

12.4 (ATA 23) COMMUNICATIONS

12.4.1 Introduction

The Audio and Radio Management System (ARMS) is used to control and monitor the communication systems that follow:

- Radio Communication (RCOM) and Radio Navigation Management
- Passenger Address and Communication Interphone System (PACIS)
- Audio Integration System (AIS)

The Dash 8-Q400 aeroplane also has the following communication related equipment:

- Cockpit Voice Recorder (CVR)
- Flight Data Recorder (FDR)
- Emergency Locator Transmitter (ELT)

12.4.2 General

The ARMS uses two Audio and Radio Control Display Units (ARCDU 1, ARCDU 2) to supply the flight crew and observer with individual control of the:

- Communication radios
- Navigation receivers audio signals
- Interphone between pilot, copilot, observer, and ground crew
- Passenger Address and Communication Interphone System (PACIS)

Pilot and copilot stations have:

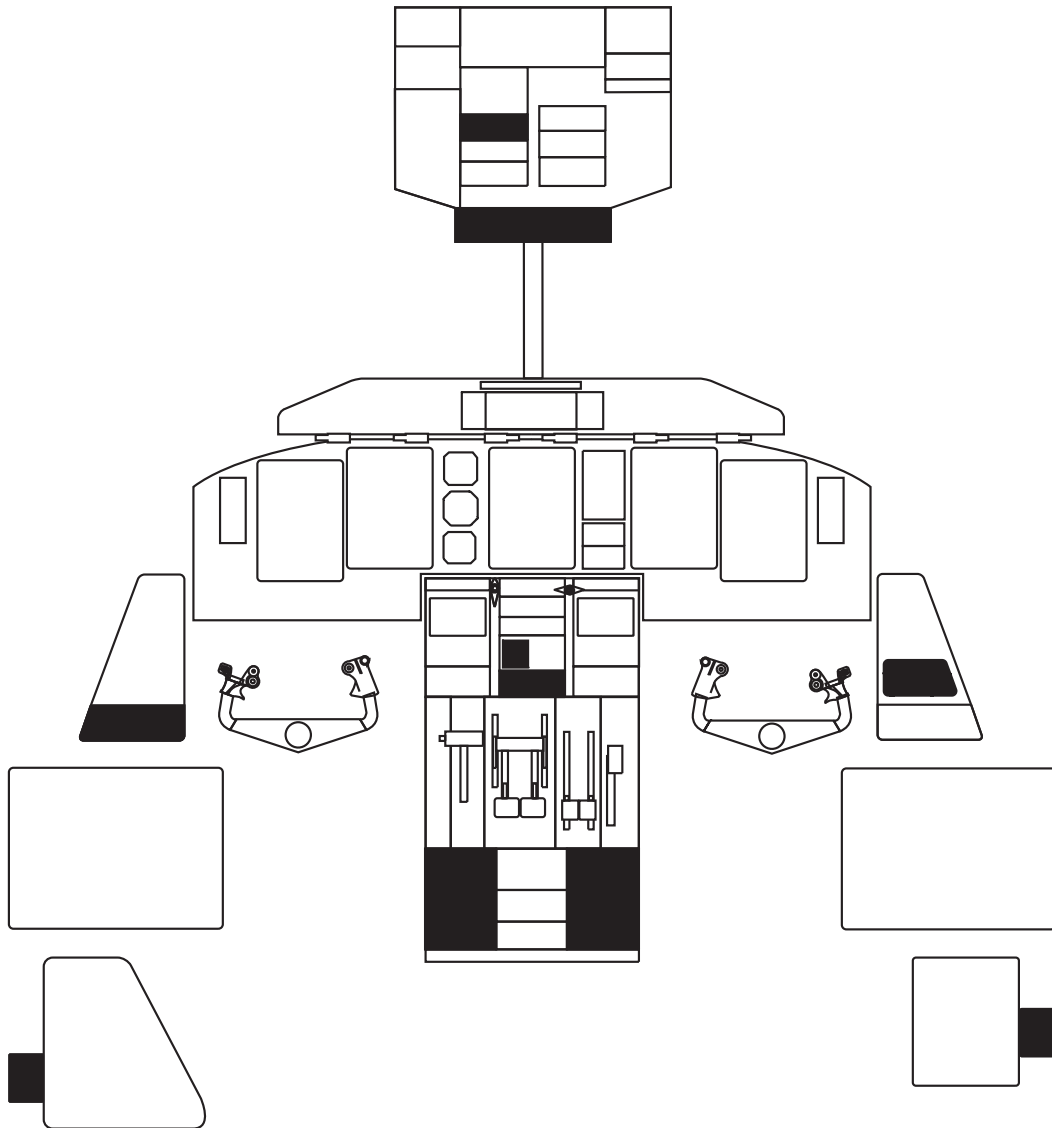
- ARCDU
- Phone Jack Panel
- Hand microphone
- Flight deck speaker
- Control wheel Push-To-Talk (PTT) Interphone switch

There is also a PTT switch on the nosewheel steering control, and an interphone transmit switch on the copilot side panel.

The observer's station has:

- Phone Jack Panel
- Audio Control Panel (ACP)
- Transmit-interphone (INT/RAD) toggle switch

12.4.3 Controls and Indications - Communication



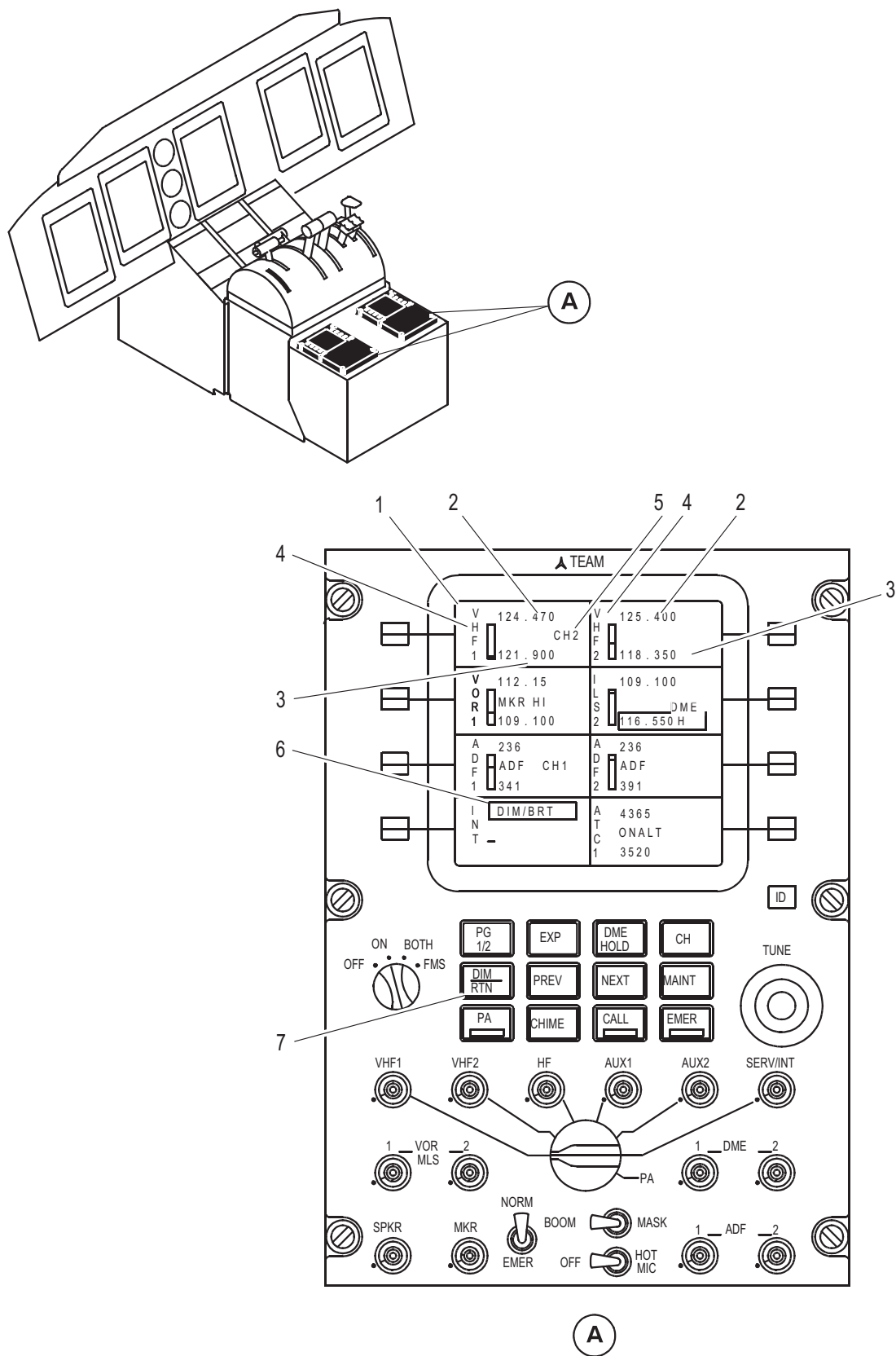


Figure 12.4-1 Audio and Radio Control Display Unit (ARCDU) (1 of 6)

ARCDU CALLOUTS PERTAINING TO COMMUNICATIONS ITEMS

**1. ACTIVE MATRIX LIQUID CRYSTAL DISPLAY Area
(colored font on black background)**

- typical first main page shown

2. ACTIVE FREQUENCY (green)

- this is the current frequency in use
- when the particular communication system sends valid data to the ARCDU, the digits are displayed in green
- invalid data or no data displays the digits in white

3. PRESET FREQUENCY (cyan)

- when highlighted (cyan digits change color to black digits on cyan background), this area is known as the tune window, or scratch pad
- invalid data or no data displays FAIL in red text

4. LABEL (white)

- identifies the applicable communication receiver unit

5. CHANNEL MEMORY ANNUNCIATION (green)

- indicates active frequency is a stored channel

**6. DIM/BRT ANNUNCIATION
(reverse video, black text on white background)**

- appears when the DIM/RTN key is selected
- if no further action occurs within the next 5 seconds, the DIM/BRT annunciation is removed

7. DIM/RTN KEY (momentary action)

PUSH - allows control of the brightness of the ARCDU screen

- DIM/BRT annunciation appears adjacent to the INT label
- turning either TUNE knob will adjust the brightness of the ARCDU screen while the DIM/BRT annunciation is displayed
- turning the TUNE knob clockwise increases the brightness, and turning it counterclockwise decreases the brightness
- continued turning after min or max brightness is attained has no further action
- the RTN function is only active in maintenance mode

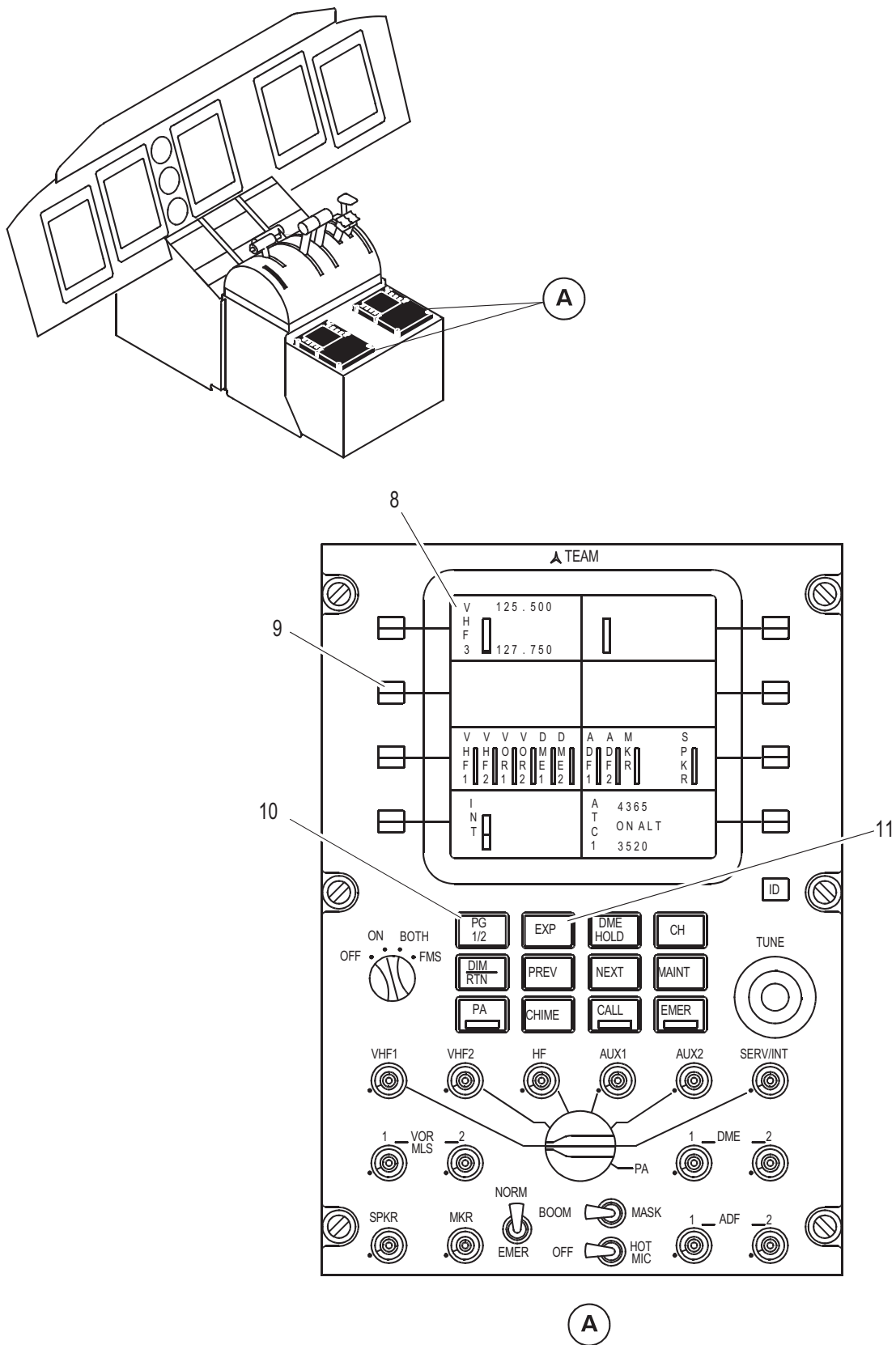


Figure 12.4-2 Audio and Radio Control Display Unit (ARCDU) (2 of 6)

ARCDU CALLOUTS PERTAINING TO COMMUNICATIONS ITEMS (cont'd)

**8. ACTIVE MATRIX LIQUID CRYSTAL DISPLAY AREA
(colored font on black background)**

- typical second main page shown
- second main page is displayed when the PG 1/2 key is pushed

9. SIDE KEYS (8, momentary action)

PUSH - allows two types of operations:

- changing of the preset frequency
- swapping of preset and active frequencies
- the above operations are done in conjunction with the TUNE knob
- if there is no action with the TUNE knob within 5 seconds of a side key being pushed, the selection is cancelled
- pushing on another side key within 5 seconds of the first push, will cancel the previous tune window and activate a tune window associated with this side key
- pushing a side key adjacent to a blank area, or adjacent to INT, will have no effect
- when an action on a side key is not allowed, the label associated with this key flashes for 5 seconds
- details on how to tune windows is described on the following pages

10. PG 1/2 KEY (momentary action)

PUSH - allows the display of:

- the second main page when the first main page is displayed
- the first main page when the second main page or any particular page is displayed
- when there is no second main page, this key has no effect when the first main page is displayed

11. EXP KEY (momentary action)

PUSH - an action on this key done after an action on a side key, like radio communication (VHF1, VHF2, etc.), radio navigation (VOR1, VOR2, etc.), or others, allows the display of the particular pages dedicated to the selected system

- scratchpad selection remains active for a further 5 seconds as soon as the particular page is displayed
- if the EXP key is selected with no previous side key selection, nothing happens

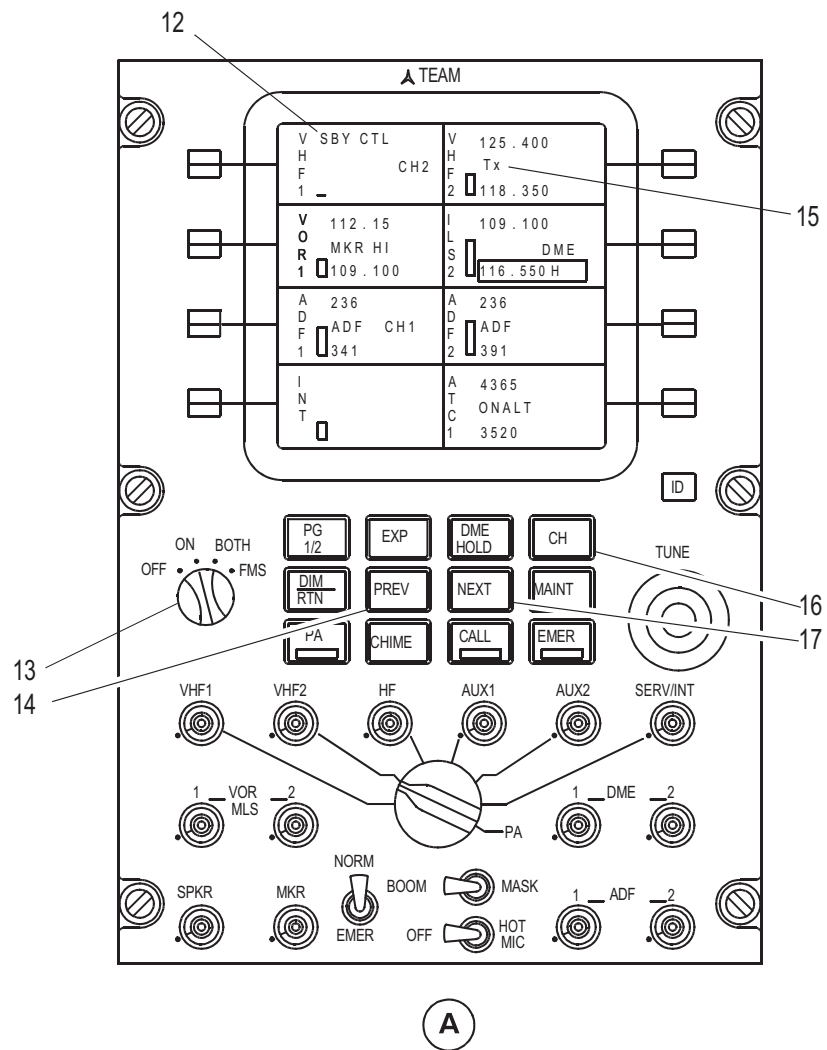
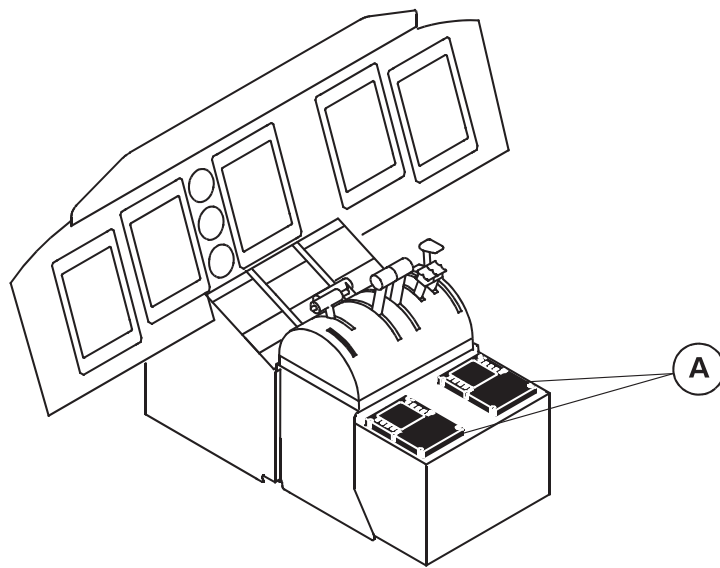


Figure 12.4-3 Audio and Radio Control Display Unit (ARCDU) (3 of 6)

ARCDU CALLOUTS PERTAINING TO COMMUNICATIONS ITEMS (cont'd)

12. SBY CTL ANNUNCIATION (green)

- displayed when the standby control and display for VHF1 COM (COM control display) is turned on
- if the COM control display is activated while in any of VHF1 particular pages, the display returns to the first main page
- if the COM control display is activated, access to VHF1 particular page is inhibited; an action on EXP key done after an action on VHF1 side key will induce the flashing of the VHF1 label for 5 seconds

13. ROTARY SWITCH (4 position)

OFF - the ARCDU is not powered. The related FMS controls and tunes as a backup

ON - the ARCDU controls and tunes its related radio system

BOTH - the ARCDU controls and tunes its related and opposite radio systems (Cross Side Tuning)

FMS - the FMS controls and tunes its related and opposite radio systems (cross side tuning)

14. PREV KEY (momentary action)

PUSH - allows the return to the previous page displayed

- if one of the main pages is displayed, the display remains the same
- maintenance function only

15. COMM TX ANNUNCIATION (green)

- displayed for the duration when a push to talk is activated for a radio communication by any crew member

16. CH KEY (momentary action)

PUSH - key toggles the tuning mode of the selected radio between frequency tuning mode and channel tuning mode

- key is active only when one of the following radios is selected: VHF1, 2, 3 or VHF NAV1, 2 or ADF1, 2
- the TUNE knob allows the selection of one of the channels which have previously been programmed

17. NEXT KEY (momentary action)

PUSH - allows the next page to be displayed

- if one of the main pages is displayed, the display remains the same
- maintenance function only

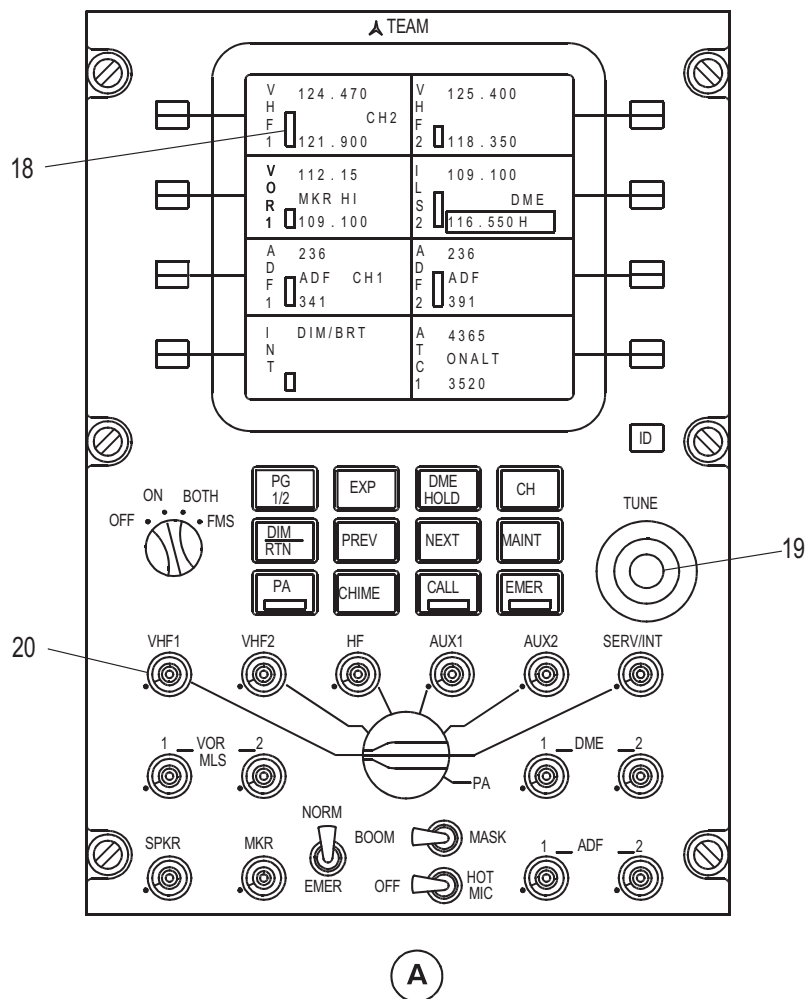
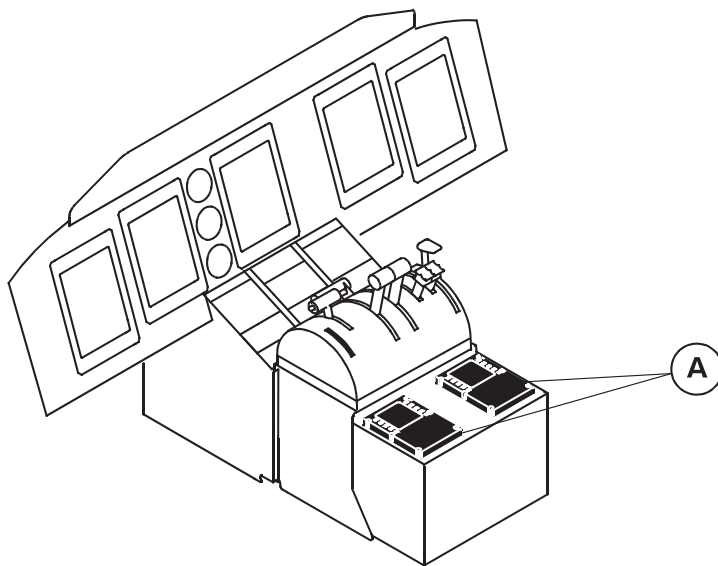


Figure 12.4-4 Audio and Radio Control Display Unit (ARCDU) (4 of 6)

ARCDU CALLOUTS PERTAINING TO COMMUNICATIONS ITEMS (cont'd)

18. VOLUME LEVEL ADJUST BAR GRAPH (white or green)

WHITE - the respective audio pushbutton is selected off

GREEN - the respective audio pushbutton is selected on

- the height of the bar graph shows the volume selection level

19. TUNE KNOBS (2, rotary action)

TURN - changes digits of selected parameter

- the outer knob selects the digits left of the decimal
- the inner knob selects the digits right of the decimal
- both knobs have roll over capability
- variable rate tuning advances the frequency several digits when the inner knob is rotated rapidly
- if the CH key has been pressed, the TUNE knobs will cycle through the programmed channels for the selected radio

20. COMM PUSHBUTTON SWITCHES (5)

(alternate action switch and rotary volume control)

PUSH - turns respective comm receiver audio ON/OFF

ROTATE - changes comm audio volume level

- the display area shows the volume level as a vertical bar graph
- the height of the bar graph is representative of the volume level
- the pushbuttons AUX1 and AUX2 are used to control optional radios which do not have their own pushbuttons; for instance, AUX1 for VHF3 and AUX2 for HF2
- when a basic or optional radio system is not installed, the associated pushbutton has no effect. It remains OFF and audio level is zero
- pushbuttons labeled HF, SPKR and MKR have volume level bar graphs on the second main page
- the listening level of the Audio Warnings is not adjustable and cannot be turned ON/OFF
- ON/OFF positions and pushbuttons settings are saved on power cut and restored at power up
- ON/OFF selections can be overridden by the Emer/Norm switch or automatic reconfiguration (see Detailed Description). The same is true for pushbuttons settings

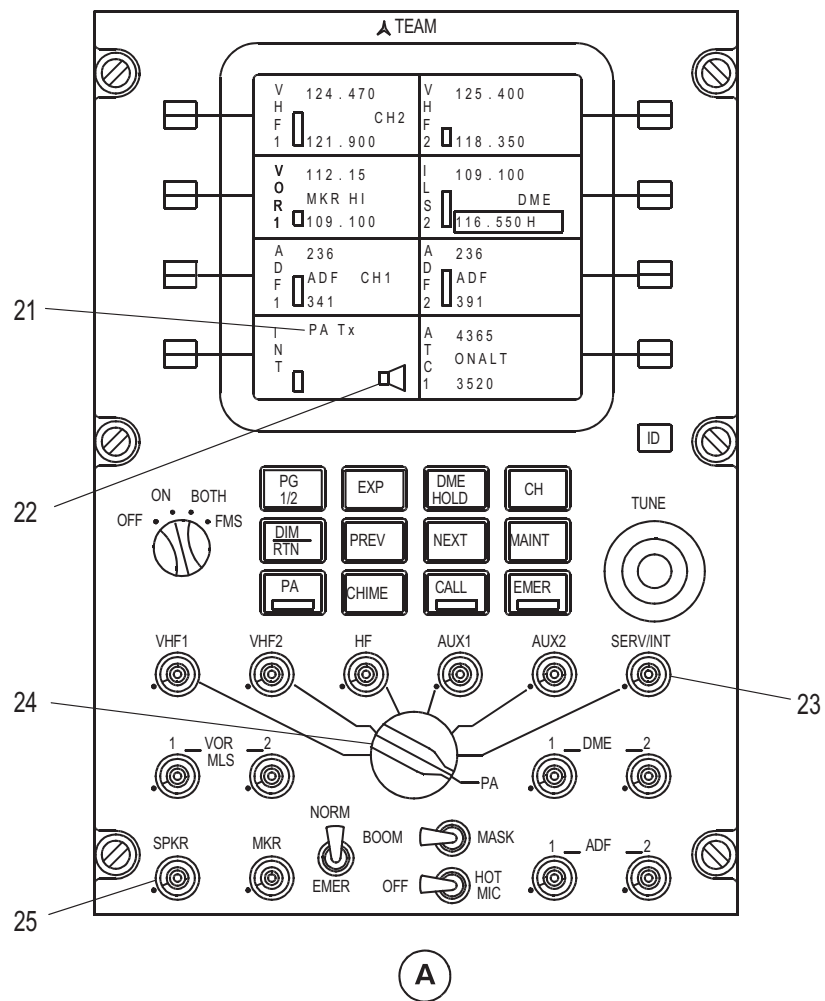
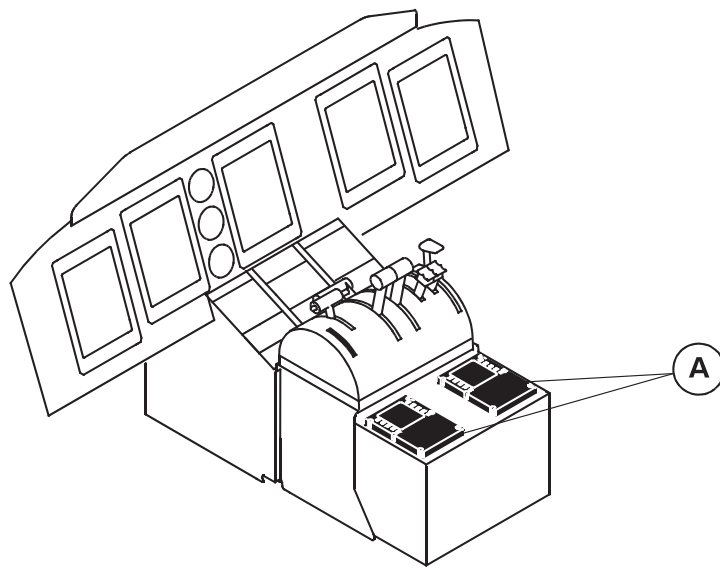


Figure 12.4-5 Audio and Radio Control Display Unit (ARCDU) (5 of 6)

ARCDU CALLOUTS PERTAINING TO COMMUNICATIONS ITEMS (cont'd)

21. INT TX ANNUNCIATION (green)

- when the activated push to talk is related to the INT or PA system, the annunciator becomes INT Tx or PA Tx respectively, and is displayed for the duration of the push to talk
- when HOT MIC is on, Tx will display full time

22. SPKR ON ANNUNCIATION (green)

- indicates speaker pushbutton switch is selected on

23. SERV/INT PUSHBUTTON SWITCH

(alternate action switch and rotary volume control)

PUSH - turns the SERV/INT receiver audio ON/OFF

ROTATE - changes SERV/INT audio volume level

- the INT display area shows the volume level as a vertical bar graph
- the height of the bar graph is representative of the volume level

24. MICROPHONE/ INTERPHONE SELECTOR (rotary action, 7 position)

TURN - selects communications radios (VHF1, VHF2, HF, AUX 1 or 2) or interphone communication between crew members (SERV/INT) or Public Address Cabin Interphone System (PA) for transmission

- when a push to talk is activated for a radio communication by any crew member, a green Tx annunciation is displayed for the duration of the push to talk on the radio communication area
- the SERV/INT position allows any push to talk switch to be used for interphone communication. Interphone conversations between the flight crew member and the attendant can be monitored only when the INT volume control push button is in the ON position
- selection for transmission can be overridden by the Emer/Norm switch or automatic reconfiguration (see Detailed Description)

25. SPEAKER PUSHBUTTON SWITCH

(alternate action switch and rotary volume control)

PUSH - turns overhead speaker ON/OFF

ROTATE - changes speaker volume level; displayed on second main page.

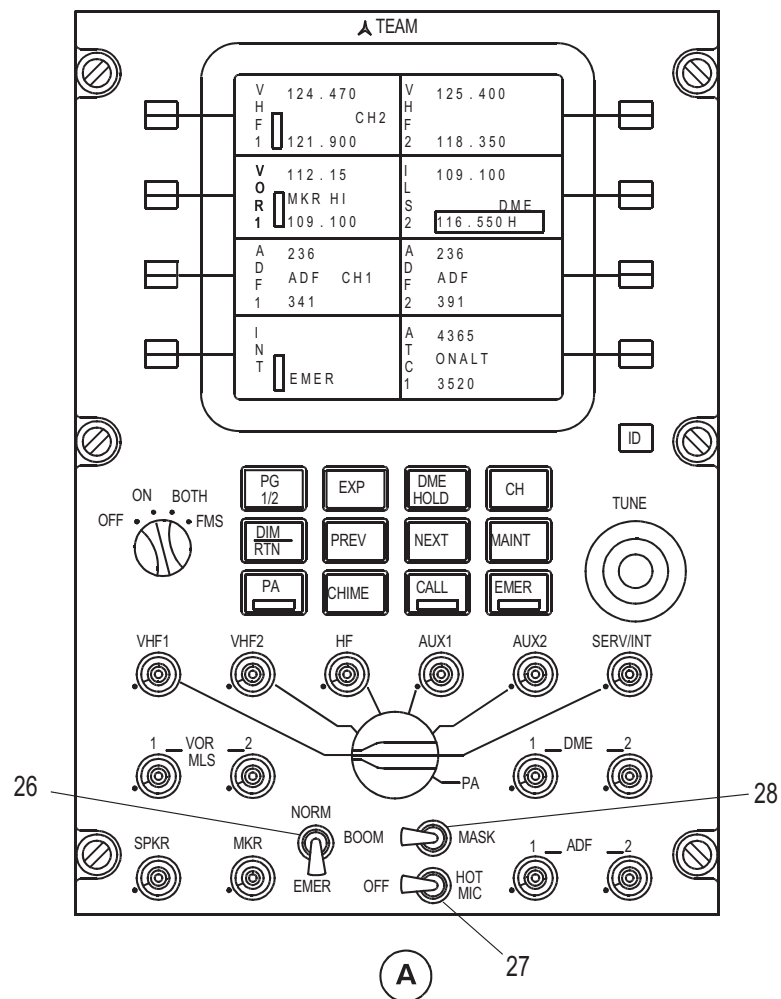
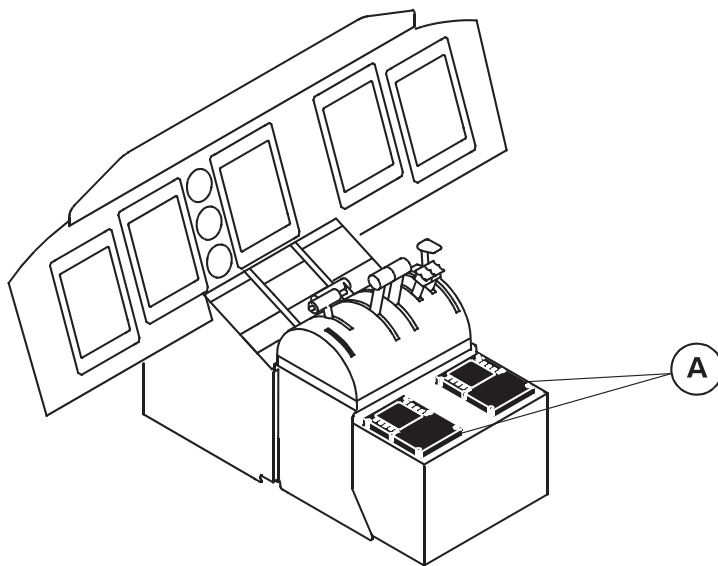


Figure 12.4-6 Audio and Radio Control Display Unit (ARCDU) (6 of 6)

ARCDU CALLOUTS PERTAINING TO COMMUNICATIONS ITEMS (cont'd)

26. EMER/NORM SWITCH (two position)

NORM - provides normal operation of the Audio and Radio Management System (ARMS)

- all radios are individually selectable with variable volume control

EMER - selects emergency mode

- EMER will be displayed in red on the third line of the INT area
- when selected on pilot's ARCDU:
 - the headset and microphones are directly routed to VHF1
 - the interphone audio side-tone is directly routed to the headset
 - audio level is fixed for VHF1 and INT
- when selected on copilot's ARCDU:
 - the headset and microphones are directly routed to VHF2
 - the interphone audio side-tone is directly routed to the headset
 - audio level is fixed for VHF2 and INT
- the PTT/INPH must be selected to PTT for access to onside COMM. Interphone function is not available in EMER except for Audio
- the microphone/interphone selector is overridden while EMER mode is selected
- EMER mode has precedence over automatic reconfiguration
- in automatic reconfiguration mode, FAIL is annunciated instead of EMER, however, it appears on the second line of the INT area

27. HOT MIC SELECTOR (two position switch)

ON - microphones are automatically and continuously keyed for interphone operation only

HOT MIC - normal position, microphones must be keyed for operation

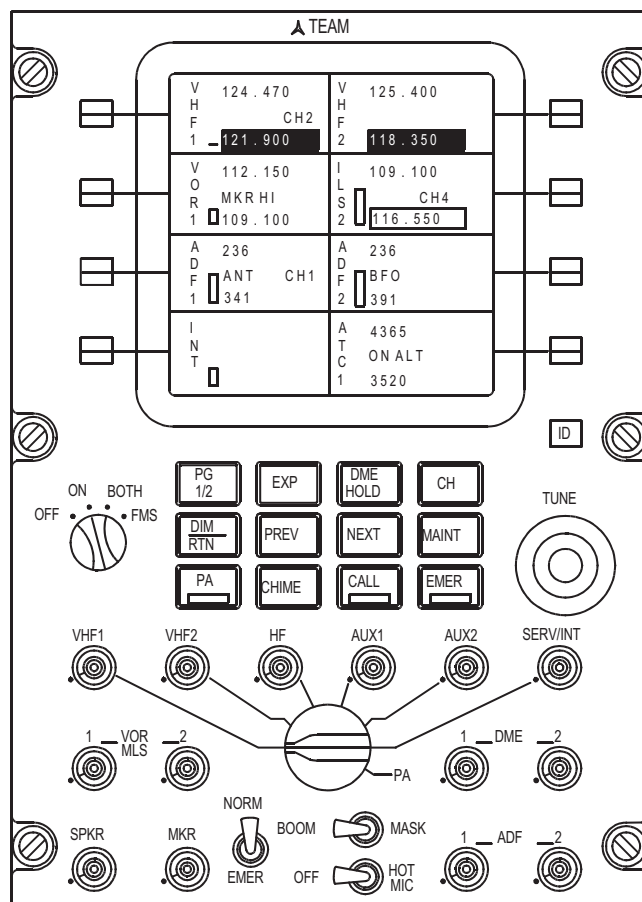
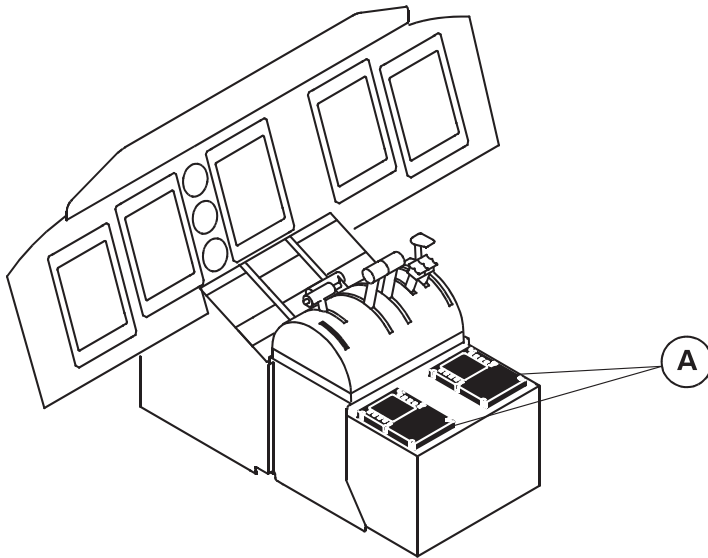
- in automatic reconfiguration, interphone system is in hot microphone mode, so HOT MIC position has no effect

28. BOOM/ MASK MICROPHONE (two position switch)

BOOM - transmit from boom microphone

MASK - transmit from oxygen mask microphone

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Figure 12.4-7 ARCDU VHF Communication Operation (1 of 3)

ARCDU VHF COMM FREQUENCY SELECTION

SWITCHING BETWEEN ACTIVE AND PRESET FREQUENCIES

- Push the **side key** adjacent to the VHF label to highlight (black digits on cyan background) the preset code
- If no further action occurs within the next 5 seconds, the preset frequency reverts back to cyan digits
- Push the **side key** again and the preset frequency becomes the active frequency, and the active frequency becomes the preset frequency

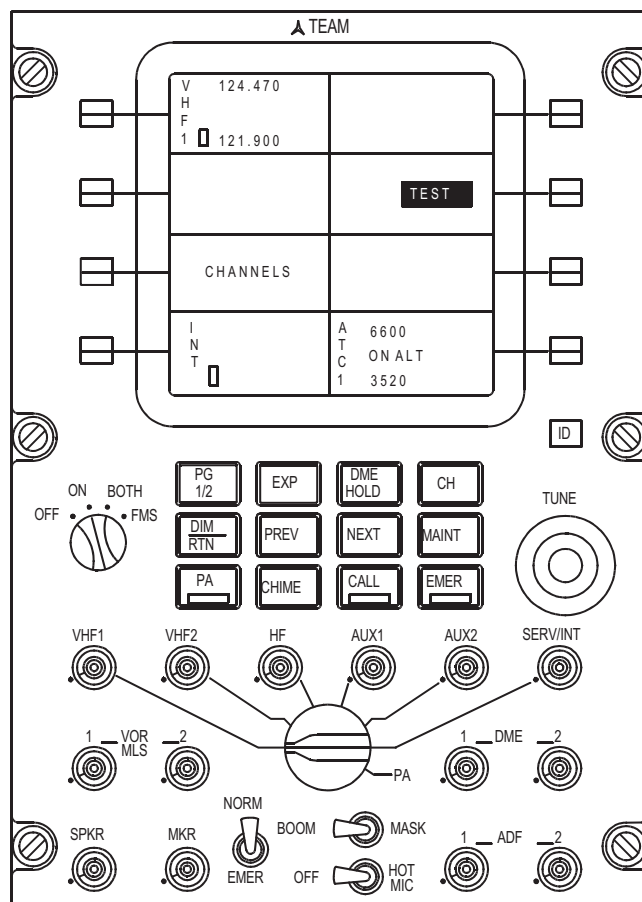
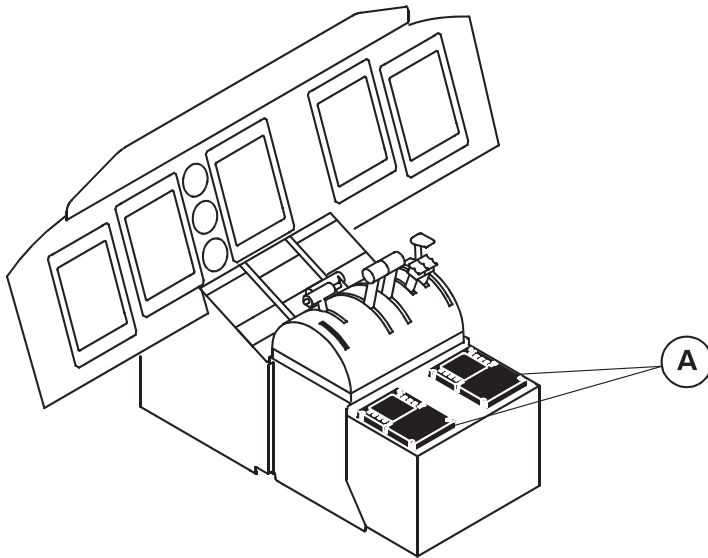
CHANGING THE PRESET FREQUENCY

- Push the **side key** adjacent to the VHF label to highlight the preset code
- Turn the **TUNE knobs** to change the preset code to the desired frequency
- Push the **side key** again and the preset frequency becomes the active frequency

SELECTING A MEMORIZED PRESET FREQUENCY

- Push the **CH key** to activate the channel mode selection function
- The channel memory annunciator CH x (where “x” is the programmed channel from 1 to 8) is displayed on the second line of the display area and its associated frequency is displayed as the preset frequency
- Push the **side key** adjacent to the VHF label to highlight and change the preset frequency
- The channel number changes to reflect the preset frequencies memory location (8 possible per label)
- If the **TUNE knob** is not operated within the next 5 seconds, the preset frequency reverts back to cyan digits
 - Turn either **TUNE knob** to display the memorized channels one after the other:
 - from the displayed channel number if a channel number is already displayed (preset frequency associated)
 - from CH 1 if no channel number is already displayed (preset frequency not associated)
- Push the **side key** again and the preset frequency becomes the active frequency
- The channel memory number appears in green below the active frequency. This shows that the active frequency is associated with a channel memory number
- When the **CH key** is pushed again, the channel memory mode changes to the normal frequency selection. All channel memory annunciators are removed

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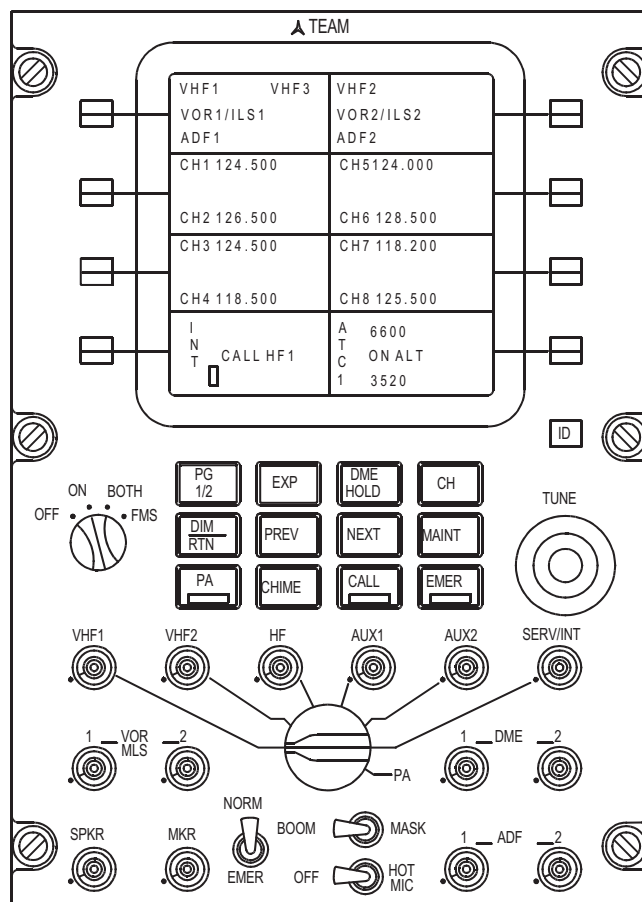
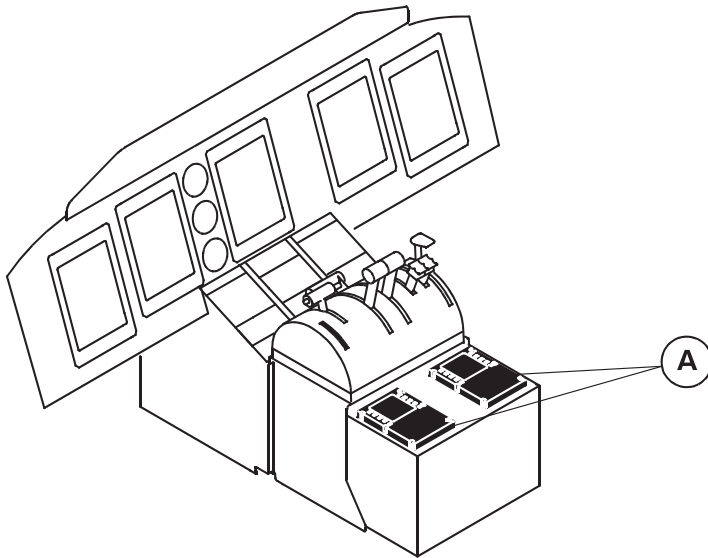
Figure 12.4-8 ARCDU VHF Communication Operation (2 of 3)

ARCDU VHF COMM FREQUENCY SELECTION (cont'd)

VHF TESTING

- Push the VHF **side key** followed by the **EXP key** to display the VHF particular page as shown
- The VHF label is displayed in black digits on a white background
- The TEST legend is displayed in white text
- Push the **side key** adjacent to the TEST legend to start the test of the VHF system
- When TEST is selected, it changes to reverse video, and displays as black characters on a green background
- The audio module automatic squelch circuit is disabled to let the VHF communication receiver noise be heard. This makes sure that the receiver is operational.
- This is indicated by a green SQL message with a diagonal line through it on the second line of the VHF area
- Test duration is 1 second
- The legend returns to white after the test sequence is completed
- There is no test result indicated

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Figure 12.4-9 ARCDU VHF Communication Operation (3 of 3)

ARCDU VHF COMM FREQUENCY SELECTION (cont'd)

CHANNEL PROGRAMMING

- Push the VHF **side key** followed by the **EXP key** to display the VHF particular page
- The VHF label is displayed in black digits on a white background
- Push the **side key** adjacent to the CHANNELS legend to access the Channel Programming page
- The channel programming page contains a list of radios with channel capabilities (pilots on the left, copilots on the right). One radio is selected and the frequencies for that radio are displayed
- When channel programming is selected, the radio is selected which is associated on the particular page where the CHANNEL request originate
- Eight preset channels are available for VHF communication tuning as displayed on the channel programming page
- Channel presets are labeled as CH1 through CH8 in white characters. Each channel display area contains two channel definitions. Successive pressing onside key shall successively select one of the two channels
- Push the **side key** to select the channel to be changed and the current frequency value changes to black characters on a cyan background
- Turn the two **TUNE knobs** located at the lower right side of the ARCDU to change the frequency
- The channel window shows the new frequency in cyan characters

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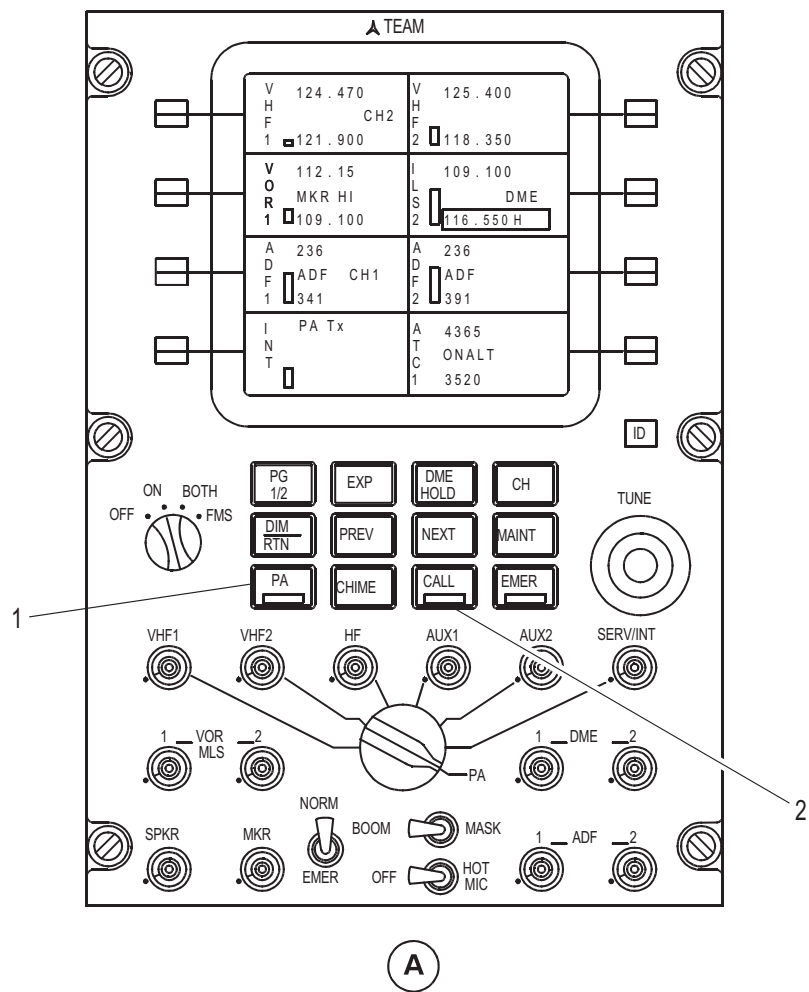
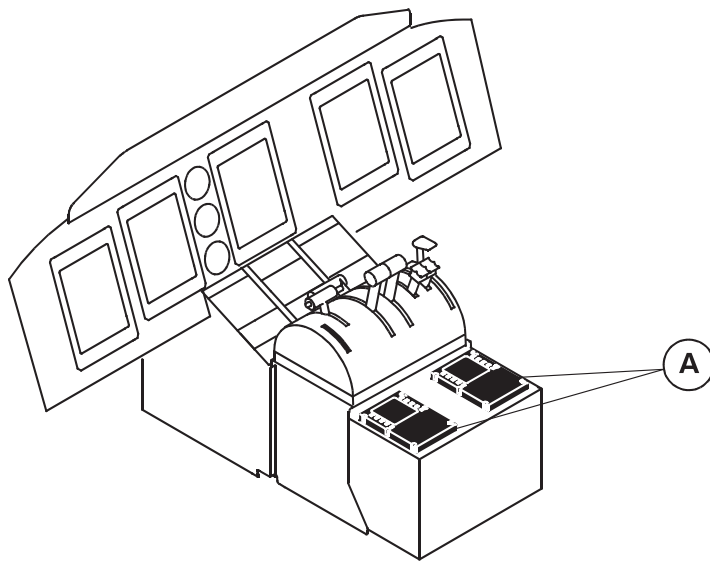


Figure 12.4-10 ARCDU PACIS (1 of 2)

ARCDU CALLOUTS PERTAINING TO PACIS

1. PA KEY (MOMENTARY ACTION)

PUSH - key segment (green)

- selecting the microphone/interphone selector to PA, enables the flight crew to make PA transmissions using the PTT/INPH switch
- green annunciator light on both ARCDUs, the PA lights on both the cabin attendant keyboard (FWD) and handset (AFT), and on the cabin attendant advisory light panels will come on
- there is no volume control in PA mode
- the PA mode is terminated by pushing on the PA key again, by choosing another PACIS mode (CALL or EMER) or by moving the microphone/interphone selector to another transmitting position. The side tone is then set to zero
- when the PA mode is activated by another crew member, the PA key segment (green) comes on as an indication, regardless of the microphone/interphone selector position (there will be no side tone unless the selector is on the PA position)
- to activate the PA mode, the microphone/interphone selector shall be set on the PA position and then the PA key must be pressed

2. CALL KEY (MOMENTARY ACTION)

PUSH - key segment (green)

- with the microphone/interphone selector set to PA, it enables the pilot (or the copilot) to call and communicate with the flight attendant(s)
- generate a chime sound in the cabin only
- green annunciator light on both ARCDUs, the CALL lights on both the cabin attendant keyboard (FWD) and handset (AFT), and on the flight attendant advisory light panels will come on
- the pilot (or the copilot) will be able to listen and talk to the attendant(s) on the intercom network as soon as the attendant lifts the handset
- a PTT, INPH or HOT MIC selection is required by the flight crew in order to connect their microphone to the interphone system
- when the CALL mode is activated by another crew member, the CALL annunciator is lit up as an indication
- when a cabin attendant is calling the flight crew, a chime sound is generated in the flight deck
- it is not necessary to press a PTT or the cabin crew handset when communicating on the interphone
- this mode is terminated by pressing the CALL key again, by choosing another mode (PA or EMER) or moving the microphone/interphone selector to another transmitting position

NOTE: During emergency conditions in which the only aeroplane power is from the batteries and the Emergency Lights switch is in the ARM or ON position, the PA and CALL lights on the pilots ARCDU and both attendant keypads will be illuminated incorrectly and should be ignored. This condition is a function of the operation of the RCAU and in no way inhibits the correct audio function of the PACIS system.

Pilots PA operation continues to be indicated by a PA TX indication on the ARCDU when the PTT is pressed and headset sidetone. Pilots CALL operation continues to be indicated by a high-low chime heard on the cabin speakers and in the pilots headset.

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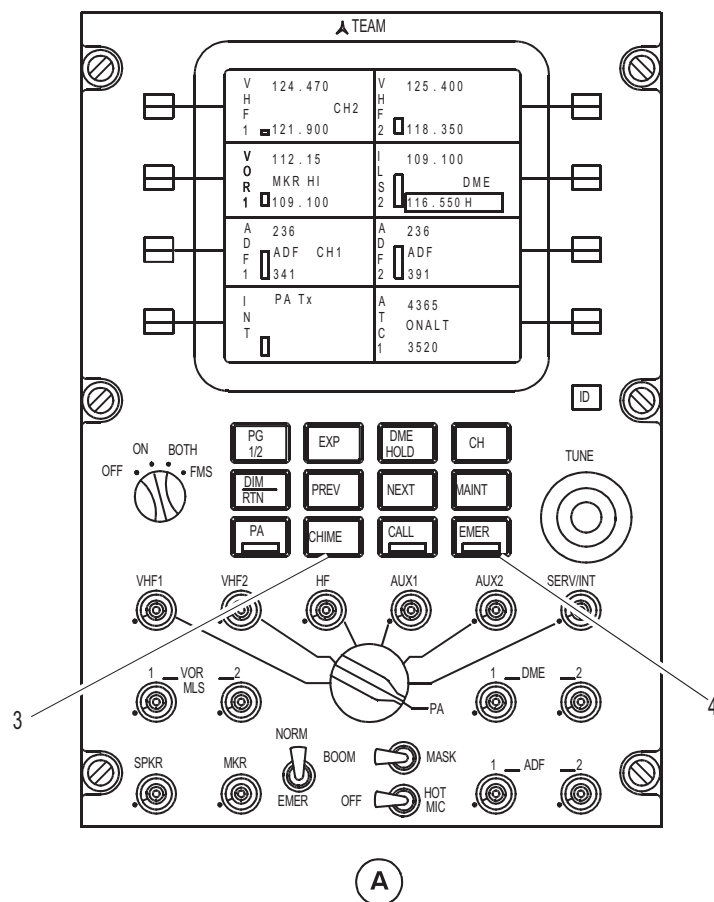
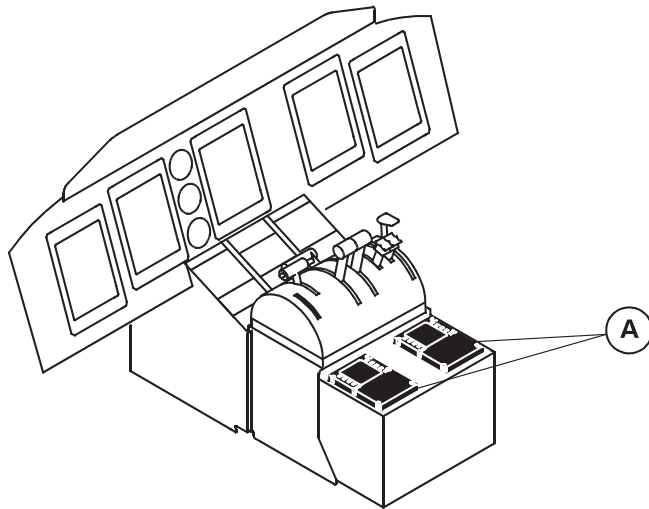


Figure 12.4-11 ARCDU PACIS (2 of 2)

ARCDU CALLOUTS PERTAINING TO PACIS (cont'd)

3. CHIME KEY (MOMENTARY ACTION)

PUSH - causes a chime sound to broadcast in the cabin

- this key operates regardless of the microphone/interphone selector position and of the other PACIS mode

4. EMER KEY (MOMENTARY ACTION)

PUSH - key segment (amber)

- selecting the microphone/interphone selector to PA, enables the pilot (or the copilot) to call and communicate with the flight attendant(s)
- same functionality as the CALL key, except:
- the amber EMER lights on the ARCDUs, and both the cabin attendant keyboard (FWD) and handset (AFT), will flash
- there will be a red flashing annunciator on the cabin attendant advisory light panels
- the chime sound is broadcast on the flight deck and in the cabin
- the microphone/interphone selector must be selected to PA for the flight crew to hear the cabin crew member
- the selection of the EMER mode at any other station overrides and postpones the CALL mode (even if it is already activated)
- this mode is terminated by pressing on the same key again, by choosing another mode (PA or CALL) or moving the microphone/interphone selector to another transmitting position
- when an emergency mode or an automatic reconfiguration occurs, the PA, CALL, and EMER lights extinguish and PACIS modes are suspended
- on the same ARCDU, only one of the CALL, PA, and EMER modes can be activated at any one time, but the activated mode on one ARCDU can be different from the activated mode on the other one, therefore, two keys can be illuminated at the same time

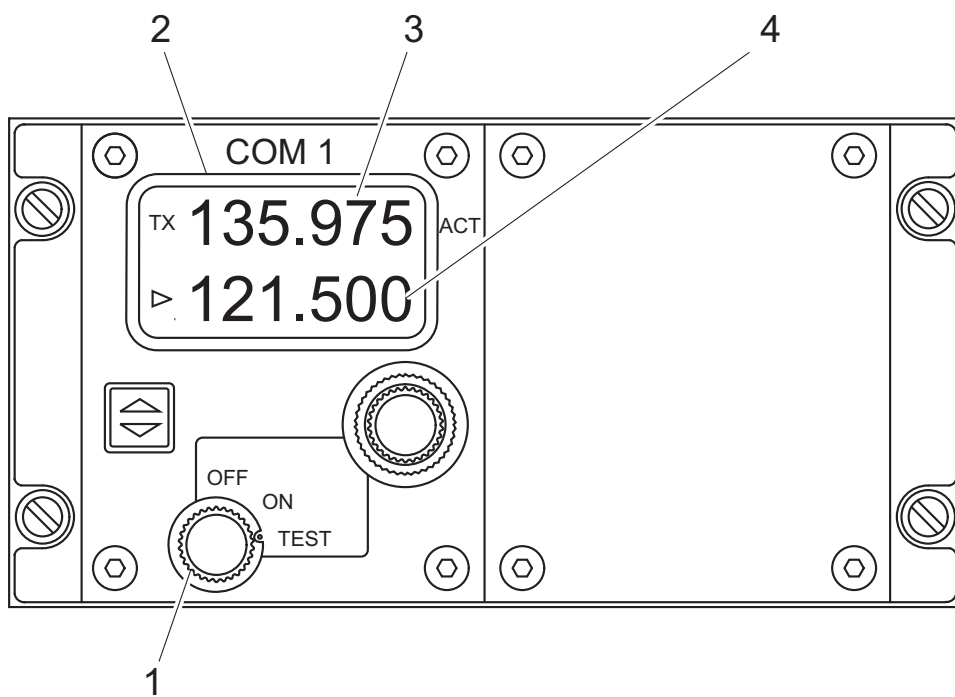
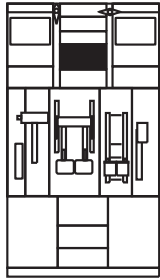


Figure 12.4-12 VHF1 Standby Control and Display Unit (1 of 2)

VHF1 STANDBY CONTROL AND DISPLAY UNIT CALLOUTS

1. OFF-ON-OFF TEST (three position, rotary switch)

OFF:Standby control panel OFF

ON: Standby control panel ON

TEST:- receiver squelch of the radio is disabled

-if background noise can be heard, the radio is operational

2. FREQUENCY AND ADVISORY DISPLAY

- displays active frequency in upper portion
- displays preset frequency in lower portion
- the transmit annunciator displays Tx each time the microphone is keyed and a RF output is present

3. ACTIVE FREQUENCY

- shows that the top set of numerals is the active (ACT) frequency setting
- the active frequency display is the top set of numerals to which the remote transceiver is tuned

4. PRESET FREQUENCY

- shows that the lower set of numerals is the preset (PRE) frequency setting

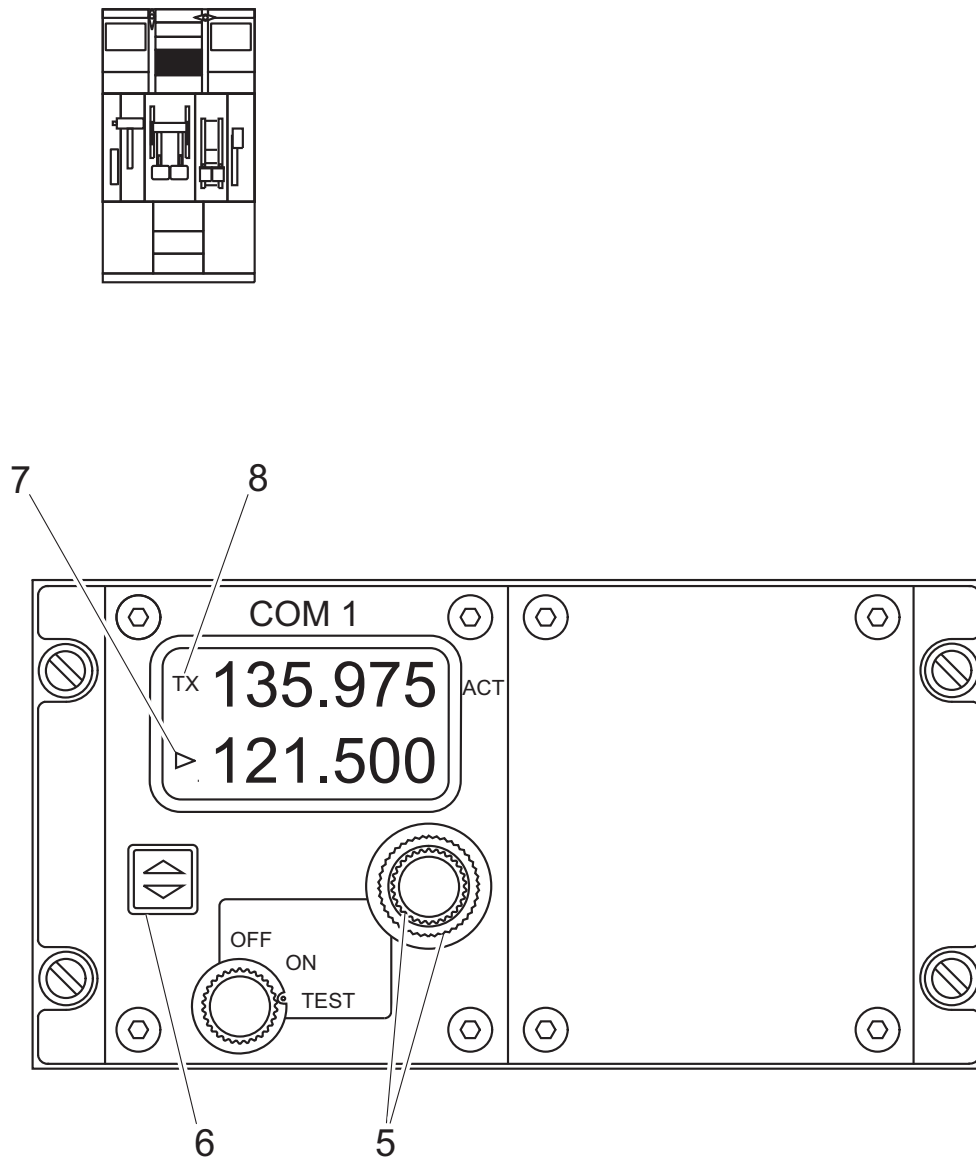


Figure 12.4-13 VHF1 Standby Control and Display Unit (2 of 2)

VHF1 STANDBY CONTROL AND DISPLAY UNIT CALLOUTS (cont'd)

5. FREQUENCY SELECTOR (concentric, rotary action)

TURN - selects the desired frequency

- the outer (large) knob tunes the whole megahertz frequencies in increments of one MHz
- the inner (small) knob tunes the frequencies in increments of 25 KHz (or 8.33 KHz)
- clockwise rotation of either knob increases frequency and counter-clockwise rotation decreases frequency

6. FREQUENCY TRANSFER PUSHBUTTON (momentary action)

PUSH (less than 2 seconds) - interchanges the active and standby frequencies on the display

PUSH and HOLD (2 to 3 seconds) - causes the standby frequency display to disappear allowing the operator to change the active frequency setting

PUSH and HOLD (2 to 3 seconds for the 2nd time) - restores the standby frequency display

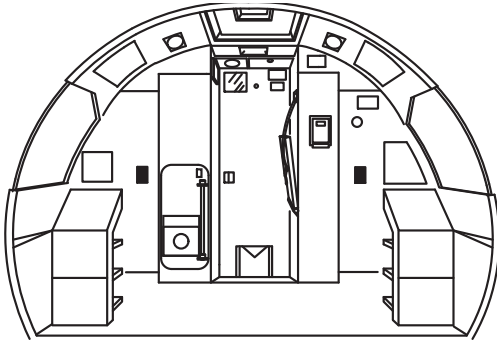
PUSH and HOLD (more than 7 seconds) - causes the transceiver to retune to 121.500 MHz, and display it in the top window. If nothing is displayed due to a display failure, any frequency can be selected knowing that every "click" on the large frequency selector knob will give 1 MHz increment and the small knob will give 25 KHz (or 8.33 KHz) increment

7. TRANSFER ANNUNCIATOR

- displayed as long as the readback frequency (from the transceiver) is not the same as the activate frequency, which follows the momentary push of the transfer switch

8. TRANSMIT ANNUNCIATION

- microphone has been keyed
- RF output present



NOTE

Pilot's equipment shown.
Copilot's equipment similar.

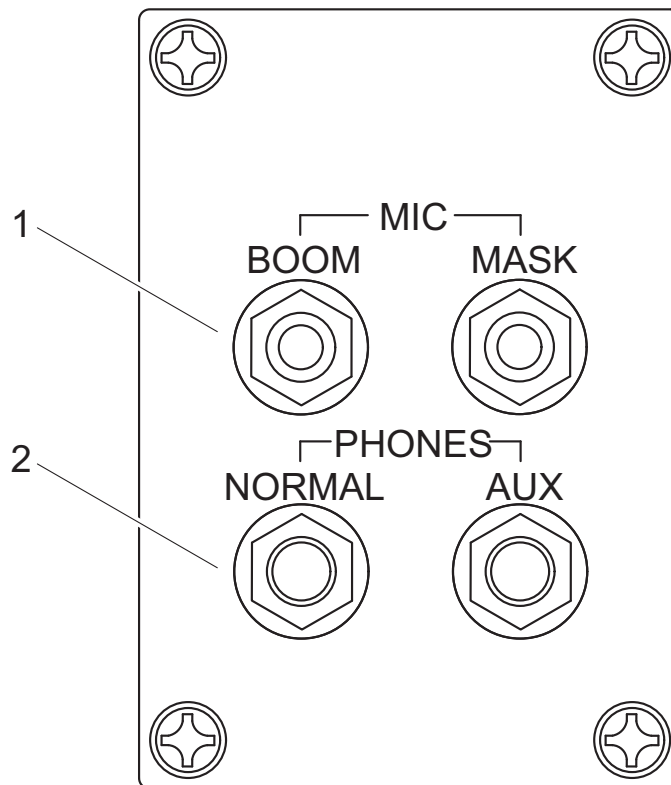


Figure 12.4-14 Pilot's and Copilot's Phone Jack Panel

PILOT'S AND CO-PILOT'S PHONE JACK PANEL CALLOUTS

1. MICROPHONE JACKS

BOOM - the headsets have a microphone plug that is connected to the BOOM jack to supply boom microphone audio to the Remote Control Audio Unit (RCAU)

MASK - the oxygen mask has a microphone plug only. It is connected to the MASK jack to supply mask microphone audio to the RCAU

2. HEADPHONE JACKS

NORMAL - the headsets have a headphone plug that is connected to the NORMAL jack to supply headphone audio from the RCAU

AUX - the AUX headphone audio jack is used when the NORMAL jack malfunctions to receive audio from the opposite audio system

- for example, when the pilot's headphone audio plug is connected to the AUX headphone audio jack, the copilot's ARCDU is used to control the audio selections

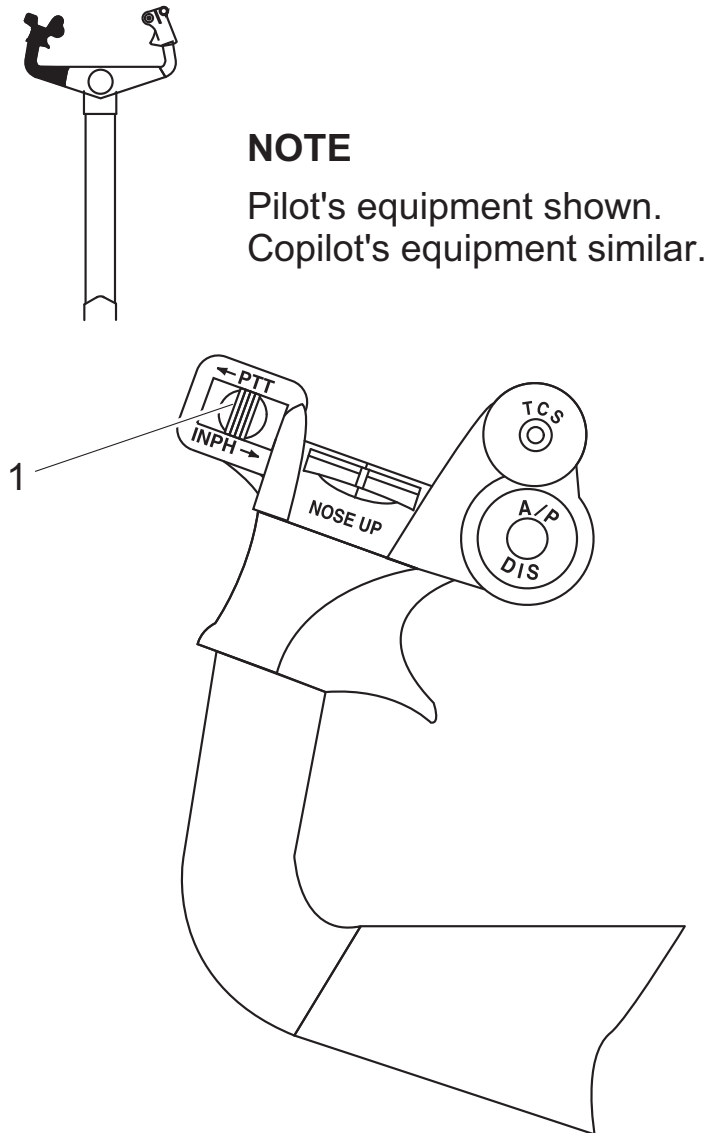


Figure 12.4-15 Control Wheel PTT INPH Switch

CONTROL WHEEL CALLOUTS PERTAINING TO COMMS

1. PTT/INPH SWITCH (three position, spring loaded to center)

PTT - allows a transmission to be made using the communications transceiver selected on the ARCDU with the microphone/interphone selector

- causes the flight deck speakers to mute by 6 dB to prevent feedback

INPH - connects microphone to cabin interphone system (flight deck, cabin crew, and ground crew stations)

- microphone/interphone selector on the ARCDU must be in the SERV/INT or PA position

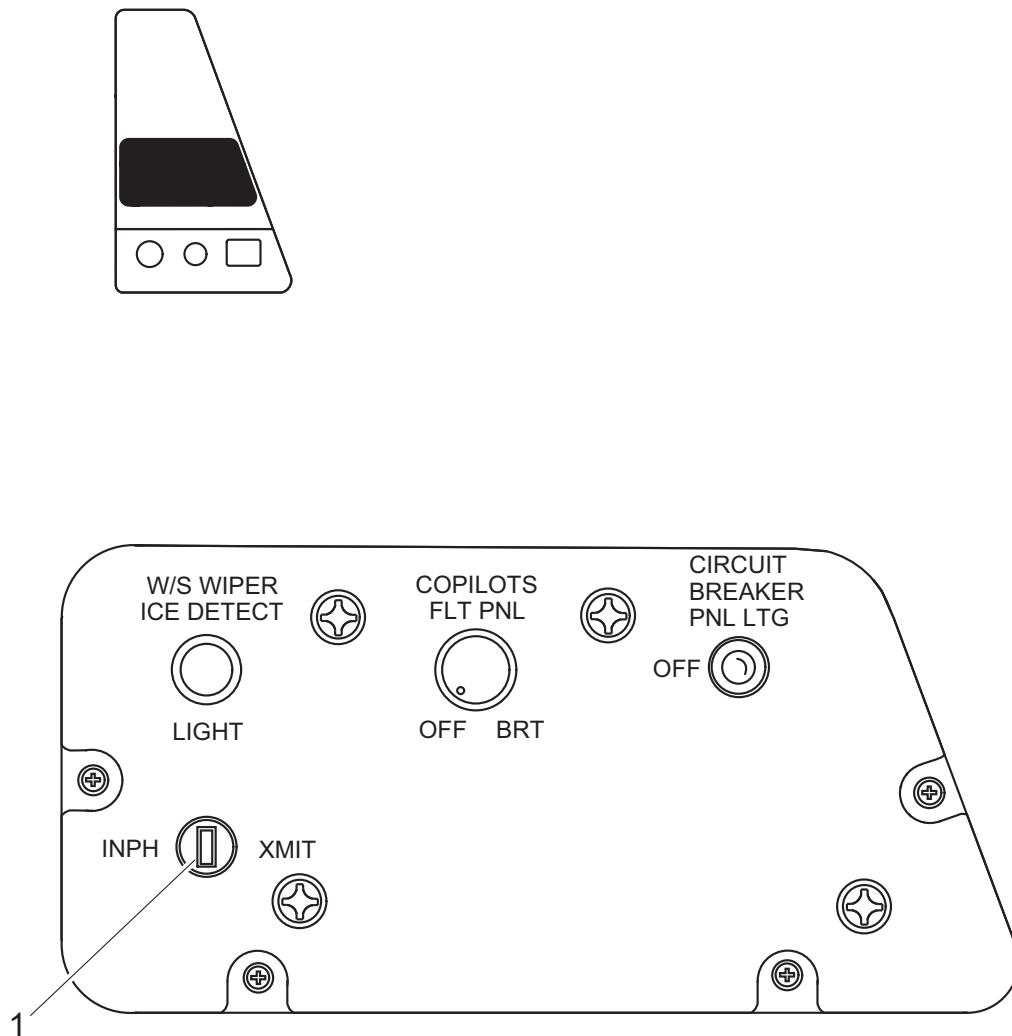


Figure 12.4-16 Copilot's Side Panel

COPILOT'S SIDE PANEL CALLOUT PERTAINING TO COMMS

1. XMIT/INPH SWITCH (three position, spring loaded to center)

XMIT - allows a transmission to be made using the communications transceiver selected on the ARCDU with the microphone/interphone selector

- causes the flight deck speakers to mute by 6 dB to prevent feedback

INPH - connects microphone to cabin interphone system (flight deck, cabin crew, and ground crew stations)

- microphone/interphone selector on the ARCDU must be in the SERV/INT or PA position

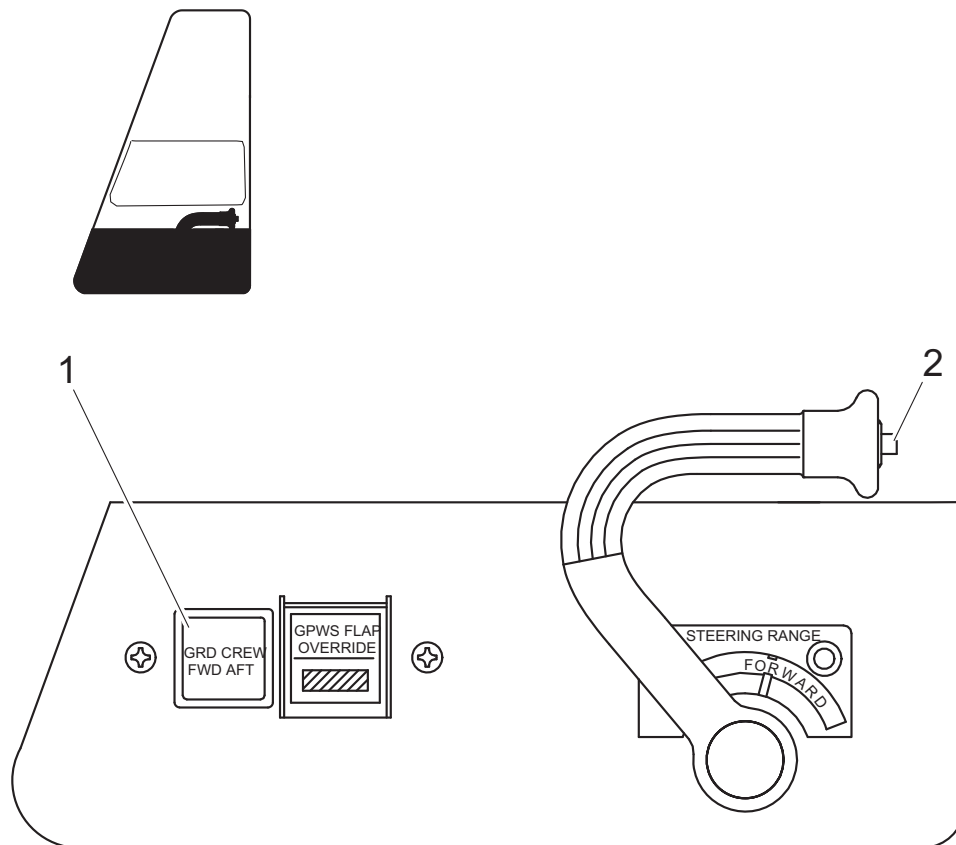


Figure 12.4-17 Nosewheel Steering Side Panel

STEERING PANEL CALLOUTS PERTAINING TO COMMS

1. GROUND CREW CONNECTION ANNUNCIATOR

FWD segment (amber) - ground crew connected to DC external connection point

AFT segment (amber) - ground crew connected at REFUEL/DEFUEL panel, or aft aircraft connection point

2. PTT SWITCH (momentary action)

PRESS - allows a transmission to be made using the communications transceiver selected on the ARCDU with the microphone/interphone selector

- causes the flight deck speakers to mute by 6 dB to prevent feedback

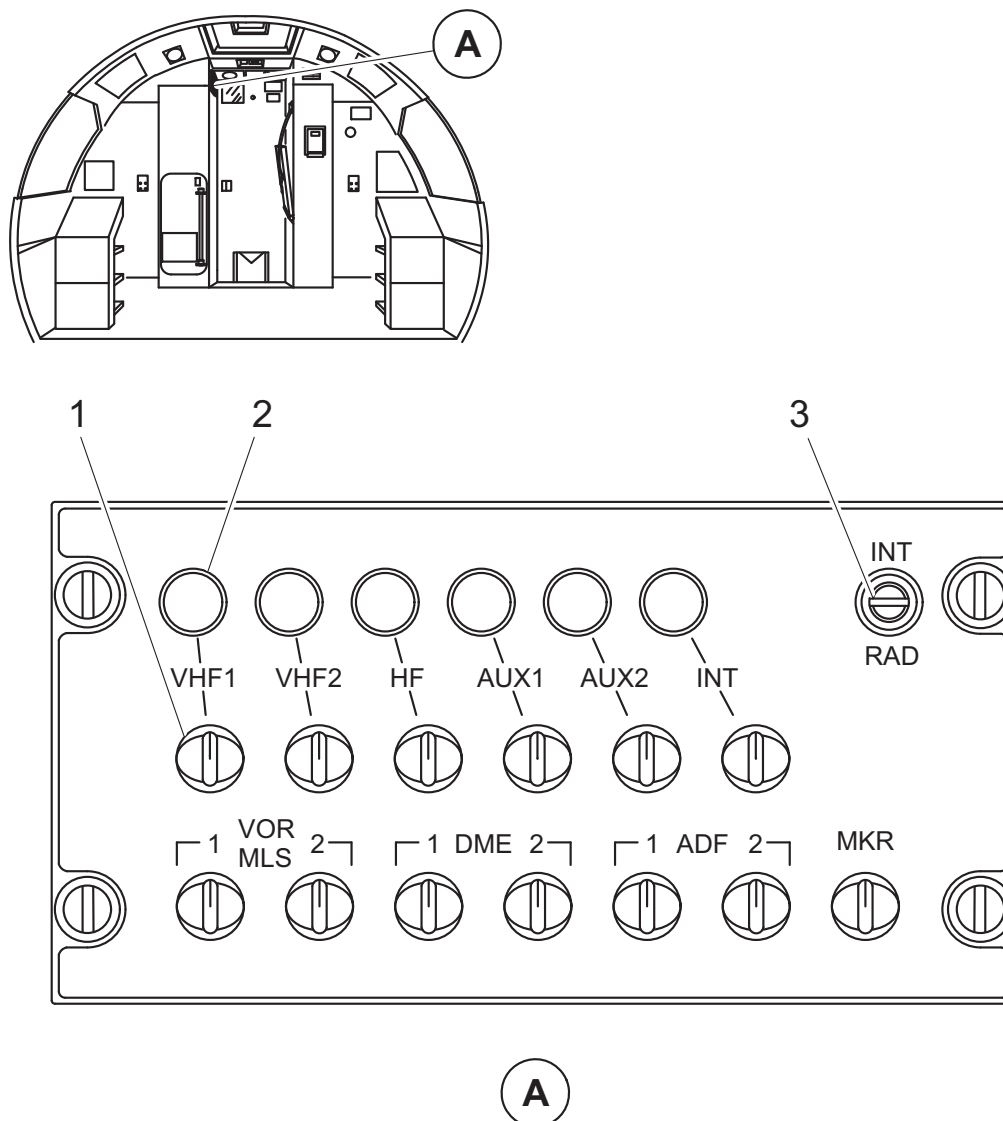


Figure 12.4-18 Observer's Audio Control Panel

OBSERVER'S AUDIO CONTROL PANEL CALLOUTS

1. HEADPHONE AUDIO KNOBS (13, rotary action)

TURN - controls the audio volume of the applicable knob. The related audio goes off when a knob is set to the full counterclockwise position

2. TRANSMITTER KEYS (alternate action)

PUSH - selects applicable radio for transmission. Switches are mechanically interlocked so that only one can be selected at a time

3. INT/RAD SWITCH (three position, spring loaded to center)

INT - connects microphone to interphone system

RAD - allows transmission on selected radio

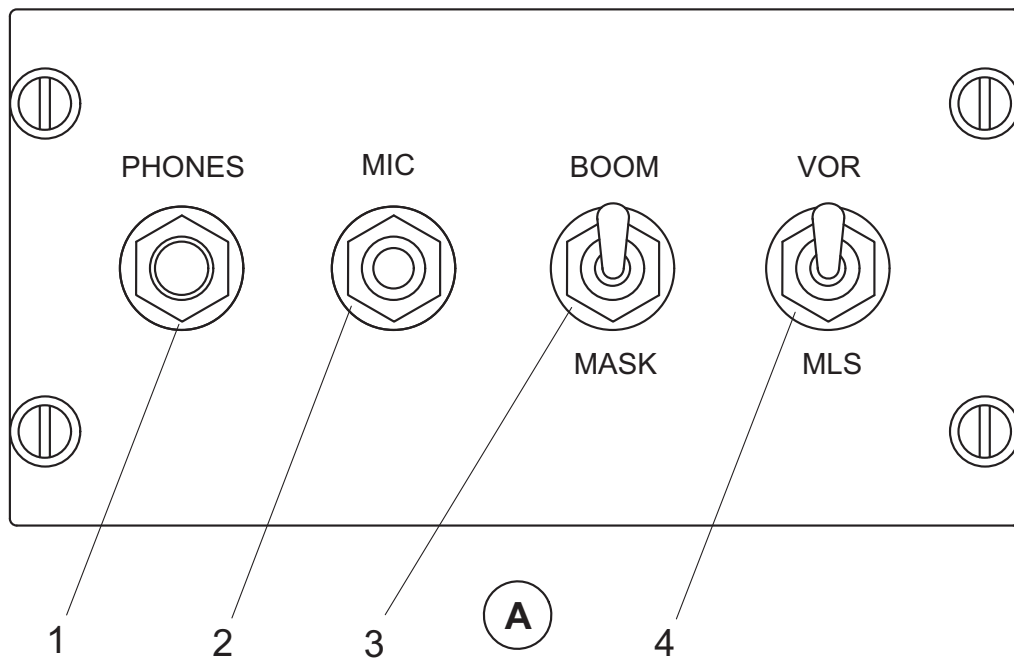
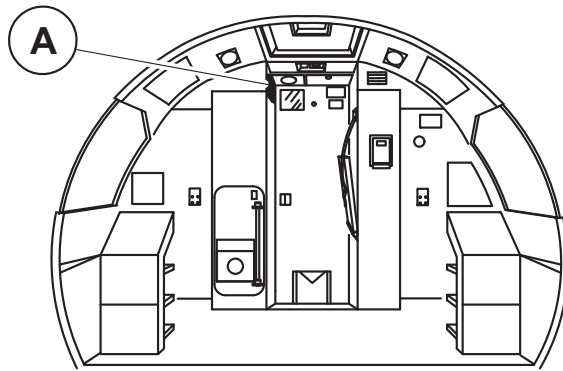


Figure 12.4-19 Observer's Jack Panel

OBSERVER'S JACK PANEL CALLOUTS

1. HEADPHONE JACK

- the headsets have a headphone plug that is connected to the NORMAL jack to supply headphone audio from the Remote Control Audio Unit (RCAU)

2. MICROPHONE JACK

- supplies boom microphone or oxygen mask microphone audio (depending on which is plugged in, and which is selected with the BOOM/MASK switch) to the RCAU

3. BOOM/MASK SWITCH (two position)

BOOM - supplies headset boom microphone audio to the Audio Integration System (AIS)

MASK - supplies oxygen mask microphone audio to the AIS

4. VOR/MLS TOGGLE SWITCH (two position)

VOR - lets the observer's Audio Control Panel (ACP) control the audio from the VHF navigation receiver that is selected on the Flight Guidance Control Panel (FGCP)

MLS - lets the observer's ACP control the audio from the optional MLS receiver that is selected on the Flight Guidance Control Panel (FGCP)

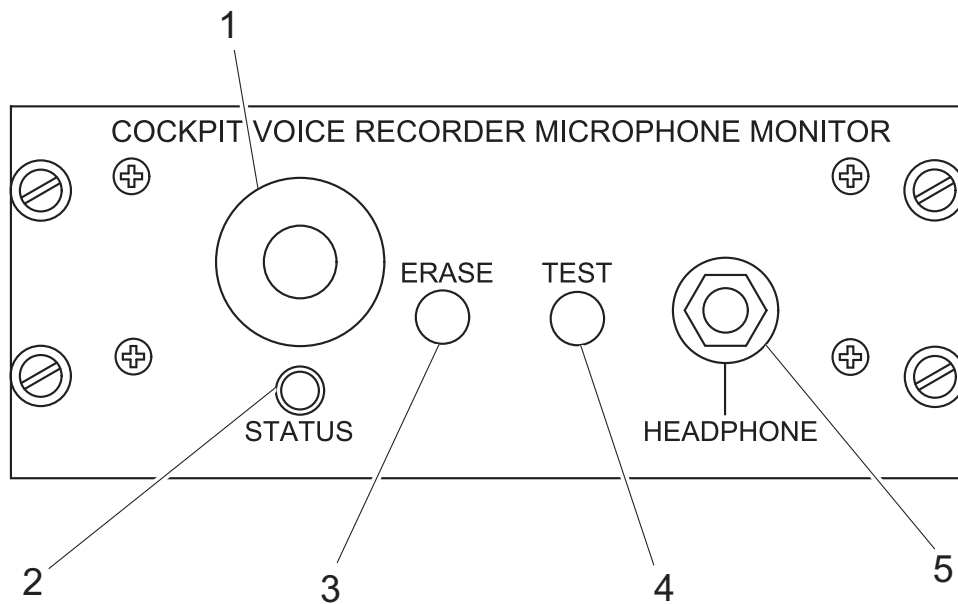
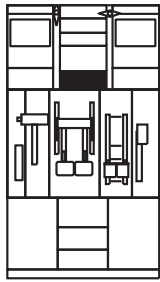


Figure 12.4-20 Cockpit Voice Recorder Monitor Panel

COCKPIT VOICE RECORDER CALLOUTS

1. AREA MICROPHONE

- the Cockpit Voice Recorder (SSCVR) system records the following channels of audio inputs:
 - Pilot
 - Copilot
 - Observer and Passenger Address (PA)
 - Flight deck area microphone

2. STATUS ANNUNCIATOR (red)

FOR 1 SECOND - indicates successful self test

CONTINUOUSLY - failure condition exists

3. ERASE PUSHBUTTON (momentary action)

PUSH - when pushed for 0.5 seconds or longer, erases all audio data when the parking brake is set and the aeroplane is on the ground

- it erases all audio data within 5 seconds of the selection
- the erase function is verified by a 400Hz tone in the HEADPHONE jack

4. TEST pushbutton (momentary action)

PUSH - momentarily pushed to test the CVR

- the CVR gives the following results within 3 seconds of successfully completing the self-test that follow:
 - an 800 Hz aural tone for 2 seconds at the audio monitor HEADPHONE output jack
 - the red STATUS indication turns on for 1 second on the Microphone Monitor Unit (MMU)

5. HEADPHONE JACK

- gives a continuous audio output channel which is the composite of the four audio input channels in real time
- a secondary function of this output is to give an aural tone to indicate successful completion of initiated self-test and erase functions

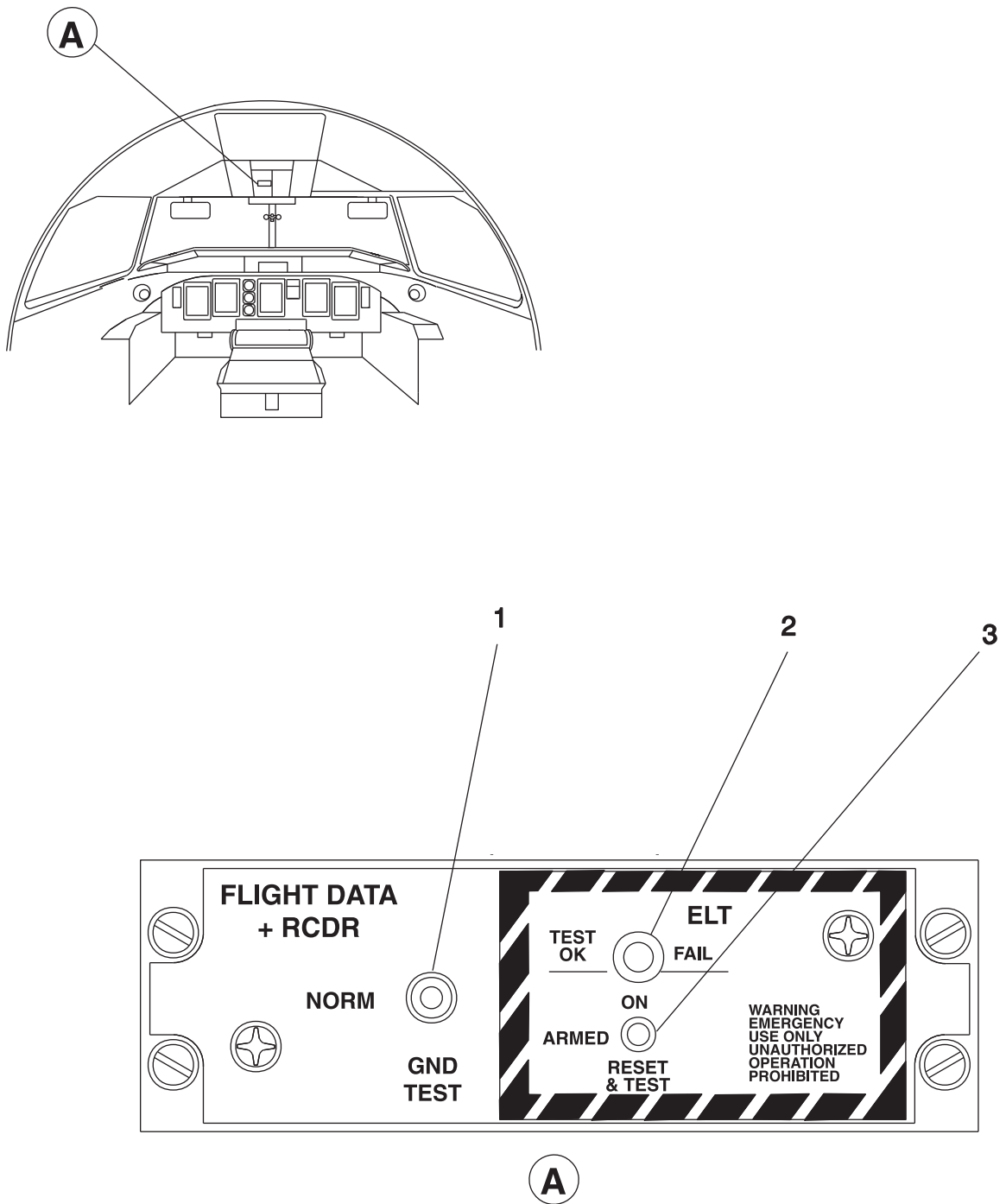


Figure 12.4-21-1 FDR and Three Freq ELT Control Panel

FLIGHT DATA RECORDER AND THREE FREQUENCY ELT CALLOUTS

THREE FREQUENCY ELT WITH COPAS/SRSAT KANNAD 406 MHZ FREQUENCY

1. GROUND TEST SWITCH (two position, spring loaded to center)

GND TEST - test the Flight Data Recorder (FDR) while the aeroplane is on the ground

- the RED-OFF-WHITE A/COL switch on the Exterior Lights Panel is set to OFF for the test
- this causes the FLT DATA RECORDER caution light to turn on
- the test is satisfactory when the FLT DATA RECORDER caution light goes out

2. ELT MONITOR LIGHT (red)

- see below

3. ELT REMOTE SWITCH (three position, spring loaded away from RESET & TEST)

ON - manually activates the ELT in the event of an emergency

- the ON selection overrides the automatic inertia switch
- the monitor light located above the remote switch comes on, flashing once every 4 seconds
- also provides a means to test the ELT during a preflight test

ARMED - operates in the automatic mode

- the ELT transmits when the inertia switch activates, and the red ELT monitor light located above the remote switch comes on
- it is activated by longitudinal inertia forces between 5 and 7 G (gravity) acceleration

RESET & TEST (momentary) - allows for reset of an inadvertent ELT activation

- re-arms the ELT and the ELT monitor light goes out
- select and hold to test for fault. Confirm ELT monitor light illuminate after approx. 3 seconds for one long flash. A series of short flashes indicates a fault

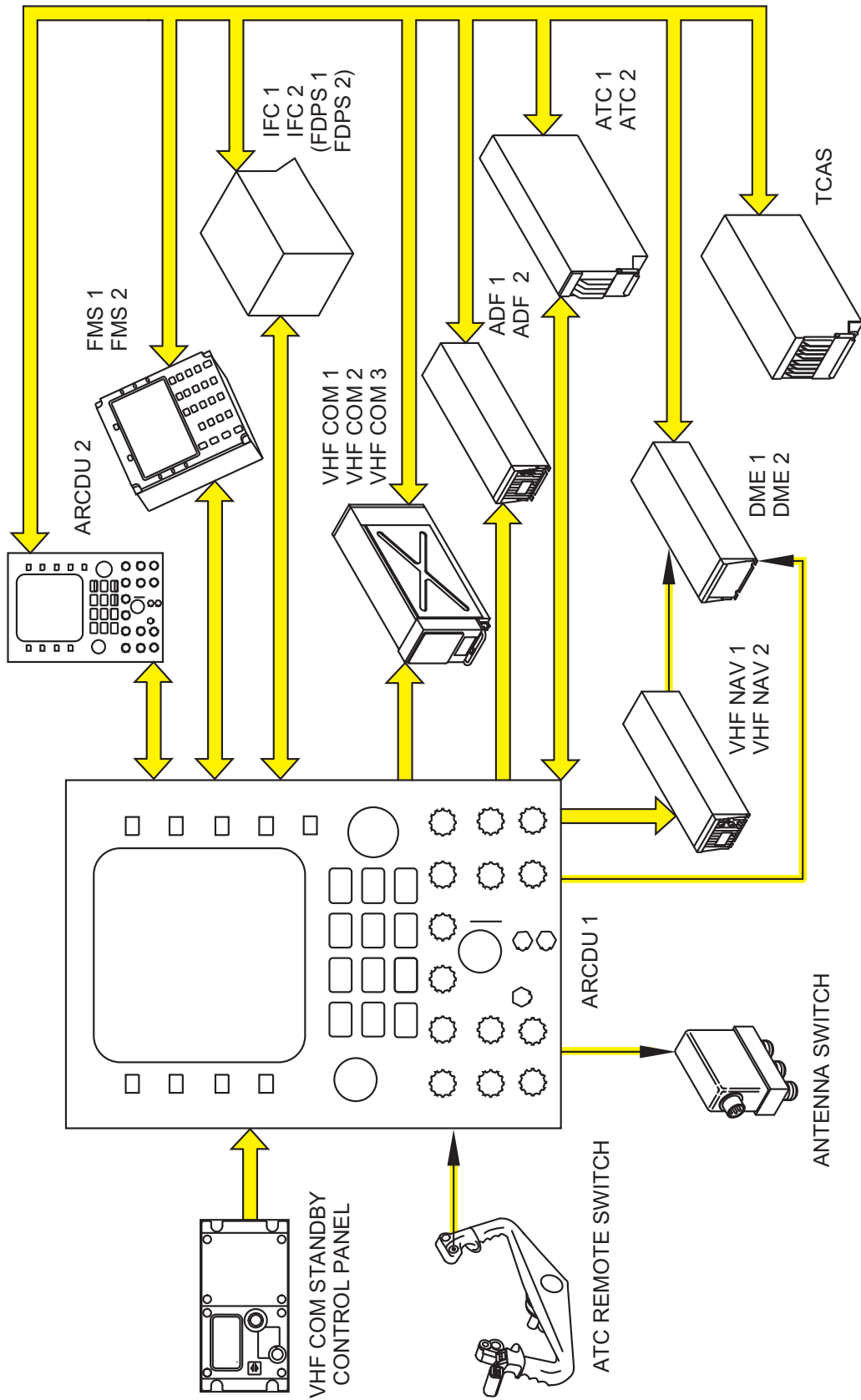


Figure 12.4-22 ARCDU Schematic (1 of 2)

12.4.4 Audio Radio Management System

The Radio Management System has two Audio and Radio Control Display Units (ARCDU 1, ARCDU 2). They are the principal crew interface component with the communication system. The ARCDUs have the crew functions that follow:

- Tunes the radio communication and radio navigation systems and controls their operational modes
- Shows all data that is related to the operation of the radio communication and navigation systems
- Controls the operation of the Passenger Address and Communication Interphone System (PACIS)
- Controls the audio selection to the pilots headphones and flight deck speakers
- Monitors the operation of the RCOM and RNAV systems to show malfunctions

The two ARCDUs are connected to each other and to the other systems (Figure 12.4-22, 23) that follow:

- Remote Control Audio Unit (RCAU)
- Radio Navigation receivers (RNAV)
- Traffic Collision Avoidance System (TCAS)
- Flight Data Processing System (FDPS)
- Flight Management System (FMS)

The Audio Integration System (AIS) uses the ARCDUs and Observer's Audio Control Panel to control the Remote Control Audio Unit (RCAU). The Audio Integration System (AIS) has the components (Figure 12.4-24) that follow:

- Remote Control Audio Unit, (RCAU)
- Observer's Audio Control Panel
- Flight Deck Speakers
- Hand Microphones
- Jack Boxes - Flight Deck
- Jack Box - Observer
- Jack - Ground Crew
- Cockpit Voice Recorder (CVR)

The Audio and Radio Control Display Unit (ARCDU) is the main interface between the pilot and the aeroplane Radio Communication Navigation equipment. It replaces all traditional radio control heads and audio control panels. All necessary in-flight information is continuously displayed on the two ARCDUs.

Most of the Communication and Navigation equipment can also be manually tuned by the Flight Management System (FMS) when installed.

In the event the Remote Control Audio Unit (RCAU) fails, a means exists to maintain communications. Selection of the NORM/EMER switch to EMER on the ARCDU and INT connects the pilot's headset directly to VHF Communication 1 audio output, and provides a direct connection of the pilot's transmitter keyline to VHF Communication transceiver No. 1 (when keyed). The copilot is similarly connected to VHF Communication transceiver No. 2 and INT. Indication of operation in EMER mode is provided by the word EMER in red characters on the third line of the INT display area on the ARCDU.

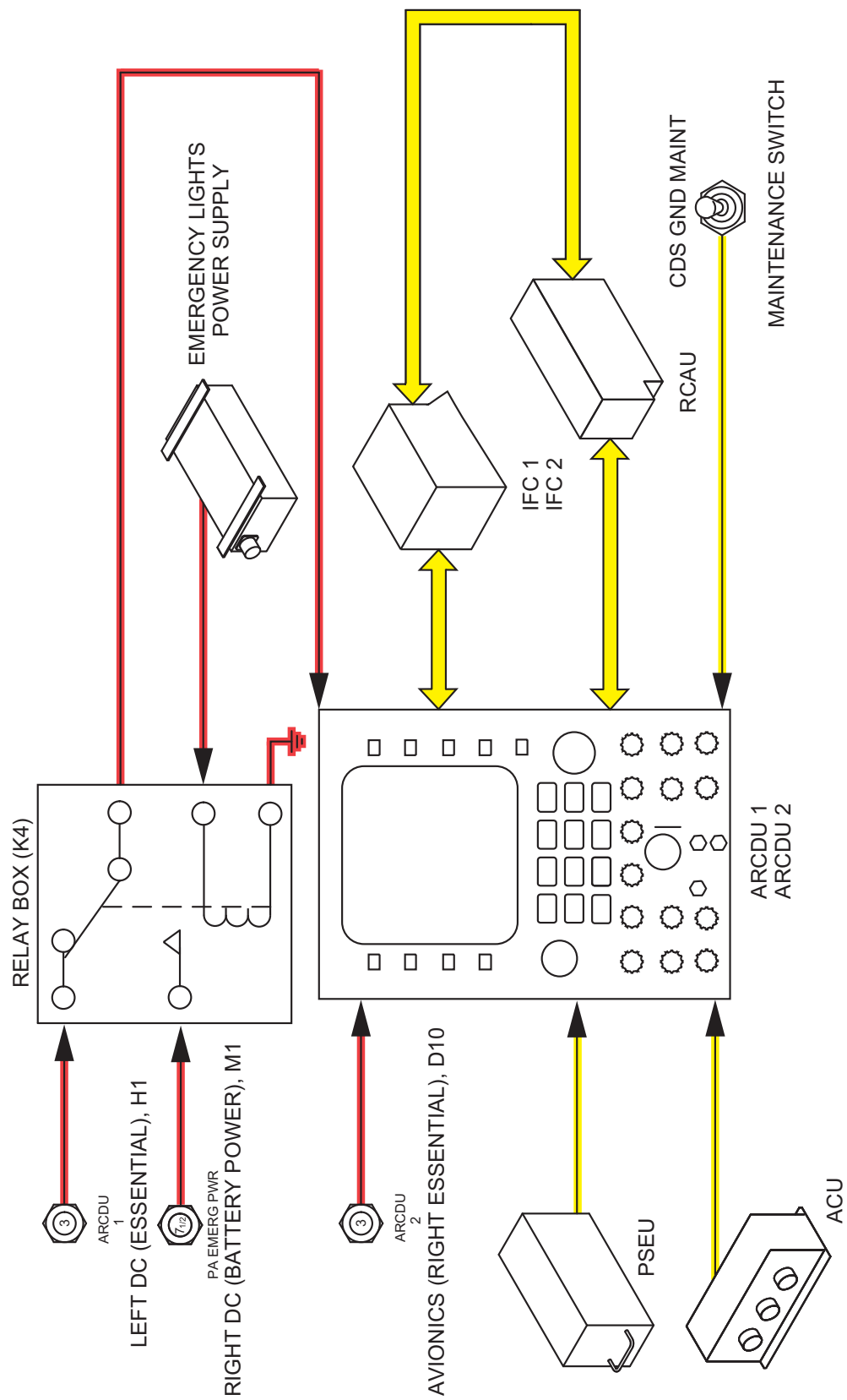


Figure 12.4-23 ARCDU Schematic (2 of 2)

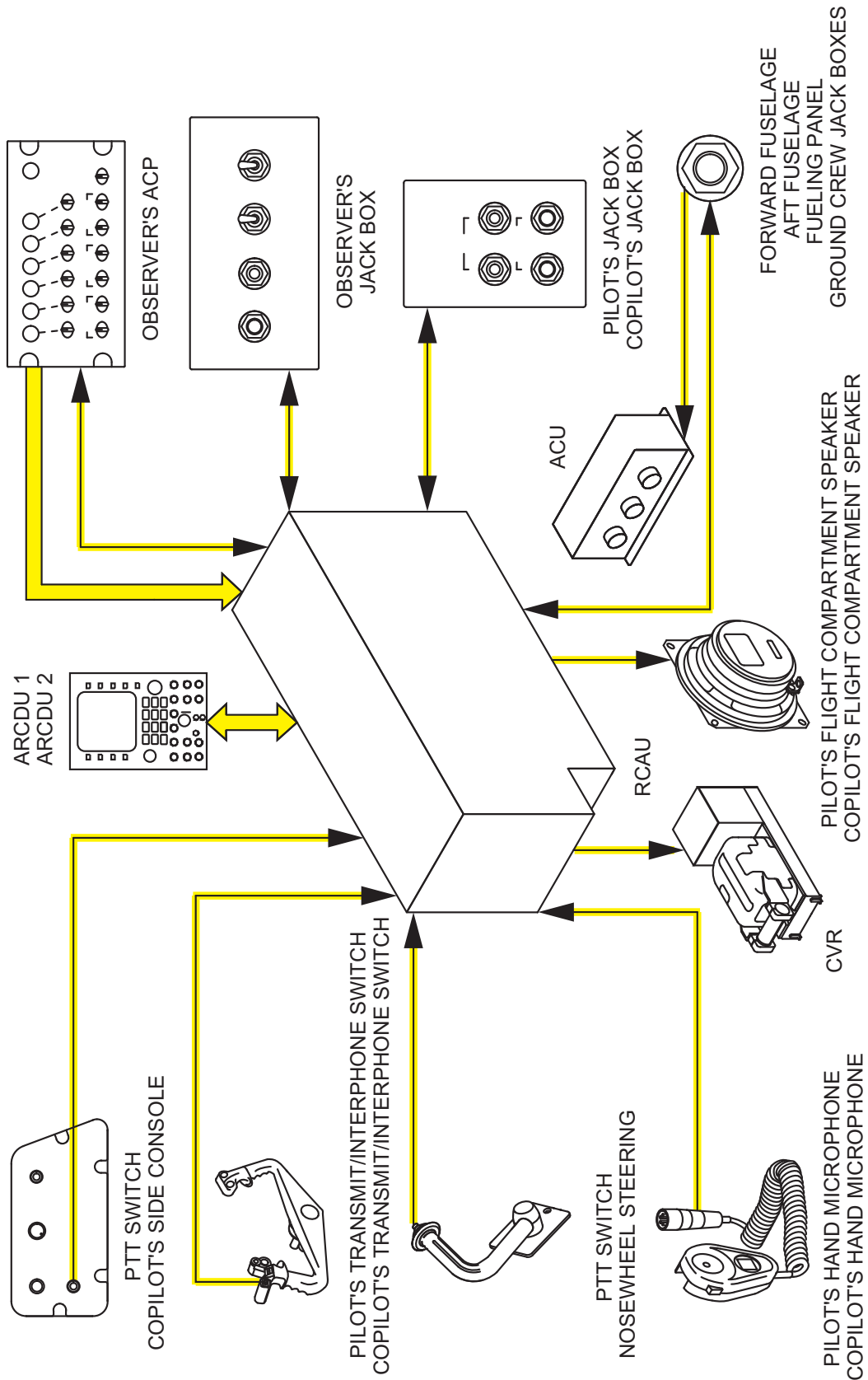


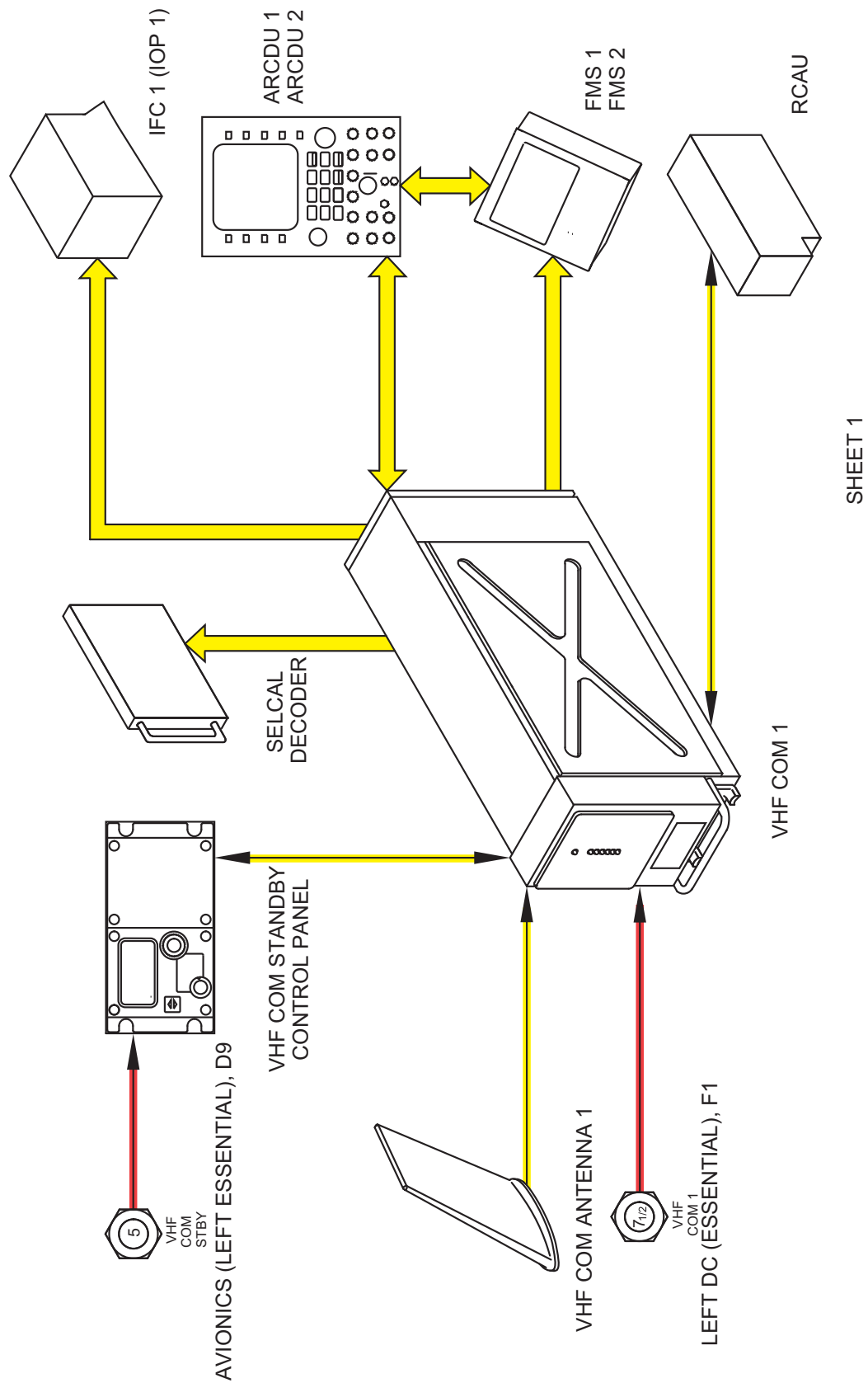
Figure 12.4-24 Audio Integration System

Loss of communication between the ARCDU and the RCAU audio channel dedicated to it, induces the audio channel to switch automatically in a pre programmed configuration (known as Automatic Reconfiguration) which is displayed on the ARCDU. The annunciation of loss of communication consists of the display of the message FAIL on the second line of the INT display area on the ARCDU. Audio is available for VHF1, VHF NAV1, and INT. Interphone is the only system selected for transmission and is in the HOT microphone mode. The copilot is similarly connected to VHF Communication receiver No. 2 and VOR No. 2.

EMER mode has precedence over Automatic Reconfiguration.

ARCDU1 is powered from the left essential bus and the right main bus. When the left essential bus malfunctions, the aeroplane's right main bus continues to supply electrical power.

The emergency lights operate a relay to change the power source from the left essential bus to the battery bus. The battery bus supplies 28 VDC power through a 7.5 ampere circuit breaker to the pilot's audio card, ARCDU1, the Passenger Address Amplifier (PAA), and the cabin attendants' handsets. (The PA system also continues to operate.)



SHEET 1

Figure 12.4-25 VHF1 Schematic

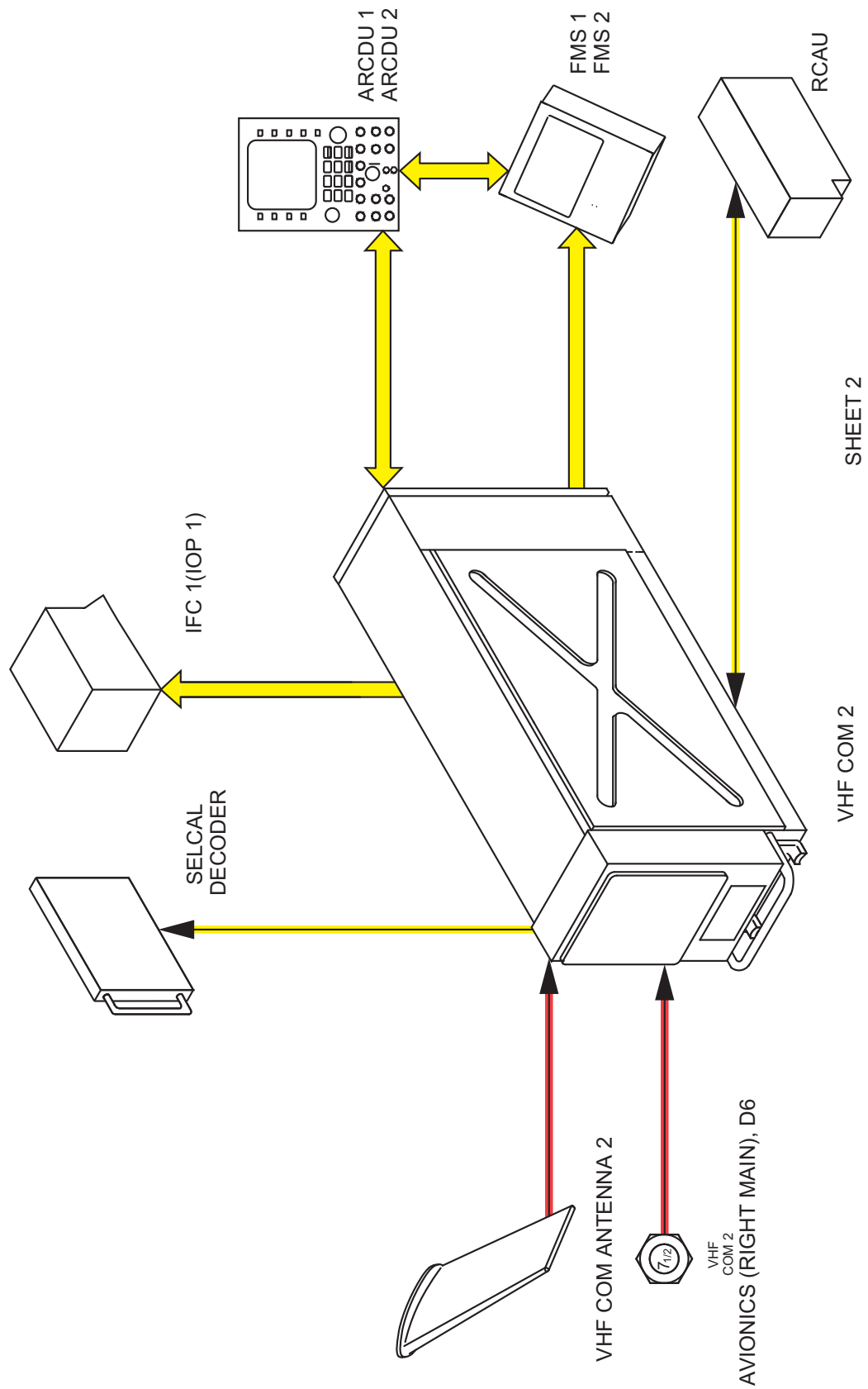


Figure 12.4-26 VHF2 Schematic

12.4.5 VHF Communication System

The VHF Communication System is used as the primary means of voice communication with ground-based Air Traffic Control (ATC) systems. It is also used for aeroplane-to-aeroplane communication or emergency purposes. Up to three VHF transceivers can be installed.

The VHF1 transceiver (Figure 12.4-25) is controlled by the equipment that follow:

- One Audio and Radio Control Display Unit (ARCDU) or the other
- Standby controller for VHF 1 transceiver
- Flight Management System (FMS) Multi-Functional Control Display Unit (MCDU)

A standby control panel is used to control VHF COM1 when both ARCDUs malfunction. The standby control panel will control VHF COM1 when it is powered.

The VHF2 (Figure 12.4-26) transceiver is controlled by the equipment that follow:

- One Audio and Radio Control Display Unit (ARCDU) or the other
- Flight Management System (FMS) Multi-Functional Control Display Unit (MCDU)

The ARCDUs are used to select VHF Communication modes, functions, and manually tune the VHF COM1 and VHF COM2 frequencies. The Flight Management System (FMS) will also tune the communication receivers.

Failure of the VHF Communications System or removal of 28 VDC to the system causes the applicable radio window of the ARCDU to display in red FAIL message in the location normally dedicated to the preset frequency at which point tuning is disabled.

The flight crew and observer can transmit and receive on the system through their ARCDU and Observer's Audio Control Panel (ACP) using:

- Headsets and boom microphones
- Hand-held (except observer) or oxygen mask microphones
- Overhead speaker in the flight deck

NOTE: Speaker audio is muted when the PTT/INPH switch on either control wheel is selected, or when the PTT switch on the nosewheel steering switch is pushed.

12.4.5.1 ACARS with 1/2 Size Printer and 3rd VHF (8.33 kHz)

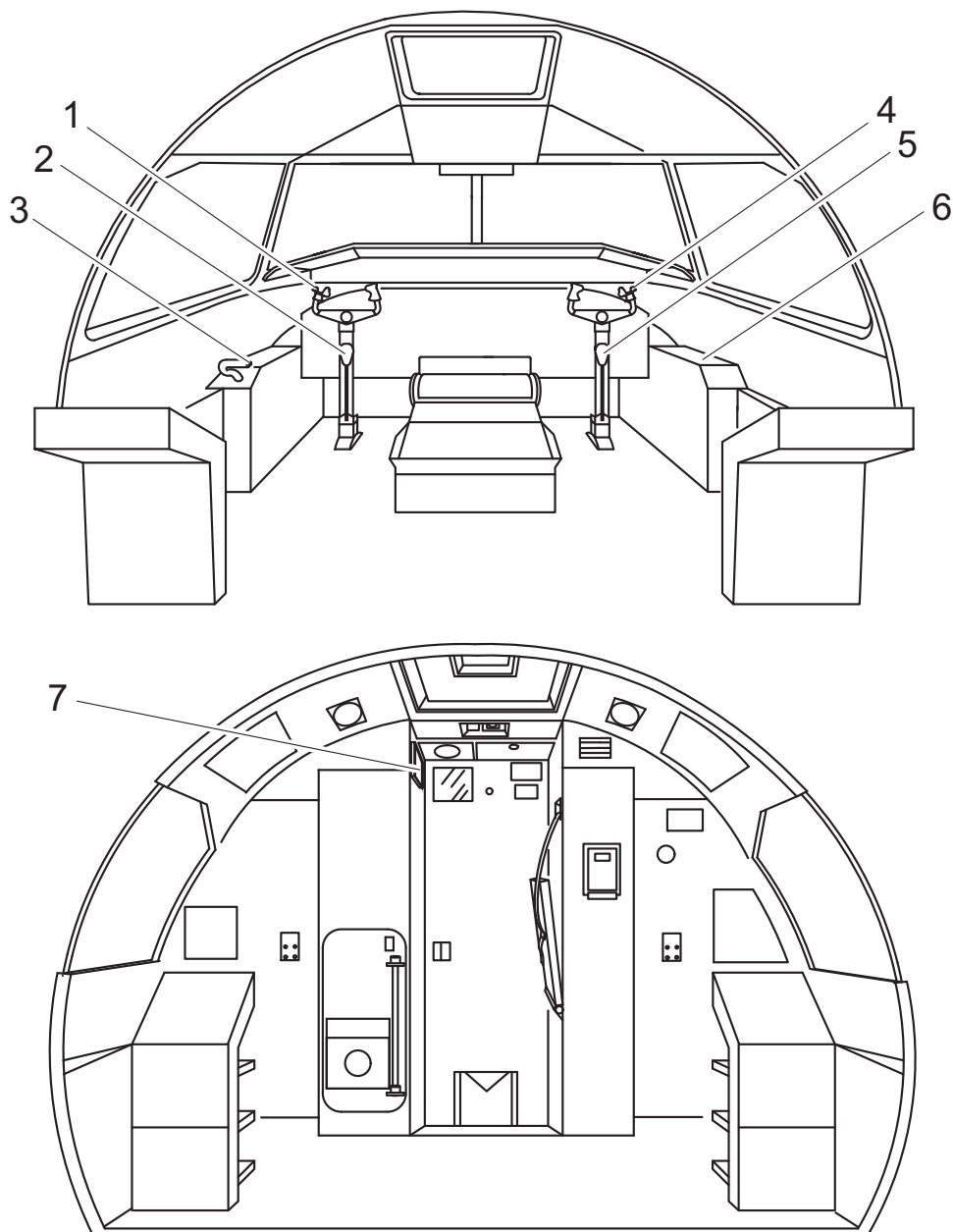
The Aircraft Communications, Addressing and Reporting System (ACARS) is an airborne data communication system. This allows aircraft data to be down loaded to a ground station while enroute. It also allows ground information such as clearance, weather information, gate assignments, etc. to be uploaded, all via a VHF Radio Link.

The Allied Signal MK II ACARS system works in conjunction with the Allied Signal Global Star 2100 FMS, which allows the multi-function Control Display Unit (MCDU) function of the FMS to be used as the ACARS control and display terminal.

The ACARS system communicates via a dedicated 3rd VHF Comm (Thompson EVR 76 VHF Comm) as a data link with the ACARS service provider. It is an independent system using a dedicated antenna and has no voice capability. The 3rd VHF Comm is tuned by the ACARS.

The ACARS maybe loaded and/or updated manually via an ARINC 615 portable data loader. It has the capability to download aircraft system data normally available from the IOP and FMS including the OOOI data (Out-Off-On-In) Position, etc.

Included with this option is an Allied Signal PTA - 45B Half Size Data Printer. It is mounted just below the forward side console on the co-pilot side.



LEGEND

1. Pilot's Hand Wheel Transmit/Interphone Switch.
2. Pilot's Hand Microphone.
3. Pilot's Nose Wheel Steering PTT Switch.
4. Copilot's Hand Wheel Transmit/Interphone Switch.
5. Copilot's Hand Microphone.
6. Copilot's Side Console Transmit/Interphone Switch.
7. Observers Transmit/Interphone Switch.

Figure 12.4-28 Flight Deck Interphone Components

The interphone system is for crew to crew communication. The system includes:

- Flight crew interphone (Figure 12.4-28)
- Service interphone
- Passenger Address/Communication Interphone System (PACIS-) CALL and EMER for flight crew to cabin crew communication

The flight crew interphone is for flight deck communication. The ARCDUs and the observer's Audio Control Panel (ACP) interface with the RCAU to control the:

- Push To Talk (PTT)
- Microphone audio (Figure 12.4-29)
- Headphone audio
- Interphone communications
- Speaker audio

The ability to detect a stuck hand microphone keyline is available. If the hand microphone keyline is activated for longer than 3 minutes, it is automatically disabled.

Each speaker has three sets of wires connected to it. One is controlled by the speaker pushbutton switches located on the ARCDUs to make an on or off selection. The other input is used for aural alerts. The volume level of the tone or synthetic voice message sounds cannot be adjusted by the flight crew.

The service interphone is used to communicate between the flight deck and ground crew. The system has three external ground crew stations, one on the left side forward fuselage (Figure 12.4-30), one at the REFUEL/DEFUEL panel in the right nacelle (see chapter 12.9, FUEL), and one in the tail of the aeroplane located near the CVR or FDR.

The Passenger Address and Communication Interphone System allows pilots and cabin crew:

- Private voice communication between the flight deck and cabin crew member (F/A) station (CALL or EMER)
- Visual and aural notification of both normal and emergency calls

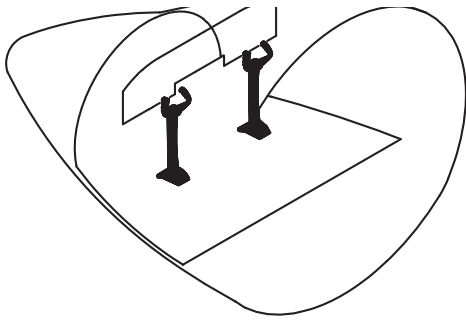
If the primary aeroplane power fails, the PACIS will receive power from the emergency lighting batteries.

The PA mode will continue to function even if the engines and auxiliary power have stopped and no external power sources are connected.

When the emergency lights are turned on, the pilot and the two flight attendants can make PA announcements when the primary electrical power source is not available. The battery bus supplies electrical power through the PA EMER PWR circuit breaker to the:

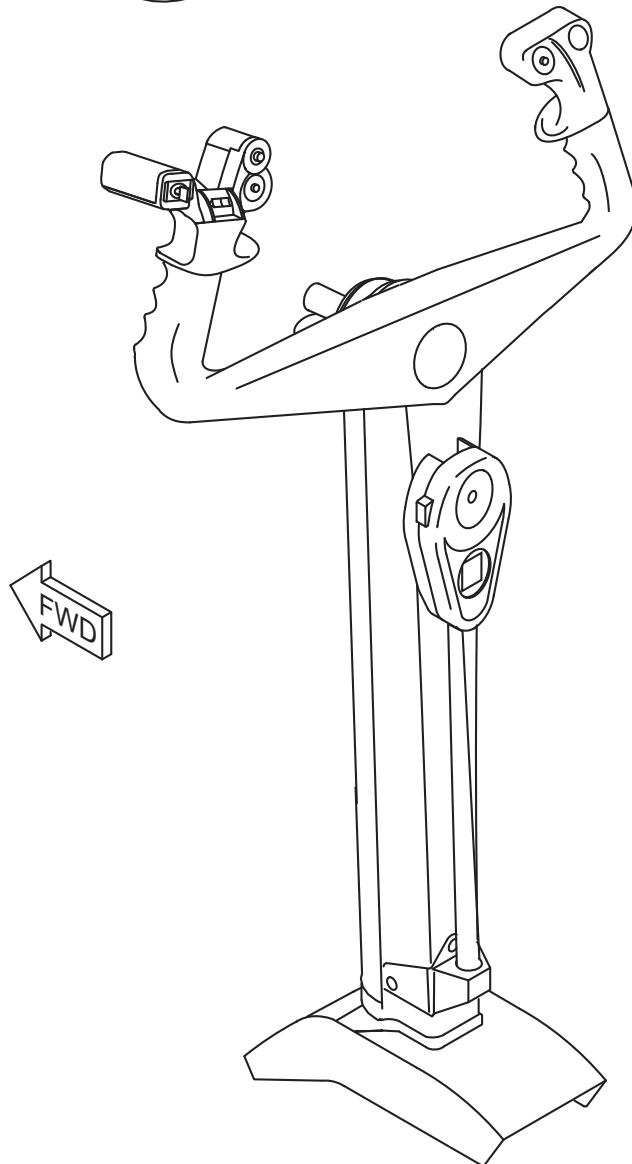
- PAA
- ARCDU 1
- Pilot circuit card in the RCAU
- Forward and aft flight attendant hand sets.

NOTE: The interphone system does not include PA functions, even though PACIS is used as part of the interphone system through use of CALL and EMER keys



NOTE

Pilot side shown.
Copilot side similar.



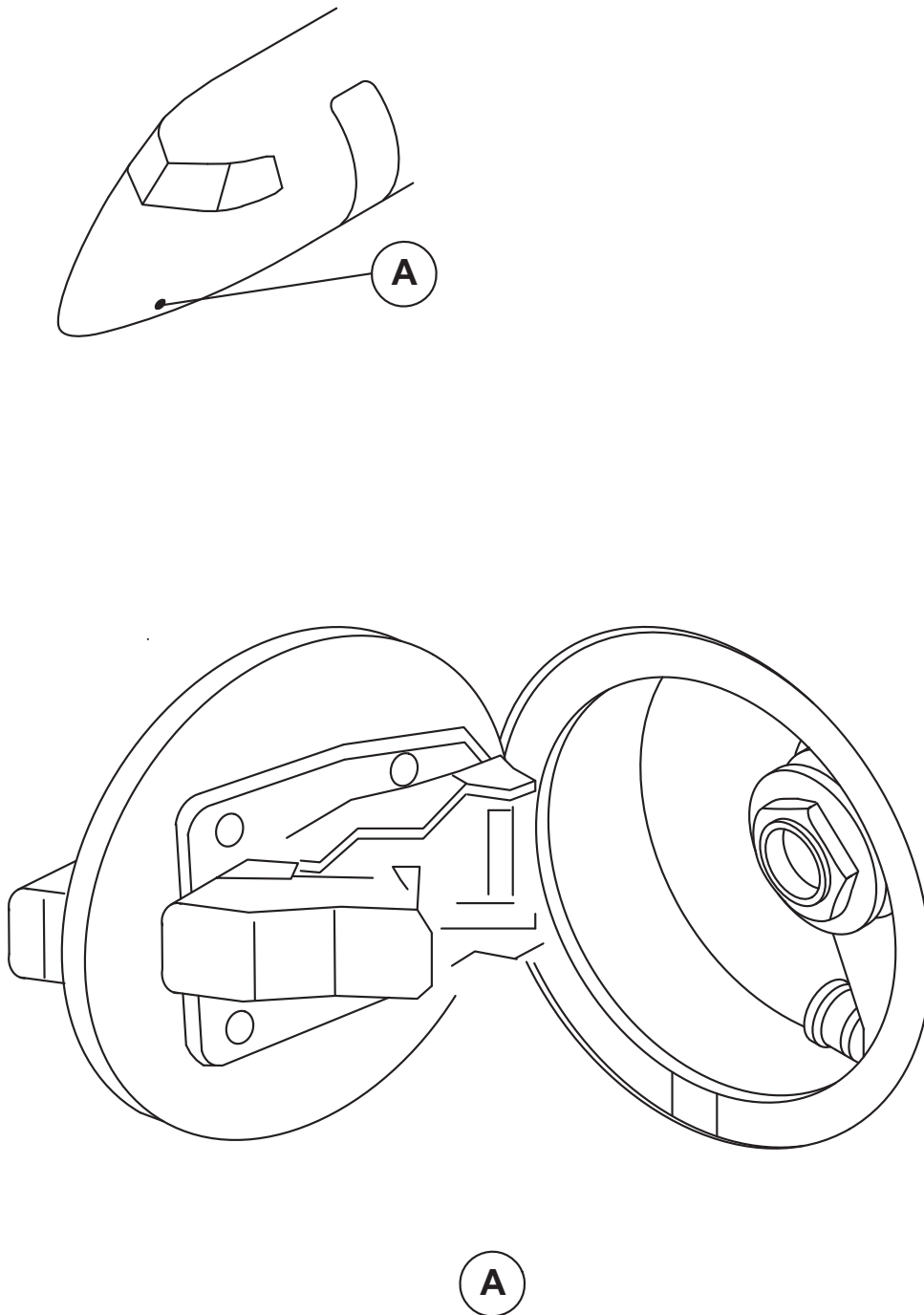


Figure 12.4-30 External Ground Crew Connection Point

12.4.7 Cockpit Voice Recorder

When the aeroplane electrical system is powered, the Solid State Cockpit Voice Recorder (SSCVR) system records the last two hours of:

- all flight crew communication
- flight deck area microphone
- PA announcements
- clock data

The CVR receives audio data from the Audio and Radio Management System (ARMS). It records audio in a digital format in crash-survivable Non-Volatile Memory (NVM).

The CVR is located in a crash-survivable case in the aeroplane tail. The control unit is in the CENTER console. An inertia switch removes power from the system if the G-forces are more than the preset limits. The CVR also has an Underwater Locating Device (ULD), which starts automatically when submersed in water.

12.4.8 Flight Data Recorder

The Flight Data Recorder (FDR) assesses, measures, and records parameters of flight for subsequent analysis. The FDR receives from the Integrated Flight Cabinet (IFC 1), the aeroplane parameters that follow:

- Flight path
- Speed
- Attitude
- Engine Power
- Configuration
- Operation

With power available, the FDR will record when any of the following conditions are satisfied:

- Anti collision light set to RED or WHITE
- Both engines running (based on oil pressure)
- Aeroplane airborne

The recorder is in a crash-survivable case in the aeroplane tail. On the ground, the system operates when there is electrical power on the aeroplane and the anti-collision lights are selected on. In the air, the flight data recorder will operate with the anti-collision lights on or off. An inertia switch removes power from the system if the G-forces are more than the preset limits.

The unit records 25 hours of data in a continuous loop format. The flight data recorder has an underwater locator beacon, which starts automatically upon contact with water.

12.4.9 Extended Storage Quick Access Recorder (EQAR)

The optional Extended storage Quick Access Recorder (EQAR) is an on-board recorder based on rewriteable optical disk technology and works in conjunction with the FDR. It records the equivalent information as recorded on the FDR including the Date and Flight Number if an alternate Clock option is installed. The equipment may be used as a Quick Access Recorder (QAR) or as Digital ACMS (Aircraft Condition Monitoring System) Recorder (DAR) for recording on-board aeroplane flight and message data supplied by the aeroplane FDPS. The EQAR will record approximately 320 hours of data.

12.4.10 Emergency Locator Transmitter

The Emergency Locator Transmitter (ELT) system provides the aeroplane with an independent and automatically latched continuous distress signal transmission. The ELT is a self-contained unit in the aeroplane dorsal fin. An inertia switch automatically starts operation of the ELT if the G-forces are more than the preset limits.

The ELT system also supplies the flight crew with the functions that follow:

- Visual annunciation of operation
- System reset capability when operating due to an automatically-latched initiation
- Manual system operation

The ELT can be manually operated by using the ELT remote switch on the OVERHEAD panel. The ELT transmits at the assigned international civil and military emergency frequencies of 121.5 MHz and 243.0 MHz. The ELT power supply is independent of the aeroplane electrical system. It uses an internal 7.5 VDC Alkaline and Manganese battery pack.

Three Frequency ELT with COPAS/SARSAT 406 MHz Frequency

The Kannad 406 AF ELT is a single transmitter unit capable of Fixed Manual and Automatic operation.

A remote control switch panel is located in the cockpit which controls the required operating and test functions, and provides a buzzer that satisfies the aural warning requirements of the system. It can be programmed to provide other forms of aircraft identification (i.e. aircraft nationality registration, etc.).

12.4.11 Limitations

See Chapter 12.4.9 Flight Data Recorder.