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1.05.20 TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS)

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20.3 OPERATION

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10.1 DESCRIPTION

(See schematic p 19/20)

The aircraft communication system provides :

- * radio communications between aircraft and ground stations
(an emergency beacon is also provided).
- * interphone between
 - cockpit crew stations
 - cabin attendant station
 - ground crew stations at :
 - hydraulic bay (left main landing gear fairing)
 - ground electrical power receptacle
 - unpressurized bay in the rear fuselage
- * passenger address system
- * distribution, (in the loudspeakers only) of aural alerts generated by the MFC and the GPWS

The main components of the systems are :

- The Remote Control Audio Unit (RCAU)
- The crew audio control panels.

In addition the communication system includes one ATC transponder and as options an other ATC transponder, ATSCALL and ACARS.

OPERATION

To communicate, the crew member select on their audio control panel the desired transmission key and adjust the volume control knob.

Transmission may be performed :

- using the hand mike with integrated switch
- using the boom set mike or the oxy mask mike with :
 - the PTT selector on the control wheel, or
 - the RAD/INT selector on the audio control panel, or
 - the switch located on the nose wheel steering control handle (for CAPT only).

Note : A switch located in the oxygen mask box when in released position (oxygen mask out), automatically transfer transmissions from the boom set mike to the oxygen mask mike. Transmission with hand mike remains available regardless of transfer switch position.

Radio reception is not affected by the transfer switch position.

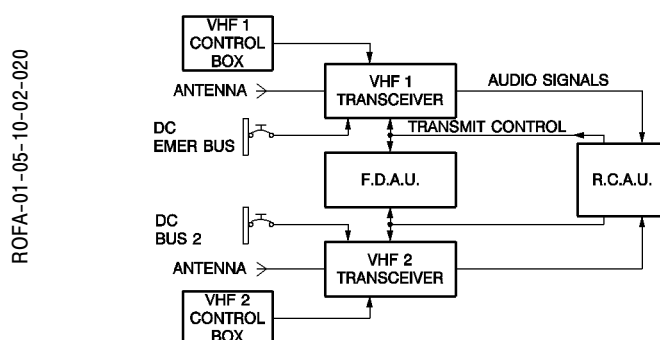
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VHF COMMUNICATION SYSTEM

Two systems are provided.

Each system has its own transceiver to provide communications on more than 2000 channels from 118.000 to 136.975 MHz with 8.33 KHz spacing, and is controlled by a VHF control box with dual channel selection.

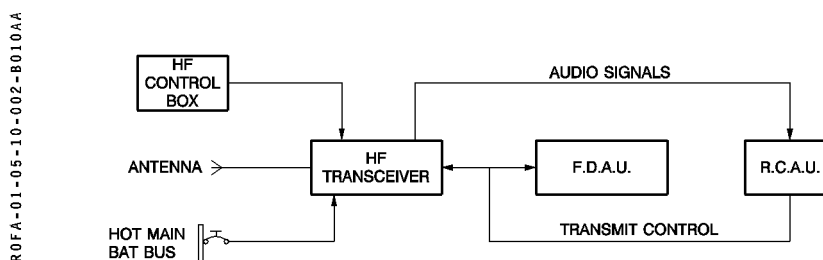


In case of audio control panel loss, two AUDIO SEL pbs allow to select one VHF on each side.

HF COMMUNICATION SYSTEM

The system provides the pilot access to 40 programmable channels, plus a full 280,000 operating frequencies in the 2.0 to 29.9999 MHz range.

It is controlled by a HF control box through its transceiver.



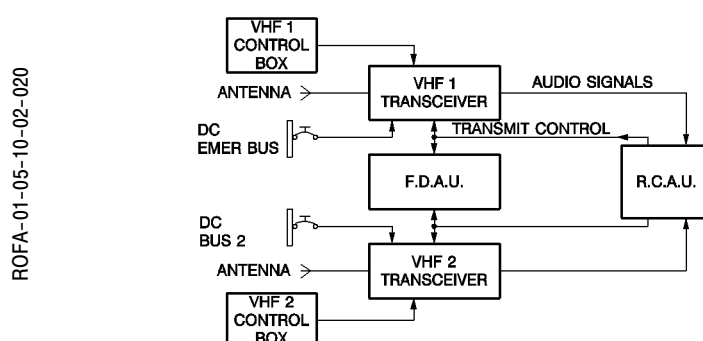
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VHF COMMUNICATION SYSTEM

Two systems are provided.

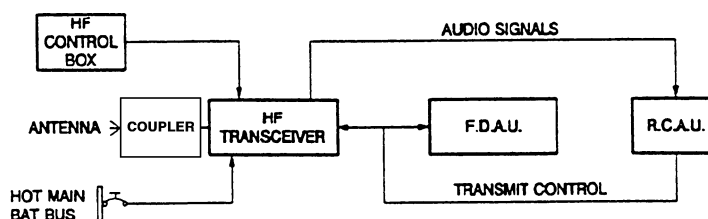
Each system has its own transceiver to provide communications on 720 channels (or 760 depending on version) from 118.000 to 136.975 MHz with 25 KHz spacing, and is controlled by a VHF control box with dual frequency selection.



In case of audio control panel loss, two AUDIO SEL pbs allow to select one VHF on each side.

HF COMMUNICATION SYSTEM

The HF system covers the 2.0 to 29.999 MHz frequency range in 100 Hz steps. Communication is possible in both simplex and half duplex in upper sideband (USB), lower sideband (LSB) when allowed, amplitude modulation equivalent (AME), continuous wave (CW) and optional frequency modulation (FM) mode. The system has the capability to store 99 user programmed preset channels. In addition, six emergency channel frequencies and all 249 half-duplex ITU maritime radiotelephone channels are programmed.



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INTERPHONE SYSTEM

- To interconnect all stations (ground crew stations + cockpit + cabin attendant) :
 - Depress INT transmissions key
 - Use PTT pbs
- Cockpit crew interphone
Using boom set or oxy mask :
 - Set the RAD/INT selector on "INT" position without use of PTT pb or,
 - Set the PTT selector (control wheels) in the forward position regardless of the RAD/INT selector position
- To call cabin attendant from the cockpit (see 1.05.10 p 9)
 - Depress the ATTND pb (overhead panel) for a normal call, or press the ATTND pb three times successively for an emergency call.

A single chime (or three for an emer call) is generated in the cabin and the CAPT white light illuminates on the cabin attendant panels. As soon as the cabin attendant selects "INT", the CAPT It extinguishes.

- To call cockpit from cabin attendant station
 - Depress INT pb (besides the hostess panel) for a normal call or press the EMER pb for an emergency call.

Associated ATTND light illuminates on overhead panel and a door bell is generated by the MFC. By pressing RESET, both visual and aural calls will be cancelled.

- To call the ground crew from the cockpit (see 1.05.10 p 9)
 - Depress MECH pb (overhead panel)

A horn call is generated in the nose gear bay.

- In case of ground crew call
MECH pb illuminates blue on overhead panel and a door bell is generated by the MFC. By pressing RESET, both visual and aural calls will be cancelled.

PASSENGER ADDRESS SYSTEM

The passenger address system allows the crew and the cabin attendant to make announcements to the passengers. Passenger address system also generates single chime sound in the cabin. The passenger address system is connected to :

- The RCAU which allows the cockpit crew to make announcements to the passengers by selecting PA key on audio control panel.
- The cabin attendant handset
- The cabin attendant call pb distributed in the cabin for the passengers
- The cabin attendant call pb in the cockpit
- The NO SMOKING/FASTEN SEAT BELTS controls
- The cockpit voice recorder
- Loudspeakers distributed in the cabin (one of them being installed in the toilet)

DISTRIBUTION OF AURAL ALERTS

Generated by CCAS (refer to chapter 1.02)

Generated by GPWS (refer to chapter 1.15)

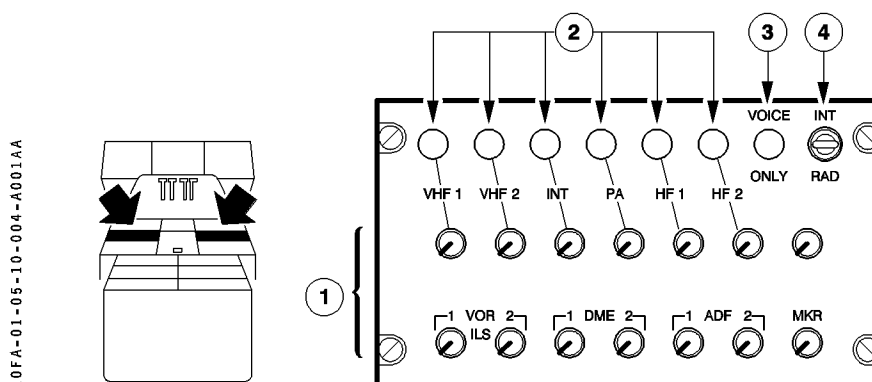
Generated by TCAS (when installed, refer to 1.05.20)

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10.2 CONTROLS

AUDIO CONTROL PANEL



- ① Volume control knob
To control reception volume for associated communication or navigation facilities.
- ② Transmission keys
To select the individual communication facilities for transmission, six interlocked keys are provided. Only one key can be engaged at a time. It illuminates white when selected.
- ③ VOICE ONLY key
When depressed, it inhibits NAV receivers station identification by activating a band cut off filter above 1020 HZ. Light illuminates amber.
- ④ INT/RAD selector
Provides selection of transmission mode when using OXY MASK or BOOM SET mike.

INT Hot mike position. Interphone is always operative between crew stations. Other transmissions require to select a transmission key and use a PTT pb.

NEUTRAL Only handmike is usable as long as one transmission key is selected.

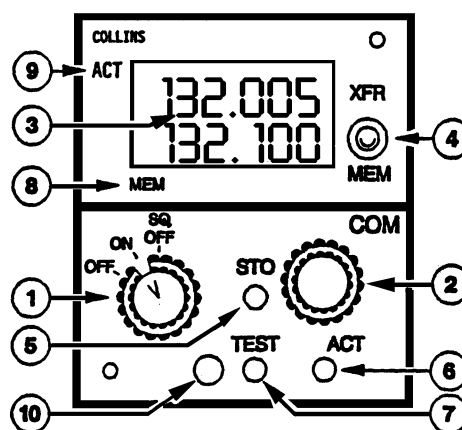
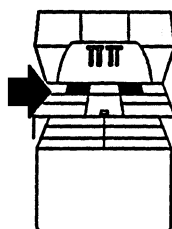
RAD This position is required to automatically connect for transmissions BOOM SET and OXY MASK mikes without using a PTT pb.

Note : Recovering boomset/micro function when the oxygen mask is out of its container : cf 1.07.20.

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ROFA-01-05-10-005-020



① ON/OFF and volume knob

Energizes the control box and the associated VHF. SQ OFF position disables the receiver squelch circuit.

② Channel selector

In normal use, controls the preset channel display :

- an outer knob is used for selection of numbers left of the decimal point
- an inner knob is used for selection numbers right of the decimal point

③ Channel display

The active channel is displayed on the first line.

The preset channel is displayed on the second line.

Annunciators are displayed on both lines.

④ XFR/MEM switch

This is a three positions spring loaded toggle switch.

- NEUTRAL
- XFR : exchanges preset and active channel.
- MEM : successive actions cycle the six memory channel through the display.

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⑤ STO button

Allows entering six channels in the memory .When depressed, the upper window displays the channel number of available memory (CH1 to CH6).For 5 seconds,the MEM swith may be used to advance through the channel numbers.

Push the STO button a second time enters the preset channel.

⑥ ACT button

Allows to change the active channel .When depressed, second line displays dashes, and first line can directly be tuned from channel selector.

Returns to the initial configuration when depressed a second time.

⑦ TEST button

Is used to initiate the radio self-test diagnostic routine.

⑧ Annunciators

Three types of messages can appear in this location.

MEM illuminates when a preset channel is being displayed on the second line.

RMT illuminate when the VHF is remotely tuned (by an FMS e.g.)

TX illuminates when the VHF is transmitting.

⑨ Compare annunciator

ACT signal illuminates when channels are being changed.

ACT flashes if the actual channel is not identical to the channel in the active channel display.

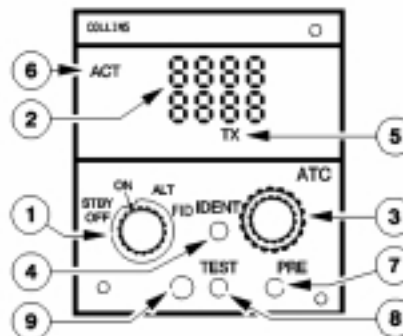
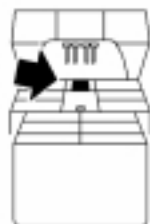
⑩ Light sensor

Automatically controls the display brightness.

CAUTION: Untimely squelch triggering may occur on the following channels 124.990 , 128.390 , 128.400 , 129.990 and 134.990 without disturb emission and reception.

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AA ATC CONTROL BOX



(1) - Power and mode switch

OFF ATC control box and transceiver are deenergized.

STBY ATC system is under power, but does not transmit replies.

ON ATC Transponder Mode S replies to both Mode A and Mode C interrogations but without from ground or air.

ALT Normal operating position. Transponder replies with flight level information.

FID Elementary Surveillance. Flight IDentification (FID) display and selection.

(2) - ATC Code and FID Display

Display selected ATC code and Flight ID.

(3) - Code select knobs

ATC : - Outer knob controls the two left-hand digits.

- Inner knob controls the two right-hand digits.

FID : - Outer knob selects digits.

- Inner knob controls digits.

(4) - IDENT button

When depressed, causes the transponder to transmit "IDENT" signal.

(5) - Annunciators

- TX is displayed when the ATC replies to an interrogation.

- RMT is displayed when the ATC is remotely tuned.

(6) - ACT Compare annunciator

ACT is displayed during code changes. ACT flashes when the actual reply code is not identical to the code shown in the active code display.

(7) - PRE button (Preset)

Push and hold the PRE button while turning the code select knobs to select a preset code for storage. The stored code can be recalled by momentarily pressing the PRE button again.

(8) - Test button

Press the TEST button to initiate the radio self test routine.

(9) - Photo cell

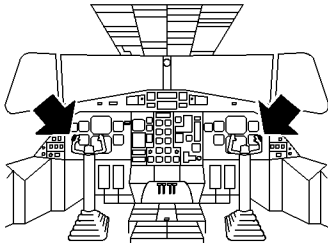
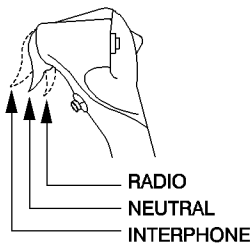
Automatically controls the display brightness.

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PTT SELECTOR

ROFA-01-05-10-008-A001AA



The outboard horn of both control wheels is provided with a PTT selector controlling the transmission mode and effective only when BOOM SET or OXY MASK mike is used for transmission.

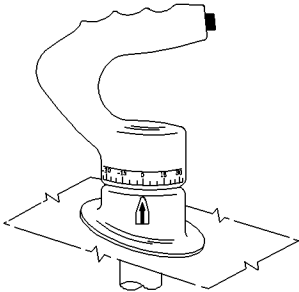
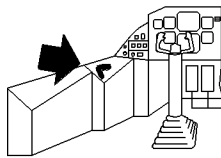
Interphone Forward position springloaded to neutral. transmission on flight interphone selected. INT transmission key has not to be used to communicate between cockpit crew stations.

Neutral Center position. Transmission is not possible. Reception is normal. Hand microphones are connected for transmission when keyed.

Radio Backward position springloaded to neutral. BOOM SET or OXY MASK is connected for transmission over the selected communication facility.

NOSE WHEEL STEERING CONTROL SW

ROFA-01-05-10-008-B001AA

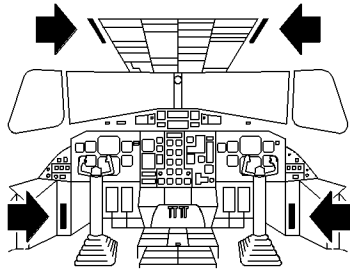


When depressed, BOOM SET or OXY mike is connected for transmission over the selected communication facility.

HEAD SET/BOOM SET PANEL/HAND MIC PANELS

ROFA-01-05-10-008-C001AA

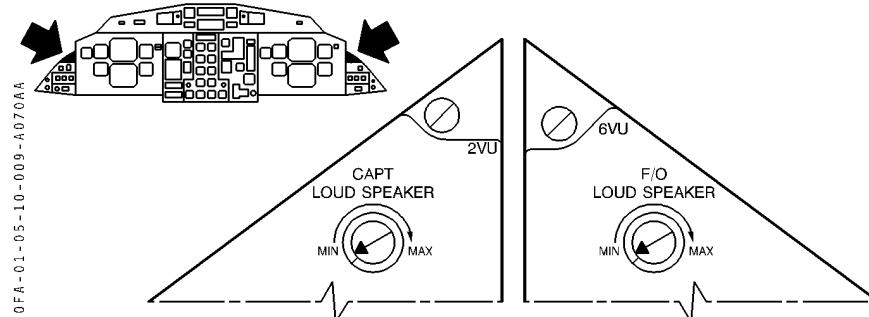
Allow connection of a boom set, a head set and a hand mike.



 ATR 72 F.C.O.M.	COMMUNICATIONS		1.05.10		
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LOUDSPEAKERS VOLUME KNOBS

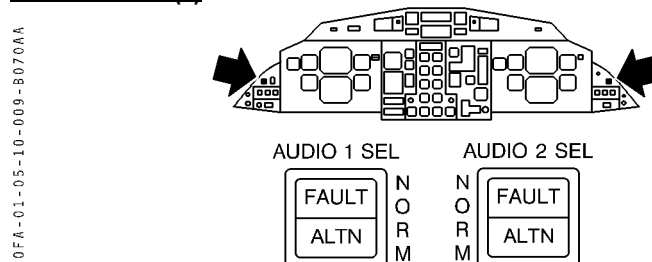


Communication reception over cockpit loudspeakers is controlled by an individual knob for each of the two cockpit loudspeakers.

Note : In case of aural alert :

- normal volume is always available regardless of knobs position.
- during any transmission, the volume of both loudspeakers is muted.

AUDIO SEL PB(s)



Controls functioning of associated RCAU processing board.

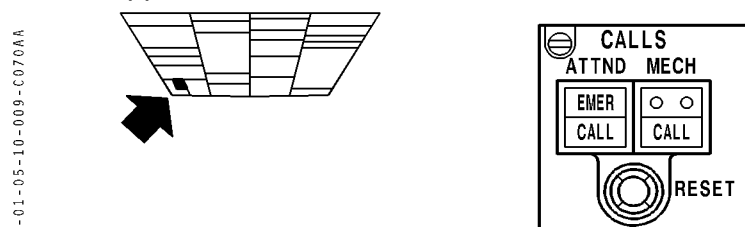
NORM (pb depressed) RCAU functions normally.

FAULT illuminates amber and the CCAS is activated when an associated RCAU processing board failure or power loss is detected.

ALTN (pb released) affected crew station is connected directly to :
VHF 1 if CAPT station is affected or VHF 2 if F/O station is affected.
Volume is adjusted by affected loudspeaker volume control.

Note : On the affected side PA, interphone and other VHF can not be used any longer.

CALLS PB(s)

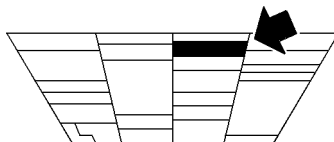


See 1.05.10 p 3

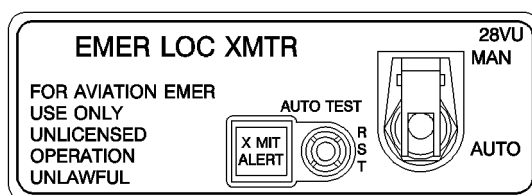
 ATR 72 F.C.O.M.	COMMUNICATIONS		1.05.10		
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EMERGENCY BEACON



R0FA-01-05-10-010-A050AA



The transmitter is located in the ceiling of the cabin between the passengers entry door and the toilet door. The antenna is located in the fairing ahead of the stabilizer fin. This system includes its own battery.

AUTO transmission is made automatically on 121.5 MHz, 243 MHz and 406 MHz when deceleration exceeds 5 g (X MIT ALERT It illuminates amber).

MAN allows commanded operation (X MIT ALERT It illuminates amber).

AUTO TEST RST is used in case of undue alert (reset), or to test the emergency beacon. Two cases are possible for the test :

- Net work X MIT ALERT illuminates amber during 2 seconds.
- Failure X MIT ALERT It flashes during 15 seconds.

CAUTION : The test must not be performed in MAN mode.

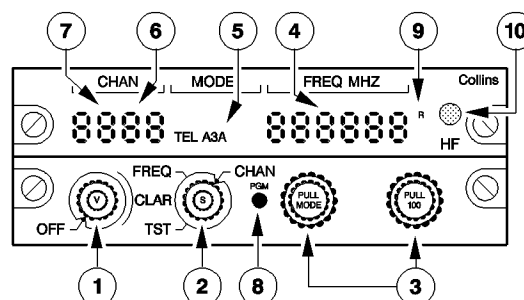
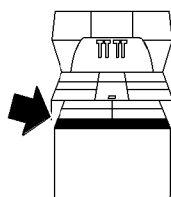
R Aircraft on ground (and electrically supplied), when the emergency beacon is triggered
R after 30 seconds, the mechanical horn is triggered too.

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HF CONTROL BOX

R0FA-01-05-10-011-A010AA



① – ON/OFF and CLARIFIER knobs

- Inner knob turns ON and OFF the system, and controls the volume.
- Outer knob (clarifier) adjusts received frequency in case of single sideband operating mode.

② – SQUELCH/FREQ-CHAN selector

- Inner knob allows to reduce background noise when not receiving a signal.
- Outer knob selects channel mode or discrete frequency mode of operation.
 - FREQ : selection knobs ③ allow to directly select used frequency (displayed on ④).
 - CHAN : selection knobs ③ allow to select :
 - Either a 2-digit channel number (displayed on ⑥) received to store a frequency on this channel.
 - Either a 4-digit ITU (Maritime) channel number (displayed on ⑥/⑦) corresponding to a duplex function : on each ITU channel, a received frequency and a transmit frequency are automatically stored.
- When an ITU channel is selected, received frequency is displayed on ④. When transmitting, transmit frequency is displayed on ④.

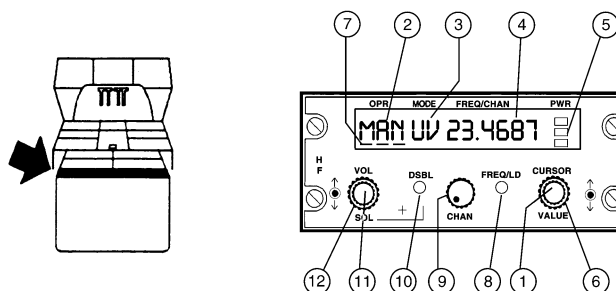
③ – CHANNEL/FREQUENCY selection knobs

- When FREQ/CHAN selector is in "FREQ" position.
 - Left outer knob : Selects and displays the MHz digits (1 through 29).
 - Left inner knob : * Pusher in : selects the 100 Hz digits (0 through 9).
* Pulled out : selects HF modes (USB, AM or LSB).
 - Right outer knob : Selects and displays the 10 KHz digit (0 through 9).
 - Right inner knob : * Pushed in : selects the 1 KHz digit (0 through 9).
* Pulled out : selects the 100 Hz digit (0 through 9).
- When FREQ/CHAN selector is in "CHAN" position.
 - Left outer knob : Selects the ITU band (first two digits) in case of ITU channel selection. When turned down, the two first digits disappear, and right outer knob displays a storing channel.
 - Left inner knob : * Pushed in : has no effect.
 - Left inner knob : * Pulled out : selects modes (TEL SUP CAR or TEL PLT CAR) in case of ITU channel selection.

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HF CONTROL BOX



(1) **CURSOR** - The cursor control moves the cursor left or right to select the field to be changed. A segmented line display is positioned under field to be changed (OPR. MODE. FREQ/CHAN. or PWR) by rotating CURSOR control.

(2) **OPR** - The OPR field displays the system operating mode. The available modes include the following :

- CHN - Channel mode ; allows selection of user-programmed channels.
- EMR - Emergency mode ; allows selection of preprogrammed emergency channels.
- EXT - External mode ; selects external system control.
- MAN - Manual mode ; allows selection of a discrete frequency and mode.
- MAR - Maritime mode ; allows selection of built-in maritime channels.
- PGM - Program mode ; used to program channels.
- SBY - Standby mode.
- SCN - Scan mode ; allows scanning (reception) of user-programmed channels.
- TST - Test mode ; selects built-in test (BIT).

The OPR field will display FLT (fault) or WRN (warning) should a fault or warning occur in the system. The OPR field will momentarily display VOL (volume) or SQL (squelch) when either the VOL or SQL control settings are changed. The VOL or SQL levels will be displayed at the same time in the FREQ/CHAN field.

(3) **MODE** - The MODE field uses two alphanumeric characters to display the RF emission mode. The emission mode is selected using the VALUE control. The system makes available the following RF emission modes.

- UV - Upper sideband voice
- LV - Lower sideband voice (where allowed)
- UD - Upper sideband data
- LD - Lower sideband data (where allowed)
- AM - Amplitude modulation equivalent
- CW - Continuous wave
- FM - Frequency modulation (option)

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- Right outer knob : Selects the individual channel number (last two digits) in case of ITU channel selection.
Selects the two digits storage channel in case of programming use.
When selecting beyond 1 or 40 channel number, ITU channels will appear.
- Right inner knob : Has no effect.

④ Frequency display

Displays the frequency (directly selected or channel-stored).

⑤ Mode display

Displays the associated mode (for normal frequencies or ITU channels).

⑥ CHANNEL display - Right digits

Displays the individual channel number, or the storage channel number.

⑦ CHANNEL display - Left digits

Displays the ITU band in case of ITU channel selection.

⑧ PGM (Program) switch

Allows to store frequencies in the 40 available channels by the following mode :

- Selector on "CHAN" position.
- Select the desired user channel by using selecting knobs ③.
- Press PGM button. The whole display blinks.
- Select the desired frequency and mode by using selecting knobs ③.
- Press PGM button again to store the frequency.

At this point, three ways are possible.

- Store a received only frequency : only wait 20 s that the display blinking stops.
- Store a simplex channel : press PGM button a third time to store the blinking frequency as a transmit frequency. Received and transmit frequencies are now the same.
- Store a half duplex channel : during the display blinking time (20 s) a second frequency can be selected as a transmit frequency. The considered channel stores the first frequency as a receive one, and the second frequency as a transmit one.

⑨ Indicator

- "R" indicates that the system is in received mode.
- "T" indicates that the system is in transmit mode.

⑩ Photo cell

Automatically adjusts display brightness.

Note : Depending on version one or two identical HF control boxes may be installed.
Only one antenna is associated with these two control boxes permitting two reception but only one emission at the same time.

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(4) **FREQ/CHAN**

- The frequency is displayed using all six digits and a decimal point. Change the frequency using the VALUE control.
- Channel selection is accomplished using either the CHAN or VALUE control.

(5) **PWR** - The power field is a 3-level bar indicator that displays the selected RF output power as follows :

Bottom bar - low power

Bottom two bars - medium power

All three bars - high power

Use the VALUE control to select the power level.

(6) **VALUE** - The VALUE control changes (increments or decrements) the field (OPR, MODE, FREQ/CHAN, or PWR) selected by the cursor.

(7) See (1)

(8) **FREQ/LD** - For simplex operation, press the FREQ/LD switch when PGM is displayed in OPR field to load desired receive-transmit emission mode, frequency, and channel data into non-volatile memory of the receiver-transmitter for the 99 user-programmable channels.

For half-duplex operation, press both the FREQ/LD switch and the microphone key to load transmit data.

Press the FREQ/LD switch when CHN is displayed in OPR field to recycle the channel and frequency display.

Press FREQ/LD switch when EMR or MAR is displayed in OPR field to view emergency (receive and transmit) or maritime (receive) frequency. Press FREQ/LD switch while keying microphone to view maritime transmit frequency.

(9) **CHAN** - The CHAN control provides selection of all preprogrammed (maritime, emergency, user-programmed) channels. Rotating CHAN control sequentially changes (increments or decrements) the current channel number regardless of cursor position.

(10) **DSBL** - Disables the squelch circuit

(11) **SQL** - Allows to reduce background noise when not receiving a signal.

CAUTION :

Collins ADF system is connected to HF9000 PTT to inhibit erratic bearing deviation during transmission. Should a permanent stuck-on PTT failure occur during more than 15 to 30 sec., the ADF bearing pointer will be parked in 90° position (ADF flag).

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LEFT INTENTIONALLY BLANK

	COMMUNICATIONS	1.05.10		
		P 14	001	
				DEC 96

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LEFT INTENTIONALLY BLANK

	COMMUNICATIONS	1.05.10		
		P 15	001	
				DEC 96

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LEFT INTENTIONALLY BLANK

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		P 16	001	
				JUN 97

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LEFT INTENTIONALLY BLANK

	COMMUNICATIONS	1.05.10		
		P 17	001	
	GENERAL			DEC 96

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10.3 ELECTRICAL SUPPLY/MFC LOGIC/SYSTEM MONITORING

ELECTRICAL SUPPLY

EQUIPMENT	DC BUS SUPPLY (C/B)	AC BUS SUPPLY (C/B)
VHF 1	DC EMER BUS (on overhead panel VHF 1)	– Nil –
VHF 2	DC BUS 2 (on overhead panel VHF 2)	– Nil –
CAPT audio system	DC ESS BUS (on overhead panel CAPT)	– Nil –
F/O audio system	DC ESS BUS (on overhead panel F/O)	– Nil –
ATC	DC EMER BUS (on overhead panel ATC)	– Nil –
TCAS (if installed)	DC BUS 2 (on overhead panel TCAS)	– Nil –
Attendant call	DC ESS BUS (on overhead panel ATTND)	– Nil –
Ground crew call	DC ESS BUS (on overhead panel MECH)	– Nil –
Passenger call system	DC ESS BUS (on overhead panel PUBLIC ADDRESS)	– Nil –
HF2 (when installed)	HOT MAIN BAT BUS (on overhead panel HF2)	– Nil –
HF1 (when a second HF is installed)	DC BUS 1 (on overhead panel HF1)	– Nil –
SELCAL (when installed)	DC BUS 1 (on overhead panel SEL CAL)	– Nil –

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MFC LOGIC

See chapter 1.01.

SYSTEM MONITORING

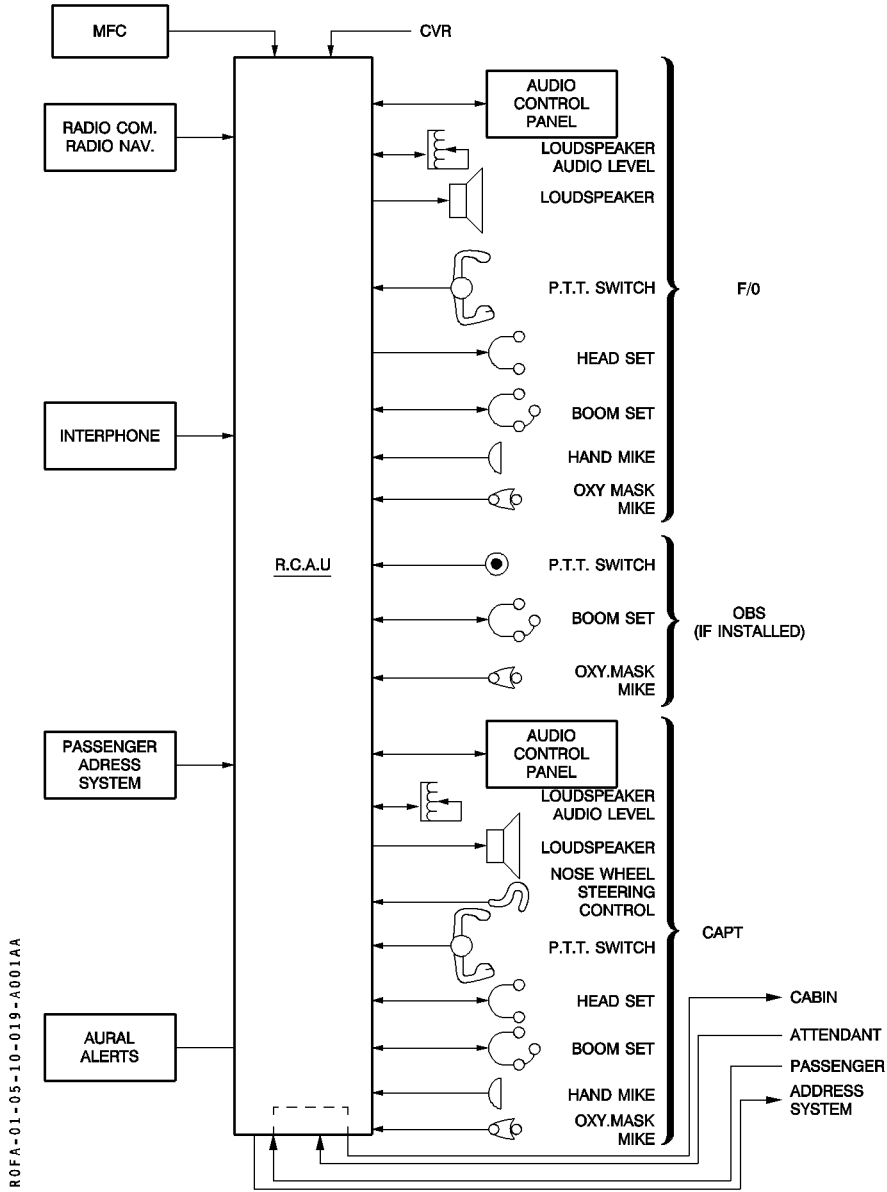
The following conditions are monitored by visual and aural alerts :

- RCAU processing board failure or power loss.
 - See AUDIO SEL FAULT procedure in chapter 2.05.12.

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10.4 SCHEMATIC



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20.1 DESCRIPTION

The TCAS is an on-board collision avoidance and traffic situation display system with computer processing to identify and display potential and predicted collision targets, and issue vertical resolution advisories on the pilot's TCAS vertical speed indicator (TCAS VSI) to avoid conflict. From the transponder replies, TCAS determines relative altitude, range, and bearing of any aircraft equipped with a mode C or S transponder. From this, TCAS will determine the threat using standardized algorithms. Outputs from the TCAS System are voice messages and visual displays on the TCAS VSI's for Resolution Advisories (TCAS RA's) and Traffic Advisories (TCAS TA's).

The TA is informative and indicates potential threats. The RA displays a threat resolution in the form of a vertical maneuver if the potential conflict is projected to occur.

Threat aircraft with mode A transponders will not provide altitude information ; therefore TCAS will not issue resolution advisories for these threats. The TCAS will not detect aircraft without transponders.

The TCAS is a single system installation consisting of :

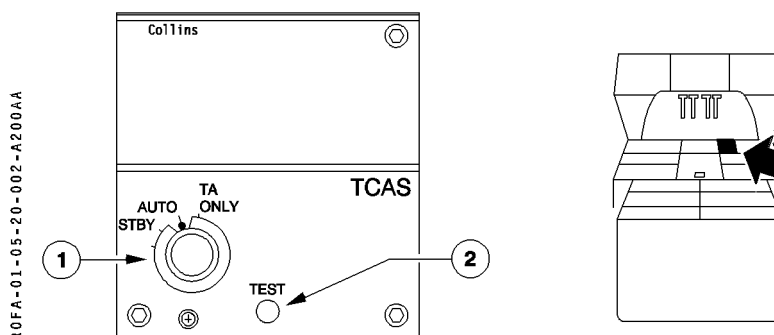
- One TCAS processor,
- two high resolution bearing antennae (one top mounted and one bottom mounted)
- two mode S transponders,
- two modified TCAS VSIs each integrating traffic advisory display and vertical speed information,
- one pylon mounted TCAS control box,
- two overhead speakers for voice messages and associated wiring.

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		P 2	200	
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20.2 CONTROLS

TCAS CONTROL BOX



① TCAS rotary selector

Enables TCAS to be set to standby (STBY), automatic (AUTO), or traffic advisories only (TA ONLY) mode of operation.

STBY : TCAS system is under power, but TCAS functions (intruder visualisation, Traffic Advisory mode or Resolution Advisory) are not operative.

AUTO : Normal operating mode of the TCAS.

TA only

- Disables the RA mode of operation.
- May be selected but should be used only to prevent unnecessary resolution advisory when operating near closely spaced parallel runways or in the cases TCAS could command Climb maneuvers resulting in an unsafe situation for the aircraft (see limitations on 2.01.05).

Note : - If altitude reporting is off or no valid ModeS transponder is selected, TCAS will be in standby (RA OFF on TCAS VSI).

- If appropriate, TCAS will automatically go into the TA only mode when the TCAS equipped aircraft is below the RA descent altitude and in a climb inhibit configuration.

② TCAS test function

- The TCAS should be tested by pressing the "TEST" button during cockpit preparation.
- Use of the self-test function in flight will inhibit TCAS operation for up to 20 seconds depending upon the number of targets being tracked.
- The mode S ATC transponder will no function during some portion of the self-test sequence.

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AA

DEFINITIONS

Ⓐ Advisory

A message given to the pilot containing information relevant to collision avoidance.

Ⓑ Corrective resolution advisory :

A resolution advisory that advises the pilot to deviate from current vertical speed, e.g., CLIMB when the aircraft is levelled.

Ⓒ Intruder

A target that has satisfied the TCAS threat detection logic and thus requires a traffic advisory.

Ⓓ Mode S :

Type of secondary surveillance radar (SSR) equipment which provides replies to mode A and Mode C interrogations and discrete address interrogations from the ground or air.

Ⓔ Preventive resolution advisory :

A resolution advisory that advises the pilot to avoid certain deviations from the current vertical speed because certain vertical speed restrictions exist.

Ⓕ Proximate traffic :

Nearby aircraft within ± 850 ft and 6NM which are neither an RA nor a TA.

Ⓖ Resolution advisory (RA) :

Aural and visual information provided to the flight crew to avoid a potential collision.

Ⓗ Threat :

A target that has satisfied the threat detection logic and thus requires a resolution advisory.

Ⓘ Traffic advisory (TA) :

Information given to the pilot pertaining to the position of another aircraft in the immediate vicinity. The information contains no resolution information.

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20.3 OPERATION

The TCAS provides two levels of threat advisories :

If the traffic gets between 20 and 48 seconds (depending on aircraft altitude) of projected Closest Point of Approach (CPA), it is then considered an intruder, and an aural and visual traffic advisory is issued. This level calls attention to a developing collision threat using the traffic advisory display and the voice message, "TRAFFIC TRAFFIC". It permits mental and physical preparation for a possible maneuver to follow, and assists the pilot in achieving visual acquisition of the threat aircraft.

If the intruder gets between 15 and 35 seconds (depending on aircraft altitude), of CPA, it is considered a threat and an aural and visual resolution advisory is issued. This level provides a recommended vertical maneuver using modified TCAS VSI's and voice messages to provide adequate vertical separation from the threat aircraft, or prevents initiation of a maneuver that would place the TCAS aircraft in jeopardy.

The TCAS resolution advisories are annunciated by the following voice messages, as appropriate :

- (A) "CLIMB, CLIMB, CLIMB" :
(Climb at the rate depicted by the green (fly to) arc on the TCAS VSI).
- (B) "DESCEND, DESCEND, DESCEND" :
(Descend at the rate depicted by the green (fly to) arc.)
- (C) "MONITOR VERTICAL SPEED, MONITOR VERTICAL SPEED" :
(Spoken only once if issued after a previous corrective advisory). Assure that vertical speed is out of the illuminated TCAS VSI red arc.
- (D) "REDUCE CLIMB, REDUCE CLIMB" :
(Reduce vertical speed to a value within the illuminated green arc).
- (E) "CLEAR OF CONFLICT" :
(Range is increasing, and separation is adequate, return to assigned clearance).
- (F) "CLIMB, CROSSING CLIMB, CLIMB, CROSSING CLIMB" :
(Climb at the rate depicted by the green (fly to) arc on the TCAS VSI). Safe separation will best be achieved by climbing through the threat's flight path.).
- (G) "REDUCE DESCENT-REDUCE DESCENT" :
(Reduce vertical speed to a value within the illuminated green arc).
- (H) "DESCEND, CROSSING DESCEND, DESCEND, CROSSING DESCEND" :
(Descend at the rate depicted by the green (fly to) arc on the TCAS VSI) safe separation will best be achieved by descending through the intruder's flight path.

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The following voice messages annunciate enhanced TCAS maneuvers when the initial TCAS RA does not provide sufficient vertical separation. The tone and inflexion must constate increased urgency.

- Ⓐ "INCREASE DESCENT, INCREASE DESCENT" :

(descend at the rate depicted by the green (fly to) arc on the TCAS VSI). Received after "DESCEND" advisory, and indicates additional descent rate required to achieve safe vertical separation from a maneuvering threat aircraft.
- Ⓑ "INCREASE CLIMB, INCREASE CLIMB" :

(climb at the rate depicted by the green (fly to) arc on the VSI). Received after "CLIMB" advisory, and indicates additional climb rate required to achieve safe vertical separation from a maneuvering threat aircraft.
- Ⓒ "CLIMB-CLIMB NOW, CLIMB-CLIMB NOW" :

(climb at the rate depicted by the green (fly to) arc on the TCAS VSI). Received after a "DESCEND" resolution advisory and indicates a reversal in sense is required to achieve safe vertical separation from a maneuvering threat aircraft.
- Ⓓ "DESCEND-DESCEND NOW, DESCEND-DESCEND NOW" :

(descend at the rate depicted by the green (fly to) arc on the TCAS VSI). Received after a "CLIMB" resolution advisory and indicates a reversal in sense is required to achieve safe vertical from a maneuvering threat aircraft.

All TCAS aural alerts are inhibited :

- below 1100 ft AGL when aircraft is climbing
- below 900 ft AGL when aircraft is descending

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- **NON ICING CONDITIONS** of inhibition

- ICING CONDITIONS of inhibition

- The “increase climb” RA is inhibited for certain above conditions.

- “DESCEND” RA’s are inhibited :

- “INCREASE DESCEND” RA’s are inhibited

- All RA's are inhibited :

- There can be a case where the threat aircraft track on altitude information is lost during an RA. In this case, the RA will terminate without a “CLEAR OF CONFLICT” annunciation.