CHAPTER

34

NAVIGATION

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CHAPTER 34 - NAVIGATION
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CHAPTER 34 - NAVIGATION
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NAVIGATION - DESCRIPTION AND OPERATION

1. General

A. Navigation system includes those systems, components and units which provide aircraft navigational information.

The Maintenance Manual Chapter 34-00-00 “Navigation” consists in the following sections:

34-10-00 Flight Environment Data;

34-12-00 Attitude and Direction;

34-40-00 Independent Position Determining;

34-50-00 Dependent Position Determining System;

34-60-00 Flight Management Computing.

Note that for the P180 AVANTI II avionics suite Localizer, Glide Slope and Marker Beacon functions (typically represented into the chapter 34-30-00, namely Landing and Taxing Aids) are integrated into a unique equipment, including VOR, ILS, MKR and ADF capability. These equipments have been included into the Section 34-50-00 “Dependent Position Determining System”.

The Stand By Instrument, model GH-3100, is an independent equipment including both Air Data and Attitude data source capability.

The Air Data section is represented in part of 34-10-00, while Attitude section, is represented on part of 34-20-00.

The Radio Tuning Unit, model RTU-3000, that includes controls for both Communication and Navigation systems has been included into Section 34-50-00, while Communication section is recalled on the chapter 23-00-00, Communication Systems.

The Control Display Unit, model CDU-3000, that includes controls for both Communication and Navigation systems has been included into Section 34-50-00, while Communication section is recalled on the chapter 23-00-00 Communication Systems and Flight Management Computing section is recalled into the 34-60-00.

For general information, Navigation System schematic block diagram is shown in Fig. 1, Equipments location in the Nose Avionics Bay, in the Cockpit Instrument Panels and Antennas location are shown in the Fig. 2, 3 and 4.

B. In detail the chapter 34-00-00 "Navigation" consists of:

(1) 34-10-00 "Flight Environment Data"

The Section 34-10-00 "Flight Environment Data" includes that portion of the system which senses environmental conditions and uses the data to influence navigation. Includes such items as Air Data Computers, pitot/static systems, air temperature, rate-of-climb, airspeed, high speed warning, altitude reporting, altimeter correction system, etc.

Specifically, the Section 34-10-00 "Flight Environment Data", includes:

34-11-00 Pitot / Static System;

34-12-00 Air Data System;

34-13-00 Standby Instrument (Air Data section);

Note that the Standby Instrument is an independent source including both Air Data and Attitude capability. Therefore the description of this component is shared between Sections 34-13-00 and 34-22-00.

(2) 34-20-00 "Attitude & Direction"

The Section 34-20-00 "Attitude and Direction" includes the portion of the system which uses magnetic or inertia forces to sense and display the direction or attitude of the aircraft. This includes sensing, computing, indicating, and warning devices, such as magnetic compasses, vertical and directional references, magnetic heading systems, attitude director systems, etc.

Specifically, the Section 34-20-00 "Attitude and Direction" includes:

34-21-00 Attitude and Heading System;

34-20-00 Standby Instrument (Attitude section);

34-23-00 Magnetic Compass;.

(3) 34-40-00 "Indipendent Position Determining"

The Section 34-40-00 "Independent Position Determining" includes that portion of the system which provides information to determine position and is mainly independent of ground installation or orbital satellites. Includes items such as inertial guidance systems, weather radar, proximity warning, etc.

Specifically, the Section 34-40-00 "Independent Position Determining" includes:

34-41-00 Weather Radar System.

34-42-00 Radio Altimeter.

34-43-00 TCAS I

34-44-00 TWAS

34-45-00 Turbulence Radar System

(4) 34-50-00 "Dependent Position Determining"

The Section 34-50-00 "Dependent Position Determining" includes that portion of the system which provides information to determine position and is mainly dependent on ground installation or orbital satellites. Includes items such as DME, transponders, radio compass, VOR, ADF, GLOBAL POSITIONING, etc.

Specifically, the Section 34-50-00 "Dependent Position Determining" includes:

34-51-00 Radio Tuning Unit;

34-52-00 Control Display Unit;

34-53-00 VOR/ILS/MKR/ADF Receiver(NAV);

34-54-00 DME System;

34-55-00 ATC Transponder;

34-56-00 Global Positioning System (GPS);

34-60-00 Secondary ATC Transponder.

(5) 34-60-00 "Flight Management Computing"

The Section 34-60-00 "Flight Management Computing" includes that portion of the system which combines navigational data to compute or manage aircraft's geographical position or theoretical flight path. Includes items such as course computers, flight management computers, performance data computers, and associated control display unit, etc.

Specifically, the Section 34-60-00 "Flight Management Computing" includes:

34-61-00 Flight Management System;

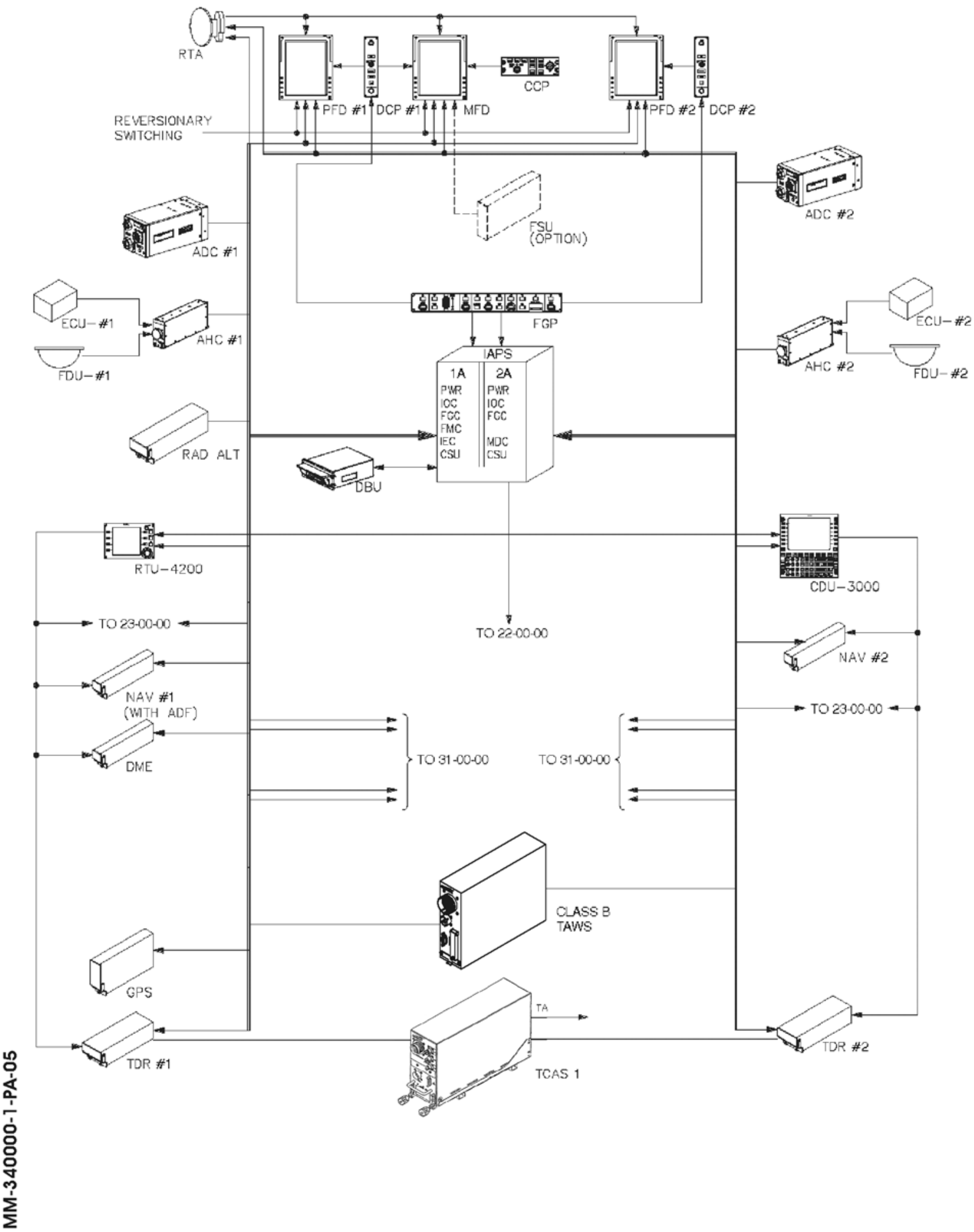


Fig. 1 - Navigation System Block Diagram

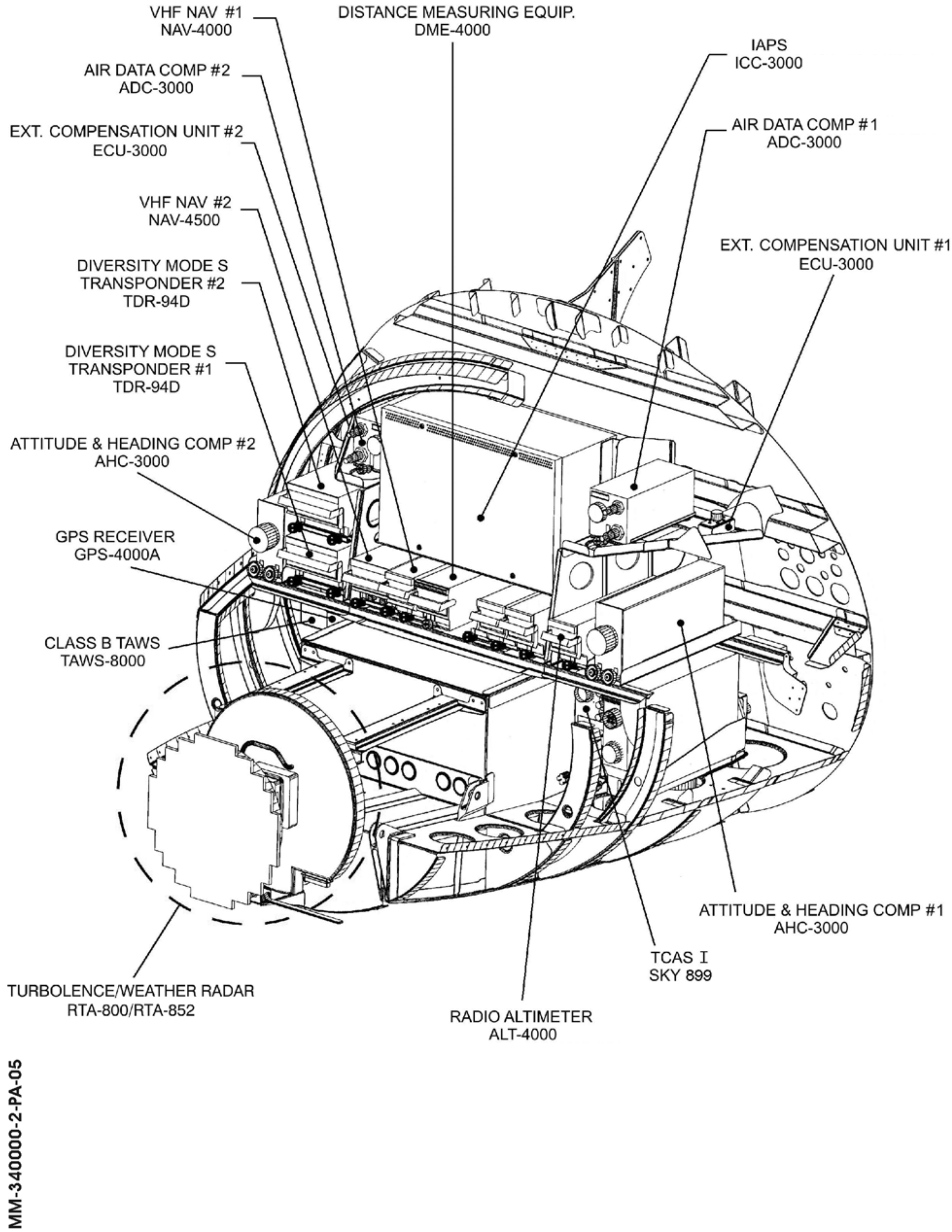
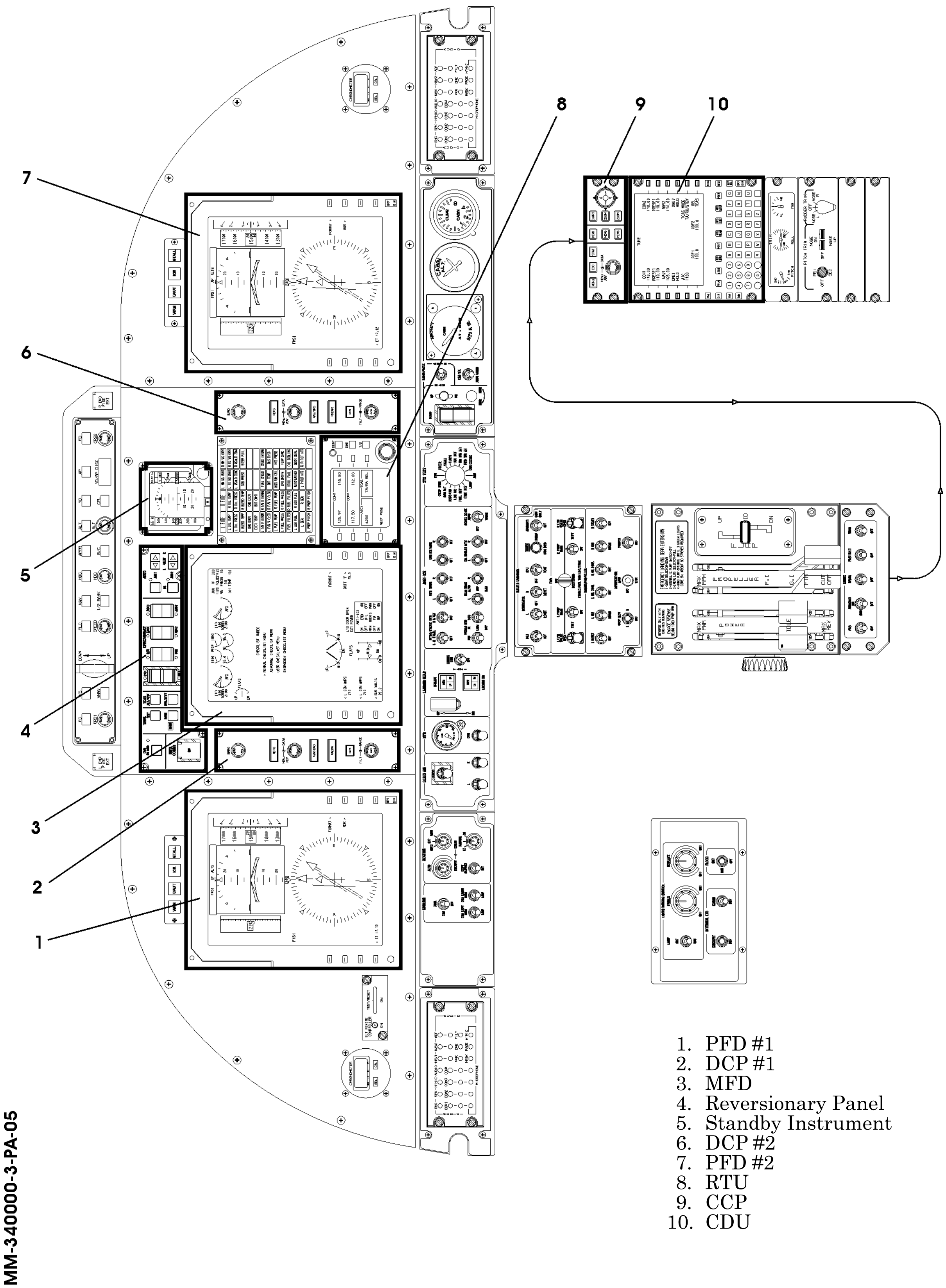


Fig. 2 - Nose Avionics Bay (Typical Lay-out)



1. PFD #1
2. DCP #1
3. MFD
4. Reversionary Panel
5. Standby Instrument
6. DCP #2
7. PFD #2
8. RTU
9. CCP
10. CDU

Fig. 3 - Cockpit Instruments Panel (Typical Lay-out)

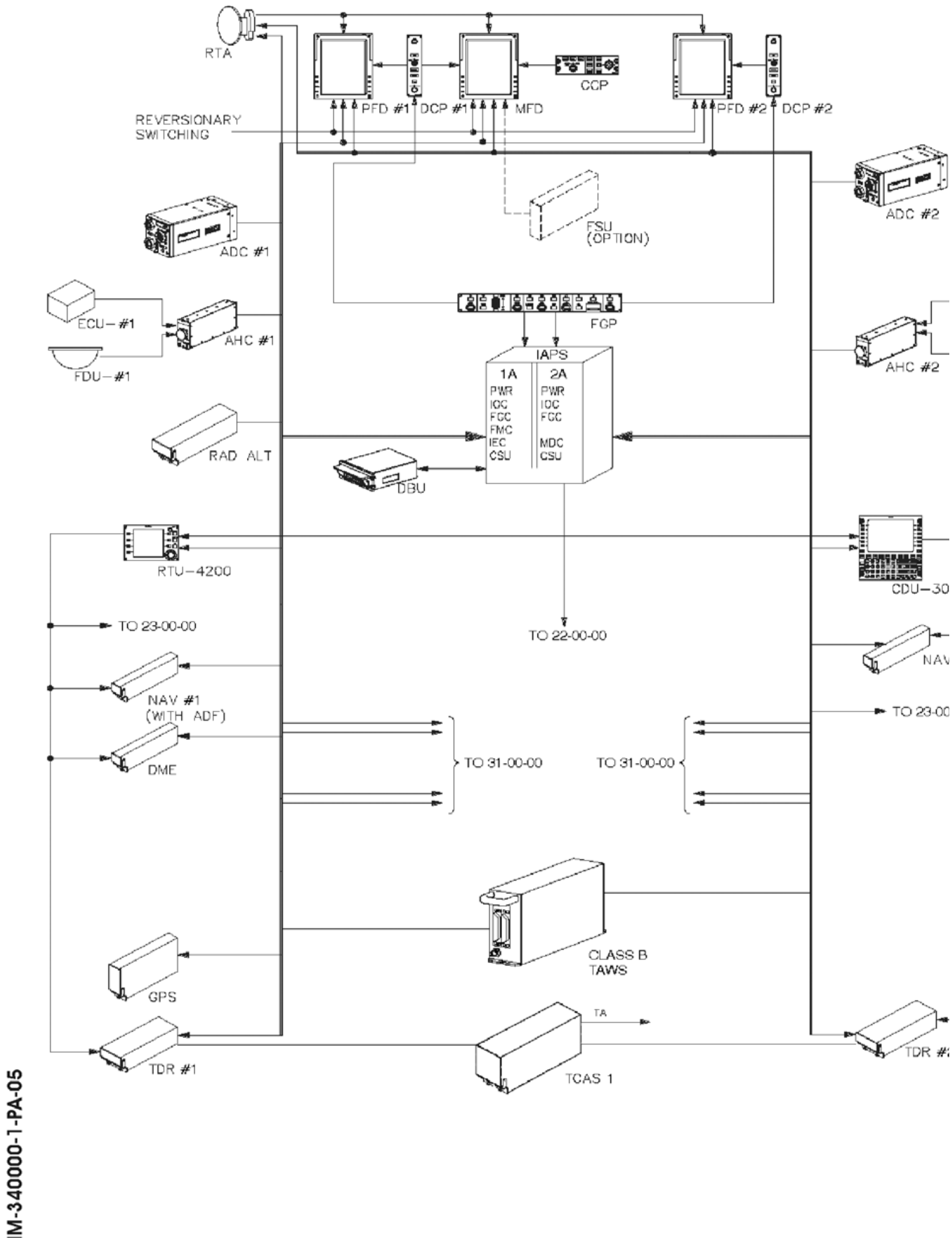


Fig. 4 - A/C 3 view with Antennas (Typical Lay-out)

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FLIGHT ENVIRONMENT DATA - DESCRIPTION AND OPERATION

1. General

In this Section 34-10-00 “Flight Environment Data”, description is given for the systems which senses environmental conditions and uses the data to influence navigation.

This section includes:

34-11-00 Pitot / Static System;

34-12-00 Air Data System;

34-13-00 Standby Instrument (Air Data section);

34-14-00 Lightning Detection System (LDS);

The Standby Instrument is an independent source including both Air Data and Attitude capability. In this Section only the Air Data section is described. For attitude section refer to Section 34-22-00.

The air data display, that uses pitot and static air pressure are: PFD 1, PFD 2, MFD and Standby instrument.

In this section are described the data displays of these instruments.

For the “MAINTENANCE PRACTICE” of the PFD 1, PFD 2, MFD, make reference to Chapter 31-00-00.

Pitot and static air pressure is the source of the Air Data computers (refer to 34-12-00) and also the source of the Standby instrument (refer to 34-13-00).

Other aircraft systems utilizing pitot and static air pressure are the cabin pressurization control and autopilot systems.

– Refer to Chapter 22-00-00 for further information on the auto flight system.
– Refer to Chapter 21-00-00 for further information on the cabin pressurization system.

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PITOT-STATIC SYSTEM - DESCRIPTION AND OPERATION

1. General

A. The Pitot-Static system supplies total and static air pressure for the operation of pilot and co-pilot equipments, instruments and the cabin pressure control system.

The Pitot/Static system consists of two-Pitot probes located on the front fuselage under the forward wing, two double static-ports installed on the both sides of the fuselage, downward the second windows, an alternate static port on the right side of the fuselage and the related lines to equipments.

The pilot and co-pilot Pitot/Static system are completely independent, the pilot Pitot/Static system provides static pressure and Pitot to primary Air Data Computer. The pilot static pressure can also be supplied by way of the alternate static port when the Static selector is turn from normal (STATIC TUBE) to alternate source (ALTERNATE SOURCE).

The co-pilot system provides static pressure and Pitot to secondary Air Data Computer and to Stand-by Instrument, refer to schematic Block Diagram at Fig. 1.

B. Pitot Probes:

The Pitot probes, one installed on the left side and other on the right side of forward fuselage under the forward wing, provide ram air to the pilot and co-pilot air data systems.

Each Pitot tube supplies the total pressure to the related side Air Data Computer. Additionally, the right side co-pilot Pitot tube supplies the total pressure also to the Stand-by instrument. (see Fig. 2).

Each Pitot probe head is equipped with an electrical heating element to prevent icing. An Pitot heating monitor device is installed on the central instrument panel to provide the indication to the pilot that the pitot heating system electrical circuit is not operating or it has been interrupted.

Indicator lights L PITOT HTR and R PITOT HTR, installed on annunciator panel, are controlled by monitor device according to the current sensitive relays, installed on the lines supplying power to the pitot heaters, detecting the current to the heating elements.

For further detail refer to Chapter 24-00-00.

Each Pitot Probe is provided with a drain hole to allow the draining of Pitot lines.

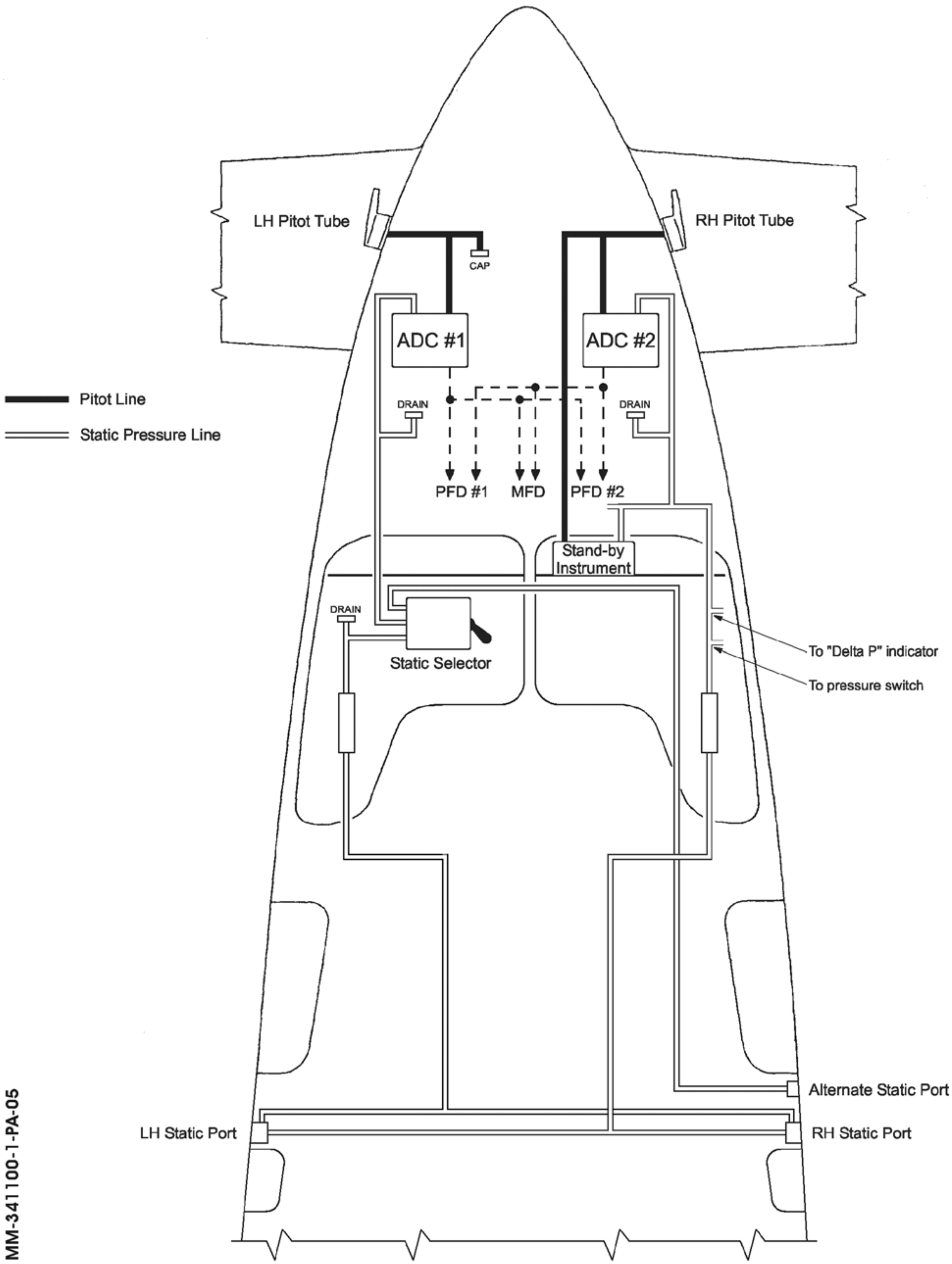

Fig. 1 - Pitot and Static System Schematic Block Diagram

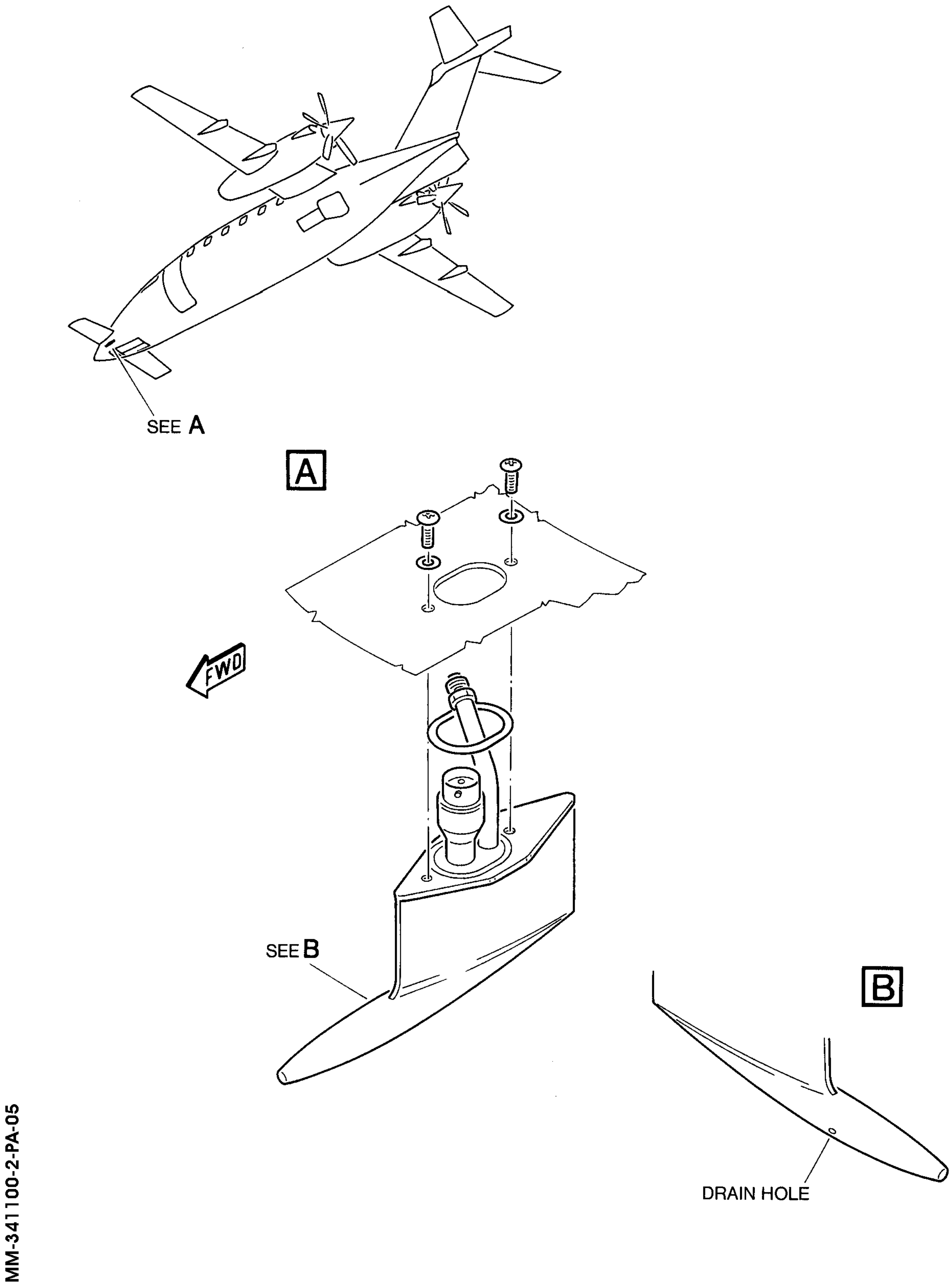

Fig. 2 - Pitot probe

C. Static Ports:

Three static ports are installed on the aircraft. Two static ports, are located on both sides of the fuselage, downward the second windows, the alternate static port, is located on the right side of the fuselage.

Each port is provided with two static source openings. There is a set of openings (one per each side) for the pilot's primary ADC and a set for the co-pilot's secondary ADC. The right side static port provides also static pressure to Stand-by instrument.

These static ports are aerodynamically compensated to minimize position error (see Fig. 3).

The alternate static port, provides a selectable third independent static pressure line that can supply static pressure to the pilot primary Air Data Computer. Selection is made through a selector in the cockpit (see Fig. 4).

Each port is equipped with an electrical heating element to prevent icing. For further detail refer to Chapter 24-00-00

The static system lines are drained through three screw plugs, two in the aircraft nose and a third one in the cockpit. For the location of screw plugs, refer to Fig. 202 in this Chapter.

D. Static selector

The static Selector, is located just below the switch panel, pilot side (see Fig. 4).

The Static selector allows the selection of the normal (STATIC TUBE) or alternate source (ALTERNATE SOURCE) for the static pressure supply to the pilot primary Air Data Computer.

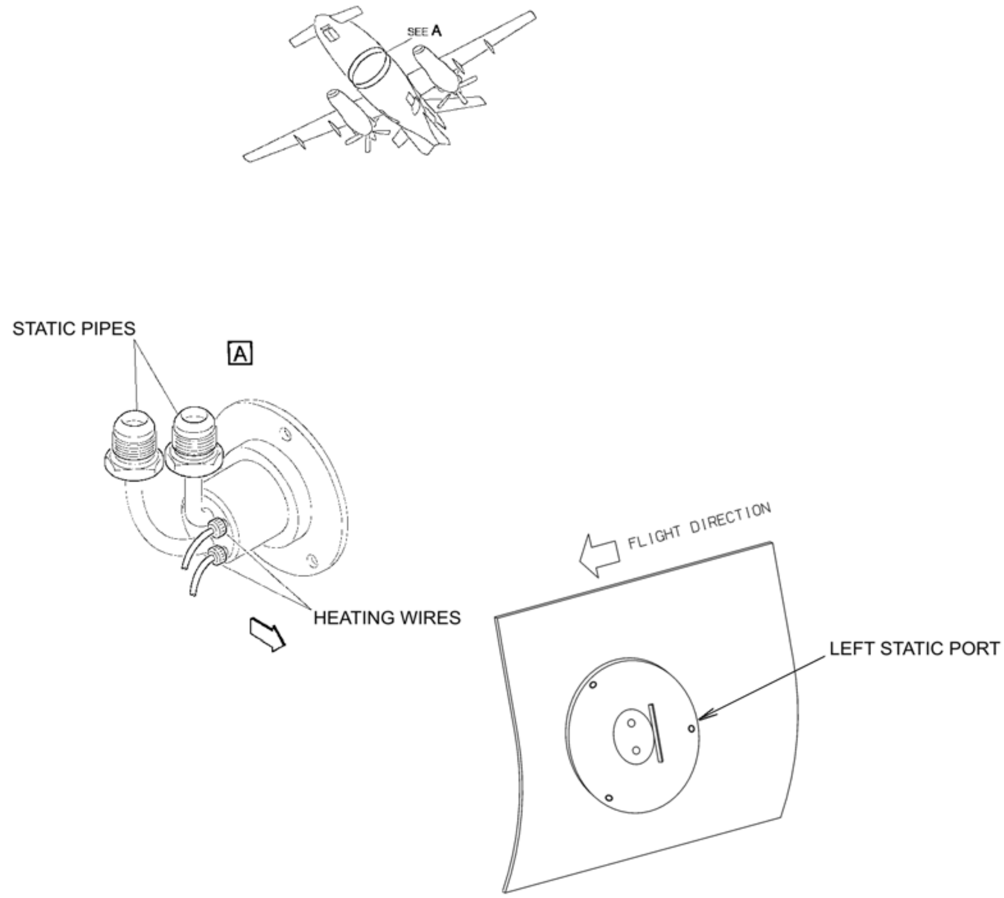

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Fig. 3 - Static Ports

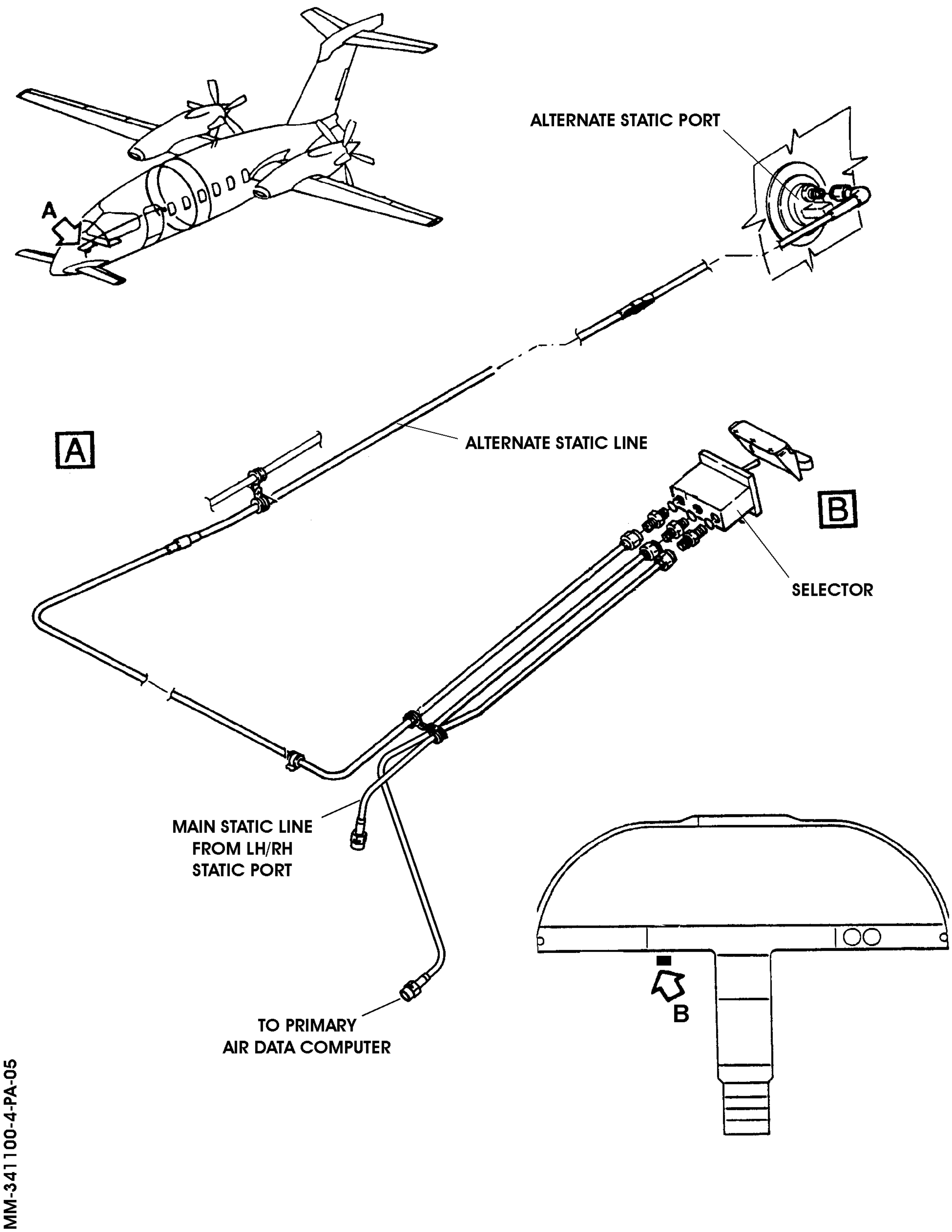


Fig. 4 - Alternate port and Static Selector

PITOT-STATIC SYSTEM - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00

A. The Maintenance Practices for the Pitot-Static System are as follows:
   - Pitot-Static System - Draining
   - Pitot Tube - Removal
   - Pitot Tube - Installation
   - Static Selector - Removal
   - Static Selector - Installation
   - Pitot-Static - Leak test
   - Pilot Pitot Line Check
   - Pilot Static Line Check
   - Copilot Pitot Line Check
   - Copilot Static Line Check
   - Static (Outer) Plate and Inner Port Step Height Measurement
   - Visual Inspection of the Region Surrounding the Static Ports (RVSM Critical Region)

2. Pitot-Static System - Draining (Ref. to Fig. 201 and 202)

A. Referenced Information

Maintenance Manual Chapter 24-00-00

Maintenance Manual Chapter 53-10-00

B. Procedure (Ref. Fig. 202)

(1) Remove all electrical power (Refer 24-00-00)

(2) Install locally manufactured warning placards.

(3) Remove the radome/nosecone (Refer to 53-10-00).

(4) At LH static line drain plug, remove and discard locking wire, place container below drain plug and remove drain plug blanking cap (2).

(5) When draining is complete, remove container from below static drain line and install and tighten (Torque 100 - 140 lbs.in.) LH static drain plug blanking cap (2).

CAUTION: TORQUE ABOVE 140 LBS.IN. CAN DAMAGE THE DRAIN PLUG BLANKING CAP AND CAUSE LEAKAGE.

(6) Safety the LH static drain plug blanking cap (2) with lockwire.

(7) At RH static line drain plug, remove and discard locking wire, place container below drain plug and remove drain plug blanking cap (5).

(8) When draining is complete, remove container from below static drain line and install and tighten (Torque 100 - 140 lbs.in.) LH static drain plug blanking cap (5).

CAUTION: TORQUE ABOVE 140 LBS.IN. CAN DAMAGE THE DRAIN PLUG BLANKING CAP AND CAUSE LEAKAGE.

(9) Safety the RH static drain plug blanking cap (5) with lockwire.
(10) Install the radome/nosecone (Refer to 53-10-00).
(11) On the LH cockpit, under the instrument panel, at LH static drain plug, remove and discard locking wire, place container below drain plug and remove drain plug blanking cap (7).
(12) When draining is complete, remove container from below static drain line and install and tighten (Torque 100 - 140 lbs.in.) LH static drain plug blanking cap (7).

CAUTION: TORQUE ABOVE 140 LBS.IN. CAN DAMAGE THE DRAIN PLUG BLANKING CAP AND CAUSE LEAKAGE.

(13) Perform a Pitot-Static System Leak Test as described in this section.
(14) Remove locally manufactured warning placards.

NOTE: The pitot lines are automatically drained through a hole in the bottom of the LH and RH pitot body.

3. Pitot Tube - Removal (Ref. to Fig. 203)

NOTE: Removal and installation procedures for either pitot tube is identical.

A. Fixtures, Test and Support Equipment

Blanking Caps

B. Referenced Information

Maintenance Manual Chapter 24-00-00
Maintenance Manual Chapter 53-10-00

C. Expendable Parts

ITEM	NOMENCLATURE	IPC-CSN
	Seal	

D. Procedure

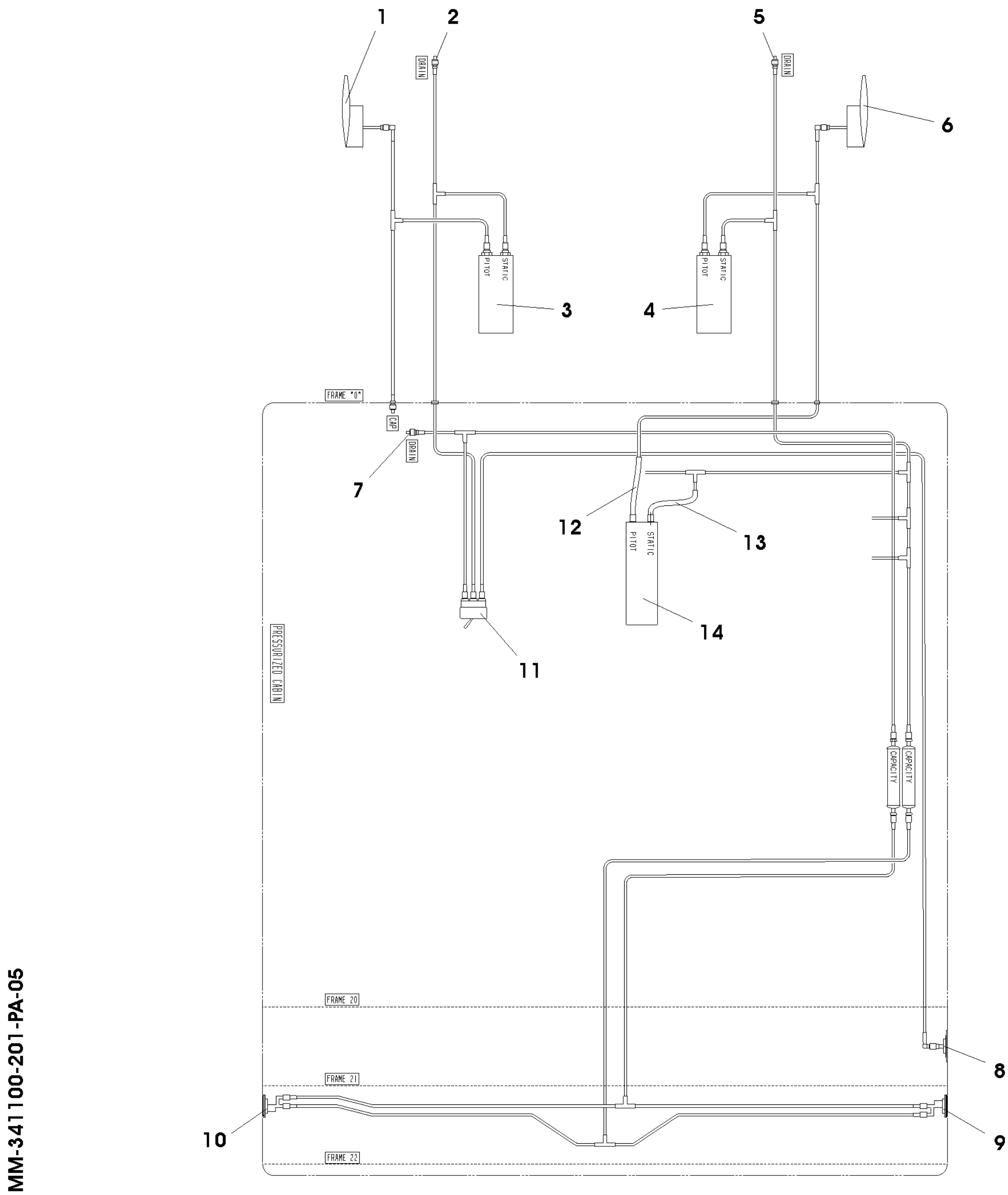
(1) Remove all electrical power (Refer to 24-00-00).
(2) Install locally manufactured warning placards.
(3) Remove the radome/nosecone (Refer to 53-10-00).
(4) Gain access to pitot tube and disconnect pitot line from pitot tube. Cap exposed line.

(5) Disconnect electrical wiring from pitot tube.

(6) Remove two screws (2) and washers (3) securing pitot head to fuselage.

(7) Remove pitot head.

(8) Using a suitable tool, remove and discard sealing ring (1).



1. LH Pitot Probe
2. LH Static line draining plug
3. Primary Air Data Computer
4. Secondary Air Data Computer
5. RH Static line draining plug
6. RH Pitot Probe
7. LH Static line compartment draining plug
8. Alternate Static port
9. RH Static Port
10. LH Static Port
11. Static Selector
12. Pitot Hose
13. Static Hose
14. Standby Instrument

Fig. 201 - Pitot Static System - Schematic Diagram

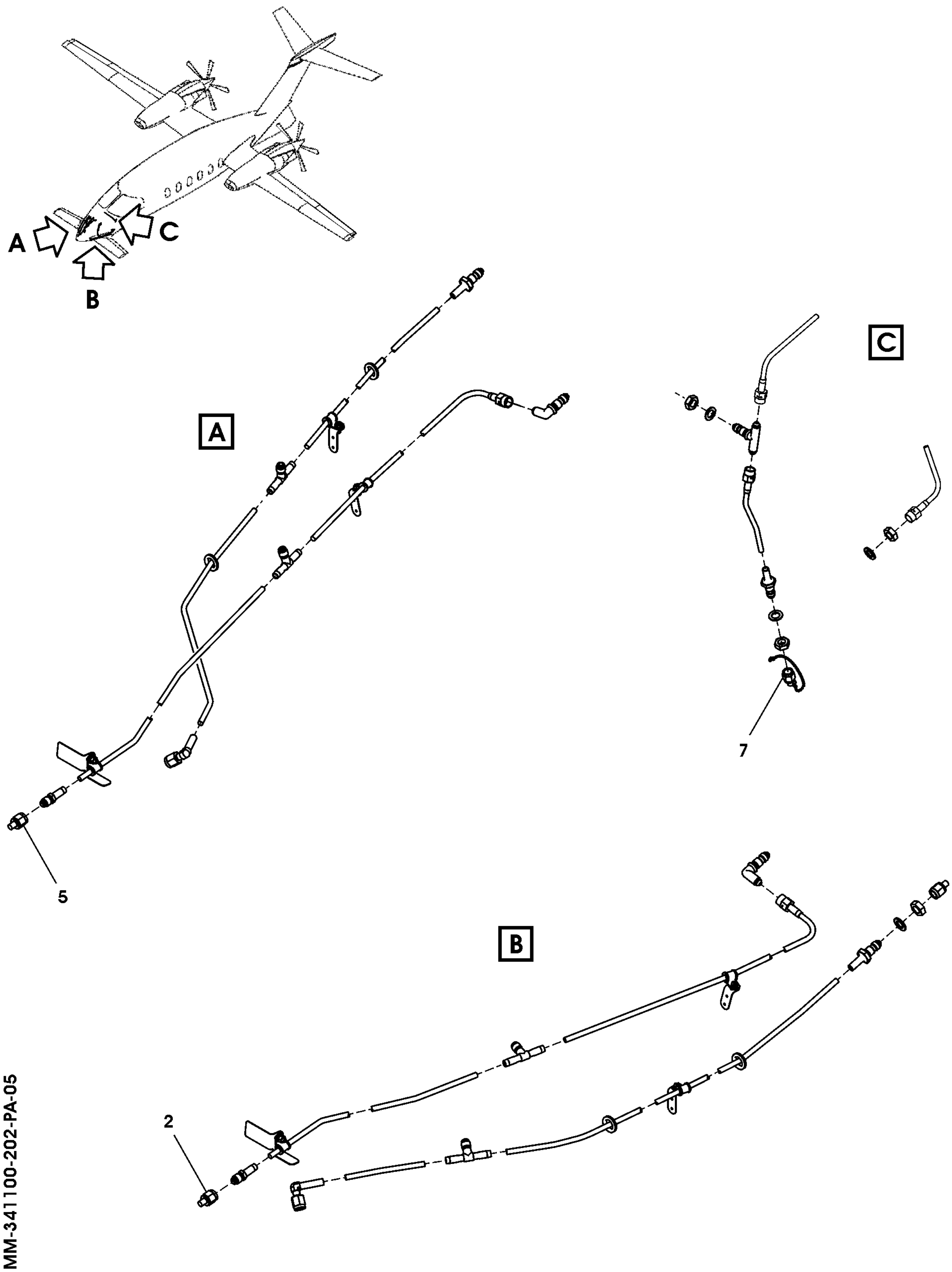


Fig. 202 - Pitot-Static System - Draining

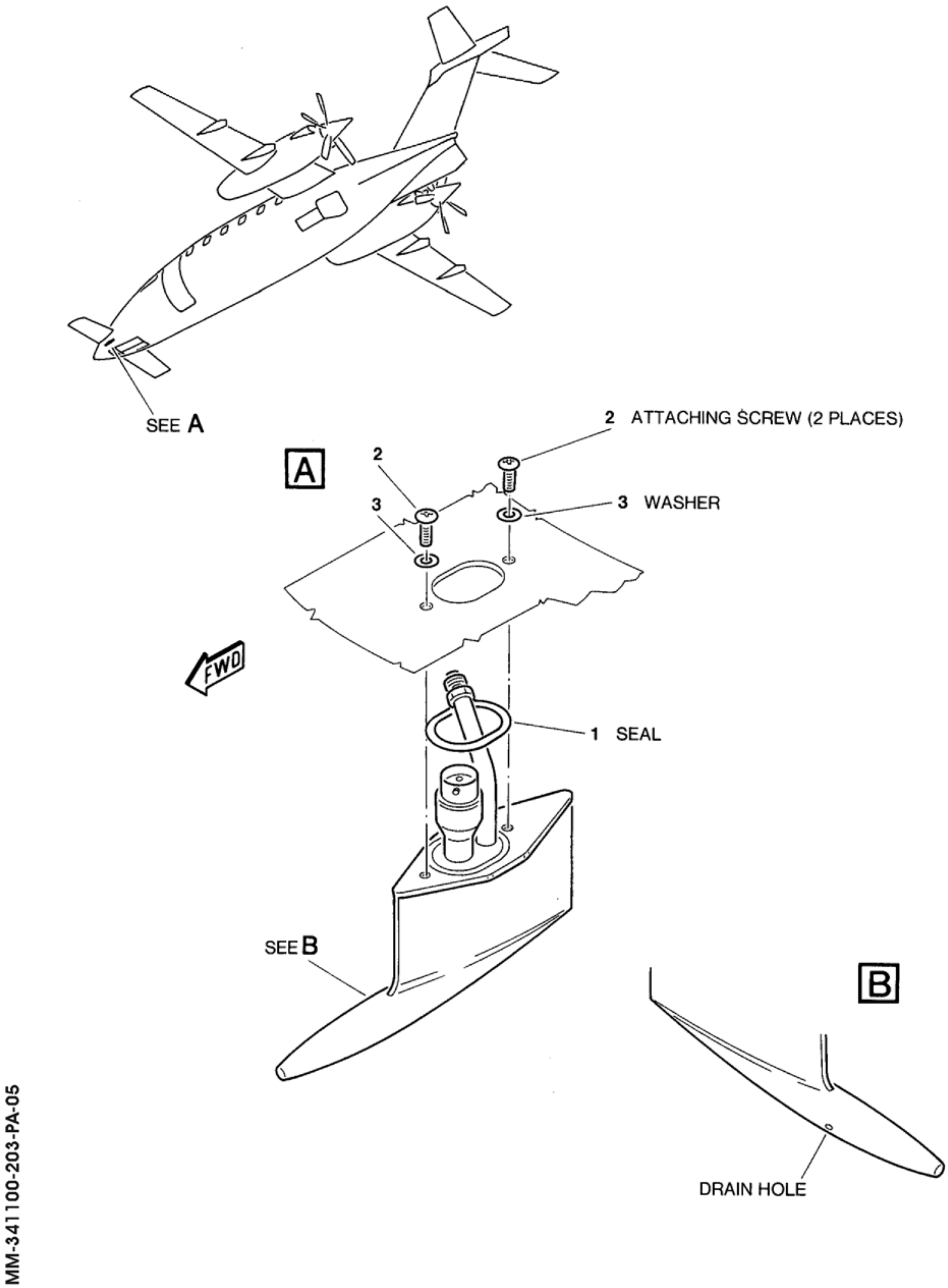


Fig. 203 - Pitot Tube - Removal/Installation

4. Pitot Tube - Installation (Ref. to Fig. 203)

NOTE: Removal and installation procedures for either pitot tube is identical.

A. Fixtures, Test and Support Equipment

Blanking Caps

B. Referenced Information

Maintenance Manual Chapter 24-00-00
Maintenance Manual Chapter 53-10-00

C. Expendable Parts

ITEM	NOMENCLATURE	IPC-CSN
	Seal	

D. Procedure

(1) Make sure, as necessary that:
– There is no electrical power on the airplane
– The system is safe
– Warning Notices are in position
– Access is available

(2) Install new seal (1) in position on fuselage.
(3) Install pitot tube in fuselage and secure in position using two screws (2) and washers (3).
(4) Remove cap from pitot line and connect line to pitot tube.
(5) Connect electrical wiring to pitot tube.
(6) Do a Pitot System Leak Test as described in this section.
(7) Install the radome/nosecone (Refer to 53-10-00).
(8) Restore electrical power (Refer to 24-00-00).

5. Static Selector - Removal (Ref. to Fig. 204)

A. Fixtures, Test and Support Equipment

Blanking Caps

B. Referenced Information

Maintenance Manual Chapter 24-00-00
Maintenance Manual Chapter 25-10-00

C. Expendable Parts

ITEM	NOMENCLATURE	IPC CSN
	O rings	

D. Procedure

(1) Remove all electrical power (Refer to 24-00-00).
(2) Remove Pilot seat to gain access to static selector (4). (Refer to 25-10-00).
(3) Remove four screw (6) and remove the bent assembly (5) from panel.
(4) Unscrew three pipes (1) from related unions (2) located on the selector (4) backside.
(5) Remove the static selector (4).
(6) On bench unscrew three unions (2), retain the unions and discharge the three O-rings (3).

6. Static Selector - Installation (Ref. to Fig. 204)

A. Fixtures, Test and Support Equipment

Blanking Caps

B. Referenced Information

Maintenance Manual Chapter 24-00-00
Maintenance Manual Chapter 25-10-00

C. Expendable Parts

ITEM	NOMENCLATURE	IPC-CSN
	Seal	

D. Procedure

(1) Make sure, as necessary that:
- There is no electrical power on the airplane
- The system is safe
- Warning Not ices are in position
- Access is available

(2) On bench insert three new O-rings (3) on the unions (2).
(3) Screw the three unions (2) on the static selector (4).
(4) Install and screw the three pipes (1) to the unions (2) on static selector (4) backside.
(5) Fix the static selector (4) to the panel and the bent assembly (5) tightening the four screw (6).
(6) Perform Pitot-Static Leak Test as described in this section.
(7) Install Pilot seat (Refer to 25-10-00).

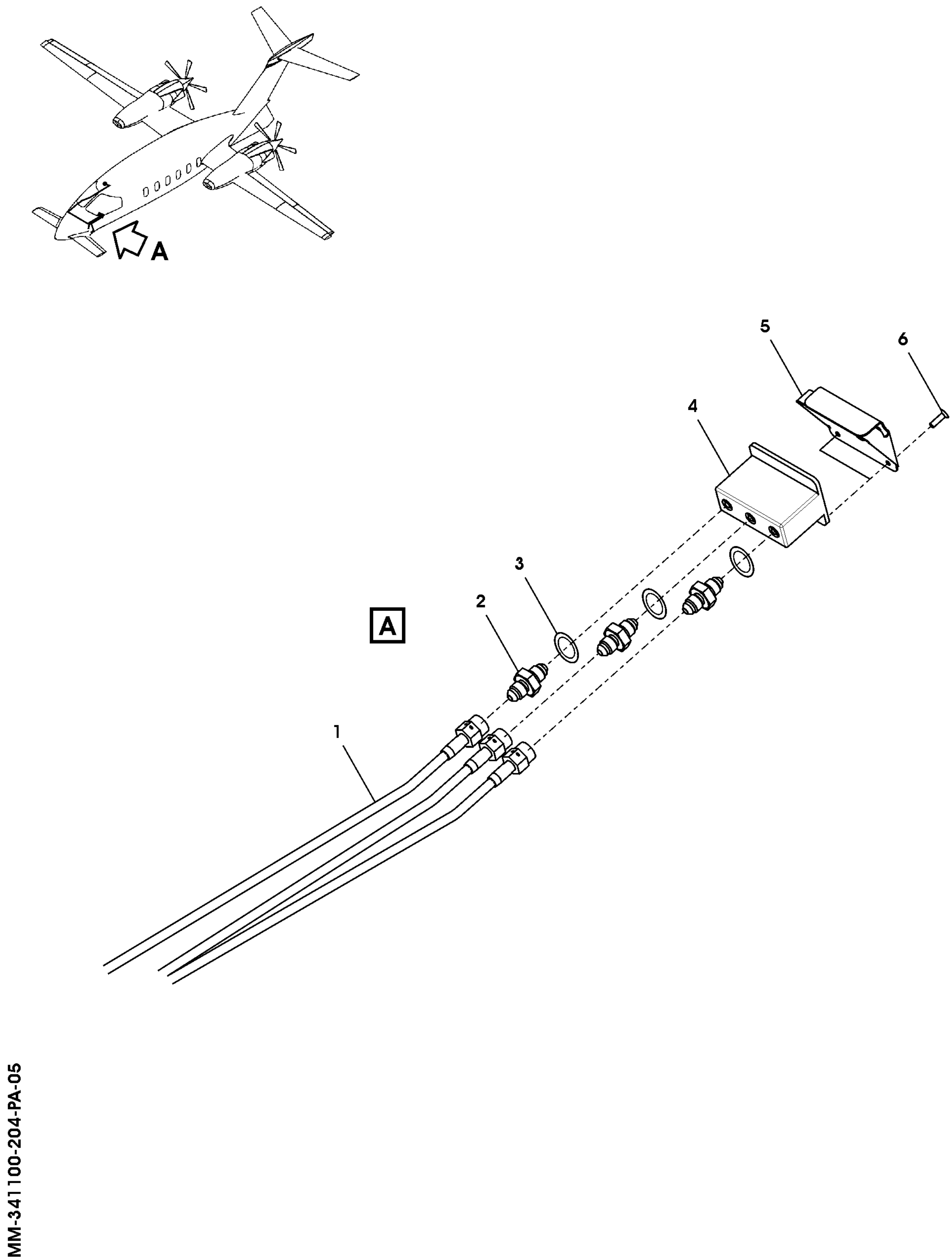


Fig. 204 - Static Selector - Removal/Installation

7. Pitot-Static Leak Test

NOTE: This check should not be regarded as an alternative to the Pitot-Static System Functional Test.

A. Fixtures, Test and Support Equipment

Pitot Static Test Set	Model DMA MPS30 (or equivalent)

B. Referenced Information

Maintenance Manual Chapter 07-10-00
Maintenance Manual Chapter 24-40-00

C. Procedure

NOTE: Test equipment should be checked for leaks prior to test.

(1) Connect the external power supply to airplane (Refer to 24-40-00).
(2) Set the Battery switch to BAT position.
(3) Set the Avionics switch to AVIONICS position.
(4) Connect the Pitot Static Test Set to the pitot and static ports.
(5) Set on the Pitot-Static Test Set a vacuum equivalent to 27000 ft. a speed of 170 Kts. and a rate of climb of 2500 ft.
(6) Close the Pitot-Static Test Set delivery air and check on the PDF that over a one minute period, leakage shall not exceed more than 0,05 inHg. or 540 ft. of pressure altitude.
(7) Use the Pitot Static Test Set as required to perform descent in such a way not to damage the instruments.
(8) Set the Avionics switch to OFF position.
(9) Set the Battery switch to OFF position.
(10) Disconnect the external power supply to airplane (Refer to 24-40-00).

8. Pilot Pitot Line Check and Clean (Ref. Fig. 205)

CAUTION: MAKE SURE THAT NOT OTHER INSTRUMENTS OR SENSORS ARE INSTALLED ON THE PILOT PITOT LINE, IF INSTALLED DISCONNECT THE PILOT PITOT LINE AND CAP THE PIPE.

A. Materials

Plastic Bag (to collect F.O.D.) Not Specified
Blanking Caps

B. Referenced Information

Maintenance Manual Chapter 24-40-00
Maintenance Manual Chapter 53-10-00

C. Procedure

(1) Remove electrical power. Put a warning notice in the flight compartment to tell people not to apply electrical power.

(2) For check the pilot pitot line perform the following procedures:

(3) Open the radome/nosecone (Ref. 53-10-00).

(4) Disconnect the Pilot Pitot Line (3) from the Primary Air Data Computer (1).

(5) Put a plastic bag (2) at the front of pilot pitot hole .

(6) Blow nitrogen at 35 PSI inside the pilot pitot line from the Air Data Computer fitting disconnected.

(7) Check that the nitrogen flow freely out from the pilot pitot.

(8) Connect the Pilot Pitot Line (3) to the Primary Air Data Computer (1).

(9) Make the leakage test of Pilot Pitot Line.

(10) Install the radome/nosecone (Ref. 53-10-00).

(11) Remove the warning notice in the flight compartment..

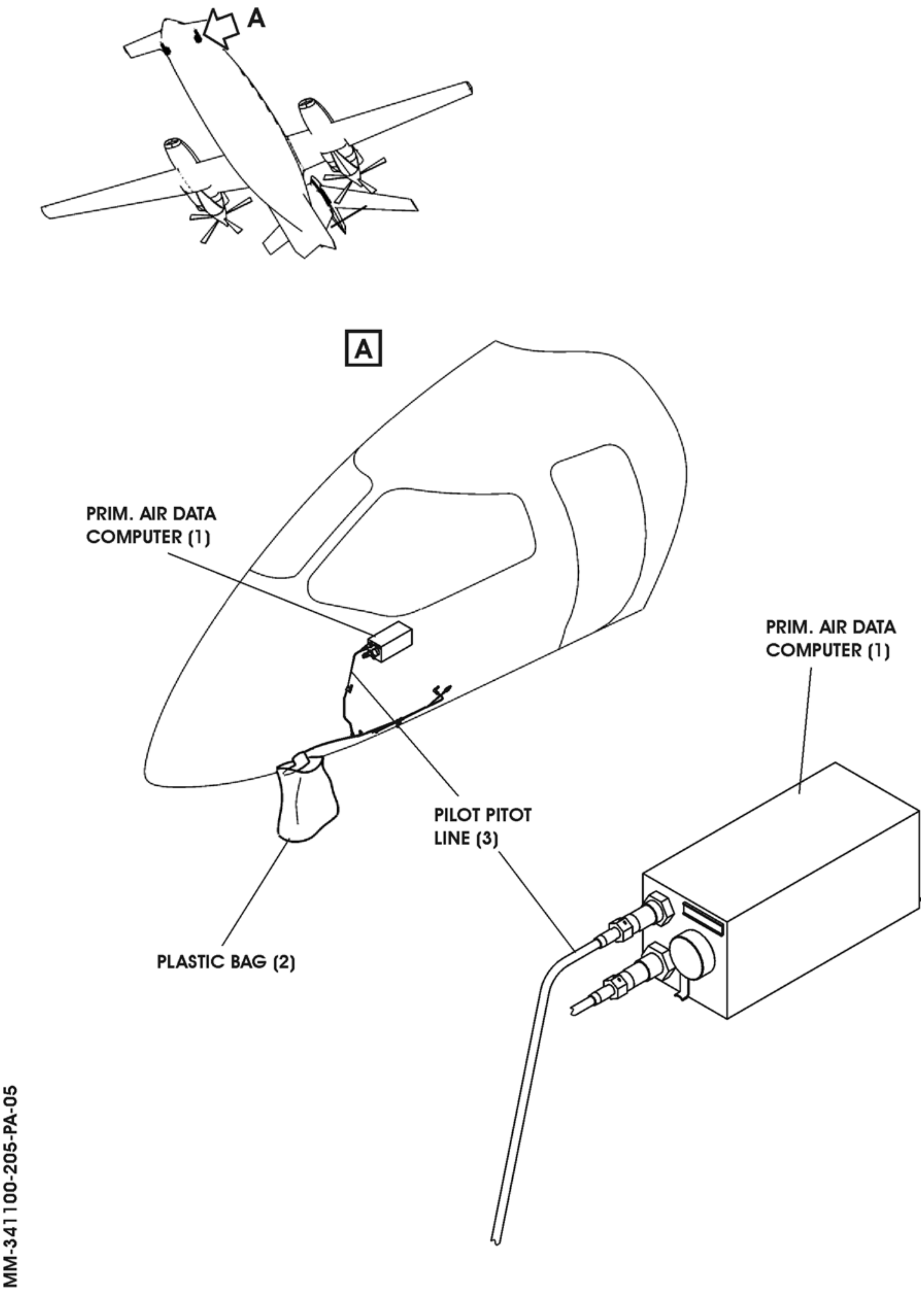


Fig. 205 - Pilot Pitot Line - Check

9. Pilot Static Line Check and Clean (Ref. Fig. 206)

CAUTION: MAKE SURE THAT NO OTHER INSTRUMENTS OR SENSORS CONNECTED TO PILOT STATIC LINE, IF THEY ARE, DISCONNECT THE PILOT STATIC LINE AND PLUG THE PIPE.

A. Materials

Plastic Bag (to collect F.O.D.) Not Specified

Blanking Caps

B. Referenced Information

Maintenance Manual Chapter 24-00-00

Maintenance Manual Chapter 53-10-00

C. Procedure

(1) Remove electrical power. Put a warning notice in the flight compartment to tell people not to apply electrical power.
(2) Open the radome/nosecone (Ref. 53-10-00).
(3) Disconnect the Pilot Static Line (3) from the Primary Air Data Computer (1). Cap the static line tube end.
(4) Remove the Pilot Static Drain Line Cap (4).
(5) Put a plastic bag at the front of static holes (2) located on both sides of the fuselage.

NOTE: Check the position of static selector should be on NORMAL.

(6) Blow nitrogen at 35 PSI inside the fitting of pilot static line of Pilot Static Draining (4) disconnected.
(7) Check that the nitrogen flow freely out from the static holes (2) on both sides of the fuselage.
(8) Remove cap and connect the Pilot Static Line (3) to the Primary Air Data Computer (1).
(9) Install the Pilot Static Drain Line Cap (4).
(10) Make the leakage test of Pilot Static Line.
(11) Install the radome/nosecone (Ref. 53-10-00).
(12) Remove the warning notice in the flight compartment.

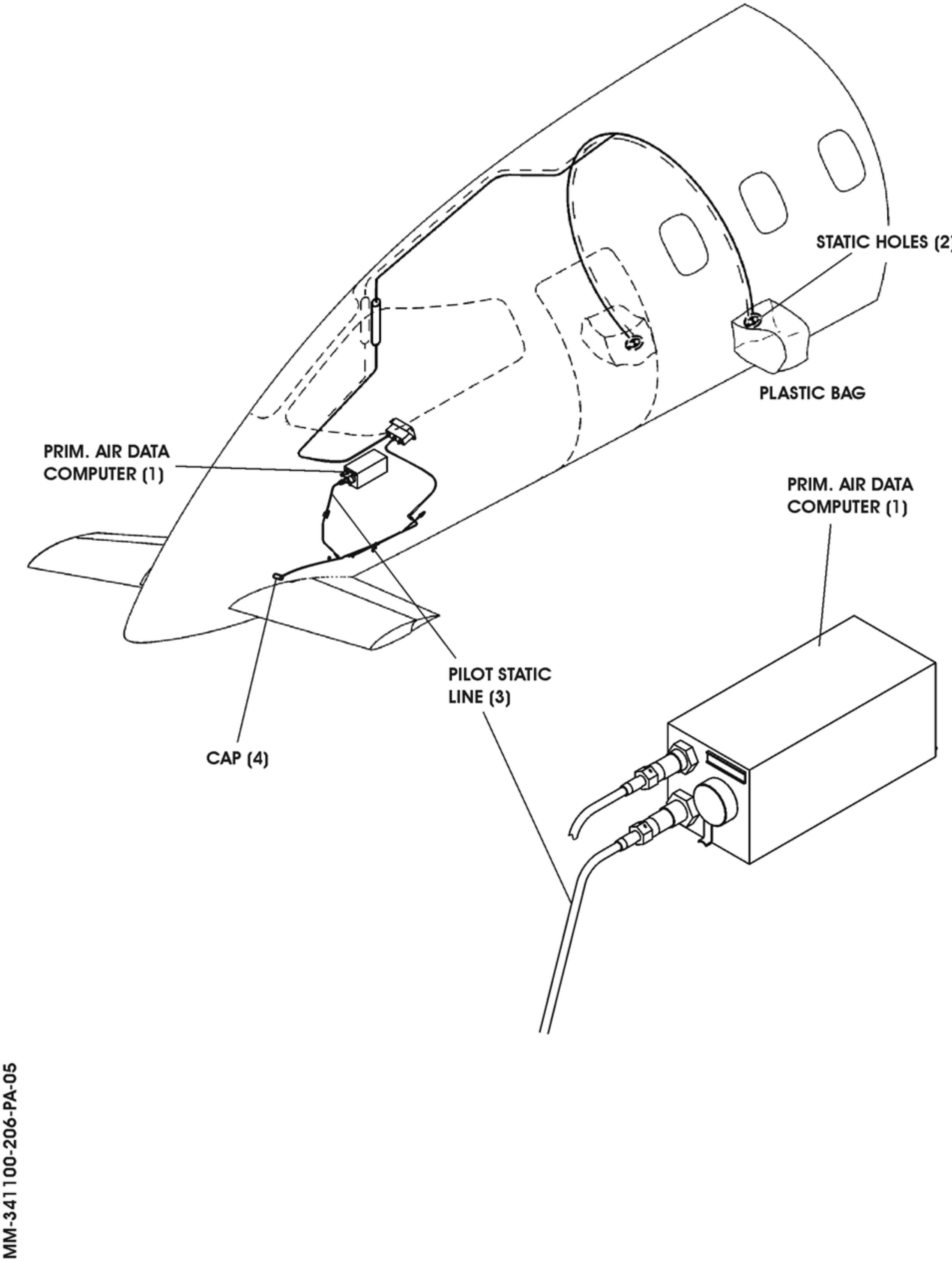


Fig. 206 - Pilot Static Line - Check

10. Co-pilot Pitot Line Check and Clean (Ref. Fig. 207)

CAUTION: MAKE SURE THAT NO OTHER INSTRUMENTS OR SENSORS CONNECTED TO COPILOT PITOT LINE, IF THEY ARE, DISCONNECT THE COPILOT PITOT LINE AND PLUG THE PIPE.

A. Materials

Plastic Bag (to collect F.O.D.)	Not Specified
Blanking Caps	

B. Referenced Information

Maintenance Manual Chapter 24-00-00

Maintenance Manual Chapter 34-13-00

Maintenance Manual Chapter 53-10-00

C. Procedure

(1) Remove electrical power. Put a warning notice in the flight compartment to tell people not to apply electrical power.
(2) Remove the Standby Instrument (3) from the instrument panel (Ref. 34-13-00).
(3) Open the radome/nosecone (Ref. 53-10-00).
(4) Disconnect the Co-pilot Pitot Line (2) from the Secondary Air Data Computer (1). Cap the Co-pilot Pitot Line disconnected.
(5) Disconnect the Co-pilot Pitot Line (5) from Standby Instrument (3). Put a plastic bag (4) at the front of co-pilot Pitot hole. Blow nitrogen at 35 PSI inside the co-pilot Pitot line (5) disconnected from the Standby Instrument fitting.
(6) Check that the nitrogen flow freely out from the Co-pilot Pitot.
(7) Cap the Co-pilot Pitot Line (5) disconnected from the Standby Instrument fitting.
(8) Remove Cap from the Co-pilot Pitot Line (2) disconnect from Secondary Air Data Computer (1). Blow nitrogen at 35 PSI inside the co-pilot Pitot line (2) disconnected from the Secondary Air Data Computer (1) fitting.
(9) Check that the nitrogen flow freely out from the Co-pilot Pitot.
(10) Remove Cap and connect the Co-pilot Pitot Line (5) to the Standby Instrument (3)
(11) Connect the Co-pilot Pitot Line (2) to the Secondary Air Data Computer (1).
(12) Install the Standby Instrument (3) to the instrument panel (Ref. 34-13-00).
(13) Make the leakage test of Co-pilot Pitot Line.
(14) Install the radome/nosecone (Ref. 53-10-00).
(15) Remove the warning notice in the flight compartment

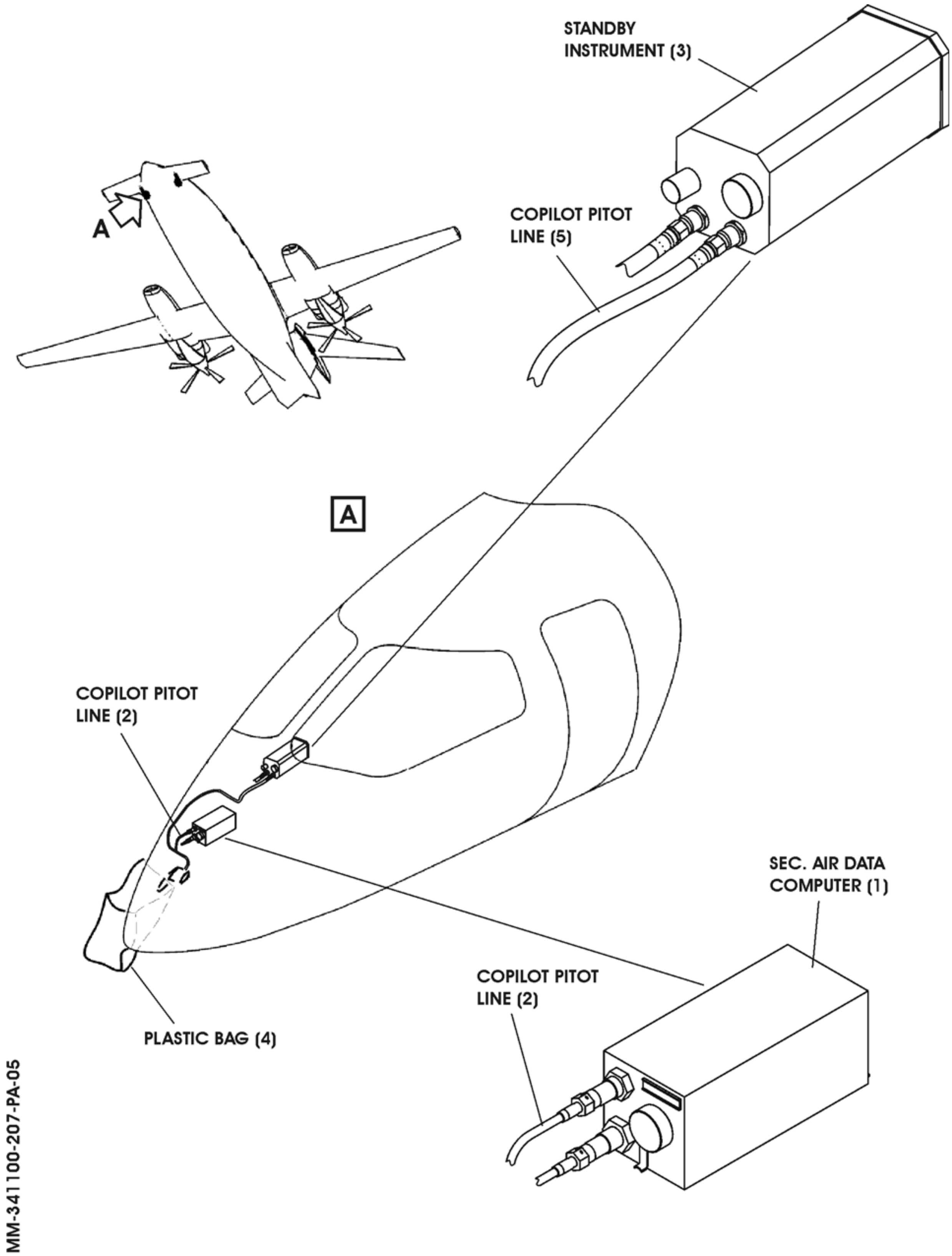


Fig. 207 - Co-pilot Pitot Line - Check

11. Copilot Static Line Check and Clean (Ref. Fig. 208)

CAUTION: MAKE SURE THAT NO OTHER INSTRUMENTS OR SENSORS CONNECTED TO COPILOT STATIC LINE, IF THEY ARE, DISCONNECT THE COPILOT STATIC LINE AND PLUG THE PIPE.

A. Materials

Plastic Bag (to collect F.O.D.)	Not Specified
Blanking Caps	

B. Referenced Information

Maintenance Manual Chapter 24-00-00

Maintenance Manual Chapter 25-10-00

Maintenance Manual Chapter 31-10-00

Maintenance Manual Chapter 53-10-00

C. Procedure

(1) Remove electrical power. Put a warning notice in the flight compartment to tell people not to apply electrical power.

(2) Remove the Pilot and Copilot Seat (Ref. 25-10-00).

(3) Remove the MFD (Ref. 31-10-00).

(4) Remove the four screw (7) that fasten the panel where is installed the Cabin Differential Pressure Gauge (Ref. 31-10-00)

(5) Withdraw the panel and disconnect the electrical connectors and the Static line from the rear side of the Cabin Differential Pressure Gauge (8). Cap the static lines tube ends.

(6) Remove the Pressure Transducer (9) from the Pressurization Static Line. Cap the pressurization static line tube end.

(7) Remove the PFD 1, PFD 2 (Ref. 31-10-00) to obtain access to the Automatic Pressurization Controller.

(8) Disconnect the Pressurization Static line from the Automatic Pressurization Controller (10). Cap the pressurization static line tube end.

(9) Open the radome/nosecone (Ref. 53-10-00).

(10) Disconnect the Co-pilot Static Line from the Secondary Air Data Computer (14). Cap the static line tube end.

(11) Disconnect the Co-pilot Static Line from the Standby Indicator (13). Cap the static line tube end.

(12) Remove the Co-pilot Static Drain Line Cap.

(13) Put the plastic bags at the front of static holes located on both side of the fuselage.

(14) Blow nitrogen at 35 PSI from the co-pilot drain static line.

(15) Check that the nitrogen flow freely out from the both static holes.

(16) Connect the Co-pilot Static Line to the following items, after plugs removed:

(a) Automatic Pressurization Controller.

(b) Pressurization Pressure Transducer.

(c) Cabin Differential Pressure Gauge

(d) Secondary Air Data Computer
(e) Standby Indicator

(17) Install the Co-pilot Static Drain Line Cap.
(18) Install the PFD 1, PFD 2 and MFD (Ref. to 31-10-00).
(19) Make the leakage test of Co-pilot Static Line.
(20) Installed the Cabin Differential Pressure Gauge (Ref. v)
(21) Close the radome/nosecone (Ref. 53-10-00).
(22) Install the Pilot and Co-pilot Seats (Ref. to 25-10-00).
(23) Remove the warning notice in the flight compartment.

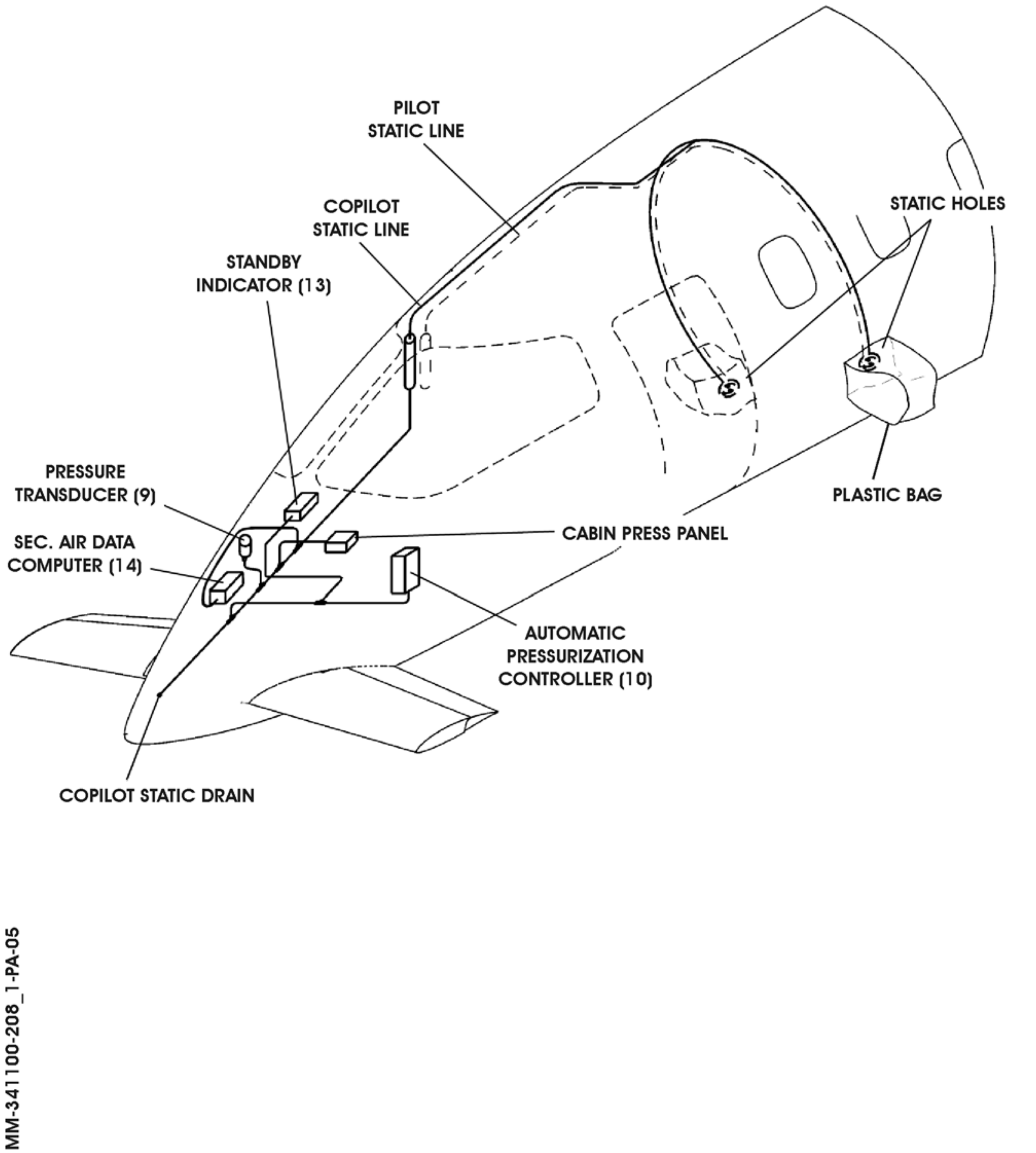


Fig. 208 - Copilot Static Line - Check (Sheet 1 of 6)

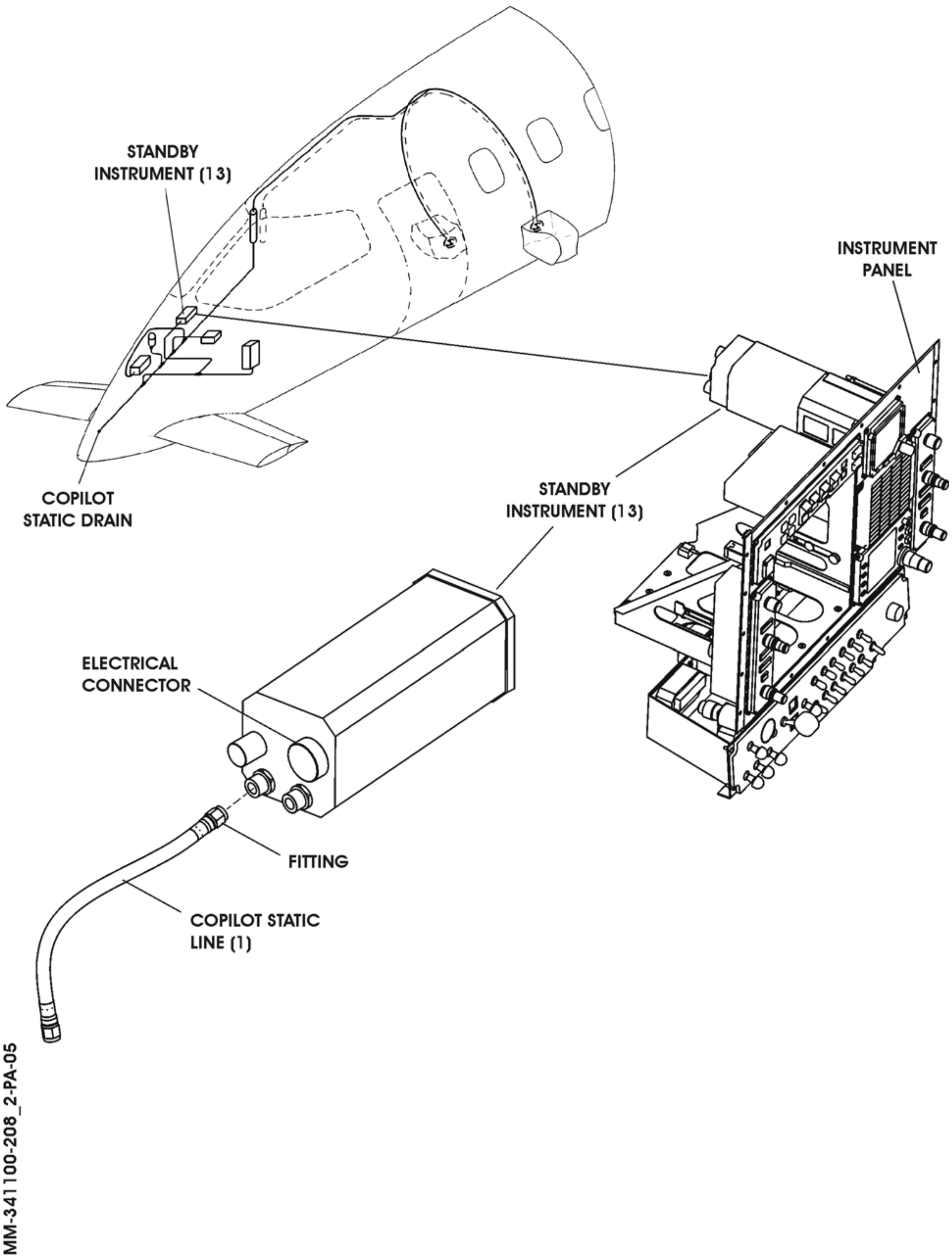


Fig. 208 - Copilot Static Line - Check (Sheet 2 of 6)

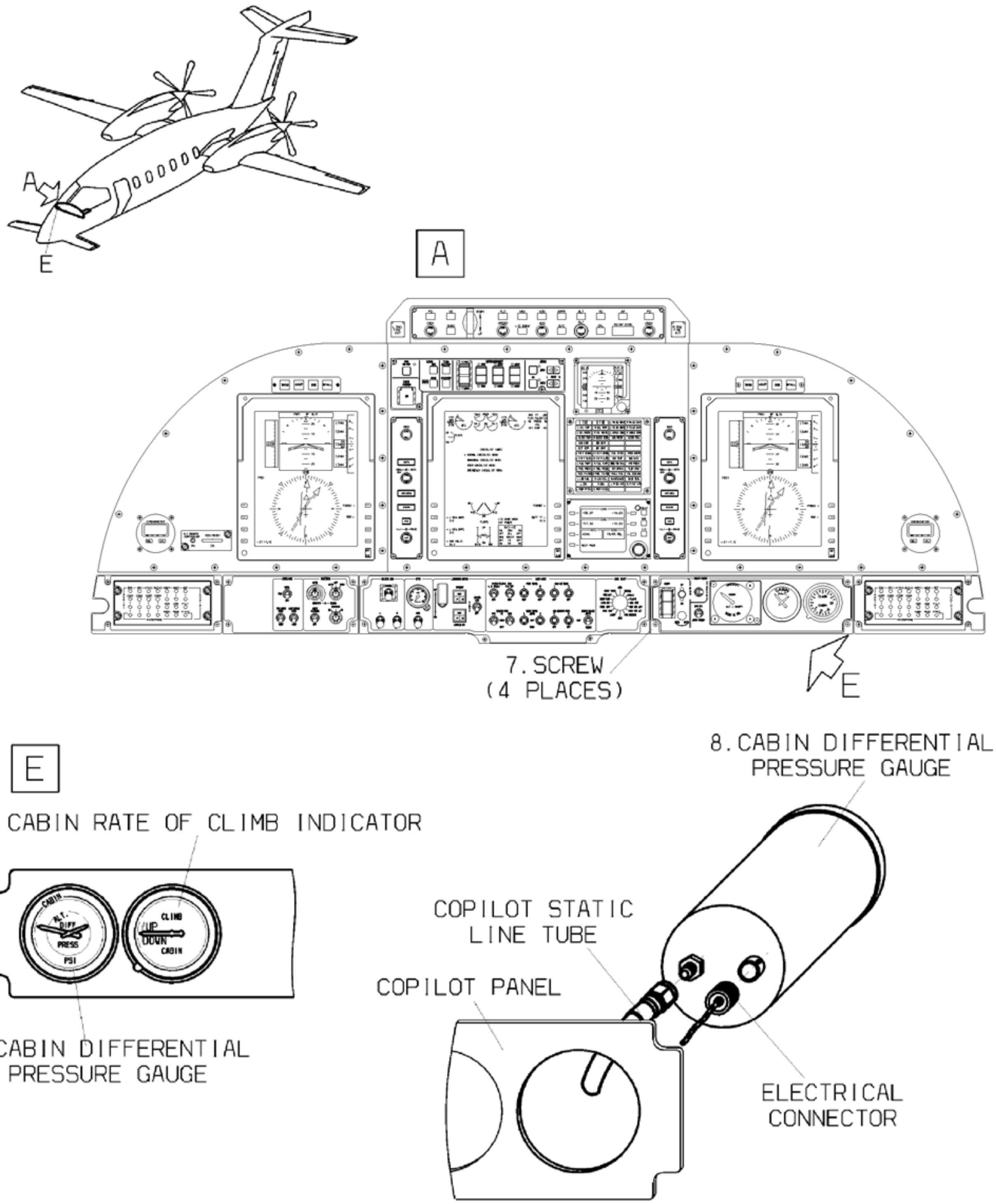


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Fig. 208 - Copilot Static Line - Check (Sheet 3 of 6)

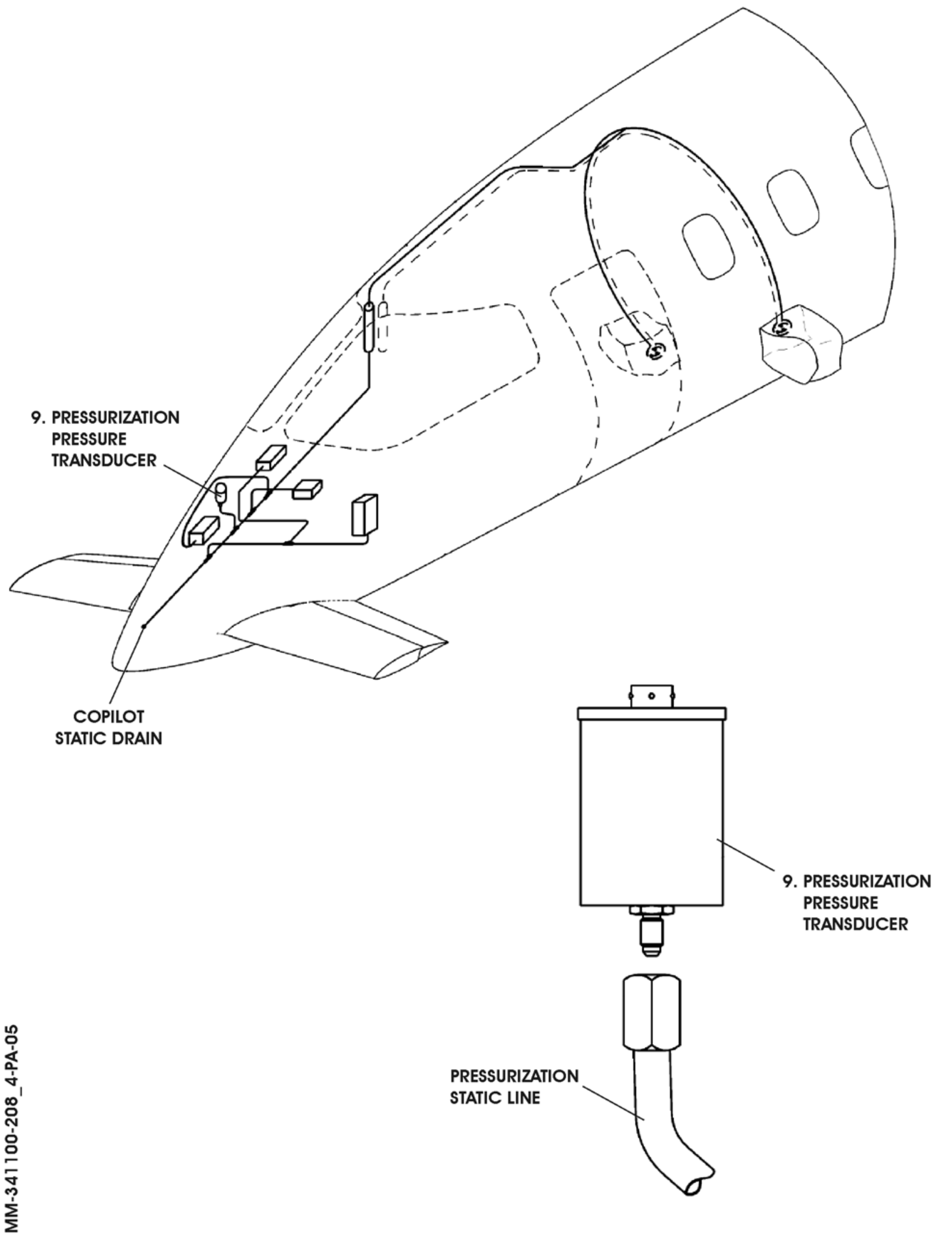


Fig. 208 - Copilot Static Line - Check (Sheet 4 of 6)

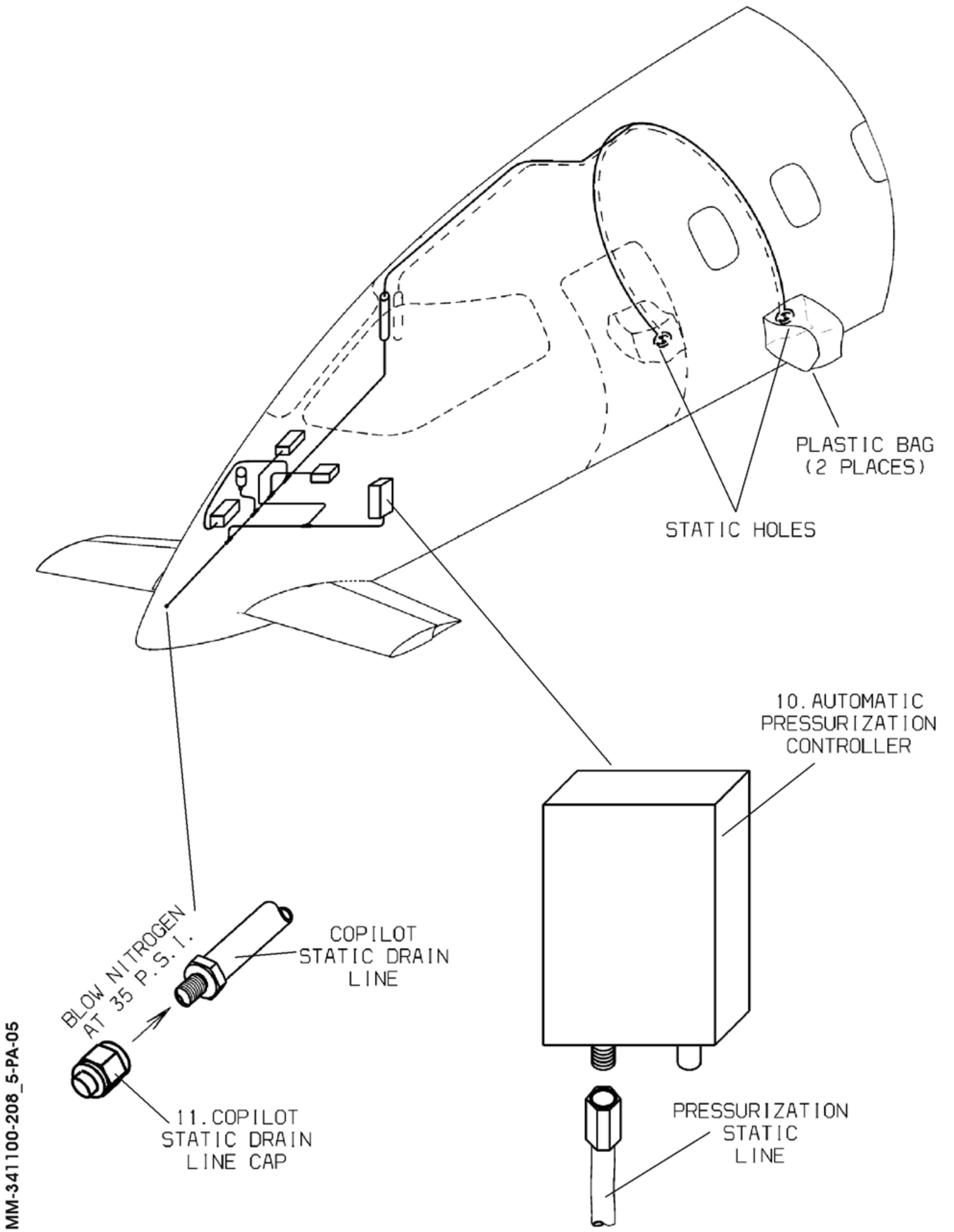


Fig. 208 - Copilot Static Line - Check (Sheet 5 of 6)

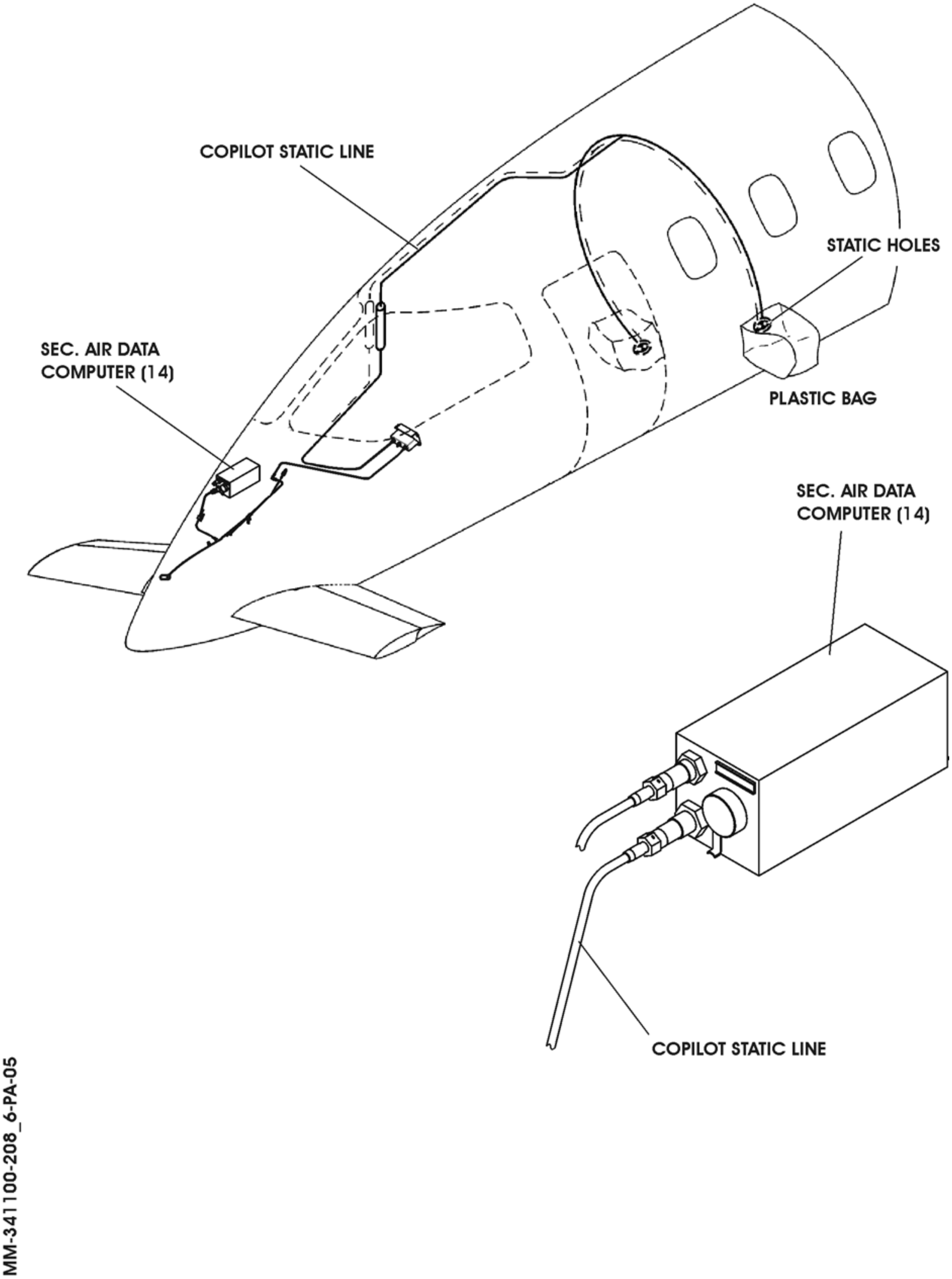


Fig. 208 - Copilot Static Line - Check (Sheet 6 of 6)

12. Pilot Pitot Drain Hole - Cleaning (Ref. Figg.201, 203, 205, 207)

A. Materials

Lockwire 0.3mm dia. max.

B. Procedure

NOTE: This procedure can be combined with "Pilot Pitot Line Check and Cleaning".

(1) Remove electrical power. Put a warning notice in the flight compartment to tell people not to apply electrical power.
(2) Open the radome/nosecone (Ref. 53-10-00).
(3) Disconnect the Pilot Pitot Line from the Air Data Computer.
(4) Plug the Pilot's Pitot frontal hole.
(5) Blow dry nitrogen at 35 PSI in the Pilot Pitot Line, from the ADC fitting previously disconnected, to flush dirt out of Pilot Pitot Drain Hole.
(6) Unplug the Pilot's Pitot frontal hole.
(7) Carefully introduce a straight locking wire 0,3mm dia. max. into the Pitot Drain Hole to make sure that it is not obstructed.
(8) Leave the locking wire inserted, and inflate dry nitrogen at 35 PSI in the Pilot Pitot Line from the Air Data Computer fitting, previously disconnected to flush dirt out of Pitot's frontal hole.
(9) Remove the locking wire from the pitot Drain Hole.
(10) Connect the Pilot Pitot Line from the Air Data Computer.
(11) Restore the electrical power.
(12) Perform Pitot-Static Leak Test.
(13) Close the radome/nosecone (Ref. 53-10-00).
(14) Remove the warning notice in the flight compartment.

13. Copilot Pitot Drain Hole - Cleaning (Ref. Figg.201, 203, 205, 207)

A. Materials

Lockwire 0.3mm dia. max.

B. Procedure

NOTE: This procedure can be combined with "Copilot Pitot Line Check and Cleaning".

(1) Remove electrical power. Put a warning notice in the flight compartment to tell people not to apply electrical power.
(2) Remove the four screws that secure the Copilot Airspeed Indicator to the copilot instrument panel.
(3) Remove the Airspeed Indicator from the instrument panel until its rear side is reach.
(4) Disconnect the Copilot Pitot Line from the Copilot Airspeed Indicator.

(5) If installed, disconnect the Copilot Pitot Line from the ADDU, then plug the Pitot Line end (Ref. to 34-12-01).

(6) Plug the Copilot's Pitot frontal hole.

(7) Blow dry nitrogen at 35 PSI in the Copilot Pitot Line, from the Airspeed Indicator fitting previously disconnected, to flush dirt out of Copilot Pitot Drain Hole.

(8) Unplug the Copilot's Pitot frontal hole.

(9) Carefully introduce a straight locking wire 0,3mm dia. max. into the Copitot Drain Hole to make sure that it is not obstructed.

(10) Leave the locking wire inserted, and inflate dry nitrogen at 35 PSI in the Copilot Pitot Line from the Airspeed Indicator fitting, previously disconnected to flush dirt out of Pitot's frontal hole.

(11) Remove the locking wire from the pitot Drain Hole.

(12) Connect the Copilot Pitot Line to the Copilot Airspeed Indicator .

(13) Install the Copilot Airspeed Indicator to the copilot instrument panel.

(14) If installed, remove the plug and reconnect the Copilot Pitot Line to the ADDU (Ref. to 34-12-01).

(15) Restore the electrical power.

(16) Perform Pitot-Static Leak Test.

(17) Remove the warning notice in the flight compartment.

14. Static (Outer) Plate and Inner Port Step Height Measurement

A. Fixtures, Test and Support Equipment

Static Port and Plate Flushness (Step-Height) Measurement Tool, SPF-4, or an equivalent step-height measuring device Calibration (Gage) Block, -109

B. Materials

Lint-Free Cloth	04-013

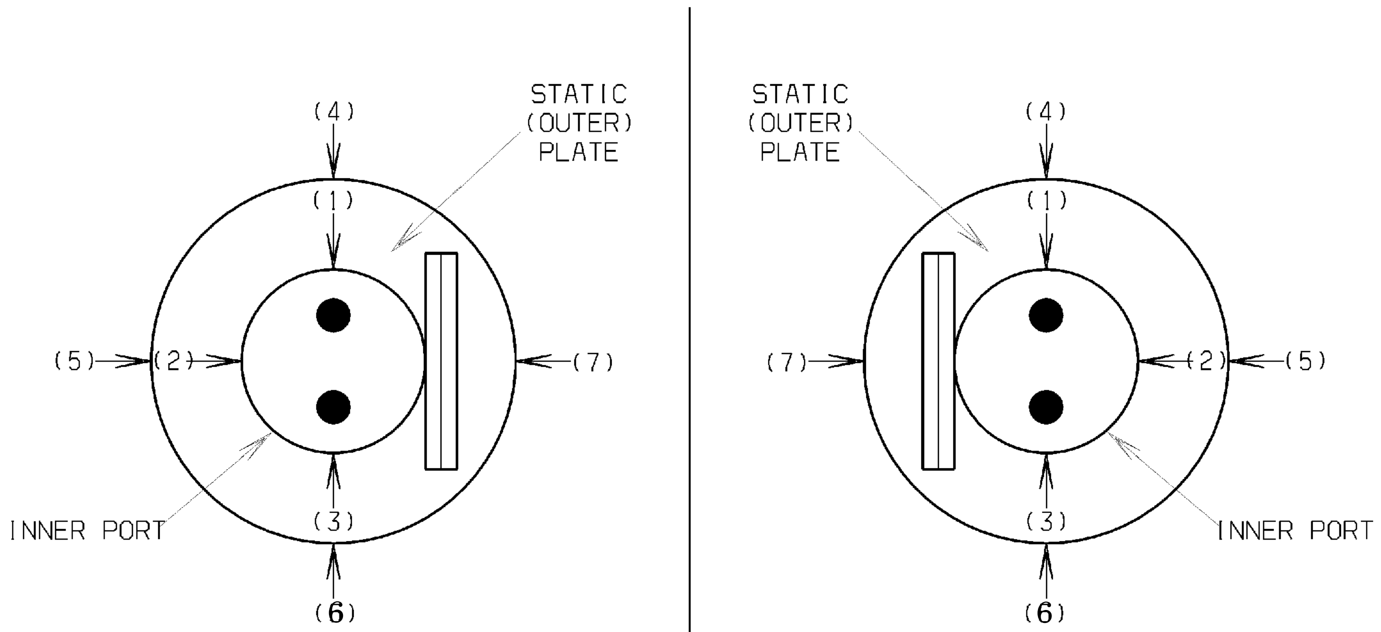
C. Procedure

NOTE: The static (outer) plate and inner port installation flushness ("step height") must be measured to ensure compliance with RVSM air data accuracy requirements. The inspection must be conducted initially, at 24-month intervals, and upon removal and installation of any of the static (outer) plates and/or inner ports (Pilot and Copilot's systems, left and right side).
Step height measurements are obtained at three (3) locations on each inner port and at four (4) location on each static (outer) plate. The measurements are used to calculate an average static (outer) plate and inner port flushness value.
The calculated inner port and outer plate flushness values must fall within the range shown in the Table 1.
Figure 209 shows the measurement locations and calculation of the static port and plate flushness values.

MM-341100-209-PA-05

AIRCRAFT ID. : ____________________
OWNER : ____________________
DATE : ____________________

NOTES/COMMENTS : ____________________
____



INNER PORT:	STATIC (OUTER) PORT:	INNER PORT:	STATIC (OUTER) PORT:
(1) ________	(4) ________	(1) ________	(4) ________
(2) ________	(5) ________	(2) ________	(5) ________
(3) ________	(6) ________	(3) ________	(6) ________
	(7) ________		(7) ________

LEFT INNER PORT AVERAGE= ____________ RIGHT INNER PORT AVERAGE= ____________

REQUIREMENT FOR EACH INNER PORT : -0.005 INCHES <PORT AVERAGE < +0.005 INCHES

LEFT STATIC (OUTER) PLATE AVERAGE= ____________ RIGHT STATIC (OUTER) PLATE AVERAGE= ____________

REQUIREMENT FOR EACH STATIC(OUTER)PLATE :0.040INCHES< PLATE AVERAGE<0.090INCHES

Fig. 209 - Static (Outer) Plate and Inner Port Step Height Measurement Worksheet

EFFECTIVITY:

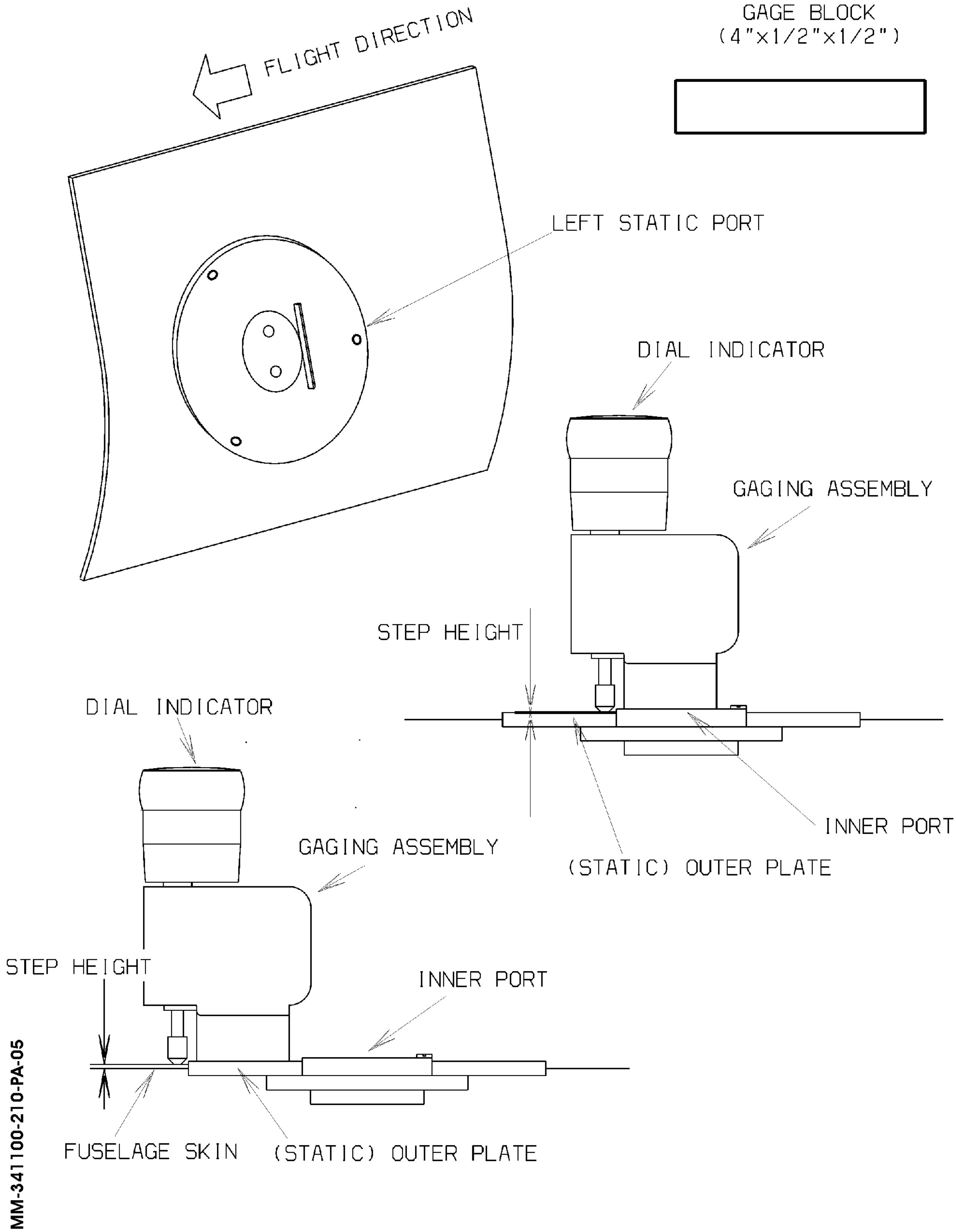


Fig. 210 - Static Port and Plate Flushness (Step-Height) Measurement Tool, SPF-4

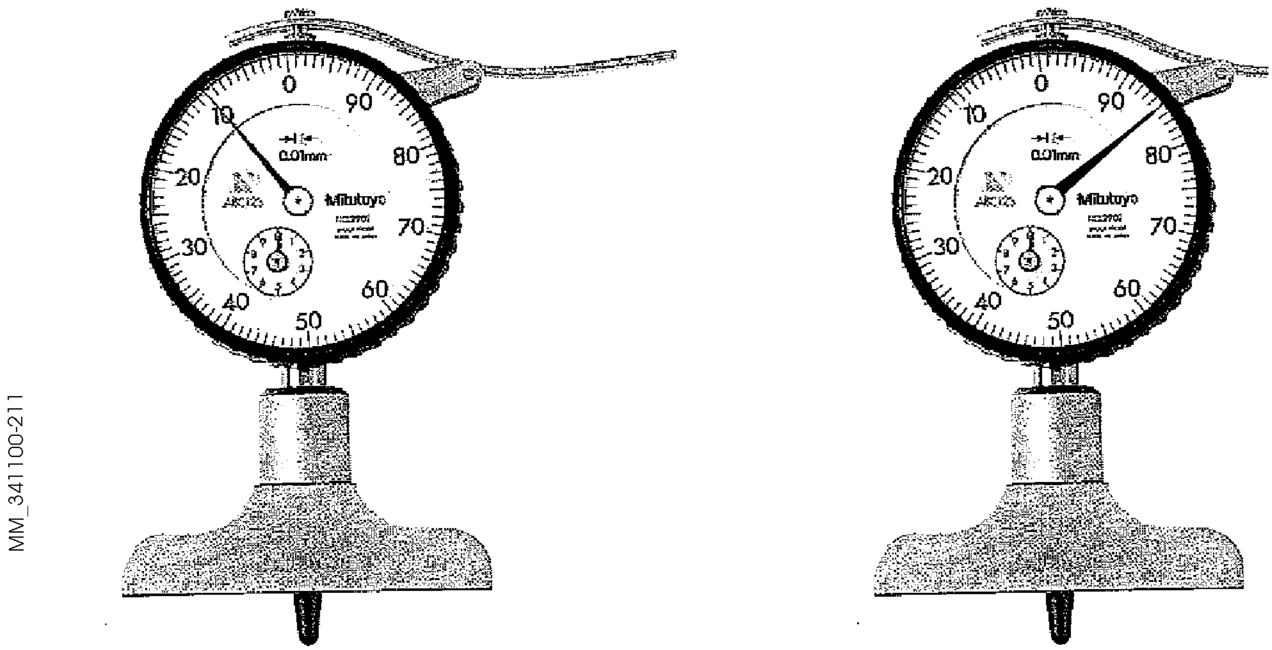


Fig. 211 - Measurement Tool, SPF-4

Allowable Range of Individual Static (Outer) Plate and Inner Port Flushness Average
Maximum Permissible Range Flushness Value
+0.040 (1.016mm) ≤ Static (Outer) Plate Flushness Average ≤ +0.090 (2.286mm)
-0.005 (0.127mm) ≤ Inner Port Flushness Average ≤ +0.005 (0.127mm)

CAUTION: STATIC SPF-4 MUST BE CALIBRATED BEFORE USE. USE THE GAGE BLOCK AS A TOOLING REFERENCE TO INITIALIZE THE SPF-4 AS THE FOLLOWING STEPS.

(1) Inspect the SPF-4 for damage and/or contamination.
(2) Clean the gaging assembly, the gage block, and the dial indicator, as required.
(3) Place the gaging assembly on the gage block (Ref. Fig. 210). Set the dial indicator to read 0.100" (2.54mm).
(4) Remove the gaging assembly.
(5) Properly store the gage block.

NOTE: Make sure that the dial indicator reads negative when the "plunger" is depressed and positive when the "plunger" is elongated.

NOTE: To perform the step height measurements select the right or left side of the airplane and locate the static port RVSM critical Region. Note the Pilot's and Co-pilot's inner ports.

(6) Enter airplane information (Aircraft ID, Owners, and Date) on the Worksheet (Ref. Fig. 209).
(7) Clean surface of the port(s), plate(s), and fuselage in measurement region. Inspect and note any damage to port(s), plate(s), and/or surrounding skin on the back of the worksheet (i.e. anomalies such as paint runs, dimples, dents, blister, etc. and where they are located).
(8) Place the gaging assembly onto the inner port surface with the plunger on the static (outer) plate, as shown in Figure 210.
(9) Move to a measurement point on the inner port, as shown on the Static (Outer) Plate and Inner Port Step Height Measurement Worksheet (Ref. Fig. 209), and record the dial indicator reading.
(10) Repeat "step 9" for each measurement location, (1) to (3), on the inner port.
(11) Place the gaging assembly onto the static (outer) plate surface with the plunger on the fuselage skin, as shown in Figure 210).
(12) Move to a measurement point on the static plate, as shown on the Static (Outer) Plate and Inner Port Step Height Measurement Worksheet (Ref. Fig. 209), and record the dial indicator reading.
(13) Repeat the "step 12" for each measurement location, (4) to (7), on the static (outer) plate.

(14) Proceed to the opposite side of the airplane and repeat the procedure from "step 8" to “step 14”.

(15) Calculate the step height average for each port and plate (add all measurements and divide by the number of measurement points). Enter these values in the worksheet as noted.

(16) Ensure the static (outer) plate and inner port average flushness values are within the specified tolerance. If not, remove and re-install the ports and/or plates, as necessary, to ensure the RVSM system flushness tolerances are met.

(17) Properly store the gaging assembly.

CAUTION: SINCE THE GAGE IN NOMINALLY SET TO 0.100”(2.54mm), YOU MUST SUBTRACT YOUR READING FROM 0.100”(2.54mm) TO DETERMINE ACTUAL FLUSHNESS MEASUREMENT VALUE. THIS SHOULD BE COMPLETE BEFORE CALCULATING ANY AVERAGES.(REF. TO FIG. 211)

15. Visual Inspection of the Region Surrounding the Static Ports (RVSM Critical Region)

A. Referenced Information

Maintenance Manual Chapter 12-24-02

Structural Repair Manual - Report N°.180- MAN-0250-01106

B. Procedure

NOTE: Small markings must be applied to the corners of the RVSM Critical Region to allow for easy identification. These markings are visible and easy individuable for conducting the inspection. The Fig. 212 defines the RVSM Critical Region and the Fig. 213 illustrates the markings and their position on the skin surface.

(1) Prior to all flights in RVSM airspace, during the walk around check procedure, the operator must visually inspect the RVSM Critical Region for obvious damage or deformation, perhaps due to walkway damage, foreign object damage, service vehicles, etc. The inner port orifices must also be inspected for corrosion, elongation, deformation, and/or obstruction and the operator must ensure that no foreign matter is found within the inner port orifice. If damage is sustained within the RVSM Critical Region, follow the manufacturer established procedure for repair. Repairs should remain internal, if possible. In all cases, damage and repair within the RVSM Critical Region will necessitate a special instrumented inspection of the skin contour and surface geometry near the static ports, to determine RVSM compliance status. At this point the operator should contact the airframe manufacturer for assistance.
If the static (outer) plates and/or inner ports are damaged or deformed, they should be renewed or replaced per established procedures. The static (outer) plates and inner ports must be installed such that the requirements for plate/ port flushness are met.

(2) In presence of dust, slush, greased dust refer to Maintenance Manual Chapter 12-24-02 for cleaning procedure.
In presence of nicks, dents, or scratched refer to Structural Repair Manual for repaire.

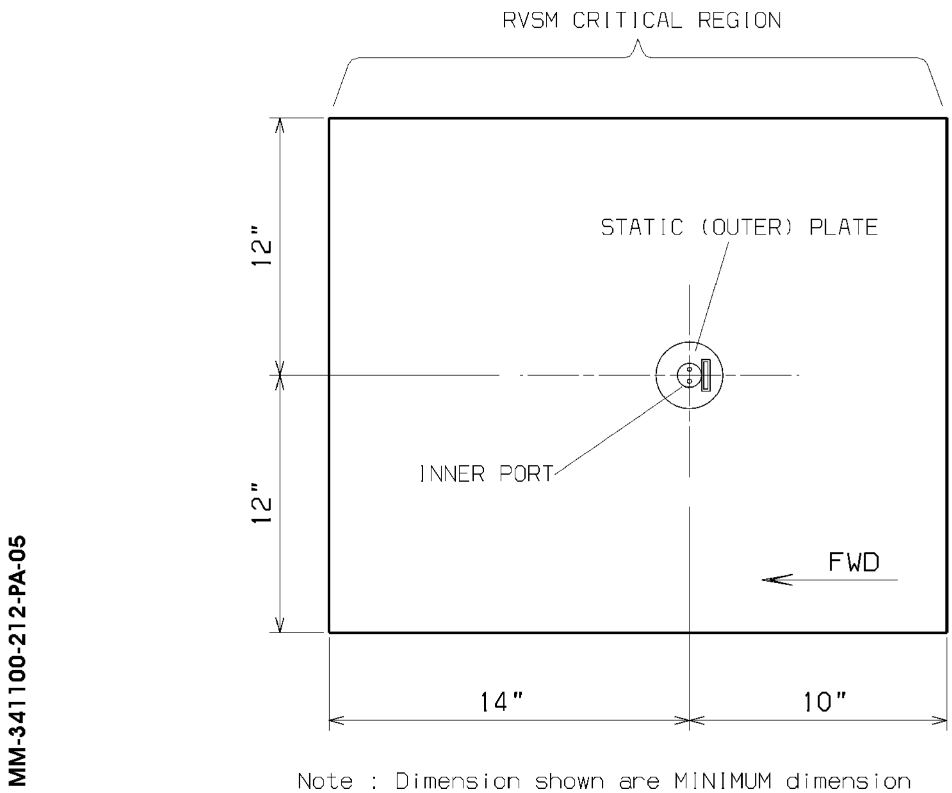


Fig. 212 - RVSM Critical Region Definition - Left Side Shown

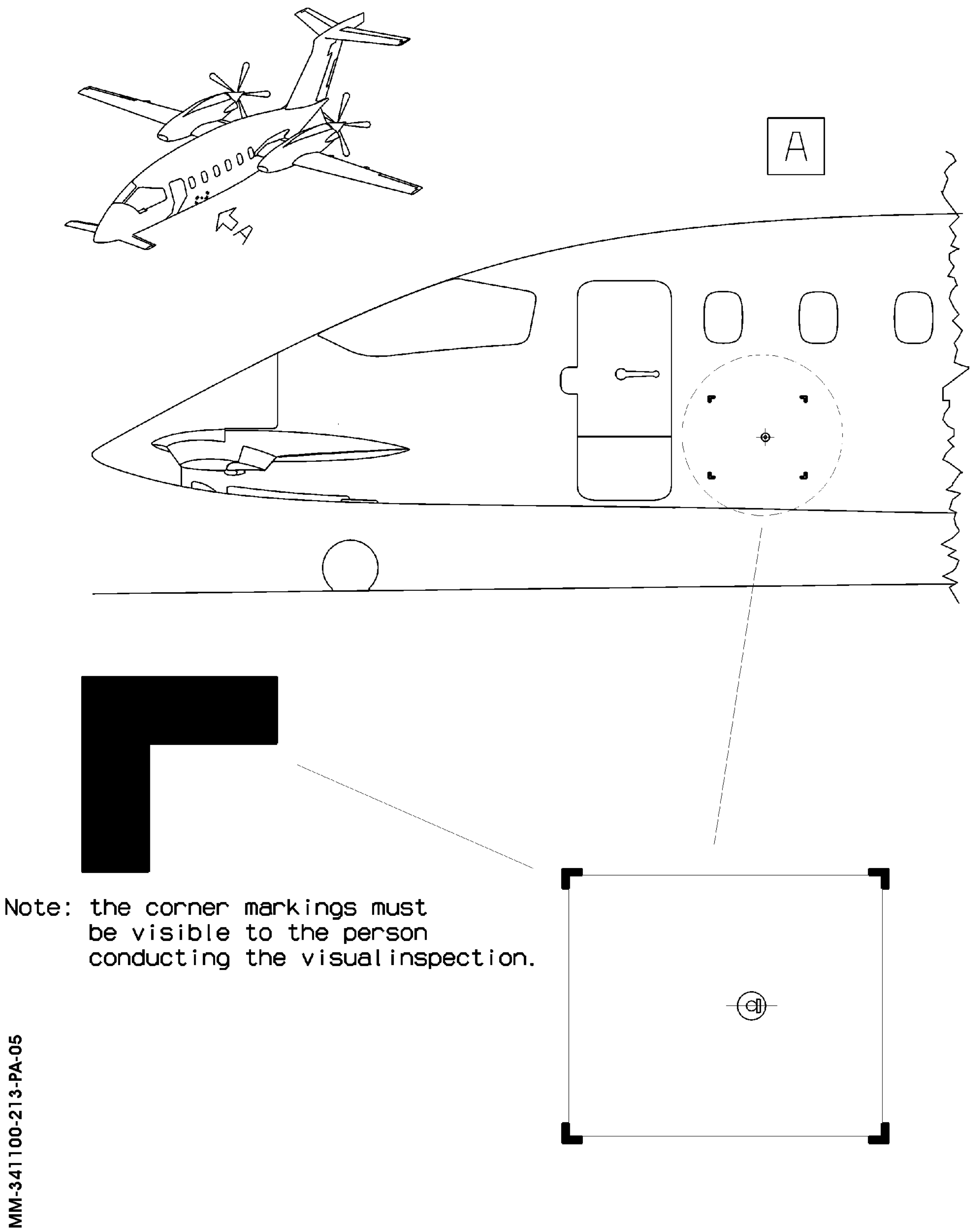


Fig. 213 - RVSM Critical Region - Left Side Shown

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PITOT-STATIC SYSTEM - ADJUSTMENT/TEST

1. Pitot-Static System - Functional Test

A. Fixtures, Test and Support Equipment

Pitot-Static Test-Unit	PN A352 NSN 4920-21-893-0772
Air Data Accessories Kit	Model No. ADA 180-612 FSCM 38002

B. Referenced Information

Maintenance Manual Chapter 24-00-00
Maintenance Manual Chapter 30-00-00

C. Procedure

NOTE: Test equipment should be checked for leaks prior to test.

NOTE: The procedure for functionally testing the Pitot-Static system consists of the following:

- applying a vacuum to the static system and comparing the data on both PFD and Standby Instrument displays.
- applying pressure to the pitot system and comparing the data on both PFD and Standby Instrument.

(1) Make sure electrical power is available (Refer to 24-00-00).
(2) Open tag and safety these circuit breakers: R PITOT ST HTR, L PITOT ST HTR.
(3) Check the following circuit breakers are closed : ADC 1, ADC 1 SEC, ADC 2, STANDBY INSTR.
(4) Set the Avionics Master Switch to ON.
(5) Check static ports for freedom from obstruction.
(6) Check the position of Static Selector is in normal position (STATIC TUBE).
(7) Connect correct end of static hose assembly to LH airplane static port and other end of static hose assembly to Pitot-Static Test-Unit outlet decaled A/C STATIC. Close RH static port.

NOTE: Close all Pitot-Static Test-Unit valves.

(8) Operate vacuum pump on Pitot-Static Test-Unit to create a vacuum, as indicated by gage decaled SOURCE VACUUM, of approx. 27 in.Hg.
(9) Check that BARO setting on PFDs are set to 1013.25 mbar (29.92 in.Hg.).

CAUTION: APPLY AND RELEASE STATIC AND PITOT PRESSURE SLOWLY, TO PREVENT DAMAGE TO THE PRIMARY AIR DATA COMPUTER.

(10) Carefully rotate VACUUM CONTROL on Test-Unit until altimeter on Test-Unit indicates approx. 2000 ft of altitude.

(11) Check the data on pilot PFD to see if related instruments on Pitot-Static Test-Unit indicate same values.

NOTE: If large differences are displayed between data on the Pilot PFD during test, physically check static lines to Air Data Computer and Static selector. If static lines are serviceable, replace Air Data Computer or Static selector.

(12) Allow system to stabilize.
(13) Note altitude reading and start stop-watch. Check altitude reading does not drop more than 40 ft. in one minute.
(14) Slowly release static test pressure (STATIC DUMP) and allow system to return to ambient pressure.
(15) Disconnect static hose assembly from LH Pitot-Static port.
(16) Connect correct end of static hose assembly to RH airplane static port and other end of static hose assembly to Pitot-Static Test-Unit outlet decaled A/C STATIC. Close LH static port

NOTE: Close all Pitot-Static Test-Unit valves.

(17) Repeat point (8) and (9).

CAUTION: APPLY AND RELEASE STATIC AND PITOT PRESSURE SLOWLY, TO PREVENT DAMAGE TO THE SECONDARY AIR DATA COMPUTER AND STANDBY INSTRUMENT.

(18) Repeat point (10).
(19) Check the data on co-pilot PFD and Standby Instrument to see if related instruments on Pitot-Static Test-Unit indicate same values.

NOTE: If large differences are displayed between data on the co-pilot PFD and Standby Instrument during test, physically check static lines to Secondary Air Data Computer and Standby instrument. If static lines are serviceable, replace Air Data Computer or Standby instrument.

(20) Allow system to stabilize.
(21) Note altitude reading and start stop-watch. Check altitude reading does not drop more than 40 ft. in one minute.
(22) Slowly release static test pressure (STATIC DUMP) and allow system to return to ambient pressure.
(23) Disconnect static hose assembly from RH Pitot-Static port.
(24) Cover LH and RH pitot head drainage holes using non-transparent adhesive tape.
(25) Install pitot adaptors on LH and RH pitot tubes.
(26) Using pitot adaptor tube connect LH and RH pitot adaptors to Test-Unit pressure outlet decaled A/C PITOT.

CAUTION: DO NOT APPLY ANTI-ICE HEATING TO PITOT TUBES WHEN PITOT ADAPTORS ARE INSTALLED.

(27) Operate Test-Unit pump to charge pitot pressure chamber of Test-Unit to approx.

CAUTION: APPLY AND RELEASE PITOT PRESSURE SLOWLY, TO PREVENT DAMAGE TO THE AIR DATA COMPUTERS AND STANDBY INSTRUMENT.

(28) Slowly open pressure control, on Test-Unit.

(29) Compare Airspeed readings on PFD and on Standby Instrument. If large difference is displayed > 3 kts, physically check pilot pitot lines to the Primary Air Data Computer and co-pilot pitot lines to Secondary Air Data Computer and and Standby Instrument. If pitot lines are serviceable, replace faulty Air Data Computer or Standby Instrument.

(30) Note Airspeed readings and start stop-watch. No visible movement should occur in one minute. If necessary, locate and rectify leak.

CAUTION: APPLY AND RELEASE PITOT PRESSURE SLOWLY, TO PREVENT DAMAGE TO INSTRUMENTS.

(31) Slowly release pitot test pressure and allow system to return to ambient pressure.

(32) Remove pitot adaptors from LH and RH pitot tubes.

(33) Remove non-transparent adhesive tape from LH and RH pitot head drainage holes.

(34) Set the Avionics Master Switch to OFF.

(35) Remove safety clips and close circuit breakers: R PITOT ST HTR, L PITOT ST HTR.

(36) Do Operational Test of Anti-Ice System (Refer to 30-00-00).

(37) De-energize airplane electrical system.

(38) Allow pitot tubes and static ports to cool.

(39) Fit protective covers to pitot tubes.

2. <u>Autopilot (Altitude Hold) Performance Test</u>

NOTE: RVSM operation requires that the flight control system accurately maintain selected altitude during normal cruise flight. Perform autopilot checks and/or maintenance in accordance with the Airplane Maintenance Manual.

A. Procedure

(1) During normal cruise flight at an altitude between FL 290 and FL 410 (Baro 29.92 in Hg or 1013mb) engage the autopilot and activate altitude hold on the flight guidance panel. Allow the airplane to stabilize on the selected altitude.

CAUTION: THE AIR MUST BE STABLE (NO TURBULENCE) DURING THIS CHECK.

(2) With the airplane in the normal (cruise) mode and altitude hold engaged, record the data from the PFDs (Ref. to Table 1) every 5 minutes for a flight segment up to 1 hour in length. On longer flights, the data may be recorded every 10 minutes. The maximum altitude deviation shown on the display not exceed +/- 65 ft.

Table 1: RVSM Autopilot Performance Check Table
Cruise Condition

Airplane:__________________ Date:___________________

Enroute to:__________________ Pilot____________________

Time (Minutes)	Pilot's Altimeter	Copilot's Altimeter	Pilot's Mach	Copilot's Mach	Pilot's KIAS	Copilot's KIAS
0:00						
0:05						
0:10						
0:15						
0:20						
0:25						
0:30						
0:35						
0:40						
0:45						
0:50						
0:55						
1:00						

3. RVSM - Ground Test

A. Fixtures, Test and Support Equipment

Pitot Static Test Set — Model DMA MPS30 (or equivalent)

B. Referenced Information

Maintenance Manual Chapter 07-10-00
Maintenance Manual Chapter 24-40-00

C. Procedure

NOTE: Test equipment should be checked for leaks prior to test.

(1) Lift the airplane on jacks until the wheels are clear of the ground (Refer to 07-10-00) to simuate the flight conditions and display the speed on the PFD.
(2) Connect the external power supply to airplane (Refer to 24-40-00).
(3) Set the Battery switch to BAT position.
(4) Set the Avionics switch to AVIONICS position.
(5) Connect the Pitot Static Test Set to the pitot and static ports.

(6) Set the altitude and speed on the Pitot Static Test Set following the values of Table 1.

(7) Take note of the altitude values displayed (on the PFD) on the PILOT and COPILOT columns.

(8) Check that the values are in tolerance (Refer to Table 2).

(9) Set the Battery switch to OFF position.

(10) Set the Avionics switch to OFF position.

(11) Disconnect the external power supply to airplane (Refer to 24-40-00).

(12) Lower the airplane on the ground and remove the jacks (Refer to 07-10-00).

TEST POINT	MACH NUMBER	AIRSPEED (KTS)	TEST ALTITUDE (FEET)	DISPLAYED ALTITUDE (FEET)			NOMINAL ALTITUDE (FEET)	ALLOWABLE ALTITUDE TOLERANCE [SSEC CORRECTED OUTPUT] (FEET)		
				PILOT	COPILOT	STANDBY				
1		100	29000	______	______	______	28988	28935	to	29041
2	0.453	170	29000	______	______	______	28976	28923	to	29029
3	0.530	200	29000	______	______	______	28965	28912	to	29018
4	0.606	230	29000	______	______	______	28921	28868	to	28974
5		100	35000	______	______	______	34986	34925	to	35047
6	0.488	160	35000	______	______	______	34976	34915	to	35037
7	0.546	180	35000	______	______	______	34962	34901	to	35023
8	0.603	200	35000	______	______	______	34927	34866	to	34988
9	0.631	210	35000	______	______	______	34904	34843	to	34965
10		100	41000	______	______	______	40982	40906	to	41059
11	0.526	150	41000	______	______	______	40968	40892	to	41045
12	0.559	160	41000	______	______	______	40957	40880	to	41033
13	0.591	170	41000	______	______	______	40936	40859	to	41012

AIR DATA TEST SET INFORMATION

MANUFACTURER :DMA MARCHIORI   Model : MPS 30

SERIAL NUMBER 5558   Date of Calibration : __________

ACCURACY SPECIFICATION : ____________________

Table 2

AIR DATA SYSTEM - DESCRIPTION AND OPERATION

1. Description

A. The Air Data System (ADS) is a dual (pilot and co-pilot side) ADS 3000 system.

Each Air Data Computer is connected to Pitot-Static system of the aircraft (respectively left side (primary) ADC to pilot system and right side (secondary) ADC to co-pilot system) and to an independent section of the Total Air Temperature (TAT) probe .

The pilot and co-pilot side ADC and associated sensors are functionally isolated and each functions as a self-contained, stand-alone system.

The ADCs supply processed air data to the Flight Guidance System (FGS), Attitude Heading System (AHS), Electronic Flight Instrument System (EFIS), Integrated Avionics Processor System (IAPS), and the navigation systems (including the Mode S Transponder) through the digital busses architecture (Ref. to Fig. 1).

Each pilot can select Air Data from the cross-side ADS, via reversionary panel, by switching the rocker switch ADC1/ADC2 in the event of an on-side air data failure.

The Primary ADS is powered by the Essential Avionics Bus through the ADC 1 circuit breaker and by converter DC 1 CH1 through the ADC 1 SEC circuit breaker located on pilot c/b panel.

The Secondary ADS is powered by the Right Avionics Dual Feed Bus through the ADC 2 circuit breaker located on te copilot c/b panel.

In this way the Primary ADS system, is always provided with electrical power also in case of a double generator failure. The Secondary ADS system is powered by a separately selectable bus by the pilot in an abnormal condition.

Operation of the ADS-3000 is automatic when power is applied to the system and the initialization process has been completed.

B. The Air Data Computers are installed in the nose avionics bay (Ref. to Fig. 2).

Each ADC receives total (Pt) and static air pressure (Ps) and air temperature inputs from the Pitot/Static system.

Each ADC also receives pre-programmed aircraft data on static source error correction (SSEC) and maximum allowable airspeed (V_{MO} /M_{MO}).

The ADC processes the raw data, then sends digital air data to the Primary Flight Display (PFD) and other aircraft subsystems that use air data inputs, via the IAPS and system bus structure.

A redundant system bus supplies the digital air data directly to the PFD and MFD. Processed air data provided by the ADC include: uncorrected pressure altitude, baro corrected altitude, vertical speed (VS), airspeed (IAS/CAS), IAS trend, Mach, V_{MO}/M_{MO}, true airspeed (TAS), total air temperature (TAT), static air temperature (SAT), and International Standard Atmosphere (ISA) delta temperature.

The Air Data Computers are provided by mean of controls located on the PFDs and DCPs.

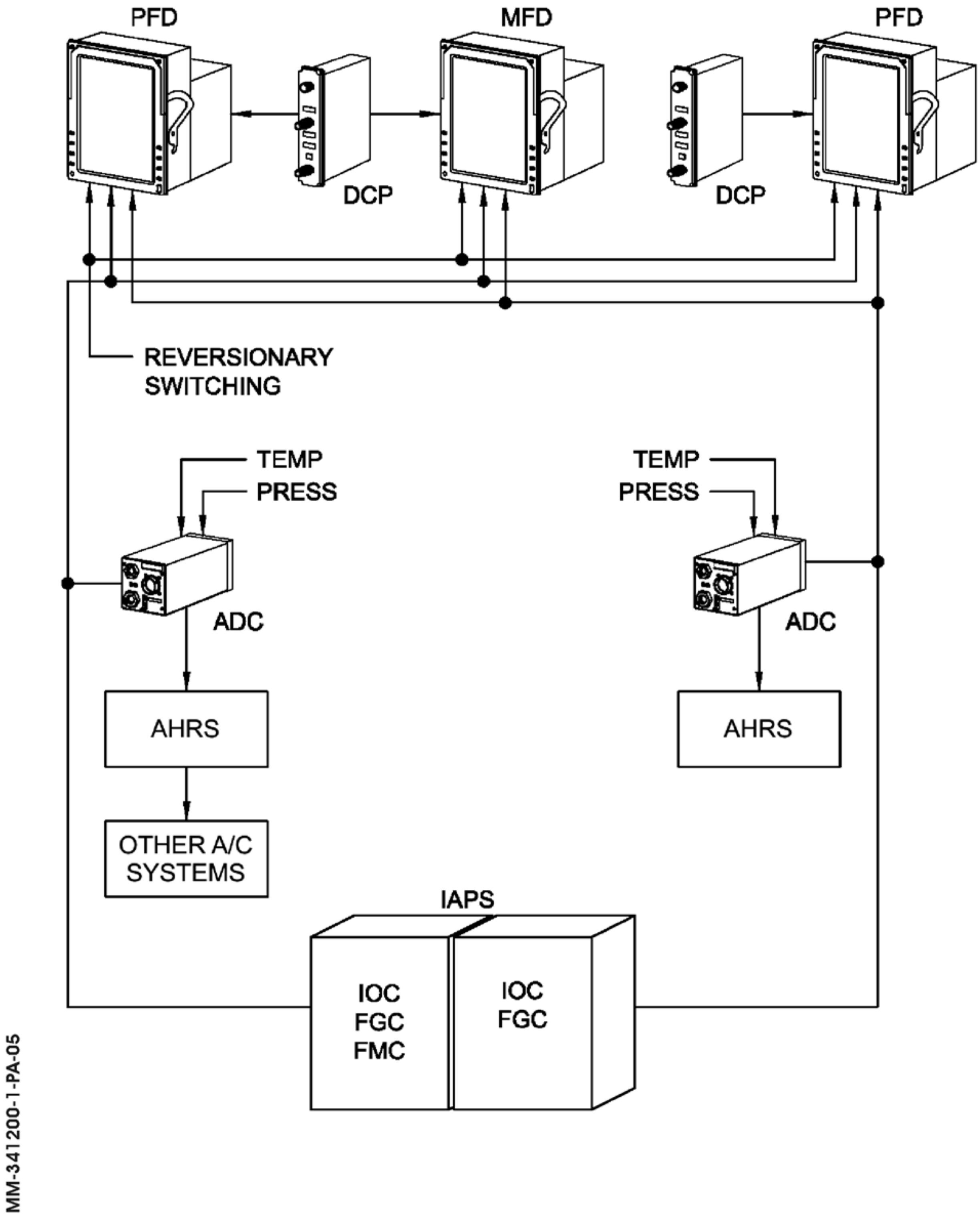

Fig. 1 - Air Data System - Block diagram

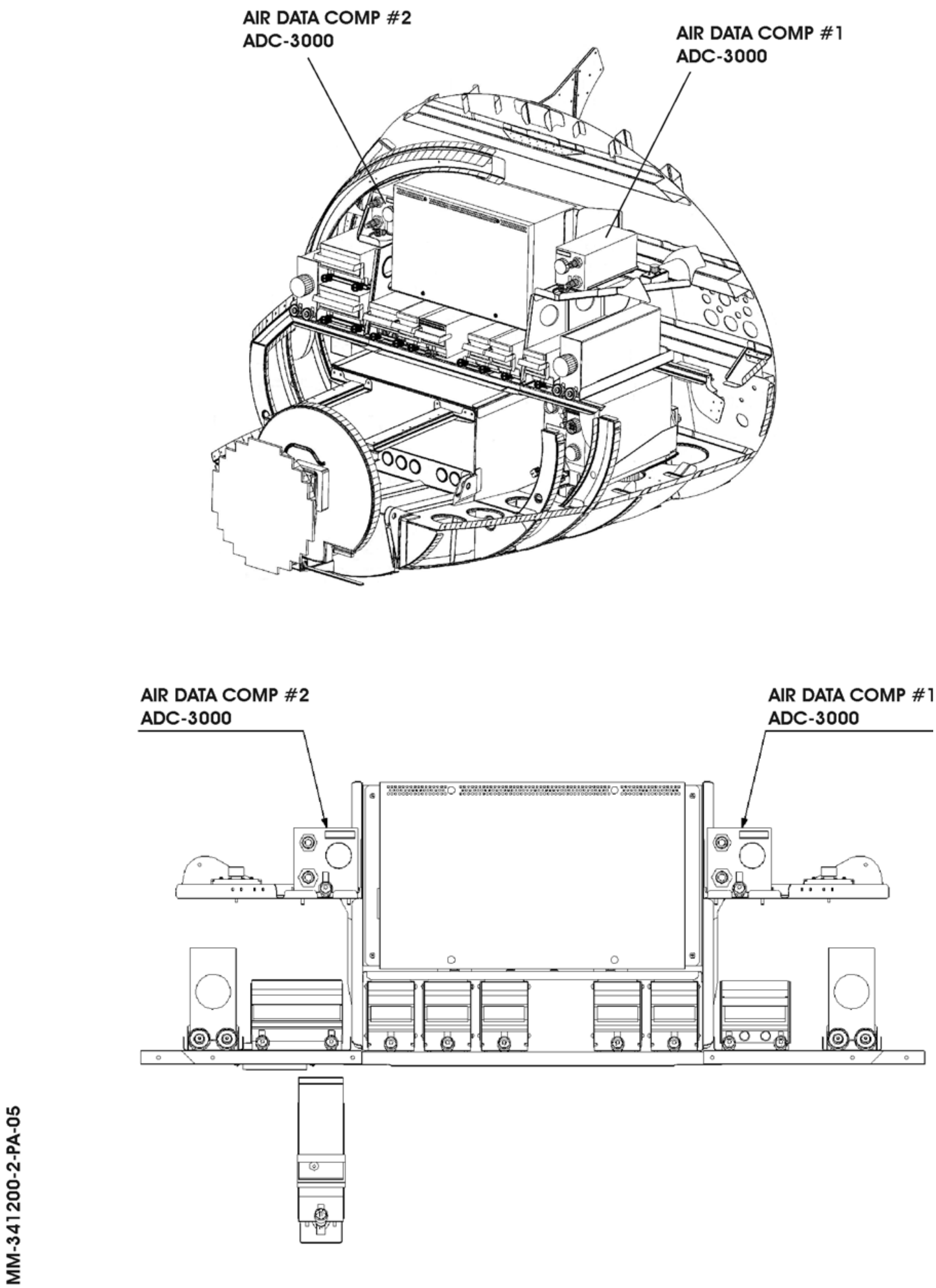

Fig. 2 - Air Data Computers location

C. The Total Air Temperature (TAT) probe provides temperature signals to the both Air Data Computer Primary and Secondary.

The Total Air Temperature (TAT) probe is installed on the front fuselage on the lower left side at STA. -310 (Ref. to Fig. 3).

The sensing element of the temperature probe consists of a platinum wire having a 500-ohm resistance at 0° C and is insulated and hermetically sealed within two concentric tubes.

The Total Air Temperature is provided with a deicing heater that is powered from Pitot Static Stall Heater system through the TAT HEATER circuit breaker and controlled by the PITOT/STATIC HTR R & TAT switch located on ANTI ICE panel in order to assure the de-icing heater of the probe.

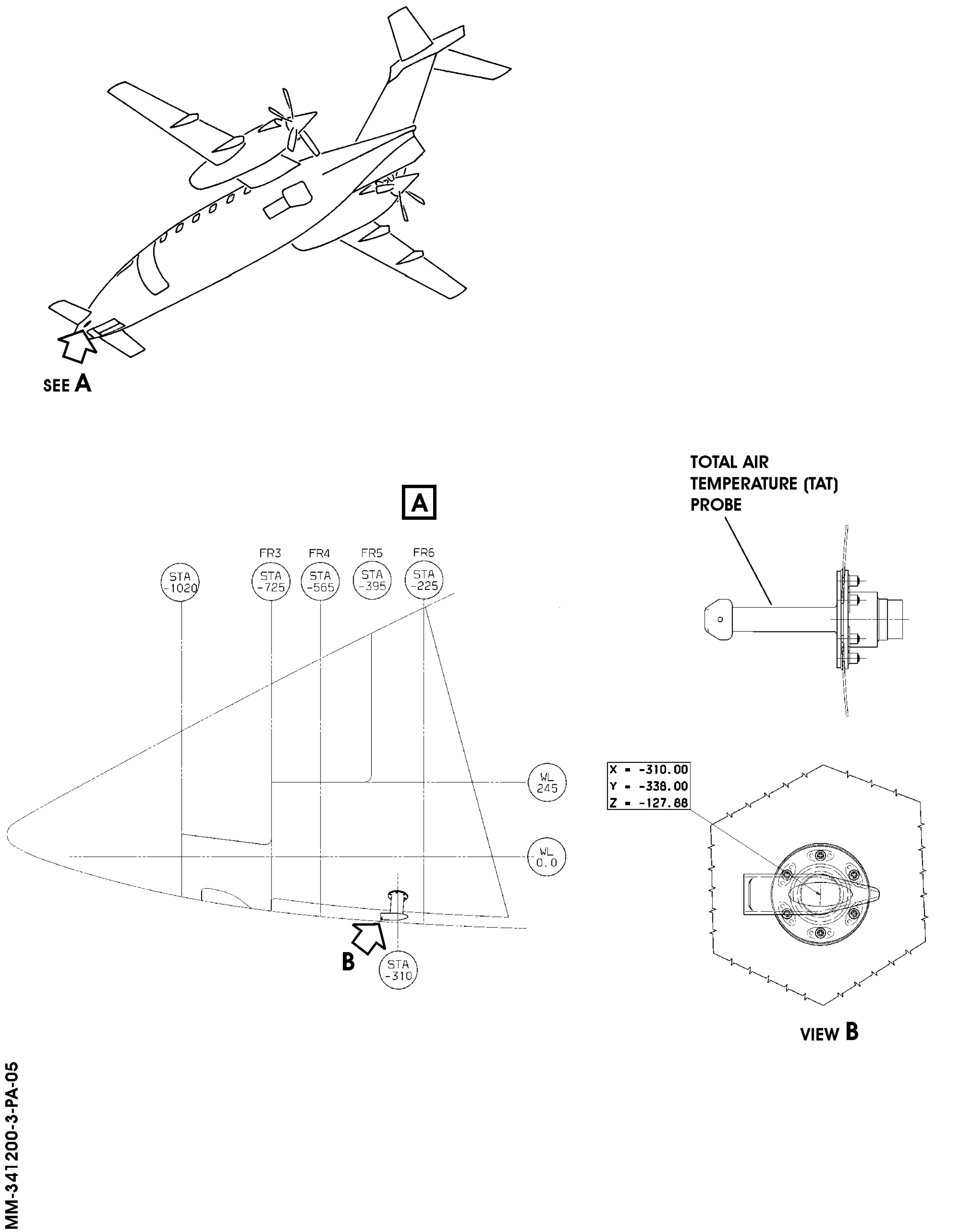

Fig. 3 - Total Air Temperature (TAT) probe location

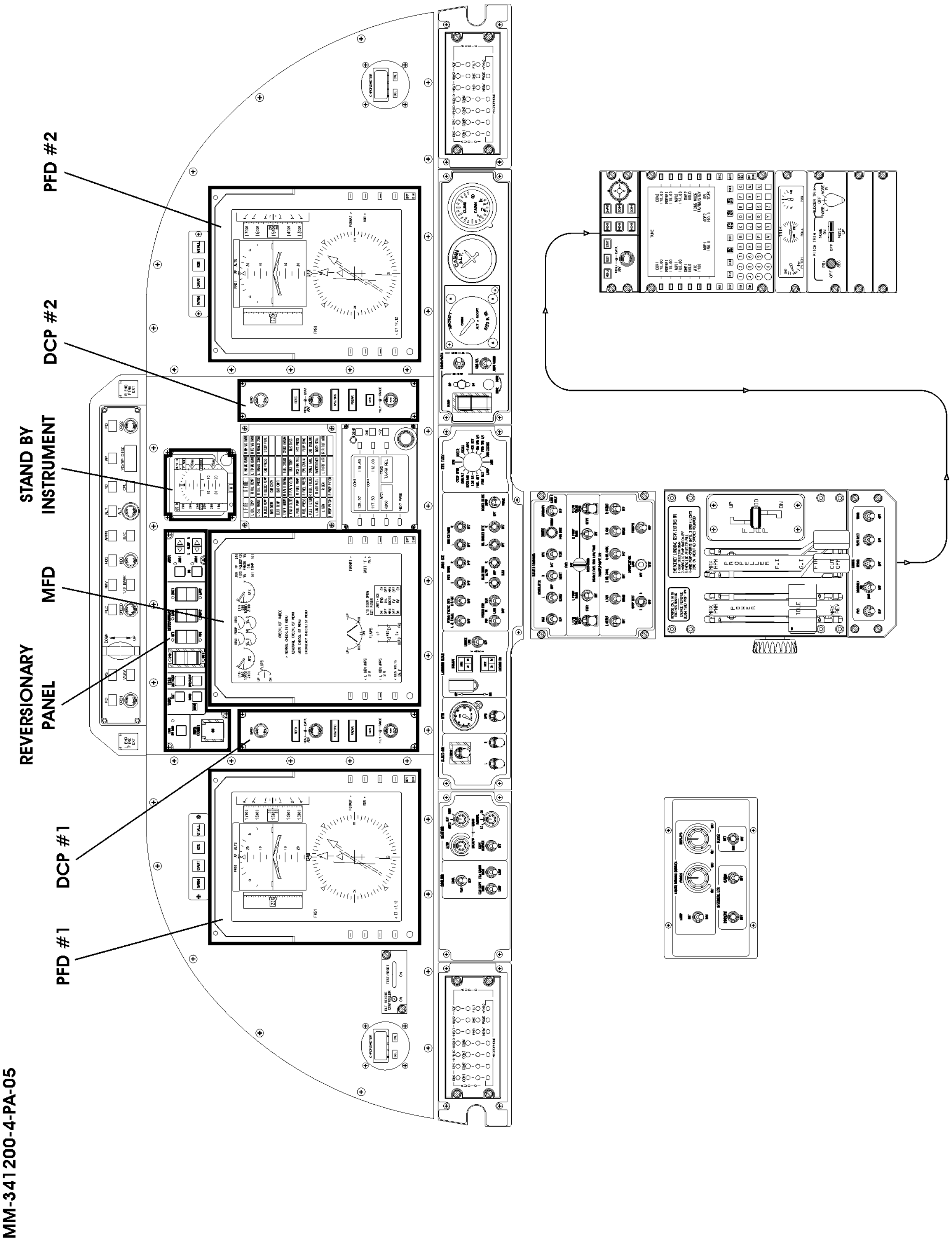

Fig. 4 - PFDs, DCPs and Reversionary Panel location

2. Operations

A. The Display Control Panels (DCP) are installed on the instrument panel on side of related Primary Flight Display (PFD) on the right for the pilot and on the left for the copilot side (Ref. Fig. 4).
Each Display Control Panel (DCP), in conjunction with the line select keys on the PFD, provide the primary interface to control the Displays.

The controls of the functions related to Air Data System are following described (Ref. Fig. 5).

BARO: The BARO knob on the DCP is used to adjust the altimeter setting for nonstandard pressure.

PUSH STD: The PUSH STD (Standard) button in the center of the BARO knob is used to set the standard BARO pressure setting

REFS: The REFS (Reference) button is used to select and deselect the REFS menu on the PFD. The REFS menu provides access to Vspeeds, RA MIN and BARO MIN values.

MENU ADV: The MENU ADV(advance) knob is used to move the cyan selection box on the PFD menus such as the REFS menu.

DATA: The DATA knob is used to select the active state (on, off, stby, etc.) or adjust the settable value highlighted by the cyan selection box.

PUSH SELECT:The PUSH SELECT button is used to select a reference for display (e.g., V_R) or select the active state (on, off, stby, etc.).

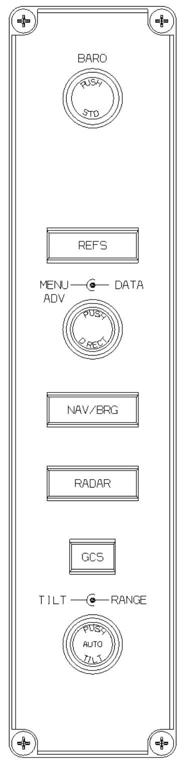

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Fig. 5 - Display Control Panel (DCP)

B. The Avionics (Reversionary) panel is multifunction panel that is installed on the instrument panel (Ref. Fig. 4).

The Air Data System is controlled by a rocker switch ADC1/ADC2 located on REVERSIONARY section of the Reversionary panel. (Ref. Fig. 6).

This switch ADC1/ADC2 is used to select Air Data Computer (ADC) reversion. ADC reversion allows either pilot to select an alternate source of air data in case of an onside air data failure.

As the dual ADSs provide two independent air data sources, upon selection of ADC reversion, the onside ADC data is replaced with ADC data from the cross-side making the cross-side ADC the common air data source.

When the ADC on the pilot side is the common source, the message is ADC1 and is shown in haloed white letters inside a yellow box on both PFDs. When the ADC on the copilot side is the common source, the message shown in haloed white letters inside a yellow box on both PFDs is ADC2.

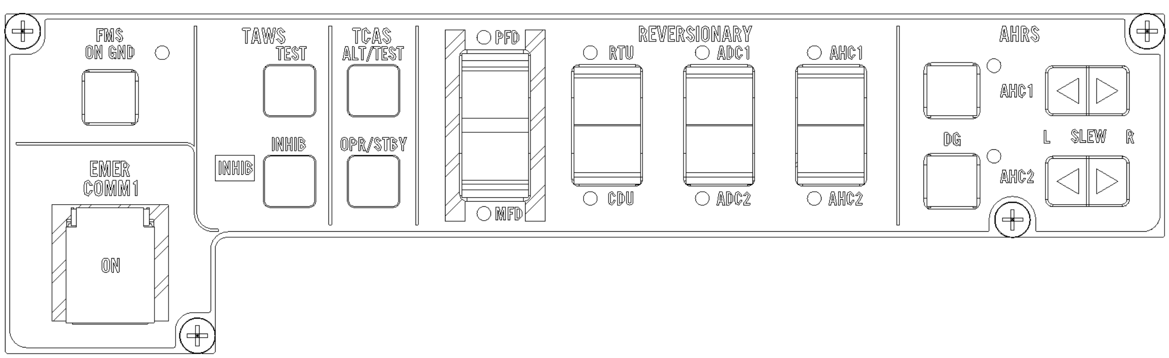

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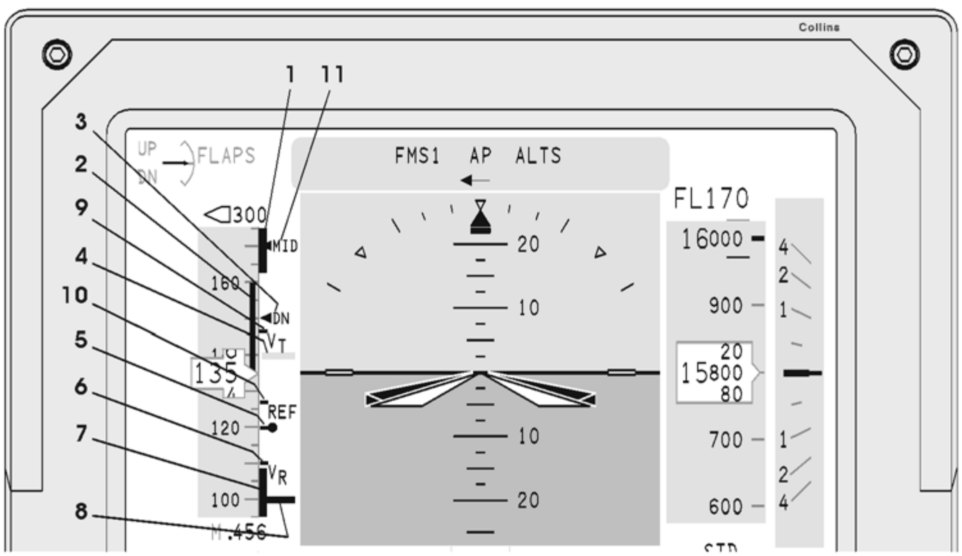
Fig. 6 - Reversionary Panel

C. The typical layout of PFD for air data are shown in Fig. 7, 8 and 9.



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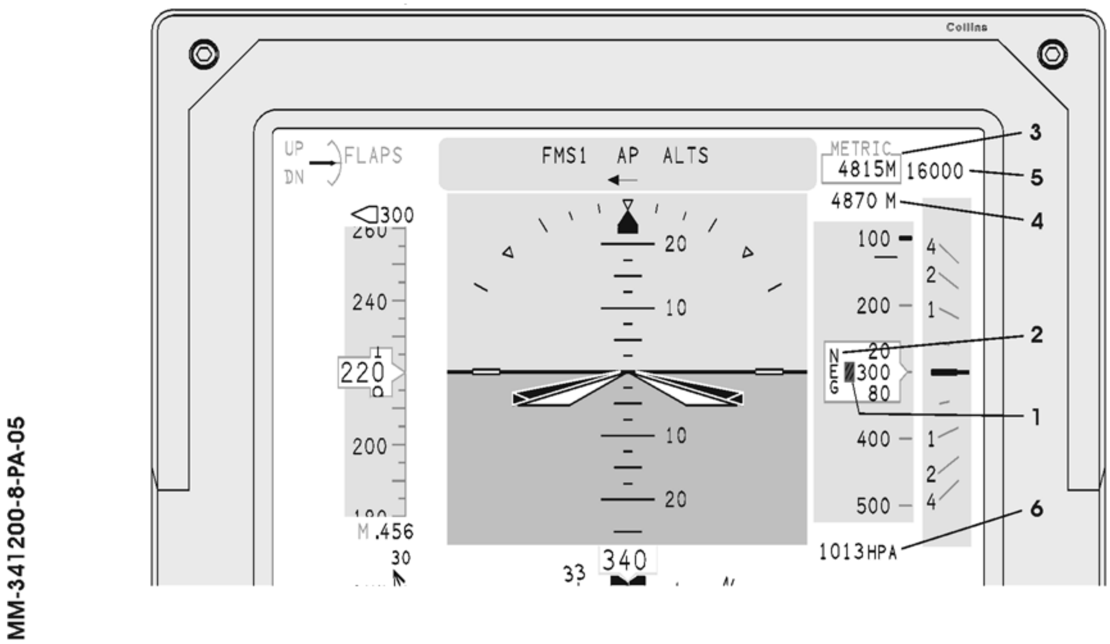
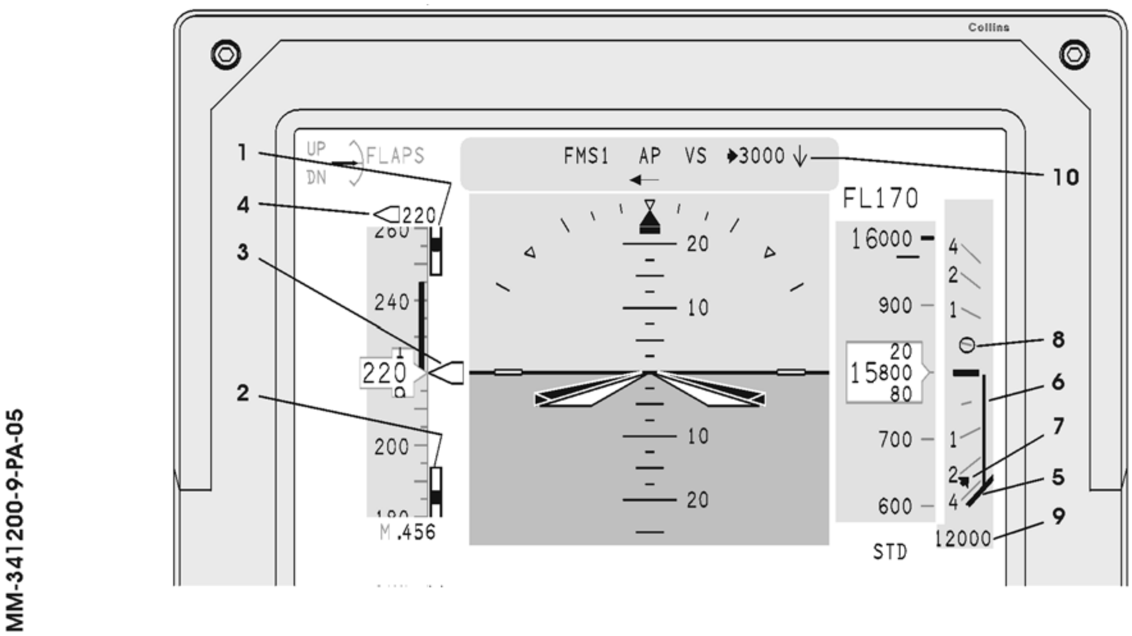
1. Overspeed Cue (not emphasized)
2. Airspeed Trend Vector
3. DN (Max Speed with Flaps Full Down)
4. V_{YSE} (Blue line)
5. V_{50}
6. V_R
7. Low Speed Cue (not emphasized)
8. V_{MCA} (Redline)
9. V_T (Target Airspeed)
10. V_{REF} (Reference Approach Speed)
11. MID (Max Speed with Flaps in MID position)

Fig. 7 - Airspeed Symbology



1. Thousand Shutter
2. Negative Legend
3. Metric Altitude
4. Metric PSA
5. FPTA
6. Baro Pressure, Hecto Pascals

Fig. 8 - Barometric Altitude Symbology



1. Overspeed Cue (emphasized)
2. Low Speed Cue (emphasized)
3. Speed Bug
4. Speed Bug Icon and Value
5. VS Pointer
6. VS Drag Line
7. Selected VS Bug
8. FMS VSR
9. Current VS Digital Value
10. FCS Selected VS Mode, Icon, and Arrow

Fig. 9 - V_{MO} /M_{MO} and Vertical Speed

AIR DATA SYSTEM - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00

A. This topic provides the following Air Data System Maintenance Practices:

– Air Data Computer - Removal
– Air Data Computer - Installation
– Total Air Temperature Probe - Removal
– Total Air Temperature Probe - Installation

2. Air Data Computer - Removal (Ref. to Fig. 201)

A. Fixtures, Test and Support Equipment

Blanking Caps	Not specified
Warning notices	

B. Referenced Information

Maintenance Manual Chapter 24-00-00
Maintenance Manual Chapter 53-10-00

C. Procedure

NOTE: The removal procedures of the Primary and Secondary Air Data Computer are the same. Only the location of Air Data Computer is different.

(1) Remove the electrical power (Refer to 24-00-00).
(2) Remove the radome/nosecone (Refer to 53-10-00).
(3) Bleed pitot-static system slowly.

CAUTION: DO NOT REMOVE FITTINGS FROM FRONT OF UNIT WHILE THEY MAY BE UNDER PRESSURE FOR TESTING.

(4) Get access to Primary Air Data Computer (1) [Secondary (2)] and a disconnect the interconnect cable (3) from the ADC-3000 circular connector.
(5) Disconnect pitot (4) and static (5) lines from the Primary Air Data Computer (1) [Secondary (2)]. Install protective covers to pitot and static ports on the unit and to ends of the disconnected lines.
(6) Loosen the knob (6) that secures the unit to the mount. Remove the unit from the mount.

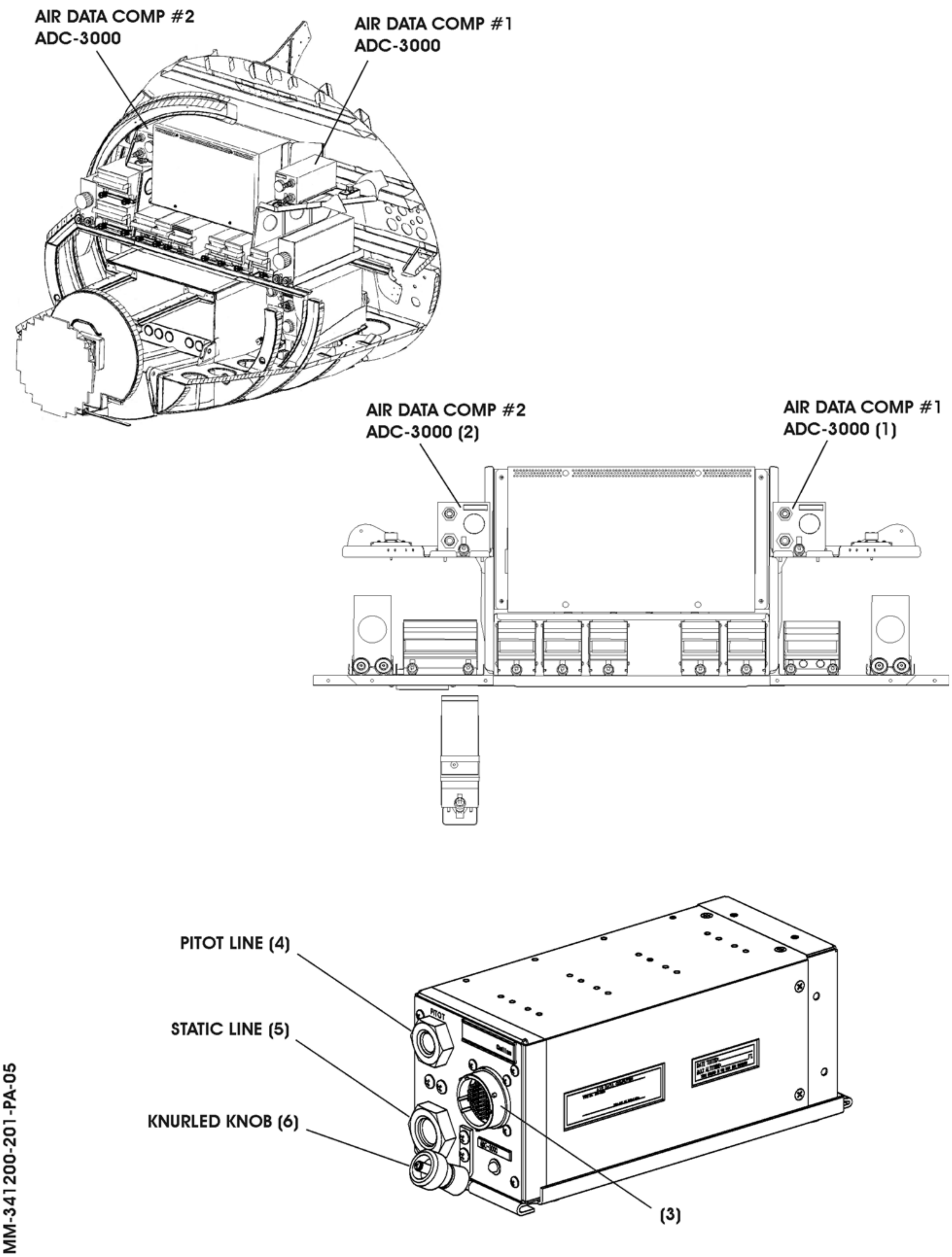


Fig. 201 - Air Data Computer - Removal/Installation

3. Air Data Computer - Installation (Ref. to Fig. 201)

A. Fixtures, Test and Support Equipment

Blanking Caps
Warning notices

B. Referenced Information

Maintenance Manual Chapter 24-00-00
Maintenance Manual Chapter 53-10-00

C. Procedure

NOTE: The installation procedures of the Primary and Secondary Air Data Computer are the same. Only the location of Air Data Computer is different.

(1) Make sure, as necessary that:
- There is no electrical power on the airplane
- The warning notices are in position
- Access is available

(2) Slide Primary Air Data Computer (1) [Secondary (2)] into mount until fully engaged.
(3) Position knurled knob (6) on front of mount to engage unit mounting projection and tighten knurled knob.
(4) Press on front panel to ensure that the unit is fully seated in the mount. Retighten knurled knob (6) until unit is secure in mount.
(5) Make sure that a good electrical bond exists between the unit and the mount (Refer to 20-20-02).
(6) Remove the caps from the pitot and static ports on the air data computer and from the ends of the pitot and static lines.
(7) Connect the pitot (4) and static (5) lines to the Air Data Computer. Torque the fittings to a maximum of 5 ft/lbs (6,77 Nm) torque.
(8) Connect the aircraft inter connect cable to the circular connector (3) on the Primary Air Data Computer (1) [Secondary (2)].
(9) Do a Pitot - Static Leak Test (Refer to 34-11-00).
(10) Carry out a Air Data Computer Operational Test (Refer to 34-12-00).
(11) Install the radome/nosecone (Refer to 53-10-00).

4. Total Air Temperature Probe - Removal (Ref. to Fig. 202)

A. Fixtures, Test and Support Equipment

Blanking Caps

B. Referenced Information

Maintenance Manual Chapter 24-00-00
Maintenance Manual Chapter 53-10-00

C. Expendable Parts

ITEM	NOMENCLATURE	IPC	CSN
	Seal		

D. Procedure

(1) Remove all electrical power (Refer to 24-00-00).
(2) Remove the radome/nosecone (Refer to 53-10-00).
(3) Gain access to Total Air Temperature Probe internal part and disconnect electrical wiring from probe. Cap exposed connector.
(4) Remove six screws (2) securing to Total Air Temperature Probe (1) to front fuselage.
(5) Remove to Total Air Temperature Probe (1).

5. Total Air Temperature Probe - Installation (Ref. to Fig. 202)

A. Fixtures, Test and Support Equipment

Blanking Caps

B. Referenced Information

Maintenance Manual Chapter 24-00-00
Maintenance Manual Chapter 53-10-00

C. Expendable Parts

ITEM	NOMENCLATURE	IPC	CSN
	Seal		

D. Procedure

(1) Make sure, as necessary that:
- There is no electrical power on the airplane
- The system is safe
- Warning Notices are in position
- Access is available

(2) Install Total Air Temperature Probe (1) in fuselage and secure in position using six screws (2)

(3) Remove cap from Total Air Temperature Probe connector and connect wiring harness to the Total Air Temperature Probe.

(4) Restore electrical power (Refer to 24-00-00).

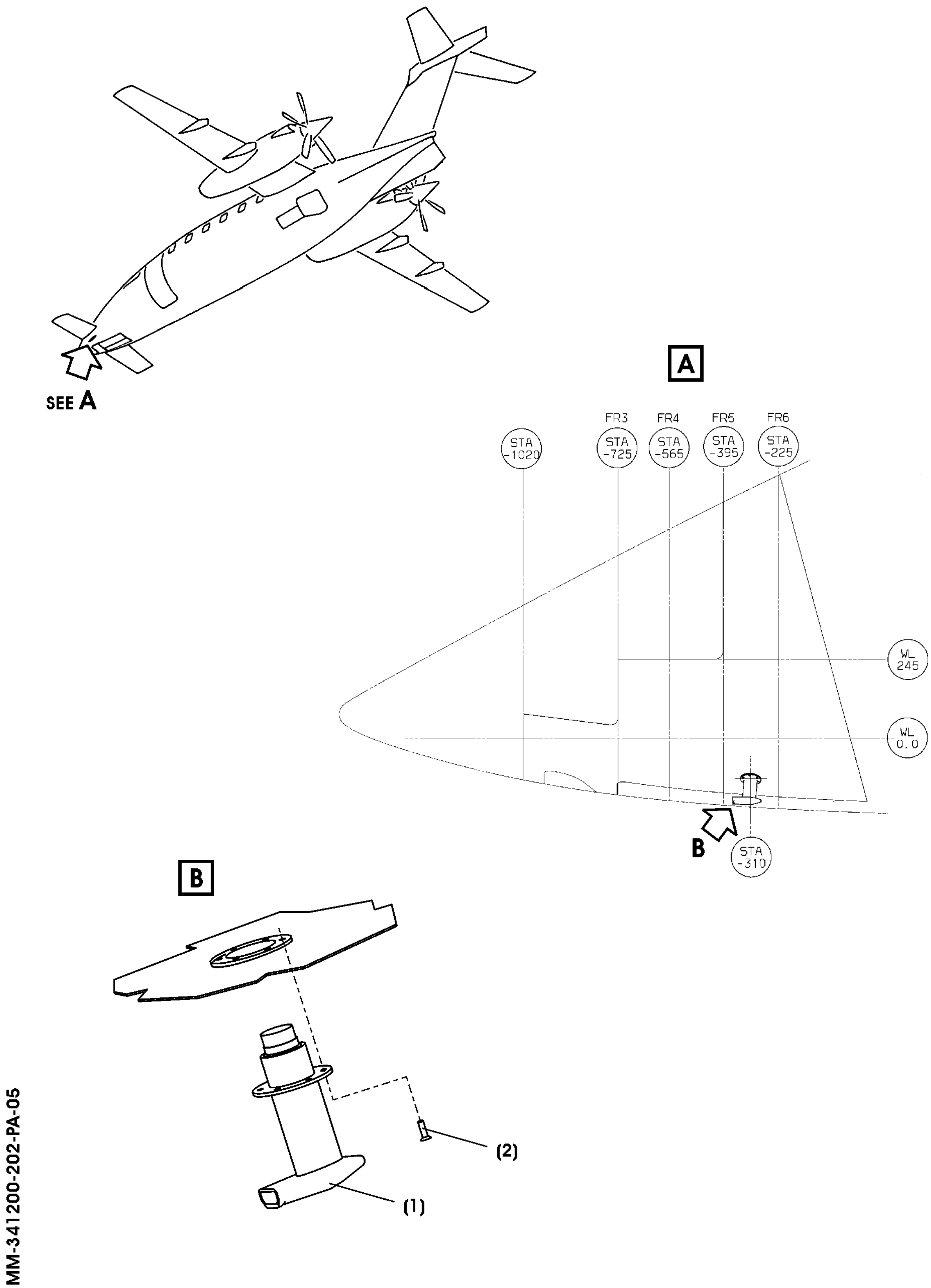


Fig. 202 - Total Air Temperature Probe - Removal/Installation

AIR DATA COMPUTER - ADJUSTMENT/TEST

1. Air Data Computer - Operational Test

A. Fixtures, Test and Support Equipment

Not Applicable

B. Referenced Information

Maintenance Manual Chapter 24-00-00

C. Diagnostic Information

The Air Data Computer (ADC-3000) has a single multicolor LED on the front panel for maintenance and servicing. The LED reflects the operation of the fault monitoring system in the Air Data Computer and indicates a fault when the fault has been present long enough or often enough to alter the Air Data Computer operation.

The LED has two states: red and off. During normal operation the LED remains off.

If a failure is detected, the Air Data Computer categorizes the failure into one of the following types:

1. A failure that it cannot necessarily isolate within itself
2. A failure in the Air Data Computer that will not affect the operation of the unit in the aircraft
3. A failure in the Air Data Computer that will affect the operation of the unit in the aircraft

For failures corresponding to types 1 and 2 above, the LED remains off. For type 3 failures, the LED turns red. If no type 3 faults are currently detected, the Air Data Computer ADC-3000 examines the fault log for the previous four power-up cycles and categorizes the faults as type 1, 2, or 3. Any type 3 faults in the previous four power-up cycles will cause the LED to turn red.

During power-up and initialization, the LED turns red until it has completed all of its initialization checks.

If a type 3 failure is detected during power up, the LED remains red after the initialization checks are complete.

The following type 3 failures, turns the LED red:

1. Initialization Errors

   Strap code mismatch

   Offset data invalid

   Sensor coefficient data invalid

   Aircraft configuration data invalid

   Sensor initialization timeout

   Hardware version/software version mismatch

2. Initialization and Background Errors
   ARINC wrap test failure
   CRC test failure
   Memory test failure (RAM or Shadow RAM pattern test)
3. Unexpected Event Errors
   Foreground cycle overrun
   Unexpected 386 interrupt

D. Procedure

(1) Check the following circuit breakers are closed : ADC 1, ADC 1 SEC, ADC 2, STANDBY INSTR.

(2) Set the Battery Master and Avionics Master Switch to ON.

(3) Wait 2 minutes for the ADS-3000 system to stabilize

(4) Set the barometric display to the local reported baro setting using the BARO knob on the DCP.

(5) Check that all air data displays are normal and air data flags are not displayed. Verify LED on front of Primary Air Data Computer (1) [Secondary (2)] is not illuminated.

Verify that V_{MO} is indicated at the expected value for the aircraft.

(6) Observe the altitude indication on the display is about the same as the elevation of the airfield.

STANDBY INSTRUMENT (AIR DATA SECTION) - DESCRIPTION AND OPERATION

1. Description

A. The integrated Standby Instrument system consists of an Electronic Standby Instrument type GH-3100 and a Detachable Configuration Module type DCM-3100.

The Standby Instrument is a self-contained solid state instrument requiring pitot and static pressure and +28 Vdc input power to provide a visual display of air data (baro corrected altitude, air speed, mach number, and vertical speed), attitude (pitch and roll) and slip/skid information. For description of Attitude and slip/skid refer to 34-22-00.

The DCM-3100 is a solid-state device installed on the GH-3100 (J2) connector, that retains software and hardware configuration information for a specific aircraft.

The Electronic Standby Instrument receives Static and Pitot pressure inputs from RH Pitot / Static system. Refer to 34-11-00.

The Standby Instrument is powered by the 28 V dc Emergency Power Bus through the STANDBY INSTR circuit breaker located on pilot c/b panel.

The Standby Instrument also receives 5 Vdc for lighting through the Avionics lights circuit. The power is supplied by the Emergency Power Bus through the EMER LTS circuit breaker located on pilot c/b panel.

In case of total loss of A/C DC sources (DC generators and battery), the Emergency Power Bus is automatically powered through an Emergency Power Unit to assure at least 30 minutes of operative time to the stand-by instrument.

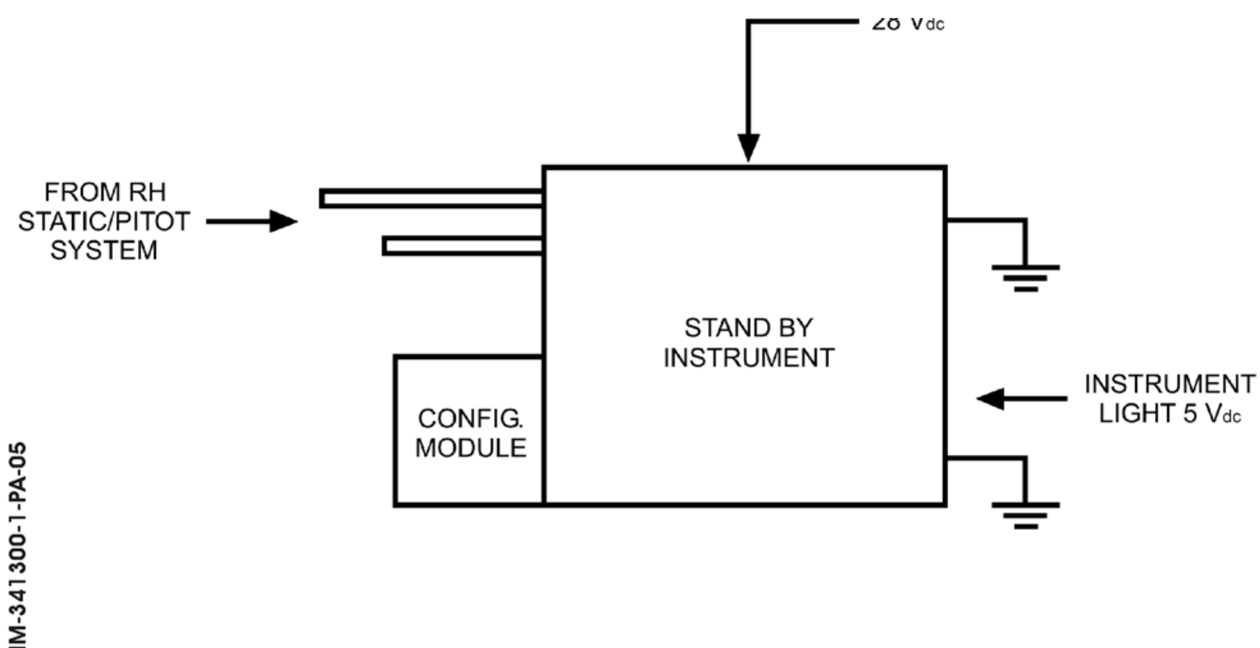


Fig. 1 - Standby Instrument Block Diagram

B. The Electronic Standby Instrument GH-3100 is installed on the central instrument panel (ref. Fig. 2) and consists of a standby attitude and air data indicator, incorporating a strap-down inertial sensor, two pressure sensors and a color active matrix liquid crystal display. It provides the air crew with attitude, altitude and airspeed information in the event of failure of the primary attitude and/or air data computers.

The inertial sensor provides tilt angles in roll, pitch and angular rates used in a strapdown algorithm to compute attitude and slip.

Information is displayed on a color Active Matrix Liquid Crystal Display (AMLCD), in a format which simulates the appearance of an electro-mechanical attitude indicator.

The pressure sensors are used to compute airspeed and altitude data. This information is presented in digital readout and rolling tape formats.

A bezel mounted light sensor provides automatic display dimming capability, with manual offset control achieved through the menu mode.

C. The Detachable Configuration Module type DCM-3100 is a solid-state device, which is installed on the GH-3100 (J2) connector (ref. Fig. 3), that retains software and hardware configuration information for the specific aircraft on which is used, including pre-programmed A/C data on Static Source Error Correction and maximum allowable Airspeed.

When the GH-3100 Electronic Standby Instrument is removed for maintenance, the DCM-3100 Detachable Configuration Module remains with the aircraft via a chain that is attached to the GH-3100 wiring harness.

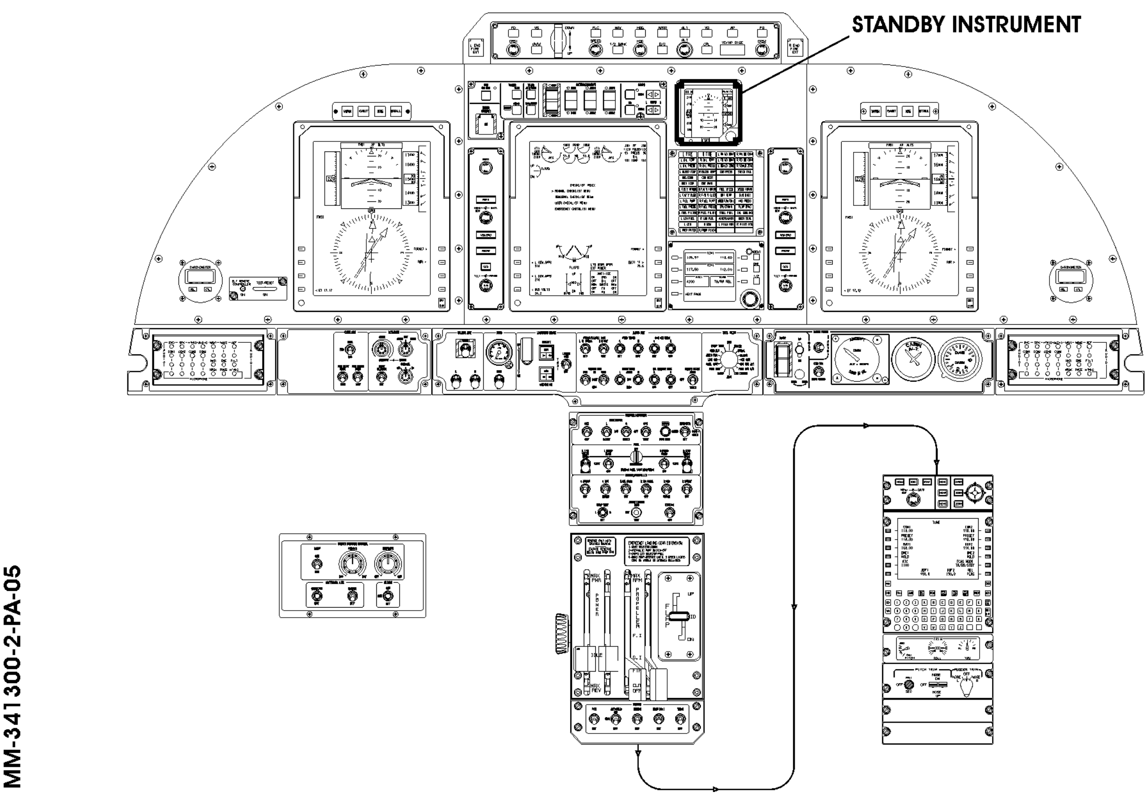


Fig. 2 - Standby Instrument location

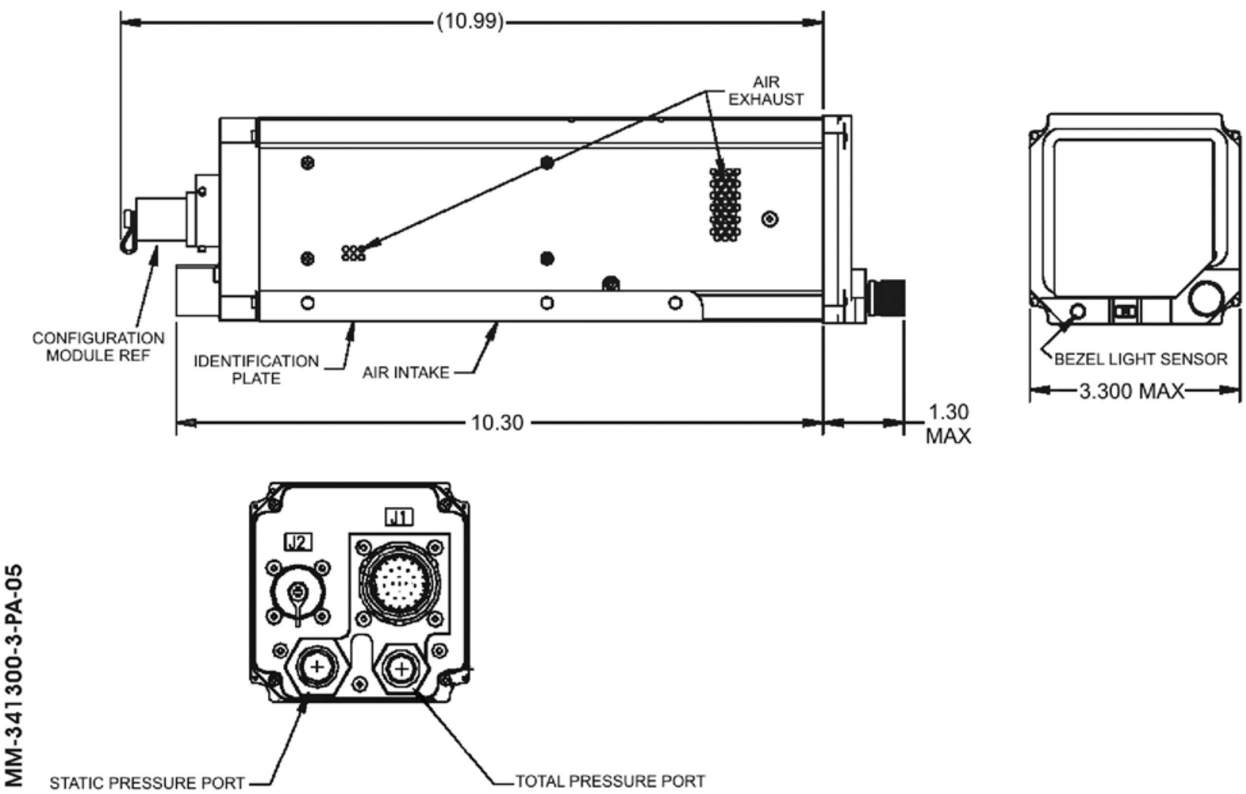


Fig. 3 - Standby Instrument and Configuration Module dimension

2. Operations

A. The Controls of Standby Instrument are located on the front panel of the instrument. (Ref. Fig. 4). These consist in an adjustment Knob and Push Button Key.

B. Adjustment Knob

The adjustment knob is located in the lower right corner of the indicator. The knob may be rotated to the right and left, and pushed in. Data to be changed by the adjustment knob will increase with a clockwise rotation of the knob, decrease with counter-clockwise rotation.
The adjustment knob allows the Barometric Correction.

C. Push Button Key

The push button key is located on the lower middle portion of the indicator. The button is identified as a small rectangular button marked with a white capital “M”. that illuminates for ease of locating. The push button key pushes in and activates the menu mode display.

D. The push-button key and the adjustment knob are used to view, select, and change alphanumeric menu items displayed on the screen. In the menu mode, a list of menu items will be presented across the lower portion of the screen. The characters of a highlighted menu item will be white and will be preceded by a white “>” symbol at the beginning of the line.
When the menu list is displayed, pressing the “M” key will terminate the menu mode.
When a sub-menu is displayed, pressing the “M” key will return the menu mode to the previous menu list. After between 15 to 20 seconds with no menu mode activity, the menu mode will be terminated automatically.
The adjustment knob is used for scrolling the menus and initiating the highlighted function.

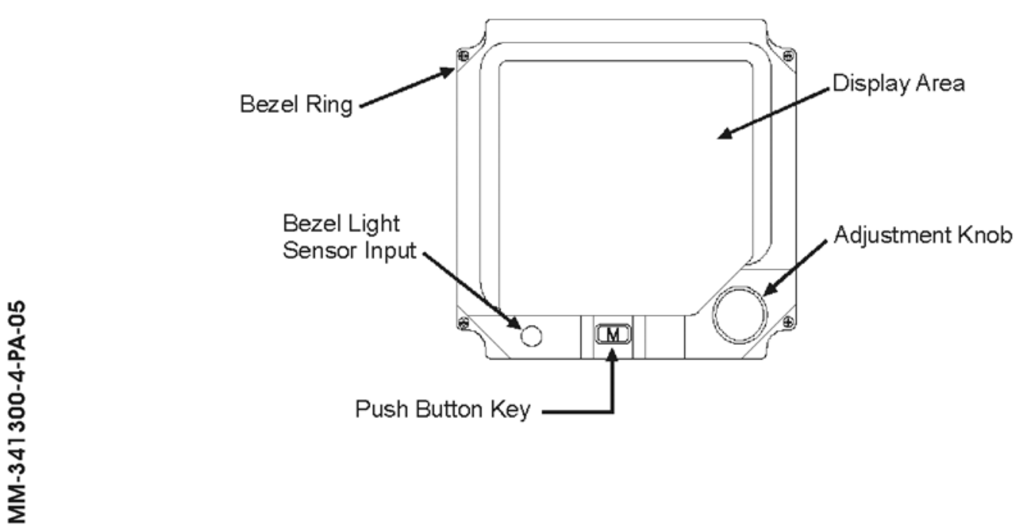


Fig. 4 - Standby Instrument Front Panel Control

E. Upon entering the menu mode, the order in which the available menu items appear will be FAST ERECT; SET BRIGHTNESS OFFSET; FAST ALIGN; BARO TYPE.

When the menu mode is first initiated after power-on, the FAST ERECT command will be highlighted.

F. Bezel Light Sensor Input

The light sensor is located in the lower left corner of the indicator. The sensor automatically adjusts the brightness of the display to cockpit lighting levels. The menu selection provides an offset command to manually change the display brightness.

G. Power ON Sequence

With the application of +28.0 Vdc to the indicator, the unit start the sequence of the operating modes, in order:

a) Power ON Self Test Mode:

During the power-on self-test mode, the indicator will test its internal sensors, interface circuitry, and memory devices. The display will be blank for the duration of the power-on self-test mode.

b) Identification Mode:

When power-on tests are complete, the indicator will display an identification screen containing the words “Goodrich”, indicator software identification numbers, a software copyright notice, total number of operating hours, and the result of the power-on self tests (if a failure is detected).
The identification mode will display self-test results as:

– Fan Failure: when the power-on tests detect a failure in the indicator’s fan, this will be displayed for fourteen to sixteen seconds before the indicator enters the sensor alignment mode. Unit will continue to function normally, but should be serviced at next opportunity.
– Air Data Failure: If the unit fails the air data self-test or valid V_{MO} and SSEC data is not in the DCM-3100, the identification screen will have the words "AIR DATA FAILURE" as the test results. This screen will be displayed for 14 to 16 seconds before the unit enters the sensor alignment mode.
– DCM Failure: If valid configuration data cannot be obtained from the required DCM, the identification screen will have the words “Configuration Required” as the test results. The indicator will remain in the identification mode for as long as power is applied.
– Miscellaneous Self-Test Failures: If any test results other than a fan failure or DCM failure are detected during the power-on self-test mode, the identification screen will have the words “System Test Failure” as the test results, with a failure code to indicate the detected failure(s). The indicator will remain in the identification mode for as long as power is applied, with no attempt to sequence through the sensor alignment mode to the normal operational mode.
– All Tests Pass: If all tests pass, the identification screen will have the words “Aircraft: P180” as the test results. The indicator will display this screen for fourteen to sixteen seconds before continuing on to the sensor alignment mode.

c) Sensor Alignment Mode:

Following successful power-on self-tests, the indicator will begin aligning the sensors.
For further details, refer to 34-22-00 “Standby Instrument, Attitude section”.

d) Background Self-Tests:

Continuous background self-tests will begin and continue immediately after the power-on self-tests are complete. Background self-tests will be performed without disrupting normal operation. The pilot will be alerted when an Hazardous Misleading Information (HMI) fault condition exists. A background self-test failure limited to attitude or air data will be annunciated by a failure indication specific to that item.

e) Normal Operating Mode:

After a successful sensor alignment, the indicator will enter the normal operational mode. Pitch and roll attitude data, air data, and slip/skid data are displayed during normal operational mode.

3. Display

A. The Standby Instrument displays Air data and Attitude data. The Air data display appears as shown in Fig. 5. For Attitude data refer to 34-22-00.

The Air data, i.e. pressure altitude, baro corrected altitude, mach, computed airspeed and vertical speed, are supplied by the Standby Instrument. The Static Source Error Correction (SSEC) curve and maximum allowable airspeed curve are supplied to the Instrument by the DCM-3100. In details:

a) Altitude display data is calculated from the unit baro correction setting, SSEC curve(s) and the internal pressure transducers.

b) The IAS data is calculated from data supplied from the internal pressure transducers. The V_{MO} data will be calculated from data supplied in the DCM-3100.

c) The internal pressure transducer of the unit supplys the mach data.

d) When displaying vertical speed, vertical speed data is calculated from the altitude data.

e) The invalid altitude display as shown in Fig. 7 will be shown if any tests of air data hardware find fault with the altitude data or the computed airspeed data

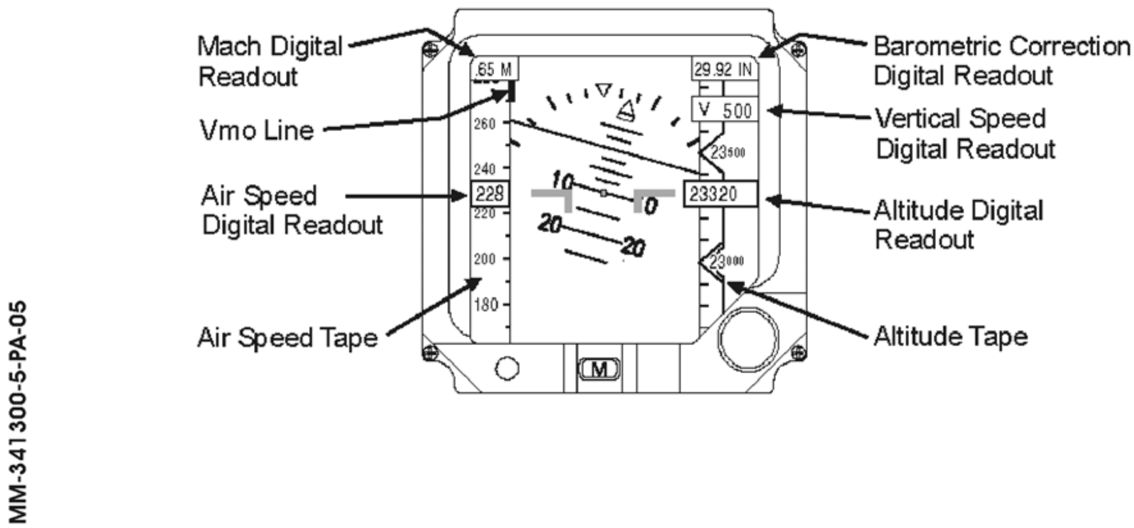


Fig. 5 - Standby Indicator Display with Airspeed and Altitude

B. The Air Data displays appear as shown in the Fig. 5.

(1) Altitude Tape

Altitude tape is presented on a vertical tape on the right side of the display area (with the digital baro correction readout at the top of the tape.
The tape displays altitudes from - 1,000 to +55,000 feet with 500-foot increments.
For altitudes < -1,000 or > +55,000 an X or a box with “ALT” descriptor will be drawn over the altitude tape area (refer to Fig. 7). The color of the descriptors will be based on the selected configuration.

(2) Altitude Digital Readout Format

The altitude digital readout box(s) and digital readout(s) will be drawn “on top” of the altitude tape and attitude display area.
They consist of up to five large sized, right justified digits capable of displaying altitudes from - 1,000 to + 55,000 feet with a resolution of 10 feet.
The right two digits of the altitude digital readout are paired in 20-foot increments, and the altitude digits roll inside a modified box.
The altitude digital readout box is expanded vertically above and below the two least significant digits to allow two vertically consecutive “rolling digits” data to be in the box (refer to Fig. 6 C). The axis of the altitude digital readout “rolling digits” will be centered vertically in the box.

(3) Digital Barometric Correction Readout Format

The digital baro correction readout isdisplayed in a box positioned at the top of the altitude tape, at the right side of the display.
The digital baro correction digits and descriptor letters are medium sized and color configured to either white or cyan.

The pilot may select the desired type of descriptor displayed using the menu mode. The possible selections are: IN HG (refer to Fig. 6 A), HPA: (refer to Fig. 6 C) or MB (see Fig. 6 B or D).

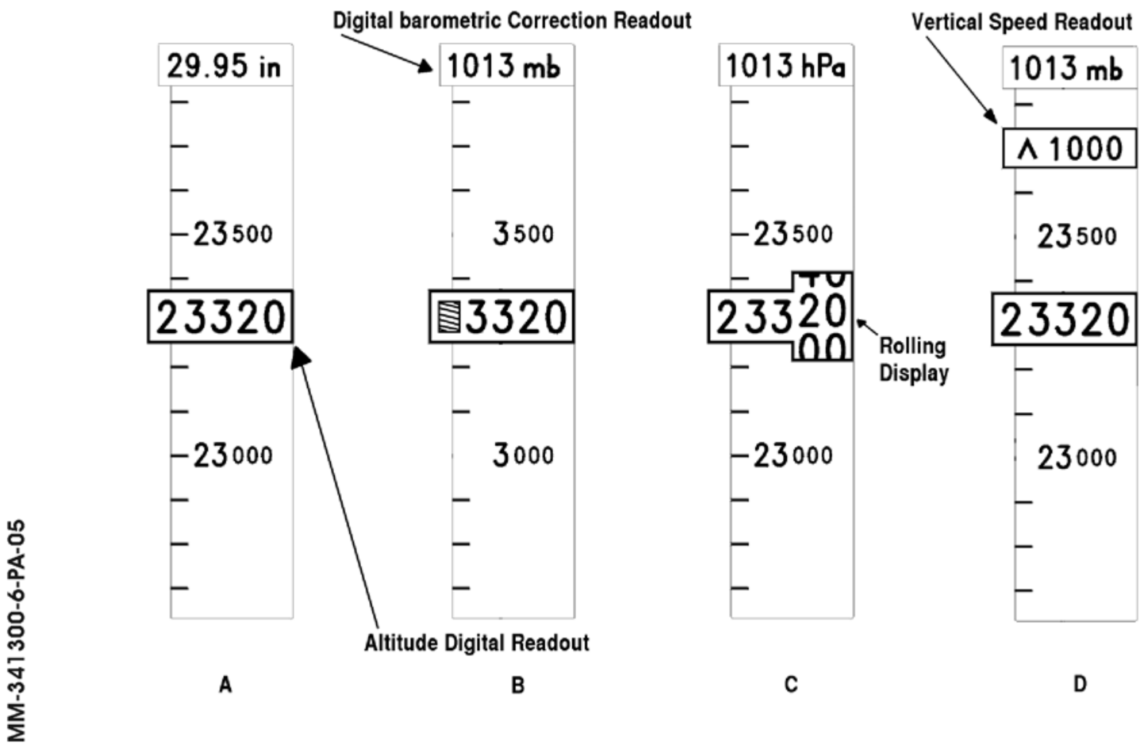


Fig. 6 - Altitude Displays

(4) Altitude Display Invalidity

An invalid altitude display omits the tape tic marks, tape scale digits, the digital readout digits, the baro correction digits, and the optional chevrons.

When an invalid altitude display is shown, an “ALT” in large size characters with a border is drawn in the tape area above the digital readout. Refer to Fig. 7.

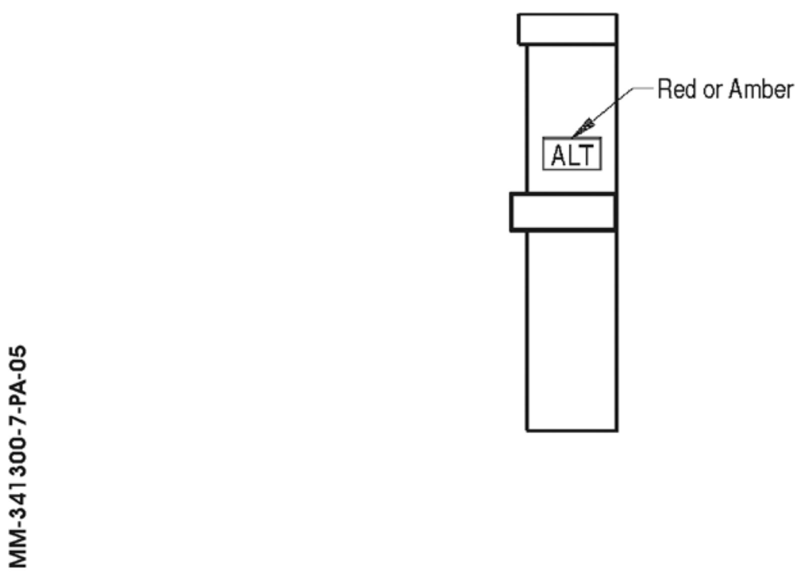


Fig. 7 - Invalid Air Data Displays

(5) Vertical Speed Digital Readout Format

The Vertical Speed Digital Readout is shown at the top right of the indicator display, below the baro readout window.
The vertical speed window color is black with a white border. The digit and arrow color is based on unit configuration (ALT/IAS Digital Readout Numbers Color). The vertical speed digital readout consists of two to four medium size digits.
For positive (climb) vertical speeds 60 feet per minute and above, the digital readout is shown in Fig. 6 D.
Vertical speed is measured in feet per minute. The readout range is multiple of 20 feet per minute for vertical speeds from ± 60 fpm through ± 980 fpm and multiple of 100 feet per minute for vertical speeds from ± 1,000 fpm through ± 9,900 fpm.

(6) Airspeed (IAS Tape)

Airspeed will be presented on the left side of the display area on a vertical tape (refer to Fig. 5). The Mach readout is located at the top to the tape. IAS tape format is shown in Fig. 8.
The IAS tape displays a span of 100 knots when the menu is not displayed, from the bottom of the mach box to the bottom of the display.
The current IAS on the tape is aligned with the vertical center of the attitude display area as shown in Fig. 8.
The IAS tape scale digits and tic marks is white with a gray background and no border. The 100-knot tape scale digit is blanked for IAS markings below 100 knots.
The IAS tape is capable of displaying airspeeds between 0 and 450 knots. The IAS tape is marked at 20 knot increments with tic marks at 10-knot increments.
No markings will be shown when IAS is outside the tape limit. If tape exceeds 950 knots, an X or a box with “IAS” descriptor (Air Data Failure Color configuration) will be drawn as shown in Fig. 9.
IAS Tape will move down for increasing IAS as shown in Fig. 8 A, C, or D.
The IAS tape contains a red V_{MO} bar at the right side of the tape from V_{MO} point to the high speed end of the tape.
The V_{MO} bar is as wide as the length of the short IAS tape tic marks. The V_{MO} bar appears behind the IAS tape tick marks as shown in Fig. 8 B or C.

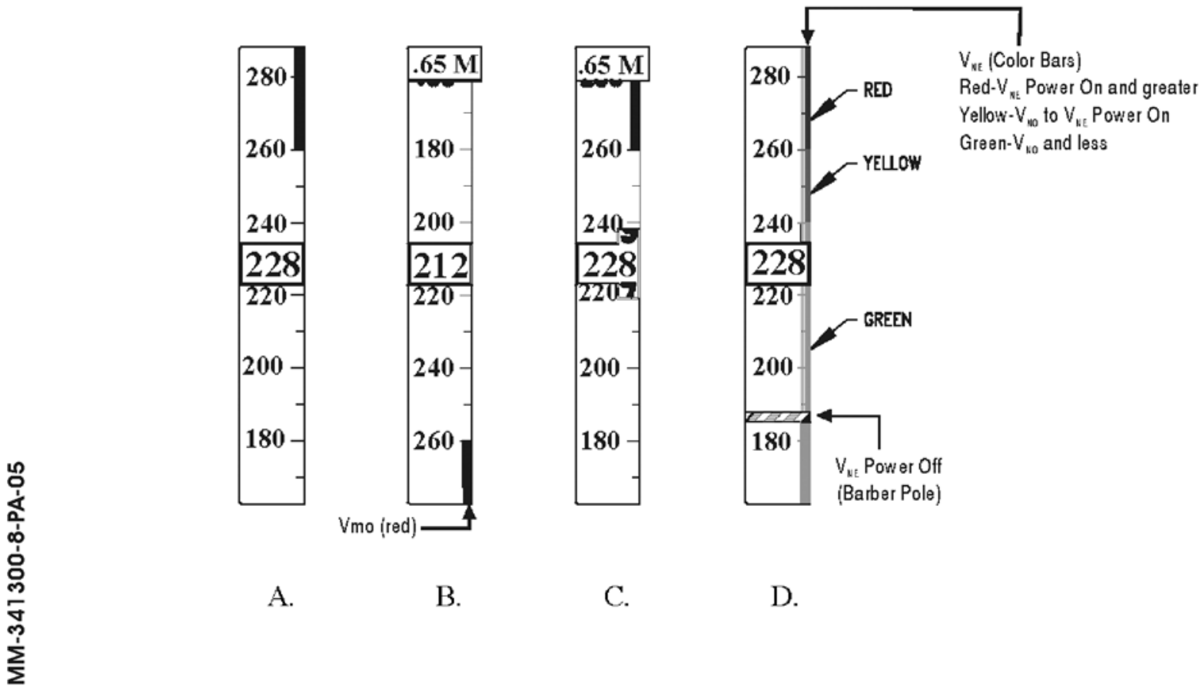


Fig. 8 - IAS Tape Displays

(7) IAS Digital Readout Format

The IAS digital readout consists of three large size, right justified digits capable of displaying current IAS from 40 to 450 knots with a resolution of one knot (refer to Fig. 8). Leading zeroes in the IAS digital readout is blanked.
A black IAS box with a white border is drawn behind the IAS digital readout with the readout centered vertically in the box. The IAS box is positioned horizontally against the left edge of the display area with its vertical center aligned to the center of the attitude display area.
IAS digital readout characters are red when the IAS is greater than V_{MO}.
The rolling IAS digits moves in the same direction as the IAS tape.

(8) Mach Digital Readout Format

The mach digital readout is displayed in the mach box positioned at the top of the IAS tape, at the left side of the display. The box is black with no border.
The mach digital readout is two digits preceded by a decimal point (".") and followed by a "M" descriptor as shown in Fig. 8 B or C.
The mach digital readout range will be from 0.45 to 1.00 mach with resolution of 0.01 mach.
The mach digital readout turns ON and OFF. When the Mach Digital Readout is OFF, the IAS tape continues to the top of the display area as shown in Fig. 8 A. When the mach digital readout is ON, the mach digital readout will be drawn "on top" of the IAS tape and attitude display area as shown in Fig. 8 B or C.

When the mach digital readout is OFF and the mach data is greater than or equal to 0.45 mach, the mach digital readout shall be turned ON.
When the mach digital readout is ON and the mach data is less then or equal to 0.40 mach, the mach digital readout shall be turned OFF.

(9) IAS Display Invalidity

An invalid IAS display omits the IAS tape tic marks, IAS tape scale digits, IAS digital readout digits, mach digital readout digits, and the V_{MO} or V_{NE} bars. It includes the mach box.
When an invalid IAS display is shown, an “IAS” in large size characters with a border and will be drawn in the tape area above the IAS digital readout area as shown in Fig. 9.

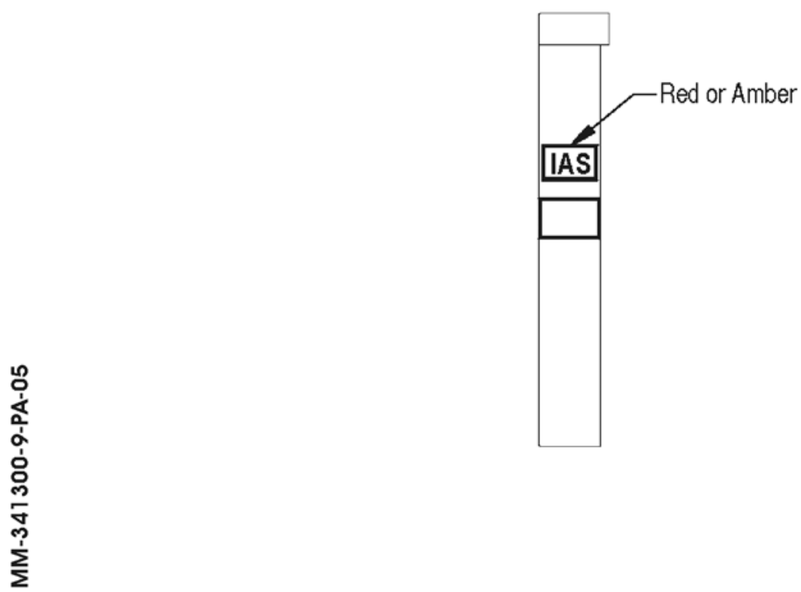


Fig. 9 - IAS Invalidity Displays

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STANDBY INSTRUMENT - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00

A. This topic provides the following Standby Indicator Maintenance Practices:

– Standby Instrument - Removal
– Standby Instrument - Installation
– Standby Instrument - Operational Check
– Standby Instrument - Pneumatic Pressure Checks

B. The Standby Instrument is installed in the central instrument panel.

2. Standby Instrument - Removal (Ref. to Fig. 201)

A. Fixtures, Test and Support Equipment

Blanking caps	Not specified

B. Referenced Information

Maintenance Manual Chapter 24-00-00
Maintenance Manual Chapter 20-00-00

C. Procedure

(1) Remove all electrical power (Refer to 24-00-00).
(2) Open, tag and safety this circuit breaker:

Pilot CB panel:	Pilot CB panel:
STANDBY INSTR	LTS DIM 1

(3) Put a Warning Notice in the flight compartment to tell persons not to apply electrical power.
(4) Bleed pitot-static system slowly.

CAUTION: DO NOT REMOVE FITTINGS FROM FRONT OF UNIT WHILE THEY MAY BE UNDER PRESSURE FOR TESTING.

(5)
(6) Loosen Standby Instrument screws (3) and release Standby Instrument (2) from instrument panel (4).
(7) Disconnect static and pitot lines from Standby Instrument.
(8) Cap all exposed fittings.
(9) Disconnect the Data Configuration module DCM 3100 (5) from Standby Instrument (2) and leave the module attach to Wiring Harness with the chain.
(10) Disconnect electrical plug from Standby Instrument (Refer to 20-00-00).
(11) Put caps on all electrical connectors.
(12) Withdraw instrument into flight compartment.

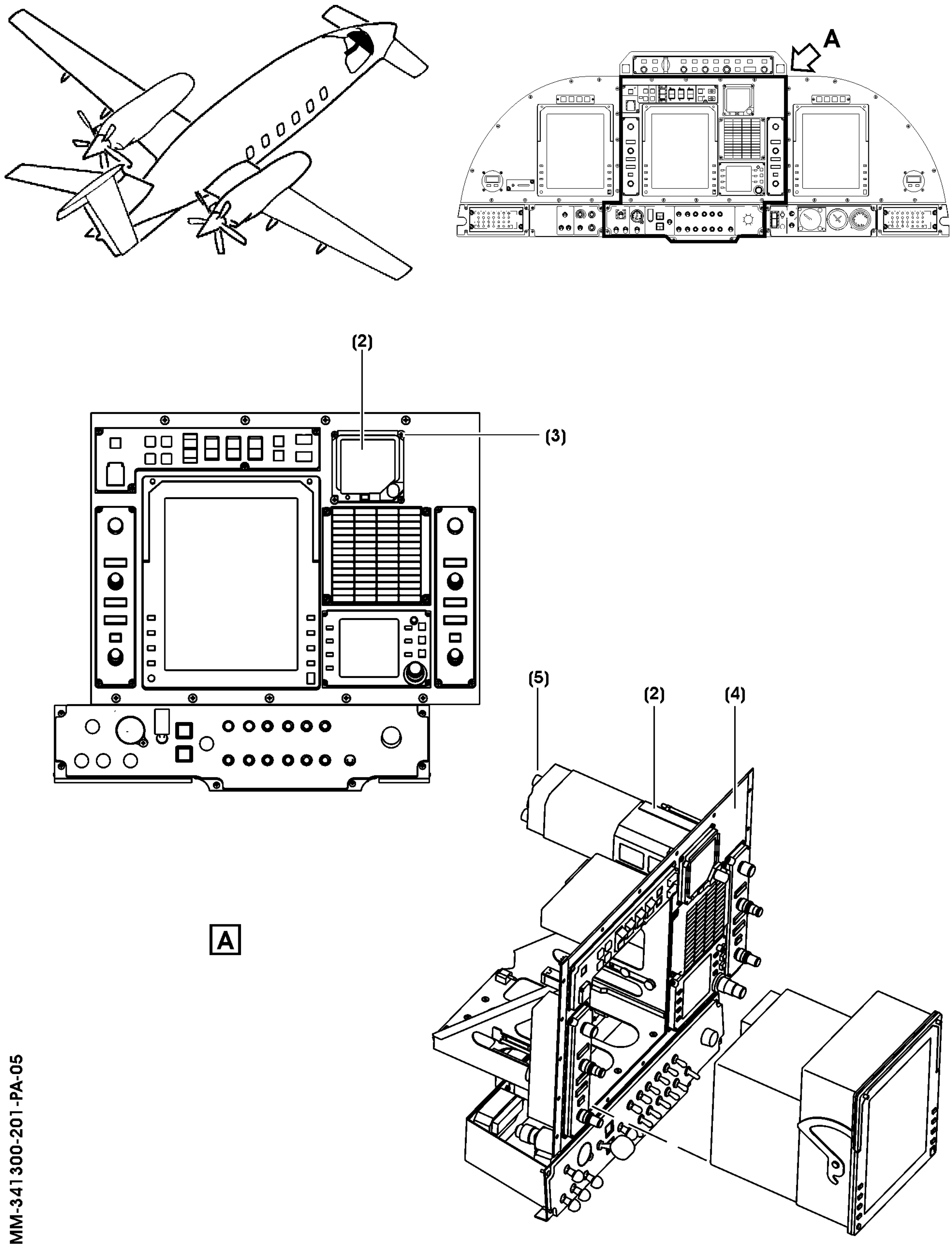

Fig. 201 - Standby Instrument. - Removal/Installation

3. Standby Instrument - Installation (Ref. to Fig. 201)

A. Fixtures, Test and Support Equipment

Blanking caps	Not specified

B. Referenced Information

Maintenance Manual Chapter 24-00-00

Maintenance Manual Chapter 20-00-00

C. Procedure

(1) Make sure, as necessary that:
- There is no electrical power on airplane and the circuit breaker STANDBY INSTR on pilot c/b panel is open, safety and tagged.
- The Warning Notices are in position
- Access is available

(2) Remove the caps from the connectors.

(3) Connect the Data Configuration module DCM 3100 (5), that is remained attached to Wiring Harness with the chain, to Standby Instrument (2).

(4) Connect the electrical connector to Standby Instrument (2).

(5) Remove caps from fittings.

(6) Connect static and pitot lines to Standby indicator (2).

(7) Position Standby indicator (2) in instrument panel (3) and tighten screw (4).

(8) Remove the safety tags and close circuit breakers STANDBY INSTR and LTS DIM 1.

(9) Remove tools, materials and equipment from the work area.

(10) Do a Pitot-Static Leak Test (Refer to 34-11-00).

(11) Do the following test as applicable:
- Standby Instrument Functional Test in case of equipment replacement / repair.
- Standby Instrument Operational Test after reinstallation of the removed equipment.

4. Standby Instrument - Functional Check

(1) Be sure the Standby Instrument is correctly installed and connected with Data Configuration Module (DCM-3100).

NOTE: If the Standby Instrument is removed for maintenance, the Data Configuration Module (DCM-3100) remains with the aircraft via a chain that is attached to the instrument wiring harness.

NOTE: Aircraft or instrument should not be placed into motion or be in motion during indicator alignment.

(2) Check the circuit breaker STANDBY INSTR on pilot c/b panel is closed.

(3) Make sure electrical power is available (Refer to 24-00-00).

(4) Allow the indicator to complete Built-in-Test (BIT). A normal display will be viewed in approximately three minutes. The display should reflect the attitude of the aircraft as it rests on the ramp.

(5) Compare results on Standby Instrument display with that of primaries.

(a) Attitude will be ± 0.5°.

(b) Airspeed indication minimum setting at 40 Kts, as per Data Configuration Module (DCM).

CAUTION: WINDGUSTS CAN CAUSE THE AIRSPEED INDICATION ON THE STANDBY INSTRUMENT TO EXCEED THE MINUMUM SETTING CONFIGURED IN THE DCM

(c) Altitude will indicate field elevation within ± 20 feet. (Ensure proper baro setting)

(6) Follow instructions given in Pneumatic Pressure Checks Paragraph .

5. Pneumatic Pressure Checks

(1) Push in on Standby indicator adjustment knob and observe that the barometric correction window displays “STD” (29.92 In HG).

(2) Connect an Air Data Test Set to the aircraft pitot and static ports (refer to 34-11-00).

(3) Adjust pitot and static pressures to provide a vertical velocity of between 1000 and 3000 feet per minute. Observe that the indicator altitude tape moves smoothly and properly displays altitude.

(4) Stop the air data test set at 9,000, 20,000 and 29,000 feet. Record the values read on the STBY indicator altitude tape and check that this values are within the tollerance shown in Table 1, Test Paragraph T1.

(5) Use the air data test set to provide an adequate increasing (higher/positive) airspeed rate of change to observe airspeed tape operation. Observe and record the air speed tape information as shown in Table 1.

NOTE: If static source error correction is programmed, computed air data will differ from test set values by the amount of static source error correction.

(6) If Mach is configured to be displayed, adjust air data test set control pressures to 9,000 feet and 260.0 KIAS and observe indicator Mach number to be 0.46. Record results in Table 1. Test Paragraph T2.

(7) To verify V_{MO} operation, use the Air Data Test Set to provide airspeed greater than V_{MO}. A red V_{MO} bar will extend from the VMO point to the high-speed end of the tape.
The digits change to red in the Air Speed Digital Readout window when the air speed is greater than V_{MO}.
Record results in Table 1, Test Paragraph T3.

(8) Using the air data test set, adjust the pressures to provide a descending vertical velocity between 1,000 and 3,000 feet per minute to ambient pressure. Observe that the indicator altitude tape moves smoothly and properly displays altitude in the window.

(9) Adjust the air data test set pressures to provide a decreasing airspeed rate of change to observe the airspeed tape operation. Observe that the indicator airspeed tape moves smoothly and properly displays airspeed in the window.

(10) Release pitot and static pressure from the air data test set and disconnect pitot and static lines at the aircraft. Observe that the indicator display has returned to field altitude at current barometric setting with no airspeed indicated.

(11) Make certain that indicator is properly secured in the instrument panel and all tools and foreign matter are removed from aircraft. Place all avionics in the off condition and remove power from the aircraft. Record the data obtained from Table 1 with the aircraft logs and records.

Table 1 - Installation Data Record

Test Paragraph	Test Data	
	Test Date:	Aircraft Serial Number:
	Location:	Start Time:
		Completion Time:
	Indicator / Air Data Test Set Comparison	
	Indicator Display (observed)	**Air Data Test Set (setting)**
	Altitude	
T1	8980 ± 40 feet	9,000 feet (at 260 KIAS)
	19985 ± 30 feet	20,000 feet (at 150 KIAS)
	28935 - 29041 feet	29,000 feet (at 100 KIAS)
T2	Airspeed	
	(0.46M ± 0.01M) Yes / No	9,000 feet & 260.0 KIAS ± 2.0K
T3	Yes / No	>V_{MO} Changes to red

6. Standby Instrument - Operational Check

(1) Be sure the Standby Instrument is correctly installed and connected with Data Configuration Module (DCM-3100).

NOTE: If the Standby Instrument is removed for maintenance, the Data Configuration Module (DCM-3100) remains with the aircraft via a chain that is attached to the instrument wiring harness.

NOTE: Aircraft or instrument should not be placed into motion or be in motion during indicator alignment.

(2) Check the circuit breaker STANDBY INSTR on pilot c/b panel is closed.

(3) Make sure electrical power is available (Refer to 24-00-00).

(4) Allow the indicator to complete Built-in-Test (BIT). A normal display will be viewed in approximately three minutes. The display should reflect the attitude of the aircraft as it rests on the ramp.

(5) Compare results on Standby Instrument display with that of primaries.

   (a) Attitude will be ± 0.5°.

   (b) Airspeed indication minimum setting at 40 Kts, as per Data Configuration Module (DCM).

   CAUTION: WINDGUSTS CAN CAUSE THE AIRSPEED INDICATION ON THE STANDBY INSTRUMENT TO EXCEED THE MINUMUM SETTING CONFIGURED IN THE DCM

   (c) Altitude will indicate field elevation within ± 20 feet. (Ensure proper baro setting)

LIGHTNING DETECTION SYSTEM - DESCRIPTION AND OPERATION

1. Lightning Detection System (LDS)

A. Description

The Lightning Detection System (LDS) (Refer Fig. 1) provides thunderstorm mapping information to EFIS (PFDs and MFD) that, through lightning strikes depiction, alerts the flight crew to the presence of thunderstorm activity.
It can detect electrical activity 360 degrees around the aircraft up to 200 nm.
The system is made up by the following components:

– WX-1000E Processor
– Antenna
– Switch

WX-1000E Processor Unit

The processor is a compact computer unit. It receives electrical discharge information from the antenna, processes it to determine distance and azimuth of the thunderstorm and forwards the information for presentation to the EFIS via an ARINC 429 serial data bus.

Antenna

The antenna is an aerodynamically shaped, combined crossed-loop and sense antenna, incorporating internal active circuitry. It receives information by detecting the electric and magnetic fields emitted from lightning generated by thunderstorms; once detected, it forwards this information to the processor for analysis.

"STRIKES CLEAR" Switch

This switch is a SPDT momentary pushbutton, with black background and illuminated legend. By pressing this switch the WX-1000E Processor memory is erased together with the discharge points displayed on EFIS. The "STRIKES CLEAR" Switch can be installed either on the control pedestal or on the instrument panel copilot side.

The Lightning Detection System (LDS) is connected to the R Avionics Single Feed Bus and protected by a 3 Amps circuit breaker located on the Copilot CB Panel.

B. Operation

The optional Lightning Detection System (LDS) detects various levels of lightning activity and processes that information into ARINC 429 format for display on the PFDs and MFD. The system is able to provide information on electrical discharge activities up to 200 nm and 360° around the A/C.
LDS displays show on PFDs and MFD HSI Arc and FMS PPOS formats:

- on the AFDs and MFD, the "TERR/LX/RDR" white legend is adjacent to the RH Line Select Key 2 (R-LSK2);
- pressing three times the R-LSK2, "LX/" legend is shown in cyan and lightning data are added to the associated display;
- the fourth time the R-LSK2 is pressed, lightning data are removed from the associated display.

Detected electrical discharges are displayed as lightning bolt icons with the relative bearing and distance to the aircraft; the icon color identifies the level of lightning intensity:

- Light level thunderstorm cells are yellow (up to 8 strikes/min)
- Medium level thunderstorm cells are red (9-25 strikes/min)
- Heavy level thunderstorm cells are magenta (26 or more strikes/min).

The lightning icons are displayed for about 46 seconds.

By means of the "STRIKES CLEAR" switch, installed on the pedestal, the displayed discharge points can be erased. Clearing the discharge points is a good way to determine if the storm is building or dissipating:

- discharge points in a building storm will reappear faster and in larger numbers;
- discharge points in a dissipating storm will reappear slower and in smaller numbers.

The lightning icons are superimposed over the Weather Radar data and are overwritten by TCAS data.

If an LDS fault is reported when Lightning Detection is selected for display:

- the "LX/" legend turns yellow and flashes for 5 seconds, then steadies;
- the lightning icons are removed from the display.

A Lightning Detection System Testing Receptacle is intalled in the baggage compartment.

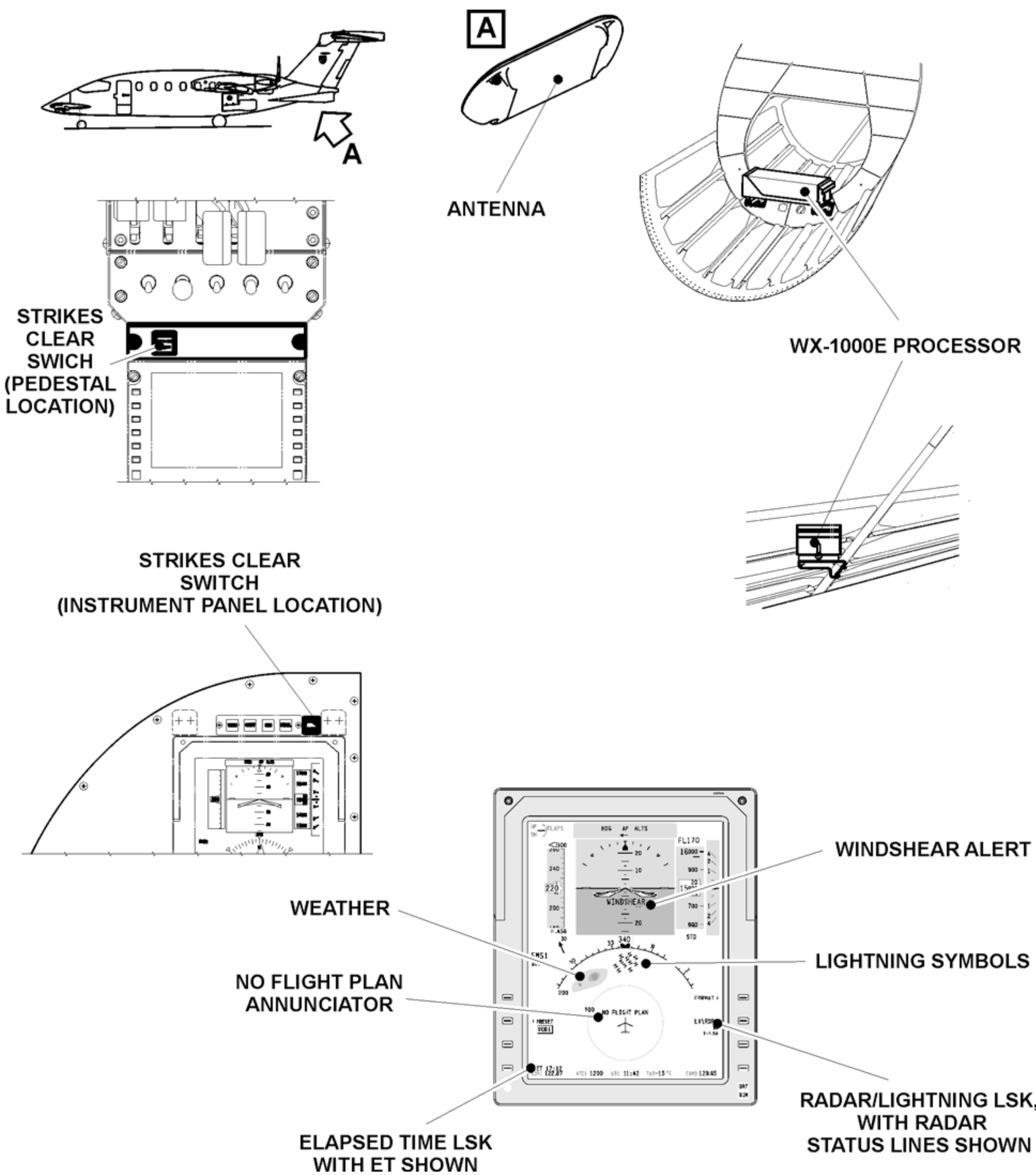

Fig. 1 - Lightning Detection System - Components Location

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LIGHTNING DETECTION SYSTEM - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 34-00-00.

A. This topic provides the following Lightning Detection System Maintenance Practices:

– WX-1000E Processor - Removal
– WX-1000E Processor - Installation
– Antenna - Removal
– Antenna - Installation

2. WX-1000E Processor - Removal (Ref. to Fig. 201)

A. Fixtures, Test and Support Equipment
Circuit Breaker safety clips and tags.

Blanking caps	Not specified

B. Referenced Information

Maintenance Manual Chapter 06-00-00

C. Procedure

(1) Set the Avionics Master Switch to OFF
(2) Set the Battery Switch to OFF
(3) Open, tag and safety the circuit breakers:
Copilot CB panel:
LDS
(4) Remove the Baggage Compartment Floor panel 283BZ (Refer to 06-00-00).
(5) Disconnect the two Electrical Connectors (1) located to the WX-1000E Processor front.
(6) Loosen the Hold-Down Nut (2) that secure the Processor (3) to its own support (4).
(7) Slide out the WX-1000E Processor (3) from the Support (4).
(8) Put caps on the electrical connectors.

3. WX-1000E Processor - Installation (Ref. to Fig. 201)

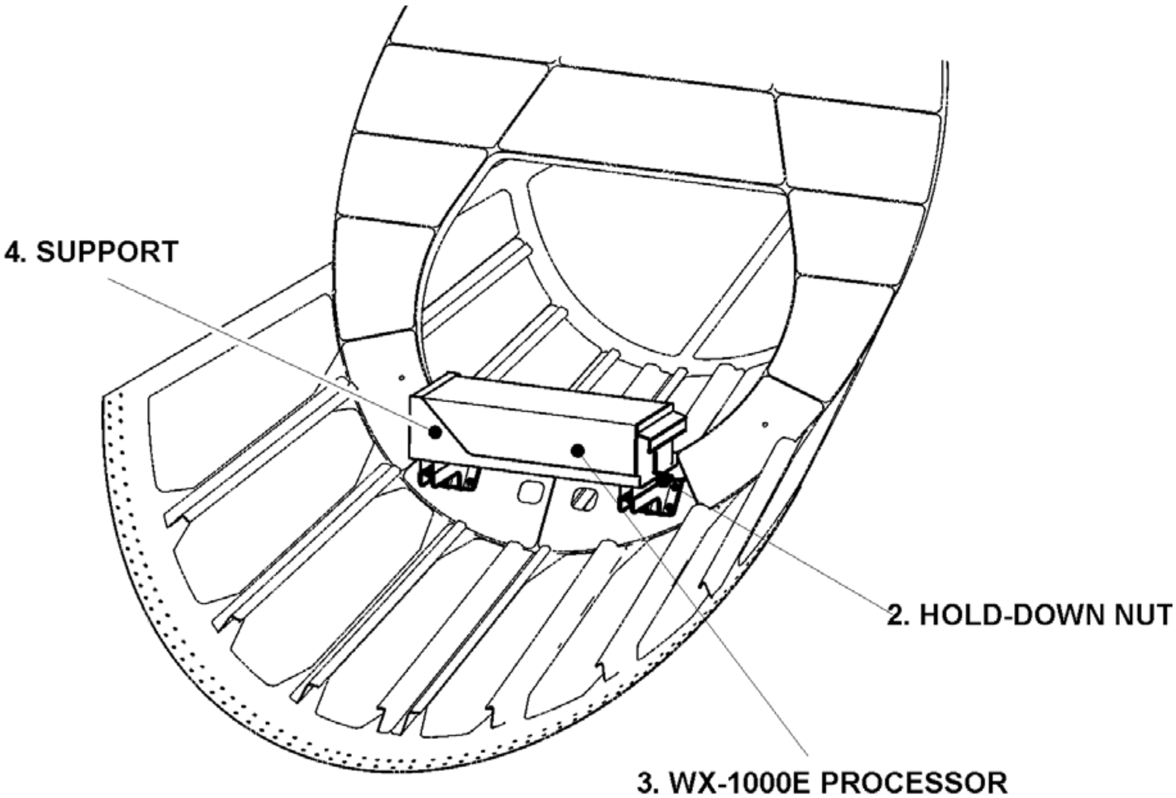
A. Referenced Information

Maintenance Manual Chapter 06-00-00

B. Procedure

(1) Make sure that the Battery and Avionics Master Switches are OFF, and that the LDS circuit breaker is open, safetied and tagged.

(2) Remove the caps from electrical connectors.
(3) Place the WX-1000E Processor (3) on the Support (4).
(4) Connect the two Electrical Connectors (1).
(5) Engage hold-down nut (2) and tighten it.
(6) Remove the safety tags and close the previously opened "LDS" circuit breaker.
(7) Perform an Operational Test as described in this section.
(8) Install the Baggage Compartment Floor panel 283BZ (Refer to 06-00-00).



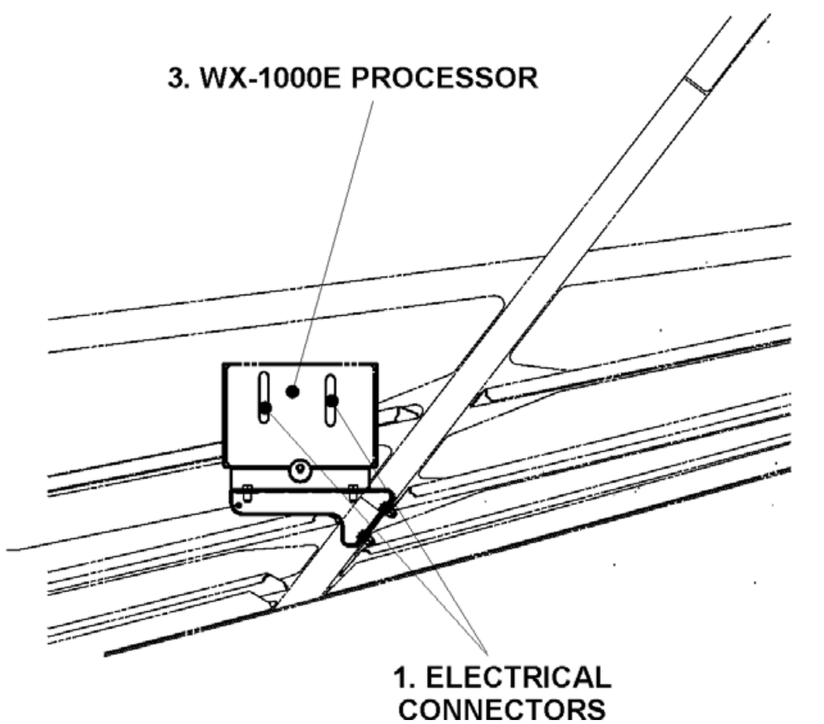


Fig. 201 - WX-1000E Processor - Removal / Installation

4. Lightning Detection Antenna - Removal (Ref. to Fig. 202)

A. Fixtures, Test and Support Equipment
Circuit Breaker safety clips and tags.

Blanking caps	Not specified

B. Referenced Information

Maintenance Manual Chapter 06-00-00

C. Procedure

(1) Set the Avionics Master Switch to OFF
(2) Set the Battery Switch to OFF
(3) Open, tag and safety the circuit breakers:
Copilot CB panel:
LDS
(4) Remove the Access Panel 320AL (Refer to 06-00-00).
(5) Disconnect the Electrical Connector (1).
(6) Remove the four screws (2) that secure the Antenna (3) to the Fuselage skin.
(7) Remove the antenna with the gasket (4).
(8) Put caps on the electrical connector.

5. Lightning Detection Antenna - Installation (Ref. to Fig. 202)

A. Fixtures, Test and Support Equipment

Lint -free cloth	Not specified
Non Metallic Scraper	Not specified

B. Materials

02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 06-00-00
Maintenance Manual Chapter 20-00-00

D. Procedure

(1) Make sure that the Battery and Avionics Master Switches are OFF, and that the LDS circuit breaker is open, safetied and tagged.

WARNING: BE CAREFUL WHEN YOU USE MEK. OBEY THE HEALTH AND SAFETY INSTRUCTIONS IN 20-00-00.

(2) Use a clean lint-free cloth, made moist with the MEK, to clean the replacement parts and their interfaces (Refer 20-00-00).

(3) Remove the caps from electrical connectors.
(4) Place the the gasket (4) and the Antenna (3) to the fuselage skin.
(5) Install the four screws (2) that secure the Antenna (3) to the Fuselage skin.
(6) Connect the Electrical Connector (1) to the Antenna (3).
(7) Install the Access Panel 320AL (Refer to 06-00-00).
(8) Restore the surface finish around the antenna (Refer to 20-00-00).
(9) Perform an Operational Test as described in this section.
(10) Remove the safety tags and close the previously opened "LDS" circuit breaker.

6. Lightning Detection System - Operational Test

(1) Set the Battery Switch to ON.
(2) Set the Avionics Master Switch to ON.
(3) Pull out the Circuit Breaker "LDS" and verify that LX/legend on PFDs and MFD turns yellow and flashes for 5 seconds, then steadies.
(4) Pull in the Circuit Breaker "LDS" and verify that no LX/legend on PFDs and MFD turns yellow and flashes.

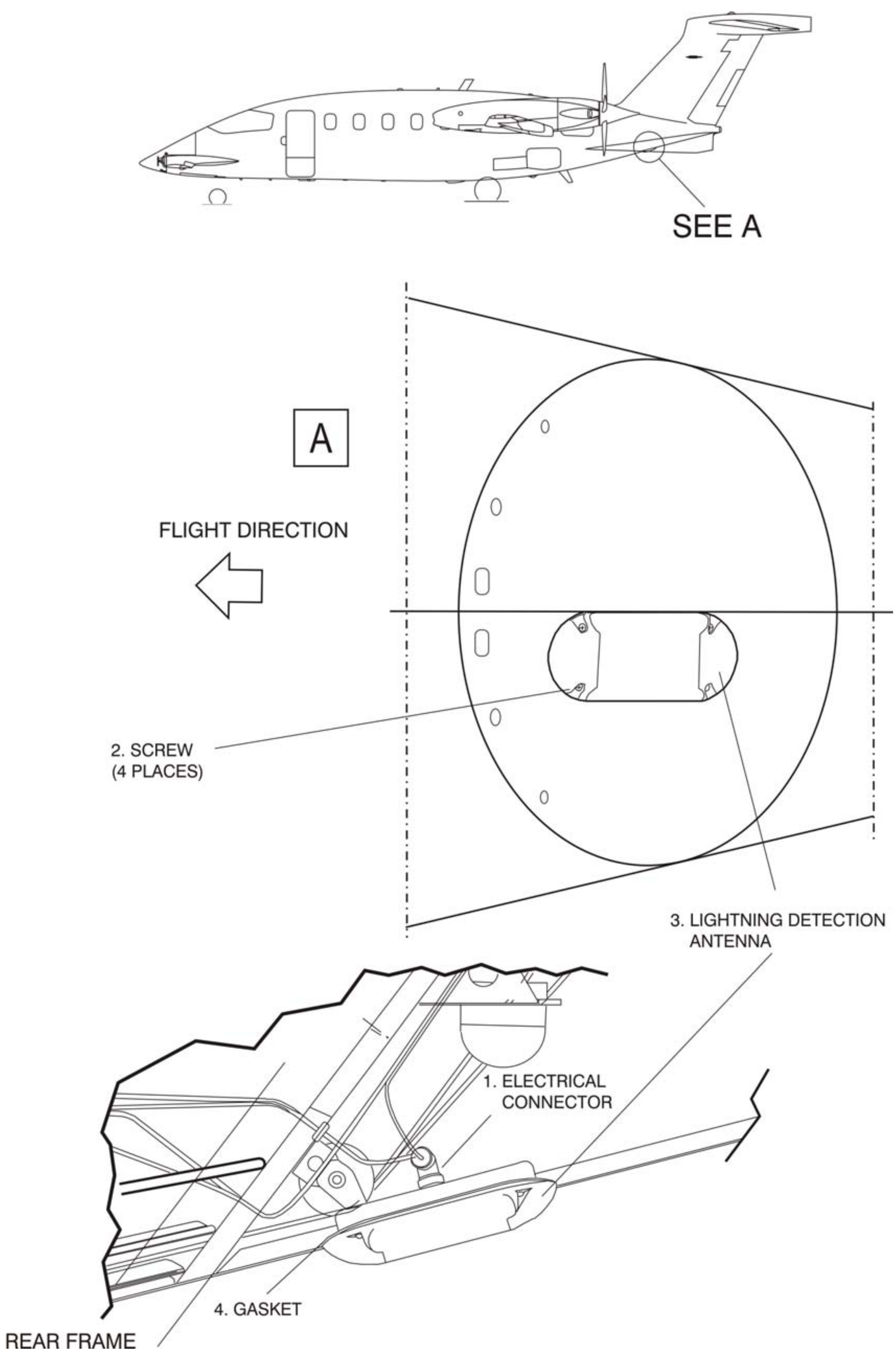


Fig. 202 - Lightning Detection Antenna - Removal / Installation

ATTITUDE AND HEADING - DESCRIPTION AND OPERATION

1. General

This Section 34-20-00 “Attitude and Direction” includes the portion of the system which uses magnetic or inertia forces to sense and display the direction or attitude of the aircraft. This includes sensing, computing, indicating, and warning devices, such as magnetic compasses, vertical and directional references, magnetic heading systems, attitude director systems, etc.

This Section includes:

34-21-00 Attitude and Heading System;

34-22-00 Stand By Instrument (Attitude section);

34-23-00 Magnetic Compass;.

The Stand By Instrument is an independent source including both Air Data and Attitude capability. In this Section only the Attitude section is described. For Air Data section refer to Section 34-13-00.

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ATTITUDE AND HEADING SYSTEM - DESCRIPTION AND OPERATION

1. Description

A. The Attitude and Heading Reference System (AHRS) consists of a dual (pilot and copilot side) AHS-3000 system.

Each AHS-3000 is composed of the following equipment:

– Attitude/Heading Computer (AHC), type AHC-3000;
– Flux Detector Unit (FDU), type FDU-3000;
– External Compensation Unit (ECU), type ECU-3000;

The pilot and copilot side AHS are functionally isolated and each functions as a self-contained, stand-alone system.

The AHS uses data from inertial sensors in the AHC, inputs from the FDU, and aircraft specific information stored in the ECU to calculate stabilized magnetic heading and attitude data.

Also, the AHS receives data from Air Data System (TAS and Altitude Rate) to improve system accuracy.

The AHS supplies attitude and stabilized magnetic heading to the PFDs and MFD, to the Flight Guidance System (FGS), to the navigation systems, to the Weather Radar System (WXR), and to the Integrated Avionics Processor System (IAPS) through the digital busses .

Rocker switch and pushbutton switches located on Reversionary panel (see Fig. 3) are used to select Directional Gyro (DG) mode, slew the compass heading, and revert (transfer) to the cross-side AHS in case the onside AHS fails.

The Primary AHR-3000 System is powered by the Essential Avionics Bus through the AHC 1 circuit breaker and by converter DC-DC 1 CH2 through the AHC 1 SEC circuit breaker located on pilot c/b panel.

The Secondary AHR-3000 System is powered by the Right Avionics Dual Feed Bus through the AHC 2 circuit breaker located on copilot c/b panel.

B. Two Attitude Heading Computer (AHC) are installed in the nose avionic bay one on the left side for the pilot (Primary AHC) and the other on the right side for the copilot (Secondary AHC) (see Fig. 2).
The (AHC) uses inertial sensors to measure angular rate and linear acceleration about the body of the aircraft and processes this data to calculate 3-axis (pitch, roll, and yaw) angle, rate, and acceleration.
The AHC uses magnetic heading from the FDU and magnetic heading deviation information stored in the ECU to calculate stabilized magnetic heading.
The attitude and heading data are supplied to the PFDs, MFD and other aircraft subsystems via the IAPS and system bus structure (see Block Diagram at Fig. 1).
A redundant system bus supplies attitude and heading data directly to the PFD.
AHC reversion is available in case of an onside AHC failure.

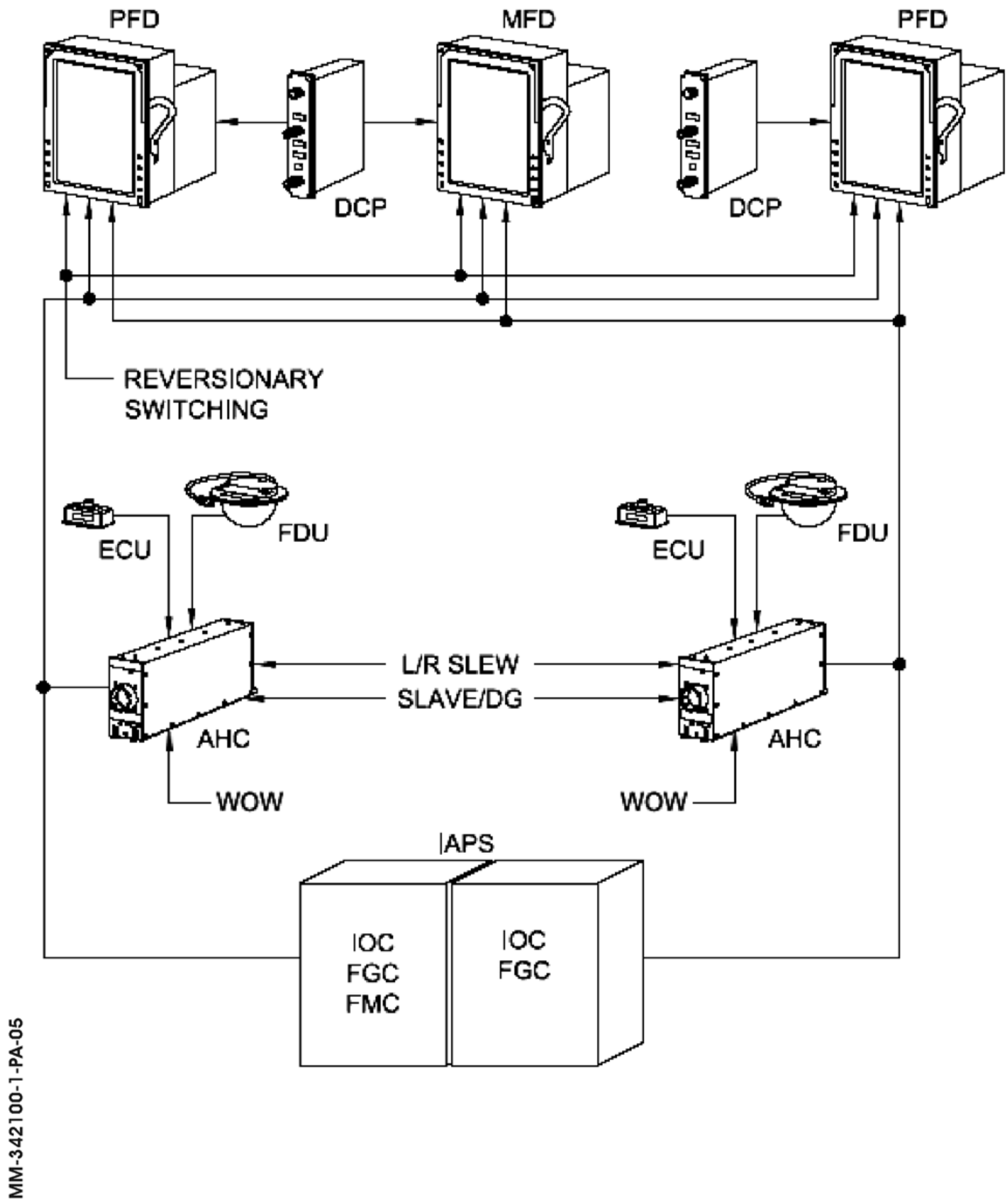


Fig. 1 - Attitude and Heading Systems- Block diagram

C. The two External Compensation Units (ECU) are installed in the nose avionic bay one for the pilot side system and one for the copilot side system (see Fig. 2).
Both ECU, which remain installed during any computer unit removal, store alignment and compass correction data needed to cancel compass errors.
This data is specific to each aircraft, and is obtained during an automated compass swing procedure. The correction data is supplied to the AHC where it is used to calculate stabilized magnetic heading.

D. The two Flux Detector Unit (FDU) are installed on the rear part of the fuselage one for the pilot side system and one for the copilot side system (see Fig. 2)
The FDU is a magnetic sensor that detects the horizontal component of the earth's magnetic field.
The magnetic heading information is supplied to the AHC where it is used to compute stabilized magnetic heading.

2. Operations

A. AHC operations are controlled through external switches, included in the Reversionary Panel, (ref. Fig. 4) as detailed in the following.

The DG/Slave switch is used to select magnetic heading (slaved) mode or directional gyro (DG) mode. In slaved mode, magnetic heading from the Flux Detector Unit (FDU) is output by the AHC.

When DG (directional gyro) mode is active the system ignores magnetic heading inputs and operates as a free-gyro. DG mode is used when operating in areas of low magnetic flux (HDG flag in view).

The message DG shows in white on the PFD when DG mode is active.

The slew switches are used in both DG and slaved modes to slew the heading computations in the computer (and the heading that shows on the compass cards) toward the selected direction.

When slaved mode is active, the compass card will slowly rotate back to the heading detected by the flux detector after Slew switch operation.

When the AHC1/AHC2 reversion switch is not actuated, the two Attitude Heading Computers (AHC) provide independent attitude and heading data sources.

In the event the onside computer fails, the rocker switch AHC1/AHC2 selects the cross-side attitude and heading source.

When the pilot side is the common source of ATT/HDG data the message AHS1 shows on the PFDs. The message shows as a yellow box with AHS1 in white lettering.

When the copilot side is the common source of ATT/HDG data the message AHS2 shows on the PFDs. The message shows as a yellow box with AHS2 in white lettering.

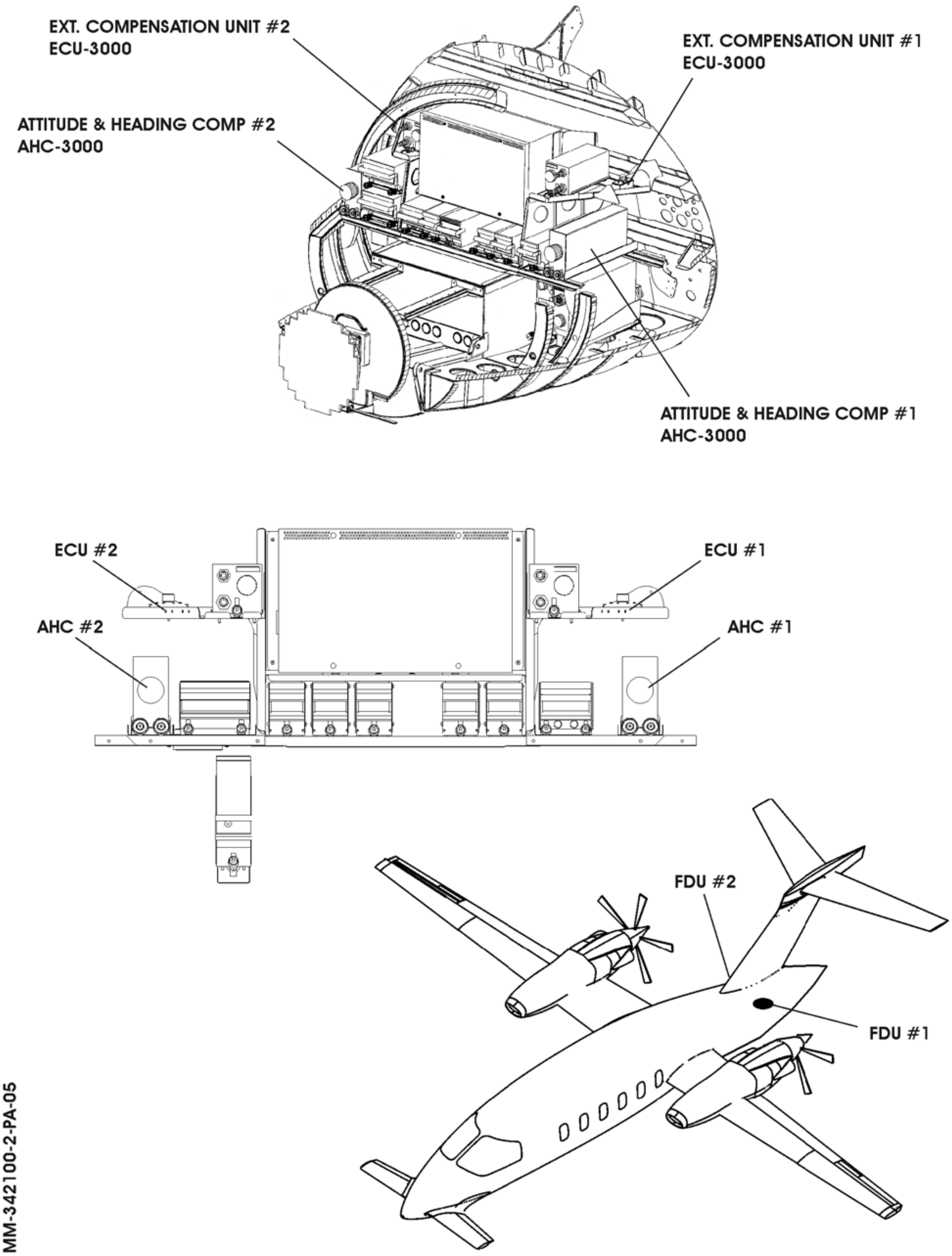


Fig. 2 - Attitude and Heading Computers location

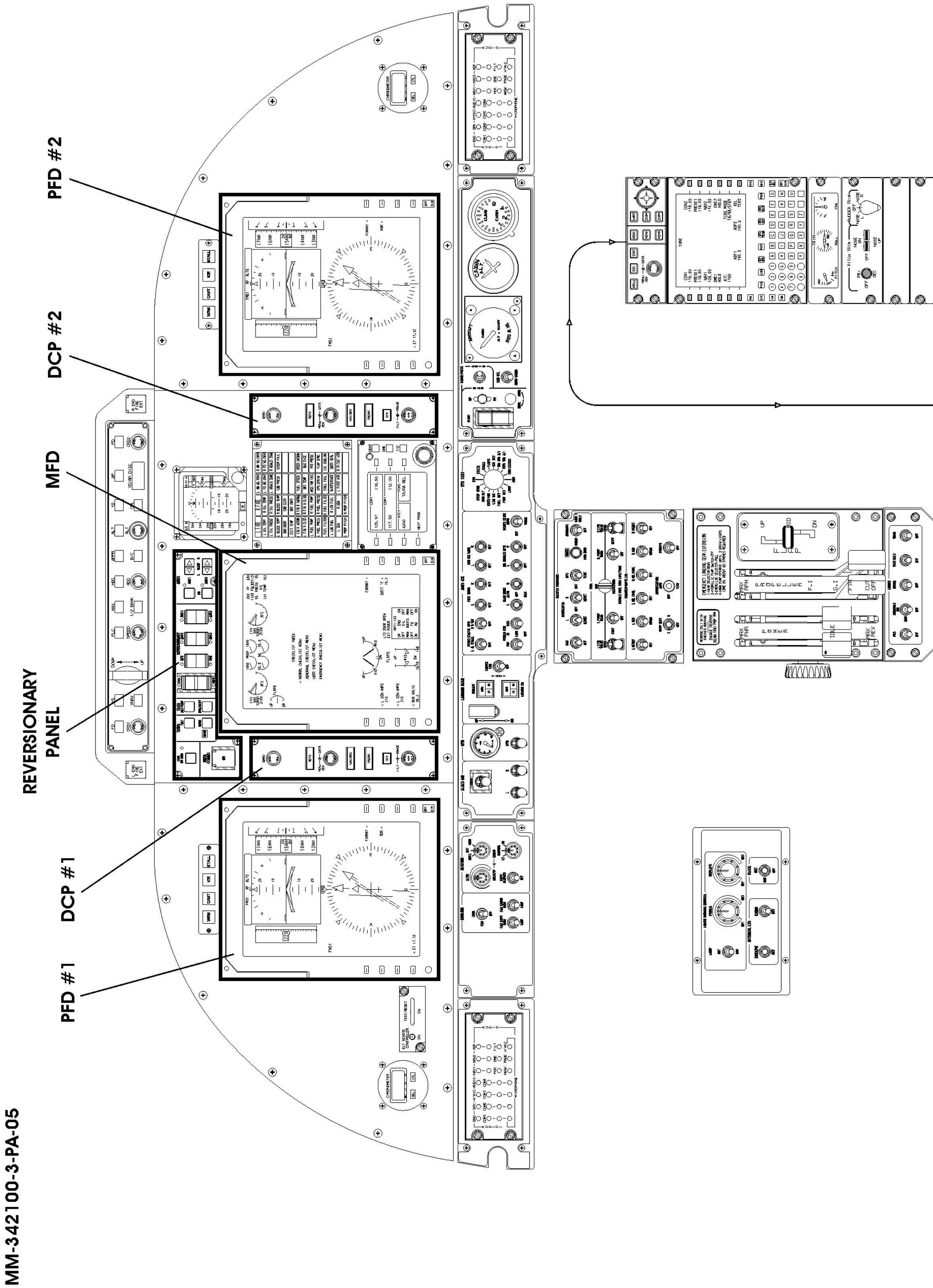


Fig. 3 - PFDs, DCPs and Reversionary Panel location

B. Normal Initialization

The Attitude Heading System (AHS) is not operational until an initialization is completed. Initialization routine automatically starts when DC power is applied to the Attitude Heading Computer (AHC).

The normal procedure is to perform the initialization on the ground after engine start. During the initialization, the AHC uses input from inertial sensors for aircraft attitude, and data from the Flux Detector Unit (FDU) and External Compensation Unit (ECU), to compute a stabilized magnetic heading, and the pitch and roll attitudes. A normal initialization takes approximately 35 seconds for the pilot side computer, and approximately 45 seconds for the copilot side computer. The time difference is a system function that prevents any errors induced by aircraft motion from affecting both AHCs simultaneously.

C. Initialization with motion or power interruption

During the initialization cycle, significant aircraft motion (other than that encountered during cargo loading or buffeting from winds) will interrupt the initialization. The system will automatically restart the initialization process. An interruption of power will also cause the initialization cycle to restart. No action is required from the pilot in either case. The compass cards will continue to rotate for a second (or more) initialization cycle.

D. Dg Mode Initialization

If the DG mode is selected before power is applied to the AHC, the initialization cycle will be performed in the DG mode.
It follows the same process as a normal initialization, taking longer time (about 5 minutes) to complete the cycle because the AHC is not using input from the FDU.
Compass card rotation will be extremely slow. At the end of the 5 minute period, the HDG and ATT flags will clear, but the heading comes up in the DG mode.

E. Airborne Initialization

The AHS can be initialized in the air if power to the AHC is lost in-flight. An airborne initialization takes place automatically when power is applied following a loss of electrical power.
The pilot should maintain straight and level flight during an airborne initialization.
An airborne initialization is the same as a normal initialization, except that the compass cards do not rotate as they would in a normal initialization. This is to prevent the pilot from confusing compass card rotation that indicates a heading change with the compass card rotation that is associated with the initialization process.

F. Heading Flag in view en route

The HDG flag may appear when the aircraft is operating in or near geographic areas known to have low magnetic flux levels, such as areas in high latitudes.
Flying in or around areas of low magnetic flux can cause temporary drops in the required flux levels for the AHS. The AHC monitors flux levels intensity and shows the HDG flag when the magnetic flux level is below the threshold for reliable magnetic navigation. In areas of magnetic disturbances or low magnetic flux, the slaved magnetic heading error may also be larger than normal. Short-term use of the DG mode is the suggested corrective action to remove the heading flag from the display.

G. Heading Flag in view before departure

The HDG flag may appear when operating at airports in areas of low magnetic flux. Airports that are located just inside low flux areas may have sufficient flux levels during approach and departure, but not on the airfield area.
The suggested corrective action that follows should be used when operating at affected airports.

H. Heading Flag in view during takeoff roll

The HDG flag may appear when operating at airports that have low magnetic flux only during some conditions.
Some airports are located in fringe areas that have insufficient flux levels only under some dynamic conditions. The acceleration force during takeoff roll on southerly runways in the northern hemisphere may cause the HDG flag to come into view due to the pendulum movement of the flux detector coils. The heading flag goes out of view when acceleration is reduced. The suggested corrective action that follows should be used if the heading flag come into view only on the takeoff roll.

I. Heading Errors during ground operations

Ground operations under certain conditions can cause errors in the aircraft heading that is shown on the displays.
When the flux detector is near a large structure with a high percentage of iron, the heading that is shown on the displays can be “pulled” away from the actual aircraft heading by the magnetic field distortion caused by the structure. Trucks, tugs, power carts, buildings, and even buried metal objects in the ramp or taxiways have the potential to distort the magnetic field. In dual systems, this could affect only one of the heading systems, and result in a heading comparator warning.

J. Heading Errors due to acceleration/deceleration

Acceleration or deceleration can cause errors in the heading that is shown on the displays.
The sensing coils in the flux detector are gimbaled so that they remain horizontal to the earth. Acceleration and deceleration forces move the flux detector coils off of horizontal. The vertical component of the earth’s magnetic field is then sensed by the flux detector, which becomes an error. The compass system will be “pulled” by this error at a rate of 3°/minute. The longer the acceleration or deceleration lasts, the greater the heading error becomes.

K. Heading Errors in turns

Shallow turns (less than 7° of bank) can cause errors in the aircraft heading that is shown on the displays.
The centrifugal forces generated during turns move the flux detector coils away from their horizontal position. The vertical component of the earth’s magnetic field is then sensed by the flux detector, which becomes an error.
For long, shallow turns when the bank angle is less than approximately 7°, errors may be induced in the heading at up to 3°/minute in the worst case. The compass system will be “pulled” away from the actual heading by this error.

L. Heading Errors in turbulence

Operation in turbulence can cause errors in the aircraft heading that is shown on the displays.
Forces encountered in turbulent conditions move the flux detector coils away from

their horizontal position. When this happens, errors result because of the influence of the vertical magnetic field.
Errors induced by turbulence will usually corrected by the slaving system itself.

M. AHS Reversion

In the event the onside Attitude Heading Computer fails, AHC1/AHC2 reversion rocker switch , located in the Reversionary Panel (ref. Fig. 4), selects the cross-side Attitude Heading Computer and sensors as the attitude and heading source.
When the pilot side is the common source of ATT/HDG data, the message AHS1 shows on the PFDs. The message shows as a yellow box with AHS1 in white lettering.
When the copilot side is the common source of ATT/HDG data, the message AHS2 shows on the PFDs. The message shows as a yellow box with AHS2 in white lettering.
While AHC1/AHC2 reversion rocker switch is selected, the pilot should frequently compare pitch and roll on the PFD with pitch and roll on the standby attitude instruments.

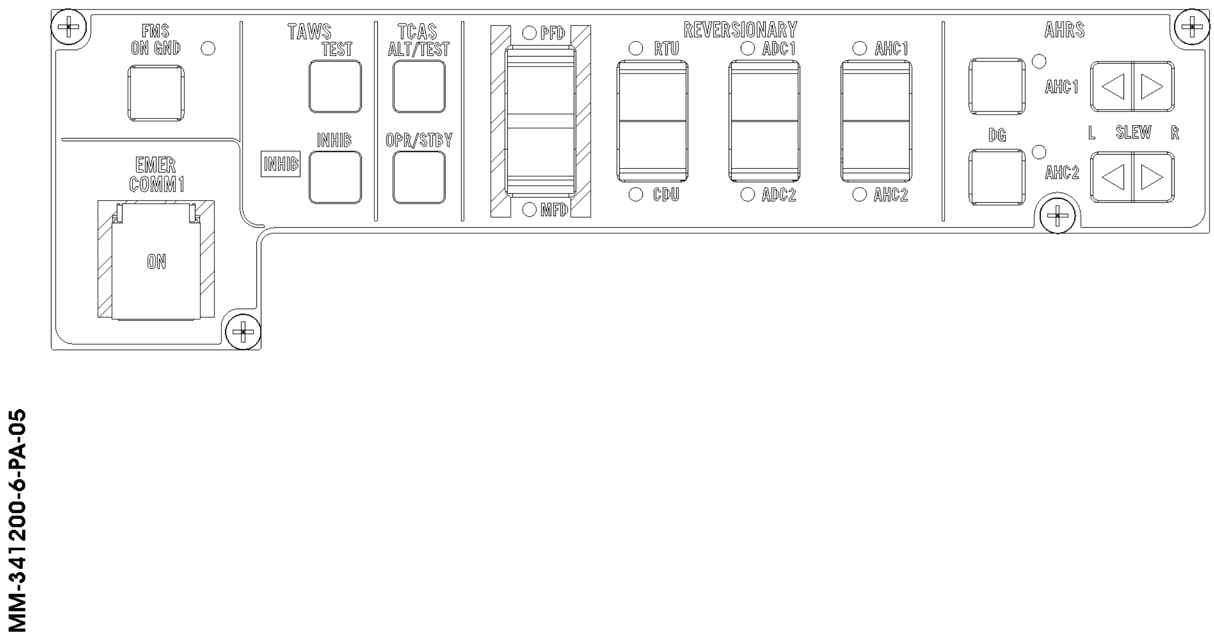
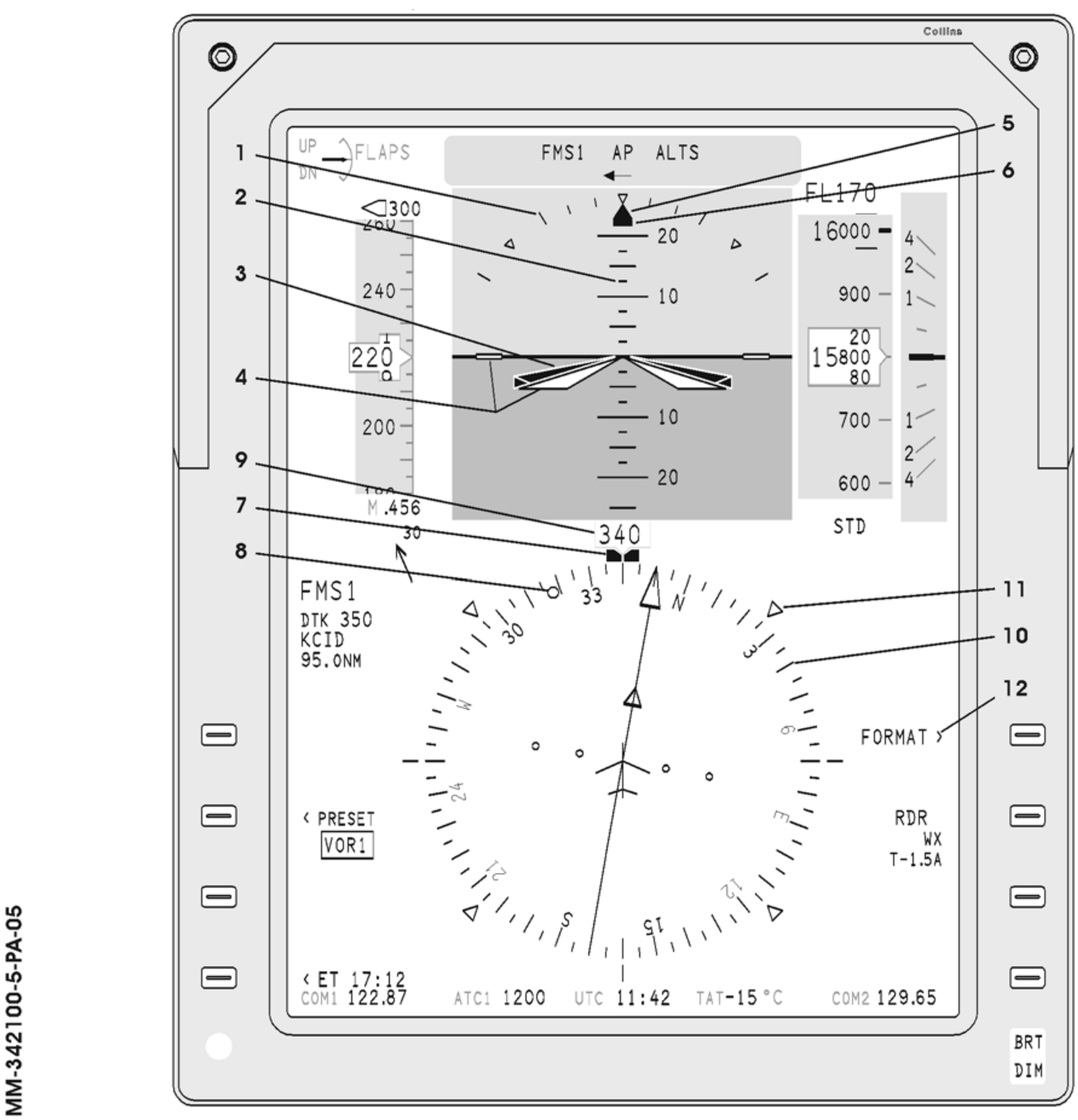


Fig. 4 - Avionics Reversionary Panel

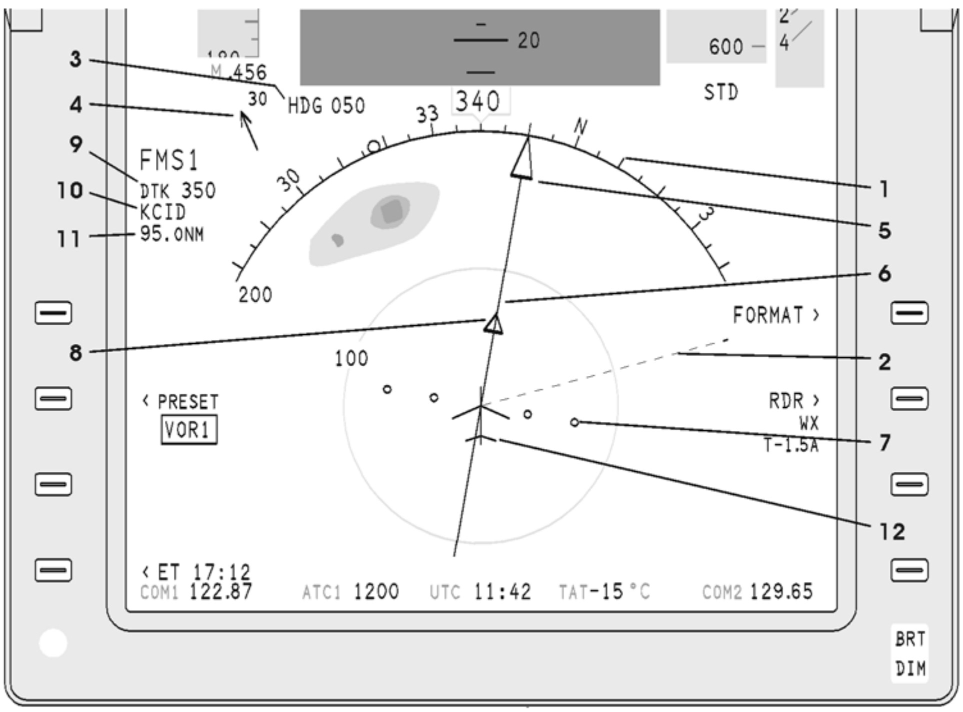
N. The tipical layout of PFD for attitude and heading is shown in Fig. 5.

In particular Attitude data are available on the PFDs, while Heading data are shown on both PFDs and MFD.



1. Roll Scale
2. Pitch Tape
3. Flight Director (FD) Single Cue
4. Single Cue Aircraft Symbol
5. Roll Pointer
6. Slip Skid Indicator
7. Heading (HDG) Bug
8. Track Pointer
9. Heading Pointer and Current Value
10. Heading in Rose Format
11. Compass Reference Mark
12. Format Line Select Key (LSK)

Fig. 5 - Attitude & Heading Display on PDFs -Typical View



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1. Heading in ARC Format
2. Selected Heading Vector
3. Selected Heading Current Value
4. Windspeed and Direction Arrow
5. Course (CRS) [Desired Track(DTK)] Pointer
6. Deviation (Crosstrack) Bar
7. Lateral Deviation Scale
8. TO/FROM Pointer
9. Course (CRS) [Desired Track(DTK)] Readout
10. Station/Waypoint Identifier (ID)
11. Distance Display
12. Compass Aircraft Symbol

Fig. 6 - Attitude & Heading Display on PDFs -Typical View

ATTITUDE AND HEADING SYSTEM - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00

A. This topic provides the following Attitude and Heading System Maintenance Practices:

– Attitude and Heading Computer (AHC) - Removal/Installation
– Flux Detector Unit (FDU) - Removal/Installation
– External Compensation Units (ECU) - Removal/Installation

2. Attitude and Heading Computer - Removal (AHC) (Ref. to Fig. 201)

A. Fixtures, Test and Support Equipment

Blanking caps	Not specified
Warning notices	

B. Referenced Information

Maintenance Manual Chapter 24-00-00
Maintenance Manual Chapter 53-10-00

C. Procedure

NOTE: The removal procedures of the Primary and Secondary Attitude and Heading Computer (AHC) are the same. Only the location of Attitude and Heading Computer (AHC) is different.

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(2) Remove the electrical power (Refer to 24-00-00).
(3) Remove the radome/nosecone (Refer to 53-10-00).
(4) Get access to Primary Attitude and Heading Computer (AHC) (1) [Secondary (2)] and a disconnect the interconnect cable (3) from the AHC-3000 circular connector.
(5) Loosen the two knobs that secure the unit to the mount. Remove the unit from the mount.

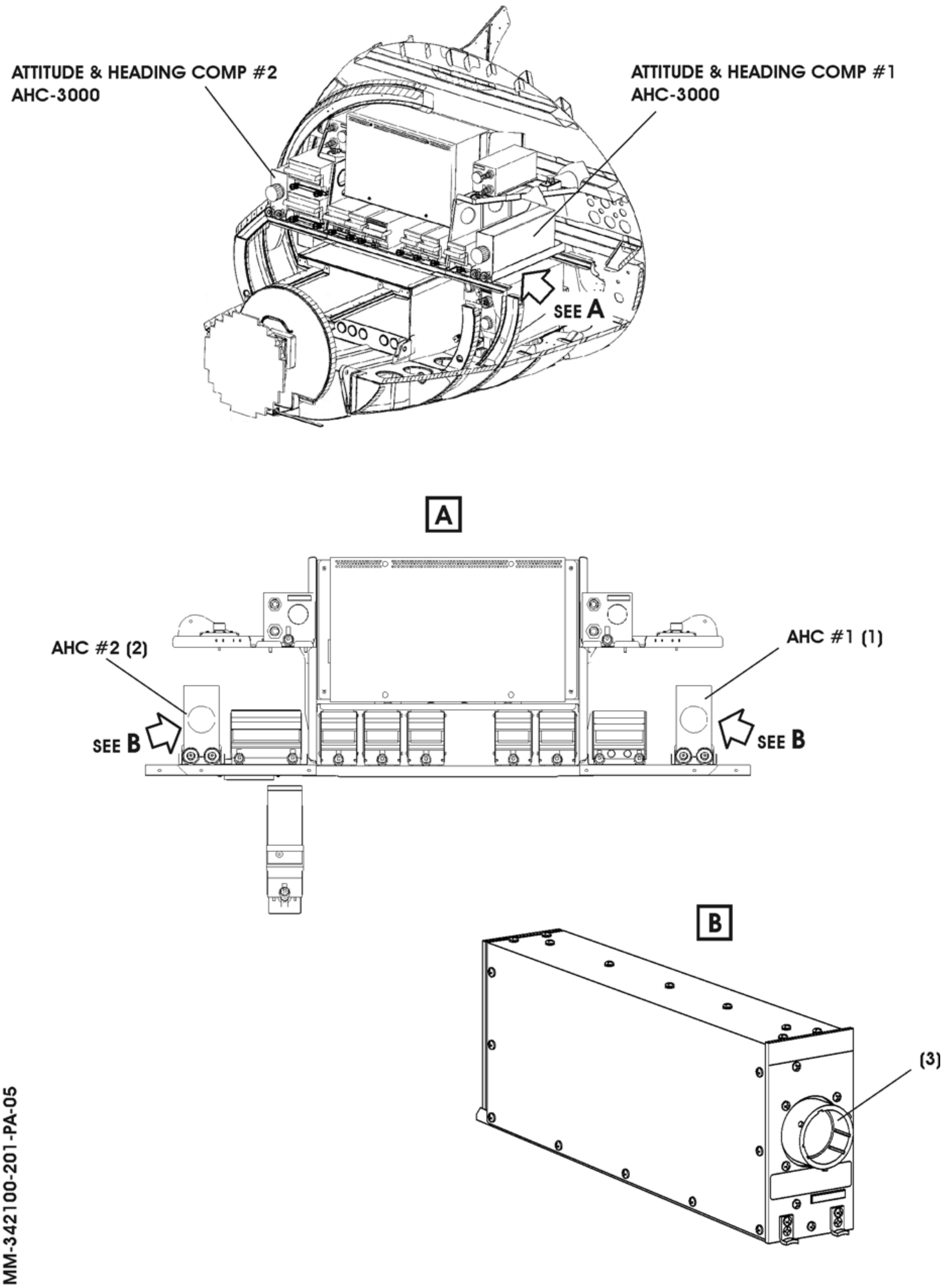

Fig. 201 - Attitude and Heading Computer (AHC) - Removal/Installation

3. Attitude and Heading Computer(AHC) - Installation(Ref. to Fig. 201)

A. Fixtures, Test and Support Equipment

Blanking caps	Not specified
Warning notices	

B. Referenced Information

Maintenance Manual Chapter 24-00-00

Maintenance Manual Chapter 53-10-00

C. Procedure

NOTE: The installation procedures of the Primary and Secondary Attitude and Heading Computer (AHC) are the same. Only the location of Attitude and Heading Computer (AHC) is different.

(1) Make sure, as necessary that:
- There is no electrical power on the airplane
- The warning notices are in position
- Access is available

(2) Slide Primary Attitude and Heading Computer (AHC) (1) [Secondary (2)] into mount until fully engaged.

(3) Position knurled knobs on front of mount to engage unit mounting projection and tighten knurled knobs.

(4) Press on front panel to ensure that the unit is fully seated in the mount. Retighten knurled knob until unit is secure in mount.

(5) Make sure that a good electrical bond exists between the unit and the mount.

(6) Attach wire harness mating connector to front connector of the Primary Attitude and Heading Computer (AHC) (1) [Secondary (2)]. Verify proper connector engagement by observing indicators on connector.

(7) Carry out a Attitude and Heading Computer (AHC) Operational test.

(8) Install the radome/nosecone (Refer to 53-10-00).

(9) Remove the Warning Notice in the flight compartment

4. Flux Detector Unit (FDU) - Removal (Refer to Fig. 202)

A. Fixtures, Test and Support Equipment

Blanking caps	Not specified

NOTE: Use non magnetic material for Removal /Installation of unit on aircraft.

B. Referenced Information

Maintenance Manual Chapter 06-00-00

NOTE: The removal procedures of the Primary and Secondary Flux Detector Units (FDU) are the same. Only the location of Flux Detector Units (FDU) is different.

C. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.

(2) Open, tag and safety the following circuit breakers: AHC 1, AHC1 SEC for Primary FDU [AHC 2 for Secondary FDU]

(3) Remove the tailcone access panel 310 A (Refer to 06-00-00).

(4) Disconnect the connector from Flux Detector Unit (FDU)

(5) Put caps on all electrical connectors.

(6) Remove and retain the three securing screws (1) and washers (2) from the Flux Detector Unit (FDU).

(7) Remove the Flux Detector Unit (FDU) (3) from the support bracket.

5. Flux Detector Unit - Installation (Ref. to Fig. 202)

A. Fixtures, Test and Support Equipment

NOTE: Use non magnetic material for Removal /Installation of unit on aircraft.

B. Referenced Information

Maintenance Manual Chapter 06-00-00

NOTE: The installation procedures of the Primary and Secondary Flux Detector Units (FDU) are the same. Only the location of Flux Detector Units (FDU) is different.

C. Procedure

(1) Make sure that the following circuit breakers: AHC 1, AHC1 SEC for Primary FDU [AHC 2 for Secondary FDU] are open, safetied and tagged.

(2) Remove caps from electrical connectors.

(3) Connect the aircraft connector to Flux Detector Unit (FDU) connector.

(4) Position the Flux Detector Unit (FDU) (3) on the LH (RH) support bracket (4) and install and tighten the three securing screws (1) and washers (2).

(5) Install access panel 310 A (Refer to 06-00-00).

(6) Remove the Warning Notice in the flight compartment.

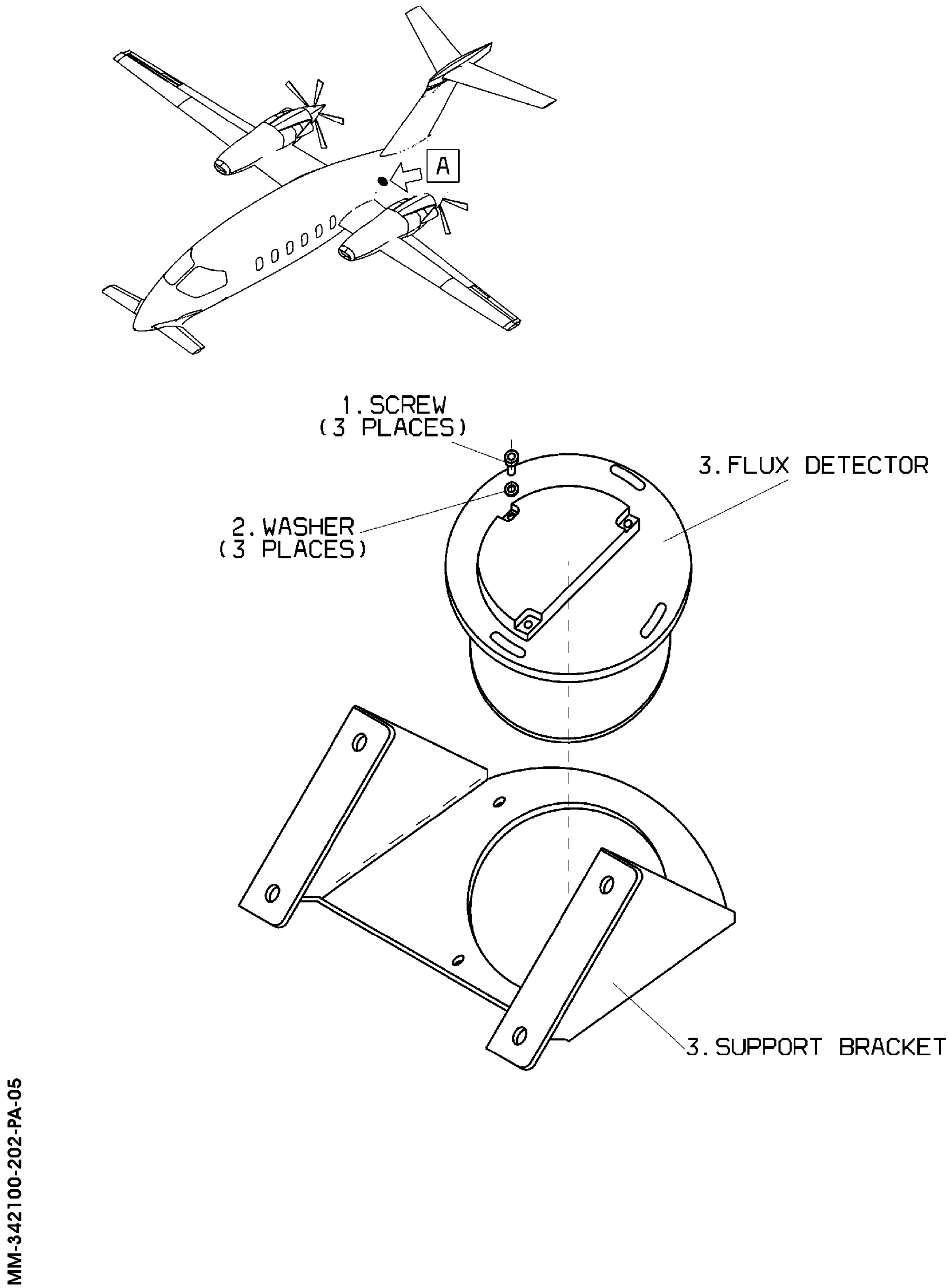

Fig. 202 - Flux Detector Unit - Removal/Installation

6. External Compensation Units (ECU) - Removal (Ref. to Fig. 203)

A. Fixtures, Test and Support Equipment

Blanking caps

B. Referenced Information

Maintenance Manual Chapter 24-00-00

Maintenance Manual Chapter 53-10-00

NOTE: The removal procedures of the Primary and Secondary External Compensation Units (ECU) are the same. Only the location of External Compensation Units (ECU) is different.

C. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(2) Open, tag and safety the circuit breakers: : AHC 1, AHC1 SEC for Primary FDU [AHC 2 for Secondary FDU]
(3) Remove the radome/nosecone (Refer to 53-10-00).
(4) Get access to the avionics compartment.
(5) Disconnect the connector from External Compensation Units (ECU)
(6) Put caps on the electrical connectors.
(7) Remove the two screws (1)
(8) Remove External Compensation Units (ECU) (2) from aircraft.

7. External Compensation Units (ECU) - Installation (Ref. to Fig. 203)

A. Referenced Information

Maintenance Manual Chapter 53-00-00

NOTE: The installation of the Primary and Secondary External Compensation Units (ECU) are the same. Only the location of External Compensation Units (ECU) is different.

B. Procedure

(1) Make sure that the following circuit breakers: AHC 1, AHC1 SEC for Primary ECU [AHC 2 for Secondary ECU] are open, safetied and tagged.
(2) Remove caps from electrical connectors.
(3) Connect the aircraft connector to External Compensation Units (ECU) connector.
(4) Position the External Compensation Units (ECU) (2) on the bracket, install and tighten the two securing screws (1)
(5) Close the radome/nosecone (Refer to 53-00-00).
(6) Remove the Warning Notice in the flight compartment.

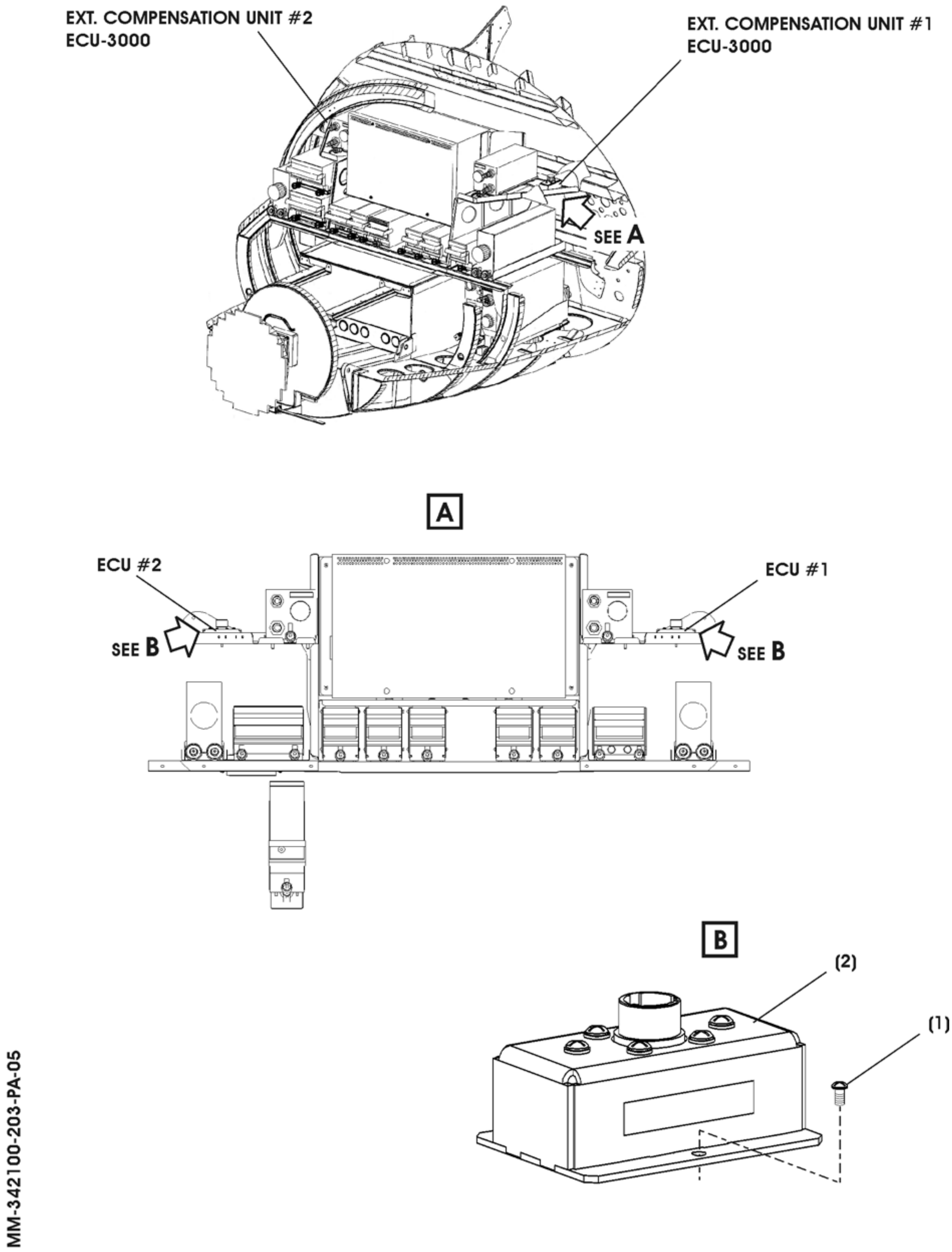

Fig. 203 - External Compensation Units (ECU) - Removal/Installation

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ATTITUDE AND HEADING SYSTEM - ADJUSTMENT/TEST

1. Attitude and Heading Computer (AHC) - Operational Test

A. Referenced Information

Maintenance Manual Chapter 24-00-00

B. Diagnostic Information

During the operation of the AHC-3000, the computer continuously performs in-line monitoring functions. The LRU monitors for excessive aircraft maneuvers and data received from the FDU and air data source.

The unit annunciates detected faults through the maintenance words output on the general purpose data bus.

The AHC also provides indications of the system status on the front panel LED. If the AHC-3000 has a critical fault, the LED will be red. If the FDU-3000, or ECU-3000, but not the AHC-3000 has a critical fault, the LED will be amber. If there are no critical faults the LED will be off.

C. Procedure

NOTE: – Do not initialize in a hangar, near magnetic disturbances, or near power cables.
– Do not move, tow, or taxi the aircraft from the time power is applied until completion of the initialization. Do not remove power or switch electrical buses that can interrupt power to the AHC during the initialization as this will restart the cycle.
– Do not change the position of the nose wheel by operating the nose wheel steering system until the initialization is complete.
– Do not change the position of the flaps until the initialization is complete.

(1) Check the following circuit breakers are closed : AHC 1, AHC 1 SEC, MFD, MFD HTR, CCP, L-PFD, PILOT PFD HTR, L-DCP , L-IAPS, on circuit breakers pilot panel; and AHC 2, R-PFD, COPILOT PFD HTR , R DCP R IAPS on circuit breakers co-pilot panel.

(2) Set the Battery Master and Avionics Master Switch to ON.

(3) Wait about 1 minute for the AHRS-3000 system for initialization and stabilization.

(4) Check the LED on front panel of both Primary and Secondary Attitude and Heading Computer are off.
If LED is red, the system detected faults of AHC Computer. If LED is amber, the system detected faults of FDU or ECU. In this case stop the check and carry out a troubleshouting

(5) When power is applied to the AHC, the initialization cycle begins automatically. The HDG and ATT flags remain in view while the compass cards rotate to north and pause. The compass cards then rotate clockwise 360° back to north, and the HDG and ATT flags clear.
The compass cards finally rotate to the actual magnetic heading of the aircraft. One revolution of the compass card takes approximately 35 to 50 seconds.

NOTE: Cross-check the compass heading on the displays against the magnetic compass to make sure the headings agree.

(6) A successful initialization is indicated by the following:
- HDG and ATT flags are out of view.
- The compass cards show the current aircraft magnetic heading.
- The ADI on the PFD display shows the current pitch and roll attitude.

(7) On the Reversionary panel, put the DG/Slaved mode switch, related to AHC 1 system, in the DG position and push the Slew pushbutton to Right.

(8) Verify the compass card on primary PFD rotates clockwise (heading decreases)

(9) Return the DG/Slaved mode switch to the Slaved position.

(10) Verify the compass card quickly rotates back to the original heading.

(11) Put the DG/Slaved mode switch in the DG position and push the Left Slew pushbutton.

(12) Verify the compass card rotates counterclockwise (heading increases)

(13) Repeat step from (7) to (13) with DG/Slaved mode switch, related to AHC 2 system.

(14) Return the DG/Slaved mode switch to the Slaved position.

STANDBY INSTRUMENT (ATTITUDE SECTION) - DESCRIPTION AND OPERATION

1. Description

A. The integrated Standby Instrument system consists of an Electronic Standby Instrument type GH-3100 and a Detachable Configuration Module type DCM-3100.

The Standby Instrument is a self-contained solid state instrument requiring pitot and static pressure and +28 Vdc input power to provide a visual display of air data (baro corrected altitude, air speed, mach number, and vertical speed), attitude (pitch and roll) and slip/skid information. For description of Air Data refer to 34-13-00.

The DCM-3100 is a solid-state device installed on the GH-3100 (J2) connector, that retains software and hardware configuration information for a specific aircraft.

The Electronic Standby Instrument receives Static and Pitot pressure inputs from RH Pitot / Static system. Refer to 34-11-00.

The Standby Instrument is powered by the 28 V dc Emergency Power Bus through the STANDBY INSTR circuit breaker located on pilot c/b panel.

The Standby Instrument also receives 5 Vdc for lighting through the Avionics lights circuit. The power is supplied by the Emergency Power Bus through the EMER LTS circuit breaker located on pilot c/b panel.

In case of total loss of A/C DC sources (DC generators and battery), the Emergency Power Bus is automatically powered through an Emergency Power Unit to assure at least 30 minutes of operative time to the stand-by instrument.

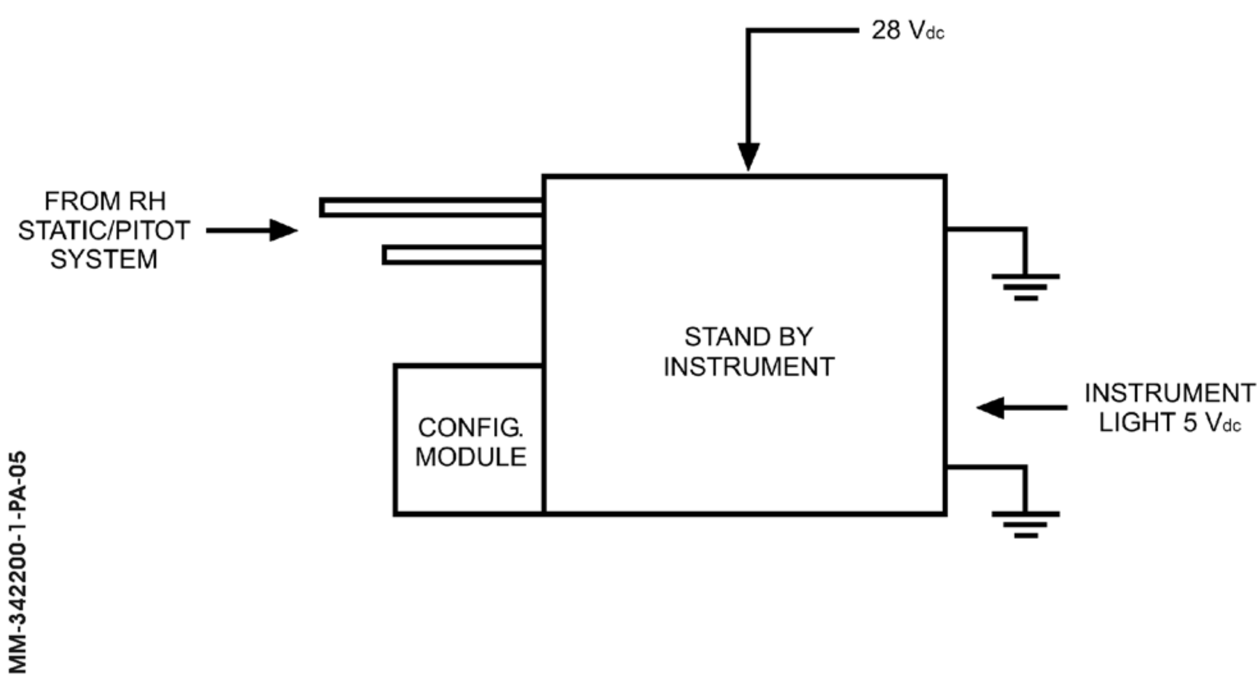


Fig. 1 - Standby Instrument Block Diagram

B. The Electronic Standby Instrument GH-3100 is installed on the central instrument panel (ref. Fig. 1) and consists of a standby attitude and air data indicator, incorporating a strap-down inertial sensor, two pressure sensors and a color active matrix liquid crystal display. It provides the air crew with attitude, altitude and airspeed information in the event of failure of the primary attitude and/or air data instruments.

The inertial sensor provides tilt angles in roll, pitch and angular rates used in a strapdown algorithm to compute attitude and slip.

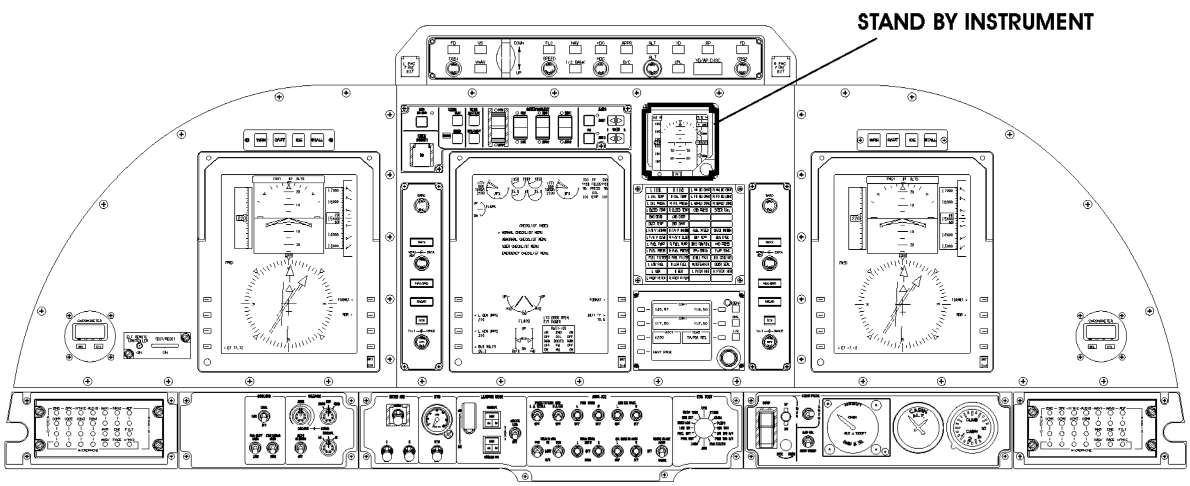
Information is displayed on a color Active Matrix Liquid Crystal Display (AMLCD), in a format which simulates the appearance of an electro-mechanical attitude indicator.

The pressure sensors are used to compute airspeed and altitude data. This information is presented in digital readout and rolling tape formats.

A bezel mounted light sensor provides automatic display dimming capability, with manual offset control achieved through the menu mode.

C. The Detachable Configuration Module type DCM-3100 is a solid-state device, which is installed on the GH-3100 (J2) connector (ref. Fig. 3), that retains software and hardware configuration information for the specific aircraft on which is used, including pre-programmed A/C data on Static Source Error Correction and maximum allowable Airspeed.

When the GH-3100 Electronic Standby Instrument is removed for maintenance, the DCM-3100 Detachable Configuration Module remains with the aircraft via a chain that is attached to the GH-3100 wiring harness



MM-342200-2-PA-05

Fig. 2 - Standby Instrument location

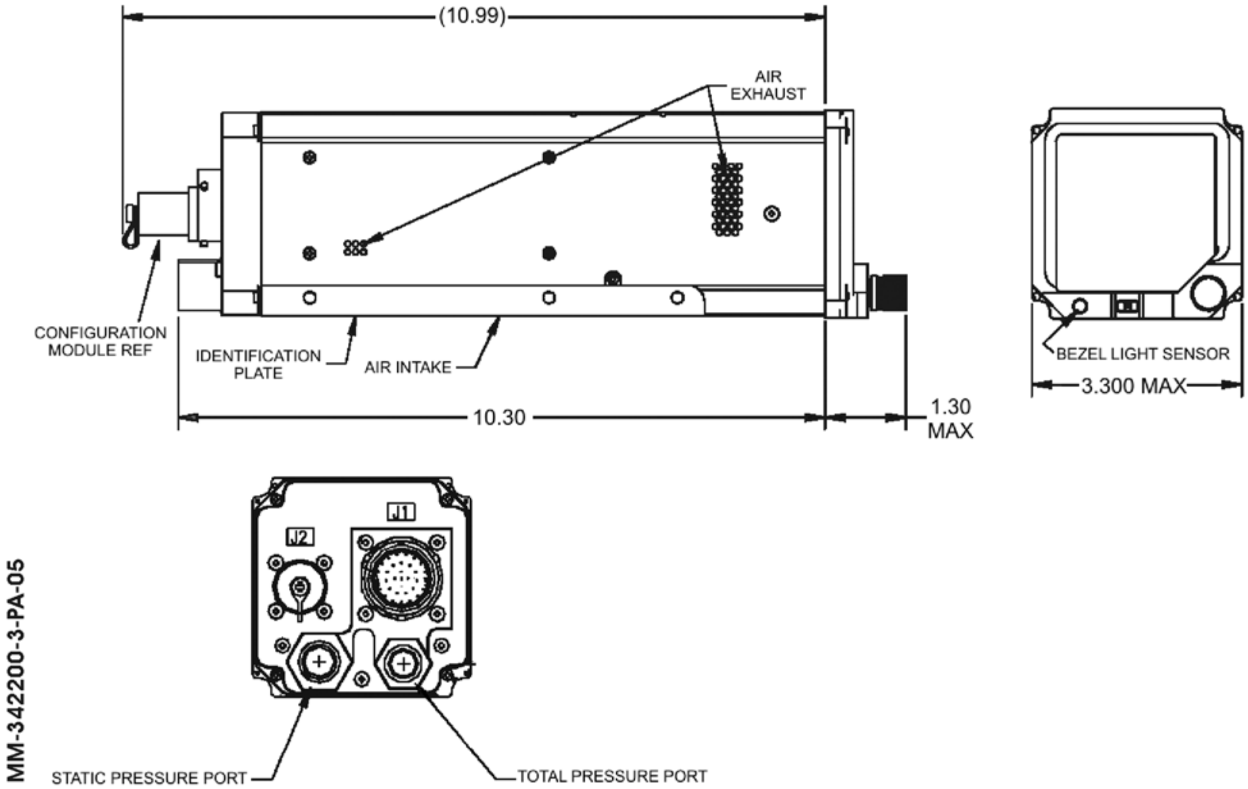


Fig. 3 - Standby Instrument and Configuration Module dimension

2. <u>Operations</u>

A. The Controls of Standby Instrument are located on the front panel of the instrument. (Ref. Fig. 4). These consist in an adjustment Knob and Push Button Key.

B. Adjustment Knob

The adjustment knob is located in the lower right corner of the indicator. For further detail refer to 34-13-00.

C. Push Button Key

The push button key is located on the lower middle portion of the indicator. For further detail refer to 34-13-00.

D. The push-button key and the adjustment knob are used to view, select, and change alphanumeric menu items displayed on the screen. In the menu mode, a list of menu items will be presented across the lower portion of the screen. For further detail refer to 34-13-00.

E. Upon entering the menu mode, the order in which the available menu items appear will be FAST ERECT; SET BRIGHTNESS OFFSET; FAST ALIGN; BARO TYPE; When the menu mode is first initiated after power-on, the FAST ERECT command will be highlighted.

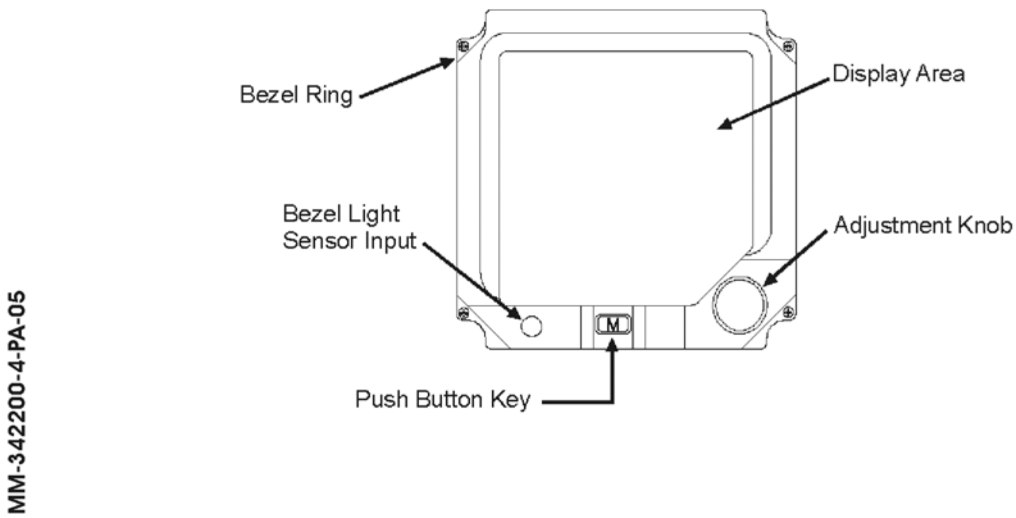


Fig. 4 - Standby Instrument Front Panel Control

F. Bezel Light Sensor Input

The light sensor is located in the lower left corner of the indicator. The sensor automatically adjusts the brightness of the display to cockpit lighting levels. The menu selection provides an offset command to manually change the display brightness.

G. Power ON Sequence

With the application of +28.0 Vdc to the indicator, the unit start the sequence of the operating modes, in order: Power ON Self Test Mode, Identification Mode, Sensor Alignment Mode, Background Self-Tests, Normal Operating Mode. For further detail on this operational mode refer to 34-13-00.

3. Display

A. The Standby Instrument displays Air data and Attitude data. The Attitude data appears as shown in Fig. 5. For Air data display refer to 34-13-00.

Attitude data is displayed in the form of a pitch ladder, a roll pointer, a roll scale, a slip / skid indicator and aircraft reference symbol. Refer to full screen display as shown in Fig. 5.

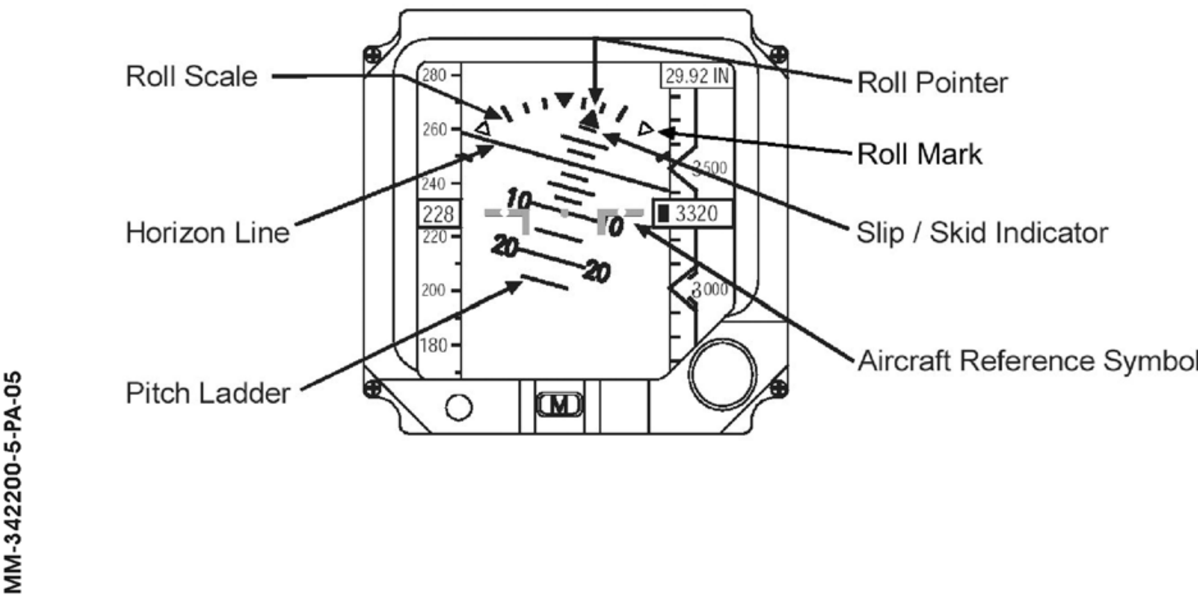


Fig. 5 - Standby Indicator Display - Typical Attitude display

B. Pitch Ladder

The pitch ladder consists of a series of parallel white lines, orthogonal to, and centered on, an imaginary line which runs vertically through the center of the attitude display area when the aircraft is at zero roll. The pitch ladder rotates about the center of the attitude display area with an angle equal to the roll angle of the aircraft.

(a) Scale Lines

As shown in Fig. 5 the longest scale lines represent 10° increments of pitch on either side of the horizon line. These 10° lines have a white number that rotates as roll changes.
Scale lines midway are shorter and representing 5° increments. Further there are scale lines at ±2.5° and ±7.5° that are shorter.

(b) Horizon Line

The horizon line is drawn at the point, which represents zero pitch. The horizon line extends to the edges of the attitude display area.

When the actual horizon line lies outside of the circular viewing area, the pitch ladder continues to move with the actual pitch, but the sky / ground boundary remains in view to help the pilot keep his orientation. A reduced intensity line will mark the ghost horizon boundary.

(c) Background

The background on which pitch ladder lines are drawn is blue on the side of the horizon line, which represents positive pitch (the sky) and brown on the side of the horizon line, which represents negative pitch (the ground). This sky / ground background fills the entire attitude display area.

(d) Excessive Pitch Attitude

The excessive pitch display is a chevron type format as shown in Fig. 6. Red chevrons, pointing to the horizon, are located with their points at +45° and +65° of pitch (sky area) and at -35°, -50°, and -65° of pitch (ground area).
The pitch ladder continues beyond the normal pitch range of ±90° to fill the circular viewing area. The 10° lines outside the normal range have their numeric labels upside-down relative to the normal numeric labels.

C. Aircraft Reference Symbol

The aircraft reference symbol provides the reference point for the pitch ladder (refer to Fig. 5). This symbol consists of two L-shaped "wings" and a fixed square boresight mark, each colored black with a white outline. The boresight mark represents the center of the display. The aircraft reference symbol is displayed in front of the pitch ladder and remains visible at all times.

D. Roll Pointer

The roll pointer consists of an equilateral triangle drawn on the sky/ground background (refer to Fig. 5). This pointer is located on the centerline of the pitch ladder and rotates with a changing roll condition. The apex will point toward the edge of the display (roll scale) in the direction of increasing pitch and its base remains parallel with the pitch lines.

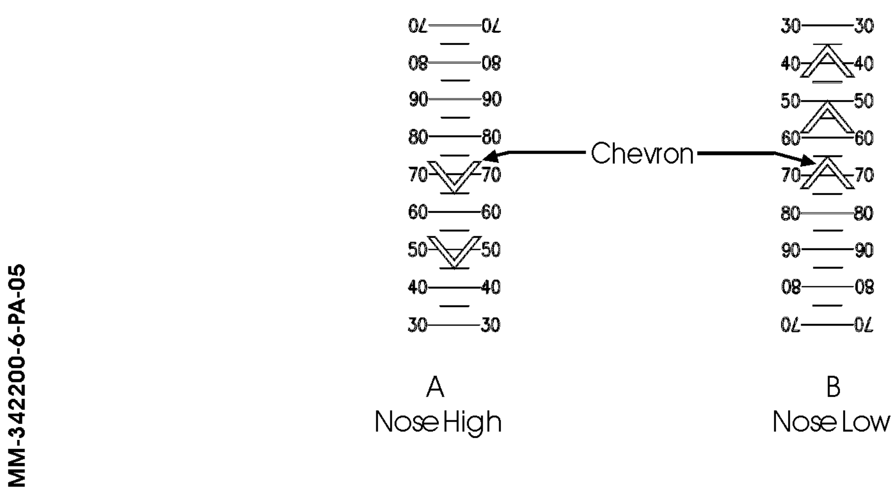


Fig. 6 - Chevrons in Excessive Pitch Attitude Display

E. Roll Scale

The roll scale consists of an equilateral triangle to mark zero (refer to Fig. 5). Additionally, there are a series of white lines representing ± 10°, ± 20°, ± 30°, and ± 60° roll. The lines radiate out from the center of the attitude display area, starting on an arc of a circle tangent to the apex of the zero roll triangle. The lines for ± 30° and ± 60° are longer than the other lines.
The ±45° roll marks are filled white equilateral triangles. The 45° roll triangles are smaller than the roll pointer, with their apexes pointing toward the center of the attitude display area.
The zero roll triangle is located at the top center of the attitude display area with the apex pointing down.
The roll scale is drawn on the sky / ground background.

F. Slip / Skid Indicator

The slip / skid indicator is a white rectangular symbol located below the roll pointer (refer to Fig. 5). This symbol moves with the roll pointer, but moves laterally from the roll pointer to show slip / skid information. Display of this information requires no external equipment.

G. Attitude Failure Indications

For the Attitude Failure Indication, the pitch ladder, roll pointer, and slip/skid indicator are removed leaving the roll scale and the aircraft symbol visible on a cyan background. The large characters "ATT FAIL" appears centered above the aircraft symbol (Refer to Fig. 7).

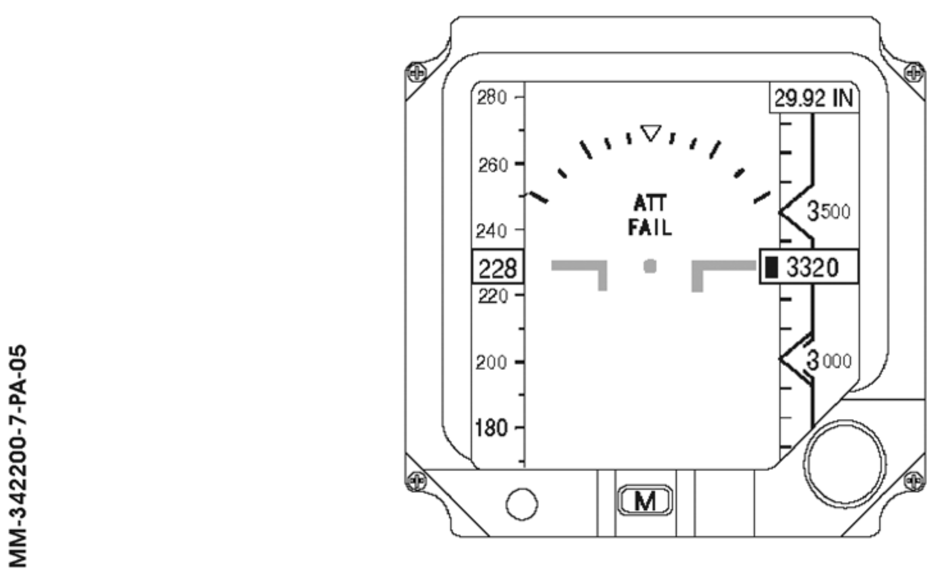


Fig. 7 - Full Screen Attitude Failure Display

H. Extended Maneuver Indication

a. “EXT MANUV” are shown in small white characters at the bottom of the display whenever the system experiences erection cut-off for a duration, which is long enough for potential attitude errors to develop.

b. After appearing, the Extended Maneuver indication is removed when any of the following occur:

– Normal erection and heading alignment (if configured for heading) are restored.

– The attitude failure indication is displayed. (Refer to Fig. 7).

I. Processor Error Screens

A warning, shown as a red X across the display or as a black screen with instructions is displayed if errors are detected in the graphic or host processors as shown in Fig. 8.
Errors attributed to the Graphics Processor will automatically generate a graphics processor reboot with little display or information interruption. Errors attributed to the Host Processor will require the operator to manually reset power to the indicator.

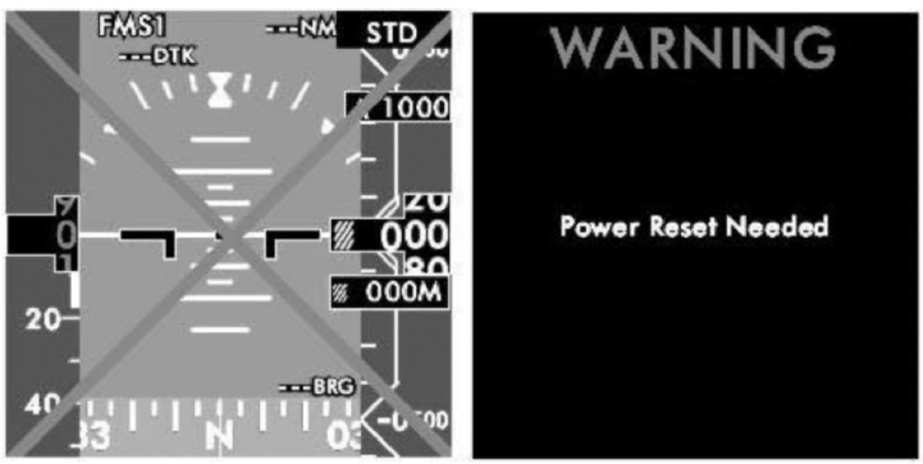


Fig. 8 - Processor Error Screens

STANDBY INSTRUMENT (ATTITUDE SECTION) - MAINTENANCE PRACTICES

1. General

   A. For the following paragraph

      – Standby Instrument - Removal/Installation
      – Standby Instrument - Functional Check

      refer to 34-13-00.

   For Configuration Module removal refer to 34-13-00 Stand by Instrument procedure removal, step 7.

   For Configuration Module installation refer to 34-13-00 Stand by Instrument procedure installation, step 3.

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MAGNETIC COMPASS - DESCRIPTION AND OPERATION

1. Description

A. The aircraft is equipped with a non-stabilised magnetic compass that displays the magnetic heading in all the normal or emergency flight conditions.

B. The magnetic compass consists in a rotating card with 5° increments labelled every 30°, which rotates against a fixed index sufficiently close to the card to minimise the reading parallax error.
The moving parts of the magnetic compass are shock mounted in a sealed casting filled with a dumping fluid, and for compensating the volume changes of the fluid due to temperature variations the casting is closed with an elastic diaphragm.
Two internal compensating magnets (for E-W and N-S directions) are provided for compensating the errors induced by eventually perturbing local permanent magnetic fields. They are accessible by means of two screws placed on the front of the compass.

The magnetic compass is installed centrally over the instrument glareshield into the pilot primary field of view.

The magnetic compass is equipped with a lamp power by instrument lighting circuit .

The lighting power (+5 V dc) is connected to the magnetic compass by means of a shielded wire and a shielded connector.
The lighting power (+5 V dc) of the magnetic compass is generated from Emergency Power Bus thought EMER LTS circuit breaker located on c/b Pilot panel (Refer also to 24-30-00).

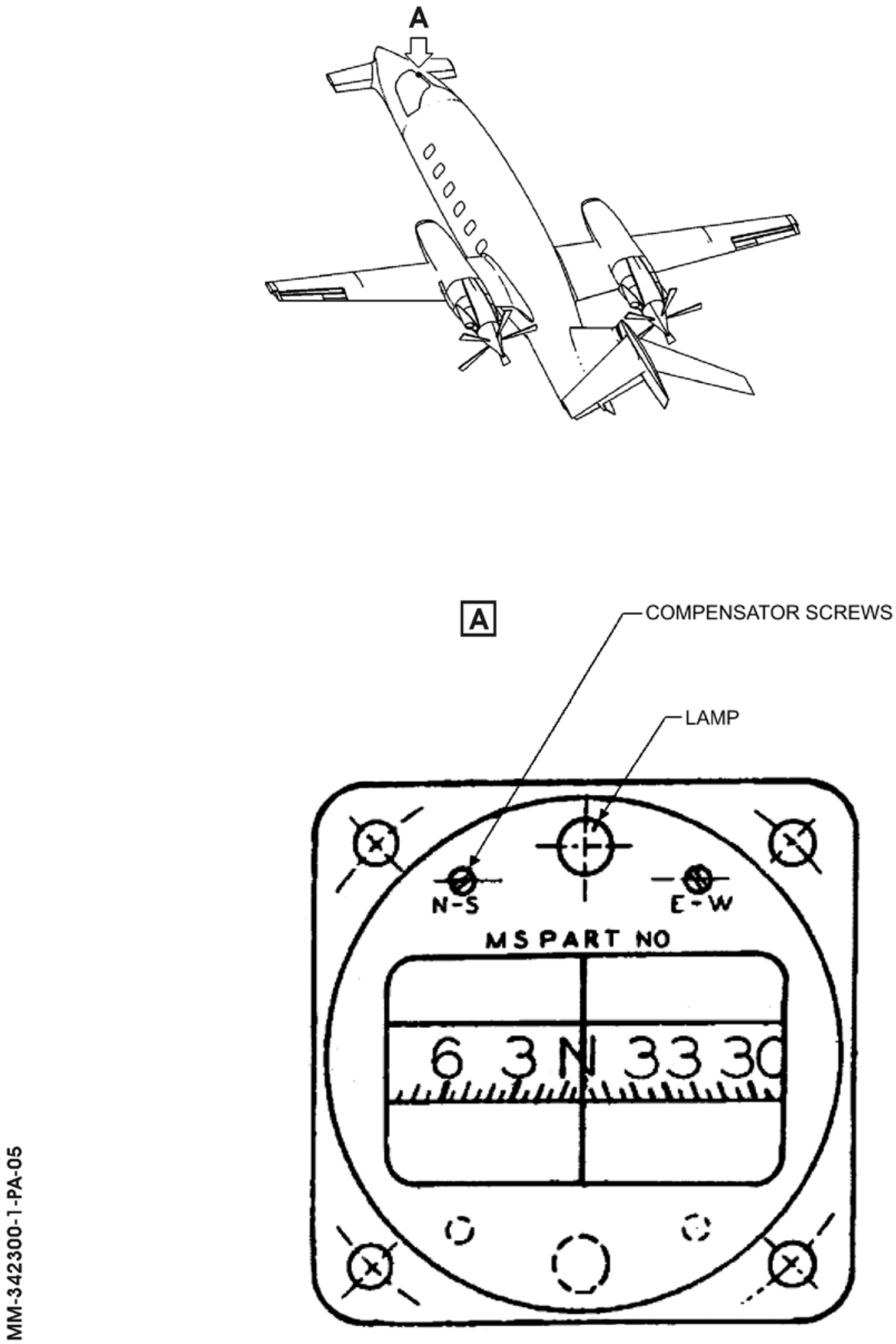

Fig. 1 - Magnetic Compass location

MAGNETIC COMPASS - MAINTENANCE PRACTICE

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00.

A. This topics provides the following Magnetc Compass Maintenance Practices:
   – Magnetic Compass - Removal/Installation
   – Magnetic Compass - Adjustment / Test

2. Magnetic Compass - Removal (Ref. Fig. 201)

A. Procedure
   (1) Open, tag and safety this circuit breaker:
   Copilot CB Panel:
   LTS DIM 1
   (2) Remove the two screws (1) that secure the Magnetic Compass (2) to the airplane structure between the windshields.
   (3) Remove the Magnetic Compass.

3. Magnetic Compass - Installation (Ref. Fig. 201)

A. Procedure
   (1) Install the two screws (1) that secure the Magnetic Compass (2) to the airplane structure between the windshields.
   (2) Do a Magnetic Compass Test.
   (3) Remove the safety tags and close circuit breaker LTS DIM 1.

4. Magnetic Compass - Adjustment / Test

A. Procedure
   (1) Position the airplane on the Approved Compass Adjustment Platform.
   (2) The Reference line is the axis passing through the Main Wheel Centers.
   (3) Rotate the airplane around its own vertical axis at 30 degrees steps and verify that the indication (reference line) coincides with the magnetic compass indication within 10% tolerance.

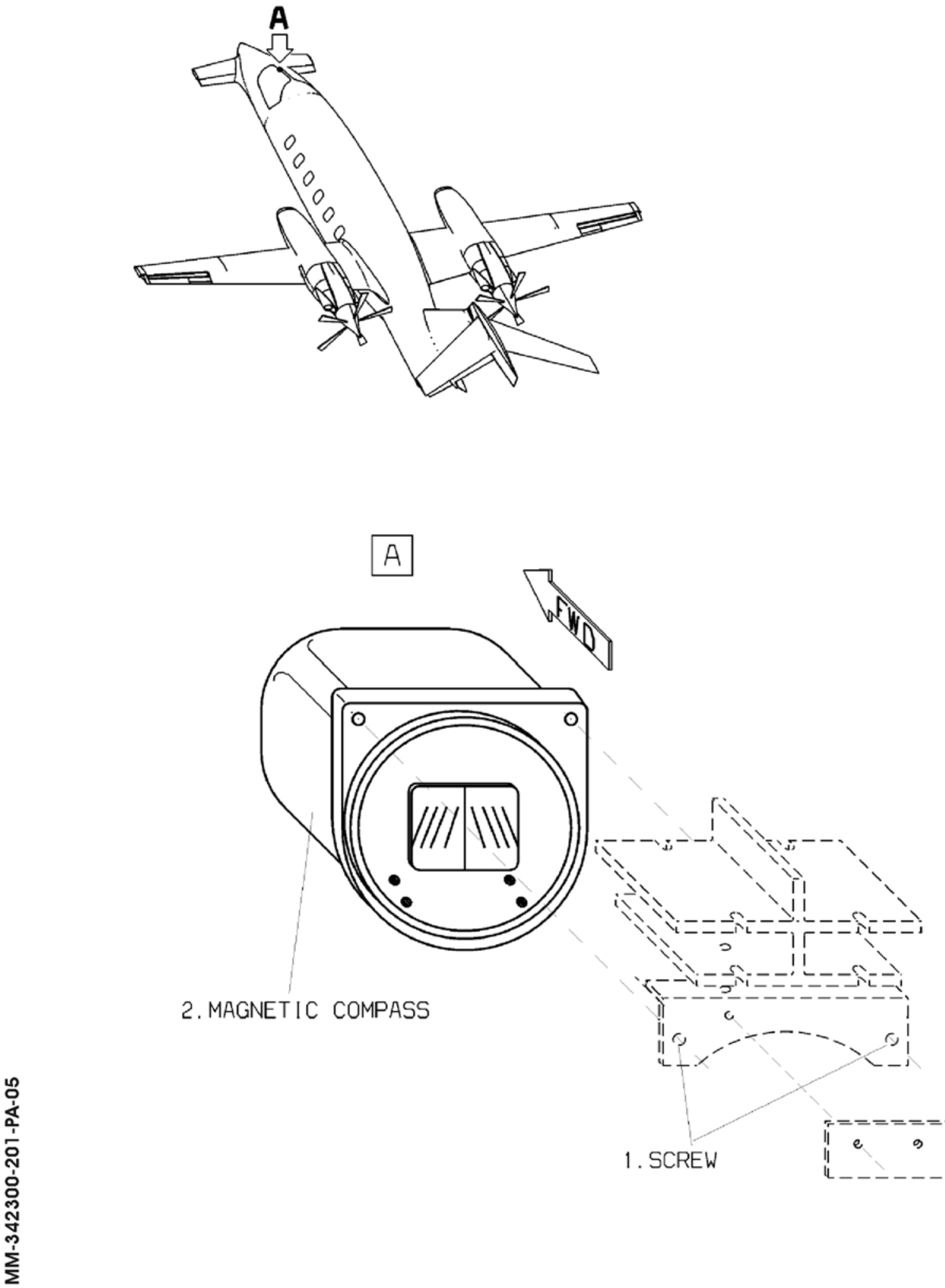

Fig. 201 - Magnetic Compass - Removal Installation

INDEPENDENT POSITION DETERMINING - DESCRIPTION AND OPERATION

1. General

This Section 34-40-00 “Independent Position Determining” includes that portion of the system which provides information to determine position and is mainly independent of ground installation or orbital satellites. Includes items such as inertial guidance systems, weather radar, proximity warning, etc.

Specifically, the Section includes:

34-41-00 Weather Radar System

34-42-00 Radio Altimeter System

34-43-00 TCAS I

34-44-00 TWAS

34-45-00 Turbulence Radar System

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WEATHER RADAR SYSTEM - DESCRIPTION AND OPERATION

1. Description

   A. The Weather Radar System type RTA-800 is a 2-channel, solid-state, X-band color weather radar system that detects and locates weather targets for the purpose of navigating around weather hazards within 60 degrees either side of the flight path. The Weather Radar System can also be used to provide ground terrain information.

   The weather and map information can be overlaid on most of the navigation formats on the PFDs and MFD.

   The Weather Radar System are controlled by means of line keys provided for the PFDs, MFD and Display Control Panels (DCP). (Ref. Fig. 1)

   The Weather Radar System is powered by the Right Avionics Dual Feed Bus through the WEATHER RDR circuit breaker, located on the copilot c/b panel.

   B. The Weather Radar System RTA-800 is installed in the front section of the avionics bay, facing the nose radome of the aircraft (see Fig. 2).

   The unit is one piece designed equipment, combining the receiver, transmitter and antenna into single unit (see Fig. 3).

   The forward portion of this unit is the 12 inches diameter flat plate antenna. Directly behind the antenna and attached to it is the RF Assembly, consisting of the transmitter and the receiver.

   The RF (transmitter / receiver / antenna) assembly mounts on the pedestal drive assembly and swings from left to right as the system scans the horizon and up and down for the tilt. The pedestal drive assy contains the motor and gears for the scan and tilt functions, and attaches to the base assembly.

   The base assembly is cylindrical in shape, about 15 inches in diameter and slightly less than 2 inches in depth. It serves as the mounting base and contains the power supply and signal processing portion of the RTA-800 unit.

   The RTA assembly is mounted on the forward bulkhead dedicated plate, enclosed by a radome.

   The system receives manual control from pilot and copilot Display Control Panels PFDs and MFD, via the IAPS bus structure, while the radar processed data are sent to the PFDs and MFD through the digital data bus.

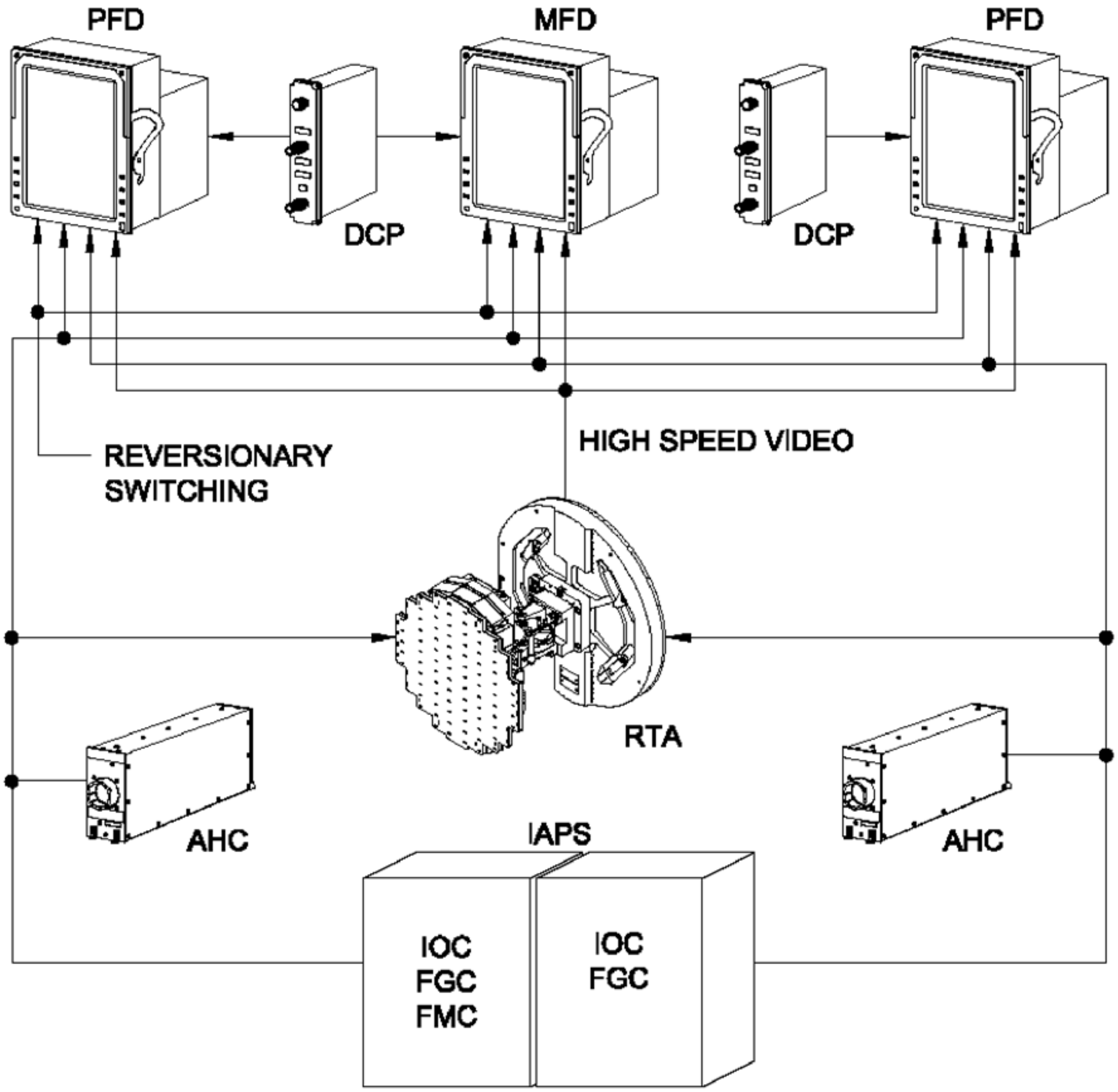

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Fig. 1 - Weather radar System Block Diagram

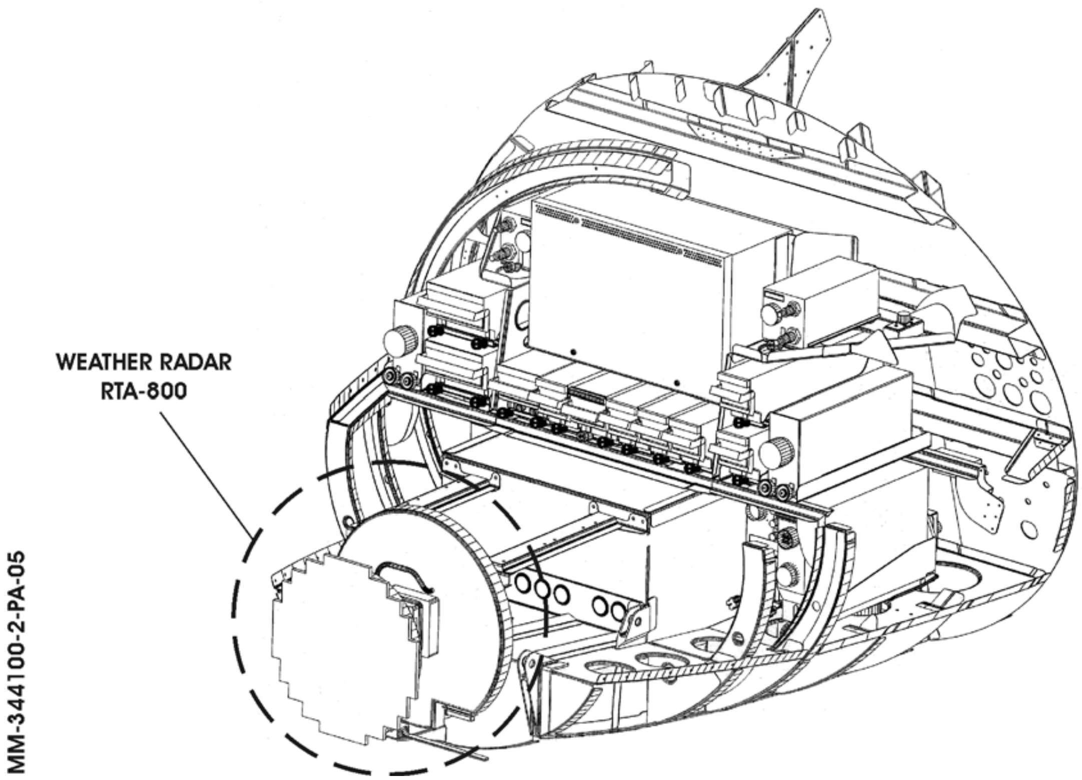

Fig. 2 - Weather radar System Location

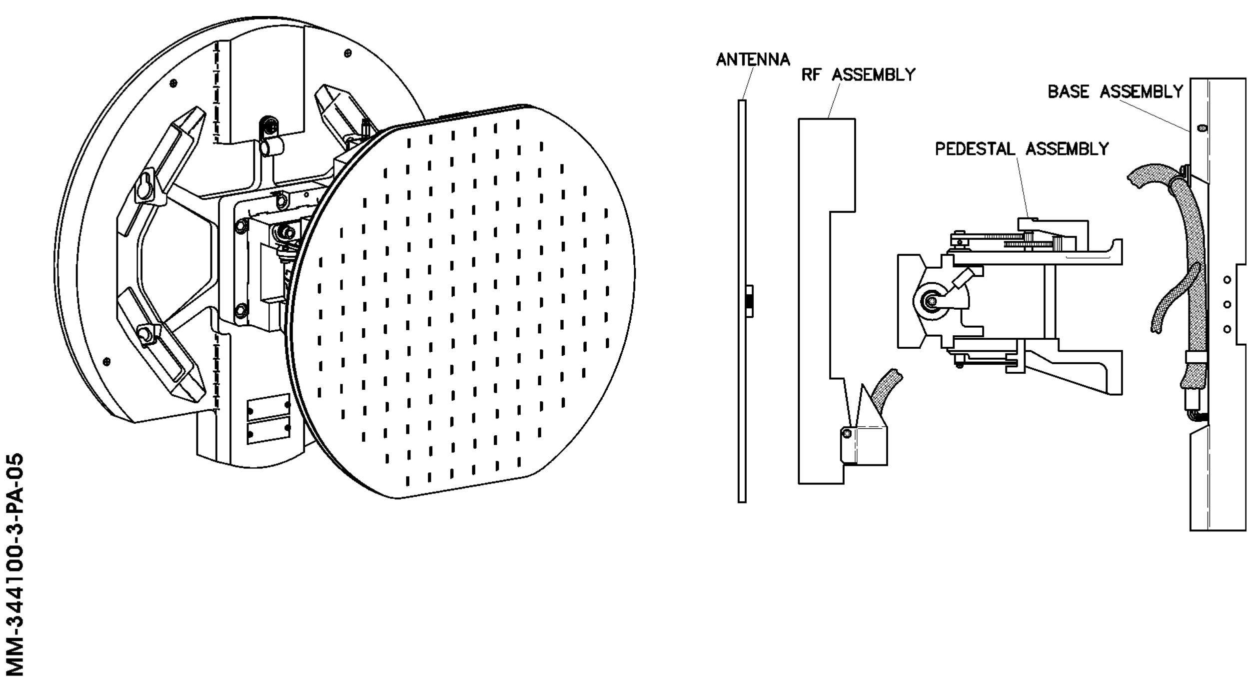

Fig. 3 - RTA-800 Receiver /Transmitter /Antenna Assembly and Major Subassemblies

2. Operations

A. Weather Radar operations are controlled through the DCP in conjunction with the PFD and MFD using a Menu selection process.

B. Two Display Control Panels (DCP) are installed on the instrument panel, one for the pilot side and one for the copilot side.

The Display Control Panels (DCP), in conjunction with the line select keys on the Primary Flight Displays (PFD) and Multifunction Flight Displays (MFD), provide the control of the radar and other navigation sources, bearing pointers, and speed and altitude references etc. When a DCP function switch is pushed, the PFD shows the appropriate menu. While the menu is in view, the PFD line select keys are active.

The RADAR button on the DCP is used to select the RADAR Menu on the onside PFD.

When the RADAR Menu is active, line select keys on the PFD are used to set the Weather Radar System mode. The GCS button is used to select the Weather Radar System Ground Clutter Suppression (GCS) feature. The TILT knob (outer knob) is used to adjust the Weather Radar System antenna tilt angle. The RANGE knob is used to select the display range.

The PFD and MFD provide control of the Weather Radar mode by means of the RDR line select key to select the Radar display.

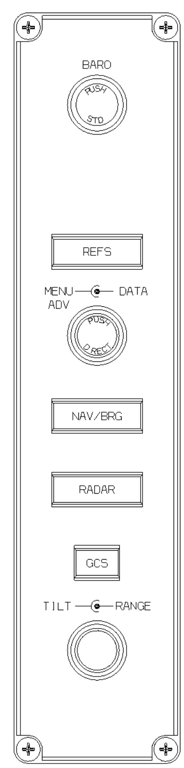

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Fig. 4 - Display Control Panel (DCP)

C. The controls related to Weather Radar System are :

MENU ADV (advance): The MENU ADV knob is used to move the cyan selection box on the PFD menus such as the REFS menu and RADAR menu.

DATA: The DATA knob is used to select the active state (on, off, stby, etc.) or adjust the settable value highlighted by the cyan selection box.

PUSH SELECT: The PUSH SELECT button is used to select a reference for display or select the active state (on, off, stby, etc.).

RADAR: The RADAR button is used to select and deselect the weather RADAR Menu on the PFD. The RADAR menu provides access to the Weather Radar mode selections.

GCS (Ground Clutter Suppression): The GCS button is used to select and deselect the Weather Radar GCS feature. The GCS feature reduces the intensity of ground returns in WX mode, which assists in the interpretation of rainfall rates.

TILT (antenna tilt): The TILT knob is used to manually adjust the Weather Radar Antenna tilt angle. Proper use of the TILT knob allows the operator to achieve the best picture of storm cell size, height, and relative direction of movement. The tilt range is +/-15°. Turn the TILT knob clockwise to select a positive tilt (tilt up) angle and counterclockwise to select a negative tilt (tilt down) angle.

RANGE: The RANGE knob is used to adjust the flight display range setting. The display range setting affects the navigation and hazard avoidance maps on the PFDs and MFD. Turn the RANGE knob clockwise to increase the range display and counterclockwise to decrease the range display. The display ranges are: 10, 25, 50, 100, 200 and 300 NM.

D. The PFDs and MFD provides control of the Weather Radar mode through RADAR menu .

The PFDs (Ref. Fig. 5) and MFD (Ref. Fig. 6) contain the RDR line select key to select the Radar display (on or off). The RDR line select key is the second line select key on right of Flight Display.

With two PFDs operational, the Radar functions like two independent Radars. Each pilot’s display is controlled by the onside DCP/PFD and is updated on alternate sweeps of the antenna.

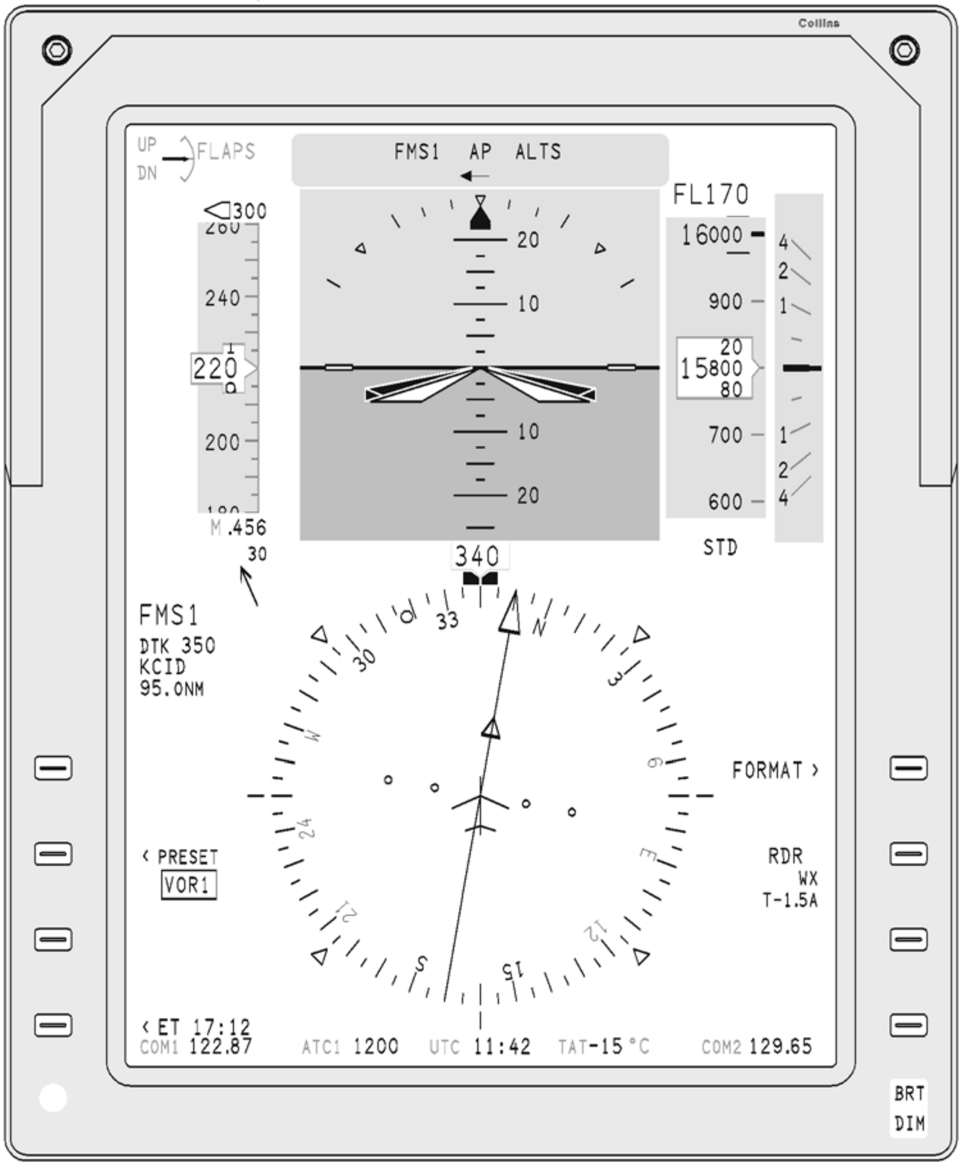

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Fig. 5 - Primary Flight Display (PFD)

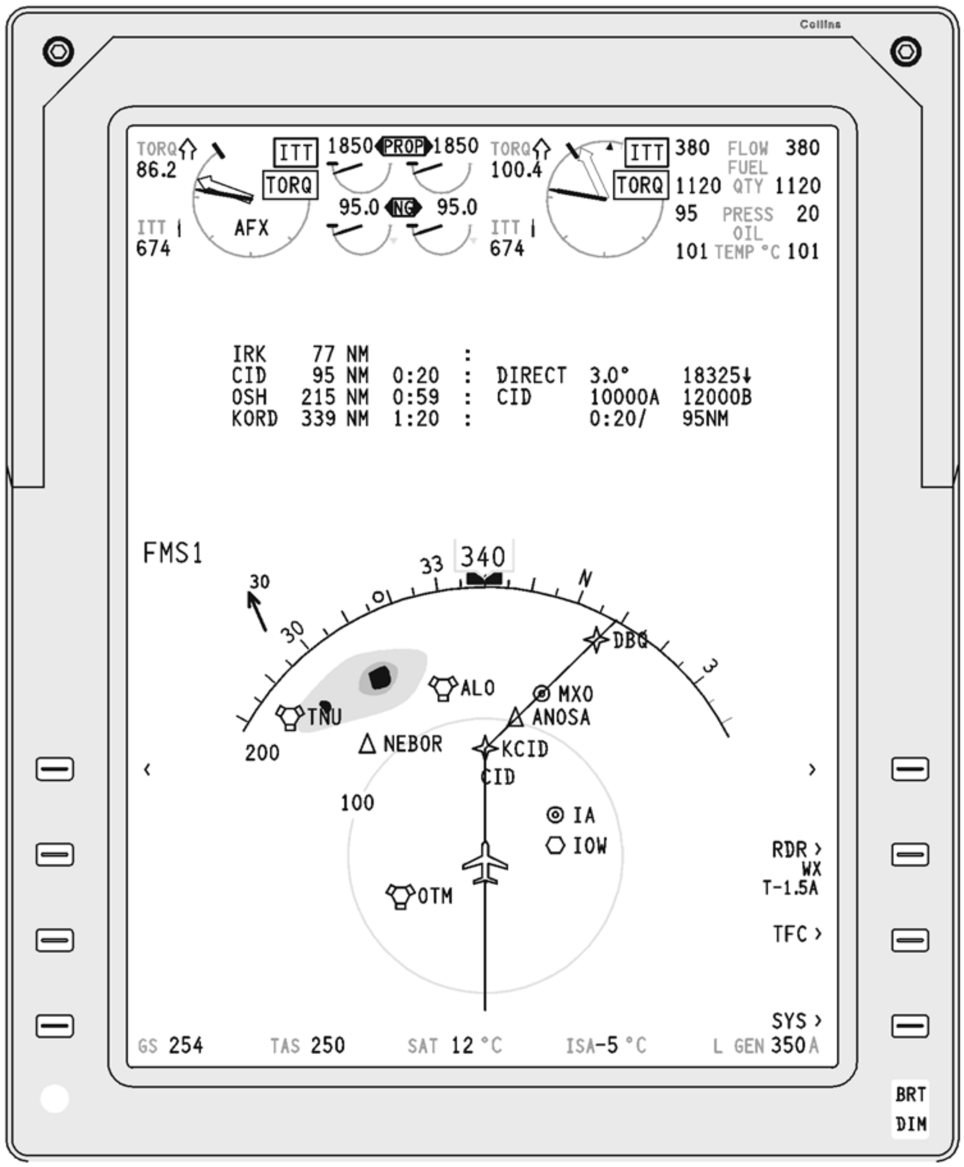

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Fig. 6 - Multi-Function Display (MFD)

Radar Menu: The RADAR button on the DCP is used to select and deselect the RADAR menu on the PFD. When the RADAR menu is in view, a solid box shows around the current RADAR mode. The solid box is moved with the MENU ADV knob on the DCP or the adjacent line select key.
The DATA knob or PUSH SELECT button on the DCP is used to select the desired value or state (on or off).

The possible radar modes are:

– STBY In Standby (STBY) mode the Weather Radar system is on but not transmitting. With 2 PFDs operational, selecting STBY on either side causes both sides to go to STBY.
Independent radar modes may be selected by each pilot, but either pilot selecting STBY will again force both sides to STBY.

NOTE: The Weather Radar system should be set to standby mode when on the ground to ensure the safety of people and equipment from possible radar radiation.

– WX In weather (WX) mode, the Weather Radar system is optimized to detect precipitation. Detectable precipitation shows as one of four colors: green, yellow, red, or magenta (least to greatest precipitation rate).

– MAP Ground Map (MAP) mode provides the detailed ground returns giving the mapping of the terrain. Signal processing and target colors are changed to accentuate ground features. Ground targets show in cyan, green, yellow, and magenta (least reflective to most reflective).

– TEST Test mode ensures the displays ability to display the necessary colors. A test pattern made up of six colored arcs in a rainbow-like pattern show on the display. The pattern is made up of the colors green, yellow, red, and magenta. The fifth arc changes between red and magenta on alternate scans. Normal radar returns do not show when test mode is active.

Receiver Gain **(**GAIN) The Receiver Gain (GAIN) settings allow the crew to increase or decrease the receiver gain to analyze radar returns. Normally, receiver gain is set to the 0 (NORM) position. Six other positions, are available for analyzing the details of the returns. The higher settings are useful in identifying the lightest levels of precipitation, while the lower settings are useful for more in-depth studies of the most intense weather targets.
Use the MENU ADV knob on the DCP to position the solid box around the GAIN function. Use the DATA knob to select the desired receiver gain setting (NORM, ± 1, ± 2, ± 3).

Ground Clutter Suppress.: Ground Clutter Suppression (GCS) reduces the intensity of ground returns in WX mode, which assists in the interpretation of rainfall rates. The GCS feature also removes very light rainfall, especially rainfall that is not associated with convective cells. The rain that is removed is unagitated (rain with no associated turbulence) and appears ground-like to the doppler processing. Push the GCS button on the DCP to select GCS. GCS automatically times out after 30 seconds.

Antenna Stabilization: The STAB (antenna stabilization) feature uses inputs from the Attitude Heading System (AHS) to eliminate the effects of aircraft pitch and roll in order to maintain a horizontal scan. Antenna stabilization is normally set to ON.

3. Displays

A. The Weather Radar display is shown on both PFDs and MFD (Ref. Fig. 5 and 6).

The Weather Radar System detects and locates precipitation for the purpose of navigating around weather hazards. The system depicts the bearing, range, and precipitation rate of all detectable precipitation within the scan area and display range.
A ground mapping mode is used to show ground mapping returns.
Each pilot’s display is controlled by the onside DCP/PFD and is updated on alternate sweeps of the antenna. A WXR overlay is available for display on either or both PFDs and MFD on the Arc and PPOS map formats.
The PFDs and MFD contain the RDR line at the second line select key on right, to select the WXR overlay.
A RADAR control menu shows on the PFD when selected by the pilot.

B. Detectable weather shows in four colors: green, yellow, red, and magenta. The lowest precipitation rates shows in green. The highest precipitation rates show in magenta.

Display Colors and Precipitation Rate

Display Color	Precipitation rate
No display	Less than 0.03 in/hr
Green	0.03 to 0.07 in/hr
Yellow	0.07 to 0.20 in/hr
Red	0.20 to 0.52 in/hr
Magenta	0.52 in/hr and greater

C. The Path Attenuation Compensation (PAC) Alert Arc feature compensates automatically for Radar beam absorption by heavier rainfall rates. The compensation provided by the PAC alert function can be exceeded. A yellow PAC Alert arc shows at the perimeter of the radar display to identify where the compensation has been exceeded.

D. The second line select key on right “RDR” is used to select the Radar overlay. A cyan caret shows, next to second line on right, when the Arc or PPOS map format is active to indicate the key is active. When the display is not in the Arc or PPOS map format, the caret does not show and the key is not active. The legend next to second line select key on right indicates which overlay is active. The legend for the active overlay shows in larger cyan characters.

E. The Weather Radar data field shows below second line select key on right on the PFD. The data field is two lines of text below the RDR legend. When radar reflectivity is active on the PFD/MFD, the data shows in cyan. When radar reflectivity data is not active the data shows in white.

- The first line shows the Radar mode and, when other than NORM, the receiver gain setting. The mode can be STBY, WX, MAP and TEST. The message GCS replaces the active Radar mode message when the GCS feature is active. Receiver gain shows the letter G with a plus/minus sign and 1, 2, or 3. When no Radar operating mode is being received by the PFD or MFD from the radar system, the message RDR OFF shows in white in place of the Radar mode message. RDR OFF flashes for 5 seconds, then remains steady.
- The second line shows the Tilt angle readout and USTB message. The Tilt angle readout consists of the letter T followed by a plus or minus sign and up to three digits for the readout, except when the tilt is 0.0. The message USTB (unstabilized) shows in yellow in place of the tilt angle readout when an AHS failure to the Radar occurs.

F. On the PFD and MFD are display also flag and message to inform the crew on radar system fault or operation condition

Radar Fault Flag	When displays select Weather Radar standby mode. This message shows when the radar reports itself as failed. The RDR FAULT message replaces the GAIN and RADAR MODE messages. It flashes for five seconds when it first shows, then becomes steady.
USTB Message:	When displays select the antenna stabilization to off. The USTB message shows in yellow when attitude data to the radar fails while Radar is showing. The USTB message flashes for 5 seconds, then remains steady.
T+/- Message:	Monitor the antenna tilt angle. When Autotilt is not active and the commanded tilt value and the reported tilt value (from the Radar) disagree, the tilt value changes to yellow.
RDR RANGE XXX	The radar range message shows in white in the overlay fault field when range data received from the radar does not match the range currently set on the PFD/MFD. The XXX portion of the message represents the range selected with the DCP RANGE knob.
RADAR ON:	Select Standby mode on the Weather Radar. RADAR ON shows in white in the overlay fault field when the Weather Radar is transmitting with weight on wheels. When any Radar mode other than STBY or TEST is selected and it is more than 65 seconds after an air-to-ground transition, the message RADAR ON shows. The message also shows when any Weather Radar mode other than STBY or TEST is selected, it is more than 3 seconds after power-up, and there is weight on wheels. The message flashes for 5 seconds, then remains steady.

WEATHER RADAR SYSTEM - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00

A. This topic provides the following Weather Radar Maintenance Practices:

– Weather Radar Receiver/Transmitter - Removal /Installation
– Weather Radar Receiver/Transmitter - Inspection
– Weather Radar Receiver/Transmitter - Operational Test
– Weather Radar Receiver/Transmitter - Cleaning and Lubrication

For the Control Display Unit (CDU), PFD and MFD Maintenance Practices refer to 31-10-00.

2. Weather Radar Receiver/Transmitter - Removal (Ref. to Fig. 201)

A. Fixtures, Test and Support Equipment

Blanking Caps	Not specified

B. Referenced Information

Maintenance Manual Chapter 53-10-00

C. Procedure

(1) Open, tag and safety this circuit breaker:
Copilot CB Panel:
WEATHER RDR

(2) Remove the radome/nosecone (Refer to 53-10-00).

(3) Get access to the Weather Radar Receiver/Transmitter and disconnect the mating electrical connector.

(4) Cap the electrical connector.

(5) Remove the four socket head screws (1) which secure the Weather Radar Receiver/Transmitter in position.

(6) Remove the Weather Radar Receiver/Transmitter from the airplane.

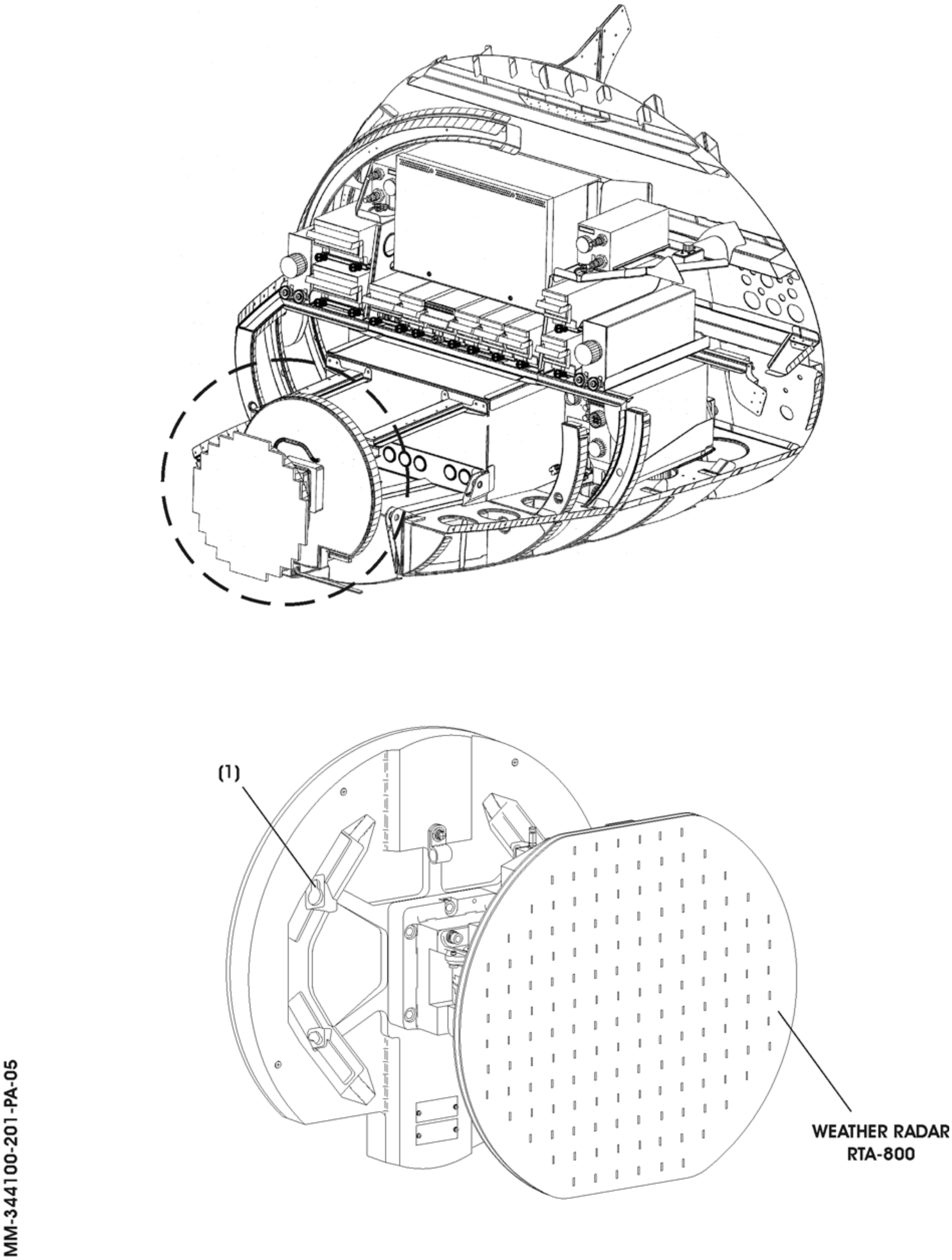


Fig. 201 - Weather Radar Receiver/Transmitter - Removal/Installation

3. Weather Radar Receiver/Transmitter - Installation (Ref. to Fig. 201)

A. Referenced Information

Maintenance Manual Chapter 53-10-00

B. Procedure

(1) Make sure that circuit breaker WEATHER RDR is open, safetied and tagged.
(2) Install the Weather Radar Receiver/Transmitter in the correct position in the airplane.
(3) Install and tighten the four socket head screws (1).
(4) Remove the caps from the electrical connector
(5) Connect the mating electrical connector.
(6) (Remove tools, materials and equipment from the area.
(7) Install the radome/nosecone (Refer to 53-10-00).
(8) Do an Operational Test of the Weather Radar System.

4. Weather Radar Receiver/Transmitter - Inspection

A. Referenced Information

Maintenance Manual Chapter 53-10-00

B. Procedure

(1) At any service operation in which the radome is removed.
(2) Get access to the avionics compartment.
(3) Inspect the receiver/transmitter for general condition and security of installation.
(4) Ensure that the radar is in good physical condition before the radome is reinstalled; that is, that no damage has been inflicted to the radar while the radome was off.
(5) Inspect the wiring for correct routing, chafing and evidence of damage.
(6) Install the radome/nosecone (Refer to 53-10-00).

5. Weather Radar Receiver/Transmitter - Operational Test

WARNING: THE AREA WITHIN THE SCAN ARC AND WITHIN 0.65 METER (2 FEET) OF AN OPERATING WXR-800 WEATHER RADAR SYSTEM CAN BE A HAZARDOUS AREA. DO NOT OPERATE THE SYSTEM IN ANY MODE OTHER THAN STANDBY (STBY) OR TEST (TEST) WHEN THE ANTENNA MIGHT SCAN OVER PERSONNEL WITHIN THAT RANGE.
OPERATORS SHOULD TAKE NECESSARY AND REASONABLE PRECAUTIONS TO ENSURE THAT PERSONNEL AND EQUIPMENT SENSITIVE TO MICROWAVE RADIATION ARE NOT EXPOSED.

A. Procedure

(1) Make sure electrical power is available (Refer to 24-00-00).

(2) Make sure the circuit breaker: WEATHER RDR is closed.

(3) Turn the BATTERY switch to BAT position and Avionics Master Switch to AVIONICS position.

(4) On DCP push the RADAR button.

(5) On PFD/MFD will be select the Radar menu.

(6) When Radar menu is in view, select the solid box with MENU ADV knob on DCP (or adiacent line select key on the display) to select STBY mode and set the range to 5 NM.

(7) In approximately 20 seconds, one range arc with (2.5) at right end of range arc, airplane symbol at bottom center, compass sector and STBY annunciator appear.

(8) On DCP, turn the RANGE knob and check the range variation. Set the range to 25 NM.

(9) On DCP, turn theMENU ADV knob (or adiacentline select key on the display) to select TEST mode.

(10) The display on PFD should be of six colored arcs (Ref. Fig. 202).

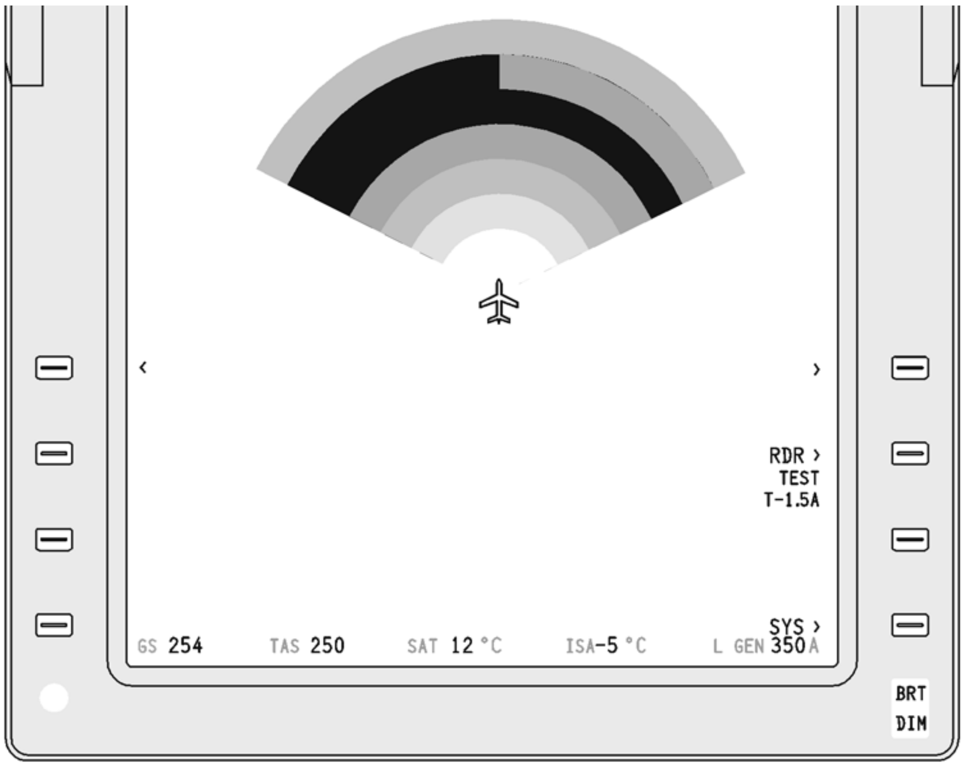
(11) Check functionality of TILT command on DCP.

(12) Select WX Mode.

(13) Check the antenna sweep and the PFD/MFD display targets, range mark and WX annunciator.

(14) Select MAP Mode.

(15) Check the PFD/MFD display ground targets, range mark and MAP annunciator.



MM-344100-202-PA-05

Fig. 202 - Weather Radar Test Display

6. Weather Radar Receiver/Transmitter - Cleaning and lubrication

There are no regular, or periodic maintenance requirements for the Weather Radar System.

However, the mechanically moving parts typically require cleaning and lubrication. Therefore, it is suggested that whenever the system is inspected, tested, or repaired for any other reason, the mechanical drive mechanism should be inspected to determine whether cleaning and lubrication may be required.

Furthermore, while the radar was exposed (nosecone/radome removed), users are to be alert to the possibility of inadvertent damage during procedures and ensure that the radar is in good working condition when the radome is reinstalled and secured.

Inspect the mechanical portion of the RTA-800, primarily the scan and the tilt gears and sectors, for contaminants such as dirt and/or grease buildup. Unless the mechanism has been severely contaminated by dirt and dried/baked lubricant, it should not be necessary to remove the unit for disassembly. In most cases, if a small amount of contamination is present, adequate cleaning is possible using a small soft-bristled brush and a lubricant based cleaning solution such as Genesolv 2004 or equivalent

After cleaning, apply a small amount of grease, such as Aeroshell 7 or equivalent, to the gear and sector teeth. Wipe any excess grease from the surrounding areas using a lint free cloth. Pay particular attention to the scan and tilt mechanism and note that all mechanically mating parts are adequately lubricated.

The scan and tilt motor bearings are lifetime lubricated and therefore should not require re-lubrication.

RADIO ALTIMETER SYSTEM - DESCRIPTION AND OPERATION

1. Description

A. The ALT-4000 Radio Altimeter System consists on a Transmitter/Receiver (Transceiver); and two Receiver/Transmitter Antennas.

The Radio Altimeter provides a above ground level height measurement to touchdown used by the Flight Guidance System (FGS) and displayed on the Primary Flight Displays (PFDs).

The digital radio altitude data are provided to the FGS, TCAS and PFDs via the IAPS through the digital bus (ref. Fig. 1).

The controls for Radio Altimeter are located on the Display Control Panel (DCP) and line select keys on the PFDs and MFD.

The ALT-4000 Radio Altimeter System is powered by the Right Avionics Dual Feed Bus through the RADIO ALTM circuit breaker, located on the copilot c/b panel.

B. The Radio Altimeter Receiver/Transmitter measures height above ground level (AGL) from 0 to 2500 feet. The altitude data is supplied to the pilot for the approach phase of the flight and to other aircraft subsystems via the IAPS and system bus structure.

The system can be checked by means of the SYS TEST rotary switch part of the Central Control Panel located on the Cockpit Instruments Panel.

Radio Altimeter Receiver/Transmitter is installed on the left side of the avionics bay, (ref Fig. 2).

The Radio Altimeter System can be tested by means of the SYS TEST rotary switch when is turn to RAD ALT position and operated pushing down.

The SYS TEST switch, located on the Cockpit Instruments Panel (ref. Fig. 2), allows the Radio Altimeter system to be completely checked.

When the Radio Altimeter system is in test condition, a yellow haloed RA TEST is displayed on Primary Flight Display (PFD) adjacent to the digital Radio Altimeter readout.

If ALT-4000 system is functioning properly, 50 feet is displayed as altitude value on Primary Flight Displays (PFD)

C. The two antennas, are located on the lower fuselage skin: the forward (transmitting) between Fus. Sta.2703 and Fus. Sta.2908, and the rear (receiving) between Fus. Sta.3526 and Fus. Sta. 3731. (see Fig. 2).

Their installation takes into consideration the aircraft distance above the terrain and aircraft pitch attitude during landing and, moreover, provide a clearance cone for both the antennas of over 120°.

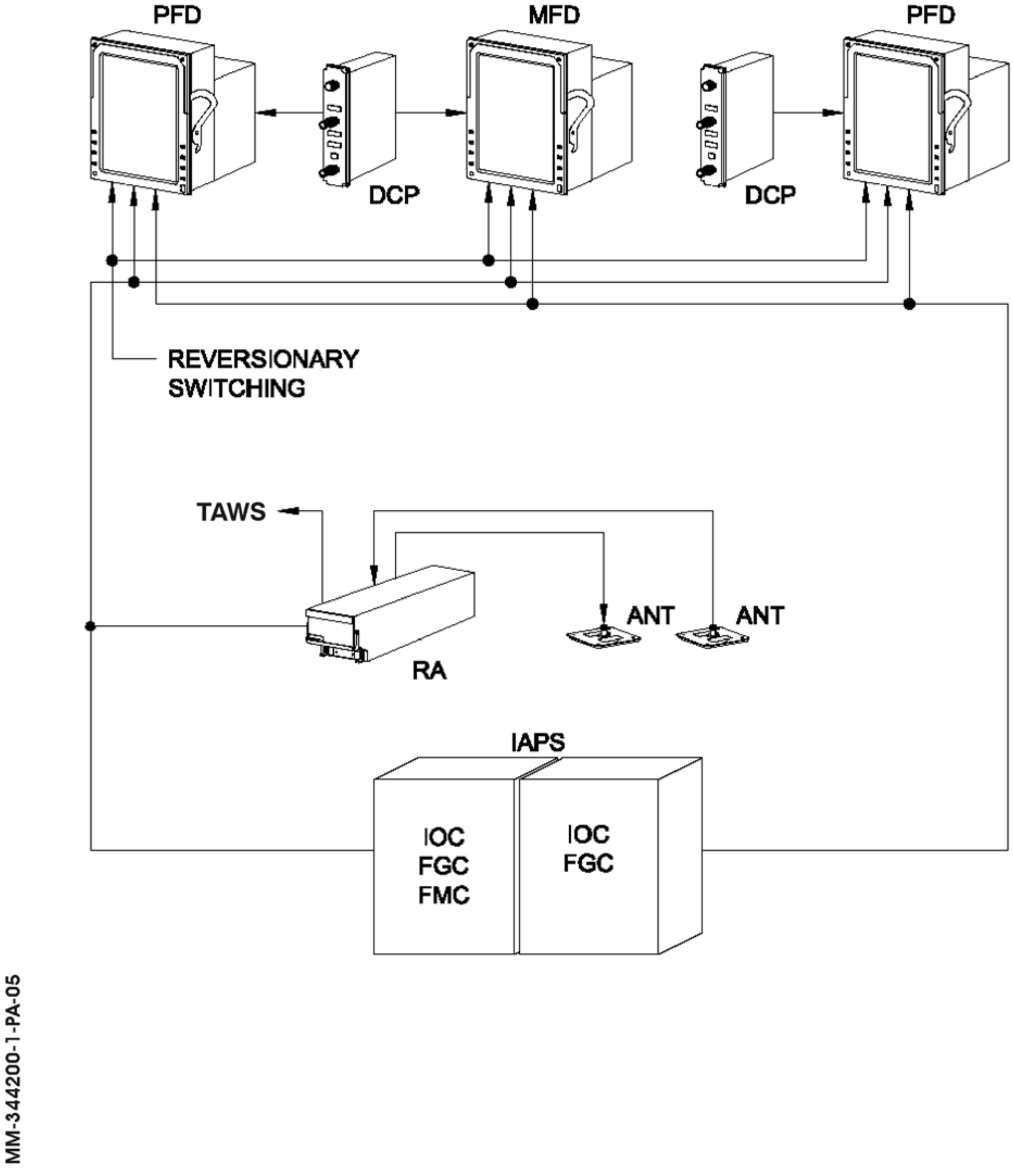
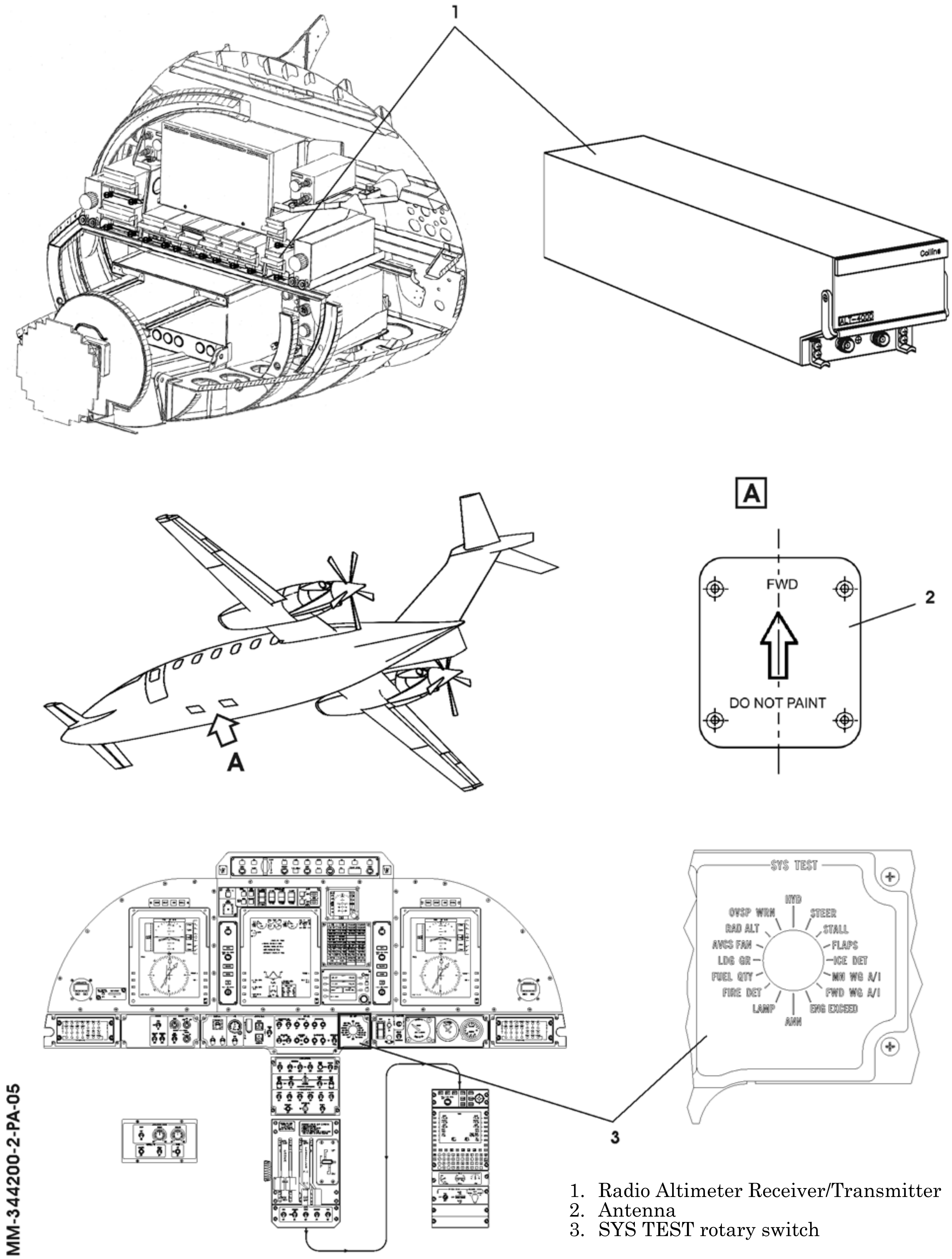


Fig. 1 - Radio Altimeter system Block Diagram



1. Radio Altimeter Receiver/Transmitter
2. Antenna
3. SYS TEST rotary switch

Fig. 2 - Radio Altimeter system component location

2. Operations

A. The Radio Altimeter operation is controlled through the DCP in conjunction with the line select keys on the PFD using a Menu selection process.

The two Display Control Panels (DCP), installed on the side of pilot and copilot PFDs, allow the control of the displays. (Ref. Fig. 2)

When a DCP function switch is pushed, the PFD shows the appropriate menu. While the menu is in view, the PFD line select keys are active.

The function controls on DCP (ref. Fig. 3) related to Radio Altimeter System are :

REFS (references):	The REFS button is used to select and deselect the REFS menu on the PFD. The REFS menu provides access to Vspeeds, RA MIN and BARO MIN values.
MENU ADV (advance):	The MENU ADV knob is used to move the cyan selection box on the PFD menus such as the REFS menu
DATA:	The DATA knob is used to select the active state (on, off, stby, etc.) or adjust the settable value highlighted by the cyan selection box.
PUSH SELECT:	The PUSH SELECT button is used to select a reference for display or select the active state (on, off, stby, etc.).

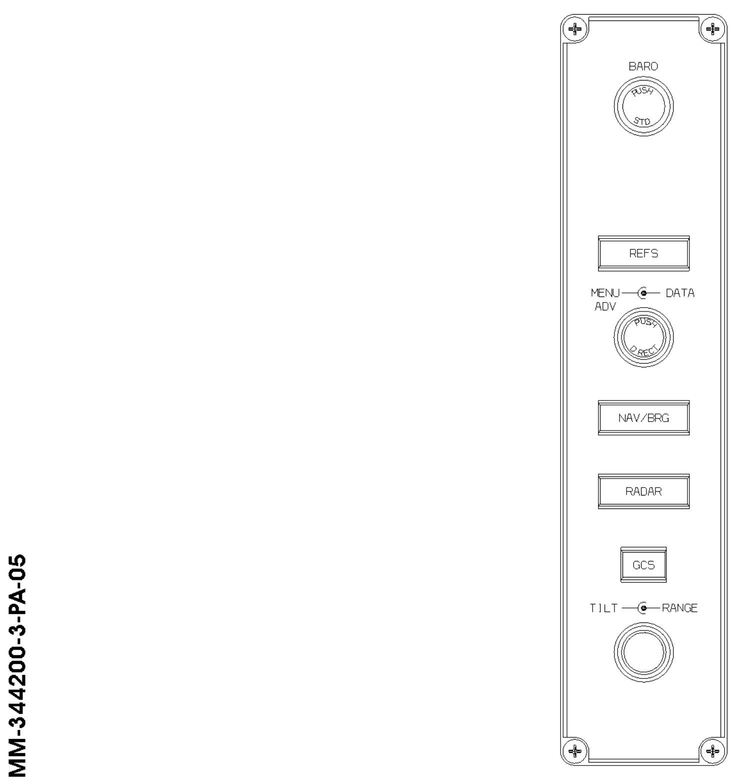


Fig. 3 - Display Control Panel (DCP)

B. Radio altitude is shown on the PFD (ref Fig. 4). A radio altitude digital readout, analog reference and the RA BARO MIN alert are functions of radio altitude.

Radio Altitude: Analog radio altitude shows in the altitude tape area to improve ground awareness. A digital readout of radio altitude is located in the lower part of the attitude display.

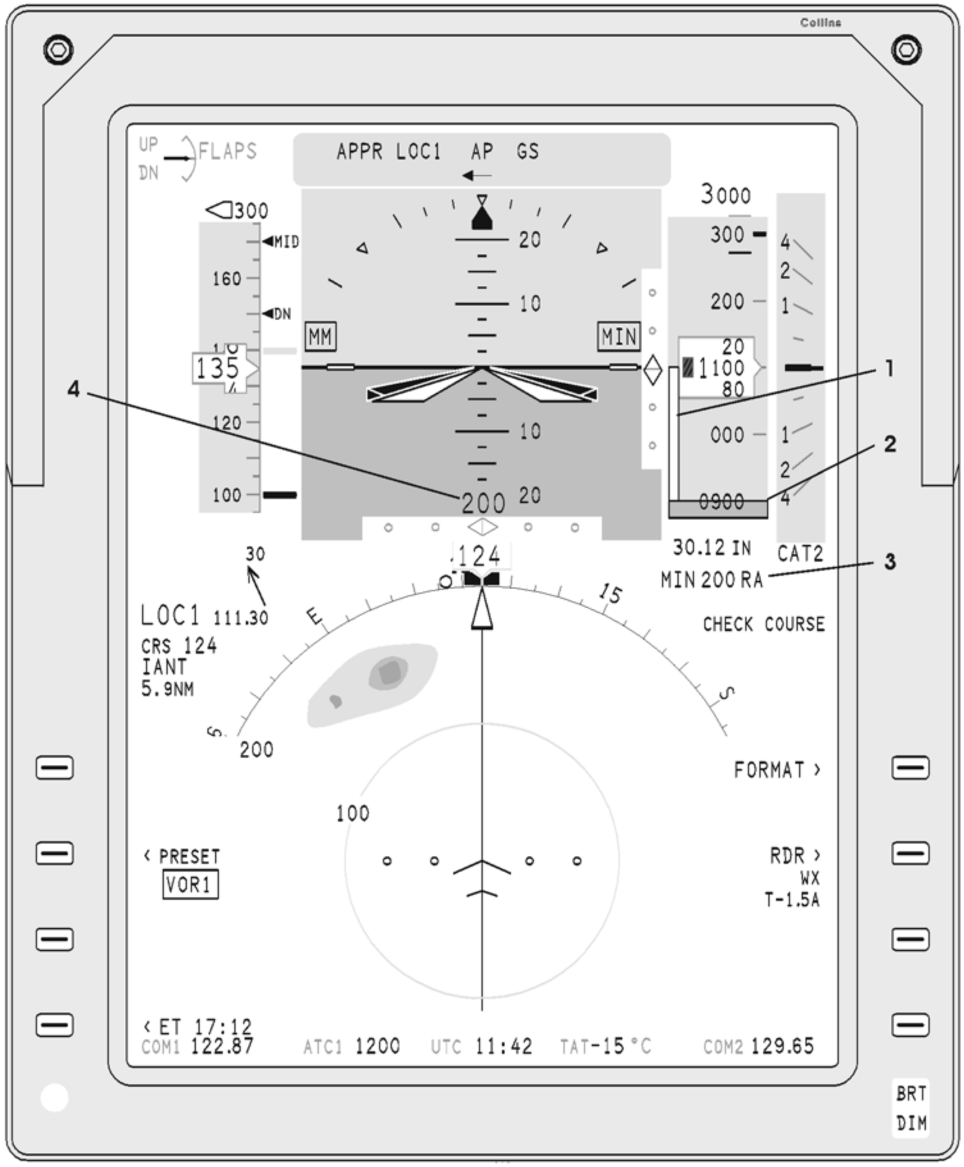
– The digital readout of radio altitude shows when the aircraft is within 2500 feet of the ground. The 4-digit radio altitude readout normally shows in green. When the RA MIN alert is in view, the readout changes to yellow.

RA MIN Alert: The MIN alert shows to alert the pilots that the aircraft has reached the selected RA.

RA MIN: RA MIN shows as a digital readout and analog reference on the altitude display. The MIN alert shows on the PFD to alert the pilots that the aircraft has reached the selected RA MIN altitude.
Once the DH or MDA value has been set, the system shows the RA MIN on the PFD below the altitude display for reference. The RA MIN readout is the current active Decision Height (DH)
Radio altitude (RA) MIN is Above Ground Level and is used for DH. The RA MIN is set on the REFS menu.

– RA MIN and BARO MIN are mutually exclusive. Selecting RA turns off BARO, selecting BARO turns off RA.
– RA “NNN” MIN shows when RA is selected on the REFS menu and the aircraft radio altitude is at or below 2500 feet AGL. “NNN” is the selected DH. Range for the RA MIN readout is 5 to 999 feet in increments of 1 foot.
– The MIN alert occurs when the aircraft radio altitude is equal to or below the RA MIN readout.
– At RA MIN alert, “MIN” shows boxed and in yellow to the right of the pitch scale on the attitude ball. In addition, the MIN readout and MIN bug change from cyan to yellow. All three references flash for 5 seconds, then remain steady.
– The MIN alert function is inhibited on the ground and disabled until the aircraft climbs higher than 50 feet above the RA MIN readout.

C. On PFD a red, boxed, RA flag comes into view when the system loses power, when the altitude readout does not track the altitude signal from the radio altimeter, or during self-test of the system.
The radio altitude readout and ground elevation field are removed when the radio altitude flag is in view on the PFD.
When the aircraft is above 2500 feet the flag remains out of view unless a malfunction occurs.



1. RA MIN Analog Reference
2. RA Ground Reference
3. RA MIN Ref Value
4. Current Radio Altitude

MM-344200-4-PA-05

Fig. 4 - Radio Altitude and Altitude related data display on PFD

RADIO ALTIMETER SYSTEM - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00

A. This topic provides the following Radio/Altimeter Maintenance Practices:
- Radio Altimeter Transceiver - Removal/Installation
- Radio Altimeter Antennas - Removal/Installation
- Radio Altimeter Transceiver - Operational Test

2. Radio Altimeter Transceiver - Removal (Ref. to Fig. 201)

A. Fixtures, Test and Support Equipment

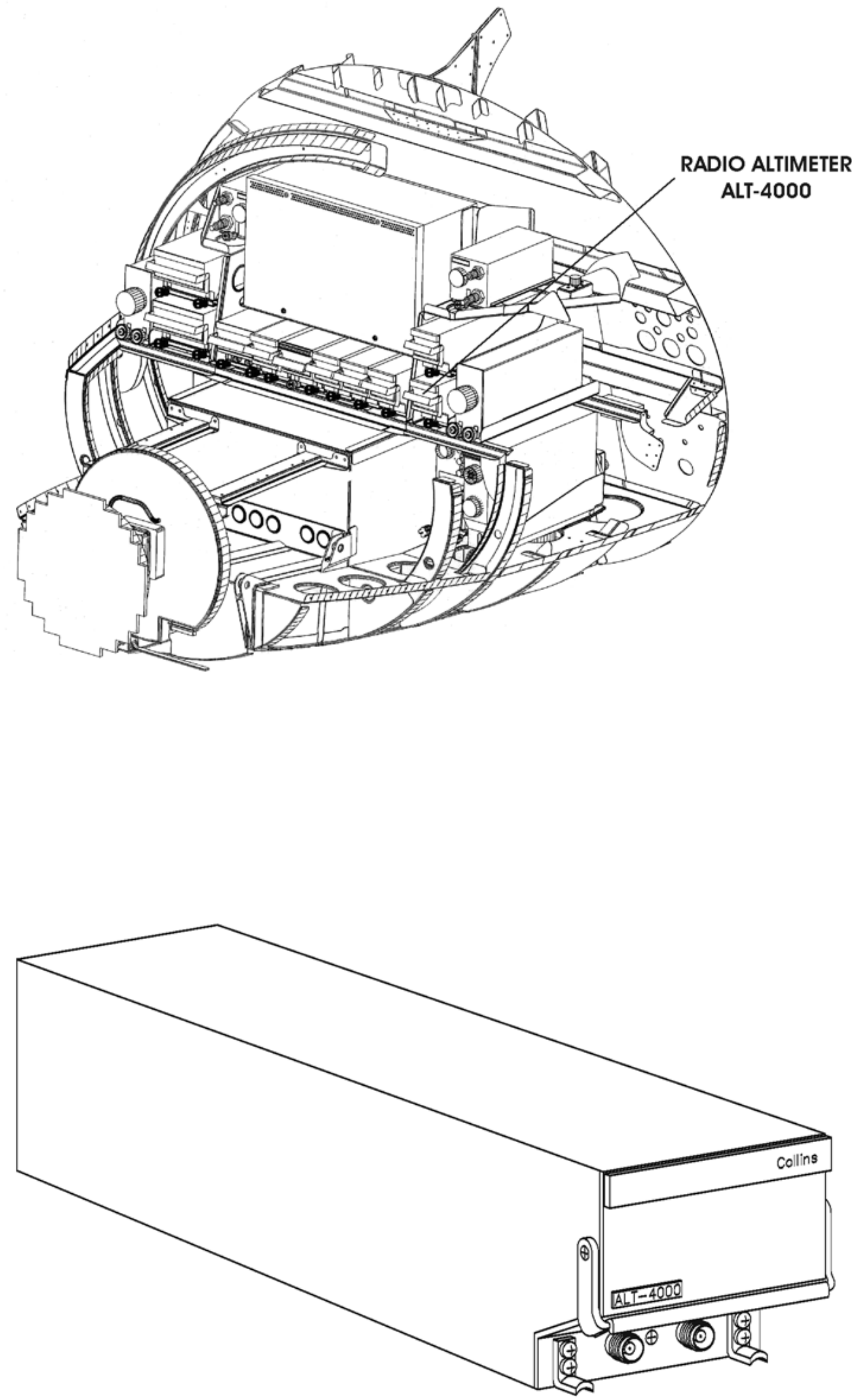
Blanking Caps	Not specified

B. Referenced Information

Maintenance Manual Chapter 53-10-00

C. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(2) Open, tag and safety the circuit breakers:
Copilot CB panel:
RADIO-ALTM
(3) Remove the radome/nosecone (Refer to 53-10-00).
(4) Get access to the avionics compartment.
(5) Disconnect TNC connectors on receive and transmit antenna cables at front of unit. Tag cables to ensure correct reinstallation.
(6) Loosen two knurled knobs and disengage from retainer brackets on unit.
(7) Raise handle and slide forward until rear connector is disengaged and clear of mounting tray connector.
(8) Remove radio altimeter Transceiver from mounting tray.
(9) Put caps on the electrical connectors.



MM-344200-201-PA-05

Fig. 201 - Radio Altimeter Transceiver - Removal/Installation

3. Radio Altimeter Transceiver - Installation (Ref. to Fig. 202)

A. Referenced Information

Maintenance Manual Chapter 53-10-00

B. Procedure

(1) Make sure the circuit breakers are safetied and tagged:
Copilot CB panel:
RADIO-ALTM

(2) Slide the Transceiver into mount until mating connectors are fully engaged.

(3) Position knurled knobs on front of mount to engage unit mounting projections and tighten knurled knobs.

(4) Press on front panel to ensure that the unit is fully seated in the mount. Retighten knurled knobs until unit is secure in mount.

(5) Connect receive and transmit antenna cables to two TNC connectors on front of radio altimeter.

(6) Remove the safety tag and close circuit breaker: RADIO-ALTM on Copilot CB panel

(7) Remove tools, materials and equipment from area.

(8) Install the radome/nosecone (Refer to 53-10-00).

(9) Do an operational test of Radio Altimeter Transceiver (Refer to Para. 4).

(10) Remove the Warning Notice in the flight compartment.

4. Radio Altimeter Transceiver - Operational Test

(1) Apply electrical power to the Radio Altimeter system by turning the BATTERY Switch to BAT position and Avionics Master switch to AVIONICS position.

(2) Check the circuit breaker RADIO ALT on co-pilot c/b panel is closed.

(3) On the PFDs the red boxed flag “RA” shall be out of view and the Radio altitude and analogue indication shall show the expected on-ground altitude for the aircraft .

(4) Activate the ALT-4000 self test function by turning the SYS TEST selector on Central panel to RAD ALT position and pushdown the knob.

(5) If no fault is detected the Altitude output indicates 50 feet and the RA red boxed flag shall be in view.

(6) If a fault is detected after self test is activated Altitude readout indicates 2600 feet and the RA red boxed flag shall be in view. After 10 seconds, the altitude output will change to the sum of value assigned to each of the failure conditions listed below:

100 feet = Input power failure

200 feet = Strap failure

400 feet = Other fault

800 feet = Antenna fault

The altitude reported is the sum of the failure conditions detected. For example, if a strap failure and antenna failure conditions are detected the display altitude will be 1000 feet (200+800).

(7) Release ALT-4000 self test. Displayed altitude returns to the expected on ground altitude on the PFDs.

5. Radio Altimeter Antenna - Removal (Ref. to Fig. 202)

A. Fixtures, Test and Support Equipment

Lint-free cloth	
Non-metallic scraper	Not specified

B. Materials

02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 20-00-00

D. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.

(2) Open, tag and safety this circuit breaker:
Copilot CB panel:
RADIO-ALTM

(3) Remove the four attaching screws from the antenna base.

(4) Cut sealant around base of antenna and remove antenna to get access to antenna cable connector.

(5) Disconnect antenna cable from antenna and remove the antenna, make sure connector does not withdraw into airframe.

(6) Scrape sealant from the antenna area on fuselage using non-metallic scraper.

WARNING: BE CAREFUL WHEN YOU USE MEK. OBEY THE HEALTH AND SAFETY INSTRUCTIONS IN 20-00-00.

(7) Clean the antenna fuselage using MEK.

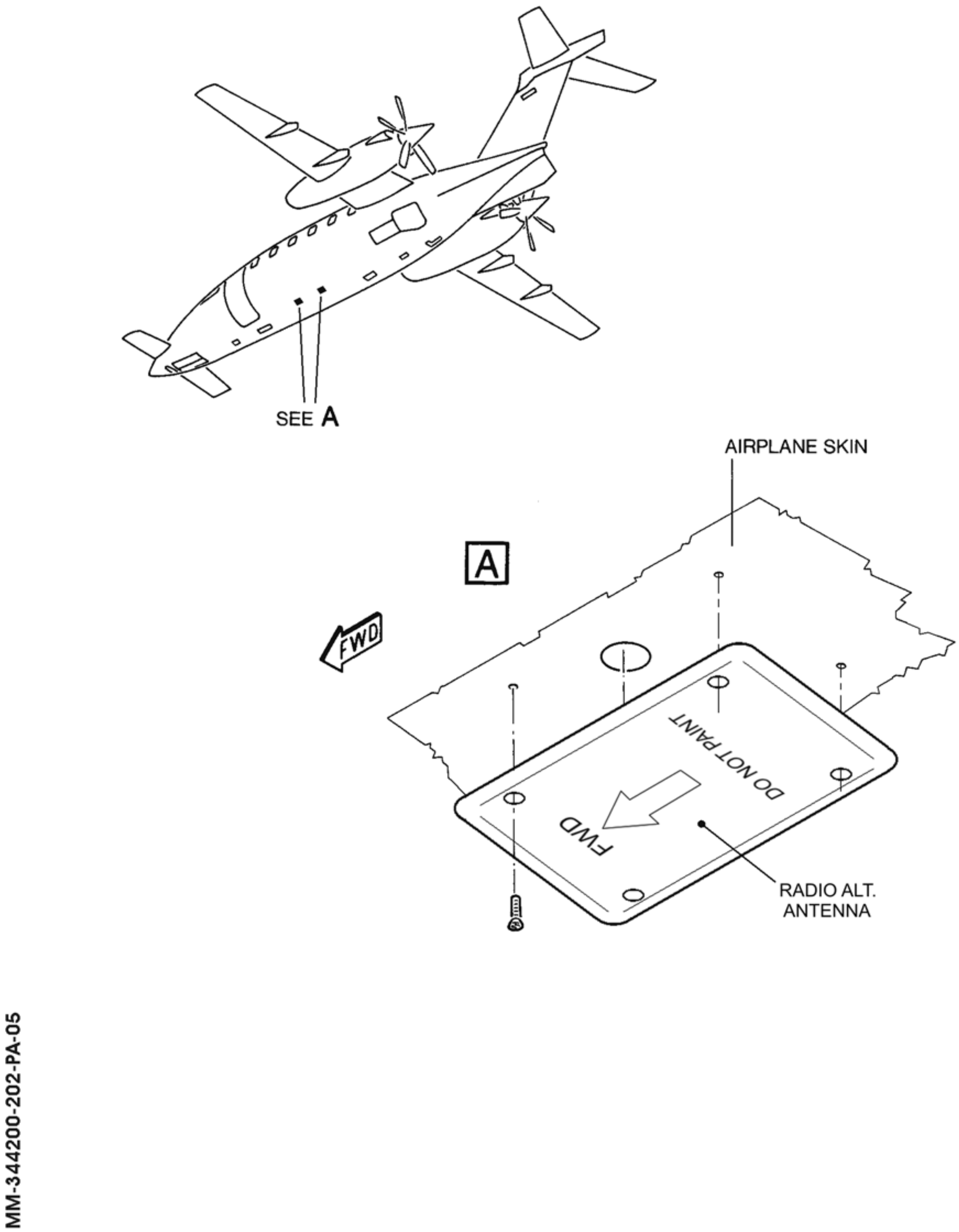


Fig. 202 - Radio Altimeter Antenna - Removal/Installation

6. Radio Altimeter Antenna - Installation (Ref. to Fig. 202)

A. Fixtures, Test and Support Equipment

Lint-free cloth	Not specified
Non Metallic Scraper	Not specified

B. Material

06-005, Sealant	As required
02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 91-00-00

D. Procedure

(1) Make sure that the circuit breaker RADIO ALTM is open, safetied and tagged.

WARNING: BE CAREFUL WHEN YOU USE MEK. OBEY THE HEALTH AND SAFETY INSTRUCTIONS IN 20-00-00.

(2) Clean the replacement parts using MEK and dry with lint-free cloth.
(3) Connect antenna cable to antenna connector.
(4) Align Antenna with securing screw holes and install and tighten the securing screws.
(5) Apply the sealant around antenna to prevent ingress of water between airframe and attached part (Refer to 20-00-00).
(6) Remove safety clips and tags and close circuit breaker RADIO ALTM.
(7) Connect the electrical power (Refer to 24-00-00).
(8) Restore the surface finish (Refer to 20-00-00).
(9) Do an Operational Test of the Radio Altimeter system (Refer to Para. 4)
(10) Remove the Warning Notice in the flight compartment.

TCAS I - DESCRIPTION AND OPERATION

1. Description

A. The Traffic Alert and Collision Avoidance System I (TCAS I) type SKY899 is an active system that operate as an aircraft-to-air aircraft interrogation device. The System is designed to protect a volume of airspace around the TCAS-equipped airplane by warning the pilots of the threat of other transponder-equipped aircraft penetrating that airspace.

The system interrogates ATC transponders in nearby airplanes and analyzes their replies to identify potential and predicted collision threats. The effective range is approximately 35 Nm.

The TCAS I system consists of one Transmitter Receiver Computer (TRC899), one System Configuration Module, one directional antenna and two control switches (Ref. Fig. 1).

The TCAS I system receives data from Air Data Computers, Attitude and Heading Computers, Radio Altimeter, ATC transponders and from the directional antenna.

The TCAS system processes data inputs and generates traffic symbology that can show on the PFDs and MFD.

The TCAS Traffic Display (TD) shows on the PFDs and MFD HSI Rose, HSI Arc, and FMS PPOS Map.

The controls for operating the TCAS are installed on Reversionary Panel.

The TCAS I system is supplied by the Right Avionics Dual Feed Bus through the TCAS I circuit breaker located on the Copilot CB Panel.

B. The Transmitter Receiver Computer model TRC 899 contains the circuitry necessary to process inputs from directional antenna and from other aircraft system via data bus, in order to provide output data representation of intruding aircraft and, if necessary, aural and visual traffic advisories.

The TRC can track up to 30 aircrafts simultaneously but, to reduce clutter, only the most imminent intruders are tracked.

Output data generated by the TRC processor are sent to processor Primary and Secondary PFD and MFD to be displayed and integrated with other aircraft Navigation data.

An Audio signal is also generated and sent to audio system.

The TRC is installed on the left side of nose avionics bay (Ref. Fig. 2).

C. The System Configuration Module is located inside the backshell of P1 connector of TRC. The Module is used to store aircraft installation parameter e.g. aircraft type, discrete inputs, speed of data bus, etc). Aircraft specific information is selected via service menu, typically during the system setup. Once the setup setting have been saved the system configuration will stay with the aircraft wiring allowing the TRC to be replaced without having to re-configure the system. When powered up, the configuration information is sent to the TRC via a bi-directional data bus.

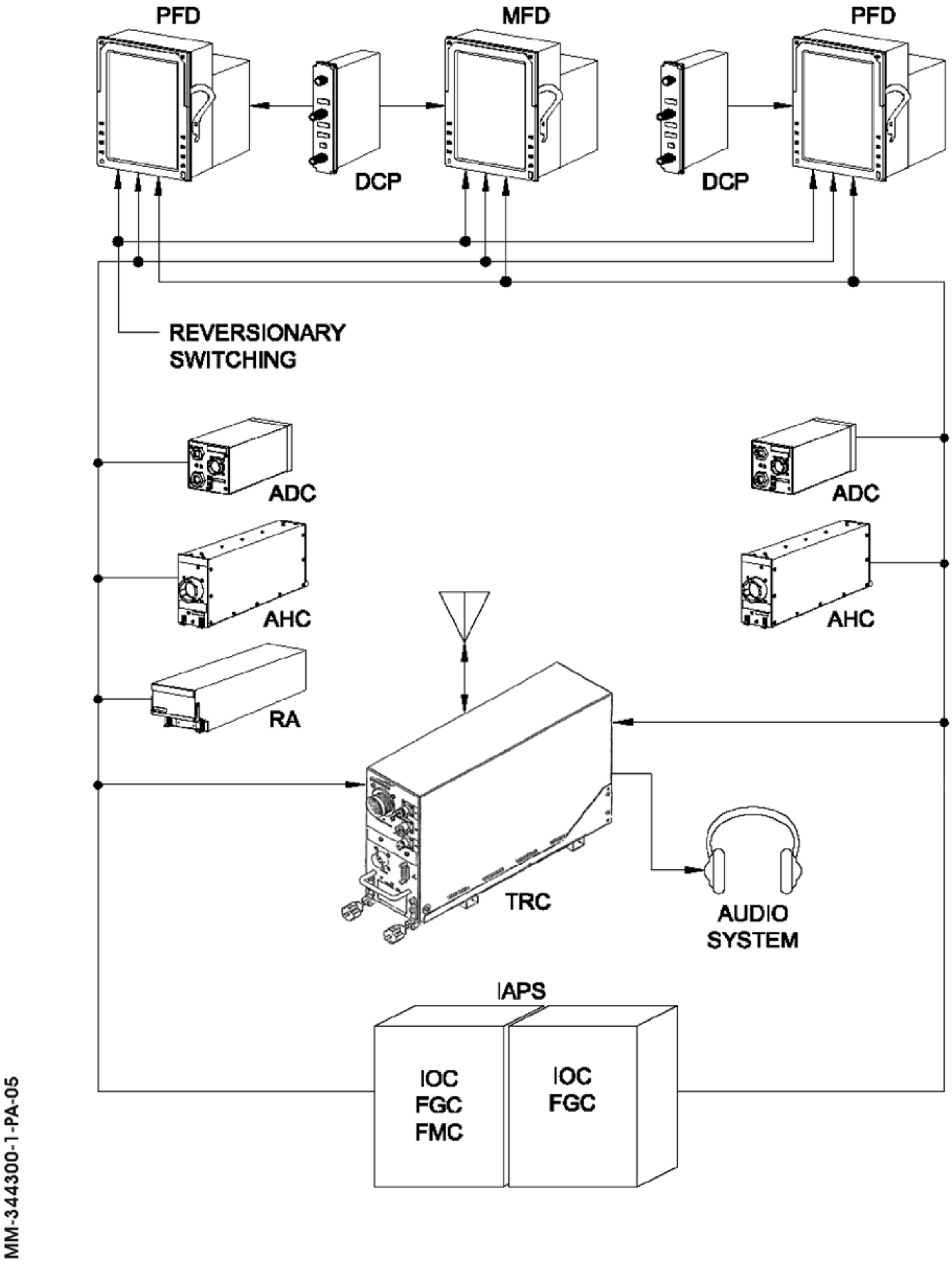


Fig. 1 - TCAS I Block Diagram

D. The directional antenna, model NY 156, transmits omni-directional interrogations and receives directional replies from other transponder equipped nearby aircrafts.

Connections are made througt one BNC and two TNC connectors.

The TCAS directional antenna is installed on the top forward fuselage, between frame 22 (Fus. Stat 2908) and frame 23 (Fus. Stat 3114) slightly shifted to the right from the centerline (Ref. Fig. 2).

E. The control operations of TCAS I are carried out by the two pushbuttons switches (ALT / TEST and OPR / STBY) located on the section TCAS of reversionary Panel in instrument panel (Ref. Fig. 2).

2. Operation

A. On Reversionary panel located on instrument panel there is a section named TCAS that includes two pushbutton switches ALT / TEST and OPR / STBY).

The ALT / TEST pushbutton can select the ALTITUDE Mode, or activate the Self Test.

The OPR / STBY pushbutton can select the Standby or Operation Mode.

3. Display

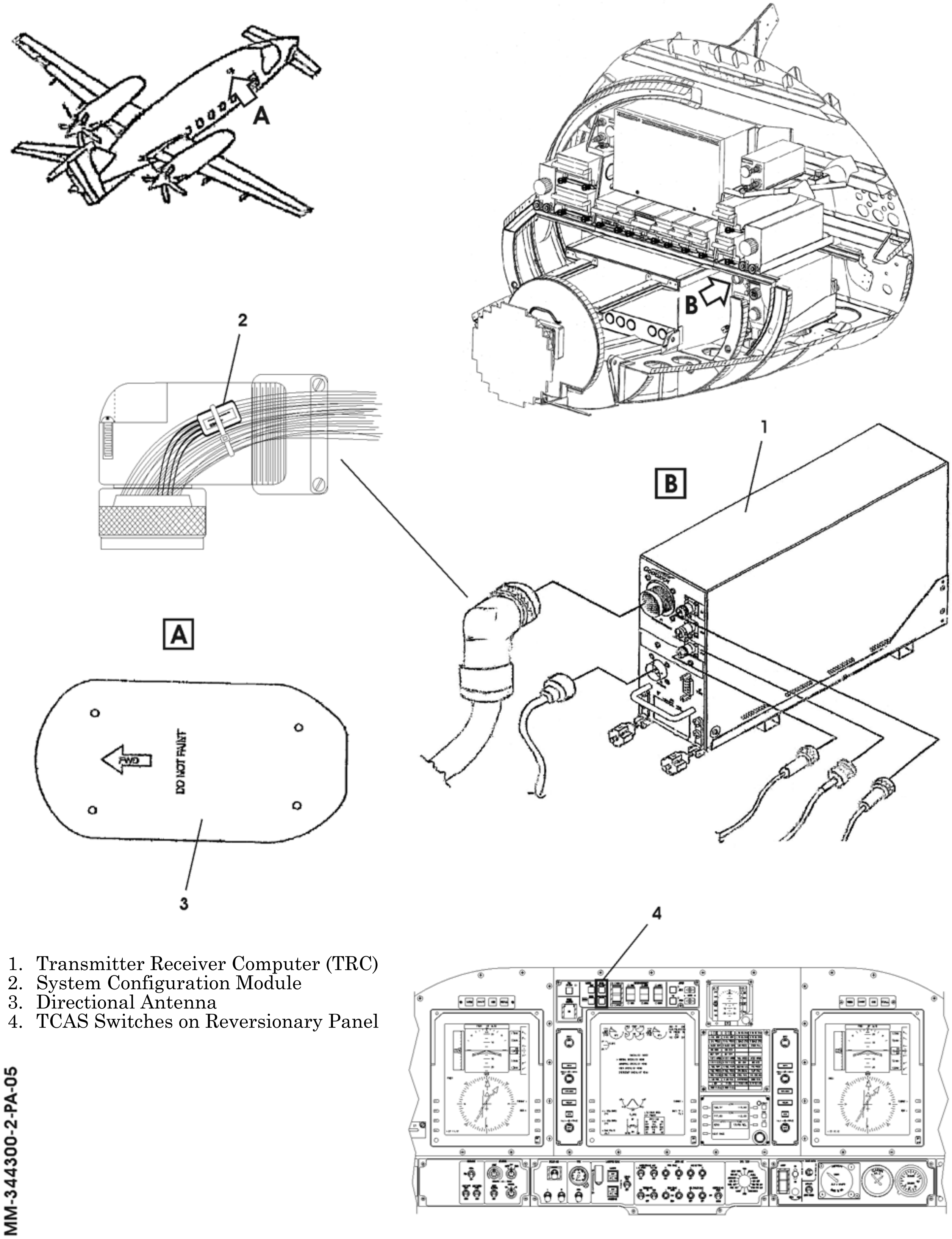
The current TCAS mode selected from either the OPR/STB or ALT / TEST pushbutton switches located in the Reversionary panel can be displayed on the PFD and MFD.

The TCAS mode shall be shown below the TFC Line Select Key on the right side of the PFD. See Figure 3

The PFD can also present TCAS Traffic in a pictorial format. TCAS traffic displays can be overlayed on the PFD ROSE, ARC and MAP formats.

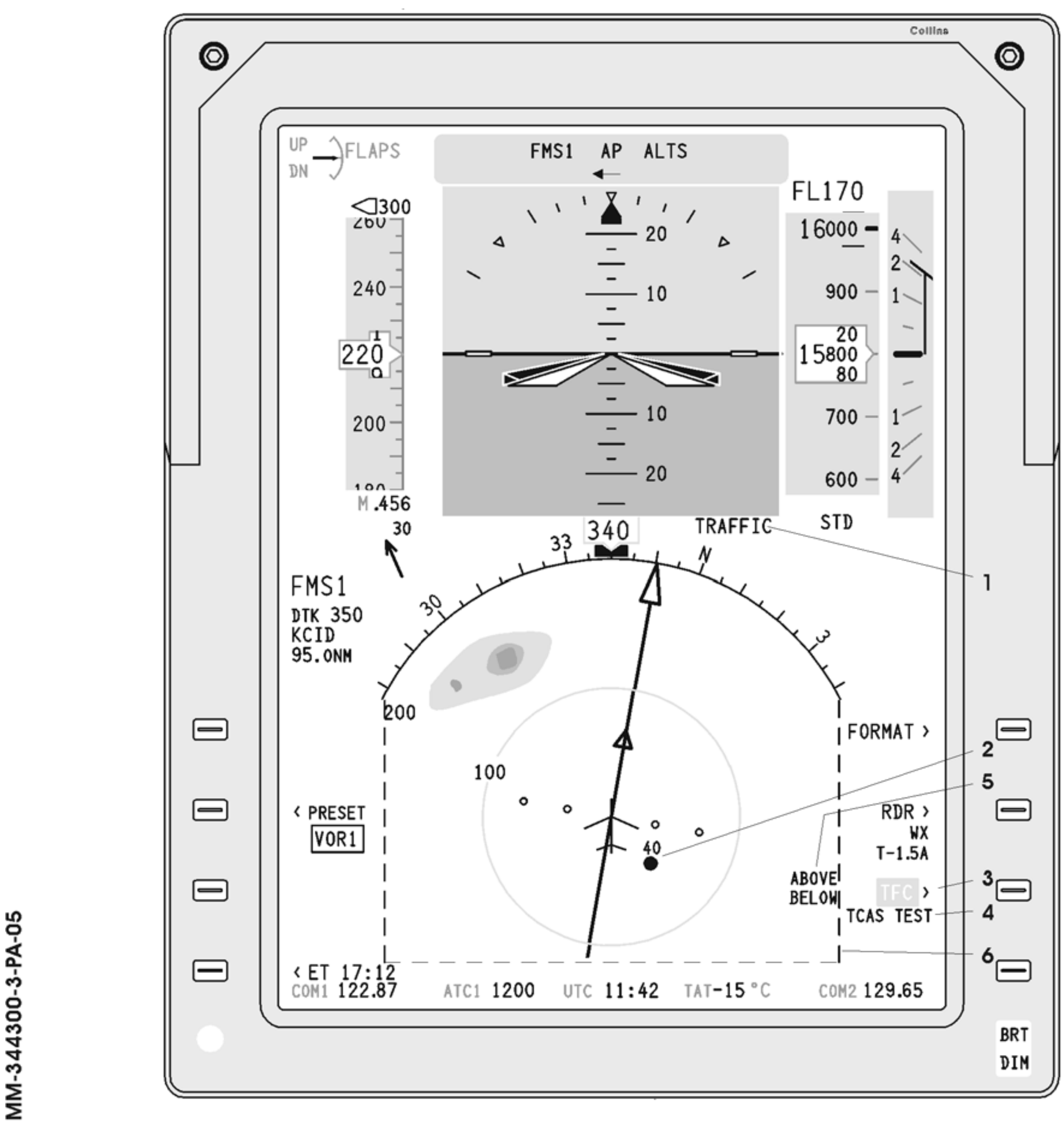
The MFD displays TCAS Traffic in a manner similar to the PFD.

TCAS traffic displays are overlayed on some of the MFD displays. The MFD TFC Line Select Key (third on right side) is used to select the overlay display (See Figure 4).



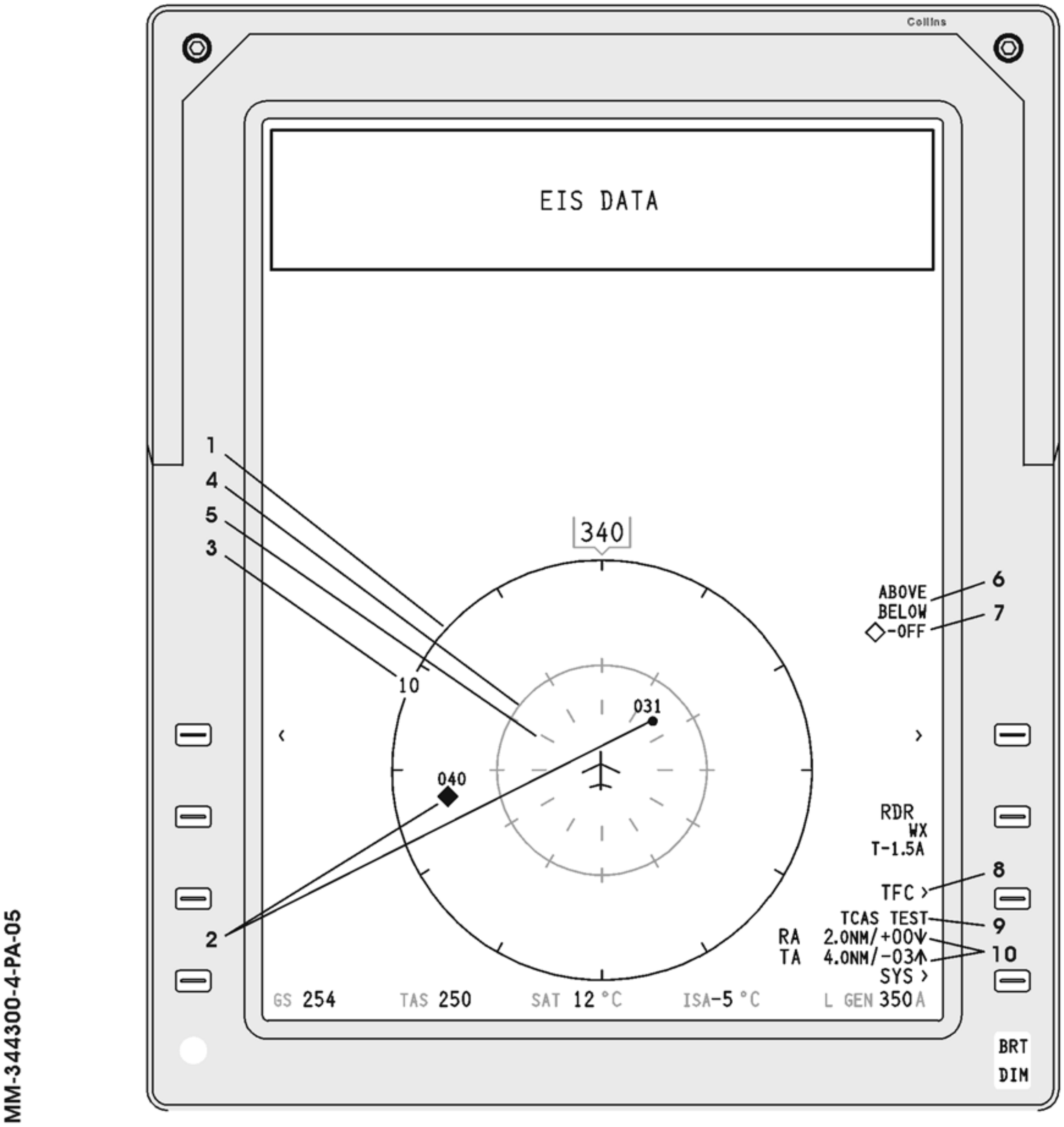
1. Transmitter Receiver Computer (TRC)
2. System Configuration Module
3. Directional Antenna
4. TCAS Switches on Reversionary Panel

Fig. 2 - TCAS I system component location



1. TA/TCAS FAIL Annunciation
2. TCAS Traffic Symbol
3. Traffic Line Select Key (LSK) (Inverse Video Box shown)
4. TCAS Mode Annunciation
5. Above/Below enabled
6. TCAS Display Boundaries (dashed lines for info only, not actually shown)

Fig. 3 - TCAS Mode and Annunciation on PFD display Typical view



1. TCAS Only Format
2. TCAS Traffic Symbols
3. TCAS Range Ring, 10 NM Range shown
4. TCAS Half Range Ring
5. TCAS 3 NM Range Ring
6. Above/Below enabled
7. TCAS Other Traffic off Icon
8. Traffic Line Select Key (LSK)
9. TCAS Mode Annunciation
10. TCAS NO BRG Table

Fig. 4 - TCAS Mode Only and Annunciation on MFD display - Typical view

TCAS I - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00

NOTE: This topic provides the following TCAS I Maintenance Pratices:

- Transmitter Receiver Computer Removal/Installation
- Directional Antenna Removal/Installation
- TCAS I Configuration
- TCAS I Antenna Calibration
- TCAS I Data Verification
- TCAS I System - Test
- TCAS I Operate / Standby Function

NOTE: The TCAS I Antenna Calibration, TCAS I Data Verification, TCAS I System - Test and TCAS I Operate / Standby Function procedures, must be performed in at least 75 m. clear area.

2. Transmitter Receiver Computer (TRC) - Removal (Ref. to Fig. 201)

A. Fixtures, Test and Support Equipment

Blanking Caps	Not specified

B. Referenced Information

Maintenance Manual Chapter 53-10-00

C. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(2) Open, tag and safety this circuit breaker:
Copilot CB Panel:
TCAS I
(3) Remove the radome/nosecone (Refer to 53-10-00).
(4) Get access to the Transmitter Receiver Computer (TRC).
(5) Disconnect the three antenna connectors (1,2,3) from the Transmitter Receiver Computer (TRC) (4).
(6) Disconnect the Power connector (5) from the TRC.
(7) (Disconnect the Interconnect connector (6) from the TRC.
(8) Put the blanking caps on the electrical connectors.
(9) Loose the Hold-Down Knobs (7).
(10) Pull slowly the TRC by the proper handle (8) in flight direction.
(11) When the Unit is disengage from its own mounting tray (9) lift and remove it.

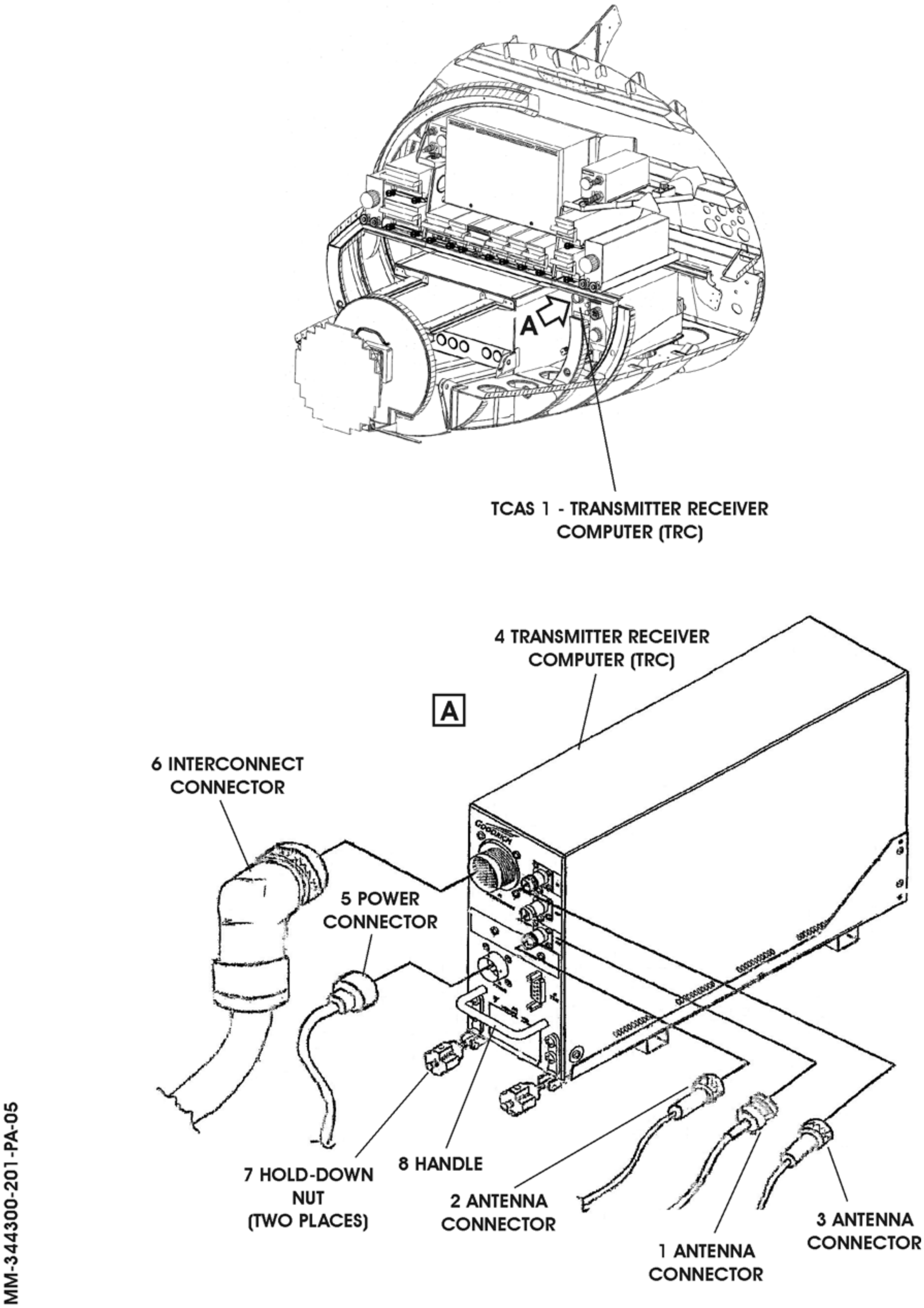


Fig. 201 - TCAS 1 Transmitter Receiver Computer (TRC) - Removal/Installation

3. Transmitter Receiver Computer (TRC) - Installation (Ref. to Fig. 201)

A. Referenced Information

Maintenance Manual Chapter 53-10-00

B. Procedure

NOTE: If the Transmitter Receiver Computer as been removed for repair, is not necessary reconfigure the Unit during reinstallation, nevertheless it is necessary to calibrate the Antenna.

(1) Make sure that circuit breaker TCAS I is open, safetied and tagged.
(2) Install and secure the TRC in the proper Mounting Tray by the Hold- Down Knobs.
(3) Remove the blanking caps from the electrical connectors.
(4) Connect the three antenna connectors (1,2,3) to the Transmitter receiver Computer (TRC) (4).
(5) Connect the Power connector (5) to the TRC.
(6) Connect the Interconnect connector (6) to the TRC.
(7) Remove the safety tags and close circuit breaker TCAS I.
(8) Remove tools, materials and equipment from the work area.
(9) Install the radome/nosecone (Refer to 53-10-00).
(10) Do a the following tests, described in this section:
   – TCAS I Configuration
   – TCAS I Antenna Calibration
   – TCAS I Data Verification
   – TCAS I System - Test
   – TCAS I Operate / Stanbby function
(11) Remove a Warning Notice in the flight compartment

4. TCAS I Antenna - Removal (Ref. to Fig. 202)

A. Fixtures, Test and Support Equipment

Blanking Caps	Not specified

B. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(2) Open, tag and safety this circuit breaker:
   Copilot CB Panel:
   TCAS I
(3) Remove the four attaching screws (1) that fasten the antenna (2) to the airplane top fuselage between the F.S. 2908 and F.S. 3114.
(4) Support the antenna (2) and cut the sealant around the base of antenna.

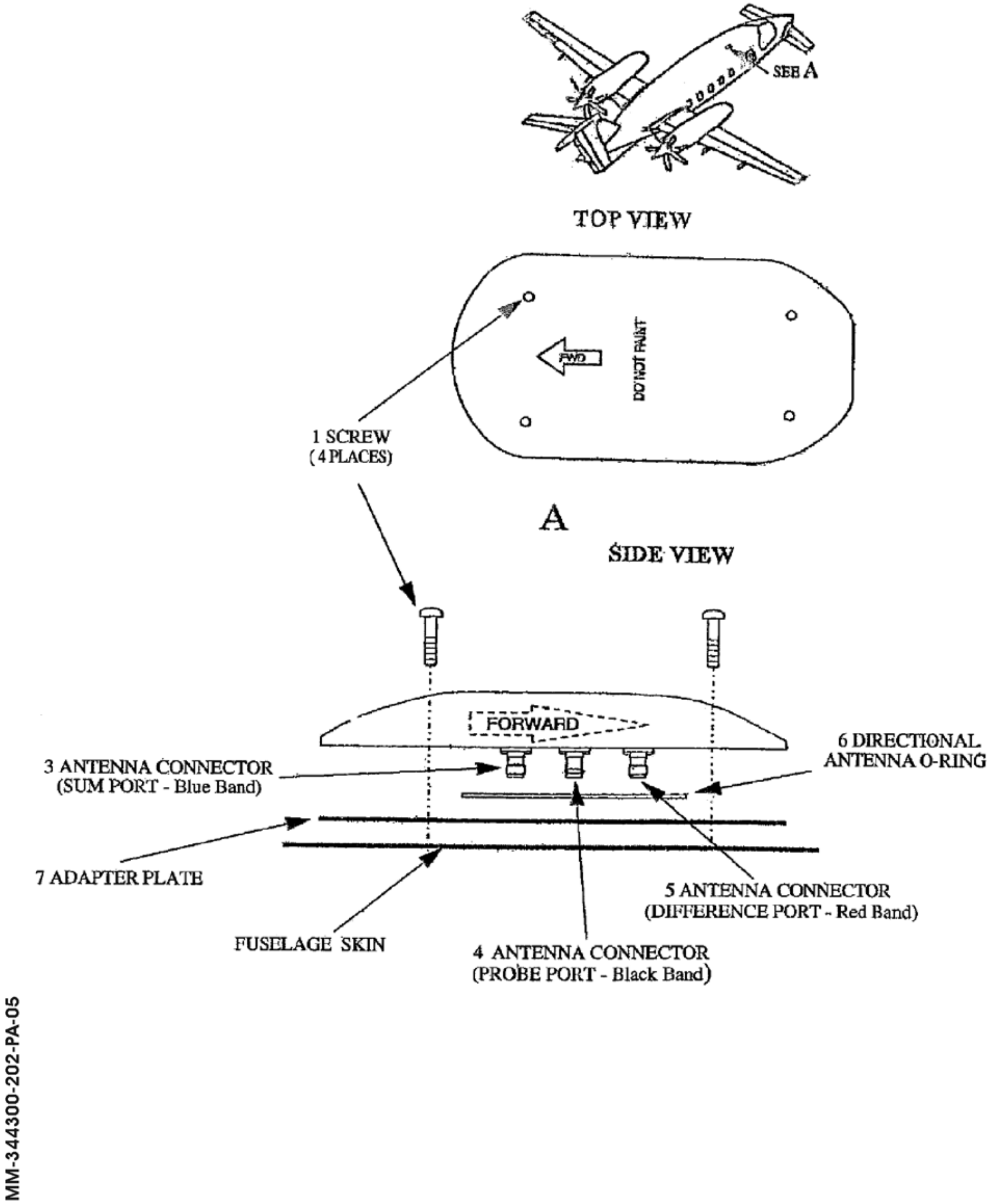


Fig. 202 - TCAS 1 Antenna - Removal/Installation

(5) Disconnect the three antenna connectors (3, 4, 5) from antenna and remove the antenna. Make sure connectors does not withdraw into airframe.
(6) Remove the Directional Antenna O-Ring (6).
(7) Remove the Adapter Plate (7).
(8) Put the blanking caps on the electrical connectors .

5. TCAS I Antenna - Installation (Ref. to Fig. 202)

A. Fixtures, Test and Support Equipment

Lint -free cloth	Not specified
Non Metallic Scraper	Not specified

B. Material

06-005, Sealant	As required
02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 91-00-00

D. Procedure

(1) Make sure that circuit breaker TCAS I is open, safetied and tagged.

WARNING: BE CAREFUL WHEN YOU USE THE MEK. OBEY THE HEALT AND SAFETY INSTRUCTIONS GIVEN IN CHAPTER 20-00-00.

(2) Clean the replacement parts using MEK and dry with lint-free cloth.
(3) Clean the antenna surface (upper and lower sides).
(4) Install the Adapter Plate (7).
(5) Install the Directional Antenna O-Ring (6).
(6) Remove blanking caps and connect antenna cables to antenna connectors (3, 4, 5).
(7) Place the antenna in position to the fuselage skin and hold in position.
(8) Secure the antenna in position by proper four screws (1).
(9) (Apply the sealant around antenna to prevent ingress of water between airframe and attached part (Refer to 20-00-00).
(10) Do a TCAS I Antenna Calibration as described in this section.
(11) Remove a Warning Notice in the flight compartment.

6. TCAS I Configuration

A. Material

Personal computer	Window installed

B. Procedure

(1) The TCAS I Configuration must be performed in the following indicated cases:

(a) When the processor must be replaced, perform the antenna calibration and check if the configuration previously memorized is correct. If not, perform the TCAS I Configuration.

(b) When the TCAS I Memory Configuration Module is replaced.

(2) Airplane on ground (WOW)

(3) Connect the External Electrical Power Unit (GPU) to the airplane.

(4) Verify that all circuit breakers are closed.

(5) Set the Battery Switch to BAT.

(6) Set the Bus Switch to NORM.

(7) Set the Avionics Switch to ON position.

(8) Push the OPR on the Reversionary Panel.

NOTE: During the configuration, if the data transfer from the memory card (Ref. to Fig. 203) to the TCAS I System or viceversa is to be performed, it is necessary to do the following procedure ,once the Hyperterminal Program is open.

- Select "Menu" and then "Configuration Management".
- Select "Archive to CF" if the TCAS I data are to be saved on the memory card.
- Select "Retrieve from CF" if the memory card data are to be tranferred to the TCAS I.

(9) Connect the TCR 899 (J7 connector) to a PC (serial port), for harness diagram refer to Fig. 203.

(10) On the PC open "My Computer" and select Hyperterminal.

(11) To communicate with the TRC, the RS-232 terminal device must be setup as follows, with no hardware or software handshaking (flow control) being used.

Baud Rate	19200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	Xon / Xoff

(12) Select "menu" on the white window, then "enter", select 1, "set up", then enter.

(13) Select 1 "Top Antenna" and enter, then wait for the process end.

(14) Set the TCAS I as follows:

AIRPLANE TYPE	Fixed wing
ANTENNA SYSTEM	Top-NY156 Directional
AUDIO LEVEL	60%
ARINC 429 PORTS	Ch 1: Bar Alt - 12.5 Khz
	Ch 2: Rad Alt - 12.5 Khz
	Ch 3: No type - No speed
	Ch 4: No type - No speed
	Ch 5: Mag Hdg - 100 KHz
AVIONICS EQUIPMENT	
GPS NAV	None
Magnetic Heading	ARINC 429
Barometric Altitude	ARINC 429
Radio Altitude	ARINC 429
Landing Gear	None
Weight on whells	Active Low
Audio Suppression	Active Low
External Display	Standard Type 3

7. TCAS I Antenna Calibration

A. Material

Personal computer	Window installed

B. Procedure

(1) Airplane on ground (WOW)
(2) Connect the External Electrical Power Unit (GPU) to the airplane.
(3) Verify that all circuit breakers are closed.
(4) Set the Battery Switch to BAT.
(5) Set the Bus Switch to NORM.
(6) Set the Avionics Switch to ON position.
(7) Push the OPR on the Reversionary Panel.
(8) On the PC select "TCAS I" (Hyperterminal program).
(9) Select "menu" and then "calibration".
(10) Select "Top Antenna".
(11) Check that no error messages appear.
(12) Wait for a few seconds before pressing exit.

8. TCAS I Data Verification

A. Material

Personal computer	Window installed

B. Procedure

(1) Airplane on ground (WOW)
(2) Connect the External Electrical Power Unit (GPU) to the airplane.
(3) Verify that all circuit breakers are closed.
(4) Set the Battery Switch to BAT.
(5) Set the Bus Switch to NORM.
(6) Set the Avionics Switch to ON position.
(7) Push the OPR on the Reversionary Panel.
(8) On "menu" service select "Information" and then "Data Monitors".
(9) Select ARINC 429 rcvrs and check:

Ch 1: Bar Alt	Low-parity 0
Ch 2: Rad Alt	Low-parity 0
Ch 3: No type	No speed-parity 0
Ch 4: No type	No speed-parity 0
Ch 5: Mag Hdg	High-parity 0

(10) Press "X" and then enter.
(11) Select "Barometric Altitude" and check:

ARINC 429 Valid Altitude (Same visualization on the PFD)

(12) Press "X" and then enter.
(13) Select Discrete Values and check.

WOW sense:	Active Low - WOW state: on ground
Gear sense:	None - Gear state: ----------
AUDIO INHIB:	Active low - Audio state: Normal

(14) Press "X" and then enter.
(15) Select "GPS Nav" and check: None.

None

(16) Press "X" and then enter.
(17) Select "Mag Heading " and check

ARINC 429 - Valid - Heading (Same visualization on the EHSI)

(18) Press "X" and then enter.

(19) Select "Rad altitude" and check.

ARINC 429 - Valid - Altitude (Same visualization on the R / A)

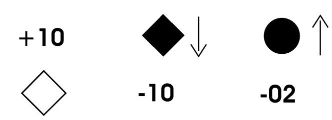
(20) From main menu select setup.
(21) Secect Audio Level and check that the volume is at 60%.
(22) Select Exit up to the Menu Service.

9. <u>TCAS I System - Test</u>

A. Procedure

(1) Airplane on ground (WOW)
(2) Select TFC on the PFD / MFD.
(3) On the Reversionary panel located on Instrument panel, in the section” TCAS 1”, set the switch ALT / TEST on "TEST" position and verify the following steps:
– On the Reversionary Panel the “OPER / STBY" light comes ON.
– On the PFD / MFD is displayed "TCAS-TEST" in cyan colour.
– On the PFD / MFD is displayed "TRAFFIC" in yellow colour.

– On the PFD is displayed the OT, PT and TA simbols:



– At the end of the test the message "Skywatch System Test Passed” is hearable on the audio device.
– After 10 seconds the system automatically exits from the test condition.

10. <u>TCAS I Operate / Standby function</u>

A. Procedure

(1) Airplane on ground (WOW).
(2) Select TFC on PFD / MFD.
(3) On the reversionary panel press OPR/STBY.
(4) Check that on the PFD / MFD displays the cyan TCAS I OFF annunciator disappears.
(5) Check that on the PFD / MFD displays the air traffic data appears.

11. <u>TCAS I Memory Configuration Module - Removal / Installation</u>

A. Procedure

(1) The Memory Configuration Module replacing, require a specific maintenance procedures. If it is necessary to replace the Memory Configuration Module, please contact Piaggio Aero Industries Product Support.

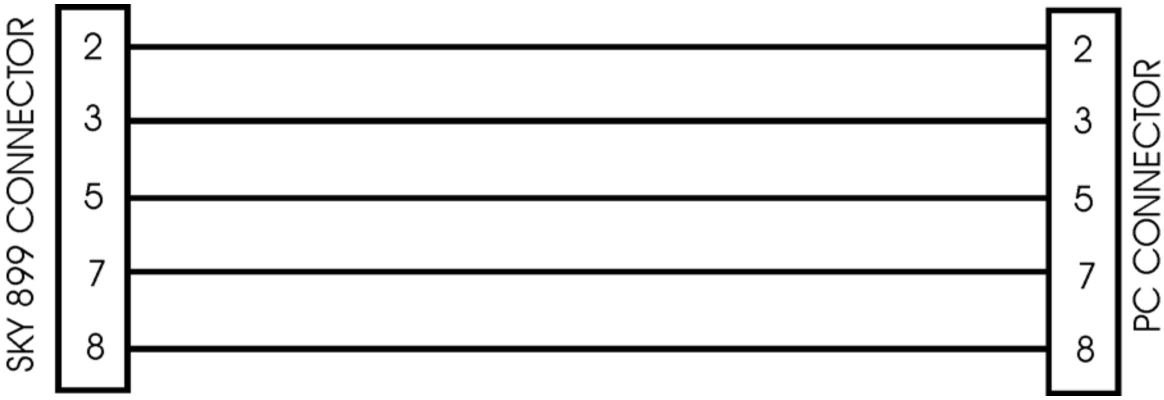


Fig. 203 - Down Load / Set Up - Typical Harness Diagram

TAWS - DESCRIPTION AND OPERATION

1. Description

A. The Terrain Awareness and Warning System (TAWS) Class B model TAWS8000 provides predictive Terrain warnings based on the aircraft present position and the TAWS projection of the aircraft flight path.

The TAWS contains a worldwide database consisting of terrain, airports, and other data. It compares its flight path projection with the database to detect upcoming hazardous conditions. The TAWS provides aural and visual warnings to alert the pilot if it detects a hazardous condition.

The TAWS uses worldwide database information, specific aircraft information from the GPS, attitude and heading data from the Attitude Heading Computer, altitude data from the Air Data Computer, to generate system messages, alerts, and terrain symbology.

The output display of TAWS is available on both the PFDs and the MFD and aurally through audio device.

Specified TAWS fault messages show on the PFDs and MFD. Controls located on the PFDs, Display Control Panel (DCP), and external switches provide TAWS control.

The TAWS System consists of a TAWS8000 Remote Computer, a 67DC Terrain Database Cartridge, a System Configuration Module and two external switches located on Reversionary panel.

The TAWS system is supplied by the Right Avionics Single Feed Bus through the TAWS circuit breaker located on the Copilot CB Panel.

B. The TAWS Remote Computer uses worldwide database information, specific aircraft information, position data from the FMS, GPS and Navigation receivers, altitude from the Radio Altimeter, attitude and heading from the AHC, air data from the Air Data Computer, and AOA data to generate system messages, alerts, and terrain symbology.

The TAWS computer supplies terrain symbology, alerts, and system messages to the PFD and MFD via the IAPS and system bus structure.

An audio voice message is alsosent to the aircraft audio system.

The TAWS Remote Computer interfaces with discrete signals from landing gear system in order to determine if the landing gear is up or down and from weight on wheel switch to determine if the aircraft is on the ground or flying.

The TAWS Remote Computer Continuous fault monitoring that activates a system flag when a fault is detected.

The Remote computer allows to be connect to a lap top .This interface is used to support maintenance and diagnostic functions. The interface is accessed via a front panel connector identified by J3.

The TAWS Remote Computer is located on the nosecone, in the left side (Ref. Fig. 2).

C. The Terrain Database Cartridge is a removable Data card that must be insert in the Remote Computer Data card slot, located behind an access door on the front of the computer, to operate properly.

The Data card contains a data base of the terrain, obstacles, runaways, and magnetic variations for selected regions of the world.

The database information is scrolled into the TAWS computer memory and is updated periodically. To update the database the user simply replaces the existing data-card with an updated one.

D. The System Configuration module is a small non volatile memory module installed on the J1 mating connector backshell.

In the System Configuration module are stored aircraft installation dependent selections (e.g., aircraft type, discrete input configuration, the type of air data computer, heading source, etc.). The TAWS computer reads data from the configuration module only at power-up. Aircraft specific information is selected via the Service Menu.

E. On the Reversionary panel, in the section TAWS two switches and a annunciation lamp INHB are installed to control the self test and inhibit of the TAWS system.

2. Operation

A. On Reversionary panel located on instrument panel there is a section named TWAS that includes two pushbuttons switches TEST and INHB and a annunciation lamp INHB.

The TEST pushbutton can activate the TAWS Remote Computer Self Test . The Self Test is inhibited during flight. The Self Test can run only when the aircraft is on the ground.

The INHB pushbutton can select the inhibition of the system and put to Standby TAWS Remote Computer. When the TAWS Remote Computer has been inhibited, the annunciation lamp INHB will light on.

3. Displays

A. TAWS Alerts are displayed on the PFD/MFD when commanded by the TAWS.
Mode and Fault annunciations are displayed on the PFD/MFD when graphical Terrain data displays are selected on PFDs and MFD Arc and PPOS Map formats. See Figure 3.
The graphical terrain elevation data shows in a ±90° arc in front of the aircraft. System messages, warnings, and a Peaks elevation value also show on the PFDs.

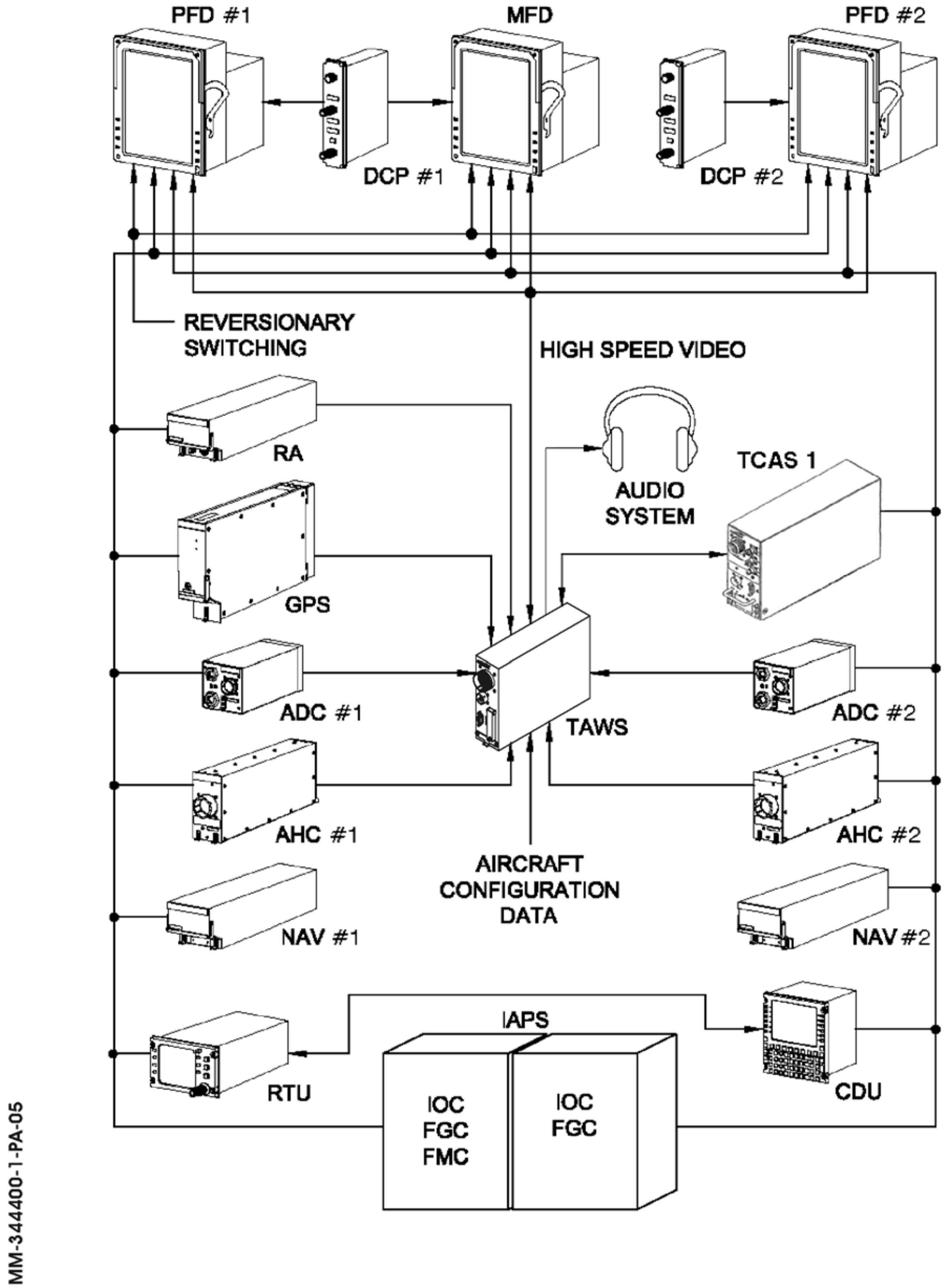


Fig. 1 - TAWS Block Diagram

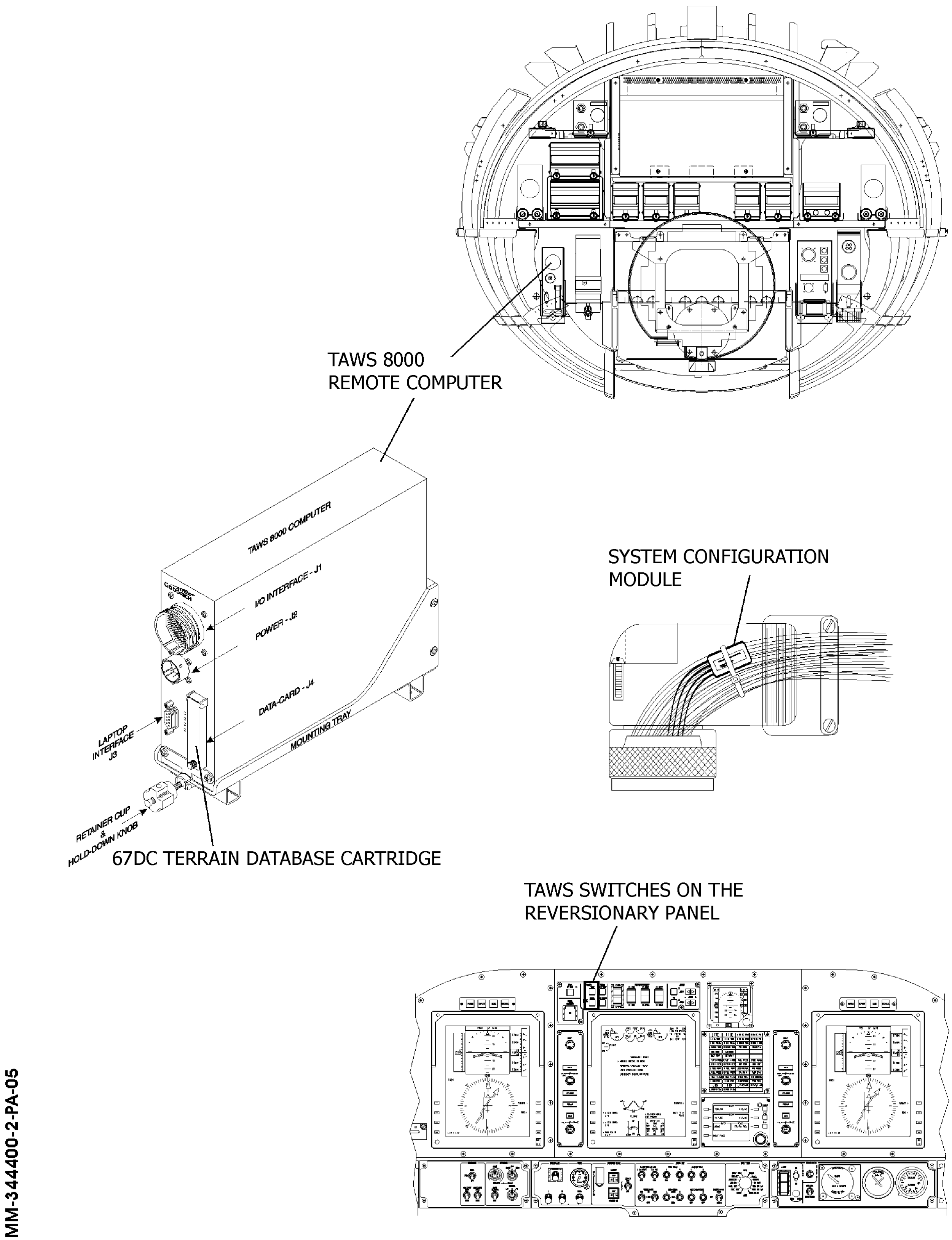


Fig. 2 - TAWS - Components Location

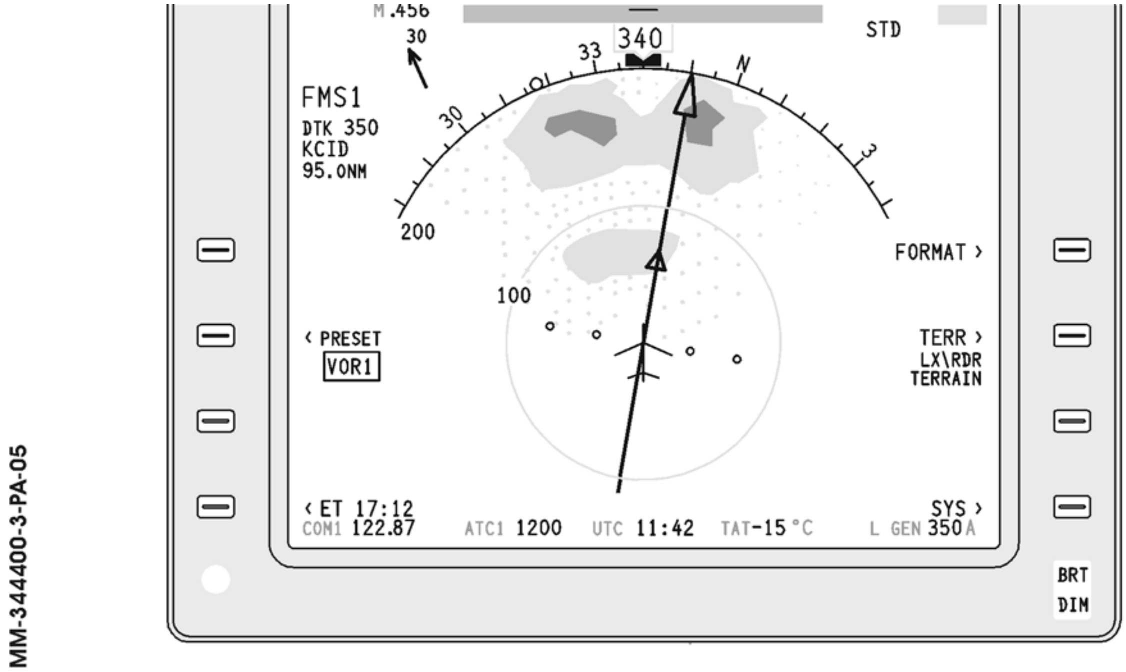


Fig. 3 - TAWS Typical Display on PFD/MFD - Terrain Overlay on the ARC Format

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TAWS - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00

A. This topic provides the following TAWS Maintenance Pratices:

– TAWS Remote Computer - Removal/Installation
– TAWS Data Base - Updating
– TAWS Configuration
– TAWS Data Verification
– TAWS Self Test
– TAWS Inhibit
– TAWS Audio Delay (TCAS I Installed)
– TAWS Audio Priority (TCAS I Installed)
– TAWS Failure Annunciations (TCAS I Installed)

NOTE: For the TAWS Configuration, TAWS Data Verification, TAWS Inhibit, TAWS Audio Delay (TCAS I Installed), TAWS Audio Priority (TCAS I Installed), TAWS Failure Annunciations (TCAS I Installed) and TAWS Self Test procedures,the airplane must be placed in an area that allow the GPS System acquisition and interchange data.

2. TAWS Remote Computer - Removal (Ref. to Fig. 201)

A. Fixtures,Test and Support Equipment

Blanking Caps	Not specified

B. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(2) Open, tag and safety this circuit breaker:
Copilot CB Panel:
TWAS
(3) Remove the radome/nosecone (Refer to 53-10-00).
(4) Get access to the TAWS Remote Computer (1) on the right lower panel in the avionics bay.
(5) Disconnect the Input/Output Interconnect connector (2) from the front of TAWS Remote Computer J1 connector.
(6) Disconnect the Power connector (3) from the TAWS Remote Computer J2 connector.
(7) Put the blanking caps on the electrical connectors .
(8) Loose the Hold-Down Knob (4).

(9) Pull slowly the TAWS Remote Computer (1) in flight direction.
(10) When the Remote Computer is disengage from its own mounting tray, lift and remove it.

3. TAWS Remote Computer - Installation (Ref. to Fig. 201)

A. Referenced Information

Maintenance Manual Chapter 53-10-00

B. Procedure

(1) Make sure that circuit breaker TWAS is open, safetied and tagged.
(2) Install and secure the Remote Computer (1) in the proper mounting tray by the Hold- Down Knob (4).
(3) Remove the blanking caps from the electrical connectors.
(4) Connect the Power connector (3) to the J2 connector on front of TAWS Remote Computer.
(5) Connect the Input/Output Interconnect connector (2) to the J1 connector on front of TAWS Remote Computer.
(6) Remove the safety tags and close circuit breaker TWAS.
(7) Remove tools, materials and equipment from the work area.
(8) Install the radome/nosecone (Refer to 53-10-00).
(9) Do a TAWS following test described in this section:
- TAWS Configuration
- TAWS Data Verification
- TAWS Self Test
- TAWS Inhibit
- TAWS Audio Delay (TCAS I Installed)
- TAWS Audio Priority (TCAS I Installed)
- TAWS Failure Annunciations (TCAS I Installed)

(10) Remove a Warning Notice in the flight compartment.

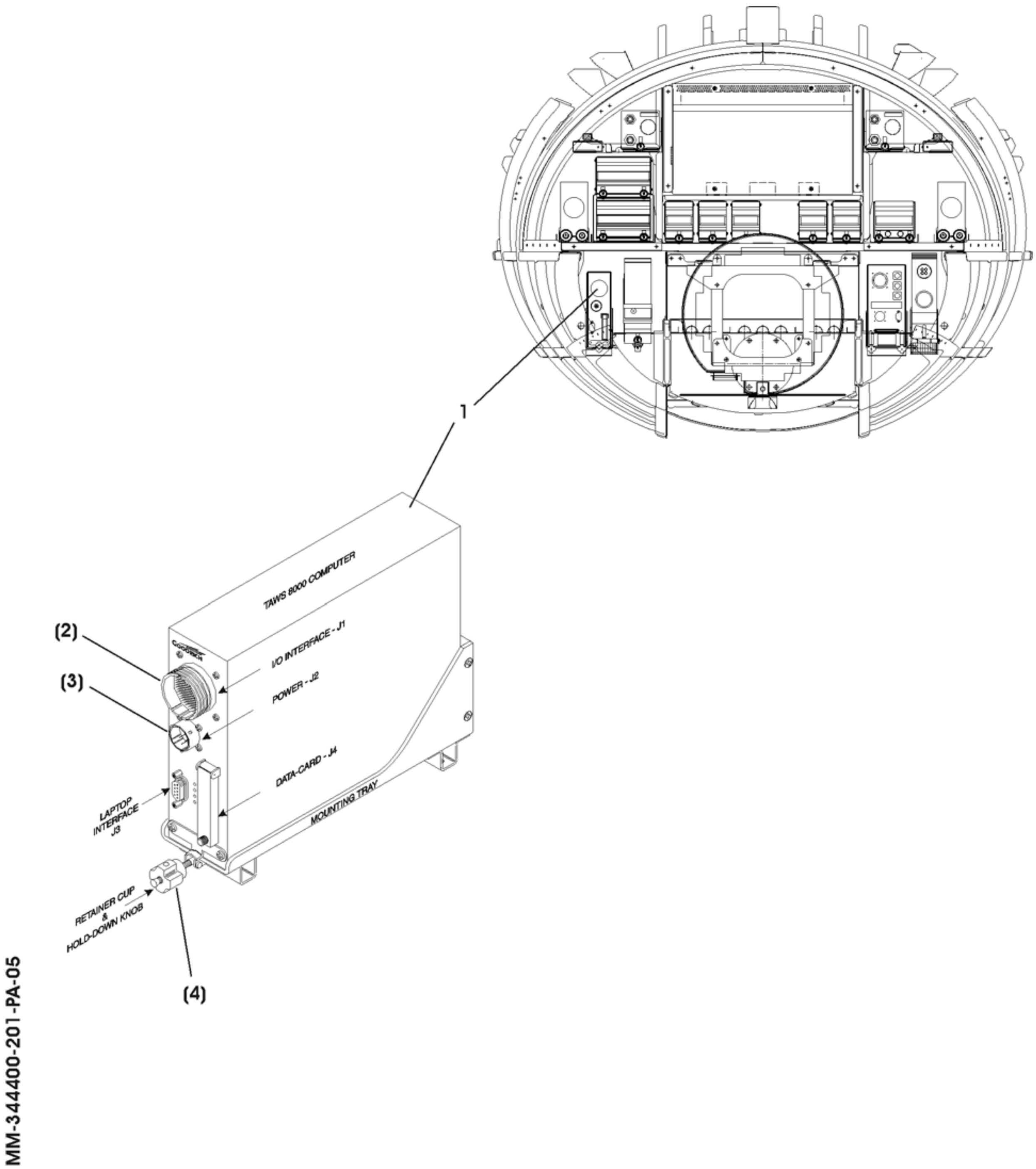

Fig. 201 - TAWS Remote Computer- Removal/Installation

4. TAWS Database - Updating (Ref. to Fig. 202)

   To update the TAWS Database, perform the following steps:

   1. Remove power from the TAWS system.

      CAUTION: REMOVING OR INSERTING THE DATA-CARD WHILE THE TAWS COMPUTER IS POWERED ON MAY RESULT IN DAMAGE TO THE CARD.

   2. At the TAWS computer (Ref. to Fig. 202), loosen the captive thumb screw at J4.

   3. Open the data-card access door.

   4. Remove the old data-card.

   5. Insert the new data-card. Be sure to align the arrow on the data-card with the arrow on the TAWS computer.

   6. Close the data-card access door.

   7. Hand tighten the thumb screw.

   8. The databases will automatically update when power is applied to the TAWS computer.

   9. After system power up, run the self-test (see paragraph 4). During the self-test, the system will announce the effective date of the database. Verify that the effective date matches what is printed on the card.

      NOTE: The current database version can be displayed by selecting the Software Version option from the Service Menu

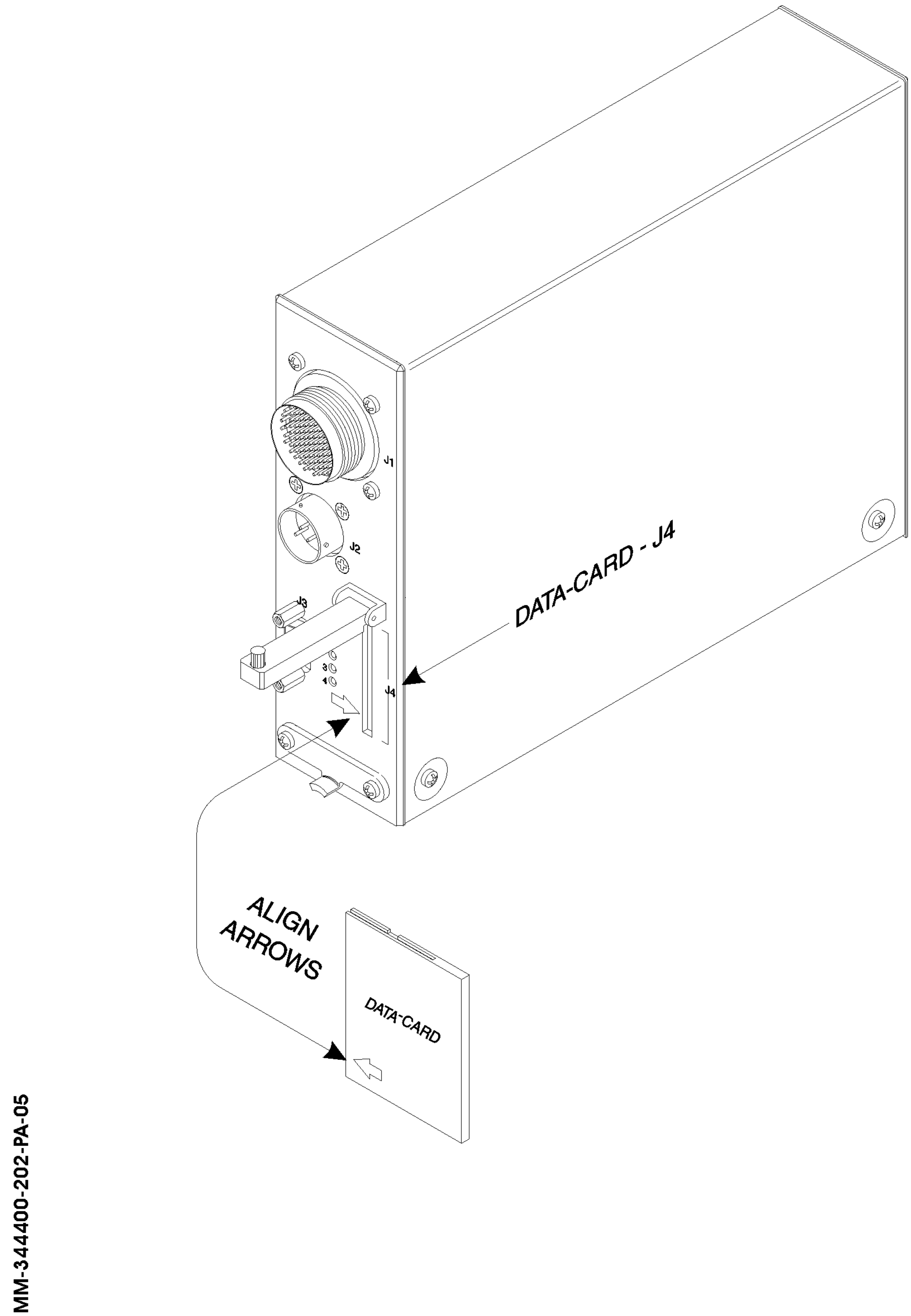

Fig. 202 - TAWS Remote Computer Database Installation

5. TAWS Configuration

A. Material

Personal computer	Window installed

B. Procedure

(1) The TAWS Configuration must be performed in the following indicated cases:

(a) When the processor must be replaced, perform the antenna calibration and check if the configuration previously memorized is correct. If not, perform the TAWS Configuration.

(b) When the TAWS Memory Configuration Module is replaced.

(2) Airplane on ground (WOW)

(3) Connect the External Electrical Power Unit (GPU) to the airplane.

(4) Verify that all circuit breakers are closed.

(5) Set the Battery Switch to BAT.

(6) Set the Bus Switch to NORM.

(7) Set the Avionics Switch to ON position.

NOTE: During the configuration, if the data transfer from the memory card (Ref. to Fig. 202) to the TAWS System or viceversa is to be performed, it is necessary to do the following procedure ,once the Hyperterminal Program is open.

- Select "Menu" and then "Setup".
- Select "Config Manag".
- Select "Archive to CF" if the TAWS data are to be saved on the memory card.
- Select "Retrieve from CF" if the memory card data are to be tranferred to the TAWS.

(8) Connect terminal device to the RS-232 serial data TEST port (J3) located on the front of the TAWS Computer. For harness diagram refer to Fig.203.

The TAWS Computer is located in the Cabinet Vanity Closet lower Panel.

(9) On the PC open "My Computer" , select 3,5" floppy and select Hyperterminal.

(10) To communicate with the TAWS8000, the RS-232 terminal device must be setup as follows, with no hardware or software handshaking being used.

Baud Rate	19200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

(11) Select "menu".

(12) Select "Setup" and then "Airplane Configuration".

(13) Select the following items and check that:

ADC.	ARINC 429
GPS Navigation:	ARINC 743A
GPS RAIM discrete:	None
Magnetic Heading:	ARINC 429
Heading Flag discrete:	None
Landing Gear down.	Down = Low
Squat switch on ground:	Ground = Low
Flaps:	None
Audio Suppression Input:	Suppression = High
RS-232 / 422 Terrain Display:	None
ARINC 453 Terrain Display	Collins Pro Line 21
Barometric correction:	None
Obstacle display:	Enabled
Pop Up Terrain reporting:	Enabled

(14) Press "X".

(15) Select "Communication ports" and then "ARINC 429 Receivers".

(16) Configure the 5 ports as follows:

Ch 0: (port 1):	Terrain Display Range Right; 100 KHz
Ch 1: (port 2):	ADC, AHRS, Terrain Display Range Left, 100 KHz
Ch 2: (port 3):	GPS; 12,5 KHz
Ch 3: (port 4):	None 12,5 KHz
Ch 4: (port 5):	None 12,5 KHz

(17) Press"X", select"ARINC 429 Transmitter" and configure it as 12.5 KHz.

(18) Press"X", select "ARINC 453 Terrain Display bus" and configure it as "Collins Pro Line 21".

(19) Press"X", select ARINC 575 Receivers" and configure it as "None, 12,5 KHz."

(20) Press "X" select "RS-232 / 422 Serial ports"

(21) Configure the 4 ports as follows:

Port 1:	None
Port 2:	None
Port 3:	None
Port 4:	None

(22) Press "X" and from "setup" menu select "audio configuration".

(23) Into the "Audio configuration" menu configure as follows:

Item 1 "Alert List":	Primary

Item2 "Whoop-Whoop": Disabled

(24) Select item 3 " Audio Level".
(25) As the Audio Level menu appears set volume at 73%.
(26) Select item 3 "Test" if you want to change the volume %.

6. TAWS Data Verification

(1) With the PC connected (Hyperterminal Program) write "Menu" and select "Information " and then "Data monitor".
(2) On the monitor the "ARINC 429 rx" menu appears.
(3) Check that any selected channel (Ch0 Ch1 and Ch2) is operative.:

Ch 1: (port 1):	Terrain Display Range Right; 100 KHz
Ch 2: (port 2):	ADC, AHRS, Terrain Display Range Left, 100 KHz
Ch 3: (port 3):	GPS; 12,5 KHz
Ch 4: (port 4):	None
Ch 5: (port 5):	None

(4) Press "C"
(5) On the monitor the "RS 232" menu appears.
(6) Check that for any port the same information previously selected appears.

Port 1:	None
Port 2:	None
Port 3:	None
Port 4:	None

(7) Press "C": on the monitor the "ADC" menu appears
(8) Check that on the screen the current air data appears.
(9) Press "C": on the monitor the "GPS navigation " menu appears
(10) Check that on the screen the airplane position appears.
(11) Press "C": on the monitor the "Discrete" menu appears
(12) Check that the data of Landing Gear, Squat Switch and Audio suppression correspond to the data setted in the configuration.
(13) Press "C": on the monitor the "Heading" menu appears.
(14) Check that Heading information are the same of the compass heading.
(15) Press "C"and then "X".
(16) If the configuration as been changed, press "S" to save and then exit from the Service Menu, otherwise press "X".
(17) Disconnect the PC from the TAWS J3 connector.

7. TAWS Self Test

NOTE: The self-test is inhibited during flight. The self-test can run only when the aircraft is on the ground.
Prior to perform the test verify that the indications on the TAWS and GPS Control Panel are off.
Perform the test with Configuration Data Card.

(1) Before starting the Self Test make sure that all aiplane systems are ON and operating.
(2) Set altitude at 100 ÷200 ft.
(3) Make sure that GPS Data is active.
(4) On the Reversionary Panel push the TAWS TEST button and perform the following checks:
 (a) On the PFD and MFD the display of the cyan "TERR TEST" indication and the yellow "TERRAIN FAIL" indication.
 (b) On the PFD the following indications are dislayed in sequence: yellow "TERR", yellow "GND PROX" and red "PULL-UP" (visible only if GPS is ON).
 (c) A territory graphics is displayed on PFD and MFD.
(5) The audio emits the following announcements:
 – Software version (i.e. "LANDMARK sofware version 1.10")
 – Data base "TERRAIN (i.e. "LANDMARK data base: Word. Effective date March 22, 2004").
 – Altitude (i.e. "MSL 150").
(6) At the end of Self Test check that:
 – The audio emits "LANDMARK System Test, Passed".

8. TAWS Inhibit

(1) Set the TAWS switch located on the Reversionary Panel to INHIB.
(2) When TERRAIN is active and INHIBIT Mode is selected, the cyan TERR INHB indication is visible below the Terrain selection switch and on the Reversionary panel (Refer to Table).
(3) When TERRAIN is not active and the INHIBIT Mode is selected the indication is visible only on the Reversionary panel (Refer to Table).

TEST SETTING

Cond	Taws INHIB Switch	PFD / MFD Format (R-LSK-1)	RDR / TERR (Overlay) PFD / MFD Switch (R-LSK-2)	PFD / MFD Range
A	NORM / INHIB	ARC / PPOS	Active / TERR / RDR	Any
B	NORM / INHIB	ROSE / PLAN	Not Active	Any

9. TAWS Audio Delay (TCAS I Installed)

(1) On the Pilot Switch panel set the System Test selector to STALL.
(2) Press TEST on the TAWS Control Panel.
(3) During the Audio signal press the System Test Selector.
(4) Check that the TAWS audio test is suppressed until the stall audio signal is present.

10. TAWS Audio Priority (TCAS I Installed)

(1) On the TCAS Control Panel set the switch to TEST.
(2) During the TCAS audio signal press the TEST button on the TAWS control Panel.
(3) Check that the TCAS audio test is suppressed until the TAWS audio signal is present.

11. TAWS Failure Annunciations (TCAS I Installed)

(1) Select and show the indication on the PFD / MFD.
(2) Open the GPS (CB 5060) copilot side circuit breaker and check the yellow "TERRAIN FAIL" indication is displayed on the PFD / MFD.
(3) Close the circuit breaker and check that the yellow "TERR" indication is displayed on PFD.
(4) Open the TAWS (CB 5063) copilot side circuit breaker and check the yellow "TERRAIN FAIL" indication is displayed on the PFD / MFD.
(5) Close the circuit breaker and check that the yellow "TERR" indication is displayed on PFD.

12. TAWS Memory Configuration Module - Removal / Installation

A. Procedure

(1) The Memory Configuration Module replacing, require a specific maintenance procedures. If it is necessary to replace the Memory Configuration Module, please contact Piaggio Aero Industries Product Support.

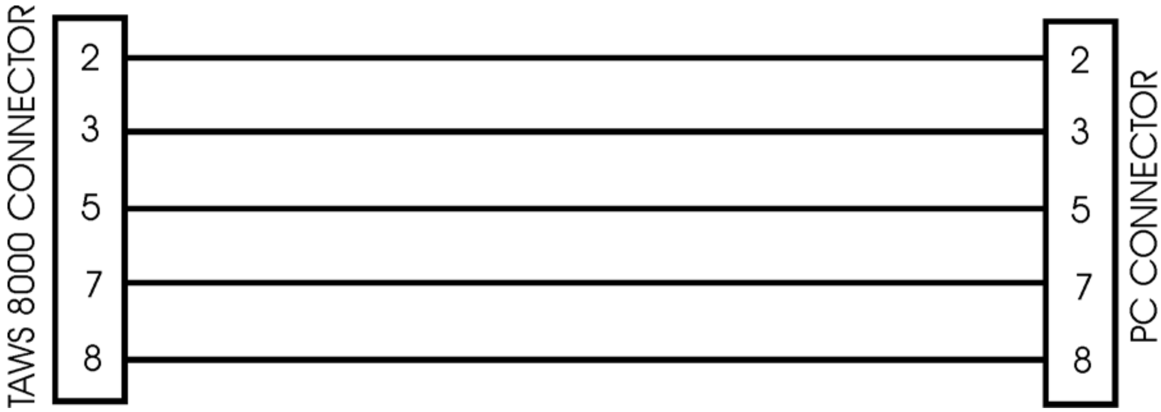

Fig. 203 - Down Load / Setup - Typical Harness Diagram

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TURBULENCE RADAR SYSTEM - DESCRIPTION AND OPERATION

1. Description

A. The Turbulence Weather Radar System consists of a Receiver/Transmitter/ Antenna (RTA) type RTA-852 that detects and locates weather targets for the purpose of navigating around weather hazards. The WXR can also be used to provide ground terrain information.

The Turbulence Weather Radar System are form and fit equivalent to the RTA 800 weather radar (Ref. to 34-41-00), have the same weight but the functions are enhanced.

For general information equivalent to RTA 800 weather radar, refer to 34-41-00.

The new function of Receiver/Transmitter/Antenna RTA-852 respect to RTA-800 are:

– Addition of Sector Scan Control
– Addition of two position of the Radar Menu
– Addition of Auto tilt Control that require the use of a different model (DCP-3030) of Display Control Panels.

The location, wiring harness, and power supply are identical of Weather Radar System RTA 800.

B. When the Sector Scan control function is not active, the antenna sweep is normal of +/- 60 degree (total 120 degree) in same way of RTA-800.

When the Sector Scan control is active, the sector of antenna sweeping is reduced to +/- 30 degree (total 60 degree).

By reducing the antenna scan angle, the amount of time needed for the antenna to complete its sweep is also reduced. This effectively increases the Weather Radar update rate.

C. On the Weather Radar Menu with RTA 852 two addition position are available:

WX+T (for selected radar range greater than 50 NM

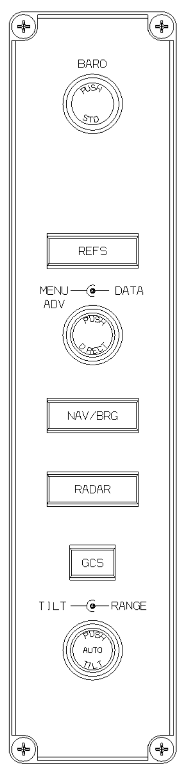
TURB (for selected radar range less than 50 NM

D. On the Display Control Panel DCP3030 a control of Auto Tilt is install (inner pushbutton of TILT Knob). This control, when selected, enables the automatic tilt feature of the Weather Radar Antenna.

2. Operations

A. In addition of Weather Radar operations controlled through the DCP in conjunction with the PFD and MFD using a Menu selection process listed on 34-41-00, the Turbulence Weather Radar adds the following controls:

PUSH AUTO TILT: The PUSH AUTO TILT button is used to deselect and select the normally on Weather Radar antenna Autotilt feature.
The Autotilt feature automatically adjusts the antenna tilt angle to attempt to keep the radar in the same region of space when the aircraft climbs and descends. This feature is designed to reduce the number of times you need to adjust the TILT control whenever the aircraft altitude or the radar range setting changes. The TILT knob on the DCP knob remains operational when Autotilt is active to allow the operator to change the tilt/ range ratio to be maintained (the system always uses the current manual tilt setting as the starting point).



MM-344500-1-PA-05

Fig. 1 - Display Control Panel for Turbulence radar (DCP-3030)

B. The PFDs and MFD provides control of the Weather Radar mode through RADAR menu. In addition of Weather Radar controls listed on 34-41-00, the Turbulence Weather Radar adds the following controls:

The further possible radar modes are:

Weather plus turbulence (WX+T):	WX+T mode is used to detect precipitation and precipitation-related turbulence targets. Detectable precipitation shows as one of four colors: green, yellow, red, or magenta (least to greatest precipitation rate). The highest precipitation rates and turbulence show in magenta. WX+T mode is only active out to 50 NM. When a display range greater than 50 NM is selected, the "+T" part of the WX+T mode flashes in white.
Turbulence Only Mode (TURB):	TURB mode shows precipitation-related turbulence targets only. This is useful for closely analyzing areas of precipitation-related turbulence that have been detected while in WX+T mode. TURB mode is automatically deselected after a 30 second time-out and WX+T is then selected. Like WX+T mode, TURB mode is only active out to 50 NM.
Sector Scan Sector:	The Sector Scan reduces the antenna scan angle from the normal +/- 60 sweep (120 total) to a +/- 30 sweep (60 total). By reducing the antenna scan angle, the amount of time needed for the antenna to complete its sweep is also reduced. This effectively increases the Weather Radar update rate. Selecting sector scan on one display affects all PFDs and MFD. Use the MENU ADV knob on the DCP or the adjacent line select key on the display to position the solid box around the SEC SCAN function. Use the DATA knob or PUSH SELECT button on the adjacent line select key on the display to select the desired state (ON or OFF). The selected state shows in large cyan text.

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TURBULENCE RADAR SYSTEM - MAINTENANCE PRACTICES

1. General

   A. For the Turbulence Radar Maintenance Practices refer to Weather Radar Maintenance Practices 34-41-00.

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ACAS II - DESCRIPTION AND OPERATION

1. Description

A. The ACAS II is a system that monitors the airspace around the aircraft where it is installed, interrogating any 'intruding' aircraft transponder to determine if a potential airspace conflict exists. This is done by computing the range, differential altitude, bearing, and closure rate of other transponder- equipped aircraft with respect to the ACAS II equipped aircraft.

B. The ACAS II is based on autonomous and Secondary Surveillance Radar Transponder Signals which operates independently of ground based equipment; it monitors a radius of approximately 14 nautical miles around the aircraft where it is installed, to protect the volume of airspace around the aircraft itself (Ref. to Figg. 1 and 2) and determine if a potential airspace conflict exists with a possible intruder, supplying visual and aural alerts to the crew , when necessary, by means of traffic (TAs) and vertical resolution advisories (RAs).

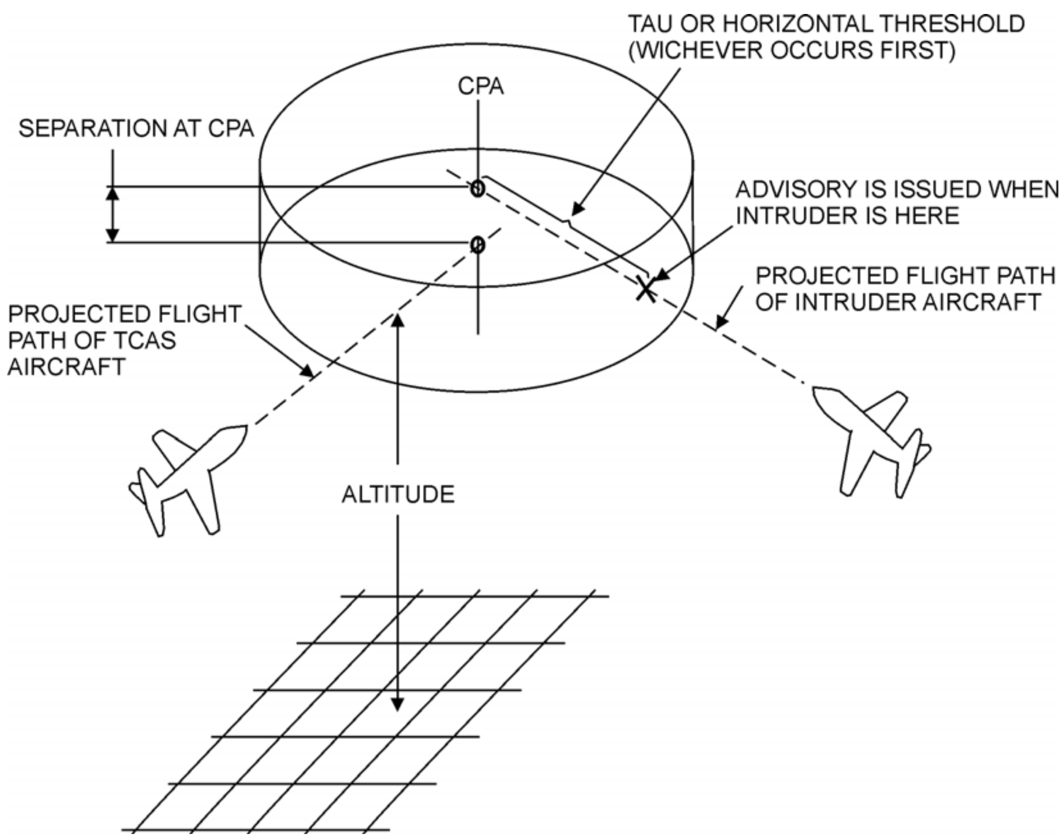

Fig. 1 - ACAS II Advisory, Protected Airspace Diagram

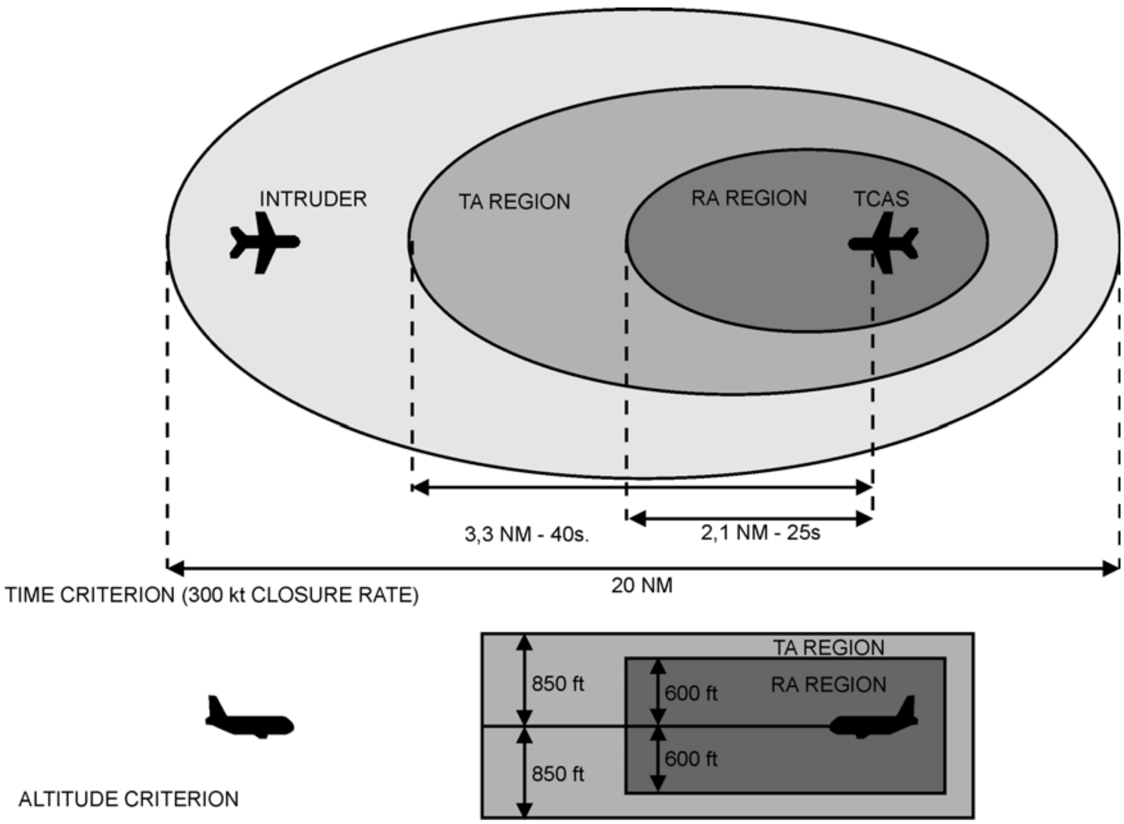

Fig. 2 - Example of ACAS II Protection Volume between 5000 and 10000 feet

C. In general, an ACAS II system carries out the following main functions:

- Surveillance
- Collision avoidance tracking
- Threat detection
- Threat resolution
- Communication and coordination.
- Voice Announcement Priority
  - ***Surveillance***

  Through its own antennas, the ACAS II interrogates the transponders of neighboring aircrafts and receives their replies (i.e. via the transponder Mode C and Mode S messages). The interrogation rate is about 1Hz and the maximum surveillance range is about 14 nmi with display of detected intruder aircraft up to 12 nmi. The ACAS II system can track up to 60 aircraft simultaneously and display up to 30 aircraft.

  - ***Collision Avoidance Tracking***

  The ACAS II receiver/transmitter uses the replies of the neighboring aircraft transponders to locate and track those aircraft. These replies include pressure altitude information. Bearing and distance information is derived using the ACAS II directional antennas and timing information based on transponder replies to specific interrogations. The bearing, distance, and altitude of each aircraft is used to calculate the track. This data is used to evaluate any potential conflict.

– ***Threat Detection***

Table 2 shows the parameters used in determining the type of advisory to be issued based on the particular threatening situation. The type of advisory appropriate for a given threatening situation is a function of the aircraft altitude. These altitude ranges can be seen as "sensibility" levels. Thus, the system provides no resolution advisories at altitudes below 1000 feet. Descriptions of the three types of advisories that can be issued are listed below:

- Traffic advisory (TA). A TA is the first information provided, informing the crew of nearby traffic that is not presently seen as a threat but can become a threat if conditions change adversely.
- Preventive Resolution Advisory (PRA), A PRA advises the crew to avoid specific deviations from the present vertical flight path since the ACAS II has determined that the situation is being resolved with the existing conditions.
- Corrective Resolution Advisory (CRA). A CRA advises the crew to take specific actions (i.e. climb or descend) in order to resolve the developing threat.

– ***Threat Resolution***

The key to understand the ACAS II threat evaluation and resolution logic is in recognizing that it is based on a projected CPA (closest point of approach). This CPA is the center of an airspace volume cylindrical in shape with a radius determined by either of two thresholds; TAU, which is the time dependant threshold or the horizontal distance threshold, whichever occurs first. Both TAU and horizontal threshold increase with altitude. The vertical depth of this cylindrically-shaped volume is determined by specific separation ranges also increasing with altitude.

		RADIO ALTITUDE		PRESSURE ALTITUDE				
	ADVISORY	UP TO 1000	UP TO 2350	UP TO 5000	5000 TO 10000	10000 TO 20000	10000 TO 42000	Above 42000
Advisory Time to CPA (TAU)	Traffic	20 sec.	25 sec.	30 sec.	40 sec.	45 sec.	48 sec.	48 sec.
	Resolution	---------	15 sec.	20 sec.	25 sec.	30 sec.	35 sec.	35 sec.
Horizontal Threshold	Protected Volume	---------	0.20 nmi	0.35 nmi	0.55 nmi	0.80 nmi	1.10 nmi	1.10 nmi
Vertical Separation Threshold at CPA	Traffic	850 ft	850 ft	850 ft	850 ft	850 ft	850 ft	1200 ft
	Preventive Resolution Threshold	---------	600 ft Inhibited	600 ft	600 ft	600 ft	700 ft	800 ft
	Corrective Resolution Threshold	---------	300 ft	300 ft	350 ft	400 ft	600 ft	700 ft

Table 1: ACAS II Advisory Parameters

– ***Communication and Coordination***

If both aircraft involved in an "advisory" situation are ACAS II equipped, the ACAS communicates with the other aircraft to coordinate evasive strategies. This coordination may occur before an advisory is issued and is calculated for optimum safe separation using the least disruptive maneuver possible. For example, if one of the aircraft is in a particular vertical speed profile, it may be advantageous for that aircraft to increase or decrease its VS as opposed to the other assuming appropriate VS. Whatever maneuver is selected this information is communicated to other aircraft and Air Traffic Control ground facilities. If the other aircraft is not ACAS equipped, the corrective or preventive maneuver responsibility is assumed by the ACAS II-equipped aircraft.

– Voice Announcement Priority

When an intruder enter in the protective space the aural alert shall be annunciated by a dedicated voice message over a cockpit speaker or headset, via the audio distribution panel at a volume adequate for clear understanding with high cockpit noise levels, at the same time not excessively loud at low noise levels.

2. Operational Details

As said before, the ACAS II interrogates once a potential threat is detected and presents audible and visual data to the pilot as a Traffic Advisory (TA). If the threat becomes imminent then ACAS II proposes an avoidance maneuver to the pilot in the vertical sense: this is a Resolution Advisory (RA).

A. General

Tracked distance and closure rate - in the slant range and vertical sense - permits the ACAS logic to estimate the time TAU until collision. The critical TAU thresholds depend on altitude and vary for the TA between 20s and 48s and for the RA between 15s and 35s. The defined TAU thresholds provide variable protective volumes for each altitude band.
The main feature of ACAS II is to function according to time criteria and not only with distance. From several successive replies, ACAS II calculates a time to reach the CPA (Closest Point of Approach) with the intruder, by dividing the range with the closure rate. This time value is the main parameter for issuing alerts and the type of alert depends on it. If the aircrafts transmit their altitude, ACAS II also computes the time to reach coaltitude.

With this information, the computer classifies the traffic into one of the four categories listed below and detailed in the following:

– Other Traffic (OT)
– Proximate Traffic (PT)
– Traffic Advisory (TA)
– Resolution Advisory (RA)

For traffic determined to be a threat (RA traffic), the TTR-4000 gives an RA on the audio system and on the ACAS II display(s). Pilots use the aural and visual RA to perform ACAS II established vertical maneuvers to avoid the threat traffic. RAs with other ACAS II equipped aircraft are coordinated by the TTR-4000 through the TDR-94D Mode S Transponder. The coordination may take place even before ACAS II issues the RA. In this way, ACAS II determines the least disruptive maneuver for each aircraft and avoids each aircraft performing the same maneuver.
ACAS II operates on relatively short time scales. The maximum generation time for a TA is 48 seconds before the CPA. For an RA the time is 35 seconds. The time scales are shorter at lower altitudes (where aircraft typically fly slower). Unexpected or rapid aircraft maneuver may cause an RA to be generated with

much less lead time. It is possible that an RA will not be preceded by a TA if a threat is imminent. The effectiveness of an RA is evaluated by the ACAS II equipment every second and, if necessary, the RA may be strengthened, weakened, reversed, or terminated. A protected volume of airspace surrounds each ACAS II equipped aircraft. The size of the protected volume depends on the altitude, speed, and heading of the aircraft involved in the encounter.

B. Type of traffic

– **Other Traffic (OT):**
  Other traffic are aircrafts within the selected traffic display range but not determined, by the computer, to be a potential threat.
– **Proximate Traffic (PT):**
  Proximate traffic are intruder aircrafts within ±1200 feet relative altitude and within 6 nmi. These aircrafts have a CPA determined by the computer not to be a threat. This type of intruding traffic always shows on the traffic display only when TA and RA traffic are present to visually aid the pilots acquiring the traffic.
– **Traffic Advisory (TA):**
  Traffic advisory alert are intruder aircrafts for which the CPA is within the time limits listed in the Table 2. This type of intruder is determined by the computer not to be a threat and no maneuvers are commanded. TA traffic shows on the traffic displays and may be upgraded to RA traffic depending on the continued flight path of the aircraft.
– **Resolution Advisory (RA):**
  Resolution advisory traffic are traffic determined by the computer to be a threat. The flight path of this type of intruder brings the CPA within time in seconds at the specified altitudes listed in the Table 2. There are two type of Resolution Advisory:

  1) **Preventive Advisory:** a preventive RA is announced when the current aircraft vertical speed will be able to resolve the threat situation. The computer issues an aural advisory command (for example "Monitor Vertical Speed"), and shows the vertical speed range to be maintained on the display VS bar.
  2) **Corrective Advisory:** The corrective RA is announced when the ACAS II computer has determined that the pilots shall take an action to avoid the threat traffic. The computer issues aural and visual advisory commands to the pilots to resolve the threat situation. To comply with these advisories, the pilots must change the vertical speed to a speed within the green band shown on the VSI.
     The computer may increase or decrease the vertical speed range as necessary to resolve the threat situation. If the vertical speed range changes, it is aurally annunciated and visually changed on the display VS bar.

C. Aural Messages

Each ACAS II aural alert is annunciated by a dedicated voice message on speakers and /or headset, at a volume adequate for clear understanding with high cockpit noise levels, but not excessively loud at low noise levels. A complete list with the explanation of the aural messages is provided in this section.

D. Inhibition of TA and RA

When below 1,700 ft AGL, the ACAS II logic estimates the altitude of the intruder above the ground, using own pressure altitude, own radar altimeter and the pressure altitude of the intruder. As noted on Figure 3, if this altitude is less than 380 ft, ACAS II considers the target to be on the ground, and so does not generate any TA or RA alarm.

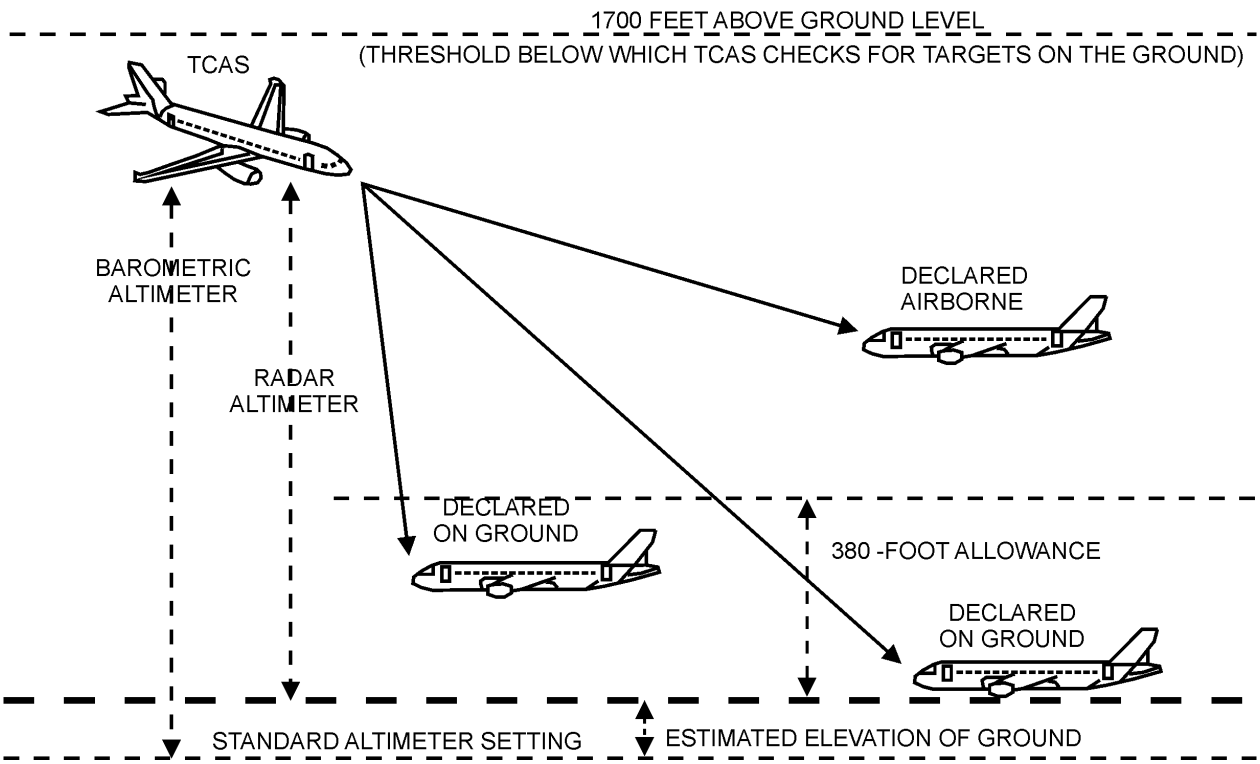

Fig. 3 - Target on the Ground Determination

The ACAS II computer is programmed to inhibit below 1700 feet specific warnings depending on the phases of flight (climb or descend).
Following a summary of the system inhibitions programmed into the ACAS II computer.

INHIBIT	PARAMETERS
Increase Descent RA	Inhibited below 1650 ft AGL while climbing and inhibited below 1450 ft AGL while descending.
Descend RA	Inhibited below 1200 ft AGL while climbing and inhibited below 1000 ft AGL while descending.
TA Voice Messages	Inhibited below 400 ft AGL while descending and inhibited below 600 ft AGL while climbing.

Table 2: System Inhibit

INHIBIT	PARAMETERS
RAs	Inhibited below 1100 ft AGL while climbing, and inhibited below 900 ft AGL while descending. (TCAS automatically reverts to TA only).
Advisory Priority	Automatically reverts to TA ONLY when higher priority advisories (such as Stall, GPWS/TAWS and Windshear) occur.
Climb RA	Inhibited when above 36000ft
Increase Climb RA	Inhibited when above 36000ft

Table 2: System Inhibit

E. Main Components

The ACAS II system is composed by a Transceiver, two Directional Antennas and a Radio Tuning Unit.
The ACAS II system aids the flight crew by detecting the presence of nearby aircraft and providing a warning when the proximity of that aircraft is determined to be a safety threat. The ACAS II interrogates the transponders in the surrounding aircrafts and uses the replies from those transponders to compute their flight path. From this data, the ACAS II evaluates the potential threat.
The ACAS II determines the relative position of surrounding aircraft by using its directional antennas for bearing information and by measuring the time from interrogation to reply to compute the distance. Altitude information is supplied by the transponders.

– ***TTR-4000 Transceiver***

The TTR-4000 contains the circuitry necessary to convert inputs from the directional antennas and from other aircraft systems interfaced into an on-screen representation of intruding aircraft, and if necessary, traffic and resolution advisories.

Output data generated by the ACAS II Transceiver are sent to the EFIS displays (Collins AFDs) to be shown together with the other Navigation System information.

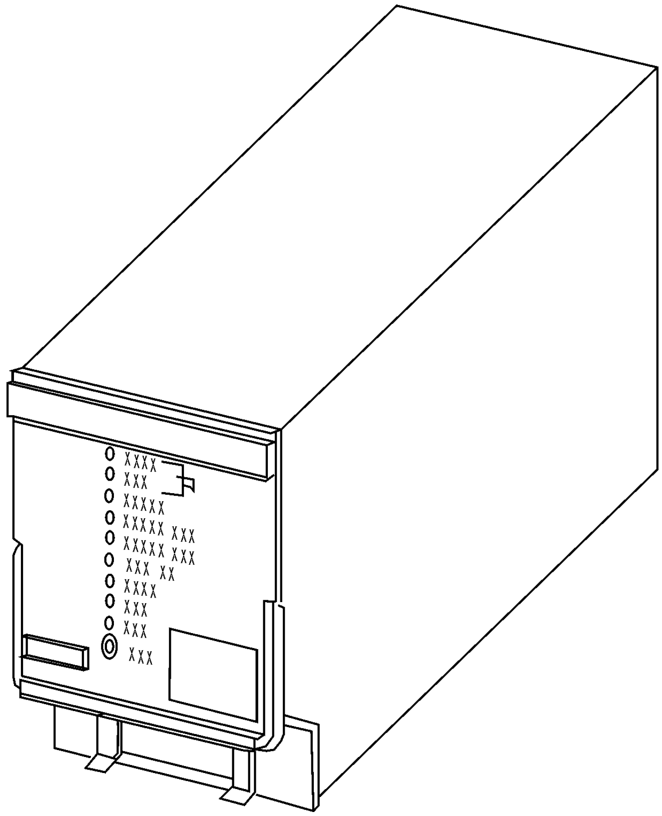

Fig. 4 - TTR-4000 Computer

– ***TRE-920 Directional Antenna***

The TRE-920 Antenna is the directional antenna for the ACAS II system. It has four passive antenna elements for directionality and is mounted outside of the aircraft fuselage.
The TTR-4000 Transmitter/Receiver receives and transmits through two directional antennas, one installed on the top side and the second on the bottom side of the fuselage.
The bottom antenna is installed to detect any aircraft that may be shadowed from the top antenna by the airframe and vice versa.
The connections between TTR-4000 Transmitter/Receiver and the antenna are made trough four TNC connectors and related coaxial cables.

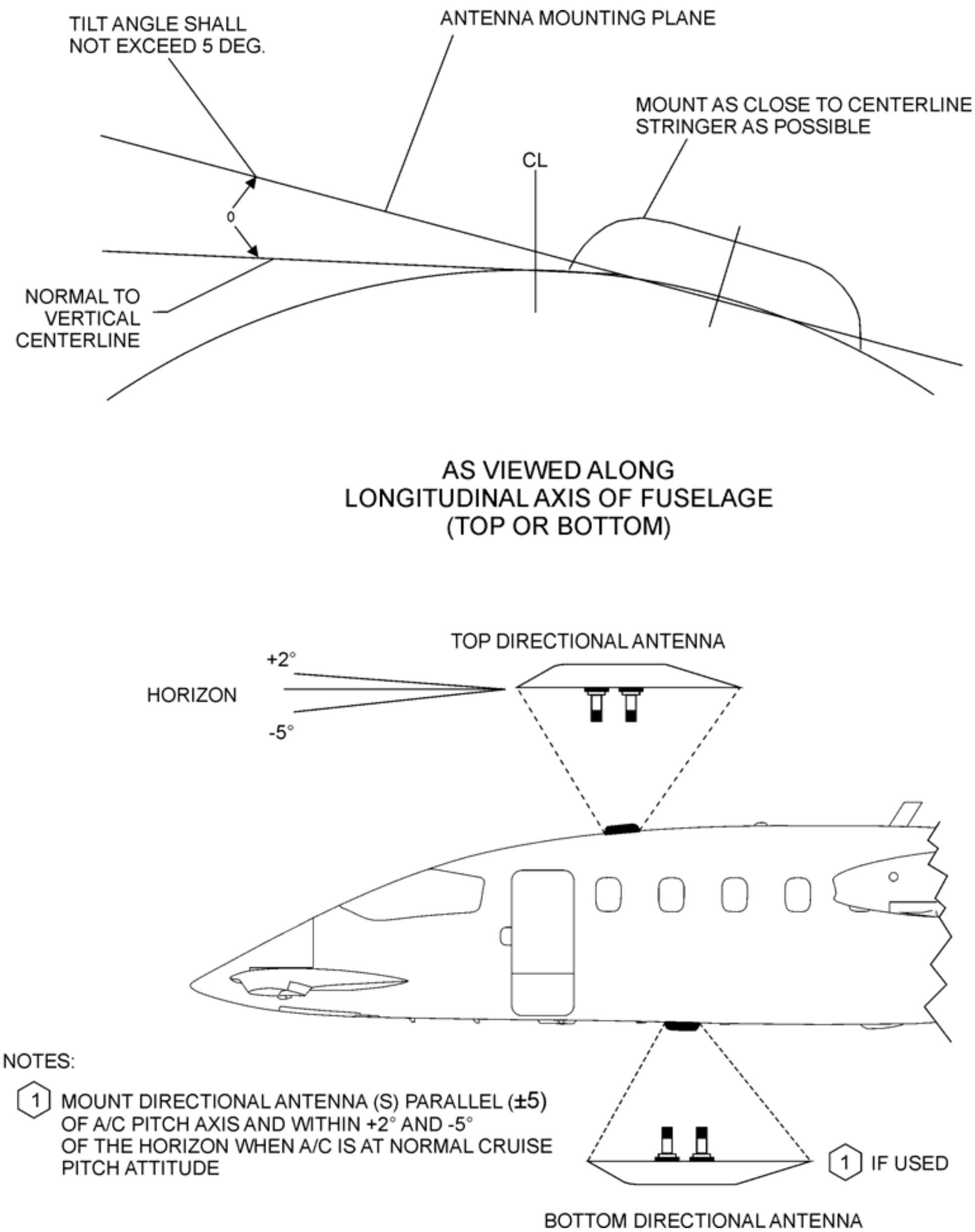

Fig. 5 - TRE-920 ACAS II Directional Antenna Installation

- ***RTU-4220 Radio Tuning Unit***
  The optional RTU-4220 combines control of communication, navigation, transponder, and TCAS radios into a single control unit.
  The equipment is form, fit and (almost) function equivalent with the basic RTU-200; the only difference is the integration of ACAS II controls.
  ACAS II controls are sent via TDR 94 Transponder.

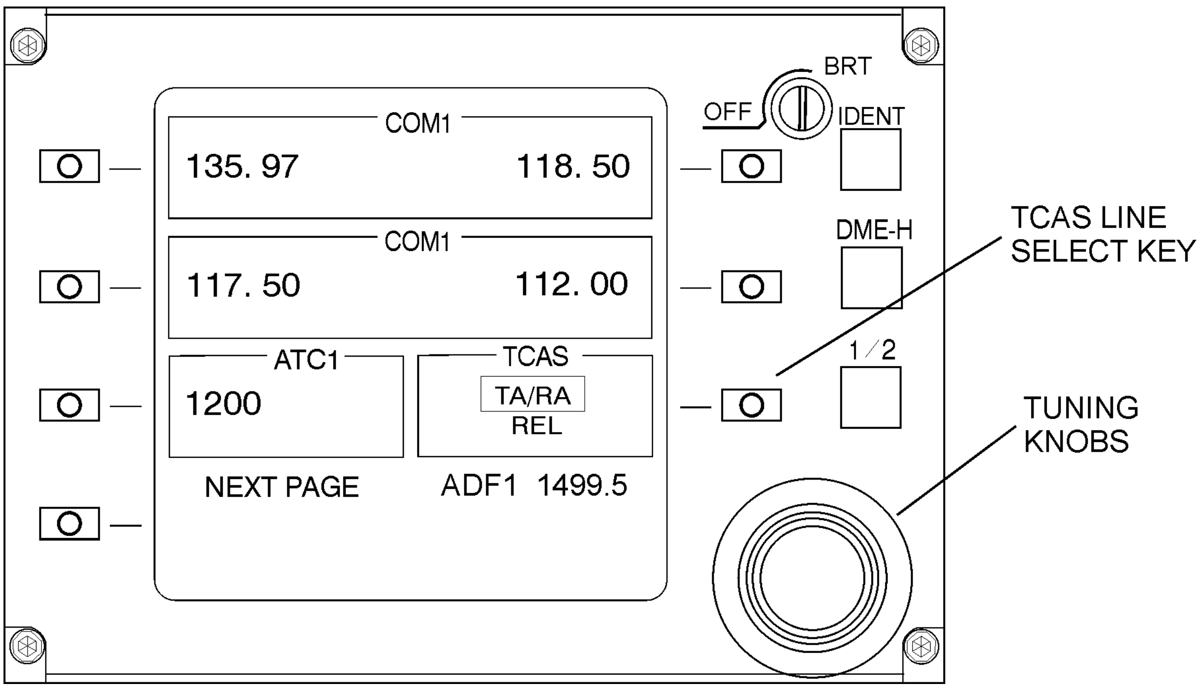

Fig. 6 - RTU-4220 Unit Top Level Display

– ***CDU-3000 Control Display Unit***
As the RTU-4220, the CDU-3000 combines control of communication, navigation, transponder, and CAS II radios into a single control unit (Ref. to Figg. 7 and 8).
To display the ACAS II command page, the first action is to press the Tune button on the CDU and then the Line select key adjacent to the TCAS MODE (R2).
As per RTU-4220, the controls are sent to the ACAS II via TDR 94 Transponder.
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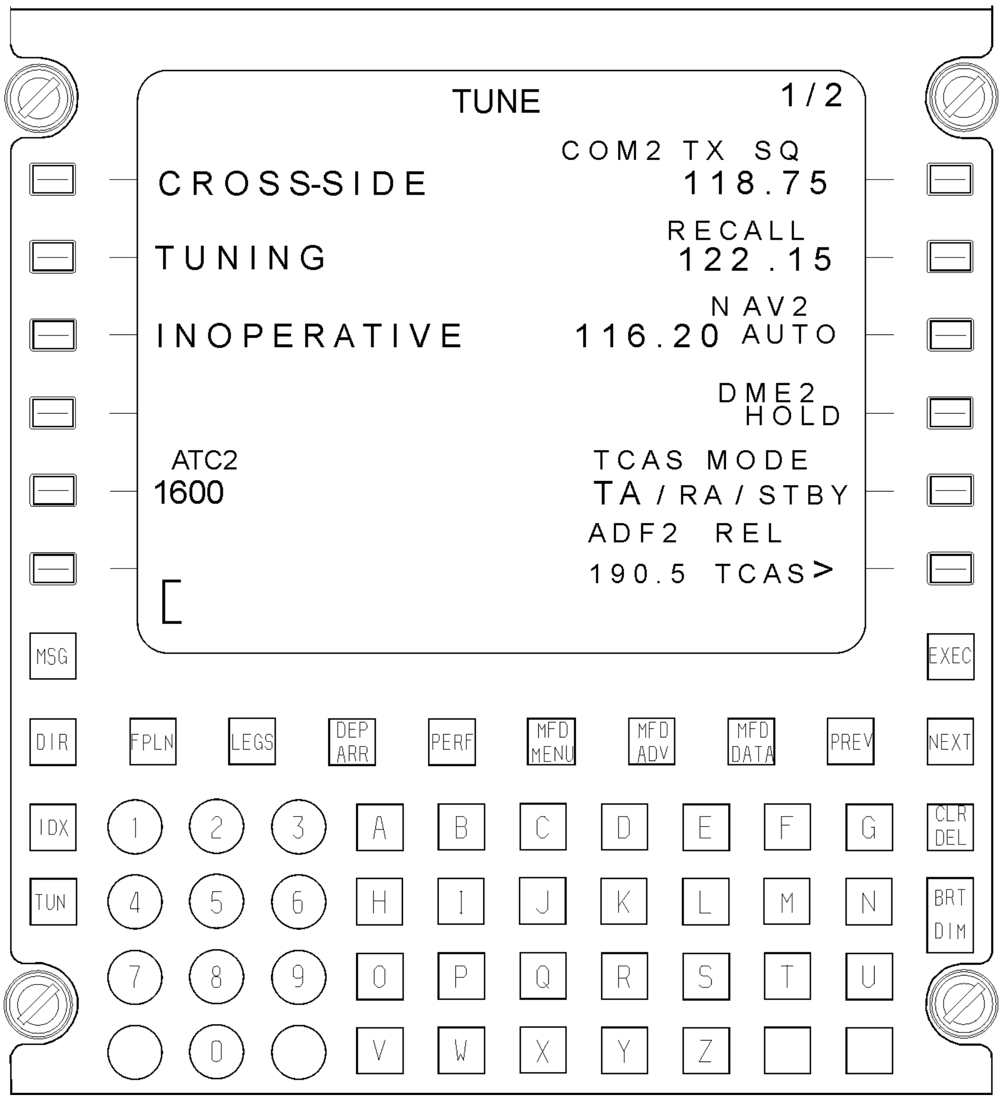


Fig. 7 - Tune page on CDU-3000

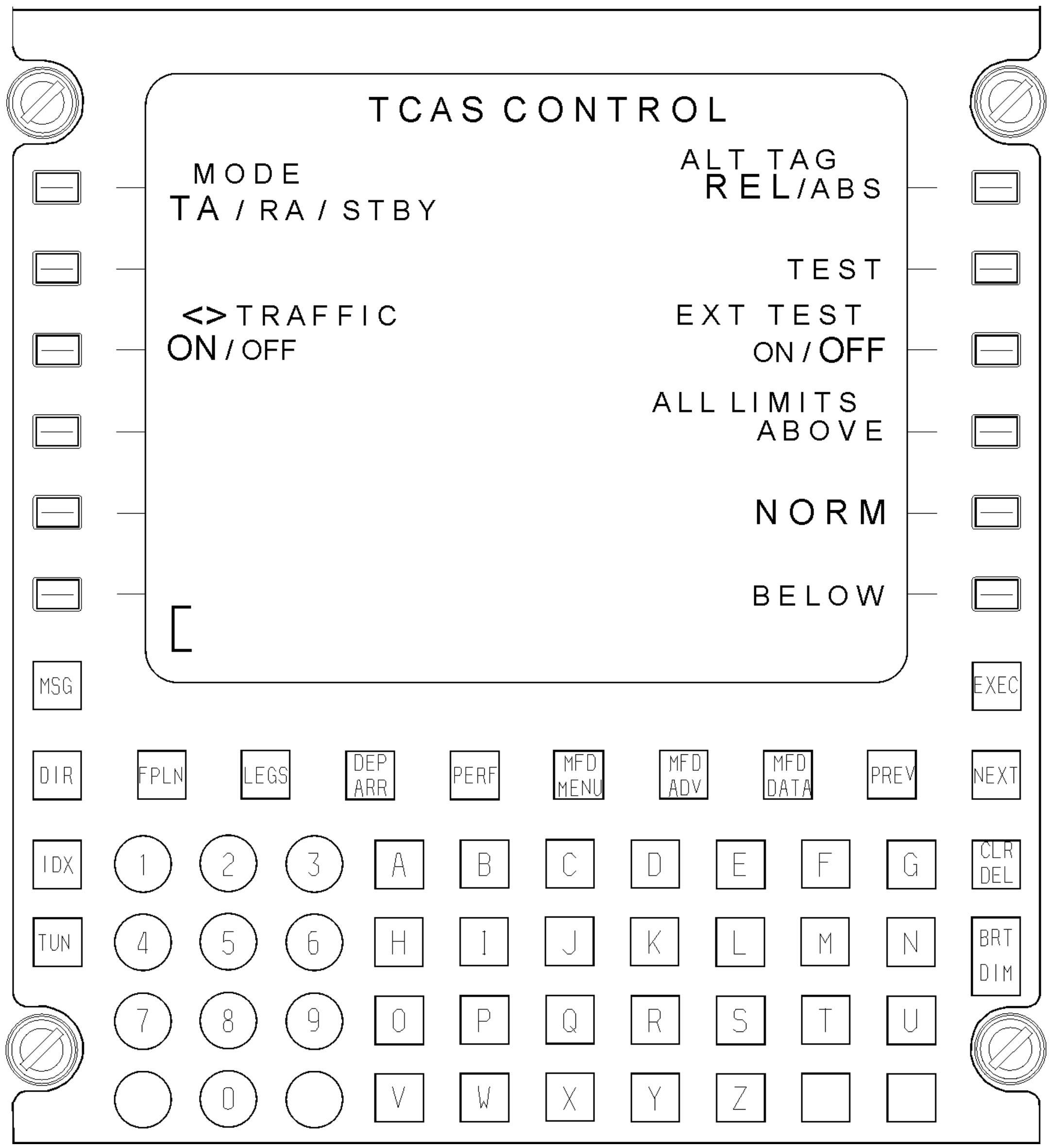


Fig. 8 - CDU ACAS II Control Page

– ***TDR 94D Mode S Transponder (including Pressure Altitude data)***
Primary (basic) and Secondary (optional) TDR-94D Diversity Mode-S transponders are installed, capable to operate on mode-A (ident), mode-C (altitude) and Enhanced Mode-S. Enhanced Mode-S capability allows sending and receiving messages via the interrogation / reply data link.
Identification alphanumeric code (which is a unique airplane identification assigned at installation and based on airplane registration number) as well as flight ID and navigation data are transmitted as defined by Enhanced protocol. Activation of the Primary and Secondary transponders is mutually exclusive: the active one between them operates with the ACAS system.

The active transponder receives through an Arinc-429 digital line the data sourced for collision avoidance by the onboard ACAS II, to be transmitted to the surrounding aircrafts and some diagnostic data that are sent to the IAPS.
Pressure Altitude data sourced by the ADC-3000 Air Data system used for navigation is sent to the ACAS II by means of the active transponder through an Arinc-429 digital line.
For Pressure Altitude resolution and accuracy see Figure 9.
The transponder receives the altitude it is to report from the CDU or RTU that is commanding it. In normal operation, the CDU or RTU will pass along the altitude associated with the ADC of the coupled autopilot or flight director. If the altitude data from the coupled ADC is invalid or missing and the altitude data from the cross-side air data is valid,the cross-side data will be passed along to the transponder. If an ADC has been "deselected" via the ADC reversion switch, its altitude data will not be passed along to the transponder, even if the SSM declares it is valid.

PARAMETER	RANGE	RESOLUTION	ACCURACY
Pressure Altitude	-1871 ft to +61.190 ft	1 ft	±20 at -1871 ft
			±20 at 0 ft
			±20 at 100 ft
			±25 at 10000 ft
			±35 at 20000 ft
			±40 at 30000 ft
			±40 at 40000 ft
			±90 at 50000 ft
			±110 at 55000 ft

Table 3: Pressure Resolution and Accuracy

– ***Radio Altimeter***
A basic ALT-4000 Radio Altimeter is installed to measure the height above ground level (AGL) from 0 to 2500 feet during the approach and take-off phases of flight. Two antennas, one for transmitting and one for receiving, are used.
Radio Alt information is sent through an Arinc-429 digital line to the ACAS II, and used to inhibit the Resolution Advisory at different altitudes (below 1700 feet) and different phases of flight (climb or descend).

– ***Attitude & Heading System***
Two basic AHC-3000 equipment are installed in the nose avionics bay, one on the pilot (left) side and one on the copilot (right) side.
Attitude & Heading data are sent through an Arinc-429 digital line from the Primary AHRS to the ACAS II.

– ***Display Control Panel (DCP)***
The two basic Display Control Panels (DCP), one for the pilot side displays (L PFD and MFD) and one for the copilot display (R PFD), allow selection of data to be displayed on the AFDs as well as selection of the active navigation sources, etc.
The RANGE knob on the DCP is used to control the display range for the ACAS II traffic information available for display on the PFDs and MFD.

– ***B1045 Audio Panels***
Two basic B1045 Audio Panels, one available to the pilot and the other one to

the copilot, control the audio signals coming from COM, NAV, MKR, DME and ADF, the signals from the Aural Warning, the communications between crew members and between crew and passengers.
When ACAS II system is installed, the audio line coming from ACAS II Computer is sent to a dedicated auxiliary, not mutable Audio input available on the Audio Panels. In this way, the Aural Alert and self-test result messages generated by the ACAS II Computer are immediately available to the pilots through the A/C audio integrated system, on the headphones or cockpit speakers depending on the selection made through the Audio Panels controls themselves, at a fixed level that can't be muted or adjusted.
Since the ACAS voice announcements alert, in particular the prioritisation and compatibility, must be consistent with the general philosophy of other alert systems, the priorities of alerts/ warnings must be Stall, Windshear (if installed), GPWS/EGPWS (if installed), and then ACAS.

– ***Integrated Avionics Processor System (IAPS)***
  The basic IAPS provides a central data collection and distribution point for the avionics systems.
  The Integrated Avionics Processor System (IAPS) is located in the nose avionics bay.
  Appropriate configuration is set on the IAPS Central Strapping Unit modules for ACAS II installation.
– ***Adaptive Flight Display (AFD)***
  The basic AFDs provide display and control functions for the flight instruments, engine instruments, navigation, hazard avoidance and communications systems. Three AFDs are installed. The left and right AFDs are configured as Primary Flight Displays (PFDs), the central AFD is configured as a Multifunction Display (MFD).
  Traffic information are sent from the ACAS II to the AFDs through two dedicated Arinc-429 digital busses. The Number 1 Arinc 429 bus send information to LPFD and MFD, the Number 2 Arinc 429 bus send information to RPFD.
  Traffic symbols and related data as well as Traffic / Resolution Advisory messages are shown on the PFDs and MFD (only in HSI Rose, HSI Arc and FMS PPOS Map formats), stand alone or shared with the other navigation information, as selected through controls available by means of dedicated soft-keys.
– ***Discrete Information from aircraft configuration sensors***
  The discrete inputs used by this system are listed in the following:
  – EGPWS Inhibit (TA only when active).
  – STALL Inhibit (TA only when active).
  – WOW status.
  – Landing Gear in extended configuration.

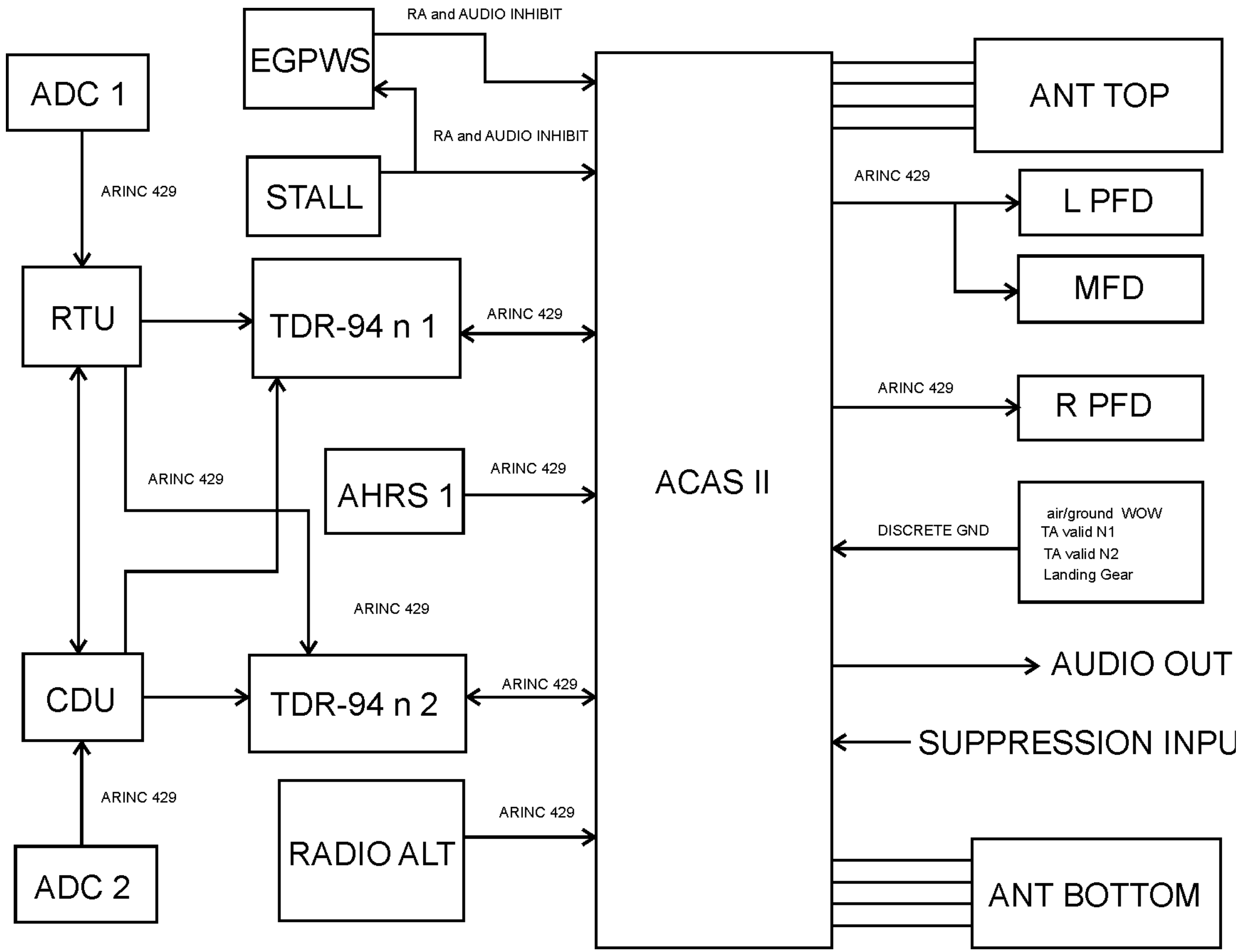


Fig. 9 - ACAS II - Block Diagram

- ***Mechanical Installation and Power Supply***
  The ACAS II Computer is installed in the nose avionics bay.
- The TRE-920 Antennas are installed one on the top forward fuselage, between frame 20 and frame 21, one on the bottom forward fuselage, between frame 23 and frame 24.
  The ACAS II system is powered by the Right Avionics Supplementary Bus through the "TCAS" circuit breaker (5 Amps), located on the Copilot CB Panel (as per the TCAS I system previously installed on P180 Avanti II A/Cs as option.

3. Operation

A. Controls

The control of the ACAS II is done by both RTU and CDU.
With reference to Fig. 6 shown in this section, set the TCAS mode from the top-level display page, pushing the TCAS line select key once to position the tune window around the TCAS mode in the TCAS sub-display.
Set the TCAS mode by turning either tuning knob.

- TA/RA (traffic and resolution advisories)
- STBY (standby)
- TA ONLY (traffic advisories only)
- TEST

The active mode is shown in large letters.
With reference to Figg. 7 and 8 shown in this section, press the TCAS line select key (R2) once to position the tune window around the TCAS mode in the TCAS sub-display.
Set the TCAS mode by proper LSK.

- TA/RA (traffic and resolution advisories)
- STBY (standby)
- TA ONLY (traffic advisories only)
- TEST

The active mode is shown in large letters.

The operating controls of the ACAS II system are synchronized on RTU and CDU, for example if RTU sets the ACAS II system in STBY mode, CDU will display the same information (STBY).
Considered the commonality of TCAS controls available on the RTU and CDU, in the following only the RTU is described in detail.
The RTU shows TCAS operating modes and ATC squawk codes on the top level display page and TCAS and transponder operating modes on the TCAS and ATC main display pages. The top-level display page is shown at power-up and when no RTU control has been selected for a period of time (after about 20 seconds of inactivity). The top-level display page shows sub-displays for each of the radios controlled by the RTU, and provides access to the main display pages. For TCAS and ATC functions, the RTU provides:

- Two knobs that are used to set TCAS modes and ATC squawk codes
- An ATC IDENT button to turn on the transponder IDENT function
- 7 display line keys to select the active display line on the top level display page and to select and set various operating modes on the main display pages
- A BRT knob to adjust the general brightness of the display.

B. TCAS Main Display Page

To access the TCAS main display page from the top level display page, push the TCAS line select key two times; first to position the tune window around the TCAS mode in the sub-display, and second to change to the TCAS main display page (see Figure 11).
Following a list of the available commands.

TCAS mode select	Push the adjacent line select key to toggle through the TCAS modes. The available modes are TA/RA (traffic and resolution advisories), STBY (standby), and TA ONLY (traffic advisories only).
Altitude mode select	Push the adjacent line select key to toggle between the altitude modes. The available modes are REL (relative) and ABS (absolute).
Traffic display select	Push the adjacent line select key to set other traffic (non-threat traffic) monitoring ON (all traffic) or OFF (threat traffic only).
Return key	Push the adjacent line select key to return to the top level display page.
OT window display	Other traffic (OT) shows on the TCAS traffic display in variable altitude volumes. Normal (NORM) mode is displayed when neither ABOVE or BELOW is selected. Normal mode sets the OT window limits from 2700 feet above to 2700 feet below own aircraft altitude.
Above limit select	Push the adjacent line select key to extend to 9900 feet the upper OT window limit. May be used in conjunction with the below limit selection.
Below limit select	Push the adjacent line select key to extend to 9900 feet the lower OT window limit. May be used in conjunction with the above limit selection.
Test	Push the test line select key to initiate the TCAS self-test function. Push and hold the test line select key to initiate the extended TCAS self test. When TCAS self test is initiated, the ATC self test is also initiated.

The active mode is shown in cyan and in large letters on the TCAS main display page.
ACAS II self test operates with the aircraft in flight and on ground.

When the ATC system is set to STBY mode automatically also the ACAS II system is set to STBY mode.
When the ATC system is set to TEST mode automatically also the ACAS II system is set to TEST mode and vice versa.

When, on the ATC system, the altitude-reporting mode is set to OFF, the ACAS II does not show traffic or give resolution advisories.

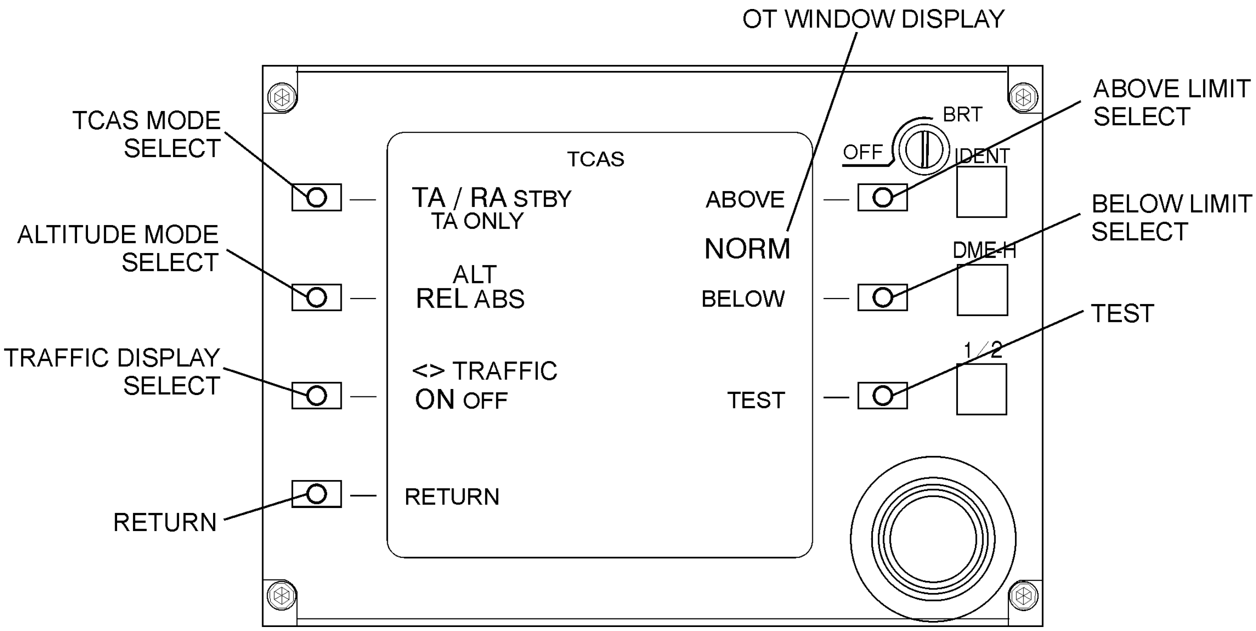


Fig. 10 - TCAS Main Display Page

C. RTU set-up for ATC
The ATC control with the RTU-4220 is the same as for the basic RTU-4200 control.

D. PFD Traffic Displays
ACAS II traffic information is shown on the PFDs to assist the pilot in identifying nearby traffic and potential collision threats.

E. To show the ACAS II traffic displays one of these format shall be selected (press line select key R3):

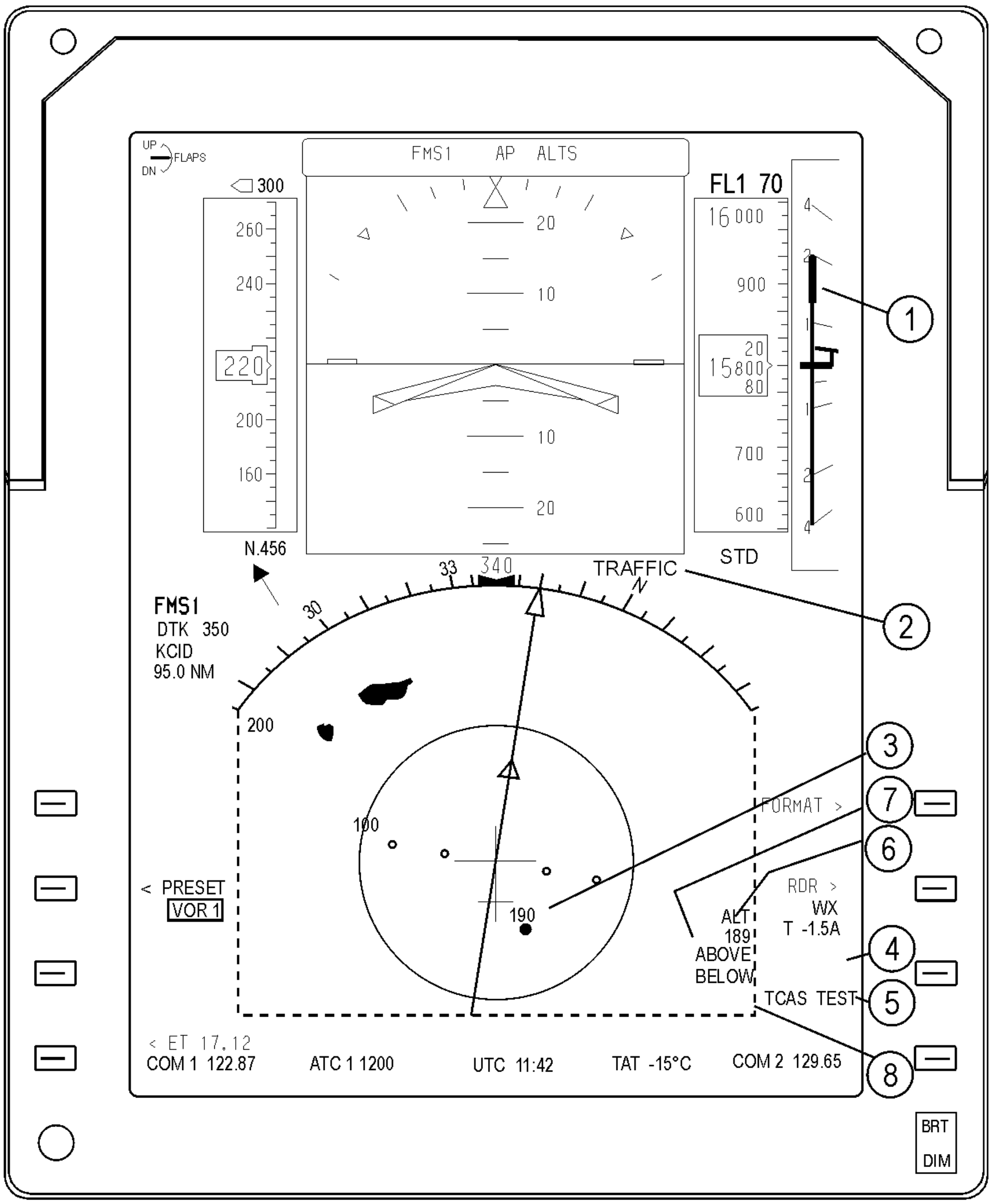
- ROSE
- ARC
- MAP

After, for display which ACAS II mode is selected press the TFC line select key (R2).

Below are listed the TCAS II information displayed depending on the operative modes:

1) When the TA/RA mode is active (see par. 3.1.8.1), the intruder traffic is displayed on both PFDs, the RA vertical speed 'fly-to' commands is displayed on both PFD (see Figure 12 and Figure 13).
2) When TA ONLY mode is active (3.1.8.1), the TCAS computer does not provide RA 'fly-to'commands on both PFD.
3) When STBY mode is selected (3.1.8.1), the TCAS computer does not show traffic on the displays, does not give resolution advisories, and the transponder does not reply to TCAS interrogations, from other airplanes.
4) Whenever a Resolution Advisory or Traffic Advisory is active, and TCAS is not displayed with a range of 40 NM or less selected, an inverse video cyan box shall be placed around the white TFC Line Select key (R-LSK3) Legend.

– In this case, the first momentary press of the TFC R-LSK3 shall select the Rose/TCAS format with the 10 mile Full Range selected (5 mile ½ Range Ring shown) and the TFC returns to its normal color (if appropriate) if the associated advisory warning goes away.
– The inverse video cyan box shall also be removed, and TFC returns to its normal color (if appropriate) if the associated advisory warning goes way.
– Radar or optional Terrain information, if previously displayed, shall be deselected from display.
– Radar or optional Terrain information, if previously displayed, shall be deselected from display.
– Radar and optional Terrain shall not be selected in Rose/TCAS mode .



1. Resolution Advisory
2. TA/RA Alert/TCAS FAIL Annunciation
3. TCAS Traffic Symbol
4. Traffic KSK (Inverse Video Box shown)
5. TCAS Mode Annunciation
6. TCAS ABS ALT
7. Above/below enabled
8. TCAS Display Boundaries (dashed lines for info only, not actually shown)

Fig. 11 - PFD ACAS II Annunciation

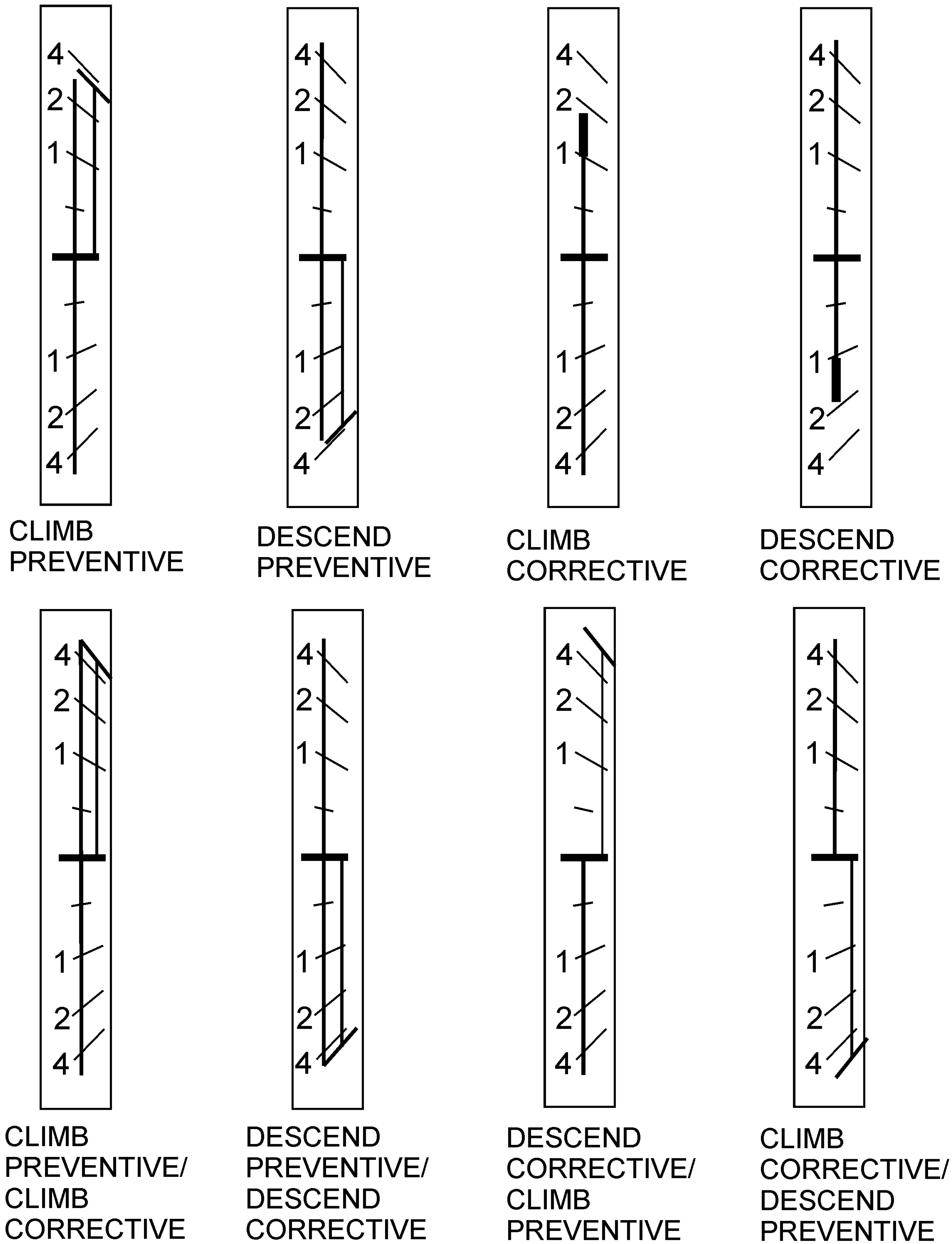


Fig. 12 - ACAS II Vertical Speed Advisories

F. Mode and Annunciations on PFDs

The "TCAS" indications shall be shown below the TFC label on the right lower side of the PFD (Figure 12).
Only one ACAS II mode annunciator can be displayed at a time, as presented in the priority list.

ANNUNCIATION	DESCRIPTION
NO VSI RA	This annunciation shall be displayed in yellow whenever TA/RA mode is active and TCAS Vertical Resolution Advisory word can't provide advisory information or if vertical speed is not displayed on the PFD
TCAS TEST	This annunciation shall be displayed in cyan whenever TCAS is placed into test mode and TD is actively selected for display Shall be white if TD is not actively selected for display.
TCAS OFF (see NOTE)	This annunciation shall be displayed in cyan whenever TCAS system is placed into STBY mode and TD is actively selected for displayed. Shall be white if TD is not actively selected for display
TA ONLY	RAs shall not be displayed when TA ONLY is the active mode. This annunciation shall be displayed in cyan when "TA ONLY" mode is selected either on the CDU or RTU and TD is actively selected for display. Shall be white if TD is not actively selected for display This annunciation shall turn yellow and flash when a TA is present, regardless of TD state

Other annunciations are displayed in a different location and are not prioritized

ANNUNCIATION	DESCRIPTION
TRAFFIC	If the ACAS II unit issues a Resolution Advisory (RA) or Traffic Advisory (TA), "TRAFFIC" is displayed, the annunciation shall be red for an RA. Shall be yellow for a TA. The annunciation shall be displayed below and to the left, of the Barometric Altitude The "TRAFFIC" annunciation shall flash for 5 seconds when it first comes in view The "TRAFFIC" annunciation shall also flash for 5 seconds if an TA is upgraded to an RA.

ANNUNCIATION	DESCRIPTION
TCAS FAIL	Regardless of the selected traffic display state, this annunciation shall be displayed in yellow whenever the ACAS II system is failed or no data is received by the PFD. This annunciation shall be displayed when ACAS II RA, ACAS II TD, or other RA or TD related information, is not properly received by the AFD Failures related exclusively to TD shall cause the message when TD is enabled. The annunciation shall be positioned where TRAFFIC is positioned (above). If ACAS II FAIL is displayed no ACAS II Modes shall be displayed.
Vertical RA	The Resolution Advisory commanded vertical speed shall be displayed on the Vertical Speed Scale The advisories shall be displayed as red/ green bands showing the forbidden/ acceptable commanded vertical speed ranges and limits. The red and green bands shall be displayed between Vertical Speed numbers and the Vertical speed Pointer. The Vertical Speed pointer, its trailing tail (thermometer), and the Vertical Speed digital readout (when in view) shall become red if the current Vertical Speed is in a red (forbidden) ACAS II zone.

NOTE: An ACAS II turned off is considered failed. "TRAFFIC" and "TCAS FAIL" are displayed.

G. Annunciation Symbol on PFDs

The ACAS II symbols of intruder and related altitude information are displayed as follows:

- The symbols shall be displayed with the relative or absolute altitude, as selected on either the CDU or RTU, and with a datatag (altitude, climb/descend arrow) when appropriate.
- Resolution advisory (RA) symbols shall be solid red squares o Traffic advisory (TA) symbols shall be solid yellow circles.
- Proximate (PROX) traffic symbols shall be filled cyan diamonds
- OTHER Traffic (non-threat) symbols shall be open cyan diamonds.
- If the intruder is neither climbing nor descending, no arrow shall be shown.
- The datatag value shall represent the relative or absolute intruder altitude in 100's of feet.

- The datatag shall be the same color as the ACAS II intruder symbol it is accompanying
- When Relative altitude is selected on either the CDU or RTU (therefore, no ACAS II Altitude

Annunciation displayed on the PFD/MFD), or Absolute Altitude is inoperative, altitudes shown with each intruder shall be relative to the current aircraft's altitude, and the datatag value has a range of -99 to + 99.

- Values below -99 shall be displayed as "-99".
- Values above +99 shall be displayed as "+99".
- For ACAS II Absolute Altitude modes, the altitudes shown with the intruder are Absolute
- Altitudes and the datatag value shall have a range of 000 to 999.
- If the calculated value is less than zero, the three digits shall be replaced with the letters "XXX".
- If the calculated value is greater than 999, then "999" shall be displayed.
- If an intruder aircraft is at a higher altitude, the datatag shall appear above the associated ACAS II symbol.
- If an intruder aircraft is at a lower altitude, the datatag shall appear below the associated ACAS II symbol.
- The default PFD ACAS II traffic display shall be the Rose/TCAS mode, at current TCS range, without Weather Radar displayed.

H. MFD Traffic Displays

ACAS Traffic information shown on the MFDs assists the pilot in identifying nearby traffic and potential collision threats.
ACAS traffic displays can be overlaid on the MFD ROSE, ARC, and Present Position Map formats.
An ACAS ONLY format replaces any previously displayed incompatible format on the MFD when the TFC Line Select Key is selected.
The MFD displays TCAS Traffic in a manner similar to the PFD except the RA vertical guidance information (see Figure 14 and Figure 15).
The ENGINE INDICATORS, are not impacted by the ACAS II traffic visualizations (all considerations regarding this aspect performed in report in ref. [17] are still valid). See also Figure 14 and Figure 15.

I. Mode and Annunciations on MFD

ACAS II mode annunciations shall be the same as on the PFD, with the following exceptions:

- TCAS FAIL annunciation shall not occur for failures that are related exclusively to RA displays.
- The MFD shall provide no Vertical Resolution Advisories or Vertical Resolution Annunciations.

J. Annunciation Symbol on MFD

MFD ACAS II Traffic Annunciators shall be the same as PFD (see Figure 14 and Figure 15) with the following exceptions:

- ACAS Full Range ring shall be a white circle with fixed inward tick marks at the 12 cardinal clock positions.
- When ACAS II ONLY format is selected, the Full Range value shall be displayed as a white number in the Full Range circle near the 10 o'clock position.
- The ACAS II Altitude Annunciation's operation is the same, but the annunciation shall be displayed to the left of the ABOVE/BELOW status annunciation location.
- Plan Map shall not be compatible with traffic overlay.
- When the Plan Map format is selected, the TFC legend normally associated with R-LSK3 shall turn white (if previously cyan) and the cyan caret remains cyan.
- ABOVE/BELOW status annunciation's operation is the same, but the annunciation location shall be above Lower FORMAT (R-LSK1).

MFD Traffic Display shall be the same as PFD Traffic Display with the exceptions noted below.

- MFD Formats that are ACAS II compatible shall be Rose, ARC, MAP, and TCAS ONLY.
- The Default MFD TCAS Traffic display shall be the TCAS ONLY mode, at current ACAS II range, without Weather Radar or optional Terrain displayed

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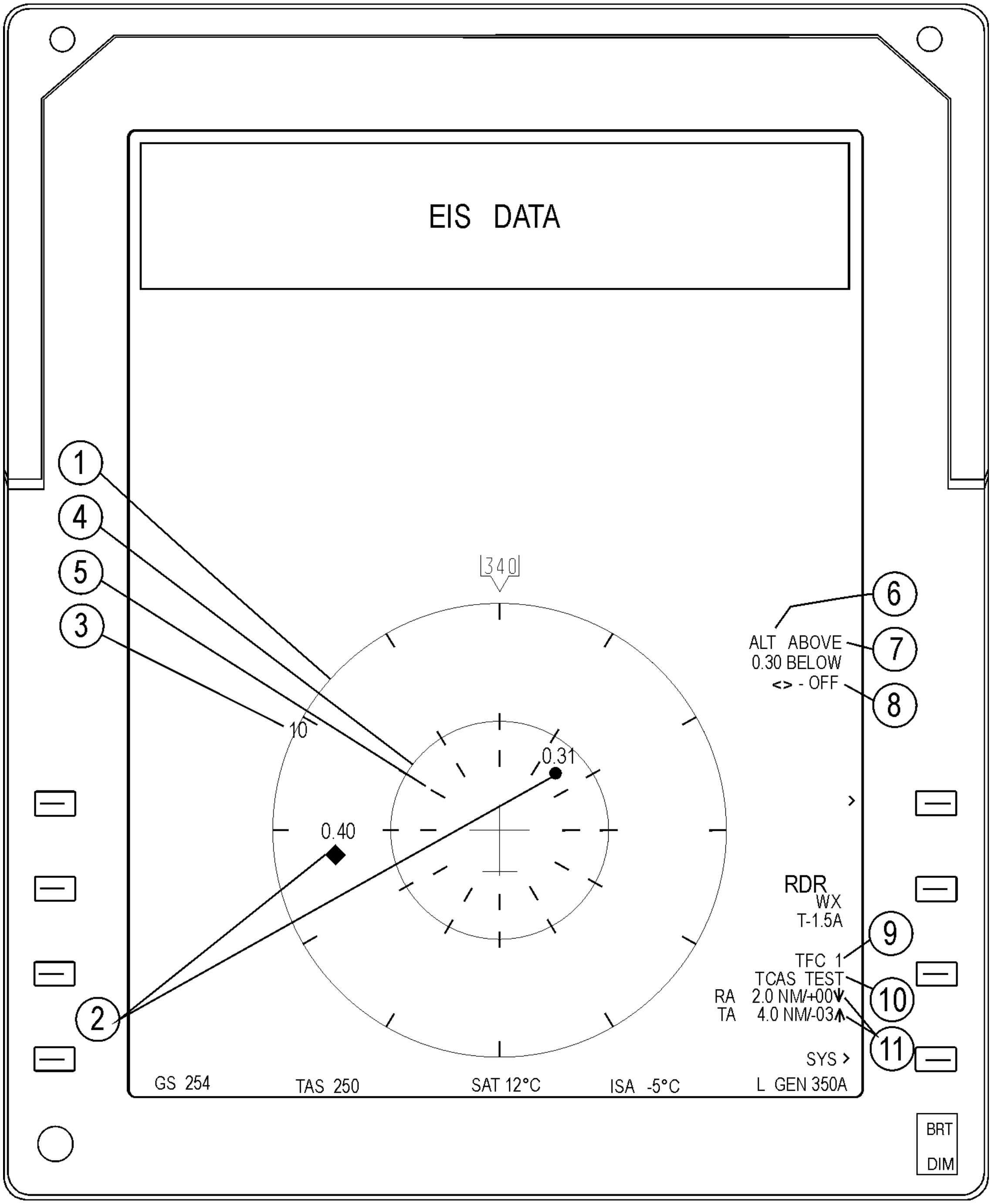

1. TCAS Only Format
2. TCAS Traffic Symbol
3. TCAS Range Ring, 10 NM Range shown
4. TCAS Half Range Ring
5. TCAS 3NM Range Ring
6. TCAS ABS ALT
7. Above/Below enabled
8. TCAS Other Traffic off Icon
9. Traffic LSK
10. TCAS Mode Annunciation
11. TCAS NO BRG Table

Fig. 13 - MFD TCAS II Annunciations

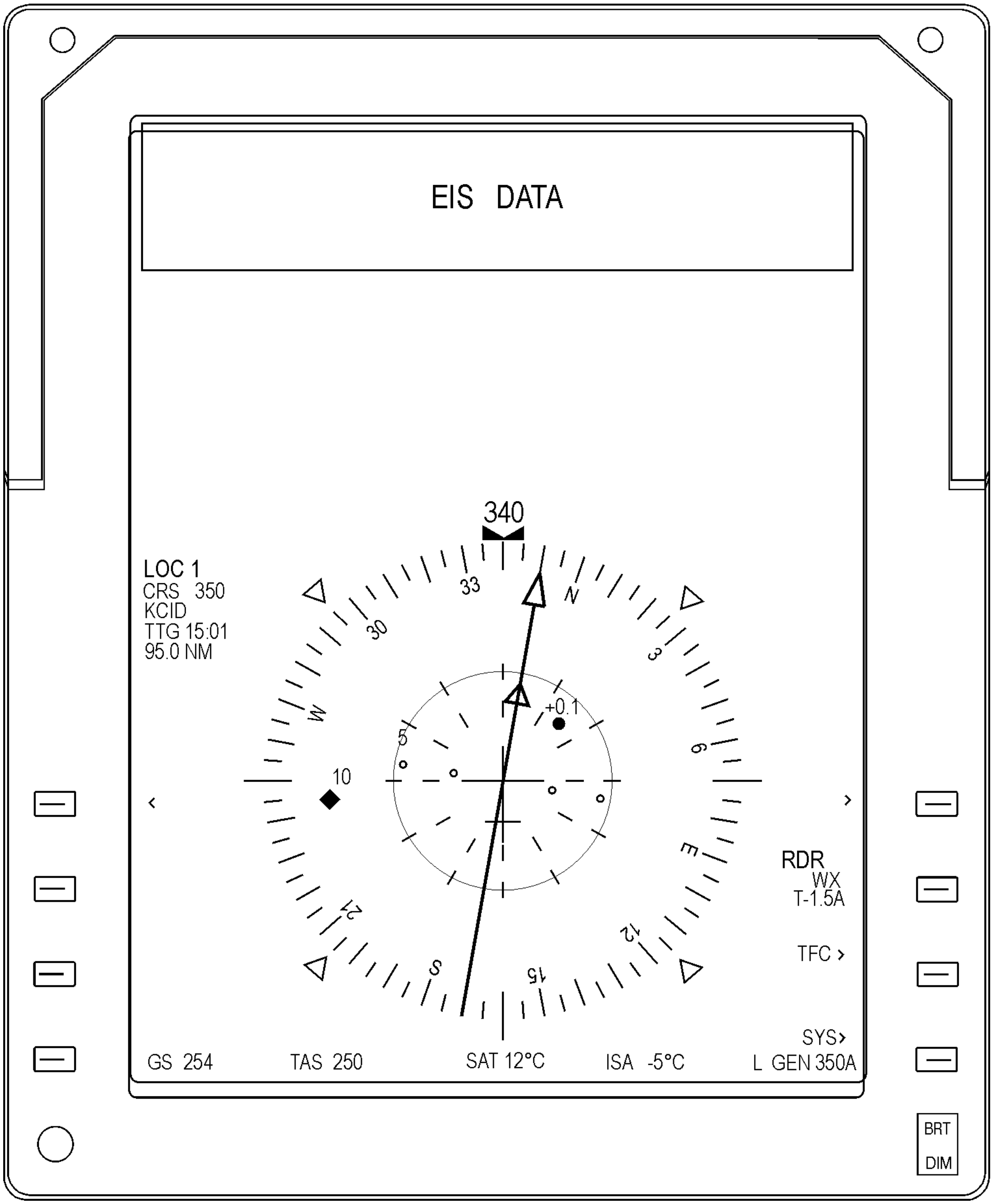

Fig. 14 - MFD ACAS II Rose mode

K. Aural Messages

Following the list of the aural messages with the explanation.

Traffic Advisories (TAs) annunciated by the voice message "TRAFFIC, TRAFFIC" stated once for each TA.
Resolution Advisories (RAs) annunciated by the following voice messages, as appropriate:

"CLIMB, CLIMB"--climb at the rate depicted by the green (fly to) arc or line on the IVSI.

"DESCEND, DESCEND"--descend at the rate depicted by the green (fly to) arc or line on the IVSI.

"MONITOR VERTICAL SPEED"--ensure that vertical speed is out of the illuminated IVSI red arc or line.

"ADJUST VERTICAL SPEED, ADJUST"--modify the vertical speed to a value within the illuminated green arc or line.

"CLEAR OF CONFLICT"--range is increasing, and separation is adequate; expeditiously return to the applicable clearance, unless otherwise directed by ATC.

"CLIMB, CROSSING CLIMB, CLIMB, CROSSING CLIMB"-- climb at the rate depicted by the green (fly to) arc or line on the IVSI. Safe separation will best be achieved by climbing through the threat's flight path.

"DESCEND, CROSSING DESCEND, DESCEND, CROSSING DESCEND"--descend at the rate depicted by the green (fly to) arc or line on the IVSI. Safe separation will best be achieved by descending through the threat's flight path.

"MAINTAIN VERTICAL SPEED, MAINTAIN"--maintain the existing climb or descent rate as depicted by the green (fly to) arc or line on the IVSI. Safe separation will best be achieved by not altering the existing vertical speed.

"MAINTAIN VERTICAL SPEED, CROSSING MAINTAIN"-- maintain the existing climb or descent rate as depicted by the green (fly to) arc or line on the IVSI. Safe separation will best be achieved by not altering the existing vertical speed and climbing or descending through the threat's flight path.
The following voice messages are required to annunciate enhanced ACAS II maneuvers when the initial RA does not provide sufficient vertical separation. The tone and inflection must connote increased urgency.

"INCREASE CLIMB, INCREASE CLIMB"--climb at the rate depicted by the green (fly to) arc or line on the IVSI. Received after "CLIMB" advisory, and indicates an additional climb rate is required to achieve safe vertical separation from a maneuvering threat aircraft.

"INCREASE DESCENT, INCREASE DESCENT"--descend at the rate depicted by the green (fly to) arc or line on the IVSI. Received after "DESCEND" advisory, and indicates additional descent rate is required to achieve safe vertical separation from a maneuvering threat aircraft.

"CLIMB - CLIMB NOW, CLIMB - CLIMB NOW"--climb at the rate depicted by the green (fly to) arc or line on the IVSI. Received after a "DESCEND" resolution advisory and indicates a reversal in direction is required to achieve safe vertical separation from a maneuvering threat aircraft.

"DESCEND - DESCEND NOW, DESCEND - DESCEND NOW"-- descend at the rate depicted by the green (fly to) arc or line on the IVSI. Received after a "CLIMB" resolution advisory and indicates a reversal in direction is required to achieve safe vertical separation from a maneuvering threat aircraft.

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ACAS II - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00

A. This topic provides the following ACAS II System Maintenance Practices:
– ACAS II Computer - Removal/Installation
– ACAS II Directional Antenna Upper - Removal/Installation
– ACAS II Directional Antenna Lower - Removal/Installation

2. ACAS II Computer - Removal (Ref. to Fig. 201)

A. Fixtures, Test and Support Equipment

Blanking caps	Not specified
Warning Notices	

B. Referenced Information

Maintenance Manual Chapter 24-00-00
Maintenance Manual Chapter 34-41-00

C. Procedure

(1) Open, tag and safety this circuit breakers:
Copilot CB Panel
– TCAS
(2) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(3) Remove the electrical power (Refer to 24-00-00).
(4) Remove the radome/nosecone (Refer to 34-41-00).
(5) Loosen the two Hold Down Nuts that secure the unit to the Mounting Tray.
(6) Remove the unit from the Mounting Tray. The system connectors on the rear is automatically disconnected.

3. ACAS II Computer - Installation(Ref. to Fig. 201)

A. Fixtures, Test and Support Equipment

Blanking caps	Not specified
Warning Notices	

B. Referenced Information

Maintenance Manual Chapter 24-00-00

Maintenance Manual Chapter 34-41-00

C. Procedure

(1) Make sure, as necessary that:
- The applicable circuit breakers are open, tagged and safetied
- The Warning Notices are in position
- There is no electrical power on the airplane
- Access is available

(2) Slide the ACAS II Computer into Mounting Tray until fully engaged. The system connectors on the rear is automatically connected.

(3) Secure the unit to the Mounting Tray by the Hold Down Nut.

(4) Install the radome/nosecone (Refer to 34-41-00).
Remove the safety tags and close the previously opened circuit breaker:
- TCAS

(5) Replace the electrical Power.

(6) Remove the Warning Notice in the flight compartment

4. ACAS II Directional Antenna - Removal (Refer to Fig. 202)

A. Fixtures, Test and Support Equipment

Circuit breaker safety clips and tags

B. Referenced Information

Maintenance Manual Chapter 24-00-00

Maintenance Manual Chapter 25-00-00

C. Procedure

NOTE: The removal procedure for the Upper and Lower ACAS II Directional Antenna is identical.

(1) Open, tag and safety this circuit breakers:
Copilot CB Panel
- TCAS

(2) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.

(3) Remove the interiors to gain access to the ACAS II Directional Antenna (Refer 25-00-00).

(4) Disconnect the four Electrical Connectors.

(5) Remove the four screws that secure the antenna to the fuselage skin.

(6) Remove the Antenna.

(7) Cut the sealant and remove the Adapter.

(8) Cap and stow the electrical connectors and the wiring harness from dust if replacement unit is not to be installed immediately.

5. ACAS II Directional Antenna - Installation (Fig. 202)

A. Fixture, Test and Support Equipment

0.5 in (12 mm) paint brush	Not specified
Lint-free cloth	Not specified
Non-metallic spatula	Not specified

B. Materials

06-005, Sealant

02-009, Metyl-Ethyl-Ketone

C. Referenced Information

Maintenance Manual Chapter 24-00-00

Maintenance Manual Chapter 20-00-00

D. Procedure

(1) Make sure, as necessary that:
- The applicable circuit breakers are open, tagged and safetied
- The Warning Notices are in position
- There is no electrical power on the airplane
- Access is available

WARNING: BE CAREFUL WHEN YOU USE MEK. OBEY THE HEALTH AND SAFETY INSTRUCTIONS GIVEN IN CHAPTER 20-00-00.

NOTE: The installation procedure for the Upper and Lower ACAS II Directional Antenna is identical.

(2) If previeously installed, remove the cap from the electrical connectors and free the electrical harness.

(3) Clean the replacement parts and their interfaces (Refer 20-00-00).

(4) Apply a fillet of sealant around the ACAS II Antenna Adapter.

(5) Place in position the Adapter.

(6) Locate the Antenna to Adapter and fasten with four screws. Apply the sealant on the antenna screws.

(7) Connect the four Electrical Connectors to the Antenna.

(8) Remove excessive sealant (Refer 20-00-00).

(9) Install the interiors removed previously (Refer 25-00-00).

(10) Remove the safety tags and close the previously opened circuit breaker :

Copilot CB Panel
- TCAS

(11) Replace the Electrical Power.

(12) Remove the Warning Notice in the flight compartment.

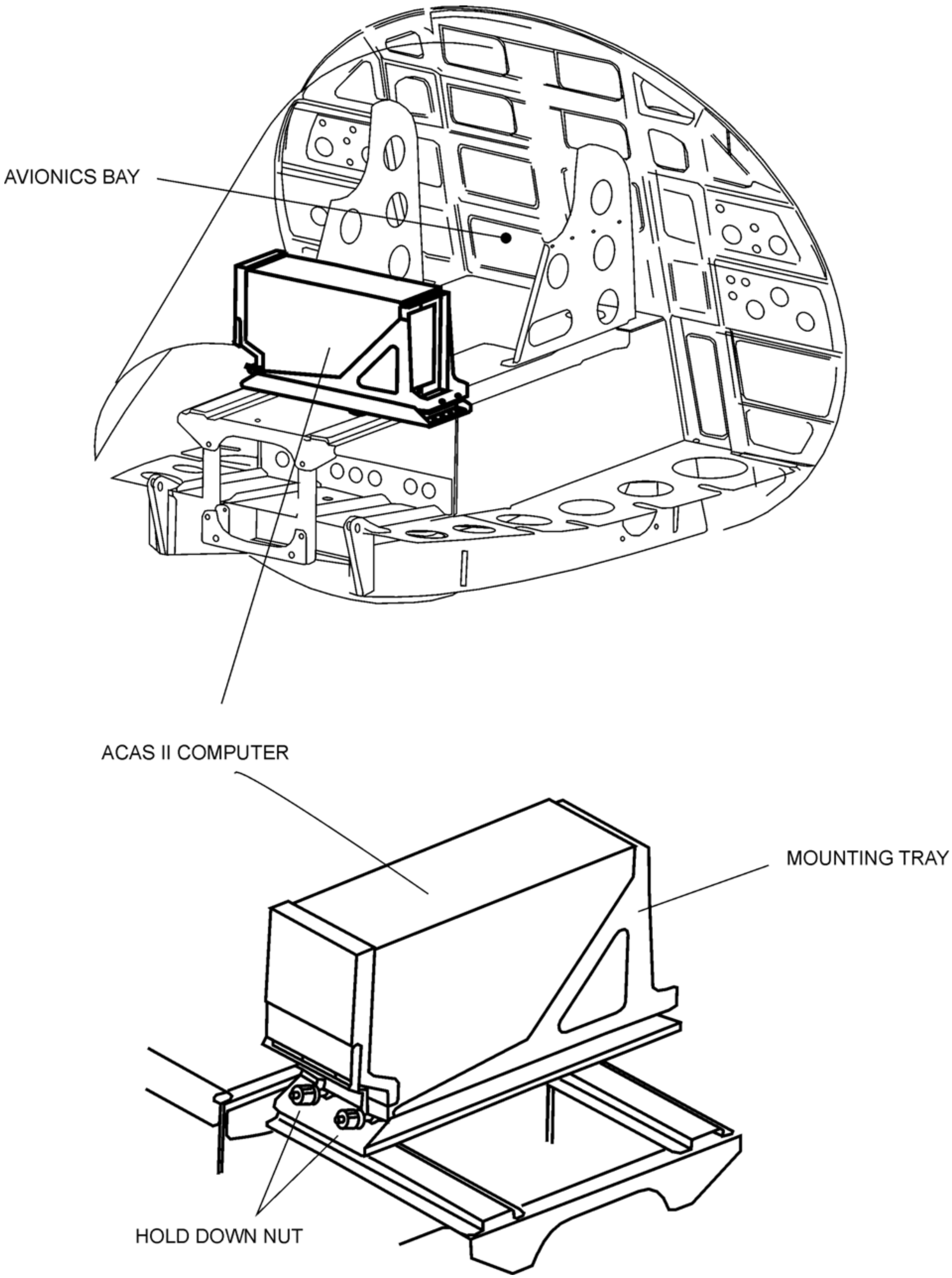

Fig. 201 - ACAS II Computer - Removal/Installation

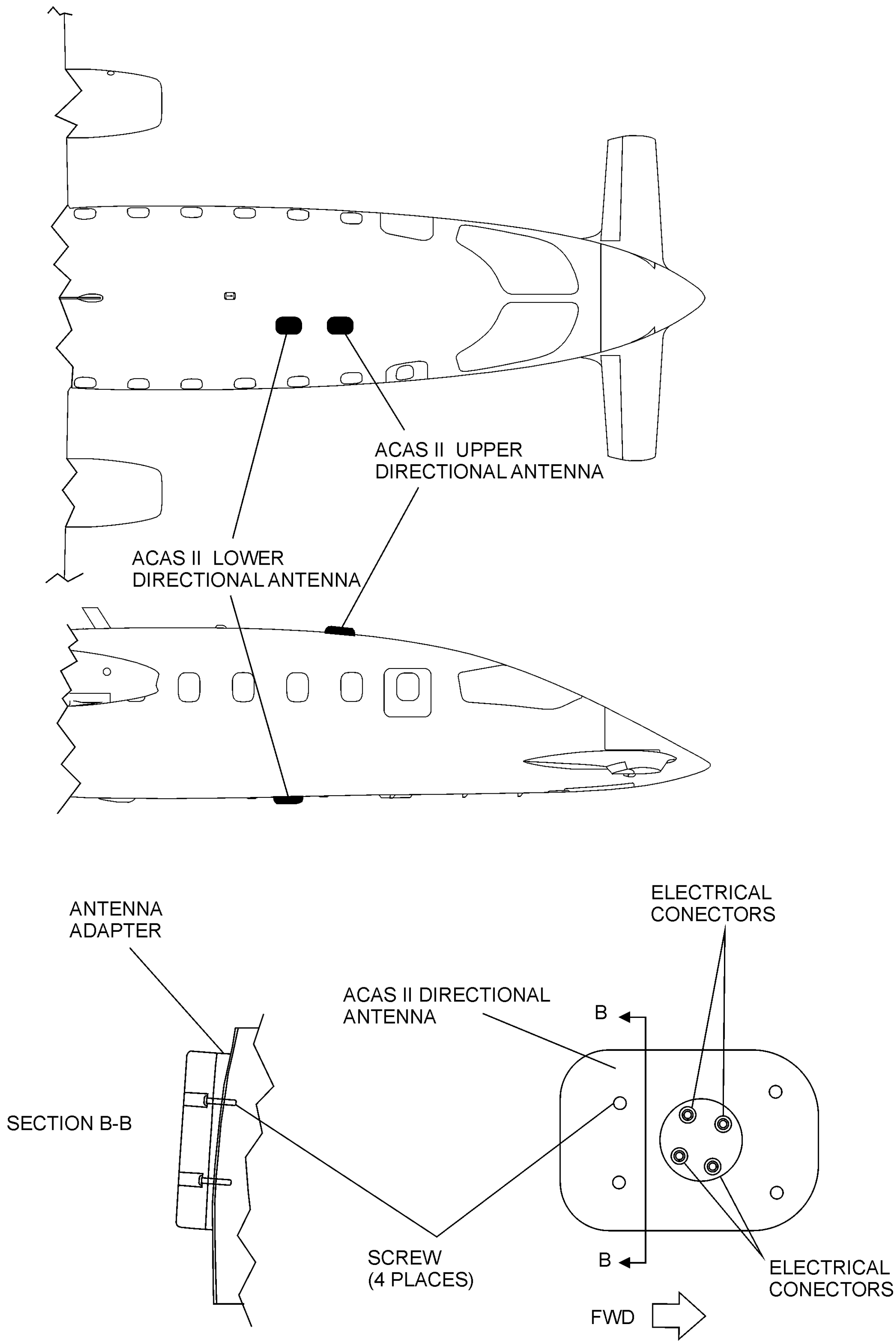

Fig. 202 - ACAS II Directional Antenna

6. ACAS II Self- Test (Fig. 203)

A. Procedure

(1) Remove Radome/Nosecone (Refer 53-10-00) to gain access to the TTR4000 computer.

(2) Set BAT switch to ON position.

(3) Set AVIONICS switch to ON position.

(4) Press and release the TEST button on the TTR4000 front panel.

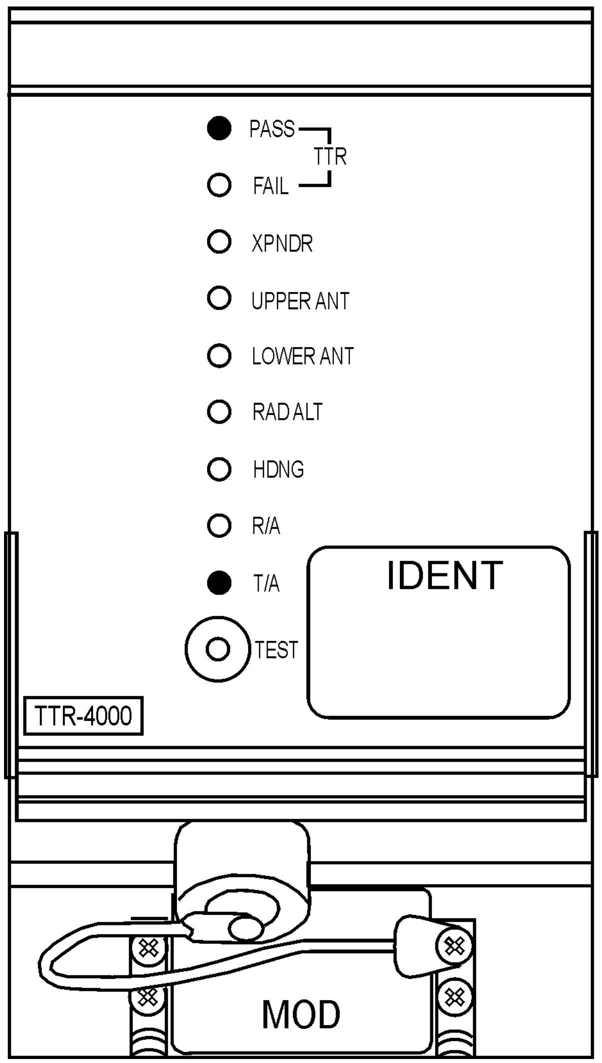

Fig. 203 - TTR-4000

(5) Verify that all lamps (except PASS lamp) light for 1 sec.

(6) At the end of the test all lamps must be OFF, PASS lamp must be ON. If any one of them stay ON (and PASS lamp stay OFF, FAIL lamp ON), a failure is present in the system. Refer to the table 201 below for the diagnostic evaluation

ANNUNCIATOR	DESCRIPTION
TTR PASS	ACAS System OK
TTR FAIL	ACAS Receiver-transmitter Failure
XPNDR	Mode S Transponder or Data Link Failure
UPPER ANT	Top Mounted Antenna Failure
LOWER ANT	Bottom Mounted Antenna Failure
RAD ALT	Lack or Failure or Radio Altimeter Information
HDNG	Lack or Failure of Heading Information
RA	Resolution Advisory Indicator Failure
TA	Traffic Display Failure

Table 201:

7. ACAS II Functional Test (Fig. 204)

A. Procedure

Functional test performed by RTU:

(1) Set the Battery switch to ON.

(2) Set the Avionics switch to ON.

(3) Select ACAS II on both PFD and MFD.

(4) Select TCAS page on CDU

(5) Select the ALT mode on the TCAS page of RTU.

(6) Select XPNDR page on RTU and activate XPNDR 1 to STBY.

(7) Select TCAS page on RTU and select the TA/RA mode.

(8) Press TEST button on RTU and verify:

- TCAS TEST indication in view on both PFD and MFD.
- On TCAS page of CDU, the TEST indication enlarges and becomes cyan color.
- On both PFD and MFD a RA symbol (red square) appears 2 nmi away, at 200 ft above the relative quote (read +02), without VS arrow indication and +90 degrees of bearing.
- On both PFD and MFD a TA symbol (yellow circle) appears 2 nmi away, at 200 ft below the relative quote (read -02), with climbing VS arrow indication and -90 degrees of bearing.
- On both PFD and MFD a PT symbol (white or cyan diamond) appears 3650 nmi away, at 1000 ft below the relative quote (read -10), with descending VS arrow indication and +33.75 degrees of bearing.
- On both PFD and MFD a OT symbol (white or cyan empty diamond) appears 3650 nmi away, at 1000 ft above the relative quote (read +10),

without VS arrow indication and -33.75 degrees of bearing.
- A "TCAS SYSTEM TEST OK" audio message will be audible at the end of the test.

(9) Set the Avionics switch to OFF.

(10) Set the Battery switch to OFF.

Functional test performed by CDU:

(1) Set the Battery switch to ON.

(2) Set the Avionics switch to ON.

(3) Select ACAS II on both PFD and MFD.

(4) Select TCAS page on RTU

(5) Select the ALT mode on the TCAS page of CDU.

(6) Select XPNDR page on RTU and activate XPNDR 2 to STBY.

(7) Select TCAS page on CDU and select the TA/RA mode.

(8) Press TEST button on CDU and verify:
- CAS TEST indication in view on both PFD and MFD.
- On TCAS page of RTU, the TEST indication enlarges and becomes cyan color.
- On both PFD and MFD a RA symbol (red square) appears 2 nmi away, at 200 ft above the relative quote (read +02), without VS arrow indication and +90 degrees of bearing.
- On both PFD and MFD a TA symbol (yellow circle) appears 2 nmi away, at 200 ft below the relative quote (read -02), with climbing VS arrow indication and -90 degrees of bearing.
- On both PFD and MFD a PT symbol (white or cyan diamond) appears 3650 nmi away, at 1000 ft below the relative quote (read -10), with descending VS arrow indication and +33.75 degrees of bearing.
- On both PFD and MFD a OT symbol (white or cyan empty diamond) appears 3650 nmi away, at 1000 ft above the relative quote (read +10), without VS arrow indication and -33.75 degrees of bearing.
- A "TCAS SYSTEM TEST OK" audio message will be audible at the end of the test

(9) Set the Avionics switch to OFF.

(10) Set the Battery switch to OFF.

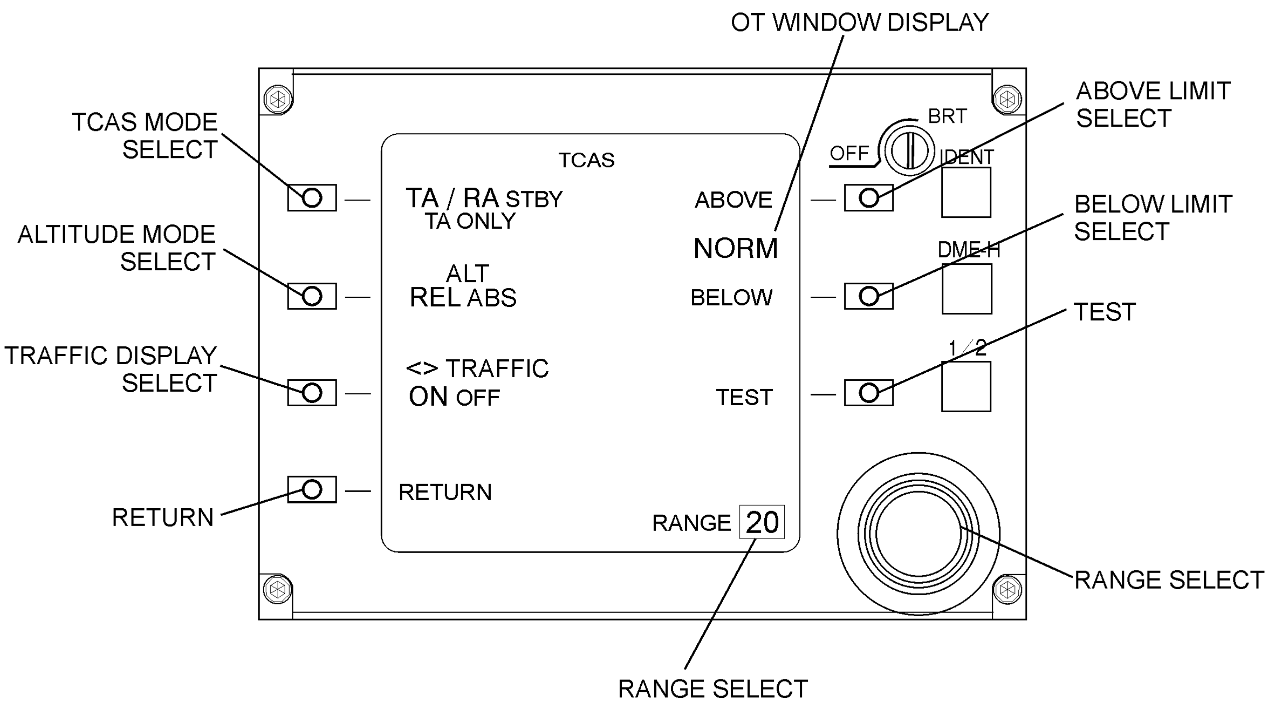

Fig. 204 - RTU "ACAS II Page"

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EGPWS - DESCRIPTION AND OPERATION

1. Description

A. The Enhanced Ground Proximity Warning System (EPGWS) is installed as an alternative for the TAWS Class B system.
The equipment provides alerts and warnings to prevent Controlled Flight Into Terrain (CFIT). The system obtains these objectives by integrating a variety of aircraft parameters as inputs, by applying alerting algorithms and by providing the pilots visual and aural annunciations.
The system uses GPS, Attitude, Air parameters, Radio Altimeter and ILS receiver data to compute the A/C present position. The worldwide database allows the system to provide terrain situational awareness for the present and next (about 45 seconds) position. The basic GPWS is the main function of the MK VIII EGPWS so that its integry is maintained independent of other functions.

The system integrates the following groups of components:

– EGPWS computer (including system control and configuration components)
– Inputs of aircraft systems (aircraft configuration, autopilot engaged, etc)
– Audio system for aural warnings integration
– EFIS (for terrain display and visual annunciations).

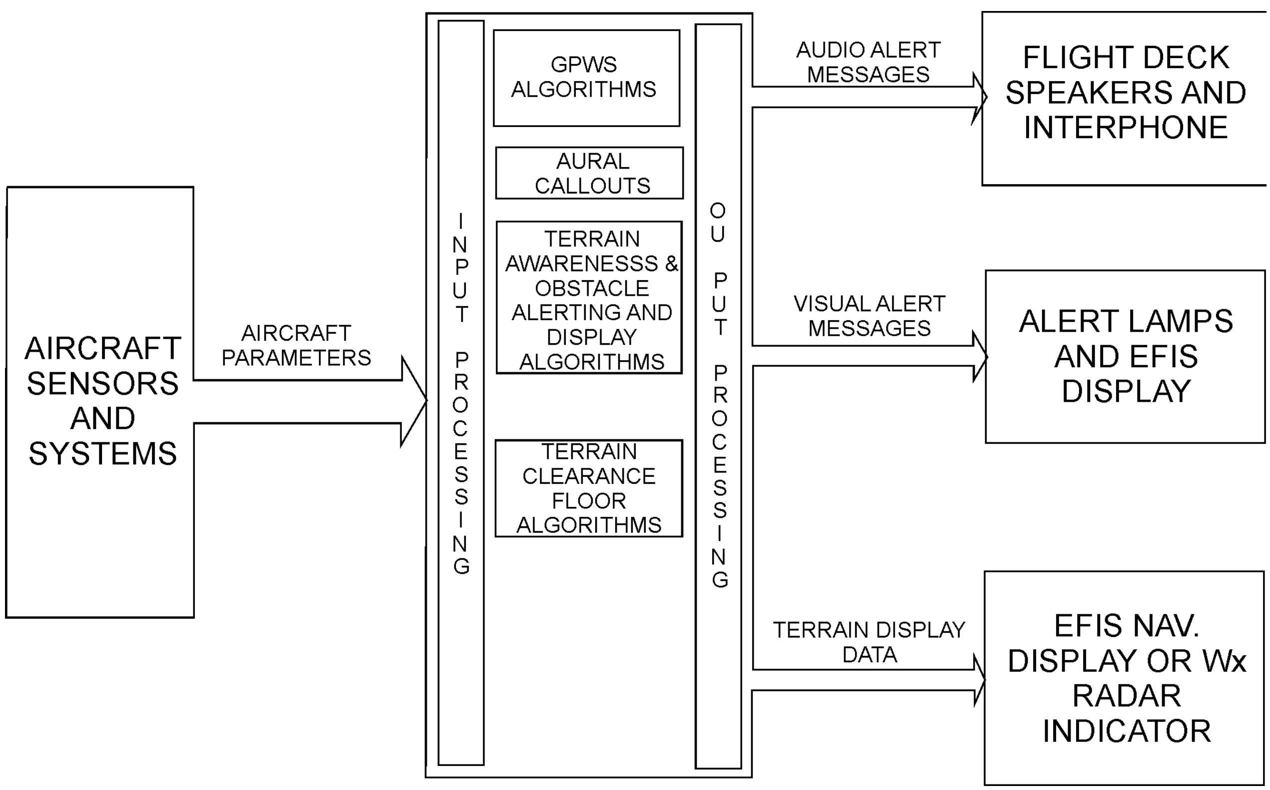

Fig. 1 - EPGWS

The EGPWS main components are listed below:

- EGPWS Computer
- EGPWS Configuration Module
- Miscellaneous / Reversionary Panel
- Smart Cable (PCMCIA Interface) - ground test equipment (maintenance only)
- Terrain Data base Card - is used with the smart cable

B. EGPWS Computer and Mount

- The MK VIII EGPWS Computer is a rack mounted GPWS and TAWS Class A computer..

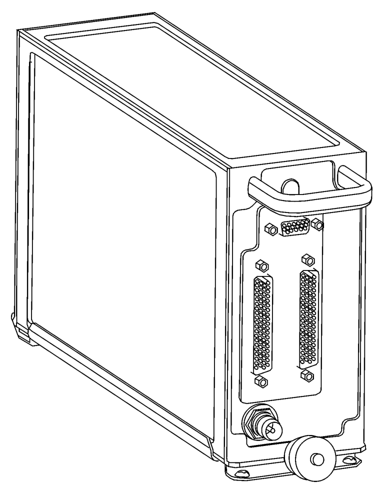

Fig. 2 - MK VIII EPGWS Computer

It is installed in the Nose Avionics Bay, on the RH side.

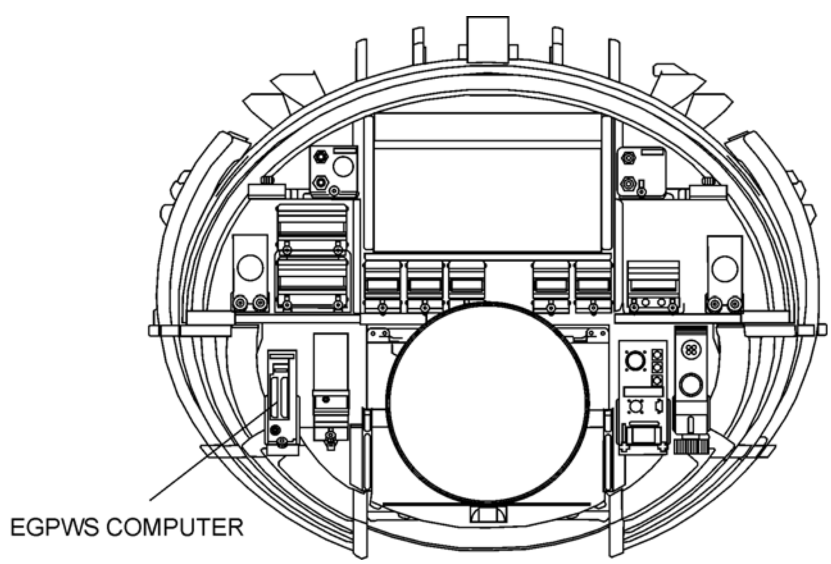

Fig. 3 - MK VIII EPGWS Computer Position

The main system functions are:

- Basic GPWS Modes 1 to 5
- Mode 6 Altitude Callout and Bank Angle alert
- Terrain Clearance Floor
- Terrain and Obstacles Awareness alert and display (FLTA function)
- Updatable database (front loading using RS232 connection)
- External Configurable Module

In addition to the above functions the EGPWS computer performs the following ones:

- Input signal processing (including filtering and signal monitoring)
- Alert output processing (including alert prioritization, voice message synthesis, audio outputs and display and caution/warning lamp drivers)
- Built In Test and monitoring including cockpit activated self-test
- PCMCIA interface for uploading software and databases (using the Smart Cable)
- Front panel maintenance test connector for system checkout and troubleshooting
- System status LED's located on the LRU front panel to indicate fault, computer OK and computer fail conditions.

The MK VIII EGPWS can be interfaced with a RS232 digital bus. This connection is used to connect either an EGPWS Smart Cable (PCMCIA Interface) or a portable PC to upload/verify the system interface configuration, database upload and flight history download.

The following Figure 4 shows the front panel layout of the MK VIII EGPWS Computer. The colors of the LEDs are:

- External FaultYellow
- Computer OKGreen
- Computer FailRed

Internal faults (Computer Fail) are those faults that originate within the EGPWC. These faults are indicated via the EGPWS front panel "Computer Fail" LED, self-test and the RS-232 and ARINC 429 interfaces.

External faults are those faults that originate from sources outside the EGPWC. The following faults are categorized as external faults: ARINC 429 bus activity faults, ARINC 429 signal faults, and discrete signal faults. These faults are indicated via the EGPWS front panel "External Fault" LED, self-test and the RS-232 interface.

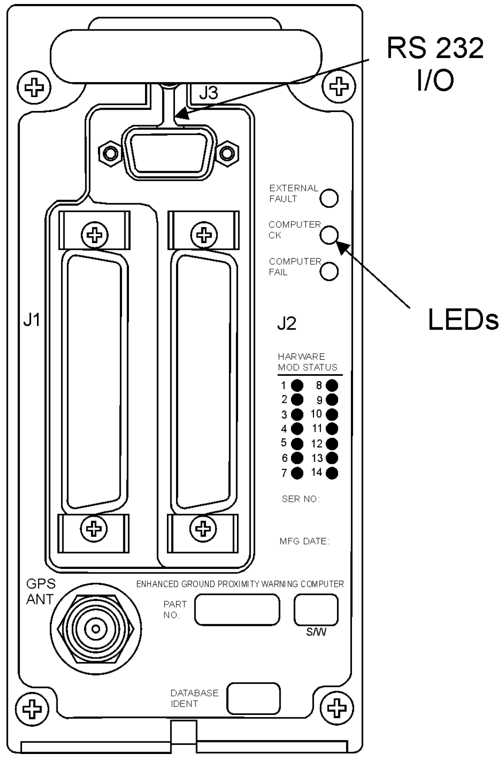

Fig. 4 - EPGWS Computer Front Panel Layout

C. Terrain Database

The terrain databases are embedded into the EGPWS Computer, including the following features:

– Terrain data
– Obstacle data
– Runway data
– Airport data

Updatings are available on a PCMCIA card to be uploaded using the Smart Cable or may be downloaded from Honeywell database dedicated portal to be up loaded using the same Smart Cable.

Honeywell document "Database Development Process for EGPWS" describes the overall process used to develop the embedded Terrain/Obstacles/Airport/Runway database.

The **Terrain Database** is a worldwide one and is updated about twice a year. The version number is identified in the dash number (ex. -453). The Terrain database Version number is displayed as "TDB4xx" where "4xx" is the current terrain database version. On the Honeywell database portal is available a table listing the time schedule of the future database releases. Each time a new release is available the differences respect to the previous one are listed so that the aircraft owner can decide to acquire it or not.

The **Obstacle Database** is a separated file from the terrain database and is represented similar with the terrain database. It catalogues obstacles higher than 100 ft. The option is activated by the configuration file.

The **Magnetic Variation** data is also included in the terrain database using International Geomagnetic Reference Field (IGRF).

D. Computed Geometric Altitude

Related to the Terrain Database is the computed **Geometric Altitude** which ensures optimal operation for the Terrain Awareness and Display function for all phases of flight and for all atmospheric conditions. Geometric Altitude uses an improved pressure altitude calculation, GPS altitude, radio altitude, and terrain and runway elevation data to reduce errors introduced by the corrected barometric altitude. Altitude corrected altitude and Static Air Temperature are also used. The figure in the following shows Geometric Altitude calculation.

E. Fault History

Fault history is stored in a non volatile memory in the form of fault history records and is used mainly for troubleshooting. Fault history data can be reviewed using the RS-232 interface or by voice.

Fault recordings is enabled after 25 seconds from power up. To avoid multiple occurrences of the same fault only one fault record is stored in any single flight leg.

Depending of the "In Air" status the following faults are recorded:

– If "In Air" status is False: only internal faults are stored
– If "In Air" status is True: both internal and external faults are stored

System capacity is of minimum 256 fault history records and 64 faults legs in non volatile memory, representing minimum 4 faults per leg.

The self-test switch on the Reversionary/Miscellaneous panel activates the fault history readout.

Using the front RS232 connector, the fault history can also be activated using the WinVIEWS utility.

Fault history can be downloaded directly on the PCMCIA Flight History Download card using the Smart Cable.

F. Configuration Module

The Configuration Module, installed by replacing a part of the EGPWS connector backshell is used to store aircraft/EGPWS interface configuration. The configuration, copied in Non Volatile Memory of the EGPWS, is read only during power-up.

G. Reversionary / Miscellaneous Panel

The optional Reversionary/Miscellaneous Panel is dedicated to the EGPWS system.

The EGPWS Controls are shown in the encircled area).

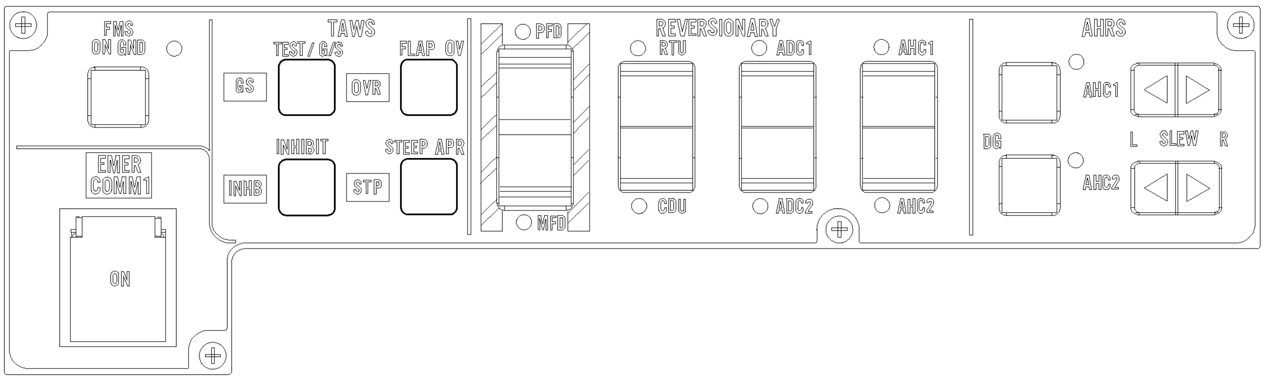

Fig. 5 - Miscellaneous / Reversionary Panel - Layout

The following pushbuttons and annunciators are integrated in the Reversionary / Miscellaneous Panel.

Table 1:

N°	Function	Switch Description (Type)	Lamp (Color)	Reset Conditions	Remarks
1	Terrain Inhibit	INHIBIT (Alternate)	INHB (Amber)	- Only manually	- Switch triggered
2	Self Test	G/S OFF /TEST (1)	N/A	- On Ground	- Operable on ground only
3	Flap Override	FLAP OVR (Momentary)	OVR (Amber)	Below 50 ft AGL	- EGPWS triggered - Flap position availa ble from the Flap Control Level (Up=+28V, MID&DN=Open).
4	G/S Cancel	G/S OFF/TEST (1) (Momentary)	OFF (Amber)	- On Ground (2) - RALT>2,000 ft - Non ILS Frequency - NOT Manually	EGPWS triggered Operable in flight only

Table 1:

N°	Function	Switch Description (Type)	Lamp (Color)	Reset Conditions	Remarks
5	Steep Approach	DISABLED	STP (Amber)	- On Ground (2) Manually - Flaps / Gear raised for Go-Around	EGPWS triggered if Switch activated or if Envelope Modulation activates the Steep Approach. Lamp is activated also if Envelope Modulation activates the Steep Approach

NOTE: 1. The G/S Cancel and the Self Test functions are performed by a common switch because Self Test is disabled in flight while G/S Cancel is reset at landing.

2. On Ground condition - Airspeed below 40 knots and the Radio Altitude less than 30 feet;
In Air condition - Airspeed greater than 60 knots and Radio Altitude is greater than 30 feet for more than 1 second.

H. Terrain Database Card

It is a PCMCIA card including the following databases:

– Terrain database
– Obstacle database
– Runway database
– Airport database

The databases can be uploaded into the EGPWS Computer using the Smart Cable.

I. Flight History Download card

It is a PCMCIA card used to downloaded Flight History files from the EGPWS Computer using the Smart Cable

J. Smart Cable

The EGPWS Smart Cable is a removable PCMCIA interface. It is compatible with any ATA flash PC cards.

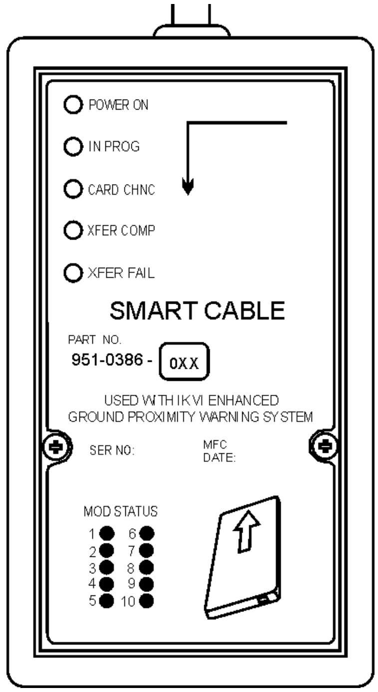

Fig. 6 - Smart Cable - Layout and Details

K. Power Supply

EGPWS is powered by a +28 VDC Right Avionics Dual Feed Bus through a 3A circuit breker labeled TAWS, located on the Copilot CB Panel

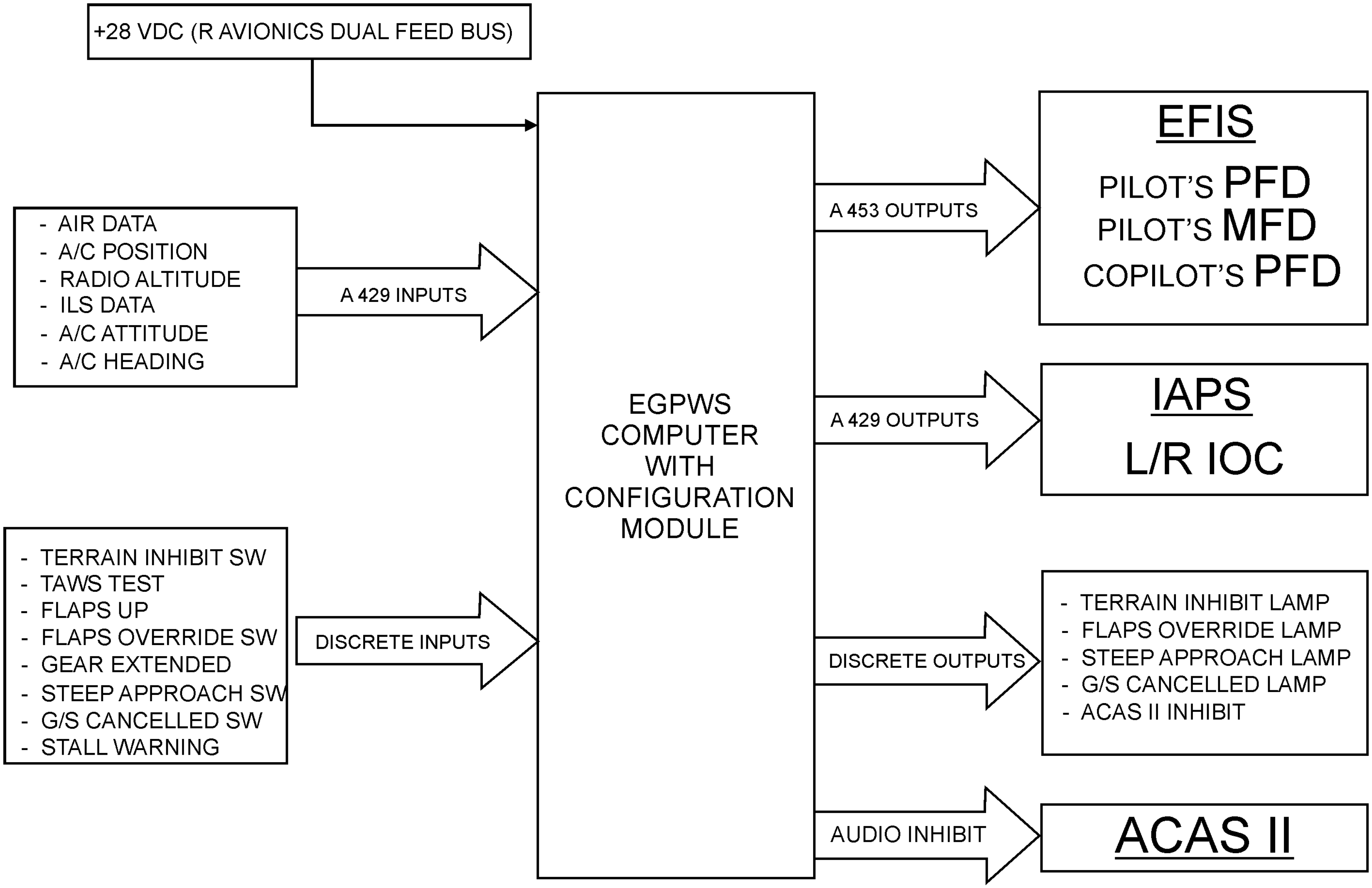

Fig. 7 - EPGWS Block Diagram

2. Operation

A. General

The Mark VIII EGPWS, as stated before, is a TAWS Class A which provides basic GPWS functions and a series of additional "enhanced" terrain and display features.

The system uses aircraft inputs (geographical position, altitude and airspeed, attitude, radio altitude, glideslope deviations and aircraft configuration data) to display a conflict between these elements and the internal terrain and obstacles database. The conflict will result in the EGPWS providing a visual and audio caution or warning alert.

The following features are implemented in the Mark VIII EGPWS:

- **Obstacles Database** - Visual and aural alerts for flight into obstacles, i.e. towers.
- **Peaks Mode** - Displays high terrain that is more than 2,000 ft. below the aircraft. It provides situational awareness during initial descent, rapid decompression / descent to breathable altitudes, engine out drift down, free flight off airway and WX diversions.
- **Geometric Altitude** - Provide MSL Altitude for correct terrain reference and Look Ahead Algorithms. Independent of atmospheric errors, temperature, non-standard atmosphere, incorrect altimeter settings and use of QFE / QNH. Operates with impaired static pressure and can provide backup to pressure altitude for pilot on FMS.
- **"Look Ahead" Alert/ Warning Algorithms** - Increases alert time for flight into terrain at high ground speeds without nuisance alerts.
- **Obstacle/Terrain Clearance Floor** - Based on Geometric Altitude above Field Elevation. Independent of radio altitude, it reduces the risk of landing short of runway.
- **Terrain Clearance Floor Cutoff** - Improved alerting for landing short of runway. Requires GPS & WGS-84 runway threshold coordinates.
- **Improved GPWS Alert Modes 1, 2, 4 & 5.**
- **Replaced Baro Alt with Geometric Altitude in GPWS Envelope Modulation Tables** - Improves GPWS operation under extreme temperature variations.
- P**seudo Radio Altitude** - Allows voting to determine correct radio altitude. Eliminates unwanted alerts caused by over-flight of other aircraft as in Reduced Vertical Separation Situations or holding. Also addresses heavy rain, hail and loss of radio altimeter tracking.
- **Envelope Modulation of "Look Ahead" Algorithms at Specific locations/ airports** - Improved effectiveness of timely alerts when needed and improved margins against unwanted alerts at some locations throughout the world and improves nuisance margins at another. All position data is verified to altimeter, ground based navigation aids and heading information, and stored terrain characteristics prior to being accepted by the Envelope Modulation algorithm.

The table that stores the Envelope Modulation data is preserved on the non-volatile memory.

- **Low Temperature correction for some non-Geometric Altitude Aircraft** - Helps minimize effect of low outside temperature on Terrain Display and "Look Ahead" Algorithms.
- **"Bank Angle" callout to +30° when Autopilot Engaged** - Alerts pilot sooner when a slow progression of roll increases beyond the Normal Autopilot Maximum Bank Angle Limits. Lower setting used only when autopilot engaged. There have been numerous serious incidents, leading often to loss or near loss of control.
- **Self Test aural annunciation of Terrain data and Software revisions on first page and visually on Terrain Display** - Helps customers quickly identify current status of Terrain Database and Software Version in the installed EGPWS.

B. GPWS Functions

Each mode has caution and warning aural and visual alarms.

The visual alerts (yellow GND PROX and red PULL UP) and failure (yellow GPWS and TERR) annunciations are displayed only on the pilot and copilot PFDs.

C. MODE 1 - Excessive Descent Rate

Mode 1 provides alerts for excessive descent rates with respect to altitude AGL and is active for all phases of flight.

D. MODE 2 - Excessive Terrain Closure Rate

Mode 2 provides two types of alerts based on aircraft gear/flap configuration radio altitude and closure rate (radio altitude variation). It is triggered if rapidly rising terrain is detected. There are two variants of Mode 2.

E. MODE 3 - Altitude Loss After Takeoff

Mode 3 provides alerts for excessive altitude loss after takeoff or low level go-around (below 245 ft AGL) with gear or flaps not in landing configuration. By selecting FLAP OV switch the allowable altitude loss is increased.

F. MODE 4 - Unsafe Terrain Clearance

Mode 4 generates three types of voice alerts based on radio altitude, computed airspeed and aircraft configuration to alert the crew for insufficient terrain clearance.

G. MODE 5 - Descent below Glideslope

Mode 5 provides alerts when the aircraft descends more than 1,3 dots below the GS beam (soft alarm) or more than 2 dots below GS (hard alarm).

H. MODE 6 - Altitude Callout

Mode 6 provides advisory callouts, configurable. Except FIVE HUNDRED callout, all other are optional ones and are configurable. The callouts represents radio altitude (value - 10/20 ft) and excessive bank angle and are enunciated once per approach.

The following callouts are configured onboard P.180 Avanti II:

- MINIMUM-MINIMUM DH or MDA
- FIVE HUNDREDS 500 ft AGL
- ONE HUNDRED 100 ft AGL
- FIFTY 50 ft AGL
- ORTY 40 ft AGL
- HIRTY 30 ft AGL
- TWENTY 20 ft AGL
- TEN 10 ft AGL
- BANK ANGLE, BANK ANGLEbank Angle: 15° to 50°/15° to 33° (A/P Not Engaged/Engaged).

MINIMUMS -MINIMUMS callout requires landing gear down. It has priority over the other altitude callouts.

3. Enhanced Function

A. Terrain Clearance Floor

The Terrain Clearance Floor (TCF) alert function adds an additional element of protection to the standard Ground Proximity Warning System. It creates an increasing terrain clearance envelope around the airport runway to provide CFIT protection against situations where Mode 4 provides limited or no protection. TCF alerts are based on current aircraft location from GPS, destination runway center point position (from the terrain database) and radio altitude. TCF is active during takeoff, cruise and final approach. This alert mode complements the existing Mode 4 protection by providing an alert based on insufficient terrain clearance even when in landing configuration. Alerts for TCF illuminate GND PROX and produce aural messages.

The TCF function has been enhanced with a Runway Field Clearance Floor (RFCF) alert function based on current aircraft location, destination runway center point position and height (MSL, not AGL) above destination runway.

When an aircraft penetrates either the TCF or the RFCF alert envelope the aural message TOO LOW TERRAIN will occur.

This aural message will occur once when initial envelope penetration occurs, and one time thereafter for each 20% degradation in either altitude (AGL) or altitude (MSL) depending on which envelope was violated (TCF or RFCF respectively). At the same time the appropriate GND PROX will remain on until the alert envelope is exceeded.

position accuracy, providing protection against landing short events. The envelope bias factor is reduced to 1/4 nm if runway and position data is of high integrity.

Next Figures 8 and 9, explain the TCF function parameters.

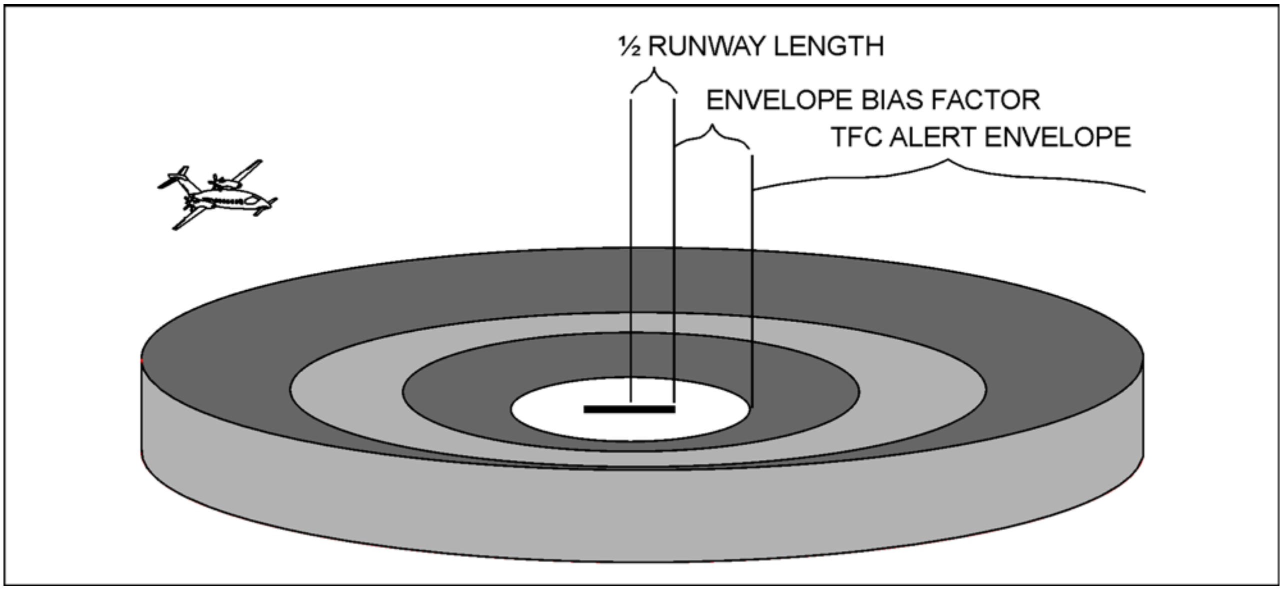

Fig. 8 - TCF Alert Envelope

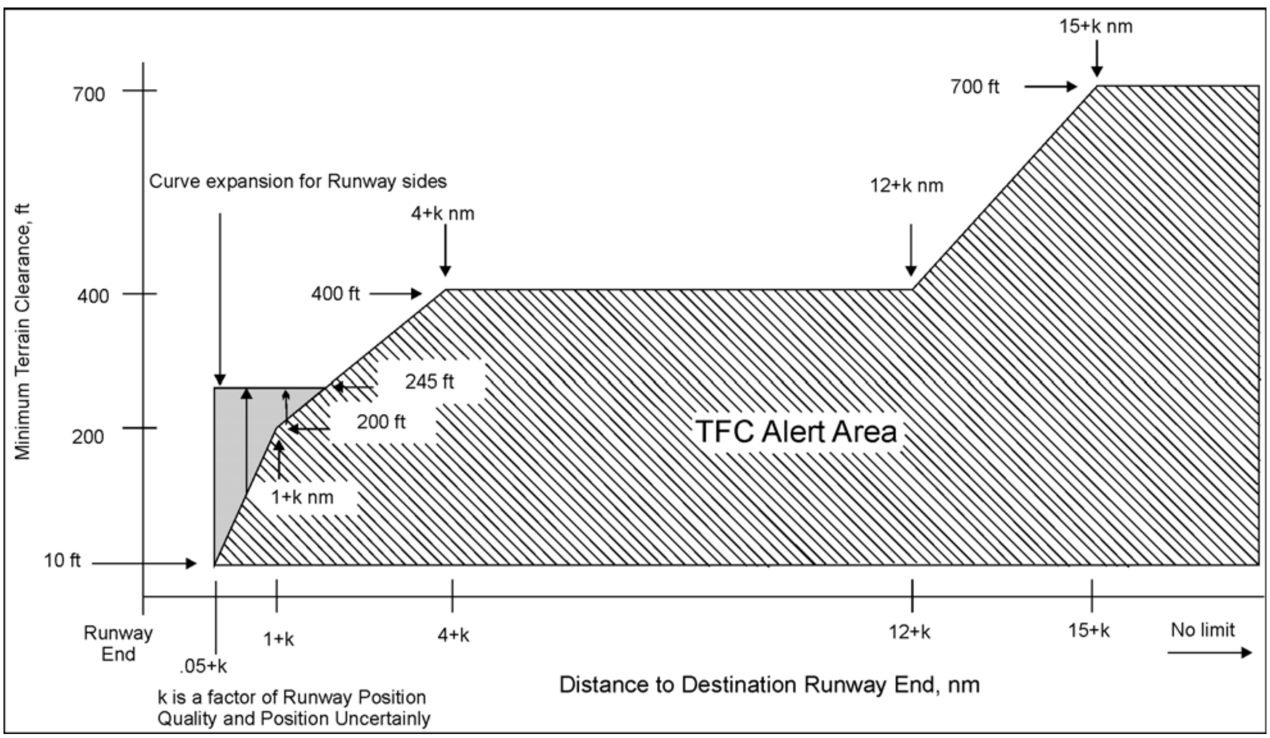

Fig. 9 - TCF Alert Curve

B. Runway Field Clearance Floor

The Runway Field Clearance Floor (RFCF) alert envelope is a circular band centered over the selected runway but unlike the radio altitude based TCF envelope, the RFCF envelope only extends 5 NM past the end of the runway.

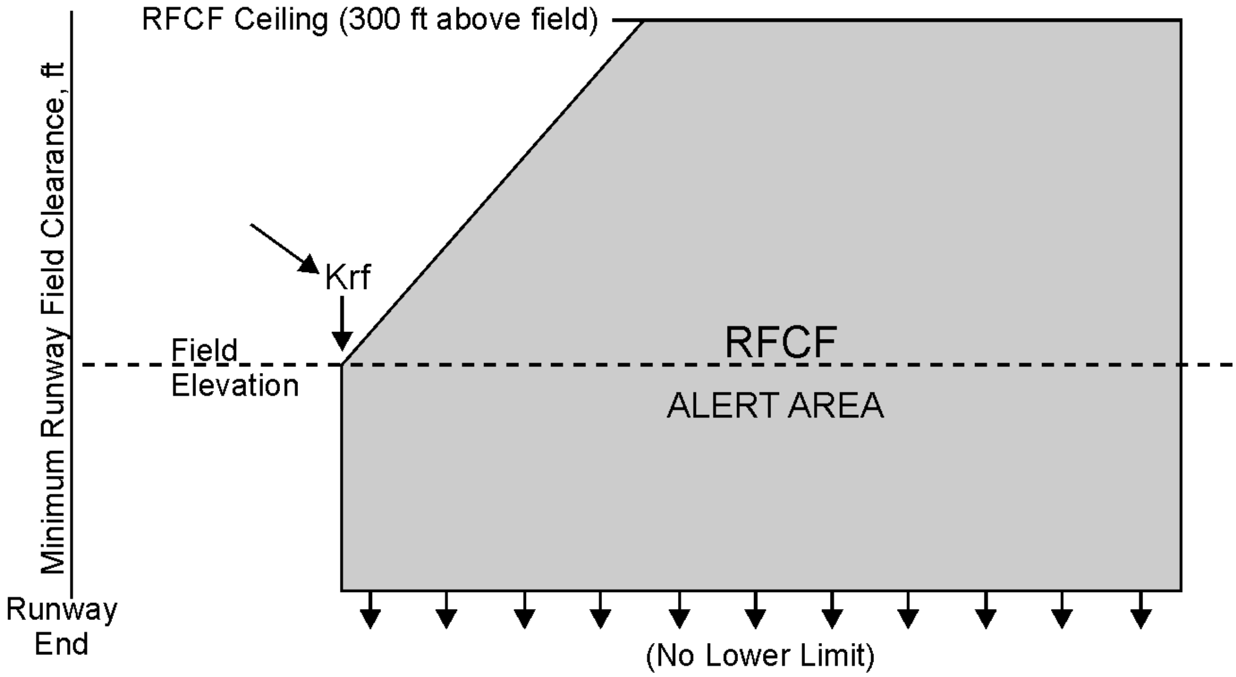

Fig. 10 - RFCF Alert Envelope

C. Terrain Awareness Function

The Terrain Awareness component of the EGPWS is divided into the functional blocks shown in Figure 11 with an interface to the cockpit displays. The encircled blocks monitor aircraft position with respect to local database cataloged terrain and provide rapid audio and visual alerts when a terrain threat is detected. Terrain threats are recognized and annunciated when terrain violates specific computed envelope boundaries forward of the aircraft path. The terrain database also includes the obstacle database providing similar annunciation when cataloged obstacles violate the same envelope boundaries.

Terrain Awareness Functions are inhibited by pushing the INHIB Switch on the Reversionary/Miscellaneous Panel. The action is confirmed by a TERR INHB message on the PFDs (from the EGPWS Computer) and by the INHIB lamp on the Reversionary/Miscellaneous Panel (lit by the switch itself).

The Terrain Awareness annunciators and audio outputs behave in the same manner as the standard GPWS mode alerts.
A terrain conflict intruding into the caution ribbon activates EGPWS caution lights and the aural message CAUTION TERRAIN, CAUTION TERRAIN. An obstacle conflict provides a CAUTION OBSTACLE, CAUTION OBSTACLE message. The caution alert is given typically 40-60 seconds ahead of the terrain/obstacle conflict and is repeated every seven seconds as long as the conflict remains within the

caution area When the warning ribbon is intruded (typically 30 seconds prior to the terrain/obstacle conflict), EGPWS warning lights activate and the aural message TERRAIN, TERRAIN, PULL UP or OBSTACLE, OBSTACLE, PULL UP is enunciated with PULL UP repeating continuously while the conflict is within the warning area.

The look-ahead alerting algorithms are enhanced at higher airspeeds (about 300 Knots or greater). In this case, the look-ahead distance is designed to provide a 60-second warning alert for up to 8 NM look-ahead. The look-ahead distance is increased for descents at high speeds to improve alerting times

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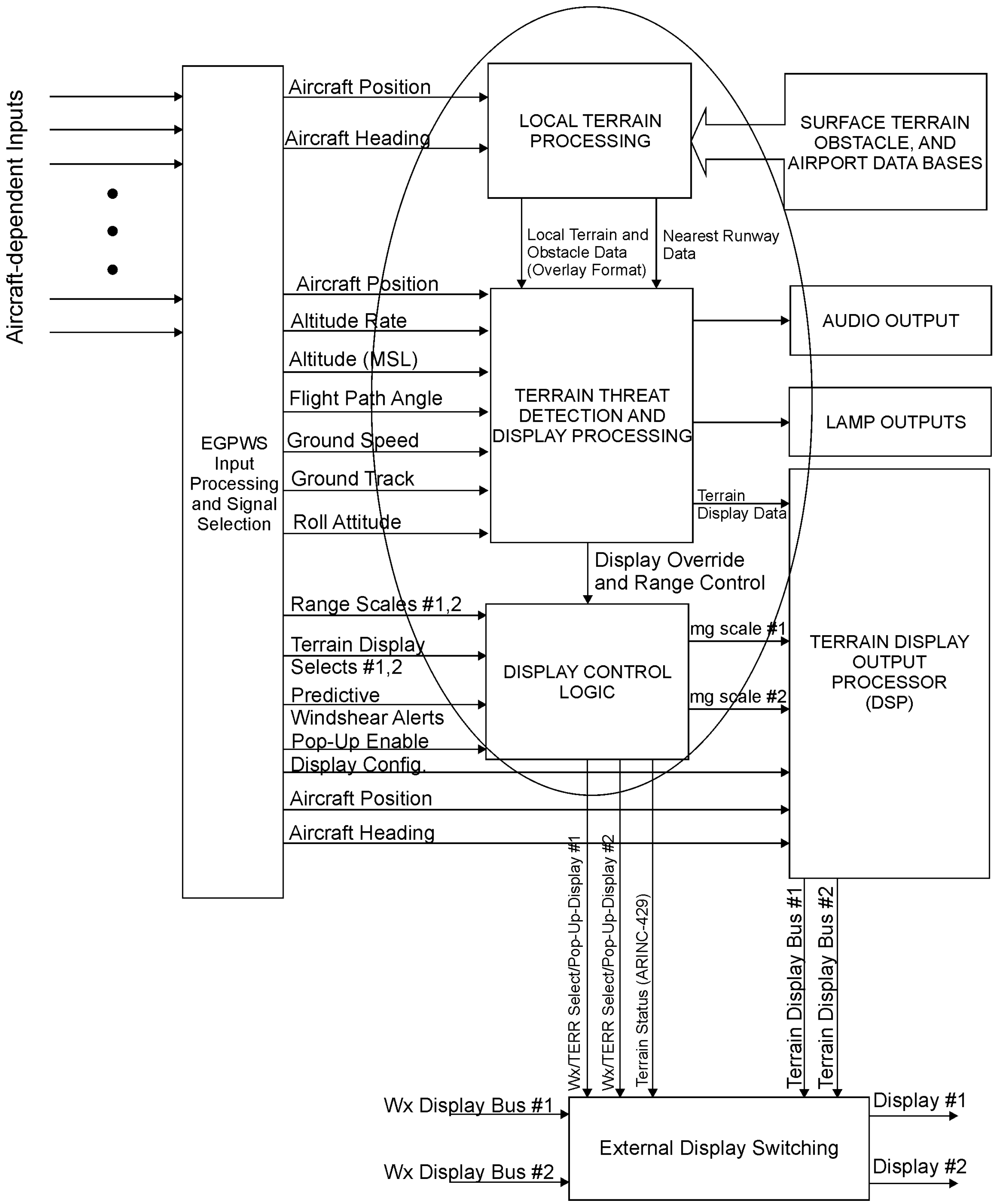

Fig. 11 - Terrain Awareness Functions

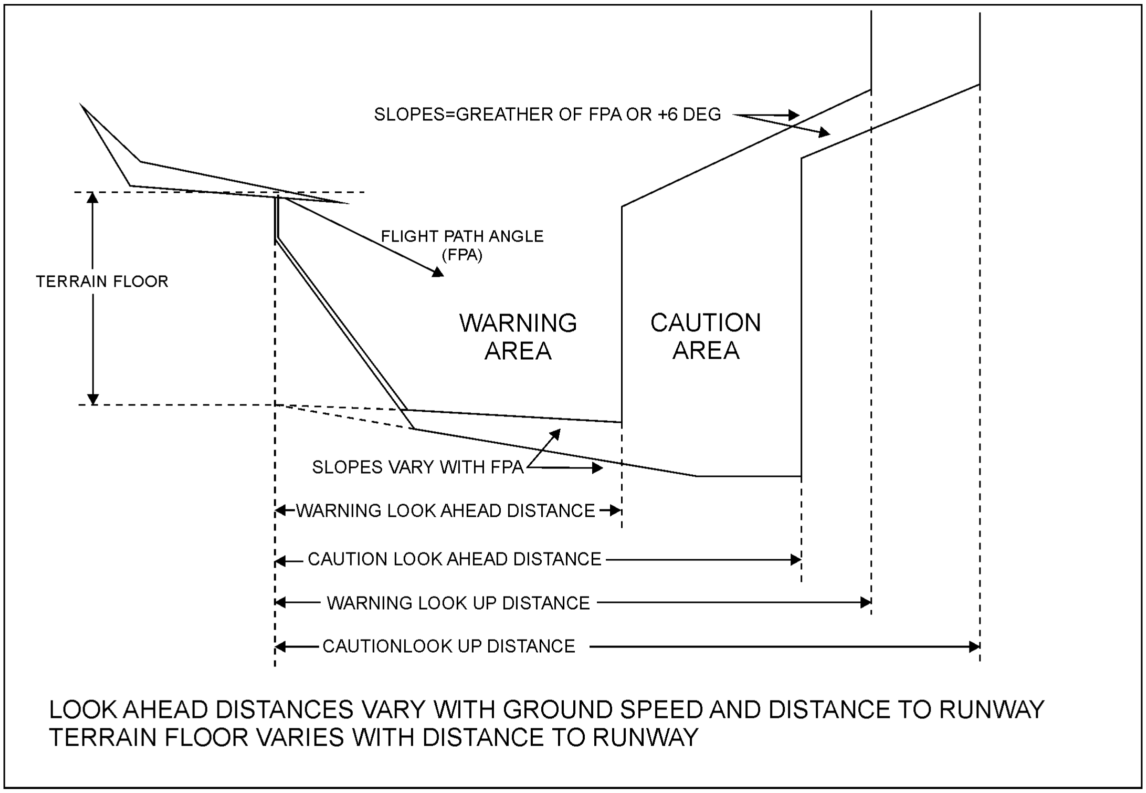

Fig. 12 - Terrain Caution and Warning Envelope Boundaries

D. Peak Display

The Terrain Awareness alerting and display function maintains a background display of local terrain forward of the aircraft available on all three displays. In the event of terrain or obstacle caution or warning conditions, an aural alert and lamp outputs are triggered. The background image is then enhanced to highlight terrain or obstacle threats forward of the aircraft. Obstacle threats forward of the airplane are also enhanced if the adjacent terrain altitude is within a lower terrain layer, or if the adjacent cells are not illuminated. Obstacle enhancement is only applicable to the 15, 30 and 60 arc second tiers.

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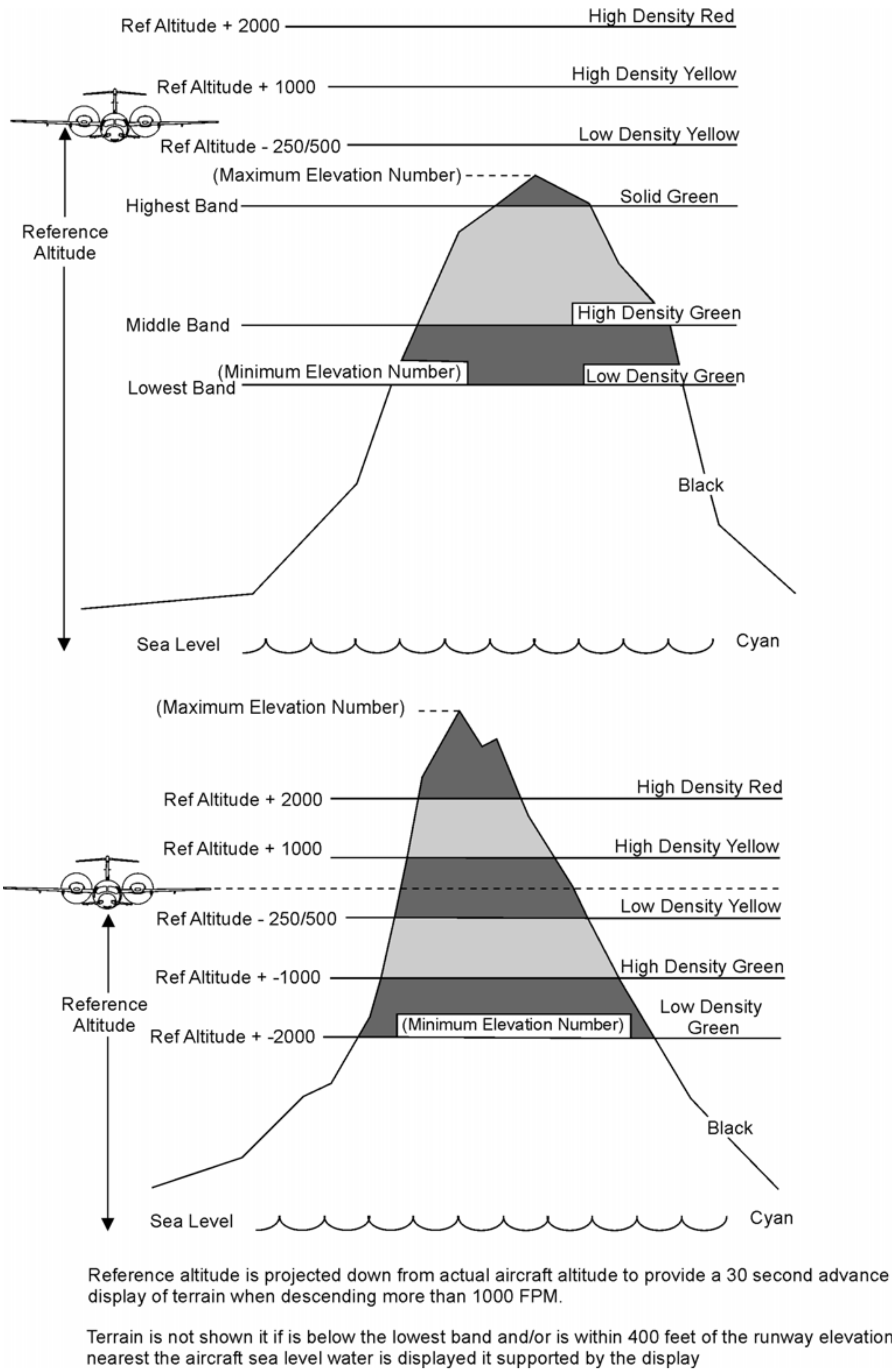

Fig. 13 - Peaks Terrain Background Display at High and Low Relative Altitude

E. Pop-Up and Auto Range

Terrain Pop-Up (MFD only) allows graphical terrain data to show automatically on the MFD when a terrain hazard is encountered. The Terrain overlay is added to the current display format when the Terrain overlay is not already in view on the onside MFD and when the MFD format is compatible with Terrain. The terrain data remain in view until terrain display is manually deselected.

Auto Range, when Pop-Up occurs, provides the automatic range presentation (10 NM). If the terrain auto-range is different than the display selected range, a TERR RANGE XXXNM message is shown until the range is manually changed or terrain-display is deselected.

F. Audio Alerts

The following EGPWS Audio Alerts are selected onboard P.180 Avanti II:

Table 2: Mode 2 Audio Menu

Priority	Alert/Warning Condition	Visual Alert	Notes
1	Mode 1 Pull Up	PULL UP	1
2	Mode 2 Pull Up Preface	TERRAIN TERRAIN	1, 2
3	Mode 2 Pull Up	PULL UP	1
4	Terrain Awareness Preface	TERRAIN TERRAIN	1, 2
5	Terrain Awareness Warning	PULL UP	1
6	Obstacles Awareness Preface	OBSTACLE OBSTACLE	1, 2
7	Obstacles Awareness Warning	PULL UP	1, 3
8	Mode 2 Terrain	TERRAIN	
9	Mode 6 MINIMUMS	MINIMUMS-MINIMUMS	
10	Terrain Awareness Caution	CAUTION TERRAIN (pause) CAUTION TERRAIN	4
11	Obstacles Awareness Caution	CAUTION OBSTACLES (pause) CAUTION OBSTACLES	4
12	Mode 4 Too Low Terrain	TOO LOW TERRAIN	
13	TCF Too Low Terrain	TOO LOW TERRAIN	
14	Mode 6 Altitude Callouts	Selected Callouts	
15	Mode 4 Too Lower Gear	TOO LOW GEAR	
16	Mode 4 Too Lower Gear	TOO LOW FLAPS	

Table 2: Mode 2 Audio Menu

Priority	Alert/Warning Condition	Visual Alert	Notes
17	Mode 1 Sinkrate	SINKRATE (pause) SINKRATE or SINKRATE	5
18	Mode 3 Don't Sink	DON'T SINK (pause) DON'T SINK	
19	Mode 5 Glideslope	GLIDESLOPE	
20	Mode 6 Bank Angle	BANK ANGLE (pause) BANK ANGLE, BANK ANGLE BANK ANGLE	

Notes:

1) These are the only voices that can interrupt aural alerts with lower priority
2) The preface voices will always be given prior to the warning voice
3) Voice message is continuous
4) Voice message will repeat every 10 seconds
5) Long Self-Test will only issue a single SINKRATE

The EGPWS Audio Alerts are integrated with the rest of the Aural Alert of P180 Avanti II electrical/avionics systems through the Audio Panels non volume adjustable input. The following priority regarding the Audio Alerts is implemented:

– STALL Warning
– TAWS (EGPWS) Warning
– ACAS Warning (if installed)

G. The rest of the aural tones - generated by the Aural Warning Tone Generator - are mixed in the headsets/loudspeakers with the above ones.

H. The volume of the EGPWS alerts may be regulated on ground during maintenance setup The normal volume is 4 W rms into an 8 ohm load and 600 ohm into 100 milli-watts rms into a 600 ohm load. The volume can be lowered from nominal by 6dB to 24dB. An additional 6dB volume reduction can be obtained activating Mode 6 Low Volume.

4. Controls

A. Miscellaneous / Reversionary Panel

– **TEST/GS - TEST** - performs system tests with various levels of status verification (from 1 to 6), only on ground
G/S - Typically used when unreliable GS is expected or when maneuvering is

required during ILS final approach, cancels alerts for the GPWS Mode 5, Excessive ILS Down Deviation, even if the aircraft is below G/S

– **INHIBIT** - Typically used when landing on an airport not in the database, inhibits TAD and TCF functions if selected; the INHIB amber annunciator is lit by an internal circuitry (the status feedback is displayed on the pilot/copilot PFDs).
– **FLAP OV** - When active (OVR amber annunciator is lit by the EGPWS Computer) the EGPWS does not consider the flaps position in the logic that identifies an approach phase of flight (flaps are considered in landing configuration: MID or DN)
– **STEEP APR** - When selected (STP amber annunciator is lit by the EGPWS Computer) the system accepts steep approaches maneuvers.
Typically used in case of required steep approach procedure, desensitize GPWS Mode 1, Excessive Descent Rate curve.
– **STEEP APPROACH** selection is disabled by now.
The STP lamp is ON also without a manual selection in case the steep approach mode is automatically triggered by the Envelope Modulation for the particular airports predisposed in the TAWS database.

B. Controls Located on the DCPs

Range knob of pilot DCP is active to select TAWS display range when terrain data are shown on the pilot PFD and MFD as well as range knob of copilot DCP when terrain data are shown on copilot PFD.

C. Controls Located on the PFDS and MFD

The TERR line select key R2 is used to select the Terrain overlay on the PFDs and MFD. See next section "Data display on PFDs / MFD" for detail.

D. Data Display on PFDs/MFD

The EGPWS, a TAWS Class A category system, is an enhancement to Ground Proximity Warning System (GPWS) that can provide Terrain data and GPWS alerts. EGPWS provides predictive warnings based on the aircraft present position and the EGPWS projection of the aircraft's flight path. The EGPWS compares its flight path projection with the database to detect upcoming hazardous conditions. Graphical terrain elevation data is available for display on the PFDs and MFD Arc and PPOS Map formats. The graphical terrain data show in a ±90° arc in front of the aircraft. The optional Terrain Pop-Up feature allows automatic display of Terrain data on the MFD when a Terrain hazard is encountered.

System messages and warnings are also shown on the both PFDs and MFD. EGPWS Alerts (PULL UP and GND PROX) and fail flags (boxed GPWS and TERR) show exclusively on the PFD. Terrain associated mode and fault messages show on both the PFD and the MFD.

NOTE: Terrain data and Weather radar data are sharing the same area of the PFD and MFD and cannot be shown at the same time on a single display. Manual or automatic selection of terrain data automatically deselects

Weather Radar. Similarly, selection of Weather Radar automatically deselects Terrain.

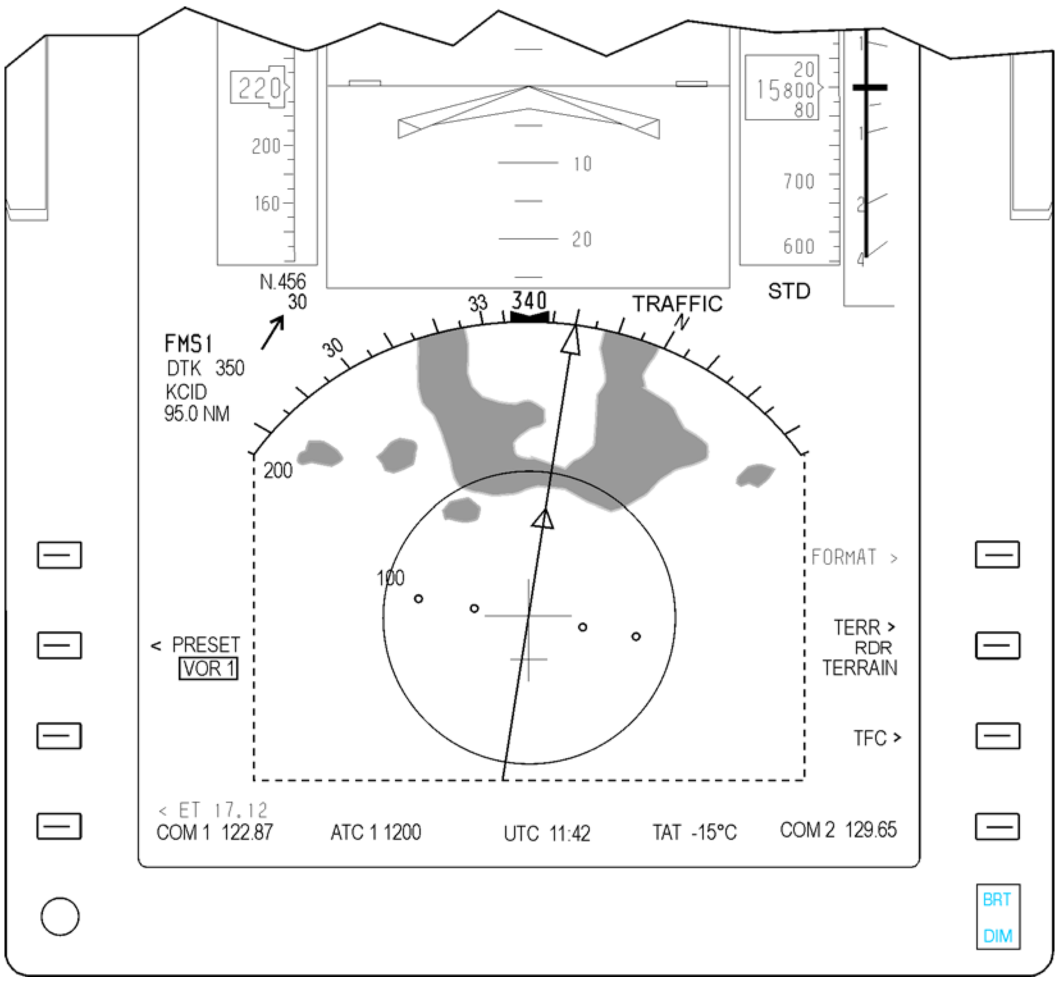

Fig. 14 - EGPWS - Terrain Display on PDF

Terrain Colors: The display colors represent various terrain elevations with respect to the altitude of the aircraft. The display colors associated with the terrain elevations are as follows:

- Solid Red - Warning Terrain Threat Area;
- Solid Yellow - Caution Terrain Threat Area;
- 50% Red Dots - Terrain that is more than 2,000 feet above aircraft altitude;
- 50% Yellow Dots - Terrain that is between 1,000 and 2,000 feet above aircraft altitude;
- Solid Green - Shows only when no red or yellow terrain areas are within range on the display;
- 50% Green Dots - Terrain that is 500 (250 with gear down) feet below to 1,000 below aircraft altitude;
- 16% Green Dots - Terrain that is 1,000 to 2,000 feet below aircraft altitude;
- Black - No significant terrain;
- Magenta Dots - Unknown terrain.

TERR/RDR Legend: The legend TERR shows next to line select key R2 along with RDR. Line select key R2 is used to select the TERR overlay when the Arc or FMS PPOS map format is active

NOTE:

- When TERR is not the active overlay and the EGPWS Computer declares a Terrain Awareness Warning or Caution, an inverse video cyan box shows on the PFDs around the white TERR legend, and the cyan caret shows to indicate that selecting line select key R2 will cause an immediate response. In this case, the first momentary push TERR line select key selects Terrain for display on the Arc format at the 10 NM range. The inverse video box is removed on the side on which the line select key was pushed.
- Terrain data and Weather Radar reflectivity do not show at the same time on a single display. Selection of Weather Radar automatically deselects Terrain

Terrain Data Field:	A Terrain data field shows along the right side of the display. The terrain mode/status message shows in the terrain data field. When a Terrain compatible format is active on the PFDs and MFD, the mode/status message shows in cyan. When the format is changed so it is not Terrain compatible, the mode/status message shows in white.

- The message TERRAIN shows in small characters when the mode is set to Terrain;
- The message TERR INHB shows in small characters when Terrain is inhibited. When this message is in view, the Terrain overlay is removed from the display;
- The message TERR TEST shows in small characters when Terrain is selected for display and Terrain is set to Test. When the test is active, each of the TAWS failure messages are sequentially activated, in addition a graphical Terrain test pattern is generated.

EGPWS Alerts (PFD only)::	The Terrain Awareness Warning System (TAWS) is effectively two independent systems in one: Ground Proximity and Terrain. Each mode has a distinct aural alert and associated visual messages. The EGPWS alerts overwrite the pitch tape in the lower half attitude display of the PFD when they are asserted by the EGPWS Computer. Each of the alerts flash for five seconds when first in view, then become steady. Alerts sharing the same field are presented in the following order in case of conflicts:

- PULL UP shows in red for a GPWS warning situation;
- PULL UP shows in red for a EGPWS warning situation;
- GND PROX shows in yellow for a GPWS alert situation;
- GND PROX shows in yellow for a EGPWS caution situation.

NOTE: The message TERR RANGE XXXNM shows when range data received from the EGPWS does not match the range currently set on the PFD/MFD for more than 3 seconds.

TAWS Self-test: Refer to 34-47-00 Maintenance Practicies Section

TAWS Fail: When a EGPWS failure condition is detected, TERR (Terrain) failure annunciation shall be displayed boxed, in medium yellow letters in the lower left section of the ground portion of the attitude display. In case of EGPWS completely inoperative (for instance following a loss of power) the GPWS boxed annunciation is displayed just below TERR annunciation, means that there is no information coming from EGPWS.

EGPWS Alerts (PFD only):: The Terrain Awareness Warning System (TAWS) is effectively two independent systems in one: Ground Proximity and Terrain. Each mode has a distinct aural alert and associated visual messages. The EGPWS alerts overwrite the pitch tape in the lower half attitude display of the PFD when they are asserted by the EGPWS Computer. Each of the alerts flash for five seconds when first in view, then become steady. Alerts sharing the same field are presented in the following order in case of conflicts:

- PULL UP shows in red for a GPWS warning situation;
- PULL UP shows in red for a EGPWS warning situation;
- GND PROX shows in yellow for a GPWS alert situation;
- GND PROX shows in yellow for a EGPWS caution situation.

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EGPWS - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00

A. This topic provides the following TAWS Maintenance Pratices:

– EGPWS Remote Computer - Removal/Installation
– EGPWS Data Base - Updating
– Database Upload on EGPWS
– EGPWS Configuration
– EGPWS Self Test
– EGPWS Inhibit
– EGPWS Audio Priority (TCAS I or ACAS II Installed)
– EGPWS Failure Annunciations (TCAS I Installed)
– EGPWS Configuration Module - Removal / Installation

NOTE: For the TAWS Configuration, TAWS Data Verification, TAWS Inhibit, TAWS Audio Delay (TCAS I Installed), TAWS Audio Priority (TCAS I Installed), TAWS Failure Annunciations (TCAS I Installed) and TAWS Self Test procedures,the airplane must be placed in an area that allow the GPS System acquisition and interchange data.

2. EGPWS Remote Computer - Removal (Ref. to Fig. 201)

A. Fixtures,Test and Support Equipment

Blanking Caps	Not specified

B. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(2) Open, tag and safety this circuit breaker:
Copilot CB Panel:
TAWS
(3) Remove the radome/nosecone (Refer to 53-10-00).
(4) Get access to the EGPWS Computer on the right lower panel in the avionics bay.
(5) Disconnect the two Electrical Connector from the front of EGPWS Computer.
(6) Put the blanking caps on the Electrical Connectors .
(7) Loose the Hold-Down Knob.
(8) Pull slowly the EGPWS Computer in flight direction.
(9) When the Remote Computer is disengage from its own Mounting Tray, lift and remove it.

(10) Cap and stow the electrical connectors and the wiring harness from dust if replacement unit is not to be installed immediately.

3. EGPWS Remote Computer - Installation (Ref. to Fig. 201)

A. Referenced Information

Maintenance Manual Chapter 53-10-00

B. Procedure

(1) Make sure as necessary that:
- The applicable circuit breakers are open, tagged and safetied
- The Warning Notices are in position
- The system is safe
- Access is available

(2) If previeously installed, remove the cap from the electrical connectors and free the electrical harness.
(3) Install and secure the Computer the proper Mounting Tray by the Hold- Down Knob.
(4) Remove the blanking caps from the Electrical Connectors.
(5) Connect the Electrical Connector on front of EGPWS Computer.
(6) Remove the safety tags and close circuit breaker TWAS.
(7) Remove tools, materials and equipment from the work area.
(8) Install the radome/nosecone (Refer to 53-10-00).
(9) Do a EGPWS following test described in this section:
- EGPWS Configuration
- EGPWS Data Verification
- EGPWS Self Test
- EGPWS Inhibit
- EGPWS Audio Priority (TCAS I Installed)
- EGPWS Failure Annunciations (TCAS I or ACAS II is Installed)

(10) Remove a Warning Notice in the flight compartment.

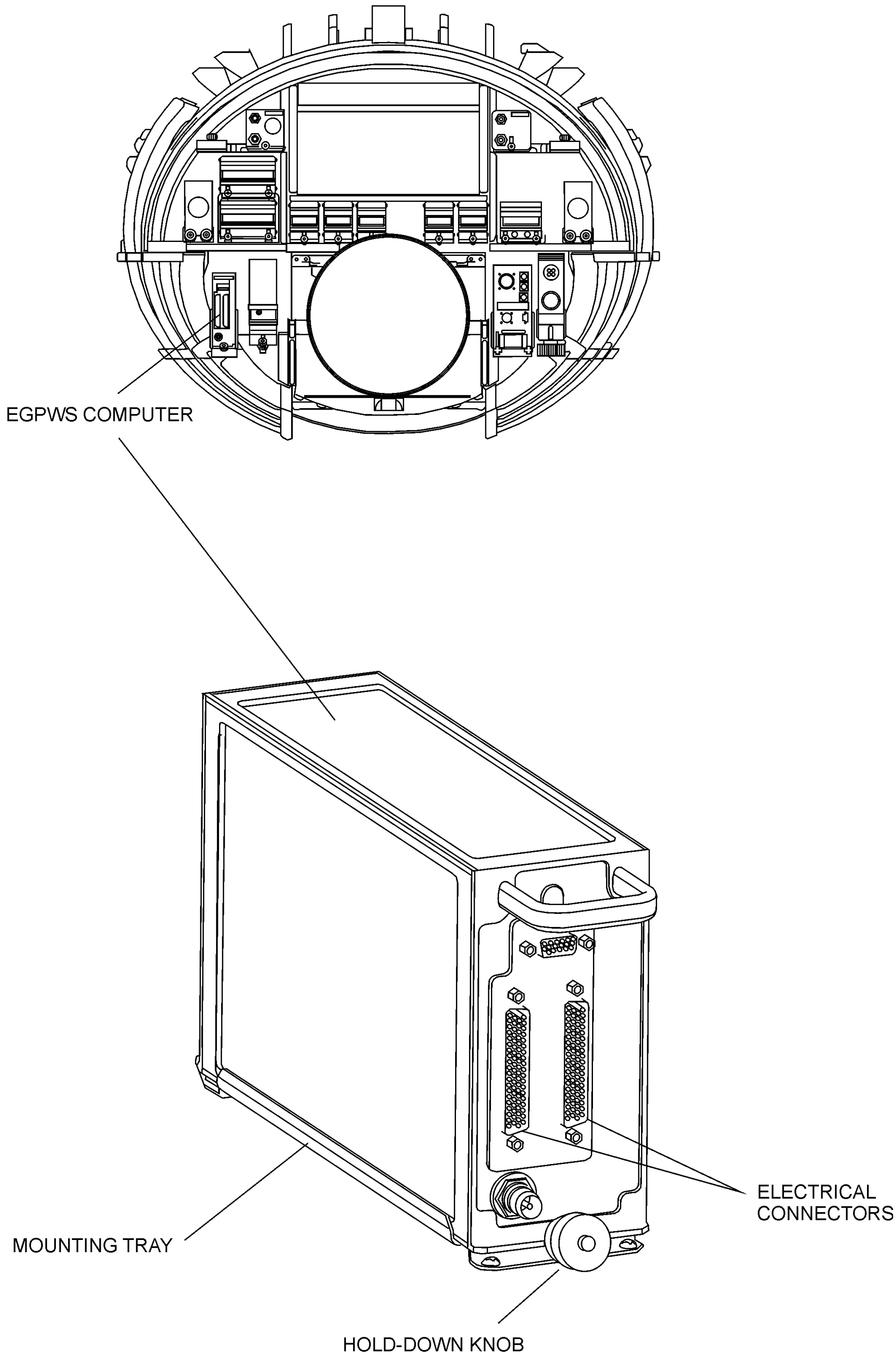

Fig. 201 - EGPWS Remote Computer- Removal/Installation

4. EGPWS Database - Updating

To update the TAWS Database, perform the following steps:

A. Remove power from the TAWS system.

B. The equipment identified below is necessary to do this procedure:

- An internet connection with a password to access the EGPWS web location(http://www.honeywell.com/sites/aero/Egpws-Home.htm). The web site addressis case-sensitive. Use the Database link on the left side of the window to get theinstructions to download the applicable database.
- Blank PCMCIA card. Refer to the applicable Service Letter for the correct part number .
- IBM PC or an equivalent with a Pentium processor, 133 MHz or higher, and the items identified below:
  - Windows 95, 98, ME, 2000, or XP
  - The PCMCIA card reader.

C. Do the instructions given below to copy the applicable data from the EGPWS web location to a PCMCIA card.

(a) Make a folder in the PC hard drive.
(b) Use the internet browser in the PC to go to the EGPWS web location (http://www.honeywell.com/sites/aero/Egpws-Home.htm).
(c) Use the Database link on the left side of the window to go to the Terrain Database download page.
(d) Do the instructions as given on the download page. Put the files in the folder that was made in this procedure step "C (a)".
(e) Put the PCMCIA card into the PCMCIA card reader.
(f) Use the Windows Explorer to make sure there are no folders or files in the PCMCIA card. Remove all the folders and files as necessary.
(g) Move the APP and TDB folders (with all included files) from the folder that was made in this procedure step C (a) to the PCMCIA card.
(h) Make sure that all the necessary files were put in the PCMCIA card.
1) On the left side of the Windows Explorer, click on the PCMCIA card reader device letter. This will show the contents of the PCMCIA card on the right side of the window
2) Make sure that the APP and TDB folders are in the PCMCIA card.
3) On the left side of the window, click on the TDB folder. This will show the contents of the TDB folder on the right side of the window. If necessary, make a menu selection of VIEW, ARRANGE ICONS, and BY NAME to put the names in alphabetical order.
4) Look at a random sample of the files with the file extension .BMF. Make sure they all have the correct date and time as given in the applicable Service Letter. If the file extensions are not shown, make a menu selection of VIEW and DETAILS to show the file extensions.
5) On the left side of the window, click on the TDB folder so that it is highlighted.
6) Make a menu selection of FILE and PROPERTIES.

7) Make sure that the size and number of files and folders are correct as given in the applicable Service Letter.

8) On the left side of the window, click on the APP folder. This will show the contents of the APP folder on the right side of the window. If necessary, make a menu selection of VIEW, ARRANGE ICONS, and BY NAME to put the names in alphabetical order.

9) Make sure that the contents of the APP folder are correct. Refer to the applicable Service Letter.

a For each file, make sure that the file name, date, and time are correct.

b or each file, right click on the file name and make a menu selection of PROPERTIES. Make sure the size of the file is correct.

(i) Make the files READ-ONLY.

1) On the left side of the window, click on the TDB folder so that it is highlighted.

2) Make a menu selection of FILE and PROPERTIES.

3) Make sure that the READ-ONLY attribute box is checked. If not, check the READ-ONLY attribute box and click on the APPLY button, then click on the OK button.

4) Make a menu selection of EDIT and SELECT ALL.

5) Make sure all of the files in the folder are highlighted.

6) Make a menu selection of FILE and PROPERTIES.

7) Make sure that the READ-ONLY attribute box is checked. If not, check the READ-ONLY attribute box and click on the APPLY button, then click on the OK button.

8) On the left side of the Explorer window, click on the APP folder so that it is highlighted.

9) Make a menu selection of FILE and PROPERTIES .

10) Make sure that the READ-ONLY attribute box is checked. If not, check the READ-ONLY attribute box and click on the APPLY button, then click on the OK button.

11) Make a menu selection of EDIT and SELECT ALL.

12) Make sure all of the files in the folder are highlighted.

13) Make a menu selection of FILE and PROPERTIES.

14) Make sure that the READ-ONLY attribute box is checked. If not, check the READ-ONLY attribute box and click on the APPLY button, then click on the OK button.

15) Remove the PCMCIA card from the PCMCIA card reader.

(j) Identify the PCMCIA card as the applicable Terrain Database version with the applicable Envelope Modulation Database. Refer to the applicable Service Letter.

5. Database Upload on EGPWS

A. The equipment identified below is necessary to do this procedure:

– Smart cable assembly (Part Number 951-0386-001).

B. Install the applicable Terrain Database with the applicable Envelope Modulation Database in the EGPWS.

(a) Make sure the power to the EGPWS is on. Make sure the COMPUTER OK LED on the EGPWS front panel is on (Refer to Fig. 202).

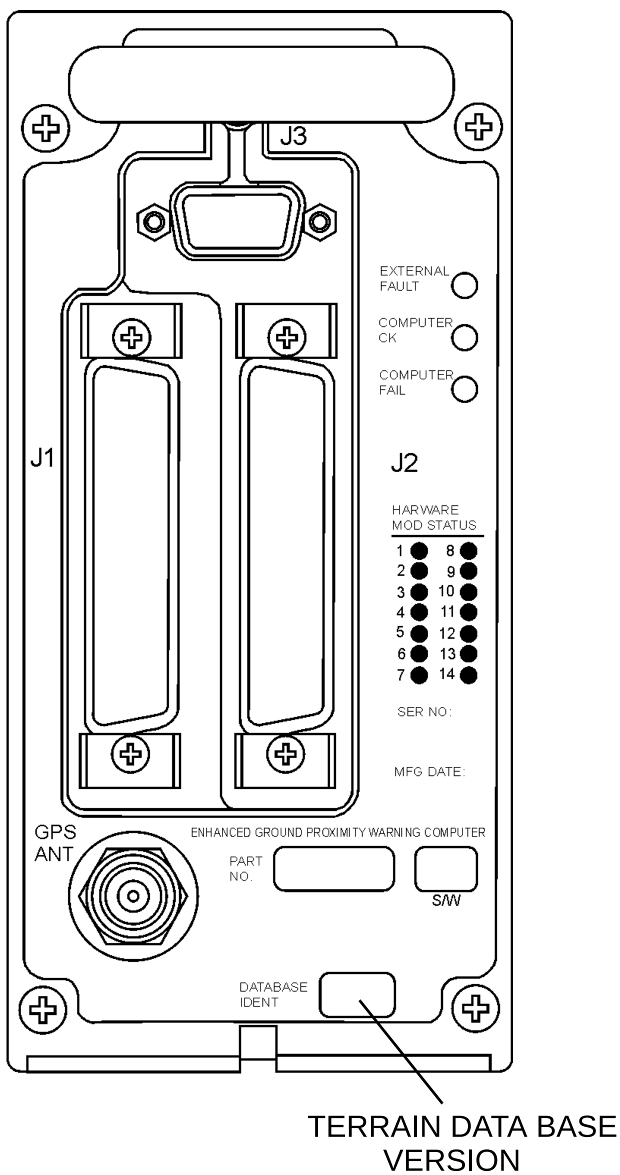

Fig. 202 - EGPWS Front Panel

(b) Connect the smart cable assembly to the connector J3 on the front panel of the EGPWS. Make sure the POWER ON LED on the smart cable assembly is on (Refer to Fig. 203).

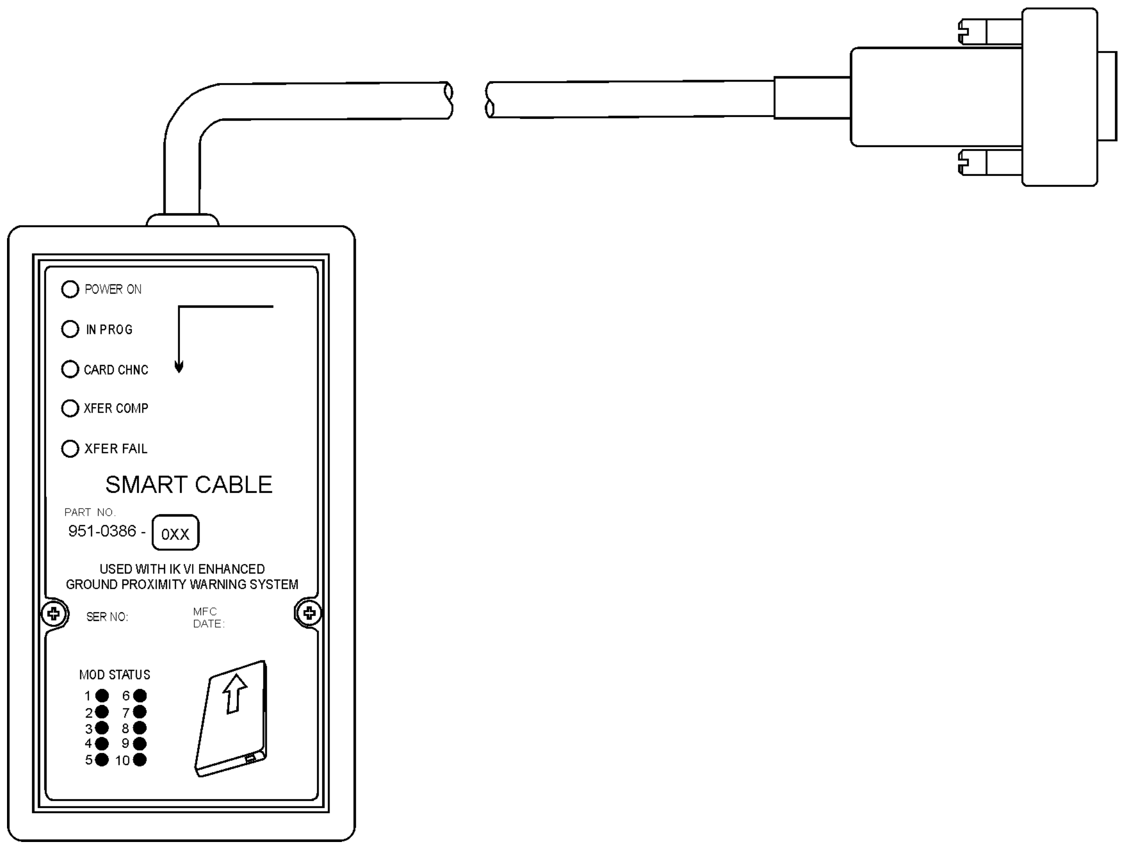

Fig. 203 - Smart Cable Assembly

(c) Put the PCMCIA card into the PCMCIA card slot in the smart cable assembly.

(d) While the databases are installed, make sure that the IN PROG LED on the smart cable assembly stays on.

(e) After the databases are installed, make sure the XFER COMP LED on the smart cable assembly comes on.

(f) Remove the PCMCIA card from the smart cable assembly.

(g) After approximately 30 seconds, make sure that the COMPUTER OK LED on the EGPWS comes on. This identifies that the databases were installed correctly.

(h) Disconnect the smart cable assembly from the connector J3 on the front panel of the EGPWS.

C. Make sure the correct data was installed in the EGPWS.

NOTE: The ST function cannot be started if the EGPWS does not identify that the aircraft is on the ground.

NOTE: The data check is done with the ST function. The ST function may be started from the two possible locations identified below:

- The aircraft cockpit with the GPWS test switch. Use of the cockpit ST function can be different from one aircraft to another. For example, the ST function can be started when the GP\lVS PULL-UP indicator is pushed or when a separate ST switch is pushed.
- The ST button behind the front panel door of the EGPWS.

"ST button" means to start the ST function from the aircraft cockpit or the EGPWS front panel. The EGPWS ST function has six levels that identify the data given below:

- Condition and configuration of the EGPWS
- Fault and warning history
- Condition of the different inputs.

To help go through the different levels, there are two cancel functions:

- Short cancel (push and hold the ST button for more than 0.5 second but less than two seconds)
- Long cancel (push and hold the ST button for more than two seconds but less than eight seconds).

The short cancel and long cancel functions operate differently when the ST is in different levels. To start the ST sequence, or to continue from one level to another, use the short cancel. When the instruction "push the ST button" is given below, use the short cancel sequence.

The procedure given below moves the operator directly to the Level 3 ST (system configuration). Most of the Level 1 and Level 2 ST are not done.

(a) Push the ST button to start the Level 1 ST.

(b) After the Level 1 ST message starts, push the ST button. This cancels the Level 1 ST and starts the Level 2 ST.

(c) After the Level 2 ST message starts (CURRENT FAULTS ...), push and hold the ST button for approximately five seconds. This cancels the Level 2 ST.

(d) When the message PRESS TO CONTINUE is heard, push the ST button. This starts the Level 3 ST (system configuration).

(e) Make sure that the messages given below are heard, where XXX and YYY are the correct versions:

– TERRAIN DATABASE VERSION: XXX

– ENVELOPE DATABASE VERSION: YYY.

(f) When the Level 3 ST is complete, the message PRESS TO CONTINUE is heard. If the ST button is not pressed, the ST sequence stops.

6. EGPWS Configuration

A. Follow the steps:

- Connect the laptop with WinVIEWS to the EGPWS using the RS232 cable
- Apply power to the a/c
- Switch Battery SW to ON
- Switch Master SW to Avionics
- Ensure the green "Computer OK" lamp of the EGPWS is illuminated
- Ensure the amber "External Fault" and red "Computer Fail" lamps are not illuminated
- Start WinVIEWS program
- Select Terminal Mode (F6)
- Type "CFG" at the Terminal Mode prompt;
- Type "CFG>CUW 0/15 # # # # # # # # # # # # # # #", (15 is the number of categories - minimum 15; if less categories are selected complete the missing ones with 0's)

  Where

  - "0 is the version number
  - "/15 beginning of the data string with 15 categories to follow
  - "# are the IDs for the categories listed in Annex A; the form is <Cat ID#> (only digits)

  For P180 Avanti II the configuration command is:
  "CFG>CUW 0/15 0 255 0 11 0 254 125 253 255 255 255 0 7 0 0/"
- Press ENTER after completing the string
- The following message appears: "Confirm this data reflects the configuration to be programmed (Y/N)"
- The EGPWS will reboot to allow the new configuration to become active
- After EGPWS reboot press Ctrl Z to restart WinVIEWS Terminal Mode communication
- Type "CFG" to restart configuration sub-mode and type "CMR <ENTER>" so that the categories and associated IDs are listed
- To exit type "Exit<ENTER>"

NOTE: Please see the TEMPORARY REVISION that revises this page

TEMPORARY REVISION NO. 126

To Chapter 34-47-00

This Temporary Revision is now considered a part of P. 180 Avanti II
MAINTENANCE MANUAL

NOTE: Record the incorporation of this Temporary Revision on the RECORD OF TEMPORARY REVISIONS sheet at the front of the manual

Insert: MAINTENANCE MANUAL
Report: 180-MAN-0200-01105 Rev. B3 Sept.21/12
After Page 208

Reason for issue : **Configuration command update**

NOTE: The remainder of this page is INTENTIONALLY BLANK. Refer to page 1 of this Temporary Revision

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6. EGPWS Configuration

A. Follow the steps:

- Connect the laptop with WinVIEWS to the EGPWS using the RS232 cable
- Apply power to the a/c
- Switch Battery SW to ON
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- Ensure the green "Computer OK" lamp of the EGPWS is illuminated
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- Start WinVIEWS program
- Select Terminal Mode (F6)
- Type "CFG" at the Terminal Mode prompt;
- Type "CFG>CUW 0/15 # # # # # # # # # # # # # # #", (15 is the number of categories - minimum 15; if less categories are selected complete the missing ones with 0's)

  Where

  - "0 is the version number
  - "/15 beginning of the data string with 15 categories to follow
  - "# are the IDs for the categories listed in Annex A;
    the form is <Cat ID#> (only digits)

  For P180 Avanti II the configuration command is:
  "CFG>CUW 0/15 1 255 0 11 0 254 125 253 255 255 255 0 7 0 0/"
- Press ENTER after completing the string
- The following message appears: "Confirm this data reflects the configuration to be programmed (Y/N)"
- The EGPWS will reboot to allow the new configuration to become active
- After EGPWS reboot press Ctrl Z to restart WinVIEWS Terminal Mode communication
- Type "CFG" to restart configuration sub-mode and type "CMR <ENTER>" so that the categories and associated IDs are listed
- To exit type "Exit<ENTER>"

7. EGPWS Self Test

- Connect the laptop to the EGPWS using the RS232 cable
- Apply power to the a/c
- Switch Battery SW to ON
- Switch Master SW to Avionics

A. SELF TEST LEVEL 1 - GO/NO GO TEST

- Ensure the INHIBIT Switch is NOT engaged
- Push the TAWS TEST Switch on the Miscellaneous/Reversionary Panel for less than 2 seconds or the type the "ST 1" command and verify the following sequence:
- Amber GPWS and TERR annunciators on the PFDs and MFD are turned ON
- Flap override OVR lamp is ON (Miscellaneous/Reversionary panel)
- Steep approach STP lamp is ON (Miscellaneous/Reversionary panel)
- Amber GND PROX on the PFDs and MFD is shown
- "GLIDESLOPE" aural message is heard
- Amber GND PROX on the PFDs and MFD is turned OFF
- Amber G/S Cancelled annunciator turns ON momentarily (Miscellaneous/ Reversionary panel)
- Red PULL UP on the PFDs and MFD is turned ON
- "PULL UP" aural message is heard
- Terrain Self test pattern is displayed
- "TERRAIN TERRAIN PULL UP" aural message is heard
- Red PULL UP on the PFDs and MFD is turned OFF
- Terrain Self test pattern turns off
- GPWS and amber TERR annunciators on the PFDs and MFD are turned OFF

B. SELF TEST LEVEL 2 - CURRENT FAULTS

- Initiate Self Test Level 1
- Once the test started press the TAWS TEST switch again for less than 2 seconds or type the "ST 2" command
- Verify the following messages are heard: "CURRENT FAULTS" and NO FAULTS"
- If current faults are present they are enunciated as External Faults or Internal Faults. Aural messages will provide a description
- If the test is initiated with the TAWS TEST switch, the message "PRESS TO CONTINUE" is given at the end of the test

7. EGPWS Self Test

- Connect the laptop to the EGPWS using the RS232 cable
- Apply power to the a/c
- Switch Battery SW to ON
- Switch Master SW to Avionics

A. SELF TEST LEVEL 1 - GO/NO GO TEST

- Ensure the INHIBIT Switch is NOT engaged
- Push the TAWS TEST Switch on the Miscellaneous/Reversionary Panel for less than 2 seconds or the type the "ST 1" command and verify the following sequence:
- Amber GPWS and TERR annunciators on the PFDs and MFD are turned ON
- Flap override OVR lamp is ON (Miscellaneous/Reversionary panel)
- Steep approach STP lamp is ON (Miscellaneous/Reversionary panel)
- Amber GND PROX on the PFDs and MFD is shown
- "GLIDESLOPE" aural message is heard
- Amber GND PROX on the PFDs and MFD is turned OFF
- Amber G/S Cancelled annunciator turns ON momentarily (Miscellaneous/ Reversionary panel)
- Red PULL UP on the PFDs and MFD is turned ON
- "PULL UP" aural message is heard
- Terrain Self test pattern is displayed
- "TERRAIN TERRAIN PULL UP" aural message is heard
- Red PULL UP on the PFDs and MFD is turned OFF
- Terrain Self test pattern turns off
- GPWS and amber TERR annunciators on the PFDs and MFD are turned OFF

B. SELF TEST LEVEL 2 - CURRENT FAULTS

- Initiate Self Test Level 1
- Once the test started press the TAWS TEST switch again for less than 2 seconds or type the "ST 2" command
- Verify the following messages are heard: "CURRENT FAULTS" and NO FAULTS"
- If current faults are present they are enunciated as External Faults or Internal Faults. Aural messages will provide a description
- If the test is initiated with the TAWS TEST switch, the message "PRESS TO CONTINUE" is given at the end of the test

NOTE: Please see the TEMPORARY REVISION that revises this page

C. SELF TEST LEVEL 3 - EGPWS CONFIGURATION

– Initiate Self Test Level 2

After "PRESS TO CONTINUE" message is shown press the TAWS TEST switch again for less than 2 seconds or the type "ST 3" command and verify that the following messages are present and record any non conformity.

NOTE: The "X" listed represents numbers, letters, the word "point" or no annunciation. Any of this annunciations are acceptable where "X" is listed below:

- "SYSTEM CONFIGURATION"
- "PART NUMBER 965-1210-026"
- "MOD STATUS X"
- "SERIAL NUMBER XXXX"
- "APPLICATION SOFTWARE VERSION XXX"
- "TERRAIN DATABASE VERSION XXX"
- "ENVELOPE MODE DATABASE VERSION XXX"
- "BOOT CODE VERSION XXX"
- "AIRCRAFT TYPE 3"
- "AIR DATA TYPE 255"
- "POSITION INPUT TYPE 0"
- "CALLOUTS OPTION 11"
- "AUDIO MENU 0"
- "TERRAIN DISPLAY TYPE 254"
- "OPTIONS 1 TYPE 125"
- "RADIO ALTITUDE TYPE 253"
- "NAVIGATION INPUT TYPE 255"
- "ATTITUDE INPUT TYPE 255"
- "MAGNETIC HEADING TYPE 255"
- "WINDSHEAR INPUT TYPE 0"
- "I/O DESCRETE TYPE 7"
- "VOLUME SELECT 0"
- "BANK ANGLE SELECTED"
- "ALTERNATE POP-UP SELECTED"
- "OBSTACLE AWARENESS ENABLED"
- "PEAKS MODE ENABLED"
- "GPS ALTITUDE REFERENCE MSL SELECTED"
- "STEEP APPROACH ENABLED"

8. EGPWS Inhibit

(1) Set the TAWS switch located on the Reversionary Panel to INHIB.
(2) When TERRAIN is active and INHIBIT Mode is selected, the cyan TERR INHB indication is visible below the Terrain selection switch and on the Reversionary panel (Refer to Table).
(3) When TERRAIN is not active and the INHIBIT Mode is selected the indication is visible only on the Reversionary panel (Refer to Table).

TEST SETTING				
Cond	Taws INHIB Switch	PFD / MFD Format (R-LSK-1)	RDR / TERR (Overlay) PFD / MFD Switch (R-LSK-2)	PFD / MFD Range
A	NORM / INHIB	ARC / PPOS	Active / TERR / RDR	Any
B	NORM / INHIB	ROSE / PLAN	Not Active	Any

9. EGPWS Audio Priority (TCAS I or ACAS II Installed)

(1) On the Reversionary / Miscellaneous Control Panel set the switch to TEST.
(2) During the TCAS audio signal press the TEST button on the Reversionary / Miscellaneous control Panel.
(3) Start TCAS Self-Test and check that the TCAS audio test is suppressed until the EGPWS audio signal is present (Refer to 34-43-00).

10. EGPWS Failure Annunciations

(1) Select and show the indication on the PFD / MFD.
(2) Open the GPS (CB 5060) copilot side circuit breaker and check the yellow "TERRAIN FAIL" indication is displayed on the PFD / MFD.
(3) Close the circuit breaker and check that the yellow "TERR" indication is displayed on PFD.
(4) Open the TAWS (CB 5063) copilot side circuit breaker and check the yellow "TERRAIN FAIL" indication is displayed on the PFD / MFD.
(5) Close the circuit breaker and check that the yellow "TERR" indication is displayed on PFD.

11. EGPWS Configuration Module - Removal / Installation

A. Procedure

(1) The Configuration Module replacing, require a specific maintenance procedures. If it is necessary to replace the Memory Configuration Module, please contact Piaggio Aero Industries Product Support

DEPENDENT POSITION DETERMINING - DESCRIPTION AND OPERATION

1. General

This Section 34-50-00 “Dependent Position Determining” includes that portion of the system which provides information to determine position and is mainly dependent on ground installation or orbital satellites. Includes items such as DME, transponders, radio compass, VOR, ADF, GLOBAL POSITIONING, etc.

Specifically, this Section” includes:

34-51-00 Radio Tuning Unit (RTU);

34-52-00 Control Display Unit (CDU);

34-53-00 VOR/ILS/MKR/ADF (VHF NAV) System;

34-54-00 DME System;

34-55-00 ATC Transponder;

34-56-00 Global Positioning System (GPS);

34-57-00 Secondary ATC Transponder

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RADIO TUNING UNIT (RTU) - DESCRIPTION AND OPERATION

1. Description

A. The Radio Tuning Unit (RTU-4200) provides centralized control and display of the radios (Communications and Navigation) and Air Traffic Control (ATC) transponder installed on the aircraft. The RTU can display the active frequencies from all installed radios.
The RTU is used to control the aircraft VHF COMM, DME/NAV, ADF, and ATC systems. It is normally used to select the operating frequency (or ATC code), operating mode, and self-test functions of the radios. The RTU provides centralized control and display of aircraft communication and navigation radio systems via serial bus.
Standard features include tuning capability for dual COM, NAV radios, DME, XPDR, ADF and FMS interface via serial bus, and an ON/OFF control for switching RTU power. The RTU can display system/radio diagnostic data, internally select and/or display the aircraft's radio subsystem configuration, and accept external tuning inputs from CDU.

The unit is located on the cockpit, in the central instrument panel, on the left of the copilot.
Power is obtained by the 28 Vdc essential bus, via circuit breaker RTU.

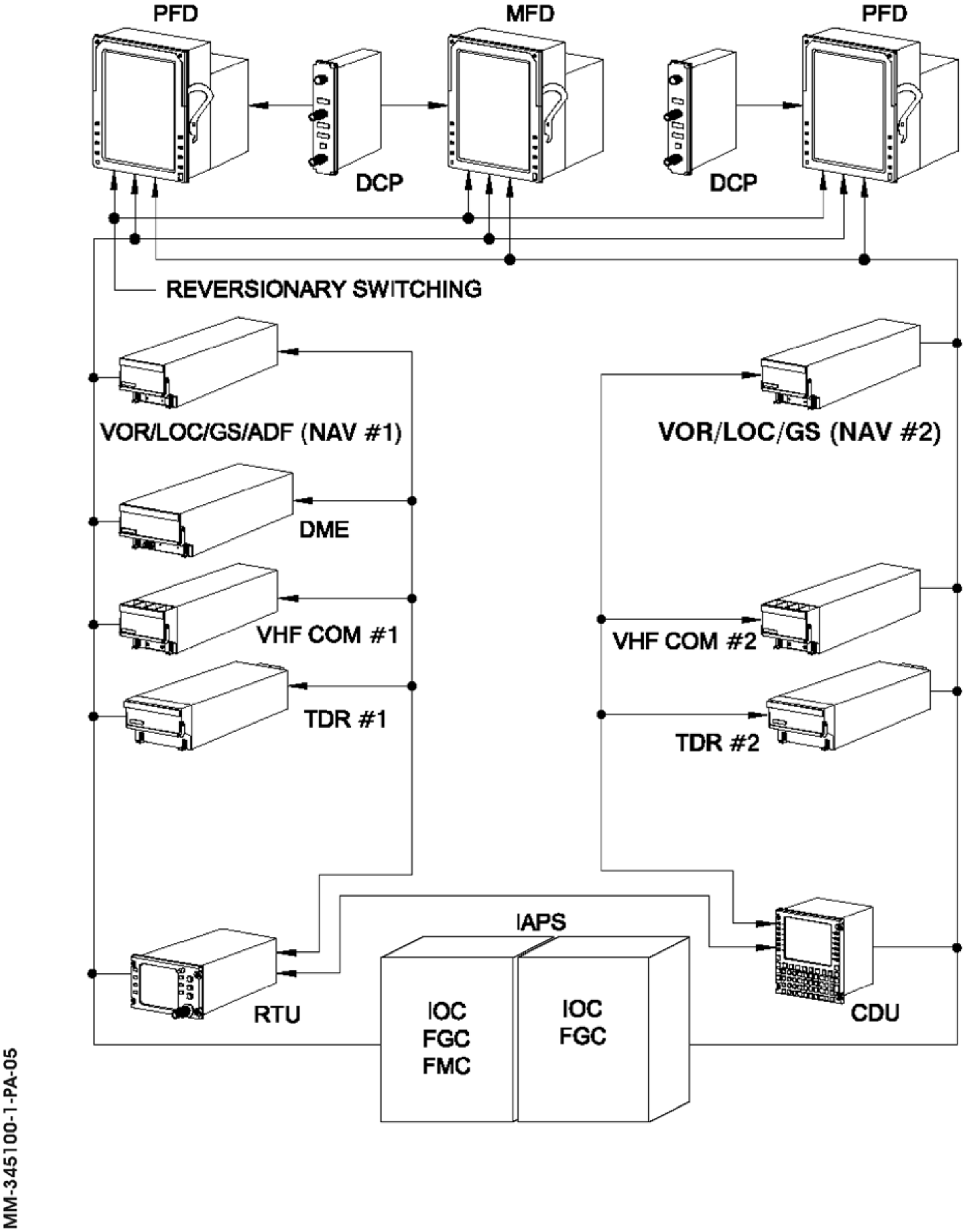


Fig. 1 - Radio Tuning Unit - Block Diagram

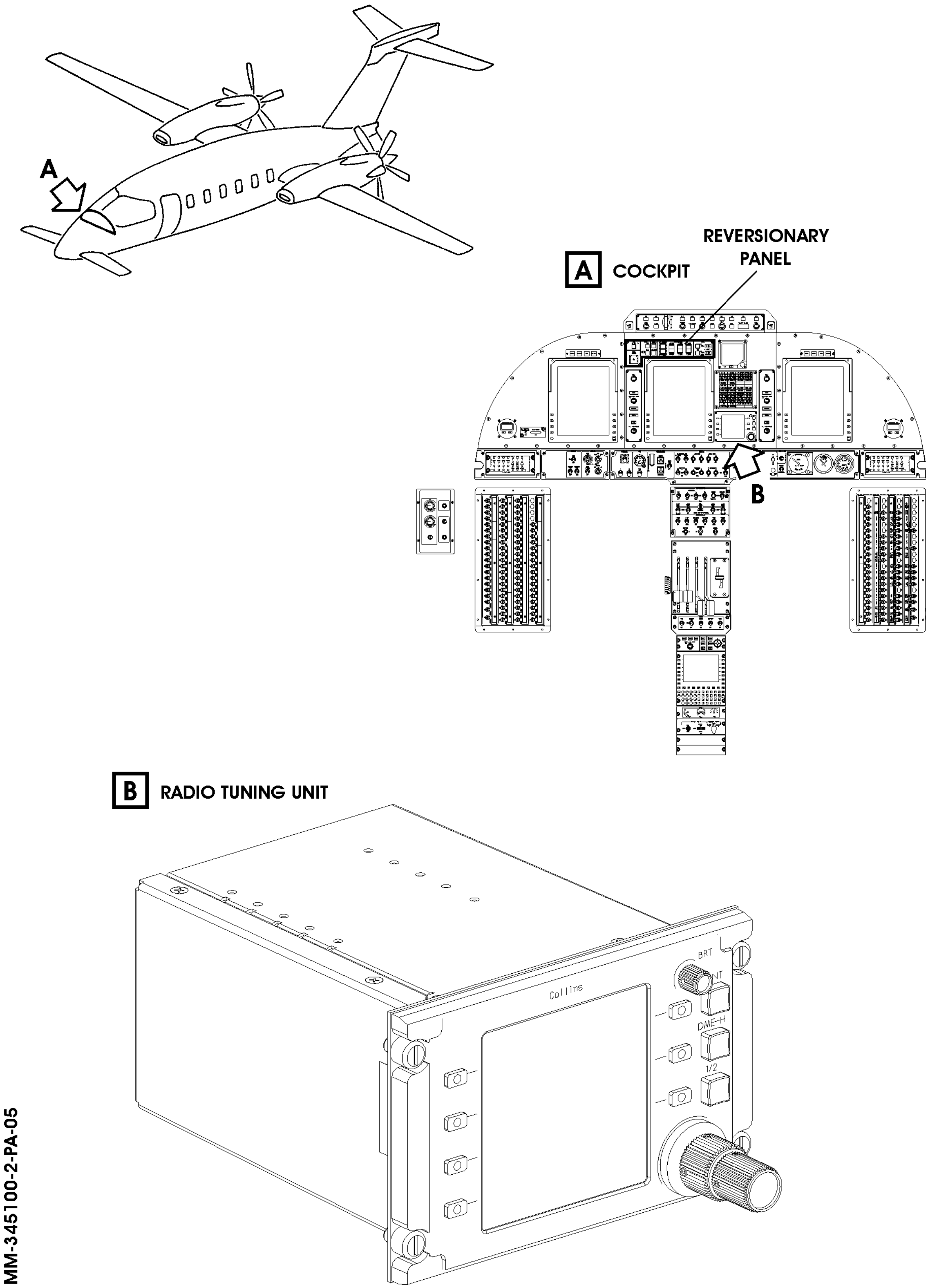
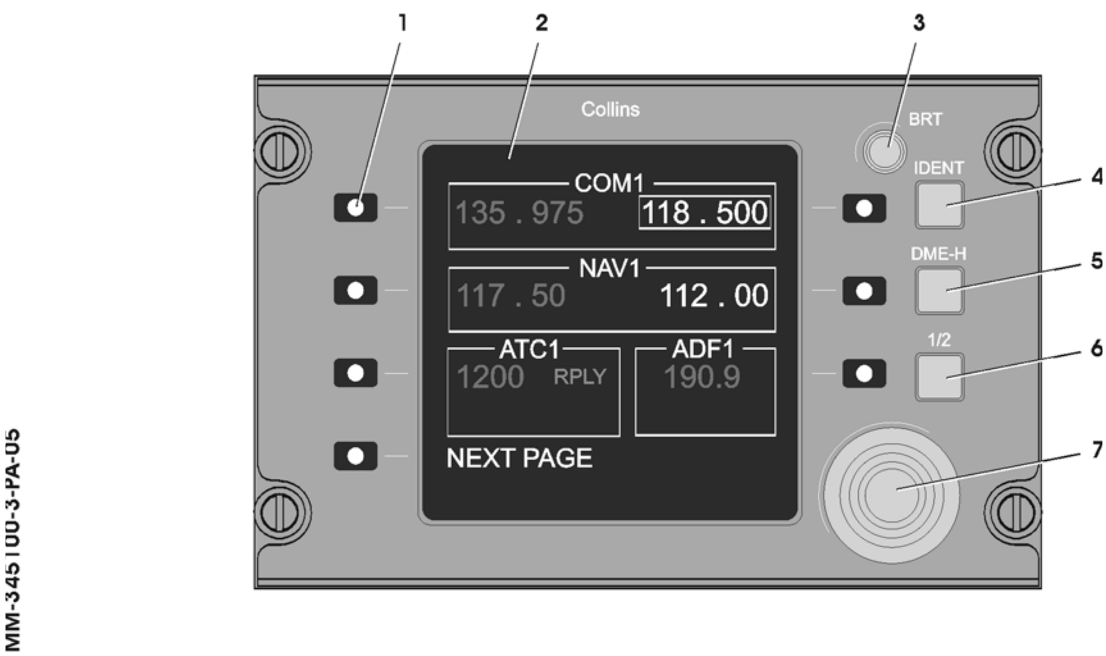


Fig. 2 - Radio Tuning Unit - Location of Components

2. Operation

A. The RTU provides control of the operating frequency, active mode, and self-test functions of the radios VHF communication, VOR/ILS/DME and ADF navigation, and ATC transponder.
There are three methods of RTU radio tuning: direct tuning, recall tuning, and tuning from the preset pages.



1. Line select keys (7)
2. LCD
3. LCD brightness control
4. IDENT key
5. DME-H key
6. 1/2 key
7. Concentric tune knob

Fig. 3 - Radio Tuning Unit - Typical Layout

Line Select Keys	The RTU has seven line select keys adjacent to the display, four on the left side and three on the right. The functions performed by any specific line select key depend solely on the page format present on the display. Each line select key is continually monitored. When a key is pressed, only the function associated with that key is activated. A stuck line select key will disable only its associated function and cannot disable or affect the overall operation of the RTU. Pressing an unassigned line select key does not affect the operation of the RTU. Detection of the line select key is disabled when the volume or tune knobs are rotated.
BRT	The BRT control in the upper right hand corner of the front panel serves as the primary LCD brightness control. When the RTU is controlled from the external dimming source, the BRT control functions as a secondary, or trim control for the LCD brightness. The BRT control also functions as an on/off switch.
IDENT	Pressing this key initiates the command for the active ATC to transmit the aircraft identifier. This key has no effect if pressed from the cross-side radio tuning inoperative page, configuration error page, menu page, or any display page under these pages in the hierarchy.
DME-H	Pressing this key toggles the DME hold function on the controlled DME channel. This key has no effect if pressed from the cross-side radio tuning inoperative page, configuration error page, menu page, or any display page under these pages in the hierarchy.
1/2	Pressing the 1/2 key displays the cross-side top-level page. Pressing the 1/2 key again returns the display to the on-side display page that was present before the 1/2 key was pressed. Operation of the 1/2 key is disabled if the configuration error page, menu page, or any page under these pages in the hierarchy is displayed, except for radio main and radio diagnostics pages.
Tune Knob	Two-tier concentric knob assembly is used for the tune function in order to perform the frequency/channel select functions. Subsystem functions controlled by the tune knobs include active frequency/channel selection, preset frequency/channel selection, channel numbers in the preset field, page scrolling, and configuration codes. Radios are directly tuned by changing the active frequency or code.

B. General RTU Tuning

Radios are directly tuned by changing the active frequency or code. Active values show in green and are located on the left side of those subdisplays that occupy both an active and recall line select key (COM, NAV, etc.)

Radios are recall tuned by setting a frequency or preset into the recall (right side) display, and then swapping the active and recall frequencies. This method of tuning allows the operator to set the desired frequency prior to tuning, and preserves the formerly active frequency.

The preset frequency shows in white. Recall tuning is available for COM and NAV radios only.

There are two recall tuning modes, frequency tuning mode and preset tuning mode.

- Frequency mode is identified by the absence of a preset below the frequency in the recall (right side) display area. Preset mode is identified by the presence of a preset (1-20, RCL, or EMER) below the frequency in the recall display area.
- To set the recall tuning mode for a particular radio, push the TUNE MODE line select key on the associated radio preset page. The active mode (FREQ or PRESET) shows in cyan and in large letters below the TUNE MODE label.

NOTE: The RCL preset is automatically generated when a preset frequency is swapped with the frequency in the active display. Once swapped, the formerly active frequency (now in the recall display) is programmed into the preset list and labeled the RCL (recall) preset. Once set, the RCL frequency may be reselected at any time by selecting RCL from the preset list. The recall preset is located between presets 1 and 20 on the preset list.

The COM, NAV, and ADF, radios may be tuned to a preset frequency from the preset pages. To access a preset page, push the PRESET PAGE line select key on the desired radio's main display page.

C. COM Operation
The COM subdisplay on the top level page provides basic COM radio tuning control.
Refer to 23-11-00.

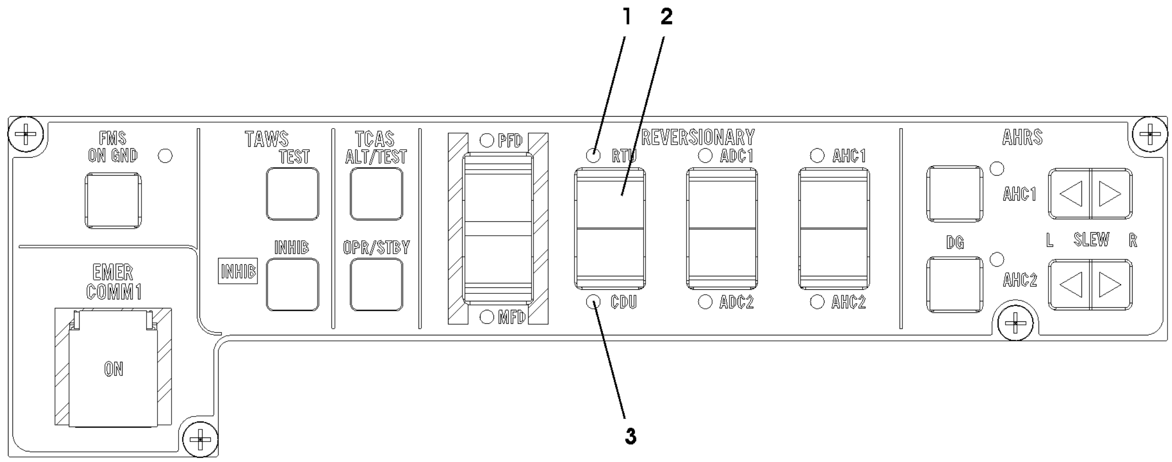
D. NAV Operation
The NAV subdisplay on the top level page provides basic NAV receiver tuning control.
Refer to 34-53-00 and 34-54-00.

E. ADF Operation
The ADF subdisplay on the top level page provides basic ADF receiver tuning control.
Refer to 34-53-00.

F. ATC Operation
The ATC subdisplay on the top level page provides control of the ATC code.
Refer to 34-55-00.

G. Cross-side Tuning
Cross-side tuning is an alternative to the pilot reaching across the controller (either RTU or CDU) to tune the cross-side radios. The pilot can select the cross-side radios for display on the RTU.

H. Reversionary Tuning
The Reversionary panel contain in the section “REVERSIONARY“, a 3 positions rocker switch labeled CDU/RTU, can select the position neutral, CDU or RTU.



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1. RTU LED
2. CDU/RTU rocker switch
3. CDU LED

Fig. 4 - Reversionary Panel

When the rocker switch CDU/RTU is not actuated (neutral position, no LED lighted), the CDU or RTU can provide the tuning of the Radio Communication and Navigation and transponder systems.

In case of RTU fails or loses tuning capability of the radios, actuating the CDU/RTU rocker switch on the Reversionary panel, to select the position CDU, the tuning capability of the radios is allowed only with CDU, and the RTU is disabled.

A LED, near the CDU ad RTU position labels, turns on to confirm the selected position.

When the rocker switch CDU/RTU on the Reversionary panel, is set to RTU, cross-side tuning capability is restored.

In case of CDU fails or loses tuning capability of the radios, actuating the CDU/RTU rocker switch on the Reversionary panel, to select the position RTU, the tuning capability of the radios is allowed only with RTU, and the CDU is disables.

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RADIO TUNING UNIT (RTU) - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00.

A. This topic provides the following Radio Tuning Unit Maintenance Practices:
– Radio Tuning Unit - Removal/Installation
– Radio Tuning Unit - Test.

2. Radio Tuning Unit - Removal (Refer to Fig. 201)

A. Fixtures, Test and Support Equipment

Circuit Breaker safety clips and tags	
Blanking cap	Not specified

B. Procedure

(1) Open, tag and safety the following circuit breaker:

Pilot CB panel:	Copilot CB panel:
RTU	LTS DIM 1

(2) Unscrew the four fixing screws.
(3) Extract the unit and disconnect the rear cable from the connector.
(4) Put cap on the electrical connector

3. Radio Tuning Unit - Installation (Refer to Fig. 201)

A. Procedure

(1) Remove the cap from electrical connector, if present (Ref. Para. 2, point B, item 4).
(2) Connect the rear cable to the connector and insert the unit in its housing.
(3) Screw in the four fixing screws.
(4) Remove the safety tags and close the previously opened circuit breaker:

Pilot CB panel:	Copilot CB panel:
RTU	LTS DIM 1

(5) Do the Radio Tuning Unit Test.

4. Radio Tuning Unit - Test

A. Refer to the Rockwell Collins documentation.

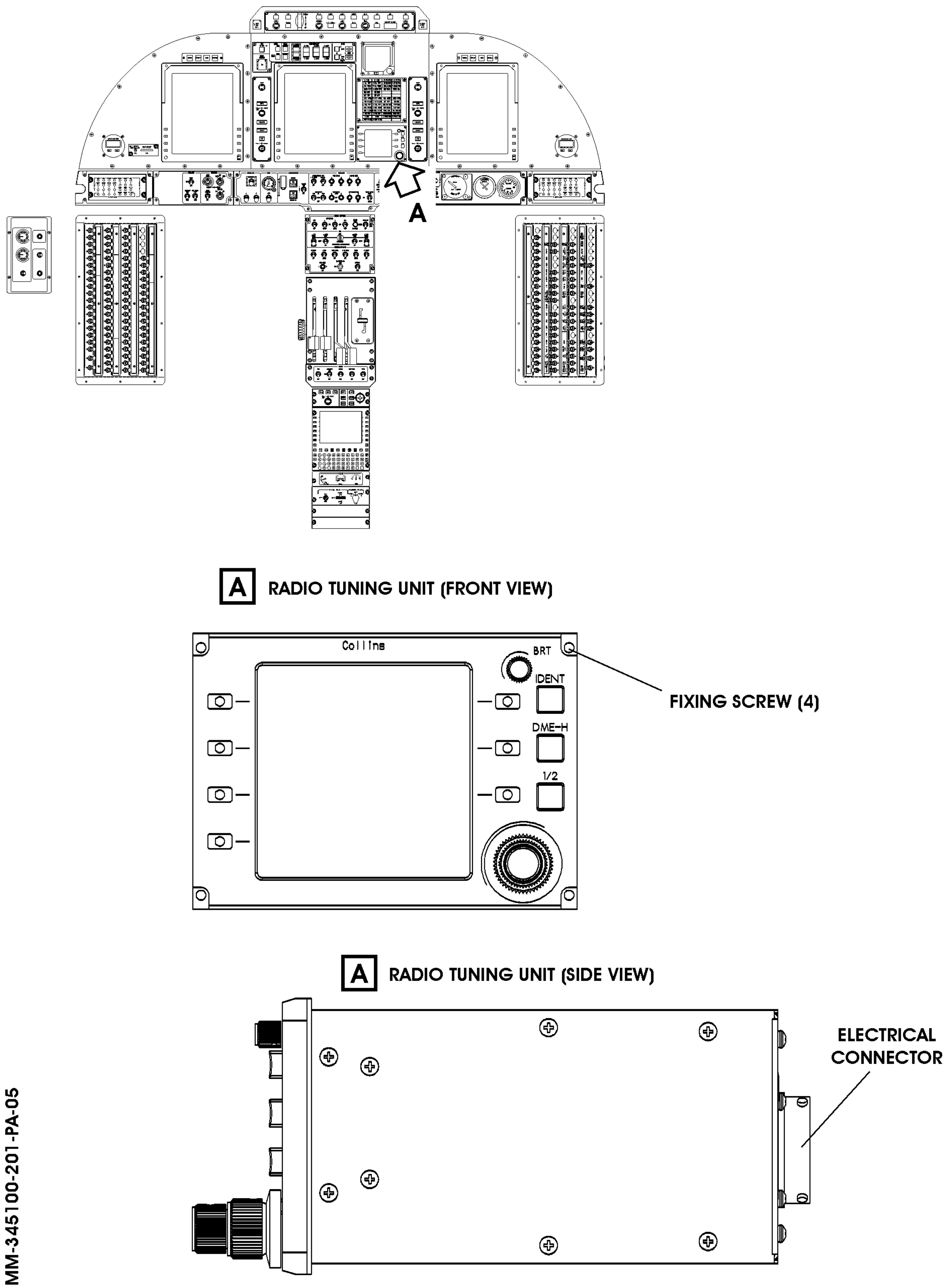


Fig. 201 - Radio Tuning Unit - Removal/Installation

CONTROL DISPLAY UNIT (CDU) - DESCRIPTION AND OPERATION

1. Description

   A. The Control Display Unit (CDU-3000) is a shared user interface that provides control and display functions for the Flight Management System and Radio Communication, Navigation and ATC transponder System.
   Dedicated keys select a variety of flight plan functions and system index, message, and MFD control pages. The CDU also selects radio frequencies for the COM, NAV, ADF, and ATC transponder codes. These functions include frequency/channel/code select, mode select, and self-test select.

   The unit is located on the pedestal, amid pilot and copilot.
   Power is obtained by the 28 Vdc left avionics supplementary bus, via circuit breaker CDU.

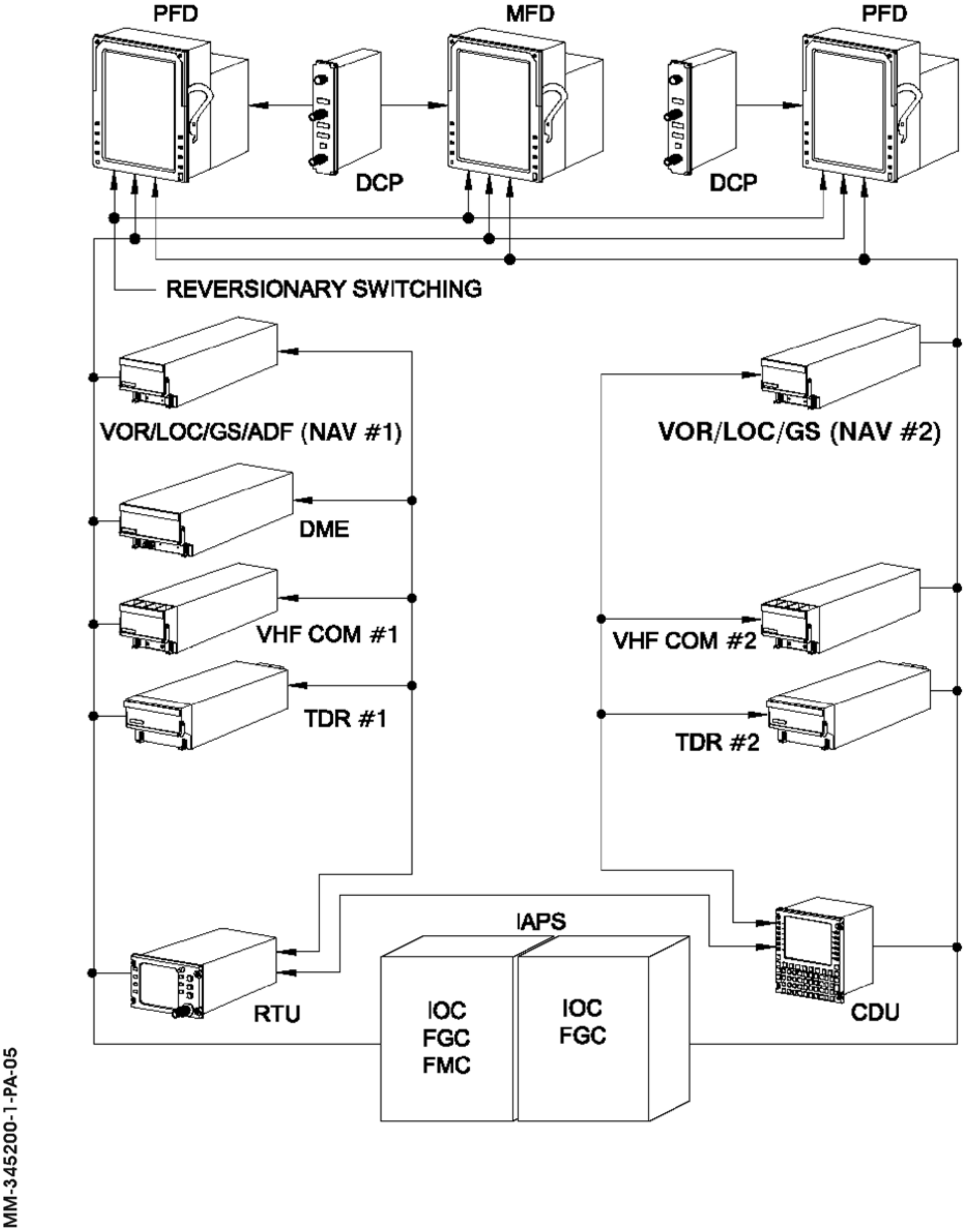


Fig. 1 - Control Display Unit - Block Diagram

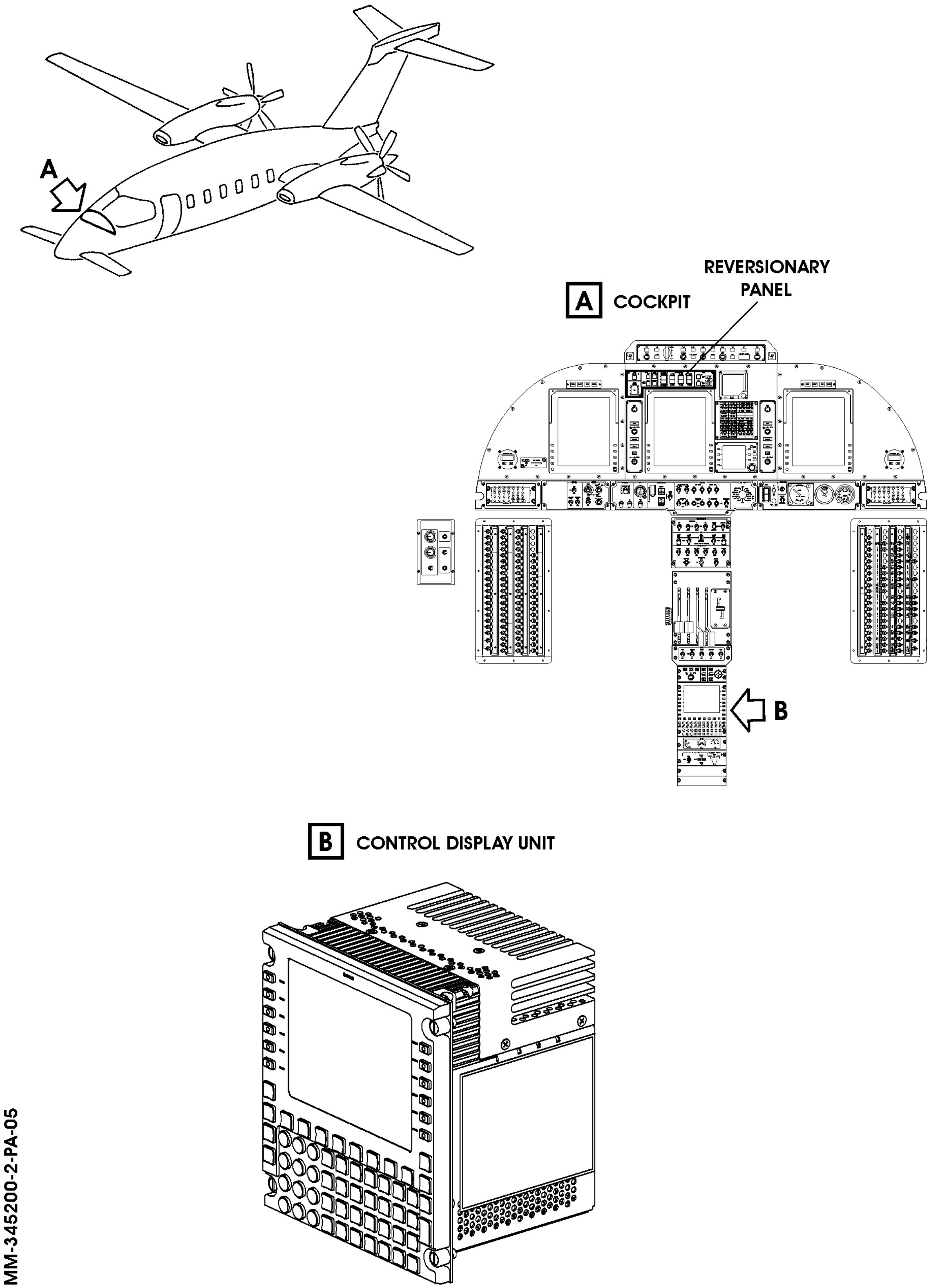


Fig. 2 - Control Display Unit - Location of Components

2. Operation

A. The CDU acts as the single control point for Flight Management System operations and functions. The electronic flight displays (PFD/MFD) provide additional display capability for information and functions.
The CDU has a color display to show the FMS-related information and function modes. The line select keys are used to select modes and copy or to transfer displayed information. The CDU function keys are used to directly select many of the FMS functions and display modes. The CDU also has a full alphanumeric keypad for entering data.

B. CDU Controls.
All operations that entail entering data for FMS operating functions are done through the use of a scratchpad entry system. Data are entered directly into the scratchpad with the keypad, or by pushing a line select key to copy data shown on a display line to the scratchpad. From the scratchpad, data is transferred to the appropriate data line by pushing the line select key for the entry position. FMS operating modes are selected directly by pushing the appropriate function key, or by pushing a line select key adjacent to an item in a menu shown on the display. Some functions are alternately switched on and off with sequential pushes of the associated line select key or a function key.

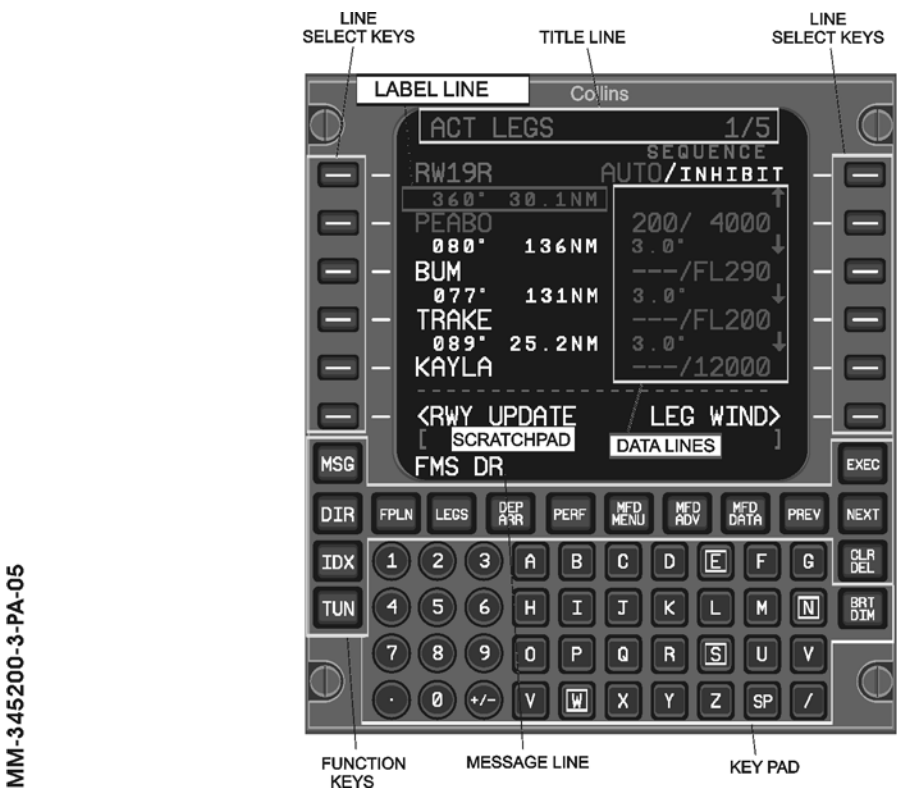


Fig. 3 - Control Display Unit - Typical Layout

Line Select Keys	The line select keys are placed on either side of the display. Push a line select key to copy or transfer its associated display data to or from the scratchpad, or to select an associated operating mode or function shown on a display page.
MSG	Push the Message function key on the CDU to show the MESSAGES page. Push the MSG key while the MESSAGES page is showing to return to the CDU display mode that was showing before the MESSAGES display mode was selected.
DIR	Push the Direct function key on the CDU to show the ACT DIRECT-TO pages. The ACT DIRECT-TO pages may consist of several pages and show a list of waypoints in the active flight plan. The pilot may select a DIRECT-TO waypoint from the list, or enter any valid waypoint into the top (dashed) waypoint line as a DIRECT-TO waypoint. The pilot may also enter an altitude for a vertical DIRECT-TO. The ACT DIRECT-TO pages also show a selection for NEAREST AIRPORTS.
FPLN	Push the Flight Plan function key on the CDU to show either the ACT FPLN or MOD FPLN page.
LEGS	Push the Legs key to show either the ACT LEGS or MOD LEGS page.
DEP ARR	Push the Depart Arrival function key on the CDU key to show the DEPART page for the origin airport, the ARRIVAL page for the destination airport, or the DEP/ARR INDEX page.
PERF	Push the Performance function key on the CDU to show the PERF MENU page. The PERF MENU page shows a menu of the available performance functions, allows the pilot to enable the VNAV advisory function, and displays/enables the VNAV PLAN SPD.
MFD MENU	Push the MFD menu pages on the CDU to show the DISPLAY MENU page. When the MFD MENU function key is pushed, either the MAP DISPLAY page or the TEXT DISPLAY page shows. The MFD DATA function key controls whether the MAP DISPLAY or TEXT DISPLAY menu shows. The DISPLAY MENU page is used to select the display of airports, navigation facilities, and other navigation-related display elements, modes or options for the PPOS MAP, PLAN MAP, and TEXT display modes of the MFDs.
MFD ADV	Push the MFD Advance function key on the CDU to show the DISPLAY ADVANCE page. Use this page to move through the MFD text pages, or to move the center waypoint on the MFD PLAN MAP. This page shows either a TEXT DISPLAY menu or a PLAN MAP CENTER menu, depending on whether the MFD is in a Map mode or the Text mode. The MFD DATA function key controls whether the TEXT DISPLAY or the PLAN MAP CENTER menu shows.
MFD DATA	Push the MFD Data function key on the CDU to alternately switch display modes between MAP and TEXT modes for the on-side MFD. When MAP mode is selected, the MFD is in MAP mode. On the CDU, the MAP DISPLAY menu shows when the MFD MENU key is pushed, and the PLAN MAP CENTER page shows when the MFD ADV key is pushed. When TEXT mode is selected, the MFD is in TEXT mode. On the CDU, the TEXT DISPLAY menu shows when the MFD MENU key is pushed, and the TEXT DISPLAY menu shows when the MFD ADV key is pushed.

PREV	Many CDU display modes, such as ACT LEGS and ACT FPLN, may require several pages to show all their information. Page numbers in the upper right corner show the current page and total number of pages of the display mode. Push the Previous function key to go back to a previous page of a selected display mode. When the first page of display mode is showing, push the PREV function key to go directly to the last page of that display mode.
NEXT	Many CDU display modes, such as ACT LEGS and ACT FPLN, may require several pages to show all their information. Page numbers in the upper right corner show the current page and total number of pages of the display mode. Push the Next page function key to advance to the next page of the selected display mode. When the last page of a display mode is showing, push the NEXT function key to return to the first page of that display mode.
EXEC	Push the Execute function key to execute a flight plan and change the MOD LEGS to the ACT LEGS or MOD FPLN to the ACT FPLN page. Pushing the EXEC key allows the FMS to use the flight plan to generate steering commands for the flight control systems if any of the following apply: - A new flight plan is entered on the FPLN or LEGS pages - A modification is made to an active flight plan on the ACT FPLN or ACT LEGS pages - Selected entries or changes are made on the PERF INIT pages This method of flight plan activation allows the operator to enter, change, and review a flight plan before it is activated for use as a steering source by the FMS.
IDX	Push the Index function key to show the INDEX pages. The INDEX pages show a menu of available additional FMS functions that do not have direct access function keys.
TUN	Push the Radio Tuning function key on the CDU to show the TUNE page.
CLR DEL	The Clear Delete key performs two functions that depend on whether or not there is data in the scratchpad. - When there is data in the scratchpad, push and release the Clear Delete key to backspace one character at a time (right to left), or push and hold the key for more than one half second to clear the entire scratchpad at once. - When there is no data in the scratchpad, push the CLR DEL key to enter the word DELETE into the scratchpad. This can then be transferred to various functions or data fields on the CDU pages to delete the data currently entered/showing for that function or field.
Keypad	The keypad includes the 26 letters of the alphabet, the numbers 0 through 9, a decimal point, a +/– key, a space (SP) key, and a slash (/) key. Push the letter keys to enter letter characters into the scratchpad. Push the number keys to enter numbers into the scratchpad.
BRT DIM	The Brightness Diminution button adjusts the brightness of the CDU display. Push the BRT edge of the button to increase brightness. Push the DIM edge of the button to decrease brightness.

C. Data Entering

The top line of the display shows a title/mode, and the current page number and total number of pages as applicable for that display mode. Below the title/mode line, there are six data lines and six label lines to show data for a given display page. The two bottom lines on the display are used for the scratchpad and message lines. Many of the display pages are configured to show two columns of information, which allows the use of the line select keys on both sides of the display to select, copy, or transfer displayed data.

Text Lines	The display shows up to 15 lines of 24 characters of text in five colors, in a large or small font.
Title/Mode Line	The top line of the display always shows the display page title or mode, and the current page and total number of pages when applicable.
Data Lines	Data lines align with the line select keys. Data lines show specific information related to the selected display page. On many of the display pages, the line select keys can copy the associated data line information into the scratchpad to use on another data line on the same page, or on another display page.
□□□□□□ **(Prompts)**	Prompts show on data lines as small square boxes. A prompt indicates required input of data to perform the function related to the prompt description on the label line.
– – – – – – – – **(Dashes)**	Dashes show on data lines where data can be entered. The dashed data lines are for optional information.
Label Lines	Label lines show above each data line. They describe the information in a data line or provide additional information related to the data.
Function Lines	Many of the display pages use the two bottom line select keys for additional function selections. To separate function selection lines from the data lines, the display page shows a dashed line across the display on the label line above the bottom two line select keys.
Scratchpad	The bracketed **[ ]** scratchpad display line shows just below the bottom line select keys. Unless specified otherwise, all data entered, changes made to a flight plan, or other FMS-controlled functions, must be done through the scratchpad.
Message Line	Below the scratchpad on the bottom line of the display is the message line. Various messages show on the message line to inform or alert the operator of the various functional operations.
Display Colors	Five colors (cyan, yellow, magenta, white, and green) are used to show text on the various display pages.

D. FMS Operation. It is selected by pushing the appropriate function key or a line select key adjacent to an item in a menu shown on the display. Refer to 34-60-00.

E. CDU Tune Operation. There are three methods of CDU radio tuning: direct tuning, recall tuning, and preset tuning. Refer to 23-00-00 and 34-53-00.

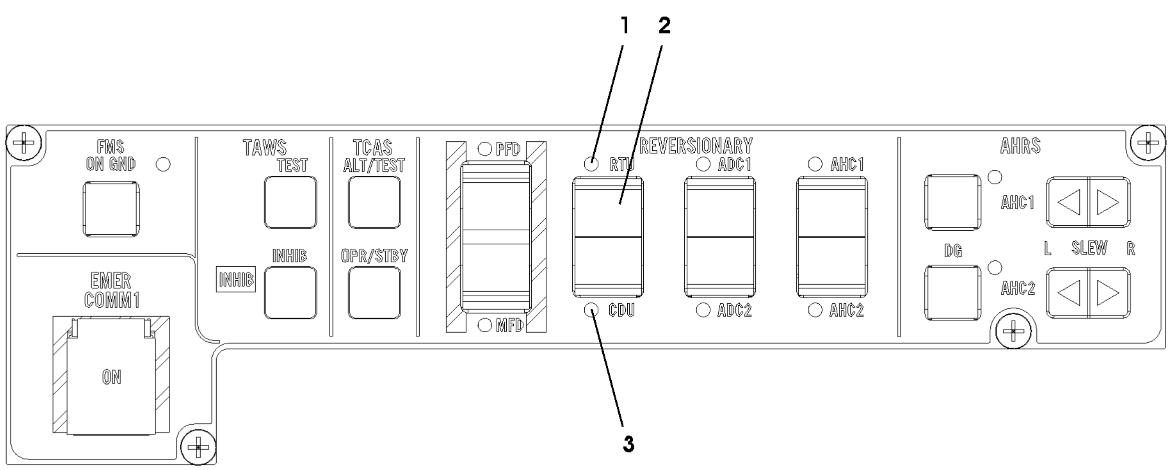
F. Dec. 15/09COM Operation. The active and recall frequency can be tuned from the COM subdisplay on the TUNE page or from the COM CONTROL 1/5 page. Refer to 23-00-00.

G. NAV Operation. The active frequency is tuned from the NAV subdisplay on the TUNE page. It can also be tuned from the NAV CONTROL 1/7 page. Refer to 34-53-00 and 34-54-00.

H. ADF Operation. The active frequency is tuned from the ADF subdisplay on the TUNE 2/2 page. It can also be tuned from the ADF CONTROL 1/5 page. Refer to 34-53-00.

I. ATC Operation. The ATC subdisplay on the CDU TUNE page provides control of the ATC code. The active code can also be set from the ATC CONTROL page. Refer to 34-55-00.

J. Reversionary Tuning. The CDU position of the rocker switch installed on the reversionary panel is used to restore full tuning capability to the CDU in the event of an RTU failure. In the case of an RTU failure, the CDU loses normal full tuning capability of the cross-side radios. The message CROSS-SIDE TUNING INOPERATIVE shows in yellow on the CDU when cross-side tuning capability is lost. When the rocker switch is set to CDU, cross-side tuning capability is restored.



1. RTU LED

1. RTU LED
2. CDU/RTU ROCKER SWITCH
3. CDU LED

Fig. 4 - Reversionary Panel

CONTROL DISPLAY UNIT (CDU) - MAINTENANCE PRACTICES

1. General

   WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00.

   A. This topic provides the following Control Display Unit Maintenance Practices:
   - Control Display Unit - Removal/Installation
   - Control Display Unit - Test.

2. Control Display Unit - Removal (Refer to Fig. 201)

   A. Fixtures, Test and Support Equipment

Circuit Breaker safety clips and tags	
Blanking cap	Not specified

   B. Procedure

   (1) Open, tag and safety the following circuit breaker:

Pilot CB panel:	Copilot CB panel:
CDU	LTS DIM 1

   (2) Unscrew the four fixing screws.

   (3) Extract the unit and disconnect the rear cable from the connector.

   (4) Put cap on the electrical connector.

3. Control Display Unit - Installation (Refer to Fig. 201)

   A. Procedure

   (1) Remove the cap from electrical connector, if present (Ref. Para. 2, point B, item 4).

   (2) Connect the rear cable to the connector and insert the unit in its housing.

   (3) Screw in the four fixing screws.

   (4) Remove the safety tags and close the previously opened circuit breaker:

Pilot CB panel:	Copilot CB panel:
CDU	LTS DIM 1

   (5) Do the Control Display Unit Test.

4. Control Display Unit - Test

   A. Refer to the Rockwell Collins documentation.

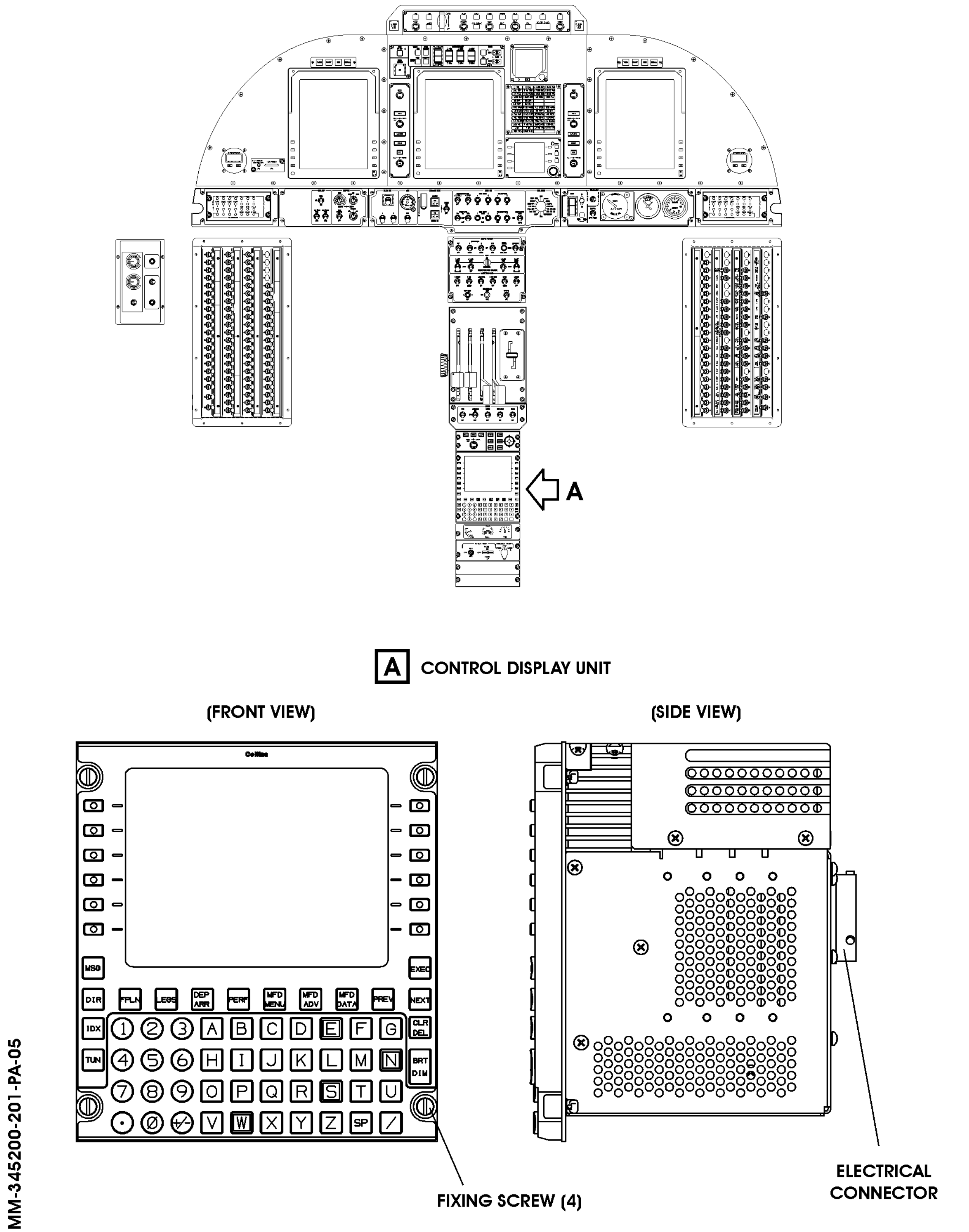


Fig. 201 - Control Display Unit - Removal/Installation

VOR/ILS/MKR/ADF RECEIVER (VHF NAV) SYSTEM - DESCRIPTION AND OPERATION

1. Description

A. The VHF radio navigation system is a dual system (primary and secondary) that provides navigational data to the displays and to other aircraft system and consists of two VHF radio combined receivers and two display/control units.

The primary navigation (PRI NAV) receiver is a combined VOR/ILS/MKR/ADF receiver type NAV-4000; the secondary navigation (SEC NAV) receiver is a combined VOR/ILS/MKR receiver type NAV-4500.

The NAV receivers are remote-mounted navigation receivers that provide VOR/LOC, glideslope, ADF and marker beacon outputs for use by the PFDs, MFD, FGS and FMS.

The primary VHF NAV Receiver (NAV-4000) contains VOR/LOC, glideslope, marker beacon, and ADF receivers in a single package. The secondary VHF NAV Receiver (NAV-4500) contains VOR/LOC, glideslope, and marker beacon receivers in a single package.

The VOR signals provide enroute navigation and terminal area guidance. The ILS LOC/GS signals provide approach and landing guidance data. The marker beacons provide distance to runway data.

The control portion of the system consists of a Control Display Unit (CDU) and a Radio Tuning Unit (RTU). The CDU and RTU provide integrated control of several combinations of aircraft communications and navigation subsystems (Refer to Fig. 1).

Only the primary navigation (NAV) receiver, that is combined with the ADF receiver, is connect to the ADF antenna; meanwhile the VOR/ILS/MKR receivers installed either on primary and secondary NAV receivers are connected to a single VOR/LOC antenna through the VOR/LOC Diplexer, to a single Glideslope antenna through the G/S Diplexer and to a single Marker antenna through the Marker Diplexer.

The Primary Radio Navigation System is powered by the Essential Avionics Bus through the NAV1 circuit breaker, located on the pilot c/b panel.

The Secondary Radio Navigation System is powered by the Right Avionics Dual Feed Bus through the NAV2 circuit breaker located on copilot c/b panel.

B. The primary and secondary NAV receivers are in the avionics bay, right side (see Fig. 2).

The PFDs, MFD, DCPs, CDU and RTU are located on the cockpit panel.

The ADF antenna (only for primary Navigation system) is located on the lower fuselage between FS 4968 and 5369.

The VOR/LOC antenna is a double elements located on the both side of vertical stabilizer.

The Glide slope (GS) antenna is located in the radome of nose avionics bay at FS - 1150.

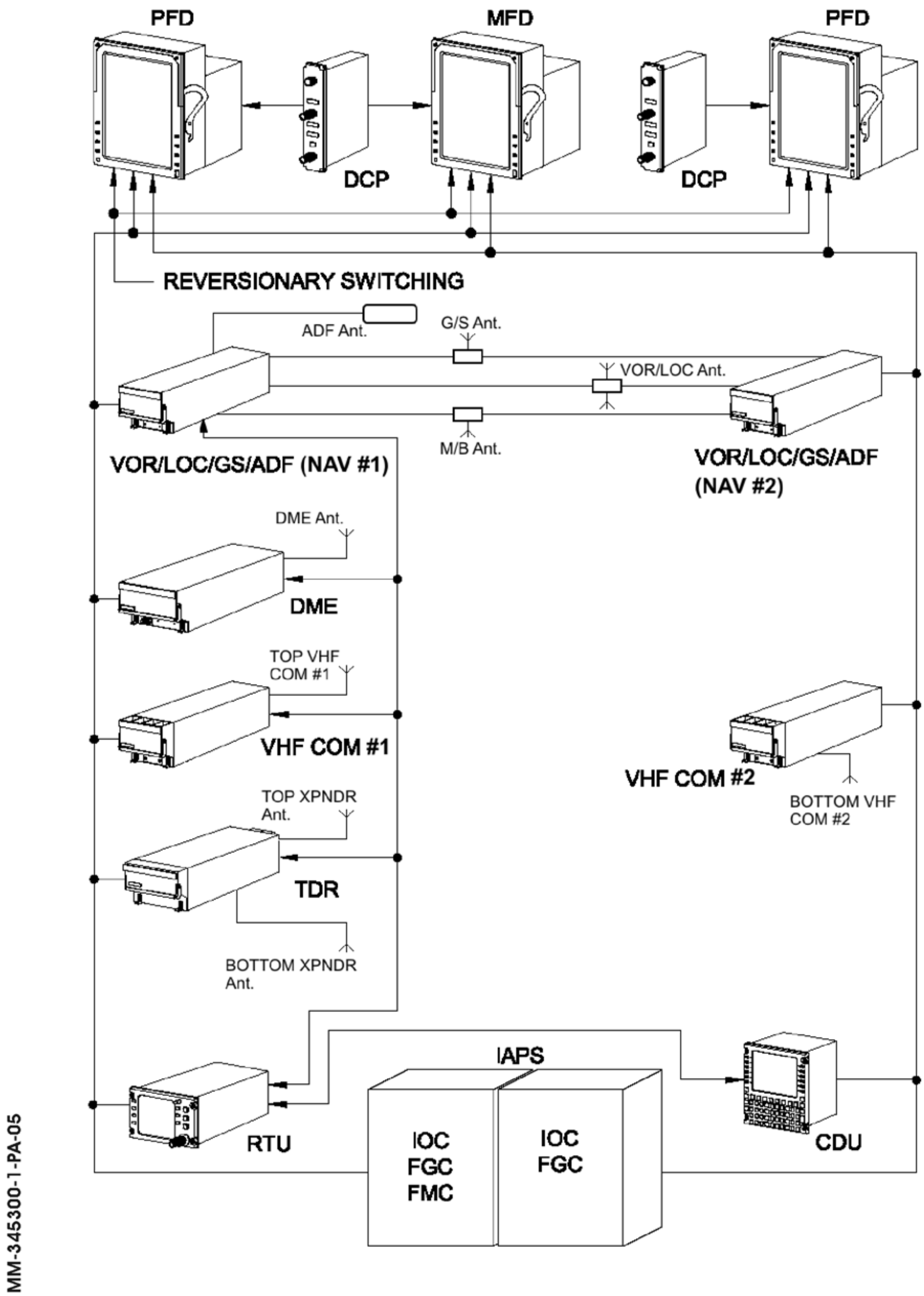


Fig. 1 - Primary and secondary Radio Navigation Block Diagram

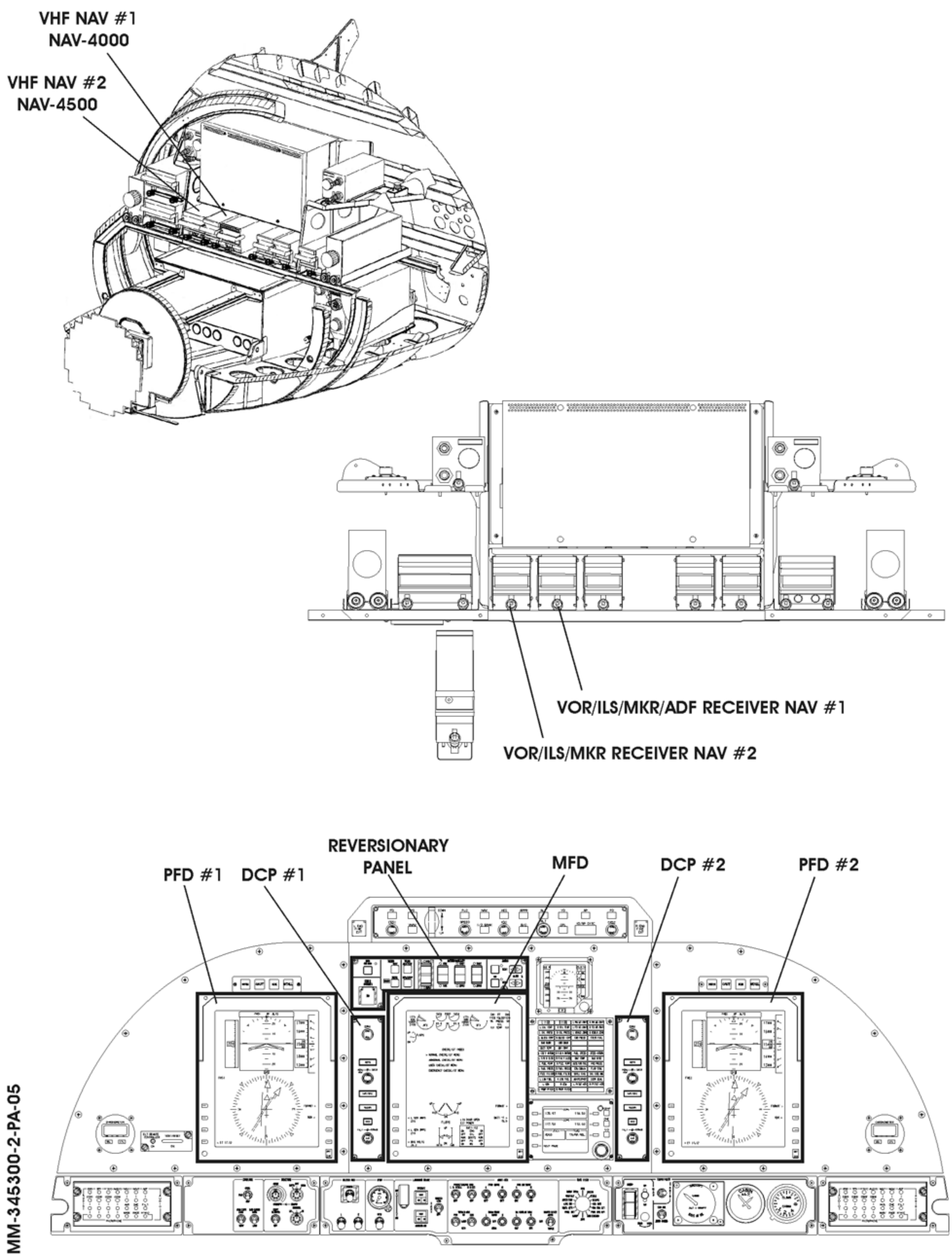


Fig. 2 - Radio Navigation Receivers, controls and displays location

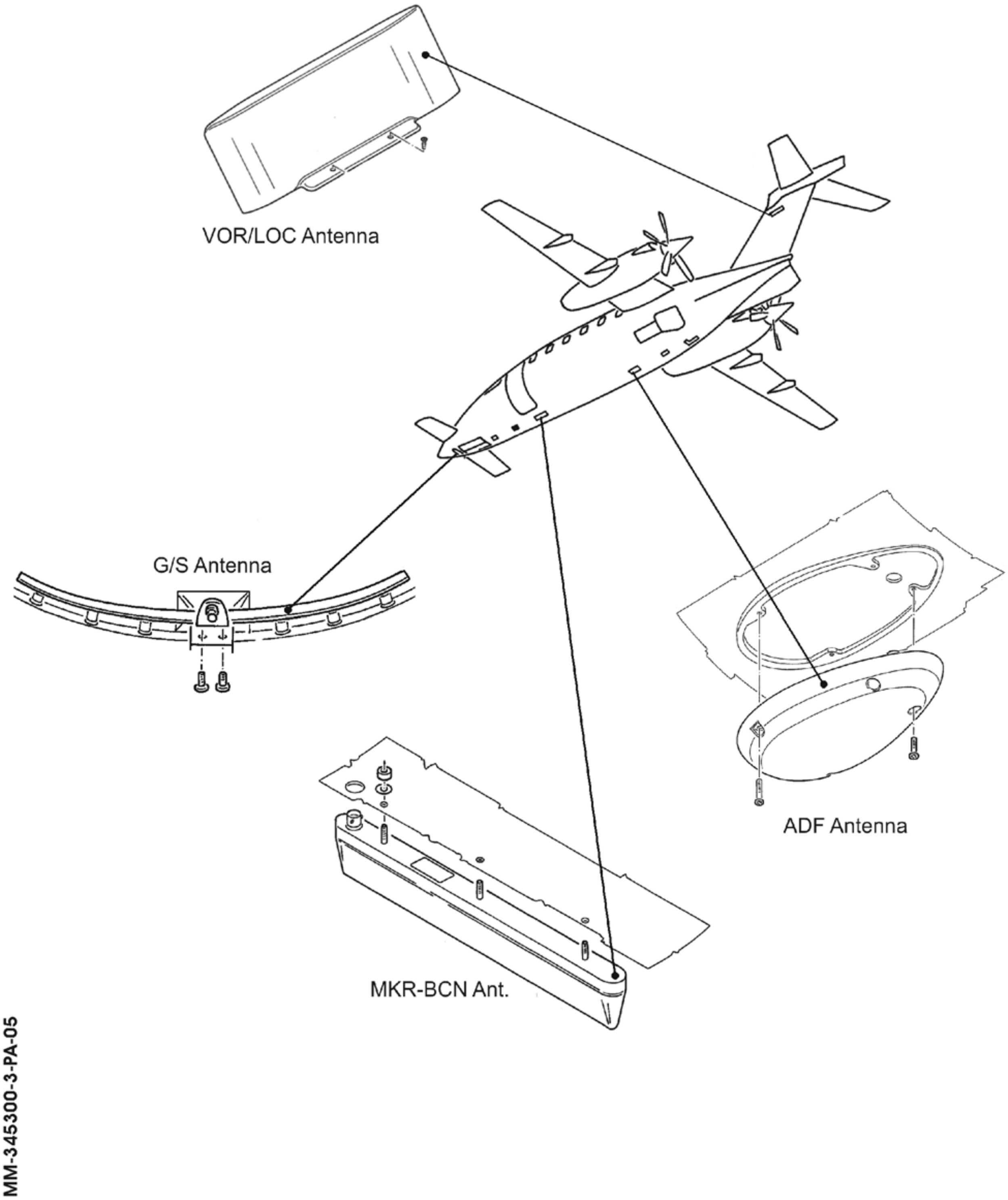


Fig. 3 - ADF, VOR/LOC, G/S and MKR antennas location

The Marker Beacon antenna is located in the lower front fuselage between FS 1723-2159. For the location of all Radio Navigation Antennas refer to Fig. 3.

The Diplexer antennas are located on the avionics bay, behind the both NAV receivers.

C. The ADF receiver (only on primary VHF NAV receiver NAV 4000) provides the pilot with bearing information to selected stations. These stations are generally low- and medium-frequency non-directional beacons (190 to 850 kHz and 1615 to 1799 kHz) or standard AM broadcast stations. Non-directional beacons are identified by a CW 1020 Hz tone keyed to transmit a three-letter identification code. Standard AM broadcast stations are identified by voice transmission of the station call letters.

   Measuring the direction of arrival of a received signal and from this information provide a relative bearing indication with respect to the center line of the aircraft is the concept of ADF navigation. The ADF system resolves voltages induced into two mutually perpendicular directional loop antennas and an omnidirectional sense antenna.

D. The VOR/LOC receiver is a single conversion receiver that demodulates the VOR or LOC signal from the 118.0 to 117.95 MHz band and applies detected signal to a converter. The amplified output is digitized by a converter and applied to the Digital Signal Processor. The circuits process the detected signals to derive the 30 Hz reference and 30 Hz variable phase signals from the detected VOR signal to calculate the VOR bearing. In ILS mode the circuit derives a standard 90/150 Hz localizer signal from the detected LOC signal. This signal represents the left and right deviation from the localizer beam. The detected VOR/LOC signal is applied to the aircraft audio system.

E. The Glideslope Receiver is a single conversion receiver that demodulates the GS signal from 329.15 to 335.00 MHz band and applies the detected signal to the Digital Signal Processor bus. The GS frequency is paired with the localizer frequency selected on the control unit.
   This frequency is related directly to the frequency and channels the receiver to the desired station.
   The detected GS signal represents up or down deviation from the glideslope beam.

F. The Marker Beacon Receiver is single channel tuned rf receiver. The MB receiver amplifies and demodulates the received 75 MHz signal and applies the detected signal to the Digital Signal Processor and audio to the aircraft audio system.
   Sensitivity control is selected by the CDU and RTU NAV control pages.
   The detected marker beacon signals is applied to the DSP bus. The marker beacon audio amplifier is applied to the aircraft audio system.

G. Both Primary and Secondary Navigation Receivers are connected via dedicated diplexers to the VOR/LOC antenna, to the glideslope antenna and to the marker beacon antenna. Only the primary Navigation receiver is connected to ADF antenna.
   The VOR/LOC antenna receives signals from the VOR or localizer transmitters on the ground. The VOR/LOC antennas are omnidirectional and horizontally polarized.

The glideslope antenna receives glideslope signals from the glideslope transmitter located on the ground. The glideslope antenna is horizontally polarized and provides signals to two glideslope receivers.

The marker beacon antenna receives signals from the outer, middle, and inner marker beacon transmitters on the ground. The marker beacon antennas are horizontally polarized.

The ADF antenna (only for primary Navigation receiver) is a loop and sense antenna to get signals proportional to the sine and cosine of the relative bearing to a selected station. The loop antenna establishes the angle to the station. The sense antenna establishes which direction on the line the station is located.

2. Operation

A. The controls of the functions of the Radio Navigation receivers are provided by means of the Control Display Unit (CDU), by the Radio Tuning Unit (RTU) and by the two Display Control Panels (DCP) in conjunction with the line select keys on the PFD and MFD.

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Fig. 4 - Control Display Unit (CDU)

B. The Control Display Unit (CDU), located on the pedestal panel (Ref. Fig. 2), is a interface that provides control and display functions shared for the Flight Management System (FMS) and Radio Navigation System (Ref. Fig. 4).

The CDU is the normal direct means of radio tuning, control and display functions for the NAV, ADF subsystems for both pilot and copilot radios.

These functions include frequency/channel/code select, mode select, and self-test select.

The Control Display Unit (CDU) is a colour, LCD-based display with an integrated keyboard.

For further detail refer to chapter 34-52-00.

C. The NAV Operation with CDU is performed when the NAV subdisplay on the CDU TUNE page is selected. This provides tuning functions for the NAV1 and NAV2 receivers. Other NAV control functions are handled on the NAV (1 and 2) CONTROL pages.
The active NAV frequency can also be tuned from the NAV CONTROL 1/7 page.

1. The NAV is tuned on the TUNE page. Push the TUN function key on the CDU to show the TUNE page.

2. To tune the NAV radio from the TUNE page or NAV CONTROL page:
   - Enter the desired frequency, preset number or identifier in the scratchpad.
   - Push the appropriate line select key (third Left or third Right of CDU) to transfer the contents of the scratchpad to the desired (#1 or #2) NAV radio.

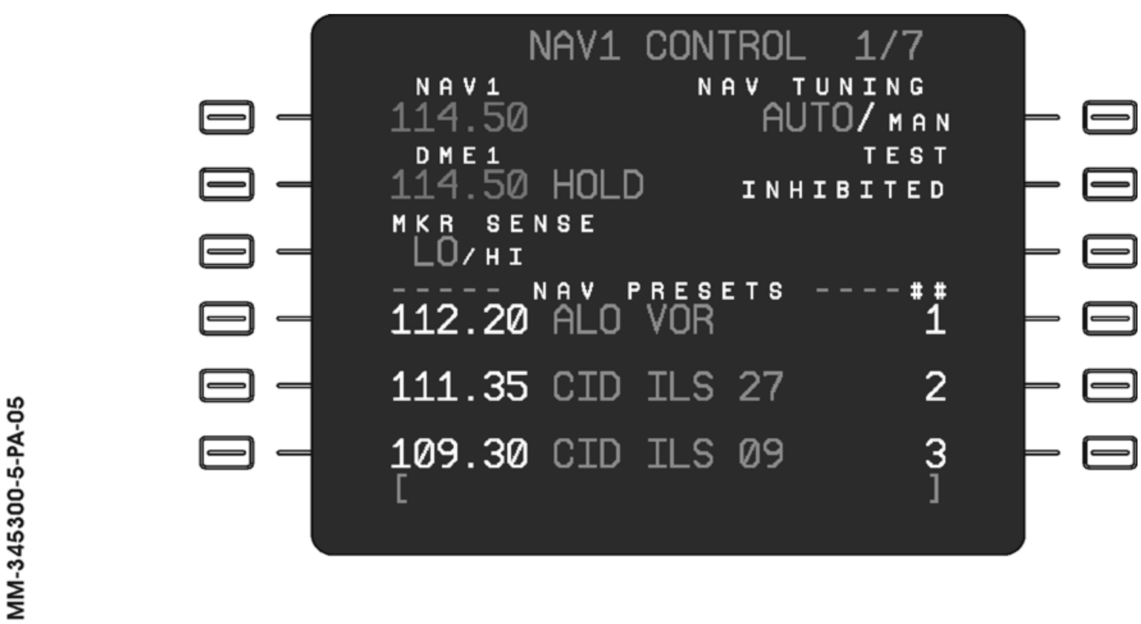

Fig. 5 - Control Display Unit (CDU)- NAV Operation typical layout

3. The NAV can be directly tuned or preset programmed, using a station identifier. Use the NEXT or PREV function keys to select the page desired.
   – Push the line select key adjacent to the desired station identifier to transfer the selected frequency and identifier to the active NAV frequency field. Upon completion of the selection, the page is replaced with the page that was showing before.
4. Push the line select key adjacent to the desired (pilot side or copilot side) NAV active frequency (with the scratchpad empty) to show the NAV CONTROL page.
5. The FMS AUTOTUNE feature can tune the NAV radio through the CDU. The FMS is allowed to automatically tune the VOR receiver(s) whenever the NAV is not the NAV source.
6. The Marker Beacon sensibility LO/HI is selected in the CDU. MK-HI shows in cyan when active.
7. Push the line select key adjacent to TEST to select the NAV/DME self-test. The self-test is active for 10 seconds.
   – During the self-test, the Marker Beacon will be set active sequentially, VOR Bearing goes to 360°, and ILS shows 1 dot deviation left and 1 dot deviation down.
   – When the NAV/DME self-test is active the TEST identifier shows in cyan and in large letters.
8. The NAV is preset tuned from the NAV CONTROL X/7 pages.
   – With the scratchpad empty, push the line select key adjacent to the desired numbered preset to transfer the numbered preset to the active frequency field.
   – The numbered preset data is green when selected and the active frequency is valid.
   – Multiple preset pages are available for the NAV radio. The NEXT or PREV function keys selects the next or previous preset page.

D. The ADF Operation with CDU is performed when the ADF subdisplay on CDU is selected.
   The active ADF frequency is tuned from the TUNE 2/2 page. The active ADF frequency can also be tuned from the ADF CONTROL 1/5 page. The ADF mode ADF or ANT, BFO feature, and ADF self-test is controlled from the ADF CONTROL page.
   1. The ADF receiver is tuned from the ADF subdisplay on the TUNE 2/2 page. Push the TUN function key on the CDU to show the TUNE 1/2 page.
      – Push the NEXT PAGE line select key on the CDU TUNE page to show the TUNE 2/2 page.
      – Enter the desired frequency or preset number in the scratchpad.
   2. With the scratchpad empty, push the line select key adjacent to the desired side (pilot or copilot) active ADF frequency to show the ADF CONTROL page.

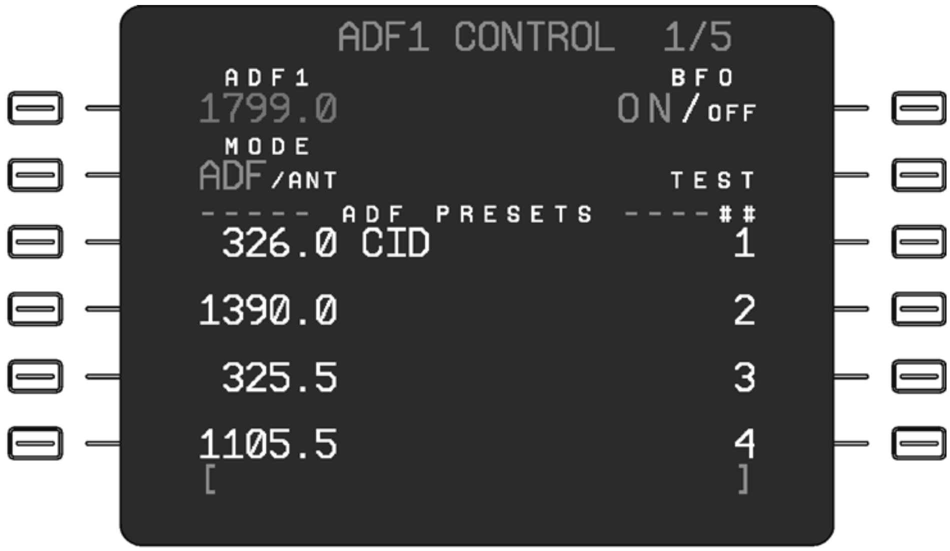

Fig. 6 - Control Display Unit (CDU)- ADF Operation typical layout

3. Push the MODE line select key to set ADF or ANT mode. When ANT mode is active the message ANT shows in cyan on the TUNE page.
4. Push the line select key adjacent to BFO ON/OFF to set the Beat Frequency Oscillator feature to ON or OFF. When BFO is set to ON, the message BFO shows in cyan on the TUNE page.
5. Push the line select key adjacent to TEST to activate the ADF self-test. During the test a 90° swing should be observed. The ADF self-test is active for 10 seconds. The identifier TEST shows in large cyan text on the ADF CONTROL page when the self-test is active.
6. Multiple preset pages are available for the ADF radio. The NEXT or PREV function keys select the next or previous preset page.
7. To transfer the frequency data in a numbered preset to the active frequency field, push the line select key adjacent to the desired preset with the scratchpad empty.
8. To program a numbered preset enter a valid ADF frequency and/or identifier into the scratchpad and push the line select key adjacent to the preset to be programmed. This action transfers the frequency data and/or identifier from the scratchpad to the numbered preset frequency field.

E. The radio Tuning Unit (RTU) is installed on cockpit panel (Ref. Fig. 2) and provides centralized control and display functions for the NAV, ADF subsystems. These functions include frequency/channel/code select, mode select, and self-test select.

Radios are directly tuned by changing the active frequency or code. Active values show in green and are located on the left side of those subdisplays that occupy both an active and recall line select key. Radios are recall tuned by setting a frequency or preset into the recall (right side) display, and then swapping the active and recall frequencies (Ref. Fig. 7).

For further details on refer to Chapter 34-51-00.

F. The NAV Operation with RTU is performed when the NAV subdisplay on the RTU top level page is selected. This provides basic NAV receiver tuning control.

The active and recall frequency can be tuned from the NAV subdisplay. The active and recall frequency can also be tuned from the NAV main display page.

Marker beacon sensitivity, NAV self-test, and preset page access is controlled from the NAV main display page.

1. The NAV radio is directly tuned from the NAV subdisplay on the top level page or from the NAV main display page.
   – Push the active (left side) NAV line select key to position the tune window around the active NAV frequency and set the desired frequency with the tuning knobs.

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Fig. 7 - Radio Tuning Unit (RTU)

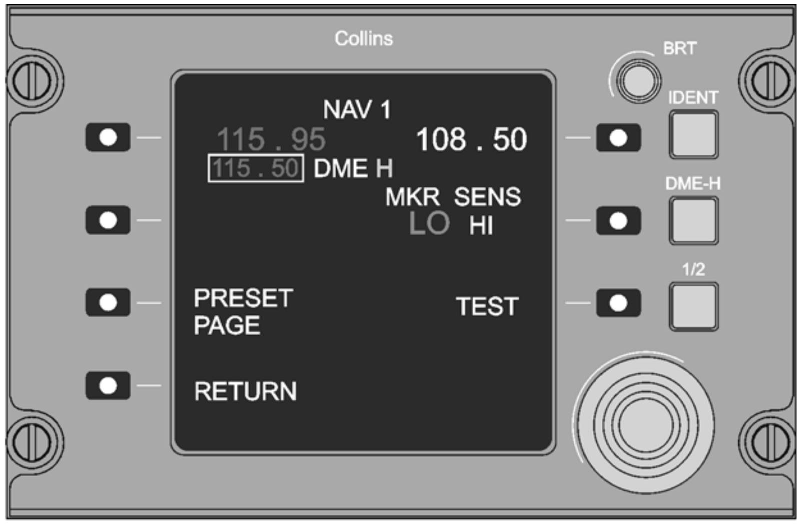

Fig. 8 - Radio Tuning Unit (RTU) - NAV Operation

2. The NAV radio can be recall tuned from the NAV subdisplay on the top level page or the NAV main display page.
   – With the tune window around the NAV recall frequency, set the desired frequency with the tuning knobs. Push the recall (right side) NAV line select key to swap the active and recall frequencies.
3. Push the active (left side) NAV line select key two times to show the NAV main display page.
4. Push the MKR SENS line select key to set the sensitivity level of Marker Beacon. When the sensitivity level is set to HIGH, MK-HI shows in cyan on the NAV top level subdisplay and the NAV preset pages.
5. Push the TEST line select key to activate the NAV self-test. The NAV self-test is active for 10 seconds.
6. Push the PRESET PAGE line select key to show the NAV preset page. Nineteen NAV presets are available for programming on five NAV preset pages.
7. Turn the tuning knobs to select the desired preset page (1-5).
8. Push the line select key adjacent to the desired preset (1-19) to position the tune window around the selected preset frequency.
9. Set the desired frequency with the tuning knobs.
10. Push the RETURN line select key to show the RTU top level page.

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Fig. 9 - Radio Tuning Unit (RTU) - NAV Operation Preset Tuning

G. The ADF Operation is performed with the RTU when the ADF subdisplay on the top level page is selected. The ADF subdisplay provides basic ADF receiver tuning control.

The active and recall frequency can be tuned from the ADF main display page.

The ADF mode (ADF or ANT), BFO feature, ADF self-test, and preset page access is controlled from the ADF main display page.

1. The ADF receiver is directly tuned from the ADF subdisplay. The ADF can also be directly tuned from the ADF main display page.
   – Push the NEXT PAGE line select key on the RTU top level page to show the second top level page.
   – Push the ADF line select key to position the tune window around the active ADF frequency. Set the desired frequency with the tuning knobs.
2. The ADF radio is recall tuned from the ADF main display page.
   – Push the ADF line select key two times on the RTU second top level page to show the ADF main display page.
   – Push the recall (right side) ADF line select key to swap the active and recall frequencies.
3. Push the active (left side) ADF line select key two times to show the ADF main display page.
4. Push the MODE line select key to set ADF or antenna (ANT) mode. When ANT mode is selected, the message ANT shows in cyan on the ADF subdisplay on the second top level page and on the ADF preset page.

Fig. 10 - Radio Tuning Unit (RTU) - ADF Operation (Typical lay-out)

5. Push the BFO line select key to set the Beat Frequency Oscillator feature to ON or OFF. When BFO is set to ON, the message BFO shows in cyan on the ADF subdisplay on the second top level page and on the ADF preset page.
6. Push the TEST line select key to activate the ADF self-test. The ADF self-test is active for 10 seconds.
7. Push the PRESET PAGE line select key on the ADF main display page to show the ADF preset page. Twenty ADF presets are available for programming on five ADF preset pages.
   – Turn the tuning knobs to select the desired preset page (1-5).
8. Push the line select key adjacent to the desired preset (1-19) to position the tune window around the selected preset frequency.
9. Set the desired frequency with the tuning knobs.
10. Push the RETURN line select key to show the RTU top level page.

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Fig. 11 - Radio Tuning Unit (RTU) - ADF Operation - Preset Page

H. The controls performed through the DCP (Ref. Fig. 4) related to Navigation receivers are listed below. When a DCP function switch is pushed, the PFD shows the appropriate menu. While the menu is in view, the PFD line select keys are active.

MENU ADV :	The MENU ADV (advance) knob is used to move the cyan selection box on the PFD menus such as he REFS menu and RADAR menu.
DATA :	The DATA knob is used to select the active state (on, off, stby, etc.) or adjust the settable value highlighted by the cyan selection box.
PUSH SELECT:	The PUSH SELECT button is used to select a reference for display or select the active state (on, off, stby, etc.).
NAV/BRG (navigation/bearing):	The NAV/BRG button is used to select and deselect the NAV SOURCE/ BRG SOURCE menu on the PFD. The NAV SOURCE/ BRG SOURCE menu provides access to the NAV source selection and the Bearing Pointer source selections.

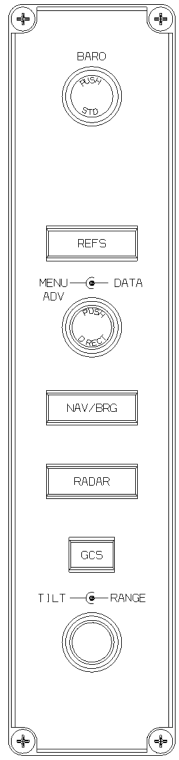

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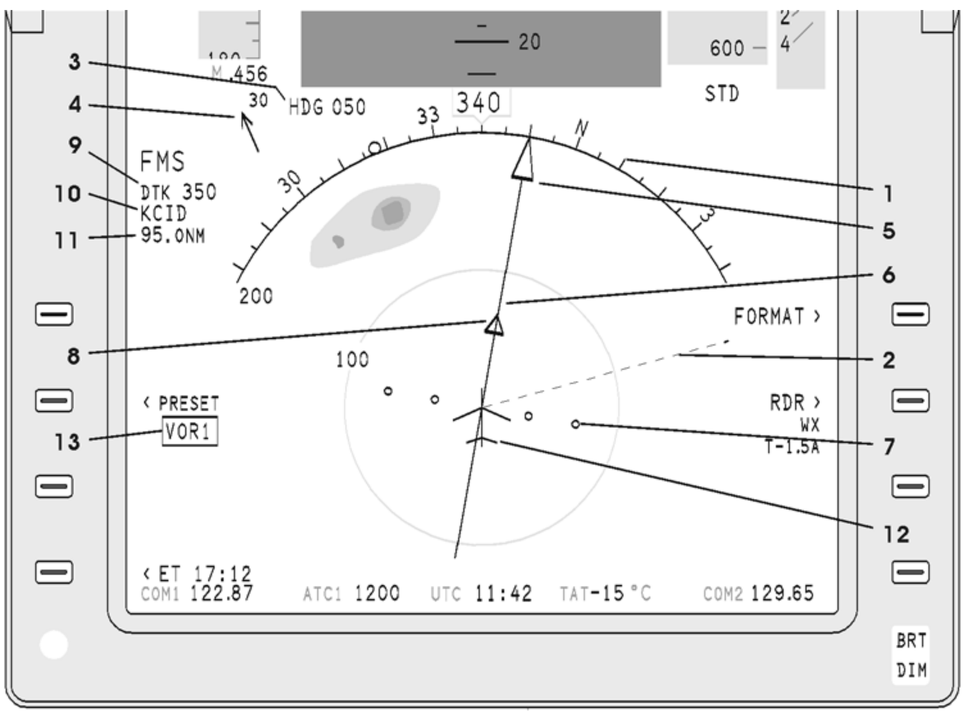
Fig. 12 - Display Control Panel (DCP)

3. Displays

A. The typical Bearing and Navigation displays on PFD/MFD are shown on Fig. 13.



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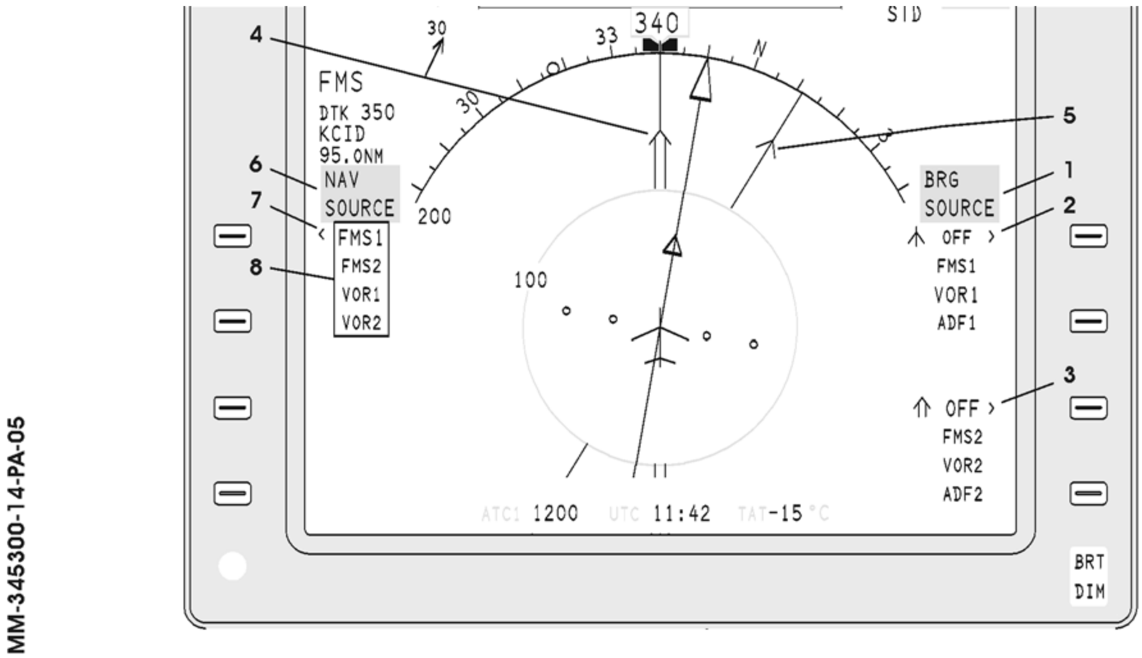
1. Heading in ARC Format
2. Selected Heading Vector
3. Selected Heading Current Value
4. Windspeed and Direction Arrow
5. Course (Desired Track) Pointer
6. Deviation (Crosstrack) Bar
7. Lateral Deviation Scale
8. TO/FROM Pointer
9. Course (Desired Track) Readout
10. Station/Waypoint ID
11. Distance Display
12. Compass Aircraft Symbol
13. Preset Nav Source

Fig. 13 - Typical Bearing and Navigation Display

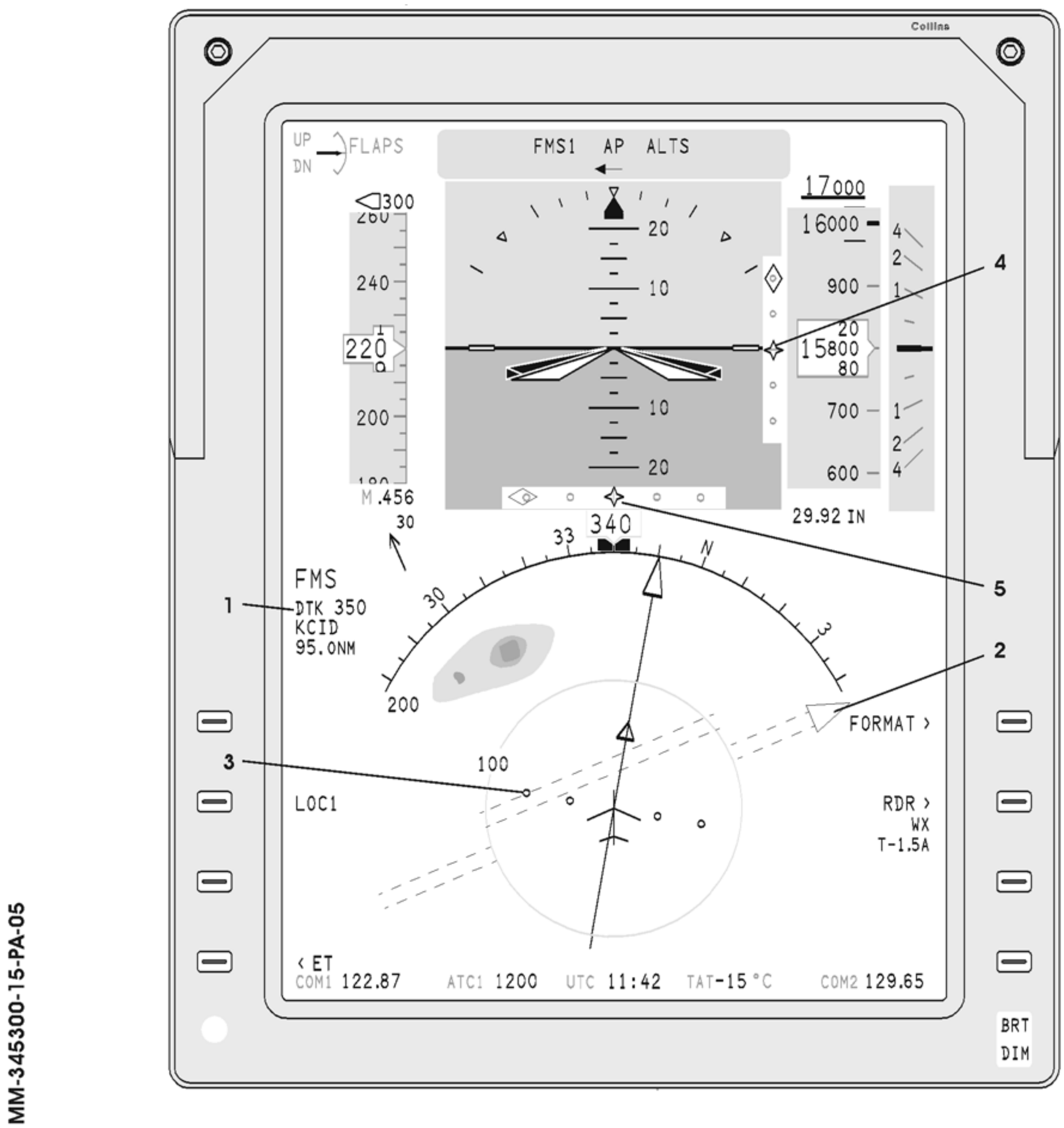
B. The typical Navigation and Bearing Menu on PFD/MFD displays is shown in Fig. 14.



1. Bearing (BRG) Source Menu Title
2. Bearing (BRG) Source #1 Line Select key (LSK)
3. Bearing (BRG) Source #2 Line Select key (LSK)
4. Bearing (BRG) Pointer #2
5. Bearing (BRG) Pointer #1
6. Nav Source Menu Title
7. Nav Source Line Select key (LSK)
8. NAV/BRG Menu Focus Indicator

Fig. 14 - NAV/BRG Menu

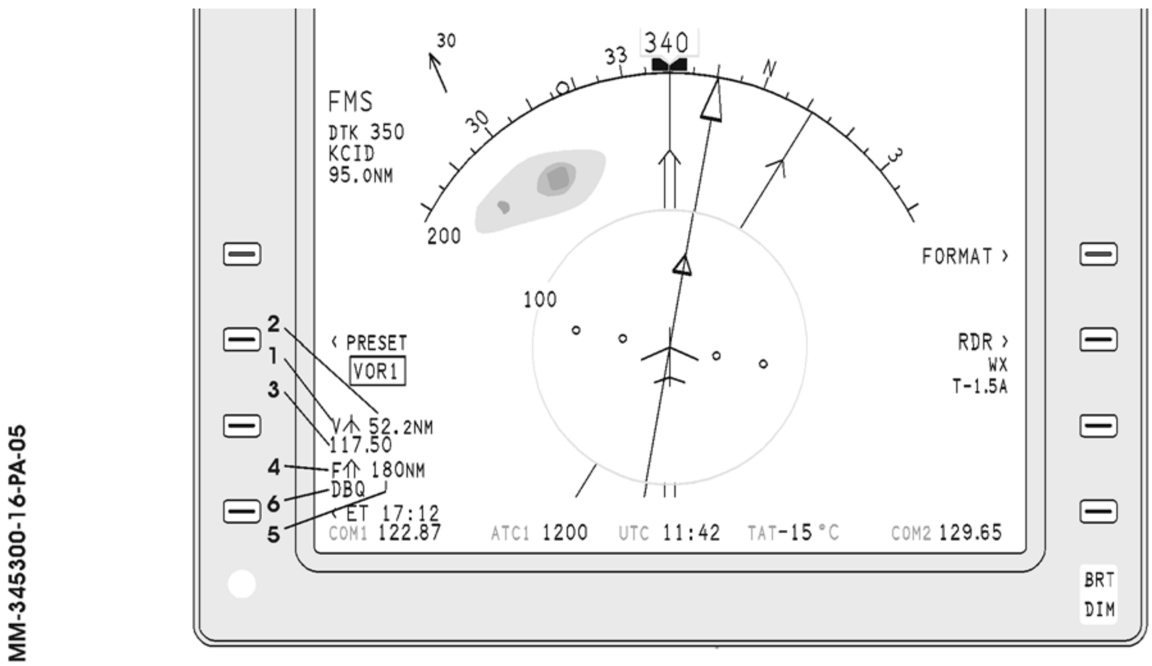
C. The typical Preselect Course on PFD/MFD displays is shown in Fig. 15.



1. Preselect Course Nav Source
2. Preselected Course Pointer
3. Preselect Deviation Bar
4. Preselect Nav Vertical Dev. Pointer
5. Preselect Nav Lateral Dev. Pointer

Fig. 15 - Preselect Course Display

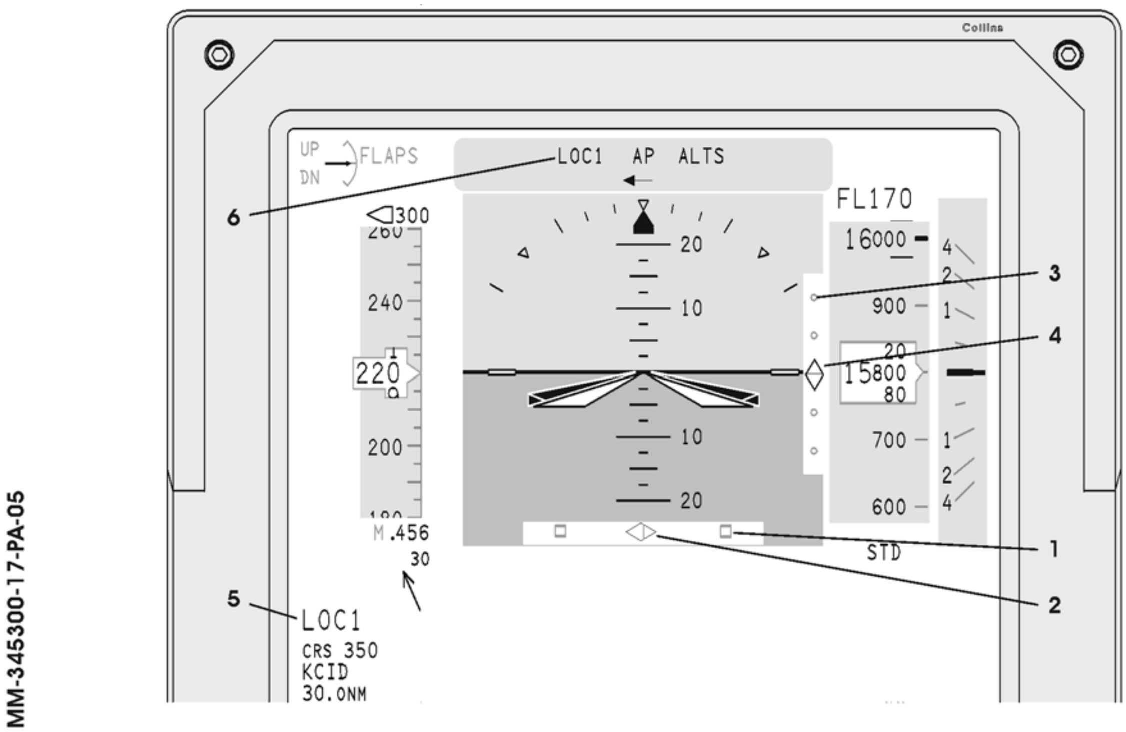
D. The typical Bearing Pointers on PFD/MFD displays are shown on Fig. 16.



1. #1 BRG Pointer Icon
2. #1 BRG Distance
3. #1 BRG FREQ/ID
4. #2 BRG Pointer Icon
5. #2 BRG Pointer Distance
6. #2 BRG Pointer FREQ/ID

Fig. 16 - Bearing Pointers

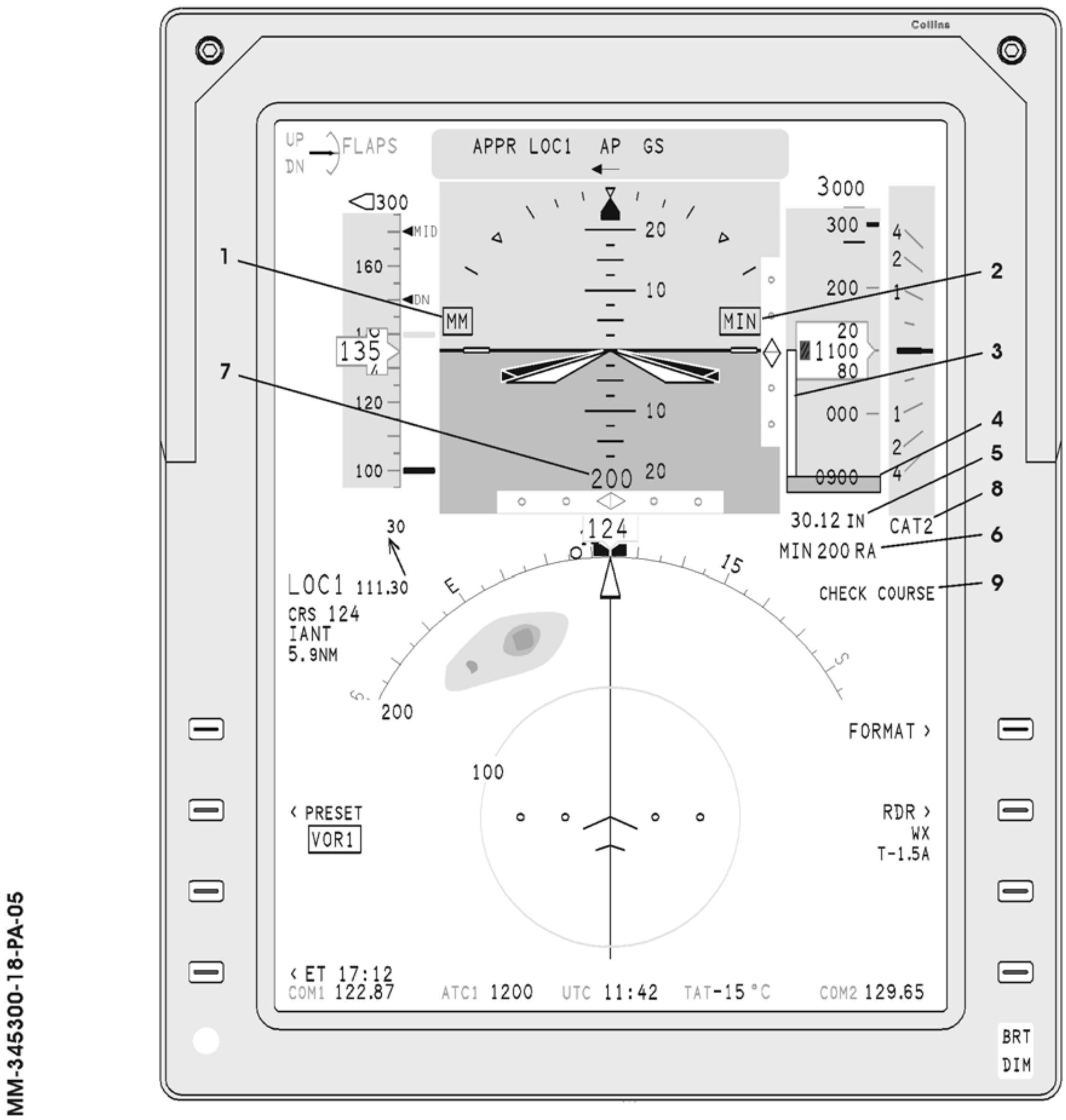
E. The typical Navigation source on PFD/MFD displays are shown on Fig. 17.



1. Expanded Lateral Deviation Scale
2. ADI Localizer Deviation Pointer
3. Vertical Deviation Scale
4. Glideslope Deviation Pointer
5. Active Nav Source with Frequency
6. FCS Annunciation Fields

Fig. 17 - Navigation Source Display

F. The typical Approach Display on PFD/MFD displays are shown on Fig. 18.



1. Marker Beacon Annunciator
2. Min Annunciator
3. RA MIN Analog Reference
4. RA Ground Reference
5. BARO Pressure
6. RA MIN Ref Value
7. Current Radio Altitude
8. CAT2 Annunciator
9. CAT2 Checklist Message

Fig. 18 - Typical Approach Display

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VOR/ILS/MKR/ADF RECEIVER (VHF NAV) SYSTEM - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00

A. This topic gives the Maintenance Practices for the primary navigation system as follows:

– Navigation Receiver - Removal/Installation
– Navigation Receiver - Operational Test
– Glideslope Antenna - Removal/Installation
– Marker Beacon Antenna - Removal/Installation
– VOR/LOC Antenna - Removal/Installation
– ADF Antenna - Removal/Installation
– Diplexer - Removal/Installation

2. Navigation Receiver - Removal (Ref. to Fig. 201)

A. Fixtures, Test and Support Equipment

B. Referenced Information

Maintenance Manual Chapter 24-00-00

Maintenance Manual Chapter 53-10-00

C. Procedure

NOTE: The removal procedures of the Primary and Secondary Navigation Receiver are the same.

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(2) Open, tag and safety these circuit breakers:

Pilot CB panel	(Copilot CB panel for Secondary Navigation Receiver):
NAV 1	(NAV 2 for Secondary Navigation Receiver)

(3) Remove the radome/nosecone (Refer to 53-10-00).
(4) Get access to the forward avionics compartment.
(5) Loosen hold-down nut and disengage from hold down on receiver (1).
(6) Raise handle and pull receiver forward to remove from rack.
(7) Cap electrical connector.

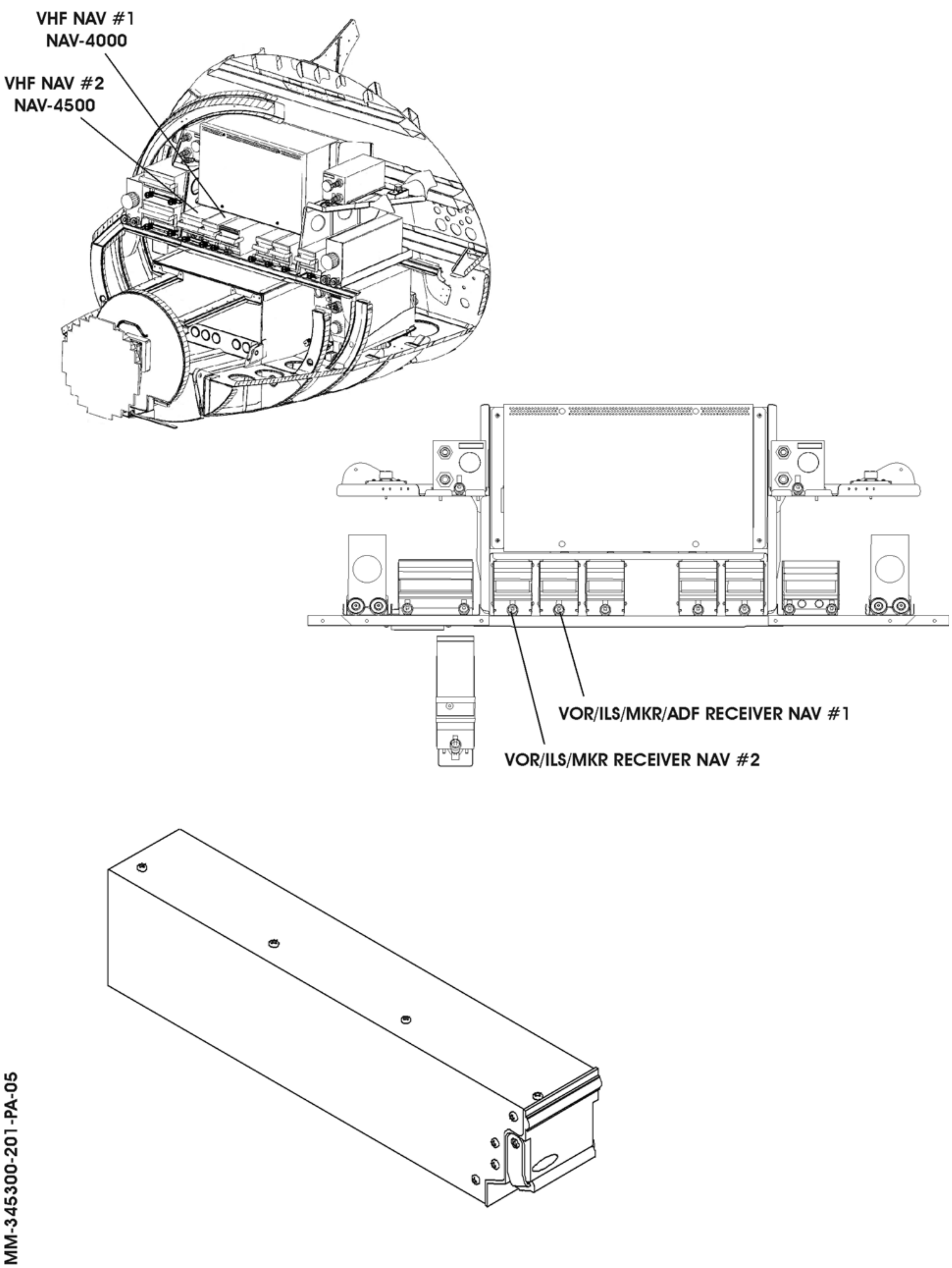

Fig. 201 - Primary and Secondary Navigation Receiver - Removal/Installation

3. Navigation Receiver - Installation (Ref. to Fig. 201)

A. Referenced Information

Maintenance Manual Chapter 53-10-00

B. Procedure

NOTE: The installation procedures of the Primary and Secondary Navigation Receiver are the same.

(1) Make sure that circuit breaker; NAV 1, (NAV 2 for Secondary Navigation Receiver) is open, safetied and tagged.
(2) Remove cap from electrical connector.
(3) Carefully slide receiver (1) back on mount rack until rear connector engages with mating connector. Ensure pins are properly engaged and then firmly push unit back until rear connector is firmly and fully engaged with mount connector.
(4) Tighten the knurled knob to the hook projection on the front of the unit.
(5) Press on front panel to ensure that the unit is fully seated in the mount. Retighten knurled knob until unit is secured in mount.
(6) Ensure that a good electrical bond exists between the unit and its mount
(7) Remove the safety tags and close circuit breakers NAV 1, (NAV 2 for Secondary Navigation Receiver).
(8) Remove tools, materials and equipment from the work area.
(9) Install the radome/nosecone (Refer to 53-10-00).
(10) Do an Operational Test of the Primary (Secondary) Navigation Receiver (Refer Para. 4).
(11) Remove the Warning Notice in the flight compartment.

4. Navigation Receiver - Operational Test

A. To perform a Operational Test of VOR, Localizer and Glideslope, Marker Beacon, and ADF receiver, refer to the Rockwell Collins documentation.

5. Glideslope Antenna - Removal (Ref. to Fig. 202)

NOTE: The glideslope antenna is connected to G/S Diplexer.

A. Referenced Information

Maintenance Manual Chapter 53-10-00

B. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.

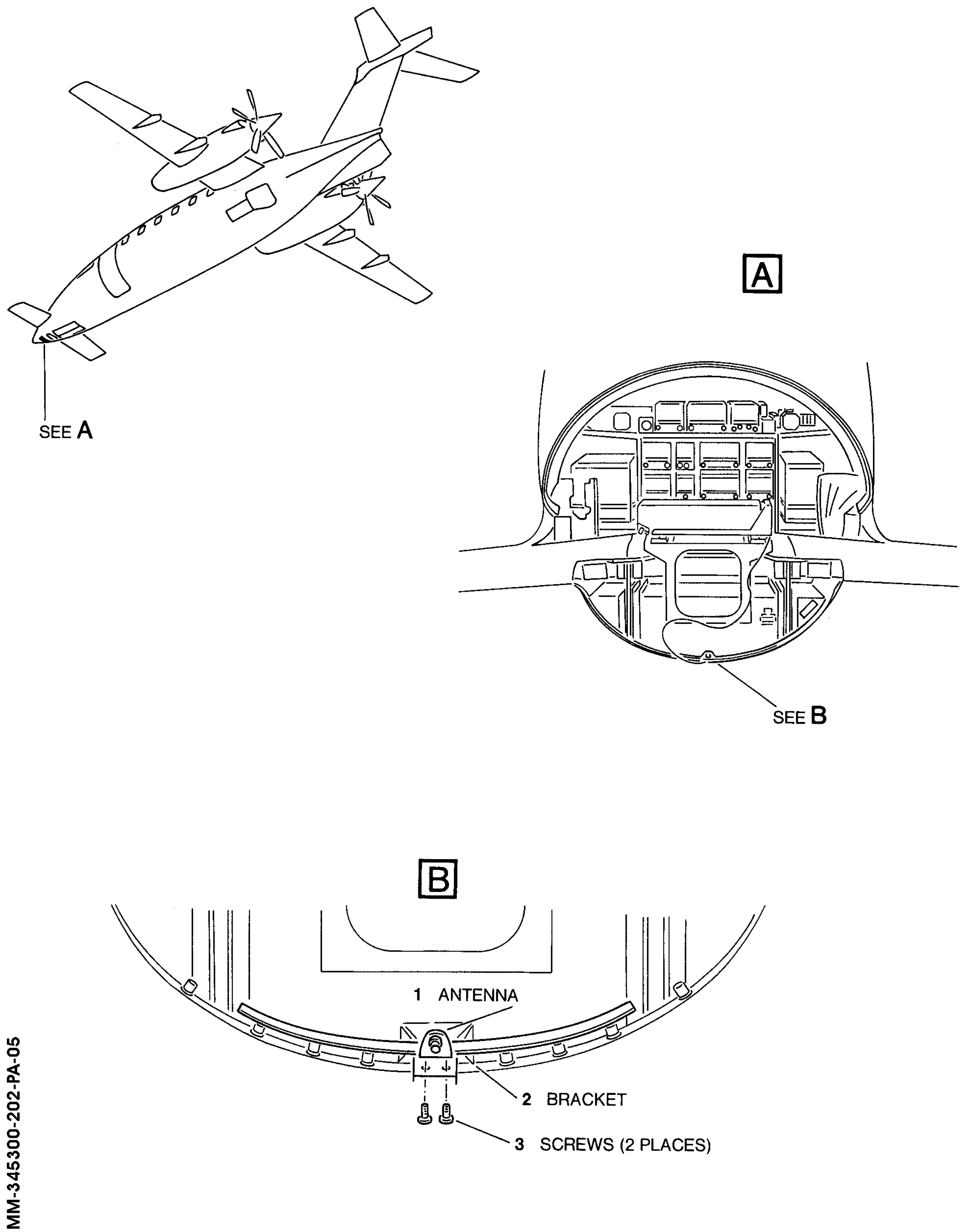

Fig. 202 - Glideslope Antenna - Removal/Installation

(2) Open, tag and safety these circuit breakers:

Pilot CB panel	Copilot CB panel
NAV 1	NAV 2

(3) Remove the radome/nosecone (Refer to 53-10-00).
(4) Get access to frame -1020 and disconnect the antenna cable from the glideslope antenna (1).
(5) Remove the 2 screws (3) from the antenna support bracket (2).
(6) Remove the glideslope antenna.

6. Glideslope Antenna - Installation (Ref. to Fig. 202)

NOTE: The glideslope antenna is connected to G/S Diplexer.

A. Referenced Information

Maintenance Manual Chapter 20-00-00

Maintenance Manual Chapter 24-00-00

Maintenance Manual Chapter 53-10-00

B. Procedure

(1) Make sure that circuit breakers; NAV 1, NAV 2 are open, safetied and tagged.
(2) Position glideslope antenna (1) on antenna support bracket (2). Install and tighten the two securing screws (3).
(3) Connect the antenna cable to the glideslope antenna.
(4) Install the radome/nosecone (Refer to 53-10-00).
(5) Remove safety clips and close circuit breakers: NAV 1, NAV 2
(6) Connect electrical power (Refer to 24-00-00).
(7) Restore the surface finish (Refer to 20-00-00).
(8) Do an Operational Test of the Glideslope receiver of Primary and Secondary Navigation Receiver (Refer Para. 4).
(9) Remove the Warning Notice in the flight compartment.

7. Marker Beacon Antenna - Removal (Ref. to Fig. 203)

NOTE: The Marker Beacon antenna is connected to M/B Diplexer.

A. Fixtures, Test and Support Equipment

Lint -free cloth	Not specified
Non Metallic Scraper	Not specified

B. Materials

02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 20-00-00
Maintenance Manual Chapter 24-00-00

D. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.

(2) Open, tag and safety these circuit breakers:

Pilot CB panel	Copilot CB panel
NAV 1	NAV 2

(3) Remove the six attaching screws (2) from the antenna base (1).

(4) Cut sealant around base of antenna and remove antenna to get access to antenna cable.

(5) Disconnect antenna cable from antenna and remove the antenna; make sure cable does not withdraw into airframe.

(6) Scrape sealant from the antenna and antenna area on fuselage using non-metallic scraper.

WARNING: BE CAREFUL WHEN YOU USE MEK. OBEY THE HEALTH AND SAFETY INSTRUCTIONS IN 20-00-00.

(7) Clean the antenna fuselage area using MEK and dry with lint-free cloth

8. Marker Beacon Antenna - Installation (Ref. to Fig. 203)

NOTE: The Marker Beacon antenna is connected to M/B Diplexer.

A. Fixtures, Test and Support Equipment

Lint -free cloth	Not specified
Non Metallic Scraper	Not specified

B. Materials

06-005, Sealant	As required
02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 20-00-00
Maintenance Manual Chapter 24-00-00

D. Procedure

(1) Make sure that circuit breakers: NAV 1, NAV 2 are open, safetied and tagged.

(2) Connect antenna cable to the antenna connector (3).

(3) Align the antenna (1) with the securing screw holes and install and tighten the securing screws (2).

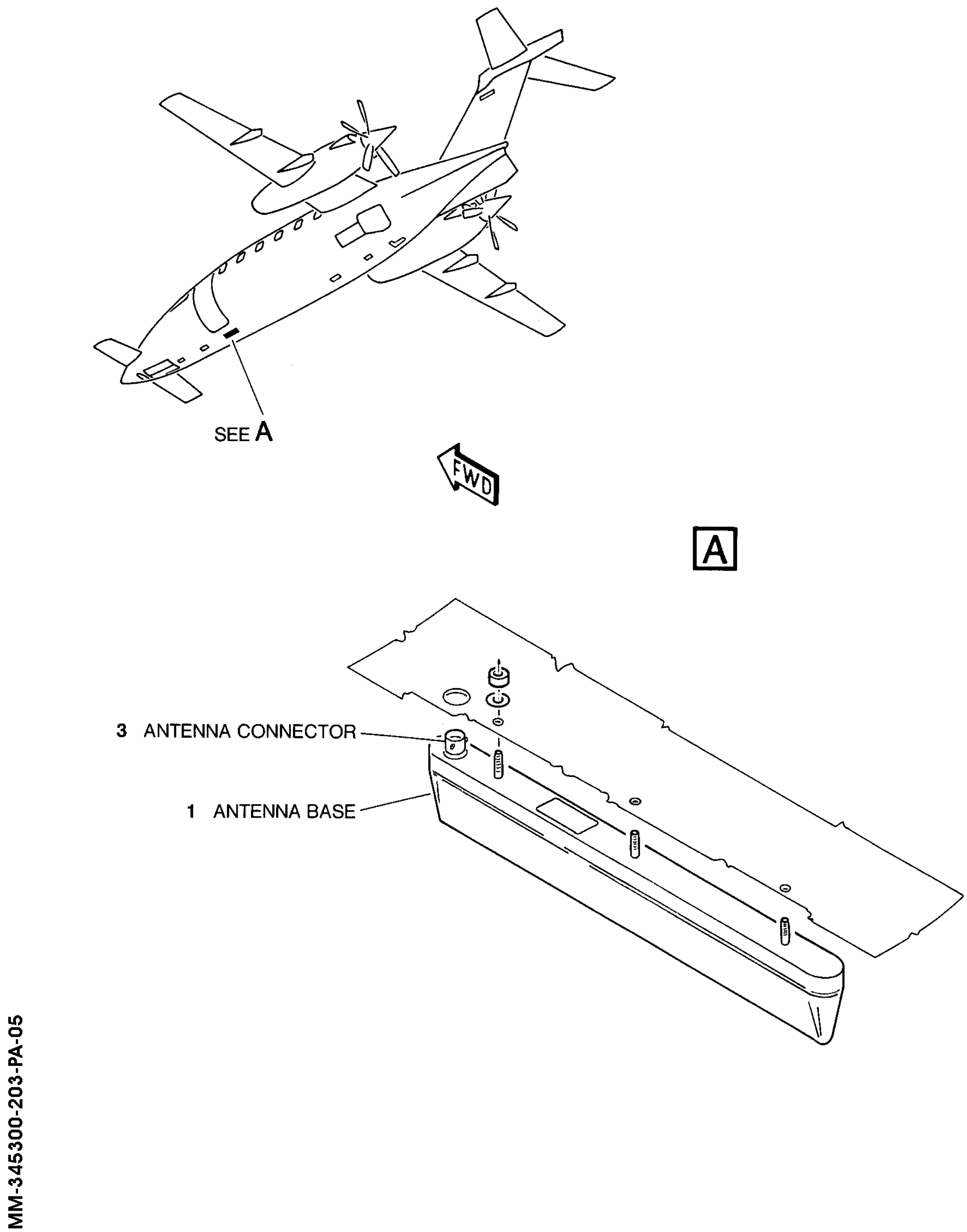

Fig. 203 - Marker Beacon Antenna - Removal/Installation

(4) Apply the sealant around the antenna base to prevent the ingress of water between the airframe and the attached part (Refer to 20-00-00).
(5) Remove safety clips and tags and close circuit breakers NAV 1, NAV 2 .
(6) Connect electrical power (Refer to 24-00-00).
(7) Restore the surface finish (Refer to 20-00-00).
(8) Do an Operational Test of the Marker Beacon system of Primary and Secondary Navigation Receiver (Refer Para. 4).
(9) Remove the Warning Notice in the flight compartment

9. VOR/LOC Antenna - Removal (Ref. to Fig. 204)

NOTE: The VOR/LOC antenna is connected to VOR/LOC Diplexer.

A. Fixtures, Test and Support Equipment

Lint -free cloth	Not specified
Non Metallic Scraper	Not specified

B. Materials

02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 20-00-00
Maintenance Manual Chapter 24-00-00

D. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(2) Open, tag and safety these circuit breakers:

Pilot CB panel	Copilot CB panel
NAV 1	NAV 2

NOTE: This procedure is applicable to the LH and RH installation.

(3) Remove the four attaching screws (3) from the LH (RH) antenna base (2).
(4) Cut sealant around base of antenna and remove antenna to get access to antenna cable connector.
(5) Disconnect antenna cable from antenna and remove the antenna; make sure cable does not withdraw into vertical stabilizer.
(6) Scrape sealant from antenna and antenna area on vertical stabilizer using non-metallic scraper.

WARNING: BE CAREFUL WHEN YOU USE MEK. OBEY THE HEALTH AND SAFETY INSTRUCTIONS IN 20-00-00.

(7) Clean antenna area of vertical stabilizer using MEK and dry with lint-free cloth.

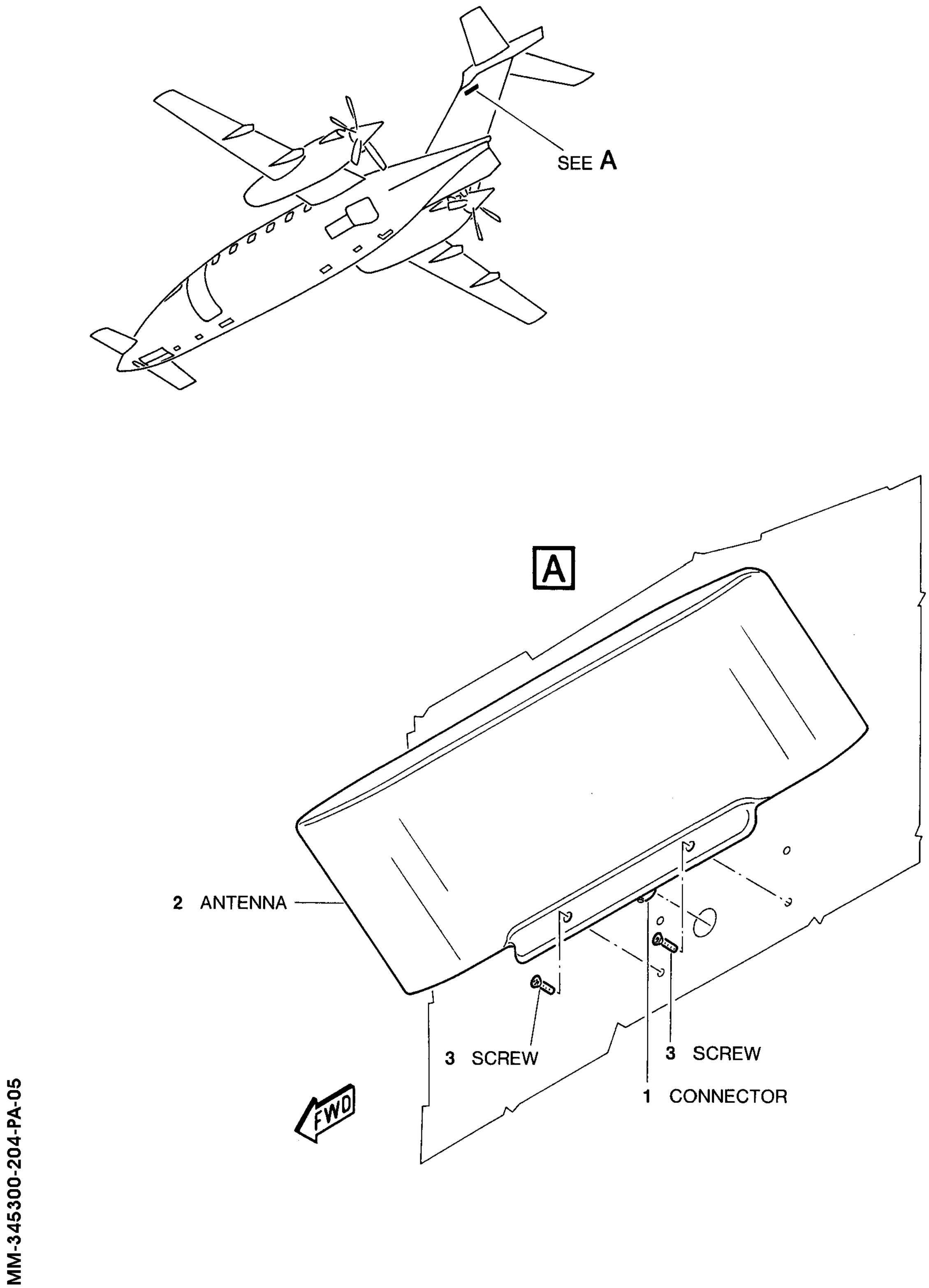

Fig. 204 - VOR/LOC Antenna - Removal/Installation

10. VOR/LOC Navigation Antenna - Installation (Ref. to Fig. 204)

NOTE: The VOR/LOC antenna is connected to VOR/LOC Diplexer.

A. Fixtures, Test and Support Equipment

Lint -free cloth	Not specified
Non Metallic Scraper	Not specified

B. Materials

06-005, Sealant	As required
02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 20-00-00
Maintenance Manual Chapter 24-00-00

D. Procedure

(1) Make sure that circuit breakers NAV 1, NAV 2 are open, safetied and tagged.

NOTE: This procedure is applicable to the LH and RH installation.

(2) Connect antenna cable to the LH (RH) antenna connector (1).
(3) Align the antenna (2) with the screw holes, and install and tighten the four securing screws (3).
(4) Apply the sealant around the antenna base to prevent water ingress between the airframe and attached part (Refer to).
(5) Remove safety clips and tags and close circuit breakers NAV 1, NAV 2.
(6) Connect electrical power (Refer to 24-00-00).
(7) Restore the surface finish (Refer to 20-00-00).
(8) Do an Operational Test of the VOR/LOC receiver of Primary and Secondary Navigation Receiver (Refer Para. 4).
(9) Remove the Warning Notice in the flight compartment.

11. ADF Antenna - Removal (Ref. to Fig. 205)

A. Fixtures, Test and Support Equipment

Lint -free cloth	Not specified
Non Metallic Scraper	Not specified

B. Materials

02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 20-00-00
Maintenance Manual Chapter 24-00-00

D. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.

(2) Open, tag and safety these circuit breaker:

Pilot CB panel

NAV 1

(3) Remove the four attaching screws (3) from the antenna base (2).

(4) Cut sealant around base of antenna and remove antenna to get access to antenna cable connector.

(5) Disconnect antenna cable from antenna and remove the antenna; make sure cable does not withdraw into vertical stabilizer.

(6) Scrape sealant from antenna and antenna area on vertical stabilizer using non-metallic scraper.

WARNING: BE CAREFUL WHEN YOU USE MEK. OBEY THE HEALTH AND SAFETY INSTRUCTIONS IN 20-00-00.

(7) Clean antenna area of vertical stabilizer using MEK and dry with lint-free cloth.

12. ADF Antenna - Installation (Ref. to Fig. 205)

A. Fixtures, Test and Support Equipment

Lint -free cloth	Not specified
Non Metallic Scraper	Not specified

B. Materials

06-005, Sealant	As required
02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 20-00-00

Maintenance Manual Chapter 24-00-00

D. Procedure

(1) Make sure that circuit breaker NAV 1 is open, safetied and tagged.

(2) Connect antenna cable to the antenna connector (2).

(3) Align the antenna (1) with the screw holes, and install and tighten the four securing screws (3).

(4) Apply the sealant around the antenna base to prevent water ingress between the airframe and attached part (Refer to 24-00-00).

(5) Remove safety clip and tag and close circuit breaker NAV 1.

(6) Connect electrical power (Refer to 24-00-00).

(7) Restore the surface finish (Refer to 20-00-00).

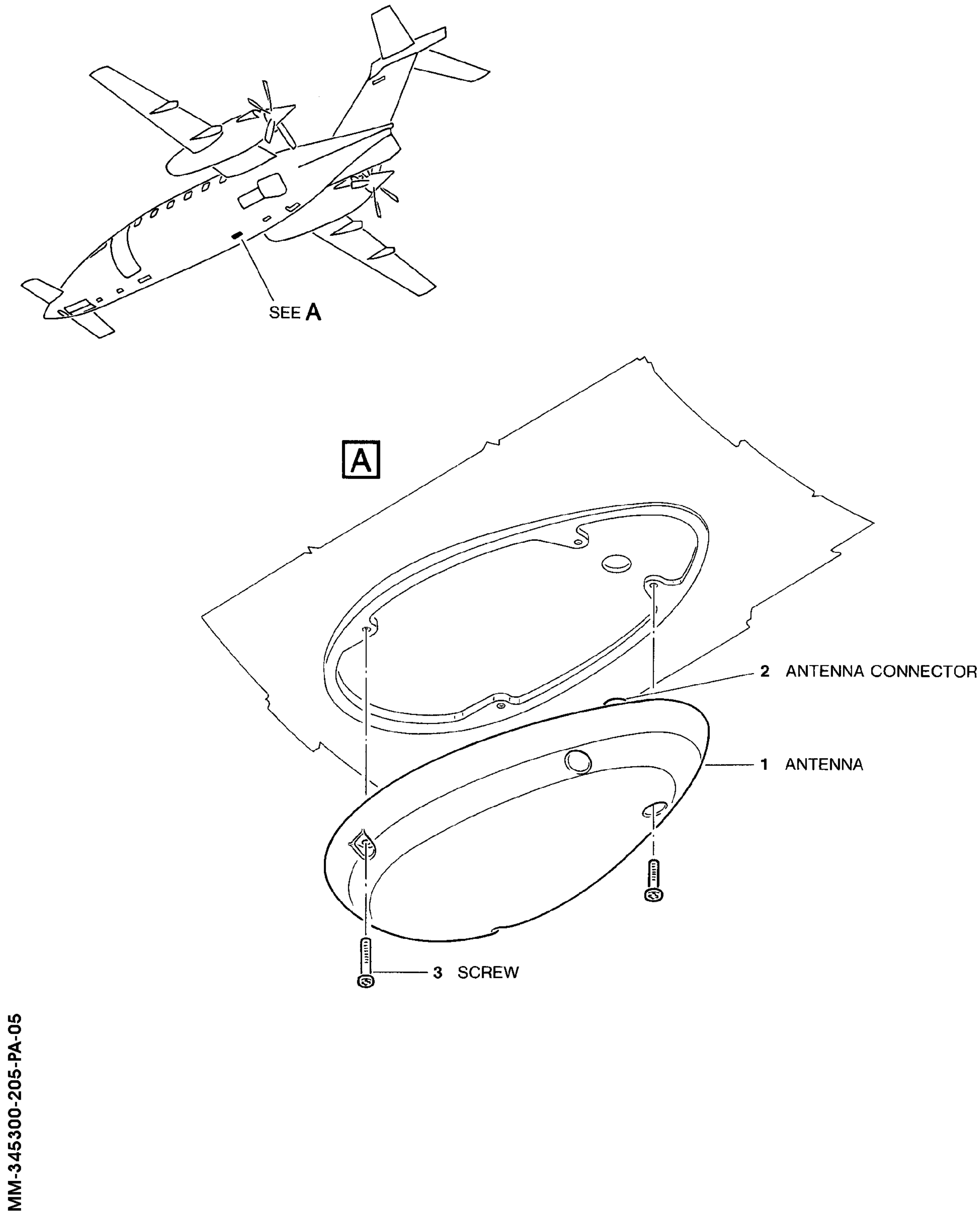

Fig. 205 - ADF Antenna - Removal/Installation

(8) Do an Operational Test of the ADF receiver of Primary Navigation Receiver (Refer Para. 4).

(9) Remove the Warning Notice in the flight compartment.

13. Diplexer - Removal(Ref. to Fig. 206)

A. Referenced Information

Maintenance Manual Chapter 53-10-00

B. Procedure

NOTE: The removal procedures of the G/S Diplexer, MKR Diplexer and VOR/LOC Diplexer are the same.

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.

(2) Open, tag and safety these circuit breakers:

Pilot CB panel	Copilot CB panel
NAV 1	NAV 2

(3) Remove the radome/nosecone (Refer to 53-10-00).

(4) Get access to the forward avionics compartment.

(5) Disconnect the three connectors from the diplexer.

(6) Remove the two screw off from the diplexer.

(7) Remove the diplexer.

14. Diplexer - Installation (Ref. to Fig. 206)

A. Referenced Information

Maintenance Manual Chapter 53-10-00

B. Procedure

NOTE: The installation procedures of the G/S Diplexer, MKR Diplexer and VOR/LOC Diplexer are the same.

(1) Make sure that circuit breakers NAV 1, NAV 2 are open, safetied and tagged.

(2) Get access to the forward avionics compartment.

(3) Install the diplexer and tighten the two screw.

(4) Connect the three connectors to the diplexer.

(5) Do an Operational Test of the dedicated receiver of Primary and Secondary Navigation Receiver related to diplexer installed (Refer Para. 4).

(6) Remove the Warning Notice in the flight compartment.

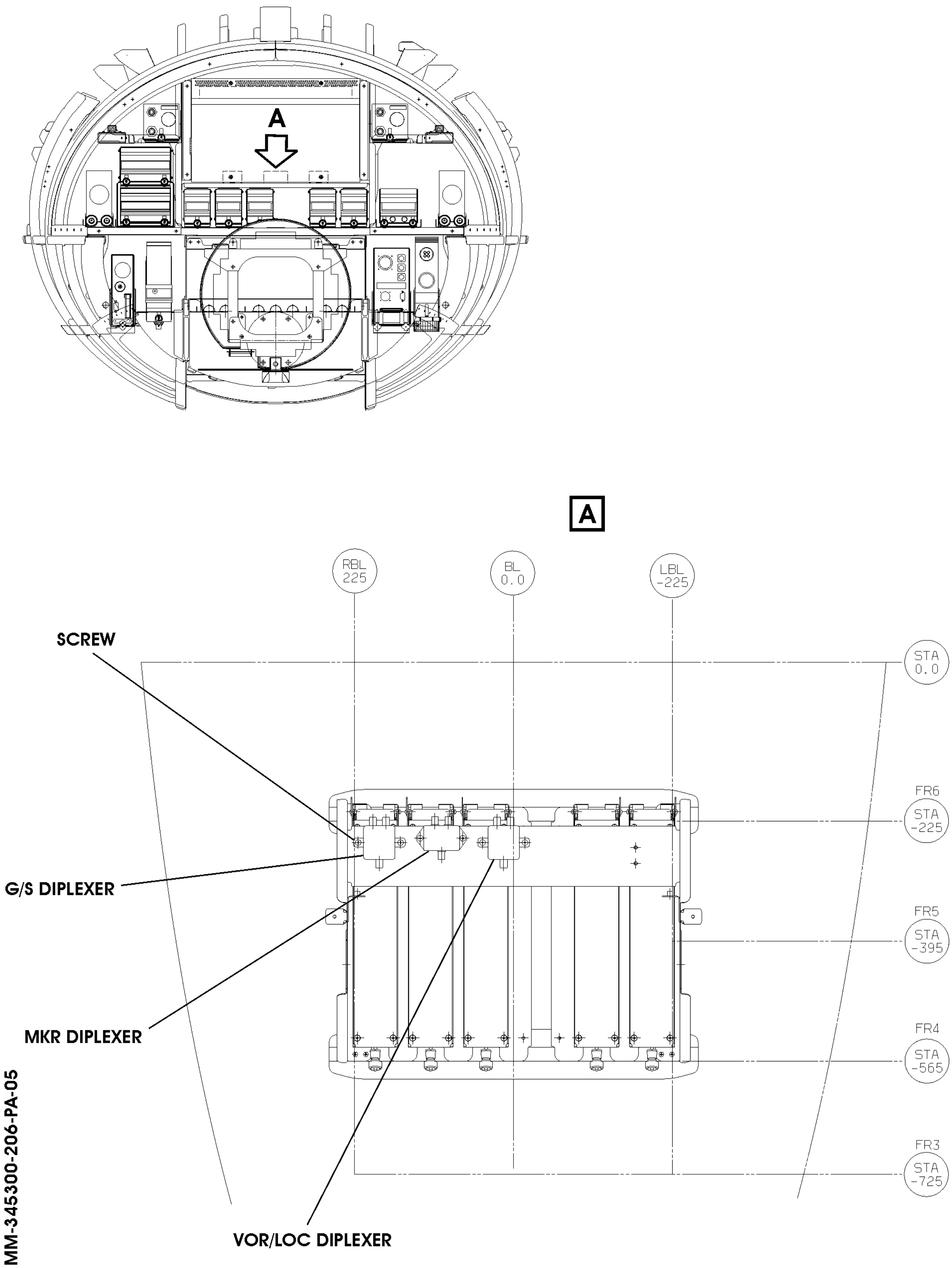

Fig. 206 - VOR/LOC, G/S and MKR antenna diplexers location

DME SYSTEM - DESCRIPTION AND OPERATION

1. Description

A. The Distance Measuring Equipment (DME) system computes distance from the airplane to the ground station as aid to Navigation.

The system consists of a Transceiver type DME-4000 and a DME antenna.

The Transceiver transmits, receives, and processes signal of selected ground DME station to provide slant range (line-of-sight) distance from the aircraft to the station, computes relative closure rate and time-to-station, and decodes the station identifier.

The DME Transceiver provides audio outputs that are applied to the pilot and copilot audio system, and digital bus outputs are applied to Integrated Avionics Processor System (IAPS) for the other navigation systems. A discrete DME suppression signal provides transmit inhibit logic between all L-band units.

The DME information are displayed on PFDs/MFD and the DME transceiver control is performed by Control Display Unit (CDU) and by Radio Tuning Unit (RTU) in combinations with other navigation subsystems.

The DME is a 3-channel transceiver that can track as many as three stations at a time. Channels 1 and 2 are normally manually tuned with the CDU or RTU and the data is used for direct display by the crew. Channel 3 is available to the FMS for tuning.

The DME is powered by the Right Avionics Dual Feed Bus through the DME 1 circuit breaker located on copilot c/b panel.

B. The DME-4000 Transceiver operates in the range of 960 to 1215 MHz. There are 252 DME frequency-channels related to the VHF navigation frequency-channnels.

The DME Transceiver consists of a specific integrated circuit, a Digital Signal Processor, a **Field Programmable Gate Array**, a transmitter, a receiver, and an audio circuit. An internal power supply converts the +28 V dc voltage supply by aircraft into required supply levels.

The DME transceiver is located in the nose avionics bay (see Fig. 2).

C. The DME antenna is an L-band that provide omnidirectional radiation pattern with vertical polarization.

The DME antenna is installed on the lower part of the fuselage, under the cabin between Fus. Stat. 1130-1340.

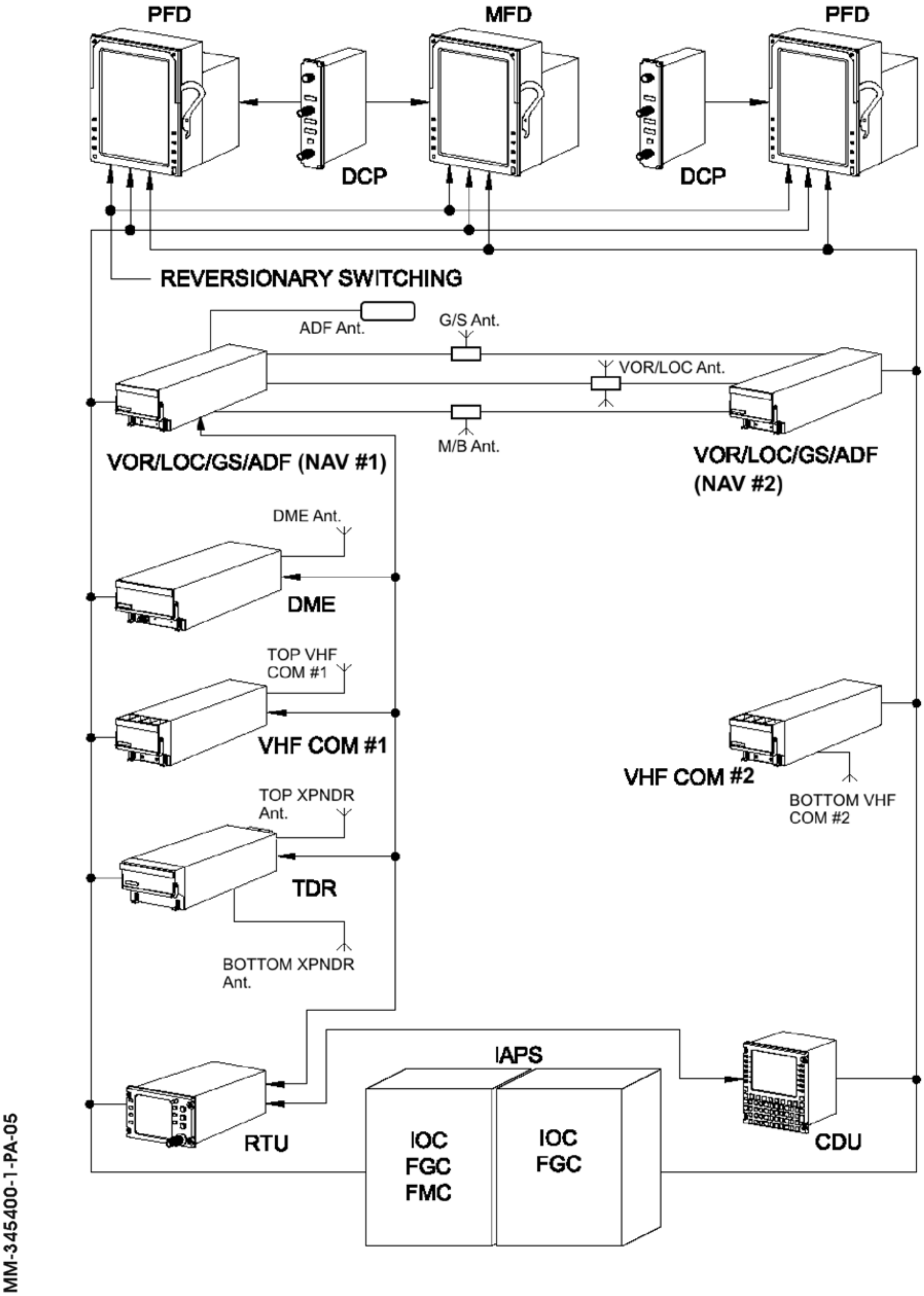

Fig. 1 - DME Block Diagram

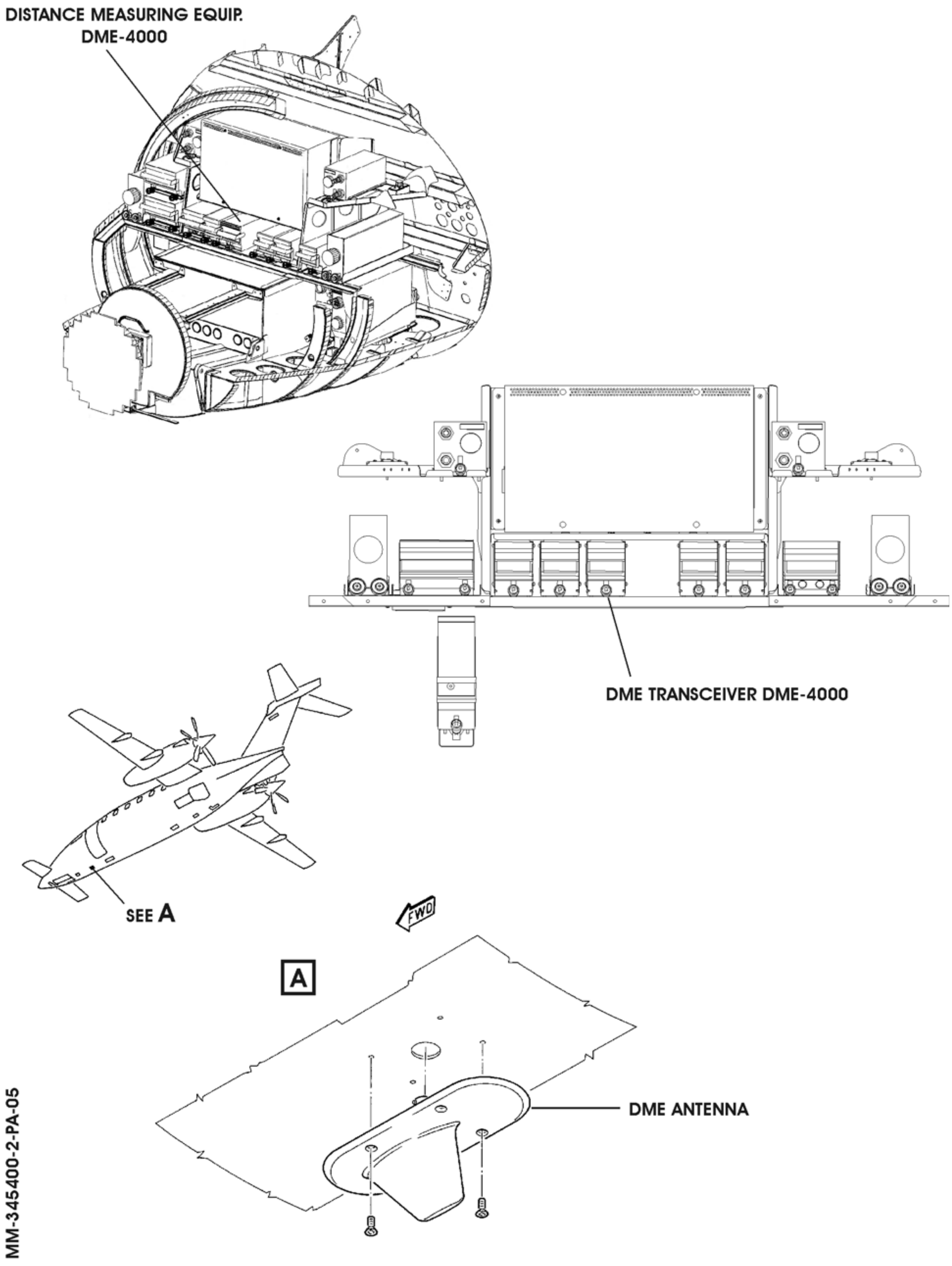

Fig. 2 - DME components location

2. Operation

A. The control of the function of the DME transceiver is provided by means of the Control Display Unit (CDU), and by the Radio Tuning Unit (RTU).
The CDU is located on the pedestal panel. The CDU is a shared user interface that provides control and display functions for the Flight Management System and Radio Navigation System. The Control Display Unit (CDU) (Ref. Fig. 3) is a color, LCD-based display with an integrated keyboard. The CDU is the normal direct means of radio tuning for both pilot and copilot radios. (For further details refer to 34-52-00)

The radio Tuning Unit (RTU) is installed on cockpit panel and provides centralized control and display functions for the NAV, ADF subsystems (Ref. Fig. 5). These functions include frequency/channel/code select, mode select, and self-test select. (For further details refer to 34-51-00).

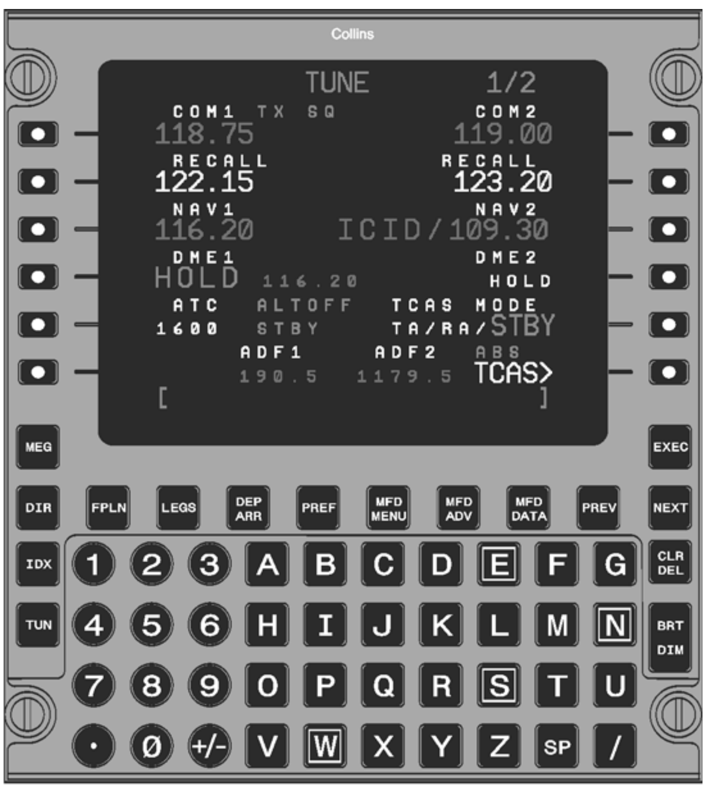

Fig. 3 - Control Display Unit (CDU)

B. NAV / DME Operation using CDU

The NAV / DME operation with CDU is performed when the NAV subdisplay on the CDU TUNE page is selected. This provides, other tuning functions for the NAV1 and NAV2 receivers, also DME1 HOLD and DME# tuning.

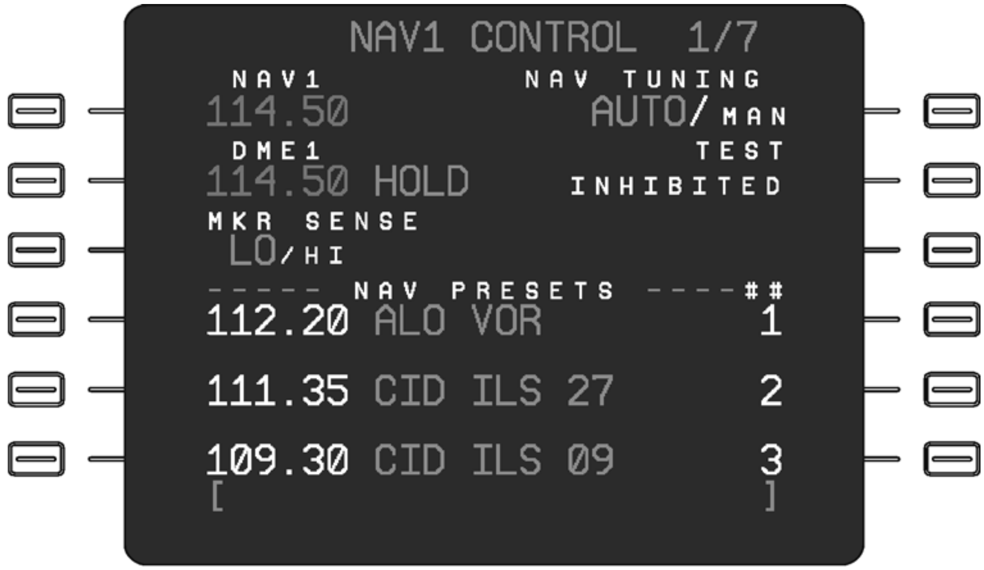

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Fig. 4 - Control Display Unit (CDU)- NAV Operation

(1) The NAV is tuned on the TUNE page. Push the TUN function key on the CDU to show the TUNE page.

(2) To tune the NAV radio from the TUNE page or NAV CONTROL page:

(a) Enter the desired frequency, preset number or identifier in the scratchpad.

(b) Push the appropriate line select key (third Left or third Right of CDU) to transfer the contents of the scratchpad to the desired (#1 or #2) NAV radio.

(3) The NAV can be directly tuned or preset programmed, using a station identifier. When there is more than one VOR, DME, or localizer associated with that identifier, the SELECT NAVAID page shows, unless one of the NAVAIDs is within 300 NM of the FMS position. In that case, the frequency associated with the NAVAID that is within 300 NM is tuned and the SELECT NAVAID page does not show.

(a) Each NAVAID contains the identifier, NAVAID type, frequency, ICAO country identifier, and latitude/longitude position of the associated NAVAID. Use the NEXT or PREV function keys to elect the page with the desired NAVAID.

(b) Push the line select key adjacent to the desired NAVAID to transfer the selected NAVAID frequency and identifier to the active NAV frequency field.

(4) Push the line select key adjacent to the desired (pilot side or copilot side) NAV active frequency (with the scratchpad empty) to show the NAV CONTROL page.

(5) Push the line select key adjacent to DME HOLD (fourth on Left or fourth on Right of CDU) on the TUNE page to select DME Hold (push-on/push-off). The active DME frequency is placed in hold.

(a) The message HOLD enlarges and shows next to the DME frequency when active. The HOLD message shows on both the TUNE and NAV CONTROL pages.

(b) The DME frequency shows in yellow on the TUNE and NAV CONTROL page if the echo feedback from the radio is invalid or missing, and HOLD is inactive.

(6) The FMS AUTOTUNE feature can tune the NAV (VOR and DME) radio through the CDU. The FMS is allowed to automatically tune the VOR receiver(s) whenever the NAV is not the NAV source and the associated DME is not in HOLD. The FMS autotune commands are preempted when the pilot tunes the radios with the CDU or the RTU.

(a) Push the line select key adjacent NAV# TUNING AUTO/MAN to toggle between the AUTO or MAN function. MAN is automatically selected if the NAV# is tuned manually through the CDU or RTU.

(7) Push the line select key adjacent to TEST to select the NAV/DME self-test. The self-test is active for 10 seconds.

(a) During the self-test, the DME shows 100 NM, station ID shows AOK, and Time To Go shows 60 NM.

(b) When the NAV/DME self-test is active the TEST identifier shows in cyan and in large letters.

(c) If inhibited from entering test, the message INHIBITED shows below the TEST identifier on the NAV CONTROL page and the TEST line select key is disabled. The self-test is inhibited when airborne and the Autopilot is coupled to NAV radio.

(8) The NAV is preset tuned from the NAV CONTROL X/7 pages.

(a) With the scratchpad empty, push the line select key adjacent to the desired numbered preset to transfer the numbered preset to the active frequency field. The numbered preset data line changes color to match the active frequency. The previous active frequency is transferred to the RECALL frequency field.

(b) The numbered preset data is green when selected and the active frequency is valid. The numbered preset data is yellow when selected and the active frequency is invalid.

(c) Multiple preset pages are available for the NAV radio. The current page number and the total number of pages show in the upper right corner of the display. The NEXT or PREV function keys selects the next or previous preset page.

C. The radio Tuning Unit (RTU) is installed on cockpit panel and provides centralized control and display functions for the NAV, ADF subsystems. These functions include frequency / channel / code select, mode select, and self-test select.

Radios are directly tuned by changing the active frequency or code. Active values show in green and are located on the left side of those subdisplays that occupy both an active and recall line select key. Radios are recall tuned by setting a frequency or preset into the recall (right side) display, and then swapping the active and recall frequencies (Ref. Fig. 5).

For further details on refer to Chapter 34-51-00.

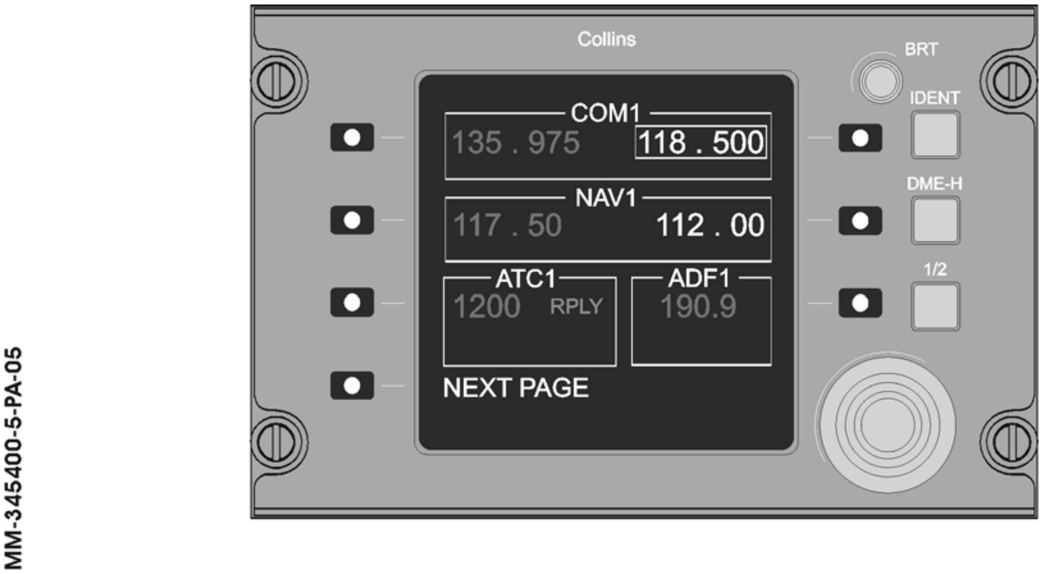

Fig. 5 - Radio Tuning Unit (RTU)

D. NAV / DME Operation using RTU.

The NAV subdisplay on the RTU top level page provides basic NAV receiver tuning control. The active and recall frequency can be tuned from the NAV subdisplay on the top level page. The active and recall frequency can also be tuned from the NAV main display page.

Independent DME tuning, marker beacon sensitivity, NAV self-test, and preset page access is controlled from the NAV main display page.

(1) The NAV radio is directly tuned from the NAV subdisplay on the top level page. The NAV can also be directly tuned from the NAV main display page.

(a) Push the active (left side) NAV line select key to position the tune window around the active NAV frequency and Set the desired frequency with the tuning knobs.

(2) The NAV radio can be recall tuned from the NAV subdisplay on the top level page or the NAV main display page.

(a) With the tune window around the NAV recall frequency, set the desired frequency with the tuning knobs.

(b) Push the recall (right side) NAV line select key to swap the active and recall frequencies.

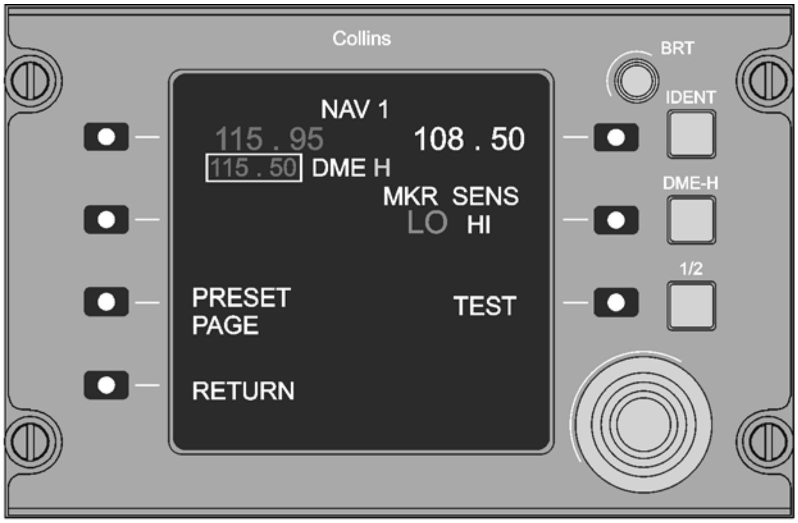

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Fig. 6 - Radio Tuning Unit (RTU) NAV Operation

(3) The FMS AUTOTUNE feature can tune the NAV (VOR and DME) radio through the RTU. The FMS is allowed to automatically tune the VOR receiver(s) whenever the NAV is not the NAV source and the associated DME is not in HOLD. The FMS autotune commands are pre-empted when the pilot tunes the radios with the RTU. Push the line select key adjacent to the DME-Hold frequency to position the tune window around DME-Hold frequency.

(4) Push the active (left side) NAV line select key two times to show the NAV main display page.

(5) Push the dedicated DME-Hold button on the RTU to select DME Hold (push-on/push-off). When the DME is in the hold state and independent DME tuning is enabled by the configuration, the DME hold frequency shows below the NAV active frequency.

   (a) Push the line select key adjacent to the active NAV frequency (first on left) two times. The first push positions the tune window around the active NAV frequency and the second push moves the tune window to the DME hold frequency.

   (b) Set the desired frequency with the tuning knobs. When the DME hold frequency is invalid the display changes to DME – –.

(6) Push the TEST line select key to activate the NAV/DME self-test. The NAV self-test is active for 10 seconds. When active, the TEST identifier shows in cyan and in large letters. If inhibited from entering test, INHIBITED shows below the TEST identifier and the TEST line select key is disabled.

(7) Push the RETURN line select key to show the RTU top level page.

DME SYSTEM - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00

A. This topic provides the following Maintenance Practices:
- DME Transceiver - Removal/Installation
- DME Transceiver - Operational Test
- DME Antenna - Removal/Installation

2. DME Transceiver - Removal (Ref. Fig. 201)

A. Fixture , Test and Support Equipment

Blanking Caps

B. Referenced Information

Maintenance Manual Chapter 20-00-00
Maintenance Manual Chapter 53-10-00

C. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(2) Open, tag and safety this circuit breaker:
Copilot CB panel: DME 1
(3) Remove the radome/nosecone.
(4) Get access to the avionics compartment.
(5) Loosen hold-down nut and disengage from hold down on receiver (1).
(6) Raise handle and pull receiver forward to remove from rack.
(7) Cap electrical connector.

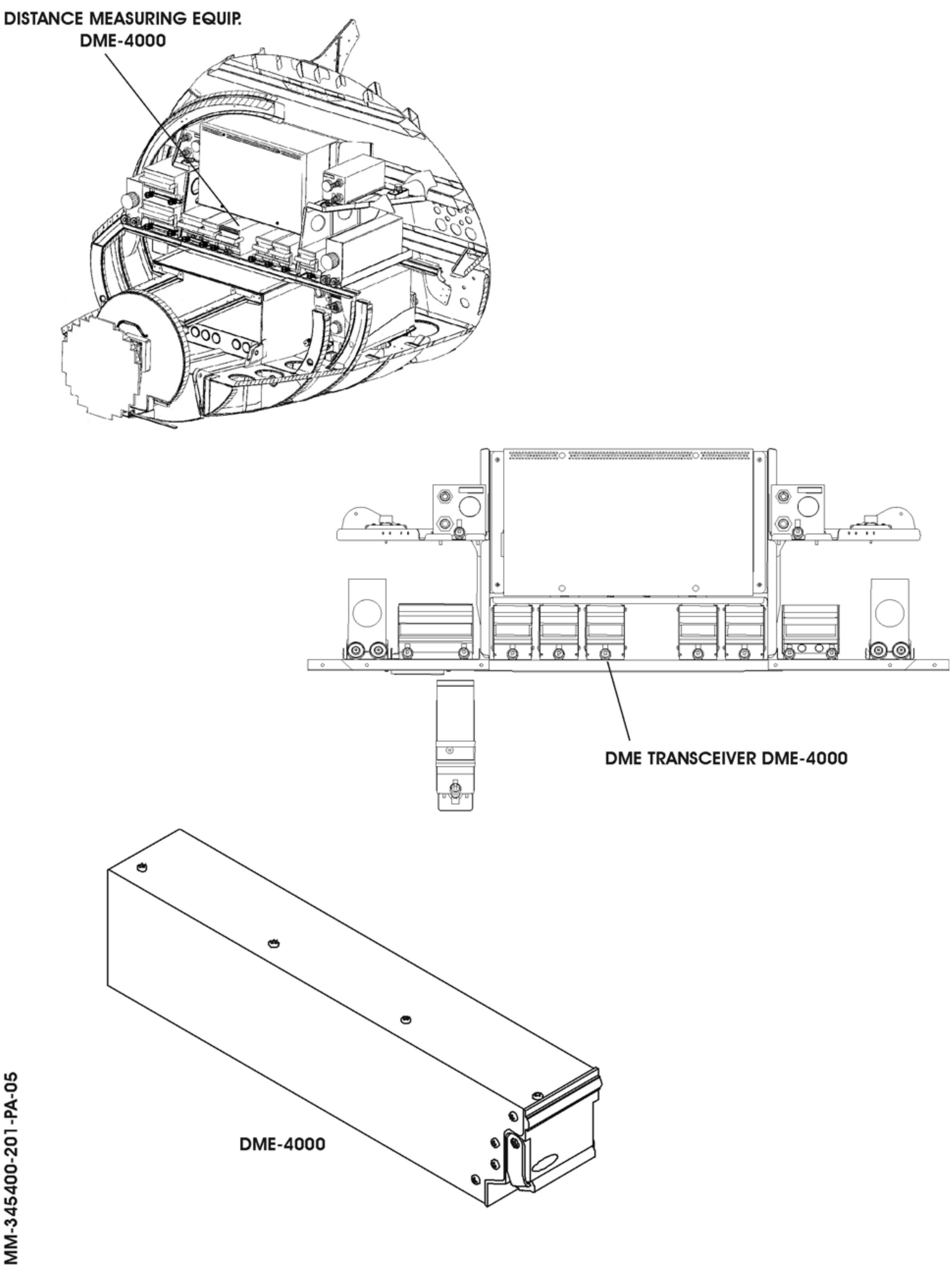

Fig. 201 - DME Transceiver - Removal/Installation

3. DME Transceiver - Installation (Ref. Fig. 201)

A. Reference Information

Maintenance Manual Chapter 20-00-00

Maintenance Manual Chapter 53-10-00

B. Procedure

(1) Make sure that circuit breaker DME 1, is open, safetied and tagged.
(2) Remove cap from electrical connector.
(3) Carefully slide receiver (1) back on mount rack until rear connector engages with mating connector. Ensure pins are properly engaged and then firmly push unit back until rear connector is firmly and fully engaged with mount connector.
(4) Tighten the knurled knob to the hook projection on the front of the unit.
(5) Press on front panel to ensure that the unit is fully seated in the mount. Retighten knurled knob until unit is secured in mount.
(6) Ensure that a good electrical bond exists between the unit and its mount.
(7) Remove the safety tag and close circuit breaker DME 1.
(8) Remove tools, materials and equipment from the work area.
(9) Install the radome/nosecone (Refer to 53-10-00).
(10) Do an Operational Test of the DME Transceiver (Refer Para. 4).
(11) Remove the Warning Notice in the flight compartment.

4. DME Transceiver - Operational Test

A. To perform a Operational Test of DME Transceiver, refer to the Rockwell Collins documentation.

5. DME Antenna - Removal (Ref. to Fig. 202)

A. Fixtures, Test and Support Equipment

Lint -free cloth	Not specified
Non Metallic Scraper	Not specified

B. Materials

02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 20-00-00

Maintenance Manual Chapter 24-00-00

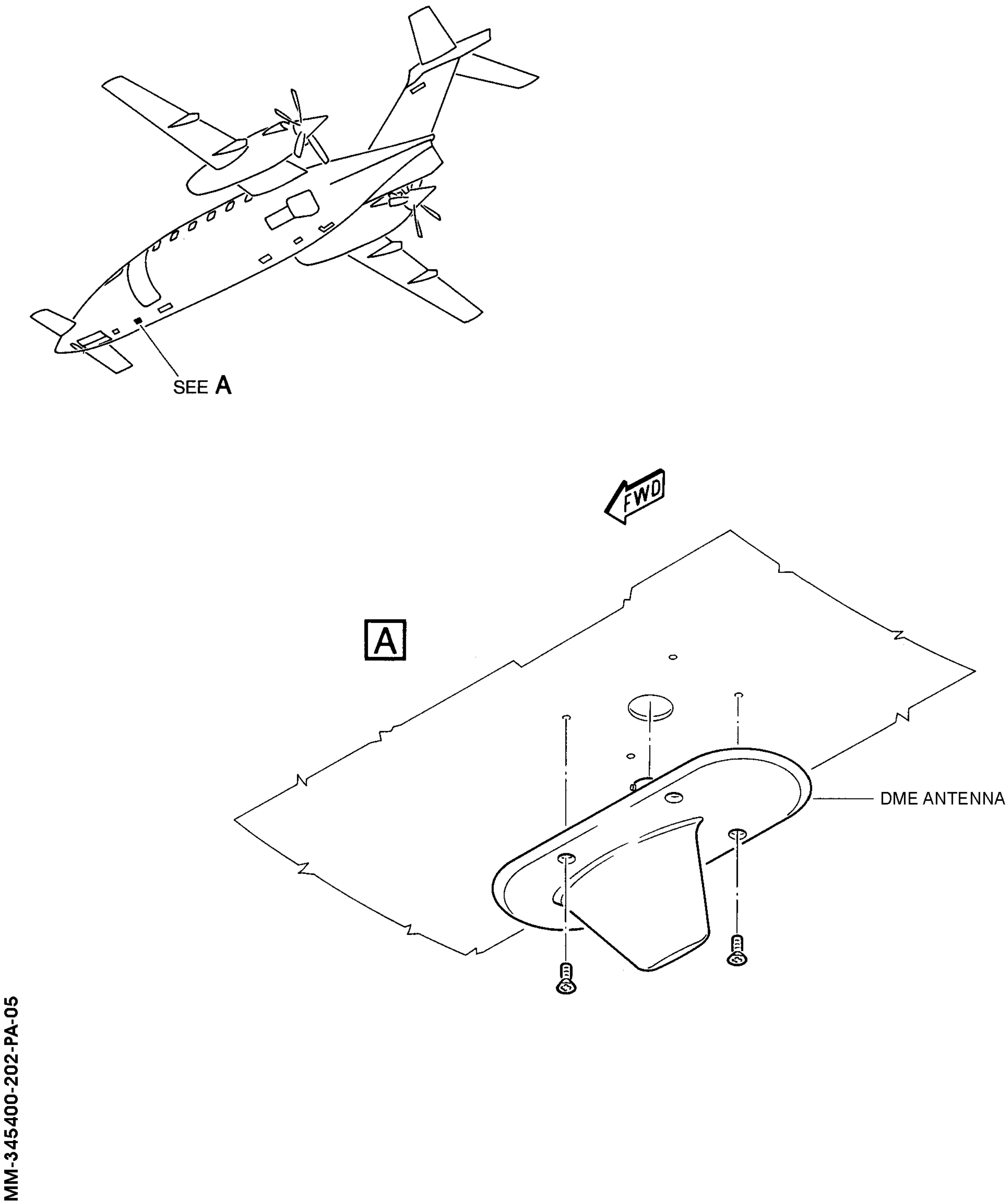

Fig. 202 - DME Antenna - Removal / Installation

D. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.

(2) Open, tag and safety these circuit breakers:
CoPilot CB panel: DME 1

(3) Remove the four attaching screws (3) from the antenna base (2).

(4) Disconnect antenna cable from antenna and remove the antenna and gasket.

(5) Make sure that the antenna cable does not retract into the fuselage.

(6) Scrape sealant from the antenna and antenna area on fuselage using non-metallic scraper.

WARNING: BE CAREFUL WHEN YOU USE MEK. OBEY THE HEALTH AND SAFETY INSTRUCTIONS IN 20-00-00.

(7) Clean the antenna fuselage area using MEK and dry with lint-free cloth

6. DME Antenna - Installation (Ref. to Fig. 202)

A. Fixtures, Test and Support Equipment

Lint -free cloth	Not specified
Non Metallic Scraper	Not specified

B. Materials

06-005, Sealant	As required
02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 20-00-00
Maintenance Manual Chapter 24-00-00

D. Procedure

(1) Make sure that circuit breaker DME 1 is open, safetied and tagged.

(2) Connect antenna cable to the antenna connector.

(3) Align the antenna with the securing screw holes and install and tighten the securing screws

(4) Apply the sealant around the antenna base to prevent the ingress of water between the airframe and the attached part (Refer to 20-00-00).

(5) Restore the surface finish (Refer to 20-00-00).

(6) Remove safety clip and tag and close circuit breaker DME 1.

(7) Connect electrical power (Refer to 24-00-00).

(8) Do an Operational Test of DME Transceiver (Refer Para. 4).

(9) Remove the Warning Notice in the flight compartment.

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ATC TRANSPONDER - DESCRIPTION AND OPERATION

1. Description

A. The ATC Diversity Mode S Transponder with Enhanced Capability type TDR-94D, provides identification and altitude reporting for the Air Traffic Control (ATC) system.

The transponder is a mode-A (ident), mode-C (altitude), and has the capability of operating with mode S (select). The mode S capability permits sending and receiving messages of the identification alphanumeric code (which is a unique airplane identification assigned at installation and based on airplane registration number),via the interrogation/reply data link.

The ATC Diversity Mode S Transponder system consists of the Transponder type TDR-94D, two antennas, installed on the top and on the bottom of the fuselage. For the controls, the Transponder uses the CDU / RTU.

When the TDR-94D Mode-S Transponder is active, automatically responds to all valid ATC radar interrogations with a coded identification and/or reporting altitude reply. The transponder provides feature of selectable altitude reporting and 4096 code selections. The TDR response code is selected on the CDU / RTU.

The transponder system receives encoded altitude data from the Digital Air Data System. The TDR outputs a digital bus to the IAPS (Ref. Fig. 1).

In this chapter only the description of single (Primary) transponder is given. For the dual (Secondary) transponder system refer to chapter 34-57-00.

The ATC Transponder is powered by the Essential Avionics Bus through the XPNDR 1 circuit breaker, located on the pilot c/b panel.

B. The TDR-94D consists of a main microprocessor, serial and discrete I/O interfaces, a 1030 MHz receiver, an interrogation processor, and a 1090 MHz transmitter.

The 1030 MHz interrogations/data are applied from the L-band antennas to the receiver. In the receiver, the signal is mixed with a 1090 MHz output from the local oscillator to produce a 60 MHz i.f. The i.f. signal is amplified, detected, and passed on to the signal and message processor.

The processor decodes the interrogation to extract the message or interrogation-request data. This data is input to the CPU circuits. Here, the data is further processed for output through the Input/Output circuits. The modulator portion of the transmitter circuits receives the data, or reply, to be transmitted from the signal and message processor. The 1090 MHz local oscillator is applied to switching diodes. As the modulator biases these diodes on and off, the resulting 1090 MHz output pulses that are further amplified. The signal is then output to the antenna for transmission.

In mode C operation, the transponder reply has added pulses which are used to encode the aircraft altitude.

A digital bus brings control and altitude data from the CDU, a further digital bus brings control and altitude data from the RTU. The last digital bus brings in output data destined for the IAPS.

A discrete signal received from CDU/RTU rocker switch located on the Reversionary panel, selects the active control.

If in mode S, the added pulses may encode TCAS coordination data, Air traffic control radar beacon system TCAS output data, or acknowledgment data.

The transponder receives a discrete signal of weight on wheel position of main landing gear and provides an output that contains the ATC code A discrete SUPPRESSION line to provide transmit inhibit logic between all L-band units.

The ATC Transponder is installed on the nose avionics bay, right side (Ref. Fig. 2)

C. The two Transponder Antennas are L-band type that provide omnidirectional radiation pattern with vertical polarization.

The top transponder antenna is located between Fus. Sta. 4556 and Fus. Sta.4762 and the bottom antenna between Fus. Sta. 500 and Fus. Sta. 700 (Ref. Fig. 3).

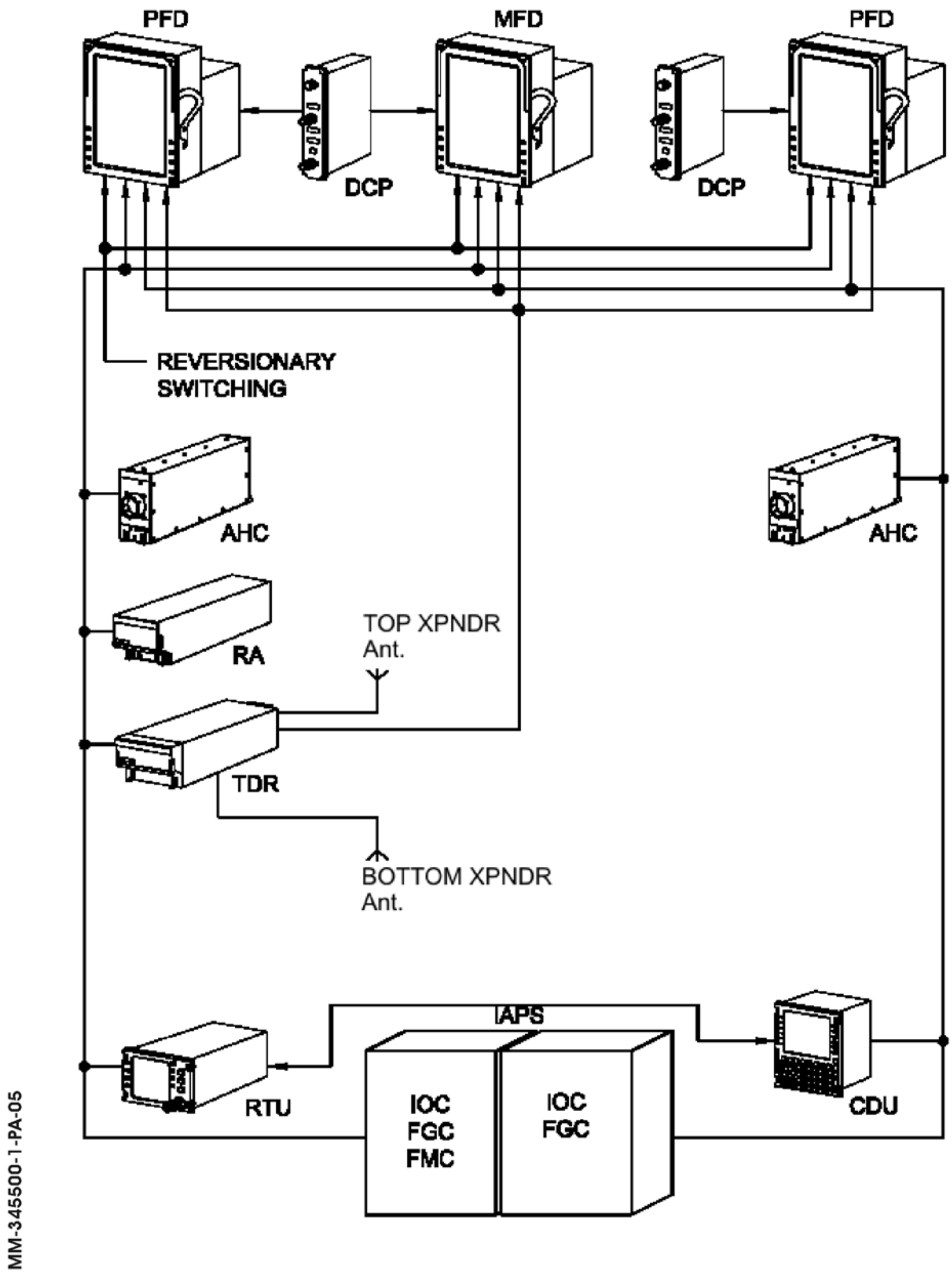

Fig. 1 - ATC Transponder Block Diagram

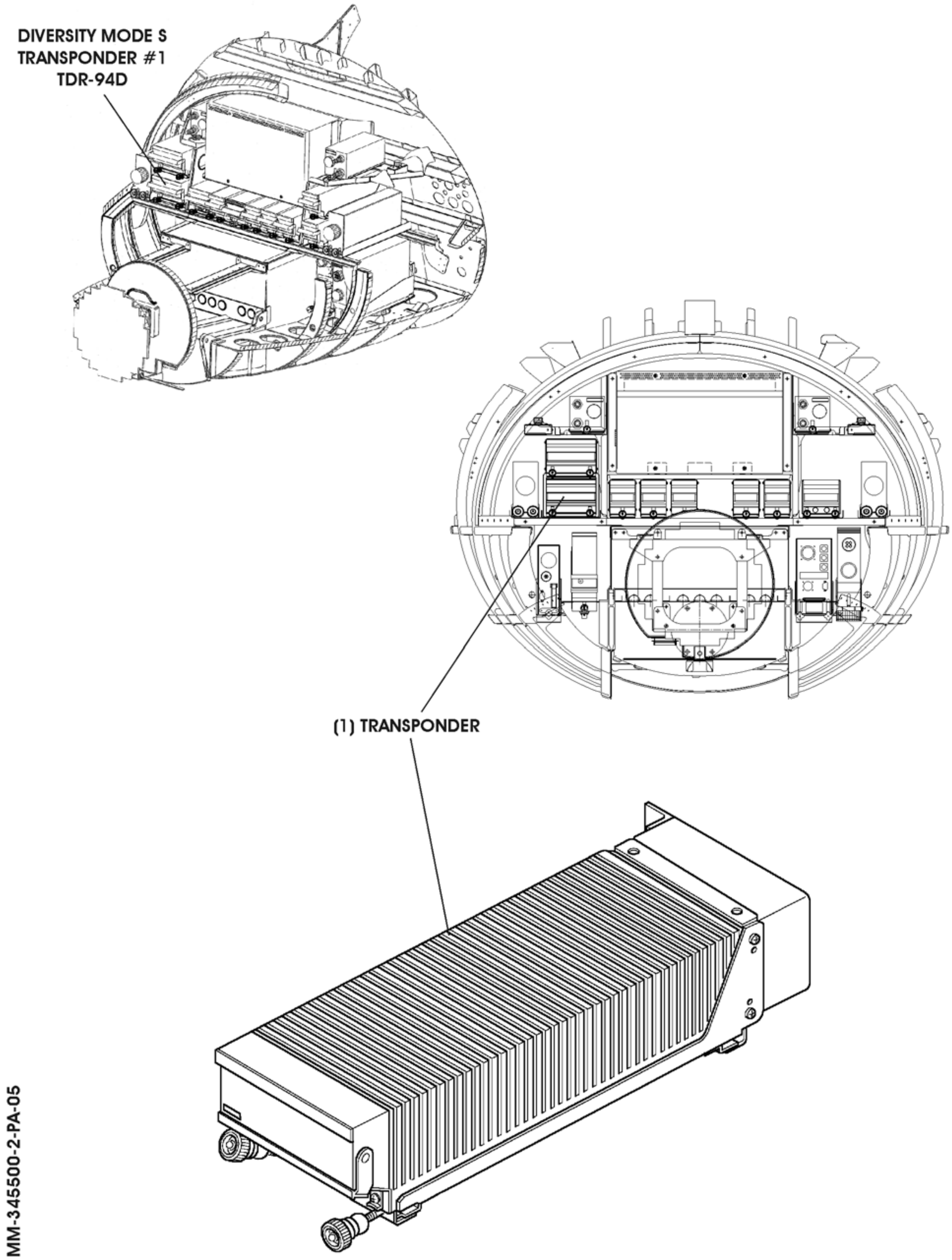

Fig. 2 - ATC Transponder - Component Location

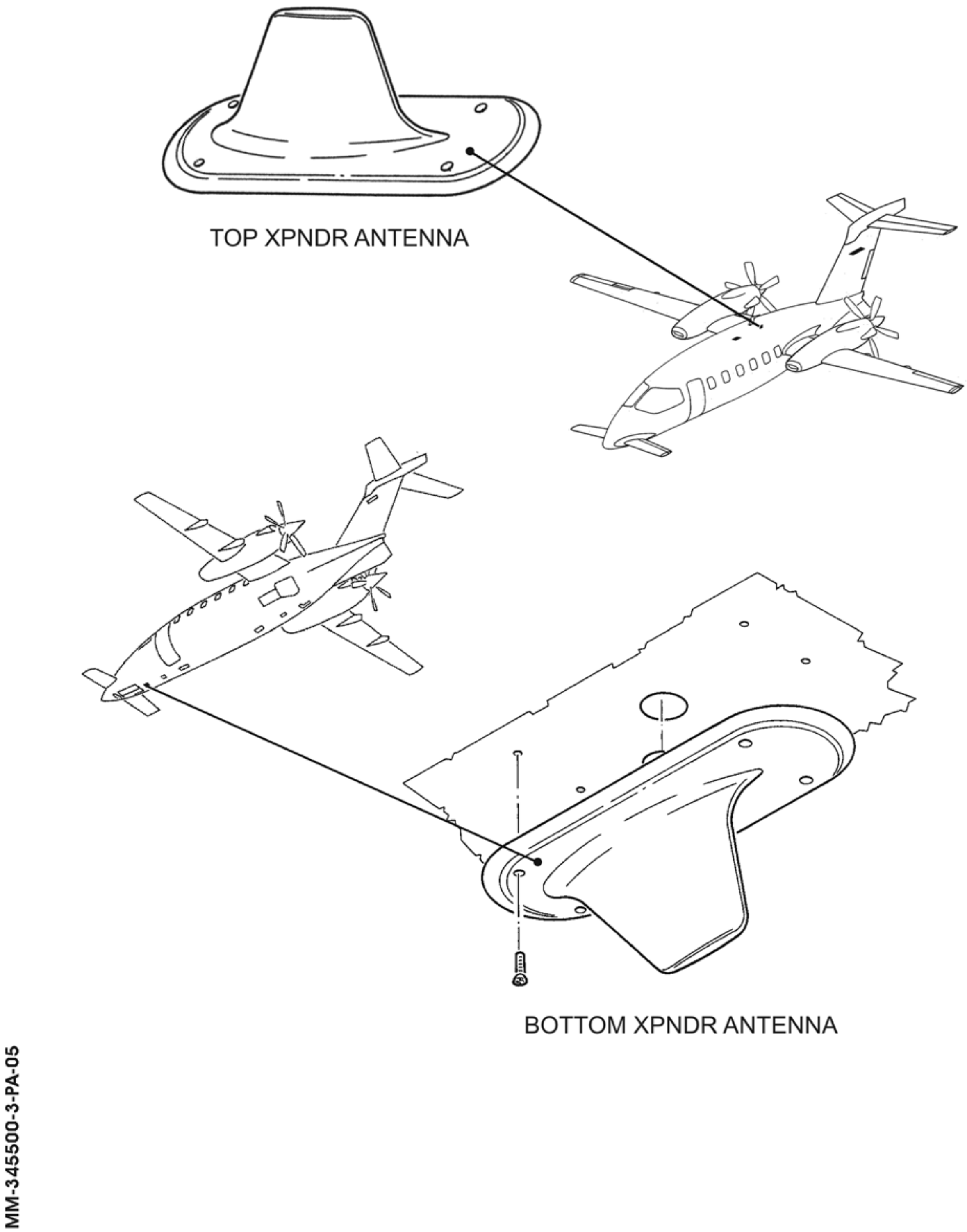

Fig. 3 - ATC Transponder Antennas Location

2. Operation

A. To control ATC Transponder, the Control Display Unit (CDU) and Radio Tuning Unit (RTU) are used.
The CDU is located on the pedestal panel The CDU is a shared user interface that provides control and display functions for the Flight Management System and Radio Navigation System. The Control Display Unit (CDU) is a color, LCD-based display with an integrated keyboard. The CDU is the normal direct means of radio tuning for both pilot and copilot radios. (For further details refer to 34-52-00)

The radio Tuning Unit (RTU) is installed on cockpit panel and provides centralized control and display functions for the NAV, ADF subsystems. These functions include frequency/channel/code select, mode select, and self-test select. (For further details refer to 34-51-00)

B. ATC Operation using the CDU

On the CDU TUNE page, the ATC subdisplay provides control of the ATC code. The active code can also be set from the ATC CONTROL page. The same ATC code shows on both the CDU and RTU and can be set from either controller.
The ATC mode, altitude reporting status (ALT REPORT ON / OFF), and ATC self-test feature are controlled from the ATC CONTROL page.
Further, the Flight ID can be entered on the ATC CONTROL page.

(1) The transponder selection is made by pressing the fourth Line Select Key on the left, associated with the SELECT legend.

(2) The transponder mode selection is made by pressing the fifth Line Select Key on the left, associated with the MODE legend. The possible transponder mode selections are ON or STBY. The selected transponder mode enlarges.

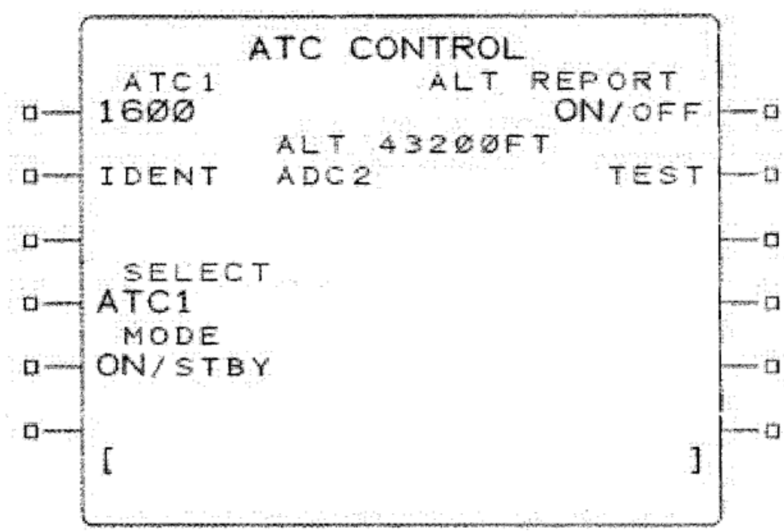

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Fig. 4 - Control Display Unit (CDU)- ATC operation typical lay-out

(3) The ATC Ident code is set on the TUNE page. Push the TUN function key on the CDU to show the TUNE page. The subdisplay for the active transponder shows on both the pilot and copilot TUNE page.

(4) To set the ATC Ident code from the TUNE page or ATC CONTROL page. Enter the desired code in the scratchpad. The conditions that follows define a valid beacon code entry:

– One to four digits have been entered.

– Each digit entered is between 0 and 7 .

(5) Push the ATC ident key (fifth left) to transfer the contents of the scratchpad to the ATC field.

(6) With the scratchpad empty, push the line select key adjacent to the ATC code to show the ATC.

(7) Push the line select key adjacent to IDENT select the ident feature. The IDENT legend on the ATC control page changes to larger cyan text when selected and active. The message IDENT shows on the TUNE page to the right of the ATC beacon code when the ident feature is active.

(8) The Flight ID can be set on the ATC CONTROL page. To set the Flight ID from the ATC CONTROL page enter the desired Flight ID in the scratchpad.
Push the line select key next to the Flight ID to transfer the contents of the scratchpad to the Flight ID line.
Note that the Flight ID can also be entered on the TUNE 2/2 page.

(9) Push the line select key adjacent to ALT REPORT ON/OFF to set altitude-reporting mode to ON or OFF. The message ALT OFF shows in cyan on the TUNE page to the right of the ATC legend. The ALT REPORT status shows on the ATC CONTROL page.

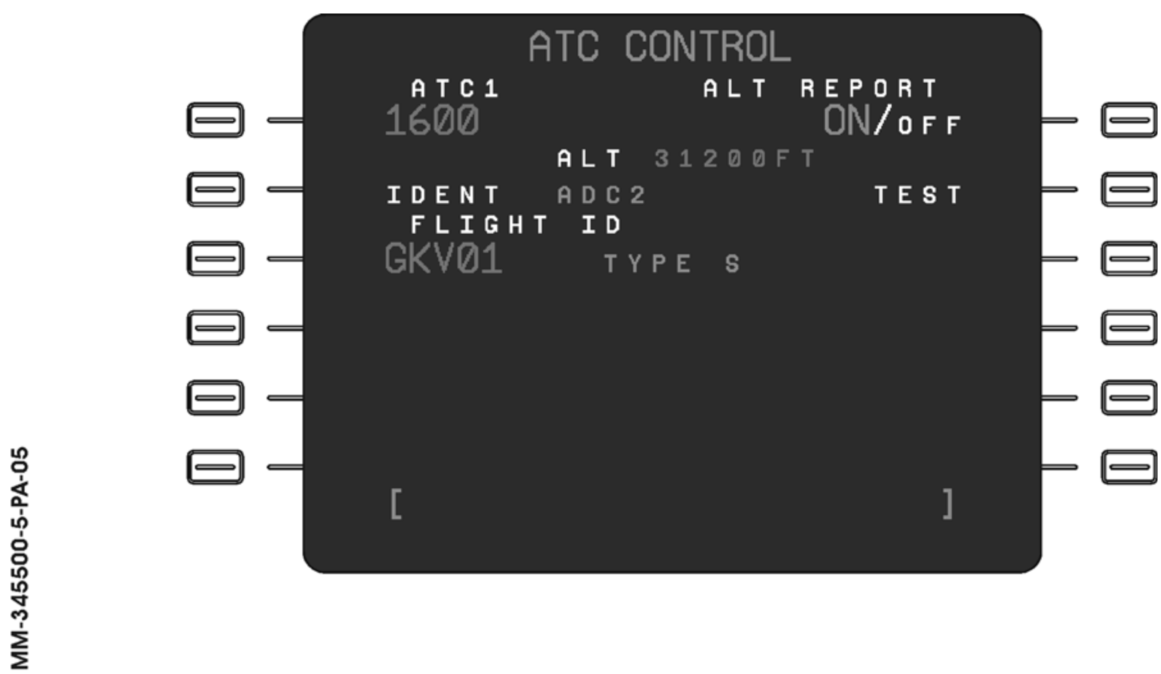

Fig. 5 - Control Display Unit (CDU)- ATC operation typical lay-out

(10) Push the line select key adjacent to TEST to initiate the ATC self-test. The legend TEST enlarges when active, and becomes cyan in color. The ATC test cycle is approximately 10 seconds.

(11) The Reported Altitude shows on the ATC CONTROL page in the center of the display below the altitude source when the transponder is in Mode C. The altitude data is replaced with four white dashes if the echo feedback is flagged or missing.

(12) The altitude source shows on the ATC CONTROL page.

C. ATC Operation using the RTU

On the RTU top level page, the ATC subdisplay provides control of the ATC code. The active and recall ATC code can be set from the ATC main display page. The ATC identification (ident) code for the active transponder is set from the ATC subdisplay.
Further the Flight ID can be set on the ATC subdisplay.
The same ATC transponder display (ATC1 or ATC2) shows on both the RTU and the CDU. Mode C operation and ATC self-test feature are controlled from the ATC main display page.

(1) The Standby Mode selection of the ATC transponder can be selected by pushing the third line select key on the left of display adjacent to STBY .

(2) The ATC ident code is set from the ATC subdisplay on the RTU top level page. The subdisplay for the active transponder shows on the top level page. Push the third line select key on the left adjacent to the ATC subdisplay on the RTU top level page . This action positions the tune window around the active ATC ident code. Rotate the tuning knobs on the RTU to set the desired ATC ident code.

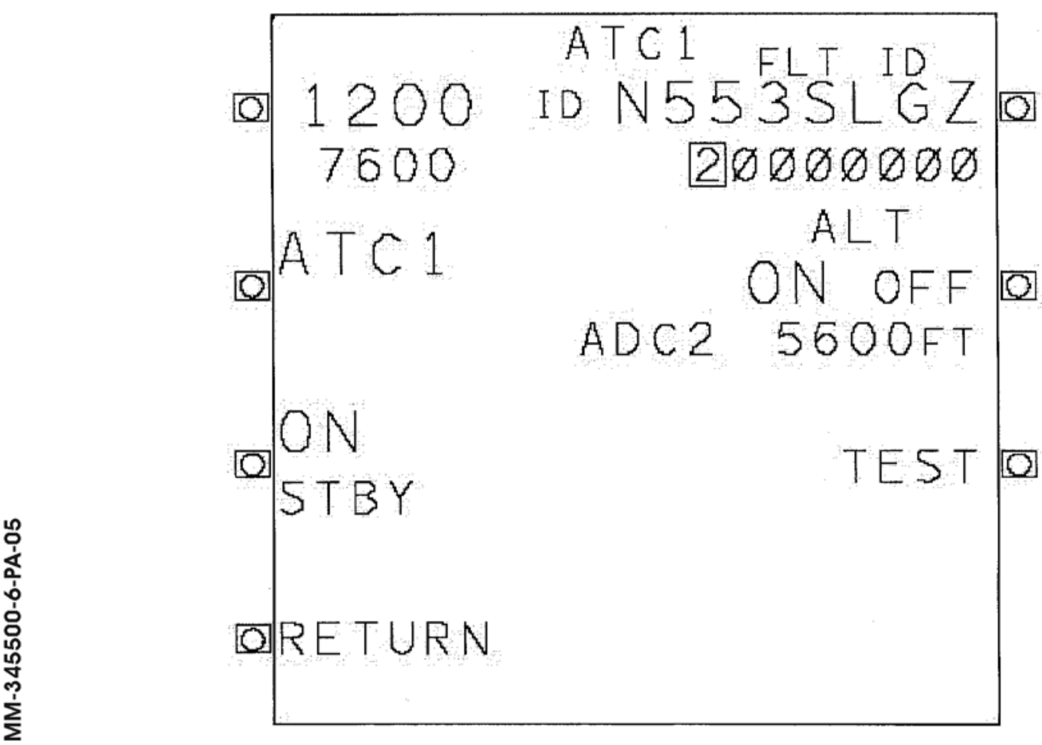

Fig. 6 - Radio Tuning Unit (RTU) typical lay-out ATC Main Display page typical lay-out

(3) The standby/recall ATC IDENT code is set from the ATC main display page. Push the ATC line select key two times on the RTU top level page to show the ATC main display page. Push the recall ATC line select key to two times to swap the active and recall codes.

(4) The Flight ID can be set on the ATC subdisplay. To set the Flight ID from the ATC CONTROL page push the line select key adjacent to FLT ID (Flight ID) to position the tune window. Rotate the tuning knobs on the RTU to set the desired FLT ID code.

(5) Push the second line select key on the right adjacent to the ALT ON/OFF selection on the ATC main display page to set the desired state. The active state (ON or OFF) shows in larger cyan text. When ALT reporting is set to ON, the four most significant digits of the altitude readout (to the nearest 100 feet) show on the ATC main display page. If the transponder is not reporting an altitude, the readout is dashed (ALT ----). When altitude reporting is set to OFF, the message ALT OFF shows in cyan on the ATC subdisplay.

(6) Push the third line select key on the right adjacent to the TEST selection on the ATC main display page to select the ATC self-test.

(7) Push the IDENT function key on the RTU front panel to initiate the ATC ident feature. The message ID shows in cyan on ATC subdisplay and ATC main display page when the ident feature is active.

Fig. 7 - Radio Tuning Unit (RTU)- ATC operation typical lay-out

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ATC TRANSPONDER - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00

A. This topic provides the following Maintenance Practices:
- ATC Transponder (TDR-94D) - Removal/Installation
- ATC Transponder (TDR-94D) - Operational Test
- Top and bottom ATC Transponder Antennas - Removal/Installation

2. ATC Transponder (TDR-94D) - Removal(Ref. Fig. 201)

A. Fixture , Test and Support Equipment

Blanking Caps

B. Referenced Information

Maintenance Manual Chapter 20-00-00

Maintenance Manual Chapter 53-10-00

C. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.

(2) Open, tag and safety this circuit breaker:
Pilot CB panel: XPNDR-1

(3) Remove the radome/nosecone.

(4) Get access to the avionics compartment.

(5) Loosen hold-down nuts (3) on ATC Transponder (1).

(6) Raise handle (2) and pull transponder from rack.

(7) Cap the electrical connectors.

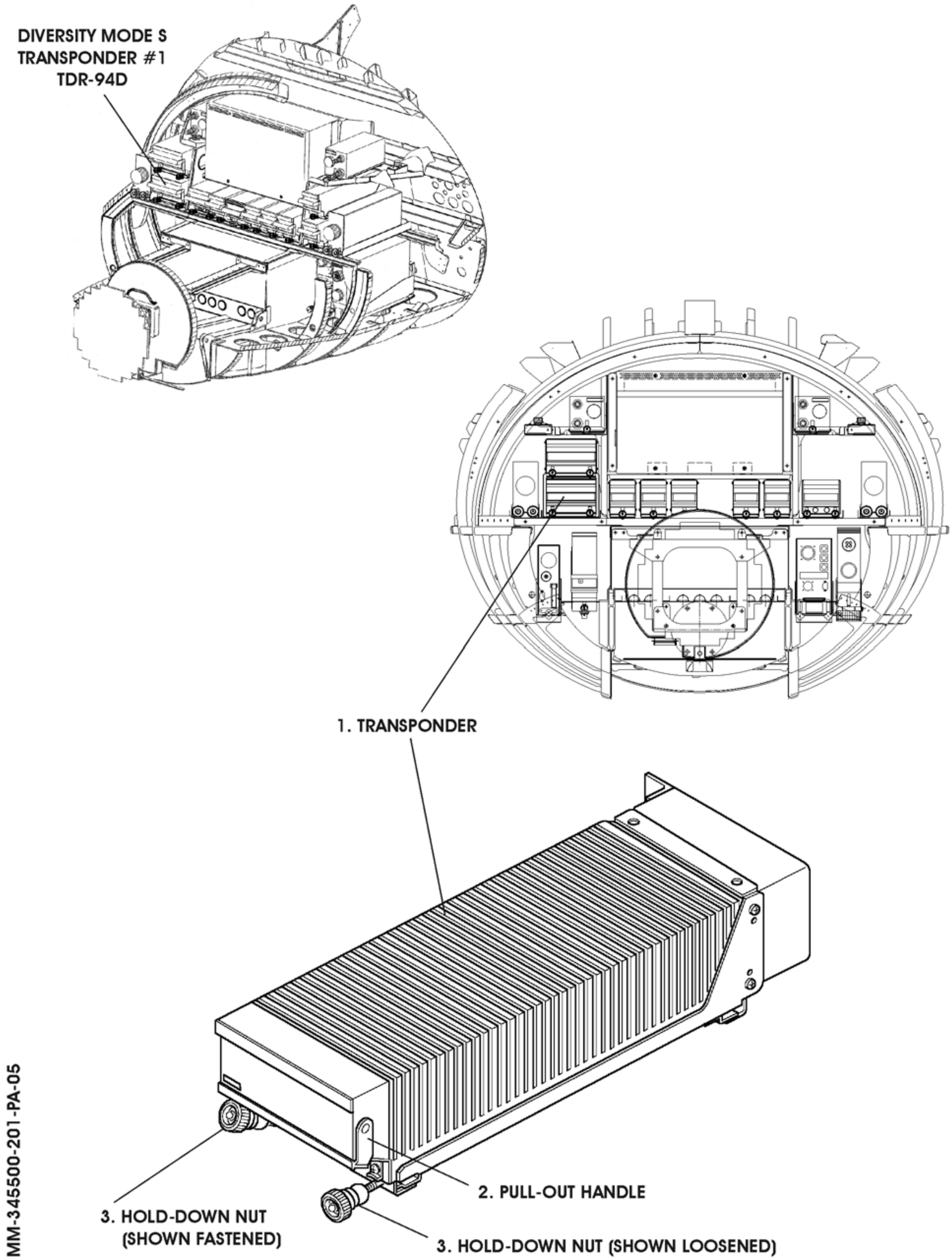

Fig. 201 - ATC Transponder (TDR-94D) - Removal/Installation

3. ATC Transponder (TDR-94D) - Installation (Ref. Fig. 201)

A. Reference Information

Maintenance Manual Chapter 20-00-00

Maintenance Manual Chapter 53-10-00

B. Procedure

(1) Make sure that circuit breaker XPNDR-1 is open, safetied and tagged.
(2) Remove the caps from the electrical connectors.
(3) Slide transponder (1) onto the avionic rack.
(4) Engage hold-down nuts (3) and tighten.
(5) Remove the safety tags and close circuit breakers XPNDR-1
(6) Remove tools, materials and equipment from the work area.
(7) Install the radome/nosecone (Refer to 53-10-00).
(8) Do an operational Test of Primary Transponder System
(9) Remove the Warning Notice in the flight compartment.

4. ATC Transponder - Operational Test

A. To perform a Operational Test of ATC Transponder, refer to the Rockwell Collins documentation.

5. Top and bottom ATC Transponder Antenna - Removal (Ref. to Fig. 202)

NOTE: The removal procedures for the Top and the Bottom ATC Transponder Antenna are the same.

A. Fixtures, Test and Support Equipment

Lint -free cloth	Not specified
Non Metallic Scraper	Not specified

B. Materials

02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 20-00-00

Maintenance Manual Chapter 53-10-00

D. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(2) Open, tag and safety these circuit breakers:
Pilot CB panel: XPNDR-1

(3) Remove the four attaching screws (3) from the antenna base (2).
(4) Disconnect antenna cable from antenna and remove the antenna and gasket.
(5) Make sure that the antenna cable does not retract into the fuselage.
(6) Scrape sealant from the antenna and antenna area on fuselage using non-metallic scraper.

WARNING: BE CAREFUL WHEN YOU USE MEK. OBEY THE HEALTH AND SAFETY INSTRUCTIONS IN 20-00-00.

(7) Clean the antenna fuselage area using MEK and dry with lint-free cloth

6. Top and bottom ATC Transponder Antenna - Installation (Ref. to Fig. 202)

NOTE: The installation procedures for the Top and the Bottom ATC Transponder Antenna are the same.

A. Fixtures, Test and Support Equipment

Lint -free cloth	Not specified
Non Metallic Scraper	Not specified

B. Materials

06-005, Sealant	As required
02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 20-00-00
Maintenance Manual Chapter 24-00-00

D. Procedure

(1) Make sure that circuit breaker XPNDR 1 is open, safetied and tagged.
(2) Connect antenna cable to the antenna connector.
(3) Align the antenna with the securing screw holes and install and tighten the securing screws
(4) Apply the sealant around the antenna base to prevent the ingress of water between the airframe and the attached part (Refer to 20-00-00).
(5) Restore the surface finish (Refer to 20-00-00).
(6) Remove safety clips and tags and close circuit breakers XPNDR 1.
(7) Connect electrical power (Refer to 24-00-00).
(8) Do an Operational Test of ATC Transponder (Refer Para. 4)
(9) Remove the Warning Notice in the flight compartment.

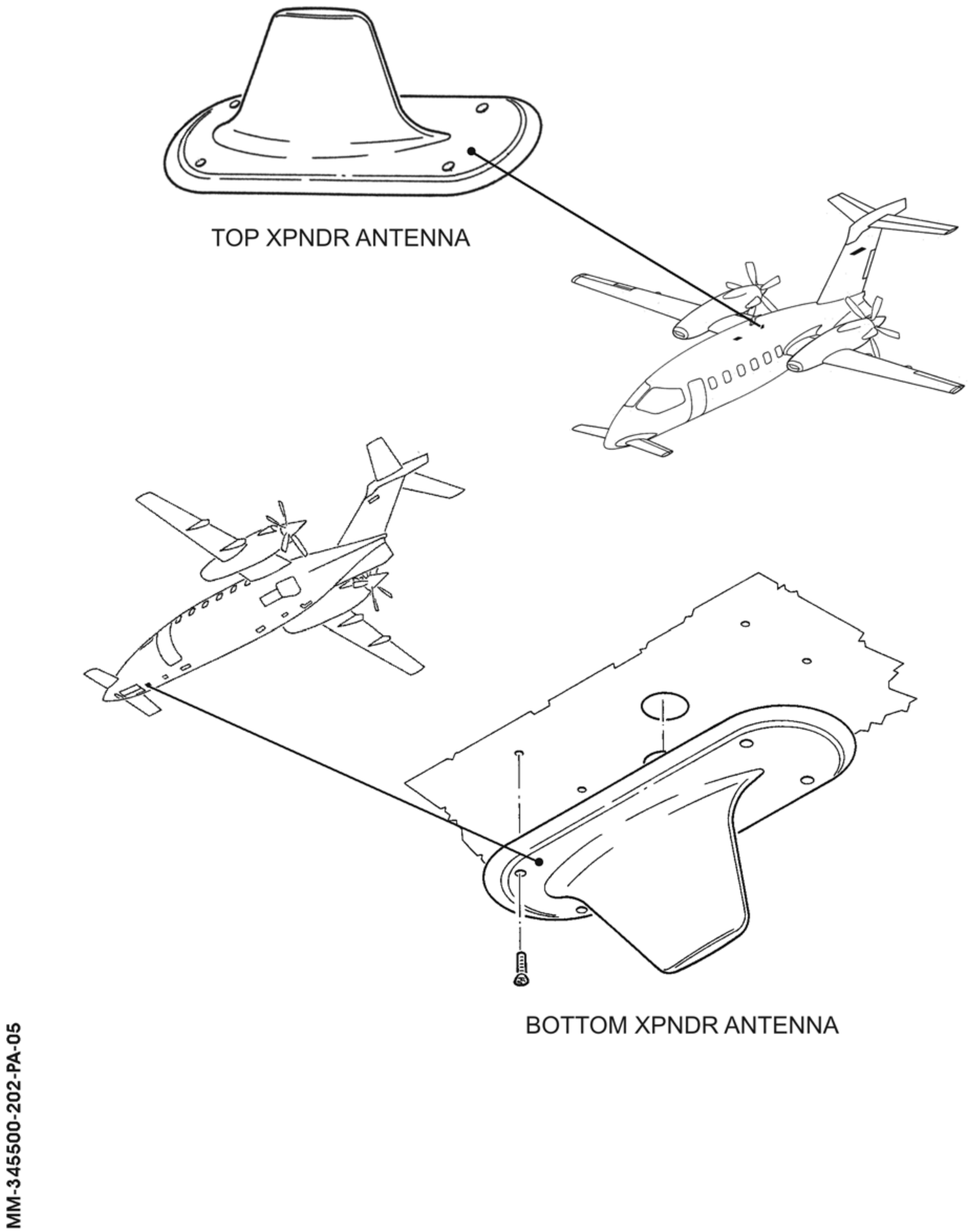

Fig. 202 - Top and Bottom ATC Transponder Antennas - Removal / Installation

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GLOBAL POSITIONING SYSTEM (GPS) - DESCRIPTION AND OPERATION

1. Description

A. The Global Positioning System (GPS-4000A) consists of a receiver and an antenna. The Global Positioning System processes the GPS signals received from the antenna to provide various navigation data (three dimensional positions, three dimensional velocity and time) to the onside IAPS data concentrators. The active GPS antenna acquires, actively filters, and amplifies the GPS signals from up to 12 satellites and sends them to the GPS receiver. The GPS satellite signals provide all data needed to calculate the position, velocity and time.

Power is obtained by the 28 Vdc right avionics dual feed bus, via circuit breaker GPS.

B. Receiver

The receiver provide precise position, velocity, and time measurements for en route, terminal and non-precision approaches. The position, velocity, and time determinations are computed by the receiver based on satellite signals provided by the Global Positioning System (GPS) satellite constellation. The receiver may be used as a primary means of navigation for oceanic/remote operations.

The GPS contains receiver UARTs, I/O processor, and the GPS ENGINE. The +28 Vdc power input is applied to the power supply which provides all required internal voltage levels.
The active GPS antenna filters and amplifies the received GPS satellite signals. The antenna is powered by +12 Vdc on the antenna coax cable and applies the received GPS signal to the GPS ENGINE. The GPS ENGINE calculates the airplane position. The I/O processor outputs calculated position data through the UART on a low-speed data bus. The GPS outputs the data bus to the IAPS data concentrator and to the CDU.

The receiver is located on the nose avionics bay right side.

C. Antenna

The GPS Antenna is a passive antenna hermetically sealed type, with low profile and a radome design that offer protection against rain, ice and lighting strikes.
The antenna requires a d.c. bias provided through the coaxial connector.

The antenna is installed on top of the fuselage between Fus. Sta. 3938 and Fus. Sta. 4144.

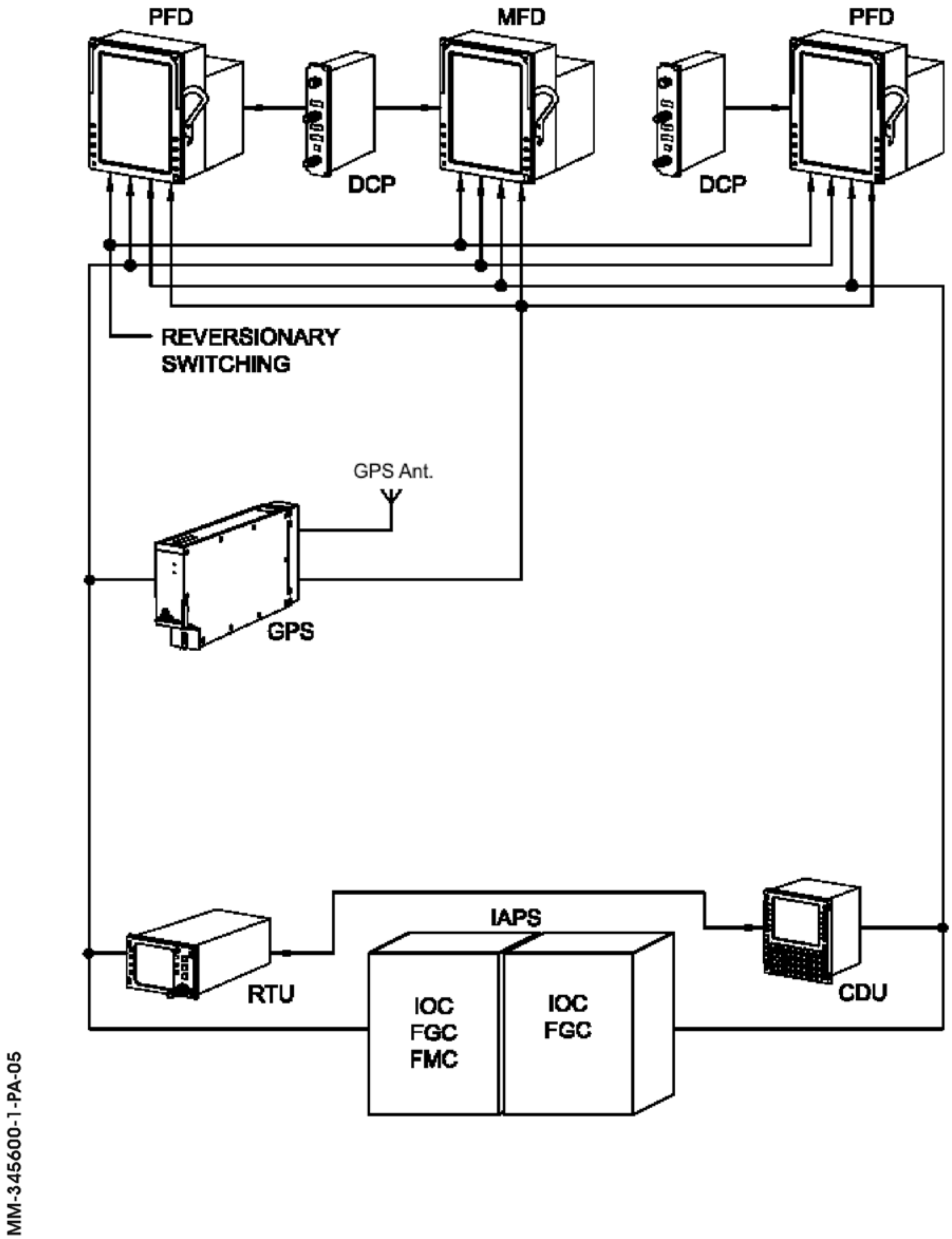


Fig. 1 - Global Positioning System - Block Diagram

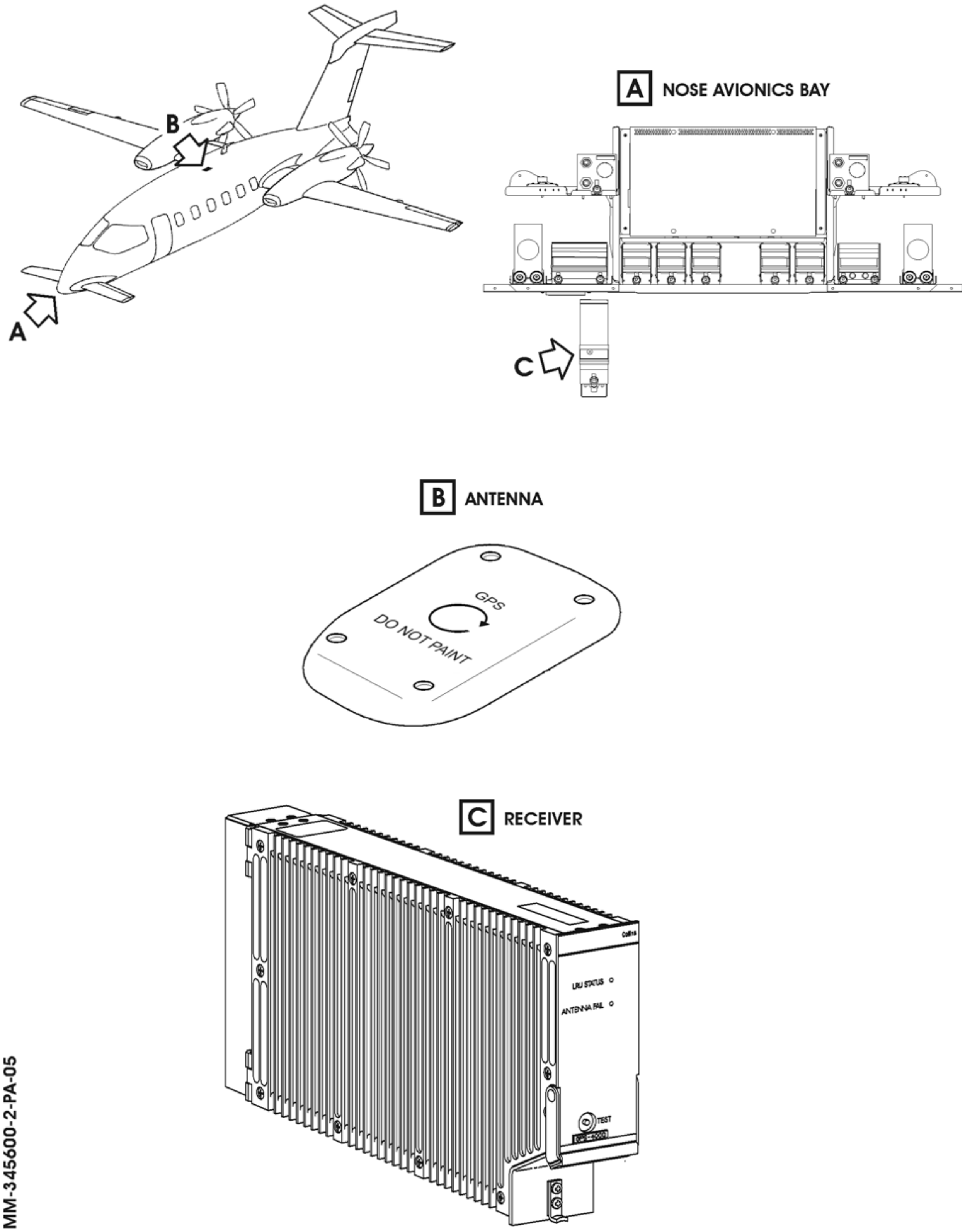


Fig. 2 - Global Positioning System - Location of Components

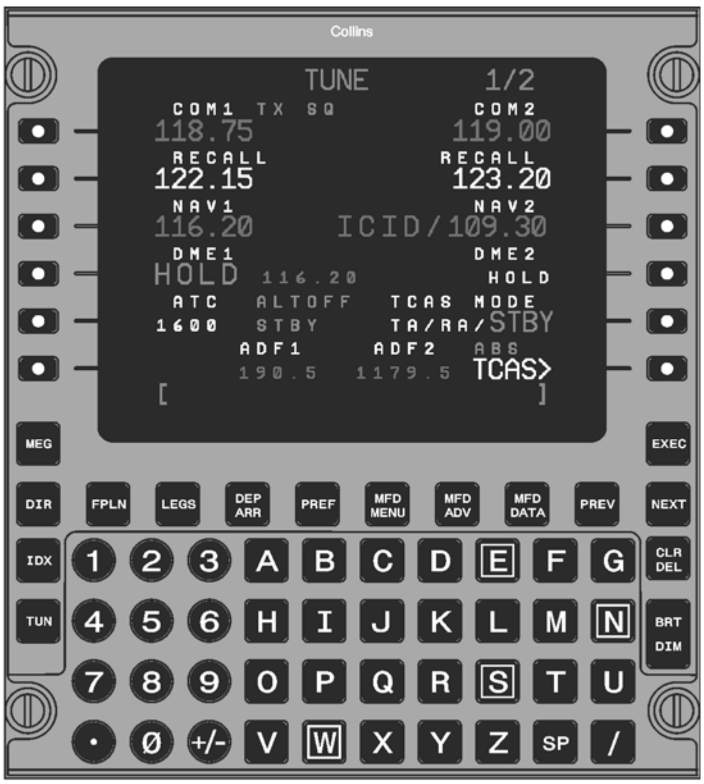
2. Operation

The GPS controls are managed via Control Display Unit (CDU-3000).

The CDU is located on the pedestal panel. It is a shared user interface that provides control and display functions for several aircraft systems. The display area supports 12 display lines, a title line, a scratchpad, and a message line. The keyboard has 16 function keys plus a full alphanumeric keypad. In addition, the CDU has 6 line select keys located in the bezel on each side of the display.

For more information on the CDU, refer to 34-52-00.

The GPS control is carried out by means of two video pages: GPS CONTROL page and GPS page.



MM-345600-3-PA-05

Fig. 3 - Control Display Unit

A. GPS CONTROL page

Refer to Fig. 4 to see the access path to GPS CONTROL page and a page example.

The GPS CONTROL page shows position differences (POS DIFF) between each GPS sensor position and the position calculated by the FMS. Both direction and distance (up to 99.9 NM) are shown. A position difference greater than 99.9 NM shows as 99.9 NM. Dashes show for the POS DIFF if there is insufficient data to calculate a difference.

The line select key for each installed GPS sensor enables or disables the use of the sensor by the FMS.

If a GPS sensor has been DISABLED, it remains disabled until the pilot manually enables it. SAT DESELECT is used to deselect up to eight satellites that are scheduled to be out of service as identified in NOTAMs. Deselected satellites (SAT DESELECT) are not included in the predicted RAIM computations. Enter the satellite numbers one at a time. Enable all deselected satellites at once with the CLR/DEL function key, or enable individual satellites from the list by re-entering the satellite number.

The DEST and ETA entries, by default, are those of the active flight plan. Changes can be manually entered to see if RAIM is available for other destinations and/or arrival times. APPR RAIM indicates if approach RAIM will be available at the ETA shown.

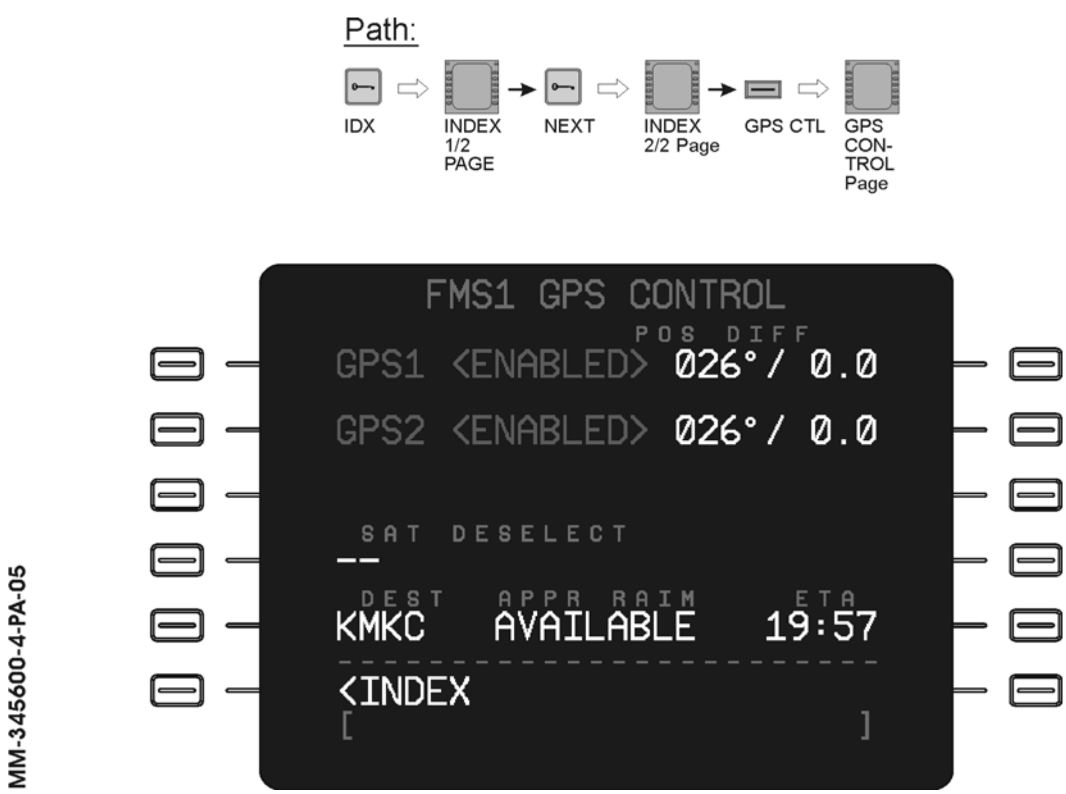


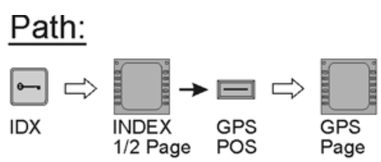
Fig. 4 - Control Display Unit (CDU) - GPS CONTROL Page typical view

B. GPS page

Fig. 5 shows the path to access the GPS page and a page example.

The GPS page is used to show the current GPS position and related GPS information. The information on the GPS page is for display only and cannot be edited. The GPS page shows:

– The current time and date
– Latitude and longitude coordinates of the GPS position
– Track angle and ground speed
– RAIM LIMIT in nautical miles
– PROBABLE ERROR in nautical miles
– The current GPS MODE
– The number of satellites the GPS is currently tracking



MM-345600-5-PA-05

Fig. 5 - Control Display Unit (CDU) - GPS Page typical view

GLOBAL POSITIONING SYSTEM (GPS) - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00.

A. This topic provides the following Global Positioning System Maintenance Practices:

– GPS Receiver - Removal/Installation
– GPS Antenna - Removal/Installation
– Receiver and antenna - Operational Test.

2. GPS Receiver - Removal (Refer to Fig. 201)

A. Fixtures, Test and Support Equipment

Circuit Breaker safety clips and tags	
Blanking cap	Not specified

B. Referenced Information

Maintenance Manual Chapter 24-00-00
Maintenance Manual Chapter 53-10-00

C. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(2) Open, tag and safety the following circuit breaker:
Copilot CB panel:
GPS
(3) Remove the nose avionics compartment cover (Refer to 53-10-00).
(4) Loosen hold-down nut and disengage it from the receiver.
(5) Raise handle and carefully extract the receiver. The connectors on the rear side are disconnected as a consequence.
(6) Put caps on the electrical connectors.

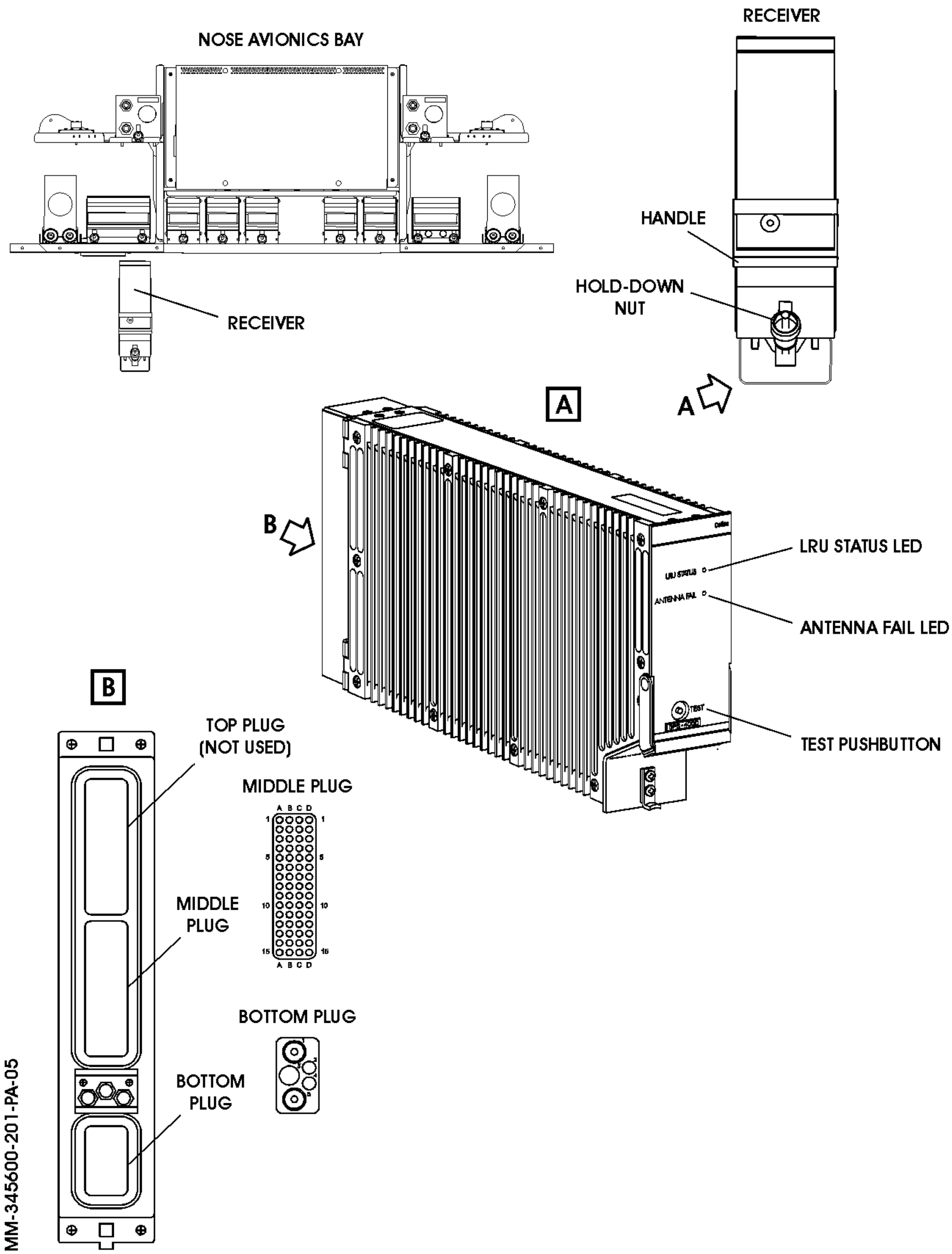


Fig. 201 - GPS Receiver - Removal/Installation

3. GPS Receiver - Installation (Refer to Fig. 201)

A. Referenced Information

Maintenance Manual Chapter 24-00-00

Maintenance Manual Chapter 53-10-00

B. Procedure

(1) Remove the caps from the electrical connectors, if present (Ref. Para. 2, point C, item 5).

(2) Carefully insert the receiver (the connectors on the rear side are connected as a consequence) and lower the handle.

(3) Engage hold-down nut and tighten it.

(4) Reinstall the nose avionics compartment cover (Refer to 53-10-00).

(5) Remove the safety tags and close the previously opened circuit breaker:

Pilot CB panel:

GPS

(6) Remove the Warning Notice in the flight compartment.

4. GPS Antenna - Removal (Refer to Fig. 201)

A. Fixtures, Test and Support Equipment

Circuit Breaker safety clips and tags	
Blanking cap	Not specified

B. Referenced Information

Maintenance Manual Chapter 24-00-00

C. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.

(2) Open, tag and safety the following circuit breaker:

Copilot CB panel:

GPS

(3) Remove the four screws from the antenna.

(4) Cut sealant and withdraw the antenna to access the coaxial cable connector.

(5) Disconnect the coaxial cable and remove the antenna.

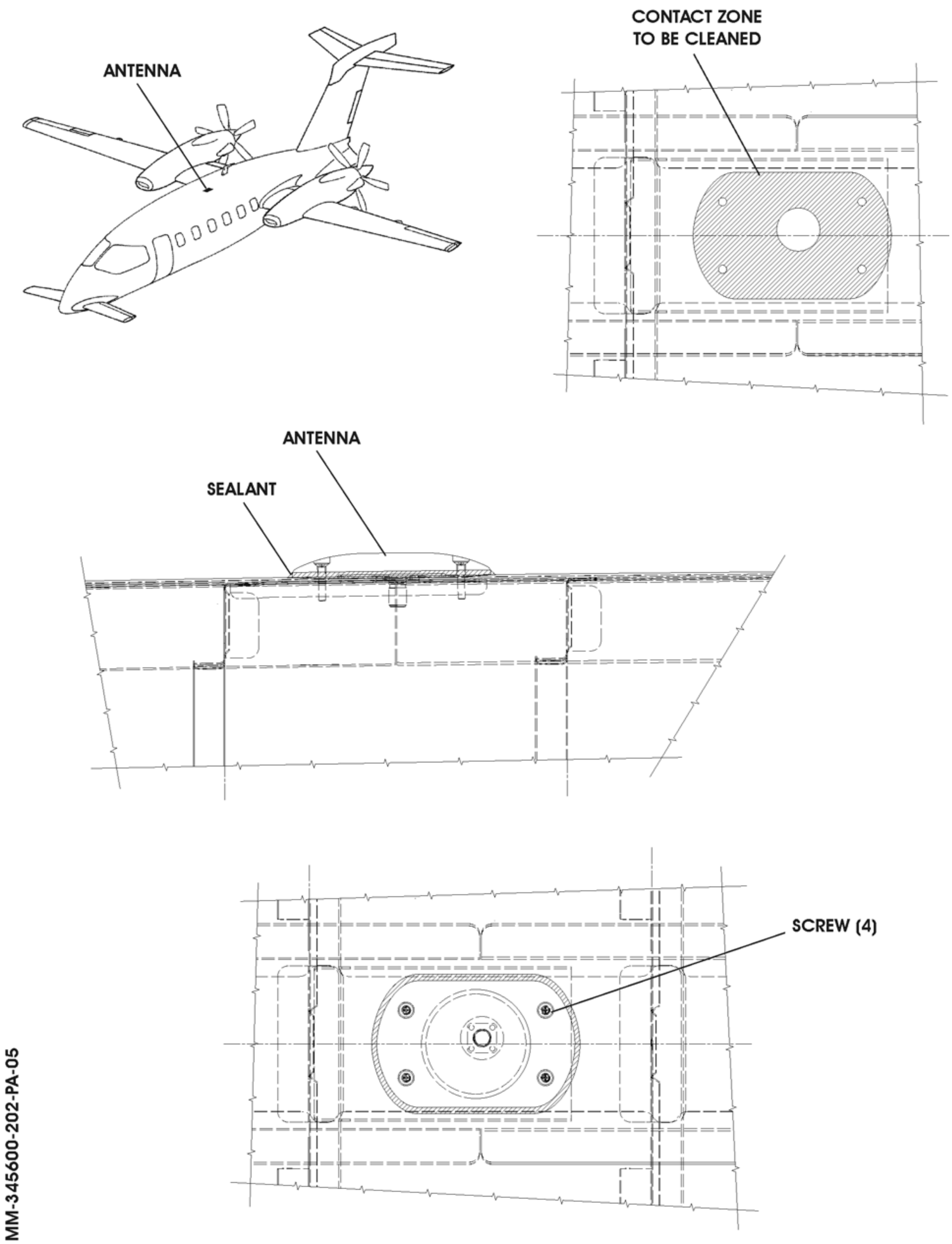


Fig. 202 - GPS Antenna - Removal/Installation

5. GPS Antenna - Installation (Refer to Fig. 202)

A. Fixture, Test and Support Equipment

0.5 in (12 mm) paint brush	Not specified
Lint-free cloth	Not specified
Non-metallic spatula	Not specified

B. Materials

006, Sealant

02-009, Metyl-Ethyl-Ketone

C. Referenced Information

Maintenance Manual Chapter 24-00-00

D. Procedure

(1) Make sure that the system is electrically safe.

WARNING: BE CAREFUL WHEN YOU USE MEK. OBEY THE HEALTH AND SAFETY INSTRUCTIONS GIVEN IN CHAPTER 20-00-00.

(2) Clean the replacement parts and their interfaces (Refer 20-00-00).
(3) Connect the coaxial cable to the antenna.
(4) Locate antenna and attach with four screws.
(5) Apply a fillet of sealant around antenna base (Refer 20-00-00).
(6) Remove excessive sealant (Refer 20-00-00).
(7) Remove the safety tags and close the previously opened circuit breaker:
Copilot CB panel:
GPS
(8) Remove a Warning Notice in the flight compartment.

6. GPS Receiver and Antenna - Operational Test (Refer to Fig. 201)

A. The receiver may be self-tested when the aircraft is on the ground. With power applied to the system, momentarily push the TEST button on the receiver front panels (Refer to Fig. 201). The front panel LED indicators, LRU STATUS and ANTENNA FAIL, are energized for self-test mode operation only. The indicators are disabled for all other, power-up and continuous, test operations. The self-test takes less than 10 seconds to complete and operates in the following sequence:

(1) Lamp Test - Both of the front panel indicators are activated and indicate red for first two seconds, followed by the LRU STATUS indicator turning green while the ANTENNA FAIL indicator continues to be red for two seconds.
(2) Self-Test-In-Progress - Both LEDs are extinguished for the next two-plus seconds while the self-test operation is in progress.

(3) Test Results - The Self-Test-In-Progress sequence is followed by the display of the appropriate results of the self-test. The receiver passes the self-test if the LRU STATUS indicator is green and the ANTENNA FAIL indicator is off. If the LRU STATUS stays red, remove the power and replace the receiver (Refer to Para. 2 e Para. 3). If the ANTENNA FAIL indicator stays red, look for the problem in the antenna or an associated coaxial cable. The LEDs continue to display results for 30 seconds or until the manually requested self-test operation is restarted by a subsequent push of the TEST button.

(4) End-of-Test - At the end of the test period, all LEDs are returned to an all-off condition.

SECONDARY ATC TRANSPONDER - DESCRIPTION AND OPERATION

1. Description

A. The Secondary ATC Diversity Mode S Transponder with Enhanced Capability type TDR-94D, can be installed to get the dual Surveillance Mode S diversity Transponder functionality.

The secondary ATC transponder is equivalent to the single (primary) ATC transponder with same type, and with same enhanced capability.

The installation with secondary ATC transponder consists of primary ATC trasponder installed on the same position of single ATC transponder installation, with the addition of the secondary ATC transponder with a Mount installed on a Piggyback Mount kit.

In the Dual configuration, the two transponder share the same top and bottom antennas installed in the single Transponder layout. The antennas are shared by means of two additional coaxial relays, one for each antenna.

The secondary Transponder receives encoded data from the other aircraft system via digital busses. The secondary TDR outputs digital bus to the IAPS (Ref. Fig. 1).

For the controls, the secondary ATC Transponder uses the CDU / RTU.

The Secondary ATC Transponder is powered by the Right Avionics Dual Feed Bus through the XPNDR 2 circuit breaker, located on the copilot c/b panel.

B. For the description of the Secondary ATC Transponder, that is identical to the Primary ATC Transponder, refer to 34-55-00.
The Secondary ATC Transponder is installed on the right side of nose avionics bay, upper on the Primary ATC Transponder (Ref. Fig. 2).

C. The two Transponder Antennas are the same used for single (Primary) ATC transponder. The top and Bottom transponder antennas are connected to the both primary and secondary transponders by means of two coaxial relays.
For antennas details and location, refer to 34-55-00.

D. The two additional coaxial relays, one for each antenna, are controlled by the RTU /CDU Control unit trough dedicated discrete signals.
The coaxial relay consists of a coaxial switch with one way two position, where the common input (IN) is connected to the antenna, the normally closed position (1 - NC) is connected to Primary ATC Transponder and the normally open position (2 - NO) is connected to Secondary ATC Transponder. The control of coaxial switches are performed in parallel from RTU/CDU and Secondary Transponder relay K5004.
The two coaxial relays and the Sec. Transponder relay (K5004) are located on Nose avionics bay left side behind the Primary and Secondary VHF Communication Transceiver (refer Fig. 3)

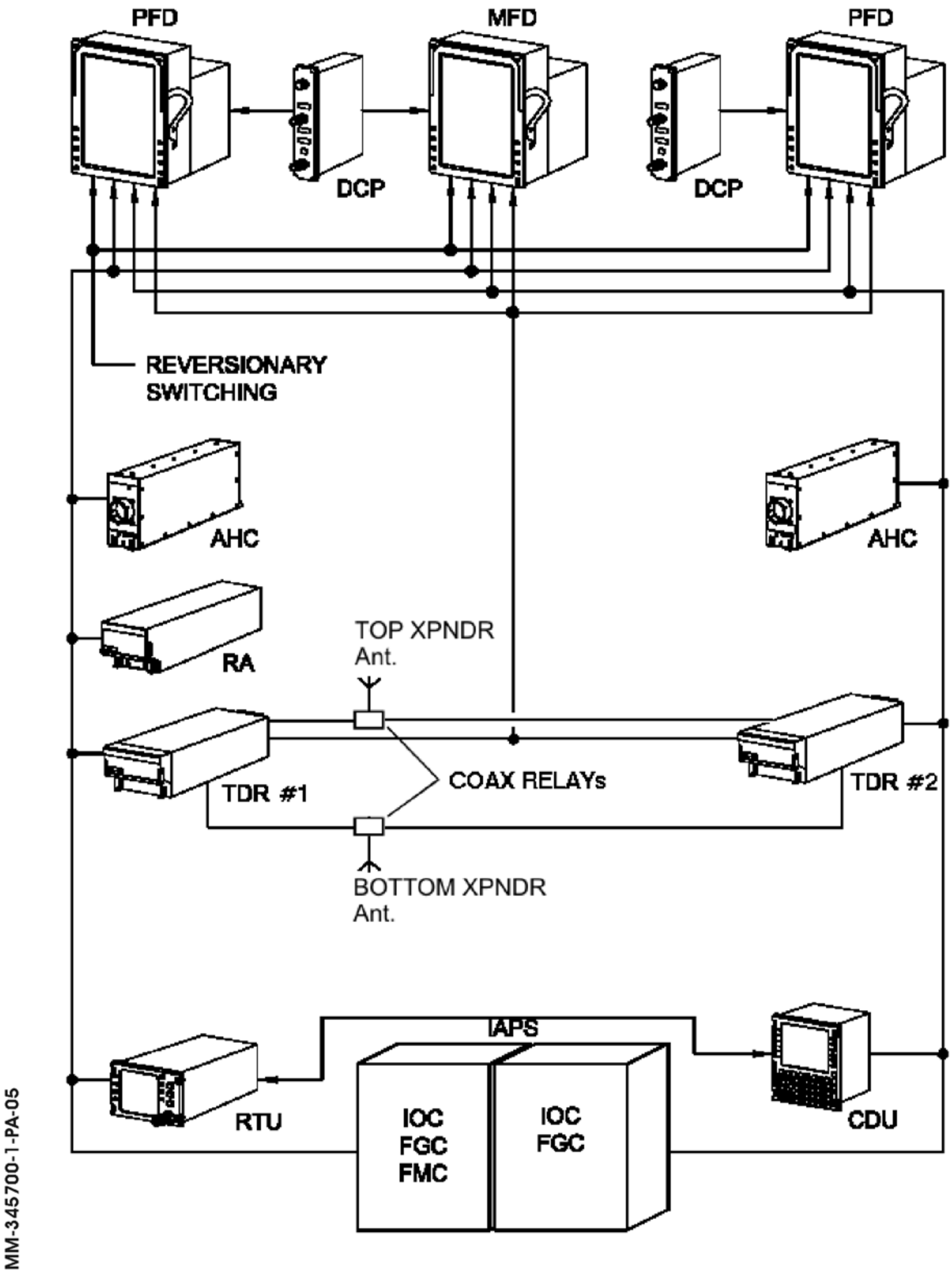


Fig. 1 - Secondary ATC Transponder Block Diagram

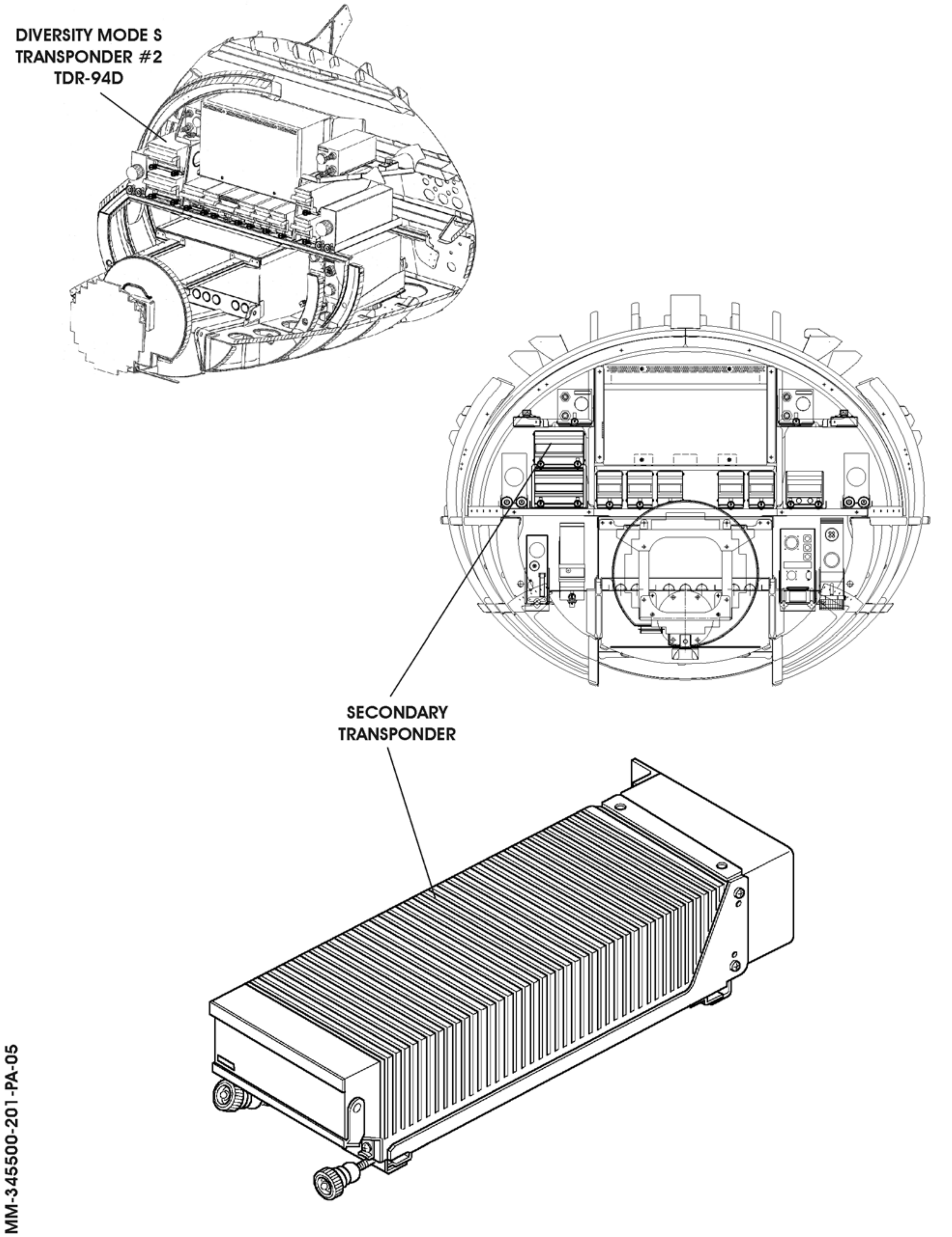


Fig. 2 - Secondary ATC Transponder - Component Location

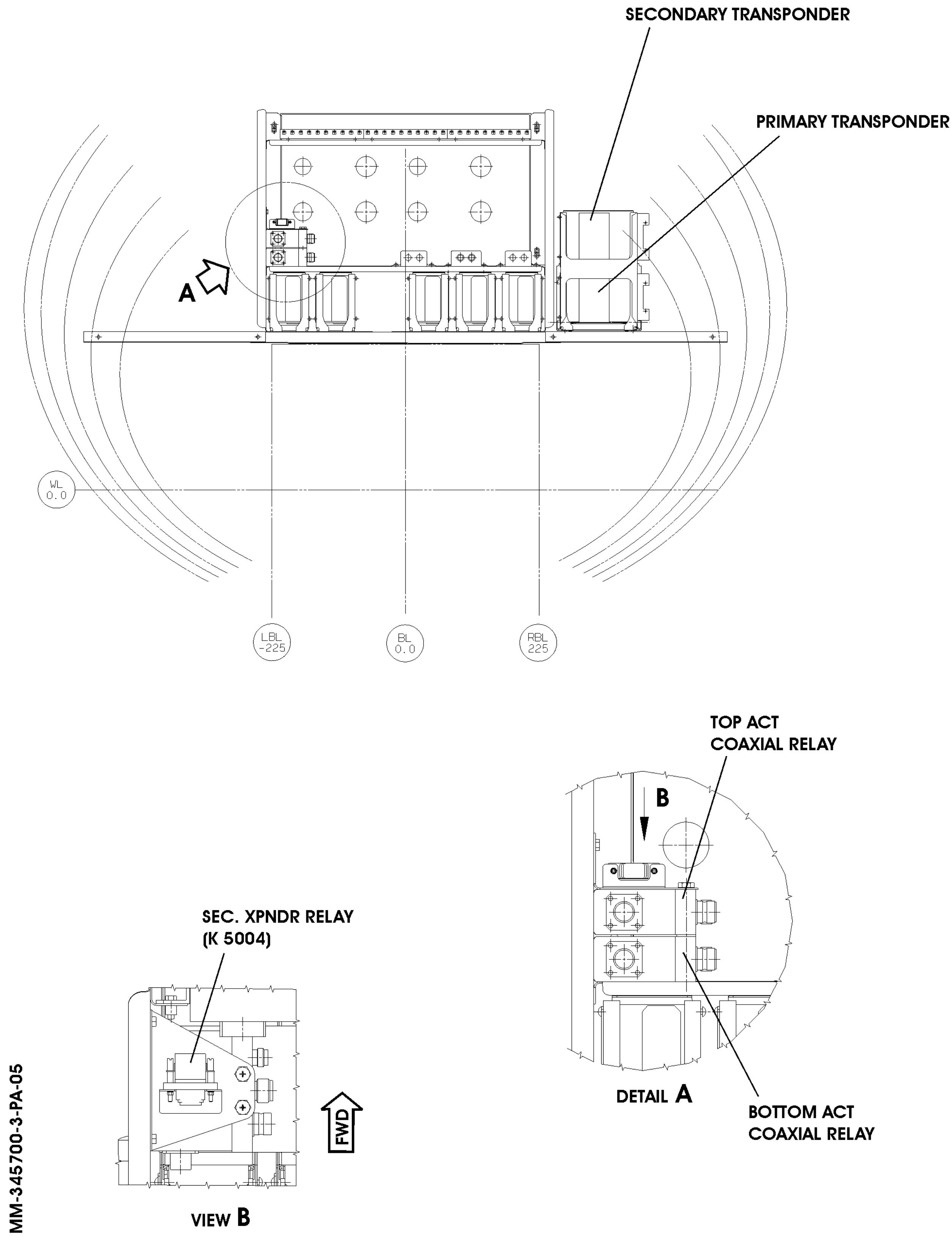


Fig. 3 - Antennas Coaxial relays Location

2. Operation

A. To control the Secondary ATC Transponder the Control Display Unit (CDU) and Radio Tuning Unit (RTU) are used.

The CDU is located on the pedestal panel The CDU is a shared user interface that provides control and display functions for the Flight Management System and Radio Navigation System. The Control Display Unit (CDU) is a color, LCD-based display with an integrated keyboard. The CDU is the normal direct means of radio tuning for both pilot and copilot radios. (For further details refer to 34-52-00)

The radio Tuning Unit (RTU) is installed on cockpit panel and provides centralized control and display functions for the NAV, ADF subsystems. These functions include frequency/channel/code select, mode select, and self-test select. (For further details refer to 34-51-00)

B. For the ATC Operation using the CDU, refer to 34-55-00.

C. For the ATC Operation using the RTU, refer to 34-55-00.

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SECONDARY ATC TRANSPONDER - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00

A. This topic provides the following Maintenance Practices:

– Secondary ATC Transponder (TDR-94D) - Removal/Installation
– Secondary ATC Transponder (TDR-94D) - Operational Test
– Top and bottom ATC Transponder Antennas - Removal/Installation
– ATC Coaxial Relay - Removal/Installation

2. Secondary ATC Transponder (TDR-94D) - Removal (Ref. Fig. 201)

A. Fixture , Test and Support Equipment

Blanking Caps

B. Referenced Information

Maintenance Manual Chapter 20-00-00

Maintenance Manual Chapter 53-10-00

C. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(2) Open, tag and safety this circuit breaker:
Copilot CB panel: XPNDR-2
(3) Remove the radome/nosecone.
(4) Get access to the avionics compartment.
(5) Loosen hold-down nuts (3) on ATC Transponder (1).
(6) Raise handle (2) and pull transponder from rack.
(7) Cap the electrical connectors.

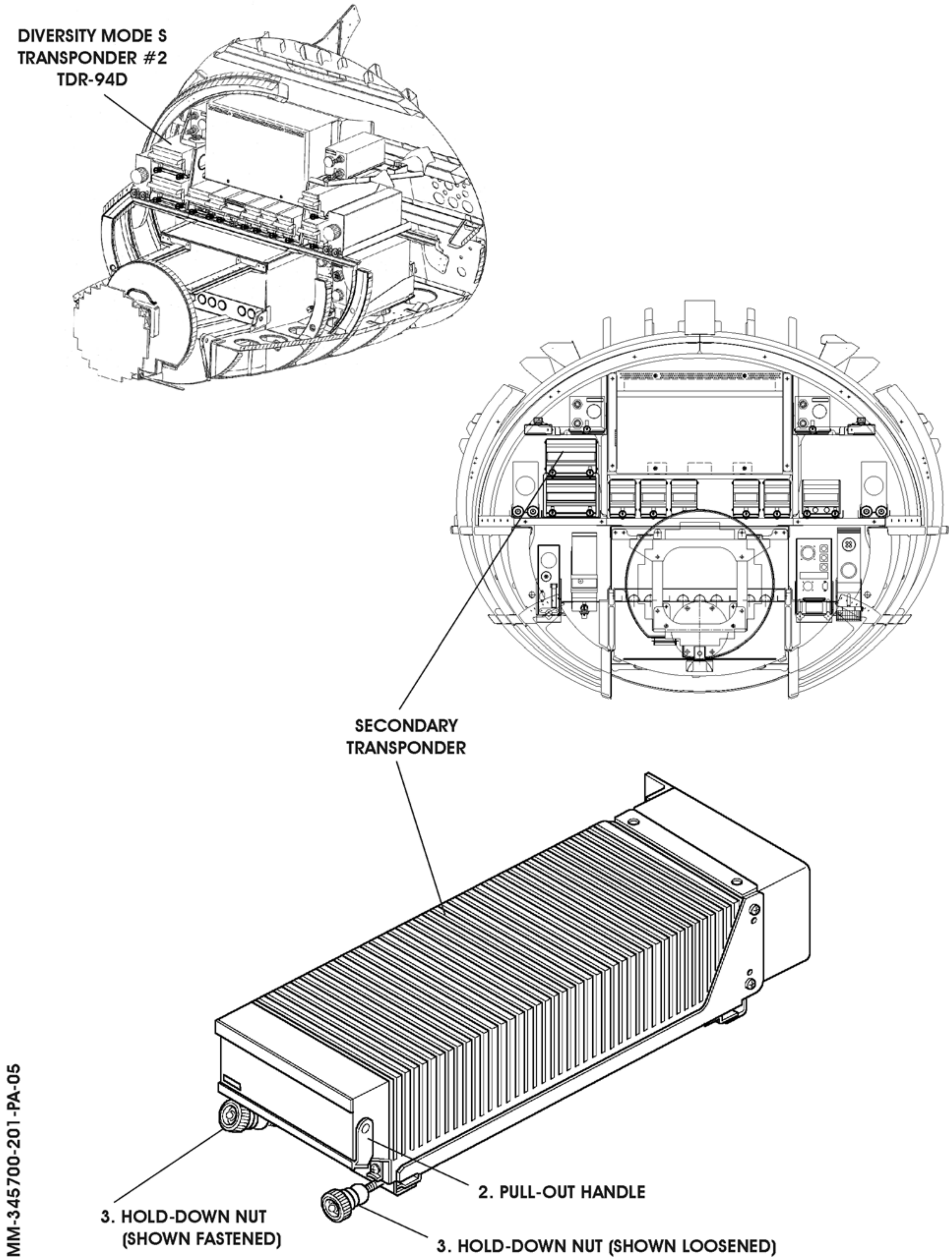

Fig. 201 - Secondary ATC Transponder (TDR-94D) - Removal/Installation

3. Secondary ATC Transponder A (TDR-94D) - Installation (Ref. Fig. 201)

A. Reference Information

Maintenance Manual Chapter 20-00-00

Maintenance Manual Chapter 53-10-00

B. Procedure

(1) Make sure that circuit breaker XPNDR-2 is open, safetied and tagged.
(2) Remove the caps from the electrical connectors.
(3) Slide transponder (1) onto the avionic rack.
(4) Engage hold-down nuts (3) and tighten.
(5) Remove the safety tags and close circuit breakers XPNDR-2
(6) Remove tools, materials and equipment from the work area.
(7) Install the radome/nosecone (Refer to 53-10-00).
(8) Do an operational Test of Secondary Transponder System
(9) Remove the Warning Notice in the flight compartment.

4. Secondary ATC Transponder - Operational Test

A. To perform a Operational Test of ATC Transponder, refer to the Rockwell Collins documentation.

5. Top and bottom ATC Transponder Antenna - Removal (Ref. to Fig. 202)

NOTE: The removal procedures for the Top and the Bottom ATC Transponder Antenna are the same.

A. Fixtures, Test and Support Equipment

Lint -free cloth	Not specified
Non Metallic Scraper	Not specified

B. Materials

02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 20-00-00

Maintenance Manual Chapter 24-00-00

D. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(2) Open, tag and safety these circuit breakers:
Pilot CB panel: XPNDR-1 CoPilot CB panel: XPNDR-2

(3) Remove the four attaching screws (3) from the antenna base (2).
(4) Disconnect antenna cable from antenna and remove the antenna and gasket.
(5) Make sure that the antenna cable does not retract into the fuselage.
(6) Scrape sealant from the antenna and antenna area on fuselage using non-metallic scraper.

WARNING: BE CAREFUL WHEN YOU USE MEK. OBEY THE HEALTH AND SAFETY INSTRUCTIONS IN 20-00-00.

(7) Clean the antenna fuselage area using MEK and dry with lint-free cloth

6. Top and bottom ATC Transponder Antenna - Installation (Ref. to Fig. 202)

NOTE: The installation procedures for the Top and the Bottom ATC Transponder Antenna are the same.

A. Fixtures, Test and Support Equipment

Lint -free cloth	Not specified
Non Metallic Scraper	Not specified

B. Materials

06-005, Sealant	As required
02-009, Methylethylketone (MEK)	As required

C. Referenced Information

Maintenance Manual Chapter 20-00-00
Maintenance Manual Chapter 24-00-00

D. Procedure

(1) Make sure that circuit breakers XPNDR 1 and XPNDR 2 are open, safetied and tagged.
(2) Connect antenna cable to the antenna connector.
(3) Align the antenna with the securing screw holes and install and tighten the securing screws
(4) Apply the sealant around the antenna base to prevent the ingress of water between the airframe and the attached part (Refer to 20-00-00).
(5) Restore the surface finish (Refer to 20-00-00).
(6) Remove safety clips and tags and close circuit breakers XPNDR 1 and XPNDR 2
(7) Connect electrical power (Refer to 24-00-00).
(8) Do an Operational Test of ATC Transponder (Refer Para. 4).
(9) Remove the Warning Notice in the flight compartment.

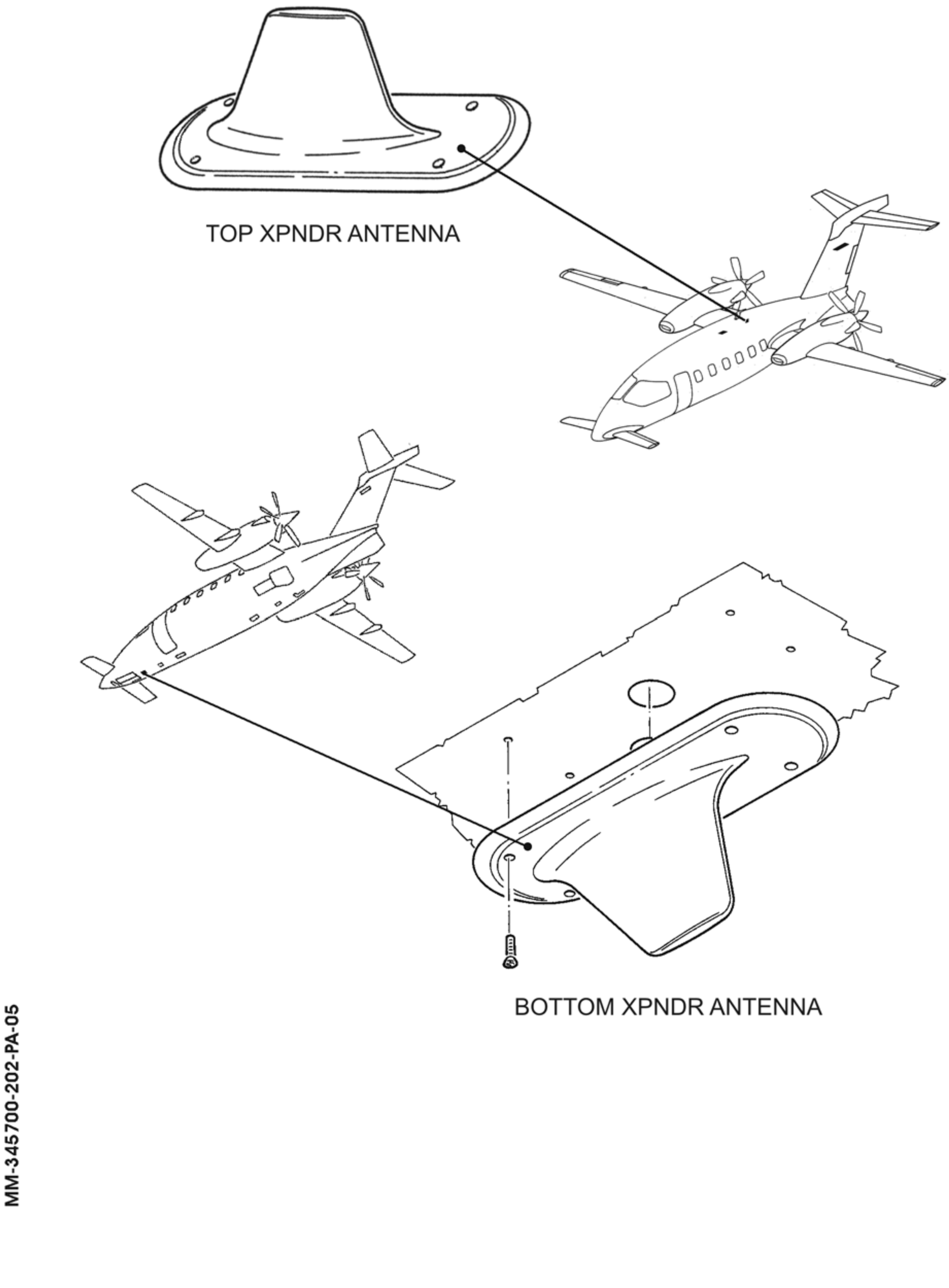

Fig. 202 - Top and Bottom ATC Transponder Antennas - Removal / Installation

7. ATC Coaxial Relay - Removal (Ref. to Fig. 203)

NOTE: The removal procedures for the Top and the Bottom ATC Coaxial Relay are the same.

A. Fixtures, Test and Support Equipment

Blanking Caps	Not specified

B. Referenced Information

Maintenance Manual Chapter 53-10-00

C. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.
(2) Open, tag and safety these circuit breakers:
Pilot CB panel: XPNDR-1 Copilot CB panel: XPNDR-2
(3) Remove the radome/nosecone.
(4) Get access to the left side of avionics compartment.
(5) Disconnect the top (bottom) antenna cable connecter from the IN connector of coaxial relay (1) (2).
(6) Disconnect the Primary Transponder coaxial cable connector from the 1 (NC) connector of coaxial relay (1) (2).
(7) Disconnect the Secondary Transponder coaxial cable connector from the 2 (NO) connector of coaxial relay (1) (2).
(8) Cap the electrical connectors.
(9) Unscrew the two bolts (3) that fixing the coaxial relay (1), (2).
(10) Remove the coaxial relay (1), (2).

8. ATC Coaxial Relay - Installation (Ref. to Fig. 203)

NOTE: The installation procedures for the Top and the Bottom ATC Coaxial Relay are the same.

A. Fixtures, Test and Support Equipment

Blanking Caps	Not specified

B. Referenced Information

Maintenance Manual Chapter 53-10-00

C. Procedure

(1) Make sure that circuit breakers XPNDR-1 XPNDR-2 are open, safetied and tagged.
(2) Remove the caps from the electrical connectors.
(3) Get access to the left side of avionics compartment..

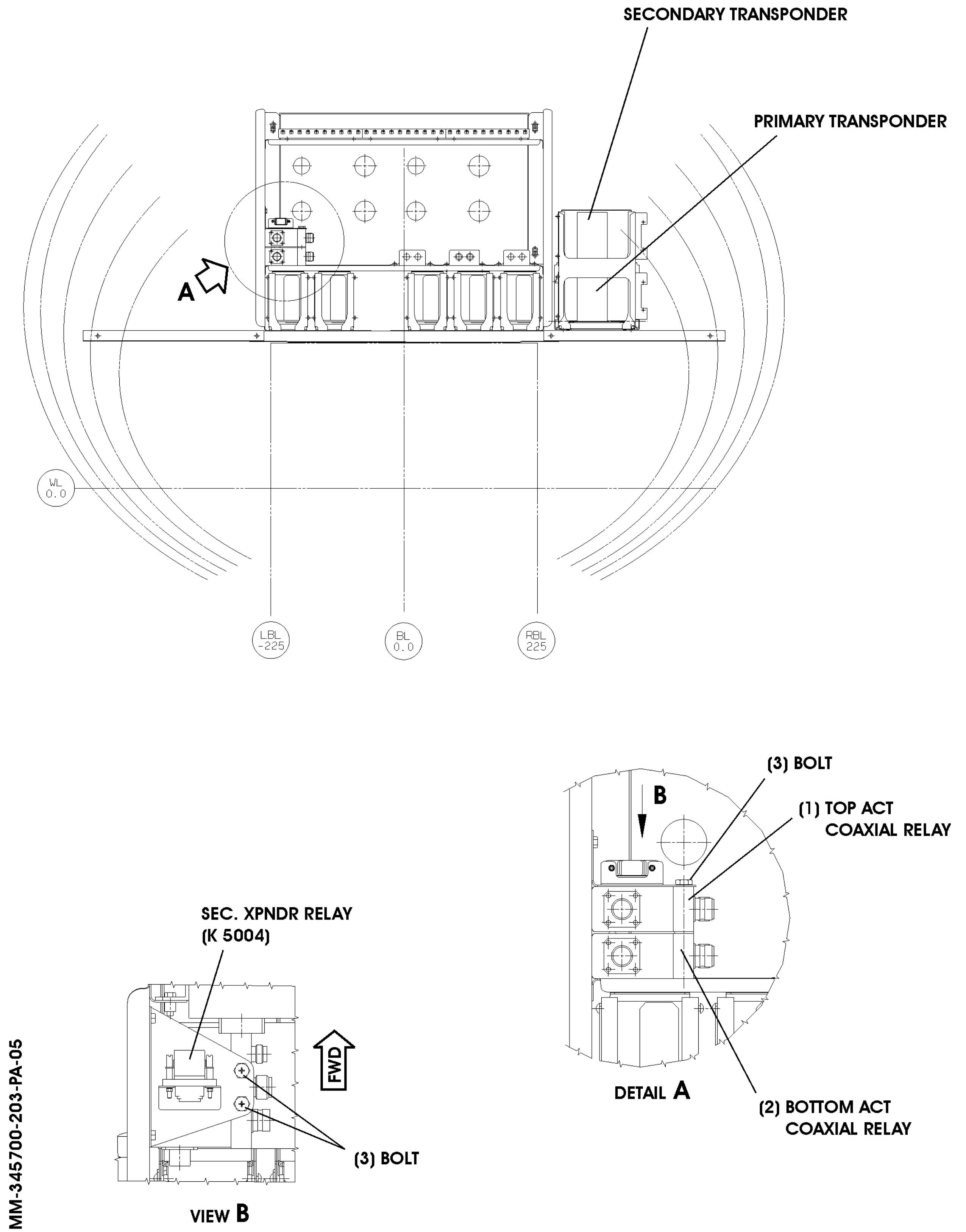

Fig. 203 - Antennas Coaxial relays Removal/Installation

(4) Install the coaxial relay (1), (2) on the support.

(5) Install and tighten the two bolts (3) that fixing the coaxial relay (1), (2).

(6) Connect the top (bottom) antenna cable connecter to the IN connector of coaxial relay (1) (2).

(7) Connect the Primary Transponder coaxial cable connector to the 1 (NC) connector of coaxial relay (1) (2).

(8) Connect the Secondary Transponder coaxial cable connector to the 2 (NO) connector of coaxial relay (1) (2).

(9) Remove safety clips and tags and close circuit breakers XPNDR 1 and XPNDR 2.

(10) Connect electrical power (Refer to 24-00-00).

(11) Do an Operational Test of ATC Transponder (Refer Para. 4).

(12) Remove the Warning Notice in the flight compartment.

FLIGHT MANAGEMENT COMPUTING - DESCRIPTION AND OPERATION

1. General

This Section 34-60-00 "Flight Management Computing" includes that portion of the system which combines navigational data to compute or manage aircraft's geographical position or theoretical flight path. Includes items such as course computers, flight management computers, performance data computers, and associated control display unit, etc.

Specifically, this Section includes:

34-61-00 Flight Management System.

34-61-00 FMS Database.

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FLIGHT MANAGEMENT SYSTEM - DESCRIPTION AND OPERATION

1. Description

A. The Flight Management System (FMS) consists of a Control Display Unit (CDU-3000) and a Flight Management Computer (FMC-3000, a module part of the IAPS).

To load navigation and performance databases, store and load pilot-defined routes and pilot-defined waypoints, the FMS is equipped with a Data Base Unit (DBU-4100 or DBU-5000).

The FMS-3000 provides the capability of en route, terminal, and non-precision approach navigation. Navigation is based on using all of the aircraft's available navigation sensors to fly from waypoint to waypoint along a flight plan route.

With the navigation and other sensor data available, the FMS determines its present position relative to the flight plan route, and computes steering commands for use by the flight control system to fly the aircraft along the route.

The Flight Management System (FMS) receives information from GPS receiver, via IAPS, and processes the transmissions from multiple GPS satellites simultaneously to calculate navigation solutions based on information from all satellites that are in view. The computed GPS position, velocity and time are input to the FMS, which integrates this data into the flight plan based navigation solution.

The FMS also receives data from the AHS, ADC, DME and VOR. The FMS provides necessary controls for all input sensors, when appropriate.

The FMS interfaces with the aircraft flight displays to provide conventional navigation information and presentation by means of CDU.

The CDU is used to control the display of FMS data on both the left and right side primary flight display (PFD) and multifunction display (MFD) and to select the NAV sensors from either side of the aircraft.

If GPS-4000S is installed together with FMC-3000 upgraded to SW 4.1, the following capabilities are added:

- RF Legs
- Displaced Thresholds
- Step Down Fixes
- XYZ Naming
- SBAS Cabibility and provision for LPV (Localizer Performance with vertical Guidance)
- Greatly increased accuracy (1.5-2 meters in both Horizontal and Vertical)
- Improved availability as compared to unaided GPS
- Allows use as alternate airport of those airports with GPS only approach capability
- Allows AC 90-100A RNAV operation without performing Pre-Dispatch RAIM prediction

On the airplane it is possible to install the optional version of the FMC-3000 SAR that includes the following Search & Rescue Patterns:

- Ladder
- Expanding Square
- Circle
- Sector Pattern

B. The Flight Management Computer FMC-3000 is a single module, located into the IAPS in the nose avionics bay. It accepts data from multiple navigation sensors, including VOR, DME, and GPS, and computes a position estimate.

The data from each sensor is weighted according to its error characteristics so that the position estimate is the best possible. The FMC will provide navigation in the en route, terminal, and approach phases of flight. The FMC will determine that it is in the terminal phase of flight when an origin or arrival airport has been entered in the flight plan, and the location of the aircraft is within 30 NM of the origin or arrival airport. The FMC will determine that it is in the approach phase of flight upon passage of 2 NM inbound to FAF (Final Approach Fix) and fly a non-precision approach when the approach has been activated.

FMS navigation is based on using all the aircraft available navigation sensors to fly from waypoint to waypoint along a flight plan route. The waypoints are defined based on information contained in a navigation data base. A flight plan route is created by selecting waypoints or airways from the data base. FMS determines the present position relative to the flight plan route and computes steering commands for use by the flight control system (FCS) to fly the aircraft along the route.

In order for the FMS to accurately determine its present position, a position initialization process is required after power is applied to the FMS. The position initialization process is done with the CDU on the POS INIT pages. The flight crew selects or enters the current position of the aircraft into the FMS, such as the position for the airport, gate, runway threshold or navaid.

This allows the FMS to then use the sensors available to accurately determine and track its present position, direction and speed.

FMS holds two flight plans. One flight plan is the active flight plan and the other is the second flight plan. The active flight plan and second flight plan are independent of each other. Only the active flight plan is used for navigation and it is used only when FMS is selected as the NAV source.

To navigate, the FMS may use sensor data from GPS, VOR/DME navaids, AHS, and Air Data Systems along with the active flight plan and the navigation data base information. The sensor data is used by the FMS to determine its present position, direction, and speed.

To determine its present position, the FMS uses all of the installed and enabled navigation sensors available to it (GPS, and VOR/DME). Each sensors data is part of the position determination as long as the sensors data is valid or it has not been specifically disabled. By default, at startup, all navigation sensors are enabled for use by the FMS. Disabling sensors may degrade the accuracy of the position determination. The FMS monitors each sensors accuracy and validity as part of its position determination and if a VOR or DME is on the air but outputting bad data, the FMS will use the data, but may annunciate a “CHK POS” message or can automatically switch to a cross-side sensor if the onside sensor fails.

Two minutes prior to reaching the last waypoint of a flight plan, the CDU message line and page show the message “LAST WAYPOINT” and the waypoint alert flashes the waypoint for five seconds. When the aircraft is within five seconds of passing abeam the last waypoint, the waypoint alert again flashes the waypoint. As the aircraft passes abeam the last waypoint, the FMS stops steering to follow a course and rolls the aircraft to wings level to maintain the aircraft's current heading. The FMS will continue to steer the current heading until it is deselected as the navigation source or until a new waypoint is entered into the flight plan and the legs page will show the last waypoint until a new one is entered.

C. The Control Display Unit (CDU-3000) is located in the pilot cabin. When is installed it is used to control the display of FMS data on both the left and right side primary flight display (PFD) and multifunction display (MFD) and to select the NAV sensors from either side of the aircraft.

The CDU provides mode/control data through the FMC to the IAPS I/O concentrators, and tuning to the radios directly. The available subsystems are selectable from the INDEX page at all times.

The CDU consists of a Display, a CDU Keyboard and Line Select Keys.

(1) CDU display

The CDU display format is 15 lines high by 24 characters wide. Displayed data may be shown in 6 colors. The display consists of a title line, six label/data line pairs, a scratchpad line, and an annunciator line.

The title line contains a page title, and in cases of multiple pages an indication of page number.

There are six data lines arranged next to the six line select keys. Above each of the six data lines is a label line used to identify data. The bottom pair (left and right) of line select keys is most often used as control keys. If the line select keys are used as control keys, a series of dashes in the label line separates the display portion of the CDU display from the control portion of the display.

A single scratchpad line is reserved on every page for data entry. The scratchpad contains 22 usable character spaces.

A single annunciator line is reserved at the bottom line of every page for annunciation of conditions requiring flight crew attention or knowledge.

(2) CDU Keyboard

The CDU keyboard consists of 0-9 number keys, A-Z letter keys, the DEL (delete)/ CLR (clear) key, punctuation keys (period, slash, plus / minus, and space), and function keys (MSG, DIR, IDX, TUN, FPLN, LEGS, DEP ARR, PERF, MFD MENU, MFD ADV, MFD DATA, PREV, NEXT, EXEC, and BRT DIM).

(3) Line Select Key

There are 12 line select keys. Six line select keys are on the left side of the display and six line select keys are on the right side of the display. Pushing the line select key next to a function label, selects that function. The line functions are dependent on which page is displayed.
For further details, refer to 34-52-00.

D. Data Base Unit DBU-4100

The DBU is a data loader for the FMS system. It is located in the LH FWD partition in the pilot cabin and contains a 3.5 inches disk drive used primarily to download maintenance data from the maintenance diagnostic computer. The DBU is also used to load checklist and maintenance files.

The DBU uses four full-duplex RS-422 serial interfaces (L-FMC-5, MDC-3, L-FSU-1 and L-FSU-3), a power supply, microprocessor, and disk drive assembly.

The FMC applies read file requests on the L-FMC-5 bus to the DBU. This data is applied through a protection circuit and receiver to a select multiplexer. The multiplexer selects the L-FMC-5 input and applies this data via serial line to the processor. The DBU also receives the MDC-3 bus from the maintenance diagnostic computer.

During a disk read operation, the processor applies the (read) file data to the serial line and enables the serial line to transmit this data to a select multiplexer. The multiplexer selects this input and applies it through the RS-422 transmitter and protection circuit. The L-FSU-1 bus is output to the FMC. The L-FSU-3 bus is output to the maintenance diagnostic computer.

The +28 Vdc airplane power, coming from the right single feed bus by means of DBU circuit breaker and K5003 relay (located on copilot circuit breaker panel), is applied through a protection circuit to an internal power supply. The power supply generates the required voltages and provides discrete monitor/valid outputs. The power supply provides a regulated +5 Vdc voltage for general use and a separate +5 Vdc voltage to power the disk drive. The +5 Vdc output lights a POWER indicator whenever voltage is present. Alert condition (undervoltage, unstable voltage, under-temperature) are monitored. The processor inhibits disk drive operation if the temperature is below 0 °C.

E. Personal Computer Data Connector

A PCD connector is located on the left side of pedestal panel and allows the Flight Management System and the Maintenance Diagnostic Computer to be connected with a remote personal computer in order to make data upload or download on which is running the CPAS-3000 Data Loader program.

When the personal computer is connected to the PCD Connector, a ground is supplied to the coil of K5003 relay that opens the contacts and disconnects the power supply to the DBU. In the same time the four lines RS 422 interface connecting the FMC to the DBU are routed to the external CPAS interface.

For further information, refer to the Rockwell Collins documentation.

If DBU 5000 is installed the PCD connector is not available anymore.

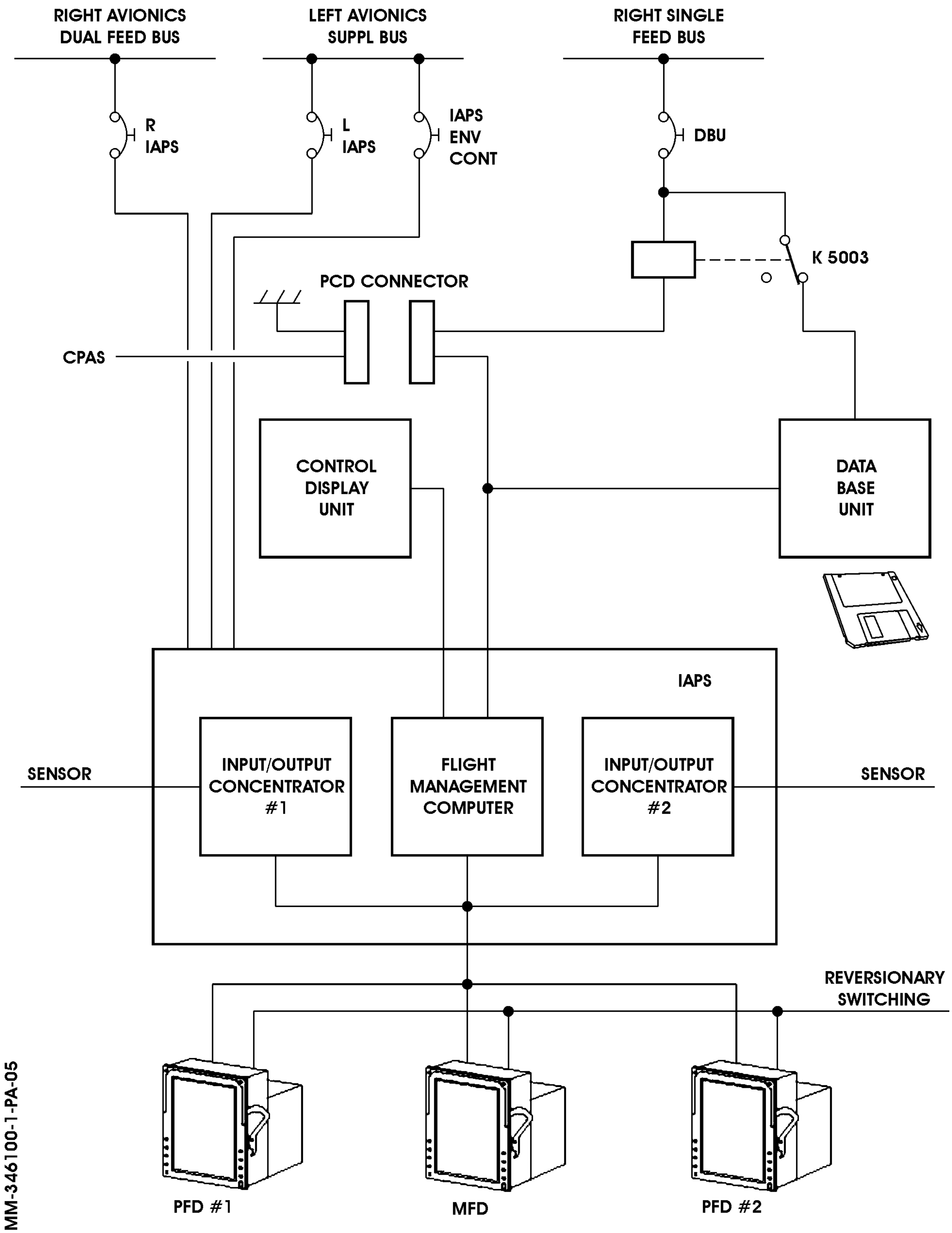

Fig. 1 - Flight Management System - Block Diagram (DBU-4100 Installed)

F. Data Base Unit DBU-5000

The DBU-5000 is used for the following purposes:

- FMS databases and MDT software upload
- Pilot created routes or waypoints upload
- Download the route and waypoints
- Download the maintenance data

The DBU-5000 requires the use of a portable USB 2.0 Memory Stick Drive with the following characteristics:

- The Memory Stick Drive must be compatible with Microsoft FAT16 or FAT32 file systems and not contain any installed Windows based programs.
- The Minimum recommended USB Memory Stick Drive size must be 128 Megabytes (MB) for use with Proline 21 (without IFIS) and 1 Gigabyte (GB) for use on Proline 21 (with IFIS).

When power is applied to the DBU-5000, the tri-color LEDs will be yellow as the DBU initializes itself and progresses through a self test. When the LED is green, it is safe to insert a storage device in the USB port; do not remove or insert the USB storage device when the LED is blinking yellow as this may corrupt the files on the storage device or start the DBU initialization process.

The DBU-5000 will accept two memory storage devices, but one at a time. When loading the FMS or MDC using the Database Disk Ops page or MFD, the top USB port is the default port, and is recommended port to use for this operation. The DBU will check each device for compatible files and show a green LED light when complete. After the LED is green, the second device can be inserted and the DBU LED shall turn green before proceeding.

If when the power is applied to the DBU-5000, any of the tri-color LEDs becomes red, the DBU has failed.

The DBU-5000 is an equipment that can be used only on ground.

During flight the DBU-5000 is powered, but cannot be used to perform any operation; its operation is limited to an exchange of data with the maintenance system that allows only the DBU-5000 fault isolation function

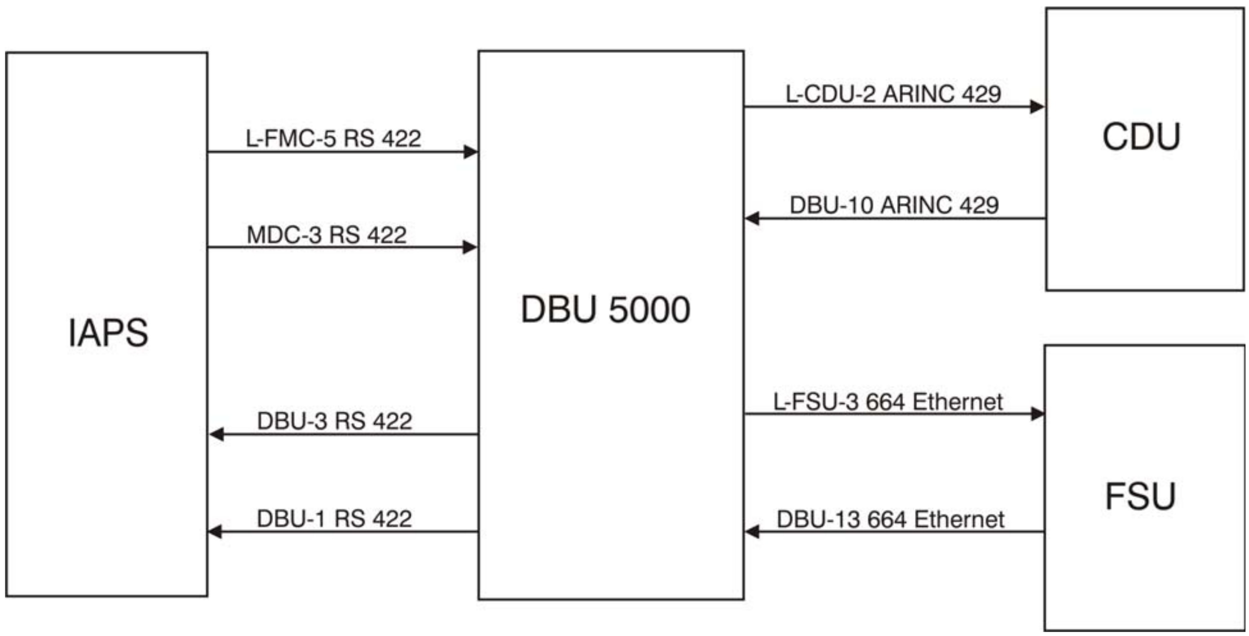

Fig. 2 - Flight Management System - Block Diagram (DBU-5000 Installed)

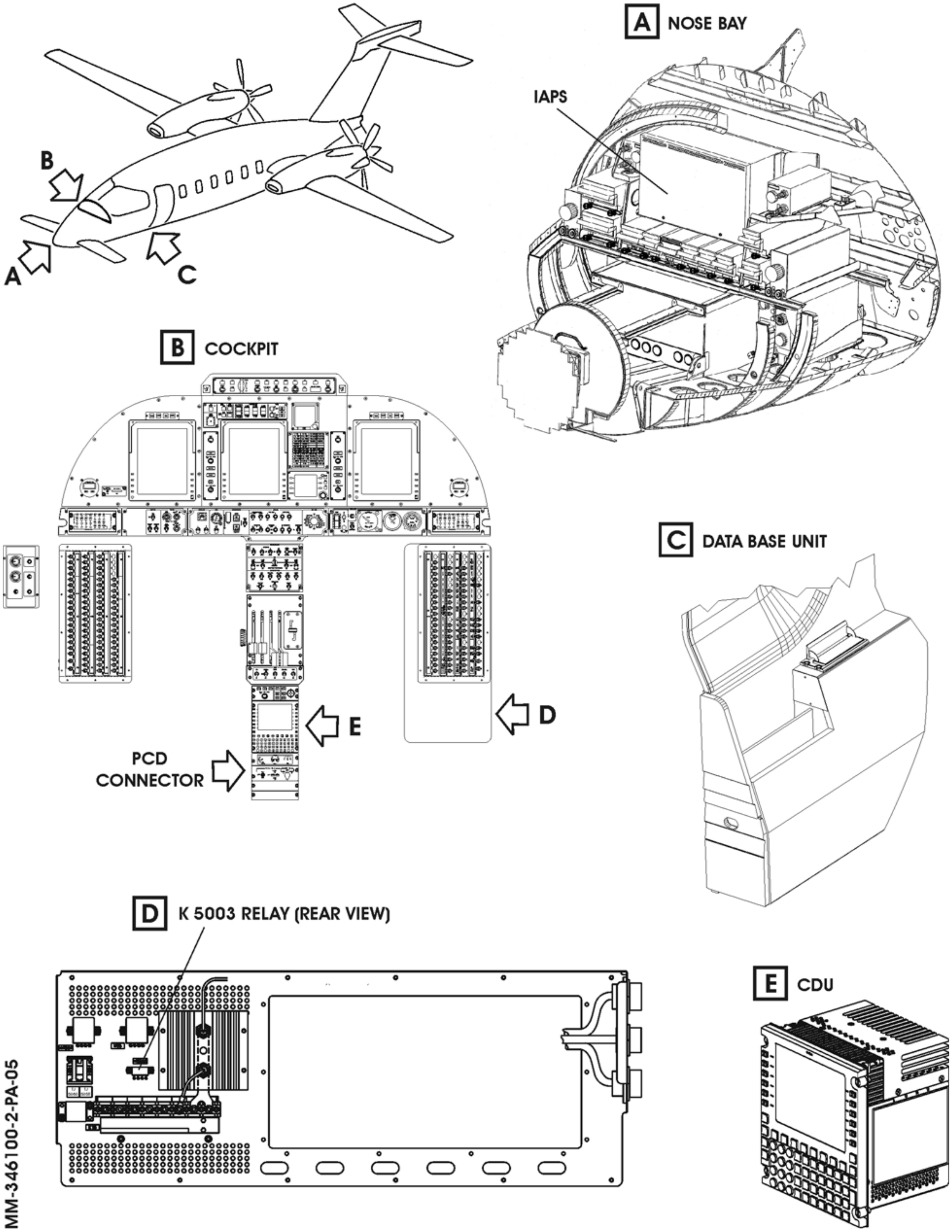

Fig. 3 - Flight Management System - Location of Components

2. Operation

The CDU is the pilot's interface with the various functions of the Flight Management System. It has a color display. The line select keys around the display are used to select modes and copy or transfer displayed information. The function keys are used to directly select many of the FMS functions and display modes. The CDU also has a full alphanumeric keypad for entering data.

All operations that entail entering data for FMS operating functions are done through the use of a scratchpad entry system. Data are entered directly into the scratchpad with the keypad, or by pushing a line select key to copy data shown on a display line to the scratchpad. From the scratchpad, data is transferred to the appropriate data line by pushing the line select key for the entry position.

FMS operating modes are selected directly by pushing the appropriate function key, or by pushing a line select key adjacent to an item in a menu shown on the display. Some functions are alternately switched on and off with sequential pushes of the associated line select key or a function key.

Fig. 4 - CDU Controls Layout

Line Select Keys	The line select keys are placed on either side of the display. Push a line select key to copy or transfer its associated display data to or from the scratchpad, or to select an associated operating mode or function shown on a display page.
MSG	Push the Message key to show the MESSAGES page. Push the MSG key while the MESSAGES page is showing to return to the display mode that was showing before the MESSAGES display mode was selected.
DIR	Push the Direct function key to show the ACT DIRECT-TO pages. The ACT DIRECT-TO pages may consist of several pages and show a list of waypoints in the active flight plan. The pilot may select a DIRECT-TO waypoint from the list, or enter any valid waypoint into the top (dashed) waypoint line as a DIRECT-TO waypoint. The pilot may also enter an altitude for a vertical DIRECT-TO. The ACT DIRECT-TO pages also show a selection for NEAREST AIRPORTS.
FPLN	Push the Flight Plan function key to show either the ACT FPLN or MOD FPLN page.
LEGS	Push the Legs function key to show either the ACT LEGS or MOD LEGS page.
DEP ARR	Push the Departure/Arrival function key to show the DEPART page for the origin airport, the ARRIVAL page for the destination airport, or the DEP/ARR INDEX page. If the DEPART or ARRIVAL page is showing, a second push of the DEP ARR key shows the DEP/ARR INDEX page.
PERF	Push the Performance function key to show the PERF MENU page. The PERF MENU page shows a menu of the available performance functions, allows the pilot to enable the VNAV advisory function, and displays/enables the VNAV PLAN SPD.
MFD MENU	Push the MFD Menu function key pages to show the DISPLAY MENU page. When the MFD MENU function key is pushed, either the MAP DISPLAY page or the TEXT DISPLAY page shows. The MFD DATA function key controls whether the MAP DISPLAY or TEXT DISPLAY menu shows. The DISPLAY MENU page is used to select the display of airports, navigation facilities, and other navigation-related display elements, modes or options for the PPOS MAP, PLAN MAP, and TEXT display modes of the MFDs.
MFD ADV	Push the MFD Advanced function key to show the DISPLAY ADVANCE page. Use this page to move through the MFD text pages, or to move the center waypoint on the MFD PLAN MAP. This page shows either a TEXT DISPLAY menu or a PLAN MAP CENTER menu, depending on whether the MFD is in a Map mode or the Text mode. The MFD DATA function key controls whether the TEXT DISPLAY or the PLAN MAP CENTER menu shows.
MFD DATA	Push the MFD Data function key to alternately switch display modes between MAP and TEXT modes for the on-side MFD. When MAP mode is selected, the MFD is in MAP mode. On the CDU, the MAP DISPLAY menu shows when the MFD MENU key is pushed, and the PLAN MAP CENTER page shows when the MFD ADV key is pushed. When TEXT mode is selected, the MFD is in TEXT mode. The TEXT DISPLAY menu shows when the MFD MENU key is pushed, and the TEXT DISPLAY menu shows when the MFD ADV key is pushed.

PREV	Previous page function key. Many CDU display modes, such as ACT LEGS and ACT FPLN, may require several pages to show all their information. Push the PREV function key to go back to a previous page of a selected display mode. When the first page of display mode is showing, push the PREV function key to go directly to the last page of that display mode.
NEXT	Next page function key.
EXEC	Push the Execute function key to execute a flight plan and change the MOD LEGS to the ACT LEGS or MOD FPLN to the ACT FPLN page. Pushing the EXEC function key allows the FMS to use the flight plan to generate steering commands for the flight control systems if any of the following apply: • A new flight plan is entered on the FPLN or LEGS pages • A modification is made to an active flight plan on the ACT FPLN or ACT LEGS pages • Selected entries or changes are made on the PERF INIT pages This allows the operator to enter, change, and review a flight plan before it is activated for use as a steering source by the FMS.
IDX	Push the Index function key to show the INDEX pages. The INDEX pages shows a menu of available additional FMS functions that do not have direct access function keys.
TUN	Push the Radio Tuning function key on the CDU to show the TUNE page.
CLR DEL	The Clear/Delete function key performs two functions that depend on whether or not there is data in the scratchpad. • When there is data in the scratchpad, push and release the CLR DEL key to backspace one character at a time (right to left), or push and hold the key for more than one half second to clear the entire scratchpad at once. • When there is no data in the scratchpad, push the CLR DEL key to enter the word DELETE into the scratchpad. This can then be transferred to various functions or data fields on the CDU pages to delete the data currently entered/showing for that function or field.
Keypad	The keypad includes the 26 letters of the alphabet, the numbers 0 through 9, a decimal point, a +/– key, a space (SP) key, and a slash (/) key. Push the letter keys to enter letter characters into the scratchpad. Push the number keys to enter numbers into the scratchpad.
BRT DIM	The Bright/Dim button adjusts the brightness of the display. Push the BRT edge of the button to increase brightness. Push the DIM edge of the button to decrease brightness.

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FLIGHT MANAGEMENT SYSTEM - MAINTENANCE PRACTICES

1. General

WARNING: OBEY THE SAFETY PRECAUTIONS GIVEN IN 20-00-00.

A. This topic provides the following Flight Management System Maintenance Practices:

– Flight Management Computer - Removal/Installation
– Control Display Unit (DBU 4100 / DBU 5000)- Removal/Installation
– Data Base Unit - Removal/Installation
– Data Base Unit - Test.

2. Flight Management Computer - Removal/Installation

A. Refer to 31-40-00

3. Control Display Unit - Removal/Installation

A. Refer to 34-52-00.

4. Data Base Unit (DBU 4100 / DBU 5000) - Removal (Refer to Fig. 201)

A. Fixtures, Test and Support Equipment

Circuit Breaker safety clips and tags	
Blanking cap	Not specified

B. Procedure

(1) Place a Warning Notice in the flight compartment to tell persons not apply electrical power.

(2) Open, tag and safety the following circuit breakers:

Pilot CB panel:	Copilot CB panel:
L IAPS	R IAPS
IAPS ENV CONT	DBU

(3) Unscrew the four fixing screws (standard DZUS type) of the Data Base Unit.

(4) Extract the unit and disconnect the rear cables from the connectors.

(5) Cap and stow the electrical connectors and the wiring harness from dust if replacement unit is not to be installed immediately.

5. Data Base Unit DBU 4100 / (DBU 5000) - Installation (Refer to Fig. 201)

A. Procedure

(1) Make sure as necessary that:
- The applicable circuit breakers are open, tagged and safetied
- The Warning Notices are in position
- The system is safe
- Access is available

(2) If previously installed, remove the cap from the electrical connectors and free the electrical harness.

(3) Connect the rear cables to the connectors and insert the unit in its housing.

(4) Screw in the four fixing screws of the Data Base Unit.

(5) Remove the safety tags and close the previously opened circuit breakers:

Pilot CB panel:	Copilot CB panel:
L IAPS	R IAPS
IAPS ENV CONT	DBU

(6) Remove a Warning Notice in the flight compartment.

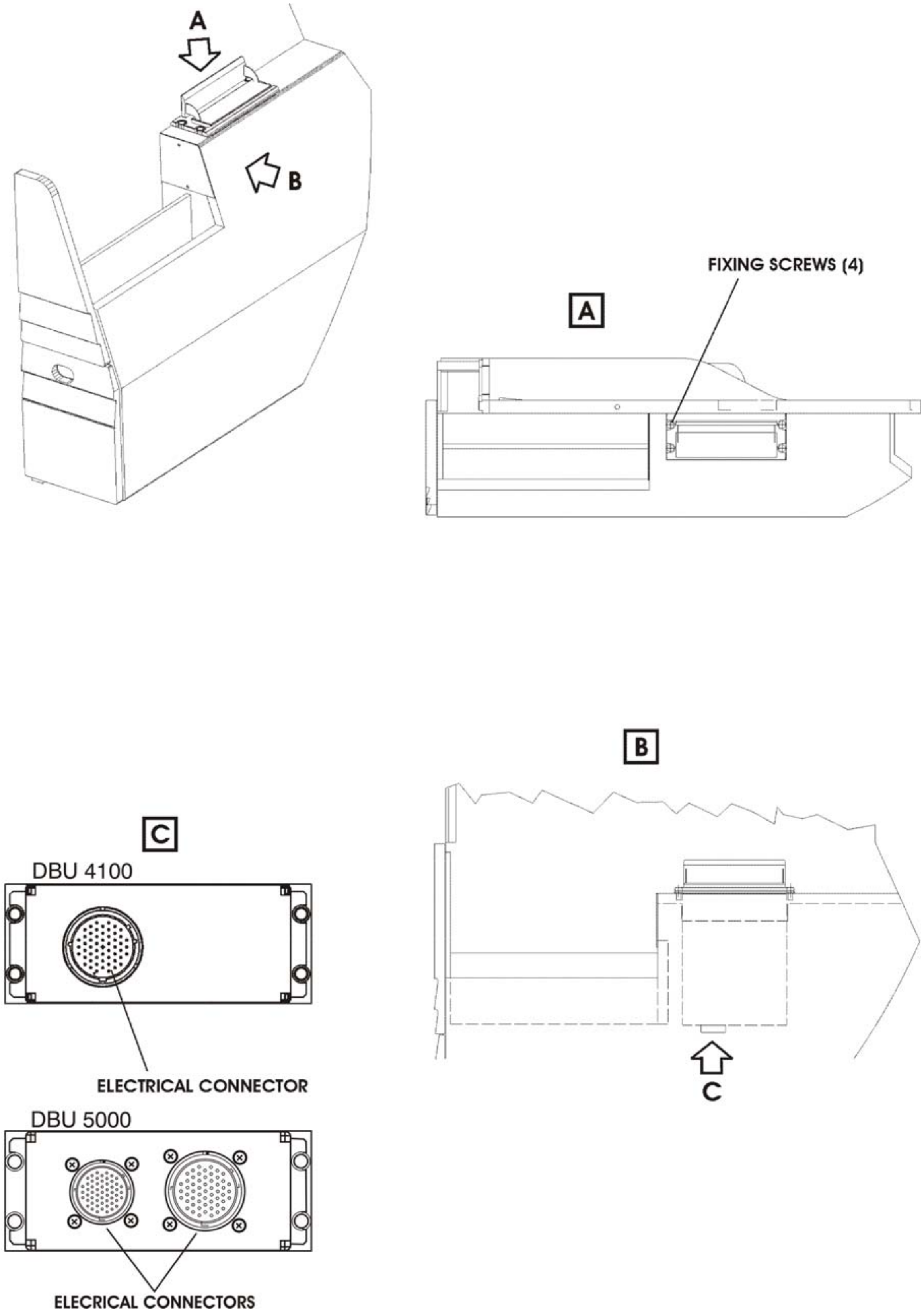

Fig. 201 - Data Base Unit - Removal/Installation

6. Data Base Unit - Test

A. Refer to the Rockwell Collins documentation.

7. FMS Data Base Acquisition

The FMS databases have to be downloaded from Internet with the following procedure:

(1) Download Site https://www.rockwellcollins.com/fms (Ref. Fig. 202)

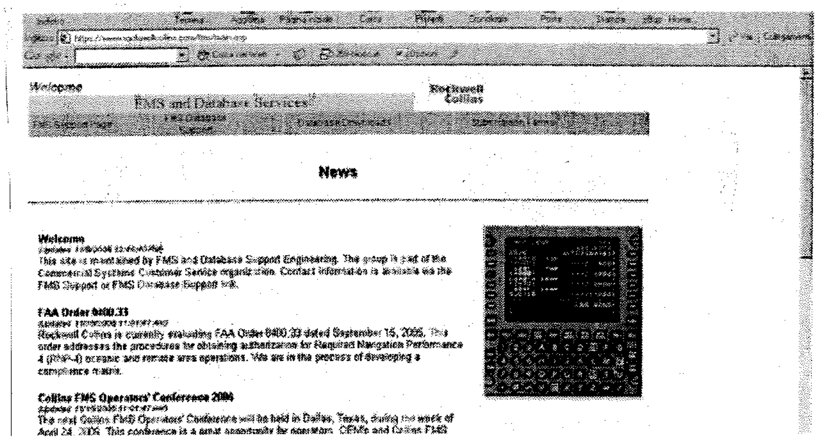

Fig. 202 - FMS Home Page

(2) Click Database Downloads

(3) On FMS DATABASE SERVICE page (Ref. Fig. 203) insert the following authorization (provided by RCI Rockwell Collins International) data before logging in:

- Username
- Password

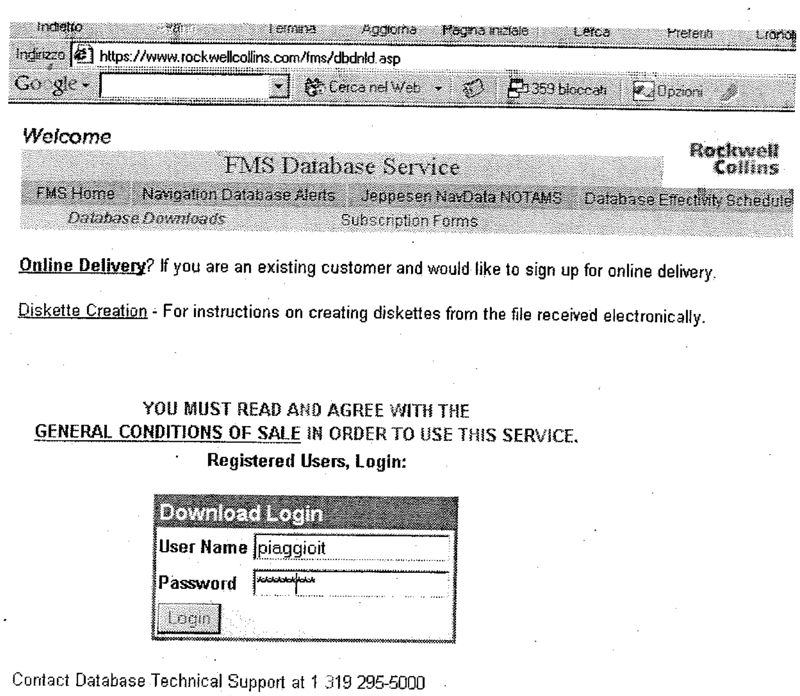

Fig. 203 - FMS Database Service

(4) DBU-4100 - The following file may be downloaded from the Rockwell Collins dedicated web site page dedicated to the aircraft owner (Fig. 204 shows Piaggio Aero Industries page), depending on the means to be used for the upload onboard the aircraft.

– File T6 World - if the upload has to be done using the basic DBU-4100 (floppy disk drive).

(5) DBU-5000, PCD-3000 and CPAS-3000 - The following file may be downloaded from the Rockwell Collins dedicated web site page dedicated to the aircraft owner (Fig. 204 shows Piaggio Aero Industries page), depending on the means to be used for the upload onboard the aircraft.

– File T6 World -USB if the upload has to be done using the DBU-5000.

(6) Unzip the above file in the following USB memory stick directories (Supposing F:\ is the USB memory stick drive):

– For DBU-5000 save in F:\, if no IFIS is installed.
– For DBU-5000 save in F:\ FMC_Nav if IFIS is installed.
– For PCD-3000 save in F:\
– For CPAS-3000 save in F:\ FMC_Nav

(7) Logout

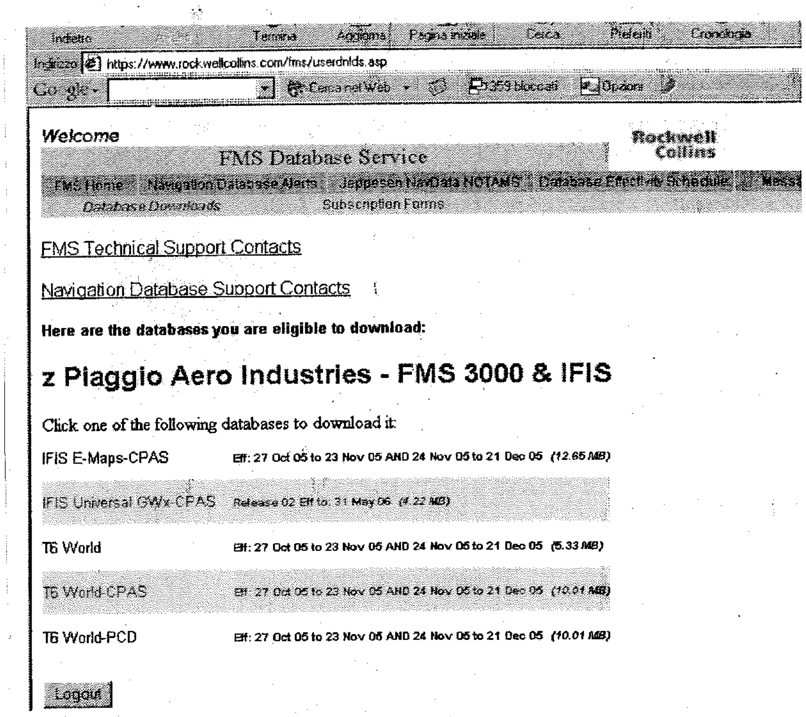

Fig. 204 - Piaggio Aero Industries authorized Databases

8. <u>FMS Data Base Upload - Preparation - DBU 4100</u>

This paragraph presents the actions to be taken before uploading the FMS database

A. T6 WORLD FILE

This is a self-extracting archive file, used for uploading the FMS database with the DBU-4100 floppy drive.

When the file is run:

- The database is copied on floppy disks (at least 9 required) (Ref. Fig. 205, 206 207, 208 and 209 for the steps to be followed before inserting the first disk).
- A self-extracting file (6-World.doc) containing the labels for the floppy disks is opened (Ref. Fig. 210).

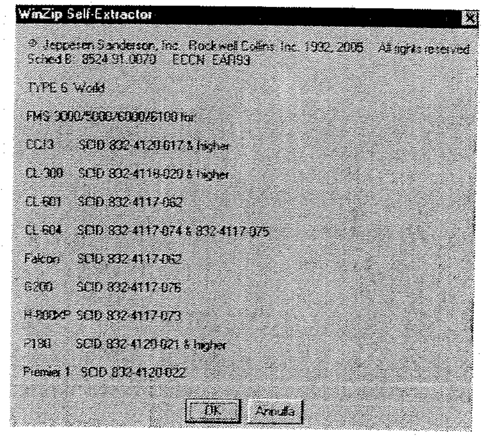

Fig. 205 -

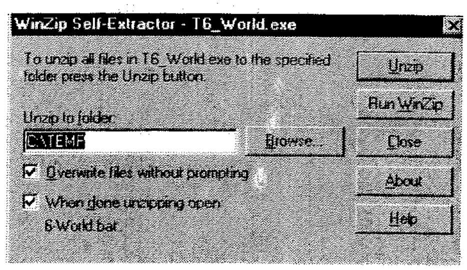

Fig. 206 -

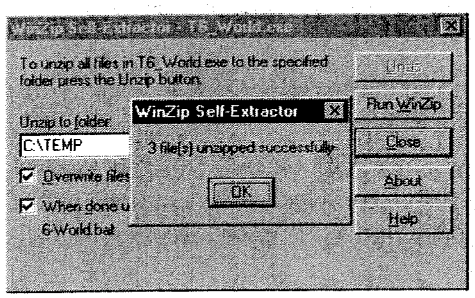

Fig. 207 -

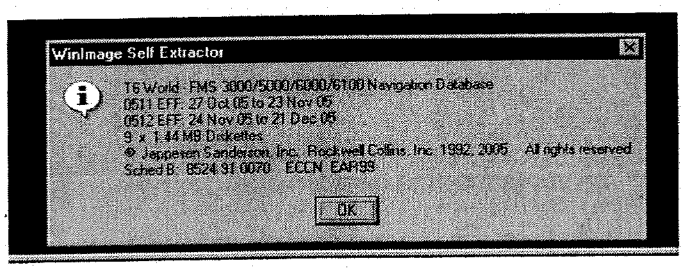

Fig. 208 -

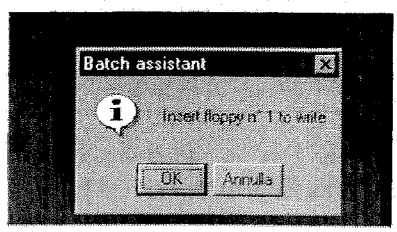

Fig. 209 -

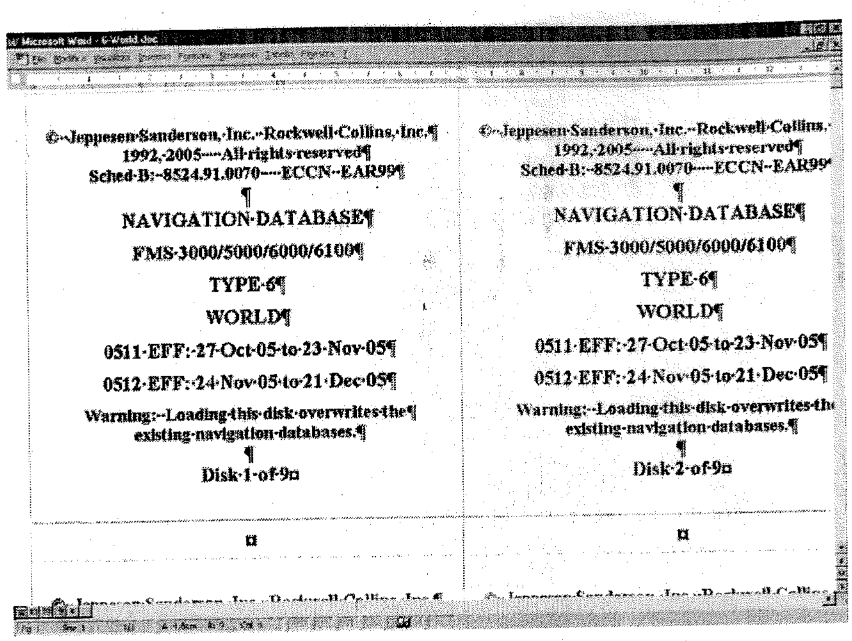

Fig. 210 - Labels

B. T6 WORLD USB - FILE (Using PCD-3000)

This file is used for database upload using the PCD-3000 kit and the following procedure may be performed only on the laptop that includes the PCD-3000 software.

The file is self extracted (Refer to FMS Data Base Acquisition, as describe in this section). Press "Copy Data Base to Hard Drive" button and select the USB Memory Stick Drive. The database is added in a folder included in the PCD-3000 program one.

The installed database is shown in the DATABASE UPLOAD window with its expiration date, as in the following Fig. 211. A maximum of 6 FMS databases can be installed on PCD-3000. For uninstalling a previous database, see "PCD-3000 Operator's Guide". If there are more than 6 of them, the older one is replaced by the new downloaded database

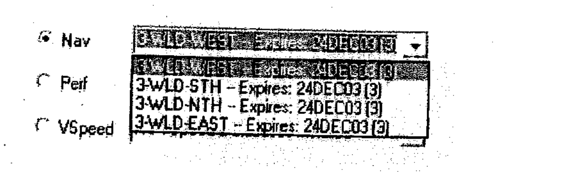

Fig. 211 -

C. T6 WORLD USB - FILE (Using CPAS-3000)

This file is used for database upload using the CPAS-3000 kit and the following procedure may be performed only on the laptop that includes the CPAS-3000 software.

The file is self extracted (Refer to FMS Data Base Acquisition, as describe in this section). Press "Import" button and select the USB Memory Stick Drive. The database is added in a folder included in the CPAS-3000 program one.

The T6 World database is shown in the DATA/SOFTWARE INSTALLED ON CPAS list box as in Fig. 212 (see also "CPAS-3000 Data Loader - Operator's Guide").

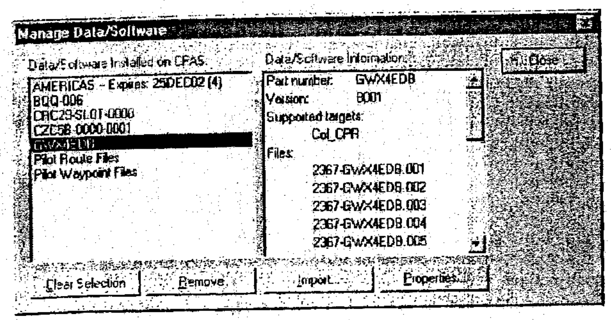

Fig. 212 -

9. Upload

A. DBU-4100 UPLOAD PROCEDURE

DBU loader is installed behind the pilot's seat as shown in the following Fig. 213

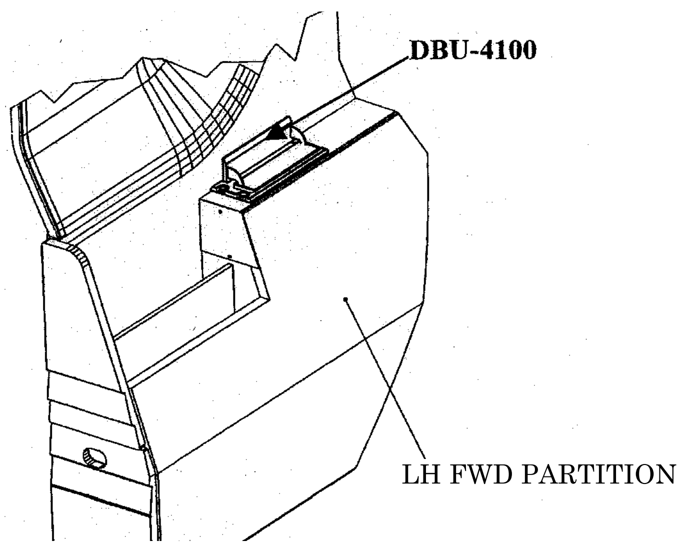

Fig. 213 - DBU Installation Layout

After creating the floppy disks containing FMS data base as described in this section.

All controls are done using the CDU-3000 control.

Note:

- About 45 minutes are required to complete the upload;

- Before starting the upload the FMS cancel the previously loaded one, so that in case of loading problems (usually generated by the floppy quality) no database is available onboard.

(1) Push INDEX (INDEX 1/2 Page is shown)

(2) Push NEXT (INDEX 2/2 Page is shown, see following Fig. 214)

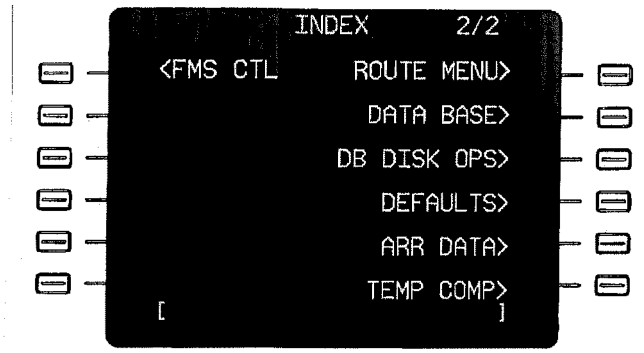

Fig. 214 - INDEX 2/2 Page

(3) Select DB DISK OPS

(4) DATA BASE DISK OPS page (Ref. Fig. 215) is shown

(5) Insert DISK #1/9 into the DBU

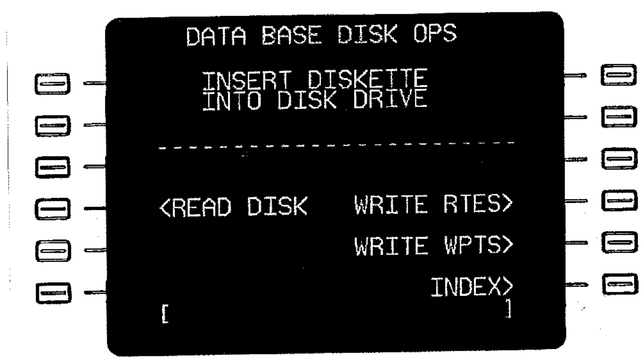

Fig. 215 - Data Base Disk Operation Page

(6) Select READ DISK

(7) Insert disks 2/9 to 9/9 as required by the DATA BASE DISK OPERATION page

(8) At the end of reading all the remaining disks the following page (Ref. Fig. 216) is shown

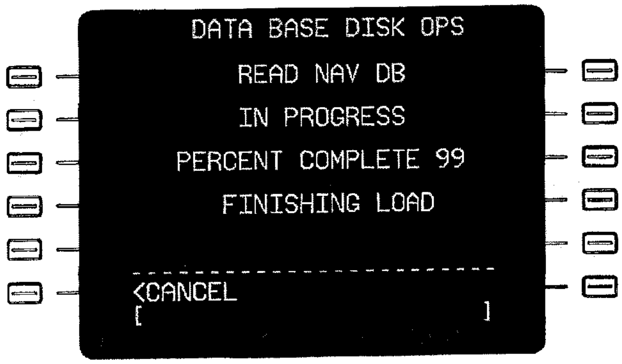

Fig. 216 - Data Load Finishing Message

(9) Wait until the INDEX 1/2 page is shown

(10) Select STATUS page (Ref. Fig. 217)

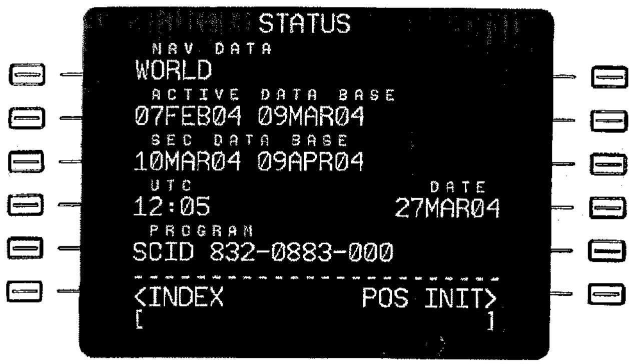

Fig. 217 - STATUS Page

(11) Verify that the Active Data Base is the actual one; if not swap the Active with the Sec data bases.

B. PCD-3000 UPLOAD PROCEDURE

PCD Connector is installed on the right side of the central pedestal as shown in the following Fig. 218.

The T6_World-USB file, prepared as described in this section, Para 10 Step B , is used.

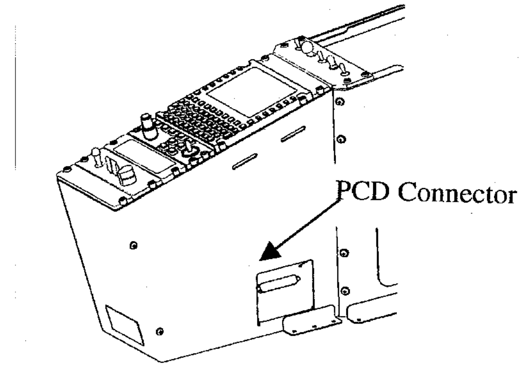

Fig. 218 - PCD Connector

The steps are described in the follow.

NOTE: - About 35 minutes are required to complete the upload;
- Very low probability of loosing the availability of the onboard FMS databases due to problems during upload process because of the reliability of the laptop installed data

(1) Insert the PCMCA CARD of the PCD-3000 kit into the laptop

(2) Connect the connector of the PCD-3000 cable to the J5315 PCD connector of the aircraft

(3) Double click on the PCD-3000 icon

(4) A page similar to the following one is shown

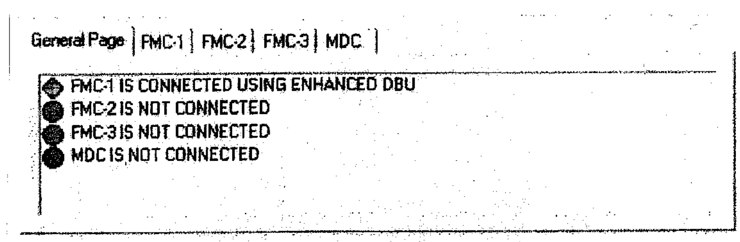

Fig. 219 - PCD - 3000 General Page

(5) Verify that the connection for FMC-1 is symbolized with a green diamond with a black cross (enhanced DBU mode enabled);

(6) Select the FMS database to be uploaded (Ref. Fig. 220)

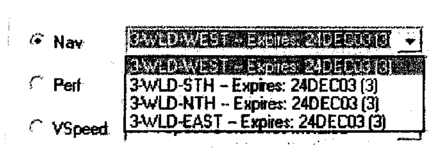

Fig. 220 -

(7) Select Enable Enhanced Data Mode

(8) Select Begin Load (Ref. Fig. 221)

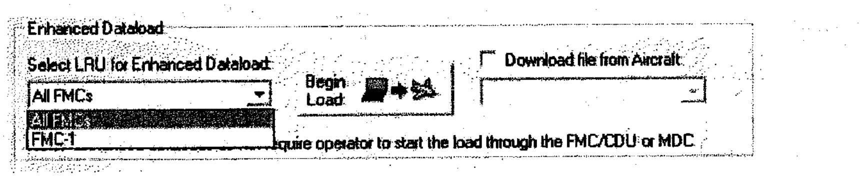

Fig. 221 -

(9) Select FMC-1 on General Page (Ref. Fig. 221) and verify the communication messages between the PCD-3000 and the FMC.

(10) CDU-3000 displays "Remote Data Transfer / Writing Data to FMS" message

(11) After completition of a navigation database dataload, the PCD-3000 screen returns to the state it was prior to the dataload and the CDU display returns to the to the STATUS page (Ref. Fig. 217);

(12) Verify that the Active Data Base is the actual one; if it is not swap the Active with the Sec data bases.

C. CPAS-3000 UPLOAD PROCEDURE

The steps are described in the follow. Figure 222 shows the data flow during CPAS-3000 upload.

NOTE: - The FSA-5000 operating system must be installed before FMS database upload
- About 20 minutes are required to complete the upload;
- Very low probability of loosing the availability of the onboard FMS databases due to problems during upload process because of the reliability of the laptop installed data
- The FMS Charts data base should be loaded first, followed by Enhanced Maps, and finally the Electronic Charts (Refer to Chapter 46-20-00).

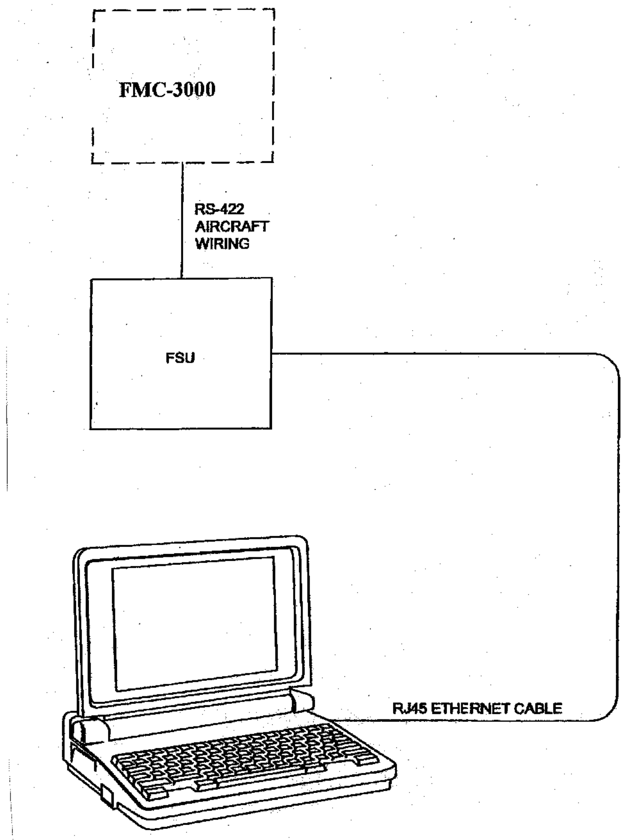

Fig. 222 - FMS Database Upload using CPAS - 3000

(1) Push the MENU button, on the CCP, to show the STATUS MENU on the MFD.

(2) Turn the MENU ADV knob, on the CCP, to position the focus indicator around the DATABASE EFFECTIVITY line.

(3) Push the PUSH SELECT button to show the DATABASE EFFECTIVITY page on the MFD.

(4) Wait one additional minute, from the time a valid FILE SERVER CONFIGURATION page shows until it is ready to transfer file information, for the FSU to initialize. The E-maps and Charts functions do not operate during this time. The message FSU INOP shows on the MFD.

(5) Make sure the a/c is in WOW configuration

(6) Connect the Laptop to the J5317 CPAS connector (Ethernet connection).

(7) Select the FSU/DBU Switch in FSU position.

(8) Double-click LAUNCH PAD icon.

(9) In the Launch Pad, single-click the DATA LOAD icon.

(10) Wait for REFRESH TARGETS button to not be grayed-out.

(11) When the FSU is in Data Load Mode, it stops exchanging information with the MFD. Make sure this page shows FSU INOP message. The selected functions are removed and replaced with either, PROCESSING REQUEST or FILE SERVER CONFIGURATION FAULT and the FSA PART NO and CRC and ECU S/N may be dashed.

(12) Click the pull-down triangle to expand the Select Target/LRU to be Updated window. Verify this pull-down window is filled with at least, "FSU" and "Node". If not, click on the Refresh Targets Button.

(13) Wait for "429-Based LRU" to appear in the SELECT TARGET/LRU TO BE UPLOADED window. This, along with the REFRESH TARGETS button not grayed-out, is an indication that the FSU is in Data Load Mode.

(14) Verify the MFD indicates the FSU is in Data Load Mode as described in step 11.

(15) Select FMC-1 as Target/LRU to be Updated.

(16) Click the pull-down triangle to expand window, if necessary.

(17) Highlight the FMC-1 and left-click.

(18) Click the LOAD FROM HARD DRIVE button.

(19) Select DATA/SOFTWARE to be Updated.

(20) Click the pull-down triangle to expand window.

(21) Select software.

(22) Highlight selection, left-click.

(23) Click the BEGIN LOAD button.

(24) Monitor the CPAS Data Load Status.

NOTE: A status tab is created for each load that is started by clicking on the BEGIN LOAD button. Each load status tab in the Status area contains the selected target type name and position, the selected data/software items part number or name, the overall percentage of the load completed, and an icon indicating the current state of the load process.

NOTE: There are three load state icons. A periodically rotating circle indicates the load is currently in progress. A check-mark indicates the load has successfully completed. An exclamation point indicates the load has encountered an error.

(25) Monitor the OVERALL PROGRESS and File progress bars. The OVERALL PROGRESS bar shows the progress on the number of files, not on the combined size of the files. Progress may also be monitored in the text scrolling in the Status Window.

(26) Wait for a Green Check-mark to indicate a successful load.

(27) The OVERALL PROGRESS bar and the STATUS WINDOW show 100% COMPLETE before the data load process is complete. These bars only indicate that the file transfer is complete. The FSU must complete a CRC (Cyclic Redundancy Check) of the data transferred. The FSU compares the CRC results against those included in the file set and reports success back to the CPAS before the process is complete.

(28) Make sure the CANCEL UPLOAD button has changed to CLOSE STATUS.

(29) Click the CLOSE STATUS button to close the status window.

(30) Close the CPAS if no other database has to be uploaded.

(31) Make sure the operation of FMS is correct.

(32) Verify if the active database is the actual one, if not switch the two databases as described in para 3 step A.

10. FMS Data Base Upload - DBU 5000

This paragraph presents the actions to upload the FMS database

A. Perform Nav. Database Loading Sequence

(1) On CDU push the IDX function key to show the INDEX 1/2 page.
(2) On CDU push the NEXT function key to show the INDEX 2/2 page.
(3) On CDU push the DB DISK OPS line select key to show the DATA BASE DISK OPS page.
(4) Insert the USB storage device with the database into the USB port.
(5) On CDU push the READ DISK line select key.
(6) On CDU push the line select key for the database that shall be loaded.
(7) Follow the instructions on the CDU display. The display shows the status of each step in the database loading process. The display also annunciates when the loading is complete.

Fig. 223 - Loading Complete

B. Perform Database Loading Check

(1) On CDU push the IDX function key to show the INDEX 1/2 page.
(2) On CDU push the STATUS function key
(3) Verify that the ACTIVE and SECOND DATA BASE are properly loaded.

C. Copy Routes and Waypoints

(1) Create a Route on the FMS
(2) Push the IDX function key to show the INDEX 1/2 page.
(3) Push the NEXT function key to show the INDEX 2/2 page.
(4) Push the DB DISK OPS line select key to show the DATA BASE DISK OPS page.
(5) Insert the USB storage device into USB port.
(6) Push the WRITE RTES or WRITE WPTS line select key and then follow the instructions on the display. The display indicates when copying into USB storage device is complete (Ref. Figure 224).

Fig. 224 - Copy Route and Waypoint

D. Error Messages

Below is shown a list of error messages which may occur during the uploading or downloading of the files, with relevant explanation and some corrective actions.

MESSAGE	DESCRIPTION
DISK DRIVE NOT READY	No USB storage device is inserted in the DBU. Insert a USB storage device and try again

MESSAGE	DESCRIPTION
NO STORAGE DEVICE	No USB storage device is inserted in the DBU. Insert a USB storage device and try again.
LRU NOT RESPONDING	The LRU is powered off or it is not responding to commands from the DBU.
INVALID LRU RESPONSE - CYCLE POWER ON LRU	The LRU is providing invalid responses to the DBU commands. Cycle power on LRU and try again.
FMS NOT RESPONDING	The FMS is not responding to commands from the DBU.
DBU NOT RESPONDING	The DBU is not responding to commands from the LRU.
NO LOADABLE FILES	The USB storage device in the DBU does not contain any loadable files for that LRU. Install the correct database onto the USB storage device and try again.
NO SAVABLE FILES	You have requested the LRU to store data to a USB storage device. However, there is no data available for storage.
WRONG VERSION	During the loading of the data, the incorrect version of the database was installed onto the USB storage device. Reinstall the correct version of the database and try again.
FMS LOAD ERROR	The FMS has detected an error in loading the data. Cancel the operation or try again.
CRC CHECK FAILED	The LRU has detected an error in loading the database. Reinstall a new database onto the USB storage device and try again.
DBU PROTOCOL ERROR	An error occurred while transferring data between the LRU and the DBU. Cancel the operation or try again.
FILE NOT RECOGNIZED	The database on the USB storage device contains a file not recognized by the LRU. Cancel the operation or check to be sure you installed the correct database and try again.

MESSAGE	DESCRIPTION
UNEXPECTED FILE	The database on the USB storage device contains a file not recognized by the LRU. Cancel the operation or check to be sure you installed the correct database and try again.
FILE NOT FOUND	The database on the USB storage device does not contain a file requested by the LRU. Cancel the operation or check to be sure you installed the correct database and try again.
FILE TRANSFER ERROR	An error occurred while transferring data between the LRU and the DBU. Cancel the operation or try again.
BAD FILES ON STORAGE DEVICE	The database on the USB storage device contains a file not recognized by the LRU. Cancel the operation or check to be sure you installed the correct database and try again.
INSUFFICIENT DISK SPACE	The memory available on the USB storage device does not meet the amount needed to write the complete database to the USB storage device.
STORAGE DEVICE FULL	The memory available on the USB storage device does not meet the amount needed to write the complete database to the USB storage device.
MEDIA WRITE PROTECTED	You attempted to write data to the USB storage device in the DBU and the write protection is set. If you are sure that you want to write to this USB storage device, then unprotect this device or try again.
POWER INTERRUPT DETECTED	A momentary loss of power has been detected during DBU operations. Cancel or continue the operation as necessary.
NO POLL BYTE	The LRU is not responding to commands from the DBU. Cycle power on LRU and try again
TOO MANY RETRIES	The LRU is providing invalid responses to the DBU commands. Cycle power on LRU and try again.

MESSAGE	DESCRIPTION
PROCESSOR WON'T RESPOND	The LRU is powered off or it is not responding to commands from the DBU. Cycle power on LRU and try again.
INCOMPLETE RESPONSE RECEIVED	The LRU is providing invalid responses to the DBU commands. Cycle power on LRU and try again.
UNEXPECTED BLOCK NUMBER	The LRU is providing invalid responses to the DBU commands. Cycle power on LRU and try again.
DP BUFFER RESERVE FAIL	Internal LRU failure. Cycle power on LRU and try again.
DBU OTHERS EXCEPTION	Internal LRU failure. Cycle power on LRU and try again.
INPUT FORMAT CONFLICT	Internal LRU failure. Cycle power on LRU and try again.
INSUFFICIENT EEPROM SPACE	Internal LRU failure. Cycle power on LRU and try again
EEPROM PROGRAMMING ERROR	Internal LRU failure. Cycle power on LRU and try again.

11. FMC-3000 - Battery Check

A. Procedure

(1) On the MFD, show the "MAINTENANCE MAIN MENU" Page ;

(2) Move cursor to "CURRENT FAULTS" line and push the "SELECT" line select key

(3) Verify the fault messages shown in the "ATA/LRU/STATUS/FAULT MESSAGE", if any ("NO FAULTS shows that all monitored units are OK).

(4) In case "BATTERY LOW" message is in view for the "ATA34- FMS" equipment, it means that the FMC internal battery should be still available for few days.

(a) The FMC internal battery must be replaced by a Rockwell Collins Service Center as soon as practicable.

(b) Remove the FMC-3000 module inside the IAPS and send the unit to the nearest Rockwell Collins Service Center. Please be sure to coordinate with Rockwell Collins Service Center and or the rental exchange pool prior to any maintenance action

NOTE: 1) If the operator does not notice the "LOW VOLTAGE" indication and the appropriate actions are not taken within the required time, the battery will go under the minimun acceptable voltage level. Then the first indication that a battery problem exists is the pilot entered defaults are gone and the manufacturing defaults will be applicable.
If the pilot does not recognize the change in defaults, the next most obvious indication is that fact that the pilot will not be able to enter a flight plan. At this point the pilot will either decide to fly without the FMS or put the FMS under maintenance. If this is the case, go directly to step (6) of the above check procedure.