

Network Control Engine

Product Bulletin

MS-NCE25xx-x

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The Metasys® Network Control Engine (NCE) Series controllers combine the network supervisor capabilities and Internet Protocol (IP) network connectivity of a Network Automation Engine (NAE) with the Input/Output (I/O) point connectivity and direct digital control capabilities of a Field Equipment Controller (FEC). NCEs provide a cost-effective solution designed for integrating central plants and large built-up air handlers into your Metasys networks.

All NCE models provide IP Ethernet network connectivity, the Metasys Site Management Portal User Interface (UI), and the network supervisory capabilities featured on NAE35/NAE45 Series network automation engines.

NCEs provide connectivity to and supervisory control of a specified field bus trunk with up to 32 field controllers. Depending on the model, an NCE supports either a BACnet® Master-Slave/Token-Passing (MS/TP) trunk, an N2 Bus trunk, or a LONWORKS® network trunk; except the MS-NCE2000-0 and MS-NCE2506-0 models, which do not provide a physical field controller trunk connection.



NCE25 Network Control Engine

All NCE models feature 33 integral I/O points and a Sensor Actuator (SA) Bus, which allow you to increase the NCE's I/O field point capacity and also integrate NS Series Network Sensors and Variable Frequency Drives (VFDs) into your NCE application.

Some NCE models feature an integral field controller display screen with a navigation keypad. In addition, some NCE models feature an internal modem that supports standard dial-up capabilities.

Table 1: Features and Benefits

Features	Benefits
Use of Commonly Accepted Information Technology (IT) Standards at the Automation and Enterprise Level	Allows you to install the NCE on the existing IT infrastructure within a building or enterprise and use standard IT communication services over the company intranet, Wide Area Network (WAN), or public Internet with firewall protection.
Web-Based User Interface	Allows you to access, monitor, and control the NCE from a supported Web browser connected to the network, including remote users connected by dial-up telephone or an Internet Service Provider (ISP).
Supervision of Either an N2 Bus, LONWORKS Network, or BACnet MS/TP Bus Field Controller Trunk	Supports connectivity to open network standards for flexibility in the selection of field devices. Supports up to 32 field controllers on either a BACnet MS/TP bus, LONWORKS network, or N2 Bus trunk.
Multiple Connection Options for Data Access	Allow connection of a Web browser via the Internet Protocol (IP) network using the Ethernet port. For a dial-up connection, use the optional internal or external modem.
Integral Field Controller with 33 I/O Points	Provides field level control of central plant and large air-handler applications combined with enterprise level IP network connectivity.
Expandable I/O Point Capacity, NS Sensor Connectivity, and VFD Control on Field Controller SA Bus	Allow you to connect multiple Input/Output Modules (IOMs), NS Series Network Sensors, and VFDs to the field controller SA Bus, which greatly expands the NCE's field level control capabilities.

Enterprise Network Supervisory Control

The NCE features the NAE supervisory controller technology that drives the new generation of Building Automation Systems (BASs). The NCE is a network automation engine, just like the NAE, that manages BASs using information and Internet technology. The NCE provides enterprise level supervisory control of an integral field controller, and depending on the model, can control up to 32 additional controllers on a field controller trunk.

The NCE uses standard BAS communication protocols and technologies to monitor and supervise Heating, Ventilating, and Air Conditioning (HVAC) equipment; lighting; security; fire; and access control. Depending on the model, the NCE can monitor and supervise either an MS/TP bus trunk, an N2 Bus trunk, or a LONWORKS network trunk.

A single NCE at a central plant or large air-handler (or a network of multiple NCE/NAEs in a facility or campus of buildings) provides monitoring and control, alarm and event management, data exchange, trending, energy management, scheduling, and data storage.

NCEs have multiple connection port options that allow you to build an extremely flexible network at the automation and enterprise level of your system, and at the field controller and data acquisition levels.

IP Ethernet Network

The NCE connects directly to an IP Ethernet network running at 10 or 100 Mbps. Multiple NCEs and NAEs communicate with each other over the network, and typically an Application and Data Server/Extended Application and Data Server (ADS/ADX) or NAE is designated as the Metasys network Site Director. The Site Director is the point of access to the entire BAS network on the site and is accessed via a Web browser and the Metasys Site Management Portal UI. Data transmission on the Metasys network uses standard IT protocols, services, and formats.

Networks in different buildings may be interconnected using standard WAN technologies and network service providers. The speed of transmission depends on the technology used.

Web Browser Access

You access building systems through the NCE with a standard supported Web browser on a desktop or laptop computer. The computer does not require any special workstation software other than the browser and a standard Java® software. The Web browser accesses the NCE directly over the IP network, or via the Internet or public telephone service.

Remote NCE

The NCE can be accessed remotely over standard WAN infrastructures, the Internet via an ISP line, or over the public telephone network using a modem and the Point-to-Point Protocol (PPP). NCEs offer optional internal modems or support an external modem.

Application and Data Server (ADS)/ Extended Application and Data Server (ADX)

The ADS/ADX is an optional software package running on a computing platform that provides a location for storage of the system configuration database, trend logs, alarm logs, and audit trails. An ADS/ADX is typically configured as the Site Director. The software supports standard IT firewall technologies for protection against unauthorized access.

Field Network Level Control

The NCE also features an integral Field Equipment Controller (FEC) that provides direct interface to and control of remote field equipment, such as large central cooling and heating plants, and large built-up air handler units.

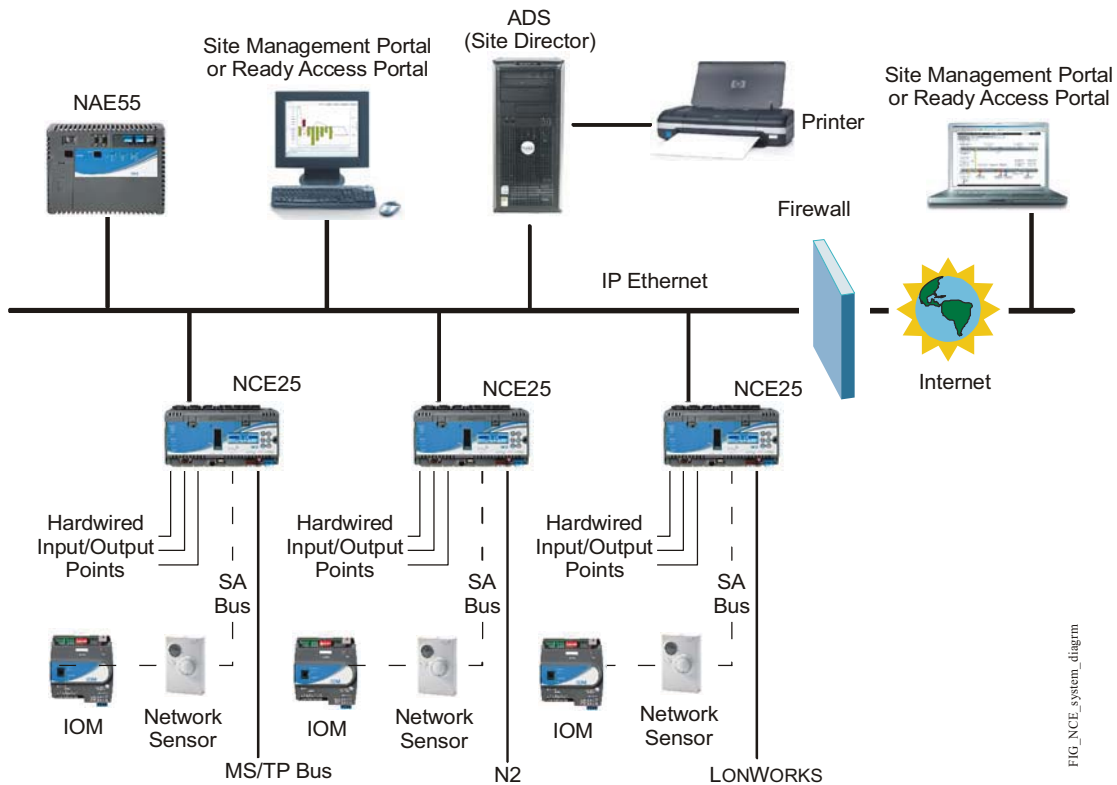
The NCE has 33 onboard I/O control points and an SA Bus. The SA Bus allows you to connect Input/Output Modules (IOMs) and increase the I/O control points in your application.

You can also connect NS Series Network Sensors and supported VFDs to the SA Bus, and integrate state-of-the-art temperature control and motor speed control into your NCE application.

You define and configure the 33 I/O points on the NCE and the I/O points and devices on the NCE SA Bus in the Controller Configuration Tool (CCT) software.

The 33 onboard NCE I/O points include the following:

- **10 Universal Input** points, each point can be defined as either a Current Analog Input (4-20 mA), Voltage Analog Input (0-10 VDC), a Resistive Analog Input, or a Dry Contact Binary Input
- **8 Binary Input** points, each point can be defined as either Dry Contact Maintained or Pulse Counter Mode (100 Hz high-speed)
- **4 Analog Output** points, each point can be defined as either a Voltage Analog Output (0-10 VDC) or a Current Analog Output (4-20 mA)
- **4 Configurable Output** points, each point can be defined as either a Voltage Analog Output (0-10 VDC) or a Binary Output (24 VAC Triac)
- **7 Binary Output** points (24 VAC Triac)



FIG_NCE_system_diagram

Three NCEs Connected to a Metasys System Network

Field Networks and Protocols

NCEs/NAEs offer the ability to pass data from one field network to another, and transmit data from the field network to the enterprise and automation level of the network. This ability allows your system to operate as one virtual control network.

Automation Level Communication

NCEs/NAEs communicate internal system data using peer-to-peer messaging over the IP Ethernet network. Thus, each NCE and NAE shares data and has access to information on all other NCE and NAE nodes on the site network, which enables coordination of the overall functions of the BAS.

BACnet MS/TP Bus

The BACnet MS/TP bus is based on BACnet standard protocol American National Standards Institute/ American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ANSI/ASHRAE) 135-2004.

The MS/TP bus is a peer-to-peer, multiple-master protocol in which each master device takes turns originating messages to pass to any other device on the bus.

NCE25s can connect to BACnet MS/TP field controllers over wireless mesh networks using the ZFR1800 Series Wireless Field Bus System. Refer to the *ZFR1800 Series Wireless Field Bus System Product Bulletin (LIT-12011336)* for more information.

N2 Bus

The N2 Bus is a Johnson Controls® field communications trunk that links Application Specific Controllers (ASCs) and programmable controllers to a supervisory controller. ASCs include the Air Handling Unit (AHU), Unitary (UNT) controller, Variable Air Volume (VAV) controllers, and VAV Modular Assembly (VMA) devices. Programmable controllers include the DX9100.

The N2 Bus supports Metasys system compatible devices from other manufacturers and the Metasys Integrator® system. The Metasys Integrator system includes an extensive series of software drivers for the integration of other manufacturers' control devices, including HVAC equipment, power monitoring, lighting panels, security, and fire detection systems.

LONWORKS Bus

Specified NCE models can supervise a LONWORKS network trunk with up to 32 LONWORKS network devices. LONWORKS network trunks are supported if the network interface follows current LONMARK® guidelines, preferably with the LONMARK certification, and uses the Free Topology Transceiver FTT10.

The LONWORKS network interface in the NCE supports all current LONMARK certified devices including devices from Johnson Controls such as the LN Series Controllers, the NexSys® controller line, and the LONWORKS enabled programmable Flexible System Controller (FSC).

Software for Efficient Building Operation

NCEs ship with the latest version of the Metasys system software, which provides the following features:

- **Metasys Site Management Portal User Interface** provides data and graphic screens to supported Web browsers. Authorized users simply log on to the NCE from the Web browser to access the Site Management Portal. This embedded user interface is ideal for smaller networks and remote locations where a dedicated computer platform to support a user interface is not required.



Metasys Site Management Portal Screen

- **System Security** enables an NCE to recognize legitimate users with valid user IDs and passwords at the Site Management Portal user interface. User access data is encrypted in the transmission and in the NCE database. The system administrator manages user profiles, authorization levels, user ID, password, and specific NCE data access privileges in each user account.

- **Monitoring and Control** all the mechanical and electrical systems in a typical building by collecting data from the field devices and then coordinating and sending the required commands to the controlled equipment at the required priority.
- **Global Search** allows you to search the Metasys system and manage lists of objects, which can be used by other features for commanding, trending, reporting, and object selection.
- **Global Command** allows you to send a single command to multiple objects, and view a log of the command results.
- **Transaction Recording** audits and logs all user actions performed through the NCE.
- **Alarm and Event Processing** enables NCEs to send alarm and event messages to Web browsers, pagers, e-mail servers, Network Management Systems, and serial printers, as well as store and view alarm and event logs on the NCE and transfer it to an ADS/ADX.
- **Historical Trend Data** can be collected by NCEs for any monitored value at user-defined intervals, or trending can be based on Change-of-Value. You can use trend logs to analyze building system performance and locate system problems. NCE trend logs can be transferred to the ADS/ADX at defined intervals or when the NCE logs are full.
- **Totalization Data** allows you to monitor energy (and other consumables) use and generate cost reports to support utility cost reductions, and also provides data for service, maintenance, and early identification of building system problems.
- **Trend Studies** allows you to view multiple trend extensions in a single view to facilitate monitoring and troubleshooting your Metasys site.
- **Scheduling** allows you to define occupancy periods and start and stop times for mechanical or electrical equipment. Operating parameters can be set according to time of day, day/days of the week, holiday, or for calendar dates.
- **Network-Wide System Interlocking** enables NCEs to collect field controller data, make logical comparisons, and issue relevant commands to other field controllers anywhere on the network.
- **Optimal Start** automatically determines the best time to start heating and cooling systems to ensure that the facility is ready for occupants. It adjusts to seasonal variations and reduces energy use.

- **Demand Limit and Load Rolling (DLLR)** monitors energy meters for electricity, gas, steam, or water, and automatically sheds equipment loads according to user-defined levels. Demand Limit helps manage utility demand charges. Load Rolling controls equipment operating levels to reduce total energy consumption. Comfort overrides prioritize equipment shedding.

System Configuration Tool

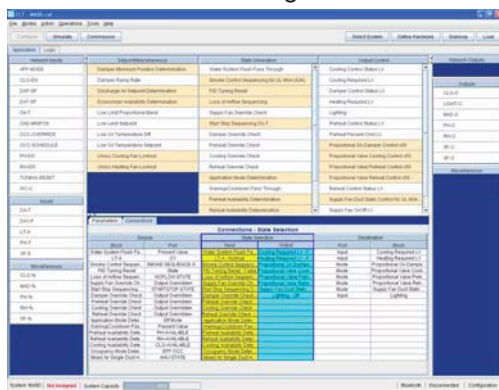
You can define the NCE supervisory level database online through a Web browser directly connected to an NCE device, or connected from a remote location via a WAN. Using the System Configuration Tool (SCT), you can define the system configuration and database offline for later download to the NCE over the network. In either case, the supervisory level database is typically archived on the SCT or ADS/ADX.

All the software required for supervisory level database configuration resides on the NCE or SCT. You do not need to have a local copy of the database on the Web browser to make authorized changes.

Controller Configuration Tool

The Controller Configuration Tool (CCT) is a software tool (packaged with the SCT) that provides a flexible UI for configuring and commissioning the integral field controller on the NCE and the devices connected on the NCE SA Bus. The CCT is also used to commission and configure the Metasys MS/TP field controllers on NCE models that support an MS/TP bus trunk.

The CCT features the following:



CCT User Interface

- a **Configuration** mode that allows you to build custom control applications for your mechanical systems by selecting simple mechanical and control logic options from a library and then combining them to meet your building application requirements
- a **Simulation** mode that allows you to review, test, and adjust your custom control applications before downloading the applications to the field controllers
- a **Commissioning** mode that allows you to manage the custom application downloads to the target field controllers

The CCT has a consistent user interface across the Configuration, Simulation, and Commissioning modes and flexible connection options for downloading and commissioning field controllers, including a wireless connection option using the Wireless Commissioning Converter (MS-BTCVT-1).

NCE Hardware Features

The NCE hardware platform features the following:

- multiple processors for supervisory and direct digital control
- nonvolatile solid-state Flash memory to store all programs and data
- standard Universal Serial Bus (USB) connection
- data protection battery to save data and power the real-time clock when primary power to the NCE is interrupted
- Light-Emitting Diodes (LEDs) to indicate power, communications, and device condition, to allow easy servicing
- removable, color-coded, screw terminal blocks for 24 VAC power, communications bus, and I/O point field wiring connections
- standard 9-pin sub-D connectors for RS-232-C serial port
- RJ-45 8-pin modular connector for Ethernet connection
- optional internal modem and RJ-12 6-pin telephone line connector (on specified models)
- integral display screen with navigation keypad (on specified models)

Ordering Information

Contact the nearest Johnson Controls representative to order an NCE or accessories. Specify the desired product code number using Table 2 and Table 3.

Table 2: NCE Model Ordering Information

Product Code Number ¹	Description
MS-NCE25xx-x (Base Features on Each NCE25)	Each NCE25 Series model requires a 24 VAC power supply and includes one RS-232-C serial port, one RS-485 optically isolated SA Bus port, one USB serial port, one Ethernet port, and an MS-BAT1020-0 Data Protection Battery. Each NCE25 Series model has 33 integral I/O points and supports up to 128 additional I/O points on the SA Bus.
MS-NCE2500-0²	Base features with no physical field controller trunk connection.
MS-NCE2506-0²	Base features with no physical field controller trunk connection. Includes integral display screen.
MS-NCE2510-0	Supports one N2 Bus trunk with up to 32 N2 devices.
MS-NCE2511-0	Supports one N2 Bus trunk with up to 32 N2 devices. Includes internal modem.
MS-NCE2516-0	Supports one N2 Bus trunk with up to 32 N2 devices. Includes integral display screen.
MS-NCE2517-0	Supports one N2 Bus trunk with up to 32 N2 devices. Includes integral display screen and internal modem.
MS-NCE2520-0	Supports one LONWORKS network trunk with up to 32 LONWORKS devices.
MS-NCE2521-0	Supports one LONWORKS network trunk with up to 32 LONWORKS devices. Includes internal modem.
MS-NCE2526-0	Supports one LONWORKS network trunk with up to 32 LONWORKS devices. Includes integral display screen.
MS-NCE2527-0	Supports one LONWORKS network trunk with up to 32 LONWORKS devices. Includes integral display screen and internal modem.
MS-NCE2560-0	Supports one MS/TP Bus trunk with up to 32 MS/TP devices.
MS-NCE2561-0	Supports one MS/TP Bus trunk with up to 32 MS/TP devices. Includes internal modem.
MS-NCE2566-0	Supports one MS/TP Bus trunk with up to 32 MS/TP devices. Includes integral display screen.
MS-NCE2567-0	Supports one MS/TP Bus trunk with up to 32 MS/TP devices. Includes integral display screen and internal modem.

1. Some models are also available in a Buy American version (add a G after the code number). For repair parts, add -700 after the code number.
2. NCE25 model available in Europe only.

Table 3: NCE Accessories Ordering Information (Part 1 of 2)

Product Code Number	Description
MS-BAT1020-0	Replacement data protection battery for NAE35, NAE45, and NCE25. Rechargeable NiMH battery: 3.6 V 500 mAh, with a typical life of 10 years at 21°C (70°F)
MS-BTCVT-1	Wireless Commissioning Converter, with Bluetooth® technology, for configuring and commissioning the NCE field controller and the devices on the NCE SA Bus
MS-DIS1710-0	Local Controller Display connects to NCE on SA Bus and provides menu display and navigation keypad for monitoring status and controlling parameters on the NCE's integral field controller. Note: A DIS1710 display does not operate on NCE models that have an integral controller display.
AS-XFR100-1	Power transformer (Class 2, 24 VAC, 92 VA maximum output), with enclosure
AS-XFR010-1	Power transformer (Class 2, 24 VAC, 92 VA maximum output), no enclosure

Table 3: NCE Accessories Ordering Information (Part 2 of 2)


Product Code Number	Description
MS-RAP-0	Ready Access Portal Server, which provides a user interface that is a natural, complementary extension of the Metasys Site Management Portal UI. Note: This option is not necessary for sites that have an ADS/ADX as the Site Director because it is provided with the ADS/ADX solution.
MS-EXPORT-0	Metasys Export Utility, which extracts historical trend, alarm, and audit data from the system and presents the historical data in a variety of formats. Note: This option is not necessary for sites that have an ADS/ADX as the Site Director because it is provided with the ADS/ADX solution.

Technical Specifications

NCE25 (Part 1 of 2)

Power Requirement	Dedicated nominal 24 VAC, Class 2 power supply (North America), Safety Extra-Low Voltage (SELV) power supply (Europe), at 50/60 Hz (20 VAC minimum to 30 VAC maximum)
Power Consumption	25 VA maximum for NCE25 only Note: The 25 VA rating does not include any power supplied by the NCE to devices connected at the NCE Binary Outputs (BOs). BO devices connected to and powered by an NCE can require an additional 125 VA (maximum).
Ambient Operating Conditions	0 to 50°C (32 to 122°F), 10 to 90% RH, 30°C (86°F) maximum dew point
Ambient Storage Conditions	-40 to 70°C (-40 to 158°F), 5 to 95% RH, 30°C (86°F) maximum dew point
Data Protection Battery	Supports data protection on power failure. Rechargeable NiMH battery: 3.6 VDC 500 mAh, with a typical life of 5 to 7 years at 21°C (70°F); Product Code Number: MS-BAT1020-0
Processors	Supervisory Controller: 192 MHz Renesas™ SH4 7760 RISC processor Field Controller: 20 MHz Renesas H8S2398 processor
Memory	Supervisory Controller: 128 MB Flash nonvolatile memory for operating system, configuration data, and operations data storage and backup and 128 MB Synchronous Dynamic Random Access Memory (SDRAM) for operations data dynamic memory Field Controller: 1 MB Flash and 1 MB Random Access Memory (RAM)
Operating System	Microsoft® Windows® CE embedded
Network and Serial Interfaces (Depending on NCE model. See Table 2 for model information.)	One Ethernet port; 10/100 Mbps; 8-pin RJ-45 connector One optically isolated RS-485 SA Bus port; with a pluggable and keyed 4-position terminal block (on all NCE25 models) One optically isolated RS-485 port; with a pluggable and keyed 4-position terminal block (only on NCE25 models that support an N2 Bus or MS/TP bus trunk) One LONWORKS port; FTT10 78 Kbps; pluggable, keyed 3-position terminal block (only on NCE25 models that support a LONWORKS Network trunk) One RS-232-C serial port with standard 9-pin sub-D connector that supports standard baud rates One USB serial port with standard USB connector Option: One 6-pin RJ-12 jack for connecting to internal modem; up to 56 Kbps
Analog Input/Analog Output Point Resolution	Analog Input Points: 16-bit resolution Analog Output Points: 16-bit resolution and ±200 mV accuracy on 0-10 VDC applications
Dimensions (Height x Width x Depth)	155 x 270 x 64 mm (6.1 x 10.6 x 2.5 in.) Minimum mounting space required: 250 x 370 x 110 mm (9.8 x 14.6 x 4.3 in.)
Housing	Plastic housing Plastic material: ABS and polycarbonate Protection: IP20 (IEC60529)

NCE25 (Part 2 of 2)

Mounting	On flat surface with screws on three mounting clips or a single 35 mm DIN rail
Shipping Weight	1.2 kg (2.7 lb)
	United States: UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment; Industry Canada Compliant, ICES-003
	Europe: CE Mark – Johnson Controls, Inc., declares that the NCE25 Series Controllers are in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC.
	Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller (B-BC)

The performance specifications are nominal and conform to acceptable industry standard. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

United States Federal Communication Commission (FCC) Compliance Statement

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.

Canadian Compliance Statement

This Class (A) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.
 Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.



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