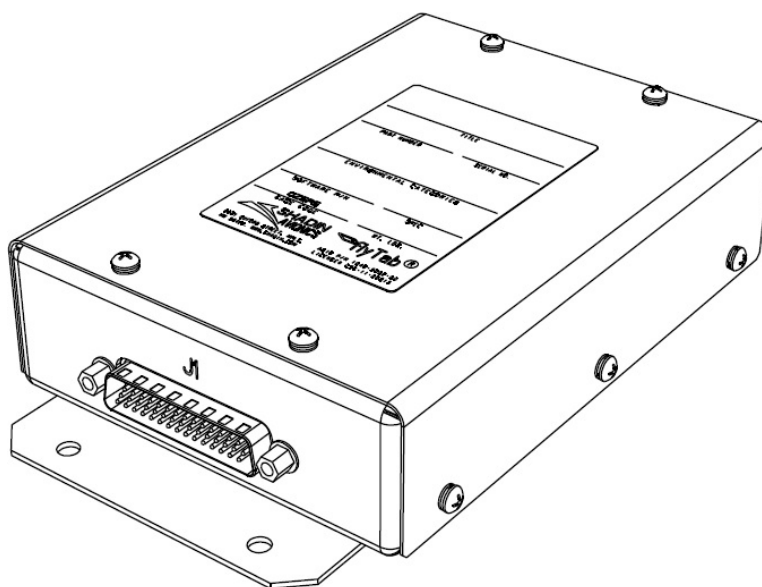




AIS-360 AIRCRAFT INTERFACE MODULE

P/N: 833620-00



INSTALLATION MANUAL

MANUAL P/N: M833620-00

REV A

Shadin Avionics
6831 Oxford Street
St. Louis Park, MN 55426
USA

Sales: (800) 328-0584
Customer Service: (800) 388-2849 or (952) 927-6500

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Revision Log

REV	DATE	APP'D	CHANGE	CVS Version
-	05/30/13	RJW	Baseline Release	2.0
A	07/01/13	TJO	Updated output with NMEA description, removed software verification descriptions from Section 3.2 and renumbered paragraphs	3.0

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The information in this manual is subject to change without notification.

1 OVERVIEW

1.1 THE MANUAL

This manual is intended to determine a proper installation of the AIS-360 AIRCRAFT INTERFACE MODULE (AIM). Installation instructions should be read and followed.

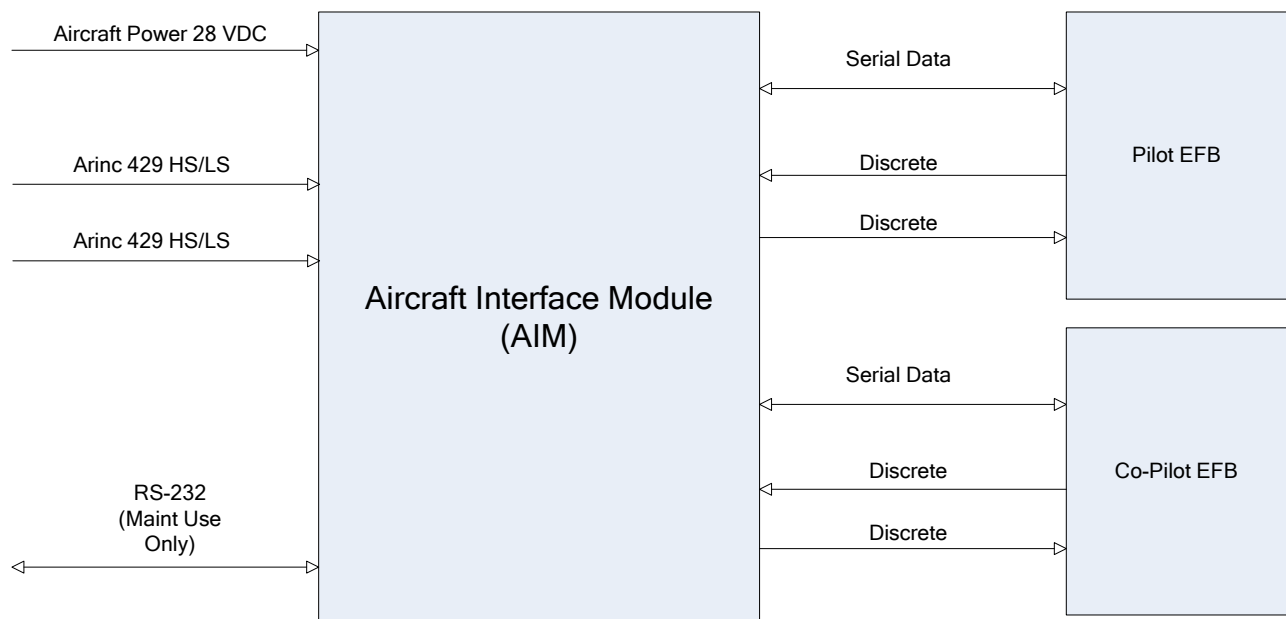
1.2 PRODUCT DESCRIPTION

The AIM, Shadin Avionics part number 833620-00, provides the interface between aircraft ARINC 429 data busses and two customer tablet devices.

Aircraft data is accepted on two ARINC 429 busses which are connected to the aircraft Flight Management System (FMS) or other aircraft avionics. ARINC data from the aircraft is used to build GPWGA and GPRMC NMEA GPS (defined in section 1.5) message strings, which are sent to the tablet devices to provide current location data. Additionally, applications on the consumer devices can request to receive ARINC data from the AIM.

Communication between the consumer devices and the AIM utilizes standard serial ports. Discrete digital input and output ports are used to detect the connection of a device to the AIM and signal the connection of the AIM to the device. When connected, the AIM must first complete an identification and authentication process. After authentication is complete, location data is provided to the device. This location data is available to any application on the device. A Software Development Kit (SDK) allows applications running on the EFB (Electronic Flight Bag) to communicate with the AIM. This communication includes the ability to configure the reception of specific ARINC labels and the rate at which that data is sent to the application.

A block diagram of the system follows.



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1.3 SPECIFICATIONS

Physical Specifications

Dimensions: 1.57H x 6.90L x 4.24W (inches)

Weight: 0.7 lbs.

Electrical and Functional

Power Supply Voltage: +28VDC Nominal

Supply Current (No Loads): 100 mA at 28 VDC

Supply Current Typical (With Loads): 600 mA at 28 VDC

Environmental RTCA/DO-160F (by similarity to P/N 833811-00)

Categories: [A4X]BBB[R(B,B1) U2(F,F1)]XXXXXXZ[BXX]AZ[CC][RR]M[XXJ33]XXAX

Operating Temperature: -40° to +70°C

Operating Altitude: Up to 42,000 ft

Storage Temperature: -55° to +85°C

In-Flight loss of Cooling: Equipment can run indefinitely with no cooling

Regulatory: TSO-C115c INCOMPLETE SYSTEM

MIL-HDBK-217 MTBF: greater than 20,000 hours

MTBF Definition:

Mean time between failures (MTBF) is calculated following MIL-HDBK-217 guidance as a starting point, when available field or vendor data is used in place of MIL-HDBK-217 predictions. The AIS-380 prediction is for an environment of airborne, inhabited, cargo. At 20°C the prediction is 36,367 hours and at 40°C it is 22,607 hours.

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1.4 INPUTS

The AIM accepts ARINC 429 data and passes the data through to the tablet interface. The AIM has the ability to be customized to filter or ignore specific labels. The following inputs are provided:

- Two ARINC-429 inputs configurable for high or low speed
- One RS-232 interface for ground maintenance
- One RS-232 receive/transmit interface for Pilot EFB communication
- One RS-232 receive/transmit interface for Co-Pilot EFB communication
- Two Discrete Inputs which accept the following signal levels:

Discrete Input State	Voltage/Resistance Levels
Low/Ground Signal (Active)	V < 3.5 VDC (with I < 20mA sink) R, 10 ohms
High/Open Signal (Inactive)	5 VDC < V < 33 VDC R > 100 Kohms

1.5 OUTPUTS

The AIM provides serial data to the EFB. This data is conditioned and provided to the SDK interface which accepts it into the flight bag application.

- Two RS-232 transmit interfaces for EFB communication (one per EFB)
- Two discrete outputs for the Accessory Detect signal (Open/Ground type). Each output has a maximum current rating of 0.5 amps.

Time, latitude, longitude, and speed are gathered from the ARINC bus and put into NMEA GPGGA and GPRMC format for the EFB to receive.

NMEA GPGGA	NMEA GPRMC
Time (UTC)	Time (UTC)
Latitude	Status
North or South	Latitude
Longitude	North or South
East or West	Longitude
GPS Quality Indicator	East or West
Number of satellites in view	Speed over ground, knots
Horizontal Dilution of Precision	Track made, good, degrees true
Antenna Altitude above/below mean-sea-level (geoid)	Date, ddmmyy
Units of antenna altitude, meters	Magnetic variation, degrees
Geoidal separation	East or West
Units of geoidal separation, meters	Checksum
Age of differential GPS data	
Differential reference station ID	
Checksum	

NMEA messages are ASCII comma separated strings as seen in the example below.

GPGGA:

```
$--GGA,hhmmss.ss,lll.ll,a,yyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh
```

GPRMC:

```
$--RMC,hhmmss.ss,A,lll.ll,a,yyyy.yy,a,x.x,x.x,xxxx,x.x,a*hh
```

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2 INSTALLATION PROCEDURE

2.1 LIMITATIONS

This equipment is developed to RTCA/DO-178B Design Assurance Level C. The Equipment acts as an extension of the output of the Flight Management System (FMS) only and is therefore certified as an "Incomplete system". The AIM does not output any data back to the FMS. The output of the AIM is intended to be used for supplemental data to the flight crew and the installer is responsible for ensuring the certification levels are appropriate for the application through a system safety analysis.

2.2 MOUNTING

The AIS-360 AIRCRAFT INTERFACE MODULE (P/N 833620-00) should be mounted according to the installation drawing given in Appendix A. The equipment should be installed in a controlled temperature and pressurized location. The unit can be mounted in any orientation in the aircraft.

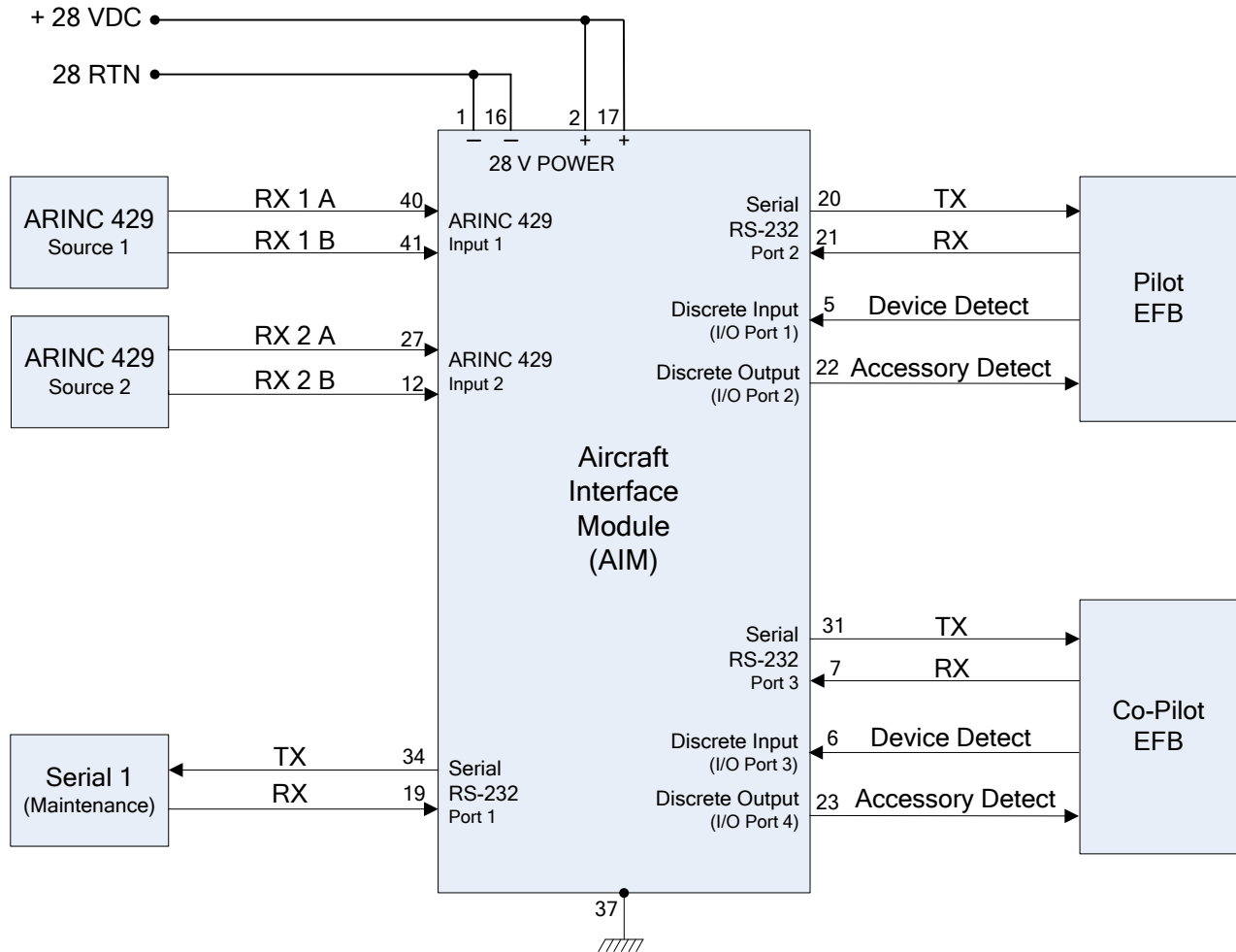
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2.3 ELECTRICAL CONNECTIONS

Installation Drawing D833620-00 provides connector J1 pinout information. Typical electrical wiring is shown below.



2.4 INSTALLATION NOTES

Aircraft power +28 VDC can be connected to both pins 2 and 17 for redundancy as shown above. Alternatively the unit can be powered only through pin 2, or only through pin 17. The same applies to the return lines: Pins 1 and 16 can both be routed to the aircraft 28 V return, or return can be connected to either pin 1 or pin 16.

Pin 37 is tied directly to the AIM chassis. After the AIM is mounted to the airframe, this pin is equivalent to airframe ground and can be used as a connection to cable shields in the connector backshell.

The EFBs are powered separately from the AIM. The power source provides the common ground connection for the interface signals.

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3 SETTING THE AIM CONFIGURATION

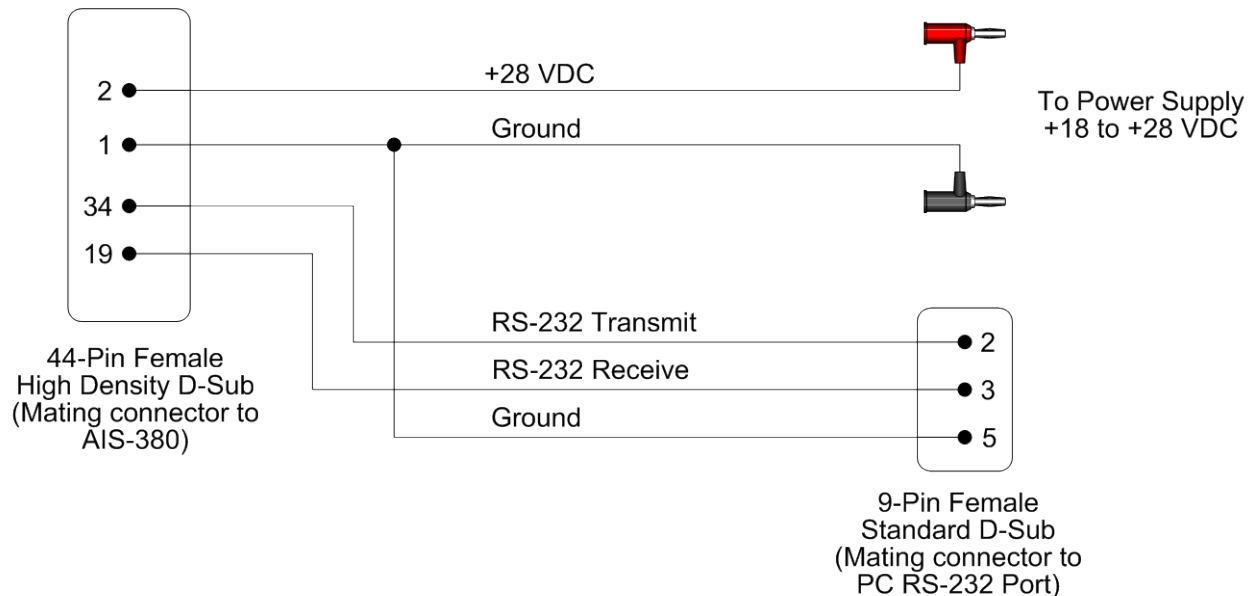
This section describes the method of setting the AIM configuration through the maintenance port Serial 1. The AIM is to be configured on a test bench prior to installation in the aircraft. The ARINC port configuration is given below as well as other functions that may be useful. Below is a list of the equipment needed.

Equipment List

- +18 V to +28 V DC Power Supply
- Desktop or Laptop PC with serial port or USB adapter if no serial port is available
- 833620-00 AIS-360 Aircraft Interface Module

A cable configured per the figure below can be built to interface the AIM to the PC. Alternatively, a cable assembly can be acquired from Shadin Tech Support per the contact information below:

Web: www.shadin.com
 E-mail: service@shadin.com
 Phone: (952) 927-6500 or
 (800) 388-2849



Field Configuration Cable

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3.1 COMMUNICATION INTERFACE

Communication between the AIM and the maintenance device occurs on RS-232 serial port 1 of the AIM Device. The port is configured for 115200 baud, 8 data bits, No parity, and 1 stop bit.

The AIM interface will utilize ANSI escape sequences to clear the terminal screen and reset the cursor to the home position. For optimum readability, the maintenance device terminal program should be set to emulate an ANSI terminal.

Additionally, the maintenance device should be set to display sent characters (Half Duplex), as the AIM does not echo received characters.

Data input to the AIM will only be processed when the AIM receives the carriage return character (0x0D), which can be sent from most terminal programs by pressing the 'Enter' key.

3.2 MAINTENANCE PORT SCREEN DISPLAYS

AIM maintenance and configuration screen displays are shown below. Almost any terminal emulation program can be used.

The maintenance port window has additional options that were used during software verification. In the paragraphs that follow are the options used during aircraft installation and configuration.

Setting up Connection

1. Connect the field configuration cable to the PC and AIM.
2. Connect power leads to +28 VDC and turn power on.
3. Start terminal emulation program and enter the following configuration:
 - a. Set the com port that is connected to serial port 1 of the AIM.
 - b. Port parameters to:
 - 115200 baud
 - no parity
 - 8 data bits
 - 1 stop bit
 - no flow control
4. Set Display parameters to display as Ansi, Half Duplex,
5. Press "Enter". With the AIM running the Main Menu will be displayed.
6. Use the available options shown for viewing and controlling AIM configuration and maintenance.
7. Selecting options consists of typing single digit numbers followed by "Enter".

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3.2.1 MAIN MENU DISPLAY

```

Aircraft Interface Module
Configuration and Maintenance Interface

1) Display Part Numbers
2) Configuration
3) Display Current Status
4) Arinc Stats
5) Code Coverage

```

Figure 1 – Main Menu Display

The main menu will be displayed when the AIM receives a carriage return (hex character 0x0D). Selection of the main menu options will be accomplished by sending the number corresponding to the desired option followed by a carriage return.

3.2.2 PART NUMBER DISPLAY

```

Shadin Part Number 833620-00
Software Part Number 403621-00

Press 'Enter' to return to main menu

```

Figure 2 – Part Number Display

The part number display will be accessed by entering 1 from the main menu. This option will display the hardware and software part numbers. Sending a carriage return will re-display the main menu.

3.2.3 CONFIGURATION DISPLAY

```

Channel 1  x  x
Channel 2  x  x

Configuration not valid

EFB Port  Type  App
1  x  x  x
2  x  x  x

Configuration not valid

Enter 1 to modify ARINC settings,
Enter 2 to modify EFB settings,
Enter 3 to Clear Configuration,
Enter anything else to exit:

```

Figure 3 – Configuration Display

The current configuration will be displayed by entering 2 from the main menu. This option will display the current ARINC and EFB configuration. Sending 1 or 2, followed by a carriage return, will display menus to modify the configuration table.

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Sending 3, followed by a carriage return, will clear the configuration table.
 Sending any other characters (or no characters) and a carriage return will re-display the main menu.

The example in Figure 3 is from an configured unit. Based on previous configurations data may be populated for Channel 1 and 2, and EFB 1 and 2.

3.2.4 MODIFYING ARINC SETTINGS

```
Available ARINC Configurations:
1) Tx:Low   Rx:Low
2) Tx:High  Rx:High
3) Tx:High  Rx:Low
Enter <channel> <selection>:
```

Figure 4 – Modifying ARINC Settings

Sending 1 from the configuration menu will display the ARINC configuration options.
 The configuration of an ARINC channel will be set by sending the channel number, space, selection number, and carriage return.
 The configuration menu will be re-displayed, without changing the configuration, if any other characters (or no characters) and a carriage return are sent.

3.2.5 MODIFYING EFB SETTINGS

```
Select Configuration or Enter to exit:
1) EFB 1 - UART 1 - IAP       - Flytab
   EFB 2 - UART 2 - IAP       - Flytab
2) EFB 1 - UART 1 - None     - None
   EFB 2 - UART 2 - None     - None
```

Figure 5 – Modifying EFB Settings

Sending 2 from the configuration menu will display the EFB configuration menu.
 The EFB configuration will be set by sending the selection number and character return.
 The configuration menu will be re-displayed, without changing the configuration, if any other characters (or no characters) and a carriage return are sent.

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4 ENVIRONMENTAL QUALIFICATION FORM (EQF)

This Environmental Qualification Form describes qualification testing performed on the 833811-00. The 833620-00 uses identical hardware and is qualified by similarity to the P/N 833811-00.

The 833620-00 is therefore qualified to RTCA/DO-160F standards.

NOMENCLATURE: AIS-380 FUEL FLOW ADAPTER

TYPE/MODEL/PART NO: 833811-00

MANUFACTURER'S SPECIFICATION AND/OR OTHER APPLICABLE SPECIFICATION:

Report SD-110037, RTCA/DO-160F

MANUFACTURER: Shadin Avionics

ADDRESS: 6831 Oxford Street, St. Louis Park, Minnesota 55426-4412

<u>CONDITIONS</u>	<u>SECTION</u>	<u>DESCRIPTION OF TESTS CONDUCTED</u>
Temperature and Altitude	4.0	(1) Tested to Category A4X See remarks
Low Temperature	4.5.1, 4.5.2	-40°C
High Temperature	4.5.3, 4.5.4	+70°C
Altitude	4.6.1	(2) +42,000 ft (See remarks)
Decompression	4.6.2	(2) +42,000 ft (See remarks)
Overpressure	4.6.3	-15,000 ft
Temperature Variation	5.0	Tested to Category B
Humidity	6.0	Tested to Category B
Operational Shock and Crash Safety	7.0	Tested to Category B
Vibration	8.0	Tested to Category R (B, B1), U2(F, F1)
Explosion	9.0	Identified as Category X Not tested
Waterproofness	10.0	Identified as Category X Not tested
Fluids Susceptibility	11.0	Identified as Category X Not tested

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ENVIRONMENTAL QUALIFICATION FORM (Cont.)

<u>CONDITIONS</u>	<u>SECTION</u>	<u>DESCRIPTION OF TESTS CONDUCTED</u>
Sand and Dust	12.0	Identified as Category X Not tested
Fungus	13.0	Identified as Category X Not tested
Salt Spray	14.0	Identified as Category X Not tested
Magnetic Effect	15.0	Tested to Category Z
Power Input	16.0	Tested to Category BXX
Voltage Spike	17.0	Tested to Category A
Audio Frequency Susceptibility	18.0	Tested to Category Z
Induced Signal Susceptibility	19.0	Tested to Category CC
Radio Frequency Susceptibility	20.0	Tested to Category RR
Radio Frequency Emission	21.0	Tested to Category M
Lightning Induced Transient Susceptibility	22.0	Tested to Category XXJ33
Lightning Direct Effects	23.0	Identified as Category X Not tested.
Icing	24.0	Identified as Category X Not tested.
Electrostatic Discharge	25.0	Tested to Category A
Fire, Flammability	26.0	Identified as Category X Not tested.

REMARKS:

- (1) The 833811-00 was tested to -40°C, beyond the normal A4 category temperature limits.
(2) The 833811-00 was tested to +42,000 ft, beyond the normal A4 category altitude and decompression limits.

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5 INSTALLATION DRAWINGS AND INSTALL KIT PARTS LIST

Appendix A: INSTALLATION DRAWING – D833620-00

Appendix B: INSTALL KIT, PARTS LIST – K833811-00

NOTES:

- 1. ALL DIMENSIONS ARE REFERENCE ONLY.
- 2. PHYSICAL SIZE, EXCLUDING SCREW HEADS IS 6.9" (L) X 4.0" (W) X 1.46" (H).
- 3 MOUNTING SCREW SIZE IS NO. 8.
- 4. WEIGHT = .7 LBS
- 5 CONNECTOR J1 IS A 44 PIN HD D-SUB, MALE. WIRE TYPE "SINGLE" IS A SINGLE WIRE. WIRE TYPE "STP" IS A SHIELDED TWISTED PAIR.
- 6. MATING CONNECTOR IS A HIGH DENSITY 44 PIN FEMALE D-SUB. STP WIRE SHIELDS SHOULD BE TIED TO MATING CONNECTOR SHELL OR PIN 37.

Appendix A

ERN #	REV.	DATE	BY	APPROVED	DESCRIPTION
1302/004	—	2013/02/12	CAL	MET	BASELINE RELEASE
1303/008	A	2013/05/29	CAL	RJW	SWAPPED PAIR (REF) PIN 35 AND 36.

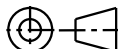
5 J1 CONNECTOR PIN OUT

PIN	SIGNAL NAME	DESCRIPTION	TYPE(REF)	PAIR(REF)	PIN	SIGNAL NAME	DESCRIPTION	TYPE(REF)	PAIR(REF)
1	PWR GND	POWER RETURN	SINGLE	N/A	23	DISCRETE-10-4	DISCRETE INPUT/OUTPUT #4	SINGLE	N/A
2	+28V PWR	28 VDC POWER POSITIVE	SINGLE	N/A	24	RESERVED	N/A	N/A	N/A
3	RESERVED	N/A	N/A	N/A	25	ARINC-429-TX1-A	ARINC 429 OUTPUT #1 (LINE A)	STP	PIN 10
4	RESERVED	N/A	N/A	N/A	26	ARINC-429-TX2-A	ARINC 429 OUTPUT #2 (LINE A)	STP	PIN 11
5	DISCRETE-10-1	DISCRETE INPUT/OUTPUT #1	SINGLE	N/A	27	ARINC-429-RX2-A	ARINC 429 INPUT #2 (LINE A)	STP	PIN 12
6	DISCRETE-10-3	DISCRETE INPUT/OUTPUT #3	SINGLE	N/A	28	RESERVED	N/A	N/A	N/A
7	SER-3-RX	SERIAL 3 RECEIVE	STP	PIN 31	29	RESERVED	N/A	N/A	N/A
8	RESERVED	N/A	N/A	N/A	30	RESERVED	N/A	N/A	N/A
9	SPARE				31	SER-3-TX	SERIAL 3 TRANSMIT	STP	PIN 7
10	ARINC-429-TX1-B	ARINC 429 OUTPUT #1 (LINE B)	STP	PIN 25	32	RESERVED	N/A	N/A	N/A
11	ARINC-429-TX2-B	ARINC 429 OUTPUT #2 (LINE B)	STP	PIN 26	33	SER-4-TX	SERIAL 4 TRANSMIT POSITIVE	STP	PIN 18
12	ARINC-429-RX2-B	ARINC 429 INPUT #2 (LINE B)	STP	PIN 27	34	SER-1-TX	SERIAL 1 TRANSMIT	STP	PIN 19
13	RESERVED	N/A	N/A	N/A	35	SER-4-RX	SERIAL 4 RECEIVE POSITIVE	STP	PIN 36
14	RESERVED	N/A	N/A	N/A	36	SER-4-RX-NEG	SERIAL 4 RECEIVE NEGATIVE	STP	PIN 35
15	SPARE				37	CHASSIS-GND	CHASSIS GROUND	SINGLE	N/A
16	PWR GND	POWER RETURN	SINGLE	N/A	38	DOWNLOAD-ENABLE	DOWNLOAD ENABLE INPUT (ACTIVE LOW)	SINGLE	N/A
17	+28V PWR	28 VDC POWER POSITIVE	SINGLE	N/A	39	RESERVED	N/A	N/A	N/A
18	SER-4-TX-NEG	SERIAL 4 TRANSMIT NEGATIVE	STP	PIN 33	40	ARINC-429-RX1-A	ARINC 429 INPUT #1 (LINE A)	STP	PIN 41
19	SER-1-RX	SERIAL 1 RECEIVE	STP	PIN 34	41	ARINC-429-RX1-B	ARINC 429 INPUT #1 (LINE B)	STP	PIN 40
20	SER-2-TX	SERIAL 2 TRANSMIT	STP	PIN 21	42	RESERVED	N/A	N/A	N/A
21	SER-2-RX	SERIAL 2 RECEIVE	STP	PIN 20	43	RESERVED	N/A	N/A	N/A
22	DISCRETE-10-2	DISCRETE INPUT/OUTPUT #2	SINGLE	N/A	44	RESERVED	N/A	N/A	N/A

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UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES TOLERANCES: X.X = ±.1 X.XX = ±.01 X.XXX = ±.005 < ±.1

THIRD ANGLE PROJECTION



833620-00	833620-00	FINISH: N/A
NEXT ASSEMBLY	USED ON	MATERIAL: N/A
APPLICATION		FILENAME: D833620-00A.PDF

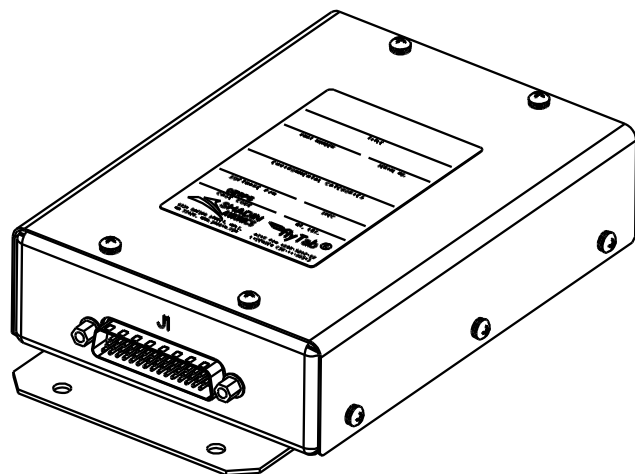
CONTRACT NO.		
APPROVALS		DATE
DRAWN	CAL	2012/11/20
CHECK	MET	2012/11/20
ENGINEER	MET	2012/11/20
DIRECTORY PATH		



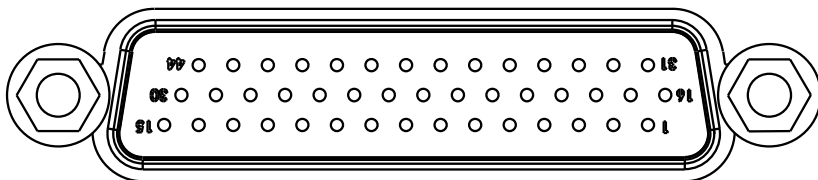
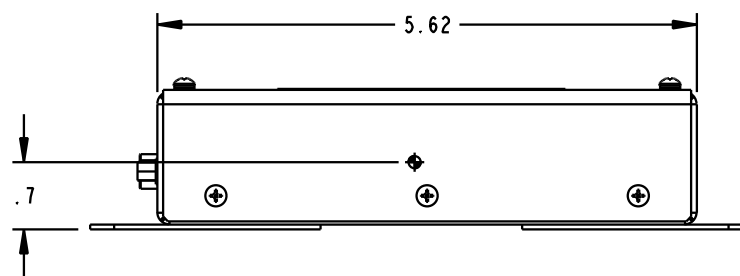
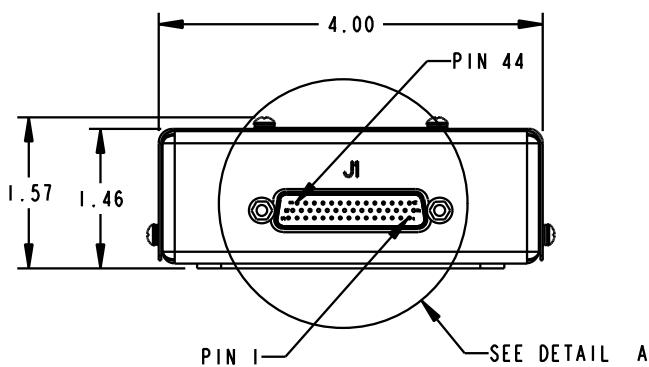
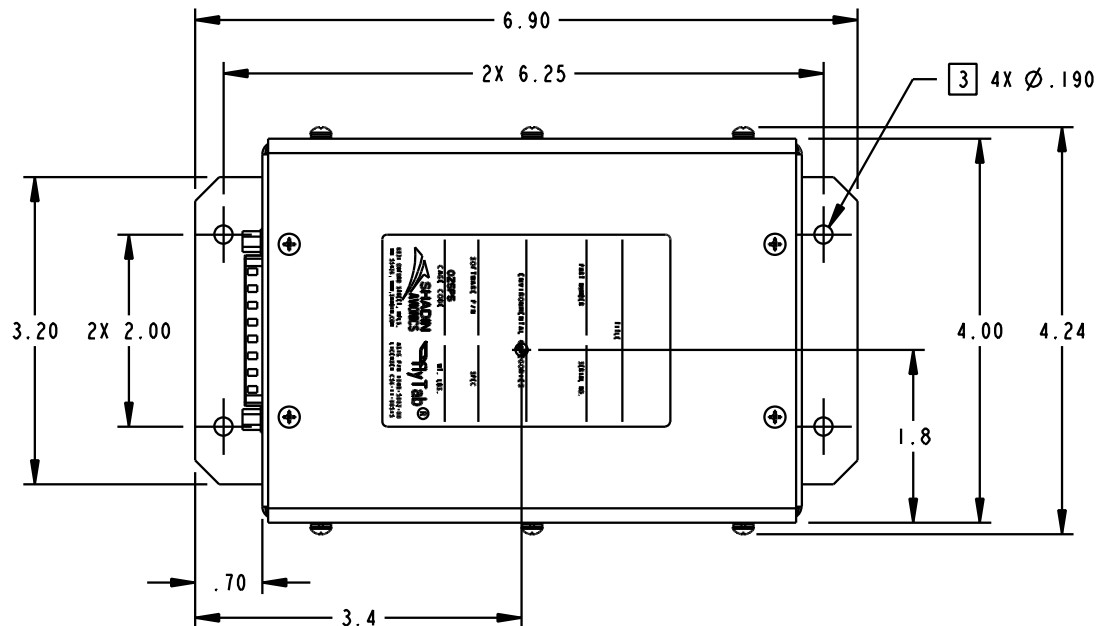
MINNEAPOLIS, MN 55426

INSTALLATION DWG, AIS 833620-00

SIZE	CAGE CODE	DRAWING NUMBER	REV
A	0Z5P5	D833620-00	A
SCALE	RELEASE DATE	SHEET	
NONE	2012/11/20	1 OF 2	



ISOMETRIC
REFERENCE VIEW



DETAIL A
SCALE 2.000

SHADIN AVIONICS
PROPRIETARY INFORMATION
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SIZE A	CAGE CODE 0Z5P5	DRAWING NUMBER D833620-00	REV A
SCALE .5 : 1	RELEASE DATE	SHEET 2	

Shadin Avionics CAGE CODE: 0Z5P5
 File Name: K833811-00-.DOC

ERN #: 1302/004
 Release Date: 2013/02/14
 Approved: ZK

Rev: -

PARTS LIST

Part #: **K833811-00**

Drawing #: NA

Description: **INSTALL KIT, AIS 833811-00**

<u>FN</u>	<u>P/N</u>	<u>QTY.</u>	<u>DESCRIPTION</u>	<u>MFG.</u>	<u>MFG.#</u>	<u>DESIGNATION</u>	<u>COMMENTS</u>
5	232012	1	CONN, HD D-Sub 44 Pin, Female Crimp w/FC8022D2 Contacts	POS	ODD44S1000X		
10	232507	1	CONN, Backshell, 25P D-Sub, Zinc Die Cast	APH	17E-1657-25		
15	239004	1	TOOL, INSERT/EXTRACT M81969/1-04	NWK	59K0052		
20	753217	1	Thermal Label, 4"x 1"	ULI	S-8601		
25	PK1001	2	BAG, 2.5 x 3, 4 MIL Zip Lock				
30	PK1007	1	BAG, 6 x 8, 4 MIL				

7 items