AVIATOR 200S

Installation Manual

COBHAM

AVIATOR 200S System

Installation Manual

Disclaimer

Information in this document is subject to change without notice.

The information, drawings and wiring diagrams contained in this manual are intended as a reference for engineering planning only. The drawings and wiring diagrams contained herein do not represent any specific Supplemental Type Certificate (STC). It is the installer's responsibility to compose installation drawings specific to the aircraft. This manual and the drawings and wiring diagrams contained herein may not be used as a substitute for an STC package.

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Record of revisions

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A	Original document	28 October 2020	UFO
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C	§3.1; §3.2; §3.3: Outline drawings replaced by generic ones	09 June 2022	BMA

Table of contents

About this manual

1.1   Purpose

The purpose of this manual is to provide information for installation of the AVIATOR 200S system.

> **Important** The information, drawings and wiring diagrams contained in this manual are intended as a reference for engineering planning only. The drawings and wiring diagrams contained herein do not represent any specific Supplemental Type Certificate (STC). It is the installer's responsibility to compose installation drawings specific to the aircraft. This manual and the drawings and wiring diagrams contained herein may not be used as a substitute for an STC package.

1.2   Organization

The chapters of this Installation Manual have the following information:

- **Introduction**
  An overview of the AVIATOR 200S system and services.

- **Equipment drawings**
  Outline drawings of the units, trays and connectors of the AVIATOR 200S system.

- **Installation**
  Wiring drawings, installation instructions and wiring requirements.

- **Configuration**
  A description of how to set up the AVIATOR 200S system.

- **Verification with check procedures.**
  An overview of the recommended check procedures and checklists.

- **Service and maintenance**
  Service information, initial troubleshooting

- **Appendices**
  Equipment specifications, DO-160 Forms, list of error messages (BITE) and a list of applicable standards.

1.3 Precautions: Warnings, Cautions and Notes

Text marked with "Warning", "Caution", "Note" or "Important" show the following type of data:

- **Warning**: A Warning is an operation or maintenance procedure that, if not obeyed, can cause injury or death, or jeopardize the flight safety on the aircraft.

- **Caution**: A Caution is an operation or maintenance procedure that, if not obeyed, can cause damage to the equipment.

- **Note**: A Note gives information to help the reader.

- **Important**: A text marked Important gives information that is important to the user, e.g. to make the system work properly. This text does **not** concern damage on equipment, flight safety nor personal safety.

General precautions

All personnel who operate equipment or do maintenance as specified in this manual must know and follow the safety precautions. The warnings and cautions that follow apply to all parts of this manual.

> **WARNING!**   Before using any material, refer to the manufacturers' material safety data sheets for safety information. Some materials can be dangerous.

> **WARNING!**   Make sure that system power is off before you disconnect the LRU mating connectors.

> **CAUTION!**   Do not use materials that are not equivalent to materials specified by Cobham. Materials that are not equivalent can cause damage to the equipment and can void the warranty.

Weights and measurements

Weights and measurements are in metric values (SI) with imperial metrics in parentheses.

Introduction

This chapter has the following sections:

- *General description*
- *Part numbers*

2.1   General description

This installation manual provides the general installation instructions and setup of the AVIATOR 200S System. See the accompanying LGA-5005 HELGA Installation Manual [8] for the antenna which forms part of the AVIATOR 200S System.

The installer must derive specific installation details for each different aircraft type, using this manual as a guideline, while adhering to standard aircraft practices. Refer to [1], or its equivalent.

> ⚠️ **CAUTION!**   The material in this manual is subject to change. Before you start with the installation you must verify that the complete and up-to-date publication is used.

2.1.1   The AVIATOR 200S System

System overview

The AVIATOR 200S System is an Inmarsat aeronautical SATCOM system, which provides Inmarsat SwiftBroadband services and safety services (Class 4). It delivers secure ACARS services over a robust IP data link together with dual cockpit voice channels. The AVIATOR 200S System is a single-channel system for cockpit use and complies with ARINC Characteristic 781 Mark 3 Aviation Satellite Communication Systems. The system provides services in the L-band (1518 to 1559 MHz for the receive channel and 1626.5 to 1660.5 and 1668 to 1675 MHz for the transmit channel).

The AVIATOR 200S System provides the following classes of communication services:

- Air Traffic Service (ATS)
- Airline Operational Control (AOC)
- Aeronautical Administrative Communications (AAC)
- Aeronautical Passenger Communication (APC)

The services include cockpit voice with two voice channels, IP data (Internet), ACARS over IP and Electronic Flight Bag (EFB) services for direct satellite communication in the Inmarsat BGAN Satellite Network, using the Inmarsat 4th generation satellites.

The following figure shows the AVIATOR 200S System.

HELGA (LGA-5005)

HLD and Enhanced Low Gain Antenna

Coax Cable:
RF, DC power, Control, BITE

CSDU (SDU-5045)
Compact
Satellite Data Unit

SCM (SCM-5055)

SDU Configuration Module

2 MCU
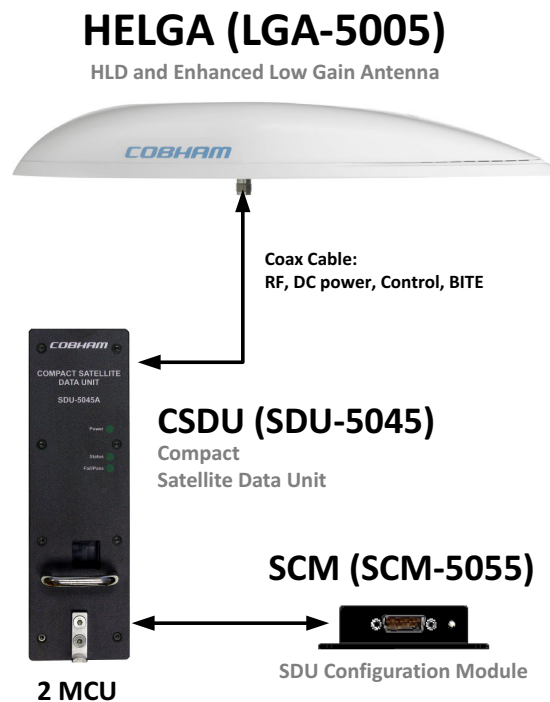
Figure 2-1: AVIATOR 200S System, single channel (Class 4)

The AVIATOR 200S System consists of:

- SDU-5045 Compact Satellite Data Unit (CSDU)

- SCM-5055 Compact SDU Configuration Module (SCM)

- LGA-5005 HLD/Enhanced Low Gain Antenna (HELGA)

The CSDU is the master of the AVIATOR 200S System and controls the associated units in the system. The SCM and the antenna are powered by the CSDU.

The AVIATOR 200S System has the following features:

- Complete aircraft network segregation with priority for the Aircraft Control Domain (ACD) over the Aircraft Information Services Domain (AISD).

- ARINC 781-7 compliant network security

- Approved FANS 1/A services, including CPDLC, ADS-C and ACARS.

- Enhanced ACARS (with IPSEC VPN) and Secure Cockpit Voice.

- Media for aircraft monitoring systems and continuous positioning reporting.

- Background IP data for AISD (e.g. EFB) applications.

- ARINC 781-7 Compact 2 MCU package with active HLD/Enhanced Low Gain Antenna.

- Two cockpit voice over 4-wire connections, with three MCDU ARINC 429 interfaces for SATCOM and voice management

- Two CMU/AFIS ARINC 429 interfaces for ACARS.

Compact Satellite Data Unit (CSDU)

The AVIATOR 200S Compact Satellite Data Unit (CSDU) is a 2 MCU LRU with an ARINC 600 connector. It is a highly secure system with complete aircraft network segregation for the Aircraft Control Domain (ACD) over the Aircraft Information Service Domain (AISD). The aircraft network segregation between ACD and AISD ensures highest data security and meets all data communications specifications of ARINC 781-7, Attachment 8 [3] requirements. The system also meets requirements for Future Air Navigation System (FANS) 1/A operations.

The domain specific interface groups and the external interfaces of the CSDU are listed in the following table.

Domain	Interface Group	Description
ACD	Cockpit User Interfaces	Interfaces to avionics equipment used by the flight crew
ACD	Internal SATCOM Interfaces	Interfaces between units in the SATCOM system
ACD	Aircraft Interfaces	Interfaces to Avionics equipment used by the SATCOM system
ACD	Maintenance Interfaces	Interfaces intended for maintenance staff
ACD	System Configuration inputs	Discrete configuration pins
ACD	Power Supply inputs	Power supply inputs
AISD	Cockpit User Interfaces for EFB services	Interfaces dedicated for EFB devices

Table 2-1: Domain specific interface groups

The following table lists the external interfaces of the CSDU, grouped after system functions.

Cockpit interfaces	
System function	Interfaces
Flight Deck	3x ARINC 429 inputs, for MCDU/WSC 1x ARINC 429 output, for MCDU/WSC 1x ARINC 429 output, for FWC/FWS
Cockpit Voice	2x 4-Wire DO-214A, for Cockpit Audio for AMS 1x Discrete input ARINC 781, for Mic-on for/PTT for ACP 1x Discrete input ARINC 781, for Call Place/End for ACP 1x Discrete input ARINC 781, for Cockpit Voice Go Ahead Chime reset for ACP 1x Discrete output, for Call Light for ACP 2x Discrete *relay* contacts ARINC-781, for Chime signal for ACP

Table 2-2: System function, cockpit interfaces

Cockpit interfaces	
System function	Interfaces
Cockpit Data	1x Ethernet AISD#1, for EFB 1x Ethernet Priority IP ACD#1 (provisioned) 1x Ethernet AISD#2 Spare 1x Ethernet ACD#2 Spare
ACARS	1x Discrete output, hardware provisioned for ACARS Service Available 2x ARINC 429 Input for 2x CMU 1x ARINC 429 Output for CMUs

Table 2-2: System function, cockpit interfaces (Continued)

Product interfaces	
System function	Interfaces
Inmarsat Radio	2x HS ARINC 429 input for IRS/GNSS 1x ARINC 429 input for GNSS 1x Discrete input, ARINC 781, for Tx Mute 1x Modem control + DC 210 kHz Modem Control (provisioned) 1x ARINC 429 output planned for Multi-Control (provisioned) 1x ARINC 429 input planned for Antenna BITE (provisioned) 1x Discrete output, ARINC 781, for LNA On/Off (provisioned) 1x Discrete input, ARINC 781, for LNA BITE (provisioned) 1x Input from LNA, hardware provisioned 1x Input from antenna, hardware provisioned 1x Cobham antenna control interface, hardware provisioned 1x DLNA interface, hardware provisioned 1x RF TX/RX interface, for HELGA
Configuration	1x ARINC 429 input for AES ID 1x Discrete input, ARINC 781, for SDU Number 1x Discrete input, ARINC 781, for SCM Fitted 1x Discrete input, ARINC 781, for Program Pin Parity 1x Discrete output, ARINC 781, for 0V Common

Table 2-3: System functions, product

Maintenance interfaces	
System function	Interfaces
BITE	1x ARINC 429 output for CFDS 1x ARINC 429 input for CFDS 1x Discrete ARINC 781 output, hardware provisioned for System Fail
Data Loading	1x Ethernet for Data Loader A615A 1x Discrete input ARINC 781 for Data Loader Link A 1x ARINC 429 output for Data Loader A615 1x ARINC 429 input for Data Loader A615
Support	1x USB for Local Maintenance 1x Ethernet for Shop Maintenance

Table 2-4: System functions, interfaces

Aircraft interfaces	
System functions	Interfaces
Environment	1x Power AC input 115 VAC 360 to 800 Hz 1x Discrete input, for External Reset 1x Discrete input, ARINC 781, for WoW 1x Discrete input for Dual System Disable 1x Discrete I/O output for Dual System Select I/O 1x Discrete output, hardware provisioned for Fallback SDU Reset 1x Discrete output, hardware provisioned for Slave Tx Mute 1x ARINC 429 output, hardware provisioned for Crosstalk 1x ARINC 429 input, hardware provisioned for Crosstalk 1x ARINC 429 input, hardware provisioned spare 1x ARINC 429 output, hardware provisioned spare 4x Discrete input, ARINC 781, hardware provisioned spares 2x Discrete output, ARINC 781, hardware provisioned spares

Table 2-5: System functions, aircraft

SDU Configuration Module (SCM)

The SCM contains non-volatile memory for storing the Secure Owner Requirement Table (ORT) and the User ORT, which hold the system settings. The SCM contains a write-protected area for storing installation data (system configuration, RF cable losses, antenna system etc.) that are only updated during installation, and a user non-write-protected area for storing a phone book and the customer-specific configuration parameters.

The SCM is an external module for the CSDU, making it easier to replace the CSDU while retaining all system and user settings in the SCM. If the CSDU must be replaced, the SCM remains installed in the aircraft. When the replacement CSDU is installed and connected to the SCM the system then user settings are available again.

The SCM contains four Inmarsat BGAN USIM cards and one security SmartCard. In the AVIATOR 200S System system, one USIM card is used to access the Inmarsat SwiftBroadband services and the remaining three USIM cards are reserved for future use. The Security SmartCard contains integrity/ciphering keys and authentication algorithms and is used by the Aircraft ACARS Gateway (AAGW). The SCM is delivered with all five cards installed and these cannot be replaced in the field.

HLD/Enhanced Low Gain Antenna (HELGA)

The CSDU interfaces directly to a HELGA antenna (Class 4 Enhanced Low Gain Antenna with a built-in Diplexer Low Noise Amplifier (DLNA) and High Power Amplifier (HPA). The HELGA complies with ARINC 781-7, Attachment 7 [3] ELGA (Enhanced Low Gain Antenna) mounting footprint. It uses a phased array antenna with no moving parts. Together with the CSDU it forms a Class 4 system. The LGA-5005 HELGA is compliant with ARINC 781 and has the following internal SATCOM interfaces:

• 1x Coaxial RF interface (for Rx/Tx signals, power, control and BITE) to the CSDU

The antenna is steered by the CSDU, which derives steering information from aircraft navigational data.

For more information see the HELGA installation manual [8].

Operation with an SCDU and headset

You can operate the AVIATOR 200S system via the following user interfaces:

- Headset and SCDU connected to the CSDU to make and answer calls
- SCDU to display system messages (Information and BITE codes)
- Headset connected to the audio control panel to make and answer calls

Up to 3 SCDUs can be connected. System status and BITE messages of the AVIATOR 200S system can be displayed in the SCDU display.

Other user interfaces

The AVIATOR 200S system has a dedicated AISD Ethernet interface for EFB or other cockpit application requiring IP data communication services.

Configuration files for the AVIATOR 200S system

The configuration files (Secure ORT and User ORT) for the AVIATOR 200S system are uploaded to the CSDU with an ARINC 615A (Ethernet) or ARINC 615-3 (ARINC 429) compliant data loader. Refer to the ORT Tool User Guide [9]. There are two configuration files:

- Secure ORT with all necessary system settings for the correct functioning of the system

- User ORT with phone book and other non-critical user-specific data.

2.1.2 Maintenance interfaces (ACD)

The following interfaces belong to the ACD and are controlled by it. These interfaces are all located on the front panel of the CSDU.

- 1x Ethernet maintenance interface (shop maintenance)

- 1x Micro USB maintenance interface (on-ground aircraft maintenance)

- 3x Status LEDs

- 1x button for push-to-test

2.1.3 Power supply input

The system is designed for the following power supply input:

- 115 VAC, 360 to 800 Hz

2.1.4 Interface to the SCM

The SCM is connected to the CSDU via the following interface:

- 1x ARINC-781 compliant power and RS-422 communications interface [3]

2.1.5 Interface to the HELGA

The HELGA interface is part of the internal SATCOM interfaces and listed below:

- 1x Coax RF (Rx/Tx, Power, Control and BITE) from CSDU

2.1.6 Electrical interfaces - overview
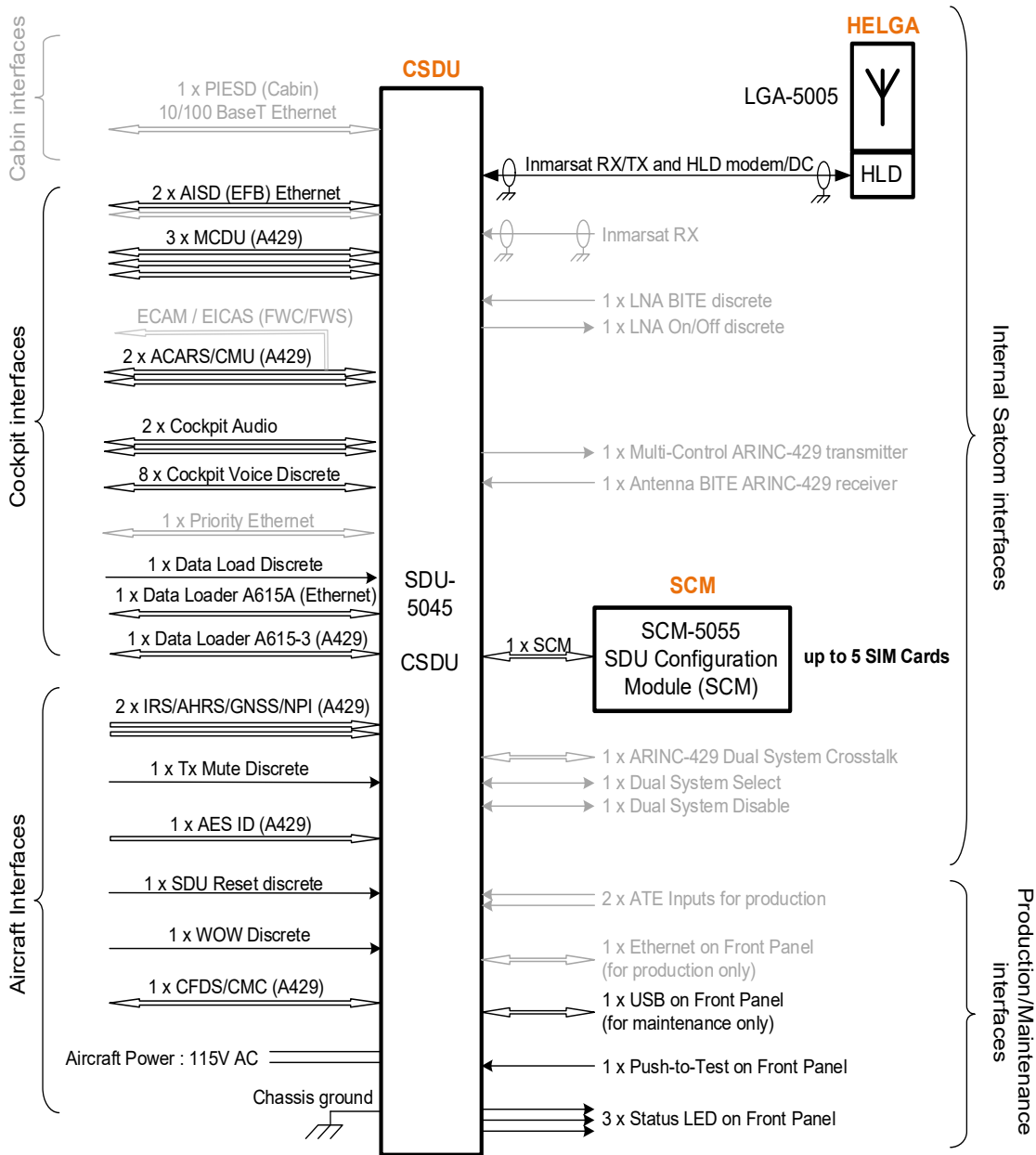
Figure 2-2: Electrical interfaces - overview

> **Note** The interfaces greyed out are disabled or not in use in the AVIATOR 200S software. This can be due to interfaces not being supported or reserved for future use.
>
> Interfaces marked in black are supported in the AVIATOR 200S software.
>
> For interfaces marked in black showing support of 2 interfaces, at least one will be implemented. This is the case for AISD EFB Ethernet, e.g. picture shows 2xEFB, but only one EFB interface is available. The second AISD Ethernet is reserved for test or maintenance use.

2.2 Part numbers

This installation manual is for the AVIATOR 200S system and is applicable to the type and part numbers below:

Type number	Part number	Component name
SDU-5045	405045-vvccc[a]	Compact Satellite Data Unit (CSDU)
SCM-5055	405055-vvccc	Compact SDU Configuration Module (SCM), external
LGA-5005	405005-vvccc	HLD and Enhanced Low Gain Antenna (HELGA). Refer to LGA-5005 HELGA Installation Manual [8].

Table 2-6: Type and part numbers for the AVIATOR 200S system

a. The part number suffix vvccc is variable and consists of the fields vv = customer variant and ccc = minor variant.

The system also needs Field Loadable Software (FLS) containing:

- User ORT
- Secure ORT
- SBU FLS
- ORT tool
- HELGA FLS

Circuit breakers

Part number	Recommended circuit breakers
2TC2-2	Klixon 2TC series, 2 A current rating (AC input)

Table 2-7: Part numbers for Klixon circuit breaker

Tray and connector

Part number	Recommended tray and connector
ECS 6L02S1C1C20	Tray assembly, 2 MCU (for forced air flow cooling)
AD2-203CF-30081510 CU	CSDU tray ARINC 600 connector (Amphenol)

Table 2-8: Part numbers for tray and connector

Equipment drawings

This chapter has the following sections.

- *SDU-5045 Compact Satellite Data Unit*
- *SCM-5055 SDU Configuration Module*
- *LGA-5005 HLD/Enhanced Low Gain Antenna*
- *CSDU tray*
- *CSDU tray connector*

The following pages show copies of outline drawings of important system units relevant for an installation.

3.1 SDU-5045 Compact Satellite Data Unit
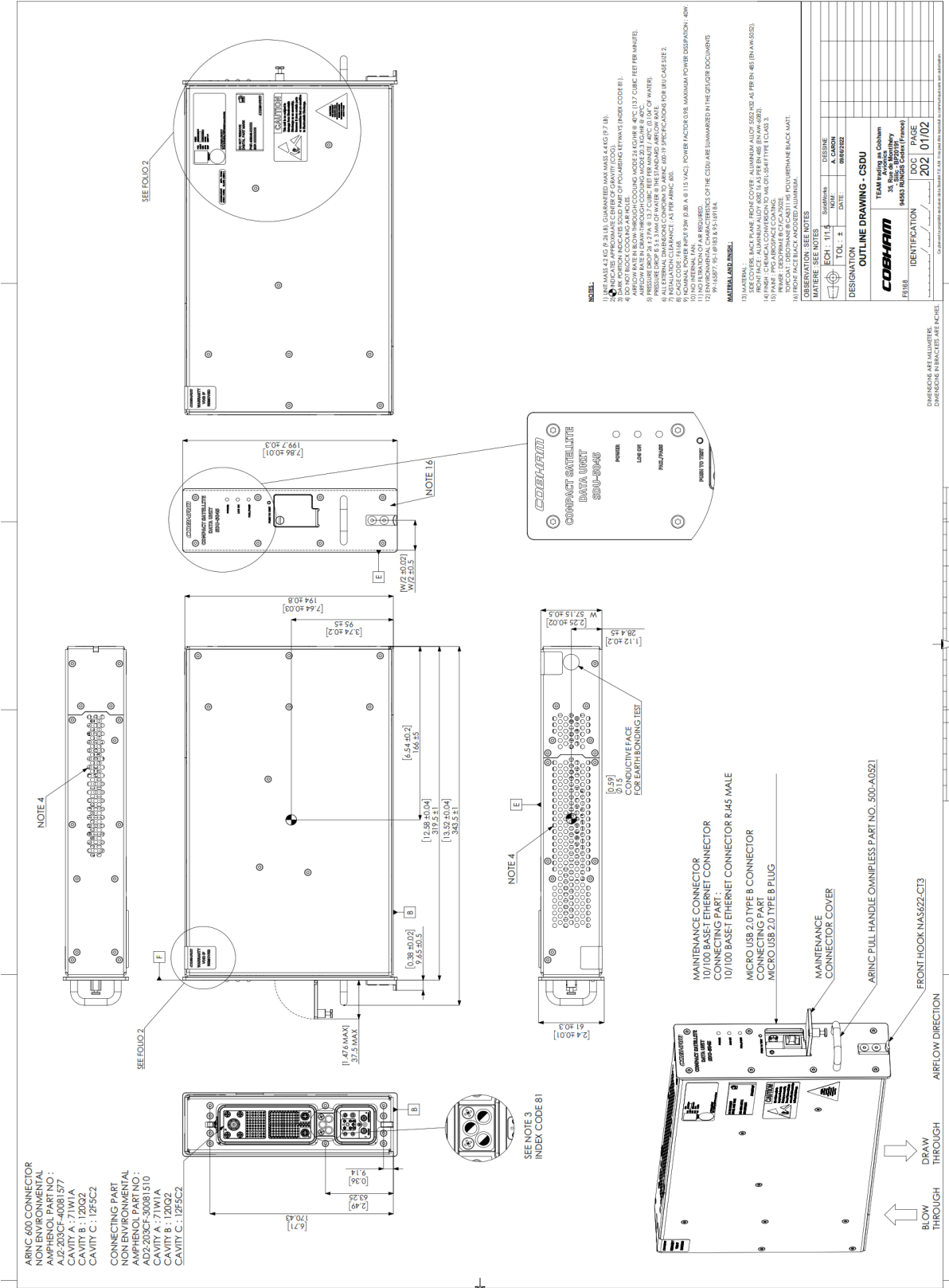
Figure 3-1: Outline Drawing: CSDU

3.2 SCM-5055 SDU Configuration Module
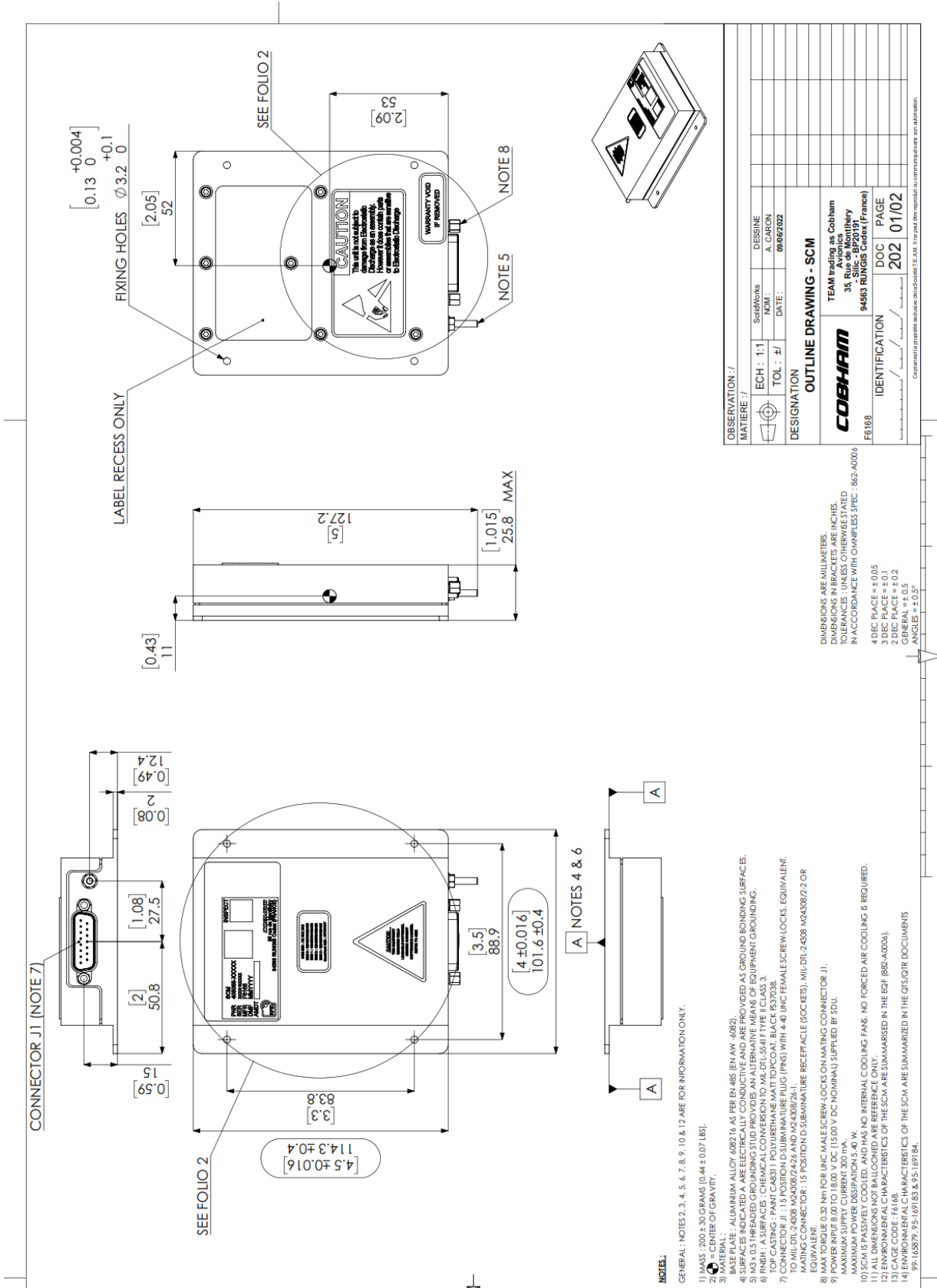
Figure 3-2: Outline drawing SCM-5055 (1/2)
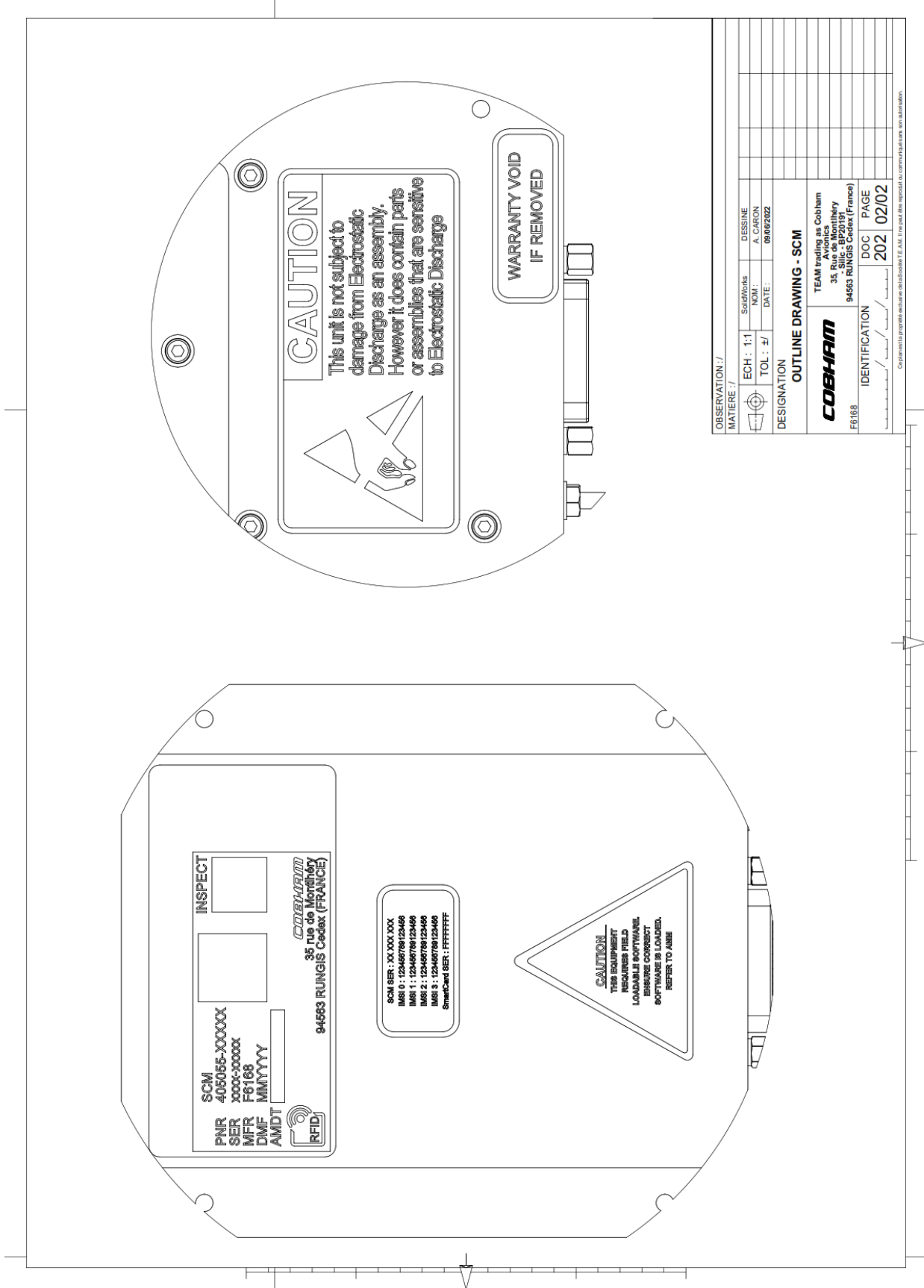
Figure 3-3: Outline drawing SCM-5055 (2/2)

3.3 LGA-5005 HLD/Enhanced Low Gain Antenna

Figure 3-4: Outline Drawing: HELGA (1/2)

Ø9.5 [0.374] COUNTERBORE
Ø5.2 [0.205] THRU HOLE
4 PLACES

1/4 TURN SEALING PLUGS INSTALLED AFTER ANTENNA INSTALLATION
(PART OF SEALING KIT). ONLY PORT SIDE SHOWN

B

B

A

A

OBSERVATION : SEE NOTES
MATIERE : SEE NOTES

ECH : 1:2	SolidWorks	DESSINE
TOL : ±/	NOM :	A. CARON
	DATE :	09/06/2022

DESIGNATION

COBHAM

OUTLINE DRAWING - HELGA

TEAM trading as Cobham Avionics
35, Rue de Monthléry
Silic - BP20191
94563 RUNGIS Cedex (France)

F6168

IDENTIFICATION

| DOC | PAGE |
| 202 | 02/03 |

[0.588] 2 PLACES
14.93

SECTION B-B

(TYPICAL - NOT SUPPLIED)

[0.590] 2 PLACES
14.99

SECTION A-A

FLAT BOLT HEAD
(INTERFACES, CHEMICAL
CONVERSION AS PER
NOTE 8. NO PAINT

SEALING KIT

Figure 3-5: Outline Drawing: HELGA (2/2)

Chapter 3: Equipment drawings
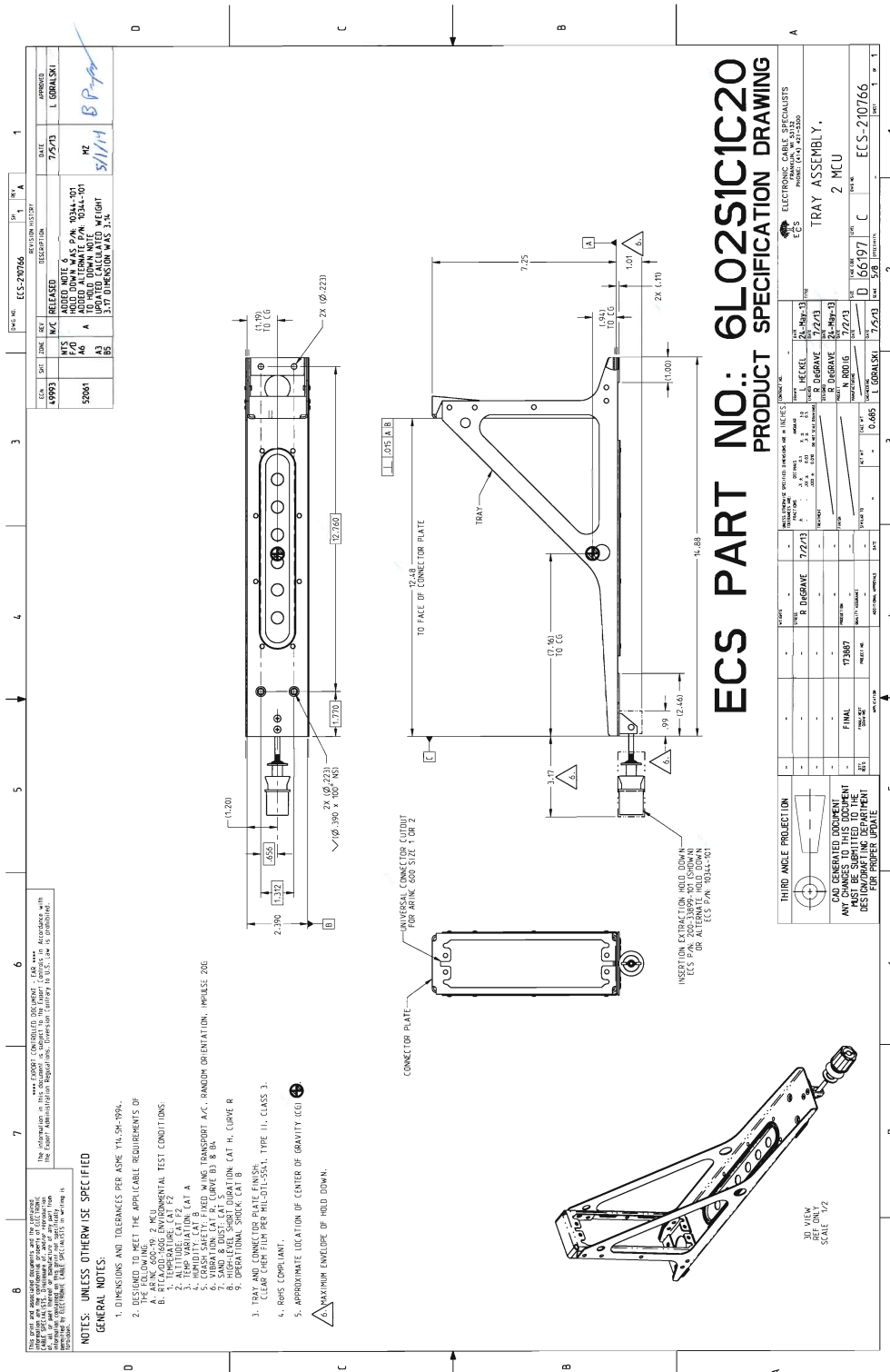
3.4 CSDU tray

Figure 3-6: Outline drawing: CSDU tray

3.5 CSDU tray connector
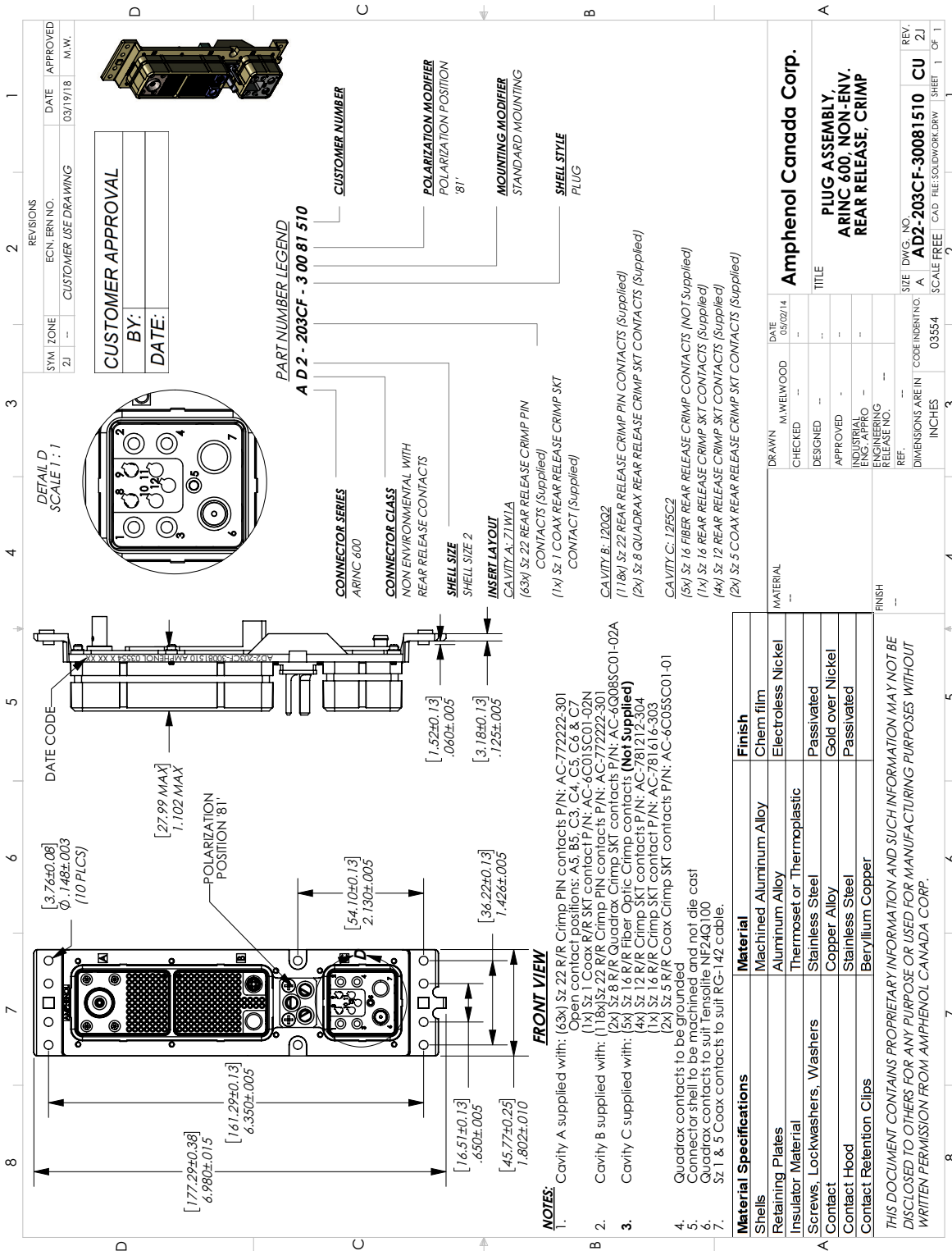
Figure 3-7: ARINC 600 tray connector

Installation

This chapter has the following sections:

- *General installation information*
- *Mounting considerations*
- *Electrical installation and wiring*
- *Recommended cables*
- *Verifying the installation*
- *Activation of airtime services*

4.1 General installation information

4.1.1 Overview

This chapter contains considerations and recommendations for the installation of the AVIATOR 200S System. Interconnect harness wiring and physical mounting must satisfy all applicable regulations. Also see the accompanying LGA-5005 HELGA Installation Manual [8] for the antenna, which is part of the AVIATOR 200S system.

The information, drawings and wiring diagrams in this manual are intended as a reference for engineering planning only. The drawings and wiring diagrams contained herein do not represent any specific STC. It is the installer's responsibility to compose installation drawings specific to the aircraft. This manual and the drawings and wiring diagrams contained herein may not be used as a substitute for an STC.

> **Note** For optimal performance from the AVIATOR 200S system you must strictly follow the installation guidelines in this chapter.

4.1.2 System components

A working system consists of:

- 1 SDU-5045 CSDU
- 1 SCM-5055 SCM
- 1 LGA-5005 HELGA (see [8])

The SCM and antenna are powered by the CSDU. The following drawing shows the minimum installation.

Minimum system drawing

This drawing shows which units to connect as a minimum for the system to function.
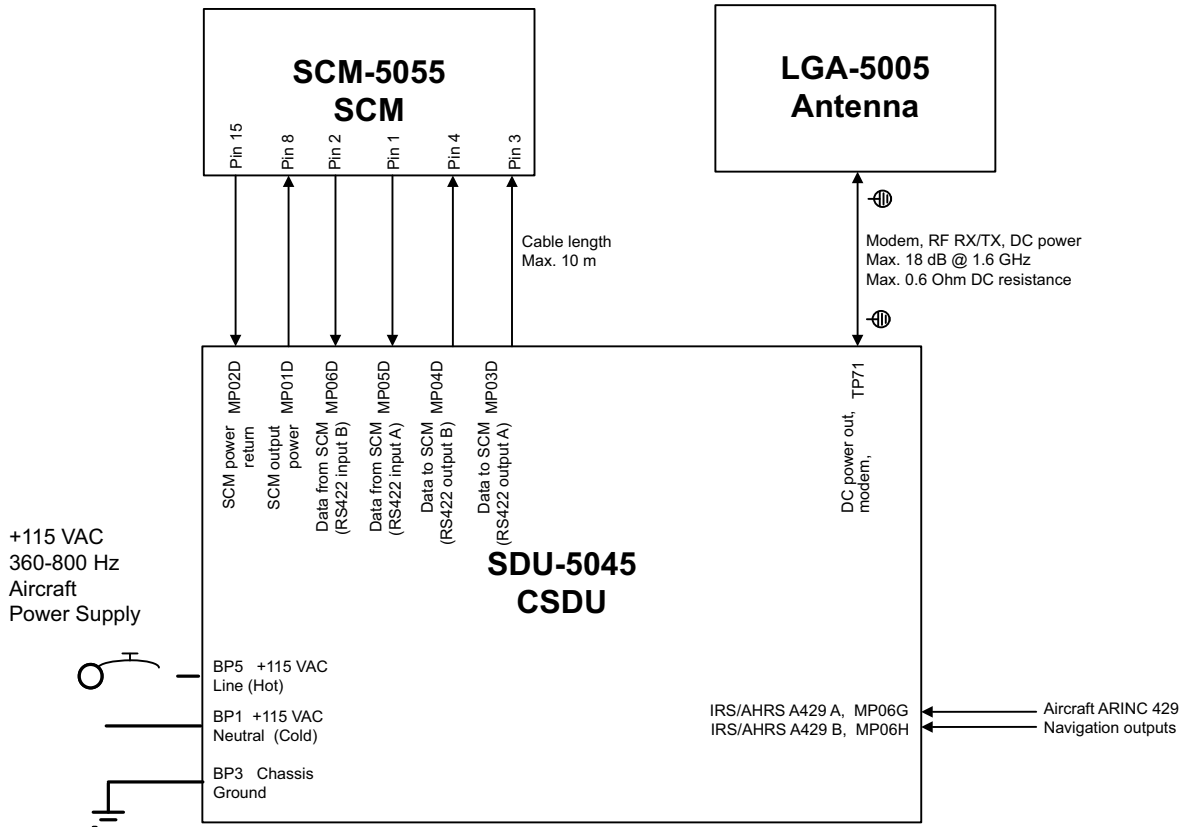
Figure 4-1: AVIATOR 200S system (minimum, AC powered)

4.2   Mounting considerations

4.2.1   Overview

For optimum system performance you must follow some guidelines on where to install the components of the AVIATOR 200S system. Installation and placement details are included in this section.

For information on requirements to cables refer to the individual sections in *Electrical installation and wiring* on page 4-6. For information on recommended cable types and lengths refer to *Recommended cables* on page 4-28.

Note	When mounting the units, give enough space for a sufficient bend radius for the cables. Refer to the cable data sheet for minimum bend radius.

4.2.2   SDU-5045 CSDU

Installation

Install the CSDU in one of the locations described below:

- Temperature/Non-temperature controlled locations and forced airflow cooling (Tray with fan/plenum)

- Temperature/Non-temperature controlled location and supplied airflow cooling (Tray integrated onto a shelf rack system)

- Pressurized/Non-pressurized locations.

Mount the CSDU in a suitable tray, refer to **Figure 3-6: Outline drawing: CSDU tray**.

Coolant air pressure drop through the CSDU (ARINC 600 Equipment Level 1)

Install the CSDU in a location with forced cooling.

The CSDU dissipates approximately 40 W and requires air at a flow rate of 26 kg/hr at a maximum of 70°C. This leads to a pressure drop of roughly 20 Pa (2 mm water, within the 5 ±3 mm of water specification of ARINC 600 [4], Level 1).

Ground bonding[1]

1. Make the grounding wires shorter than 150 mm from grounding start at cable to crimp terminal lugs.

2. Make the grounding wires as short as possible.
When you combine ground wires it is necessary that the combined wires are as short as possible.

Requirements for combined grounding wire for cockpit audio

1. Crimp with: Contact size: #22, R/R Crimp PIN contacts P/N: AC-772222-301

---

1. Source: TT97-146191-B.

2. Mount according to Amphenol ARINC 600 Document SL-379-3.

3. Mount ground PIN to MP04G on ARINC 600 Connector

Chassis Ground: ARINC 600 pin BP3

Amphenol contact part number: AC-781212-304. Fit to wire AWG12 & AWG14

Total max resistance: 25 mOhm.

Shield from fluid drippage

To fulfill DO-160G Waterproofness Cat. Y, the equipment must be shielded from fluid drippage.

4.2.3 SCM-5055 SCM

Installation

1. Install the SCM in temperature controlled areas and inside or outside pressurized locations (e.g. avionics bay).

2. Forced flow air cooling is not required.

3. To prevent fluids from entering the SCM through the connector, select the SCM mounting orientation such that its connector is not oriented vertically

4. Mount the SCM to the aircraft structure using four fasteners through its mounting flange. Refer to **Figure 3-2: Outline drawing SCM-5055 (1/2)**. The flange thickness is 2 mm.

5. Insert the D-sub connector of the SCM cable harness into the mating connector on the SCM.

6. Torque the cable harness D-sub connector screw-locks to 0.32 Nm.

7. You may add a drip loop to the cable harness to prevent water from flowing along the cable harness and towards the SCM connector.

Ground bonding

1. Use an electrically conductive back shell for the DB15 connector.

2. Terminate the cable shields to the electrically conductive back shell.

3. Bond the SCM to the aircraft structure via the top and bottom surfaces of the SCM mounting flange. These are electrically conductive and are designated as the equipment's ground bonding points. Refer to **Figure 3-2: Outline drawing SCM-5055 (1/2)**.

4. The M3 threaded stud provides and alternative means for bonding the SCM and may be used at the installer's discretion by fitting a suitable ground bonding strap. Refer to Figure 3-2.

4.2.4   LGA-5005 HELGA

> **Note** | The antenna installation must be in accordance with the aircraft manufacturers requirements and/or FAA AC 43.13 - 1B/2A and approved by the appropriate Civil Aviation Authorities.

Refer to the LGA-5005 HELGA Installation Manual [8] for instructions and details on the installation of the antenna. Make sure all requirements in the antenna mounting instructions are met. Place the antenna with unobstructed view to the satellite. The outline drawing is shown in **Figure 3-4: Outline Drawing: HELGA (1/2)**.

An AVIATOR 200S System can only be used with the LGA-5005 HELGA.

> ⚠ **WARNING!**   Keep a safety distance of minimum 60 cm (2 ft) to the antenna when the system is transmitting, unless the antenna manual or the specific system configuration presents different requirements. This safety distance ensures that a maximum radiation power density of 5 mW/cm^2 is not exceeded (Recommended by the American National Standards Institute, ANSI/IEEE C95.1-1999).

> ⚠ **CAUTION!**   The system contains items that are sensitive to electrostatic discharge. Use approved industry precautions to keep the risk of damage to a minimum when you touch, remove or insert parts or assemblies.

Coaxial cable between the CSDU and the antenna

1. Do not bend the cables to a radius smaller than the minimum bend radius stated for the cables.

2. Measure all RF losses at 1.6 GHz.[1]

3. As the installation is designed to allow power on a coaxial cable, make sure that the DC resistance is no more than 0.6 Ohms.

4. Make sure that the system meets its requirements with the following RF cable loss ranges:

Cable	Loss (dB)
Tx/Rx cable, CSDU to ELGA	0 to 18 dB

Table 4-1: RF cable loss range

For further information on cables, see *To wire the antenna* on page 4-10 and *Recommended RF cables* on page 4-29.

---

1. Cable losses from ARINC 781-7, Attachment 7, section 2.2.6.

4.3 Electrical installation and wiring

4.3.1 Wiring symbols

Throughout the wiring section these common symbols are used:

Coax

Shield

Ground (fuselage)

Twisted

Twisted and shielded

Important | Each wiring drawing in this chapter only shows the connections referred to in that particular section. Other connections may be required for the system to work properly.

4.3.2 Wiring − overview

Figure 4-2: Wiring − overview

4.3.3 To wire the CSDU with AC input

ARINC-781 compliant.

The aircraft power bus provides the electric power required to operate the CSDU, and a chassis connection to the aircraft chassis and the installation tray. The +115 VAC power wire must include a circuit breaker capable of carrying the required current continuously under the required environmental conditions.

The following drawing shows the wiring of the CSDU AC power supply. Requirements to the wiring are stated in the notes on the drawing and in the section *To wire the SCM* on page 4-10.
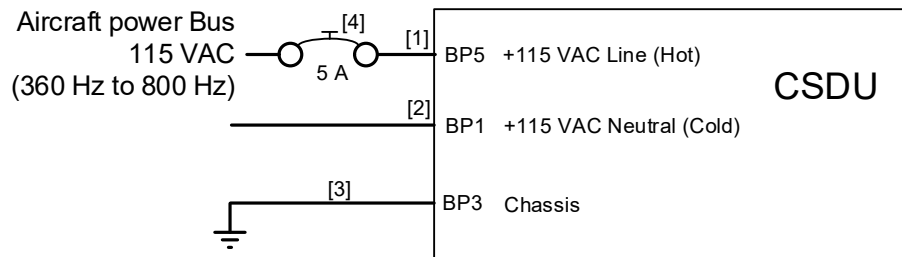
[1] + [2] Total resistance (Hot and cold) max. 1 Ohm incl. circuit breaker.
[3] Directly to installation tray and aircraft chassis, max. 25 mOhm resistance.
[4] Compatible with an aircraft circuit breaker of the following characteristics: 115VAC / 5A Solid state power controllers (SSPC)

Figure 4-3: Wiring AC power

The COLD does not need to go through a break.

The COLD must not be connected to chassis ground. Connect the COLD to the aircraft power bus as stated in the following table.

Pins for AC power

The following list shows the pins used for the AC power supply.

CSDU pin	Name	Description
BP1	+115 VAC Line (Hot)	+115 VAC Line (Hot) power input from aircraft power bus.
BP5	+115 VAC Neutral (Cold)	+115 VAC Neutral (Cold) return from aircraft power bus.
BP3	Chassis Ground	Chassis connection, connect to the installation tray and Aircraft chassis.

Table 4-2: CSDU pins (AC input)

Description of the CSDU power supply

+115 VAC Power (BP1, BP5)

The target line impedance should be as low as possible; 1 Ohm preferred maximum; should not exceed 4 Ohms.

Required current capability for the Circuit Breaker: 99 W @ 90 VAC which equals 1.1 A at the required environmental conditions. A suitable circuit breaker is **Klixon 2TC series** with 2 A current rating.

> **Important** | Use a separate 2 A circuit breaker for the AC input.

Chassis Ground (BP3)

The chassis connection makes sure that the cabinet and the installation tray has the same potential, and that there is a connection from the wiring shields to the cabinet for EMC (ElectroMagnetic Compatibility) purposes.

Connect the wire directly to the installation tray, and to aircraft chassis.

Cable requirements, CSDU power supply (AC)

Cable[a]	Maximum resistance	Other Requirements
[1] 115 VAC Line and neutral	1 Ω, incl. circuit breaker	
[2] Chassis Ground	25 mΩ	Connect directly to the aircraft chassis.

Table 4-3: Requirements to CSDU power cables (AC input)

a. The cable numbers refer to the numbers stated on the wiring drawing in the section *To wire the CSDU with AC input* on page 4-8.

> **Note** | Maximum cable lengths are calculated and listed in the section *Allowed cable lengths for power cables* on page 4-28.

4.3.4 To wire the SCM

Wiring diagram

The following drawing shows the wiring of the SCM to the CSDU. The SCM connector pin-out is compliant with ARINC-781.
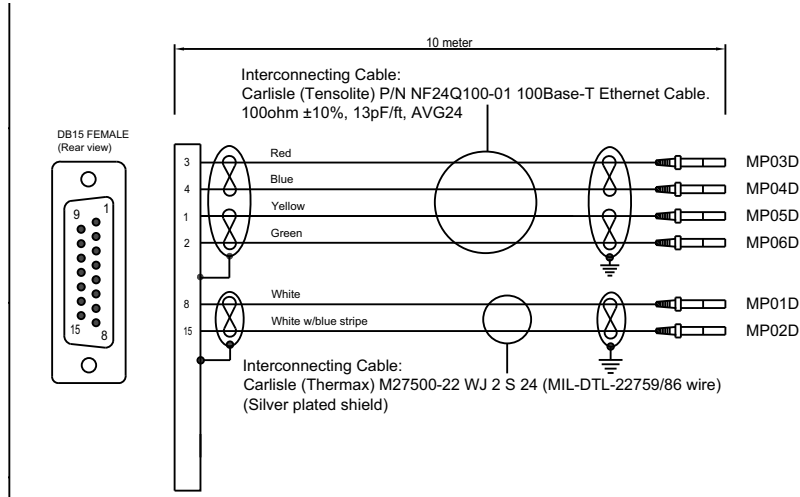
Figure 4-4: To wire the SCM

Maximum cable length: 10 m (ARINC-781)

Pins for the SCM

CSDU pin	Description
MP01D	SCM Power, +8 to 18 V
MP02D	SCM Power return 0V
MP03D	CSDU data to SCM A
MP04D	CSDU data to SCM B
MP05D	SCM data to CSDU A
MP06D	SCM data to CSDU A

Mating connector

The mating connector for use on the SCM cable harness is a 15 position D-subminiature receptacle (sockets), MIL DTL-24308 M24308/2-2 or equivalent.

4.3.5 To wire the antenna

ARINC-781 compliant.

Refer to the LGA-5005 HELGA Installation Manual [8] for instructions and details on the installation of the antenna.

Cable losses

> **Note** During installation, measure and write down the cable loss of the RF cables. See section 4.2.4 for the maximum loss requirement at 1.6 GHz.

Wiring diagram

See **Figure 4-1: AVIATOR 200S system (minimum, AC powered)** for the wiring for an AVIATOR 200S System with the LGA-5005 HELGA

For the requirements to RF cable see *Recommended RF cables* on page 4-29.

4.3.6   To wire the SCDU 1, 2 and 3

ARINC-781 compliant.

The CSDU has interfaces for three high or low speed ARINC-429 interfaces for communication with SCDU #1, SCDU #2 and SCDU #3. For cable requirements see *Recommended cables for ARINC 429* on page 4-29.

Wiring diagram

See *Wiring – overview* on page 4-7.

Pins for SCDU 1, 2 and 3

CSDU pin	Description
MP10J	Data to SCDU 1,2,3. A. (A429 output)
MP10K	Data to SCDU 1,2,3. B. (A429 output)
MP01A	Data from SCDU 1. A. (A429 input)
MP01B	Data from SCDU 1. B. (A429 input)
MP01J	Data from SCDU 2. A. (A429 input)
MP01K	Data from SCDU 2. B. (A429 input)
MP10A	Data from SCDU 3. A. (A429 input)
MP10B	Data from SCDU 3. B. (A429 input)

Description

The Satellite Control and Display Unit (SCDU) interfaces allow the CSDU to be managed from a cockpit control panel. The CSDU uses SCDU protocol standards defined in ARINC Characteristic 739 or WSCI (see ARINC 741, Part 2, Attachment 2F-42.1). Display and control details may be manufacturer-specific.

4.3.7   To wire the CMU 1 and 2

ARINC-781 compliant.

Wiring diagram

See *Wiring – overview* on page 4-7.

Pins for CMU 1 and 2

CSDU pin	Description
MP07J	Data to CMU 1 and 2. A. (A429 output)
MP07K	Data to CMU 1 and 2. B. (A429 output)
MP03A	Data from CMU 1. A. (A429 input)
MP03B	Data from CMU 1. B. (A429 input)
MP03J	Data from CMU 2. A. (A429 input)
MP03K	Data from CMU 2. B. (A429 input)

Description

The Communications Management Unit (CMU) or equivalent is responsible for integrating data communications or datalinks on the aircraft. The CMU manages communication across multiple subnetworks, including VHF and SATCOM networks.

4.3.8   To wire cockpit audio 1 and 2

ARINC-781 compliant.

See also the wiring of the cockpit audio discrete interfaces in section 4.3.10.

Wiring diagram

See *Wiring – overview* on page 4-7

Pins for cockpit audio 1 and 2

CSDU pin	Description
MP04A	Cockpit audio input 1. High.
MP04B	Cockpit audio input 1. Low.
MP05A	Cockpit audio output 1. High.
MP05B	Cockpit audio output 1. Low.
MP04J	Cockpit audio input 2. High.
MP04K	Cockpit audio input 2. Low.
MP05J	Cockpit audio output 2. High.
MP05K	Cockpit audio output 2. Low.

Description of the cockpit audio 1 and 2

There are two 4-wire interfaces to be connected to a headset.

4.3.9   To wire IRS/GNSS

Wiring diagram

See *Wiring – overview* on page 4-7.

Pins for IRS/GNSS

CSDU pin	Description
MP02A	Data from primary IRS/GNSS A
MP02B	Data from primary IRS/GNSS B
MP02J	Data from secondary IRS A
MP02K	Data from secondary IRS B
MP06J	Data from GNSS to CSDU A
MP06K	Data from GNSS to CSDU B

4.3.10   To wire discrete inputs and outputs

ARINC-781 compliant.

Wiring diagram

See *Wiring – overview* on page 4-7

Pins for discrete inputs and outputs

CSDU Pin	Description
MP01C	Call Place End Discrete Input 1, Cockpit Voice discrete input
MP01H	Call Place End discrete Input 2. Cockpit Voice discrete input
MP01G	External reset Discrete Input
MP02C	Cockpit Voice Chime signal contact 1. Discrete "relay" contact
MP02H	Cockpit Voice Chime Signal Contact 1. Discrete "relay" contact
MP03C	Cockpit Voice Call Light output 1. Cockpit Voice discrete output
MP03E	Spare discrete output #1
MP03H	Cockpit Voice Call Light output 2. Cockpit Voice discrete output
MP04C	Cockpit Voice Mic On input 1. Cockpit Voice discrete input
MP04E	Spare discrete output #2
MP04H	Cockpit Voice Mic On input 2. Cockpit Voice discrete input
MP05C	Cockpit Voice Go Ahead Chime reset 1. Cockpit Voice discrete input
MP05E	Spare discrete output #3
MP06A	Spare discrete input #1
MP06B	Spare discrete input #2

CSDU Pin	Description
MP06C	Spare discrete input #3
MP07C	Spare discrete input #4
MP07D	WOW input1
MP08E	Data loader link A. Discrete input
MP08F	TX mute input. Discrete input

Description

Various discrete interfaces are available, as listed here.

4.3.11 To wire airborne data loader

ARINC-781 compliant.

Wiring diagram

See *Wiring – overview* on page 4-7

Pins for airborne ARINC 429 (ARINC 615-3) data loader

CSDU pin	Description
MP09A	From airborne data loader A
MP09B	From airborne data loader B
MP09J	To airborne data loader A
MP09K	To airborne data loader B

Description of the data loaded

Supports ARINC 429 data loaders compliant to ARINC 615-3.

4.3.12 To wire fault/health reporting (CFDS)

ARINC-781 compliant.

Wiring diagram

See *Wiring – overview* on page 4-7

Pins for fault/health reporting

CSDU pin	Description
MP08A	Data from CFDS A
MP08B	Data from CFDS B

CSDU pin	Description
MP08J	Data to CFDS A
MP08K	Data to CFDS B

Description of the fault/health reporting

The CSDU communicates Built-In Test Equipment (BITE) reporting to the aircraft Centralized Fault Display System (CFDS) or Central Maintenance Computer (CMC).

4.3.13 To wire Ethernet 1 (AISD#1 or EFB 1)

ARINC-781 compliant.

- Ethernet Port Definition: Electronic Flight Bag 1

- Security Domain: Airline Information Services Domain (AISD)
Ethernet 11 (AISD#2):

Wiring diagram

See *Wiring – overview* on page 4-7

Pins for Ethernet 1 (AISD#1 or EFB 1)

CSDU pin	Description
TP03A	Ethernet 1 from CSDU to User + (AISD#1)
TP03B	Ethernet 1 from User to CSDU + (AISD#1)
TP04B	Ethernet 1 from CSDU to User - (AISD#1)
TP04A	Ethernet 1 from User to CSDU - (AISD#1)

Description of Ethernet 1 (AISD#1 or EFB 1)

The EFB 1 interface is for cockpit (AISD) applications which require an IP data connection, for example for EFB connectivity.

4.3.14 To wire Ethernet 11 (AISD#2 or EFB2)

The Ethernet 11 interface is ARINC-781 compliant, but reserved for flight test use only and disabled for general use.

- Ethernet Port Definition: Electronic Flight Bag 2

- Security Domain: Airline Information Services Domain (AISD)

Wiring diagram

See *Wiring – overview* on page 4-7

Pins for Ethernet 11 (AISD#2 or EFB 2)

CSDU pin	Description
TP03J	Ethernet 11 from CSDU to User + (AISD#2)
TP03K	Ethernet 11 from User to CSDU + (AISD#2)
TP04K	Ethernet 11 from CSDU to User - (AISD#2)
TP04J	Ethernet 11 from User to CSDU - (AISD#2)

Description of Ethernet 11 (AISD#2 or EFB 2)

This interface is for test purposes only and is only accessible when the aircraft is in flight test mode.

4.3.15   To wire Ethernet 3 (ADL in ACD)

ARINC-781 compliant.

Wiring diagram

See *Wiring – overview* on page 4-7

Pins for Ethernet 3 (ACD) Quadrax connector

CSDU pin	Description
MP 1T 1	Ethernet 3 from CSDU to ADL +
MP 1T 2	Ethernet 3 from ADL to CSDU +
MP 1T 3	Ethernet 3 from CSDU to ADL -
MP 1T 4	Ethernet 3 from ADL to CSDU -

Description

- Ethernet Port Definition: Airborne Data Loader
- Security Domain: Aircraft Control Domain (ACD)

4.3.16   To wire Ethernet 4 (ACD#1)

ARINC-781 compliant, but software disabled and reserved for future use.

Wiring diagram

See *Wiring – overview* on page 4-7

Pins for Ethernet 4 (ACD#1) Quadrax connector

CSDU pin	Description
MP 2T 1	Ethernet 4 from CSDU to User +
MP 2T 2	Ethernet 4 from User to CSDU +
MP 2T 3	Ethernet 4 from CSDU to User -

CSDU pin	Description
MP 2T 4	Ethernet 4 from User to CSDU -

Description of Ethernet 4 (ACD#1)

This interface is software disabled and reserved for future use.

- Ethernet Port Definition: Cockpit Priority Data 1
- Security Domain: Aircraft Control Domain (ACD)

4.3.17   To wire Ethernet 5 (ACD #2)

The Ethernet 5 interface is ARINC-781 compliant, but reserved for flight test use only and disabled for general use.

Wiring diagram

See *Wiring – overview* on page 4-7

Pins for Ethernet 5 (ACD#2)

CSDU pin	Description
MP06E	Ethernet 5 (Spare) from CSDU to User + (ACD#2)
MP07E	Ethernet 5 (Spare) from User to CSDU + (ACD#2)
MP06F	Ethernet 5 (Spare) from CSDU to User - (ACD#2)
MP07F	Ethernet 5 (Spare) from User to CSDU - (ACD#2)

Description

This interface is test purposes only and is only accessible when the aircraft is in Flight Test mode.

4.3.18   To wire the Maintenance interfaces

> **Important** | Make sure that there is no cable connected to the CSDU Maintenance connector when the aircraft is airborne.

SDU-5045 Compact Satellite Data Unit

The CSDU Front Panel Ethernet interface is for shop maintenance use only and disabled for general use.

The following drawing shows the wiring of the Maintenance PC connection on the CSDU front via Micro USB.
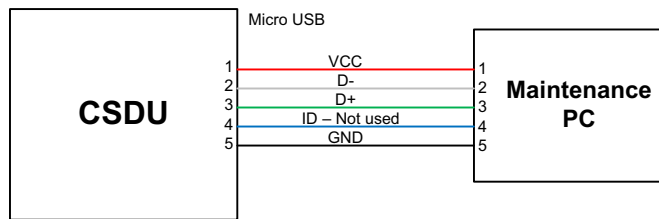
Figure 4-5: Wiring Maintenance PC via Micro USB
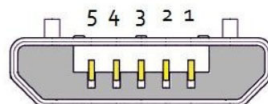
Figure 4-6: Micro USB maintenance connector of the CSDU, face view of
engaging end

The following list shows the pins used for the Micro USB interface (Front connector on the CSDU).

Pin	Pin Name	Description
1	VCC	+5 VDC
2	D-	Data -
3	D+	Data +
4	ID	Not Used
5	GND	Signal ground

Description of the maintenance interfaces on the CSDU

Use the maintenance interface on the front of the CSDU or the AISD 1/EFB 1 (Ethernet 11) interface for maintenance purposes. These interfaces are only accessible for maintenance when the aircraft is on the ground. The interfaces can be accessed from a PC with Ethernet interface or a Micro USB connector.

The maintenance interface has the following characteristics:

- Ethernet 11 (AISD 1 / EFB 1):100 Base-T /10 Base-T Ethernet / IEEE 802.3
- Front Panel Micro USB (115200 bps)

Person Activated Self Test (PAST) Push-To-Test button

The CSDU resets the system and initiates a Person Activated Self-Test "PAST" when the Push-To-Test button on the front panel is pressed for at least 2 seconds and less than 20 seconds and while in Maintenance Allowed mode (i.e. a PC is connected via the Micro USB

maintenance interface on the front of the CSDU or via the AISD 1 / EFB 1 Ethernet interface).

Figure 4-7: SDU-5045 Front plate

The front panel status LEDs will display the following:

- Steady red: A fault, which may degrade the system operation, is present in the CSDU.

- Flashing short green/long pause: Power On Self-Test (POST) or Person Activated Self-Test (PAST) is in progress.

- Flashing long green/short orange: No failure, but a BITE failure/warning is logged in the BITE log, severity ERROR.

- Steady green: No faults.

- Off->orange->off->red->off->green->off: Indicator Test

- When powering up the initial color of the 3 LEDs is orange.

4.3.19   CSDU ARINC 600 connector block

ARINC 600 connector drawing - overview
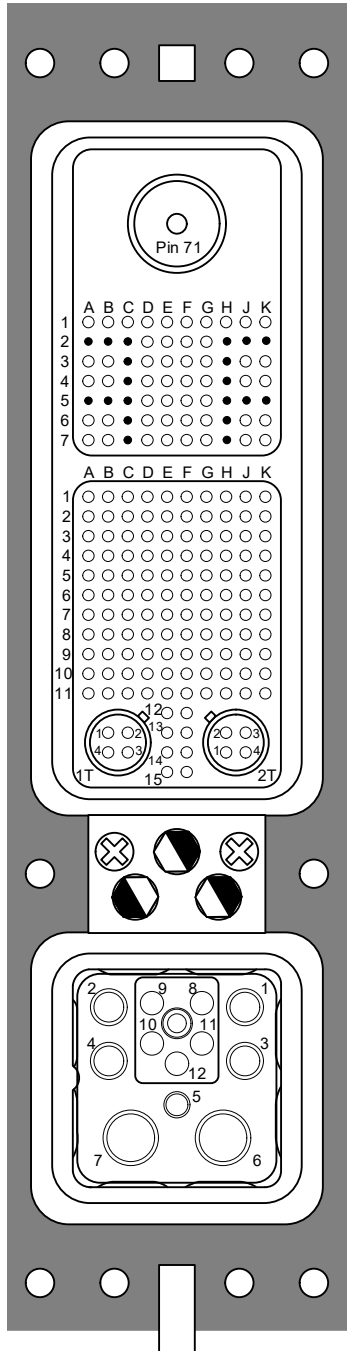
Size 2 Shell receptacle

Top Plug (TP):
Insert arrangement 08
Receptacles
1 Size 1 Coax cavity
50 Size 22 sockets
• = empty cavity

Middle Plug (MP):
Insert arrangement 120Q2
Receptacles
2 Size 8 Quadrax cavities
118 Size 22 sockets

Index pin code 81 (5,2,2)
Light areas are key holes in receptacle.

Bottom Plug (BP):
Insert arrangement 12F5C2
Receptacles
4 Size 12 pins
1 Size 16 pin,
2 Size 5 coax cavities
5 Size 16 optical cavities (not used)

Figure 4-8: CSDU ARINC 600 connector specifications

ARINC 600 connector drawings with functions

The following drawing shows the top plug, middle plug and bottom plug of the SDU rear receptacle with pin functions. For wiring details of this connector see *Electrical installation and wiring* on page 4-6.

Note ▶ The pins named **No Connect** are not connected to any electrical circuit inside the CSDU. The pins named **Reserved** are connected to passive components only inside the CSDU.

	A	B	C	D	E	F	G	H	J	K
1	No Connect	No Connect	ATE Pin 3 (Spare GND)	ATE Pin 4 (Spare Discrete Input #5)	ATE Pin 5 (Spare Discrete Output #4)	ATE Pin 6 (Spare Discrete Output #5)	ATE Pin 7 (ATE Pin A Discrete Input)	ATE Pin 8 (ATE Pin B Discrete Input)	Reserved ATE 9	ATE Pin 10 (Spare GND)
2	Empty Cavity	Empty Cavity	Empty Cavity	ATE Pin 14 (Spare Discrete Input #6)	ATE Pin 15 (Spare Discrete Input #7)	ATE Pin 16 (Spare Discrete Output #6)	ATE Pin 17 (Spare Discrete Output #7)	Pin 18 Empty Cavity	Pin 19 Empty Cavity	Pin 20 Empty Cavity
3	Ethernet 1 from CSDU to User+ (AISD#1)	Ethernet 1 from User to CSDU + (AISD#1)	Empty Cavity	Config Pin 1 (0V Common)	No Connect	Config Pin 3 (Program Pin Parity)	Config Pin 4 (SCM Presence)	Empty Cavity	Ethernet 11 From CSDU to User + (AISD#2)	Ethernet 11 From User to CSDU + (AISD#2)
4	Ethernet 1 from User to CSDU - (AISD#1)	Ethernet 1 from CSDU to User - (AISD#1)	Empty Cavity	Config Pin 5 (SDU Number)	No Connect	No Connect	No Connect	Empty Cavity	Ethernet 11 From User to CSDU - (AISD#2)	Ethernet 11 From CSDU to User - (AISD#2)
5	Empty Cavity	Empty Cavity	Empty Cavity	No Connect	No Connect	No Connect	No Connect	Empty Cavity	Empty Cavity	Empty Cavity
6	Ethernet 2 from CSDU to User + (PIESD#1)	Ethernet 2 from User to CSDU + (PIESD#1)	Empty Cavity	No Connect	No Connect	No Connect	No Connect	Empty Cavity	Ethernet 12 From CSDU to User + (PIESD#2)	Ethernet 12 From User to CSDU + (PIESD#2)
7	Ethernet 2 from User to CSDU - (PIESD#1)	Ethernet 2 from CSDU to User - (PIESD#1)	Empty Cavity	No Connect	No Connect	No Connect	No Connect	Empty Cavity	Ethernet 12 From User to CSDU - (PIESD#2)	Ethernet 12 From CSDU to User - (PIESD#2)

Figure 4-9: CSDU Top Plug in rear receptacle with pin functions

	A	B	C	D	E	F	G	H	J	K
1	Data from MCDU 1 A	Data from MCDU 1 B	Call Place/End Discrete Input 1	SCM Power 15 V	No Connect	No Connect	Ext. Reset Discrete Input	Call Place/End Discrete Input 2	Data from MCDU 2 A	Data from MCDU 2 B
2	Data from Primary IRS/GNSS A	Data from Primary IRS/GNSS B	Cockpit Voice Chime Signal Contact 1	SCM Power Return 0 V	No Connect	No Connect	No Connect	Cockpit Voice Chime Signal Contact 2	Data from Secondary IRS A	Data from Secondary IRS B
3	Data from CMU 1 A	Data from CMU 1 B	Cockpit Voice Call Light Output 1	SDU Data to SCM A	Spare Discrete Output #1	No Connect	No Connect	Cockpit Voice Call Light Output 2	Data from CMU 2 A	Data from CMU 2 B
4	Cockpit Audio Input 1 High	Cockpit Audio Input 1 Low	Cockpit Voice Mic-On Input 1	SDU Data to SCM B	Spare Discrete Output #2	No Connect	No Connect	Cockpit Voice Mic-On Input 2	Cockpit Audio Input 2 High	Cockpit Audio Input 2 Low
5	Cockpit Audio Output 1 High	Cockpit Audio Output 1 Low	Cockpit Voice Go Ahead Chime Reset 1	SCM Data to SDU A	Spare Discrete Output #3	No Connect	Spare ARINC 429 Output #1 A	Spare ARINC 429 Output #1 B	Cockpit Audio Output 2 High	Cockpit Audio Output 2 Low
6	Spare Discrete Input #1	Spare Discrete Input #2	Spare Discrete Input #3	SCM Data to SDU B	Ethernet 5 Ethernet T (Spare) from SDU to User + (ACD #2)	Ethernet 5 Ethernet T (Spare) from SDU to User- (ACD #2)	Spare ARINC 429 Input A	Spare ARINC 429 Input B	Data from GNSS to SDU A	Data from GNSS to SDU B
7	AES ID Input A	AES ID Input B	Spare Discrete Input #4	WoW Input 1	Ethernet 5 Ethernet T (Spare) from User to SDU + (ACD #2)	Ethernet 5 Ethernet T (Spare) from User to SDU - (ACD #2)	Spare ARINC 429 Output #2 A	Spare ARINC 429 Output #2 B	Data to CMU 1 & 2 A	Data to CMU 1 & 2 B
8	Data from CFDS A	Data from CFDS B	No Connect	No Connect	Data Loader Link A	TX Mute Input	No Connect	No Connect	Data to CFDS A	Data to CFDS B
9	From Airborne Data Loader A	From Airborne Data Loader B	Crosstalk from other SDU A	Crosstalk from other SDU B	Dual System Select Discrete I/O	Dual System Disable Discrete Input	Crosstalk to other SDU A	Crosstalk to other SDU B	To Airborne Data Loader A	To Airborne Data Loader B
10	Data from MCDU 3 A	Data from MCDU 3 B	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	Data to MCDU 1, 2, 3 A	Data to MCDU 1, 2, 3 B
11	Reserved	Reserved	No Connect	No Connect	No Connect	Service Availability Discretes 2	No Connect	No Connect	Reserved	Reserved
12					Service Availability Discretes 3	No Connect				
13					No Connect	No Connect				
14					No Connect	No Connect				

Left connector (rows 12–14, columns A–D): 10/100BASE-TX
- 1 Ethernet 3 from CSDU to ADL +
- 2 Ethernet 3 from ADL to CSDU +
- 4 Ethernet 3 from ADL to CSDU -
- 3 Ethernet 3 from CSDU to ADL -

Right connector (rows 12–14, columns G–K): 10/100BASE-TX
- 2 Ethernet 4 from User to CSDU +
- 3 Ethernet 4 from CSDU to User -
- 1 Ethernet 4 from CSDU to User +
- 4 Ethernet 4 from User to CSDU -

Figure 4-10: CSDU Middle Plug in rear receptacle with pin functions

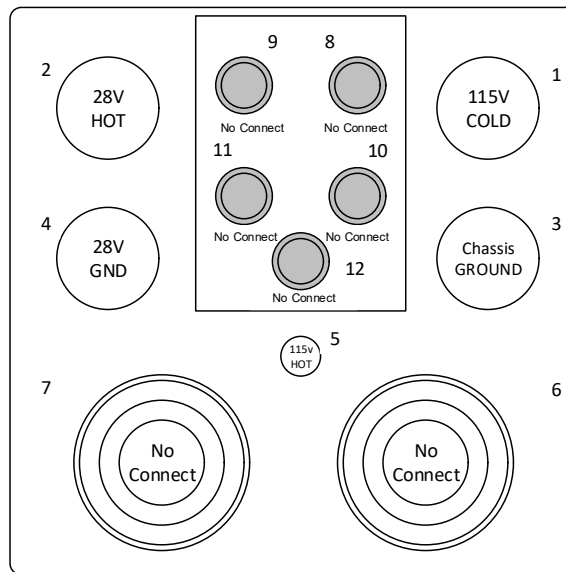Figure 4-11: CSDU Bottom Plug in rear receptacle with pin functions

Pin-out for CSDU rear receptacle (top plug)

Pin	Pin name
TP71	RF TX or RX/TX, to HELGA/HLD
TP01A	No connect
TP01B	No connect
TP01C	ATE pin 3 (Spare GND)
TP01D	ATE pin 4 (Spare Discrete Input #5)
TP01E	ATE pin 5 (Spare Discrete Output #4)
TP01F	ATE pin 6 (Spare Discrete Output #5)
TP01G	ATE pin 7 (ATE Pin A Discrete Input)
TP01H	ATE pin 8 (ATE Pin B Discrete Input)
TP01J	ATE pin 9 (Spare 0V)
TP01K	ATE pin 10: (Spare GND)
TP02A	Empty Cavity
TP02B	Empty Cavity
TP02C	Empty Cavity
TP02D	ATE pin 14 (Spare Discrete Input #6)
TP02E	ATE pin 15 (Spare Discrete Input #7)
TP02F	ATE pin 16 (Spare Discrete Output #6)
TP02G	ATE pin 15 (Spare Discrete Output #7)
TP02H	ATE pin 18: Empty Cavity
TP02J	ATE pin 19: Empty Cavity
TP02K	ATE pin 20: Empty Cavity
TP03A	Ethernet 1 from CSDU to User + (AISD#1)
TP03B	Ethernet 1 from User to CSDU + (AISD#1)
TP03C	Empty cavity!
TP03D	Config Pin 1 (0B Common)
TP03E	No Connect
TP03F	Config Pin 3 (Program Pin Parity)
TP03G	Config Pin 4 (SCM Presence)
TP03H	Empty Cavity
TP03J	Ethernet 11 from CSDU to User+ (AISD#2)
TP03K	Ethernet 11 from User to CSDU+ (AISD#2)
TP04A	Ethernet 1 from User to CSDU - (AISD#1)
TP04B	Ethernet 1 from CSDU to User - (AISD#1)
TP04C	Empty cavity!
TP04D	Config Pin 5 (SDU Number)
TP04E	No Connect

Pin	Pin name
TP04F	No Connect
TP04G	No Connect
TP04H	Empty Cavity
TP04J	Ethernet 11 from User to CSDU- (AISD#2)
TP04K	Ethernet 11 from CSDU to User- (AISD#2)
TP05A	Empty Cavity
TP05B	Empty Cavity
TP05C	Empty Cavity
TP05D	No connect
TP05E	No connect
TP05F	No connect
TP05G	No connect
TP05H	Empty Cavity
TP05J	Empty Cavity
TP05K	Empty Cavity
TP06A	Ethernet 2 from CSDU to User+ (PIESD#1)
TP06B	Ethernet 2 from User to CSDU+ (PIESD#1)
TP06C	Empty Cavity
TP06D	No connect
TP06E	No connect
TP06F	No connect
TP06G	No connect
TP06H	Empty Cavity
TP06J	Ethernet 12 from CSDU to User+ (PIESD#2)
TP06K	Ethernet 12 from User to CSDU+ (PIESD#2)
TP07A	Ethernet 2 from User to CSDU- (PIESD#1)
TP07B	Ethernet 2 from CSDU to User- (PIESD#1)
TP07C	Empty cavity
TP07D	No connect
TP07E	No connect
TP07F	No connect
TP07G	No connect
TP07H	Empty Cavity
TP07J	Ethernet 12 from User to CSDU- (PIESD#2)
TP07K	Ethernet 12 from CSDU to User- (PIESD#2)

Table 4-4: Pin allocation for the CSDU top plug

Pin-out for CSDU rear receptacle (middle plug)

Pin	Pin name and description	Pin	Pin name and description
MP01A	Data from MCDU 1 A	MP04B	Cockpit audio input 1 Low
MP01B	Data from MCDU 1 B	MP04C	Cockpit Voice Go Ahead Chime Reset
MP01C	Call Place End Discrete Input 1	MP04D	SDU Data to SCM B
MP01D	SCM Power output 15 V	MP04E	Spare discrete output #2
MP01E	No Connect	MP04F	No Connect
MP01E	No Connect	MP04G	No Connect
MP01G	Ext Reset Discrete Input	MP04H	Cockpit Voice Mic On input 2
MP01H	Call Place End discrete Input 2.	MP04J	Cockpit audio input 2 High
MP01J	Data from MCDU 2 A	MP04K	Cockpit audio input 2 Low
MP01K	Data from MCDU 2 B	MP05A	Cockpit audio output 1High
MP02A	Data from Primary IRS/ GNSS A	MP05B	Cockpit audio output 1Low
MP02B	Data from Primary IRS/ GNSS B	MP05C	Cockpit Voice Go Ahead Chime reset 1
MP02C	Cockpit Voice Chime signal contact 1	MP05D	SCM Data to SDU A
MP02D	SCM Power return 0 V	MP05E	Spare discrete output #3
MP02E	No Connect	MP05F	No Connect
MP02F	No Connect	MP05G	Spare ARINC 429 Output #1 A
MP02G	No Connect	MP05H	Spare ARINC 429 Output #1 B
MP02H	Cockpit Voice Chime Signal Contact 2	MP05J	Cockpit Audio Output 2 High
MP02J	Data from Secondary IRS A	MP05K	Cockpit Audio Output 2 Low
MP02K	Data from Secondary IRS B	MP06A	Spare discrete input #1
MP03A	Data from CMU 1 A	MP06B	Spare discrete input #2
MP03B	Data from CMU 1 B	MP06C	Spare discrete input #3
MP03C	Cockpit Voice Call Light output 1	MP06D	SCM Data to SDU B
MP03D	Data to SCM A	MP06E	Ethernet 5 Ethernet F (Spare) from SDU to User+ (ACD#2)
MP03E	Spare discrete output #1	MP06F	Ethernet 5 Ethernet F (Spare) from SDU to User- (ACD#2)
MP03F	No Connect	MP06G	Spare ARINC 429 Input A.
MP03G	No Connect	MP06H	Spare ARINC 429 Input B.
MP03H	Cockpit Voice Call Light output 2	MP06J	Data from GNSS to SDU A
MP03J	Data from CMU 2 A	MP06K	Data from GNSS to SDU B
MP03K	Data from CMU 2 B		
MP04A	Cockpit audio input 1 High		

Table 4-5: Pin allocation for the CSDU middle plug 1/2

Pin	Pin name and description
MP07A	AES ID input A
MP07B	AES ID input B
MP07C	Spare discrete input #4
MP07D	WOW input 1
MP07E	Ethernet 5, Ethernet T (Spare) from User to SDU+ (ADC#2)
MP07F	Ethernet 5, Ethernet T (Spare) from User to SDU- (ADC#2)
MP07G	Spare ARINC 429 Output #2 A
MP07H	Spare ARINC 429 Output #2 B
MP07J	Data to CMU 1 & 2. A
MP07K	Data to CMU 1 & 2. B
MP08A	Data from CFDS A
MP08B	Data from CFDS B
MP08C	No Connect
MP08D	No Connect
MP08E	Data loader link A
MP08F	TX mute input
MP08G	No Connect
MP08H	No connect
MP08J	Data to CFDS A
MP08K	Data to CFDS B
MP09A	From airborne data loader A.
MP09B	From airborne data loader B
MP09C	Crosstalk from other SDU A
MP09D	Crosstalk from other SDU B
MP09E	Dual System Select Discrete I/O
MP09F	Dual System Disable Discrete Input
MP09G	Crosstalk to other SDU A
MP09H	Crosstalk to other SDU B
MP09J	To airborne data loader A
MP09K	To airborne data loader B
MP10A	Data from MCDU 3 A
MP10B	Data from MCDU 3 B
MP10C	No Connect

Pin	Pin name and description
MP10D	No Connect
MP10E	No Connect
MP10F	No Connect
MP10G	No Connect
MP10H	No Connect
MP10J	Data to MCDU 1, 2, 3 A
MP10K	Data to MCDU 1, 2, 3 B
MP11A	Reserved
MP11B	Reserved
MP11C	No Connect
MP11D	No Connect
MP11E	No Connect
MP11F	Service Availability Discretes 2
MP11G	No Connect
MP11H	No Connect
MP11J	Reserved POTS 2. A (TIP)
MP11K	Reserved POTS 2 B (RING)
MP12E	Service Availability Discretes 3
MP12F	Service availability discretes 4. Discrete output. System fail.
MP13E	No Connect
MP13F	No Connect
MP14E	No Connect
MP14F	No Connect
MP15E	No Connect
MP15F	No Connect
MP1T 1	Ethernet 3 from CSDU to ADL + (ACD)
MP1T 2	Ethernet 3 from ADL. to CSDU + (ACD)
MP1T 3	Ethernet 3 from CSDU to ADL - (ACD)
MP1T 4	Ethernet 3 from ADL to CSDU - (ACD)
MP2T 1	Ethernet 4 from CSDU to User + (ACD)
MP2T 2	Ethernet 4 from User. to CSDU + (ACD)
MP2T 3	Ethernet 4 from CSDU to User - (ACD)
MP2T 4	Ethernet 4 from User to CSDU - (ACD)

Table 4-6: Pin allocation for the CSDU middle plug 2/2

Pin-out for CSDU rear receptacle (bottom plug)

Pin	Pin name and description
BP1	115 V COLD. 115 VAC power return
BP2	28 V HOT. 28 VDC power (No Connect - Provision only)
BP3	Chassis Ground
BP4	28 V GND. 28 VDC power return (No Connect - Provision only)
BP5	115V HOT. 115 VAC power
BP6 BP7 BP8 BP9 BP10 BP11 BP12	No Connect

4.4 Recommended cables

4.4.1 Introduction

This section lists recommended cables and allowed cable lengths for the cables in the AVIATOR 200S system.

> **Important** For specific cable requirements see the applicable section in **4.3 Electrical installation and wiring**.

4.4.2 Allowed cable lengths for power cables

Cable type: unshielded

Allowed cable lengths for CSDU

The following table shows the allowed CSDU cable lengths for selected AWG types.

> **Note** It is generally recommended to keep cable lengths as short as possible, specially on cables for **Chassis GND**.

Description	Pin	Contact size	Total maximum resistance (Hot and cold)	mΩ/m (at 70°C)				
				AWG12	AWG14	AWG16	AWG18	AWG20
115 VAC Line	BP1	16	650 mΩ[a]	x	x	14.3	22.9	36.3
115 VAC Neutral	BP5	12	1 Ω-350 mΩ in circuit breaker	5.7	9	x	x	x
Chassis	BP3	12	25 mΩ (Max. 1 m)	5.7	9	x	x	x
x = not suitable for this contact size.								

Example for 115 VAC

Requirement for maximum total resistance: 650 mΩ

Selected wire for Line: AWG 16 (14.3 mΩ/m)

Selected wire for Neutral: AWG 12 (5.7 mΩ/m)

$$\text{Maximum length} = \frac{650 m\Omega}{(14,3 m\Omega + 5,7 m\Omega)/\text{m}} = 32{,}5\text{m}$$

4.4.3   Recommended power cables

The cable types must meet the following standards:

- M27500 for shielded wire.

- M22759 for single wire.
AC Power:

Single unshielded wire 18 AWG (Hot) & 12 AWG (Cold)

Manufacturer: Carlisle (Thermax) MIL-DTL-22759/86-18

Manufacturer: Carlisle (Thermax) MIL-DTL-22759/86-12

4.4.4   Recommended RF cables

RG142 Double Shielded Coax Cable

Manufacturer: M17/60-RG142 MIL-DTL-17 22478 Harbour Industries

4.4.5   Recommended cables for ARINC 429

The cables for the ARINC 429 interfaces must be twisted and shielded. They must conform to the standards for aeronautical use. Use a cable that meets the following standard:

- M27500 for shielded wire
The cables for the ARINC 429 interfaces must be twisted and shielded and conform to the standards for aeronautical use.

ARINC-429 Data Bus Cable 2 Conductor 24AWG shielded

Manufacturer: Carlisle (ECS) P/N 522402

4.4.6   Recommended cables for Ethernet

Use an Ethernet cable that meets one of the following standards:

- TIA/EIA568-A CAT5 Requirements

- FAR 25.869(a)
The following cable types meet the requirements:

100ohm +-10%, 13pF/ft, 24 AWG shielded

Manufacturer: Carlisle (Tensolite) P/N NF24Q100-01 100Base-T Ethernet Cable

4.4.7   Recommended cables for discrete signals

Use cables for discrete wiring that meet the following standard:

- M27500 for shielded wire
2 Conductor Cable 22 AWG shielded

Manufacturer: Carlisle (Thermax) M27500-22 WJ 2 S 24

4.4.8 Recommended cable between the SCM and the CSDU

Use the following cables to connect the SCM to the CSDU:

- Communication cable (LAN). Data to and from the SCM: Carlisle (Tensolite) 100Base-T Ethernet Cable, 100 Ohm ±10%, 13 pF/ft, AVG24
Part number: NF24Q100-01

- Twisted pair shield cable for power source and power return: Carlisle (Thermax) M27500-22 WJ 2 S 24 (MIL-DTL-22759/86 wire), silver plated shield

4.5 Verifying the installation

You must perform certain check procedures during and after installation of the AVIATOR 200S system. The first check procedures are performed after wiring, but before inserting LRUs.For information on the required and recommended check procedures, refer to *Verification* on page 6-1.

4.6 Activation of airtime services

Before the AVIATOR 200S system becomes operational, the aircraft owner or operator must establish a contract with an Inmarsat Service Provider (ISP) so the system can be activated. The airtime provider handles terminal activation, billing and technical support that is related to the communication network.

The activation process may take some time, so to make sure it is ready in time, start the activation procedure some time **before the installation on the aircraft** begins.

4.6.1 ID numbers for the AVIATOR 200S system

ICAO address / AES ID

The ICAO address (International Civil Aviation Organization) is unique and assigned to an aircraft by the civil aviation authority of the state in which the aircraft is registered. This number is the same number used for the Mode S transponder and the TCAS system and in some countries it's calculated from the tail no. In the Inmarsat world, this is also referred to as the AES ID (Airborne Earth Station ID). The ICAO is normally noted in Oct (octal), but in some cases Hex is also used. The CSDU has an ARINC-429 compliant AES ID input for reception of a unique aircraft identification code.

- ARINC 600 connector, rear receptacle, middle plug: MP07A, MP07B.

- Label 275 and 276

The ICAO address can also be received from the CMU (label 214 and 216).

IMSI

The IMSI (International Mobile Subscriber Identity) is the ID for the SwiftBroadband service and is tied to the SDU Configuration Module (SCM).

SwiftBroadband USIM cards

The AVIATOR 200S system is delivered with four USIM cards permanently installed in the SCM. The USIM cards are pre-authenticated by Inmarsat and identified by their unique IMSI (International Mobile Subscriber Identity) number. The length of the IMSI is 15 digits. The SCM is delivered with the USIM cards not yet activated for SwiftBroadband services. For details how to activate the USIM cards contact your airtime provider. The IMSI number is needed to activate the satellite communication service.

A fifth card is a Security SmartCard.

The contract for SwiftBroadband services with your airtime provider contains among other items the following phone number:

• Direct phone numbers that is associated with the IMSI numbers of the installation. Typically the service provider provisions the USIMs for both circuit switched and packet switched services.

Service providers

You find a list of Service providers on Inmarsat's web site under Aviation, Aviation Connectivity services ((https://www.inmarsat.com/aviation/complete-aviation-connectivity/).

To retrieve the USIM card ID (IMSI number)

With the system you receive the IMSI numbers of the USIM cards that are installed in the SCM.

Important | The USIM cards are permanently installed in the SCM. Do not remove or replace the USIM cards.

Note | The IMSI numbers are printed on a label on the SCM enclosure and printed on the Certificate of Conformity letter belonging to the SCM.

Setup of the system

This chapter has the following sections:

- *Software upload*
- *SATCOM system ready for use*

Note	**Line of sight**

You can configure the system while the aircraft is in the hangar. Note that you cannot typically check the satellite communication while the aircraft is still in the hangar. There must be a line of sight between the SATCOM antenna and the satellite in order to register and use the satellite service.
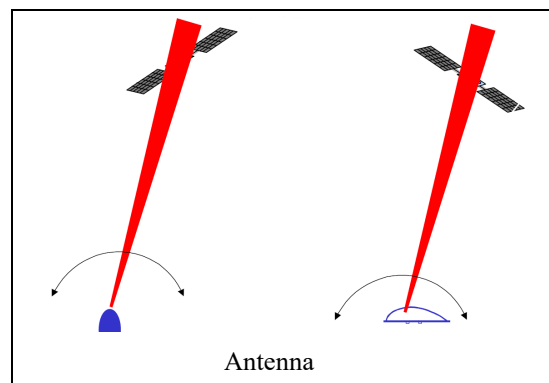

Antenna

Figure 5-1: Line of sight when communicating with the satellite

5.1 Software upload

5.1.1 Overview

After the physical installation of the system it must be loaded with the following files:

- Software image for the system, i.e. CSDU and antenna (typically factory loaded)
- Secure ORT (Owner Requirements Table)
- User ORT

Software image files should only be loaded via Ethernet (ARINC 615A) data loader as an ARINC 429 data loader (A615-3) would require more than 2 hours. All ORT files are loaded using an ARINC 429 or Ethernet (A615A) data loader.

The software image makes the system ready for configuration to the specific aircraft installation and application requirements. The ORT files contain the settings for the individual aircraft. The Secure ORT contains all aircraft specific settings. The User ORT contains user data, e.g. a telephone directory.

Secure ORT

The Secure ORT contains all settings for the connected units, including the antenna setup, cable losses and navigational input, interfaces to connected avionics equipment (e.g. CMU, MCDU, audio management panels etc.). This file is locked and cannot be edited. The Secure ORT file is generated with an ORT tool and loaded using an ARINC 429 (ARINC 615-3) or Ethernet (ARINC 615A) compliant data loader.

User ORT

The User ORT can be edited using the ORT tool (refer to *ORT Tool User Guide (99-168498)* [9]), you can add a telephone directory. The User ORT file is loaded using an ARINC 429 (ARINC 615-3) or Ethernet (ARINC 615A) compliant data loader.

5.1.2   Uploading software

Note Before you start loading the software files, make sure that the SCM is connected to the CSDU.

Note Software upload should only be done by qualified personnel.

To upload software, do as follows:

1. Make sure you have access to the following files:
   - Software image for the system, i.e. CSDU and HELGA (typically factory loaded)
   - Secure ORT (Owner Requirements Table)
   - User ORT
2. Upload the files using a compliant data loader, see the data loader's instruction manual.

5.2   SATCOM system ready for use

Having installed the AVIATOR 200S system and loaded the necessary software, verify that the system is fully operational.

Note **Line of sight during operation!**

Make sure that there is a line of sight between the SATCOM antenna and the satellite in order to logon to and use the SATCOM service.

To verify the system, do as follows:

1. Power on the system.
2. Wait until the three LEDs (No faults, power on and log on) on the CSDU front panel are green.
3. Continue verifying the system with functional tests, see chapter 6, *Verification*.

Verification

This chapter has the following sections:

- *Basic check flow*
- *Pre-Installation Check*
- *Functional Test, on Ground*
- *Interference Test*
- *Functional test, airborne*

6.1   Basic check flow

| Important | None of the check procedures described in this chapter can serve as a replacement for any of the required approvals and certifications. |

6.1.1   Check procedures

In order to ensure the correct function of the system, follow the below check flow.

1. **Pre-Installation Check**.
   Perform this check after wiring, but before inserting the LRUs.
   This is a check of the most important connections, the circuit breakers, cable losses etc. Refer to *Pre-Installation Check* on page 6-2.

2. **Configuration**.
   After performing the Pre-Installation Check, load the Secure ORT and the User ORT files. Refer to *Setup of the system* on page 5-1.

3. **Functional Test, on Ground**.
   When the system is configured and activated, make a functional test on ground. The functional test should check all user interfaces, such as voice, data, annunciators, etc. Refer to *Functional Test, on Ground* on page 6-3.

4. **Interference Test**.
   After the functional test, make an interference test. This test is to verify that transmission from the AVIATOR 200S system has no effect on the avionics of the aircraft, particularly navigation equipment. Refer to *Interference Test* on page 6-4.

   | Note | If additional avionics are installed in the aircraft at a later stage, repeat the interference test to ensure compatibility. |

5. **Functional Test, Airborne**.
   After the interference test, do a functional test while the aircraft is airborne. This test is basically the same as the functional test on ground. Refer to *Functional test, airborne* on page 6-5.

6.2   Pre-Installation Check

It is recommended to check the installation before inserting LRUs. The following list provides some of the most important issues, but other additional checks may be relevant for the specific installation.

Item	Description of Check	Reference Section	√	Value/ Comment
Mounting trays	Ensure service/maintenance accessibility.			
Coding of tray connectors	Check orientation of coding pins in the CSDU tray connector			
Grounding stud	Check that the grounding stud on the CSDU is connected correctly to the aircraft chassis.			
Circuit breaker rating	Check the circuit breaker.			
AC power	Check AC power on CSDU tray connector BP5: +115 VAC Line (Hot) BP1: +115 VAC Neutral (Cold)			
RF cable losses	Measure and note the cable loss from CSDU to the antenna			
RF cable DC resistance	Measure and note the DC resistance of the cable from CSDU to the antenna (as per section 4.2.4)			
Software version	Check the software version of the CSDU.			

Table 6-1: Check Sheet: Installation Check before inserting LRUs.

After a successful check of the installation, you must load the secure ORT and the user ORT with a data loader. For further information, refer to *Setup of the system* on page 5-1.

6.3 Functional Test, on Ground

6.3.1 Before you start

The system must be activated before performing this test. For further details see *Activation of airtime services* on page 5-49.

6.3.2 Check list for functional test on ground

The following list provides some of the most important checks to perform after power-up, but other additional checks may be relevant for the specific installation.

If you already know that certain interfaces or services are not going to be used, it is not necessary to perform tests on these specific interfaces or services.

Item	Description of Check	Reference	√	Value/ Comment
CSDU LEDs	Check that the Power LED is green			
	Check that the Fail/Pass LED is green			
	Check that the Logon LED is green			
MCDU headsets #1 to #3	Make an aircraft to ground call	AVIATOR 200S User Manual		
	Make a ground to aircraft call	AVIATOR 200S User Manual		
Ethernet	Connect to the Internet from a laptop, using the Ethernet AISD 1 / EFB 1 connection. .	AVIATOR 200S User Manual		
ACARS / AFIS / CMU	Send a test message and verify the reply or request for weather data and verify the data is downloaded. Both is done from the CDU / MCDU.	CDU / MCDU Manual		

Table 6-2: Check Sheet: Functional test, on Ground

6.4 Interference Test

6.4.1 Introduction

It is recommended to do an interference test to ensure that transmission from the AVIATOR 200S system does not influence any of the primary avionics on the aircraft.

> **Important** This test is **not** a replacement for any EMC tests in connection with e.g. an STC (Supplemental Type Certificate), TC (Type Certificate) or Field Approval. It is only an additional practical test of the application.

6.4.2 Test procedure

During the test, the aircraft must be on ground. A skilled person should be observing the instruments.

> **Important** Make sure that all possible avionics/equipment are powered on when A/C in ground state.

1. Determine the approximate location and direction towards the relevant satellite to be used.

2. Position the aircraft so that the SATCOM antenna transmits in the direction of the other antennas on the aircraft.

   Example: If the satcom antenna is tail-mounted, place the aircraft with the nose pointing in the direction of the satellite. The antenna will then transmit in the direction of the other antennas located in front of it.

3. You can establish a transmission by, for example, making a video call or sending a large file via a laptop that is connected to the EFB 1 Ethernet interface.

4. While transmission is ongoing, observe all primary navigation instruments, autopilot, VOR/ILS, ADF and DME etc. and make sure none of the instruments are influenced by the AVIATOR 200S transmission.

5. Check aircraft GPS signal-to-noise ratio.

6. Monitor VHF communication and make sure squelch is not opened unintentionally.

7. If TCAS/ACAS is installed, verify that it is not flagged "FAILED" during SATCOM transmission.

> **Note** If any additional avionics are installed at a later stage, do the interference test again.

6.5 Functional test, airborne

The following list provides some of the most important checks to do while the aircraft is airborne, after all on-ground tests are passed. Other additional checks may be relevant for the specific installation.

6.5.1 Before you start

If you already know that certain interfaces or services are not going to be used, it is not necessary to perform tests on these specific interfaces or services.

6.5.2 Check list for functional test, airborne

Item	Description of Check	Reference	√	Value/ Comment
MCDU headsets #1 to #2	Make an air to ground call and keep it up during a 360° turn.	AVIATOR 200S User Manual		
	Make a ground to air call	AVIATOR 200S User Manual		
Ethernet	Connect to the Internet from a laptop, using the Ethernet connection.).	AVIATOR 200S User Manual		
ACARS / AFIS / CMU	Send a test message and verify reply or request for weather data and verify the data is downloaded. Both is done from the CDU / MCDU.	CDU / MCDU Manual		

Table 6-3: Check Sheet: Functional test, Airborne

Maintenance and troubleshooting

This chapter has the following sections:

- *Continued Airworthiness*
- *Helpdesk*
- *Software update*
- *To exchange an LRU*
- *Troubleshooting*
- *Returning units for repair*
- *Disposal of electrical and electronic equipment*

7.1 Continued Airworthiness

7.1.1 General

Maintenance

Maintenance requirements and instructions for continued airworthiness of the Cobham SATCOM units in the AVIATOR 200S System are defined here.

The AVIATOR 200S System (CSDU, SCM and HELGA) requires no periodic scheduled servicing tasks.

> **Note** When replacing the CSDU, it is important to leave the SCM installed in the aircraft, because the SCM contains the aircraft-specific configuration data.

The CSDU is a Line-Replaceable Unit (LRU) and constructed for factory repair only. Defective units must be returned to the factory for investigation, repair and test.

The SCM is a Line-Replaceable Unit (LRU) and constructed for factory repair only. Defective units must be returned to the factory for investigation, repair and test.

See also the installation manual of the HELGA, refer to [8] *LGA-5005 HELGA Installation Manual (98-152675)*.

Technical support

Web address: https://cobhamaerospacecommunications.com/avionics-support-services/

E-mail to Cobham technical support: AVIATOR.support@cobham.com.

Telephone numbers for technical support:

- EMEA: +45 3955 8322 (8am to 4 pm, European Time Zone)

- Americas: +1 757 747-2344 (8am to 5 pm, Eastern Time)

Technical Training

E-mail to Cobham technical support: AVIATOR.support@cobham.com.

AOG desk

OEM Services

Telephone: +33 1 72 02 2323

E-mail: aog@oemservices.aero

7.1.2   Maintenance instructions

Documentation

Maintenance information for the AVIATOR 200S System is contained in this manual. Place the wiring diagram information in this manual in the aircraft operator's appropriate aircraft wiring diagram manuals.

Inoperative units

If a system component is inoperative, remove or replace the unit.

Secure all cables, collect applicable switches and circuit breakers, and label them inoperative. Revise the equipment list and weight and balance as applicable prior to flight and make a log book entry that the unit was removed.

For information on how to return a unit for repair, see *Returning units for repair* on page 7-10. Once repaired, reinstall the unit in the aircraft in accordance with the instructions in this Installation and Maintenance Manual.

Scheduled Maintenance Program

The AVIATOR 200S System components are considered on-condition units and no additional maintenance is required other than a check for security and operation at normal inspection intervals.

The recommended periodic scheduled maintenance tasks to be added to the aircraft operator's appropriate aircraft maintenance program are as follows:

CSDU	None required

Table 7-1: Periodic scheduled maintenance tasks

| SCM | None required |
| HELGA | None required |

Table 7-1: Periodic scheduled maintenance tasks

The recommended periodic scheduled inspection tasks to be added to the aircraft operator's appropriate aircraft maintenance program are as follows:

CSDU	None required
SCM	None required
HELGA	None required

Table 7-2: Periodic scheduled inspection tasks

The recommended periodic scheduled preventative maintenance tasks to be added to the aircraft operator's appropriate aircraft maintenance program are as follows:

(Tests to determine system condition and latent failures)

CSDU	None required
SCM	None required
HELGA	None required

Table 7-3: Periodic scheduled preventative maintenance tasks

Inspection intervals of the HELGA (LGA-5005) are equal to the Mandatory Periodic Inspection interval for the aircraft type on which it is fitted. For further information refer to [8].

7.2   Helpdesk

If this manual does not provide the remedies to solve your problem, you may want to contact your Airtime Provider or your local distributor.

7.2.1   System support

If you need assistance with problems caused by the CSDU, SCM or HELGA, call a distributor in your area. See *Technical support* on page 7-2.

7.2.2   Security log and system log files

For instructions how to retrieve security and system log files, see the AVIATOR S Operational User Guidance [10].

7.3 Software update

See *Software upload* in chapter 5.

7.4 To exchange an LRU

This document describes the procedures for removal and re-installation of the AVIATOR 200S LRUs:

- CSDU (*405045-vvccc*).
- SCM (*405055-vvccc*)

For the procedure of removal and re-installation of the HELGA (LGA-5005) see the HELGA installation manual [8].

7.4.1 Time required

The time required for removal and re-installation of an LRU is estimated to 15 minutes.

7.4.2 Tools required

- CSDU: No tools required.
- SCM: No special tools required. Screw driver if fixed with a screw or bolt.

7.4.3 Removal and re-installation of the CSDU (SDU-5045)

To remove the CSDU do as follows:

1. Ensure that power is removed from the SATCOM system before removing any LRU.
2. Pull and turn to loosen the knurled knob(s) that retain(s) the LRU in the tray.
3. Pull the LRU straight out from the tray by the handle. Be careful not to drop the unit.

7.4.4 Re-installation of the CSDU (SDU-5045)

To re-install the CSDU do as follows:

1. Insert the LRU straight in the tray by the handle. Be careful not to drop the unit.
2. Make sure that the LRU is completely seated against the mating connector.
3. Pull and turn to fasten the knurled knob(s) that retain(s) the LRU in the tray.

7.4.5   Removal and re-installation of the SCM (SCM-5055)

1. Ensure that power is removed from the SATCOM system before removing the SCM.

2. Release the screw-locks on the D-sub connector and remove the 15 pin D-sub connector from the SCM.

3. Remove the four fasteners holding the SCM in place through its mounting flange.

Re-installation

1. Mount the SCM to the aircraft structure with the four fasteners through its mounting flange.SCM.

2. Connect the 15 pin D-sub connector to the SCM and tighten the connector screw-locks to 0.32 Nm.

7.4.6   Removal and re-installation of the HELGA (LGA-5005)

Refer to the LGA-5005 HELGA installation manual [8].

7.5 Troubleshooting

7.5.1 Status signalling

Built-In Test Equipment (BITE)

The CSDU provides a Built-In Test Equipment (BITE) function in order to make fault diagnostics easy during service and installation.

The BITE test is done during:

- Power On Self Test (POST), which is automatically performed each time the system is powered on.

- Person Activated Self Test (PAST), which is initiated by pressing the Push To Test button on the front panel of the CSDU.

Also, during operation a Continuous Monitoring BITE function is performed.

Each LRU in the AVIATOR 200S system has its own BITE function but they are all controlled and monitored by the CSDU in the system.

Results from the BITE tests for the complete AVIATOR 200S system are shown as four digit error codes. The two most significant digits represent the main group. The two least significant digits give further details. The CSDU BITE codes inform you that there are errors in the CSDU. Use the CSDU diagnostic report for further information on the BITE errors.

Means of signalling

The AVIATOR 200S System provides various methods for signalling the status of the system.

- **LEDs** on the front panel of the CSDU are used to signal:
  - Power on/off
  - Logon
  - Fail/Pass

- Connected display units (e.g. **MCDU)** display messages concerning:
  - information from the services
  - status information from the system to the user
  - equipment errors.

- Security and system log files: In Maintenance allowed mode.

Messages in the MCDU display

Two types of messages are displayed:

- Cause codes are information from the services or status information from the system to the user.

- BITE codes are information about errors in the equipment.

For further information and lists of the possible error codes, refer to the appendix *System messages* on page B-1.

7.5.2   Status signalling with LEDs

LEDs on CSDU

During the power-up procedure all LEDs on the front plate are orange. If all 3 LEDs on the front stay orange after power up, check the AC supply of the CSDU. If the wiring is good, the CSDU software may be corrupted. If the wiring is good, the CSDU software is corrupted. Contact your local distributor for instructions how to proceed.

Logon LED on CSDU	
Behaviour	Description
Red	Acquiring satellite network
Orange	Network synchronization
Green	Network logon
Off	No acquired satellite/logged off

Table 7-4: Function of the CSDU Logon LED

Fail/Pass LED on CSDU	
Behaviour	Description
Steady red	A fault which may degrade the system operation is present in the SDU
Flashing: short green/ long pause	Power On Self Test (POST) or Person Activated Self Test (PAST) in progress
Flashing: long green/ short orange	No current failure, but a BITE failure / warning is logged in the error log
Steady green	No faults

Table 7-5: Function of the CSDU Fail/Pass LED

7.5.3   Initial troubleshooting

Overview

This section describes an initial check of the primary functions of the AVIATOR 200S System, and provides some guidelines for troubleshooting, if one of the checks should fail.

Means available for troubleshooting

The following means are available for troubleshooting:

- **LEDs and BITE messages**. Generally, if a fault occurs without any obvious reason, it is always recommended to observe the LED behaviour. For information on the function of the LEDs refer to *Status signalling* on page 7-7. For a list of all the BITE codes and Cause codes, refer to the appendix *System messages* on page B-1.

- **Maintenance interface**. For troubleshooting errors in the CSDU, connect to the Micro USB maintenance port on the front plate of the CSDU and extract the relevant log files. Refer to the Operational User Guidance [10] for instructions how to extract and analyze the log files.

Problem	What to do
No GPS signal: Interference from satcom antenna on GPS antenna	If the existing GPS antenna on board the aircraft does not provide sufficient filtering of the satcom antenna signal to provide a usable GPS signal, you must replace the existing GPS antenna with a GPS antenna that has a satcom filter.
Registration for voice or data on the BGAN network not possible	In case the system cannot register properly for voice or data service, check with your Service provider that the USIM cards in the SCM are not blocked.

Table 7-6: Initial troubleshooting

7.6 Returning units for repair

7.6.1 Repackaging requirements

Should you need to send the product for repair, please read the below information before packing the product.

The shipping carton has been carefully designed to protect the AVIATOR 200S and its accessories during shipment. This carton and its associated packing material should be used when repacking for shipment. Attach a tag indicating the type of service required, return address, part number and full serial number. Mark the carton FRAGILE to ensure careful handling.

> **Note** Correct shipment is the customer's own responsibility.

If the original shipping carton is not available, the following general instructions should be used for repacking with commercially available material.

> **Note** The packaging must meet at least ATA 300 CATEGORY III.

1. Protect the connectors of the CSDU and SCM with plastic connector protection.

2. Wrap the defective unit in heavy paper or plastic. Attach a tag indicating the type of service required, return address, part number and full serial number.

3. Use a strong shipping container, e.g. a double walled carton.

4. Protect the front- and rear panel with cardboard and insert a layer of shock-absorbing material between all surfaces of the equipment and the sides of the container.

5. Seal the shipping container securely.

6. Mark the shipping container FRAGILE to ensure careful handling.

Failure to do so may invalidate the warranty.

7.7 Disposal of electrical and electronic equipment

Old electrical and electronic equipment marked with this symbol can contain substances hazardous to human beings and the environment. Never dispose these items together with unsorted municipal waste (household waste). In order to protect the environment and ensure the correct recycling of old equipment as well as the re-utilization of individual components, use either public collection or private collection by the local distributor of old electrical and electronic equipment marked with this symbol.

Contact the local distributor for information about what type of return system to use.

Equipment specifications

A.1   Introduction

This appendix has the following sections:

- *SDU-5045 Compact Satellite Data Unit*
- *SCM-5055 Configuration Module*

Important note!

The information, drawings, and wiring diagrams contained in this manual are intended as a reference for engineering planning only. It is the installer's responsibility to compose installation drawings specific to the aircraft.

Cables and connectors are not included.

For specifications of the antenna see the documentation provided with the antenna.

A.2   SDU-5045 Compact Satellite Data Unit

Characteristics	Specification
Dimensions (L x W x H)	2 MCU ARINC 600 enclosure 319.50 mm x 61.00 mm x 199.70 mm (12.58" x 2.40" x 7.86")
Weight	4.2 kg (9.26 lbs) Guaranteed weight max 4.4 kg (9.7 lbs)
Mounting	Mount in an ARINC 600 2 MCU tray. • Controlled-temperature locations and convection airflow cooling • Non-controlled-temperature locations and forced airflow cooling (Tray with fan/plenum) • Non-controlled-temperature location and supplied airflow cooling (tray integrated onto a shelf racking system) • Non-pressurized locations. • Pressurized locations.
Supply voltage	Nominal AC supply: 115 VAC (360 - 800Hz) Continuous operation: +90 V to 134 V Short time operation: +70.0 V - 170 V (30ms)
Transparency time	200 ms
Typical Power Consumption: CSDU alone in a Class 4 system (AVIATOR 200S)	AC: 44 W Power provided for HELGA: 51 W Power provided for SCM: 4.5 W
Power consumption as Class 4 system AVIATOR 200S including SCM and HELGA	AC: <100 W
Maximum heat dissipation	<50 W
Connectors	Rear: ARINC 600 Attachment 11 Front: micro USB (for maintenance).
Operating temperature Convection airflow cooling Forced airflow cooling Supplied airflow cooling	 -40˚ to +40˚ C (+40˚C/20 hours; +55˚C/30 minutes) -40˚ to +70˚ C -40˚ to +70˚ C

Table A-1: CSDU specifications

Characteristics	Specification
Ground survival temperature	-55˚ to +85˚ C
Shelf life	Max. 7 years at max. 35˚ C
Maximum resistance, AC input	< 1.0 Ohm
Altitude	For installation in non-pressurized locations: Max. 55000 ft (Cat-F2)
Decompression	For installation in pressurized locations: 55000 ft (Cat. A2)
Overpressure	For installation in pressurized locations: -15000 ft (Cat. A2)
Relative humidity	95% non-condensing at +50˚C
Environmental categories	See appendix C, *DO-160G specifications, Compact Satellite Data Unit (CSDU)* on page C-2.

Table A-1: CSDU specifications

A.3   SCM-5055 Configuration Module

Characteristics	Specification
Dimensions (L x W x H)	114.00 mm x 101.60 mm x 25.40 mm (4.49" x 4.00" x 1.00")
Weight	200 ± 30 g
Mounting	• Non-controlled temperature locations with convection airflow cooling • Non-pressurized locations. • Pressurized locations.
Supply voltage	The SCM is connected to and powered by the CSDU.
Connectors	15 position D-subminiature plug (pins) with 4-40 UNC female screw-locks, equivalent to MIL-DTL-24308 M24308/24-26 and M24308/26-115 (ARINC 781 compliant)
Operating temperature	-40˚ to +70˚ C
Ground survival temperature	-55˚ to +85˚ C
Shelf life	Max. 7 years at max. 35˚ C
Altitude	For installation in non-pressurized locations: Max. 55000 ft (Cat. F2)
Decompression	For installation in pressurized locations: 55000 ft (Cat. A2)
Overpressure	For installation in pressurized locations: -15000 ft (Cat. A2)
Environmental categories	See appendix C, *DO-160G specifications, Configuration Module (SCM)* on page C-5.

Table A-2: SCM specifications

System messages

This appendix has the following sections:

- *BITE error codes*

The AVIATOR 200S system shows system messages in connected display units (e.g. MCDU) or in the security and system log files of the CSDU when extracted in maintenance-allowed mode.

B.1 BITE error codes

BITE error codes contain information from the AVIATOR 200S system. This information is a result of a POST or PAST sequence or Continuous Monitoring performed by the Built-In Test Equipment. BITE error codes and explanation is shown in the MDCU display.

B.1.1 List of BITE error codes

Fault message code	Fault message subject	Failure cause	Consequences on the system	FDCE type 1
1	SDU1(5RV1)	Faulty SDU	One or more system functions will be significantly degraded, possibly to the extend of being unable to communicate with other A/C LRUs, unable to log onto Inmarsat network or unable to support cockpit and/or cabin voice/data calls depending on the failure	SATCOM Fault
2	SDU1(5RV1)	Faulty SDU	One or more system functions may suffer minor degradations, depending on the specific failure cause.	Loss of AISD or PIESD Communication
4	SDU1(5RV1)	Faulty SDU	Loss of all communications	SATCOM Fault
6	ANTENNA-LOW GAIN (46RV1)	HELGA failure, Configuration data failure	Probable loss of all communications	SATCOM Fault
7	SCM1(78RV1)	SCM failure	Probable loss of all communications	SATCOM Fault

Table B-1: BITE error codes

Fault message code	Fault message subject	Failure cause	Consequences on the system	FDCE type 1
8	MCDU1 (2CA1)	SATCOM system receives an ARINC 429 message from MCDU1 with a SSM set to NCD/FW/FT	MCDU1 is unusable for control/status of the SATCOM system. If available, MCDU2 or MCDU3 may be used if their SDU interfaces have not failed.	Loss of HMI
9	MCDU2 (2CA2)	SATCOM system receives an ARINC 429 message from MCDU2 with a SSM set to NCD/FW/FT	MCDU2 is unusable for control/status of the SATCOM system. If available, MCDU1 or MCDU3 may be used if their SDU interfaces have not failed.	Loss of HMI
10	MCDU3 (2CA3)	SATCOM system receives an ARINC 429 message from MCDU3 with a SSM set to NCD/FW/FT	MCDU3 is unusable for control/status of the SATCOM system. If available, MCDU1 or MCDU2 may be used if their SDU interfaces have not failed.	Loss of HMI
11	ATSU1 (1TX1)	SATCOM system receives an ARINC 429 message from ATSU1 with a SSM set to NCD/FW/FT which lead to the Loss of Labels 214 and 216	Probable loss of all communications	SATCOM Fault
12	ATSU2 (1TX2)	SATCOM system receives an ARINC 429 message from ATSU1 with a SSM set to NCD/FW/FT which lead to the Loss of Labels 214 and 216	Probable loss of all communications	SATCOM Fault
13	ADIRU1 (1FP1)	SATCOM system receives an ARINC 429 message from ADIRU1 with a SSM set to NCD/FW/FT	The SDU will attempt to obtain all inertial data from its other IRS input, resulting in loss of all satellite communications only if an independant and healthy second ADIRU is unavailable.	Loss of Communication
14	ADIRU2 (1FP2)	SATCOM system receives an ARINC 429 message from ADIRU2 with a SSM set to NCD/FW/FT	The SDU will attempt to obtain all inertial data from its other IRS input, resulting in loss of all satellite communications only if an independant and healthy second ADIRU is unavailable.	Loss of Communication
18	ATSU1(1TX1)/ SDU1(5RV1)/ WRG	SATCOM system receives an ARINC 429 message from ATSU1 with a SSM set to SILENT	Probable loss of all communications	SATCOM Fault
19	MCDU1(2CA1)/SDU1(5RV1)/WRG	SATCOM system receives an ARINC 429 message from MCDU1 with a SSM set to Silent	MCDU1 is unusable for control/status of the SATCOM system	Loss of HMI

Table B-1: BITE error codes (Continued)

Fault message code	Fault message subject	Failure cause	Consequences on the system	FDCE type 1
20	MCDU2(2CA2)/SDU1(5RV1)/WRG	SATCOM system receives an ARINC 429 message from MCDU2 with a SSM set to Silent	MCDU2 is unusable for control/status of the SATCOM system	Loss of HMI
21	ATSU2(1TX2)/SDU1(5RV1)/WRG	SATCOM system receives an ARINC 429 message from ATSU2 with a SSM set to SILENT	Probable loss of all communications	SATCOM Fault
24	HPA-HI GAIN(7RV1)/SDU1(5RV1)/WRG(41RV)	No data from HPA to CSDU	Probable loss of communications	SATCOM fault
25	SDU1(5RV1)/SCM1(78RV1)/WRG	No data from SCM to the CSDU	Loss of communications	SATCOM fault
26	MCDU3(2CA3)/SDU1(5RV1)/WRG	SATCOM system receives an ARINC 429 message from MCDU3 with a SSM set to Silent	MCDU3 is unusable for control/status of the SATCOM system	Loss of HMI
27	ATSU1(1TX1)	Loss of label 270	None	NONE
28	ATSU2(1TX2)	Loss of label 270	None	NONE
40	SDU1(5RV1)/ANTENNA-LOW GAIN (46RV1)/WRG(131RV)	Failure in HELGA and/ or SDU, and/or Coax	Loss of communications	SATCOM Fault
41	WRG (42RV)	Failure in the DLNA-CSDU Coaxial Cable	Loss of communications	SATCOM Fault
45	POWER SUPPLY INTERRUPT	Power interrupt	Loss of communications	Loss of Communication
54	RMP1(3RN1)	SATCOM system receives an ARINC 429 message from RMP1 with a SSM set to NCD/FW/FT	RMP1 is unusable for control/status of the SATCOM system. If available, RMP2 or RMP3 may be used if their SDU interfaces have not failed.	Loss of HMI
55	RMP2(3RN2)	SATCOM system receives an ARINC 429 message from RMP2 with a SSM set to NCD/FW/FT	RMP2 is unusable for control/status of the SATCOM system. If available, RMP1 or RMP3 may be used if their SDU interfaces have not failed.	Loss of HMI
56	RMP3(3RN3)	SATCOM system receives an ARINC 429 message from RMP3 with a SSM set to NCD/FW/FT	RMP3 is unusable for control/status of the SATCOM system. If available, RMP1 or RMP2 may be used if their SDU interfaces have not failed.	Loss of HMI

Table B-1: BITE error codes (Continued)

Fault message code	Fault message subject	Failure cause	Consequences on the system	FDCE type 1
57	RMP1(3RN1)/ SDU1(5RV1)/ WRG	SATCOM system receives an ARINC 429 message from RMP1 with a SSM set to Silent	RMP1 is unusable for control/status of the SATCOM system	Loss of HMI
58	RMP2(3RN2)/ SDU1(5RV1)/ WRG	SATCOM system receives an ARINC 429 message from RMP2 with a SSM set to Silent	RMP2 is unusable for control/status of the SATCOM system	Loss of HMI
59	RMP3(3RN3)/ SDU1(5RV1)/ WRG	SATCOM system receives an ARINC 429 message from RMP3 with a SSM set to Silent	RMP3 is unusable for control/status of the SATCOM system	Loss of HMI
90	ADIRU1(1FP1) /SDU1(5RV1)/ WRG	SATCOM system receives an ARINC 429 message from ADIRU1 with a SSM set to Silent	Probable loss of all communications	Loss of Communication
91	ADIRU2(1FP2) /SDU1(5RV1)/ WRG	SATCOM system receives an ARINC 429 message from ADIRU2 with a SSM set to Silent	Probable loss of all communications	Loss of Communication
94	AUTO RESET		Loss of communications during the reset	Loss of Communication
95	MANUAL RESET		Loss of communications during the reset	Loss of Communication
96	HI GAIN ANTENNA-TOP (16RV1)	HGA Failure	Probable loss of all communications	SATCOM Fault
97	SCM1 (78RV1)/ OVER TEMPERA	The SCM is overheated	Probable loss of communications	SATCOM Fault
98	HPA-HI GAIN(7RV1)/O VER TEMPERA	The HPA is overheated	Probable loss of communications	SATCOM Fault
99	SDU1(5RV1)/ OVER TEMPERA	The SDU is overheated	Loss of AISD and/or PIESD communication	Loss of AISD and/or PIESD Communication

Table B-1: BITE error codes (Continued)

Fault message code	Fault message subject	Failure cause	Consequences on the system	FDCE type 1
100	ANTENNA-LOW GAIN (46RV1)/ OVER TEMPERA	The HELGA is overheated	Probable loss of communications	SATCOM Fault
101	WRG: CONFIG PIN PROG/SDU1(5 RV1)	Configuration HPP Parity error, Configuration HPP combination not plausible, ATE HPP parity error	Probable loss of communications	SATCOM Fault
102	SDU1(5RV1)	Faulty SDU	Loss of AISD or PIESD communication	Loss of AISD or PIESD Communi cation
103	SCM1(78RV1)	AISD/PIESD user ORT failure	Loss of AISD or PIESD communication	Loss of AISD or PIESD Communi cation
104	SCM1(78RV1) SOFTWARE COMP	SCM Failure	Probable loss of all communications	SATCOM Fault
105	HPA-HI GAIN(7RV1) SOFTWARE COMP	MCHPA Failure	Probable loss of all communications	SATCOM Fault
106	ANTENNA-LOW GAIN (46RV1) SOFTWARE COMP	HELGA failure	Probable loss of all communications	SATCOM Fault
107	SCM1(78RV1)	Cabin USIM interface Failure	Loss of Cabin communications	Loss of PIESD Communi cation
108	SCM1(78RV1)	SECURE ORT/ ACD user ORT failure	Loss of all communications	SATCOM Fault

Table B-1: BITE error codes (Continued)

Fault message code	Fault message subject	Failure cause	Consequences on the system	FDCE type 1
109	SDU1(5RV1)/WRG	Discrete Output failure	No light indication of incomming call on channel 2 or No light indication of incomming call on channel 1	No light indication of incoming call on channel 2 or No light indication of incoming call on channel 1
110	SCM1(78RV1) SOFTWARE COMP	SCM Failure	Loss of Cabin Communications	Loss of AISD or PIESD communication
111	SCM1(78RV1)/REGISTRATION	SCM Registration Failure	Probable loss of all communications	SATCOM Fault
112	XPDR-1(1SH1)	SATCOM system receives an ARINC 429 message from XPDR1 with a SSM set to NCD/FW/FT	Probable loss of all communications	SATCOM Fault
113	XPDR-1(1SH1)/SDU1(5RV1)/WRG	SATCOM system receives an ARINC 429 message from XPDR1 with a SSM set to Silent	Probable loss of all communications	SATCOM Fault

Table B-1: BITE error codes (Continued)

DO-160G specifications

This appendix has the following sections:

- *General DO-160 information*
- *Compact Satellite Data Unit (CSDU)*
- *Configuration Module (SCM)*

Refer to LGA-5005 HELGA installation manual [8] for DO-160 specifications of the antenna.

C.1 General DO-160 information

C.1.1 Certifying agency

Approval of the installation of the AVIATOR 200S system is not authorized by this installation manual. Acceptance for the installation and use of the AVIATOR 200S system and its associated components must be obtained through the appropriate offices of the FAA or other certifying agency. It is recommended that all proposed installations be coordinated with the local jurisdiction of the FAA or other certifying agency prior to performing the installation.

C.1.2 Environmental Qualification Forms

The Environmental Qualification Forms list the environmental categories under which all Cobham SATCOM components of the AVIATOR 200S system are approved.

Please refer to RTCA DO-160G for further details on the following Environmental Qualification Forms.

C.2 Compact Satellite Data Unit (CSDU)

Part Number: SDU-5045

Environmental variable	DO160 G section (Unless otherwise specified)	Category and requirements
Temperature and Altitude	4	[(A2F2)Z]
Ground Survival Low Temperature Test -55˚C	4.5.1	A2
Short-Time Operating Low Temperature Test -40˚C	4.5.1	A2
Operating Low Temperature Test -40˚C	4.5.2	A2
Ground Survival High Temperature Test +85˚C	4.5.3	A2
Short-Time Operating High Temperature Test +70˚C	4.5.3	A2
Operating High Temperature Test +70˚C	4.5.4	A2
In Flight Loss of Cooling	4.5.5	Z
Altitude Test +55.000ft	4.6.1	F2
Decompression Test	4.6.2	A2F2
Overpressure Test	4.6.3	A2
Temperature Variation (-40˚C to +70˚C)	5	B
Humidity	6	A
Operational Shocks and Crash Safety	7	-
Operational Shocks	7.2	E / B
Crash Safety (Impulse)	7.3.1	E / B
Crash Safety (Sustained)	7.3.3	Aircraft Type 5, Orientation: Random
Bench Handling Shocks	MIL-STD 810G, Method 516.6, Proc. VI	MIL-STD 810G, Method 516.6, Proc. VI
Vibration	8	-
Standard Random Vibration	8.5	S(B3)

Table C-1: Common environmental conditions and tests (DO160G) for CSDU

Environmental variable	DO160 G section (Unless otherwise specified)	Category and requirements
High-Level, Short Duration Vibration	8.6	H(R)
Explosion Atmosphere	9	E
Waterproofness	10	Y
Fluids Susceptibility	11	F
Sand & Dust	12	D
Fungus Resistance	13	F
Salt Fog	14	X
Magnetic Effect	15	Z
Power Input	16	A(WF)HLPI
Voltage Spike	17	A
Audio Frequency Conducted Susceptibility	18	
AC Power	18.3.2	R(WF)
Induced Signal Susceptibility	19	
Magnetic Fields Induced into Equipment.	19.3.1	CWX
Magnetic Fields Induced into Interconnecting Cables	19.3.3	CWX
Electrical Fields Induced into Interconnecting Cables	19.3.4	CWX
Spikes Induced into Interconnecting Cables	19.3.5	CWX
Radio Frequency Susceptibility (Conducted & Radiated)	20	-
Conducted	20.4	T
Radiated	20.5	T
Radio Frequency Emission	21	-
Conducted	21.4	M
Radiated	21.5	M
Lightning Induced Transient Susceptibility	22	AZZZLZ
Lightning Direct Effects	23	X

Table C-1: Common environmental conditions and tests (DO160G) for CSDU (Continued)

Environmental variable	DO160 G section (Unless otherwise specified)	Category and requirements
Icing	24	X
Electrostatic Discharge	25	A
Fire, Flammability	26	C
Federal Aviation Regulation	FAR 25.853(a) & Appendix F, part I, §(a)(1)(ii) FAR 25.853(a) & Appendix F, part I, §(a)(1)(v) FAR 25.869 (a)(1) & Appendix F, part I	

Table C-1: Common environmental conditions and tests (DO160G) for CSDU (Continued)

C.3 Configuration Module (SCM)

Part Number: SCM-5055

Environmental variable	DO160 G section (Unless otherwise specified)	Category and requirements
Temperature and Altitude	4	-
Ground Survival Low Temperature Test -55˚C	4.5.1	A2
Short-Time Operating Low Temperature Test -40˚C	4.5.1	A2
Operating Low Temperature Test -40˚C	4.5.2	A2
Ground Survival High Temperature Test +85˚C	4.5.3	A2
Short-Time Operating High Temperature Test +70˚C	4.5.3	A2
Operating High Temperature Test +70˚C	4.5.4	A2
In Flight Loss of Cooling	4.5.5	X
Altitude Test +55.000ft	4.6.1	F2
Decompression Test	4.6.2	A2
Overpressure Test	4.6.3	A2
Temperature Variation (-40˚C to +70˚C)	5	B
Humidity	6	A
Operational Shocks and Crash Safety	7	-
Operational Shocks	7.2	B, E
Crash Safety (Impulse)	7.3.1	B, E
Crash Safety (Sustained)	7.3.3	Aircraft Type 5 (Helicopter and All Fixed-Wing) Orientation: Random Functional Test before and after, not during

Table C-2: Common environmental conditions and tests (DO160G) for SCM

Environmental variable	DO160 G section (Unless otherwise specified)	Category and requirements
Bench Handling Shocks	MIL-STD 810G, Method 516.6, Proc. VI	
Vibration	8	-
Standard Random Vibration	8.5	S(B3)
High-Level, Short Duration Vibration	8.6	H(R)
Explosion Atmosphere	9	X
Waterproofness	10	Y
Fluids Susceptibility	11	F
Sand & Dust	12	S
Fungus Resistance	13	F
Salt Fog	14	X
Magnetic Effect	15	Z
Induced Signal Susceptibility	19	
Magnetic Fields Induced into Equipment.	19.3.1	-
Magnetic Fields Induced into Interconnecting Cables	19.3.3	CWX
Electrical Fields Induced into Interconnecting Cables	19.3.4	CWX
Spikes Induced into Interconnecting Cables	19.3.5	CWX
Radio Frequency Susceptibility (Conducted & Radiated)	20	-
Conducted	20.4	T
Radiated	20.5	T
Emission of Radio Frequency Energy	21	-
Conducted	21.4	M (modified)[a]
Radiated	21.5	M
Lightning Induced Transient Susceptibility	22	A3 (Level 3, WF3 & WF4)
Electrostatic Discharge (DO-160)	25	A

Table C-2: Common environmental conditions and tests (DO160G) for SCM (Continued)

Environmental variable	DO160 G section (Unless otherwise specified)	Category and requirements
Fire, Flammability (DO-160)	26	C
Federal Aviation Regulation	FAR 25.853(a) & Appendix F, part I, §(a)(1){ii) FAR 25.853(a) & Appendix F, part I, §(a)(1)(v) FAR 25.869 (a)(1) & Appendix F part I	

Table C-2: Common environmental conditions and tests (DO160G) for SCM (Continued)

a. Category M modified by testing up to 200 MHz (instead of 152 MHz) and with a more severe level.

C.4   HLD/Enhanced Low Gain Antenna (HELGA)

Part number: LGA-5005

Refer to the LGA-5005 HELGA installation manual [8].

References

D.1 Applicable standards

[1]   AC 43.131B/2B; Acceptable Methods, Techniques, and Practices - Aircraft Inspection Repair and Alterations, U.S. Department of Transportation, FAA

[2]   ARINC Characteristic 743-A GNSS sensor

[3]   ARINC Characteristic 781-7 Mark3 Aviation Satellite Communication Systems, August 9, 2017

[4]   ARINC 600-19 Air Transport Avionics Equipment Interfaces

[5]   RTCA DO-160G: Environmental Conditions and Test Procedures for Airborne Equipment, December 8, 2010

[6]   ARINC 429P1-19 Digital Information Transfer System (DITS), Part 1, Functional Description, Electrical Interfaces, Label Assignments and Word Formats, January 22, 2019

D.2 Other references

[7]   AVIATOR 200S User Manual (98-158752).

[8]   LGA-5005 HELGA Installation Manual (98-152675)

[9]   ORT Tool User Guide (99-168498)

[10]   AVIATOR Operational User Guidance (99-157303)

A

AAC	Aeronautical Administrative Communications
ACARS	Aircraft Communications Addressing And Reporting System
ACAS	Aircraft Collision Avoidance System..
ACD	Aircraft Control Domain
ACP	Audio Control Panel
ADF	Automatic Direction Finder. A navigation receiver based on the AM radio band. A very simple device which literally points towards the station that is tuned in.
ADL	Airborne Data Loader
ADS-C	Automatic Dependent Surveillance - Contract
AES	Aeronautical Earth Station
AFIS	Airborne Flight Information System
AISD	Aircraft Information Services Domain
AMS	Audio Management System
AOC	Airline Operational Control
AOG	Aircraft On Ground
APC	Airline / Aeronautical Passenger Communication
ARINC	Aeronautical Radio Incorporated
ATS	Aircraft Traffic Service
AWG	American Wire Gauge

B

BGAN	Broadband Global Area Network
BITE	Built-In Test Equipment

C

CDU	Control Display Unit
CFDS	Central Fault and Display System
CMC	Central Maintenance Computer
CMU	Communications Management Unit
CPDLC	Controller to Pilot Data Link Communications
CSDU	Compact Satellite Data Unit

D

DME	Distance Measuring Equipment

E

ECAM	Electronic Centralized Aircraft Monitor
EFB	Electronic Flight Bag
EICAS	Engine-Indicating and Crew-Alerting System
ELGA	Enhanced Low Gain Antenna
EMC	Electro Magnetic Compatibility

F

FAA	Federal Aviation Administration
FANS	Future Air Navigation System
FDCE	Flight Deck and Cabin Effect
FWC	Flight Warning Computer
FWS	Flight Warning System

H

HELGA	HLD Enhanced Low Gain Antenna
HLD	Hipgh Power Amplifier, Low Noise Amplifier and Diplexer

I

ICAO	International Civil Aviation Organization
ILS	Instrument Landing System. A system of tightly focused transmitters located at the end of a runway that provides flight guidance information to flight crews.
IMSI	International Mobile Subscriber Identity
IPSEC	Internet Protocol Security

L

LGA	Low Gain Antenna
LRU	Line Replaceable Unit. A separate unit or module which can easily be replaced.

M

MCDU	Multi-Function Control Display Unit
MCU	Modular Component Unit

O

ORT	Owners Requirements Table

P

PAST	Person Activated Self Test
PIESD	Passenger Information and Entertainment Services Domain
PTT	Push To Talk

R

RF	Radio Frequency (signal)
RMA	Return Material Authorization
Rx	Receive (signal)

S

SATCOM	Satellite Communications
SB	Swift Broadband
SCDU	Satellite Control/Display Unit
SCM	SDU Configuration Module
SDU	Satellite Data Unit
SSPC	Solid State Power Controller
STC	Supplemental Type Certificate.

T

TC	Type Certificate
TCAS	Traffic Alert and Collision Avoidance System. A system which warns pilots of potential conflicts with other aircraft.
TX	Transmit (signal)

U

USB	Universal Serial Bus
USIM	Universal Subscriber Identity Module

V

VHF	Very High Frequency. 30-300 MHz.
VOR	VHF Omnidirectional Range
VPN	Virtual Private Network

W

WoW	Weight on Wheels
WSC	Williamsbrug SDU Controllers