GE GE □□□ Series Service Manual

IS200VAICH1C

1. Description

IS200VAICH1C Technical Specifications

2. Specifications

Specification	Value
Original	**Manufacturer GE General Electric**
Series	**Mark VI**
GE	**Functional Product Number IS200VAICH1C**
Functional	**Description Analog I/O Board**
Instruction	**Manual GEH-6421**
Functional	**Acronym VAIC**
PCB	**Coating Style Conformal Coating**
Primary	**Functional Revision C**
About	**the IS200VAICH1C**
The	**IS200VAICH1C board component is part of GE's Mark VI turbine control system. The Mark VI Turbine Control System Series in specific is one of the most complex, most advanced Speedtronic systems created by General Electric. This IS200VAICH1C device is considered something of a versatile model of Mark VI Turbine Control System Series product offering, as it can be used to create both TMR (triple modular redundant) and Simplex control systems for industrial turbine systems (gas or steam). However, most Mark VI components are now in legacy status and are no longer supported by the OEM. We here at AX Control do our best to keep these products in our on-hand, ready-to-ship stock so we can more quickly fulfill o**

3. Product Information

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SPECIFICATIONS

Part Number: IS200VAICH1C

Manufacturer: General Electric

Series: Mark VI

Product Type: Analog I/O Board

Function: VAIC Processor Board

Number of Channels: 24 Channels (20 AI, 4 AO)

Availability: In Stock

Country of Origin: USA

IS200VAICH1C is a VME Analog Input/Output (VAIC) Board manufactured by General Electric as a part of the Mark VI Series used in gas turbine control systems. The Analog Input/Output (VAIC) board accepts 20 analog inputs and controls 4 analog outputs. Each terminal board accepts 10 inputs and 2 outputs. Cables connect the terminal board to the VME rack where the VAIC processor board is located. VAIC converts the inputs to digital values and transfers them over the VME backplane to the VCMI board, and then to the controller. For outputs, the VAIC converts digital values to analog currents and drives these through the terminal board into the customer circuit. VAIC supports both simplex and triple modular redundant (TMR) applications. When used in a TMR configuration, input signals on the terminal board are fanned out to three VME board racks R, S, and T, each containing a VAIC. Output signals are driven with a proprietary circuit that creates the desired current using all three VAICs. In the event of a hardware failure, the bad VAIC is removed from the output and the remaining two boards continue to produce the correct current. When used in a simplex configuration, the terminal board provides input signals to a single VAIC, which provides all of the currents for outputs.

COMPATIBILITY

There are two generations of the VAIC board with corresponding terminal boards. The original VAIC includes all versions prior to and including VAICH1C. VAICH1B is included in this generation. When driving 20 mA outputs these boards support up to 500 load resistance at the end of 1000 ft of #18 wire. This generation of the board requires terminal board TBAIH1B or earlier for proper operation. They also work properly with all revisions of DTAI terminal boards. The newest VAICH1D and any subsequent releases are designed to support higher load resistance for 20 mA outputs drive voltage: up to 18 V is available at the terminal board screw terminals. This permits operation into loads of 800 with 1000 ft of #18 wire with margin. This generation of the board requires TBAIH1C or later, or any revision of STAI.

VAIC Analog Input Terminal Boards and Cabling (TMR System)

Fig 1: VAIC, Analog Input Terminal Boards, and Cabling (TMR System)

INSTALLATION

Power down the VME processor rack

Slide in the board and push the top and bottom levers in with your hands to seat its edge connectors

Tighten the captive screws at the top and bottom of the front panel

OPERATION

The VAIC board accepts 20 analog inputs, controls 4 analog outputs, and contains signal conditioning, an analog MUX, an A/D converter, and a D/A converter. The type of analog input, either voltage, 4-20 mA, or terminal board. Two of the four analog output circuits are 4-20 mA and the other two can be configured for 4-20 mA or 0-200 mA. Inputs and outputs have noise suppression circuitry to protect against surge and high-frequency noise.

VAIC and Analog Input Terminal Board Simplex System

Fig 2: VAIC and Analog Input Terminal Board, Simplex System

In a TMR system, analog inputs fan out to the three control racks from JR1, JS1, and JT1. The 24 V dc power to the transducers comes from all three VME racks and is diode OR selected on the terminal board. Each analog current output is fed by currents from all three VAICs. The actual output current is measured with a series resistor, which feeds a voltage back to each VAIC. The resulting output is the voted middle value (median) of the three currents. The following figure shows VAIC in a TMR arrangement. Transmitters/transducers can be powered by the 24 V dc source in the control system or can be powered independently. Diagnostics monitor each output and a suicide relay disconnects the corresponding output if a fault cannot be cleared by a command from the processor. Hardware filters on the terminal board suppress high-frequency noise. Additional software filters on VAIC provide configurable low pass filtering.

COMPRESSOR STALL DETECTION

VAIC firmware includes gas turbine compressor stall detection, executed at 200 Hz. Two stall algorithms can be selected. Both use the first four analog inputs, scanned at 200 Hz. One algorithm is for small LM gas turbines and uses two pressure transducers (refer to the figure, Small (LM) Gas Turbine Compressor Stall Detection Algorithm). The other algorithm is for heavy-duty gas turbines and uses three pressure transducers (refer to the figure, Heavy Duty Gas Turbine Compressor Stall Detection Algorithm). Real-time inputs are separated from the configured parameters for clarity. The parameter CompStalType selects the type of algorithm required, either two transducers or three. PS3 is the compressor discharge pressure. A drop in this pressure (PS3 drop) indicates a possible compressor stall. The algorithm also calculates the rate of change of discharge pressure, dPS3dt, and compares these values with configured stall parameters (KPS3 constants). The compressor stall trip is initiated by VAIC, which sends the signal to the controller where it is used to initiate a shutdown. The shutdown signal can be used to set all the fuel shut-off valves (FSOV) through any relay output.

Three LEDs at the top of the VAIC front panel provide status information. The normal RUN condition is flashing green, and FAIL is a solid red. The third LED displays STATUS and is normally off, but displays a steady orange if a diagnostic alarm condition exists on the board. Diagnostic checks include the following:

Each analog input has hardware limit checking based on preset (non-configurable) high and low levels set near the ends of the operating range. If this limit is exceeded a logic signal is set and the input is no longer scanned. If any L3DIAG_VAIC, which refers to the entire board. Details of the individual diagnostics are available from the toolbox. The diagnostic signals can be individually latched, and then reset with the RESET_DIA signal.

Each input has system limit checking based on configurable high and low levels. These limits can be used to generate alarms and can be configured for enabling/disabling, and as latching/non-latching. RESET_SYS resets the out-of-limits.

In TMR systems, if one signal varies from the voted value (median value) by more than a predetermined limit, that signal is identified and a fault is created. This can provide an early indication of a problem developing in one channel.

Monitor D/A outputs, output currents, total current, suicide relays, and 20/200 mA scaling relays; these are checked for reasonability and can create a fault.

TBAI has its own ID device that is interrogated by VAIC. The board ID is coded into a read-only chip containing the terminal board serial number, board type, revision number, and the JR, JS, and JT connector location. When the chip is read by the I/O processor and a mismatch is encountered, a hardware incompatibility fault is created.

Hardware Tips and Specifications

The IS200VAICH1C works in conjunction with a terminal board that can accept ten inputs and two outputs. The board and its corresponding terminal board work inside a Mark VI VME processor rack, communicating with other boards within this location. Each board is individually identifiable. The IS200VAICH1C board is built with a single-width front faceplate that includes three status LEDs and two clips that will keep the unit in place once it has been installed in the rack system. The rear edge of the board has two horizontal connectors. The board itself is populated by capacitors, resistors, processor chips, and other ICs, transistors, and diodes. Most components are marked with original manufacturer marks and with their reference designation. Codes on the surface of the board will help with positioning and wiring the board. This IS200VAICH1C product is edited from the base product of its original Mark VI Series functional role through its installation of an atypical C-rated revision.

Installation and handling procedures can be sourced through original manuals or user guides from General Electric. Please follow all safety procedures recommended in these publications. Installation procedures should be read and understood before you unbox your new component. This specific IS200VAICH1C printed circuit board product offering is generally not followed by any great amount of originally-printed instructional manual materials online, which is more than likely attributable to its status as one of the more copyright infringed-upon General Electric Mark product series iterations since its rollout following the Mark V Turbine Control System Series of a similar full extended series name. Due in large part to this concerted lack of instructional documentation, the IS200VAICH1C functional product number itself can actually be isolated as a fine supplementary source of IS200VAICH1C Board hardware component and component specification information, as it codes for various relevant IS200VAICH1C Board details through a series of consecutive functional naming segments. For instance, the IS200VAICH1C product number begins with an iteration of the dual-functional IS200 series tag dictating this IS200VAICH1C PCB's normal Mark VI Series assembly on top of its more standard domestic original manufacture location. Some of the other relevant IS200VAICH1C Board qualities exposed through this medium include its:

VAIC functional product acronym

Group one Mark VI Series grouping

Conformal PCB coating style

Sole C-rated revision