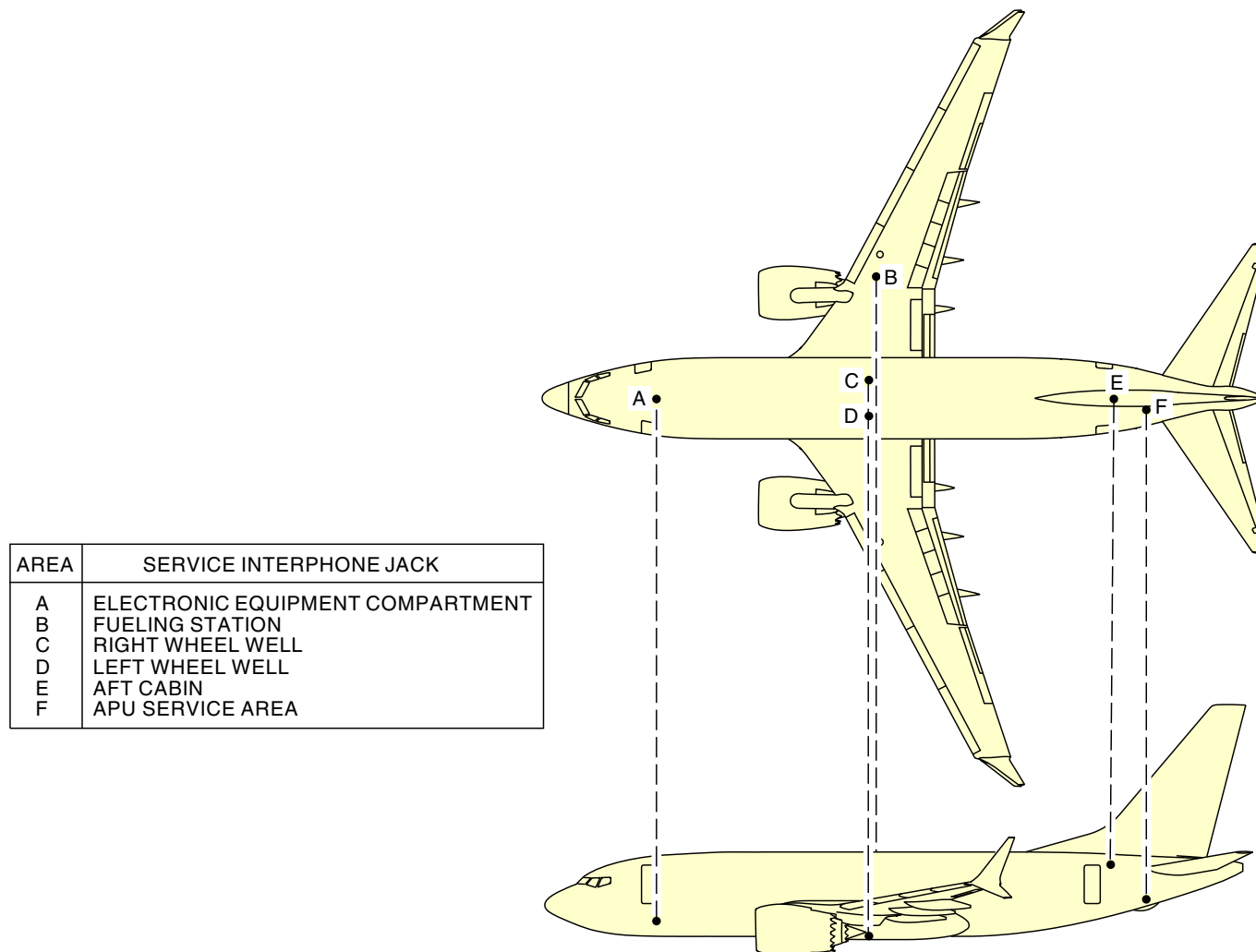
### Jack Locations

These locations have service interphone jacks:

- Electronic equipment compartment
- Fueling station, behind the access door on the right wing
- Right wheel well, on the forward wheel well fairing exterior
- Left wheel well, on the forward wheel well fairing exterior
- Aft cabin, on the ceiling above the attendant station
- APU service area, adjacent to the 48 section access door.

| SIA ALL | EFFECTIVITY   |
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## SERVICE INTERPHONE SYSTEM - JACK LOCATIONS



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## SERVICE INTERPHONE SYSTEM - JACK LOCATIONS

**23-41-00**



## SERVICE INTERPHONE SYSTEM - INTERFACES

### Flight Crew Interface

The flight crew uses microphones and headsets with audio control panel (ACP) control. When the ACP transmitter selector is set to service interphone, the flight crew can use a push-to-talk (PTT) switch to speak with the attendants and the service personnel. The ACP sends the transmitter selection data to the REU on the control input. The ACP sends the PTT signal (R/T-PTT) to the REU.

There is an interphone jack on the aft face of the P8 aft electronic panel. The flight crew can use a handset at this jack to talk on the service interphone.

### Attendant Interface

The attendants use a handset at their station. Attendants speak with each other, the flight crew, and the service personnel.

### Service Interface

Service personnel use headsets at service interphone jacks locations. When the service interphone switch is ON, they can speak with each other, the flight crew, and the attendants.

The service interphone switch disconnects microphone inputs from the external service interphone jacks. The service interphone audio to the headsets does not go through the switch.

### Remote Electronics Unit

The remote electronics unit (REU) has an audio accessory unit (AAU) card that gets microphone inputs from attendant, service, and flight crew interfaces. The AAU card mixes them together, amplifies, and sends the audio signal to these places:

- Forward and aft attendant panel
- Interphone jack on the aft face of P8
- External service interphone jacks
- Captain, first officer, and observer station card.

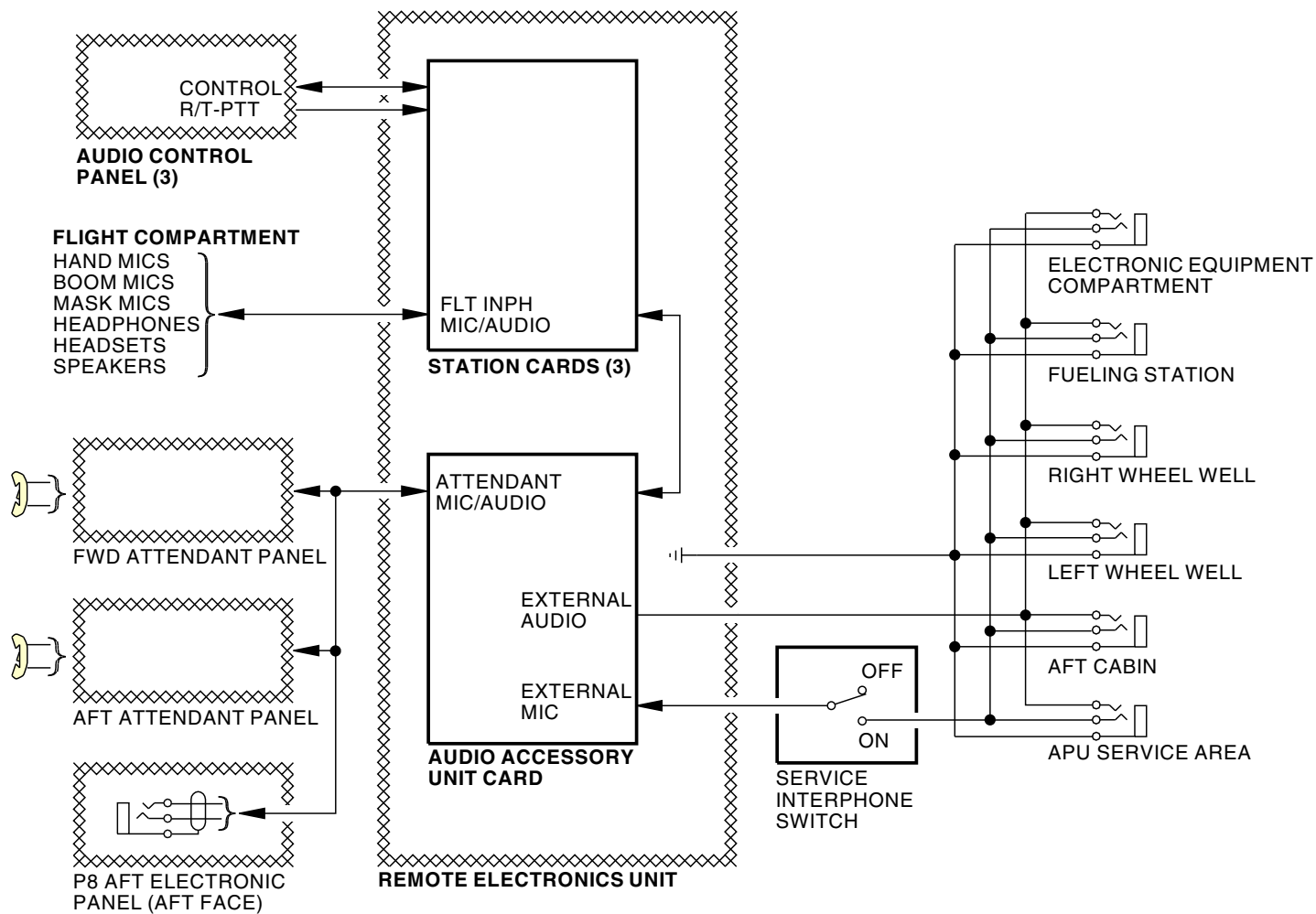
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SIA ALL EFFECTIVITY

D633AM102-SIA

ECCN 9E991 BOEING PROPRIETARY - See title page for details

### SERVICE INTERPHONE SYSTEM - INTERFACES



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### SERVICE INTERPHONE SYSTEM - INTERFACES

23-41-00

**SERVICE INTERPHONE SYSTEM - FUNCTIONAL DESCRIPTION****General**

The remote electronics unit (REU) processes service interphone audio signals. The audio accessory unit (AAU) circuit card in the REU contains service interphone circuits.

The service interphone circuits have an audio mixer. The audio mixer combines the microphone audio from the flight crew station cards, the attendant stations, and the service interphone jacks. The service interphone circuits increase the level of the audio signal. The audio goes to the flight crew station cards, the attendant stations, and the service interphone jacks.

**Operation**

The AAU card mixes these service interphone inputs:

- Flight compartment microphones
- Flight compartment handset microphone
- Attendant handset microphones
- Service interphone microphones when the service interphone switch is on.

Audio from the mixer goes to three audio amplifiers. The amplifier outputs go to:

- Flight compartment speakers and headsets
- Service interphone headsets
- Attendant handsets.

The gain controls are on the REU front panel. They change the amplifier gain. You do these adjustments in the shop. Use the calibration procedures in the maintenance manual.

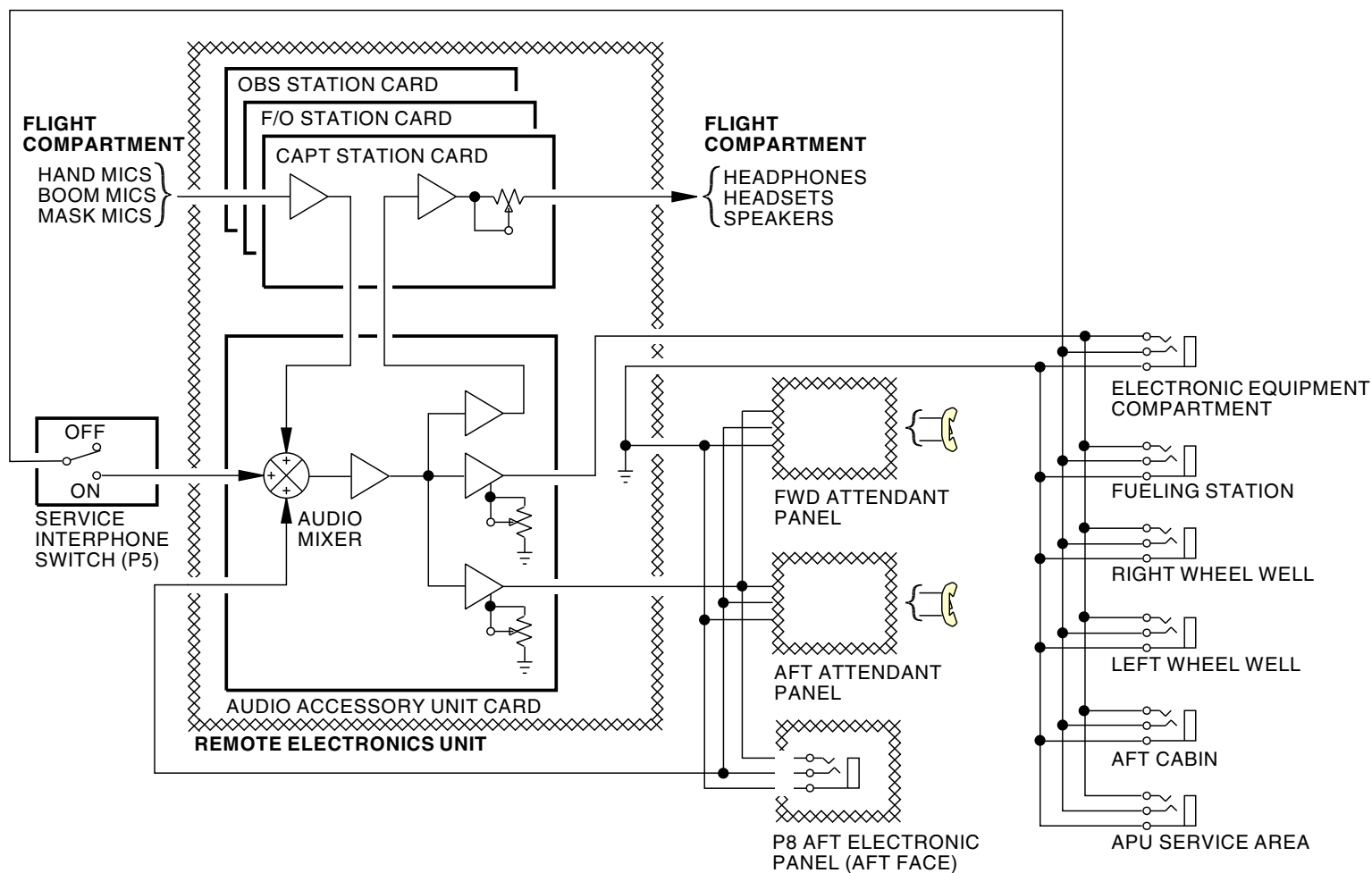
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ECCN 9E991 BOEING PROPRIETARY - See title page for details

# SERVICE INTERPHONE SYSTEM - FUNCTIONAL DESCRIPTION



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## SERVICE INTERPHONE SYSTEM - FUNCTIONAL DESCRIPTION

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**23-42-00**

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## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - INTRODUCTION

### Purpose

The flight crew call system tells:

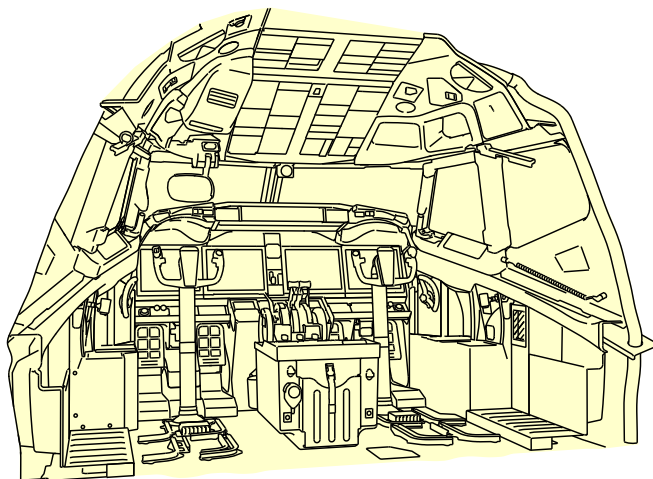
- Flight compartment personnel that there is a call from the cabin attendants
- Attendants there is a call from the flight compartment or another attendant panel.

### Abbreviations and Acronyms

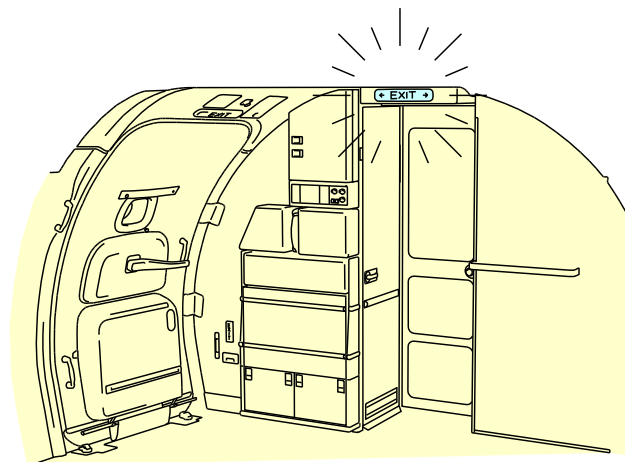
- ADIRS - air data inertial reference system
- attend - attendant
- flt - flight
- grd - ground
- IHC - integrated handset controller
- PA - passenger address
- PTT - push-to-talk
- v dc - volts direct current

| EFFECTIVITY |  |
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## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - INTRODUCTION



FLIGHT COMPARTMENT



CABIN

2368754 S00061518052\_V1

## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - INTRODUCTION

**23-42-00**

**FLIGHT CREW CALL SYSTEM/CABIN INTERPHONE - GENERAL DESCRIPTION****General**

The flight crew call system lets the flight crew and attendants call each other. These are the calls that can be made:

- Cabin Alert system
- Flight compartment to attendant stations
- Attendant station to flight compartment
- Attendant station to attendant station.

Aural and visual indications from the system tell the flight and cabin crew to use the cabin interphone.

**Cabin Alert System**

The Cabin Alert System provides aural and visual indications in the flight compartment and the passenger compartment when it is activated.

This system consists of three push button switches located near the attendant seats in the passenger cabin and a switch on the PRIORITY COMM (P5) overhead panel in the flight compartment.

To activate the system, the attendant pushes any of the three switches in the cabin. When the system is activated, these are the indications:

- Aural Warning module makes a chime in the flight compartment.
- Aural Warning module makes a chime in the passenger compartment over PA speakers.
- Blue indicator light on PRIORITY COMM (P5) overhead panel comes on.
- Call lights on the forward and aft EXIT locator signs in the passenger cabin come on.

To deactivate the system, the flight crew pushes the switch on the PRIORITY (P5) panel. When deactivated, the lights in the flight compartment turn off.

If the system is not deactivated by the flight crew, it stays on for 40 seconds and becomes deactivated.

**Flight Compartment to Attendant Stations**

You push the ATTEND switch on the passenger signs panel to call the attendant stations from the flight compartment. When you make this call, these are the indications in the passenger cabin:

- Pink light on the forward and the aft exit locator signs comes on
- Passenger address system sends a HI/LO chime to the cabin speakers.

**Attendant Station to Flight Compartment**

You use the handset to call the flight compartment from an attendant station. When you make this call, these are the indications in the flight compartment:

- Cabin call light on the audio control panel comes on
- Aural warning module makes a HI chime.

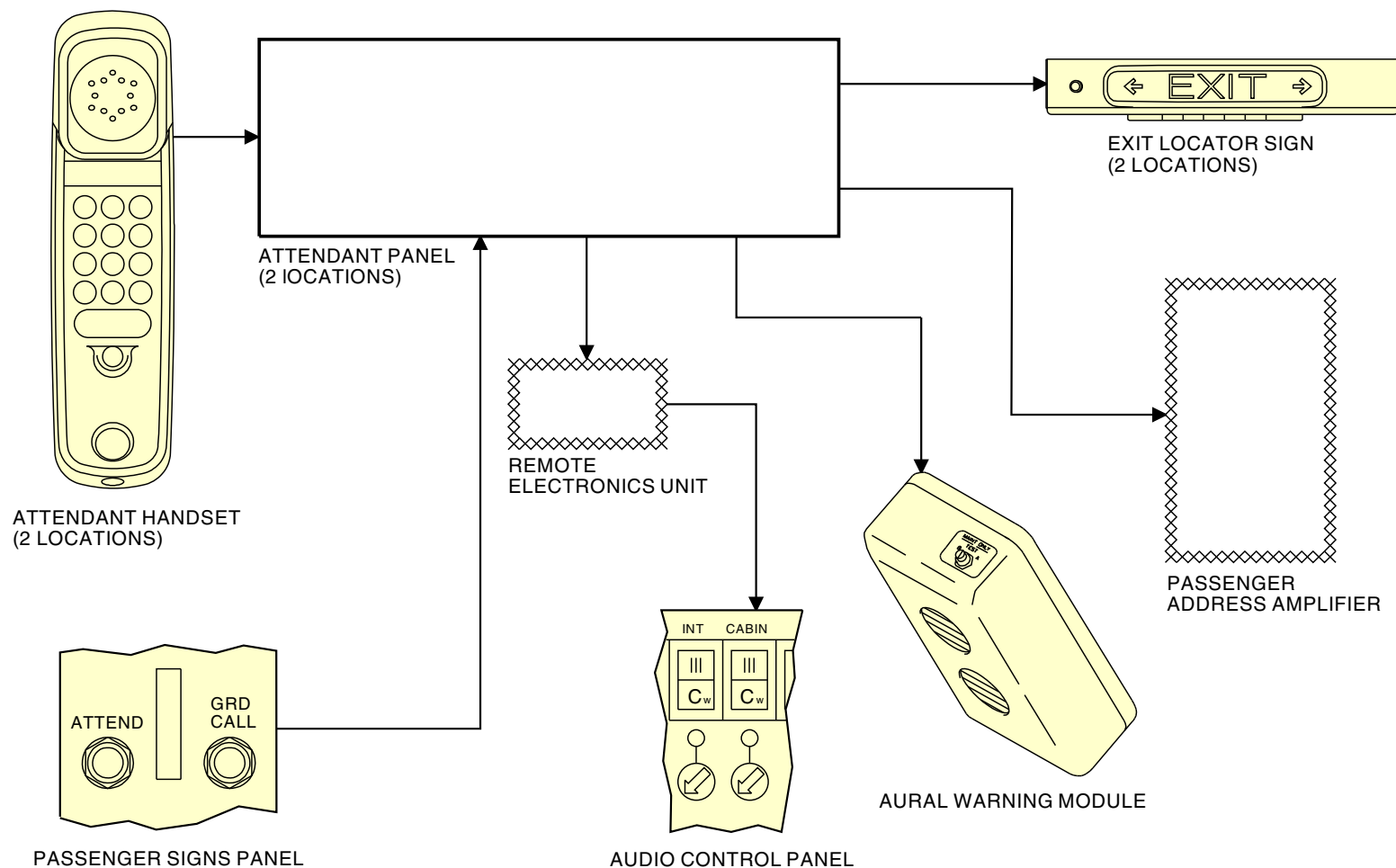
**Attendant Station to Attendant Station**

You use the handset to call one attendant station from another attendant station. When you make this call, these are the indications in the passenger cabin:

- Pink light on the exit locator sign comes on at the other attendant station
- Passenger address system sends a HI/LO chime to the cabin speakers.

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# FLIGHT CREW CALL SYSTEM/CABIN INTERPHONE - GENERAL DESCRIPTION



2368755 S00061518054\_V1

## FLIGHT CREW CALL SYSTEM/CABIN INTERPHONE - GENERAL DESCRIPTION

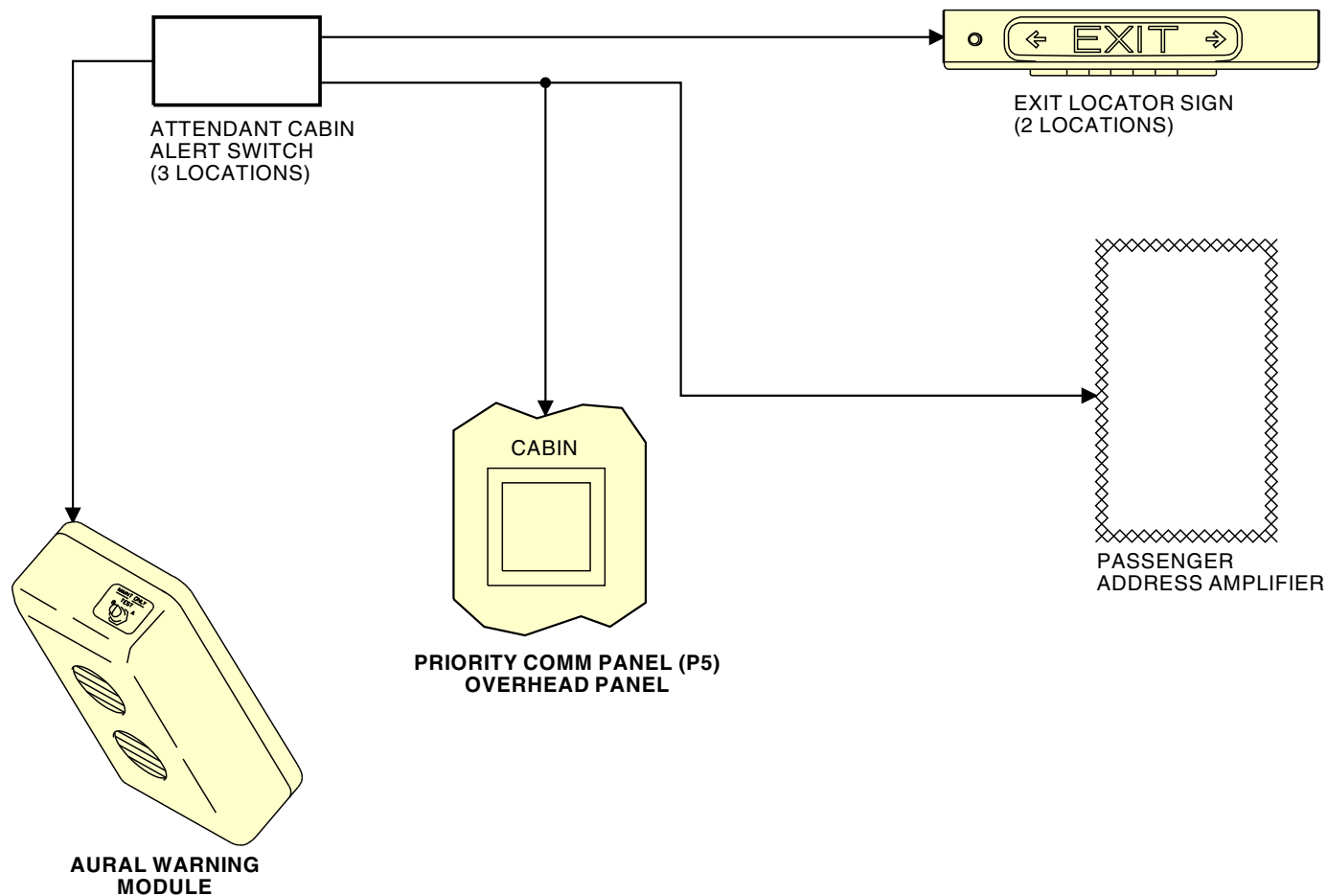
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| SIA ALL | EFFECTIVITY   |
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# FLIGHT CREW CALL SYSTEM/CABIN INTERPHONE - GENERAL DESCRIPTION



2548170 S0000606418\_V1

## FLIGHT CREW CALL SYSTEM/CABIN INTERPHONE - GENERAL DESCRIPTION

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## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - PASSENGER COMPARTMENT COMPONENT LOCATIONS

### Handsets

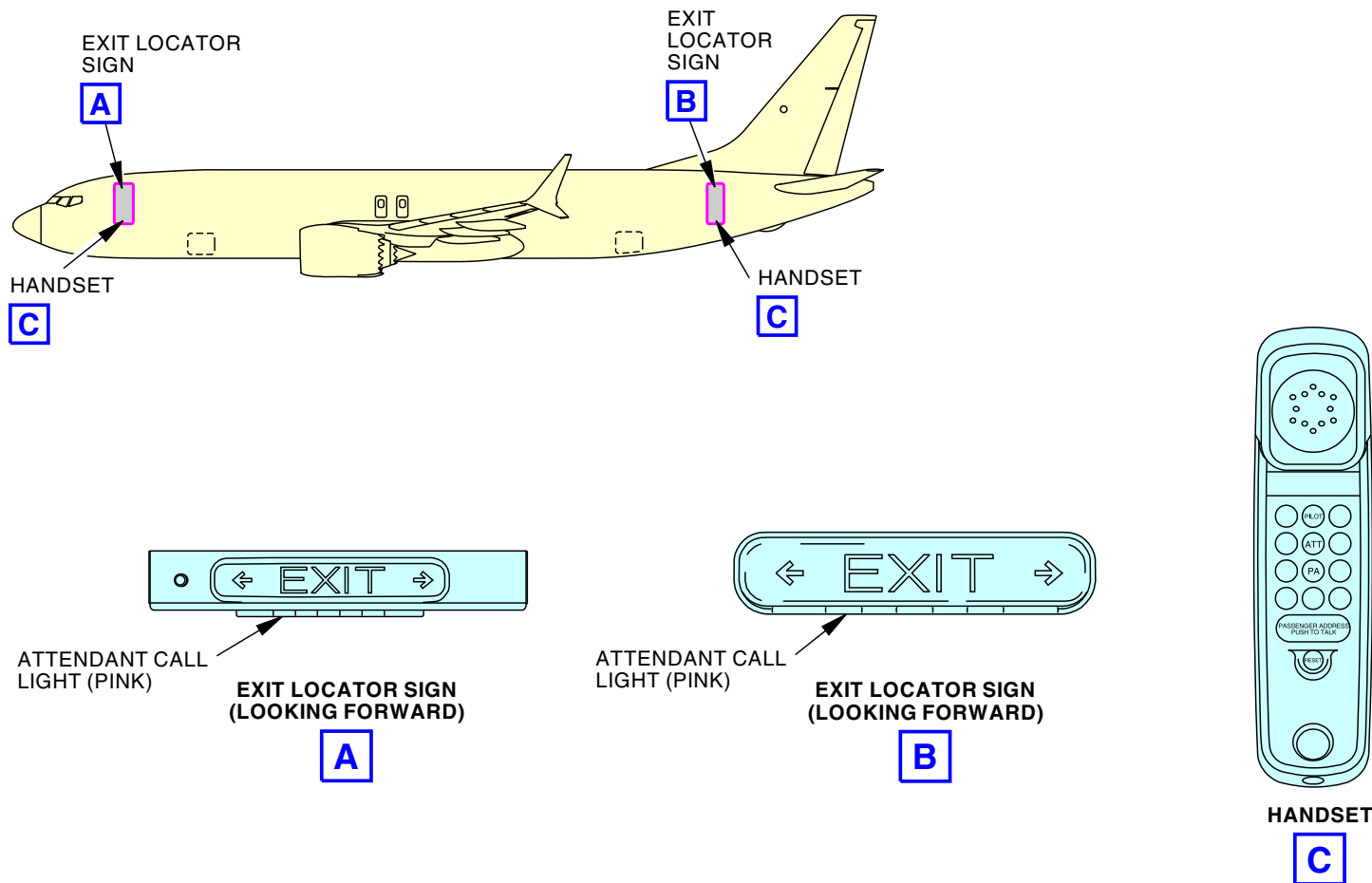
The handsets are below the cabin attendant panels at each attendant station.

### Attendant Call Lights

The attendant call lights are on the forward and aft exit locator signs. These are on the ceiling at the forward and aft sections of the passenger compartment.

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## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - PASSENGER COMPARTMENT COMPONENT LOCATIONS



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## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - PASSENGER COMPARTMENT COMPONENT LOCATIONS

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## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FLIGHT COMPARTMENT COMPONENT LOCATION

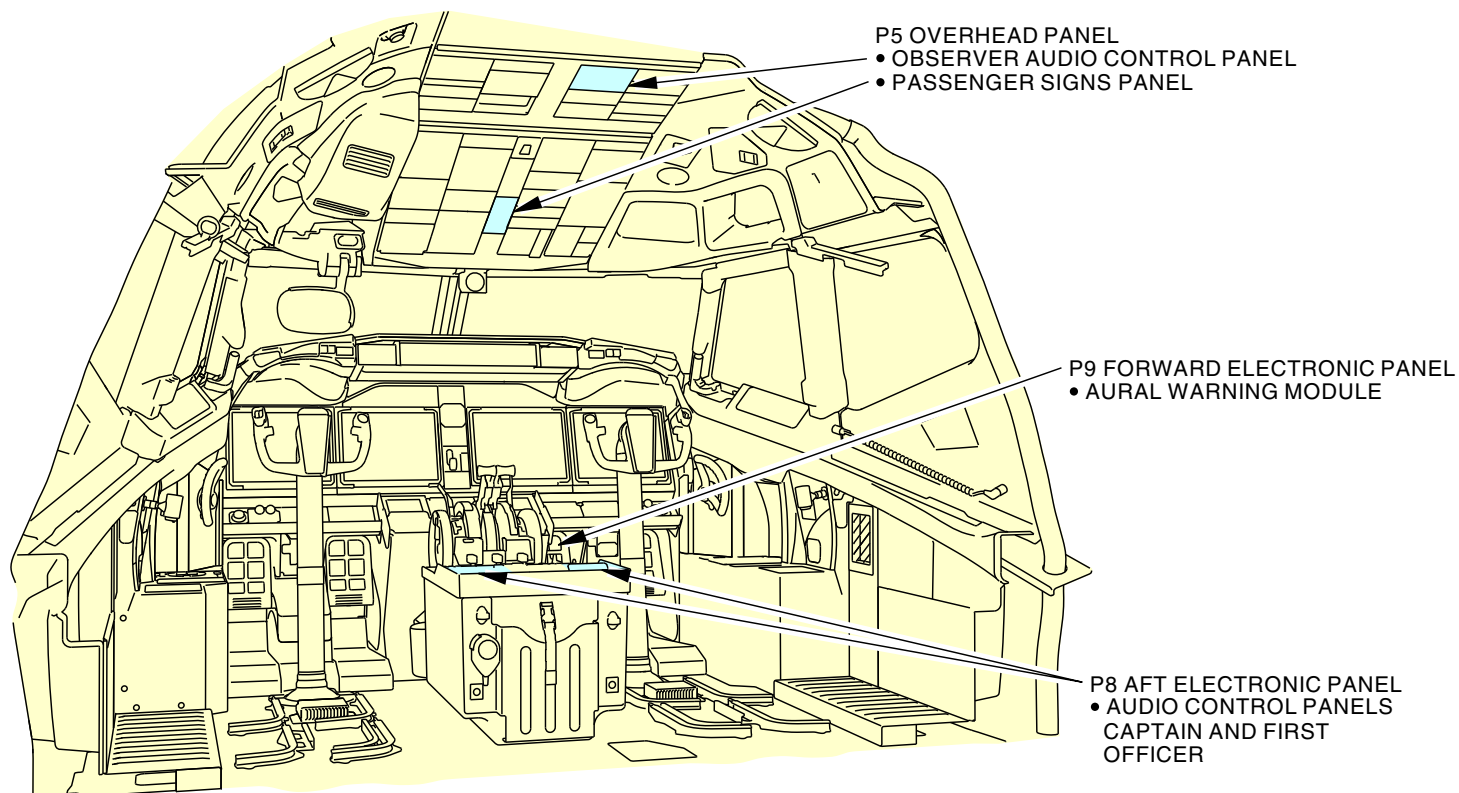
### Flight Compartment Component Location

The audio control panels are on the P5 aft overhead panel and on the P8 aft electronic panel.

The blue CABIN indicator light and reset switch are on the PRIORITY COMM (P5) overhead panel.

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# FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FLIGHT COMPARTMENT COMPONENT LOCATION



2368757 S00061518058\_V1

## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FLIGHT COMPARTMENT COMPONENT LOCATION

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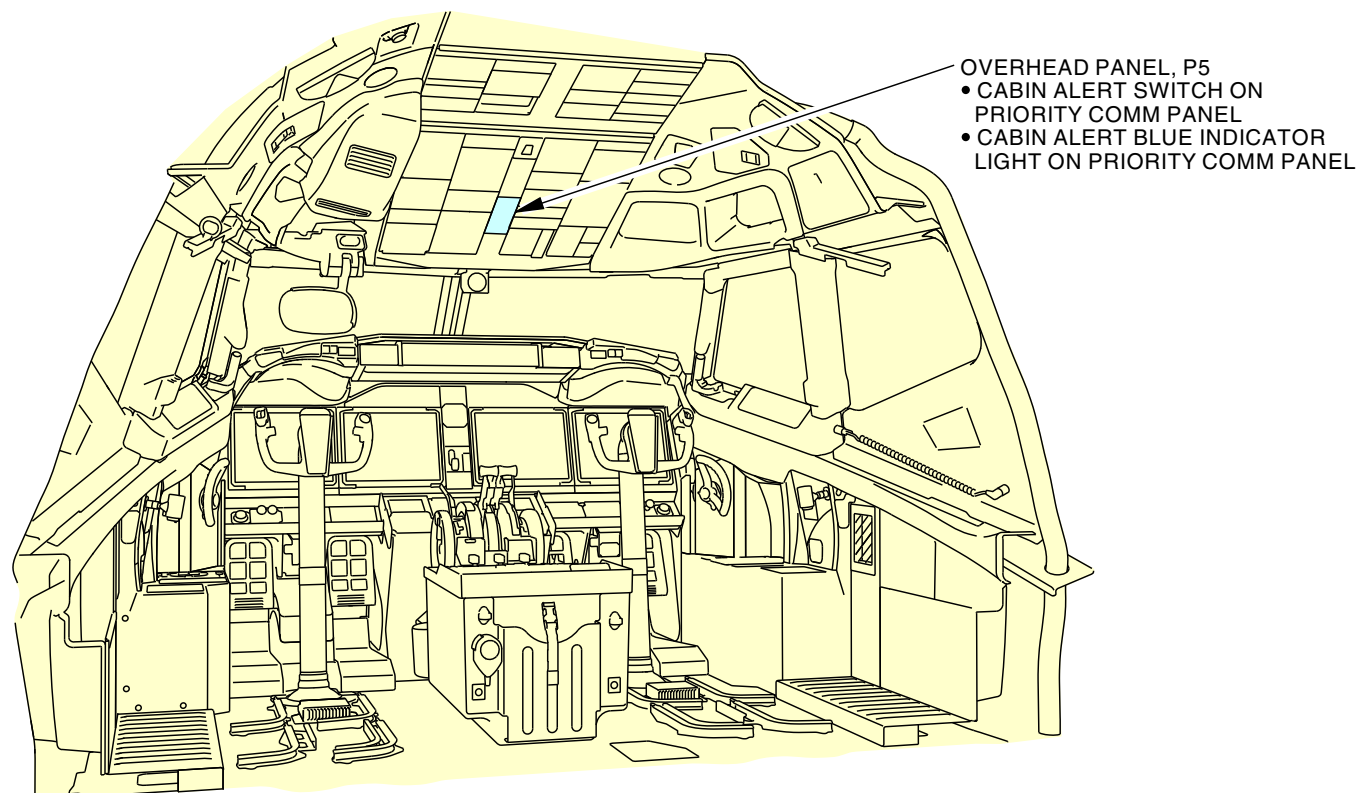
SIA ALL

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# FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FLIGHT COMPARTMENT COMPONENT LOCATION



FLIGHT COMPARTMENT

2548171 S0000606421\_V1

## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FLIGHT COMPARTMENT COMPONENT LOCATION

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**FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - INTERFACES****Power**

The flight crew call system/cabin interphone gets power from the following sources.

The CREW CALL circuit breaker on the P18 panel supplies 28v dc to:

- The attendant call switch
- The cabin alert system components in the flight compartment and passenger compartment
- The Integrated Handset Controller (IHC) in the forward and aft attendant control panels

The INPH AND WARN and ENTERTAINMENT PA SYS BAT circuit breakers on the P6 panel supply 28v dc to the IHC's in the forward and aft attendant control panels.

The ATTENDANT PANEL circuit breaker on P6 panel supplies 28v dc to the LCD touchscreen of the attendant control panels.

**Passenger Signs Panel**

The passenger signs panel has an attendant call switch that sends a call signal to the forward attendant control panel. The attendant control panel turns on the attendant call lights at the two attendant stations, and sends a discrete signal to the passenger address amplifier to make a high/low chime.

**Attendant Handsets**

An attendant handset connects to the forward and aft attendant control panels. The handset can send call signals to the flight compartment or the other attendant station.

For calls to the flight compartment, the attendant control panel sends two discrete signals. One discrete signal goes to the REU. The REU turns on the call light in the audio control panels. The other discrete signal goes to the aural warning module to make a high chime.

For calls to the other attendant station, the attendant control panel turns on the attendant call light at that station and sends a discrete signal to the passenger address amplifier to make a high/low chime.

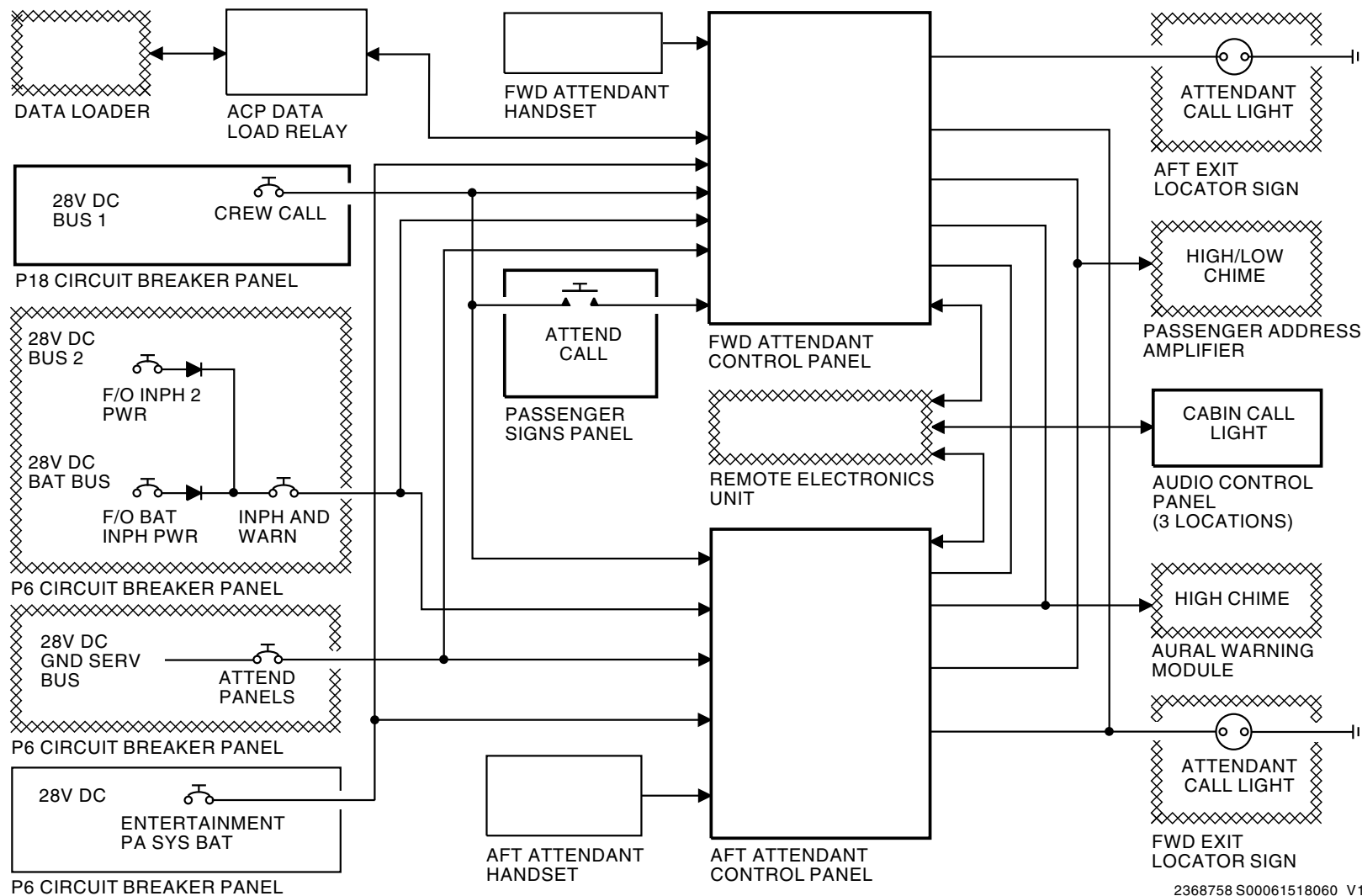
**Cabin Alert System**

To activate the system, the attendants can push any of the three Cabin Alert switches adjacent to their seats. This will send signals to turn on the blue CABIN light on the PRIORITY COMM overhead panel and a hi tone chime on the aural warning module in the flight compartment. In the passenger compartment, this turns on the white call lights on the forward and aft EXIT locator signs and a hi chime on the passenger address amplifier.

To deactivate the system, the flight crew push the reset switch on the PRIORITY COMM panel. This will turn off the lights on the overhead panel and the lights in the passenger compartment.

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# FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - INTERFACES



2368758 S00061518060\_V1

## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - INTERFACES

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SIA ALL

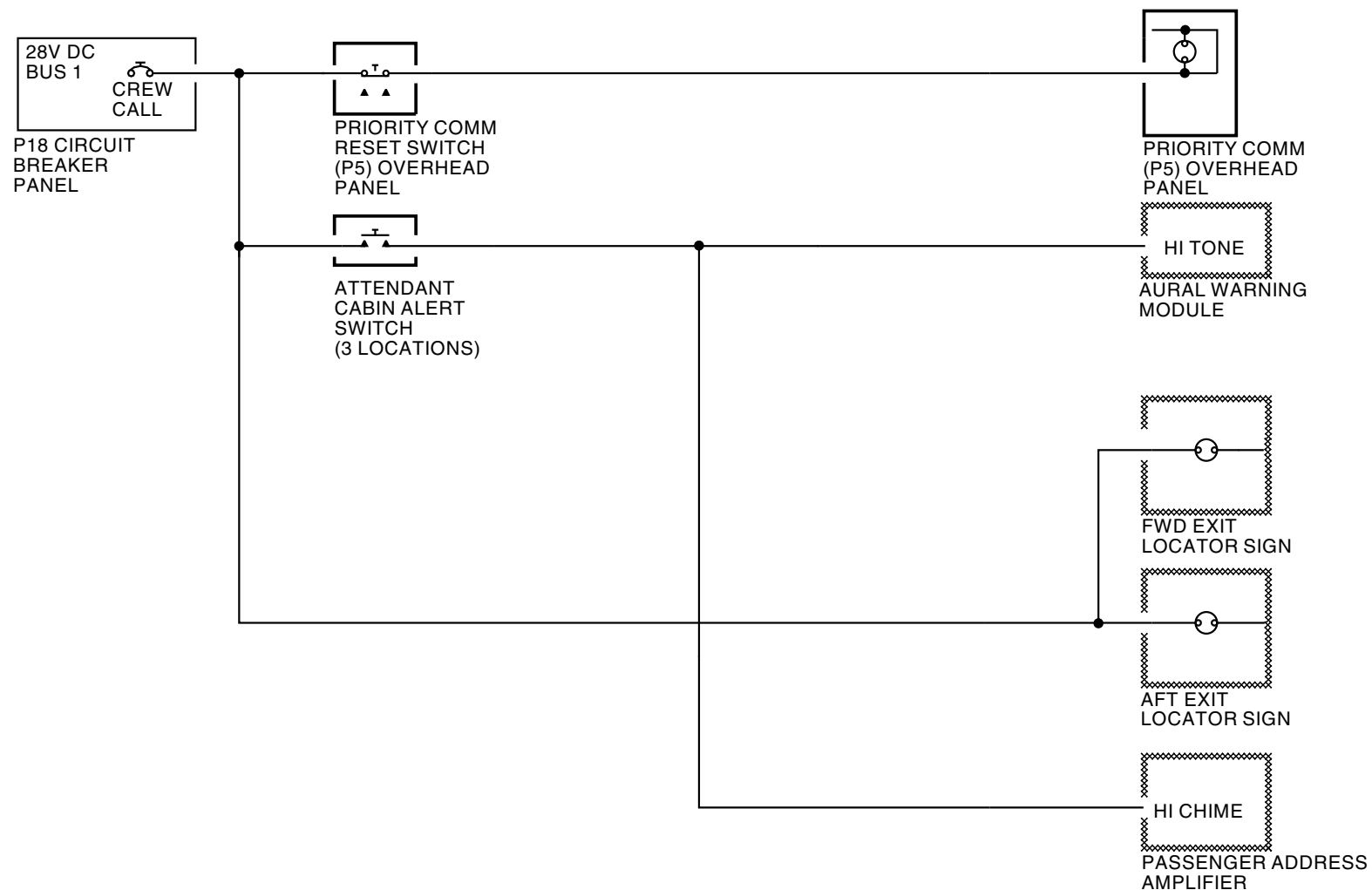
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# FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - INTERFACES



2368759 S00061518061\_V1

# FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - INTERFACES

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## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - HANDSET

### Purpose

The attendants use handsets to speak with each other. They also use them to make announcements on the passenger address (PA) system.

### Physical Description

The interphone handset is like a telephone handset. It has these features:

- Earpiece speaker
- Microphone
- Push-button switches.

A handset cradle holds the interphone handset. The cradle has a magnetic strip. The handset uses a magnetically operated reed switch to detect an on-hook or off-hook condition of the handset.

### Location

There is a handset at the forward attendant panel and at the aft attendant panel in the passenger compartment.

### Operation

Lift the handset off the hook. This connects the handset microphone and speaker to the service interphone system.

The handset push-buttons have these functions:

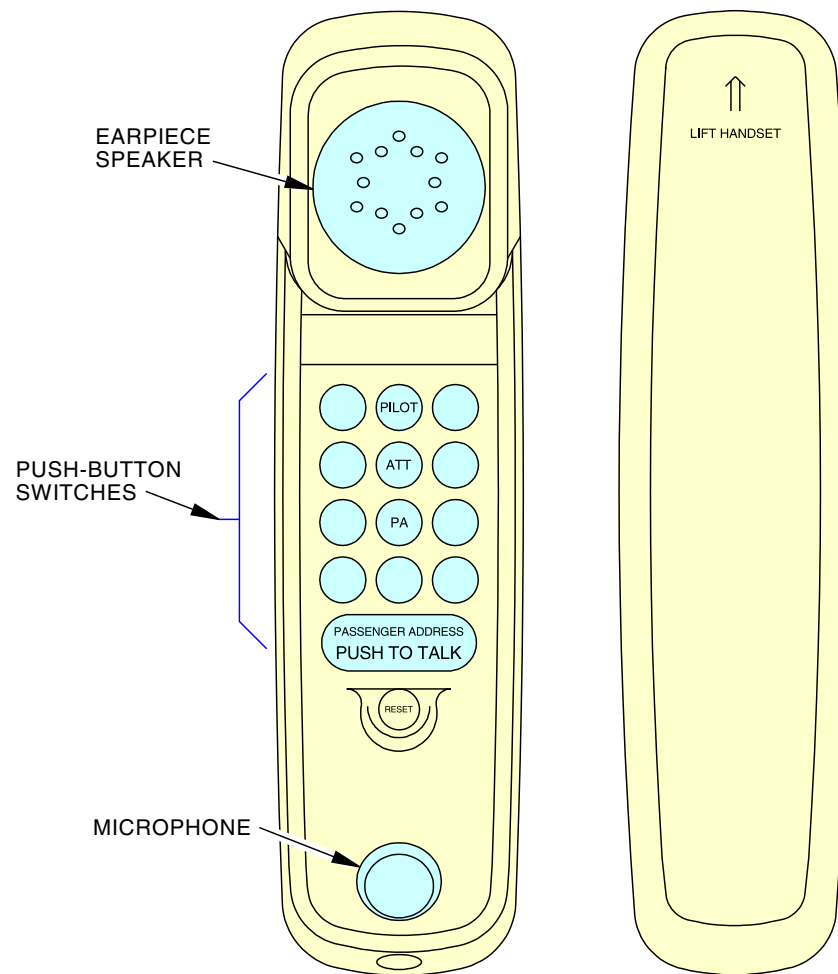
- Push the pilot button to call the pilot. This turns on the cabin call light on the audio control panel and makes a high chime in the flight compartment
- Push the attendant (ATT) button to call the other attendant station. This turns on the attendant call light at that station and makes a high/low chime in the passenger compartment
- Push the PA button to connect the handset to the passenger address system
- Push the push-to-talk button to make PA announcements
- Push the reset button to disconnect the handset from the passenger address system or to cancel the call

- Push the PILOT button more than one time to alert the pilot of an emergency condition. The number of times to push to alert the pilot is shown on the placard of the handset.

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## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - HANDSET



2368760 S00061518063\_V1

## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - HANDSET

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## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FUNCTIONAL DESCRIPTION

**General**

You use the flight crew call system to make these calls:

- Pilot to attendant
- Attendant to pilot
- Attendant to attendant
- Cabin Alert system

**Pilot to Attendant Call**

When you push the ATTEND switch on the passenger signs panel, 28v dc goes to the forward attendant control panel. The panel turns on the attendant call lights at the two attendant stations. The panel also sends a discrete signal to the passenger address (PA) amplifier. The PA amplifier sends a high/low chime to the cabin speakers.

The attendant call lights stay on until you lift one of the handsets from the cradle. If the handset is already out, you can push the handset RESET button to turn off the attendant call lights.

**Attendant to Pilot Call**

When you push the PILOT button on the attendant handset, an encoded signal goes to the attendant control panel.

**NOTE:** If the attendant handset is set for PA, then you must push RESET on the handset to make a pilot call.

The attendant control panel sends a discrete signal to the aural warning module to make a high chime in the flight compartment. It also sends a latched 28v dc discrete to the REU to energize a relay. The REU sends a ground discrete to make the CABIN call light on the audio control panel come on.

The light stays on until you push the RESET button on the handset, or put the handset back in the cradle.

**Attendant to Attendant Call**

When you push the ATT button on the attendant handset, an encoded signal goes to the attendant control panel.

**NOTE:** If the attendant handset is set for PA, then you must push RESET on the handset to make an attendant call.

The attendant control panel turns on the attendant call light at the other attendant station. It also sends a discrete signal to the PA amplifier. The PA amplifier sends a high/low chime to the cabin speakers.

When you lift the handset from the cradle at the other attendant station, the call light goes off. If the handset is already out, you can push the handset RESET button to make the attendant call light go off.

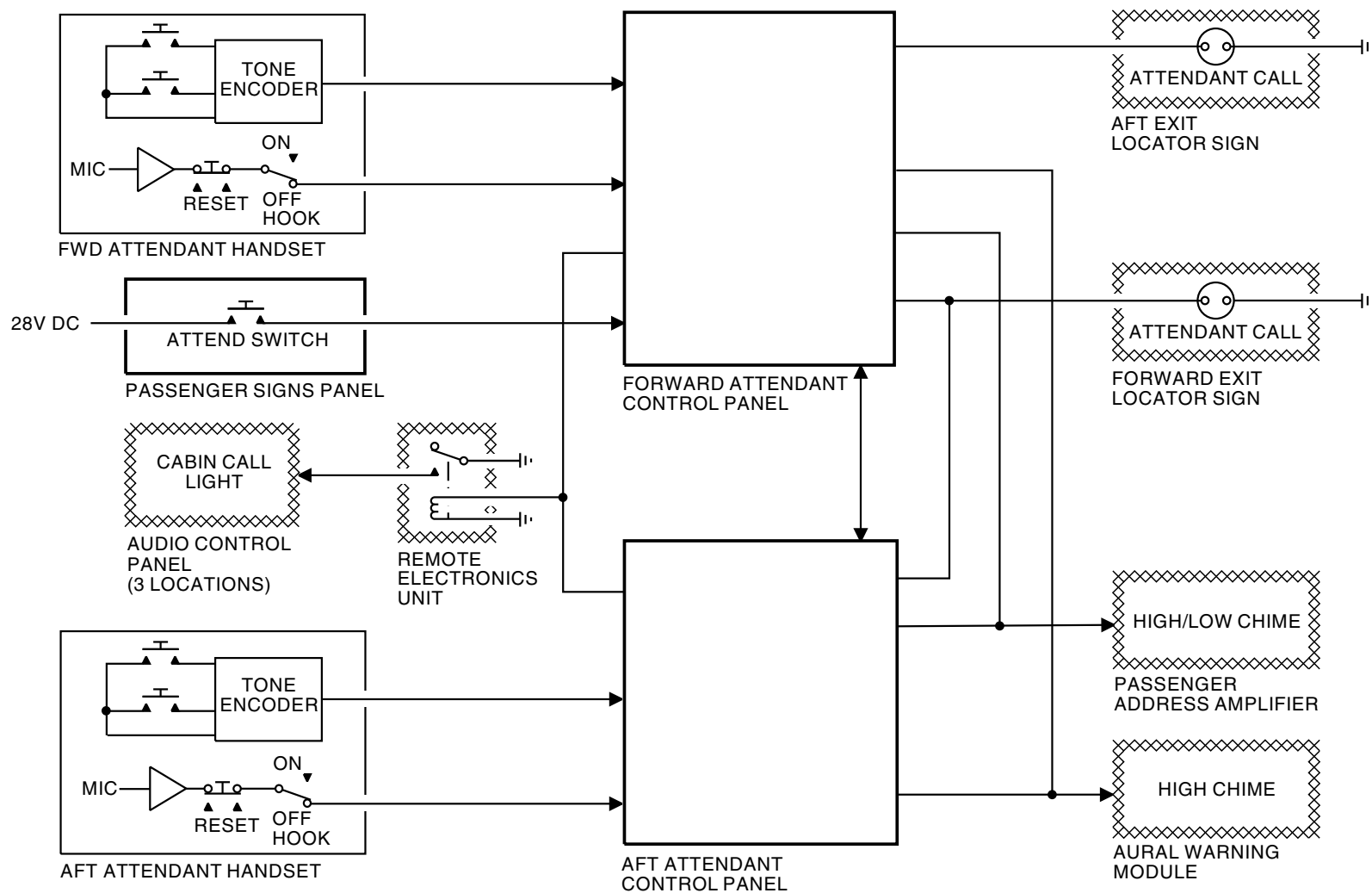
**Cabin Alert System**

When you activate any of the three Cabin Alert switches in the passenger cabin, the blue CABIN light on the PRIORITY COMM panel on the P5 overhead panel and the white attendant call lights in the passenger cabin come on. This also generate a chime in the flight compartment and a chime in the passenger cabin. If no action takes place, the system will stay on for 40 seconds.

To deactivate the system, the flight crew pushes the switch on the PRIORITY COMM panel. This will make the light in the flight compartment and passenger cabin go off.

| EFFECTIVITY |  |
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# FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FUNCTIONAL DESCRIPTION



2368761 S00061518065\_V1

## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FUNCTIONAL DESCRIPTION

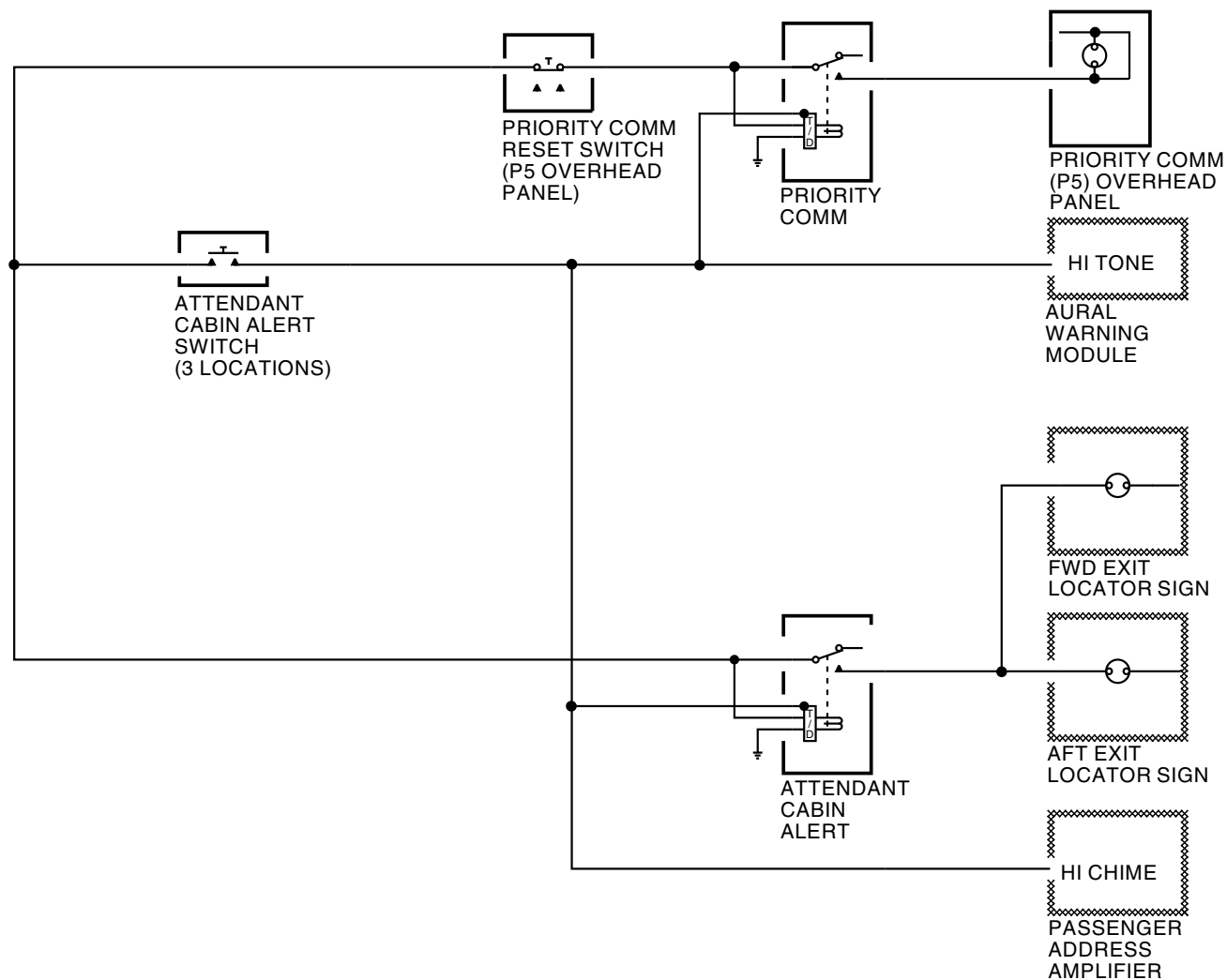
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# FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FUNCTIONAL DESCRIPTION



2548172 S0000606425\_V1

## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FUNCTIONAL DESCRIPTION

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## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - ATTENDANT CONTROL PANEL

**Purpose**

The Attendant Control Panel (ACP) is used by the flight attendant to monitor and control several cabin features and functions such as lighting, entertainment, PC Power, lavatory smoke detectors, cell phones, air stairs, ground service bus, emergency exit lights, emergency evacuation, cabin ready and cabin temperature.

The ACP functions as the Integrated Handset Controller (IHC) for the Flight Crew Call / Cabin Interphone system.

**General Description**

The ACP is located at the attendant station. It is mounted on the wall, above the attendant seat headrest.

The ACP panel is 16 " wide, 9" high and 4.5 " deep. A shroud covers the ACP unit.

The ACP panel has an Integrated Switch Assembly (ISA), a Liquid Crystal Display (LCD) touch screen and an Integrated Handset Controller (IHC).

The LCD touchscreen includes a Graphical User Interface (GUI) menu. The controls for the GUI menu are defined by configuration database. The database can be modified with the software tool Configuration Database Generator (CDG). The forward and aft ACP's have different menus. Users can activate the touchscreen by touching two opposite corners of the screen sequentially. If the touchscreen is inoperative, users will not be able to provide inputs to systems on the related ACP. In this case, the Cabin light will be converted to white light (default state). The Flight Crew Call / Cabin Interphone system will remain operative.

The ISA contains hard mounted switches located next to LCD touchscreen. The amber LED at the upper left corner of the ISA will turn on when the ACP is not operative. The LED will stay on when there is an over temperature condition in the ACP. The LED will flash when there is an internal fault with the ACP. At power-up the LED will turn on for 2 seconds and then turn off.

The IHC, with the use of the attendant handset, provides Cabin Interphone functionality. The IHC is embedded in the circuit assembly inside the ACP.

**Functional Description**

The ACP has ability to monitor and control various systems. The basic functions of the ACP are:

- Integrated Handset Controller (IHC) for Cabin Interphone: The ACP interfaces with the flight deck and cabin handsets and provides the capability to switch each handset between Cabin Interphone and Passenger Address modes. The IHC provides a hardwired party line network for the Cabin Interphone system when the handsets are in Cabin Interphone mode. The IHC also controls the illumination of call lights and chime commands for calls from the flight deck or cabin.
- Cabin Lighting Control: The ACP controls lighting in the cabin work areas, the entry ways and the passenger seating area. The flight attendant can select lighting scenes for the passenger seating area through the ACP lighting menu. Standard and custom lighting scenes can be selected from the lighting menu. In case of decompression, the ACP will display the White Bright scene to the passenger seating area, the entry ways and turn on several discrete lights in the attendant work areas. More information on lighting can be found in CHAPTER 33.
- Potable Water Level Monitoring: The ACP displays the potable water level using a color bar graph.
- Vacuum Waste Monitoring: The ACP displays the airplane's waste tank levels and status of the waste tank sensors. This function provides an indication of LAV INOP status when the waste tank is full.
- Ground Service Bus: The ACP allows the flight crew to control ground service power bus.
- Emergency Exit Lights: The ACP allows the flight crew to control the emergency exit light via a hard switch located on the Integrated Switch Assembly.

If selected, the ACP can be used in the following systems:

- In Flight Entertainment: The ACP provides the flight crew the ability to turn system power on and off via a soft button on the touch screen.
- PC Power: The ACP provides the flight crew the ability to turn the system power on and off via a soft button on the touch screen.

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**FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - ATTENDANT CONTROL PANEL**

- Lavatory Smoke Detector: The ACP will monitor the smoke detector status inside the lavatories and display a pop-up screen when smoke is detected. The flight attendant must reset the smoke detector for the warning to disappear.
- Cell Phone: The ACP allows the flight crew to control the cell phone service via a soft button on the touch screen.
- Air Stairs: The ACP allows the flight crew to control the extension and retraction of the air stairs via a hard switch located on the Integrated Switch Assembly (ISA).
- Emergency Evacuation: The ACP allows the flight crew ability to initiate alerts and shut off warnings during emergency evacuation.
- Cabin Temperature: The ACP allows the flight crew to control the cabin temperature.
- Special Function: The ACP is able to receive up to 3 additional functionalities in the future without engineering modification.

**Configuration Check**

The ACP Configuration Check can be accomplished at the forward ACP under the Maintenance menu.

The Configuration Check provides hardware and software part number information for the ACP's and each light LRU.

When the system is in Configuration Check mode, all other maintenance soft buttons on the forward ACP are desensitized and the aft ACP displays a message indicating that a maintenance action is in progress.

**Lamps Test**

The Lamps test turns ON all LEDs (30% bright) to allow mechanic to determine if any LEDs are not working properly.

The Lamps Test is accomplished under the Maintenance menu at the forward ACP. When the system is in Lamps Test mode, all other maintenance soft buttons on the forward ACP are desensitized and the aft ACP displays a message indicating that a maintenance action is in progress.

**BITE Test**

The Attendant Control Panel can perform BITE (Built-In-Test Equipment) test. The BITE test is achieved at power-on, startup and at specified intervals while the software is running.

Depending on the ACP software version, user can do the BITE test alone or as part of the system test. The system test includes of BITE test and test for the lighting LRU's.

At the end of the test, the ACP will provide the status of the BITE or system test results. The ACP will show the faults (if applicable) with recommended maintenance actions.

The ACP will lock out all commands during the BITE or system test. The test is only available when the airplane is on the ground.

When the ACP detects critical faults or in case of memory failure, the ACP will store a fault code, shut down and illuminate the amber LED on the Integrated Switch Assembly (ISA). When the ACP experiences a critical failure, it will shut down while the IHC function will remain operative.

**Data Loading**

Data loading for the Operational Software (OPS), Configuration Database (CDB) and Lighting Database (LDB) can be accomplished at the forward ACP under the Data Load section of the Maintenance menu.

**AIRPLANES WITH V4 SOFTWARE;**

- The soft button "ADL to ACP" allows data loading from the data loader to the forward ACP.
- The soft button "ACP to ACP" allows data loading from the forward ACP to the aft ACP.
- The soft button "ACP to LRUs" allows data loading from the forward ACP to the Light LRU's. This process give Light LRU its address, zone information, standard and custom scene definition.

**AIRPLANES WITH V5 SOFTWARE;**

- Phase 1 Data Load allows data loading from data loader to the forward ACP.

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**FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - ATTENDANT CONTROL PANEL**

- Phase 2 Data Load allows data loading from the forward ACP to the aft ACP and Light LRU's. User can select software from a selection table. This process give Light LRU its address, zone information, standard and custom scene definition.

**Touchscreen Menu Pages**

The ACP touchscreen's main menu consists of the following pages:

- Lighting: This page displays available and selected lighting scenes for the passenger seating and entry areas.
- Passenger Services: This page consists of soft buttons controlling the following systems (if applicable) : In-flight Entertainment, PC Power, Cell Phone, Cabin Ready.
- Environment: This page controls Cabin Temperature and Smoke Detector systems (if applicable). The aft ACP also displays the Potable Water level, the Vacuum waste level and the LAV INOP status button.
- Maintenance: The forward ACP's Maintenance page provides ability to do BITE Test or System Test, Configuration Check, Clean Screen, Lamps Test and Data Load. The aft ACP's Maintenance page provides ability for BITE Test (if applicable), Vacuum Waste section (LAV INOP Test, LAV INOP, Clean Check Sensors) and Clean Screen. When the maintenance menu is selected, a maintenance password entry screen will pop up requiring the user to enter a password to access to the maintenance menu functions. If the password protection feature is disabled, no password entry screen will come up.
- Special Functions: This page provides Enable and Status buttons for future functions to be added.
- Display functions: The Display function menu is located on the bottom left hand of the LCD touchscreen and includes Clean screen, Screensaver lock, Brightness decrease and Brightness increase. The Clean screen locks the ACP for 30 seconds and ignores user input. The Screensaver locks the ACP by switching to screen saver mode. The user can exit screen saver mode by touching two different corners of the screen sequentially.

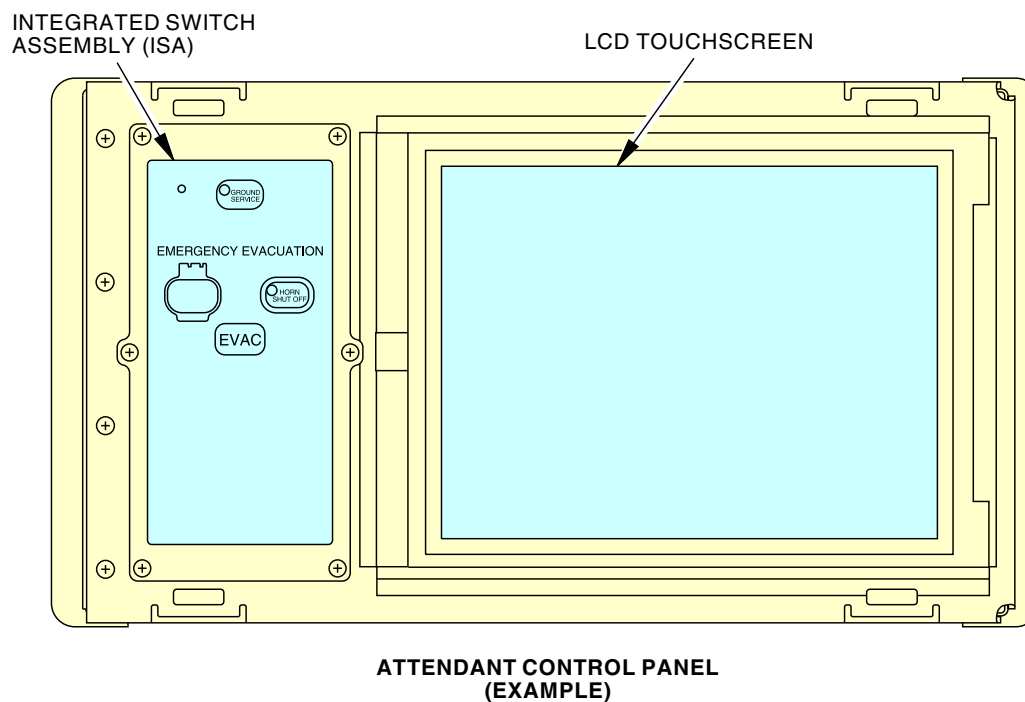
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# FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - ATTENDANT CONTROL PANEL



ATTENDANT CONTROL PANEL  
(EXAMPLE)

2368762 S00061518067\_V1

## ATTENDANT CONTROL PANEL

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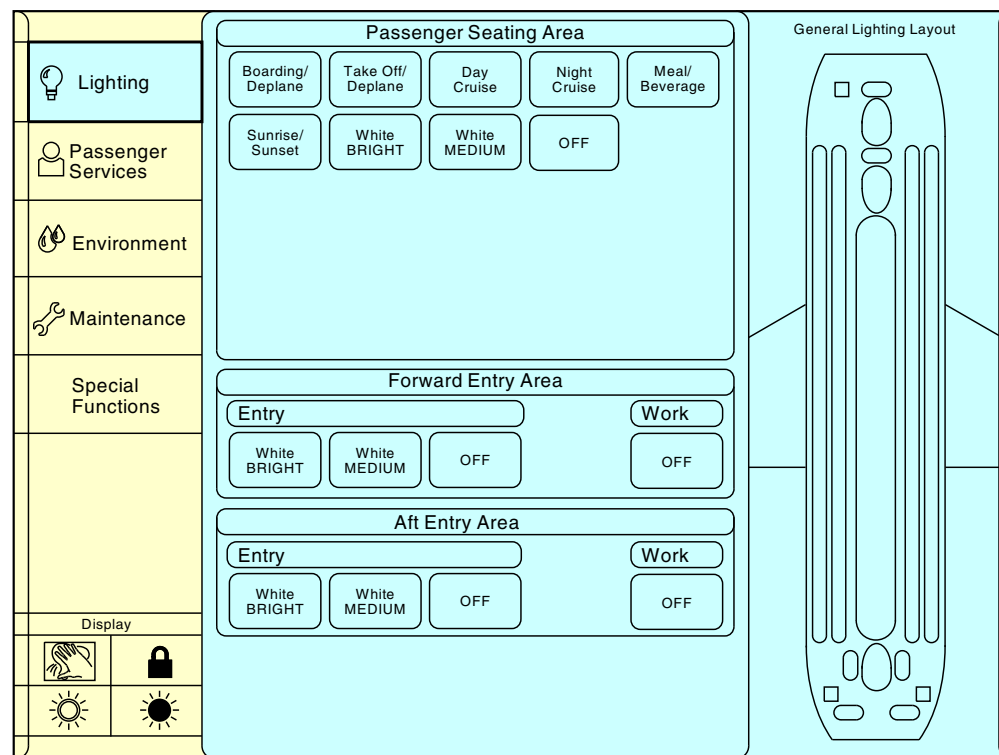
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## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - ATTENDANT CONTROL PANEL



**LIGHTING MENU  
(EXAMPLE)**

2368763 S00061518068\_V1

### ATTENDANT CONTROL PANEL LIGHTING MENU

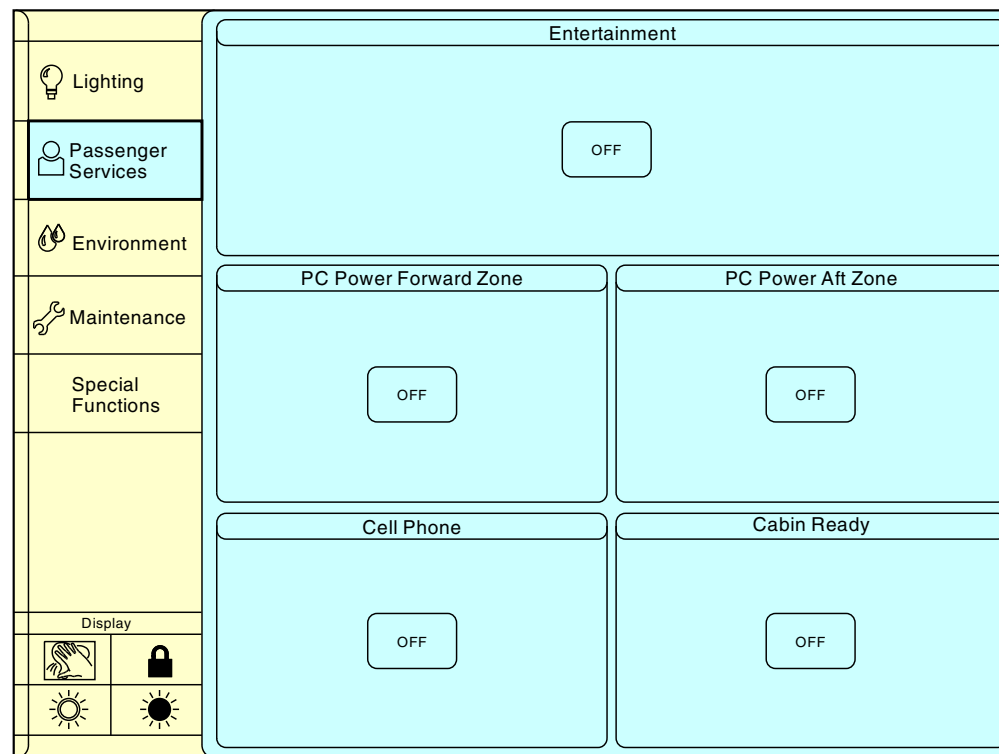
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## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - ATTENDANT CONTROL PANEL



PASSENGER SERVICES MENU  
(EXAMPLE)

2368764 S00061518069\_V1

### ATTENDANT CONTROL PANEL PASSENGER SERVICES MENU

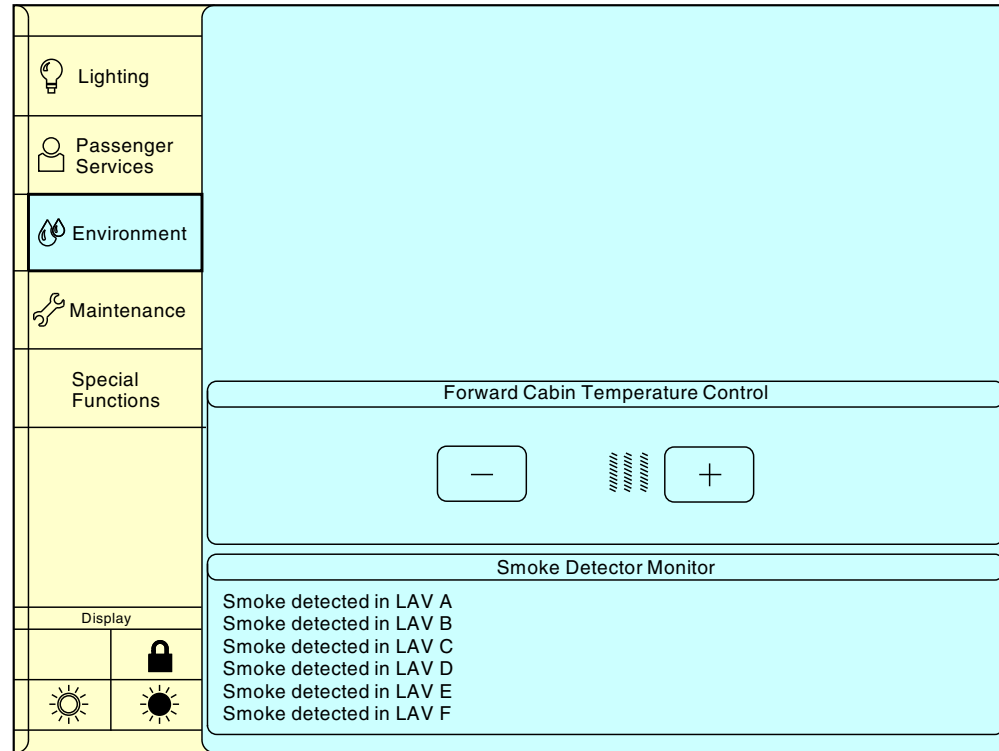
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FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - ATTENDANT CONTROL PANEL



FORWARD PANEL ENVIRONMENT MENU  
(EXAMPLE)

2368765 S00061518070\_V1

ATTENDANT CONTROL PANEL ENVIRONMENT MENU

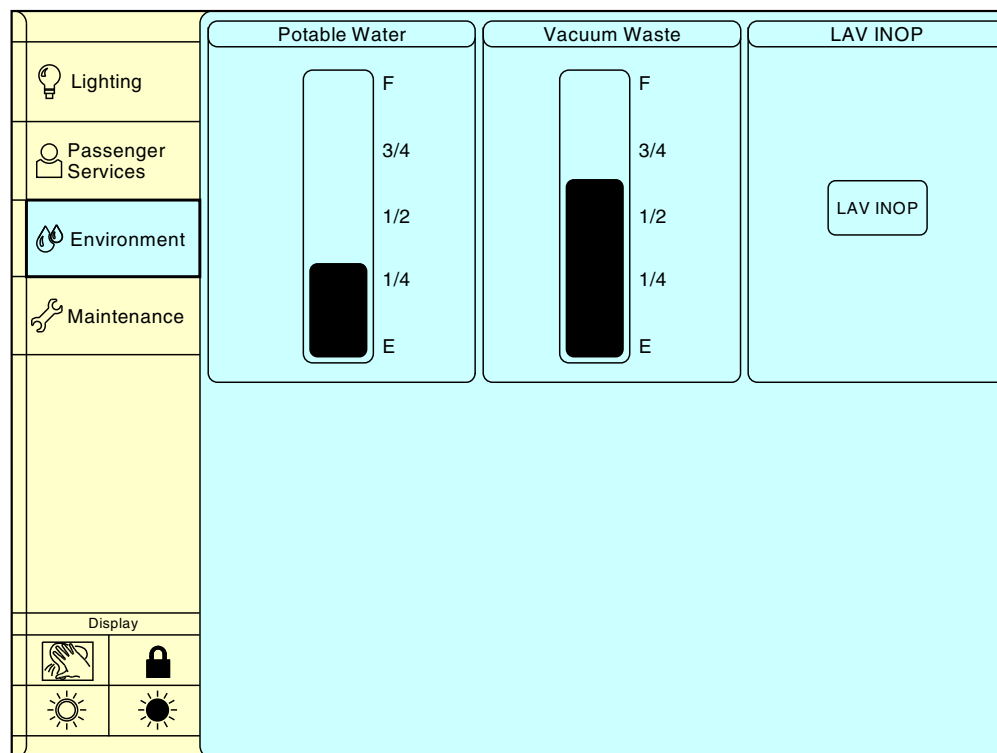
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# FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - ATTENDANT CONTROL PANEL



AFT PANEL ENVIRONMENT MENU  
(EXAMPLE)

## ATTENDANT CONTROL PANEL ENVIRONMENT MENU

2368766 S00061518071\_V1

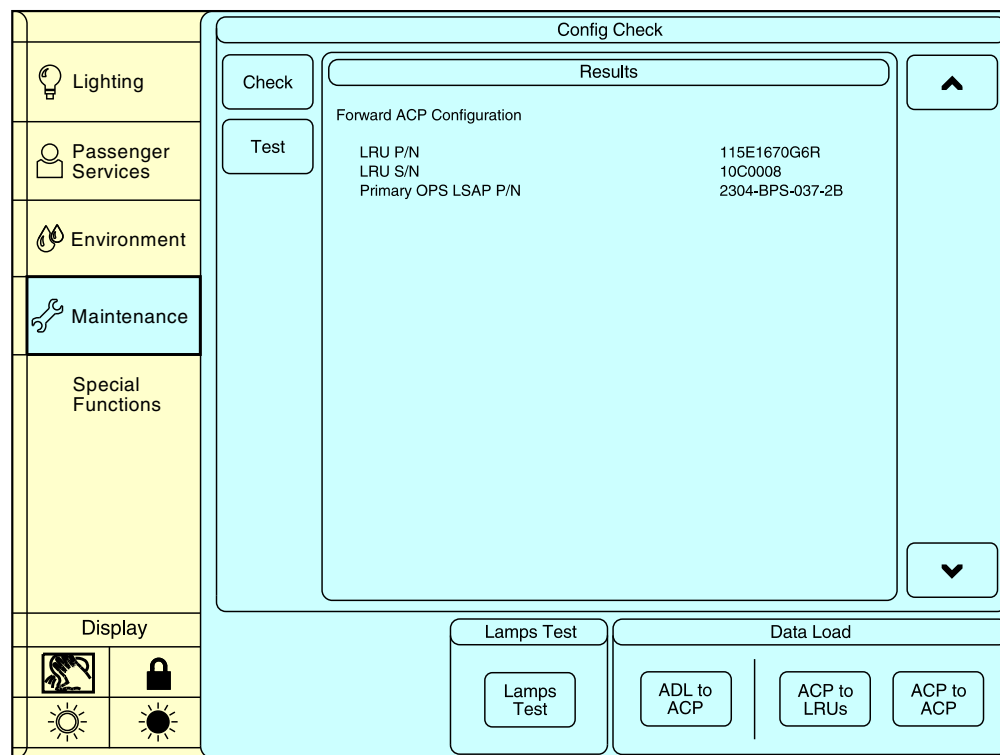
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# FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - ATTENDANT CONTROL PANEL



FORWARD PANEL MAINTENANCE MENU  
(EXAMPLE)

## ATTENDANT CONTROL PANEL MAINTENANCE MENU

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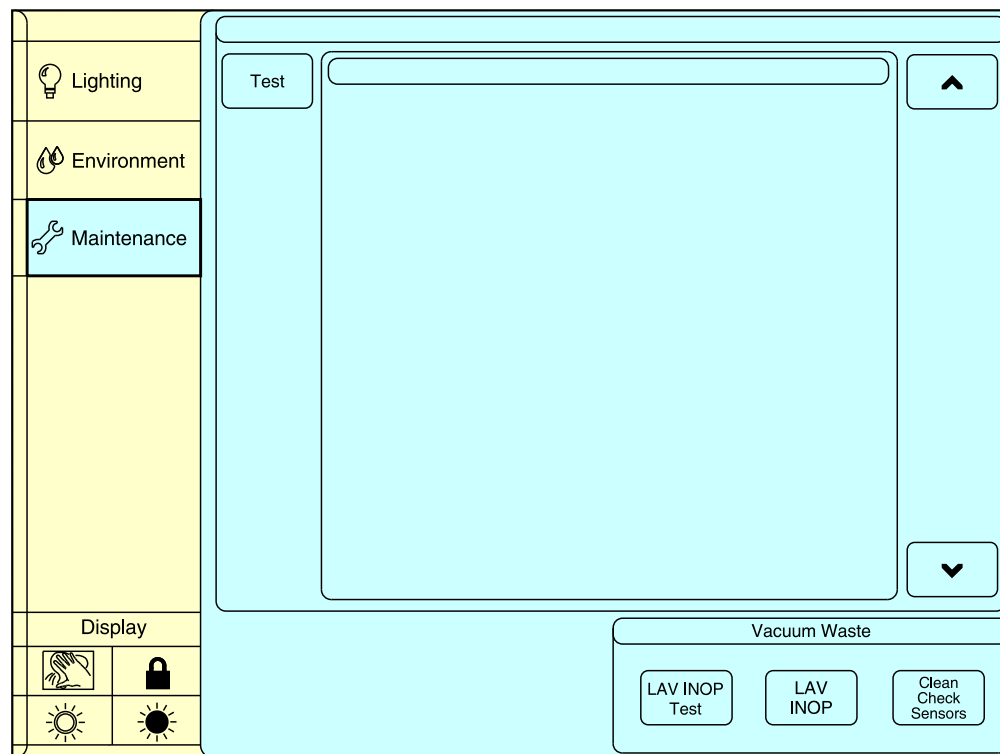
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## FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - ATTENDANT CONTROL PANEL



AFT PANEL MAINTENANCE MENU  
(EXAMPLE)

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## ATTENDANT CONTROL PANEL MAINTENANCE MENU

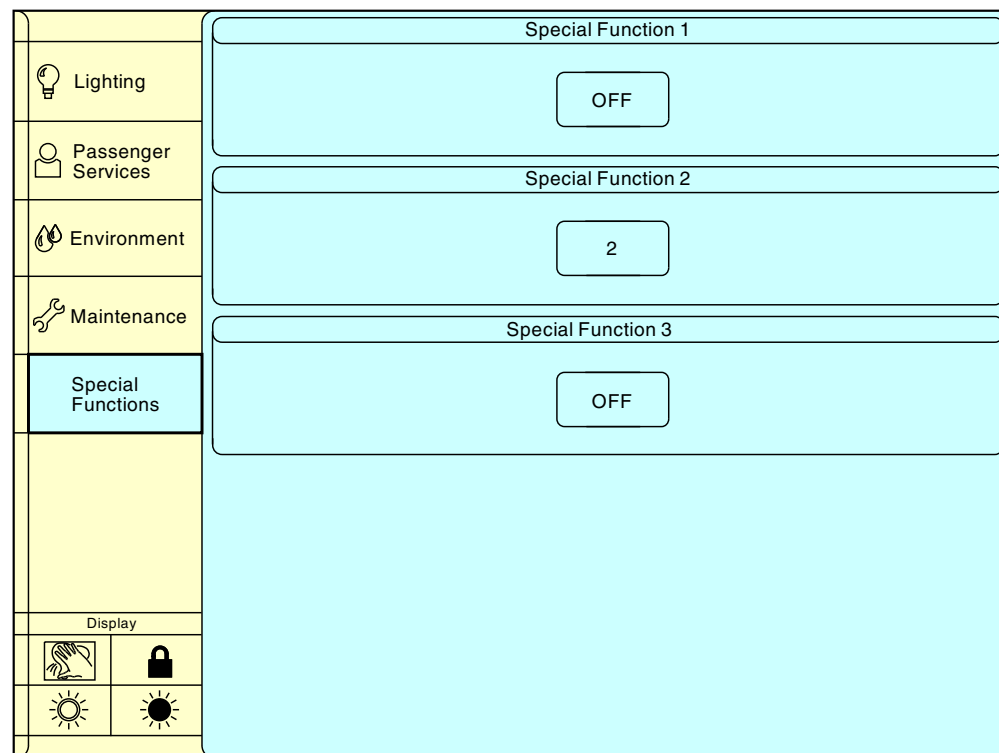
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# FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - ATTENDANT CONTROL PANEL



**SPECIAL FUNCTION MENU  
(EXAMPLE)**

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## ATTENDANT CONTROL PANEL SPECIAL FUNCTION MENU

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## GROUND CREW CALL SYSTEM - INTRODUCTION

### Purpose

The ground crew call system tells:

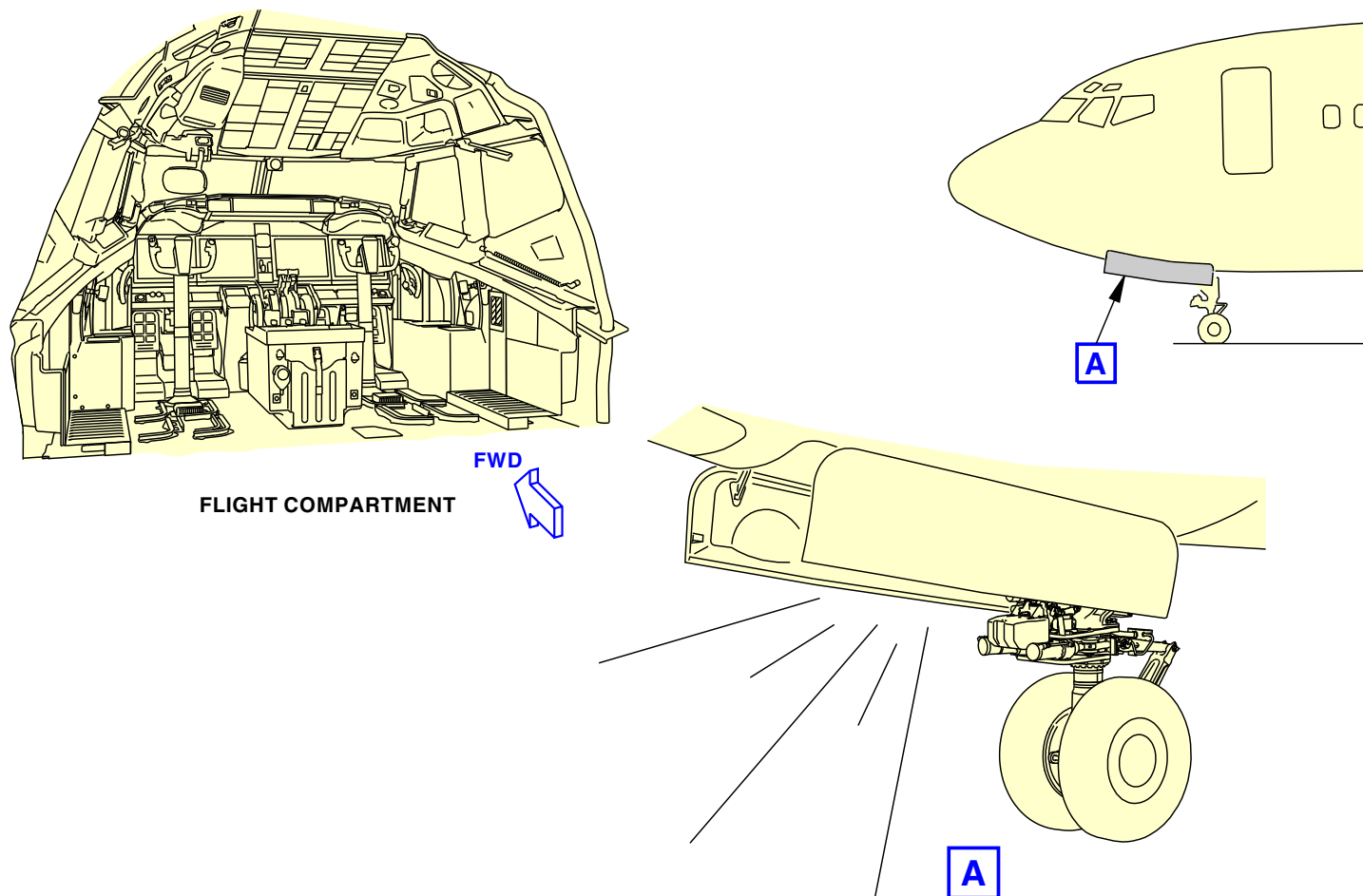
- Flight compartment personnel that there is a call from the ground personnel
- Ground personnel that there is a call from the flight compartment.

### Abbreviations and Acronyms

- ACP - audio control panel
- ADIRS - air data inertial reference system
- attend - attendant
- flt - flight
- grd - ground
- IHC - integrated handset controller
- PA - passenger address
- PTT - push-to-talk
- v dc - volts direct current

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## GROUND CREW CALL SYSTEM - INTRODUCTION



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## GROUND CREW CALL SYSTEM - INTRODUCTION

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## GROUND CREW CALL SYSTEM - GENERAL DESCRIPTION

### General

The ground crew call system lets the flight crew and ground crew call each other. The system tells people in the flight compartment or outside of the airplane to use the flight interphone system.

### Between Flight Compartment and Ground Crew

A crew member pushes the GRD CALL switch in the flight compartment to call the ground crew. The switch is on the passenger signs panel on the P5 forward overhead panel. A horn in the nose wheel well makes a sound when the crew member pushes the switch.

The ground crew pushes the PILOT CALL switch on the external power panel or the FLIGHT DECK CALL switch in the interphone box to call the flight crew. That sends a signal to the remote electronics unit and to the aural warning module. The aural warning module makes a high chime. The remote electronics unit sends a signal to make the INT call light, on the audio control panel, come on. The call light is in the lower half of the INT microphone selector switch. When the ground crew releases the PILOT CALL or FLIGHT DECK CALL switch, the INT call light goes off.

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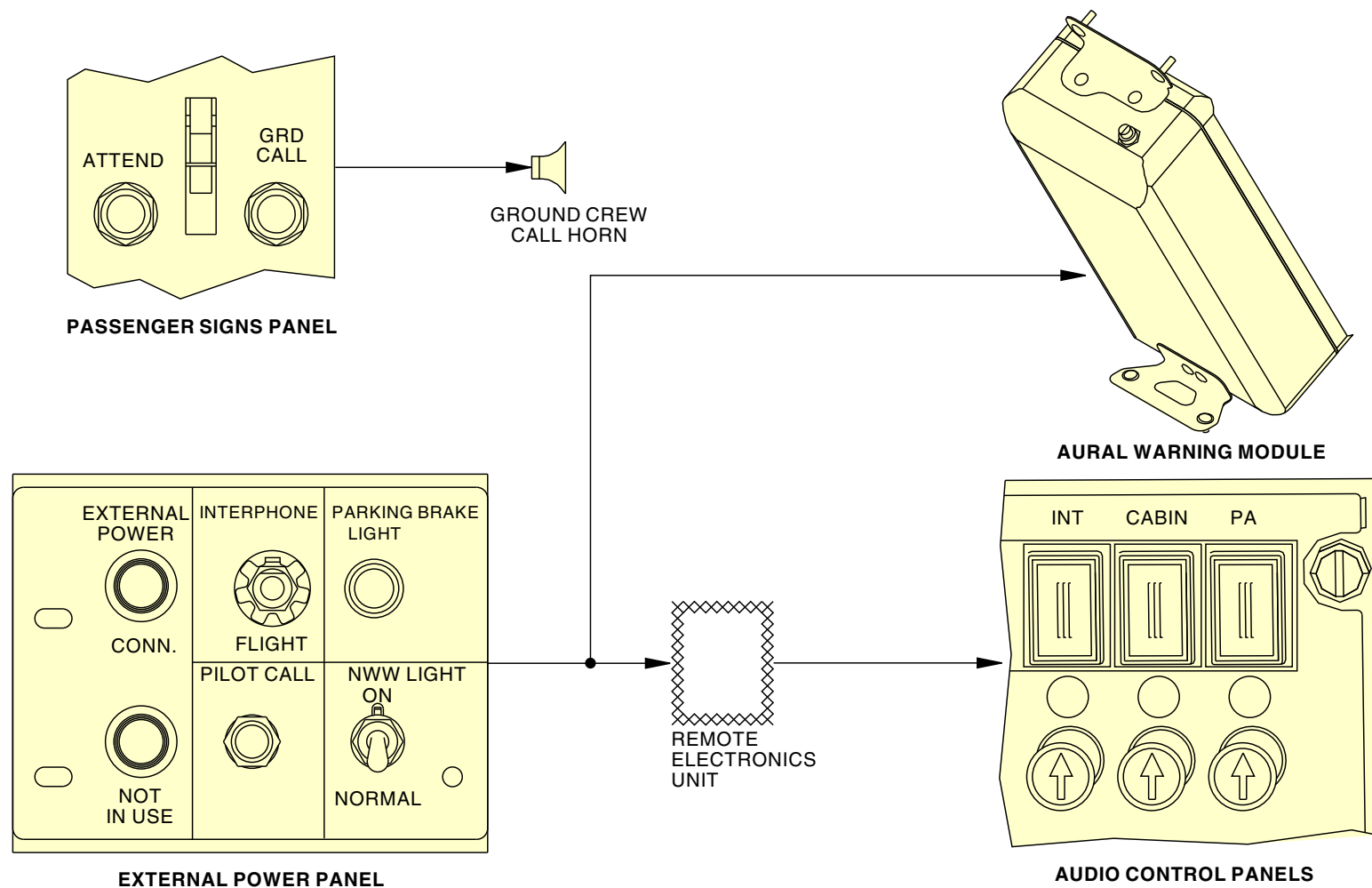
The ground crew connects the headset and pushes the FLIGHT DECK CALL switch in the interphone box or the Push-To-Talk (PTT) switch to the INT position on the headset to call the flight crew. That sends a signal to the remote electronics unit and to the aural warning module. The aural warning module makes a high chime. When the ground crew releases the PTT switch, disconnect the headset from the interphone box.

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# GROUND CREW CALL SYSTEM - GENERAL DESCRIPTION



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## GROUND CREW CALL SYSTEM - GENERAL DESCRIPTION

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GROUND CREW CALL SYSTEM - EXTERNAL COMPONENT LOCATION

Ground Crew Call System Component Locations

The ground crew call horn is on the forward wall of the nose wheel well.  
The PILOT CALL switch is on the P19 external power panel. This panel is forward of the nose wheel well on the right side of the airplane.

**SIA 013-999; SIA 001-012 POST SB 737-24-1236**

The FLIGHT DECK CALL switch is in the interphone box. This box is in the nose wheel well on the right side of the airplane.

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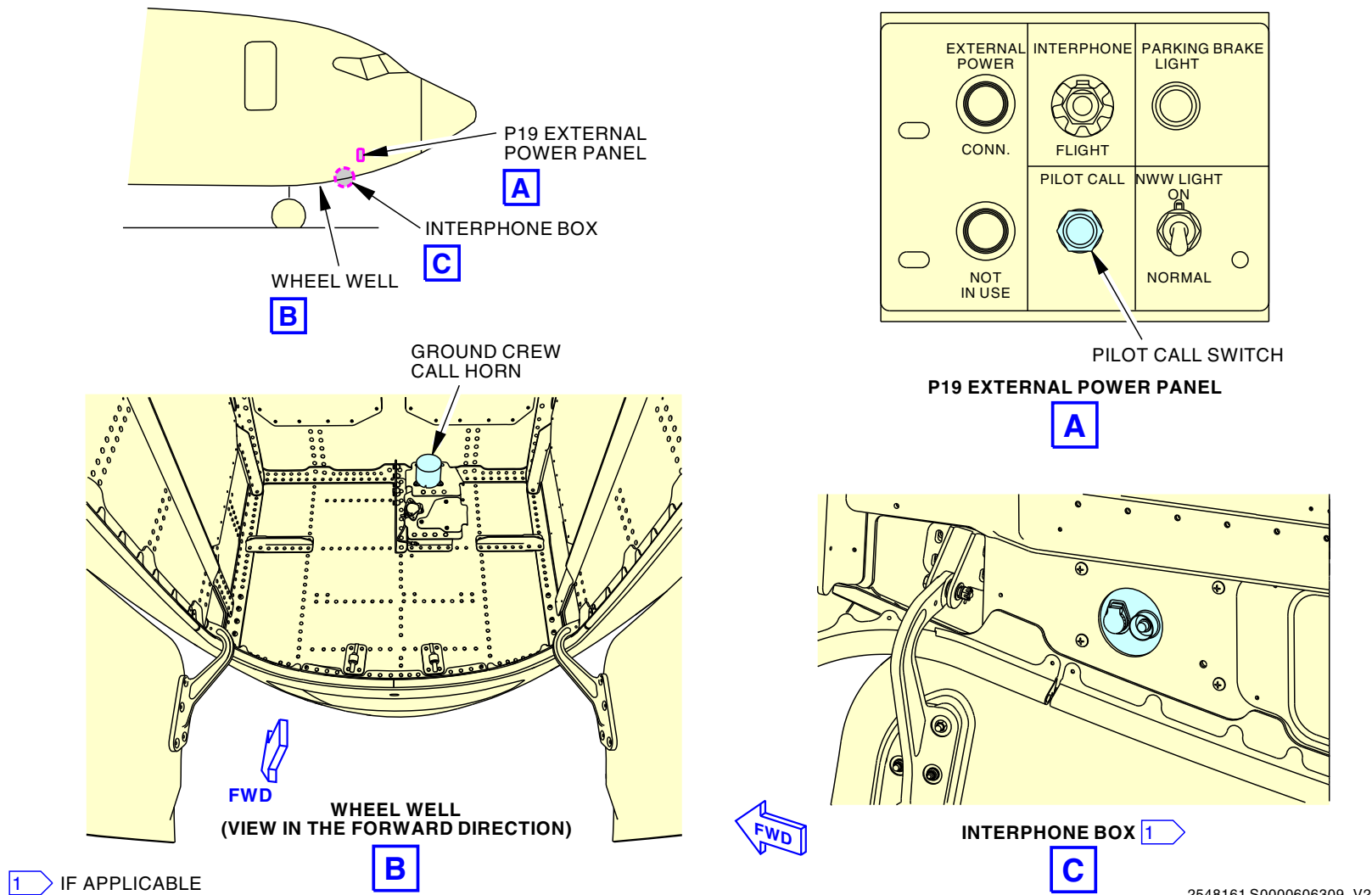
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### GROUND CREW CALL SYSTEM - EXTERNAL COMPONENT LOCATION



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### GROUND CREW CALL SYSTEM - EXTERNAL COMPONENT LOCATION

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## GROUND CREW CALL SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

### Flight Compartment Component Locations

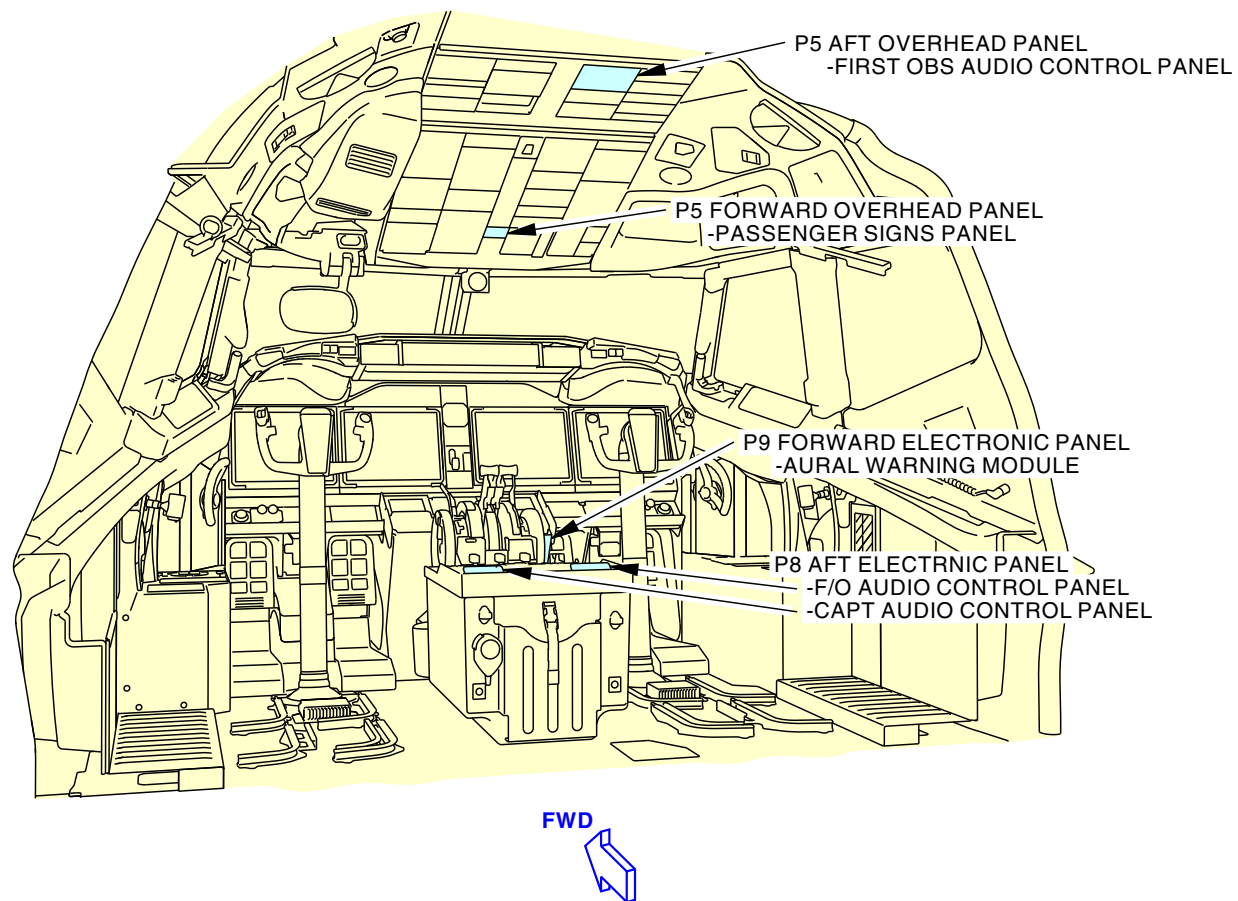
The passenger signs panel is on the P5 forward overhead panel.

The aural warning module is on the F/O side of the P9 forward electronic panel.

The captain and first officer audio control panels (ACP) are on the P8 aft electronic panel. The observer ACP is on the P5 aft overhead panel.

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## GROUND CREW CALL SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS



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## GROUND CREW CALL SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

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## GROUND CREW CALL SYSTEM - INTERFACES

### Power

The P18 circuit breaker panel sends 28v dc to these components:

- PILOT CALL switch
- GRD CALL switch.

### P19 External Power Panel or Interphone Box

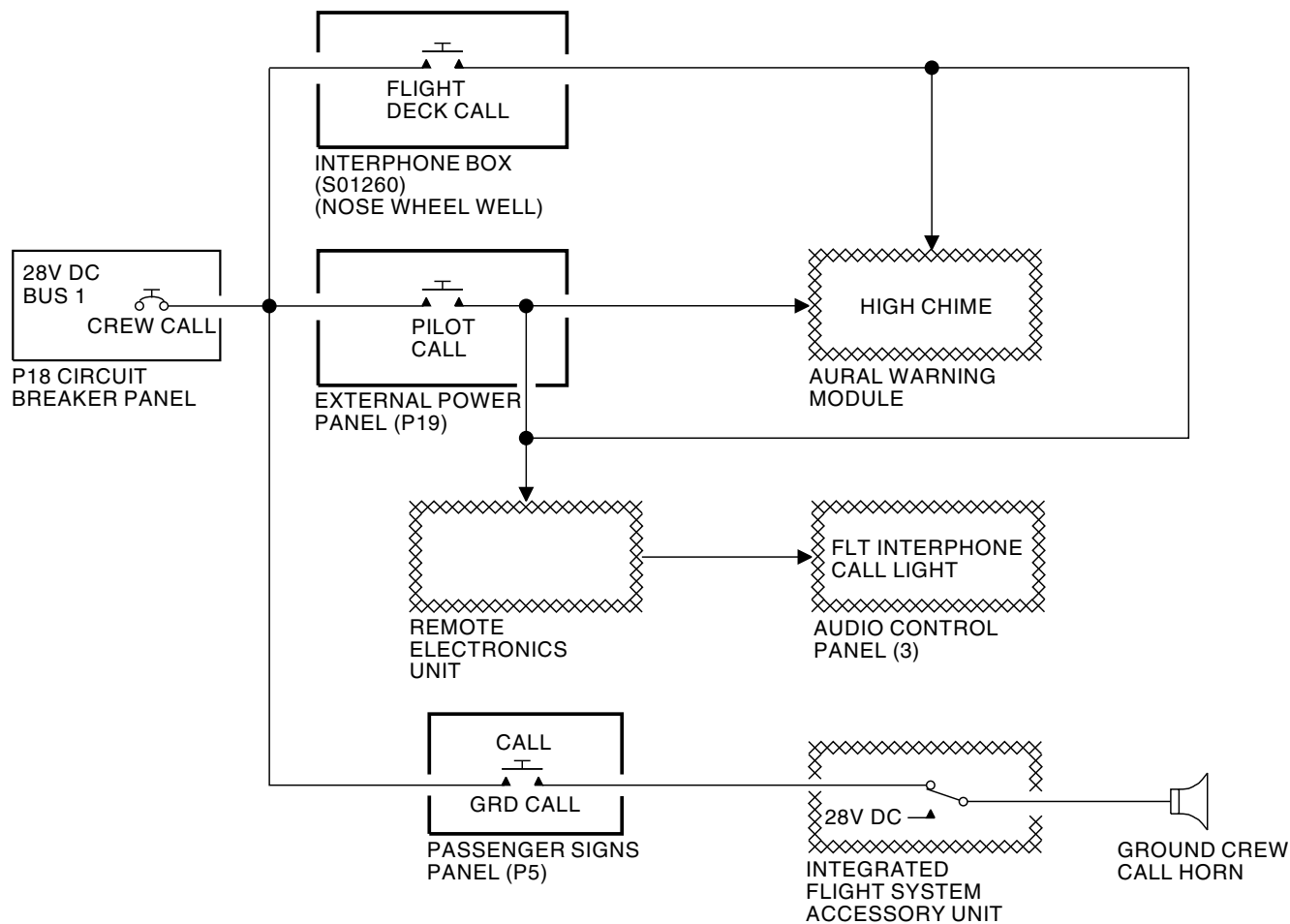
When you push the PILOT CALL or FLIGHT DECK CALL switch, the pilot call signal goes to the remote electronics unit (REU) and to the aural warning module. The REU sends a discrete to the audio control panel.

### Passenger Signs Panel

When you push the GRD CALL switch, the ground crew call signal goes through a relay in the integrated flight system accessory unit and then to the ground crew call horn.

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## GROUND CREW CALL SYSTEM - INTERFACES



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## GROUND CREW CALL SYSTEM - INTERFACES

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## GROUND CREW CALL SYSTEM - CALL HORN

### Purpose

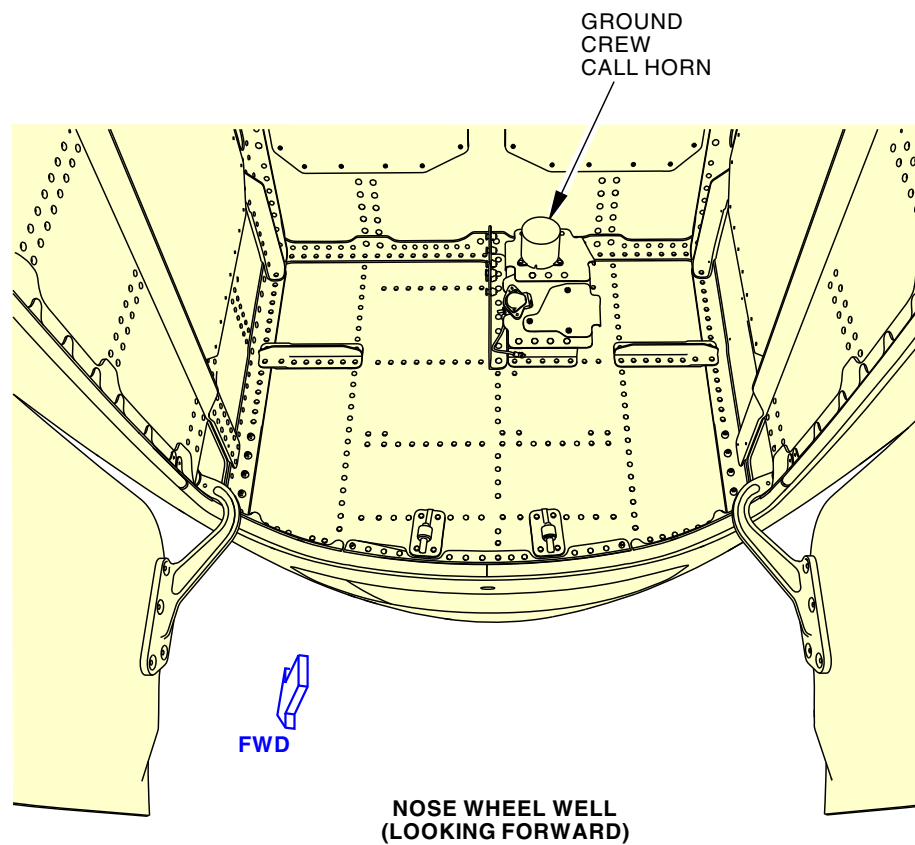
When you push the GRD CALL switch, the call horn makes a sound. When you release the switch, the sound stops.

The horn makes a continuous sound when the ADIRS battery warning circuit is active or ADIRS cooling is not sufficient.

The horn makes a sound when the electrical battery is discharging. This happens when the battery charger power is off and the battery switch is on.

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## GROUND CREW CALL SYSTEM - CALL HORN



## GROUND CREW CALL SYSTEM - CALL HORN

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**GROUND CREW CALL SYSTEM - FUNCTIONAL DESCRIPTION****General**

The ground crew calls the flight crew with the PILOT CALL switch. The flight crew uses the GRD CALL switch to call the ground crew.

**PILOT CALL or FLIGHT DECK CALL Switch**

You push the PILOT CALL or FLIGHT DECK CALL switch to call the pilot. This switch connects 28v dc to the REU call relay. The call relay energizes and sends a ground discrete to the ACP to set the flight interphone call light. When you release the switch, the REU call relay de-energizes and the CALL light goes off. The 28v dc also goes to the aural warning module to make a high tone chime in the flight compartment.

**GRD CALL Switch**

The pilot pushes the GRD CALL switch to make the ground crew call horn operate. The switch connects 28v dc to the ground crew call horn. The horn stops when you release the switch.

**Ground Crew Call Horn**

These are the conditions which cause the ground crew call horn to operate:

- Push the GRD CALL switch
- The inertial reference system cooling is not sufficient on the ground
- The inertial reference system (IRS) battery warning circuit is on.
- The electrical system battery is discharging (battery charger is powered off and battery switch is on).

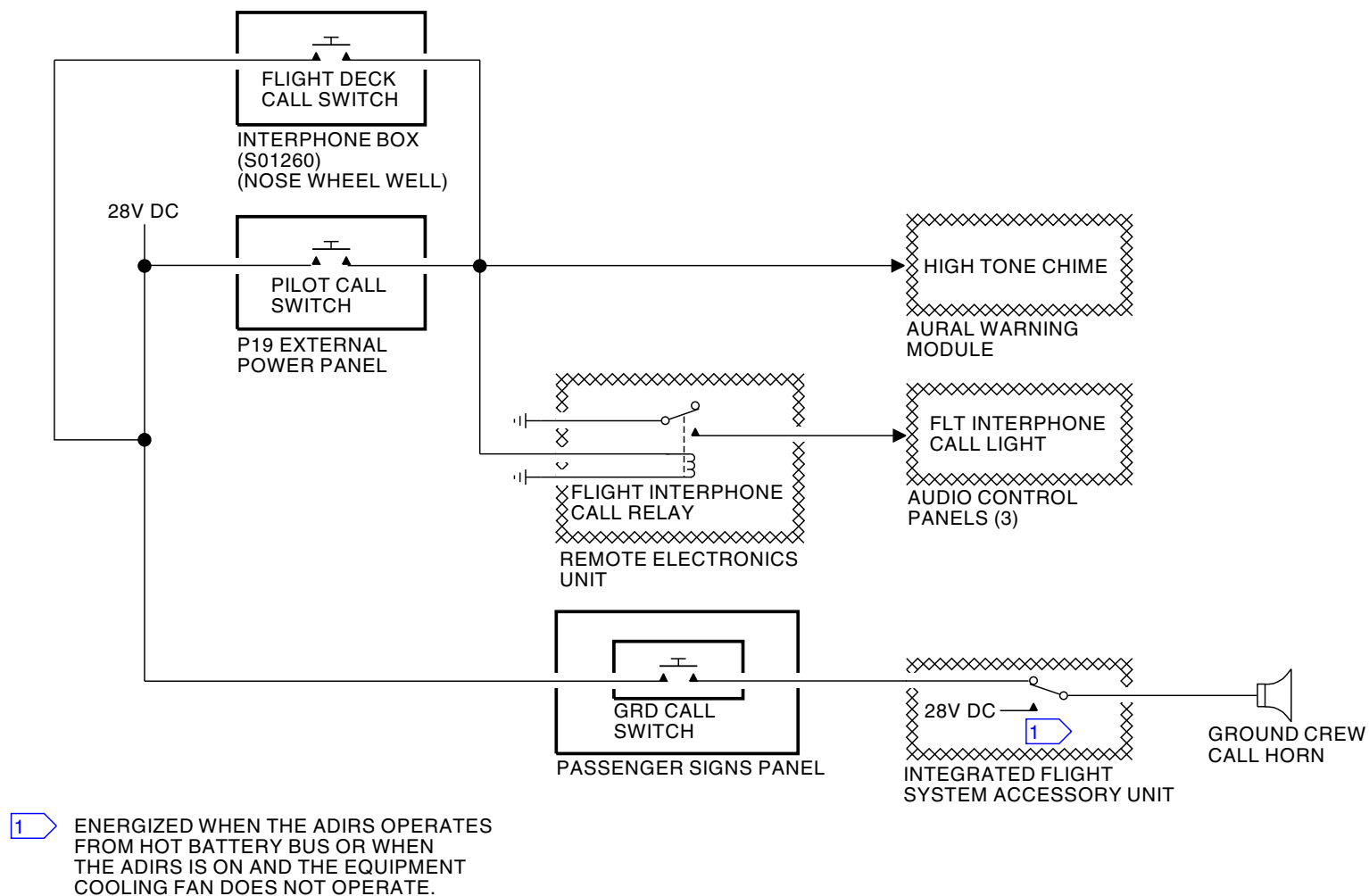
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## GROUND CREW CALL SYSTEM - FUNCTIONAL DESCRIPTION



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## GROUND CREW CALL SYSTEM - FUNCTIONAL DESCRIPTION

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## FLIGHT INTERPHONE SYSTEM - INTRODUCTION

### Purpose

The flight crew uses the flight interphone system to speak with each other and the ground crew.

Flight and maintenance crews use the flight interphone system to get access to the communication systems. You can also use the flight interphone system to monitor the navigation receivers.

### Abbreviations and Acronyms

- AAU - audio accessory unit
- ACP - audio control panel
- ADF - automatic direction finder
- ALT - alternate
- CAPT - captain
- COMM - communication
- DFCS - digital flight control system
- DME - distance measuring equipment
- FCC - flight control computer
- F/O - first officer
- GPWC - ground proximity warning computer
- HF - high frequency
- I/C - intercommunication
- ILS - instrument landing system
- INT - interphone
- MD&T - master dim and test
- MIC - microphone
- MKR - marker
- NORM - normal
- OBS - observer
- PA - passenger address
- PLA - programmed logic array
- PTT - push to talk
- REU - remote electronics unit
- R/T - receive/transmit
- SATCOM - satellite communication
- STA - station
- TCAS - traffic alert and collision avoidance system
- VHF - very high frequency
- VOR - very high frequency omni-range system
- XCVR - transceiver

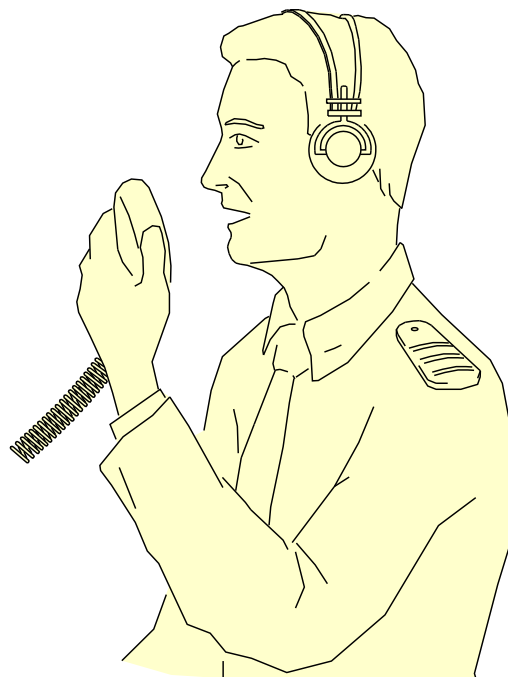
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**FLIGHT INTERPHONE SYSTEM - INTRODUCTION**



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**FLIGHT INTERPHONE SYSTEM - INTRODUCTION**

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## FLIGHT INTERPHONE SYSTEM - GENERAL DESCRIPTION

### General

The remote electronics unit (REU) and the audio control panel (ACP) control the audio signals to and from the flight crew. The REU also controls the communication with the service interphone and related electronics equipment. During a system failure, emergency operation bypasses all active system circuitry and keeps airplane-to-ground station communication.

The REU also controls the communication with the service interphone and related electronics equipment. During a system failure, emergency operation bypasses all active system circuitry and keeps airplane-to-ground station communication.

### Flight Crew Interfaces

This system description shows the captain system. Interfaces and components for other flight crew stations are similar.

The flight crew uses microphone (mic) switches on these components to send audio to the REU:

- Control wheel
- ACP
- Hand microphone

A microphone on these components lets the flight crew speak on the flight interphone system:

- Oxygen mask
- Headset boom mic
- Hand mic

The flight crew uses the audio control panels for these functions:

- Listen to the communication and navigation receivers
- Adjust the volume of the received audio
- Select a transmitter and microphone
- Monitor SELCAL
- Monitor Crew Call

- Key the microphone

The REU sends audio signals to the headsets and to the flight interphone speakers.

### Other Component and System Interfaces

The REU connects to these other components:

- Communications radios - the REU sends push-to-talk (PTT) and microphone audio to the transceivers and receives audio back from them
- Navigation receivers - the REU receives voice and Morse code identification tones.

The flight interphone system also has an interface with these other systems:

- Passenger address system - lets the flight crew make announcements to passengers
- Service interphone system - lets the flight crew speak with attendants and service personnel
- Voice recorder - records the flight crew microphone and receive audio
- Flight crew call - gives discrete for call light
- Ground crew call - gives discrete for call light
- Ground proximity warning computer (GPWC) - lets flight crew monitor warning signals
- Traffic alert and collision avoidance system (TCAS) - lets the flight crew monitor TCAS signals
- Flight control computer (FCC) - gives discrete signals to the REU. This signal activates an altitude alert tone generator.

Aural alerts for TCAS, ground proximity, and altitude are not heard at the captain, first officer, or observer headphones. You can hear the aural alerts at the flight interphone speakers.

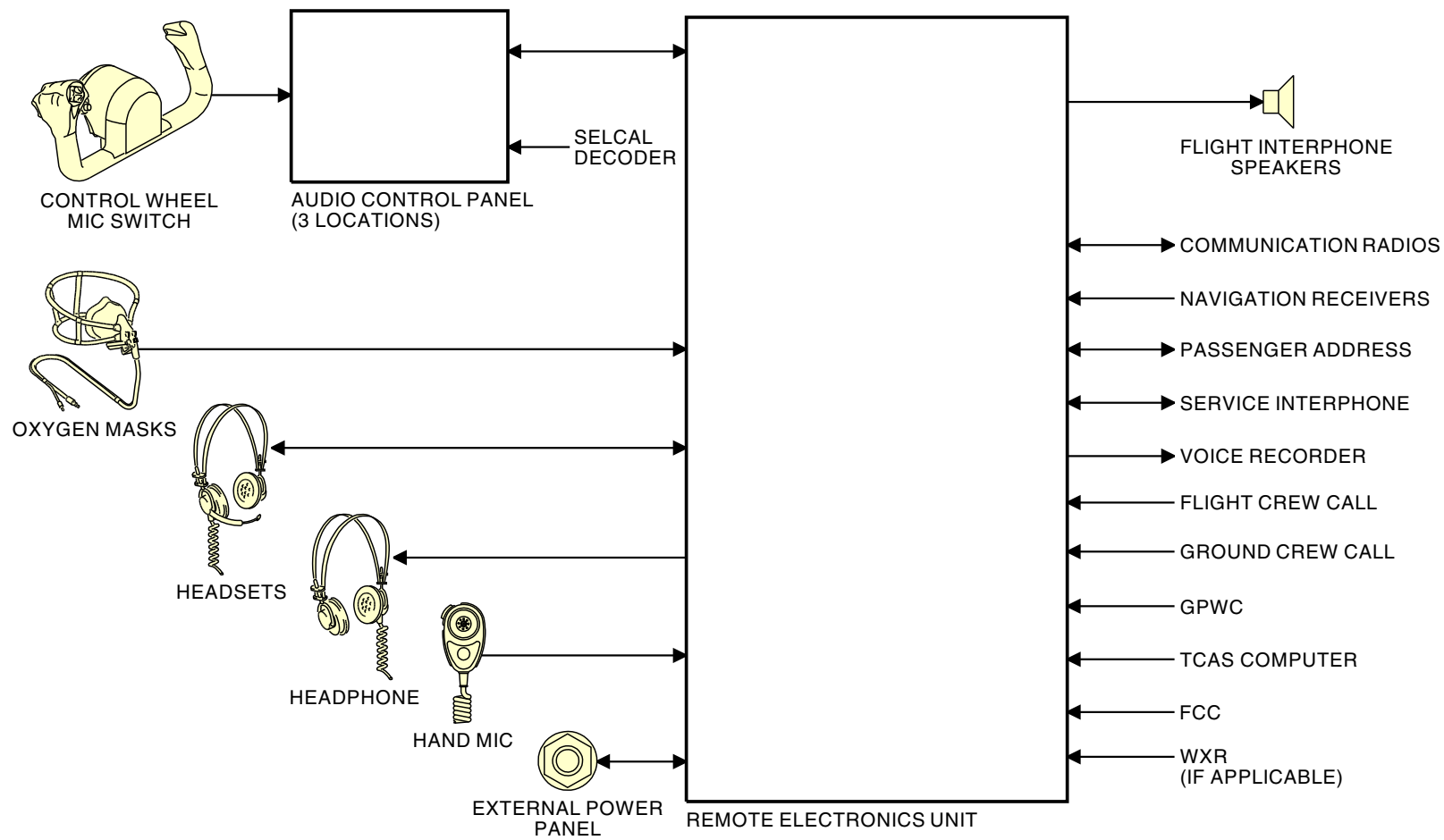
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# FLIGHT INTERPHONE SYSTEM - GENERAL DESCRIPTION



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## FLIGHT INTERPHONE SYSTEM - GENERAL DESCRIPTION

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## FLIGHT INTERPHONE SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

### Flight Compartment Component Locations

These are the captain and first officer flight interphone system components:

- Control wheel mic switch
- Flight interphone speaker
- Hand mic jack
- Oxygen mask mic jack
- Boom mic jack
- Headphone jack
- Audio control panel

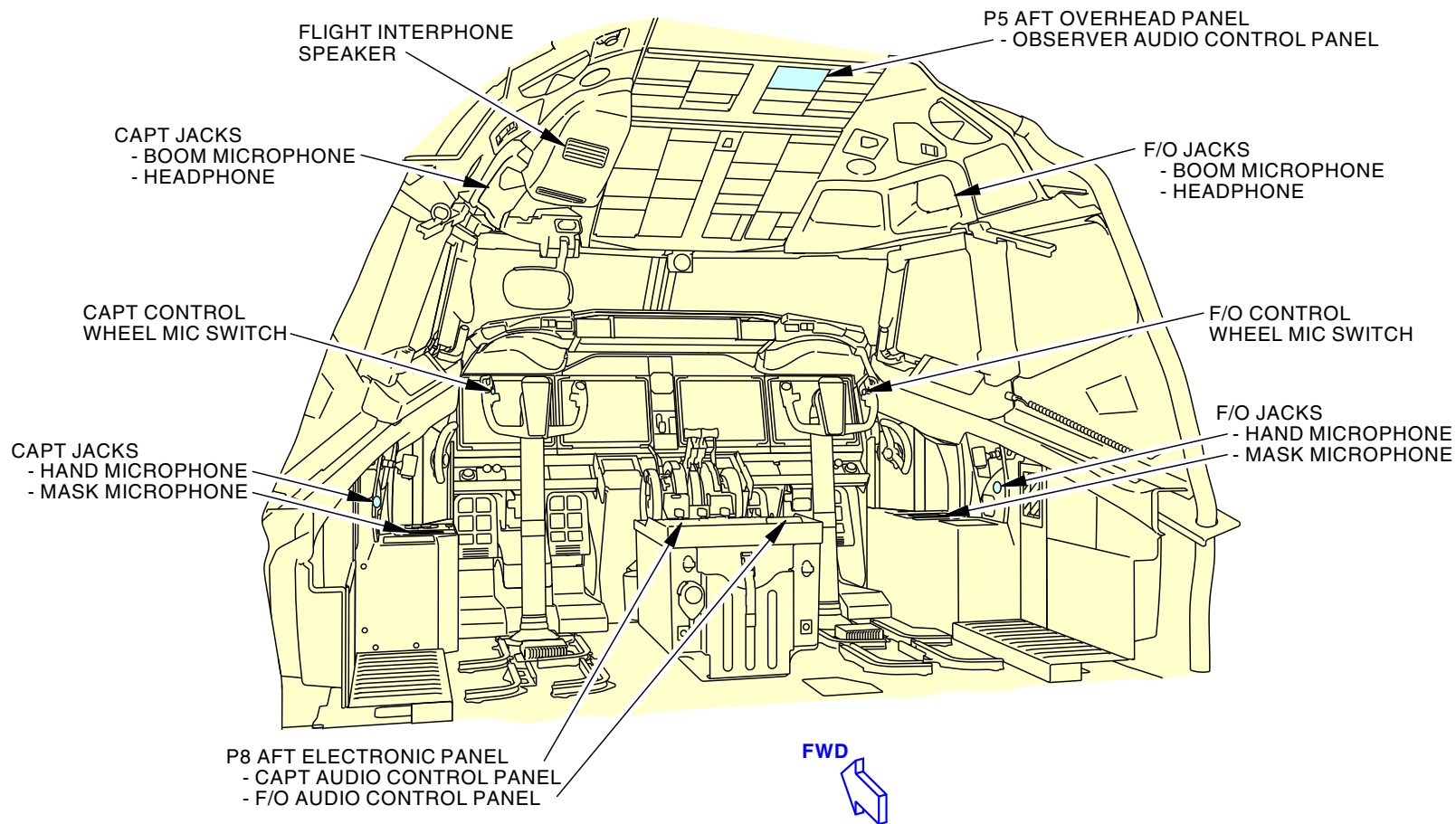
The observer has these flight interphone components:

- Hand mic jack
- Oxygen mask mic jack
- Headphone jack
- Audio control panel

The second observer has a headphone jack only.

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# FLIGHT INTERPHONE SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS



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## FLIGHT INTERPHONE SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

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## FLIGHT INTERPHONE SYSTEM - COMPONENT LOCATIONS

### Flight Interphone Component Locations

There are flight interphone system components in these locations:

- Electronic equipment compartment
- Flight compartment
- Passenger cabin

### Electronic Equipment Compartment

The REU is on the E4-1 rack

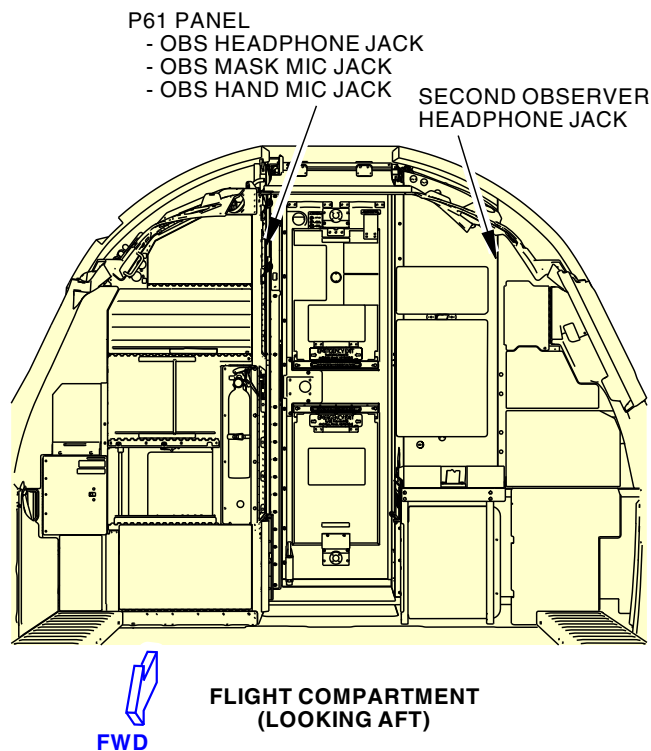
### Flight Compartment

These are the flight interphone system components in the aft portion of the flight compartment:

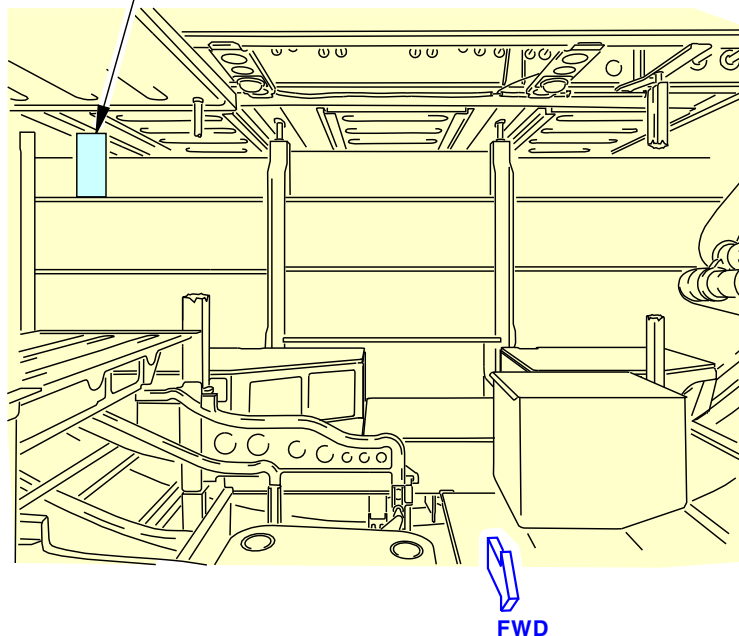
- Second observer headphone jack
- Observer headphone jack
- Observer mask microphone
- Observer hand microphone

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## FLIGHT INTERPHONE SYSTEM - COMPONENT LOCATIONS



E4-1 SHELF  
- REMOTE ELECTRONICS UNIT



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## FLIGHT INTERPHONE SYSTEM - COMPONENT LOCATIONS

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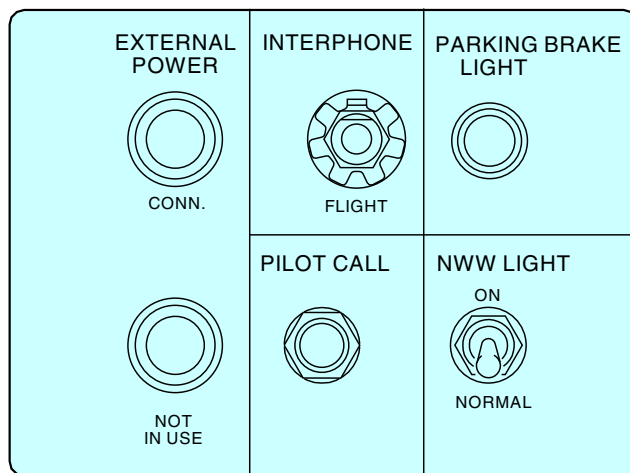
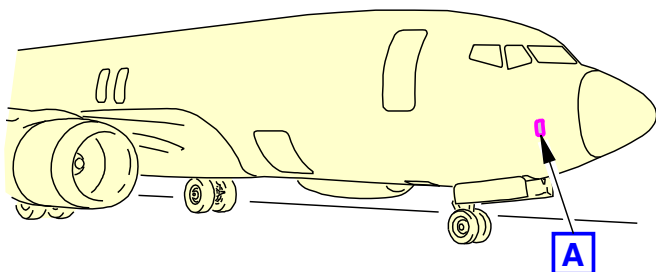
## FLIGHT INTERPHONE SYSTEM - EXTERNAL FLIGHT INTERPHONE JACK LOCATION

### Flight Interphone Jack

There are flight interphone jacks on the P19 external power panel and in the interphone box.

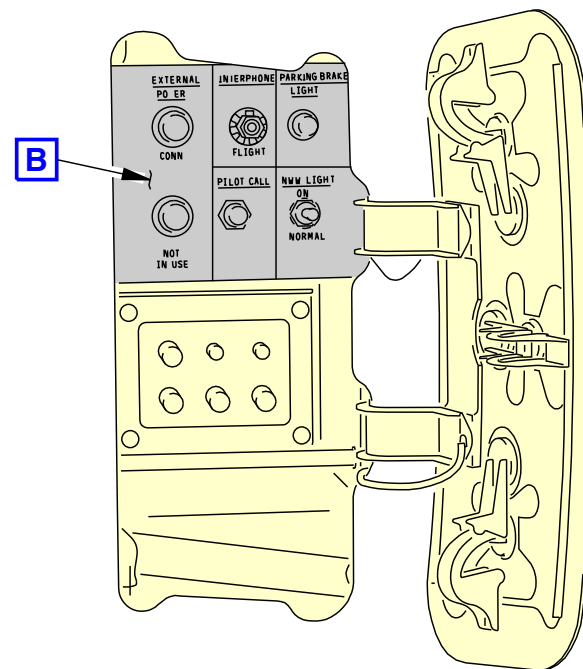
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# FLIGHT INTERPHONE SYSTEM - EXTERNAL FLIGHT INTERPHONE JACK LOCATION



P19 EXTERNAL POWER PANEL

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# FLIGHT INTERPHONE SYSTEM - EXTERNAL FLIGHT INTERPHONE JACK LOCATION

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**FLIGHT INTERPHONE SYSTEM - POWER INTERFACE****General**

Power for the flight interphone system comes through circuit breakers in the P6-2 circuit breaker panel.

The REU has three station cards and an audio accessory unit (AAU) card. Each card has a power supply for internal operation. The station cards supply 15v dc to the audio control panels (ACP).

**CAPT AUDIO Circuit Breaker**

The CAPT AUDIO circuit breaker supplies 28v dc to the captain station card in the remote electronics unit. The captain station card supplies 15v dc to the captain ACP.

**F/O AUDIO Circuit Breaker**

The F/O AUDIO circuit breaker supplies 28v dc to the first officer station card in the remote electronics unit. The F/O station card supplies 15v dc to the first officer ACP.

**OBS AUDIO Circuit Breaker**

The OBS AUDIO circuit breaker supplies 28v dc to the observer station card in the remote electronics unit. The observer station card supplies 15v dc to the observer ACP.

**INPH AND WARN Circuit Breaker**

The INPH AND WARN circuit breaker supplies power to the audio accessory unit card in the remote electronics unit.

**Master Dim and Test**

Each ACP gets 28v dc from the master dim and test (MD&T) system when the BRT/DIM/TEST switch on the captains main instrument panel is in the BRT position, and 16v dc when the switch is in the DIM position. This voltage supplies power for the lamps in the mic selector switches.

The MD&T system also supplies power to the call lamps in the mic selector switches.

**Panel Lighting**

Each ACP gets 5v ac from the airplane electrical system to supply power for the edgelit panel lighting.

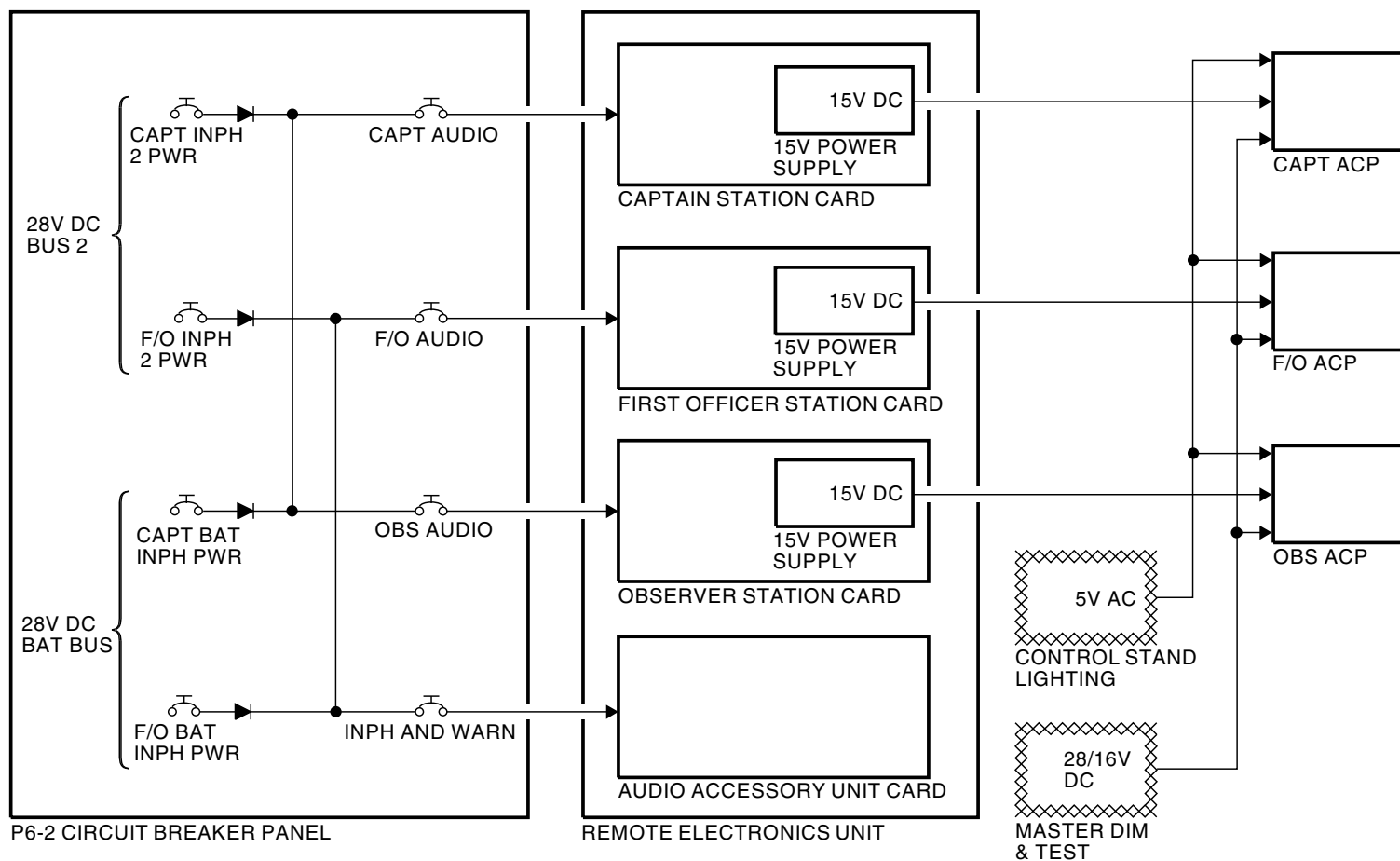
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# FLIGHT INTERPHONE SYSTEM - POWER INTERFACE



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# FLIGHT INTERPHONE SYSTEM - POWER INTERFACE

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**FLIGHT INTERPHONE SYSTEM - FLIGHT COMPARTMENT INTERFACES****General**

The flight interphone system has these flight compartment stations:

- Captain
- First officer
- Observer.

The REU gets control and PTT signals from the audio control panels (ACPs). The REU sends a clock signal to the ACPs to control the data multiplexing.

The remote electronics unit (REU) has three station cards that supply an interface to each station. Each station card:

- Receives control inputs from the audio control panel (ACP)
- Supplies push-to-talk (PTT) and microphone audio signals to communication systems
- Supplies audio from communication and navigation receivers to the stations.

**Captain and First Officer Stations**

The captain and the first officer station cards have an interface to these components:

- Control wheel PTT switch
- Audio control panel
- Hand microphone
- Oxygen mask stowage panel
- Headset
- Headphone
- Flight interphone speaker.

The control wheel PTT switch connects in parallel with the ACP RADIO - INT (or R/T - I/C) switch.

When you select MIC on the control wheel switch or RADIO (or R/T) on the ACP, the ACP sends the R/T-PTT discrete signal to the REU.

When you select INT on the control wheel switch or INT (or I/C) on the ACP, the ACP multiplexes the interphone-PTT signal with other control signals and sends the control signal to the REU.

The PTT discrete signal from the hand mic goes directly to the REU.

The microphone audio can come from these sources:

- Hand microphone
- Oxygen mask microphone
- Headset boom microphone.

The oxygen mask stowage panel sends a door discrete, MASK MIC ON/OFF signal, to the audio control panel. An open discrete, mask mic off, is door closed and a ground discrete, mask mic on, is door open.

The REU sends audio to the headset, the headphone, and the flight compartment speaker at each station.

When you use the hand microphone or the boom microphone, the REU decreases the volume to the flight compartment speaker at that station. The volume to the other speaker does not change.

**Observer Station**

The observer station card has an interface to these components:

- Audio control panel
- Hand microphone
- Oxygen mask microphone
- Headphone

When you select RADIO (or R/T) on the ACP, the ACP sends a R/T-PTT discrete signal to the REU.

When you select INT (or I/C) on the ACP, the ACP multiplexes the interphone-PTT signal with other control signals and sends the control signal to the REU.

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## FLIGHT INTERPHONE SYSTEM - FLIGHT COMPARTMENT INTERFACES

The microphone audio can come from these sources:

- Hand microphone
- Oxygen mask microphone

When you use the hand microphone, the REU decreases the volume to the flight compartment speakers. The PTT discrete signal from the hand mic goes directly to the REU.

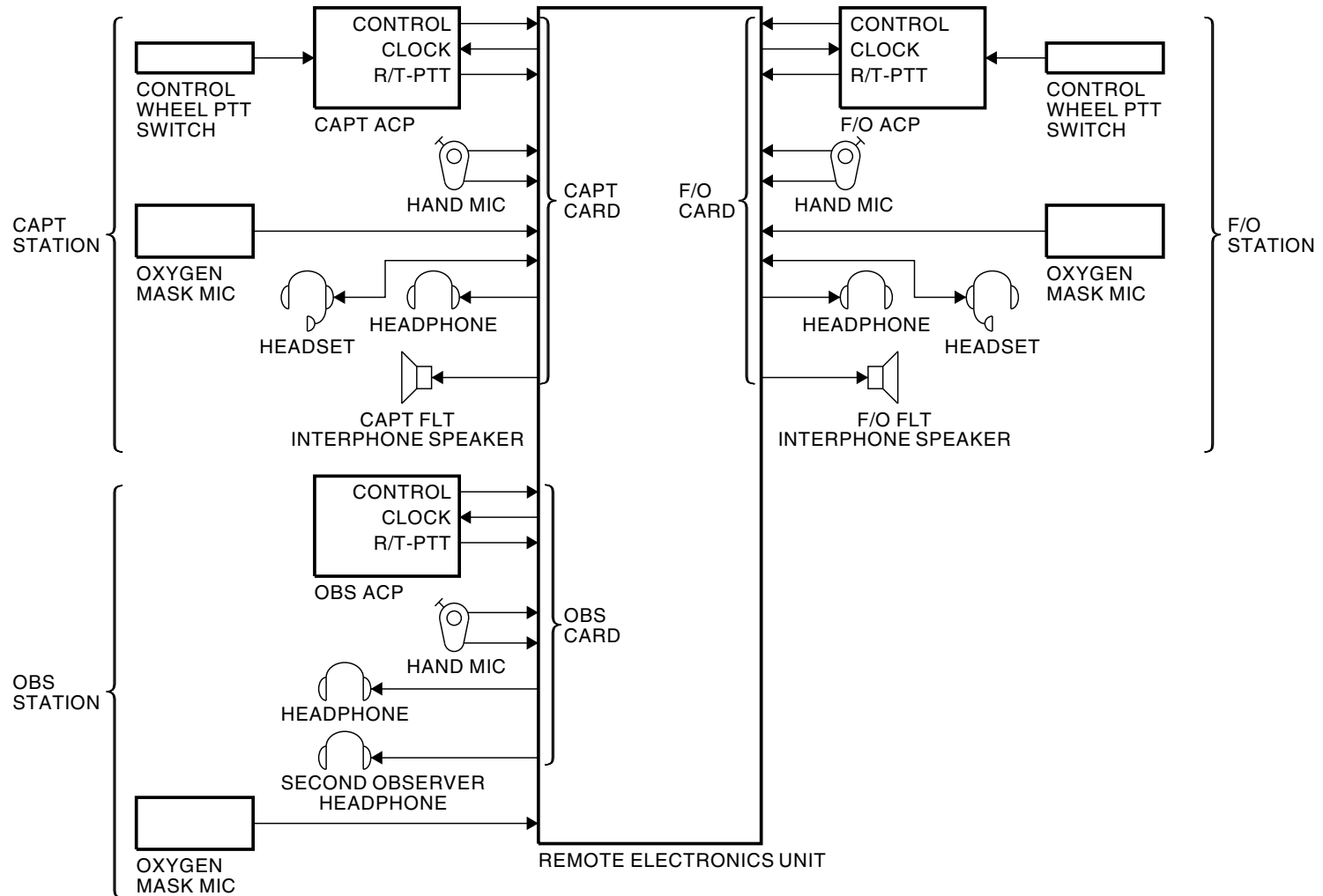
The REU sends audio to the headphone.

### Second Observer Station

The observer station card has an interface to a headphone jack for a second observer. The second observer hears the same audio as the first observer.

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### FLIGHT INTERPHONE SYSTEM - FLIGHT COMPARTMENT INTERFACES



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### FLIGHT INTERPHONE SYSTEM - FLIGHT COMPARTMENT INTERFACES

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**FLIGHT INTERPHONE SYSTEM - COMMUNICATION SYSTEM INTERFACES****Remote Electronics Unit**

The REU controls the audio in the flight interphone system.

The REU gets control and PTT signals from the audio control panels (ACPs). The REU sends timing signals to the ACPs to control the data multiplexing.

**Communication Transceivers**

The communication transceivers get microphone audio and PTT discretes from the REU. The transceivers send audio outputs to the REU. The REU uses very high frequency (VHF) transceivers.

**Passenger Address Amplifier**

The REU sends audio and PTT signals to the passenger address (PA) amplifier. The REU receives sidetone audio from the PA amplifier.

REU front panel potentiometers, PA SENSE and PA GAIN, connect to the PA amplifier. The PA SENSE sets the PA amplifier microphone input level. The PA GAIN sets the PA amplifier main power amplifier output level.

**Voice Recorder**

The REU sends audio from the captain, first officer, and observer to the voice recorder.

**Service Interphone System**

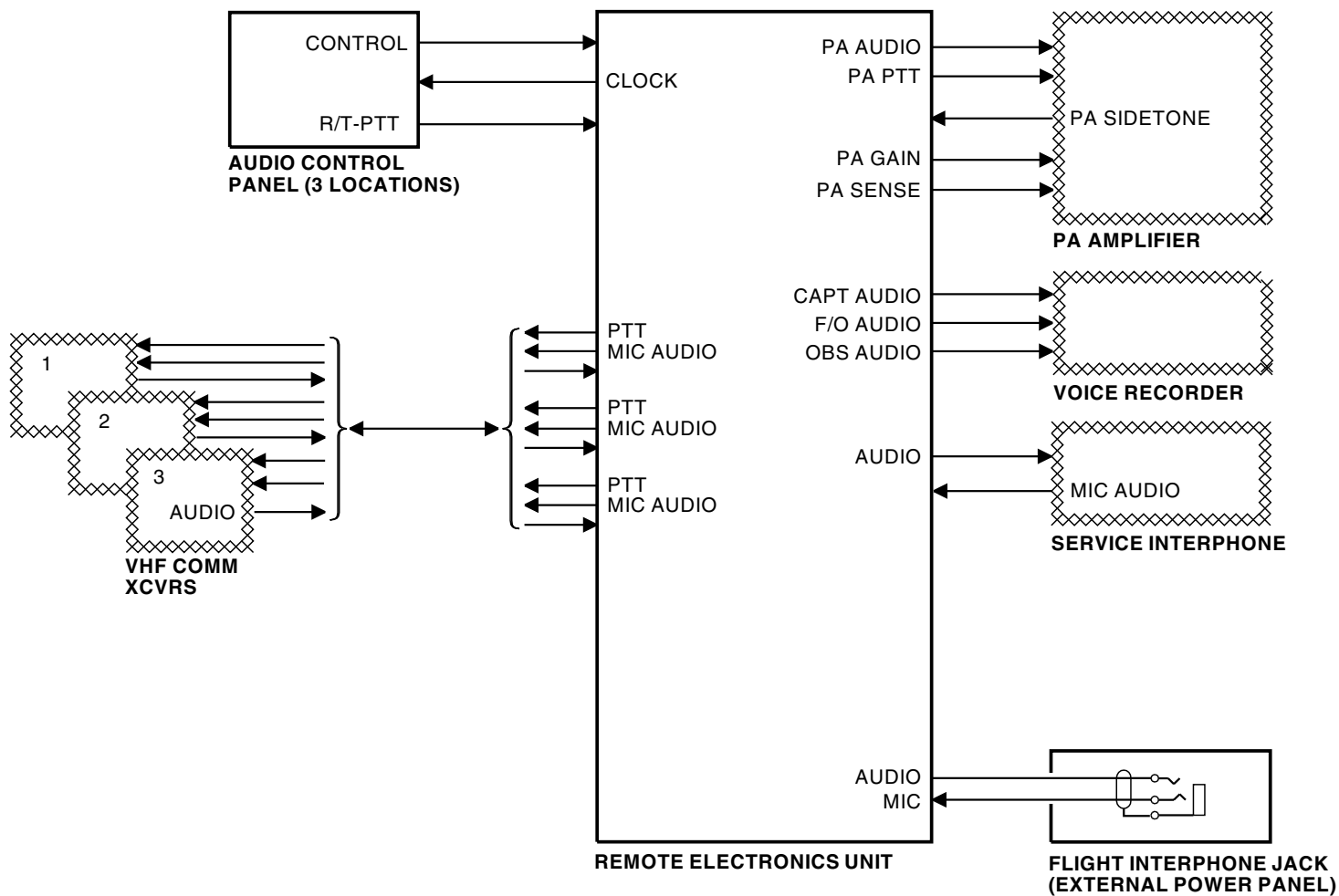
The REU sends audio to the service interphone system when you select service interphone on the ACP. Service interphone audio is available at all service interphone stations and attendant handsets.

**Flight Interphone Jack**

The ground crew uses the flight interphone jack at the P19 external power panel or the interphone box to talk to the flight crew.

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## FLIGHT INTERPHONE SYSTEM - COMMUNICATION SYSTEM INTERFACES



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## FLIGHT INTERPHONE SYSTEM - COMMUNICATION SYSTEM INTERFACES

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**FLIGHT INTERPHONE SYSTEM - NAVIGATION INTERFACE****Navigation Interfaces**

These navigation radio systems send audio signals to the REU:

- Multi-mode receiver (MMR)
- VHF omnidirectional range (VOR)/marker beacon system
- Automatic direction finder (ADF) system
- Distance measuring equipment (DME) system.

The REU pairs the DME with either the MMR or VOR audio. The REU sets the DME audio level at a lower level than the MMR or VOR audio.

**Audio Alerts**

These systems send audio alert signals to the REU:

- Flight control computer (FCC) - altitude alert
- Traffic alert and collision avoidance system (TCAS)
- WXR receiver transmitter
- Ground proximity warning computer (GPWC).

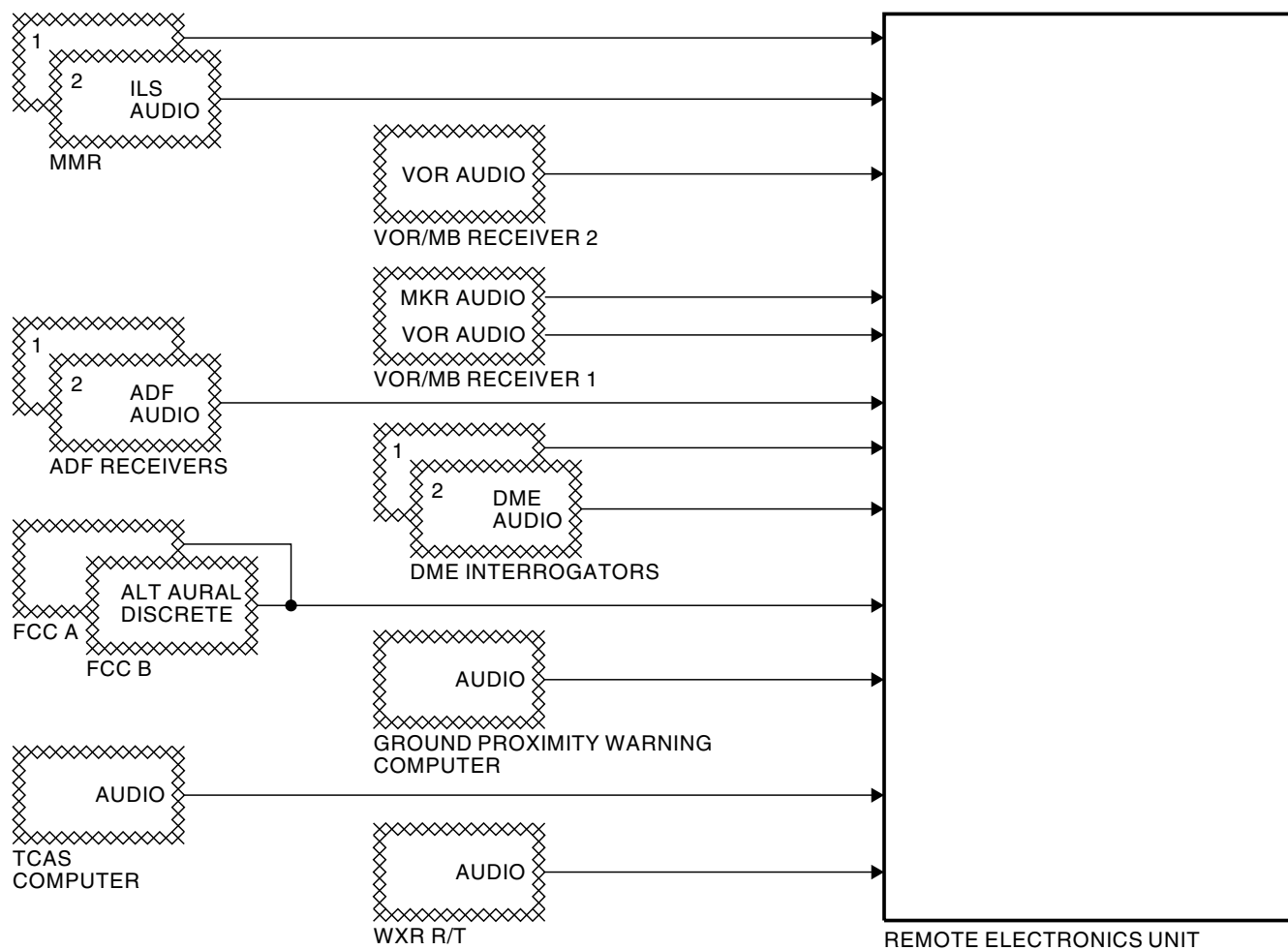
The FCC sends a ground discrete to start the altitude alert signal. The REU supplies a C-chord aural with each ground discrete. The REU sums and amplifies TCAS, GPWC, WXR, and C-chord audio alert signals.

You can hear alert signals on the flight components below:

- Flight Interphone speakers

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# FLIGHT INTERPHONE SYSTEM - NAVIGATION INTERFACE



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# FLIGHT INTERPHONE SYSTEM - NAVIGATION INTERFACE

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**FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL****Purpose**

The flight crew uses the audio control panels (ACPs) to control audio for the communication and navigation systems. Each ACP controls one station.

**Controls**

These are the controls on the ACP:

- Transmitter selectors
- Receiver switches
- Radio-Intercom PTT switch
- Filter switch
- SATCOM end call switches
- ALT-NORM switch

**Microphone Selector Switches**

The flight interphone system gets audio from these microphones:

- Boom
- Oxygen mask
- Hand-held

You push a transmitter selector to select a communication transmitter or system. You can select only one system at a time.

When you push a transmitter selector, this happens:

- The selector switch light comes on.
- The lamps in the selector switch are field replaceable.
- The received audio comes on at the volume set by the receiver volume control.
- The microphone audio and PTT signals are enabled for that system.

The transmitter selectors (except PA) have call lights in the switch. The call lights come on when the flight crew get any one of these calls:

- SELCAL on a VHF or HF radio

- Ground crew call (INT light)
- Ground crew call (FLT light)
- SATCOM call
- Flight crew call (CABIN light).

To turn off the call light, the flight crew selects the system and sends a PTT to that system.

When you push a PTT switch, the microphone audio and PTT signals go to the system set by the selector switches.

When the ACP initially gets power, the flight interphone system is active.

**Receiver Switches**

Push the receiver switch (push-on, push-off) to listen to communication or navigation system audio. Turn it to adjust the volume. You can monitor any combination of systems at any time.

**Radio-Intercom PTT Switch**

The radio-intercom PTT switch is a three-position switch with a momentary contact in the RADIO position and a latching contact in the INT position. In the RADIO position, the microphone audio and PTT signals go to the communication system set by the transmitter selectors. In the INT position, the boom or mask microphone jacks connect to the flight interphone system.

The radio-intercom PTT switch is in parallel with the PTT switch on the control wheel.

**Filter Switch**

The filter switch controls the filter that processes the navigation audio you receive. This switch has these positions:

- V (voice) position passes only voice frequencies through the filter and blocks the 1020 hz range frequency.
- B (both) position passes voice and range (coded station identification) frequencies through the filter to the audio output.

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**FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL**

- R (range) position passes only range frequencies through the filter and blocks voice frequencies.

**ALT-NORM Switch**

You use the ALT-NORM switch to select either normal or emergency operation of the flight interphone system. Each station operates independently.

When you select NORM, the flight interphone system operates as usual.

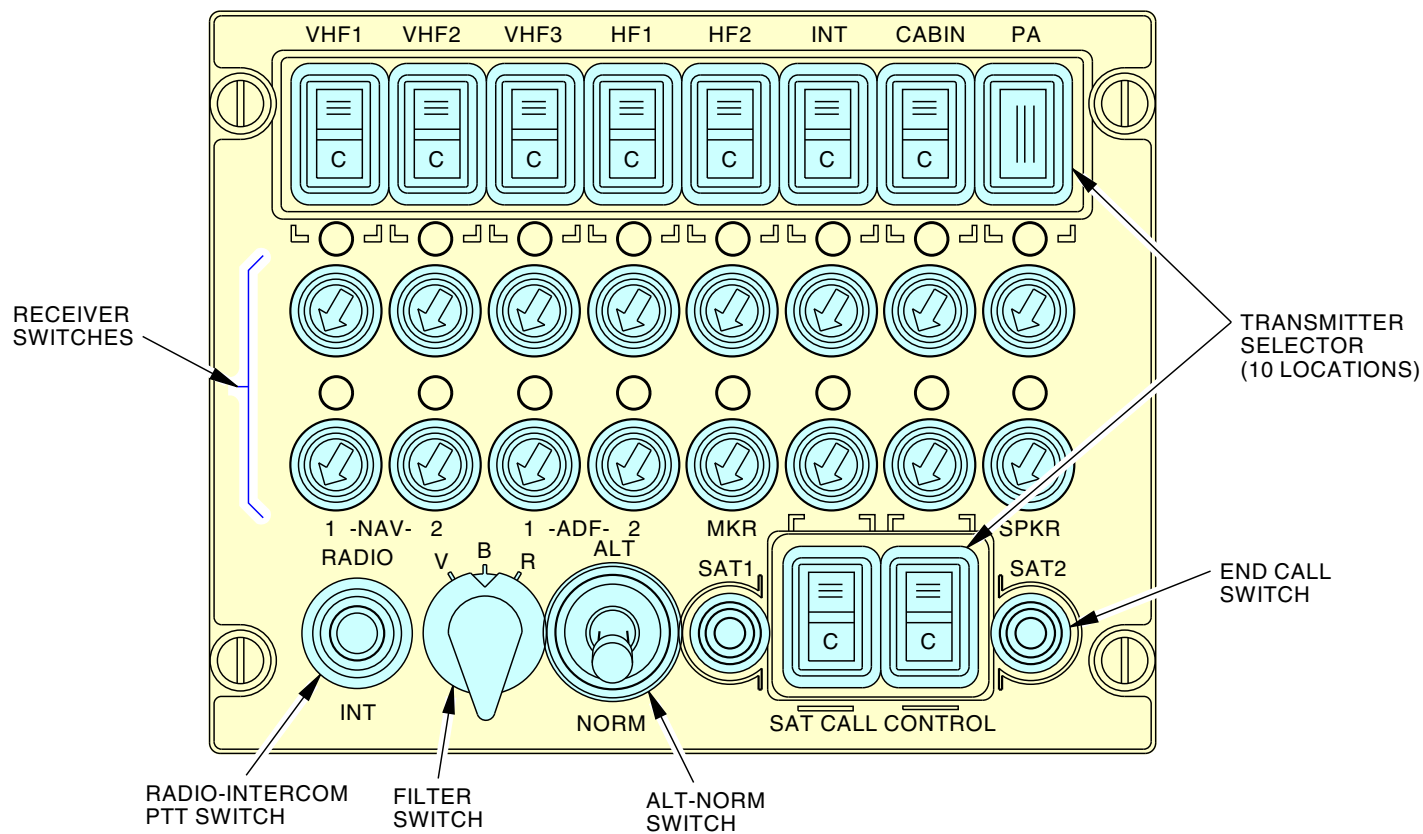
When you select ALT, the flight interphone system operates in the emergency mode. The only ACP control that operates is the RADIO position of the PTT switch. The hand-mic does not operate.

When you select ALT on the captain or observer ACP, you hear receiver audio from the VHF-1 transceiver at the headphone and headset jacks. When you key the MIC, the audio and PTT signals go to the VHF-1 transceiver.

When you select ALT on the first officer ACP, you hear receiver audio from the VHF-2 transceiver at the headphone and headset jacks. When you key the MIC, the audio and PTT signals go to the VHF-2 transceiver.

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## FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL



### AUDIO CONTROL PANEL (EXAMPLE)

INOP

1 INOP PLACARDS ARE OVER THE LEGEND OF ANY TRANSMITTER SELECTOR OR RECEIVER SWITCH THAT IS NOT CONNECTED.

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## FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL

**23-51-00**

**FLIGHT INTERPHONE SYSTEM - REMOTE ELECTRONICS UNIT****Purpose**

The remote electronics unit (REU) controls audio signals in the flight interphone system.

**Physical Description**

The REU has these physical properties:

- Length is 17.6 in. (447.0 mm)
- Height is 7.62 in. (193.55 mm)
- Width is 3.58 in. (90.93 mm)
- Weight is 7.75 lb (3.52 kg)

**Functions**

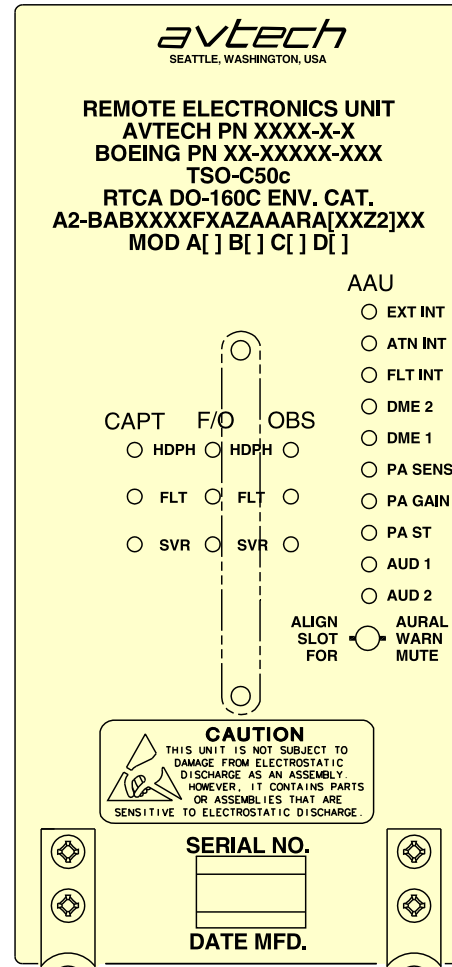
The REU uses the ACP selections to connect these signals:

- Communication transceiver audio
- Navigation receiver audio
- Passenger address audio
- Service interphone audio
- Flight interphone.

The AURAL WARN MUTE switch on the front panel of the REU activates the muting of the aural warning signal in the headphones. The switch is a ten position rotary switch. The switch is in the active muting position when it is horizontal to the bottom edge of the front panel.

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## FLIGHT INTERPHONE SYSTEM - REMOTE ELECTRONICS UNIT



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## FLIGHT INTERPHONE SYSTEM - REMOTE ELECTRONICS UNIT

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**FLIGHT INTERPHONE SYSTEM - CONTROL WHEEL PTT SWITCH****Purpose**

The control wheel PTT switch gives push-to-talk input for the boom or oxygen mask microphones.

**Description and Controls**

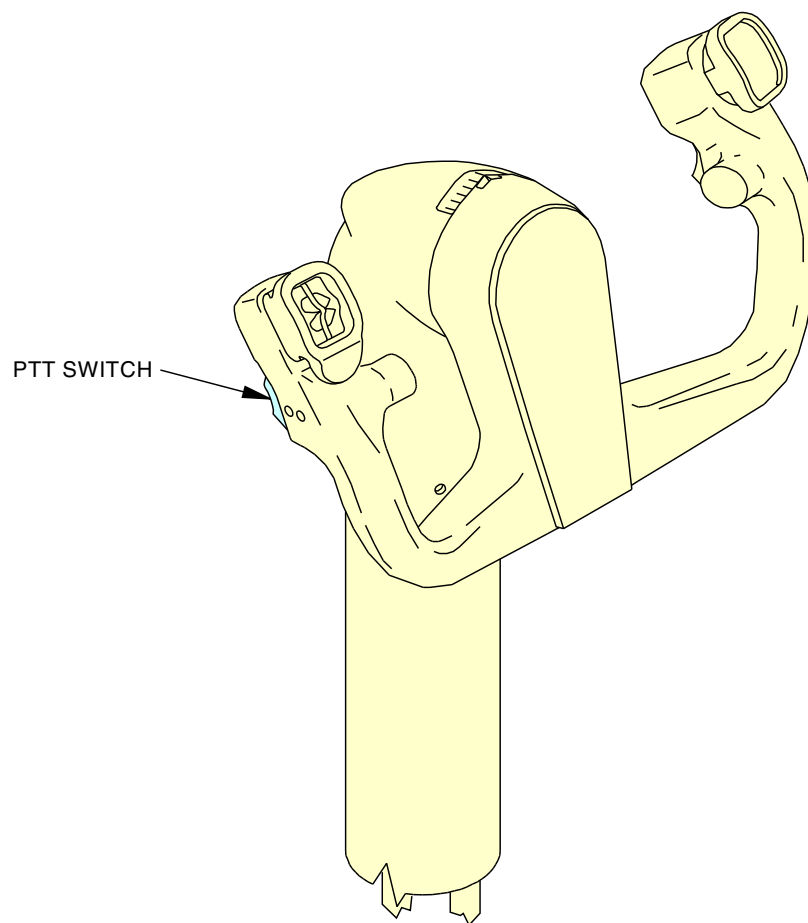
The control wheel PTT switch is a three position switch. It is on the outboard horn of the captain's and the first officer's control wheel. These are the switch positions:

- MIC - microphone audio and PTT signals go to the communication system you select
- OFF - The ACP PTT switch can key the microphone
- INT - microphone audio goes to the flight interphone system (ACP selection is not changed).

The switch is spring loaded to the middle OFF position from the MIC position. It is locked in the INT position until selected to either OFF or MIC.

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# FLIGHT INTERPHONE SYSTEM - CONTROL WHEEL PTT SWITCH



CAPTAIN CONTROL WHEEL

## FLIGHT INTERPHONE SYSTEM - CONTROL WHEEL PTT SWITCH

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**FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL FUNCTIONAL DESCRIPTION****General**

You use the audio control panel (ACP) to select the audio for headsets and flight interphone speakers. ACPs also select a communication system.

ACPs show SELCAL and crew calls.

**ACP Components**

The ACP has these components:

- Power supply
- Front panel lights and switches
- Switching multiplexer
- Volume control multiplexer
- Select circuits
- Emergency circuit.

**Power Supply**

The ACP gets 15v dc from the REU. The ACP converts this voltage to 12v dc and 5v dc which gives power for electronic circuits.

Master dim and test (MD&T) sends 28v dc or 16v dc to the microphone selector lamps and the call lamps. The airplane electrical system sends 5v ac for panel lighting.

**Front Panel Lights and Switches**

The ACP has these front panel components:

- Microphone select switches with mic select lights and call lights
- Filter switches
- Receiver select switches and volume controls.

The mic select lights get 28v dc or 16v dc from the MD&T circuits. A mic select light turns on when it gets a ground from the electrical interlock programmed logic array (PLA) circuit.

The VHF or HF call lights turn on when SELCAL comes for that radio. To turn off these call lights, push the microphone select switch and key the mic. When you push the pilot call switch at the external power panel or the flight deck call switch at the interphone box, the INT call light comes on. When you release the pilot call or flight deck call switch, the INT call light goes off. The CABIN call light comes on when the cabin crew makes a pilot call. When the cabin crew pushes reset on the handset or puts the handset into the cradle, the CABIN call light goes off.

When you push the microphone select switch, it sends 5v dc to the PLA. The PLA is an electrical interlock circuit. It makes a 4 bit binary code for the selected switch.

System selection is latched into the PLA. The PLA sends the applicable code to the switching multiplexer. The PLA also sends a signal to turn on a receiver volume control when you push the microphone select switch.

Push the receiver volume control to hear audio from the related system. The receiver volume control switch sends a dc voltage from a potentiometer (0 to 12v dc) to the multiplexer. The multiplexer sends this voltage to the REU to set the radio output volume level. When the audio volume control switch is off, 12v dc goes to the REU and you cannot hear the system audio.

**Switching Multiplexer**

The switching multiplexer gets these signals:

- Microphone select binary code from the PLA circuit
- DC voltages from filter switches
- DC voltages from the service interphone, PA, and speaker volume controls.

The switching multiplexer sequentially selects the inputs. The data output goes to the REU as a control system data word. This multiplexer operation stops when the volume control multiplexer operates.

**Volume Control Multiplexer**

The volume control multiplexer gets DC voltages from the remaining receiver volume controls.

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**FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL FUNCTIONAL DESCRIPTION**

The volume control multiplexer sequentially selects the inputs. The data output goes to the REU as a control system data word. This multiplexer operation stops when the switching multiplexer operates.

**Select Circuits**

A multiplexer selects each input in sequence for a given time. A clock in the REU increases the value of a counter. This counter provides the select address for the two analog multiplexers.

Two multiplexers combine the data from all the switches and the controls. The scan inhibit circuits prevent the operation of one multiplexer output while the other scans.

**Emergency Circuits**

The REU gives power for the ACP. You lose ACP power when for these conditions:

- REU has no power
- ACP has the ALT selection.

These conditions occur when you lose power in the ACP:

- The ALT/NORM relay has no power
- The data line to the REU identifies the mask storage compartment discrete status
- 28 volts from MD&T goes through the ALT/NORM relay contacts to the VHF 1 mic selector switch lamp for the captain and observer, and VHF 2 mic selector switch lamp for the first officer.

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## FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL FUNCTIONAL DESCRIPTION

**FLIGHT INTERPHONE SYSTEM - PTT FUNCTION****General**

These components send a push-to-talk (PTT) signal to the remote electronics unit (REU):

- Audio control panel (ACP) radio-intercom PTT switches
- Control wheel PTT switches
- Hand microphone PTT switches

Set the radio-intercom PTT switch on the ACP to the RADIO position to send a PTT signal to a communications system. Set the switch to INT to talk on the flight interphone system.

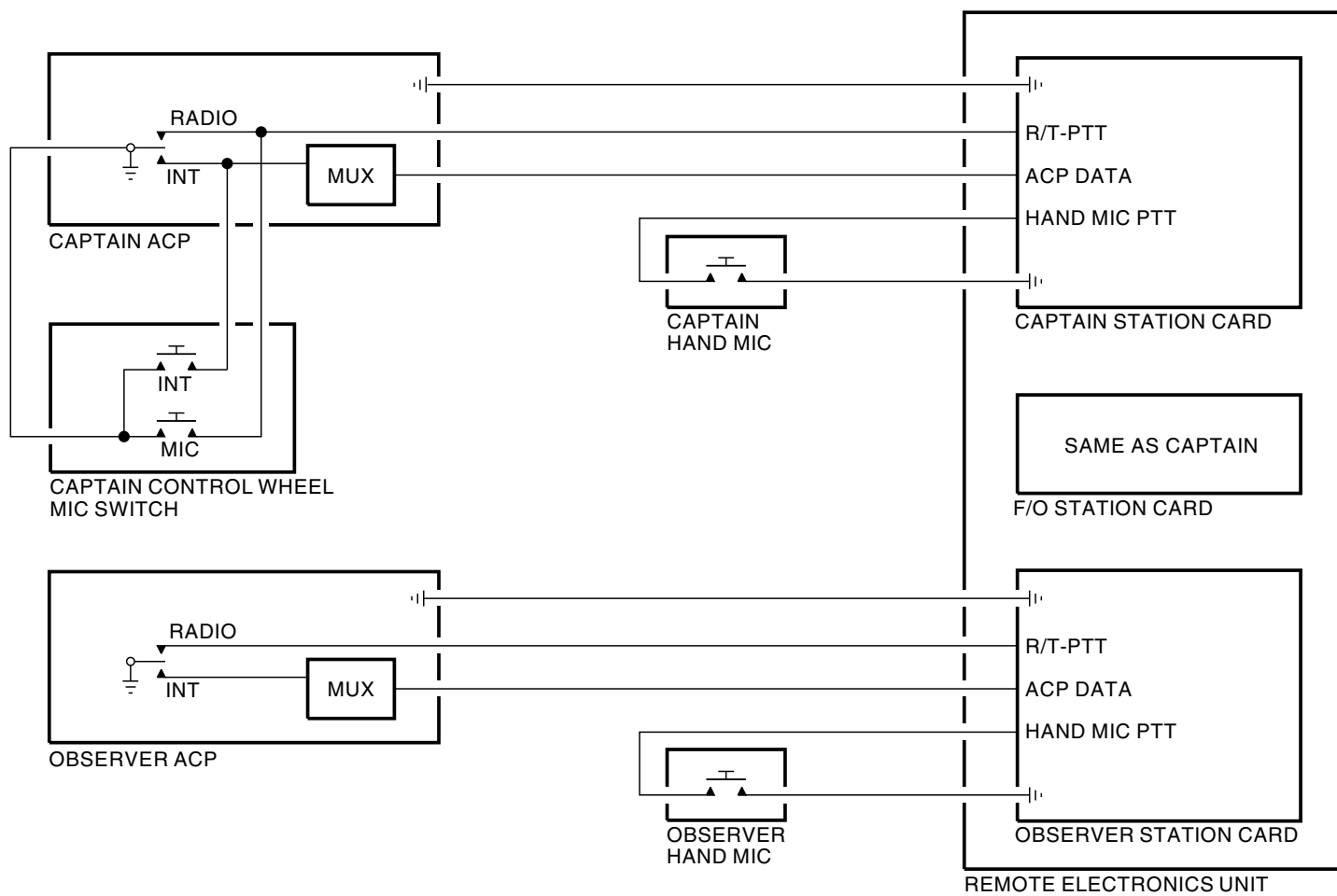
Push the remote mic switch on the glareshield to send a PTT signal to a communication system.

Set the control wheel PTT switch to MIC to send a PTT signal to a communications system. Set the switch to INT to talk on the flight interphone system.

The observer can only send a PTT from the hand microphone or ACP.

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# FLIGHT INTERPHONE SYSTEM - PTT FUNCTION



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# FLIGHT INTERPHONE SYSTEM - PTT FUNCTION

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## FLIGHT INTERPHONE SYSTEM - REMOTE ELECTRONICS UNIT FUNCTIONAL DESCRIPTION

**General**

The remote electronics unit (REU) controls the communication between these:

- Three flight deck stations
- Service interphone
- Flight interphone
- All related electronics equipment.

The REU contains three identical station cards. The cards are for these crew members:

- Captain
- First officer
- Observer.

The REU also has an audio accessory unit (AAU) card. The card contains circuitry for flight and service interphone, alert tone generation and various audio accessory functions.

REU cards process these signals:

- REU inputs
- REU outputs
- AAU signals
- Emergency signals.

**REU Inputs**

Each station card in the REU receives audio from these sources:

- Flight compartment microphones
- Communication transceivers
- Navigation receivers
- Passenger address amplifier
- AAU card aural alerts.

The station cards get control inputs from the audio control panels (ACPs) and microphone push-to-talk (PTT) switches.

The mux receiver, in the REU, sends a data clock to the ACP. The ACP replies back with crew selected receiver audio, navigation signals, volume and particular transmitter.

The mux receiver responds to the crew inputs and sends control signals to the following circuits:

- Receiver circuits
- Mic/PTT select logic
- Transmitter circuits
- Speaker mute/volume logic.

The receiver circuits receive audio inputs from the communication and navigation systems, passenger address amplifier, service interphone and flight interphone. The circuits process the crew selected audio. The audio goes to summing amplifiers. The summing amplifiers send the audio to the speaker mute/volume logic circuits, CVR amplifier and headphone amplifier.

The mux receiver sends boom/mask and interphone PTT signals to the mic/PTT select logic. The mic/PTT select logic processes input microphone audio and PTT signals. It routes the selection to the transmitter circuits. The mic/PTT select logic circuits process speaker mute signals and hot mic audio.

The transmitter circuits route the microphone audio and/or PTT to the selected communication system.

The speaker mute/volume logic circuits process flight compartment speaker muting and set the speaker volume to the level as commanded from the mux receiver.

**REU Outputs**

Each station card sends audio to these:

- Headphones
- Headsets

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**FLIGHT INTERPHONE SYSTEM - REMOTE ELECTRONICS UNIT FUNCTIONAL DESCRIPTION**

- Voice recorder
- Flight compartment speakers from CAPT and F/O station cards
- Communication transceivers
- Passenger address amplifier.

The station cards also send PTT signals to the communication transceivers and the passenger address amplifier.

**AAU Signals**

The AAU uses these audio signals:

- Altitude alert
- Ground proximity alert
- Flight interphone
- Service interphone.

The flight control computers (FCCs) send an altitude alert discrete to the AAU card. This input starts a C-chord generator.

The ground proximity computer and the weather radar receiver transmitter send alert audio to the AAU card. The AAU card combines this audio with the output from the altitude alert tone generator and sends it to each station card summing amplifier. The summing amplifier combines the AAU alert audio with TCAS audio. Station cards amplify these signals and send them to these components:

- Voice recorder
- Headphones
- Headsets
- Speakers.

The flight interphone amplifier amplifies microphone audio from station cards. Microphone audio goes to the flight interphone jack.

The AAU card amplifies audio from the external flight interphone jack and sends it to station cards.

The service interphone amplifier amplifies these inputs:

- Audio from attendant handsets
- Audio from service interphone jacks
- Microphone audio when service interphone is set on the ACP.

This audio goes to service interphone jacks and station cards.

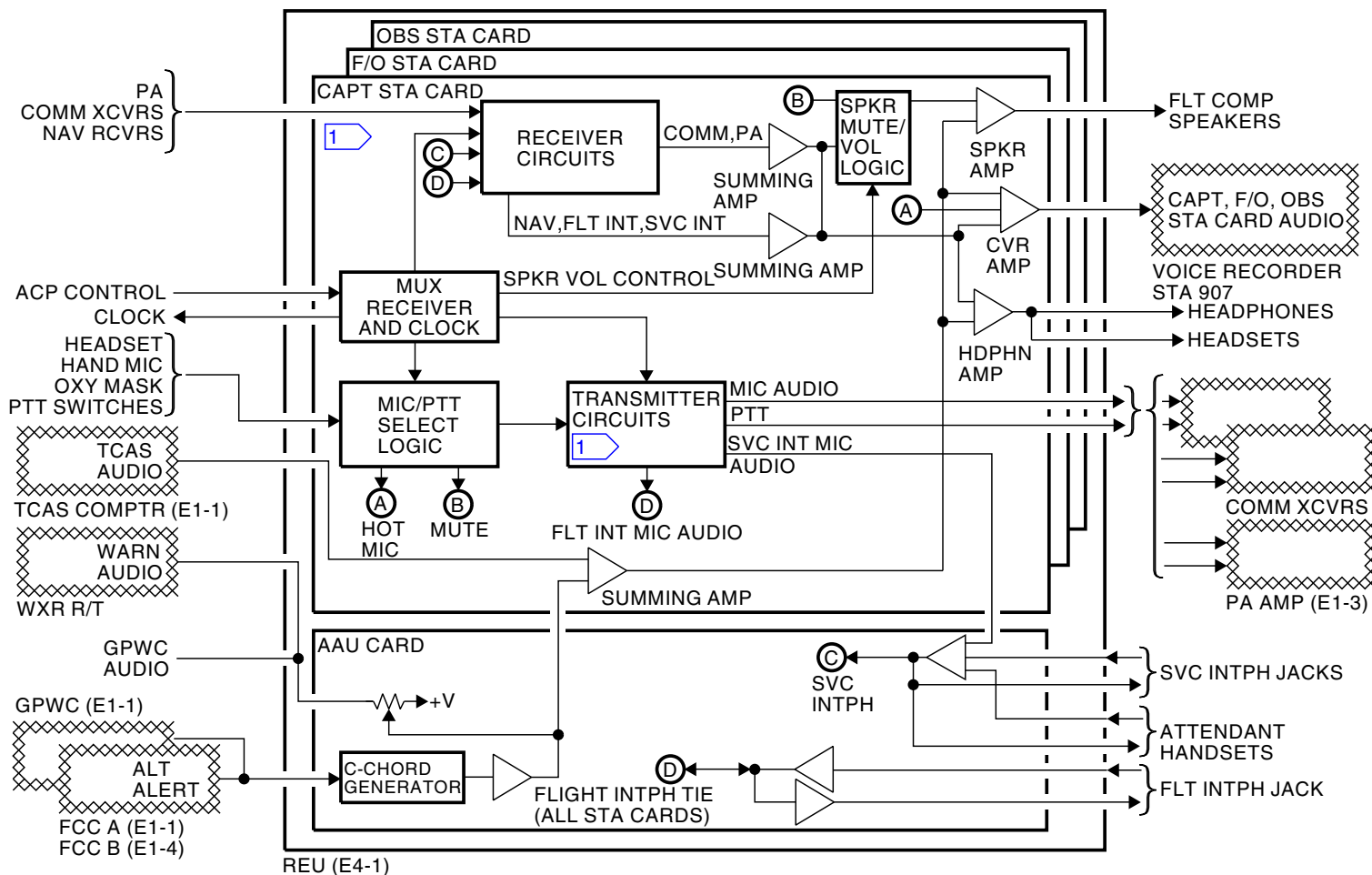
**Emergency Signals**

Emergency operation bypasses all active circuitry in the system to maintain communications between the aircraft and ground stations.

Microphone audio and PTT signals from the CAPT and OBS stations go directly to the VHF 1 transceiver. Microphone audio and PTT signals from the F/O station goes to the VHF 2 transceiver.

Received audio from the VHF 1 transceiver goes to the CAPT and OBS station headsets. Received audio from the VHF 2 transceiver goes to the F/O station headset.

# FLIGHT INTERPHONE SYSTEM - REMOTE ELECTRONICS UNIT FUNCTIONAL DESCRIPTION



1 EMERGENCY - MIC AUDIO AND PTT DIRECT TO VHF 1 FOR CAPT AND OBS. VHF 2 FOR F/O. RECEIVE AUDIO DIRECT TO HEADPHONE AND HEADSET OUTPUT.

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## FLIGHT INTERPHONE SYSTEM - REMOTE ELECTRONICS UNIT FUNCTIONAL DESCRIPTION



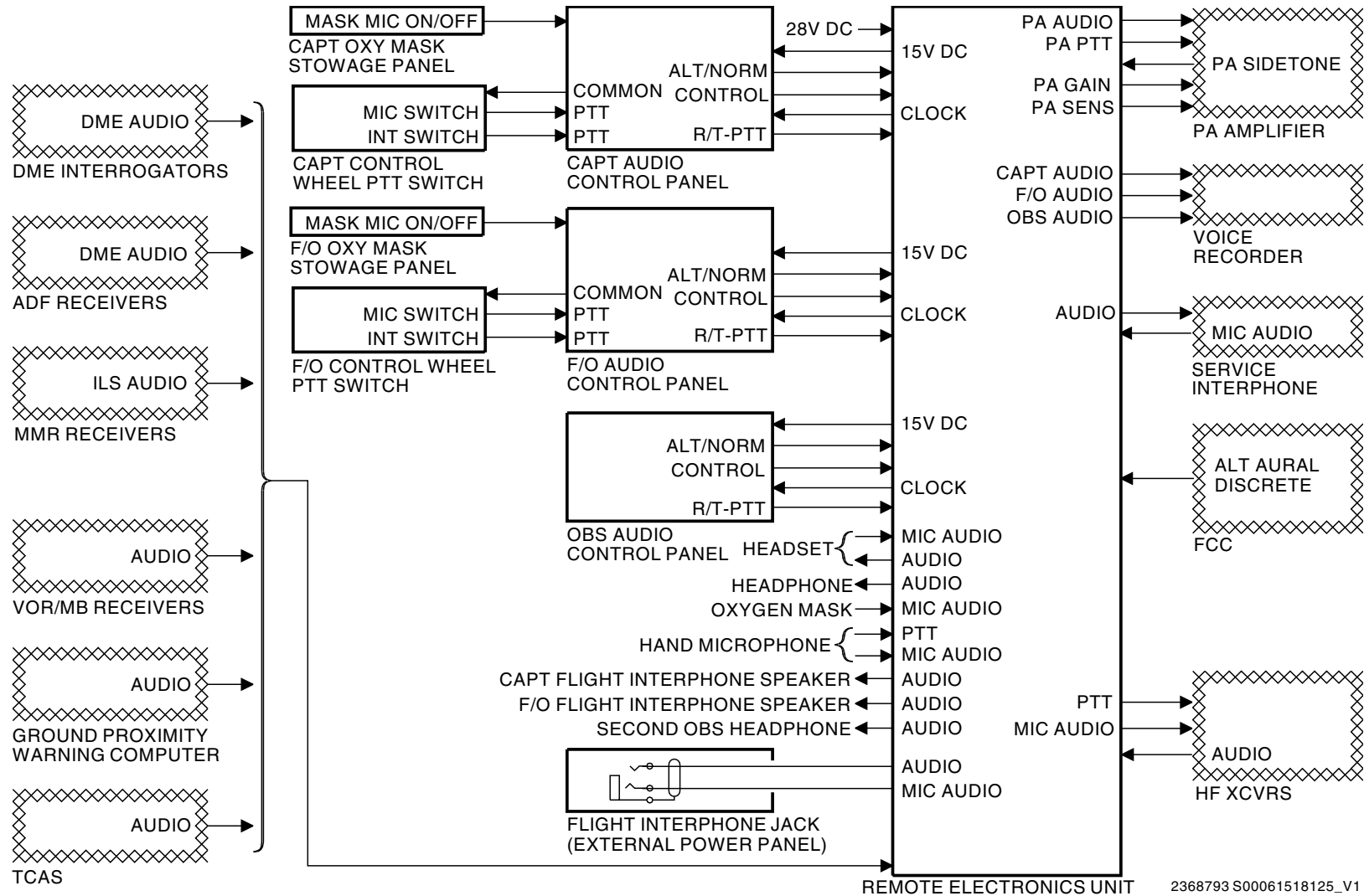
FLIGHT INTERPHONE SYSTEM - SYSTEM SUMMARY

General

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# FLIGHT INTERPHONE SYSTEM - SYSTEM SUMMARY



## FLIGHT INTERPHONE SYSTEM - SYSTEM SUMMARY

REMOTE ELECTRONICS UNIT

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## STATIC DISCHARGERS

### Purpose

There are static dischargers on the airplane to decrease radio receiver interference. The static dischargers discharge static at points as far from the fuselage as possible. This makes sure there is the least amount of coupling into the radio receiver antennas.

### Characteristics

Each discharger has a carbon fiber tip at the end of a slender rod. The rod is a resistive (conducting) material and attaches to a metal base. The base attaches and bonds to the airplane surface.

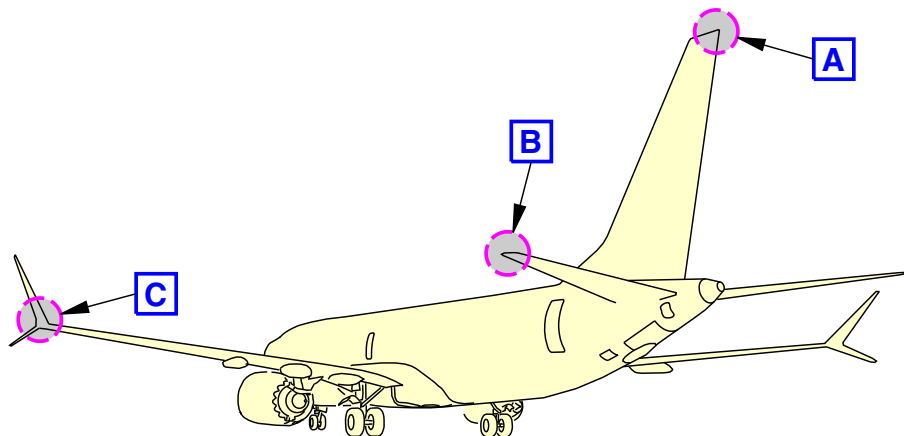
There are trailing edge and tip dischargers. The tip dischargers are smaller than the trailing edge dischargers.

### Location

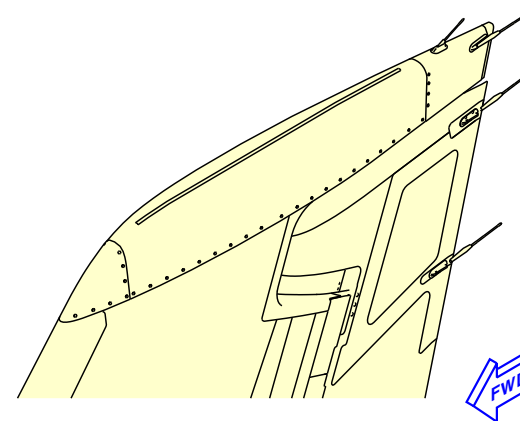
Each wing has two trailing edge dischargers. The vertical fin has a tip discharger and three trailing edge dischargers. Each side of the horizontal stabilizer has a tip discharger and two trailing edge dischargers. Each winglet has four trailing edge dischargers.

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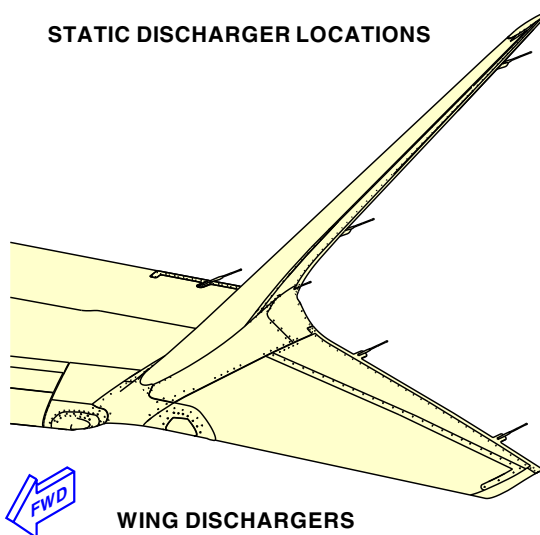
**STATIC DISCHARGERS**



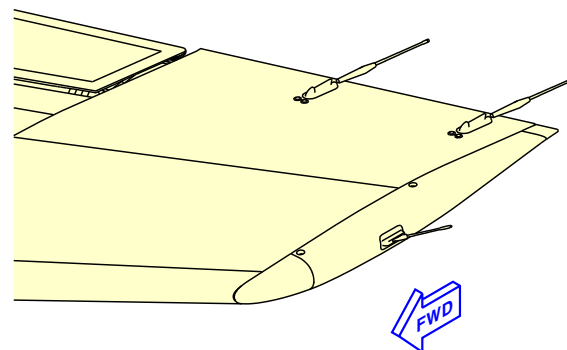
**STATIC DISCHARGER LOCATIONS**



**VERTICAL STABILIZER DISCHARGERS**



**WING DISCHARGERS**



**HORIZONTAL STABILIZER DISCHARGERS**

**STATIC DISCHARGERS**

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## VOICE RECORDER SYSTEM - INTRODUCTION

### General

- XFR - transfer

The voice recorder continuously records these:

- Flight crew communications
- Flight compartment sounds.

### **SIA 001-010**

The voice recorder keeps the last 120 minutes of audio.

### **SIA 011-999**

The voice recorder keeps the last 1500 minutes of audio.

### **SIA ALL**

### Abbreviations and Acronyms

- ACP - audio control panel
- A/D - analog-to-digital
- ARINC - aeronautical radio incorporated
- BITE - built in test equipment
- CAPT - captain
- CSMU - crash survivable memory unit
- D/A - digital-to-analog
- F/O - first officer
- F/OBS - first observer
- Hz - hertz
- MIC - microphone
- REU - remote electronics unit
- RIPS - recorder independent power supply
- ULB - underwater locator beacon
- V AC - volts alternating current
- V DC - volts direct current
- VR - voice recorder

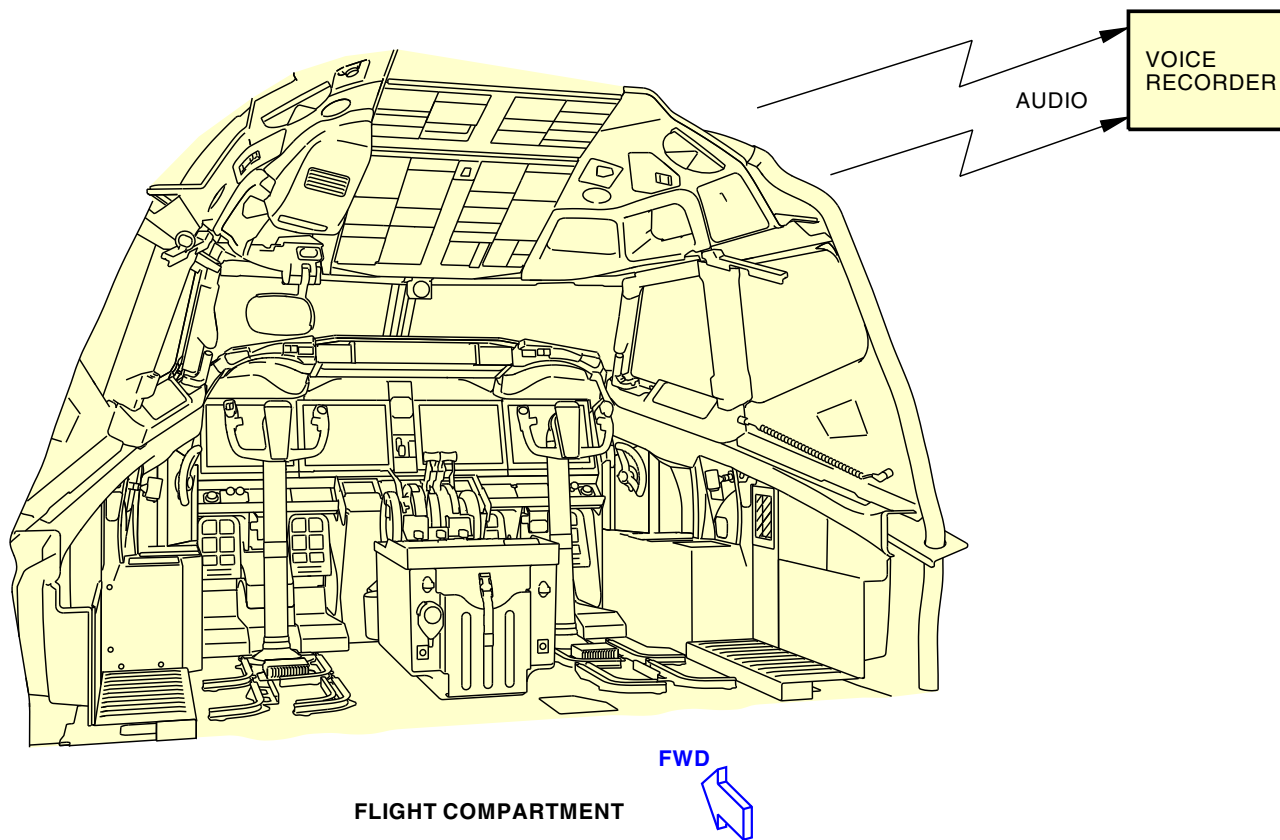
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VOICE RECORDER SYSTEM - INTRODUCTION



VOICE RECORDER SYSTEM - INTRODUCTION

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## VOICE RECORDER SYSTEM - GENERAL DESCRIPTION

### General

The voice recorder unit makes a record of flight crew communication and flight compartment sounds. It erases the communication data automatically so that the memory stores only recent audio.

#### **SIA 001-010**

The voice recorder unit keeps the last 120 minutes of communication data in memory.

#### **SIA 011-999**

The voice recorder unit keeps the last 1500 minutes of communication data in memory.

#### **SIA ALL**

The voice recorder unit receives audio from the remote electronics unit (REU) and the area microphone. The area microphone is in the cockpit voice recorder panel.

The voice recorder unit receives time from the clock system for reference.

### Components

The voice recorder system has these components:

- Cockpit voice recorder panel
- Voice recorder switch
- Voice recorder unit.
- Recorder independent power supply.

### Functional Description

The pilot uses the voice recorder switch to control voice recorder power. The AUTO switch position provides automatic control. In this position, the voice recorder receives power through the time delay relay. When an engine is at or above idle, an engine running relay energizes the time delay relay. The energized relay keeps voice recorder power on from engine start to engine shutdown. The time delay relay also keeps power for an additional ten minutes after engine shutdown to let the pilots complete postflight checks.

The ON position lets you apply power to the voice recorder for maintenance or for preflight tests. In this position, the voice recorder switch latches while it supplies the power. It gives this power until an engine starts or until you put the switch back to AUTO. The switch automatically goes to AUTO when an engine is at or above idle.

The voice recorder unit collects these audio at the same time:

- Captain microphone and headphone
- First officer (F/O) microphone and headphone
- First observer (F/OBS) microphone and headphone
- Area microphone on the cockpit voice recorder panel.

The voice recorder unit also receives time from the clock system.

The inputs from the captain, first officer, and first observer microphones go to the REU. The REU mixes each station microphone audio with that station headphone audio. The REU then increases the audio signal and sends it to the voice recorder.

The area microphone collects flight compartment sounds, such as voices and aural warnings. The cockpit voice recorder panel increases the audio signal from the area microphone and sends it to the voice recorder unit.

You can monitor the CVR audio if you connect a headphone to the phone jack at the cockpit voice recorder panel.

An erase switch on the voice recorder control panel removes all the audio that the voice recorder keeps. You can only erase data when the airplane is on the ground and the parking brake is set.

A test switch on the cockpit voice recorder panel starts a test of the voice recorder system. A status indicator LED on the cockpit voice recorder panel shows the results of the test.

An underwater locator beacon is on the front panel of the voice recorder unit.

The recorder independent power supply will supply 10 minutes of auxiliary power to the CVR when aircraft power systems are off or malfunction.

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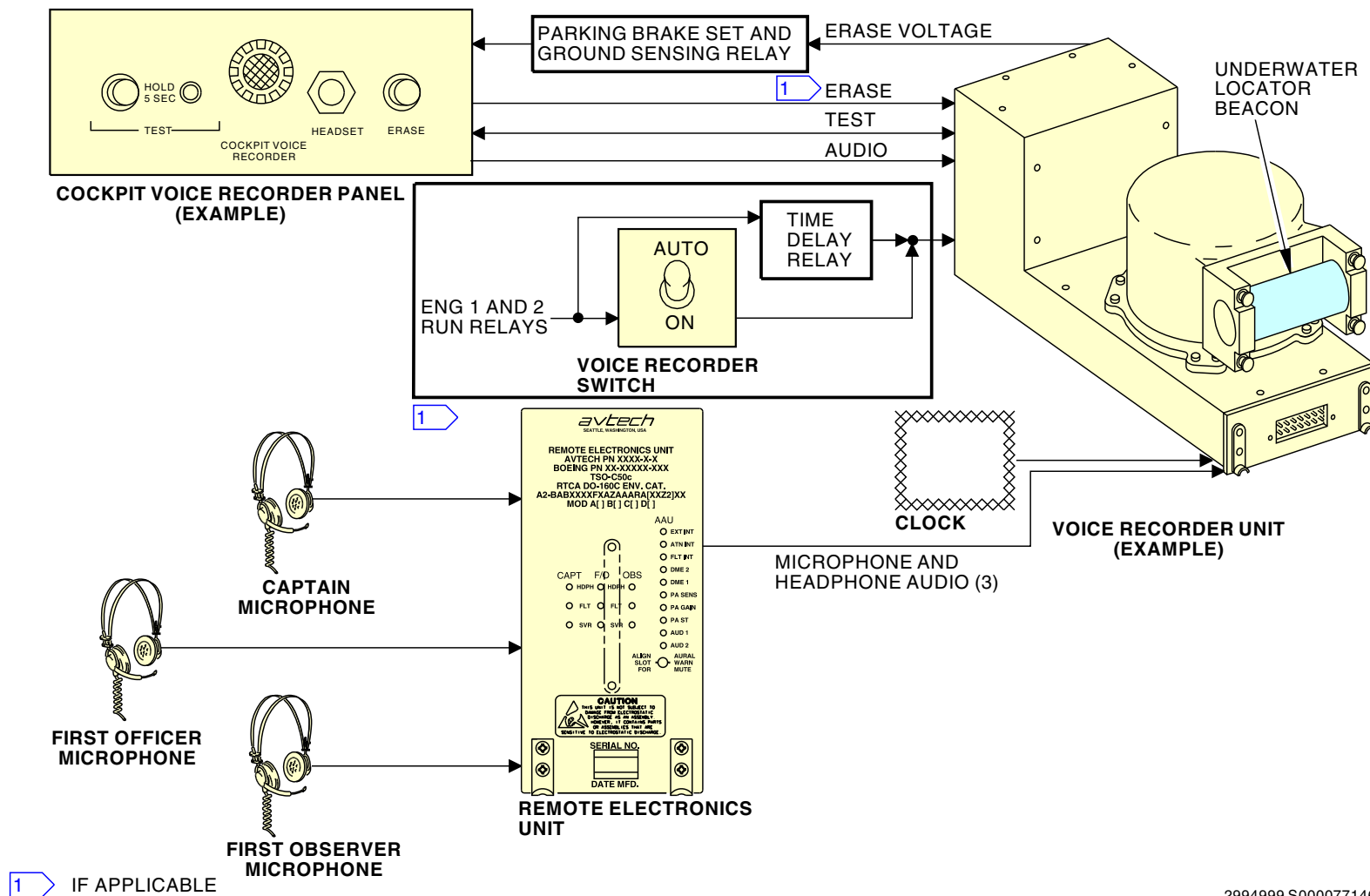


## VOICE RECORDER SYSTEM - GENERAL DESCRIPTION

The CVR records the datalink messages from the ACARS system. The CSMU keeps the datalink messages that it receives from the ACARS system.

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## VOICE RECORDER SYSTEM - GENERAL DESCRIPTION



## VOICE RECORDER SYSTEM - GENERAL DESCRIPTION

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## VOICE RECORDER SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATION

### General

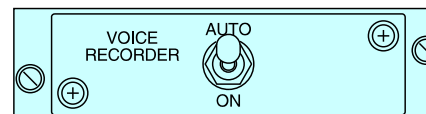
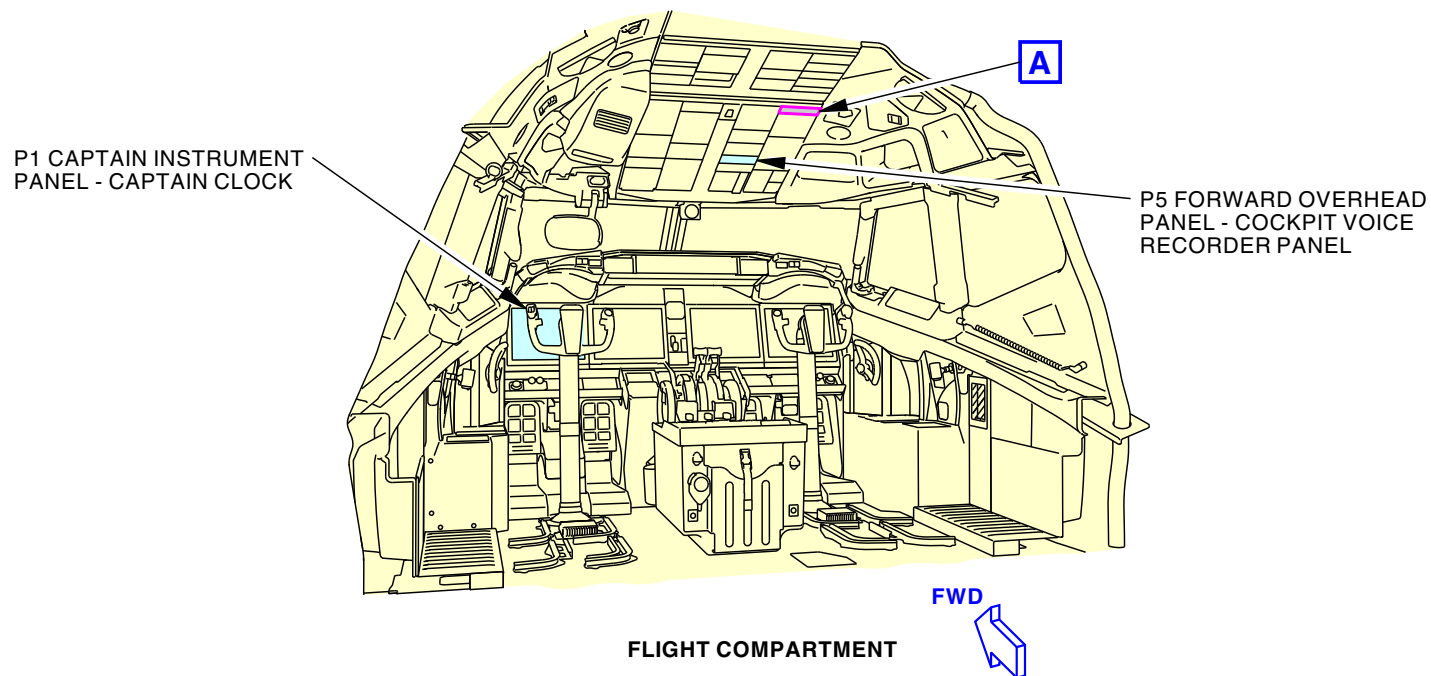
The cockpit voice recorder panel is on the P5 forward overhead panel.

The voice recorder switch is on the P5 forward overhead panel.

The captain clock is on the P1 captain instrument panel.

| SIA ALL | EFFECTIVITY   |
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# VOICE RECORDER SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATION



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## VOICE RECORDER SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATION

**23-71-00**



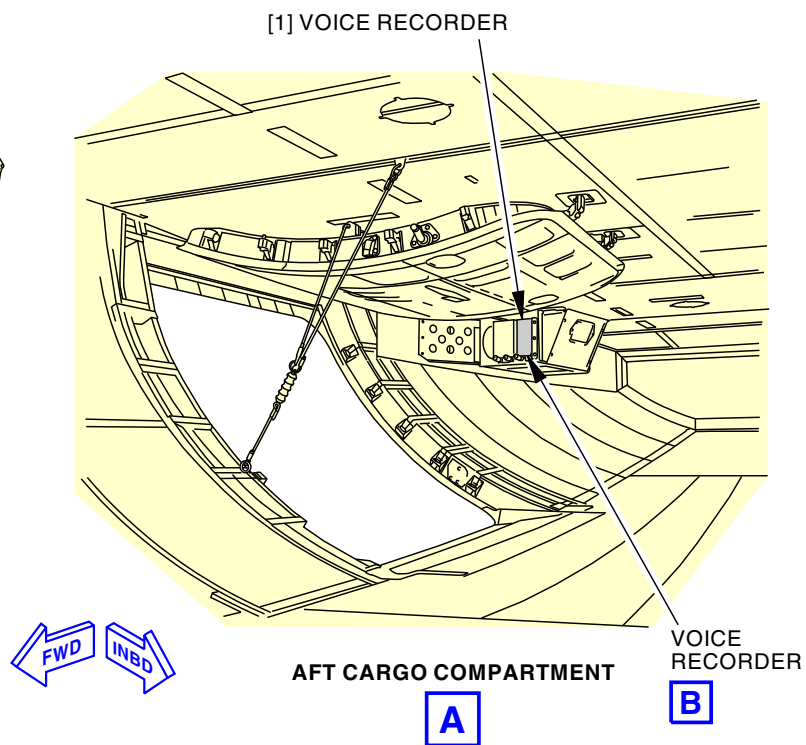
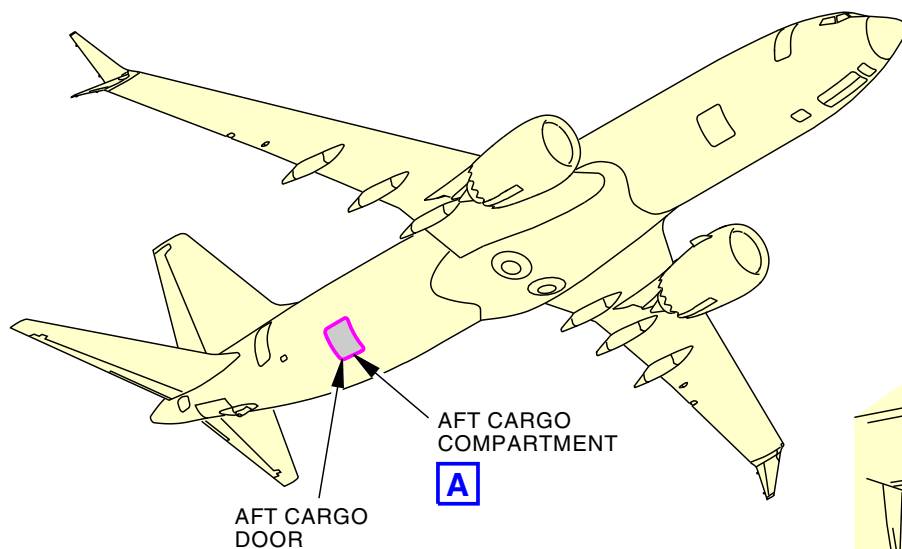
## VOICE RECORDER SYSTEM - RECORDER LOCATION

### General

The voice recorder unit is in the aft cargo compartment just aft of the cargo door.

| SIA ALL | EFFECTIVITY   |
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# VOICE RECORDER SYSTEM - RECORDER LOCATION



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## VOICE RECORDER SYSTEM - RECORDER LOCATION

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ECCN 9E991 BOEING PROPRIETARY - See title page for details

## VOICE RECORDER SYSTEM - INTERFACE

### Power

The voice recorder system gets power from the airplane 28V DC BUS 2 through the Voice Recorder/RIPS and Voice RCDR Relay circuit breakers.

The Voice Recorder/RIPS circuit breaker supplies power to the Recorder Independent Power Supply (RIPS).

The Voice RCDR Relay circuit breaker supplies power to the voice recorder switch, latch relay and CVR dispatch relay.

The MOAO RIPS Power Cutoff relay gets 28v dc from the RIPS.

The voice recorder gets power from the RIPS when the MOAO RIPS Power Cutoff relay is energized.

To energize the MOAO RIPS Power Cutoff relay, one of these conditions must occur:

- The Voice Recorder switch is set to the ON position, or
- One of the engines is running, or
- The airplane is in air mode.

With the MOAO RIPS Power Cutoff relay energized, the power from the Voice Recorder/RIPS circuit breaker first goes to the RIPS, then the 28v dc output power from the RIPS goes to the voice recorder.

When the RIPS senses less than nominal power from 28V DC BUS 2, the RIPS battery pack supplies the necessary backup power to the voice recorder. The RIPS supplies 28v dc to the voice recorder for ten (10) minutes  $\pm$  1 minute.

The voice recorder supplies 18v dc to the audio amplifier in the cockpit voice recorder panel.

When the voice recorder switch is put to the ON position, this will cause the MOAO RIPS Power Cutoff relay to energize, and allows the 28v dc power supplies from the RIPS to the voice recorder. A latching relay holds the switch in the ON position. This keeps the voice recorder power on for pre-flight checks.

When one of the engines starts, the latching relay opens. This returns the voice recorder switch to the AUTO position. At the same time, the MOAO RIPS Power Cutoff relay stays energized and allows the RIPS continuously supplies 28v dc power to the voice recorder.

When the engines are shut down, the RIPS keeps supply power to the voice recorder for an additional 10 minutes. This gives time for post-flight checks.

### Cockpit Voice Recorder Panel

The cockpit voice recorder panel sends these signals:

- Erase discrete to the voice recorder (if applicable)
- Test discrete to the voice recorder
- Test discrete to the recorder independent power supply.
- Area audio to the channel 4 input of the voice recorder.

### PSEU

The proximity switch electronics unit (PSEU) gets 30v dc from the voice recorder unit. A park and ground relay in the PSEU closes when the parking brake is set and the airplane is on the ground. When it closes, the relay sends 30v dc to the erase switch on the cockpit voice recorder panel.

### Remote Electronics Unit

The remote electronics unit (REU) sends these signals to the voice recorder unit:

- Observer audio
- First officer (F/O) audio
- Captain audio.

### Clock

Clock data from the captain clock goes to the voice recorder on an ARINC 429 data bus.

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SIA ALL EFFECTIVITY

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ECCN 9E991 BOEING PROPRIETARY - See title page for details

**VOICE RECORDER SYSTEM - INTERFACE****Voice Recorder Unit**

The voice recorder unit sends 30v dc to the park and squat ground sensing relay. It also sends these signals to the cockpit voice recorder panel:

- Test indication to the monitor indicator
- Monitor/test audio to the headphone jack on the CVR panel.

**Recorder Independent Power Supply**

The recorder independent power supply monitors the 28v dc of the voice recorder unit. It also sends this signal to the cockpit voice recorder panel:

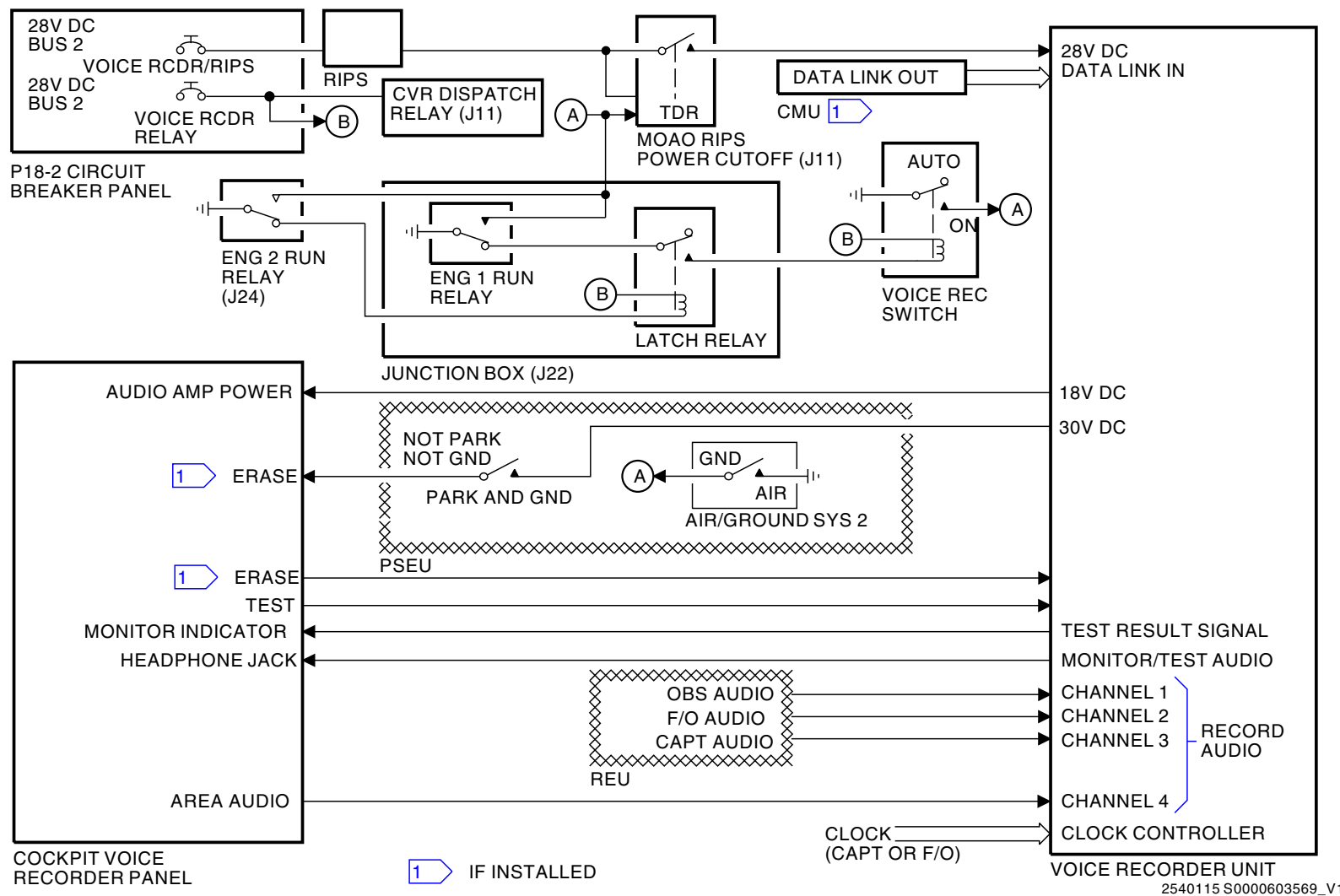
- Test indication to the monitor indicator.

**Datalink Recording Activation**

The datalink activation occurs when the CMU connects to the CVR by ARINC 429 data buses. This lets the CVR record the datalink messages from the CMU.

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# VOICE RECORDER SYSTEM - INTERFACE



# VOICE RECORDER SYSTEM - INTERFACE

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EFFECTIVITY

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ECCN 9E991 BOEING PROPRIETARY - See title page for details

**VOICE RECORDER SYSTEM - VOICE RECORDER SWITCH PANEL****General**

The voice recorder switch lets you control the voice recorder power.

**Operation**

The voice recorder switch has two positions, AUTO and ON. AUTO is the normal switch position. The AUTO position gives power to the voice recorder at engine start through post-flight checks. In this position, a time delay relay gives power to the voice recorder during these conditions:

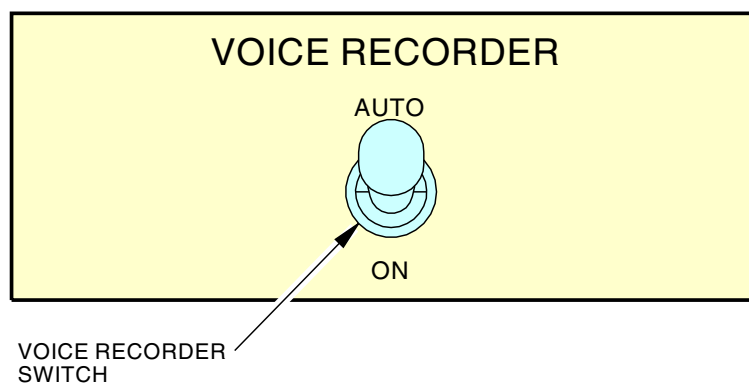
- An engine is at or above idle
- First ten minutes after engine shutdown
- An engine start lever is in IDLE for 5 minutes or more.

The ON position is for maintenance and for pre-flight tests. While the switch is in ON, the switch gives power to the voice recorder. The switch latches to this position. The switch goes back to AUTO when you either manually return the switch to AUTO or when an engine running relay energizes. The engine 1 or 2 running relays energize when one of these happens:

- An engine is at or above idle
- An engine start lever is in IDLE for 5 or more minutes.

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# VOICE RECORDER SYSTEM - VOICE RECORDER SWITCH PANEL



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## VOICE RECORDER SYSTEM - VOICE RECORDER SWITCH PANEL

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ECCN 9E991 BOEING PROPRIETARY - See title page for details



## VOICE RECORDER SYSTEM - VOICE RECORDER UNIT

### Purpose

The voice recorder unit continuously records these:

- Time
- Flight crew communications
- Flight compartment sounds.

### Physical Description

The container for the voice recorder unit has these properties:

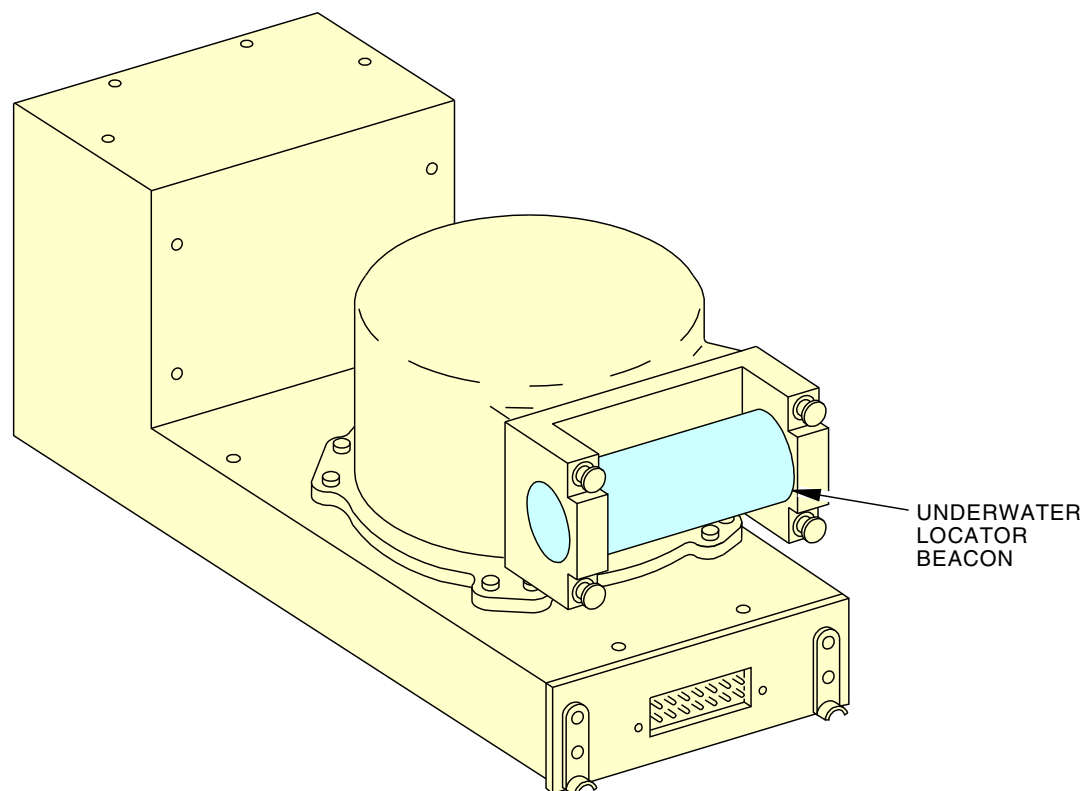
- Watertight
- Shock resistant
- Heat resistant.

The voice recorder unit has an underwater locator beacon (ULB) on the front panel. The ULB helps find the voice recorder unit in water.

The voice recorder unit has a BITE indicator on the front panel. This indicator comes on when there is a voice recorder unit fault.

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VOICE RECORDER SYSTEM - VOICE RECORDER UNIT



2529955 S0000597520\_V1

VOICE RECORDER SYSTEM - VOICE RECORDER UNIT

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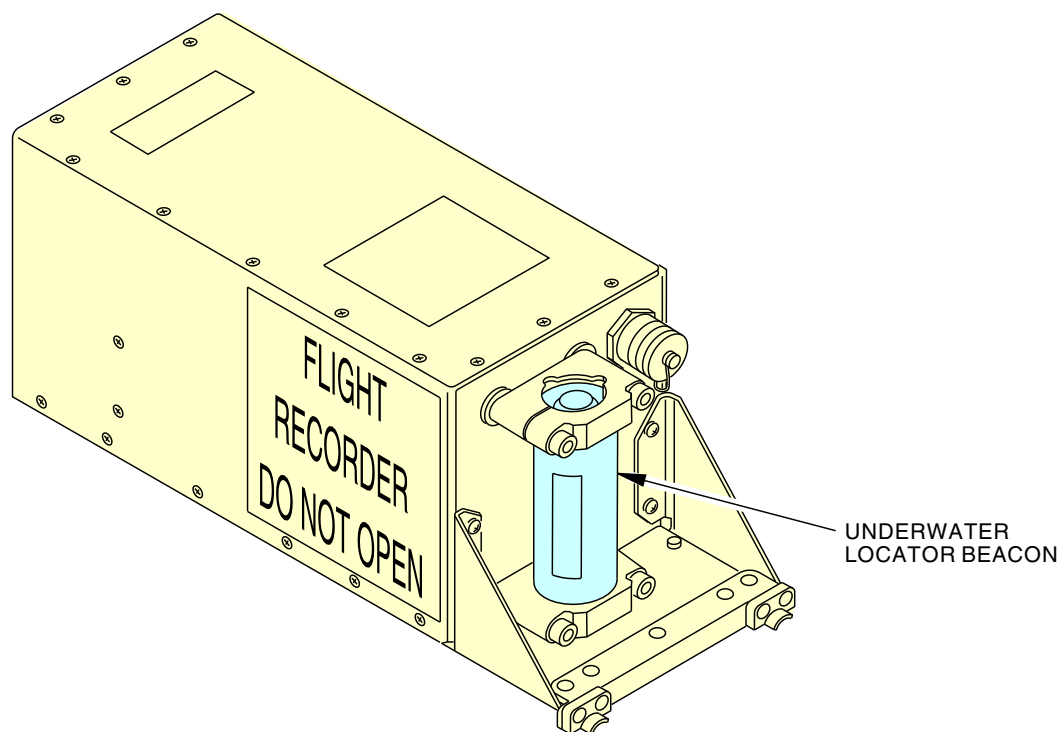
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VOICE RECORDER SYSTEM - VOICE RECORDER UNIT



2983978 S0000761845\_V1

VOICE RECORDER SYSTEM - VOICE RECORDER UNIT

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**VOICE RECORDER SYSTEM - COCKPIT VOICE RECORDER PANEL OPERATION****Purpose**

You can do these functions at the cockpit voice recorder panel:

- Monitor the recorded audio
- Erase the recorded audio (if installed)
- Test the voice recorder system.

**Features**

The cockpit voice recorder panel has these controls and indicators:

- Status indicator
- Erase switch
- Test switch
- Headphone jack.

The status indicator shows the test results.

You can erase the audio with the ERASE switch if the airplane is on the ground and the parking brake is set.

The TEST switch starts a BITE test.

You can monitor the four audio channels with a headphone connected to the monitor jack.

An area microphone sends flight compartment sounds to the voice recorder.

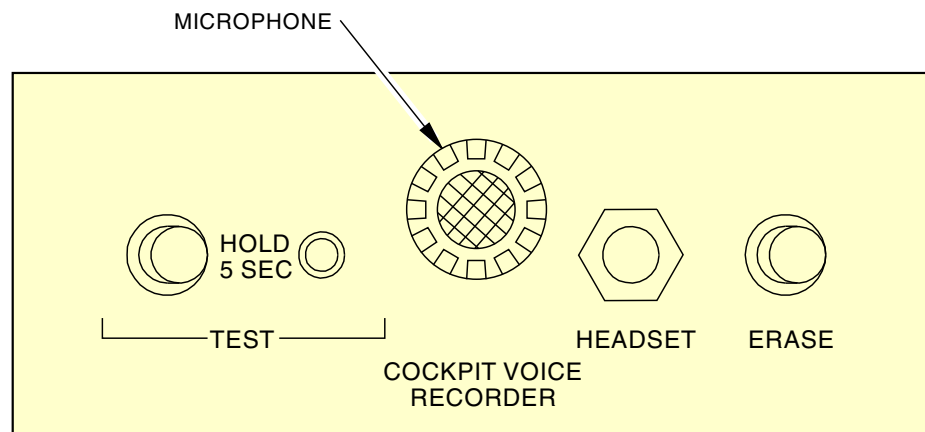
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## VOICE RECORDER SYSTEM - COCKPIT VOICE RECORDER PANEL OPERATION



COCKPIT VOICE RECORDER PANEL

## VOICE RECORDER SYSTEM - COCKPIT VOICE RECORDER PANEL OPERATION

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**VOICE RECORDER SYSTEM - UNDERWATER LOCATOR BEACON****Purpose**

The Underwater Locator Beacon (ULB) is an ultrasonic beacon. It makes the Cockpit Voice Recorder (CVR) easier to find if it is under water.

**Physical Description**

The ULB is a line replaceable unit that is 1.3 in. (3.3 cm) in diameter and 3.92 in. (9.96 cm) long. It weighs less than 7 oz (0.198 kg).

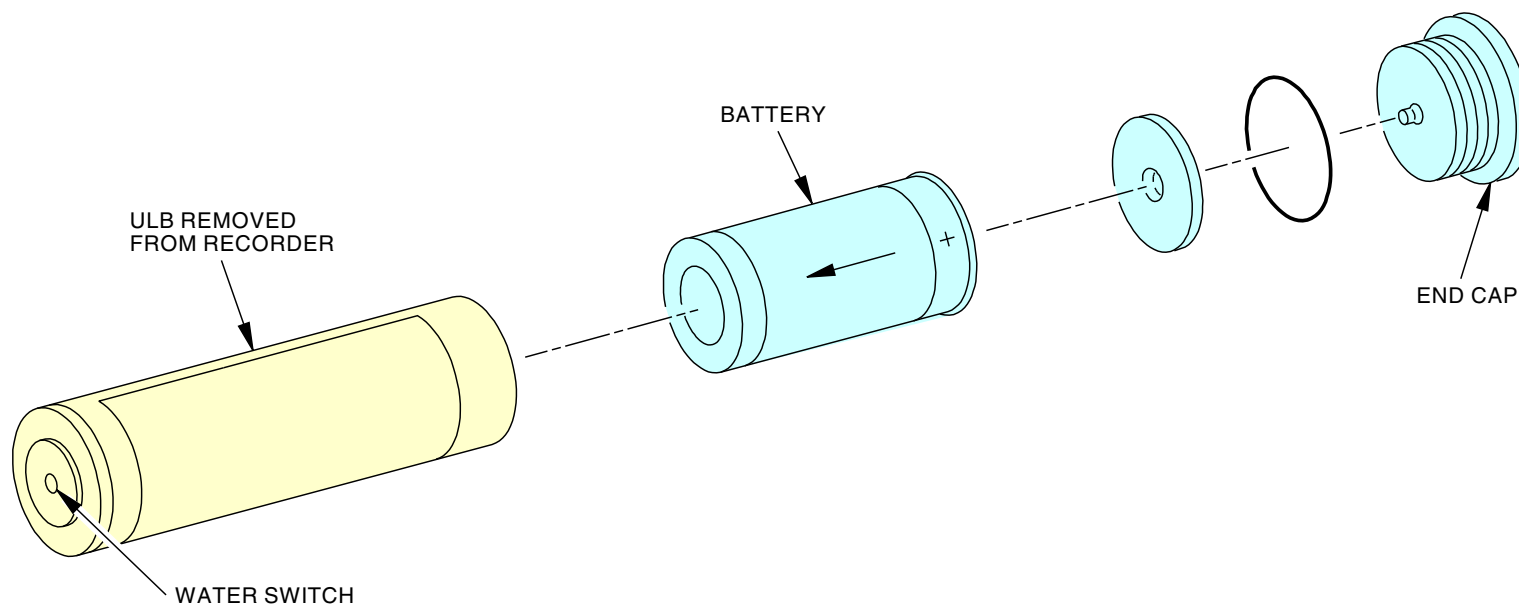
**Functional Description**

The ULB has these operation characteristics:

- Operates when it is put into water
- Operates to a maximum depth of 20,000 ft (6096 m)
- Has a detection range of 6000 ft (1829 m) to 12,000 ft (3658 m)
- Can operate under water for a minimum of 90 days
- Sends out an acoustic pulse tone of 37.5 kHz at a rate of one pulse-per-second.

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## VOICE RECORDER SYSTEM - UNDERWATER LOCATOR BEACON



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## VOICE RECORDER SYSTEM - UNDERWATER LOCATOR BEACON

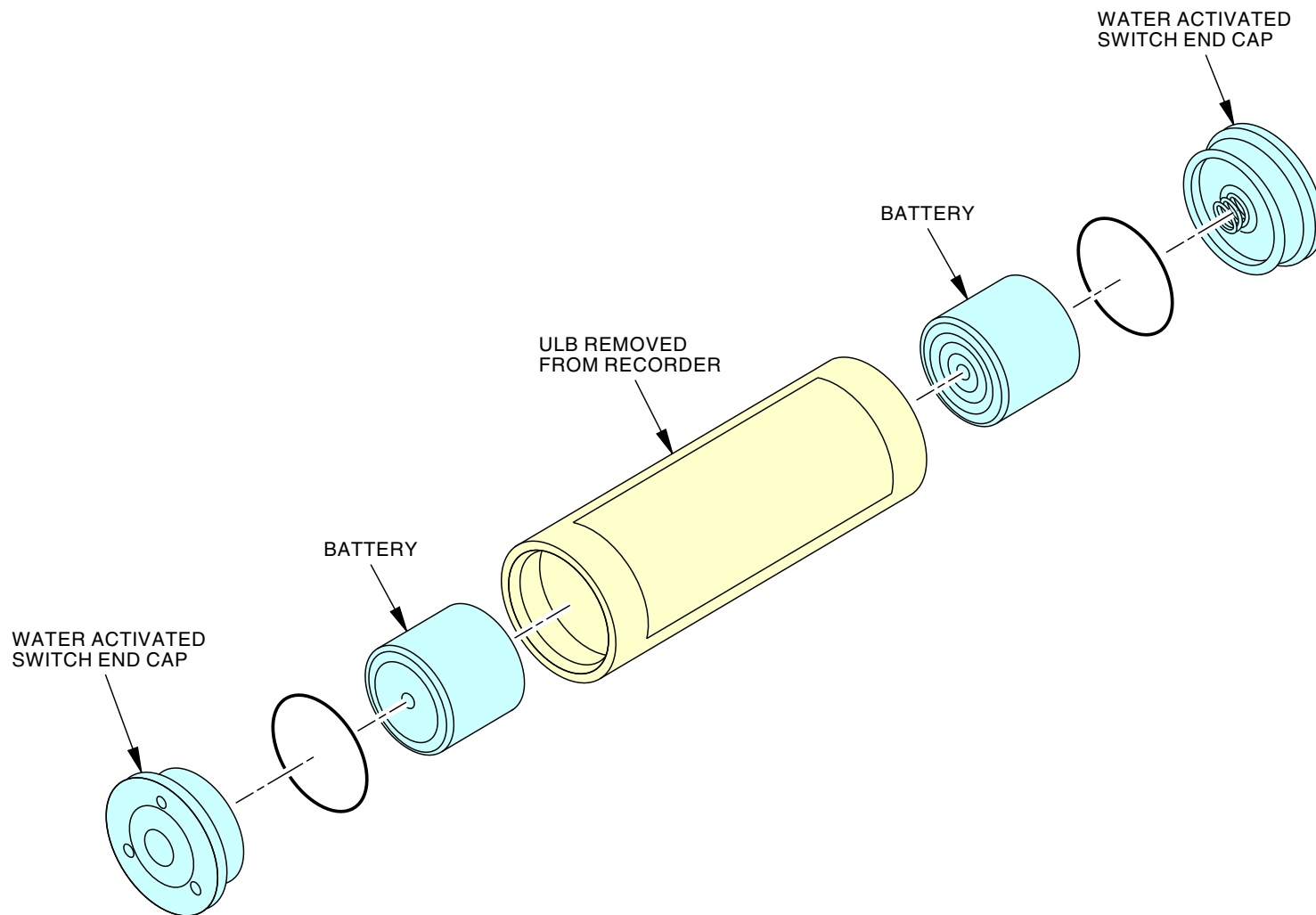
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EFFECTIVITY  
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ECCN 9E991 BOEING PROPRIETARY - See title page for details

# VOICE RECORDER SYSTEM - UNDERWATER LOCATOR BEACON



2981696 S0000760055\_V1

## VOICE RECORDER SYSTEM - UNDERWATER LOCATOR BEACON

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EFFECTIVITY  
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**VOICE RECORDER SYSTEM - RECORDER INDEPENDENT POWER SUPPLY (RIPS)****General Description**

The Recorder Independent Power Supply (RIPS) supplies auxiliary battery power to the Cockpit Voice Recorder. The RIPS will supply 10 minutes of auxiliary power when aircraft power system are off or malfunctions.

The RIPS monitors the aircraft bus voltage of 28V dc (volts direct current) and keeps its internal battery pack charged. If the primary voltage of the aircraft decreases to approximately 20V dc, the RIPS battery will supply the CVR with 28V dc for a period of 10 minutes.

The RIPS will not supply power if the aircraft voltage increases to 22V dc or if the 10 minute period is completed. When standard aircraft power is on, the RIPS will charge the batteries if necessary.

**SIA 001-005**

The RIPS, PN 100-3020-400 have two assemblies, the Charger Assembly and the Lithium-Ion Battery Pack Assembly.

**SIA 006-999**

The RIPS, PN 100-3010-401 have two assemblies, the Charger Assembly and the Nickel-Cadmium Battery Pack Assembly.

**SIA ALL****Physical Description****SIA 001-005**

The RIPS, PN 100-3020-400 is in an Aluminum enclosure with an electrical connector in the front. The unit is approximately 4.500  $\pm$ 0.010 in. (114.30  $\pm$ 0.25 mm) long, 4.000  $\pm$ 0.030 in. (101.60  $\pm$ 0.76 mm) wide, and 3.325  $\pm$ 0.040 in. (84.46  $\pm$ 1.02 mm) tall.

**SIA 006-999**

The RIPS, PN 100-3010-401 is in an Aluminum enclosure with an electrical connector in the front. The unit is approximately 4.500  $\pm$ 0.010 in. (114.30  $\pm$ 0.25 mm) long, 4.000  $\pm$ 0.030 in. (101.60  $\pm$ 0.76 mm) wide, and 3.950  $\pm$ 0.040 in. (100.33  $\pm$ 1.02 mm) tall.

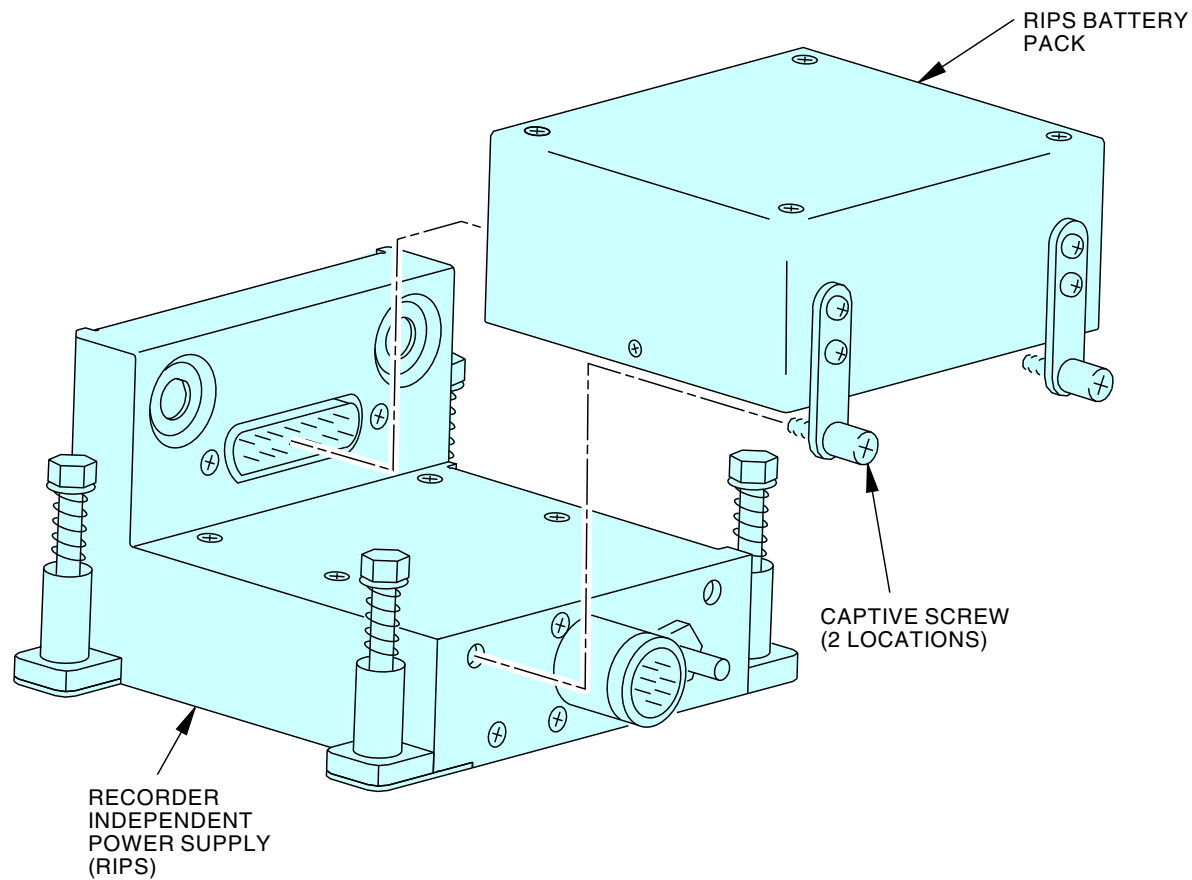
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VOICE RECORDER SYSTEM - RECORDER INDEPENDENT POWER SUPPLY (RIPS)



2368804 S00061518149\_V1

VOICE RECORDER SYSTEM - RECORDER INDEPENDENT POWER SUPPLY

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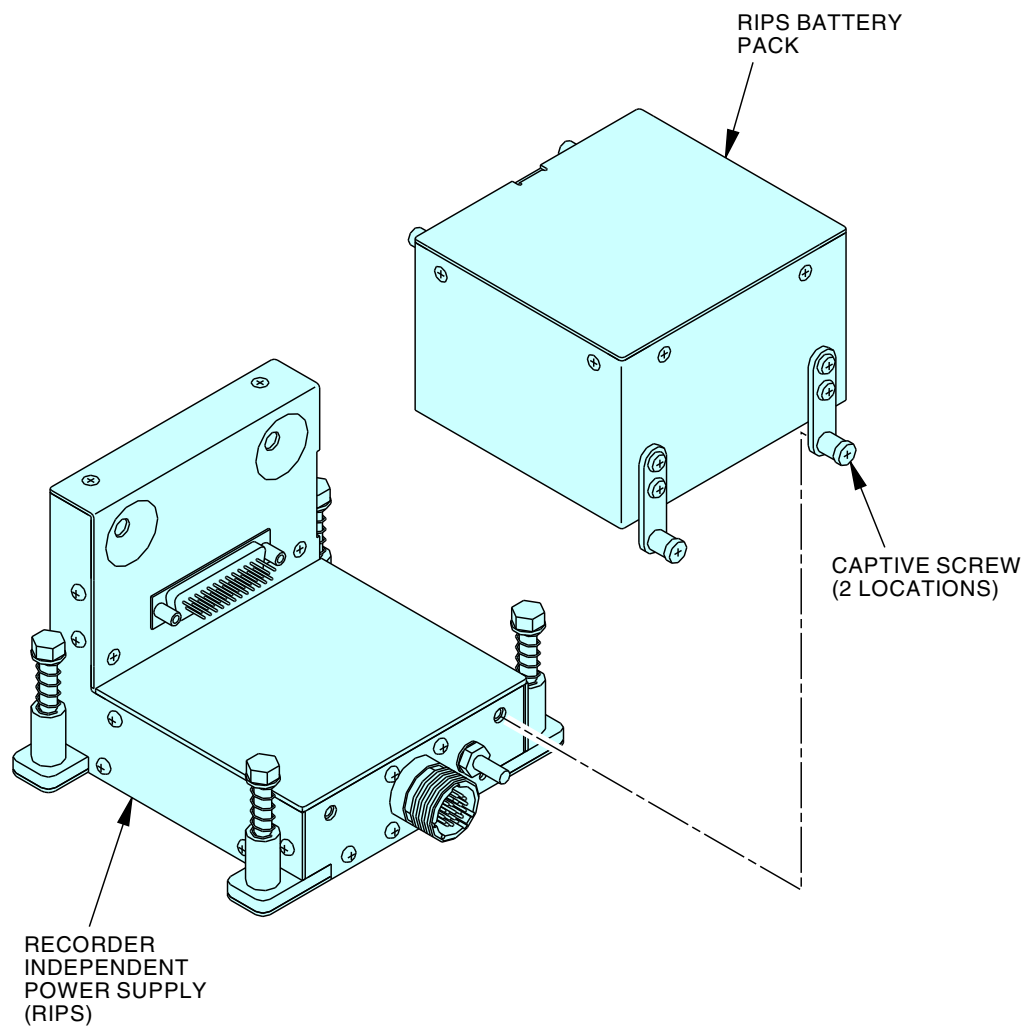
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SIA 001-005

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# VOICE RECORDER SYSTEM - RECORDER INDEPENDENT POWER SUPPLY (RIPS)



2815981 S0000648493\_V1

## VOICE RECORDER SYSTEM - RECORDER INDEPENDENT POWER SUPPLY

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## VOICE RECORDER SYSTEM - FUNCTIONAL DESCRIPTION

### General

The voice recorder system receives flight compartment sounds and flight crew communications. It keeps this audio in a solid state memory. The voice recorder system has these modes of operation:

- Normal
- Test
- Erase.

### Normal Operation

The voice recorder operates continuously when the airplane has power and one of these occurs:

- Voice recorder switch in ON position
- An engine at or above idle
- First ten minutes after engine shutdown
- An engine start lever in IDLE for 5 minutes or more.
- The Airplane is in the air mode.

When one of the above conditions occurs, this will energize the MOAO RIPS Power Cutoff relay.

The MOAO RIPS Power Cutoff relay controls the 28v dc power supplies from the RIPS to the voice recorder. When this relay energized, this allows the 28v dc power supply from the RIPS to the voice recorder.

Four audio channels go to the voice recorder. The remote electronics unit gives audio to channels 1, 2, and 3. Each channel gets audio from one person in the flight crew. The audio on each channel is the sum of these signals:

- Hot mic audio (microphone audio without push-to-talk)
- Received audio that crew members select on an audio control panel (ACP)
- Sidetone audio to the crew member.

Channel 4 audio is from the area microphone on the cockpit voice recorder panel. The area microphone sends flight compartment audio to the voice recorder unit. The preamplifier in the cockpit voice recorder panel gets 18v dc from the voice recorder unit. The preamplifier increases the strength of the channel four audio.

All the audio that the voice recorder unit receives goes to the voice recorder unit aircraft interface. The aircraft interface has these functions:

- Connects aircraft wiring to the voice recorder unit
- Regulates power
- Gives pre-amp power to the voice recorder control panel
- Conditions discrete signals.

The aircraft interface sends the four channels of audio to the audio processor.

The audio processor gets the input audio signals from the aircraft interface. The audio processor conditions, amplifies and equalizes the signals. The processor then changes the audio signals to digital audio. This digital audio goes to the store processor.

The audio processor also mixes all the audio signals. This combined audio goes to the aircraft interface. The aircraft interface sends this combined audio to the headphone jacks.

The store processor organizes the digital audio and prepares it for storage. The store processor then sends commands to the flash/crash survivable store unit. These commands select the memory device and the memory address. The memory address tells the solid-state memory where to keep the digital audio data.

### Test

Push and hold the TEST switch on the voice recorder panel to start the self test. Hold the TEST switch for at least 5 seconds. The voice recorder panel sends a test signal to the aircraft interface in the voice recorder. This test signal goes through the aircraft interface to the audio processor.

**VOICE RECORDER SYSTEM - FUNCTIONAL DESCRIPTION**

The audio processor turns on its test tone generator. The frequency of the tone generator is 620 Hz. This tone goes to each of the four audio channels. While in test, each audio channel turns on for 1/2 seconds in sequence. Each channel changes the test tone to digital audio. The audio processor gets the digital audio from each channel and mixes it. The audio processor then changes the mixed audio to an analog signal. This signal goes to the aircraft interface.

From the aircraft interface, this mixed audio tone goes to the headphone jacks on the control panel and on the voice recorder unit.

The aircraft interface also sends a signal to turn on the status indicator.

During the test, the processors monitor test data for faults. When the processor finds a fault, it stops the signal to the status indicator and stops the audio tone.

With no faults, the status indicator momentarily comes on. At the same time you hear the 620 Hz tone at the headphone jack.

**Erase**

You erase the memory of the voice recorder unit with these conditions:

- Airplane is on the ground
- Parking brake is set
- Push the ERASE switch for at least 2 seconds, and then release.

The erase cycle starts when you release the switch.

While in erase, the ERASE switch sends an erase signal to the aircraft interface on the voice recorder. This signal then goes to the audio and store processors. The audio processor stops normal audio and the store processor erases the stored data on the flash/crash survivable store unit.

You hear a 400 Hz tone at the headphone jacks while in erase. You hear this tone for about 13 seconds.

**Clock Input**

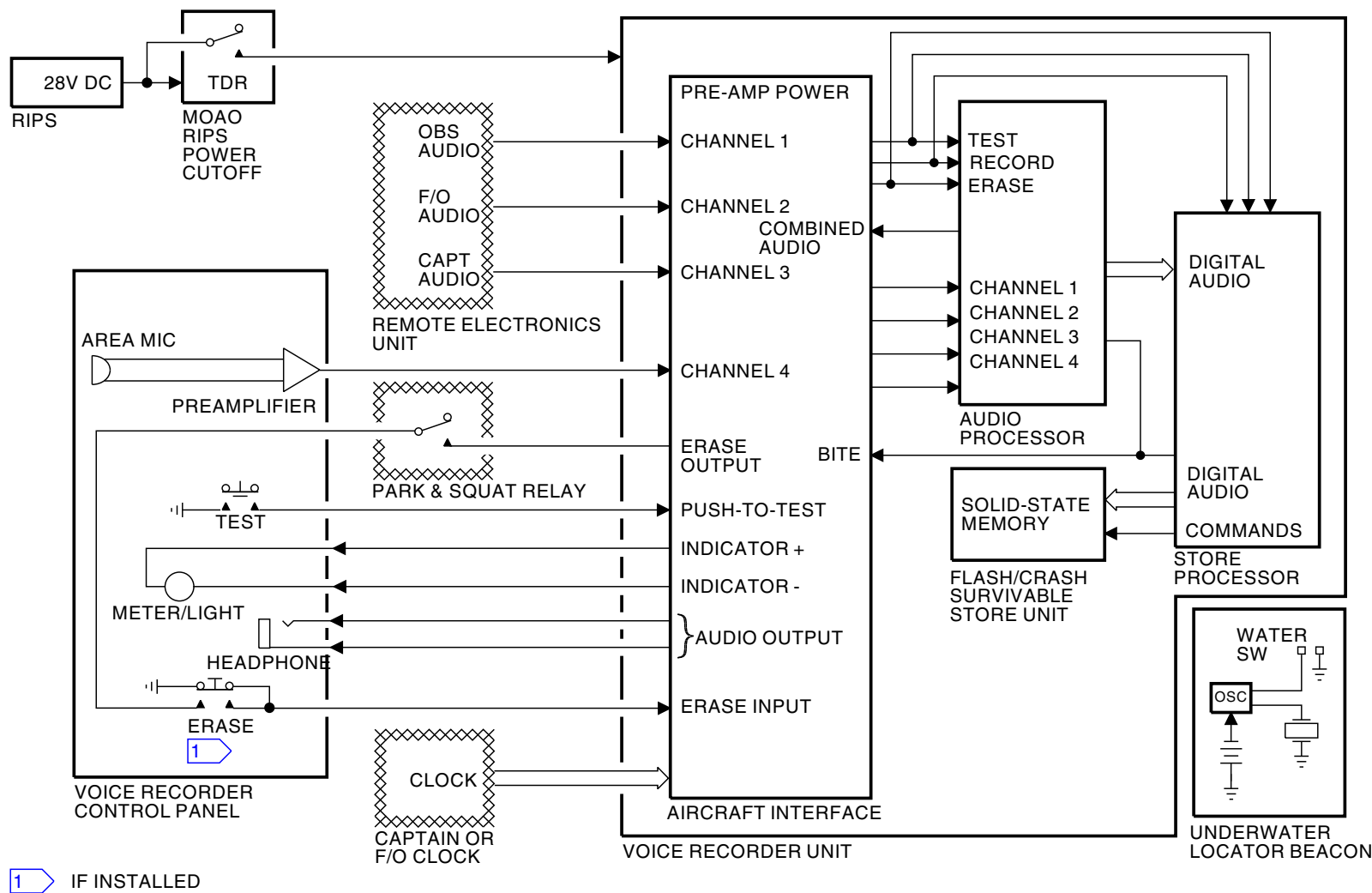
The captain clock data comes into the voice recorder on an ARINC 429 bus. This puts the time data into memory. The clock input gives a time relation between the voice recorder and the flight data recorder.

**Underwater Locator Beacon Functions**

The underwater locator beacon (ULB) sends a sound signal when in the water. It uses a battery for power. The battery sends power to the oscillator that operates at 37.5 KHz. The transducer changes an electrical signal to a sound signal and transmits the signal once per second.

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# VOICE RECORDER SYSTEM - FUNCTIONAL DESCRIPTION



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## VOICE RECORDER SYSTEM - FUNCTIONAL DESCRIPTION

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VOICE RECORDER SYSTEM - FUNCTIONAL DESCRIPTION

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## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INTRODUCTION

### General

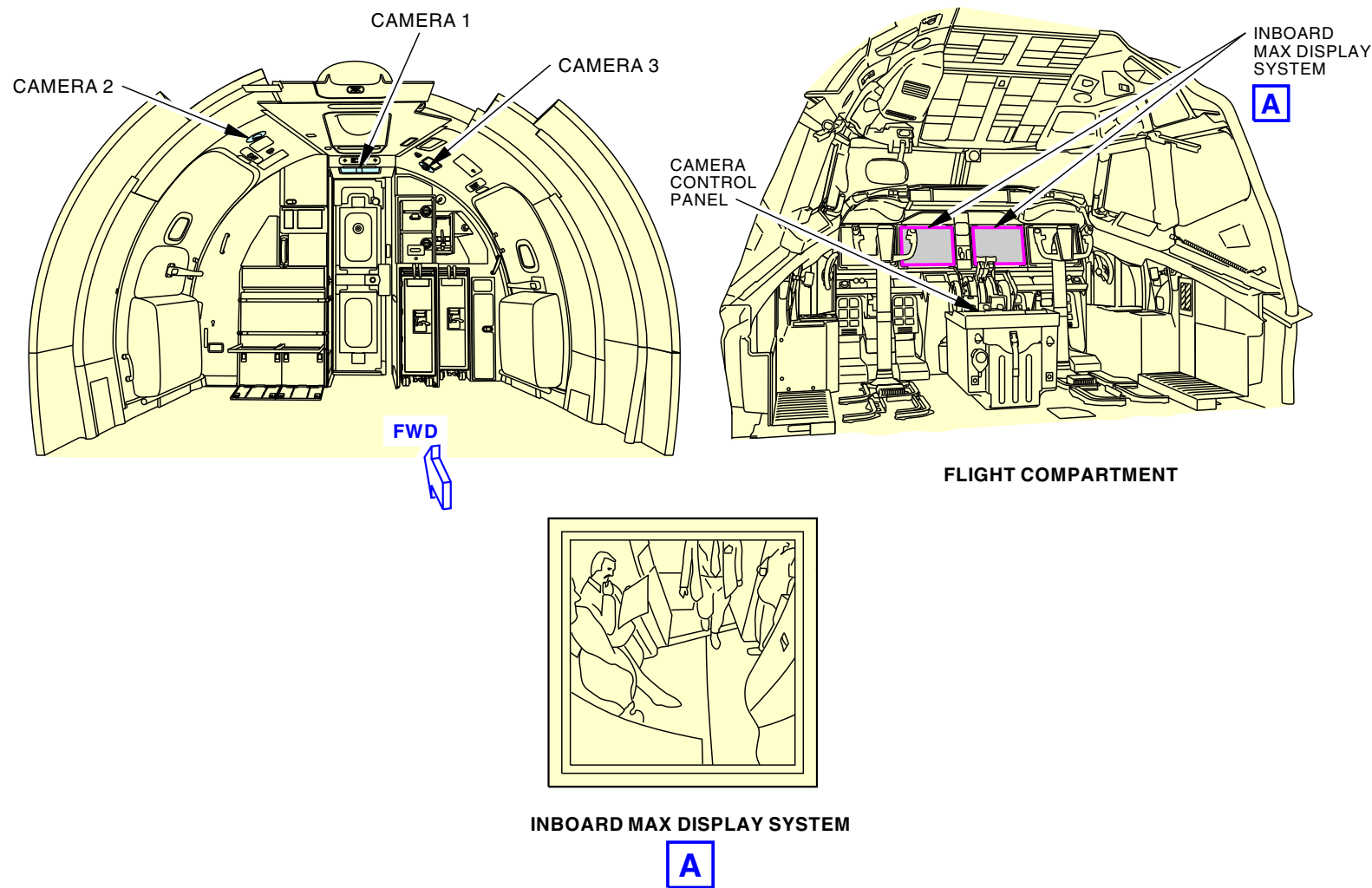
The Flight Deck Entry Video Surveillance System (FDEVSS) is a video system that gives the flight crew surveillance capability of the flight deck entry door, airplane door 1-left, and door 1-right.

### Abbreviations and Acronyms

- CCU - camera control unit
- CCP - camera control panel
- DSPL - display (command)
- FDEVSS - flight deck entry video surveillance system
- IR - infra-red
- MDS - MAX display system
- VS - video switch.

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**FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INTRODUCTION**



**FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INTRODUCTION**

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**FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - GENERAL DESCRIPTION****General**

The Flight Deck Entry Video Surveillance System (FDEVSS) is a video system that provides video surveillance of the cockpit door and surrounding area. This lets the flight crew, before they allow entry, see the person who wants access to the flight compartment.

**Components**

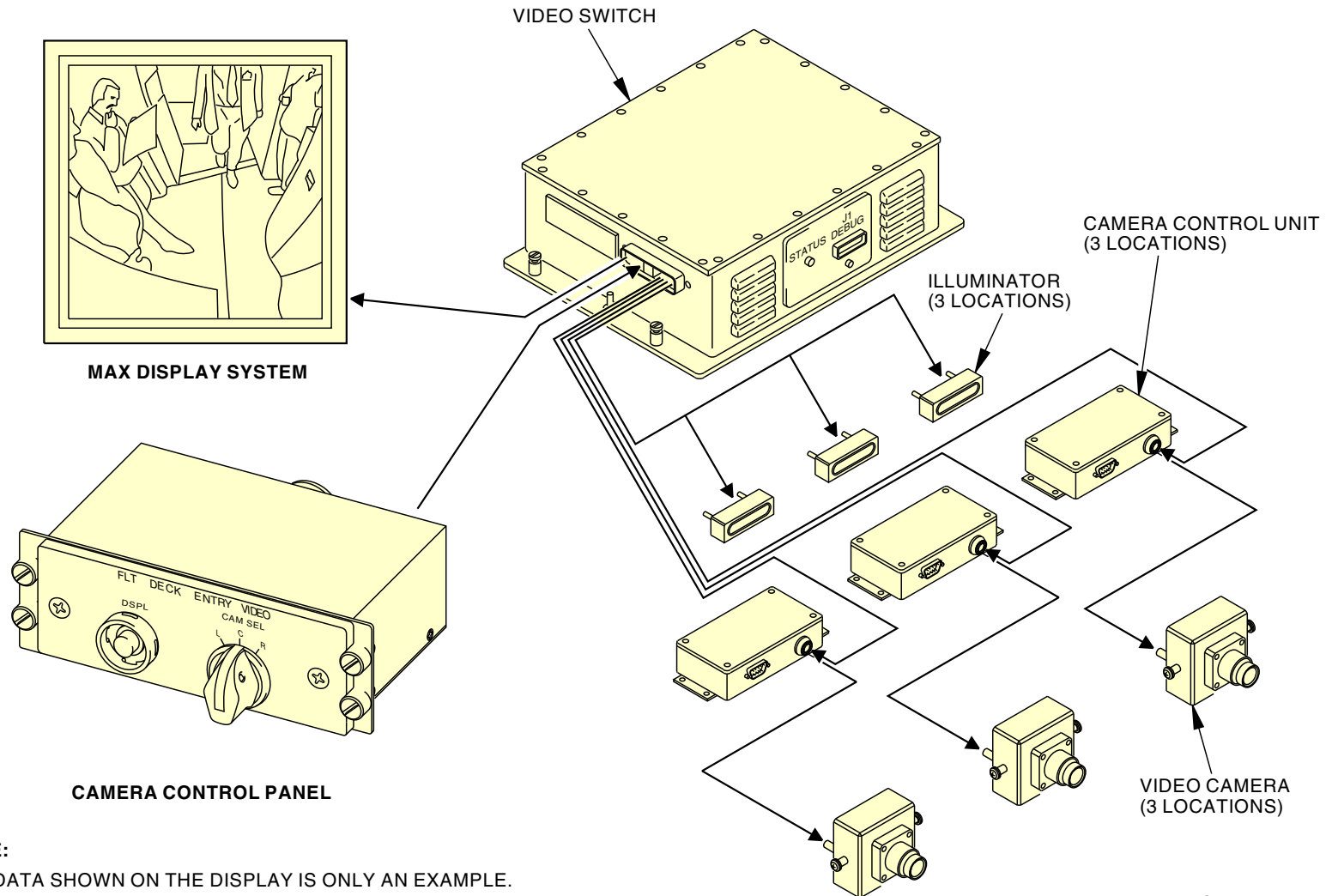
The FDEVSS consists of the following components:

- Camera control panel (CP), M3000
- Three monochrome video cameras, M3002, M3026, and M3004
- Video Switch (VS), M3029
- Three camera control units (CCU), M3005, M3030, and M3009
- Three infrared (IR) illuminators, M3006, M3031, and M3010.

The FDEVSS video can show on the captain's or the first officer's inboard MAX display system.

| SIA ALL | EFFECTIVITY |
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## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - GENERAL DESCRIPTION



2575204 S0000619054\_V1

## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - GENERAL DESCRIPTION

**FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - COMPONENT LOCATIONS****General**

The Flight Deck Entry Video Surveillance System (FDEVSS) has components in the flight compartment and in the passenger cabin area.

**Flight Compartment**

In the flight compartment, the camera Control Panel (CP) is installed aft of the throttles, on the P8 aisle stand.

The output of the FDEVSS transmits video to the MAX display system (MDS). The MDS shows video on the captain's or the first officer's inboard display.

**Passenger Cabin**

In the passenger cabin, the video switch (VS), M3029, is installed in a frame above the ceiling panel at STA 390, WL 295, LBL 11.

Three video cameras are mounted to monitor activity around the flight deck entry door. Each camera position has one camera, one camera control unit (CCU), and one infra-red illuminator (IR) installed.

The components at position 1 are installed on the backside of the ceiling panel. The components are as follows:

- Camera 1, M3002, is installed at STA 285, BL 0.
- CCU 1, M3005, at STA 285, BL 0.
- IR 1, M3006, at STA 285, BL 0.

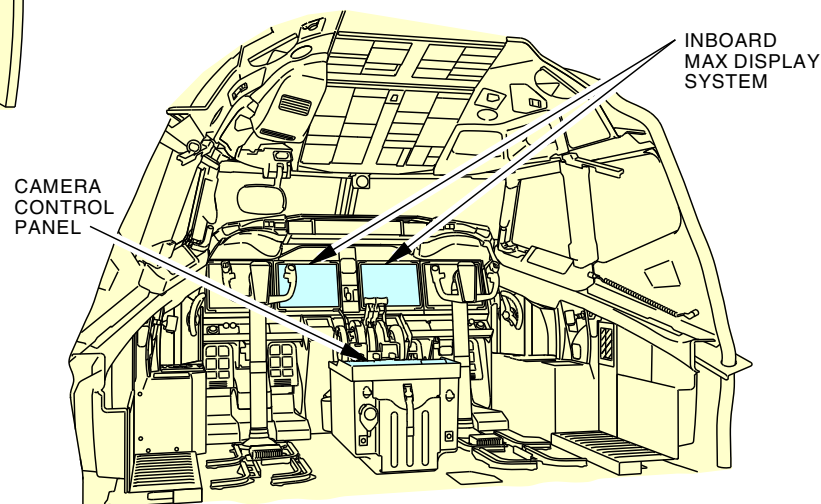
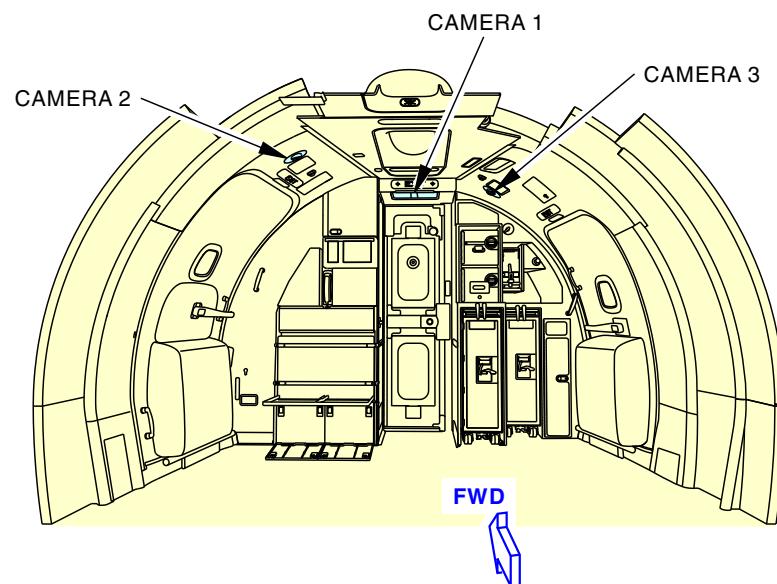
The camera at position 2 is installed on the appearance side of the forward entry doorway header. The other components are installed on the non-appearance side of the forward entry doorway header. These are the components:

- Camera 2, M3026, is installed at STA 338, LBL 28.
- CCU 2, M3030, at STA 338, LBL 28.
- IR 2, M3031, at STA 338, LBL 28.

The camera at position 3 is installed on the appearance side of the forward galley doorway header. The other components are installed on the non-appearance side of the forward galley doorway header. These are the components:

- Camera 3, M3004, is installed at STA 300, RBL 23.
- CCU 3, M3009, at STA 300, RBL 23.
- IR 3, M3010, at STA 300, RBL 23.

## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - COMPONENT LOCATIONS



FLIGHT COMPARTMENT

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## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - COMPONENT LOCATIONS

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**23-75-00**



## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INTERFACES

### Video Switch (VS)

The video switch (VS) receives 115V ac (volts alternating current) from transfer bus 1. Power is controlled by the Surveillance Camera circuit breaker, C01641, on panel P6 -12 . The VS also supplies 28V dc (volts direct current) power to three camera control units, and three infrared illuminators. The video input, and output is analog.

The VS has these interfaces:

- Receptacle J1 - identified as Debug, used only for depot maintenance.
- Receptacle J2 - primary connection (80 pin) for all inputs and outputs.

### Camera Control Unit

The video switch has video, and power interfaces to three camera control units (CCU). Each CCU has a transformer to supply reduced voltage to the cameras. The CCU also receives and processes the analog video signal from the camera, and supplies it to the VS.

### Infrared Camera

Each CCU is supports one infrared camera. The 10 pin connector, permanently attached to the camera, has the functions that follow:

- Receives 9V dc for camera operation.
- Transmits a continuous video output signal.

### Illuminator

The video switch supplies 28V dc to three infrared illuminators.

### Camera Control Panel

The camera Control Panel (CP) has one interface:

- Input Output (I/O) connector (J1).

The CP has a variable-brightness plastic light plate that requires 5V dc. Brightness is controlled by the aislestand panel lighting control. The CP has no other power requirement.

### MAX Display System

The MAX Display System (MDS) shows the flight deck video on the captain's or first officer's inboard display unit. When the MDS is set to show flight deck video, the applicable display unit receives and shows video from the video switch.

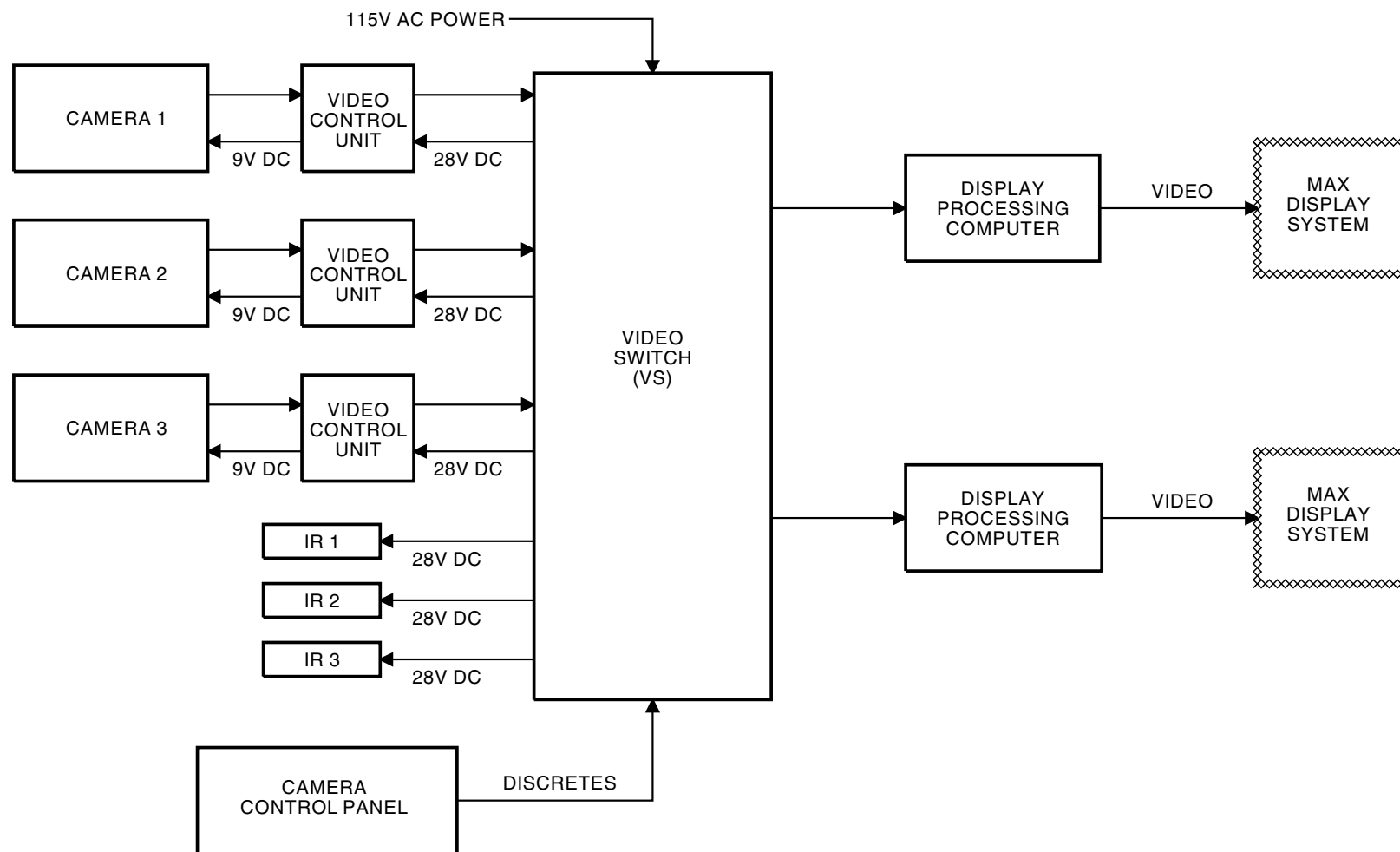
# 23-75-00

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| SIA ALL     |  |

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# FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INTERFACES



2575206 S0000619133\_V2

## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INTERFACES



## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INFRARED CAMERA

**General**

The infrared (IR) camera is a sealed component that senses the strength and position of IR light reflected by an object, and converts that to an analog signal. The cameras produce a monochrome (black and white) image in NTSC format. The camera is line-replaceable, and can not be modified, or repaired in the field.

The camera has physical characteristics as follows:

- Width - 1.2 in. (29.5 mm)
- Height - 1.2 in. (29.5 mm)
- Depth - 1 in. (26 mm), approximately
- Weight - 2 oz (52 g), approximately, including wires.

The camera has one lead with a single 10-pin connector.

Power to the camera is supplied by the camera control unit (CCU). The camera and CCU are matched for impedance and voltage, and are set by the specified part numbers.

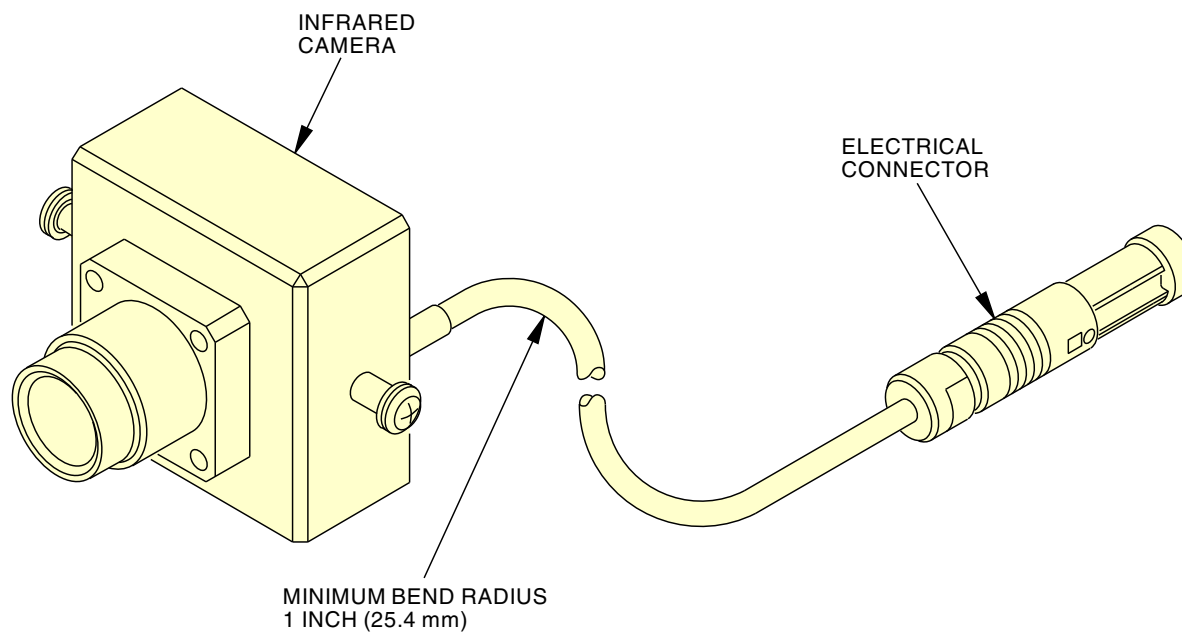
|                                                                                   |                                                                                                                                                       |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | THE REPLACEMENT COMPONENTS MUST HAVE THE SAME PART NUMBERS AS THE COMPONENTS WHICH WERE REMOVED. INCORRECT COMPONENTS CAN CAUSE DAMAGE TO THE SYSTEM. |
| <b>CAUTION</b>                                                                    |                                                                                                                                                       |

The features that follow are set by the camera manufacturer's part number.

- Lens aperture (size)
- Camera resolution (lines)
- Input voltage
- Impedance
- Lead length and material.

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# FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INFRARED CAMERA



CAMERA 1

2575208 S0000619139\_V2

## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INFRARED CAMERA

**23-75-00**

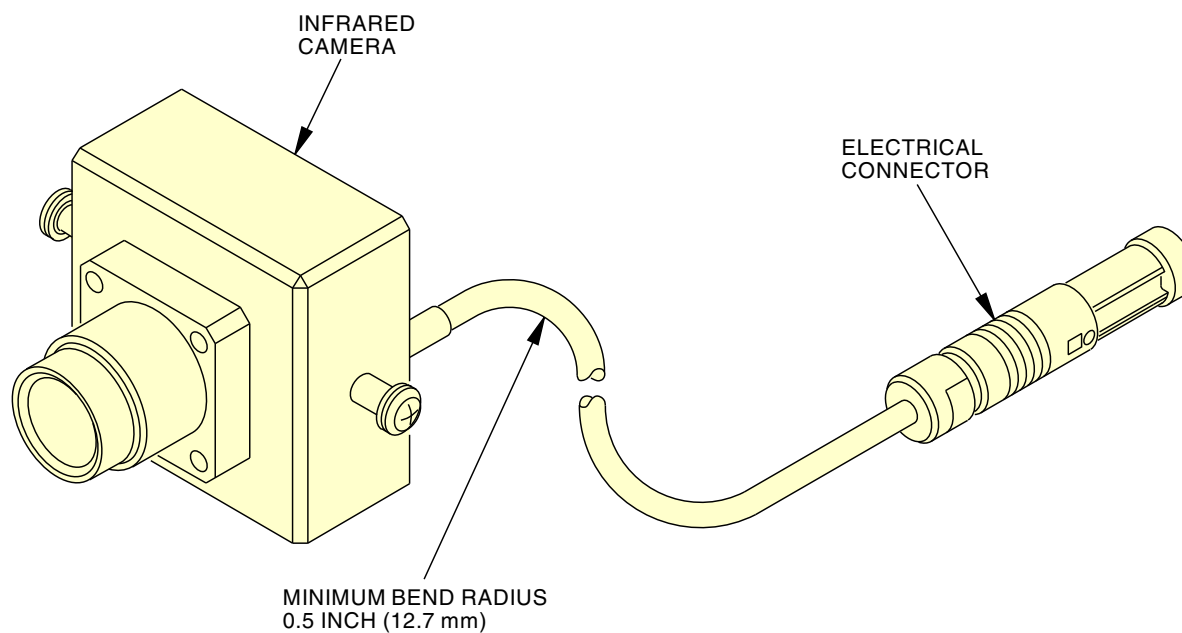
23-75-00-005

EFFECTIVITY  
SIA 001-005

D633AM102-SIA

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# FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INFRARED CAMERA



CAMERA 1

2986014 S0000763315\_V1

## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INFRARED CAMERA

**23-75-00**

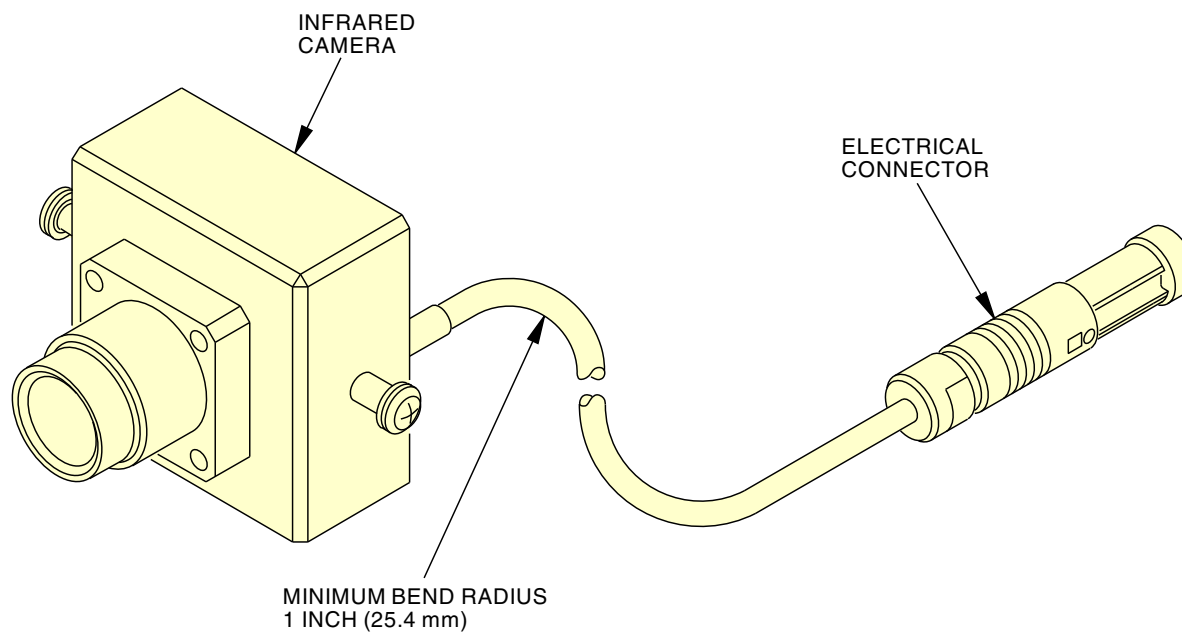
23-75-00-005

EFFECTIVITY  
SIA 006-999

D633AM102-SIA

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# FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INFRARED CAMERA



CAMERA 2 AND 3

2986415 S0000764303\_V1

## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INFRARED CAMERA

**23-75-00**

23-75-00-005

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## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - FUNCTIONAL DESCRIPTION

### General

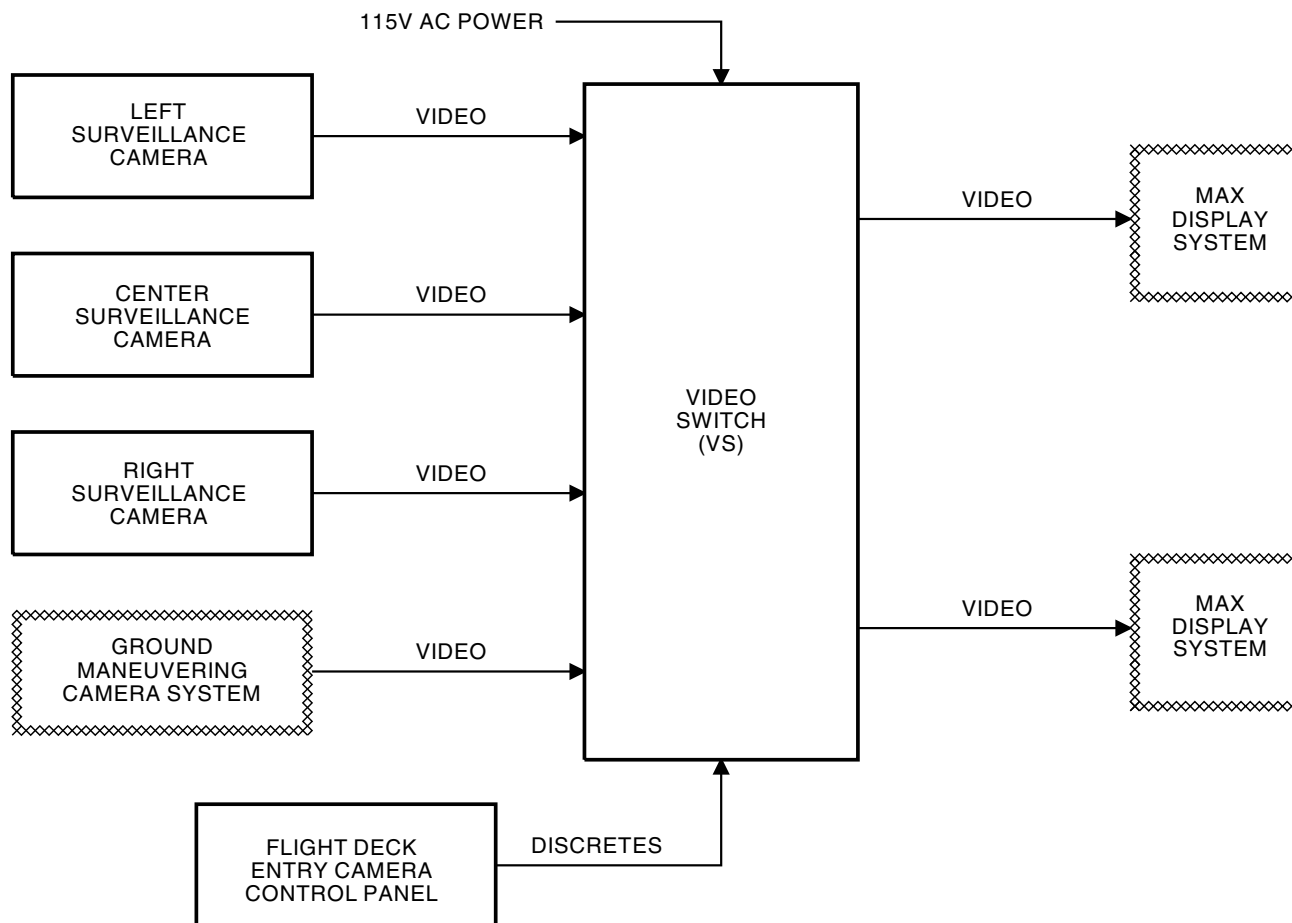
The video switch (VS) receives video images from three analog cameras installed aft of the flight deck entry door. One of the three signals is sent to the MAX Display System (MDS), and shows on the captain's or the first officer's inboard display unit.

The camera control panel (CP) selects which of the three signals is sent to the MDS. On the control panel (CP), the rotary switch is set to R (right), C (center), or L (left). The push-button marked display (DSPL) on the control (CP) sets the VS selection.

**NOTE:** The FDEVSS can show only the signal from a single camera at one time.

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# FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - FUNCTIONAL DESCRIPTION



2794769 S0000637229\_V2

## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - FUNCTIONAL DESCRIPTION

23-75-00-006

| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |

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23-75-00

**FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - CAMERA CONTROL PANEL****General**

The camera Control Panel (CP) sets the video switch (VS) to transmit one of three available camera signals (camera 1, 2, or 3) to the MAX display system (MDS). The MDS can show the flight deck entry video on the captain's or the first officer's inboard MDS.

**Physical Description**

The face of the CP has one rotary knob, and one push-button. The rear of the unit has one multi-pin connector. The unit has four captive fasteners to attach the unit to the mounting rack.

The CP has these physical characteristics:

- Height - 1.9 in. (47.5 mm)
- Width - 6 in. (146 mm)
- Depth - 2.6 in. (65.9 mm)
- Weight - 1.1 lb (0.5 kg), maximum.

**Functional Description**

The CP has a three-position rotary switch to select the left, center, or right camera video signal. Adjacent to the rotary switch, a push button marked DSPL (DISPLAY) tells the VS to transmit the selected video signal to the multifunction display.

The relationship between the rotary switch position, image selection, and camera number (wiring diagram) is as follows:

| SWITCH POSITION | IMAGE VIEW             | CAMERA NUMBER |
|-----------------|------------------------|---------------|
| L               | Door 1 Left            | 2             |
| C               | Flight Deck Door Entry | 1             |
| R               | Door 1 Right           | 3             |

For illumination, the CP receives 5.0V ac (volts alternating current) from the pilot's control stand lighting circuit breaker, C1115.

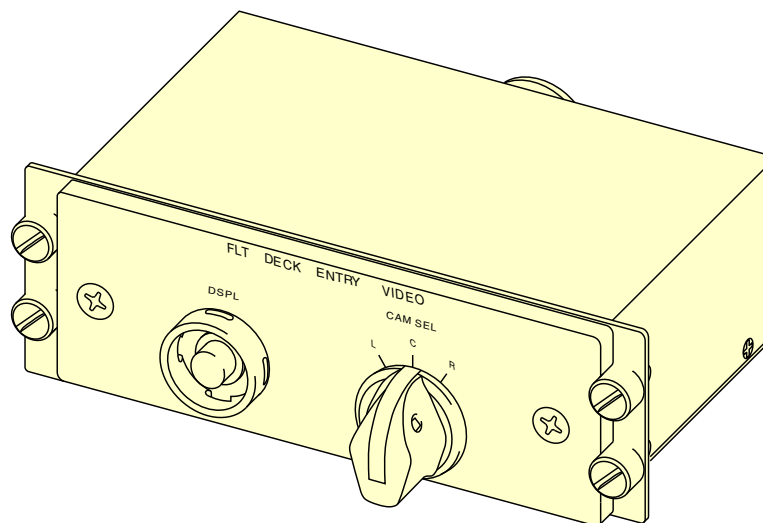
**23-75-00**

SIA ALL EFFECTIVITY

D633AM102-SIA

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# FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - CAMERA CONTROL PANEL



FLIGHT DECK ENTRY VIDEO  
CAMERA CONTROL PANEL

## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - CAMERA CONTROL PANEL

2575210 S0000619157\_V1

23-75-00-007

| SIA ALL | EFFECTIVITY   |
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|         | D633AM102-SIA |

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**23-75-00**

**FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - CAMERA CONTROL UNIT****General**

The camera control unit (CCU) is an analog interface unit between the video switch, and infrared camera. One CCU is installed adjacent to each camera.

The CCU is line-replaceable, and can not be serviced in the field.

**Physical Description**

Each CCU has properties as follows:

- Length - 5.5 in. (139.7 mm)
- Width - 2.5 in. (64 mm)
- Height - 1.6 in. (41.6 mm)
- Weight - 7.8 oz (220 g) maximum.

The housing is aluminum, with an attachment flange on each side. There is a tamper-proof label on the cover.

There are two electrical connectors as follows:

- Round 10 pin, SK1, connects to the camera.
- Trapezoid 9 pin, PL1, connects to the video switch.

The CCU is cooled by convection. No forced-air cooling is required.

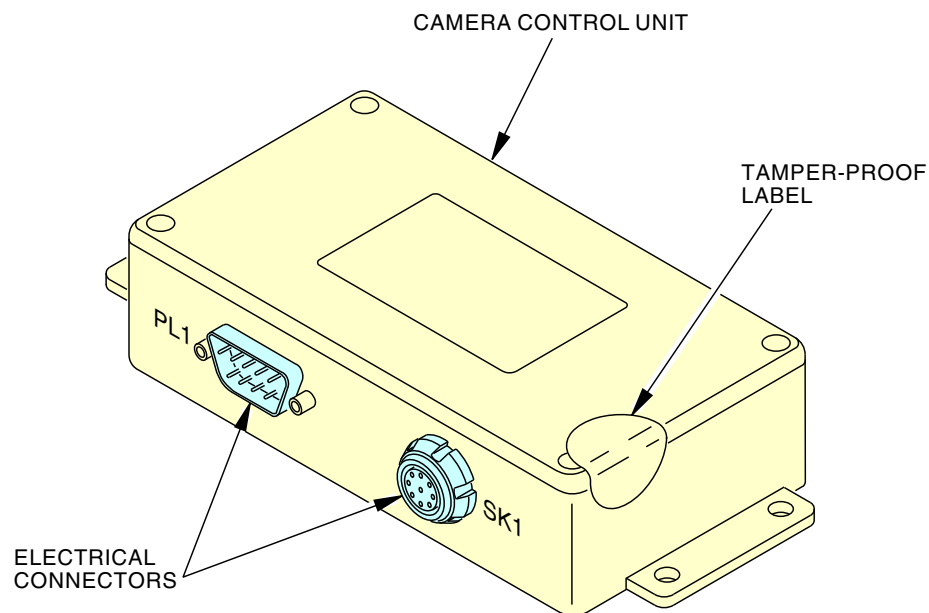
**Functional Description**

The CCU has these functions:

- Receives 28V dc (volts direct current) from the video switch (VS).
- Supplies 9V dc to one camera.
- Changes unbalanced analog video from the camera, to balanced analog video for the VS.
- Changes the camera output impedance from 75 ohms, to the value required for the VS.
- For cameras with lens heaters, the CCU senses and controls the activation of the heaters.

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# FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - CAMERA CONTROL UNIT



2575211 S0000619162\_V1

## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - CAMERA CONTROL UNIT

**23-75-00**

23-75-00-008

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EFFECTIVITY

D633AM102-SIA

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**FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - ILLUMINATOR****General**

The illuminator emits a wide beam of near-infrared light that is invisible to the eye, but is sensed by the flight deck entry cameras. Typically, there is one illuminator installed near each camera.

The illuminator is a sealed assembly, and can not be repaired.

**Physical Description**

Each illuminator has properties as follows:

- Height - 0.6 in. (14.3 mm)
- Width - 1.7 in. (44.3 mm)
- Depth - 0.9 in. (23.8 mm)
- Weight - 0.5 oz (14.2 g) maximum, excluding the wires.

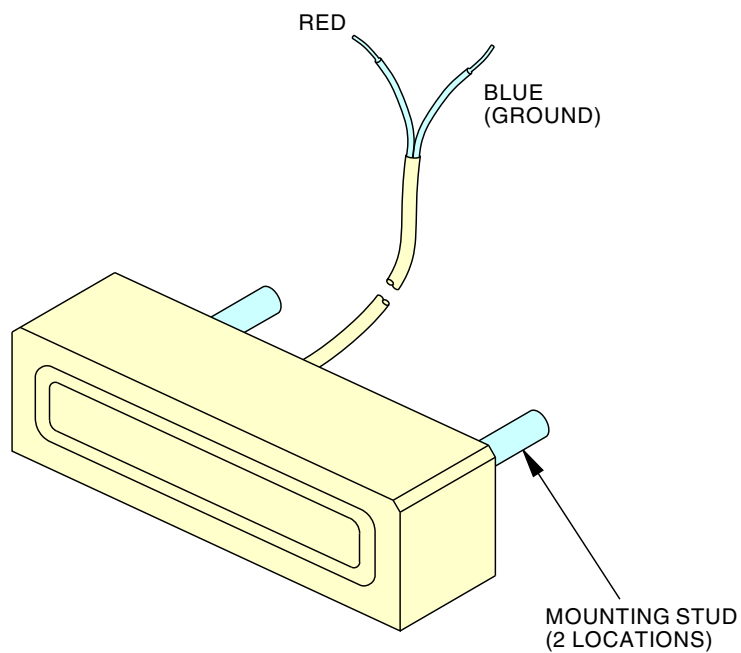
The housing is plastic, with two threaded attachment posts on the rear face. The assembly includes two wire leads (red receives power, blue goes to ground).

**Functional Description**

The illuminator operates continuously using 24V dc (volts direct current) from the video switch, M3001. The unit emits light at the frequency of approximately 880nm (nanometers). The projected beam is approximately 150 degrees wide.

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# FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - ILLUMINATOR



2575212 S0000619165\_V1

## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - ILLUMINATOR

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| SIA ALL | EFFECTIVITY   |
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**23-75-00**



## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - VIDEO SWITCH

**General**

The video switch (VS) functions as a video router, and power transformer for components of the flight deck entry video surveillance system.

The VS supports three camera control units and three illuminators. The video output goes to the flight deck MAX display system (MDS).

The camera image shows on the captain's or the first officer's inboard (MDS), as set by the camera control panel.

**Physical Description**

The video switch has the physical characteristics that follow:

- Height - 4.3 in. (109.0 mm)
- Width - 15 in. (374.0 mm)
- Depth - 10.9 in. (278.0 mm)
- Weight - 11 lb (5 kg), maximum.

The face of the unit has a status indicating lamp, and RS-232 connector identified as J1 Debug. To one side, the unit has one connector, identified as J2, with two insert modules. Each J2 module has 40 pins. The base has four (4) captive screws, and one (1) ground post.

The VS is vented, and cooled by natural convection. No forced-air cooling is required.

**Functional Description**

The video switch functions as a power transformer, and video signal router.

Control of the VS is through the camera control panel.

The VS receives 115V ac (volts alternating current) power from the surveillance camera circuit breaker, C1641, located on panel P6-12. The VS has a transformer that supplies 28V dc (volts direct current) power to three camera control units (CCU), and three illuminators. Each CCU then supplies 9V dc to one camera.

The camera control panel, M3000, sets the VS to transmit one of the three signals to the MAX display system (MDS). The captain's or the first officer's inboard MDS can show flight deck entry video.

**NOTE:** The aircraft is wired so that the video switch sends video to the displays.

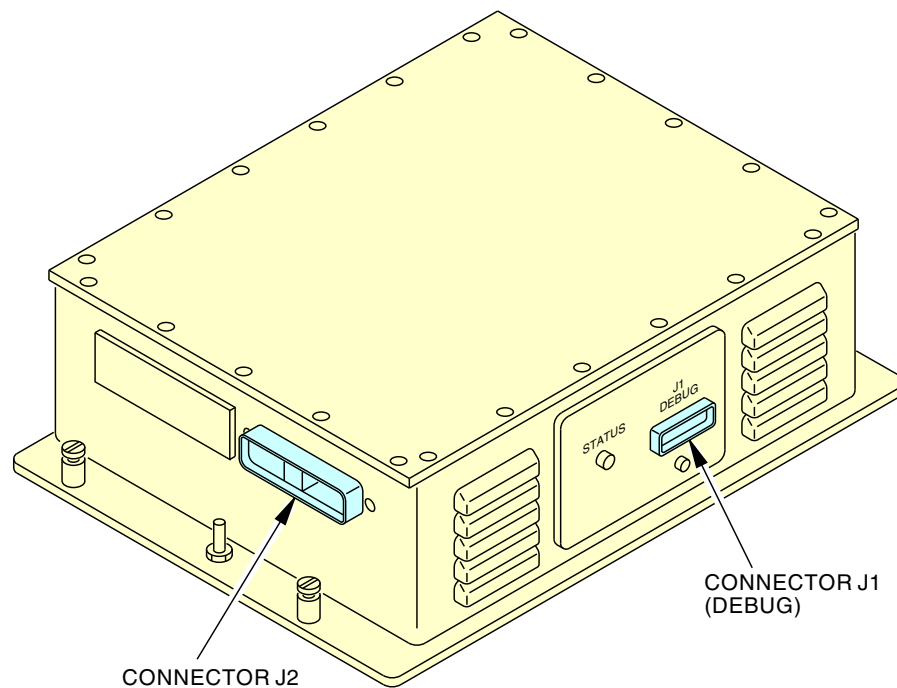
**Operational Description**

The VS receives continuously three isolated video signals, one from each camera control unit.

Camera selection is set by the rotary dial, and push-button on the camera control panel. One of the three positions (left, center, or right) is selected, and the DSPL (display) button is pressed. This sets the VS to transmit the selected video image to the MAX display system (MDS).

**NOTE:** The camera control panel sets the VS to transmit the left, center, or right camera signal. The MDS uses the captain's and the first officer's display select panel to choose the FDEVSS signal, or other data, to show on the applicable MDS.

# FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - VIDEO SWITCH



## FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - VIDEO SWITCH

2575213 S0000619169\_V1

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SIA ALL

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