CHAPTER

23

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BOEING Intercontinental 707

MAINTENANCE MANUAL

CHAPTER 23

COMMUNICATIONS

TABLE OF CONTENTS

INTERPHONE SYSTEM - DESCRIPTION AND OPERATION

1. General

A. The interphone system provides communication between crew members in the airplane, air-to-air and air-to-ground communication through integration with the airplane radio equipment, monitoring of received radio signals, and communication to passengers through interconnection with the passenger address system. Audio selector panels for the flight interphone system are at the pilot's, copilot's, navigator's and electronic rack stations. On turbofan airplanes two loudspeakers, which are connected to the pilot's and copilot's audio selector panels, are in the ceiling panels over the pilot's and copilot's stations. Muting relays for each loudspeaker are installed in RJ-17 and RJ-18 in the lower nose section.

B. The interphone system provides two-way communication between those stations provided for ground servicing. (See figure 1.) Each of the service interphone stations is equipped with a single jack for handset, or headset and microphone. A service interphone switch on the flight engineer's panel is opened during flight to disable all service interphone stations except those at the flight engineer's station, both attendants' panels, the external power receptacle panel, electronic equipment compartment (under weather radar) and on the turbofan airplanes at the cargo attendant's interphone panel (in the seat bolster) and at the cargo door.

C. Service interphone jacks are at the following locations:

(1) External power receptacle panel.

(2) **Deleted.**

(3) Left and right wing single point refueling stations.

(4) Left and right main wheel wells (external access).

(5) Tail section.

(6) Tail cone (external access).

(7) Electronic equipment compartment.

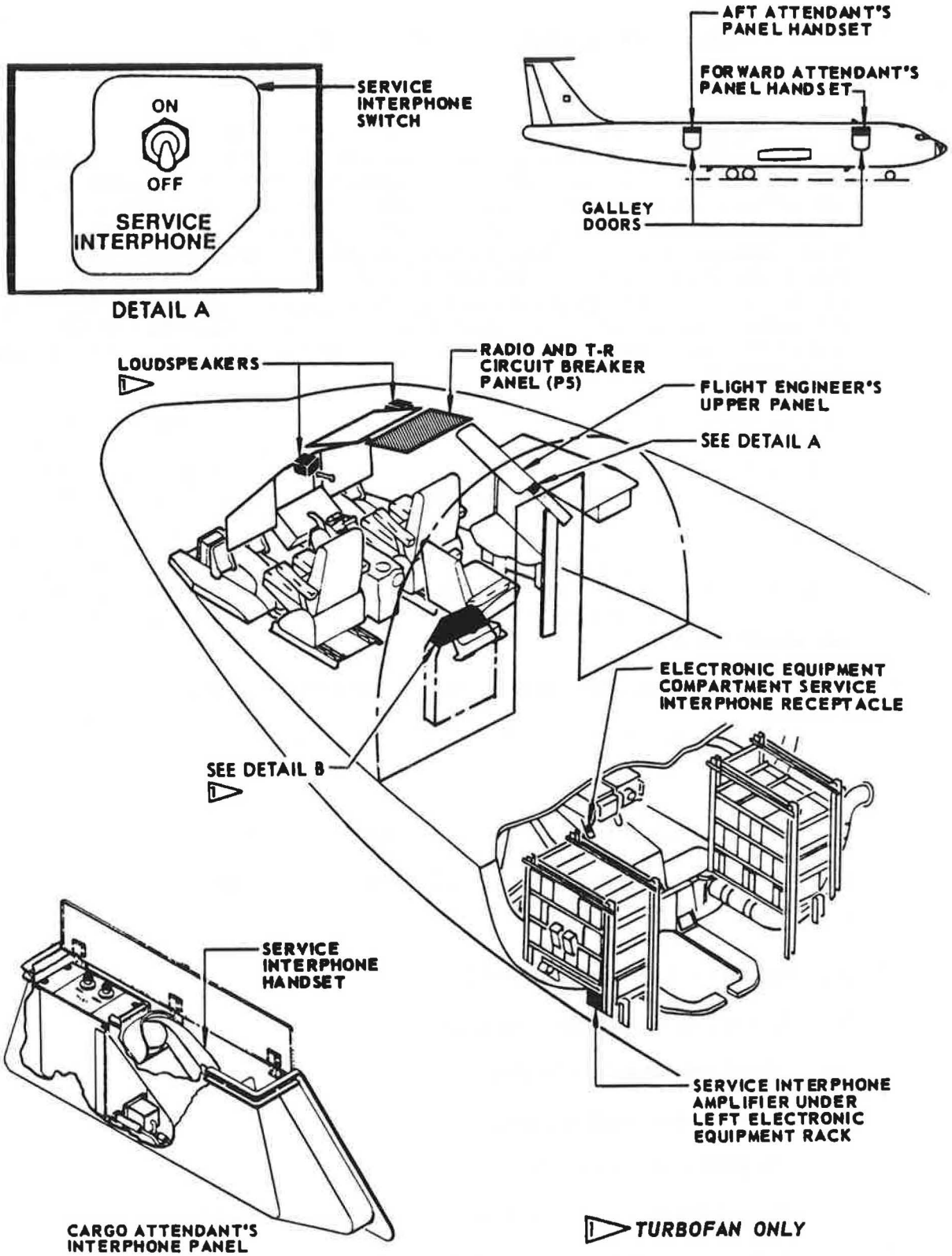
(8) Flight engineer's station.

(9) Forward attendant's panel.

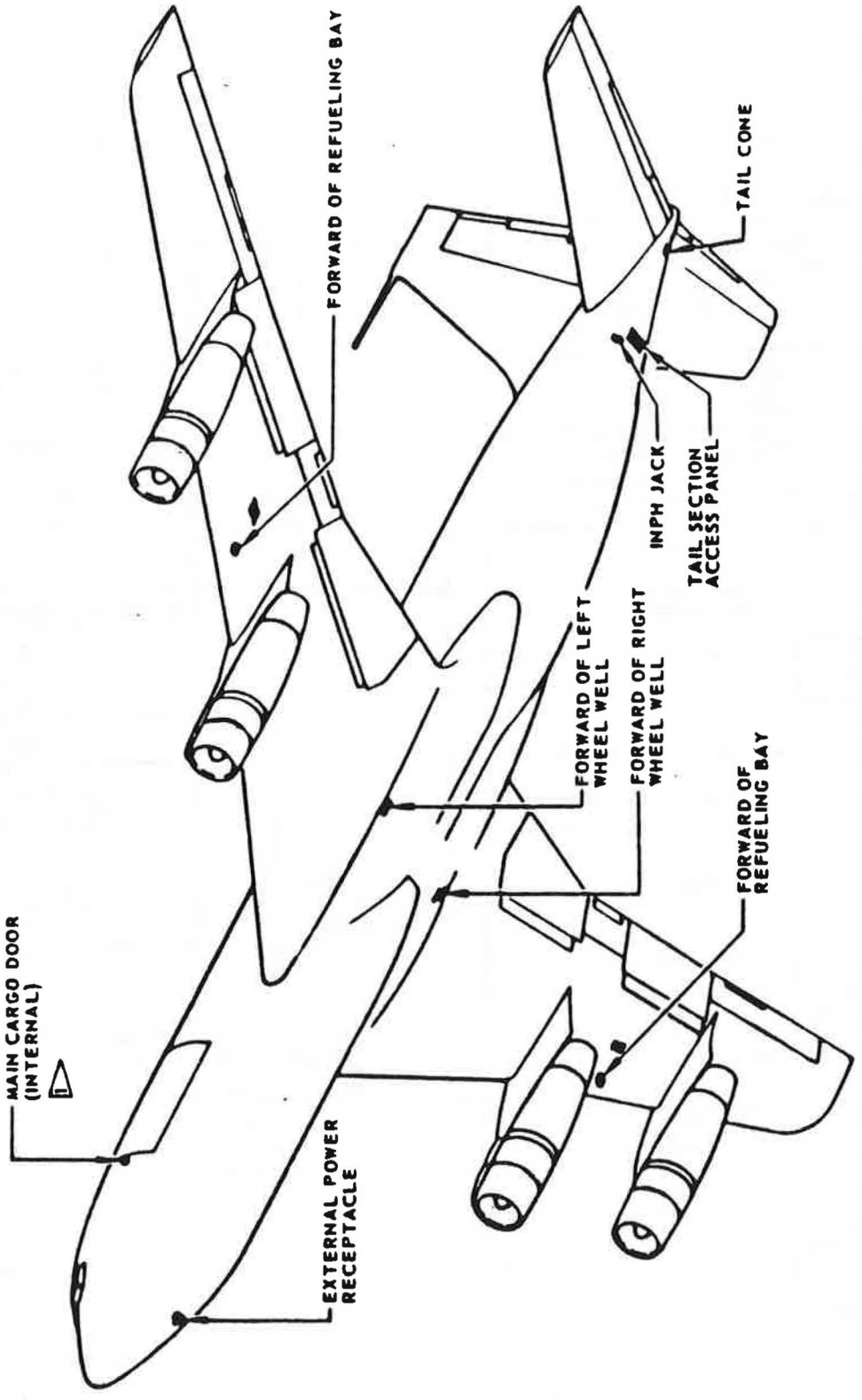
(10) Aft attendant's panel.

(11) Cargo attendant's interphone panel (turbofan only).

(12) Cargo door (sta 480) (turbofan only).



Service Interphone Station Locations
Figure 1 (Sheet 1)



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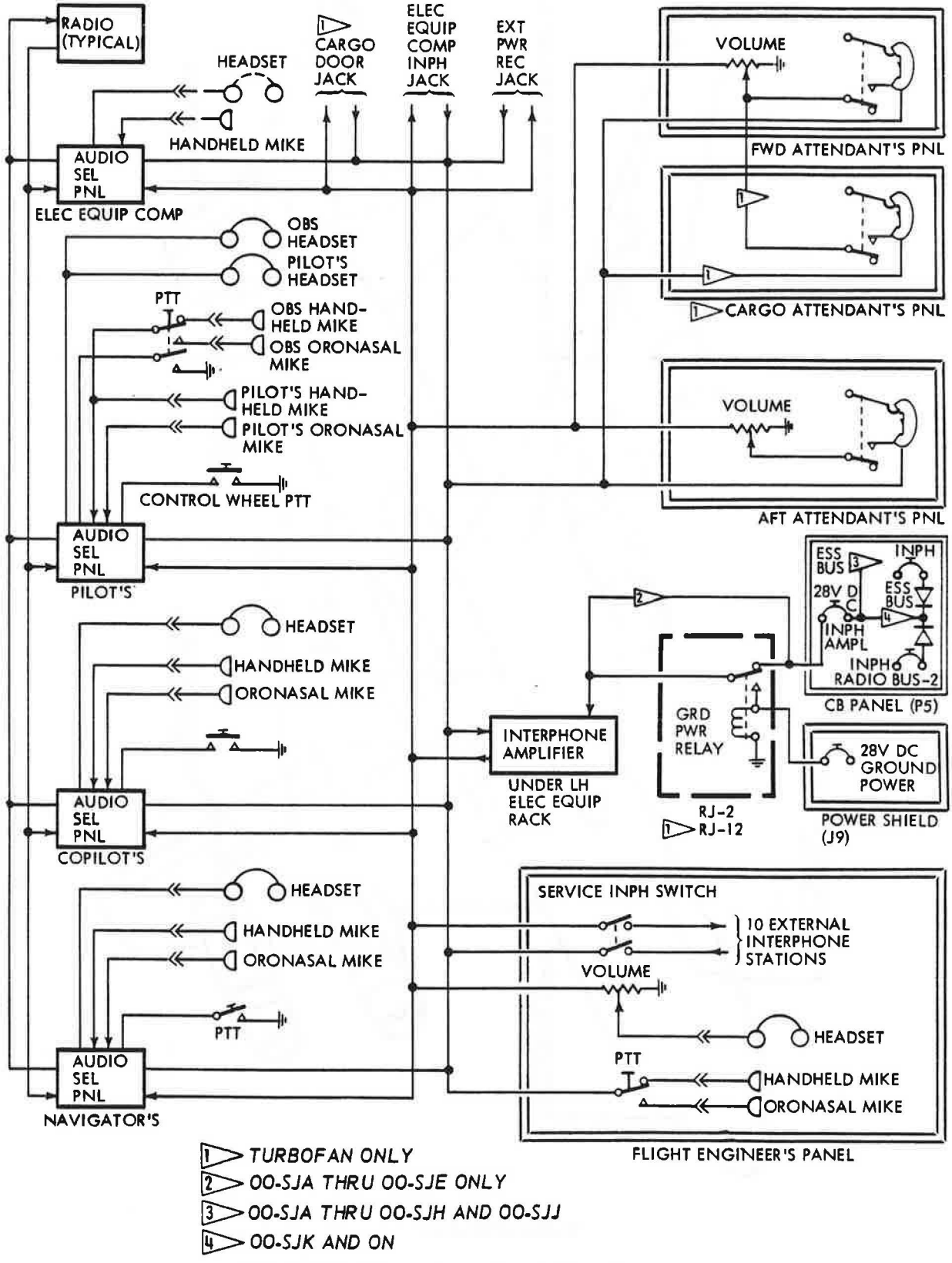
Service Interphone Station Locations
Figure 1 (Sheet 2)



Interphone System Diagram
Figure 2

D The service interphone amplifier obtains 28 volt dc power simultaneously from the essential flight instrument bus and flight instrument bus No. 2. This provides the interphone system with the capability of operation in the event of power loss on one source. Diodes provide isolation between the two power sources. When ground power is applied from ground power shield (J9) 28 volt dc is also applied to the interphone system. A service interphone ground power relay switches ground power to the amplifier whenever ground power is applied to the airplane.

E. The interphone amplifier receives signals from the interphone system whenever a flight crewmember selects INT on his audio selector panel. When the position is selected, output of that crewmember's microphone is fed to the interphone amplifier. Output of the interphone amplifier is fed to the interphone system audio selector panels, and may be monitored at any interphone station. (See figure 2.)

2. Audio Selector Panels

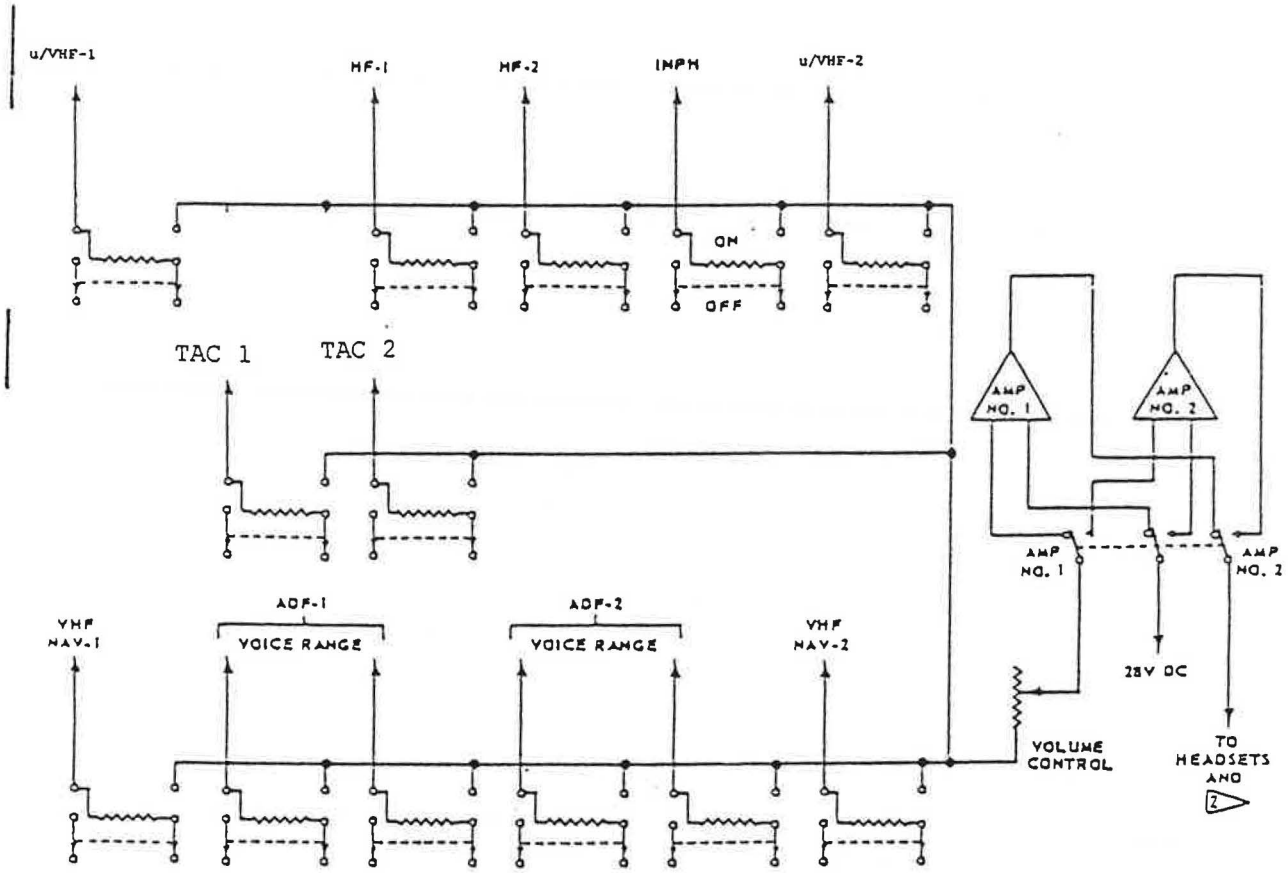
A. Audio selector panels are provided at the Aft Electronic Panel and Lower Flight Engineer's Auxiliary Panel. Each audio selector panel contains 15 audio selector toggle switches, a volume control, a six-position rotary microphone selector switch and an amplifier selector switch. (See Figure 3.).

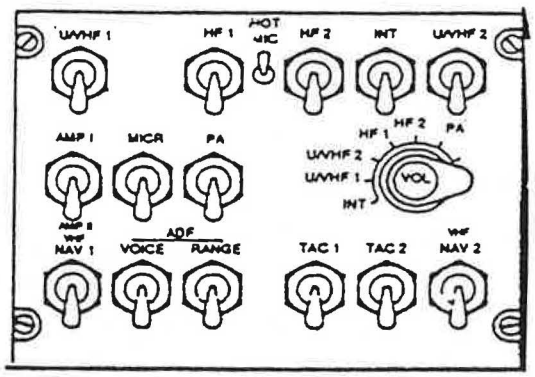
B. Toggle switches an the audio selector panels enable each station so equipped to monitor any one or any cobination of the communication and navigation receiver audio outputs. Actuation of each switch connects audio signals from the associated receiver to the input of the audio amplifier. The amplifier signals are sent to the crewmenber's headset. Any one, or any combination of audio facilities can be monitored by actuation of the associated switches. (See figure 3.)

C. A volume control is provided for audio outputs from all communication and navigation receivers and from interphone. The volume control is mounted concentric with the microphone selector switch.

D. An amplifier selector switch is provided to connect the audio output to amplifier No. 1 or amplifier No. 2 in case one of the two amplifiers is known to be nonoperative.

E. The microphone selector switch on each of the audio, selector panels enables the crewmember to select any one communication facility. By means of the switch, the crewmember's microphone output can be directed to the passenger address system, high frequency transmitter No. 1 or No 2, u/VHF transmitter No. 1 or No. 2, or to the interphone system. Operation the microphone selector switch completes both microphone control and audio circuits, and permits voice communication of the selected facility. (See figure 4.)

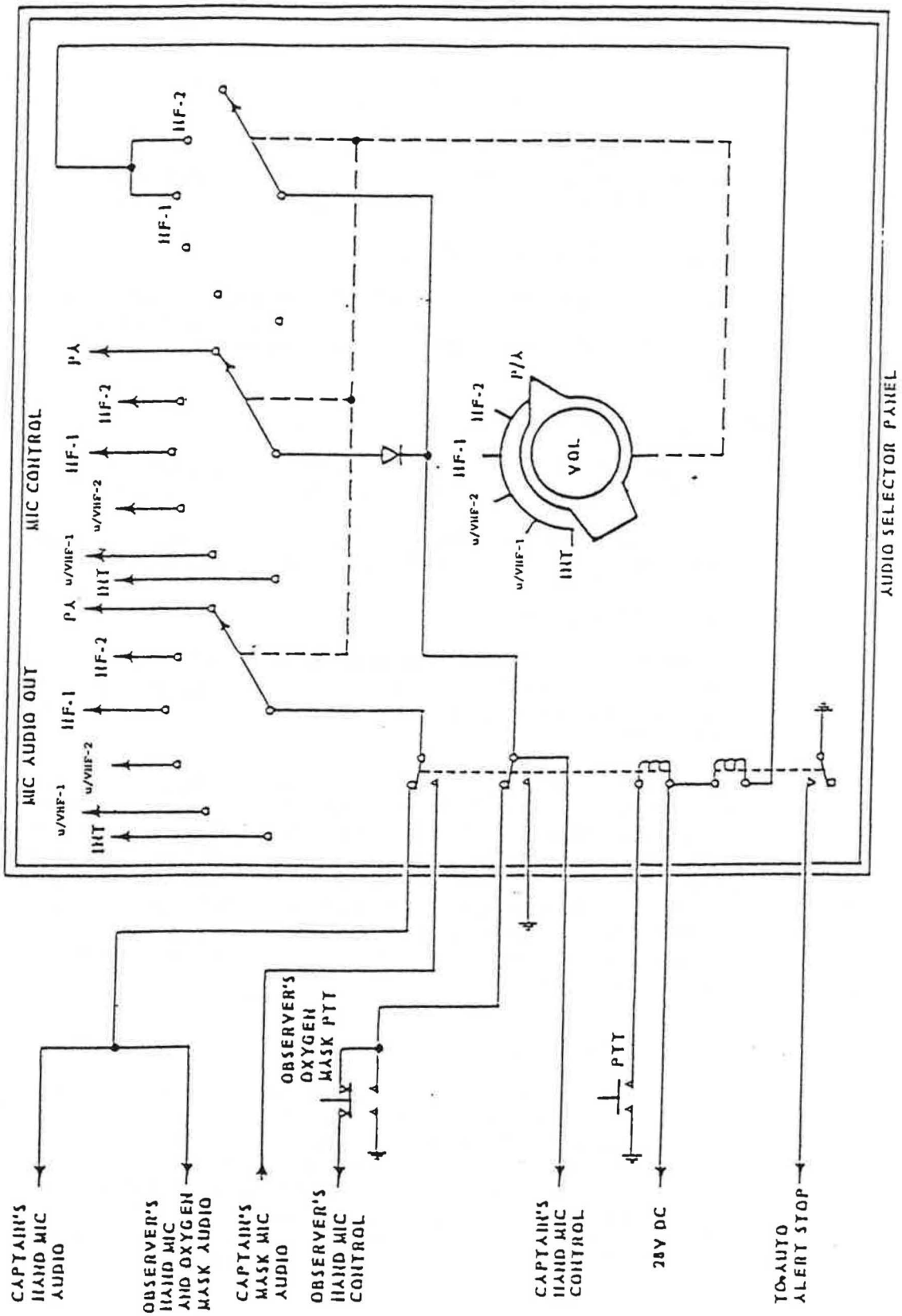




AUDIO SELECTOR PANEL

2 ON TURBOFAN AIRPLANES, AUDIO TO COCKPIT SPEAKERS FROM PILOT'S AND COPILOT'S PANELS

Audio Selector Panel Signal Switching
Figure 3



Audio Selector Panel Microphone Switching
Figure 6

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3. Forward and Aft Attendants' Panels

A. The forward and aft attendants' panels are equipped with telephone-type handsets. The handsets are suspended on hook switches when not in use. Removal of the handset from the hook switch connects the audio line, and closing the microphone switch on the handset connects the microphone line to the interphone system. A potentiometer for adjusting handset receiver audio to a comfortable listening level is installed in each panel.

4. Ground Service Interphone Jacks

A. Each of the ground service interphone stations are equipped with single receptacles for a handset or a headset and microphone. The receptacles are energized through the service interphone switch on the engineer's panel.

5. Interphone Headsets

A. Interphone headsets are 600-ohm magnetic headsets to match the 600-ohm output impedance of the audio selector panel amplifiers.

B. Headset jacks are provided at the pilot's, copilot's, flight engineer's, navigator's, observer's and electronic rack stations.

6. Interphone Microphones

A. Either carbon microphones or transistorized dynamic microphones may be used with the interphone system. The interphone amplifier microphone input circuit is designed to provide polarizing voltage for carbon microphones.

B. Handheld microphones, which incorporate microphone switches, may be used at each of the interphone stations during normal flight operation. If the pilot, copilot, navigator, flight engineer or observer is wearing an oxygen mask, a microphone in the oxygen mask may be used when a separate push-to-talk switch at the crewmember's station is operated. The oxygen mask microphones are provided with new in line preamplifiers. Each station is furnished with a boomset. The microphones of the boomsets are also provided with in line amplifiers.

7. Interphone Handsets, Attendants'

A. The attendants' panels are equipped with telephone-type handsets. The handsets, when not in use, are stowed on hook-switches on the panels. When the handset is removed from the stowage hook, a switch is closed which completes the audio circuit to the handset receiver. When the handset is stowed, the hook-switch opens the receiver audio circuit. Voice audio signals are sent to the interphone input when a push-to-talk switch on the handset is closed and the attendant speaks into the handset microphone. Releasing the switch opens the microphone audio circuit.

8. Interphone Amplifier

A. The interphone amplifier is a small, light, audio amplifier that operates directly from the airplane dc supply. It is designed to use carbon or transistorized dynamic microphones and magnetic headsets. Direct operation from the 28 volt dc power system is accomplished by using transistors throughout the amplifier.

B. The amplifier provides an electrical output of 2 watts to the interphone line. The gain as a function of frequency is within 3 db from 400 to 8000 cps. An input of 0.183 volts rms will drive the amplifier to full rated output. A volume control in the amplifier permits gain adjustments to be made to provide optimum performance for various loading requirements.

C. Output impedance of the amplifier is 125 ohms which provides a correct match for five 600-ohm magnetic headsets in parallel. Additional headsets may be used at the several service interphone stations as required, however, the power supplied to each headset is reduced as additional headsets are connected.

D. Volume adjustment at the interphone amplifier is normally done on the ground and not in flight, since the audio selector panels of the flight interphone system have individual volume controls. No on-off control is provided for the interphone amplifier.

9. Range Filters

A. Radio signals from the ADF receivers and VOR receivers are fed into voice-range filter assemblies, where voice signals are separated input on the audio selector panels.

B. The voice-range filters are mounted in the left terminal shield box at body station 400.

10. Control Cabin Loudspeaker (Turbofan)

A. A loudspeaker is provided at pilot's station to enable monitoring communication facilities without wearing a headset. The loudspeaker utilizes 28 volt dc power, which is obtained from the same source as pilot's audio selector panel.

B. The loudspeaker contains transistorized amplifiers which provide a maximum power output of 3 watts to the speaker voice coil. An on-off-volume knob on the front of the speaker assembly enables adjusting speaker output to the desired level. Total power drain of the unit at maximum output is 11.2 watts.

C. A muting relay in the loudspeaker assembly is energized whenever the associated microphone control switch is closed. When the relay is energized, an additional resistance is placed in series with the volume control to reduce the output level of the loudspeaker. The muting resistance is variable so that speaker muting may be adjusted as desired. A screwdriver is used to adjust the muting resistor. When the muting relay is not energized, the muting resistor is short circuited.

11. Operation

A. The interphone amplifier has no on-off control and as a consequence is energized whenever the 28 volt dc essential T-R bus is energized. The amplifier and audio selector panels are energized from a dual power source of the essential bus and radio bus-2.

B. Operation of the interphone system from any interphone station except those stations for ground service only (figure 1, sheet 2) requires actuation of the push-to-talk switch. When a handheld microphone or handset is used, the incorporated push-to-talk switch should be actuated. When a maskk microphone is used, a separate push-to-talk switch at the respective crewmember's station should be actuated. Releasing the push-to-talk switch disconnects the microphone audio line from the interphone system.

INTERPHONE SYSTEM - TROUBLE SHOOTING

1. General

A. Trouble shooting the flight interphone system is best accomplished by comparing operation at one station with operation at another. In this way it is easy to determine if the trouble is confined to a single audio selector panel, or if the trouble is in the signal source.

B. If no signals can be heard at a station, monitor signals individually using amplifier No. 2. If signals can be heard when amplifier selector switch is on No. 2 position, the audio selector panel amplifier No. 1 is inoperative. Power sources for the individual audio selector panels and interphone amplifier may be checked by measuring voltages at the terminals in the radio junction box. During normal operation 28 volt dc power should be available at the following terminals.

Interphone Station	Turbofan Terminal (RJ11)
Pilot-Navigator	E6, E7
Pilot	E6, E7
Copilot	F8, F9
Navigator	E9
Electronic Rack	F6, F7
Interphone Amplifier	D18

C. Failure of the interphone amplifier will cause failure of the entire intercommunication channel. Short circuits in any interphone station audio wiring will also cause complete loss of communication, since all output from the amplifier is from a single source.

D. On turbofan airplanes, two separate microphone inputs are used. One input connects all audio selector panel interphone microphone audio circuits to the amplifier. The second input connects all service interphone receptacles, attendants' handsets and the flight engineer's microphone circuits to the amplifier. A fault an, any one of the inputs win cause failure of all microphones connected to the input, but should not affect either of the remaining inputs. Faults of this nature may be found through continuity tests of the wiring.

INTERPHONE SYSTEM - MAINTENANCE PRACTICES

1. Adjustment/Test Interphone System

A. Test Interphone System

(1) Connect external power.

(2) Supply power to radio buses and close interphone circuit breakers on radio and T-R circuit breaker panel (P5).

(3) Close SERVICE INTERPHONE switch on flight engineer's panel.

(4) Set all switches on crew audio selector panels in "INT" position.

(5) Communication should be possible between any of the following points.

NOTE: The interphone amplifier is incapable of handling more than three microphone inputs and ten receivers in simultaneous operation.

(a) Pilot

(b) Copilot

(c) Flight engineer

(d) Navigator

(e) Observer (The pilot has priority over observer's microphones.)

(f) Electronic rack (audio selector panel and jack)

(g) Forward attendant's panel

(h) Aft attendant's panel

(i) External power receptacle

(j) Tail section

(k) Tail cone

(l) Each nacelle

(m) Left and right wing refueling stations

(n) Left and right main wheel wells

(o) Cargo attendant's interphone panel (turbofan only)

(p) Main cargo door (turbofan only)

(6) Open SERVICE INTERPHONE switch. only pilot's, copilot's, 1 st and 2nd observer's, flight engineer's, electronic rack, cargo door and all attendants' panels should remain an interphone system.

(7) Check radio equipment audio and microphone channels.

(a) Turn on receivers and transmitters controlled or monitored through audio selector panels, and allow to warm up.

(b) Tune equipment to authorized frequencies.

NOTE: Transmission frequencies should. be monitored through suitable receiver and transmission kept to a minimum to avoid. traffic interference. Out-jut of receivers not within range of transmitting station may be identified by characteristic noises, etc.

(c) Turn pilot's microphone selector switch on audio selector panel to u/VHF1, u/VHF 2 ,INT, HF 1, HF2 successively and operate hand mike for each position. Monitor transmission through receivers for similar equipment. INT position can be monitored on one of the other interphone stations. On turbofan airplanes, cockpit loudspeakers shall be muted when a PTT button is pressed at the pilot's, copilot's or observer's stations.

NOTE : Oxygen mask microphone may be used; however, only tap side of mask mike to produce audible signals.

(d) Repeat step (c) for copilot's, navigation and electronic rack station audio selector panels.

(e) Operate following toggle switches on pilot's audio selector panel and determine that signals are heard from each facility selected. Amplifier selector switch should be in AMPL 1 position.

1) u/VHF-1

2) u/VHF-2

3) HF-1

4) HF-2

DRW CDRL 43/44
Issue D dtd May 19/89 Paragraph 7.3

5) u/VHF-2

6) VHF NAV-1

7) ADF-1 Voice

8) ADF-1 Range

9) TACAN 2

10) TACAN 1

11) VHF NAV-2

(f) Repeat step (e) at copilot's, 2nd observer's and electronic rack audio selector panel.

(g) Repeat steps (e) and (f) with amplifier selector switch in "AMPL 2" position.

(h) Turn off all radio equipment.

(8) Remove electrical power from system.

DRM CDRL
Issue D dtd May 19/89 Paragraph 7.3

Effectivity:
TCA S/N20199 only

INTERPHONE AMPLIFIER - MAINTENANCE PRACTICES

1. Removal/Installation Interphone Amplifier

A. Remove Interphone Amplifier

(1) Deleted.

(2) Disconnect electrical connector from amplifier (See figure 201).

(3) Release slide fasteners and remove amplifier.

CAUTION: AMPLIFIER CONTAINS THIN FRAGILE INSULATING MICA WASHERS WHICH ARE EASILY DAMAGED. HANDLE AMPLIFIER CAREFULLY.

B. Install Interphone Amplifier

(1) Slide tongue on base of amplifier into lip an forward end of mounting plate.

(2) Engage slide fasteners.

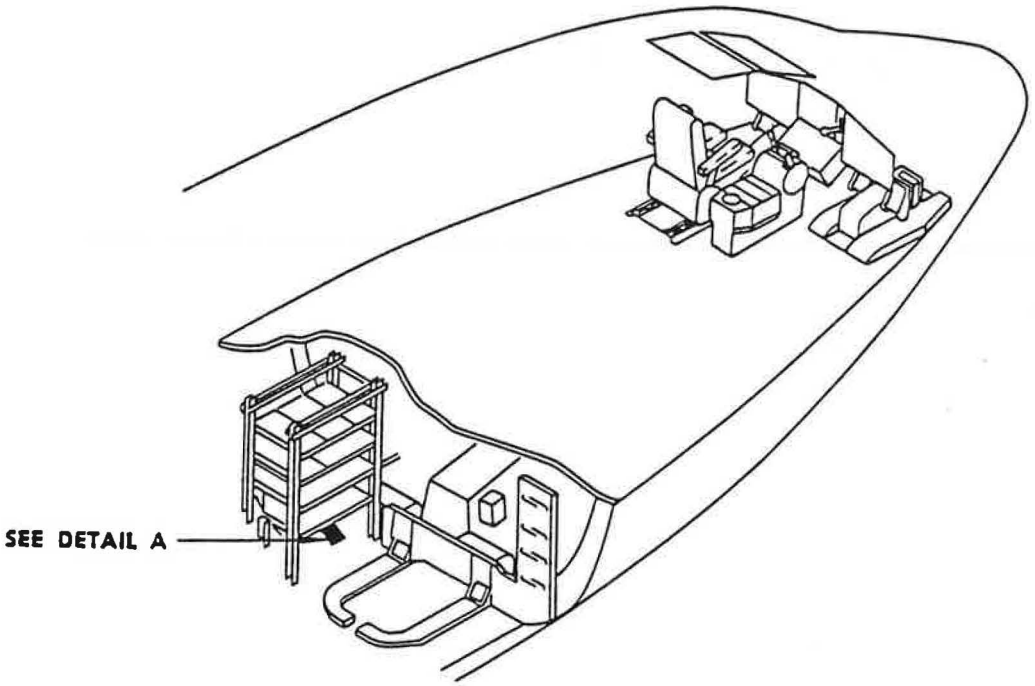
(3) Connect electrical connector to amplifler.

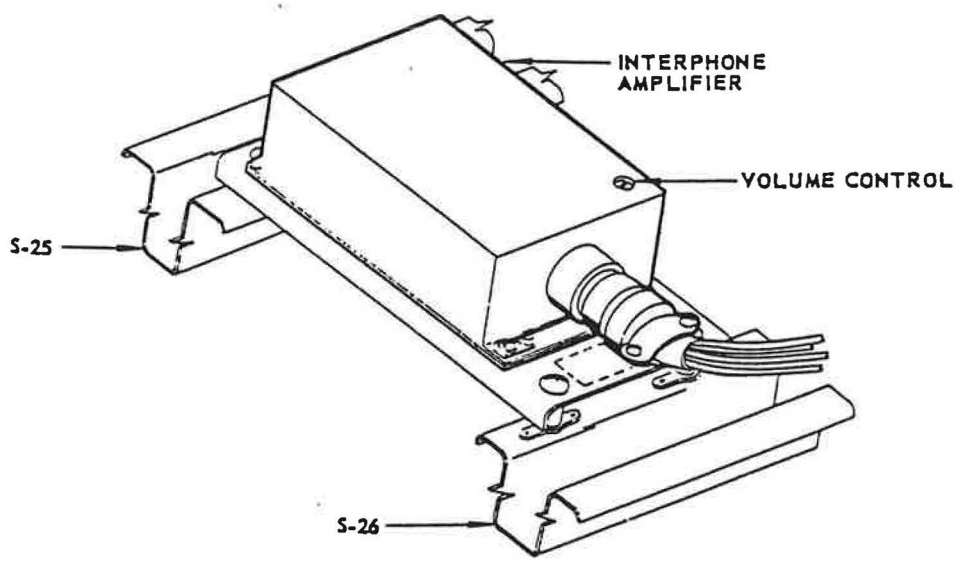
(4) Deleted

2. Adjustment/Test Interphone Amplifier

A. Adjust Interphone Amplifier

(1) A variable potentiometer, (screwdriver adjusted), accessible from exterior of the amplifier, may be used to control volume. (See figure 201.) Adjust volume control as necessary to obtain a suitable audio level.





DETAIL A

Effectivity:
RTCA only
S/N 19997
and 20000

SERVICE INTERPHONE AMPLIFIER - REMOVAL/INSTALLATION

1. Removal and Installation of Service Interphone Amplifier (see Fig. 401)

1.1 Remove service interphone amplifier.

1.1.1 Remove cover from interphone amplifier box.

1.1.2 Remove plug from amplifier.

1.1.3 Remove locking screw and take out amplifier.

CAUTION: THE AMPLIFIER CONTAINS THIN, FRAGILE MICA INSULATION LAMINATIONS WHICH CAN EASILY BE DAMAGED. THEREFORE HANDLE CAREFULLY.

1.2 Install service interphone amplifier.

1.2.1 Insert guide tongue of amplifier into guide slot at forward end of mounting plate.

1.2.2 Tighten locking screw.

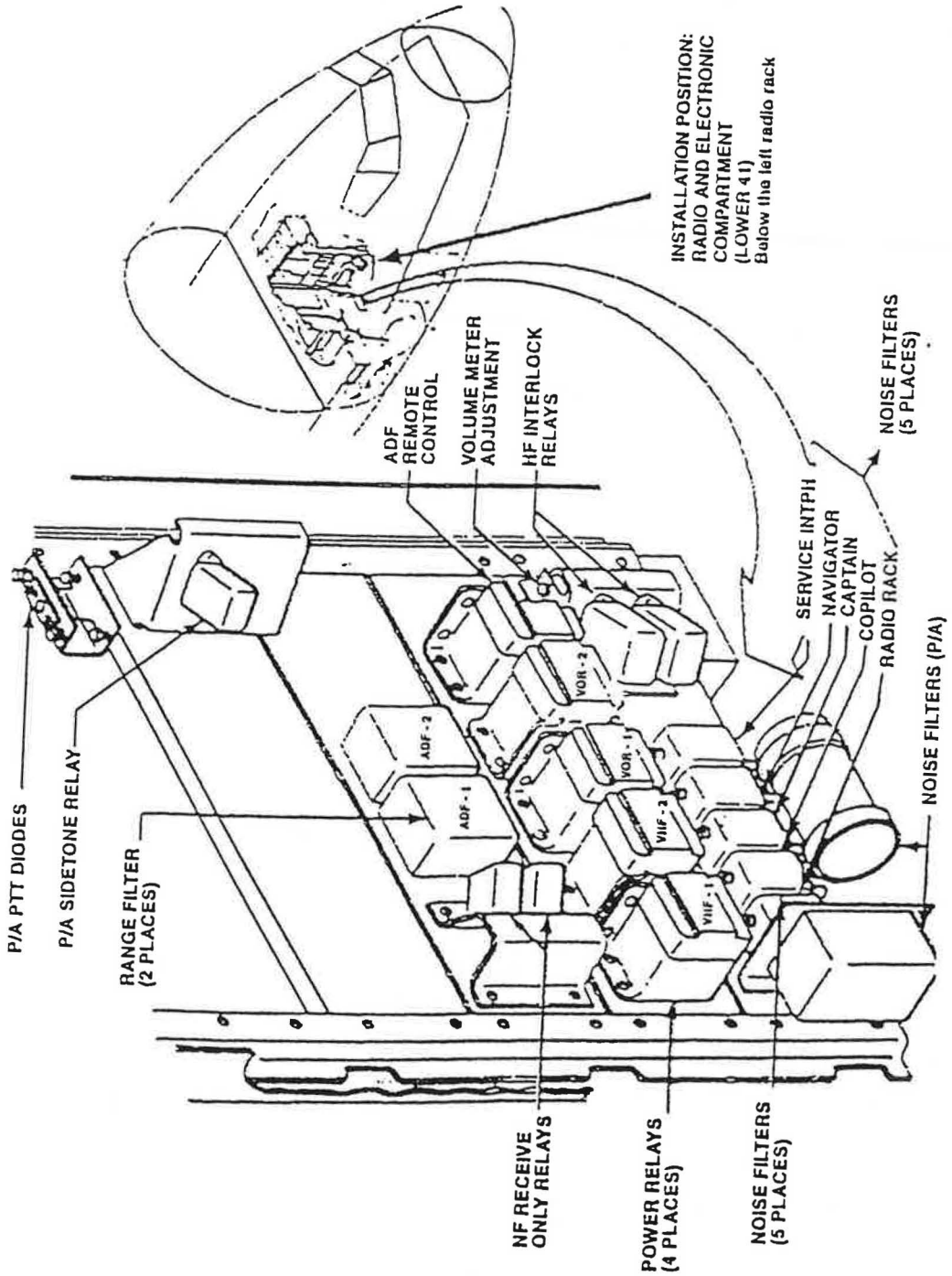
1.2.3 Connect plug to amplifier.

1.2.4 Place cover on interphone amplifier.

2. Adjustment and Testing of Service Interphone Amplifier

2.1 Adjust Service Interphone Amplifier

A rheostat in the amplifier, which can be accessed from outside close to the plug, serves to adjust volume. Volume can be adjusted as required for service interphone headset operation.



Installation of Interphone Amplifier
Figure 401

VHF COMMUNICATION SYSTEMS - DESCRIPTION AND OPERATION

EFFECTIVITY

00-SJL and on

1. General

A. Two independent very high frequency (VHF) communication systems are installed on the airplane. The VHF systems provide amplitude modulated voice communication between aircraft and ground or other aircraft. Communication in the 118 to 135.975 megahertz frequency range on any of 720 channels with a 25 kilohertz spacing may be accomplished. VHF control panels provide a means of selecting the desired operating frequency. Average communicating distances from the aircraft to ground are approximately 30 miles at 1000 feet and 135 miles at 10,000 feet.

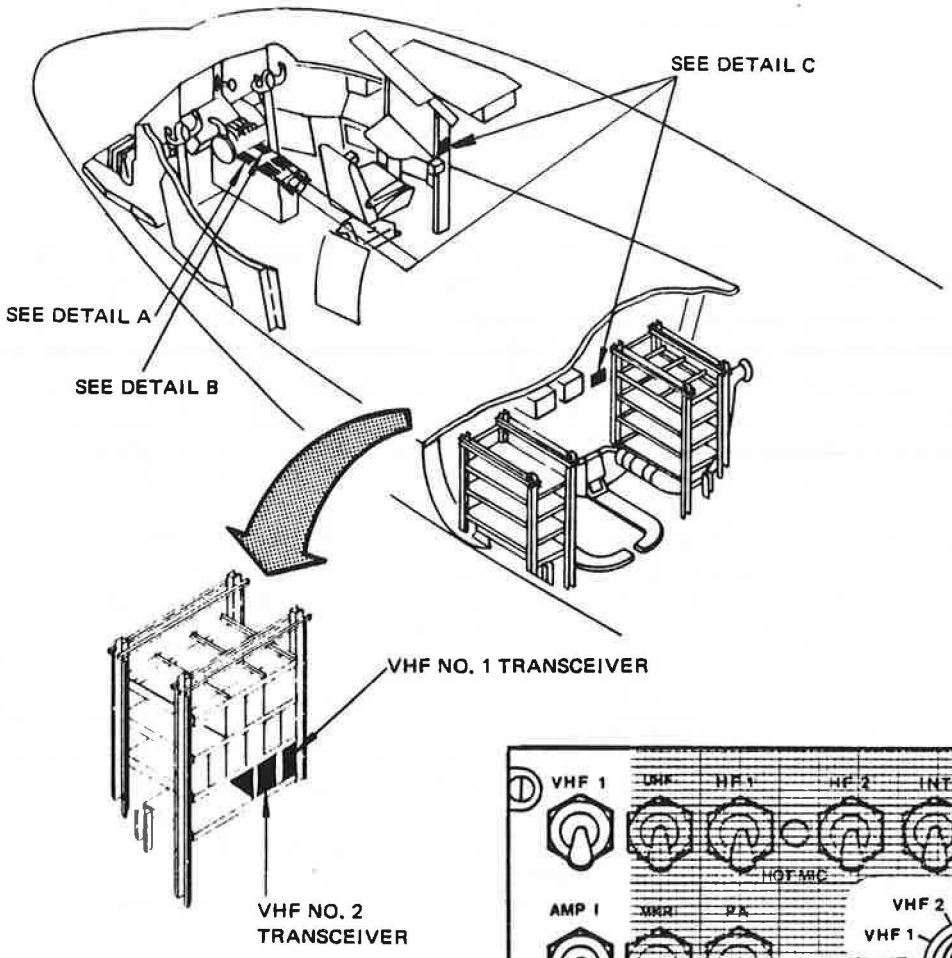
B. Each VHF system is composed of one transceiver, control panel and antenna. The transceivers are installed in the left electronic equipment rack. VHF No. 1 and VHF No. 2 control panels are located on the aft electronic section of the control stand in the control cabin. VHF No. 1 control panel is on the captain's side and VHF No. 2 control panel is on the first officer's side. VHF No. 1 antenna is at station 470, top centerline of the fuselage. VHF No. 2 antenna is at station 490, bottom centerline of the fuselage. VHF No. 3 antenna provisions are at station 930 bottom centerline of the fuselage. (See figure 1.)

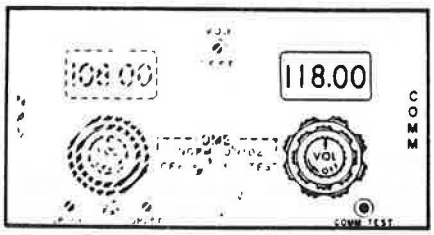
C. The VHF systems use 28 volt dc power obtained from circuit breakers on circuit breaker panel P5. VHF No. 1 system power is obtained from the essential radio bus. VHF No. 2 system power is obtained from radio bus No. 2.

D. Communication on each VHF communication system is completed through the audio selector panels of the flight interphone system. (See 23-2-0.)

2. Control Panels

A. Two identical VHF control panels are installed in the control stand. Each panel contains VHF communications, VHF navigation systems and DME controls, however, only those components relating to the VHF communication systems will be described.





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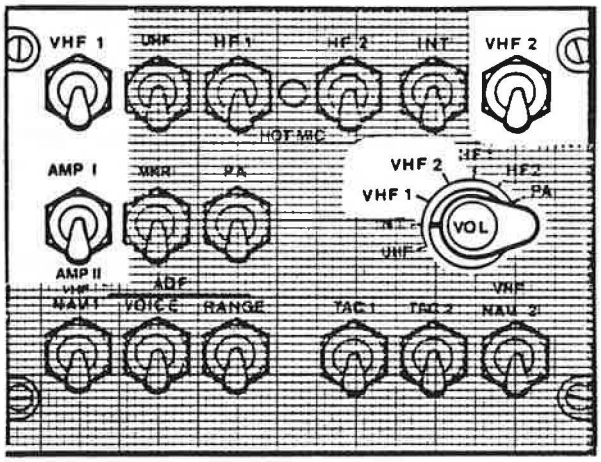
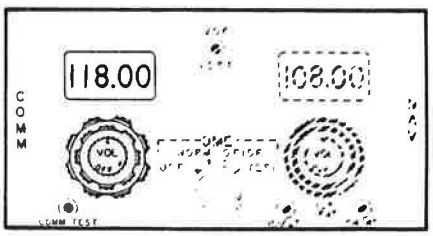


DETAIL C



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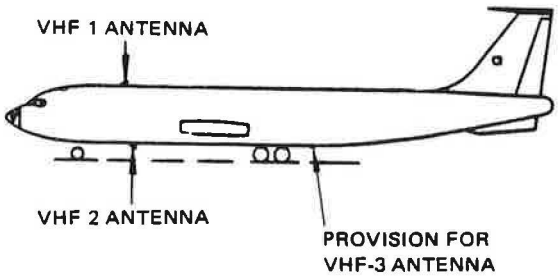


VHF Communication System Component Location
Figure 1

B. The VHF communication system controls consist of a COMM TEST pushbutton and two frequency selection knobs. The COMM TEST pushbutton, when pressed, disables the receiver squelch circuits to help indicate whether receiver squelch circuits are operating correctly. Receiver background noise will increase when button is pressed. Rotation of the two knobs selects the desired frequency. The outer knob has 18 positions numbered 118.00 through 135.975. The inner knob has 40 positions numbered .00 through .97. The frequency selected is shown in an indicator window above the knobs. Any of 720 channels with 25 kilohertz spacing may be selected on frequencies of 118 to 135.975 megahertz.

3. Transceiver

A. The transceiver is composed of a combination transmitter and receiver which share certain circuits. Frequency selection is available in the 118 to 135.975 megahertz range, providing 720 channels with 25 kilohertz spacing. Tuning of the receiver and transmitter sections is accomplished almost immediately with digital synthesizer and phase detection techniques. Tuning is completed whenever a frequency is selected on the VHF control panel. Push-to-talk circuits are disconnected until tuning is completed. The transceiver is composed of solid-state circuits. Transient protection and voltage regulation circuits ensure operating voltages to all circuits.

B. The receiver is normally on unless a push-to-talk circuit is completed. Received amplitude modulated signals are completed through a de-energized antenna relay, to the RF amplifier. The signals are amplified, mixed and converted as necessary, then passed through the detector, squelch and amplifier circuits. Audio then passes through a de-energized receive-sidetone relay to the interphone system audio selector panels. Selcal signals received are sent to the selcal system on separate circuits. (See 23-6-0.)

C. Transmitting is completed on the same frequencies as the receiver. Pressing the push-to-talk button energizes an antenna relay which switches the antenna to the transmitter circuits. The receive-sidetone relay is also energized and connects detected transmitted audio to the interphone system audio selector panels. The transmitter is amplitude modulated by audio signals from the flight interphone system. A minimum power output of 25 watts RF energy may be applied to the VHF antenna.

4. Operation

A. A crewman may transmit or receive over a VHF system after the desired channel is selected on the VHF control panel. Receiving and transmitting are completed on the same frequency. VHF must be selected on the audio selector panel.

B. To receive, a crewman must turn on the VHF toggle switch on the audio selector panel (23-2-0). The volume control on the audio selector panel may have to be adjusted. The crewman will then hear any messages that may be received on the selected frequency. Receiver sensitivity may be checked by pressing the COMM TEST button. Receiver background noise should increase.

C. To transmit over the VHF systems, the mike selector switch on the audio selector panel must be set to the desired VHF position. Operating the microphone push-to-talk button of the flight interphone system will then operate control circuits within the transceiver which will disconnect the receiver circuits and connect the transmitter circuits to the antenna. Amplitude modulated transmission will begin when audio signals are impressed on the microphone circuits. Sidetone is rectified from the modulated RF to the antenna and returned to the headphones of the flight interphone system to indicate proper operation of the transmitter. When the push-to-talk button is released the system will return to the receive condition.

VHF COMMUNICATIONS SYSTEMS - TROUBLE SHOOTING

EFFECTIVITY

SABENA OO-SJL and on
BOAC G-AVPB and on

1. General

A. Trouble shooting the VHF communication systems is comparatively simple due to duplication of components between systems. Trouble spots can be most easily checked by interchanging common components between systems. If the system is operative after an assumed malfunctioning component has been replaced by a known operative component, the faulty component has been isolated.

B. If a system is completely inoperative, the first check should be to determine whether or not proper voltages are available to the system. Ensure all VHF circuit breakers on circuit breaker panel P5 are closed (pushed in) and power is available to them. Power measurements are made in RJ11. The following table indicates which terminals should be used for making power checks.

Component	28V DC at Terminals
VHF-1 Transceiver	G-8
VHF-2 Transceiver	H-8

C. To decrease the number of unscheduled removals, confirm that the condition stated in the flight report exists prior to replacing system components. If a VHF system is reported to be inoperative on one or two specific frequencies, a precautionary check of the equipment should be made to confirm the report and that the problem is repetitive. The trouble may be due to the area and position of the airplane in respect to the ground station, or to other conditions existing at the time. Also ensure the flight interphone system is operating properly so that poor communication attributed to the VHF systems is not actually due to a faulty isolation amplifier in an audio selector panel. Some checks to make prior to exchanging components in the VHF systems are:

(1) A loose coaxial connector will cause intermittent operation and noise in the system, therefore, ensure all connectors are tight. Also check connectors for oxidation. Oxidation may occur at soldered connections, thereby creating a mismatch which will result in a decreased signal to noise ratio (apparent noise increase).

(2) Channeling

(a) Rechannel the system several times from both above and below the reported inoperative frequency. Wafer switch contacts in the control panel may be bent.

(b) Compare system operation against that of the other system in the aircraft.

(3) Transmitter Output

(a) The transmitter sidetone is demodulated RF output, therefore the presence of good sidetone is consistent with good transmitter modulated output.

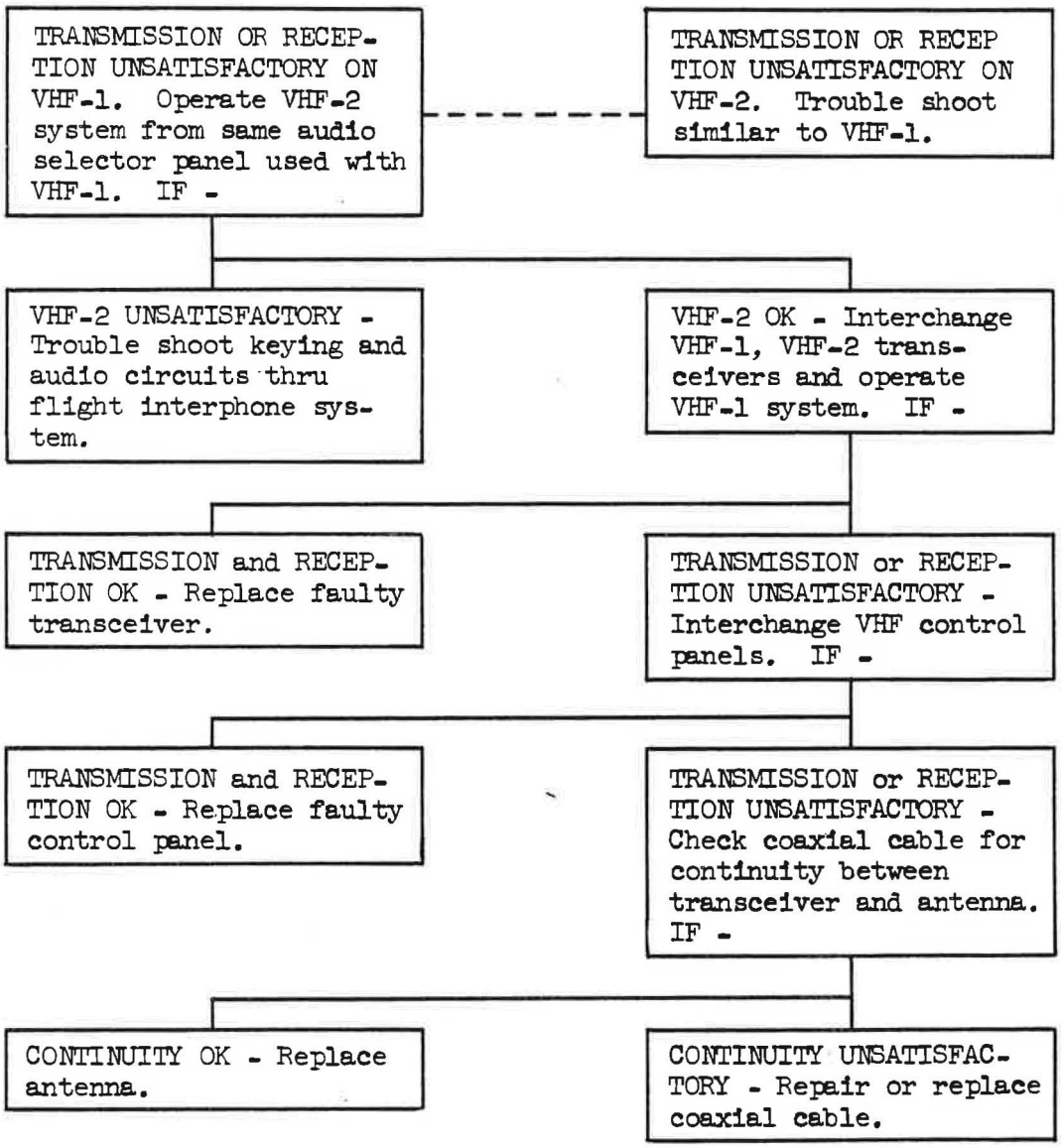
(b) Transmitter frequency may be checked on one VHF system by receiving on the other VHF system.

(4) Receiver Operation

(a) Receiver operation and frequency may be checked by monitoring signals from ground stations, other aircraft, or from the other VHF system.

(b) If the control panel has a squelch control (sensitivity) the receiver can be checked for normal sensitivity by comparing the operation of the squelch control on the reported malfunctioning channel with operation on known good channels.

2. Trouble Shooting Chart



VHF COMMUNICATION SYSTEMS - ADJUSTMENT/TEST

EFFECTIVITY

00-SJL and on

1. General

A. The following test should be used to check the operation of a VHF system after a system component has been replaced or repaired. Conduct test using only authorized test frequencies and check to ensure frequency is not in use before transmitting.

B. The airplane should not be in or near a large metallic structure, such as a hangar or tower, which may attenuate RF energy. Airplane structure, such as landing gears, may block the VHF antenna when the airplane is in certain positions with respect to ground station antennas.

2. Prepare to Test

A. Provide ground power to the airplane and energize busses on circuit breaker panel P5.

B. Ensure all VHF circuit breakers and interphone audio selector panel circuit breakers are closed.

C. If control panels have an on-off switch turn on VHF systems and allow 5 minutes for warm-up.

D. Check flight interphone system and ensure audio selector panels are operable. (See 23-2-0.)

3. Test VHF Communication System

A. At pilot's station, set microphone selector switch to VHF-1 on audio selector panel.

B. At copilot's station, set microphone selector switch to VHF-2 on audio selector panel.

C. If a squelch control is on the control panel, tune each VHF system to an unused frequency. Press the COMM TEST or TEST button. Receiver background noise shall increase when squelch control is pressed.

D. Tune each VHF system to an active channel. Listen to communication traffic and compare receiver sensitivities. They should be approximately equal. All but the weakest signals should open squelch.

E. Rotate volume controls (if on VHF panels) and confirm controls work smoothly throughout entire range.

F. Tune each system to several different channels and ensure operation is good by channeling from both above and below the selected frequency. Compare reception between receivers; each should be approximately equal on each frequency.

CAUTION: DO NOT KEY THE VHF TRANSMITTERS WHEN AIRCRAFT IS BEING FUELED.

G. With each VHF system, establish communication on an authorized test frequency from each station where an audio selector panel is installed. Reception and transmitter sidetone shall be loud and clear.

H. Secure VHF systems.

I. Determine whether there is any further need for electrical power on the airplane, if not, remove external power.

VHF COMMUNICATION SYSTEMS ANTENNAS - MAINTENANCE PRACTICES

1. Removal/Installation VHF Antenna

A. Equipment and Materials

(1) Sealant BMS 5-13; Aerodynamic Smoother

B. Remove VHF Antenna (See figure 201.)

(1) Remove ten screws on antenna base.

(2) Turn jacking screws to separate antenna base and antenna supporter.

CAUTION: TUNING LINE (IF INSTALLED) AND ANTENNA CABLE ARE CONNECTED TO BASE OF ANTENNA. LOWER ANTENNA SHOULD NOT BE ALLOWED TO DROP AND UPPER ANTENNA SHOULD NOT BE LIFTED UNTIL DISCONNECTED.

(3) Tilt antenna slightly forward exposing tuning line (if installed) and antenna cable at aft end of antenna base.

(4) Disconnect antenna.

NOTE: When removing upper VHF antenna secure connectors so they will not fall into interior of airplane.

C. Prepare for Applying Faying Surface Seal

(1) Remove old seal and clean antenna base and well in fuselage. See Chapter 51, "Prepare for Sealing."

D. Install VHF Antenna

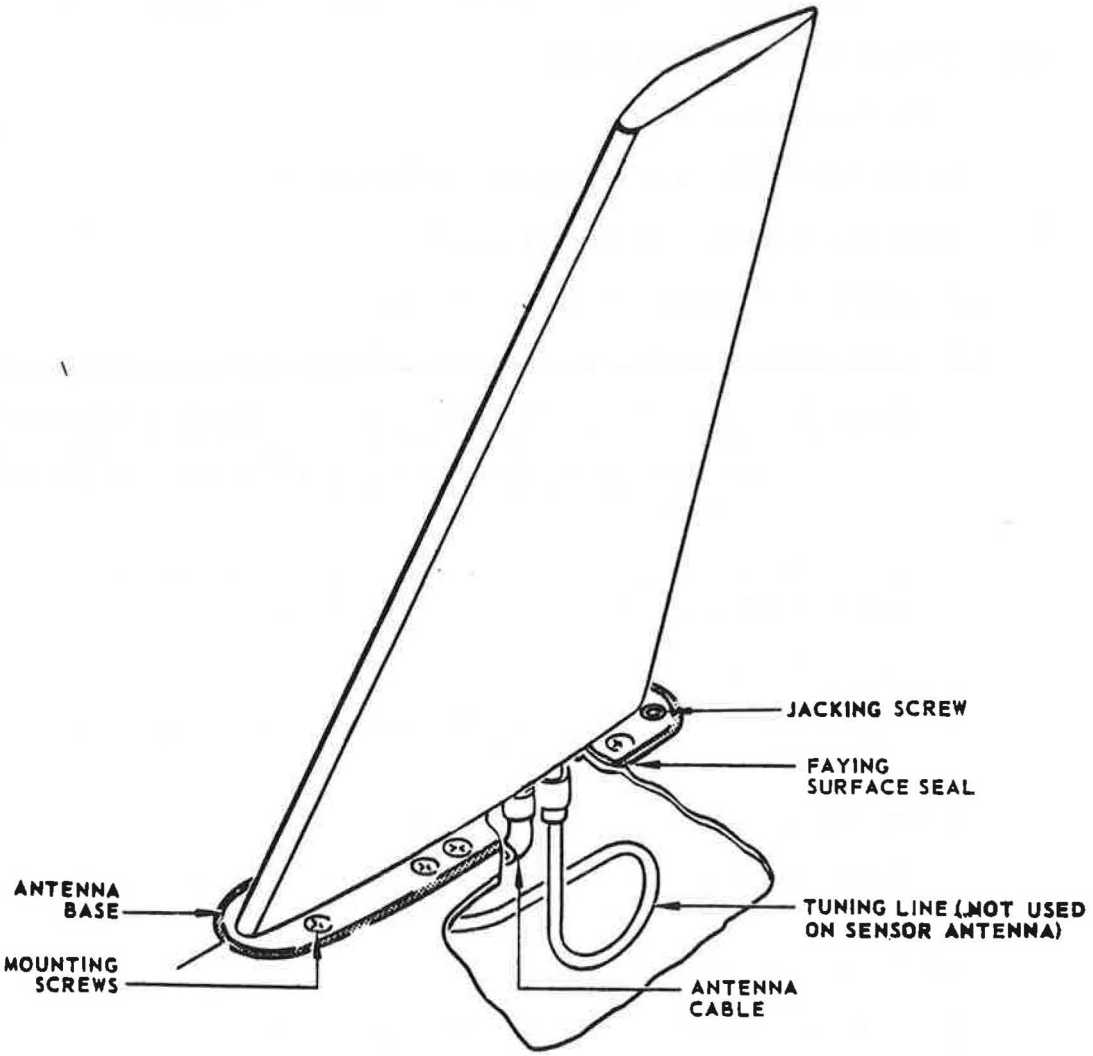
(1) Back out jacking screws as far as they can come.

(2) Tilt antenna forward and attach tuning line (if needed) and antenna cable.

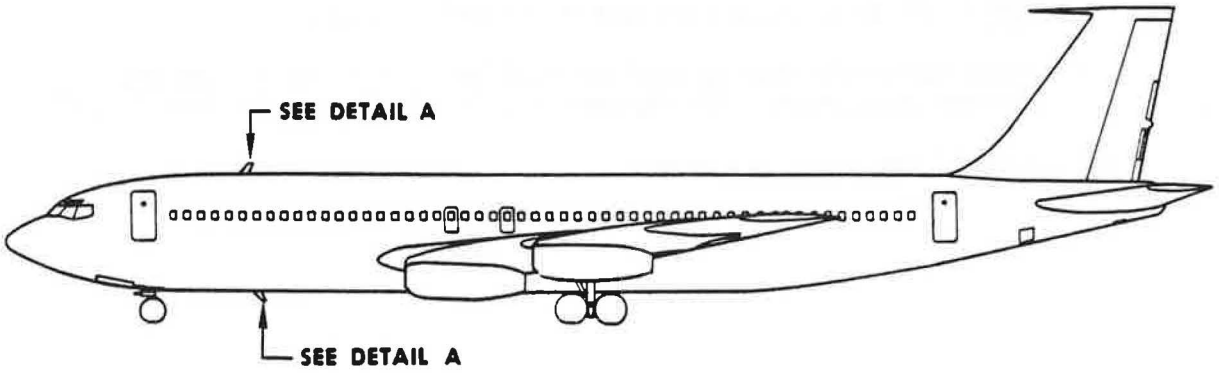
NOTE: Be sure connectors are tightened securely.

(3) Apply removable faying surface seal between antenna base and antenna supporter. See Chapter 51, "Apply Faying Surface Seal."

(4) Install ten mounting screws.


JACKING SCREW
FAYING SURFACE SEAL
ANTENNA BASE
TUNING LINE (NOT USED ON SENSOR ANTENNA)
MOUNTING SCREWS
ANTENNA CABLE

DETAIL A


SEE DETAIL A
SEE DETAIL A

E. Check Antenna Bonding

(1) General

(a) The following bonding check should be conducted any time that a VHF antenna has been reinstalled.

(2) Equipment and Materials

(a) Low Resistance Testing Set - Microhm Bridge Type W Bonding Meter, Model T-207, Avton Manufacturing Co., or equivalent.

(3) Measure dc resistance between antenna base and fuselage structure. Resistance shall not exceed 0.001 ohm.

VHF ANTENNA - ADJUSTMENT/TEST

1. General.

This test shall be performed in two steps.

A. Coaxial line and connector test.

B. Antenna test.

NOTE: Both tests shall be made using special equipment operating or usable in VHF range.

2. Equipment and Materials

A. VHF loss test equipment, SABENA P/N 1-7488, and associated between series adapters.

B. Polyskop II - ROHDE & SCHWARZ, Type SWOB, BN 4245/50

3. Prepare for Test

A. Coaxial Line and Connector Test

(1) Remove VHF transceiver 1 and 2 from LH-4 electronic shelf.

CAUTION: BE SURE THAT ELECTRICAL POWER IS REMOVED FROM AIRPLANE OR THAT VHF COMM BREAKERS ON P5 PANEL ARE PULLED BEFORE REMOVING TRANSCEIVERS.

(2) Gain access to VHF 1 and VHF 2 antenna connectors and disconnect RD265 (TOP) and RD1479 (BOTTOM).

(3) Connect generator P/N 1-7488-2 to load P/N 1-7488-1 using proper adaptor cable. Switch on generator and allow 5 minutes for output stabilization. Check that battery status indicator is in green area. Adjust on load for 0db readout. Do not switch off generator until the end of test. Disconnect generator from load.

(4) Connect generator P/N 1-7488-2 of test equipment P/N 1-7488 to A1 terminal of RD130B (BP) for testing system 1, or to A1 terminal of RD135B (BP) for testing system 2, using suitable adapter cable.

(5) Connect load P/N 1-7488-1 of test equipment P/N 1-7488 to RD265 for testing system 1 or to RD1479 for testing system 2.

B. Antenna Test

(1) This test can only be performed if coaxial line and connector test has been successful.

(2) Make sure that RD265 for system 1 and RD1479 for system 2 are disconnected.

(3) Connect Polyskop II RF output to A1 terminal of RD130 (BP) for testing system 1 or to A1 terminal of RD135B (BP) for testing system 2, using suitable adapter cable.

(4) Provide 220V 50Hz to supply Polyskop II.

4. Test

A. Coaxial Line and Connector

(1) Be sure that battery status indicator is still in green area.

(2) Read on indicator on load the loss in db. Value must be as follows:

- VHF 1: 1db $\pm$ 0,2db
- VHF 2: 0,6db $\pm$ 0,2db

(3) Move coaxial cable by hand where appearing, and try to move connectors by hand versus shield, observing needle on load indicator. Any variation in needle position indicates poor contact in the connector or in the cable; rework connector or replace cable accordingly.

(4) No variation of needle position and loss in the range specified, indicate that test has been successful.

(5) If there is no more use of the test equipment, switch off and disconnect.

(6) Reinstall VHF transceivers 1 and/or 2 and push breakers accordingly. Confirm both systems are operable.

B. Antenna

(1) Switch Polyskop II on.

(2) Adjust calibrated output attenuator to -10db.

(3) Adjust "Brightness" and "Focus" to obtain good picture. Adjust 0-reference line to 0 on graticule.

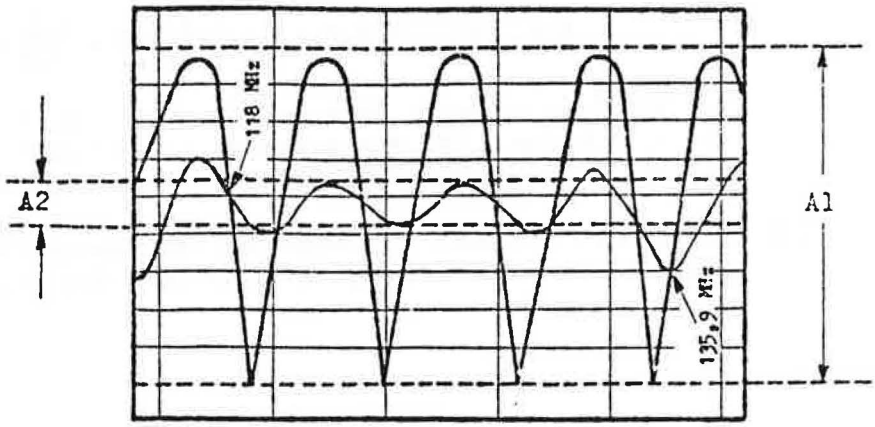
(4) Select frequency range 100 to 200 MHz.

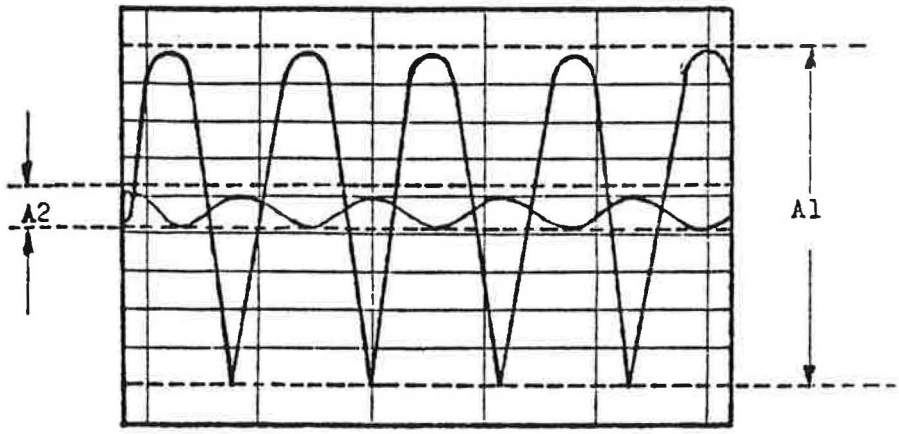
(5) Select Y1 amplifier selector switch UA, adjust vertical gain Y1 to obtain a picture of about 10 graduations.

(6) Select frequency marker 10 MHz, adjust "Marker Amplitude" to approximately 1 cm (one centimeter) height.

(7) Adjust "Centre Frequency" and "Sweep Width" to have frequency range 100 to 150 MHz on all graticule width.

(8) Observe picture on the screen and read the amplitude of the undulations A1.





(9) Reconnect RD265 (TOP) for system VHF 1 and RD1479 (BOTTOM) for system VHF 2.

(10) Observe picture on the screen and in the communication range (118 MHz to 135,957 MHz) read the amplitude A2.

(11) Calculate reflection coefficient "r" as follows:

$$r = \frac{A2}{A1}$$

Example: $r = \frac{1}{10} = 0,1$

(12) Calculate Voltage Standing Wave Ratio "V.S.W.R.":

$$V.S.W.R. = \frac{1 + r}{1 - r}$$

Example: $V.S.W.R. = \frac{1 + 0,1}{1 - 0,1} = \frac{1,1}{0,9} = 1,22$

For VHF Comm antenna, VSWR must be less than 1,75. If calculated value is below 1,75, the antenna is serviceable, otherwise check antenna bonding and if satisfactory, replace antenna.

(13) Disconnect Polyskop II. Reinstall VHF transceivers 1 and 2 and push breakers accordingly. Confirm both systems are operable.

SELCAL DECODERS - DESCRIPTION AND OPERATION

1. General

A. A dual Selcal (SELective CALling) decoder is installed in the left electronic equipment rack. The unit operates in conjunction with HF Communication receivers or VHF Communication receivers. (See figure 1)

B. The Selcal unit relieves the pilots from continuously monitoring the radio receivers, and will alert the pilots by sounding a chime whenever a properly coded transmission is received from a ground station and decoded by the Selcal unit. At the same time the chime is sounded, a light on the control panel will flash on and off, thus indicating to the pilot whether the coded signal has been received by decoder No. 1 or No. 2.

C. The Selcal decoder is reset by pressing the push-to-reset button on the control panel.

2. Selcal Control, Chime and Lights

A. Selcal Control

(1) A switch on the panel provides selection of operating in conjunction with HF Communication receivers or VHF Communication receivers.

B. Selcal Chime

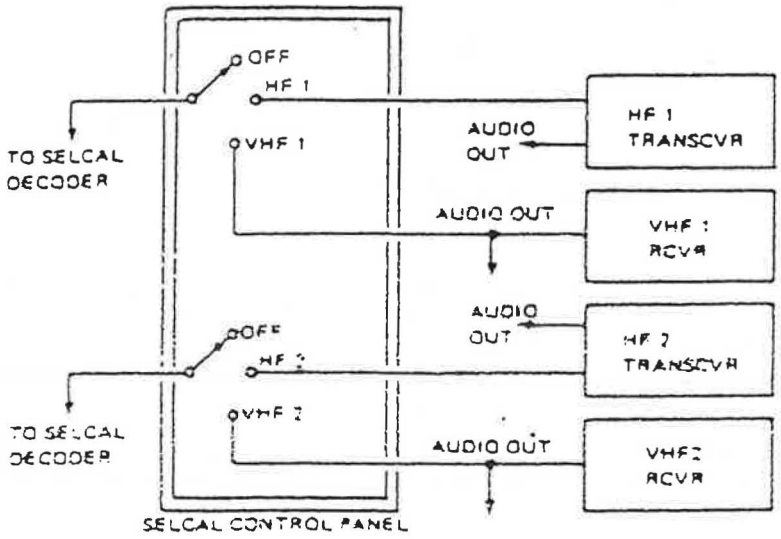
(1) The Selcal chime is sounded when either section of the dual Selcal decoder receives a properly coded signal. When a signal is decoded, a circuit in the decoder is closed and 28 volt d-c power is applied to the chime.

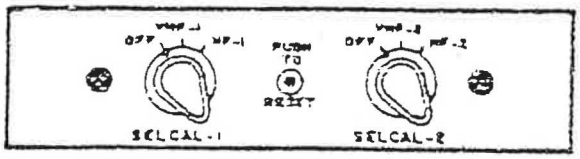
(2) The chime is "reset" whenever the Selcal decoder is reset.

(3) The Selcal chime is under the flight engineer's table.

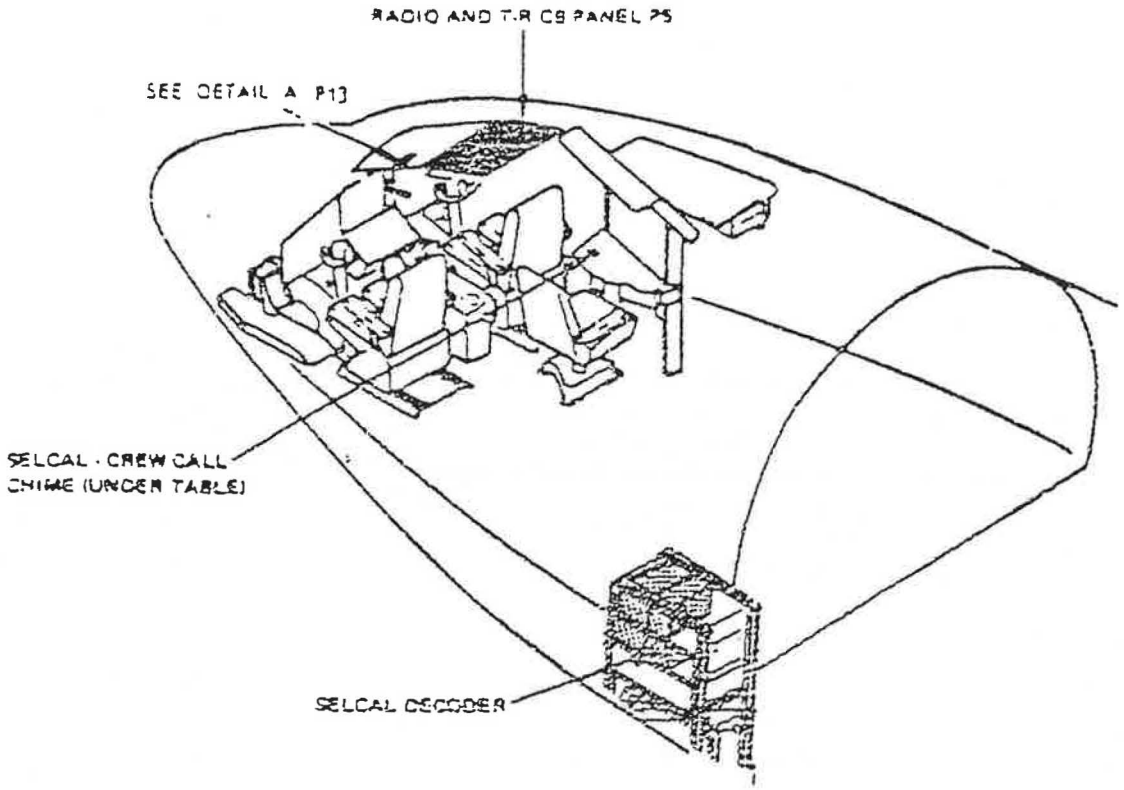
C. Selcal Lights

(1) Whenever a properly coded signal is received and decoded by either section of the dual decoder an associated flashing lamp is energized to indicate whether the signal was received by decoder No. 1 or No. 2. A properly coded signal causes an intermittant signal circuit to operate in the section of the decoder unit receiving the signal. The signal circuit switches the lamp on and off until the decoder is reset.

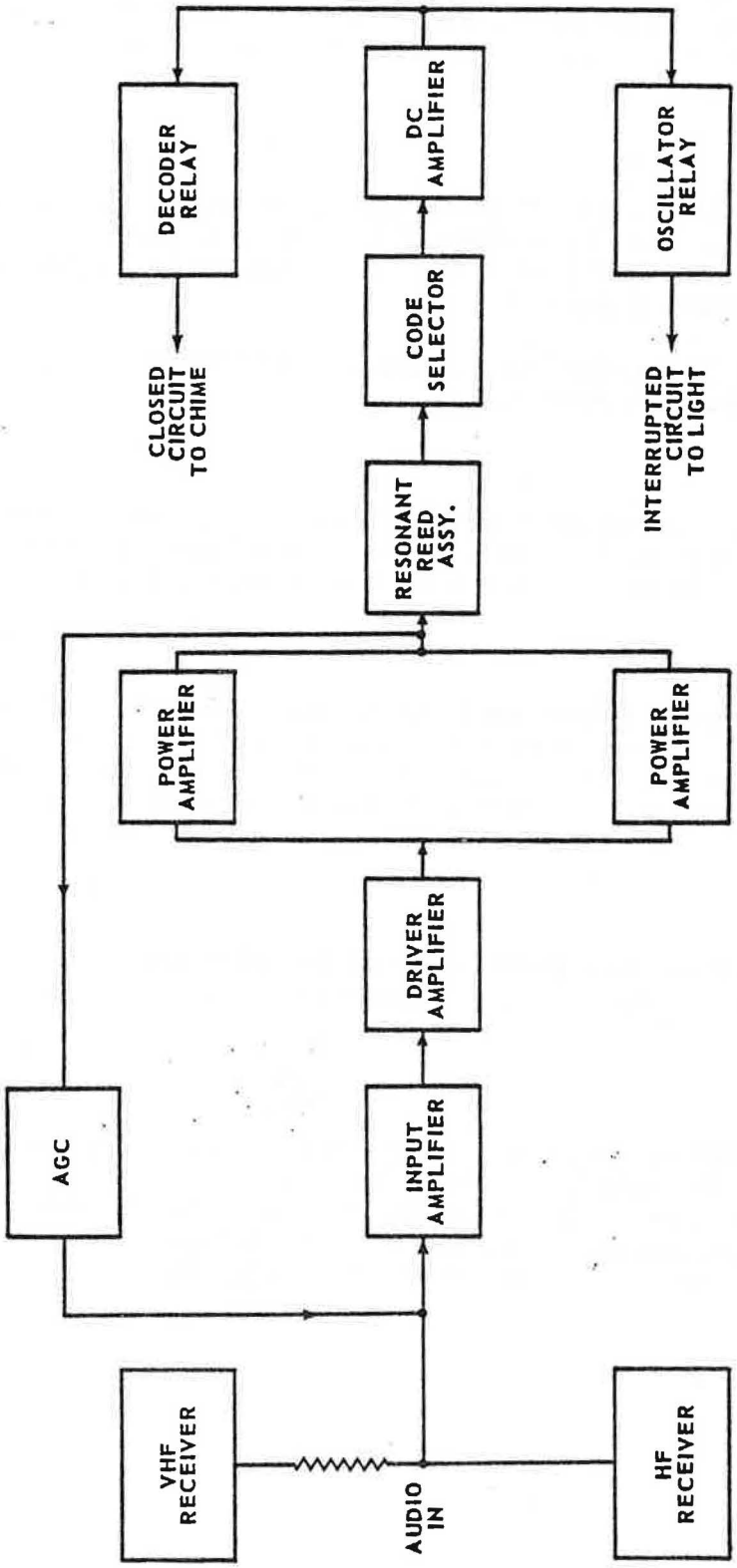




DETAIL A



Selcal System
Figure 1



Selcal Decoder Block Diagram
Figure 2

3. Selcal Decoder Unit

A. The Selcal decoder unit consists of two separate decoder chassis in a common case. Each of the decoder assemblies consists of an AGC audio amplifier, a dc amplifier, control relays and Vibrasponder reed assemblies. (See figure 2.)

B. AGC Audio Amplifier

(1) The audio amplifier consists primarily of two stages of voltage amplification followed by a push-pull power amplifier. The high level output of the power amplifier is capacitively coupled to the Vibrasponder Resonant Reed coils.

(2) An AGC circuit is provided to maintain proper drive to the Vibrasponder Resonant Reed coils.

C. D. C. Amplifier

(1) The dc amplifier is biased beyond cut-off so that no current flows through the relay coil. When a proper coded signal is received, dc amplifier will conduct and energize the decoder relay.

D. Vibrasponders

(1) Vibrasponders are resonant reed relays which respond only to a specific tone. Twelve tones are available in the 300 to 1000 cycle per second range. The units are used in pairs to make up specific tone combinations so that each airplane may be assigned a unique tone code.

4. Auto Alert Provisions

A. Space provisions for an auto alert unit are incorporated in the decoder housing, and all necessary wiring and controls are installed in the airplane.

5. Operation

A. Controls for both Selcal decoders are duplicated on a single control panel located in the pilots overhead panel. Each section consists of a selector switch and a push-to-reset button with flashing light incorporated. When the selector switch is on "HF" or "VHF" position, the decoder is on and receives signals from HF or VHF receivers.

B. When the proper coded signal is received, a pair of reeds vibrate during the first pulse and another pair of reeds vibrate during the second pulse. If the time interval between the two pulses is proper, the dc amplifier will conduct and energize the decoder relay. When the decoder relay is energized, three sets of contacts are actuated. One set electrically locks the decoder relay. A second set provides a closed circuit to operate the Selcal chime. A third set applies 28 volts to the relay oscillator circuit which causes the Selcal light to flash on and off.

C. The decoder unit is reset by pressing the "PUSH TO RESET" button on the control panel. This action shorts the decoding relay winding causing it to open. The audio amplifier again receives power, the relay oscillator is de-energized and the decoder is reset.

END

SELCAL DECODERS - MAINTENANCE PRACTICES

1. Adjustment/Test Selcal Decoders

A. Test Equipment Required

(1) VHF transmitter

(2) HF transmitter

(3) Selcal Console - Motorola TA-203, or equivalent.

NOTE: Existing HF and VHF ground operated transmitters used for transmitting coded tone signals may be used.

B. Prepare to Test Selcal Decoders

(1) Make arrangement for ground operator to transmit selected code signals as necessary.

C. Test Selcal Decoders

(1) Connect external power to airplane and energize radio and T-R circuit breaker panel (P5).

(2) Turn on VHF No. 1, VHF No. 2, HF No. 1 and HF No. 2 and allow to warm up.

(3) Select HF No. 1 on Selcal panel No. 1.

(4) Tune HF No. 1 to predetermined frequency and signal ground station operator to transmit code signal on HF transmitter.

NOTE: Do not tune HF No. 2 to transmission frequency until test using HF No. 1 is completed.

(5) Check results of code signal reception.

(a) Two pairs of tones should be heard.

(b) Selcal chime should sound.

(c) Selcal No. 1 light on control panel should flash.

(6) Press flashing light assembly to reset Selcal Decoder.

(7) Repeat (3), (4), (5) and (6) for HF No. 2.

(8) Repeat (3), (4), (5) and (6) using VHF No. 1 system.

(9) Repeat (3), (4), (5) and (6) using VHF No. 2 system.

(10) Repeat above tests from (3) to (9) inclusive using Selcal panel No. 2.

(11) Reset Selcal No. 1 and No. 2.

(12) Shut off radio equipment.

(13) Disconnect power supply.

END

BOEING Intercontinental 707

MAINTENANCE MANUAL

TEMPORARY REVISION NR. DFW 23-6

INSERT FOLLOWING SUBCHAPTER 23-6-0, PAGE 202

REASON FOR CHANGE: Installation of Audio Mixing Amplifier Model 247

INSTRUCTION: Insert updated page block.

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NOTE: The insertion of this TR has to be listed in the Record of Temporary Revisions at the beginning of Volume 1.

V/UHF COMMUNICATION SYSTEM - DESCRIPTION AND OPERATION

1. General

A. Each aircraft is equipped with a dual V/UHF system SRT-651/N manufactured by ELMER.
The dual system equipment consists of:

- two transceivers, RT-651N
- two control panels, CP-9000/SH
- two V/UHF antenna
- one Audio Mixing Amplifier (Dual Channel), Model 247

B. The RT-651/N is a 30-400 Mhz V/UHF transceiver capable of communication with 8.33 kHz channel spacing in the 118.5 MHz - 136.975 MHz ATC band and 25 kHz in all other bands. The equipment is remote controlled by the CP-9000/SH control panel.

2. Description

A. Control Panel

Both V/UHF control panels are located on the aft electronic panel. See figure 1 for the layout of the control panel.

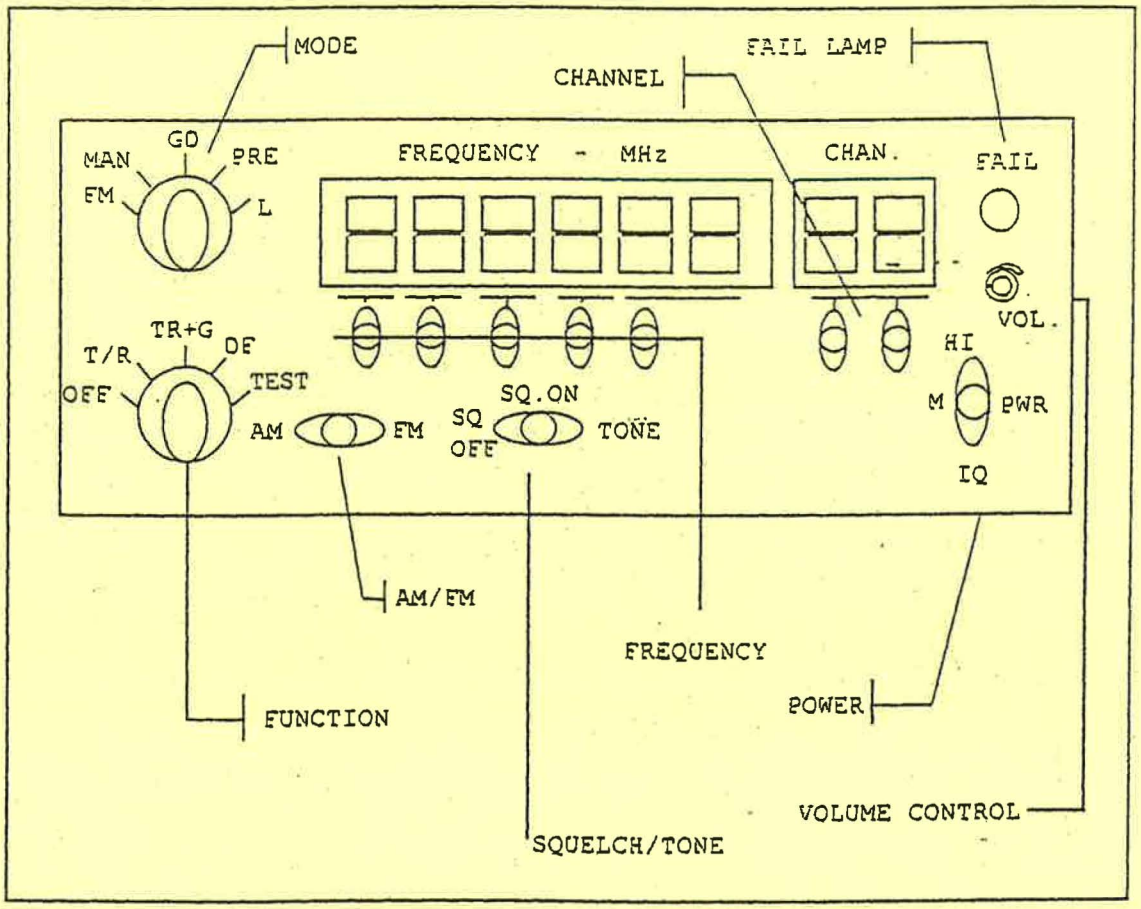

Fig. 1 CP-9000/SH Front Panel Layout

Ref: ELMER Pub PO1629

The front panel of the CP-9000/SH (Figure 1) contains the following controls and displays:

MODE Selector: This is a five position rotary switch, that selects the method of choosing the transceivers operational frequency:

- EM EMERGENCY frequency selection (243 MHz)
- MAN Manual frequency selection CD Guard frequencies selection
- GD Guard frequencies selection
- PRE Preset frequencies selection
- LD Loads a new preset frequency

FUNCTION Selector: This is a four position rotary switch, that selects the following radio functions:

- OFF Deactivates RCP
- T/R Transmit/Receive
- T/R+G Transmit/Receive+Guard Receive
- DF Direction Finding activation
- TEST Activates Interruptive BIT

FREQUENCY Selector: This consists of five toggle switches. The toggle switches have three positions,"down", "centre/ no action" and "up". The switches are based to the "centre/ no action" position with the up/down selections having momentary actions. The switches permit manual selection of the operational frequency with each selector being dedicated to a digit (100 MHz, 10 MHz, 1 MHz, 100 kHz, 10 kHz/1 KHz).

VOLUME control: Adjust desired audio level.

Ref: Elmer Pub PD1629

CHANNEL Selector:	This consists of two toggle switches. The toggle switches have three positions/selections, "down", "centre/no action" and "up". The switches are biased to the "centre/no action" position with the up/down selections having momentary actions. This permits selection of the preset channel number (Range 00 to 99).
AM/FM Selector:	This is a single, two positions,toggle switch. It selects the modulation mode, in the lower UHF band (225 to 399.975 MHz).This switch is not active in the other frequency bands, where the type of modulation is fixed.
SQUELCH/TONE Selector:	This is a single toggle switch. This toggle switch has three positions, "SQ.OFF", "SQ. ON" and "TONE". The TONE position has a momentary action. The switch enables/disables the main receiver squelch and a 1000 Hz tone.
FAIL Lamp:	This is a filament lamp indicator. It flashes during the TEST execution; when lit (fixed) it signals the occurrence of a failure detected by the BIT of the transceiver.
FREQUENCY Display:	This is a six digit display. It displays the numerical value of the operational frequency, either manual or preset, and after an interruptive BIT activation, it shows a code with the bit test result.
CHANNEL Display:	This is a two digits display. It displays the number of the preset channel (when the mode selector is set to 'PRE" or "LD" position).
PWR Selector:	This is a two digits display. It displays the number of the preset channel (when the mode selector is set to 'PRE" or "LD" position).

Ref: Elmer Pub PD1629

B. Transceiver:
The V/UHF transceiver is mounted on the LH radio rack shelf 4 (See figure 3)

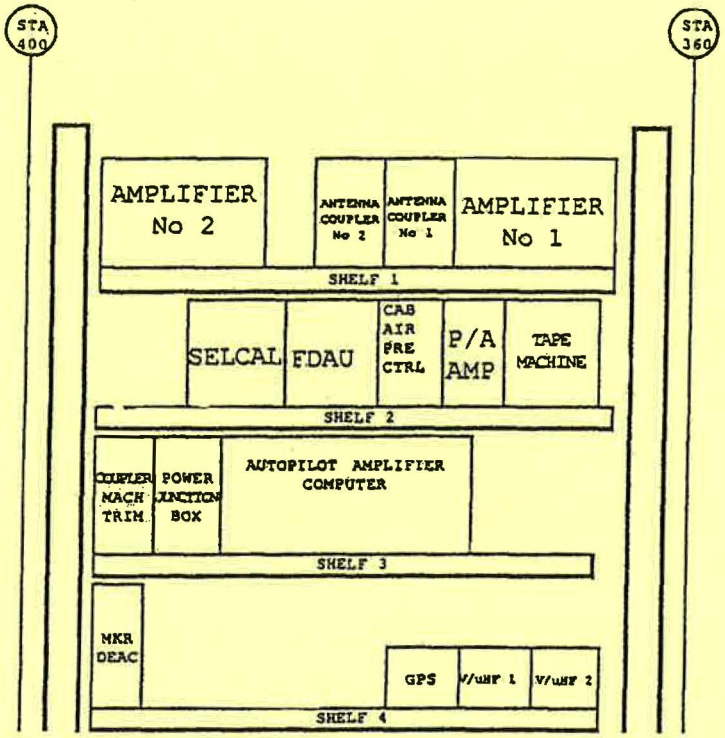

Fig. 2 RTCA LH radio rack

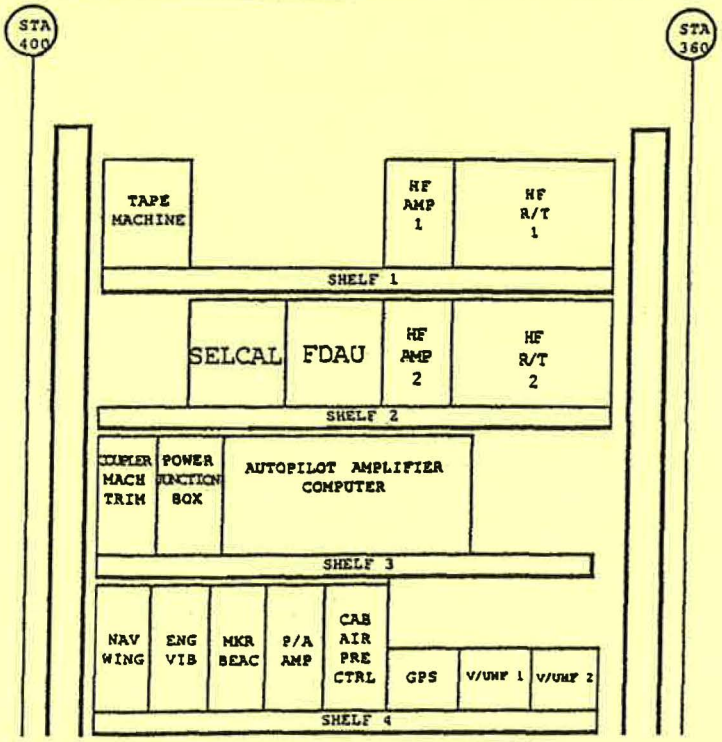

Fig. 3 TCA LH radio rack

C. Antenna

The V/UHF No 1 antenna is located at BS 470
The V/UHF No 2 antenna is located at BS 490
Refer to figure 4.

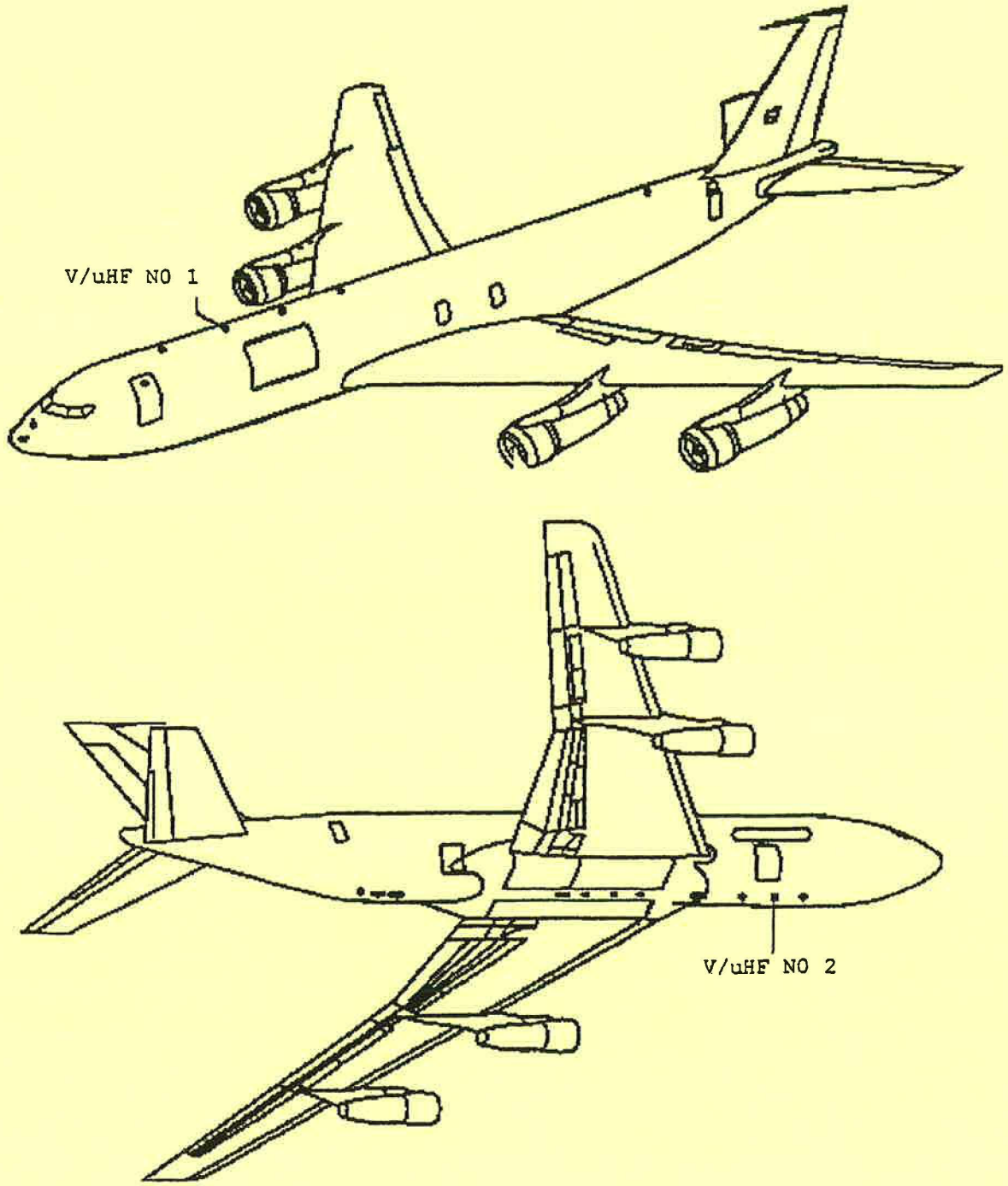

Fig. 4 Antenna Location

D. Audio Mixing Amplifier

One Audio Mixing Amplifier is installed on the RJ-12 COM/NAV term and component shield. It matches the impendance of the V/UHF transceiver microphone input with aircraft interphone system. The Audio Mixing Amplifier has two fully independent Audio Amplifiers with their own Power Supply installed.

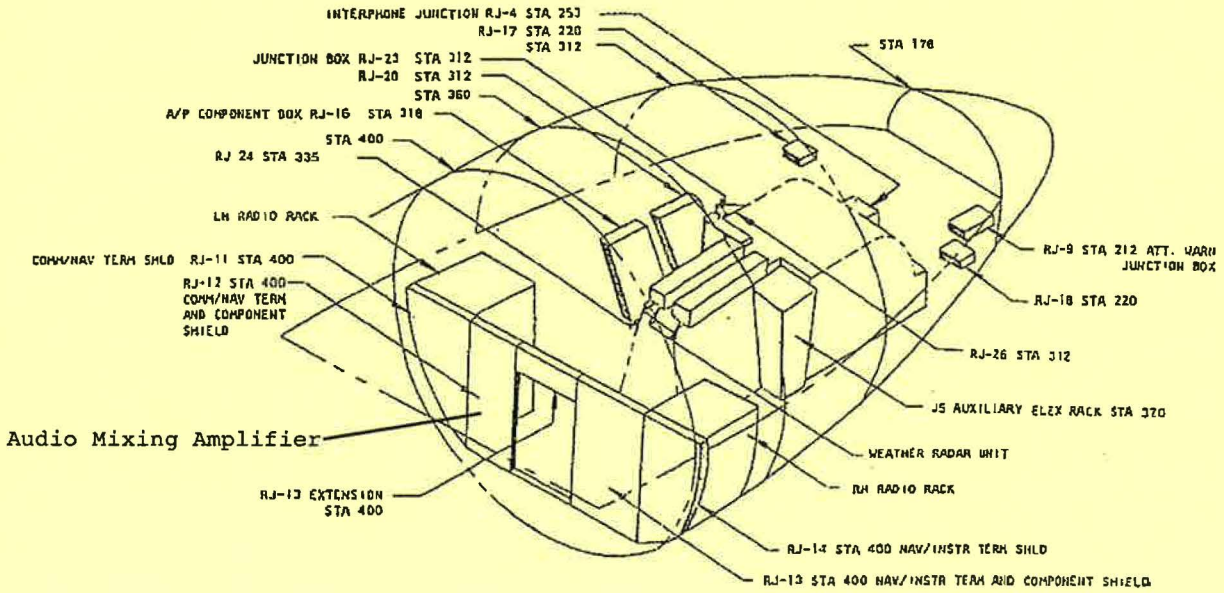

Fig. 5 Audio Mixing Amplifier Location

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BOEING Intercontinental 707

MAINTENANCE MANUAL

TEMPORARY REVISION NR. DFW 23-7

INSERT FOLLOWING SUBCHAPTER 23-10-0, PAGE 102

REASON FOR CHANGE: Installation of Audio Mixing Amplifier Model 247

INSTRUCTION: Insert updated page block.

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NOTE: The insertion of this TR has to be listed in the Record of Temporary Revisions at the beginning of Volume 1.

V/UHF COMMUNICATION SYSTEM - REMOVAL/INSTALLATION

1. Transceiver removal.

   A. On P5 circuit breaker panel, open and tag circuit breakers labeled V/UHF 1 and V/UHF 2.

   B. Disconnect cables from front of transceiver.

   C. Loosen transceiver from mount and remove transceiver.

2. Transceiver installation.

   A. Screw transceiver in mount.

   B. Connect cables to transceiver.

   C. Close V/UHF 1 and V/UHF 2 circuit breakers on P5 panel.

3. V/UHF control panel removal

   A. On P5 circuit breaker panel, open and tag circuit breakers labeled V/UHF 1 and V/UHF 2.

      CAUTION: DO NOT REMOVE THE CONTROL PANEL WITH POWER APPLIED. DAMAGE TO THE EQUIPMENT MAY RESULT.

   B. At the aft electronic panel, release the fasteners and lift out the panel as far as the cable permits.

   C. Disconnect cable and remove control panel.

4. V/UHF control panel installation.

   A. Position control panel close to the opening of aft electronic panel and connect cable to unit.

   B. Place control panel in cut-out of aft electronic panel and secure fasteners.

   C. On P5 circuit breaker panel, close V/UHF 1 and V/UHF 2 circuit breakers.

5. V/UHF antenna removal.

   A. Open tag on P5 circuit breaker panel, the circuit breakers labeled V/UHF 1 and V/UHF 2.

   B. If applicable, remove some aerodynamic smoother from around antenna base to facilitate removal. Use hardwood or plastic scraper.

   C. Remove mounting screws holding antenna to aircraft and remove as far as cables will permit.

NOTE: If antenna is located on top of aircraft, secure cable so that it will not fall into aircraft.

D. Disconnect cable and remove antenna.

6. V/UHF antenna installation.

A. Remove any aerodynamic smoother from mounting surfaces on aircraft, using hardwood or plastic scraper.

B. Clean faying surfaces of antenna and aircraft.

C. Install new O-ring in antenna mounting flange.

D. Position antenna and connect cable.

E. Place antenna in position and install mounting screws.

F. Using milliohmmeter, measure bonding resistance between antenna base and aircraft structure. Resistance shall be 0.5 milliohm or less.

G. Apply aerodynamic smoother.

H. Remove tags and close previously opened circuit breakers.

7. Audio mixing amplifier removal.

A. On P5 circuit breaker panel, open and tag circuit breakers labeled V/UHF 1 and V/UHF 2.

B. Remove electrical connector from audio mixing amplifier.

C. Loosen audio mixing amplifier from mount and remove unit.

8. Audio mixing amplifier installation.

A. Screw audio mixing amplifier in mount.

B. Install electrical connector to audio mixing amplifier.

C. Close V/UHF 1 and V/UHF 2 circuit breakers on P5 panel.

V/UHF COMMUNICATION SYSTEM - REMOVAL/INSTALLATION

1. Equipment and Materials.

   (1) Self Leveling Green Sealant (P/N HT3326-5-50).

   (2) Tape Stretch Seal (P/N AD89503/01-36).

2. Transceiver removal.

   (1) On P5 circuit breakter panel, open and tag circuit breakers labelled V/UHF 1 and V/UHF 2.

   (2) Disconnect cables from front of transceiver.

   (3) Loosen transceiver from mount and remove transceiver.

3. Transceiver installation.

   (1) Screw transceiver in mount.

   (2) Connect cables to transceiver.

   (3) Close V/UHF 1 and V/UHF 2 circuit breakers on P5 panel.

4. Control Panel removal.

   (1) On P5 circuit breaker panel, open and tag circuit breakers labelled V/UHF 1 and V/UHF 2.

   CAUTION: DO NOT REMOVE THE CONTROL PANEL WITH POWER APPLIED, DAMAGE TO THE EQUIPMENT MAY RESULT.

   (2) At the aft electronic panel, release the fasteners and lift out the panel as far as the cable permits.

   (3) Disconnect cable and remove control panel.

5. V/UHF control panel installation.

   (1) Position control panel by opening in aft electronic panel and connect cable to unit.

   (2) Place control panel in cut-out of aft electronic panel and secure fasteners.

   (3) On P5 circuit breaker panel, close V/UHF 1 and V/UHF 2 circuit breakers.

6. V/UHF antenna removal.

NOTE: Removal of an upper antenna requires a work stand high enough to reach the top of the fuselage.

(1) Open the circuit breakers V/UHF 1 and V/UHF 2 on P5 overhead circuit breaker panel.

(2) Locate the V/UHF 1 and V/UHF 2 antennas
V/UHF 1 Station 470 (top)
V/UHF 2 Station 490 (bottom)

(3) Remove six screws that attach the antenna to the fuselage.

(4) Pull antenna out far enough to disconnect coaxial cable connector.

NOTE: If antenna is located on top of the aircraft, secure cable so that it will not fall into aircraft.

(5) Disconnect coaxial cable connector from antenna.

7. V/UHF antenna installation.

(1) Place antenna gasket on antenna.

(2) Apply self leveling green sealant to connector base. Allow the sealant to cure for 30 minutes before mounting the antenna to the aircraft.

(3) Remove any remaining aerodynamic sealant from mating surface on aircraft, using a plastic scraper.

(4) Inspect aircraft skin for corrosion and repair per SRM 51-8-1, using alodine MIL-C 5541 class 3 per SOPM 20-43-03.

(5) Prime and paint all bare metal outside the original footprint and decrease the original footprint by 0,2 inch per AMM 51-90-00.

NOTE: Ensure all bare metal within antenna footprint is clean, alodined and corrosion free before installing the antenna gasket.

(6) Clean the antenna footprint and skin surfaces with aliphatic naphtha TT-N-95 or equivalent per AMM 13-1-3.

(7) Remove the aliphatic naphtha with a clean cloth.

(8) Place antenna near mounting location and connect coaxial cable to antenna.

(9) Wind stretch seal tape around the connector until it is 1.5 inch above the connector covering the coax cable.

NOTE: Make sure that the adhesive side of the tape is pointing to the coaxial cable and the connector. This provides for a tight seal.

CAUTION: DO NOT APPLY AERODYNAMIC SEALANT TO THE EDGES OF THE ANTENNA. AERODYNAMIC SEALANTS PREVENT MOISTURE REMOVAL BY THE GASKET WHICH CAN CAUSE CORROSION DAMAGE TO THE AIRPLANE AND ANTENNA MATING SURFACES.

(10) Place antenna in position ensuring the antenna gasket is positioned correctly.

(11) Secure antenna with six mounting screws. Ensure that a Teflon washer is placed under each screw.

(12) Tighten antenna screws so that antenna gasket is compressed evenly.

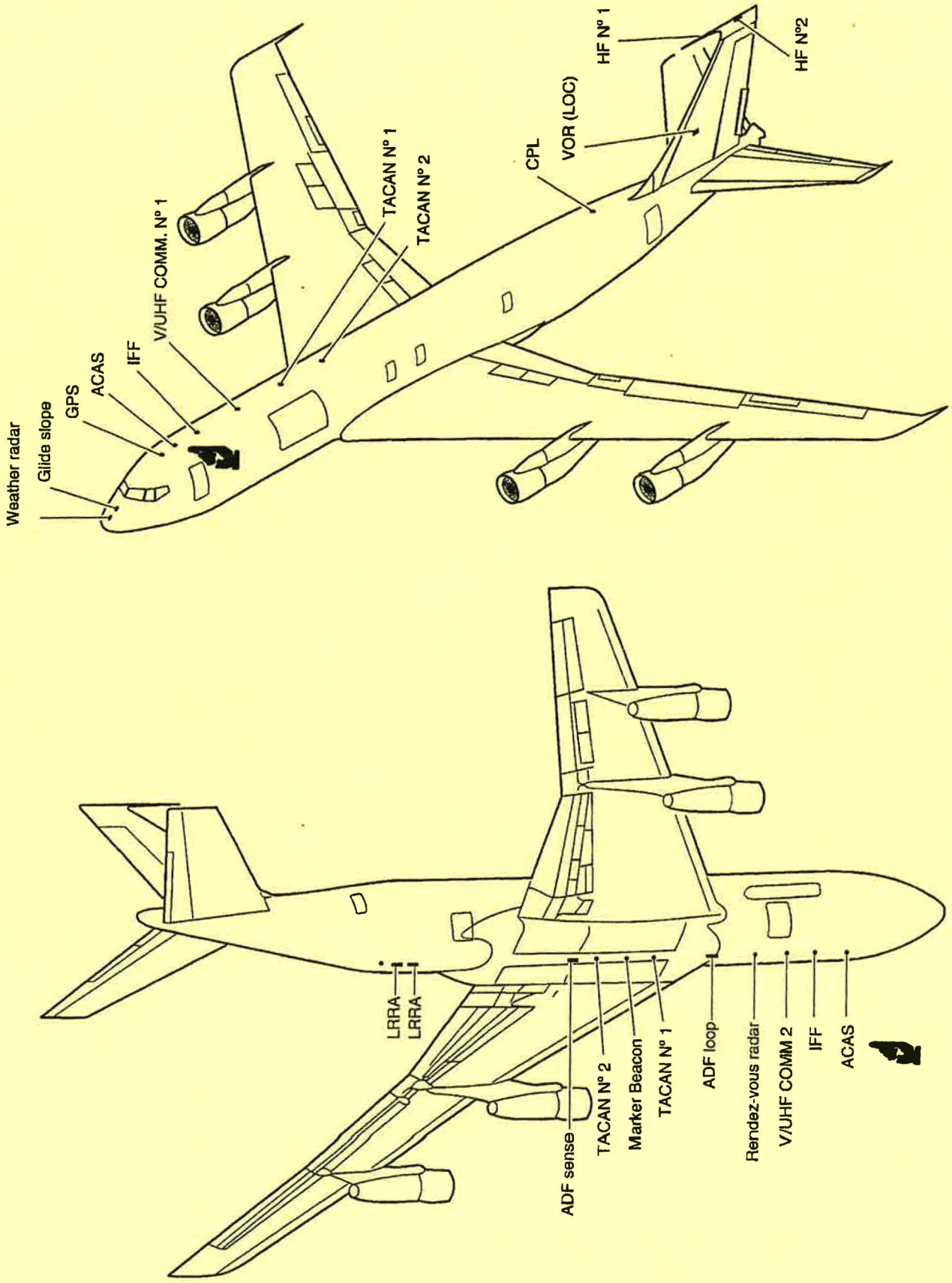
(13) Torque screws per AMM 13-9-21. Re-torque after 15 minutes.

(14) Measure electrical bond resistance between antenna and fuselage, using a milliohm meter. Resistance must be less than 0.001 Ohm.

(15) Close circuit breakers V/UHF 1 and V/UHF 2 on P5 overhead circuit breaker panel.

(16) Perform an operational test per AMM 23-53-01 page 501 par. 4.

ICN: 1P-ammx-23-0007-01



Antenna Locations
Fig. 3

V/UHF COMMUNICATION SYSTEM - DESCRIPTION AND OPERATION

1. General

A. Each aircraft with be equipped with a dual V/UHF system SRT-651/N manufactured by Emer
The dual system equipment consist of :

- two transceivers, RT-651N
- two control panels, CP-9000/SH
- two V/UHF antenna

B. The RT-651/N is a 30-400 MHz V/UHF transceiver capable of communication with 8.33 kHz channel spacing in ATC band and 25 kHz in all other bands. The equipment is remote controlled by the CP-9000/SH control panel.

2. DESCRIPTION

A. Control panel

Both V/UHF control panels are located on the aft electronic panel. See figure 1 for the lay-out of the control panel.

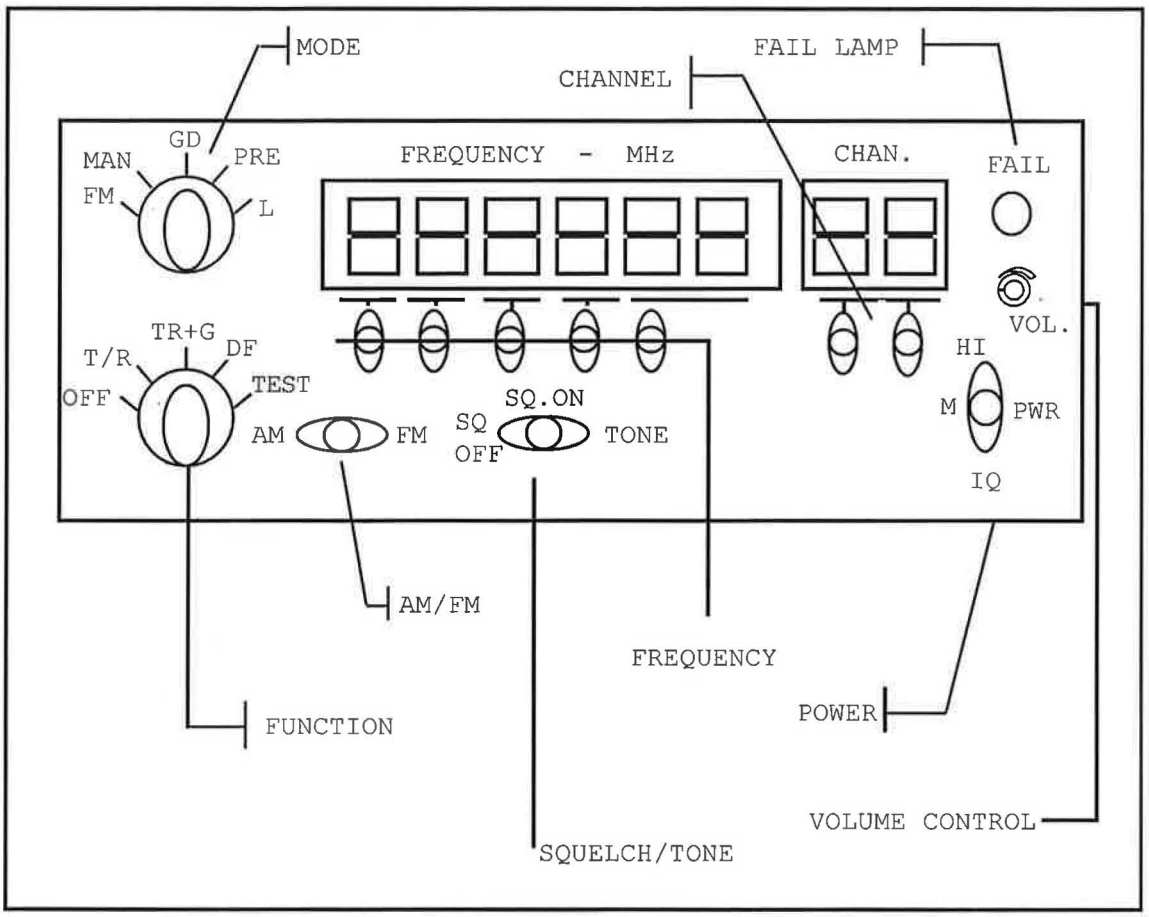


Figure 1 CP-90000/GDF Front Panel Layout

Ref : Elmer Pub PO1629

The front panel of the CP-9000/SH (Figure 1) contains the following controls and displays:

MODE Selector: This is a five position rotary switch, that selects the method of choosing the transceivers operational frequency:

- EM EMERGENCY frequency selection (243 MHz)
- MAN Manual frequency selection
- GD Guard frequencies selection
- PRE Preset frequencies selection
- LD Loads a new preset frequency

FUNCTION Selector: This is a four position rotary switch, that selects the following radio functions:

- OFF Deactivates RCP
- T/R Transmit/Receive
- T/R+G Transmit/Receive+Guard Receive
- DF Direction Finding activation
- TEST Activates Interruptive BIT

FREQUENCY Selector: This consists of five toggle switches. The toggle switches have three positions,"down", "centre/ no action" and "up". The switches are based to the "centre/ no action" position with the up/down selections having momentary actions. The switches permit manual selection of the operational frequency with each selector being dedicated to a digit (100MHz, 10 MHz, 1 MHz, 100 kHz, 10 kHz/1 KHz).

VOLUME control : Adjust desired audio level.

Ref.: Elmer Pub PD1629

B. Tranceiver :

The V/uHF transceiver is mounted on the LH radio rack shelf 4 (See figure 3)

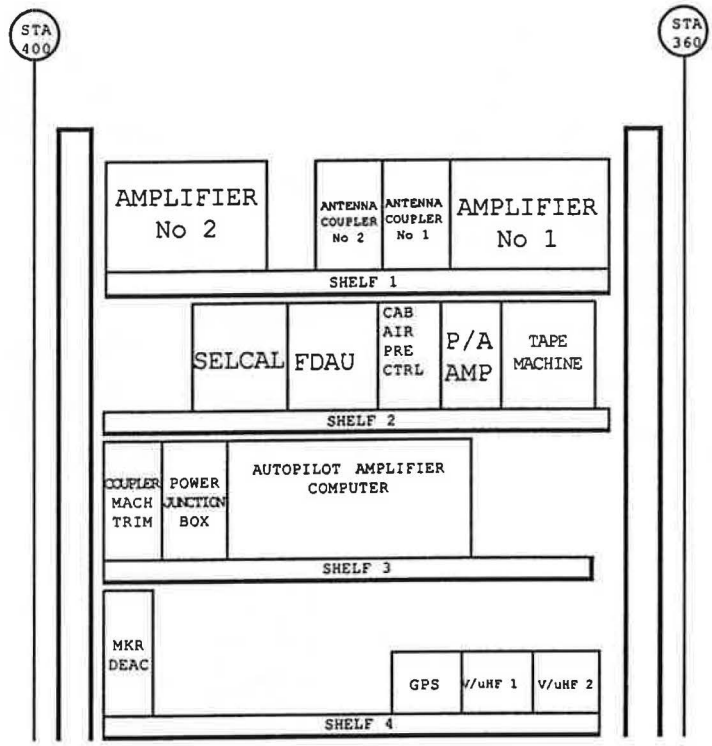


Figure 2: RTCA LH radio rack (S/N 19997, 20000)

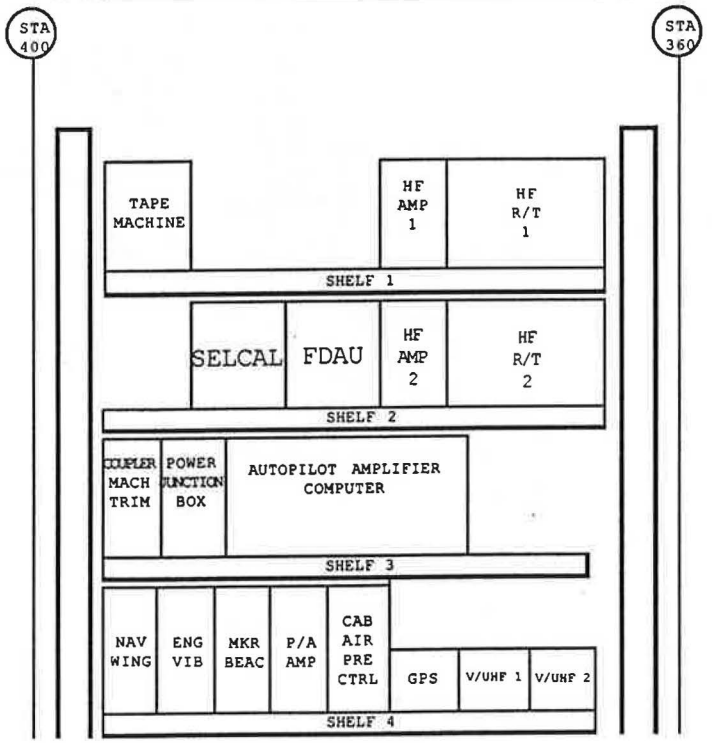


Figure 3: TCA LH radio rack (S/N 20199)

C. Antenna

The V/uHF N° 1 antenna is located at BS 470
The V/uHF N° 2 antenna is located at BS 490
Refer to figure 4.

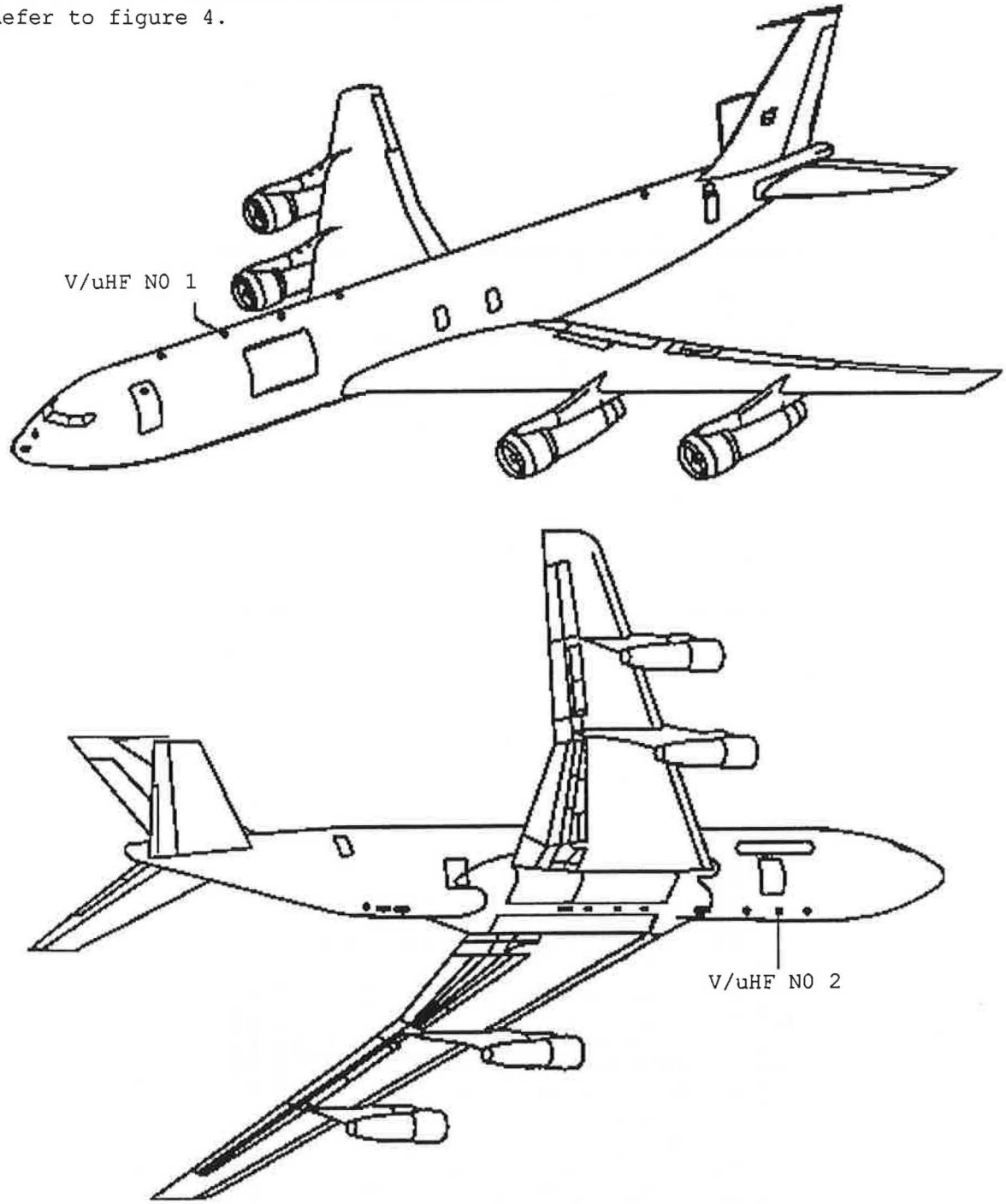


Figure 4: Antenna location

3. OPERATION

This section illustrates the various procedures used to mùodify data in order to control the radio's by CP-90000/SH. Operational parameters (like frequency) are controlled by the use of the display and the switches to set frequency, the various procedures will be explained later.

3.1 Power-up

At power-up CP-9000/SH performs an automatic Lamp Test; then after the Radio Power up test is completed it sends data to the Radio.

3.2 MODE SELECTOR

3.2.1 MAN (Manual) Position

3.2.1.1 Frequency Selection

When the MODE selector is in the "MAN" position it is possible to modify the operational parameter "frequency" manually. When the operator moves the MODE selector to the MAN position it is automatically set the last valid frequency. To modify the frequency toggle up/down the switches relative to every digit. Changing frequency, if an illegal one is selected, the frequency display starts blinking; it stops blinking when you select a new valid frequency.

3.2.2 Emergency Frequency

3.2.2.1 EM Position

The "EM" position of the selector MODE allows the unconditional selection of 243 MHz on the main receiver (and transmitter). When the control panel is in "EM" position it is impossible to use the toggle switches to change frequency. In "EM" position the channel display is off.

3.2.3 Guard Frequency

3.2.3.1 GD Position

The GD position allows to tune the main receiver (and transmitter) on the guard frequency relevant to the selected frequency range.
In GD position, on the display, appears the frequency of the guard channel activated.
When the Control Panel is in GD position, it is impossible to use the toggle switches to change frequency. In GD position the channel display is off.

Ref.: Elmer Pub PD1629

3.2.4 PRE Position

When the MODE selector is on the 'PRE' position the operator can control the following functions: Frequency channel preset, WOD & Date loading, WOD selection, WOD) verify, WOD zeroize, Training frequencies loading, Frequency channels spacing choice, Rx audio level, Main receiver squelch threshold, Guard receiver squelch threshold, Tx audio level, FM sidetone level, AM sidetone level. The kind of information stored in the CP-9000/SH nonvolatile memoryeis Frequencies

3.2.4.1 Frequency channels preset

If the MODE selector is in the "PRE" position the operator can store frequencies in the available channels. The available channels used to store frequencies are from 1 to 99, while channel "00" is reserved for the activation of service functions.
If the frequency is modified, the frequency display flashs; when the selector is moved to the LOAD position the frequency, on the display, is associated with the selectedchannel and the frequency display stops flashing, to show that the frequency has been loaded and sent to the radio.
If the operator does not LOAD in 3 seconds from the last toggle switch moved, on the display appears the last frequency memorised in the selected channel.
If the frequency selected is an illegal one the frequency display will blink and, on the LOAD operation, the frequency is not stored into the channel and will appear the last valid stored frequency.

3.5 FUNCTION SELECTOR

By the functions selector it is possible to choose the operative condition of the selected radio.

3.5.1 OFF Position

When the FUNCTION rotary switch is on the OFF position CP-9000/SH is deactivated; in this situation the radio is OFF.

3.5.2 T/R Position

If the operator moves the FUNCTION rotary switch to the T/R position, the Transceiver is activated.

3.5.3 T/R+G Position

If the operator moves the FUNCTION rotary switch to the T/R+G position both Transceiver and Guard Receiver are activated. The frequency on the guard receiver is relevant to the RF band of the main receiver.

Ref.: Elmer Pub PD1629

3.5.4 TEST position

When the operator selects the TEST momentary position the IBIT is performed on the radio; the selector must be held in the TEST position until the function has been performed. During the TEST the Fail Lamp is blinking and the frequency display shows the last frequency. At the end of the test routine, if no fail has been found, the Fail Lamp stops blinking and on the frequency display appears "AOAOAO" until the operator move the rotary selector out of the TEST position.
If a fail has been detected the Fail Lamp remains lit up fixed and on the frequency display appears the indication of module(s) failed (AxAxAx) in decreasing probability order.
In case of Warning condition the Fail Lamp remains lit up fixed and on the frequency display appears the indication of Warning occured (Px).
In Tables 2.1/2.2 are reported the meaning of the various codes shown at the end of the Test routine.

Failed module	Ax
Test OK	0
FP/Controller	1
ECCM	2
IF/Audio	3
Synthesiser	4
RF/IF Converter	5
Power Supply	6
Power Amplifier	7
Flex Cable	8

Table 2.1

Ref.: Elmer Pub PD1629

Warning condition	PX
High Temperature	1
High VSWR	2
Low Power Supply	3

Table 2.2

When the FUNCTION selector is returned to a normal operative position, the radio is configured in the last setting.

3. 6 SQUELCH/TONE SELECTOR

3.6.1 SQ. ON/OFF Position

Moving the SQUELCH/TONE selector to the SQ.OFF position the main receiver Squelch is disabled. Moving the SQUELCH/TONE selector to the SQ.ON position the main receiver Squelch is enabled.

3. 6.2 Tone Position

The SQUELCH/TONE selector has a momentary TONE position, with the following possible functions:

- when enabled in UHF range, AM mode, if the TOD is present, the radio transmits the TOD and after about one second the internal 1024Hz tone control;
- in the frequency range out of UHF range, or in UHF if the TOD is not present, the radio transmits the internal 1024Hz tone control.

3.7 POWER

Using the three position PWR selector it is possible to choose three levels of power for the selected transmitter: "HF' full power, "M' intermediate power, "LOW' low power.

Ref.: Elmer Pub PD1629

3. 8 MODULATION

In the lower part (225.000 to 399.975 MHz) of the UHF band (225 to 469.975 MHz) it is possible to choose the type of modulation used by the selected radio; acting on the two positions selector AM/FM, the user can choose AM modulation or FM. This possibility is not provided for the other frequency bands, where the type of modulation is fixed.

3.9 SPECIAL FUNCTIONS

3.9.1 Channels spacing preset

a) Select the 'PRE" position with the MODE rotary switch.

b) Select the channel N' 00 and store in it the frequency 202.000 MHZ by "LD" function.

c) Set the channel in the range 11 to 54, where the channel ten digit selects the frequency range and channel unit selects the frequency step in the selected range in accordance with the following tables:

CHANNEL TENS	FREQUENCY RANGE (MHZ)
1	30 ÷ 87.975
2	108 ÷ 117.975
2	137 ÷ 155.975
3	118 ÷ 136.975 (ATC band)
4	156 ÷ 173.975
5	225 ÷ 469.975

Table 2.1

Ref.: Elmer Pub PD1629

CHANNEL UNIT	STEP (KHz)
1	5
2	8.3
3	12.5
4	25

Table 2.2

d) Move the MODE rotary switch to the LD position to accept the above selection; the channel display will show the channel 00 and the frequency display will show frequency 202.000 MHz; moving the MODE rotary switch to the LD position, for two times, the CP90001/SH returns to the operative mode.

Note:

1. If the operator doesn't change the step after activating this function, and he wants to return to the operative mode, he has to select channel 00; the frequency display will show the exit frequency. Moving the MODE selector to the LD position will restore the operative mode.

2. In case of 8.33 step selection, in ATC sub-band, the sequence and meaning of the numbers, showed on the 10 KHz and 1 KHz digits, will be as in the following:

Ref.: Elmer Pub PD1629

Display Value	Channel Width(kHz)	Working Frequency
XXX.X00	25	XXX.X000
XXX.X05	8.33	XXX.X000
XXX.X10	8.33	XXX.X083
XXX.X15	8.33	XXX.X166
XXX.X25	25	XXX.X250
XXX.X30	8.33	XXX.X250
XXX.X35	8.33	XXX.X333
XXX.X40	8.33	XXX.X416
XXX.X50	25	XXX.X500
XXX.X55	8.33	XXX.X500
XXX.X60	8.33	XXX.X583
XXX.X65	8.33	XXX.X666
XXX.X75	25	XXX.X750
XXX.X80	8.33	XXX.X750
XXX.X85	8.33	XXX.X833
XXX.X90	8.33	XXX.X916
XXX.X00	25	XXX.X000
XXX.X05	8.33	XXX.X000
Etc.		

3.9.2 Audio level adjustment

a) Select the "PRE" position with the MODE rotary switch.
b) Select the channel N° 00store in the frequency 203.000MHz by "LD" function.
c) The frequency display shows now in the 1 MHz digit an "A" letter while the other digits and the channel display are maintained blank.

Ref.: Elmer Pub PD1629

d) Push up or down the 1 MHz digit switch to increment or decrement the audio level.

e) Move the MODE rotary switch to "LD" position twice to exit the function.

3.9.3 Main Squelch adjustment

a) Select the "PRE" position with the MODE rotary switch.

b) Select the channel N° 00 and store in it the frequency 204.000 MHz by "LD" fiunction.

c) The frequency display shows now in the 1 MHz and 100 KHz digits an uppercase "S1" letter while the other digits and the channel display are maintained blank.

d) Push up or down the 1 MHz digit switch to increment or decrement the audio level.

e) Move the MODE rotary switch to "LD" position twice to exit the function.

3.9.4 Guard Squelch Adjustment

a) Select the "PRE" position with the MODE rotary switch.

b) Select the channel N' 00 and store in it the frequency 205.000 MHz by "LD" function.

c) The frequency display shows now in the 1 MHz and 100 KHz digits an uppercase "S2' letter while the other digits and the channel display are maintained blank.

d) Push up or down the 1 MHz digit switch to increment or decrement the audio level.

e) Move the MODE rotary switch to "LD" position twice to exit the function.

3.9.5 Audio Tx Narrow Band Level

a) Select the '"PRE" position with the MODE rotary switch.

b) Select the channel N° 00 and store in it the frequency 206.000 MHz by "LD" function.

Ref.: Elmer Pub PD1629

c) The frequency display shows now in the 1 MHz and 100 KHz digits an uppercase "A1" letter while the other digits and the channel display are maintained blank

d) Push up or down the 1 MHz digit switch to increment or decrement the audio level.

e) Move the MODE rotary switch to "LD" position twice to exit the function.

3.9.6 Audio FM Sidetone N.B.L :

a) Select the "PRE" position with the MODE rotary switch.

b) Select the channel N° 00 and store in it the frequency 207.000 MHz by "LD" function.

c) The frequency display shows now in the 1 MHz and 100 KHz digits an uppercase "A2" letter while the other digits and the channel display are maintained blank.

d) Flush up or down the 1 MHz digit switch to increment or decrement the audio level.

e) Move the MODE rotary switch to "LD" position twice to exit the function.

3.9.7 Audio AM Sidetone N.B.L.

a) Select the "PRE" position with the MODE rotary switch.

b) Select the channel N° 00 and store in it the frequency 208.000 MHz by "LD" function.

c) The frequency display shows now in the 1 MHz and 100 KHz digits an uppercase "A3" letter while the other digits and the channel display are maintained blank.

d) Push up or down the 1 MHz digit switch to increment or decrement the audio level.

e) Move the MODE rotary switch to "LD" position twice to exit the function.

Ref.: Elmer Pub PD1629

V/uHF COMMUNICATION SYSTEM - TROUBLE SHOOTING

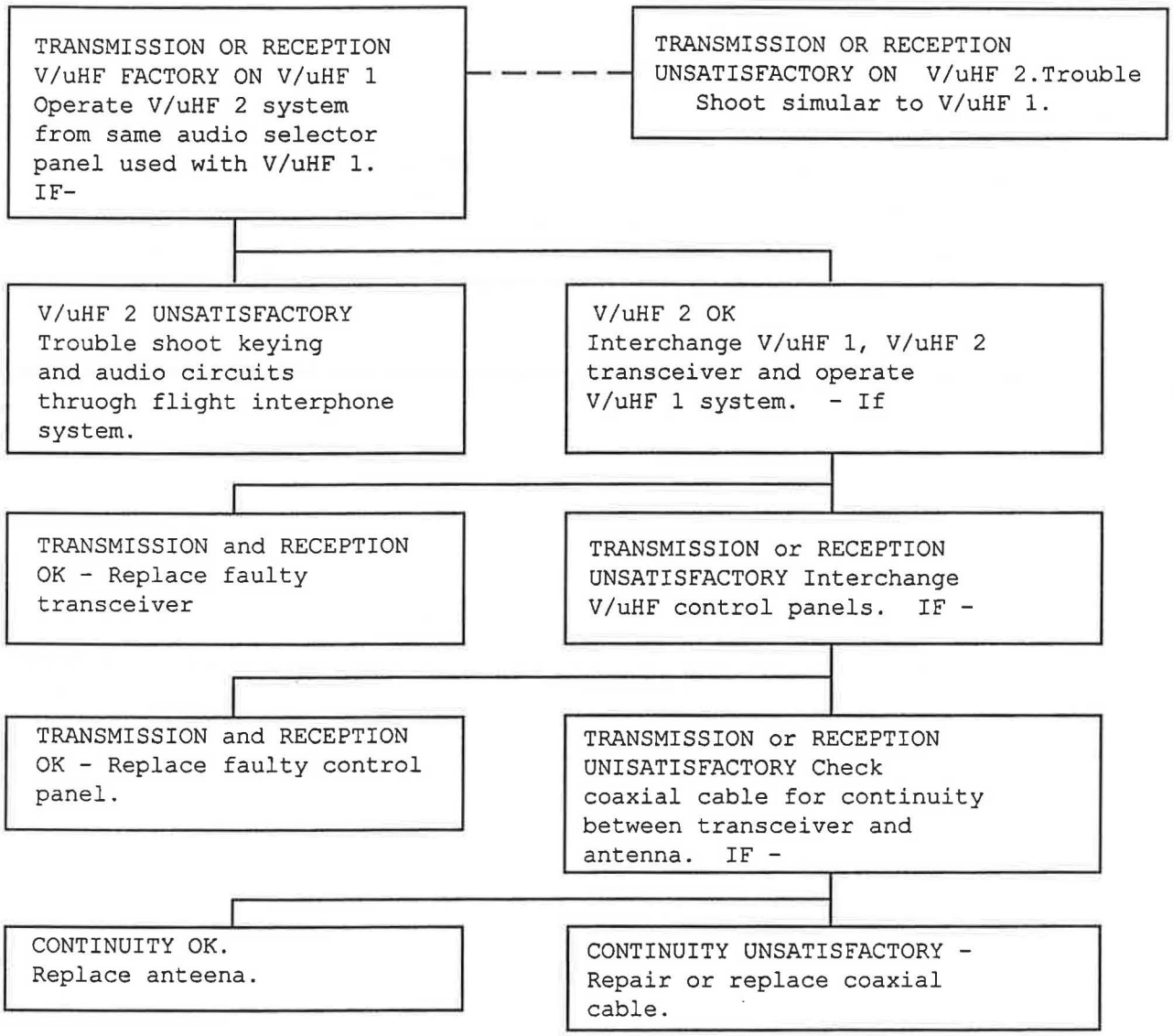
1. General

A. Trouuble shooting the V/uHF communication system is comparatively simple due to the duplication of components between sytems. Trouble spots can be most easly checked by interchanging common components between systems. If the system is operative after an assumed malfunctioning component has been replaced by a known operative component, the faulty component has been isolated.

B. If the system is completely inoperative, the first check should be to determine whether or not proper voltage are avaible to the system. Ensure all V/uHF circuit breakers on P5 circuit breaker panel are closed and power is avaible to them.

C. To decrease the number of unscheduled removals, confirm that the condition stated in the flight report exist prior to replacing system components. If a V/uHF system is reported to be inoperative on one ar two frequencies, a precautionary check of the equipment should be mode to corfirm the report and that the problem is repetitive. The trouble may be due to the area and position of the aircraft in respect to the ground station, or other conditions existing at the time. Also ensure the flight interphone system is operating propely so that poor communication attributed to the V/uHF systems is not actually due to a faulty isolation amplifier in an audio selector panel.

2. TROUBLE SHOOTING CHART



TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Intermittent or poor reception	Faulty transceiver or control panel	Check reception at transceiver PHONE jack. If reception is satisfactory, control panel is faulty. If reception is poor, transceiver is faulty.	Replace transceiver or control panel

UHF Communications System Trouble Shooting
Table 101 (Sheet 2 of 2)

V/uHF COMMUNICATION SYSTEM - REMOVAL/INSTALLATION

1. Transceiver removal.

   (1) On P5 circuit breaker panel, open and tag circuit breakers labelled V/uHF 1 and V/uHF 2.

   (2) Disconnect cables from front of transceiver.

   (3) Loosen transceiver from mount and remove transceiver.

2. Transceiver installation.

   (1) Scews transceiver in mount.

   (2) Connect cables to transceiver.

   (3) Close V/uHF 1 and V/uHF 2 circuit breakers on P5 panel.

3. Control panel removal.

   (1) On P5 circuit breaker panel, open and tag circuit breakers labelled V/uHF 1 and V/uHF 2.

   CAUTION : DO NOT REMOVE THE CONTROL PANEL WITH POWER APPLIED, DAMAGE TO THE EQUIPMENT MAY RESULT.

   (2) At the aft electronic panel, release the fasteners and lift out the panel as for as the cable permits.

   (3) Disconnect cable and remove control panel.

4. V/uHF control panel installation.

   (1) Position control panel by opening in aft electronic panel and connect cable to unit.

   (2) Place control panel in cut-out of aft electronic panel and secure fasteners.

   (3) On P5 circuit breaker panel, close V/uHF 1 and V/uHF 2 circuit breakers.

5. V/uHF antenna removal.

   (1) Open tag on P5 circuit breaker panel, the circuit breakers labelled V/uHF 1 and V/uHF 2.

   (2) If applicable, remove same aerodynamic smoother from around antenna base to facilitate removal. Use hardwood or plastic scraper.

(3) Remove mounting screws holding antenna to aircraft and remove as for as cables will permit.

NOTE : If antenna is located on top of aircraft, secure cable so that it will not fall into aircraft.

(4) Disconnect cable and remove antenna.

6. V/uHF antenna installation.

(1) Remove any aerodynamic smoother from mounting surfaces on aircraft, using hardwood or plastic scraper.

(2) Clean faying surfaces of antenna and aircraft.

(3) Install new O-ring in antenna mounting flange.

(4) Position antenna and connect cable.

(5) Place antenna in position and install mounting screws.

(6) Using miliohmmeter, measure bo,ding resistance between antenna base and aircraft structure. Resistance shall be 0.5 miliohm or less.

(7) Apply areodynamic smoother.

(8) Remove tags and close prevously opened circuit breakers.

(3) Remove eight screws holding antenna to aircraft and remove as far as cables will permit.

NOTE: If antenna is located on top of aircraft, secure cable so that it will not fall into aircraft.

(4) Disconnect cable and remove antenna and

7. Blade Antenna installation.

A. Replace blade antenna as follows:

(1) Remove any aerodynamic smoother from mating surface on aircraft, using hardwood or plastic scraper.

WARNING: USE SOLVENT IN A WELL VENTILATED AREA. AVOID PROLONGED INHALATION OF FUMES OR CONTACT WITH SKIN. SOLVENT IS FLAMMABLE, AND SHOULD BE KEPT AWAY FROM SPARKS, OPEN FLAME, AND OTHER SOURCES OF IGNITION.

(2) Clean faying surfaces of antenna and aircraft, using a clean lint-free cloth moistened with dry cleaning solvent, Federal Specification P-D-680, Type II. Apply corroslon preventive compound MIL-C-16173.

(3) Install new O-ring in antenna mounting flange.

(4) Position antenna with arrow forward and connect cable.

(5) Place antenna in position and secure with eight screws.

(6) Using milliohmmeter, measure bonding resistance between antenna base and aircraft structure. Resistance shall be 0.5 milliohm or less.

(7) Apply aerodynamic smoother

(8) If worn or not installed, apply polyurethane tape.

(9) If circuit breakers were opened prior to removal, remove tags and close.

8. Removal/Installation of Antenna Tape.

A. Peel off any tape remaining on antenna.

WARNING: USE SOLVENT IN A WELL VENTILATED AREA. AVOID PROLONGED INHALATION OF FUMES OR CONTACT WITH SKIN. SOLVENT IS FLAMMABLE, AND SHOULD BE KEPT AWAY FROM SPARKS, OPEN FLAME, AND OTHER SOURCES OF IGNITION.

B. Clean antenna using a clean lint-free cloth moistened with dry cleaning solvent.

C. Cut a length of tape equal to the length of the leading edge of antenna.

D. Center tape over leading edge of antenna so that entire leading edge is covered.

E. Slowly, to avoid causing air bubbles or wrinkles, fold tape back along sides of antenna.

V/uHF COMMUNICATION SYSTEM - ADJUSTMENT/TEST

1. General

   A. The following test should be used to check the operation of a V/uHF system after a system component has been replaced or repaired. Conduct test using only authorized test frequencies and check to ensure frequencies is not in use before transmitting.

   B. The airplane should not be in or near a large metallic structure, swich as a hangar or tower, which may atternate RF energy. Airplane structure, swich as landing gears, may block the VHF antenna when the airplane is in certain position with respect to ground station antennas.

2. Prepose to test.

   A. Provide ground power to the airplane and energize busses or circuit breaker panel P5.

   B. Ensure all V/uHF circuit breakers and interphone audio selector panel circuit breakers are closed.

   C. Ensure audio selector panels and interphone system are operable.

3. Test V/uHF communication system.

   A. At pilot's station, set microphone selector switch to V/uHF-1 on audio selector panel.

   B. At co-pilots station, set microphone selector switch to V/uHF-2 on audio selector panel.

   C. Set the "ON/OFF" ratary witch or control panel in T/R position. Verify that the equipment is operating.

      NOTE: At the power-up the CP-9000/SH performs an automatic lamp test, then after the radio power-up test is completed it sends data to the radio.

   D. Manual Freqeuncy SELECTOR/INDICATOR

      1) Set the "FREQUENCY SELECTOR MODE" rotary switch on CP in "MAN" position.

      2) Select several frequencies on toglle switches and observe the change of indication on control panel display.

      3) On an authorized test frequency press the PTT and estallish a two way communication.

E. STORE/PRESET Operation

1) Set the "CHAN SEL" toggle switch in one of 99 channels;

2) Set the "FREQUENCY SELECTOR MODE" in PRE and a frequency value by the "MANUAL FREQUENCY SWITCH"; the selected frequency will be shown on the control panel display.

3) Set the "FREQUENCY SELECTOR MODE " in LD ; (the frequency value selected at point 0 will be memorized on the system).

4) Set the "FREQUENCY SELECTOR MODE" in MAN; the control panel display shows the previous frequency value before store operation.

5) Set the "FREQUENCY SELECTOR MODE" in PRE.

6) Verify that frequency on the display is the memorized one.

F. Squelch Toggle Switch

1) Set in "OFF" position the "SQL" toggle switch on CP.

2) At Pilot's station, set headset selector switch to V/UHF-1 on interphone audio selector panel;
At Copilot's station, set headset selector switch to V/UHF-2 on interphone AUDIO SELECTS PANEL.

3) Verify on headphone the presence of noise.

4) Set in "ON" position the "SQL" toggle switch on CP.

5) Verify the disappearance of noise on headphone.

G. Transceiver Functional Test (Interruptive BIT)

2.6.1 Set by frequency selector a frequency in the 30 to 469.975 MHz band.

2.6.2 Set the "FUNCTION SELECTOR SWITCH on "TEST" position to activate the IBIT function (the selector must be held in the TEST until the function has been performed).

2.6.3 Verify that at the end of IBIT is displayed AØ AØ AØ.
(During the test the "FAIL" lamp is blinking and the frequency display shows the last selected frequency. At the end of the test routine , if no fail has been found, the fail lamp stops blinking).

NOTE:

1) If a FAILURE has been detected the Fail lamp remains lit up fixed and the frequency display shows the indication of failed module(s) (AXAXAX) in decreasing probability order.

2) In case of WARNING condition the fail lamp remains lit up fixed and on the frequency display appears the indication of occured warning (PX).

3) The following tables report the meaning of the various failure and warning codes.

FAILED MODULE	AX
Test OK	0
FP/Controller	1
ECCM	2
IF/Audio	3
Synthesizer	4
RF/IF Converter	5
Power Supply	6
Power Amplifier	7
Flex Cable	8

WARNING CONDITION	PX
High temperature	1
High VSWR/Controller	2
Low Power Supply	3

DECOUPLED STATIC DISCHAGERS - DESCRIPTION AND OPERATION

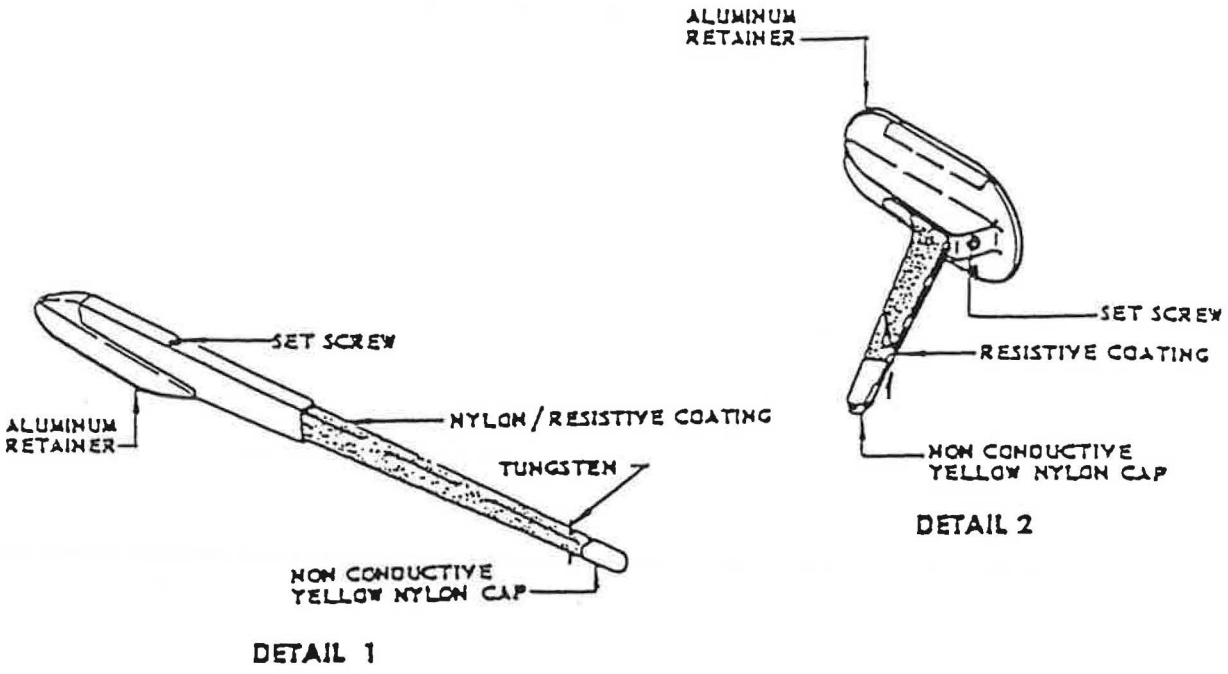
Effectivity:
LX-N20199

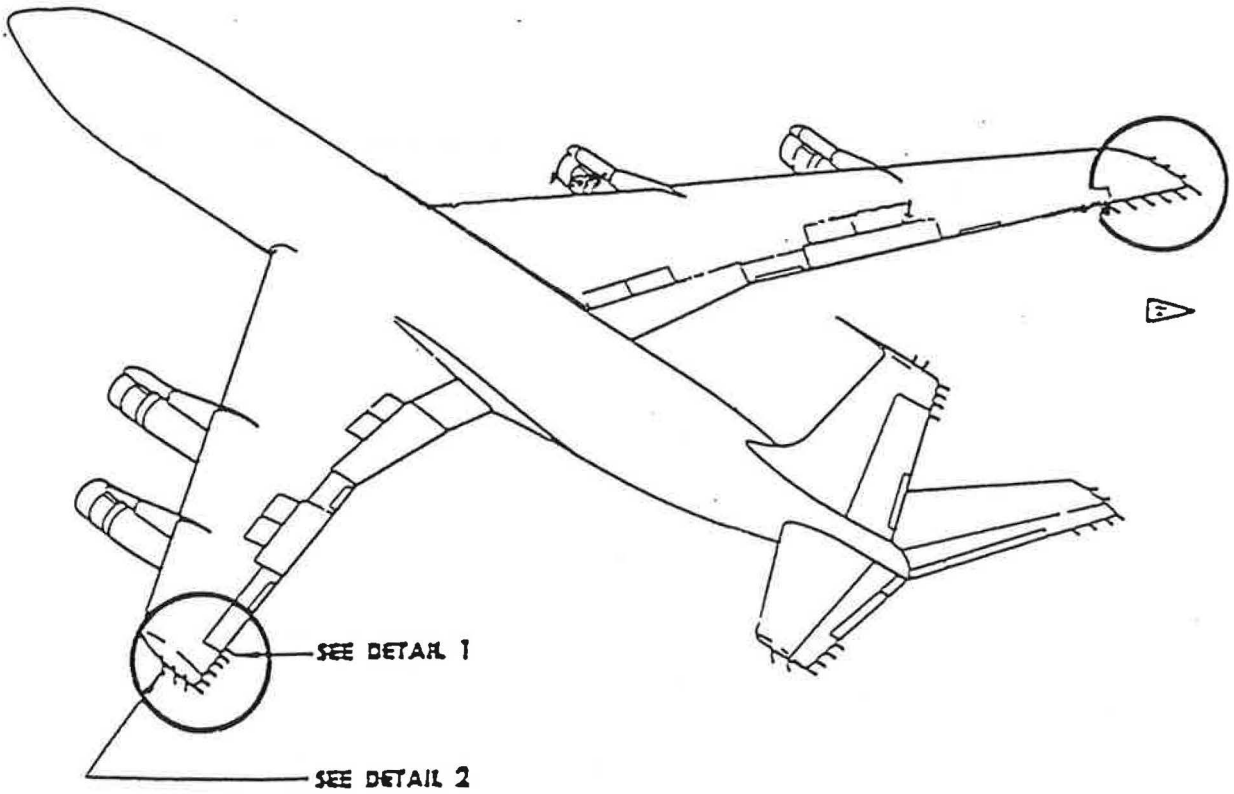
1. General

A. Decoupled static dischargers are installed on the airplanes to reduce interfermce in the radio receivers. This radio interference is caused by corona dischargers emitted from the airplane surfaces as a result of precipitation static and engine charging. Precipitation static results from an electric charge accumulated by the airplane striking charged air and moisture particles. Static usually discharges at the wing and tail extremities and is coupled into the radio receiver antennas. The static dischargers are designed to discharge the static at points which are a critical length away from the wing and tail extremities where there is little or no coupling of the static into the radio receiver antennas.

B. The dischargers installed along the trailing edges of the wings and tail surfaces (figure 1) consist of two metal needles mounted near the end of a slender rod. The rod is coated with a resistive (conducting) material and is attached to a metal retainer. The retainer is bonded, or riveted and bonded, to the trailing edge surfaces with a special conductive cement. The wing tip dischargers are smaller but have the same general construction and attach in the same manner.

C. The vertical fin has two tip dischargers and four trailing edge dischargers. Each horizontal stabilizer tip has two tip dischargers and four trailing edge dischargers. On turbofan airplanes, each wing tip has two tip dischargers and six trailing edge dischargers.





▷ TURBOFAN – 2 WING TIP DISCHARGERS
6 TRAILING EDGE DISCHARGERS

Decoupled Static Discharger Locations
Figure 1

DECOUPLED STATIC DISCHARGERS - MAINTENANCE PRACTICES

1. General

A. Decoupled static dischargers should be carefully checked on a periodic basis since failure to do so will impair radio reception and cause undue static interference.

2. Removal/Installation Decoupled Static Discharger Retainers

A. Equipment and Materials

(1) Adhesive - 610-1016, Granger Associates, Palo Alto, California or Electro-Bond 2016 A/B, Adhesive Engineering Co., San Carlos, California

(2) Methyl ethyl ketone

(3) Putty - DUXSEAL, Johns Manville Co. or equivalent

(4) Stripper - Turco 5351 Turco Products Inc., Wilmington, California

(5) Aluminum oxide paper - 600, 400, 180 grit or equivalent

(6) Infrared Lamp - 350 watt, or Heat Clamp, 610-1013 Granger Associates, or Hot Air Blower - Master Appliance Incorporated, Model 12500 or equivalent

(7) Masking tape - 1 inch

(8) Grease pencil - or other nondestructive marker

(9) Polyvinyl Alcohol Film, (if heat clamp is used) 610-1018 - Granger Associates

(10) Thermocouple and temperature indicator - 150 degree to 250 degree range

(11) Torque Tool - 610-1014, Granger Associates

(12) Multimeter, Simpson 269-2 or equivalet

(13) Pro-Seal 890, B-2, Coast Pro-Seal and Manufacturing Co., Los Angeles, California

(14) Rivets or screws

(15) Low Resistance Testing Set, Microhm Bridge, Type W Bonding Meter Model T-207 - Avtron Manufacturing Co., 10409 Meech Ave., Cleveland 5, Ohio or equivalent

B. Remove Decoupled Static Discharger Retainers

(1) Remove static discharger from retainer.

CAUTION: THE DISCHARGERS ARE SECURED TO THE RETAINERS BY NYLOK ALLEN HEAD SCREWS. CARE MUST BE EXERCISED WHEN REMOVING OR INSTALLING DISCHARGERS TO INSURE THE THREADS OR RECESSED HEAD OF THE SET SCREW IS NOT DAMAGED.

(2) Mark position of discharger retainers beyond cleaning area with a nondestructive marking. Line should be parallel with slipstream.

(3) Remove rivets, when installed, from retainer base per 51-2-2 in Structural Repair Manual.

(4) Scrape off sealant along one edge of retainer with plastic scraper and apply chemical stripper to adhesive fillet.

(5) After 30 minutes the surface of the adhesive will soften and may be scraped off with a plastic scraper.

(6) Insert a sharp, broad bladed putty knife under edge of retainer and lift retainer off.

CAUTION: EXTREME CARE MUST BE TAKEN TO AVOID DAMAGING AIRPLANE SURFACES, ESPECIALLY HONEYCOMB PANELS.

C. Prepare to Install Decoupled Static Discharger Retainers

(1) Aluminum skin

(a) Build a dam around adhesive residue using putty and fill dam with stripper until adhesive is completely covered. Allow adhesive to soften for 30 minutes or longer if necessary.

NOTE: If surface is painted, remove paint from an area approximately 1/4 inch wider on all sides of discharger base outline.

(b) Scrape adhesive with a plastic scraper. Depending on thickness of adhesive, process is repeated until all residue is removed.

(c) Clean and degrease bonding area with methyl-ethyl-ketone. Apply solvent from squeeze bottle or safety can with clean oil-free gauze or cheesecloth.

CAUTION: SOLVENT USED IN THIS PROCESS IS FLAMMABLE AND SHOULD NOT BE USED NEAR FLAME OR SPARKS. USE ONLY IN WELL VENTILATED AREA.

(d) Wipe off solvent before it evaporates using more clean gauze or cheesecloth. Ascertain that area is not contaminated.

(e) Abrade surface with new 600 grit paper or cloth until all shine is removed and surface takes on a uniform satin sheen.

NOTE: Because the surface loads up rapidly, change paper or cloth frequently.

(f) Remove sanding dust by wiping with clean dry gauze or cheesecloth. Do not use solvent.

NOTE: Because of difficulty in keeping surfaces uncontaminated, cleaning should be completed no sooner than 5 minutes before bonding.

(2) Fiberglass Laminates

(a) Remove adhesive by sanding with 180 grit or finer sandpaper.

CAUTION: TAKE CARE NOT TO SAND THROUGH RESIN SURFACE INTO GLASS FABRIC. DO NOT USE CHEMICAL STRIPPERS.

NOTE: A surface 90 percent clear of adhesive is satisfactory.

(b) Clean and degrease bonding area with methyl ethyl ketone. Apply solvent from squeeze bottle or safety can with clean oil-free gauze or cheesecloth.

CAUTION: SOLVENT USED IN THIS PROCESS IS FLAMMABLE AND SHOULD NOT BE USED NEAR FLAME OR SPARKS. USE ONLY IN WELL VENTILATED AREA.

(c) Wipe off solvent before it evaporates using more clean gauze or cheesecloth. Ascertain that area is not contaminated.

NOTE: Because of difficulty in keeping surfaces uncontaminated, cleaning should be completed no sooner than 1 hour before bonding.

D. Install Decoupled Static Discharger Retainers

(1) Prepare adhesive as follows:

(a) Mix all of part B, hardener, with all of part A, resin, in a clean glass or metal container.

(b) Mix thoroughly with wood tongue depressor until mixture is smooth.

(c) Allow adhesive to stand for 10 minutes prior to application.

CAUTION: ADHESIVES CONTAIN EPOXY RESIN. AVOID BREATHING VAPORS, CONTACT WITH EYES, SKIN OR CLOTHING. WASH HANDS FREQUENTLY.

NOTE: Pot life for 1 ounce kit after mixing is approximately 1 hour at 70°F. One ounce kit is suitable for about six dischargers.

(2) Remove metal discharger retainer from plastic bag without touching mounting surface with fingers, and abrade surface per steps C.(1)(c) through C.(1)(f).

NOTE: Plated retainers should not be abraded, but cleaned per steps C.(1)(c) and C.(1)(d). A plated retainer will have a green dot on it for identification. Gloves should be worn when handling retainers.

(3) Apply a thin coating of adhesive, about 0.02 inch thick, to mounting surface of retainer and to airplane surface within 5 minutes of cleaning mounting area. Ensure concave surfaces are filled with adhesive and no voids are apparent.

(4) Apply retainer firmly to airplane surface. Twist slightly with moderate pressure to assure thorough wetting and to squeeze out excess adhesive.

NOTE: Retainer should be in line with slipstream and location mark. A template may be made and used for aligning retainers. Do not re-press or allow base to twist once it has been set in place.

(5) Remove excess adhesive with wooden scraper but be sure there is a fillet of adhesive around the entire edge of retainer.

(6) Fill any existing voids with adhesive. No cracks should be visible, even if airplane surface does not exactly conform to retainer.

(7) Clean off excess adhesive with cloth dampened with methyl ethyl ketone leaving a fillet no more than 0.125 inch around base of the retainer and no higher than face of retainer.

CAUTION: BE SURE NOT TO WASH AWAY ADHESIVE FILLET.

(8) Be sure retainer is mounted parallel to direction of airstream.

(9) Rivet retainer to airplane surface per 51-2-2 in Structural Repair Manual, when applicable, within 1 hour after mixing the adhesive and before heat cure is applied.

(10) Cure trailing edge and tip type retainers.

(a) If retainer is not riveted, tape retainer firmly to airplane surface with masking tape, or if heat clamp is to be used, place polyvinyl alcohol film over retainer.

(b) Set an infrared lamp, heat clamp or blower directly over the retainer. Position lamp about 4-6 inches from retainer.

(c) Adjust blower, heat clamp or infrared lamp to give a bond line temperature of 200°F.

NOTE: A thermocouple should be taped adjacent to the bond area to aid in indicating bond line temperature.

CAUTION: ON HONEYCOMB TRAILING EDGE PANELS, TEMPERATURE MUST NOT EXCEED 200°F. OR HONEYCOMB SANDWICH WILL BE DAMAGED.

(d) Cure for 10-20 minutes at 200°F. Cure is complete when adhesive cannot be indented with knife.

CAUTION: CLEANING AND BONDING OF RETAINERS MUST BE DONE CORRECTLY OR CONDUCTIVITY OF ADHESIVE MAY NOT BE ASSURED.

(11) Fill any visible gaps or cracks in fillet or between retainer base and airplane surface with fresh adhesive.

(12) Cure the new adhesive per step (10) or cure for approximately 24 hours if ambient temperature is 75°F. or higher.

(13) Check Decoupled Static Discharger Retainers

(a) When adhesive is fully cured and cooled to between 70° and 80°F, check for cracks in adhesive fillet between retainer and airplane surface. Any crack is cause for rejection.

(b) Use torque tool and check retainer adhesion to following values:

CAUTION: TORQUE SHOULD BE APPLIED IN A PLANE PARALLEL TO THE PLANE OF CONTACT BETWEEN AIRPLANE STRUCTURE AND RETAINER. STRUCTURAL DAMAGE MAY OCCUR IF TENSION OR COMPRESSION LOADS ARE APPLIED.

1) Trailing edge type retainer - 246 inch-pounds

2) Tip type retainer - 196 inch-pounds

(c) Measure dc resistance between discharger retainers and aluminum structure with a low resistance testing set. Replace retainers measuring more than 0.1 ohm resistance. Measure dc resistance between discharger retainer and fiberglass structure. Replace retainers measuring more than 300,000 ohms.

E. Prepare to Seal Decoupld Static Discharger Retainers

(1) Check static discharger retainer installation per paragraph 2.D.(13) before applying edge seal.

(2) Clean and degrease the area to be sealed around the retainer base fillet and rivet heads. Apply solvent from squeeze bottle or safety can with clean oil-free gauze or cheesecloth. Repeat as necessary.

CAUTION: SOLVENT USED IN THIS PROCESS IS FLAMMABLE AND SHOULD NOT BE USED NEAR FLAME OR SPARKS.

(3) Wipe off solvent each time before it evaporates, using more gauze or cheesecloth. Ascertain that area to which sealant is to be applied is not contaminated.

F. Seal Decoupled Static Discharger Retainers

(1) Prepare sealant as follows:

(a) Mix base compound with matched curing compound in clean glass or metal container per vendor's recommendation.

(b) Mix thoroughly with wood tongue depressor until mixture is homogenous.

NOTE: Pot life of sealant Class B-2 is approximate 2 hours at ambient temperature range of 60-80°F. Sealant should not be applied if temperature is below 50°F.

(2) Apply a continuous sealant fillet around edge of retainer base with sealant gun or aluminum tube. Cover the exposed adhesive completely and lap the sealant 1/8 to 3/16 inch onto the airplane skin and retainer surface.

(3) Smooth the sealant surface and feather the edges of the fillet with sealant gun nozzle or fairing tool. Cover all exposed adhesive with a minimum of 0.03 inch of sealant.

(4) Deleted

(5) Cure the sealant application as follows:

(a) Circulate warm air over the sealant with blower. Adjust blower to provide a sealant temperature not to exceed 120°F.

NOTE: A thermocouple should be taped adjacent to the sealant area to aid in indicating sealant temperature.

(b) Cure for approximately 18 hours at 120°F.

NOTE: Sealant will cure at ambient temperature of 75° to 80°F in approximately 72 hours.

(6) Refinish bared surface of airplane to match surrounding area.

NOTE: Do not paint any part of dischargers or retainers.

3. Static Discharger Inspection/Check

A. Check Static Dischargers

(1) Visually check to determine that all dischargers are secure on mounting retainers and are not broken. Check that at least three trailing edge dischargers are installed on each wing, stabilizer surface, and vertical fin (total of 15). Check that at least one tip discharger is installed on each wingtip and two dischargers are installed on each stabilizer and fin tip (total of 8).

(2) Check dischargers for lightning damage as evidenced by pitting of the metal discharger base. Replace as necessary.

(3) Check dischargers for broken, bent, or blunted tungsten pins. If possible, straighten bent pins. If not, replace discharger.

(4) Measure resistance of all dischargers between discharger pins and structure. Discharger resistance shall be within the following limits:

(a) Trailing edge dischargers - 8 to 100 megohms

(b) Tip dischargers - 5 to 60 megohms

NOTE: Dischargers not meeting resistance check requirements should be replaced.

(5) Measure dc resistance between discharger base and aluminum structure with a low resistance test set. If resistance is more than 0.1 ohm, replace discharger base.

WARNING: IF THE METER USED TO VERIFY THE BOND RESISTANCE IS NOT EXPLOSION PROOF, THE HAZARDOUS GAS CONTENT OF THE ATMOSPHERE AS MEASURED BY A COMBUSTIBLE GAS DETECTOR MUST BE 25 PERCENT OR LESS OF THE LOWER EXPLOSIVE LIMIT.

DECOUPLED STATIC DISCHARGERS

Effectivity:
LX-N19997
LX-N20000

1. General

A. Electrostatic charge on airplanes leads to substantial interference in the radio receivers during flight. By contrast to atmospheric interference, electrostatic interference occurs a continuous grating noise in the receiver. The volume and pitch are subject to considerable fluctuation so that reception of radio signals is highly disturbed by the discharge. By the way in which they are created, discharges can be divided into two categories:

(1) External Charge

Viewed from the electrostatic aspect, an airplane constitutes a capacity which more less takes on the potential of its surroundings. In the case of a potential gradient, charging or discharging takes place. The charging of the airplane body is by mean of frictional energy through the impact of raindrops snow and ice crystals. Higher charges come about with dry particles (dust particles) and when flying through cirrus clouds at altitudes of 30,000 feet or more. The capacity of a B707 airplane body is approximately 1000 pF. The potential gradient between the airplane and surrounding air for short periods reaches voltages of more than 100,000 volts.

(2) Self-charging

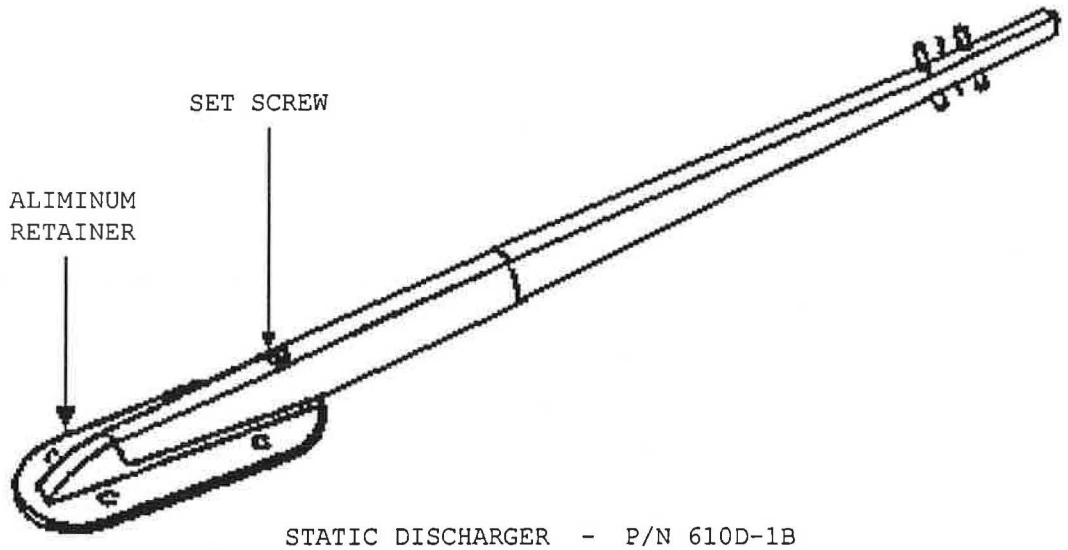
The main causes of self-charging are the exhaust from the engines. The size of charge depends on the type of exhaust gases, the flow speed and the floating particles content (water injection). Because selfcharging and discharge mainly occurs in the exhaust from the engines, interference with the radio systems is generally less than in the case of external charging.

With the described magnitudes of potentials it cannot be avoided that around the airplane very intensive electrical fields are formed which emit part of the charge energy to the environment.

This discharge consists of a sequence of single impulses with a short rise time (approx. 0.01 microsec.) followed by an exponential fall time (0.2 microsec.). These discharges are mainly found on the outer wing tips, the horizontal stabiliser and on all metallic structures outside the aerodynamic surface (antennae) to the surrounding ionised air.
In order to reduce interference in the radio receivers operating in the frequency range between 100 KHz and 150 MHz as much as possible, the charge is discharged via static dischargers located at specified positions to the surrounding air. The static dischargers installed on

To improve effectiveness, the dischargers are installed on the airplane in groups.
However, the minimum distance between them must be kept in order not to interfere with the electric field distribution.
The dischargers consist of a rod with high electrical resistance to which two metal needles are attached at right angles to the rod.
The tip of the rod is coated with dielectric material in order to prevent discharges at this place.

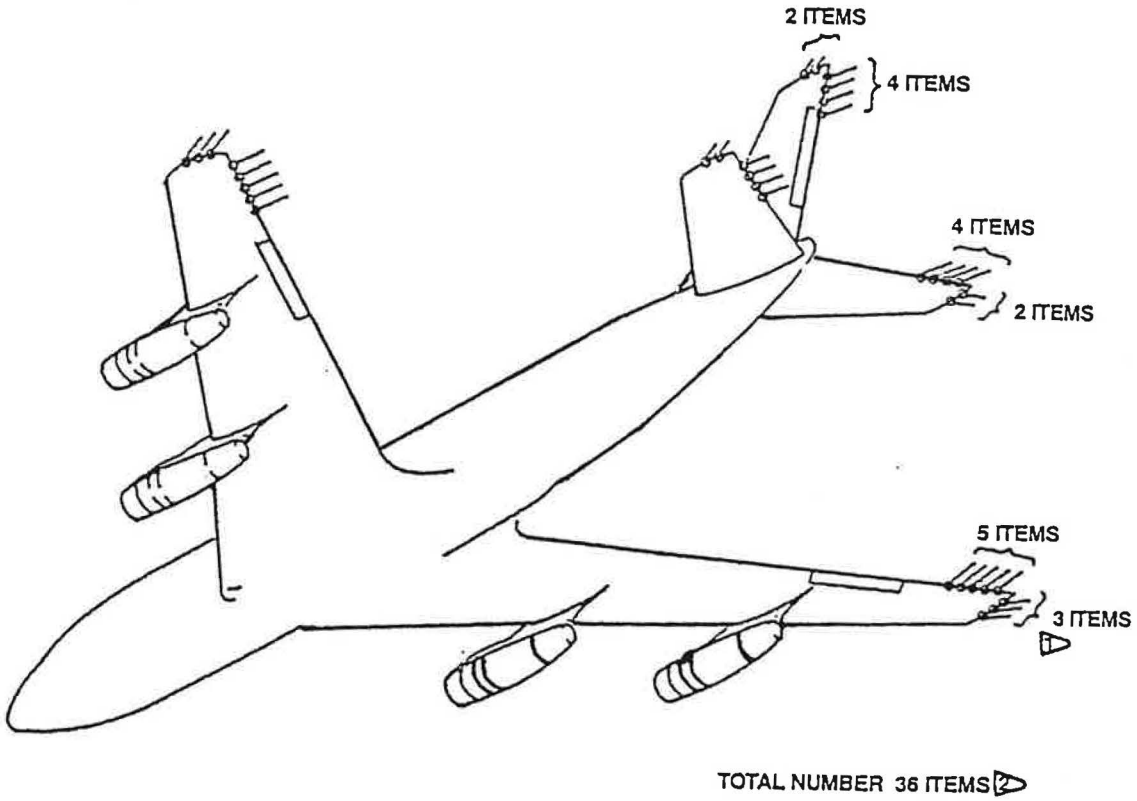
The static discharger is attached to a metal retainer which must have a perfect electrical connection to the airplane structure.



STATIC DISCHARGER - P/N 610D-1B
METAL RETAINER - P/N 610R-9A

STATIC DISCHARGER - P/N 611D-1B
METAL RETAINER - P/N 611R-6A

Figure 1



1 ON LX-N19997 ONLY 1 ITEM

2 ON LX-N19997 ONLY 30 ITEMS

Decoupled Static Discharger Locations
Figure 2

A. Bondine

1. Materials

(a) Adhesive: I. Adhesive Engineering Company "Electrobond 2016"
II. Granger Associates (PIN 610-1016) 1 ounce, (P/N 610-1015) 1/2 ounce.

(b) Mixture: The resin (A) of the Electrobond 2016 kit can be mixed with the hardener (B) in the resin container.
Proportions: 17 parts A to 1 part B (parts weight)
6.7 parts A to 1 part B (parts volume)

When using the kit P/N 610-1016, the mixing proportions of 10 parts weight resin to 1 part weight hardener must be adhered to exactly.

CAUTION: WHEN MIXING THE ADHESIVE (RESIN + HARDENER) TAKE CARE TO MIX QUANTITIES THAT CAN BE USED WITHIN POT LIFE.

(c) Pot life: The mixture of the entire Electrobond 2016 kit has a pot life of one hour at 21 deg. C (70 deg. F).

Mixtures of lesser quantities have a shorter pot life corresponding to the weight ratio (1/2 hour at 38 deg. C (100 deg. F).

CAUTION: QUANTITIES GREATER THAN 28.4 G ARE IMPRACTICAL BECAUSE ONE MAN CAN ONLY JUST PROCESS THIS QUANTITY DURING ONE HOUR.

(d) Hardening time: The adhesive hardens for 16 to 24 hours at 70 deg. F (R.T.), 45 minutes at 150 deg. F (65 deg. C), 15 minutes at 200 deg. F (94 deg. C). At other temperatures the hardening time can be obtained by interpolation of the above values.

(e) Solvent: E-Z strip 19-A to soften the hardened adhesive.

(f) Cleaner: Methyl ethyl ketone or ethyl acetate

(g) Cloth: A sufficient quantity of clean cloths

(h) Emery cloth: Emery cloth with 400 or 600 grain.

(i) Masking film: POLYVINYL ALCOHOL film (P/N 610-1018). This film is laid between discharger retainer and heat clamp in order to avoid the heat clamp becoming contaminated by adhesive during the hardening process.

2. Tools

(a) Heat clamp: This enables the attachment of the discharger retainers to the airplane, except when attaching them to the curved areas (wing, stabiliser, fin). The heat clamp (P/N 610-1013) presses the discharger retainer firmly on to the skin during the drying process and prevents it from slipping because thermal expansion occurs between the discharger retainer and the skin.

(b) Warm air blower: This is needed in order to dry the clean surfaces and everywhere to reduce the hardening times of the bonded discharger retainers where the heat clamp cannot be used.

(c) Template: It is necessary to ensure that the discharger retainers are attached parallel to the airflow over the corresponding surface.

The template is to be manufactured from 2024T3.040, the specified angles being taken from Fig. 2, 3 and 4.

(d) Torque tool: After hardening the adhesive, the discharger retainers must be checked for solid seating.

CAUTION: USE THE CORRECT CLAMP FOR THE CORRESPONDING DISCHARGER RETAINER.

3. Bonding Instructions

(a) Prepare the Bonding Area on the Skin

(1) Mark the appropriate surfaces on which to glue the discharger retainers with paint on the skin; the paint must be easily removable after gluing the retainers.

(2) If the appropriate surface (aluminium skin) already has a paint coat, it must be stripped using "Turco 4377B".

(3) Painted fibreglass surfaces must be rubbed down with 180 or finer emery cloth. It is sufficient for 90% of the bonded surface to be free of paint.

CAUTION: DO NOT RUB THROUGH THE RESIN COATING OF THE FIBREGLASS.

(4) Surfaces to which a discharger retainer has already been bonded but has separated must be cleaned in accordance with 5).

(5) Clean and degrease bonding areas with methyl ethyl ketone. Apply solvent from a squeeze bottle and remove dirt with a clean cloth. Wipe off solvent before it evaporates. Once the surface has been cleaned, take care to ensure that cleaned surfaces do not get contaminated. Do not touch with the fingers. Shortly before applying adhesive, blow on surfaces to be bonded with warm air to ensure that they are completely dry.

(b) Mixing the adhesive

Mix resin and hardener thoroughly in a clean container, mixing ratio: see section A.1.b) and
pot life A.1.c).

(c) Prepare discharger retainers for adhesive.

(1) Clean non-plated discharger retainers and degrease in accordance with section A.3.a)5). Abrade surface with emery cloth (400 or 600 grain) until all shine is removed and the surface takes on a uniform satin sheen. Remove sanding dust with a clean dry cloth; do not use cleaner.
Apply about 0.5 mm thick layer of adhesive to the clean surface within one minute of cleaning.

(2) Clean plated discharger retainers (symbol: green dot) and degrease in accordance with section A.3.a)5). Do not Polish surfaces to be glued. Apply adhesive direct to cleaned surface.

(d) Glue discharger retainers

(1) Clean bonding areas on aircraft skin of the oxide layer after cleaning in accordance with A.3.a)5) with emery cloth (400 or 600 grain). Remove sanding dust with a clean cloth, do not use cleaner.

(2) The discharger retainer must be glued on within one minute of removing the oxide layer. Twist the discharger retainer to and fro on the skin with alternating pressure on the gluing position so that the surplus adhesive is squeezed out and the remaining adhesive is well distributed.

(3) Clean off excess adhesive with a wooden scraper or cloth soaked in methyl ethyl ketone before it dries, leaving a fillet no more than 3 mm wide around the retainer base and no higher than face of retainer.

(4) Clamp retainer (with heat clamp or see Fig. 7) and dry in accordance with section A.3.a)5).

(e) Drying

(1) Trailing edge with aluminium skin (not honeycomb panels):

Clamp discharger retainer so that it cannot move. Place polyvinyl alcohol film between heat clamp and discharger retainer so that the clamp is not contaminated with adhesive. Wrap template in polyvinyl alcohol film and check whether the discharger retainers are positioned at the correct angle to the trailing edge. Set drying temperature to 93 - 107 deg. C (200 - 225 deg. F).

(2) Honeycomb trailing edge:

Glue discharger retainers in accordance with above instructions. Set drying temperature to max. 93 deg. C (200 deg. F).

(3) Fibreglass trailing edge:

Glue discharger retainers as above instructions, but fasten the discharger retainers with adhesive tape in order to prevent them slipping (see Fig. 6). Dry the adhesive with hot air. After drying, remove adhesive tape.

CAUTION: AS FIBREGLASS IS NOT CONDUCTIVE, GLUE ON 0.2 MM THICK AND 25 MM WIDE ALUMINIUM FOIL. CLEAN AND PREPARE THE ALUMINIUM FOIL AND BONDING SURFACE AS DESCRIBED.

(f) Check the Bonded Discharger Retainers:

(1) Carefully check all glued discharger retainers for cracks in the adhesive between skin and discharger retainer.

(2) Once the adhesive has hardened and dried, check the discharger retainers for solid fit:

Model 610 - 246 inch pounds (2.83 kg)
Model 611 - 196 inch pounds (2.21 kg).

(3) Measure DC resistance between discharger retainer and aluminium structure with a low resistance test set. Replace retainers measuring more than 0.1 ohm resistance. Measure DC resistance between discharger retainer and fiberglass structure. Replace retainer measuring more than 300.000ohms.

4. Remove Bonded Discharger Retainers

The discharger retainers must be removed if :

a) the contact resistance is too high (see above),
b) the adhesive is damaged (has cracks),
c) corrosion is found.

Scratch the edge of the adhesive around the discharger retainer with a sharp utensil.

CAUTION: DO NOT DAMAGE THE SKIN.

Once a crack has formed the discharger retainer can easily be removed. To accelerate the removal, soften the adhesive with PR-3? or E-Z strip 19-A.

B. Riveting
(Only applies to discharger retainers on rudder unit and vertical rudder, see Fig. 4 detail I-VII, page 210).

The discharger retainers must be glued on in accordance with section A.3) and then riveted.

CAUTION: RIVET BEFORE THE ADHESIVE HAS HARDENED.

1. Vertical stabiliser tip:
Glue on discharger retainers as in Fig. 4, detail I, and rivet using MS 20605B3-3 rivets.

2. Vertical stabiliser:

(a) Discharger on WL 588-0:

The discharger retainer is bonded to this location in accordance with Fig. 4 on the left side.

(b) Discharger on WL 570:

The discharger retainer is glued on at this location in accordance with Fig. 4, detail II on the right side and fastened with MS20426B3 rivets.

(c) Discharger on WL 546-0:

The discharger retainer is glued on at this location in accordance with Fig. 4, detail Ill on the left side and fastened with MS20426B3 rivets.

(1) Make distance bushes, P/N 65-14298-2, of 5/16" diam., 2024T4 material in accordance with Fig. 4, detail VI.

(2) Make reinforcement plates, P/N 65-23406-3, -4, in accordance with Fig. 4, detail II, from 2024T4 material.

(3) Attach the discharger retainers (Fig. 4, detail III):

a) Drill two holes 8 mm diam. in one side of the vertical stabiliser skin (for distance bushes, P/N 65-14298-2).

b) Insert distance bushes 65-14298-2 with adhesive BAC 5010, type 40, into the drilled holes. Remove protruding bush ends until flush with the skin.

c) Mount reinforcement plates 65-23406-3, -4. Drill the holes in accordance with detail Ill to 4 mm diam. though the reinforcement plates and skin. Countersink the holes on the upper side of the reinforcement plates to 100 deg. and then fasten the reinforcement plates with cherry-look rivet CR22485-2, -3.

d) Adjust discharger retainers and drill the four holes for the MS20246B3 rivets (2.4 mm diam. - 0.0935 diam.). Countersink holes in the discharger retainer upper side to 100 deg. Glue on and rivet discharger retainer.

3. Discharger on vertical stabiliser

Mount discharger in accordance with Fig. 4, detail VII to the right side as follows:

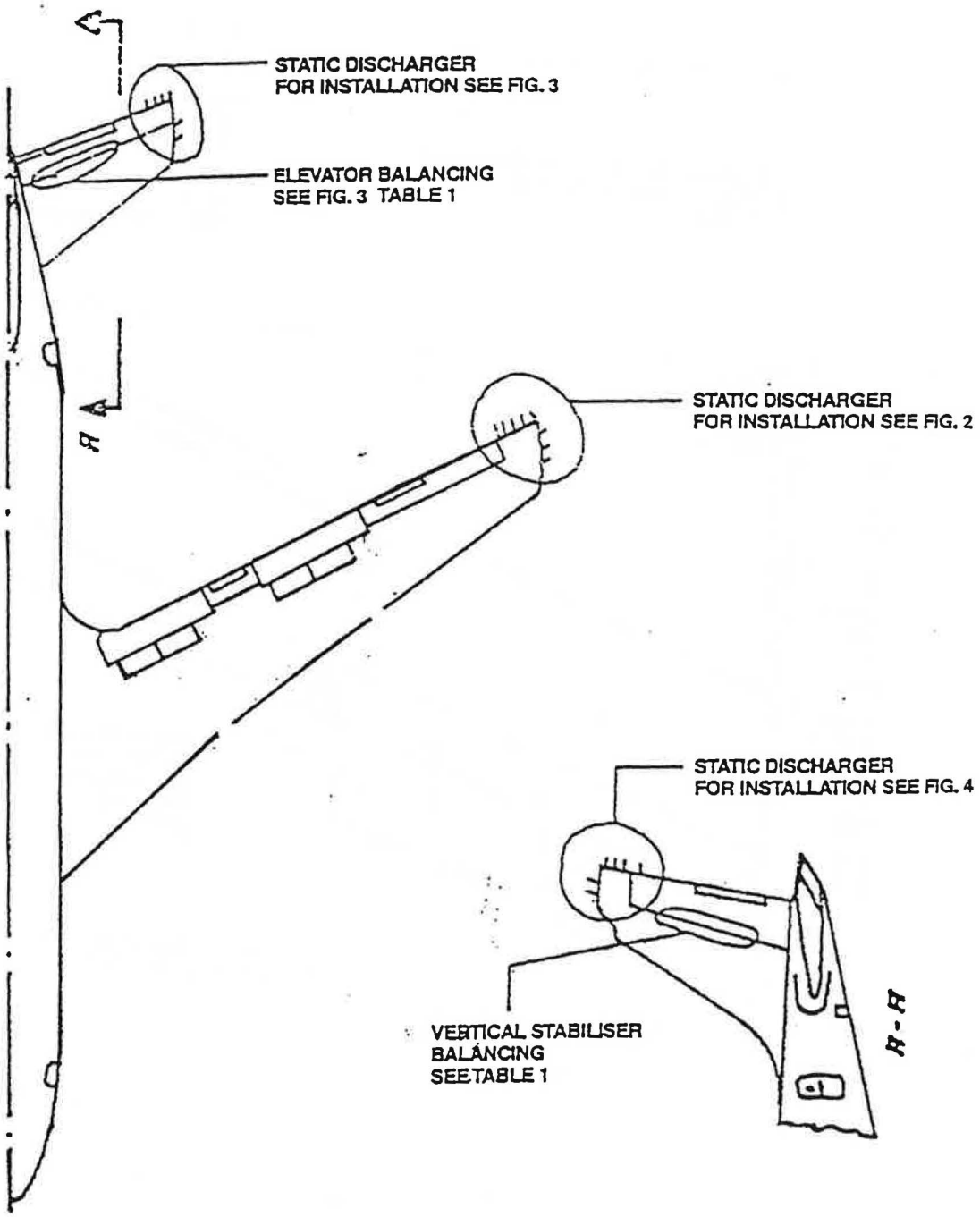
(a) Drill two holes for the distance bushes in one side of the skin.

(b) Insert distance bushes with adhesive and remove protruding edges until the bushes are flush with the skin.

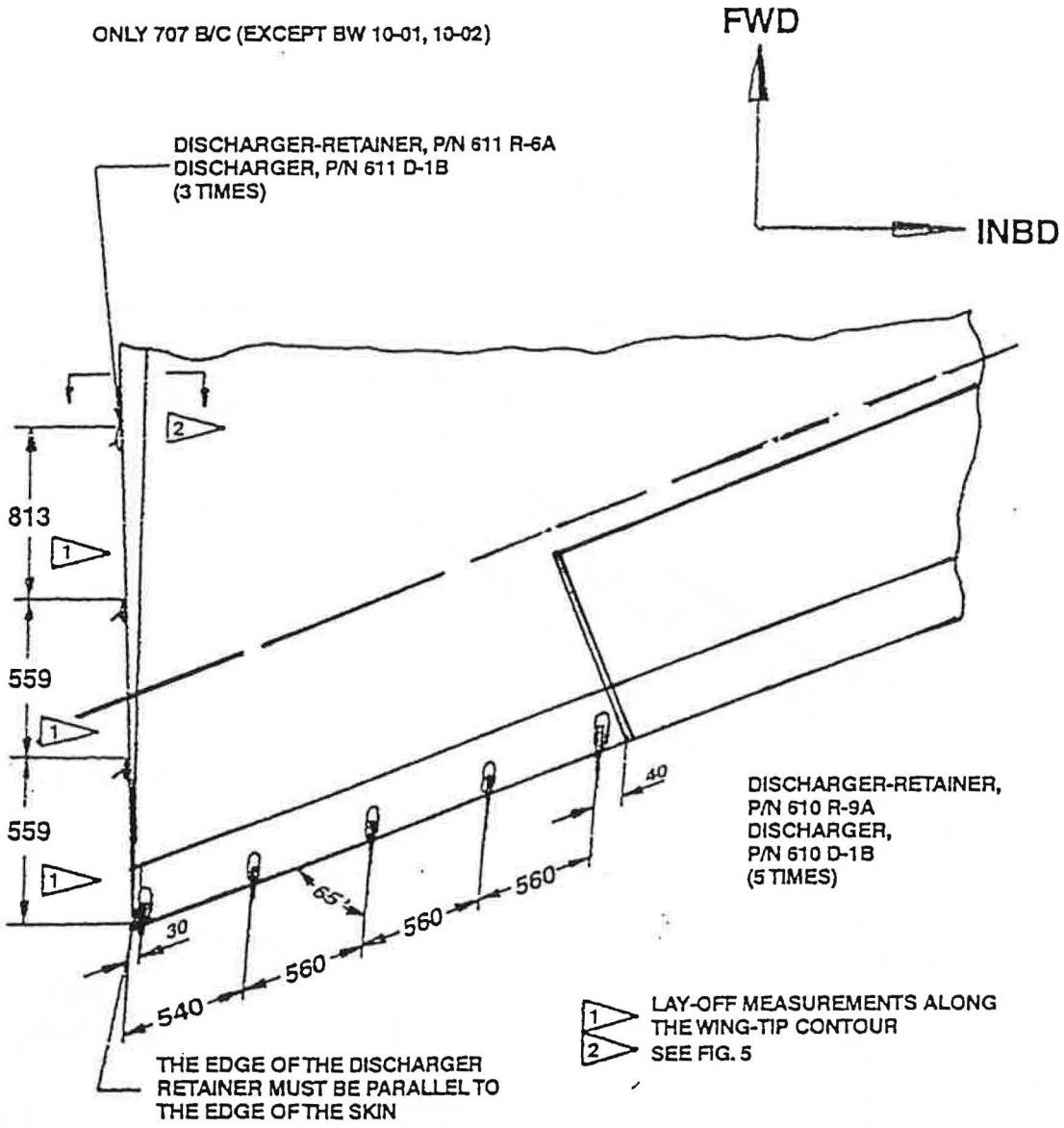
(c) Position and pre-drill discharger retainer. Countersink holes on the upper side of the discharge retainer to 100 deg. Glue on and rivet discharger retainer.

C. Painting

The surroundings of the static dischargers stripped of paint must be repainted. Care must be taken to keep the static discharger retainer free of paint.



Installation Overview
Figure 1



View of Left Side; Right Side Mirror-inverted
Figure 2

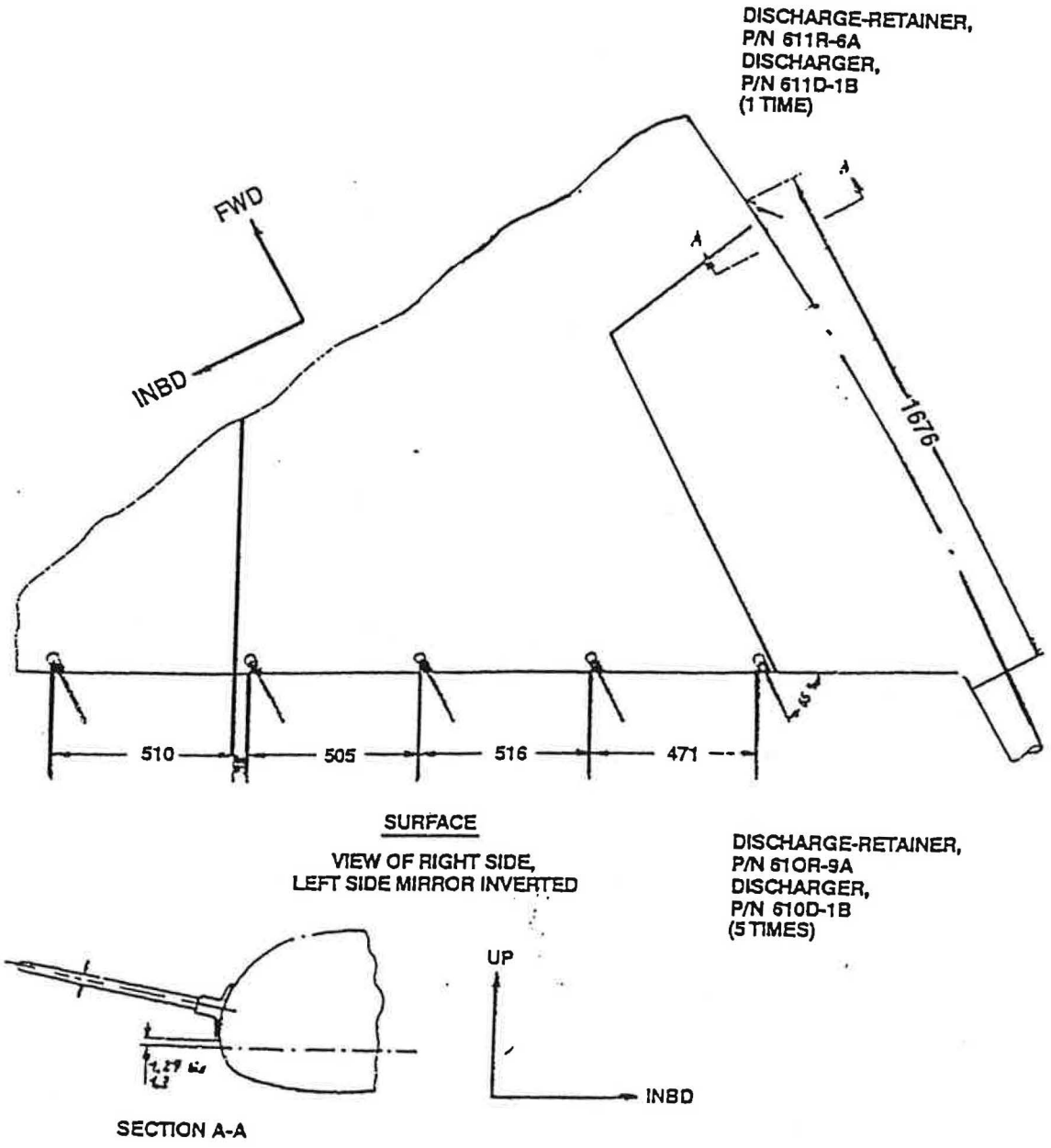

DISCHARGE-RETAINER,
P/N 611R-6A
DISCHARGER,
P/N 611D-1B
(1 TIME)
FWD
INBD
A
A
1676
510
505
516
471
SURFACE
VIEW OF RIGHT SIDE,
LEFT SIDE MIRROR INVERTED
DISCHARGE-RETAINER,
P/N 610R-9A
DISCHARGER,
P/N 610D-1B
(5 TIMES)
UP
INBD
SECTION A-A

Figure 2a

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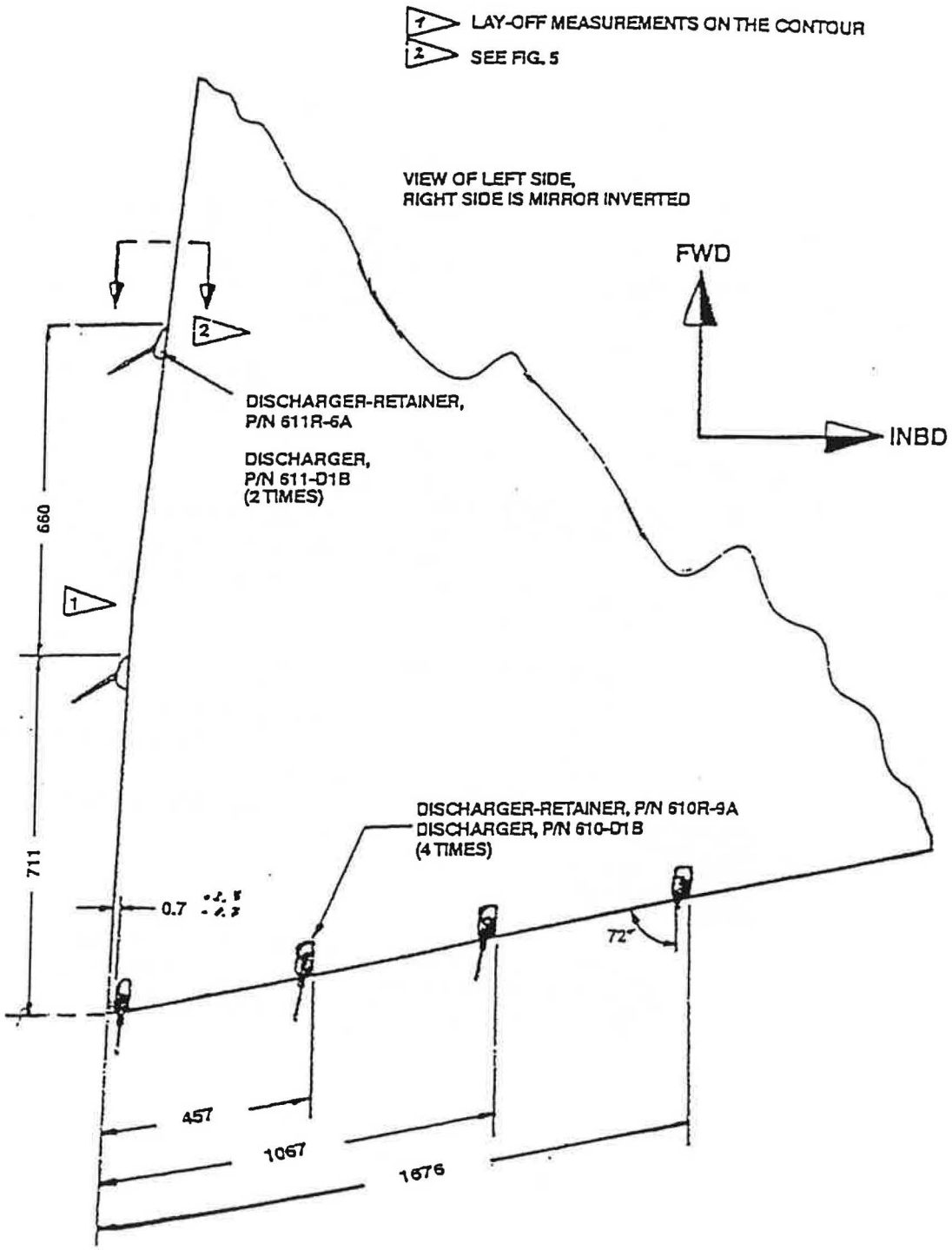
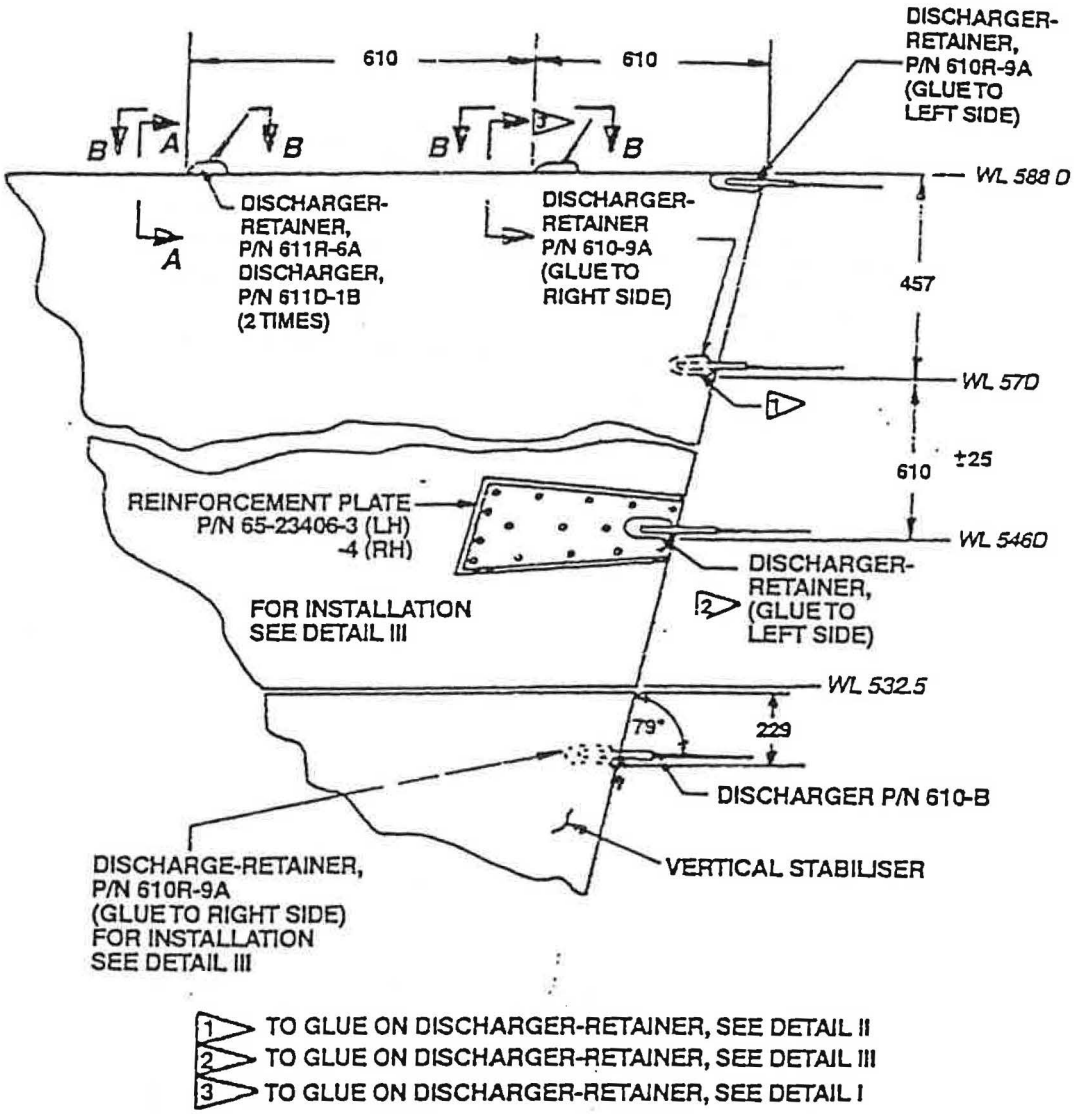
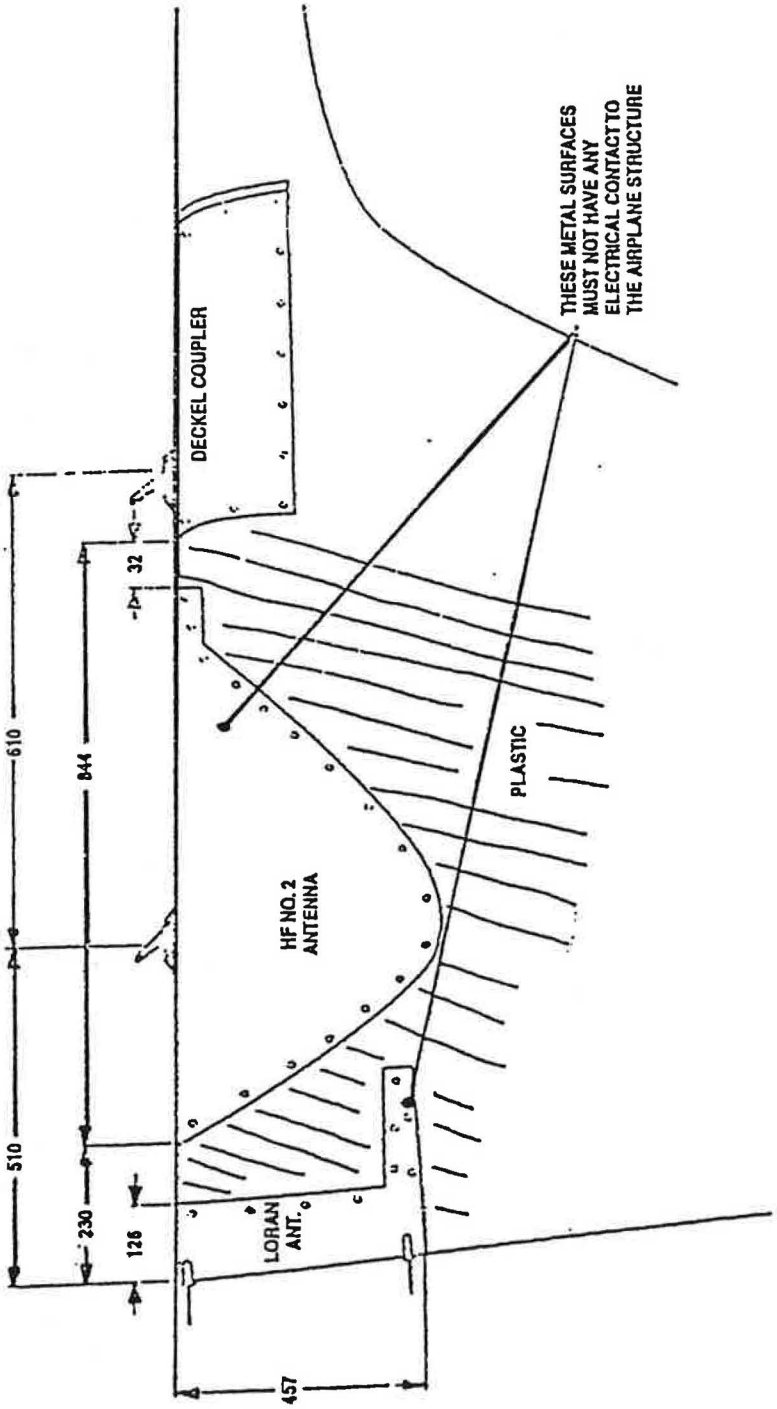


Horizontal Stabiliser
Figure 3



Vertical Stabiliser
Figure 4



DISTRIBUTION OF PLASTIC AND ANTENNA SURFACES ON VERTICAL STABILISER (ONLY ON 707 B/C)

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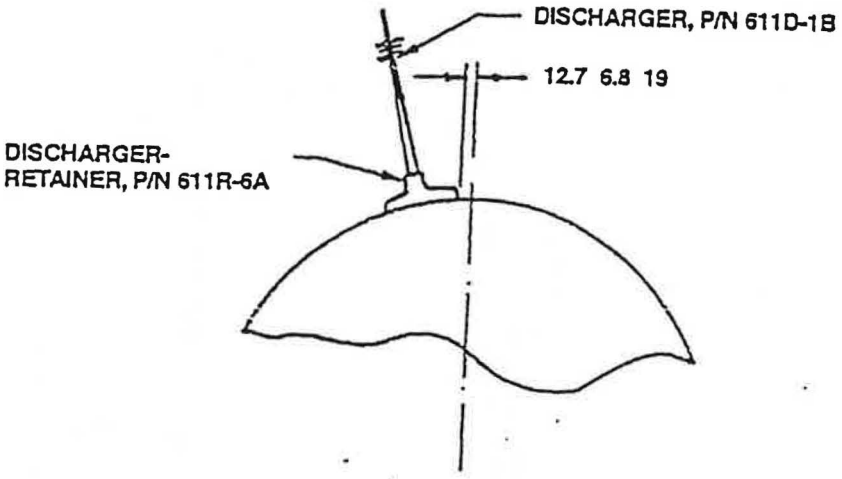
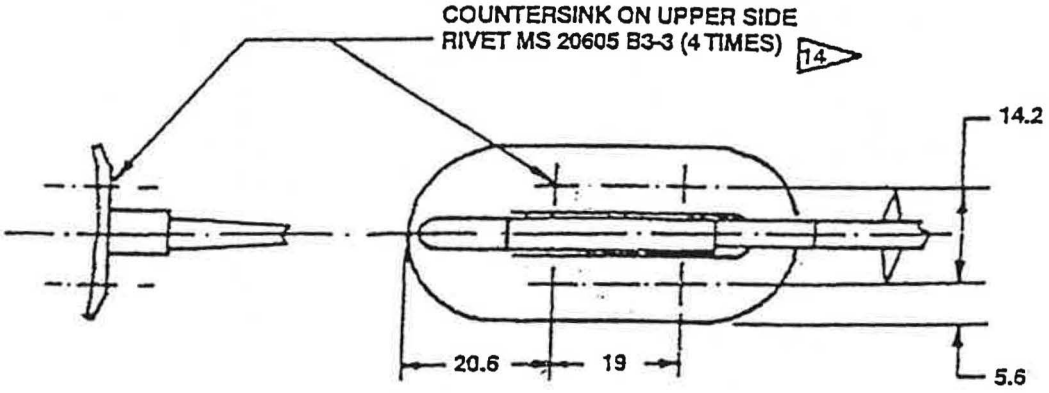


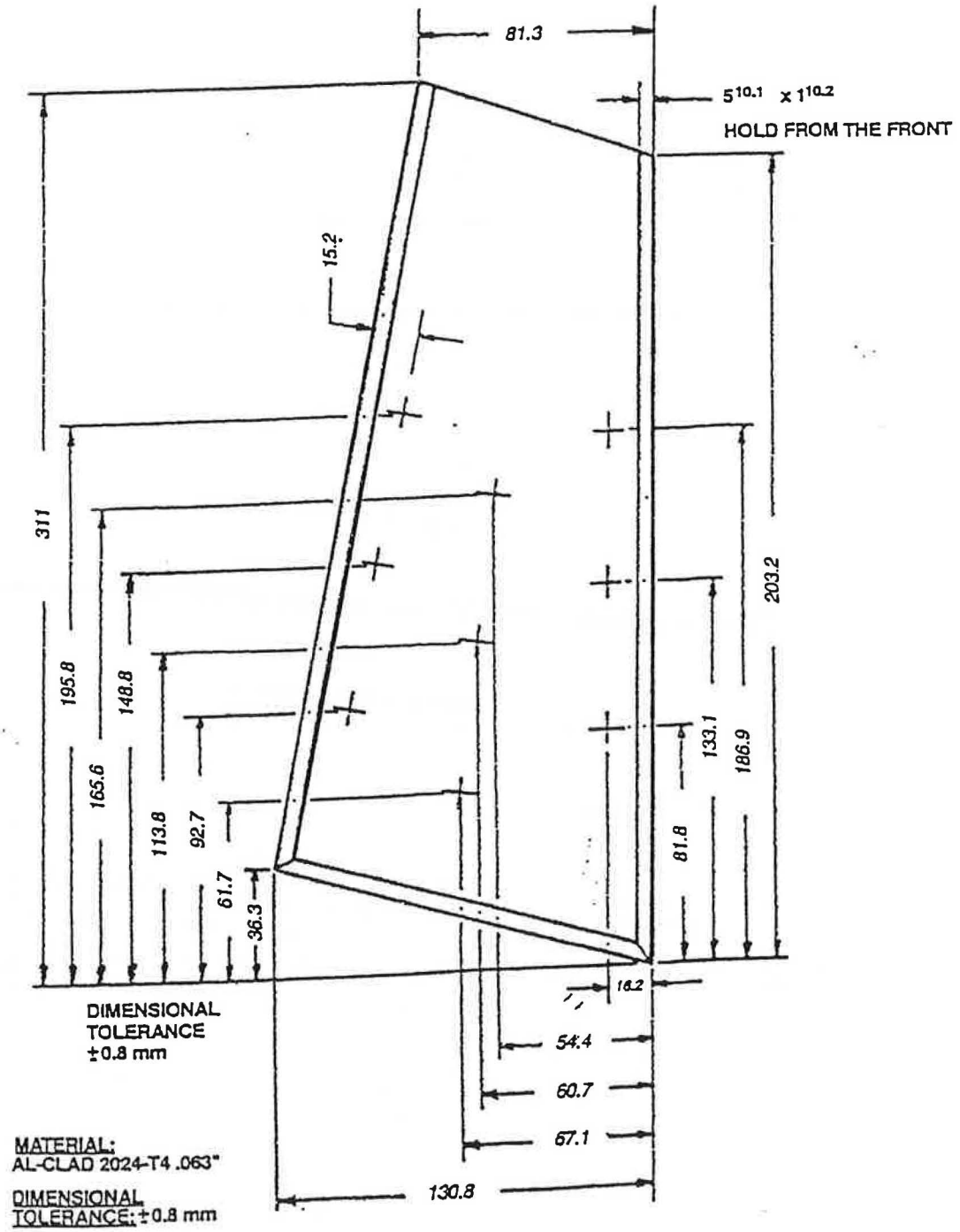
SECTION A-A
FRONT VIEW

14 GLUE ON DISCHARGER RETAINER AND BEFORE THE ADHESIVE CURES RIVET IT.



SECTION B-B
TOP VIEW

Vertical Stabiliser
Figure 4
Detail I



Vertical Stabiliser
Figure 4
Detail IV

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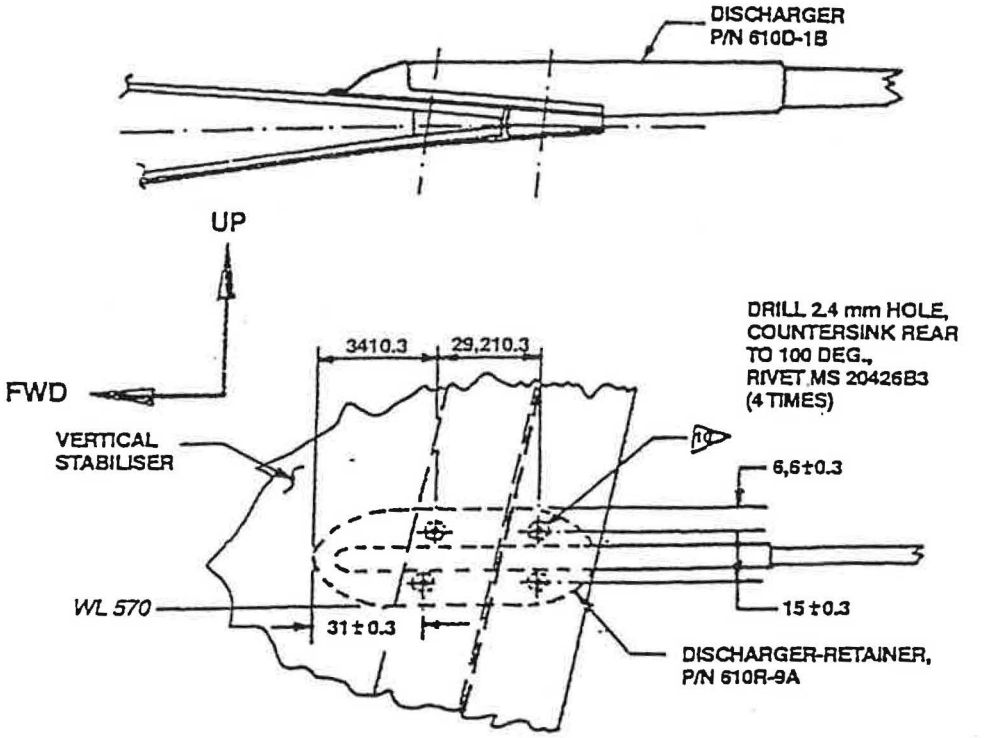


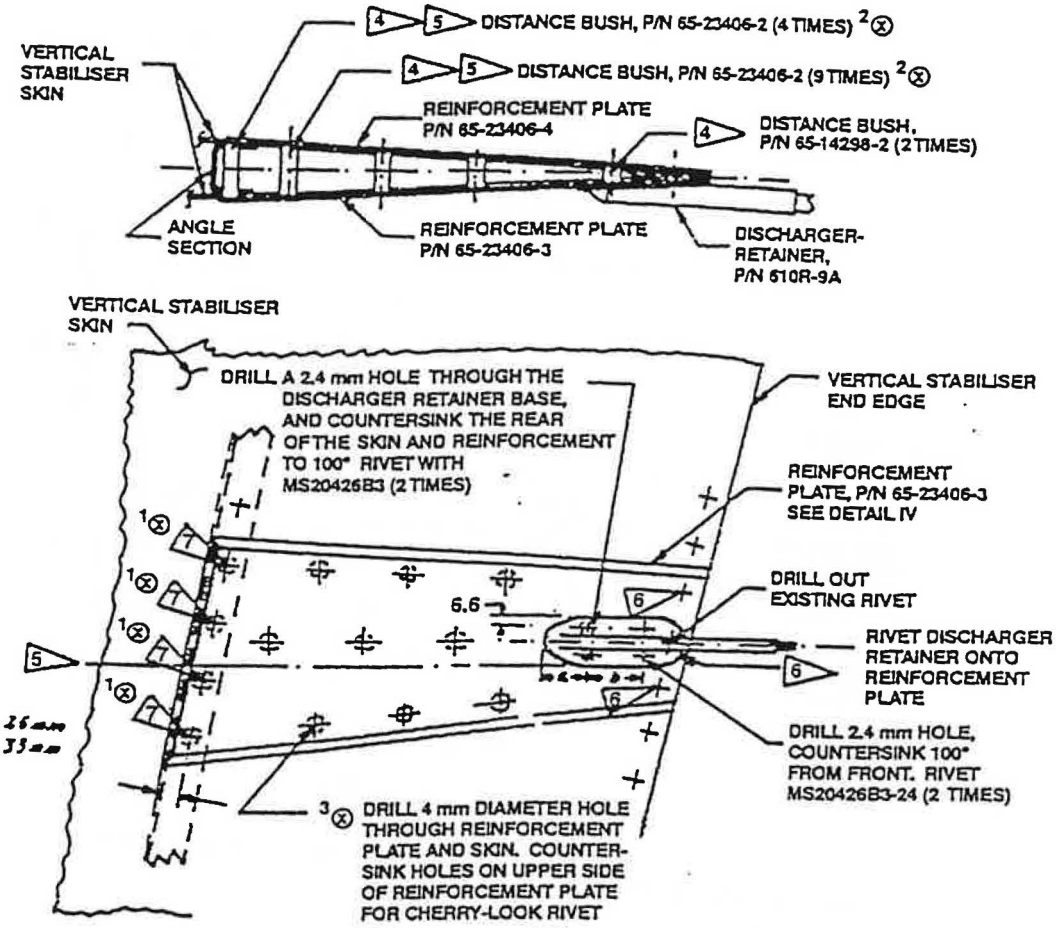
7 MOUNT REINFORCEMENT PLATE SO THAT THE EXISTING RIVET HOLES CAN BE USED AGAIN, OR DISTANCE BUSHES CAN BE INSTALLED BETWEEN THE EXISTING RIVETS.

8 REMOVE EXISTING RIVET. DRILL A 4-mm HOLE AND INSERT RIVET MS 20426B5. USE ONLY THE EXISTING RIVET HOLES IF THE MINIMUM DISTANCE BETWEEN EDGES IS PRESENT.

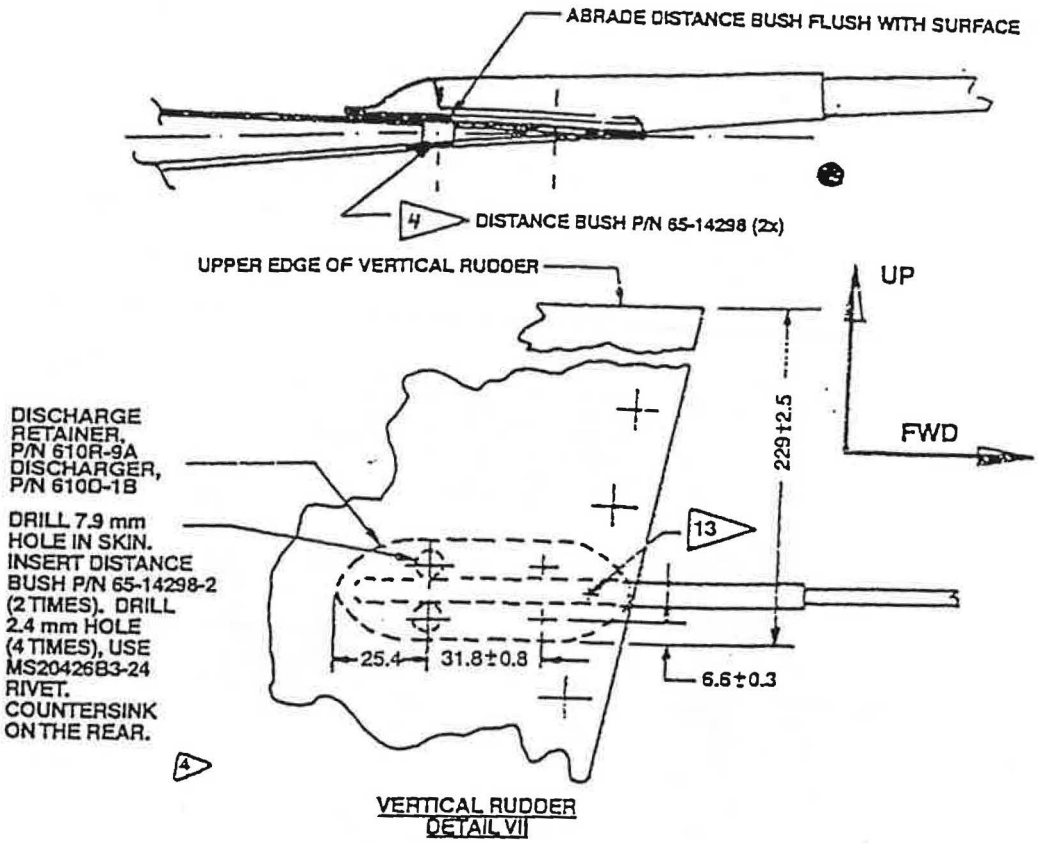
9 APPLIES ONLY TO AIRPLANES FROM GROUPS I AND II

10 GLUE BEFORE RIVETING. ALLOW ADHESIVE TO HARDEN AFTER RIVETING.

Figure 4
Détail II
Vertical Stabiliser

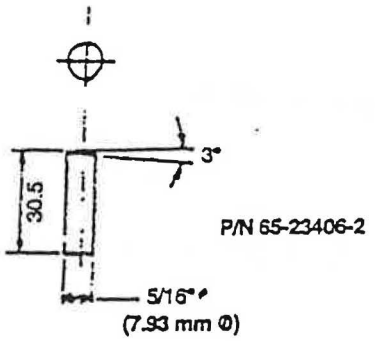


Vertical Stabiliser
Detail III

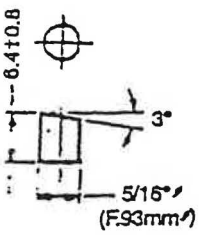


VERTICAL RUDDER
DETAIL VII

13 REPLACE EXISTING RIVET WITH MS 2042685 IF RIVET HEAD IS IN WAY.



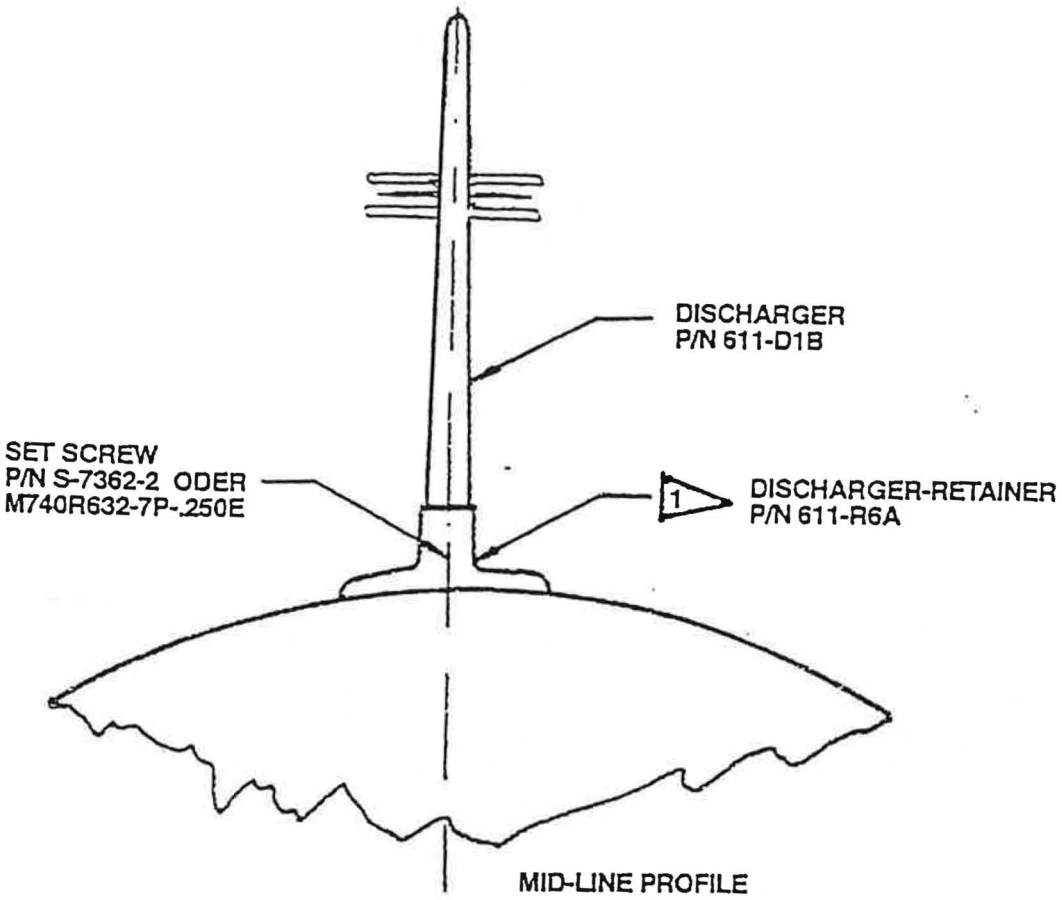
DETAIL VII



P/N 65-14298-2

DETAIL VI

MATERIAL: MAKE DISTANCE BUSHES (SEE DETAILS VI AND V) OF 2024T4 ROD 5/16".



1 MOUNT DISCHARGER RETAINER WITHIN A TOLERANCE ±10 DEG. TO MID LINE PROFILE.

Surface and Horizontal Stabiliser Curve
Figure 5

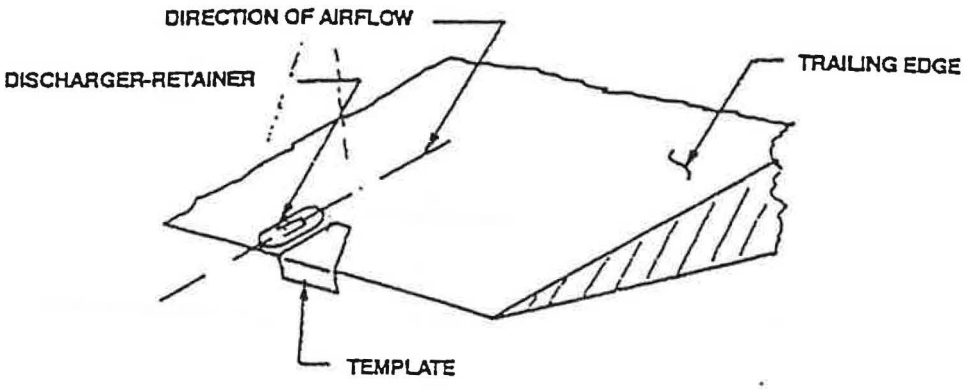
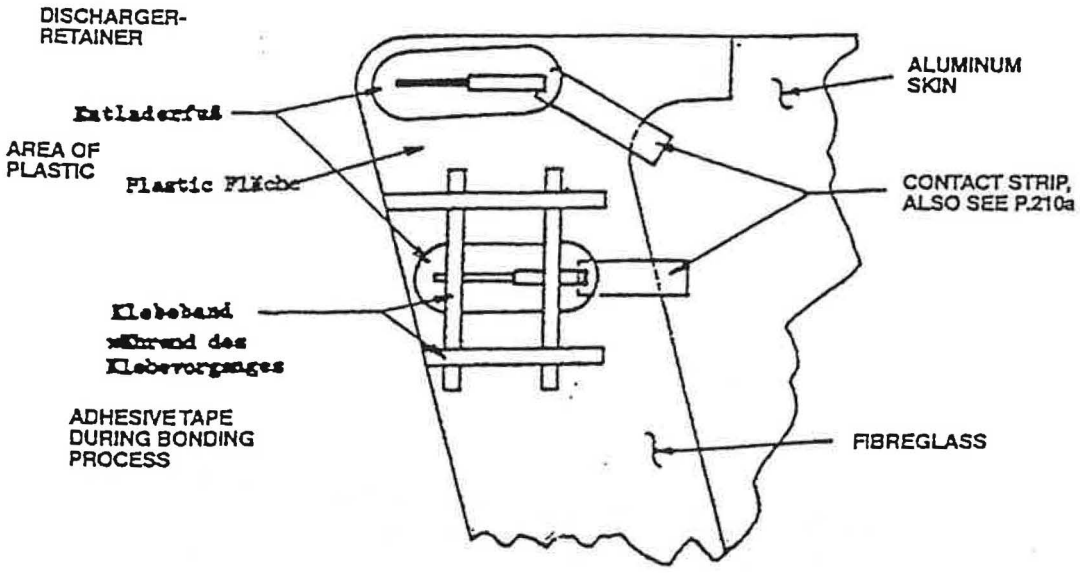
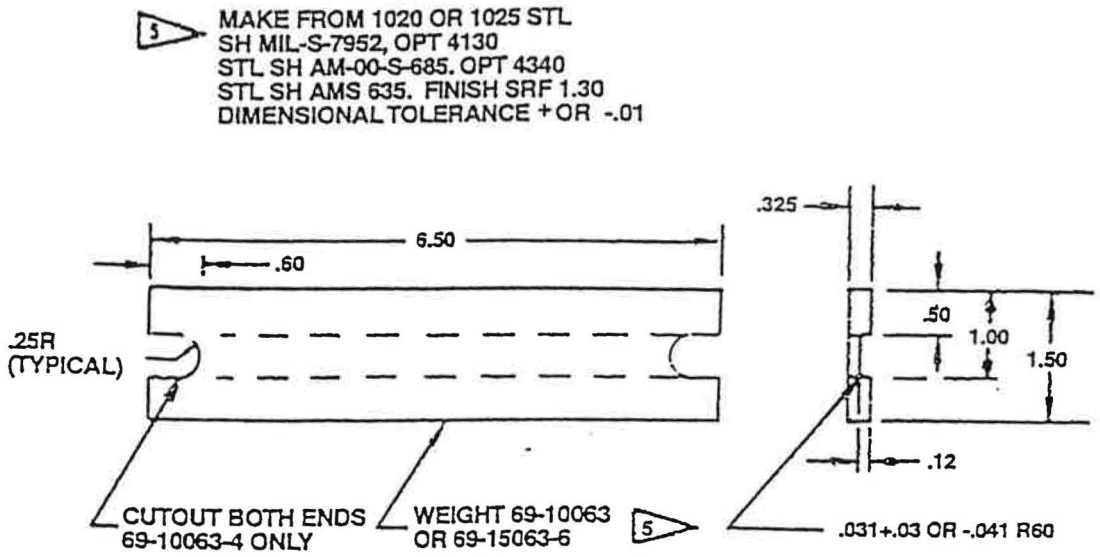


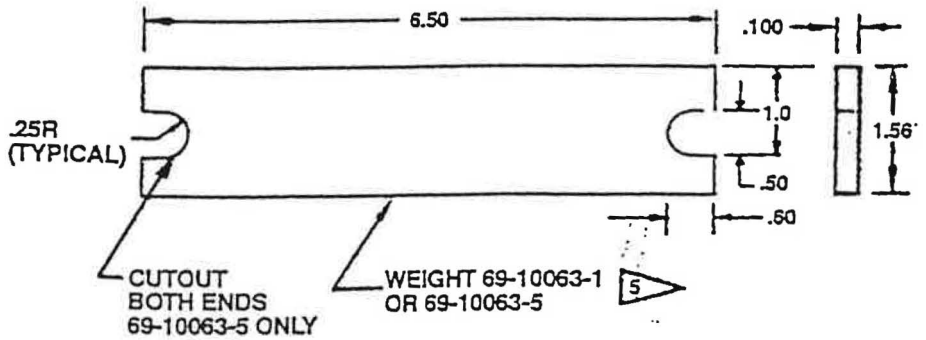
FIGURE 6



Installation of Retainers
Figure 7



DETAIL I



DETAIL II

Elevator Balancing Weight Installation
Figure 8

CHECK STATIC DISCHARGERS

1. Visual Check

   A. Check dischargers from ground in accordance with 23-12-0, p. 3 for any missing and any obvious damage (e.g. plastic rod broken).

   B. Replace missing dischargers, but it is permissible for one per group to be missing.

   C. Deleted.

2. Condition Check

   A. Check all dischargers for solid seating on their retainers. See also 23-12-0, p. 204, f).

   B. Replace broken dischargers.

   C. Check tips of dischargers carefully using fingers. Any with blunt or broken tips must be replaced.

   D. Replace dischargers with lightning damage (burned parts).

   E. Dischargers with isolating surfaces are connected to the remaining structure with a strip conductor. Examine it for breaks or bums and replace where necessary.

   F. Replace missing retainers. See 23-12-0, p.3 and pp. 206, 207.

   G. Deleted.

3. Measurement of Contact Resistance

   A. The respective contact resistance between retainer base and airplane structure must be measured. The resistance must not exceed 0.1 ohm. At any higher value the retainer must be replaced in accordance with 23-12-0, p.201 through 204.

4. Measurement of all Dischargers

   A. Condition check on retainer bases, see point 2. F.

   B. Measure contact resistance of retainer bases, see point 3.

   C. Condition check on dischargers, replacing any missing or obviously damaged dischargers, so that the target stock of 34 (for positions see 23-12-0, p.3) is restored.

D. Measure contact resistance on the remaining dischargers between discharger tip and retainer with a high-resistance gauge. Value ranges as below must be complied with:

trailing edge discharger = 8 ... 100 MOhm
tip discharger = 6 ... 60 MOhm

Dischargers outside the specified values must be replaced.

Dischargers inside the specified values must be cleaned with alcohol.

COMMUNICATION SYSTEMS - DESCRIPTION AND OPERATICN

1. General

A. The communications systems are those systems used primarily to transmit and receive audible communication information. The systems include the interphone system, passenger address system, high frequency communication system, very high frequency communication system, and Selcal decorders.

B. The information transmitted or received may be voice communication, tone signals or

C. The major components of each communication system are mounted in electronic equipment racks in the lower noise compartment. Access to the equipment during flight is gained through a door in the control cabin. While on the ground, access is obtained through the electronic compartment access door, which is aft of the nose gear wheel well. Location of the electronic equipment is shown in figures 1 and 2. Antennas for each of the radio systems are shown in figure 3.

D. Controls for each of the systems are located according to their primary purpose, therefore, radio controls are adjacent to the pilots and the passenger address controls are available at the passenger attendant's station. The primary controls of all the communication systems are remote from the major system components.

WARNING: THE VOLTAGES UTILLIZED IN SOME CIRCUIT IN THIS SYSTEM CAN PRODUCE CURRENTS WHICH CAN BE FATAL. USE EXTREME CAUTION WHEN WORKING AROUND ENERGEZED EQUIPMENT.

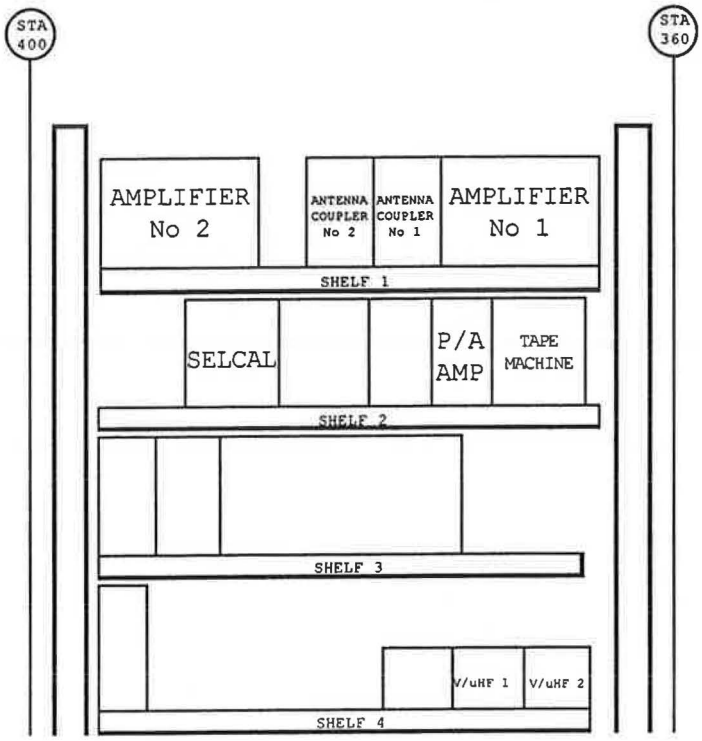


Figure 1a: RTCA LH radio rack (S/N 19997, 20000)

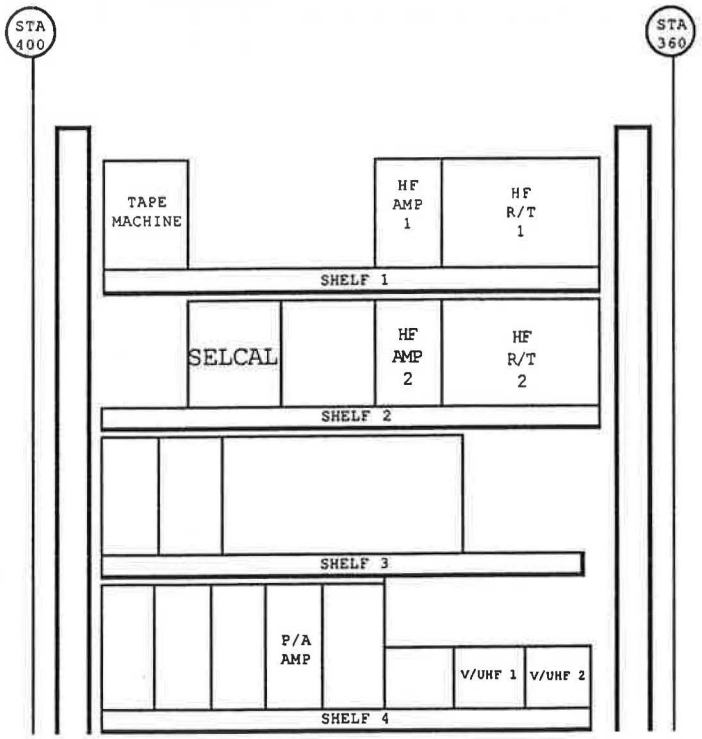
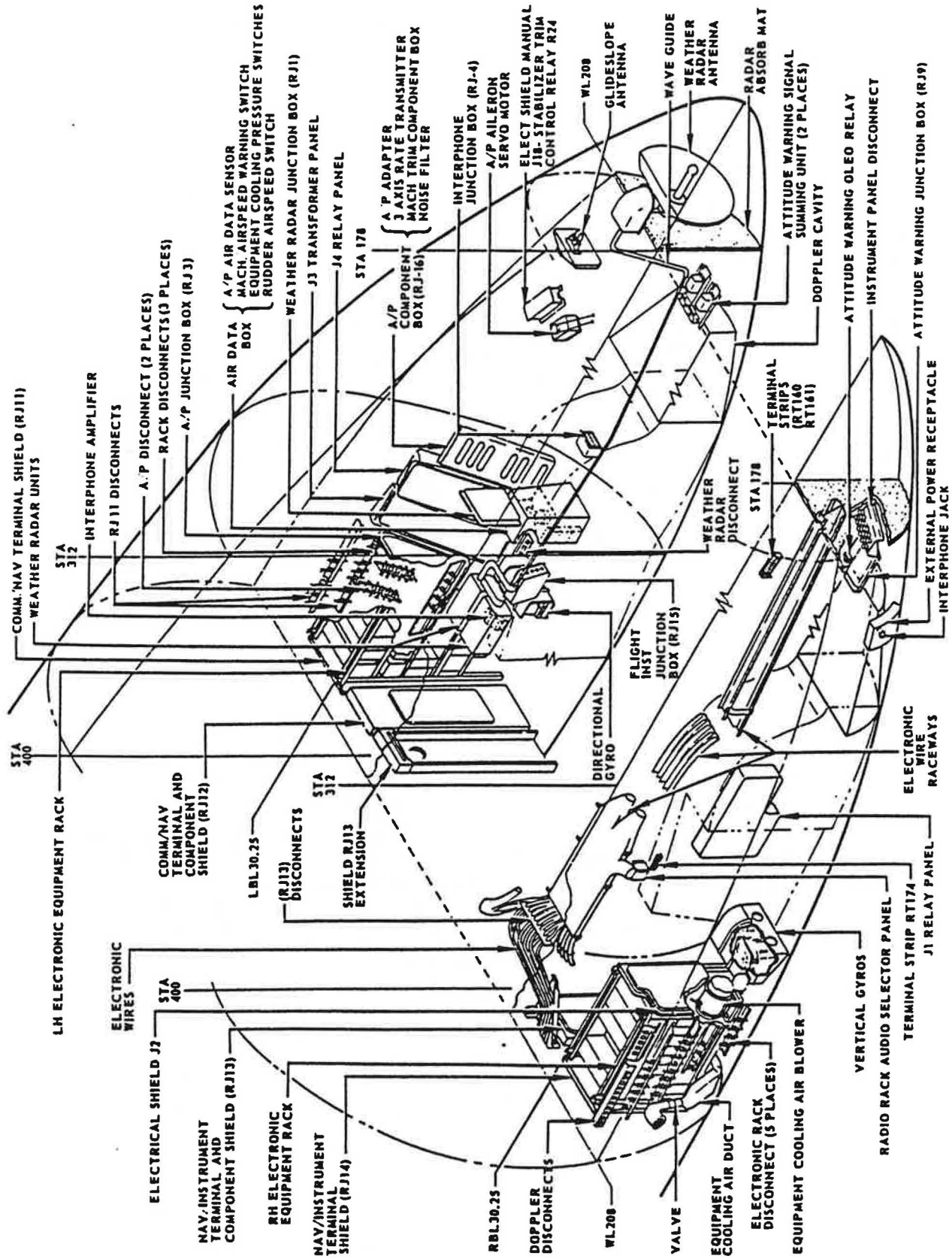
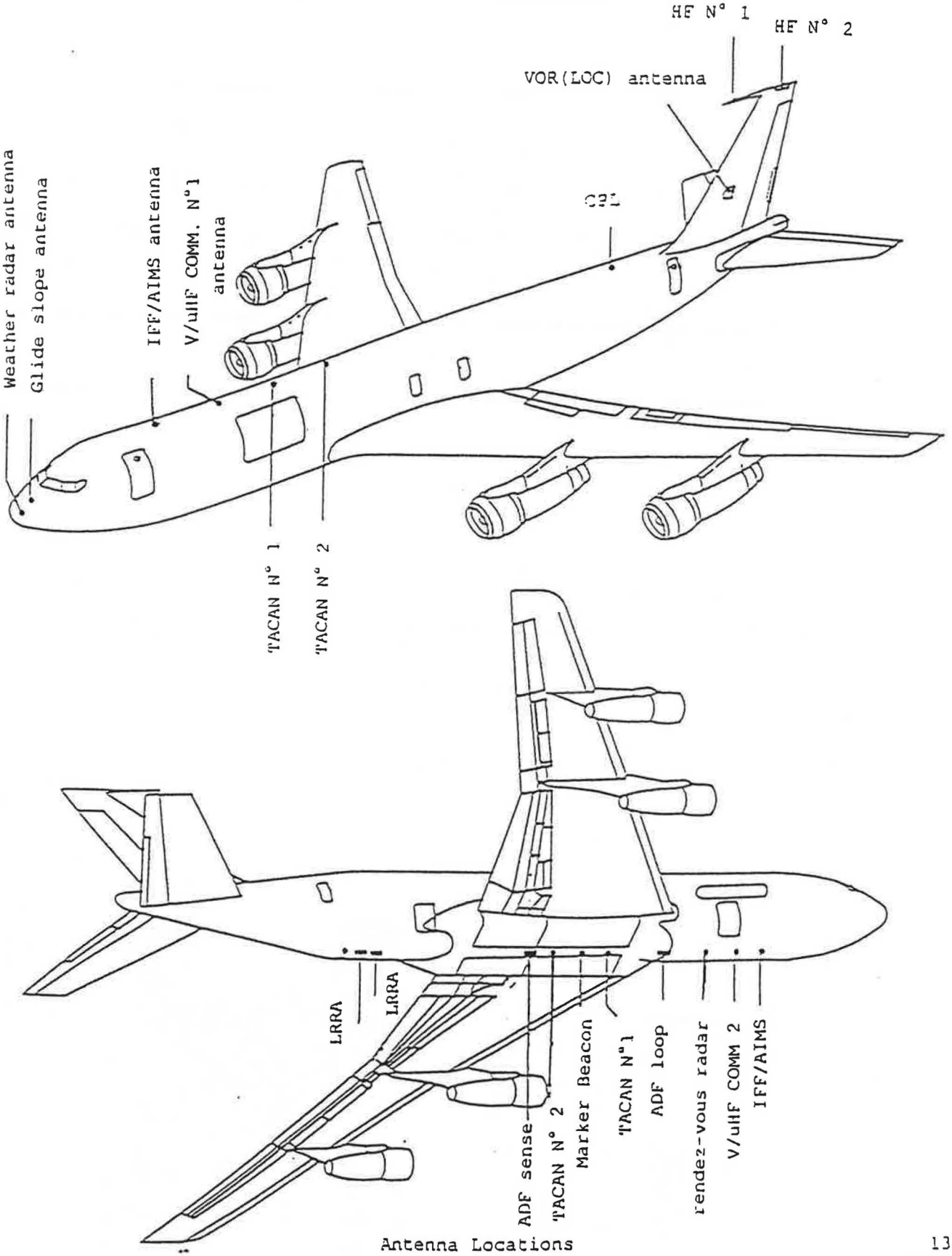


Figure 1b: TCA LH radio rack (S/N 20199)



Electronic Equipment Locations
Figure 2



Antenna Locations
Figure 3

COMMUNICATION SYSTEMS - MAINTENANCE PRACTICES

1. General

A. Whenever testing any of the communication systems on the ground, external power must be connected to the airplane if no airplane generators are operating.

B. Since the most important communications systems are duplicated, or have duplicate components, trouble shooting may be readily accomplished by substituting operative units for apparently faulty units.

C. Since nearly all components are panel-mounted or rack-mounted, no specific removal or installation procedures are given, except where necessary.

D. When any component is removed from a system, all ports or openings should be covered to prevent entrance of dirt or any other foreign material. Plugs and receptacles should be covered to prevent corrosion or dirtying of contacts. Plastic bags (polyethylene) are excellent covers for plugs and receptacles.

E. When components are removed from the electronic equipment rack, the cooling air ports in the electronic rack shelves should be covered to prevent foreign material from entering the cooling system.

CAUTION: BE SURE ALL DUCTS, PLUGS OR COVERS ARE REMOVED FROM COOLING AIR PORTS BEFORE INSTALLING EQUIPMENT. IF PORTS ARE BLOCKED, EQUIPMENT MAY OVERHEAT. USE ONLY AN APPROVED GROUND POWER SUPPLY FOR GROUND OPERATION OR TESTING.

MISCELLANEOUS COMMUNICATIONS SYSTEMS COMPONENTS - DESCRIPTION AND OPERATION

1. General

A. The majority of the communication equipment is installed in electronic racks located on both sides of the lower nose compartment forward of the forward cargo compartment. A junction box for equipment wiring connections forms the dividing partition between the electronic racks and the cargo compartment. Forced airflow cooling of electronic units utilizes the shelves and sides of the electronic racks as part of the exhaust ducting to an overboard venturi outlet.

B. All interconnecting wiring, where practical, conforms to the ARINC equipment wiring specification. Nylon covered wire is used in all circuits. Shielded leads are furnished as required in certain sensitive circuits.

C. Circuit protection for all communication equipment is provided by trip-free circuit breakers. These are on the radio and T-R circuit breaker panel (P5)

2. Master Radio Power Circuits

A. Two master radio power switches on the radio and T-R circuit breaker panel (P5) control all a-c and d-c power to the essential and No. 2 radio busses. Power used for flight instruments, interphone; mach trim system and navigation compass systems is not switched. The radio and T-R circuit breaker panel is the distribution point for all electrical power used by the communication and navigation electronic equipments.

B. The essential radio bus, essential instrument bus, instrument bus No. 2 and radio bus No. 2 consist of a number of separate busses with interconnecting wires so that circuit breakers for both a-c and d-c power for any equipment are adjacent to each other, where practical.

C. Essential radio bus and essential instrument bus d-c power is taken from the essential T-R unit. Alternating current for the essential radio and instrument busses is taken from the 115-volt essential a-c bus, which may receive power from any one generator during flight, or from the external a-c power system an the ground.

D. Radio bus No. 2 and instrument bus No. 2 receive d-c power from T-R bus No. 2, and receive ac power from 115-volt a-c bus No. 2.

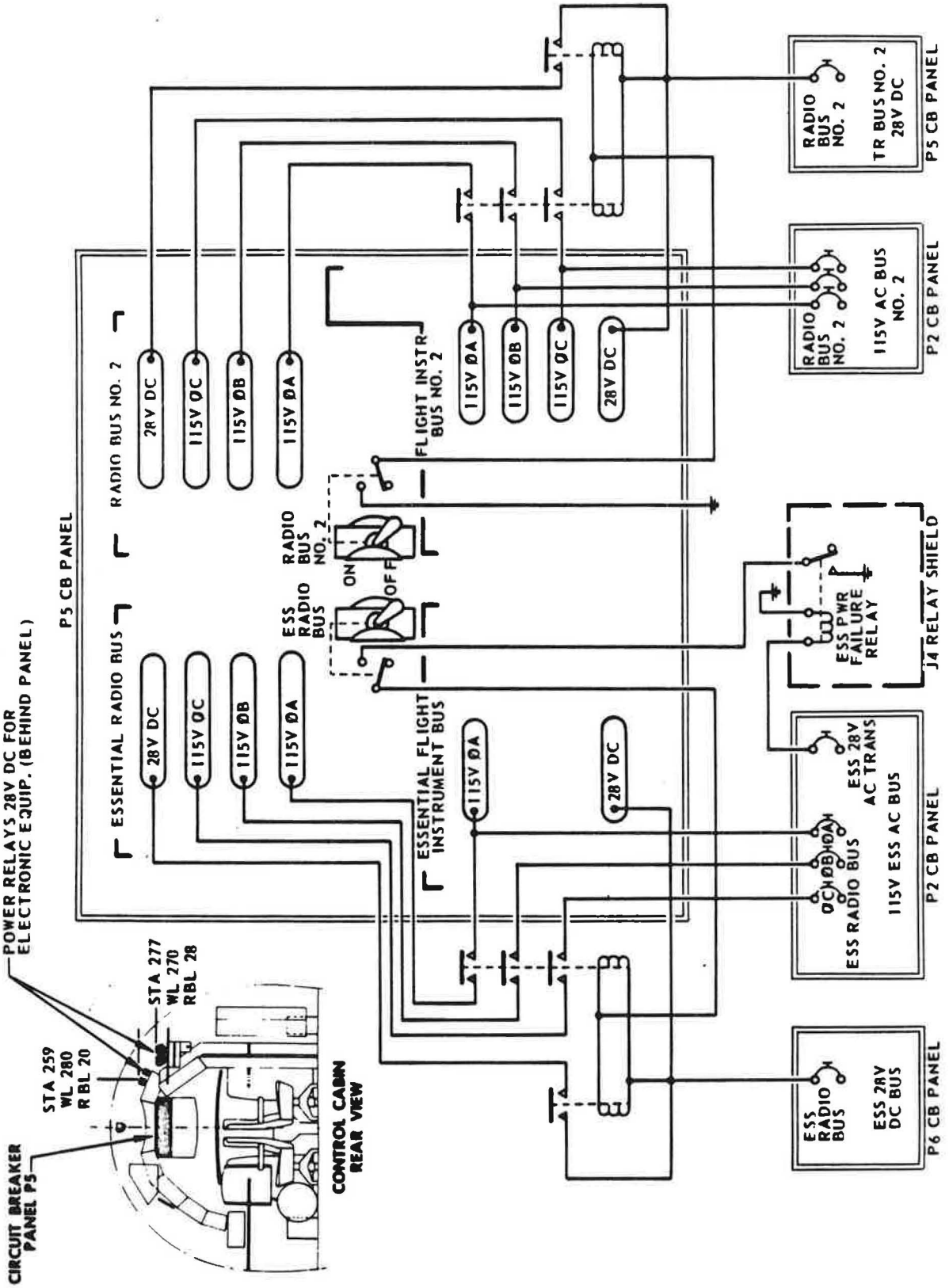
3. Master Radio Power Switches

A. Both the essential radio bus and radio bus No. 2 are energized through associated power switches. The switches are in the radio and T-R circuit breaker panel, and will normally be in the "ON" position. Operation of either switch will remove power from many of the communication and navigation electronic equipment units, except the flight instruments, interphone system and navigation compass systems.

4. Electronic Terminal Shields (Junction Boxes)

A. The electronic and navigation terminal shields (RJ11, RJ12, RJ13 and RJ14) are in the lower nose compartment. The shields are located on each side of the door at the forward wall of the cargo compartment. Most of the communication and navigation equipment interconnects are made in the electronic and navigation terminal shields.

B. Interphone connections are made in the RJ4 shield, located above the pitot static compartment at the left side of the nose wheel well.



Electronic Power Distribution
Figure 1

PASSENGER ADDESS SYSTEM - DESCRITION AID OPERATION

1. General

A. Flight crew announcements or recorded music are directed to the passengers through the passenger address system. The PA system consists of an amplifier, a tape reproducer, loudspeakers and system controls. (See figure 1.) The loudspeakers are located throughout the passenger compartment and lavatories. Signal input to the amplifier may be from the pilots' PA microphone, flight interphone system audio selector panels, forward or aft attendants' PA microphones, or from the tape reproducer. (See figure 2.)

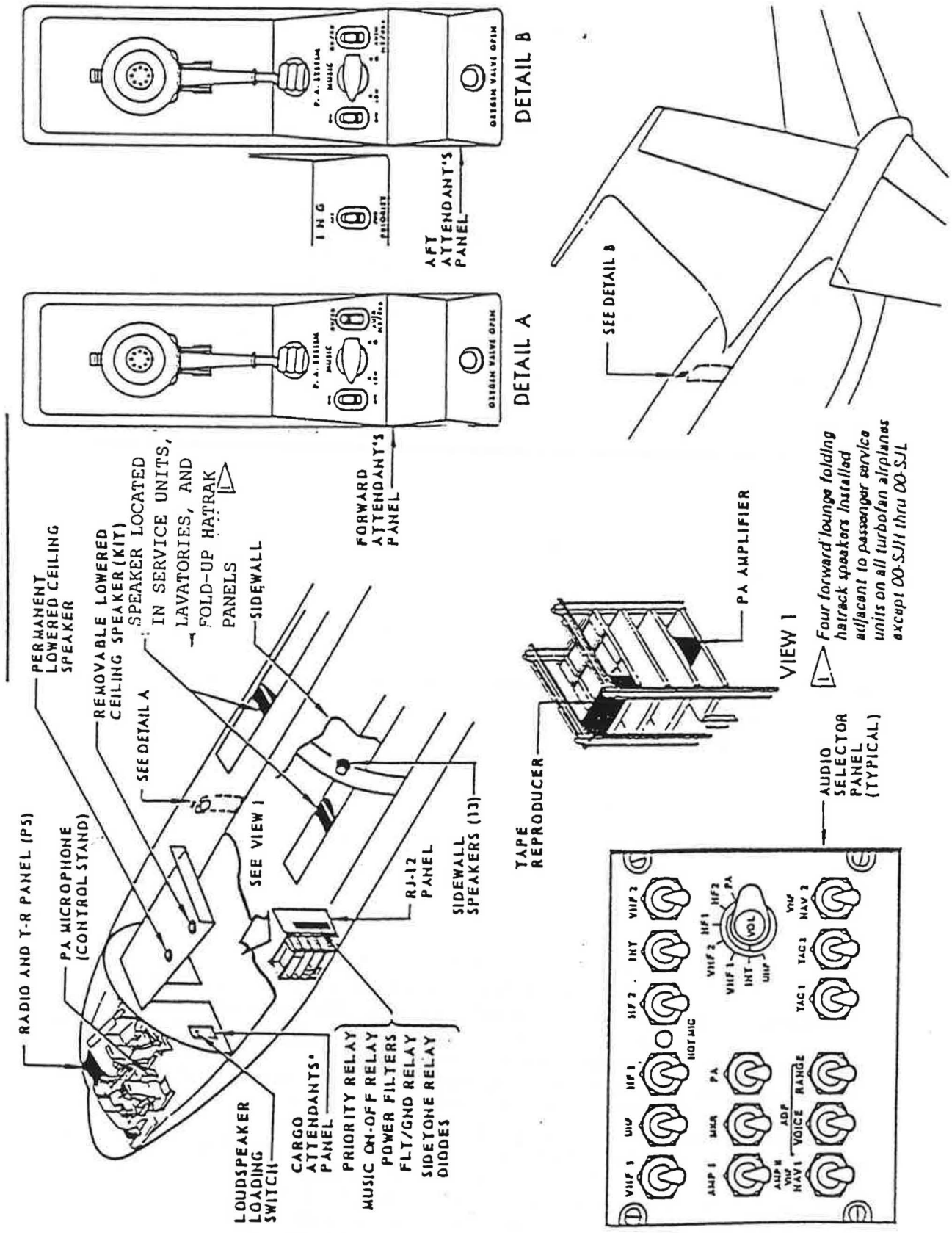
B. Speaker receptacles are located at 20-inch intervals along each side of the passenger compartment. All receptacles are interconnected so that speakers may be connected at the most convenient locations to suit various seating arrangements. The speakers impedance matching transformers and speaker plugs are in the passenger service units and in the left foldable that racks in the forward cabin. Thirteen speakers are also installed in the left sidewall of the airplane and one speaker is installed in the lowered forward ceiling . Provisions for installation of a second speaker (forward lounge removable speaker kit) are also in the lowered forward ceiling. Provisions for installation of a lavatory E speaker are at station 1400.

C. The tape reproducer and passenger address amplifier use 28-volt de and 115-yolt, 400-Hz ac. (See figure 2.) The 115 volts ae for the passenger address amplifier in used for adjustment and test purposes only.

D. See chapter 25, Cabin Accommodation - Conversions for installation of removable passenger lounge speaker and tape reproducer kits.

2. Passenger Address System Controls

A. Control of the passenger address system is from the attendants' panels. For aircraft 20199, two switches and a volume control are provided on each panel. (See figure 1.)
For aircraft 19997 and 20000, the control device is inthe aft control panel only. The MUSIC ON-OFF switch energizes relays in the passenger address amplifier and tape reproducer which complete the music input into the amplifier. The music input into the amplifier is automatically disconnected whenever a crew member energizes a push-to talk circuit.
The volume knob controls tape reproducer output over a range of 20 db.
The OVERRIDE- AUTO FLT/GND switch controls a preset volume level circuit in the passenger address amplifier. The switch is normally in the AUTO FLT/GND position, thereby reducing the volume level automatically whenever the airplane is on the ground. Placing the switch in the OVERRIDE position disconnects the volume level circuit in the amplifier; the volume level then increases to normal. A PRIORITY switch on the aft attendan's panel switches all of the aft attendant's functions to the forward attendant's panel when positioned to FWD.



Passenger Address System Component Locations
Figure 1

B. Announcements may be completed over the PA system from the flight interphone system, a PA microphone installed on the aft end of the control stand or from microphones installed in the forward and aft attendants' panels. Announcements made with the control stand PA microphone and flight interphone system have priority over announcements made with the attendants' microphones. Sidetone from the PA amplifier is directed to the crew members audio selector panels. Crew members may monitor the PA system by positioning the INT toggle switch on their audio selector panels up. (See 23-2-0.)

C. Additional controls for the passenger address system are provided for adjusting preset volume levels; however, the controls are in the amplifier and are not normally used after initial adjustment. A speaker loading switch located on the cargo attendant's panel connects the PA amplifier 50 ohm output line or 125 ohm output line to the loudspeakers.

3. Passenger Address Microphones

A. Transistorized dynamic microphones at the forward and aft attendants' panels and control stand are used in making announcements through the passenger address system. Receptacles at each of the stations accommodate plugs on the microphone cords.

B. Each microphone incorporates a transistor amplifier which provides a suitable output level and an output impedance of approximately 150 ohms. A press-to-talk switch in the microphone provides control of input priority relays in the passenger address amplifier, and also completes the audio circuit to the microhpone amplifier. Input matching transformers and circuits for the attendants' microphones are in the associated attendants' panels.

4. Passenger Address Loudspeaker

A. Loudspeakers are permanent magnet, 5-inch round speakers. Each speaker has a separate matching transformer to match speaker impedance to line impedance. Most speakers in the passenger compartment are mounted in the passenger service units. Speakers in the lavatories are permanently located and are not equipped with plugs. Speakers mounted in the sidewall have covers over them with the speaker matching transformer mounted on the cover.

5. Passenger Address Amplifier

A. The passenger address amplifier provides the power necessary to drive the speakers of the passenger address system. The amplifier is completely transistorized, and operates on 28-volt d-c power. Standby operation of the amplifier requires one ampere input at 28 volts, and full power output requires an input current of 3 amperes at 28 volts.

B. The passenger address amplifier has a rated continuous output of 40 watts, with no more than ten percent distortion at 1000 cycles per second. The frequency response at rated output is within ± 3.0 db from 100 to 7000 cycles per second.

C. Three separate inputs to the amplifier are provided. These are from the crew members' microphones, attendants' microphones and from the tape reproducer. The inputs are controlled through input relays in such a manner that input No. 1 (crew members' microphones) has priority over input No. 2 (attendants' microphones) and input No. 2 has priority over the tape reproducer input.

D. Output from the amplifier is at 50 or 125 ohms impedance. Additional output impedances of 25, 200, 350 or 500 ohms are provided, but are not used.

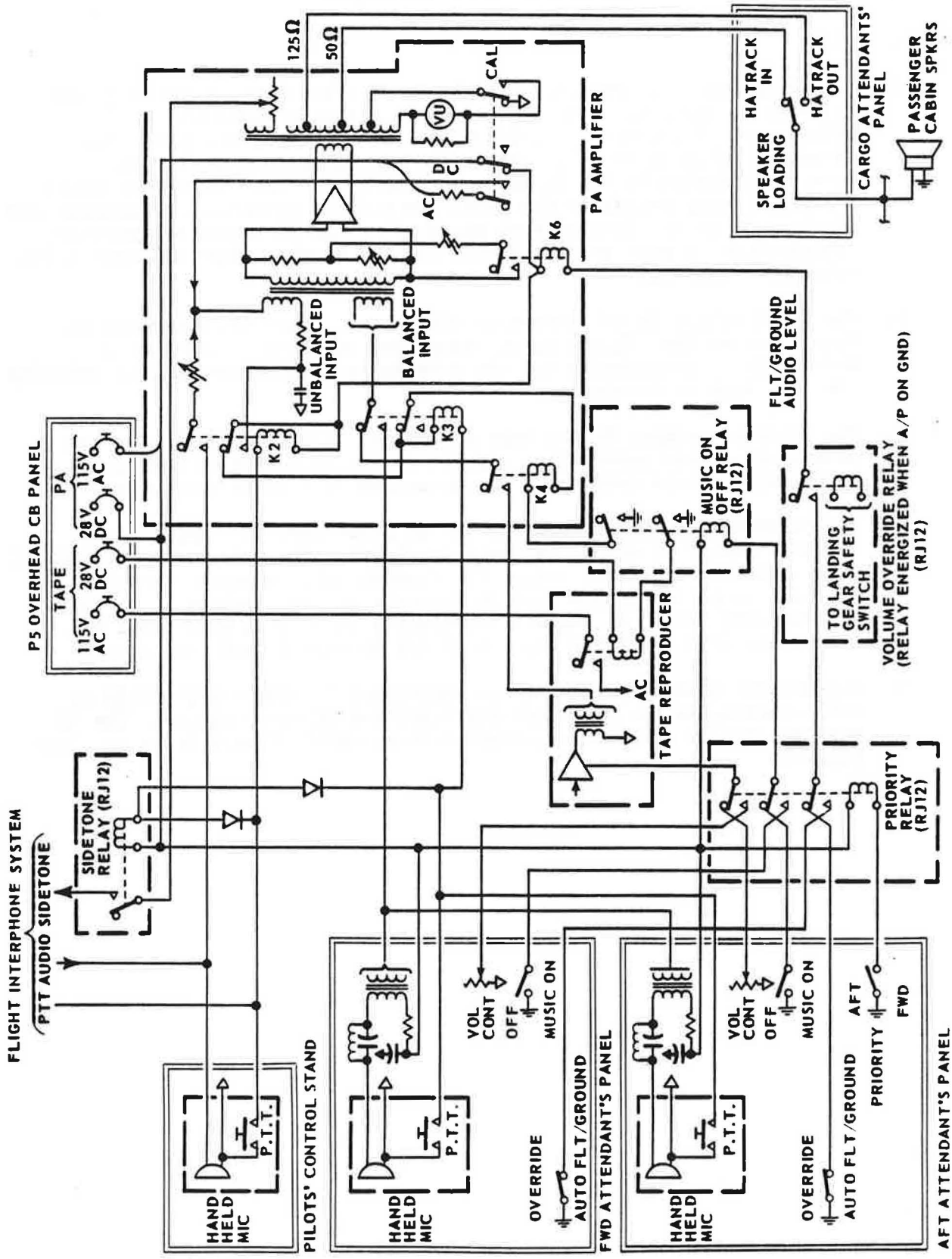
E. Ground and flight volume levels are set on potentiometers in the amplifier. Selection of the flight or ground output levels is automatic but a volume override switch is provided on the attendants' panels.

F. A test switch and an audio level meter on the front of the amplifier facilitate test and adjustment of the amplifier and passenger address system. When the test switch is actuated a 400-cycle signal is fed to the amplifier input and a circuit is completed to the audio level meter, which indicates the output level of the amplifier.

6. Tape Reproducer

A. Music for the passenger address system is provided by a magnetic tape reproducer installed in the left electronic equipment rack. The tape reproducer uses 28 volts dc and 115 volts ac obtained from circuit breaker panel (P5).

B. The tape reproducer 7-inch reels operating at 3-3/4 inches per second provide a playing time of approximately 4 hours using dual track half mil tape. Automatic tape reversal provides continuous playing with automatic shutoff provided in case of tape breakage. Controls for adjusting bass and treble are located within the tape reproducer case and are normally used for installation adjustments only. Output from the preamplifier, within the case, is 1 mw across a 500 ohm balanced line with a signal to noise ratio of 38 db or better.



Passenger Address System Schematic
Figure 2

7. Operation

A. Crew announcements are completed through the passenger address system from the control stand, and to selector panels, forward and aft attendants' microphones. Positioning the audio selector panel mike selector switch to PA will connect the microphones of the flight interphone system to the PA system. Pushing the microphone PTT switch energizes input relays to the passenger address amplifier. Announcements may then be made. Crew members may monitor the PA system whenever an announcement is made by positioning the INT toggle switch on their audio selector panels up.

B. The input relays in the passenger address amplifier are sequenced in such a manner that flight crews' announcements have priority over attendants' announcements and the attendants' announcements have priority over the tape reproducer.

C. The recorded program in the tape reproducer is completed through the passenger address system when a music switch is in the ON position. Volume of the tape reproducer is controlled by a music volume control.

D. The OVERRIDE-AUTO FLT/GRD switch may be positioned to OVERRIDE to increase amplifier output as desired. Leaving the switch in AUTO FLT/GRD will allow the amplifier output to automatically decrease when the airplane is on the ground, and to increase as the airplane is airborne. The PRIORITY switch on the aft attendant's panel will switch all PA system controls to either the aft or the forward attendants' panels.

E. The SPEAKER LOADING switch may be positioned to either HATRACK-IN or OUT according to the passenger configuration of the airplane. The IN position may be used for a passenger-cargo combination with up to eight pallets.

PASSENGER ADDRESS SYSTEM - TROUBLE SHOOTING

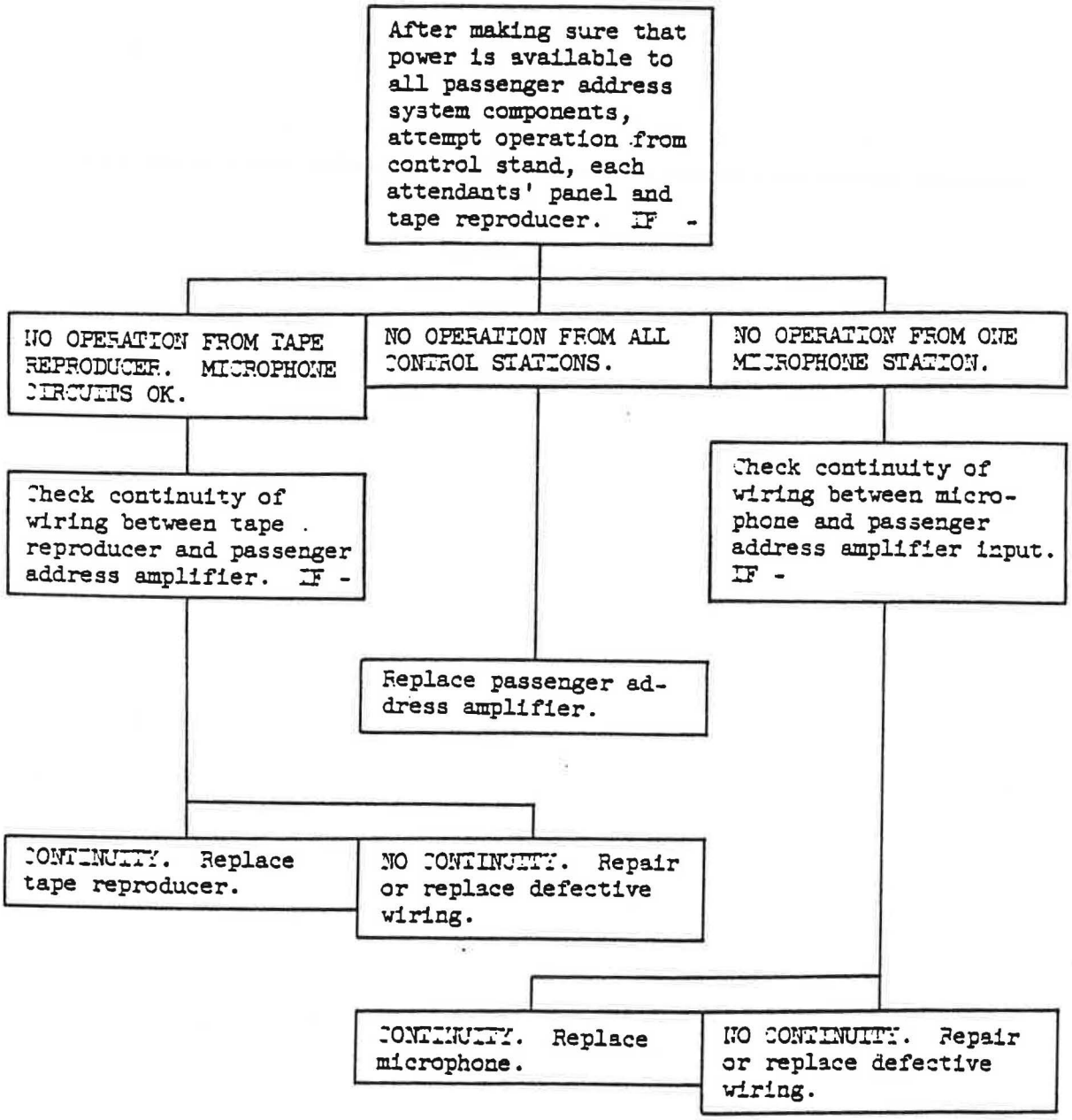
EFFECTIVITY

TURBOFAN

1. General

A. The first step in trouble shooting the passenger address system is to energize system by closing circuit breakers on radio and T-R circuit breaker panel (P5). Check power at the following terminals in electronic terminal shield (RJ11).

2. Passenger Address System Trouble Shooting Chart


After making sure that power is available to all passenger address system components, attempt operation from control stand, each attendants' panel and tape reproducer. IF -
NO OPERATION FROM TAPE REPRODUCER. MICROPHONE CIRCUITS OK.
NO OPERATION FROM ALL CONTROL STATIONS.
NO OPERATION FROM ONE MICROPHONE STATION.
Check continuity of wiring between tape reproducer and passenger address amplifier. IF -
Check continuity of wiring between microphone and passenger address amplifier input. IF -
Replace passenger address amplifier.
CONTINUITY. Replace tape reproducer.
NO CONTINUITY. Repair or replace defective wiring.
CONTINUITY. Replace microphone.
NO CONTINUITY. Repair or replace defective wiring.

PASSENGER ADDRESS SYSTEM - MAINTENANCE PRACTICES

EFFECTIVITY

TURBOFAN

1. Adjustment/Test Passenger Address System

A. Equipment and Materials

(1) Test box as shown in figure 201

NOTE: Test box may be fabricated locally.

(2) Ohmmeter

(3) V.T.V.M.

(4) Audio Generator - Hewlett-Packard 205AG or equivalent

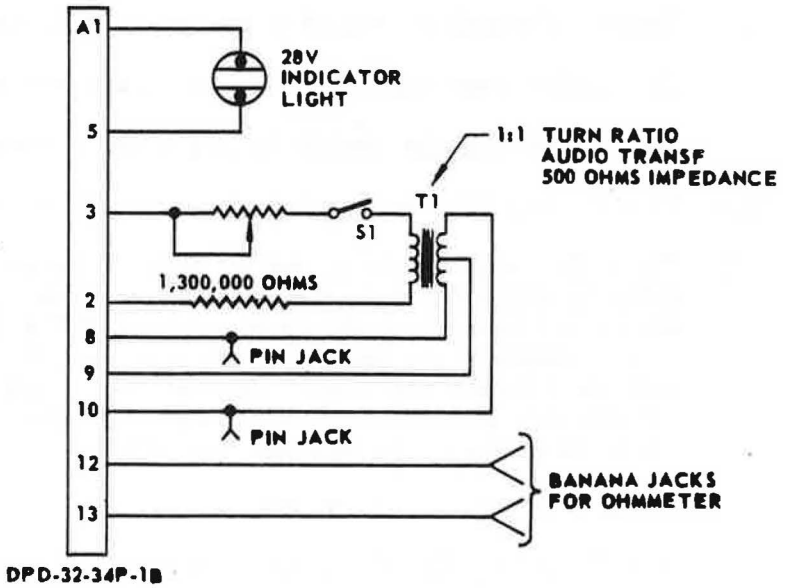
B. Test Passenger Address System

(1) Disconnect wiring harness from tape reproducer.

(2) Connect test box to wiring harness (plug RD 313) as shown in figure 201.

(3) Connect external power source to airplane and energize radio and T-R circuit breaker panel (P5).

(4) Check that tape reproducer, safety relay, interphone system and passenger address amplifier circuit breakers are closed.



Test Box for Passenger Address System
Figure 201

(5) Place the forward attendant's OVERRIDE-AUTO FLT/GND switch in OVERRIDE position.

NOTE: Ensure PRIORITY switch on aft attendant's panel is positioned to FWD.

(6) Actuate tape reproducer control switch on forward attendant's control panel to ON position.

(a) Red lamp on test box should light.

(b) Audio tone at 400 cycles should be heard from all passenger address loudspeakers in airplane.

(7) Connect ohmmeter to banana jacks of test box and rotate tape reproducer volume control knob on forward attendant's panel.

(a) Resistance should vary smoothly from 0 to 5000 ohms.

(8) Place OVERRIDE-AUTO FLT/GND switch on forward attendant's control panel in AUTO FLT/GND position and note operation of the passenger address system. Return switch to OVERRIDE position. Check that audio output is higher in OVERRIDE position.

(9) Position the PRIORITY switch on the aft attendant's panel to AFT.

(a) Control functions of the forward attendant's panel shall switch to the aft attendant's panel.

(10) Return PRIORITY switch on aft attendant's panel to FWD position.

(a) Control functions shall revert to the forward attendant's panel.

(11) Operate forward attendant's passenger address microphone.

(a) Audio tone should not be heard while microphone is operating.

(b) Voice signals should be heard while speaking into microphone.

(12) Repeat step (10) using microphone at aft attendant's panel.

(13) Close INT toggle switch and position mike selector switch to PA on pilot's audio selector panel. Close flight interphone mike PTT switch or control stand PA microphone PTT switch and make an announcement while passenger address system is being operated from forward attendant's panel. Operation should switch from the attendant's station to the pilots' station. Sidetone should be heard from flight interphone headphones.

(14) Check loudspeaker operation.

(a) Connect V.T.V.M. across voice coil of any passenger address loudspeaker.

(b) Energize system by depressing any push-to-talk microphone switch. Hum level across loudspeaker voice coil shall not exceed 3 millivolts.

NOTE: Energized microphone should be muffled to minimize acoustic pickup.

(c) Connect audio generator to music input terminals of passenger address amplifier. Set generator frequency output at 120 cps.

(d) Set music volume control on the forward attendant's panel at maximum.

(e) Adjust level of audio oscillator for 450 (± 25) mv across speaker voice coil.

(f) Check for a pure 120 cps tone from the speaker system. Monitor each speaker individually. A pure 120 cps tone indicates that speaker performance is acceptable and installation is proper. A 120 cps tone combined with a buzzing or rattling sound indicates a defective speaker or loose or resonant components in the respective passenger service unit. Do not remove speaker unless the defect is in the speaker itself. Make certain that the overhead hatrack is clear of loose articles to avoid misleading results.

(15) Actuate tape reproducer power switch on forward attendant's panel to OFF position.

(16) Disconnect test box from wiring harness and connect wiring harness to tape reproducer.

(17) Check that tape reproducer has magnetic tape installed.

(18) Operate tape reproducer by actuating switch on forward attendant's panel to ON position.

(a) Check that output is loud and clear.

(b) Operate remote volume control on forward attendant's panel and check that volume varies smoothly.

(19) Return forward attendant's OVERRIDE-AUTO FLT/GND switch to AUTO FLT/GND position.

(20) Determine whether there is any further need for power on the airplane, if not, remove external power.

PASSENGER ADDRESS LOUDSPEAKERS - MAINTENANCE PRACTICES

EFFECTIVITY

TURBOFAN

1. Removal/Installation Passenger Address Loudspeaker (See figure 201.)

   A. Remove Passenger Address Loudspeaker

      (1) Lower passenger service panel. (See Chapter 25 "Passenger Service Panels - Maintenance Practices.")

      (2) Detach two leads on loudspeaker.

      NOTE: Identify leads.

      (3) Remove two mounting bolts.

      (4) Remove loudspeaker.

      (5) Close passenger service panel.

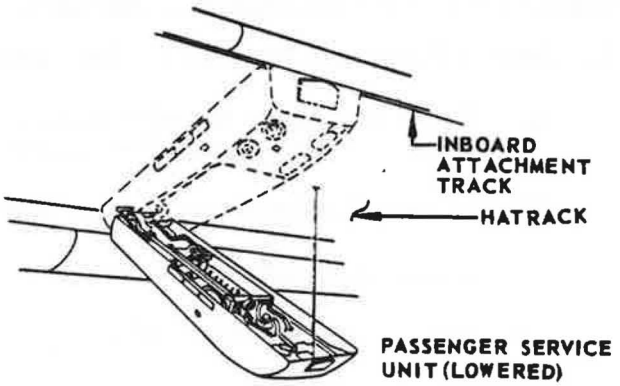
   B. Install Passenger Address Loudspeaker

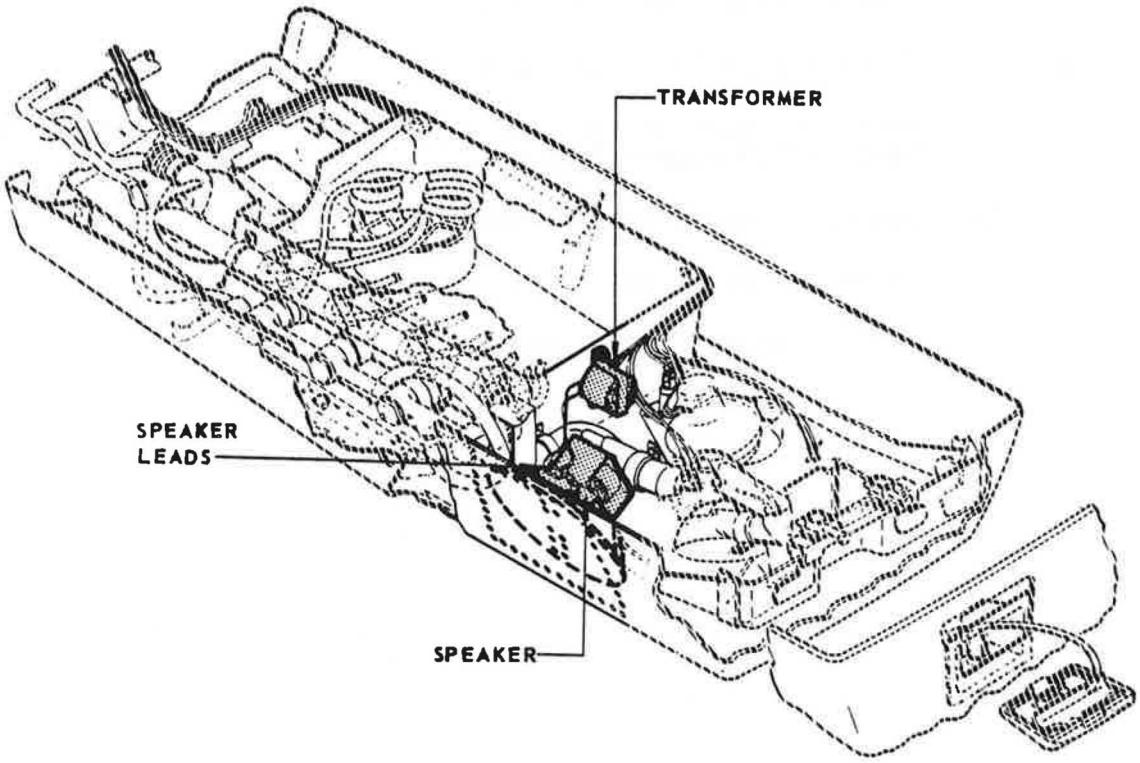
      (1) Lower passenger service panel. (See Chapter 25 "Passenger Service Panels - Maintenance Practices.")

      (2) Mount loudspeaker in position with two bolts.

      (3) Connect leads to loudspeaker.

      (4) Close passenger service panel.





Passenger Address Loudspeaker Installation
Figure 201

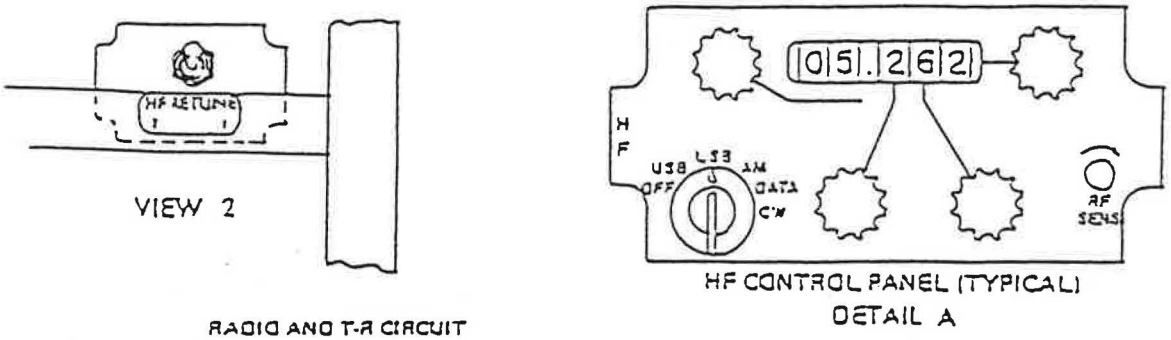
HF COMMINICATIONS SYSTEMS - DESCRIPTION AND OPERATION

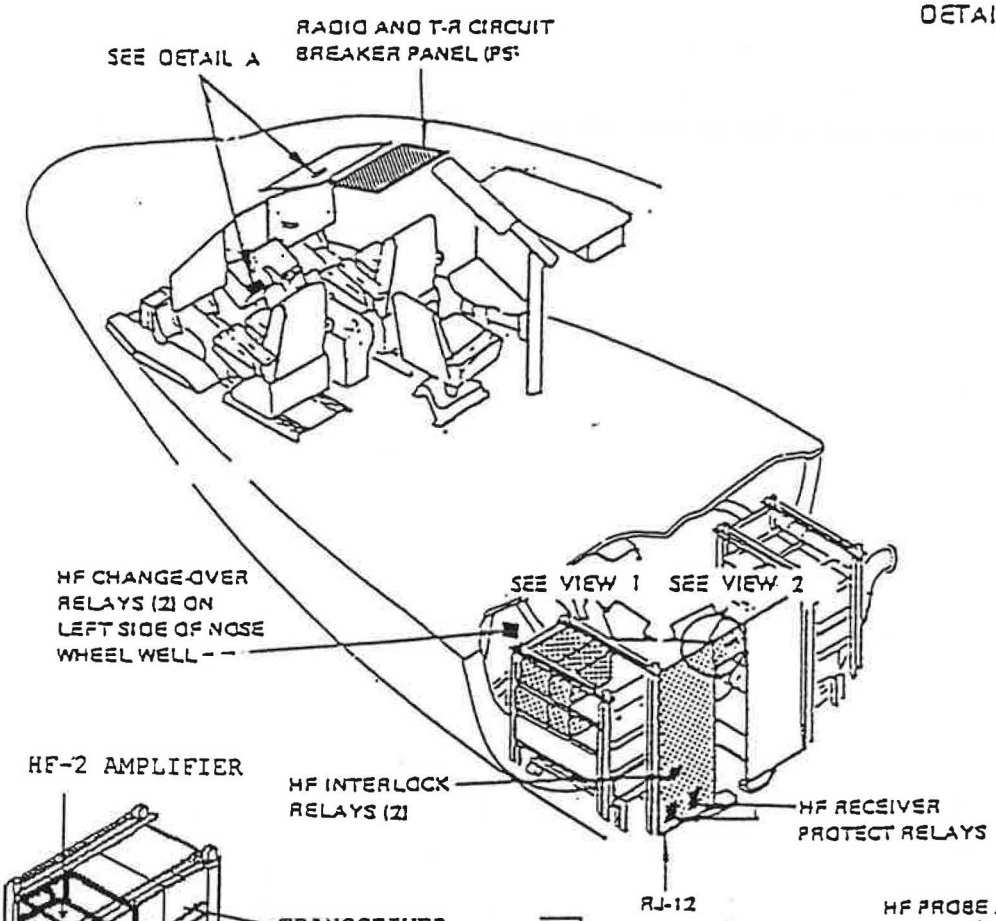
1. General

A. Two high frequency (HF) communication systems are installed in the airplane. The HF communication systems provide amplitude modulated and single side band voice communication between aircraft and ground or other aircraft. Communication in the 2 to 30 megahertz frequency range an any of 28,000 channels may be accomplished; however, most communication stations are in the 2 to 18 MHz range; therefore, all channels may not necessarily be used. Propagation characteristics of the HF band are most suitable for long distance communications.

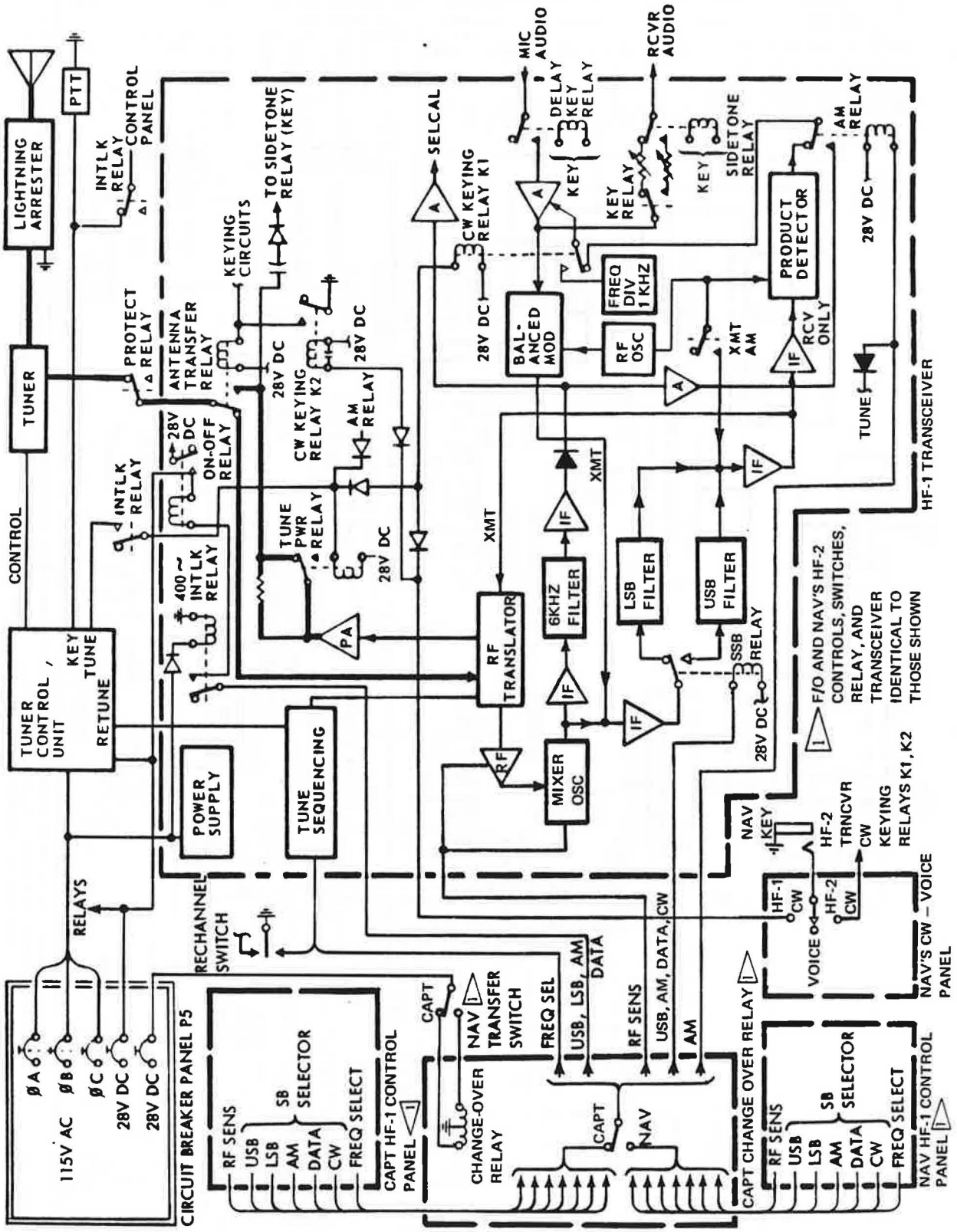
B. Each HF communication system is composed, of two control panels, transceiver, tuner control unit, tuner, lightning arrester, antenna and necessary relays. The control panels for each system are installed one in the forward section of the control stand and one on the pilots overhead panel.
The tuners, lightning arresters, and antennas are installed in the vertical fin tip. The tuners and HF-1 lightning arrester are mounted together in the forward section of the vertical fin tip. HF-2 lightning arrester and antenna grounding relay are installed aft of the tuners in the fin tip. All other major components are installed in the left electronic equipment rack. The two receiver protect relays and two interlock relays are installed in RJ-12. A retune test switch is installed above the entryway between RJ-12 and. RJ-13. (See figure 1.)

C. The HF communication system control panel enables the desired communication channel to be selected, the system to be turned on or off, and completes keying circuits to the transceiver. (see figures 2 and. 3.) Only one system may transmit at a time; however, both system may receive simultaneously. Since HF-2 system has a receive only antenna, all transmissions are completed with the probe antenna. The HF-1 lightning arrester contains an antenna transfer relay which connects HF-2 RF to the probe whenever HF-2 push to-talk circuit is are completed. HF-2 tuner is grounded by the HF-2 receive antenna grounding relay whenever a push-to-talk control aircraft is completed for HF-1. An interlock relay for each system will disconnect the push-to-talk control circuits between the flight interphone system and HF control panel and a transceiver. The

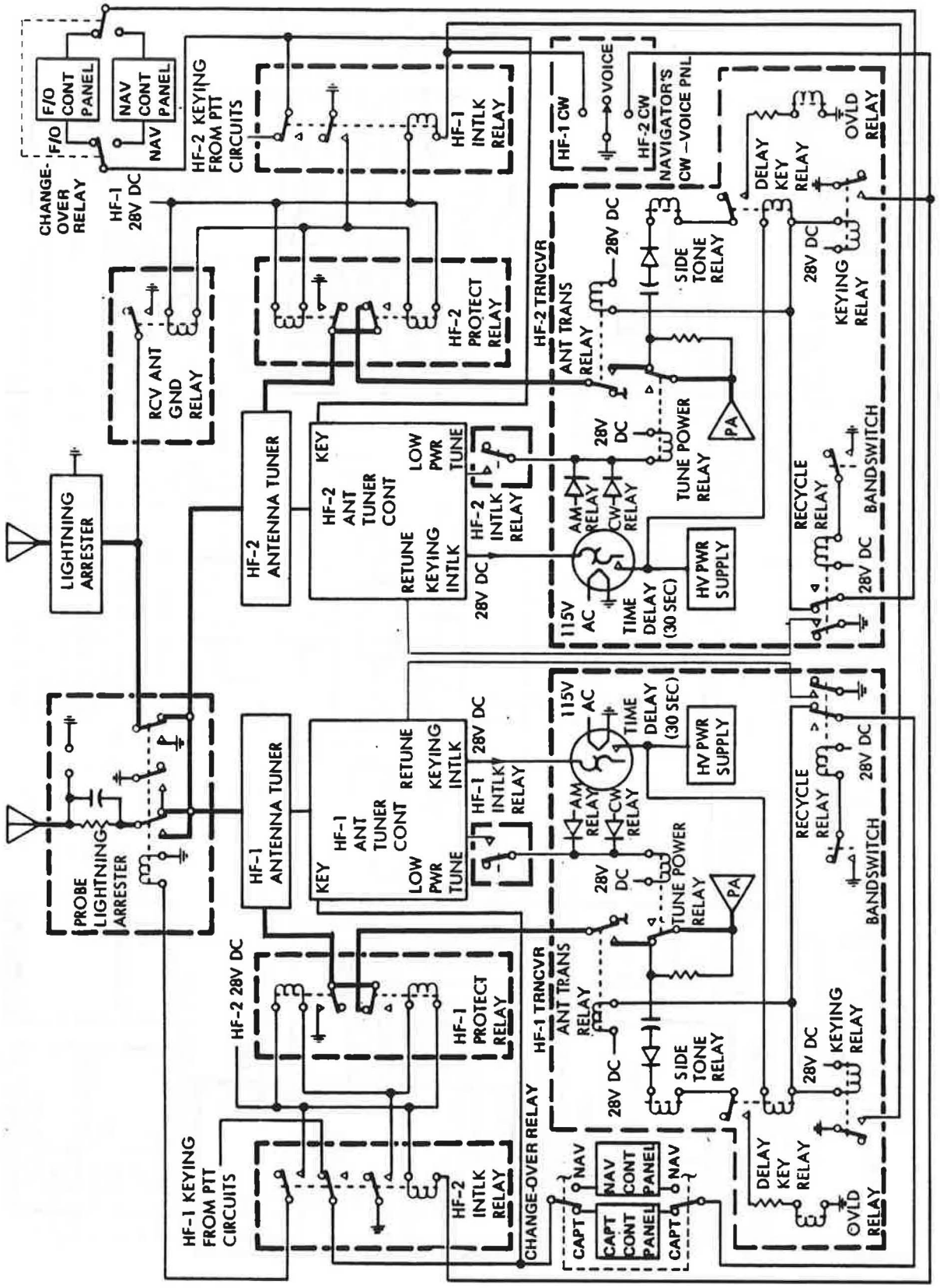




HF Communication Systems Component Location
Figure 1



HF Communication System Diagram
Figure 2



HF Communication System Interlock Diagram
Figure 3

HF-1 or HF-2 interlock relay also provides a ground, for the receiver protect relay whenever a push-to-talk circuit is completed for the other HF system. The antenna tuner and tuner control unit match the characteristic antenna line impedance to the impedance of the transceiver at the particular frequency on which the system is operating. The tuner control unit and tuner will automatically keep the voltage standing wave ratio (VSWR) to a level of 1.3 to 1.0 or better thus providing the best possible power transfer. Communication on the HF systems is completed through use of microphones and headphones of the flight Interphone system. (See 23-2-0.)

D. The HF communication systems uses 3-phase, 115 volt, 400 cycle ac power and 28 volt dc power obtained from, circuit breakers on overhead circuit breaker panel P5. HF No. 1 system obtain power from the essential radio bus. HF No. 2 system obtains power from radio bus-2.

E. A retune switch is used to facilitate checking the tuning cycle of the transmitter. Channel 6 is first selected an the control panel. The retune switch then provides a means of changing Channels remotely so that personnel may observe the meter on the tuner control unit. Holding the switch in the 1 or 2 position causes the associated system to cycle. The transceiver will retune to channel 6 when the return switch is released.

2. HF Controls

A. The HF control panel can select any me of 280.,000 channels, spaced 0.1 kHz apart in the 2-30 MHz range. The panel contains four frequency selector knobs, a frequency display window, an RF SENS knob and a six position mode selector witch. The left frequency selector knob selects megahertz, the two center knobs select 100 kHz and 10 kHz parts and the right knob selects 1 kHz and parts of the frequency. The RF SENS knob controls 17 gain in the receiving section of the transceiver. The mode selector switch turns the system off (OFF), selects upper sideband, (USB), lower sideband (LSB), amplitude modulation (AM), DATA (not used), and CW modes. Push-to-talk keying circuits are directed to the transceiver through the mode selector switch.

3. HF Antennas

A. Both HF antennas are on the tip of the vertical fin. A probe antenna extending forward from the fin is used for transmission by both HF transmitters, and is used as a receiving antenna by HF system No. 1. A second flush-mounted antenna aft of the probe antenna is used only for receiving by HF system NO. 2.

B. Each of the antennas is connected through a lightning arrester assembly to tuning units which tune the probe antenna and provide optimum impedance matching at all frequencies used.

4. Lightning Arresters

A. The lightning arresters protect radio equipment by conducting antenna lightning strokes along a preferred path to aircraft structure. A series capacitor with parallel bleeder resistor and protective spark gap are installed in a pressurized chamber. The bleeder resistor provides a dc path for precipitation static currents. The probe lightning arrester also contains an antenna transfer relay for connection of HF-2 tuner to the probe antenna and grounding of HF-1 tuner when HF-2 system is keyed.

5. Antenna Tuners

A. Antenna tuning is accomplished automatically by antenna tuner and tuner control units for each HF system. Each of the tuner systems consist of a control unit in the electronic equipment rack, and a remote tuning unit mounted with the respective HF antenna arrester assembly.

B. Whenever a frequency is selected for use a signal is sent to the tuning circuits in the transceiver and antenna tuner system. This signal causes the tuning circuit to be driven to a "home" or starting position. The transceiver then mechanically tunes with no RF output. When the transceiver tuning cycle is completed, a signal is sent to the antenna tuner control unit which connects the transceiver to the antenna. This completes the initial tuning cycle.

C. Whenever the transceiver is keyed by a push-to-talk circuit, RF power is fed to the antenna tuner and antenna. Sensing circuits in the antenna tuner control measure the ratio of transmitted power to reflected power and automatically operate antenna tuning circuits in the tuner so that the reflected power is at a minimum. Upon completion of tuning the system is returned to normal.

D. The tuners will match any combination of antenna resistance and reactance to the characteristic impedance of the interconnecting coaxial cable at any carrier frequency from 2 to 30 megahertz. Completion of matching adjustments occurs within 16 seconds after starting, and will take an average time of approximately 8 seconds. After final adjustment the vswr (voltage standing wave ratio) measured at the RF connector is less than 1.3 to 1.

E. The tuner control uses 115 volt ac and 28 volt dc power obtained from the same circuit breakers as the HF transceiver.

6. HF Transceiver

A. The single side band (SSB) transceiver is capable of transmitting (400 watts PEP output in SSB and 100 watts carrier), and receiving at 2.000 to 29.9999 megahertz on 28,000 channels with kilohertz spacing. Frequency selection is completed at the control panel. The 100 kHz, 10 kHz and 1 kHz frequency selector knobs, on the control unit, control an autopositioner in the HF translator module. The autopositioner mechanically tunes a variable frequency oscillator (VFO) over a 3.500 to 2.501 bEz range in one thousand 1 kHz steps. The megahertz frequency selector knob, on the control unit, controls a motor in the RF translator module. This motor switches tuning elements which tune an HF oscillator to 28 frequencies, each 1 MHz apart. The HF oscillator, in conjunction with a 17.5 MHz oscillator, provides twenty-eight 1 MHz bands for each of the one thousand 1 kHz steps from the VFO. Thus, 28,000 channels are generated. Tuning time is less than 8 seconds. A 1 kHz tone is connected to the interphone system to indicate system tuning sequences are in progress or provides sidetone when cw mode is used.

B. Mic audio is completed through two audio amplifiers, one of which supplies sidetone audio to the interphone system after a push-to-talk (keying) circuit is completed. A balanced modulator then combines the audio with a 500 kHz signal from the RF oscillator producing an upper and lower sideband output, one on each side of 500 kHz. The two sidebands are then amplified and fed through, one of two mechanical filters. The selection of the filter is controlled by the mode selector switch on the control panel. One filter passes only the upper sideband; the other filter passes only the lower sideband. When the transceiver is operated in the AM mode, the upper sideband is passed and a 500 kHz carrier is reinserted at the filter output. The out-cut is then amplified and heterodyned as necessary to obtain the final transmitting frequency. A driver and power amplifier then supply the signal to the antenna circuits. When the CW mode is selected, a 1000 kHz tone is transmitted on upper sideband whenever the key is closed. CW keying relay K2 has a timing network across it which causes it to remain energized long enough to hold the transceiver in the transmit condition while CW keying relay K1 follows the keying pulses and completes the 1000 Hz signals to the balanced modulator.

C. The receiver is normally on unless a keying circuit is completed. A received signal is amplified and heterodyned as necessary to produce a 500 kHz IF. The 500 kHz IF is then fed to both SSB and AM IF amplifiers. The AM amplifiers operate in both the SSB and AM modes to provide a selcal output. In the SSB mode, the 500 kHz IF is fed to one of two mechanical filters. Each filter has a band width of 3 kHz. One filter passes only the upper sideband; the other filter passes only the lower sideband, depending on which mode is selected at the control panel.

The filter output is then amplified and fed to a product detector where the audio signal is recovered. In the AM mode, the 500 kHz IF is fed through, a mechanical filter with a 6 kHz band width to obtain both sidebands. Filter output is then amplified and fed to an AM detector which recovers the audio signals. Amplified signals are then coupled to the audio circuits of the interphone system through the AM relay, AM amplifier and sidetone relay.

D. The transceiver contains its own 3-phase high voltage power supply module which converts 115 volt, 400 Hz ac to the necessary operating voltages required. Transient protection is incorporated within the power supply. Interlock circuits ensure operating voltages are supplied in the correct sequence to the various sections of the transceiver when in the transmitting mode, tuning or receiving mode. A built-in blower provides cooling air through the transceiver whenever the transceiver is turned on. During transmissions, blower output is increased.

E. A PHONE jack, MIC jack, meter and a 5 position meter selector switch are an the front of the panel. Four of the meter selector switch positions are used to cheek voltages in various sections of the transceiver. The fifth position, CAL TONE, is used to compare the transceiver operating frequency with WWV. Coaxial cable connections are also on the front panel. A SQUELCH IN-OUT switch allows the selection of squelch or no squelch modes of reception.

7. Operation

A. The captain or first officer may transmit or receive over the HF system after the desired channel is selected on the associated HF control panel. HF-1 functions may be controlled from the control panel on forward electronic panel overhead. HF-2 functions may be controlled from pilot's HF-2 control panel. Receiving and transmitting are accomplished on the same frequency. After a push-to-talk button has been pressed, at least five seconds are required for completion of system tuning. EF must be selected on the audio selector panel.

B. To receive, a crewman must switch on the HF toggle switch on an audio selector panel (see 23-2-0) and adjust the RF SENS control to obtain a comfortable listening level. The volume control on the audio selector panel may also require adjustment.

D. To transmit over the HF systems, HF must be selected with a mike selector switch on the audio selector panel. Operating a microphone push-to-talk switch of the flight interphone system will operate control circuits which complete system, tuning, disconnect receiver circuits and connect the transmitter circuits to the antenna. A 1000 Hertz tone may be heard during system tuning, or when using the CW mode of operation. Transmission will begin when audio signals are impressed on the microphone circuits. Sidetone is returned to the headphones of the flight interphone system to indicate proper operation of the transmitter. Releasing the push-to-talk switch will return the system to the receive condition.

E. HF Interlock Circuit

(1) An interlock circuit using two interlock relays, two protection relays, a receiving antenna grounding relay and the transfer relay in the probe antenna lightning arrester allow the HF systems to receive simultaneously or transmit one at a time using the probe antenna. The interlock circuit will disconnect both receiving circuits when either transmitter is keyed.

(2) By referring to figure 3, it can be seen that under normal receiving conditions, the probe antenna is connected to HF-1 receiver and the receiving antenna is connected to HF-2 receiver. Transmitting conditions are initiated whenever the HF system is keyed. Assume HF-1 system is being operated. The following sequences will take place.

(a) The keying ground from a push-to-talk switch completes keying circuits, through an interlock relay, change-over-relay and HF control panel, in HF-1 transceiver which provide a ground for HF-1 interlock relay, energizes HF-1 transceiver sidetone circuits and antenna transfer relay. RF is then applied to the probe antenna through HF-1 protection relay, antenna tuner, and the de-energized lightning arrester transfer relay to the probe antenna.

(b) The energized HF-1 interlock relay disconnects HF-2 keying circuits and provides a ground for the HF-2 protection relay and receiving antenna grounding relay. Circuits are also completed which allow the tuner to key the transceiver for low power output while the tuner tunes the antenna circuits to resonance.

(c) The HF-2 protect relay and antenna grounding relay place grounds an the HF-2 RF lines and disconnect the HF-2 transceiver from HF-2 antenna tuner. HF-2 system components are then completely isolated and protected.

(3) The sequence of operation is similar when transmitting with HF-2 system except HF-2 interlock relay provides a ground for the probe antenna lightning arrester transfer relay which in tunr grounds HF-2 receiving antenna, HF-1 tuner, and connects HF-2 RF lines to the probe antenna.

HF COMMNICATION SYSTEM - TROUBLE SHOOTING

1. General

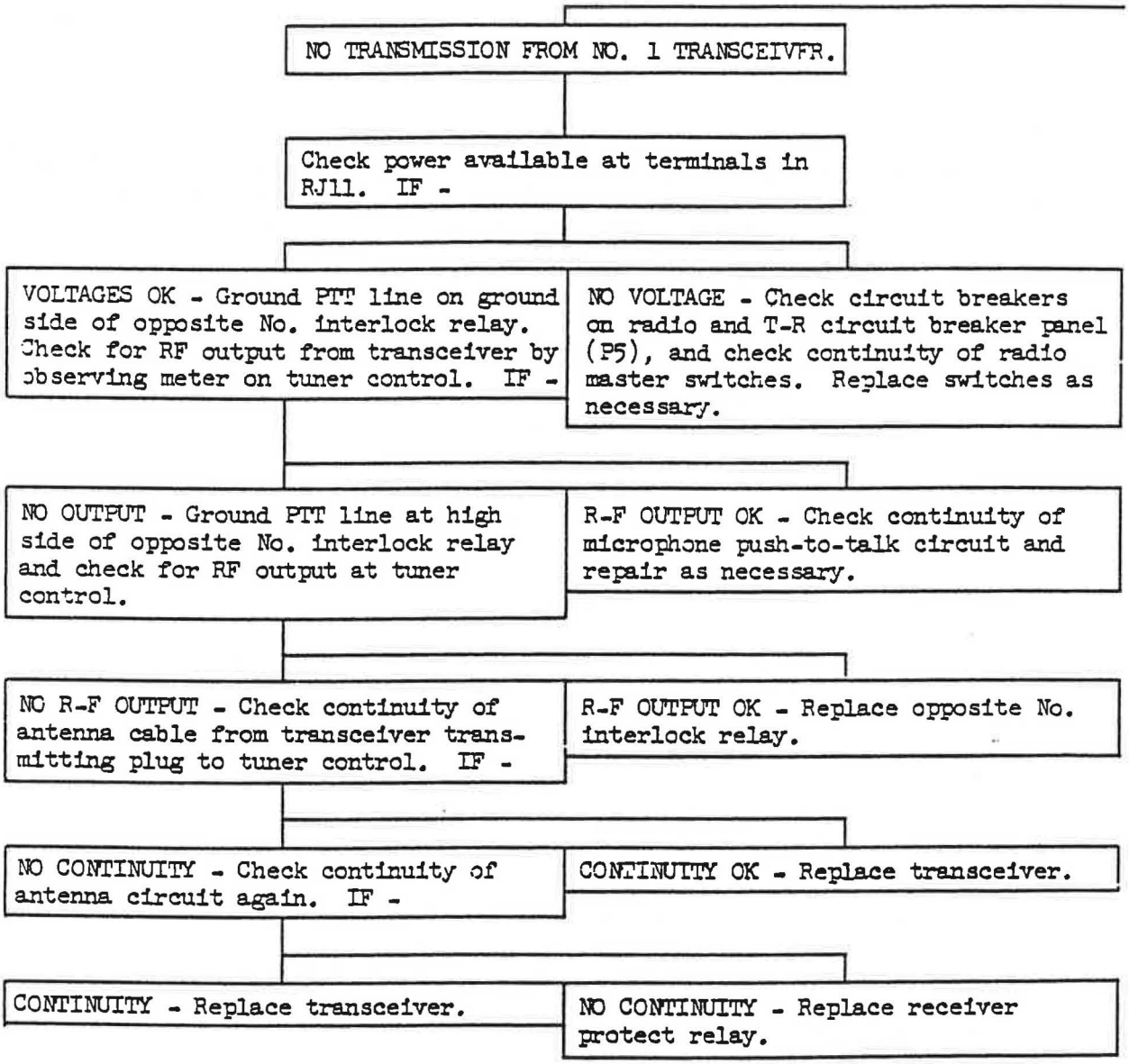
A. Trouble spots in the HF communication system can be most easily corrected by replacing a suspected malfunctioning component. If the system is not operative after assumed malfunctioning components have been replaced by known operative components, cheek airplane wiring. Protect relays and interlock relays may be checked in radio junction box RJ-12.

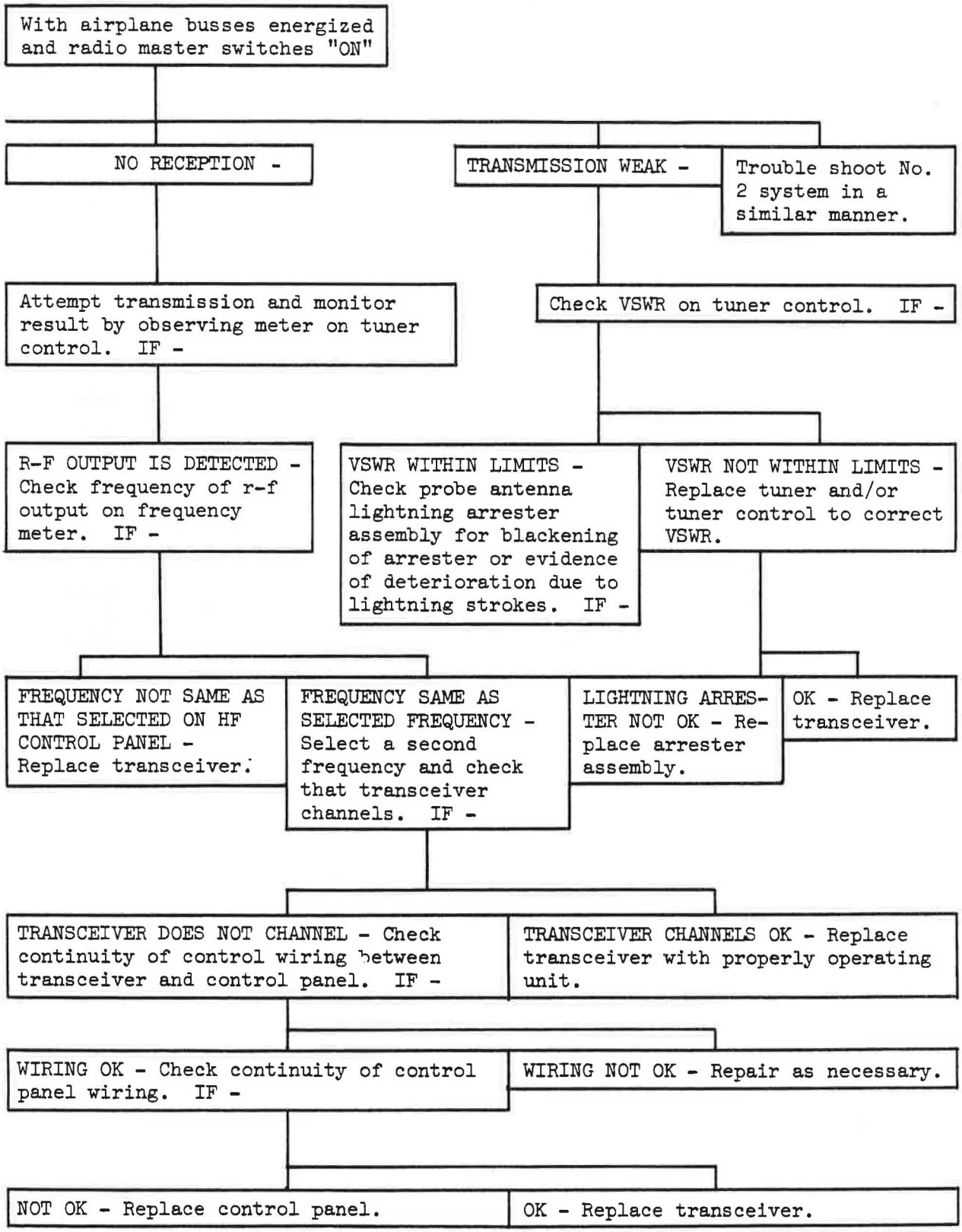
B. To decrease the number of uncheduled removals, confirm that the condition stated in the flight report exists prior to replacing system components. If HF system is reported to be inoperative on one or two specific frequencies, a precautionary cheek of the equipment should be made to confirm the report and that the problem is repetitive. The trouble may be due to the area and position of the airplane in respect to the ground station, or to other conditions existing at the time. Also ensure the flight interphone system is operating properly so that poor communication attributed to the HF system is not actually due to a faulty isolation amplifier in an audio selector panel.

C. If intermittent malfunctioning or excessive noise problem are experienced in the HF Communication Systems, coaxial connections at the antenna tuning unit, the tin break at station 1410 and at the left-hand electronic equipment rack should be examined. Oxidation may occur at soldered connections between connectors and coaxial cables, thereby creating a mismatch which will result in a decreased signal to noise ratio, (apparent noise increased). A loose coaxial connector will cause intermittent operation and noise in the system.

D. Before attempting to operate HF system, ensure all HF circuit breakers on circuit breaker panel P5 are closed (pushed in) and power is available to them. Voltages are most easily checked by using the meter on the front of the transceiver. Allow the system to warm up for 10 minutes before trouble shooting.

2. Trouble Shooting Charts




With airplane busses energized and radio master switches "ON"
NO RECEPTION -
TRANSMISSION WEAK -
Trouble shoot No. 2 system in a similar manner.
Attempt transmission and monitor result by observing meter on tuner control. IF -
Check VSWR on tuner control. IF -
R-F OUTPUT IS DETECTED - Check frequency of r-f output on frequency meter. IF -
VSWR WITHIN LIMITS - Check probe antenna lightning arrester assembly for blackening of arrester or evidence of deterioration due to lightning strokes. IF -
VSWR NOT WITHIN LIMITS - Replace tuner and/or tuner control to correct VSWR.
FREQUENCY NOT SAME AS THAT SELECTED ON HF CONTROL PANEL - Replace transceiver.
FREQUENCY SAME AS SELECTED FREQUENCY - Select a second frequency and check that transceiver channels. IF -
LIGHTNING ARRESTER NOT OK - Replace arrester assembly.
OK - Replace transceiver.
TRANSCEIVER DOES NOT CHANNEL - Check continuity of control wiring between transceiver and control panel. IF -
TRANSCEIVER CHANNELS OK - Replace transceiver with properly operating unit.
WIRING OK - Check continuity of control panel wiring. IF -
WIRING NOT OK - Repair as necessary.
NOT OK - Replace control panel.
OK - Replace transceiver.

HF COMMUNICATION SYSTEMS - ADJUSTMENT/TEST

1. General

A. The following test should be used to cheek the operation of HF system after a system component has been replaced or repaired. Conduct test using only authorized test frequencies and check to ensure frequency is not in use before transmitting.

B. The airplane should not be in or near a large metallic structure, such as a hangar or tower, which may attenuate RF energy.

2. Prepare to Test

A. Provide ground power to the airplane and energize busses an circuit breaker panel P5.

B. Ensure all HF circuit breakers and interphone audio selector panel circuit breakers are closed.

C. Turn on both HF systems and allow 5 minutes for warmup.

D. Check flight interphone system and ensure audio selector panels are operable. (See 23-2-0.)

3. Test HF Ccmmunication-System

A. At pilot's station, select HF-1 with mike selector switch and push up HF-1 toggle switch on audio selector panel. At copilot's station, select HF-2 with mike selector switch and push up HF-2 toggle switch on audio selector panel.

B. Turn captain's and first officer's HF control panel mode selector switches to AM and tune each system to several WWV frequencies. Reception shall be approximately equal for both systems.

NOTE: WWV transmits on 2.5, 5, 10, 15, 20, and 25 megahertz. The RF signals are modulated by pulses at 1 Kz and also by standard audio frequencies alternating between 440 and 600 Hz. WWV transmissions are continuous except for a 4 minute interruption beginning approximately 45 minutes after the hour. Do not key HF systems when selecting WWV frequencies.

Volume controls on audio selector panels should be set to similar positions.

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Paragraph 7.10

C. Perform an approximate frequency check on the transceiver by listening to WWV with the mode selector switch in the USB, LSB and AM positions. Reception shall be satisfactory in all positions.

D. Select an authorized test frequency on HF-1 system and press a microphone push-to-talk button. HF-2 reception shall be interrupted during keying of HF-1 system.

NOTE: The HF tuner will not tune until a push-to-talk circuit is completed.

E. Tune HF-1 system to WWV and conduct step D. with HF-2 system. HF-1 reception shall be interrupted during keying of HF-2 system.

F. Adjust SENSE (RF gain) control on HF-1 control panel to maximum. If subsequent tests reveal RF overloading is occuring, back off control to point where overload condition just disappears.

G. Tune HF-1 system to several active channels and establish communication. Compare receiver sensitivity. Ensure operation is good by channeling from both above and below the selected frequency. Reception should be approximately equal on all channels. Check operation with mode selector switch in AM, USB and LSB positions. Communication shall be satisfactory in all positions.

NOTE: Allow sufficient time for circuits to tune up when changing frequency. Failure to do so may overheat 30 second thermal time delay in tuner and render system temporarily inoperative. Rechanneling will reset the system.

H. Tune HF-1 system to an authorized test frequency. Key the system and establish communication. Check the meter indications on the front of the transceiver by rotating meter switch to each of the following positions. Transmission and reception should be loud and clear. Sidetone should be clearly audible when transmitting. The retune cycle shall go to completion with the push-to-talk switch closed.

Meter Switch Position		Typical Indications
1500V	(Keyed)	Red
	(Not Keyed)	0
130	(Not Keyed)	Red
28V	(Not Keyed)	Red
PA-MA	(with voice modulation - AM)	Red
	(without voice modulation and keying - AM)	0
	(with voice modulation - LSB or USB)	300 peak
	(without voice modulation and keying - LSB or USB)	260

NOTE: Any significant variation from typical readings indicates possible defective circuitry or improper tuning of the transmitter. In PA-MA (modulation voltage) switch position, modulate the transmitter with a strong voice.

CAUTION: DO NOT KEY THE HF TRANSMITTER WHEN AIRCRAFT IS BEING FUELED.

I. Set HF-1 to channel 6. Momentarily hold rechannel switch (located on shelf 1 of left electronic equipment rack) on HF-1.

(1) The system shall cycle.

(2) When switch is released, system shall return to original channel setting.

J. Repeat steps F. through I. with HF-2 system.

K. Turn off HF systems.

L. Detemine wether there is any further need for electrical power; if not, remove external power supply.

1. Removal/Installation HF Probe Antenna

A. Equipment and Materials

(1) Countersink steel, 7/16 x 20 thread shank, 7/8 inch diameter cutter with 1/4 inch integral pilot. Included angle of countersink 100 degrees, AN part no. 7900-114488.

(2) Six AN174-7 bolts and 5AN174-11 bolts.

(3) Six each NAS334CPA6 and PAS334CPA7 screws.

(4) Alodine 1200 solution.

(5) Battery charger, 50 ampere capacity.

(6) Millivoltmeter, 0-100 millivolt scale.

B. Remove HF Probe Antenna

(1) Remove twelve screws forward of gap between antenna probe and fin tip.

(2) Slide probe forward off of fin tip fitting. (See figure 201.)

C. Prepare for Installation

(1) Cheek to see if faying surfaces of probe and fin tip fitting are alodized; if not, alodize with Alodine 1200 solution. (See Interior and Exterior Finishes, Chapter 51.)

D. Install HF Probe Antenna

(1) Slide probe antenna in place making certain alignment mark on antenna matches with its mating witness mark on tin tip and drain hole is on bottom.

(2) Install six AN174-7 bolts finger-tight in forward mounting holes. Install five AN174-11 bolts finger-tight in aft mounting holes.

(3) Countersink empty hole to 100 degrees x 0.51 inch diameter.

(4) Install NAS334CPA7 screw in empty hole.

(5) Remove temporary bolts in aft holes one at a time and repeat (3) and (4) for each hole.

(6) Remove one AN174-7 bolt from forward mounting hole. Repeat (3) and (4) using NAS334CPA6 screw.

(7) Install five remaining NAS334CPA6 screws in forward holes in same manner.

(8) Test Current Return Path

(a) Remove one NAS334CPA6 screw from forward mounting hole.

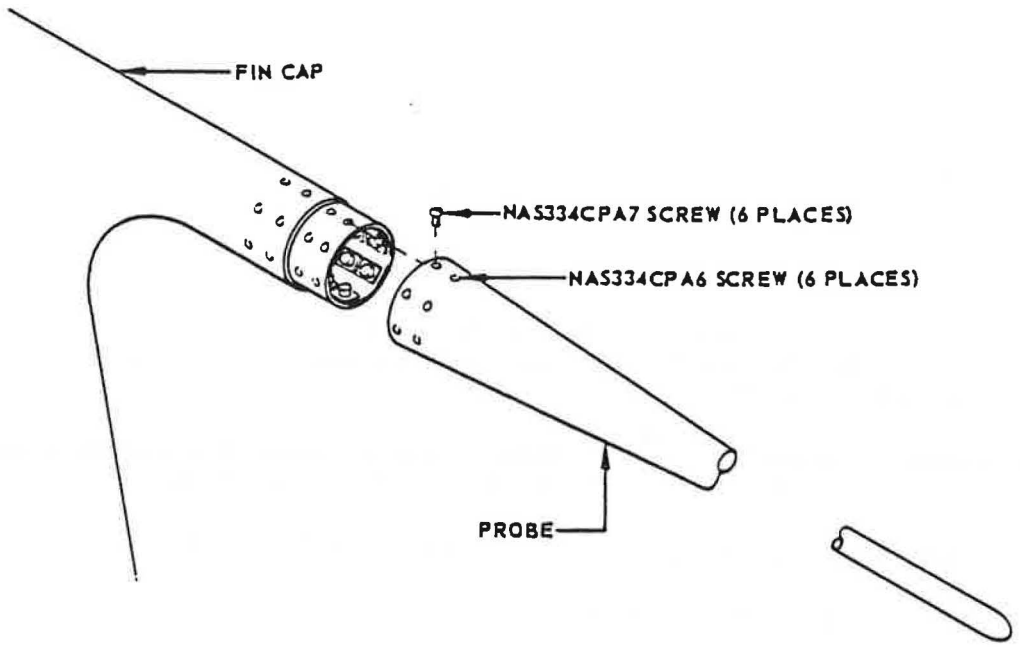
(b) Conduct current return path test between aft end of fin tip fitting and screw hole.

1) With 50 amperes current flow voltage drop shall not exceed 32 millivolts.

NOTE: On vertical fin probe, slide antenna connector forward to expose aft end of fin tip fitting.

(c) Replace NAS334CPA6 screw.

(9) Fill void between antenna and fin tip assembly with aerodynamic smoother. (See Sealing, Chapter 51.)



HF Probe Antenna Installation
Figure 201

HF ANTENNA COUPLERS - MAINTENANCE PRACTICES

1. General

   A. The following procedure applies to either antenna tuner. Access to the tuners is through an access door on right side of fin tip. (See figure 201.)

2. Equipment and Materials

   A. Silicone Compound, Dow Corning DC-4, or equivalent.

3. Removal/Installation HF Antenna Tuners

   A. Remove HF Antenna Tuner

      (1) Open HF antenna tuner access door. Refer to Chapter 12, "Access Doors and Panels."

      (2) Disconnect electrical connectors on tuner.

      (3) Remove wedge bolt.

      (4) Loosen tuner aft mounting bolts.

      (5) Loosen ratcheting knob on T-bolt, swing T-bolt away from tuner and slide tuner aft. If tuner is not free to slide aft, push T-bolt back into place and use lock nut on forward end of T-bolt to move tuner aft. Swing T-bolt aside.

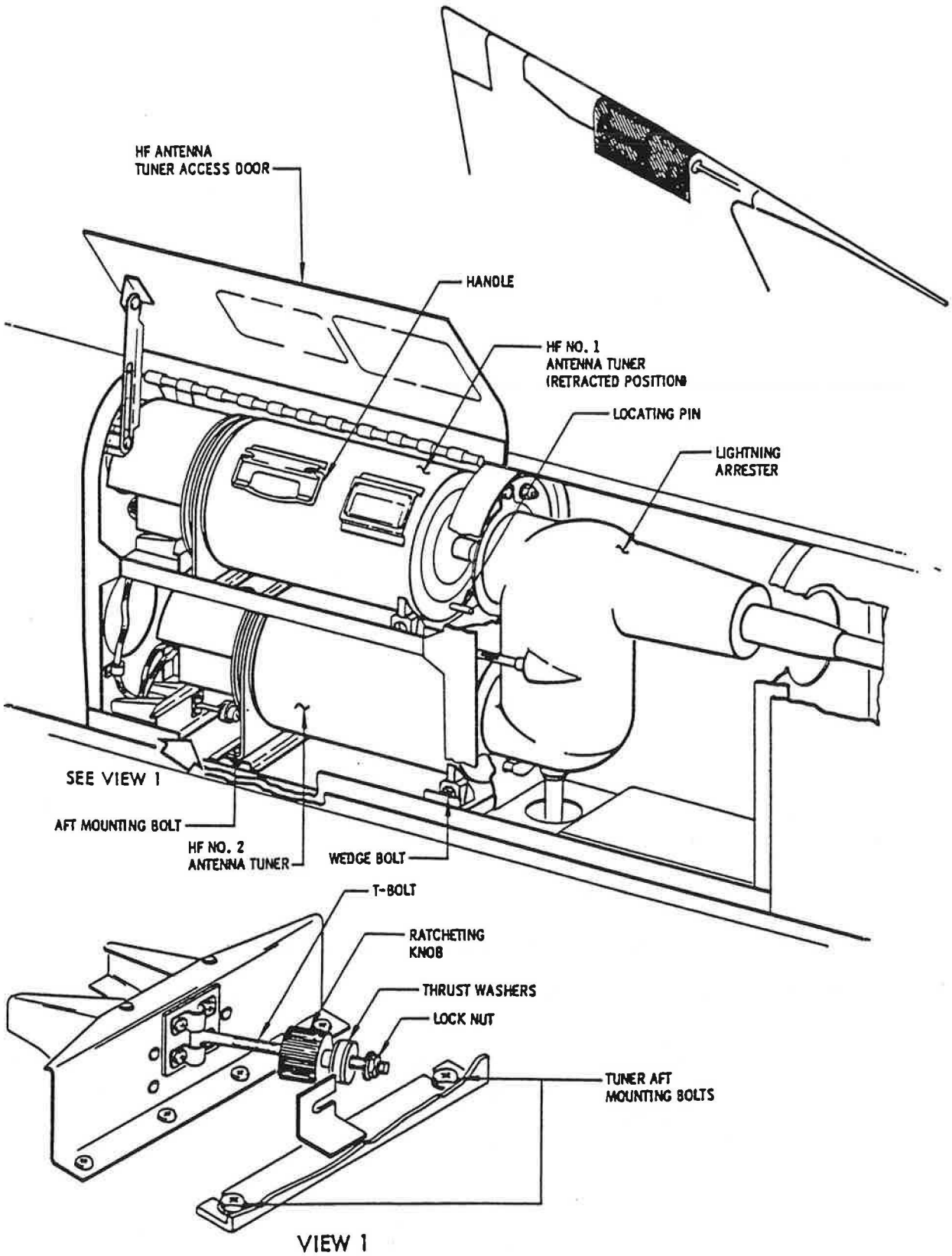
         NOTE: A thin walled box end wrench may have to be filed down in order to fit over lock nut due to limited clearance.

      (6) Remove tuner aft mounting bolts.

         CAUTION: TUNER WUST BE SUPPORTED DURING REMOVAL

      (7) Slide tuner aft approximately two inches to clear structure and lift out using handle.

         NOTE: If tuner is not to be returned or replaced for any extended period, all connectors should be protected from foreign matter.



HF Antenna Tuner Installation
Figure 201

B. Prepare to Install Antenna Tuner

(1) Open access door and remove all protective covers.

(2) Coat both sides of gasket with Dow Corning DC-4 compound (or equivalent).

(3) Place gasket on tuner.

CAUTION: MAKE SURE NO METAL PARTICLES ARE IN AREA OF GASKET.

(4) Brighten tuner mounting contact areas and wipe clean with a dry cloth.

C. Install Antenna Tuner

(1) Engage front end of tuner in wedge.

(2) Install two tuner aft mounting bolts finger tight.

(3) Push tuner forward.

(4) Install wedge bolt finger tight.

(5) Engage T-bolt at aft end of tuner and loosen lock nut on forward end of T-bolt.

NOTE: Be sure that the shoulder on ratcheting knob is forward.

(6) Tighten ratcheting knob until it ratchets.

(7) Tighten lock nut on the forward end of the T-bolt.

(8) Tighten wedge bolt and tuner aft mounting bolts.

(9) Connect electrical connectors to tuner.

4. Test Antenna Tuner Bonding

A. Equipment

(1) Microhm Bridge, Avtron, Model T-207 or equivalent.

B. Test Bonding

(1) Measure resistance between tuner, at each mounting bolt and wedge bolt, and basic structure. Resistance shall not exceed 0.001 ohm.

(2) Close access door.

1. Removal/Installation EF Probe Antenna Ligbtning Arrester

A. Remove HF probe Antenna Lightning Arrester

(1) Remove lightning arrester access panel (529) on right side of fin tip. Refer to Access Doors and Panels, Chapter 12. (See figure 201.)

(2) Disconnect connectors on right side and bottom of lightning arrester.

(3) Slide antenna connector sleeve forward through bulkhead as far as possible.

NOTE: This sleeve should disengage from antenna terminal with a load of no more than 10 pounds applied by hand.

(4) Remove the two lower lightning arrester mounting bolts.

CAUTION: SUPPORT LIGHTNING ARRESTER WHILE REMOVING UPPER MOUNTING BOLT.

(5) Remove upper mounting bolt.

(6) Move lightning arrester forward until contact fingers and tuner terminals are disengaged.

(7) Remove lightning arrester.

B. Prepare to Install HF Probe Antenna Lightning Arrester

(1) Check contact fingers around terminal receptacles at aft end of lightning arrester for damage.

(2) Slide antenna connector as far forward as it will go.

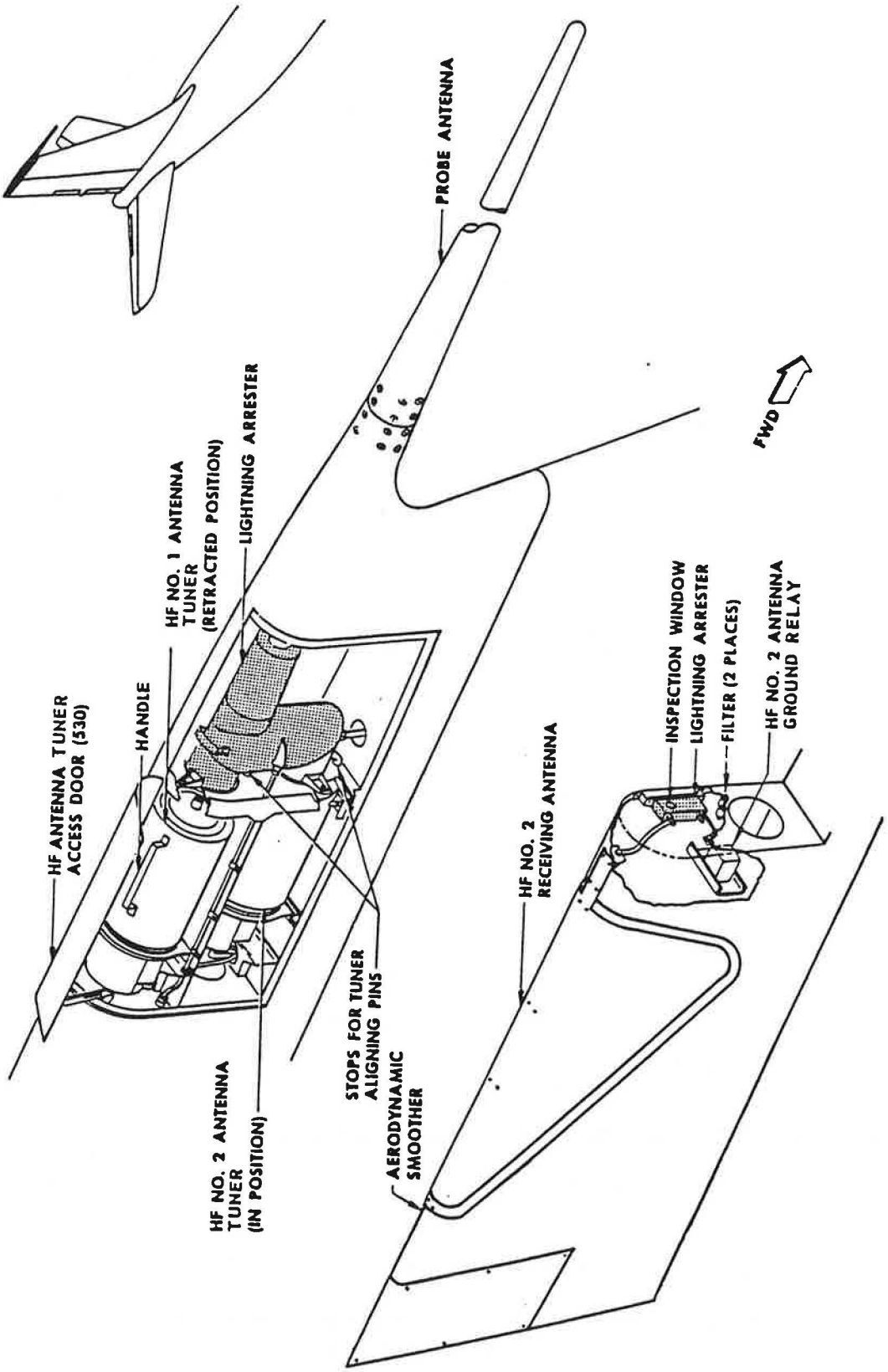
(3) Remove all protective coverings on connectors.

C. Install HF Probe Antenna Lightning Arrester

(1) Align lightning arrester terminal receptacles with tuner terminal plugs.

(2) Install the three lightning arrester mounting bolts.

(3) Slide antenna connector sleeve aft over spring wire antenna terminal on forward end of lightning arrester.



HF Antenna Lightning Arrester Installation
Figure 201

(4) Install connectors on right side and bottom of lightning arrester.

(5) Close and secure access panel.

2. Removal/Installation HF 2 Receiving Antenna Lightning Arrester

A. Remove HF 2 Receiving Antenna Lightning Arrester. (See figure 201.)

(1) Remove HF antenna tuner No. 1.

(2) Working through lightning hole in aft bulkhead of tuner compartment, remove two connectors from antenna terminal and equipment terminal.

(3) Remove two screws mounting lightning arrester to frame.

(4) Remove lightning arrester.

B. Install HF 2 Receiving Antenna Lightning Arrester

(1) Install lightning arrester with two screws.

(2) Connect antenna connector to upper terminal and equipment connector to lower terminal.

(3) Install HF antenna tuner No. 1.

3. Inspection/Check HF Antenna Lightning Arresters

A. General

(1) The HF antenna lightning arresters should be visually checked if it is suspected that lightning arresters have by-passed any lightning strokes. Also check if HF transmission or reception is poor at low frequencies.

B. Equipment and Materials

(1) Capacitor-Resistor Bridge-Model TO-4, Sprague or equivalent tester with a 2.5 ohm to 25 megohms and 1 mmfd to 2000 mfd range.

(2) Gap Test Equipment-Model 5250, Associated Research or equivalent tester with a range of 0-30 kv dc, 0-2500 microamperes.

C. Check HF Antenna Lightning Arresters

(1) Examine glass window on probe HF antenna lightning arrester through window on right side fin tip for discoloration and pitting.

NOTE: The HF-1 tuner must be removed to examine HF-2 lightning arrester. Each lightning stroke the arrester by-passes causes the glass envelope to become darker. If glass window is black, arrester should be replaced.

(2) Check HF reception and transmission at lowest possible frequencies. Poor reception or transmission on lower frequencies indicates arrester is damaged.

(3) If further testing is desired, remove or retract lightning arrester.

(a) Measure resistance between antenna terminal and tuner terminal. Resistance should fall within range of 1.0 megohms ± 15 per cent.

(b) Measure capacitance between antenna terminal and tuner terminal. Capacitance should fall within the range of 2000 to 5000 mmfds.

(4) Determine that electric gap will withstand RF transmitting voltages without arcing due to fouling or electrode movement.

(a) Measure d-c sparkover level between antenna terminal and mounting flange. Sparkover should fall within the range of 13.0 - 16.5 kv dc.

CAUTION: BE SURE TUNER TERMINAL IS WELL AWAY FROM ANY GROUNDED OBJECTS (STRUCTURE, ANTENNA TUNER ETC.) FAILURE TO DO SO MAY PLACE HARMFUL VOLTAGE STRESSES ON THE BLEEDER RESISTOR.

NOTE: Gap sparkover will be indicated by a fluctuation of tester indicator reading and an audible snapping from inside arrester. Sparkover may also be visually detected by observing arcing between electrodes through arrester glass window.

(5) Replace arrester if damaged.

4. Test Lightning Arrester Bonding

A. Equipment

(1) Microhm Bridge, Avtron, Model T-207 or equivalent.

B. Test Bonding

(1) Measure resistance between lightning arrester, at each mounting bolt, and basic structure. Resistance shall not exceed 0.0001 ohm.