Aerolineas Argentinas

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CHAPTER 23 – COMMUNICATIONS

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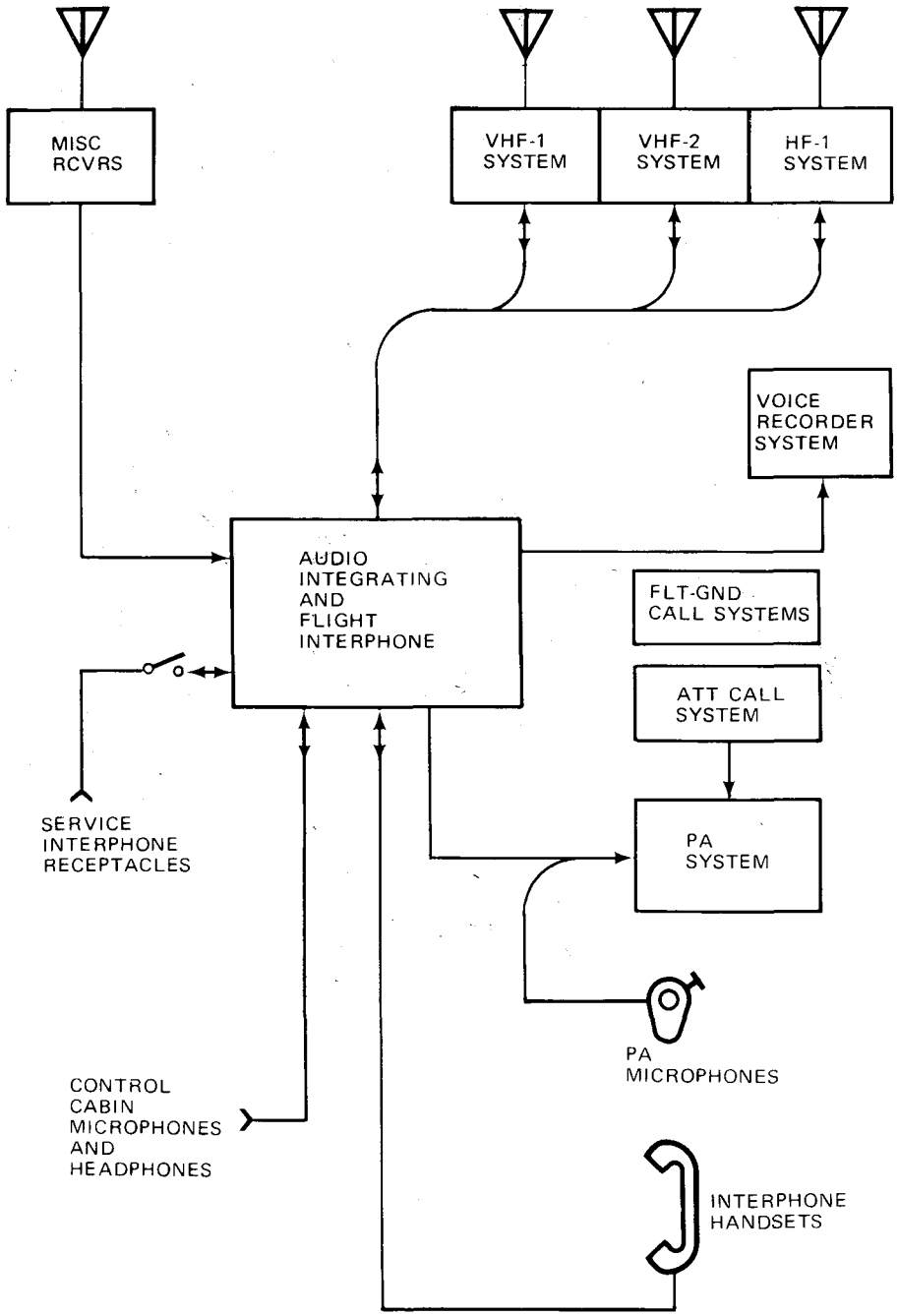
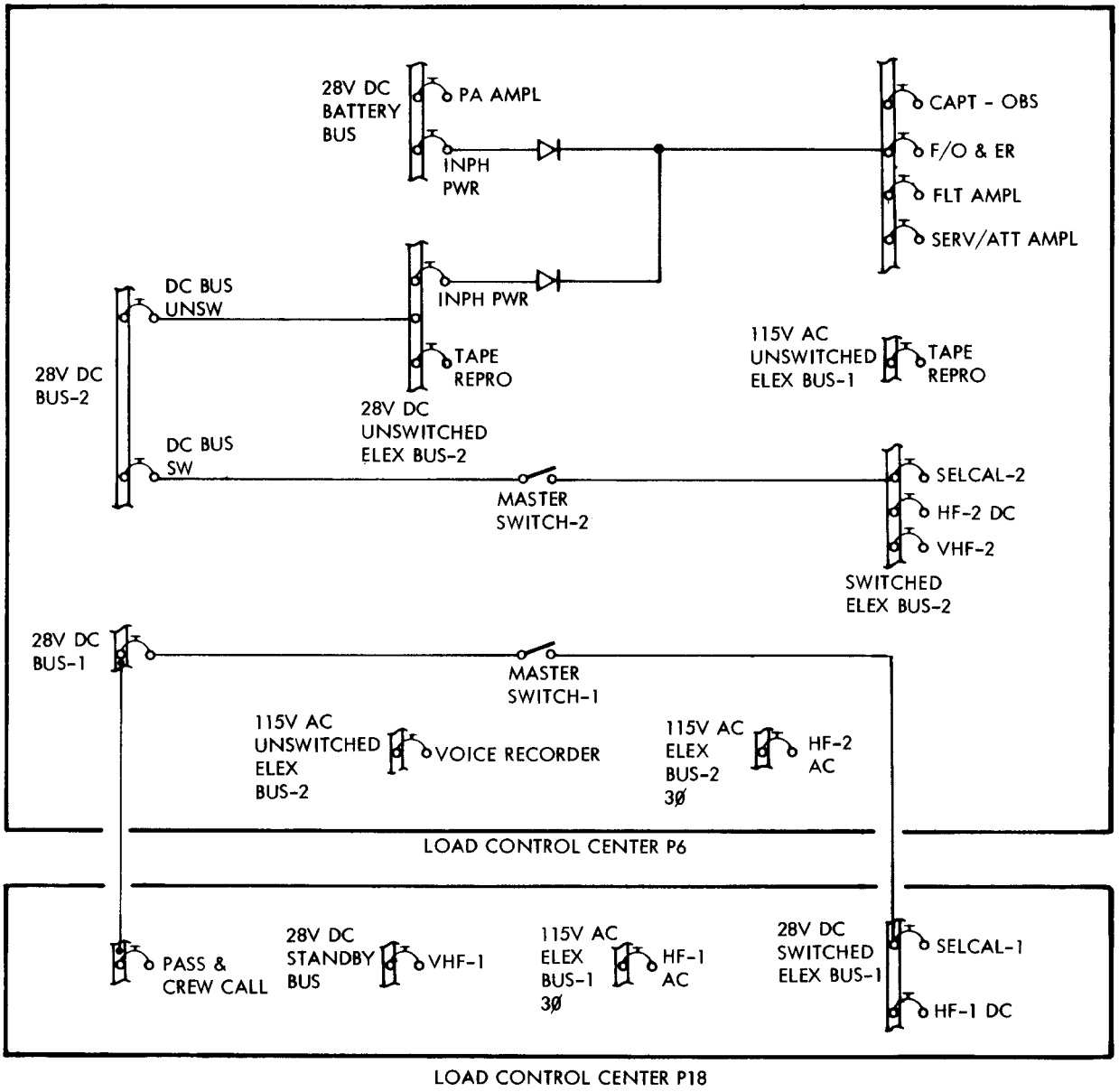
COMMUNICATIONS - DESCRIPTION AND OPERATION

1. General
   A. The communications systems provide facilities for passenger entertainment, recording control cabin communication and transmitting -receiving intelligible information between airplane crewmembers, passengers, ground maintenance personnel, other aircraft and ground based radio facilities. The airplane communication systems consist of: high frequency (HF), very high frequency (VHF) communication systems, selcal systems, passenger address (PA) system, service interphone system, flight and ground crew call systems, flight interphone system, audio selecting system, and voice recorder system. (See figure 1.)
   B. The major components of the HF, VHF, Selcal, PA and interphone systems, including audio accessory unit and paralleling network, are installed on electronic equipment rack E2 in the electronic equipment compartment. The voice recorder is installed in the aft cargo compartment. Systems control panels are installed on the control stand and overhead panel P5 where the pilots' have convenient access to them. External entrance into the electronic equipment compartment may be gained through an access door located immediately aft of the nose wheel well.
   C. The audio accessory unit contains modules for various communication systems. Amplifier modules for the flight interphone system and service interphone system are installed in the unit. A module for the passenger address system contains diodes and loading resistors. Loading resistors are installed on a module for systems which may be monitored through the audio selecting system. Potentiometers are instal1ed on the front of the unit for adjusting PA sidetone and flight and service interphone system amplifiers. Detailed description of the individual modules is covered in the description of the associated system.
   D. The majority of the communication systems circuit breakers are on load control center P6, which is on the bulkhead behind the first officer's seat. Only the VHF-1, HF-1 and selcal-1 systems circuit breakers are on load control center P18, which is on the bulkhead behind the captain's seat. System power is taken from the dc battery bus, the dc standby bus, unswitched ac electronic bus No. 1, switched dc electronic bus No. 2 and ac-dc unswitched electronic buses No. 2. The switched electronic buses are energized through electronic bus No. 1 and electronic bus No. 2 master switches. Therefore, systems on the switched buses may be quickly isolated from the main power buses in case of emergency. (See figure 2.) The master switches are on circuit breaker panel P6.
   E. Static dischargers are located on the wing, vertical fin, rudder, and elevator trailing edges and tips. Four dischargers are installed on each wing and on the vertical fin and rudder. Three dischargers are installed on each elevator. Static dischargers are installed to reduce precipitation static interference in the airplane radio receivers.



Communication System Block Diagram
Figure 1



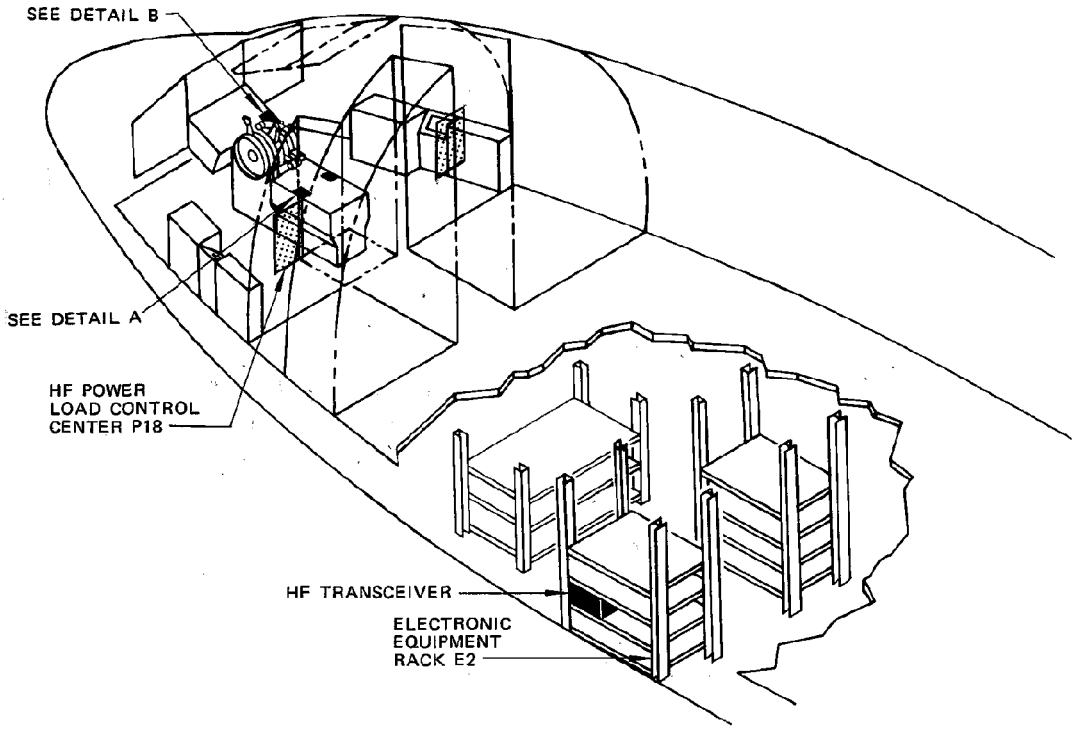
Communication Systems Power Schematic
Figure 2

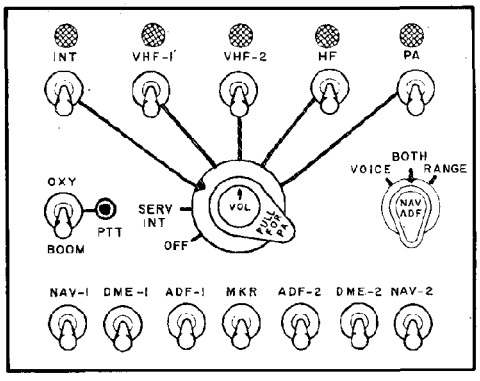
COMMUNICATIONS - MAINTENANCE PRACTICES

1. General
   A. Before working on any communications systems, ensure the system circuit breakers are pulled and tagged and all power is off to the system. The master switches on circuit breaker panel P6-1 control power to the selcal systems and VHF-2 system as well as noncommunications systems circuit breakers. The battery bus and unswitched electronics bus-2 supply power to the interphone systems; therefore, ensure both INPH DUAL PWR SOURCE circuit breakers are pulled and tagged before working on any of the interphone systems. Power may be removed from the remaining systems by pulling and tagging the individual system circuit breakers.
   B. Ground power may be applied to the airplane at external ground power receptacle panel P19. The buses are then energized by positioning the GRD PWR switch on overhead panel P5 to ON. Both ac and dc power is then applied to all buses. Positioning the GRD PWR switch to OFF will remove all power from the buses (Ref 24-41-0).
   C. No installation or removal procedures are given, except where necessary, since most of the components are panel-mounted, rack-mounted or plug-in modular units. When a 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 with polyethylene caps or bags to prevent corrosion or damage to contacts.
   D. Few terminals are available to check voltages on the electronic racks. Any voltage measurements or continuity checks may be made at the rack connectors after disconnecting the mounting tray plug from the aircraft wiring bundle connector at the back of the rack.

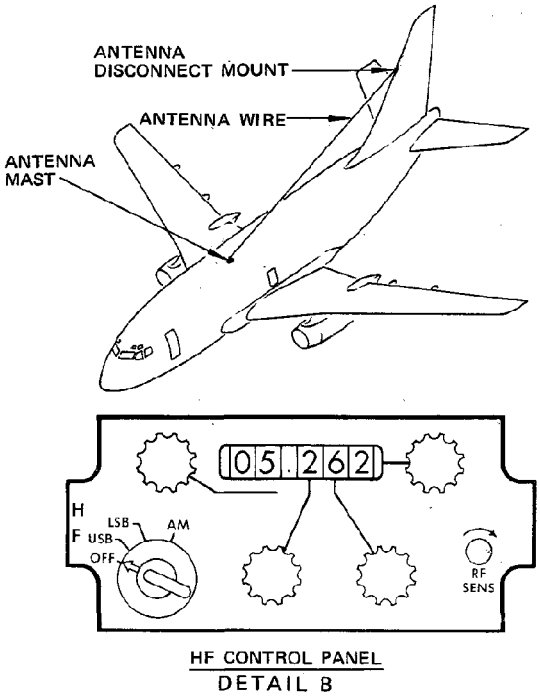
HF COMMUNICATIONS SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. A single high frequency (HF) communication system is installed in the airplane. The HF communication system provides amplitude modulated and single sideband voice communication between aircraft and ground or other aircraft. Communication in the 2 to 30 megahertz frequency range on 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. The HF communication system is composed of a transceiver, antenna coupler, lightning arrester, antenna and necessary relays. The control panel is installed in the forward electronic section of the control stand. A wire antenna is installed on the airplane, and is supported by the stub antenna mast at the forward end, (STA 583) and the antenna disconnect mount at the leading edge of the vertical fin. The antenna coupler and lightning arrester are installed inside the cabin ceiling approximately under the stub antenna mast. The transceiver is installed on electronic equipment rack E2. (See figure 1.)
   C. The HF communication system control panel enables the desired communication channel to be selected and the system to be turned on or off. Sidetone is connected to the HF system audio switches in the flight interphone system. The antenna coupler unit matches the characteristic antenna line impedance to the impedance of the transceiver at the particular frequency on which the system is operating. The antenna coupler 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 system is completed through use of microphones and headphones of the flight interphone system. (See 23-52-0.)
   D. The HF communication system uses 3-phase, 115-volt, 400-Hz ac and 28-volt dc power obtained from load control center P18. AC power is obtained through a single 3-phase circuit breaker.
2. Control Panel
   A. The HF control panel can select any one of 28,000 channels, spaced 1 kHz apart in the 2 to 30 MHz range. The panel contains four frequency selector knobs, a frequency display window, an RF SENS knob and a four-position mode selector switch. The left frequency selector knob selects megacycles, the two center knobs select 100 kHz and 10 kHz parts and the right knob selects 1 kHz parts of the frequency. The RF SENS knob controls RF gain in the receiving section of the transceiver. The mode selector switch turns the system off (OFF), selects upper side band (USB), lower side band (LSB), and amplitude modulation (AM) modes.





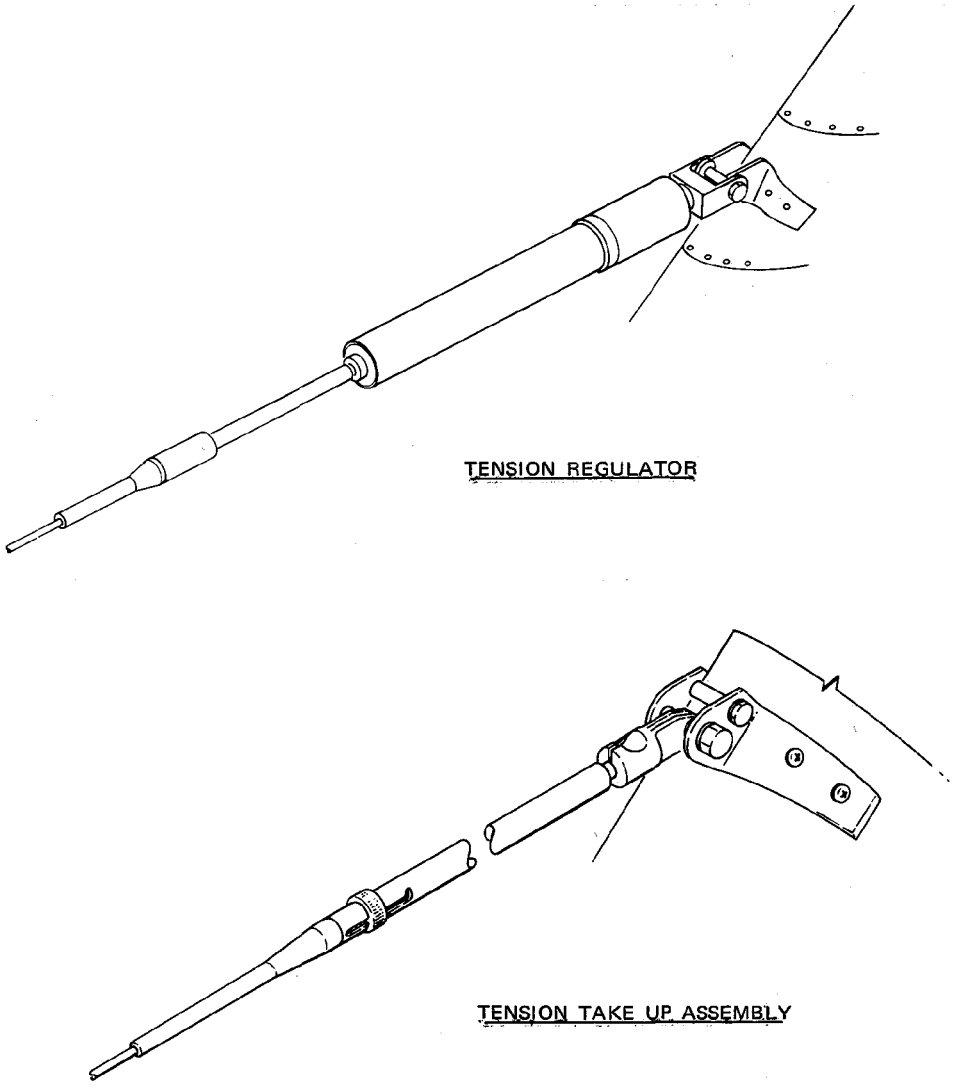
AUDIO SELECTOR PANEL
DETAIL A



HF CONTROL PANEL
DETAIL B

HF Communication System Component Location
Figure 1

3. Antenna Couplers
   A. The antenna couplers automatically match the impedance of the wire antennas to the characteristic transmission line impedance within approximately 3 seconds and maintain a VSWR within 1.3:1 over a frequency range of 2 to 30 MHz. The couplers are mounted in the cabin ceiling area under the antenna masts.
   B. The antenna couplers contain the variable RF match circuitry, drive motors, transfer relays, servo-amplifiers, fixed RF components and their switches, and the phasing-loading discriminator for matching the antenna with the characteristic impedance of the antenna line. Power required for operation of the antenna couplers is obtained from the HF transceivers.
4. Lightning Arresters
   A. The lightning arresters protect 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.
   B. The lightning arresters are installed inside the cabin ceiling, between the stub antenna masts and the antenna couplers.
5. Antenna
   A. Two wire antennas are installed on the airplane. HF-1 antenna is supported by an antenna mast at body station 583 left buttock line 16 and an antenna disconnect mount at fin station 142 on the vertical fin leading edge. HF-2 antenna is supported by an antenna mast at body station 583 right buttock line 16 and an antenna disconnect mount at fin station 170 on the vertical fin leading edge.
   B. The antenna tension regulator assembly tension takeup assembly, whichever is installed, adjusts the antenna length to maintain proper wire tension and also contains a safety disconnect feature. The antenna wire is attached to the chuck body at the forward end of the assembly. The inner barrel is attached to the aft end of the spring and is free to move along the plunger to adjust the antenna wire. The spring is preloaded to a tension of 70 pounds during installation. The room for spring expansion within the outer barrel is more than adequate to compensate for natural changes in wire length. The assembly will maintain proper tension as long as the antenna wire is intact. If the antenna wire breaks or comes loose at the antenna mast the antenna wire falls away from the airplane to prevent it from causing skin damage or becoming entangled in the control surfaces.



HF Wire Antenna Tension Regulator
Figure 2

6. HF Transceiver

A. The single side band (SSB) transceiver is capable of transmitting (400 watts PEP output in SSB and 125 watts carrier) and receiving at 2.000 to 29.999 megahertz on 28,000 channels with 1 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 RF translator module. The autopositioner mechanically tunes a variable frequency oscillator (VFO) over a 3.500 to 2.501 MHz 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 one of 28 operating 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. After a push-to-talk key is operated a 1 kHz tone is connected to the interphone system to indicate tuner tuning sequences are in progress.

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 side band output, one on each side of 500 kHz. The two side bands 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 side band; the other filter passes only the lower side band. When the transceiver is operated in the AM mode, the upper side band is passed and a 500 kHz carrier is reinserted at the filter output. The output 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.

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 bandwidth of 3 kHz. One filter passes only the upper side band; the other filter passes only the lower side band, 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 bandwidth to obtain both side bands. Filter output is then amplified and fed to an AM detector which recovers

D. 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.

E. The transceiver contains its own 3-phase high voltage power supply module which converts 115 volt, 400 hertz 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.

F. A PHONE jack, MIC jack, meter and a five-position meter selector switch are on the front of the panel. Four of the meter selector switch positions are used to check 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.

7. Operation

A. A crewman may transmit or receive over an HF system after the desired channel is selected on an HF control panel. Receiving and transmitting are accomplished on the same frequency. After a push-to-talk button has been pressed, at least 5 seconds are required for completion of system tuning. HF 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 23-52-0). The volume control on the audio selector panel may be adjusted to obtain a comfortable listening level.

C. To transmit over the HF system, HF must be selected with a mike selector switch on the audio selector panel. Pressing a microphone push-to-talk button 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. 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 button will return the system to the receive condition.

HF COMMUNICATION SYSTEM - TROUBLESHOOTING

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, check airplane wiring.
   B. To decrease the number of unscheduled 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 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 HF system is not actually due to a faulty isolation amplifier in an audio selector panel.
   C. Before attempting to operate HF system, ensure HF circuit breaker on load control center P18 is closed (pushed in) and power is available. Since no terminals are available for power measurements, voltages are most easily checked by using the meter on the front of the transceiver. Allow the system to warm up for 15 minutes before troubleshooting.
2. Troubleshooting Charts

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
No reception or transmission	No power to transceiver or faulty transceiver	Position transceiver meter switch to 28 volts and then to 130 volts. If meter indicates in red, voltage is available; transceiver is faulty. If no voltage, check circuit breaker and power to P18.	Replace transceiver
Intermittent or poor reception and transmission	Transceiver does not tune to selected frequency. Faulty control panel	Rechannel system several times from both above and below inoperative frequency. If system reception or trans-mission is poor when channeled from above but ok when channeled from below frequency or vice versa, control panel wafer switch contacts may be bent. Control panel is faulty	Replace control panel
	System does not tune. Antenna coupler may be faulty	Tune transmitter to selected frequencies. Key transmitter at each frequency. TUNE indicator lamp lights when reflected power is present and stays lit until antenna coupler is tuned. When tune cycle is completed, TUNE indicator lamp should extinguish and OPR indicator lamp should light within 5 seconds. If TUNE lamp does not light, antenna coupler is not receiving RF power. If both OPR and TUNE lights come on, it is beyond its tuning	Replace antenna coupler

TROUBLE	PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
Intermittent or poor reception and transmission (Cont)	Faulty lightning arrester	Check transceiver reception and transmission on several frequencies throughout frequency range. If reception and transmission is poor on only lower frequencies, the lightning arrester may be faulty. Check lightning arrester for short to ground	Replace lightning arrester
	Noise in system	Check all connectors for tightness. Check connector soldered connections for oxidation	Replace or tighten connectors
Intermittent or poor transmission	Faulty transceiver	Check transceiver meter indications. If meter indicates correctly for each position but sidetone from transceiver is poor, transceiver is faulty	Replace transceiver
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

HF COMMUNICATION SYSTEM - ADJUSTMENT/TEST

1. General
   A. The following test should be used to check the operation of an 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. HF Communication System Test
   A. Prepare to Test
      (1) Make sure the HF circuit breaker and interphone audio selector panel circuit breakers are closed.
      (2) Provide ground power to the airplane and energize buses on load control center P18.
      (3) Turn on HF system and allow 15 minutes for warmup.
      (4) Check flight interphone system and ensure audio selector panels are operable (AMM 23-52-0).
   B. Test HF Communication System
      (1) Rotate mike selector switch to HF and push up HF toggle switch on audio selector panel.
      (2) Turn HF control panel mode selector switch to AM and tune system to several WWV frequencies.

          NOTE: WWV transmits on 2.5, 5, 10, 15, 20, and 25 MHz. The RF signals are modulated by pulses at 1 Hz per second 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.

      (3) Perform an approximate frequency check on the transceiver by listening to WWV with the mode selector switches in the USB, LSB and AM positions. Reception shall be satisfactory in all positions.
      (4) Select an authorized test frequency and press a microphone push-to-talk button. A 1 kHz tone shall be heard during system tuning.
      (5) Adjust SENS (RF gain) control on HF control panel to maximum. If subsequent tests reveal RF overloading is occurring, back off control to point where overload condition just disappears.
      (6) Tune HF system to several active channels and establish communication. Compare receiver sensitivity. 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.

(7) Tune system to several different channels and ensure operation is good by channeling from both above and below the selected frequency.

NOTE: The tuner duty cycle is 5 minutes on and 5 minutes off on frequencies between 2 to 3 MHz. Excessive keying of system on low frequencies may cause 100°C overheat switch in tuner to fault system; wait 5 minutes and rechannel to reset system. Above 3 MHz the duty cycle is continuous.

(8) Tune HF 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

WARNING: DO NOT OPERATE THE HF COMMUNICATION SYSTEM WHILE THE AIRPLANE IS REFUELED OR DEFUELED. AN EXPLOSION CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO THE AIRPLANE.

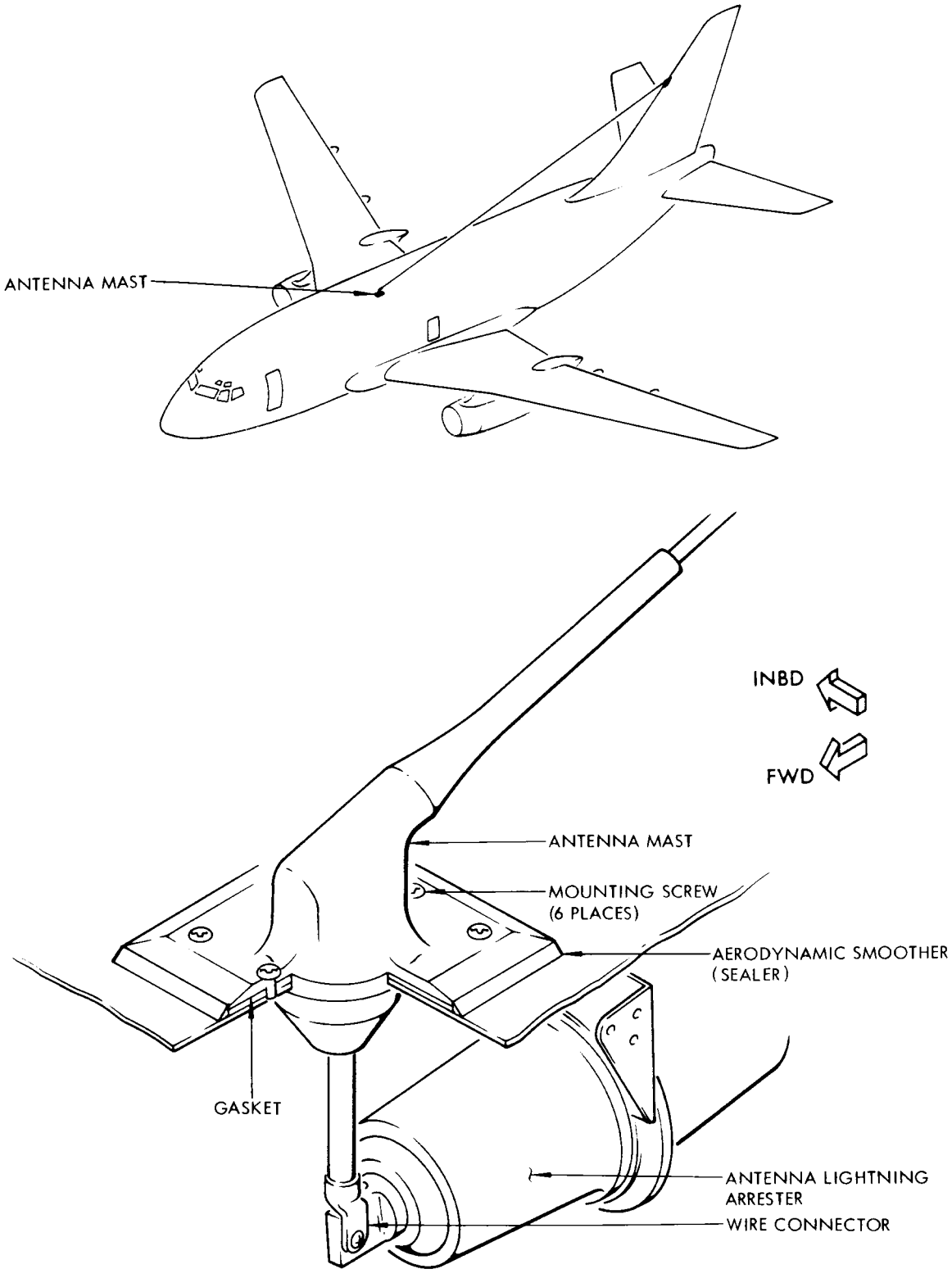
WARNING: MAKE SURE PERSONNEL STAY A MINIMUM OF 10 FEET (3 METERS) AWAY FROM THE HF COMMUNICATION ANTENNA WHEN THE HF SYSTEM TRANSMITS. RF ENERGY FROM THE HF COMMUNICATION ANTENNA CAN CAUSE INJURIES TO PERSONNEL.

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.

(9) Secure HF systems.
(10) Determine whether there is any further need for electrical power on the airplane; if not, remove external power.

HF ANTENNA MAST - REMOVAL/INSTALLATION

1. Removal/Installation of Antenna Mast
   A. Equipment and Materials
      (1) Cleaning Solvent - BMS 3-2, Type I
      (2) Gauze
      (3) Aerodynamic Smoother - BMS 5-79
   B. Remove Antenna Mast
      (1) Remove antenna wire from antenna mast. See HF Wire Antenna Removal/Installation.
      (2) Remove appropriate cabin ceiling panel.
      (3) Disconnect lead wire from lightning arrester.
      (4) Remove aerodynamic smoother around the antenna mast base.
      (5) Remove six mounting screws from antenna mast base.
      (6) Remove antenna mast.
      (7) Remove gasket.
   C. Prepare to Install Antenna Mast
      (1) Clean antenna mast.
      (2) Dry and remove any traces of dust and solvent with a dry clean gauze.
      (3) Check gasket for damage; if damaged, replace with new gasket.
   D. Install Antenna Mast
      (1) Tilt gasket in position.
      (2) Tilt antenna mast in position, install six mounting screws and tighten.
      (3) Apply aerodynamic smoother (sealer) around the antenna mast base.
      (4) Repeat steps B.(1), (2) and (3) in reverse order of removal.

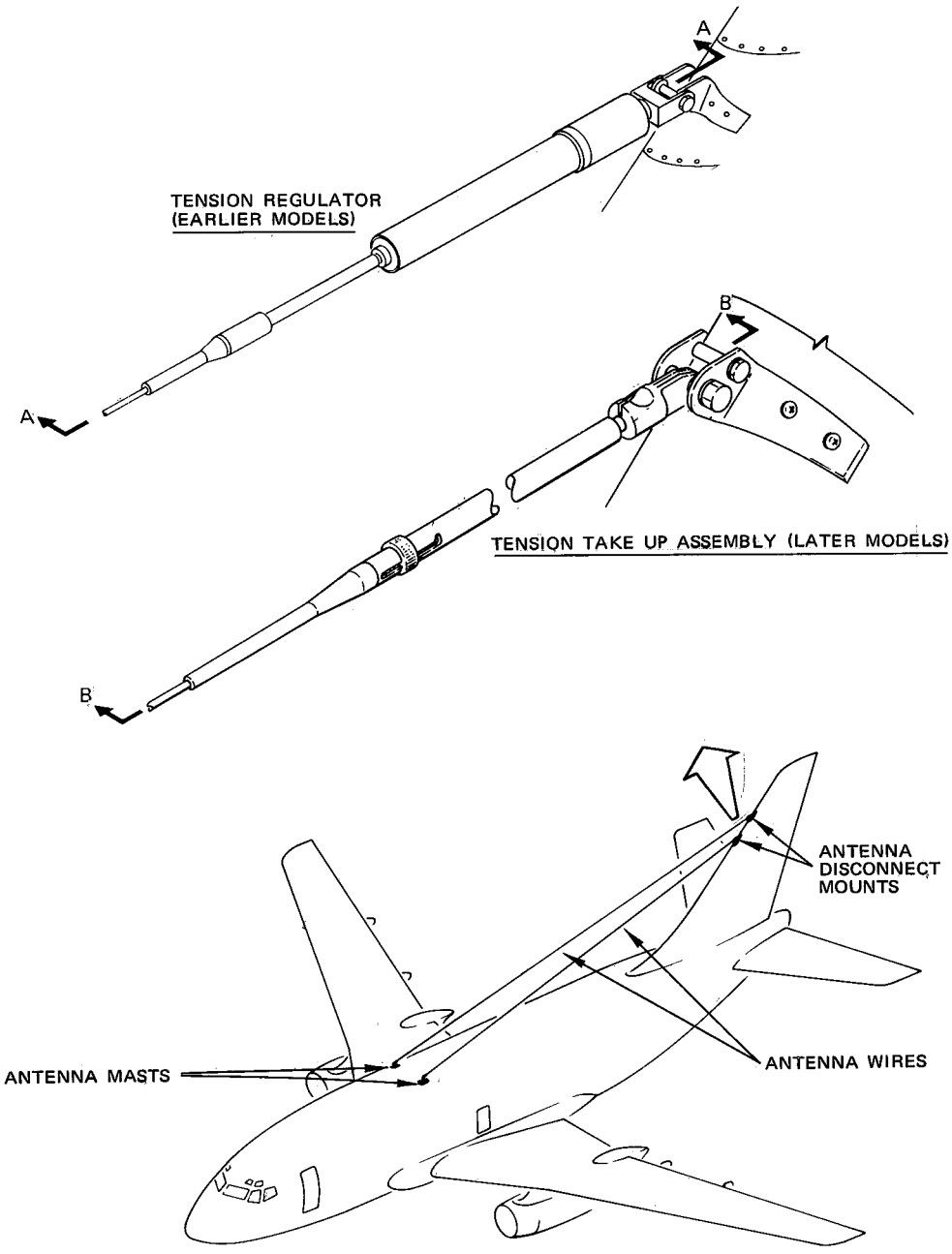


HF Antenna Mast Installation
Figure 401

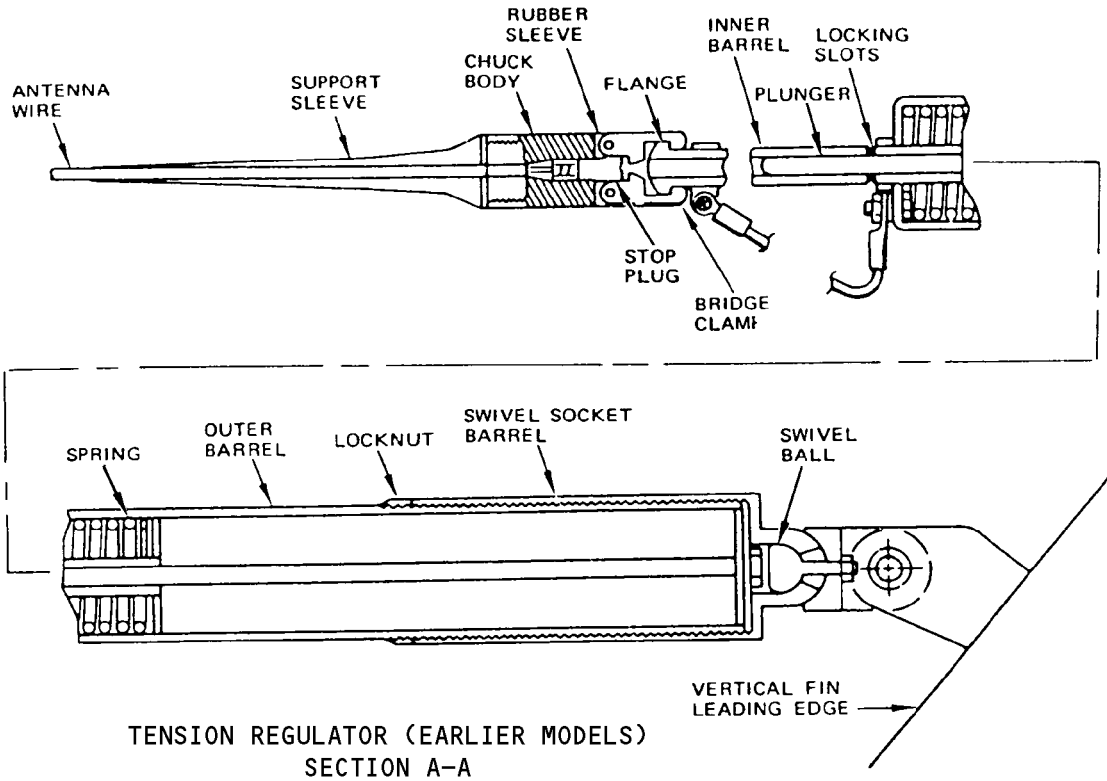
HF WIRE ANTENNA - REMOVAL/INSTALLATION

1. General
   A. Suspension assemblies at the forward end of each HF wire antenna are similar on all 737 airplanes. However, design improvements in the aft antenna tension takeup assemblies have recently been incorporated in later model airplanes which are less susceptible to corrosion and antenna malfunctions (Fig. 401).
      (1) Earlier model airplanes are equipped with a tension regulator assembly at the aft end of the antenna.
      (2) Later model airplanes, plus airplanes incorporating SB 23-1015, are equipped with a tension takeup assembly at the aft end of the antenna.
      (3) Removal of the antenna in accordance with the following procedure is necessary before any part of the antenna may be replaced.
2. Equipment and Materials
   A. Mast Plug Driver (14806) - Dayton Aircraft Products Inc. (LAC 697391-11)
   B. Pretensioning Tool (14807) - Dayton Aircraft Products Inc.
   C. Retriever Tool (14808) - Dayton Aircraft Products Inc.
   D. Silicone Compound - Dow Corning, DC-4, or equivalent
   E. Grease, Molybdenum Disulfide - MIL-G-21164
3. Remove Wire Antenna - Earlier Models (Fig. 401)
   A. At aft end of antenna (antenna mount), lock safety disconnect compression spring in loaded position by placing a 5/16 open-end wrench in the locking slot of inner barrel.
   B. At forward end of antenna (antenna mast), remove antenna support sleeve and washers from chuck housing.
   C. Remove chuck from the mast housing with forked end of mast plug driver.
   D. To remove wire from chuck, cut wire 1 inch from end of chuck and remove exposed insulation. Tap on end of wire to spread chuck jaws then push wire through the small piece of insulation inside the chuck assembly and through the jaws of the chuck assembly. Extract small piece of insulation left inside the chuck assembly.
   E. At aft end of antenna, remove antenna support sleeve from safety disconnect.
   F. Roll back rubber sleeve from disconnect bridge clamps and disengage bridge clamps from inner barrel flange.
   G. Remove wire from chuck by unlocking chuck jaws and pushing wire through chuck jaws as in step 3.D.

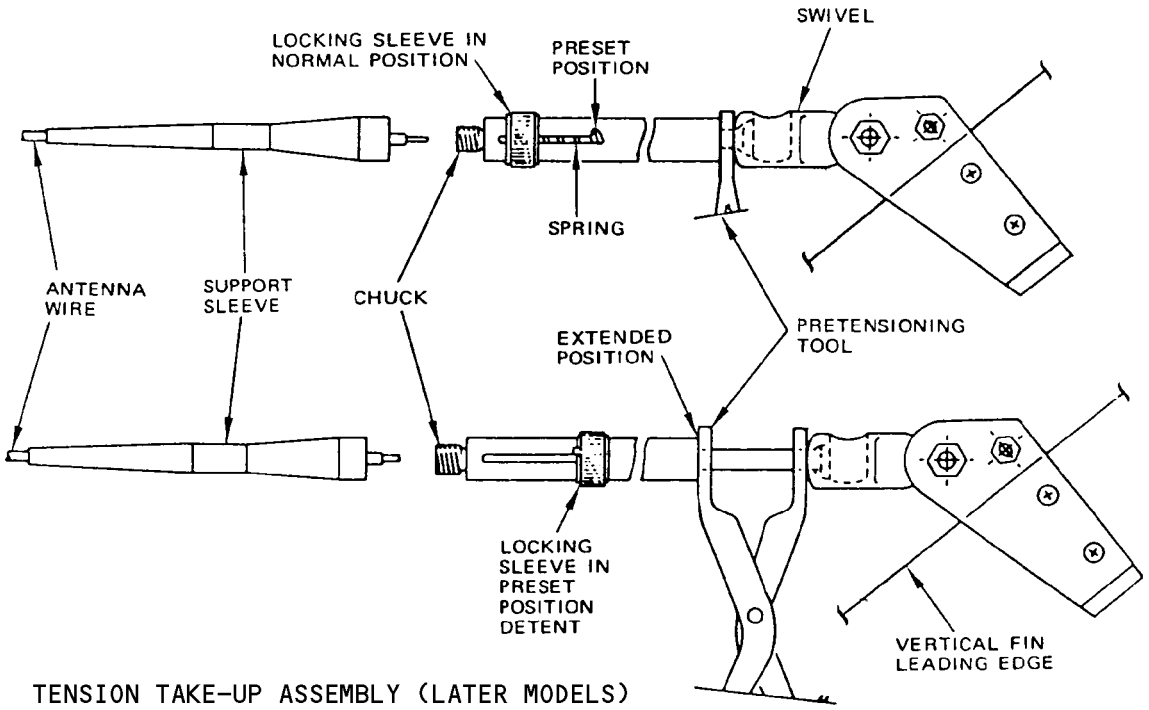
      NOTE: The antenna wire removed cannot be used for reinstallation.



HF Wire Antenna Installation
Figure 401 (Sheet 1)

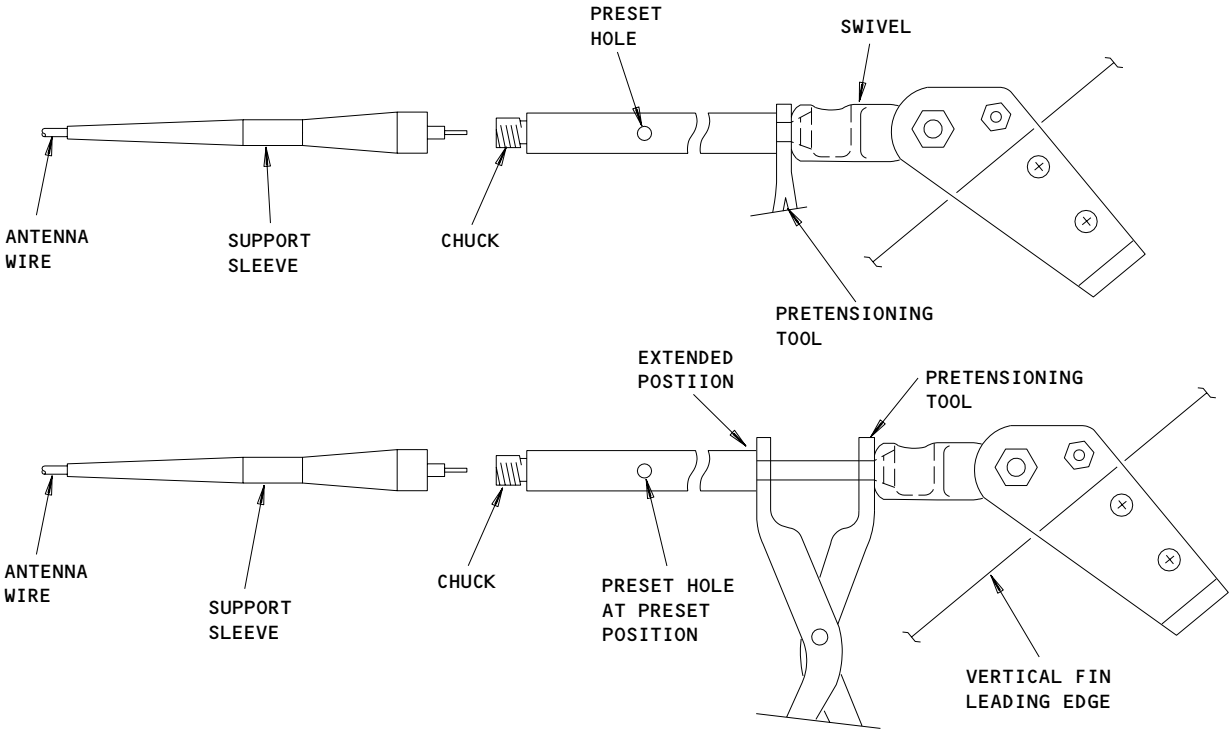


TENSION REGULATOR (EARLIER MODELS)
SECTION A-A



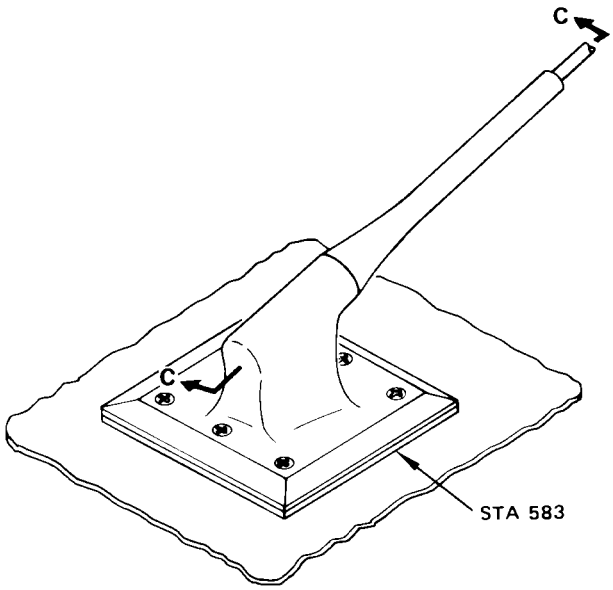
TENSION TAKE-UP ASSEMBLY (LATER MODELS)
SECTION B-B

HF Wire Antenna Installation
Figure 401 (Sheet 2)

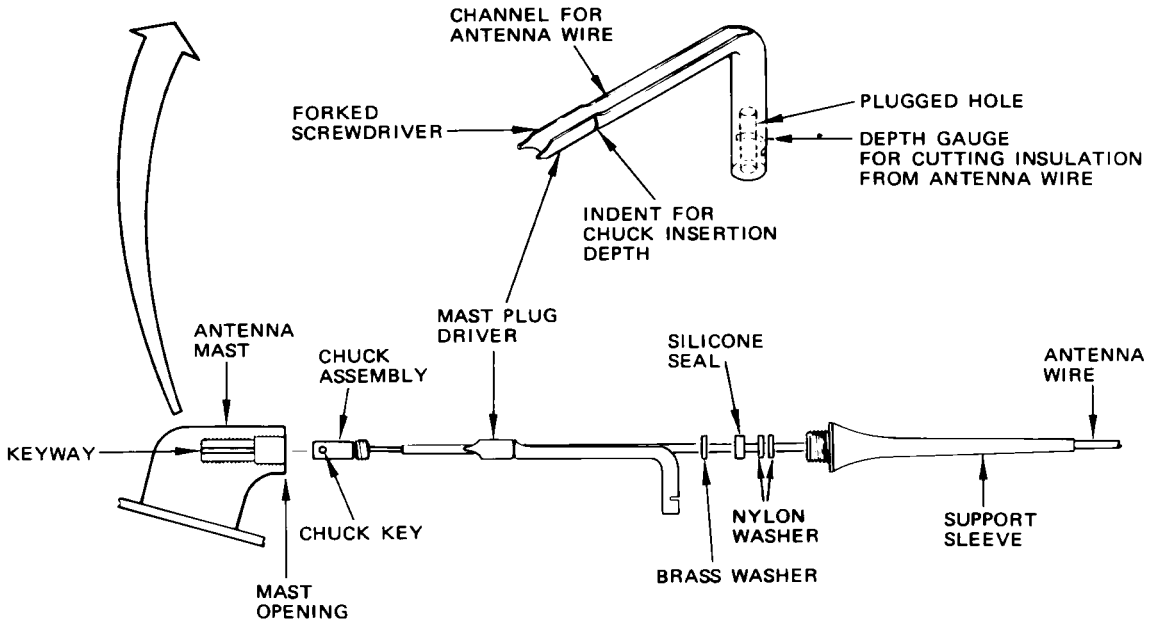


TENSION TAKE-UP ASSEMBLY
DAYTON-GRANGER P/N 14818

HF Wire Antenna Installation
Figure 401 (Sheet 3)



ANTENNA MAST



ANTENNA MAST ASSEMBLY (ALL MODELS)
SECTION C-C

HF Wire Antenna Installation
Figure 401 (Sheet 4)

4. Install Wire Antenna - Earlier Models (Fig. 401)
   A. At Aft End of Antenna:
      (1) Strip approximately 0.50 inch of insulation from aft end of antenna wire (use cutting slot in Mast Plug Driver).

          CAUTION: DO NOT NICK OR SCRATCH WIRE.

      (2) Place antenna support sleeve on aft end of antenna wire and slip stripped portion of wire into chuck jaw. Tighten plug stop.
      (3) Pack Molybdenum grease into cavity and under sleeve of disconnect end of aft chuck body assembly. Engage bridge clamp on inner barrel flange and roll rubber sleeve over bridge clamps.
      (4) Coat threads of antenna support sleeve with silicone compound and screw into chuck body.
      (5) Tighten outer barrel into swivel socket barrel until outer barrel bottoms. This is accomplished when only three threads are visible past locknut. Tighten locknut.
   B. At Forward End of Antenna:
      (1) Apply 70 ±6 pounds of tension load on wire keeping wire close and in line with mast housing opening. Mark wire at mast opening to denote extended position.
      (2) Cut wire 2.7 inches from marked point and carefully strip approximately 0.50 inch of insulation from antenna wire (use cutting slot).
      (3) Slide all parts on antenna wire in following order: support sleeve nylon washers, silicone seal, and brass washer.
      (4) Insert stripped portion of antenna wire into chuck jaw and push in tight.
   C. At aft end of antenna, loosen locknut on outer barrel and rotate outer barrel counterclockwise until it has 2.75 inches of thread exposed.

      NOTE: This step facilitates start of chuck into antenna mast housing at forward end.

   D. At forward end of antenna, start chuck into mast housing and screw in approximately 1 inch using forked end of mast plug driver.
   E. At aft end of antenna, tighten outer barrel into swivel socket until outer barrel bottoms. Check that only three threads are visible past locknut. Tighten locknut.

      CAUTION: UNDER NO CIRCUMSTANCES SHALL THE OUTER BARREL BE USED FOR ANTENNA WIRE TENSION ADJUSTMENT SINCE IT IS IMPERATIVE THAT THE PLUNGER ASSEMBLY BE SOLIDLY ENGAGED BETWEEN THE OUTER BARREL AND THE SWIVEL SOCKET TO ENSURE POSITIVE DISCONNECT OF THE ANTENNA.

F. At forward end of antenna:
(1) Adjust chuck with mast plug driver until 70-pound mark on antenna wire (Ref par. 4.B.(1)) aligns with mast opening.
(2) Insert brass washers silicone seal and nylon washer into mast.
(3) Coat threads of support sleeve with silicone compound and screw into mast housing.

G. At aft end of antenna check that bonding jumper is secured tightly to tension regulator.

5. Remove Wire Antenna - Later Models (Fig. 401)

A. At aft end of antenna:
(1) Insert pretensioning tool between swivel assembly and takeup body. Compress pretensioning tool handles to free locking sleeve. Slide and twist locking sleeve into preset position. Release pretensioning tool.
(2) Unscrew support sleeve from chuck assembly.
(3) Cut wire approximately 1.5 inches from end of chuck assembly, and remove insulation from wire.
(4) Slip wire retriever tool onto wire and insert into chuck assembly. Tap retriever lightly with plastic hammer to spread chuck jaws. Remove all old antenna wire and insulation from chuck.

CAUTION: ENSURE THAT ALL WIRE IS REMOVED FROM CHUCK. TENSION UNIT MAY FAIL IF NEW ANTENNA WIRE IS INSTALLED IN CHUCK WITH OLD WIRE END PRESENT.

B. At forward end of antenna:
(1) Remove antenna support sleeve and washers from mast housing.
(2) Remove chuck from mast housing using mast plug driver.
(3) To remove wire from chuck, repeat as in A. (3) and (4) above.

6. Install Wire Antenna - Later Models (Fig. 401)

A. At aft end of antenna wire:
(1) Remove support sleeve from tension takeup body.
(2) For tension takeup assembly with locking sleeve; Insert pretensioning tool between swivel and takeup body. Compress pretensioning tool to free locking sleeve. Slide locking sleeve to preset position, twist to lock in place and release pretensioning tool. For tension takeup assembly with preset hole for preset position; insert pretensioning tool between swivel and takeup body. Compress pretensioning tool to align preset hole at preset position. Put an appropriate 1/8-inch diameter pin through the preset hole to hold the assembly at preset position. Release the pretensioning tool.
(3) For tension takeup assembly with locking sleeve, mark shaft to denote extended position, as shown in Fig. 401, Sheet 2 (this will be the 70 ±6 pound mark).
(4) Slip support sleeve on wire to a position away from end of wire.

(5) Strip approximately 1/2 inch of insulation from end of wire (use cutting slot in mast plug driver).

CAUTION: DO NOT NICK OR DAMAGE WIRE.

(6) Insert wire into chuck, push firmly to make sure that exposed conductor is properly positioned in chuck. Pull on wire sharply to test installation. If wire slips repeat procedure until wire is seated firmly.
(7) Install support sleeve on chuck.

B. At forward end of antenna wire:
(1) Pull wire taut (by hand) keeping it close to and in line with mast housing opening. Mark wire at mast opening.

NOTE: Locking sleeve (preset hole) at aft end of antenna should remain in the preset position for these steps.

(2) Cut wire +1.9 inches beyond marked point and strip 1/2 inch of insulation from wire (use cutting slot in mast plug driver).
(3) Slide all parts on antenna wire in following order: support sleeve, two nylon washers, silicone seal, and brass washer.
(4) Insert stripped portion of antenna wire into jaw end of chuck and push in tight.
(5) Insert chuck assembly into mast housing and screw in until all threads are engaged.
(6) For tension takeup assembly with preset hole for present position; continue to screw in chuck assembly until the pin in the preset hole slides out easily. Remove the pin.

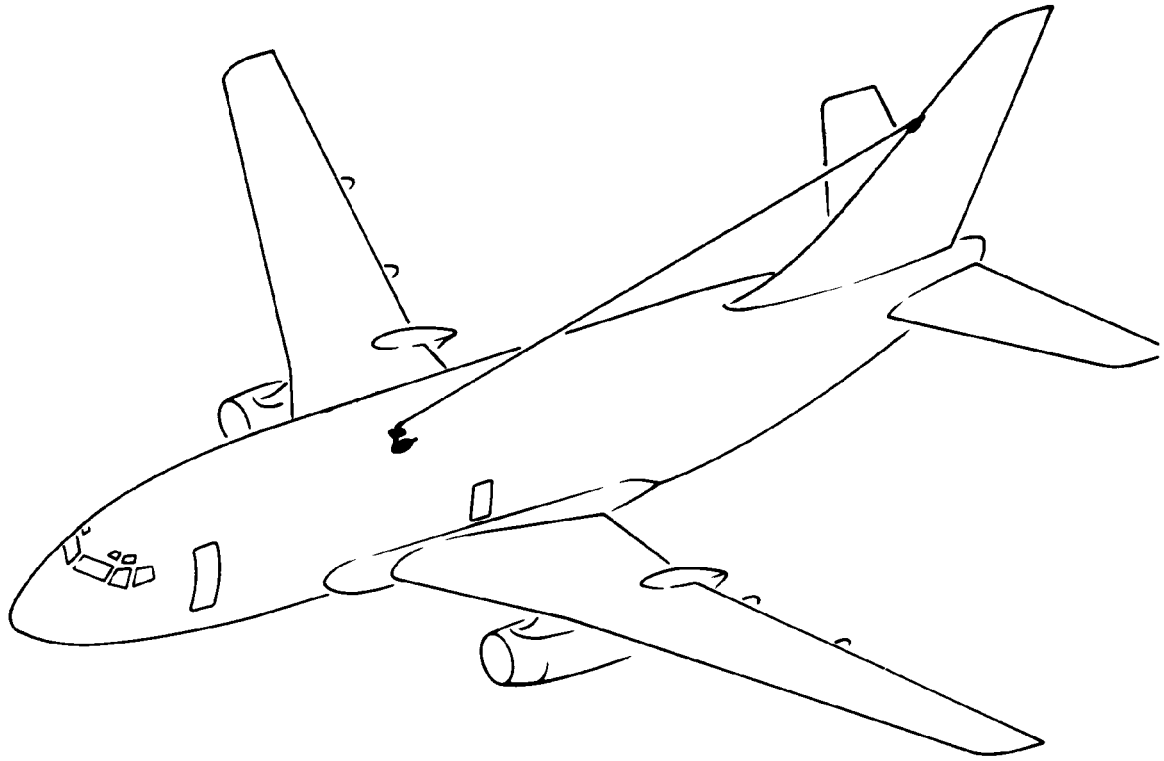
C. For tension takeup assembly with locking sleeve, at aft end of antenna wire, insert pretensioning tool between swivel and takeup body. Compress pretensioning tool to relieve tension on locking sleeve. Twist sleeve to unlock preset. Remove tool.

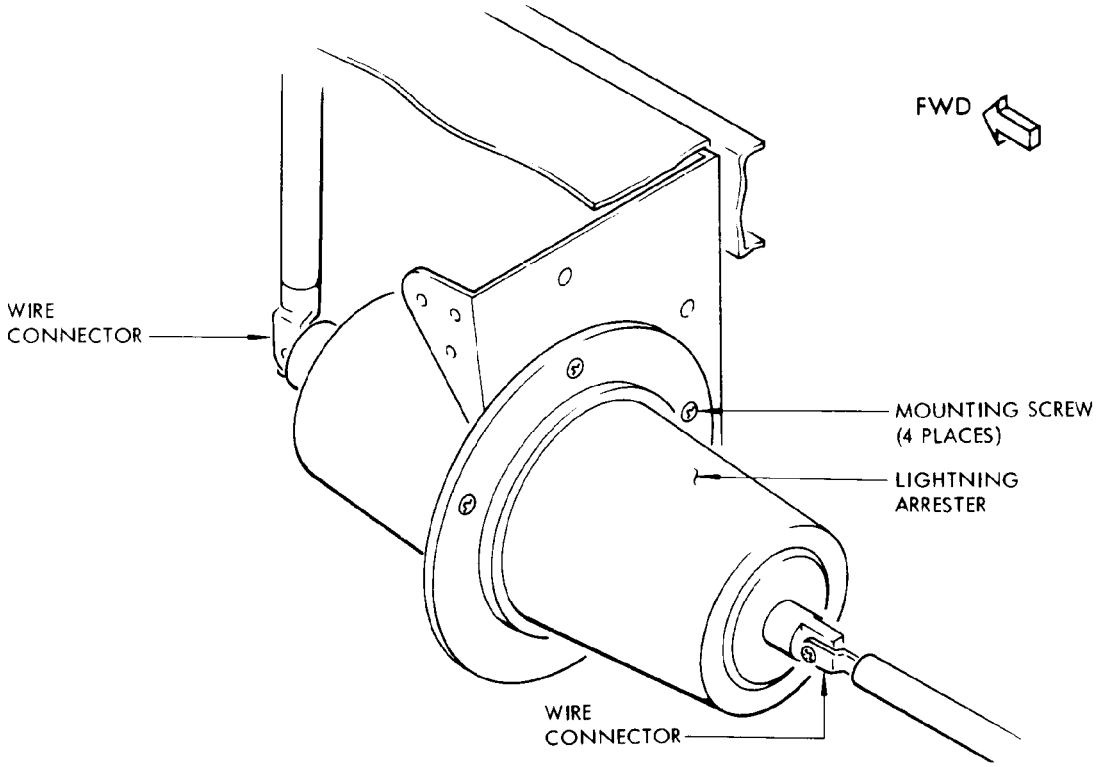
D. For tension takeup assembly with locking sleeve; At forward end of antenna, adjust chuck using mast driver until the extended position mark, obtained in 4.A.(3) above, lines up once more at the aft end of the antenna.

E. At forward end of antenna;
(1) Insert brass washer, silicone seal, and nylon washers into mast.
(2) Screw support sleeve into mast housing.

HF LIGHTNING ARRESTER - REMOVAL/INSTALLATION

1. Removal/Installation of Lightning Arrester
   A. Remove Lightning Arrester
      (1) Remove appropriate cabin ceiling panel at station 583.
      (2) Disconnect antenna mast and antenna coupler lead wires from lightning arrester.
      (3) Remove four mounting screws from support bracket, supporting lightning arrester from below.
      (4) Remove lightning arrester.
   B. Install lightning arrester.
      (1) Install lightning arrester in reverse order of removal.

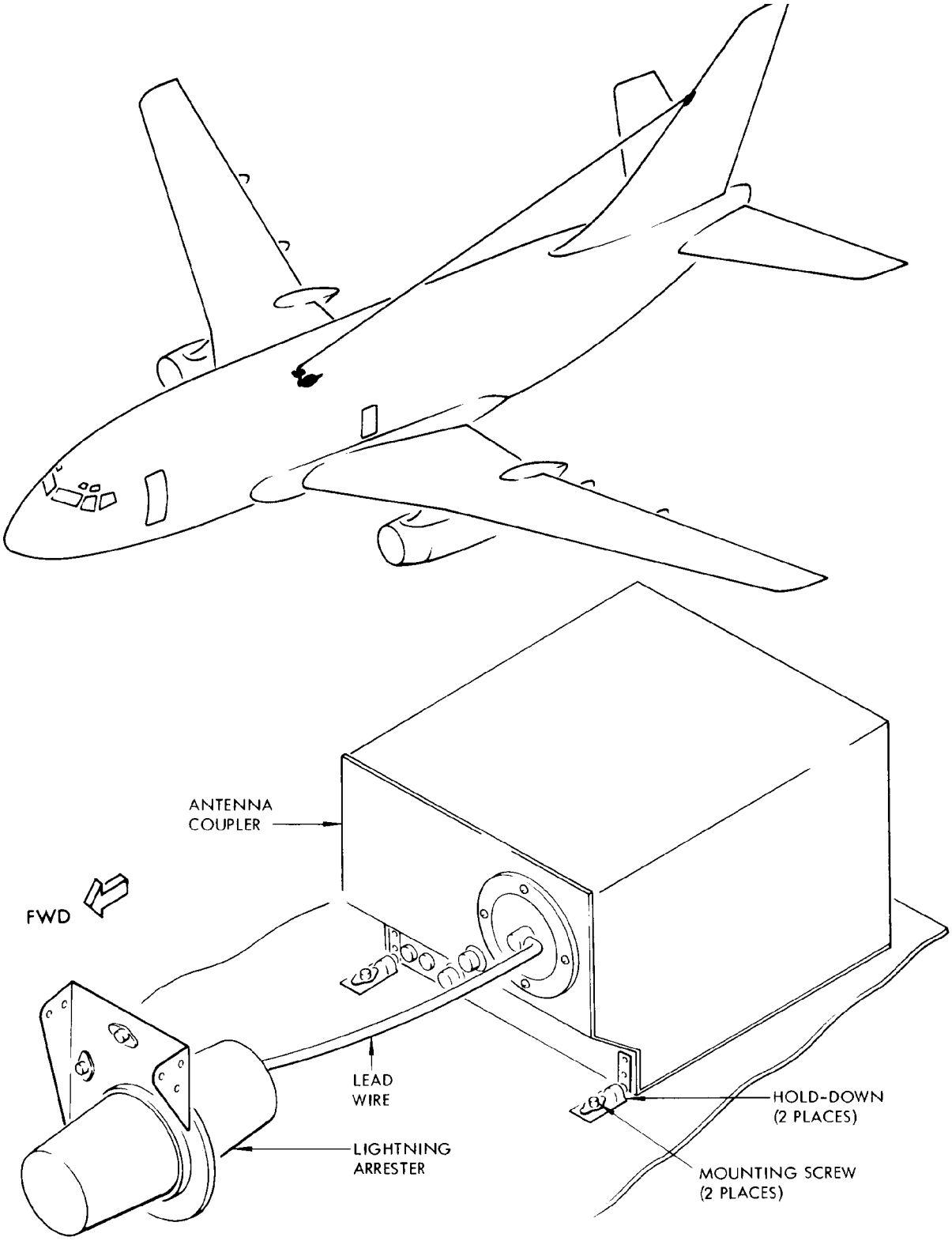




HF Lighting Arrester Installation
Figure 401

HF ANTENNA COUPLER - REMOVAL/INSTALLATION

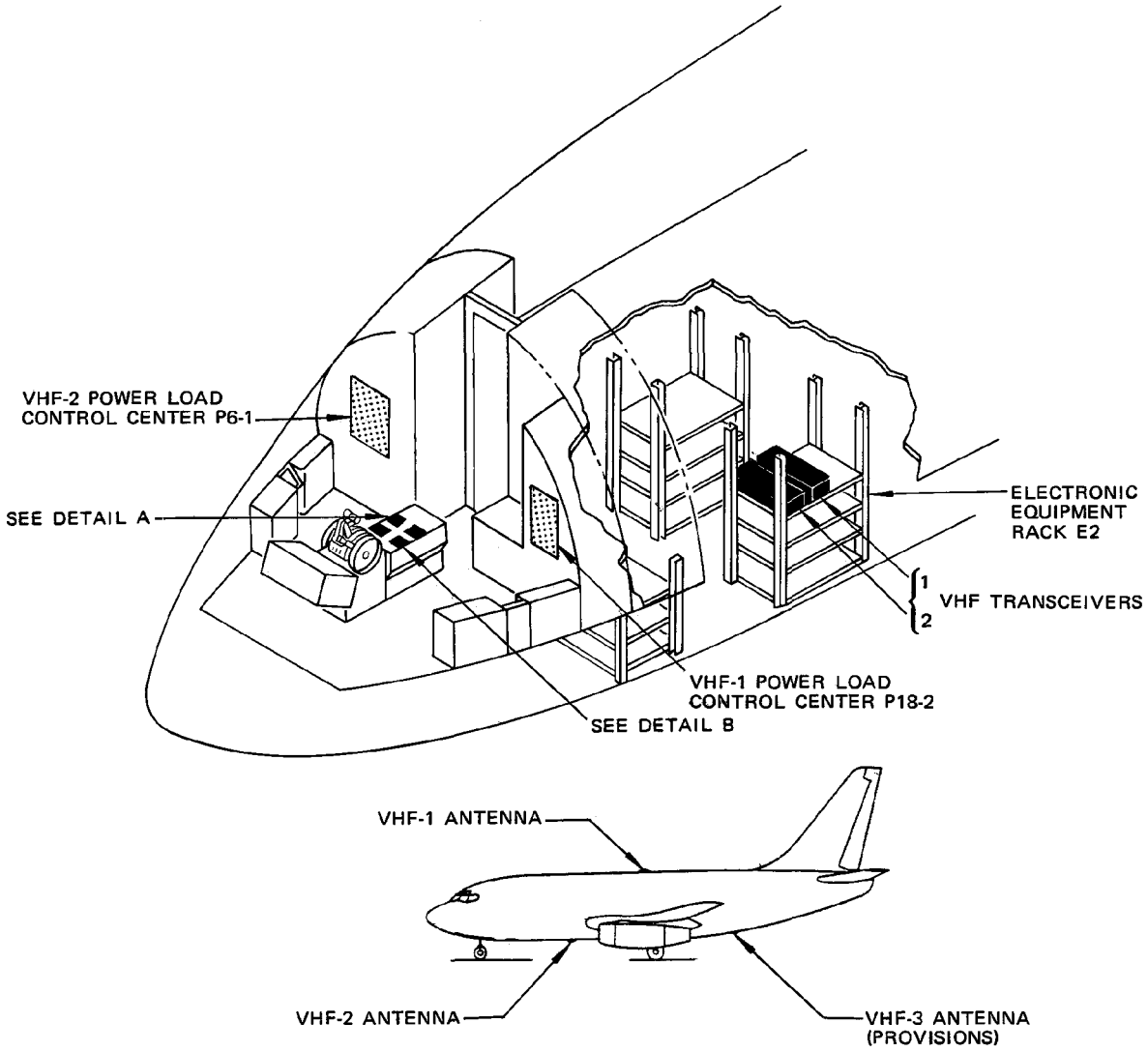
1. Removal/Installation of Antenna Coupler
   A. Remove antenna coupler.
      (1) Remove appropriate cabin ceiling panel at station 583.
      (2) Release fastener and lower shield assembly.
      (3) Remove electrical connector and disconnect the lead wire from lightning arrester.
      (4) Remove two mounting screws and hold down.
      (5) Pull out the antenna coupler.
   B. Install antenna coupler.
      (1) Install lightning arrester in reverse order of removal.



HF Antenna Coupler Installation
Figure 401

VHF COMMUNICATION SYSTEMS - DESCRIPTION AND OPERATION

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 135.95 megacycle frequency range on any of 360 channels with a 50 kilocycle 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 electronic equipment rack E2. VHF No. 1 and 2 control panels are located on the aft 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 627, top centerline of the fuselage. VHF No. 2 antenna is at station 500+10, bottom centerline of the fuselage (Fig. 1).
   C. The VHF systems use 28-volt dc power obtained from circuit breakers on load control centers P18 and P6. VHF No. 1 system power is obtained from the standby dc bus on load control center P18. VHF No. 2 system power is obtained from switched electronics bus No. 2 on load control center P6.
   D. Communication on each VHF communication system is completed through the audio selector panels of the audio selecting system (AMM 23-53-0).
2. Control Panels
   A. The VHF communication system control consist of: a dual set of frequency selection knobs, a volume control, a test button, two green indicating lights, and a transfer switch. Each section of the dual set of frequency knobs control the same VHF system. A different frequency may be set up on each section. By positioning the transfer switch to the left, the frequency set up on the left will be used by the VHF transceiver and the left light will illuminate. Positioning the transfer switch to the right will cause the VHF transceiver to tune to the frequency set up on the right and the right light will illuminate. Rotation of the two outer knobs will set up the frequency which is then indicated through a window above the knobs. The outermost knob has 18 positions numbered 118 thru 135. The next knob has 20 positions numbered 0.00 thru 0.95.
   B. Any of 360 channels with 50 kilocycles spacing may be selected on frequencies of 118.00 to 135.95 megacycles. The associated volume control may be used to adjust received audio to a comfortable listening level. Pressing the TEST button will disable the squelch circuit allowing an increase in background noise thus indicating whether the receiver is operating properly.



AUDIO SELECTOR PANEL
DETAIL A

VHF PANEL
DETAIL B

VHF Communication Systems Component Location
Figure 1

3. Transceiver
   A. The transceiver is composed of a combination transmitter and receiver which share certain circuits. Frequency selection is available in the 118.00 to 135.95-megacycle range. Tuning of the receiver and transmitter sections is accomplished immediately whenever a frequency is selected on the VHF control panel. The transceiver is composed of solid-state circuits. Transient protection and voltage regulation circuits ensure correct 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 output of the receiver is fed to the audio selecting system through the VHF control panel volume control. Selcal signals received are sent to the selcal system on separate circuits (AMM 23-28-0).
   C. The same selected frequency is used for both transmitting and receiving. Pressing the push-to-talk button energizes an antenna relay which switches the antenna to the transmitter circuits. The transmitter is amplitude-modulated by audio signals from the flight interphone system after crystal oscillator frequencies are mixed and multiplied as required to obtain the final output radio frequency. Transmitted audio is passed through the receiver and sent back to the transceiver sidetone output circuits where it is then connected to output circuits to the VHF control panel volume control and then to the audio selector panels. A minimum power output of 25-watt RF energy may be applied to the VHF antenna.
   D. The front panel of the transceiver contains a rotary selector switch, a meter, a SQUELCH DISABLE button, and three jacks: PHONE, MIKE and EXT. METER. The rotary switch and meter enable a quick check of the condition of certain important stages of the transceiver. The meter measures currents and gives relative indications of voltage and power levels. Pressing the SQUELCH DISABLE button disables the squelch circuits allowing the receiver to operate at maximum sensitivity.
4. Antennas
   A. Each VHF communication system uses an all metal VHF sharkfin-shaped blade antenna. Each antenna is used for both receiving and transmitting. The antennas are interchangeable between the upper and lower installations.
5. 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. The transceiver will be capable of receiving immediately after frequency selection is completed. Position the transfer switch to the left or right to connect the transceiver to the desired frequency selected on the dual controls.

B. To receive, a crewman must turn on the VHF toggle switch or select VHF with the mike selector switch on the audio selector panel (AMM 23-53-0) and adjust the VHF volume control to obtain a comfortable listening level. The volume control on the audio selector panel may also have to be adjusted. The crewman will then hear any messages that may be received on the selected frequency.

C. To transmit over the VHF systems, the mike selector switch on the audio selector panel must be positioned to the desired VHF system. Pressing 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. The VHF volume control may be used to adjust the sidetone audio to a comfortable listening level. When the push-to-talk button is released, the system will return to the receive condition.

VHF COMMUNICATION SYSTEM - TROUBLESHOOTING

1. General
   A. Troubleshooting 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 ensure proper voltages are available to the system. Ensure all VHF circuit breakers on load control centers P6 and P18 are closed (pushed in) and power is available to them.
   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 faulty circuits 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.
      (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 airplane.
      (3) Transmitting
         (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.

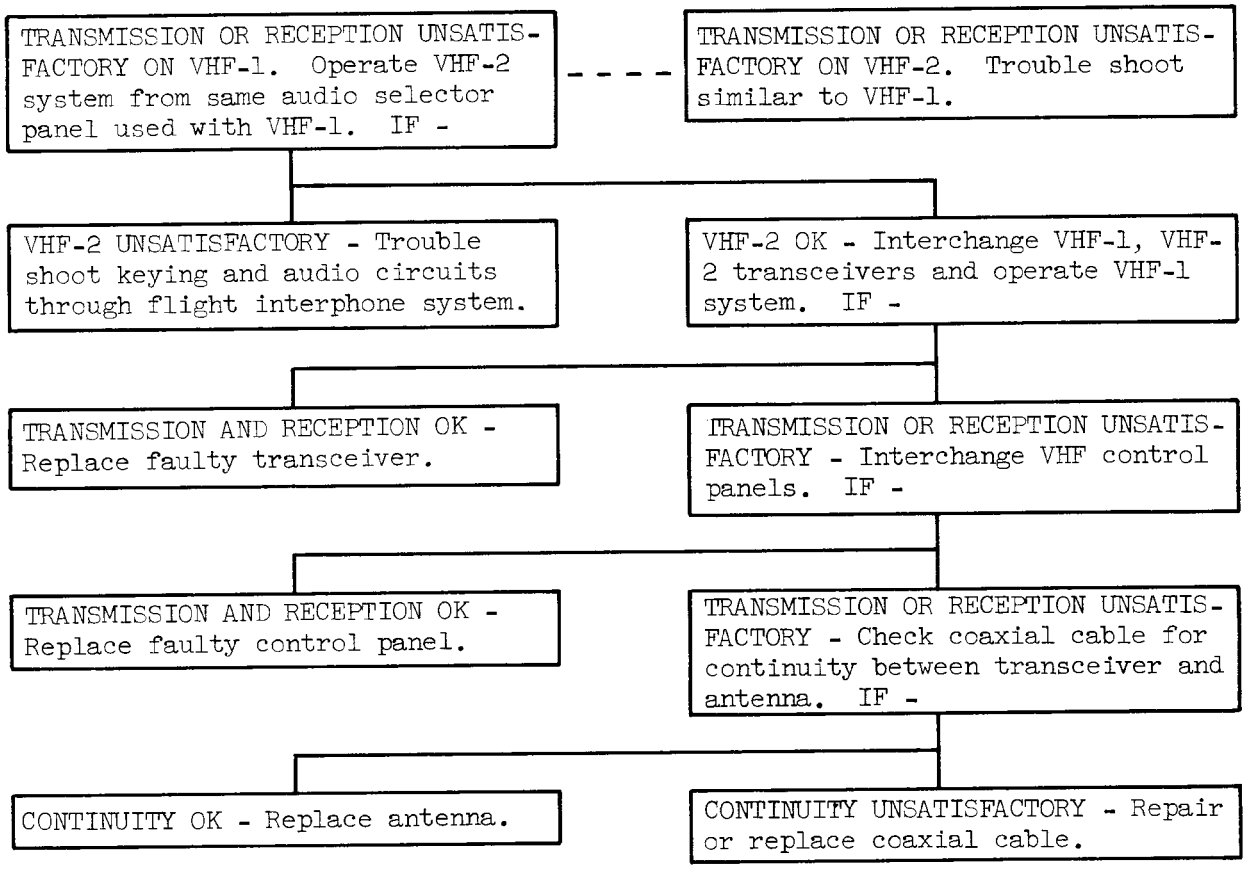
(4) Receiving

(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 malfunction malfunctioning channel with operation on known good channels.

D. If the transceiver has a meter and selector switch, faulty components may be isolated by using the meter and switch. See adjustment/test procedures for correct meter readings. If a transceiver does not have a meter, the following trouble chart may be used to isolate the faulty component.

2. Troubleshooting Chart



VHF Communication System
Figure 101

VHF COMMUNICATION SYSTEMS - ADJUSTMENT/TEST

1. Test VHF Communication Systems
   A. General
      (1) 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.
      (2) The airplane should not be in or near a large metallic structure, such as a hanger 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.
   B. Prepare to Test
      (1) Provide ground power to the airplane and energize busses on load control centers P6 and P18.
      (2) Ensure the radio bus master switches are closed.
      (3) Ensure all VHF circuit breakers and interphone circuit breakers are closed.
      (4) If control panels have an on-off switch, turn on VHF systems and allow 5 minutes for warmup.
      (5) Check flight interphone system and ensure audio selector panels are operable. (See 23-52-0.)
   C. Test VHF Communication System
      (1) Tune each VHF system to an unused frequency and press the test button on the control panel. The receiver shall operate at maximum sensitivity as verified by an increase in background noise.
      (2) Position the VHF control panels transfer switches to the left and tune each VHF system to an active frequency with the left set of controls. The left light should illuminate. Listen to communications traffic and compare receiver sensitivity. They should be approximately equal. All but the weakest signals should open squelch.
      (3) Rotate VHF system volume controls and confirm controls work smoothly through entire range.
      (4) 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; reception should be approximately equal.

(5) Position the transfer switch on each VHF control panel to the right and repeat steps C.(2) thru C.(4). Results shall be similar except the right light should illuminate.
(6) Tune VHF-1 system to an authorized test frequency. Key the system and establish communication. Check meter indications on the front of the transmitter by rotating the meter switch to each of the following positions. Transmission and reception should be loud and clear. Sidetone should be clearly audible when transmitting. The push-to-talk button must be pressed for all positions.

Meter Switch Position	Typical Indications
OSC-G	0.7 +0.2
PA-G	0.7 +0.3
PA-C	0.7 +0.2
PWR	25 (RED)
R-PWR	2.0 (RED)
MOD-E	0.5 +0.2

NOTE: Any significant variation from typical readings indicates possible defective circuitry or improper tuning of the transmitter.

CAUTION: LACK OF CLEAR RECEPTION MAY BE AN INDICATION OF AN OPEN TRANSMISSION LINE. AVOID KEYING THE TRANSMITTER IF RECEPTION IS NOT SATISFACTORY.

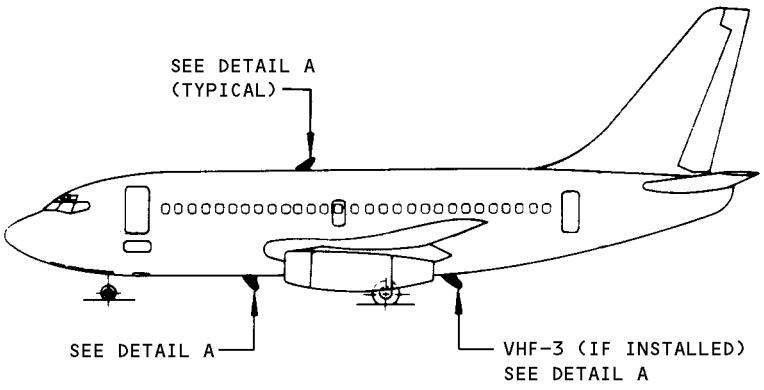
(7) Conduct step C.(6) on VHF-2 system.
(8) Use each VHF system and establish communication, on an authorized VHF test frequency, from each station where an audio selector panel is installed. Reception and transmitter sidetone shall be loud and clear.
(9) Secure VHF systems.
(10) Determine whether there is any further need for electrical power on the airplane; if not, remove electrical power.

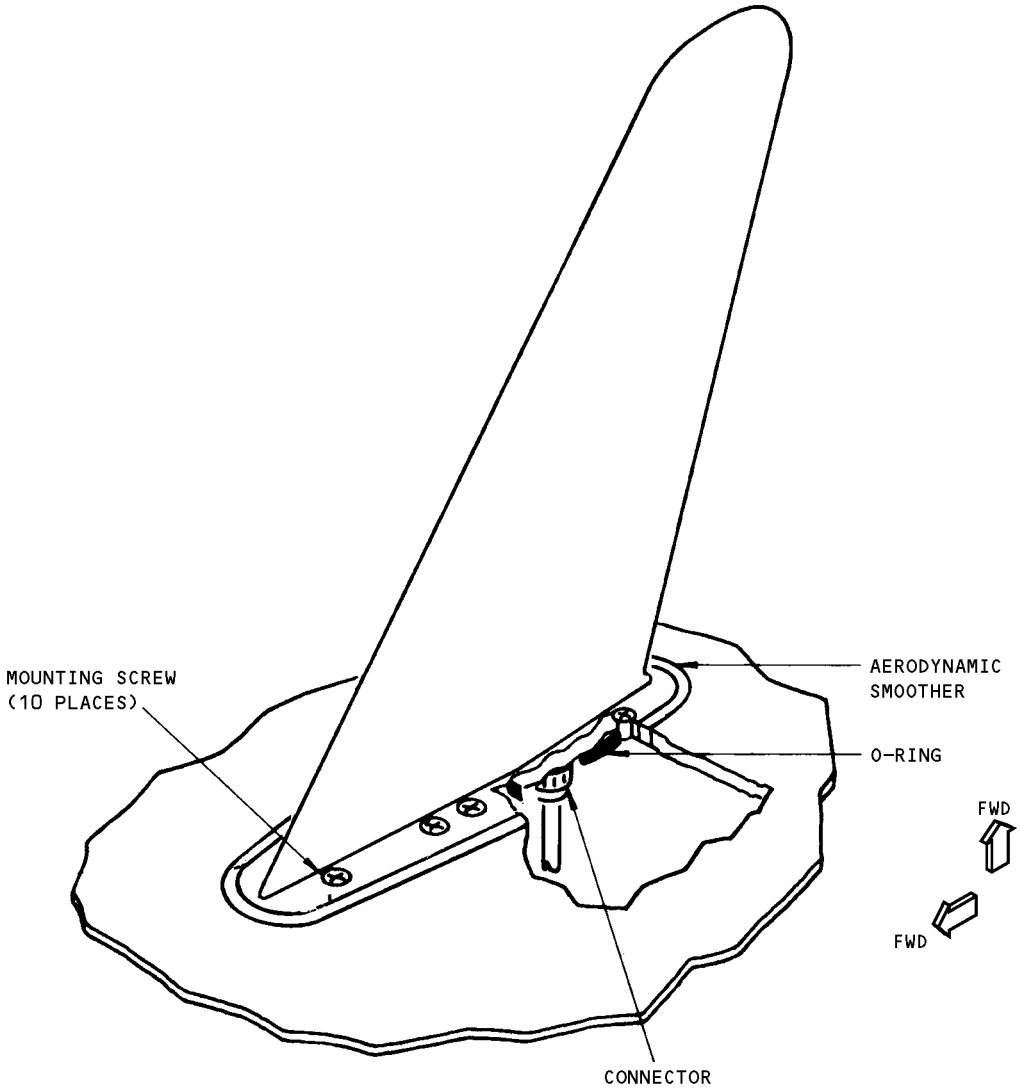
VHF ANTENNA - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Cleaning Solvent - BMS 3-2, Type I
   B. Gauze
   C. Aerodynamic smoother - BMS 5-13
2. Remove VHF Antenna (Fig. 401)
   A. Remove aerodynamic smoother around the antenna base.
   B. Remove ten mounting screws from antenna base.
   C. Separate antenna from airplane.
   D. Tilt antenna to one side and expose antenna electrical connector and cable on aft end of antenna base.

      NOTE: On upper antenna, secure cable so that it cannot fall into airplane.

   E. Disconnect antenna from connector.
   F. Remove O-ring.
3. Prepare to Install VHF Antenna
   A. Clean antenna base and antenna mount on fuselage with cleaning solvent.
   B. Dry and remove any traces of dust and solvent with clean dry gauze.
   C. Apply water resistant compound to mating surfaces (Ref 51-21-91, Cleaning/Painting).
   D. Check O-ring for damage; if damaged, replace with new O-ring.
4. Install VHF Antenna
   A. Install O-ring.
   B. Connect connector to antenna and tighten securely.
   C. Tilt antenna into position; install ten mounting screws and tighten.
   D. Apply aerodynamic smoother (sealer) around antenna base.
   E. Conduct bonding check (Ref 23-21-11, Inspection/Check).





DETAIL A

VHF Antenna Installation
Figure 401

VHF ANTENNA - INSPECTION/CHECK

1. General
   A. The following bonding check should be conducted any time that a VHF antenna has been reinstalled (Ref 23-21-11 R/I).
2. Equipment and Materials
   A. Bonding Meter (Ref 20-22-01)
3. Check VHF Antenna Bonding
   A. Measure dc resistance between antenna base and fuselage structure per 20-22-01. Resistance should not exceed 0.1 ohm.

SELCAL SYSTEMS - DESCRIPTION AND OPERATION

PRS 1. General

A. Two identical selcal (selective calling) systems are installed in the aircraft. A four tone alert signal from a ground station, is sent to an airplane VHF or HF system and is detected by the selcal system. The selcal system alerts the crew members by means of a light and a chime whenever a message is to be received on one of the communication systems.

B. The selcal systems are composed of a decoder, chime, and selcal control panel. The decoder is located in electronic equipment rack (E2-2). The chime is enclosed within the aural warning devices box on the forward right side of the control stand. The selcal control panel is installed on the forward electronic section of the control stand. (See figure 1.)

C. Selcal system No. 1 obtains 28 volts dc from switched electronics bus No.1 on circuit breaker panel P18. Selcal system No. 2 obtains 28 volts dc from switched electronics bus No. 2 on circuit breaker panel P6.

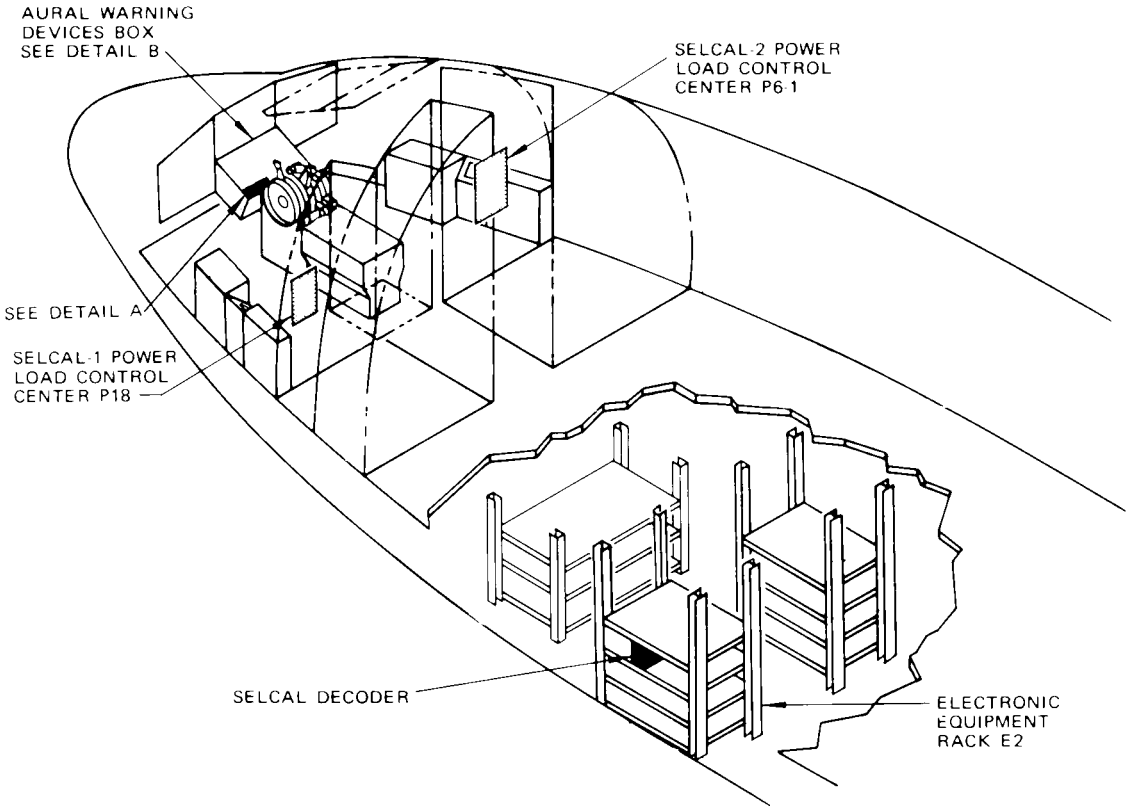
2. Decoders

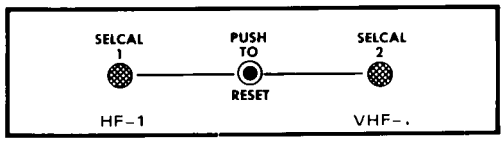
A. The selcal decoder consists of two separate decoder units in a common case. The number one unit is connected to HF No. 1 and the number two unit is connected to VHF No. 1 system receiver. Each unit consists of an audio amplifier, dc amplifier, control relays and vibrasponder resonant reed assemblies. (See figure 2.)

B. The decoder unit audio amplifier consists primarily of two stages of amplification followed by push-pull power amplifier. The power amplifier is capacitively coupled to the coils of twelve vibrasponders (resonant reed assemblies). When a tone signal is received, the signal is amplified and fed to the coils of the vibrasponders. An AGC circuit is provided to maintain proper drive for the vibrasponders.

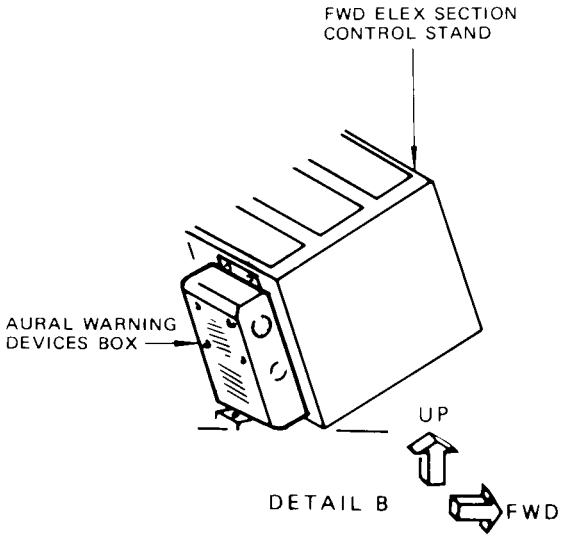
C. The dc amplifier consists of the vibrasponder contactors, filter network and an amplifier. When the proper combination of tones is impressed on the vibrasponders, the vibrasponder reeds vibrate and complete the circuit through the reed contacts to the filter network and amplifier. When the amplifier is operating a circuit is completed through a decoder relay. When the decoder relay is closed, a voltage is applied to the coil of the relay causing it to effectively latch closed.

D. With the decoder relay energized, three sets of contacts are actuated. One set causes the relay to latch closed as described. A second set of contacts applies power to an oscillator relay circuit. The third set of contacts complete power to the selcal indicator light. The oscillator relay receives power through the decoder relay and thus becomes energized. When energized, two sets of contacts are operated. One set closes a circuit to the selcal system chimes. The second set of contacts grounds the capacitor and transistor oscillator circuit connected to the relay coil. Since the relay is in a time delay circuit, it will remain closed momentarily and then open. After it opens, the capacitor will charge and the relay coil will again receive power. The close-open cycle will repeat until the decoder is reset.



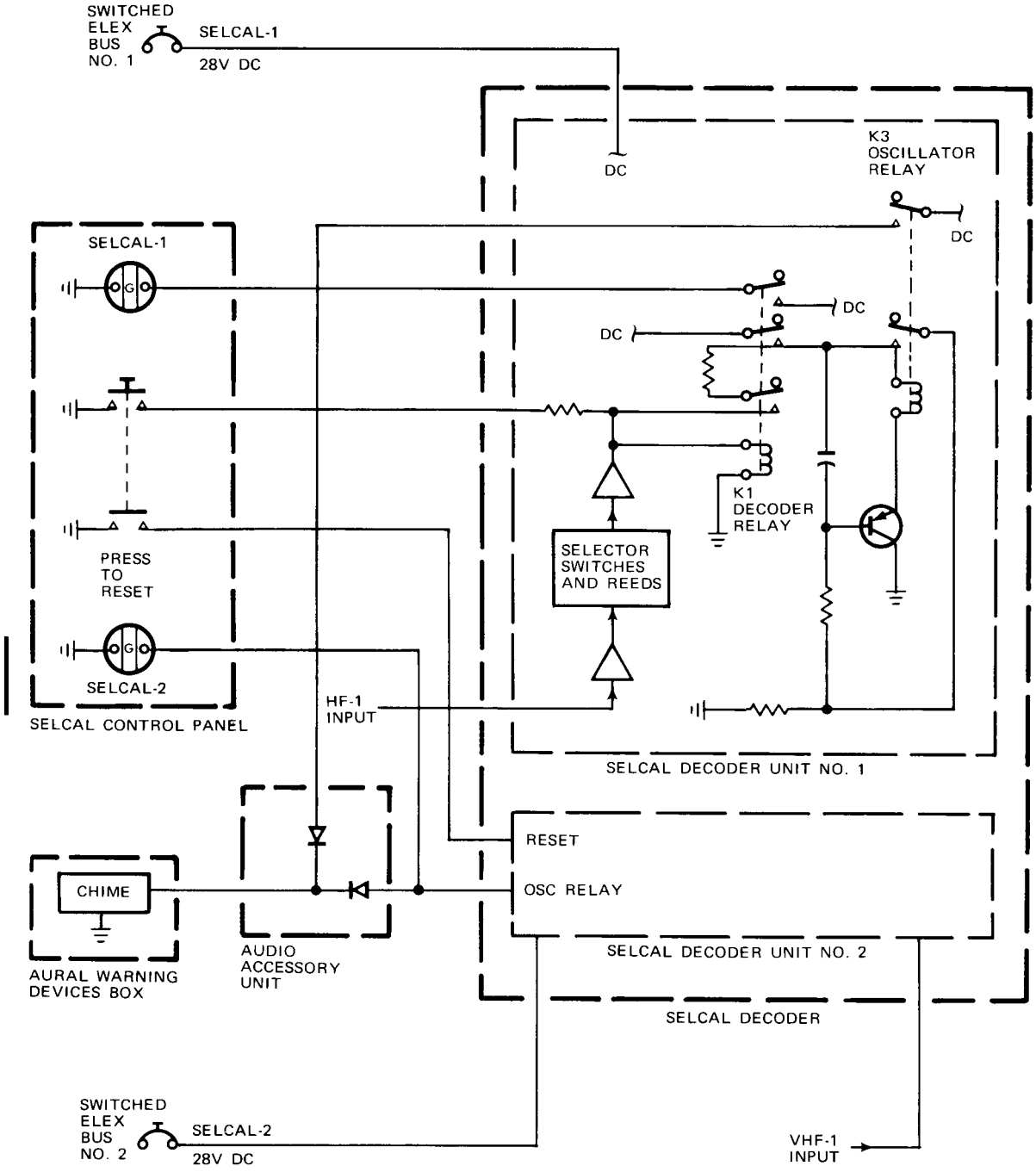


DETAIL A



DETAIL B

Selcal System Component Location
Figure 1



Selcal System Schematic
Figure 2

E. A reset circuit is completed whenever the toggle switch on the selcal panel is held to RESET. When the reset circuit is operated, power to the decoder relay is grounded causing the decoder relay to open. When the decoder relay opens, the oscillator relay is de-energized and the system is reset.

3. Chime

A. An electrical chime is in the aural warning devices box with other aural warning components. The chime will emit a two-tone signal each time the oscillator relay of a decoder unit closes. The chime is connected to both decoder unit No. 1 and decoder unit No. 2 oscillator relays; therefore, it will operate whenever either decoder unit receives the proper tone combination through the respective HF or VHF communication receiver. (See Aural Warning and Call Devices, Chapter 31.)

4. Operation

A. Operation of the selcal systems is dependent upon the fact that each airplane is assigned a particular four-tone audio combination for identification purposes. A decoder is installed in the airplane to detect only the identification tones assigned to the airplane. Whenever a ground station attempts to communicate with a particular aircraft on HF or VHF, they will transmit the proper identification tone combination for that airplane. Provided the proper frequency is selected on the HF or VHF system for the area in which the pilots expect to receive communications, the airplane selcal decoder will detect the tones and operate a chime and a green selcal alert light to indicate to the crewmembers that communication on HF or VHF is desired from a ground station.

B. The selcal system may be reset by pressing the RESET button located on the Selcal control panel. The selcal light will then go out and the chimes will stop.

SELCAL SYSTEM - TROUBLESHOOTING

1. General
   A. Since both selcal decoder units are housed in a single case, failure of either selcal system requires the entire decoder to be replaced in electronic equipment rack E2. The selcal tones may be monitored with the flight interphone system headphones and associated VHF system to verify whether the decoder is receiving the tones. If the chime fails to operate when selcal tones are received, replace the aural warning devices box. If the selcal tones are not received, replace the decoder. If the selcal tones are still not received, replace the associated control panel.

SELCAL SYSTEMS - ADJUSTMENT/TEST

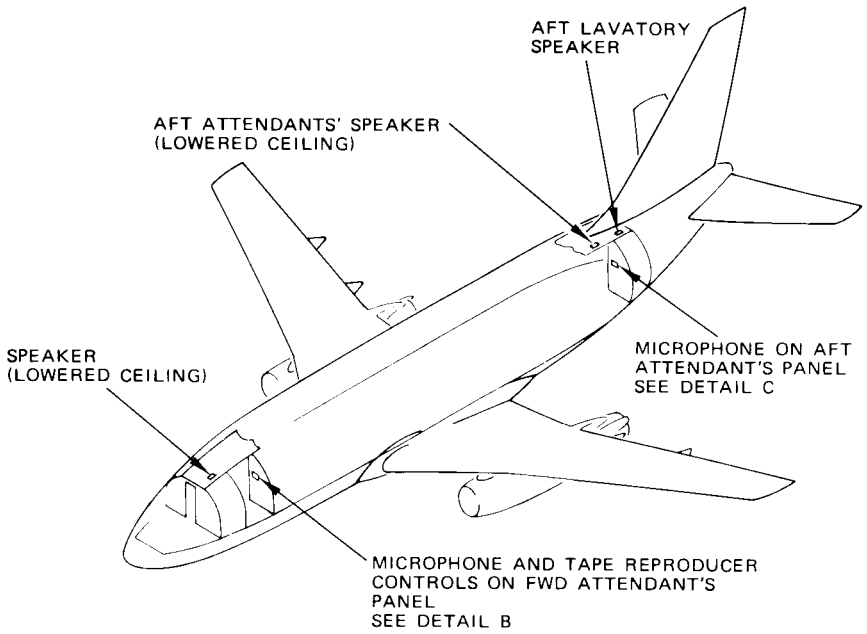
1. Selcal Systems Test
   A. General
      (1) The following test is intended to check for proper operation of the selcal decoders and connected lights and chime whenever a coded signal is received over the respective HF or VHF system.
      (2) The airplane shall be located with respect to the ground station such that there are no buildings or other obstacles in the transmission path between ground station and airplane.
   B. Equipment Required
      (1) Selcal Ground Station Encoder - Motorola N-1001A/NA128 (rack-mounted) or N-1000A/NA127 (Console)
      (2) VHF Transmitter
      (3) HF Transmitter
   C. Prepare to Test
      (1) Connect external power to the airplane.
      (2) Ensure power is available to load control centers P6 and P18, and both master radio switches are closed.
      (3) Ensure Selcal, Interphone, HF and VHF circuit breakers are closed.
      (4) Turn on HF-1 and VHF-1 systems and confirm systems are operable.
      (5) Make arrangements for ground operator to transmit selected code signals as necessary. Transmissions shall be made only on authorized frequencies.
   D. Test Selcal Systems
      (1) Select an authorized test frequency on HF-1 control panel.
      (2) Contact ground station and have operator transmit code signal on the desired test frequency.

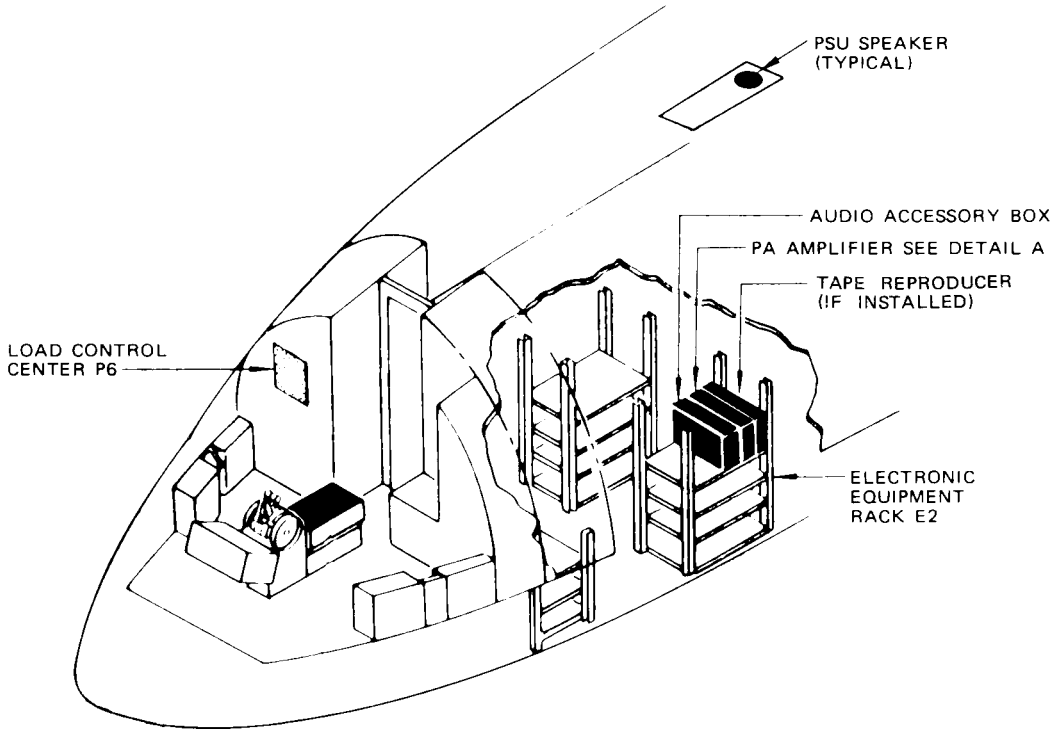
          NOTE: Airplane selcal code is marked on a placard located on the main instrument panel. Voice communication shall not be made during code transmissions.

          (a) The selcal No. 1 light should illuminate.
          (b) The chime shall emit a repetitive tone.
      (3) Press the RESET button on the control panel. The light should go out and the chimes stop.
      (4) Repeat steps D.(1) through D.(3) using VHF-1 system, results should be similar.
      (5) Secure HF and VHF systems.
      (6) Determine whether there is any further need for electrical power on the airplane; if not, remove external power.

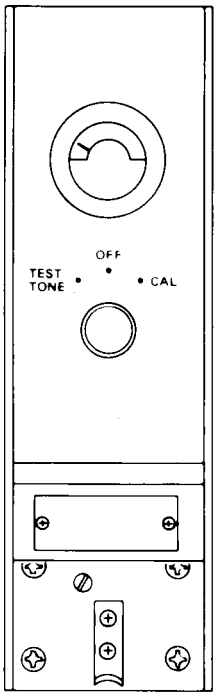
PASSENGER ADDRESS SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The passenger address (PA) system provides means of communicating with the passengers and entertaining them with recorded music played over the speakers in the passenger compartment. It also provides chime signals upon command to attract the attention of flight attendants as well as passengers. Announcements may be made using any of the three hand microphones or using the microphones and audio selector panels in the flight interphone system.
   B. The passenger address system consists of a PA amplifier, loudspeakers, a tape reproducer, a control knob on the forward attendant's panel, and interconnecting wiring. On airplanes LV-LIV thru LV-VIW, the tape reproducer is not installed.
   C. Power for the system is 28 volts dc and 115 volts ac provided through circuit breakers on the P6 panel.
2. Passenger Address Amplifier
   A. The passenger address amplifier provides high-quality audio power to the speaker system of the airplane. It includes microphone inputs for use by the pilot and cabin attendants and two balanced inputs for use with tape reproducers for announcements and programmed music. The amplifier has high, high/low, and low chimes for use by the pilot and passengers.
   B. The amplifier unit consists of a two-level chassis with an attached front panel and dust cover. A three-position rotary switch and a meter are located on the front panel. The center position of the switch is normal (OFF), but the meter is connected across the output load. The spring-loaded CAL position allows the unit to be tested for a predetermined output and supplies a tone for checking the speakers.
   C. An access hole is provided on the front panel for adjustment of the master level control. All other controls are accessible with the dust cover removed. The amplifier has chime and auxiliary circuits on removable subchassis assemblies located in the upper and lower sections of the main chassis.
   D. The amplifier uses silicon semiconductors to provide 60 watts of high-quality audio power to an 83-ohm loudspeaker system. It accepts audio signals from transistorized microphones, carbon microphones, tape reproducers, automatic message annunciators, or other call/alert devices. It amplifies them for reproduction through a loudspeaker system and through headphones for sidetone.
   E. The five inputs have individual level controls and solid-state priority switching. Photo switches are used in the input for dc voltage control of the audio inputs. Thus, key click is eliminated and isolation between control circuits and audio paths is provided. Priority of switching follows numerical order, with input 1 being first in priority. A compression amplifier, used with all microphone inputs, ensures an equal audio output level even though different levels are applied to the input.



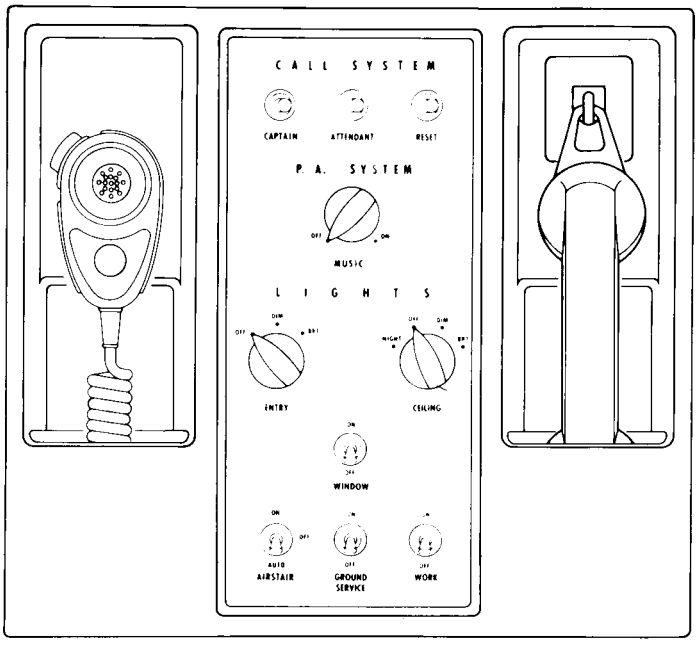


Passenger Address System Component Location
Figure 1 (Sheet 1)



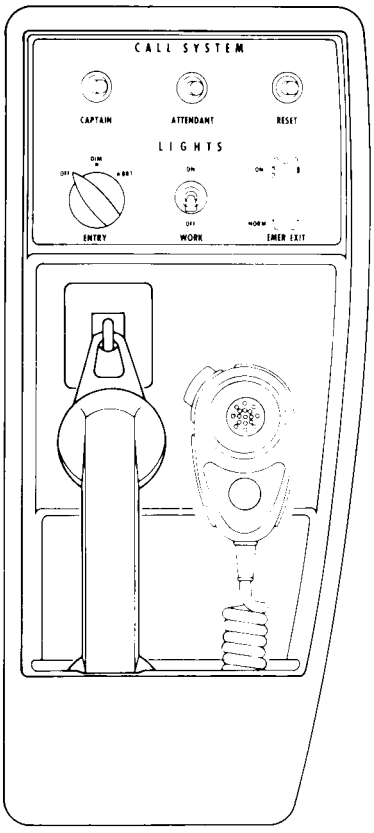
PA AMPLIFIER

DETAIL A



FORWARD ATTENDANT'S PANEL

DETAIL B



AFT ATTENDANTS' PANEL

DETAIL C

Passenger Address System Component Location
Figure 1 (Sheet 2)

F. The volume level of the audio system is changed to overcome the variations between ground and flight noise by an engines on/off control switch which is installed to operate automatically. Operation of this switch results in a reduced audio output when the engines are off.

G. The master level control makes it possible to tailor the gain of the amplifier to a particular aircraft according to its size and acoustical characteristics. A 5-watt auxiliary amplifier in the amplifier minimizes acoustical feedback from the attendant's station and also allows desired chime tones to be sounded only in the attendant's speakers.

H. In the high chime (587-Hz tone) and high/low chime (587-/494-Hz tones) will sound only when the passenger or the pilot signals. The low (494-Hz tone) chime will sound when either the fasten-seat-belt or no-smoking sign is turned on or off.

I. The battery bus provides 28 volts dc to the amplifier through the PA AMPLIFIER circuit breaker on P6.

3. Loudspeakers

A. Loudspeakers are located in the ceiling panels in alternate passenger service units (PSU's). The forward and aft attendants each have a 5-inch speaker located in the center ceiling panel at the attendant's station. A 5-inch speaker is located in each lavatory.

4. Hand Microphones

A. Hand microphones are located on hooks at the attendant's panels and the aft end of the control stand. The PTT button on the microphone must be pressed to transmit. Each microphone is equipped with a plug connector so it may be easily replaced or used at another station.

5. Tape Reproducer

A. The tape reproducer provides an aircraft with high-fidelity monaural sound entertainment while in flight or on the ground. The equipment is designed for remote operation. It employs a standard 1/4-inch wide prerecorded magnetic tape (3.75 IPS) to provide 3 hours of uninterrupted programming.

B. The reproducer consists of a main chassis and tape transport mechanism, a power supply module, a relay control module, and a preamplifier module. The modular subassemblies are provided with connectors to facilitate removal for maintenance.

C. A synchronous capstan drive motor is coupled to the capstan by a resilient belt drive and a heavy, balanced flywheel. Two ac torque motors are coupled to the reel hubs. Tape tension is sensed by the takeup tension arms which are also associated with the automatic functions of reversal and shutoff. The automatic shutoff provision protects against tape damage from low power supply voltage or improper tape tension. In addition, the tape transport reverses at the end of each direction of run. The motor circuit incorporates a time delay which allows the drive motor to reach synchronous speed upon starting without wow or other detracting characteristics. The heads are switched automatically during reversal.

D. The power supply module provides the dc and ac voltages required by the tape transport and electronic circuits.

E. The relay control module incorporates the necessary relays and time delays for manual and automatic operating sequences, a voltage sensing circuit which allows the equipment to operate over a proper voltage range, and a filter for internal dc power.

F. The preamplifier increases the signal level from the tape heads sufficiently to drive an amplifier. Loudspeaker volume, bass, and treble controls are provided in the preamplifier. The preamplifier volume may also be controlled by a remote volume control on an attendant's panel.

6. Attendant's Panels (Fig. 1)

A. The forward attendant's panel contains the integral volume control and on-off switch for the tape reproducer, the hand microphone used for PA announcements. The aft attendant's panel contains the hand microphone. Both attendant's panels also contain the control buttons for the call system and light controls.

7. Operation (Fig. 2)

A. The passenger address system may be used to communicate with anyone in the passenger compartment, announcements and sign posted chimes, and music are heard by the passengers over the PSU speakers and lavatory speakers. The crew call chimes are also heard over the attendant's speakers.

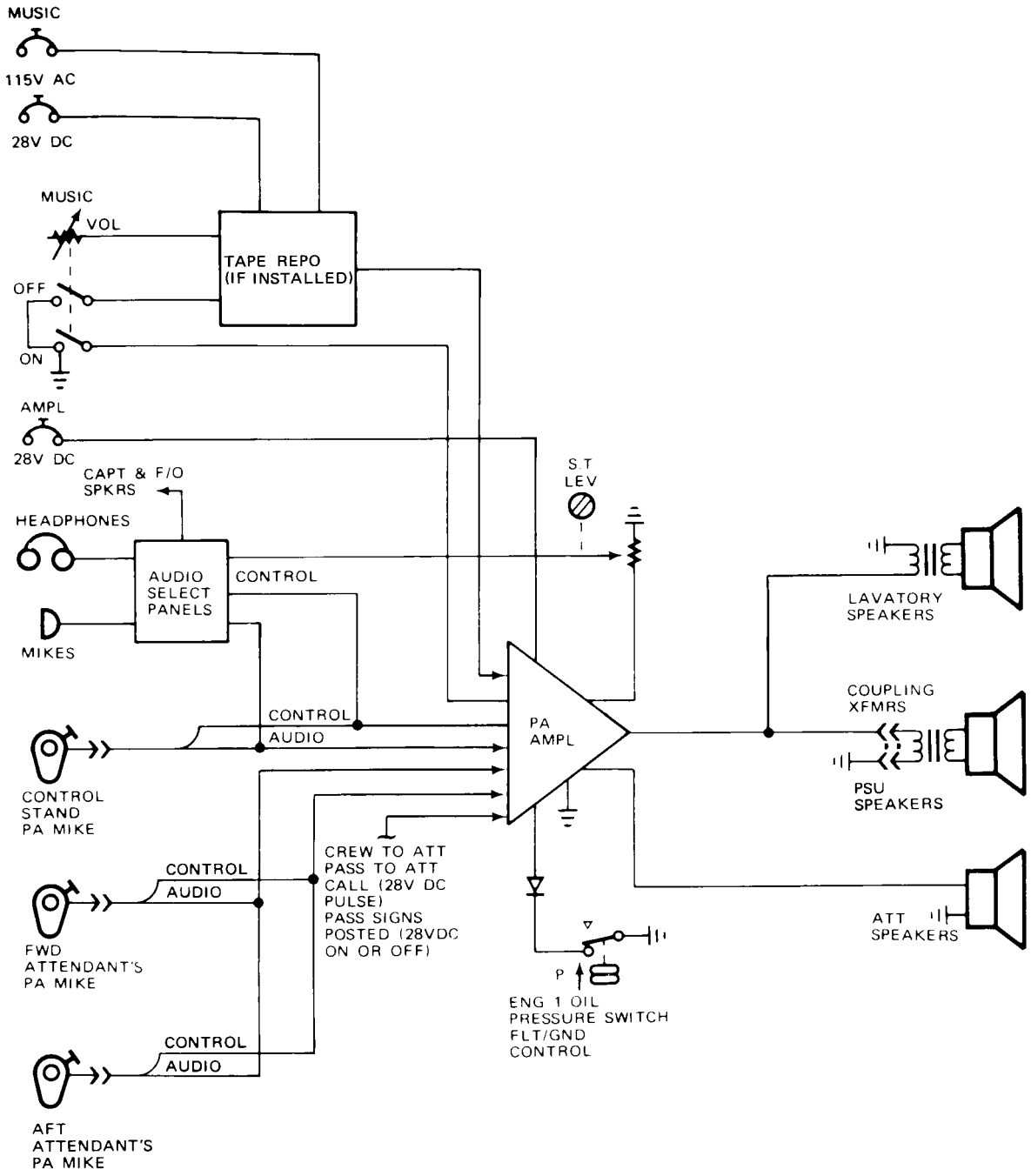
B. Music and all announcements are amplified by the PA amplifier. Switching in the amplifier assigns a priority to each input which causes any higher priority input to interrupt any lower priority input. In descending order the priorities are (l) pilot's announcements, (2) attendant's announcements, (3) prerecorded announcements, and (4) boarding music.

C. A control signal from a PTT switch enables voice audio to be amplified. Sidetone is returned to the pilots through the interphone system. A flight/ground level signal from the oil pressure indicating system establishes the audio level to the speakers. When the airplane is on the ground and engines not running, the level of speaker audio is reduced from that of flight conditions by 6 db.

D. Music from the music reproducer is sent to the amplifier when the music switch-volume control on the forward attendant's panel is turned on and adjusted.

E. A self-test switch on the front panel of the PA amplifier may be used to check the operating status of the system. When the switch is set to TEST TONE, test signals cause the amplifier to produce an audible tone which may be heard over the loudspeakers. When the switch is set to CAL, the front panel meter is switched across an internal load for checking power output. The OFF position is used for normal system operation.

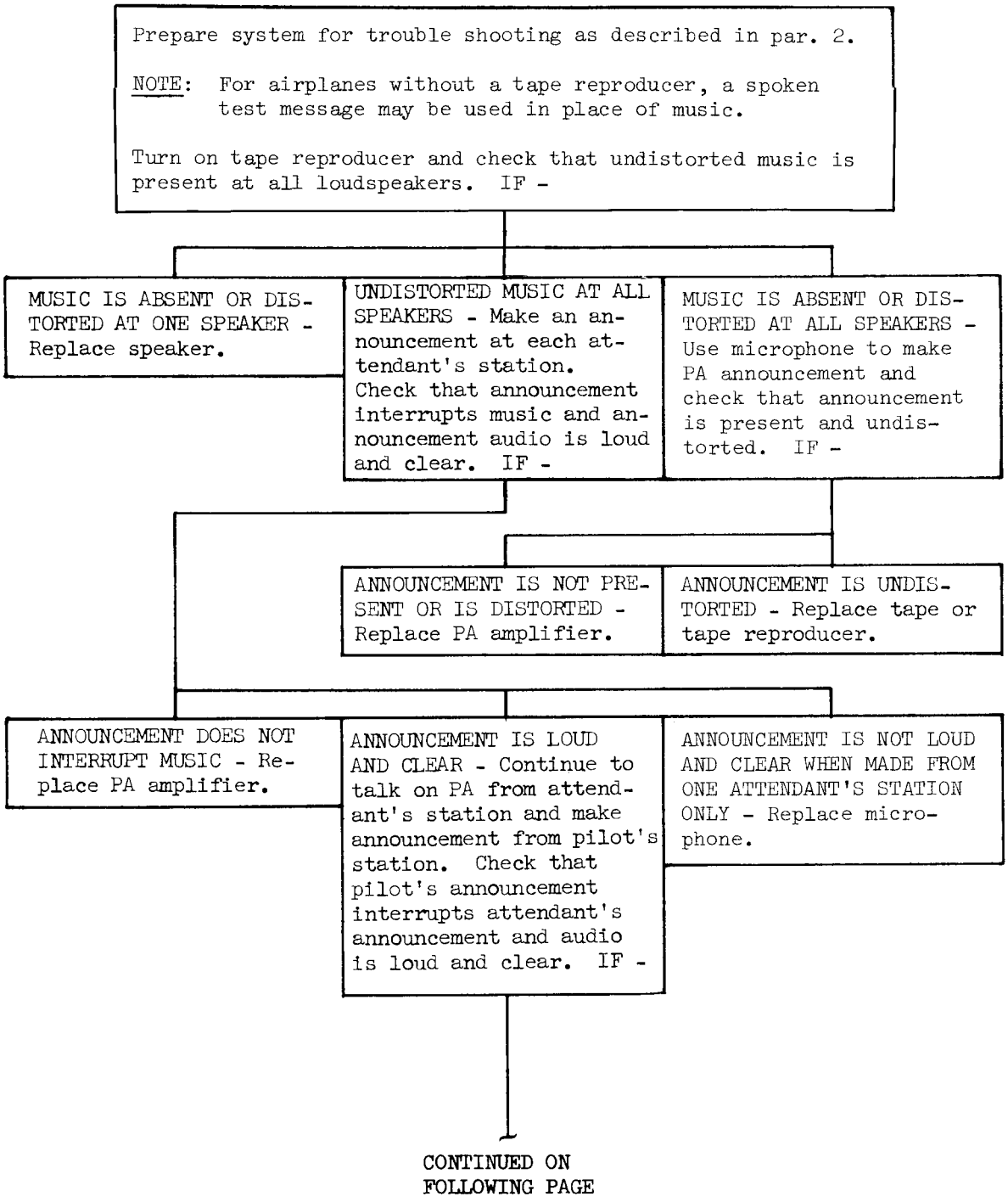
F. A chime within the PA amplifier sounds a single high tone over the loudspeaker when a passenger presses his attendant call switch. A two-tone chime is heard over the loudspeakers for crew call. A single low tone is heard when a passenger sign is posted.



Passenger Address System Circuit
Figure 2

PASSENGER ADDRESS SYSTEM – TROUBLESHOOTING

1. General
   A. The following troubleshooting procedures are based on performance of the system operational test and are presented in a tree-type format to aid in rapid fault isolation.
   B. When a test step does not check out, find the box containing the trouble symptom and perform the stated action. Continue to follow a single line by analyzing the results of each test step until the required corrective action is determined. Perform the specified corrective action, then repeat the step at which the failure was encountered and complete the test to check out the system.
   C. All troubleshooting procedures are based on the assumption that wiring is OK and that electrical power is available. If the corrective action in the procedure does not correct the problem, check wiring using the wiring diagram.
2. Prepare for Troubleshooting
   A. Provide electrical power to airplane.
   B. Check that the following circuit breakers on P6 are closed:
      (1) PA AMPLIFIER
      (2) TAPE REPRODUCER DC
      (3) TAPE REPRODUCER AC
      (4) FLT INPH AMPL
      (5) CAPT & OBS
      (6) F/O & E/R
   C. Check that the following circuit breakers on P18 are closed:
      (1) PASS SIGN CONTROL
      (2) PASS & CREW CALL
   D. Turn on captain's and first officer's flight interphone loudspeaker.



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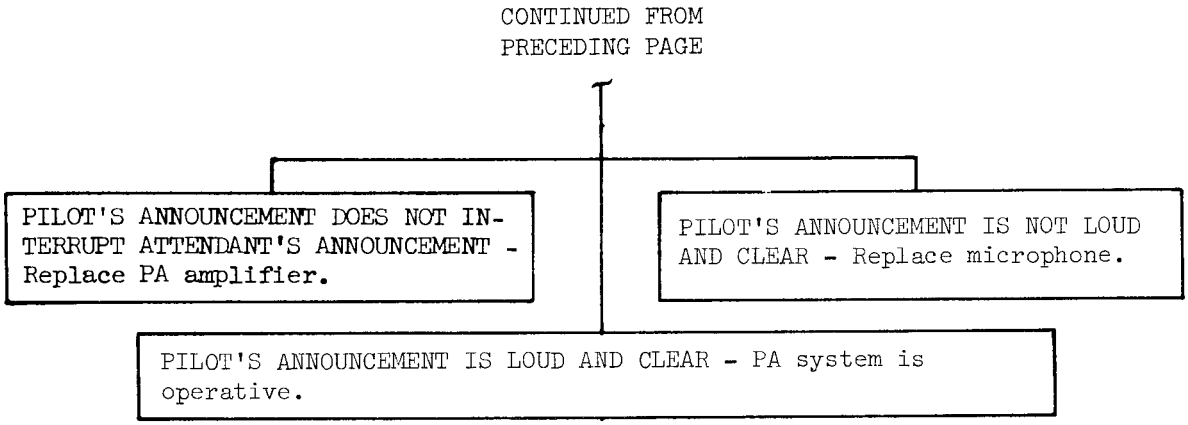
Passenger Address System
Figure 101 (Sheet 1)



Passenger Address System
Figure 101 (Sheet 2)

PASSENGER ADDRESS SYSTEM - MAINTENANCE PRACTICES

1. General
   A. The following is a speaker test that applies to all airplane installation configurations. A random noise input is applied to the microphones and the speaker audio output is measured. This is not a passenger cabin audio level test. The passenger cabin audio level is a function of speaker size and the number of speakers installed in the cabin. Basic airplane design determines the number of speakers installed. If the individual speaker audio level output is within specified tolerances, the passenger cabin audio level will meet minimum requirements.
2. Equipment and Materials
   A. Random Noise Generator - Model 543-1, Pacific Electro Dynamics
   B. Sound Level Meter - GR-1565-A, General Radio
3. Prepare to Test
   A. Provide electrical power to airplane.
   B. Check that all interphone and PA system circuit breakers are closed.
4. Test Passenger Address System
   A. Closely couple noise generator to sound level meter.
   B. Set sound level meter to C weighted scale.
   C. Set noise generator PWR/PTT switch to ON and OUTPUT switch to SPKR. Check that sound level meter indicates 100 ±1 dbA.

      NOTE: If reading is outside tolerance, check batteries of both units. If batteries are good adjust noise generator for correct output.

   D. Closely couple noise generator to PA microphone/handset at flight crew station.
   E. Press PTT switch on microphone/handset.
   F. Closely couple sound level meter to cabin speaker, moving meter across face of speaker for maximum indication on meter.

      NOTE: Do not measure output of speaker while meter is in motion as noise generated by movement may give a false indication.

   G. With sound level meter set to C weighted scale, check that speaker output is 99 +10-2 dbA.
   H. Place PA system in flight mode of operation (Ref Passenger Address System - Adjustment/Test).
   I. Repeat step G. Check that audio level increases by 6 dbA.
   J. Place PA system in ground mode of operation.
   K. Repeat steps D thru G for remaining passenger cabin speakers.
   L. Repeat steps D thru G for other PA microphones/handsets.
   M. Disconnect test equipment.

N. Remove electrical power if no longer required.

PASSENGER ADDRESS SYSTEM - ADJUSTMENT/TEST

1. General
   A. Paragraph 2 of this section gives the procedure for an operational test of the system. Satisfactory completion of this test will provide assurance that the system is fully operative.
2. Passenger Address System Operational Test
   A. Prepare to Test
      (1) Provide electrical power to airplane.
      (2) Check that the following circuit breakers on P6 are closed:
         (a) PA AMPLIFIER
         (b) TAPE REPRODUCER DC
         (c) TAPE REPRODUCER AC
         (d) FLT INPH AMPL
         (e) CAPT & OBS
         (f) F/O & E/R
      (3) Check that the following circuit breakers on P18 are closed:
         (a) PASS SIGN CONTROL
         (b) PASS & CREW CALL
      (4) Turn on captain's and first officer's flight interphone loudspeaker.
   B. Test Passenger Address System
      (1) At forward attendant's panel (Standard Passenger Airplanes), or aft attendant's panel (Passenger/Cargo Convertible Airplanes) turn on music and adjust it to a comfortable listening level.

         NOTE: For airplanes without a tape reproducer installed, a spoken test message must be used in place of music.

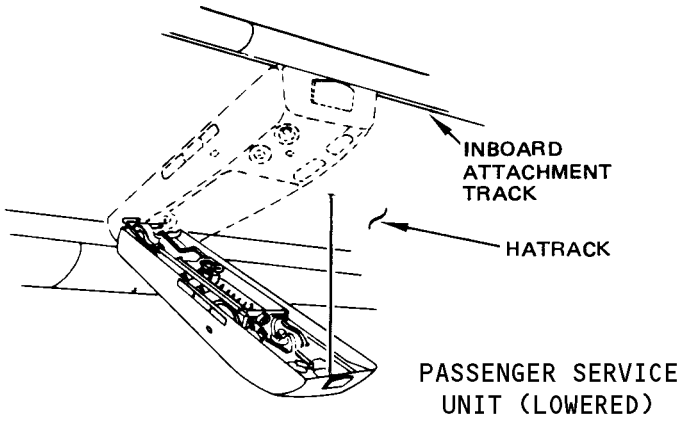
      (2) Check that music is at the same level and is clear in all PA speakers except attendant's speakers.
      (3) Rotate the volume control on the forward attendant's panel and check that the audio level varies smoothly throughout the entire range.
      (4) Turn on PA audio on captain's audio selector panel and check that music is present at captain's speaker.
      (5) Make an announcement from the forward attendant's station and check that announcement is loud and clear at any PA speaker and that it interrupts music.
      (6) While making an announcement from the forward attendant's station, make an announcement from the control stand PA microphone or handset as applicable and check that attendant's announcement is interrupted and check that PA sidetone is present in captain's earphones.

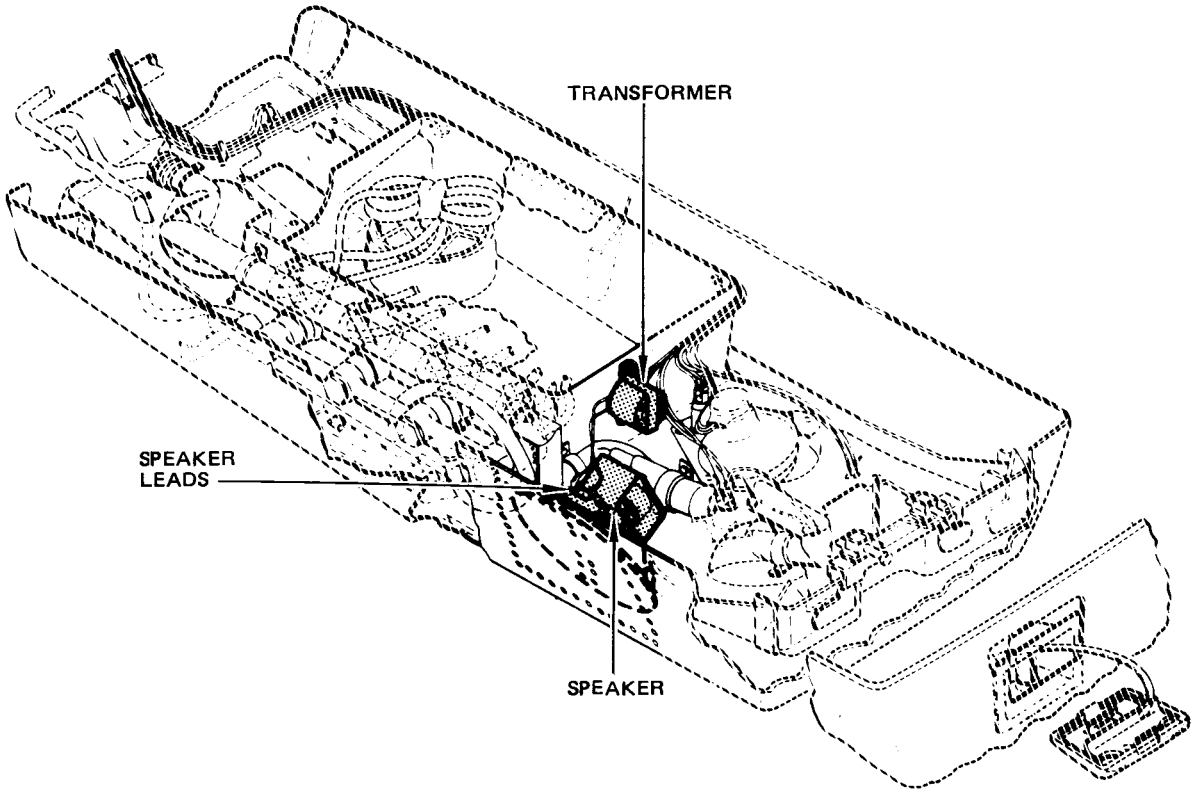
         NOTE: The PA sidetone may be adjusted to a comfortable listening level with the PA sidetone potentiometer on the front of the audio accessory unit.

(7) Select PA microphone on captain's audio selector panel.
(8) While making an announcement from the forward attendant's station, make an announcement from captain's station through flight interphone system and check that attendant's announcement is interrupted.
(9) Make an announcement from rear attendant's panel and check that announcement is loud and clear at any PA speaker.
(10) While listening to music, disconnect D4147J at E2-1 and check that audio level increases.
(11) Reconnect D4147J.
(12) Turn off music and interphone speakers.
(13) Press call button at a PSU and check for a high tone.
(14) Reset call button.
(15) Press ATTENDANT call button at forward attendant's panel and check for a high tone followed by a low tone.
(16) Set FASTEN BELTS switch on overhead panel P5 to ON and check for low tone in passenger cabin.
(17) Set FASTEN BELTS switch on overhead panel P5 to OFF and check for low tone in passenger cabin.
(18) Remove electrical power if no longer required.

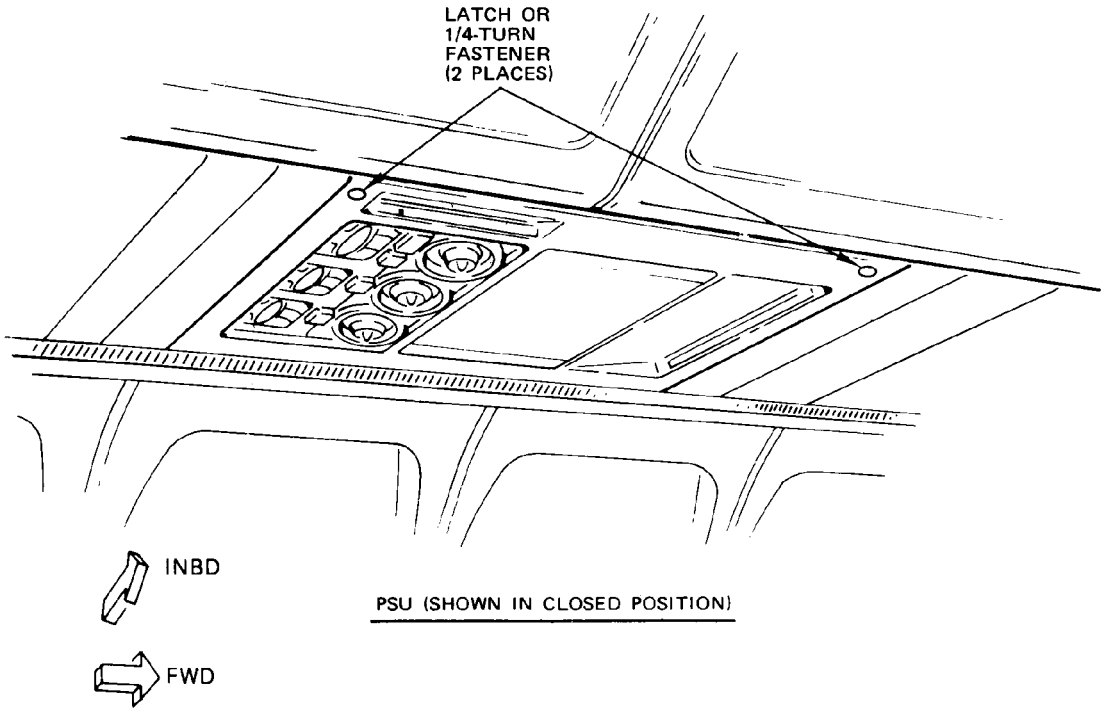
PASSENGER ADDRESS LOUDSPEAKERS - REMOVAL/INSTALLATION

1. General
   A. The passenger loudspeakers are installed in the PSUs (passenger service units) in the passenger cabin.
   B. Each attendant loudspeaker is installed in a center ceiling panel at the attendant station.
   C. Lavatory speakers are installed in the ceiling PSUs in the lavatories.
   D. Do the Test Loudspeaker Installation steps after you complete the installation steps.
2. Prepare for Speaker Removal and Installation
   A. Open the following circuit breakers on P6:
      (1) PA AMPLIFIER
      (2) TAPE REPRODUCER DC
      (3) TAPE REPRODUCER AC
3. Removal/Installation of PSU (Original Interior) (Fig. 401)
   A. Remove Passenger Address Loudspeaker
      (1) Lower passenger service panel (Ref Chapter 25, Maintenance Practices).
      (2) Identify and then detach two leads on loudspeaker.
      (3) Remove two fasteners and remove speaker.
      (4) Close passenger service panel.
   B. Install Passenger Address Loudspeaker
      (1) Lower passenger service panel (Ref Chapter 25, Maintenance Practices).
      (2) Install loudspeaker with two fasteners.
      (3) Attach leads to loudspeaker.
      (4) Close passenger service panel.
4. Removal/Installation of PSU Loudspeaker (New Look Interior) (Fig. 402)
   A. Remove Loudspeaker
      (1) Release two 1/4-turn fasteners on PSU or insert small rod or similar device into hole near each inboard corner of PSU and push to release latch (use care not to mar PSU surface) and lower PSU until lanyard is taut.
      (2) Identify and then detach two leads from loudspeaker.
      (3) Unfasten speaker and remove.
      (4) Raise PSU and check that latches or 1/4-turn fasteners are engaged.
   B. Install Loudspeaker
      (1) Release two 1/4-turn fasteners on PSU or insert small rod or similar device into hole near each inboard corner of PSU and push to release latch (use care not to mar PSU surface) and lower PSU until lanyard is taut.
      (2) Install loudspeaker with four fasteners.
      (3) Attach speaker leads.

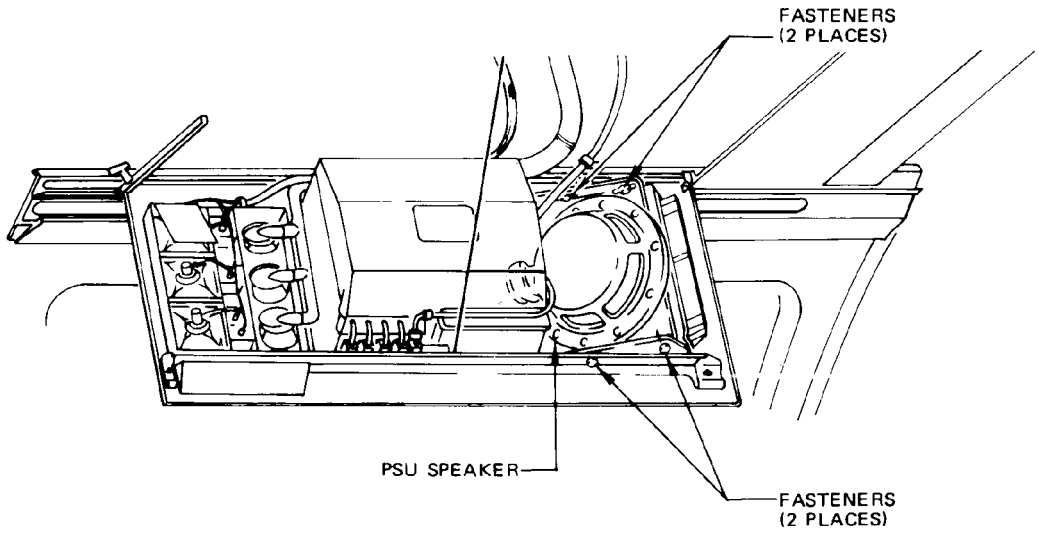




PSU Loudspeaker Installation (Original Interior)
Figure 401



PSU (SHOWN IN CLOSED POSITION)

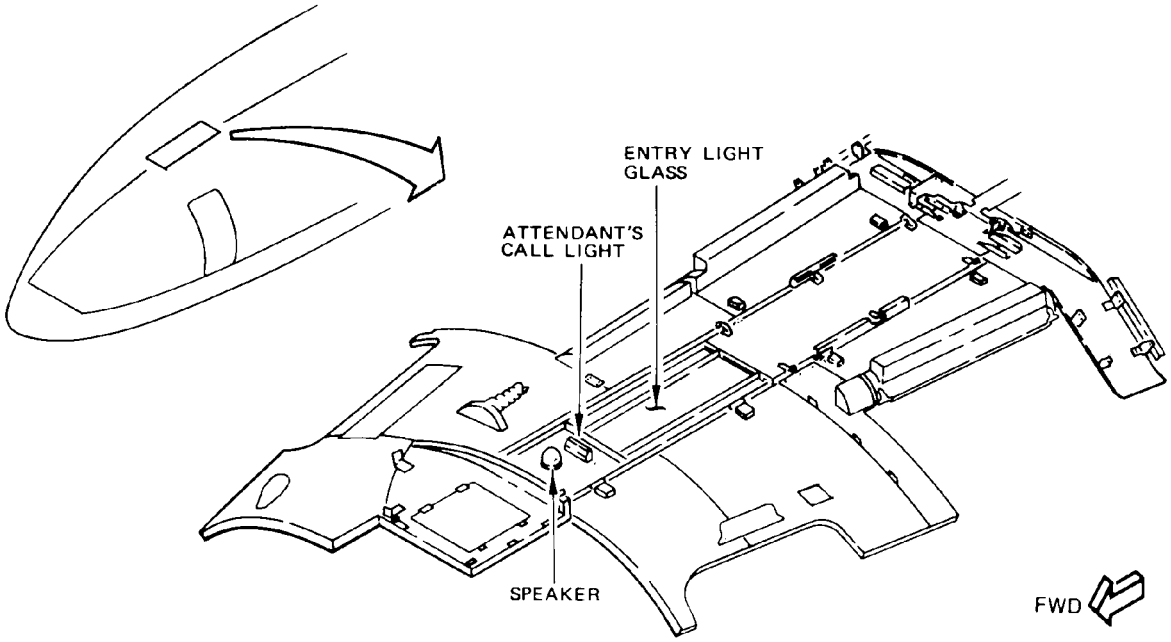


PSU (SHOWN IN LOWERED POSITION)

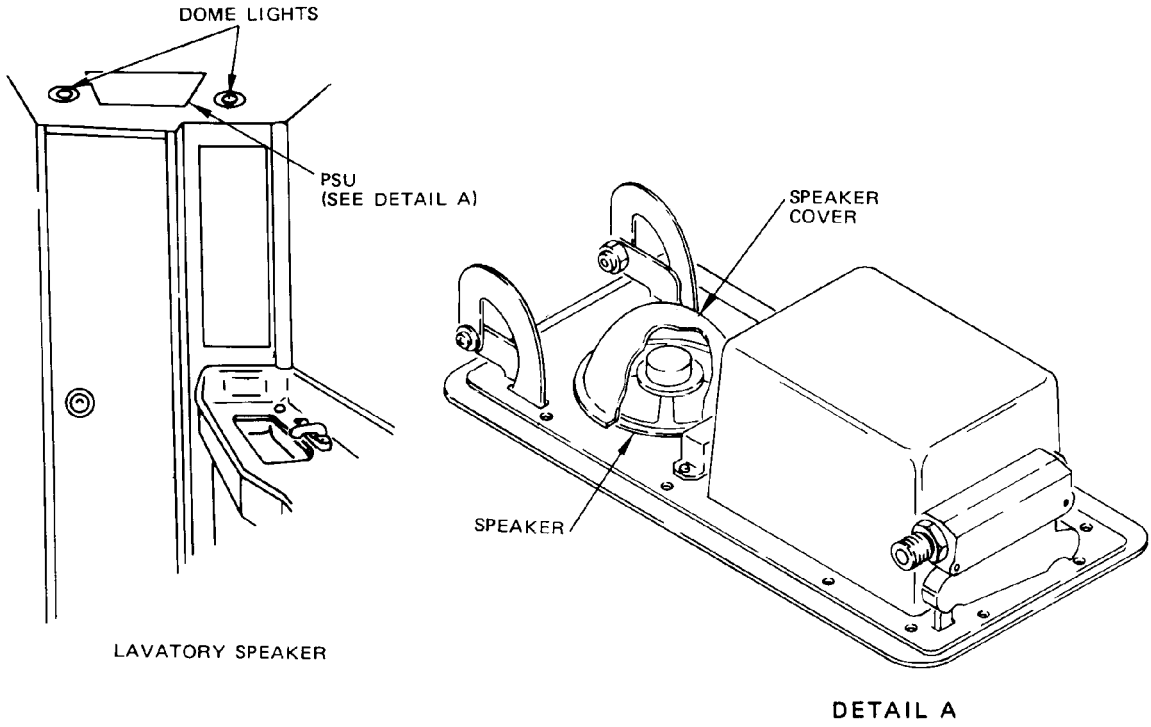
PSU Speaker Removal/Installation
Figure 402

(4) Raise PSU and check that latches or 1/4-turn fasteners are engaged.

5. Removal/Installation of Attendant's Loudspeaker (Fig. 403)
   A. Remove Loudspeaker
      (1) Release two catches and lower ceiling panel.
      (2) Identify and detach two leads from speaker.
      (3) Remove four screws, speaker cover, and speaker.
   B. Install Loudspeaker
      (1) Hold speaker and cover in place and secure with four screws.
      (2) Attach leads to speaker.
      (3) Raise ceiling panel and check that catches are fully engaged.
6. Removal/Installation of Lavatory Loudspeaker (Fig. 403)
   A. Remove Loudspeaker
      (1) Release two quick-release fasteners near each inboard corner of ceiling PSU in lavatory or insert small rod through hole in each inboard corner and push to release latches as applicable and lower PSU.
      (2) Identify and detach two leads from speaker.
      (3) Remove four screws, speaker cover, and speaker.
   B. Install Loudspeaker
      (1) Hold speaker and cover in place and secure with four screws.
      (2) Attach leads to speaker.
      (3) Raise PSU and check that latches are fully engaged.
7. Test Loudspeaker Installation
   A. Close the following circuit breakers on P6:
      (1) PA AMPLIFIER
      (2) TAPE REPRODUCER DC
      (3) TAPE REPRODUCER AC
   B. Provide electrical power.
   C. Depress the call button at a PSU and check that a single high tone is heard from the speaker.
   D. If a more definitive test of speaker output is desired, perform Passenger Address System - Maintenance Practices (Ref 23-31-0).
   E. Remove electrical power if no longer required.



Typical Attendant's Speaker Installation
Figure 403



Typical Lavatory Loudspeaker Installation
Figure 403

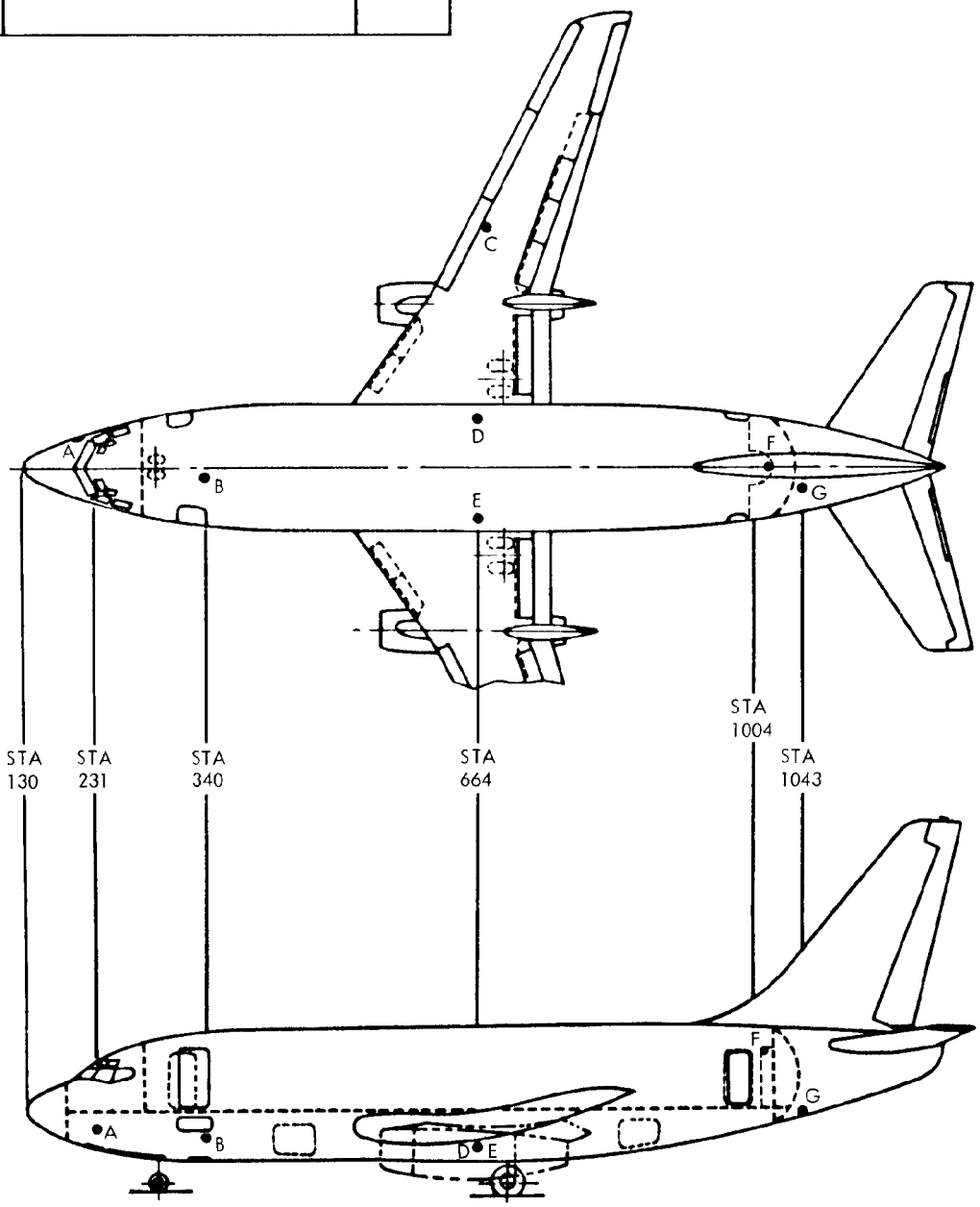
INTERPHONE SYSTEMS - DESCRIPTION AND OPERATION

1. General
   A. Two separate communication systems are installed in the airplane to enable crew members on the airplane to communicate with or signal each other and to communicate with ground personnel. These systems are: a service interphone system; the flight and ground crew call systems.
   B. The service interphone system consists of a network of handset jacks and attendants? handsets located conveniently throughout the airplane. An amplifier completes audio circuits within the system, enabling maintenance personnel and crew members to communicate with each other from various locations in or around the airplane.
   C. The flight and ground crew call systems are three basic systems which are used to call ground personnel to the airplane (ground crew call system), to call control cabin crew members to the service interphone handsets (crew call system), and to call attendants to the service interphone system (attendant call system). The ground crews attention is obtained through use of an electromechanical horn. The control cabin crew members, and attendants attention is obtained through use of chimes and lights whenever an associated call button is pressed in the respective system.
   D. Power for the systems is obtained from load control centers P18 and P6.

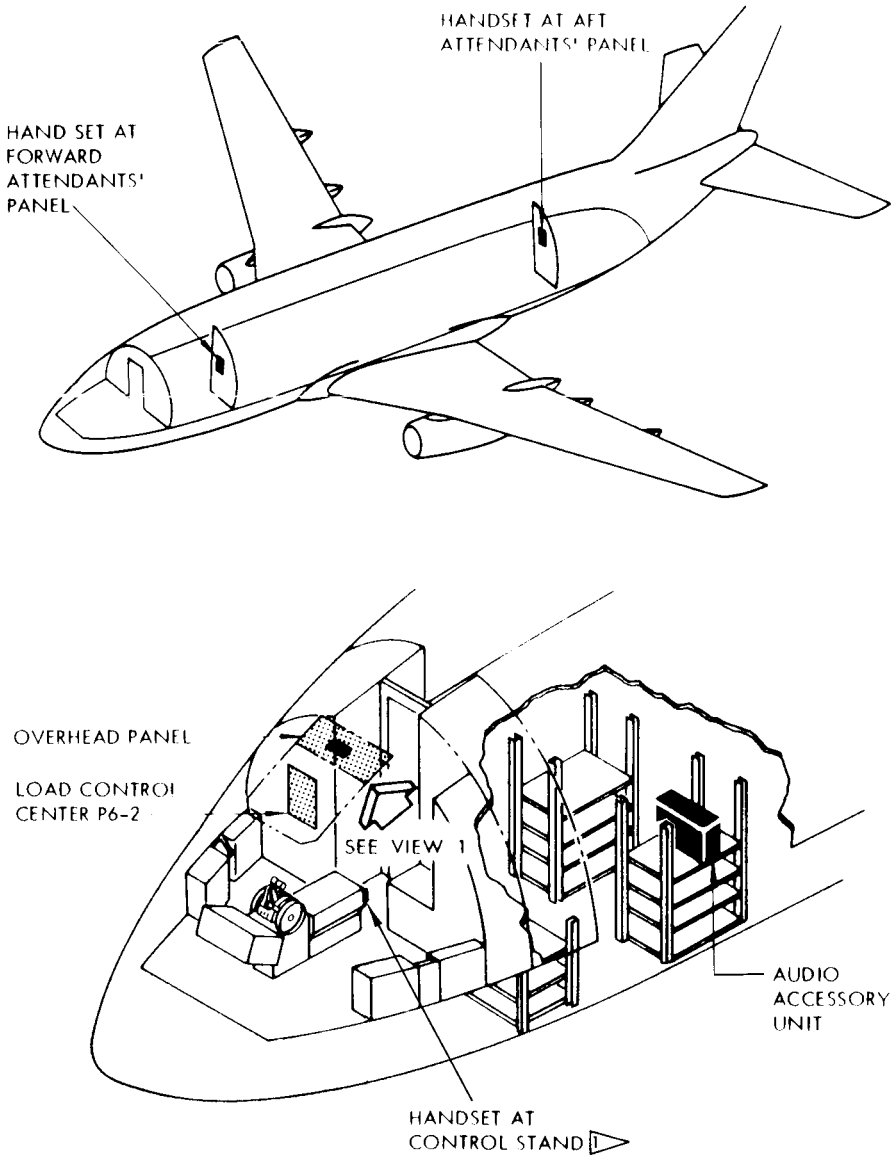
SERVICE INTERPHONE SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The service interphone system enables airplane crewmembers and ground crew personnel to communicate with each other from various locations on the airplane. Handset jacks are located throughout the airplane for use by ground crew personnel during airplane servicing and maintenance. Handsets equipped with connectors are installed on the forward and aft attendants' panels for communication between attendants and control cabin personnel. On airplanes LV-JMW thru LV-JMZ; LV-JND; LV-JNE, a handset is also installed on the control stand. Personnel in the control cabin may also communicate with the attendants through use of audio selector panels and boom mike headsets of the flight interphone system. Refer to 23-52-0. Seven service stations require a handset to be provided by ground crew personnel since no storage facilities for handsets are provided at the stations. (See figure 1.)
   B. An amplifier and an attendants' potentiometer are installed in an audio accessory unit in electronic equipment rack E2-1. The amplifier is also used by the flight interphone system. Refer to 23-52-0. The potentiometer may be used to adjust the attendants handset receiver audio level to a comfortable listening level. An amplifier gain potentiometer in the audio accessory unit may be used to adjust handset audio level at the service jacks. A service interphone switch, on overhead panel P5 in the control cabin, is used to disconnect all of the jacks, except jacks and handsets on the control stand and attendants' panels, from the system whenever they are not being used. This is done so that a short in the microphone circuit of any service jack will not disable the attendants' and flight crew communications. (See figures2 and 3.)
   C. The audio accessory unit interphone amplifier uses 28 volts dc provided from the battery bus and unswitched electronics bus No. 2. The interphone amplifier circuit breaker is on load control center P6. No on-off switch is provided for the system; therefore, the system will be operable whenever power is provided to the busses.
2. Amplifier
   A. A transistorized amplifier module is installed in the audio accessory unit. The module has two separate input circuits thus providing isolation between the service interphone system and flight interphone components. Two separate outputs to the switched service interphone jacks and the control stand, attendants' handsets and flight interphone components are also provided. Design of the amplifier permits a temporary short to occur on either one of the input or output circuits without catastrophic failure of the amplifier. The amplifier will continue to function normally for a short period thus enabling communications to continue until the fault may be located and corrected. Automatic gain control circuits ensure a constant output regardless of the number of handsets connected to the amplifier. Either carbon or transistorized microphones may be used with the amplifier. The amplifier uses 28 volts dc and completes the necessary dc voltage to the systems microphones. Since no on-off switch is provided for the amplifier, it will be operable whenever the battery bus or unswitched electronic bus No. 2 are hot.

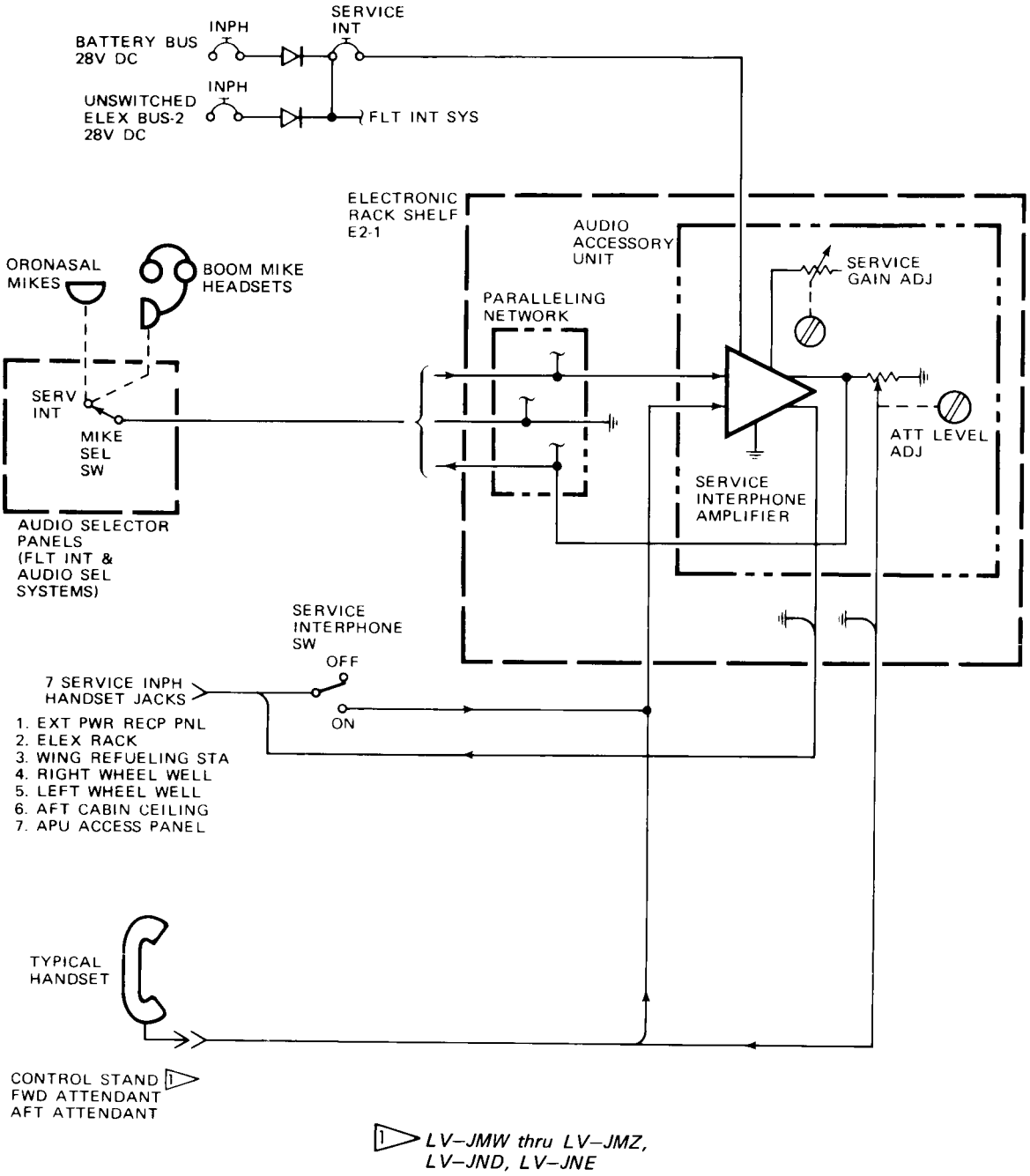
CODE	LOCATION	AREA
A	EXT PWR PNL	EXT
B	ELECTRONICS RACK	INT
C	WING REFUELING STA	EXT
D	FWD OF RIGHT WHEEL WELL	EXT
E	FWD OF LEFT WHEEL WELL	EXT
F	AFT CABIN CEILING	INT
G	APU ACCESS PANEL	EXT



Switched Service Interphone Jacks Location
Figure 1



Service Interphone System Component Location
Figure 2



Service Interphone System Circuit
Figure 3

3. Handsets
   A. The interphone amplifier provides the necessary voltage for operation of carbon or transistorized handsets. The microphone may be of the press-to-use or press-to-talk type. The button on a press-to-use type handset completes both microphone and receiver audio circuits when the handset button is pressed. The button on a press-to-talk type handset completes only the microphone circuits when it is pressed; receiver circuits are connected directly to the system. Handset impedance is approximately 150 ohms.
4. Operation
   A. Attendants may communicate directly to each other with handsets installed at their stations or with control cabin personnel using the control stand handset. The service interphone switch on overhead panel P5 completes the microphone circuits to the interphone amplifier from external service jacks at external power panel P19, APU, the right wheel well, the left wheel well, the right wing refueling station, as well as from internal jacks in the electronic equipment compartment and the aft cabin ceiling jack at the aft attendant's station.
   B. Control cabin personnel may also communicate with the attendants and personnel at the service jack stations after selecting service interphone on their audio selector panels. Refer to 23-52-0.
   C. Potentiometers on the front of the audio accessory unit may be used to adjust amplifier gain and the control stand handset and attendants' handset receiver audio to a comfortable listening level.
   D. No handset stowage is provided on the airplane for the switched interphone jacks; therefore, handsets must be furnished by ground personnel.

SERVICE INTERPHONE SYSTEM – TROUBLESHOOTING

1. General
   A. The service interphone system has the attendants' handsets and control stand handset connected directly to the amplifier; failure of the amplifier is indicated if communication between all stations is not available. If only jacks connected through the SERVICE INTERPHONE switch are not operable, then either the switch is faulty or a jack is shorted. Failure of individual jacks or handsets can easily be detected by interchanging handsets between stations.
   B. If the service interphone system is completely inoperable, ensure power is available to the 28 volt dc battery transfer bus or unswitched electronic bus-2 and the service interphone amplifier circuit breaker on load control center P6 is closed. If power is available, replace the audio accessory unit. No terminals are available to check for power to the amplifier.
   C. The service interphone amplifier may also be used by the flight interphone system. Therefore, if the amplifier fails, audio will be unavailable to the flight interphone and audio selecting systems audio selector panels as well as the service interphone system stations. Refer to 23-52-0 and 23-53-0.

SERVICE INTERPHONE SYSTEM - ADJUSTMENT/TEST

1. Test Service Interphone System
   A. General
      (1) The following test procedures should be conducted whenever a jack, handset, or audio accessory unit has been replaced. When using jacks, wipe handset plugs clean prior to inserting plug into jack as dirt may cause intermittent operation or damage the jack. Handsets must be furnished by ground personnel. Handsets are installed at the attendants' stations and control stand.
   B. Prepare to Test
      (1) Provide ground power to the airplane and energize the busses on load control center P6.
      (2) Ensure all interphone and DUAL PWR SOURCE circuit breakers are closed.
      (3) Position the SERVICE INTERPHONE switch to ON.
   C. Test Service Interphone System
      (1) Using a handset at the control stand, establish satisfactory communications with the following stations:
         (a) Forward Attendant's handset.
         (b) Aft Attendant's handset.
         (c) Panel P19 SERVICE jack.
         (d) APU (Auxiliary Power Unit).
         (e) Right Wheel Well.
         (f) Left Wheel Well.
         (g) Right Wing Refueling Station.
         (h) Electronics Rack.
         (i) Aft Cabin Ceiling.

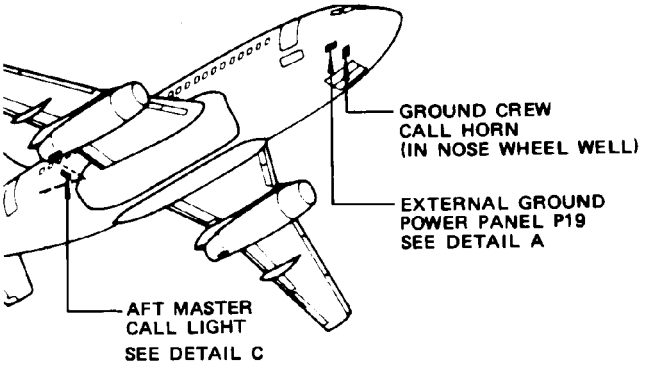
         NOTE: The service interphone amplifier gain control on the front of the audio accessory unit may be adjusted to obtain a comfortable listening level for all stations except the control stand and attendants' stations. The attendants' interphone potentiometer may then be adjusted to provide a comfortable listening level for the attendants' and control stand handsets.

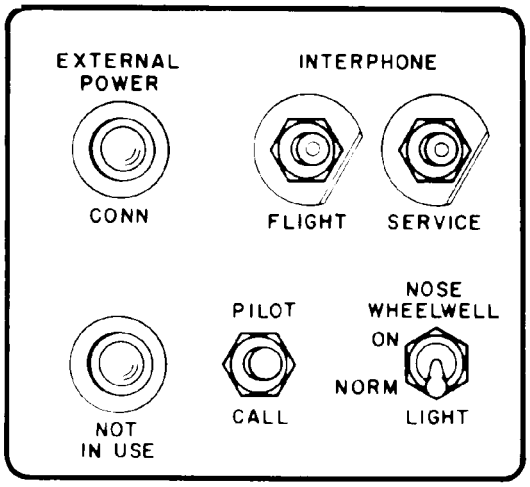
      (2) Position the SERVICE INTERPHONE switch to OFF and repeat step C.(1). Only the following stations should be able to communicate.
         (a) Control stand jack or control stand handset
         (b) Forward attendant's handset
         (c) Aft attendant's handset
      (3) Select service interphone on the captain's audio selector panel.
      (4) Establish satisfactory communications between the forward attendant's station and the captain's station.

(5) Repeat steps C.(3) and C.(4) at the first officer's, observer's and electronic rack stations.
(6) Determine whether there is any further need for electrical power on the airplane; if not, remove external power.

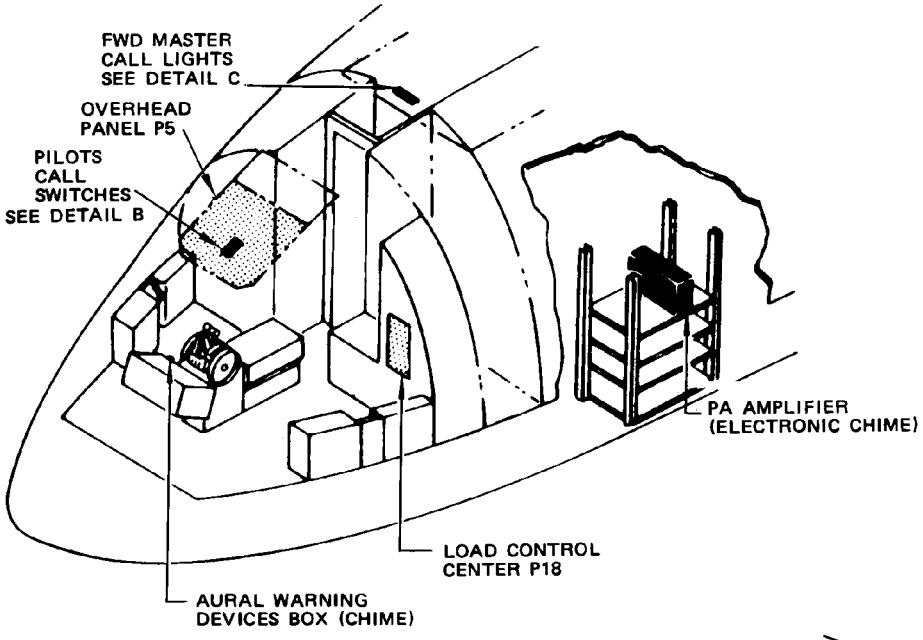
FLIGHT AND GROUND CREW CALL SYSTEMS - DESCRIPTION AND OPERATION

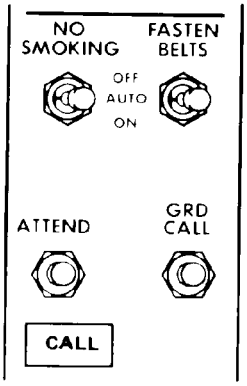
1. General
   A. The system enables call signaling between the flight compartment and cabin attendants, between the flight compartment and ground maintenance personnel, and between cabin attendants. The system is used to signal personnel to use the service interphone system to communicate with the person initiating the call.
   B. The system consists of pushbutton call signaling switches, call indicating lights, and audible call indicating devices. The location of components is shown on Fig. 1.
   C. The system obtains operating power from 28-volt dc bus No. 1 through a circuit breaker on panel P18-4 (Fig. 2).
2. Call Horn
   A. The horn is an electromechanical device located in the nose wheel well on approximately the airplane centerline.
3. Chimes
   A. The flight compartment high-tone chime is an electronic device located in the aural warning devices box (Ref 31-26-0). This box is installed on the forward end of the control stand.
   B. The attendants' hi-lo tone chime is an electronic device located in the PA amplifier (Ref 23-31-0). The PA amplifier is installed on shelf 1 of the E2 equipment rack.
4. Passenger Signs Panel
   A. The panel is located in the P5 pilots' overhead panel and contains two call signaling switches and a blue call indicating light.
5. External Power Receptacle Panel
   A. The P19 panel is located near the external power receptacle and contains a call signaling switch and two interphone jacks.
6. Attendants' Panels
   A. A panel is located at the forward and aft attendants' seated stations. Each panel contains two call signaling switches and a switch to reset the attendants' call circuits.
7. Master Call Lights
   A. An attendants' call light is located on the forward and aft master call annunciator light module. The attendants' interphone call lights are pink.
8. Operation (Fig. 2)
   A. The system is supplied power through circuit breaker PASS AND CREW CALL on panel P18-4. The system is turned on by closing the circuit breaker.
   B. The system is used to signal crewmembers in the flight or passenger compartments or ground maintenance personnel to use the service interphone system to communicate with the person initiating the call.
   C. When the GRD CALL switch on the forward overhead panel is pressed, 28-volt dc power is applied to the call horn causing it to sound. This gains the attention of personnel outside the airplane.





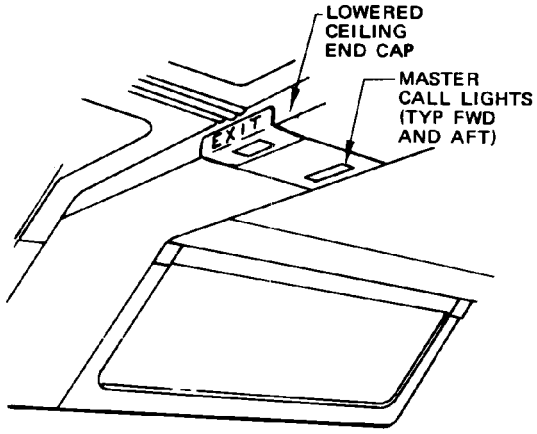
DETAIL A





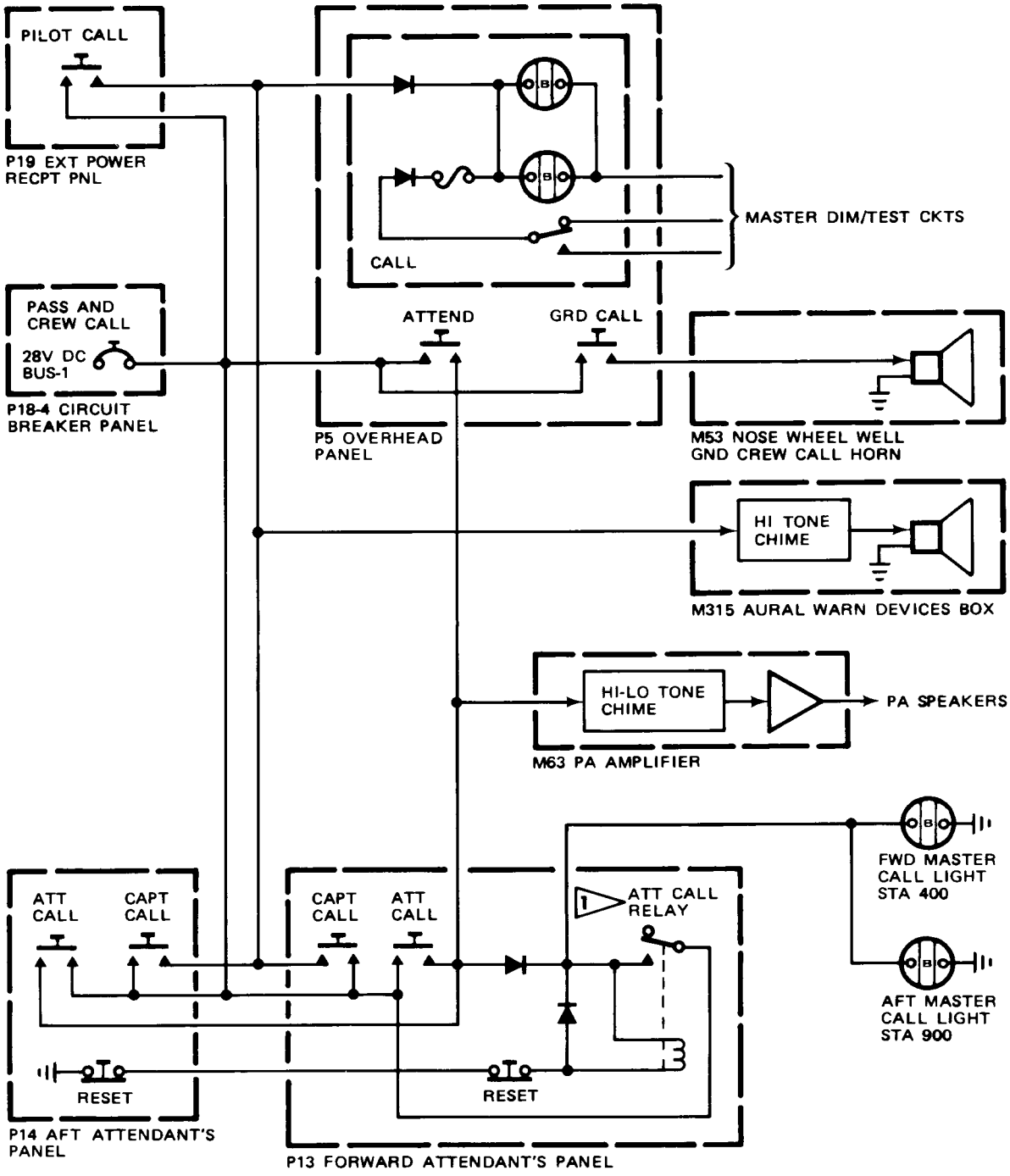
DETAIL B

CALL BUTTONS ON FWD
AND AFT ATTENDANT'S PANEL



DETAIL C

Flight and Ground Crew Call Systems Component Location
Figure 1



1 ATTENDANT'S CALL RELAY INSTALLED IN FWD ATTND PANEL, AS SHOWN; ON PASSENGER APL'S AND IN AFT ATTND PANEL ON PASSENGER/CARGO CONVERTIBLE APL'S. ON CONVERTIBLE APL'S, REVERSE PANEL NOMENCLATURE TO OBTAIN APPLICABLE SCHEMATIC

Flight and Ground Crew System Schematic
Figure 2

D. When the PILOT CALL switch on the external power receptacle panel or the CAPTAIN CALL switch on an attendant's panel is pressed, 28-volt dc power is applied to the hi-tone chime causing it to sound. This gains the attention of personnel in the flight compartment. When either switch is pressed, the blue call light on the passenger signs panel comes on to provide an additional call indication in the flight compartment.

E. When the ATTEND call switch is pressed in the flight compartment or an ATTENDANT call switch is pressed on an attendants' panel, 28-volt dc power is applied to the forward and aft pink master call lights causing them to come on and to the hi-lo chime in the PA amplifier causing the tones to be broadcast over the PA system. In addition, electrical power is applied to the crew call relay in the forward attendant's panel causing it to energize and keep power applied to the lights after the call switch has been released.

F. When the RESET switch on either attendants' panel is pressed, electrical power is removed from the crew call relay causing it to de-energize and turn off the forward and aft master call lights.

FLIGHT AND GROUND CREW CALL SYSTEMS - TROUBLESHOOTING

1. General
   A. Failure of the ground crew call horn or call button is immediately apparent if the call button on pilots' overhead panel P5 fails to operate the horn. Replacing the call button usually will correct the problem, if not, replace the horn.
   B. The captain's call chime is operated from external ground power panel P19 and the forward and aft attendants' panels. Failure of the chime to operate when all the captain call buttons are pressed requires that the aural warning devices box be replaced. If the chime fails to operate when keyed from just one station, replacing the call button will usually correct the problem.
   C. Failure of the attendants' call chime circuits in the PA amplifier is immediately apparent if the chime will not sound when keyed from several stations. Replacement of the PA amplifier will usually correct the problem. If the chime fails to operate when keyed from just one station, replace the call button. If both pink master call lights fail to remain illuminated when an attendant call button is pressed, the call relay or one of the reset buttons is probably faulty. On all passenger airplanes, the call relay is located in the forward attendant's panel. On all passenger/cargo convertible airplanes, the call relay is located in the aft attendant's panel. If replacement of the call relay fails to correct the problem, check for continuity through both reset buttons and replace the faulty reset button.

FLIGHT AND GROUND CREW CALL SYSTEM - ADJUSTMENT/TEST

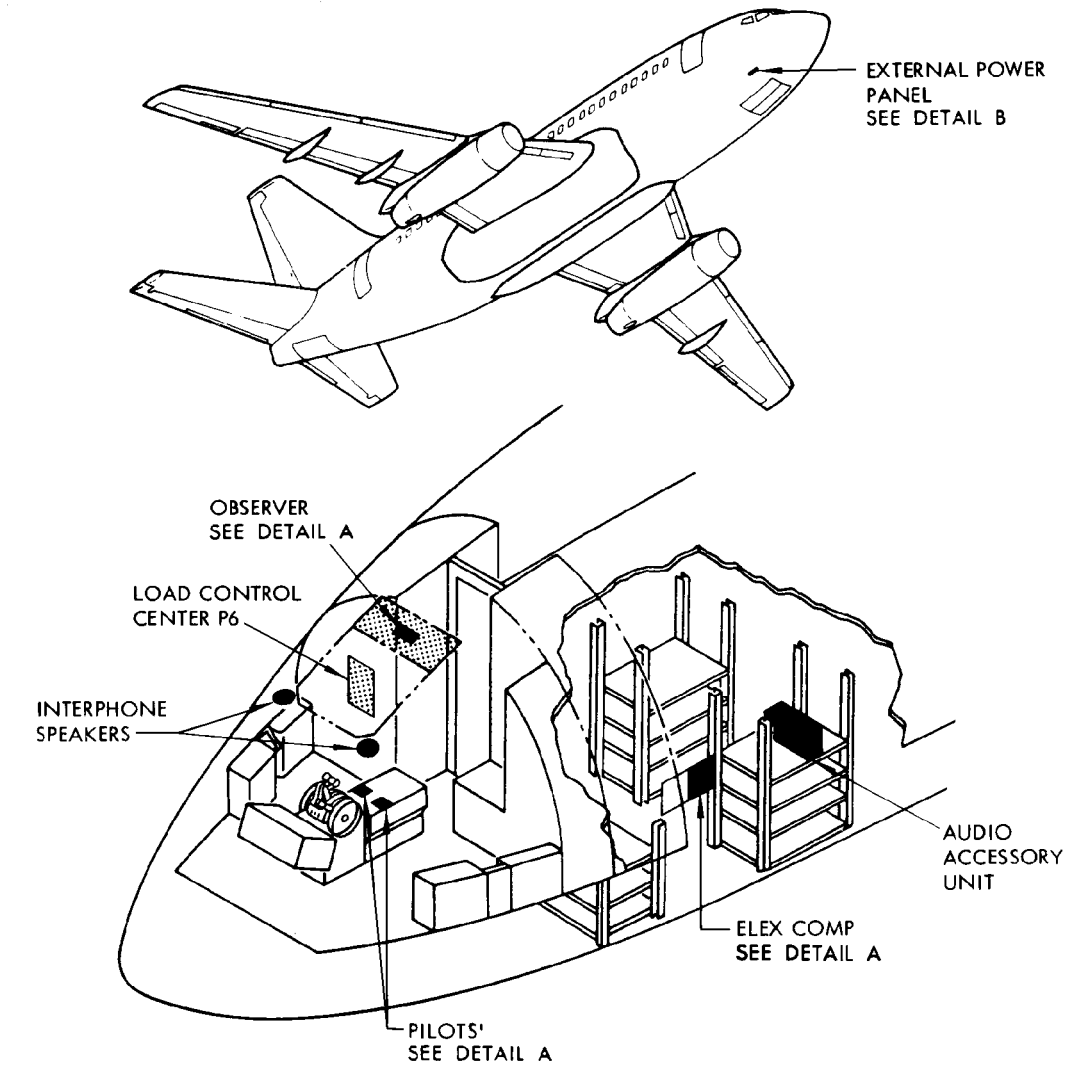
1. Flight and Ground Crew Call System test
   A. Prepare to test flight and ground crew call system.
      (1) Provide electrical power.
      (2) Check that PASS AND CREW CALL and PASSENGER ADDRESS circuit breakers on P18 panel are closed.
      (3) Check that AURAL WARNING circuit breaker on P6-2 panel is closed.
   B. Test flight and ground crew call system.
      (1) Press GRD CALL switch on overhead panel P5 and check that ground crew call horn sounds. Release switch and check that sound stops.
      (2) Press PILOT CALL switch on external ground power panel P19 and check that:
         (a) CALL light on overhead panel P5 comes on.
         (b) Hi-tone chime sounds once in flight compartment.
         (c) CALL light goes off when PILOT CALL switch is released.
      (3) Press CAPTAIN call switch on forward attendant's panel and check that:
         (a) CALL light on overhead panel P5 comes on.
         (b) Hi-tone chime sounds once in flight compartment.
         (c) CALL light goes off when CAPTAIN switch is released.
      (4) Repeat step 1.B.(3) at aft attendant's panel.
      (5) Press ATTEND call switch on overhead panel P5 and check that:
         (a) Forward and aft pink master call lights come on.
         (b) Hi-lo tone chime sounds once over PA speakers.
         (c) Master call lights remain on after ATTEND call switch is released.
         (d) Master call lights go off when RESET switch is pressed on either attendant's panel.
      (6) Press ATTENDANT call switch on forward attendant's panel and check that:
         (a) Forward and aft pink master call lights come on.
         (b) Hi-lo tone chime sounds once over PA speakers.
         (c) Master call lights remain on after ATTENDANT call switch is released.
         (d) Master call lights go off when RESET switch is pressed on either attendant's panel.
      (7) Repeat step 1.B.(6) at aft attendant's panel.
      (8) Remove electrical power if no longer required.

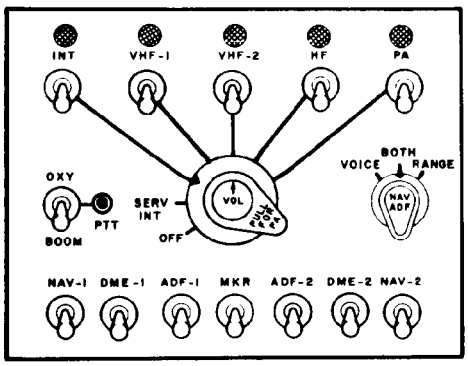
AUDIO INTEGRATING - DESCRIPTION AND OPERATION

1. General
   A. The flight interphone system and audio selecting system provide the connecting link between the airplane radio receivers, transmitters, and interphone systems. Audio selector panels and associated headphones and microphones enable control cabin crewmembers to complete voice communications over the HF and VHF communication, interphone, and passenger address systems. The ADF, DME, marker beacon and VOR (VHF) navigation receivers may also be monitored.
   B. The flight interphone system enables control cabin members to communicate with each other with their associated microphones, headphones and audio selector panels. An interphone amplifier provides the necessary audio amplification between stations. The amplifier is in the audio accessory unit. Two loudspeakers installed in the control cabin enable the captain and first officer to monitor systems selected on their audio selector panels without wearing headphones. The captain and first officer have INT-MIC (interphone/microphone) switches on their respective control wheels which may be used with oronasal mask microphones or boom microphone/headphones to complete communications to selected systems or to the interphone system. A boom microphone/headphone and oronasal (oxygen) mask microphone are provided at the captain's and first officer's stations. The captain and first officer each have provisions (jacks) for a handheld microphone and a headphone. A handheld microphone, headphone, and oronasal mask microphone are provided at the observer's station. A flight interphone handset jack is on external ground power receptacle panel P19.
   C. The audio selecting system consists of audio selector panels which enable crewmembers to select any of the airplane communication facilities. Audio selector panels are located at the captain's, first officer's, and observer's stations and in the electronic equipment compartment. Audio selector panel circuits are paralleled on electronic rack shelf E2-1.
   D. The audio selector panels, loudspeakers and interphone amplifier use 28 volts dc obtained from the battery bus and unswitched electronics bus No. 2. Systems circuit breakers are on load control center P6.
   E. On AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE, LV-JTD, and LV-JTO, pressing a push-to-talk button when a radio system has been selected on an associated audio selector panel will cause an event marker to be recorded by the flight data recorder (Ref Chapter 31, Flight Recorder System).

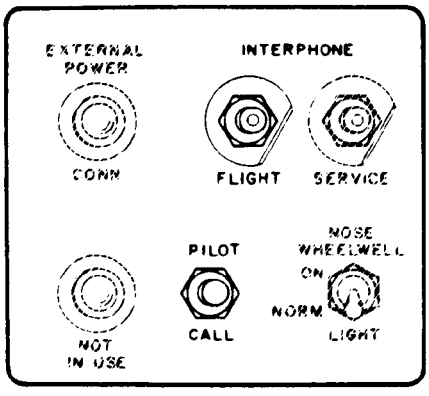
FLIGHT INTERPHONE SYSTEM - DESCRIPTION AND OPERATION

1. General
   A. The flight interphone system allows the crewmembers to communicate with each other or ground facilities. Audio selector panels enable crewmembers to select and complete voice communications over the selected system (Ref 23-53-0).
   B. The flight interphone system consists of a flight interphone amplifier, microphones, headphones, and two loudspeakers. The amplifier is installed as a module in the audio accessory unit on electronics rack E2-1. The flight interphone amplifier gain potentiometer is mounted on the front of the accessory unit. The captain and first officer each have a loudspeaker assembly installed in the ceiling panels at their stations. A flight interphone handset jack on external ground power receptacle panel P19 is paralleled to the flight interphone amplifier for communications between ground personnel and crewmembers. Location of components is shown on Fig. 1.
   C. The captain and first officer each have boom mike/headphone, oxygen mask microphone, handheld microphone, and headphone jacks installed on the sidewalls of their stations. Oxygen mask microphone and boom microphone INT-MIC push-to-talk (PTT) switches are on the outboard horn of their control wheels. An oxygen mask microphone and boom microphone PTT button is on each of their audio selector panels.
   D. Headphone, handheld microphone, and oxygen mask microphone jacks are installed at the first observer's station. A headphone jack for a second observer is provided and is electrically paralleled to the first observer's headphone jack. An oxygen mask microphone and boom microphone PTT button is on the first observer's audio selector panel.
   E. Handheld microphone and headphone jacks are installed in the electronic equipment compartment near the audio selector panel on the left side of the airplane.
   F. The flight interphone amplifier and audio selector panels obtain 28-volt dc power from the dual power source of the battery bus and unswitched electronics bus-2. Each pilot's loudspeaker obtains 28-volt dc power from his audio selector panel power circuits. All interphone circuit breakers are on load control center P6 (Fig. 2).
2. Microphones
   A. Handheld microphones incorporate a transistorized preamplifier within them for amplification of audio signals to a level suitable for use by the various communication systems. A push-to-talk switch on the microphone will complete power circuits to the preamplifier and complete systems control grounds whenever the switch is pressed. The handheld microphones are equipped with plug connectors so that they may be easily replaced or used at any station which has a handheld microphone receptacle. Hooks are provided at each station for microphone stowage.



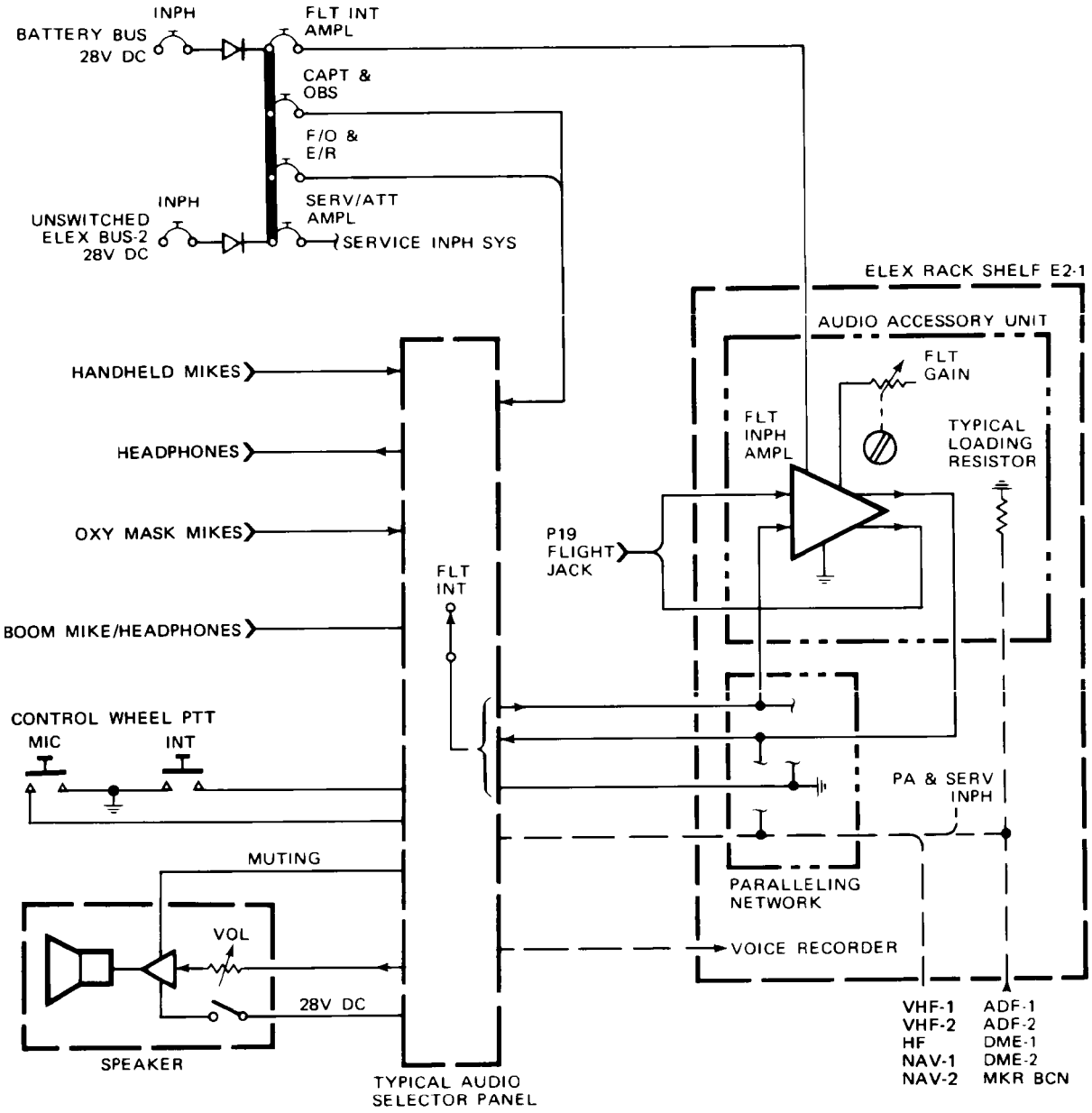


AUDIO SELECTOR PANEL
DETAIL A



DETAIL B

Flight Interphone System Component Location
Figure 1



STATION	AUDIO SELECTOR PANEL	HEADPHONE	HANDHELD MIKE	OXYGEN MASK MIKE	BOOM MIKE HEADPHONE	CONTROL WHEEL PTT	SPEAKER
CAPTAIN	X	JACK	JACK	X	X	X	X
F/O	X	JACK	X	X	X	X	X
1 OBS	X	X	X	X			
2 OBS		X					
E/R	X	JACK	JACK				

1 AR ALL EXCEPT LV–JMW THRU LV–JMZ, LV–JND, AND LV–JNE

Flight Interphone System Circuit
Figure 2

B. The oxygen masks have a carbon microphone built into the mask. Each mask is equipped with an oxygen connection and a microphone plug. The PTT switch on an audio selector panel may be used to complete mask microphone audio and control circuits to the system selected on the audio selector panel. The MIC-INT switch at the crewmember's station may be used to complete circuits to the selected system or directly to the interphone system without prior interphone selection on the selector panel. Stowage bins for the masks are provided at each station.

C. The earphone/boom microphone headset incorporates an earphone and a microphone connected to an adjustable headband. The PTT switch on an audio selector panel may be used to complete the headset assembly microphone audio and control circuits to the system selected on the audio selector panel. The MIC-INT switch at the crewmember's station may be used to complete circuits to the selected system or directly to the interphone system without prior interphone selection on the selector panel. The headset assemblies are stowed on a hook at each station.

3. Headphones

A. Magnetic headphones equipped with plugs enable crewmembers to monitor audio signals directed through the audio selector panels. Headphones with an impedance of approximately 600 ohms may be used at any station equipped with a headphone jack. Headphones are stowed on hooks at each station.

4. Loudspeaker Assemblies

A. Each loudspeaker assembly consists of a transistorized amplifier, speaker, muting circuits, an on-off switch and a volume control. The on-off switch and volume control are mounted on the case of the assembly where they are convenient to the pilots. Audio input to the amplifier is paralleled from the associated pilot's headphone circuits. Muting circuits attenuate the loudspeaker output whenever a push-to-talk button is pressed at the captain's, first officer's or observer's station to prevent audio feedback into the systems. The loudspeaker will also be muted if the PA microphone on the control stand is used and the PA monitor switch on the captain's, first officer's or observer's audio selector panel is turned on. The loudspeaker amplifier uses 28 volts dc obtained from the associated audio selector panel.

5. Amplifier
   A. A transistorized amplifier module is installed in the audio accessory unit. The amplifier has two separate input and output circuits, thus providing isolation between the jack on the external power panel and the remainder of the flight interphone system. Design of the amplifier permits a temporary short to occur on either one of the input or output circuits without catastrophic failure of the amplifier. Either carbon or transistorized microphones may be used with the amplifier. The amplifier uses 28 volts dc and completes the necessary dc voltage to the systems microphones. Since no on-off switch is provided for the amplifier, it will be operable whenever the battery bus or unswitched electronics bus No. 2 are hot.
6. Operation
   A. The captain, first officer, and observer may communicate with each other over the flight interphone system after first selecting flight interphone on their audio selector panels. Any microphone and headphone facility available at the station may be used. Microphone audio will be completed through the flight interphone system when the appropriate push-to-talk switch is pressed.
   B. Handheld microphones contain their own PTT switch. Pressing the switch will complete microphone audio and control circuits to the system selected on the associated audio selector panel.
   C. If an oxygen mask microphone or boom microphone is used at the captain's or first officer's station, the MIC-INT push-to-talk switch on the outboard horn of their control wheels may be used to complete the microphone circuits. Pressing the MIC side of the switch connects the microphone circuits to the system selected on the associated audio selector panel. Pressing the INT side of the switch connects the microphone circuits directly to the flight interphone system amplifier regardless of the system selected on the audio selector panel. However, if the flight interphone system has not been selected on the audio selector panel, the flight interphone monitor toggle switch must be pushed up to supply flight interphone audio to the associated headset. The push-to-talk switch on the audio selector panels may be used at either station to connect oxygen mask microphone or boom microphone circuits to the system selected on the audio selector panel. All push-to-talk switches at both stations are spring loaded and will return to the off position when released.
   D. If an oxygen mask microphone is used at the observer's station, the PTT button on the observer's audio selector panel is used to connect the microphone circuits to the system selected on the audio selector panel.

E. The pilots' loudspeakers may be turned on or off with a switch on the loudspeaker assembly case. Loudspeaker output may be adjusted to a comfortable listening level with the volume control adjacent to the on-off switch. Both loudspeakers will be muted if the captain, first officer or observer uses his microphones. The loudspeakers will also be muted if an announcement is made using the PA microphone on the control stand (when installed) while monitoring the PA system at the captain's, first officer's, or observer's audio selector panel.

F. Ground personnel may communicate with control cabin crewmembers through the flight interphone system by using a handset plugged into the flight interphone jack on external ground power receptacle panel P19.

G. A flight interphone amplifier gain potentiometer on the front of the audio accessory unit may be used to adjust audio signals to a suitable level.

FLIGHT INTERPHONE SYSTEM - TROUBLESHOOTING

1. General
   A. Troubleshooting the flight interphone system is relatively easy due to duplication of components within the system. Interchanging suspected faulty components with known good components will quickly isolate the faulty components. If the flight interphone system is completely inoperable, the flight interphone amplifier is faulty. If the amplifier is faulty, replace the audio accessory unit.
   B. Interphone loudspeaker failure can usually be detected by comparison between headphone audio and the loudspeaker audio. If audio is not available to either one, the audio selector panel is faulty.
   C. Isolation of a faulty control wheel PTT switch can be determined by a comparison with the control panel PTT switch. If oronasal mask mike audio can be completed using the control panel PTT switch but not when using the control wheel PTT switch, the control wheel PTT switch is faulty. If audio can not be completed with either one, the audio selector panel is faulty.

FLIGHT INTERPHONE SYSTEM - ADJUSTMENT/TEST

1. Test Flight Interphone System
   A. General
      (1) The following tests should be conducted whenever a system component has been replaced or repaired.
      (2) Communications and navigation audio, which is monitored with the flight interphone system components, is checked as part of the requirements of the respective communication and navigation systems test.
   B. Prepare to Test
      (1) Provide power to the airplane and energize buses on load control center P6.
      (2) Ensure all interphone and the dual power source circuit breakers are closed.
      (3) Turn on both flight interphone loudspeakers.
   C. Test Flight Interphone System
      (1) Position the mike selector switch to INT on the captain's, first officer's, observer's and electronic equipment compartment audio selector panels.
         (a) The green INT light should illuminate on each audio selector panel.
      (2) Provide handheld microphones and headphones and establish communications between the captain's station and each remaining station with an audio selector panel.
         (a) Communications should be loud and clear between stations.
         (b) Varying the volume control on each audio selector panel should increase or decrease the associated headphone audio level.
         (c) Varying the volume control on the captain's or first officer's audio selector panel should increase or decrease the associated loudspeaker audio level.
         (d) Varying the volume control on a loudspeaker should increase or decrease the loudspeaker audio level.
         (e) Both loudspeakers should be muted whenever a PTT switch is pressed at the captain's, first officer's or observer's station.
         (f) Ensure the loudspeakers can be turned off and on.

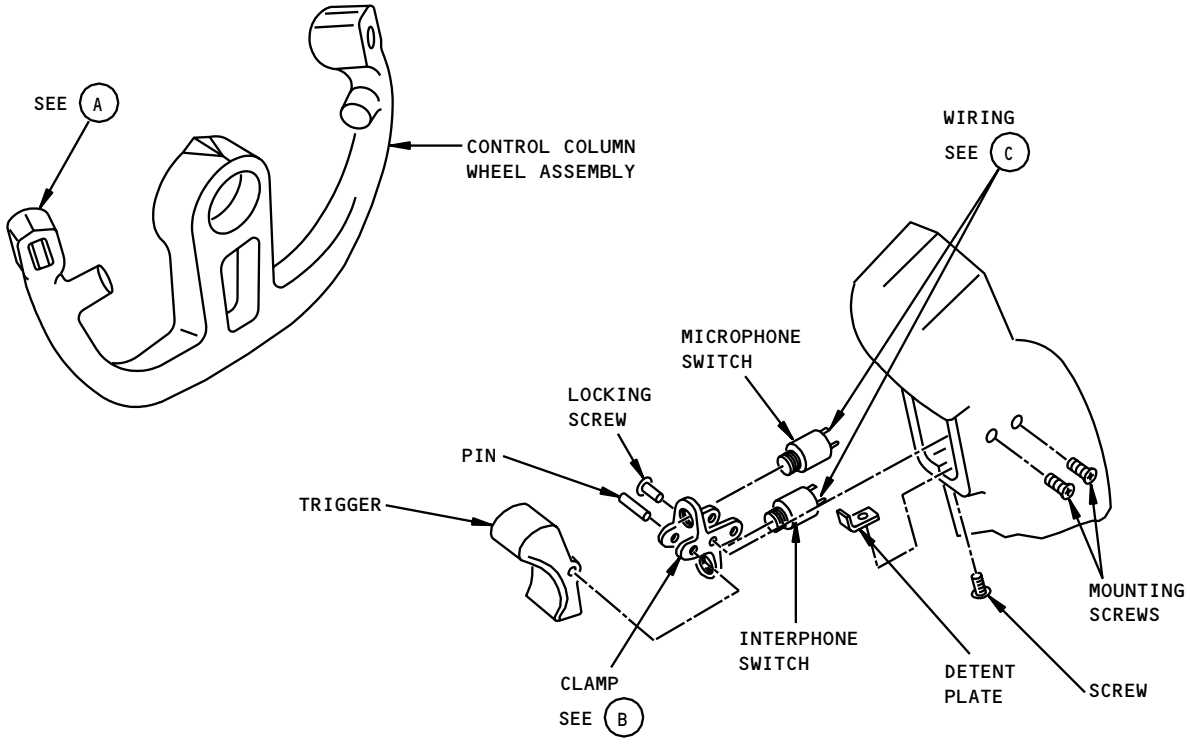
            NOTE: The second observer has a headphone jack paralleled to the first observer's audio selector panel. If necessary, adjust the flight interphone amplifier gain potentiometer on the front of the audio accessory unit to obtain a comfortable listening level.

(3) Select OXY on each audio selector panel and establish communications between the captain's, first officer's and first observer's stations using their oronasal mask mikes. Tap the side of the mike to produce audio signals and press the audio selector panel PTT button to operate the mike.
   (a) Communications should be loud and clear between stations.
   (b) Both loudspeakers should be muted whenever a PTT switch is pressed.
   (c) The PTT switch should be spring loaded to an off position when released.
(4) Repeat step C.(3) between the captain's and first officer's stations using their oronasal mask mikes and their control wheel PTT switches held to the MIC position. Results shall be similar.
(5) Position the mike selector switch on all audio selector panels to OFF.
   (a) The INT light should extinguish.
(6) Select BOOM with the BOOM-OXY switch and push up the INT toggle switch on all audio selector panels.
(7) Establish communications between the captain's and first officer's stations using boom mikes and the INT side of the control wheel PTT switches.
   (a) Communications should be monitored at all stations regardless of the position of the audio selector panel mike selector switches.
   (b) Both loudspeakers should be muted whenever the PTT switch is pressed.
(8) Position the PTT switches to the off position.
(9) Using a handset plugged into the FLIGHT jack on external power receptacle panel P19, establish communications with each audio selector panel.
   (a) Handset audio should be heard loud and clear with headphones at each station.
(10) Turn off the interphone loudspeakers, and push down the INT toggle switch on each audio selector panel.
(11) If no longer required, remove electrical power from the airplane.

CONTROL WHEEL PUSH-TO-TALK (PTT) SWITCH - REMOVAL/INSTALLATION

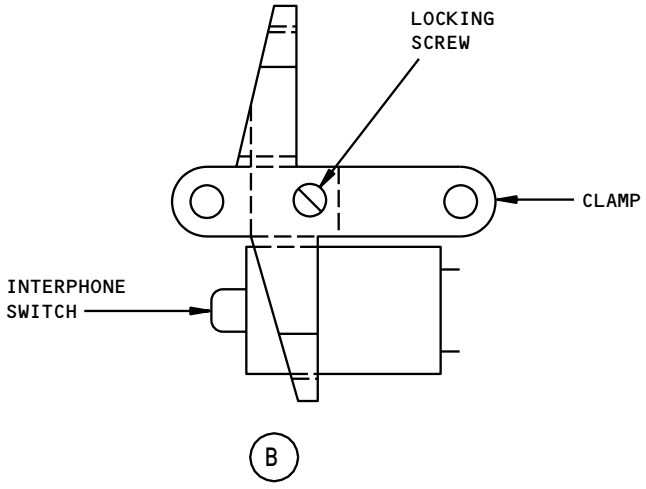
1. General
   A. There are three tasks in this procedure. The first task is the removal of a PTT switch from a control wheel. The second task is the installation of a PTT switch on a control wheel. The third task is a test of the operation of a PTT switch on the control wheel.
   B. Each control wheel has a Push-To-Talk (PTT) switch installed. You can use this procedure for the two PTT switches on a control wheel.
2. Control Wheel Push-To-Talk (PTT) Switch Removal (Fig. 401)
   A. General
      (1) This task removes the captain's or the first officer's PTT switch from the control wheel.
   B. Access
      (1) Location Zones
          101 Control Cabin - Left
          102 Control Cabin - Right

   C. Procedure
      (1) Open the circuit breaker and attach a DO-NOT-CLOSE tag for the applicable switch position:
          (a) P6 Load Control Center - Right
              1) C83 -- CAPT AUDIO or CAPT & OBS
              2) C86 -- F/O AUDIO or F/O & EQUIP RACK
      (2) Remove the Push-To-Talk (PTT) Switch on the Control Wheel:
          (a) Remove the two mounting screws from the Control Wheel.
          (b) Carefully remove the PTT switch assembly to get access to the wires.
          (c) Disconnect the terminal lugs from the switch.
              1) Make sure the disconnected wire ends do not touch.
          (d) Remove the locking screw from the clamp.
          (e) Turn the PTT switch in a counterclockwise direction to remove it from the clamp.
          (f) Remove the PTT switch from the clamp.
3. Control Wheel Push-To-Talk (PTT) Switch Installation (Fig. 401)
   A. General
      (1) This task installs the PTT switch on the control wheel. There are two parts to this task. The first part installs the upper PTT switch and the second part installs the lower PTT switch.
      (2) Use the first part if the airplane has only the momentary PTT switches. Use the first and the second part if the airplane has a momentary and a detent PTT switch.
   B. Access
      (1) Location Zones
          101 Control Cabin - Left
          102 Control Cabin - Right

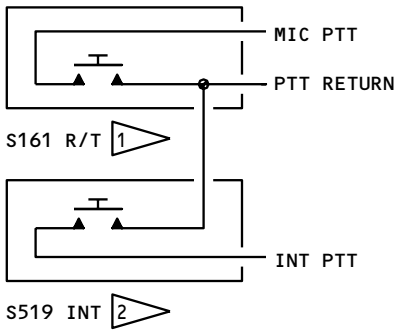


SWITCH ASSEMBLY

A



B



C

TYPICAL

1 CAPTAIN'S SHOWN, FIRST OFFICER'S S214

2 CAPTAIN'S SHOWN, FIRST OFFICER'S S520

Control Wheel PTT Switch – Removal/Installation
Figure 401

C. Procedure
(1) Install the Push-To-Talk Switch on the Control Wheel:
(a) Do these steps for the top MIC PTT switch:
1) Put the PTT switch in the top switch mount on the clamp.
2) Turn the switch in a clockwise direction until the switch makes contact with the trigger and the ball makes contact with the switch mount detent.
3) Install the locking screw in the clamp.
4) Connect the terminal lugs to the switch you installed (see detail C).
5) Make sure you connect the correct wire on the correct terminal.
6) Carefully push the clamp into the recess in the control wheel.
7) Install and tighten the two mounting screws on the control wheel.
(b) Do these steps for the lower INT PTT switch:
1) Put the PTT switch in the lower switch mount on the clamp.
2) Turn the switch in a clockwise direction until the switch makes contact with the trigger.
3) Turn the switch counterclockwise - turn.
4) Install and tighten the locking screw in the clamp.
5) Move the trigger up and down.
6) If the trigger does not stay in the detented position, turn the switch counterclockwise until the switch stays in the detented position.
7) Connect the terminal lugs to the switch you installed (Detail C).
8) Make sure you install the correct wire on the correct terminal.
9) Carefully push the clamp into the recess in the control wheel.
10) Install and tighten the two mounting screws on the control wheel.
(2) Remove the DO-NOT-CLOSE tag and close the circuit breakers:
(a) P6 Load Control Center - Right
1) C83 -- CAPT AUDIO or CAPT & OBS
2) C86 -- F/O AUDIO or F/O & EQUIP RACK
(3) Do the Push-To-Talk (PTT) Switch Installation Test task (Ref par. 4)

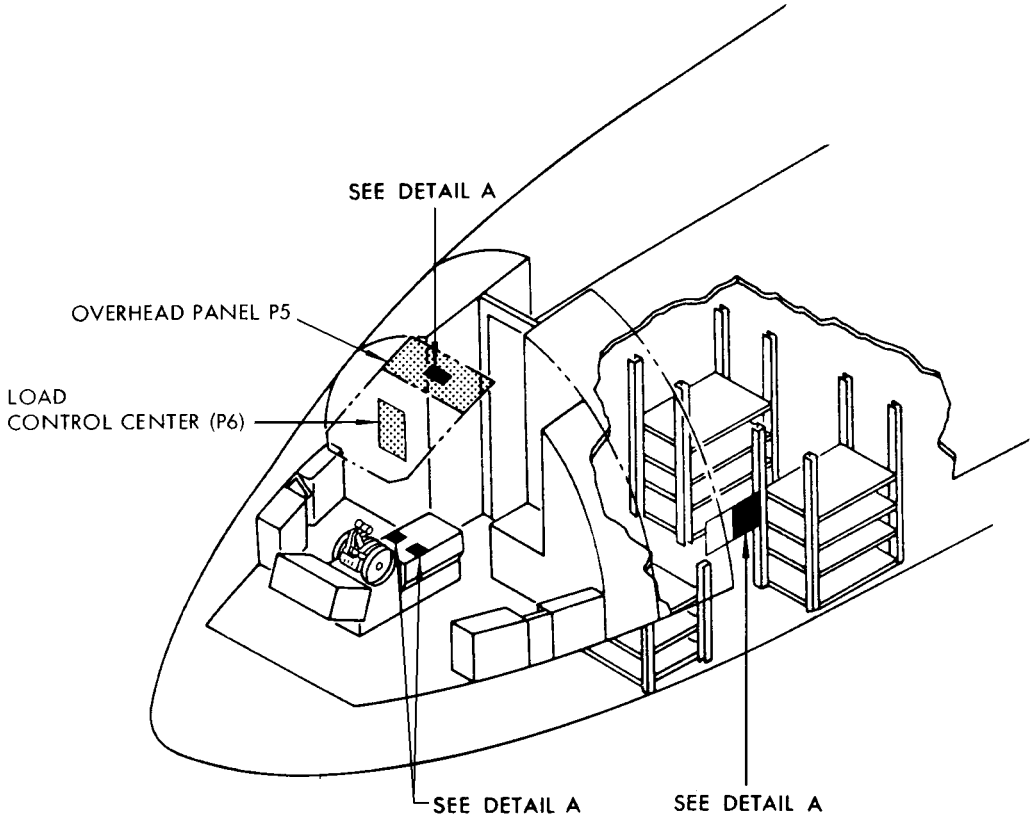
4. Push-To-Talk (PTT) Switch Installation Test
A. General
(1) This task does a test of the PTT switch you installed.
B. Reference
(1) 24-22-00/201, Manual Control

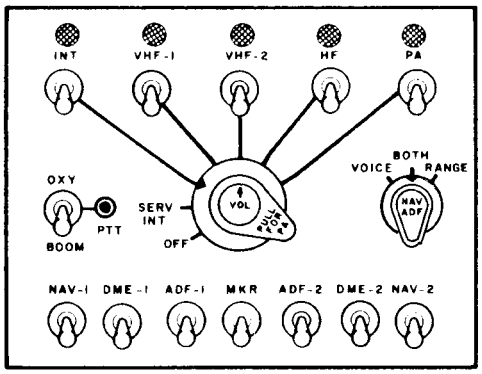
C. Access
(1) Location Zones
101 Control Cabin - Left
102 Control Cabin - Right

D. Procedure
(1) Supply electrical power (Ref 24-22-00/201).
(2) Do a Test of the Installed PTT Switch:
(a) At a pilot's Audio Selector Panel (ASP), set the audio selection to the flight interphone system.
(b) Push the Control Wheel PTT switch to the MIC position.
1) On airplanes with a Control Wheel detent PTT switch; make sure the switch stays in the detent position.
(c) Make a voice announcement.
1) Make sure you hear the announcement.
(d) On airplanes with a Control Wheel detent PTT switch; push the PTT switch again.
1) Make sure the switch goes to the (center) off position.
(e) Set the microphone selection on the ASP to the flight interphone microphone.
(f) Push the Control Wheel PTT switch to the INT position.
(g) Make a voice announcement.
1) Make sure you hear the announcement.
(h) Release the PTT switch.
1) Make sure the switch goes to the (center) off position.
(i) Put the ASP back to the usual condition.
(3) Remove electrical power if it is not necessary (Ref 24-22-00/201).

AUDIO SELECTING SYSTEM - DESCRIPTION AND OPERATION

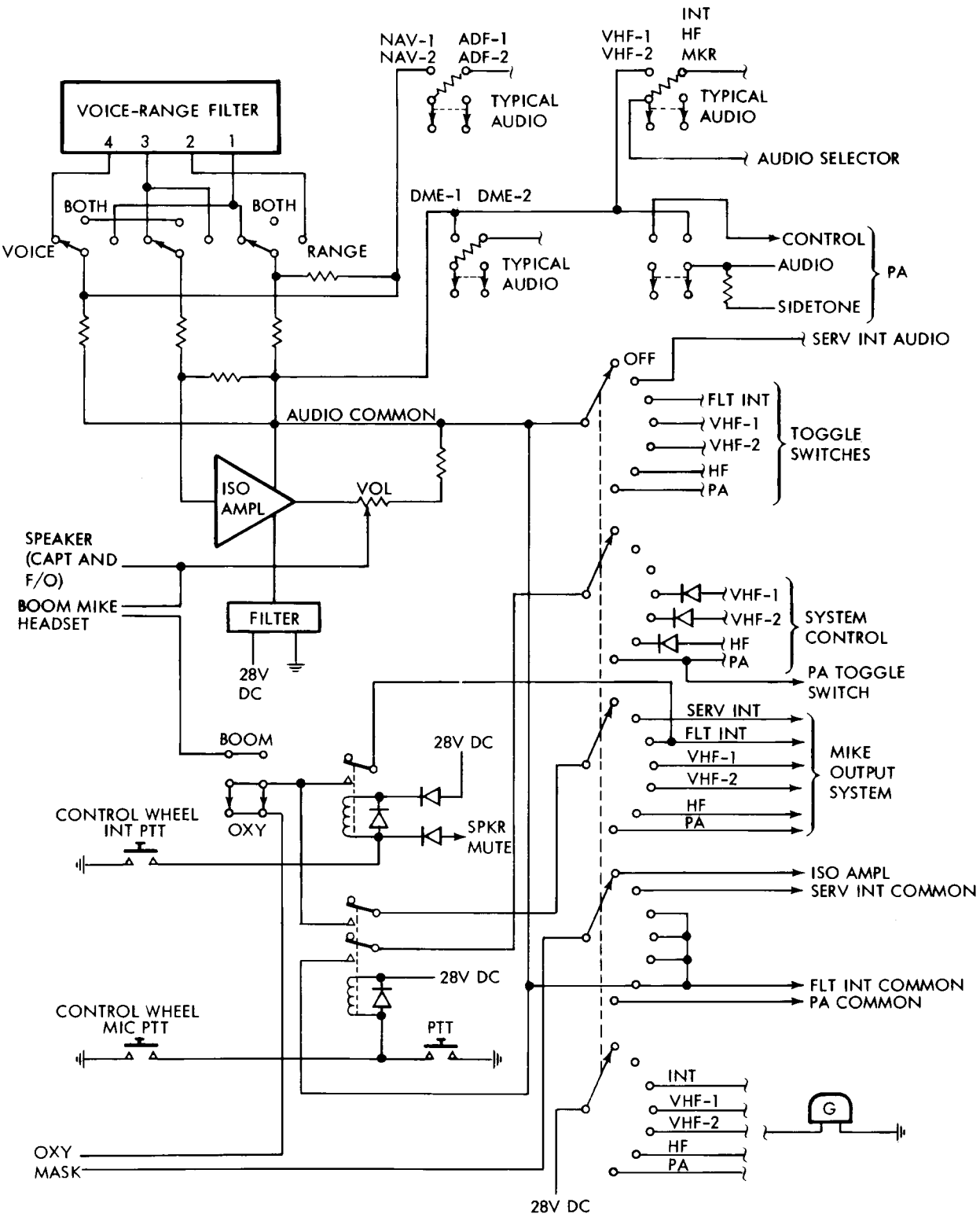
1. General
   A. The audio selecting system enables personnel in the control cabin and electronic equipment compartment to use the various airplane radio and communication facilities to perform normal flight communications and maintenance services. Audio selector panels may be used to complete HF or VHF communications, communications with personnel on the airplane with the interphone systems or make announcements to passengers with the PA system. Airplane VOR (VHF) navigation, DME, marker beacon and ADF receivers may also be monitored.
   B. Four audio selector panels are installed on the airplane. The captain's and first officer's audio selector panels are installed on the aft electronic section of the control stand. The first observer's audio selector panel is installed on overhead panel P5. The electronic equipment compartment audio selector panel is installed forward of electronics rack E2 on the left side of the airplane. The flight interphone system boom headsets and oronasal mask microphones are connected through jacks and connectors to the audio selector panels. All audio selector panel functions are connected in parallel with the paralleling network on electronics rack shelf E2-1 (Fig. 1).
   C. Power for the audio selector panels is obtained from the 28 volts dc battery bus and unswitched electronics bus No. 2. The captain's and observer's audio selector panels power sources are from a single circuit breaker; and the first officer's and electronics rack audio selector panels power sources are from a single circuit breaker. The two circuit breakers are on circuit breaker panel P6. The captain's and first officer's audio selector panels also complete power to the flight interphone system loudspeakers.
2. Switching
   A. Each audio selector panel contains monitoring toggle switches and indicator lights, a rotary mike selector switch, a push-to-talk button, boom mike/oronasal mask mike toggle switch, volume control, isolation amplifier, relays, diodes, filter, and resistor circuitry, green indicating lights, and a rotary voice-both-range switch.
   B. Toggle switches connect audio signals from the various radio receivers and flight interphone system to the input of the isolation amplifier. Four monitoring toggle switches connect ADF and NAV audio to the rotary voice-range filter switch. ADF and NAV audio is either connected directly to the isolation amplifier input or filtered and then connected to the isolation amplifier input. The OXY-BOOM toggle switch connects the oronasal mask mike or boom mike to the audio selector panel relay. The PA toggle switch also completes the muting control circuit for the flight interphone system loudspeakers whenever the switch is pushed up and the PA microphone on the control stand is used.





AUDIO SELECTOR PANEL
DETAIL A

Audio Selecting System Component Location
Figure 1



Audio Selector Panel Switching
Figure 2

C. The rotary voice-range filter switch connects audio signals to the range filter only when positioned to RANGE or VOICE. The range filter is bypassed when the switch is positioned to BOTH. When in the RANGE position, only the NAV 1020 (VOR) cycle and ADF (radio range) morse code tones will be heard. In the VOICE position, NAV and ADF voice will be heard.

D. Relays complete microphone audio and control circuits to the rotary mike selector switch and complete the ground for muting the flight interphone system loudspeakers. When one relay is energized, by pressing the OXY/BOOM or control wheel MIC push-to-talk switch, oronasal or boom mike audio and control ground are completed through the rotary mike selector switch. When the second relay is activated, by pressing the control wheel INT push-to-talk switch, the oronasal or boom mike circuit is completed to the flight interphone system through the mike selector switch. The INT push-to-talk button completes the ground for the loudspeaker muting circuits and systems control circuits whenever the push-to-talk button is closed.

E. The rotary mike selector switch enables crewmembers to select any one of six communication facilities. The mike selector switch can direct the crewmember's microphone output and control circuits to the VHF transmitters, HF transmitter, the two interphone systems and, when pulled out of detent position, to the PA system. The mike selector switch also directs VHF and HF receiver audio, and audio from the service, flight or PA system amplifiers to the isolation amplifier input. The audio common lines, which are terminated on electronic rack shelf E2-1, are also completed through the mike selector switch. The mike selector switch also completes power for the appropriate green indicating lights when VHF, HF, flight interphone, or PA is selected. The isolation amplifier output is connected to the volume control. The volume control adjusts the audio signals to the headphones and, on the captain's and first officer's audio selector panels, the associated loudspeaker. A filter circuit ensures that voltage transients do not damage the transistorized amplifier. Audio outputs from the captain's, first officer's and observer's panels are also connected to the voice recorder system (refer to 23-71-0).

AUDIO SELECTING SYSTEM - TROUBLESHOOTING

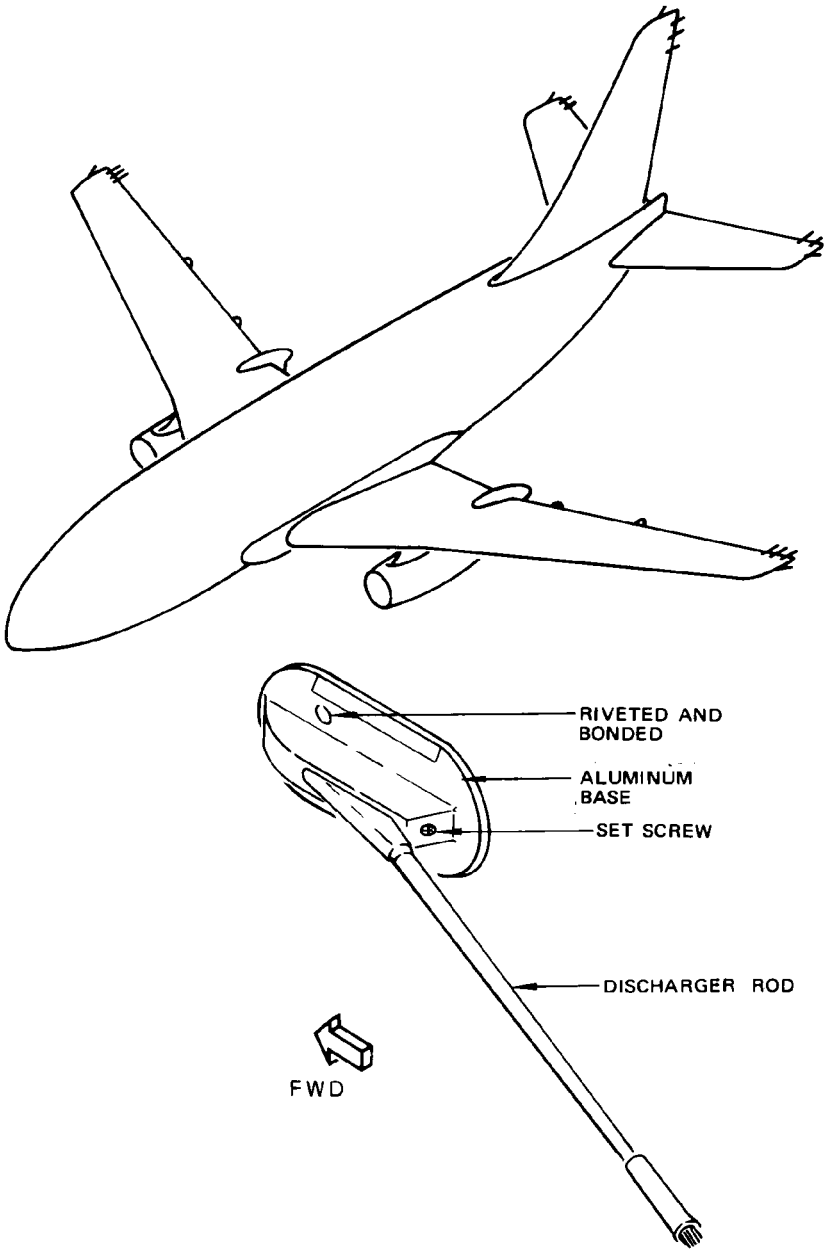
1. General
   A. An inoperative audio selector panel can usually be detected if audio or keying circuits are incomplete on more than one select system. Replacement of the panel will usually correct the problem. If difficulty is experienced in monitoring a particular system, isolation of the panel can be accomplished by first comparing reception with another audio selector panel. If audio signals are not available at any of the audio selector panels, then probably the monitored system is inoperative. Refer to Chapter 34 for those systems not covered in Chapter 23.

AUDIO SELECTING SYSTEM - ADJUSTMENT/TEST

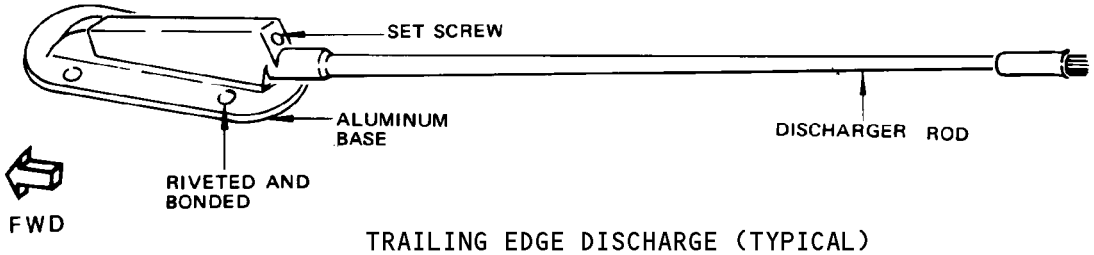
1. Test Audio Selecting System
   A. General
      (1) The audio selector panels are tested as part of the individual communication and navigation systems tests. Refer to Chapter 34 for those systems not covered in Chapter 23.

DECOUPLED STATIC DISCHARGERS - DESCRIPTION AND OPERATION

1. General
   A. Decoupled static dischargers are installed on the airplane to reduce interference in the radio receivers. This radio interference is caused by corona discharges 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 static into the radio receiver antennas.
   B. Each discharger installed along the trailing edges of the wing and tail surfaces consists of a bundle of metal needles at the end of a slender rod (Fig. 1). The rod is coated with a resistive (conducting) material and is attached to a metal base. The base is riveted and bonded to the trailing edge surface. The wingtip dischargers are smaller than the wing and tail dischargers, but have the same general construction and are attached in the same manner.
   C. The vertical fin has a tip discharger and three trailing edge dischargers. Each horizontal stabilizer has a tip discharger and two trailing edge dischargers. Each wing has a tip discharger and three trailing edge dischargers (Fig. 1).



TIP DISCHARGER (TYPICAL)



TRAILING EDGE DISCHARGE (TYPICAL)

Decoupled Static Discharger Locations
Figure 1

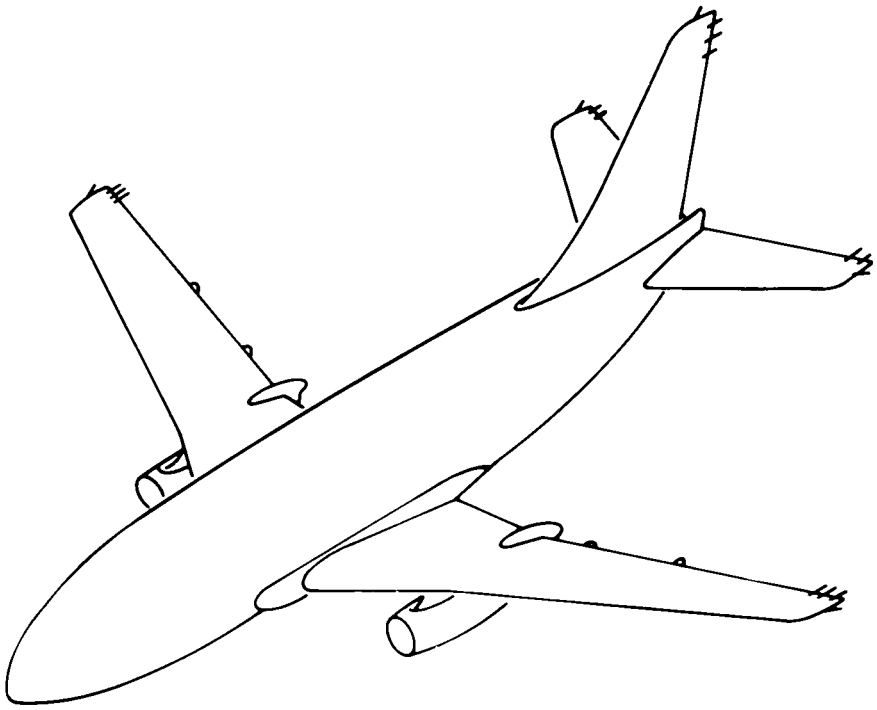
DECOUPLED STATIC DISCHARGER - REMOVAL/INSTALLATION

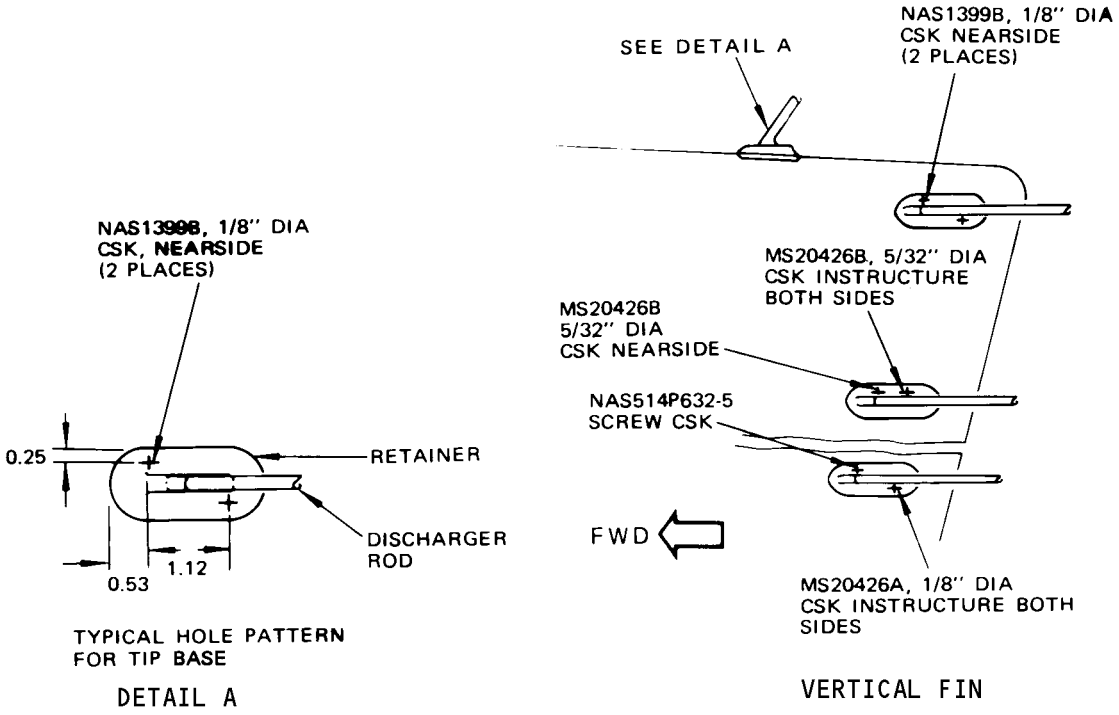
1. Equipment and Materials
   A. Sealant (Fiberglass Laminates) - BMS 5-95, Coast Pro-Seal Teledyne Co., 19451 Susanna, Compton, California 90221
   B. Sealant (Aluminum Skin) - BMS 5-95, Products Research Corp., 5426 San Fernando Rd, Glendale, California 91203
   C. Cleaning Solvent - B01008 Final cleaning of Metal Prior to Non-structural Bonding (Series 88) (Ref. 20-30-88).
   D. Putty - DUXSEAL, Johns Manville Co.
   E. Stripper - Turco 5351, Turco Products Inc., Wilmington, California
   F. Aluminum oxide paper - 600, 400, 180 grit
   G. Infrared Lamp - 350 watts, or Heat Clamp, 610-1013 Granger Associates, or Hot Air Blower - Master Appliance Incorporated, Model 12500
   H. Masking tape - 1 inch
   I. Grease pencil - or other nondestructive marker
   J. Polyvinyl Alcohol Film (if heat clamp is used) - 610-1018, Granger Associates
   K. Thermocouple and temperature indicator - 60- to 130-degree range
   L. Shore A Durometer - Hardness 35 to 60
   M. Megohmmeter (500 VDC Test Voltage, maximum 5 milliampere short circuit current) - Quadtech 1863 megohmmeter (or equivalent)
   N. Rivets or screws
   O. Bonding Meter (Ref 20-22-01)
   P. Broad-bladed putty knife and plastic scraper
2. Remove Static Discharger Base (Fig. 401)
   A. Prepare to remove Static Discharger Base.
      (1) Remove pressure and power from the hydraulic systems for the applicable flight control surfaces (Ref 27-11-0 MP, 27-21-0 MP, 27-31-0 MP).

      WARNING: MAKE SURE PRESSURE IS REMOVED FROM HYDRAULIC SYSTEMS. MAKE SURE HYDRAULIC POWER AND ELECTRICAL POWER ARE NOT SUPPLIED. IF HYDRAULIC PRESSURE IS PRESENT OR HYDRAULIC/ELECTRICAL POWER IS SUPPLIED, THE FLIGHT CONTROL SURFACES CAN MOVE. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

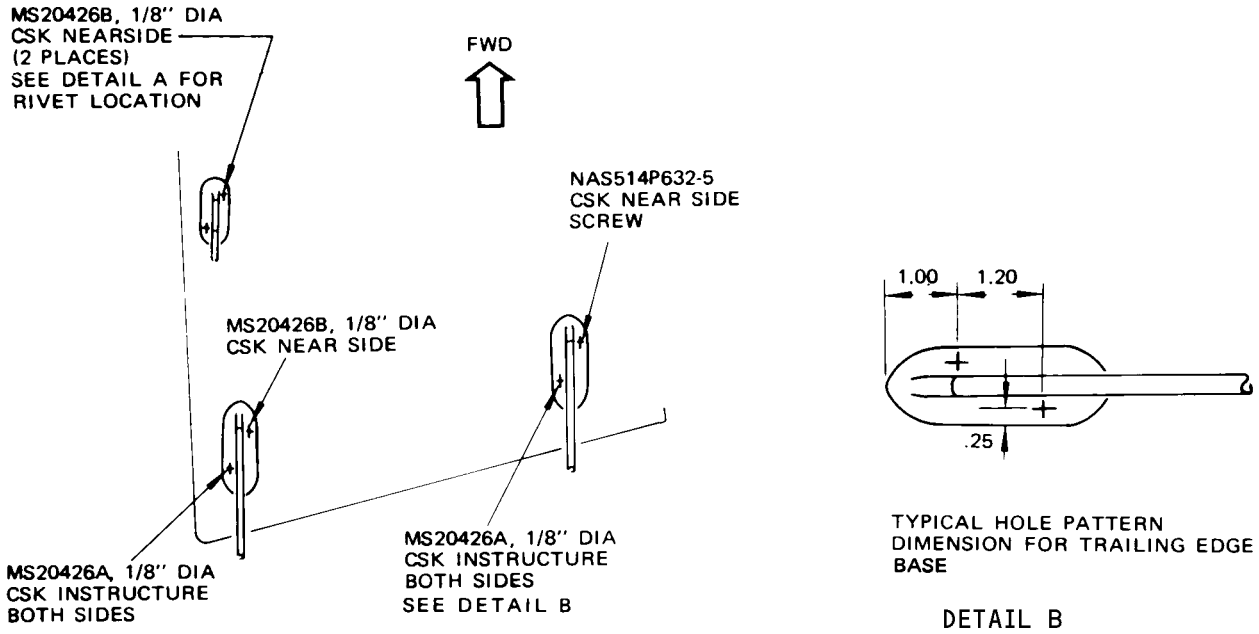
      (2) Remove power from the electrical system (Ref 24-22-0 MP).
   B. Loosen discharger setscrew and remove discharger from base.

      CAUTION: THE DISCHARGER IS SECURED TO THE BASE BY A BRISTOL HEAD SCREW. CARE MUST BE EXERCISED WHEN REMOVING OR INSTALLING DISCHARGER TO ENSURE THE THREADS OR RECESSED HEAD OF THE SETSCREW IS NOT DAMAGED.

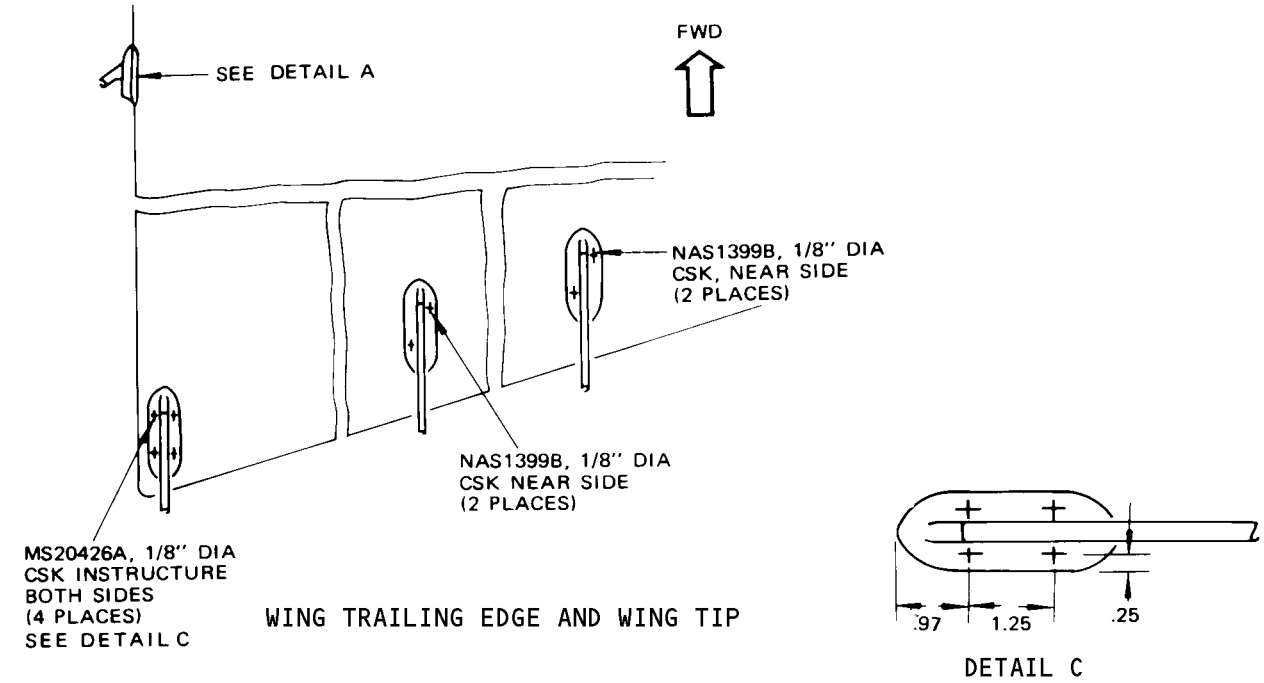




Decoupled Static Discharger Base Replacement
Figure 401 (Sheet 1)



ELEVATOR AND HORIZONTAL STABILIZER TIP



WING TRAILING EDGE AND WING TIP

Decoupled Static Discharger Base Replacement
Figure 401 (Sheet 2)

C. Mark position of discharger base beyond cleaning area with a nondestructive marking. Check that line is parallel with slipstream.
D. Remove rivets from base per 51-30-2 in Structural Repair Manual.
E. Scrape off sealant along one edge of base (AMM 51-31-0/201) and apply chemical stripper to adhesive fillet.
F. After 30 minutes the surface of the sealant will soften and may be scraped off (AMM 51-31-0/201).

CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE SEALANT. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

G. Insert a sharp, broad-bladed putty knife under edge of base and lift base off.

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

3. Install Static Discharger Base (Fig. 401)
A. Prepare to Install Static Discharger Bases
(1) Remove pressure and power from the hydraulic systems for the applicable flight control surfaces (Ref 27-11-0 MP, 27-21-0 MP, 27-31-0 MP).

WARNING: MAKE SURE PRESSURE IS REMOVED FROM HYDRAULIC SYSTEMS. MAKE SURE HYDRAULIC POWER AND ELECTRICAL POWER ARE NOT SUPPLIED. IF HYDRAULIC PRESSURE IS PRESENT OR HYDRAULIC/ELECTRICAL POWER IS SUPPLIED, THE FLIGHT CONTROL SURFACES CAN MOVE. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Remove power from the electrical system (Ref 24-22-0 MP).
(3) Aluminum skin
(a) Build a dam around sealant residue using putty or modeling clay and fill dam with stripper until sealant is completely covered. Allow sealant 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 sealant (AMM 51-31-0/201). Depending on thickness of sealant repeat step (a) until all residue is removed.

CAUTION: OBEY THE INSTRUCTIONS IN THE PROCEDURE TO REMOVE THE SEALANT. IF YOU DO NOT OBEY THE INSTRUCTIONS, DAMAGE TO THE AIRPLANE SURFACE CAN OCCUR.

(c) Clean and degrease bonding area with applicable cleaning solvent, Series 88 (Ref. 20-30-88). Apply solvent from squeeze bottle or safety can with clean oil-free gauze or cheesecloth.

WARNING: DO NOT GET SOLVENT IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

(d) Wipe off solvent before it evaporates using more clean gauze or cheesecloth. Do not touch surface with fingers.
(e) Prepare sealant as described in par. 3.B. below.
(f) Abrade surface with new 600-grit abrasive paper or cloth until all shine is removed and surface takes on a uniform satin sheen.

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

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

CAUTION: INSTALL STATIC DISCHARGER BASES WITHIN 5 MINUTES AFTER SANDING TO PREVENT ALUMINUM OXIDATION.

(4) Fiberglass Laminates
(a) Remove sealant 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% clear of sealant is satisfactory.

(b) Clean and degrease bonding area with applicable cleaning solvent, Series 88 (Ref 20-30-88). Apply solvent from squeeze bottle or safety can with clean oil-free gauze or cheese cloth.

WARNING: DO NOT GET SOLVENT IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES

(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, complete cleaning no sooner than 1 hour before bonding.

B. Install Static Discharger Bases

(1) Prepare sealant as follows:

(a) Mix all of part B, hardener (1 part), with all of part A resin, (10 parts), in a clean glass or metal container. Do not use waxed or porous paper container.

(b) Mix thoroughly with wood tongue depressor until mixture is smooth and uniform in color. Take care not to entrap air in the mixture.

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

CAUTION: SEALANTS 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 1-ounce kit is suitable for about six dischargers.

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

NOTE: Do not abrade plated bases, but clean per steps A.(1)(c) and A.(1)(d). A plated base has a green dot on it for identification. Wear gloves when handling bases.

(3) Attach the base to the airplane surface:

(a) Make sure you install the base in the same direction as the airstream.

(4) Install the fasteners:

(a) Attach the base to the aluminum structure in 5 minutes or less to prevent aluminum oxidation.

1) Use rivets to attach the base to the airplane surface (SRM 51-40-02/201).

2) Apply sealant, BMS5-95 to the rivet (AMM 51-31-00/201).

(b) Attach the base to the composite structure.

1) Apply sealant, BMS 5-95 to the screws (AMM 51-31-00/201).

2) Use the four 5/32 inch screws to attach the base to the structure.

(5) Apply a bead of sealant, BMS 5-95 to the edge of the discharger base.
   (a) Make a fillet seal around the discharger base (AMM 51-31-00/201).
   (b) Make sure no cracks are seen, this includes airplane surfaces that do not correctly align with the base.
   (c) Clean away unwanted sealant with a cloth that is moist with methyl ethyl ketone, BMS 11-7, FCC-55, MEK:sec-butyl alcohol (42:58), or MPK.

WARNING: DO NOT GET SOLVENT IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM SOLVENTS. SOLVENTS ARE HAZARDOUS MATERIALS. REFER TO PRODUCT MATERIAL SAFETY DATA SHEETS (MSDS) AND LOCAL REQUIREMENTS FOR PROPER HANDLING PROCEDURES.

CAUTION: BE SURE NOT TO WASH AWAY FILLET.

(6) Cure trailing edge and tip type bases.
   (a) If base is not riveted, tape base firmly to airplane surface with masking tape, or if heat clamp is to be used, place polyvinyl alcohol film over base. Check alignment before cure.

NOTE: Tape a thermocouple adjacent to the bond area to aid in indicating bond line temperature.

   (b) Set an infrared lamp, heat clamp or blower directly over the base. Position lamp about 4 to 6 inches from base.
   (c) Adjust blower, heat clamp or infrared lamp to give a bond line temperature as indicated in following chart.

Temp (°F)	Minimum Cure Time
60	48 hours
75	24 hours
130	3 hours

CAUTION: DO NOT CURE SEALANT BELOW 60°F OR ABOVE 130°F.

(d) Cure for time shown below. Cure is complete when sealant cannot be indented with knife.
(e) Check that fillet has durometer reading of 30 before returning airplane to service.

(7) Fill any visible gaps or cracks in fillet or between base and airplane surface with fresh sealant.

(8) Check static discharger base.
(a) When sealant is fully cured and cooled to between 70 and 80°F, check for cracks in sealant fillet between base and airplane surface. Any crack is cause for rejection.
(b) Check electrical bond between discharger bases and aluminum structure per 20-22-01. Resistance for newly installed dischargers should not exceed:

0.01 ohms for dischargers mounted on metal panels.
0.10 ohms for dischargers mounted on fiberglass laminate or composite panels coated with aluminum flame spray and dischargers mounted on aluminum coated glass fabric.
1.0 ohms for dischargers mounted on composite panels without aluminum coating.

WARNING: MAKE SURE THAT THE BONDING METER IS RESISTANT TO EXPLOSION. IF NOT IT IS POSSIBLE THAT AN EXPLOSION OR FIRE CAN OCCUR.

(9) Install Static Discharger

NOTE: Before installing new discharger, check general condition of discharger. Reject discharger with blunt or bent pins.

(a) Fit static discharger on mounting base.
(b) Hold discharger in place and tighten setscrew.
(c) Check security of discharger on mounting base.

(d) Use these precautions for possible fuel vapors when you use a megohmeter:

WARNING: USE THE PRECAUTIONS THAT FOLLOW WHEN YOU USE A MEGOHMMETER. IF YOU DO NOT USE PRECAUTIONS, THEN IT IS POSSIBLE THAT AN EXPLOSION OR FIRE CAN OCCUR.

1) Use the Quadtech 1863 megohmmeter or equivalent meter with a 500 VDC test voltage and a maximum 5 milliampeter short circuit current.
2) Do not use a megohmmeter at these locations:
   a) Area adjacent to or below a wing fuel tank vent, five foot (1.524 meters) diameter column, from vent to ground.
   b) Zero to 18 inches (457 mm) above the ground in the area around the airplane.
3) Make sure that:
   a) Area is well ventilated.
   b) Metal workstands are grounded.
   c) Megohmmeter is plugged into a grounded receptacle.
   d) Megohmmeter is insulated from metal work stands.

(e) Measure resistance between the end of discharger tip and the discharge base using a megohmmeter of at least 500 volts. To make a good surface contact with the end of the discharger tip, wet a paper towel, cotton cloth or sponge with tap water and place in contact with entire surface of end of discharger tip. Place megohmmeter leads on base and on wet material at end of tip. If reading is high, verify that the wet material is adhering to the meter lead and to the end of the discharger tip. Add more water if necessary and measure again. Take lowest reading. Check that measured resistance is within a reading of 6-100 megohms for tip and trailing edge dischargers.

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

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

C. Put the airplane back to its usual condition

(1) Put the hydraulic systems for the flight control surfaces back to the usual condition (Ref 27-11-0 MP, 27-21-0 MP, 27-31-0 MP).

DECOUPLED STATIC DISCHARGER - INSPECTION/CHECK

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. Equipment and Materials
   A. Megohmmeter (500 VDC Test Voltage, maximum 5 milliampere short circuit current) - Quadtech 1863 megohmmeter (or equivalent).
   B. Bonding Meter (Ref 20-22-01)
3. Periodic Check of Decoupled Static Discharger
   A. Prepare for check of Static Dischargers.
      (1) Remove pressure and power from the hydraulic systems for the applicable flight control surfaces (Ref 27-11-0 MP, 27-21-0 MP, 27-31-0 MP).

          WARNING: MAKE SURE PRESSURE IS REMOVED FROM HYDRAULIC SYSTEMS. MAKE SURE HYDRAULIC POWER AND ELECTRICAL POWER ARE NOT SUPPLIED. IF HYDRAULIC PRESSURE IS PRESENT OR HYDRAULIC/ELECTRICAL POWER IS SUPPLIED, THE FLIGHT CONTROL SURFACES CAN MOVE. THIS CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

      (2) Remove power from the electrical system (Ref 24-22-0 MP).
   B. Visually check to determine that all dischargers are secure on mounting base and are not broken or missing.
   C. Check dischargers for lightning damage as evidenced by a burning and roughening of the black conductive coating of the discharger and pitting of the metal discharger base.
   D. Check for excessive erosion of discharger needles.
   E. Check for excessive erosion of the discharger coating. Leading edge erosion of the dischargers should not extend back more than one-third the width of the discharger.
   F. Check electrical bond between base and airplane structure per 20-22-01. Resistance for existing installations should not exceed:
      (1) 0.05 ohms for dischargers mounted on metal panels.

(2) 0.5 ohms for dischargers mounted on fiberglass laminate or composite panels coated with aluminum flame spray and dischargers mounted on aluminum coated glass fabric.
(3) 5.0 ohms for dischargers mounted on composite panels without aluminum coating.

WARNING: MAKE SURE THAT THE BONDING METER IS RESISTANT TO EXPLOSION. IF NOT IT IS POSSIBLE THAT AN EXPLOSION OR FIRE CAN OCCUR.

G. Use these precautions for possible fuel vapors when you use a megohmeter:

WARNING: USE THE PRECAUTIONS THAT FOLLOW WHEN YOU USE A MEGOHMMETER. IF YOU DO NOT USE PRECAUTIONS, THEN IT IS POSSIBLE THAT AN EXPLOSION OR FIRE CAN OCCUR.

(1) Use the Quadtech 1863 megohmmeter or equivalent meter with a 500 VDC test voltage and a maximum 5 milliampeter short circuit current.
(2) Do not use a megohmmeter at these locations:
    (a) Area adjacent to or below a wing fuel tank vent, five foot (1.524 meters) diameter column, from vent to ground.
    (b) Zero to 18 inches (457 mm) above the ground in the area around the airplane.
    (c) Make sure that:
        1) Area is well ventilated.
        2) Metal workstands are grounded.
        3) Megohmmeter is plugged into a grounded receptacle.
        4) Megohmmeter is insulated from metal work stands.

H. Measure, for all dischargers, the resistance between the end of discharger tip and the discharge base using a megohmmeter of at least 500 volts. To make a good surface contact with the end of the discharger tip, wet a paper towel, cotton cloth or sponge with tap water and place in contact with entire surface of end of discharger tip. Place megohmmeter leads on base and on wet material at end of tip. If reading is high, verify that the wet material is adhering to the meter lead and to the end of the discharger tip. Add more water if necessary and measure again. Take lowest reading.

NOTE: If you are testing 80-1746-2 or 80-1828-2 Static Discharger, DO NOT wrap the wetted material around the tip of the discharger. Wrapping the wetted material around the tip of discharger can cause erroneous resistance readings resulting in the unnecessary removal of a serviceable static discharger. Place the wetted material between the tip of the discharger and the megger probe. If resistance is not within limits, remove wetted matterial and place megger probe directly onto tip of discharger core material and repeat test. Refer to Figure 601, ON WING DISCHARGER RESISTANCE TEST. If you are using the alternate discharger test method, connect the megger probe to the edge of the wetted material as shown in Figure 601, ALTERNATE (OFF WING) DISCHARGER RESISTANCE TEST.

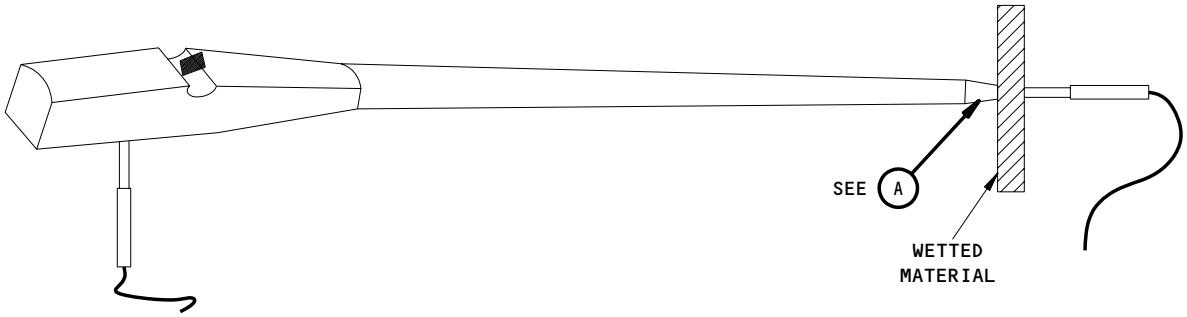
(1) Discharger resistance shall be within the limits of 6-100 megohms for trailing edge and tip types of dischargers.

NOTE: Dischargers failing to meet the resistance check should be replaced.

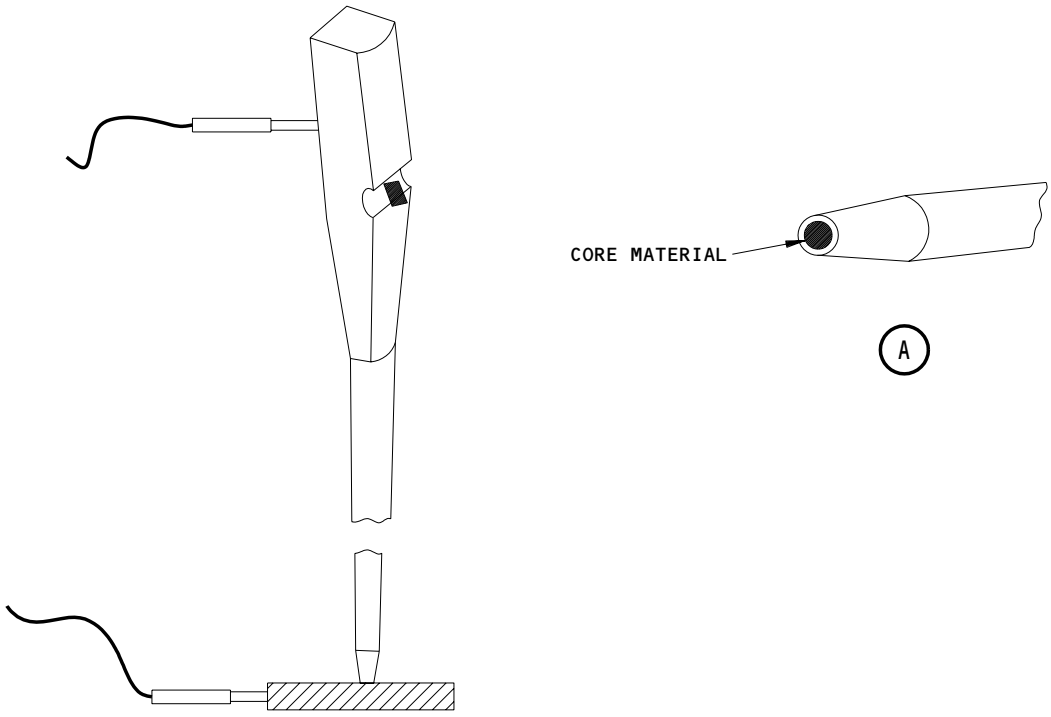
I. Dischargers exhibiting any damage or failure to meet the resistance check requirements should be replaced.

J. Put the airplane back to its usual condition.

(1) Put the hydraulic systems for the flight control surfaces back to the usual condition (Ref 27-11-0 MP, 27-21-0 MP, 27-31-0 MP).



ON WING DISCHARGER RESISTANCE TEST



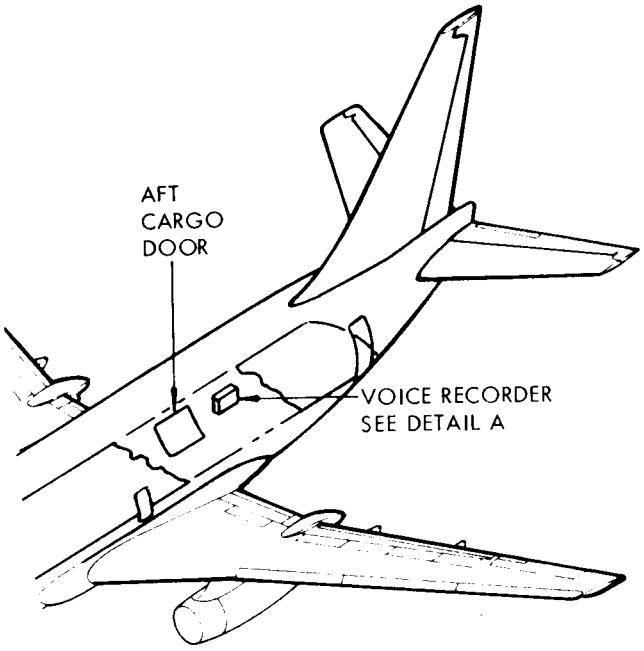
ALTERNATE (OFF WING) DISCHARGER RESISTANCE TEST

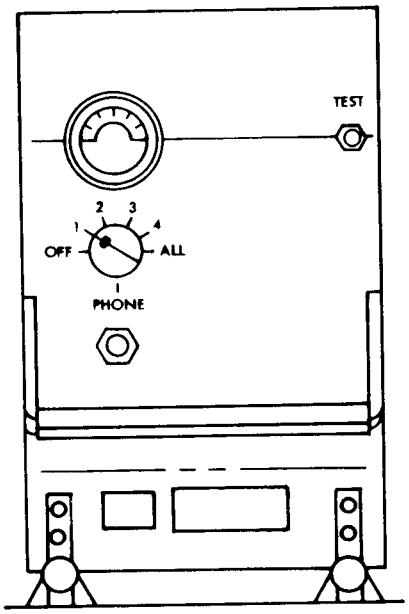
NOTE: TEST PROCEDURES FOR THE TRAILING EDGE AND WING TIP DISCHARGERS ARE THE SAME.

Static Discharger Resistance Test
Figure 601

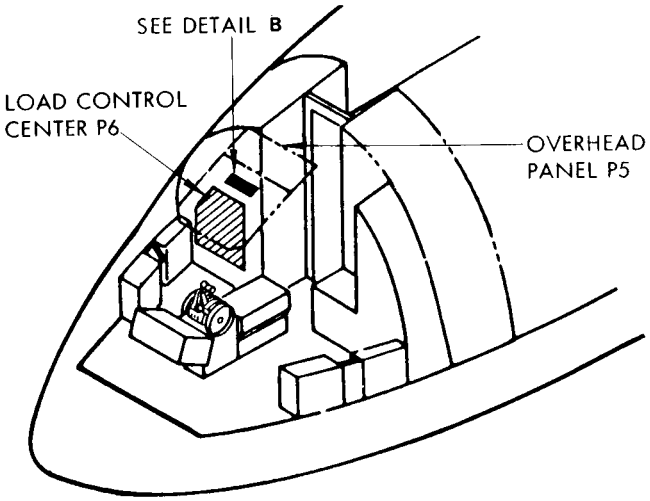
VOICE RECORDER SYSTEM - DESCRIPTION AND OPERATION

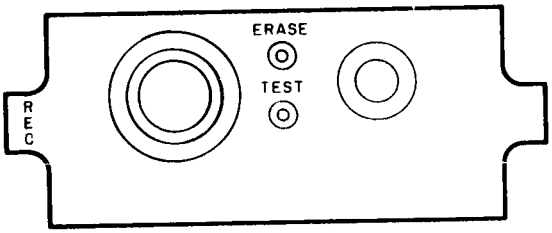
1. General (See figure 1.)
   A. The voice recorder system records and preserves a continuing record of the latest 30 minutes of flight crew communications and conversation. The voice recorder system has four separate inputs for simultaneous recording of any communications in the flight compartment on 4-track magnetic tape. Channel one receives audio from the first observers audio selector panel, channel two receives audio from the first officer's audio selector panel and channel three receives audio from the captain's audio selector panel. Channel four audio is taken from a microphone in the control unit.
   B. The voice recorder system (figure 1) consists of a voice recorder unit installed on the right side of the airplane in the aft cargo compartment; a control unit installed in the pilots' overhead panel P5; interconnecting wiring; and relay contacts in landing gear accessory unit module, M338.
   C. An erase head in the recorder unit automatically erases previously recorded information before recording. A 30-minute length of closed loop magnetic tape then provides a record of the previous 30 minutes of conversation. Internal test and playback circuits may be used to test for proper operation of the recording mechanism and circuits. A test light and a Jack present audible and visible indications derived from the test and playback circuits when the test switch on the control unit is operated. The entire tape may be erased after the airplane has landed and the parking brake has been set.
   D. Operating power for the voice recorder system is 115 volts, 400 Hz ac obtained from the unswitched electronics bus through the VOICE RECORDER circuit breaker on P6.
2. Control Unit
   A. The control unit is located in the pilots' overhead panel P5. It contains a microphone with preamplifier and filter circuits, a test light, a test pushbutton, a headphone jack, and an erase pushbutton. The microphone and its preamplifier pick up the conversation in the flight compartment and provide audio to channel 4 of the voice recorder unit. When the TEST pushbutton is pressed, it energizes a test circuit in the recorder unit. If all channels are recording properly, the test light will cane on after approximately 1 second. The ERASE pushbutton will erase the entire tape in the recorder if pressed for 6 seconds or longer. However, the bulk erase circuit will operate only with the airplane on the ground, power applied to the airplane, and the parking brake set.





DETAIL A





DETAIL B

Voice Recorder System Component Location
Figure 1

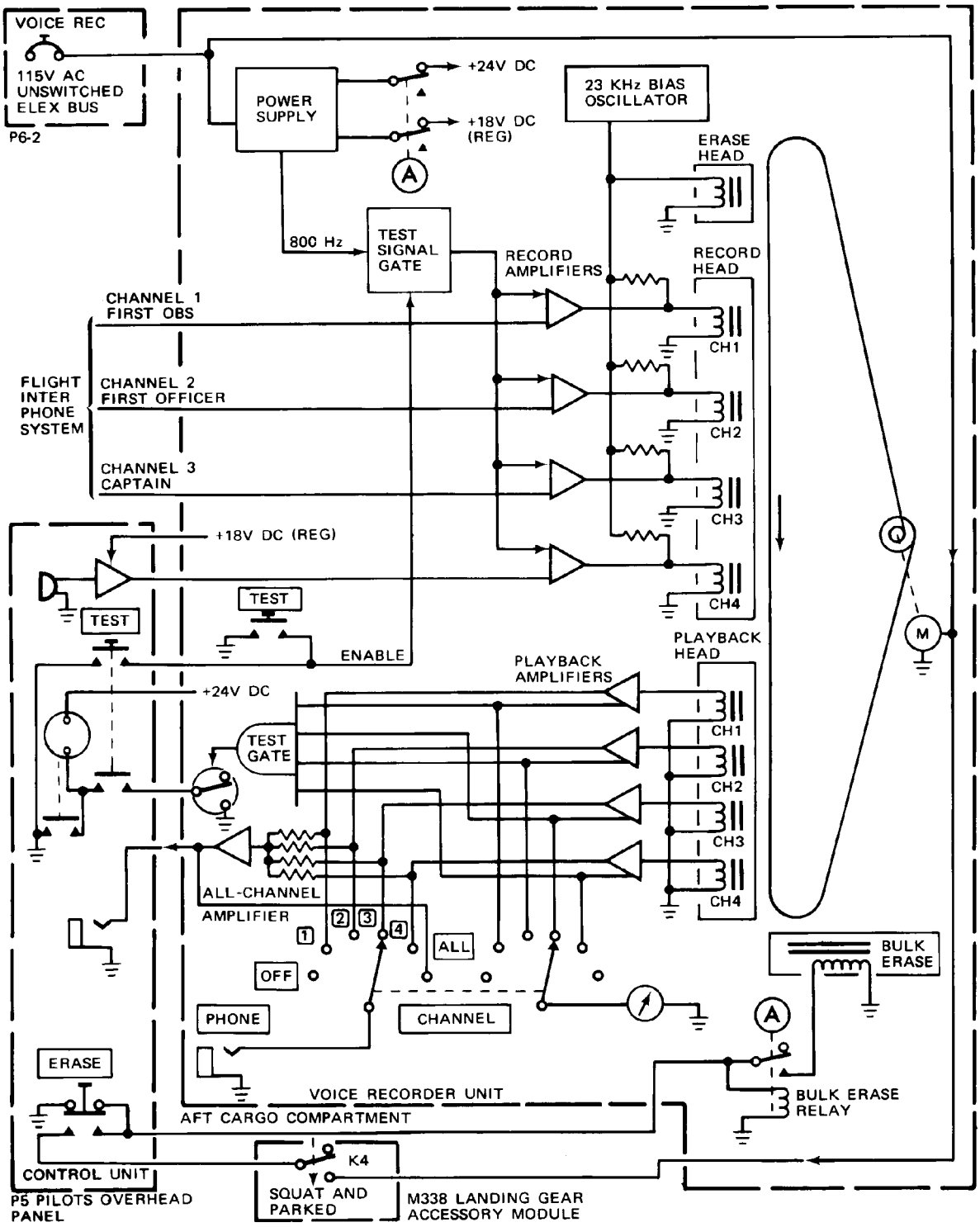
3. Voice Recorder Unit
   A. The voice recorder unit is installed on the right side of the airplane in the aft cargo compartment. It is housed in a thermally insulated, impact resistant, 1/2 ATR short case. All electrical connections are made through a single multipin connector at the rear of the unit. The voice recorder unit contains a tape transport, a 23-kHz bias oscillator, four recording amplifiers, a mixer circuit for each channel, four playback amplifiers, an all-channel output amplifier, test circuits, a test meter, a test (PHONE) jack, bulk erase circuits, and a power supply. In addition to the tape drive mechanism and tape, the tape transport contains the recording head; an erase head, a playback head and a bulk erase coil.
   B. The meter, the PHONE jack, a rotary channel selector switch, and a TEST pushbutton are located on the front panel of the recorder unit. All channels may be checked by a single test or the channels may be checked individually. When the TEST pushbutton on the control unit is pressed, the test circuit applies an'800-Hz signal to all four recording amplifiers. If all channels are recording properly, an 800-Hz tone will be heard at headphones plugged into the jack and the test light will come on. To check a single channel, the channel is selected by the rotary switch on the front panel of the recorder unit and the TEST pushbutton is pressed. If the channel is recording properly, an 800-Hz tone will be heard on headphones plugged into the PHONE jack on the front panel,
4. Operation
   A. Functional Description (Fig. 2).
      (1) The voice recorder system automatically records the latest 30 minutes of communications and conversation in the flight compartment. The system is in operation whenever 115-volt ac power is applied to the essential radio bus. Communications and interphone audio from the first observers, the first officer's, and the captain's audio selector panels is supplied to channels 1 through 3 respectively of the voice recorder unit through the interphone audio accessory box. Conversation in the flight compartment is picked up and amplified by the microphone and preamplifier in the control unit and supplied to channel 4.
      (2) The 23-kHz bias frequency for all four recording amplifiers is supplied from a common bias oscillator. This frequency is also used to drive the erase head removing information from the tape before recording.

(3) The bias frequency is used to shift the audio band upward to a frequency range suitable for recording on magnetic tape. The bias frequency is combined with the audio signal by a resistive mixer at the output of each record amplifier. This mixed signal drives an inductive (electromagnetic) recording head which produces a varying magnetic field. As the tape transport moves the tape past the recording head at a constant speed, the varying magnetic field produced by the head magnetizes the metallic oxide film on the tape producing a magnetic track of varying strength. As the magnetic track moves past the playback head, it induces a small varying current in the coil of the head. The bias frequency is removed by the tuned input of the playback amplifier, which functions as a low-pass filter.

(4) The audio output of each playback amplifier is provided to the test gate, the al1-channel amplifier, and the CHANNEL switch. When audio signals from all playback amplifiers are present at the test gate, it turns on a solid-state switch applying a ground to the test light on the control unit through the TEST switch on the control unit. The al1-channel amplifier provides the combined signal from the four channels to the jack on the control unit and to the CHANNEL switch. The CHANNEL switch is used to switch each channel of audio or the combined audio of all channels to the PHONE jack on the voice recorder unit. It also applies each channel audio signal separately to the meter. Al1-channel audio is not applied to the meter.

(5) Pressing the TEST pushbutton on the control unit enables the test signal gate, applying an 800-Hz signal obtained from the power supply to the input of each recording channel. After the TEST pushbutton has been pressed for approximately 1 second, the test light on the control unit will come on if the test gate receives an output from each playback amplifier. Pressing the TEST pushbutton on the voice recorder unit also applies the 800-Hz signal to the recording channels. Any individual channel output selected by the CHANNEL switch is applied to the meter and the PHONE jack. When the CHANNEL switch is positioned to ALL, combined audio is applied to the PHONE jack only.

(6) The bulk erase function is performed by applying 115-volt, 400-Hz power to the bulk erase coil. When the erase pushbutton on the control unit is pressed with the airplane on the ground and the parking brake set, 115-volt power is applied to the bulk erase relay. After approximately 1/2 second, the relay applies the power to the bulk erase coil. At the same time, the bulk erase relay removes dc power from the record, playback, and test circuits. The ERASE pushbutton must be pressed for at least 6 seconds to ensure complete erasure. This is the time required for one revolution of the tape spool.



Voice Recorder System, Simplified Schematic
Figure 2

B. Control

(1) The voice recorder system operates automatically whenever power is applied from the unswitched electronics bus.

(2) To erase all data recorded on the tape, proceed as follows:

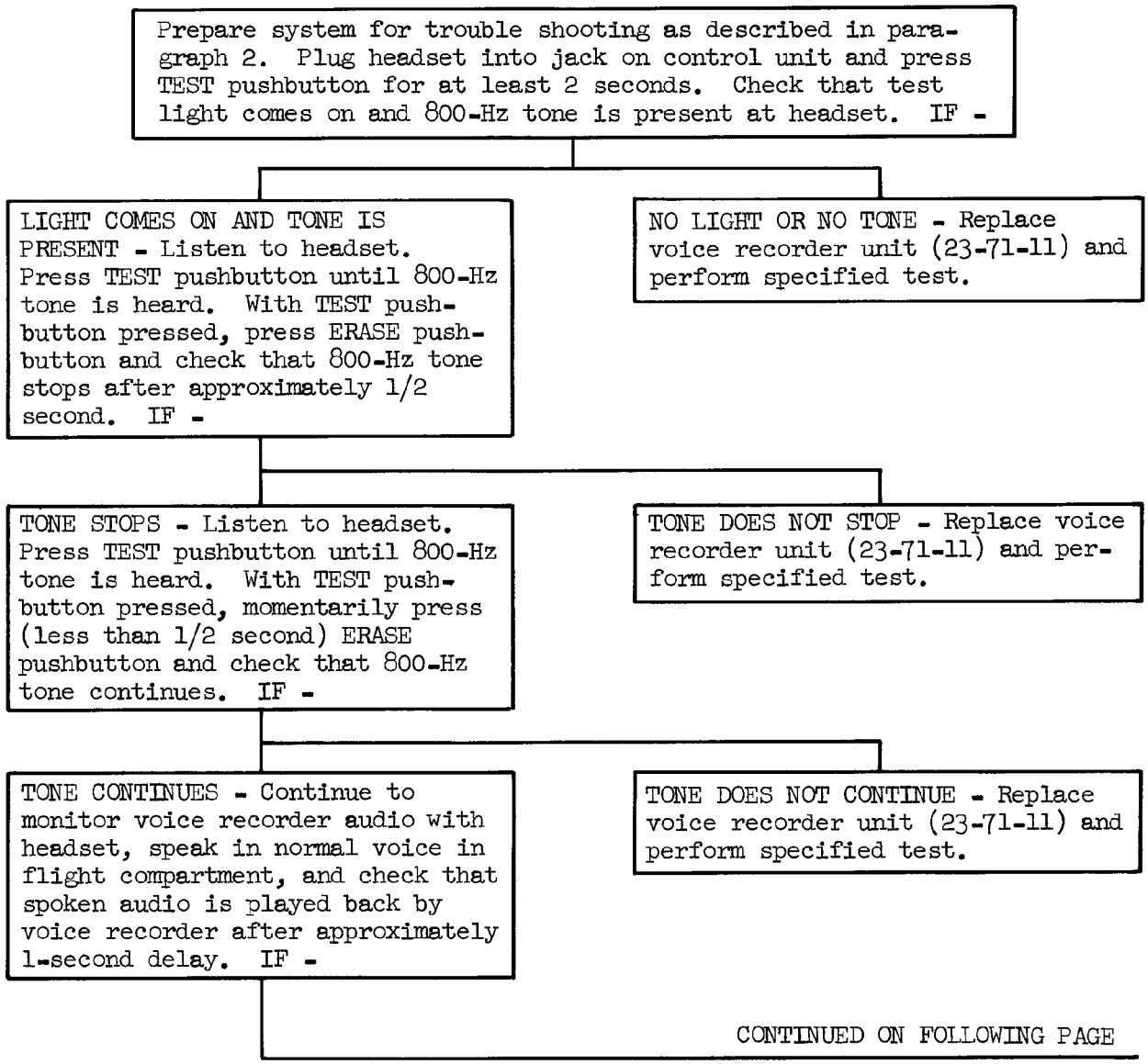
NOTE: The tape can be erased only with the airplane on the ground and the parking brake set.

(a) Press ERASE pushbutton on voice recorder control panel and hold for at least 6 seconds.

(b) Release ERASE pushbutton.

VOICE RECORDER SYSTEM - TROUBLESHOOTING

1. General
   A. The following troubleshooting procedures are based on performance of the system operational test and are presented in a tree-type format to aid in rapid fault isolation.
   B. When a test step does not check out, find the box containing the trouble symptom and perform the stated action. Continue to follow a single line by analyzing the results of each test step until the required corrective action is determined. Perform the specified corrective action, then repeat the step at which the failure was encountered and complete the test to check out the system.
   C. All troubleshooting procedures are based on the assumption that wiring is OK and that electrical power is available. If the corrective action in the procedure does not correct the problem, check wiring using the wiring diagram.
2. Prepare for Troubleshooting
   A. Provide ground electrical power to airplane.
   B. Ensure that voice recorder and flight interphone circuit breakers on P6 are closed.
   C. Check that test light on control panel comes on when pressed.



Voice Recorder System - Troubleshooting
Figure 101 (Sheet 1)

CONTINUED FROM PRECEDING PAGE

SPOKEN AUDIO IS PLAYED BACK -
Cover area microphone on control unit to prevent pickup of sound. In turn, check captain's, first officer's and first observer's recorder channels as follows:

(a) Disable audio inputs to voice recorder from stations not being checked by turning of all audio on audio selector panels.

(b) On audio selector panel for station being checked, select flight interphone operation.

(c) At another audio selector panel, select flight interphone microphone and transmit a test message.

(d) Check that test message is played back by voice recorder after approximately 1-second delay.

IF -

SPOKEN AUDIO NOT PLAYED BACK -
Replace control unit (23-71-13) and perform specified test.

CONTINUED ON FOLLOWING PAGE

Voice Recorder System - Troubleshooting
Figure 101 (Sheet 2)

CONTINUED FROM PRECEDING PAGE

MESSAGE PLAYED BACK BY ALL CHANNELS - System is operative.

TEST MESSAGE IS NOT PLAYED BACK - Check for interphone audio between the connector pins listed below for the voice recorder channel.

Channel	Connector	Pins
Captain's	D4371P	15 to 16
First Officer's	D4371P	13 to 14
First Observer's	D4371P	26 to 27

IF -

OK - Check for defective wiring for the channel between connector pins and voice recorder unit as listed below:

Channel	From D4371J	To Recorder
Captain's	Pin 16	Pin 41
	Pin 15	Pin 43
F/O's	Pin 13	Pin 35
	Pin 14	Pin 37
First Observer's	Pin 26	Pin 30
	Pin 27	Pin 32

Repair or replace defective wiring as required.

NOT OK - Check for defective wiring for the channel between connector pins and audio selector panel as listed below:

Channel	From D4371P	To Audio Sel Panel
Captain's	Pin 16	Pin 37
	Pin 15	Pin 42
F/O's	Pin 13	Pin 37
	Pin 14	Pin 42
First Observer's	Pin 26	Pin 37
	Pin 27	Pin 42

IF -

OK - Replace audio selector panel.

NOT OK - Repair or replace defective wiring as required.

Voice Recorder System - Troubleshooting
Figure 101 (Sheet 3)

VOICE RECORDER SYSTEM - ADJUSTMENT/TEST

1. General
   A. The following tests will provide assurance that the voice recorder system is functioning properly and is ready for use. There are no system tests or adjustments.
2. Operational Test - Voice Recorder System
   A. Prepare to Test
      (1) Check that VOICE RECORDER and INTERPHONE circuit breakers on panel P6 are closed.
   B. Test Voice Recorder System
      (1) Plug headset into jack on control unit.
      (2) Press TEST pushbutton for at least 2 seconds. Check that test light comes on and 800-Hz tone is present at headset.
      (3) With TEST pushbutton pressed and 800-Hz tone present, press ERASE pushbutton and check that tone stops after approximately 1/2 second.
      (4) With TEST pushbutton pressed and 800-Hz tone present, momentarily press (less than 1/2 second) ERASE pushbutton and check that tone continues.
      (5) With TEST pushbutton pressed and 800-Hz tone present, release parking brake, press erase pushbutton on control panel for more than 1/2 second, and check that 800-Hz tone continues.

          WARNING: BEFORE RELEASING PARKING BRAKE, VERIFY THAT WHEELS ARE CHOCKED AND CLEAR ALL PERSONNEL FROM WHEEL AREAS.

      (6) Reset parking brake.
      (7) Continue to monitor voice recorder audio with headset, speak in a normal voice in flight compartment at least 4 feet from area microphone, and check that spoken message is present at headset after a delay of approximately 1 second.
      (8) Check captain's, first officer's, and first observer's recorder channels as follows:
          (a) Cover area microphone on control unit to prevent pickup of sound.
          (b) On first officer's and first observer's audio selector panels, turn off all audio.
          (c) On captain's audio selector panel, select flight interphone operation.
          (d) On first observer's audio selector panel, select flight interphone microphone and transmit test message.
          (e) Check that test message is played back by voice recorder after approximately 1-second delay.
          (f) On captain's audio selector panel, turn off all audio.
          (g) On first officer's audio selector panel, select flight interphone operation.

(h) From first observer's station, transmit test message on flight interphone.
(i) Check that test message is played back by voice recorder after approximately 1-second delay.
(j) On first officer's audio selector panel, turn off all audio.
(k) On first observer's audio selector panel select flight interphone operation.
(l) From first officer's station, transmit test message on flight interphone.
(m) Check that test message is played back by voice recorder after approximately 1-second delay.
(n) Remove cover from area microphone on control panel.

(9) Disconnect headset.
(10) Remove electrical power if no longer needed.

VOICE RECORDER UNIT - REMOVAL/INSTALLATION

US 1. General

A. The voice recorder unit is mounted on the right side of the airplane in the aft cargo compartment. All electrical connections are made through a single connector at the rear of the unit.

2. Remove Voice Recorder Unit

A. Open VOICE RECORDER circuit breaker on circuit breaker panel P6.

B. Remove voice recorder unit.

3. Install Voice Recorder Unit

A. Install voice recorder unit.

B. Close VOICE RECORDER circuit breaker on electronics circuit breaker panel P6.

C. Check voice recorder unit installation.

(1) Provide ground electrical power to airplane.

(2) Press TEST pushbutton on control unit and check that test light comes on after approximately 1 second.

(3) Remove electrical power if no longer required.

CONTROL UNIT - REMOVAL/INSTALLATION

1. General
   A. The control unit panel is located in the pilots' overhead panel P5. All electrical connections are made through a single connector at the rear of the panel.
2. Remove Control Unit
   A. Open VOICE RECORDER circuit breaker on electronics circuit breaker panel P7.
   B. Remove control unit.
3. Install Control Unit
   A. Install control unit.
   B. Close VOICE RECORDER circuit breaker on circuit breaker panel P6.
   C. Check control unit installation.
      (1) Provide ground electrical power to airplane.
      (2) Press test light on control unit and check that light comes on.
      (3) Remove electrical power if no longer required.