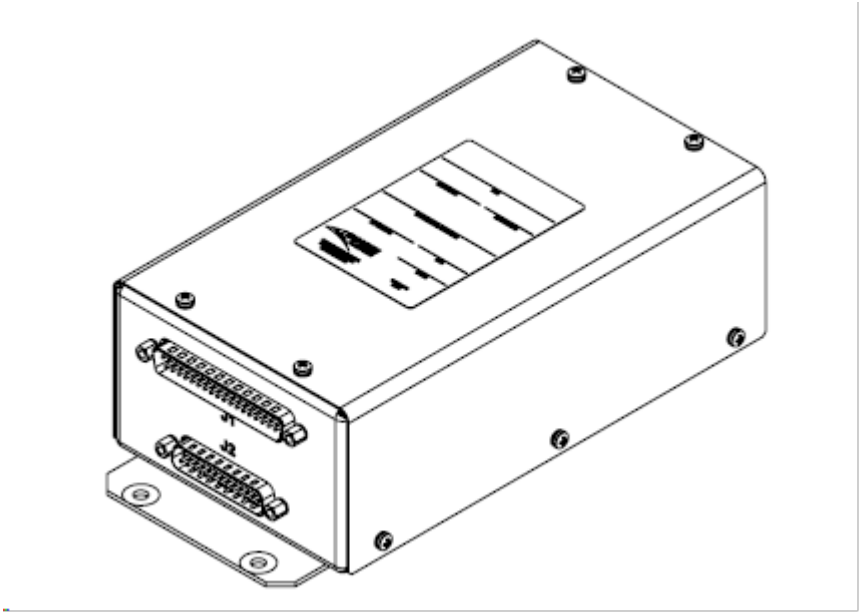
# AIS-450 SYNCHRO CONVERTER

## P/N: 834510-03



# INSTALLATION MANUAL
# MANUAL P/N: M834510-03
## REV -


**SHADIN AVIONICS**
***7555 Market Place Drive***
***Eden Prairie, MN  55344***

**Customer Service: 952-927-6500**

# REVISION LOG

| Rev | Date | ERN | DESCRIPTION |
| --- | --- | --- | --- |
| — | 26 January 2024 | 2401/007 | Initial Issue |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

SHADIN AVIONICS

Digitally signed by ShadinCM-met
Date: 2024.02.02 10:44:44 -06'00'

# TABLE OF CONTENTS



# LIST OF FIGURES



# LIST OF TABLES

# 1 OVERVIEW

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

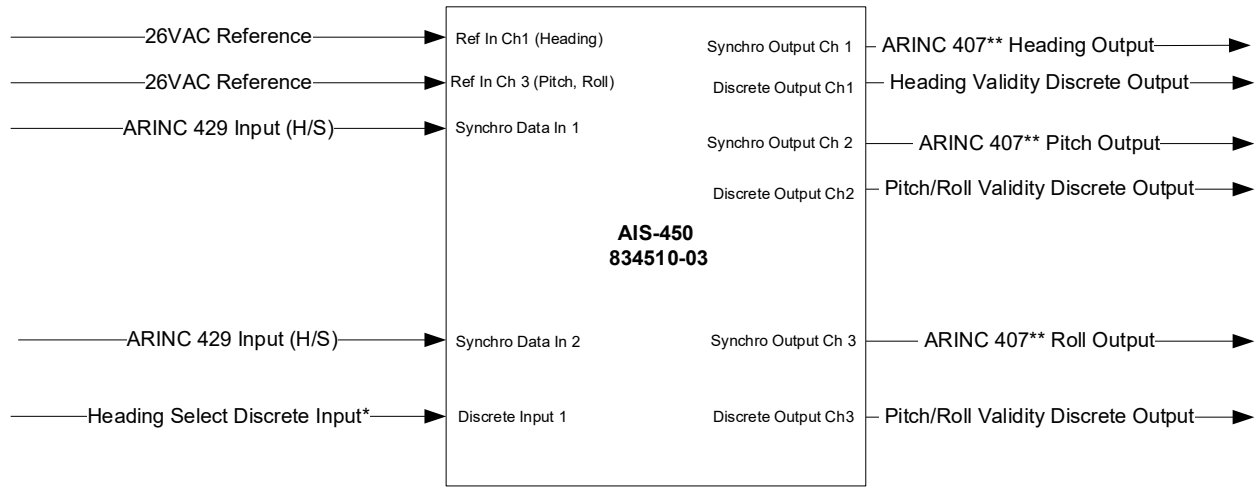
## 1.1 SCOPE

This manual is intended to guide the proper installation of AIS-450 Synchro Converter. 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 first output is mapped to the True or Magnetic Heading ARINC 429 label (314 or 320) depending on the state of the Heading Select Discrete Input. A High/Open state maps the output to Magnetic Heading and a Low/Ground state maps the output to True Heading. The second output is mapped to the Pitch ARINC 429 label (324). The third output is mapped to the Roll ARINC label (325). The Synchro Validity Discrete Outputs indicate whether each of the ARINC 407 outputs is valid. The ARINC 429 Input 1 takes priority over the ARINC 429 Input 2. Valid Pitch and Roll labels must be received on the same ARINC Input to enable the Pitch and Roll Validity Discrete Outputs

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




* Input = Open/High = Magnetic Heading
Input = Ground/Low = True Heading

** 3-wire Syncro

**Figure 1: Overview Block Diagram**

## 1.3 DEFINITIONS AND ABBREVIATIONS

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

# 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 ± 1% |
| Synchro Reference: | 24.7VAC to 27.3VAC[1], 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<br>Open = Magnetic Heading (Label 320)<br>Ground = True Heading (Label 314) |

### *2.3.2 OUTPUTS:*

| | |
|---|---|
| ARINC 429 | High Speed, 100 Kbps ± 1% |
| Synchro-X, Y, and Z | 0 to 11.8VAC Typical, 12.4 VAC Max |
| (Heading, Pitch and Roll) | 0.209VA into 500 Ω each channel |
| Synchro Angle Accuracy | Input Angle ± 0.5° |
| Synchro-Valid-CH1,-CH2,-CH3 | +28VDC(Valid) / Open(Invalid) Discrete, 75mA Max |
| | Short Circuit Protected |
| Alternate 2-wire | Synchro (ARINC 561) 200mV/Deg |

1. Input Voltage more than 27.3 VAC may result in Synchro output voltage greater than 12.5 VAC.

## 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.

# 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 D834510-03.

## 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.

## 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 | +26-VAC-REFERENCE-H-CH1 | SYNCHRO REFERENCE VOLTAGE HIGH - CHANNEL 1 |
| J2:2 | +26-VAC-REFERENCE-H-CH3 | SYNCHRO REFERENCE VOLTAGE HIGH - CHANNEL 3 |
| J2:14 | +26-VAC-REFERENCE-C-CH1 | SYNCHRO REFERENCE VOLTAGE COMMON - CHANNEL 1 |
| J2:15 | +26-VAC-REFERENCE-C-CH3 | SYNCHRO REFERENCE VOLTAGE COMMON - CHANNEL 3 |
| ***OUTPUTS*** | | |
| J2:8 | SYNCHRO-X-CH2 | SYNCHRO PITCH OUTPUT X – CH 2 |
| J2:7 | SYNCHRO-Y-CH2 | SYNCHRO PITCH OUTPUT Y – CH 2 |
| J2:21 | SYNCHRO-Z-CH2 | SYNCHRO PITCH OUTPUT Z – CH 2 |
| J2:5 | SYNCHRO-X-CH1 | SYNCHRO HDG OUTPUT X – CH 1 |
| J2:4 | SYNCHRO-Y-CH1 | SYNCHRO HDG OUTPUT Y – CH 1 |
| J2:18 | SYNCHRO-Z-CH1 | SYNCHRO HDG 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 |
| J2:6 | DISCRETE OUTPUT CH1 | HDG VALID DISCRETE OUT |
| J2:9 | DISCRETE OUTPUT CH2 | PITCH/ROLL VALID DISCRETE OUT |
| J2:12 | DISCRETE OUTPUT CH3 | PITCH/ROLL VALID DISCRETE OUT |

### *3.4.1 TYPICAL INSTALLATION WIRING*

Figure 2 is a typical installation wiring diagram.

The electrical connections are defined in the AIS 834510-03 Installation Dwg, P/N D834510-03. 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.

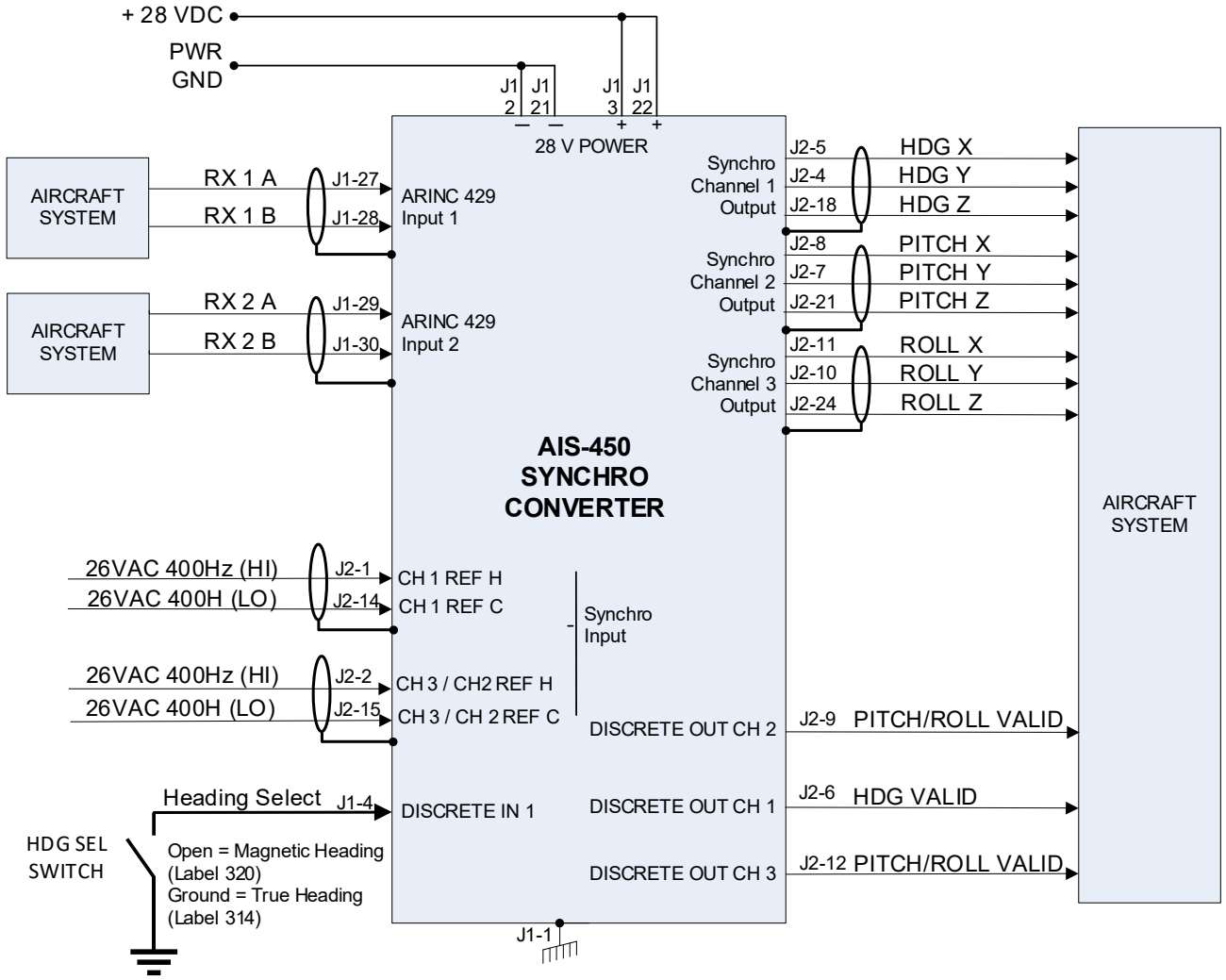



**Figure 2: Wiring Diagram**

# 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
**TYPE/MODEL/PART NO:** 834510-03 **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)<br>High Temperature (Operating)<br>Altitude<br>Decompression<br>Overpressure | 4 | -40˚C<br>+70˚C<br>55,000ft<br>55,000ft<br>-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 |

# 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.

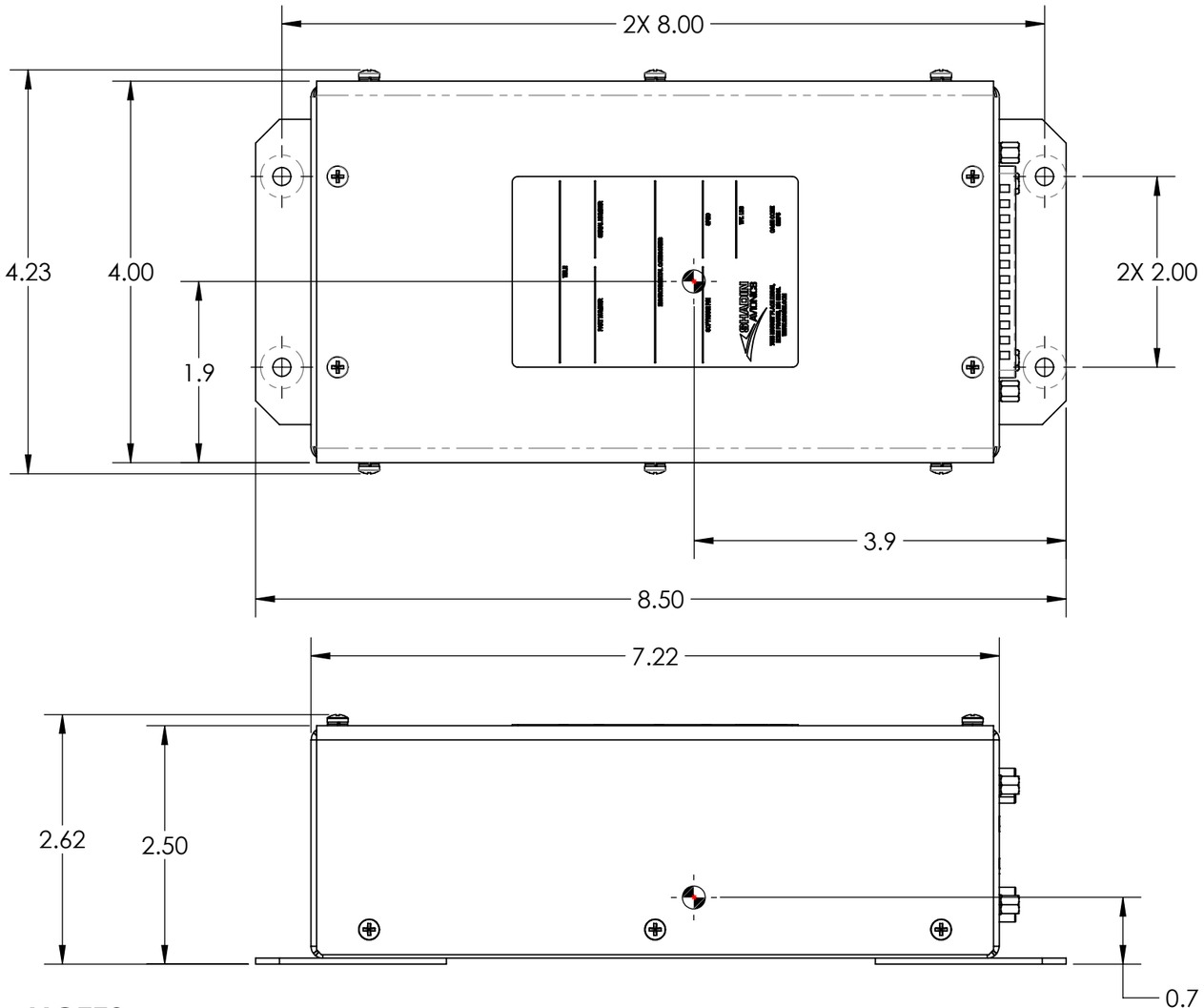
## 5.3 MAINTAINABILITY

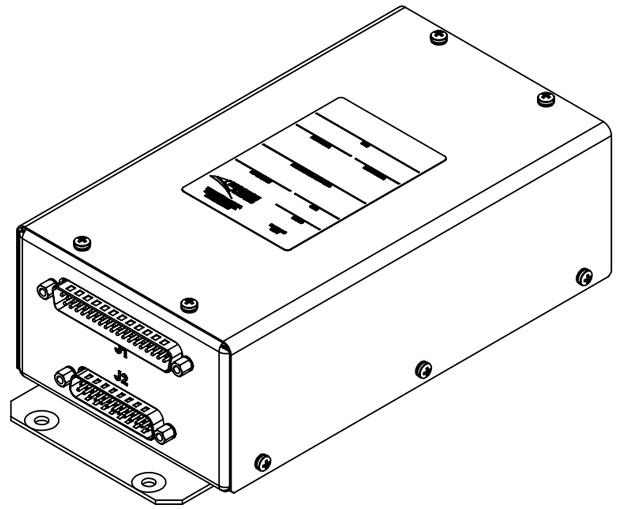
No maintenance is required for this unit.

# 6 APPENDIX A: INSTALLATION DRAWING

Installation drawing D834510-03 can be found on the next page.

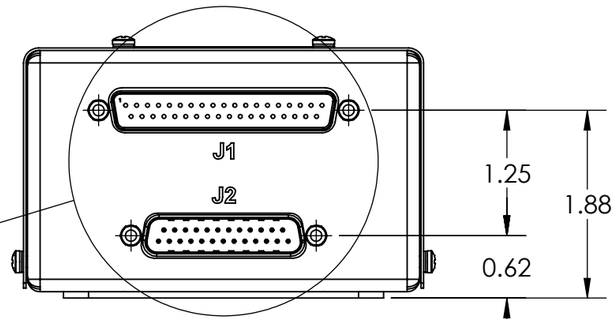
| REVISIONS | | | | | |
|---|---|---|---|---|---|
| ERN # | REV. | DATE | BY | APP'D | DESCRIPTION |
| 2401/007 | - | 1/29/2024 | SRJ | DB | BASELINE RELEASE |



**PICTORIAL VIEW**

**SEE DETAIL A**
SHEET 2




## NOTES:

1. DIMENSIONS ARE FOR REFERENCE ONLY.
2. PHYSICAL SIZE, EXCLUDING SCREW HEADS:
   8.5" (L) X 4.0" (W) X 2.5" (H)
3. WEIGHT: 1.7 LBS

[4] MOUNTING SCREW SIZE: NO. 8

5. J1 CONNECTOR: 37 PIN D-SUB, MALE
   J2 CONNECTOR: 25 PIN D-SUB, MALE

[6] 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.



UNLESS OTHERWISE SPECIFIED:
DRAWN PER ASME Y14.5M-2009
DIMENSIONS ARE IN INCHES
THIRD ANGLE PROJECTION
TOLERANCES:
X/X ± 1/64
X° ± 1°
X.X ± 0.1
X.XX ± 0.01
X.XXX ± 0.005
FINISH: BLACK POLYURETHANE
MATERIAL: ALUMINUM

SHADIN AVIONICS

| | | |
|---|---|---|
| DRAWN | SRJ | 1/26/2024 |
| CHECKED | JAW | 1/26/2024 |
| ENG APPR. | DB | 1/26/2024 |

SIZE B | CAGE CODE: 0Z5P5 | F/N D834510-03.SLDDRW | SCALE: N/A | SHEET 1 OF 2

# INSTALLATION DWG, P/N 834510-03

DWG. NO. D834510-03

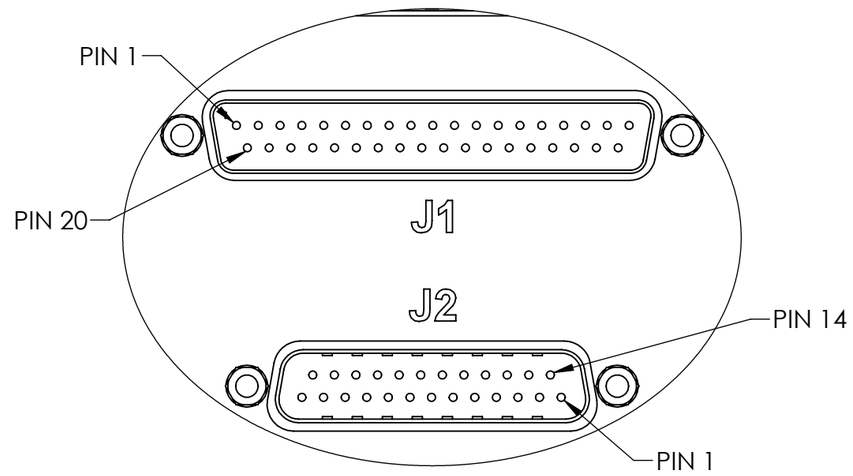
REV -

## 6 J1 CONNECTOR PIN OUT

| PIN | SIGNAL NAME | DESCRIPTION | TYPE (REF) | PAIR (REF) |
|---|---|---|---|---|
| 1 | CHASSIS GND | CHASSIS GROUND | SINGLE | N/A |
| 2 | POWER-GND-IN | POWER RETURN | SINGLE | N/A |
| 3 | +28V-IN | 28 VDC POWER POSITIVE | SINGLE | N/A |
| 4 | DISCRETE-INPUT-1 | DISCRETE INPUT #1 (ACTIVE LOW) | SINGLE | N/A |
| 5 | DISCRETE-INPUT-2 | DISCRETE INPUT #2 (ACTIVE LOW) | SINGLE | N/A |
| 6 | DISCRETE-OUTPUT-1 | DISCRETE OUTPUT #1 | SINGLE | N/A |
| 7 | DISCRETE-OUTPUT-2 | DISCRETE OUTPUT #2 | SINGLE | N/A |
| 8 | ARINC-429-TX1-A | ARINC 429 OUTPUT #1 (LINE A) | STP | PIN 9 |
| 9 | ARINC-429-TX1-B | ARINC 429 OUTPUT #1 (LINE B) | STP | PIN 8 |
| 10 | ARINC-429-TX2-A | ARINC 429 OUTPUT #2 (LINE A) | STP | PIN 11 |
| 11 | ARINC-429-TX2-B | ARINC 429 OUTPUT #2 (LINE B) | STP | PIN 10 |
| 12 | DOWNLOAD-ENABLE | DOWNLOAD ENABLE LINE (ACTIVE LOW) | SINGLE | N/A |
| 13 | RS232-TX-1 | RS232 TRANSMIT #1 | STP | PIN 14 |
| 14 | RS232-RX-1 | RS232 RECEIVE #1 | STP | PIN 13 |
| 15 | ARINC-429-RX4-A | ARINC 429 RECEIVE #4 (LINE A) | STP | PIN 35 |
| 16 | RS232-TX-3 | RS232 TRANSMIT #3 | STP | PIN17 |
| 17 | RS232-RX-3 / ARINC-429-RX6-B | RS232 RECEIVE #3 / ARINC 429 RECEIVE #6 (LINE B) | STP | PIN 16 / 34 |
| 18 | RS485-RX-POS | RS485 RECEIVE POSITIVE | STP | PIN 19 |
| 19 | RS485-RX-NEG | RS485 RECEIVE NEGATIVE | STP | PIN 18 |
| 20 | ARINC-429-RX5-A | ARINC 429 INPUT #5 (LINE A) | STP | PIN 26 |
| 21 | POWER-GND-IN | POWER RETURN | SINGLE | N/A |
| 22 | +28V-IN | 28 VDC POWER POSITIVE | SINGLE | N/A |
| 23 | DISCRETE-GND | DISCRETE GOUND | SINGLE | N/A |
| 24 | SPARE-1 | UNUSED PIN (CONNECTED TO SIGNAL GROUND) | SINGLE | N/A |
| 25 | SIGNAL-GND | SIGNAL GROUND | SINGLE | N/A |
| 26 | ARINC-429-RX5-B | ARINC 429 INPUT #5 (LINE B) | STP | PIN 20 |
| 27 | ARINC-429-RX1-A | ARINC 429 INPUT #1 (LINE A) | STP | PIN 28 |
| 28 | ARINC-429-RX1-B | ARINC 429 INPUT #1 (LINE B) | STP | PIN 27 |
| 29 | ARINC-429-RX2-A | ARINC 429 INPUT #2 (LINE A) | STP | PIN 30 |
| 30 | ARINC-429-RX2-B | ARINC 429 INPUT #2 (LINE B) | STP | PIN 29 |
| 31 | ARINC-429-RX3-A | ARINC 429 INPUT #3 (LINE A) | STP | PIN 32 |
| 32 | ARINC-429-RX3-B | ARINC 429 INPUT #3 (LINE B) | STP | PIN 31 |
| 33 | RS232-TX-2 | RS232 TRANSMIT #2 | STP | PIN 34 |
| 34 | RS232-RX-2 / ARINC-429-RX6-A | RS232 RECEIVE #2 / ARINC 429 INPUT #6 (LINE A) | STP | PIN 33 / 17 |
| 35 | ARINC-429-RX4-B | ARINC 429 INPUT #4 (LINE B) | STP | PIN 15 |
| 36 | RS485-TX-POS | RS485 TRANSMIT POSITIVE | STP | PIN 37 |
| 37 | RS485-TX-NEG | RS485 TRANSMIT NEGATIVE | STP | PIN 36 |

## 6 J2 CONNECTOR PIN OUT

| PIN | SIGNAL NAME | DESCRIPTION | TYPE (REF) | PAIR (REF) |
|---|---|---|---|---|
| 1 | +26-VAC-REFERENCE-H-CH1 | SYNCHRO REFERENCE VOLTAGE HIGH - CHANNEL 1 | STP | PIN 14 |
| 2 | +26-VAC-REFERENCE-H-CH3 | SYNCHRO REFERENCE VOLTAGE HIGH - CHANNEL 3 | STP | PIN 15 |
| 3 | SPARE-1 | UNUSED PIN | N/A | N/A |
| 4 | SYNCHRO-Y-CH1 | SYNCHRO OUTPUT Y - CHANNEL 1 | STT/STP | PINS 5 & 18 |
| 5 | SYNCHRO-X-CH1 | SYNCHRO OUTPUT X - CHANNEL 1 | STT | PINS 4 &18 |
| 6 | SYNCHRO-VALID-CH1 | SYNCHRO VALIDITY DISCRETE - CHANNEL 1 | SINGLE | N/A |
| 7 | SYNCHRO-Y-CH2 | SYNCHRO OUTPUT Y - CHANNEL 2 | STT | PINS 8 & 21 |
| 8 | SYNCHRO-X-CH2 | SYNCHRO OUTPUT X - CHANNEL 2 | STT | PINS 7 & 21 |
| 9 | SYNCHRO-VALID-CH2 | SYNCHRO VALIDITY DISCRETE - CHANNEL 2 | SINGLE | N/A |
| 10 | SYNCHRO-Y-CH3 | SYNCHRO OUTPUT Y - CHANNEL 3 | STT | PINS 11 & 24 |
| 11 | SYNCHRO-X-CH3 | SYNCHRO OUTPUT X - CHANNEL 3 | STT | PINS 10 & 24 |
| 12 | SYNCHRO-VALID-CH3 | SYNCHRO VALIDITY DISCRETE - CHANNEL 3 | SINGLE | N/A |
| 13 | SPARE-2 | UNUSED PIN | N/A | N/A |
| 14 | +36-VAC-REFERENCE-C-CH1 | SYNCHRO REFERENCE VOLTAGE COMMON - CHANNEL 1 | STP | PIN 1 |
| 15 | +36-VAC-REFERENCE-C-CH3 | SYNCHRO REFERENCE VOLTAGE COMMON - CHANNEL 3 | STP | PIN 2 |
| 16 | SPARE-3 | UNUSED PIN | N/A | N/A |
| 17 | RESERVED | RESERVED | N/A | N/A |
| 18 | SYNCHRO-Z-CH1 | SYNCHRO OUTPUT Z - CHANNEL 1 | STT | PINS 4 & 5 |
| 19 | SPARE-4 | UNUSED PIN | N/A | N/A |
| 20 | RESERVED | RESERVED | N/A | N/A |
| 21 | SYNCHRO-Z-CH2 | SYNCHRO OUTPUT Z - CHANNEL 2 | STT | PINS 7 & 8 |
| 22 | SPARE-5 | UNUSED PIN | N/A | N/A |
| 23 | RESERVED | RESERVED | N/A | N/A |
| 24 | SYNCHRO-Z-CH3 | SYNCHRO OUTPUT Z - CHANNEL 3 | STT | PINS 10 & 11 |
| 25 | SPARE-6 | UNUSED PIN | N/A | N/A |




**DETAIL A**
ENLARGED



| SIZE | CAGE CODE: 0Z5P5 | DWG. NO. | REV |
|---|---|---|---|
| B | F/N D834510-03.SLDDRW | D834510-03 | - |
| | SCALE: N/A SHEET 2 OF 2 | | |

# 7 APPENDIX B: INSTALLATION KIT, PARTS LIST

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

ECO Date: February 24, 2011
Rev: –
Sec.: IX
Page 1 of 1

ECO #: 1102/014
Release Date: 2/24/2011
Approved: HWL

**PARTS LIST**

Drawing #s: NA

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

| FN | P/N | QTY. | DESCRIPTION | MFG. | MFG.# | DESIGNATION | COMMENTS |
|---|---|---|---|---|---|---|---|
| *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