

NAVICO NAIS-400

Class B AIS Transceiver

Operational Description

Wireless House, Westfield Industrial Estate, Midsomer Norton, Bath BA3 4BS, England. Tel: +44 (0)1761 409 500

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1. HISTORY

Issue	Date	Author	Review No.	Details
1	29/05/2012	Richard McMahon		Created

2. TABLE OF CONTENTS

1.	HISTORY.....	2
2.	TABLE OF CONTENTS	3
3.	INTRODUCTION	4
4.	SUBSYSTEMS	7
4.1.	Tx to Rx Channel A and Channel B Switching.....	7
4.2.	VHF Receivers	7
4.3.	GPS Receiver	7
4.4.	VHF Transmitter	7
4.5.	Baseband / signal Processing.....	7
4.6.	Power supply.....	8
4.7.	Serial ports.....	8

3. INTRODUCTION

This document provides a description of the operation of the NAVICO NAIS-400 AIS Class B Transponder.

The NAVICO NAIS-400AIS Class B Transponder It contains a module (called COBALT) inside of environmental and safety proof housing, the module itself performs all functionality and all of its serial power RF and GPS connections are routed directly to the outside of the casing.

The operation of the NAVICO NAIS-400AIS Class B (the unit) can be split into functional blocks as follows:

- Rx to Tx Channel A & Channel B switching
- VHF Receivers
- GPS receiver
- VHF Transmitters
- Base band / signal processing
- Serial ports
- Power supply

Note that the operational requirements for the unit are defined in IEC62287-1

A block diagram of NAVICO NAIS-400AIS Class B with the cobalt module inside of an enclosure is provided in Figure 1 to show the interconnection of the functional blocks. A block diagram showing the devices operational blocks (of the nodule) is provided in Figure 2.

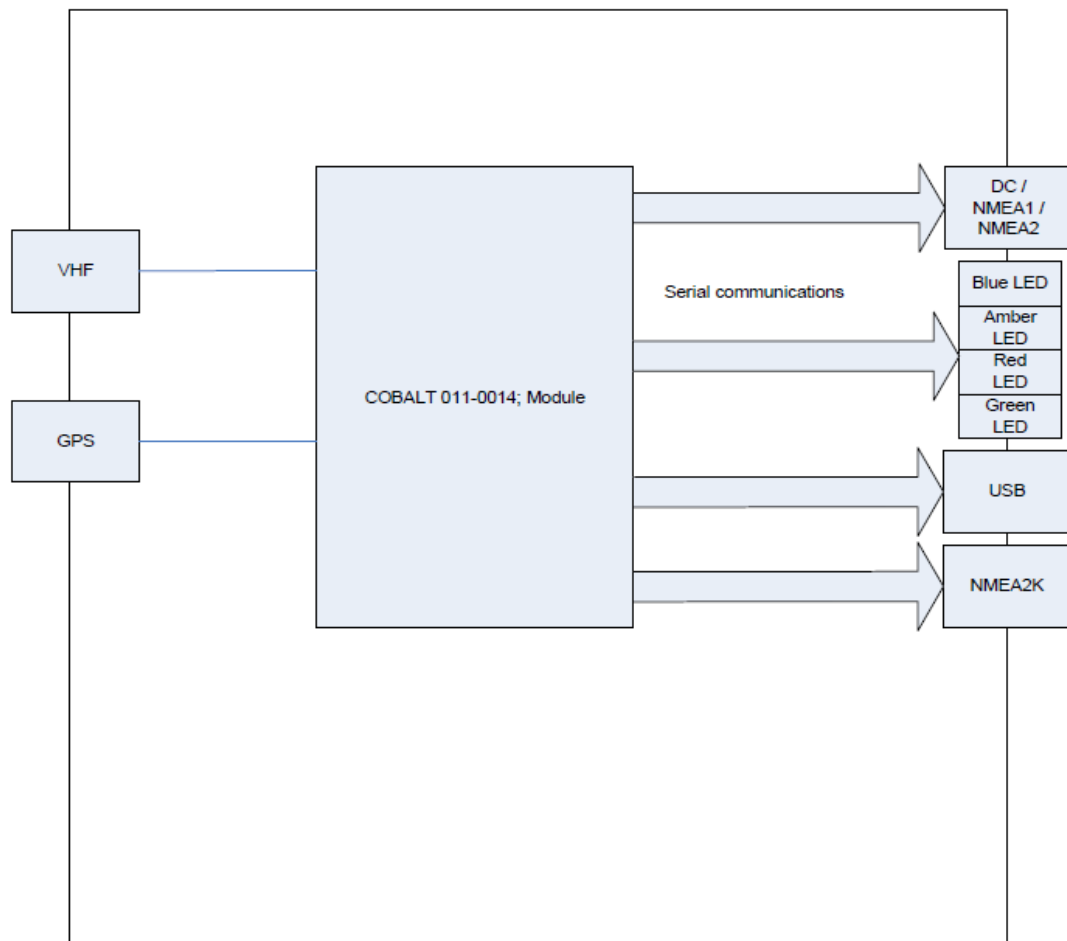


Figure 1 - Overview block diagram

COBALT Module

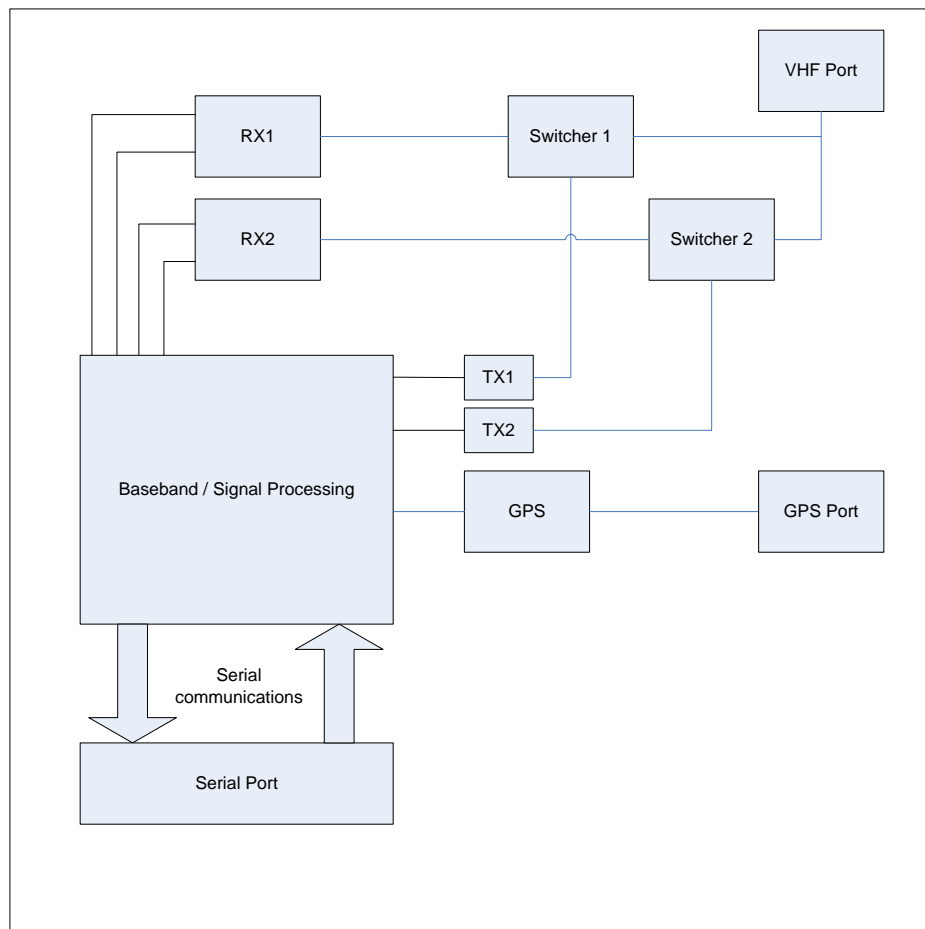


Figure 2 - RF Subsystem

The remainder of this document provides a functional description of each functional block.

4. SUBSYSTEMS

4.1. Tx to Rx Channel A and Channel B Switching

A common VHF antenna is used for both AIS transceiver chains. The transceiver chains A & B are nominally tuned to receive on AIS A and AIS B (169.975MHz and 162.025MHz), the RF switch allows the amplification and transmission of an AIS encoded signal on the Transceiver Chain A or B for the correct calculated timeslot, then return to receive mode for the beginning of the next timeslot.

4.2. VHF Receivers

VHF Receiver 1 and VHF Receiver 2 cover the marine VHF band from 156.025MHz to 162.025MHz. The audio input is demodulated and used by the baseband. To allow simultaneous reception on two different marine band VHF channels each receiver uses a different intermediate frequency. The receivers are configured as shown in the table below.

Receiver	Intermediate frequency
1	19.2 MHz
2	28.8 MHz

4.3. GPS Receiver

The GPS receiver is a 16 channel UBX-G6010 module manufactured by u-blox AG. The module is configured to operate with an external GPS antenna or its own internal GPS antenna incorporating a low noise amplifier. A 5V DC bias to power either antenna's LNA is provided at the GPS antenna connector centre pin for the external antenna or to the internal GPS antenna module.

The GPS receiver provides position information and timing information for use by the base band subsystems.

4.4. VHF Transmitter

The transmitters utilise a 'fractional-n synthesiser' to directly synthesise modulated signal at the required output frequency from digital data provided by the baseband processor. The synthesiser generates RF output in the frequency band 156.025MHz to 162.025MHz. The audio output of the baseband while transmitting is modulated into VHF GMSK signals.

Forward and reverse power measurements are made by the baseband / signal processor. Power measurement is used to actively control the output power amplification in the switcher during transmission. The RF output power of the unit is 33dBm as required by IEC62287-1.

4.5. Baseband / signal Processing

The base band subsystem consists of a DSP (digital signal processor), and associated volatile and non-volatile memory.

All RF modulation and demodulation functions, all layers of AIS protocol, serial communications, DSC demodulation and internal data interface and signal controls are carried out by software implemented on the DSP.

4.6. Power supply

The power supply runs from either nominal 12VDC or 24VDC, while rated between the ranges of 9.6VDC to 31.2VDC, generating low voltage DC supplies for cobalt internal subsystems.

4.7. Serial ports

Five serial ports are provided. All relevant AIS related data is output according to sentences defined by the NMEA 0183 specification. Control and configuration messages can be sent to the unit via the USB serial port.

Serial port 1 operates at 4.8kBaud using NMEA 0183 levels. The receiver is optically isolated from the internal power supplies.

Serial port 2 operates at 38.4kBaud using NMEA 0183 levels. The receiver is optically isolated from the internal power supplies.

Serial port 3 operates at 38.4kBaud using USB levels and used for configuring the unit. The receiver is optically isolated from the internal power supplies.

Serial port 4 is an SD card for configuring the unit and recoding AIS related data.

A proprietary NMEA2000 interface is also provided.