



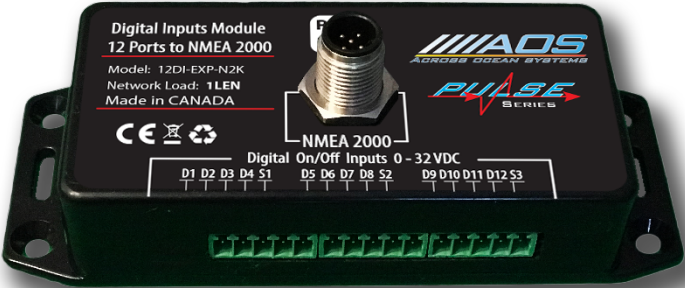
***Digital Input Expansion Module
(12 Channel)***

12DI-EXP-N2K

Owner's Installation Manual

March 2020
(Rev 1)





NOTES:

RECORD DATA BEFORE INSTALLATION FOR FUTURE REFERENCE

Model #:	
Serial #:	
Date of Purchase:	
Date of Installation:	

TABLE OF CONTENTS

1	Introduction	5
1.1	Contact	5
1.2	Compliant Use	5
1.3	Copyrights & Trademarks	5
2	Safety	6
2.1	Safety Alerts	6
2.2	Notice to Installer	6
2.3	Product Hazards	7
3	About The Digital Input Expansion Module	8
3.1	Product Description	8
3.2	Intended Use	8
3.3	Technical Data	8
4	Unpacking the Product	9
5	Choosing the Installation Location	Error! Bookmark not defined.
6	Mounting	10
6.1	3D Model.....	Error! Bookmark not defined.
7	Connecting the Electrical	11
7.1	Electrical Connectors	11
7.2	Connecting the digital inputs	13
7.3	Cabling Recommendations.....	14
7.4	Application Examples	15
8	Troubleshooting	16
9	Warranty	Error! Bookmark not defined.

1 INTRODUCTION

1.1 CONTACT

Across Ocean Systems Ltd. (AOS)

313-131 West 4th Street
North Vancouver, BC
Canada, V7M 3C8

Sales Tel: +1-236-688-8948
Email: sales@acrossoceansystems.com
Website: acrossoceansystems.com

This document is intended to clearly present comprehensive product data and provide technical information to assist the end user in design applications. Across Ocean Systems Ltd. reserves the right, without notice, to change the design, or construction, of any products and to discontinue or limit distribution of any products. Across Ocean Systems Ltd. (AOS) also reserves the right to change, or update, without notice, any technical information contained within this document.

Across Ocean Systems Ltd. recommends that customers visit our website to check for updates to this Manual. Once a product has been selected for use, it should be tested by the user to ensure proper function in all possible applications. For further instructions, please contact our distributors or visit our website.

1.2 COMPLIANT USE

This module is an aid only and should not be used as the sole method of decision making. It will not protect the systems that it is monitoring.

The installer shall:

- Only use non-defective products.
- Check the safety of operation and the condition of the device before each use.
- Verify that the product is operational at all times and keep it in good working conditions.

Only Across Ocean Systems Ltd. Authorized Dealers or Authorized Technicians are to repair this module.

1.3 COPYRIGHTS & TRADEMARKS




All product names, logos and brands are property of their respective owners. All company, product and service names used in this manual are for identification purposes only. Use of these names, logos, and brands does not imply endorsement.

2 SAFETY

Throughout this manual, the following symbols are used to alert the installer to special instructions concerning a service or operation that may be hazardous if performed incorrectly or carelessly. The associated risk levels are

2.1 SAFETY ALERTS

Throughout this manual, the following symbols, and their accompanying explanation, are used to alert the user to special instructions concerning a service or operation that may be hazardous if performed incorrectly or carelessly. The associated risk levels are stated below.

 DANGER	This symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	This symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	This symbol indicates a hazardous situation, which if not avoided, could result in minor or moderate injury.
NOTICE	This symbol informs the reader of events not related to personal injury but which there is a risk of damage to property or equipment.
SAFETY INSTRUCTIONS	This symbol informs the reader of safety-related instructions or procedures.

2.2 NOTICE TO INSTALLER

Disregarding the following safety measures can result in an accident causing severe injury to personnel and damage to material assets.

- Only use the product as directed in this manual.
- Never put the product into service if there is evidence of visible damage.
- Never put the product into service before fully completing installation and commissioning.
- Do not carry out any modifications to the product.
- Only use authentic AOS spare parts.
- Observe all local regulations, directives and laws during the installation of this product.
- All installation, commissioning, and maintenance work must only be conducted by qualified personnel. (For the purpose of this manual, qualified personnel are persons

who are familiar with the assembly, installation, commissioning, and operation of the product and who have the qualifications necessary for their occupation.)

- Observe all specifications in this manual. If these guidelines are not followed and damage occurs, the warranty will be voided.

2.3 PRODUCT HAZARDS



WARNING

Disconnect Power: Turn off power at distribution panel before beginning installation to protect installer from electrical hazards.



CAUTION

Voltage and Current Compatibility: Confirm that the power source is compatible with the maximum voltage and current ratings of its product variant. Failure to do so could result in damage or fire.

3 ABOUT THE DIGITAL INPUT EXPANSION MODULE

3.1 PRODUCT DESCRIPTION

The Digital Input Expansion Module allows the user to connector up to twelve (12) additional digital inputs. The inputs are separated into three banks to allow inputs with different references.

3.2 INTENDED USE

This module is designed identify presence of a DC voltage on 12V or 24 V system, convert the that data to NMEA2000 protocol and send it to other devices on the same network

3.3 TECHNICAL DATA

Table 1: Digital Input Expansion Module Technical Data

Electrical	
Operating Voltage	12 VDC and 24 VDC Nominal
Operating Current	Less than 50 mA (1 LEN)
Short Circuit Protection	Yes.
Reverse Battery Protection	Yes. Indefinite.
Voltage Surge Protection	Yes.
Interfaces	NMEA 2000
Connectors	1x NMEA 2000 M12 3x Digital Input Banks (4 Channels per Bank)
Digital Input Limits	0 – 32VDC
Mechanical	
Physical Dimensions (L x W x H)	126 mm x 50 mm x 35 mm [5.0" x 2.0" x 1.4"]
Mounting Dimensions (L x W)	113.4 mm x 31.8 mm [4.465" x 1.252"] 4.5 mm [0.17"] Thru-Holes
Product Weight	0.1 kg [0.22 lbs]
Enclosure Material	Plastic, Polycarbonate
Shipping Dimensions (L x W x H)	216 mm x 140 mm [8.5" x 5.5"]
Shipping Weight	0.2 kg [0.44 lbs]
Environmental	
Operating Temperature	-20°C to 55°C [-4°F to 131°F]
Storage Temperature	-30°C to 70°C [-22°F to 158°F]
Operating Humidity	95% Non-condensing
Storage Humidity	75% Non-condensing
Ingress Protection	IP40
Certifications	
Certifications	NMEA 2000 (Pending)

4 UNPACKING THE PRODUCT

When unpacking the box containing the Digital Input Expansion Module, the box should include the following additional items:

- 1x Digital Input Expansion Module
- 1x Quick Start Guide

If any of these items are missing or damaged, please contact Across Ocean Systems Ltd. to arrange replacements.

5 MECHANICAL INSTALLATION

5.1 CHOOSING THE INSTALLATION LOCATION

The installer should consider the following parameters when choosing a mounting location:

1. The Module should be protected from direct water exposure.
2. The Module should be mounted near the digital signals to be measured.
3. The Module should be mounted away from any AC cabling or power sources.
4. The Module should be mounted away from any large sources of Electromagnet Interference (EMI).
5. Wiring between the Module and digital signals should not run parallel to high voltage or high current carrying wires or cables.

5.2 MOUNTING THE PRODUCT

Securing the Digital Input Expansion Module is a crucial step in the installation process. This ensures safety to the product while providing ease of access to the installer.

There are two steps to securing the Digital Input Expansion Module:

1. Ensure that there is enough room to accommodate the depth of the product and the attached cables. Note, the NMEA 2000 connection exits from the top of the unit and requires a substantial bend radius for the cable.
2. Use recommended M4 or #8-32 screws to secure it into place at each side. Do not over-tighten the screws as it can lead to damaging the enclosure.

5.3 3D MODEL REFERENCE

A 3D Model of the unit is available on the Across Ocean Systems Ltd. product page for download (acrossoceansystems.com).

6 CONNECTING THE ELECTRICAL

The Digital Input Expansion Module requires cables to connect all the required instruments to the appropriate connectors on the unit. Cables are supplied separately and are available through a Vitals dealer or local marine installer.

6.1 ELECTRICAL CONNECTORS

Connectors are indicated as ① to ④. Connection to ④ is required for basic operation. All other connections are optional and based on the users' specific installation needs.

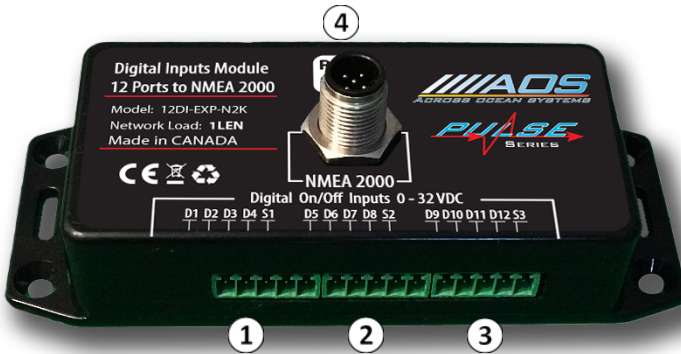


Figure 1: Digital Input Expansion Module Connector Layout

Table 1: Connector List

No.	Connector Name
1	Digital Input Bank #1 Connector
2	Digital Input Bank #2 Connector
3	Digital Input Bank #3 Connector
4	NMEA 2000 M12 Connector

6.1.1 Digital Input Bank #1 Connector

The Digital Inputs #1-4 Connector allows the connection of up to four (4) digital signals and the signal reference.

Table 2: Digital Input Bank #1 Connector

1 Digital Input Bank #1 Connector			
Pin #	Pin Designator	Pin Type	Function
1	D1	Input	Digital input #1
2	D2	Input	Digital input #2
3	D3	Input	Digital input #3
4	D4	Input	Digital input #4
5	S1*	Reference	External Reference for D1 to D4 *normally connected to GND

6.1.2 Digital Input Bank #2 Connector

The Digital Input Bank #2 Connector allows the connection of up to four (4) digital signals and the signal reference.

Table 3: Digital Input Bank #2 Connector

2 Digital Input Bank #2 Connector			
Pin #	Pin Designator	Pin Type	Function
1	D5	Input	Digital input #5
2	D6	Input	Digital input #6
3	D7	Input	Digital input #7
4	D8	Input	Digital input #8
5	S2*	Reference	External Reference for D5 to D8 *normally connected to GND

6.1.3 Digital Input Bank #3 Connector

The Digital Input Bank #3 Connector allows the connection of up to four (4) digital signals and the signal reference.

Table 4: Digital Input Bank #3 Connector

3 Digital Input Bank #3 Connector			
Pin #	Pin Designator	Pin Type	Function
1	D9	Input	Digital input #9
2	D10	Input	Digital input #10
3	D11	Input	Digital input #11
4	D12	Input	Digital input #12
5	S3*	Reference	External Reference for D9 to D12 *normally connected to GND

6.1.4 NMEA 2000 M12 Connector

The NMEA 2000 M12 Connector is used to directly connect to standard NMEA 2000 networks based on circular connector cabling standards. The connector has the following pin-out.

Table 5: NMEA 2000 M12 Connector

4 NMEA 2000 M12 Connector			
Pin #	Pin Designator	Pin Type	Function
1	SHIELD	Power	NMEA 2000 Shield Pin
2	NET-S	Power	NMEA 2000 Power Supply Positive
3	NET-C	Power	NMEA 2000 Power Supply Ground
4	NET-H	Comms	NMEA 2000 CAN High Signal
5	NET-L	Comms	NMEA 2000 CAN Low Signal

6.2 CONNECTING THE DIGITAL INPUTS

The digital inputs can be configured to be triggered either by connecting the input to positive voltage, referred to as “Active High”, or by connecting to ground, referred to as “Active Low”. The digital inputs on Vitals are configured from the factory as “Active High” and it will trigger by positive DC voltage between 5 VDC and 30 VDC. This is the most common use as majority of the switches on the boat interrupt the battery power to the load.

The reference can be set using terminals **S1**, **S2**, and **S3**. Terminal **S1** controls the reference for **D1-D4**, **S2** controls the reference for **D5-D8**, and **S3** controls the reference for **D9-D12**. If set to VDC (HIGH), digital inputs need to short to GND (LOW). If set to GND (LOW), then switches need to go to VDC (HIGH).

6.3 CABLING RECOMMENDATIONS

If the ground connection is shared throughout the vessel, including the ground to Vitals, all that is needed to activate a digital input is to connect it on the load side of the switch for the device being monitored. Make sure that the reference terminals, **S1**, **S2**, or **S3** are connected to the appropriate reference. Ensure that there are no large ground loops.

Note that if voltage source is connected to S1, S2 or S3 to apply appropriate fuse protection (1A) to protect the wire and the source (ABYC standard calls for protection within 1' from the source)

Follow recommended wiring practices and standards as per relevant local codes.

6.4 APPLICATION EXAMPLES

6.4.1 Connecting to a bilge pump switch

The following diagram shows an example where a bilge pump is monitored by Vitals, through the Digital Input Expansion Module. In this example, the vessel has a secondary battery for the bilge pump, an automatic float switch, and a manual bilge toggle. In this configuration, the bilge pump is triggered either by the manual switch or, when switched in auto mode, by the float switch. This causes the bilge pump to turn on and activates the digital input on the Digital Input Expansion Module. When using another power source, the grounds must be connected.

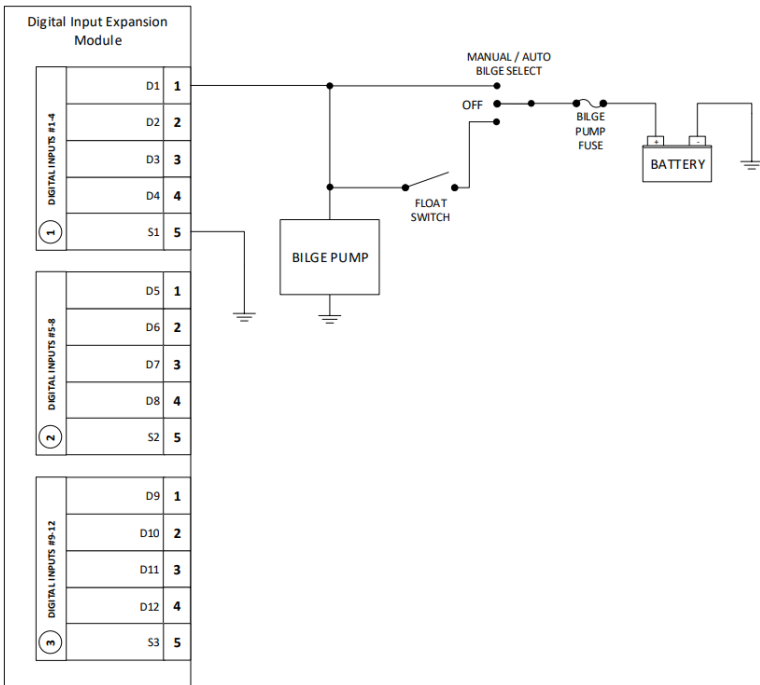


Figure 2: Connecting single wire digital input to bilge pump arrangement

7 CONFIGURATION & OPERATION

Once installed onto a properly configured NMEA 2000 network and power has been connected to the Digital Input Expansion Module it will begin to transmit sensor messages on the network.

8 TROUBLESHOOTING

If you encounter problems with the operation of your product, please refer to the troubleshooting suggestions before contacting AOS for assistance. If the steps below do not resolve your issue, please reach out either AOS directly or our Dealers in your area.

Table 6: Common Solutions

Problem (Issue encountered)	Cause (What it means)	Corrective Action (What to do)
Module not responding	Module power not supplied	1. Check that NMEA 2000 cable is providing power to module.

9 WARRANTY

Across Ocean Systems Ltd. (AOS) warrants the Products and Parts manufactured by AOS to be free from defects in workmanship or material and that said products are designed mechanically and functionally to perform to specifications.

This warranty is effective providing:

- The equipment is used within the intended operating conditions and in accordance with AOS recommendations
- The equipment is installed according to equipment diagrams, specifications and recommendations which AOS has provided

This warranty becomes invalid if the factory supplied serial number has been removed or altered on the product. This warranty does not cover cosmetic damage or damage caused by an act of God, accident, misuse, abuse, negligence or modification of any part of the product. This warranty does not cover damage due to improper operation or maintenance, connection to inappropriate equipment or attempted repair by anyone other than an authorized AOS representative.

Upon identification of a potential issue or defect with AOS Product or Part, the Warranty Applicant (“Applicant”) must immediately contact AOS and describe the issue in writing, by letter, fax, email or other electronic conveyance. AOS will then assess the cause of the defect and determine warranty applicability and appropriate remediation.

If any part is found to be defective, AOS will replace said part FOB the AOS factory provided that any such defective part is returned by the Buyer with freight and applicable forwarding charges prepaid by the Buyer. AOS sole obligation to the Applicant will be to repair or replace the defective part with same or similar product, to a maximum value of the list price of the product or part. The AOS warranty does not cover labour charges, Installation charges, travel or any other associated expenses.

All Products and Parts manufactured by AOS are subject to a warranty against manufacturer’s defects in materials or workmanship for a period of two (2) years from the date of purchase.

AOS will be responsible for all Products or Parts sold by AOS but manufactured by 3rd party manufacturing companies. However, these products and parts are subject to applicable 3rd party warranties and may not be the same as the AOS warranty.

10 APPENDIX A: NMEA 2000 PGN LIST

The following NMEA 2000 Program Group Numbers (PGN) are transmitted by this unit.

- 127501 // Binary Switch Bank Status

Page Intentionally Left Blank



Across Ocean Systems Ltd.

313-131 West 4th Street
North Vancouver, British Columbia,
Canada, V7M 3C8

Sales Tel: +1-236-688-8948

Email: sales@acrossoceansystems.com

Website: acrossoceansystems.com

Made in Canada / Printed in Canada