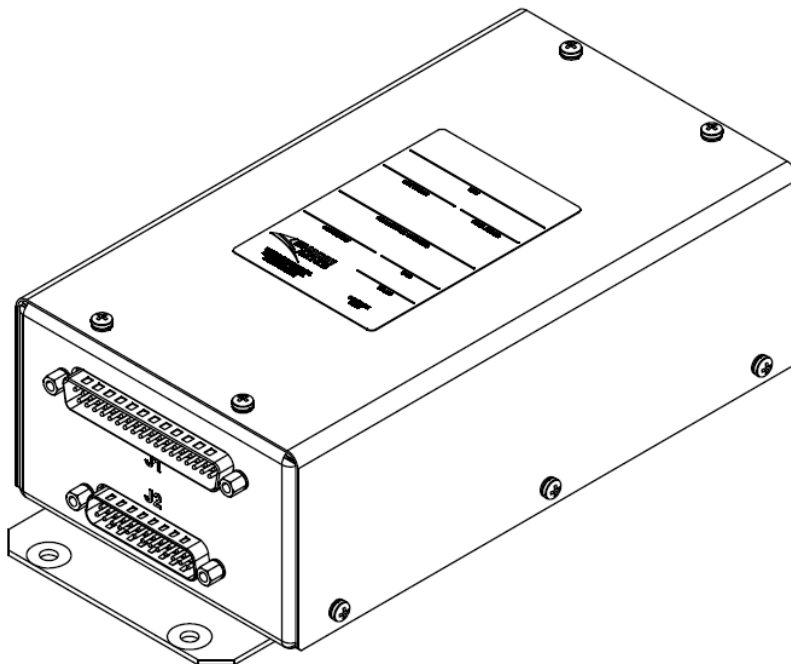




AIS-450 SYNCHRO CONVERTER (36V REF)

P/N: 834510-01



INSTALLATION MANUAL MANUAL P/N: M834510-01 REV B

SHADIN AVIONICS
7555 Market Place Drive
Eden Prairie, MN 55344

Customer Service: 952-927-6500

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REVISION LOG

Rev	Date	ERN	DESCRIPTION
—	20 July 2021	2107/006	Initial Issue
A	27 July 2021	2206/017	Add discrete 1 for heading select, revised pin descriptions in wiring diagram to more closely match customer application.
B	26 January 2024	2401/019	Updated installation drawing part number.

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1 OVERVIEW

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

1.1 SCOPE

This manual is intended to guide the proper installation of AIS-450 Synchro Converter (36V REF). Installation instructions should be read and followed.

1.2 PRODUCT DESCRIPTION

The AIS-450 is a digital to synchro based converter that receives angular data (Heading, Pitch, and Roll) on two ARINC 429 inputs and converts it to three SELSYN synchro outputs (3-wire). The two ARINC 429 inputs are high speed (H/S) and accept only angular ARINC 429 labels for Heading, Pitch, and Roll (ARINC Labels 314, 320, 324, and 325). The ARINC 429 outputs are high speed (H/S) and pass through only the valid angular ARINC 429 labels received on the inputs. The AIS-450 has three outputs that are configured as 3-wire synchro.

The purpose of the AIS-450 (36V REF) is to provide heading, pitch and roll synchro data derived from an ARINC 429 input bus for use with the AP-34B autopilot system of the type installed on the MI-17/171Sh helicopters.

The block diagram below in Figure 1 depicts the intended use of the unit installed in the aircraft.

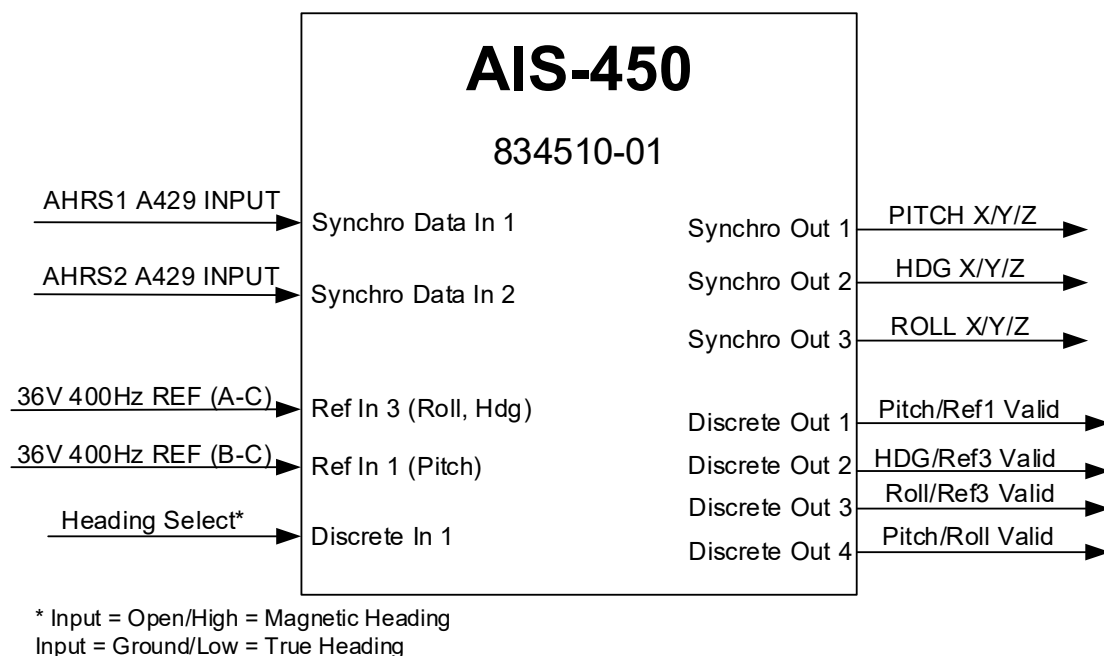


Figure 1: Overview Block Diagram

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1.3 DEFINITIONS AND ABBREVIATIONS

AIS	Avionics Interface Solution
EQF	Environmental Qualification Form
MTBF	Mean Time Between Failures
REF	Reference
SELSYN	Self-Synchronous

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2 SPECIFICATIONS

For a complete listing of product qualifications please review the Environmental Qualification Form (EQF) found in Section 4.

2.1 PHYSICAL

Nominal Dimensions:	8.5"L x 4.0"W x 2.5"H
Weight:	1.7 pounds (lbs.)
Mounting:	Screw Size # 8
Mounting Locations:	8.00"L x 2.00"W

2.2 ELECTRICAL

Power Supply Voltage:	+18VDC to +33VDC
Supply Current:	520 mA Maximum (745 mA Max including external loads)

Protection:	Active current limiting to 2.0 Amps
-------------	-------------------------------------

2.3 FUNCTIONAL

2.3.1 *INPUTS:*

ARINC 429:	High Speed, 100 Kbps $\pm$ 1%
Synchro Reference:	36Vrms, 400Hz
Discrete Input (ARINC 763-3)	Active: Low / Ground Signal $V < 3.5$ VDC with $I < 20$ mA sink or $R < 10$ Ω

Inactive: High / Open Signal
18.5 VDC $< V < 36.0$ VDC or $R > 100$ K Ω

Discrete Input 1:	Heading Source Select Open = Magnetic Heading (Label 320) Ground = True Heading (Label 314)
-------------------	---

2.3.2 *OUTPUTS:*

ARINC 429	High Speed, 100 Kbps $\pm$ 1%
-----------	-------------------------------

Synchro-X, Y, and Z	0 to 50.0 Vrms Typical, 73 Vrms Max
(Heading, Pitch and Roll)	25.0 mA into 500 Ω each channel
Synchro Angle Accuracy	Input Angle $\pm$ 0.5°

Synchro-Valid-CH1 - CH3	+28VDC(Valid) / Open(Invalid) Discrete, 75mA Max Short Circuit Protected
-------------------------	---

Combined Pitch/Roll Validity	+28VDC(Valid) / Open(Invalid) Discrete, 75mA Max Short Circuit Protected
------------------------------	---

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2.4 ENVIRONMENTAL

RTCA/DO-160F F1-BAB[R(B, B1)]XXXXXXZ[AXX]AR[CC][WW]M[XXXXX]XXAX

Operating Temperature	-40°C to +70°C
Storage Temperature	-55°C to +85°C
Operating Altitude	Up to 55,000 ft
In-Flight loss of Cooling:	Equipment can run indefinitely with no cooling.

Equipment can run indefinitely within stated environmental range with no external cooling.

2.5 SOFTWARE CERTIFICATION

This product was developed in accordance with RTCA/DO-178C Design Assurance Level C.

2.6 REGULATORY CERTIFICATION

This product meets requirements of TSO-C4c, TSO-C5f, TSO-C6e "Incomplete System"

2.7 RELIABILITY

MTBF (Mean Time Between Failures) 24,000 hours [Airborne Inhabited Cargo (AIC), 30°C]

The reliability predictions were performed using the general methodology of MIL-HDBK-217F. The component failure rate calculation models presented in MIL-HDBK-217F were used as a guide to determine each component's initially assigned predicted failure rate.

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3 INSTALLATION PROCEDURE

3.1 LIMITATIONS

The conditions and tests required for TSO 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 if performed under 14 CFR part 43 or the applicable airworthiness requirements.

3.2 MOUNTING

The unit may be mounted in any orientation in environments specified in the environmental categories, Section 4.

The unit should be mounted according to Installation Drawing, P/N D834510-01.

3.3 BONDING

The primary bonding is achieved through metal-to-metal contact of the mounting feet. The two mounting feet (2.4 x 3.2 inches) are unpainted, chemical conversion coated per MIL-DTL-5541F Type II, Class 3. Additionally, the tops of the four mounting holes are unpainted to a diameter of roughly 0.45 inches. The aircraft's mating surface should be free of paint or any anodizing primer or finish which would prevent solid grounding contact between the aircraft and the unit.

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3.4 ELECTRICAL CONNECTION

Table 1 lists the connector and pin number (i.e. J1:3), signal name, and signal description of the electrical connections for the unit.

Table 1: Electrical Connection

Connector & Pin Number	Signal Name	Signal Description
Connection to Power Supply		
J1:1	CHASSIS-GND	CHASSIS GROUND
J1:2, 21	POWER-GND-IN	POWER RETURN
J1:3, 22	+28V-IN	28 VDC POWER POSITIVE
INPUTS		
J1:4	DISCRETE-INPUT-1	HEADING SELECT DISCRETE INPUT
J1:27	ARINC-429-RXA-1	ARINC-429 INPUT #1 (LINE A)
J1:28	ARINC-429-RXB-1	ARINC-429 INPUT #1 (LINE B)
J1:29	ARINC-429-RXA-2	ARINC-429 INPUT #2 (LINE A)
J1:30	ARINC-429-RXB-2	ARINC-429 INPUT #2 (LINE B)
J2:1	+36-VAC-REFERENCE-H-CH1	SYNCHRO REFERENCE VOLTAGE HIGH - CHANNEL 1
J2:2	+36-VAC-REFERENCE-H-CH3	SYNCHRO REFERENCE VOLTAGE HIGH - CHANNEL 3
J2:14	+36-VAC-REFERENCE-C-CH1	SYNCHRO REFERENCE VOLTAGE COMMON - CHANNEL 1
J2:15	+36-VAC-REFERENCE-C-CH3	SYNCHRO REFERENCE VOLTAGE COMMON - CHANNEL 3
OUTPUTS		
J2:8	SYNCHRO-X-CH2	SYNCHRO HDG OUTPUT X – CH 2
J2:7	SYNCHRO-Y-CH2	SYNCHRO HDG OUTPUT Y – CH 2
J2:21	SYNCHRO-Z-CH2	SYNCHRO HDG OUTPUT Z – CH 2
J2:5	SYNCHRO-X-CH1	SYNCHRO PITCH OUTPUT X – CH 1
J2:4	SYNCHRO-Y-CH1	SYNCHRO PITCH OUTPUT Y – CH 1
J2:18	SYNCHRO-Z-CH1	SYNCHRO PITCH OUTPUT Z – CH 1
J2:11	SYNCHRO-X-CH3	SYNCHRO ROLL OUTPUT X – CH 3
J2:10	SYNCHRO-Y-CH3	SYNCHRO ROLL OUTPUT Y – CH 3
J2:24	SYNCHRO-Z-CH3	SYNCHRO ROLL OUTPUT Z – CH 3
J1:6	DISCRETE OUTPUT 1	PITCH/ROLL VALID DISCRETE OUT
J2:6	DISCRETE OUTPUT CH1	PITCH/REF1 VALID DISCRETE OUT
J2:9	DISCRETE OUTPUT CH2	HDG/REF3 VALID DISCRETE OUT
J2:12	DISCRETE OUTPUT CH3	ROLL/REF3 VALID DISCRETE OUT

3.4.1 TYPICAL INSTALLATION WIRING

Figure 2 is typical installations wiring diagram.

The electrical connections are defined in the AIS 834510-01 Installation Dwg, P/N D834510-01. The mating connectors are standard female 25 and 37 pin D-Sub connectors (Included in installation kit are shell P/Ns Amphenol 205165-1 and 205167-1 and contacts P/N Positronic M39029/63-368). All interface wires should be 20 AWG. All wire shielding for STP (Shielded Twisted Pair) and STT (Shielded Twisted Triple) wires should be tied to the mating connector backshell.

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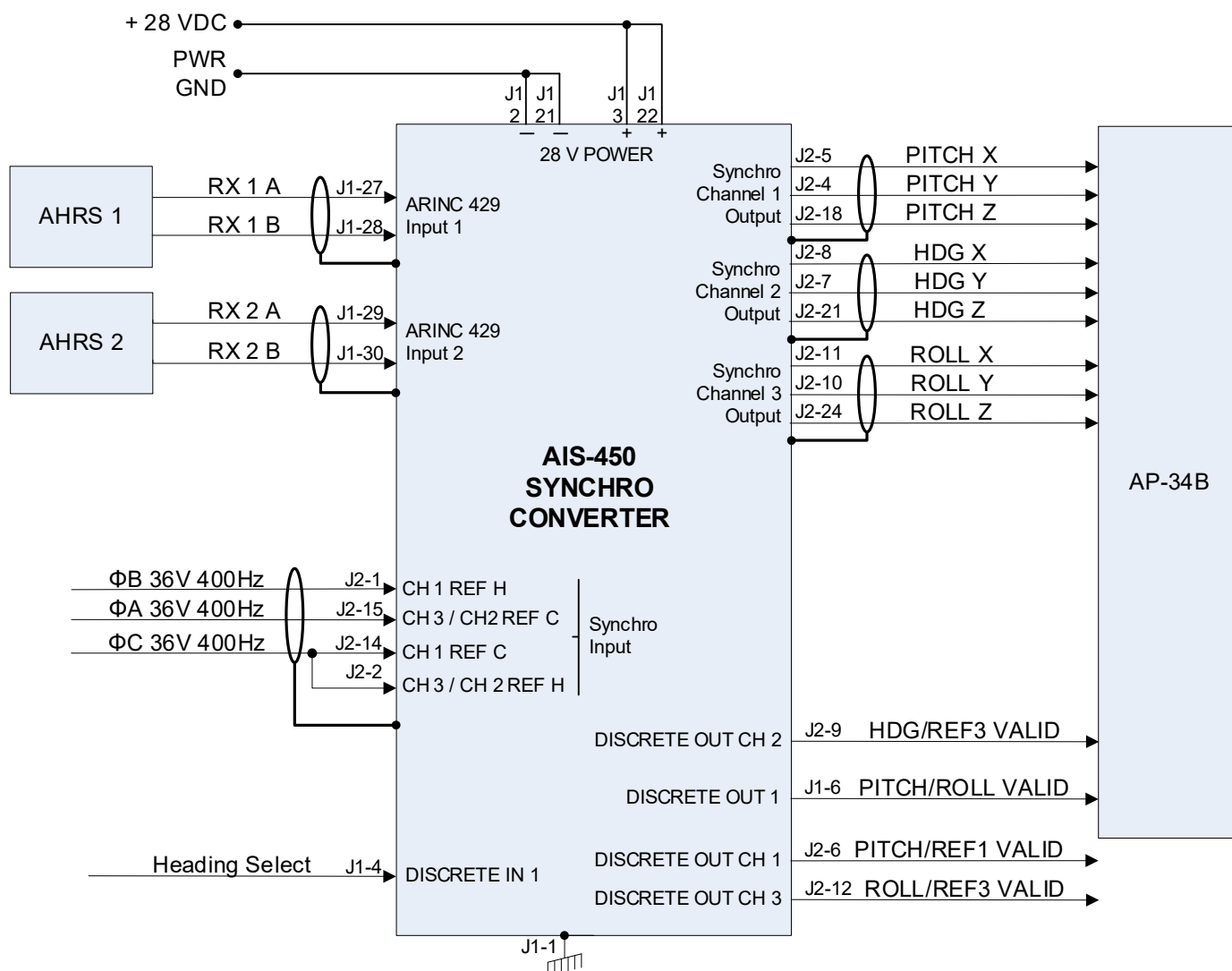


Figure 2: Wiring Diagram

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4 ENVIRONMENTAL QUALIFICATION FORM (EQF)

The AIS-450 hardware was environmentally tested with all functions active to RTCA/DO-160F and is documented in Shadin Qualification Testing Report SD-100170.

NOMENCLATURE: AIS-450 Synchro Converter (36V REF)

TYPE/MODEL/PART NO: 834510-01

CERTIFICATION: TSO-C4c, -C5f, -C6e "Incomplete System"

MANUFACTURER'S SPECIFICATION AND/OR OTHER APPLICABLE SPECIFICATION: RTCA/DO-160F

MANUFACTURER: Shadin Avionics

ADDRESS: 7555 Market Place Drive Eden Prairie, MN 55344

Items listed with an "X" for test conducted will be identified as not being tested. Any other description indicates either a test category or a modification to a test.

CONDITIONS	SECTION	DESCRIPTION OF TESTS CONDUCTED
Temperature and Altitude	4	F1
Low Temperature (Operating)	4	-40°C
High Temperature (Operating)		+70°C
Altitude		55,000ft
Decompression		55,000ft
Overpressure		-15,000ft
Temperature Variation	5	B
Humidity	6	A
Operational Shock and Crash Safety	7	B
Vibration	8	R(B,B1)
Explosion	9	X
Waterproofness	10	X
Fluids Susceptibility	11	X
Sand and Dust	12	X
Fungus	13	X
Salt Spray	14	X
Magnetic Effect	15	Z
Power Input	16	AXX
Voltage Spike	17	A
Audio Frequency Susceptibility	18	R
Induced Signal Susceptibility	19	CC
Radio Frequency Susceptibility	20	WW
Radio Frequency Emission	21	M
Lightning Induced Transient Susceptibility	22	XXXXX
Lightning Direct Effects	23	X
Icing	24	X
Electrostatic Discharge	25	A
Fire, Flammability	26	X

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5 SETUP AND USE

5.1 INITIAL SETUP

There is no initial setup procedure for this unit. The unit becomes active and ready when power is applied to its power pins.

5.2 CONFIGURATION

This unit is not field configurable. This unit leaves the factory configured as described in the functional description of this Installation Manual.

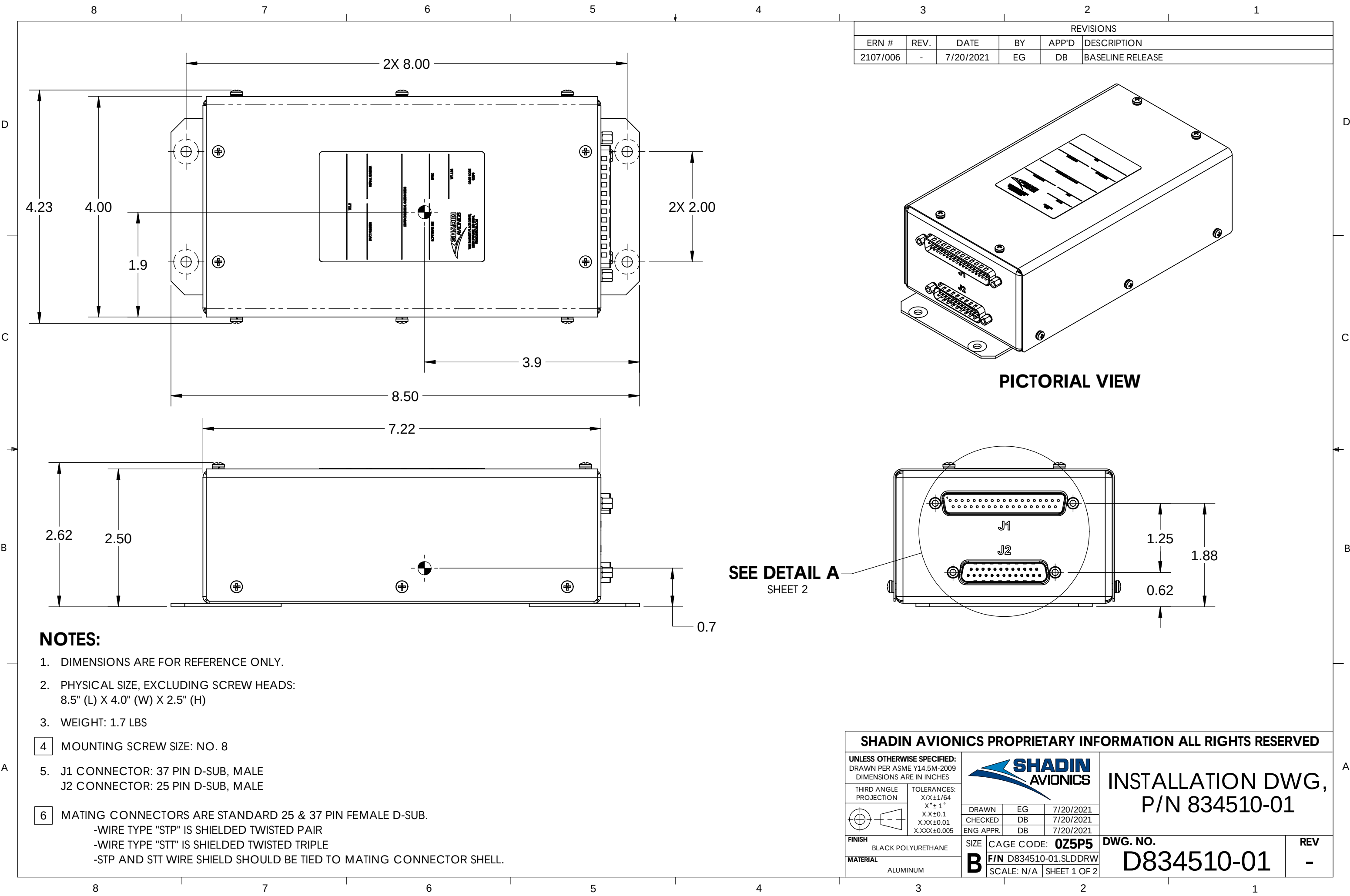
5.3 MAINTAINABILITY

No maintenance is required for this unit.

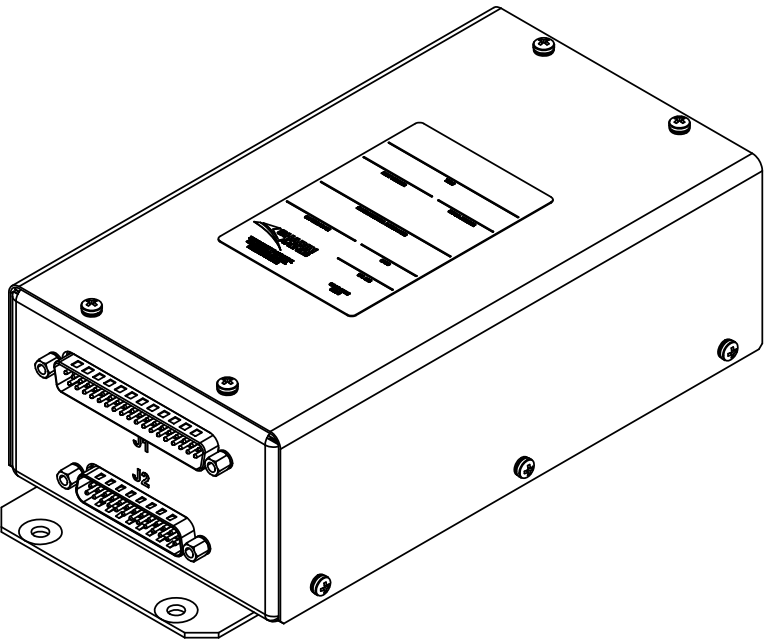
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6 APPENDIX A: INSTALLATION DRAWING

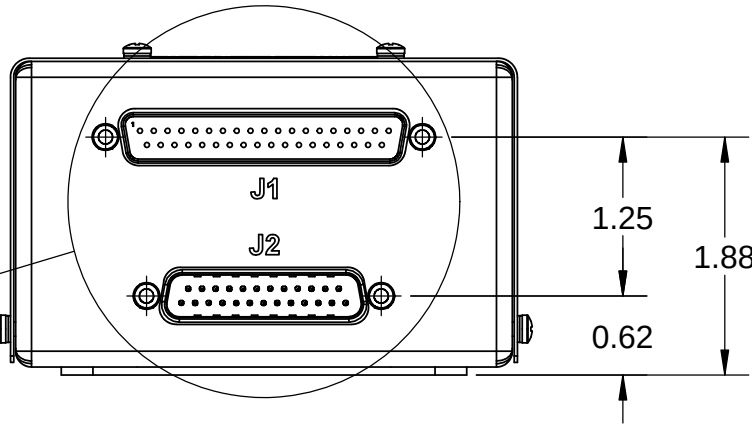
Installation drawing D834510-01 can be found on the next page.



REVISIONS					
ERN #	REV.	DATE	BY	APP'D	DESCRIPTION
2107/006	-	7/20/2021	EG	DB	BASELINE RELEASE



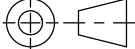
PICTORIAL VIEW



SEE DETAIL A
SHEET 2

NOTES:

- DIMENSIONS ARE FOR REFERENCE ONLY.
- PHYSICAL SIZE, EXCLUDING SCREW HEADS:
8.5" (L) X 4.0" (W) X 2.5" (H)
- WEIGHT: 1.7 LBS
- MOUNTING SCREW SIZE: NO. 8
- J1 CONNECTOR: 37 PIN D-SUB, MALE
J2 CONNECTOR: 25 PIN D-SUB, MALE
- MATING CONNECTORS ARE STANDARD 25 & 37 PIN FEMALE D-SUB.
-WIRE TYPE "STP" IS SHIELDED TWISTED PAIR
-WIRE TYPE "STT" IS SHIELDED TWISTED TRIPLE
-STP AND STT WIRE SHIELD SHOULD BE TIED TO MATING CONNECTOR SHELL.

SHADIN AVIONICS PROPRIETARY INFORMATION ALL RIGHTS RESERVED									
UNLESS OTHERWISE SPECIFIED: DRAWN PER ASME Y14.5M-2009 DIMENSIONS ARE IN INCHES					INSTALLATION DWG, P/N 834510-01				
THIRD ANGLE PROJECTION		TOLERANCES: X/X±1/64 X"±1" X.X±0.1 X.XX±0.01 X.XXX±0.005		DRAWN	EG	7/20/2021		DWG. NO. D834510-01	
				CHECKED	DB	7/20/2021			
				ENG APPR.	DB	7/20/2021			
FINISH BLACK POLYURETHANE			SIZE		CAGE CODE: 0Z5P5			REV -	
MATERIAL ALUMINUM			B		F/N D834510-01.SLDDRW				
					SCALE: N/A SHEET 1 OF 2				

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7 APPENDIX B: INSTALLATION KIT, PARTS LIST

The install kit parts list IK834510 can be found on the next page.

Shadin Avionics CAGE CODE: 0Z5P5
File Name: IK834510-.DOC
DIRECTORY: IKXXXX

ECO Date: February 24, 2011
Rev: -
Sec.: IX
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ECO #: 1102/014
Release Date: 2/24/2011
Approved: HWL

PARTS LIST

Drawing #: NA

Part #: **IK834510**
Description: **INSTALL KIT, P/N 834510**

<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	230055	36	CONTACT, Crimp D-Sub, Fem, 20-24, M39029/63-368	POS	M39029/63-368 (FC6020D)		29 pcs needed, 7 pcs are spares.
10	230082	1	CONN HOOD, 37 Pin D-Sub ST	CIN	DC-24660		
15	230088	1	CONN SHELL, 25 Pin D Sub Fem Crimp Type	AMP	205165-1		
20	230089	1	HOOD, 25 Pin D-Sub, ST	CIN	DB-24659		
25	232002	1	CONN SHELL, 37 Pin D-Sub, Fem Crimp	AMP	205167-1		
30	239001	1	TOOL, Insertion/Extraction	DAN	M81969/1-02		
35	512101	4	RETAINER CLIP, "Bow Tie" Style	KEY	2061K		
40	753217	1	Thermal Label, 4"x 1"	ULI	S-8601		
45	PK1001	2	BAG, 2.5 x 3, 4 MIL Zip Lock				
50	PK1007	1	BAG, 6 x 8, 4 MIL				

49 items