GE GE □□□ Series Service Manual

IS200DSPXH1BBD

1. Description

SPECIFICATIONS

2. Specifications

Specification	Value
Assembly	**Level Base Level**
Functional	**Revision B; ISBus Revision One**
Group	**Variation H, Conformal Coating**
I/O	**Connectors 3; P1, P5, and P6**
Manufacturer	**GE Motors and Industrial Systems**
Memory	**Flash, NVRAM, RAM, and Add-Only**
Standard	**Hardware Stack Overflow (INT0), Inner Loop Load Pulse (INT1), Two Configurable Inputs (INT2 and INT3)**
About	**the IS200DSPXH1B**
Digital	**Signal Controller Board model IS200DSPXH1B is one of the DSPX models that can be used in conjunction with the EX2100 Excitation Controller series. The DSPX model is not equipped with any fuses, does not have any adjustable hardware, and does not contain any user test points. If your IS200DSPXH1B model is being used in conjunction with the EX2100 Series the DSPX board will be attached to another board which is known as the EISB; if needed these two boards can be detached.**

3. Product Information

SPECIFICATIONS

Part No.: IS200DSPXH1BBD

Manufacturer: General Electric

Function: DSP Control Board

Country of Manufacture: United States (USA)

LED: DS1, DS2

I/O connectors: P1, P5, P6

Assembly: Base Level

Revision: B, ISBus Revision One

I/O Connectors: P1, P5, and P6

Memory: Flash, NVRAM, RAM, and Add-Only

Repair: 3-5 Days

Test point ports: P6 and P7

Product Type: PCB

Availability: In Stock

Series: EX2100

Functional Description

IS200DSPXH1BBD functions as DSP (Digital Signal Processor) Control board developed by GE. It is the primary controller for the Innovation Series drives bridge, motor regulator, and gating functions. It also controls the EX2100 Excitation Control's generator field control functions. The logic, processing, and interface functions are all provided by the board. The board is comprised of a high-performance digital signal processor (DSP), standard memory components, and an application-specific integrated circuit (ASIC) that performs custom logic functions. The two LEDs on this board display Fault and Status information. When there are problems with the board, the red DS1 LED will illuminate. The green DS2 LED will flash when the board is operating normally, will be solid when the DSP has stopped, and will be off when a fault occurs during reset.

Features

At the assembly level, the functional revision is B with ISBus Revision One, featuring group variation H and conformal coating. The I/O connectors consist of three: P1, P5, and P6. Manufactured by GE Motors and Industrial Systems, the board incorporates various memory types including Flash, NVRAM, RAM, and Add-Only, along with standard hardware components such as Stack Overflow (INT0), Inner Loop Load Pulse (INT1), and two configurable inputs (INT2 and INT3) at the base level.

It offers a range of I/O Definitions, including a P6 engineering monitor port designed to establish a connection with the DSP synchronous serial port. Additionally, there is a P1 backplane connector that facilitates memory mapping, and a P5 DSP emulator port that not only serves as a scan interface for emulation but also supports FLASH programming.

Once installed, the board is positioned within the board rack and establishes its connection with the backplane through a 128-pin, 4-row DIN connector. Within the EX2100 series, this board is categorized under the DSPX model, and it can be affixed to another board of the series, specifically the EISB model. However, it's important to note that these two boards can also be detached, offering a level of flexibility in system configuration.

Standard Hardware Features

The Digital Signal Processor (DSP) is a key hardware component of the system, offering significant processing power and efficiency for digital signal processing tasks.

Processing Speed: The DSP operates at a speed of 60 MHz, indicating the frequency at which it performs calculations and executes instructions. The high clock speed enables the DSP to handle complex mathematical operations and real-time signal processing tasks efficiently. This processing speed is crucial for applications that require fast and accurate data processing, such as audio and video processing, communications systems, control systems, and digital signal analysis.

Specialized Microprocessor: The DSP is a specialized microprocessor designed specifically for handling digital signal processing tasks. It is optimized for performing mathematical operations, filtering, modulation/demodulation, and other signal manipulation tasks. Compared to general-purpose microprocessors, the DSP offers higher computational efficiency and parallel processing capabilities, making it ideal for real-time signal processing applications.

Algorithm Execution: The DSP's hardware architecture is designed to execute complex algorithms efficiently. It features specialized arithmetic logic units (ALUs) and multiplier-accumulators (MACs) that can perform multiply-accumulate operations, which are fundamental to many signal processing algorithms. These hardware components enable the DSP to execute repetitive mathematical computations quickly and accurately, minimizing processing time and ensuring reliable results.

Data Memory: The DSP includes dedicated data memory resources, such as registers and data buffers, to store and manipulate the input and output data during signal processing operations.

External Interrupts

The hardware is equipped to handle four external interrupts during normal operation. These interrupts serve as signals that prompt the DSP to temporarily suspend its current execution and respond to specific events. The four external interrupts are:

Inner Loop Load Pulse (INT1): This interrupt, labeled INT1, is triggered by a load pulse generated within the inner loop of the system. It allows the DSP to allocate resources or perform specific actions based on this event.

Stack Overflow (INT0): INT0 is an interrupt that is triggered when the system's stack, used for storing temporary data during program execution, overflows. This interrupt helps prevent data corruption and enables appropriate error handling.

Two Configurable Inputs (INT2, INT3): The system also includes two configurable inputs, INT2 and INT3, that can be programmed to respond to specific events or signals. These interrupts provide flexibility in designing the system to accommodate various external conditions or requirements.

Memory Types

FLASH Memory: The system utilizes FLASH memory for multiple purposes, including storing DSP boot images, executable code, configurable item storage, and system history records. FLASH memory is nonvolatile, meaning it retains its data even when the power is turned off. It allows for storing and retrieving crucial system information and software components.

RAM (Random Access Memory): RAM is employed for data storage and code execution. It provides temporary storage for variables, intermediate results, and data buffers during program execution. RAM is volatile memory, meaning its content is lost when the power is disconnected. It offers fast read and write access, enabling efficient data manipulation and processing by the DSP.

NVRAM (Nonvolatile Random Access Memory): NVRAM serves as nonvolatile data storage. It retains data even when power is removed. NVRAM is typically used to store critical system parameters, configuration settings, or user-specific data that need to be preserved across power cycles or system resets.

Add-On Memory: The board incorporates add-on memory specifically for board revision identification. This memory is used to store information related to the board revision, allowing the system to identify and differentiate between different hardware revisions. It helps ensure compatibility and proper functioning of the system with the specific hardware version.

These standard hardware features, including the DSP operating at 60 MHz, external interrupts for event handling, and the various memory types such as FLASH, RAM, NVRAM, and add-on memory, collectively contribute to the system's functionality, performance, and data storage capabilities.

Onboard Firmware

Boot Loader: The boot loader is a fundamental component of the firmware that manages the power-on sequence of the device. It is responsible for initializing essential system components and establishing the necessary environment for the device to start up correctly. It is important to note that the boot loader should not be reloaded or modified in the field, as any changes to this critical component could disrupt the proper functioning of the device.

Application Code for Control Functions: The specific control functions for the drive or exciter product are defined by the application code. This code contains the instructions and algorithms that govern the behavior and performance of the device. The application code is loaded into the exciter through the Tool port, which provides a means for programming the device with the required control functions. This allows for customization and adaptation of the device's behavior to suit specific application requirements.

Configuration Parameter Loading: Configuration parameters are essential settings that determine various operating characteristics of the device. These parameters are typically loaded using a toolbox or configuration software. The Unit Data Highway is utilized to load configuration parameters specific to the exciter. This data highway serves as a communication pathway for transferring the configuration parameters to the appropriate sections of the exciter.

Exciter Parameter Loading: The exciter parameters, which govern the behavior and performance of the exciter module, are loaded using the Unit Data Highway. These parameters can include settings such as voltage limits, feedback loop gains, control modes, and other operational parameters. By loading the exciter parameters, the device can be fine-tuned to operate optimally based on the specific application requirements.

Drive Parameter Loading: In cases where the device functions as a drive, additional parameters specific to the drive functionality may need to be loaded. These drive parameters, such as motor speed limits, acceleration and deceleration rates, torque control settings, and communication configurations, are loaded into the Advanced Control Language (ACL_) section of the device. The drive parameters can be loaded via a serial port, ISBus (industrial serial bus), or Ethernet, depending on the available interfaces.

I/O connectors

P1 backplane connector

P5 DSP emulator port

P6 engineering monitor port

Specialized Hardware Functions

Custom logic in Field Programmable Gate Arrays (FPGA) or ASICs with supporting circuits is used to provide specialized functions on the DSPX board.

ASICs contain the majority of specialized and support functions. Figure 2 shows the DSPX Board ASIC Block Diagram. P1 has four serial interfaces, which are as follows:

Two 5 Mb/s ISBusTM interfaces that can be used as either master or slave.

One asynchronous TTL interface for a PC-based configuration tool that includes RX, TX, and TXEN/RTS data signals.

One asynchronous TTL interface to a programmer board that includes RX, TX, and RTS data signals.

The following functions are performed by synchronizing load pulse signals:

An inner loop load pulse signal captures the values of I/O such as bridge, motor, or generator voltages and current VCOs, tachometer counters, and discrete inputs.

It can also synchronize ISBus channels, software, and bridge gating outputs.

An application loop load pulse signal is used to capture values of other application VCOs and optionally the tachs at a sub-multiple or multiple of the inner loop load pulse.

Both the foreground stack (from internal memory) and the background stack have overflow detection (from external SRAM). If either stack overflows, an interrupt INT0 is generated. A hard reset is generated if both stacks overflow. A configuration register is provided to disable the stack overflow reset. The DSP activates and periodically toggles a watchdog timer (toggle interval is configurable). A watchdog timer timeout will result in a hard reset. A free running timer of 24 bits is also provided and is used as a reference for certain functions.

IS200DSPXH1B Technical Specifications

Assembly Level Base Level

Functional Revision B; ISBus Revision One

Group Variation H, Conformal Coating

I/O Connectors 3; P1, P5, and P6

Manufacturer GE Motors and Industrial Systems

Memory Flash, NVRAM, RAM, and Add-Only

Standard Hardware Stack Overflow (INT0), Inner Loop Load Pulse (INT1), Two Configurable Inputs (INT2 and INT3)

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Four different memory types are available within your IS200DSPXH1B model, they are NVRAM, RAM, add-only memory, and FLASH memory. Each memory has an original function, the functions are as follows; the RAM is typically used for the execution of codes and storage of data; the NVRAM is used for the nonvolatile storage of data; the add-only memory of your DSPX board allows for identification of revisions, and the FLASH memory of the board is used for the execution of code, history records within the system, and memory for digital signal processor boot images.