Aerolineas Argentinas

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CHAPTER 31 - INSTRUMENTS

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CHAPTER 31 - INSTRUMENTS

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INSTRUMENT INDICATORS - DESCRIPTION AND OPERATION

1. General
   A. There are principally three types of instrument indicators. They are the clamp, bezel, and rear mounted types.
   B. The clamp type indicator is held in position by a spring clamp which is fastened to the rear of the front panel with a clamp retaining screw. The clamp is tightened around the indicator by a clamp adjustment screw; thereby, holding the indicator in position.
   C. The bezel type indicator is held in position similarly as the clamp type indicator. A bezel is mounted on the front of the panel; otherwise the indicators are secured in an identical manner.
   D. The rear-mounted type of indicator is held in position with three retaining screws which holds the flange on the indicator flush with the rear of the instrument panel.

BEZEL AND CLAMP-TYPE INDICATORS - REMOVAL/INSTALLATION

1. General
   A. The following instructions concern the removal/installation of the bezel and clamp-type instrument indicators.
2. Remove Bezel and Clamp-Type Indicators
   A. Open applicable circuit breakers pertaining to indicator being removed.

      WARNING: TAG AND SAFETY THE CIRCUIT BREAKERS.

      WARNING: MAKE SURE EACH ELECTRICAL CONNECTOR HAS A TAG TO IDENTIFY THE CORRECT INSTALLATION LOCATION TO THE [name of gage, indicator, component]. CROSS-CONNECTION OF THE ELECTRICAL CONNECTORS CAN CAUSE THE AIRPLANE SYSTEM TO MALFUNCITON AND THE LOSS OF SAFE FLIGHT.

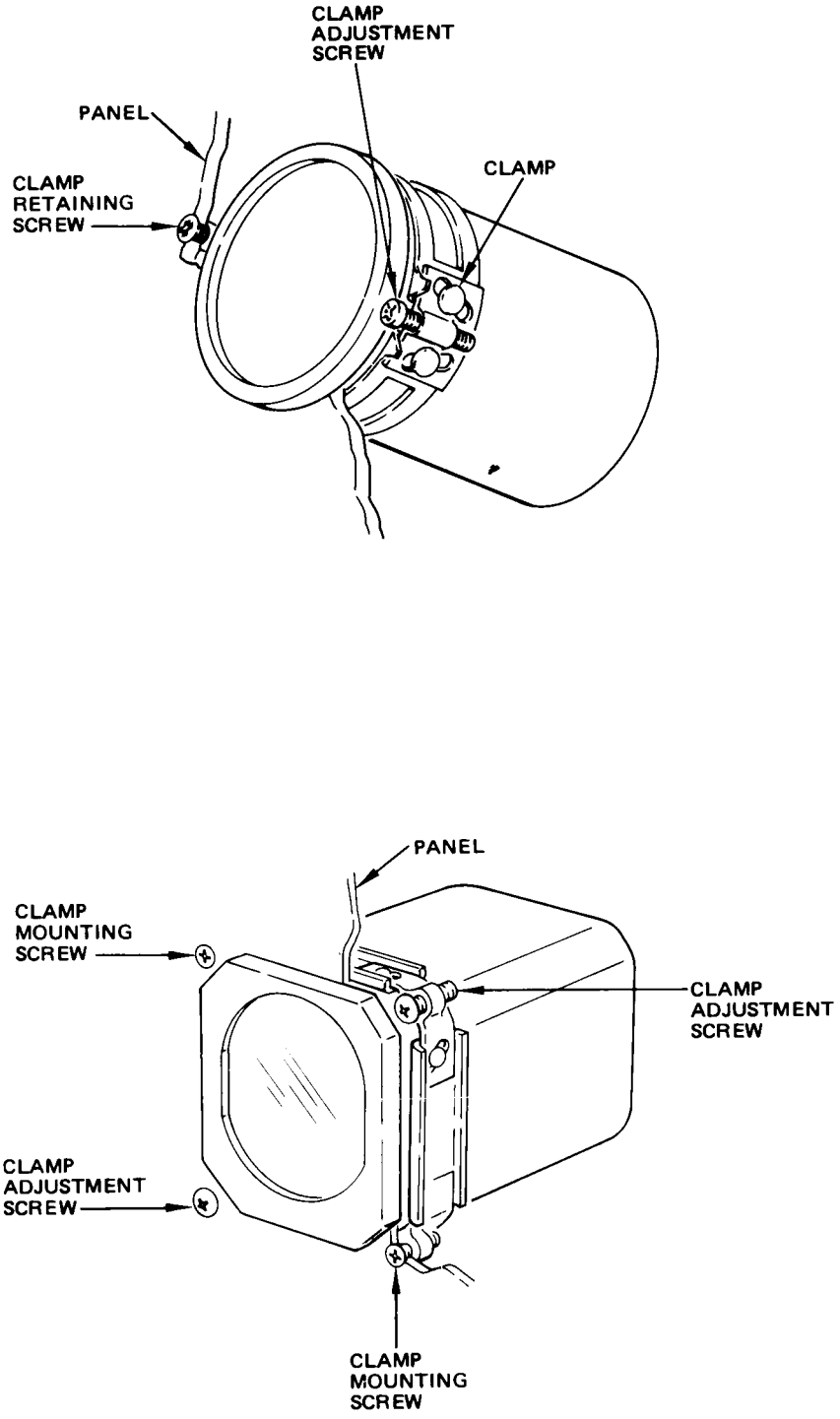
      CAUTION: REMOVE POWER FROM THE TURN AND BANK INDICATOR AND ALLOW GYRO 5 MINUTES TO COMPLETELY RUN DOWN OTHERWISE GYRO MAY BE DAMAGED.

   B. Loosen quarter-turn fasteners along panel or module edge by turning fasteners one-quarter turn counterclockwise.
   C. Fold down instrument panel or pull-out module.
   D. Loosen indicator mounting clamp adjustment screw. (See figures 401 and 402.)
   E. Disconnect electrical connectors and lines (pitot, static, etc.).
   F. Cap electrical connectors and lines. Tag and secure them to prevent falling back into cutout.
3. Install Bezel and Clamp-Type Indicators
   A. Make certain that applicable circuit breakers pertaining to indicator to be installed are opened and tagged.

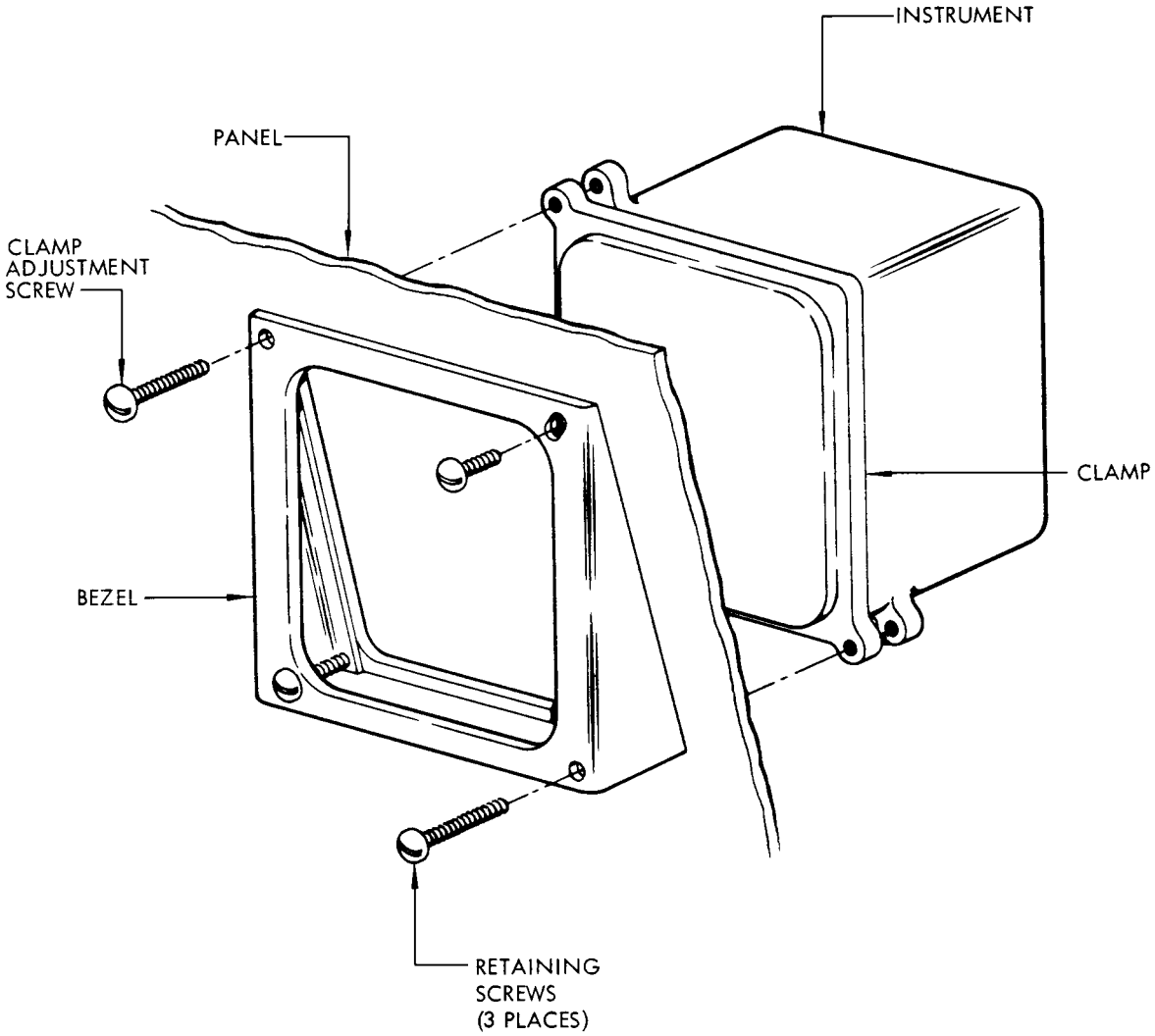
      WARNING: MAKE SURE EACH ELECTRICAL CONNECTOR HAS A TAG TO IDENTIFY THE CORRECT INSTALLATION LOCATION TO THE [name of gage, indicator, component]. CROSS-CONNECTION OF THE ELECTRICAL CONNECTORS CAN CAUSE THE AIRPLANE SYSTEM TO MALFUNCITON AND THE LOSS OF SAFE FLIGHT.

   B. Remove dust cap and tag from electrical connectors and lines, if any.
   C. Align applicable indicator and connect electrical connectors to indicator. Connect lines if any.
   D. Insert indicator into panel.
   E. Tighten mounting clamp adjustment screw.
   F. Fold up instrument panel or push-in module.

G. Tighten quarter-turn fasteners along panel or module edge by turning fasteners one-quarter turn clockwise.
H. Close circuit breakers and remove safety tags.



Clamp Mounted Indicator Installation
Figure 401



BEZEL MOUNTED INSTRUMENT INSTALLATION (TYPICAL)

Bezel-Mounted Indicator Installation
Figure 402

REAR-MOUNTED TYPE INDICATOR - REMOVAL/INSTALLATION

1. General
   A. The following instructions concern the removal/installation of the rear-mounted instrument indicator.
2. Remove Rear-Mounted Type Indicator
   A. Open applicable circuit breakers pertaining to indicator being removed.

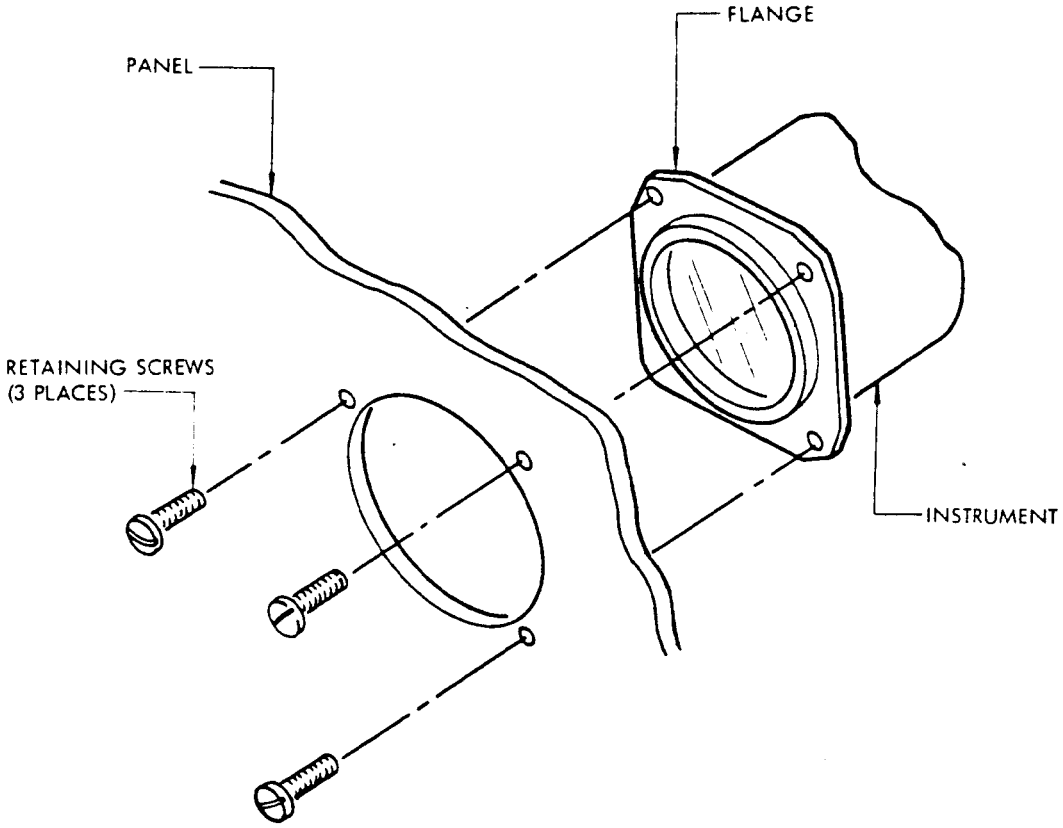
      WARNING: TAG AND SAFETY THE CIRCUIT BREAKERS.

      WARNING: MAKE SURE EACH ELECTRICAL CONNECTOR HAS A TAG TO IDENTIFY THE CORRECT INSTALLATION LOCATION TO THE [name of gage, indicator, component]. CROSS CONNECTION OF THE ELECTRICAL CONNECTORS CAN CAUSE THE AIRPLANE SYSTEM TO MALFUNCTION AND THE LOSS OF SAFE FLIGHT.

   B. Loosen quarter turn fasteners along panel or module edge.
   C. Fold down panel or pull-out module and remove electrical connectors and lines from indicator (pitot, static, etc.).
   D. Remove three indicator retaining screws on front of panel or module (Fig. 401).
   E. Cap electrical connectors and lines. Tag and secure them.
3. Install Rear-Mounted Type Indicator
   A. Make certain the applicable circuit breakers pertaining to the indicator to be installed are open and tagged.

      WARNING: MAKE SURE EACH ELECTRICAL CONNECTOR HAS A TAG TO IDENTIFY THE CORRECT INSTALLATION LOCATION TO THE [name of gage, indicator, component]. CROSS CONNECTION OF THE ELECTRICAL CONNECTORS CAN CAUSE THE AIRPLANE SYSTEM TO MALFUNCTION AND THE LOSS OF SAFE FLIGHT.

   B. Remove dust cap and tag from electrical connectors and lines, if any.
   C. Connect electrical connectors to indicator. Connect lines if any. Align indicator at rear of panel.
   D. Fold up instrument panel or push in module and tighten quarter turn fasteners.
   E. Close circuit breakers and remove safety tags.

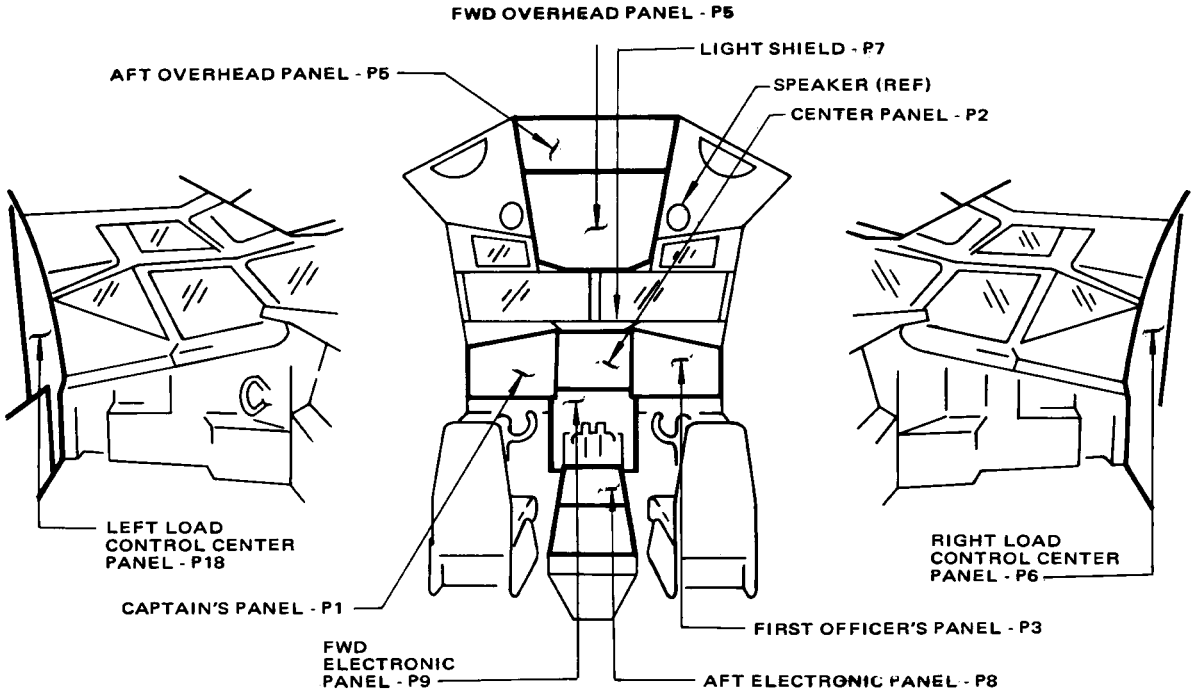


REAR MOUNTED INSTRUMENT
INSTALLATION
(TYPICAL)

Rear-Mounted Indicator Installation
Figure 401

PANELS - DESCRIPTION AND OPERATION

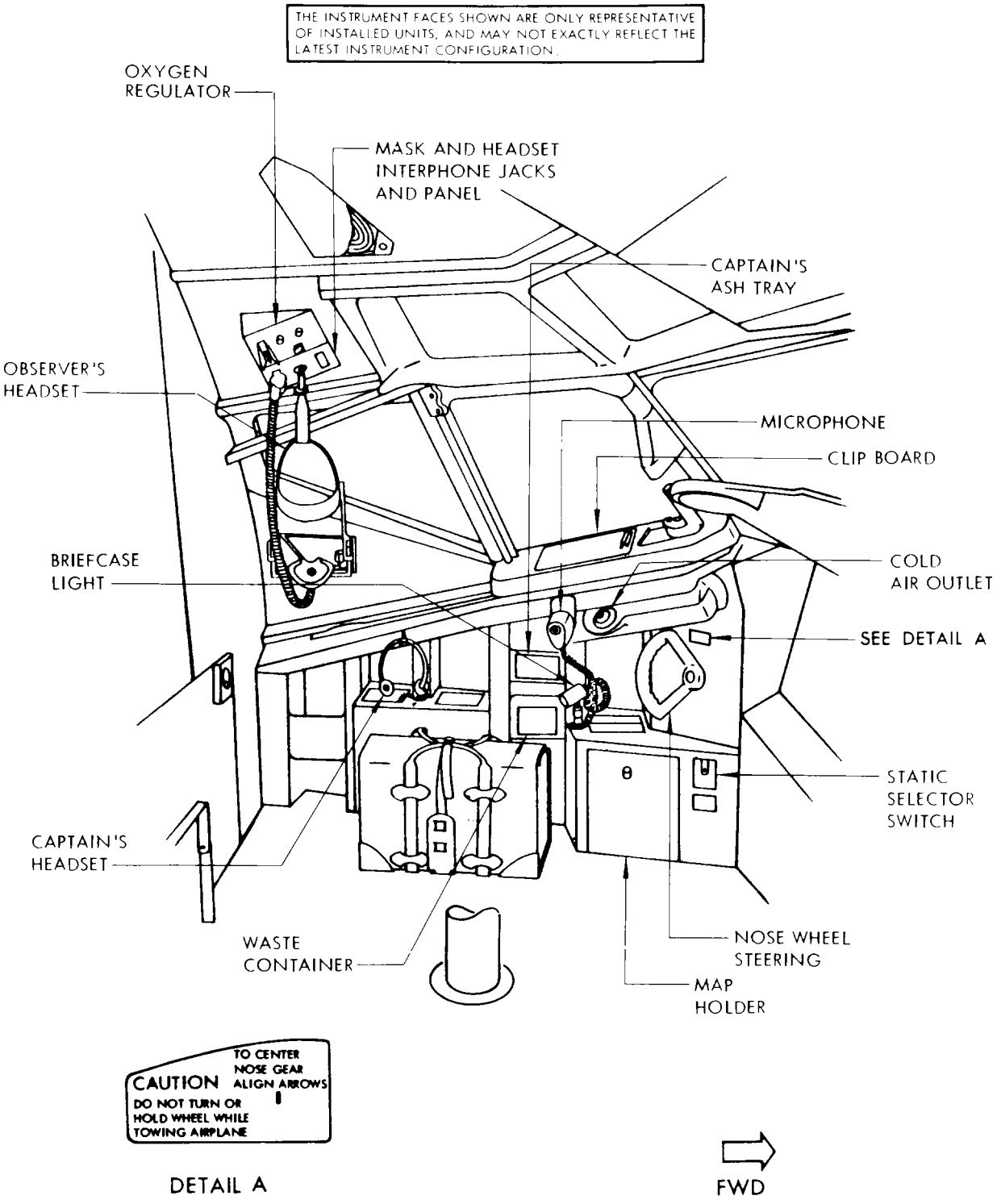
1. General
   A. The layout of the instrument panels in the control cabin is illustrated in figure 1.
   B. The pilots' main panels consist of the Captain's panel, the center panel, the light shield and the First Officer's panel. The instruments on the captain's and First Officer's panels are generally duplicates of each other to enable either pilot to fly the airplane.
   C. The pilots' overhead panels consist of forward and aft panels installed in the center of the ceiling immediately above the windows.
   D. The pilots' electronic panels consist of a forward panel, immediately below the center panel, and an aft panel on the engine control stand.
   E. Auxiliary panels consist of observer's panels and the pilots' side panels.



Control Cabin Instrument Panels Location
Figure 1

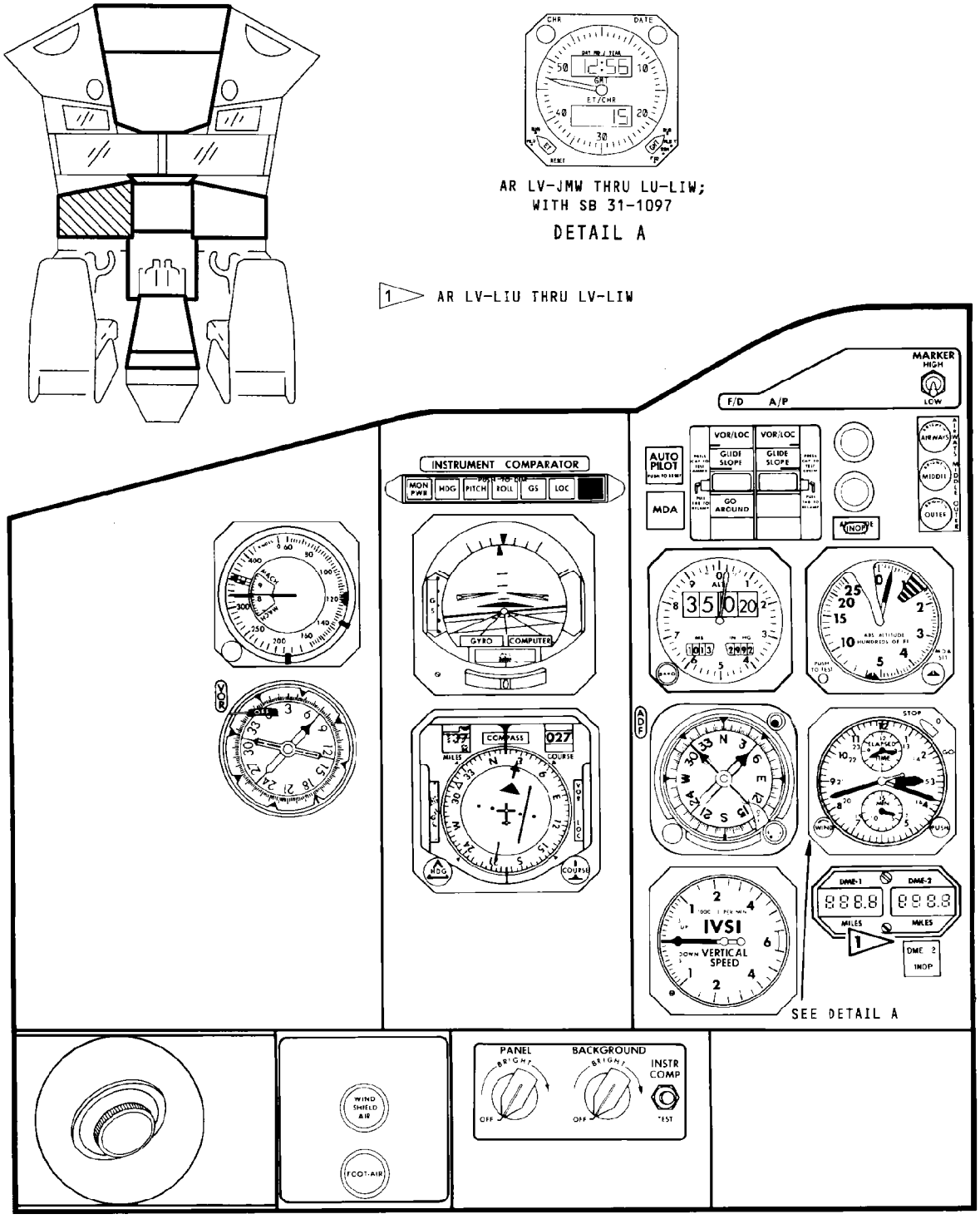
CAPTAIN'S SIDEWALL PANEL - DESCRIPTION AND OPERATION

CAPTAIN'S SIDEWALL PANEL - DESCRIPTION AND OPERATION



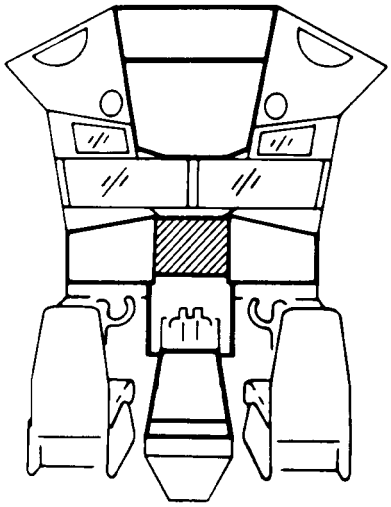
Captain's Sidewall Panel
Figure 1

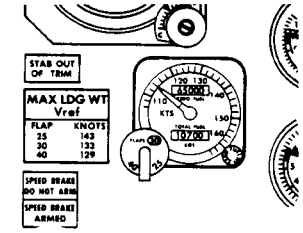
CAPTAIN'S PANEL - DESCRIPTION AND OPERATION



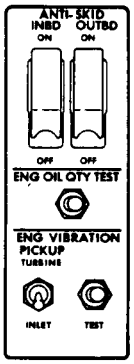
Captain's Panel
Figure 1

CENTER PANEL - DESCRIPTION AND OPERATION

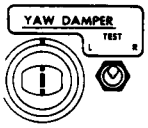




AR LV-JMW THRU LV-JMZ
DETAIL A

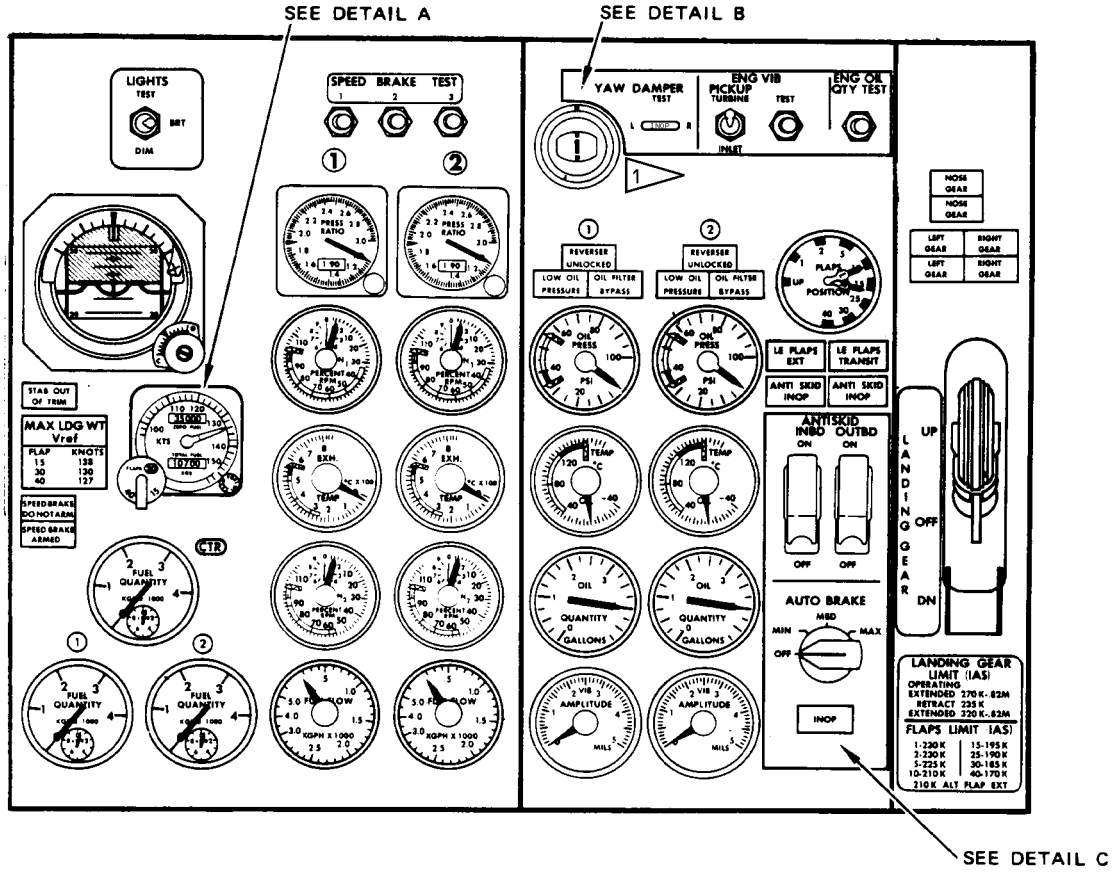


AR LB-JMW
THRU LV-JMZ
DETAIL C



AR LZ-JMW THRU LV-JMZ
DETAIL B

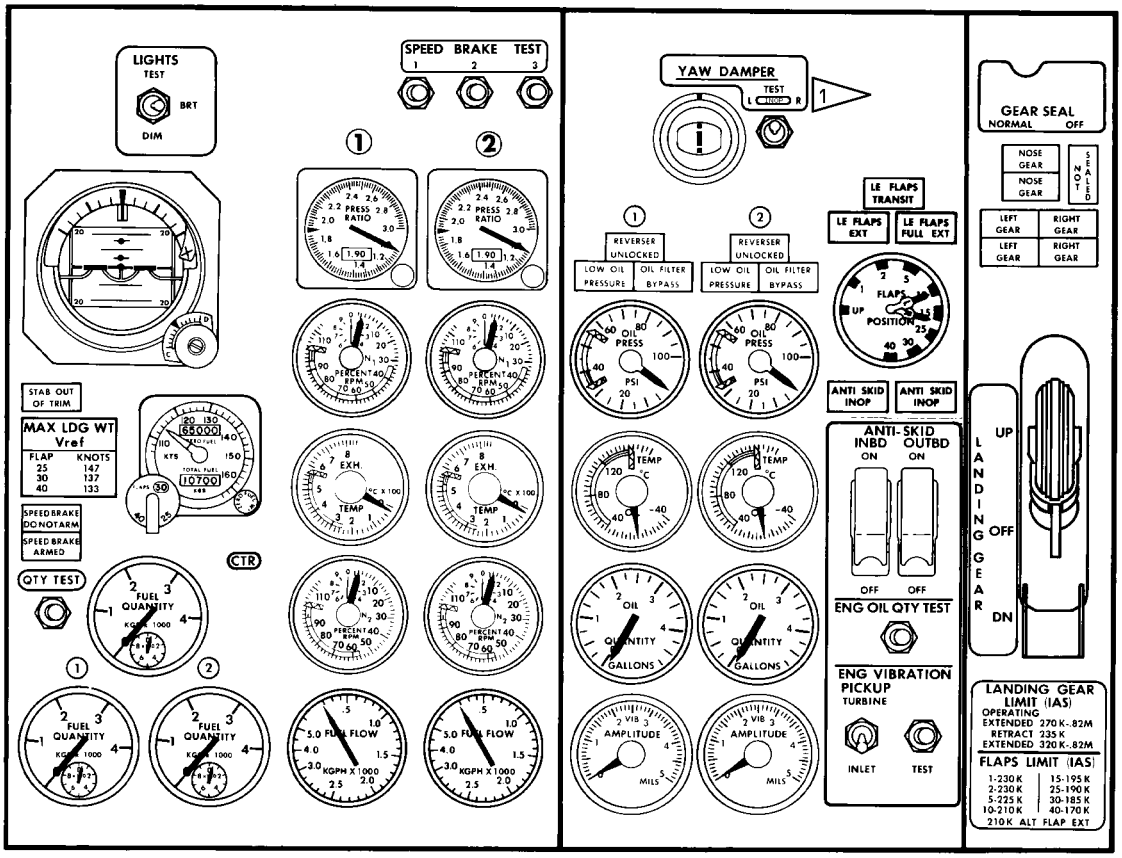
1 AIRCRAFT INCORPORATING SB 27A1206



Center Panel
Figure 1 (Sheet 1)

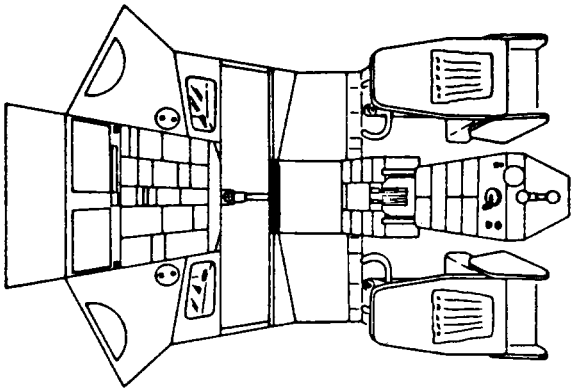
462596

1 AIRCRAFT INCORPORATING SB 27A1206

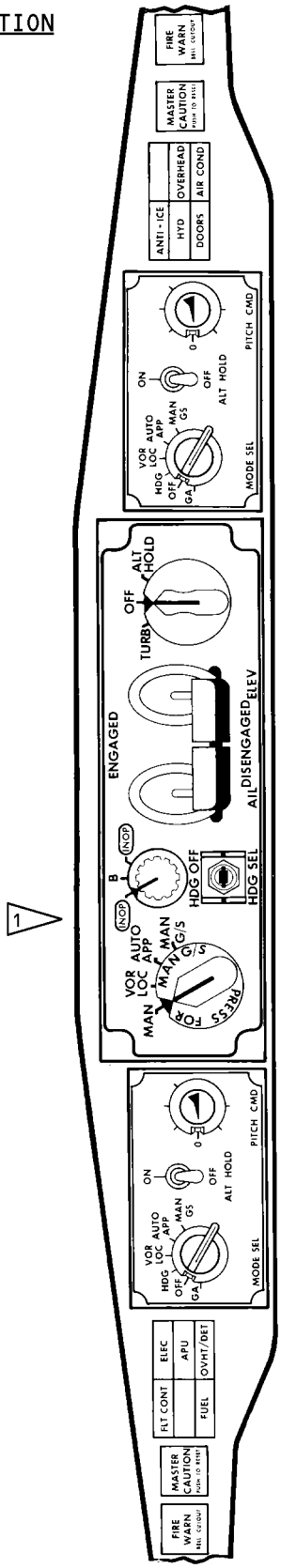


Center Panel
Figure 1 (Sheet 2)

PILOT'S LIGHTSHIELD - DESCRIPTION AND OPERATION



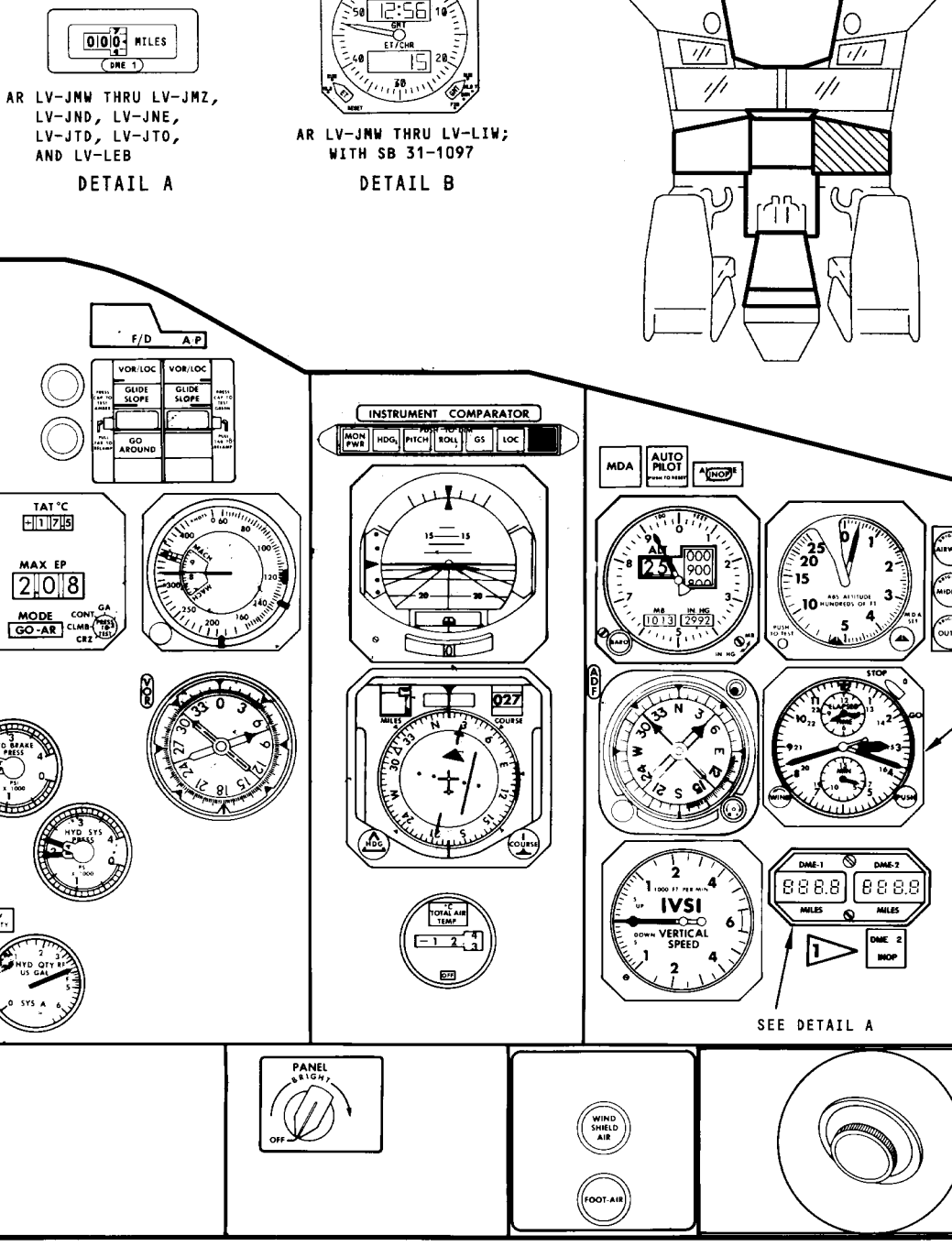
THE INSTRUMENT FACES ARE ONLY REPRESENTATIVE AND MAY NOT EXACTLY REFLECT THE LATEST CONFIGURATION.



1 AIRCRAFT INCORPORATING SB 27A1206

Pilots' Lightshield
Figure 1

FIRST OFFICER'S PANEL - DESCRIPTION AND OPERATION

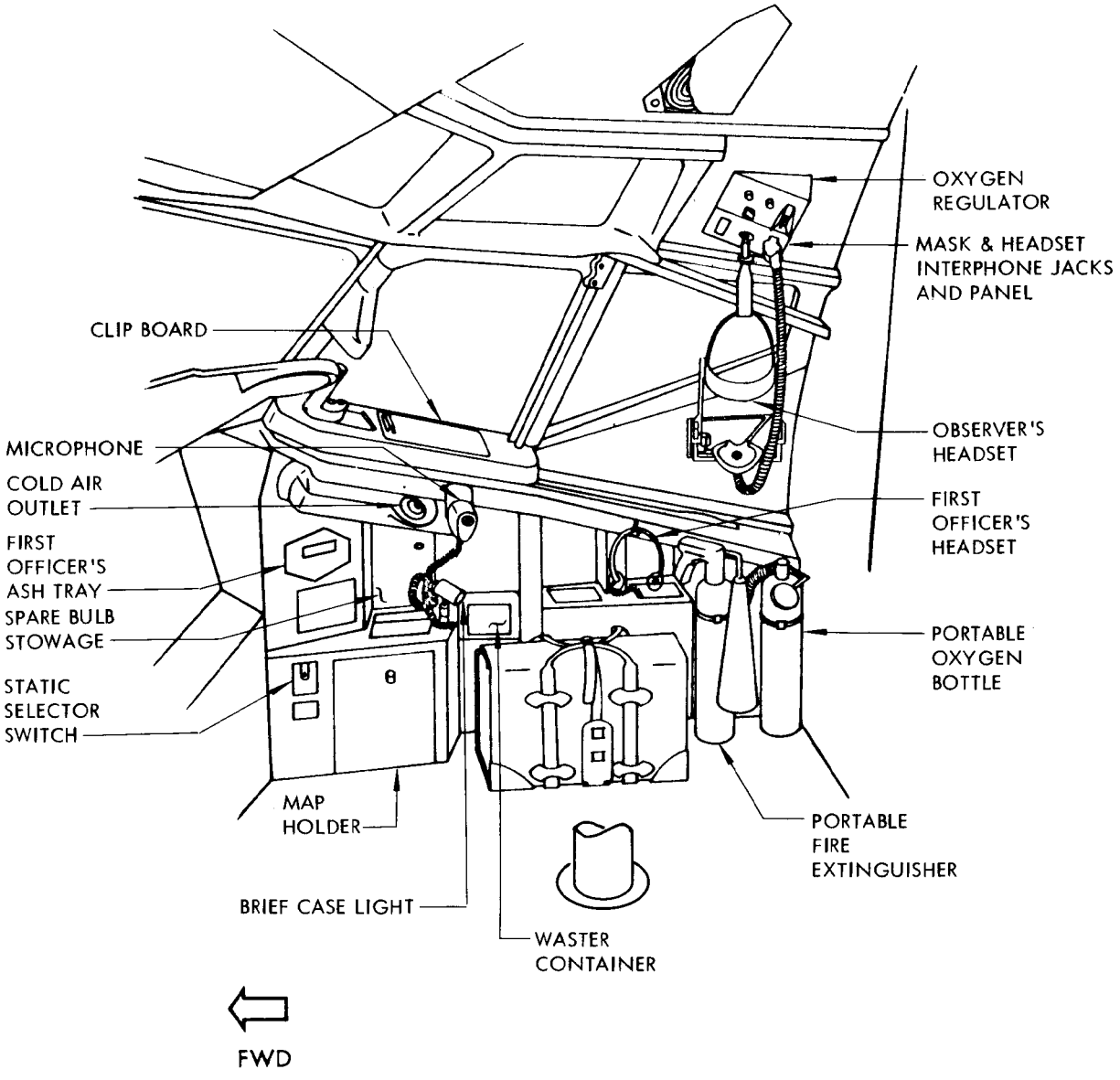


First Officer's Panel
Figure 1

FIRST OFFICER'S SIDEWALL PANEL - DESCRIPTION OPERATION

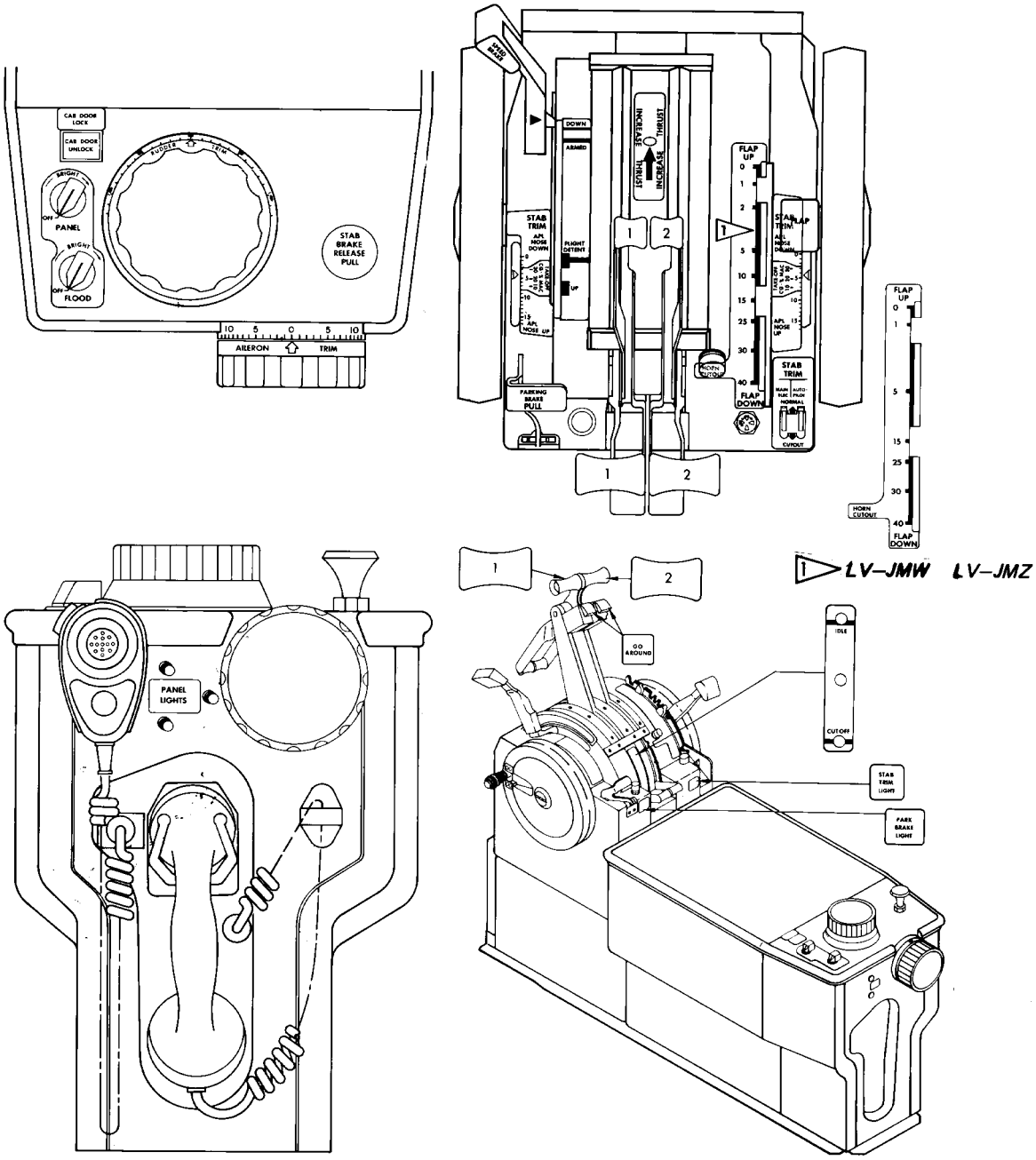
FIRST OFFICER'S SIDEWALL PANEL - DESCRIPTION AND OPERATION

THE INSTRUMENT FACES SHOWN ARE ONLY REPRESENTATIVE OF INSTALLED UNITS, AND MAY NOT EXACTLY REFLECT THE LATEST INSTRUMENT CONFIGURATION.



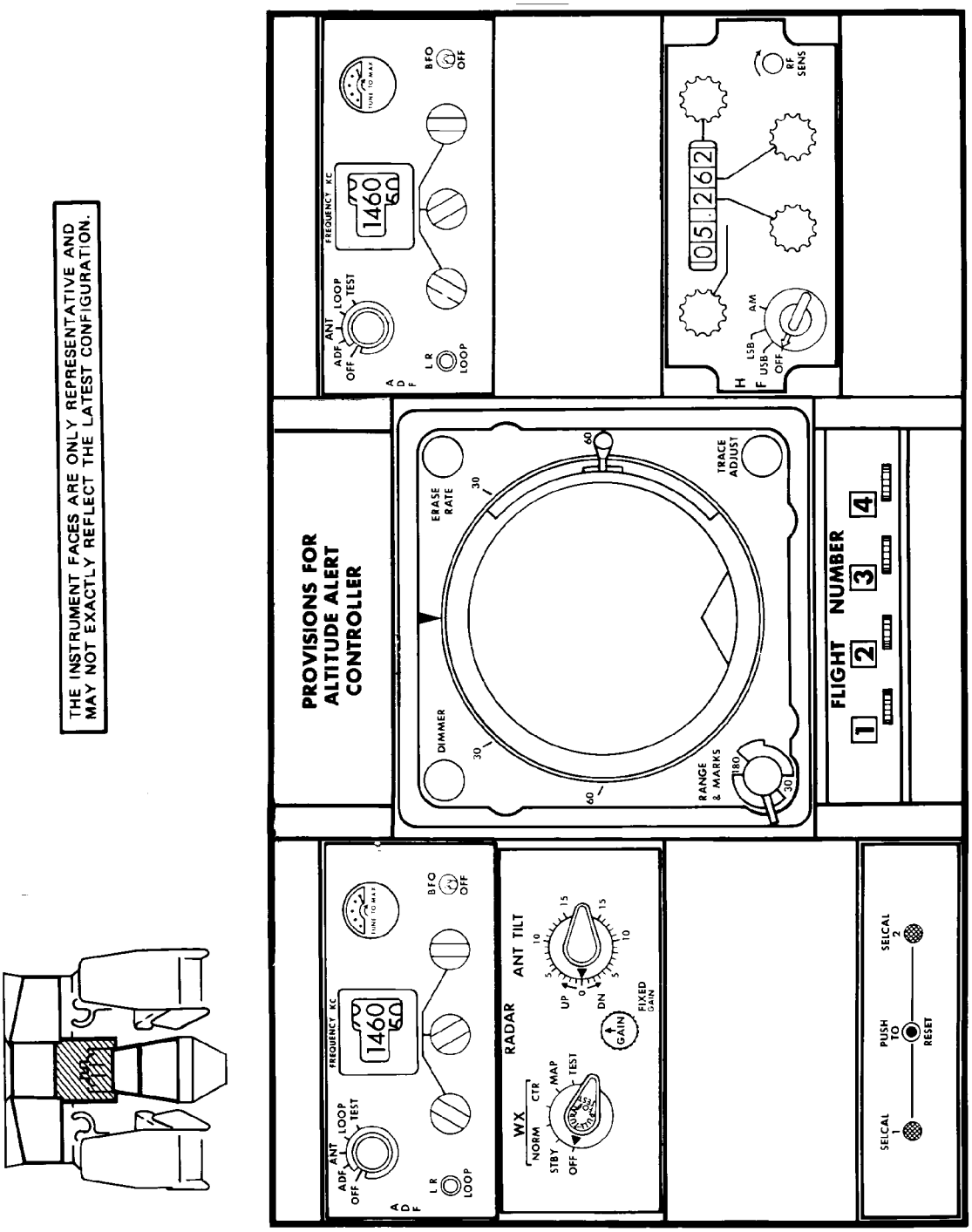
First Officer's Sidewall Panel
Figure 1

PILOTS' CONTROL STAND - DESCRIPTION/OPERATION



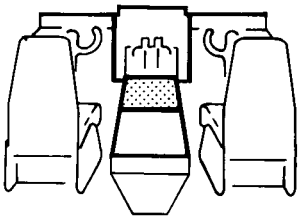
Pilots' Control Stand
Figure 1

FORWARD ELECTRONIC PANEL – DESCRIPTION AND OPERATION

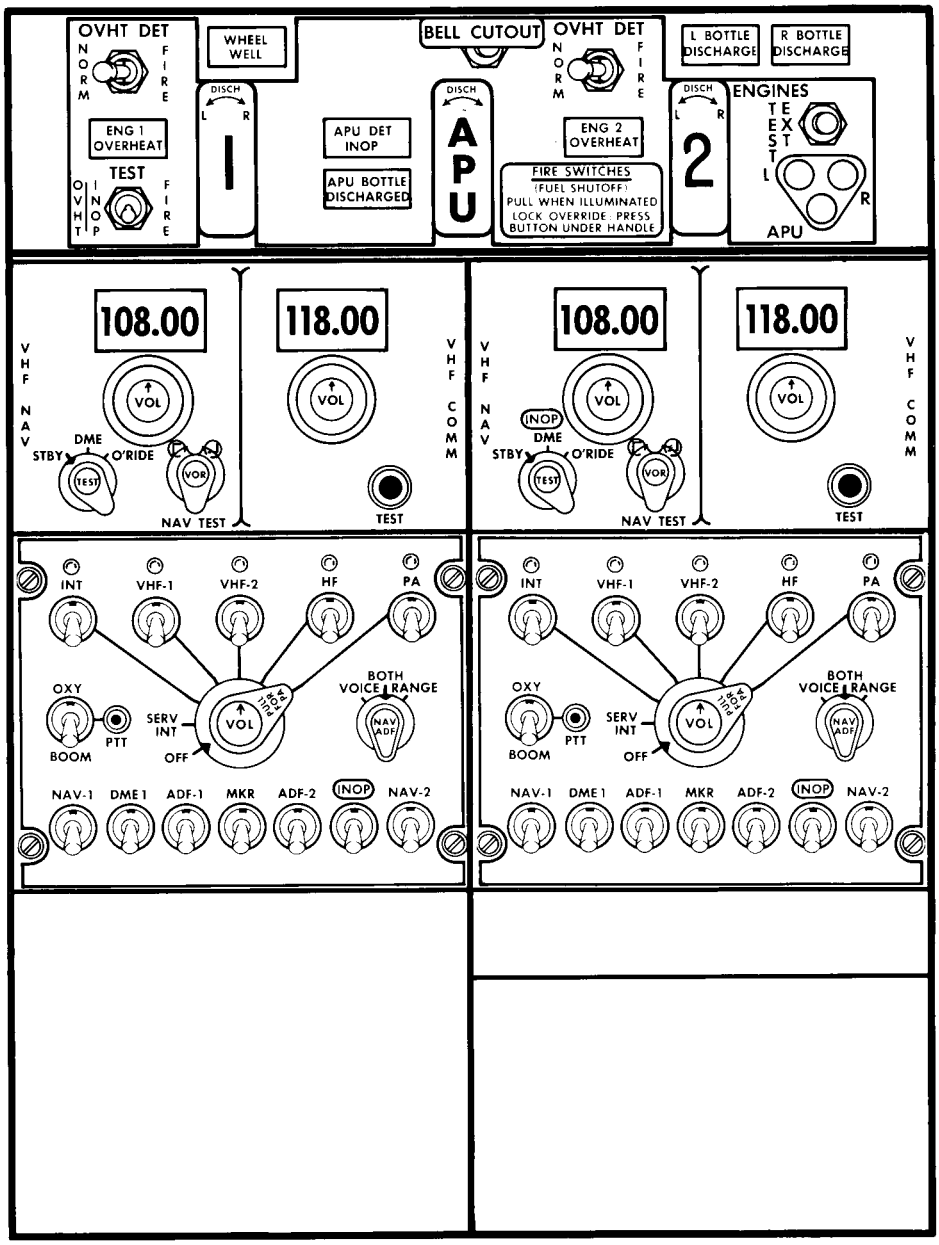


Forward Electronic Panel
Figure 1

AFT ELECTRONIC PANEL – DESCRIPTION AND OPERATION

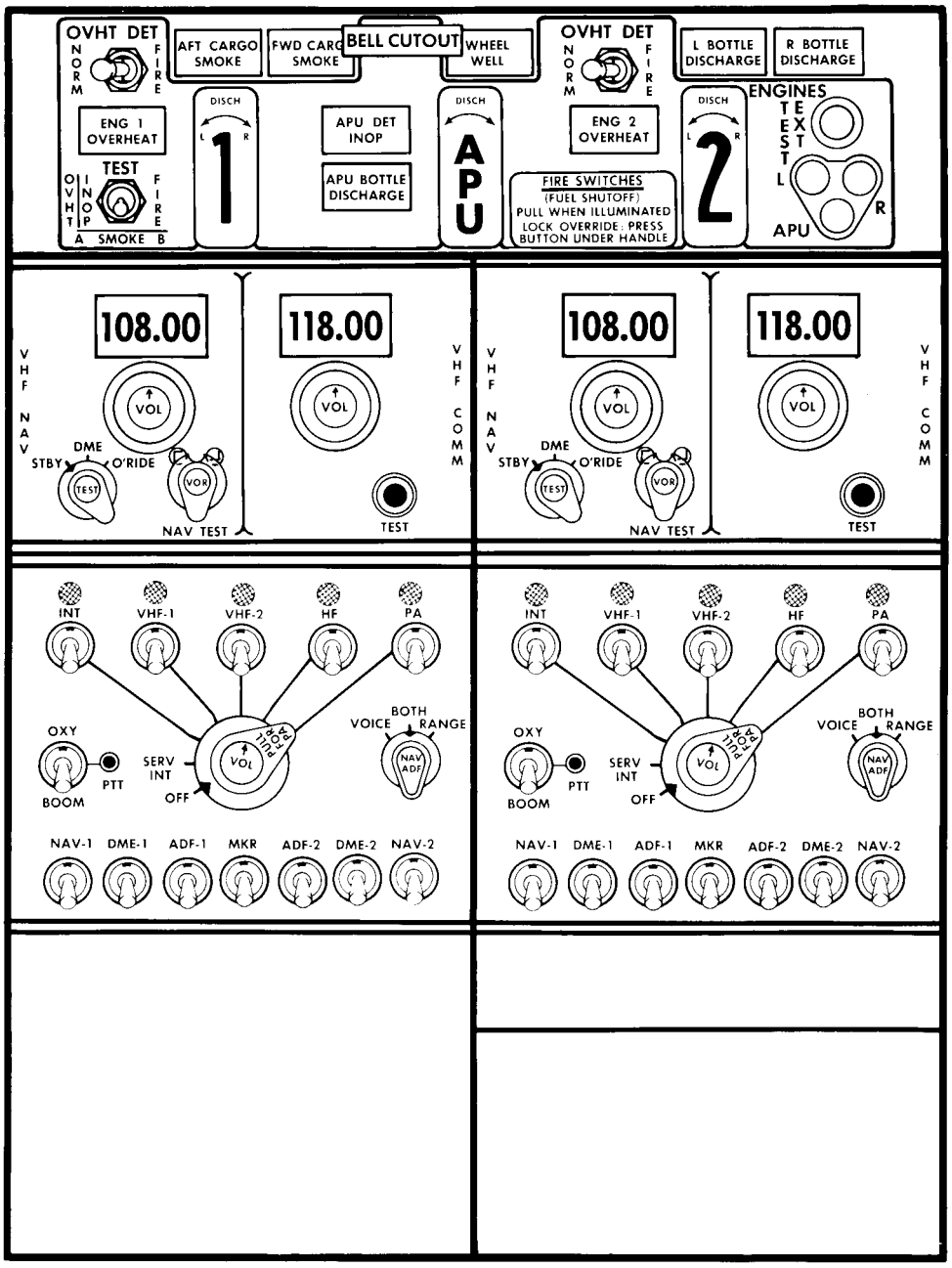


THE INSTRUMENT FACES ARE ONLY REPRESENTATIVE AND MAY NOT EXACTLY REFLECT THE LATEST CONFIGURATION.



Aft Electronic Panel
Figure 1 (Sheet 1)

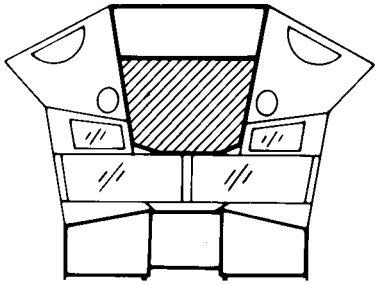
THE INSTRUMENT FACES ARE ONLY REPRESENTATIVE AND MAY NOT EXACTLY REFLECT THE LATEST CONFIGURATION.



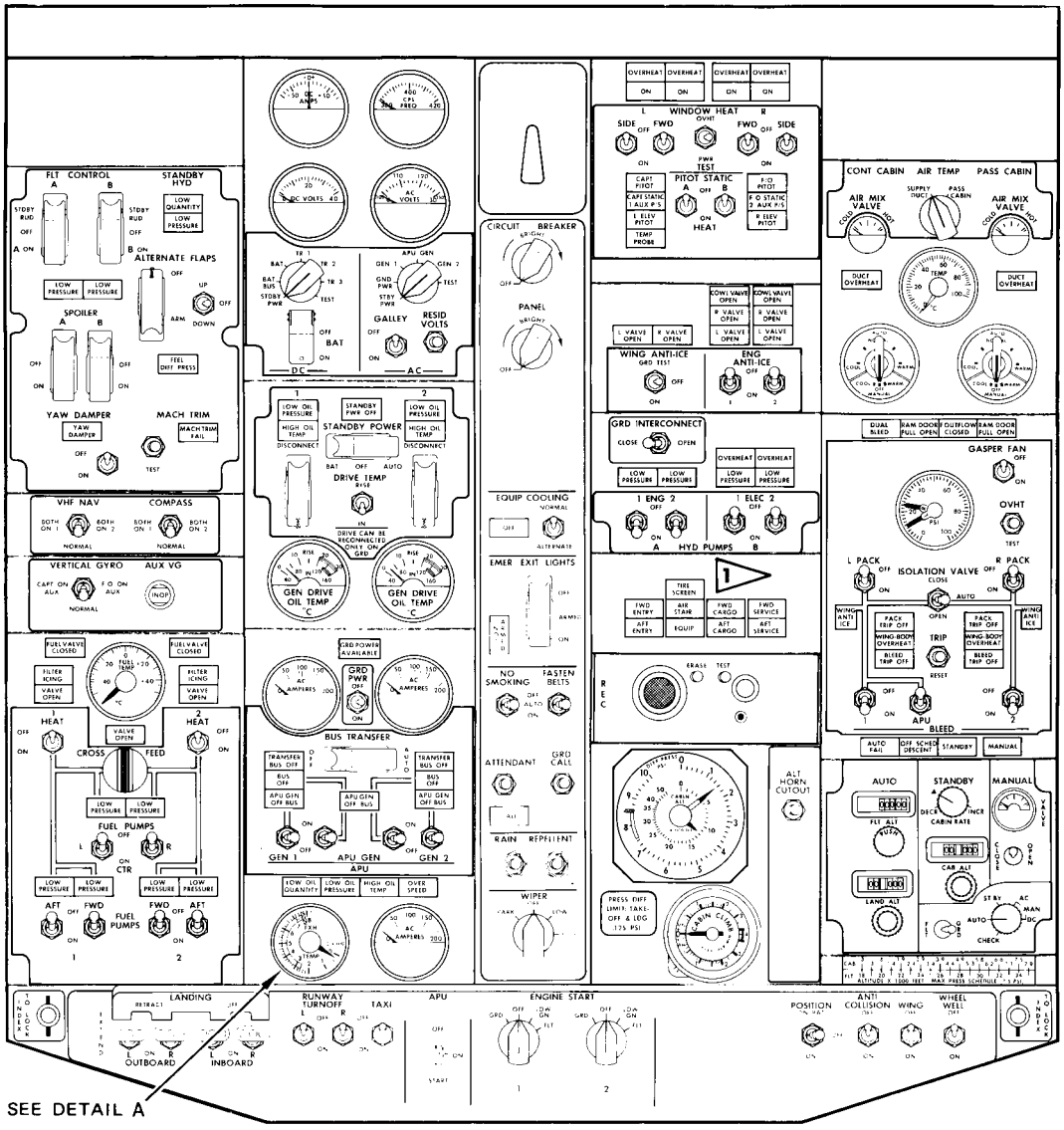
Aft Electronic Panel
Figure 1 (Sheet 2)

FORWARD OVERHEAD PANEL - DESCRIPTION AND OPERATION

FORWARD OVERHEAD PANEL - DESCRIPTION AND OPERATION

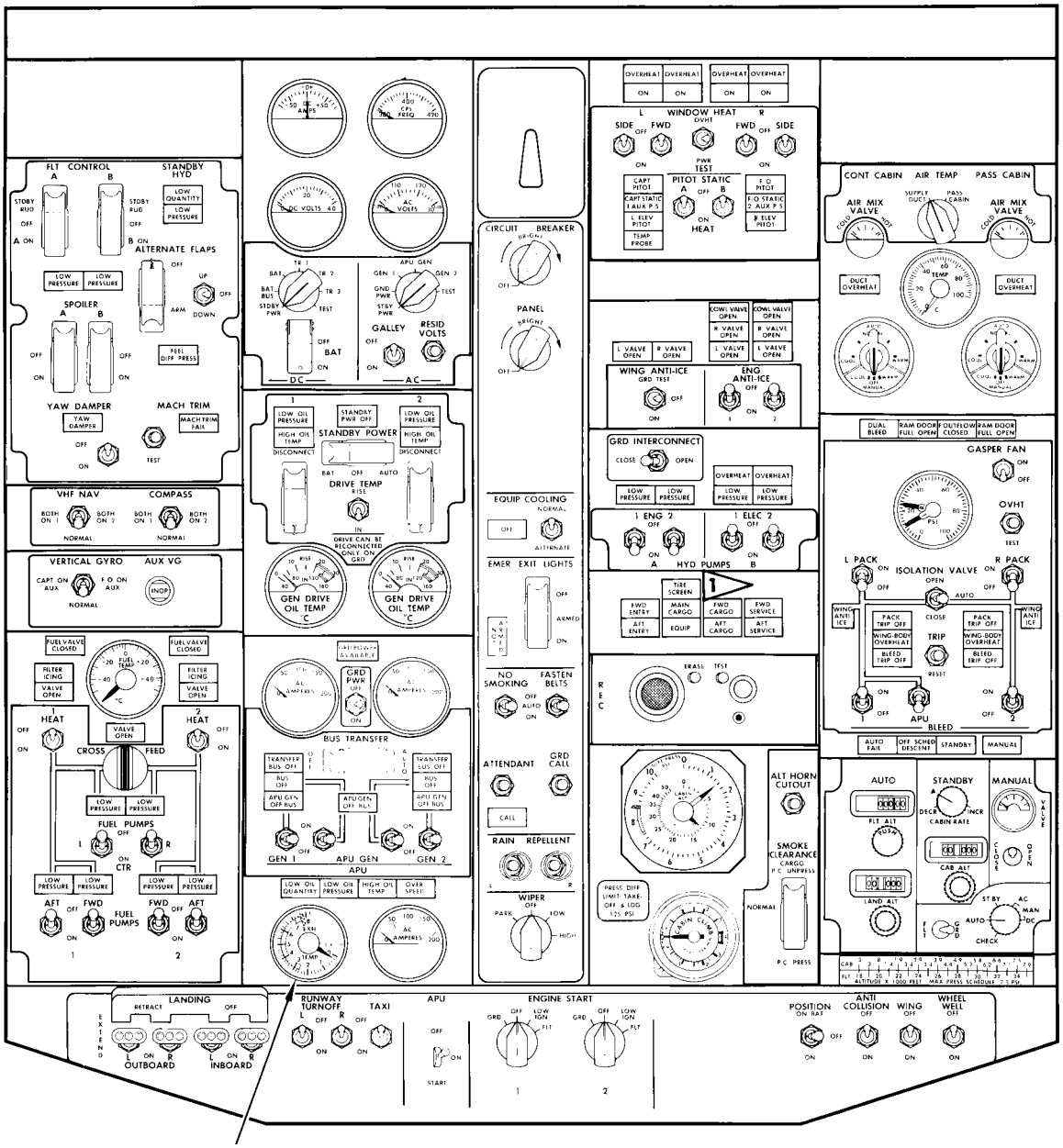


WITH SB 49-1072
DETAIL A



1 "INOP" INSTALLED ON "TIRE SCREEN" WITH SB 52-1091

Forward Overhead Panel
Figure 1 (Sheet 1)



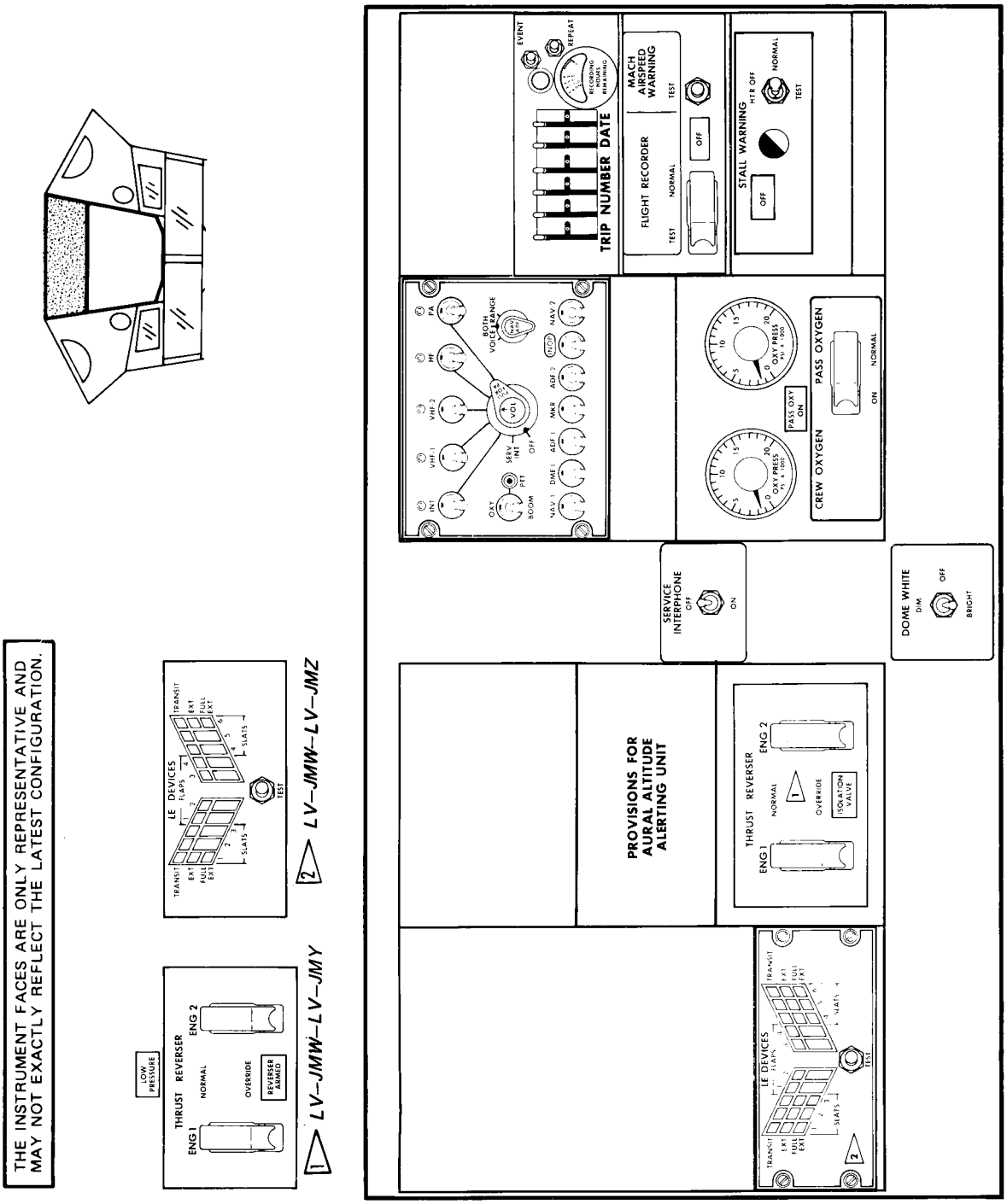
WITH SB 49-1072

DETAIL A

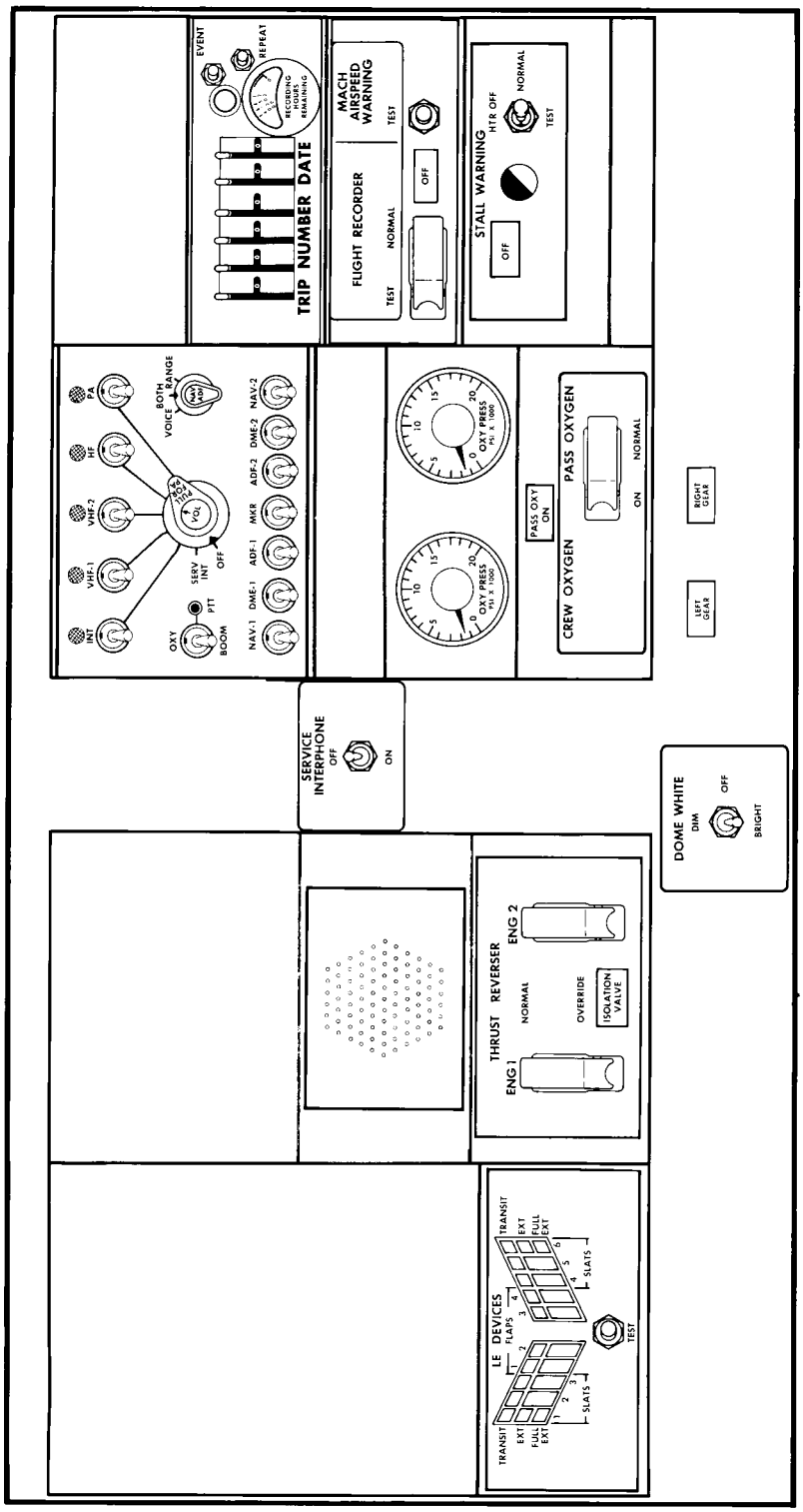
1 "INOP" INSTALLED ON "TIRE SCREEN" WITH SB 52-1091

Forward Overhead Panel
Figure 1 (Sheet 2)

AFT OVERHEAD PANEL – DESCRIPTION AND OPERATION



Aft Overhead Panel
Figure 1 (Sheet 1)

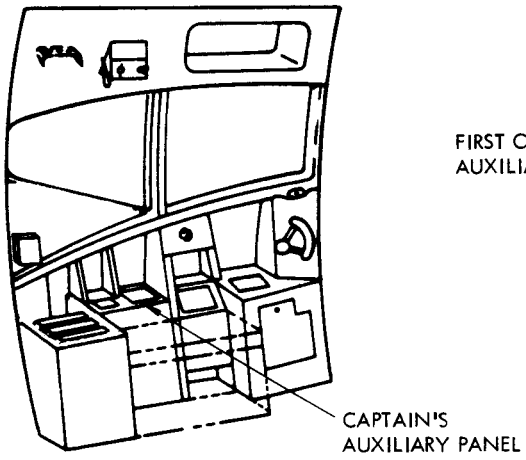


THE INSTRUMENT FACES ARE ONLY REPRESENTATIVE AND MAY NOT EXACTLY REFLECT THE LATEST CONFIGURATION

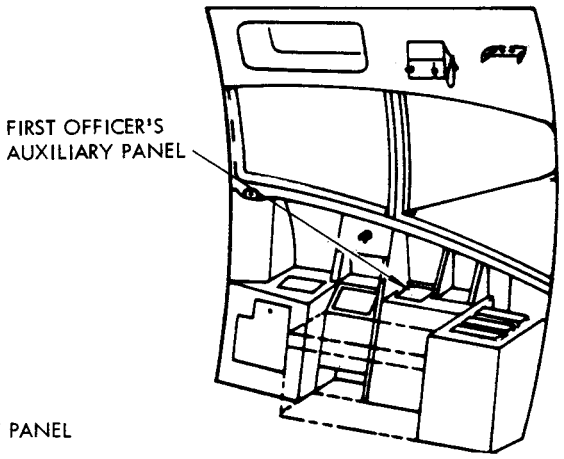
Aft Overhead Panel
Figure 1 (Sheet 2)

463737

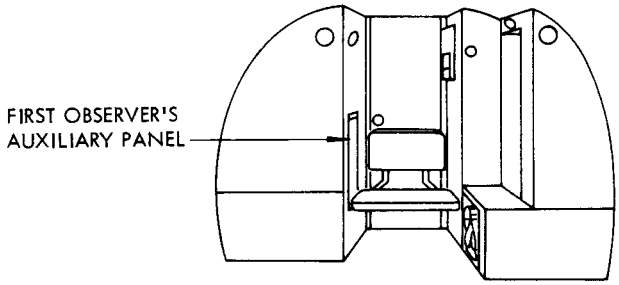
AUXILIARY PANELS – DESCRIPTION AND OPERATION



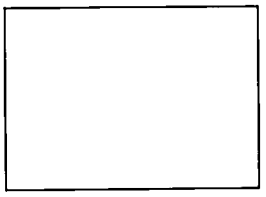
CAPTAIN'S SIDEWALL



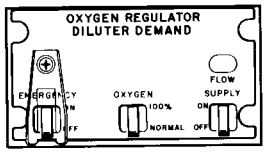
FIRST OFFICER'S SIDEWALL



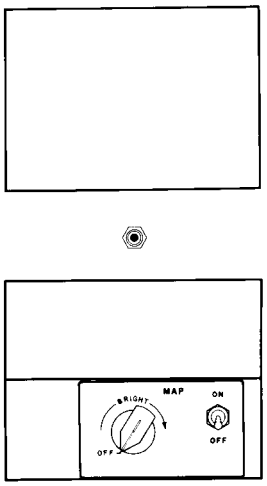
OBSERVER'S STATION



CAPTAIN'S AUXILIARY PANEL

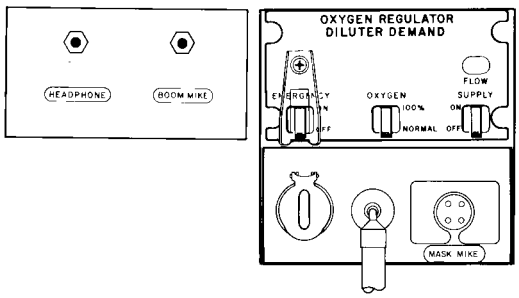


FIRST OBSERVER'S AUXILIARY PANEL



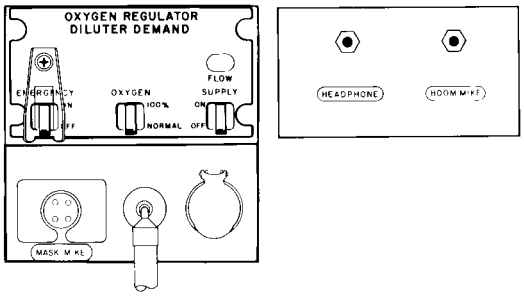
FIRST OFFICER'S AUXILIARY PANEL

Auxiliary Panels
Figure 1 (Sheet 1)



CAPTAIN'S SIDEWALL PANELS

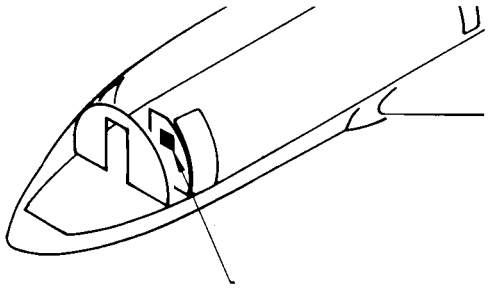
THE INSTRUMENT FACES ARE ONLY REPRESENTATIVE AND MAY NOT EXACTLY REFLECT THE LATEST CONFIGURATION.



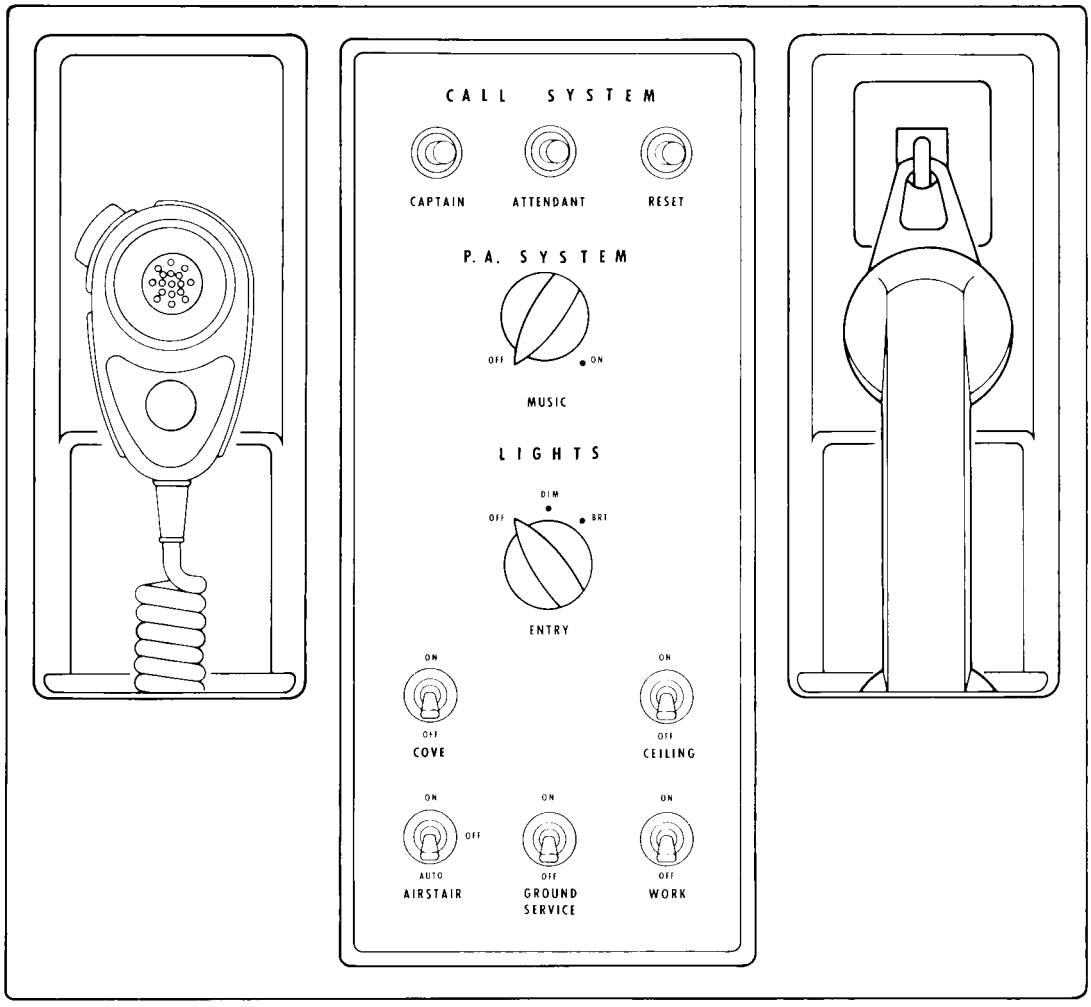
FIRST OFFICER'S SIDEWALL PANELS

Auxiliary Panels
Figure 1 (Sheet 2)

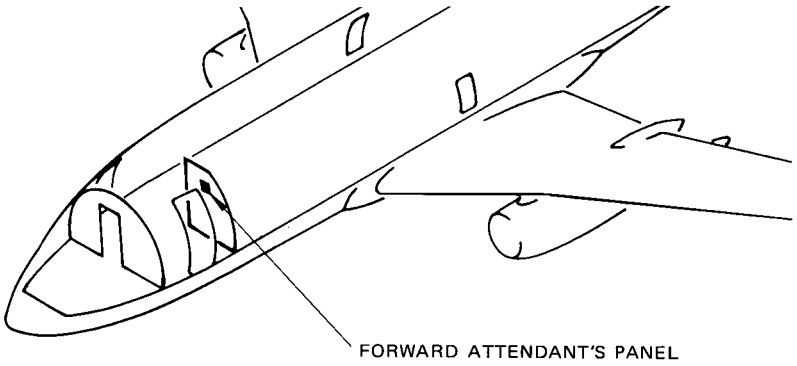
FORWARD CABIN ATTENDANTS' PANEL – DESCRIPTION AND OPERATION

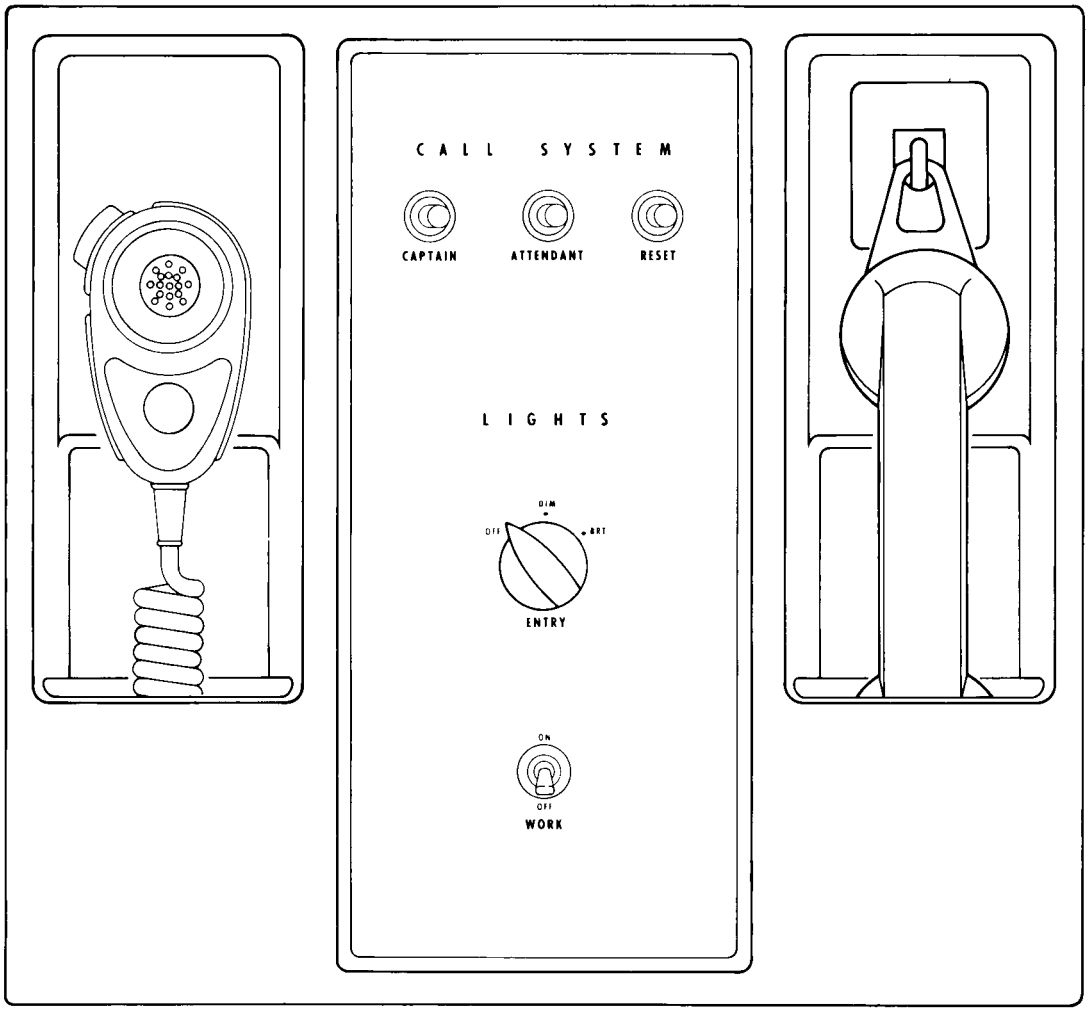


THE INSTRUMENT FACES ARE ONLY REPRESENTATIVE AND MAY NOT EXACTLY REFLECT THE LATEST CONFIGURATION.



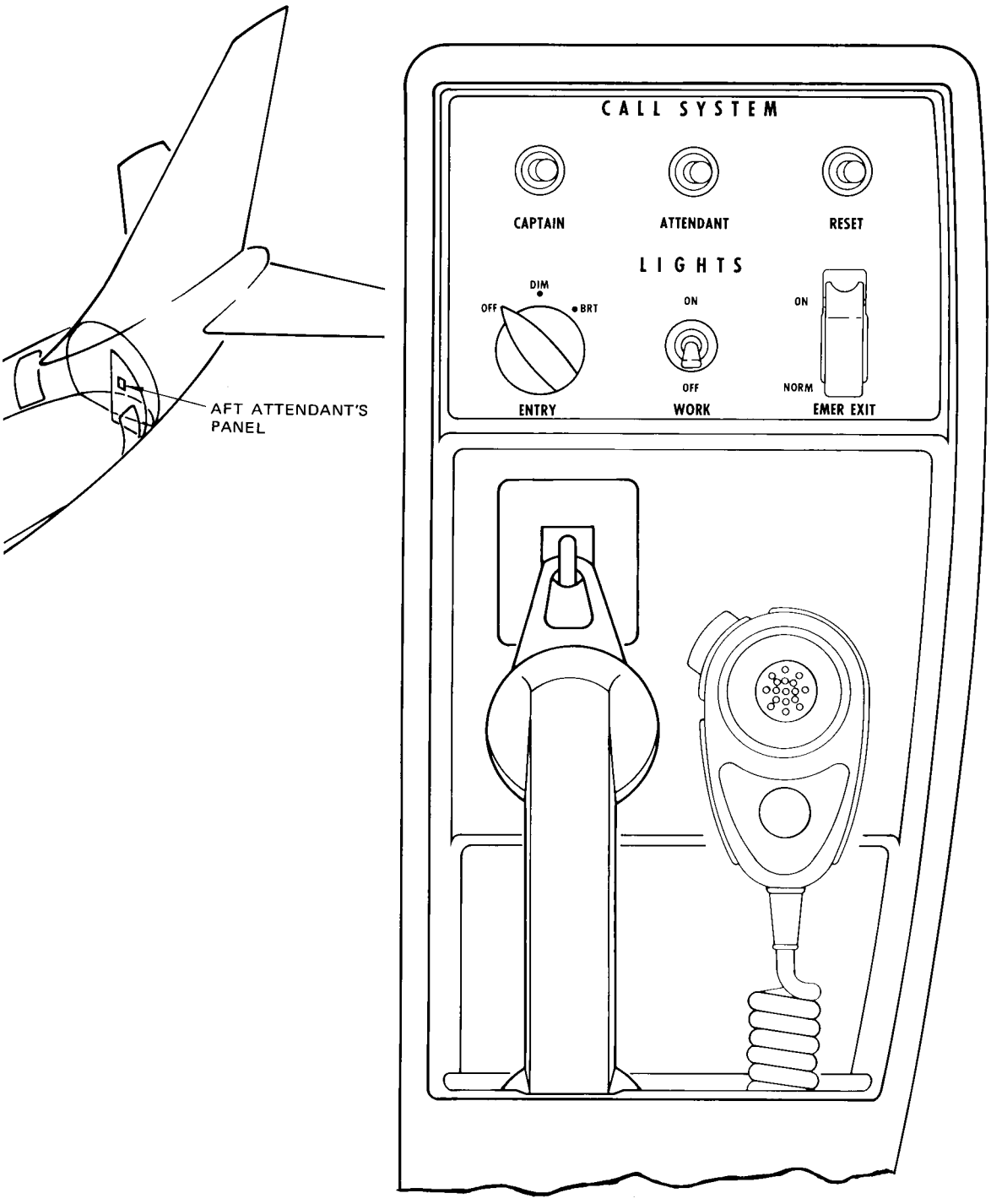
Forward Cabin Attendants' Panel
Figure 1 (Sheet 1)



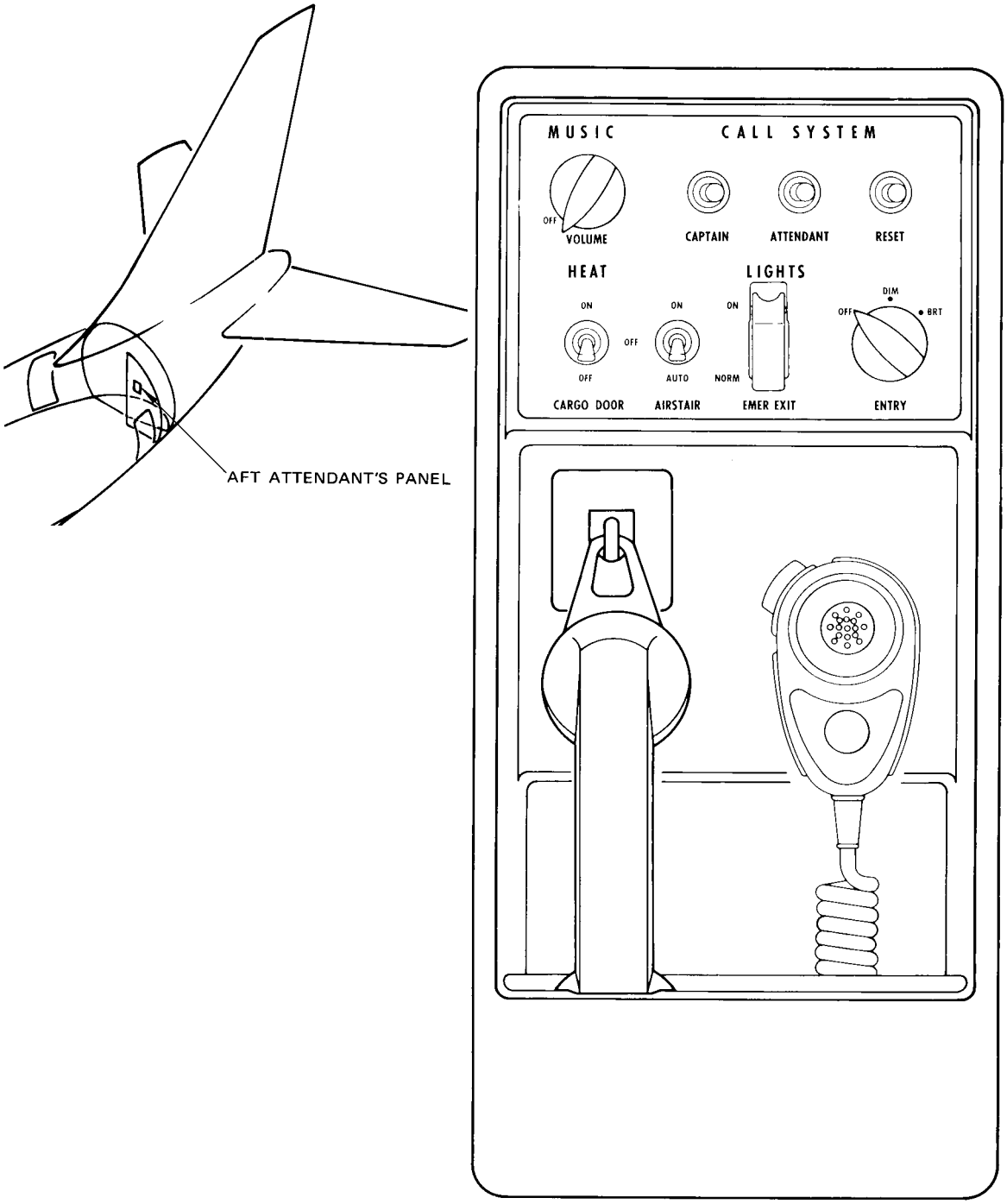


Forward Cabin Attendants' Panel
Figure 1 (Sheet 2)

AFT CABIN ATTENDANTS' PANEL - DESCRIPTION AND OPERATOIN



Aft Cabin Attendants Panel
Figure 1 (Sheet 1)

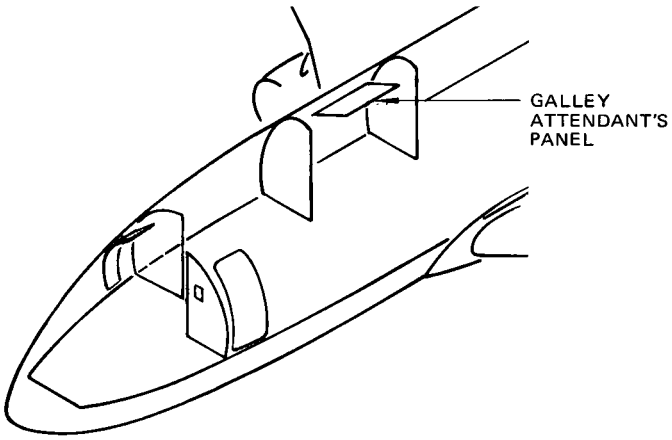


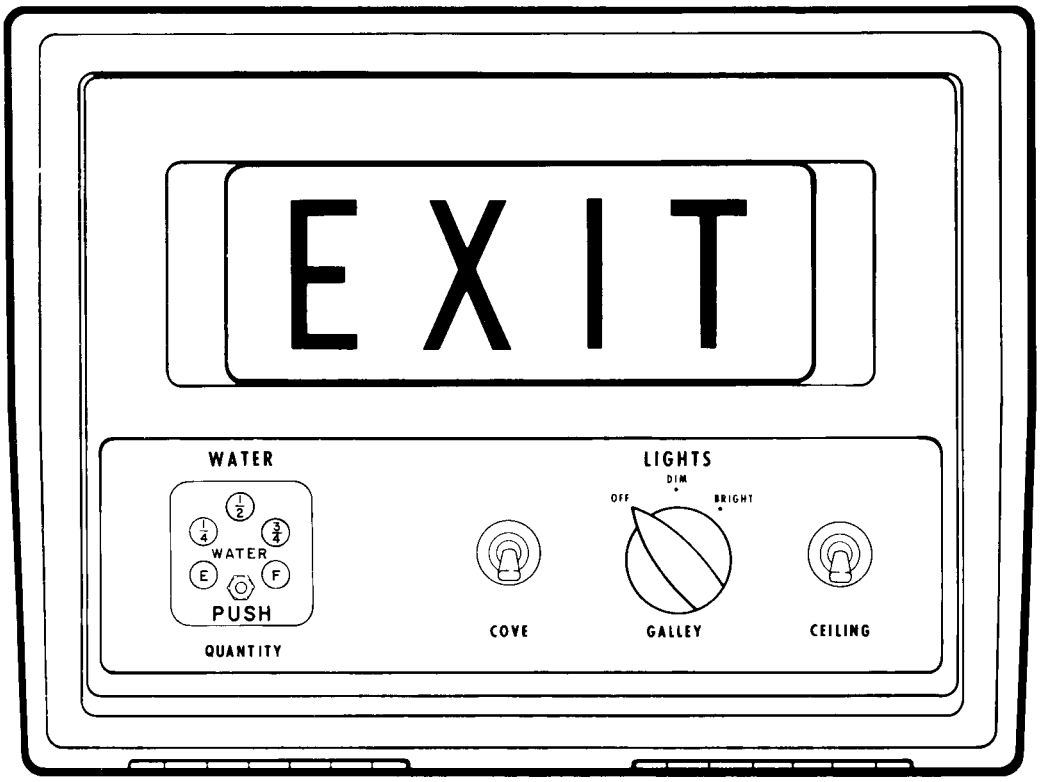
THE INSTRUMENT FACES ARE ONLY REPRESENTATIVE AND MAY NOT EXACTLY REFLECT THE LATEST CONFIGURATION.

Aft Cabin Attendants Panel
Figure 1 (Sheet 2)

464134

GALLEY CABIN ATTENDANT'S PANEL – DESCRIPTION AND OPERATION

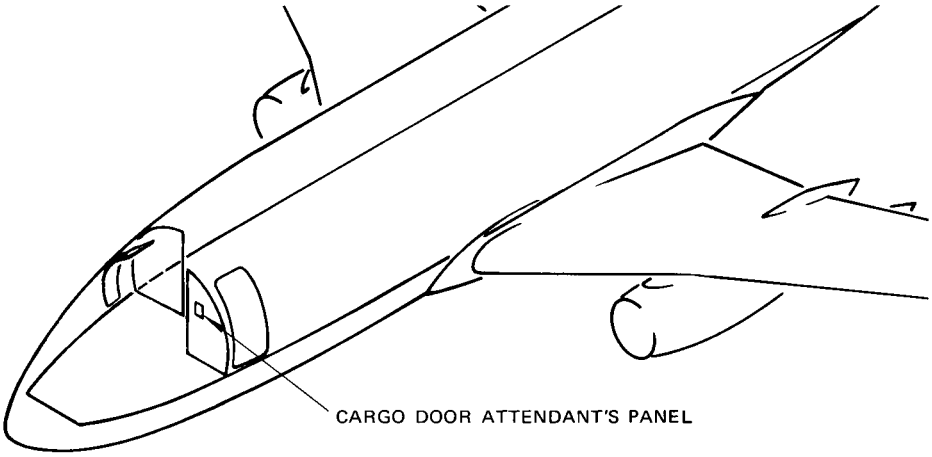


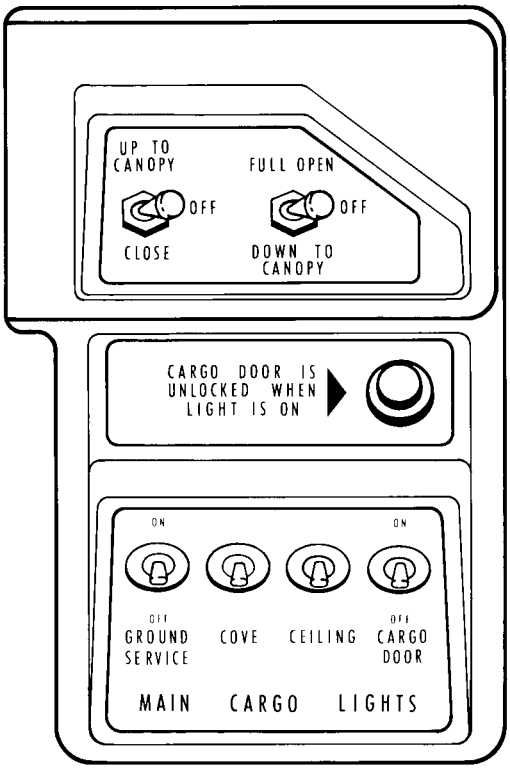


THE INSTRUMENT FACES ARE ONLY REPRESENTATIVE AND MAY NOT EXACTLY REFLECT THE LATEST CONFIGURATION.

Galley Cabin Attendant's Panel
Figure 1

CARGO DOOR ATTENDANTS' PANEL - DESCRIPTION AND OPERATION

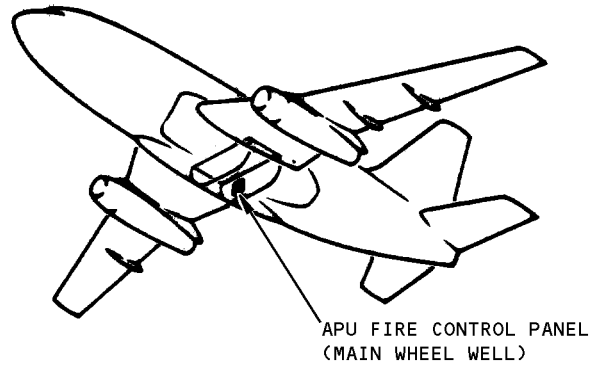


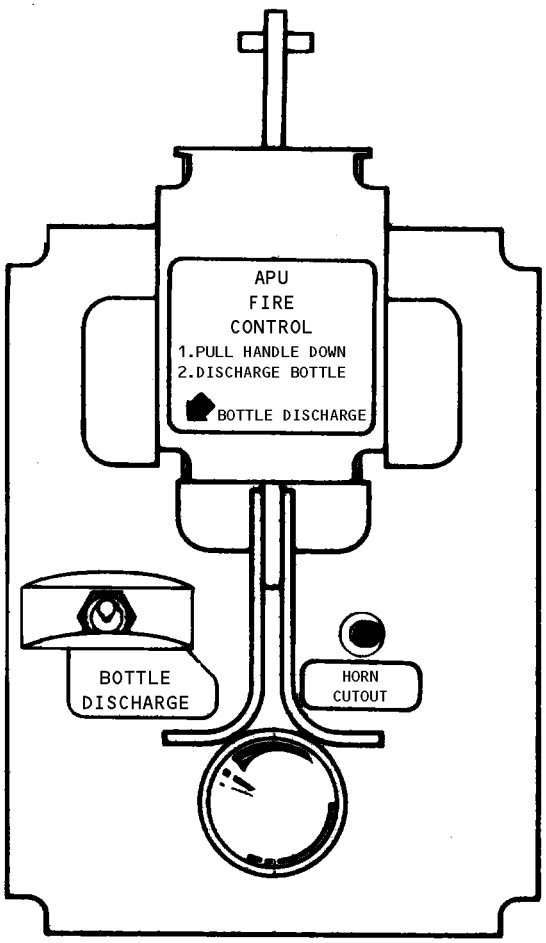


THE INSTRUMENT FACES ARE ONLY REPRESENTATIVE AND MAY NOT EXACTLY REFLECT THE LATEST CONFIGURATION.

Cargo Door Attendants Panel
Figure 1

REMOTE APU FIRE CONTROL PANEL – DESCRIPTION AND OPERATION

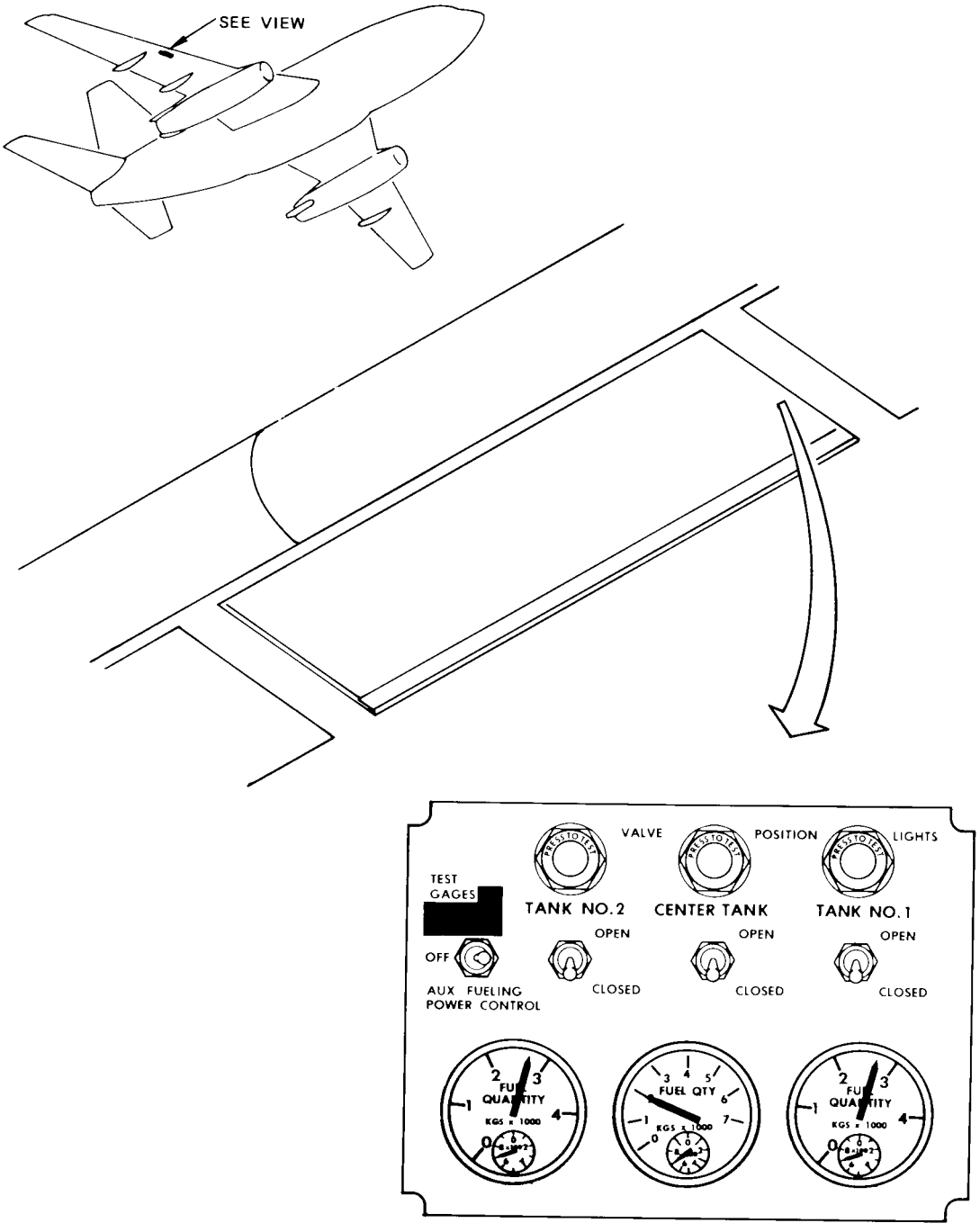




Remote APU Fire Control Panel
Figure 1

WING FUELING STATION CONTROL PANEL – DESCRIPTION AND OPERATION

WING FUELING STATION CONTROL PANEL - DESCRIPTION AND OPERATION



THE INSTRUMENT FACES ARE ONLY REPRESENTATIVE AND MAY NOT EXACTLY REFLECT THE LATEST CONFIGURATION.

Wing Fueling Control Station
Figure 1

TH

FLIGHT DATA RECORDER SYSTEM - DESCRIPTION AND OPERATION

1. General

A. The flight recorder provides a permanent record of airplane altitude, airspeed, heading, vertical acceleration and radio transmission recorded rectilinearly on a metal foil tape. Trip and date information may also be recorded provided a trip and date encoder is installed in the control cabin. Airplane flight parameters, a reference line, trip and date information and airplane radio transceiver keying are scribed on tape moving at a controlled rate. The reference line and controlled tape rate provide an accurate reference and time base from which events may be measured. Heading information is taken from a synchro transmitter on the first officer's radio magnetic indicator (RMI) which operates in conjunction with directional gyro No. 2. Heading excitation voltage is taken from the 26-volt ac instrument transformer No. 2 in the compass system (AMM Chapter 34, Compass Systems). Altitude is recorded by an evacuated aneroid and mechanism which are connected to the airplane auxiliary static system. Airspeed is recorded by a bellows and mechanism which are connected to the airplane auxiliary pitot-static system. The difference between the pitot and static pressures is an indication of the airspeed of the airplane. A vertical accelerometer provides acceleration information to the recorder. The recorder is capable of recording: altitudes from -1000 feet to +50,000 feet, airspeeds from 100 to 450 knots, headings from 0 through 360 degrees, and accelerations from -3G to +6G. Two hundred feet of tape moving at a rate of 1/2 foot per hour provide a recording time of 400 hours on a side. The tape may be turned over and recordings placed on the other side; therefore, total usage of the tape is 800 hours. Flight recorder operation will begin as soon as one of the engines is operating and airplane electrical power is available to the circuit breaker panels. The recorder will stop whenever the airplane is on the ground and neither engine is operating. A failure warning light (test module) on overhead panel P5 provides indication of an inoperative flight recorder.

B. The flight recorder system is composed of: a recorder, an accelerometer, a test module, and a trip and date encoder panel. The recorder is installed above the ceiling panels at station 947, left of the airplane centerline.

C. AR LV-JMN thru LV-JMZ, LV-JND and LV-JNE;
The accelerometer is installed near the airplane center of gravity on the forward side of the left main wheel well forward bulkhead at station 663. Access to the accelerometer is through the ram air duct access doors.

D. AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND and LV-JNE;
The accelerometer is installed on the aft side of the left main wheel well bulkhead at station 663. Access to the accelerometer is through the wheel well. The test module and the trip and date encoder are located on the aft overhead panel P5 in the control cabin (Fig. 1).

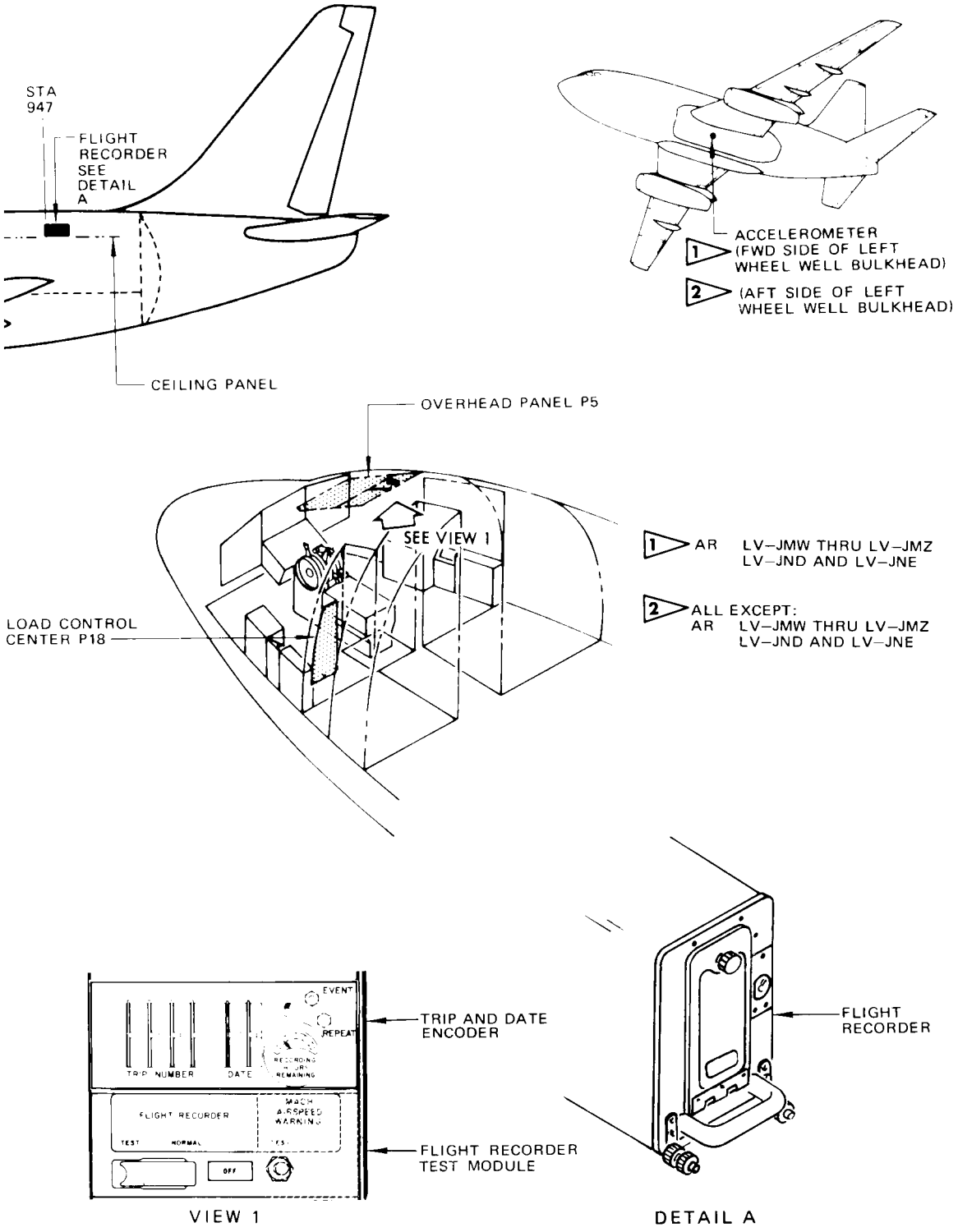
E. The recorder uses electronic bus 115 volts ac obtained through a circuit breaker on load control center P18. The test module logic circuits use 28 volts dc obtained from the flight recorder dc circuit breaker supplied by the battery bus on load control center P18. The master dimming and caution circuits supply power for the flight recorder failure warning light on the test module. Refer to Control Cabin Lighting, Chapter 33.

2. Flight Recorder Test Module

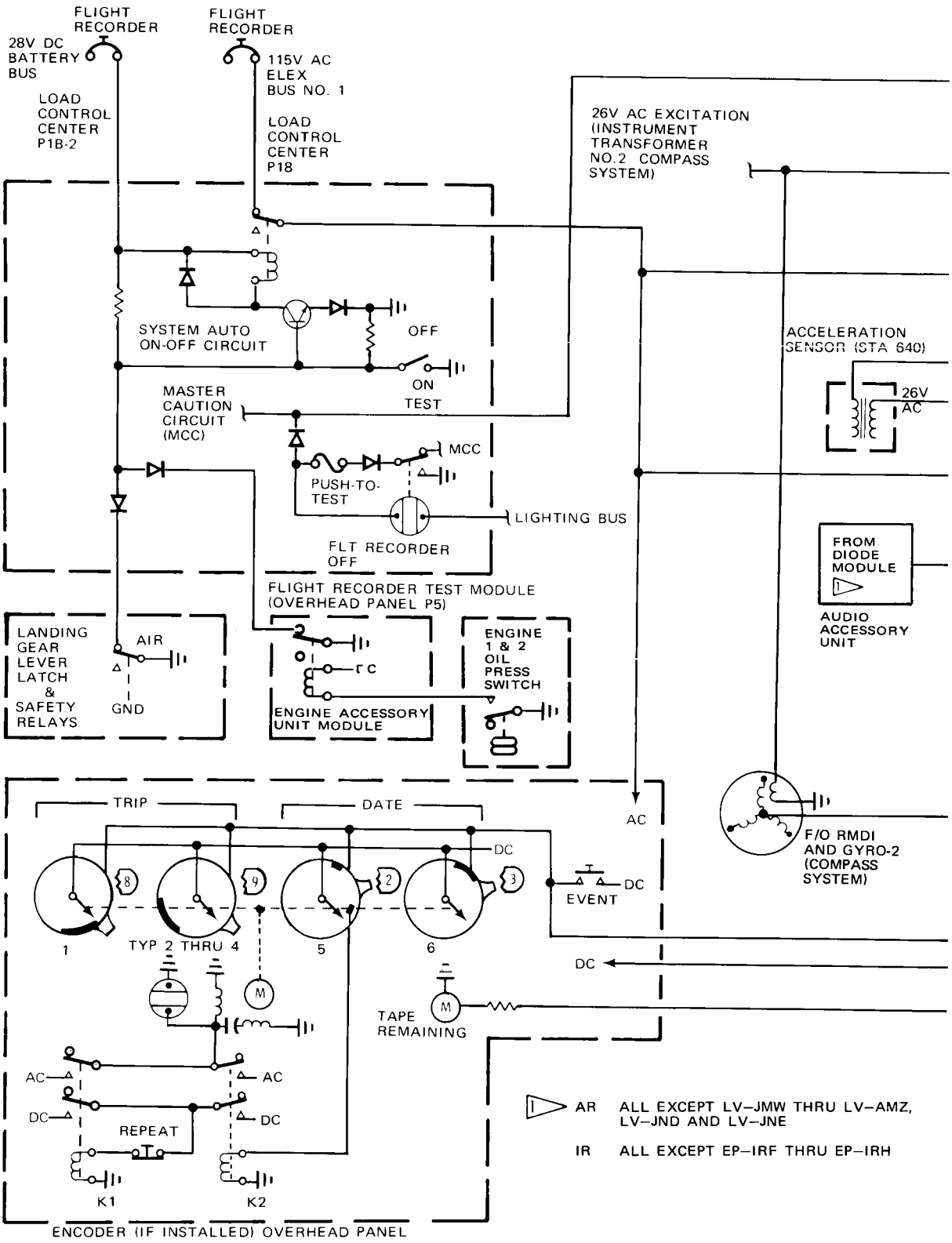
A. The flight recorder test module contains a flight recorder failure warning light, a test switch, an auto on-off circuit and electronic circuits which are part of the stall warning system, mach warning system and master caution system. Only those components related to the flight recorder system will be described (Fig. 2).

B. The amber push-to-test flight recorder failure light provides indication of an inoperative flight recorder when illuminated. A ground for the light is completed through a de-energized power relay in the flight recorder whenever power is not available to the flight recorder, or a ground is completed by a 15-second time delay circuit whenever the tape in the flight recorder is broken or fouled.

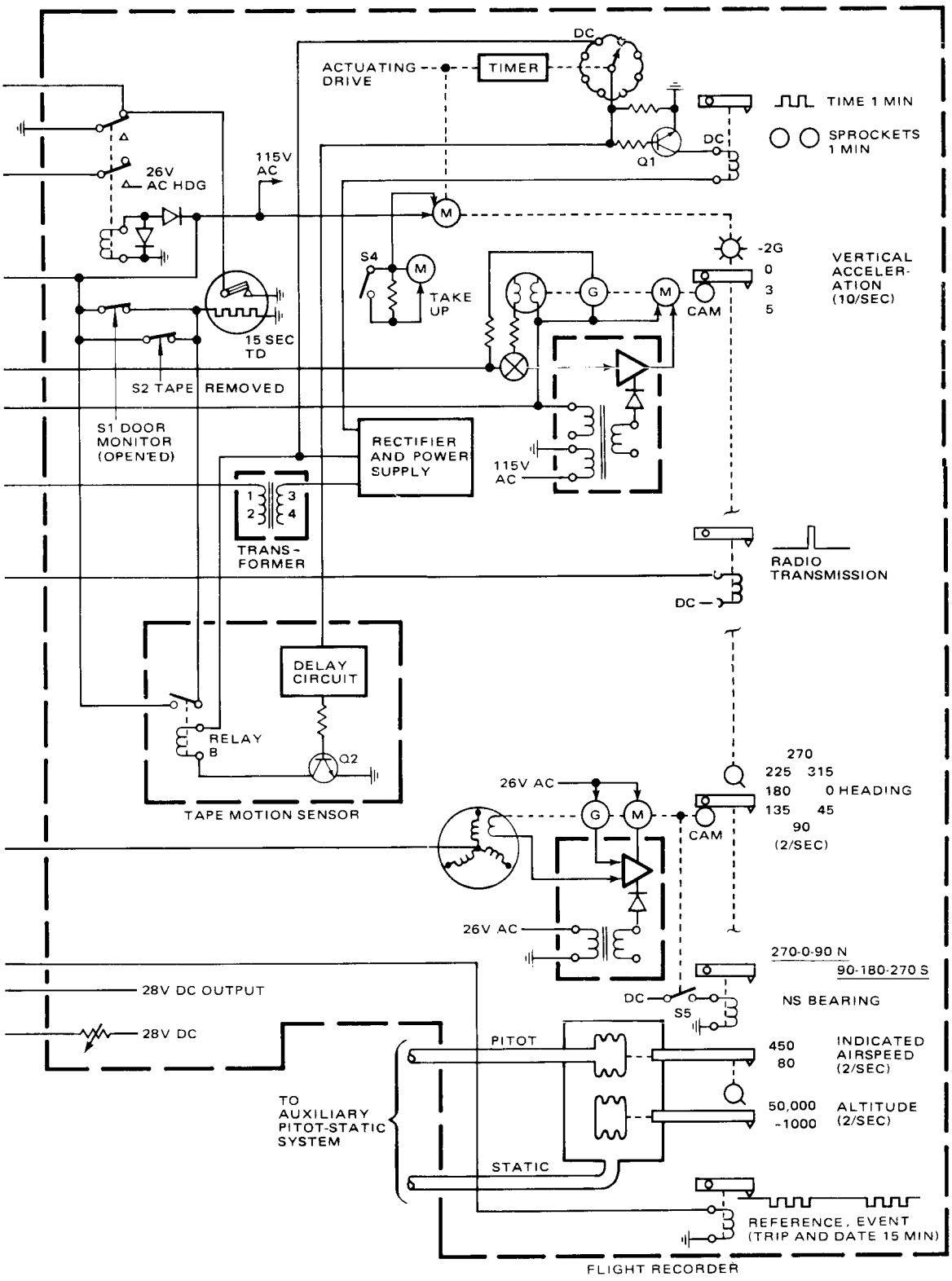
C. A transistorized auto-on-off circuit and relay complete 115 volts ac power to the flight recorder. The transistor circuit is normally conducting when ground power is on the airplane and the airplane engines are inoperative; the relay is pulled in and power is disconnected to the flight recorder. The relay can become de-energized, thus completing power to the flight recorder, in any one of three ways. Starting either one of the airplane engines causes an engine oil pressure switch to close thus grounding the transistor and causing the relay to open. If the airplane is airborne and both engines should be shut down, a ground is provided through the landing gear and lever latch relays, keeping the transistor circuit grounded and thus the flight recorder still operating. A test switch on the flight recorder test module may be used to operate the flight recorder during ground maintenance checkout.



Flight Recorder System Component Location
Figure 1



Flight Recorder System Diagram
Figure 2 (Sheet 1)



Flight Recorder System Diagram
Figure 2 (Sheet 2)

3. Trip and Date Encoder
   A. The trip and date encoder supplies signals to a trip and date (reference) solenoid actuated scribe in the recorder which scribes the recorder tape in a pulse sequence indicative of the trip and date information. The panel contains a tape time remaining indicator, an EVENT pushbutton, a REPEAT push button and an indicator light. The panel also contains six manually operated levers which may be used to select a coded trip number of up to four digits and a date number of two digits. Numbers from 0 to 9 may be selected with each control. The unit contains a motor, switching disc assemblies, relays and circuitry which develop event, trip, and date signals as selected by the front panel controls. The trip and date recording cycle requires 15 minutes; the indicator light on the encoder is on whenever the encoder is cycling. Pressing the REPEAT pushbutton will cause the trip and date information to be recorded again. Pressing the EVENT pushbutton causes the trip and date (reference) scribe in the recorder to operate for as long as the pushbutton is held. The EVENT button must not be operated while the trip and date data is being recorded. The encoder uses 115 volts ac and 28 volts dc obtained from the flight recorder.
   B. The encoder will operate as soon as power is supplied to the flight recorder (Fig. 2). When 115 volts ac is applied to the encoder motor (which drives the switching discs) through de-energized relay K1, the encoder begins its 15-minute cycle and the indicator light is illuminated. Voltage is applied to the binary trip and date (reference) solenoid in the flight recorder in a sequential series corresponding to the numbers set up on the encoder. A switching disc set to the number seven will then complete seven pulses to the solenoid which then scribes seven pulse marks on the recorder tape. Each disc is rotated in turn until all information is recorded. At the end of the cycle, the stop contact on switching disc five completes 28 volts dc to energize relay K2. Relay K2 then completes 28 volts dc to relay K1 which becomes energized. Relay K2 completes power to the motor until the stop contact on switching disc five breaks, allowing K2 to become de-energized, stop the motor and extinguish the indicating light. Relay K1 remains energized until airplane power is no longer available or until the REPEAT button is pressed. Pressing the REPEAT button de-energizes relay K1 and starts the encoder cycle again. When power is no longer available to the flight recorder and encoder, relay K1 becomes de-energized, thus resetting the encoder for an automatic cycle whenever power is returned to the system.
4. Accelerometer
   A. The accelerometer is a self-contained sealed unit mounted on the forward side of the forward wall of the left wheel well and is accessible through the ram air duct access door in the wing to body fairing. The accelerometer sensitive axis is oriented to detect vertical acceleration forces within a range of minus 3G to plus 6G. The unit supplies the recorder with a 400-cycle amplitude modulated signal which is a function of vertical acceleration of the aircraft. A 26-volt, 400-cycle ac excitation voltage is provided to the accelerometer from the vertical acceleration servo-amplifier in the flight recorder.

5. Flight Recorder

A. The flight recorder provides a permanent record of airplane headings of 0 to 360 degrees, airspeeds of 100 to 450 knots per hour, altitudes of -1000 to +50,000 feet and vertical accelerations of -3G to +6G by scribing marks on a metal foil tape. Trip and date information may also be recorded. A replaceable magazine assembly contains the tape and spool assemblies.

B. The recorder assembly consists of separate mechanical and electronic chassis units. The mechanical chassis provides for installation of a magazine assembly through a hinged door in the front plate assembly. In addition, the mechanical chassis includes: the takeup drive assembly, the actuator drive assembly, the timer assembly, the heading servo assembly and scribe, the vertical acceleration servo assembly and scribe, the altitude sensor and indicated airspeed sensor assemblies and scribes, three solenoid- actuated binary scribe assemblies, a door-operated switch (which disconnects the warning circuitry when the door is open), a time remaining indicator (on the front panel), an elapsed time indicator and magazine engagement devices. The electronic chasses contains: two servo-amplifier assemblies, a power relay, a 28-volt dc power supply, a time delay relay and associated wiring. Pitot-static connections for the altitude and airspeed aneroid-bellows assemblies are on the front panel of the recorder.

C. The magazine assembly contains the recording medium (5-inch metal foil tape), its supply and takeup spools, rollers which support and control the movement of the tape, a handle locking mechanism which locks the magazine in the recorder assembly and various recorder engagement devices. The magazine is designed to facilitate removal and replacement of the recording tape and its spools in a minimum amount of time and without damage. When installed in the recorder, the magazine is precisely positioned to prevent the need for individual adjustments each time the magazine is changed. The magazines are interchangeable between recorders. The metal foil tape is made of stainless steel and nickel thus providing high resistance to mechanical damage, heat and corrosion. The tape is driven at a constant speed of 1/2 foot per hour through sprocket holes in the tape spaced 0.2 inch (2 minutes) apart at each outer edge. The 200-foot tape is sufficient for 800 hours of recording time, 400 hours on each side. The tape spools must be reversed and rethreaded through the magazine to record on the unused side. Since the tape moves at a constant speed, an accurate time base is provided, however, a solenoid-operated scribe also marks the tape with timing marks spaced at 1-minute intervals. A lever on the supply spool senses the radius of the tape remaining on the supply spool and transmits the indication through a linkage and cable mechanism to the tape remaining indicator on the front panel of the recorder. A potentiometer mechanically connected to the linkage transmits an electrical signal to the tape remaining indicator on the encoder panel. Both indicators are calibrated in hours.

D. Acceleration data and heading information is connected to servo-amplifiers which in turn operate the acceleration and heading scribes. The heading servo-amplifier uses 26-volt, 400-Hz ac excitation voltage from instrument transformer No. 2 in the airplane compass system. A synchro transmitter in the first officer's radio magnetic deviation indicator (RMDI) provides heading information to the heading servo-amplifier which then moves the scribe until the signal is nulled out by a synchro control transformer. The position of the scribe corresponds to an equivalent heading position on the tape. Only 180 degrees of compass heading is recorded. A solenoid operated scribe resolves heading ambiguity when headings are in the 270 to 0 to 90 degree range by marking a line at one level (the north line) and marking a line lower on the tape (the south line) when headings are in the 90 to 180 to 270 degree range. The acceleration servo-amplifier uses flight recorder 115 volts, 400 Hz ac which is converted to 26 volts ac for operation of the accelerometer and the servo-amplifier. Acceleration signals modulating the 26-volt excitation voltage are used by the acceleration servo-amplifier to move a scribe to an equivalent acceleration position on the tape until the signal is nulled out by an induction potentiometer in the servo-amplifier assembly.

E. Altitude and airspeed data is taken from the airplane pitot-static systems. Positioning of the altitude scribe is done with static pressure balanced against an evacuated aneroid and scribe assembly. The expansion or contraction of the aneroid moves the scribe to an equivalent altitude position on the tape. Airspeed is a function of both static and pitot pressures. Therefore, pitot pressure is supplied to a bellows which is in a static pressure chamber. The difference between the two pressures causes the bellows and scribe assembly to move to an equivalent airspeed position on the tape.

F. The heading, airspeed, altitude and acceleration scribes are caused to press against the tape periodically by a pressure bar, thus marking the tape in a rectilinear fashion. Heading, airspeed, and altitude are recorded at 1-second intervals. Acceleration is recorded 10 times per second. The scribes assume their new positions during that time in which they are not pressed against the tape. The other three scribes are solenoid-operated and record continuously. One solenoid-operated scribe provides the north-south reference lines, the second scribes the 1-minute timing marks and the third scribes the basic reference line and the trip and date pulses.

G. AR ALL EXCEPT LV-JMW thru LV-JND and LV-JNE;
An additional binary scribe records radio transmission (ATC event) on any of the airplane radios. The radio transmission signal is a dc ground provided to the recorder by the diode module in the audio accessory unit when any radio transmitter is keyed.

H. The front panel of the recorder contains the pitot static connections and the time remaining indicator. The indicator indicates the number of hours of tape remaining on the spool. A door on the front provides access for removal and installation of the magazine assembly. The recorder uses 115 volts, 400 Hz ac. Two switches (tape monitor and door monitor) in the recorder monitor circuit complete voltage to a 15-second time delay relay. The delay relay then provides a ground for the power failure warning light on overhead panel P5 if power is unavailable to the recorder or if the tape is not tight or is fouled on the spools. The door monitor switch is provided so that the recorder may be serviced while operating with the door open without having the power failure light illuminated.

6. Operation

A. The flight recorder will start automatically as soon as power is supplied to load control center P18 and an engine is started. Either one of the engine oil pressure switches will complete the circuit to activate the recorder whenever they are started. The landing gear lever latch relays complete a parallel circuit with the oil pressure switches whenever the airplane is airborne; thereby, providing backup control to keep the recorder operating in case of engine failure. The recorder may be operated manually for ground maintenance checks by pressing the flight recorder test button on overhead panel P5. The flight recorder failure warning light (push-to-test type), adjacent to the test button, will be illuminated whenever, flight recorder power fails, power is on the airplane and both engines are shut down, any interference occurs with the tape movement (either by jamming of the takeup drive or tearing of the tape), the spool is exhausted, or the magazine is removed and the door closed. The recorder may be operated with the magazine removed.

B. When power is supplied to the flight recorder', externally supplied information is applied to mechanically position the scribes as the foil moves through the magazine. A pressure bar periodically depresses the four parameter scribes onto the recording foil for a short time, thus scribing the foil in a rectilinear fashion. The heading ambiguity scribe., (trip and date) reference scribe and time base scribe record continuously. Since the recording foil travels at a controlled rate, another time base is provided for the recorded information. The trip and date information is recorded for the first 15 minutes of tape movement. The trip and date information may be repeated or event scribed by operating buttons on the encoder panel. The rest of the time, the scribe provides a reference line.

C. The flight recorder incorporates a tape motion sensor to indicate when the tape is not in motion (Fig. 2). As long as the recorder timer commutator is rotating, the tape motion sensor provides a positive indication of tape motion and the flight recorder failure lights on the P5 overhead panel will remain off. If the timer commutator stops, the tape motion sensor energizes the delay relay, which actuates in approximately 2 minutes. When actuated, the delay relay will cause the failure light to illuminate, indicating the flight recorder tape is not in motion. If a pulse from the motion sensor appears at the delay device reset terminals during the delay period, the delay device will reset, preventing the failure light from illuminating.

D. The trip and date encoder (if installed) operates in conjunction with the flight recorder to place coded information on the recording tape to identify trip, date and events. When the flight and date digital levels on the encoder are positioned, they set up circuits to the trip and date solenoid scribe. When power is supplied to the recorder, the encoder automatically goes through a fifteen minute recording time cycle and then shuts off. The gear-driven switching disc assemblies supply 28 volts DC to the recorder reference solenoid in an on-off sequence as selected by the levers. The indicator light will be illuminated whenever the trip and date recording cycle is in process. The REPEAT button can be pressed to start a new cycle at any time after the first 15 minutes of recorder operation. IF the recorder power is interrupted during the recording cycle the encoder will stop but will continue from the stopped position when power is restored. An event may be scribed on the tape by pressing the EVENT button after the initial trip and date data have been recorded

1. Flight Recorder System Test
   A. General

      CAUTION: RUNNING FLIGHT RECORDER WITH NO RECORDING TAPE IN MAGAZINE WILL CAUSE STYLUS TO DAMAGE MAGAZINE ROLLER.

      (1) Operation of flight recorder when airplane is on ground and no engines operating requires placing test witch on flight recorder test module on P5 panel to test position.
      (2) Pitot-static heaters will remain off during tests.
      (3) Pitot line pressure application will always equal or exceed static line pressure and difference will not exceed 10.00 inches of mercury.
      (4) Do not apply pressure in excess of 31 inches of mercury absolute to static lines.
      (5) Apply or release vacuum at a rate of climb or descent of approximately 3000 feet per minute or less between test points. At each test point pressure will be reduced slowly to desired level without overshooting.

   B. Equipment and Materials
      (1) Air pressure and vacuum source 5-40 inches of mercury absolute for pitot system test.
      (2) Adequate lengths of hoses and connectors for connecting to pitot and static ports test fittings.
      (3) Gauge for measuring differential pressure with a minimum range of 10 inches of mercury.
      (4) Air pressure and vacuum source 5-30 inches of mercury absolute for static system test.
      (5) Gauge for measuring pressure with a maximum range of 31 inches of mercury absolute.

   C. Prepare Flight Recorder System for Test
      (1) Seal static ports temporarily at skin surface in such a way that removal of seal will be complete, leaving no deposits or roughness in or about static ports.
      (2) With static system selector valve in NORMAL position, evacuate auxiliary static system by connecting vacuum source to either test fittings located in cockpit or drain fitting located in nose wheel well. (Refer to AMM 34-11-0, Pitot Static System, for correct procedure.)

         CAUTION: DO NOT CHANGE SETTING OF STATIC SELECTOR VALVE WHILE A VACUUM IS ON STATIC SYSTEM.

      (3) Install loaded tape magazine. Make sure that tape is tight in magazine, by turning takeup spool by hand, and close flight recorder door.

(4) Apply external power.
(5) Make sure that following circuit breakers are closed:
  (a) LIGHT circuit breaker on P6 panel
  (b) FLIGHT RECORDER circuit breakers on P18 panel
  (c) Two MASTER CAUTION BUS circuit breakers on P6 panel
  (d) Nine INDICATOR LIGHTS MASTER DIMMING BUS circuit breakers on P6 panel
  (e) DIM & TEST circuit breaker on P6 panel
  (f) NO. 1 and 2 ENGINE THRUST REVERSER circuit breakers on P6 panel (if installed)

D. Test Flight Recorder System
(1) General
  (a) To test flight recorder system all following checks must be performed. However, any of the checks may be made independent of the others to check portions of the system.
  (b) Unless otherwise directed, the following tests will be performed with the test switch on test module in TEST position.
(2) Test Power Failure Light
  (a) With flight recorder test switch on P5 panel released or at NORMAL position, flight recorder failure light on P5 panel, two master caution lights and overhead system annunciator light on pilots' lightshield will be illuminated.
  (b) Depress one of two master caution lights on pilots' lightshield and place flight recorder test switch on P5 panel in test position. Both master caution lights, overhead system annunciator light on pilots' lightshield and flight recorder failure light will go out.
  (c) Open LIGHT circuit breaker on P6 panel. Flight recorder failure light will go out. Close circuit breaker.
  (d) Place flight recorder test switch to test position. Flight recorder failure light will go out.
(3) Test Event Marker

NOTE: Event pushbutton on encoder panel, on P5 panel, should not be used while encoding cycle is on (i.e., while light on encoder is illuminated) and/or for at least 5 minutes after encoding cycle is completed. Encoding cycle will start automatically as soon as power is applied to flight recorder. Once started, encoding cycle will last for approximately 16 ±2 minutes.

(a) Depress event pushbutton on encoder for 15 seconds, and make sure that trip, date, and event binery scriber (bottom scriber) on flight recorder moves.

(4) Test Repeat Button

(a) Make sure that repeat test pushbutton light on encoder panel is off.

(b) Depress and hold repeat pushbutton for at least 15 seconds. Repeat test pushbutton light on encoder panel will illuminate and remain so.

(c) Trip, date, and event scriber (bottom scriber) on flight recorder will make an up and down movement for period that encoder is operating.

(d) After approximately 16 ±2 minutes, trip and date scribe on flight recorder will stop moving, and repeat test pushbutton light on encoder panel will go out and remain so.

(5) Test Altitude Marker

(a) Apply a vacuum not exceeding 2 inches of mercury absolute to flight recorder static line. Make sure that altitude recording stylus moves up (away from reference line) and airspeed stylus moves down (toward reference line). The deviations will be small.

NOTE: If styli noted above move in opposite direction as called out, the pitot-static lines are reversed and must be corrected before proceeding.

(b) Continue applying a vacuum, to a maximum of 20 inches of mercury (absolute). Make sure that larger deflections occur for altitude and airspeed styli in directions noted above.

(c) Physically inspect altitude stylus linkage to make sure that no disconnections have occurred as a result of applied vacuum.

(6) Test Airspeed Record

(a) Apply a pressure of approximately 2 inches of mercury (gage) to flight recorder (SV HZ-AGC thru HZ-AGG) or to CADC-1 (SV ALL EXCEPT HZ-AGC thru HZ-AGG) pitot line. Make sure that airspeed stylus moves down (toward reference line) and altitude stylus does not move. The deflection will be small.

NOTE: If airspeed stylus moves up or if altitude stylus moves, the pitot-static lines are reversed and must be corrected before proceeding.

(b) Continue applying pressure up to approximately 8.40 inches of mercury (gage). Make sure that a larger deflection (down) occurs.
(c) Physically inspect airspeed stylus linkage to make sure that no disconnections have occurred as a result of applied pressure.

CAUTION: PRESSURE APPLIED AT PITOT PORT MUST NOT EXCEED 10.89 INCHES OF MERCURY (GAGE).

(7) Test Magnetic Heading
(a) Switch on compass system (AMM 34-21-0, Compass Systems).

NOTE: Compass need not be calibrated for this test.

(b) Using synchronizing knob of compass system that feeds compass heading signals to flight recorder, rotate heading card through 0, 90, 180, 270, and 0 degrees.
(c) Make sure that heading binary scriber (fourth from bottom) and heading scriber (fifth from bottom) on flight recorder moves, and as heading is brought back to 0 degree, both scribers assume their original position.
(d) Switch off compass system.
(8) Test Vertical Acceleration
(a) Remove accelerometer-mounting bolts and gently move accelerometer vertically. Make sure that vertical acceleration scriber (second from top) on flight recorder moves.

NOTE: Refer to page 1 for access to accelerometer.

(b) Install accelerometer-mounting bolts.
(9) Test ATC (Radio Transmission) Marker (when installed)
(a) On captain's audio selector panel, select VHF-1 radio.
(b) Press captain's PTT switch and make sure that auxiliary binary scriber moves.
(c) On captain's audio selector panel, select VHF-2 radio.
(d) Press captain's PTT switch and make sure that auxiliary binary scriber moves.
(e) On captain's audio selector panel, select HF-1 radio.
(f) Press captain's PTT switch and make sure that auxiliary binary
(10) Test Recording Hours Remaining Indicator
(a) Close LIGHT circuit breaker on P6 panel, and release test switch on test module or place in NORMAL position. Insert tape magazine into the flight recorder very slowly. Meter pointer, on flight recorder front panel, will move. When tape magazine is fully in and locked in position, meter pointer on flight recorder will register an appropriate reading.

(b) Place flight recorder test switch on P5 panel to test position, and open LIGHTS circuit breaker on P6 panel. With tape magazine installed and flight recorder system energized, press test switch on test module. Hours remaining meter on trip and date encoder and meter on front panel of flight recorder will indicate same reading.

(11) Test Power Interlock Thermal Switch and Tape Motion Sensor

(a) Release or place flight recorder test switch to NORMAL position. Remove tape magazine and close magazine access door.

(b) Open LIGHT circuit breaker on P6 panel. Flight recorder power shall come on immediately as indicated by motor operation.

NOTE: For flight recorders up to S/N 1399, power shall be interrupted by thermal delay relay and flight recorder failure light shall come on within 15 seconds. For flight recorders S/N 1400 and on, flight recorder failure light shall come on in approximately 15 seconds, but power to the recorder shall not be interrupted.

E. Restore Airplane to Normal Configuration

(1) Release flight recorder test switch or position to NORMAL.

(2) Return pitot and static system pressures to ambient and remove seal from static and pressure ports.

(3) With static selector valve in NORMAL position remove vacuum source from test or drain fittings.

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

(5) Close LIGHT circuit breaker on P6 panel.

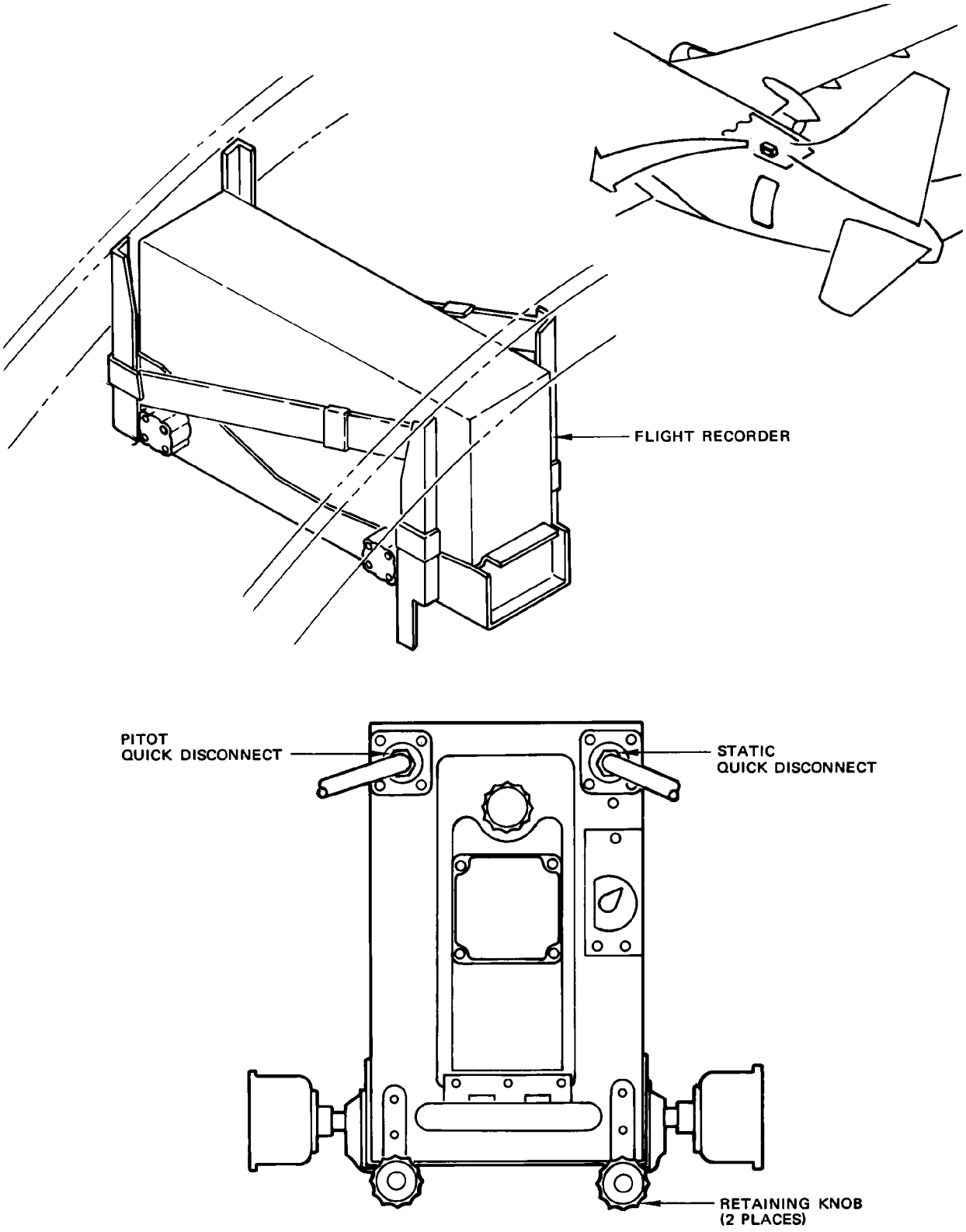
(6) Return airplane pitot-static and pressure system to normal configuration.

FLIGHT RECORDER - REMOVAL/INSTALLATION

1. General
   A. The flight recorder is installed in a mounting tray above aft lowered ceiling panel No. 2 in the passenger compartment. Pitot and static lines to the recorder are flexible. They are equipped with quick-disconnect fittings.
2. Remove Flight Recorder (Fig. 401)
   A. Open FLIGHT RECORDER AC and DC circuit breakers on P18.
   B. Open aft lowered ceiling panel No. 2 (Ref Chapter 25).
   C. Release pitot and static quick disconnects by pulling out on the fittings. Considerable force may be required to release the disconnects.
   D. Cap lines and fittings on recorder.
   E. Unscrew recorder retaining knobs; release flight recorder and remove from mounting tray.

      NOTE: If recorder is to be removed for any length of time, cap the electrical connector at the back of the mounting tray.

3. Install Flight Recorder (Fig. 401)
   A. Remove electrical connector cap, if installed; place recorder in mounting tray; and slide recorder into tray to mate connector contacts.
   B. Tighten retaining knobs to secure recorder.
   C. Remove caps from pitot and static fittings and connect pitot and static lines to recorder. Considerable force may be required to seat disconnects on recorder fittings.
   D. Close two FLIGHT RECORDER circuit breakers on P18.
   E. Test flight recorder system.
      (1) Provide electrical power.
      (2) Observe that OFF light on flight recorder control panel is ON.
      (3) Set TEST switch on control panel to TEST position. Check that OFF light goes off.
      (4) Return TEST switch to NORMAL position.
      (5) If no longer required, remove electrical power.



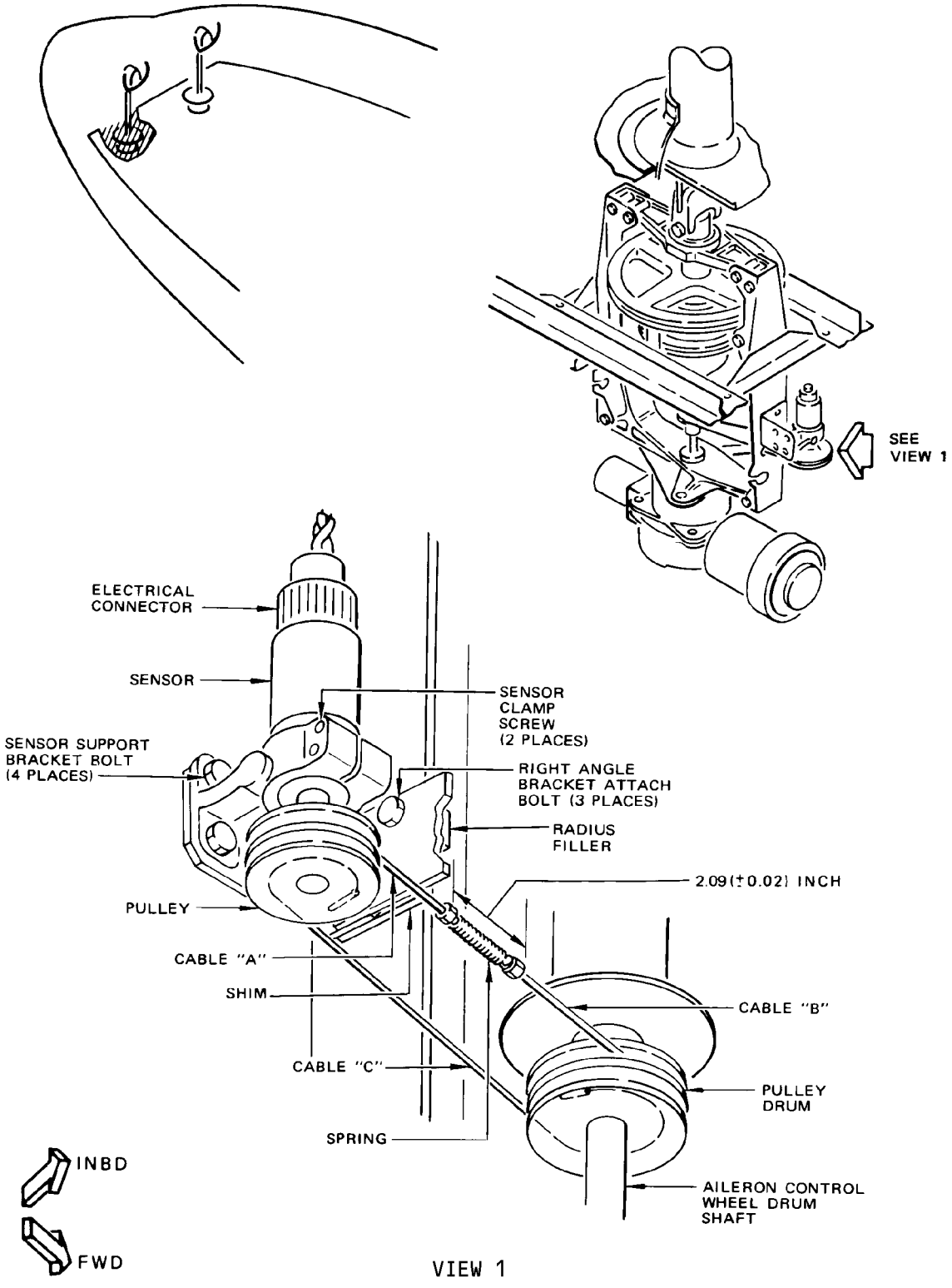
Flight Recorder Installation
Figure 401

CONTROL WHEEL POSITION SENSOR - REMOVAL/INSTALLATION

1. Equipment and Materials
   A. Grease - MIL-G-25760
   B. Corrosion Preventive Compound - MIL-C-16173, Grade 2
   C. Rigging Pin E-1 - 0.311 +0.000/-0.002-inch diameter, 6 inches long (MS20392-4)
   D. Rigging Pin A/S-1A - 0.311 +0.000/-0.002-inch diameter, 5.5-inch minimum length (MS20392-4)
2. Prepare to Remove Control Wheel Position Sensor
   A. Depressurize aileron hydraulic system (Ref 27-11-0, Maintenance Practices).
   B. Open flight controls circuit breakers on panel P6.
   C. Open FLIGHT RECORD AC and DC; FLIGHT RECORD POSITION SENSOR circuit breakers on panel P18.
   D. Open lower nose compartment access door 1103.
3. Remove Sensor (Fig. 401)
   A. Install rigging pin E-1 in left forward elevator control quadrant (Ref Chapter 27, Elevator and Tab Control System).
   B. Insert rigging pin A/S-1A in aileron transfer mechanism (Ref Chapter 27, Aileron and Aileron Trim Control System).
   C. Disconnect electrical connector from sensor.
   D. Disconnect sensor control cables from sensor pulley, spring and pulley drum on aileron control wheel drum shaft installation.
   E. Remove two clamp screws securing sensor to bracket and remove sensor.
4. Install Sensor
   A. Install sensor in support bracket with shaft down. Install sensor clamp screws. Prior to installing screws, apply a thin coat of corrosion preventive compound on both internal and external surfaces of mating threads.

      NOTE: Screws are to be tightened to torque of 30 to 35 pound-inches. Do not exceed this torque.

   B. Install pulley drum on end of shaft and secure with bolt, nut and washer.



VIEW 1

Control Wheel Position Sensor Installation
Figure 401

C. Install cables
   (1) Install cable C between bottom spool on sensor pulley drum and bottom spool of drum on aileron control drum shaft. With cable terminals secured on pulley and drum, secure cable terminals with cotter pin.

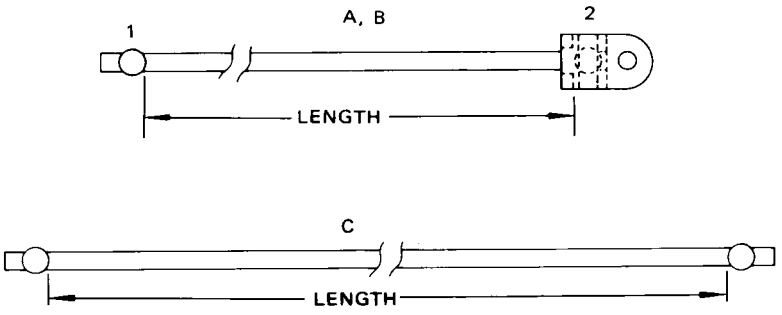
       NOTE: See Fig. 402 for cable lengths.

   (2) Secure pulley terminal end of cable A to upper spool of sensor pulley and pulley terminal end of cable B to upper spool at pulley drum on aileron control wheel drum shaft as shown in Fig. 401 and secure each terminal with cotter pin. Connect spring between the other end terminals of cables A and B.
   (3) Align cables as necessary by loosening sensor support bracket mounting bolts and raising or lowering bracket in slotted holes on attach bracket.
   (4) Lubricate cables with grease for full length of travel on drum and quadrant.
D. Remove laminations from laminated shim as required to obtain spring extension dimension between cable terminals as shown in Fig. 401.
E. Tighten the sensor support bracket bolts and install electrical connector to sensor.
F. Close FLIGHT RECORDER AC and DC circuit breakers on panel P18 and flight control circuit breakers on panel P6.
G. Pressurize hydraulic system (Ref 27-11-0).
H. Perform adjustment/test (Ref 31-24-32).
I. Remove rigging pins.
J. Close nose compartment door.

CABLE REF	DRAWING NUMBER	NO. REQ	LENGTH	CABLE SIZE	FITTINGS	
					1	2
A	69-40951-41	1	4.80	3/64 7 X 7	RA2487-047	RA2487-047 and 69-40947-1
B	69-40951-43	1	5.32	3/64 7 X 7	RA2487-047	RA2487-047 and 69-40947-1
C	69-40951-45	1	11.99	3/64 7 X 7	RA2487-047	RA2487-047

MATERIAL – CABLE STAINLESS STEEL CABLE, AIRCRAFT QUALITY, HACKENSACK CABLE CORP., HACKENSACK, N.J., OR EQUIV

TERMINALS AMERICAN CHAIN AND CABLE CO., BRIDGEPORT, CONN.



Control Wheel Control Sensor Cables
Figure 402

RUDDER PEDAL POSITION SENSOR - REMOVAL/INSTALLATION

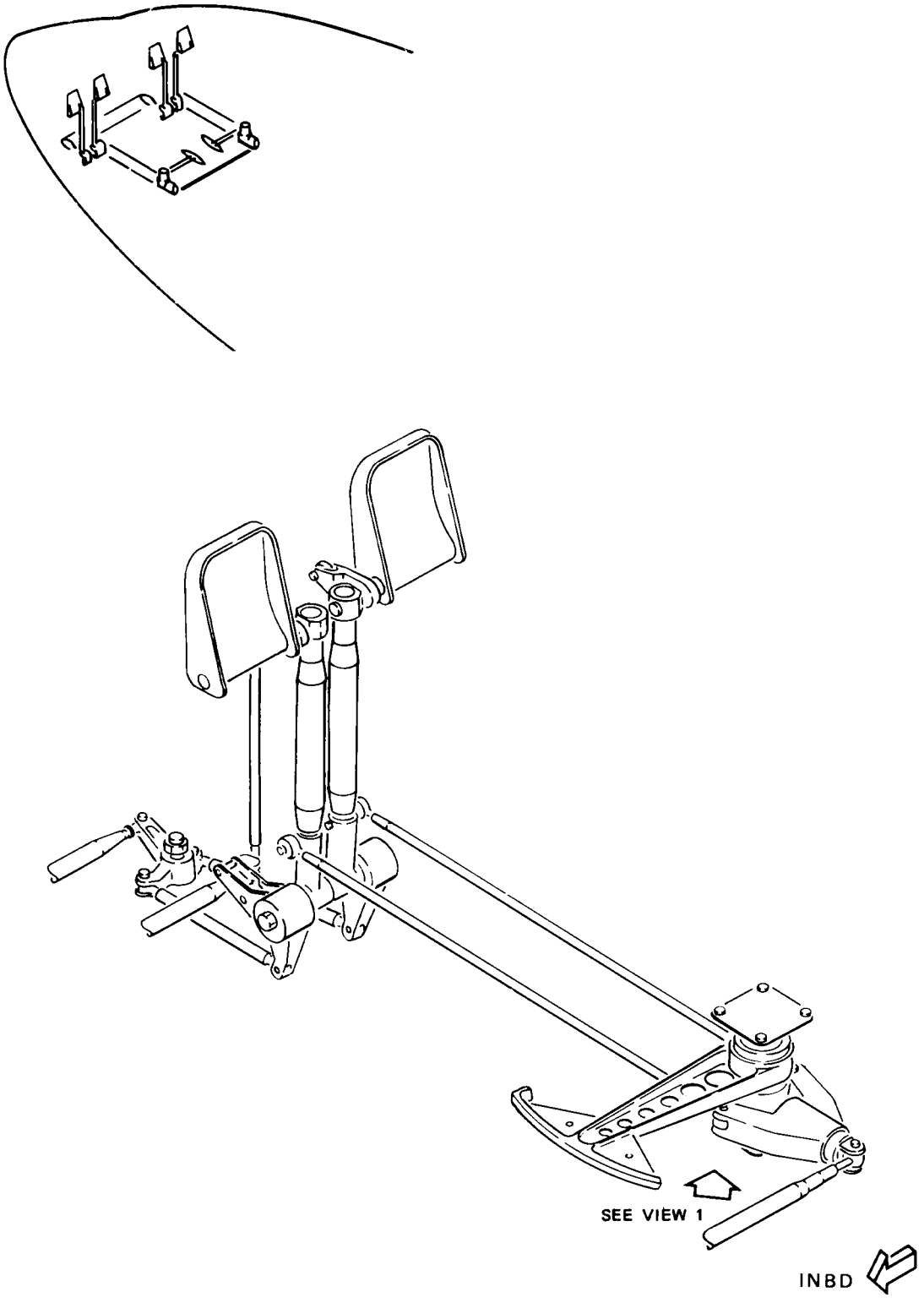
1. Equipment and Materials
   A. Grease - MIL-G-25760
   B. Corrosion Preventive Compound - MIL-C-16173, Grade 2
   C. Rigging Pin R-4 - 0.311 +0.000/- 0.002-inch diameter, 3-1/2 inches long (MS20392-4)
2. Prepare to Remove Sensor
   A. Depressurize rudder hydraulic system (Ref Chapter 27, Rudder and Rudder Trim Control System).
   B. Open FLIGHT RECORDER AC and DC circuit breakers on P18 panel.
   C. Open flight controls circuit breakers on P6 panel.
   D. Remove nose wheel well forward access panels, and open lower nose compartment door 1103.
3. Remove Sensor
   A. Place rudder pedals in neutral position. Install rigging pin R-4.
   B. Disconnect cables from spring, quadrant at bottom of rudder jackshaft, and pulley drum (Fig. 401).
   C. Disconnect electrical connector from sensor.
   D. Remove pulley from bottom of sensor shaft by removing bolt, nut, and washer.
   E. Remove two clamp screws securing sensor to bracket and remove sensor.
4. Install Sensor
   A. Install sensor in bracket with shaft down. Install two clamp screws. Prior to installing clamp screws apply thin coat of corrosion preventive compound on both internal and external surfaces of mating threads.

      NOTE: Screws are to be tightened to torque of 30 to 35 pound-inches. Do not exceed this torque.

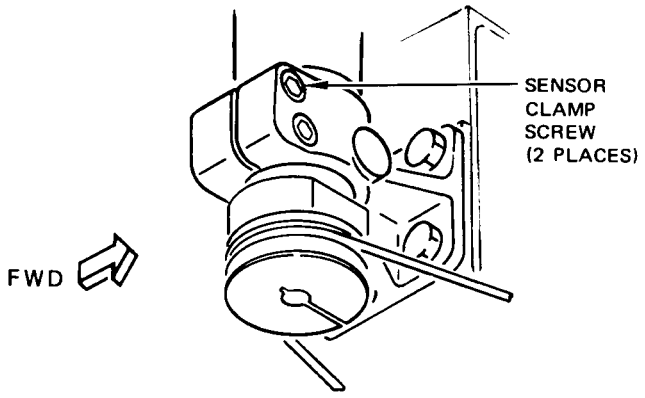
   B. Install pulley drum to bottom of sensor shaft. Secure with bolt, nut, and washer under bolthead and nut.
   C. Install quadrant assembly to bottom of rudder jackshaft with two bolts and washers. Lockwire the two boltheads together.
   D. Install cables.
      (1) Install cable C between upper sector on jackshaft quadrant and upper spool on pulley drum. Secure cable terminals at both ends of cable with cotter pin.

          NOTE: See Fig. 402 for cable lengths.

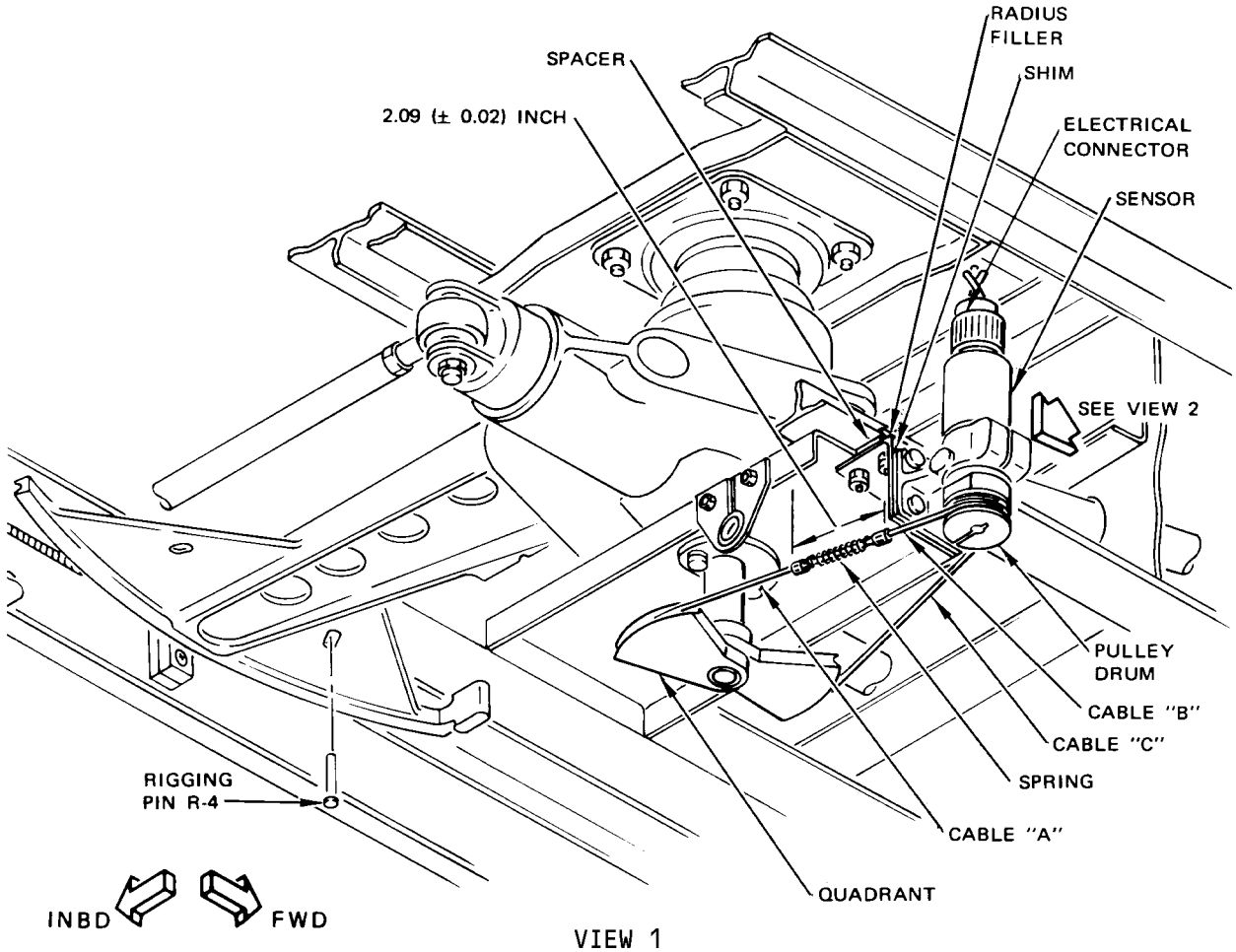
      (2) Secure ball terminal end of cable A to lower sector of quadrant. Secure ball terminal end of cable B to lower spool on pulley drum. Connect spring between the loose end terminals of cables A and B.
      (3) Lubricate cables with grease for full length of travel on drum and quadrant.



Rudder Pedal Sensor Installation
Figure 401



VIEW 2



VIEW 1

Rudder Pedal Position Sensor Installation
Figure 402

(4) Align cables as necessary by loosening sensor support bracket mounting bolts and raising or lowering bracket in slotted holes on right angle bracket.

E. Check that dimension measured across spring between cable terminals is 2.09 ±0.02 inches as shown in Fig. 401. Remove laminations from laminated shim as required to obtain the required dimension.

F. Tighten the four sensor support bracket bolts and install electrical connector to sensor.

G. Close FLIGHT RECORDER AC and DC circuit breakers on panel P18, and flight control circuit breakers on panel P6.

H. Pressurize hydraulic system (Chapter 27).

I. Perform Adjustment/Test (AMM 31-24-42).

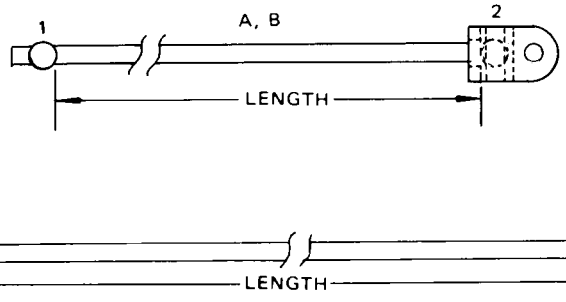
J. Remove rigging pin R-4.

K. Close lower nose compartment door.

CABLE REF	DRAWING NUMBER	NO. REQ	LENGTH	CABLE SIZE	FITTINGS	
					1	2
A	69-40951-31	1	3.97	3/64 7 X 7	RA2487-047	RA2487-047 and 69-40947-1
B	69-40951-31	1	3.97	3/64 7 X 7	RA2487-047	RA2487-047 and 69-40947-1
C	69-40951-35	1	9.77	3/64 7 X 7	RA2487-047	RA2487-047

MATERIAL – CABLE STAINLESS STEEL CABLE, AIRCRAFT QUALITY, HACKENSACK CABLE CORP., HACKENSACK, N.J., OR EQUIV

TERMINALS AMERICAN CHAIN AND CABLE CO., BRIDGEPORT, CONN.



Rudder Pedal Position Sensor Cables
Figure 403

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CONTROL COLUMN POSITION SENSOR - REMOVAL/INSTALLATION

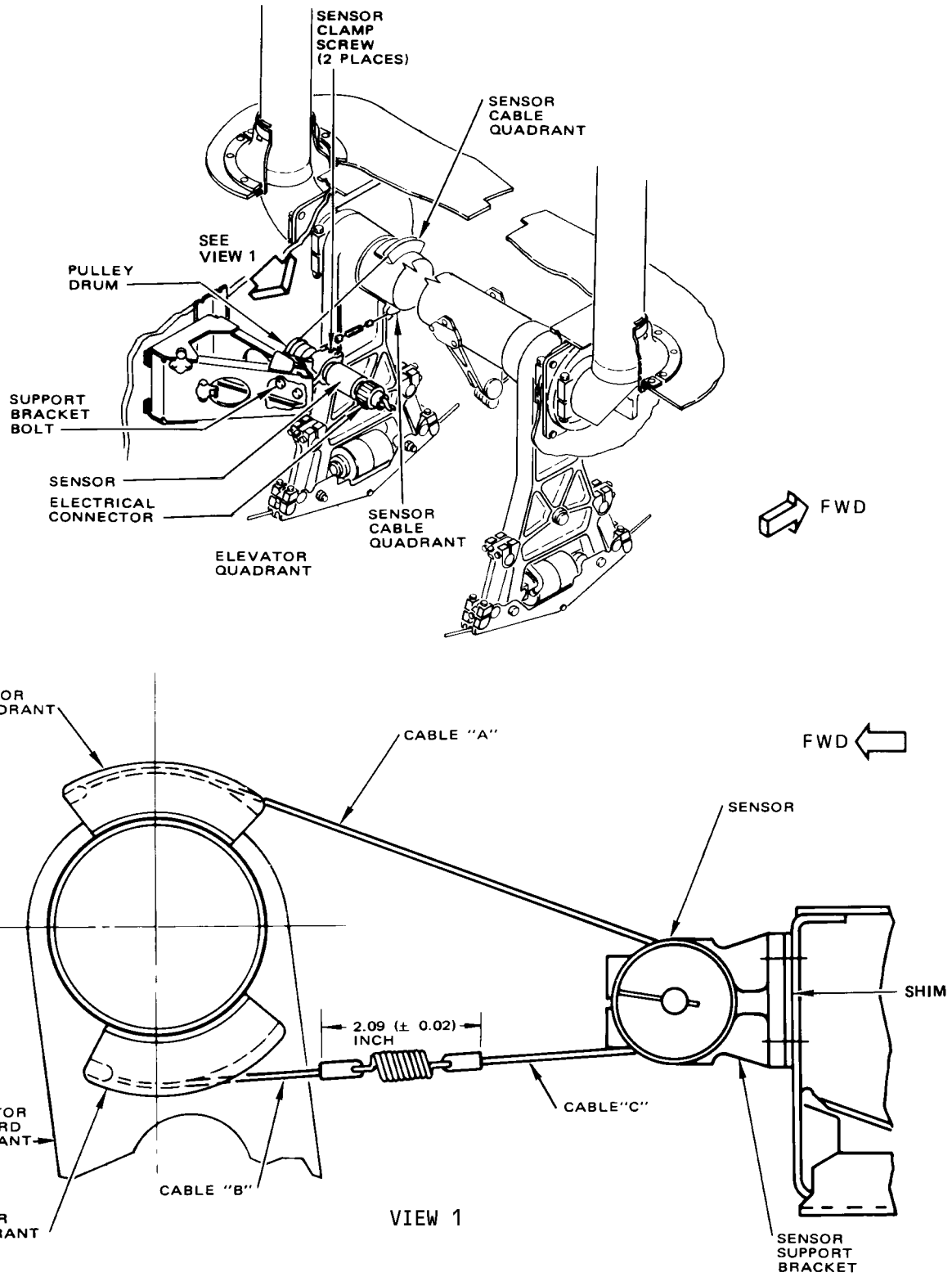
1. Equipment and Materials
   A. Rigging Pin E-1 - 0.311 +0.000/-0.002-inch diameter, 6 inches long (MS20392-4)
   B. Grease - MIL-G-25760
   C. Corrosion Preventive Compound - MIL-C-16173, Grade 2
2. Prepare to Remove Control Column Position Sensor
   A. Depressurize elevator hydraulic systems A and B (Chapter 27, Elevator and Tab Control System).
   B. Open flight controls and breakers on panel P6.
   C. Open FLIGHT RECORDER AC and DC circuit breakers on panel P18.
   D. Open lower nose compartment access door 1103.
3. Remove Sensor
   A. Install rigging pin E-1 in left forward elevator control quadrant (Fig. 401).
   B. Disconnect electrical connector from sensor.
   C. Disconnect sensor control cables from sensor pulley, spring, and quadrants on elevator forward quadrants cross-shaft.
   D. Remove pulley from sensor shaft by removing bolt, nut, and washer.
   E. Remove two clamp screws securing sensor to bracket and remove sensor.
4. Install Sensor
   A. Lightly install sensor clamp bolts. Prior to installing bolts apply thin coat of corrosion preventive compound on both internal and external surfaces of mating threads.

      NOTE: Clamp bolts are to be tightened to 30-35 pound-inches. Do not exceed this torque value.

   B. Install pulley drum on end of shaft and secure with bolt, nut, and washer.
   C. Install cables (Fig. 401).
      (1) Install cable A between sensor quadrant on upper surface of elevator forward quadrant shaft and sensor pulley drum. With cable terminals secured on quadrant and pulley drum, secure cable terminals with cotter pins.

          NOTE: See Fig. 402 for cable lengths.

      (2) Secure ball terminal end of cable C to lower quadrant on elevator forward quadrant shaft. Secure ball terminal end of cable B to pulley drum on sensor. Connect spring between the loose end terminals of cables B and C.
      (3) Lubricate cables with grease for full length of travel on drum and quadrant.
   D. Install electrical connector to sensor.



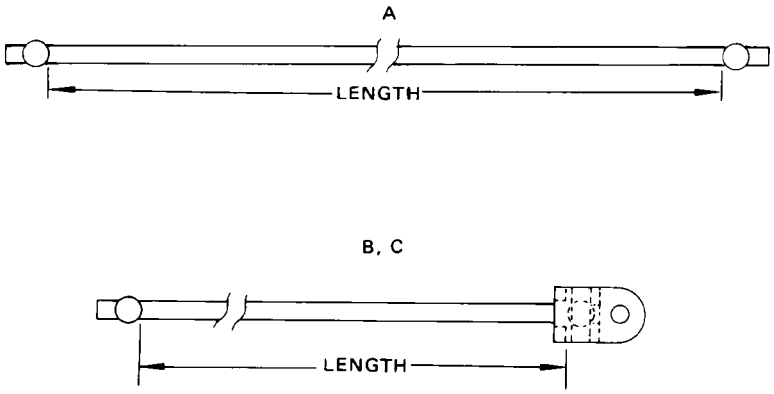
Control Column Position Sensor Installation
Figure 401

E. Close FLIGHT RECORDER AC and DC circuit breakers on panel P18, and flight control circuit breakers on P6.
F. Pressurize hydraulic system (Chapter 27).
G. Remove rigging pin E-1.
H. Close lower nose compartment door.
I. Perform adjustment/test (AMM 31-24-52).

CABLE REF	DRAWING NUMBER	NO. REQ	LENGTH	CABLE SIZE	FITTINGS	
					1	2
A	69-40951-39	1	10.34	3/64 7 X 7	RA2487-047	RA2487-047
B	69-40951-37	1	3.71	3/64 7 X 7	RA2487-047	RA2487-047 and 69-40747-1
C	69-40951-37	1	3.71	3/64 7 X 7	RA2487-047	RA2487-047 and 69-40747-1

MATERIAL – CABLE STAINLESS STEEL CABLE, AIRCRAFT QUALITY, HACKENSACK CABLE CORP., N.J., OR EQUIV

TERMINALS AMERICAN CHAIN AND CABLE CO., BRIDGEPORT, CONN.



Control Column Sensor Cables
Figure 402

ELEVATOR AND AILERON POSITION SENSOR - REMOVAL/INSTALLATION

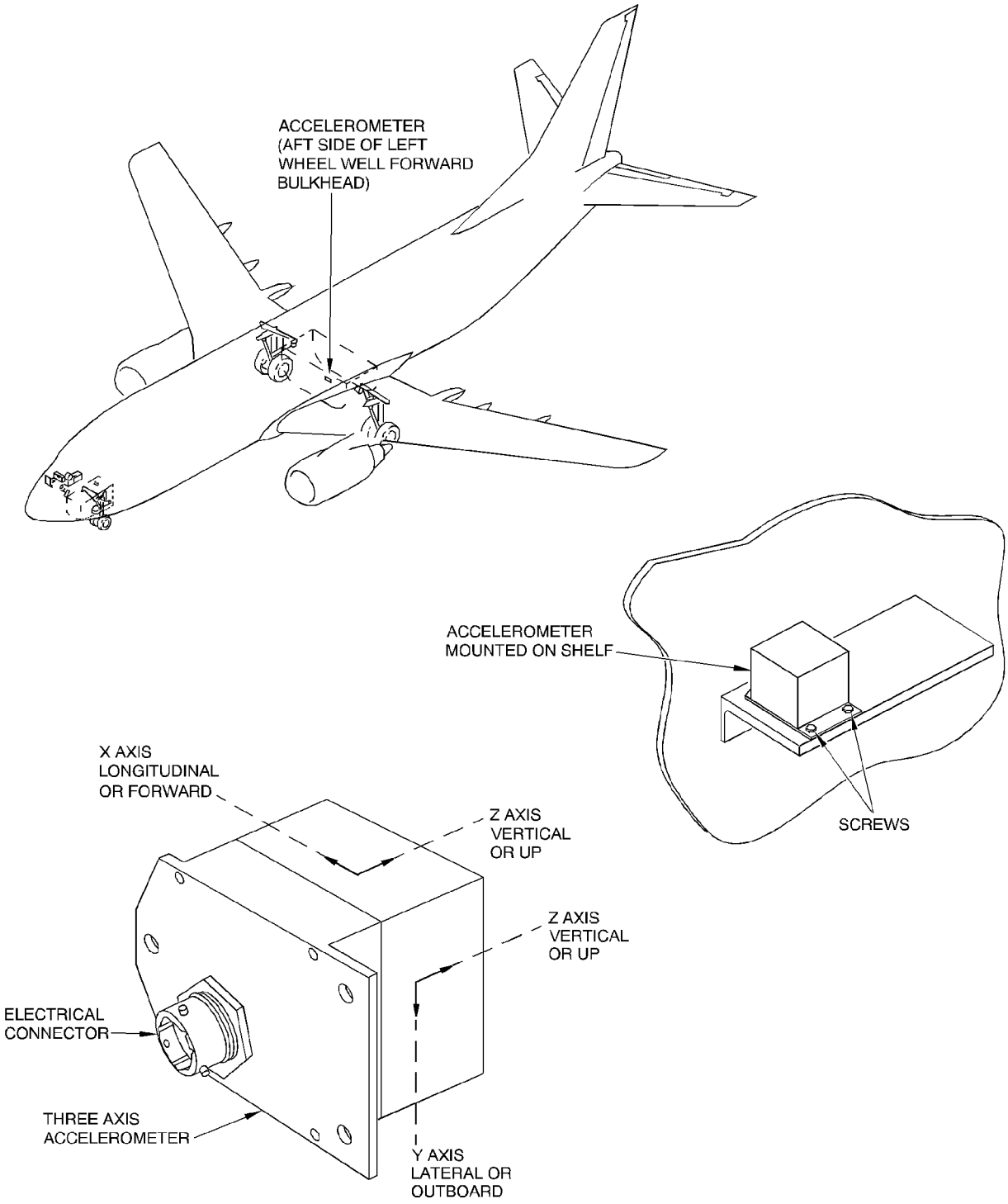
1. General
   A. There are two tasks in this procedure: removal and installation of the accelerometer. The accelerometer is mounted on the aft side of the forward wall of the left main wheel well at station 663. Access to the accelerometer is through the wheel well.
2. Accelerometer Removal (Fig. 401)
   A. Open the FDR AC and FDR DC circuit breakers on the P6-1 circuit breaker panel.

      CAUTION: Take care not to jar or drop the accelerometer. Damage to the accelerometer may result.

   B. Disconnect the electrical connector from the accelerometer.
   C. Remove the screws that attach the accelerometer to the mounting bracket.
   D. Remove the accelerometer from the airplane.
3. Accelerometer Installation

   CAUTION: Take care not to jar or drop the accelerometer. Damage to the accelerometer may result.

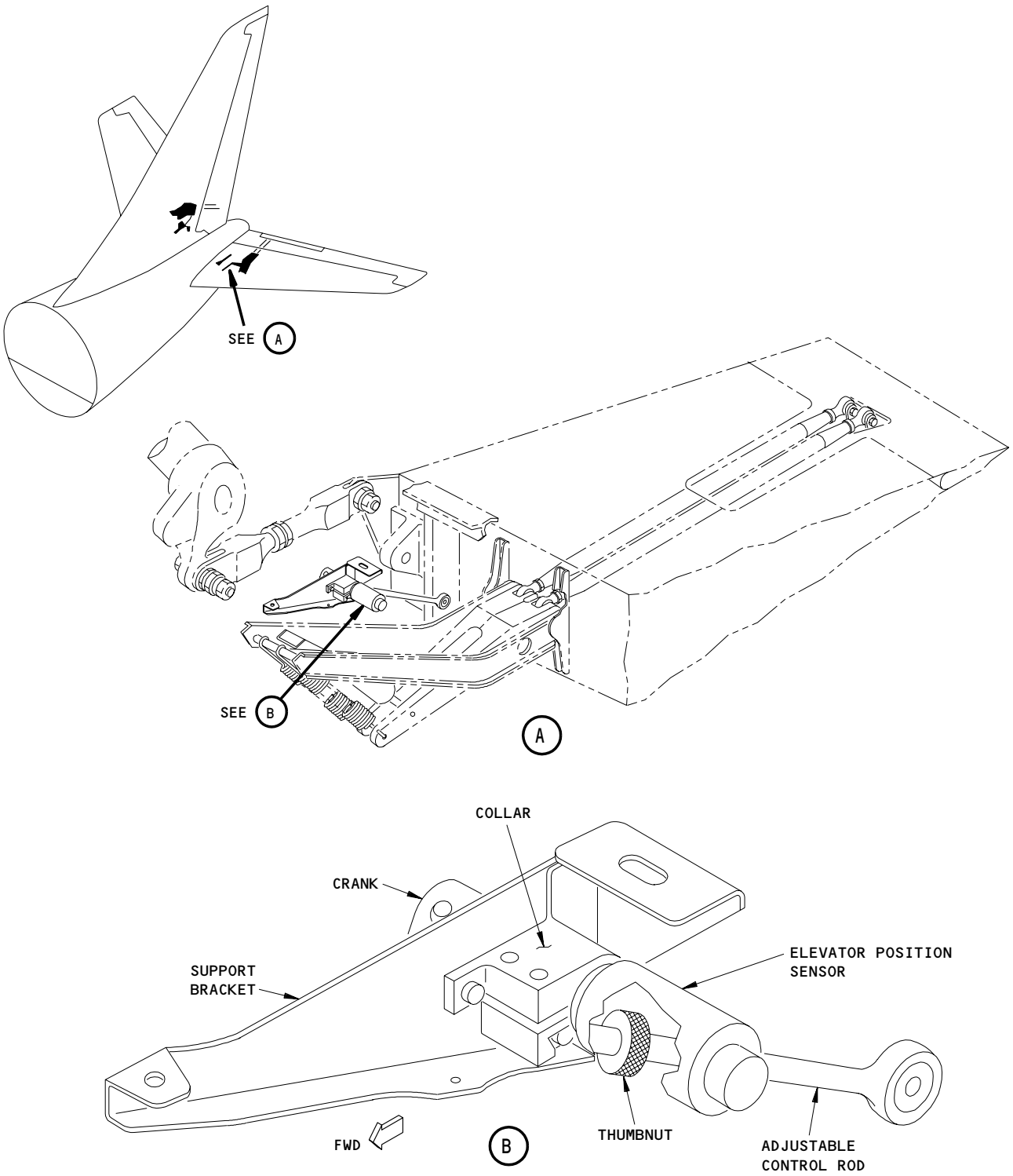
   A. Place the accelerometer on its mounting bracket.
   B. Install the screws that attach the accelerometer to the bracket.
   C. Install the electrical connector on the accelerometer.
   D. Close the FDR AC and FDR DC circuit breakers on the P6-1 circuit breaker panel.
   E. Perform Acceleration Signals Test portion of DFDR Adjustment/Test (Ref. 31-24-0, A/T).
   F. Grease - MIL-G-25760
   G. Corrosion Preventive Compound - MIL-C-16173, Grade 2
   H. Sealant - BMS 5-95, Type I, Class B
   I. Rigging pins E-1 ± 0.311 +0.00/-0.002 inch diameter, 6.7 +/- 0.25 inches long, or equivalent
4. Elevator Position Sensor Removal (Fig. 401)
   A. Depressurize the elevator hydraulic system (Ref. 27±31±0, Maintenance Practices).
   B. Open the flight recorder position sensor and flight recorder ac and dc circuit breakers on panel P18.
   C. Open the flight controls circuit breakers on panel P6
   D. Open the tail cone access panel and then the elevator access panel (Ref. 12±31±51, Maintenance Practices).
   E. Install E-1 rigging pin in the forward control quadrant (Ref. 27±31±0, Maintenance Practices).
   F. Disconnect the electrical connectors from the elevator position sensor.
   G. Loosen the screws on the collar.
   H. Remove the elevator position sensor from the airplane.
5. Elevator Position Sensor Installation
   A. Install the elevator position sensor in the collar.



Accelerometer Installation
Figure 401

B. Align the zero reference index marks on the elevator position sensor housing and shaft until the index is in a vertical position pointing down.
C. Install the transmitter with two screws. Tighten the two screws by hand.
D. Install the electrical connector on the sensor.
E. Remove rigging pins installed in step 2.
F. Close the access panels.

6. Restore Airplane to Normal
A. Close flight control and flight recorder ac and dc circuit breakers.



NOTE: LEFT SENSOR IS SHOWN.

Elevator Position Sensor Installation
Figure 402

CLOCKS - DESCRIPTION AND OPERATION

1. General
   A. Clocks are installed on the captain's and first officer's instrument panels. The clocks have a 12-hour dial, and associated hands, a sweep second hand, a small minute dial, an elapsed time dial, and associated controls.
   B. A knob (WIND) at the lower left edge of the clock is used to wind the clock, and to set the main indicating hands. Counterclockwise rotation of the knob winds the clock. Setting is accomplished by pulling out on the knob and rotating as required to indicate the correct time.
   C. The elapsed time dial, which records hours, is controlled by a lever at the upper right edge of the clock. When the lever is positioned on 0 (zero), the two elapsed time hands should be on 12. Clockwise rotation of the lever from 0 (zero) to GO starts the hands. Clockwise rotation of the lever from GO to STOP, stops the hands. Counterclockwise rotation of the lever from STOP to GO restarts the hands. Clockwise rotation of the lever from STOP to 0 (zero) resets the hands.
   D. The sweep second hand and the minute recording dial hand are controlled by a knob (PUSH) at the lower right edge of the clock. When the sweep second hand and minute hand are on zero, the hands may be started by pushing the knob. Pushing the knob a second time stops the hands. Pushing the knob a third time resets both hands.
      (1) A small flag visible through a circular opening located within the minute recording dial shows the operating condition of the sweep second hand and the minute recording hands. The flag shows all white when the hands are reset to zero. The flag shows half white and half black when the hands have been stopped but not reset. The flag shows all black when the hands are operating.

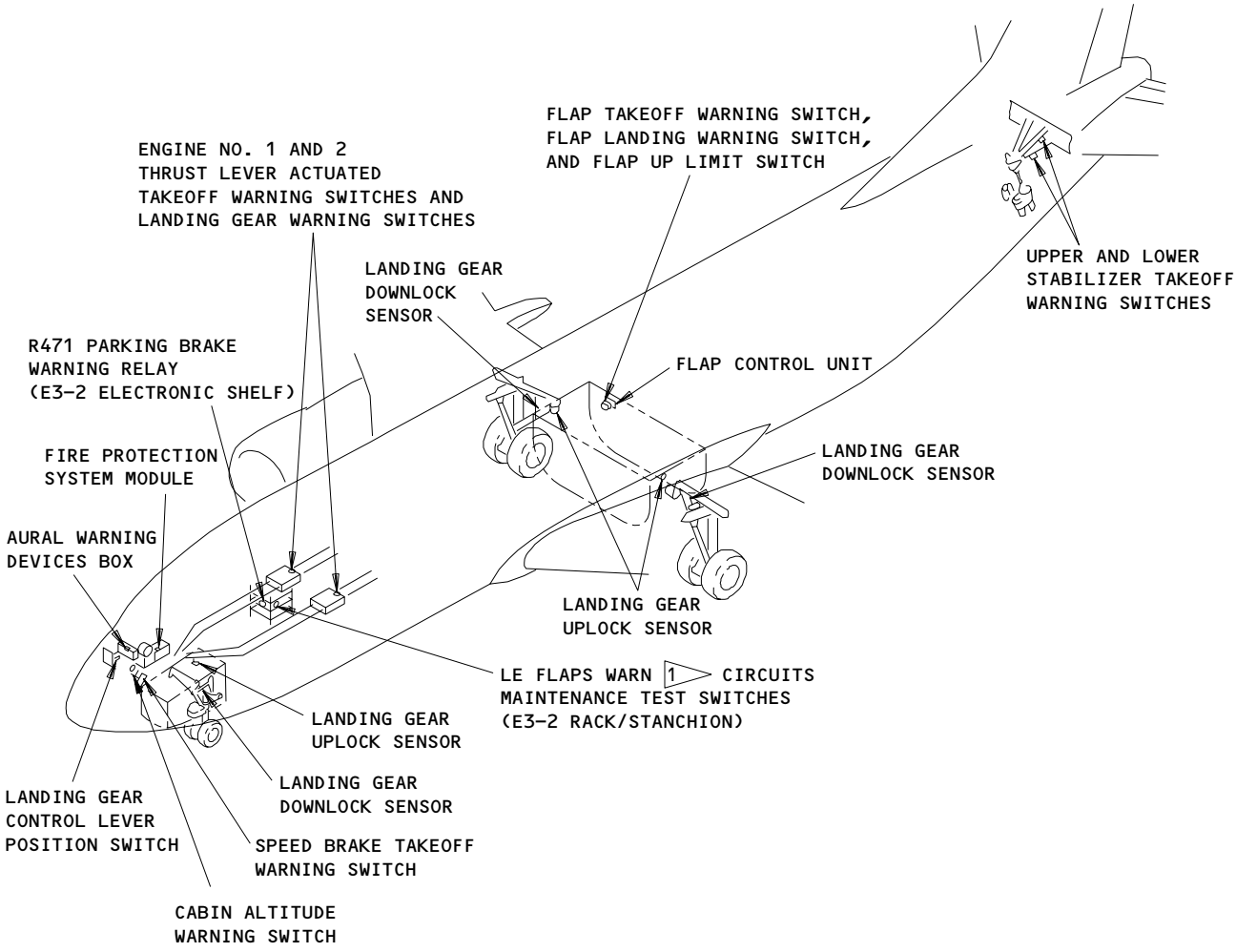
AURAL WARNING SYSTEMS - DESCRIPTION AND OPERATION

1. General
   A. The control cabin aural warning systems provide characteristic audio signals to alert the pilots to: an abnormal takeoff condition, landing condition, pressurization condition, mach-airspeed condition, an engine, APU or wheel well fire and calls from the crew call system or selcal (if activated) systems. The aural warning and call devices are installed in an aural warning devices box. The box is on the right side of the forward section of the control stand in the control cabin (Fig. 1). On some aircraft the 65-54499 Series aural warning devices box has been replaced by the 69-78214-1 Series aural warning module.
   B. Inputs to the aural warning devices box are from: the flight and ground crew call system and selcal systems (Chapter 23), the mach-airspeed warning system (Chapter 34), the engine, APU and wheel well fire detection systems (Chapter 26), cabin altitude warning system (Chapter 21), the takeoff warning system, and the landing gear warning system (Fig. 2). 1A. Aural Warning Module (69-78214-1 Series)
   C. The aural warning module has two redundant channels, channels A and B. There are two aural synthesizers in each channel. One supplies the bell/clacker aural warnings and the other supplies the horn/wailer/chime warnings. These synthesizers make a combined audio signal input to the analog channel. The analog channel then outputs an audio signal to the speaker amplifier. Each channel can be tested independently using the BITE.
2. Aural Warning Devices Box (65-54499 Series)
   A. The aural warning devices box contains solid state horn, chime, logic and oscillator circuits, mounted on a printed circuit board, which provide the horn audio and chime audio to a loudspeaker whenever the appropriate circuits are keyed (Fig. 2). A second printed circuit board contains the oscillators and solid-state switching circuits use d with a mechanical bell and clacker. The printed circuit boards may be easily removed from their connectors and replaced as needed. The power amplifier transistors are on heat sinks installed directly on the box. A single multipin connector on the backside of the box completes all circuits to the box. The components use 28 volts dc obtained through circuit breakers on load control center P6.

B. Circuit board A1 is used with the clacker and bell. The board contains a multivibrator, an oscillator and two solid-state switching (gate) circuits. Whenever the oscillator is keyed by a ground from the mach-airspeed warning system, an oscillator turns a gate on and off, thus causing power through the clacker to be completed to ground. The clacker sounds once when the circuit is turned on and once again when it is turned off, therefore, the clacker sounds at twice the oscillator rate. When the multivibrator is keyed by a ground from the fire detection system, the multivibrator turns a gate on and off, thus causing power through the bell to be completed to ground and the bell to sound at the multi-vibrator rate.

C. Circuit board A2 contains a multivibrator, horn sound (tone) generation circuits, chime sound (tone) generation circuits, amplifiers, oscillator and logic circuits required to produce appropriate sounds from the loudspeaker. The circuit board also contains circuits, which are not used at present but provide a buzzer, wailer and low chime sound capability when required. Whenever the steady horn circuit is keyed by a ground from the landing warning circuits, an oscillator circuit provides a horn sound, which is, coupled to a driver (amplifier), power amplifier and loudspeaker. When the intermittent circuit is keyed by a ground from the takeoff warning or cabin pressure warning circuits, the oscillator is turned off and on by the multivibrator circuit, thus producing an intermittent horn sound. The chime circuits are capable of being keyed from a steady 28-volt dc voltage or from a 28-volt dc pulse. A logic and hold-on circuit operates the chime generation (phase oscillator) circuits each time the hi circuits are keyed by 28 volts dc from the flight and ground crew call system or each time the hi-lo or hi-lo-repeat circuits are keyed by 28 volts dc from the selcal system (if activated). The hold-on circuits keep the chime circuits operating and control the chime decay after the initial 28-volt dc keying pulse. Horn and chime tone controls are on the printed circuit boards and are not accessible from outside the box.

D. A priority is established within certain circuits to prevent different sounds from occurring at the same time and becoming garbled. The clacker and bell are not in the priority circuits, therefore, they may operate with each other or with any of the other sounds. Those sounds in the following priority list will be turned off by control circuits of sounds in a higher priority.



1 FOLLOW-ON AIRPLANES AND AIRPLANES INCORPORATING SB 31-1038.

Aural Warning Systems Component Location
Figure 1

PRIORITY	SOUND
1	Intermittent Horn
2	Steady Horn
3	Wailer
4	Buzzer

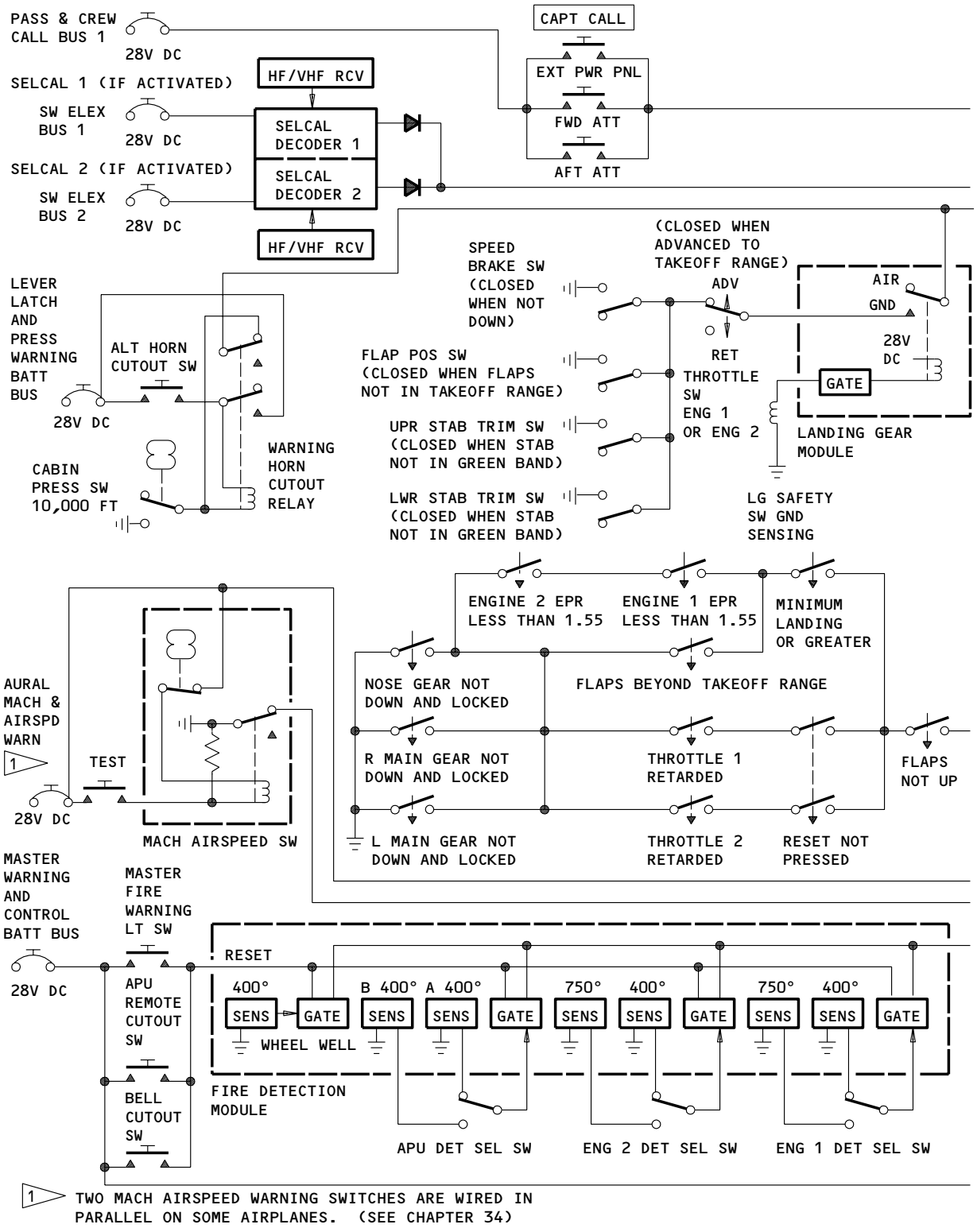
E. The high chime, low chime or high-low chimes (not repeated) can be operated along with any of the sounds listed above. The high-low chime (not repeated) cannot be operated simultaneously with the low chime. The high and low chimes may be operated simultaneously. The high-low chime (repeat) can be operated simultaneously with the wailer or buzzer but will be turned off by the intermittent or steady horn control signals. If the high-low chime (repeat) is being used, the rest of the chime circuits are cut off; conversely, if one of the other chimes is being operated the high-low chime (repeat) is cut off.

3. Landing Gear Warning System

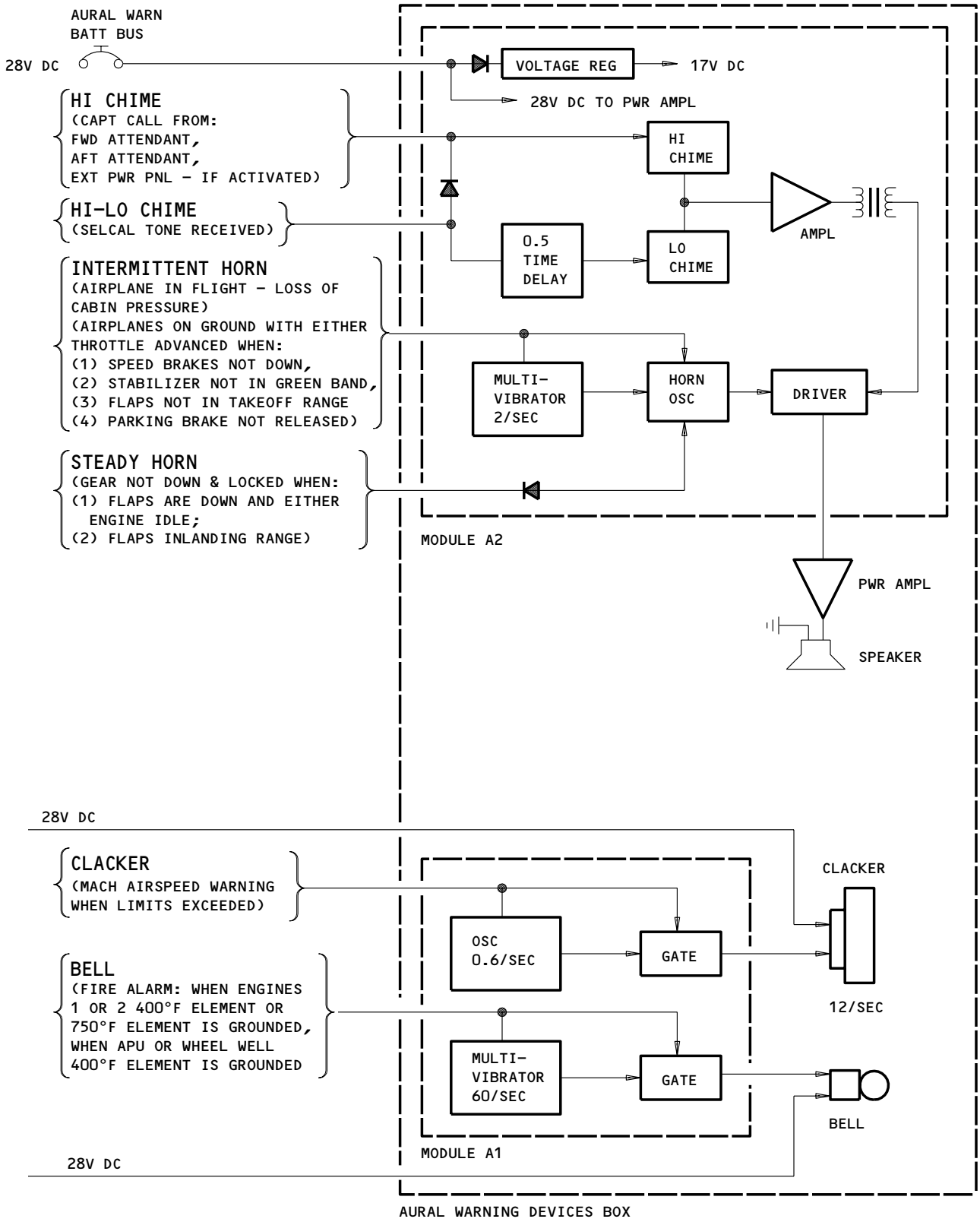
A. A warning horn sounds when the landing gear position is incorrect for the current operating conditions. Switches, operated by the movement of engine thrust levers or the flap follow-up drum, control the warning horn. Secondary control is provided through the landing gear module to ensure that the horn will not sound when the landing gear position is right for the current condition. The warning horn is mounted on the warning devices panel located on the right side of the aisle stand (Fig. 1).

B. Landing Gear Uplock and Downlock Sensors - The landing gear uplock and downlock sensors (proximity switches) provide signals to the landing gear warning system (Fig. 1).

C. The main landing gear downlock sensors provide signals to the corresponding solid-state circuits in the landing gear module when the main landing gear is down and locked. The solid-state circuits will switch to a grounding condition when furnished a signal from the downlock sensor and thus provide a ground to illuminate the green indicator light for the individual main gear. The downlock and uplock sensors provide signals to the solid-state circuits so that the appropriate circuit will provide a ground to illuminate the red warning light and provide aural warning signals when the individual main gear is not locked or until the main gear position agrees with the landing gear control lever position.



Aural Warning System Schematic
Figure 2 (Sheet 1)



Aural Warning System Schematic
Figure 2 (Sheet 2)

D. The nose gear sensors provide a signal to solid-state circuits in the landing gear electrical module when the nose gear is either up and locked or down and locked. The sensor signal will cause the circuit to remove ground from a red warning light and the light will go off. The absence of a signal from a nose gear sensor (nose gear not up and locked, or down and locked) will cause the circuit to provide a ground to illuminate the red warning light and provide aural warning signals. The nose gear downlock circuit also provides a ground to illuminate a green indicator light when the nose gear is down and locked.

E. Thrust Lever Actuated Landing Gear Warning Switches
   (1) These switches are actuated he n the thrust levers are retarded and will actuate before the thrust levers contact the idle stop. An actuated switch completes a circuit to ground and sounds the warning horn if any gear is not down and locked.

F. Flap Operated Landing Gear Switch
   (1) The flap operated landing gear warning and flap up limit switches sound the warning horn if the flaps are in the landing position and all gears are not down and locked (Fig. 1). The switches are cylindrical-shaped, plunger-type microswitches, and are mounted on the outboard flap drive follow-up drum support. The flap drive follow-up drum is located at the top of the aft bulkhead in the right wheel well. Rotation of the follow-up drum turns a cam which raises the plunger to operate the switch.

G. Flap Takeoff Warning Switch
   (1) The warning horn is sounded if the landing gear or flaps are not down with EPR less than 1.6 on both engines. The flap takeoff warning switch has dual sets of contacts, one set is used in the landing warning system, the other in the takeoff warning system. The switch is installed on the flap control valve follow-up mechanism and is actuated when the flaps are not in the takeoff range (Fig. 1). The takeoff flap switch is bypassed by an EPR logic circuit in the engine accessory unit when the EPR is less than 1.6 (Fig. 2). The EPR detector is connected to the EPR transmitter and indicating circuit. Two test switches and EPR indicating lights on the front of the engine accessory unit allow ground testing the EPR function (Chapter 77, Engine Pressure Ratio Indicating System).

H. Warning Horn Reset Switch
   (1) The warning horn reset (HORN CUTOUT) switch is located on the aisle stand. The reset switch may be used at the crew's discretion to silence the warning horn for either or both engine thrust levers by energizing circuits in the landing gear electrical module. The circuit is reset automatically when a thrust lever is advanced (Fig. 1).

4. Takeoff Warning System
   A. The takeoff warning system warns the pilot if flaps, stabilizer and speed brakes are not in their respective takeoff positions prior to takeoff. If either thrust lever is advanced to takeoff power, an intermittent warning horn in the control cabin will sound if either the flaps or stabilizer are not in the takeoff range or the speed brakes are not down. The horn can only be silenced by correcting the configuration or retarding the thrust lever. On airplanes with SB 31-1073, the aural warning horn will operate if the parking brake is not released.
   B. The flight controls warning switches are parallel-wired. In series with these switches are two parallel-wired thrust lever actuated switches and an air-ground safety sensor. The thrust lever actuated switches complete the warning horn circuit when either thrust lever is advanced. The safety sensor deactivates the warning circuit when the airplane is airborne (weight off the landing gear).
   C. Thrust Lever Actuated Takeoff Warning Switches
      (1) Two thrust lever actuated takeoff warning switches are installed on the thrust lever switch mechanisms for engines No. 1 and 2 in the ceiling of the electrical/electronic equipment compartment (Fig. 1). When either thrust lever is advanced to takeoff power setting, a cam in the thrust lever switch mechanism actuates the corresponding switch.
   D. Flap Takeoff Warning Switch
      (1) The flap takeoff warning switch is installed on the flap control valve follow-up mechanism (Fig. 1). It is actuated by a cam on the control valve follow-up drum shaft when the flaps are outside the takeoff range.
   E. Stabilizer Takeoff Warning Switches
      (1) The two stabilizer takeoff warning switches are installed in the stabilizer actuator compartment and actuated by cams on the stabilizer center section leading edge structure (Fig. 1). The upper switch actuates when the stabilizer is outside the takeoff (green band) range in the leading edge up (APL NOSE DN) direction. The lower switch actuates when the stabilizer is outside the takeoff (green band) range in the leading edge down (APL NOSE UP) direction.
   F. Speed Brake Takeoff Warning Switch
      (1) The speed brake takeoff-warning switch is installed on the speed brake forward drum mechanism in the lower nose compartment. The switch is actuated by a cam on the forward drum when the speed brake control lever is placed in or aft of the ARMED detent.
5. Cabin Altitude Warning System
   A. The cabin altitude warning system provides an audible signal when cabin pressure approaches an altitude detrimental to passenger comfort.
   B. The cabin altitude warning system consists of a pressure switch, a cutout switch and a cutout relay. The system provides an intermittent sound signal when cabin altitude exceeds approximately 10,000 feet.

C. The pressure switch is an aneroid type switch. When cabin pressure, as sensed in the cabin port, reaches approximately 10,000 feet the difference in pressure inside and outside the bellows closes the switch contacts and provides a ground for the aural warning devices box.

6. Fire Detection System
   A. The fire detection system provides visual and aural warnings from sensors in each engine, auxiliary power unit (APU), and wheel well areas. The fire protection system module in the control cabin provides controls and visual indicators. Control circuits are contained in the engine and APU fire detection accessory unit located in the electronic equipment rack. When a fire is detected, the control circuit provides a ground to activate the alarm bell in the aural warning devices box.
7. Mach Airspeed Warning System
   A. The mach airspeed warning system provides a warning to the flight crew when the airplane approaches a critical speed.
   B. The system consists of a mach airspeed warning switch located at the electronic equipment compartment adjacent to the vertical gyro shelf, a MACH AIRSPEED WARNING TEST switch located on the aft overhead panel; and a warning clacker, located in the aural warning and call device box. The mach airspeed warning aneroid switch is controlled by the pitot static pressure inputs, and mechanically connected to a set of contacts. When the mach airspeed limit is exceeded, the contact opens, de-energizes the relay and provides a ground to turn on the warning clacker. The clacker remains on until corrective action is taken.
   C. A system self-test may be performed by pressing the TEST switch. The clacker will come on when the TEST switch is pressed.
8. Operation
   A. Landing Gear Warning
      (1) A continuous steady horn will sound if any landing gear is not down and locked when certain conditions exist on the airplane. The warning control circuits and monitor circuits are in the landing gear module. Only those portions of the circuit which control keying of the aural warning box is discussed (Fig. 2). The conditions which must exist for the horn not to operate in the flight mode are as follows: all landing gear must be down and locked when the flaps are in the landing range, or all landing gear must be down and locked when the flaps are less than full up and the thrust levers are retarded to idle.
      (2) If any landing gear is not down when either one of the above two conditions exist, the steady horn circuits will be keyed. If the flaps are less than full up but not in the landing range and the thrust lever is retarded and all landing gear are not down, the horn can be silenced by pressing the thrust lever horn reset switch just to the right of the thrust levers on the control stand. For a discussion of landing gear position indicating, refer to Chapter 32.

(3) The conditions which cause the landing warning horn to sound or not sound are shown schematically in Fig. 2. When the flaps are at the up limit, the horn is inhibited and cannot sound. When the flaps are not fully up and either thrust lever is retarded, ground potential is applied to the horn causing it to sound unless the landing gear are all down and locked. The horn can be silenced by pressing the reset button. The horn also sounds when the flaps are placed in the landing range and the gear is not down and locked.

(4) Because the takeoff and landing flap ranges overlap, engine EPR signals are used to differentiate between the takeoff and landing conditions to prevent spurious landing warnings during climbout after gear retraction. If the flaps are within the minimum landing range but not beyond the takeoff range and the EPR of both engines is less than 1.55 and the gear is not down and locked, the horn will sound. If the EPR of either engine is at least 1.71 and the flaps are in the takeoff range, the horn will not sound if the gear is not down and locked. When the flaps are in the landing range, the horn will sound if the gear is not down and locked.

B. Takeoff Warning

(1) An intermittent horn will sound if certain abnormal conditions exist when the airplane is about to take off. An intermittent horn will sound if the throttles are advanced to takeoff range and the speed brakes are not down, or the flaps are not in takeoff range, or the stabilizer is not in the green band, or if the parking brake is set. The horn can only be silenced by correcting the configuration or by retarding the thrust levers.

(2) A relay and gate circuit in the landing gear module complete the control circuit to the aural warning devices box. The relay is energized by the gate circuit whenever the landing gear ground sensing proximity switch indicates that the airplane is on the ground. A ground for control of the horn is then completed through the relay, throttle switch and a speed brake switch, or flap position switch, or stabilizer up limit switch, or stabilizer down limit switch. As the airplane leaves the ground, the relay is de-energized and the warning horn control circuits disconnected.

C. Pressurization Warning

(1) An intermittent horn will sound if at any time the cabin pressure exceeds 10,000 feet during flight. An aneroid switch provides a horn control ground through the de-energized warning horn cutout relay. The horn may be silenced by pressing the altitude horn cutout switch on overhead panel P5. This energizes and latches the relay, thus disconnecting the control ground. The relay will then become de-energized only after the condition has been corrected, thus resetting the circuit.

D. High Mach-Airspeed Warning

(1) The clacker will sound if at any time the indicated airspeed (IAS) or mach number exceeds the limits. The clacker cannot be silenced except by decreasing the speed of the airplane.

(2) Control of the clacker is from a mach airspeed switch connected to the airplane pitot static system. A relay in the switch is energized by 28 volts dc from the mach airspeed system. An aneroid in the switch will open the relay circuit if the airspeed or mach number are exceeded for the given conditions. The de-energized relay then completes a ground for control of the clacker. The system can be tested by operating a mach test switch on overhead panel P5. When the test switch is pressed, 28 volts dc is connected to the ground side of the mach airspeed switch relay, thus biasing the relay off and causing the clacker to sound for as long as the test switch is held (Chapter 34).

E. Fire Warning

(1) A bell will sound if at any time a fire is occurring in either engine, the APU or the main wheel well. The bell will also sound when the fire system is tested by pressing the fire test button on the fire detection control panel on the control stand. The bell may be silenced by pressing either the master fire warning light switch above the center instrument panel, the bell cutout switch on the fire detection control panel or the APU remote cutout switch on APU panel P28 in the main wheel well. Since the engines have both 400 and 750°F elements, the bell may also be silenced, by selecting the other element (provided the other element does not indicate a fire) with the detector selector switches on the fire detection control panel. A similar switch for the APU on the fire detection control panel connects either 400°F element A or B to the warning system (Chapter 26).

(2) Fire sensing circuits in the fire detection module sense whether a fire is in the main wheel well, engines or APU, by changes in the associated fire detection element resistance. When a sensing circuit is operated by an element, a bell control gate circuit is operated and a ground is provided for the bell circuits in the aural warning devices box. Each engine gate circuit is connected through a detector selector switch to either the 400 or 750°F sensing circuit. The APU has two 400°F elements (A and B), either one may be connected to the APU gate circuit by the APU detector selector switch. The gates may be turned off and the bell silenced by pressing one of the reset buttons. Voltage is then completed to SCR circuits, which bias off each gate. The gates are reset whenever the fire condition is corrected.

F. Crew Call (If Activated)

(1) A high chime will sound any time a captain call button is pressed at the external power panel, the forward attendants' panel or the aft attendants' panel. Each pressed call button completes a 28-volt dc pulse, which operates the high chime circuits in the aural warning devices box (Chapter 23).

G. Selcal (If Activated)

(1) A two-tone high-low chime or a single tone chime will sound whenever a call has been received by a HF/VHF communication system and decoded by the selcal decoder. When the decoder accepts a call signal, a circuit in the decoder completes 28 volts dc to the chime control circuits in the aural warning devices box. The chime then sounds each time 28 volts dc is applied to the control circuit. Whether the chime is repeated or not depends on the selcal system requirements. If the chime is repeated, the chime may be stopped by pressing a reset button on the selcal system control panel (Chapter 23).

AURAL WARNING SYSTEM - ADJUSTMENT/TEST

1. General
   A. The procedures provide a complete test of the aural warning systems and contain individual tests for systems and components. Each individual test is complete within itself and can be performed separately to check only the system or component in question.
   B. Procedures are provided to enable the following tests to be performed.
      (1) Paragraph 2, Aural Warning Devices Box Test
      (2) Paragraph 3, Cabin Altitude Warning Switch Test
      (3) Paragraph 4, Landing Gear Warning System Test
      (4) Paragraph 5, Takeoff Warning System Adjustment
      (5) Paragraph 6, Takeoff Warning System Test
   C. For all adjustments and tests, which require positioning of, thrust levers, the thrust lever position is given in degrees from idle stop. If it is desirable to use linear dimensions (arc length at control stand cover top) for positioning thrust levers, refer to 76-11-0 MP, for conversion data.
   D. For all adjustments and tests, which require movement of the landing gear, it will be necessary to jack the airplane. If unable to jack the airplane it will be necessary to simulate landing gear position.
      (1) To simulate nose gear retracted perform the following:
         (a) Place landing gear lever in OFF position. Check all red gear lights come on, green lights will remain on, and warning horn remains silent.
         (b) Insert an aluminum or copper deactuator shield between nose gear downlock sensor switch S75 and steel actuator arm located on nose gear lock brace. Make sure the nose gear green light goes off.
         (c) Put a steel actuator bar on the nose gear up and lock sensor switch S76.
      (2) To simulate retraction of left main gear:
         (a) Deactuate left gear down and lock sensor S71 located beside left main gear side brace.
         (b) Insert steel actuator bar over left main gear up and lock sensor switch S72 located on left main gear uplock hook.
      (3) To simulate retraction of right main gear:
         (a) Deactuate right main gear down and lock sensor S73.
         (b) Place steel actuator bar over right main gear up and lock sensor switch S74 located on the right main gear uplock hook.
      (4) Simulate extension of any gear by removing any aluminum or copper deactuators or steel actuator bars. Green light on P2 panel comes on and red light goes off.

2. Aural Warning Devices Box Test (65-54499 Series)
   A. General
      (1) This test provides a check of the noise generating devices contained in the aural warning devices box. The test assumes the airplane is not on jacks. This test is sufficient after replacing the aural warning devices box.
   B. Equipment and Materials
      (1) Actuator bars for the proximity sensors:
         (a) Material: 1020 steel per MIL-S-7952, 15-5PH steel, 17-4PH steel per AMS 5643, Permalloy - HYMU (carpenter steel) or Molly Permalloy (Allegheny Ludlum)
         (b) Size: For rectangular sensors - 1.5 x 0.75 x 0.05 inches
             For round sensors - 1.0 x 1.0 x 0.05 inches
      (2) Deactuator bars for the proximity sensors:
         (a) Material: 5052, 6061, 7076, or 2024 aluminum or sheet copper
         (b) Size: For rectangular sensors - 1.5 x 0.75 x 0.05 inches
             For round sensors - 1.0 x 1.0 x 0.05 inches
   C. Prepare Aural Warning Devices Box for Test
      (1) Provide electrical power.
      (2) Check that following circuit breakers are closed:
         (a) LANDING GEAR-LIGHTS circuit breaker on P6 panel
         (b) LANDING GEAR-ANTISKID TEST circuit breaker on P6 panel
         (c) AURAL WARN circuit breaker on P6 panel
         (d) MASTER WARNING and CONTROL circuit breaker on P6 panel
         (e) ENG #1 FIRE DET circuit breaker on P6 panel
         (f) AURAL MACH AND AIRSPEED WARNING circuit breaker on P18 panel
         (g) PASSENGER and CREW CALL circuit breaker on P18 panel
         (h) MACH WARN SYST #1 circuit breaker on P18 panel
         (i) Airplanes with EPR actuated takeoff warning system:
             1) EPR WARNING on P6 panel
             2) ENG No. 1 and No. 2 EPR & L.G. WARNING on P6 panel
      (3) Check that Selcal and associated radio system circuit breakers are closed, as applicable.
   D. Aural Warning Devices Box - Operational Test
      (1) Make sure you have electrical power On (APU or external power).
      (2) Put the flaps or the speed brakes in the UP position.
      (3) Advance the thrust levers to the takeoff position and, on airplanes with EPR activated takeoff warning switches, press-to-test the EPR test switches on the engine accessory module (E3-2).
         (a) Make sure the Aural Warning Horn sounds.
      (4) Retard the thrust levers or, on airplanes with EPR activated takeoff warning switches, release the press-to-test switches.
         (a) Make sure the Aural Warning Horn stops.

E. Aural Warning Devices Box - System Test
   (1) Advance both thrust levers full forward and set flap control lever to 1 unit detent. At either main gear, place an aluminum or copper shield between downlock sensor and activating bar on outboard side of strut. In similar manner, on passenger/cargo convertible airplane, shield secondary downlock sensor (Ref 32-61-0, Landing Gear Position Indicating and Warning System).
   (2) Retard either thrust lever to idle stop and check that continuous warning horn sounds; then, advance thrust lever until horn stops sounding.
   (3) Remove the aluminum or copper shield from downlock sensor.
   (4) Retard both thrust levers to idle stop and set flap control handle to 0-unit detent.
   (5) Check operation of intermittent warning horn as follows:
      (a) On airplanes without EPR activated takeoff warning system, advance either thrust lever full forward and check that horn sounds; then, retard thrust lever until horn stops sounding.
      (b) On airplanes with EPR activated takeoff warning system, advance both thrust levers full forward, then, press and hold ENGINE No. 1 (or No. 2) EPR test switch on engine accessory module at E3-2 electrical equipment shelf and check that horn sounds. Release test switch and check that horn stops sounding.
   (6) Position and hold fire test switch on aft electronic panel to FIRE and check that bell sounds.
   (7) Release fire test switch and check that bell silences.
   (8) Press and hold mach airspeed warning test switch on aft overhead panel and check that clacker sounds.
   (9) Release test switch and check that clacker silences.
   (10) On airplanes with two mach airspeed-warning systems, perform (8) and (9) for both MACH AIRSPEED WARNING TEST SWITCH NO. 1 and NO. 2 (Ref Chapter 34).
   (11) Press PILOT CALL switch at external power receptacle panel and check that hi chime sounds once.
   (12) On airplanes with Selcal, check Selcal chime signal as follows:
      (a) Turn on Selcal system and associated radio system. Verify satisfactory communications with control tower, and have tower operator select airplane selcal code on tower control console.

         NOTE: Airplane Selcal code is on placard located on pilots' main instrument panel.

      (b) Have tower operator transmit Selcal code and check that chime sounds.
      (c) Turn off Selcal system and radio system.

F. Restore Airplane to Normal
   (1) Return all switches, flaps, and throttles to their normal positions.

(2) Remove electrical power if no longer required.

3. Aural Warning Module BITE (69-78214-1 Series)

A. General

(1) The BITE is an operational check of the two channels in the aural warning module. Channel A and Channel B need to be tested separately. Failure of the BITE indicates failure of the module.

B. References

(1) 24-22-00/201, Manual Control

C. Access

(1) Location Zones 101/102 Flight Compartment

D. Procedure

(1) Supply electrical power (AMM 24-22-00/201).

(2) Make sure these circuit breakers are closed:

(a) On the Load control center - right panel, P6:

1) LANDING GEAR - AIR/GND RELAY & LTS
2) ANTISKID FAIL WARN & PARK BK
3) AURAL WARN
4) MACH WARN SYS - 2
5) MASTER WARN & CONT
6) FIRE PROTECTION DETECTION - ENG NO. 1
7) FIRE PROTECTION DETECTION - ENG NO. 2

(b) P18 Load Control Center - Left

1) MACH & WARN SYS
2) PASS & CREW CALL/LAV SMK DET

(3) Do the channel A BITE test as follows:

(a) Turn and hold the ROTATE TO TEST switch on top of the aural warning module to the A position.

1) Make sure you hear the intermittent horn.

(b) Release the ROTATE TO TEST switch.

1) Make sure you hear the clacker for about 5 seconds.

(4) Do the channel B BITE test as follows:

(a) Turn and hold the ROTATE TO TEST switch on top of the aural warning module to the B position.

1) Make sure you hear the intermittent horn.

(b) Release the ROTATE TO TEST switch.

1) Make sure you hear the clacker for about 5 seconds.

E. Put the Airplane Back to Its Usual Condition

(1) Remove the electrical power if it is not necessary (AMM 24-22-00/201).

4. Cabin Altitude Warning Switch Test

A. General

(1) The cabin altitude-warning switch controls the cabin altitude warning horn. The switch closes at cabin pressure equivalent to approximately 10,000 feet altitude.

(2) The cabin altitude-warning switch is installed on the underside of the control cabin floor just forward of the center aisle control stand. Access to the switch is obtained by removing access door 1103 from just forward of the nose wheel well.

B. Equipment and Materials
(1) Pitot Static System Tester, No. 4 Union and O-ring

C. Prepare Cabin Altitude Warning Switch for Test
(1) Remove forward access door 1103.
(2) Provide electrical power.

D. Test Cabin Altitude Warning Horn and Switch
(1) Check that the following circuit breakers on panel P6 are closed:
(a) AURAL WARN
(b) LEVER LATCH AND PRESS WARNING
(2) Connect pitot static system tester, No. 4 union and O-ring to vent port of cabin altitude warning switch.
(3) Evacuate system and monitor tester altimeter.
(4) Check that intermittent warning horn sounds at indicated altitude between 8750 and 11,250 feet.
(5) Press ALTITUDE HORN CUTOUT switch and check that horn goes off.
(6) Gradually lower indicated altitude to approximately 1700 feet below the horn actuating altitude noted in step (4).
(7) Increase indicated altitude and check that horn again sounds between 8750 and 11,250 feet.
(8) Reduce tester altitude to field level and disconnect pitot static system tester.

E. Restore Airplane to Normal Configuration
(1) Install forward access panel.
(2) Remove electrical power if no longer required.

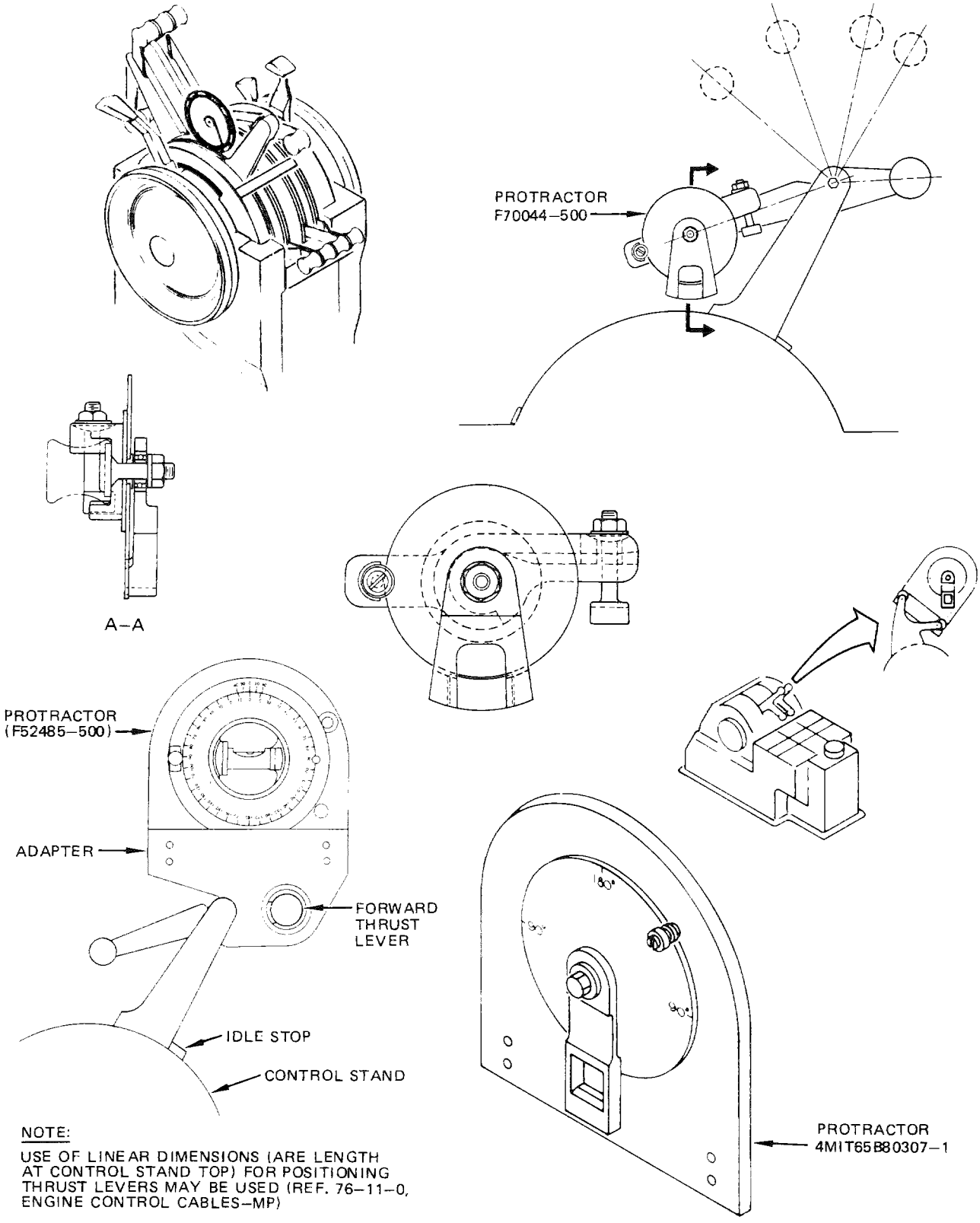
5. Landing Gear Warning System Test

A. General
(1) The landing gear warning system should be tested after maintenance has been performed on a component to ensure that the system is functioning properly. The test consists of two separate parts. Prepare to test steps must be completed prior to performing any tests.

B. Equipment and Materials
(1) Gear Ground Lockpins - F72735
(2) Airplane Control Surfaces Protractor - F52485-500, F70044-500 or 4MIT65B80307-1 as applicable
(3) Protractor Adapter (Thrust Lever) - F72952-2
(4) Hydraulic test bench capable of delivering 20 gpm at 3000 psi
(5) One air pressure source with regulated outlet, pressure of which can be accurately set at pressures between 8 and 80 psig and flow of 15 lbs per minute at 4.5 psig. All pressures are to be monitored by pressure gages with an accuracy of + 1.0%. Shutoff valves must be provided on source side of all gages.

C. Prepare to Test Landing Gear Warning System
   (1) Jack airplane until all tires clear ground (Ref Chapter 7, Jacking Airplane).
   (2) Provide electrical power.
   (3) Check that external hydraulic pressure supply is connected but do not pressurize hydraulic system A (Ref 29-11-0 MP).
   (4) On airplanes with inflatable-type wheel well seal, pressurize pneumatic manifold.
   (5) Check that LANDING GEAR LIGHTS; LEVER LATCH AND PRESS WARN; LANDING GEAR TEST; AURAL WARNING; ENGINES - EPR WARNING; ENG 1 EPR & L.G. WARNING; ENG 2 EPR & L.G. WARNING circuit breakers on the P6 panel are closed.
   (6) Check that press-to-test and all indicator light circuit breakers on circuit breaker panel P6 are closed.
   (7) With thrust levers fully retarded, place protractor with adapter in position on thrust levers and set protractor to 0 degrees (Fig. 501).
   (8) Advance both thrust levers approximately 20 degrees from idle.
   (9) Place landing gear control lever in DN position.
   (10) Install gear ground lockpins in all landing gear and check that shock struts are fully extended.
   (11) Increase hydraulic system A pressure to 3000 psi (Ref 29-11-0).
   (12) Extend trailing edge flaps to the 1-unit position (Ref Chapter 27, Trailing Edge Flap System).

D. Test Landing Gear Warning System
   (1) Test Throttle Versus Landing Gear Warning
      (a) Remove the ground lockpin from the nose landing gear.
      (b) Place landing gear control lever UP and retract nose landing gear to locked position.
      (c) Place landing gear control lever to OFF. Check that the red gear light goes off and the warning horn remains silent.
      (d) Retard No. 1 throttle toward idle. Check that continuous warning horn sounds and the red gear light illuminates before throttle lever reaches following position:
         1) On airplanes not incorporating SB 31-1024 or SB 31-1026, 3.5 degrees from idle stop.
         2) On airplanes incorporating SB 31-1024 and/or SB 31-1026, 5.0 degrees from idle stop.
      (e) Place throttle lever on idle stop. Check that horn continues sounding and red gear light remains illuminated.
      (f) Retract flaps to full UP position. Make sure that the horn stops.
      (g) Fully extend flaps. Make sure that a continuous warning horn sounds at all flap settings.
      (h) Retract the flaps to the 1 unit position. Check that the horn continues to sound and the red gear light remains on.



Thrust Lever Position Measurement
Figure 501

(i) Advance throttle lever No. 1. Check that the horn stops and the red gear light goes off before throttle lever reaches following position:
1) On airplanes not incorporating SB 31-1024 or SB 31-1026, 17.0 degrees from idle stop.
2) On airplanes incorporating SB 31-1024 and/or SB 31-1026, 13.5 degrees from idle stop.

(j) Retard the throttle lever to idle. Check that the continuous horn sounds and the red gear light illuminates.

(k) Press the horn cutout switch on the aisle stand. Check that the horn stops and the red gear light remains illuminated.

(l) Advance throttle lever No. 1 greater than 13.5 or 17 degrees, as applicable, from the idle stop and return to idle stop position. Check that a continuous warning horn sounds and the red gear light goes off then back on.

(m) Repeat steps (d) and (e), then steps (i) and (j) using throttle lever No. 2 in lieu of No.

(n) 1.

(o) Extend the nose gear. Check that the red gear light goes off and the horn stops.

(p) Advance throttle lever No. 2 greater than 13.5 or 17 degrees, as applicable, from the idle stop. Check that the horn remains silent.

(q) Repeat steps (a) thru (e), (i) thru (j), (n) and (o) using left main gear in lieu of nose gear.

(r) Repeat steps (a) thru (e), (i) thru (j), (n) and (o) using right main gear in lieu of nose gear.

(2) Test Flap Versus Landing Gear Warning With EPR Override.

(a) Connect a regulated air pressure source to engine No. 1 PT7 exhaust probe manifold fitting at the aft end of the engine. Maintain an EPR less than 1.55.

(b) Remove lockpins and place any or all landing gear in a not down and locked position. Place landing gear handle to OFF.

NOTE: Throttle levers must be advanced greater than 17 degrees from idle stops.

(c) On TM CR-BAA, CR-BAB; AR LV-JMW thru JV-JMZ, LV-JND, LV-JNE; AQ N21SW, N22SW, N25SW, extend flaps to 25 units.
On TM ALL EXCEPT CR-BAA, CR-BAB; AR ALL EXCEPT LV-JMW thru JV-JMZ, LV-JND, LV-JNE; AQ ALL EXCEPT N21SW, N22SW, N25SW, extend flaps to 15 units. Check that a continuous warning horn sounds. Continue to extend flaps and check that horn sounds at all greater positions.

(d) On TM CR-BAA, CR-BAB; AR LV-JMW thru JV-JMZ, LV-JND, LV-JNE; AQ N21SW, N22SW, N25SW, retract flaps to 25 units.
On TM ALL EXCEPT CR-BAA, CR-BAB; AR ALL EXCEPT LV-JMW thru JV-JMZ, LV-JND, LV-JNE; AQ ALL EXCEPT N21SW, N22SW, N25SW, retract flaps to 15 units. Check that horn continues to sound.
1) Gradually increase air supply pressure at PT7 exhaust probe manifold and monitor engine EPR indicator. Check that the horn stops at an EPR indication of 1.55 or greater, but less than 1.71.

(e) Continue increasing EPR to 2.40; do not exceed 2.50 EPR. Check that the horn remains silent.

(f) Reduce EPR to 1.00. Check that a continuous horn sounds at an EPR equal to or greater than 1.55 (but less than 1.71) and remains sounding at the lower EPR.

(g) Repeat steps (a) thru (g) using engine No. 2 PT7 exhaust manifold fitting.

(h) Open EPR WARN circuit breaker on P6 panel. Check that horn is silenced. Close circuit breaker. Check that a continuous horn sounds.

(i) Open ENG NO. 1 EPR & L.G. WARN circuit breaker on P6 panel. Check that horn is silenced. Close circuit breaker. Check that continuous horn sounds.

(j) Open ENG NO. 2 EPR & L.G. WARN circuit breaker on P6 panel. Check that horn is silenced. Close circuit breakers. Check that continuous horn sounds.

(k) Retract flaps to 10 units then full retract flaps. Check that horn is silent at 10 units and less.

(l) Open ENG NO. 1 EPR & L.G. WARN circuit breaker and extend flaps to 30 units then fully extend flaps. Check that a continuous horn sounds at 30 units and greater.

(m) Retract flaps to 25 units then fully retract flaps. Check that horn is silent at 25 units and less.

(n) Lower and lock landing gear.

E. Restore Airplane to Normal.

(1) Install gear ground lockpins in all landing gear.
(2) Remove protractor and adapter from thrust lever.
(3) Remove electrical power, if no longer required.
(4) Remove hydraulic power, if no longer required (Ref 29-11-0).
(5) Lower airplane and remove jacks (Ref Chapter 7, Jacking Airplane).

6. Takeoff Warning System Adjustment

A. Equipment and Materials

(1) Ohmmeter
(2) Airplane Control Surface Protractor Assembly - F52485-500, F70044-500 or 4MIT65B80307-1
(3) Protractor Adapter (Engine Cross-Shaft) - 2MIT65-45109-22
(4) Protractor Adapter (Thrust Lever) - F72952-2

(5) Stabilizer Actuator Trammel Bar - F80055-1
(6) Fuel Control Unit Idle Rig Pin - F70207-50 (Ref kit F70207-3

B. Adjust Takeoff Warning System

(1) Adjust Thrust Lever Actuated Takeoff Warning Switch S283 or S133 (Fig. 502, Sheet 1).
[Airplanes without EPR Activated T/O Warn System]

NOTE: The engine control system must be properly rigged prior to adjusting the switch (Ref 76-11-0 A/T).

(a) Open circuit breakers LANDING GEAR LIGHTS and ANTI-SKID FAIL WARN & PARK BRAKE on panel P6.
(b) Retard associated thrust lever to idle stop, on airplanes incorporating SB 31-1024 and/or SB 31-1026 (Ref skip to step (h)).
(c) Open right side engine cowling on associated engine.
(d) At engine fuel control unit, insert fuel control unit idle rig pin in thrust crank to fix thrust crank in idle position (Fig. 504).
(e) Remove rig pin bracket (Fig. 503).
(f) Mount protractor on engine cross-shaft hexnut using adapter; then, zero protractor (Fig. 503).
(g) Remove fuel control unit idle rig pin.
(h) Disconnect electrical wiring from one set of takeoff warning switch terminals (Fig. 502).
(i) Connect ohmmeter across terminals C and NO of switch and check that switch is not actuated (no continuity through switch).
(j) Advance associated thrust lever until takeoff warning switch actuates (continuity through switch). On airplanes not incorporating SB 31-1024 or SB 31-1026, check engine cross-shaft rotates to position required in Fig. 503. On airplanes incorporating SB 31-1024 and/or SB 31-1026, check thrust lever position is 12.5 +1 degrees forward of idle stop using protractor on thrust lever.
(k) If continuity is not obtained at correct thrust lever position, adjust switch in mounting slots (if provided), bend tab + 1/4 degree on actuator arm, or adjust position of switch actuating cam on autothrottle clutch/drum support assembly (if applicable) (Ref 31-26-21/22).
(l) Remove ohmmeter and connect electrical wiring to switch terminals.
(m) Remove protractor with adapter, replace rig pin bracket, and close engine cowling.

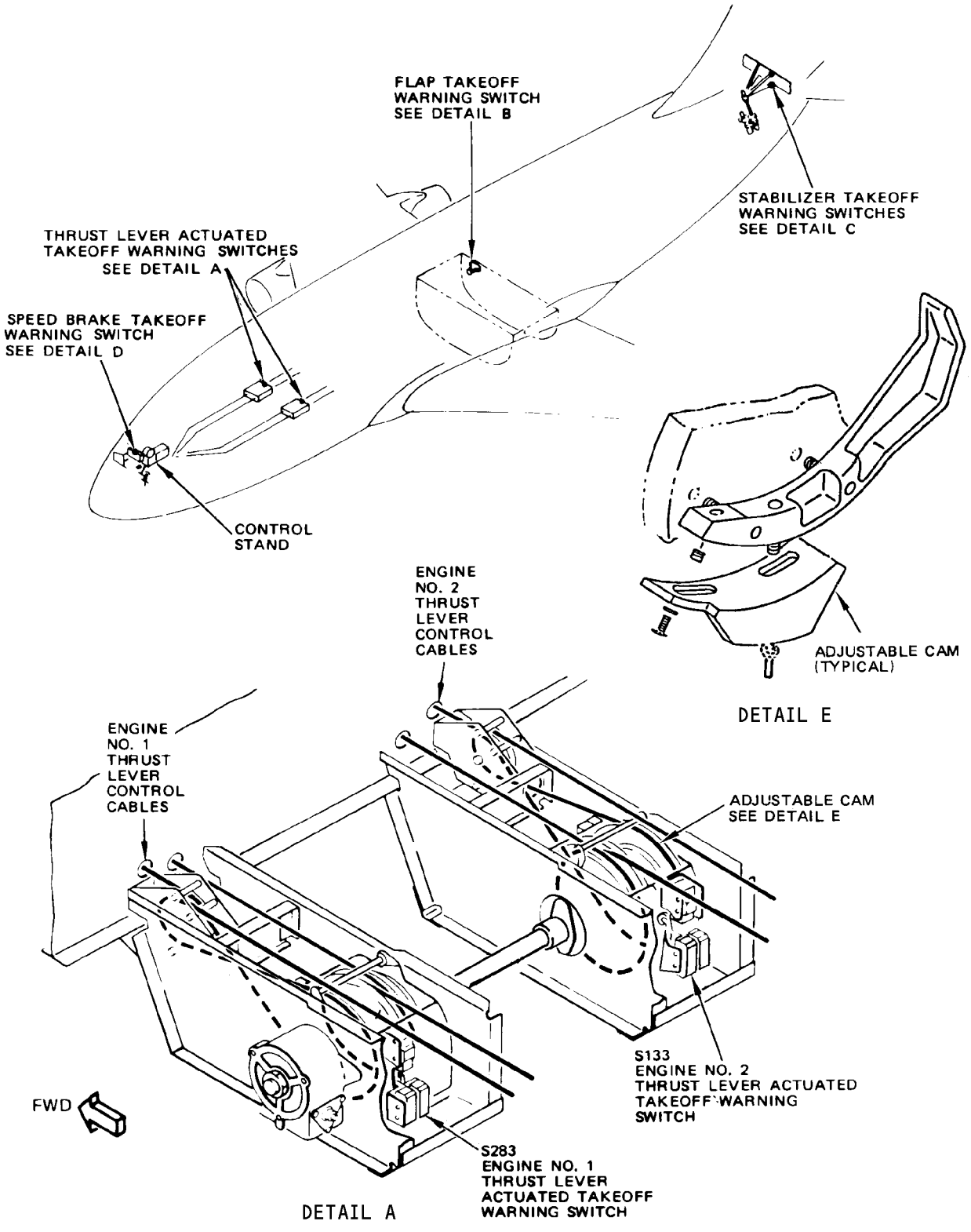
(n) Close circuit breakers LANDING GEAR LIGHTS and ANTI-SKID FAIL WARN & PARK BRAKE on panel P6.

(2) Adjust Thrust Lever Actuated Takeoff Warning Switch S283 or S133 (Fig. 502).
[Airplanes with EPR Activated T/O Warn System]

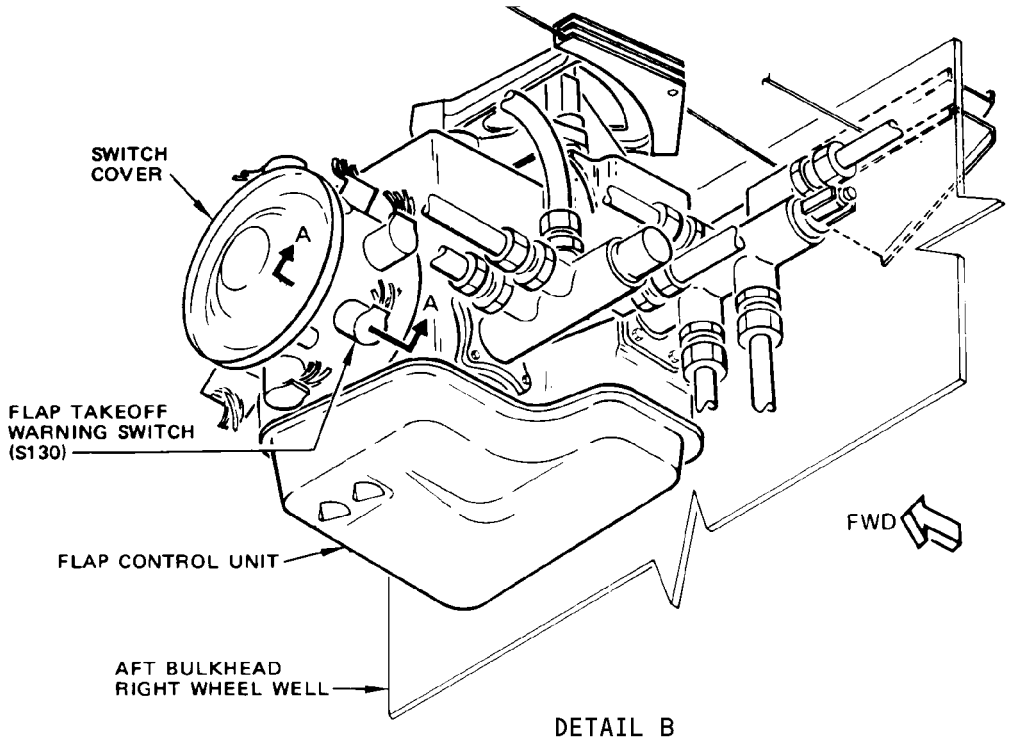
NOTE: The engine control system must be properly rigged prior to adjusting the switch (Ref 76-11-0 A/T).

(a) Open circuit breakers EPR WARN and AURAL WARN on panel P6.
(b) Retard associated thrust lever to idle stop.
(c) Place protractor with adapter on associated thrust lever and set protractor to 0 degree (Fig. 501).
(d) Disconnect electrical wiring from one set of takeoff warning switch terminals.
(e) Connect ohmmeter across terminals C and NO and check that switch is not actuated (no continuity through switch).
(f) Advance associated thrust lever until switch actuates (continuity through switch). Check that thrust lever is 12.5 ±1 degrees forward of idle stop.
(g) If continuity is not obtained at correct thrust lever position, adjust switch in mounting slots (if provided), bend tab ± 1/4 degree on actuator arm, or adjust position of switch actuating cam on autothrottle clutch/drum support assembly (if applicable) (AMM 31-26-21/22).
(h) Remove ohmmeter and connect electrical wiring to switch terminals.
(i) Close circuit breakers EPR WARN and AURAL WARN on P6 panel.

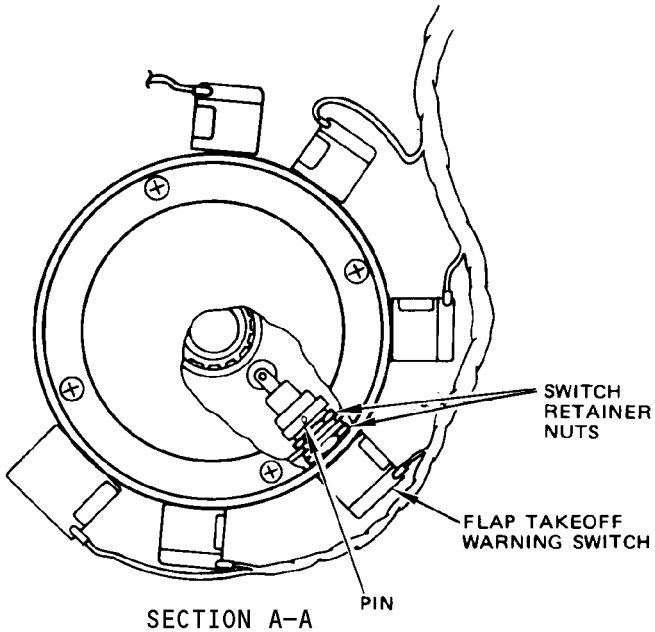
(3) Adjust Flap Takeoff Warning Switch S130 (Fig. 502)
(a) Provide trailing edge flap system A hydraulic power (Ref 27-51-0 MP).
(b) Retract flaps with the flap control lever to normal retracted position (zero-unit detent) and hold for 5 minutes.
(c) Remove No. 4 jackscrew fairing and record X dimension (Fig. 505) between No. 4 ball screw nut and its upstop.
(d) Move the flap control lever to the 25-unit detent and position the flaps electrically so that dimension X is an additional 25.96 to 26.11 inches from that recorded in step (c) (Ref 27-51-0 A/T).
(e) Remove the switch cover from the flap control unit located in the ceiling area of the right wheel well (Detail B, Fig. 502).



Takeoff Warning System Adjustment
Figure 502 (Sheet 1)



DETAIL B



SECTION A-A

Takeoff Warning System Adjustment
Figure 502 (Sheet 2)

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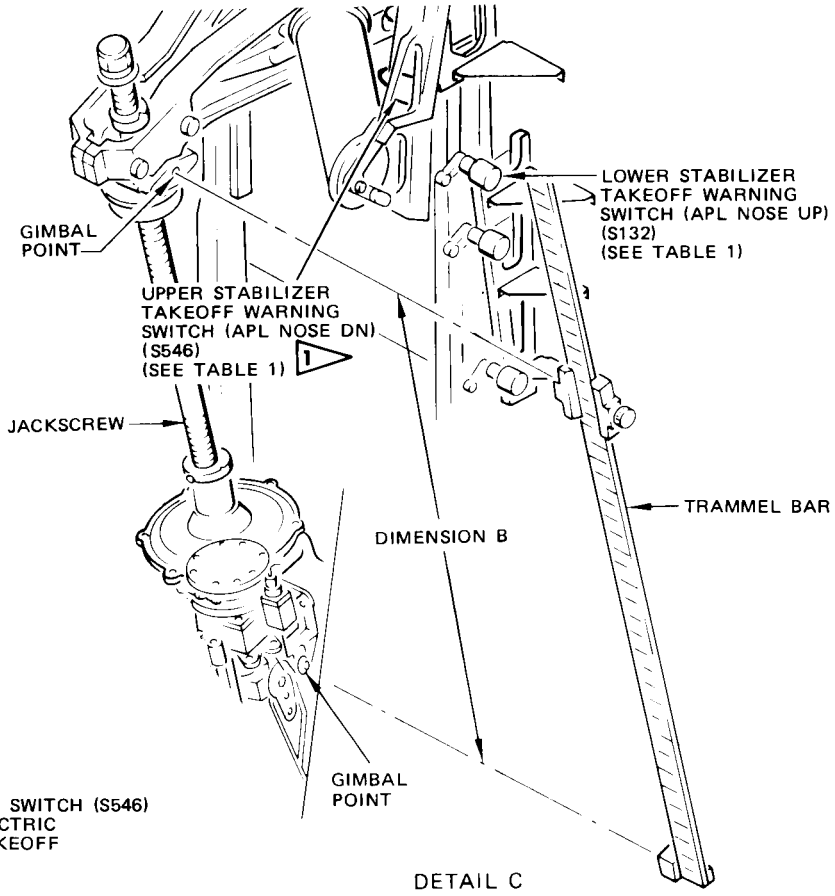


1 UPPER TAKEOFF WARNING SWITCH (S546) COMBINES ACTUATOR ELECTRIC LIMIT FUNCTION WITH TAKEOFF WARNING FUNCTION

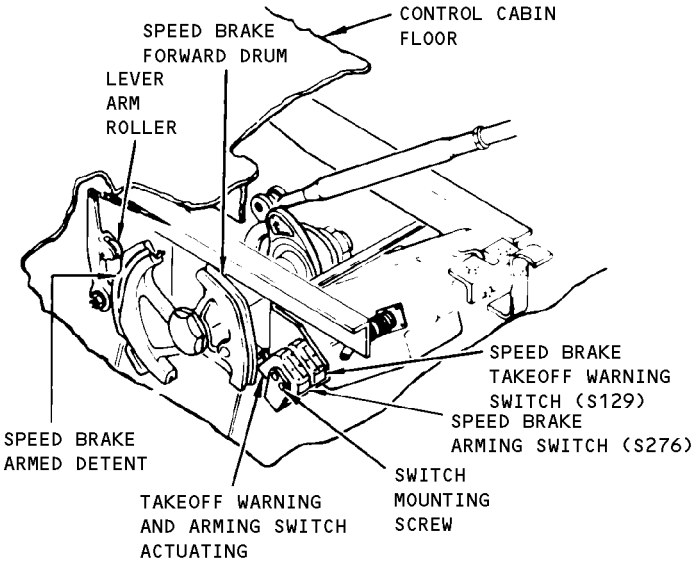
2 AR LV–JMW THRU LV–JMZ, LV–JND, LV–JNE
IC VT–EAG THRU VT–EAM
MD 5R–MFA
NH JA8403 THRU JA8411
TM CR–BAA, CR–BAB

3 ALL EXCEPT 2

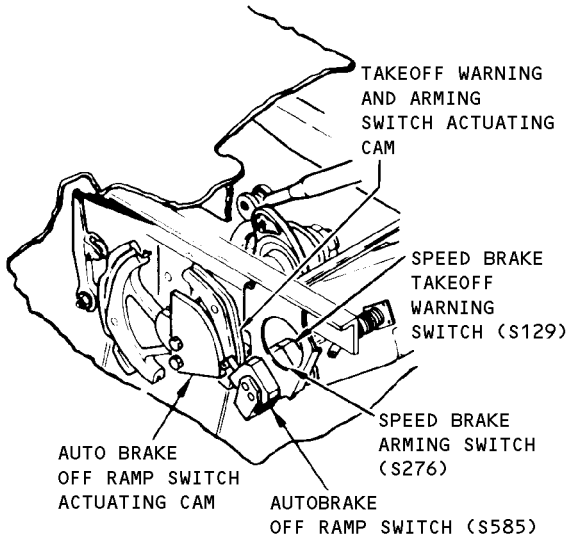
TABLE 1 (STABILIZER TAKEOFF WARNING SWITCH)

SWITCH	DIMENSION B FOR HORN SOUNDING	DIMENSION B FOR SWITCH ADJUSTMENT
UPPER SWITCH (AIRPLANE NOSE DOWN) (S131 OR S546)	41.84 - 42.44 INCHES	42.14 ± 0.05 INCHES
LOWER SWITCH (AIRPLANE NOSE UP) (S132)	34.70 - 34.10 INCHES	34.40 ± 0.05 INCHES
	33.26 - 32.66 INCHES	32.96 ± 0.05 INCHES

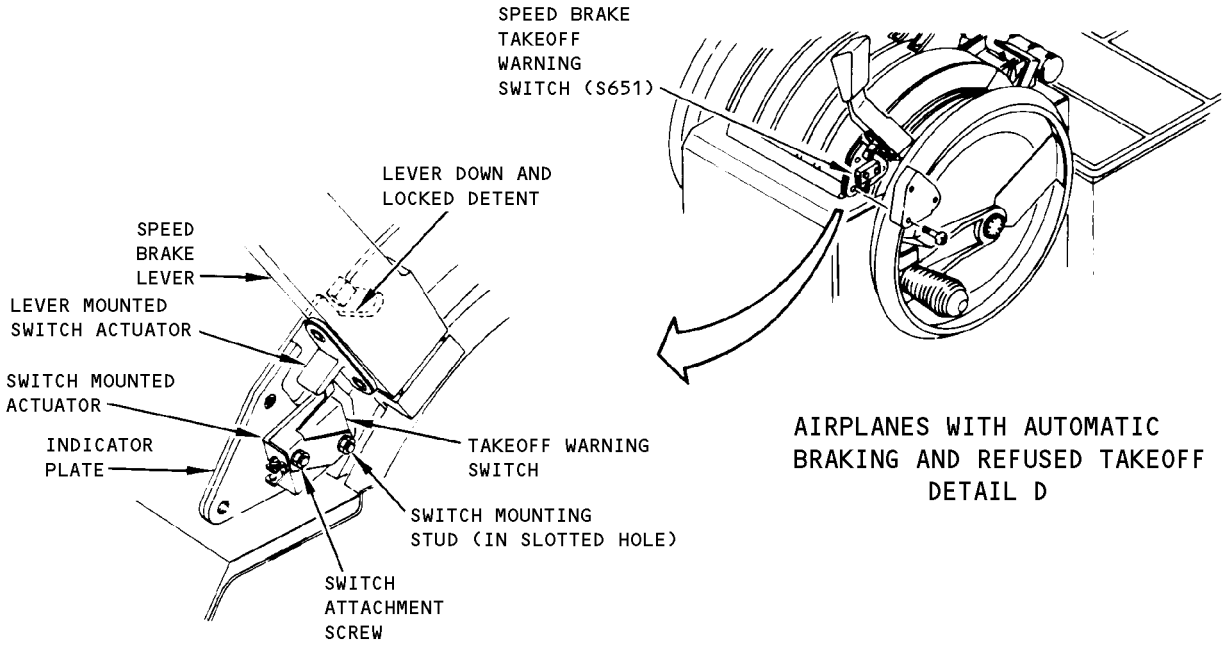
Takeoff Warning System Adjustment
Figure 502 (Sheet 3)



AIRPLANES WITHOUT AUTOMATIC BRAKING
DETAIL D



AIRPLANES WITH AUTOMATIC BRAKING
DETAIL D



AIRPLANES WITH AUTOMATIC BRAKING AND REFUSED TAKEOFF
DETAIL D

Takeoff Warning System Adjustment
Figure 502 (Sheet 4)

(f) Adjust takeoff warning switch toward its actuating cam until switch actuates.

NOTE: Care must be taken to pre-position switch so that actuation takes place with switch body being moved toward cam.

(g) Lockwire switch retaining nuts.
(h) Replace switch cover on flap control unit.
(i) Position alternate flap switch to OFF.
(j) Place flap control lever at 0-unit detent.
(k) Remove system A hydraulic power (Ref 27-51-0).

(4) Adjust Stabilizer Takeoff Warning Switches S131 or S546, Upper; S132, Lower.
(a) Open access door 3701 to stabilizer actuator compartment for access to switches.
(b) Ensure speed brakes are down and flaps are in takeoff range.
(c) Advance either engine thrust lever full forward.
(d) Move stabilizer in leading edge up (airplane nose down) direction. Check that warning horn sounds when dimension B is within the range for horn sounding (Table 1, Detail C, Fig. 502) for upper switch. Use trammel bar to measure dimension B, as shown. If horn does not sound within the required range of dimension B, adjust upper takeoff warning switch as follows:
1) Open LIGHTS and AURAL WARN circuit breakers on P6 panel.
2) Set dimension B as required for switch adjustment in Table 1 (Detail C).
3) Loosen but do not remove locknut securing switch arm to switch.

CAUTION: IF LOCKNUT IS NOT LOOSENED, DAMAGE TO WORM GEAR MECHANISM CAN OCCUR DURING ADJUSTMENT.

4) Loosen worm gear locking screw, and turn worm gear on opposite side until switch actuates.
5) Tighten and lockwire worm gear locking screw; then tighten locknut.
6) Close LIGHTS and AURAL WARN circuit breaker on P6 panel.
(e) Move stabilizer in leading edge down (airplane nose up) direction. Check that warning horn sounds when dimension B is within the range for horn sounding (Table 1) for lower switch. Use trammel bar to measure dimension B, as shown. If horn does not sound within the required range of dimension B, adjust lower takeoff warning switch in same manner as upper takeoff warning switch in previous step.

(5) Adjust speed brake arming switch (S276) and takeoff warning switch (S129) (Detail D, Fig. 502), as applicable.

NOTE: Takeoff warning switch (S129) is not installed on all airplanes (See Detail D for effectivity). When installed, it is adjusted in the same way as the arming switch, which is installed on all airplanes.
The takeoff warning and arming switches are installed with common attachment screws and actuated by common cam. On some airplanes, an autobrake off ramp switch (S585) is also installed with the same common screws, but actuated by a different cam. Check adjustment of the other switches if attachment screws are loosened.

(a) Place speed brake control lever in ARMED position so that lever arm roller is centered in ARMED detent on cam.
(b) Open lower nose compartment access door and locate switches.
(c) Place 0.18-inch thick feeler gage between switch actuator roller and cam on speed brake quadrant. Check that continuity does not exist between common and normally closed contacts of takeoff warning and arming switches.
(d) Place 0.08-inch thick feeler gage between switch actuator roller and cam. Check that continuity exists between common and normally closed contacts of takeoff warning and arming switches.
(e) Adjust switch as necessary to meet actuation requirements. Bend switch tab + 1/4 degree, if necessary. Ensure that switch attachment screws are tightened.
(f) Return speed brake lever to down position.
(g) Close lower nose compartment access door.

(6) Adjust Takeoff Warning Switch S651 (Detail D, Fig. 502, Sheet 4)
(a) Open circuit breaker LANDING GEAR LIGHTS on panel P6.
(b) Disconnect electrical wiring from switch terminals.
(c) Place speed brake lever in DOWN position.
(d) Loosen attachment fasteners and lower switch until clear of lever mounted switch actuator.
(e) Connect ohmmeter across terminals C and NC of switch and check that switch is not actuated (continuity through switch).
(f) Adjust switch upward against lever mounted switch actuator until switch actuates (no continuity through switch).
(g) Tighten attachment fasteners.
(h) Remove ohmmeter and connect electrical wiring to switch terminals.
(i) Close circuit breaker LANDING GEAR LIGHTS on panel P6.

(7) Adjust Autobrake Off Ramp Switch S585 (Fig. 502, Sheet 4), as applicable.

NOTE: The autobrake off ramp switch S585 is not installed on all airplanes. It is installed by common fasteners with the speed brake arming switch S276 and, on some airplanes, takeoff warning switch S129. If adjustment screws are loosened, check adjustment of other switches.

(a) Check that switch attachment screws are tightened.
(b) Set speed brake lever to DOWN position.
(c) Connect ohmmeter across terminals C and NO of switch and check for continuity between switch terminals.
(d) Move speed brake lever aft and check that open circuit between switch terminals is obtained when speed brake lever is 3.28 to 3.84 inches aft from DOWN position.
(e) Adjust switch as required by bending switch actuator tab.
(f) Remove ohmmeter and set speed brake lever to DOWN position.

7. Takeoff Warning System Test

A. General

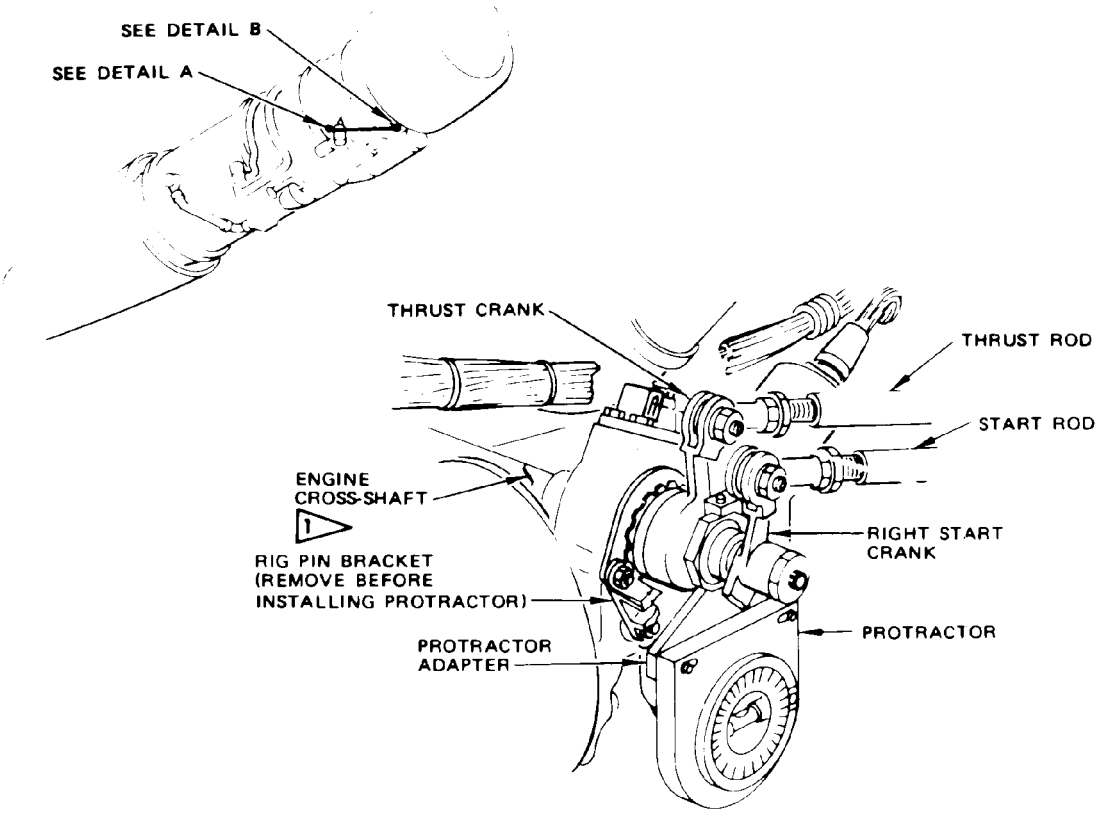
(1) The takeoff warning system should be tested after maintenance has been performed on a component to ensure the system is functioning properly. The prepare to test steps must be completed prior to performing any test.
(2) The test procedure contains separate checks to enable components to be tested individually when required. Two methods are provided to test EPR takeoff warning circuits.
One method uses the self-test switch on each engine accessory module and the other method requires the engines to be running.
(3) A leading edge and trailing edge flap position aural warning circuits test is provided at end of these procedures.

B. Equipment and Materials

(1) Protractor - F52485-500
(2) Protractor Adapter (Engine Cross-Shaft) - 2MIT65-45109-22
(3) Protractor Adapter (Thrust Lever) - F72952-2, F70044-500 or 4MIT65B80307-1
(4) Fuel Control Unit Idle Rig Pin - F70207-50. Rig pin is part of kit, F70207-3.
(5) Leading Edge Locks - F-80048
(6) Copper shield - 1.5 x 2.5 x 0.060 inches

C. Prepare to Test Takeoff Warning System

(1) Provide electrical power.
(2) Provide trailing edge flap system A hydraulic power (Ref 27-51-0 MP or 29-11-0 MP).
(3) Position stabilizer so position indicator pointer is within one unit of center of green band.



DETAIL A

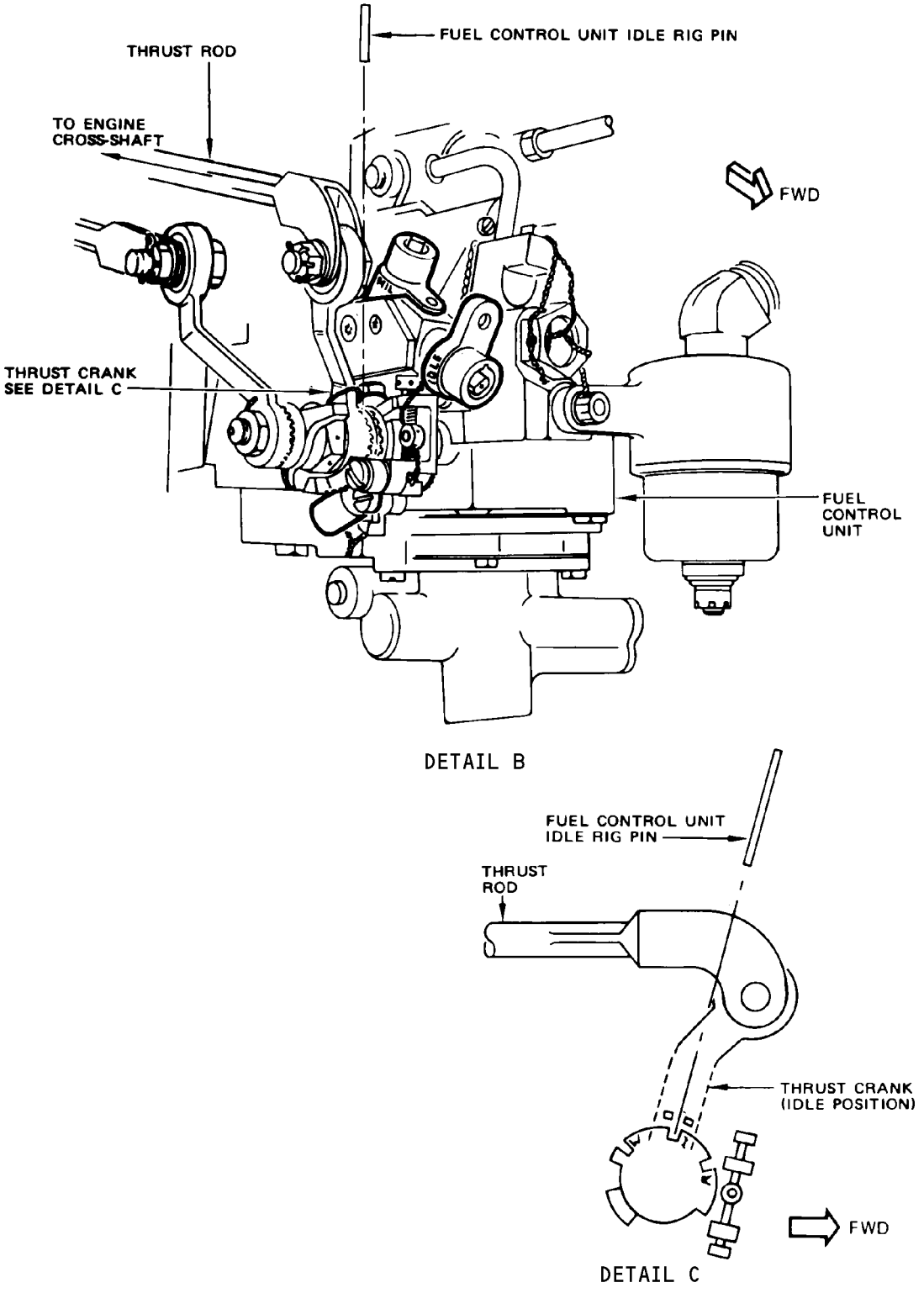
1 THRUST LEVER ACTUATED TAKEOFF WARNING SWITCH ADJUSTMENT REQUIREMENTS (ADVANCING LEVER). REFER TO SB 31–1024 AND SB 31–1026 WHEN ENGINES ARE INTERMIXED OR CHANGED FROM DELIVERED CONFIGURATION.

ENGINE	ENGINE CROSS-SHAFT POSITION FOR SWITCH ACTUATION.
JT8D-7 OR -9	20.6–21.6 DEGREES COUNTERCLOCKWISE FROM IDLE
JT8D-15	19.6–20.6 DEGREES COUNTERCLOCKWISE FROM IDLE
JT8D-17 ENGINES OPERATED AT -9 RATING	14.5–16.5 DEGREES COUNTERCLOCKWISE FROM IDLE
JT8D-17 ENGINES OPERATED AT -17 RATING	16.5–18.5 DEGREES COUNTERCLOCKWISE FROM IDLE

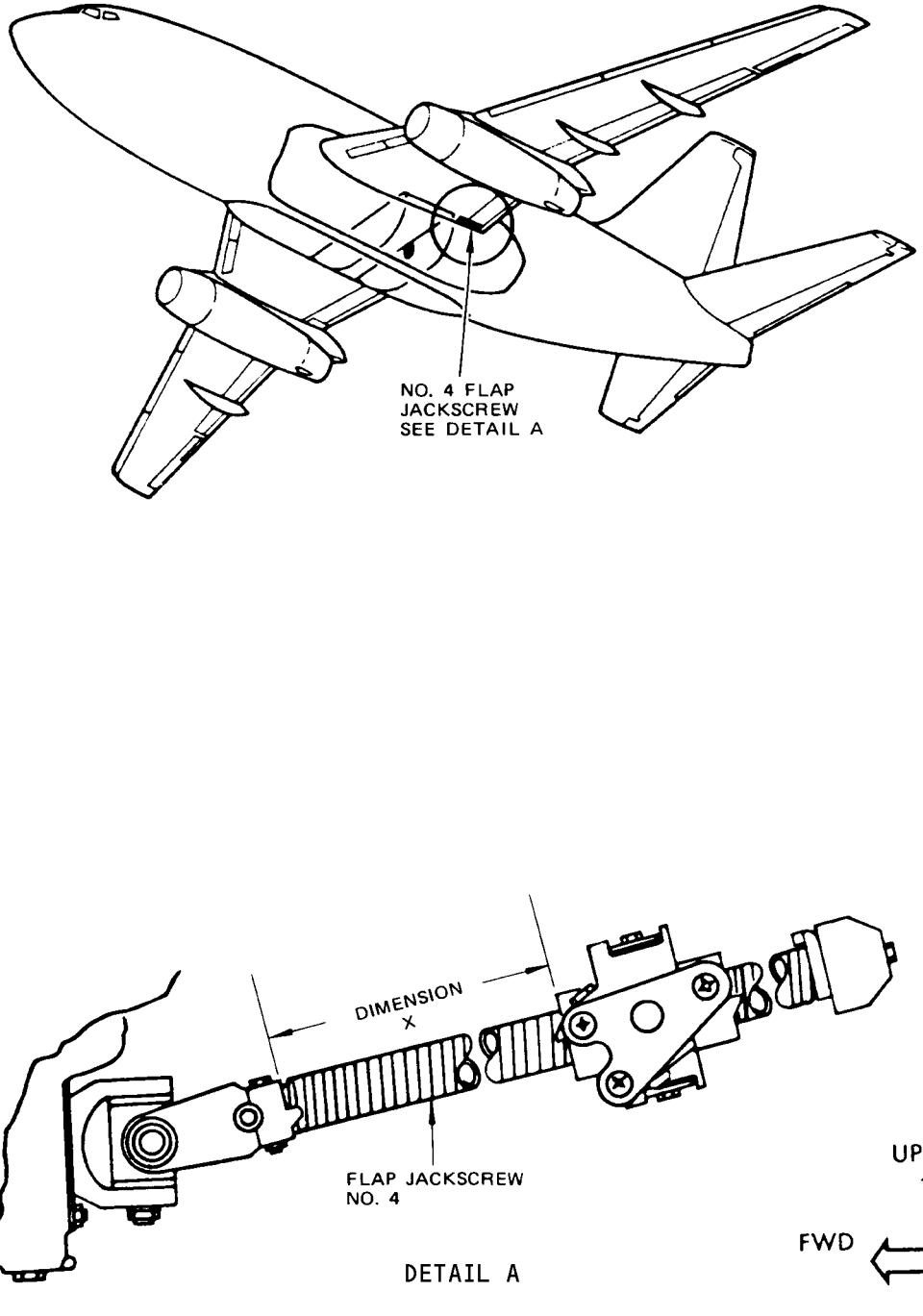
NOTE: THE TAKEOFF WARNING SWITCHES ARE ADJUSTED INDEPENDENTLY TO MEET THE REQUIREMENTS OF THE ENGINES CORRESPONDING TO EACH SWITCH. THEREFORE, IN AN ENGINE INTERMIX CONFIGURATION (BOTH ENGINES NOT OF THE SAME RATING), THE SWITCHES WILL NOT ACTUATE AT THE SAME CROSS-SHAFT ANGULAR POSITION (-7 AND -9 INTERMIX, BOTH WILL OPERATE AT 20.6 – 21.6 DEGREES).

IF AN ENGINE IS TO BE REPLACED WITH A HIGHER- OR LOWER-RATED ENGINE, THE CORRESPONDING TAKEOFF WARNING SWITCH SHOULD BE READJUSTED TO THE REQUIREMENTS OF THE ENGINE TO BE INSTALLED. HOWEVER, IF THE REPLACEMENT ENGINE IS OF LOWER RATING THAN THE ENGINE TO BE REPLACED, THE CORRESPONDING TAKEOFF WARNING SWITCH NEED NOT BE READJUSTED, BUT MAY BE, IF DESIRED, TO ELIMINATE NUISANCE WARNINGS DURING TAXI OPERATIONS.

Engine Cross-Shaft Positioning for Thrust Lever 501
Figure 503



Engine Cross-Shaft Positioning for Thrust Lever
Figure 504



No. 4 Flap Jackscrew Positioning for Flap Takeoff Warning Switch Adjustment
Figure 505

(4) Place flap control lever at zero UNITS.
(5) Place speed brake control lever to DOWN.
(6) Check that LANDING GEAR LIGHTS and AURAL WARNING circuit breakers on panel P6 are closed.
(7) On airplanes with EPR activated T.O. warn system,
  (a) Check that EPR WARNING, ENG NO. 1 EPR &L G. WARNING, and ENG NO. 2 EPR & L. G. WARNING circuit breakers on panel P6 are closed.
  (b) Place thrust levers at maximum forward thrust position.
(8) On airplanes with leading and trailing edge flap position aural warning circuits, check that circuit breakers FLAP POSITION INDICATION LEADING EDGE AC and DC on P6 panel are closed.
(9) Chock landing gear wheels.
(10) Release parking brake.

NOTE: The intermittent horn will sound if the parking brake is not released.

D. Test Takeoff Warning System (Airplanes without EPR Activated T/O Warn System)
(1) Test Thrust Lever Actuated Takeoff Warning Switches (S283, S133).
  (a) On airplanes not incorporating SB 31-1024 or SB 31-1026, perform the following:
    1) At engine fuel control unit, insert fuel control unit idle rig pin in thrust crank to fix thrust crack in idle position (Fig. 503, Sheet 2). Remove rig pin bracket (Fig. 503, Sheet 1).
    2) At engine fuel control unit, insert fuel control unit idle rig pin in thrust crank to fix thrust crack in idle position (Fig. 503, Sheet 2). Remove rig pin bracket (Fig. 503, Sheet 1).
    3) Mount protractor on No. 1 engine cross-shaft hexnut using adapter; then, zero protractor (Fig. 503).
    4) Remove fuel control unit idle rig pin.
    5) Position stabilizer outside green band range.
    6) Advance No. 1 thrust lever forward until warning horn sounds. Check that cross-shaft is within range in table in Fig. 504.
    7) Return thrust lever to idle stop, remove protractor with adapter and replace rig pin bracket.
    8) Repeat steps 4) thru 6) using No. 2 engine and thrust lever.
    9) Return stabilizer to within green band range.
  (b) On airplanes incorporating SB 31-1024 and/or SB 31-1026, perform the following:
    1) Fully retard both thrust levers.
    2) Position stabilizer outside green band range.
    3) Place protractor with adapter on No. 1 thrust lever and set protractor to zero degrees (Fig. 501).

4) Advance No. 1 thrust lever and check that intermittent horn sounds when thrust lever is 12.5 +1 degrees forward of idle stop.
5) Retard thrust lever and check that horn sound stops when thrust lever is 5 degrees (minimum) forward of idle stop.
6) Fully retard thrust lever.
7) Repeat steps 3) thru 6) for engine No. 2
8) Return stabilizer to within green band range.

(2) Test flap takeoff warning switch S130 (Fig. 502, Sheet 2).

NOTE: This test should be accomplished with the flap system properly adjusted and with hydraulic system A pressurized.

(a) Check that speed brakes are down and stabilizer position indicator is at least one-half unit into green band.
(b) Advance either thrust lever full forward.
(c) With flaps retracted the warning horn shall sound.
(d) Place flap control lever in 1-unit detent and check that the warning horn stops sounding before the flaps reach the 1-unit position.
(e) Place the flap control lever in the 15- or 25-unit detent as applicable, refer to 5.B.(3) and check that the warning horn remains silent.
(f) Place the flap control lever in the 25- or 30-unit detent as applicable, refer to 5.B.(3) and check that the warning horn sounds as the flaps move from the 15-unit position.
(g) Position flap control lever to 1 unit.
(h) Return thrust lever to idle stop.

(3) Test Stabilizer Takeoff Warning Switches (Fig. 502)
(a) Set flap control lever to any position between 1 and 25 units.
(b) Advance either thrust lever full forward.
(c) Starting within green band range, move stabilizer in APL NOSE DOWN direction.
(d) Check that intermittent horn sounds when stabilizer position pointer is within + one-half unit of end of green band.
(e) Move stabilizer in APL NOSE UP direction and check that horn is silenced when stabilizer position pointer is within + one-half unit of end of green band.
(f) Continue to move stabilizer in APL NOSE UP direction to other end of green band.
(g) Check that warning horn sound when stabilizer position pointer is within + one-half unit of end of green band.
(h) Move stabilizer in APL NOSE DOWN direction and check that horn is silenced when stabilizer position pointer is within + one-half unit of end of green band.

(i) Return stabilizer position pointer to center of green band and set flap control lever to zero units.
(j) Return thrust lever to idle stop.

(4) Test speed brake takeoff warning switch (S129 or S651).

NOTE: See Detail D, Fig. 502 for effectivity of switches S129 and S651.

(a) Set flaps in takeoff range.
(b) Advance either thrust lever fully forward.
(c) On switch S129, pull speed brake lever aft to the ARMED detent. Check that warning horn sounds. Return speed brake lever to down position and check that horn stops.
(d) On switch S651, lift speed brake lever up from bottom of DN detent but do not move lever aft; then, depress lever back into detent. Check that horn sounds when lever is lifted from detent and stops when lever is returned to DN detent.
(e) Return thrust lever to idle stop.

(5) Test speed brake arming switch (S276) (Fig. 502, Sheet 4), as applicable.

NOTE: If common attachment bolts which secure the speed brake takeoff warning switch, arming switch and autobrake off ramp switch were loosened, the arming switch should be tested. If an adjustment was not made to the speed brake takeoff warning switch this test is not necessary.
The weight of the airplane must be on the landing gear for this test.

(a) Make sure parking brake is released, if not release parking brake as follows:

NOTE: Ground interconnect valve must be manually overridden to allow parking brake to be released during tests on automatic speed brake system.

1) Place GROUND INTERCONNECT switch to OPEN position.
2) Open GROUND INTERCONNECT circuit breaker on P6 panel.
3) Release parking brake.

(b) Place both inboard and outboard antiskid switches to ON. Switches are located on center instrument panel.

(c) Ensure that the following circuit breakers on P6 panel are closed:
1) INDICATOR LIGHTS
2) FLIGHT CONTROL VALVES
3) SPOILER SHUTOFF VALVES
4) AUTO SPEED BRAKE
5) ALL ANTISKID

(d) Place engines No. 1 and 2 thrust levers in idle position.

(e) Place speed brake control lever in ARMED position. Check that ARMED light on center panel comes on.

(f) Move speed brake control lever forward to DOWN position and check that ARMED light goes off.

(g) On airplanes not incorporating SB 31-1049 or SB 31-1054, set parking brake and restore interconnect valve as follows:
1) Set parking brake.
2) Close GROUND INTERCONNECT circuit breaker on P6 panel.
3) Place GROUND INTERCONNECT switch to CLOSE position.

(6) Test autobrake off ramp switch (S585) (Fig. 502), as applicable.

NOTE: If common attachment bolts which secure speed brake takeoff warning switch, arming switch and autobrake off ramp switch were loosened, the autobrake off ramp switch should be tested. If an adjustment was not made to the speed brake takeoff-warning switch this test is not necessary.

(a) Set speed brake lever to DOWN position.

(b) Connect ohmmeter across terminals C and NO of switch and check for continuity between switch terminals.

(c) Move speed brake lever aft until open circuit is obtained between switch terminals.

(d) Check the speed brake lever is 3.28 to 3.84 inches aft from down and locked position.

(e) Remove ohmmeter and set speed brake lever to down position.

(7) Test air/ground relay.

(a) Place flap control lever in 0 detent.

(b) Advance No. 1 thrust lever until warning horn sounds.

(c) Actuate the air-sensing switch on the landing gear accessory module on the E3-2 electrical shelf. Check that horn is silenced.

(d) Release the air-sensing switch. Check the intermittent horn sounds.

(e) Fully retard the No. 1 thrust lever. Check that horn is silenced.

E. Test Takeoff Warning System (Airplanes with SB 31-1033, EPR Activated T/O Warn System)
   (1) Perform Prepare to Test Takeoff Warning System Procedures (par. 6.C.)
   (2) Test EPR Takeoff Warning Circuits (Self-Test Method)
      (a) Press and hold ENGINE No. 1 EPR test switch on the engine accessory module on the E3-2 electrical shelf. Check that the intermittent warning horn sounds and the EITHER EPR greater than 1.4 light on the engine accessory module illuminates.
      (b) Release the test switch. Check that the horn is silenced and the EPR light goes off.
      (c) Repeat steps (a) and (b) using ENGINE NO. 2 EPR test switch.
      (d) Press and hold either EPR test switch while opening and closing each of the following circuit breakers: AURAL WARNING; LANDING GEAR LIGHTS; EPR WARNING. Check that the intermittent horn stops when each circuit breaker is opened and starts when each circuit breaker is closed.
      (e) While pressing either EPR test switch, actuate the air-sensing switch on the landing gear accessory module on the E3-2 electrical shelf. Check that the horn is silenced.
      (f) Release the air-sensing switch. Check that the intermittent horn sounds.
      (g) Release the EPR test switch. Check that the horn is silenced and the EPR light goes off.
   (3) Test EPR Takeoff Warning Circuits (Engines Running Method)
      (a) Place thrust levers at idle stop position.
      (b) Release the parking brake.
      (c) Apply the main landing gear brakes.
      (d) Start engines No. 1 and 2 (Ref Chapter 71).

      WARNING: OBSERVE ALL GROUND SAFETY PRECAUTIONS TO PREVENT INJURY TO PERSONNEL.

      (e) Slowly advance engine No. 1 thrust lever. Check that intermittent horn sounds before pilot's EPR indicator reads 1.48 maximum.
      (f) Slowly retard thrust lever. Check that horn is silenced before EPR indicator reads 1.32 minimum.

(g) Return thrust lever to idle stop.

NOTE: Below approximately -20°F (-29°C), an indicated EPR of 1.48 may be commanded before the thrust lever reaches 13.5 degrees from idle stop, depending on the engine model installed. Under these conditions, the intermittent horn will sound at 13.5 degrees maximum thrust lever travel from idle stop and the indicated EPR may exceed 1.48.

(h) Repeat steps (e) thru (g) using engine No. 2.
(i) Shut down engines (Ref Chapter 71).
(j) NOTE: The remaining tests in par. (4) thru (8) are performed with engines not running.

(4) Test Thrust Lever Actuated Takeoff Warning Switches (S283, S133).
(a) Verify both thrust levers are at idle stop.
(b) Place protractor with adapter on No. 1 thrust lever and set protractor to zero degree (Fig. 501).
(c) Press and hold engine No. 1 EPR test switch on engine accessory module. Check that warning horn does not sound.
(d) Advance No. 1 thrust lever and check that intermittent horn sounds when thrust lever is 12.5 +1 degrees forward of idle stop.
(e) Retard thrust lever and check that horn sound stops when thrust lever is 5 degrees (minimum) forward of idle stop.
(f) Release EPR test switch and fully retard thrust lever.
(g) Repeat steps (b) thru (f) for engine No. 2.

(5) Test Flap Takeoff Warning Switch
(a) Place thrust levers at maximum forward thrust position.
(b) Press and hold either EPR test switch on the engine accessory module. Check that the intermittent horn sounds and the EITHER EPR greater than 1.4 light illuminates.
(c) Move the flap handle thru full travel. Check that the intermittent horn sounds for all positions except between the 1 unit detent and the 25-unit detent.
(d) Return the flap handle to zero detent and release the EPR test switch. Check that the horn is silenced and the EPR light goes off. Retard thrust levers to idle stop.

(6) Test Stabilizer Takeoff Warning Switches
(a) Place thrust levers at maximum forward thrust position.
(b) Set flap control lever to any position between 1 and 25 units.
(c) Press and hold either EPR test switch on engine accessory unit and check that intermittent horn does not sound.
(d) Starting within green band range, move stabilizer in APL NOSE DOWN direction.

(e) Check that intermittent horn sounds when stabilizer position pointer is within + one-half unit of green band.
(f) Move stabilizer in APL NOSE UP direction and check that horn is silenced when stabilizer position pointer is within + one-half unit of end of green band.
(g) Continue to move stabilizer in APL NOSE UP direction to other end of green band.
(h) Check that warning horn sounds when stabilizer position pointer is within + one-half unit of end of green hand.
(i) Move stabilizer in APL NOSE DOWN direction and check that horn is silenced when stabilizer position pointer is within + one-half unit of end of green band.
(j) Release EPR test switch, return stabilizer position pointer to center of green band, and set flap control lever to zero units. Retard thrust levers to idle stop.

(7) Test Speed Brake Takeoff Warning Switch (S129 or S651)

NOTE: See Detail D, Fig. 502 for effectivity of switches S129 and S651.

(a) Place flaps between 1 and 25 units.
(b) Advance thrust levers to maximum forward thrust position.
(c) Press and hold ENGINE NO. 1 EPR test switch on the engine accessory module. Check that the warning horn does not sound.
(d) On switch S129, pull speed brake lever aft to the ARMED detent. Check that warning horn sounds. Return speed brake lever to down position and check that horn stops.
(e) On switch S651, lift speed brake lever up from bottom of DN detent but do not move lever aft; then, depress lever back into detent. Check that horn sounds when lever is lifted from detent and stops when lever is returned to DN detent.
(e) Release the EPR test switch and return the flaps to zero units. Retard thrust levers to idle stop.

(8) Test LE & TE Flap Takeoff Warning Functions (Airplanes without LE Warning Test switches)
(a) Advance thrust levers to maximum forward thrust position.
(b) Press and hold either EPR test switch on engine accessory module. Check that intermittent horn sounds.
(c) Move TE flap lever to 1 unit detent. Check that LE and TE flaps extend and horn is silenced.
(d) Install leading edge locks on flap actuators 1 and 4.

NOTE: Depressurize hydraulic system prior to installation and removal of flap actuator locks.

(e) Insert copper shield between No. 1 LE flap extend sensor and its target plate. Check that LE No. 1 green light goes off, amber light comes on, and horn sounds.
(f) Repeat step (d) at LE flap extend sensor No. 4.
(g) Remove copper shield.
(h) Move flap lever to FLAPS UP detent. Check that LE flaps 1 and 4 remain extended and horn sounds.
(i) Move flap handle thru its full travel. Check that horn sounds except for flap positions 1 thru 25.
(j) Move flap handle to any position between 1 and 25. Check that horn is silenced.
(k) Remove actuator locks. Move flap lever to FLAPS UP detent. Check that LE and TE flaps retract and horn sounds.

NOTE: Depressurize hydraulic system prior to installation and removal of flap actuator locks.

(l) Move flap lever between 1 and 25. Check that horn stops sounding.
(m) Return flap handle to zero detent and release EPR test switch. Return thrust levers to idle stop. Check that horn is silent and EPR light goes out.

(9) Test Speed Brake Arming Switch S276 (Fig. 502, Sheet 4)
(a) Perform test same as step 6.D.(5), page 525.

(10) Test Autobrake Off Ramp Switch S535
(a) Set speed brake lever to DOWN Position (Detail D, Fig. 504, Sheet 4).
(b) Connect ohmmeter across terminals C and NO of switch and check for continuity between switch terminals.
(c) Move speed brake lever aft until open circuit is obtained between switch terminals.
(d) Check the speed brake lever is 3.28 to 3.84 inches aft from down and locked position.
(e) Remove ohmmeter and set speed brake lever to down position.

(11) Test parking brake input to Landing Gear Accessory Unit M338 (Airplanes incorporating SB 31-1049, SB 31-1054 or SB 31-1073)
(a) Verify system A hydraulic power is available (Ref 27-51-0).
(b) Position flaps to 3 units (Ref 27-51-0).

CAUTION: ENSURE THAT ALL PERSONNEL AND EQUIPMENT ARE CLEAR BEFORE MOVING CONTROL SURFACES.

(c) Remove system A hydraulic power. Verify parking brake is released (Ref 32-44-0).
(d) Verify that line speed brake lever on the P8 control stand is in the DOWN position.

(e) Set the stabilizer trim control, on the P8 position stand, in the green band.
(f) Advance both thrust levers into start of takeoff range.
(g) On the engine accessory unit module, press and hold either of the engine pressure ratio (EPR) test switches.
(h) Verify that the warning horn does not sound.
(i) Release the EPR test switch.
(j) Set the parking brake (Ref 32-44-0).
(k) Press and hold either of the EPR test switches on the engine accessory unit module.
(l) Verify that the warning horn sounds and that the parking brake light on the P8 control stand illuminates.
(m) Release the parking brake.
(n) Verify that the warning horn is silenced and that the parking brake light is extinguished.
(o) Release the EPR test switch.
(p) Fully retard both thrust levers to idle position.
(q) Restore airplane to normal.

(12) Perform step 6.F. for airplanes with LE and TE Flap Aural Warning circuits.

F. Test LE and TE Flap Aural Warning Circuits - Engines not running and airplane on theground using external power. (Airplanes with flaps LE WARNING TEST switches installed on E3-2 shelf/stanchion).
[Airplanes with and without EPR Activated T/O Warn System]

(1) If not already done, disconnect the D770 connector from the V47 ground interconnect valve.
(2) Provide trailing edge flap system A hydraulic power (Ref 27-51-0 MP or 29-11-0 MP) if necessary.
(3) Place stabilizer so that stabilizer position indicator pointer is within one unit of center of green band.
(4) Place speed brake lever in zero degree detent position.
(5) Verify thrust levers are at idle and flaps are fully retracted.
(6) Close the following circuit breakers on P6 panel.
(a) LE FLAP POSITION INDICATOR - DC
(b) LE FLAP POSITION INDICATOR - AC
(c) MASTER DIM (section 6)
(d) LANDING GEAR LIGHTS
(e) AURAL WARNING
(f) On airplanes with EPR activated take-off warning system,
1) ENG NO. 1 EPR AND LG WARNING
2) ENG NO. 2 EPR AND LG WARNING
3) EPR WARNING
(7) Warning horn remains silent at completion of circuit breaker closures in previous step (4).

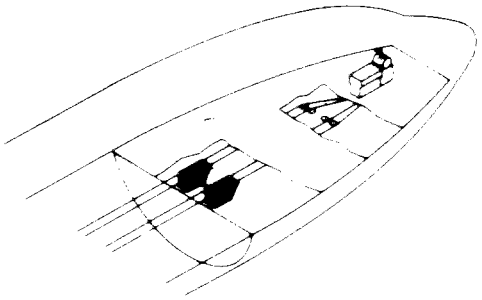
(8) On airplanes with EPR activated take-off warning system only, open ENG NO. 1 EPR AND LG WARNING and ENG NO. 2 EPR AND LG WARNING circuit breakers. Horn shall remain silent.
(9) Fully advance both throttle levers. The intermittent horn shall sound.
(10) Pull to unlock, then set and hold LE warning OVERRIDE TEST switch (S785, E3-2 shelf) to OVERRIDE position. Warning horn continues to sound and No. 1 and 4 LE FLAP EXTEND lights at P5-12 LE annunciator panel come on (green).
(11) Extend flaps to FLAPS 1 position. Horn stops. Return OVERRIDE TEST switch to center position.
(12) Extend flaps to FLAPS 25 position. Horn remains silent and No. 1 and 4 LE FLAP EXTEND green lights remain on at LE annunciator panel.
(13) Pull to unlock, then set and hold LE warning test switch (S784 E3-2 shelf) to L LE TEST position. Warning horn sounds and No. 1 LE FLAP EXTEND green light on LE annunciator panel goes out. Return test switch to NORMAL position. Horn stops and No. 1 LE FLAP EXTEND green light comes on.
(14) Pull to unlock, then set and hold test switch to R LE TEST position. Warning horn sounds and No. 4 LE FLAP EXTEND green light goes out at LE annunciator panel. Return test switch to NORMAL position. Horn stops an No. 4 LE FLAP EXTEND green light comes on.
(15) Extend flaps to not less than FLAPS 30 position. Horn sounds at or before FLAPS 30 position and remains sounding thru any greater position. Retract flaps to FLAPS 25 position. Horn stops and remains silent through FLAPS 1 position.
(16) Pull to unlock, then set and hold LE warning OVERRIDE TEST switch (S785) to OVERRIDE position. Retract flaps to FLAPS 0 position. Horn sounds and all LE FLAPS EXTEND green lights go out except No. 1 and 4.
(17) Return OVERRIDE TEST switch to center position. Horn continues to sound and No. 1 and 4 LE FLAP EXTEND green lights go out. Extend flaps to FLAPS 1 position. Horn stops and LE FLAPS EXTEND green lights come on.
(18) Return switches to center position.
(19) Return flaps to normal positions, or as required.
(20) Close circuit breakers previously opened.
(21) Airplanes with EPR activated take-off warning system; Close the ENG NO. 1 EPR AND LG WARNING and ENG NO. 2 EPR AND LG WARNING circuit breakers.

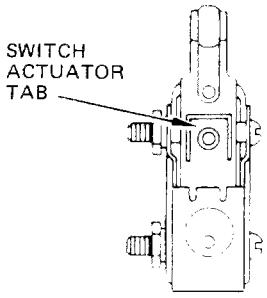
G. Restore Airplane to Normal
(1) Return speed brakes to down, stabilizer to green band range and flaps to takeoff range, if required.

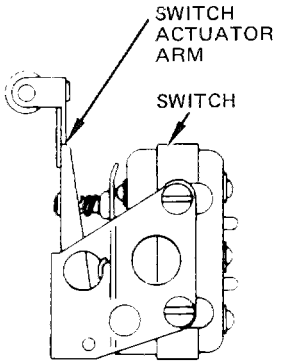
(2) On airplanes incorporating SB 31-1059, set parking brake and restore interconnect valve as follows:
  (a) Place ground interconnect valve manual override lever to position 1 (closed).
  (b) Reconnect electrical connector to ground interconnect valve.
  (c) Close ground interconnect valve circuit breaker on P6 panel.
  (d) Set parking brake.
  (e) Place ground interconnect switch to close position.
  (f) Check that valve manual override lever is in position 1 (closed).
(3) Retard thrust levers to idle stop.
(4) Remove hydraulic power, if no longer required (Ref 27-51-0).
(5) Remove electrical power, if no longer required.

THRUST LEVER ACTUATED LANDING GEAR WARNING SWITCHES - REMOVAL/INSTALLATION

1. General
   A. The thrust lever actuated landing gear warning switches S139 and S140 are mounted on the friction drum and brake or auto throttle clutch supports located in the electronic equipment compartment ceiling. Access to the switches is gained through the electronic equipment compartment access door. The removal/installation procedure is the same for both switches.
2. Equipment and Materials
   A. Ohmmeter
   B. Airplane Control Surfaces Protractor - F52485-500
   C. Protractor Adapter (Thrust Lever) - F72952-2
3. Remove Thrust Lever Actuated Landing Warning Switch (Fig. 401)
   A. Open circuit breakers LANDING GEAR LIGHTS and ANTI-SKID FAIL WARN & PARK BRAKE on panel P6.
   B. Disconnect electrical wiring from switch terminals.
   C. Remove switch mounting bolts and remove switch from support.
   D. Remove switch actuator from switch.
4. Install Thrust Lever Actuated Landing Gear Warning Switch (Fig. 401)
   A. Install switch actuator on switch.
   B. Place switch in position on support and install mounting bolts.
   C. Adjust warning switch.
      (1) Retard associated thrust lever to idle stop.
      (2) Install protractor with adapter on thrust lever and set protractor to 0 degree.
      (3) Advance thrust lever 20 degrees minimum from idle stop.
      (4) Connect ohmmeter across terminals C and NC of switch and check that switch is not actuated (no continuity through switch).
      (5) Retard thrust lever until switch actuates (continuity through switch). Check that thrust lever is in following position:
         (a) On airplanes with thrust lever actuated takeoff warn system but not incorporating SB 31-1024 and/or SB 31-1026, or intent of, 3.5 degrees minimum forward of idle stop.
         (b) On airplanes with EPR-activated takeoff warn system, and airplanes with thrust lever activated takeoff warn system incorporating SB 31-1024 and/or SB 31-1026, or intent of, 5.0 degrees minimum forward of idle stop.
      (6) Advance thrust lever until switch deactuates. Check that thrust lever is in following position:
         (a) On airplanes with thrust lever actuated takeoff warn system but not incorporating SB 31-1024 and/or SB 31-1026, or intent of, 17.0 degrees maximum forward of idle stop.
         (b) On airplanes with EPR-activated takeoff warn system, and airplanes with thrust lever activated takeoff warn system incorporating SB 31-1024 and/or SB 31-1026, or intent of, 13.5 degrees maximum forward of idle stop.

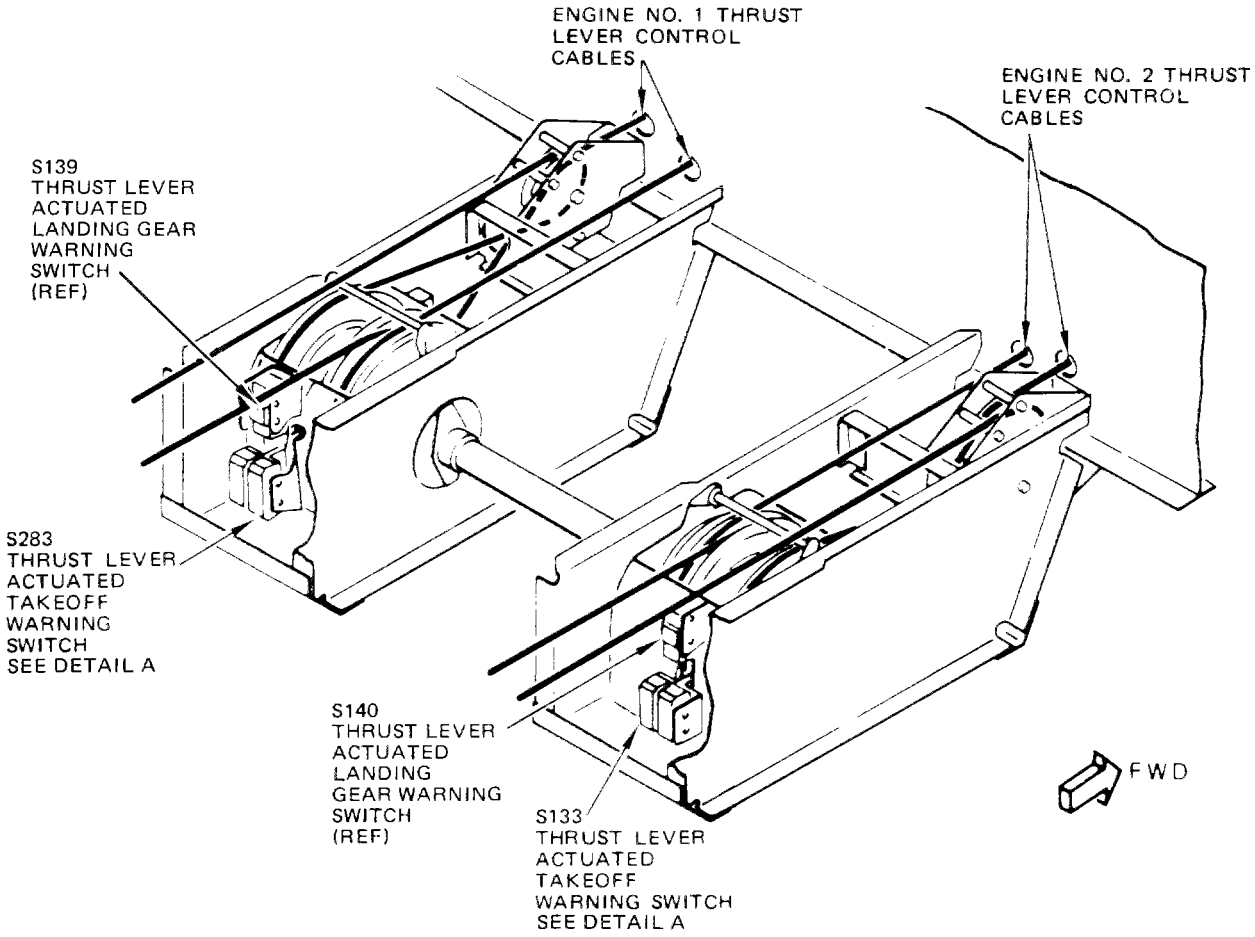






DETAIL A 1

1 DO NOT BEND ACTUATOR ARM. DO NOT BEND TAB MORE THAN ±1/4 DEGREE FROM PLANE OF ACTUATOR ARM TO ATTAIN ADJUSTMENT. PREFERRED ADJUSTMENT METHOD IS TO MOVE SWITCH ASSEMBLY IN SWITCH SUPPORT SLOTS. REPLACE SWITCH ASSEMBLIES THAT HAVE BENT/DISTORTED ACTUATOR ARMS.



AUTO THROTTLE CLUTCH OR FRICTION DRUM AND BRAKE SUPPORTS

Thrust Lever Actuated Switch Installation
Figure 401

(7) If switch does not operate at correct thrust lever position, adjust position of switch in switch support mounting slots, adjust switch actuating cam on clutch and cam assembly (if adjustable cam provided), or bend tab ± 1/4 degree on switch actuator arm (Fig. 401).

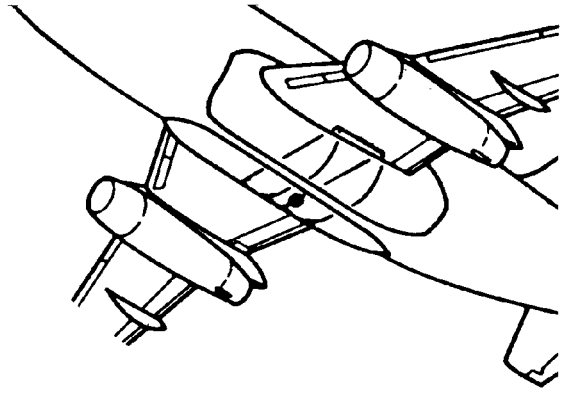
(8) Remove ohmmeter and connect electrical wiring to switch terminals.

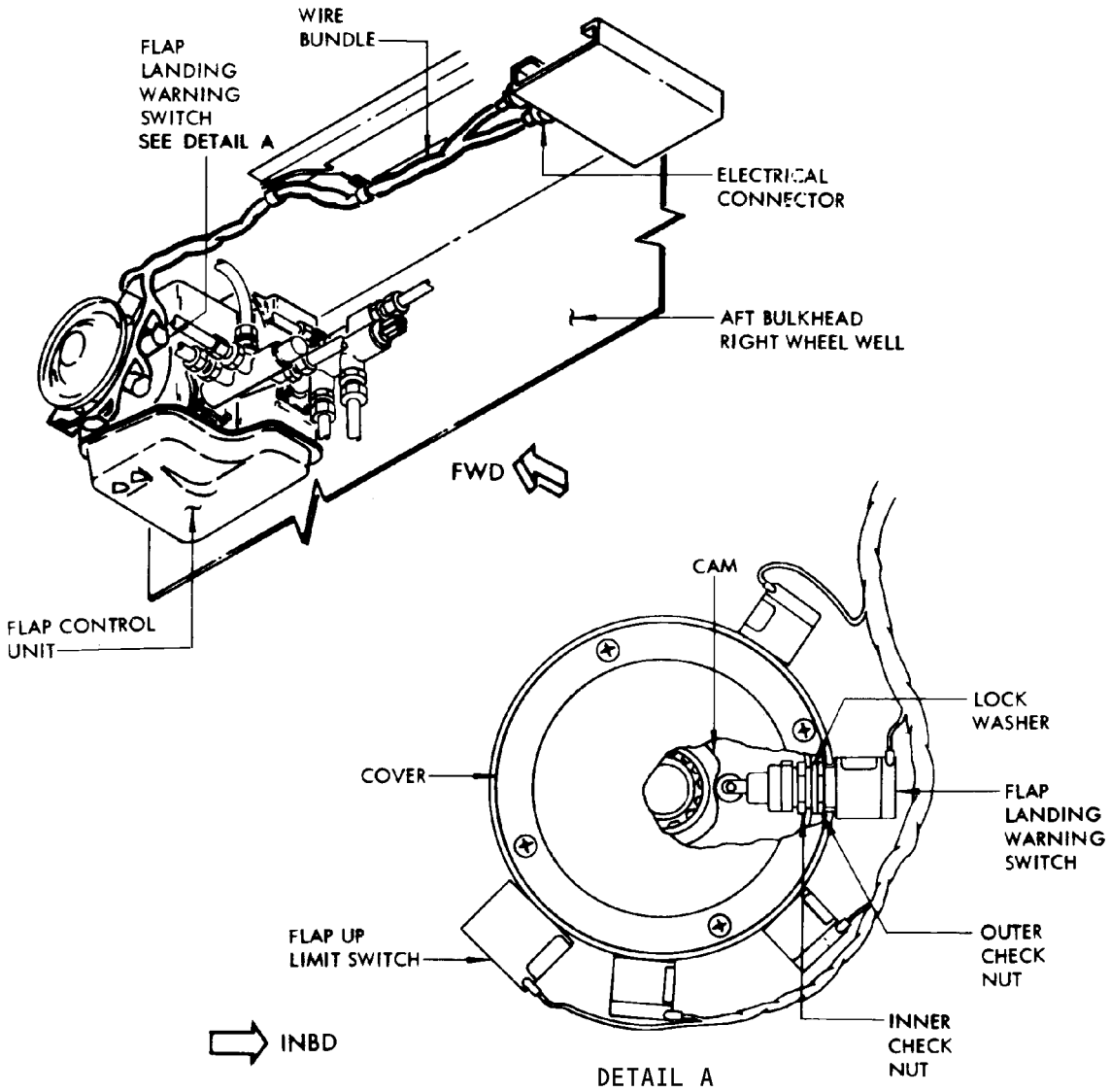
D. Test warning switch

(1) Test switch S139 or S140 (Ref 31-26-0 A/T [par. 4]).

FLAP LANDING WARNING SWITCH - REMOVAL/INSTALLATION

1. General
   A. Flap landing warning and flap limit switches are mounted on the flap control unit, located in the right wheel well.
   B. The flap up limit switch is part of the flap control system and provides an input to the landing gear position and warning system as an auxiliary function. The removal/installation of the flap up limit switch is covered in Chapter 27, Flight Controls.
2. Equipment and Materials
   A. Gear Ground Lockpin - F72735
3. Remove Flap Landing Warning Switch (Fig. 401)
   A. Check that all gear ground lockpins are installed.
   B. Open the AURAL WARNING, LIGHTS and GEAR SWITCH & ANTI-SKID TEST, circuit breakers on panel P6-2.
   C. Remove cover from flap control unit.
   D. Remove inner checknut from flap landing warning switch and remove switch from flap control unit.
   E. Remove switch electrical leads from wire bundle up to electrical connector.
   F. Disconnect electrical connector and remove landing gear warning switch pins from connector insert.
4. Install Flap Landing Warning Switch (Fig. 401)
   A. Insert flap landing warning switch in place in flap control unit and install inner checknut.
   B. Insert switch electrical leads in wire bundle. Tie and clamp wire bundle.
   C. Trim switch leads to length, install pin contacts on lead ends and install pin contacts in connector.
   D. Connect electrical connector.
   E. Close all circuit breakers opened in step 3.B.
   F. Adjust switch (Ref Flap Landing Warning Switch - Adjustment/Test).
   G. Replace cover on flap drive unit.





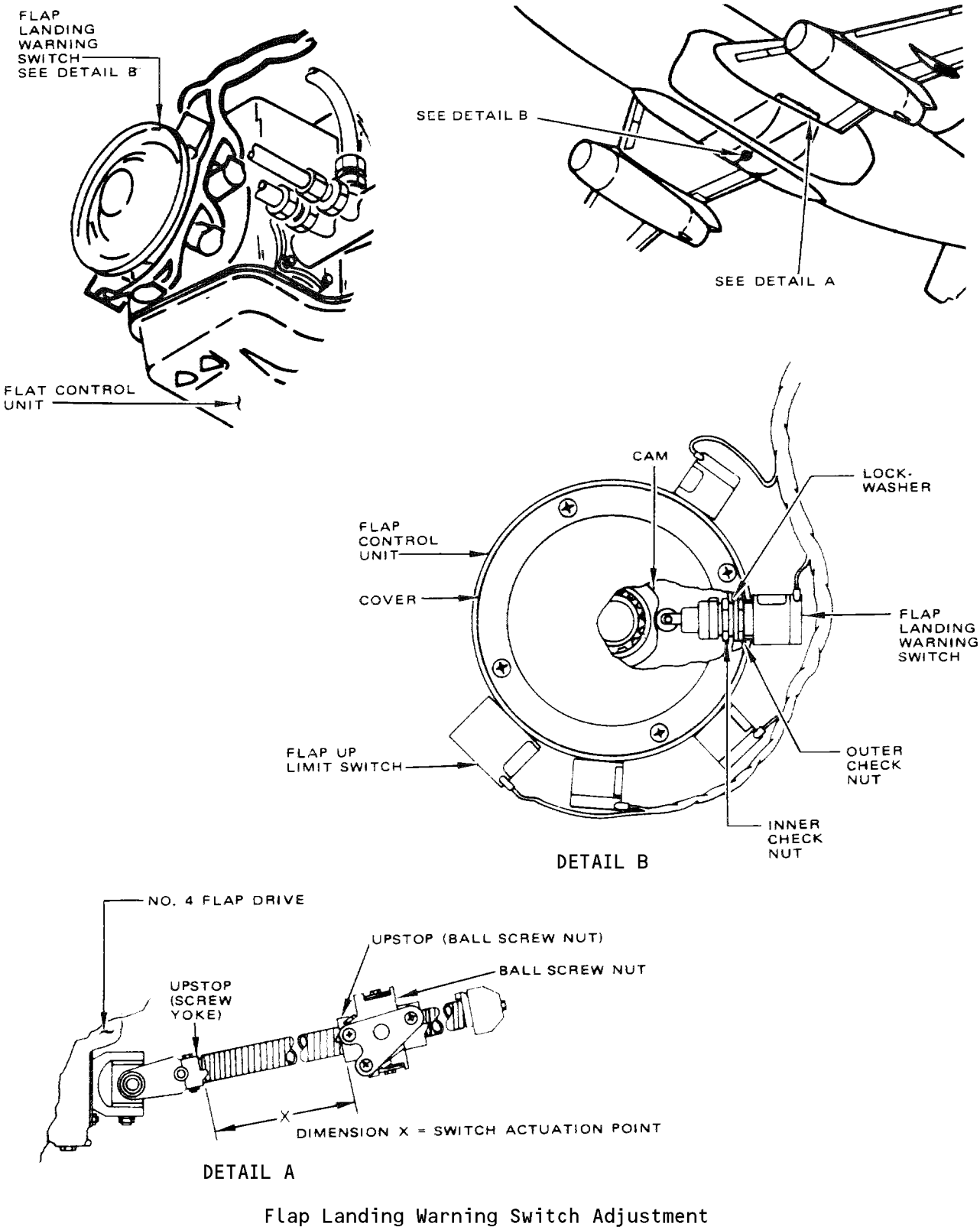
Flap Landing Warning Switch Installation
Figure 401

FLAP LANDING WARNING SWITCH - ADJUSTMENT/TEST

1. General
   A. Before adjusting flap landing warning switch, the flap system must be rigged (Ref Chapter 27, Trailing Edge Flap System).
   B. Flap up limit switch is part of the flight control system and is adjusted and tested as part of that system (Ref Chapter 27, Flap Limit Switches).
2. Flap Landing Warning Switch Adjustment (Fig. 501)
   A. Adjust Flap Landing Warning Switch
      (1) Connect external electrical power.
      (2) Retract flaps with flap control lever to normal retracted position (zero-unit detent) and hold for 5 minutes.
      (3) Remove No. 4 jackscrew fairing and record the dimension (Fig. 501) between upstop of ball screw nut and upstop on screw yoke.
      (4) AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE;
      move flap control lever to the 15-unit detent and, if necessary, position flaps electrically so that dimension X is an additional 24.95 to 25.10 inches from that recorded (AMM 27-51-0/501).
      (5) AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE;
      move flap control lever to the 10-unit detent and, if necessary, position flaps electrically so that dimension X is an additional 23.17 to 23.32 inches from that recorded (AMM 27-51-0/501).
      (6) Remove cover from flap control unit.
      (7) Adjust flap landing warning switch away from actuating cam until switch actuates.

          NOTE: There will be an audible click as switch actuates.

      (8) Tighten inner checknut on switch and lockwire.
      (9) Install cover on flap control unit.
      (10) Test switch per par. 3.
3. Flap Landing Warning Switch Test
   A. Equipment and Materials
      (1) Gear Ground Lockpins - F72735
   B. Prepare for Test
      (1) Jack airplane until wheels clear ground (Ref Chapter 7, Jacking Airplane).
      (2) Simulated landing gear position may be utilized when airplane jacks are not available, or jacking airplane is not possible.
      (3) Check that external power supply is connected.



Flap Landing Warning Switch Adjustment
Figure 501

(4) Check that all landing gear and landing gear warning system circuit breakers on circuit breaker panel P6 are closed.
(5) Check that all gear ground lockpins are installed.
(6) Pressurize hydraulic system A (Ref 29-11-0 MP).

C. Test Flap Landing Warning Switch
(1) Advance both engine thrust levers to a position greater than 25 degrees above idle stop.
(2) Remove right main gear ground lockpins. Operate override trigger and retract right main landing gear.
(3) If landing gear position is to be simulated, simulate right main gear retracted as described below. Also simulate air mode.
(a) Place landing gear lever in OFF position. Check that all red gear lights come on and green lights remain on. Warning horn remains silent.
(b) Place a copper deactuator shield between right main gear downlock sensor s73 and steel actuator arm.
(c) Place a steel actuator bar over right main gear uplock sensor switch s74 located beside the right main gear uplock hook.
(d) To simulate air mode for the main landing gear, disconnect the push-pull teleflex cable from the right main gear upper torsion link. Simulate air mode by extending the cable. Reconnect cable when complete. Do not in any way overstress the cable.

CAUTION: GENTLY PULL THE TELEFLEX CABLE UNTIL THE AIR/GND SENSOR ACTIVATES. IF THE CABLE IS NOT PULLED WITH CARE THE SENSOR TARGET BRACKET CAN BE BENT AND DAMAGED.

(4) Extend trailing edge flaps.
(a) AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE;
make sure that you hear the continuous horn at all flap control lever positions greater than 25 units from the normal retracted position (0 unit).
(b) AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE;
make sure that you hear the continuous horn at all flap control lever positions greater than 15 units from the normal retracted position (0 unit).
(5) Press horn reset button and check that horn continues to sound.

(6) Fully retract flaps.
(a) On AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE BU LN-SUA, LN-SUG, LN-SUP, LN-SUS MD 5R-MFA NH JA8401 thru JA8403, JA8405 thru JA8411, make sure the continuous horn goes off at all flap control lever positions less than 15 units during retraction.
(b) On AR ALL EXCEPT LV-JMW thru LV-JMZ, LV-JND, LV-JNE BU ALL EXCEPT LN-SUA, LN-SUG, LN-SUP, LN-SUS MD ALL EXCEPT 5R-MFA NH ALL EXCEPT JA8401 thru JA8403, JA8405 thru JA8411, make sure the continuous horn goes off at all flap control lever positions less than 10 units during retraction.

D. Restore Airplane to Normal Configuration
(1) Extend right main landing gear and install gear ground lockpin.
(2) If gear position was simulated, simulate a gear extension by removing all copper deactuator shields and steel actuator bars. Return the teleflex cable to its original position.
(a) Red lights should extinguish and green lights will illuminate.
(3) Determine if there is further need for electrical power on airplane, if not, disconnect electrical power.
(4) Determine if there is further need for hydraulic power on airplane; if not, remove System A hydraulic power (Ref 29-11-0).
(5) Lower airplane and remove jacks (Ref Chapter 7, Jacking Airplane).

THRUST-LEVER-ACTUATED LANDING GEAR WARNING SWITCHES - REMOVAL/INSTALLATION

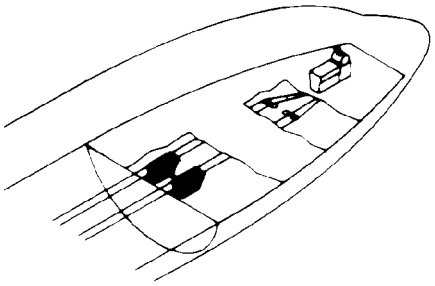
1. General
   A. The thrust lever actuated takeoff warning switches S133 and S283 are mounted on the friction drum and brake supports located in the electronic equipment compartment ceiling. Access to the switches is gained through the electronic equipment compartment access door. The removal/installation procedure is the same for both switches.
   B. The thrust lever actuated takeoff warning switches are adjusted using angular measurements taken at the engine cross-shaft.
2. Equipment and Materials
   A. Ohmmeter
   B. Airplane Control Surfaces Protractor - F52485-500
   C. Protractor Adapter (Engine Cross-Shaft) - 2MIT65-45109-22
   D. Protractor Adapter (Thrust Lever) - F72952-2
   E. Fuel Control Unit Idle Rig Pin - F70207-50

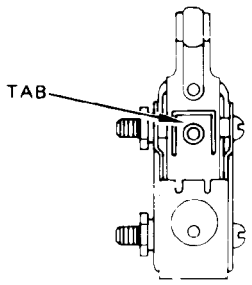
      NOTE: Rig pin is part of kit F70207-3

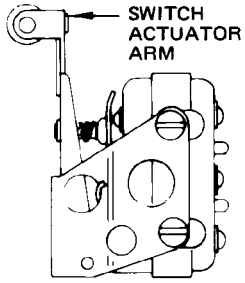
3. Remove Thrust Lever Actuated Takeoff Warning Switch (Fig. 401)
   A. Open circuit breakers LANDING GEAR LIGHTS and ANTI-SKID FAIL WARN & PARK BRAKE on panel P6.
   B. Disconnect electrical wiring from switch terminals.
   C. Remove switch mounting screws and remove switch from support.
   D. Remove switch actuator from switch.
4. Install Thrust Lever Actuated Takeoff Warning Switch (Fig. 401)
   A. Install switch actuator on switch.
   B. Place switch in position on support and install mounting screws.
   C. Adjust warning switch.

      NOTE: The engine control system must be properly rigged prior to adjusting the switch (AMM 76-11-0/501).

      (1) On airplanes not incorporating SB 31-1024 and/or SB 31-1026, perform the following:
         (a) Retard associated thrust lever to idle stop.
         (b) Open right side cowling on associated engine.
         (c) At engine fuel control unit, insert fuel control unit idle rig pin in thrust crank to fix thrust crank in idle position (Fig. 403).
         (d) Remove rig pin bracket (Fig. 402).
         (e) Mount protractor on engine cross-shaft hexnut using adapter; then, zero protractor.
         (f) Remove fuel control unit idle rig pin.



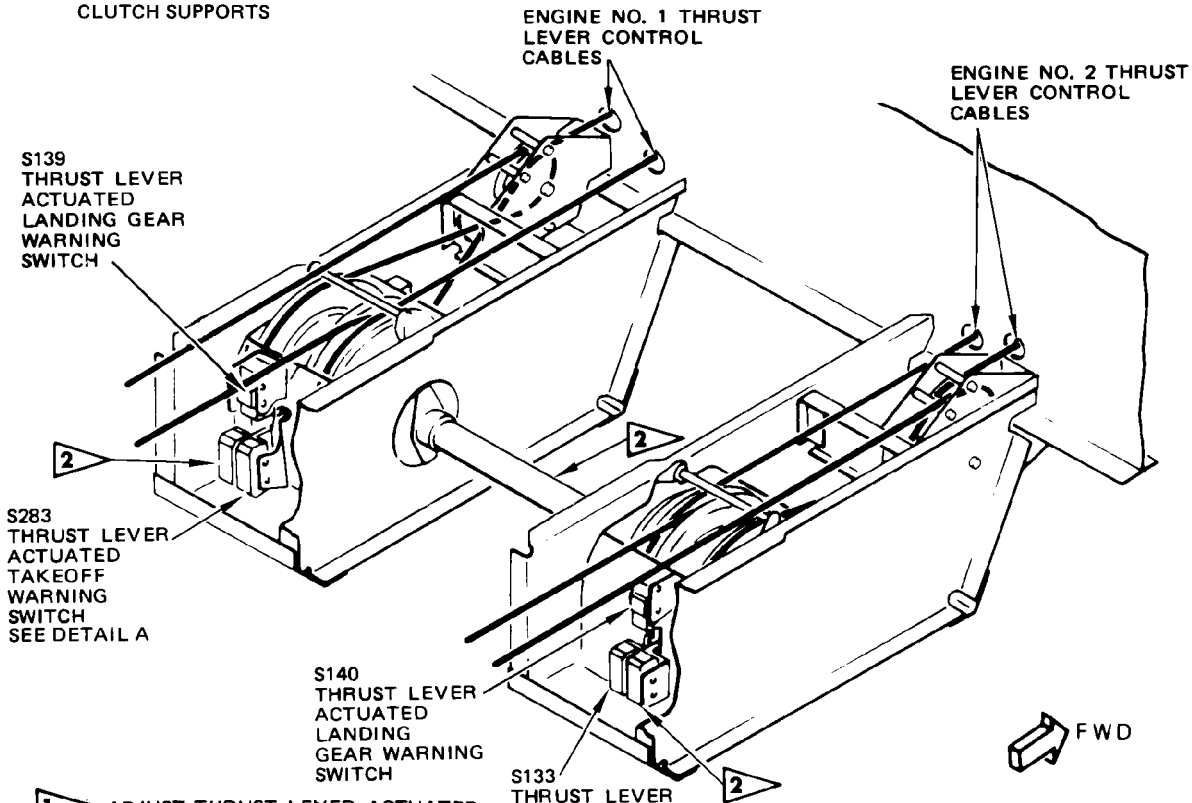




DETAIL A [1]

[1] DO NOT BEND ACTUATOR ARM. DO NOT BEND TAB MORE THAN ± 1/4 DEGREE FROM PLANE OF ACTUATOR ARM TO ATTAIN ADJUSTMENT. PREFFERED ADJUSTMENT METHOD IS TO MOVE SWITCH ASSEMBLY IN SWITCH SUPPORT SLOTS. REPLACE SWITCH ASSEMBLIES THAT HAVE BENT/DISTORTED ACTUATOR ARMS.

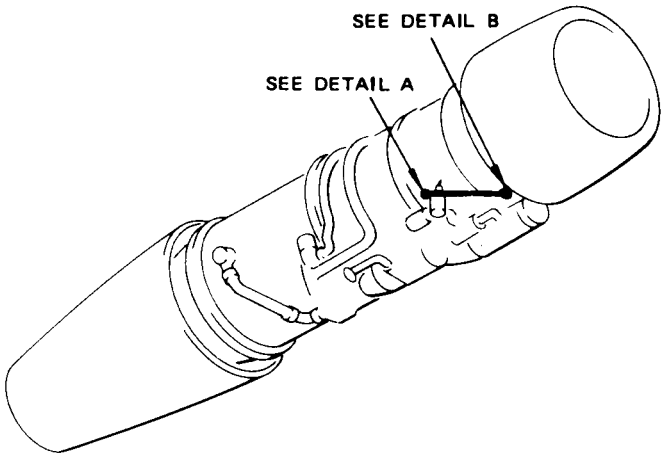
[2] INSTALLED ON AIRPLANES WITH AUTO THROTTLE CLUTCH SUPPORTS

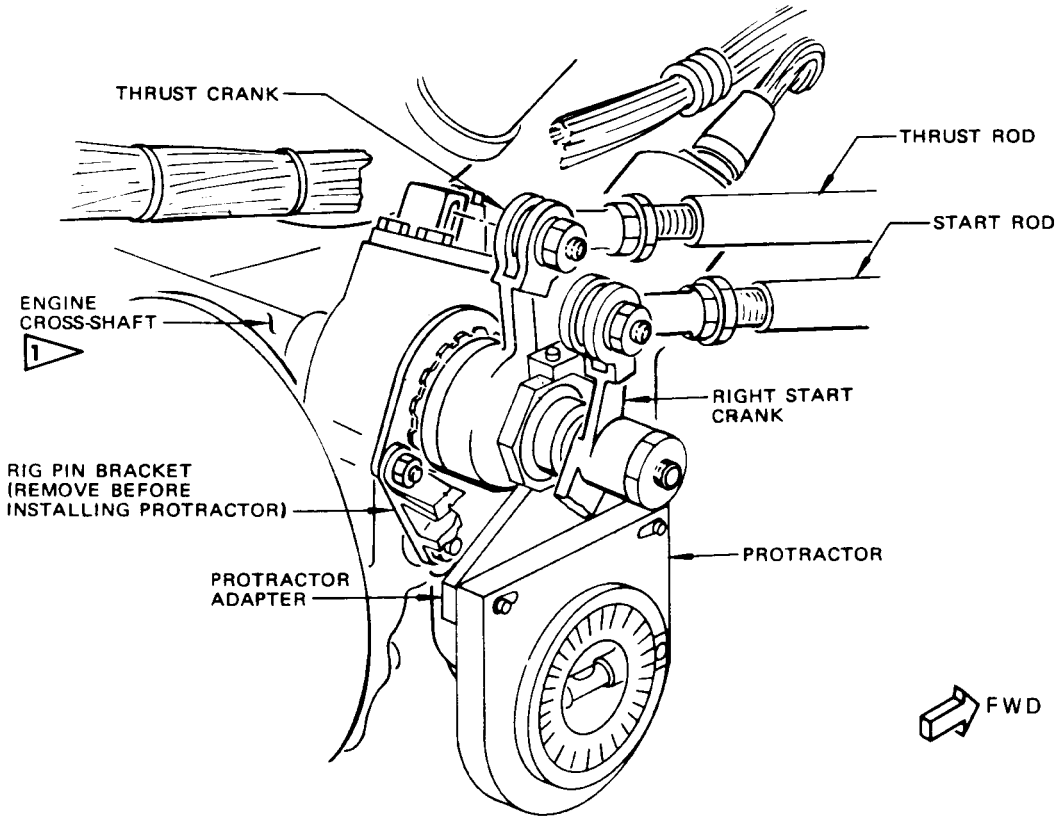


[1] ADJUST THRUST LEVER ACTUATED TAKEOFF WARNING SWITCH TO ACTUATE WHEN ENGINE CROSS-SHAFT IS 19.6–20.6 DEGREES COUNTERCLOCKWISE FROM IDLE

AUTO THROTTLE CLUTCH OR FRICTION DRUM AND BRAKE SUPPORTS

Thrust Lever Actuated Switch Installation
Figure 401

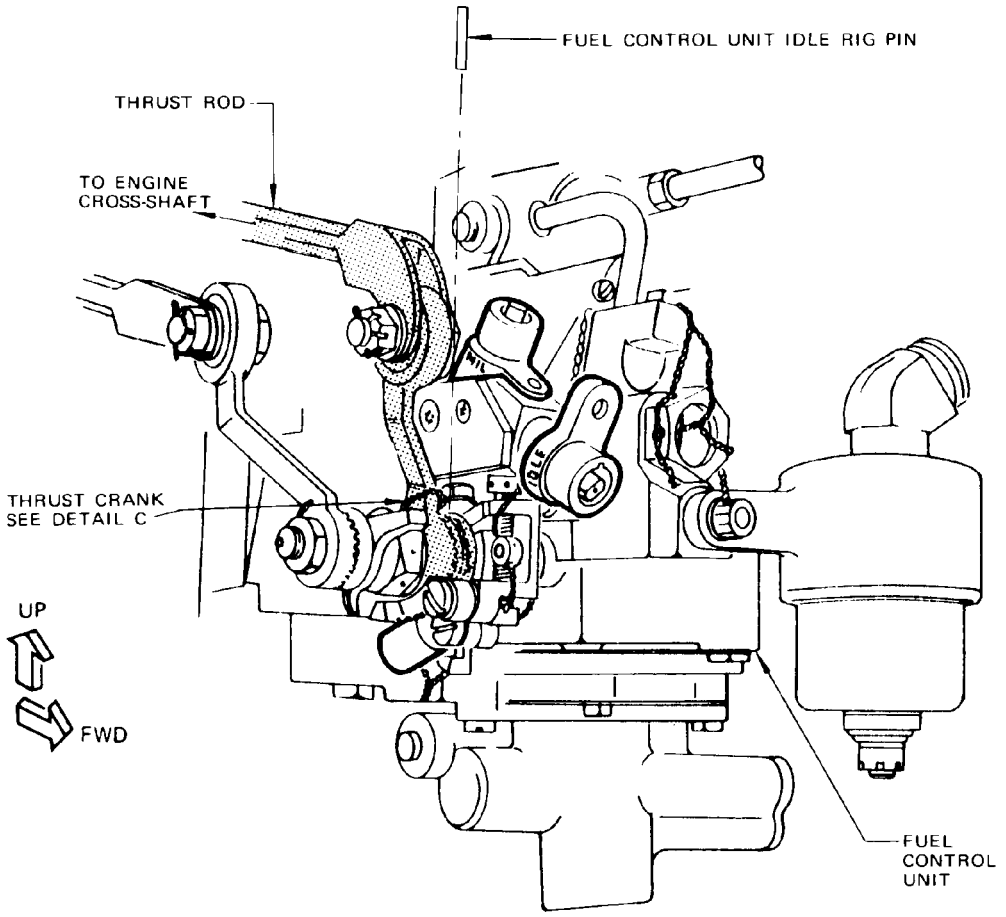




DETAIL A

1 ADJUST THRUST LEVER ACTUATED TAKEOFF WARNING SWITCH TO ACTUATE WHEN ENGINE CROSS-SHAFT IS 20.6–21.6 DEGREES COUNTERCLOCKWISE FROM IDLE

Engine Cross-Shaft Positioning for Thrust Lever Actuated Takeoff Warning Switch
Figure 402



Engine Cross-Shaft Positioning for Thrust
Figure 403

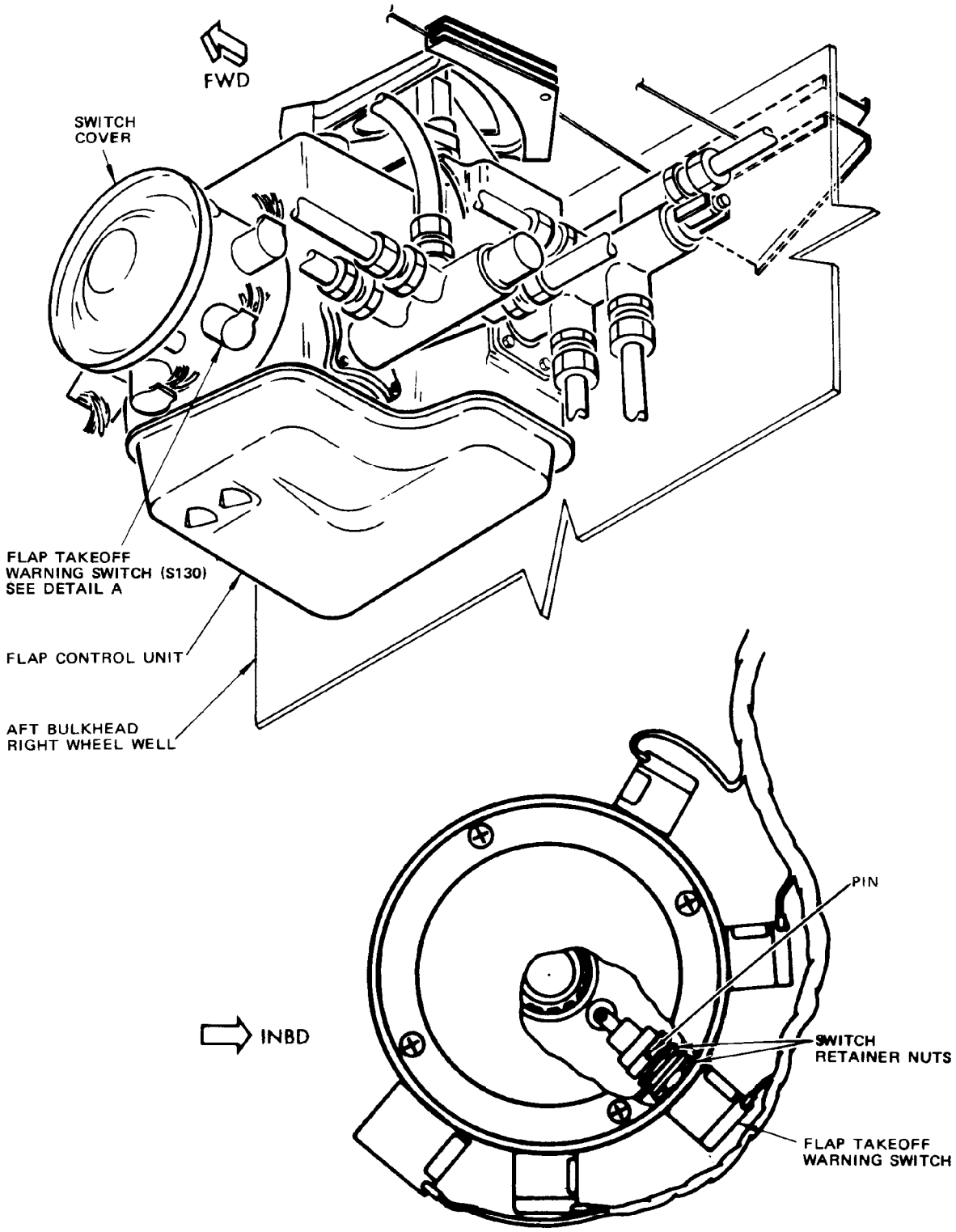
(g) Connect ohmmeter across terminals C and NO of takeoff warning switch (either set if two sets of terminals) and check that switch is not actuated (no continuity through switch).
(h) Advance associated thrust lever until takeoff warning switch actuates (continuity through switch) and check that engine cross-shaft rotates to position required in Fig. 402.
(i) If switch does not actuate at correct cross-shaft position, move switch in slotted switch support mounting holes, or adjust position of switch actuating cam (if adjustable cam provided).
(j) Remove ohmmeter and connect electrical wiring to switch terminals.

(2) On airplanes incorporating SB 31-1024 and/or SB 31-1026, perform the following:
(a) Retard associated thrust lever to idle stop.
(b) Place protractor with adapter on associated thrust lever and set protractor to 0 degree.
(c) Connect ohmmeter across terminals C and NO of switch (either set of two sets of terminals) and check that switch is not actuated (no continuity through switch).
(d) Advance associated thrust lever until switch actuates (continuity through switch). Check that thrust lever is 12.5 ±1 degrees forward of idle stop.
(e) If switch does not actuate at correct thrust lever position, adjust position of switch in slotted switch support, or adjust position of switch actuating cam (if adjustable cam provided), or bend tab ± 1/4 degree on switch actuator arm (Fig. 401).
(f) Remove ohmmeter and connect electrical wiring to switch terminals.

D. Test Warning Switch (AMM 31-26-0/501)

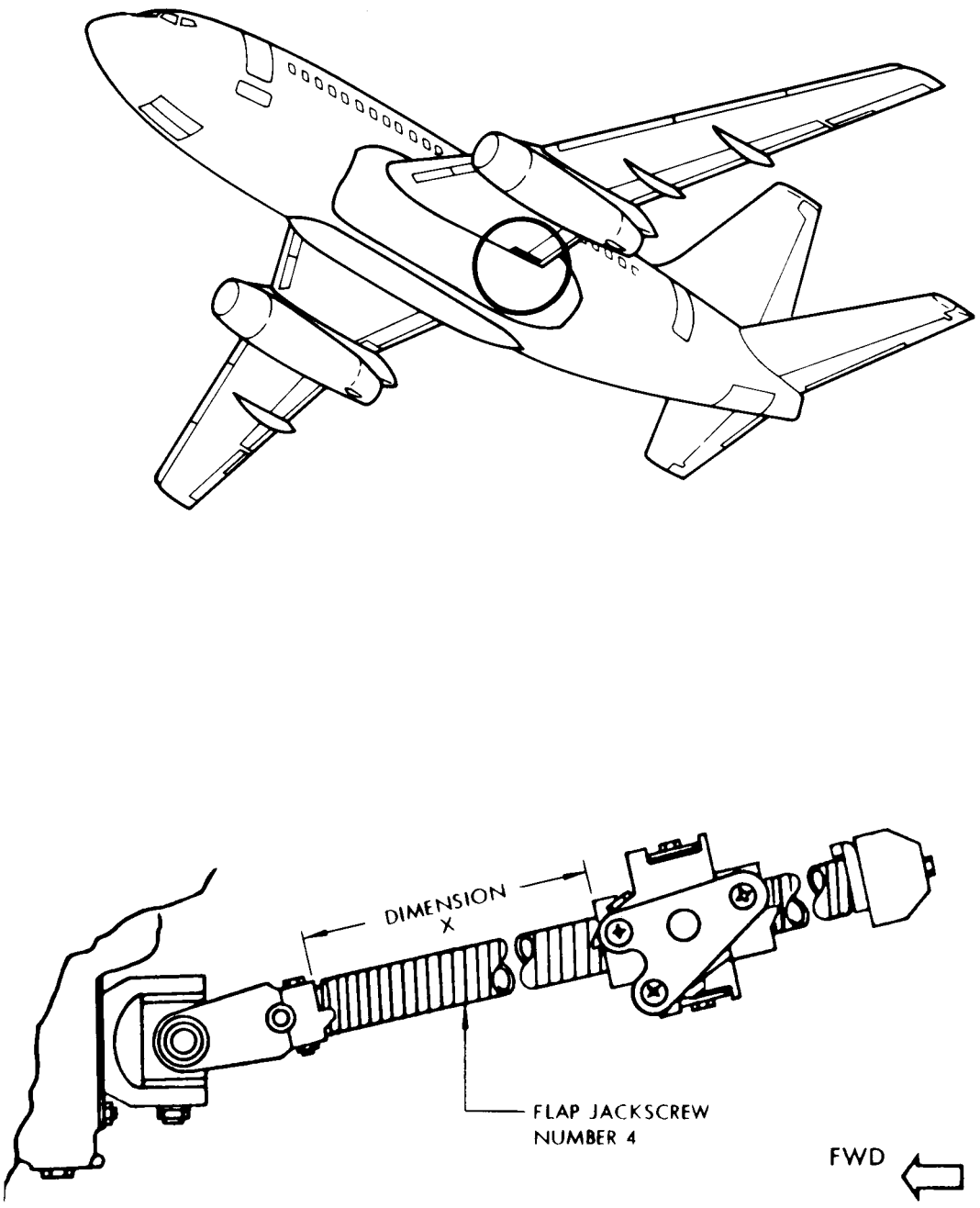
FLAP TAKEOFF WARNING SWITCH - REMOVAL/INSTALLATION

1. General
   A. The flap take off warning switch (S130) is the center switch installed on the flap control unit (Fig. 401). The switch leads make a single wire bundle and must be separated during switch removal, and retied when a new switch is installed.
2. Remove Flap Takeoff Warning Switch (Fig. 401)
   A. Open LIGHTS and AURAL WARN circuit breakers on P6 panel.
   B. Remove switch cover from flap control unit .
   C. Separate wire bundle connector from receptacle.
   D. Remove two wire bundle support clamps.
   E. Cut wire bundle ties and separate takeoff warning switch leads from remainder of bundle.
   F. Remove takeoff warning switch leads from connector.
   G. Extract pin to release roller guide.
   H. Remove retainer nut from takeoff warning switch and remove switch from control unit.
   I. Replace nut, roller guide and pin on switch.
3. Install Flap Takeoff Warning Switch (Fig. 401)
   A. Remove pin, roller guide and one retainer nut from switch .
   B. Position switch in flap control unit and install retainer nut and roller guide. Install pin to secure roller guide.
   C. Install switch leads in connector and connect to receptacle.
   D. Replace wire bundle ties.
   E. Install two wire bundle support clamps.
   F. Close LIGHTS and AURAL WARN circuit breakers on P6 panel.
   G. Adjust flap takeoff warning switch, as follows:
      (1) Provide system A hydraulic power (Ref 27-51-0, Maintenance Practices).
      (2) Provide electrical power.
      (3) Check LIGHTS and AURAL WARN circuit breakers on panel P6 are closed.
      (4) Retract the flaps with the flap control lever to their normal retracted position (zero unit detent) and hold for 5 minutes.
      (5) Remove the No. 4 jackscrew fairing and record the X dimension (Fig. 402) between the No. 4 ball screw nut and its upstop.
      (6) Position the flaps with the flap control lever to the 25-unit detent and position the flaps electrically so that dimension X is an additional 25.96 to 26.11 inches from that recorded in step (5).
      (7) Remove hydraulic power (Ref 27-51-0).



DETAIL A

Flap Takeoff Warning Switch Installation
Figure 401



Flap Jackscrew Measurement
Figure 402

(8) Adjust takeoff warning switch toward its actuating cam until switch actuates.

NOTE: are must be taken to pre-position switch so that actuation takes place with switch body being moved toward cam.

(9) Lockwire switch retainer nuts.
(10 Install switch cover on flap control unit.
(10) Position alternate flap switch to OFF.
(11) Replace jackscrew fairing.
(12) Provide electrical power (Ref 27-51-0).
(13) Position flap control lever to FLAP UP detent.

H. Test flap takeoff warning switch, as follows:
(1) Provide trailing edge flap system A hydraulic power (Ref 27-51-0, Maintenance Practices).
(2) Provide electrical power.
(3) Set stabilizer so that indicator is in green band.
(4) Set speed brake lever to DOWN position.
(5) Advance thrust lever full forward.
(6) With flaps retracted check that warning horn sounds.
(7) Place flap control lever in 1-unit position and check that warning horn stops sounding before flaps reach 1-unit position.
(8) Place flap control lever in 25-unit position and check that warning horn remains silent.
(9) Place flap control lever in 30-unit position and check that warning horn sounds as the flaps move from the 25-unit position.
(10) Retract flaps.

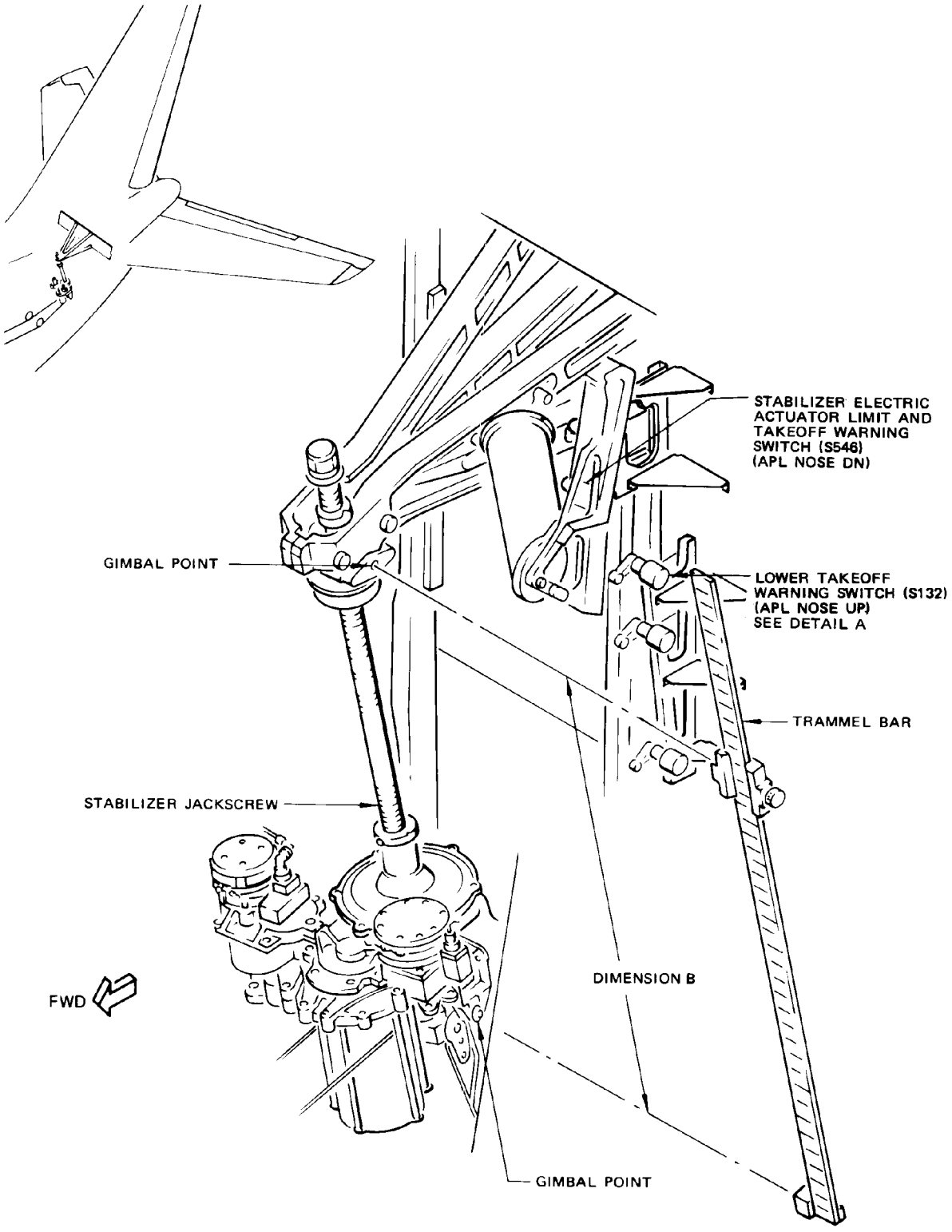
I. Restore airplane to normal.
(1) Remove system A hydraulic power (Ref 27-51-0).
(2) If no longer required, remove electrical power.

STABILIZER TAKEOFF WARNING SWITCHES - REMOVAL/INSTALLATION

1. General
   A. The two stabilizer takeoff warning switches, the upper (APL NOSE DN) (S546) and lower (APL NOSE UP) (S132), are actuated by the upper and lower limit switch cams. The upper takeoff warning switch (S546) combines the functions of stabilizer electric actuator limit and takeoff warning. Replace lower switch (S132) per this procedure. Upper switch (S546) should be replaced per AMM 27-41-101/401, although adjustment and test for the takeoff warning function can be performed per this procedure.
2. Equipment and Materials
   A. Stabilizer Actuator Trammel Bar - F80055-1
3. Remove Stabilizer Takeoff Warning Switch
   A. Open LIGHTS and AURAL WARN circuit breakers on P6 panel.
   B. Open access door 3701 and locate stabilizer takeoff warning switches (Fig. 401).
   C. Disconnect switch leads at splice.
   D. Remove locknut and retainer nut from switch shaft, and remove actuator arm from shaft.
   E. Remove retainer nut from switch shaft and remove switch from support bracket.
4. Install Stabilizer Takeoff Warning Switch
   A. Position switch assembly through support bracket and install retainer nut. Lockwire nut (Fig. 401).
   B. Position actuator arm on switch shaft and set to obtain trial dimension shown in figure. Install retainer nut and locknut.
   C. Match color-coded wires and splice. Make sure wires are properly routed through clamps.
   D. Close LIGHTS and AURAL WARN circuit breakers on P6 panel.
   E. Adjust upper and lower takeoff warning switch as follows:
      (1) Open LIGHTS and AURAL WARN circuit breakers on P6 panel.
      (2) Set dimension B as required for switch adjustment in table (Fig. 401).
      (3) Loosen but do not remove locknut securing switch arm to switch.

          CAUTION: IF LOCKNUT IS NOT LOOSENED, DAMAGE TO WORM GEAR MECHANISM CAN OCCUR DURING ADJUSTMENT.

      (4) Loosen worm gear locking screw and turn worm gear on opposite side until switch actuates.
      (5) Tighten and lockwire worm gear locking screw, then tighten locknut.
      (6) Close LIGHTS and AURAL WARN circuit breaker on P6 panel.

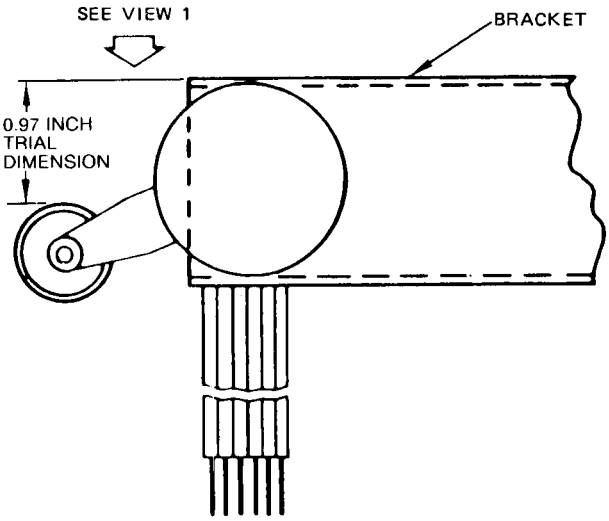


Stabilizer Takeoff Warning Switch Installation
Figure 401 (Sheet 1)

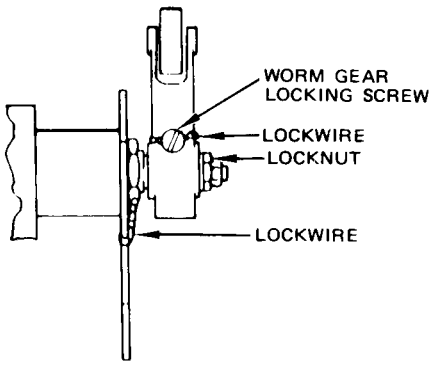
SWITCH	DIMENSION B FOR HORN SOUNDING	DIMENSION B FOR SWITCH ADJUSTMENT
UPPER SWITCH (AIRPLANE NOSE DOWN) (S131 or S546)	41.84-42.44 INCHES	42.14 ±0.05 INCHES
LOWER SWITCH (AIRPLANE NOSE UP) (S132)	34.70-34.10 INCHES 1	34.40 ±0.05 INCHES 1
	33.26-32.66 INCHES 2	32.96 ±0.05 INCHES 2

1 AR LV-JMW thru LV-JMZ, LV-JND, LV-JNE; IC VT-EAG thru VT-EAM; MD 5R-MFA; NH JA8403 thru JA8411; TM CR-BAA, CR-BAB

2 ALL EXCEPT 1



DETAIL A



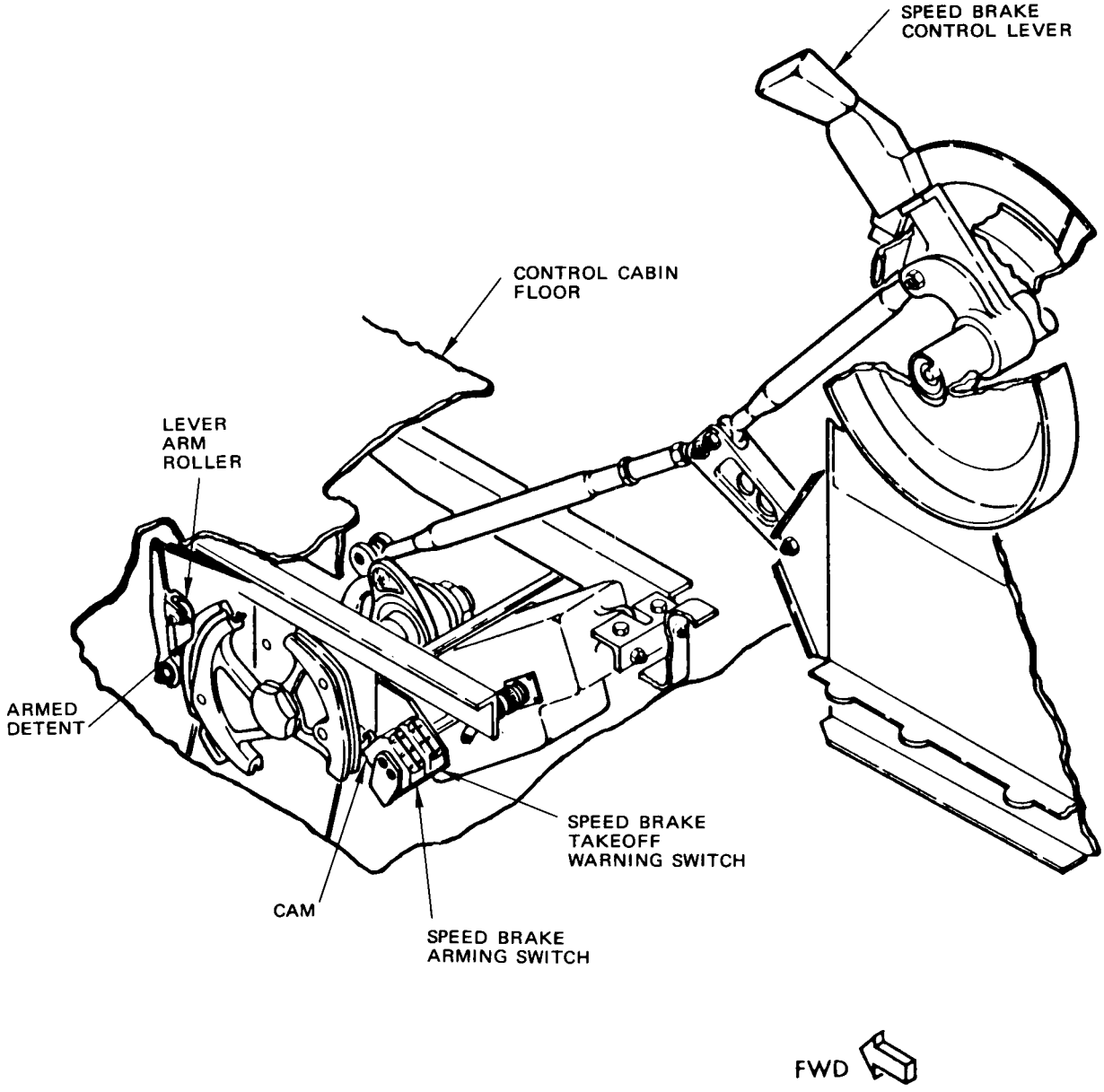
VIEW 1

Stabilizer Takeoff Warning Switch Installation
Figure 401 (Sheet 2)

F. Test upper and lower takeoff warning switch as follows:
   (1) Close LIGHTS and AURAL WARN circuit breakers on P6 panel.
   (2) Ensure speed brakes are down and flaps are in takeoff range.
   (3) Advance either engine thrust lever full forward.
   (4) For upper switch, move stabilizer in leading edge up (APL NOSE DN) direction. Check that warning horn sounds when dimension B is within the range for horn sounding in table (Fig. 401) for upper switch. Use trammel bar to measure dimension B, as shown.
   (5) For lower switch, move stabilizer in leading edge down (APL NOSE UP) direction. Check that warning horn sounds when dimension B is within the range for horn sounding (Table 1) for lower switch. Use trammel bar to measure dimension B, as shown.
   (6) Return thrust lever to idle.
   (7) Close access door 3701.

SPEED BRAKE TAKEOFF WARNING AND ARMING SWITCHES - REMOVAL/INSTALLATION

1. General
   A. The speed brake takeoff warning (S129) and arming (S276) switches are mounted on a common bracket with common attachment screws and share a common switch actuator. The switches are actuated by a cam attached to the speed brake forward drum quadrant in the lower nose compartment. Neither switch can be replaced nor adjusted alone.
2. Equipment and Materials
   A. Ohmmeter
3. Remove Speed Brake Takeoff Warning and Arming Switches (Fig. 401)
   A. Set speed brake lever on control stand at about mid travel.
   B. Open LANDING GEAR LIGHTS circuit breaker on P6 panel.
   C. Open lower forward fuselage nose access door.
   D. Disconnect electrical leads from switch to be replaced.
   E. Remove attachment screws and remove switches and actuator.
4. Install Speed Brake Takeoff Warning and Arming Switches (Fig. 401)
   A. Hold switches and actuator in position and install attachment screws.
   B. Connect electrical leads to replaced switch.
   C. Adjust speed brake warning and arming switches as follows:
      (1) Place speed brake control lever in ARMED position so that lever arm roller is centered in ARMED detent on cam.
      (2) Place 0.18-inch thick feeler gage between switch actuator roller and cam on speed brake quadrant. Check that continuity does not exist between common and normally closed contacts of takeoff warning and arming switches.
      (3) Place 0.08-inch thick feeler gage between switch actuator roller and cam. Check that continuity exists between common and normally closed contacts of takeoff warning and arming switches.
      (4) Adjust switch as necessary to meet actuation requirements. Bend switch tab, if necessary. Ensure that switch attachment screws are tightened.
      (5) Close LANDING GEAR LIGHTS circuit breaker on P6 panel.
      (6) Return speed brake lever to down position.
   D. Test speed brake warning switch.
      (1) Provide electrical power.
      (2) Provide system A hydraulic power (Ref 27-62-0, Maintenance Practices).
      (3) Check that LIGHTS and AURAL WARN circuit breakers on P6 panel are closed.
      (4) Set stabilizer trim so that indicator is in green band.
      (5) Set flaps in takeoff range.
      (6) Ensure that speed brakes are down.
      (7) Advance either thrust lever fully forward.



Speed Brake Takeoff Warning Switch Adjustment
Figure 401

(8) Pull speed brake lever aft to the ARMED detent. Check that warning horn sounds.
(9) Return speed brake lever to down position and check that horn stops.
(10) Remove system A hydraulic power (Ref 27-62-0).
(11) Remove electrical power if no longer required.

E. Test speed brake arming switch.

NOTE: Weight of airplane must be on the landing gear for this test.

(1) Provide electrical power.
(2) Provide system A hydraulic power (Ref 27-62-0, Maintenance Practices).
(3) Place both inboard and outboard antiskid switches to ON. Switches are located on center instrument panel.
(4) On circuit breaker panel P6 ensure that the following circuit breakers are closed:
INDICATOR LIGHTS
FLIGHT CONTROL VALVES
SPOILER SHUTOFF VALVES
AUTO SPEED BRAKE
ALL ANTISKID
(5) Place engines No. 1 and 2 thrust levers in idle position.
(6) Place speed brake control lever in ARMED position. Check that ARMED light on center panel comes on.
(7) Move speed brake control lever forward to DOWN position and check that ARMED light goes off.
(8) Remove system A hydraulic power (Ref 27-62-0).
(9) Remove electrical power if no longer required.

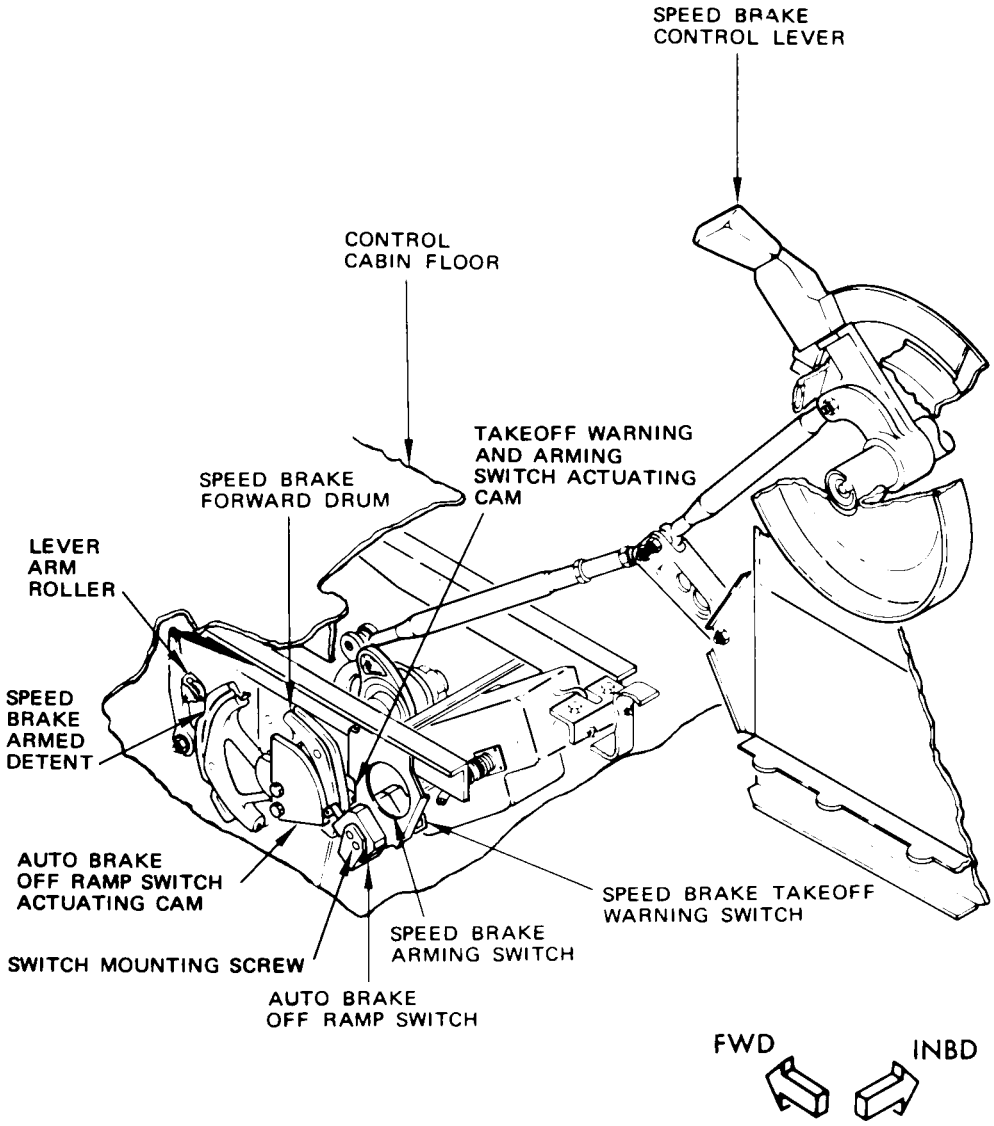
SPEED BRAKE TAKEOFF WARNING AND ARMING SWITCHES AND AUTOBRAKE

OFF RAMP SWITCH - REMOVAL/INSTALLATION

1. General
   A. The speed brake takeoff warning (S129), speed brake arming (S276) and autobrake off ramp (S585) switches are mounted on a common bracket with common attachment screws. The speed brake takeoff warning and arming switches share a common switch actuator which is actuated by a cam installed on the speed brake quadrant in the lower nose compartment. The autobrake off ramp switch is actuated by a separate switch actuator which is actuated by a separate cam on the same speed brake quadrant. The autobrake off ramp switch functions in the automatic braking system (Ref 32-43-00). None of the three switches can be replaced or adjusted by itself.
2. Equipment and Materials
   A. Ohmmeter
3. Remove Takeoff Warning, Arming or Off Ramp Switch (Fig. 401)
   A. Set speed brake lever on control stand at about mid travel.
   B. Open LANDING GEAR LIGHTS circuit breaker on P6 panel.
   C. Open lower forward fuselage nose access door.
   D. Disconnect electrical leads from switch to be replaced.
   E. Remove attachment screws and remove switches and actuator.
4. Install Takeoff Warning, Arming or Off Ramp Switch (Fig. 401)
   A. Hold switches and actuators in position and install attachment screws.
   B. Connect electrical leads to replaced switch.
   C. Adjust takeoff warning, arming and autobrake off ramp switches as follows:

      NOTE: All three switches, speed brake takeoff warning and arming and autobrake off ramp, require adjustment if the common attachment screws were loosened. Adjust speed brake warning and arming switches as follows:

      (1) Place speed brake control lever in ARMED position so that lever arm roller is centered in ARMED detent on cam.
          (a) Place 0.18-inch thick feeler gage between switch actuator roller and cam on speed brake quadrant. Check that continuity does not exist between common and normally closed contacts of takeoff warning and arming switches.
          (b) Place 0.08-inch thick feeler gage between switch actuator roller and cam. Check that continuity exists between common and normally closed contacts of takeoff warning and arming switches.



Speed Brake Takeoff Warning and Arming Switches
Figure 401

464914

(c) Adjust switch as necessary to meet actuation requirements. Bend switch tab, if necessary. Ensure that switch attachment screws are tightened.
(d) Close LANDING GEAR LIGHTS circuit breaker on P6 panel.
(e) Return speed brake lever to down position.

(2) Adjust autobrake off ramp switch as follows:
(a) Check that switch attavhment screws are tightened.
(b) Set speed brake lever to DOWN position.
(c) Connect ohmmeter across terminals C and NO of switch and check for continuity between switch terminals.
(d) Move speed brake lever aft and check that open circuit between switch terminals is obtained when speed brake lever is 3.28 to 3.84 inches aft from DOWN position.
(e) Adjust switch as required by bending switch actuator tab.
(f) Remove ohmmeter and set speed brake lever to DOWN position.

D. Test takeoff warning, arming and autobrake off ramp switches as follows:

(1) Test speed brake takeoff warning switch.
(a) Provide electrical power.
(b) Provide system A hydraulic power (Ref 27-62-0, Maintenance Practices).
(c) Check that LIGHTS and AURAL WARN circuit breakers on P6 panel are closed.
(d) Set stabilizer trim so that indicator is at least one-half unit inside green band.
(e) Set flaps in takeoff range.
(f) Ensure that speed brakes are down.
(g) Advance either thrust lever fully forward.
(h) Pull speed brake lever aft to the ARMED detent. Check that warning horn sounds.
(i) Return speed brake lever to down position and check that horn stops.
(j) Remove system A hydraulic power (Ref 27-62-0).
(k) Remove electrical power if no longer required.

(2) Test speed brake arming switch.

NOTE: Weight of airplane must be on the landing gear for this test.

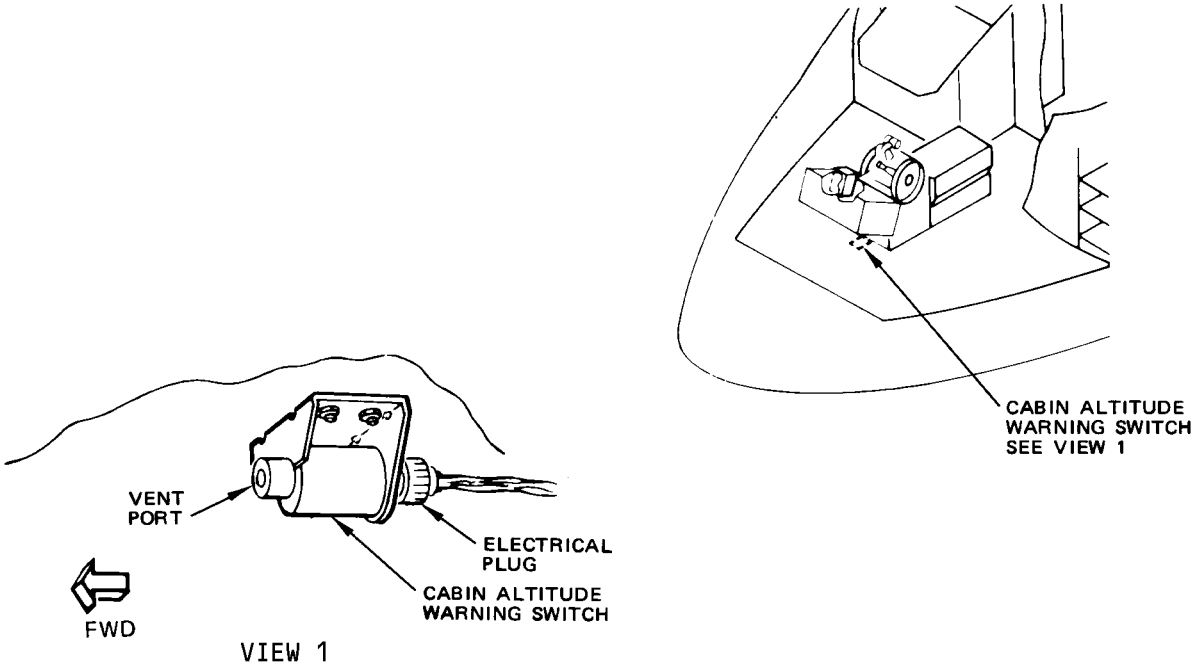
(a) Provide electrical power.
(b) Provide system A hydraulic power (Ref 27-62-0, Maintenance Practices).
(c) Place both inboard and outboard antiskid switches to ON. Switches are located on center instrument panel.

(d) On circuit breaker panel P6 ensure that the following circuit breakers are closed:
INDICATOR LIGHTS
FLIGHT CONTROL VALVES
SPOILER SHUTOFF VALVES
AUTO SPEED BRAKE
ALL ANTISKID
(e) Place engines No. 1 and 2 thrust levers in idle position.
(f) Place speed brake control lever in ARMED position. Check that ARMED light on center panel comes on.
(g) Move speed brake control lever forward to DOWN position and check that ARMED light goes off.
(h) Remove system A hydraulic power (Ref 27-62-0).
(i) Remove electrical power if no longer required.

(3) Test autobrake off ramp switch:
(a) Set speed brake lever to DOWN position.
(b) Connect ohmmeter across terminals C and NO of switch and check for continuity between switch terminals.
(c) Move speed brake lever aft until open circuit is obtained between switch terminals.
(d) Check the speed brake lever is 3.28 to 3.84 inches aft from down and locked position.
(e) Remove ohmmeter and set speed brake lever to down position.

CABIN ALTITUDE WARNING SWITCH - REMOVAL/INSTALLATION

1. General
   A. The cabin altitude warning switch is located on the underside of the control cabin floor near the airplane centerline at station 192. Access is gained by removing access door 1103 from just forward of the nose wheel well.
2. Remove Cabin Altitude Warning Switch (Fig. 401)
   A. Remove access door 1103.
   B. Disconnect electrical plug at warning switch.
   C. Remove switch mounting fasteners and remove switch.
3. Install Cabin Altitude Warning Switch (Fig. 401)
   A. Position switch against floor panel and install fasteners.
   B. Connect electrical connector to switch.
   C. Install access door 1103.
   D. Test Cabin Door Altitude Warning Switch
      (1) Provide electrical power.
      (2) Check that following circuit breakers are closed:
         (a) LEVER LATCH AND PRESS WARNING
         (b) AURAL WARN
      (3) Connect vacuum source to vent port of switch.
      (4) Evacuate system to about 5 psi vacuum (10 psia).
      (5) Check that warning horn sounds intermittently,
      (6) Press ALTITUDE HORN CUTOUT switch and check that horn stops blowing.
      (7) Remove vacuum source electrical power, if no longer required.



Cabin Altitude Warning Switch Installation
Figure 401