Installation Manual

Automated Flight Information Reporting System
AFIRS 228 Series

250-0019

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1. INTRODUCTION

This section provides a general introduction to the AFIRS 228 Series system and its applicable standards and references.

1.1 Applicability

This Installation Manual provides the information necessary to plan the AFIRS 228 system installation and integration in the aircraft. It defines the mechanical and electrical interfaces for each Line Replaceable Unit (LRU) and provides the procedures required to properly configure, test, and maintain the AFIRS 228 system. This manual is applicable to the following software version(s):

SCN: 2.0.0 and later

1.2 Model Designations

There are two model designations for the AFIRS 228 Series system.

1.2.1 AFIRS 228B

The AFIRS 228B is the 'Baseline' model version of the AFIRS 228 Series. It has a single Iridium link shared between voice and data non-safety services.

1.2.2 AFIRS 228S

The AFIRS 228S will be certified to TSO C-159a for voice and data safety-services. It has a dual-channel Iridium link, one dedicated for safety-services data and the other prioritized for safety-services voice.

Only the AFIRS 228B is available at this time. However, this manual does provide additional planning information for the future AFIRS 228S system. Throughout this document, any reference to the 'AFIRS 228B' applies only to the non-TSO'd AFIRS 228B model, while references to 'AFIRS 228S' apply only to the TSO'd AFIRS 228S model. References to 'AFIRS 228' or 'AFIRS 228 Series' apply to both model variants.

1.3 Part Numbers

The following part numbers are defined for the LRUs of the AFIRS 228 Series systems.

Table 1-1 – Part Numbers

Part Number	Description
502-1001-x	AFIRS 228S Data Management Unit (DMU)
502-2001-x	AFIRS 228B Data Management Unit (DMU)
502-3001-x	AFIRS 228 Aircraft Configuration Module (ACM)

1.4 Reference Documents

Table 1-2 – References

Ref.	Document Number	Description
1.	ANSI/TIA/EIA-232-F-1997	Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
2.	ARINC 429-19	Mark 33 Digital Information Transfer System (DITS)
3.	ARINC 573-7	Mark 2 Aircraft Integrated Data System (AIDS Mark 2)
4.	ARINC 600-16	Air Transport Avionics Equipment Interfaces
5.	ARINC 619-3	ACARS Protocols For Avionic End Systems
6.	ARINC 664-2	Aircraft Data Networks
7.	ARINC 702-6	Flight Management Computer System
8.	ARINC 702A-3	Advanced Flight Management Computer System
9.	ARINC 717-14	Flight Data Acquisition and Recording System
10.	ARINC 718-4	Mark 3 Air Traffic Control Transponder (ATCRBS/MODE S)
11.	ARINC 718A-2	Mark 4 Air Traffic Control Transponder (ATCRBS/MODE S)
12.	ARINC 739A-1	Multi-Purpose Control And Display Unit
13.	ARINC 741-13	Aviation Satellite Communication System
14.	ARINC 758-2	Communications Management Unit (CMU) Mark 2
15.	ARINC 761-4	Second Generation Aviation Satellite Communication System, Aircraft Installation Provisions
16.	FAA TSO C-159a	Technical Standard Order, Avionics Supporting Next Generation Satellite Systems (NGSS)
17.	GAMA Publication No. 11, Ver. 5.1	ARINC 429, General Aviation Subset
18.	IEEE 802.3-2008	IEEE Standard for Information Technology-Specific Requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CMSA/CD) Access Method and Physical Layer Specifications
19.	RTCA/DO-160F	Environmental Conditions and Test Procedures for Airborne Equipment

Ref.	Document Number	Description
20.	RTCA/DO-214	Audio Systems Characteristics and Minimum Operational Performance Standards for Aircraft Audio Systems and Equipment
21.	RTCA/DO-262A	Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS)
22.	TIA/EIA-422-B	Electrical Characteristics of Balanced Voltage Digital Interface Circuits

1.5 Definitions of Acronyms and Terms

Table 1-3 – Acronyms and Terms

Acronym	Definition
ACARS	Aircraft Communications Addressing and Reporting System
ACM	Aircraft Configuration Module
ACP	Audio Control Panel
AFIRS	Automated Flight Information Reporting System
ANSI	American National Standards Institute
APU	Auxiliary Power Unit
ARINC	Aeronautical Radio Incorporated
BPRZ	Bipolar Return To Zero
CFDS	Centralized Fault Display System (Airbus)
CMC	Central Maintenance Computer
CMU	Communications Management Unit
DCU	Data Concentrator Unit
DITS	Digital Information Transfer System
DMU	Data Management Unit
EFB	Electronic Flight Bag
EIA	Electronics Industry Association
EWIS	Electrical Wire Interconnection System
FAA	Federal Aviation Administration

Acronym	Definition
FDM	Flight Data Monitoring
FDAU	Flight Data Acquisition Unit
FMC	Flight Management Computer
FMS	Flight Management System
GAMA	General Aviation Manufacturers Association
GPS	Global Positioning System
GSE	Ground Service Equipment
HBP	Harvard Bi-Phase
ICD	Interface Control Document
ICE	Iridium Certified Equipment
IEEE	Institute of Electrical and Electronics Engineers
LRU	Line Replaceable Unit
MCDU	Multi-Purpose Control Display Unit
MOPS	Minimum Operational Performance Specifications
NGSS	Next Generation Satellite Systems
ORT	Owner Requirements Table
PBX	Public Branch Exchange
PC	Personal Computer
PSTN	Public Switched Telephone Network
PTT	Push To Talk
RTCA	Radio Technical Commission for Aeronautics
Satcom	Satellite Communications
SIM	Subscriber Identity Module
TIA	Telecommunications Industry Association
TSO	Technical Standard Order
WOW	Weight on Wheels
WPS	Word Per Second

2. DESCRIPTION AND OPERATION

This section describes the system operation and architecture.

2.1 System Overview

The AFIRS 228 Series Automated Flight Information Reporting System provides multiple voice and data communications functions in the aircraft. The AFIRS provides a satellite voice communications (Satcom) link with the Public Switched Telephone Network (PSTN) via the Iridium® satellite network. The system uses a standard ARINC 741/761 Satcom interface to the flight crew's Audio Integrating System and ARINC 739A Multi-Purpose Control Display Units (MCDUs) in the cockpit, as well as providing 3-extension PBX capability for up to 2 handsets in the cabin. For cockpits not capable of supporting the ARINC 741/761 interface, a dedicated AFIRS Dialer Pad can be installed in the cockpit.

Figure 2-1 – AFIRS Operational Concept

Data capabilities include the monitoring, recording, and reporting of aircraft flight and system data which consists of aircraft movement and position reports, Flight Data Monitoring (FDM) data collection, system (e.g. engine) health and trend reports, and monitored parameter exceedance and exception reports. The AFIRS also provides an interface for Electronic Flight Bags (EFBs), which can provide real-time data connectivity to the Uptime server for various third-party EFB applications. This includes the ability to send and receive text messages.

The AFIRS 228S adds a dedicated safety-services data channel that provides the capability to send and receive standard ACARS messages between the aircraft's Communications Management Unit (CMU) and a safety-services certified terrestrial service provider.

2.2 System Architecture

The AFIRS 228 Series systems consist of modular avionics components that can be tailored to meet customer needs. The core system components are the Data Management Unit (DMU), the Aircraft Configuration Module (ACM), and the Iridium/GPS Antenna (see Figure 2-2). Optional components include the following:

- Cockpit Dialer Pad
- Cabin Handset(s) (Wired or Cordless)

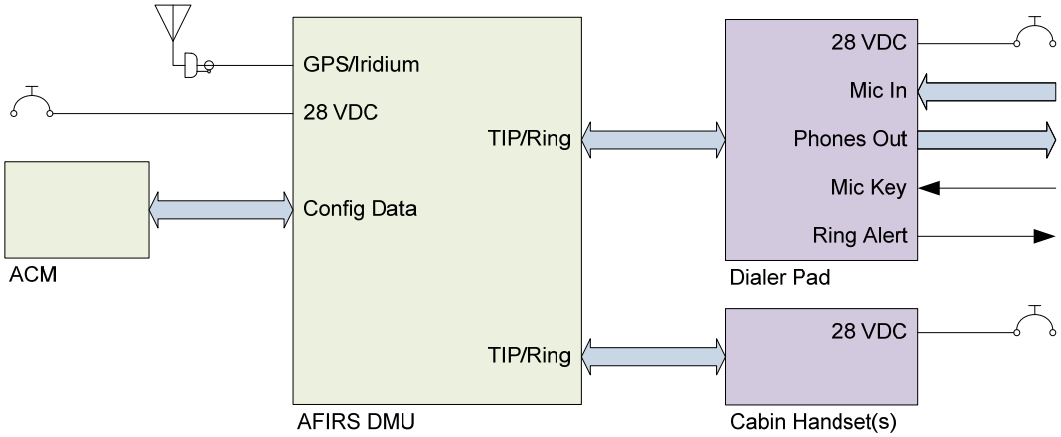


Figure 2-2 – AFIRS System Block Diagram

2.3 External System Interfaces

The AFIRS system has a number of external interfaces which are listed below and described in detail in this section.

- Audio System Interface (1)
- ARINC 573/717 Receiver (1)
- ARINC 429 Transmitters (6) and Receivers (16)
- RS-232/422 Serial Ports (4)
- Ethernet Ports (4)
- Discrete Outputs (11) and Inputs (17)
- Iridium/GPS Antenna (1)
- User Media Interfaces – SIM (1), CF (1)
- Maintenance Interfaces – Ethernet (1), ATE Serial (1)

Figure 2-3 illustrates the interfaces that the AFIRS system provides to external aircraft systems or to the user.

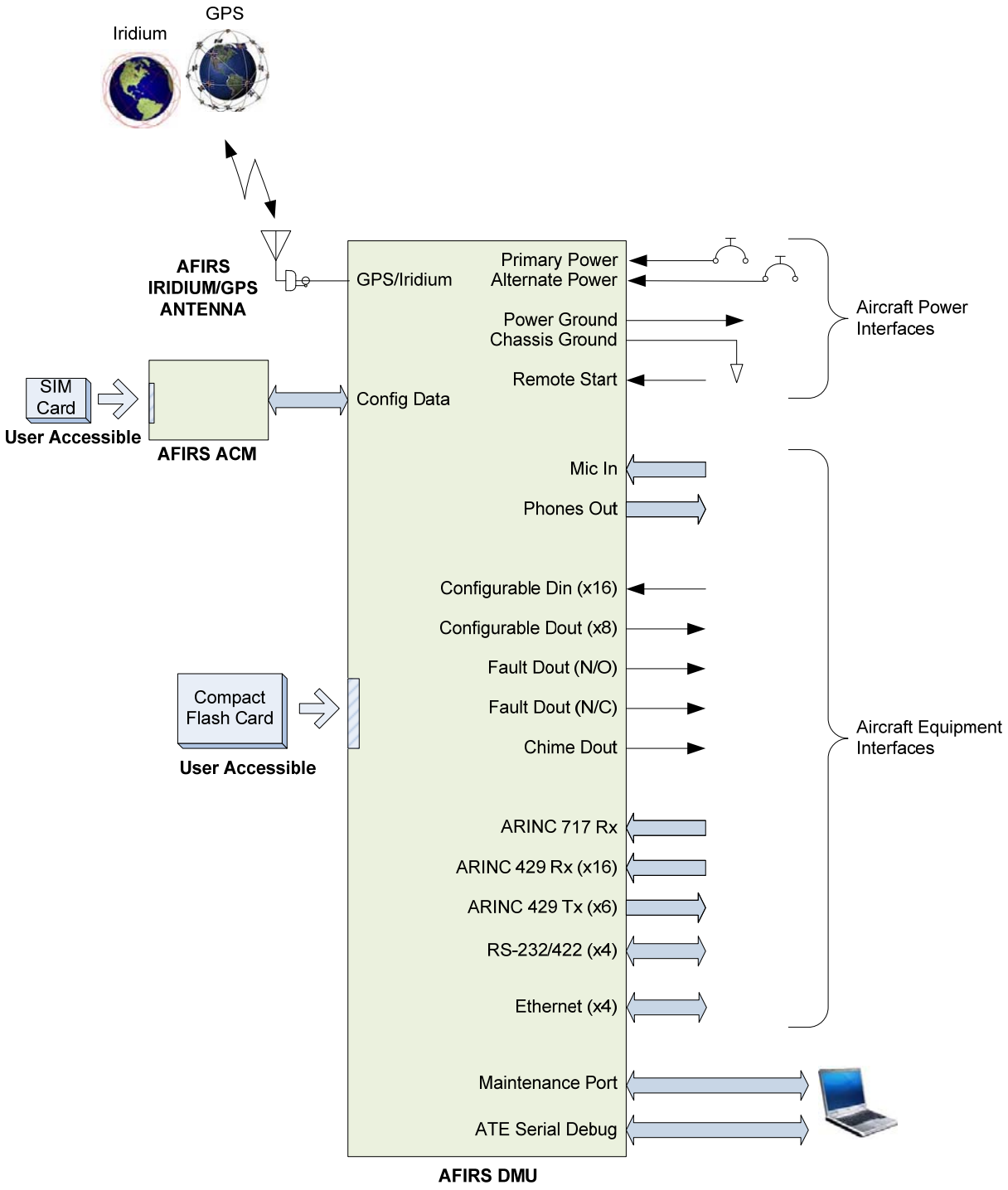


Figure 2-3 – AFIRS External Interfaces

- **Audio System Interface (1)**

  This interface consists of a Microphone Input to the DMU and an Interphone Output from DMU to connect to a standard (DO-214) Audio Integrating System (e.g. Audio Panel) in the aircraft. Software selectable discrete inputs and outputs can be configured to support this interface (e.g. Mic On, Chime, Chime Reset, End Call functions).

- **ARINC 573/717 Receiver (1)**

  This interface can be used to collect data from the Flight Data Acquisition Unit (FDAU), Data Concentrator Unit (DCU), or equivalent system in the aircraft.

- **ARINC 429 Transmitters (6) and Receivers (16)**

  These interfaces can be software-configured to connect to various aircraft systems to support both the display and control functions of the AFIRS system, as well as the data collection activities. Typical interfaced systems include MCDUs, Flight Management Systems (FMSs), ACARS CMUs, Mode S Transponders, Central Maintenance Computers (CMCs), etc.

- **RS-232/422 Serial Ports (4)**

  These interfaces can be software-configured to connect to different aircraft systems. Typical interfaced systems include EFBs, Global Positioning Systems (GPSs), etc.

- **Ethernet Ports (4)**

  These interfaces can be used to connect to several different systems. Typical interfaced systems include EFBs, CMCs, etc. One of these ports can also be used to provide a remote maintenance port interface (e.g. in the flight compartment).

- **Discrete Outputs (11) and Inputs (17)**

  Discrete inputs and outputs can be used to provide or supplement various flight crew control and display interactions, particularly for voice functions. Discrete inputs can also be used to determine the states of various aircraft systems when this information is not available on a databus (e.g. Weight-on-Wheel, Doors Closed, etc.).

- **Iridium/GPS Antenna (1)**

  An antenna mounted on the top of the fuselage is used to communicate with both the Iridium satellite network and the GPS satellite network.

- **User Media Interfaces – SIM (1), CF (1)**

  There are two types of media available for the user to insert or remove from the AFIRS system. The ACM contains a user accessible Subscriber Identity Module (SIM) card slot for storage of the Iridium communications management information. The DMU contains a front panel accessible Compact Flash card which is used to store Quick Access Recorder (QAR) data.

- **Maintenance Interfaces – Ethernet (1), ATE Serial (1)**

  An RJ45 jack on the front panel provides Maintenance Port access using an Ethernet connection. Additional low-level access is also available to factory repair personnel via the ATE Serial Debug port.

3. EQUIPMENT SPECIFICATIONS

This section describes the mechanical and environmental specifications of the components of the AFIRS 228 Series system.

3.1 Data Management Unit

This section describes the mechanical and environmental specifications of the components of the Data Management Unit (DMU).

3.1.1 General

The DMU is housed in an ARINC 600 2MCU enclosure, which is designed to be mounted in a standard ARINC 600 mounting tray. See Figure 3-1 for an outline of this component.

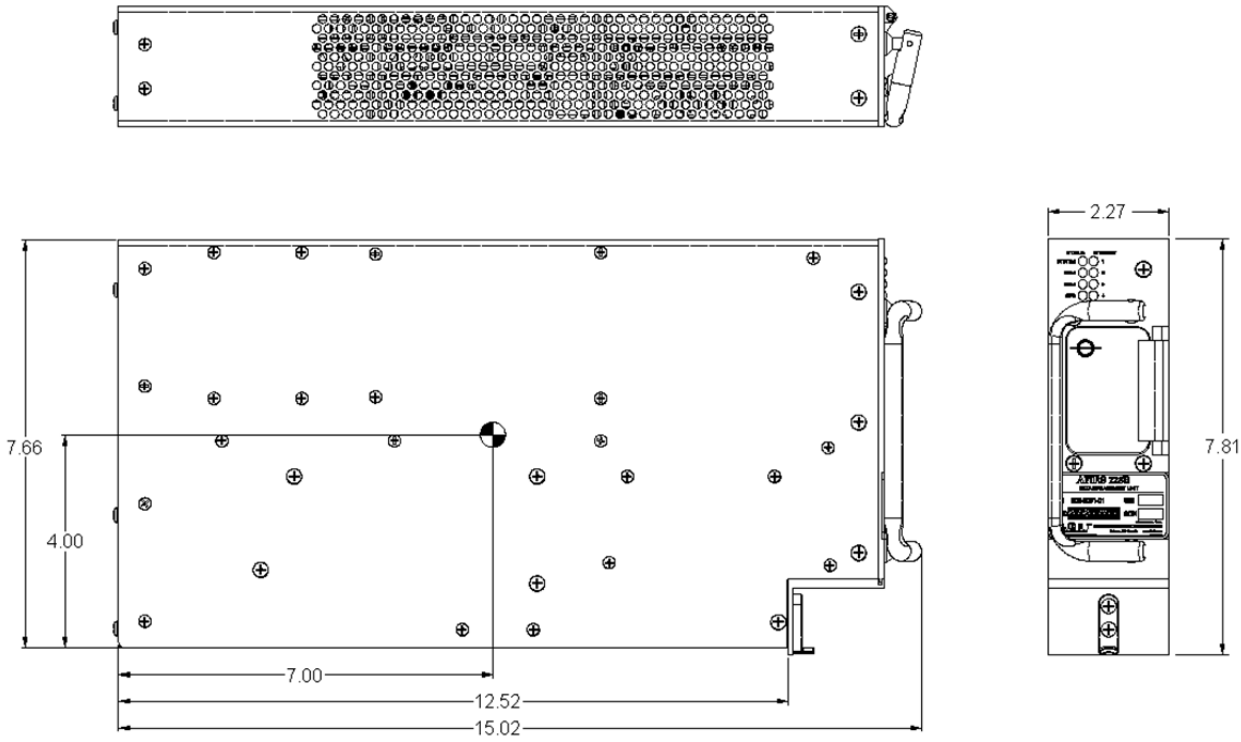


Figure 3-1 – DMU Outline Drawing

3.1.2 Mechanical Specifications

Dimensions:	7.81” x 2.27” x 15.02 (See Figure 3-1)
Weight:	7.7 lbs. (3.49 kg.) Max.
Material/Finish:	Aluminum Alloy with Blue Polyurethane Finish
Mounting:	ARINC 600 2MCU Mounting Tray

Rear Mating Connector:	Size 2 ARINC 600 Receptacle Radiall P/N: NSXN2P201S0004 ITT P/N: BKAD2-313-300-04
Maintenance Connector:	RJ45 (8P8C) Modular Connector Jack
Flash Card:	CompactFlash® (Type I or Type II)

3.1.3 Environmental Specifications – AFIRS 228B

Temperature (Operating):	-55°C to +70°C (Without Iridium Satellite Communication)
	-40°C to +70°C (With Iridium Satellite Communication)
Temperature (Survival):	-55°C to +85°C
Altitude:	55,000 ft.
Vibration:	DO-106F Cat. SCL and U2
Humidity:	<95% Non-Condensing (DO-106F Cat. A)
DO-160F Categories:	[(A2)(F2)X]BAD[(SCL)(U2)]XXXXXXZZ(XI)AZ[ZW][ST]MXXXAC

Note:
Satellite voice and data communications functions in the AFIRS 228B are not operational below -40°C. At elevated temperatures (>60°C), the voice modem has a maximum duty cycle of 60%.

3.1.4 Environmental Specifications – AFIRS 228S

Temperature (Operating):	-55°C to +70°C
Temperature (Survival):	-55°C to +85°C
Altitude:	55,000 ft.
Vibration:	DO-160G Cat. SCL and U2
Humidity:	<95% Non-Condensing (DO-160G Cat. A)
DO-160G Categories:	[(A2)(F2)X]BAD[(SCL)(U2)]XXXXXXZZ(XI)AZ[ZW][TT]MXXXAC

Note:
DO-160G Categories for the AFIRS 228S are as specified by the design. Qualification tests on the AFIRS 228S DMU have not been completed to date.

3.2 Aircraft Configuration Module

This section describes the mechanical and environmental specifications of the components of the Aircraft Configuration Module (ACM).

3.2.1 General

The ACM is housed in small enclosure, which is designed to be mounted within 24” of the DMU rear connector. Typically, the ACM will be mounted on or near the ARINC 600 mounting tray used for the DMU. See Figure 3-2 for an outline of this component.

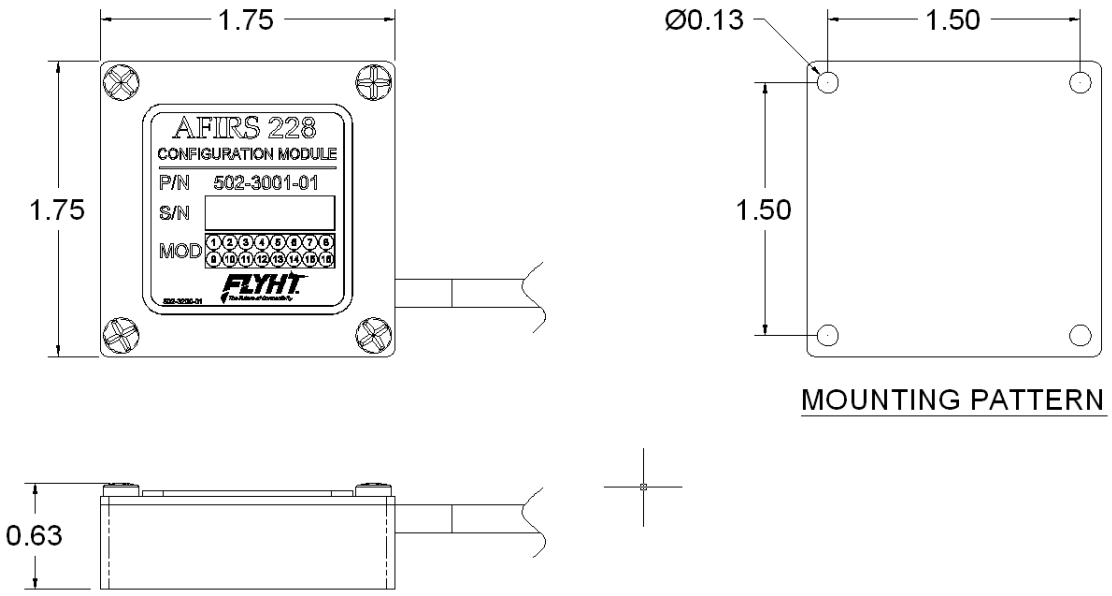


Figure 3-2 – ACM Outline Drawing

3.2.2 Mechanical Specifications

Dimensions:	1.75” x 1.75” x 0.63”
Weight:	0.2 lbs. (0.09 kg.) Max.
Material/Finish:	Aluminum Alloy

3.2.3 Environmental Specifications

Temperature (Operating):	-55°C to +70°C
Temperature (Survival):	-55°C to +85°C
Altitude:	55,000 ft.
Vibration:	DO-160F Cat. SCL and U2
Humidity:	<95% Non-Condensing (DO-160F Cat. A)
DO-160F Categories:	[(A2)(F2)X]BAD[(SCL)(U2)]XXXXXXZZ(XI)AZ[ZW][ST]MXXXAC

3.3 AFIRS Antenna

The AFIRS Antenna is to be selected by the system integrator to be suitable for the installed aircraft environment. FLYHT has evaluated the following antennas and found them to function properly with the AFIRS 228 system, and generally they will meet most aircraft operating environments:

- Sensor Systems P/N S67-1575-109
- Sensor Systems P/N S67-1575-409
- Sensor Systems P/N S67-1575-165
- Sensor Systems P/N S65-8282-101
- Aero Antenna AT2775-110GA
- Aero Antenna AT2775-110

When selecting an alternate antenna for use with the AFIRS 228 system, the antenna must meet the following criteria:

- Be suitable for the installed aircraft environmental conditions. Note that in addition to the temperature, altitude, fluids susceptibility, considerations etc., the antenna must be approved for the expected aircraft lightning environment.
- Be approved by Iridium Communications Inc. as Iridium Certified Equipment (ICE).
- Meet the following antenna performance specifications:

Type:	Passive – Patch or Helical
Frequency – Iridium:	1616 – 1626.5 MHz
Frequency – GPS:	1575 ±10 MHz
Coverage Volume:	8.2° – 90° Elevation; 360° Azimuth
VSWR (Max.):	1.8:1
Polarization:	RHCP
Impedance (Nom.):	50 Ohms
Power Handling (Min.):	20W CW
Gain (Min.):	+3 dBic @ Zenith +0 dBic Weighted Average per DO-262A

If the operator plans to upgrade to the AFIRS 228S in the future, the selected antenna should be qualified to TSO C-159a so that the system can then be approved for safety services use.

Note:
Proper antenna selection and installation are critical to proper system operation. See §5.3 for antenna installation criteria and recommendations.

4. INTERFACE SPECIFICATIONS

This section describes the interface specifications of the AFIRS 228 Series system components.

4.1 DMU Rear Connector (J1)

Table 4-1 – J1A Top Plug (TP) Insert

	A	B	C	D	E	F	G	H	J	K
1	Ethernet 1A Tx+	Ethernet 1A Rx+	O	O	Ethernet 2B Tx+	Ethernet 2B Rx+	O	O	Ethernet 3B Tx+	Ethernet 3B Rx+
2	Ethernet 1A Rx-	Ethernet 1A Tx-		O	Ethernet 2B Rx-	Ethernet 2B Tx-	O	O	Ethernet 3B Rx-	Ethernet 3B Tx-
3	O	O	O	O	O	O	O	O	O	O
4	O	O	O	O	O	O	O	O	O	O
5	Ethernet 4B Tx+	Ethernet 4B Rx+	O	O	O	O	O	O	O	O
6	Ethernet 4B Rx-	Ethernet 4B Tx-	O	O	O	O	O	O	O	O
7	O	O	O	O	O	O	O	O	O	O
8	O	O	O	O	O	O	O	O	O	O
9	O	O	O	O	O	O	O	O	O	O
10	O	O	O	O	O	O	O	O	O	O
11	O	O	O	O	O	O	O	O	O	O
12	O	O	O	O	O	O	O	O	O	O
13	O	O	O	O	O	O	O	O	O	O
14	O	O	O	O	O	O	O	O	O	O
15	O	O	O	O	O	O	O	O	O	O

Table 4-2 – J1B Middle Plug (MP) Insert

	A	B	C	D	E	F	G	H	J	K
1	O	O	O	O	O	O	No. 1 A429Rx A	No. 1 A429Rx B	No. 1 A429Tx A	No. 1 A429Tx B
2	Ext. 1 Mic Audio Hi	Ext. 1 Mic Audio Lo	Ext. 1 Audio Out Hi	Ext. 1 Audio Out Lo	O	O	O	O	O	O
3	O	O	No. 2 A429Rx A	No. 2 A429Rx B	No. 3 A429Rx A	No. 3 A429Rx B	No. 4 A429Rx A	No. 4 A429Rx B	No. 2 A429Tx A	No. 2 A429Tx B
4	O	O	O	O	O	O	O	O	ACM Power	ACM Ground
5	No. 1 Discrete Output	WOW 1 Discrete Input	No. 2 Discrete Input	No. 3 Discrete Input	No. 4 Discrete Input	No. 5 Discrete Input	No. 6 Discrete Input	No. 7 Discrete Input	ACM Data	ACM Clock
6	No. 5 A429Rx A	No. 5 A429Rx B	No. 6 A429Rx A	No. 6 A429Rx B	No. 7 A429Rx A	No. 7 A429Rx B	No. 8 A429Rx A	No. 8 A429Rx B	No. 9 A429Rx A	No. 9 A429Rx B
7	No. 10 A429Rx A	No. 10 A429Rx B	No. 3 A429Tx A	No. 3 A429Tx B	No. 4 A429Tx A	No. 4 A429Tx B	No. 11 A429Rx A	No. 11 A429Rx B	No. 1 RS232 Com	No. 4 RS232 Com
8	No. 8 Discrete Input	No. 2 Discrete Output	No. 12 A429Rx A	No. 12 A429Rx B	No. 3 Discrete Output	No. 9 Discrete Input	No. 4 Discrete Output	No. 10 Discrete Input	No. 13 A429Rx A	No. 13 A429Rx B
9	No. 2 RS232 Com	No. 3 RS232 Com	No. 5 A429Tx A	No. 5 A429Tx B	No. 1 RS422Tx- RS232TXD	No. 1 RS422Tx+ RS232RTS	No. 1 RS422Rx+ RS232RXD	No. 1 RS422Rx- RS232CTS	No. 2 RS422Tx- RS232TXD	No. 2 RS422Tx+ RS232RTS
10	No. 2 RS422Rx+ RS232RXD	No. 2 RS422Rx- RS232CTS	No. 3 RS422Tx- RS232TXD	No. 3 RS422Tx+ RS232RTS	No. 3 RS422Rx+ RS232RXD	No. 3 RS422Rx- RS232CTS	No. 4 RS422Tx- RS232TXD	No. 4 RS422Tx+ RS232RTS	No. 4 RS422Rx+ RS232RXD	No. 4 RS422Rx- RS232CTS
11	No. 11 Discrete Input	No. 12 Discrete Input	No. 13 Discrete Input	No. 14 Discrete Input	No. 15 Discrete Input	WOW HPP	No. 5 Discrete Output	No. 6 Discrete Output	No. 7 Discrete Output	No. 8 Discrete Output
12	No. 14 A429Rx A	No. 14 A429Rx B	No. 6 A429Tx A	No. 6 A429Tx B	A717Rx A	A717Rx B	No. 15 A429Rx A	No. 15 A429Rx B	No. 16 A429Rx A	No. 16 A429Rx B
13	Fault Output N/C	Fault Output N/O	O	O	O	O	O	O	O	O
14	O	Chime Output	O	O	O	O	O	O	O	O
15	O	O	O	O	O	O	Phone Ext. 2 Tip	Phone Ext. 2 Ring	Phone Ext. 3 Tip	Phone Ext. 3 Ring

Table 4-3 – J1C Bottom Plug (BP) Insert

Pin	Size	Description
1	20	Not Used
2	12	Primary 28 VDC Power Input
3	12	Power Ground
4	20	Not Used
5	20	Remote Start Input
6	20	Not Used
7	12	Not Used
8	12	Chassis Ground
9	16	Alternate 28 VDC Power Input
10	16	Not Used
11	16	Not Used
12	5	Not Used
13	5	Iridium/GPS Antenna

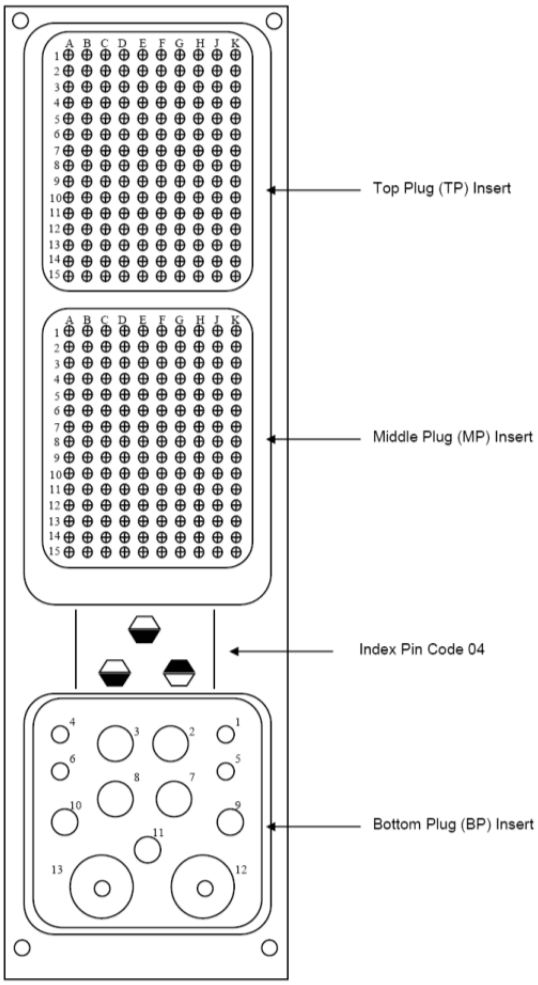


Figure 4-1 – DMU Connector Map

4.1.1 Power Input – Primary and Alternate

Nominal Input:	27.5 VDC
Voltage Range:	18.0 to 32.2 VDC
Input Current – Standby/Data (Typical):	228B: 585 mA (16.1 W) 228S: 640 mA (17.6 W)
Input Current – Voice Call (Typical):	228B: 725 mA (19.9 W) 228S: 725 mA (19.9 W)
Input Current – Max. Cont. (at 32.2 V):	228B: 1.40 A (45.1 W) 228S: 1.20 A (38.6 W)
Recommended Power Control Device:	3 to 5 Amp delayed action circuit breaker

Note:
This is not a floating input. 28 VDC must be applied to the 28 VDC Power input and airframe ground to Power Ground input.

4.1.2 Chassis Ground

For redundant chassis ground connection only. Not to be used as a normal current carrying conductor.

Quantity:	1
Format:	DC Chassis Ground

4.1.3 ARINC 573/717 Digital Serial Bus Input

Quantity:	1
Format:	ARINC 573/717, HBP and BPRZ
Data Rate:	64/128/256/512/1024 WPS

4.1.4 ARINC 429 Digital Serial Bus Input

Quantity:	16
Format:	DITS, ARINC 429 Low or high speed
Low Speed Data Rate:	12.5 Kbps ± 1%
High Speed Data Rate:	100 Kbps ± 1%
SSM/SDI/Data Definition:	Software Selectable Protocols

4.1.5 ARINC 429 Digital Serial Bus Output

Quantity:	6
Format:	DITS, ARINC 429 Low or high speed
Low Speed Data Rate:	12.5 Kbps ± 1%
High Speed Data Rate:	100 Kbps ± 1%
SSM/SDI/Data Definition:	Software Selectable Protocols

4.1.6 RS-232/422 Digital Serial Bus

Four bi-directional serial ports are provided at the rear connector. Each serial port is individually software configurable for RS-232 or RS-422, and the following parameters:

Bus Speed (Min.):	Up to and Including 19.2 Kbps
Parity:	None, Odd, Even
Data Bits:	5, 6, 7, 8
Stop Bits:	1, 2
Flow Control:	None, Xon/Xoff, RTS/CTS

When a port is configured to RS-232, it conforms to the ANSI/TIA/EIA-232-F standard. When a port is configured to RS-422, it conforms to the TIA/EIA-422-B standard with the following additions:

Cable termination not required for typical applications (See TIA/EIA-422-B Annex A)

Maximum Transceivers on Bus:	20
Receiver Input Impedance:	12 KΩ

4.1.7 Ethernet

Quantity:	4
Format:	802.3 10BASE-T/100BASE-TX, half- and full-duplex modes (auto-negotiated) ARINC 664P2 Physical Layer

4.1.8 Discrete Inputs

Quantity:	16 Configurable
Input Impedance:	>10 kΩ
Fault Current:	<15 mA
DIN+ Voltage Range:	Logic High: 7.0 – 36.0 VDC Logic Low: 0 – 3.5 VDC
Pulse Width (Min):	100 ms

4.1.8.1 Configurable Inputs

Each configurable discrete input is individually software-configurable for the following:

- Signal Level: Open-Ground (Negative-Seeking) or Open-28V (Positive-Seeking)
- Logic Assignment: Active Low or Active High
- Function: Selected from list.

Refer to §7.13 for additional information on use of configurable inputs.

4.1.8.2 Remote Start Input

In addition to the configurable discrete inputs, a Remote Start discrete input (J1C-5) is provided as a Negative-Seeking (Open/Ground) Active Low input with appropriate internal pull-up functionality. Refer to §7.3 for a description of the Remote Start functions.

4.1.9 Discrete Outputs

Each discrete output transitions between an ‘Open Circuit’ (high-impedance-to-ground) and a ‘Closed Circuit’ (low-impedance-to-ground) state to indicate a change in output logic.

Quantity:	8 Configurable
‘Open Circuit’ Impedance:	>100 kΩ
‘Open Circuit’ Voltage (Max.):	36 VDC

'Closed Circuit' Current Limit (Min.):	500 mA
Voltage Across 'Closed Circuit':	<1.25 V

4.1.9.1 Configurable Outputs

The Discrete Outputs use 'Open-Closed' signal levels, where the output is either high-impedance to ground (Open) or low-impedance to ground (Closed). Each configurable discrete output is individually software-configurable for the following:

- Logic Assignment: Active Low (Closed) or Active High (Open)
- Function: Selected from list.

Refer to §7.14 for additional information on use of configurable outputs.

4.1.9.2 Fault Output

The FAULT output is assigned to two rear connector pins, each meeting the same electrical criteria as a configurable output with the following functions:

- The Normally Closed (N/C) FAULT output (J1B-13A) is "Closed Circuit to Ground" whenever any system fault is identified, including when the system is not powered.
- The Normally Open (N/O) FAULT output (J1B-13B) is "Open Circuit" (high impedance) whenever any system fault is identified, including when the system is not powered.

4.1.9.3 Chime Output

The CHIME output goes to the "Closed Circuit to Ground" active state whenever the system is providing an aural alert in the cockpit (e.g. incoming voice call). The CHIME output is assigned to one aircraft interface connector pin (J1B-14B) meeting the following criteria:

'Open Circuit' Impedance:	>100 kΩ
'Open Circuit' Voltage (Max.):	36 VDC
'Closed Circuit' Current Limit (Min.):	2 A
Voltage Across 'Closed Circuit':	<1.25 V

4.1.10 Two-Wire Phone

Quantity:	2
Format:	Standard 2-Wire Tip and Ring Loop
Loop Battery:	48 ±4 VDC
Ring Signal:	20 Hz ±10%, 90 ±10 VAC RMS
Hook Flash:	<700 ms
Load Impedance (Nom.):	600 Ω
Polarity Sensitivity:	None
Audio Band Pass:	300 – 3400 Hz

4.1.11 Microphone Input

Quantity:	1
Format:	Standard DO-214 Microphone Input
Dynamic Range:	20 mV to 1.5 V RMS
Input Impedance:	150 Ω ± 20%
Mic. Bias (No Load):	16 ± 0.5 V
Mic. Bias Ripple:	<1 mV RMS in the 300 – 3400 Hz band
Sidetone:	Provided by System to Interphone Output
Sidetone Level:	Software Configurable
Audio Band Pass:	300 – 3400 Hz

4.1.12 Interphone Output

Quantity:	1
Format:	Standard DO-214 Interphone Output
Rated Output Impedance:	<30 Ω across the frequency range 250 Ω without system powered
Rated Load Impedance:	50 Ω across the frequency range (capable of driving unbalanced load)
Output Power Capability:	>40 mW RMS into 600 Ω (software adjustable from 0.1 mW to max.) >210 mW RMS into 50 Ω
Output Power (As Shipped):	10 mW RMS into 600 Ω
Audio Band Pass:	300 – 3400 Hz

4.1.13 Iridium and GPS Antenna

Coaxial Cable Insertion Loss (Max.):	3 dB @ 1626.5 MHz

4.2 DMU Maintenance Connector (J2)

The AFIRS DMU provides an RJ-45 Maintenance Port connector on the front panel which provides for Ethernet connection to Ground Service Equipment (GSE) e.g. a laptop or Personal Computer with a standard web browser.

4.3 Aircraft Configuration Module

The ACM provides a 24-inch, color-coded, 4-conductor flying lead, which is terminated at the DMU rear connector (J1B) as per the following table:

Table 4-4 – ACM Connections

Color	Function	Termination – J1B (MP)
Orange/Violet	ACM Power	4J
Violet	ACM Ground	4K
Green/Violet	ACM Data	5J
Blue/Violet	ACM Clock	5K

4.4 ARINC 429 Receiver Protocols

4.4.1 ACARS Communications Management Unit

Source: ARINC 758 CMU — **Speed:** Configurable

Label	Parameter	Format	Transmit Rate	Core
172	Subsystem Identifier	SAL	1 s	✓
214	ICAO 24-Bit Aircraft Address Word 1	DISC	1 s	
216	ICAO 24-Bit Aircraft Address Word 2	DISC	1 s	
270	Status Output 1	DISC	1 s	✓
276	Status Output 2	DISC	1 s	✓
377	Equipment Identifier	BCD	1 s	

4.4.2 Airbus Centralized Fault Display System (CFDS)

Source: CFDIU — **Speed:** Configurable (Lo)

Label	Parameter	Format	Transmit Rate	Core
125	Time	BCD	1 s	✓
126	Flight Phase	BNR	1 s	
155	Aircraft Configuration	DISC	1 s	✓
156	Aircraft Type	DISC	1 s	✓
157	Aircraft Options	DISC	1 s	✓
233	Flight Number 1, 2	BNR/BCD	4 s (SA)[1] 5 s (LR)	

4.4.2 Airbus Centralized Fault Display System (CFDS)

Source: CFDIU | **Speed:** Configurable (Lo)

Label	Parameter	Format	Transmit Rate	Core
234	Flight Number 3, 4	BNR/BCD	4 s (SA)[1] 5 s (LR)	
235	Flight Number 5, 6	BNR/BCD	4 s (SA)[1] 5 s (LR)	
236	Flight Number 7, 8	BNR/BCD	4 s (SA)[1] 5 s (LR)	
237	Flight Number 9,10	BNR/BCD	5 s (LR)[1]	
260G	Date	BCD	1 s	✓
301	Aircraft Identification 1-3	ISO 5	4 s	✓
302	Aircraft Identification 4-6	ISO 5	4 s	✓
303	Aircraft Identification 7-9	ISO 5	4 s	✓
304	Fleet Identification, Aircraft Type	ISO 5	4 s	

Notes:
1. Airbus Single Aisle (SA) aircraft transmit Labels 233-236 every 4 seconds. Airbus Long Range (LR) aircraft transmit Labels 233-237 every 5 seconds.

4.4.3 Flight Management System – ARINC 702/A

Source: ARINC 702/A FMC | **Speed:** Configurable

Label	Parameter	Format	Transmit Rate	Core
010	Present Position – Latitude	BCD	500 ms	✓[2]
011	Present Position – Longitude	BCD	500 ms	✓[2]
012	Ground Speed	BCD	500 ms	✓[2]
013	Track Angle – True	BCD	500 ms	
015	Wind Speed	BCD	500 ms	
016	Wind Direction – True	BCD	500 ms	
061	Departure/Destination Airports (Dep1,2,3)	BNR	1 s	
062	Departure/Destination Airports (Dep4/Des1)	BNR	1 s	
063	Departure/Destination Airports (Des2,3,4)	BNR	1 s	
074	Zero Fuel Weight	BNR	1 s	
075	Gross Weight	BNR	200 ms	
125	Universal Coordinated Time (UTC)	BCD	200 ms	✓[2]

4.4.3 Flight Management System – ARINC 702/A

Source: ARINC 702/A FMC | **Speed:** Configurable

Label	Parameter	Format	Transmit Rate	Core
150	Universal Coordinated Time (UTC)	BNR	200 ms	✓[2]
206	Computed Airspeed	BNR	125 ms	
211	Total Air Temperature	BNR	500 ms	
213	Static Air Temperature	BNR	500 ms	
233	Flight Number (Characters 1,2)	BNR/BCD	1 s	
234	Flight Number (Characters 3,4)	BNR/BCD	1 s	
235	Flight Number (Characters 5,6)	BNR/BCD	1 s	
236	Flight Number (Characters 7,8)	BNR/BCD	1 s	
237	Flight Number (Characters 9,10)	BNR/BCD	1 s	
260[1]	Date / Flight Leg	BCD	1 s	✓
261	Flight Number	BCD	1 s	
270	Status Discretes	DISC	200 ms	
310	Present Position – Latitude	BNR	200 ms	✓[2]
311	Present Position – Longitude	BNR	200 ms	✓[2]
312	Ground Speed	BNR	50 ms	✓[2]
313	Track Angle – True	BNR	50 ms	
314	True Heading	BNR	50 ms	
315	Wind Speed	BNR	100 ms	
316	Wind Direction – True	BNR	50 ms	
317	Track Angle – Magnetic	BNR	50 ms	
320	Magnetic Heading	BNR	50 ms	
360	Flight Information	BNR	1 s	

Notes:

1. Because of the potential conflict between systems that could output either the year or the flight leg number in this word, only the day and month portions of the date are used.
2. Either the BNR or BCD label (not both) is required for Latitude, Longitude, Groundspeed and UTC.

4.4.4 Flight Management System – GAMA 429

Source: GAMA 429 FMC | **Speed:** Configurable

Label[1]	Parameter	Format	Transmit Rate	Core
012	Ground Speed	BCD	500 ms	✓[4]
074G	Data Record Header	BNR	Note 2	
075G	Active WPT From/To Data	DISC	Note 2	
113G	Message Checksum	BNR	Note 3	
125	Universal Coordinated Time (UTC)	BCD	200 ms	✓[4]
150	Universal Coordinated Time (UTC)	BNR	100 ms	✓[4]
203	Pressure Altitude	BNR	1 s	
204	Baro Corrected Altitude	BNR	62.5 ms	
210	True Airspeed	BNR	125 ms	
213	Static Air Temperature	BNR	500 ms	
260G	Date	BCD	1 s	✓
275G	Status Word	DISC	400 ms	
300G	Station Magnetic Dec. Type & Class	BNR	Note 3	
301G	Message Characters 7-9	BNR	Note 3	
302G	Message Characters 10-12	BNR	Note 3	
303G	Message Length / Type / Number	BNR	Note 3	
304G	Message Characters 1-3	BNR	Note 3	
305G	Message Characters 4-6	BNR	Note 3	
306G	NAV/WPT/AP Latitude	BNR	Note 3	
307G	NAV/WPT/AP Longitude	BNR	Note 3	
310	Present Position – Latitude	BNR	200 ms	✓
311	Present Position – Longitude	BNR	200 ms	✓
312	Ground Speed	BNR	50 ms	✓[4]
313	Track Angle – True	BNR	50 ms	
314	True Heading	BNR	50 ms	
315	Wind Speed	BNR	100 ms	
316	Wind Direction – True	BNR	100 ms	
320	Magnetic Heading	BNR	50 ms	
352G	Estimated Time to Destination	BNR	1 s	
371G	Equipment Identifier	DISC	1 s	

4.4.4 Flight Management System – GAMA 429

Notes:

1. Labels with a "G" suffix are defined in GAMA Publication No. 11.
2. These labels are transmitted once at the beginning of each flightplan/graphics map data transfer. Refer to GAMA Publication No. 11 for further information.
3. These labels are used to make up the individual records that comprise a flightplan/graphics map data transfer. Not all labels are transmitted with each record. Ten records are transmitted in one second. Refer to GAMA Publication No. 11 Addendum 3 for further information.
4. Either the BNR or BCD label (not both) is required for Groundspeed and UTC.

4.4.5 Flight Management System – CMA-9000

Source: FMC – General Broadcast Output Bus | **Speed:** Configurable

Label	Parameter	Format	Transmit Rate	Core
056	ETA – At Destination	BCD	1 s	
061	Departure/Destination Airports (Dep1,2,3)	BNR	1 s	
062	Departure/Destination Airports (Dep4/Des1)	BNR	1 s	
063	Departure/Destination Airports (Des2,3,4)	BNR	1 s	
074	Zero Fuel Weight	BNR	1 s	
075	Gross Weight	BNR	1 s	
076	GPS Altitude	BNR	1 s	
150	Universal Coordinated Time (UTC)	BNR	500 ms	✓
203	Pressure Altitude	BNR	500 ms	
204	Baro Corrected Altitude	BNR	500 ms	
205	Mach Number	BNR	1 s	
206	Computed / Indicated Airspeed	BNR	1 s	
210	True Airspeed	BNR	500 ms	
213	Static Air Temperature	BNR	1 s	
233	Flight Number (Characters 1,2)	BNR/BCD	1 s	
234	Flight Number (Characters 3,4)	BNR/BCD	1 s	
235	Flight Number (Characters 5,6)	BNR/BCD	1 s	
236	Flight Number (Characters 7,8)	BNR/BCD	1 s	
237	Flight Number (Characters 9,10)	BNR/BCD	1 s	
260	Date / Flight Leg	BCD	1 s	✓
261	Flight Number	BCD	1 s	

4.4.5 Flight Management System – CMA-9000

Source: FMC – General Broadcast Output Bus | **Speed:** Configurable

Label	Parameter	Format	Transmit Rate	Core
270	FMS Status Word 1	DISC	1 s	
310	Present Position – Latitude	BNR	500 ms	✓
311	Present Position – Longitude	BNR	500 ms	✓
312	Ground Speed	BNR	500 ms	✓
313	Track Angle – True	BNR	500 ms	
314	True Heading	BNR	500 ms	
315	Wind Speed	BNR	500 ms	
316	Wind Direction – True	BNR	500 ms	
317	Track Angle – Magnetic	BNR	500 ms	
320	Magnetic Heading	BNR	500 ms	

4.4.6 Basic DTP

Source: Generic Date/Time/Position Source | **Speed:** Configurable

Label	Parameter	Format	Transmit Rate	Core
150	Universal Coordinated Time (UTC)	BNR	1 s	✓
260G	Date	BCD	1 s	✓
310	Present Position – Latitude	BNR	200 ms	✓
311	Present Position – Longitude	BNR	200 ms	✓

4.4.7 Pro Line 4/21 – I/O Concentrator (GP Bus 5)

Source: IOC – GPBUS 5 | **Speed:** High

Label	Parameter	Format	Transmit Rate	Core
151	Universal Coordinated Time (UTC)	BNR	1 s	✓
203	Pressure Altitude	BNR	50 ms	
205	Mach Number	BNR	100 ms	
206	Computed / Indicated Airspeed	BNR	50 ms	
211	Total Air Temperature	BNR	400 ms	
261	Date	BCD	1 s	✓
310	Present Position – Latitude	BNR	200 ms	✓

4.4.7 Pro Line 4/21 – I/O Concentrator (GP Bus 5)

Source: IOC – GPBUS 5 **Speed:** High

Label	Parameter	Format	Transmit Rate	Core
311	Present Position – Longitude	BNR	200 ms	✓
312	Ground Speed	BNR	200 ms	✓
313	Track Angle – True	BNR	100 ms	
314	True Heading	BNR	100 ms	
315	Wind Speed	BNR	500 ms	
320	Magnetic Heading	BNR	19 ms	

4.4.8 Multi-Purpose Control Display Unit

Source: ARINC 739A MCDU **Speed:** Configurable

Label	Parameter	Format	Transmit Rate	Core
270	MCDU Normal Discrete Word	DISC	1 s	✓
377	Equipment Identifier	DISC	1 s	✓

4.4.9 Mode S Transponder

Source: ARINC 718A Mode S Transponder **Speed:** Configurable

Label	Parameter	Format	Transmit Rate	Core
203	Altitude	BNR	100 ms	
204	Baro Corrected Altitude	BNR	100 ms	
233	Flight ID (Characters 1,2)	BNR/BCD	1 s	
234	Flight ID (Characters 3,4)	BNR/BCD	1 s	
235	Flight ID (Characters 5,6)	BNR/BCD	1 s	
236	Flight ID (Characters 7,8)	BNR/BCD	1 s	
237	Flight ID (Characters 9,10)	BNR/BCD	1 s	
275	TCAS Control (Mode S Address Part 1)	DISC	100 ms	✓
276	TCAS Control (Mode S Address Part 2)	DISC	100 ms	✓

4.5 ARINC 429 Receiver Activity Status

Table 4-5 defines the criteria the AFIRS 228 Series uses for determining whether a receiver port is active. A bus is generally declared active when 4 consecutive words at the specified rate are received and declared inactive when 4 consecutive samples fail.

Table 4-5 – ARINC 429 Receiver Port Monitoring

Receiver	Activity Label	Min. Update Rate
ACARS	270	1 Hz
Airbus CFDS	125 / 260	1 Hz
FMS (A702/A, CMA-9000)	270 / 275	1 Hz
FMS (GAMA 429)	275	1 Hz
Basic DTP	310 / 311	1 Hz
PL4/21 GPBus5	310 / 311	1 Hz
A739 MCDU	270 / 377	1 Hz
Mode S Transponder	275	1 Hz

4.6 ARINC 429 Transmitter Protocols

4.6.1 ACARS Output Bus

Destin: ARINC 758 CMU			**Speed:** Configurable	
Label	**Parameter**	**Format**	**Transmit Rate**	**Update Rate**
172	Subsystem Identifier	SAL	1 s	–
270	Status Word	DISC	1 s	1 s

4.6.2 General Purpose Output Bus

Destin: Various			**Speed:** Configurable	
Label	**Parameter**	**Format**	**Transmit Rate**	**Update Rate**
172	Subsystem Identifier	SAL	1 s	–
270	Status Word	DISC	1 s	1 s
377	Equipment Identifier	BCD	1 s	–

4.6.3 A739 MCDU Output Bus

Destin: ARINC 739A MCDU			**Speed:** Configurable	
Label	**Parameter**	**Format**	**Transmit Rate**	**Update Rate**
172	Subsystem Identifier	SAL	1 s	–
377	Equipment Identifier	BCD	1 s	–

4.6.4 Airbus Centralized Fault Display System (CFDS) Output Bus

Destin: Airbus CFDIU			**Speed:** Configurable	
Label	**Parameter**	**Format**	**Transmit Rate**	**Update Rate**
354	LRU Identification	ISO-5	500 ms	–
356[1]	Fault Status	ISO-5	200 ms	1 s
377	Equipment Identifier	BCD	1 s	–

Notes:

1. Label 356 is only transmitted when the system is in Operational or Maintenance mode and there are no active failures or faults.

5. INSTALLATION CONSIDERATIONS

This section provides information on the installation considerations for each of the AFIRS 228 Series system components.

5.1 Data Management Unit (DMU)

The DMU is housed in an ARINC 600 2MCU enclosure, which is designed to be mounted in a standard ARINC 600 mounting tray. Figure 5-1 shows a typical ARINC 600 2MCU tray used for the AFIRS DMU.

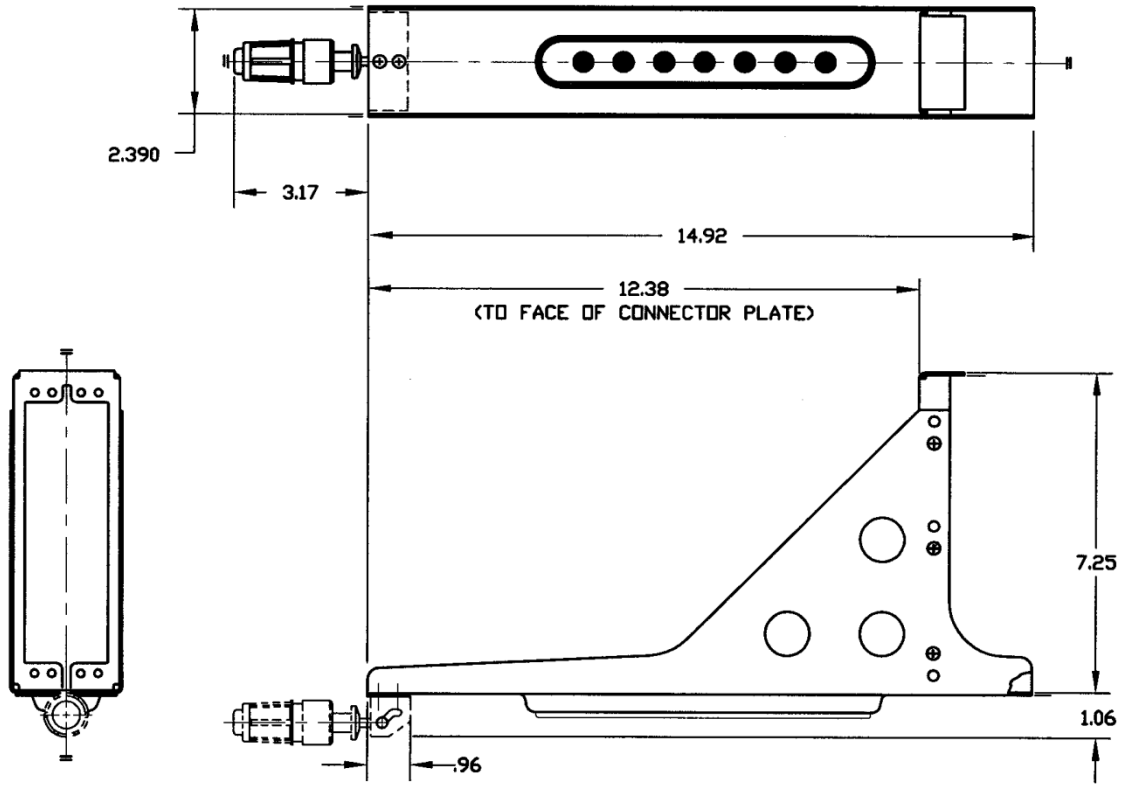


Figure 5-1 – 2MCU Mounting Tray

While the DMU does not require forced-air cooling, every attempt should be made to place the DMU in a benign and well-ventilated environment. Placing the DMU on a plenum shelf in the Electronics Bay of the aircraft and using a mounting tray that provides cooling air to the DMU is preferred.

The DMU tray should be electrically bonded to the airframe (<10 milliohms). It is recommended that the DMU be located where easy front panel access is available to facilitate replacing the flash card or connecting to the Maintenance Port.

5.2 Aircraft Configuration Module (ACM)

The ACM can be mounted on or near the DMU tray within 24 inches of the DMU rear connector. The ACM should be electrically bonded to the airframe (<10 milliohms). It is recommended that the ACM be located to provide easy access to the cover if ever the SIM card requires replacement. Refer to Figure 3-2 for the ACM mounting footprint.

5.3 AFIRS Antenna System

The AFIRS 228 Series system has a single combined Iridium/GPS RF connection on the rear interface connector, which is to be connected to a single combined Iridium/GPS Antenna. The antenna system is comprised of all the components from the rear interface connector up to and including the antenna. The total gain of the antenna system must be greater than 0 dB at 1626.5 MHz (measured at the antenna zenith).

Most Iridium antennas have a gain of +3 dBic at the zenith; therefore the maximum attenuation in the rest of the antenna system must be less than 3 dB. If an antenna with a different gain is selected, the maximum loss of the rest of the antenna system must be adjusted accordingly.

5.3.1 Antenna

The antenna is to be selected by the system integrator to be suitable for the installed aircraft environment. See §3.3 for antenna selection criteria.

5.3.2 Antenna Location

The antenna must be mounted in a location with a clear view of the sky. The typical mounting location is on top of the fuselage as close to the AFIRS DMU as possible.

The AFIRS antenna should be kept a minimum of 5 feet from GPS antennas and a minimum of 3 feet from all other antennas, unless analyses and tests demonstrate that there is no mutual interference when separation is reduced.

If the aircraft is equipped with a high-gain INMARSAT Satcom system (e.g. Aero-I, Aero-H, etc.), the separation between the high-gain INMARSAT antenna and the AFIRS antenna must be maximized, preferably >45 feet. Typically, a filter is also required to mitigate the interference from the INMARSAT system (ref. §5.3.5).

If the aircraft is equipped with a low-gain INMARSAT Satcom system (e.g. Aero-C, Sat-AFIS, etc.), the separation between the low-gain INMARSAT antenna and the AFIRS antenna should be at least 10 feet. Typically, a filter is also required to mitigate the interference from the INMARSAT system (ref. §5.3.5).

5.3.3 Antenna Mounting

The system integrator is responsible to mount the antenna to the airframe using methods that meet all of the applicable airworthiness requirements. If the antenna is mounted off the centerline of the fuselage (e.g. to avoid a stringer) or on a surface that is not parallel with the longitudinal axis of the aircraft (e.g. a fairing), a shim should be used to keep the antenna tilt angle to 5° or less in both the lateral and longitudinal axes for optimal performance.

The antenna must be installed in a manner that prevents harmful levels of lightning energy from entering the AFIRS system through the coaxial cable. This is can be accomplished by selecting

an antenna that has been tested for direct lightning effects in accordance with DO-160, and then electrically bonding the antenna to the airframe (<10 milliohms).

For metal airframes, this can be accomplished by direct metal-to-metal contact between the antenna, the mounting shim (if used) and the airframe. The airframe structure should not be painted, and fay sealing should not be used between the antenna, the shim, and airframe. For mounting on non-metallic fairings, a low-impedance ground plane (minimum 6-inches wide) should be provided to the adjacent metallic structure.

For composite airframes, refer to the airframe manufacturer's instructions for acceptable methods to install the AFIRS antenna.

5.3.4 Coaxial Cable

The coaxial cable used between the rear interface connector and the antenna is a critical component of the antenna system. The coaxial cable must meet all the environmental and flammability requirements applicable to the Electrical Wiring Interconnection System (EWIS) of the given aircraft. It must also minimize signal attenuation.

Large diameter low-loss cables cannot be connected directly to the ARINC 600 Size 5 contact on the AFIRS rear electrical connector, so a stub coaxial cable is often required. Shelf disconnect panels on modern transport category aircraft provide a convenient location to transition from the stub coaxial cable to the low-loss cable. It is recommended that cable breaks be kept to a minimum, as each connection typically adds approximately 0.1 dB of insertion loss.

FLYHT recommends the following coaxial cable types be used in aircraft installations. Alternate cables and connectors that meet the attenuation and EWIS requirements are also acceptable.

Table 5-1 – Coaxial Cable Types

Cable Part Number	Vendor	Attenuation (dB/100 ft)	Size 5 Contact	TNC Bulkhead	TNC Connector	90° TNC Connector
310701	ECS	3.9	—	BTS002	CTS002	CTR002
310801	ECS	4.6	—	BTS022	CTS022	CTR022
311201	ECS	6.7	—	BTS122	CTS122	CTR122
311501	ECS	9.1	P922	BTS922	CTS922	CTR922
S22089	PIC	4.5	—	190421	190409	190408
S55122	PIC	6.6	—	190621	190609	190608
S33141	PIC	8.6	190303	190321	190308	190309

Cable Part Number	Vendor	Attenuation (dB/100 ft)	Size 5 Contact	TNC Bulkhead	TNC Connector	90° TNC Connector
TFLX480-100	Emteq	4.8	—	TFS488-2	TMS488-1	TMR488-1
TFLX410-100	Emteq	5.2	—	TFS410-2	TMS410-1	TMR410-1
TFLX295-100	Emteq	7.6	—	TFS295-2	TMS295-1	TMR295-1
TFLX165-100	Emteq	17.0	A65165-1	TFS165-2	TMS165-1	TMR165-1

For example, a cable installation consisting of a P922 contact, 2 feet of 311501 cable, a BTS922 connector mated to a CTS022 connector, 30 feet of 310801 cable, and a CTR022 connector would result in:

0.10 + 0.18 + 0.10 + 1.38 + 0.10 = 1.86 dB attenuation

FLYHT recommends that every effort be made to minimize cable attenuation, as this improves the link margin and performance of the satellite system. When the aircraft is also equipped with an INMARSAT Satcom system, keeping the antenna system attenuation below 2.0 dB (1.0 dB for the filter and 1.0 dB for the coaxial cable) significantly improves the mitigation of interference.

5.3.5 INMARSAT Filter

When the aircraft is also equipped with an INMARSAT Satcom system, a filter is generally required to be installed in the AFIRS antenna system to mitigate the interference from the INMARSAT system. These filters generally have an insertion loss of 1.0 – 1.2 dB and this must be taken into account in the total antenna system attenuation calculation.

Due to the complexities associated with concurrent Iridium and INMARSAT system installations, FLYHT recommends that system integrators who are planning these types of installations contact FLYHT's Engineering Department for guidance and assistance.

6. INSTALLATION MATERIALS

In addition to the AFIRS 228 Series LRUs (DMU and ACM), the materials described in this section are generally required as part of a typical AFIRS 228 Series system installation.

Note:
The system integrator is responsible to ensure that all installation materials used meet the regulatory requirements for the intended aircraft installation environment.

6.1 Required Materials

- ARINC 600 2MCU mounting tray
- ARINC 600 Size 2 connector, with contacts
- ARINC 600 ground block, with contacts
- AFIRS antenna (ref. §3.3)
- Antenna coaxial cable(s) (ref. §5.3.4)
- System interface wiring (ref. §7)

The following table provides typical part numbers for installation materials.

Table 6-1 – Installation Materials

Description	Part Number	Vendor	Qty.
Mounting Tray, No Cooling	6012-102	ECS	1
Mounting Tray, Plenum	6064-102		
Connector, ARINC 600	NSXN2P201S0004	Radiall	1
Connector[1], ARINC 600, With #6-32 Clinch Nuts	NSXN2P201S0104		
Contact, #12 Reduced Barrel	620 341	Radiall	5
Contact, ARINC 600 Size 5	P922	ECS	1
Ground Block[1], ARINC	RBGP48-116N (Souriau) S280W601-116 (Boeing)	Burndy (Souriau)	1
Contact, Ground Block	M39029/1-101	–	50

Notes:
1. Connector with clinch nuts cannot be used in conjunction with ARINC ground block.

6.2 Additional Materials

Depending on the architecture of the systems being interfaced to, the following materials may be required.

- AFIRS FAULT Annunciator (ref. §7.4)
- AFIRS Status Annunciators (ref. §7.14 and §7.15)
- AFIRS Control Switches (ref. §7.13 and §7.15)

7. SYSTEM INTERFACE WIRING

This section provides information on the system interface wiring required for the AFIRS 228 Series System.

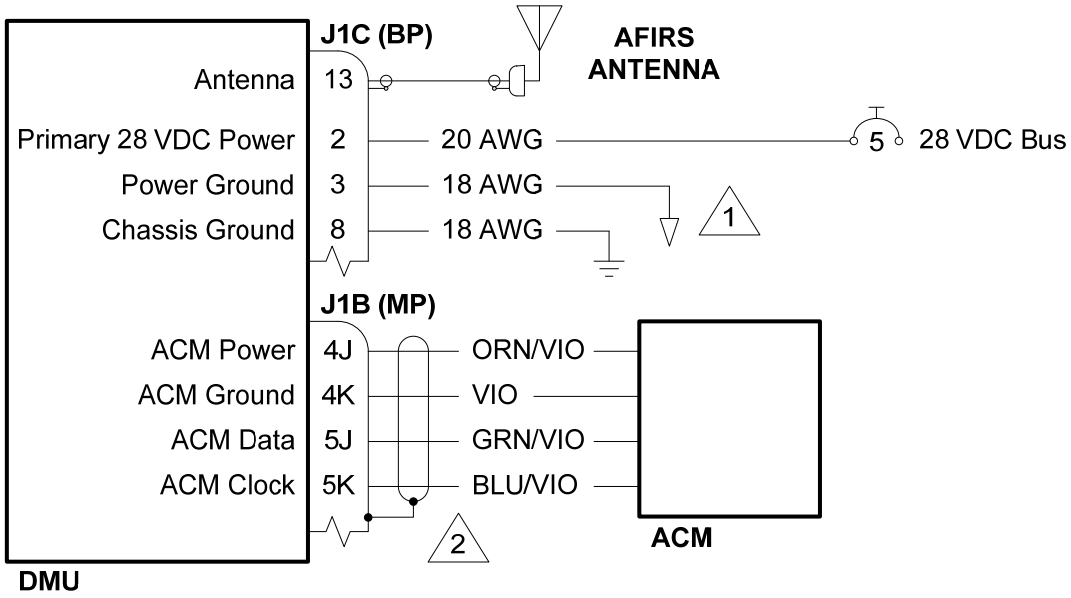
7.1 General

All wire types and installation practices must comply with the EWIS requirements for the aircraft (ref. FAR 26 Subparts B & D). Unless otherwise noted, minimum wire size is 22 AWG for standard copper wire or 24 AWG for high strength copper alloy wire.

Terminate all shields at ground block or ground stud on DMU tray. Keep shield drains and unshielded conductor lengths as short as practicable (<3").

7.2 Primary Power, Antenna, and ACM

The primary power, antenna, and ACM connections shown in Figure 7-1 are required for all AFIRS 228 system installations. The system will start and continue to operate whenever power (20.5 – 32.2 VDC) is available at the Primary Power Input pin (J1C-2).



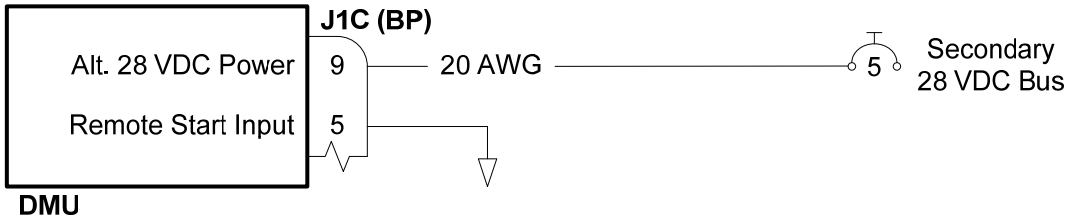
Notes:

1. Discard Size 12 contacts supplied with connector and use Size 12 Reduced Crimp Barrel contacts (Radiall P/N 630 341) instead. Alternately, standard Size 12 contacts may be used, but then the wire size must be increased to 16 AWG minimum.
2. ACM cable may be trimmed to length as required. Terminate as shown.

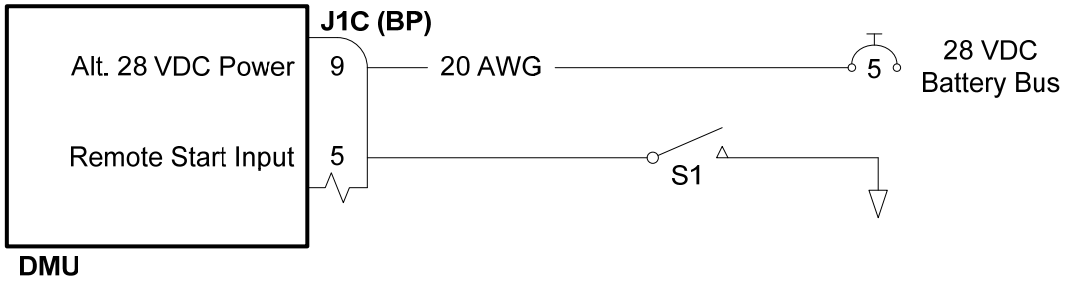
Figure 7-1 – Primary Power, Antenna and ACM Interface

7.3 Alternate Power

Alternate Power and Remote Start are optional connections (see Figure 7-2). When power is applied to the Alternate Power Input pin (J1C-9) and the Remote Start Input pin (J1C-5) is held in the Active Lo state for >100 ms, the system will run on the Alternate Power. If both the Primary and Alternate power sources are available, the system will use the Primary Power Input.



Alternate Power – Redundant Power Supply



Alternate Power – Remote Start

Figure 7-2 – Alternate Power Interface

7.3.1 Redundant Power Supply

One use of the Alternate Power Input is to provide redundant power supply to the AFIRS system. In this scenario, the Primary Power Input can be connected to a 28 VDC Main Bus and the Alternate Power Input connected to a Secondary Bus, Battery Bus, or dedicated AFIRS battery pack. The Remote Start Input is connected to ground. The AFIRS will operate on the Primary Power Input, but if Primary Power is lost, the system will continue to operate from the Alternate Power Input.

A software-configurable timer can be used to automatically shut the AFIRS system down after a specified time (0 – 30 minutes). The timer can also be set to “Always On”.

7.3.2 Remote Start

Another use of the Alternate Power Input is to provide remote start capability to the AFIRS system. In this scenario, the Primary Power Input can be connected to a 28 VDC Main Bus and the Alternate Power Input connected to a Battery Bus or dedicated AFIRS battery pack. When a

momentary ground (<100 ms) is applied to the Remote Start Input, the system will start and operate from the Alternate Power Input.

The software-configurable timer can be used to automatically turn the system off if Primary Power is not provided in the specified time. One use of this configuration is to monitor Auxiliary Power Unit (APU) start times. If the Remote Start Input is connected to the APU start logic, the AFIRS will start when the APU starts. Even if the main aircraft power is not turned on, the AFIRS can log the APU start event and advise operators if an APU is left running for an extended time.

7.4 Fault Indicator

The system integrator should provide an AFIRS FAULT indication in the cockpit. This may be provided by an ARINC 429 interface to a centralized crew alerting system, or by using a discrete Fault output from the AFIRS. The AFIRS 228 provides two separate fault outputs, a normally closed (N/C) and a normally open (N/O).

7.4.1 Fault Output (N/C)

The N/C fault output provides a ground whenever there is a system fault, including if the system is not powered. This is the preferred output for most installations. See Figure 7-3.

Figure 7-3 – Fault (N/C) Interface

7.4.2 Fault Output (N/O)

The N/O fault output provides an open circuit whenever there is a system fault, including if the system is not powered, and provides a ground when there is no fault. This interface is primarily intended for backwards compatibility for retrofit of existing AFIRS 220 systems. See Figure 7-4.

Figure 7-4 – Fault (N/O) Interface

7.5 Flight Data Monitoring

The AFIRS 228 may be connected to an ARINC 573/717 databus in the aircraft for monitoring and recording information on this databus. This interface is software-configurable to support 64, 128, 256, 512, and 1024 WPS data rates, as well as Harvard Bi-Phase or Bipolar-Return-To-Zero encoding. See Figure 7-5.

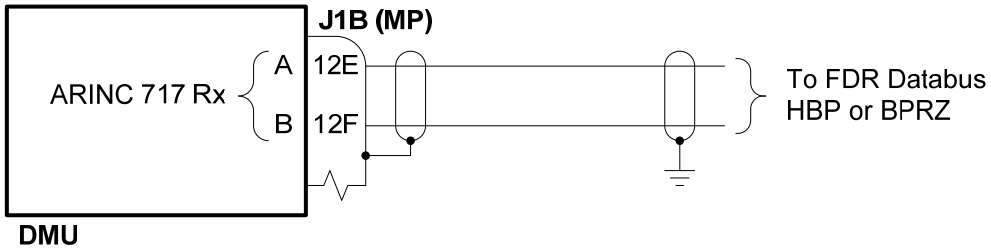


Figure 7-5 – ARINC 717 Interface

7.6 ARINC 429 Interfaces

The AFIRS 228 has 16 ARINC 429 receive ports and 6 ARINC 429 transmit ports. Each port is software-configurable for high or low speed, and the receive ports are also individually software-configurable for odd, even or no parity checking. (The transmit ports always transmit odd parity.)

7.6.1 Receiver Protocols

Each of the ARINC 429 receivers can be configured in software for the proper protocol of the external aircraft system to which it is interfaced. Below is a list of the available ARINC 429 receiver protocols. (See §4.4 for the label specifications for each receiver protocol.) Once a protocol (except “None” or “Generic 429”) is selected for any given receive port, it is no longer available for assignment to any of the other ports.

- None
- Generic 429
- ACARS 1
- ACARS 2
- Airbus CFDS
- FMS 1 – A702/A, GAMA 429, CMA-9000, Basic DTP
- FMS 2 – A702/A, GAMA 429, CMA-9000, Basic DTP
- FMS 3 – A702/A, GAMA 429, CMA-9000
- PL4/21 GPBUS5 1
- PL4/21 GPBUS5 2
- A739 MCDU 1

- A739 MCDU 2
- A739 MCDU 3
- Mode S Transponder 1
- Mode S Transponder 2

When an input is not connected to an active system (e.g. no connection, or wiring provisions only are installed), the port should be configured as “None” to avoid triggering nuisance bus inactivity faults.

7.6.2 Transmitter Protocols

Each of the ARINC 429 transmitters can be configured in software for the proper protocol of the external aircraft system to which it is interfaced. Below is a list of the available ARINC 429 transmitter protocols. (See §4.6 for the label specifications for each transmitter protocol.) Once a protocol (except “None”) is selected for any given port, it is no longer available for assignment to any of the other ports.

- None
- ACARS (AFIRS 228S Only)
- GP Bus 1
- GP Bus 2
- GP Bus 3
- GP Bus 4
- A739 MCDU
- Airbus CFDS

7.7 MCDU

If an ARINC 739A MCDU is installed, MCDU 1 should be connected to ARINC 429 Tx 1 and ARINC 429 Rx 1. For MCDU 2 and 3, ARINC 429 Rx ports 2 and 3 are used in Figure 7-6 below, but any Rx port from 2 to 16 may be used.

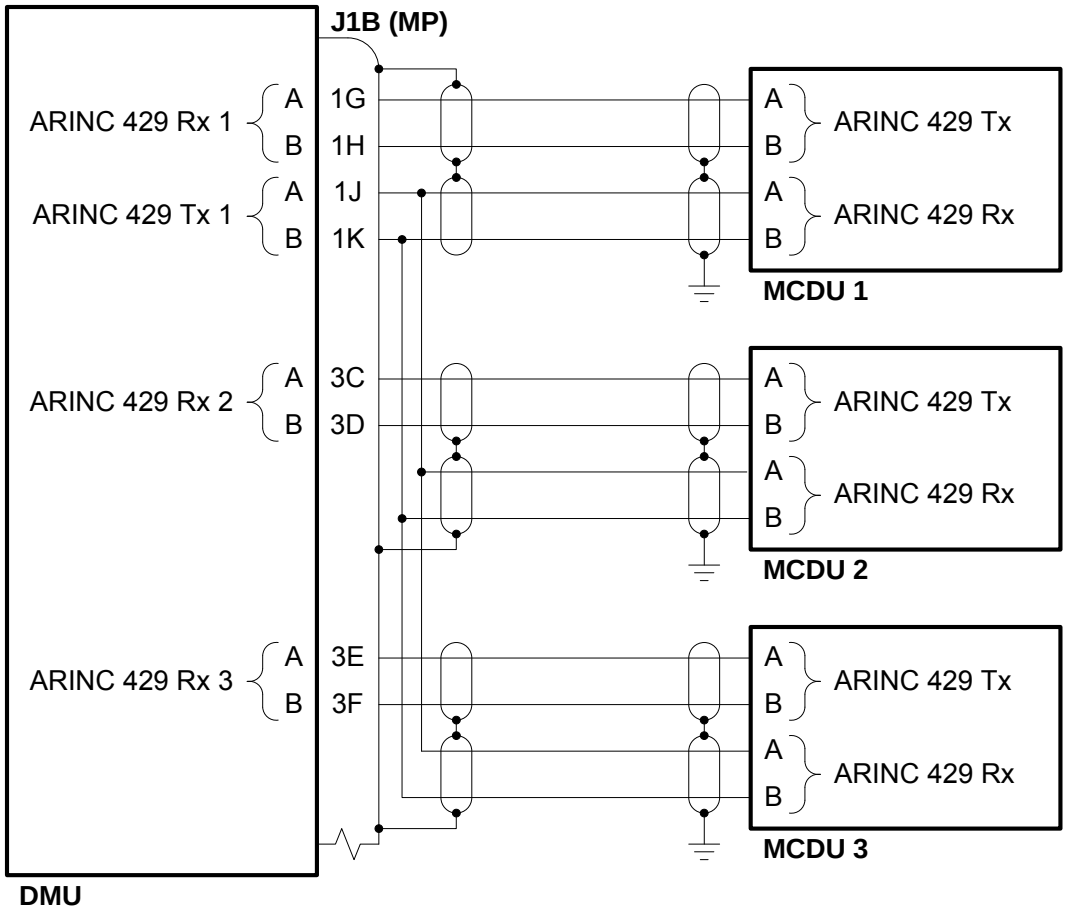


Figure 7-6 – MCDU Interface

7.8 ICAO Address

The AFIRS 228 uses the aircraft's ICAO address as the primary method of identifying the originating aircraft for non-safety services reports it sends to Uptime. It is therefore important that the correct ICAO address be available from one of the following sources. (The sources are listed in the order of priority used by the AFIRS 228.)

- ACARS CMU 1
- ACARS CMU 2
- Mode S Transponder 1
- Mode S Transponder 2
- Owner Requirements Table (ORT) stored in the ACM

While it is not required for the AFIRS 228 to receive the ICAO address from a CMU or Mode S Transponder (manually programming the ORT with the correct ICAO address will provide proper system functionality), using at least one of these interfaces ensures that the AFIRS 228 is using the same ICAO address that is programmed into the other aircraft systems.

Whenever the AFIRS 228 detects that the ICAO address from the interfaced system is different than that stored in the ORT and that the new address is valid (i.e. not 000000 or FFFFFF), it will automatically update the ICAO address stored in the ORT with the new address. If the aircraft's registration is ever changed (and the CMU and/or Mode S Transponder addresses are re-strapped accordingly), no additional maintenance tasks are then required for the AFIRS 228 to use the new ICAO address.

The system integrator may use none or any combination of the four external system interface options, depending on the availability of compatible system interfaces and the degree of redundancy desired.

7.8.1 ACARS CMU

The ACARS ARINC 429 Tx interface will provide safety-services data functionality for the AFIRS 228S, but it is 'provisions-only' for AFIRS 228B. It is recommended that the wires be capped and stowed near the connectors as shown. ARINC 429 Rx ports 4 and 5 are shown in Figure 7-7 below, but any Rx port from 2 to 16 may be used.

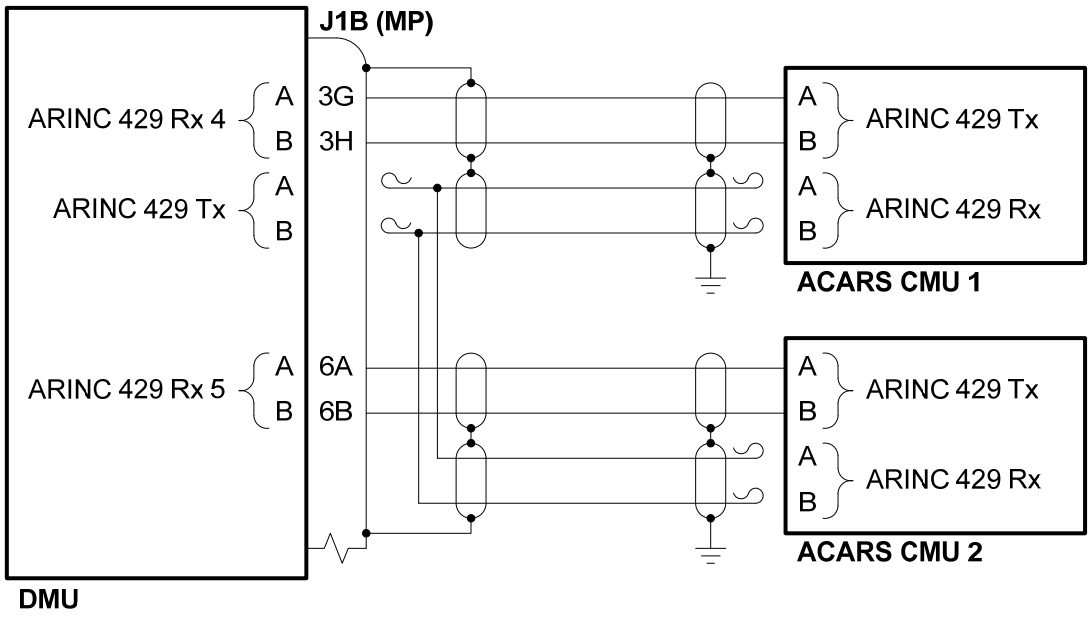


Figure 7-7 – ACARS Interface

7.8.2 Mode S Transponder

ARINC 429 Rx ports 6 and 7 are shown in Figure 7-8 below, but any Rx port from 2 to 16 may be used.

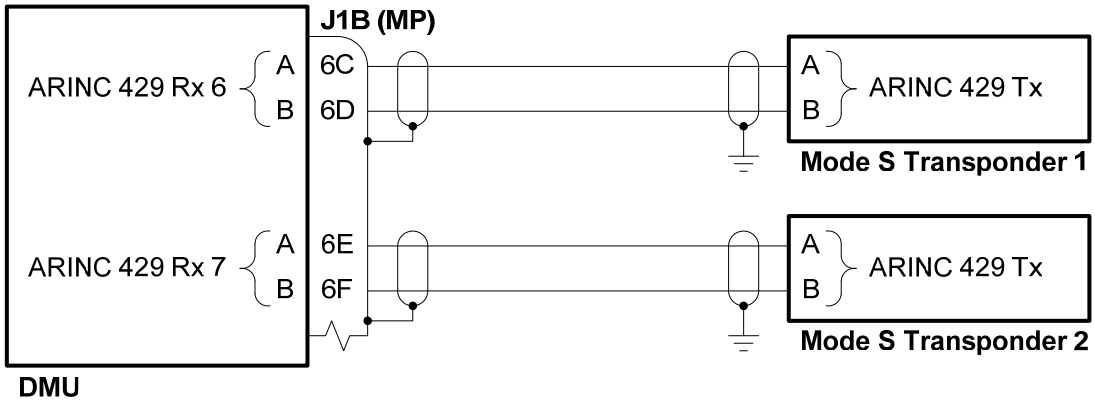


Figure 7-8 – Mode S Transponder Interface

7.9 Date, Time and Position

The AFIRS 228 uses date, time and position information for numerous purposes, including information tags attached to various reports and events. Date, time and position information can be provided by the following sources. (The sources are listed in the order of priority used by the AFIRS 228.)

- External Source 1 (FMS, GPS, etc.)
- External Source 2 (FMS, GPS, etc.)
- External Source 3 (FMS, GPS, etc.)
- Internal GPS

While it is not required for the AFIRS 228 to receive date, time and position information from any external sources, doing so provides a more robust system design and it is recommended that at least one external position source be connected if a compatible system interface is available.

The system integrator may use none or any combination of the three external system interface options, depending on the availability of compatible system interfaces and the degree of redundancy desired. The ARINC 429 Receiver table in Appendix A identifies the ARINC 429 receiver protocols that AFIRS can use for DTP information.

7.10 Generic ARINC 429 Interfaces

The “Generic 429” protocol allows customizable software components in the AFIRS to access raw ARINC 429 data from systems whose label definitions are not predefined. Connection and use of generic ARINC 429 interfaces should only be done in conjunction with FLYHT engineering support.

The General Purpose Output Bus protocol may be used to provide AFIRS 228 status information to other aircraft systems (e.g. EICAS, ECAM, CMC, etc.) Presently, none of these interfaces have been tested by FLYHT, and the system integrator must coordinate with FLYHT engineering support prior to using this transmitter protocol.

7.11 RS-232/422 Databus

The AFIRS 228 has four serial ports (transmit and receive). Each port is software-configurable for RS-232 or RS-422 mode. The speed, data bits, parity, stop bits, and flow control settings for each port are also software-configurable. See Figure 7-9.

Each serial port is assigned 5 pins on the rear connector. The function of these pins is dependent on whether RS-232 or RS-422 mode is being used.

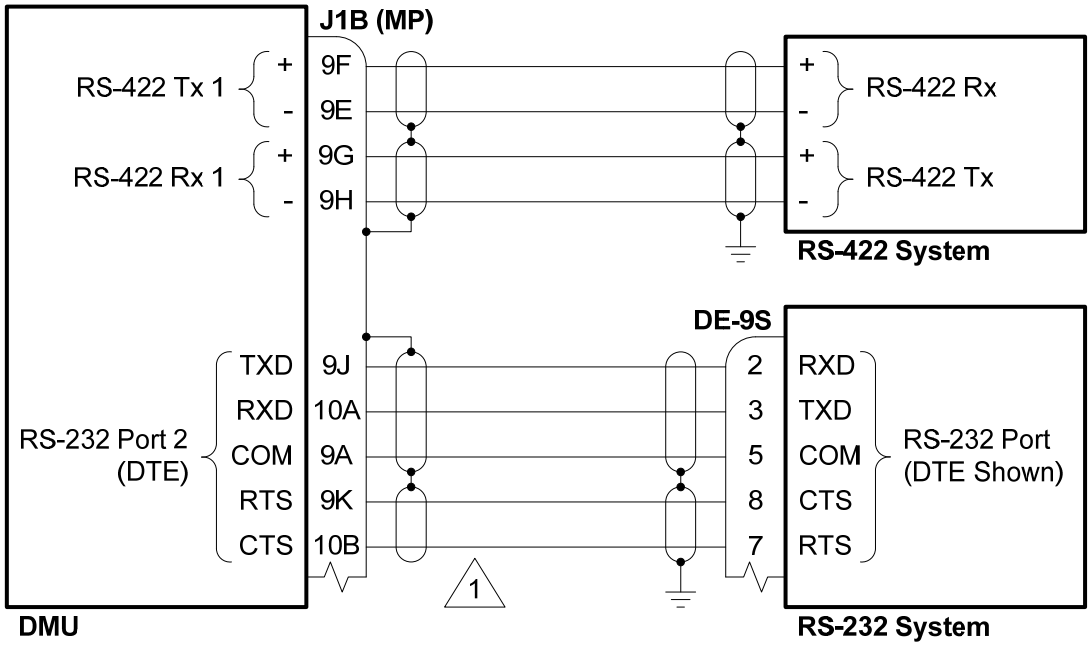
Table 7-1 – Serial Port Pin Assignments

RS-232	RS-422	Port 1	Port 2	Port 3	Port 4
TXD	Tx-	9E	9J	10C	10G
RTS	Tx+	9F	9K	10D	10H
RXD	Rx+	9G	10A	10E	10J
CTS	Rx-	9H	10B	10F	10K
Com	Not Used	7J	9A	9B	7K

When configured for RS-232 mode, the serial ports support software (Xon/Xoff) and hardware (RTS/CTS) handshaking. If hardware handshaking is not being used, the RTS and CTS pins do not need to be connected.

Each of the serial ports can be configured in software for the proper protocol of the external aircraft system to which it is interfaced. Below is a list of the available protocols. Once a protocol (except “None” or “Generic”) is selected for any given port, it is no longer available for assignment to the other ports. Unused serial ports should be configured as “None”.

- None
- Generic
- EFB 1
- EFB 2
- EFB 3



Notes:

1. If the system interface does not require or support hardware flow control, the RTS and CTS connections are not required.

Figure 7-9 – Serial Port Interface

7.12 Ethernet

The AFIRS 228 has four Ethernet ports (see Figure 7-10). Each port can auto-negotiate the best speed (10/100) and mode (full/half duplex). Port 1A is reserved for future use and is currently not configurable. Ports 2B, 3B, 4B and the Maintenance Port are connected to a second subnet through an internal managed switch.

The installation design should consider that the IP settings for Port 1A will be different than those for Ports 2B, 3B, and 4B. Therefore, when identical configuration settings for a group of devices are desired, they should all be connected to Ports 2B, 3B and 4B. For example, if EFB 1 and EFB 2 were connected to Ports 1A and 2B respectively, they would need to be configured with different IP settings. If the device locations were exchanged (which would be common for Class 2 EFBs), neither EFB connections would work until the EFBs were reconfigured. In this scenario, the preferred design would be to connect the EFBs to Ports 2B and 3B, making their IP configurations identical. Now if the device locations were swapped, both EFBs connections would still work without the need to reconfigure the devices.

A 4-conductor Ethernet cable that meets the aircraft's EWIS requirements must be used. The rear connector pin layout provides slightly better noise immunity with a star-quad cable construction, but a twisted-pair cable construction can generally also be used. For star-quad

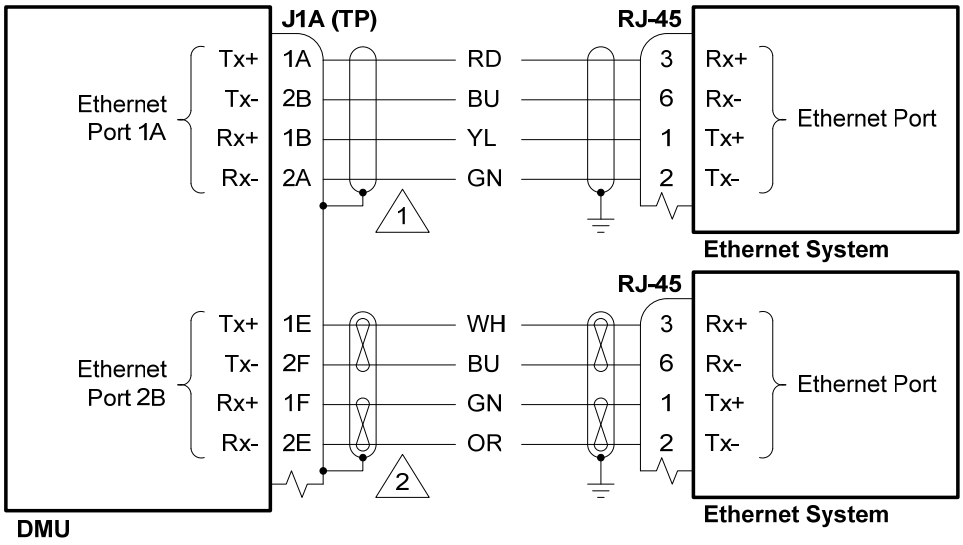
cables, the conductor lay order should be maintained without crossing the conductors when terminating. For twisted-pair construction, the conductor twists should be maintained right up to the rear connector. In either case, the best noise immunity is obtained by keeping the strip length of the shield as short as physically possible, preferably <0.25 inches.

PIC P/N E51424 and ECS P/N 422404 are examples of aircraft-quality star-quad Ethernet cables that are typically suitable for use. PIC P/N E40424 and ECS P/N 922404 are examples of aircraft-quality twisted-pair Ethernet cables that are typically suitable for use.

Each of the Ethernet ports can be configured in software for the proper protocol of the external aircraft system to which it is interfaced. Below is a list of the available protocols.

- None
- Not Monitored
- Monitored

Unused Ethernet ports should be configured as “None”. A “Monitored” port is one where the AFIRS expects to see an active link and it will generate an error report if the Ethernet link to the external system is not available. For example, if the AFIRS is connected by Ethernet to a Class 2 EFB that is routinely turned off and stowed for take-off and landing, the port should be configured as “Not Monitored” or the AFIRS will generate a nuisance fault whenever the EFB is not powered.



Notes:

1. PIC P/N E51424 (star-quad) example shown. Keep outer jacket and shield strip length as short as physically possible (ideally <0.25") and maintain conductor lay (no twists) all the way up to the connector. Refer to ARINC 664P2 Appendix K for star-quad cabling considerations.
2. PIC P/N E40424 (twisted-pair) example shown. Keep outer jacket and shield strip length as short as physically possible (ideally <0.25") and maintain conductor twists all the way up to the connector.

Figure 7-10 – Ethernet Interface

7.13 Discrete Inputs

The AFIRS has 14 configurable Discrete Inputs, each of which is software-configurable for Open-Ground or Open-28V signaling levels, Active High or Active Low logic, and the assigned function.

7.13.1 Weight-On-Wheels Input

Discrete Input No. 1 (Din 1) is dedicated for use as a Weight on Wheels (WOW1) input. When there is only one WOW input (i.e. the WOW2 function is not assigned to a Discrete Input; see §7.13.4) and the 'WOW1' input transitions to the active state, the AFIRS is signaled that the aircraft is on the ground, and the inactive state indicates that the aircraft is in the air.

WOW1 (Din 1) is only an Open-Ground input; it cannot be configured as an Open-28V input. A Hardware Programming Pin (HPP) is provided to set whether the WOW1 input is Active High or Active Low. If the WOW HPP pin (J1B-11F) is not connected, WOW1 is configured as an Active Low input, i.e. Ground = On Ground. If the WOW HPP pin is connected to ground, WOW1 is configured as an Active High input, i.e. Ground = In Air.

If one of the configurable Discrete Inputs is configured for the WOW2 function (see §7.13.4), the following logic is used to determine the aircraft's Air-Ground status:

- When the 'WOW1' discrete input is in the active state (as configured by the WOW HPP strapping) and the 'WOW2' discrete input is in the active state (as defined by the ICT setting for the discrete input configured as 'WOW 2'), the aircraft is considered as 'Weight On Wheels'.
- When any of the WOW discrete inputs are in the inactive state, the aircraft is considered as 'Weight Off Wheels'.

7.13.2 Signal Level Configuration

Each configurable Discrete Input is software-configurable for 'Open-Ground' or 'Open-28V' signaling levels.

When configured as 'Open-Ground', the input is pulled-up to 28V internally (High State) and applying a ground input (<3.5 V) transitions the input to the Low State.

When configured as 'Open-28V', the input is pulled-down to 0V internally (Low State) and applying a voltage signal to the input (>7.0 V) transitions the input to the High State.

7.13.3 Logic Configuration

Each configurable Discrete Input is software-configurable for 'Active Low' or 'Active High' signaling levels. See Table 7-2.

When configured as 'Active Low', the function is considered to be active when the input is in the Low State (<3.5V).

When configured as 'Active High', the function is considered to be active when the input is in the High State (>7.0V).

Table 7-2 – Discrete Input Configurable States

Electrical Characteristic	Logic Assignment	Description
Negative-Seeking (Open-Ground) Pulled Up to 28 V	Active Low	The input function is considered to be in its active state when the input is in the 'Logic Low' voltage range (<3.5 V).
	Active High	The input function is considered to be in its active state when the input is in the 'Logic High' voltage range (>7.0 V).
Positive -Seeking (Open-28 V) Pulled Down to 0 V	Active High	The input function is considered to be in its active state when the input is in the 'Logic High' voltage range (>7.0 V).
	Active Low	The input function is considered to be in its active state when the input is in the 'Logic Low' voltage range (<3.5 V).

7.13.4 Function Assignment

Each configurable Discrete Input can be configured in software to assign the input's function. Once a function (except "None" and "Generic Discrete") is selected for any given input, it is no longer available for assignment to any of the other inputs. See Figure 7-11.

The 'Mic On', 'End Call', and 'Chime Reset' functions are used in conjunction with the Extension 1 audio interface and are discussed in §7.15.1.1 below.

Discrete Input No. 1 (Din 1) is dedicated as a Weight on Wheels (WOW1) input. Only Discrete Inputs Din 2 through Din 15 are software-configurable.

None

When an input is not connected to an active system (e.g. no connection, or wiring provisions only are installed), the input should be configured as "None".

Generic Discrete

The "Generic Discrete" function allows customizable software components in the AFIRS to access raw discrete input data from systems whose input functions are not predefined. Connection and use of generic discrete input interfaces should only be done in conjunction with FLYHT engineering support.

Cabin Lock

When 'Cabin Lock' is selected, cabin voice extensions are prevented from initiating a voice call, and if any voice call is in progress on a cabin extension, it is terminated. This input is only needed if there are cabin extensions being installed (Extensions 2 and/or 3) and the system integrator wants to provide the flight crew with the means to disable them.

The 'Cabin Lock' discrete will toggle the cabin lock function between the inactive and active states only when the discrete input transitions from the inactive state to the active state, e.g. this would be accomplished by a momentary switch used to turn the 'Cabin Lock' function on and off on subsequent button presses. At system power up in this mode, the input resets to the inactive state (Cabin Active).

Note:
Cabin Lock functionality is also provided on the MCDU interface. A Cabin Lock discrete input is only required if the system integrator wants to provide Cabin Lock functionality and there is no MCDU, or if the system integrator wants to use a discrete input instead of the MCDU interface.

Event

When the 'Event' input transitions to the active state (momentary switch), it provides an indication to the AFIRS system that a noteworthy event has been identified by the flight crew. The AFIRS system can use the 'Event' input to perform custom pre-defined functions, so its use needs to be coordinated with FLYHT engineering support.

Iridium Off

The functionality of this discrete input can be configured by the operator to be either 'All Off' or 'Data Off'. When configured for 'All Off' and the 'Iridium Off' input goes active, all voice and data transmissions over the Iridium modems are inhibited (all Iridium voice and data services are turned off and the AFIRS does not emit any RF energy). When configured for 'Data Off' and the 'Iridium Off' input goes active, only data transmissions over the Iridium modems are inhibited (Iridium voice services and data receipt functions remain operational). When 'Iridium Off' is deselected, normal Iridium functions will occur.

The Iridium Off discrete will toggle the 'Iridium Off' function between the inactive and active states only when the discrete input transitions from the inactive state to the active state, e.g. this would be accomplished by a momentary switch used to turn the 'Iridium Off' function on and off on subsequent button presses. At system power up in this mode, the input resets to the inactive state (Iridium On).

Note:
Iridium Off functionality is also provided on the MCDU interface. Iridium Off discrete input is only required if the system integrator wants to provide Iridium Off functionality and there is no MCDU, or if the system integrator wants to use a discrete input instead of the MCDU interface.

Park Brake

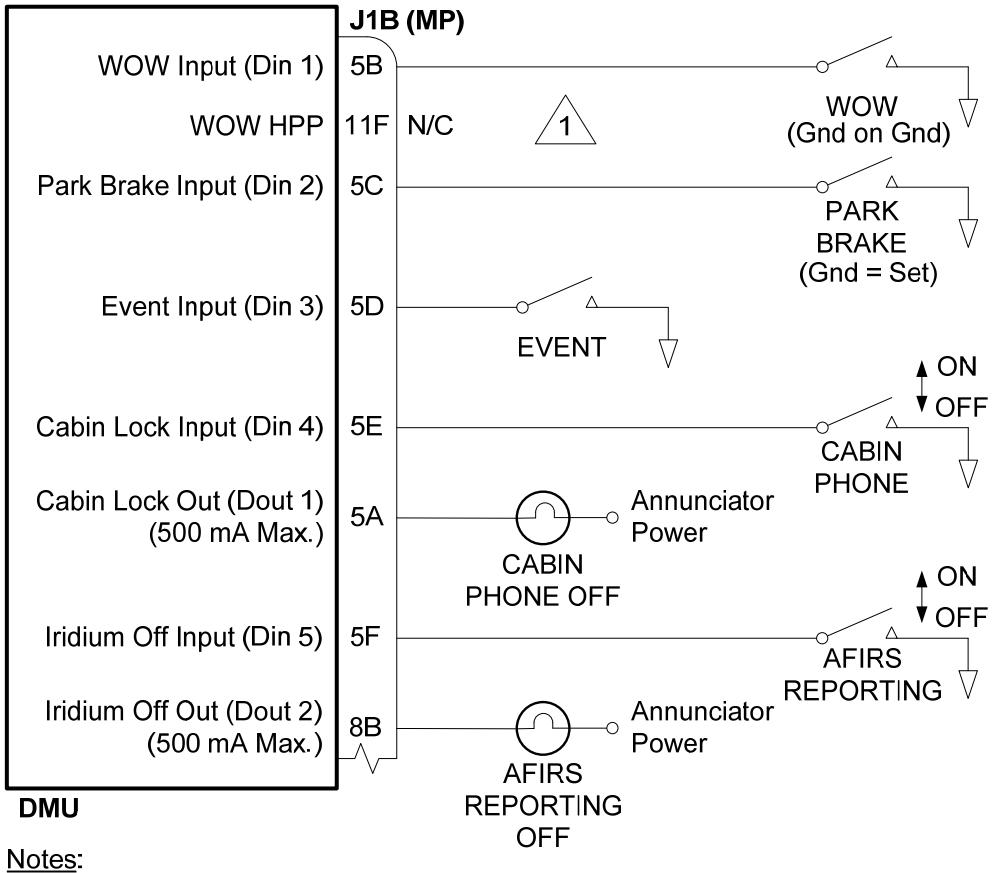
A 'Park Brake' input should be provided to the AFIRS whenever possible, either from one of the digital databuses or using a discrete input. For the discrete input, when the 'Park Brake' input transitions to the active state, the AFIRS is signaled that the aircraft's park brake is set, and the inactive state indicates that the aircraft's park brake is released (not set).

System Reset

When the 'System Reset' input transitions to the active state (momentary switch), it commands the system to perform a reset. This function is not commonly used in aircraft installations, but it is available if needed.

Weight on Wheels (WOW2)

A second Weight-On-Wheels input may optionally be provided to the AFIRS system. Refer to §7.13.1 for the logic used when a 'WOW2' input is provided.



Notes:

1. The sample Discrete Inputs shown use the 'Active Low' and 'Open/Ground' configuration settings. The sample Discrete Outputs shown use the 'Active Low' configuration setting.

Figure 7-11 – Discrete Input and Output Interfaces

7.14 Discrete Outputs

The AFIRS has 8 configurable Discrete Outputs, each of which is software-configurable for Active High or Active Low logic and the assigned function. The Discrete Outputs use 'Open-Closed' signal levels, where the output is either high-impedance to ground (Open) or low-impedance to ground (Closed).

Once a function (except "None") is selected for any given output, it is no longer available for assignment to any of the other outputs.

7.14.1 Logic Configuration

Each Discrete Output is software-configurable for ‘Active Low’ or ‘Active High’ signaling levels.

When configured as ‘Active Low’ and the assigned function goes active, the output will be in the Low State (<1.25V to ground). When the assigned function goes inactive, the output will be in the High State (Open Circuit).

When configured as ‘Active High’ and the assigned function goes active, the output will be in the High State (Open Circuit). When the assigned function goes inactive, the output will be in the Low State (<1.25V to ground).

7.14.2 Function Assignment

Each Discrete Output can be configured in software to assign the output’s function. Once a function (except “None”) is selected for any given output, it is no longer available for assignment to any of the other outputs.

The ‘Call Light’ function is used in conjunction with the Extension 1 audio interface and is discussed in §7.15.1.1 below. The ‘Ext 2 Call’ and ‘Ext 3 Call’ functions are used in conjunction with the Extension 2 and 3 audio interfaces and are discussed in §7.15.3 below.

None

When an output is not connected to an active system (e.g. no connection, or wiring provisions only are installed), the output should be configured as “None”.

Cabin Lock

The ‘Cabin Lock’ output reports the state of the ‘Cabin Lock’ function. This output can be used to illuminate an annunciator when the ‘Cabin Lock’ function is active.

GPS Link

The ‘GPS Link’ output reports the loss of valid data from all of the system’s Date-Time-Position (DTP) sources. This includes the external DTP sources (e.g. FMSs) as well as the internal GPS satellite link. This output can be used to illuminate an annunciator whenever there are no DTP sources available. Note that this output may be active whenever the AFIRS antenna does not have a clear view of the sky and the external DTP sources are not able to provide valid DTP information (e.g. the aircraft is in a hangar).

Iridium Off

The ‘Iridium Off’ output reports the state of the ‘Iridium Off’ function. This output can be used to illuminate an annunciator when the ‘Iridium Off’ function is active.

ISVM Link

The ‘ISVM Link’ output reports the status of the internal Iridium voice modem satellite link. This output can be used to illuminate an annunciator whenever the ISVM cannot receive satellite signals. Note that this output will be active whenever the AFIRS antenna does not have a clear view of the sky (e.g. the aircraft is in a hangar).

ISDM Link

The ‘ISDM Link’ applies only to the AFIRS 228S. This output reports the status of the internal Iridium safety-service data satellite link. This output can be used to illuminate an annunciator whenever the ISDM cannot receive satellite signals. Note that this output will be active whenever the AFIRS antenna does not have a clear view of the sky (e.g. the aircraft is in a hangar).

Text Msg

The ‘Text Msg’ output indicates that the AFIRS text messaging service has received a new message. This output can be used to illuminate an annunciator when a new text message is received.

7.15 Satcom

This section describes the interface and integration requirements for the AFIRS 228 Series system with a Satcom system.

7.15.1 Audio Integrating System

Extension 1 is generally intended to be connected to the aircraft’s audio integrating system for flight crew use. The interfaces required to fully support this functionality vary significantly depending on the design of the audio integrating system. Generally, the MCDUs are used for control and display of the Satcom functions for Extension 1.

7.15.1.1 Audio Discrete Signals

There are 3 discrete inputs and 2 discrete outputs that can be used to support the integrated audio interface.

Mic On Input

The ‘Mic On’ function can be configured for either ‘Switched PTT’ (momentary switch) or ‘Latched ACP’ (alternate action switch) mode.

When the ‘Mic On’ input is configured for ‘Switched PTT’, Voice Extension 1 (Mic/Phone input) will answer an incoming call when the ‘Mic On’ input transitions to the active state. Once a call is in progress, the microphone audio channel will function as long as the ‘Mic On’ input is in the active state. If a call is in progress and the ‘Mic On’ input toggles to the inactive state, the microphone audio input will be muted. In this mode, the ‘Mic On’ input does not terminate a call in progress.

When the ‘Mic On’ input is configured for ‘Latched ACP’, Voice Extension 1 (Mic/Phone input) will answer an incoming call when the ‘Mic On’ input transitions to the active state. Once a call is in progress, the microphone audio channel will function as long as the ‘Mic On’ input is in the active state. If a call is in progress and the ‘Mic On’ input toggles to the inactive state, the call will be terminated.

For outgoing calls when the ‘Mic On’ input is configured for ‘Latched ACP’, the function is dependent on which control source is configured for Extension 1. When an MCDU is the Extension 1 dialing control, setting the ‘Mic On’ input to the active state will initiate the dialing process using the phone number preselected on the MCDU. When a DTMF Dial Pad is the Extension 1 dialing control, setting the ‘Mic On’ input to the active state indicates an off-hook event so that DTMF dialing can begin.

End Call Input

When a call is in progress and the ‘End Call’ input transitions to the active state (momentary switch), Voice Extension 1 (Mic/Phone input) will terminate the call in progress. This input is often used to terminate a call when the ‘Mic On’ input is configured for ‘Switched PTT’ mode. Additionally, the ‘End Call’ input can be used to reject an incoming call, regardless of whether the ‘Mic On’ input is configured for ‘Switched PTT’ or ‘Latched ACP’.

Call Light Output

The ‘Call Light’ output is software configurable for either steady or flashing lights. When an incoming voice call is ringing, the ‘Call Light’ output will transition to the active state; either in a steady state or flashing at approximately a 1 Hz rate. When the incoming call is subsequently answered, the ‘Call Light’ output will remain active in the steady state as long as the call is in progress. When the call in progress is terminated, the ‘Call Light’ output will go inactive.

Chime Output

The ‘Chime’ output is software configurable for either single-stroke or multi-stroke. When an incoming voice call starts ringing, the ‘Chime’ output will transition to the active state and then the inactive state; either once (single-stroke) or on and off until the call is answered or the ‘Chime Reset’ input goes active (multi-stroke).

The time that the ‘Chime’ output is active and inactive is configurable in the ICT. The default settings of 500 ms on and 500 ms off provide an ARINC 741/761 compliant output. However, if a chime device such as a Sonalert is being used, the default times are too short. A chime active setting of 2.5 to 3.0 seconds and a corresponding inactive setting that produces the desired repetition rate may be more suitable, depending on the characteristics of the actual device being used.

Chime Reset Input

When an Iridium voice call is ringing and the ‘Chime Reset’ input transitions to the active state (momentary switch), the ‘Chime’ output will be reset (i.e. transition to the inactive state) for the remainder of the time that the incoming call is ringing. This input is typically only required if the ‘Chime’ output is used and it is configured for multi-stroke chime.

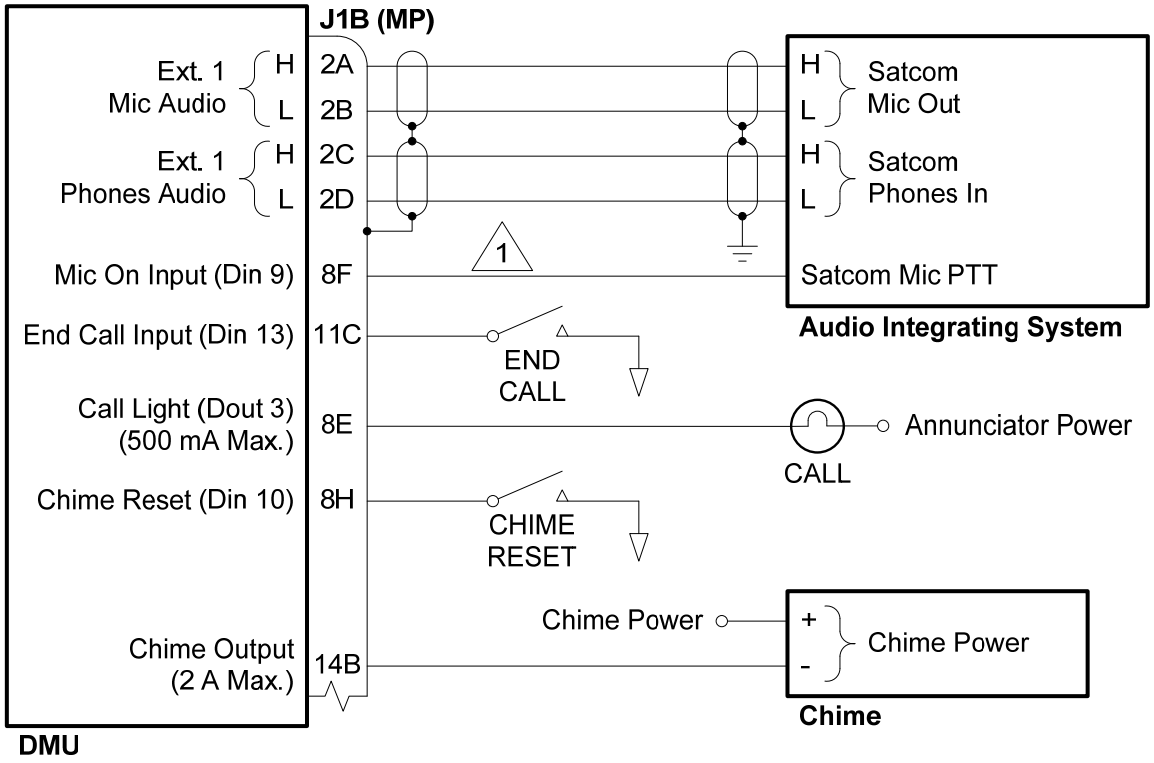
Note:
When ‘Chime Reset’ is applied, the chime is silenced but the function of the Call Light output is unaffected.

7.15.1.2 Switched PTT Configuration

If the Audio Integrating System provides a momentary Push-To-Talk (PTT) output, the following interface can be used. When an incoming call is ringing and the PTT is keyed, the call will be answered. Once the call is established, the PTT must be keyed for the microphone audio to be

transmitted. The End Call switch is used to end the call. Calls can also be answered and terminated on the MCDU screen, if available.

The Call Light, Chime and Chime Reset interfaces can be used to provide visual and aural annunciations in the cockpit. The system integrator should design the visual and aural call indications to be consistent with the aircraft's cockpit design philosophy. See Figure 7-12.



Notes:

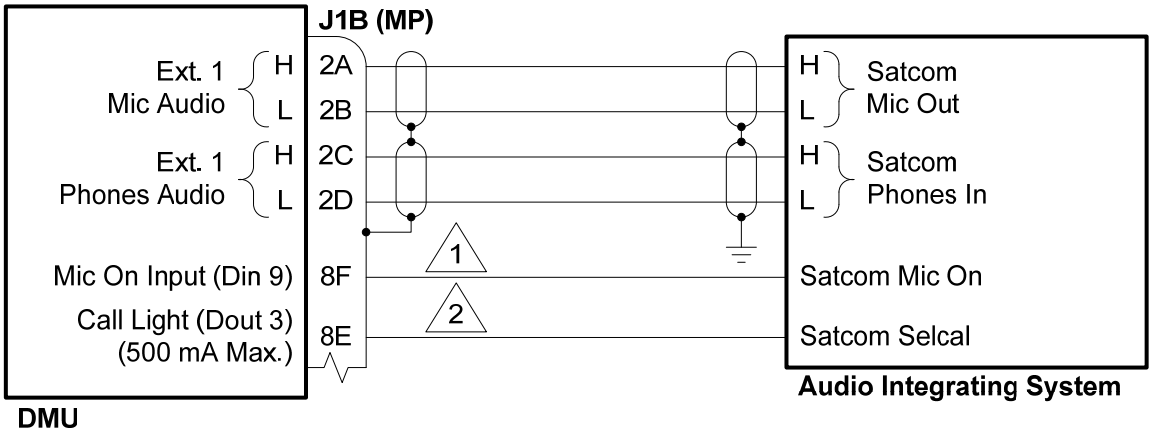
1. When the Audio Integrating System provides a momentary PTT signal, the Mic On Config must be set to "Switched PTT". A momentary End Call switch is required for this configuration.

Figure 7-12 – Switched PTT Audio Interface

7.15.1.3 Latched ACP Configuration

If the Audio Integrating System provides a latched Mic On output, the following interface can be used. When an incoming call is ringing and the Satcom switch on the Audio Control Panel is pressed, the call will be answered and microphone audio will always be live. The Satcom switch on the Audio Control Panel is pressed a second time to end the call. Calls cannot be answered and terminated on the MCDU screen in this configuration.

The following diagram also shows how the Call Light output can be interfaced to an Audio Integrating System that provides Satcom visual and aural call indications. In this case, a Call Light, Chime and Chime Reset switch are not required. See Figure 7-13.



Notes:

1. When the Audio Integrating System provides a latched Mic On signal, the Mic On Config must be set to “Latched ACP”. An End Call switch is not required for this configuration.
2. If the Audio Integrating System provides Satcom visual and aural annunciations, the Call Light output can be used to control these. The Call Light/Chime Config should be set to “Steady/ Single-Stroke”.

Figure 7-13 – Latched ACP Audio Interface

7.15.2 DTMF Dialing Source

If a compatible MCDU is not available in the aircraft, a 2-wire dial pad may be used to provide control and display of the Satcom functions for Extension 1. The following figure shows a typical dial pad installation. Refer to the applicable dial pad manufacturer’s installation instructions for proper wiring connections.

The Call Light, Chime and Chime Reset interfaces are optional, and can be used to provide visual and aural annunciations in the cockpit. The system integrator should design the visual and aural call indications to be consistent with the aircraft’s cockpit design philosophy. See Figure 7-14.

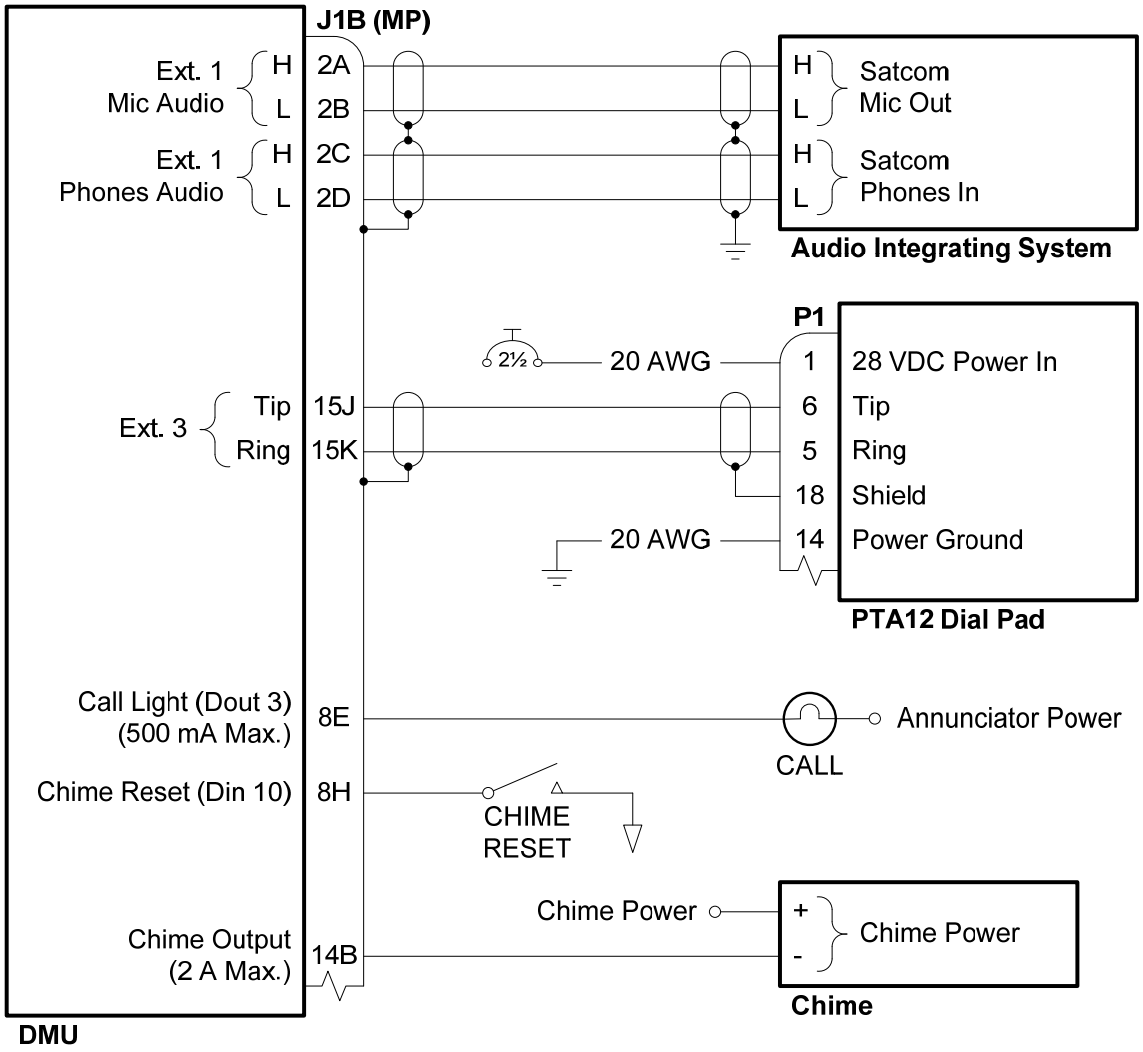


Figure 7-14 – Dial Pad Interface

7.15.3 Satcom Handsets

The AFIRS 228 can connect with up to two handsets. Any aviation-quality handset with a 2-wire POTS interface (meeting the specifications of §4.1.10) may be used.

The handsets are generally intended for cabin crew use. A handset is not recommended for use in the cockpit, as the integrated audio interface is preferred. The following diagram shows a typical cordless base station interfaced to Extension 2 and a regular handset to Extension 3, but either handset type may be used at either extension. Refer to the applicable handset manufacturer's installation instructions for proper wiring connections.

If Extension 3 is used as a DTMF dialing source for the Extension 1 audio interface, then only Extension 2 is available for connection to a handset.

Call Lights for Extensions 2 and 3 may be located near the respective handset to provide an additional visual indication that the extension is ringing. Their use is optional and at the system integrator's discretion. Discrete outputs 4 and 5 are shown, but any of the configurable discrete outputs may be used. See Figure 7-15.

Ext 2 Call

The 'Ext 2 Call' output can be configured for either steady or flashing lights. When a voice call on Extension 2 is ringing, the 'Ext 2 Call' output will transition to the active state; either in a steady state or flashing at a 1 Hz rate. When the incoming call is subsequently answered, the 'Ext 2 Call' output will remain active in the steady state as long as the call is in progress on Extension 2. When the call in progress is terminated, the 'Ext 2 Call' output will go inactive.

Ext 3 Call

The 'Ext 3 Call' output can be configured for either steady or flashing lights. When a voice call on Extension 3 is ringing, the 'Ext 3 Call' output will transition to the active state; either in a steady state or flashing at a 1 Hz rate. When the incoming call is subsequently answered, the 'Ext 3 Call' output will remain active in the steady state as long as the call is in progress on Extension 3. When the call in progress is terminated, the 'Ext 3 Call' output will go inactive.

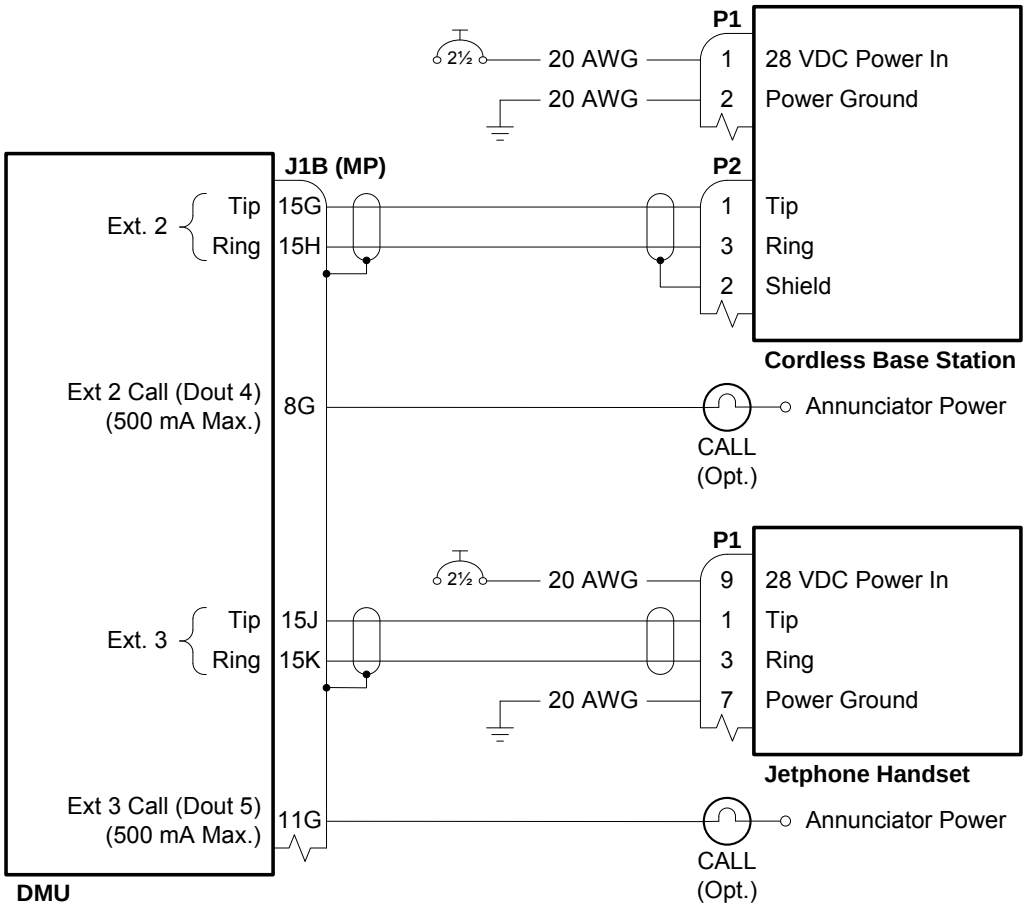


Figure 7-15 – Handset Interface

8. SYSTEM CONFIGURATION

You configure the AFIRS system via the Maintenance Port using a laptop, web browser, and the AFIRS 228 Series maintenance program which has a graphical user interface (GUI).

IMPORTANT: This manual provides information on how to connect to the Maintenance Port and access the AFIRS maintenance program. It also provides general information on the steps required to configure and update the AFIRS system. Detailed information on how to operate the maintenance program and troubleshoot the operation of the AFIRS system is provided in the AFIRS 228 Series, Automated Flight Information Reporting System's Operator's Manual, document number 250-0022.

The AFIRS 228 Series has an Ethernet interface for the Maintenance Port connection. An RJ-45 Maintenance Port jack is located behind the access door on the front panel of the DMU as shown in Figure 8-1.

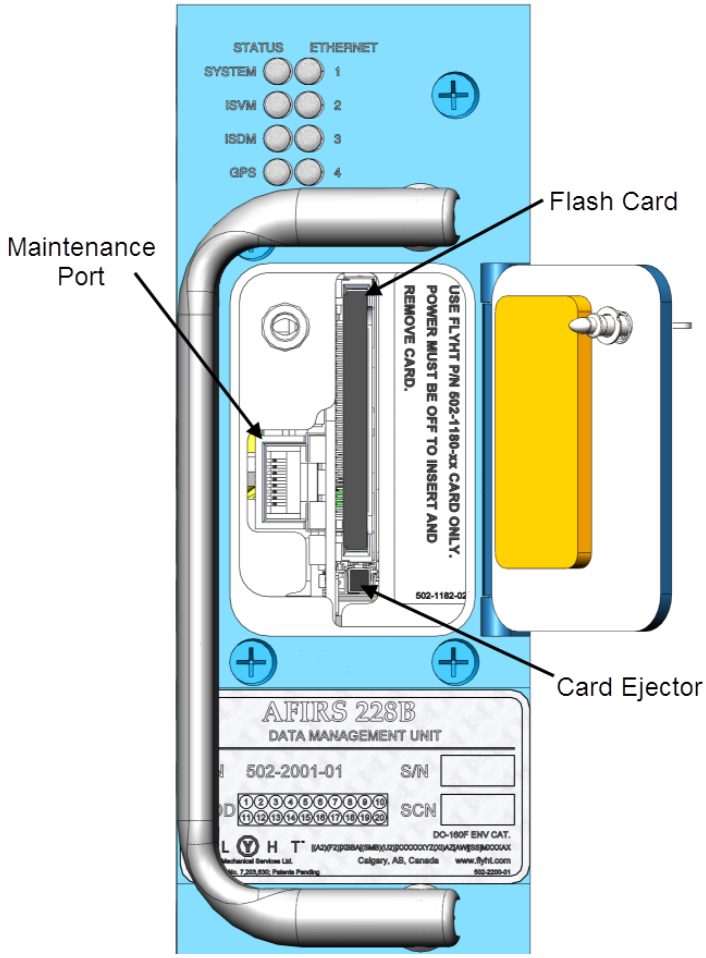


Figure 8-1 – Maintenance Port Location

Note:
When performing the initial configuration of an installed system, perform and complete the Before Power-On Tests in section 9.1 before applying power to the AFIRS system.

8.1 Connecting to the Maintenance Port

You access the AFIRS 228 Maintenance Program by connecting an Ethernet cable to the Maintenance Port of the AFIRS 228 unit. Alternatively, as described in section 7.12, one of the rear connector Ethernet ports can be used to provide an additional Maintenance Port connection in the aircraft (e.g. in the cockpit) so that system maintenance activities can be performed in a location remote from the AFIRS 228 Data Management Unit (DMU).

Also, if an Electronic Flight Bag (EFB) with a supported web browser installed is connected to one of the rear Ethernet port connections, the EFB can be used as an AFIRS maintenance terminal and a laptop is not required.

To connect to the Maintenance Port and access the Maintenance Program:

1. On the AFIRS 228 unit, open the front panel access door.
2. Connect an Ethernet cable to the Maintenance Port. AFIRS 228 system power may be on or off.
3. Connect the other end of the Ethernet cable to a laptop that is running a web browser.

Note:
The laptop network adapter must be set to DHCP to access the IP address. FLYHT has tested Internet Explorer 8, Firefox 7 and 9, and Google Chrome 16 (or later versions) with the AFIRS 228.

4. If not already powered, apply power to the AFIRS DMU.
5. Confirm that the green link light (adjacent to Maintenance Port RJ45 connector) is illuminated, either steady or flashing (a flashing link light indicates that data is being transmitted).
6. Open a web browser on the laptop and in the Address bar type the following IP address:

   192.168.128.1

   The AFIRS 228 Home page appears with the **General** tab information displayed.

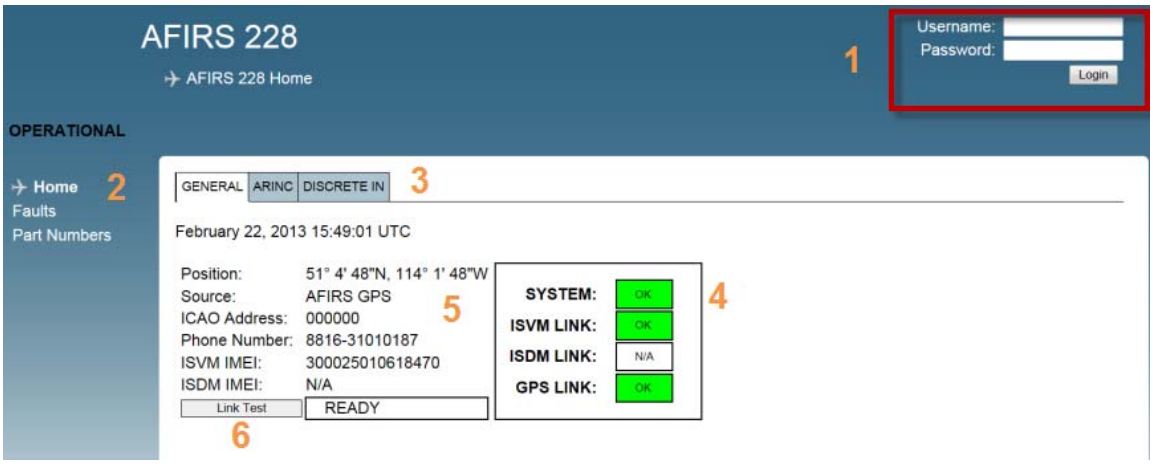


Figure 8-2 – Home Page – General Tab

The **Home** page (see Figure 8-2) displays three main areas of information:

1. Login area
2. Menu of available links to pages accessible in current login mode of operation
3. Status tabs: **General**, **ARINC**, and **Discrete In**

Upon login, the default view opens to the **General** tab (see Figure 8-2) which displays the following information:

4. System status data display area
5. System information data display area
6. Link test (user activated) used to test the connection to the Uptime Server

For information on the other two **Home** page tabs (**ARINC** and **Discrete In**) see section 8.1.1.

8.1.1 Home Page Tab Descriptions

The **General** tab page displays:

- **UTC Date and Time**: This is correlated to a GPS clock if you have a fixed GPS link. If no link is available a default date will be displayed.
- **Position**: This is the AFIRS GPS position. If no GPS is fixed, No GPS will be displayed.
- **ICAO Address**: This field displays the aircrafts ICAO address. The address is configured at system setup by the installer (must be in Maintenance Installer mode).
- **Phone Number**: Displays the aircraft phone number.
- **ISVM IMEI**: Iridium Satellite Voice Modem International Mobile Equipment Identity.
- **ISDM IMEI**: Iridium Satellite Data Modem: Not available in this release.
- **Link Test**: This is an active selection which is used to verify a link between a registered AFIRS 228 unit and the FLYHT Uptime Server. When Link Test is selected a packet of information transmitted to the FLYHT Uptime Server. If the information is received the Uptime Server will reply with an acknowledgement. Successful communication is confirmed by a RECEIVED message, unsuccessful communication is confirmed by a TIME OUT message.
- **AFIRS 228 Status Indicators**:

  System: Yellow (INIT) initializing, Green (OK), Yellow (FAULT), Red indicates Aircraft Configuration Module (ACM) or Data Management Unit (DMU) Hardware failure - critical

  ISVM LINK: Yellow (NO FIX) no iridium link, Green (OK)

  ISDM LINK: N/A, future functionality

  GPS LINK: Yellow (NO FIX), Green (OK)

The **ARINC** tab displays the state of the 16 ARINC 429 RX channels and the 1 ARINC 717 RX channel. The status of a configured function is either ACTIVE or FAULT.

The **DISCRETE IN** tab displays the state of the 16 discrete inputs. The state of the configured functional input is either ACTIVE or INACTIVE.

8.1.2 Faults Page

The **Faults** page provides access to the AFIRS system fault log and history.

8.1.3 Part Numbers Page

The **Part Numbers** page provides the status of the software and hardware configuration of the AFIRS system.

8.2 Accessing Maintenance Mode

To make changes to the configuration tables, you need to access the Maintenance Mode function of the AFIRS maintenance program.

Current versions of the maintenance program do not require a user name and password for access to Maintenance Mode. This functionality may be available in later versions of the software.

Before accessing Maintenance Mode, you need to be connected to the AFIRS Maintenance Port and have the Maintenance Program open.

To access and login to Maintenance Mode:

1. Once connected to the AFIRS 228 Maintenance Port and Maintenance Program GUI, from the **Home** page, click **Login**. You do not need a Username and Password.

   The AFIRS 228 **Home** page appears and the status fields will reflect your current system health. The AFIRS 228 **Home** page now indicates that you are logged in as an **Installer**, which provides you with the capability to enter Maintenance Mode.

2. To enter Maintenance Mode, on the top right corner of the screen, click **Enter Maintenance Mode**.

   A confirmation prompt message appears (see Figure 8-3) reminding you that if you enter Maintenance Mode key AFIRS services will be turned off. You will need to reboot the system (full system reset) to turn the services back on and return to normal Operational Mode.

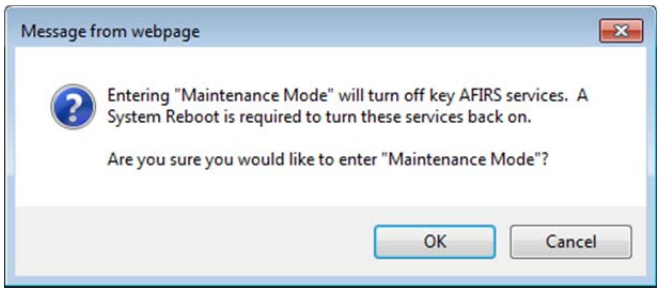


Figure 8-3 – Entering Maintenance Mode Message

3. To enter Maintenance Mode, select **OK**.

The **Home** screen appears as shown in Figure 8-4. The SYSTEM status indicates that the system is “in fault” and appears illuminated in yellow. This SYSTEM fault status is indicated as the AFIRS system turns off when you are in Maintenance Mode. When you exit Maintenance Mode, and the system restarts, the SYSTEM status will appear green.

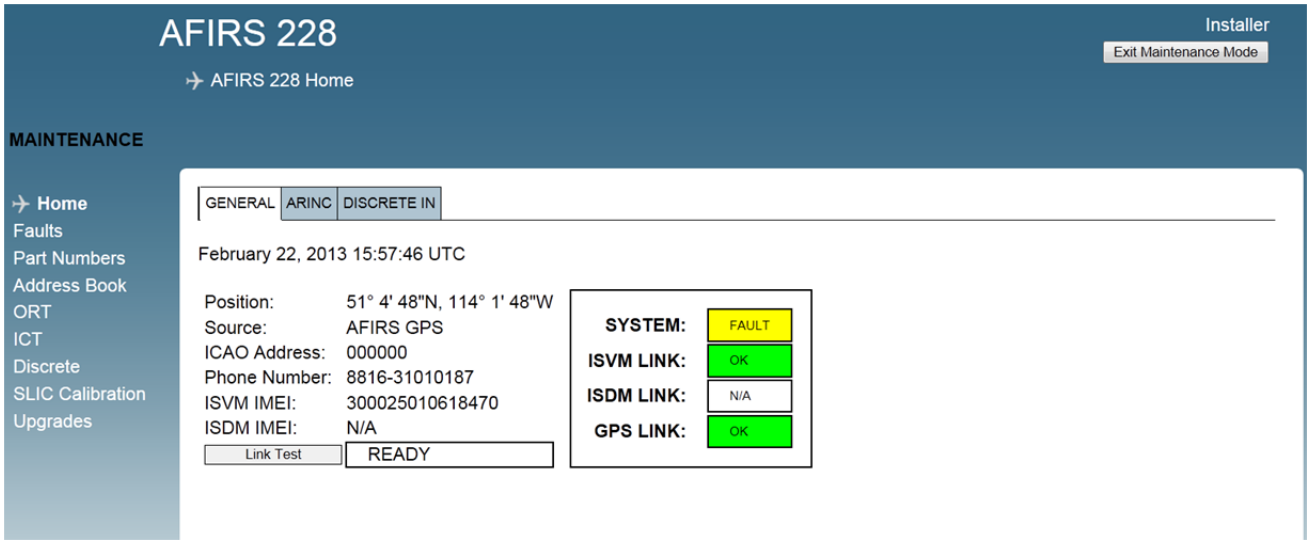


Figure 8-4 – Maintenance Mode Initial Display Screen

In Maintenance Mode, the **Home** page provides the following additional left-hand menu items: **Address Book**, **ORT**, **ICT**, **Discrete**, **SLIC Calibration**, and **Upgrades**.

The following sections describe the functionality of the additional menu items available in Maintenance Mode.

Detailed information on how to use the Maintenance Mode program are provided in the AFIRS 228 Series Operator’s Manual, document number 250-0022.

8.2.1 Maintenance Mode Menu Descriptions

The links available from the left-hand menu enable the Maintenance Installer to check, test, verify, and configure the AFIRS system as follows:

- Click **Address Book** to add, delete, or edit contact information, set call priorities and extension dialing, and enable/disable protection.
- Click **ORT** (Owner Requirements Table) to configure customized settings for specific aircraft and or operator requirements. Refer to the Appendix for a worksheet to help you define your requirements before editing the ORT information.
- Click **ICT** (Installation Configuration Table) to define how the AFIRS system interfaces to the aircraft. Refer to the Appendix for a worksheet to help you define your system requirements before editing the ICT information.
- Click **Discrete** to display the configuration of the Discrete Outs for testing purposes. You can verify the function of systems interfaced to the various discrete outputs by toggling the state from ACTIVE to INACTIVE and verify the expected response.

- Click **SLIC Calibration** to calibrate the interface for phone extensions 2 and 3. You need to calibrate the SLIC interface at time of installation and system configuration to improve noise immunity on the twisted pairs connected to additional handsets (if they are installed and operational).
- Click **Upgrades** to upgrade and update the software of the AFIRS 228 system.

8.3 Configuring the AFIRS 228 System

This section provides basic information on how to configure the AFIRS 228 system as a Maintenance Installer logged into the Maintenance Mode of the AFIRS maintenance program.

Detailed information about how to operate and use the maintenance program accessed via the AFIRS 228 maintenance port is provided in the AFIRS 228 Operator's Manual (document number 250-0022) which is available from FLYHT's product support department.

The following sections are intended to provide you with information on the configuration process and data inputs required to install and verify a system as operational. Worksheets for the ORT and ICT data are provided in the Appendix of this manual and the AFIRS 228 Series Operator's Manual.

Aircraft specific information required to configure the system should be provided to the installer by the aircraft specific documentation and the Instructions for Continued Air-Worthiness.

For the purposes of installation, system configuration and verification, the following steps should be completed:

1. Configure the **Address Book** and set call priorities.
2. Configure the **ORT** data.
3. Define the **ICT** for aircraft and system interface requirements.
4. Calibrate **SLIC** for extensions 2 and 3 (if installed).

8.3.1 Configuring the Address Book

The Address Book can only be edited if you are logged into Maintenance Mode. If you are in Operational Mode, you can view the Address Book content, but not edit the information or change the settings. The address book entries can also be viewed by a MCDU; however, you can only edit the information or change settings from within the AFIRs Maintenance Program.

To access the Address Book:

1. From the left-hand menu, click **Address Book**. The Address Book screen appears (see Figure 8-5).

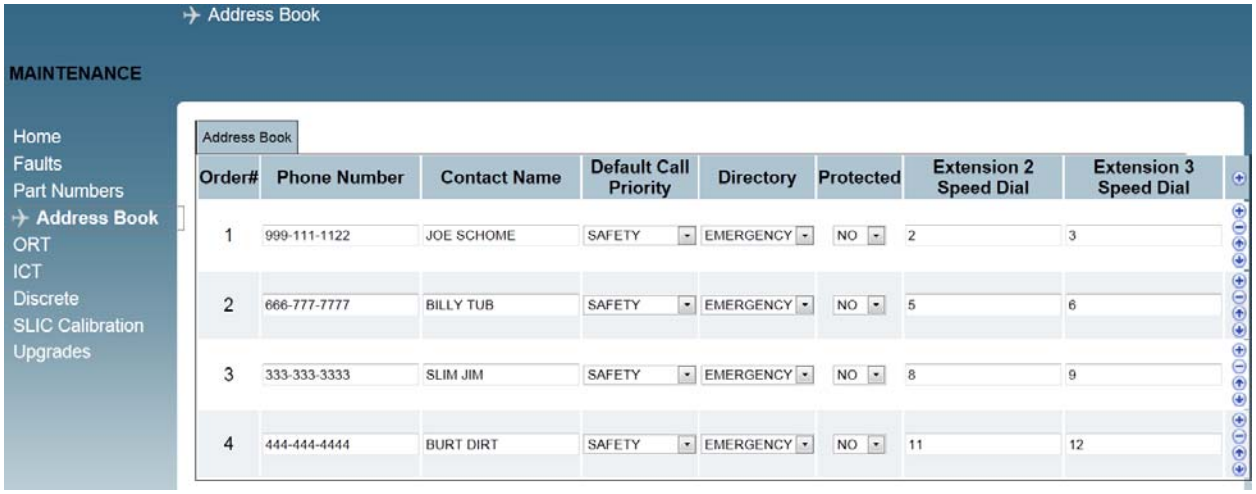


Figure 8-5 – Address Book Screen

2. Add contact information or edit information as required after reviewing the configuration tips provided below.

   Important tips for configuring the Address Book:

   - **Order#**: If you are not using an MCDU, but are using a dialer pad, you can use the Order # for speed dialing of the address entries.
   - **Phone Number:** Enter the phone number for each contact.
   - **Contact Name:** Use uppercase letters in the **Contact Name** text field. Lower case letters will not be accepted by the system as a valid entry.
   - **Default Call Priority:** You can set the Default Call Priority to match the terminology of either Airbus or Boeing categories. Airbus options are Emergency, Safety, Non-Safety, and Public. Boeing options are Emergency, Operational High, Operational Low, and Public.
   - **Protected:** Under **Protected** if you select **YES**, you "protect" the Address Book entry so that it cannot be edited from the MCDU. If you select **NO**, the Address Book entry will be "unprotected" and therefore editable from the MCDU.
   - **Extension 2 and 3 Speed Dial**: Used to configure speed dialing to extensions on the aircraft. When using a MCDU, you will have access to Extension 2 and 3. When using an AFIRS Keypad, you will only have access to one extension: Extension 2.

8.3.2 Configuring the Owner Requirements Table

The Owner Requirements Table (ORT), shown in Figure 8-6 contains the configuration items that may be customized by the individual aircraft operator. These settings may be changed as required to meet operational requirements or preferences.

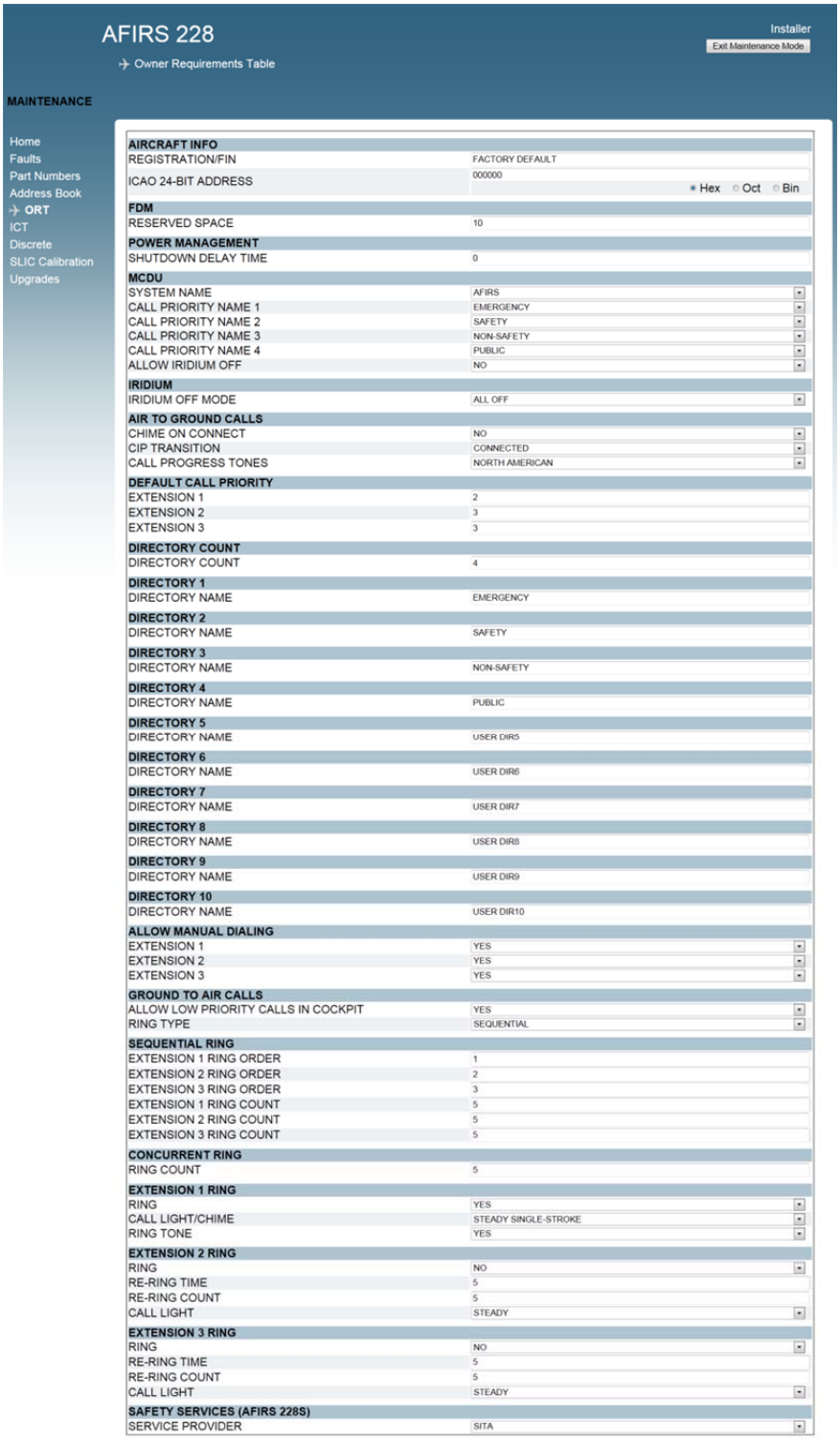


Figure 8-6 – ORT Screen

Note:
An ORT Configuration Worksheet is provided in Appendix B to assist the operator in selecting and documenting the correct ORT configuration settings.

To access and edit the ORT:

1. Click the **ORT** link on the left-hand side of the screen. The ORT page appears.
2. Enter the **AIRCRAFT INFO**: **REGISTRATION** or **FLEET IDENTIFICATION NUMBER (FIN)**.

   The content of this field is typically used in AFIRS reports that are sent off the aircraft. This entry is a “free text” field that can be up to 24 characters long. The character set for this field is limited to those characters that can be entered and displayed on an MCDU, which are the uppercase alpha-numeric characters plus five special characters: [Space] + - . /
3. Enter the aircraft’s 24-bit **ICAO** address.

   The content of this field is typically used in AFIRS reports that are sent off the aircraft. The address can be entered and displayed in hexadecimal, octal, or binary format.

Note:
If the aircraft installation includes an interface to a system that provides the ICAO address to the AFIRS, this parameter may be automatically updated to the value supplied by the external system.

4. Set the **FDM** data size reserve space.

   Space is reserved for FDM data on the CompactFlash card so that other data does not overwrite the FDM data before the operator has had the opportunity to download the FDM data. The default setting is 1.0 GB, but this can be set between 0.1 GB and 4.0 GB as required.
5. Set the **POWER MANAGEMENT** option.

   When the AFIRS has power sources connected to both the Main and Alternate power inputs, the **SHUTDOWN DELAY TIME** sets how long the system will continue to operate on the Alternate power source once the Main power source has been removed. The default is **ALWAYS ON**.
6. Configure the **MCDU** options:
   a) **SYSTEM NAME**: Enter the preferred **MCDU** display name for the AFIRS system. The system name that is displayed on the MCDU can be selected from the list shown in Appendix A. The default is **AFIRS**.
   b) **CALL PRIORITY NAME** 1 – 4: Select the label used to identify the four call priorities. The label options can be selected from the sets shown in Appendix A. The default is EMERGENCY, SAFETY, NON-SAFETY, and PUBLIC.
   c) **ALLOW IRIDIUM OFF:** The AFIRS system can be configured to provide an ALLOW IRIDIUM OFF selection on the MCDU. The default is **NO**; if set to **NO**, Iridium activity will not display on the MCDU. If you select **YES**, the IRIDIUM activity does appear on the MCDU. This setting affects only the MCDU functionality. If the system is configured to

provide an ALLOW IRIDIUM OFF discrete input, the function of that discrete input is unaffected by this configuration setting.

7. Select the **IRIDIUM** data reporting options.

   When the AFIRS system is in the **IRIDIUM OFF MODE**, the system can be configured to either disable only data reporting to the MCDU, or to disable all Iridium satellite voice and data transmissions. The default is **ALL OFF**.

8. Set the options for **AIR TO GROUND CALLS**.

   a) **CHIME ON CONNECT**: The AFIRS system can be configured to trigger the chime output when an Air-to-Ground call connects. The default is **NO.**

   b) **CIP TRANSITION**: The AFIRS system can be configured to communicate (and display) the Call in Progress (CIP) transition state to the MCDU either when an Air-to-Ground call is initiated, or when it is connected. The default is **CONNECTED**.

   c) **CALL PROGRESS TONES**: The AFIRS system can be configured to use either CALL PROGRESS TONES that are North American or European. The default is **NORTH AMERICAN.**

9. Configure the **DEFAULT CALL PRIORITY**.

   The default call priority can be configured for Extension 1. The default setting is 2**.** Priority 1 is reserved for emergencies. The default call priority can be configured for Extensions 2 and 3. The default setting is 3.

Note:
The call priority for any individual call dialed from an MCDU can be changed at the time of placing the call. The call priority for any outgoing calls dialed using a Dual Tone Multiple Frequencies (DTMF) dial pad will be set to the priority configured in the ORT.

The call priority for any outgoing calls dialed from Extension 2 or 3 is set to the priority configured in the ORT.

Extensions 2 and 3 should not be set to priority 1 unless they will only ever be used to place an Emergency call. Placing an Emergency call can trigger ATC alarms and emergency responses, so extreme caution should be exercised whenever an extension is configured to allow making an Emergency call.

10. Configure the **DIRECTORY COUNT**.

    The speed dial entries for Extension 1 are grouped into directories. The AFIRS system can be configured to provide between 1 to 10 different directories. The default setting is **4**.

11. Name **DIRECTORY 1, 2, 3, 4, 5, 6, 7, 8, 9 & 10**.

    The name of each directory is configurable. The DIRECTORY NAME is a “free text” field that can be up to 10 characters long. The character set for this field is limited to those characters that can be entered and displayed on an MCDU, which are the uppercase alpha-numeric characters plus five special characters; [Space] + - . /

Note:
The default settings provide four directories named **EMERGENCY**, **SAFETY**, **NON-SAFETY**, and **PUBLIC**. Only the Directory Names for the number of directories set in the DIRECTORY COUNT field are used by the system.

12. Configure **ALLOW MANUAL DIALING**.

    Each extension can be configured to ALLOW MANUAL DIALING, or to permit the user to only select a number for the directories or speed dial lists. The default setting is YES for each extension. **IMPORTANT!** To obtain operational approval for safety-services voice in accordance with FAA AC20-150A, Extension 1 must be configured **YES** to allow manual dialing for the flight crew.

13. Configure **GROUND TO AIR CALLS**.

    You can configure the system to **ALLOW LOW PRIORITY CALLS IN COCKPIT** (Priority 4) to ring. The default setting is **YES**.

    You can configure the **RING TYPE** for incoming calls can be configured to either ring all three extensions concurrently, or to ring one extension at a time (sequencing through the extensions). The default setting is **SEQUENTIAL**.

14. Configure the **SEQUENTIAL RING** order.

    RING ORDER: You can configure the sequential ring order to be Extension 1 first, then extension 2, and then extension 3 (which is the default) or you may configure the ring sequence in any order.

    RING COUNT: Each extension can be configured as to how many times it will ring when it is the active extension in the ring sequence. The default is 5 for each extension.

    Using the default settings, an incoming call will ring (until answered) for 5 times on Extension 1, then 5 times on Extension 2, and then 5 times on Extension 3. If unanswered by this time, the system will terminate the incoming call.

15. Set the **CONCURRENT RING** amount.

    If the Ring Type is set to **CONCURRENT RING,** the number of times the extensions will ring before the system terminates the incoming call can be configured. The default is **5**.

16. Configure the ring options for **Extension 1, 2, and 3 RING**.

    Each extension can be configured as to whether or not it will **RING** on an incoming call. The default is **YES** for all extensions. If an extension's location is configured as **NONE**, the extension will not ring regardless of this setting.

17. Configure the **CALL LIGHT** and **CHIME** (cockpit/extension 1 only).

    The behavior of the **CALL LIGHT** and **CHIME** discrete outputs can be configured. The default setting is **STEADY/SINGLE-STROKE**.

a. **FLASHING/MULTI-STROKE**: When there is an incoming call, both the Call Light output and the Chime output will toggle between active and inactive states.

b. **FLASHING/SINGLE STROKE**: When there is an incoming call, the Call Light output will toggle between active and inactive states. The Chime output will transition only once to the active state.

c. **STEADY/SINGLE STROKE**: When there is an incoming call, the Call Light output will toggle to the active state and remain there. The Chime output will transition only once to the active state.

For an incoming call, the system can be configured to output a RING TONE on the audio output of Extension 1 (Cockpit). The default setting is **YES**.

When Extension 2 (cabin) or Extension 3 (cabin) is placed on hold and the call remains active, the system will re-ring that extension to remind the operator that a call is still holding. You can set the RE-RING TIME from 1 to 10 minutes. The default setting is **5**.

When re-ringing Extension 2 or Extension 3, the system will ring that extension a number of times before terminating the call; you can set the number of rings from 1 to 10. The default setting for the field **RE-RING COUNT** is **5**.

For an incoming call, you can define the behavior of the **CALL LIGHT** for the Extension 2 and Extension 3 to be either STEADY or FLASHING. The default is **STEADY**.

18. Select a service provide for **SAFETY SERVICE**.

    Choose the service provider **ARINC** or **SITA**.

8.3.3 Configuring the Installation Configuration Table

The Installation Configuration Table (ICT) (see Figure 8-7) contains the configuration items that define how the AFIRS system interfaces to the aircraft. When in Maintenance Installer Mode, you can update the installation configuration data as required for your specific installation requirements.

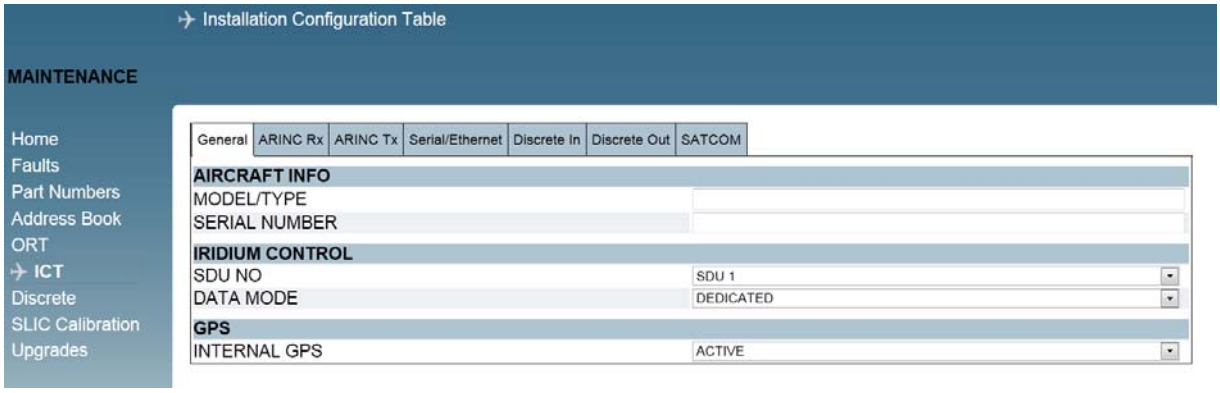


Figure 8-7 – Installation Configuration Table Screen

An ICT Configuration Worksheet is provided in Appendix A to assist the installer in selecting and documenting the correct ICT configuration settings.

8.3.4 Calibrating SLIC

The SLIC calibration page (see Figure 8-8) is used to set longitudinal balance. The measurement is made at installation time to improve noise immunity on the twisted pairs connected to the handsets (extensions 2 and 3).

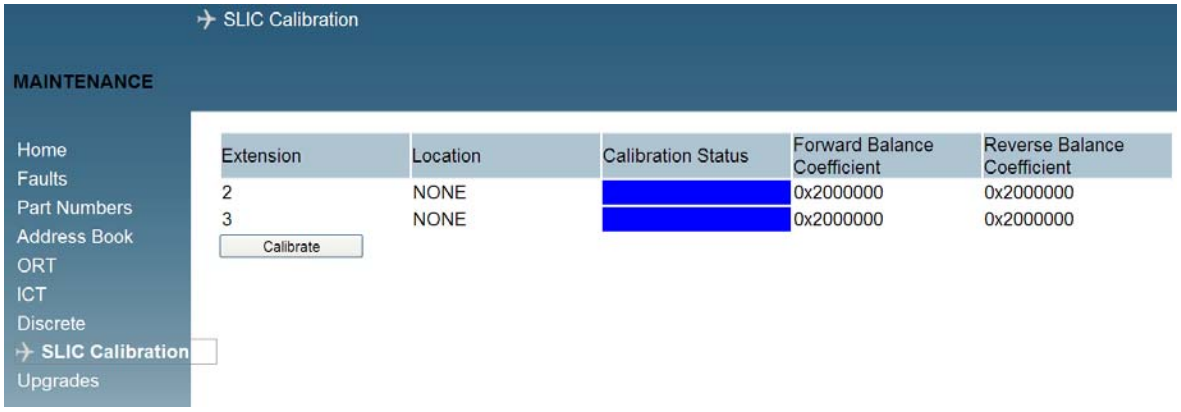


Figure 8-8 – SLIC Calibration Screen

8.4 Upgrading AFIRS 228 Software

The AFIRS 228 system software is field-upgradeable using the **Upgrade** function of the Maintenance Port program.

You can access the software upgrade functionality when logged into the AFIRS maintenance program in Maintenance Mode, by clicking the **Upgrades** link available on the left-hand menu of the AFIRS maintenance program screen.

8.4.1 Upgrade Materials

Make sure you have the following materials available before beginning the upgrade procedure.

- A notebook computer with an Ethernet port, running the Microsoft Windows operating system and a web browser such as Internet Explorer. NOTE: The Ethernet port (TCP/IPv4) must be configured to obtain an IP address automatically.
- Instructions for Continued Airworthiness applicable to the AFIRS Installation.
- A standard, straight through Ethernet patch cable.
- A copy of the software upgrade file (upgrade.tgz) applicable to the software release.
- A copy of the software release notes to identify any changes to functionality or special upload instructions.
- A P-Touch, Label Maker or equivalent with black type on silver/white background labels.

8.4.2 Upgrade Procedure

Before beginning the upload procedure, make sure you have saved the applicable software file (.tgz) to an accessible location on your laptop. Make sure you review the software release notes

and air worthiness instructions for the specific software upgrade you are planning on installing. Special instructions, specific to each install, are provided in the software release notes.

To upgrade the AFIRS 228 software:

1. From the left-hand menu, click **Upgrades**.

   The **Upgrades** screen appears.

2. Click **Browse…**to locate the software file you want to upload to the system.

3. Once you have selected the software file you want to upload, click **Upload** to start the upgrade process.

   A progress bar appears indicating the file uploading status and lists the image files that are loading into volatile memory. When the upload is complete the progress bar changes color from blue to green (see Figure 8-9).

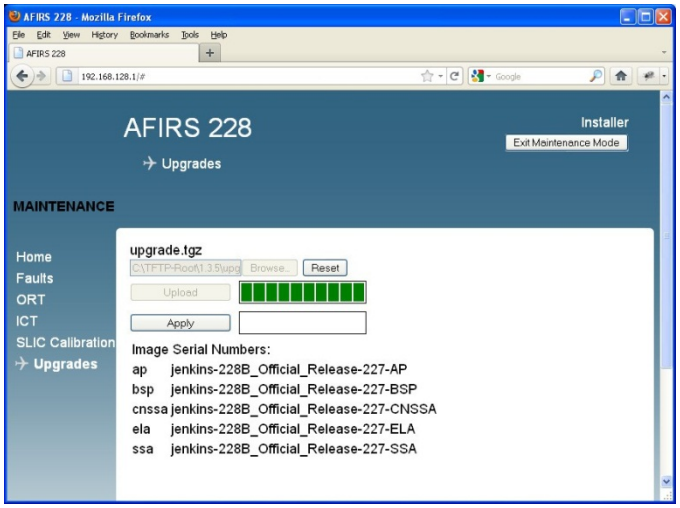


Figure 8-9 – Upgrade Progress

IMPORTANT! If you upload the incorrect file, but have not yet clicked **Apply**, click **Reset** to clear uploaded software.

Reset clears the volatile memory of the software. If you have already applied the software, you will have to repeat the upgrade to upload and apply the correct software files.

4. To load the software into non-volatile memory and complete the software upgrade procedure, click **Apply**.

   A progress bar appears indicating that the software file is being installed into the non-volatile memory of the AFIRS 228 unit. When the progress bar appears green, the software upgrade has been applied to the unit (see Figure 8-10).

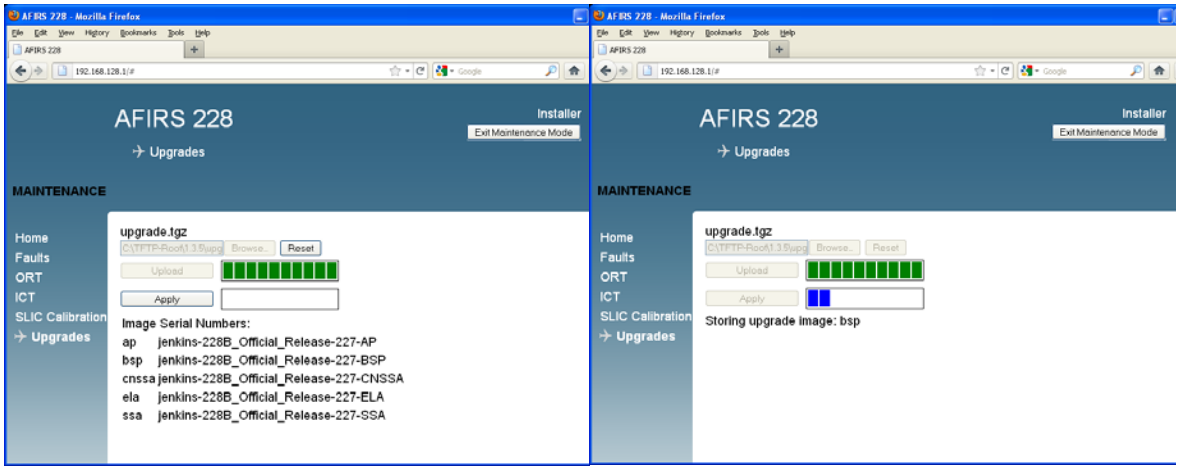


Figure 8-10 – Software Loading Progress Screens

IMPORTANT: To activate the new software load you need to exit Maintenance Mode and restart the AFIRS 228 unit.

5. To exit Maintenance mode, from the top-right corner of the screen, click **Exit Maintenance Mode**.

   A confirmation message appears that asks you to confirm that you want to exit Maintenance Mode (see Figure 8-11).

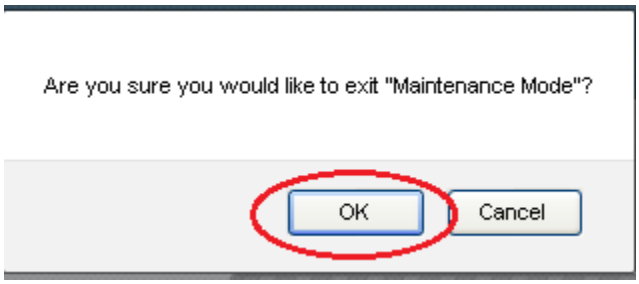


Figure 8-11 – Exit Message

6. Click **OK**.

   The AFIRS 228 unit automatically restarts and applies the newly installed software. A progress bar appears indicating the status of the reboot (restart) process.

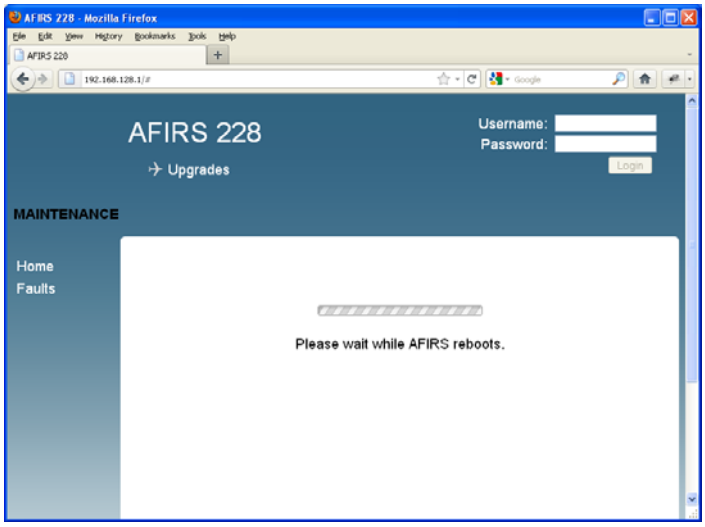


Figure 8-12 – Exit Maintenance Mode Progress Bar

7. When the restart is complete, verify that the AFIRS unit is functioning as expected and verify that correct version of software has been loaded. To verify functionality and check the software version:
    a. Log in to the AFIRS maintenance program.
    b. From the **Home** page, open the **General** and **ARINC** tabs to review the system status to confirm that no faults are displayed.
    c. From the left-hand menu, click **ORT** and review the **ORT** settings to confirm they are correct as per the Instructions for Continued Airworthiness (ICA).
    d. From the left-hand menu, click **ICT** and review the **ICT** settings to confirm they are correct as per the ICA.
    e. From the left-hand menu, click **Part Numbers** to verify that the part number displayed for each component matches the required software version and part number as noted in the release notes or upgrade instructions.

8.5 Exiting Maintenance Mode

To save your changes and configuration data you need to exit maintenance mode.

To exit maintenance mode:

1. In the top-right hand corner of the screen, click **Exit Maintenance Mode**.

   A Message appears notifying you of the number of changes that you have made and asks you for confirmation (see Figure 8-13).

   IMPORTANT! If you click **Cancel**, your changes are still active but not saved.

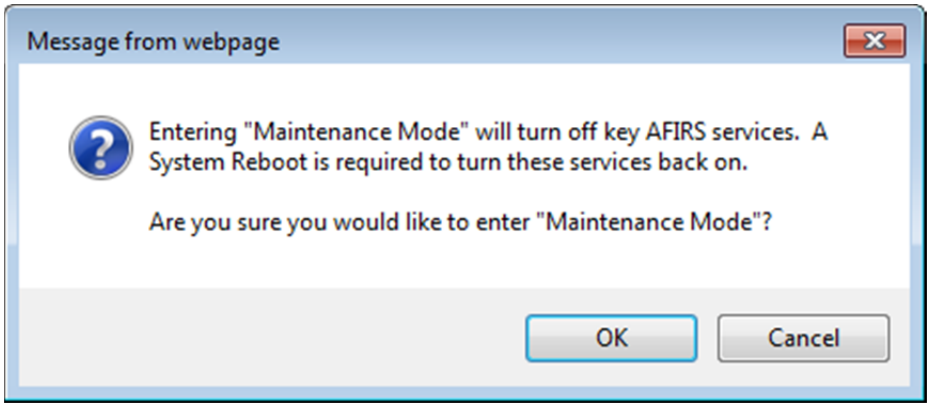


Figure 8-13 – Exiting Prompt Message

2. To save your changes, click **OK**.

   A confirmation message appears asking you to confirm that you want to save the changes that you made (see Figure 8-14). If you click **Cancel**, you exit maintenance mode and your changes are **NOT saved** (i.e. changes are deleted).

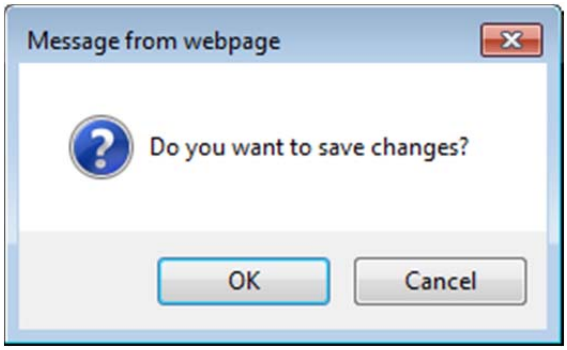


Figure 8-14 – Save Prompt

3. To save your changes and exit maintenance mode. Click **OK**.

   You exit maintenance mode and the AFIRS 228 restarts. If you try to access the maintenance interface during this restart, the following message and progress indicator appears.

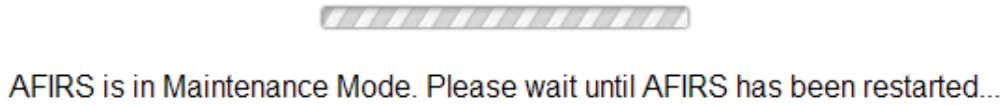


Figure 8-15 – Exit and Restart Progress Screen

4. To verify your changes and confirm that you have installed the correct software, from the Maintenance Program **Home** page, open the tab **Part Numbers**.

   The **Part Numbers** screen appears as shown in Figure 8-16. You can check the software part number status by opening the **SOFTWARE** tab on the **Part Numbers** screen.

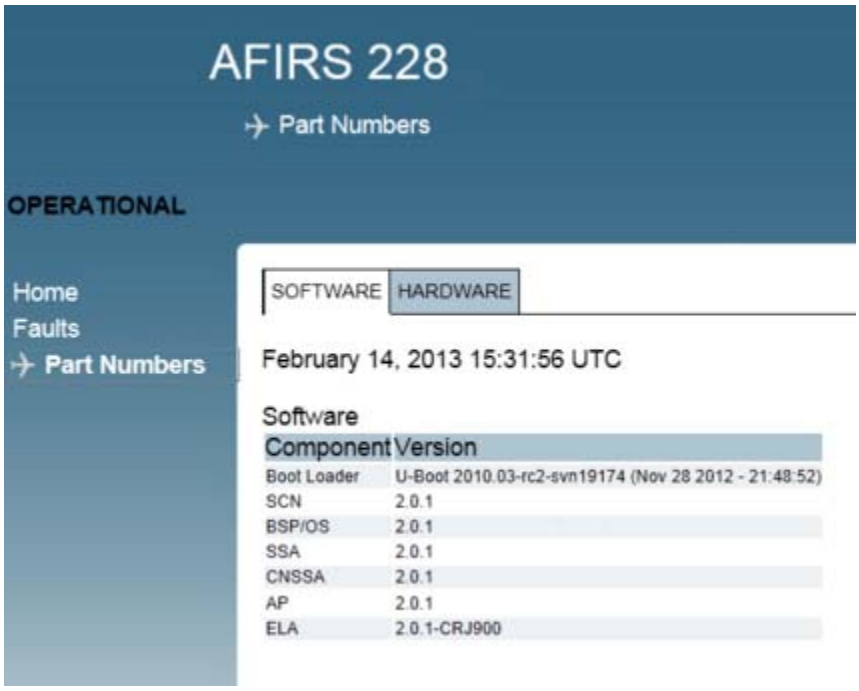


Figure 8-16 – Software Part Number Status Screen

9. MAINTENANCE AND CHECKOUT

This section provides instructions on post-installation checkout procedures and information on Instructions for Continued Airworthiness. For detailed operating procedures and additional system troubleshooting information, refer to the AFIRS 228 Series Operator's Manual, document number 250-0022.

9.1 Post-Installation Checkout

9.1.1 Before Power-On Tests

1. Before installing the AFIRS DMU in the mounting tray, confirm that all aircraft interface wiring is correct as per the aircraft wiring integration design.
2. Confirm that a valid SIM card is installed in the Aircraft Configuration Module (ACM).
3. Set the AFIRS circuit breaker for the Main power source and confirm that 28 VDC power is available between pins J1C-2 and J1C-3. Pull the circuit breaker and ensure that Main power is removed.
4. If an Alternate power source is connected, set the AFIRS circuit breaker for the Alternate power source and confirm that 28 VDC power is available between pins J1C-9 and J1C-3. Pull the circuit breaker and ensure that Alternate power is removed.
5. Place the AFIRS DMU in the mounting tray and secure the front hold-down.
6. Open the front panel door and confirm that a flash card is installed in the DMU.

Note:
Only FLYHT P/N 502-1180-x flash cards should be used in the AFIRS system. These cards have been tested to ensure they function correctly in all expected operating environments.

9.1.2 Power-On Tests

1. The cockpit AFIRS FAULT indication should be illuminated when power is not applied to the AFIRS system.
2. Set the AFIRS circuit breaker for the Main power source. The SYSTEM STATUS indicator on the front panel of the DMU will illuminate amber indicating that the system is initializing.

Note:
The first time a DMU is installed in an aircraft, the SYSTEM STATUS indicator will typically remain amber even after it has initialized. This indicates that the system is not fully operational, in this case because the proper configuration settings have not yet been made.

3. Configure the ICT and ORT in accordance with the procedures contained in section 8. Keep the laptop connected to the Maintenance Port after finishing the configuration procedure.
4. Once the system resets, the SYSTEM STATUS indicator on the front panel of the DMU will illuminate amber while the system is initializing; it will then turn green once the system is operational. The cockpit AFIRS FAULT annunciator should remain illuminated whenever the SYSTEM STATUS indicator is amber, and extinguish when the SYSTEM STATUS indicator turns green.

Note:
If the SYSTEM STATUS indicator doesn't turn green after 60 seconds, the system is not fully operational. This may be because of an incorrect configuration setting, or one of the configured interfaces is not operational.

9.1.3 Aircraft Systems Interface Tests

Note:
The tests listed in this section are generic in nature and are not intended to be used as a test plan for any specific aircraft installation. They should only be used by the aircraft systems integrator as a guide in developing the correct and complete aircraft-specific integration tests. The aircraft systems integrator's test plan should ensure that the aircraft and its systems are in a safe condition for each test to be performed.

9.1.3.1 Alternate Power Test

1. Confirm 28 VDC power is available at both the Main and Alternate power inputs, and that the AFIRS system is initialized and operating.
2. Remove power from the Main input. Confirm AFIRS continues to operate.

Note:
If AFIRS is configured to provide a shutdown delay, this step can be extended and timed to verify the AFIRS automatically shuts down at the correct delay time.

3. Remove power from the Alternate input to power down the unit.
4. Apply 28 VDC power to the Alternate power input only. If the Remote Start input pin (J1C-5) is jumpered to ground, confirm the system initializes properly.
5. If the Remote Start input pin (J1C-5) is connected to an aircraft system, manipulate that system to provide a ground on the Remote Start input. Confirm the AFIRS system initializes properly.
6. Restore 28 VDC power to the Main power input.

9.1.3.2 ARINC Databus Interface Tests

1. Using the maintenance terminal, display the AFIRS Home page.
2. Confirm the aircraft system connected to the databus port being tested is operational and transmitting on the databus.
3. Confirm that the following databuses are shown as operational, as applicable:
    a. ARINC 717 Rx Bus
    b. ARINC 429 Rx Bus (1-16)

9.1.3.3 MCDU Tests

If installed, confirm AFIRS functionality on each MCDU as follows:

1. On the MCDU Main Menu, "AFIRS" (or "SATCOM") should be available at one of the Line Select Keys (LSKs). Press the AFIRS LSK and the AFIRS MAIN page should be displayed.

2. Press the <STATUS LSK. The AFIRS STATUS page should be displayed.
3. Press the <RETURN LSK. The AFIRS MAIN page should be displayed.

9.1.3.4 Serial Port Tests

If installed, confirm AFIRS connectivity to each serial port device as follows:

1. Perform any tests specific to the connected system to confirm that it is communicating with the AFIRS over the serial port.

9.1.3.5 Ethernet Tests

If installed, confirm AFIRS connectivity to each Ethernet device as follows:

1. Confirm the DMU front panel ETHERNET indicator for the connected port is green. Flashing green indicates data is being transferred.
2. Perform any tests specific to the connected system to confirm that it is communicating with the AFIRS over the Ethernet port.

9.1.3.6 Discrete Input Tests

For each discrete input connected, confirm the correct state is detected as follows:

1. Monitor the Discrete Inputs on the maintenance terminal Home page. Manipulate the system providing the discrete input as required to output the inactive state. Confirm proper display on the Home page.
2. Manipulate the system providing the discrete input as required to output the active state. Confirm proper display on the Home page.

9.1.3.7 Discrete Output Tests

For each discrete output connected, confirm the correct aircraft system interface as follows:

1. Using the maintenance terminal, place the AFIRS system in the Maintenance Mode. Click on the “Discrete Output” link on the left hand side of the screen.
2. Select the discrete output to its inactive state. Confirm proper operation of the interfaced aircraft system.
3. Select the discrete output to its active state. Confirm proper operation of the interfaced aircraft system.
4. Exit Maintenance Mode and allow the AFIRS system to restart.

9.1.4 Operational System Tests

Note:
The tests in this section require the aircraft to be powered and outside the hangar in a location that has a clear view of the Iridium and GPS satellites. Aircraft systems that interface with the AFIRS must be installed and operational.

These tests also require the AFIRS system to have been activated on the Iridium network by FLYHT, and for a valid SIM card to be installed in the ACM.

9.1.4.1 Date, Time, and Position Tests

1. Using the AFIRS maintenance terminal (ref. section 8.1), navigate to the AFIRS Home page.
2. Confirm the correct date, time, and position (DTP) information is displayed.
3. Note the DTP source being used. If it is an external source, disable that source and confirm that a different source is being used. Repeat until the system is using the internal GPS source (if configured active).
4. Restore all disabled DTP sources.

9.1.4.2 Satcom Tests

1. Confirm Iridium satellite network availability (e.g. 'Ready to Connect' indication on the MCDU or ISVM indicator on DMU front panel is green).
2. Using an MCDU or Dial Pad, place a voice call to a ground station. Confirm proper cockpit indications for a call in progress.
3. Terminate the call from the cockpit. Confirm proper cockpit indications for the 'Ready to Connect' state.
4. Place a call from a ground station to the aircraft. Confirm proper cockpit indications for an incoming call. Answer the call and confirm proper cockpit indications for a call in progress.
5. Conference in each other extension available in the aircraft. Confirm proper extension ringing function, conference call functionality, and cockpit indications.
6. Leave the conference call from Extension 1. Confirm the call is still in progress from the remaining extension(s). Confirm proper cockpit indications for a cabin call in progress.
7. Preempt the cabin call and confirm that the cockpit now has control of the voice channel. Confirm proper cockpit indications.
8. Place a call from a ground station to the aircraft. Reject the call. Confirm proper cockpit indications.
9. Place a call from a ground station to the aircraft. Allow call to go unanswered. Confirm proper ring sequencing, eventual call termination, and proper cockpit indications.
10. Place a call from a cabin extension to a ground station. Confirm proper cockpit indications for a cabin call in progress. Set up a camp-on call from the cockpit. Terminate the call in the cabin and confirm that the camped-on call is automatically initiated. Confirm proper cockpit indications.
11. Terminate call at the ground station. Confirm proper cockpit indications.
12. Select the 'Cabin Lock' function and confirm proper cockpit indications. Confirm that cabin extensions cannot place a voice call.
13. If configured to be able to turn 'Iridium Off' with the 'All Off' option, turn 'Iridium Off' and confirm proper cockpit indications. Confirm that a voice call cannot be made to or from the aircraft. Turn Iridium back on and confirm proper operation and cockpit indications.

9.1.4.3 Datalink Tests

1. If Uptime access is available, confirm the power-on report has been received from the aircraft.
2. Confirm EFB datalink functionality is available.
3. If so configured, turn 'Iridium Off' and confirm proper cockpit indications. Confirm that data transmissions cease from the aircraft. Turn Iridium back on and confirm proper operation and cockpit indications.

9.1.5 EMI Tests

Each AFIRS aircraft installation should be tested for electromagnetic interference in accordance with procedures developed by the aircraft systems integrator. The tests should be developed to ensure that there is no objectionable interference between the AFIRS and other aircraft systems. This can include ground tests with engine running and flight tests as required.

9.2 Instructions for Continued Airworthiness

The aircraft systems integrator is responsible to provide Instructions for Continues Airworthiness (ICA) for the AFIRS system specific to the aircraft installation. The general content in this Installation Manual may be referenced by the aircraft systems integrator when developing the ICA.

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Appendix A – ICT Worksheet

ICT Group	ICT Parameter Name	Value
Aircraft Info	Model/Type (Text – 24 Characters)	
	Serial Number (Text – 24 Characters)	
Iridium	SDU No.	☐ SDU 1 ☐ SDU 2
	Iridium Data Mode	☐ DEDICATED ☐ MULTIPLEXED
GPS	Internal GPS	☐ ACTIVE ☐ INACTIVE
ARINC 717	Format	☐ NONE ☐ HBP ☐ BPRZ
	Bus Speed	☐ 64 STD ☐ 64 REV ☐ 128 ☐ 256 ☐ 512 ☐ 1024

ICT – ARINC 429 Receivers																	
Function	**DTP**	**ICAO**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
NONE																		
GENERIC 429																		
ACARS 1		•																
ACARS 2		•																
AIRBUS CFDS																		
A702/A FMS 1	•																	
A702/A FMS 2	•																	
A702/A FMS 3	•																	
GAMA 429 FMS 1	•																	
GAMA 429 FMS 2	•																	
GAMA 429 FMS 3	•																	
CMA-9000 FMS 1	•																	
CMA-9000 FMS 2	•																	
CMA-9000 FMS 3	•																	

ICT – ARINC 429 Receivers																	
Function	**DTP**	**ICAO**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
BASIC DTP 1	•																	
BASIC DTP 2	•																	
PL4/21 GPBUS5 1	•																	
PL4/21 GPBUS5 2	•																	
A739 MCDU 1																		
A739 MCDU 2																		
A739 MCDU 3																		
MODE S 1		•																
MODE S 2		•																
Speed	LO																	
	HI																	
Parity	ODD																	
	EVEN																	
	NONE																	

ICT – ARINC 429 Transmitters							
Function		**1**	**2**	**3**	**4**	**5**	**6**
NONE							
A739 MCDU							
ACARS (228S Only)							
GP BUS 1							
GP BUS 2							
GP BUS 3							
GP BUS 4							
Speed	LO						
	HI						

ICT – Serial Ports								
Function	**Receive**				**Transmit**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
NONE								
GENERIC								
EFB 1								
EFB 2								
EFB 3								
Type	232							
	422							
Speed	2.4							
	4.8							
	9.6							
	19.2							

ICT – Serial Ports					
Parameter		**1**	**2**	**3**	**4**
Data Bits	5				
	6				
	7				
	8				
Parity	NONE				
	ODD				
	EVEN				
Stop Bits	1				
	2				
Flow Control	NONE				
	XON/XOFF				
	RTS/CTS				

ICT – Ethernet Ports				
Function	**1A**	**2B**	**3B**	**4B**
NONE				
NOT MONITORED				
MONITORED				

ICT – Discrete Inputs															
Function		**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
NONE															
GENERIC															
CABIN LOCK															
CHIME RESET															
END CALL															
EVENT															
IRIDIUM OFF															
MIC ON															
PARK BRAKE															
SYS RESET															
WOW2															
Signal	OPEN/GND														
	OPEN/28V														
Logic	ACTIVE LO														
	ACTIVE HI														

ICT – Discrete Outputs									
Function		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
NONE									
CABIN LOCK									
CALL LIGHT									
EXT 2 CALL									
EXT 3 CALL									
GPS LINK									
IRIDIUM OFF									
ISVM LINK									
ISDM LINK (228S Only)									
TEXT MSG									
Logic	ACTIVE LO								
	ACTIVE HI								
Chime	Active Time (100 to 6,000 ms)						_____ ms		
	Inactive Time (100 to 6,000 ms)						_____ ms		

Satcom	ICT Parameter Name	Value
Extension 1	Location	☐ NONE ☐ COCKPIT ☐ CABIN
	Sidetone Level (-20 to -3 dB)	____ dB
	Noise Cancelling	☐ ENABLED ☐ DISABLED
	Mic On Config	☐ SWITCHED PTT ☐ LATCHED ACP
	Control Source	☐ MCDU ☐ EXT 3 DTMF
	Mic Gain (Pre-ADC) (0 to 59 dB)	____ dB
Extension 2	Location	☐ NONE ☐ COCKPIT ☐ CABIN
	Volume (1 to 5 dB)	____ dB
	Sidetone Level (-20 to -3 dB)	____ dB
	Noise Cancelling	☐ ENABLED ☐ DISABLED
Extension 3	Location	☐ NONE ☐ COCKPIT ☐ CABIN
	Volume	____ dB
	Sidetone Level (-20 to -3 dB)	____ dB
	Noise Cancelling	☐ ENABLED ☐ DISABLED

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Appendix B – ORT Worksheet

ORT Group	ORT Parameter Name	Value
Aircraft Info	Registration/FIN (Text – 24 Characters)	
	ICAO 24-Bit Address	
FDM	Reserved Space (0.1 to 4.0 GB)	_____ GB
Power Management	Shutdown Delay Time (0 to 60 min.)	☐ ALWAYS ON ☐ _____ min.
MCDU	System Name	☐ AFIRS ☐ SATCOM ☐ AFIR/SATCM
	Call Priority Name (1-4)	☐ EMERGENCY, SAFETY, NON-SAFETY, PUBLIC ☐ EMERGENCY, OPERATIONAL HIGH, OPERATIONAL LOW, PUBLIC
	Allow Iridium Off	☐ YES ☐ NO
Iridium	Iridium Off Mode	☐ ALL OFF ☐ DATA OFF
Air To Ground Calls	Chime on Connect	☐ YES ☐ NO
	CIP Transition	☐ INITIATED ☐ CONNECTED
	Call Progress Tones	☐ NORTH AMERICAN ☐ EUROPEAN
Default Call Priority	Extension 1	☐ 1 ☐ 2 ☐ 3 ☐ 4
	Extension 2	☐ 1 ☐ 2 ☐ 3 ☐ 4
	Extension 3	☐ 1 ☐ 2 ☐ 3 ☐ 4
Directory (Ext 1 Only)	Directory Count (1 to 10)	
	Directory 1 Name (Text – 10 Characters)	

ORT Group	ORT Parameter Name	Value
	Directory 2 Name (Text – 10 Characters)	
	Directory 3 Name (Text – 10 Characters)	
	Directory 4 Name (Text – 10 Characters)	
	Directory 5 Name (Text – 10 Characters)	
	Directory 6 Name (Text – 10 Characters)	
	Directory 7 Name (Text – 10 Characters)	
	Directory 8 Name (Text – 10 Characters)	
	Directory 9 Name (Text – 10 Characters)	
	Directory 10 Name (Text – 10 Characters)	
Allow Manual Dialing	Ext 1	☐ YES ☐ NO
	Ext 2	☐ YES ☐ NO
	Ext 3	☐ YES ☐ NO
Ground to Air Calls	Allow Low Priority Calls in Cockpit	☐ YES ☐ NO
	Ring Type	☐ CONCURRENT ☐ SEQUENTIAL
Sequential Ring	Ring Order	☐ 123 ☐ 213 ☐ 312 ☐ 132 ☐ 231 ☐ 321
	Ext 1 Ring Count (3 to 10)	
	Ext 2 Ring Count (3 to 10)	
	Ext 3 Ring Count (3 to 10)	
Concurrent Ring	Ring Count (3 to 10)	

ORT Group	ORT Parameter Name	Value
Ext 1 Ring	Ring	☐ YES ☐ NO
	Call_Light/Chime	☐ FLASHING/MULTI-STROKE ☐ FLASHING/SINGLE-STROKE ☐ STEADY/SINGLE-STROKE
	Ring Tone	☐ YES ☐ NO
Ext 2 Ring	Ring	☐ YES ☐ NO
	Re-Ring Time (1 to 10)	
	Re-Ring Count (1 to 10)	
	Call_Light	☐ FLASHING ☐ STEADY
Ext 3 Ring	Ring	☐ YES ☐ NO
	Re-Ring Time (1 to 10)	
	Re-Ring Count (1 to 10)	
	Call_Light	☐ FLASHING ☐ STEADY
Safety Services (228S Only)	Service Provider	☐ ARINC ☐ SITA

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Appendix C – Environmental Qualification Forms

The following two forms are provided for the AFIRS 228B DMU and AFIRS 228 ACM respectively.

RTCA DO-160F Environmental Qualification Form

Nomenclature: Data Management Unit (DMU)
Model: AFIRS 228B
Part Number: 502-2001-01
Manufacturer: FLYHT, 200W, 1144 – 29 Avenue NE, Calgary, AB, Canada T2E 7P1

Conditions	Section	Description of Tests Conducted
Temperature and Altitude	4.0	Categories A2, F2
In-Flight Loss of Cooling	4.5.5	Category X (not tested)
Temperature Variation	5.0	Category B
Humidity	6.0	Category A
Operational Shock & Crash Safety	7.0	Category D
Vibration	8.0	Categories S (Curves C & L), U2
Explosive Atmosphere	9.0	Category X (not tested)
Waterproofness	10.0	Category X (not tested)
Fluids Susceptibility	11.0	Category X (not tested)
Sand & Dust	12.0	Category X (not tested)
Fungus	13.0	Category X (not tested)
Salt Fog Test	14.0	Category X (not tested)
Magnetic Effect	15.0	Category Z
Power Input	16.0	Category Z (XI)
Voltage Spike	17.0	Category A
Audio Frequency Susceptibility	18.0	Category Z
Induced Signal Susceptibility	19.0	Category ZW
Radio Frequency Susceptibility	20.0	Category ST
Radio Frequency Emission	21.0	Category M
Lightning Induced Transient Susceptibility	22.0	Category X (not tested)
Lightning Direct Effects	23.0	Category X (not tested)
Icing	24.0	Category X (not tested)
Electrostatic Discharge	25.0	Category A
Fire, Flammability	26.0	Category C

Remarks:
1. Section 26.0 was tested as per DO-160G; all other tests as per DO-160F.

RTCA DO-160F Environmental Qualification Form

Nomenclature: Aircraft Configuration Module (ACM)
Model: AFIRS 228
Part Number: 502-3001-01
Manufacturer: FLYHT, 200W, 1144 – 29 Avenue NE, Calgary, AB, Canada T2E 7P1

Conditions	Section	Description of Tests Conducted
Temperature and Altitude	4.0	Categories A2, F2
In-Flight Loss of Cooling	4.5.5	Category X (not tested)
Temperature Variation	5.0	Category B
Humidity	6.0	Category A
Operational Shock & Crash Safety	7.0	Category D
Vibration	8.0	Categories S (Curves C & L), U2
Explosive Atmosphere	9.0	Category X (not tested)
Waterproofness	10.0	Category X (not tested)
Fluids Susceptibility	11.0	Category X (not tested)
Sand & Dust	12.0	Category X (not tested)
Fungus	13.0	Category X (not tested)
Salt Fog Test	14.0	Category X (not tested)
Magnetic Effect	15.0	Category Z
Power Input	16.0	Category Z (XI)
Voltage Spike	17.0	Category A
Audio Frequency Susceptibility	18.0	Category Z
Induced Signal Susceptibility	19.0	Category ZW
Radio Frequency Susceptibility	20.0	Category ST
Radio Frequency Emission	21.0	Category M
Lightning Induced Transient Susceptibility	22.0	Category X (not tested)
Lightning Direct Effects	23.0	Category X (not tested)
Icing	24.0	Category X (not tested)
Electrostatic Discharge	25.0	Category A
Fire, Flammability	26.0	Category C

Remarks:
1. Section 26.0 was tested as per DO-160G; all other tests as per DO-160F.

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