8000 Series I/O

Remote I/O Catalog Summary

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One of many cabinets designed and fabricated by NovaTech in Owings Mills, MD USA.

NovaTech 8000 Series I/O Overview

Overview

The NovaTech 8000 Series I/O is the newest remote I/O family native to the D/3[®] Distributed Control System (DCS). It is the preferred I/O for new installations and it can replace the older NovaTech 16000 series I/O in existing PCM cabinets, using existing field wiring connected to new termination panels with existing connectors. It also replaces Quantum I/O.

With its -40°C to +70°C temperature range and G3 corrosive coating, the NovaTech 8000 Series I/O is an I/O system designed for field mounting. It connects to conventional and smart field devices through multi-channel I/O modules. The modules communicate, via a fast internal bus, with redundant Ethernet Bus Interface Modules (EBIMs) which provide dual-redundant high speed Ethernet data connections to the D/3.

Up to 64 I/O modules can be supported within a single 8000 Series node, and each module has between 4 and 32 channels. A PCM EthernetMPC2 card can support up to 50 nodes. With the availability of intrinsically safe (IS) modules, 8000 Series I/O provides a solution for both general purpose and hazardous area applications—even within the same node.

When used with PCM 4100, PCM 4200, or PCI based PCMs, 8000 Series I/O requires an Ethernet Multi Protocol Controller 2 (EthernetMPC2) card and D/3 version 12.2 or higher. When used with PCM 5 and D/3 version 16.0 or higher the EthernetMPC2 card is not required.

Key Features

- Wide range of input and output types, in any mix
- Up to 64 I/O modules per node
- Up to 50 nodes per EthernetMPC2 card
- Wide operating temperature range -40°C to +70°C
- General-purpose and IS I/O within a single node
- Redundant Local Area Networks (LAN) and power supplies supported
- High channel density
- Zone 2 and Division 2 hazardous area mounting as standard
- I/O module hot-swapping even in Zone 2 and Division 2
- HART[®] pass-through supported
- Rugged construction, optimized for true field mounting
- Integrated (per-channel) fusing and loop-disconnect facility
- Bussed field power on carriers eliminates daisy-chain wiring at field terminals
- Sophisticated mechanical keying system eliminates risk to plant and personnel

8000 Series connects to both conventional I/O (such as 4-20 mA) and smart field devices. It allows the cost benefits of fieldbus to be enjoyed with existing field instruments—ideal for plant upgrades and expansions. Pass-through of HART information between HART instruments and the D/3 network is possible.

8000 Series nodes can be located within, and connected into, a hazardous area where there is a risk of explosion. The standard, general purpose system is approved for operation in a Zone 2 or Class I, Division 2 hazardous area, with field devices in a similarly classified area. I/O modules with IS field circuits can be connected to certified devices in Zone 0 and Class I, II, III, Division 1 hazardous areas.

Enclosures are also available for application where the Series 8000 node must be located in a Zone 1 or Division 1 area—consult NovaTech for availability.



Node Architecture

An 8000 Series node comprises single or redundant Ethernet Bus Interface Modules, up to 64 I/O modules, field terminals, and associated power supplies.

A schematic node architecture is shown above. Information from the I/O modules is transferred to and from the communication module (EBIM) via the Railbus. The Railbus is a fast, serial data bus with parallel module addressing and extends over the full length of the node. The parallel address architecture means that each I/O module position has a unique address which eliminates the need to 'train' modules during installation.

Power for the node is provided by integrated power supply modules; these convert the locally available power source into a regulated internal supply rail. This rail energizes the EBIM and all Railbus communication between the EBIM and I/O modules.

For some I/O module types—such as those with low-power and IS field circuits—it also provides power for the field wiring. Where additional power is required for field devices (such as high current AC circuits), power can be provided by means of cabled connections from each module to external relays. This Bussed Field Power facility reduces installation time by removing the need to make daisy chain wiring connections at the field terminals of each I/O module.

Node Operation

A typical request for data from the field might happen as follows:

The D/3[®] DCS requires the temperature from a particular RTD input at a particular node and transmits a signal on the I/O LAN. There are several Series 8000 nodes on the I/O LAN, but the EBIM at the chosen node recognizes its own node address, and acknowledges the request.

At each node, the input modules constantly monitor, linearize and digitize their respective field signals, and make them available to scanning on the node's internal bus (Railbus).

The EBIM continually scans the I/O modules via the Railbus, and builds up a map of the values of the input variables, ready for the PCM to read. These are converted into the LAN protocol and placed on the LAN by the EBIM, together with acknowledgment signals. The D/3 then interprets the signal and reconstructs the temperature reading.

NovaTech 8000 Series I/O Components



Modules

I/O modules transfer signals to and from field instruments. Input modules receive signals from transmitters and sensors and convert them into a digital form for presentation to the EBIM. Output modules receive commands from the EBIM and transfer them to actuators. A wide range of modules is available, including types for low-level instrumentation, AC circuits, and intrinsically safe (IS) signals. I/O modules typically have 4, 8, 16, or 32 field channels.

Carriers

Carriers allow the 8000 Series I/O to mount onto a flat panel or T- or G-section DIN rail. They support and interconnect the EBIM, power supplies, I/O modules and field terminals, and carry the address, data and power lines of the internal Railbus. They provide termination points for the LAN and field wiring cable shields and can also distribute bussed field power to the I/O modules. I/O module carriers support eight I/O modules.

Field Terminal Assemblies

Field terminal assemblies provide the interface between the I/O modules and the field wiring. They include fusing and loop disconnect as options. A mechanical keying system prevents an I/O module from being connected to the wrong type of field terminal. Field terminals mount onto the module carrier, one to each I/O module. They are clamped firmly by the I/O module to form an electrical and mechanical assembly of high integrity. They may be replaced in service without removing carriers or disturbing the operation of other modules.

Power Supplies

8000 Series I/O power supplies accept locally available unregulated power and provide a regulated supply for the EBIM and I/O modules. Supply redundancy is supported. The system power supply at an 8000 Series node converts the local supply to power the node, and can also provide field power for I/O modules with low-level field circuits. Where heavy-current or AC mains circuits are handled by the I/O modules, the 8000 Series method for distributing field power avoids complex wiring at the field terminal and minimizes the backplane/carrier wiring.



Ethernet Bus Interface Module

NovaTech 8000 Series I/O uses the Ethernet Bus Interface Module (EBIM) to provide a high speed Ethernet data connection to the D/3[®]. The EBIMs communicate using a proprietary protocol over Ethernet at speeds of 10/100MB to the D/3 PCMs.

NovaTech 8000 Series I/O Support

8000 Series I/O offers a variety of I/O boards and signal conditioning termination panels suitable for virtually every standard process sensor and actuator. Details on signal conditioning termination panels, as well as their associated I/O function boards, can be obtained in individual specification sheets. The standard D/3 configuration supports such I/O signals as:

- Analog Inputs: 4-20 mA, 0-1 V, 0-5 V, 0-10 V, 1-5 V, ±10 V, RTDs, thermocouples
- · Analog Outputs: 4-20 mA

- Digital and Pulse Inputs:
 - > Contact Closures +24 V dc
 - > Contact Closures 115 V ac
 - > Pulse Counting up to 500 Hz @ +24 V dc
- Digital and Pulse Outputs:
 - > DC Output 2 to 60 V dc
 - > AC Output 20 to 265 V ac
 - > Pulse Output 2 msec. to 130 sec @ 2 to 60 V dc
 - > Pulse Output 2 msec. to 130 sec. @ 20 to 265 V ac

NovaTech 8000 Series System Specifications

Mechanical

Mounting Method	Flat panel or DIN-rail
DIN-rail types'Top	hat', 35 x 7.5 mm to EN 50022
	or 35 x 15 mm to EN 50022
	or G-section, to EN 50035

Railbus (Backplane)

Maximumphysicallength*ofnode	6.8m(22ft)
Maximum number of extender cables	3
*overall, including backplanes and extender cables	

Node Size

BIM/Controller type	Module limit
8521-EB-NT	64 max.

Note: I/O module carriers used with these must conform to the same module address limits. See I/O module carrier datasheets for details.

Electrical

EMC compliance	To BS EN 61326	5:1998
Electrical safety	EN 61	1010-1

Isolation

I/O Modules - 2/2	
Between isolated channels250	V ac rms (to EN 61010-1)
	.(tested at 2.3 kV ac rms)
Channel (any) to Railbus	
(Except where stated on individual modu	ule specifications)

I/O Modules - 2/1

Between hazardous area terminals and Railbus60 V ac rms Between IS field circuits of separate I/O modules[†]500 V ac rms Between any IS field circuit & non-IS field circuit250 V ac rmsrefer to individual module specifications † 60 second test

Environmental

Ambient temp

Operating, optimum orientation*	-40°C to +70°C
(except where stated in individual module specificat	ions)
Operating, non-optimum orientation*	40°C to +50°C
(except where stated in individual module specificat	ions)
Storage	40°C to +85°C
*Optimum orientation is when the carrier is mount	ed in a vertical
plane with field terminals located below the module	es

Ingress ProtectionIP20 to BS EN60529:1992 (Additional protection by means of enclosure)

Corrosive atmospheres: Designed to meet ten year service in Class G3 corrosive environment, as defined by ISA Standard SP71.04.

Vibration - Storage & Transport		
EN 60068-2-6 (Sinusoidal Vibration)	10-500 Hz 5 g for surface mounting, 1 g for DIN-rail mounting	
BS2011:Part 2.1 (Random Vibration)	20-500 Hz 5 g for surface mounting 1 g for DIN-rail mounting	

Vibration - Operating	
EN 60068-2-6 (Sinusoidal Vibration)	10-500 Hz 5 g for surface mounting, 1 g for DIN-rail mounting
BS2011:Part 2.1 (Random Vibration)	20-500 Hz 5 g for surface mounting 1 g for DIN-rail mounting

Shock - Storage & Transport		
EN 60068-2-6	1 m drop onto flat concrete	
Shock - Operating		

EN 60068-2-6	30 g peak acceleration with 11 ms pulse width
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Hazardous Area Approvals - 2/2 Node

Field equipment and wiring location

Hazardous Area Approvals - 2/1 Node

Field equipment and wiring location

...... Zone 0, IIC hazardous area or Class 1, Div 2, Groups A-D hazardous location (Temperature classification will be determined by the field apparatus)

Application standards:

- Factory Mutual Research Co., Class No. 3611 for Class I, Division 2, Groups A, B, C, D hazardous locations
- Factory Mutual Research Co., Class No. 3610 for Class I, II, III, Division 1, 2 Groups A-G hazardous locations
- EN 50014:1992 Electrical apparatus for potentially explosive atmospheres, general requirements
- EN 50020:1995 Electrical apparatus for potentially explosive atmospheres, intrinsically safe "i"
- EN 50021:1999 Electrical apparatus for potentially explosive atmospheres, type of protection "n"
- EC Directive 94/9/EC (ATEX 100A)

Local Area Network

Fieldbus	protocols	supported	Modbus	(RTU	mode)
				Profib	us - DP

Note:

1. Protocols are selected by choice of Bus Interface Module 2. For other protocols consult NovaTech

Configuration: 1) via host LAN (if supported by LAN) 2) via PC connected locally at configuration port

Node address setting	Software settable in the BIM
LAN physical medium (configural	ole on carrier)
LAN A	RS485 or RS422, 5-wire
LAN B (where available)	RS485 or RS422, 5-wire
LAN isolation	
LAN A to B (if applicable)	
LAN A or B to system ground	

Local Area Network

System Supply	
Local supply input	18.5-36 V dc input
Supply redundancy	supported
Railbus supply voltage	12 V dc ± 5%

NovaTech 8000 Series EBIM NT-8521-EB-NV and NT-8522-EB-NV

The 8000 Series EBIMs, NT-8521-EB-NV and NT-8522-EB-NV, are rugged, field-mountable, D/3[®] 8000 I/O communications controllers. The EBIM supports full redundant operation, with provisions for redundant communications and automatic switchover to the standby EBIM if required. The EBIM supports HART pass-through, which can be used for remote maintenance of HART field devices.

The new, compact EBIM 8522-EB-NV is a replacement to the existing EBIM 8521-EB-NV (not backwards compatible). The 8522-EB-NV is supported by D/3 Version 16.1 Update 4, or by V16.1-1 or newer.

Key Features

- · Redundancy with bumpless transfer
- · Dual-redundant high-speed Ethernet connections
- · Field mountable in harsh process environments
- Online configuration and reconfiguration
- HART[®] pass-through of process and status variables
- Supports both zone 2/2 (81xx) and zone 2/1 (82xx) IO modules

Online Changes

EBIMs allow online configuration changes. You can add or remove EBIMs, add or remove modules, activate or deactivate points, activate or deactivate HART, and change module and point parameters all online.

Built-in Diagnostics

Extended diagnostics are available to provide module and channel status information, including high and low alarm, open circuit detection, and line fault detection at the device level and "fail-safe" perform level.

High System Availability - Easy Maintenance

Maximize up-time through use of redundant EBIM controllers, power supplies, and network connections. "Hot swap" modules without affecting system operation or re-configuring even in hazardous areas.

EBIM Redundancy

Redundant EBIMs can be used for critical control applications. The redundant EBIM pair operates in parallel, checking status multiple times through the processing loop enabling the backup EBIM to continuously monitor the health of the master EBIM, assuring a rapid and bumpless transfer to the standby EBIM.



Network Redundancy

In addition to EBIM redundancy, the EBIM has two high-speed Ethernet ports to provide security of communication. Each port can be connected to an independent LAN which is continuously monitored for its integrity. The fault tolerant network protocol provides network diagnostics and manages network connectivity. If the primary port detects a network failure, traffic is immediately switched to the other LAN to maintain full communication.

Failsafe and Automatic Cold Start

In the event of complete loss of communication the EBIM will adopt a user-defined failsafe mode and similarly instruct the I/O to take up user-defined failsafe values. In the event of power loss the EBIM will perform a cold restart.

I/O Module Configuration

The EBIM receives full details of all the I/O modules under its control and stores the information in non-volatile memory. At start-up the controller downloads to the modules their configuration details, which also include the failsafe states they should adopt in the event of communication failure.

Firmware Updates

In keeping with its ability to maintain operations on a continuous basis, redundant EBIMs are also capable of receiving a firmware upgrade. An EBIM can receive an update to its firmware while still in the field. When the upgrade has been confirmed as successful, the EBIM can be returned to full operation as a master or as a protective standby and the redundant EBIM's firmware can then be upgraded.

HART Pass-through

The EBIM has the ability to pass smart HART[®] information from field devices to the D/3[®] PCM and to a separate PC workstation. The D/3 PCM can read the additional four HART process variables associated with each 4-20 mA signal and also the instrument alarm and warning statuses. Connecting the I/O switch to a PC workstation allows you to readily interface to asset management software applications, to remotely manage the HART information contained in your HART-based field instruments. The EBIM works with a variety of asset management packages, including Endress+Hauser's FieldCare.

Hazardous Area Operation

The EBIM is designed also to operate in Class 1, Division 2, and Zone 2 hazardous areas and can control I/O modules that have field wiring extending into the more hazardous Division 1, Zone 1, and Zone 0 areas.

Grows As Your Needs Grow

The system is scalable to your needs. You can add modular I/O to your system as your needs increase. Redundant EBIMs can be added without the need to power off your system - the backup EBIM powers up automatically and is seamlessly brought online.

Environmental Stability

Like all of the 8000 Series equipment, the EBIM is designed for use in harsh environments. It operates over a temperature range of -40°C to +70°C and is resistant to shock, vibration, and corrosive environments.

Power Supplies

Each EBIM can be powered individually. NovaTech's recommends using redundant or load sharing supplies to power the EBIMs. The EBIM carrier can also accommodate a Power Supply Monitor module (NT-8410-NS-PS), which monitors the health signals available from up to seven power supplies and reports problems to the D/3.

8000 with Intrinsically Safe Field Wiring

The 8000 Series I/O System is also capable of supporting I/O modules with intrinsically safe (IS) field wiring, for connection to certified or 'simple apparatus' field devices in Division 1 or Zone 0 hazardous areas. A range of I/O module types with IS field circuits for industry-standard DI, DO, AI, AO, and pulse applications is supported.

Integrated Intrinsically Safe Power Supplies

Power for IS I/O modules is derived from integrated, modular power supply units. Each power unit is capable of supplying between eight and twenty I/O modules, depending on the I/O type and mix. Optional power supply redundancy is supported by means of an additional, redundant supply unit connected in an 'n+1' arrangement. In applications with mixed IS and non-IS safe field wiring, the full facilities of the 'Bussed Field Power' regime are retained for the non-IS part of the system. In nodes populated only with IS I/O modules, a separate system power supply module provides power for the Bus Interface Module and 'node services'. Redundancy of this supply is also supported.

LAN Interface

Transmission medium	100BaseTX or 10BaseT Ethernet
Transmission protocol	Modbus over High Speed Ethernet
Transmission rates	10-100 Mbits/s
LAN connector type (x2)	RJ45 (8-pin)
LAN Insulation (Dielectric withsta	and)1500 V
Action on software malfunction .	Halt CPU/Reset CPU
Max. nodes per EMPC2	

Hazardous Area Approvals

Location of controllerZone 2, IIC T5 hazardous areaor Class 1, Div 2, Groups A, B, C, D T5 hazardous location

Applicable standards:

- · Factory Mutual Research Co., Class No. 3611 for Class I, Division 2, Groups A, B, C, D hazardous locations
- CSA Std C22.2 No. 213 for Class 1, Division 2, Groups A, B, C, D hazardous locations
- ATEX Category 3 (for Zone 2 installation) to EN50021:1999 protection type 'n'
- UL 61010-1 "Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements, 2nd Edition

Environmental

Refer to System Specifications

Mechanical

NT-8522-EB-NV	
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Module dimensions	40 (w) x 160 (d) x 120 (h) mm
Weight (approx.)	800 g

NT-8521-EB-NV

Module dimensions	69 (w) x 232 (d) x 138 (h) mm
Weight (approx.)	1.35 kg

Compatible Mounting Backplane

NT-8522-EB-NV	
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NT-8755-CA-NS Redundant EBIM Carrier

Carrier	dimensions:	~170	(w) x	170 (c	l) x 40 (h) mm
Carrier	weight:					500g

NT-8521-EB-NV

NT-8750-CA-NS Redundant EBIM Carrier

Carrier dimensions:	~200 (w) x 253	(d) x 55 (h) mm
Carrier weight:		1.43 kg

NT-8753-CA-NS Simplex EBIM Carrier

Carrier dimensions:	~110 (w) x 253 (d) x 55 (h) mm
Carrier weight:	1.0 kg



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