

Orbit 60 Series System

Datasheet

Bently Nevada Machinery Condition Monitoring

137M5182 Rev. H



Plant-wide • One System

The Orbit 60 Series Protection and Condition Monitoring System provides one continuous, online monitoring system for both critical and plant-wide applications.

Cyber Secure • Data Isolation

Orbit 60 Series data isolation creates a safe industrial data environment designed to meet ISA 62443 with world class network security features and segregation of protection and condition monitoring functions.

Modular • Flexible • Scalable

The Orbit 60 Series system may be deployed in any combination of rackmounted and distributed hardware. This provides for better alignment of instrumentation to the machinery application.

High Speed Process Data Integration

Next generation architecture facilitates full bi-directional communications with plant control systems over a suite of standard protocols.

Extended Field Wiring Length

With the Orbit 60 Series distributed architecture, connection of multiple chassis through Bridge modules decreases overall electrical installation costs, reduces analog ground loops and noise issues, and moves key maintenance activities further from hazardous areas.

Industry Leading System Capabilities

The Orbit 60 Series is designed to support monitoring of single machine trains or multiple machines in a single deployment. Each system is defined by one System Interface Module (SIM) and can encompass up to 80 dynamic channels and 10 chassis using Bridge modules to link them.



*Embedded display will not be available in first release.



System Overview

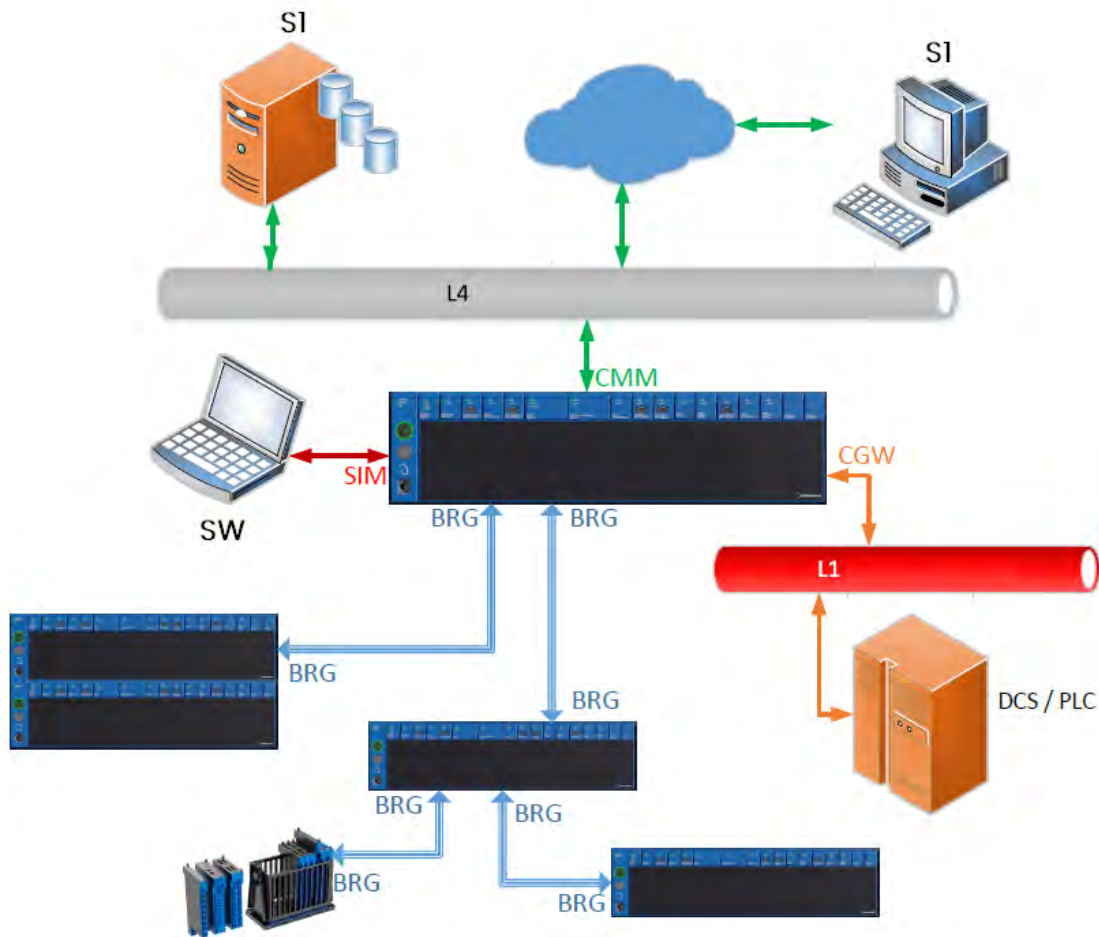
The Orbit 60 Series Protection and Condition Monitoring System provides a single platform for the continuous online monitoring of both critical and plant-wide applications. The Orbit 60 Series system may be deployed in any combination of rackmounted and distributed hardware, with Bridge modules creating a seamless connection between chassis to make a single system.

The table below gives a general overview of the components that make the Orbit 60 platform. They are grouped into System Modules, Input Modules, and Output Modules.

Table 1: Component Modules

System Modules User Guide (142M9080)	Chassis	19" Chassis - 3U high - 19 general purpose slots 19" Chassis - 6U high - 28 general purpose slots 12" Chassis - 3U high - 10 general purpose slots
	Power	Power Interface Module (PIM)
	Processors	System Interface Module (SIM) Protection Processing Module (PPM) Condition Monitoring Module (CMM)
	Comms	Bridge (BRG) Communication Gateway (CGW) - Modbus (Serial or Ethernet) or EGD (Ethernet)
Input Modules User Guide (137M0804)	Dynamic (4 channels)	Negative Dynamic Input (provides power for negatively powered transducers) <ul style="list-style-type: none"> • Prox, Accel, Velom (PAV) • Prox, Accel, Seismic (PAS) • Prox, Accel, Aero (PAA) • Prox, Accel, DC LVDT (PAD) • High Speed Keyphasor (KPH) Positive Dynamic Input (PVT) (provides power for positively powered transducers) AC LVDT
	Static (6 channels)	RTD/TC Temperature (RTD) Isolated TC Temperature (ITC) Isolated Discrete Input or Process Variable (PVD)
Output Modules User Guide (137M0803)	Relays	Electro-Mechanical Relays (EMR) Solid State Relays (SSR)
	Rec Outs	Recorder Outputs (REC) (4-20 mA, 1-5 Vdc or 0-10 Vdc)
	Display	External Display

Orbit 60 System Level Diagram



SIM - System Interface Module

CMM - Condition Monitoring Module

CGW - Comm Gateway Module

BRG - Bridge Module

SI - System I Server or Client

CNFG - Orbit Studio Configuration Software

DCS/PLC - Distributed Control Systems/
 Programmable Logic Controller

L1 - Unit Network **L4** - Business Network

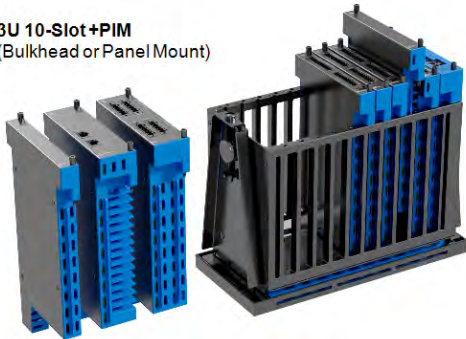
One System Interface Module (SIM) defines a system of up to 80 dynamic channels, accommodating multiple machine trains and supporting unrestricted synchronous Keyphasors for any channel. The Condition Monitoring Module (CMM) interfaces to the business network through a cyber secure access port. The Communications Gateway (CGW) sends and receives high speed, bi-directional process data with the control systems. Bridged (BRG) connections make up to 10 chassis act as a single system while decreasing overall installation costs, reducing ground loops, and minimizing electrical noise.

Orbit 60 Series Chassis

Each chassis option can be deployed flexibly with a public facing side (for rack or panel mounts) and a utility side (for wiring connections and bulkhead mounts). Modules are inserted and all wiring connections made from the utility side. The public side of the chassis is provisioned for status LEDs, configuration port, Config/Run key, and reset button. Chassis are available in three types: 3U 12" 10 slot, 3U 19" 19 slot, and 6U 19" 28 slot.

Chassis Types

3U 10-Slot+PIM
(Bulkhead or Panel Mount)



6U 28-Slot+PIM
(Bulkhead, Rack, or Panel Mount)



3U 19-Slot+PIM
(Bulkhead, Rack, or Panel Mount)

*Embedded display will not be available in first release.

Mounting Options

- **Panel Mount** – Mounts to rectangular cutouts in panels and secures to the panel using clamps supplied with the chassis in 3U 12" half-size, 3U 19" standard, and 6U 19" standard configurations. The 6U 19" will fit in the space of a 3500 rack.
- **Rackmount** – Mounts the 3U or 6U chassis on 19-inch EIA rails. Two 3U units or a single 6U form factor has been designed to fit within the space of a single 19" rackmount 3500 unit, as a retrofit.
- **Bulkhead** – Typically mounts into a protective enclosure fastened to a sub panel in 3U 12", 3U 19" standard, and 6U 19" standard configurations. NEMA 4 and 4X weatherproof housings are available when required for environmental protection or when purge air is used.

System Interface Module



A single System Interface Module (SIM) is required to define a system, whether it is just one chassis or if the system bridges across multiple chassis. The SIM occupies one slot and must be adjacent to the Power Input Module (PIM) in a panel or rackmount chassis. The SIM controls protection configuration management, local display, system-level diagnostics, system LEDs, system contacts, and the system protection fault relay.

The System Interface Module is the access point for configuring and maintaining the system. The module will communicate to the configuration utility and transmit the configuration to the other modules in the system. A key-lock switch on the public side of the SIM secures the system configuration, preventing unauthorized changes to the configuration settings. The LED indications for POWER 1 / POWER 2 show PIM status. The SIM LED indicates SIM is installed in the correct slot and operational.



Contacts and Communications

RST - Reset Contact or Button	Used to clear all latched alarms and NOT OK statuses across the system.
INHB - System Alarm Inhibit Contact	Used to inhibit all alarms within the system.
TM - Trip Multiply Contact	Used to place the system in Trip Multiply.
LOCK - Configuration Lock Contact or Key	PRG - Allows configuration changes to be made to the system. RUN - Locks the system, blocking configuration changes.
Protection Fault Relay	Indicates that all the protection functions within the system are operational.
Ethernet Ports: 1 public side 2 utility side	3 Ethernet ports for configuration of the system or data feed to the display module.

LED Indications

OK	Indicates the operational status of the module.
LINK	Internal Communication LED - successful communication on the internal network.
ATTN	Attention LED - compromised protection path or unacknowledged system events.
INHB	Inhibit LED - one or more configured alarming functions have been inhibited.

LED Indications	
LOCK	Indicates the system is in Run mode.
RST	Reset LED, indicates reset contact closed.
TM	Trip Multiply LED indicates that the system is in Trip Multiply mode.
Fault	System Fault Relay - Indicates the state of the alarming functions within the system.

Protection Processing Module



The Protection Processing Module (PPM) serves as the computational engine for the protection system, extracting all machinery measurements for the protection system and performs alarm determinations. The PPM analyzes signals from transducers, as well as process data through the Communications Gateway Module (CGW). Each module occupies a single slot within the system.

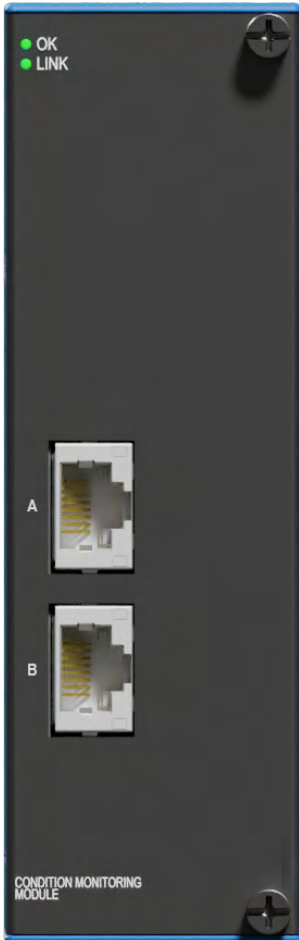


The number of channels supported by each PPM is a function of the type of processing required on the data. For example, in Turbomachinery applications, one PPM can typically support up to 80 dynamic channels. You can add multiple PPMs to the system to provide additional processing capability or to provide redundancy in protection applications.

Condition Monitoring Module



The Condition Monitoring Module (CMM) is the data acquisition and storage module for the system. It is a specialized computational engine designed to support condition monitoring applications and communications between System 1 Condition Monitoring software and Orbit 60 Series modules.



The CMM module receives all data produced by the system through a one-way information stream from the chassis. This allows the CMM to interface with business tier or remotely hosted networks to provide data to the host software without placing the protection functions at risk from cyberattacks.

The CMM listens to all information on the system chassis, including all measurements, waveforms, digital transducer signals, system controls, status information, system configuration information, process data from external systems, alarm and events logs.

Each module occupies two slots within the system. Multiple CMM modules can be placed into a system to allow additional processing power, multiple users independent access, or for redundant communications to System 1. The CMM performs all data capture functions such as alarm and transient captures. The historical data is buffered in non-volatile storage until the information is offloaded to the host software. System 1 can configure the CMM module to extract additional measurements and waveforms from system sensor data.

Each module has two independently configurable RJ-45 ethernet ports. The module OK LED indicates when the module is functioning properly and the LINK LED indicates when the module is communicating to the rest of the system.

Communication Gateway Module



The Communication Gateway Module (CGW) module provides information to external hosts including: measurements, alarms, statuses, and configuration information using standard industrial protocols. The CGW is designed to be used as part of a protection loop.



Through the Communication Gateway module, the system can acquire process data from external control systems, human interfaces, and historians. The data can also be acted on by the Condition Monitoring Module and passed through to System 1. The Communication Gateway module occupies a single slot.

There are two versions of the CGW module:

- **Serial** - Two RS-485 ports supporting Modbus protocol
- **Ethernet** - Two RJ-45 ethernet ports supporting Modbus and EGD protocols

The module OK LED indicates when the module is functioning properly and the LINK LED indicates when the module is communicating to the rest of the system.

Bridge Module (BRG)



The base-to-base Bridge module connects multiple chassis to make a distributed system. Bridge connectivity enables flexible deployments in linear or star topologies. This system significantly reduces field wiring cost, especially when extending to remote locations. Each Bridge module communicates all data in the local chassis and replicates to the remote chassis. In this way, all data within the system is communicated to all devices in the system.



The Bridge module provides protection from incompatible networks interfering with the operation of the system by blocking any transmissions from non-approved sources onto the chassis.

The module OK LED indicates when the module is functioning properly and the LINK LED indicates when the module is communicating to the rest of the system.

To link chassis together within a system, each chassis must contain at least one Bridge module, depending upon the number of connections. Bridge modules are connected using triple redundant cabling to ensure that a faulted cable does not affect operation of the system. The Bridge module occupies a single slot.

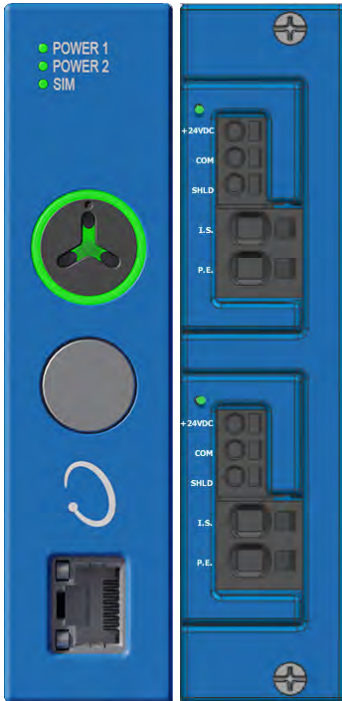
There are three cables between the two bridge modules, one in each chassis. These cables are for redundancy both for intermittent packet failures and for failure of a cable. All three cables must go between the same two bridges and are required for protection applications, single connections are only allowed for condition monitoring only applications. Multiple bridge modules connecting the same two chassis is not supported. The loss of a cable will cause a fault indication, but the system will still function even if only a single cable is functional. The fault indication will be enunciated by the Attention status and Protection Fault if the protection path crosses the bridge. The recommended wiring method is to run these three cables separate from each other so all three will not be damaged in particular circumstances. The three cables between the bridges must be close to the same length to avoid differences in propagation timing between the three paths.

The cables used are IX Ethernet cables. Even though the cables are IX Ethernet the traffic between the two bridge modules is not compatible with Ethernet Switches and Routers and can not be connected to an Ethernet network. If the bridge detects that there is traffic other than the expected bridge to bridge messages, it will shut down communication and indicate a fault. The initial release of the product will have copper IX Ethernet cables that have a maximum length of 100M. Future releases of the product will have an option for Fiber Optic bridge modules to extend the length of the connection.



Power Input Module

The Power Input Module (PIM) always resides in a special-purposed slot located in the first slot of the chassis. Every chassis must be powered through at least one PIM and each chassis requires its own PIMs and power sources. Redundant PIMs and power sources are strongly recommended.



The PIM is a half-height module that connects an external power source to the system. Each Orbit 60 Series chassis supports two stacked redundant power input modules. When both power inputs are utilized, failure of one power source does not affect the operation of the system.

The PIMs support input voltages ranging from +21 Vdc to +32 Vdc. The most common power source comes from external DIN rail mounted AC/DC +24 Vdc output power supplies. Connections to Instrument Common and Protective Earth are available.

You can remove and insert a single Power Input Module without disrupting system operation as long as another PIM remains installed and connected to its input power source.

The PIM employs out-of-range protection for mis-wiring, over voltage, and over current protection for the input power sources.

The Instrument Common and Protective Earth connections for the system are made at the utility side of the PIM.

LED Indications	
POWER 1 (public side)	Upper power input is powering the system.
POWER 2 (public side)	Lower power input is powering the system.
Module OK LED (utility side of each module)	Indicates when the power source connected to the PIM is within the appropriate range. Under voltage lockout keeps the system from turning on and will not cause damage. Extreme over voltage will cause PIM fuse to open.
Connections	
Voltage	+21 Vdc to +32 Vdc
IS	Instrument Common
PE	Protective Earth

Transducer Input Modules

The Orbit 60 Series system interfaces to multiple transducer types. The system also provides short circuit protected power for transducers that require power.

Table 1: Table 2: Supported Transducer Types

Input Module Type	Supported Transducer Types	Number of Channels	Input Module Type	Supported Transducers Types	Number of Channels
Negative Dynamic Input (PAV) Prox, Accel, Velom	3-wire (-) Accel 3-wire (-) Prox 2-wire Velomitor 2-wire IEPE Magnetic pickup	4	Positive Voltage Dynamic Input (PVT)	3-wire (+) Accel 3-wire (+) Prox 2-wire IEPE	4
Negative Dynamic Input (PAS) Prox, Accel, Seismic	3-wire (-) Accel 3-wire (-) Prox Seismoprobe Magnetic pickup	4	High Speed Keyphasor	3-wire Accel 3-wire Prox Magnetic pickup	4
			AC LVDT Input	4-wire AC LVDT 5-wire AC LVDT 6-wire AC LVDT	4
Negative Dynamic Input (PAA) Proximity, Accel, Aero	3-wire (-) Accel 3-wire (-) Prox Magnetic pickup HTVAS Acceleration Interface Module	4	RTD / TC Input	Type J, K, E, T 3-wire RTD	6
			Isolated TC Input	Type J, K, E, T	6
Negative Dynamic Input (PAD) Proximity, Accel, DC LVDT	3-wire (-) Prox 3-wire (-) Accel DC LVDT	4	Isolated Discrete Input /Process Variable	4-20 mA -10 V to +10 V Dry/wet contacts	6

Dynamic Input Modules



The primary purpose of the Dynamic Input module is to digitize the sensor signal at a rate that completely encompasses the signal content and provides transducer power for various sensors. The Orbit 60 Series Dynamic Input module is a 4-channel input module available in both negative and positive dynamic input options. The inputs can also be used for speed or Keyphasor signals.

Negative Transducer Input Module

These cards are designed to work with negative voltage external sensors offering four variants:

- **PAV** Negative Dynamic Sampler (Prox, Accel, Velom) - This module accommodates more than 80% of available input sensors allowing greater flexibility with one firmware enabled module.
- **PAS** Negative Dynamic Sampler (Prox, Accel, Seismic)
- **PAA** Negative Dynamic Sampler (Prox, Accel, Aero)
- **PAD** Negative Dynamic Sampler (Prox, Accel, DC LVDT)

Positive Transducer Input Module

The Positive Voltage (PVT) input module interfaces with industry standard third-party ICP sensors, as well as sensors that use a 3 wire (power, common, signal) or 2 wire (A/+ and B/-) positive voltage interface.

- **PVT** Positive Dynamic Sampler (Prox, Accel, Velom)

The Dynamic Input module uses an ix Industrial connection to provide access to four buffered transducer output (BTO) connectors. The BTO connection is available on the public and utility side of the module.



High Speed Keyphasor Input Module



Unlike previous systems, the Orbit 60 Series system supports Keyphasor configurations for any dynamic input channel through the PAV, PAS, PAA, and PAE input modules. For high phase accuracy applications, over 12,000 rpm, the isolated high speed Keyphasor module can be applied, supporting four transducer inputs per module. Inputs to this module can also be configured as prox vibration inputs. The Keyphasor input module occupies a single slot.



Any channel on the module can be configured as a once per turn Keyphasor or a multiple event per turn speed signal from a rotating shaft or gear used to provide a precision timing measurement. The Keyphasor Input Module is designed to work with the following transducers:

- Magnetic pickup
- 3-wire Prox
- 3-wire Accel

The module creates the Keyphasor signal when the sensor reads a notch or protrusion in the target. The signal is digitized and processed to provide machine rotative speed and vector parameters, such as IX amplitude and phase. The Keyphasor gives phase reference information for a vibration measurement, providing key relationships for diagnostic analysis.

The module OK LED indicates when the module is functioning properly and the LINK LED indicates when the module is communicating to the rest of the system. Four Channel Status LEDs located on the utility side of the module indicate when the connected sensor is installed and in OK condition.

AC LVDT Input Module



The Orbit 60 Series AC LVDT Input Module provides inputs to interface to four AC Linear Variable Differential Transformers for position measurements. It is mainly used for measurement of case expansion and valve position. The AC LVDT input module occupies a single slot.



The AC LVDT configured channels can be connected to:

- 4-wire AC LVDT
- 5-wire AC LVDT
- 6-wire AC LVDT

The module OK LED indicates when the module is functioning properly and the LINK LED indicates when the module is communicating to the rest of the system. Four Channel Status LEDs located on the utility side of the module indicate when the connected sensor is installed and in OK condition.

Dynamic Input Module Sensors and Measurements

Table 1: Table 3: List of Sensors, Measurements, Modules, Barriers, and Isolators

Sensor Type Supported	Measurement Type	Dynamic Input Module Type							External Barriers	Galvanic Isolators
		PAV	PAS	PAA	PAD	PVT	AC LVDT	KPH		
Proximitors (3-wire)	Displacement	X	X	X	X	X		X	175502	397A8827 397A8826
Accelerometers (3-wire)	Acceleration*	X	X	X	X			X	175502	397A8827 397A8826
HTVAS High-Temp Velocity Accel	Acceleration*, Velocity*			X					175502	397A8827 397A8826
86517 and 86497 Interface Modules	Acceleration*, Velocity*, Dynamic Pressure			X					175502	397A8827 397A8826
350500 Charge Amplifier	Dynamic Pressure	X	X	X	X				175502	397A8827 397A8826
350501 Charge Amplifier	Acceleration*	X	X	X	X				175502	397A8827 397A8826
Velomitors (2-wire)	Velocity*	X				X			177241	397A8827 397A8826
Seismoprobe (2-wire)	Velocity*		X						N/A	N/A
Proximitors Keyphasors (3-wire)	Speed, Gap	X	X	X	X			X	175502	397A8827 397A8826
IEPE Positive Constant Current (370300) (2-wire)	Acceleration*, Velocity*, Dynamic Pressure					X			176394	397A8827 397A8826
Negative Biased Constant Current (2-wire)	Acceleration*, Velocity*, Dynamic Pressure	X							177241	397A8827 397A8826
DC LVDT	Position				X				283615	N/A
AC LVDT	Position						X		N/A	N/A
Magnetic Speed Pickups	Speed	X	X	X	X			X	N/A	N/A

* These measurements can be integrated to provide additional measurement types.

Static Input Modules



The Orbit 60 Series static input modules (Temperature, Process Variables, Discrete) provide six transducer connections per module. This module conditions and digitizes the inputs at a rate that completely encompasses the signal content and allows for removal of typical noise sources.

The three modules are:

- RTD/TC Temperature Input Module (RTD)
- Isolated TC Temperature Input Module (ITC)
- Isolated Process Variable / Discrete Input Module (PVD)

The primary purposes of these modules are to:

- Continuously process input from connected inputs to be compared against configured alarm setpoints to drive alarms for machinery protection
- Provide discrete inputs for essential operational commands, such as Trip Multiply for machine start-up and Alarm Inhibit.

These modules occupy a single slot. The module OK LED indicates when the module is functioning properly and the LINK LED indicates when the module is communicating to the rest of the system. Six Channel Status LEDs located on the utility side of the module indicate when the connected sensor is installed and in OK condition.



RTD/TC Temperature Input Module (RTD)

Each channel of the Orbit 60 Series RTD/TC input module is individually configurable for sensor type and range. The thermocouple configured channels provide cold junction compensation for type J, K, E, or T thermocouple. The RTD/TC inputs are referenced to the internal system ground and for this reason should only be connected to transducers that are isolated at the sensing end.

Isolated TC Input Module (ITC)

Each channel of the Orbit 60 Series Isolated TC input module is individually configurable for sensor type and range. The thermocouple configured channels provide cold junction compensation for type J, K, E, or T thermocouples.

The Isolated TC input module has the circuitry to isolate the inputs from both system ground and channel to channel on the same module. This module is typically used for any grounded tip thermocouple, often in electrical equipment applications.

Isolated Process Variable / Discrete Input Module (PVD)

The Orbit 60 Series Isolated Process Variable and Discrete Input module processes machine critical parameters such as pressure, flow, temperature, and levels that merit continuous monitoring. The module conditions and digitizes the signals so that the result can be compared with user-programmable alarm setpoints. The user can program the PVD module using the Orbit Configuration software to perform current, voltage or discrete input measurements.

The monitor accepts +4 to +20 mA current inputs or any proportional voltage inputs between -10 Vdc and +10 Vdc, in addition to monitoring "dry" or "wet" contacts which can be a sensor, switch, or relay.

Recorder Outputs



The Recorder_Output module is a 8-channel module that converts measurements within the Orbit 60 Series to a proportional current or voltage output that can be connected to external systems for communications purposes. Recorder outputs can be ordered in SIL rated versions.

Recorder_Output modules can be configured to represent any measurement provided within the system. This module occupies a single slot.



These outputs adhere to Namur 43 specification and indicate Not OK conditions. This module is available for SIL applications.

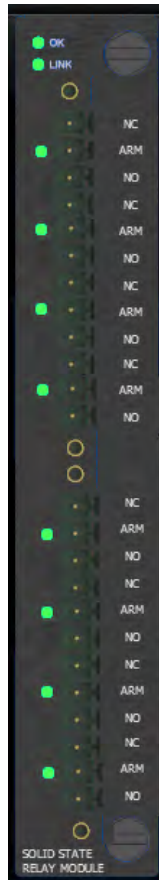
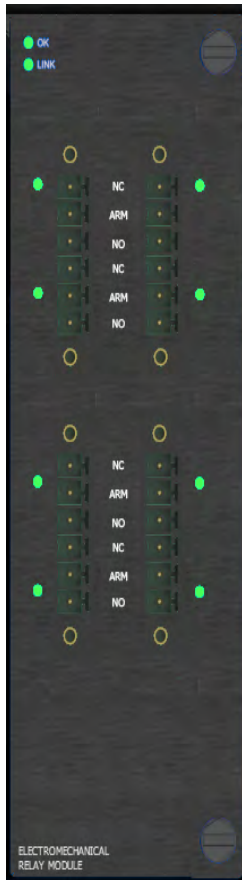
Output Types	4 to 20 mA 1 to 5 V 0 to 10 V
Signal Load for Current Output	Load generally $\geq 100 \Omega$ Range: 0 to 600 Ω
Signal Load for Voltage Output	100 k Ω or higher
Maximum Current Load	22 mA
Short Circuit Protection	A short circuit on any recorder output will not impact adjacent recorder outputs.
Output Characteristics	<ul style="list-style-type: none"> ■ 1% signal output error ■ 1 ms default update rate ■ 10 ms maximum signal delay

The module OK LED indicates when the module is functioning properly and the LINK LED indicates when the module is communicating to the rest of the system. The utility side of the module shows eight Channel Status LEDs, which indicate the condition of each channel.

Relay Modules



Relay modules provide a set of relays that can be programmed to actuate based on alarm conditions defined in other modules. They are programmable with standard logic elements to combine various alarms and statuses into relay activation conditions. The voting logic can be configured with AND and OR logic, utilizing alarming inputs from input modules, Not-OK statuses, and individual measured values from any module in the system. Use Orbit Studio to program the voting logic.



Relays can also be programmed to operate as system protection fault relays, when the included protection fault relay on the SIM does not provide adequate granularity of system health - typically for multiple machines in one system.

Electromechanical Relay (EMR)

Used for applications where the relay is used to directly drive a load, either directly or through an interposing relay. This module takes two slots. It features **8 Single Pole Double Throw Electromechanical Relays**. This module Supports voltage range of 5V-240 Vac for load of 100mA to 4.5A and DC voltages and loads as follows 5V-30VDC at 4.5A, 48VDC at 0.75A, and 125VDC at 0.2A.

Solid State Relay (SSR)

This relay is used for low current communication applications where the relay is connected to a discrete input for an external system. It only takes a single slot and features **8 Solid State Relays**. This module supports voltages up to 125 Vdc and loads of 1 mA to 125mA.

Pairs of relays within a module can be configured to function as a single Double Pole Double Throw relay. All relay types are available for SIL system implementation.

Display Options

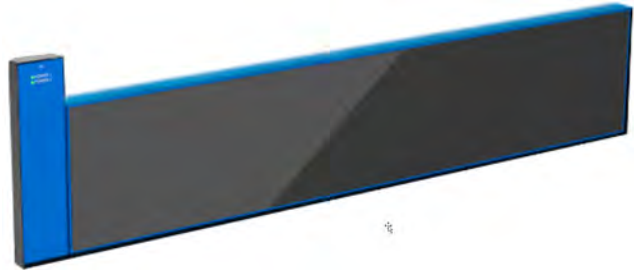
There are two Orbit 60 Front Panel Module options.

Standard Front Panel Module



The standard Front Panel Module is for Orbit 60 bases that have a SIM module installed. The Standard Front Panel Module displays the status of the power supplies, the presence of a SIM Module, and whether the SIM Module is in Program mode. The Front Panel Module can send program and reset requests via the key switch and reset buttons. The Front Panel Module provides an Ethernet port from the SIM to the RJ45 jack, with link and activity LEDs on the front of the Orbit 60 base.

Remote Front Panel Module



The remote Front Panel Module is for Orbit 60 bases that do not have a SIM module installed. The Remote Front Panel displays the status of the power supplies.

External Display

The external display utilizes an industrial computer connected to the SIM via Ethernet, the computer and display can be placed where needed for each application. The 10.4", 15", and 21.5" VGA touchscreen displays are designed for excellent viewing quality in industrial applications. The 10.4" display is suitable for use in hazardous area locations across the world. The 15" display is certified for hazardous areas for North America only.

Mounting Options

You can mount the displays in a remote enclosure, panel, or rack.

10.4" Display Can be mounted in a rack, panel, and enclosure.

15" Display Can be mounted in a rack, panel, and enclosure.

21.5" Display Can be mounted in a rack or panel.

If you want to use the 21.5" display, before ordering, verify that your 19" rack equipment enclosure can contain the 21.5" display. If rack-mounted, you must be able to access the controls at the rear of the 21.5" display. The 21.5" display is 22" wide. When mounted, the display extends 1.5" beyond each side of a 19" equipment rack. Doors, brackets, and other hardware must not interfere with the mounted display. To accommodate the display, the rack must not extend forward more than 1.1".

Bently Nevada Industrial Computer

The Orbit 60 Series Industrial Computer is certified for hazardous environments when installed in a NEMA3 or NEMA4 enclosure. The industrial computer uses a 64-bit OS to communicate with an Orbit 60 Base SIM module to gather and output data to supported displays. The small form factor (5.2 x 4.8 x 3.4 in (132 x 122 x 87 mm)) enables you mount it on a DIN-rail.

Display Content

By default, one bar graph screen shows all the primary measurements. Use the Orbit Studio configuration software to create custom screens displaying additional information, machine train groups, and system-wide data displays.



- System event list
- Alarm event list
- All module and channel data
- Alarm and OK status
- Nine custom display options

System 1 Integration

Take full advantage of System 1 Condition Monitoring Software in conjunction with Orbit 60 Series for complete monitoring and advanced diagnostics for all machine types, including roller element bearings. Use the Orbit 60 Series Condition Monitoring Module (CMM) for a read-only access point to provide a cyber secure approach for obtaining data through the business network or other systems.

When used in conjunction with the Comm Gateway module, high speed bi-directional process data can be relayed to System 1 along with system generated data.



Orbit Studio Configuration Software

Multiple Systems Configuration

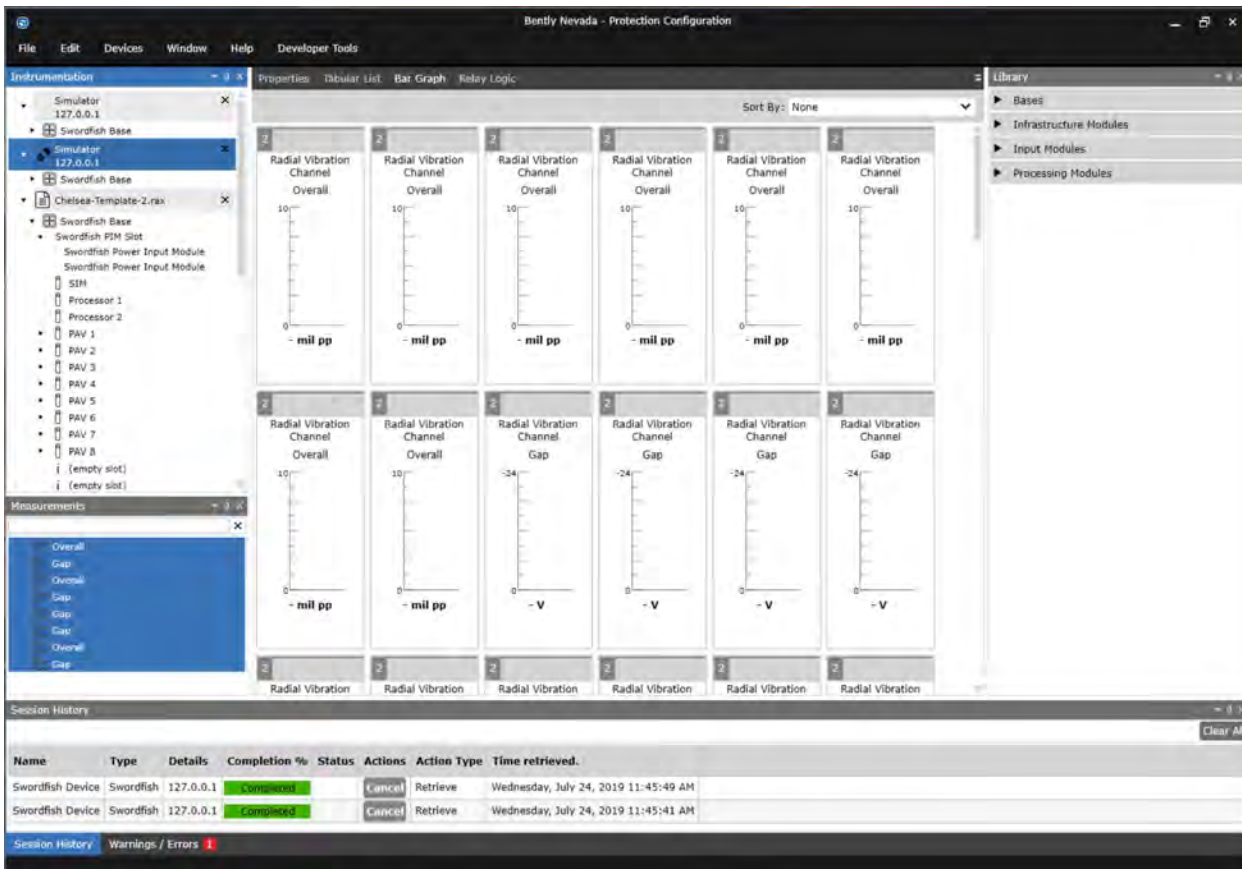
The Orbit Studio enables you to connect to multiple systems from a single client session, opening multiple offline configuration files alongside active connected systems to allow for easy cross-referencing across systems, while enabling security through user-based permissions. Copy and paste functions apply across systems and configuration files. Perform send and retrieve operations for multiple systems at a time.

Graphical System and Relay Configuration

Create and manage multiple pages of relay logic by graphically configuring, one channel per page, with drag and drop elements and connectors. Your system can also be graphically assembled by dragging and dropping components from a library of modules. The resulting assembly produces a hierarchical representation of the system for access to individual channels.

Current Values and Loop Check

View current value data across all channels within a system. Loop checks can be performed via bar graphs, tabular lists, and live plots for dynamic data, from channels throughout the system.



Specifications

Orbit 60 System

System Inputs	
Voltage Input	+21 to +32 Vdc
Current Draw	
3U 19" full load	8.6 Amps max
6U 19" full load	14.3 Amps @ 24 Vdc max
3U 12" full load	5.3 Amps max
Power Consumption	
3U 19" full load	120 Watts typical 180 Watts max
6U 19" full load	160 Watts typical 300 Watts max
3U 12" full load	70 Watts typical 110 Watts max
Out of Range Protection	An under voltage does not harm the PIM. An over voltage causes the fuse to open.
Chassis Loading	No minimum chassis loading is required.
System Weight	
3U 19" Chassis	32 lbs (14.5 kg)
6U 19" Chassis	64 lbs (29.03 kg)
3U 12" Chassis	18 lbs (8.16 kg)

System Physical Dimensions	
3U Standard Chassis	
Width	19" (48.26 cm) - with bezel 18.87" (47.93 cm) - panel mount without bezel 17.53" (44.53 cm) - rackmount without bezel
Height	5.2" (13.21 cm) - with bezel
Depth	9.67" (24.56 cm)
6U Standard Chassis	
Width	19" (48.26 cm) - with bezel 18.87" (47.93 cm) - panel mount without bezel 17.53" (44.53 cm) - rackmount without bezel
Height	10.47" (26.6 cm) - with bezel
Depth	9.67" (24.56 cm)
3U 12" Chassis	
Width	11.44" (29.06 cm) - with bezel 9.97" (25.32 cm) - w/o bezel
Height	5.2" (13.21 cm) - with bezel
Depth	9.67" (24.56 cm)
Single Wide Module	
Width	0.8" (2.03 cm)
Height	5.2" (13.21 cm)
Depth	9.67" (24.56 cm)
Double Wide Module	
Width	1.64" (4.17 cm)
Height	5.2" (13.21 cm)
Depth	9.67" (24.56 cm)

System Environmental	
Operating Temperature Range (indoor use only)	-30° C to +70° C (-22° F to 158° F)
Storage Temperature Range	-40°C to +85°C (-40° F to 185° F)
Relative Humidity	0% to 95% rH non-condensing operating and storage
Vibration	5g @ 57-500 Hz. IEC 60068-2-6
Shock	10g, 11ms IEC 60068-2-27
Altitude	< 2000 m (6,562 ft)
Pollution Degree	Pollution Degree 2
Installation Category	Category II

System Interface Module(SIM)

SIM Inputs	
Data	Three independent 10/100/1000 BaseT Auto-negotiation Cable Length 100 metres (328 feet) max 1 public side 2 utility side
Power Consumption	15.1 Watts maximum
Max Channels	Up to 80 dynamic channels with one SIM defining a system.

SIM Controls	
Reset Contact or Button	Used to clear all latched alarms and NOT OK statuses across system. ¹
System Alarm Inhibit Contact	Used to inhibit all alarms within the system.
Trip Multiply Contact	Used to place the system in Trip Multiply.
Configuration Lock Contact or Key	PRG - Used to change configuration. RUN - Locks the system, blocking configuration changes. ²

¹ Performed by either closing the contact on the module or pressing the button on the front panel.

² Performed by either closing the contact on module or setting the key on the front to the RUN setting on the front panel.

Communications Gateway (CGW)

Communications Gateway (CGW)	
Power	14.2 Watts max
Data	Two independent 10/100/1000 BaseT Auto-negotiation

Protection Processor Module (PPM)

Protection Processor Module (PPM)	
Power	12.7 Watts max

Dynamic Input Modules

Dynamic Input Module Types


PAV	(-) (Prox, Accel, Velom)
PAS	(-) (Prox, Accel, Seismic)
PAA	(-) (Prox, Accel, Aero)
PAD	(-) (Prox, Accel, DC LVDT)
PVT	(+) (Prox, Accel, Velom)

Dynamic Input Module Inputs

Power	14.2 Watts max
Analog Input	See Dynamic Input Module Sensors and Measurements on page 14.
Channels Supported	4 Dynamic Inputs

Dynamic Input Module Outputs

Analog Buffered Transducer Output	Short circuit protected output signal available through BTO connector on public and utility side.
-----------------------------------	---

 This is a true analog signal from the input, not digital to analog reconstitution of the input signal.

High Speed Keyphasor

High Speed Keyphasor Inputs


Power	14.2 Watts max
Analog Input	See Dynamic Input Module Sensors and Measurements on page 14.
Channels	4 Dynamic Inputs

High Speed Keyphasor Signal Conditioning

Speed/ Frequency Signal Ranges	Input range of 1 to 120,000 cpm (0.017 to 2 kHz).
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High Speed Keyphasor Outputs

Analog Buffered Transducer Output	Short circuit protected output signal available through BTO connector on public and utility side.
-----------------------------------	---

 This is a true analog signal from the input, not digital to analog reconstitution of the input signal.

AC LVDT

AC LVDT Inputs

Signal	Accepts 1 to 4 signal inputs from AC LVDT
Power Consumption	8.5 Watts typical, 12 Watts max

Isolated Process Variable / Discrete Input (PVD)

PVD Electrical

Power Consumption	1.5 watts typical, 5 watts maximum
Channels	6
Isolation	700 V Channel to System and Channel to Channel isolation

PVD Input

4 to 20 mA	0 to 25mA DC
-10 Vdc to +10 Vdc	-10Vdc to +10Vdc +-1%
Discrete Input with Two-Terminal Dry Contact	Polarity Independent A/B Terminals for dry contacts

Isolated Thermocouple (ITC)

ITC Electrical	
Isolation	700 V Channel to System and Channel to Channel isolation
Power Consumption	1.5 watts typical, 5 watts maximum

ITC Inputs	
Thermocouple Sensor	Type J, K, E, T

RTD/TC Temperature (RTC)

TC Temperature	
Thermocouple	Type J, K, E, T
Channel Supported	6

RTD Temperature	
RTD Type	Pt100 (385), Pt100 (392), Ni120, Cu10

Recorder Output Module

Recorder Inputs	
Input Signal	Accepts 1 to 6 processed signals from available input modules over the communication bus
Power Consumption	1.5 watts typical, 5 watts maximum

Recorder Outputs	
Output Types	4 to 20 mA range across load 1 to 5 V range across load 0 to 10 V range across load

Relay Specifications

Power Consumption	1.5 watts typical, 5 watts maximum
-------------------	------------------------------------

Electromechanical Relay (EMR)	
Type	Electromechanical Single-Pole, Double-Throw
Number of Relay Outputs	8
Environmental	Epoxy Sealed
Operation	Each relay is configurable for Normally De-Energized or Normally Energized

Contact Rating for Standard Systems	
Minimum Switched Current	100 mA
DC Maximum Switched Current	4.5 A @ 30 VDC
DC Maximum Switched Voltage	125 Vdc
AC Maximum Switched Voltage	250 Vrms
AC Maximum Switched Current	4.5 A
Maximum Switched Power	180 W or 1800 VA

Contact Rating for Hazardous Area Systems	
Maximum Switched Current	4.5 A
DC Maximum Switched Voltage	30 Vdc
AC Maximum Switched Voltage	160 Vrms

Solid State Relays (SSR)	
Type	Solid State Single-Pole, Double-Throw
Number of Relay Outputs	8
Environmental	Plastic Encapsulated
Operation	Each relay is configurable for Normally De-Energized or Normally Energized

Contact Rating for Standard Systems

Minimum Switched Current	1 mA
DC Maximum Switched Current	125 mA @ 125 Vdc
DC Maximum Switched Voltage	125 Vdc
Maximum Switched Power	650 mW

Contact Rating for Hazardous Area Systems

Maximum Switched Current	125 mA
DC Maximum Switched Voltage	50 Vdc

Display Specifications

10.4" CID2 Hazardous Area Display

Interfaces	<ul style="list-style-type: none"> VGA display output DB9 Serial port 24 V_{DC} Power input port
Diagonal Size	10.4"
Resolution	640 x 480
Aspect Ratio	4:3
Brightness	400 nits (cd/m ²)

Touchscreen	Resistive
Power	10 to 28 VDC
Operating temperature range	0 to 60°C
IP Rating	IP54 (Front Bezel only)
Certification	<ul style="list-style-type: none"> ATEX Zone 2, CID2, IECEx Zone 2

15" CID2 Hazardous Area Display

Interfaces	<ul style="list-style-type: none"> VGA and DVI-D display outputs USB 2.0 port DB9 Serial port 24 V_{DC} Power input port
Diagonal Size	15"
Resolution	1024 x 768
Aspect Ratio	4:3
Brightness	350 nits (cd/m ²)
Touchscreen	Resistive
Power	12 to 28 VDC
Operating temperature range	-20 to 60°C
IP Rating	Designed to meet IP66 (Front bezel only)
Certification	UL CID2 (North America Only Hazardous Locations)

21.5" Industrial Area Display

Interfaces	<ul style="list-style-type: none"> VGA and DVI-D display outputs USB 2.0 port DB9 Serial port
Diagonal	21.5"

Size	
Resolution	1920 x 1080
Aspect Ratio	16:9
Brightness	300 nits (cd/m ²)
Touchscreen	Projected Capacitive
Power	12 to 28 Vdc
Operating temperature range	0 to 55°C
IP Rating	IP66 (Front bezel only)
Certification	Not certified for hazardous locations.

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Interfaces	<ul style="list-style-type: none"> ■ VGA display output ■ DisplayPort display output ■ Gigabit Ethernet network port ■ USB 2.0 ports ■ DB9 Serial port
Cabinet	Brushed stainless steel
OS	64bit
Size	5.2 x 4.8 x 3.4 in. (132 x 122 x 87 mm)
Power	12 to 36 Vdc
Mounting	DIN-rail mountable
Operating temperature range	-40 to 70°C
Certification	UL CID2 (North America Only Hazardous Locations) ATEX Zone 2, IECEx Zone 2, DNV-GL, IEC 60945

Compliance and Certifications (Approvals Pending)

FCC

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

EMC

European Community Directive:

EMC Directive 2014/30/EU

Standards:

EN 61000-6-2; Immunity for Industrial Environments
EN 61000-6-4; Emissions for Industrial Environments

Electrical Safety

European Community Directive:

LV Directive 2014/35/EU

Standards:

EN 61010-1

RoHS

European Community Directive:

RoHS Directive 2011/65/EU

Cyber Security

Designed to meet IEC 62443

Maritime

DNV GL rules for classification – ships, offshore units, and high speed and light craft

ABS Rules for Condition of Classification, Part 1

- Steel Vessels Rules
- Offshore Units and Structures

Functional Safety

SIL 2

Hazardous Area Approvals (Approvals Pending)



For the detailed listing of country and product specific approvals, refer to the *Approvals Quick Reference Guide* (108M1756) available from Bently.com.

CSA/NRTL/C

Class I, Zone 2: AEx/Ex ec nC ic IIC T4 Gc;

Class I, Division 2, Groups A, B, C, and D;

T4 @ Ta = -30°C to +70°C (-22°F to +158°F)

ATEX/IECEx



T4 @ Ta = -30°C to +70°C (-22°F to +158°F)

Ordering Information



For the detailed listing of country and product specific approvals, refer to the *Approvals Quick Reference Guide* (108M1756) available from Bently.com.

Chassis

Chassis: 3U Chassis

60R/CHA01	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
-----------	--

Chassis: 3U Panel

60R/CHA02	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
-----------	--

Chassis: 3U Bulkhead

60R/CHA03	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
-----------	--

Chassis: 6U Chassis

60R/CHA04	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
-----------	--

Chassis: 6U Panel

60R/CHA05	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
-----------	--

Chassis: 6U Bulkhead

60R/CHA06	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
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Chassis: 10 Slot Panel

60R/CHA07	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
-----------	--

Chassis: 10 Slot Bulkhead

60R/CHA08	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
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System Modules

System Interface Module

60R/SIM01	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
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Protection Processing Module

60R/PPM01	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
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Condition Monitoring Module

60R/CMM01	with options for: <ul style="list-style-type: none"> • Country-specific codes
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Power Input Modules

60R/PIM01	3U Power Input Module with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
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60R/PIM02	6U Power Input Module with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
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Communications

Bridge Module

60R/BRG01	with options for:
	<ul style="list-style-type: none"> • Country-specific codes • SIL level

Communications Gateway

60R/CGW01	RJ-45 Ethernet	with options for:
		<ul style="list-style-type: none"> • Country-specific codes • SIL level
60R/CGW02	RS-485 Serial	with options for:
		<ul style="list-style-type: none"> • Country-specific codes • SIL level

Input Modules

Input: (PAV) Prox/Accel/Velom Module

60R/INP01	with options for:
	<ul style="list-style-type: none"> • Country-specific codes • SIL level

Input: (PAA) Prox/Accel/Aero Module

60R/INP02	with options for:
	<ul style="list-style-type: none"> • Country-specific codes • SIL level

Input: (PAS) Prox/Accel/Seismic Module

60R/INP03	with options for:
	<ul style="list-style-type: none"> • Country-specific codes • SIL level

Input: (PAD) Prox/Accel/DCLVDT

60R/INP04	with options for:
	<ul style="list-style-type: none"> • Country-specific codes • SIL level

Input: (PVT) Pos Voltage Xdcr Module

60R/INP05	with options for:
	<ul style="list-style-type: none"> • Country-specific codes • SIL level

Input: (KPH) Keyphasor Module

60R/INP06	with options for:
	<ul style="list-style-type: none"> • Country-specific codes • SIL level

Input: RTD / TC Module

60R/INP07	with options for:
	<ul style="list-style-type: none"> • Country-specific codes • SIL level

Input: (ITC) Isolated TC Module

60R/INP08	with options for:
	<ul style="list-style-type: none"> • Country-specific codes • SIL level

Input: (PVD) Isolated PV / DI Module

60R/INP09	with options for:
	<ul style="list-style-type: none"> • Country-specific codes • SIL level

Input: AC LVDT Module

60R/INP10	with options for:
	<ul style="list-style-type: none"> • Country-specific codes • SIL level

Output Modules

Recorder_ Output Module

60R/REC01	with options for:
	<ul style="list-style-type: none"> • Country-specific codes • SIL level

Relay: (EMR) Electro-Mech Relay Module

60R/RLY01	with options for:
	<ul style="list-style-type: none"> • Country-specific codes • SIL level

Relay: (SSR) Solid State Relay Module

60R/RLY02	with options for:
	<ul style="list-style-type: none"> • Country-specific codes • SIL level

Power Supply

AC: 110/240V (240W) for 3U chassis

60X/XPS01	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
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AC: 110/240V (480W) for 6U chassis

60X/XPS02	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
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DC: High Voltage (240W) for 3U chassis

60X/XPS03	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
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DC: High Voltage (480W) for 6U chassis

60X/XPS04	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
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External Display

60X/EXDAA-BBB-CC

AA	
01	10.4" Hazardous Area Display
02	15" Hazardous Display
03	21.5" Industrial Display
BBB – Hazardous Area Certifications	
2- 3 digits	See Approvals Quick Reference Guide (108M1756) for more information.
CC	
01	19" Rack Mount Panel
02	Panel Mount Kit
04	Independent Mount

* Displays include 10' power cable.

Bently Nevada Industrial Computer

60X/CMP-AAA

AAA	Hazardous Area Certifications
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Includes DIN Mounting Kit, 24 VDC 90-Watt DIN Mountable Power Supply, USB Mouse, 24 VDC Power Cable, 10' (3m) Ethernet Cable. A 20' Ethernet cable accessory is available.

Front Panel Configurations

3U Front Panel: SIM w/ No Display

60R/PNL01	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
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3U Front Panel: No SIM & No Display

60R/PNL03	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
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10 Slot: w/ SIM

60R/PNL05	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
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10 Slot: no SIM

60R/PNL06	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
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Dongles and Cables

60X/BTC01	4-Channel Buffered Output Adapter
60X/BCK	Bridge Field Cable Kit with option for country codes
Bridge Interface Copper Cable - 2 feet	
60X/BIC01	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
Bridge Interface Copper Cable - 10 feet	
60X/BIC02	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
Bridge Interface Copper Cable - 50 feet	
60X/BIC03	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
Bridge Interface Copper Cable - 100 feet	
60X/BIC04	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level
Bridge Interface Copper Cable - 300 feet	
60X/BIC05	with options for: <ul style="list-style-type: none"> • Country-specific codes • SIL level

External Barriers

175502	3-pin Transducer Barrier
177241	2-pin Velomitor Barrier
175990	Thermocouple Barrier
175501	RTD Barrier

External Galvanic Isolators

397A8826 397A8827	3-pin Transducer Isolator
166111	Thermocouple Isolator

166112	RTD Isolator
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Configuration Software

60X/CFG	Orbit Studio Configuration Software
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Miscellaneous

60X/WPH01	Weather Proof Housing: 3U with country-specific approval options
60X/WPH02	Weather Proof Housing: 6U with country-specific approval options
60X/WPH03	Weather Proof Housing: 10 Slot with country-specific approval options
60X/RCI01	Remote Interface: Push Button with country-specific approval options
60X/RCI02	Remote Interface: Key Switch with country-specific approval options
60X/KEY01	System Key
60X/RCI01	Remote Interface: Push Button
60X/RCI01	Remote Interface: Key Switch
60R/BLK01	Blank: Module slot blank cover
60R/BLK02	Blank: Power slot cover

Display Accessories

10.4" CID2 Hazardous Area Display

120M8155-01	Bently Nevada 10.4" Hazardous Area Display
122M3369-01	Rack Mount kit for 10" Display
122M3370-01	Panel Mount kit for 10" Display
122M3371-01	Independent Mount for 10" Display

15" CID2 Hazardous Area Display

102M8950	15" Hazardous Area Display
104M3812-01	Rack Mount Kit for 15" Display

21.5" Industrial Area Display

150M1466	21.5" Industrial Display
150M0633-01	19" Rack Mount Panel for 21.5" Display

Display Cables

		10.4"	15"	21.5"
02200794	24 VDC 90-Watt Power Supply	X	X	X
119M6509-01	10' Power cable and plug	X		
119M6509-02	10' Power cable and plug		X	X
161087-10-00	10' VGA Cable	X	X	X
161087-20-00	20' VGA Cable	X	X	X
148638-01	10' Serial Cable	X	X	
148638-02	25' Serial Cable	X	X	

174013	3m (9.8') USB Cable			X
149M1306	7m (25') USB Cable			X

Bently Nevada Industrial Computer

142M4200	Bently Nevada Industrial Computer
02200794	24 VDC 90-Watt Power Supply (can power both the industrial computer and display)
119M6509-05	10' Power cable and plug
149M1309	USB Mouse (only required for first time configuration.)
149M1310	3m (10') Ethernet Patch Cable
149M1311	7m (25') Ethernet Patch Cable

Glossary of Terms

Accel	Acceleration	RTD	Resistance Temperature Detector
Aero	Aeroderivative	SIL	Safety Integrity Level
API	American Petroleum Institute	SIM	System Interface Module
BRG	Bridge	SSR	Solid State Relay
BTO	Buffered Transducer Output	SW	Software
CGW	Communication Gateway Module	TC	Thermocouple
CMM	Condition Monitoring Module	TC/RTD	Thermocouple/Resistance Temp Detector
DCS	Distributed Control Systems	TCP/IP	Transmission Control Protocol Internet Protocol
EGD	Ethernet Global Data protocol	OEM	Orginal Equipment Manufacturer
ESD	Emergency Shutdown Device	Velom	Velomitor
EIA	Energy Information Administration		
EMR	Electro-Mechanical Relay		
HAZLOC	Hazardous Location		
HTVAS	High Temperature Velocity/Accel Sensor		
I/O	Input/Output		
IEPE	Integrated Electronics Piezo-Electric		
ITC	Isolated Thermocouple		
KPH	High Speed Keyphasor		
LVDT	Linear Variable Differential Transformer		
NEMA	National Electrical Manufacturers Association		
OEM	Orginal Equipment Manufacturer		
PAA	Prox, Accel, Seismic		
PAE	Prox, Accel, Aero		
PAS	Prox, Accel, Seismic		
PAV	Prox, Accel, Velom		
PIM	Power Input Module		
PLC	Programmable Logic Controller		
PPM	Protection Processing Module		
Prox	Proximity		
PVD	Isolated Process Variable, Discrete Input		
PVT	Positive Voltage Transducer		
REB	Roller Element Bearing		
REC	Recorder Outputs		
RMC	Remote Monitoring Center		

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1631 Bently Parkway South, Minden, Nevada USA 89423
Phone: 1.775.782.3611 or 1.800.227.5514 (US only)
[Bentley.com](https://www.bentley.com)