

THALES

86, Bushey Road
Raynes Park, London
SW20 0JW
Tel: +44 (0)20 8946 8011
Fax: +44 (0)20 8946 7530

INSTALLATION AND MAINTENANCE MANUAL

Flange Mounted High Power Amplifier (FMHPA)

82166 Series

Revision No. 00
First Issue: Jul 2008

© THALES AVIONICS Ltd. This document and any
information included are the property of Thales Avionics.
They cannot be reproduced, disclosed or utilized without the
company's prior written approval

1
Jul 2008



Installation Maintenance Manual
FMHPA 82166A30

THIS PAGE INTENTIONALLY BLANK

Section 1	INTRODUCTION	Page
1.1.	Purpose of Manual	1-1
1.2.	Scope of Manual	1-2
1.3.	Reference documents	1-2
1.4.	Compliance to Regulations	1-2
	A. Federal Communication Commission	1-2
	B. European Aviation Safety Agency	1-3
Section 2	DESCRIPTION	Page
2.1.	FMHPA SYSTEM General Description	2-1
	A. Hardware	2-1
	(1) RF SRU	2-1
	(2) Logic SRU	2-2
	B. Software	2-2
	C. General Operation	2-3
	(1) Functional Modes:	2-3
	D. HPA Module	2-4
	E. PSM and CM Module	2-4
	(1) PSM	2-5
	(2) CM	2-5
	F. Operating Environment	2-6
	(1) Normal operating temperature:	2-6
	(2) Cooling:	2-6
	(3) Heat dissipation:	2-6
	G. Environment Conditions	2-7
	H. Weight and Dimensions	2-7
	I. FMHPA Performances	2-11
2.2.	Interfaces	2-11
	A. Aircraft Power Utility Service	2-11
	B. Communication Interface	2-12
2.3.	FMHPA Interconnect Data	2-12
	A. FMHPA Interconnection Diagram	2-12
	B. FMHPA Connectors	2-12
	(1) FMHPA Connectors	2-12
	(2) Connector Designation	2-13
	(3) Connector J1 PIN Out	2-13
Section 3	INSTALLATION GUIDELINES	Page
3.1.	Introduction	3-1
3.2.	Interchangeability	3-1
3.3.	FMHPA Location and Accessibility Guidelines	3-1
3.4.	Cooling	3-2
3.5.	Power Requirements	3-2
3.6.	Bonding Requirements	3-3

Section 4	INSPECTION AND SYSTEM CHECKOUT	Page
4.1.	Inspection/Check Procedure	4-1
	A. Wiring	4-1
	B. FMHPA	4-1
4.2.	System checkout	4-2
	A. Post-Installation Test.	4-2
Section 5	FAULT ISOLATION	Page
5.1.	Bite Function	5-1
5.2.	BITE Test.	5-1
	A. Self Test	5-1
	B. Health Monitor.	5-2
5.3.	SDU LED	5-2
Section 6	MAINTENANCE Practices	Page
6.1.	General	6-1
6.2.	Equipment and Materials.	6-1
6.3.	Procedure for the FMHPA	6-2
	A. Removal and Installation Procedure	6-2
	(1) Remove the FMHPA as follows:	6-2
	(2) Install the FMHPA as follows:	6-2
	B. Adjustment Procedure.	6-4
	C. Repair Procedure	6-4
	D. Return to Service Procedures	6-4
6.4.	Cleaning of Mechanical Parts	6-5
6.5.	Periodic Checks.	6-5
6.6.	Cabling and Connections.	6-5
6.7.	Instructions for Continued Airworthiness	6-5



Installation Maintenance Manual
FMHPA 82166

THIS PAGE INTENTIONALLY BLANK

SECTION 1

INTRODUCTION

1.1. PURPOSE OF MANUAL

This manual sets forth installation and maintenance guidelines for the THALES TopFlight Satcom (TFS) Flange-mounted High Power Amplifier (FMHPA). The FMHPA installation specific and general guidelines contained within this manual are supported by mechanical and electrical interconnection drawings. Drawings should be reviewed by the installation organisation, and any requirements specific to a particular airframe should be assessed before installation is commenced.

The Manual covers the following topics:

- a. Title Page.
- b. Table of Content.
- c. Record of Revisions
- d. Introduction.
- e. Description.
- f. Installation Guidelines.
- g. Inspection and System Checkout.
- h. Fault Isolation.
- i. Maintenance Practices.

NOTE: This manual does not cover aircraft system commissioning test procedures.

Advisory notes presented within this manual such as: 'Warnings, Cautions and Notes' are applicable to the TFS system as follows:

- a. A **WARNING** is used to alert the reader to possible hazard which may cause loss of life or physical injury.
- b. A **CAUTION** is used to denote the possibility of damage to materiel but not danger to personnel.
- c. A **NOTE** is used to convey, or draw attention to, information that is extraneous to the immediate subject of the text.

Installation Maintenance Manual FMHPA 82166

For any queries related to information contained within this Manual contact the following:

THALES TFS Project Manager
86 Bushey Road
Raynes Park, London
SW20 0JW, UK
Tel. +44 (0)20 8946 8011
Fax. +44 (0)20 8946 7530

1.2. SCOPE OF MANUAL

The Thales FMHPA comply with the design requirements set forward in the ARINC 781 Characteristic. An ARINC 781 compliant system is intended to support one or more of the Inmarsat aeronautical services known as ‘Classic-Aero’, ‘Swift 64’, and ‘SwiftBroadband’.

This manual provides information specific for the FMHPA.

1.3. REFERENCE DOCUMENTS

The following publications provide additional useful information:

Table 1.1 Reference Documents

THALES FMHPA Component Maintenance Manual	
THALES SDU Component Maintenance Manual	Airbus:44-35-32 Boeing: TBD
EMS AMT-3800 High Gain Antenna Subsystem Installation Manual	MN-1242-20047
Mark 33 Digital Information Transfer System	ARINC 429
Air Transport Avionics Equipment Interfaces	ARINC 600
Mark III Aviation Satellite Communication (Satcom) System Avionics	ARINC 781

1.4. COMPLIANCE TO REGULATIONS

A. Federal Communication Commission

The FMHPA is designed to be compliant with part 15 and part 87 of the Federal Communication Commission (FCC) regulations

B. European Aviation Safety Agency

The installation must be compliant to the following European Aviation Safety Agency (EASA) regulations:

- EASA/FAR 25.869 Fire protection systems
- EASA 25X0899 Electrical bonding and protection against lightning and static electricity
- EASA/FAR 25.1301 Equipment, general, function and installation
- EASA/FAR 25.1309 Equipment, systems and installations
- EASA 25X1316 System lightning protection
- EASA/FAR 25.1353 Electrical equipment and installations
- EASA/FAR 25.1357 Circuit protective devices
- EASA 25X1360 Precautions against injury
- EASA/FAR 25.1431 Electronic equipment
- EASA 25.561 Emergency Landing.



Installation Maintenance Manual
FMHPA 82166

THIS PAGE INTENTIONALLY BLANK

SECTION 2

DESCRIPTION

2.1. FMHPA SYSTEM GENERAL DESCRIPTION

The FMHPA forms part of the airborne SATCOM system, used in conjunction with a Satellite Data Unit (SDU), a Diplexer/Low Noise Amplifier (DLNA) and a High Gain Antenna (HGA) conforming to ARINC 781, with an internal Beam Steering Unit (BSU).

The TopFlight Satcom (TFS) system conforms to the Aeronautical Radio Incorporated (ARINC) 781 Characteristic, and interfaces with onboard avionics and communication equipment to provide the aircraft with a range of communication services by transmitting and receiving L Band signals to and from the fourth generation of INMARSAT satellites. For this purpose the INMARSAT satellite constellation is connected to the ground backbone telecommunication network through Satellite Access Stations (SAS) operated by service providers.

A. Hardware

The FMHPA contains two hardware Shop Replaceable Units (SRU):

- The Radio Frequency (RF) SRU which contains the High Power Amplifier (HPA) and the RF Filter
- The Logic SRU which contains the Power Supply Module (PSM) and the Communication Module (CM).

The two SRUs have a heat-skin with cooling fins and a nozzle to dissipate the temperature.

(1) RF SRU

The RF SRU has two external connectors and two internal connectors:

- a. External connectors:
 - RF input (J2)
 - RF output (J3).
- b. Internal connectors, connecting the RF SRU to the Logic SRU:
 - Power Supplies
 - Communication signal.

(2) Logic SRU

The Logic SRU has one external connector and six internal connectors:

a. External connector:

The external connector (J1) is used to communicate with the SDU and for the power supplies of the FMHPA.

b. Internal connectors are used to:

- Connect the PSM and the CM
- Connect the RF SRU to the Logic SRU for power supplies and the communication signal.
- Supply a test connector for testing and downloading.

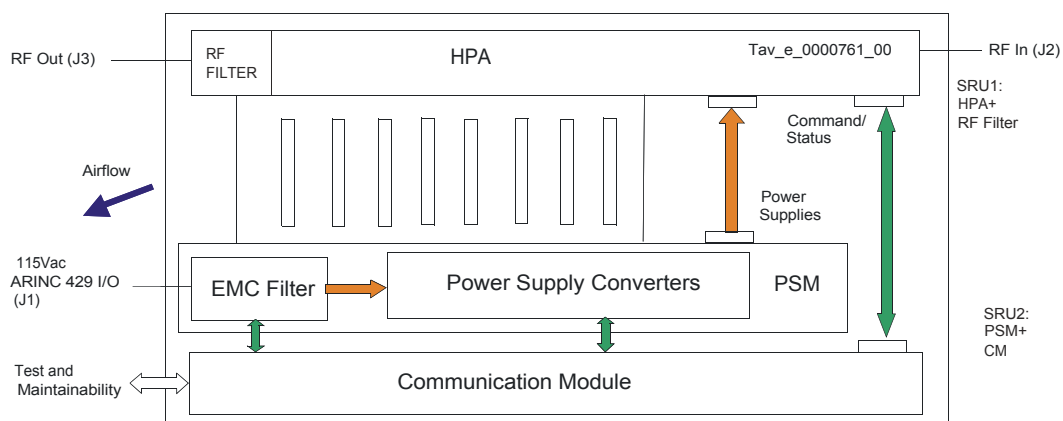


Figure 2.1 FMHPA Internal Organisation.

B. Software

There is no software in the FMHPA.

All FMHPA functions shall be allocated to hardware.

C. General Operation

The FMHPA is a Linear Power Amplifier for embedded communication system (TFS). FMHPA supplies up to 35W RF power to the Aircraft Satcom antenna when the physical separation of the SDU and the antenna is such that the RF loss between the SDU and the antenna will be greater than that allowed in ARINC 781. Alternatively, the FMHPA may be used in cases where more power is required than would be available from the HPA within the SDU, to provide the services offered.

Its function is to amplify the modulated signals supplied by the SDU. The number of signals to be amplified depends on the communication traffic, from a single up to the maximum capability of the SDU. FMHPA also includes a constant and programmable RF gain, a high grade of self test (90% of failures are detected) and a high temperature protection function.

(1) Functional Modes:

The FMHPA operates in the following five modes:

a. Nominal Mode (35W output)

Nominal Mode (NM) is defined as the operating condition when power supplies are applied. This mode is enabled by default at powerup, the power supply is defined at its nominal Voltage (around +27V)

b. Low Power mode (9W output)

Low Power Mode is defined as the operating condition which can be enabled by SDU (or FMHPA in security case) when the temperature is high and in order to reduce the dissipated power (for example to save the internal temperature when there is a loss of cooling). For this mode, the power supply is changed from Nominal Voltage (around +27V) to Low Voltage (around +17V). Cockpit only services available.

With NM and LPM modes, the main characteristic of the modes is to maintain a constant gain whatever the temperature.

c. Carriers Off/MUTE Mode

This mode switches off the RF gain, and puts the FMHPA in Standby (STBY) mode.

d. STBY / On mode

With Standby mode, the main characteristic of the mode is to have the lowest consumption.

In this mode, the RF output power equals zero, and the thermal dissipation within the FMHPA is reduced to the minimum possible to permit temperature monitoring and

communication with the SDU to continue. This STBY mode can be obtained with four configurations:

- Command configuration: In this case, an input command, Carriers Off/ Mute command from SDU, enable or disable the STBY mode
 - Auto-protection configuration: When FMHPA detect an internal failure (High level) and the SDU doesn't answer within 2 seconds
 - With carriers Off/Mute, the main characteristic of the mode is to have a high isolation between FMHPA input and FMHPA output
 - After HPA Power-On Self Test (POST) or at the end of a self test.
- e. BITE Monitoring

A monitoring Mode is defined in order to check if the FMHPA Status is OK or FAIL.

A self test is carried out at Start-up and on request from the SDU.

D. HPA Module

The HPA function is to amplify modulated signals from the SDU, up to 35 W.

The HPA includes an amplification chain, a digital part for control and communication and a RF filter.

The output RF filter is a mechanical filter, without any electronic component, with a N connector output.

E. PSM and CM Module

The PSM and CM SRU module contains two modules in the same housing:

- Power Supply Module
- Communication Module.

Installation Maintenance Manual FMHPA 82166

(1) PSM

Tav_e_0000767_00

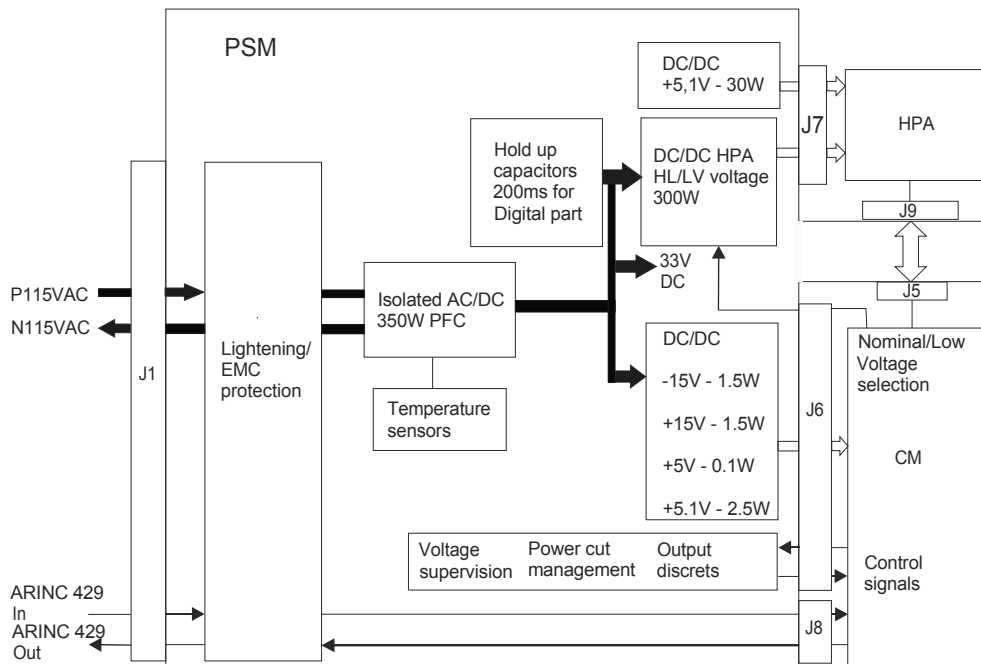


Figure 2.2 Power Supply Module

(2) CM

Its function is to manage the interface with the ARINC 429, to send control signals to the HPA and the PSM and report FMHPA status.

Tav_e_0000768_00

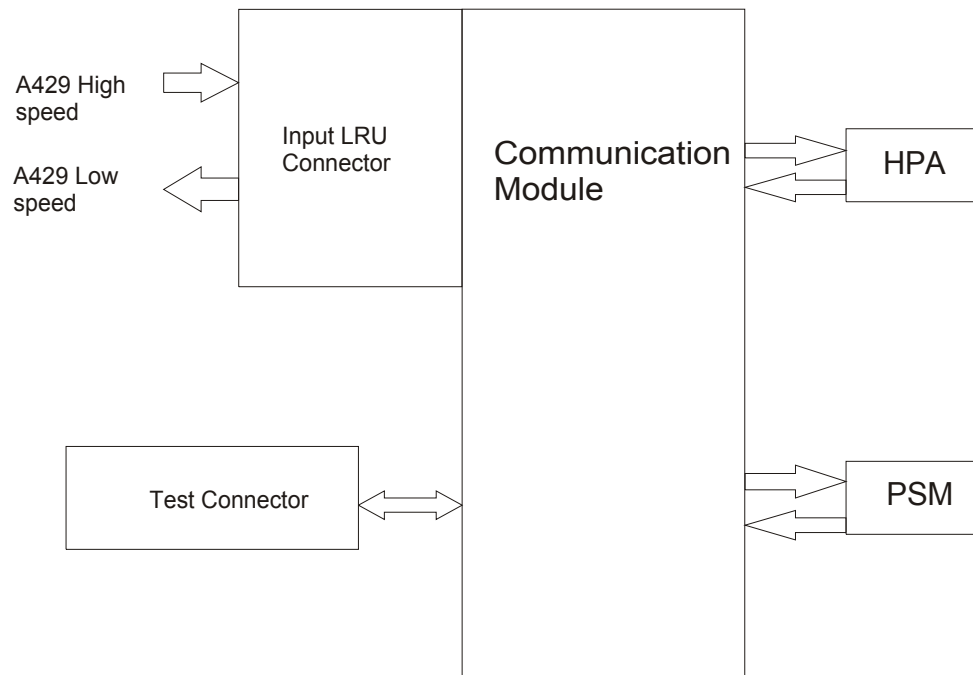


Figure 2.3 Communication Module

F. Operating Environment

(1) Normal operating temperature:

Between -15°C (5°F) and $+70^{\circ}\text{C}$ (158°F)

(2) Cooling:

Forced air type requiring Normal airflow rate of 2.6 lb/min (72 kg/hr). Nominal Mode (NM) inlet temperature $+60^{\circ}\text{C}$ (140°F) and Low Power Mode (LPM) inlet temperature of $+70^{\circ}\text{C}$ (158°F).

(3) Heat dissipation:

265 W (assuming 100% duty cycles with HPA operating at 35 W output).

G. Environment Conditions

The FMHPA complies with the RTCA/DO-160. The environmental qualifications categories complied with, are as per listed refer (Table 2.1).

Table 2.1 Environmental Test categories for SDU and SCM

RTCA DO-160 Environmental Categories		
Section	Condition	Category
4.0	Temperature/Altitude	A2
5.0	Temp Var	B
6.0	Humidity	A
7.0	Shock/Crash	E
8.0	Vibration	R
	Vibration Curve	C or C1
15.0	Magnetic Effect	A
16.0	Power Input	A
	Harmonics	H
17.0	Voltage Spike	A
18.0	Conducted Audio Susceptibility	K(CF), K(NF), K(WF)
19.0	Induced Signal Susceptibility	CC
20.0	RF Susceptibility	T
21.0	RF Emissions	T

H. Weight and Dimensions

Weight and dimensions of the FMHPA are as follows:

NOTE: Weights and measurements in this manual use both U.S (inches) and S.I. (metric: mm) values.

Maximum Weight: 8.9 kg (19.8 lb)



Installation Maintenance Manual
FMHPA 82166

THIS PAGE INTENTIONALLY BLANK

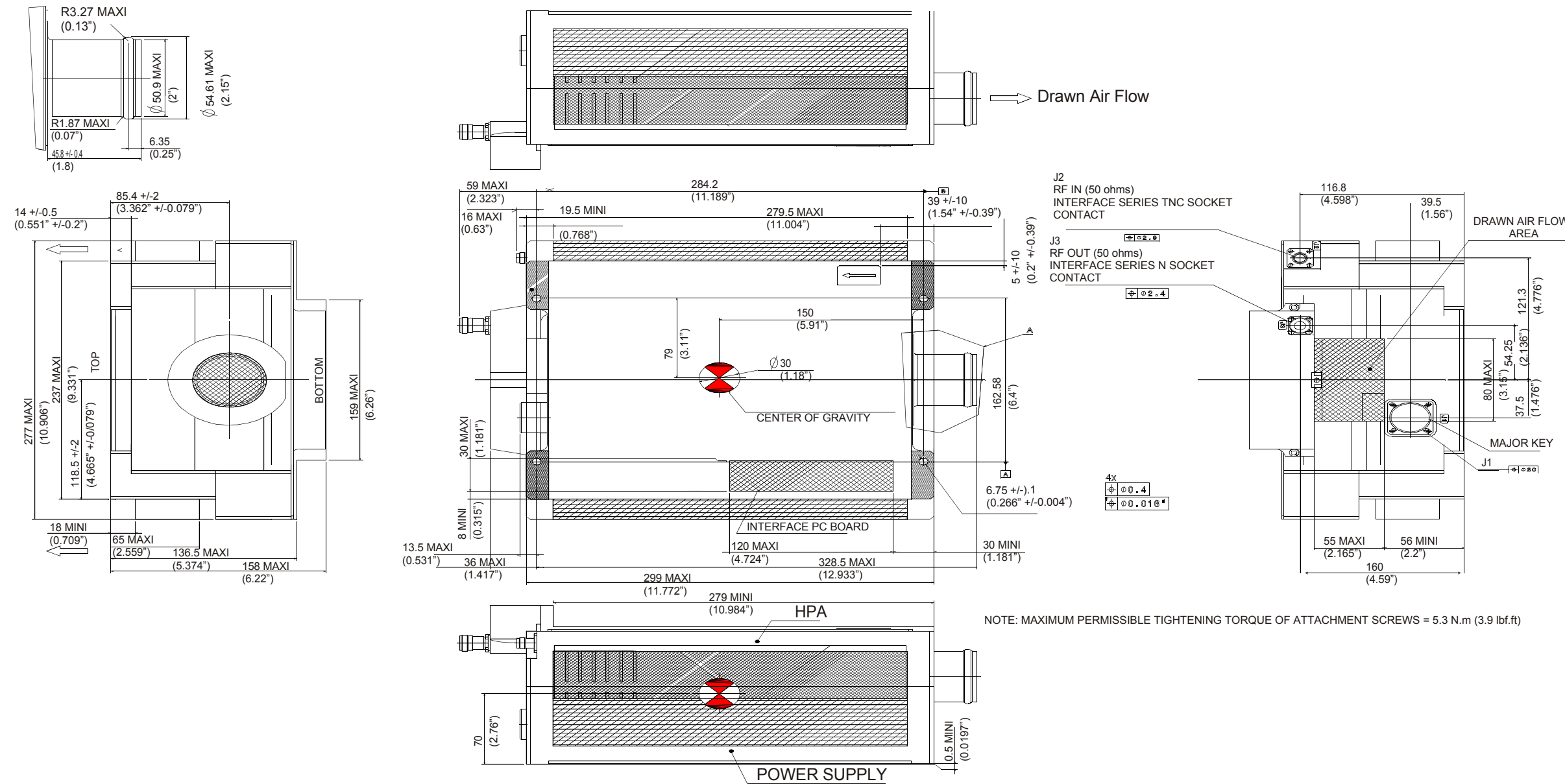


Figure 2.1 FMHPA Overall Dimensions



Installation Maintenance Manual
FMHPA 82166

THIS PAGE INTENTIONALLY BLANK

I. FMHPA Performances

- Supply voltage: 100 to 122 Vrms, ac, Frequency Range 360 to 800 Hz
- Power consumption:
 - 300 VA in NM mode
 - 150 VA in LPM
 - 50 VA in STBY mode.
- RF Frequency: 1626.5 MHz to 1660.5 MHz
- RF Power Rating: 35W for continuous operation
- RF Gain adjustable in NM and LPM: 0.5 dB increments up to 15.5 dB dynamic.

2.2. INTERFACES

The FMHPA interfaces are as follows:

A. Aircraft Power Utility Service

The FMHPA interfaces with the aircraft primary power generator (refer Figure 2.5).

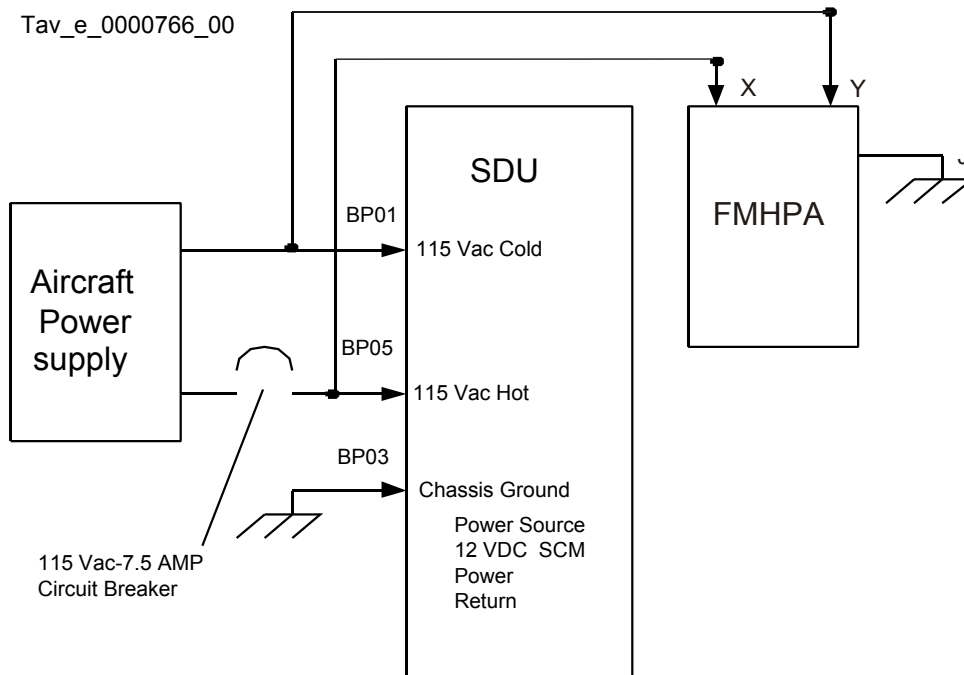


Figure 2.5 FMHPA Power Distribution Diagram

B. Communication Interface

The communication interfaces includes 2 ARINC 429 serial bus. One is an input at high speed (100 kilobits/s) and the other is an output at low speed (12.5 kilobits/s).

Table 2.2 ARINC 429 Nav Data Labels - Hybrid

PARAMETERS	ARINC 429 LABELS
FMHPA Command word (SDU to FMHPA)	143
FMHPA Command Summary word (SDU to FMHPA)	227
FMHPA Status word (FMHPA to SDU)	143
FMHPA Maintenance word (FMHPA to SDU)	350
FMHPA Additional Information word (FMHPA to SDU)	356

2.3. FMHPA INTERCONNECT DATA

A. FMHPA Interconnection Diagram

The FMHPA interconnection diagrams (refer to Figure 2.6) illustrate all the necessary connections between the FMHPA and all the other interfaced equipment.

B. FMHPA Connectors

The FMHPA has three external connectors and five internal connectors:

(1) FMHPA Connectors

Table 2.3 FMHPA Connectors

Name	Function	External	Internal
J1	Power Supply and ARINC 429 bus	X	
J2	RF Input	X	
J3	RF Output	X	
J4	Test/Maintenance	X	
J5	Connection between CM and J9		X
J6	Connection between CM and PSM		X
J7/P7	Connection between PSM and HPA		X
J8	Connection between the PSM (EMC filter) and CM		X

Installation Maintenance Manual FMHPA 82166

Name	Function	External	Internal
J9	Connection between J5 and HPA		X

(2) Connector Designation

Table 2.4 Designation

Designation	Requirement
Accessibility of connectors J1,J2 and J3	Accessible from outside
Test connector (J4)	Concealed behind an access door
Type of Power/Control connector (J1)	MIL-C-38999 Series III Insert Arrangement 17-26
Type of RF Input connector (J3)	TNC Female
Type of RF Output connector (J3)	N Type Female
PIN OUT of J1	See Table 2.5

(3) Connector J1 PIN Out

Table 2.5 PIN Out Connector J1

PIN No:	Signal	Description
A	FMHPA BITE A	ARINC 429 from FMHPA
B	FMHPA BITE B	ARINC 429 from FMHPA
C	RS422 RXD A - Not Used	Serial data to FMHPA +
D	RS422 RXD B- Not Used	Serial data to FMHPA -
E	RS422 TXD A - Not Used	Serial data from FMHPA +
F	RS422 TXD B- Not Used	Serial data from FMHPA -
G	SPARE	SPARE
H	SPARE	SPARE
J	Chassis Ground	Chassis Ground
K	SPARE	SPARE
L	SPARE	SPARE
M	Discrete BITE #1 - Not Used	Discrete BITE #1 - Not Used
N	Discrete BITE #2 - Not Used	Discrete BITE #2 - Not Used

Installation Maintenance Manual
FMHPA 82166

PIN No:	Signal	Description
P	Antenna control A	ARINC 429 to FMHPA
R	Antenna control B	ARINC 429 to FMHPA
S	Antenna control Shield	SHLD for ARINC 429
T	FMHPA BITE Shield	SHLD for ARINC 429
U	RS422 Shield (TBC) - Not Used	RS422 Shield
V	SPARE	SPARE
W	SPARE	SPARE
X	115Vac Hot	Aircraft AC power
Y	115Vac Return	Aircraft AC power
Z	SPARE	SPARE
a	Discrete BITE #3 - Not Used	Discrete BITE #3 - Not Used
b	ATE Pin - Not Used	Manufacturer specific
c	SPARE	SPARE

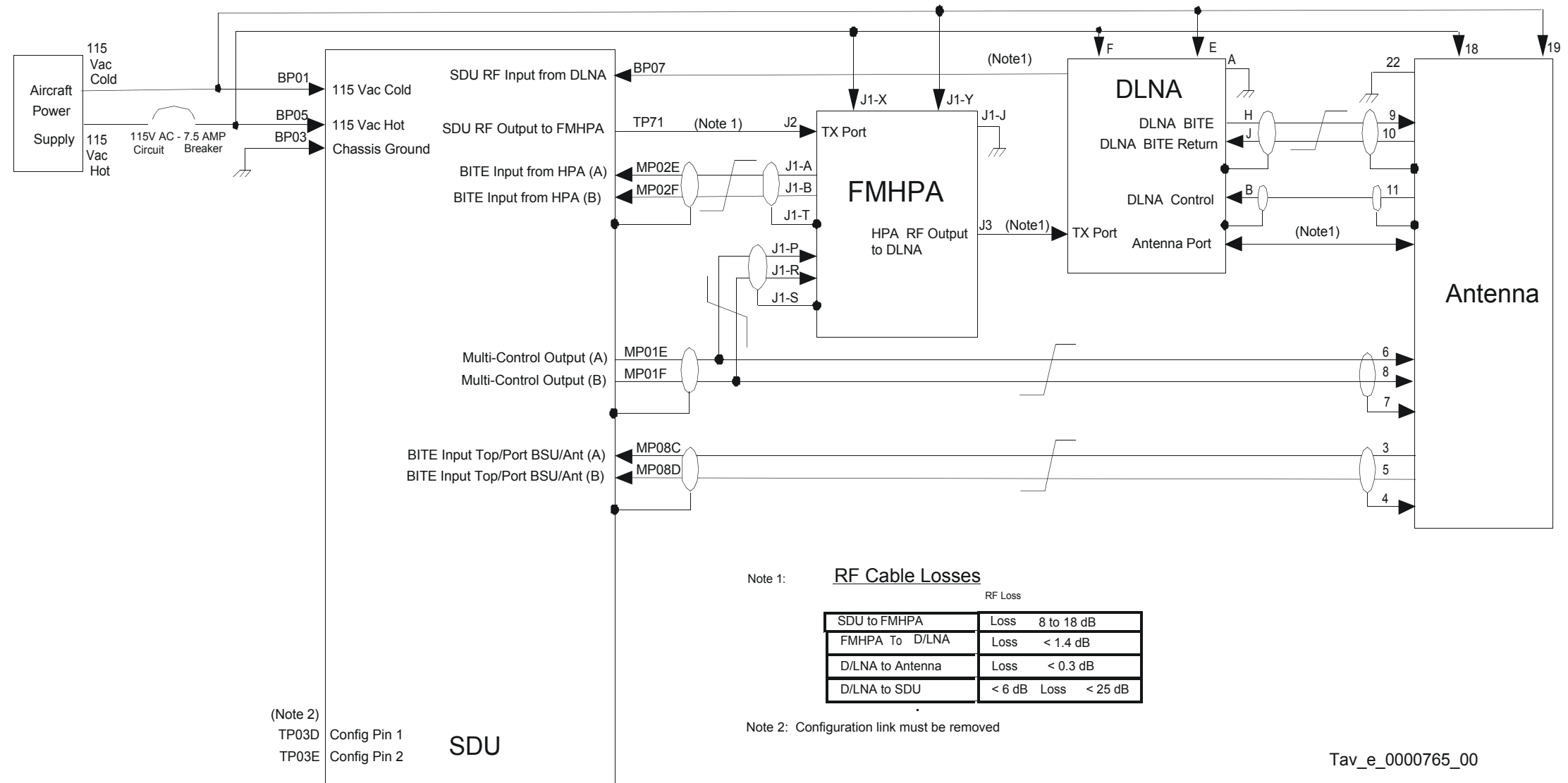


Figure 2.4 FMHPA Interconnection Block Diagram



Installation Maintenance Manual
FMHPA 82166

THIS PAGE INTENTIONALLY BLANK

SECTION 3

INSTALLATION GUIDELINES

3.1. INTRODUCTION

The FMHPA should be installed in the aircraft in a manner consistent with acceptable workmanship and engineering practices, and in accordance with the instructions set forth in this manual.

To ensure that the system has been properly and safely installed in the aircraft the installer should make a through visual inspection and conduct an overall operational check of the system on the ground prior to commissioning to the Customer and or a flight.

NOTE: Before installing any components or cabling, read all notes contained within drawings.

3.2. INTERCHANGEABILITY

The FMHPA will only operate when installed with a Thales SDU. Therefore, the FMHPA are interchangeable only with identical system components as covered in this manual.

The FMHPA and SDU are a Functional Doublet. This means that the interwiring and pin out definitions are interchangeable, but due to unique protocol implementations, the supply and acquisition of these units are manufacturer specific.

3.3. FMHPA LOCATION AND ACCESSIBILITY GUIDELINES

CAUTION: BEFORE EQUIPMENT INSTALLATION ENSURE THAT THE AIRCRAFT POWER SUPPLY TO THE SDU CIRCUIT BREAKER IS POSITIONED IN THE OFF CONDITION.

The FMHPA will be installed in an RTCA DO160 Category A2 location on an aircraft with forced air-cooling.

The FMHPA must be installed in a pressurized and partially temperature controlled zone. The FMHPA requires external forced air-cooling.

The FMHPA must have a minimum amount of free space around it, to facilitate convective cooling in the absence of forced air cooling (refer Figure 3.1). As a guideline 1” spacing in every direction.

A minimum gap of 0.5” is required from the bottom of the insulation blanket to the upper side of the FMHPA.

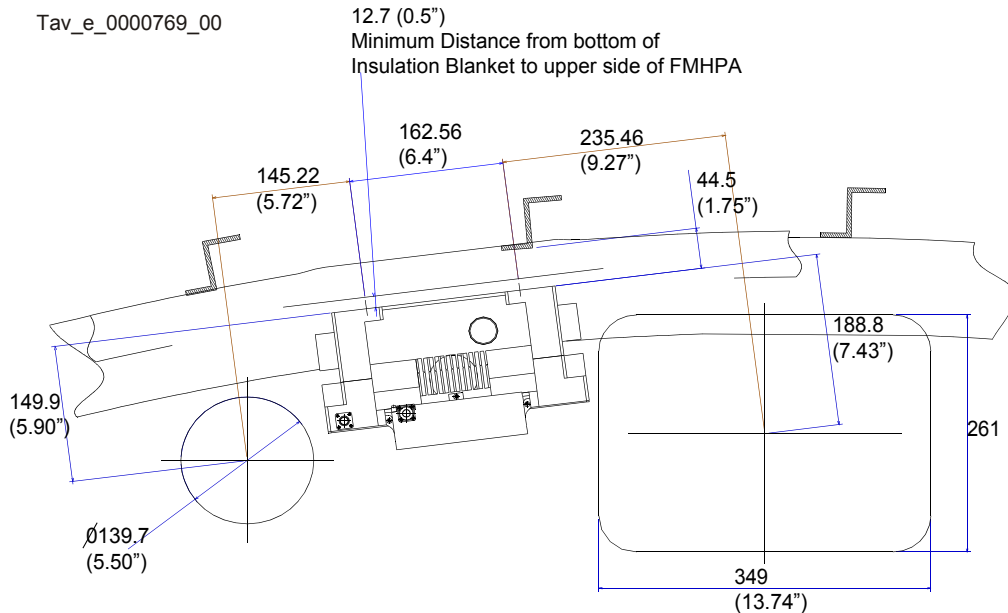


Figure 3.1 Typical FMHPA Installation

3.4. COOLING

The FMHPA is designed in accordance with ARINC 781, requiring Normal airflow rate of 2.6 lb/min (72 kg/hr). Nominal Mode (NM) inlet temperature +60° C (140° F) and Low Power Mode (LPM) inlet temperature of +70° C (158° F) . The cooling air will enter the equipment chassis at the front and drawn though from the rear forced air cooling.

3.5. POWER REQUIREMENTS

It is the responsibility of the installer to select the appropriate gauge of wire for power connections, and to ensure that the required safety and voltage drop requirements are complied with.

For FMHPA power supply specifications refer to:

- a. Paragraph 2.1.: FMHPA Performances
- b. Figure 2.5: Aircraft Power Distribution
- c. Figures 2.6: FMHPA Interconnection Diagram.

3.6. BONDING REQUIREMENTS

The bonding of all LRUs to the airframe must not exceed 20 milliohms. However some aircraft manufacturers or design/installation organisation may require a lower value than the recommended 20 milliohms.



Installation Maintenance Manual
FMHPA 82166

THIS PAGE INTENTIONALLY BLANK

SECTION 4

INSPECTION AND SYSTEM CHECKOUT

4.1. INSPECTION/CHECK PROCEDURE

The visual check procedures that follow should be performed during or after the FMHPA installation, or as a periodic maintenance inspection check of the installation:

A. Wiring

- a. Ensure that a continuity check of all the installation wiring harness had been carried out, and that all the sources are correctly rated on the correct pins.
- b. Check that none of the cables have been damaged, and cannot be damaged by components that are installed later.
- c. Clean Co-axial connections with isopropyl alcohol and torque tighten to connector manufacturers recommendations.
- d. Verify that the various RF cables are within their minimum radius of curvature tolerances.
- e. Check that the cable runs are spaced away from any moving or hot part that could damage cables when in use.

B. FMHPA

- a. Examine the assembly for external condition (absences of fractures, dents, deformations, cracks, and/or any other abnormal damage).
- b. Check that the unit is properly installed and that screws are firmly tightened.
- c. Check screws and nuts general condition.
- d. Check that the contact resistance between the FMHPA and a point on the aircraft structure close to the component does not exceed 20 milliohms.
- e. Check that the correct air cooling and air flow is provided to the FMHPA.

4.2. SYSTEM CHECKOUT

At this stage of the installation it is assumed that a continuity check of the wiring has been made, a visual check of the installation harness has been performed, and that the inspection/check procedure has been carried out.

A. Post-Installation Test

WARNING: THE RF POWER RADIATED BY THE TFS SYSTEM ANTENNA CAN CAUSE BODILY HARM. DURING SATCOM OPERATION THE SAFETY DISTANCE FROM THE ANTENNA MUST BE NO LESS THAN 3.5M OR 12 FEET. SINCE THERE ARE VARIOUS POSSIBLE ANTENNA LOCATIONS, IT IS THE RESPONSIBILITY OF THE OPERATOR TO DETERMINE THE AREA OF HAZARD FOR THEIR TFS SYSTEM CONFIGURATION AND TO TRAIN PERSONNEL IN GROUND SAFETY PROCEDURES.

WARNING: DURING ANTENNA OPERATION (TRANSMISSION), MAKE SURE PERSONNEL ARE NOT EXPOSED TO ANY REFLECTED, SCATTERED, OR DIRECT BEAMS. ENSURE PERSONNEL ARE OUTSIDE THE MINIMUM DISTANCE SPECIFIED.

CAUTION: WHEN TESTING THE COMPLETE TFS SYSTEM (ANTENNA SYSTEM INCLUDED) REFER TO THE APPLICABLE ANTENNA IMM FOR FURTHER SAFETY REQUIREMENTS AND SPECIFICATIONS. THE SDU MUST NOT BE POWERED WITHOUT AN ANTENNA OR SUITABLE LOAD CONNECTED ON THE HIGH POWER TRANSMIT OUTPUT PORT.

CAUTION: NEVER CONNECT OR DISCONNECT A SATCOM LRU WHEN POWER IS APPLIED.

CAUTION: NEVER APPLY HIGH-LEVEL RF SIGNAL TO A POWERED-DOWN LRU.

CAUTION: NEVER DISCONNECT RF CABLES WHEN SYSTEM OPERATING.

CAUTION: NEVER POWER-UP ANY LRU UNTIL ALL CONNECTIONS IN THE SYSTEM ARE MADE.

CAUTION: ENSURE THAT THE APPROPRIATE ORT SOFTWARE IS INSTALLED IN THE SCM AND/OR SDU BEFORE PERFORMING SYSTEM OPERATIONS.

This test requires that all the Satcom system LRUs (SDU, SCM, FMHPA, DLNA, Antenna and cables) be connected and operating properly, with a means of displaying any system faults detected by the LRU during the Built-In Test Equipment (BITE) test. The results of the test are indicated on the SDU front panel LED.

If no system faults are indicated by the BITE test, then the subsystem installation should be considered acceptable. If any subsystem LRU fails the test, it must be returned to the vendor (refer to your vendor customer support).

Refer to the Testing and Fault Isolation section for information on the FMHPA fault detection capabilities.



Installation Maintenance Manual
FMHPA 82166

THIS PAGE INTENTIONALLY BLANK

SECTION 5

FAULT ISOLATION

5.1. BITE FUNCTION

The FMHPA include :

- A Monitoring mode is defined in order to check if the FMHPA status is OK or FAIL
- A self test is carried out at start up and on request of SDU.

BITE/Monitoring function is available from the ARINC 429 serial output bus while operating in any of the “RF operational modes” of NM, LPM, Carriers Off/Mute, STBY mode. FMHPA BITE/Monitoring status is requested from the ARINC 429 serial input bus.

The FMHPA will continuously monitor its internal health and in the event of a detected failure will report this to the SDU through the serial interface. Such monitoring does not interrupt normal operations.

The FMHPA is equipped with an internal power detector able to provide measurement of the following:

- The RF Output power
- The RF reflected power (used to detect antenna failure/ mismatch)
- The RF Input sensor.

A number of temperature sensors are located within the FMHPA enclosure at appropriate locations in support of BITE.

5.2. BITE TEST

Any failure of the BITE monitoring circuitry will not directly degrade the operational FMHPA performance.

A. Self Test

The FMHPA will perform a self test function after power-on, and on receipt of the relevant command from the SDU via the ARINC 429 interface.

B. Health Monitor

The FMHPA will continuously monitor its internal serviceability and in the event of a detected failure will report this to the SDU via the ARINC 429 status word.

5.3. SDU LED

The FMHPA also displays serviceability via the SDU front panel Ext HPA LED (refer to the SDU/SCM IMM).

SECTION 6

MAINTENANCE PRACTICES

6.1. GENERAL

This section provides instructions for the removing, reinstalling and adjusting of the FMHPA that has been previously installed by the aircraft manufacturer or completion center.

CAUTION: TO AVOID INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT, ENSURE ADEQUATE PRECAUTIONS ARE TAKEN WHILE PERFORMING ANY WORK IF THE ELECTRICAL POWER IS APPLIED TO THE LRU.

CAUTION: TO PREVENT DAMAGE TO EQUIPMENT, TURN AIRCRAFT POWER OFF INCLUDING SDU BEFORE REMOVING OR INSTALLING FMHPA.

Field lubrication or other maintenance procedures are not required. The design of the FMHPA is such that they do not require field maintenance to maintain airworthiness. If functional problems occur, the SDU Built-in Test Equipment (BITE) capability identifies the faulty LRU. The FMHPA maintenance is limited to replacement on verified failure.

6.2. EQUIPMENT AND MATERIALS

CAUTION: BEFORE YOU USE A MATERIAL, REFER TO THE MANUFACTURERS, MATERIAL SAFETY DATA SHEETS FOR SAFETY INFORMATION. SOME MATERIALS CAN BE DANGEROUS.

6.3. PROCEDURE FOR THE FMHPA

WARNING: CARE TO BE TAKEN WHEN HANDLING THE FMHPA THE COOLING FINS ARE SHARP AND MAY CAUSE HARM TO PERSONNEL.

CAUTION: THE FMHPA COOLING FINS ARE DELICATE. HANDLE WITH CARE AS NOT TO CAUSE DAMAGE.

CAUTION: THE FMHPA IS ELECTROSTATIC DISCHARGE SENSITIVE EQUIPMENT. OBSERVE STANDARD ESD PROCEDURES WHEN HANDLING THE EQUIPMENT.

A. Removal and Installation Procedure

(1) Remove the FMHPA as follows:

- a. Ensure that electrical supply to the SDU is switched off.
- b. Remove forced drawn air cooling pipe from rear of FMHPA (Refer Figure 6.1 item 1).
- c. Disconnect DataBus/Power cable from connector J1 (5) on front of FMHPA.
- d. Disconnect RF IN cable from connector J2 (3) on front of FMHPA.
- e. Disconnect RF OUT cable from connector J3 (4) on front of FMHPA.
- f. Assuming that the mounting fixture is equipped with anchor nuts, loosen and remove the four fixings screws (2) that retain the FMHPA to its mounting fixture while supporting the FMHPA. Retain the screws for future installation.

WARNING: CARE TO BE TAKEN WHEN HANDLING THE FMHPA THE COOLING FINS ARE SHARP AND MAY CAUSE HARM TO PERSONNEL.

CAUTION: THE FMHPA COOLING FINS ARE DELICATE. HANDLE WITH CARE AS NOT TO CAUSE DAMAGE.

- g. Remove the FMHPA, and visually inspect it for any signs of damage.
- h. Install an ESD protection cap on the FMHPA connectors.
- i. Bag and stow the cables as required.

(2) Install the FMHPA as follows:

- a. Un-stow and remove the bags from the cables as required.
- b. Remove ESD protective caps from the FMHPA connectors.

WARNING: CARE TO BE TAKEN WHEN HANDLING THE FMHPA THE COOLING FINS ARE SHARP AND MAY CAUSE HARM TO PERSONNEL.

CAUTION: THE FMHPA COOLING FINS ARE DELICATE. HANDLE WITH CARE AS NOT TO CAUSE DAMAGE.

- c. Place the FMHPA to the dedicated mounting fixture and insert the four fixing screws. After all four fixing screw have been inserted torque tighten the screws to 5.3Nm with an appropriate tool.

CAUTION: ENSURE THAT THE FIXING SCREWS HAVE BEEN FASTENED, AND THAT THE LRU IS SECURELY HELD IN POSITION.

CAUTION: ENSURE THE RF CONNECTORS ARE TORQUE TIGHTENED TO THE MANUFACTURERS RECOMMENDATIONS.

- d. Inspect connectors and clean.
- e. Connect RF OUT cable to connector J3 (4) on front of FMHPA and torque tighten to manufacturers recomendations.
- f. Connect RF IN cable to connector J2 (3) on front of FMHPA and torque tighten to manufacturers recomendations.
- g. Connect DataBus/Power cable to connector J1 (5) on front of FMHPA.
- h. Connect forced drawn air cooling pipe to rear of (1) FMHPA and secure.

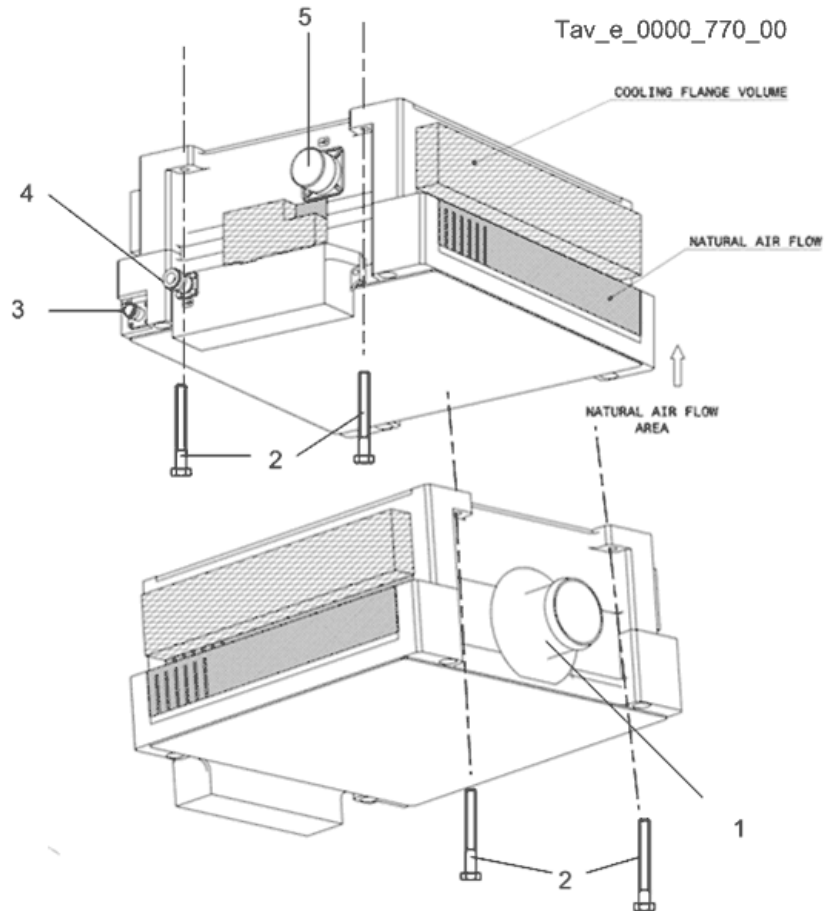


Figure 6.1 FMHPA Remove/Install

B. Adjustment Procedure

Not Applicable.

C. Repair Procedure

Not Applicable.

D. Return to Service Procedures

Do the Post-Installation Test Procedures referenced in the Inspection and System Checkout Section of this manual.

6.4. CLEANING OF MECHANICAL PARTS

CAUTION: MOISTURE AND DIRT CAN CAUSE DAMAGE TO EQUIPMENT

Equipment chassis covers give the necessary protection to keep dust away from electronic circuits. If cleaning is required this has to be limited to the removal of particles of dust, oil, grease, condensation, etc and only limited for those equipment accessible parts. Before any cleaning action is carried out ensure that the equipment is disconnected from all electrical power sources, and all the necessary ESD precautions are observed.

- a. For dust removal use a cleaning wipe, a silk paintbrush or low-pressure compressed air
- b. For removal of finger marks, grease, etc, clean the parts with a cleaning wipe and isopropyl alcohol, exercising care to not damage information labels.

6.5. PERIODIC CHECKS

See Inspection/ Check procedure in Para 4.1.

6.6. CABLING AND CONNECTIONS

CAUTION: ENSURE THE RF CONNECTORS ARE TORQUE TIGHTENED TO THE MANUFACTURERS RECOMMENDATIONS.

Periodically check cable connectors (recommended) and if cable connectors are loose, remove connector, inspect for damage and cleanliness. Refit connector and tighten to the required torque value specified by the cable manufacturer.

6.7. INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

Maintenance requirements and instructions for continued airworthiness of the TFS FMHPA components are contained in the paragraphs that follow.

Installation of FMHPA on an aircraft by an amendment to the Type Certificate (TC), Supplemental Type Certificate (STC) or Form 337 obligates the aircraft operator to include the maintenance information supplied by this manual (and listed below) in the operator, Aircraft Maintenance Manual and the operator, Aircraft Scheduled Maintenance Program.

- a. Maintenance information for FMHPA, TFS LRU (system description, removal, installation, testing, etc.).

Installation Maintenance Manual FMHPA 82166

- b. The part numbers (see section 2) of the LRU being installed (FMHPA) should be placed into the aircraft operator, appropriate aircraft Illustrated Parts Catalogue (IPC).
- c. Wiring connection information contained in this manual (see sections 2 and 3) should be placed into the aircraft operator, appropriate Wiring Diagram Manual.
- d. The FMHPA maintenance is considered as an , “On-condition”, and as such no additional maintenance is required other than a check for security and operation at normal inspection intervals.
- e. If a system LRU is inoperative remove the specific unit, secure cables and wiring, collar applicable switches and circuit breakers, and placard them inoperative. Revise equipment list and weight and balance as applicable prior to flight and make a log book entry that the unit was removed (refer to section 91.213 of the FAR or the aircraft, Minimum Equipment List (MEL).
- f. FMHPA can be repaired by an Approved Maintenance Organization or an appropriately rated FAA Part 145 repair station.
- g. Once repaired, reinstall the LRU in the aircraft in accordance with the original Form 337 approved data or instructions in this manual. Perform a Return to Service test of the system and approve it for return to service with a logbook entry required by section FAR Part 145 Section 43.9.
- h. Once repaired, install the LRU in the aircraft in accordance with the original Form 337 approved data or instructions in this manual. Do a Return to Service test of the system and approve it for return to service with a log book entry in accordance with the requirements specified in FAR Part 145 Section 43.9.