2A-23-10: General

The communications system for the Gulfstream IV, shown in Figure 1, provides the flight crew with a means of communicating with ground stations and other aircraft using Very High Frequency (VHF) and High Frequency (HF) communications equipment. Provisions are also included for intercommunication with others aboard the aircraft and on the ground. Additionally, the most recent thirty (30) minutes of all audio signals transmitted and received by cockpit crew members is recorded by the cockpit voice recorder system in the event it should be needed for investigatory purposes. An ARTEX 406 MHz Emergency Locator Transmitter (ELT) system provides triple frequency homing transmissions when activated.

The communications system is divided into the following subsystems:

- 2A-23-20: VHF Communications System (Collins VHF-422 Transceivers with Gables Digital Frequency Control Units: Aircraft SN 1000 - 1309)
- 2A-23-30: HF Communications System (Collins HF-190 and HF-9000 Series Transceivers)
- 2A-23-40: Integrated Automatic Tuning System (Collins RTU-4200 Series Radio Tuning Unit: Aircraft SN 1310 and subsequent)
- 2A-23-50: Intercommunications System
- 2A-23-60: Cockpit Voice Recorder System
- 2A-23-70: Emergency Locator Transmitter System

Note To Operators: Because of the numerous possible communication system configurations, modifications and software levels, the data contained in these sections is limited to equipment description, controls and indications. For further details and specific operational procedures, the latest approved version of the applicable vendor-supplied pilot's manuals should be consulted. Where possible, these manuals will be identified in the appropriate section.

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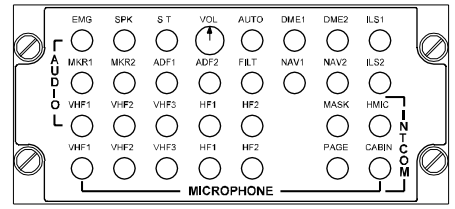

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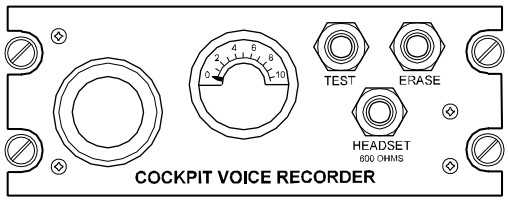

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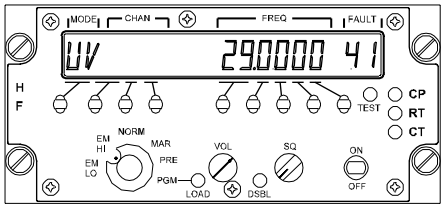
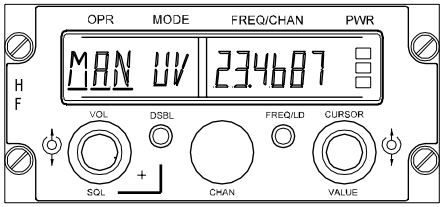
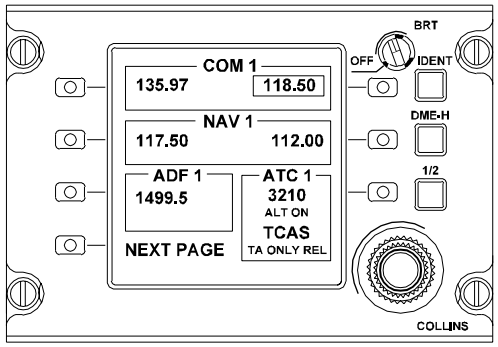


C HF-190



C HF-9000



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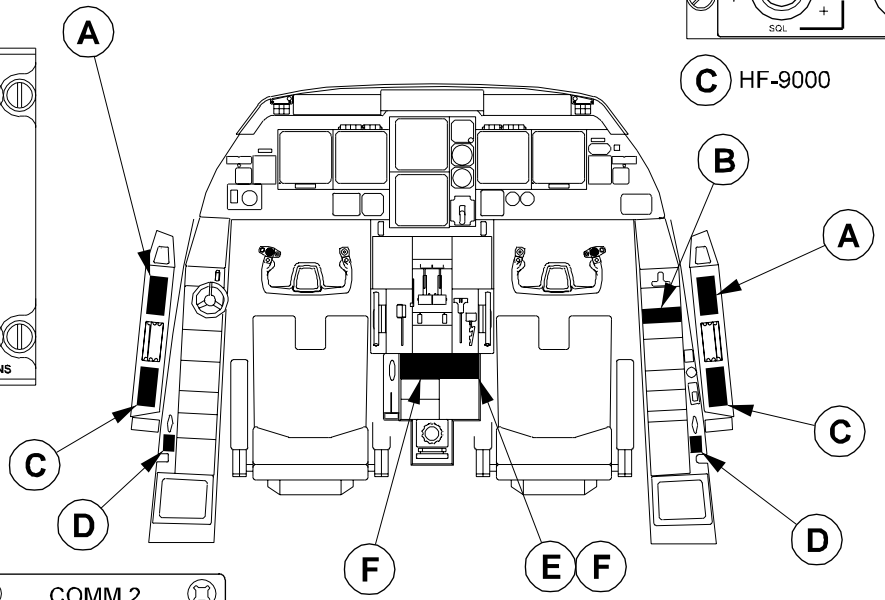

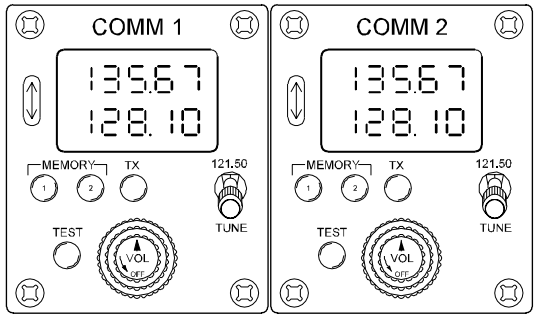

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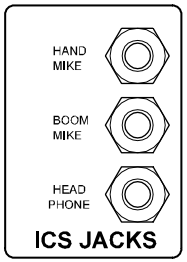


D

26016C00

GIV Communications
System Components
Figure 1

2A-23-20: VHF Communications System

THIS SECTION APPLIES TO AIRCRAFT SN 1000 - 1309

1. General Description:

The VHF communications system provides the flight crew with two-way VHF communications in the AM frequency range of 118.000 to 151.975 MHz. Channel spacing of 25 kHz provides 1,360 discrete channels.

For aircraft with 8.33 kHz channel spacing capability, available discrete channels are increased three-fold to 4,080 channels.

The VHF communications system is further divided into the VHF No. 1 system and the VHF No. 2 system. System design is such that the No. 1 and No. 2 VHF systems are isolated from each other and independent in operation. This helps to prevent any interference problems.

A typical installation consists of two Collins VHF-422 transceivers installed on a shelf inside the radome, two Gables digital frequency control units and two VHF antennas. In addition to normal system control using the digital frequency control units, the FMS is capable of controlling both VHF systems via the RTE/RTI switch on the Marker Beacon (MKR BCN) controller.

2. Description of Subsystems, Units and Components:

A. VHF Transceivers:

Two Collins VHF-422 transceivers, referred to as the VHF No. 1 transceiver and VHF No. 1 transceiver, are installed on a shelf inside the radome.

B. Digital Frequency Control Units:

Two Gables digital frequency control units, commonly referred to as the “COMM 1 and COMM 2 control heads”, are installed on the cockpit center pedestal. The COMM 1 and COMM 2 control heads form the communications portion of what is commonly known as the “six pack” configuration. Four other Gables digital frequency control units, two for navigation control (NAV 1 and NAV 2) and two for automatic direction finding control (ADF 1 and ADF 2), complete the six pack concept.

C. VHF Antennas:

The two VHF antennas (No. 1 and No. 2) are blade-type antennas that operate throughout the frequency range. The VHF No. 1 antenna is located on the bottom of the fuselage along the centerline. It provides full hemispherical coverage. The VHF No. 2 antenna is located on the upper portion of the fuselage. It provides coverage for communication on the ground.

3. Controls and Indications:

(See Figure 2.)

A. Display Window:

Each control head has a two-section display window. The upper section display consists of a five digit display indication referred to as the **active** display. The lower section display consists of a five digit display indication of the preselected frequency that is available for interchange with active display. It is referred to as the **preselect** display.

B. Power ON Switch / Volume Control:

A rotary switch is located within the frequency selector knobs that is used to apply power to the control head and control volume.

C. Frequency Selection Knobs:

Dual concentric control knobs provide control of the preselect display and frequency / code information encoded into data sent to the radio equipment. A feature of the knob is variable rate tuning, which makes the tuning process much faster. When a single control knob has a wide range to control, the more rapidly the knob is rotated, the more range per detent is covered. Clockwise rotation increases the frequency while counterclockwise rotation decreases the frequency.

The tunable range is from 118.00(0) to 151.97(5) MHz (inclusive) in 25 kHz steps. The 0.001 MHz digit is not displayed.

The 0.1 and 0.01 MHz digits are controlled by the smaller frequency selector knob. Each detent of the knob will vary the display in 0.02(5) MHz increments. The digits range from 0.00(0) to 0.97(5).

The 100 MHz digit is a constant 1. The 10 and 1 MHz digits are controlled by the larger knob with each detent altering the display by 1 MHz. The digits range from 118 through 151 MHz.

D. Active / Preselect Frequency Interchange Switch:

A push button switch located on the left of the display window provides a means of exchanging active and preselected frequencies.

E. MEMORY 1 / 2 Switches:

Push button MEMORY switches provide additional preselected frequency storage. Activation of these switches will illuminate / extinguish the MEMORY 1 / 2 indicators. When depressed from an extinguished state, the previously stored frequency will be transferred to the preselect display. This frequency is now available for ready interchange with the active display. Depressing the switch from an illuminated state causes storing of the current preselect frequency and extinguishing of the indicator. The indicators (white) are located in the push button switches and indicate which memory location is active and displayed on the lower display.

With one MEMORY switch active (illuminated), depressing the other MEMORY switch or the frequency interchange switch will extinguish the currently illuminated indicator and store the displayed frequency. This frequency is stored in the memory location that corresponds to the indicator just extinguished.

F. 121.5 Switch:

A two position recessed toggle switch provides direct access to the VHF guard frequency of 121.50 MHz when placed in the 121.50 position. Provided a COMM control head failure has not occurred, the active display will indicate a frequency of 121.50 MHz. This access discrete is also used by the VHF transceiver to cause direct radio channeling of 121.50 in the event of a COMM control head failure.

When the 121.5 switch is placed back in the TUNE position, the COMM control head will again transmit the previous active frequency displayed in the upper display before 121.5 was selected.

For aircraft with 8.33 kHz channel spacing capability, the TUNE / 121.50 switch is relabeled and reprogrammed to enable either 25 kHz spacing or 8.33 kHz spacing tuning capability. To switch between either kHz spacing, the flight crew should:

(1) Record the current active frequency.

(2) Turn the radio OFF.

(3) Reposition the kHz spacing switch to the desired spacing, e.g., from 25 kHz to 8.33 kHz, or vice versa.

(4) Turn the radio ON.

With 8.33 kHz spacing enabled for tuning and an 8.33 kHz frequency tuned, the actual frequency is not displayed. Rather, a “channel” or “code” is displayed that coincides with the frequency change as received from ATC. Additionally, the 100 MHz digit (the “constant 1”) is not displayed when 8.33 kHz spacing is enabled. An example of actual frequency versus displayed frequency is shown on the table that follows.

Because of the nature of the bandwidth differences between 25 kHz spacing and 8.33 kHz spacing, ATC may assign a frequency channel for a 25 kHz frquency when 8.33 kHz is selected for tuning. The result is that the displayed frequency may differ slightly from the actual frequency, e.g., the displayed frequencies of either 132.000 and 132.005 result in the same actual frequency of 132.0000. See the following table:

8.33 kHz SPACING: GABLES DIGITAL FREQUENCY CONTROL UNIT		
Actual Frequency	**Tuning Spacing**	**Displayed Frequency**
132.0000	**25 or 8.33**	**32.000 or 32.005**
132.0083	8.33	32.010
132.0166	8.33	32.015
132.0250	**25 or 8.33**	**32.025 or 32.030**
132.0333	8.33	32.035
132.0416	8.33	32.040
132.0500	**25 or 8.33**	**32.050 or 32.055**
132.0583	8.33	32.060
132.0666	8.33	32.065
132.0750	**25 or 8.33**	**32.075 or 32.080**

G. TX Indicator:

Green in color, the TX indicator provides an indication that the COMM Push-To-Talk (PTT) line is active.

H. TEST Switch:

The TEST switch has no effect on any other output conditions. When depressed, the following actions occur:

- Functional test status on the control head is transmitted
- Test indicator located in the TEST switch is illuminated
- All segments and decimal points of the active and preselect displays are illuminated

I. Circuit Breakers (CBs):

The VHF communications system is protected by the following CBs:

Circuit Breaker Name:	CB Panel:	Location:	Power Source:
VHF COMM CONT #1	CP	H-10	FWD EMER BATT Bus
VHF COMM CONT #2	CP	I-10	R Main DC Bus
VHF COMM #1	CP	H-9	FWD EMER BATT Bus
VHF COMM #2	CP	I-9	R Main DC Bus

J. Advisory (Blue) CAS Messages:

CAS Message:	Cause or Meaning:
VHF COMM 1-2-3 FAIL (1)	Indicated VHF communications radio has failed.

NOTE(S):

(1) A third system may be installed as an outfitting option.

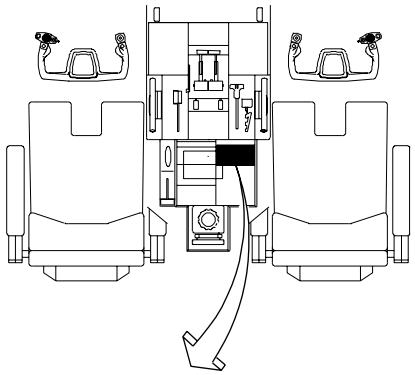
4. Limitations:

A. Flight Manual Limitations:

There are no limitations for the VHF communications system at the time of this revision.

B. Pilot's Manuals:

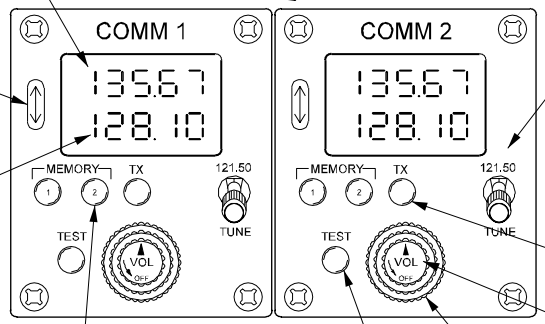
Consult the Collins RTU-4200 Series Pilot's Guide, Collins Publication Number 523-0777-900, Revision 2, dated May 1, 1996 (including Addendum 2, dated June 16, 1998) for general operating procedures of the VHF-422 transceivers.



Active Display

Interchange Swtich
Exchanges active and preselected frequencies.

Preselect Display
Interchangeable with active display.



121.5 / TUNE
- 121.5:
  - Provides direct access to VHF guard frequency of 121.50 MHz.
  - If COMM control head failure has not occurred, active display will indicate 121.50 MHz.
  - If COMM control head failure has occurred, also causes direct radio channeling of 121.50 MHz.
- TUNE:
  - COMM control head transmits active frequency displayed in active display.
- For aircraft with 8.33 kHz channel spacing capability:
  - Switch is relabeled and reprogrammed to enable either 25 kHz spacing or 8.33 kHz spacing tuning capability.
  - With 8.33 kHz spacing enabled and 8.33 kHz frequency tuned, actual frequency is not displayed. A "channel" or "code" is displayed coinciding with frequency change as received from ATC.
  - The 100 MHz digit is displayed.

TX
(Green) indicates COMM control head transmitting.

ON / OFF / VOL
Applies power to the control head and controls volume.

MEMORY 1/2
- Provides additional preselected frequency storage and indicates which memory location is active and displayed on preselect display.
- Activation illuminates / extinguishes MEMORY 1/2 indicators (white).
- When depressed from extinguished state, previously stored frequency is transferred to preselect display, making it available for interchange with the active display.
- Depressing switch from illuminated state causes storing of current preselect frequency and extinguishing of indicator.
- With one MEMORY switch active (illuminated), depressing other MEMORY switch or frequency interchange switch extinguishes currently illuminated indicator and stores displayed frequency in memory location just extinguished.

Frequency Selection Knobs
- Dual concentric control knobs.
- Provides control of preselect display.
- Clockwise rotation increases frequency; counterclockwise rotation decreases frequency.
- Tunable range is from 118.00(0) to 151.97(5) MHz in 25 kHz steps.
- The .001 MHz digit is not displayed.
- The .1 and .01 MHz digits are controlled by smaller frequency knob. Each detent of knob will vary display in .02(5) MHz increments. Digits range from .00(0) to .97(5).
- The 100 MHz digit is a constant 1. The 10 and 1 MHz digits are controlled by larger knob with each detent altering display by 1 MHz. Digits range from 118 through 151 MHz.

TEST
When depressed, the following occurs:
- Functional test status on control head is transmitted.
- TEST switch is illuminated.
- All segments and decimal points of active and preselect displays are illuminated.

26017C00

Gables Digital Frequency Control Unit
Figure 2

2A-23-30: HF Communications System

1. Type of System Installed:

The type of High Frequency (HF) communications systems installed on GIV aircraft is dependent upon aircraft production number. The two types of systems are:

- Collins HF-190 Series (Aircraft SN 1000 through 1167, excluding 1034)
- Collins HF-9000 Series (Aircraft SN 1034, 1168 and subsequent)

2. General Description:

A. Collins HF-190 System:

The Collins HF-190 series communications system is a dualized full frequency system designed to provide the flight crew with very long range airborne voice and data communication. Operating in the 2.0000 to 29.9999 MHz frequency range with channel spacing of 100 Hz, it provides 280,000 discrete channels.

HF modes of operation are:

- EM LO: Emergency frequency selection - low
- EM HI: Emergency frequency selection - high
- NORM: Normal frequency selection
- MAR: Maritime channel selection
- PRE: User programmed channel selection
- PGM: Programs user selected channels

HF emission modes include:

- UV: Upper Side Band - Voice
- LV: Lower Side Band - Voice
- UD: Upper Side Band - Data
- LD: Lower Side Band - Data
- CW: Continuous Wave
- AM: Amplitude Modulation

NOTE:

The use of lower side band is legal for some international and offshore communications (most commonly in Australia and the Far East), but is not authorized in the United States and most European countries.

The HF-190 series communications system can operate to 40,000 feet altitude with continuous key, 40,000 to 55,000 feet altitude with one minute key / one minute unkey, and 55,000 to 70,000 feet altitude with half minute key / three and one-half minute unkey, at temperatures from -54°C to +71°C.

The system contains an extensive self-test function to detect faults to the lowest Line Replaceable Unit (LRU). It displays the faults on the FAULT readout in code form and by illuminating appropriate fault light (CP / RT / CT). During self-test, all segments of the display and CP / RT / CT fault

lights will be illuminated. Any system fault detected will be displayed in the FAULT readout and in most cases, the transmit mode will be inhibited.

B. Collins HF-9000 System:

The Collins HF-9000 series communications system is a dualized full frequency system designed to provide the flight crew with very long range airborne voice and data communication. It consists of two single systems sharing a common HF antenna.

The HF-9000 system employs the use of fiber-optic cables to serially transmit all control and status information between units. Transmit and receive RF signals are supported by the RF coaxial cable. The system operates on the frequency band of 2.0000 through 29.9999 MHz, which allows 280,000 channels spaced in 100 Hz increments.

HF operating modes (either simplex or half duplex) are:

- MAN: Manual discrete frequency mode
- CHN: User-programmed preset channel mode
- SCN: User-programmed preset channel receive scan mode
- MAR: Maritime preprogrammed preset channel mode
- TST: Built-In Test (BIT) mode
- PGM: User-programmable preset channel program mode
- EMR: Emergency preprogrammed preset channel mode
- EXT: External system control mode
- SBY: Standby control mode

Emission modes include:

- UV: Upper Side Band - Voice
- LV: Lower Side Band - Voice
- UD: Upper Side Band - Data
- LD: Lower Side Band - Data
- CW: Continuous Wave
- AM: Amplitude Modulation
- FM: Frequency Modulation (Optional)

NOTE:

The use of lower side band is legal for some international and offshore communications (most commonly in Australia and the Far East), but is not authorized in the United States and most European countries.

Transmitter power output is selectable to three levels:

- Low - 10 Watts ±1db Peak Envelope Power (PEP) average
- Medium - 50 Watts ±1db PEP average
- High - 175 Watts ±1db PEP 50-watt average

The system has preset capabilities that include 99 user-programmable frequencies, 176 pre-programmed International Telecommunications Union (ITU) maritime frequencies and two preprogrammed emergency

international distress frequencies. Receiving is continuous. For transmitting, the system is capable of continuous voice operation at temperatures -55°C to +71°C.

The HF-9000 system employs an extensive self-test function to determine which unit has a fault and to display it on the control unit by illuminating the following two-digit codes:

- RT - Receiver / Transmitter
- CU - Antenna Coupler
- R - Remote Control Unit
- FO - Fiber-optic Link
- _ _ (Two Blanks) - External System Malfunction

3. Description of Subsystems, Units and Components:

A. Components Common To Both Series:

(1) Receiver / Transmitters:

Two receiver / transmitters are installed in the tail compartment. Each can operate independent of one another. Since there is only one HF antenna, both systems can receive information simultaneously. With one of the systems in transmit mode, however, the other system is disconnected from the antenna and is unable to receive or transmit.

(2) Antenna Couplers:

Two antenna couplers are installed in the tail compartment. They are pressurized tuning assemblies with a sealed control compartment. Pressurization is done to the tuner assembly to prevent possible high voltage arcing at high altitudes, to provide a predictable cooling medium and to prevent corrosive elements from entering the unit. Output from the couplers is provided to a common antenna adapter.

(3) HF Antenna:

A single HF antenna is incorporated into the leading edge structure of the vertical stabilizer. It is used by both HF systems.

4. Controls and Indications:

A. HF-190 Series Control Panel:

(See Figure 3 and Figure 4.)

(1) General:

The HF-190 series control panel is used to control and display the modes, channels, frequency selected and faults. It contains all function switches necessary to operate the HF system.

(2) ON / OFF Switch:

This switch selects the HF communications system ON or OFF. Upon selection to OFF, data in the display will be stored in non-volatile memory and will be restored to the display when the system is again selected ON.

(3) SQ (Squelch) Knob:

This knob is adjusted to mute undesired background noise when

voice communication is not present.

(4) DSBL (Squelch Disable) Pushbutton:

Depressing the DSBL pushbutton disables the squelch circuit, enabling the user to determine if there is traffic on the selected frequency without adjusting the SQL control.

(5) VOL (Volume) Knob:

The volume knob adjusts the audio level as desired by the operator. Clockwise rotation increases the volume level, while counterclockwise rotation decreases the volume level.

(6) LOAD Pushbutton:

This pushbutton stores the desired preset frequency, channel and emission mode in the non-volatile memory of the receiver / transmitter, ready for instant recall in PRE (preset) operation mode.

(7) Mode Select Knob:

The mode select knob is used to select the following modes:

(a) EM LO (Emergency Frequency Selection - Low): Manually selectable international distress channel that operates on 2.1820 MHz.

(b) EM HI (Emergency Frequency Selection - High): Manually selectable international distress channel that operates on 8.3640 MHz.

(c) NORM (Normal Frequency Selection): Manually selectable mode allowing direct tune of any one of 280,000 frequencies and any of the 6 emission modes (UV, LV, UD, LD, CW and AM).

(d) MAR (Maritime Channel Selection): Manually selectable mode allowing access to the 176 ITU Public Correspondence Channels (and their receive / transmit frequencies) in the maritime radio telephone network. All channels operate on half duplex in the upper side band voice (UV) mode only. All 176 ITU channels are permanently programmed in the non-volatile memory. The last 10 channels used are also stored in non-volatile memory to allow quick retrieval.

(e) PRE (User Programmed Channel Selection): Manually selectable mode allowing access to one of 20 user programmed channels, rather than manually selecting the frequencies and emission mode.

(f) PGM (Program User Selected Channels): Manually selectable mode used to program user channels.

(8) TEST Pushbutton:

The TEST pushbutton will initiate the self-test diagnostic routine. All LCD displays and the three fault indicators will illuminate. If the “receive” self-test detects no faults, the “transmit” self-test may be initiated by momentarily keying the system. A tuning tone will be heard during the “transmit” self-test. No frequency or modes will be displayed unless the system is in MAR mode, in which case the

selected maritime channel transmit frequency will be displayed while the system is keyed.

NOTE:

After the test is initiated, the system must be keyed, channel changed or selected OFF to exit the test.

(9) Emission Mode Switch / MODE Display:

Positioning this switch up or down when in NORM or PGM mode will cycle the emission MODE display and the system between UV, LV, LD, CW or AM emission mode.

(10) Channel Select Switches / CHAN Display:

Positioning these three switches up or down when in MAR, PRE or PGM mode allows selection and display of all 176 ITU channels when in MAR mode, and user-programmed channels when in PRE and PGM modes. The selected channel will appear in the CHAN display. The associated frequency and emission mode will appear in their respective displays. The function of each of the three switches is further explained as follows:

(a) The left channel select switch selects the maritime ITU most significant digit (4 through 22).

(b) The center channel select switch selects the most significant digit for user preset channel 10 through 19 and the 10s digit (0 through 9) for maritime ITU channels.

(c) The right channel select switch selects the user preset channels 0 through 9 as well as the least significant digit of PRE set channels 10 through 19 and the MAR 176 ITU channels.

(11) Frequency Select Switches / FREQ Display:

These 5 switches allow selection and display of discrete frequencies from 2.0000 through 29.9999 MHz in 100 Hz steps in the NORM mode and to select user preset frequencies / channels in the PGM mode for loading and for later use in PRE mode. All switches are momentary in both directions to select digits up or down, in any order. The function of each of the 5 switches is further explained as follows:

(a) The left most switch selects the MHz digit, 2 through 29.

(b) The second from left switch selects the 100 kHz digit, 0 through 9.

(c) The center switch selects the 10 kHz digit, 0 through 9.

(d) The second from right switch selects the 1 kHz digit, 0 through 9.

(e) The right most switch selects the 100 Hz digit, 0 through 9.

(12) FAULT Display / Indicators:

Any system fault detected during power on, normal operation or self-test is indicated by a fault code displayed in the FAULT display and, if appropriate, an illuminated CP / RT / CT annunciator.

B. HF-9000 Series Control Panel:

(See Figure 5 and Figure 6.)

(1) General:

The HF-9000 series control panel is used to control and display the modes, channels, frequency selected and faults. It contains all function switches necessary to operate the HF system.

(2) VOL (Volume) Knob:

The volume knob adjusts the audio level as desired by the operator. Clockwise rotation increases the volume level, while counterclockwise rotation decreases the volume level. Whenever the volume control is moved, the volume level is momentarily displayed in the FREQ / CHAN display.

(3) SQL (Squelch) Knob:

The squelch control is adjusted to mute undesired background noise when voice communication is not present. The proper squelch setting is obtained by rotating the SQL knob counterclockwise to disable squelch (SQL 0) and then clockwise one click (SQL 1). The receiver will mute after a short delay. If intermittent noise persists, the SQL knob can be further rotated clockwise one click (SQL 2) or two clicks (SQL 3).

The SQL control has no effect when in TST, PGM, EXT or SBY mode. The squelch level is momentarily displayed in FREQ / CHAN function after each change of SQL control.

(4) DSBL (Disable) Pushbutton:

Depressing the DSBL pushbutton disables the squelch circuit, enabling the user to determine if there is traffic on the selected frequency without adjusting the SQL control.

(5) CHAN (Channel) Knob:

The CHAN knob provides selection of all maritime and emergency preprogrammed preset channels and user-programmed preset channels. Using the CHAN knob, the channel will increase or decrease by one (i.e., 2236, 2237 or 2236, 2235, etc.) regardless of where the cursor is positioned. To increase or decrease channels by more than one (i.e., 2236, 2246, 2336, 3636, etc.), the CURSOR knob is used to position the cursor under the desired channel digit and the VALUE knob is used to set the digit.

(6) FREQ / LD (Frequency / Load) Pushbutton:

When in PGM mode, depressing this switch loads the desired receive-transmit emission mode, frequency and channel data into the receiver / transmitter's non-volatile memory for the 99 user-programmable preset channels for simplex operation. For half-duplex operation, the FREQ / LD switch and microphone key must be depressed to load transmit data. By depressing the switch, the channel and frequency display recycles in CHN mode; when operating in EMR or MAR mode, the emergency (receive and transmit) or maritime (receive) frequency will be displayed. To view the maritime transmit frequency, depress the FREQ / LD switch while keying the microphone. When in the TST mode and the

HF-9000 system has failed, depressing this switch will sequence through the fault diagnostic codes.

(7) CURSOR Knob:

The CURSOR knob moves the cursor left or right for selecting the display section to be changed.

(8) VALUE Knob:

The VALUE knob increases or decreases the value in the display section (OPR, MODE, FREQ / CHAN or PWR) selected by the cursor.

(9) Cursor Display:

The cursor, a segmented line display, is positioned (by using the CURSOR knob) under the display section (OPR, MODE, FREQ / CHAN and PWR) to be changed. After selection of the desired display section, the value displayed may be increased or decreased from its current value by turning the appropriate control: CHAN or VALUE knobs for CHAN function and VALUE knob for all other functions.

(10) OPR (Operating Mode) Display Section:

Three alpha-numeric characters display the HF-9000 system operating mode selected by VALUE knob. The operating modes are:

- MAN: Manual discrete frequency mode
- CHN: User-programmed preset channel mode
- SCN: User-programmed preset channel receive scan mode
- MAR: Maritime preprogrammed preset channel mode
- TST-BIT: Built-in test mode
- PGM: User-programmable preset channel program mode
- EMR: Emergency preprogrammed preset channel mode
- EXT: External system control mode
- SBY: Standby control mode

The OPR section will display FLT (fault) or WRN (warning) if a fault or warning occurs in the HF-9000 system. The OPR function will momentarily display VOL or SQL whenever the VOL (volume) or SQL (squelch) control setting has been changed. The VOL or SQL level will also be displayed at the same time in FREQ / CHAN section.

(11) MODE (Emission Mode) Display Section:

Two alpha-numeric characters display the RF emission mode selected by the VALUE knob. The following modes are available:

- UV: Upper Side Band - Voice
- LV: Lower Side Band - Voice
- UD: Upper Side Band - Data
- LD: Lower Side Band - Data
- CW: Continuous Wave
- AM: Amplitude Modulation

- FM: Frequency Modulation (Optional)

If a fault or warning occurs in the system, the MODE function characters will indicate the unit in which the fault or warning occurred: CU for antenna coupler, RT for receiver / transmitter, R for remote control unit, FO for fiber-optic system and _ _ (two blanks) for an external system malfunction.

(12) FREQ / CHAN (Frequency / Channel) Display Section:

Up to six numeric characters display frequency data and channel number for normal operation. The frequency is either increased or decreased by using the VALUE knob and is displayed in all six digits plus a decimal point. Channel selection is accomplished with the CHAN or VALUE knob. During the TST (built-in test) mode, the unit, module and circuit card failure are displayed.

(13) PWR (Power) Display Section:

This is a three-level bar indicator for selectable output power levels of low power (bottom bar), medium power (bottom two bars) and high power (all three bars). The output power level is selected by the VALUE control.

C. Circuit Breakers (CBs):

The HF-190 communications system is protected by the following CBs:

Circuit Breaker Name:	CB Panel:	Location:	Power Source:
HF COMM #1	CP	C-10	L Main AC Bus, ϕA
HF COMM #1	CP	C-11	L Main AC Bus, ϕB
HF COMM #1	CP	C-12	L Main AC Bus, ϕC
HF COMM #2	CP	E-10	R Main AC Bus, ϕA
HF COMM #2	CP	E-11	R Main AC Bus, ϕB
HF COMM #2	CP	E-12	R Main AC Bus, ϕC

The HF-9000 communications system is protected by the following CBs:

Circuit Breaker Name:	CB Panel:	Location:	Power Source:
HF RT CPLR #1	CP	D-11	L Main DC Bus
HF CONT #1	CP	D-12	L Main DC Bus
HF RT CPLR #2	CP	E-11	R Main DC Bus
HF CONT #2	CP	E-12	R Main DC Bus

5. Limitations:

A. Flight Manual Limitations:

There are no limitations for the HF communications system at the time of this revision.

B. Pilot's Manuals:

(1) HF-190 Series:

Consult the Collins High Frequency Communications System Pilot's Guide, Collins Publication Number 523-0774-209, for operating procedures of the HF-190 series system.

(2) HF-9000 Series:

Consult the Collins High Frequency Communications System Pilot's Guide, Collins Publication Number 523-0774-344, Revision 6, dated February 1, 1994 for operating procedures of the HF-9000 series system.

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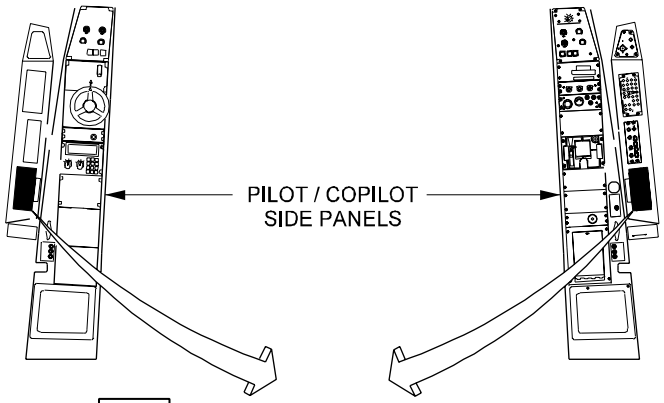

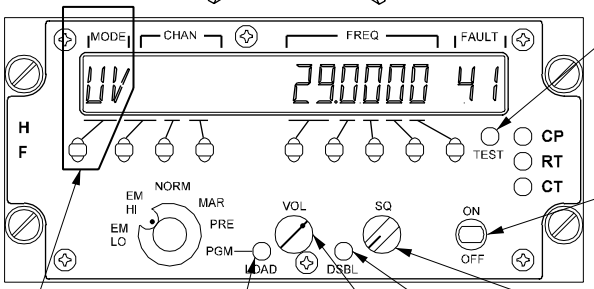

TEST
Initiates self test diagnostic routine.
- All LCD displays and the three fault indicators illuminate.
- If "receive" self test detects no faults, "transmit" self test may be initiated by momentarily keying system. A tuning tone will be heard during self test.
- No frequency or modes will be displayed unless system is in MAR mode, in which case selected maritime channel transmit frequency will be displayed while system is keyed.

NOTE: After test is initiated, system must be keyed, channel changed or selected OFF to exit test.

ON / OFF
- Selects system ON or OFF.
- Upon selection to OFF, data in display is stored in non-volatile memory and will be restored to display when system is again selected ON.

SQ
(Squelch) Mutes undesired background noise when voice communication not present.

DSBL
(Squelch Disable) disables squelch circuit without adjusting SQL.

LOAD
Stores desired preset frequency, channel and emission mode in non-volatile memory of receiver / transmitter, ready for instant recall in PRE (preset) operation mode.

Emission Mode Switch / MODE display
Cycles emission MODE display and system between UV, LV, UD, LD, CW or AM emission modes.

VOL
(Volume) Adjusts the audio volume level as desired by the operator.
- Clockwise rotation increases volume level.
- Counterclockwise rotation decreases volume level.

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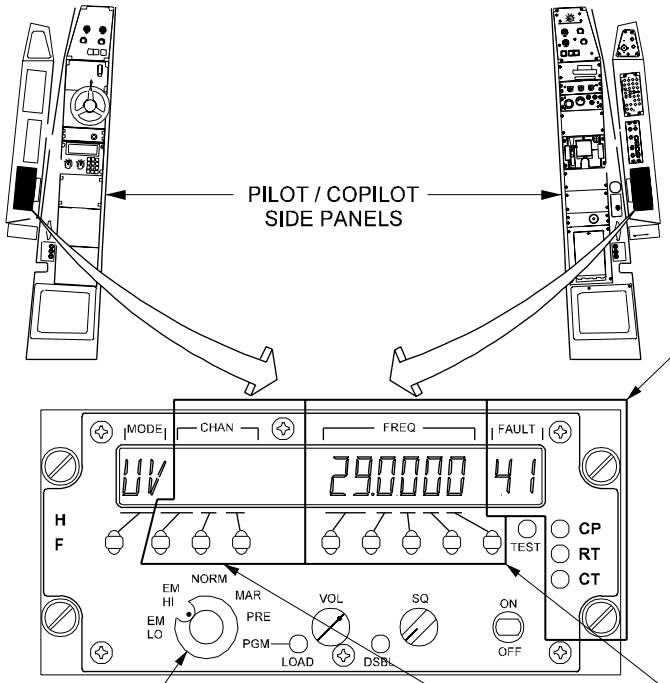
HF-190 Series Control Panel (Sheet 1 of 2)
Figure 3



Fault Display / Indicators
Any system fault detected during power on, normal operation or self-test is indicated by a fault code displayed in FAULT display and, if appropriate, an illuminated CP / RT / CT annunciator.

Frequency Select Switches / FREQ Display
Allows selection and display of discrete frequencies from 2.0000 through 29.9999 MHz in 100 Hz steps in NORM mode. Also used to select user preset frequencies / channels in the PGM mode for loading and for later use in PRE mode.
- Left most switch selects the MHz digit, 2 through 29.
- Second from left switch selects the 100 Hz digit, 0 through 9.
- Center switch selects the 10 kHz digit, 0 through 9.
- Second from right switch selects the 1 kHz digit, 0 through 9.
- Right most switch selects the 100 Hz digit, 0 through 9.

Mode Select Knob
- EM LO (Emergency Frequency Selection - Low): Manually selectable international distress channel operating on 2.1820 MHz.
- EM HI (Emergency Frequency Selection - High): Manually selectable international distress channel operating on 8.3640 MHz.
- NORM (Normal Frequency Selection): Manually selectable mode allowing direct tune of any one of 280,000 frequencies and any of the 6 emission modes (UV, LV, UD, LD, CW and AM).
- MAR (Maritime Channel Selection): Manually selectable mode allowing access to the 176 ITU channels on maritime radio telephone network. All channels operate on half duplex in UV mode only, and are permanently programmed in non-volatile memory. The last 10 channels used are also stored in non-volatile memory to allow quick retrieval.
- PRE (User Programmed Channel Selection): Manually selected mode allowing access to one of 20 user programmed channels rather than manually selecting the frequencies and emission mode.
- PGM (User Programmed Channel Selection): Manually selectable mode used to program user channels.

Channel Select Switches / CHAN Display
Selection up or down when in MAR, PRE or PGM mode allows selection and display of all 176 ITU channels when in MAR mode, and user programmed channels when in PRE and PGM modes. Selected channel will appear in CHAN display. Associated frequency and emission mode will appear in respective displays.
- Left channel select switch selects maritime ITU most significant digit (4 through 22).
- Center channel select switch selects most significant digit for user preset channel 10 through 19 and 10s digit (0 through 9) for maritime ITU channels.
- Right channel select switch selects user preset channels 0 through 9 as well as least significant digit of PRE set channels 10 through 19 and MAR 176 ITU channels.

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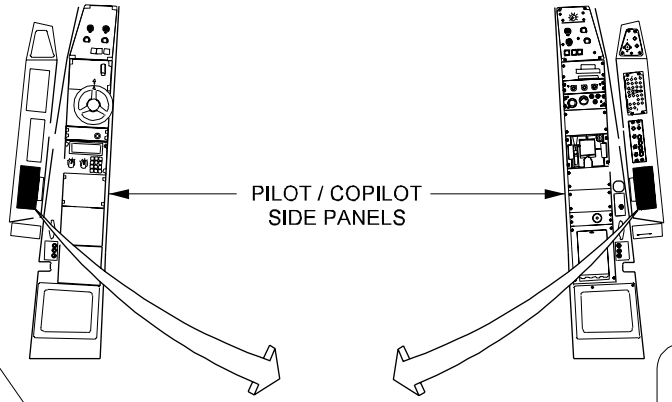
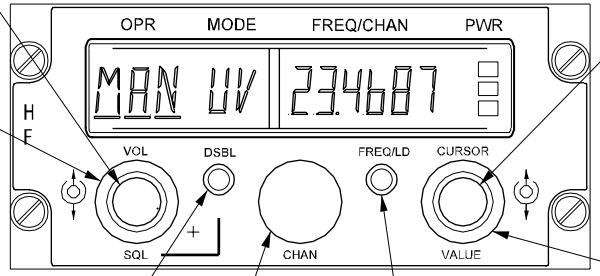
HF-190 Series Control Panel (Sheet 2 of 2)
Figure 4



VOL
(Volume) Adjusts the audio volume level as desired by the operator.
- Clockwise rotation increases volume level.
- Counterclockwise rotation decreases volume level.
- Level momentarily displayed in FREQ / CHAN display.

SQL
(Squelch) Mutes undesired background noise when voice communication not present.
- Level is momentarily displayed in FREQ / CHAN function after each change.
- Has no effect in TST, PGM, EXT or SBY mode.



CURSOR
Moves cursor left or right for selecting display section to be changed.

VALUE
Increases or decreases value in display section (OPR, MODE, FREQ / CHAN or PWR) selected by cursor.

DSBL
(Squelch Disable) Disables squelch circuit without adjusting SQL.

CHAN
(Channel)
- Provides selection of all maritime and emergency preprogrammed preset channels and user programmed preset channels.
- When using CHAN knob, channel will increase or decrease by one (i.e. 2236, 2237 or 2236, 2235, etc.) regardless of where cursor is positioned.
- To increase or decrease channels by more than one (i.e. 2236, 2246, 2336, 3636, etc.) CURSOR knob is used to position cursor under desired channel digit and VALUE knob is used to set digit.

FREQ / LD
(Frequency / Load)
- In PGM mode, depressing switch loads desired receive transmit emission mode, frequency and channel data into receiver transmitter's non-volatile memory as one of 99 user programmable preset channels for simplex operation.
- For half duplex operation, FREQ / LD switch and microphone key must be depressed to load transmit data. By depressing switch, channel and frequency display recycles in CHN mode; when operating in EMR or MAR mode, emergency (receive and transmit) or maritime (receive) frequency is displayed. To view maritime transmit frequency, depress FREQ / LD switch while keying microphone.
- When in TST mode and HF-9000 system has failed, depressing switch will sequence through fault diagnostic codes.

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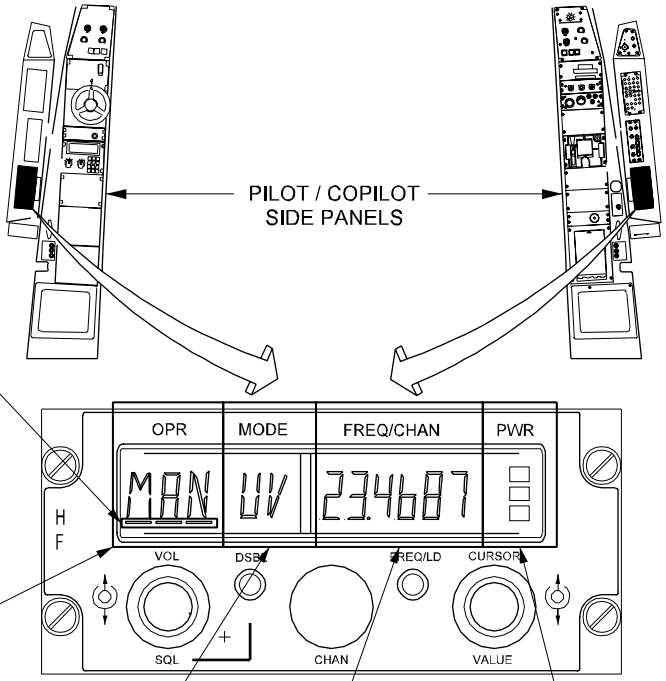
HF-9000 Series Control Panel (Sheet 1 of 2)
Figure 5

Cursor Display
A segmented line display positioned (by using CURSOR knob) under display section (OPR, MODE, FREQ / CHAN and PWR) to be changed. After selection of desired display section, value displayed may be increased or decreased from current value by turning appropriate control: CHAN or VALUE knobs for CHAN function and VALUE knob for all other functions.



OPR
(Operating Mode)
- Three alpha-numeric characters display operating mode selected by VALUE knob. Operating modes are:
  - MAN: Manual discrete frequency mode
  - CHN: User programmed preset channel mode
  - SCN: User programmed preset channel receive scan mode
  - MAR: Maritime preprogrammed preset channel mode
  - TST-BIT: Built in test mode
  - PGM: User programmable preset channel program mode
  - EMR: Emergency preprogrammed preset channel mode
  - EXT: External system control mode
  - SBY: Standby control mode
- Will display FLT (fault) or WRN (warning) if a fault or warning occurs in the HF-9000 system.
- Will momentarily display VOL or SQL whenever VOL or SQL setting has been changed. VOL or SQL level is also displayed at the same time in FREQ / CHAN section.

MODE
(Emission Mode)
- Two alpha-numeric characters display RF emission mode selected by VALUE knob. Modes available are:
  - UV: Upper Side Band - Voice
  - LV: Lower Side Band - Voice
  - UD: Upper Side Band - Data
  - LD: Lower Side Band - Data
  - CW: Continuous Wave
  - AM: Amplitude Modulation
  - FM: Frequency Modulation (Optional)
- If fault or warning occurs in system, MODE function characters indicate unit in which fault or warning occured:
  - CU for antenna coupler
  - RT for receiver / transmitter
  - R for remote control unit
  - FO for fiber optic system
  - _ _ (two blanks) for external system malfunction.

PWR
(Power) Three bar indicator displaying output power as selected by VALUE knob.
- Low power - bottom bar only
- Medium power - bottom two bars
- High power - all three bars

FREQ / CHAN
(Frequency / Channel)
- Up to six numeric characters display frequency data and channel number for normal operation.
- Frequency increased or decreased by using VALUE knob and is displayed in all six digits plus a decimal point.
- Channel selection accomplished with CHAN or VALUE knob.
- During TST mode, unit, module and circuit card failure are displayed.

26021C00

HF-9000 Series Control Panel (Sheet 2 of 2)
Figure 6

2A-23-40: Integrated Automatic Tuning System

THIS SECTION APPLIES TO AIRCRAFT SN 1310 AND SUBSEQUENT

1. General Description:

In Aircraft 1310 and subsequent, integrated control and display of aircraft communications and navigation systems is provided by Collins RTU-4200 series Radio Tuning Units (RTUs). The integrated control includes the setting of radio frequencies / channels and modes as well as optional control of radio volume. The RTUs provide single point control of both on-side and cross-side systems from either the pilot's or copilot's positions.

RTU-4200 standard features include the following:

- COM (Communications) Control Function
- NAV (Navigation) Control Function
- DME (Distance Measuring Equipment) Control Function
- ATC (Air Traffic Control Transponder) Control Function
- ADF (Automatic Direction Finder) Control Function

On the RTU-4210, TCAS (Traffic Collision Avoidance System) provisions are included. The RTU-4220 includes all features of the RTU-4200 and RTU-4210, plus the capability to display an HSI (Horizontal Situation Indicator).

The RTU is designed to be installed in pairs, with each RTU normally controlling the on-side systems. The RTU is capable, however, of controlling cross-side systems by selection of cross-side tuning or reversionary tuning is selected. Cross-side tuning obviates the need for reaching across the pedestal when both RTUs are functioning normally. Reversionary tuning allows control of both on-side and cross-side systems in the event that one RTU should fail.

In addition to on-side and cross-side RTU tuning, systems may be remotely tuned through the RTU. Manual (keyboard) and FMS tuning commands may tune both the on-side and cross-side RTUs. Remote tuning commands from a CTL (remote controller) may also tune the pilot's RTU COM and NAV functions.

All RTUs have the ability to display RTU / system / radio diagnostic data. Additionally, some RTUs provide tuning capability of a third VHF communications transceiver and one or two High Frequency (HF) communication transceivers.

2. RTU Displays:

The RTU display structure is made up of three tiers: top level displays, main display pages and preset pages. Two error pages also exist that can be shown from any level: a cross-side radio tuning inoperative page and a configuration error page. Depending on configuration, an HSI display may be accessible from the top level displays.

A. Top Level Displays:

The top level display consists of the top level page and, if installed, a second top level page. The top level page is shown at power-up and when no RTU control has been selected for a period of time. If installed, the second page can be accessed by pressing the NEXT PAGE line select key. The top level displays show subdisplays for each of the systems controlled by the RTU and provide access to the second tier of RTU display structure, the main display pages.

Subdisplays are normally shown on the RTU with which the system is paired (i.e., COM 1 subdisplay is shown on pilot's RTU, NAV 2 is shown on

copilot's RTU, etc.). Subdisplays for single systems (TCAS, etc.) are shown on both the on-side and cross-side RTUs.

The top level display normally shows subdisplays for the COM, NAV, ATC and TCAS systems. If TCAS is not incorporated, the ADF system subdisplay is shown. The second top level page, if present, shows subdisplays for items not shown on the top level page and may include ADF, HF, HSI and a third COM.

The information contained on top level subdisplays includes radio frequencies, presets, codes and mode annunciators.

Labels (i.e., COM1, ATC1, TCAS, etc.) are shown at top of each subdisplay. These labels identify the systems and indicate the RTU with which they are associated. Labels for single systems do not show a side number.

B. Main Display Pages:

Main display pages are accessed from the associated system subdisplay on the top level display. Information shown for an individual system on the top level display is also shown on that system's main display page, along with additional controls. Individual main display pages also provide access to preset pages. To return to the top level page from a main display page, the RETURN line select key is depressed.

C. HSI Page:

If incorporated, the HSI page is accessed from either the top level page or the second top level page. The HSI page shows the familiar HSI display with compass card, course pointer, TO-FROM pointer, lateral and vertical deviation display, DME distance, and marker beacon annunciators. In addition, the HSI page provides control for the COM, NAV and ATC systems. To return to the top level page from the HSI page, the RETURN line select key is depressed.

D. Preset Pages:

Preset pages for a particular system are accessed by pushing the PRESET PAGE line select key on the desired system's main display page. Active frequencies, presets and mode annunciators are shown on the preset pages, along with controls for preset programming and tune mode selection. Unless otherwise specified, four of the maximum presets available are shown on each preset page. Twenty presets are normally available for each of the COM, NAV, ADF and HF systems. To return to the main display page from a preset page, the RETURN line select key is depressed.

3. Controls and Indications:

(See Figure 7.)

A. ON / OFF Switch:

An ON / OFF switch may or may not be present, depending on the installation. If present, the ON / OFF switch is incorporated into the brightness (BRT) knob. The RTU is selected ON by rotation of the BRT knob clockwise out of the OFF detent, and OFF by rotation of the BRT knob fully counterclockwise into the OFF detent.

B. Brightness (BRT) Knob:

In installations where RTU brightness is controlled by the aircraft's master brightness control, the RTU BRT knob is used in conjunction with the aircraft's master brightness control to achieve the desired display brightness. In installations where RTU brightness is not controlled by the aircraft's master brightness control, the RTU BRT knob is solely adjusted to achieve the desired display brightness.

NOTE:

The RTU uses a fluorescent bulb for display backlighting. The performance of fluorescent bulbs and LCDs at extremely low temperatures can be degraded. Within the temperature range of -20°C to +70°C, operation will be normal after a 4 second power-up delay. Below -20°C, there will be a power-up delay of approximately 1 minute for each degree below -20°C, up to 10 minutes. After the display is ON, full display brightness may not be available for an additional 10 minutes.

C. Line Select Keys:

The RTU has seven panel-mounted line select keys surrounding the display window. These keys are used to select control individual radio frequencies, presets, codes and modes. The tune window is shown around the value selected for control.

D. Tuning Window:

The tuning window surrounds ("boxes") the frequency, preset or code selected for control. The tuning knobs are then used to change values shown inside the tuning window. The default position for the tuning window is around the COM recall (top right) frequency on the top level page.

In some installations, the tuning window automatically returns to the default position after twenty seconds of inactivity.

E. Tuning Knobs:

Tuning knobs are used to set the value shown in the tune window. When a frequency, code or mode is shown in the tune window, the large knob controls the most significant digits and the small knob controls the least significant digits.

F. Volume Knob:

A volume knob may or may not be present, depending on the installation. If present, the volume knob is the third (smallest diameter) knob on the tuning knob cluster. Individual radio volume may be set from a top level display, described as follows:

(1) The line select key adjacent to the desired radios subdisplay (on the top level display) is depressed to show the tuning window.

(2) The selected radio's volume is then set with the volume knob. A volume scale will be displayed in the recall display after the first click of the volume knob.

To set a volume level from a radio mode or preset page, the main display

page or preset page is selected and the volume knob is turned. A volume scale will be displayed after the first click of the volume knob.

DME Volume: Normally, DME volume is set to the same level as NAV volume. In installations with independent DME tuning, the DME volume level may be independently controlled from the NAV main display page when the DME Hold (DME-H) function key is depressed. The process is described as follows:

(3) The line select key adjacent to the DME hold frequency is depressed, resulting in the tuning window surrounding the DME frequency.

(4) The DME volume is then set with the volume knob. A volume scale will be displayed after the first click of the volume knob.

G. DME Hold (DME-H) Function Key:

The DME-H function key is used to hold the currently tuned DME frequency. When DME hold is active, the DME hold frequency is shown in green followed by a yellow “H” on the top level page, NAV main display page and preset page.

H. IDENT Function Key:

The IDENT function key is used to transmit an ATC identification pulse. When the IDENT feature is active, “ID” is annunciated in cyan on the ATC subdisplay and on the ATC main display page.

I. 1 / 2 (Cross-side Tuning) Function Key:

To select control of the cross-side system, the 1 / 2 function key on the on-side RTU is depressed. When selected, cross-side labels are shown in yellow. When both RTUs attempt to command the same system simultaneously, the pilot’s RTU takes precedence.

If an RTU had failed, selection of the 1 / 2 function key shows the Cross-side Radio Tuning Inoperative page. This page can be cleared by again depressing the 1 / 2 function key or any line select key. To tune the cross-side systems with a failed RTU (reversionary tuning mode), the failed RTU must first be shut off.

NOTE:

Cross-side tuning removes the associated preset from the active display.

J. 8.33 kHz Channel Spacing:

The ability to select between 25 kHz and 8.33 kHz tuning is found on the first top level page for VHF COMM tuning. This page is accessed by depressing the 1L line select key, adjacent to the active frequency. The top level page then displays the option of selecting 25 kHz or 8.33 kHz tuning using the 1R line select key. The active choice is displayed in large font, cyan in color. Continuing to depress the 1R line select key toggles between the choices. After the choice is made, the RETURN prompt adjacent to the 4L line select key is depressed. Note that when 25 kHz spacing is selected, a “25” icon is present under the preset frequency position at line select key 1R. When 8.33 kHz spacing is selected, there is no icon displayed.

With 8.33 kHz spacing selected for tuning and an 8.33 kHz frequency

tuned, the actual frequency is not displayed. Rather, a “channel” or “code” is displayed that coincides with the frequency change as received from ATC. An example of actual frequency versus displayed frequency is shown on the table that follows.

Because of the nature of the bandwidth differences between 25 kHz spacing and 8.33 kHz spacing, ATC may assign a frequency channel for a 25 kHz frquency when 8.33 kHz is selected for tuning. The result is that the displayed frequency may differ slightly from the actual frequency, e.g., the displayed frequencies of either 132.000 and 132.005 result in the same actual frequency of 132.0000. See the following table:

8.33 kHz SPACING: COLLINS RTU-4200 SERIES RADIO TUNING UNIT		
Actual Frequency	**Tuning Spacing**	**Displayed Frequency**
132.0000	**25 or 8.33**	**132.000 or 132.005**
132.0083	8.33	132.010
132.0166	8.33	132.015
132.0250	**25 or 8.33**	**132.025 or 132.030**
132.0333	8.33	132.035
132.0416	8.33	132.040
132.0500	**25 or 8.33**	**132.050 or 132.055**
132.0583	8.33	132.060
132.0666	8.33	132.065
132.0750	**25 or 8.33**	**132.075 or 132.080**

K. RTU Color Convention:

The RTU uses a color Liquid Crystal Display (LCD) to display data. For the purposes of this discussion, the RTU can be classified into two groups: those with white on-side and single system labels, and those with green on-side and single system labels. Thus, RTU color convention is shown in the following table:

DISPLAY PARAMETER	ON-SIDE / SINGLE SYSTEM LABEL COLOR	
	WHITE	**GREEN**
On-side and Single System Labels	White	Green
Cross-side System Labels	Yellow	
Active Frequency / Channel / Code Data	Green	
Active ATC Code - Standby Selected	White	
Unverified Frequency / Channel / Code Data	Magenta	Cyan
Dashed Unverified Frequency / Channel / Code Data	White	
Recall Freq / Channel / Code / Preset Data	White	Cyan
Active Mode Control Selections	Cyan	
DME Hold (H) Annunciator	Yellow	
ATC Reply (RPLY) Annunciator	Cyan	Green
Transponder Fail (XPDR FAIL) Annunciator	Yellow	
No Remote Tuning (NO RMT TUNE) Annunciator	Cyan	Yellow
CTL standby (STBY) Annunciator	Yellow	

L. Circuit Breakers (CBs):

The integrated automatic tuning system is protected by the following CBs:

Circuit Breaker Name:	CB Panel:	Location:	Power Source:
RTU #1	CP	F-7	EMER DC Bus
RTU #2	CP	F-8	ESS DC Bus

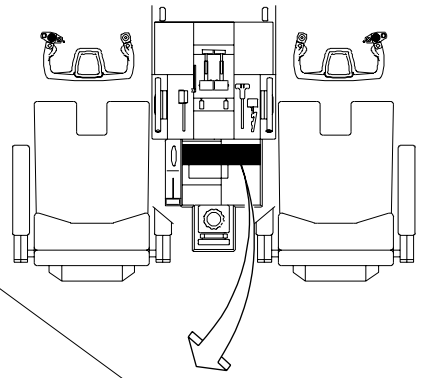
4. Limitations:

A. Flight Manual Limitations:

There are no limitations for the integrated automatic tuning system at the time of this revision.

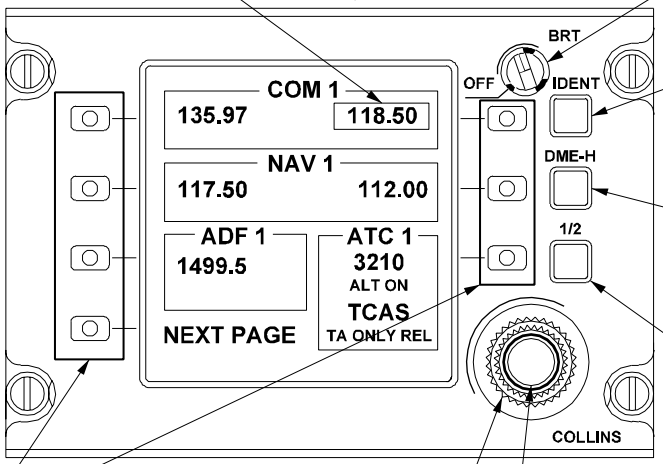
B. Pilot's Manuals:

Consult the Collins RTU-4200 Series Pilot's Guide, Collins Publication Number 523-0777-900, Revision 2, dated May 1, 1996 (including Addendum 2, dated June 16, 1998) for operating procedures of the RTU-4200 series system.



Tuning Window
- Surrounds ("boxes") frequency, preset or code selected for control.
- Default position is COM recall (top right) frequency on top level page.

ON / OFF / BRT
- ON / OFF: May or may not be present, depending on installation. If present, switch is incorporated into BRT knob. RTU is selected ON by rotation of BRT knob clockwise out of OFF detent, and OFF by rotation or BRT knob fully counterclockwise into OFF detent.
- BRT (Brightness): Used alone or in conjunction with aircraft's master brightness control to achieve desired display brightness.



IDENT
(ATC Identification)
Used to transmit an ATC identification pulse.

DME-H
(DME Hold)
Used to hold the currently tuned DME frequency.

Line Select Keys
- Provides control of individual radio frequencies, presets, codes and modes.
- Tuning window is shown around the value selected for control.

1/2
(Cross-side Tuning)
- 1/2 function key on the on-side RTU is depressed to select control of the cross-side system.
- If a RTU has failed, selection of 1/2 function key shows Cross-side Radio Tuning Inoperative page. Page can be cleared by again depressing 1/2 function key or any line select key.
- To tune the cross-side systems with a failed RTU (revisionary tuning mode), the failed RTU must first be shut off.

Tuning Knob
Used to set the value shown in tuning window. When a frequency, code or mode is shown in the tuning window, the large knob controls the most significant digits and the small knob controls the least significant digits.

Volume Knob
May or may not be present, depending on installation. If present, the volume knob is the third (smallest diameter) knob on the tuning knob cluster.

26022C00

Collins RTU-4200 Series
Radio Tuning Unit
Figure 7

2A-23-50: Intercommunications System

1. General Description:

The Intercommunications System (ICS) is an audio integrating system that ties in the communication and navigation receiver audio inputs and outputs to the cockpit speakers, ICS jacks, headsets and microphones.

A typical ICS system consists of:

- Two Baker audio control panels, one located on each upper side console
- Two communications jacks panels (labeled COMM JACKS), one located on each side console
- Two ICS receptacles (labeled ICS JACK), one located in the forward external switch panel, the other located in the tail compartment

2. Description of Subsystems, Units and Components:

A. Baker Audio Control Panel:

A dualized Baker Audio Control System (No. 1 system for the pilot and No. 2 system for the copilot) is installed in the aircraft. The ICS audio control panel and audio amplifier are housed within the same unit, providing an integrated audio system capable of selection and volume control of all installed radio equipment. Selection can be made of all communications, receive and microphone functions including onboard communications (i.e., passenger address, cabin and cockpit interphone).

Two types of pushbutton switches are used. Microphone selection is accomplished by an interlocking switch permitting only one button to lock down at one time. When another button in the microphone selector group is depressed, the previously depressed button is released automatically. The second type of pushbutton switch is known as an alternate action or push-push switch (i.e., the switch is on when depressed and may be released to the off position by depressing again). The push-push switch type of switch is used for all selections of receivers and other functions except the microphone selector.

The audio control panels have a self-contained transistor isolation and speaker amplifier with audio leveling. The system includes use of a filter network to remove the 1020 Hz identifier from the navigation or ADF receiver if desired.

In case of amplifier failure or complete power loss to the system, an emergency operation mode allows receiver selection and direct pass-through of all normal inputs to the headphones and use of the hand microphone for transmission purposes.

B. COMM JACKS Panels:

A communications jack panels (labeled COMM JACKS) is located on each side console. Each panel contains a receptacle for a hand-held microphone (HAND MIKE), a boom microphone (BOOM MIKE) and a set of headphones (HEAD PHONE).

C. Cockpit Microphones:

Hand, boom or mask microphones may be used. The desired output (radio transmitter, paging or cabin telephone) is first selected. The hand microphone, if used, is keyed in the usual way. If the pilot is wearing the oxygen mask, the ICS key on the control wheel must be used to operate

the mask microphone. A boom microphone may be used if desired by connecting to the BOOM MIC jack. Push-To-Talk (PTT) is activated using the ICS MIC switch.

D. ICS Receptacles:

Two ICS receptacles (labeled ICS JACK), one located in the forward external switch panel, the other located in the tail compartment, are provided for intercommunication with ground personnel. Both receptacles are the “single plug” (combined microphone and headset plug) type.

3. Controls and Indications:

(See Figure 8.)

A. EMG Switch:

Selection of the red EMG switch enables the emergency operation mode. This permits emergency operation of the audio system, bypassing the isolation amplifier. In the EMG position, the pilot may select the receivers he desires by using the audio selector switch but without isolation or speaker operation. The headset must be used in this mode.

B. SPK Switch:

The SPK switch controls use of the speaker or headset. Depressing the SPK switch connects the speakers to the system (headphones will remain operational). Releasing the SPK switch (switch extended) disconnects the speakers from the system.

C. S.T. Switch:

The S.T. switch controls transmitter sidetone. When the S.T. switch is depressed, sidetone is heard regardless of which pilot makes the transmission. When the switch is released (extended), no sidetone is heard.

D. VOL Control Knob:

The volume (VOL) control knob selects an audio level for all receivers feeding into the audio system and automatically maintains the selected level on all receivers with one exception: ADF receivers in the unfiltered position (voice and identifier) are neither automatically level-controlled nor affected by the VOL knob.

In the filtered position (voice remaining only), ADF receivers are automatically audio level controlled and under the control of the VOL knob. The marker receiver, however, is neither automatically level-controlled nor regulated by the VOL knob. This permits the pilot to detect audio build or fade as approach to, or departure from, the marker occurs.

E. AUTO Switch:

The AUTO switch enables the auto select feature when depressed. When depressed, each receiver’s AUDIO is automatically selected when the receiver’s MICROPHONE switch is selected. When not depressed, each receiver’s AUDIO and MICROPHONE switch must be selected individually.

F. FILT Switch:

When depressed, the FILT switch filters out or removes the 1020 Hz code identifier signal of its associated NAV or ADF receiver leaving only the voice signal. In the released position, identifier and voice are both heard on

selected receiver.

G. AUDIO Switches:

The NAV1, NAV2, DME1, DME2, VHF1, VHF2, VHF3, HF1, HF2, ADF1, ADF2, MKR1, MKR2, ILS1 and ILS2 pushbutton switches select their respective receiver audio when in the depressed position.

H. VHF1, VHF2, VHF3, HF1 and HF2 MICROPHONE Switches:

These switches connect both the hand and boom or hand and mask microphones to the desired transmitter for communications. Microphone selection is accomplished by interlocking switches, permitting only one button at a time to be depressed.

I. H'MIC Switch:

The H'MIC switch is an orange push-push type switch and is not interlocked with the other MICROPHONE selector switches. When depressed, the pilot and copilot may communicate on the intercom system through the boom microphone circuit without depressing the ICS key on the control yoke. The desired transmitter may remain selected on the MICROPHONE section while the H'MIC switch remains depressed. In this configuration, it is only necessary to depress the RADIO key on the control yoke to make a transmission. Upon releasing the RADIO key, crew intercom operation immediately returns without further keying. With the H'MIC switch released, interphone communications between pilot and copilot will only take place when the ICS button on the control yoke is depressed.

J. MASK Switch:

The MASK switch is an orange push-push type switch and is not interlocked with the other MICROPHONE selector switches. When depressed, the pilot and copilot may communicate on the intercom system through the mask microphone circuit. The desired transmitter may remain selected on the MICROPHONE section while the MASK switch remains depressed.

K. PAGE Switch:

The PAGE switch connects the microphones to the paging system in order to page personnel or make announcements on the cabin speaker system. When the PAGE switch is depressed, all audio from the radio receiver to the cockpit speakers or headphones is silenced to prevent crosstalk or receiver audio going to the cabin.

L. CABIN Switch:

The CABIN switch connects the audio system to the cabin two-way hand telephone for communications with the cabin. When the CABIN switch is depressed, all audio from the radio receiver to the cockpit speakers or headphones is silenced to prevent crosstalk or receiver audio going to the cabin.

M. Circuit Breakers:

The audio control / amplifier No. 1 is powered from the 28 Vdc emergency bus via CKPT AUDIO #1 circuit breaker. The audio control / amplifier No. 2 is powered from the 28 Vdc main bus via CKPT AUDIO #2 circuit breaker. Both circuit breakers are located on the copilot circuit breaker panel.

The intercommunications system is protected by the following CBs:

Circuit Breaker Name:	CB Panel:	Location:	Power Source:
CKPT AUDIO #1	CP	H-8	FWD EMER BATT
CKPT AUDIO #2	CP	I-8	L MAIN DC Bus

4. Limitations:

A. Flight Manual Limitations:

There are no limitations for the intercommunications system at the time of this revision.

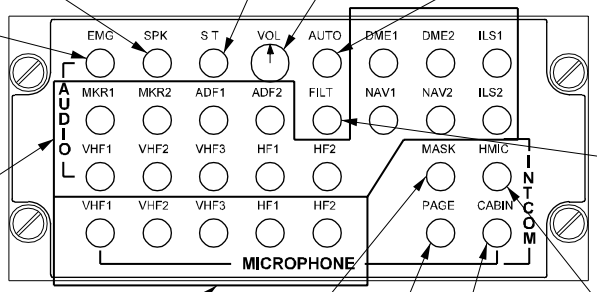
ST
(Side Tone)
- Controls transmitter side tone.
- When switch is depressed, side tone is heard regardless of which pilot makes transmission.
- When switch is released, no side tone is heard.
- Airplane SN 1485 and subsequent has an adjustable knob.

VOL
(Volume)
- Selects audio level for all receivers feeding into audio system.
- Automatically maintains selected level on all receivers except for ADF receivers in unfiltered position.

SPK
(Speaker)
- Controls use of cockpit speakers with system.
- Depressing switch connects speakers to system (headphones will remain operational).
- Releasing switch disconnects speakers from system.

AUTO
(Automatic Select)
- Controls auto select feature.
- When depressed, each receiver's AUDIO is automatically selected when receiver's MICROPHONE switch selected.
- When not depressed, each receiver's AUDIO and MICROPHONE switch must be selected individually.

EMG
(Emergency Mode, Red In Color)
- Enables the emergency operation mode.
- Bypasses isolation and speaker operation.
- Headset must be used in this mode.



FILT
(Filter)
- When depressed, filters out or removes 1020 Hz code identifier signal of associated NAV or ADF receiver, leaving only voice signal.
- In released position, identifier and voice are both heard on selected receiver.

AUDIO Switches
Selects respective receiver audio when in depressed position.

MICROPHONE Switches
- Connects both hand and boom or hand and mask microphones to desired transmitter for communications.
- Interlocking-type switches: permits only one button at a time to be depressed.

MASK
(Mask Microphone, Orange In Color)
- Not interlocked with other MICROPHONE selector switches.
- With switch depressed, pilot and copilot may communicate on ICS through mask microphone circuit.
- Desired transmitter may remain selected on MICROPHONE section while MASK switch remains depressed.

H'MIC
(Hot Microphone, Orange In Color)
- Not interlocked with other MICROPHONE selector switches.
- With switch depressed, pilot and copilot may communicate on ICS through boom microphone circuit without depressing ICS key on control yoke.
- Desired transmitter may remain selected on MICROPHONE section while H'MIC switch remains depressed making it only necessary to depress RADIO key on the control yoke to transmit. Upon releasing RADIO key, ICS operation immediately returns without futher keying.
- With switch released, ICS operation between pilot and copilot only takes place when ICS button on control yoke is depressed.

PAGE
Connects microphones to paging system in order to page personnel or make announcements on cabin speaker system.

CABIN
Connects audio system to cabin two-way hand telephone for communications with cabin.

26023C01

Baker Audio Control Panel
Figure 8

2A-23-60: Cockpit Voice Recorder System

1. General Description:

The Cockpit Voice Recorder (CVR) system provides a means for recording the most recent thirty (30) minutes of all audio signals transmitted and received by aircraft crew members. This allows the recorded data to be retrieved for investigatory purposes. The CVR system is composed of the following units and components:

- CVR Unit
- CVR Control Unit
- Cockpit Area Microphone
- Impact Switch

2. Description of Subsystems, Units and Components:

A. CVR Unit:

The CVR is mounted in the right side of the tail compartment. It provides four (4) separate channels of voice recording of either transmitted or received signals that originate at the pilot's or copilot's stations and in the cockpit area. The fourth channel is a spare. Signals are recorded on an endless-loop magnetic tape for a maximum period of 30 minutes. The recorder medium is contained within a highly-protective enclosure to guard against potential damage resulting from an aircraft accident.

An underwater acoustic beacon is physically attached to CVR unit to aid in location of CVR unit if lost in a body of water. The acoustic beacon is automatically triggered upon contact with water and operates from internal battery power.

B. Voice Recorder Control Unit (VRCU):

The VRCU is located on the copilot's side console. It accepts voice inputs for the pilot, copilot and cockpit area microphone and then outputs the audio signals to the CVR unit. Pilot and copilot receiver and transmitter audios are routed to the CVR through selection on the Audio Control Panel (ACP) amplifiers, while cockpit area microphone audio signals are introduced into an internal preamplifier and then output to the CVR.

The VRCU provides the capability to perform internal testing of the CVR system using the TEST switch. The cockpit area microphone can also be tested by connecting a headset in the HEADSET jack.

Bulk erasing of the CVR tape can be accomplished using the VRCU's ERASE switch or using a BULK ERASE switch located on the right-hand radio rack test panel. Erasing capability, however, is interlocked with the nutcracker system and is only possible on the ground.

The CVR contains an hourmeter that indicates total hours that CVR has been used. The hourmeter has a scale 0 to 5000 hours.

C. Cockpit Area Microphone:

The cockpit area microphone is located on the windshield center post between the angle-of-attack indexer lights. It is positioned to maximize the recording of human conversation and other ambient sound in the cockpit area while at the same time suppressing engine noise.

D. Impact Switch:

The CVR impact switch is located adjacent to the CVR in the tail compartment. Activation of the switch is automatic upon an impact severe enough to overcome its set force limit. Activation of the switch signals the CVR to cease recording, saving the previously-recorded data, also triggering an annunciation lamp which illuminates continuously. A reset button is located on the impact switch to reset the system.

3. Controls and Indications:

(See Figure 9 through Figure 11.)

A. Circuit Breakers (CBs):

The cockpit voice recorder system is protected by the following CBs:

Circuit Breaker Name:	CB Panel:	Location:	Power Source:
CKPT VOICE RECORDER	CP	D-13	ESS AC Bus, ϕA (1)

NOTE(S):

(1) Applies to Aircraft 1096 and subsequent. For Aircraft 1000 and Aircraft 1002 through 1095 (excluding 1034), not having ASC 49 / 49A but having ASC 186, power source is the ESS DC bus.

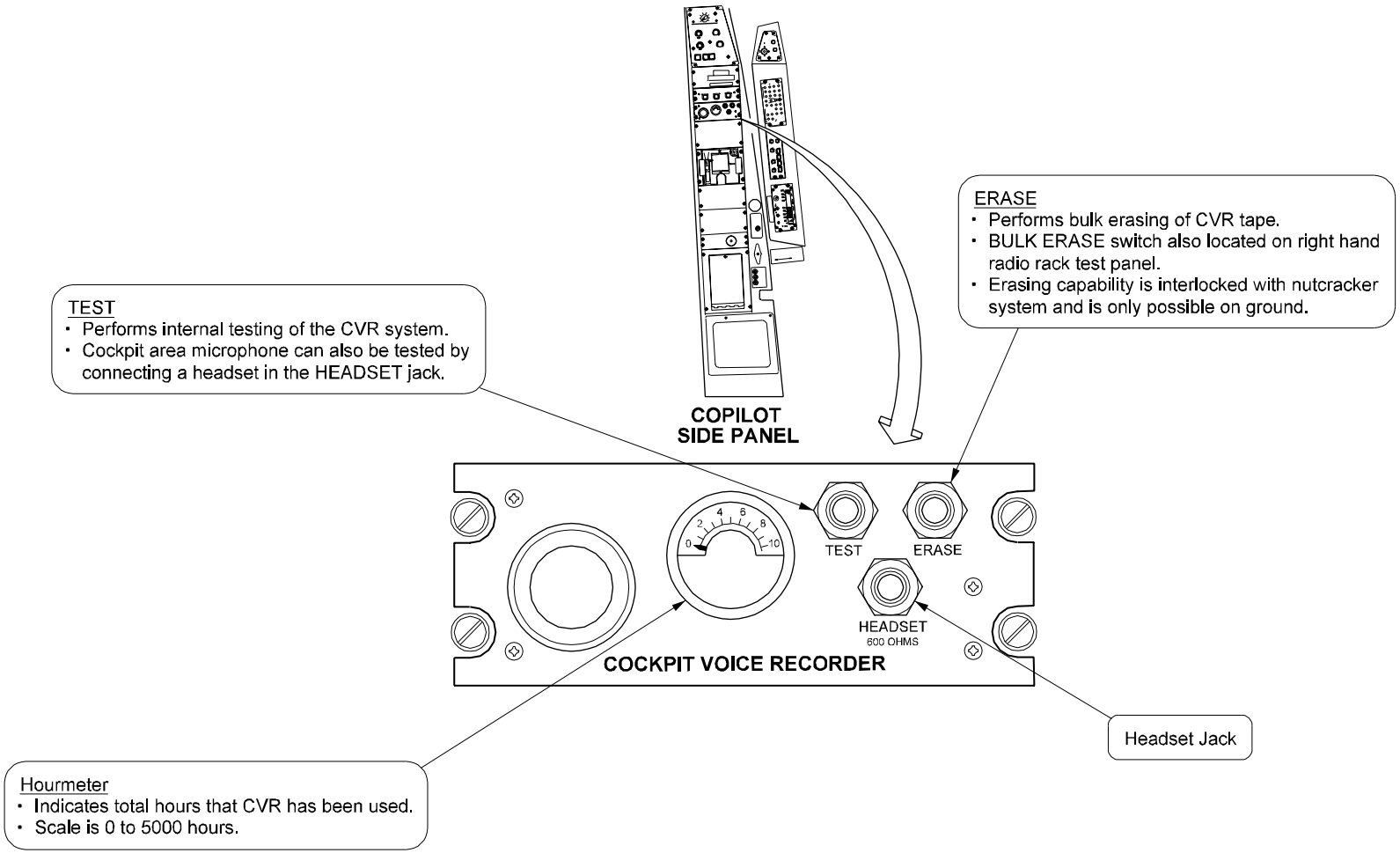
B. Advisory (Blue) CAS Messages:

CAS messages provided by the cockpit voice recorder system are:

CAS Message:	Cause or Meaning:
VOICE REC FAIL	Cockpit Voice Recorder has failed.

4. Limitations:

There are no limitations established for the cockpit voice recorder system at the time of this revision.



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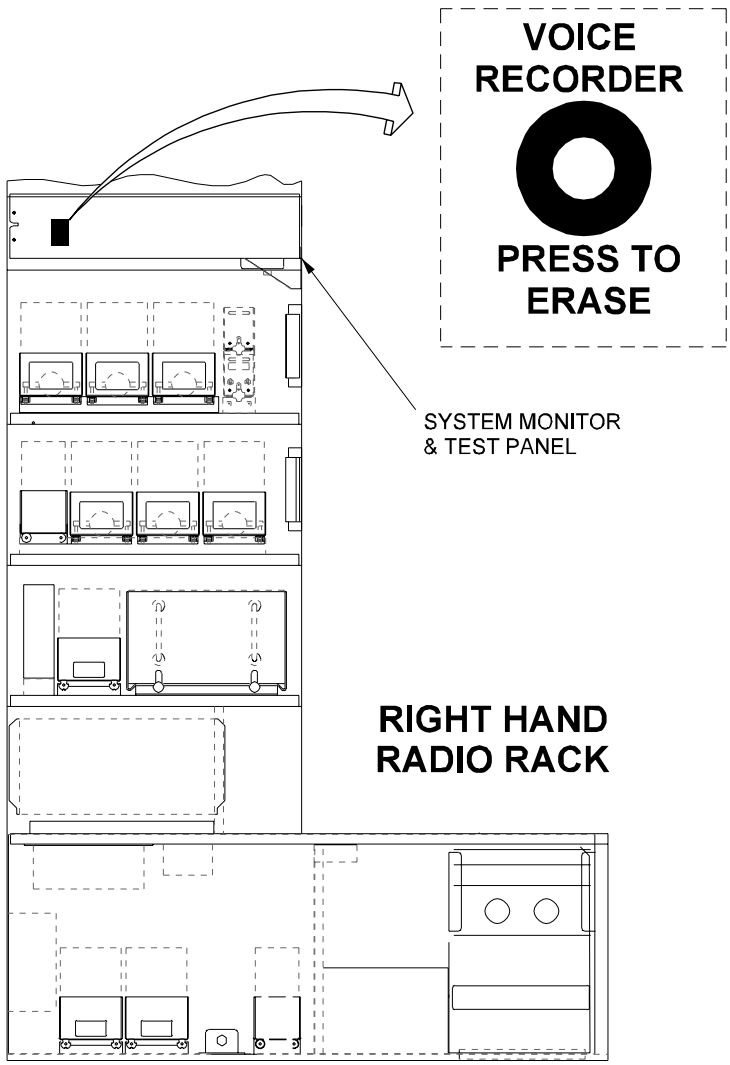
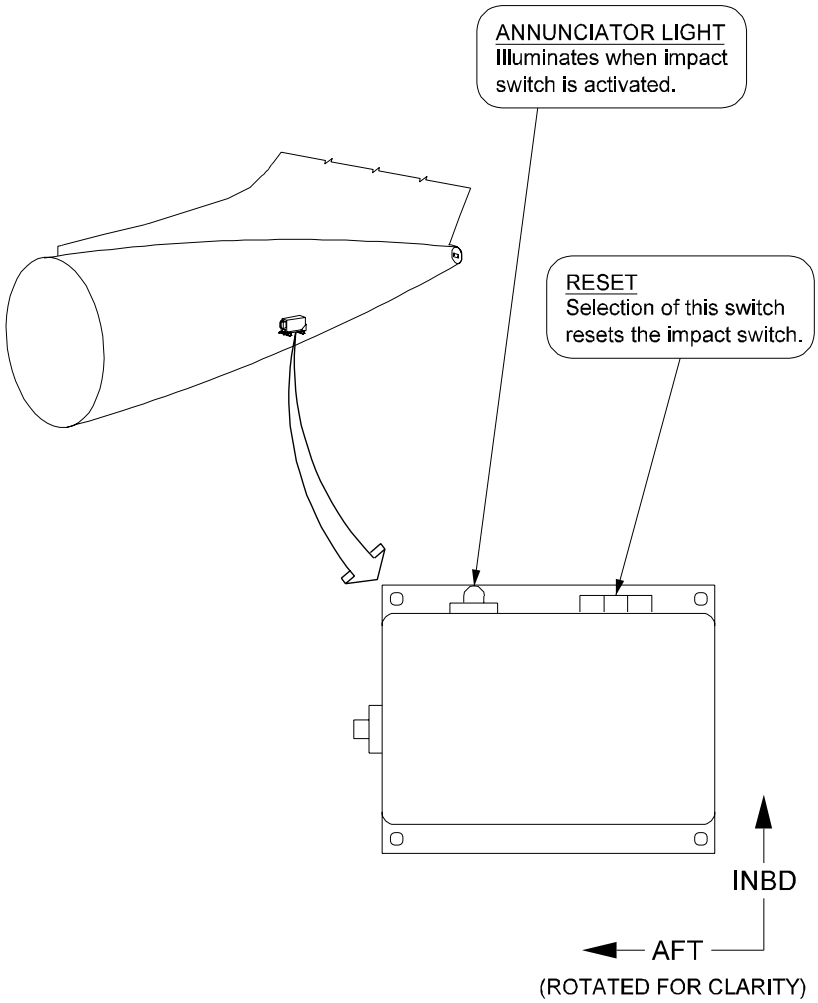
Voice Recorder Control Unit
Figure 9



Voice Recorder BULK ERASE Switch
Figure 10



Voice Recorder Impact Switch
Figure 11

2A-23-70: Emergency Locator Transmitter System:

1. General Description:

The ARTEX 406 MHz Emergency Locator Transmitter (ELT) system provides triple frequency homing transmissions when activated. The system is certified under the requirements of TSO-C126. The ELT system transmits distress signals at frequencies of 121.5 MHz, 243.0 MHz, and a satellite frequency of 406.025 MHz. The transmitter will activate automatically under emergency conditions ('G' switch activation inside the ELT transmitter unit) or may be operated manually from the flight deck to summon assistance in an emergency situation.

The ELT system is composed of the following components:

- ELT Transmitter Unit
- ELT Navigation Interface Unit (Optional)
- Remote Switch
- Antenna
- Aural Monitor

2. Description of Subsystems, Units and Components:

A. ELT Transmitter Unit:

The ELT system automatically activates under emergency conditions ('G' switch activation) and simultaneously transmits a standard swept tone on 121.5 and 243.0 MHz. Typically, the 121.5 and 243.0 MHz transmitter will continue to operate for at least 72 hours until the transmitter has exhausted battery power. The 406.025 MHz transmitter operates for the first 24 hours of the 72 total hours and then shuts down automatically.

The 406.025 MHz satellite transmitter transmits every 50 seconds for a period of 520 milliseconds. During that time, an encoded digital message is sent to the receiving satellite. The information contained in that message is as follows:

- Country of registration
- Serial number of the ELT
- Latitude and longitude position coordinates (when coupled to the optional Navigation Interface Unit)

The ELT transmitter unit has a front panel containing, among other items, a control switch and a red LED indicator. See Figure 12. The control switch provides manual selection of ON, OFF, and RESET modes. When the ELT is transmitting, the red LED indicator on the front panel blinks. The light is not illuminated when the ELT is in the OFF (armed) mode. In addition to selection of ON and OFF, the control switch can be used to reset the ELT system from operating to armed by selection from OFF to ON for one second, then returning the switch to OFF. This is confirmed by the red LED indicator extinguishing. It should be noted that reset cannot take place if either the ELT transmitter unit control switch or the remote switch is selected to ON.

The ELT transmitter unit operates on a self-contained battery and requires no other power source. It is located in the baggage compartment, usually on the lower right side. The actual location may vary, however, depending on outfitting requirements.

B. ELT Navigation Interface Unit (Optional):

The ELT navigation interface unit provides continuous latitude and longitude position updates from the Flight Management System or Global Positioning Satellite system and translates the information to the proper format for use by the ELT. Operating without the navigation interface unit, the ELT transmitter unit provides position accuracy with 1 to 2 kilometers of its location. With the navigation interface unit, position accuracy is improved to within 100 meters.

The ELT navigation interface unit receives power from the Forward Emergency Battery Bus. It is installed in the baggage compartment adjacent to the ELT Transmitter Unit.

C. Remote Switch:

The ELT system remote switch is located on the right side of the copilot's flight panel. Two types of remote switches are installed on GIV airplanes, as shown in Figure 13. The functions of each switch are identical, regardless of the type.

The remote switch provides manual selection of ON, ARM, and RESET modes. When the ELT is transmitting, a red LED indicator blinks above the switch. The light is not illuminated when the ELT is in the ARM (armed) mode. In addition to selection of ON and ARM, the remote switch can be used to reset the ELT system from operating to armed by selection from ARM to ON for one second, then returning the switch to ARM. This is confirmed by the red LED indicator extinguishing. It should be noted that reset cannot take place if either the ELT transmitter unit control switch or the remote switch is selected to ON.

D. Antenna:

The ELT system uses a high performance, externally mounted antenna. It is located on the top aft portion of the fuselage adjacent to the left engine.

E. Aural Monitor:

An aural monitor provides a distinct signal enabling an airplane with a transmitting ELT to be located in an area with a large number of aircraft (e.g., an airport). A beeper, powered by the ELT transmitter is installed to provide this function. The beeper is not designed to operate continuously, but to sound at predetermined intervals. The beeper will sound for shorter periods toward the end of the battery life.

The beeper is loud enough to be heard outside the airplane in areas with low ambient noise. In areas with high ambient noise, the airplane will have to be physically checked for a blinking red LED indicator on either the ELT transmitter unit or remote switch panel.

The aural monitor beeper is usually located in the tail compartment. The actual location may vary, however, depending on outfitting requirements.

3. Controls and Indications:

(See Figure 12 and Figure 13).

4. Limitations:

A. Flight Manual Limitations:

There are no limitations established for this system as of this revision.

B. System Notes:

WARNING

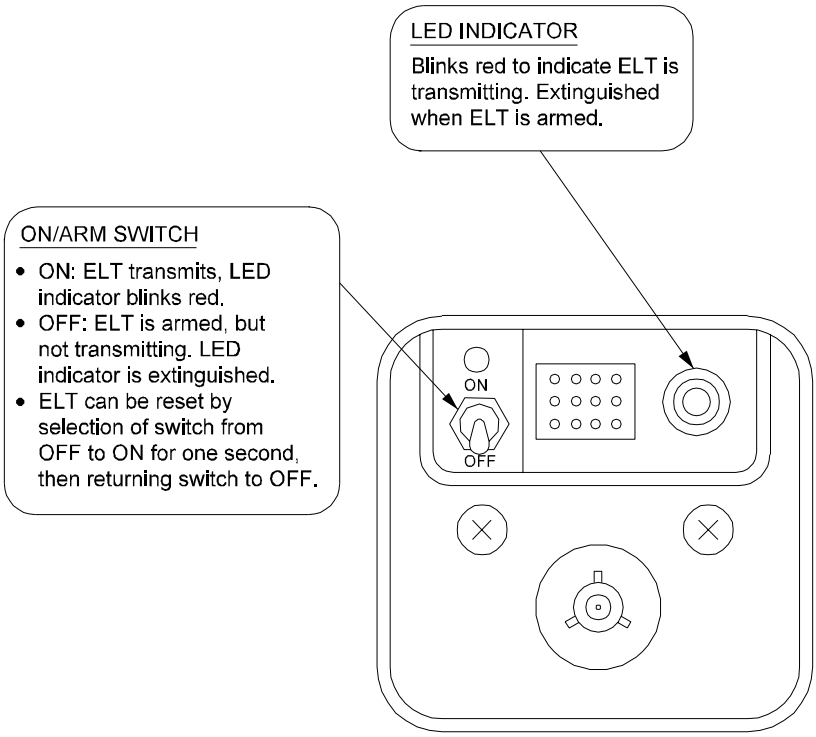
DO NOT ALLOW OPERATIONAL TEST DURATION TO EXCEED FIFTEEN (15) SECONDS. TRANSMISSIONS THAT EXCEED 15 SECONDS MAY BE INTERPRETED BY THE SATELLITE SYSTEM AS A VALID DISTRESS SIGNAL. UNIT TESTING SHOULD BE COORDINATED WITH THE LOCAL FAA ATC TOWER AND BE CONDUCTED WITHIN FIVE (5) MINUTES AFTER THE HOUR.

(1) Reset of a transmitting ELT system cannot take place if either the ELT transmitter unit control switch or the cockpit remote switch is selected to ON.

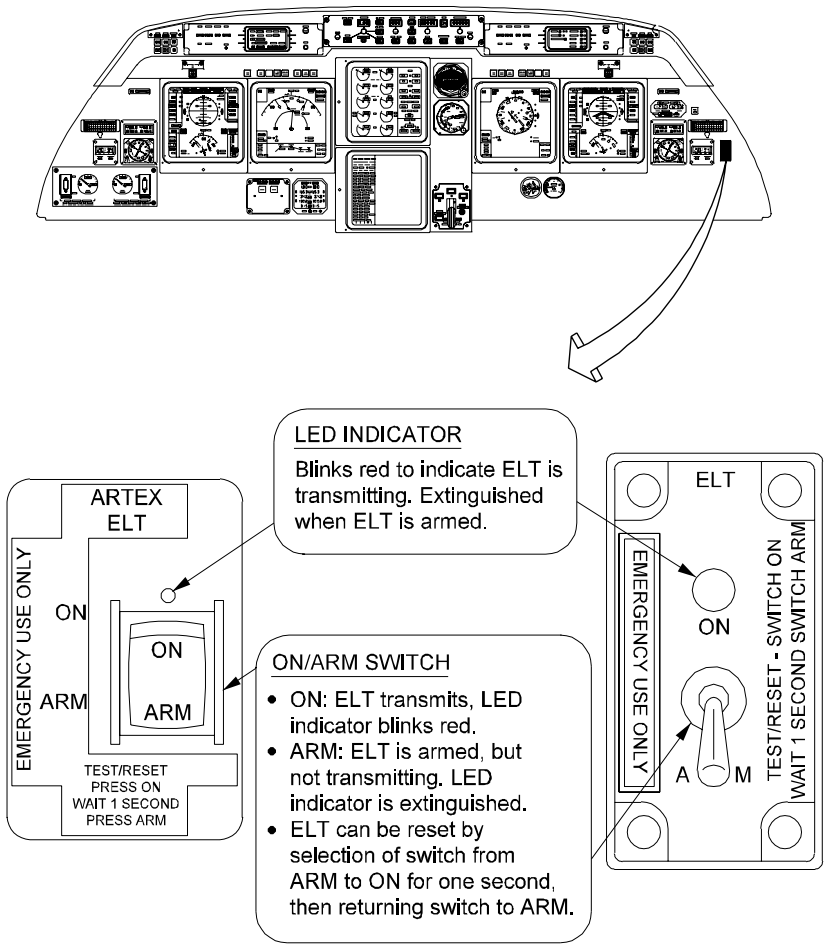
(2) The ARTEX 406 MHz ELT battery must be replaced on or before the replacement date noted on the battery pack. Tests to verify proper operation of the unit must be accomplished after battery replacement.

(3) Operational tests, including 'G' switch testing, of the ARTEX 406 MHz ELT must be accomplished every twelve (12) calendar months unless operational regulatory requirements dictate a more frequent schedule.

(4) The cockpit remote switch is required under TSO-C126 and may not be disabled or rendered inoperative.



ELT Transmitter Unit Front Panel
Figure 12



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ELT Remote Switch
Figure 13

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