METASYS®

DX-9100 Digital Controller, Version 2

The DX-9100 Digital Controller is the ideal digital control solution for multiple chiller or boiler plant control applications, for the HVAC process of air handling units or for distributed lighting and related electrical equipment control applications.

As a standalone controller, the DX has both the hardware and software flexibility to adapt to the variety of control processes found in its targeted applications. Along with its outstanding control flexibility, the controller can extend its input and output point capability by communicating with input/output (I/O) extension modules on an extension bus, and provides monitoring and control of all connected points at its built-in LED display.

A separate display unit, DT-9100, with a text and graphic LCD screen and keypad provides a customized presentation of data according to the application and customer requirements.

When integrated into a full Metasys network, point and control information is available throughout the network, and at all Metasys operator workstations.

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Figure 1: DX-9100

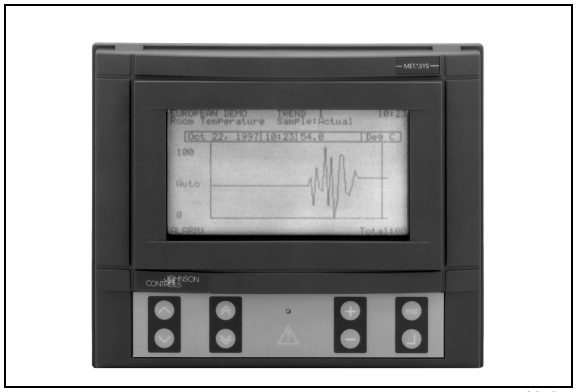

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Figure 2: DT-9100

Features and Benefits	
❑ **Full set of control algorithms in software modules** ❑ **Graphic configuration tool**	Easy to configure for a wide range of standard and special applications
❑ **Standalone control** ❑ **Real-time clock and time programs** ❑ **Trend data storage**	Distributed control for system reliability
❑ **Extension bus for additional I/O points** ❑ **Extension modules for a variety of analog and digital I/O combinations**	Modular hardware set for low-cost installation in the various applications

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Features and Benefits (Cont.)	
❑ **Built-in local status display and control panel** ❑ **Optional text and graphic display unit (DT-9100)** ❑ **Optional manual override switches on extension modules**	Display and override capabilities are available close to the controlled equipment
❑ **N2 Bus communications** ❑ **Dynamic Data Access™ capabilities with Metasys network**	Facility-wide control efficiency and cost-effective information availability

Figure 3: DX-9100 Digital Controller, Version 2, on the Metasys Network

F lexible Installation

The DX-9100 Digital Controller, Version 2, is available with two styles of base frame mounting. One base frame is designed for mounting the controller on a panel plate inside a control panel or directly on the controlled equipment via DIN rail. The other baseframe is for mounting the controller in the door of a cabinet. Both styles enable the base frame to be mounted and connected to the field wiring before installing the controller. The DT-9100 display unit is designed for mounting in the door of a cabinet and a kit is available to enable the unit to be surface mounted, for example, on a wall. The display unit may also be used as a portable device with a standard 230 VAC/12 VDC power adaptor. A cable is provided to connect the display unit to the DX controller.

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Figure 4: DX-9100 With Panel Mounting Base

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Figure 5: DX-9100 With Cabinet Door Mounting Frame

Extension Modules

The extension (XT and XTM) and expansion (XP) modules may be mounted next to the controller on the same DIN rail, or remotely, up to 1200 m from the controller.

An extension module set is assembled from submodules, providing various combinations of analog and digital (binary) I/O points. Up to eight extension modules can be connected to the controller via the RS-485 extension bus.

The XTM extension module and its expansion modules provide a wider and more flexible range of I/O options as well as a manual override option on outputs.

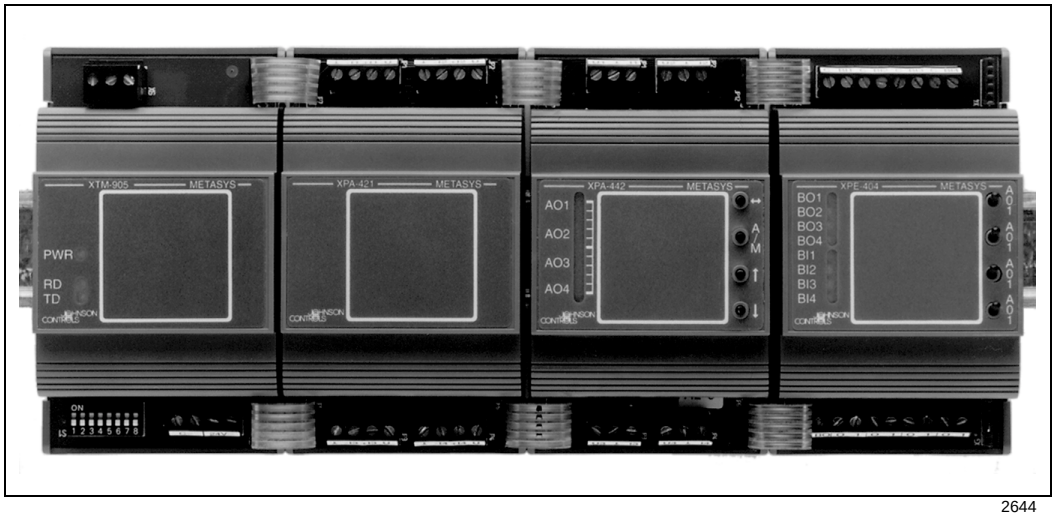

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Figure 6: Extension Modules with Manual Override

Sensors and Actuators to Complete the System

The DX Controller and extension modules are matched to a family of sensors, actuators, control valves, and dampers needed to complete the control of chiller and boiler plants, HVAC processes and other refrigeration and heating applications. Its sensor inputs can accept 0-10V transmitters and passive temperature sensors from the Johnson Controls range, as well as industry standard 4-20mA transmitters. Outputs are available to control both proportional and incremental electric actuators, as well as motor control relays, staged heating and cooling and other electrical equipment such as lighting control relays. Pneumatic actuators may be controlled by the use of an external transducer.

1784

Figure 7: Flow Temperature Sensor

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Figure 8: Room Temperature Sensor

Table 1: Point Configuration

Point Type	Quantity			Characteristics
	DX-9100	XT	XTM	
Analog Inputs	8	6	4/8	0-10 VDC (impedance 300 KΩ) 0/4-20 mA DC (impedance 100 Ω) RTD Ni1000 (JCI), A99 (JCI), and Pt1000 (DIN) XTM only: RTD Pt100 (DIN), Ni100 (DIN), potentiometer (5 Kohm)
Digital (Binary) Inputs	8	4/8/16	4/8/16	Dry Contacts (potential free)
Digital (Binary) Outputs	6	4/8/16	2…4/8/16	24 VAC Triacs (minimum 0.05 amps, maximum 0.5 amps) XT/XTM only: Relay Contact (250 VAC 3 amps) XTM only: Relays with momentary, magnetically latched or electrical hold operation
Analog Outputs	4 4	2	4/8	0-10 VDC (10 mA maximum) or 0/4-20 mA DC 0-10 VDC (10 mA maximum) only

Table 2: XT Bus Configuration

Maximum number of XT/XTMs per DX	8
Maximum number of I/Os for each XT/XTM	8 analog + 8 digital (binary), or 16 digital (binary)
Maximum number of I/Os from XT/XTMs per DX	64

C onvenient Configuration Setup

The DX-9100 Digital Controller does not need to be programmed in the traditional sense. Instead, the control algorithms, time programs and input/output point assignments are configured with the use of a Graphic Configuration Tool, which runs under the Windows™ operating system. The graphic software is installed on a laptop computer which is plugged into the controller's RS-232-C port for loading the controller's configuration.

Program data and parameters loaded into the controller and into the extension modules are stored in EEPROM, so there is no need to reload software after a loss of power. Real time and operating data in the controller are stored in battery backed RAM.

Configuring a controller and its extension modules is a simple matter of selecting desired module types to form a flow chart diagram, connecting inputs to control and logic blocks, and closing the control loop by making the connection from the control and logic blocks to the outputs. As the flow chart is being filled in, the set point parameters, gains, alarm limits, start and stop times, etc., are added to the control and logic blocks and inputs and outputs to complete the configuration. Names may be entered for inputs, outputs and operating parameters for use in the optional display unit or for electronic transfer to the Metasys Workstation data file.

B uilt-in Display Panel

Once the controller and its extension modules are configured, the operating parameters and input/output values can be seen at the display panel built into the controller. Outputs can be manually overridden and operating parameters may be changed by an operator who has plugged his security key into the controller. The same information viewed on the face of the controller can be displayed and changed from any of the Metasys operator devices, or from the Graphic Configuration Tool when in online commissioning mode.

D isplay Unit (DT-9100)

The display unit provides similar features to the built-in display panel, but the data which appears on the screen is adapted to suit the application with user-defined names for each value displayed. The control of outputs and modification of operating parameters is password protected. Trend logs are shown in graphic format and the main screen may show the controlled equipment as a graphic diagram with actual values displayed. The unit can generate alarms and keeps a log of alarms with the time and date of occurrence. The display unit is configured using the Graphic Configuration Tool.

A pplication Versatility

The DX-9100 Digital Controller can be configured to meet a wide variety of basic HVAC and multiple boiler or chiller central plant applications. Configurations may be pre-configured for common applications to use as a foundation to customize your particular needs. If the pre-configured examples don't cover your needs, you can start with a blank flow chart template on the Graphic Configuration Tool, and configure a totally customized process to meet your specific application requirements.

In addition, points unused in the control application can be used for supplementary supervisory purposes by the Metasys network.

Table 3: Flow Chart Module Configuration Options

Flow Chart Module	Configuration Options
Analog Inputs	Sensor/transmitter ranging High/low limits Filter constants Square root
Control Blocks	PID loops Remote reset logic Operation modes Control limits and alarms Sequencer and step control logic
Digital Inputs	Source points for logic functions Pulse counters
Calculation Blocks	Averaging Minimum or maximum select Enthalpy, wet bulb and dew point Input selector Arithmetic calculator Compare logic Line segment function Timer functions Run-time counter Totalizer and Integrator
Logic Blocks	“And”, “Or”, “Not” State change detect “Set” and “reset” of parameters
Time Schedule Blocks	Yearly holiday calendar Start-stop times for days of week and holidays Optimal start/stop modules (2 modules available)
Analog Outputs	High/low ranging
Digital Outputs (DX Controller)	Incremental, with or without feedback Duration adjust type On/off, including pulse and start/stop
Digital Outputs (XT Modules)	On/off, including pulse
Trend Log	12 channels Analog or binary values Sample rate Full buffer (read request) indicator

Networking Capabilities

As powerful as the DX-9100 Digital Controller is by itself or with extension modules, your facility will benefit even more when controllers are part of a larger Metasys network. A Metasys Network Controller Module (NDM) can be programmed to provide added energy management and supervisory control capabilities, such as trend log, historical data storage, electrical demand limiting and more. In remote locations, the trend log data in the controller can be transferred to the central Metasys network by a switched telephone line connection.

The Metasys Dynamic Data Access networking software, available from the Network Controller Module, makes information from each controller available throughout the facility, so that it is possible, for example, to reset the boiler or chiller discharge temperature set point based on the demand requirements of a group of terminal unit controllers. Dynamic Data Access also makes sensor values, operating status, and other parameters in the controller available to operators anywhere in your facility.

Precise, Flexible Control

The DX Controller represents the best way to fully optimize the operation of your refrigeration, heating, HVAC or lighting equipment control applications. It can be used as a member of the fully integrated Metasys system, or as a standalone controller, with or without the optional display unit. It combines ease of setup and operation, flexibility of application, and precise control for comfort and energy management.

Password Protection of Configurations

The DX Controller has an optional feature to prevent unauthorized access to its software configuration. When a configuration is loaded by the Graphic Configuration Tool with a user-defined password, it cannot be uploaded by another tool unless the password is entered.

This feature has been designed to protect standard configurations of OEM (Original Equipment Manufacturer) users.

Specifications

DX-9100 Digital Controller, Version 2

Product	*DX-9100 Digital Controller, Version 2* DX-9100-8454 Controller DX-9100-8996 Cabinet Door Mounting Frame DX-9100-8997 Panel Mounting Base (See also Table 1)
Power Requirements	24 VAC ± 15 %, 10 VA (at 24 VAC) at 50/60 Hz
Ambient Operating Conditions	0° to 40°C / 32° to 100°F 10 to 90% RH Noncondensing
Ambient Storage Conditions	-20° to 70°C / 0° to 160°F 5 to 95% RH Noncondensing
Dimensions (H x W x D)	
Controller With Cabinet Door Mounting Frame	164 x 200 x 114mm / 6.5 x 7.9 x 4.5 in.
Controller With Panel Mounting Base	200 x 184 x 100 mm / 7.9 x 7.3 x 3.9 in. Allow minimum of 160 mm / 6.3 in. depth for hinged door clearance.
Shipping Weight	Controller: 1.8 kg / 4 lbs 0 oz Panel Mounting Base: 0.8 kg / 1 lb 12 oz Cabinet Door Mounting Frame: 0.8 kg / 1 lb 12 oz
Agency Listings	CE Directive 89/336/EEC EN50081-1, EN50082-1 UL Listed, CSA Certified, FCC Compliant

DT-9100 Display Unit

Product Codes	DT-9100-8004 Display Unit with Panel Mounting Kit DT-9100-8902 Wall Mounting Kit DT-9100-8901 12 VDC Power Supply for 230 VAC Source
Communication	RS-232-C (cable provided)
Power Requirements	24 VAC +15%/-10%, 4 VA (at 24 VAC) *or* 9 to 18 VDC, 2 VA
Dimensions (H x W x D)	150 x 180 x 47 mm / 5.9 x 7.1 x 1.9 in.
Shipping Weight	0.78 kg / 1 lb 12 oz
Agency Listings	CE Directive 89/336/EEC EN50081-1, EN50082-1 UL Listed, CSA Certified, FCC Compliant

Extension and Expansion Modules

Product Codes	*XT and XP Modules without Manual Override*		
	XT-9100	Extension Module	5.5 VA
	XP-9102	6 Analog Inputs, 2 Analog Outputs	4 VA
	XP-9103	8 Digital (Binary) Outputs (triacs)	-
	XP-9104	4 Digital (Binary) Inputs, 4 Digital Outputs (triacs)	1 VA
	XP-9105	8 Digital (Binary) Inputs	2 VA
	XP-9106	4 Digital (Binary) Outputs (relay) (European Model)	6 VA
	XP-9107	4 Digital (Binary) Outputs (relay) (North American Model)	6 VA
		(See also Table 1)	
Product Codes	*XTM and XPx Expansion Modules with Manual Override Option on Outputs*		
	XTM-905	Extension Module	5.5 VA
	XPA-421	4 Analog Inputs	4 VA
	XPA-442	4 Analog Outputs	6 VA
	XPA-821	6 Analog Inputs, 2 Analog Outputs	4 VA
	XPB-821	8 Binary Inputs	3 VA
	XPM-401	4 Binary Inputs, 2 Momentary Relay Binary Outputs	4 VA
	XPL-401	4 Binary Inputs, 3 Latching Relay Binary Outputs	5 VA
	XPE-401	4 Binary Inputs, 3 Electrically Latching Relay Binary Outputs	5 VA
	XPE-404	4 Binary Inputs, 4 Electrically Latching Relay Binary Outputs	6 VA
	XPT-401	4 Binary Inputs, 4 Binary Outputs (Triacs)	2 VA
	XPT-861	8 Binary Outputs (Triacs) (Manual Override not available.)	-
		(See also Table 1)	
Agency Listing	All Modules: CE Directive 89/336/EEC EN 50081-1, EN 50082-1 XPM, XPL and XPE only: CE Directive 73/23/EEC EN 60730 All modules, except XPA-4xx-x: UL Listed, CSA Certified, FCC Compliant		
Power Requirements			
Extension Module	24 VAC +10% / -15 %, 50/60 Hz, 5.5 VA at 24 VAC		
Expansion Modules	24 VAC +10% / -15 %, 50/60 Hz, see above for VA ratings at 24 VAC		
Transformer Module	230 VAC, 50/60 Hz, up to 12 VA		
Dimensions (H x W x D) (1 Module)	118 x 70 x 57 mm / 4.7 x 2.8 x 2.3 in.		
Shipping Weight	Extension Module: 0.15 kg / 5.3 oz Expansion Module: 0.12 - 0.25 kg / 4.2 - 8.8 oz, depending on module type Transformer Module: 0.47 kg / 1 lb 1 oz		

The performance specifications are nominal and conform to acceptable industry standards. 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, and reserves the right to change or supplement the contents of this publication.

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