

NBM-HSDB-1 HSDB (HIGH SPEED DATA BUS) MONITOR FOR GARMIN™ G1000 AVIONIC BUSES



L-3's NBM-HSDB-1 module provides bus monitoring capabilities of the High Speed Data Bus (HSDB) used to interconnect Garmin G1000™ avionics equipment.



L-3 Telemetry & RF Products (L-3 T&RF) NBM-HSDB-1 has the capability to select any word from the full spectrum of traffic on the network it is monitoring.

Besides extracting data parameters, the module can generate message related parameters including time-tag of the last received message and the total number of messages received; these parameters are user programmable on a unique message by message basis.

The core of the module is a high-performance Field-Programmable Gate Array (FPGA) that includes an embedded processor running application specific code. The application software integrates a TCP/IP stack for each input that controls the interface and collects data from the specified network. The module IP layer is responsible for reassembling fragments and ensuring that the complete message has been received before passing it onto the next higher layer.

To electrically interface to the network, the NBM-HSDB-1 module provides the necessary transformer coupling, and supplies a 37-pin connector with the differential Ethernet receive and transmit signals configured to ensure maximum signal integrity.



FEATURES

- Operates as a "Bus Monitor" and tracks all traffic from a Garmin G1000 Avionics Bus
- Supports G1000 Embedded & PC Protocols
- Multiple NBM-HSDB-1 modules can be included in a NetDAS stack
- Messages are time tagged to 1 microsecond resolution with time from the internal NetDAS TE Bus backplane
- Select any word from any buffered message
- Trigger list contained in FLASH memory
- User can define placement of acquired data in the PCM stream or Vista TEC software can do it automatically
- Fully Programmable by L-3's Vista TEC software
- Setup processing support of the Garmin XML ICD

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NETWORK DATA PROCESSING

Overview

The NBM-HSDB-1 uniquely supports the processing of network data based upon the characteristics of G1000 message protocols.

Parameter Selection

To select a parameter for insertion into the output data stream, the user defines a message (message block) based upon the unique characteristics of the proprietary G1000 protocol. Once done, the user assigns channel names, input payload location (byte offset), length (in bytes) and output frame position of the selected parameters that are to be inserted into the output frame.

The NBM-HSDB-1 uses dual port RAM to support simultaneous writing and reading of parameters. In addition, the RAM is configured using a double-buffering method to allow a previously received message to be fully output before an update with new data is performed. This method ensures that the NBM-HSDB-1 updates the RAM only as fast as new channel data is read from the dual port RAM. This way, data integrity is always preserved as long as all the data requiring correlation is sampled in sequence in the PCM frame.

Modes of Operation

The NBM-HSDB-1 is a “listen only” module and does not interfere with normal network operation. The user has a choice of G1000 connection mode:

- **PC Mode:** The NBM-HSDB-1 acts as an external monitor, per G1000 requirements.
- **Embedded Mode:** The NBM-HSDB-1 is tied directly into the internal network. A separate hub type connection is required to allow traffic flow to the module.

Message Block Processing

The module is fully programmable and allows the user to select parameters from any number of messages that may be present on the network. These parameters are selected from various messages, which are defined in the G1000 Interface Control Document (ICD). Parameters can be 8, 16, 32 or 64 bits in length.

Status Information

Along with the stored data, the NBM-HSDB-1 can also provide the following information:

- **Message Time:** The NetDAS TE Bus backplane provides continuous 1 microsecond time that allows any module to perform application-specific time-tagging functions. For HSDB monitoring, the NBM-HSDB-1 time tags each message as it is received and makes it available as separate parameters for insertion into the PCM output stream. Each message has its own unique time word parameters that allow the user to differentiate when each message has been received.
- **Status Counter:** Each message includes a unique word count that provides the information below.
 - **Current Count – Previous Count > 1.** Indicates an overflow condition, in which the associated message has been input/processed multiple times since the last received copy was output.
 - **Current Count = Previous Count.** Indicates a stale condition, in which the same copy of a message is being output prior to the receipt of the next.

Programming

The G1000 messages are defined in a vendor specific Extensible Markup Language (XML) ICD, used by Vista TEC to populate the database tables that drive the NBM-HSDB-1 setup GUI. This method allows Vista TEC to easily support any message definition changes made by Garmin, without requiring any software updates to the module.

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SPECIFICATIONS

Input Characteristics

Number of Channels	2
Input Channel Type	IEEE 802.3 Fast Ethernet
Ethernet Bus Speed	10 Base-T / 100 Base-Tx (10/100 Mbps)
Interface	RJ-45 Fast Ethernet Interface Compatible

Internal Characteristics

FPGA Functions	- TE Bus input/output interface and memory interface - FLASH memory for non-volatile processor code and message trigger list - SDRAM memory for processor code and data - Embedded PowerPC processor that loads configuration parameters at power up - Message time tagging to 1 microsecond resolution - Variable parameter size of 8, 16, 32 or 64 bits - Double buffered data ensures data integrity
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Output Characteristics

Output	Internal TE Bus
Format	User defined or Vista TEC default
Content	Any Word from any message into any available output word position

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