INSERVICE MANUAL

FOR THE

AEC115

ASTRONAUTICS PN 282300-( )

PREPARED FOR
MULTI-USE

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Astronautics Corporation of America

CAGE Code
10138

Number of Sheets
38

Revision History

Rev	Description	Date	Author
A	Initial Release, branched from 282300-PLI-E	2022-09-23	T. Miller T. Geboy

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List of Acronyms

AC	Advisory Circular
ACCT	AGCS Configuration & Customization Tool
ADBP	Avionics Data Broadcast Protocol (ARINC 834)
AGCS	Air-Ground Communication System
AEC	Airborne Electronic Computer
ATD	Applicable TSOs and Deviations
BIT	Built-In Test
CA	Certificate Authority
CAGE	Commercial and Governmental Entity
CAN	Controller Area Network
CFS	Configuration File Specification
dB	Decibels
DLA	Defense Logistics Agency
EAP	Extensible Authentication Protocol
EMI	Electromagnetic Interference
HMI	Human-Machine Interface
ELOS	Equivalent Level of Safety
EMI	Electromagnetic Interference
ESD	Electrostatic Discharge
FAA	Federal Aviation Administration
FMS	Flight Management System
FQDN	Fully-Qualified Domain Name
GND	Ground
GOG	General Operator's Guide
HPP	Hardware Pin Programming
ICD	Interface Control Document
IEEE	Institute of Electrical and Electronics Engineers
I/O	Input/Output
IP	Internet Protocol
kHz	Kilohertz
LDR	Light Data Recorder
LED	Light Emitting Diode
LRU	Line Replaceable Unit
LSAP	Loadable Software Aircraft Part
Mbps	Megabits per second
MIMO	Multiple In Multiple Out
MPS	Minimum Performance Standards
MSN	Manufacturer Serial Number
MTU	Maximum Transmission Unit
NVM	Non-Volatile Memory
PDL	Portable Data Loader
PKI	Public Key Infrastructure
PSK	Pre-Shared Key
SIM	Subscriber Identity Module
SSID	Service Set Identifier
TCP	Transmission Control Protocol
TLS	Transport Layer Security
TSOA	Technical Standard Order Authorization
vDC	Volts Direct Current
VPN	Virtual Private Network

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1   General Description

1.1 Scope

This document provides physical and electrical information for use in the installation of the AEC115 Airborne Electronic Computer (AEC), Astronautics part number 282300-( ) within an Air Vehicle. This document is not a substitute for an approved airframe-specific maintenance manual or installation design drawing. The content of this document assumes use by qualified avionics engineering personnel and/or avionics installation specialists using standard aviation maintenance practices in accordance with Title 14 of the Code of Federal Regulations and other relevant accepted practices. See Section **Error! Reference source not found.** of this document, **Error! Reference so urce not found.**, for additional information and other considerations.

This document has been prepared by Astronautics Corporation of America (Astronautics) as a supporting document in its request for Technical Standard Order Authorization (TSOA) approval from the Federal Aviation Administration (FAA).

1.2 Definitions of Warnings and Cautions

> ⚠ **CAUTION**
>
> *Cautions are used to bring to the installer's attention that damage to the equipment may result if the procedure step is not followed.*
>
> ⚠ **NOTE**
>
> *Notes are used to explain the steps and provide further understanding of the reason for the specified steps.*

1.3 Printing Recommendations

This document uses color throughout its embedded figures and text. If printing this document, it is recommended to print using color ink to avoid loss of fidelity.

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2 System Overview

The AEC115 is an airborne computer with its primary function dedicated to providing on-board non-volatile memory storage for navigation databases. The AEC115 implements various secondary functions facilitating:

- navigation database importing and uploading,

- avionics data collection, distribution, and exporting,

- Built-In Test (BIT) functions to assess unit health,

- Internet data exchange for passenger entertainment, and

- IP-based data forwarding

Installation is performed by installing a wiring harness, installing the AEC115 unit, and installing antennas as necessary.

Thanks to its small dimensional envelope, the AEC115 affords the equipment installer the flexibility to mount the unit in various places on the aircraft, preferably in temperature-controlled pressurized areas. The AEC115 completely contains the controls and electronics necessary for its operation based on input/output data.

For complete dimensions of the AEC115, reference the appropriate Installation Drawing listed in Section 9.

The AEC115 Human-Machine Interface (HMI) comprises four (4) Light Emitting Diodes (LED), a removable memory card slot and two (2) Subscriber Identity Module (SIM) card slots accessible under a removable access cover plate. The LEDs indicate system health (Status LED), configuration health (CFG LED), removable memory card activity (SD LED), and non-volatile memory (NVM) health (SSD LED). The operator can use the removable memory card slot to import and persistently store a new or updated navigation database, retrieve maintenance and flight operations data collected from avionics equipment, and import loadable software aircraft parts (LSAP) in order to update AEC115 software and configuration. The operator can insert SIM cards in the designated slots in order to enable AEC115 cellular data connectivity for wirelessly importing navigation databases and AEC115 LSAPs, as well as wirelessly exporting avionics data.

The AEC115 has been tested to environmental and electro-magnetic interference (EMI) categories of DO-160G as specified in Section **Error! Reference source not found.**.

The conditions and tests required for TSO authorization approval of this article are minimum performance standards. It is the responsibility of those installing this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards.

The article may be installed only if the installation is performed in accordance with the applicable airworthiness and installation requirements.
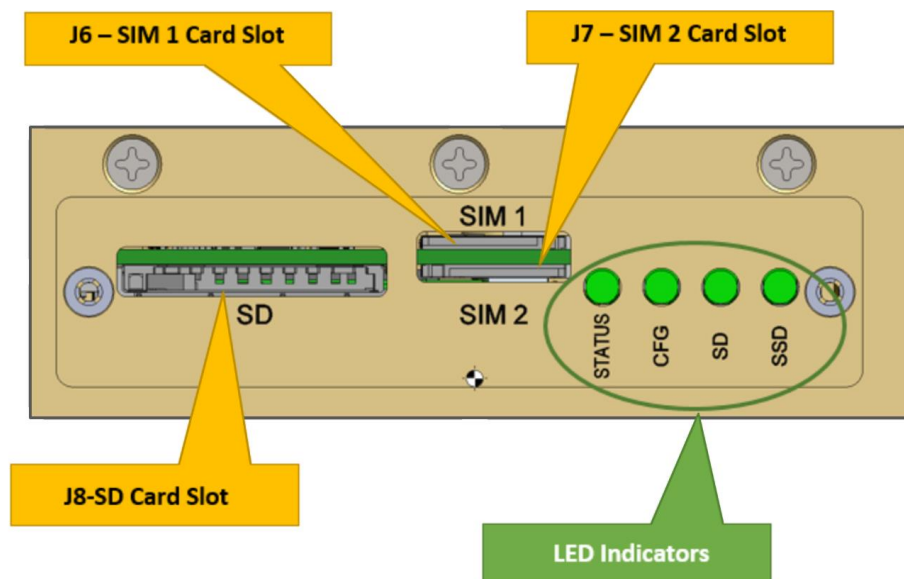
Figure 2-1: AEC115 with HMI Annotated

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2.1 Interface Summary

The AEC115 utilizes ARINC 429, Serial RS-485, Serial RS-232, IEEE 802.3 Ethernet, and discrete inputs/outputs to communicate with other LRUs, systems, and equipment on the aircraft. A block diagram of an AEC115 installation is shown in Figure 2-2. For more detail, refer to Appendix A: Installation Drawings.
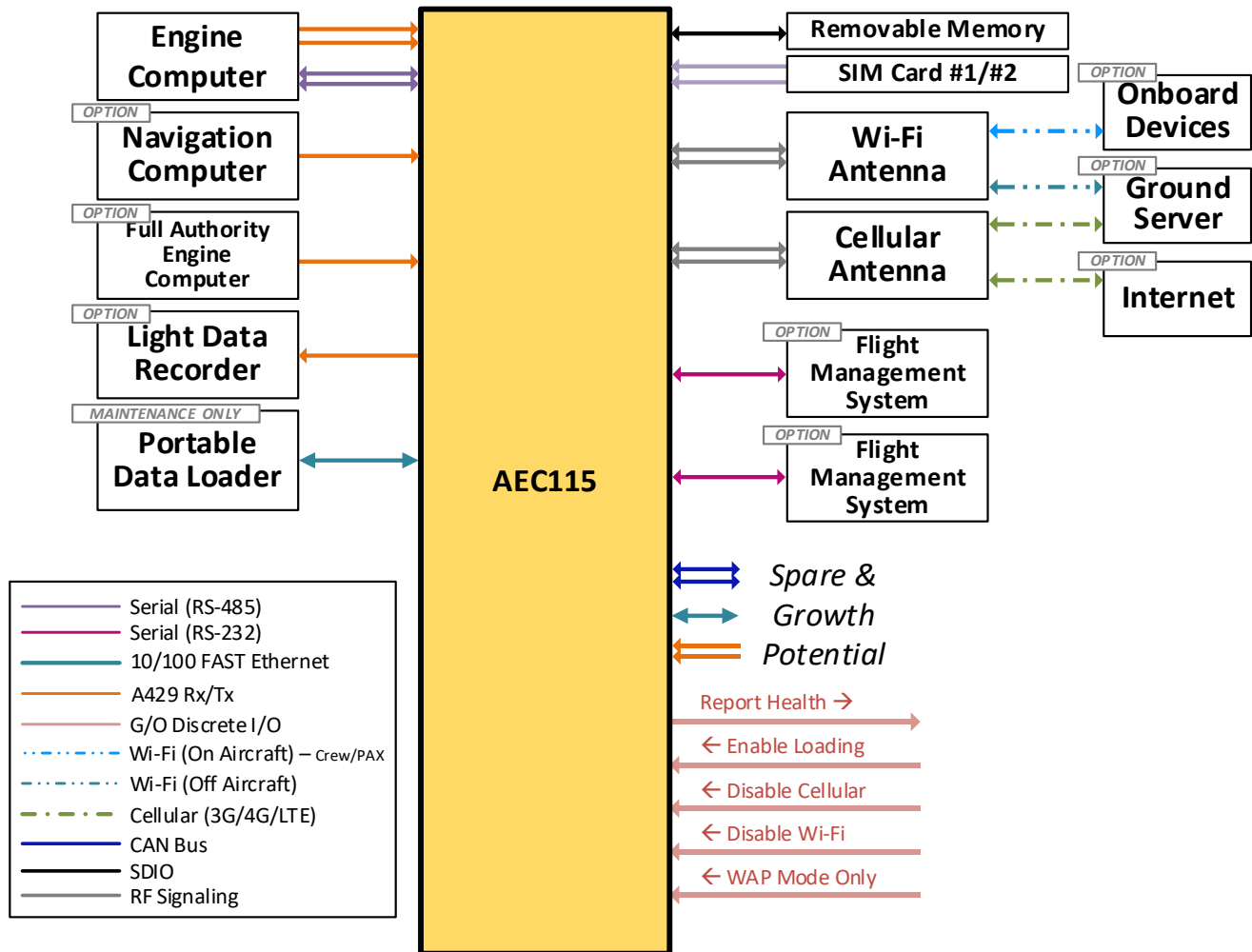
Figure 2-2: AEC115 Aircraft System Interfaces

The following table provides a list of equipment with which the AEC115 can interface at the time of TSO submittal. If this set of interfacing equipment, or equivalent, is not available on an aircraft, it may limit the functionality of the AEC115 when it is installed. This limitation extends only to the hardware and software designed at the time of TSO submittal and does not necessarily represent a current or complete list of the equipment capable of interfacing to the AEC115. As a result, Table 2-1 is for reference use only. For details regarding specific interfaces, reference Astronautics document 282300-ICD or consult Astronautics Corporation of America for additional information.

Table 2-1: Interfacing Equipment

Interface Equipment	Electrical Characteristic
Flight Management System (FMS)	Serial RS-232
Engine Computer	ARINC 429
	Serial RS-485
Navigation Computer	ARINC 429
Full Authority Engine Computer	ARINC 429
Light Data Recorder (LDR)	ARINC 429
Portable Data Loader (PDL)	100 BASE-T Ethernet

2.2 Applicable Documents

Table 2-2: Regulatory Authority Documents

Document Number	Document Description
TSO-C109	AIRBORNE NAVIGATION DATA STORAGE SYSTEM
AC 43.13-1B	ACCEPTABLE METHODS, TECHNIQUES, AND PRACTICES AIRCRAFT INSPECTION AND REPAIR

Table 2-3: Industry Standard Documents

Document Number	Document Description
RTCA DO-160G	ENVIRONMENTAL CONDITIONS AND TEST PROCEDURES FOR AIRBORNE EQUIPMENT

Table 2-4: Astronautics Documents

Document Number	Document Description
282300-ATD	APPLICABLE TSOS AND DEVIATIONS FOR THE AEC115
282300-ICD	ELECTRICAL INTERFACE CONTROL DOCUMENT FOR THE AEC115
282300-XCFS	EXTERNAL CONFIGURATION FILE SPECIFICATION FOR THE AEC115
282300-GOG	GENERAL OPERATOR'S GUIDE FOR THE AEC115
USG14477	USER'S GUIDE FOR AGCS CONFIGURATION AND CUSTOMIZATION TOOL

Note: The most recent revision of the document applies.

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2.3 Field Loadable Software and Databases

The software in the AEC115 was developed as field loadable software in accordance with DO 178-C. If a change is planned, once the FAA agrees and it is decided to make that change available in the field, the software update will be issued in the form of a Service Bulletin. The Service Bulletin will describe the software update including software revision information and will provide instructions for accomplishing the update.

3 Installation Overview

3.1 Provided Equipment

Astronautics provides the following equipment for an AEC115 installation:

Item	Part Number	Qty
AEC115 Line Replaceable Unit (LRU)	282300-( )	1

3.2 AEC115 Installation Wiring Harness / Installation Requirements

Astronautics provides all of the necessary documentation to install and configure the AEC115. Due to the flexible nature of aircraft installation, Astronautics does not supply the connectors or optional peripherals for the AEC115, however the recommended parts are provided below.

Table 3-1: Installation Components

Item	Qty
Connector, DB78 Female, Positronic DD78S10GES	1
SD Card, Standard size, SDHC UHS-1 or better, Minimum capacity 64GB	1
Wi-Fi Antenna, Adhesive, Taoglas FXP522.A.07.A.001	1
Cellular Antenna, Adhesive, Taoglas FXUB66.07.0150C	2
SMA Female Straight Crimp Plug, Amphenol PN 132195	4
I-PEX MHF-1 Crimp Connector	4

3.3 Standard Parts

Recommended length of fastener may need to be adjusted based on installation conditions such as mounting surface thickness.

Table 3-2: Standard Parts

Item	Qty
M5 socket head screw; minimum length requires at least 5-7 threads of engagement	4
Washer, metallic or non-metallic	4
RG400 Coaxial Cable (only required if wireless functions will be used)	Variable length by installation

3.4 Tools Required but Not Supplied

The following tools are required for manufacturing of the wiring harness and installation of the AEC115.

Table 3-3: Standard Tools

Item	Qty	Manufacturer
Hex Driver, M5, Standard	1	Any

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Item	Qty	Manufacturer
Cross-tip Screwdriver, No. 2 Phillips	1	Any
Slotted Screwdriver, No. 2	1	Any

NOTE

⚠ Equivalent tools from different manufacturers may be used.

3.5 Packaging Considerations

CAUTION

⚠ This unit contains electrostatic discharge (ESD) sensitive components and assemblies that can be damaged by static voltages. Although most components and assemblies contain internal protection circuits, proper ESD handling procedures must always be practiced.

The ESD-safe bag and connector caps should be left in place until the AEC115 is ready to either bench test or install in the aircraft. Avoid directly touching the connectors and connector pins.

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4   Installation Procedure

4.1 Installation

The AEC115 requires no special equipment for installation. The fasteners used require only standard hand tools (screwdrivers, hex drivers, etc.) to secure the AEC115 to the mounting surface.

Prior to performing the installation, an Aircraft Survey should be performed to verify installed LRUs for compatibility with the AEC115. See section 2.1 for an interface summary.

Prior to performing the installation, the interconnection harness must be assembled.

1. Remove Access Panel on front of AEC115.
2. As necessary, insert SIM card into slot labeled 'SIM 1'.
3. As necessary, insert SIM card into slot labeled 'SIM 2'.
4. As necessary, insert properly-formatted removable memory card into slot labeled 'SD'.
5. Re-affix Access Panel on front of AEC115.
6. Size the mounting surface and verify that all mounting holes are in alignment.
7. Install the harnesses to the existing aircraft connectors
8. As necessary, install the aircraft antenna(s) in accordance with their installation data.
9. Install the J1 connector to the AEC115.
10. Connect J2 & J3 connectors between cellular data antenna and the AEC115.
11. Connect J4 & J5 connectors between Wi-Fi antenna and the AEC115.
12. Install the AEC115 on its mounting surface.
13. Apply power to the AEC115 and perform power up check in accordance with Section 6.1.

Figure 4-1: AEC115 Installation

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4.2 Installation Considerations

As with all electronic equipment, prior to installation, the connector protective caps should be removed and the connectors inspected for bent pins.

All harnesses should be secured per FAA standards. (See Advisory Circular AC 43.13-1B "Acceptable Methods, Techniques, and Practices – Aircraft Inspection and Repair")

CAUTION

Power must be present only on the connector pins specified in Table 4-2. Extensive damage can result to the unit or maintenance personnel if power is present on any other pins.

4.3 Mass

Table 4-1: Provided Equipment Mass

Item	Part Number	Maximum Mass
AEC115	282300-( )	1.92 lbs. (870 g)

4.4 Cooling Air

The AEC115 is cooled by both convection and radiation. It is not required to provide external cooling air to this equipment. The exterior case temperature should be limited to +55°C.

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4.5 Power Requirements

Table 4-2: Power Connections

Pin	Signal	Description
J1-01	28VDC_PWR	Power Input
J1-21	28VDC_RTN	Power Return
J1-54	CHASSIS_GND	Chassis Ground

The AEC115 operates from 28 vDC aircraft power. The AEC115 can operate from 18vDC to 32vDC but will not start below 21vDC. The maximum power draw occurs when its wireless functions are enabled and searching for networks.

The AEC115 contains holdup circuitry to maintain operation through a transient 50-millisecond voltage dropout. Consecutive dropouts require a recharge time for the internal energy storage; approximately 2 seconds is required to fully recharge the internal energy storage.

Table 4-3: Current Specifications

Mode	Typical Current	Power Consumption (W)
Inrush (power-on)	0.9 A (Typical) 6.0 A[1] (Max)	8W
Normal Operation (nominal) - Wireless capabilities enabled and connected	0.7A	5W
Normal Operation - Wireless capabilities enabled and searching for networks (e.g., continuous wave mode)	2.5A	15.5W (Max)

[1] 6.0A inrush current spike at initial power-on measured for less than 60µs - this will not trip a typical 5A breaker.

4.6 Circuit Breaker

Ensure the circuit breaker for each unit is sized at 5 Amps. Astronautics recommends a circuit breaker size that is double the maximum expected current found in Table 4-3.

4.7 External Switches

The following items are switched inputs to the AEC115. For proper operation, each of the following items is required:

Table 4-4: Externally Switched Inputs

Pin	Pin Name	Signal Name	Notes
J1-14	5VGO_DIS_IN_01	DATALOAD_ENABLE	Open = Disallow AEC115 data loading GND = Allow AEC115 data loading
J1-15	5VGO_DIS_IN_02	CELLULAR_DISABLE	Open = Allow connection via cellular GND = Disable cellular radio
J1-16	5VGO_DIS_IN_03	WIFI_WAP_DISABLE	Open = Allow Wi-Fi & WAP connection GND = Disable Wi-Fi radio
J1-34	5VGO_DIS_IN_04	WAP_ONLY	Open = Operate Wi-Fi radio in WLAN and WAP modes GND = Operate Wi-Fi radio in WAP mode only

Pin	Pin Name	Signal Name	Notes
J1-35	5VGO_DIS_IN_05	WIFI_WAP_TX_POWER	Adjusts Wi-Fi transmission power lower. Refer to Table 4-5: Wi-Fi Emission Power Control
J1-36	5VGO_DIS_IN_06		

Table 4-5: Wi-Fi Emission Power Control

Pin Name	Discrete Input Value			
5VGO_DIS_IN_05	Open	**Ground**	Open	**Ground**
5VGO_DIS_IN_06	Open	Open	**Ground**	**Ground**
Wi-Fi Power Level[1,2]	MAX dB	-2dB	-4dB	-8dB

[1] MAX identifies the maximum allowed transmit power based on the aircraft's global position.

[2] Wi-Fi transmit power is throttled down from its maximum allowed power. In the event that the reduction of Wi-Fi transmission power level based on discrete input settings would cause the transmission power to be zero or negative, the AEC115 floors the transmission power at the lowest-possible operational setting.

4.8 Configuration Strapping

Three (3) Ground/Open discrete input pins are utilized to enable mode strapping. The AEC115 J1 connector has dedicated digital ground pins to facilitate mode strapping.

Table 4-6: AEC115 Mode Strapping

Mode	HPP_01 (J1-39)[1]	HPP_02 (J1-38)[2]	HPP_03 (J1-37)[3]	Notes
Normal	OPEN	OPEN	OPEN	For use installed on aircraft. This is the normal operating mode for AEC115.
Shop / Test Means	GND	GND	OPEN	**Off aircraft only** – for use by manufacturer in lab environment and troubleshooting.
ATP	OPEN	GND	GND	**Off aircraft only** – for use by manufacturer for Acceptance Test Procedure (ATP) activities.
Resident Loading	GND	OPEN	GND	**Off aircraft only** – for use by manufacturer for factory software loading.
Memory Erase	GND	GND	GND	When the AEC115 is powered on with this HPP configuration, the non-volatile memory storing flight data, logs, and databases is cleared.

[1] Associated ground pin, DGND_HPP_01, J1-20

[2] Associated ground pin, DGND_HPP_02, J1-19

[3] Associated ground pin, DGND_HPP_03, J1-18

NOTE

Other pin strapping combinations than those identified in Table 4-6 above must not be used and could result in unexpected behavior.

4.9 Ethernet Interface

The AEC115 has two (2) IEEE 802.3 10/100 BASE-T Ethernet ports. These can be used to connect a maintenance computer, portable data loader (PDL), and/or an on-board Ethernet-based camera system.

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Table 4-7: 10/100 BASE-T Ethernet

Pin	Pin Name	Notes
J1-77	ETH_100_01_RX+	Ethernet Port 1 *Maintenance Computer PDL*
J1-78	ETH_100_01_RX-	
J1-58	ETH_100_01_TX+	
J1-59	ETH_100_01_TX-	
J1-74	ETH_100_02_RX+	Ethernet Port 2 *Growth*
J1-75	ETH_100_02_RX-	
J1-55	ETH_100_02_TX+	
J1-56	ETH_100_02_TX-	

4.10 ARINC 429 Interface

The AEC115 has six (6) ARINC 429 receive ports and one (1) ARINC 429 transmit port. The AEC115 can record data acquired on its ARINC 429 receive buses and transmit a subset of recorded data in its ARINC 429 transmit bus. The words recorded and those transmitted are defined by the AEC115 configuration.

Table 4-8: ARINC 429 Ports

Pin	Pin Name	Notes
J1-04	A429_01_RX+	A429 Receive Channel 1
J1-05	A429_01_RX-	
J1-24	A429_02_RX+	A429 Receive Channel 2
J1-25	A429_02_RX-	
J1-07	A429_03_RX+	A429 Receive Channel 3
J1-08	A429_03_RX-	
J1-27	A429_04_RX+	A429 Receive Channel 4
J1-28	A429_04_RX-	
J1-09	A429_05_RX+	A429 Receive Channel 5
J1-10	A429_05_RX-	
J1-29	A429_06_RX+	A429 Receive Channel 6
J1-30	A429_06_RX-	
J1-12	A429_01_TX+	A429 Transmit Channel 1
J1-13	A429_01_TX-	

4.11 Serial RS-485 Interface

The AEC115 has two (2) RS-485 transceiver ports. These ports are provided for connection with Engine Computer to collect maintenance data.

Table 4-9: RS-485 Ports

Pin	Pin Name	Notes
J1-42	SERIAL_485_01_DATA+	Baud rate, data bit(s), stop bit, & parity bit are configurable.
J1-62	SERIAL_485_01_DATA-	
J1-44	SERIAL_485_02_DATA+	Baud rate, data bit(s), stop bit, & parity bit are configurable.
J1-64	SERIAL_485_02_DATA-	

4.12 Serial RS-232 Interface

The AEC115 has two (2) RS-232 transceiver ports. These ports are provided to interface with FMS for navigation database distribution.

Table 4-10: RS-232 Ports

Pin	Pin Name	Notes
J1-47	RS232_01_RXD	FMS1
J1-66	RS232_01_TXD	
J1-67	RS232_01_GND	
J1-68	RS232_02_RXD	FMS2 *(Optional)*
J1-49	RS232_02_TXD	
J1-48	RS232_02_GND	

4.13 CAN Bus Interface

The AEC115 has one (1) Controller Area Network (CAN) bus ports. This interface is provided for future use.

Table 4-11: CAN Bus Interfaces

Pin	Pin Name	Notes
J1-45	CAN_01_HI	*Growth*
J1-65	CAN_01_LO	

4.14 Flight Management System (FMS)

The AEC115 can interface up to two (2) FMS/GPS using serial RS-232 for the purpose of navigation database uploading and retrieval.

4.14.1 Serial RS-232 Interface

The serial interface settings for each bus connected with an FMS is configurable. ARINC 665-packaged Configuration data is generated using the AGCS Configuration & Customization Tool (ACCT) and loaded into the AEC115 using standard Ethernet-based data loading protocol, ARINC 615A-2, and a Portable Data Loader (PDL) device.

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5 Connector Pinout Information

5.1 AEC115 Aircraft Connector

This section contains information about J1, the AEC115's main connector. Detailed information about pin functions are found in Appendix A: Installation Drawings.
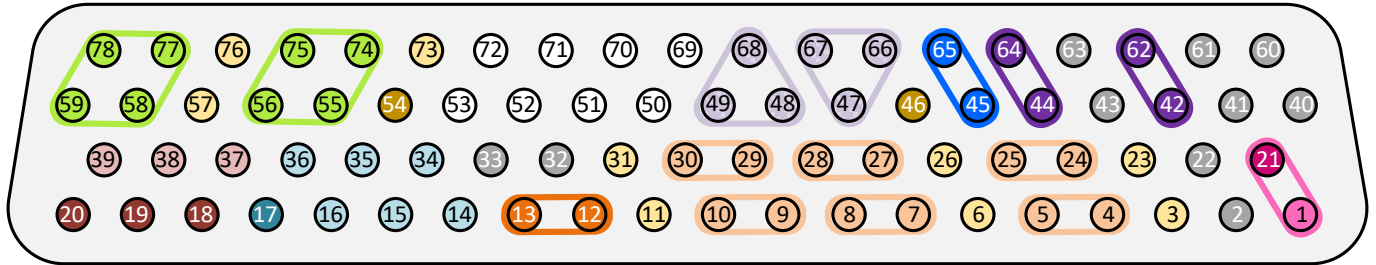
Ground (0V Reference)	28VDC Power Input	Discrete Input	ARINC 429 Input
Ground (Chassis)	Power Return	Discrete Output	ARINC 429 Output
CAN Bus	Serial RS-232	*Spare*	HPP
Ethernet (10/100)	Serial RS-485	*No Connect*	HPP Digital Ground

Figure 5-1: AEC115 J1 Rear Connector

Table 5-1: AEC115 J1 Rear Connector Pin Definitions

Pin	Designation	Pin	Designation	Pin	Designation	Pin	Designation
J1_01	28VDC_PWR	J1_21	28VDC_PWR_RTN	J1_40	No Connect	J1_60	No Connect
J1_02	No Connect	J1_22	No Connect	J1_41	No Connect	J1_61	No Connect
J1_03	GND	J1_23	GND	J1_42	SERIAL_485_01_DATA+	J1_62	SERIAL_485_01_DATA-
J1_04	A429_01_RX+	J1_24	A429_02_RX+	J1_43	No Connect	J1_63	No Connect
J1_05	A429_01_RX-	J1_25	A429_02_RX-	J1_44	SERIAL_485_02_DATA+	J1_64	SERIAL_485_02_DATA-
J1_06	GND	J1_26	GND	J1_45	CAN_01_HI	J1_65	CAN_01_LO
J1_07	A429_03_RX+	J1_27	A429_04_RX+	J1_46	GND_CHASSIS	J1_66	RS232_01_TXD
J1_08	A429_03_RX-	J1_28	A429_04_RX-	J1_47	RS232_01_RXD	J1_67	RS232_01_GND
J1_09	A429_05_RX+	J1_29	A429_06_RX+	J1_48	RS232_02_GND	J1_68	RS232_02_RXD
J1_10	A429_05_RX-	J1_30	A429_06_RX-	J1_49	RS232_02_TXD	J1_69	Spare
J1_11	GND	J1_31	GND	J1_50	Spare	J1_70	Spare
J1_12	A429_01_TX+	J1_32	DBG_UART (*NC*)	J1_51	Spare	J1_71	Spare
J1_13	A429_01_TX-	J1_33	DBG_UART (*NC*)	J1_52	Spare	J1_72	Spare
J1_14	5VGO_DIS_IN_01	J1_34	5VGO_DIS_IN_04	J1_53	Spare	J1_73	GND
J1_15	5VGO_DIS_IN_02	J1_35	5VGO_DIS_IN_05	J1_54	GND_CHASSIS	J1_74	ETH_100_02_RX+
J1_16	5VGO_DIS_IN_03	J1_36	5VGO_DIS_IN_06	J1_55	ETH_100_02_TX+	J1_75	ETH_100_02_RX-
J1_17	5VGO_DIS_OUT_01	J1_37	HPP_03	J1_56	ETH_100_02_TX-	J1_76	GND
J1_18	DGND_HPP_03	J1_38	HPP_02	J1_57	GND	J1_77	ETH_100_01_RX+
J1_19	DGND_HPP_02	J1_39	HPP_01	J1_58	ETH_100_01_TX+	J1_78	ETH_100_01_RX-
J1_20	DGND_HPP_01			J1_59	ETH_100_01_TX-		

NOTE

⚠️ *Note: ARINC 429, Ethernet, and Serial I/O channels are configurable as described in section 6.4.*

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6 System Configuration

6.1 Initial Power up

At power up the AEC115 will illuminate its STATUS LED **blue** while it progresses through its startup process, performing power-on BIT and integrity checks, launching the runtime environment, and validating its configuration data. Once all start-up activities have completed successfully, the AEC115 illuminates its STATUS LED **green** indicating the system is healthy and performing its normal functions.

NOTE

⚠ The AEC115 is designed to provide full functionality within two minutes of power on. During the nominal power on sequence the STATUS LED transitions from **Off → Blue → Green**.

6.2 Software Loading

The AEC115 requires the presence of four (4) LSAP in order to start-up successfully. Two (2) LSAPs are software parts - namely the AEC115 Platform Software and the AEC115 Radio Software; These parts are factory loaded, however they can be updated in the field. Two (2) LSAPs are configuration data: AEC115 Configuration files, and AEC115 Customization files. The AEC115 Configuration and Customization files are generated using a ground based tool provided by Astronautics called the AGCS Configuration & Customization Tool (ACCT).

During the start-up process, if the configuration and/or customization files are not present or invalid, the AEC115 will illuminate its CFG LED **Amber** to indicate missing or invalid configuration data. In this case, the operator must perform initial loading activity to install valid Configuration & Customization files. This process is defined in Section 0.

6.3 System Configuration

Upon first installation, each unit must be properly configured, identifying the settings for the interfaces with avionics equipment and open world devices. This configuration and customization data is generated by using the ACCT. Refer to Astronautics document, USG14477 (latest revision) for generic user guidance preparing AEC115 configuration and customization data.

To check the configuration of the AEC115 after installation into the aircraft, connect PDL and perform ARINC 615A Information mode operation with the AEC115. Alternatively, the AEC115 provides its system configuration on a web-based user interface accessible from Ethernet connected devices or devices connected via local Wireless Access Point (WAP) hotspot. Refer to instructions provided in Astronautics document, 282300-GOG General Operator's Guide.

6.4 Configuration Options

The following tables briefly identify the configuration data required by the AEC115 produced by the ACCT. As noted above, refer to USG14477 (latest revision) for additional details walking through the configuration wizard.

Table 6-1: Configuration Options

Configuration Item	Detail	Description
Aircraft Type	Alphanumeric Text	Up to five (5) alphanumeric characters identifying the type of aircraft (e.g. '125B3'). This data is used to organize the data collected by AEC115 into its repository and for automatically prefixing its wireless access point(s).

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Configuration Item	Detail	Description
Network Interfaces – Ethernet #1 & #2	Ethernet Interface – Enabled/Disabled	Disable communication on the AEC115 Ethernet interface(s).
	Ethernet Interface – Static IP	Define the IPv4 address of the Ethernet interface (Four octets, e.g. 192.168.1.1) *Note: Must not be the same as IP address assigned to other Ethernet Interface, if enabled.* Define the IP network mask used by the Ethernet interface (e.g. 255.255.255.0). Define the Maximum Transmission Unit (MTU) of the Ethernet interface (optional, default to 1500 bytes)
	Ethernet Interface – Disable DHCP	Disable Dynamic Host Configuration Protocol (DHCP) support through the Ethernet interface. This is the default setting. This prevents AEC115 from assigning DHCP leases to equipment connected through this interface.
	Ethernet Interface – DHCP Enabled	Enable DHCP support through the Ethernet interface. Define the starting address for the IPv4 address lease range (e.g. 192.168.100.1). *Note: Start address must be equal to or before End address and on the same sub-network as the static IPv4 address assigned to the interface.* Define the ending address for the IPv4 address lease range (e.g. 192.168.100.10). *Note: End address must be equal to or after Start address and on the same sub-network as the static IPv4 address assigned to the interface.* Define the duration of the DHCP lease (defaults to one (1) hour).
Serial Interfaces – ARINC 429 RX Buses (6x)	ARINC 429 Receive Bus – Enable/Disable	Enable or disable communication on the AEC115 ARINC 429 bus.
	ARINC 429 Receive Bus – Bus Speed	Configure the ARINC 429 bus speed - Low speed (12.5 kHz) or high speed (100 kHz).
Serial Interfaces – ARINC 429 TX Bus (1x)	ARINC 429 Transmit Bus – Enable/Disable	Enable or disable communication on the AEC115 ARINC 429 bus.
	ARINC 429 Transmit Bus – Bus Speed	Configure the ARINC 429 bus speed - Low speed (12.5 kHz) or high speed (100 kHz).
Serial Interfaces – RS-232 Buses (2x)	Serial RS-232 Bus – Enable/Disable	Enable or disable communication on the AEC115 RS-232 bus.
	Serial RS-232 Bus – Bus Settings	The following settings may be adjusted for each serial RS-232 bus: Baud Rate – Defines the data speed of the bus, possible values include: 1200, 2400, 9600, 14400, 19200, 28800, 38400, 57600, 115200. Data Bits – Defines the number of data bits in each character, possible values include: 7, or 8 (default) Parity Bit – Defines if the parity bit is transmitted, and if present, if the parity bit identifies if the number of logical 1s in the character is odd or even. Possible values include: None, Odd, or Even. Stop Bit(s) – Defines the number of stop bits sent at the end of each character, possible values include: 1 or 2. Mode – Defines if the interface is full duplex (simultaneous bi-directional communication), half duplex (serial bi-directional communication), or simplex (serial single-directional communication). Flow Control – Defines handshaking behavior. Possible values include: None (off), Hardware control, Software control, or both Hardware & Software control.

Configuration Item	Detail	Description
Serial Interfaces – RS-485 Buses (2x)	Serial RS-485 Bus – Enable/Disable	Enable or disable communication on the AEC115 RS-485 bus.
	Serial RS-485 Bus – Bus Settings	The following settings may be adjusted for each serial RS-485 bus: Baud Rate – Defines the data speed of the bus, possible values include: 1200, 2400, 9600, 14400, 19200, 28800, 38400, 57600, 115200. Data Bits – Defines the number of data bits in each character, possible values include: 7, or 8 (default) Parity Bit – Defines if the parity bit is transmitted, and if present, if the parity bit identifies if the number of logical 1s in the character is odd or even. Possible values include: None, Odd, or Even. Stop Bit(s) – Defines the number of stop bits sent at the end of each character, possible values include: 1 or 2. Mode – Defines if the interface is full duplex (simultaneous bi-directional communication), half duplex (serial bi-directional communication), or simplex (serial single-directional communication). Flow Control – Defines handshaking behavior. Possible values include: None (off), Hardware control, Software control, or both Hardware & Software control.
VPN Timeout	Seconds to keep-alive the VPN connection	Defines the number of seconds to maintain the VPN connection with the ground after inactivity. Data collected by AEC115, and data to be imported into the AEC115 is exchanged with a ground server through a secure VPN tunnel. Defaults to 300 seconds (5 minutes).
Wireless Activation	Allow Customization HMI	Enable or disable the ability for the operator to adjust customization settings using AEC115's embedded web-based HMI.
	Allow Internet on Passenger Networks	Enable or disable the ability for devices connected to the AEC115 passenger network access to resources accessible through the public Internet.
	Enable Video Data	Enable or disable the AEC115 ability to stream data from device connected through Ethernet port to devices connected through the AEC115 on-board wireless access point(s).

Configuration Item	Detail	Description
Storage Locations	Flight Data Volume Capacity	Defines the capacity, in Mebibytes (MiB), for the 'FLIGHT_DATA' directory of the AEC115 internal data repository. Defaults to 27,512 MiB. Avionics data collected & organized by AEC115 is stored into this directory. *Note: The total size across all capacities cannot exceed 46,980 MiB.*
	System Log Volume Capacity	Defines the capacity, in Mebibytes (MiB), for the 'SYSTEM' directory of the AEC115 internal data repository. Defaults to 4,000 MiB. The AEC115 system log files are stored into this directory. *Note: The total size across all capacities cannot exceed 46,980 MiB.*
	Security Log Volume Capacity	Defines the capacity, in Mebibytes (MiB), for the 'SECURITY' directory of the AEC115 internal data repository. Defaults to 4,000 MiB. The AEC115 security log files are stored into this directory. *Note: The total size across all capacities cannot exceed 46,980 MiB.*
	Upload Folder Volume Capacity	Defines the capacity, in Mebibytes (MiB), for the 'UPLD_3' directory of the AEC115 internal data repository. Defaults to 4,000 MiB. Imported AEC115 software and configuration data is staged in this directory prior to upload & installation. *Note: The total size across all capacities cannot exceed 46,980 MiB.*
	General Folder Volume Capacity	Defines the capacity, in Mebibytes (MiB), for the 'GENERAL' directory of the AEC115 internal data repository. Defaults to 4,000 MiB. This directory is used as a scratchpad for temporary data that is available across power cycles. *Note: The total size across all capacities cannot exceed 46,980 MiB.*
	FMS Upload Folder Volume Capacity	Defines the capacity, in Mebibytes (MiB), for the 'FMS_UPLD' directory of the AEC115 internal data repository. Defaults to 256 MiB. This directory is used to stage data destined for the FMS such as navigation databases, flight plans or user routes/waypoints data. *Note: The total size across all capacities cannot exceed 46,980 MiB.*
	FMS Download Folder Volume Capacity	Defines the capacity, in Mebibytes (MiB), for the 'FMS_DL' directory of the AEC115 internal data repository. Defaults to 256 MiB. *Future growth.* *Note: The total size across all capacities cannot exceed 46,980 MiB.*
Avionics Data Broadcast Settings	ARINC 429 Configuration File	Import a file, consistent with the definition provided in 282300-XCFS, that defines which labels shall be recorded by the AEC115 for continuous data recordings.
	ADBP Configuration File	Import a file, consistent with the definition provided in 282300-XCFS, that defines the encoding of the data acquired over ARINC 429 buses for distribution to connected devices via ARINC 834 ADBP.
Logging	Trace Files	Enable or disable AEC115 trace file generation. The AEC115 trace file provides detailed logging of AEC115 behaviors. Defaults to Off.

Table 6-2: Customization Options

Customization Item	Detail	Description
Ground Check	Connect with Ground Server	Allows to define whether or not a ground server is present. If this is false, some subsequent options related to ground server connectivity will be disabled in the ACCT.
Gatelink Wi-Fi	Air-Ground Wi-Fi Settings	Allows to define up to four (4) Wi-Fi access points that the AEC115 will attempt to connect with in order to exchange data with the ground server.
	Air-Ground Wi-Fi Access Point Settings	Service Set Identifier (SSID) – Define the alphanumeric text used to identify the external Wi-Fi access point.
		Hidden – Identify if the external access point is broadcasted in the clear or hidden. Possible values are No (broadcasted) and Yes (hidden).
		Antenna Mode – Defines the antenna mode to be used for Air-Ground Wi-Fi link. Possible values are Single (one antenna), or Multiple-In Multiple-Out (MIMO) (dual antenna).
		Authentication Method – Defines the security credentials AEC115 uses to connect with the external Wi-Fi access point. Possible values are 'Pre-Shared Key' (PSK) or Extensible Authentication Protocol – Transport Layer Security (EAP-TLS).
		In case of PSK authentication method: Passphrase – Defines the password/passphrase used to authenticate with the external Wi-Fi access point. Each password/passphrase must be a minimum of 8 characters in length.
		In case of EAP-TLS authentication method: Identity – Alphanumeric text identifying the authority used in associated X.509 certificates.
		Client Certificate – The X.509 client certificate used in the authentication process.
		CA Certificate – The X.509 Certificate Authority (CA) certificate used in the authentication process.
		Private Key – The private key used in the certificate-based authentication process.
Gatelink Cellular	Enable SIM slot	Allow the AEC115 to use the SIM card in the designated slot. May be enabled or disabled for each of SIM #1 or SIM #2.
	Roaming Enabled	Enable or disable the ability to roam on partner networks associated with the corresponding SIM card. May be enabled or disabled for each of SIM #1 or SIM #2.

Customization Item	Detail	Description
Wireless Access Point	SSID Auto-Prefixing	Defines if the AEC115 should automatically prefix the broadcasted SSID(s) of the on-craft Wireless Access Point(s) (WAP) provided by the AEC115. The Aircraft Type (defined by configuration) and Aircraft Serial Number (defined in customization below) are used when auto-prefixing is enabled.
	Wireless Mode	Defines the technology used when broadcasting on-craft WAPs provided by the AEC115 in accordance with IEEE 802.11. Possible values include: b, b+g, b+g+n, n, n+ac.
	Crew WAP Settings	SSID – Define the alphanumeric text used to identify the on-craft Crew WAP provided by the AEC115. SSID Hidden – Identify if the SSID is broadcasted in the clear or hidden. Possible values are No (broadcasted) and Yes (hidden). Authentication Method – Defines the security credentials a device must provide to connect with the on-craft Crew WAP. Possible values are PSK or EAP-TLS. In case of PSK authentication method: Passphrase – Defines the password/passphrase a device must provide to connect with the access point. Each password/passphrase must be a minimum of 8 characters in length. In case of EAP-TLS authentication method: Passphrase (optional) – Defines the password/passphrase a device must provide to connect with the access point Server Certificate – The X.509 server certificate used in the authentication process. CA Certificate – The X.509 Certificate Authority (CA) certificate used in the authentication process. Private Key – The private key used in the certificate-based authentication process.
	Passenger WAP Settings	SSID – Define the alphanumeric text used to identify the on-craft Passenger WAP provided by the AEC115. SSID Hidden – Identify if the SSID is broadcasted in the clear or hidden. Possible values are No (broadcasted) and Yes (hidden). Authentication Method – Defines the security credentials a device must provide to connect with the on-craft Passenger WAP. Possible values are PSK or EAP-TLS. In case of PSK authentication method: Passphrase – Defines the password/passphrase a device must provide to connect with the access point. In case of EAP-TLS authentication method: Passphrase (optional) – Defines the password/passphrase a device must provide to connect with the access point Server Certificate – The X.509 server certificate used in the authentication process. CA Certificate – The X.509 Certificate Authority (CA) certificate used in the authentication process. Private Key – The private key used in the certificate-based authentication process.

Customization Item	Detail	Description
Air-Ground VPN Settings	VPN Address	Defines the address of the ground server with which the AEC115 exchanges data (i.e. exporting the collected avionics data, and import/stage data for uploading and/or installation). Can be identified by Fully-Qualified Domain Name (FQDN) (e.g. vpn.something.com) or IPv4 address (e.g. 12.12.12.12).
	VPN Port	Defines the Universal Datagram Protocol (UDP) port used to establish the VPN. Defaults to port 4500.
	VPN Authentication Method	Defines the security credentials the AEC115 must provide to securely connect with the ground server. Possible values are RSA or Public Key Infrastructure (PKI). In case of RSA authentication method (symmetric key exchange): Server Public Key – The public key associated with the ground server. Private Key – The client's private key used in the authentication process. Public Key – The client public key used in the authentication process. In case of PKI-based authentication method: Client Certificate – The X.509 client certificate used in the authentication process. CA Certificate – The X.509 Certificate Authority (CA) certificate used in the authentication process. Private Key – The private key used in the certificate-based authentication process.
	Certificate Expiration Check	Identifies the frequency at which the AEC115 will check for expired VPN certificates (in case of 'PKI' authentication method). Possible options are: On-boot (each time AEC115 is powered), or Periodic (by days) between 1-365.
Air-Ground Data Transfer	Polling Frequency	Identifies how often the AEC115 will initiate connection with the ground to query for data pending import. Default value is 300 seconds (5 minutes).
Aircraft Environment	Aircraft Serial Number	Up to five (5) alphanumeric characters identifying the serial number of the aircraft (e.g. '99999'). This data is used to organize the data collected by AEC115 into its repository and for automatically prefixing its wireless access point(s).
	Data Link Preference	For each prioritization level, the data link preference(s) can be defined such that the files associated with the prioritization level are exchanged through the preferred data link type. An ordered list of up to two (2) preferred data links can be defined for each prioritization level by flight/ground condition. The possible values are: Not Allowed, Cellular, and Wi-Fi.
Storage Locations	Flight Data Volume Capacity	Default, 27,512 MiB
	System Log Volume Capacity	Default, 4,000 MiB
	Security Log Volume Capacity	Default, 4,000 MiB
	Upload Folder Volume Capacity	Default, 4,000 MiB
	General Folder Volume Capacity	Default, 4,000 MiB
	FMS Upload Folder Volume Capacity	Default, 256 MiB
	FMS Download Folder Volume Capacity	Default, 256 MiB
Avionics Data Broadcast Settings	ARINC 429 Configuration File	Refer to example content provided in 282300-XCFS.
	ADBP Configuration File	Refer to example content provided in 282300-XCFS.
Logging	Trace Files	Disabled

6.5 Configuration Data Loading

As a prerequisite, the user should have already generated AEC115 configuration and customization LSAPs using the ACCT as described in Sections 6.2, 6.3, and 6.4. A PDL supporting ARINC 615A-2 uploading is required for initial configuration loading.

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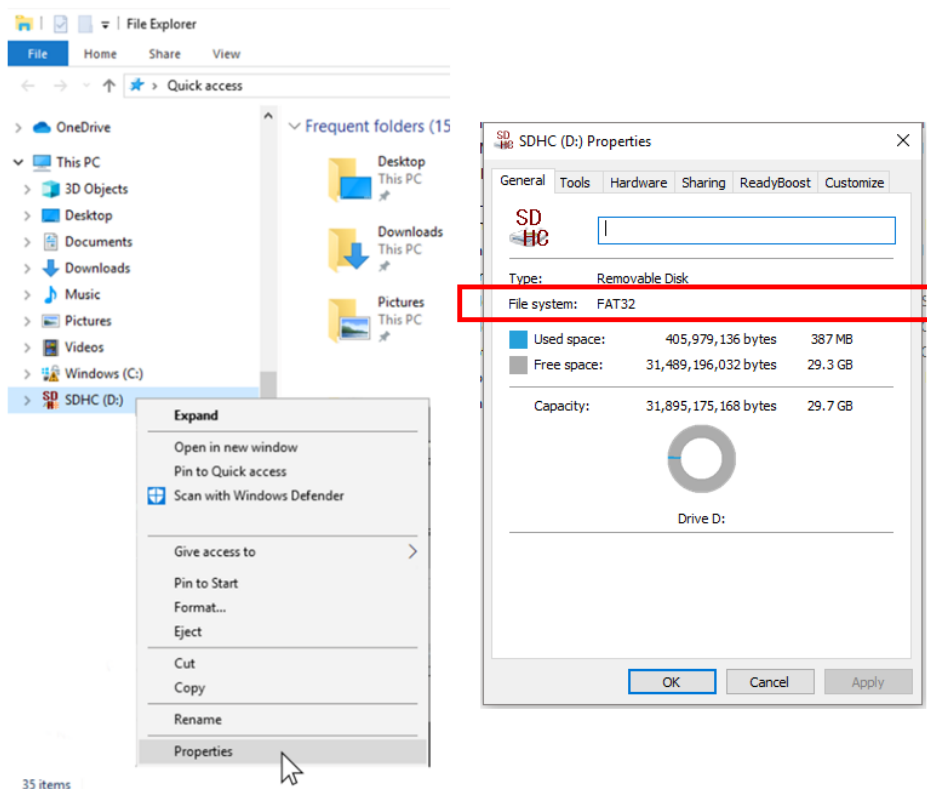
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6.5.1 Initial Configuration Data Loading

1. Connect PDL to AEC115 Ethernet Port #1 (Pins J1-58, 59, 77, 78).
2. Assert (Ground) the AEC115 DISCRETE_RX_01 signal (DATALOAD_ENABLE).
3. Power on the AEC115.
    a. When powering on the AEC115 while no valid configuration and customization is present, the AEC115 will illuminate both its STATUS LED **Blue** and CFG LED **Amber**.
4. Follow instructions provided with the PDL to perform upload activity to the AEC115 using the Configuration and Customization LSAP(s) previously generated with the ACCT. These LSAPs should be uploaded together in the same uploading session.
    a. Note: the AEC115 supports ARINC 615A Find/Snip function for equipment discovery.
5. Wait for the AEC115 to report successful uploading.
6. Deassert (Open) the AEC115 DISCRETE_RX_01 signal.
7. Power off the AEC115.
8. Disconnect PDL.
9. Power on the AEC115 and verify STATUS LED transitions from **Blue** to **Green** assuring the Configuration and Customization data just installed is considered valid.

6.5.2 Update Configuration Data

If the AEC115 already has valid configuration and customization data installed, a PDL is not required. The following procedure identifies the means by which an Operator can upload and install updated configuration and customization data.

6.5.2.1 Prepare the Media

1. Acquire the removable memory card.
2. Ensure the memory card filesystem is formatted as exFAT.
    a. To check the memory card filesystem using a PC running Microsoft Windows Operating System (OS), open a file explorer window, right click on the device drive and select 'Properties' from the context menu.

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b. If the filesystem shown is not exFAT, right click again on the device drive and select 'Format...' from the context menu. In the dialog shown, choose 'exFAT' from the File System drop-down menu and select 'Start'.
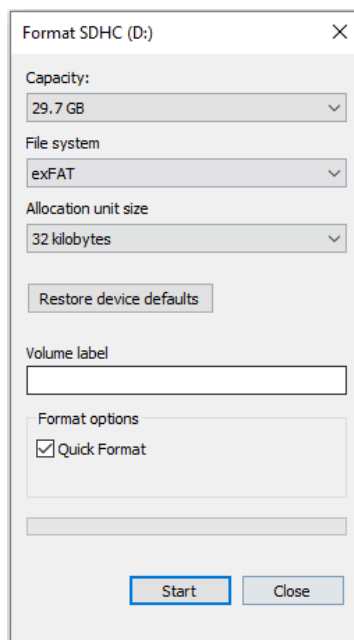

Figure 6-1: Removable Memory Filesystem Formatting

NOTE

⚠ **Reformatting the card's memory will erase all content - make sure to copy any files you want to save prior to reformatting.**

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3. If not already present, create a folder 'UPLD_3' on the memory card's root directory.

4. Inside 'UPLD_3' folder, if not already present, create folder 'WACS_CONF'.

    a. If the folder is already present, delete any contents.

5. Place contents of ACCT AEC115 configuration generated output into 'WACS_CONF' folder on memory card.

6. Inside 'UPLD_3' folder, if not already present, create folder 'WACS_CUST'.

    a. If the folder is already present, delete any contents.

7. Place contents of ACCT AEC115 customization generated output into 'WACS_CUST' folder on memory card.

8. Remove Access Panel on front of AEC115.

9. Insert memory card into AEC115 slot labeled 'SD.'

6.5.2.2 Load Configuration Data via SD Card

1. Ensure the AEC115 is powered off.

2. Insert a SD card with the Configuration Data prepared per section 6.5.2.1.

3. Power on the AEC115 while the equipment inputs to AEC115 indicate Maintenance mode and monitor the SD and Status LEDs.

4. Once the SD LED stops flashing and the Status LED is solid green, the unit has been successfully data loaded.

5. Power off the AEC115.

6. Deassert (Open) the AEC115 DISCRETE_RX_01 signal.

7. Power on the AEC115 while the equipment inputs to AEC115 indicate Normal mode.

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7 Instructions for Continued Airworthiness

7.1 An "On-Condition" AEC115

There are no specific actions required for continued airworthiness of the AEC115. Maintenance -- including inspection, cleaning, and adjustments of the AEC115 -- should be performed on an "on-condition" basis. The AEC115 does not require specific calibration.

NOTE

Cleaning of the AEC115 surface may be done as required. Use only a soft, lint-free cloth with ordinary soap and water to wipe the surface. Do not use abrasive cleaners or brushes to clean the surface. Do not pour or spray cleaning solutions directly on the equipment. Apply the cleaning solution to the cloth then proceed to gently clean the surface.

7.2 Installation

1. Remove Access Panel on front of AEC115.
2. As necessary, insert SIM card into slot labeled 'SIM 1'.
3. As necessary, insert SIM card into slot labeled 'SIM 2'.
4. As necessary, insert properly-formatted removable memory card into slot labeled 'SD'.
5. Re-affix Access Panel on front of AEC115.
6. Size the mounting surface and verify that all mounting holes are in alignment.
7. Install the harnesses to the existing aircraft connectors
8. As necessary, install the aircraft antenna(s) in accordance with their installation data.
9. Install the J1 connector to the AEC115.
10. Connect J2 & J3 connectors between cellular data antenna and the AEC115.
11. Connect J4 & J5 connectors between Wi-Fi antenna and the AEC115.
12. Install the AEC115 on its mounting surface.
13. Apply power to the AEC115 and perform power up check in accordance with Section 6.1.

7.3 Removal

CAUTION

Disconnect power to the AEC115 before removing it. Removing the unit with power connected is dangerous to life and may cause voltage transients that can damage the unit.
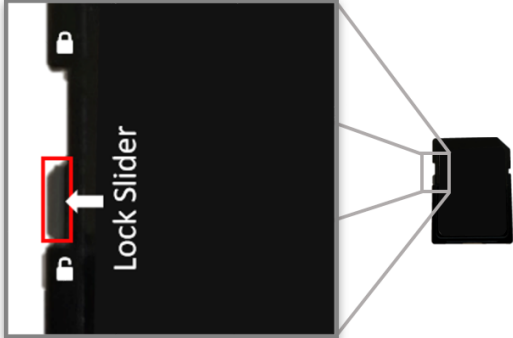
Upon removal, the AEC115 may be warm to the touch so appropriate insulating material may be used to handle the unit. This procedure is to be conducted by maintenance personnel on the ground.

1. Disconnect power from the AEC115.
2. Alternately, loosen the four mounting fasteners and washers.
3. Remove the AEC115 from its mounting surface.
4. Holding the AEC115 free of its mounting surface, remove the wiring harness from connector J1.
5. As necessary, remove coaxial SMA connectors from J2, J3, J4, and J5.
6. Install the protective end caps on the AEC115 connectors and harness.

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7.4 Troubleshooting

If the AEC115 is not working properly, the following troubleshooting guide may be used to correct issues related to the use or installation of the AEC115.

Table 7-1: Troubleshooting Information

Function	Alert Condition	Description	Suggested Maintenance Action
Removable Memory Data Transfer	**SD LED** **SOLID AMBER**	The AEC115 is experiencing an issue using the removable memory card.	Ensure the removable memory card is properly inserted into the slot labeled 'SD'.
			Ensure the removable memory card filesystem is formatted correctly as exFAT.
			Ensure there is enough free space available for writing data. Delete any unnecessary data from the removable memory card.
			Ensure the removable memory card physical 'lock' is disengaged. Lock Slider
Persistent Memory Storage & Retrieval	**SSD LED** **SOLID AMBER**	The AEC115 is experiencing an issue accessing its internal persistent memory.	Attempt to perform the memory erase function: 1. Power off the AEC115. 2. Configure its HPP signals GND. 3. Power on the AEC115. 4. Wait for the AEC115 to complete the erase activity. 5. Power off the AEC115. 6. Return its HPP signals to OPEN. 7. Power on the AEC115 and verify SSD LED no longer illuminates **SOLID AMBER**. If the issue is not resolved, uninstall the AEC115, fill out a Return Material Authorization (RMA) form [Link] and return it to Astronautics for repair and/or replacement.
Navigation DB Loading	**STATUS LED** **SOLID AMBER** **CFG LED** *OFF*	PBIT routine(s) failed during power on or CBIT routine(s) failed during operation.	Ensure correct HPP configuration (Normal), refer to Section 4.8. Power cycle the equipment. If the problem is not resolved, perform software and configuration data loading in accordance with Section 6.5.1 using PDL device. If after re-loading the AEC115 software and configuration data the problem is not resolved, fill out an RMA form [Link] and return it to Astronautics for repair and/or replacement.
AEC115 Configuration	**STATUS LED** **SOLID BLUE** **CFG LED** **SOLID AMBER**	The AEC115 does not detect the presence of valid configuration and/or customization data.	Ensure correct HPP configuration (Normal), refer to Section 4.8. Power cycle the equipment. If the problem is not resolved, perform configuration data loading in accordance with Section 6.5.1 using PDL device. If after re-loading the AEC115 configuration data the problem is not resolved, fill out an RMA form [Link] and return it to Astronautics for repair and/or replacement.

8 Regulatory Compliance

8.1 TSO Authorization Approval

The conditions and tests required for TSO authorization (TSOA) approval of this article are minimum performance standards. It is the responsibility of those installing this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval for installation in an aircraft. The article may be installed only in compliance with 14 CFR part 43 or other applicable airworthiness requirements.

Based on an FAA TSOA approval, the identification plate will be marked to indicate the the following TSOs apply to the 282300 AEC115 components.

Table 8-1: TSO Descriptions

TSO	Compliance	Description
TSO-C109	Complete	Airborne Navigation Data Storage System

8.2 Non-TSO Functions

In addition to the functions certified under TSOs, the AEC115 provides the following functions (listed in subsequent sections) which are not part of any TSO.

No special instructions are required for the non-TSO function described below. The non-TSO functions will be evaluated during the first time aircraft installation. Operating instructions are defined in the General Operator's Guide Astronautics document 282300-GOG.

All TSO and non-TSO functions were developed in accordance with DO-178C. Astronautics confirms that the non-TSO functions do not interfere with the article's compliance with the requirements outlined in TSO-C109.

Per sections 4 and 6, the Installation Procedures and Equipment Limitations are sufficient to ensure that the non-TSO functions meet the declared functions and performance specifications. Per section 6, the configuration and checkout provides the installation test procedures to ensure compliance to the TSO and non-TSO functions.

NOTE

The non-TSO functions are part of field loadable software part 282283-XXXX (where XXXX is the latest software revision) which also includes TSO functions.

Section 7 (Instructions for Continued Airworthiness) covers basic maintenance. No special instructions are needed for the non-TSO functions.

Interface requirements are defined in 282300-ICD and 282300-DICD. Interface requirements apply equally to the non-TSO functions and TSO functions and there are no distinctions between the non-TSO and TSO functions regarding the interface requirements.

All TSO and non-TSO functions were developed and verified in accordance with DO-178C.

The function described in Table 8-2 below do not interfere with navigation database storage and retrieval functions as these functions can all be performed in parallel without reducing performance of the TSO function below its minimum allowance.

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Table 8-2: Non-TSO Descriptions

Function	Description
Collect Flight Operations and Maintenance Data from Avionics Systems	The AEC115 continuously records and organizes avionics data from various source computers over various data buses (i.e. ARINC 429, Serial RS-485).
Export Collected Avionics Data	The AEC115 provides the data it collects from avionics systems to a dedicated ground server via wireless connections, and to operators through its removable memory card or web-based HMI.
Provide Internet Connectivity to Connected Devices	When devices are connected to the AEC115 and the AEC115 has established a connection to the cellular data network, the AEC115 can share its cellular data connection with these connected devices granting access to Internet-hosted resources.
Provide System Information, Data Transfer & Maintenance Interface	The AEC115 embeds a web server accessible by devices connected to its secured local wireless network and wired Ethernet interface. The web server provides the means for standard web browser applications to produce a user interface for: • AEC115 parts reporting including hardware part number, hardware serial number, software part numbers and configuration part numbers • AEC115 data loading • Monitoring AEC115 system health • Exporting AEC115 system and security log files • Importing field loadable software packages for AEC115 data loading • Exporting collected avionics data • Customizing AEC115 settings not related to the TSO function
Aircraft Parameter Data Distribution to Client Devices	Using standard ARINC 834 Avionics Data Broadcast Protocol (ADBP), the AEC115 provides parameterized avionics data to connected devices.

Table 8-3: DO-160 Test Categories

TEST DESCRIPTION	DO-160G SECTION	TEST CATEGORY
Temperature and Altitude	4	Category B4
Ground Survival Low Temperature	4.5.1	-55°C
Short-Time Operating Low Temperature		-30°C
Operating Low Temperature	4.5.2	Category B4, -30°C
Ground Survival High Temperature	4.5.3	+85°C
Short-Time Operating High Temperature		+65°C
Operating High Temperature	4.5.4	Category B4, +65°C
In-Flight Loss of Cooling	4.5.5	Category X, no test required
Altitude	4.6.1	Category C4, 35,000ft
Decompression	4.6.2	Category X, no test required
Overpressure	4.6.3	Category X, no test required
Temperature Variation	5	Category B
Humidity	6	Category A
Operational Shocks and Crash Safety	7	Category A
Operational Shocks	7.2	Helicopter and All Fixed-Wing, Test Type R, 20g
Crash Safety - Impulse	7.3.1	Category E

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TEST DESCRIPTION	DO-160G SECTION	TEST CATEGORY
Vibration (Robust)	8	U-G Robust (helicopters with unknown rotor related frequencies), Test curve G
Explosion Proofness	9	E - Equipment contains no hot spots on surfaces and does not produce sparks under normal operating conditions.
Waterproofness	10	Category X, no test required
Fluids Susceptibility	11	Category X, no test required
Sand and Dust	12	Category X, no test required
Fungus Resistance	13	Category F
Salt Fog	14	Category X, no test required
Magnetic Effect	15	Category Z
Power Input	16	*See below*
Normal Operating Conditions	16	Category B
Ripple Voltage	16	Category Z
Normal Surge Voltage	16	Category Z
Voltage Steady State	16	Category B
Abnormal Surge Voltage	16	Category Z
Low Voltage Conditions	16	Category B
Momentary Undervoltage	16	Category B
Engine Starting Undervoltage	16	Category B
Momentary Power Interruption	16	Category B
Voltage Spike	17	Category A
Audio Frequency Susceptibility-Power Inputs	18	Category Z
Induced Signal Susceptibility	19	Category ZCX
Radio Frequency Susceptibility - Radiated	20	Category R
Conducted Susceptibility on Power Leads	20	Category M
Emission of Radio Frequency Energy - Conducted	21	Category M
Emission of Radio Frequency Energy - Radiated	21	Category P
Lightning Induced Transient Susceptibility	22	Category A2J2L2
Lightning Direct Effects	23	Category X, no test required
Icing	24	Category X, no test required
Electrostatic Discharge (ESD)	25	Category A
Flammability	26	C - FAR Part 25 AC-21-16G

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8.3 Certified Software and Airborne Electronic Hardware

8.3.1 Software

Table 8-4: AEC115 Software Components

Software Component	DAL	ARINC 665 Field Loadable Software PN	Description
Bootloader Software PN 282588-0004	D	Not applicable	Boot strap loader which launches and executes the platform software image or resident loader utility based on HPP inputs.
Platform Software PN 282283-0008	D	ACZ2CA8KMBA0008	Operational software image supporting all TSO and non-TSO functions.
Radio Firmware PN 282589-0007	E	ACZ23A8KXWA0007	Manages and configures embedded wireless transceiver for cellular data connectivity.
Resident Loader Software PN 283786-0004	E	Not applicable	Performs software loading in factory. **Function is not executed when AEC115 is installed on craft.**

8.3.2 Complex Airborne Electronic Hardware

The AEC115 does not embed components categorized as complex Airborne Electronic Hardware (AEH).

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9   Appendix A: Installation Drawings

Note that the measurements in the figures below are shown in both metric units (millimeters), and imperial units [inches].
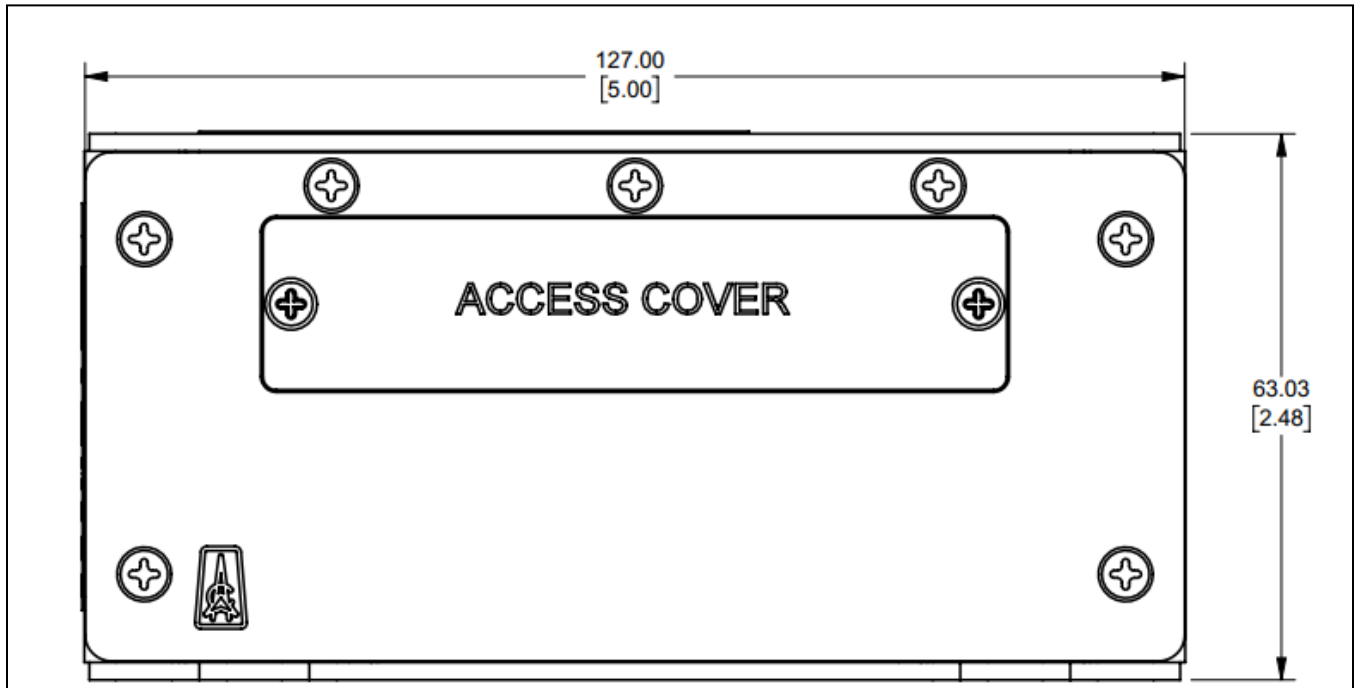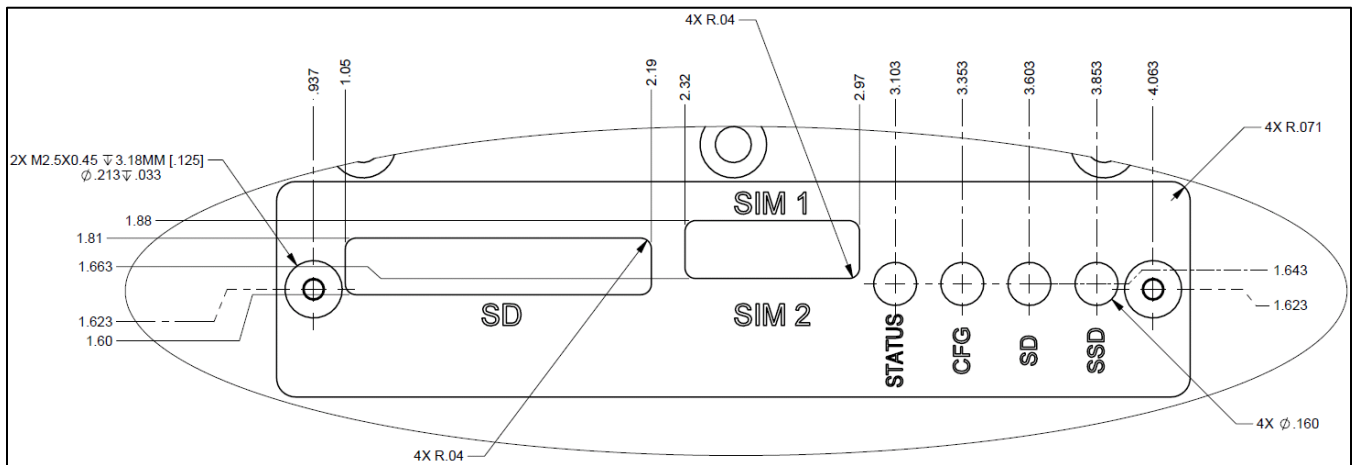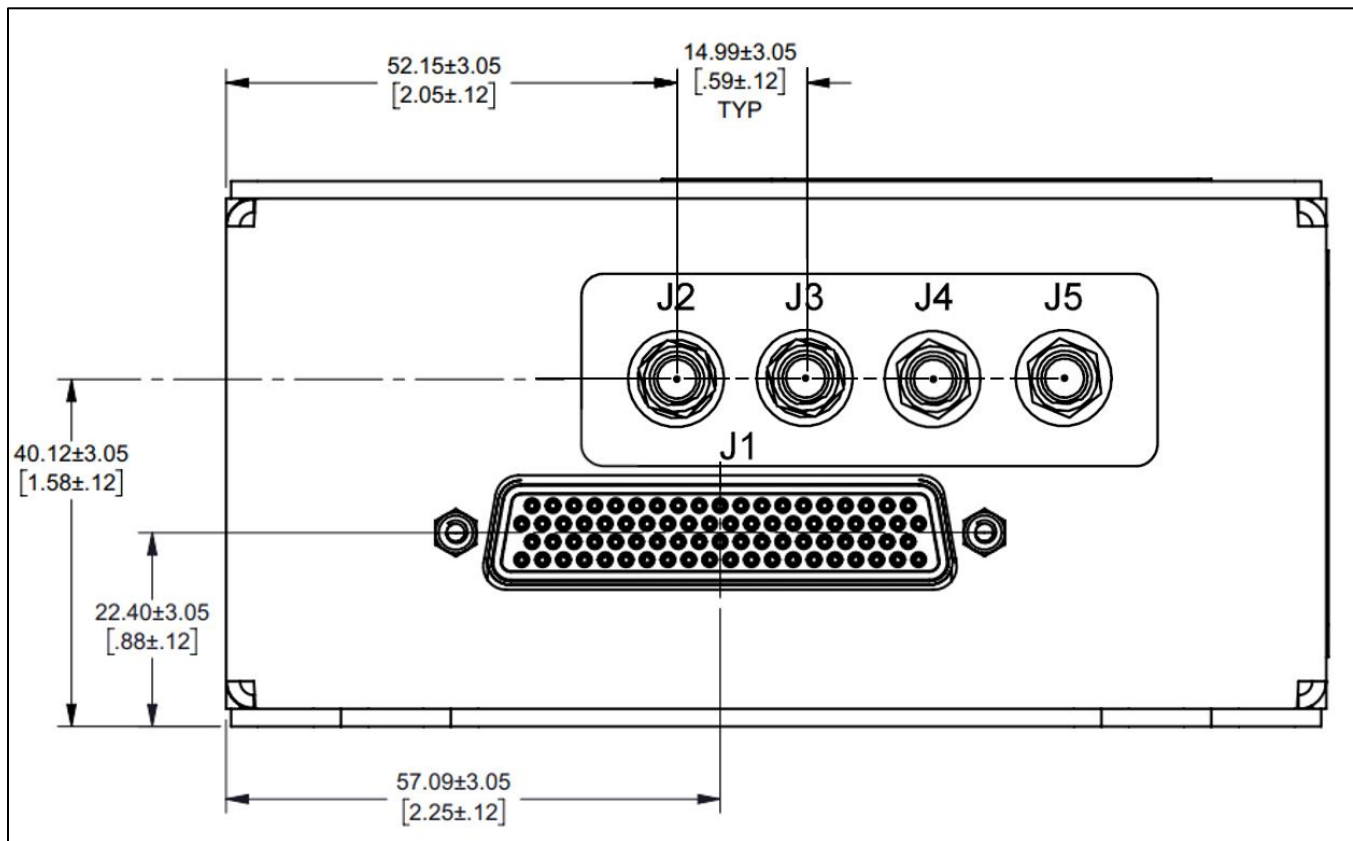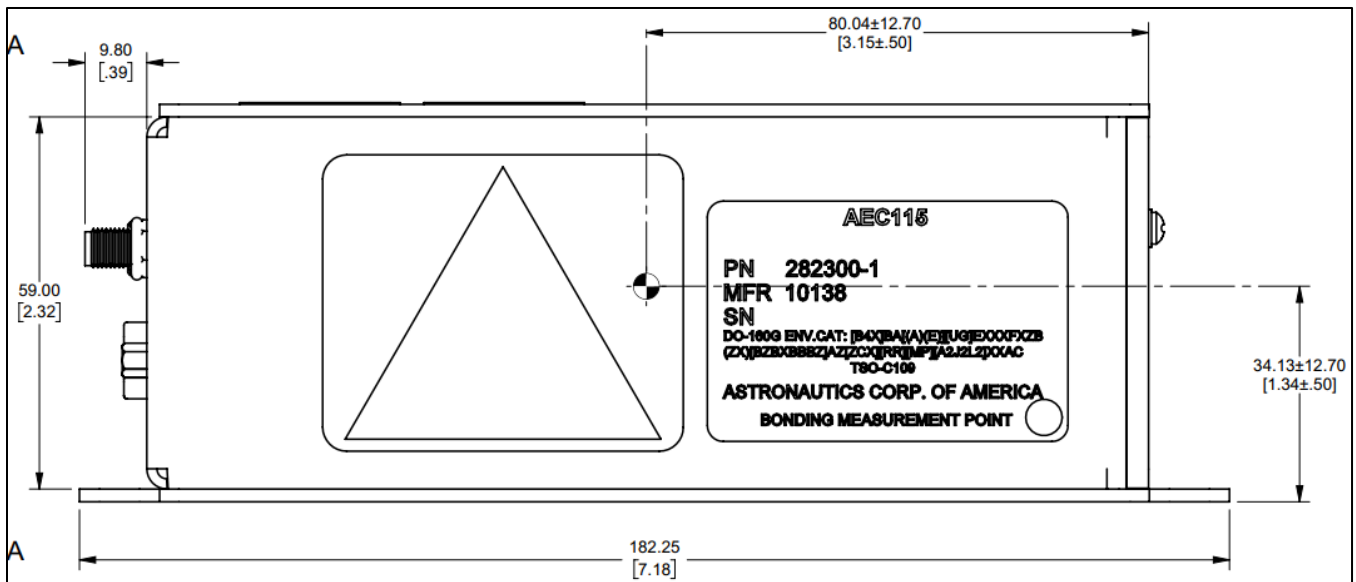

Figure 9-1: AEC115 Front View

Figure 9-2: Access Panel HMI

Figure 9-3: AEC115 Side View

Figure 9-4: AEC115 Rear View

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Figure 9-5: AEC115 Top View

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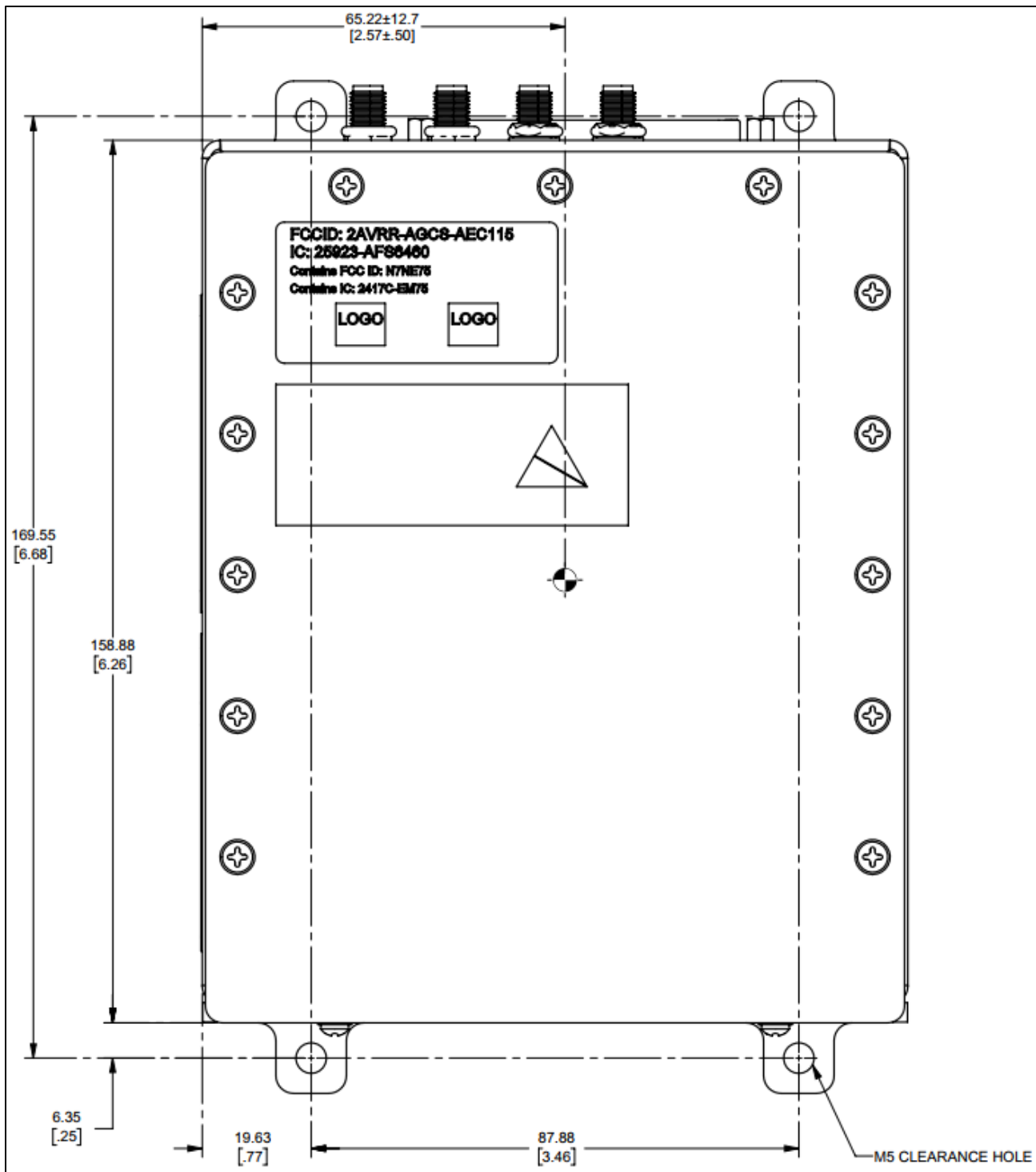
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10 Appendix B: Radio Frequency Usage

11 Product Usage Guidelines

The final operator of the mini-wACS or AEC115 shall be aware of the following usage constraints.

Product Name: mini-wACS

Model Name: AEC115

Part Number Effectivity: 282300-1

Product Constraints

WARRANTY CAUTIONS:

Professional installation of the AEC115 is required.

Please see the 282300-1 installation drawing and this Installation Control Document to properly install the unit in an air vehicle.

Electrostatic Precautions:

The AEC115 does contain interior components that are susceptible to damage due to electrostatic discharge when handling directly. The operator is not to open the AEC115 and handle the interior components.

ACA PN: 199324-1

CONFIGURATION NOTICE:

The AEC115 has no operator adjustable settings for power or frequency channels. All power and frequency settings are set by Astronautics and a tamper resistant VOID IF REMOVED label (PN: 280755) is placed on the AEC115 before the Certificate of Conformity is issued. The operator is not allowed to modify radio module input power levels, add frequency ranges, or the certification license(s) labeled on the modified AEC115 will be void.

NOTICE:

Changes or modifications made to this equipment not expressly approved by (manufacturer name) may void the FCC & other government authorizations to operate this equipment.

SOFTWARE INSTALLATION:

The AEC115 must be configured with Astronautics software. Please refer to the Air-vehicle Maintenance Manual (AMM) and / or any corresponding Service Bulletins (SB) for the certified and approved configurations of software.

The AEC115 contains the following labeling for software configuration notice to the installer.

ACA PN: 263620-1

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RADIO EMITTER NOTICE: Exposure to Radio Frequency Radiation

This AEC115 and its antennas must not be co-located or operating in conjunction with any other antenna or transmitter other than the certified and approved equipment provided by air vehicle manufacturer. This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. The AEC115 is to be installed and operated with a minimum distance of 27 centimeters between the radiator and your body.

RADIO ANTENNA NOTICE: Minimum Separation During Installation

The AEC115 antennas are required to be installed and operated with a minimum distance of 27cm between each of the antenna's installation locations. At no time should the AEC115 antennas be installed within 27cm of another antenna or the certification license(s) labeled on the AEC115 will be void.

FEDERAL COMMUNICATIONS COMMISSION: Certification Labeling

NOTICE:

This device complies with Part 15 of the FCC Rules and with Industry Canada license-exempt RSS standard(s).

Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

INDUSTRY CANADA:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio

exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et
2. l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

CONFORMITÈ EUROPÉENNE: Certification Approvals

The AEC115 complete European Union (EU) Declaration of Conformity can be found at the following public address:

- https://astronautics.com/company/about/certifications/

RADIO ANTENNA EMITTERS: Frequency Bands and Maximums

The AEC115 Frequency and Band Information / limits can be found within both this Interface Control Document revision, as well as the AEC115 System Design Definition Document 282300-SYDD-*x* revision A or later.

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