NIMBUS SYSTEMS

Guidance, Navigation & Sensing Products

Hardware Interface Control Document

Nimbus AeroLink PX-410 IMU/GNSS Sensor Module

Interface to Meridian Aerospace Host Vehicle Avionics Bus

Document Control	
Document No.	ICD–PX410–0031
Revision	C
Classification	Proprietary – Nimbus / Meridian Joint Program
Issue Date	14 March 2026
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This document defines the mechanical, electrical, and connector-level interface between the Nimbus AeroLink PX-410 sensor module and the host vehicle avionics bay. Distribution limited to the Nimbus / Meridian program office and authorized suppliers.

Contents

1 Introduction

1.1 Document Control

Rev	Date	Author	Description of Change
A	02 Sep 2025	D. Kowalski	Initial release for design review.
B	19 Nov 2025	D. Kowalski	Added J2 connector CAN bus pins; revised absolute max ratings after EMC pre-scan.
C	14 Mar 2026	D. Kowalski	Corrected PPS timing skew tolerance; added ID strap pinout; updated mounting hole callouts to match qualification hardware.

Precedence Notice

In case of conflict between this document and Nimbus drawing PX410-D-0002 (mechanical outline), the drawing governs. In case of conflict between this document and the Meridian MV-7 Power Bus ICD (MER-ICD-0114), this document governs for all PX-410 connector pin assignments.

1.2 Purpose

This Interface Control Document (ICD) establishes and maintains the mechanical, electrical, and connector-level interface requirements between the Nimbus AeroLink PX-410 Inertial Measurement Unit / GNSS Sensor Module (hereafter "the Unit") and the Meridian MV-7 host vehicle avionics bay (hereafter "the Host"). It is the controlling reference for hardware and software teams on both programs when designing, integrating, or troubleshooting the Unit-to-Host boundary.

1.3 Scope

This document covers:

- Mechanical envelope, mounting pattern, and connector keep-out zones.
- Electrical power interface, absolute maximum ratings, and grounding scheme.
- Connector part numbers and full pin-by-pin signal definitions for J1 and J2.
- Signal timing for the 1 PPS strobe and external synchronization input.
- Environmental qualification levels and the verification cross-reference matrix.

This document does not define the internal design of the Unit, the Host's software driver architecture, or the GNSS antenna interface, which are covered by ICD–PX410–0032.

1.4 Applicability

This ICD applies to all PX-410 hardware built to and after Engineering Change Order ECO-0148 (serial numbers PX410-0091 and higher). Earlier serial numbers should be evaluated against Revision A of this document before integration.

1.5 Reference Documents

Ref.	Title	Number
[1]	PX-410 Mechanical Outline Drawing	PX410-D-0002
[2]	MV-7 Power Bus Interface Control Document	MER-ICD-0114
[3]	PX-410 Environmental Qualification Test Report	NX-EQ-0077
[4]	PX-410/PX-410 GNSS Antenna ICD	ICD–PX410–0032
[5]	Nimbus EMC Design Standard	NX-STD-014 Rev. F

2 Interface Overview and Mechanical Interface

2.1 System Context

The Unit mounts inside the Host avionics bay and interfaces to two harnesses: a power and discrete-I/O harness (via connector J1) and a data harness (via connector J2) carrying RS-422 attitude data, a 1 PPS timing strobe, and a CAN bus tap used for maintenance polling. Figure 2.1 shows the interface boundary.

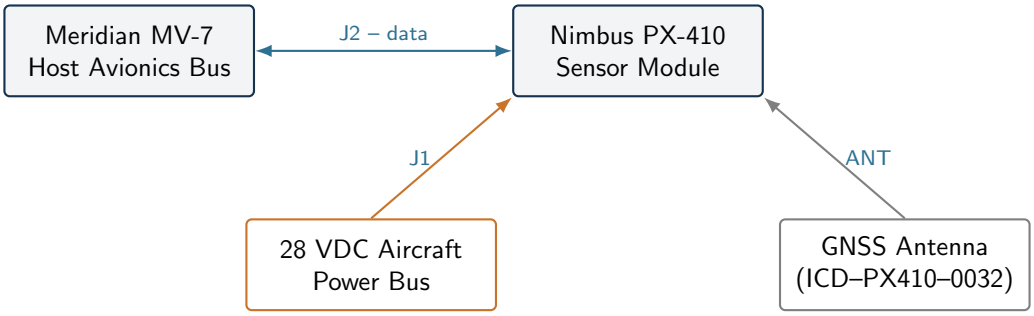

Figure 2.1: PX-410 interface context within the MV-7 avionics bay.

2.2 Connector Summary

Designator	Function	Pins	Mating Connector
J1	Power & discrete I/O	9	Micro-D, socket, per MIL-DTL-83513
J2	Data (RS-422 / PPS / CAN / ID)	15	Micro-D, socket, per MIL-DTL-83513

2.3 Envelope and Mounting

The Unit occupies an envelope of 82.0 mm × 62.0 mm × 24.5 mm (excluding connector shells) and mounts to the Host structure using four M3 fasteners torqued to 0.9 N·m. Figure 2.2 shows the mounting hole pattern as viewed from the connector face.

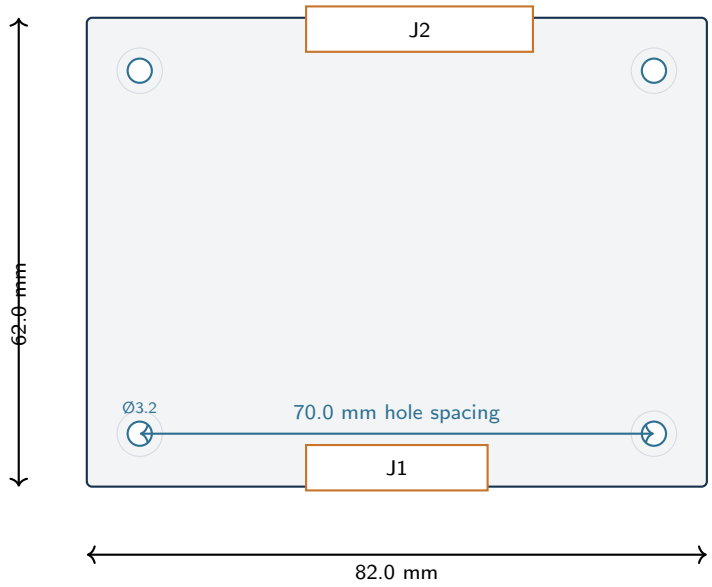

Figure 2.2: PX-410 mounting hole pattern, connector face view. Four places, Ø3.2 mm clearance for M3 fasteners.

2.4 Mechanical Requirements

Mechanical Interface Requirements

- Mounting surface flatness: 0.10 mm max over the fastener footprint.
- Fastener: four M3 × 0.5, class 8.8 or better, with lock washer.
- Connector keep-out: 18 mm clear of mating connector back-shell for cable bend radius.
- Mass: 165 g ± 8 g, including connector shells.
- Center of gravity: within 3 mm of geometric center in the mounting plane.

3 Electrical Interface

3.1 Power Interface

The Unit accepts a primary and a redundant secondary 28 VDC feed on J1. Either feed alone is sufficient for full operation; the Unit does not perform automatic load-sharing and draws from whichever feed is present, with the primary feed taking priority if both are applied.

Parameter	Min	Typ	Max	Unit
Supply voltage (steady state)	22.0	28.0	32.0	VDC
Supply voltage (transient, <50 ms)	18.0	–	40.0	VDC
Steady-state current draw	–	0.38	0.55	A
Inrush current (<10 ms)	–	1.6	2.4	A
Ripple & noise (20 MHz BW)	–	–	200	mVpp
Turn-on time to data valid	–	1.4	2.5	s

3.2 Absolute Maximum Ratings

Absolute Maximum Ratings – Exceeding These Values May Cause Permanent Damage

Parameter	Min	Max	Unit
Supply voltage, J1 pins 1–4	−0.5	36.0	V
Discrete input voltage	−0.5	32.0	V
RS-422 / CAN line voltage	−7.0	12.0	V
ESD, human body model, all pins	–	8	kV
Storage temperature	−55	100	°C
Operating case temperature	−40	85	°C

3.3 Grounding and Shielding

Chassis ground (J1 pin 5) shall bond to the Host structure through a dedicated stud with contact resistance below 2.5 mΩ. Signal ground (J2 pins 9 and 10) is isolated from chassis inside the Unit by a 1 MΩ / 1 nF network and must not be tied to chassis ground anywhere in the Host harness. Cable shields terminate to the connector back-shell at both ends (single-point per shield, 360° termination recommended at the Unit end).

4 Connector and Pinout Definition

4.1 J1 – Power and Discrete I/O

Connector type: 9-pin Micro-D, socket contacts (Unit side), per MIL-DTL-83513. **Mating connector:** Glenair 801-009M or equivalent pin-contact plug.

Pin	Signal	Type	Description
1	+28V_PRI	Power In	Primary 28 VDC power input
2	+28V_RTN	Power Return	Primary power return
3	+28V_SEC	Power In	Secondary (redundant) 28 VDC power input
4	+28V_SEC_RTN	Power Return	Secondary power return
5	CHASSIS_GND	Ground	Chassis / frame ground stud reference
6	DISC_IN_1	Discrete In	Built-in-test initiate, active low, 10 kΩ pull-up
7	DISC_OUT_1	Discrete Out	Health/status flag, open-collector, 100 mA sink max
8	SHIELD	Shield	Cable shield termination, single-point
9	RESERVED	–	No connect; reserved for future use

4.2 J2 – Data Interface

Connector type: 15-pin Micro-D, socket contacts (Unit side), per MIL-DTL-83513. **Mating connector:** Glenair 801-015M or equivalent pin-contact plug.

Pin	Signal	Type	Description
1	RS422_TX+	Output	Attitude data transmit, differential positive
2	RS422_TX−	Output	Attitude data transmit, differential negative
3	RS422_RX+	Input	Command receive, differential positive
4	RS422_RX−	Input	Command receive, differential negative
5	PPS_OUT	Output	1 PPS timing strobe, LVTTL, rising edge on-time
6	SYNC_IN	Input	External synchronization input, LVTTL
7	CAN_H	I/O	CAN bus, high, 500 kbps maintenance tap
8	CAN_L	I/O	CAN bus, low, 500 kbps maintenance tap
9	SIG_GND	Ground	Signal / logic ground reference
10	SIG_GND	Ground	Signal / logic ground reference (redundant pin)
11	TEST_1	Input	Factory test point; leave open in flight harness
12	TEST_2	Input	Factory test point; leave open in flight harness
13	ID_0	Input	Address / ID strap, bit 0 (tie to SIG_GND for ‘1’)
14	ID_1	Input	Address / ID strap, bit 1 (tie to SIG_GND for ‘1’)
15	SHIELD	Shield	Cable shield termination, single-point

ID Strap Usage

Pins 13/14 set the CAN node address for multi-unit installations: 00 = address 1 (default, both pins open), 01 = address 2, 10 = address 3, 11 = address 4. Straps are sampled once at power-on; changing them while the Unit is powered has no effect until the next boot.

5 Signal Timing, Environmental Interface and Appendix

5.1 1 PPS and External Sync

PPS_OUT rises within 100 ns of the top of the GNSS second once the Unit reports a valid navigation solution. SYNC_IN, when driven, forces the Unit's internal timing epoch to realign on the next rising edge; this is used during Host bring-up when the Unit is the timing follower rather than the timing source.

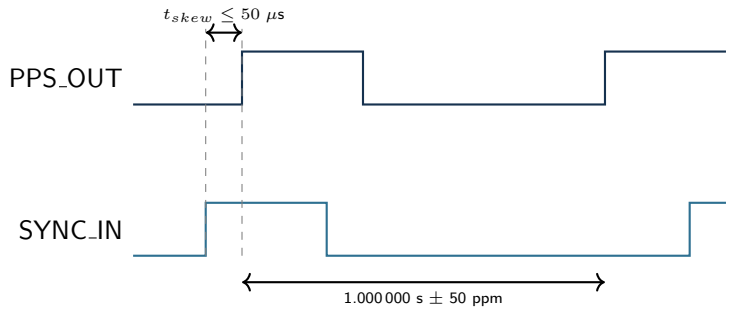

Figure 5.1: PPS_OUT to SYNC_IN timing relationship (follower mode).

5.2 Timing Requirements

Parameter	Min	Typ	Max	Unit
PPS pulse width	20	100	200	ms
PPS period accuracy	–	–	50	ppm
PPS-to-SYNC skew (follower mode)	–	12	50	µs
RS-422 data rate	9600	115200	921600	bps
CAN bus data rate	–	500	–	kbps

5.3 Qualification Levels

The Unit is qualified per NX-EQ-0077 to the levels summarized below. These are boundary conditions on the Host installation, not internal design margins.

Environment	Level
Operating temperature	−40°C to +85°C, case
Storage temperature	−55°C to +100°C
Random vibration	7.7 g_{rms}, 20–2000 Hz, 3 axes
Operational shock	40 g, 11 ms half-sine, 3 axes
Humidity	95% RH non-condensing, 48 h dwell
Altitude	Sea level to 15,000 m
Ingress protection	IP54 (mated connectors)

5.4 Verification Cross-Reference Matrix

Req. ID	Requirement	Method	Ref.
ICD-M-01	Mounting hole pattern per Fig. 2.2	Inspection	§2.3
ICD-E-02	Steady-state supply current $\leq$ 0.55 A	Test	§3.1
ICD-E-03	Survives 8 kV HBM ESD, all pins	Test	§3.2
ICD-T-04	PPS-to-SYNC skew $\leq$ 50 µs	Test	§5.1
ICD-V-05	Random vibration, 7.7 g_{rms}	Test	§5.3
ICD-V-06	IP54 with mated connectors	Analysis & Test	§5.3

5.5 Appendix A – Mating Hardware

Item	Description	Part Number
J1 mate	9-pin Micro-D plug, pin contacts	Glenair 801-009M
J2 mate	15-pin Micro-D plug, pin contacts	Glenair 801-015M
Backshell	90° EMI backshell, both connectors	Glenair 25-716SN
Mounting fastener	M3 × 0.5, class 8.8, 10 mm	Nimbus SP-0044
Chassis ground lug	M3 ring lug, tin-plated copper	Nimbus SP-0051

Change Requests

Proposed changes to this ICD are submitted through the joint Nimbus/Meridian configuration control board using form NX-CCB-002 and require concurrence from both chief engineers listed on the title page before incorporation.