Honeywell

Excel 10 W7753A Unit Ventilator Controller

EXCEL 5000 OPEN™ SYSTEM

SYSTEM ENGINEERING

CONTENTS

Table of Contents **1**

Introduction **4**

Description of Devices 4
Control Application 5
Control Provided 5
Products Covered 5
Organization of Manual 5
Applicable Literature 7
Product Names 7
Agency Listings 8
Abbreviations and Definitions 8
Construction 10
- Controllers 10
  - Performance Specifications 12
  - LonMark® Functional Profile 14
- Wall Modules 15
- Air Temperature Sensor 15

Configurations 18
- General 18
- Allowable Heating and Cooling Equipment Configurations 19
  - Staged Heating/Cooling Control 19
  - Modulating Heating/Cooling Control 20
  - Economizer Control 20
  - Pneumatic Actuator Control 21
  - Mixed Output Type Control 21
- Occupancy Sensor 22
- Window Open/Closed Digital Input 22
- Wall Module Options 22
- Fan Speed Switch 22
- Mixed Air Temperature 22
- Outdoor Air Quality CO 22
- Dirty Filter Monitor 22
- Drip Pan Full 23
- Indoor Air Quality (IAQ) Override 23
- Freeze Stat 23
- AquaStat 23
- Smoke-Control 23

Modes of Operation 23

Application Steps **25**

Overview 25
Step 1. Plan The System 25
Step 2. Determine Other Bus Devices Required 25
Step 3. Lay Out Communications and Power Wiring 26
- E-Bus Layout 26
- Power Wiring 28
  - Power Budget Calculation Example 28
  - Line Loss 29

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Step 4. Prepare Wiring Diagrams 31
General Considerations.... 31
W7753A Controllers 31
E-Bus Termination Module 36
Step 5. Order Equipment 39
Step 6. Configure Controllers 42
Step 7. Troubleshooting 42
Troubleshooting Excel 10 Controllers and Wall Modules 42
Temperature Sensor and Setpoint Potentiometer Resistance Ranges 42
Alarms 42
Broadcasting the Service Message 43
W7753 Controller Status LEDs 44
T7770C,D,E,F,G Wall Module Remote Override LED 44
T7780 DDWM Bypass Pushbutton 45

List of Figures **2**
Fig. 1. Typical system overview. 4
Fig. 2. Typical W7753A control application. 6
Fig. 3. Excel 10 W7753A Unit Ventilator Controller. 11
Fig. 4. W7753A construction. 12
Fig. 5. DIN rail adapters. 13
Fig. 6. Functional Profile number 8080 of LonMark® RTU object detail.. 14
Fig. 7. T7770A,B,C,D,E,F,G construction. 16
Fig. 8. T7780 construction. 17
Fig. 9. C7770A construction. 17
Fig. 10. Fan with two stages of heating and two stages of cooling. 20
Fig. 11. Fan with modulating heating and modulating cooling. 20
Fig. 12. Economizer control. 21
Fig. 13. Modulating heat with pneumatic valve actuator. 21
Fig. 14. Connecting the portable operator terminal to the E-Bus. 25
Fig. 15. E-Bus wiring layout for doubly terminated daisy-chain E-Bus segment. 27
Fig. 16. E-Bus wiring layout for two singly terminated E-Bus segments. 28
Fig. 17. NEMA class 2 transformer voltage output limits. 30
Fig. 18. Power wiring details for one Excel 10 per transformer. 30
Fig. 19. Power wiring details for two or more Excel 10s per transformer. 30
Fig. 20. Transformer power wiring details for one Excel 10 used in UL 1995 equipment (U.S. only). 31
Fig. 21. Attaching two or more wires at terminal blocks. 32
Fig. 22. Typical W7753A Controller with two stages heating and two stages of cooling wiring diagram. 34
Fig. 23. W7753 Controller with floating heating, cooling and economizer wiring diagram. 35
Fig. 24. W7753 Controller PWM damper actuator wiring diagram. 35
Fig. 25. W7753 Controller with C7400A 4 to 20 mA enthalpy sensor wiring diagram. 36
Fig. 26. Pneumatic transducer to W7753. 36
Fig. 27. Typical E-Bus termination module wiring diagrams. 37
Fig. 28. E-Bus termination wiring options. 38
Fig. 29. Temperature sensor and setpoint potentiometer resistance plots. 42
Fig. 30. Location of the Service Pin Button. 44
Fig. 31. LED location on W7753A. 44
Fig. 32. LED and Bypass pushbutton locations on T7770 Wall Modules. 44
Fig. 33. Bypass pushbutton location on T7780 DDWM. 45

List of Tables **2**
Table 1. Agency Listings. 8
Table 2. Configuration Options Summary For The W7753A. 18
Table 3. Modes of Operation For The Excel 10 W7753A Controller. 23
Table 4. Application Steps 25
Table 5. E-Bus Configuration Rules And Device Node Numbers. 26
Table 6. VA Ratings For Transformer Sizing. 29
Table 7. Field Wiring Reference Table. 32
Table 8. W7753A Version I/O Description. 33
Table 9. Excel 10 W7753A Controller Ordering Information. 39
Table 10. Excel 10 Alarms. 43

Appendices **45**
Appendix A. Using E-Vision to Commission W7753A Controller. 45
SENSOR CALIBRATION 45

SETTING THE PID PARAMETERS ... 45
Table A-1. Default PID Parameters ... 45
Appendix B. Sequences of Operation. ... 46
Table B-1. Common Configuration Options Summary For The W7753A Controller…. ... 46
Table B-2. Configuration Options Summary For The W7753A ... 47
Common Operations ... 47
Room Temperature Sensor (RmTemp) ... 47
Remote Setpoint (RmtStptPot) ... 47
Setpoint Limits (LoSetptLim and HiSetptLim) ... 48
Bypass Mode (StatusOvrd and StatusLed) ... 48
BypassTime ... 48
OverrideType ... 48
OverridePriority ... 48
Cycles per Hour (HeatCycHr and CoolCycHr) ... 48
T7770C,D,E,F,G Wall Module Bypass Pushbutton Operation ... 48
Table B-3. Wall Module Bypass Pushbutton Occupancy Modes ... 48
Fig. B-0. LED and Bypass pushbutton operation ... 49
Standby Mode (StatusOcySen) ... 49
Continuous Unoccupied Mode ... 49
Occupancy Mode and Manual Override Arbitration ... 49
Time Clock (TimeClckOcc) ... 50
Setpoint Ramping ... 50
Fig. B-1. Heating Recovery Ramp - Heat Ramp. ... 50
Fig. B-2. Cooling Recovery Ramp - Cool Ramp. ... 50
Fan Operation ... 50
Window Sensor (StatusWndw) ... 51
Smoke Control ... 51
Demand Limit Control (DLC) ... 51
Dirty Filter Monitor ... 51
Start-Up ... 51
Temperature Control Operations. ... 51
Fig. B-3. Schematic diagram for a typical W7753 Unit Ventilator. ... 52
Staged Cooling Control ... 53
Fig. B-4. Staged output control versus PID Error. ... 53
Table B-4. Interstage Minimum Times. ... 53
Staged Heating Control ... 54
Cascade Control of Modulating Cooling/Heating ... 54
Series 60 Modulating Control ... 54
Pulse Width Modulating (PWM) Control ... 54
AquaStat ... 54
Outdoor Air Lockout of Heating/Cooling ... 54
ASHRAE Control Cycles ... 55
Standby/Warmup ... 55
Cycle I Damper Control—Fixed Maximum Percentage of Outdoor Air ... 55
Cycle II Damper Control—Fixed Minimum Percentage of Outside Air ... 55
Cycle III Damper Control—Variable Outdoor Air Maintaining Constant Mixed Air Temperature ... 55
Indoor Air Quality (IAQ) Override ... 55
Outdoor Air Quality (OAQ) Override ... 56
Discharge Air Low Limit Control ... 56
Economizer Enable/Disable Control ... 56
Appendix C. Complete List of Excel 10 W7753 Unit Ventilator Controller User Addresses. ... 56
Table C0. Engineering Units For Analog Points. ... 57
Table C1. Input/Output Points. ... 58
Table C2. Control Parameters. ... 70
Table C3. Energy Management Points. ... 78
Table C4. Status Points ... 80
Table C5. Calibration Points ... 112
Table C6. Configuration Parameters ... 114
Table C7. LonMark® Points ... 122
Table C8. Direct Access and Special Points ... 128
Table C9. Data Share Points ... 138
Appendix D. Q7750A Excel 10 Zone Manager Point Estimating Guide. ... 141
Approximate Memory Size Estimating Procedure. ... 141
Fig. D-1 Point capacity estimate for Zone Manager ... 141
Appendix E. Sensor Data for Calibration. ... 142
Resistance Sensors. ... 144
Voltage/Current Sensors. ... 146

INTRODUCTION

Description of Devices

The W7753A is the Unit Ventilator (UV) controller in the Excel 10 product line family. The Excel 10 UV controller is a configurable direct digital controller that controls unit ventilators with staged, floating, or pulse width modulation (PWM) heating, cooling, and economizer. The UV controller uses space or return air temperature to sequence heating and cooling coils in the unit ventilator to control the temperature in the conditioned zone. The UV also uses outdoor air, re-circulated or return air from the space, or a mixture of both and is similar to fan coil units except they have the ability to supply 100 percent outside air. The UV is designed for many capacities and is used in areas where occupancy density indicates a need for controlled ventilation, for example classrooms and conference rooms. Their function allows a zone to be controlled independently of other zones in the building without using a large central fan system.

The UV features preprogrammed heating, cooling, economizer, and ASHRAE Cycles I, II, and III algorithms for standard control applications which are selected using a personal computer and the CARE/E-Vision software configuration tool. The Excel 10 UV controller offers many features required in todays commercial buildings including energy saving setpoint reset for energy demand limit control, economizer minimum position reset for indoor air quality control, standby setpoints for energy saving setpoint reset in the occupied mode and unoccupied setpoints for both heating and cooling. The control solutions are scaleable from stand-alone installations wired to an external time clock to a networked system using a Zone Manager as the network master. The UV utilizes the Echelon® LonWorks® network (E-Bus) for communications, and conforms with the Echelon® LonMark® Unit Ventilator (UV) communication profile that provides true openness and interoperability with third party LonWorks® devices.(see Fig. 6).

The T7770 direct-wired Wall Modules or the network configurable T7780 Digital Display Wall Modules (DDWM) are used in conjunction with W7753A Controllers. The zone controlled by the UV Controller typically uses a T7770A or a T7780, DDWM which includes a temperature sensor for space temperature measurement. Additional features available in T7770E through G models include analog setpoint input knob, override digital input pushbutton, override status LED, fan speed switch and E-Bus network access jack. The DDWM includes an LCD panel for controller status display and keypad for user interface.
The Q7750A Excel 10 Zone Manager is a communications interface that allows devices on the E-Bus network to communicate with devices on the standard EXCEL 5000® System C-Bus. Fig. 1 shows an overview of a typical system layout. The Q7750A also provides some control and monitoring functions.

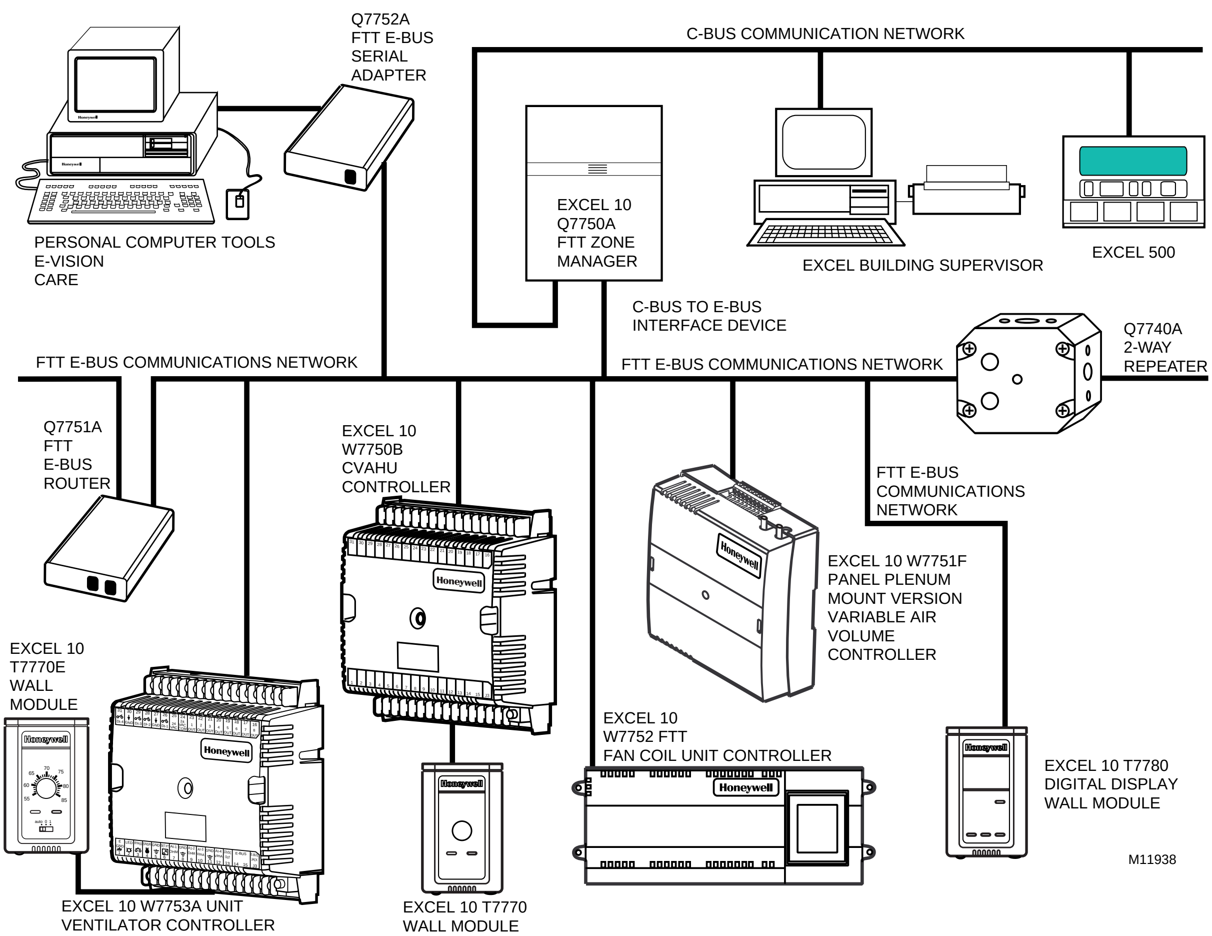


Fig. 1. Typical system overview.

Control Application

The Excel 10 UV Controller is a configurable direct digital controller that controls unit ventilators with staged, floating, or pulse width modulation (PWM) heating, cooling, and economizer. The UV controller uses space or return air temperature to sequence heating and cooling coils in the unit ventilator to control the temperature in the conditioned zone. It features preprogrammed heating, cooling, economizer, and ASHRAE Cycles I, II, and III algorithms for standard control applications that are selected using a personal computer and the CARE/E-Vision software configuration tool. The Excel 10 UV Controller offers many features required in todays commercial buildings including energy saving setpoint reset for energy demand limit control, economizer minimum position reset for indoor air quality control, standby setpoints for energy saving setpoint reset in the occupied mode and unoccupied setpoints for both heating and cooling. The control solutions are scaleable from stand-alone installations wired to an external time clock, to a networked system using a Zone Manager as the network master. The UV is typically connected to a T7770 Wall Module or T7780 (DDWM) which incorporates a temperature sensor, setpoint, fan speed controls, and a bypass or override button. Fig. 2 shows a typical UV control application.

Control Provided

The UV controller provides control by using a single space temperature (or return air temperature) control input. A discharge air temperature sensor is required for floating or PWM control of an economizer which is used for monitoring and economizer low limit control. The controller does not provide discharge air temperature control to a programmable discharge air temperature setpoint and cannot be used for discharge air temperature control applications. The UV controller has a mixed air temperature input and can provide mixed air temperature control using the economizer. The economizer dampers can be adjusted based on indoor air quality (IAQ) needs in the space. IAQ monitoring is provided through either a CO_2 sensor or a digital input from a space-mounted IAQ limit switch. No internal time clock is available in the Excel 10 UV Controller. For stand-alone applications, an external time clock will be required. If the UV is connected to the E-Bus, then it gets its time schedule information from other Excel 10 Controllers or from the Zone Manager.

Like the W7750 CVAHU Controller, the UV Controller can monitor a space-mounted occupancy sensor, and a door/window contact. These inputs affect the operational mode of the controller (see Table 3 for a list of all possible modes of operation).

The UV controller allows other controllers in the system to use the physical inputs and outputs. A digital input and an analog input can be configured to read switch states and voltage sensor values respectively, and send them out over the E-Bus network. Another device, such as the Q7750A Zone Manager, can use these values in custom control strategies. Additionally, two of the UV digital outputs are available for control program use. These outputs only respond to signals sent over the network, and are not controlled by the W7753A internal control algorithms.

Products Covered

This System Engineering Guide describes how to apply the Excel 10 family of W7753A UV Controllers and related accessories to typical applications. The specific devices covered include:
- W7753A Controllers.
- T7770A and E through G Wall Modules.
- T7780 DDWM.
- Q7750A Excel 10 Zone Manager.
- Q7751A,B Router (FTT to FTT only).
- Q7752A Serial Interface Adapter.
- Q7740A,B Repeaters (2-way and 4-way).
- 209541B FTT Termination Module.

Organization of Manual

This manual is divided into three basic parts: the Introduction, the Application Steps, and the Appendices that provide supporting information. The Introduction and Application Steps 1 through 5 provide the information needed to make accurate material ordering decisions. Application Step 6 and the Appendices include configuration engineering that can be started using Excel E-Vision PC Software after the devices and accessories are ordered. Application Step 7 is troubleshooting.
The organization of the manual assumes a project is being engineered from start to finish. If an operator is adding to, or is changing an existing system, the Table of Contents can provide the relevant information.

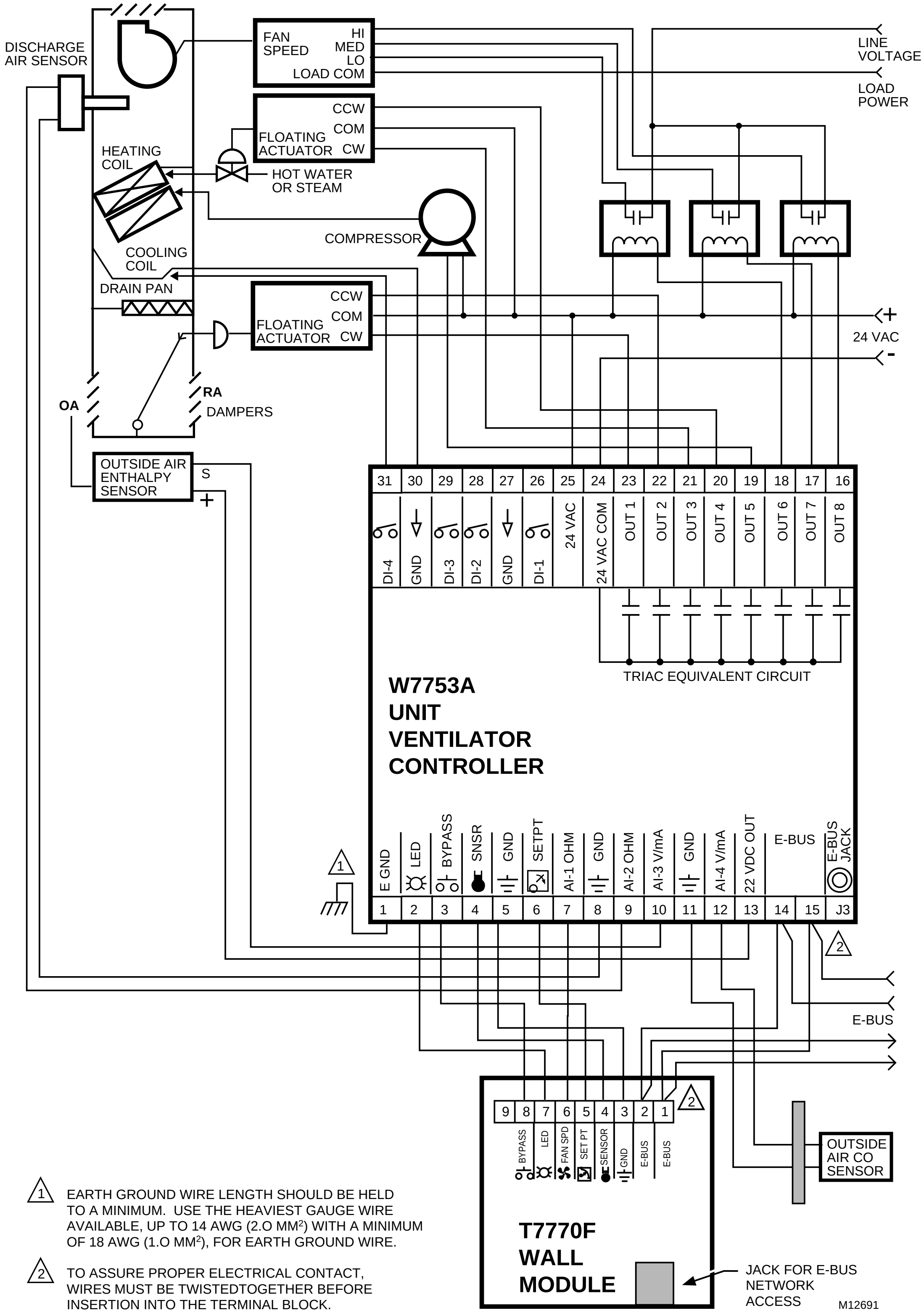


Fig. 2. Typical W7753A control application.

Applicable Literature

The following list of documents contains information related to the Excel 10 W7753A UV Controller and the EXCEL 5000® OPEN™ SYSTEM in general.

Form No.	Title
74-2076C	Excel 10 Technical Literature Collation
74-2962	Excel 10 W7753A Controller Specification Data
74-2697	T7770A,B,C,D,E,F,G Wall Module Specification Data
74-2955	T7780A Digital Display Wall Module Specification Data
74-2868	C7770A Air Temperature Sensor Specification Data
74-2950	Excel 10 Q7750A, Zone Manager Specification Data
74-2952-1	Excel 10 Q7751A,B Router Specification Data
74-2954-1	Excel 10 Q7752A Serial Interface Specification Data
74-2858	Excel 10 Q7740A,B FTT Repeaters Specification Data
74-2951	Excel 10 Q7750A Zone Manager Checkout and Test Manual
95-7520	Excel 10 W7753A Controller Installation Instructions
95-7538	T7770A,B,C,D,E,F,G Wall Module Installation Instructions
95-7558	T7780 Digital Display Wall Module Installation Instructions
95-7509	Excel 10 Q7750A Zone Manager Installation Instructions
95-7510	Excel 10 Q7751A,B Router Installation Instructions
95-7511	Excel 10 Q7752A Serial Interface Installation Instructions
95-7516	Excel 10 SLTA Connector Cable Installation Instructions
95-7555	Excel 10 Q7740A,B FTT Repeaters Installation Instructions
95-7554	Excel 10 209541B Termination Module Installation Instructions
74-2588	Excel E-Vision User's Guide
74-5587	CARE User's Manual
74-1392	CARE Excel 10 Zone Manager User's Guide
74-5577	CARE Icon Guide
74-2865	E-Bus Wiring Guidelines User's Guide
74-2039	XBS User's Manual
74-5018	XBS Application Guide

Product Names

The W7753 UV Controller is available in one model:
- **W7753A** Unit Ventilator Controller.

The T7770 Wall Module is available in seven models, The T7770 Wall Modules will work with all Excel 5000 and Excel 10 Controllers (except the W7751A,C,E,G):
- **T7770A1006** Wall Module with nonlinearized 20 Kohm NTC sensor only.
- **T7770A2004** Wall Module with nonlinearized 20 Kohm NTC sensor and E-Bus network jack.
- **T7770B1xxx** Wall Module with nonlinearized 20 Kohm NTC sensor, 10 Kohm setpoint, and E-Bus network jack.
- **T7770C1xxx** Wall Module with nonlinearized 20 Kohm NTC sensor, 10 Kohm setpoint, bypass button and LED, and E-Bus network jack.
- **T7770D1xxx** Wall Module with nonlinearized 20 Kohm NTC sensor, bypass button and LED, and E-Bus network jack.
- **T7770E1xxx** Wall Module with nonlinearized 20 Kohm NTC sensor, 10 Kohm setpoint, bypass button and LED, three position fan switch, and E-Bus network jack.
- **T7770F1xxx** Wall Module with nonlinearized 20 Kohm NTC sensor, 10 Kohm setpoint , bypass button and LED, five position fan switch, and E-Bus network jack.
- **T7770G1xxx** Wall Module with nonlinearized 20 Kohm NTC sensor, bypass button and LED, five position fan switch, and E-Bus network jack.

NOTE: The T7770B,C Models are available with a absolute 55 to 85°F (10 to 85°C) or a relative scale plate adjustable in E-Vision to ± 18°F (± 5°C).

The T7780 DDWM is available in one model:
- **T7780** DDWM displays and provides space temperature, setpoint, Occ/Unocc override, Application Mode, Fan mode/speed selection, and E-Bus network jack for all Excel 10 Controllers (except W7751A,C,E,G).

Other products:
- **Q7750A** Excel 10 Zone Manager.
- **Q7751A,B** Bus Router.
- **Q7752A** Serial Adapter.
- **Q7740A,B** FTT Repeaters.
- **209541B** FTT Termination Module.

Refer to Table 9 in Application Step 5. Order Equipment for a complete listing of all available part numbers.

NOTE: The Q7750A Zone Manager is referred to as (E-Link) in internal software and CARE.

Agency Listings

Table 1 provides information on agency listings for Excel 10 products.

Table 1. Agency Listings.

Device	Agency	Comments
W7753A Controller	UL	Tested and listed under UL916 (file number E87741).
	cUL	Listed (E87741).
	CE	General Immunity per European Consortium Standards EN50081-1 (CISPR 22, Class B) and EN 50082-1:1992 (based on Residential, Commercial, and Light Industrial). EN 61000-4-2: IEC 1000-4-2 (IEC 801-2) Electromagnetic Discharge. EN 50140, EN 50204: IEC 1000-4-3 (IEC 801-3) Radiated Electromagnetic Field. EN 61000-4-4: IEC 1000-4-4 (IEC 801-4) Electrical Fast Transient (Burst). Radiated Emissions and Conducted Emissions: EN 55022: 1987 Class B. CISPR-22: 1985.
	FCC	Complies with requirements in FCC Part 15 rules for a Class B Computing Device. Operation in a residential area can cause interference to radio or TV reception and require the operator to take steps necessary to correct the interference.
T7770A through G Wall Modules	UL	(Not applicable.)
	CSA	(Not applicable.)
	FCC	(Not applicable.)
T7780 DDWM	CE	Emissions; EN50081-1, En55022 (CISPR Class B), Immunity 50082-1
	UL &cUL	Tested and listed under UL916, S8L9 Energy Management Equipment.
	FCC	Complies with requirements in FCC Part 15 rules for a Class B Computing Device.
Q7750A Excel 10 Zone Manager	UL	Tested and listed under UL916, file number S4804 (QVAX, PAZY).
	CSA	Listing pending.
	FCC	Complies with requirements in FCC Part 15 rules for a Class A Computing Device. Operation in a residential area can cause interference to radio or TV reception and require the operator to take steps necessary to correct the interference.
Q7740A,B FTT Repeaters **Q7751A,B Router,** **Q7752A Serial Adapter**	UL	UL1784.
	CSA	Listed.
	FCC	Complies with requirements in FCC Part 15 rules for a Class B Computing Device.

Abbreviations and Definitions

AHU - Air Handling Unit; the central fan system that includes the blower, heating equipment, cooling equipment, ventilation air equipment, and other related equipment.

CO - Carbon Monoxide. Occasionally used as a measure of indoor air quality.

CO_2 - Carbon Dioxide. Often used as a measure of indoor air quality.

CARE - Computer Aided Regulation Engineering; the PC based tool used to configure C-Bus and E-Bus devices.

C-Bus -Honeywell proprietary Control Bus for communications between EXCEL 5000® System controllers and components.

CPU - Central Processing Unit; an EXCEL 5000® OPEN™ SYSTEM controller module.

cUL - Underwriters Laboratories Canada

CVAHU -Constant Volume AHU; refers to a type of air handler with a single-speed fan that provides a constant amount of supply air to the space it serves.

DDF - Delta Degrees Fahrenheit.

DDWM - Digital Display Wall Module.

D/X - Direct Expansion; refers to a type of mechanical cooling where refrigerant is (expanded) to its cold state, within a heat-exchanging coil that is mounted in the air stream supplied to the conditioned space.

E-Bus - Honeywell implementation of Echelon® LonWorks® network for communication among Excel 10 Controllers.

E-Bus Segment - An E-Bus section containing no more than 60 Excel 10s. Two segments can be joined together using a router.

Echelon® - The company that developed the LON® bus and the Neuron® chips used to communicate on the E-Bus.

Economizer - Refers to the mixed-air dampers that regulate the quantity of outdoor air that enters the building. In cool outdoor conditions, fresh air can be used to supplement the mechanical cooling equipment. Because this action saves energy, the dampers are often referred to as *economizer dampers*.

EMI - Electromagnetic Interference; electrical noise that can cause problems with communications signals.

E-Link - Refers to the Q7750A Zone Manager. This name is used in internal software and in CARE software.

EMS - Energy Management System; refers to the controllers and algorithms responsible for calculating optimum operational parameters for maximum energy savings in the building.

EEPROM - Electrically Erasable Programmable Read Only Memory; the variable storage area for saving user setpoint values and factory calibration information.

Enthalpy - The energy content of air measured in BTUs per pound (KiloJoules per Kilogram).

EPROM - Erasable Programmable Read Only Memory; the firmware that contains the control algorithms for the Excel 10 Controller.

Excel 10 Zone Manager - A controller that is used to interface between the C-Bus and the E-Bus. The Excel 10 Zone Manager also has the functionality of an Excel 100 Controller, but has no physical I/O points.
NOTE: The Q7750A Zone Manager can be referred to as E-Link in the internal software, CARE.

E-Vision - User interface software used with devices that use FTT E-Bus communications protocol.

FCU - Fan Coil Unit.

Firmware - Software stored in a nonvolatile memory medium such as an EPROM.

Floating Control - Refers to Series 60 Modulating Control of a valve or damper. Floating Control utilizes one digital output to pulse the actuator open, and another digital output to pulse it closed.

FTT - Free Topology Transceiver.

IAQ - Indoor Air Quality. Refers to the quality of the air in the conditioned space, as it relates to occupant health and comfort.

I/O - Input/Output; the physical sensors and actuators connected to a controller.

I x R - I times R or current times resistance; refers to Ohm’s Law: V = I x R.

K - Degrees Kelvin.

Level IV - Refers to a classification of digital communication wire. Formerly known as UL Level IV, but *not* equivalent to Category IV cable. If there is any question about wire compatibility, use Honeywell-approved cables (see Step 5 Order Equipment section).

NEC - National Electrical Code; the body of standards for safe field-wiring practices.

NEMA - National Electrical Manufacturers Association; the standards developed by an organization of companies for safe field wiring practices.

Node - A Communications Connection on a network; an Excel 10 Controller is one node on the E-Bus network.

NV - Network Variable; an Excel 10 parameter that can be viewed or modified over the E-Bus network.

PC - An IBM compatible Personal Computer with 386 or higher processor and capable of running Microsoft® Windows™ Version 3.1.

Pot - Potentiometer. A variable resistance electronic component located on the T7770B,C,E,F Wall Module; used to allow user-adjusted setpoints to be input into the Excel 5000 or Excel 10 Controller.

PWM - Pulse Width Modulated output; allows analog modulating control of equipment using a digital output on the controller.

RIO - Remote Input/Output device.

RTD - Resistance Temperature Detector; refers to a type of temperature sensor whose resistance output changes according to the temperature change of the sensing element.

Subnet - An E-Bus segment that is separated by a router from its Q7750A Zone Manager.

TOD - Time-Of-Day; the scheduling of Occupied and Unoccupied times of operation.

TPT - Twisted Pair Transceiver.

UV - Unit Ventilator Controller.

VA - Volt Amperes; a measure of electrical power output or consumption as applies to an ac device.

Vac - Voltage alternating current; ac voltage rather than dc voltage.

VAV - Variable Air Volume; refers to either a type of air distribution system, or to the W7751 Excel 10 VAV Box Controller that controls a single zone in a variable air volume delivery system.

VOC - Volatile Organic Compound; refers to a class of common pollutants sometimes found in buildings. Sources include out-gassing of construction materials, production-line by-products, and general cleaning solvents. A VOC is occasionally used as a measure of indoor air quality.

W7750 - The model number of the Excel 10 CVAHU Controllers (also see CVAHU).

W7751 - The model number of the Excel 10 VAV Box Controllers (also see VAV).

W7752 - The model number of the Excel 10 FCU Controllers (also see FCU).

W7753 - The model number of the Excel 10 UV Controllers (also see UV).

W7761 - The model number of the Excel 10 RIO Device (also see RIO).

Wall Module - The Excel 10 Space Temperature Sensor and other optional controller inputs are contained in the T7770 Wall Modules or T7780 DDWM. See Application Step 5. Order Equipment for details on the various models of Wall Modules.

XBS - Excel Building Supervisor; a PC based tool for monitoring and changing parameters in C-Bus devices.

Construction

Controllers

The Excel 10 W7753A Controller is available in one model. The W7753A consists of a single circuit board that is mounted in a sheet metal subbase and protected by a factory snap-on cover. The controller mounts with two screws (see Fig. 3 and 4). Using DIN rail adapters (see Fig. 5) they can also be snapped onto standard EN 50 022 35 mm by 7.5 mm (1-3/8 in. by 5/16 in.) DIN rail. DIN rail is available through local suppliers. If using DIN rail also purchase from Augat Inc. part number 2TK2D DIN rail (adapter) two each for every controller (see Fig. 5). Wires are attached to the screw terminal blocks on both sides of the controller. Connection for operator access to the E-Bus is provided by plugging the SLTA connector cable into the communications jack.

Performance Specifications

Power:

24 Vac with a minimum of 20 Vac and a maximum of 30 Vac at either 50 or 60 Hz. The W7753A power consumption is 6 VA maximum at 50 or 60 Hz. The W7753A is a NEC Class 2 rated device. This listing imposes limits on the amount of power the product can consume or directly control to a total of 100 VA (U.S. only).

The individual Triac outputs incorporate an internal common connection with the input power transformer. The Triacs provide a switched path from the hot side (R) of the transformer through the load to the common of the transformer. The UV controller design *must* use the same power transformer for any loads connected to that controller; see Fig. 22.

Each individual Triac is rated 500 mA at 30 Vac maximum. Under all operating conditions, the maximum load/source power budget for the controller is 100 VA.

CPU:

Motorola or Toshiba 3150 Neuron™ processor, containing three eight-bit CPU's. Each Neuron™ has a unique 48-bit network identification number.

Memory Capacity:

64K ROM/PROM (6K reserved for network operations, 58K usable for control algorithm code).
512 bytes EEPROM.
2K RAM.

Specified Space Temperature Sensing Range:

45 to 99°F (7 to 37°C) with an allowable control setpoint range from 50 to 90°F (10 to 32°C) when initiated from the network and 55 to 85°F (13 to 29°C) when configured and connected to T7770 Wall Modules or T7780 DDWM.

Communications:

The UV controller uses a transformer-coupled communications port with differential Manchester-encoded data at 78 kilobits per second (kbs). The transformer-coupled communications interface offers a much higher degree of common-mode noise rejection while ensuring dc isolation.

Approved cable types for E-Bus communications wiring is Level IV 22 AWG (0.34 mm^2) plenum or non-plenum rated unshielded, twisted pair, solid conductor wire. For non-plenum areas, use Level IV 22 AWG (0.34 mm^2) such as U.S. part AK3781 (one pair) or U.S. part AK3782 (two pair). In plenum areas, use plenum-rated Level IV, 22 AWG (0.34 mm^2) such as U.S. part AK3791 (one pair) or U.S. part AK3792 (two pair). (See Tables 9 and 10 for part numbers.) Contact Echelon® Corp. Technical Support for the recommended vendors of Echelon® approved cables.

A channel in the cover allows the controller status LED to be visible when the cover is in place. There are no field-serviceable parts on the circuit board and, therefore, it is intended that the cover never be removed.

The W7753A can be mounted in any orientation. Ventilation openings were designed into the cover to allow proper heat dissipation regardless of the mounting orientation. See Fig. 3 and 4.

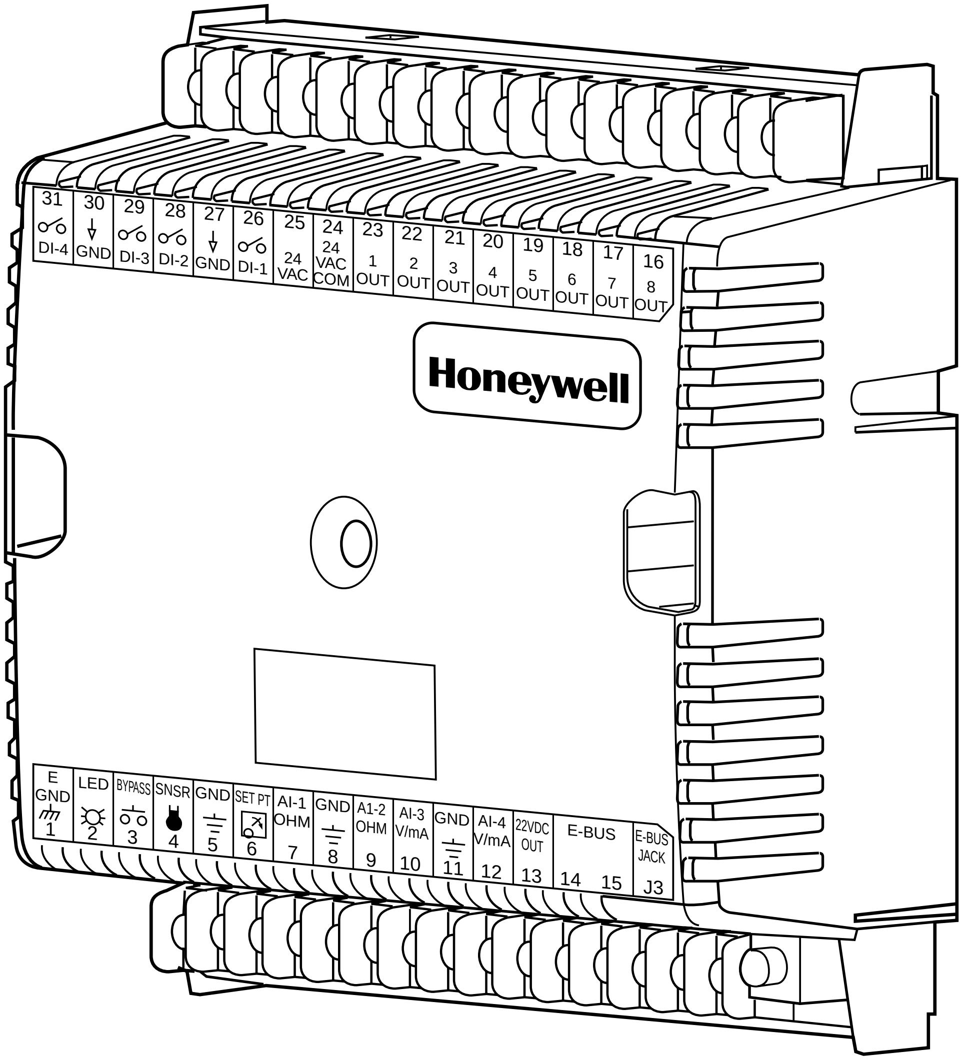


Fig. 3. Excel 10 W7753A Unit Ventilator Controller.

The Free Topology Transceiver (FTT) supports polarity insensitive free topology wiring. This frees the system installer from the need to wire using a bus topology. Star, bus, mixed, and loop wiring are all supported by this architecture. The maximum E-Bus length when using a combination of star, loop, and bus wiring (singly terminated) is 1640 ft (500m) with the maximum node-to-node length of 1312 ft (400m). In the event that the total wire length is exceeded, then a Q7740A 2-Way Repeater or a Q7740B 4-Way Repeater can be used to allow the number of devices to be spread out as well as increasing the length of wire over which they communicate. The maximum number of repeaters per segment is one (on either side of the router). A Q7751A E-Bus Router can also be used to effectively double the maximum E-Bus length. The advantage of using the router is that it will segregate traffic to a segment while when using the repeater, all traffic is repeated on each segment. When utilizing a doubly terminated E-Bus structure, use a continuous daisy-chain with no stubs or taps from the main backbone, The maximum E-Bus length is 4593 ft (1400m) with the maximum node-to-node length of 3773 ft (1150m).

FTT networks are very flexible and convenient to install and maintain, but it is imperative to carefully plan the network layout and create and maintain accurate documentation. Unknown or inaccurate wire run lengths, node-to-node distances, node counts, total wire length, and misplaced or missing terminators can cause poor network performance. Refer to E-Bus Wiring Guidelines form, 74-2865 for complete description of network topology rules.

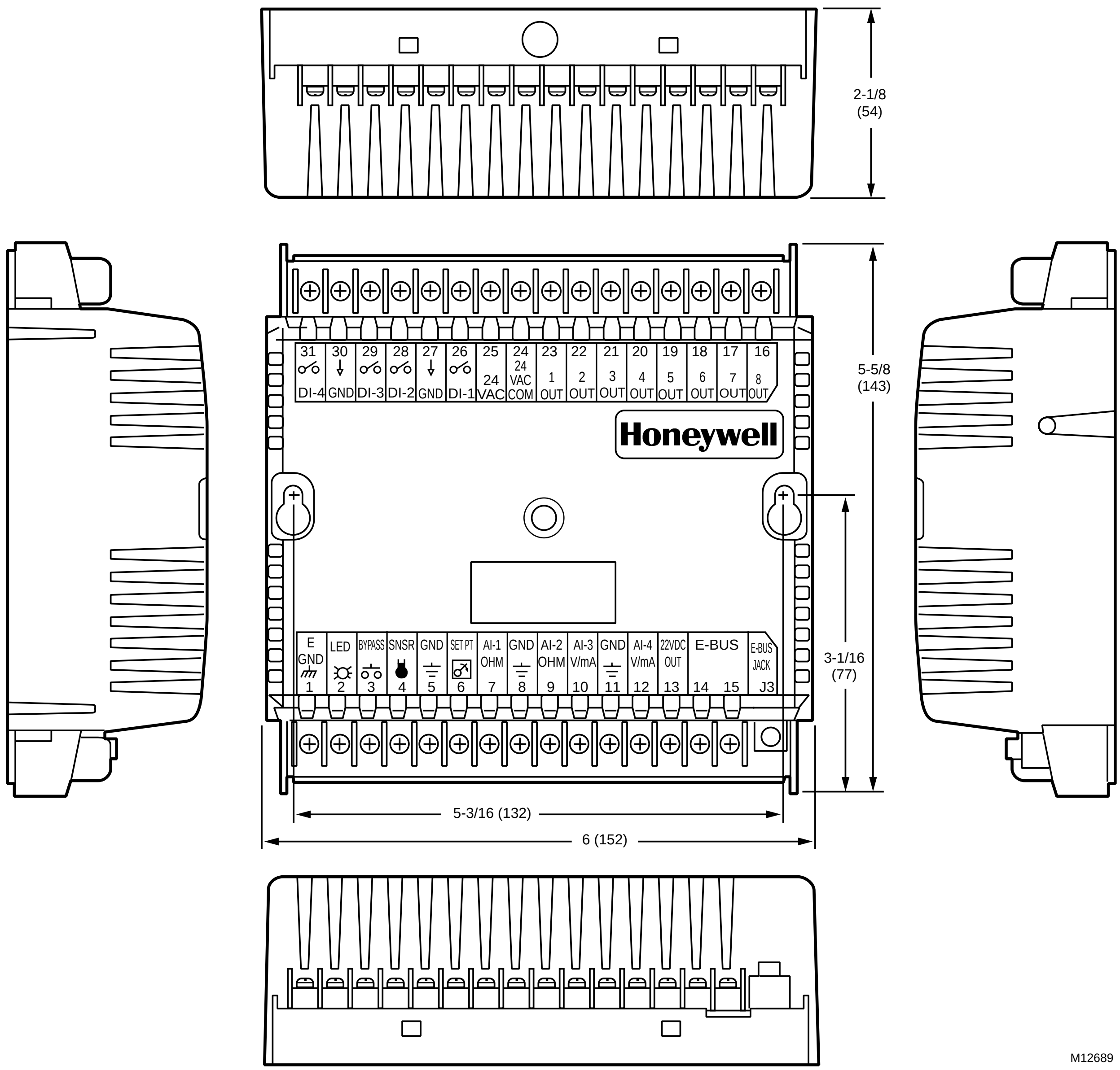


Fig. 4. W7753A construction in in. (mm).

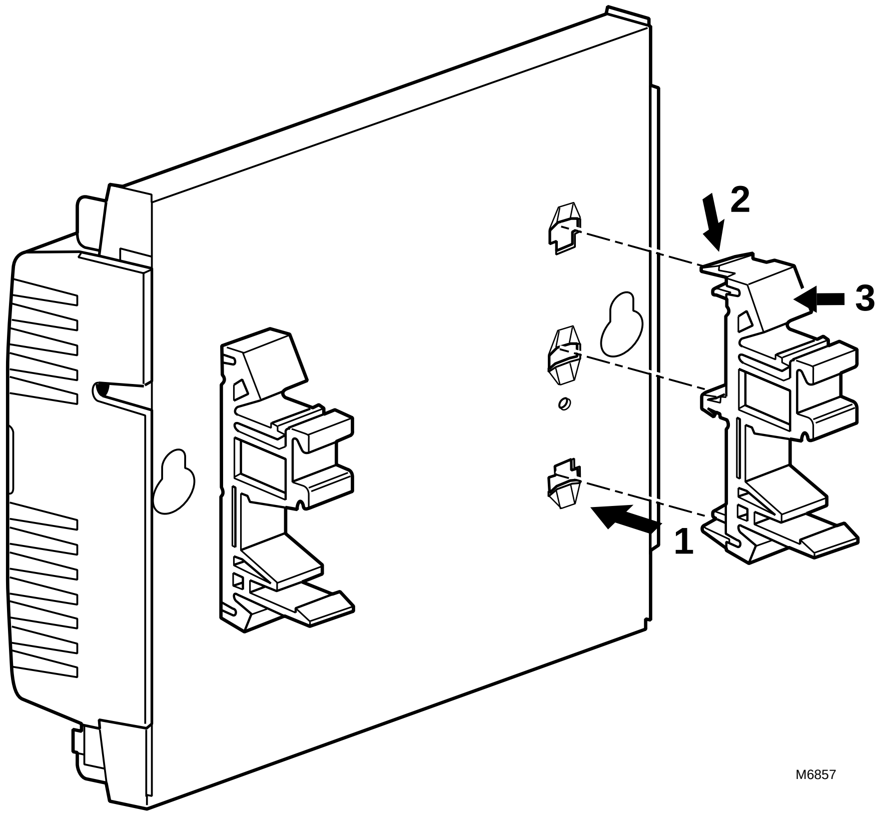


Fig. 5. DIN rail adapters.

Environmental

Operating Temperature:
-40 to 150°F (-40 to 65.5°C).

Shipping Temperature:
-40 to 150°F (-40 to 65.5°C).

Relative Humidity:
5% to 95% noncondensing.

Vibration:
Rated V2 level compliant.

Inputs/Outputs

The W7753A Controller supports the following hardware features:

- Four 20 Kohm NTC (1000 through 150,000 ohm) or PT3000 (250 through 12,000 ohm) resistive analog inputs (one reserved for space temperature and one reserved for the setpoint knob).
- Two 0.2 to 10 VDC or 2 to 20 mA (user selectable) analog inputs.
- Five dry contact digital inputs (one reserved for the Bypass pushbutton).
- Eight 24 Vac Triac digital outputs (500 mA MAX).
- LED digital output (*only* for the wall module LED).
- One 22 Vdc power supply for auxiliary devices with a maximum current of 50 mA.

Analog Inputs

Space Temperature:
Type: RTD.
Supported Sensors: T7770A,B,C,D,E,F,G, T7780.

Discharge Air Temperature:
Type: RTD.
Supported Sensors: C7100A1015*, C7770A1006, C7031B1033, C7031C1031, C7031D1062, C7031F1018, C7031J1050, C7031K1017.

Outdoor Air Temperature:
Type: RTD.
Supported Sensors: C7170A1002.

Return Air Temperature:
Type: RTD.
Supported Sensors: C7100A1015*, C7770A1006, C7031B1033, C7031C1031, C7031D1062, C7031F1018, C7031J1050, C7031K1017.

Mixed Air Temperature:
Type: RTD.
Supported Sensors: C7100A1015*, C7770A1006, C7031B1033, C7031C1031, C7031D1062, C7031F1018, C7031J1050, C7031K1017.

* The PT3000 sensor is not recommended for floating control (real time - discharge or return configured as space sensor). The PT3000 sensor is intended for monitoring or differential (staged) control.

LonMark® Functional Profile

W7753 Controllers support the LonMark® **Functional Profile number 8080** Unit Ventilator Controller, version 1.0 (see Fig. 6).

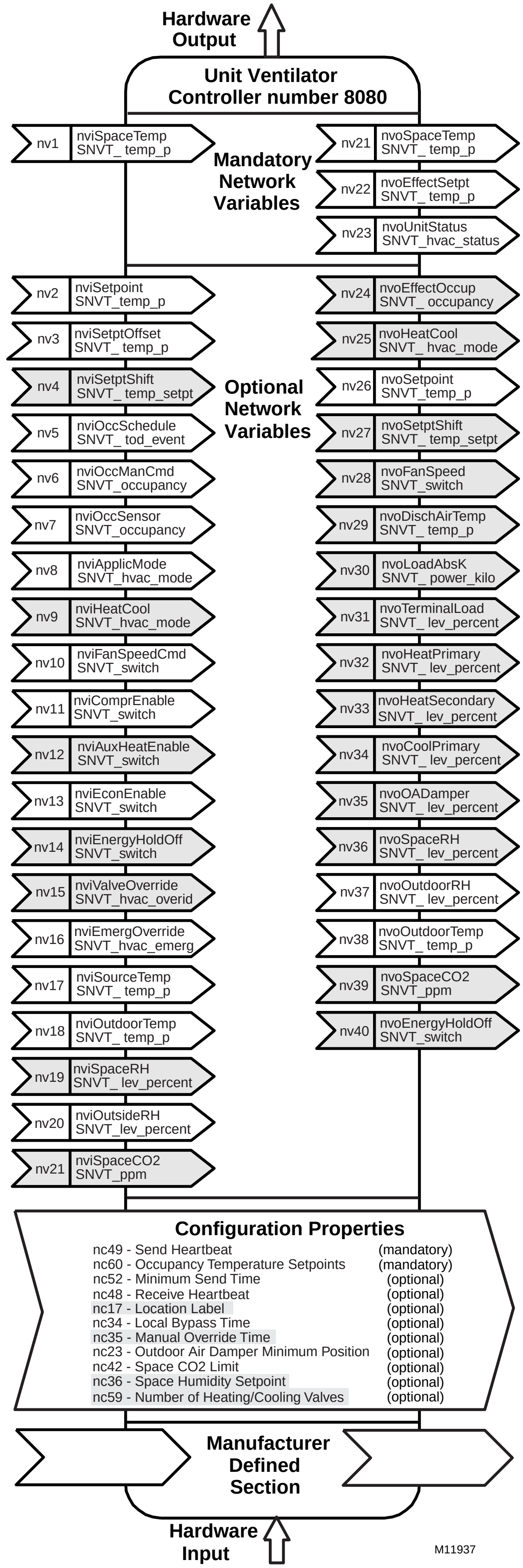


Fig. 6 Functional Profile number 8080 of LonMark® Unit Ventilator object details (variables not implemented in Excel 10 UV are greyed).

Fan Speed Switch:
Single or three speed auto/off/on control via the wall module.

Outdoor Air Humidity:
Type: Voltage/Current.
Supported Sensors: C7600B1000 and C7600B1018 (2 to 10V), C7600C1008 (4 to 20mA).

Return Air Humidity:
Type: Voltage/Current.
Supported Sensors: C7600B1000 and C7600B1018 (2 to 10V), C7600C1008 (4 to 20mA).

Outdoor Air Enthalpy:
Type: Current.
Supported Sensors: C7400A1004 (4 to 20mA).

Return Air Enthalpy:
Type: Current.
Supported Sensors: C7400A1004 (4 to 20mA).

Air Filter Differential Pressure:
Type: Voltage.
Supported Sensors: Third party 2 to 10V, 0 to 5 inw differential pressure sensors.

Space CO_2 Sensor:
Type: Voltage.
Supported Sensors: Third party 0 to 10V, 0 to 2000 ppm CO_2 sensors.

Outdoor Air CO_2 Sensor:
Type: Voltage.
Supported Sensors: Third party 0 to 10V, 0 to 2000 ppm CO_2 sensors.

Outdoor Air CO Sensor:
Type: Current.
Supported Sensors: Third party 4 to 20mA, 0 to 300 ppm CO sensor.

Monitor Sensor for network use:
Type: Voltage.
Supported Sensors: Third party 2 to 10V, 2 to 10 volts displayed.

Digital Inputs

Dry-contact inputs are sensed using a 9 milliamp at 4.8 volts detection circuit. It is very important that the device used contains high quality, noncorroding contacts with resistivity that does not degrade; that is, increase over time. Use noble metal (such as gold or silver), or pimpled or sealed contacts to assure consistent, long-term operation.

Four of the following Digital Inputs (DIs) can be configured:
— Occupancy Switch:
Contact Closed = Room is Occupied; Contact Open = Room is Unoccupied
— Fan Status:
Contact Closed = Fan on
— IAQ Switch:
Contact Closed = Poor Air Quality
— Smoke Monitor:
Contact Closed = Smoke Detected
— Dirty Filter:
Contact Closed = Dirty Filter
— Shutdown Signal:
Contact Closed = Shut off all equipment
— Window Monitor:
Contact Closed = Window is Closed
— Monitor Switch:
Contact Closed = Monitor switch is Closed
— Coil Freeze Stat:
Contact Closed = Coil Freeze Condition sensed
— Aquastat - Make on Temp Rise:
Contact Closed = Heating, Contact Open = Cooling
— Aquastat - Break on Temp Rise:
Contact Closed = Cooling, Contact Open = Heating
— Time Clock:
Contact Closed = Occupied Mode; Contact Open = Unoccupied Mode
— Drip Pan:
Contact Closed = Drip Pan is Full
— Economizer Enable Signal:
Contact Closed = Outside Air Suitable for Cooling
— Wall Module Bypass Pushbutton:
Momentary DI (See Appendix B—Sequences of Operation for bypass details.)

Triac Outputs

Triac Outputs on the UV:
— Power ratings: 20 Vac to 30 Vac at 25 mA MIN to 500 mA MAX current for any voltage.

⚠ **CAUTION**
When any device is energized by a Triac, the device must be able to sink a minimum of 25 mA.

NOTE: Triacs sink current to the 24 Vac common (COM terminal); see Fig. 22 for wiring example.

IMPORTANT
If non-Honeywell motors, actuators, or transducers are to be used with Excel 10 Controllers, Triac compatibility must be verified (see previous NOTE).

Wall Modules

The T7770 Wall Modules for the Excel 5000 and Excel 10 Controllers are available in a variety of configurations. The models T7770A and T7770E are shown in Fig. 7. The T7770B,C,D,F,G are the same physical size (see Product Names section for differences).

The T7780 DDWM for the Excel 10 Controllers (see Product Names section) is shown in Fig. 8.

Air Temperature Sensor

The C7770A Air Temperature Sensor for the Excel 5000 and Excel 10 Controllers contains a nonlinearized 20 Kohm NTC thermister. See Fig. 9.

* The PT3000 sensor is not recommended for floating control (real time - discharge or return configured as space sensor). The PT3000 sensor is intended for monitoring or differential (staged) control

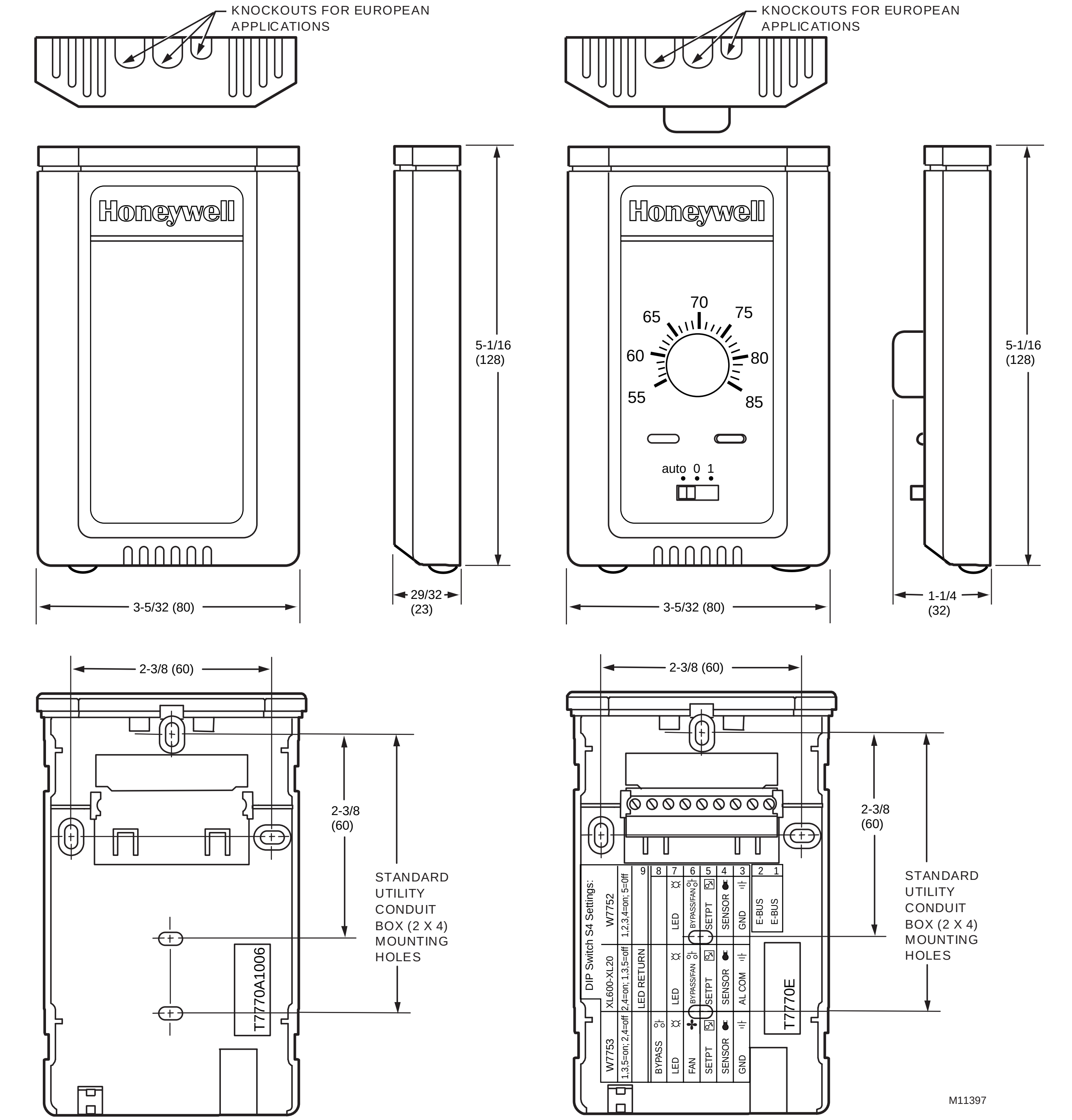


Fig. 7. T7770A,B,C,D,E,F,G Subbase dimensions in in. (mm).

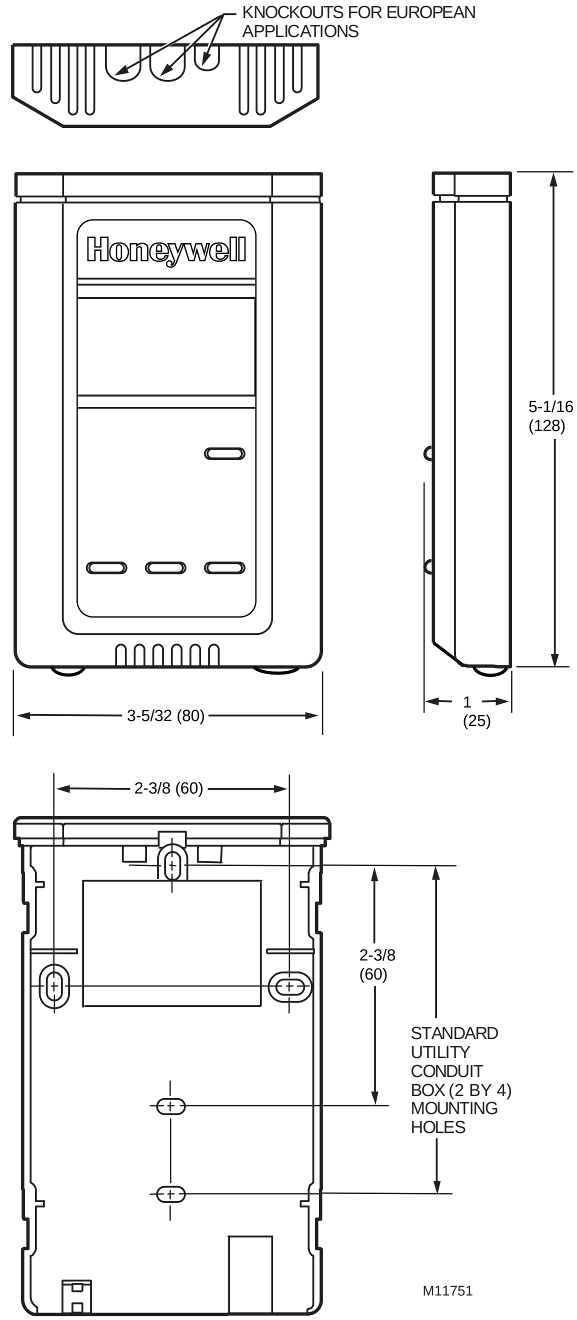


Fig. 8. T7780 Subbase dimensions in in. (mm).

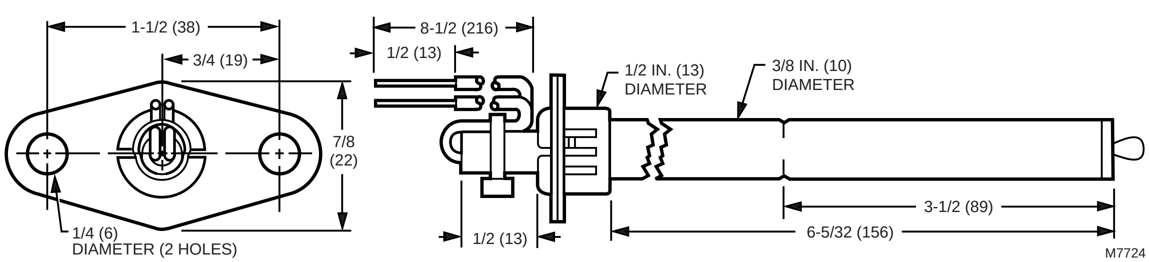


Fig. 9. C7770A construction in in. (mm).

Configurations

General

Tables 3 and 4 provide an overview of the Excel 10 W7753A configuration options. All W7753As are assumed to have a supply fan digital output. Additionally, Table 2 lists the general mechanical equipment options available with the W7753A Controller. See Application Step 6. Configure Controllers, for further information on configurations.

CAUTION

For floating control, the Excel 10 W7753A Controller is designed to work only with Series 60 valve and damper actuators. Full stroke actuator drive-time must be between 20 and 240 seconds (0.25 to 4.0 minutes).

Table 2. Configuration Options Summary For The W7753A Controller.

Option	Possible Configurations
Supply Fan	1. Mandatory Digital Output (Single or Three Speed).
Type of Heating	1. One stage.
	2. Two stages.
	3. Series 60 Modulating electric valve, or pneumatic via transducer.
	4. Pulse Width Modulating electric valve, or pneumatic via transducer.
	5. None.
Type of Cooling	1. One stage.
	2. Two stages.
	3. Series 60 Modulating electric valve, or pneumatic via transducer.
	4. Pulse Width Modulating electric valve, or pneumatic via transducer.
	5. None.
Type of Economizer	1. Digital Output Enable/Disable signal for controlling an external economizer package.
	2. Series 60 Modulating electric damper motor, or pneumatic via transducer.
	3. Pulse Width Modulating electric damper motor, or pneumatic via transducer.
	4. None.
Proof of Air Flow	1. None.
	2. Physically Connected: Contacts closed equals Fan On.
Occupancy Sensor	1. None.
	2. Connected: Contacts closed equals Occupied.
	3. Network (Occ/Unocc signal received via the E-Bus network).
Window Sensor	1. None.
	2. Physically Connected: Contacts closed equals window closed.
	3. Network (Window Open/Closed signal received via the E-Bus).
Wall Module Option	1. Local (direct wired to the controller).
	2. Network (sensor value received via the E-Bus).
Wall Module Type (All seven Types have an E-Bus access jack)	1. Sensor only.
	2. Sensor and Setpoint adjust.
	3. Sensor, Setpoint adjust and Bypass.
	4. Sensor and Bypass.
	5. Sensor, Setpoint adjust, Bypass and 3 position fan switch.
	6. Sensor, Setpoint adjust, Bypass and 5 position fan switch.
	7. Sensor, Bypass and 5 position fan switch.
Smoke Emergency Initiation	1. None.
	2. Physically Connected: Contacts closed equals smoke detected.
	3. Network (Emergency/Normal signal received via the E-Bus).

(continued)

Table 2. Configuration Options Summary For The W7753A Controller (continued).

Option	Possible Configurations
IAQ Option	1. None.
	2. Local IAQ Digital Input—directly wired to the controller. (Contacts closed means poor IAQ is detected.)
	3. Network (IAQ Override signal received via the E-Bus).
	4. Local CO_2 Analog Input—directly wired to the controller. (The sensor must be a 0 to 10V device representing 0 to 2000 PPM CO_2.)
Filter Monitor Option	1. None.
	2. Local Dirty Filter Digital Input—directly wired to the controller. (Contacts closed means that the filter is dirty.)
	3. Local Analog Input for Differential Pressure across the Filter (directly wired to the controller). The sensor must be a 2 to 10V device representing 0 to 5 inw (0 to 1.25 kPa).
Shut Down Option	1. None.
	2. Local Shut Down Digital Input—directly wired to the controller. (Contacts closed means to shut down the equipment.)
Monitor Switch Option	1. None.
	2. Local Monitor Switch Digital Input—directly wired to the controller. (Contacts closed means Monitor Switch is closed.)
Coil Freeze Stat Option	1. None.
	2. Local Coil Freeze Stat Digital Input—directly wired to the controller. (Contacts closed means that coil freeze condition is sensed.)
Aqua Stat Make On Temp Rise Option	1. None.
	2. Local AqStatMakeTmpRise Digital Input—directly wired to the controller. (Contacts closed means cooling mode, contact open means heating mode.)
Aqua Stat Break On Temp Rise Option	1. None.
	2. Local AqStatBrkTmpRise Digital Input—directly wired to the controller. (Contacts closed means Heating mode, contact open means cooling mode.)
TimeClk Option	1. None.
	2. Local TimeClk Digital Input—directly wired to the controller. (Contacts closed means Scheduled Occ mode.)
	3. Network (OccSchedule signal received via the E-Bus).
Drip Pan Full	1. None.
	2. Local DripPanFull Digital Input—directly wired to the controller. (Contacts closed means that Drip Pan is Full.)
EconEnable Option	1. None.
	2. Local EconEnable Digital Input—directly wired to the controller. (Contacts closed means Outside air is suitable for Cooling.)

Allowable Heating and Cooling Equipment Configurations

Each W7753A can control a variety of different types of mechanical cooling and heating equipment within the Unit Ventilator. See Fig. 10 through 13 for a conceptual overview of some typical configurations. For specific wiring details, see the Prepare Wiring Diagrams section.

Staged Heating/Cooling Control

Staged equipment control is available for up to two stages of heating or two stages of cooling. On the W7753A, the stages are activated through digital outputs (Triacs) one for each stage, wired to 24 Vac contactors (see Fig. 22 and 26 in Step 4. Prepare Wiring Diagrams section for wiring details). Note that the number of physical digital outputs (DOs) on the controller limits the total number of stages that can be controlled. For example, the W7753A has eight digital outputs. If you are controlling a Unit Ventilator that has a three speed fan, three digital outputs would be required to control the speed. You also have an economizer that is floating control (Series 60 – requires 2 digital outputs). You have used five of the eight possible digital outputs and only have three digital outputs left for the heating and cooling control. Fig. 10 shows a typical application of two stages of heat and two stages of cooling.

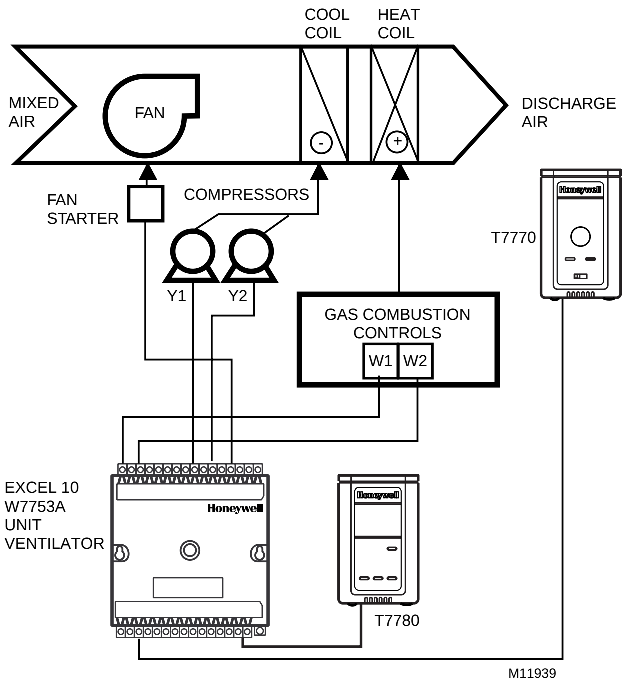


Fig. 10. Fan with two stages of heating and two stages of cooling.

Modulating Heating/Cooling Control

The W7753A Controller provides modulating equipment control for heating and cooling equipment, and economizer dampers using either Series 60 Floating Control or Pulse Width Modulated (PWM) Control. The Series 60 Modulating Control is provided through two Triac digital outputs on the W7753A, one to pulse the valve actuator open and one to pulse it closed. PWM control positions the actuator based on the length, in seconds, of the pulse from the digital output. For PWM, the controller outputs a pulse whose length consists of two parts, a minimum and a maximum. The minimum pulse time represents the analog value of zero percent and the maximum pulse length that represents an analog value of 100 percent. If the analog value is greater than zero percent, an additional time is added to the minimum pulse time. The length of time added is directly proportional to the magnitude of the analog value. The PWM actuator will begin to use the analog value at the end of the pulse and will continue to use this value until a new pulse is received. Refer to appendix B under PWM Control for an example. Series 60 actuators are generally less expensive than those for PWM, but the trade-off is that PWM requires only a single controller digital output while floating control uses two DOs. Refer to appendix B under Series 60 Modulating Control for an example. Fig. 11 illustrates a system with modulating heating and cooling (see Fig. 22 and 23 in Step 4. Prepare Wiring Diagrams section, for wiring details).

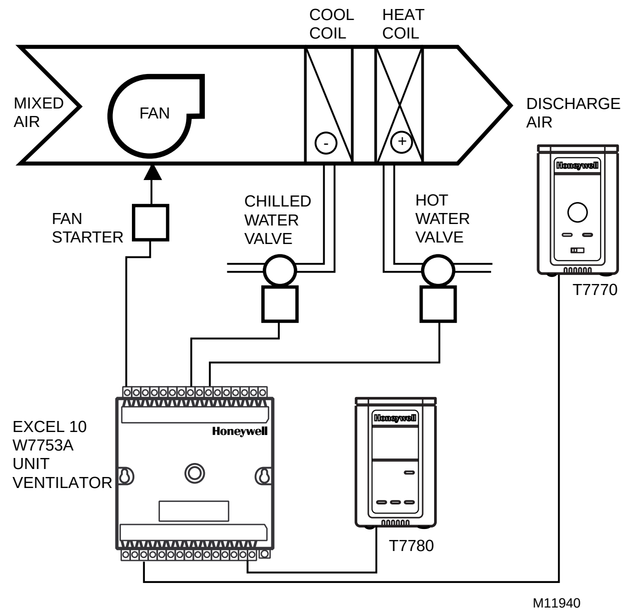


Fig. 11. Fan, modulating heating and modulating cooling.

NOTE: Pneumatically actuated valves can be controlled using a pneumatic transducer device. See Fig. 26. Also, transducer devices are available from third party vendors to convert PWM outputs to a voltage or current signal if desired.

Economizer Control

There two types of economizer controls that are supported by the W7753A Controller, a modulating control and enable/disable control (packaged economizer separate from the W7753A). If a packaged economizer is configured, the control assumes that the first stage of cooling operates an economizer whenever the Econo_ok signal indicates that the economizer is enabled (outside air is suitable for use in cooling). An external packaged economizer control then modulates the dampers. For Modulating control, the control can be either Series 60 Floating Control or PWM control. A discharge air temperature sensor is required for modulating economizer damper control. Fig. 12 illustrates a system with modulating economizer dampers (see Fig. 23 and 24 in Step 4. Prepare Wiring Diagrams section, for wiring details).

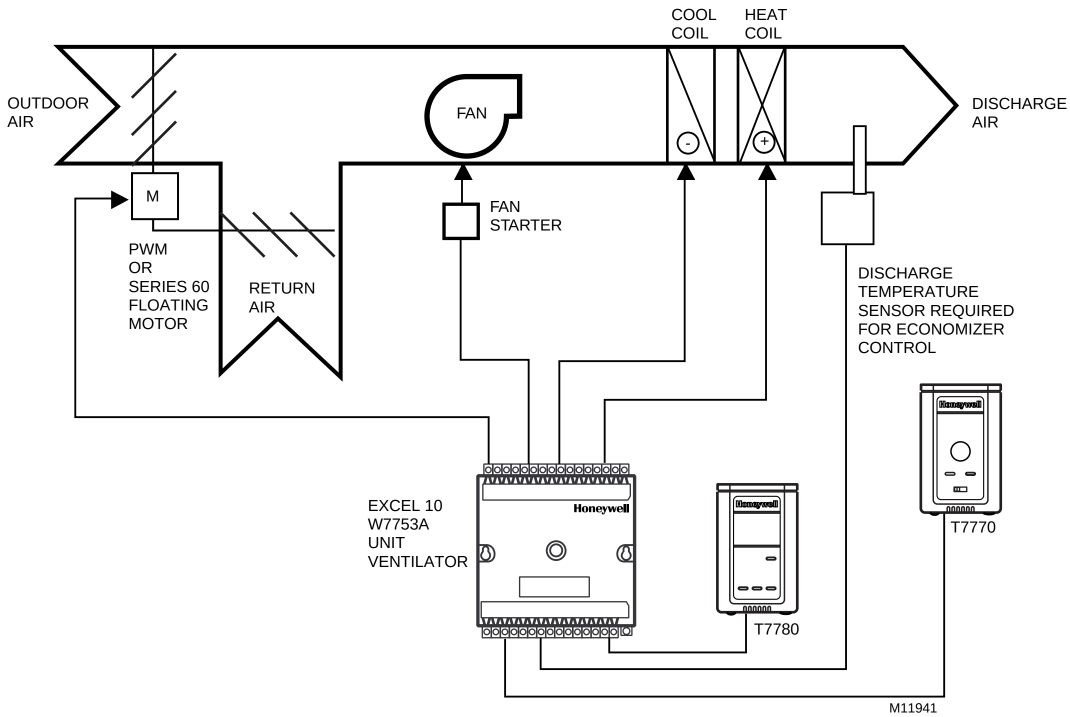


Fig. 12. Economizer control.

Pneumatic Actuator Control

The W7753A Controller can control pneumatic actuators for any or all of the three modulating outputs provided by the control algorithm (heat, cool and economizer). Control of pneumatic water/steam valves and damper actuators is provided through a transducer device using either Series 60 Floating Control or PWM DOs. A floating-to-pneumatic, or a PWM-to-pneumatic transducer is required for each output signal.

For projects with existing pneumatically actuated valves, the W7753A Controller output must be converted to a pneumatic signal using a transducer device developed for use with Excel 10 Controllers. The transducer is available through Honeywell, or directly from the manufacturer, Mamac Systems (see Table 9 for ordering information). Fig. 13. depicts a typical W7753A Controller with modulating heating valve using a pneumatic valve actuator. Also see Fig. 26 for wiring an MMC325 Pneumatic Transducer to a W7753A Controller.

NOTE: When choosing the pneumatic pressure range, make sure that the close-off pressure is 2 to 3 psi greater than that of the spring range. When using a spring range of 5 to 10 psi with 10 psi as the closed position, *do not* use the 0 to 10 psi model of the MMC325 Transducer; use the 0 to 20 psi transducer as the recommended selection.

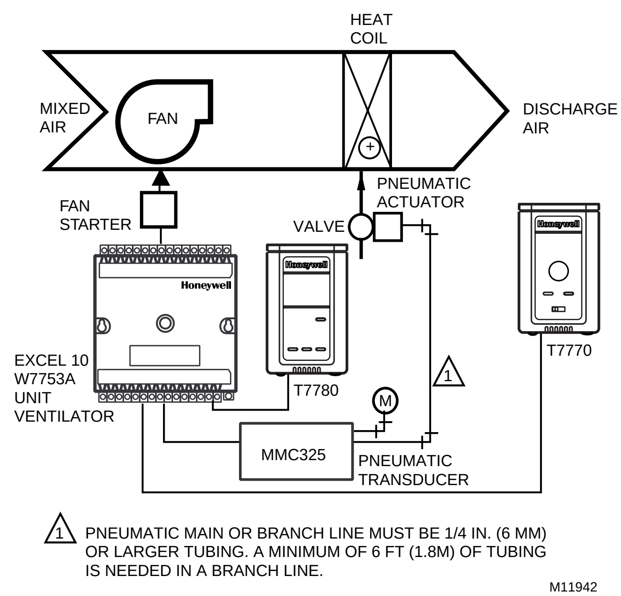


Fig. 13. Modulating heat with pneumatic valve actuator.

Mixed-Output-Type Control

The W7753A Controller provides control for mixed-output-types of applications such as PWM heating and staged cooling control occurring simultaneously with Series 60 Floating Economizer Damper Control.

Occupancy Sensor

Excel 10 W7753A Controllers provide a digital input for connection to an occupancy sensor. This is a device, such as a passive infrared motion detector, that contains a dry contact (see following NOTE) closure to indicate whether or not people are present in the space. The Excel 10 W7753A Controller expects a contact closure to indicate the space is Occupied. See Fig. 25 in Application Step 4, Prepare Wiring Diagrams, for details on wiring connections.

The control algorithm in the Excel 10 Controller uses the occupancy sensor, if configured, to determine the Effective Occupancy (see Table 3) mode of operation. If the Time Of Day (TOD) schedule indicates an Occupied state, and the occupancy sensor contact is closed, the Effective Occupancy mode is Occupied. However, if the TOD schedule indicates an Occupied state and the occupancy sensor contact is open, then the Effective Occupancy mode is STANDBY. The temperature control algorithm is then controlled to the STANDBY Cooling and Heating Setpoints.

If the occupancy sensor is not configured, a local controller can be put in the STANDBY mode only by either a one-to-one association of the occupancy sensor from another Excel 10 Controller to the local controller, or by receiving the STANDBY mode signal via the E-Bus.

NOTE: The Excel 10 Controller has limited power available (only 9 mA at 4.8 volts) for checking the digital inputs for contact closures. It is very important that the device used contains high quality, noncorroding contacts with resistivity that does not degrade; that is, increase over time. Use noble metal (such as gold or silver), or pimpled or sealed contacts to assure consistent, long-term operation.

The recommended devices for use with the Excel 10 W7753A Controllers are the EL7628A1007 Ceiling Mounted Infrared or the EL7680A1008 Wall Mounted Wide View Infrared Occupancy Sensors. If ultrasonic sensors are required, the EL7611A1003 and the EL7612A1001 Occupancy Sensors are recommended. An EL76XX Power Supply/Control Unit is required for use with these occupancy sensors. The EL7630A1003 can power up to four sensors, and is multi-tapped for several line voltages. The EL7621A1002 can power three sensors and it connects to 120 Vac line voltage. The EL7621A1010 can also power three sensors but it connects to 277 Vac line voltage.

Window Open/Closed Digital Input

A digital input is also provided for detecting whether a window in the space was opened. The Excel 10 W7753A Controller can be connected to a dry contact (see the following NOTE and Fig. 25 in Application Step 4. Prepare Wiring Diagrams, for details) or a set of contacts wired in series (for monitoring multiple windows) to verify that the window(s) are closed. The algorithm expects a contact closure to indicate the window is closed. If an open window is detected, the algorithm changes the mode of operation to FREEZE_PROTECT, which shuts down the control functions, and watches for low space temperature conditions. The freeze protection setpoint is 46.4°F (8°C), and the frost alarm occurs at 42.8°F (6°C).

NOTE: (This is the same NOTE as in the Occupancy Sensor section.) The Excel 10 has limited power available (only 9 mA at 4.8 volts) for checking the digital inputs for contact closures. It is very important that the device used contains high quality, noncorroding contacts with resistivity that does not degrade; that is, increase over time. Use noble metal (such as gold or silver), or pimpled or sealed contacts to assure consistent, long-term operation.

Wall Module Options

As previously discussed, there are seven basic varieties of the T7770 Wall Modules and the T7780 DDWM (see the Product Names and the Construction sections). Also, T7770 Wall Modules and the T7780 DDWM can be shared among two or more W7753As. The control algorithm must be given this wall module information when configuring the W7753A (see Excel E-Vision User’s Guide, form 74-2588).

Fan Speed Switch

The W7753A allows control of the units fan speed through a T7770 wall modules fan speed switch. It can be wired to either resistive input 1 or 2 and will indicate either a single or three speed auto/off/on.

Mixed Air Temperature

The Excel 10 W7753A Controller supports a mixed air temperature sensor for control of an economizer in the Cycle III operation. For Cycles I and II, the mixed air temperature sensor can be used for monitoring only. The details of the W7753A Mixed Air economizer control operation are described in Appendix B—Sequences of Operation under the Cycle III Damper control heading.

Outdoor Air Quality CO

The Excel 10 W7753A Controller provides an input for an Outdoor Air Quality sensor. The Unit Ventilator will measure the outdoor air quality of the outside air entering the Unit Ventilator in order to close outdoor dampers when the CO levels exceed the setpoint. The details of the W7753A Mixed Air economizer control operation are described in Appendix B—Sequences of Operation.

Dirty Filter Monitor

The air filter in the Unit Ventilator can be monitored by the W7753A and an alarm issued when the filter media needs replacement. The two methods of monitoring the filter are:

1. Connecting a differential pressure switch to a digital input.
2, Wiring a 2-to-10V differential pressure sensor to a voltage input. If the analog input sensor is used, its measured value 0 to 5 inw (0 to 1.25 kPa) is compared to a user-selectable setpoint, FltrPressStPt—valid range: 0 to 5 inw (0 to 1.25 kPa), and the Dirty Filter alarm is issued when the pressure drop across the filter exceeds the setpoint.

Drip Pan Full

The drip pan in the Unit Ventilator can be monitored by the W7753A and an alarm issued when there is a drip pan full condition. The W7753A expects a contact closure to indicate a drip pan full condition. The W7753A will disable the cooling upon the contact closure, but will continue to run the fan.

Indoor Air Quality (IAQ) Override

The Excel 10 W7753A Controller provides IAQ ventilation control using one of two different methods of detecting poor air quality. The first is with an IAQ switch device connected to a digital input on the W7753A Controller, where a contact closure indicates poor air quality, and initiates the IAQ Override mode. The device can detect poor air quality using any desired measure such as CO_2, VOC, CO, etc. The second method is through an analog input that connects to a CO_2 sensor (0 to 10V). The measured value of CO_2 from this sensor (0 to 2000 PPM) is compared to the setpoint (IAQSetpt). When the CO_2 level is higher than the setpoint, the IAQ Override is initiated.

The effect of initiating the IAQ Override mode is that the economizer dampers are allowed to open above the standard minimum position setting to allow more fresh air to enter the building. See Appendix B—Sequences of Operation, for further control details.

Freeze Stat

A freeze stat can be monitored by the W7753A and issue a freeze stat alarm indicating the unit ventilator is in danger of freezing its coil. Upon receiving a contact closure, the W7753A control algorithm will close the outdoor air damper and open the hot water valve (if available) to the full open as a safety precaution. The details of the W7753A freeze stat related control operation are described in Appendix B—Sequences of Operation.

AquaStat

An Aquastat can be monitored by the W7753A for Heat/Cool changeover. The aquastat can be either contacts-closed-on-temp-rise or contacts-close-on-temp-fall. The digital input must be configured for the appropriate device. The Aquastat will not change the Heat/Cool mode of the controller, only lock out or enable the cooling coil. The details of the W7753A AquaStat related control operation are described in Appendix B—Sequences of Operation.

Smoke Control

The Excel 10 W7753A Controller supports smoke-related control strategies that are initiated either via a network command (DestEmerg) or from a local (physically connected) smoke detector digital input. The details of the W7753A smoke-related control operation are described in Appendix B—Sequences of Operation.

Modes of Operation

The possible modes of operation for the W7753A Controller are listed in Table 3.

Table 3. Modes Of Operation For The Excel 10 W7753A Controller.

Mode	Description	Events causing a controller to switch to this mode
Effective Occupancy (User Address: StatusOcc)		
OCCUPIED	Controller is in Occupied mode	Any of the following: Network input (StatusSched) containing a time-of-day schedule flag from either the Excel 10 Zone Manager or an E-Bus Controller; Time Clock DI, Occupancy Sensor DI; or from Network input (ManMode) for manual override to OCC mode. ManMode has the highest priority, followed by the Time Clock DI, and then StatusSched.
STANDBY	Controller is in Standby mode	Either: (a) Network input (StatusSched) containing a time-of-day schedule flag from the Excel 10 Zone Manager or other E-Bus node is STANDBY, or (b) Network input (StatusSched) is OCCUPIED and the Occupancy Sensor DI is UNOCCUPIED.
UNOCCUPIED	Controller is in Unoccupied mode	Network input (StatusSched) containing a time-of-day schedule flag from the Excel 10 Zone Manager or E-Bus, or the network input CmdManOcc has a value of UNOCCUPIED.
BYPASS OCCUPIED	Controller is in Occupied mode through a Bypass command	This mode is derived from the schedule occupancy (StatusSched) having a state of UNOCCUPIED and a manual request for occupancy from one of three sources. Two of these are signals originated external to the unit, and received by CmdManualOcc and DestBypass. The third source for an occupancy request is from an override button located on a wall module. These three sources are arbitrated in a scheme determined by the configuration parameter (Network Wins or Last-in Wins from OvrdPriority).

(continued)

Table 3. Modes Of Operation For The Excel 10 W7753A Controller (continued).

Mode	Description	Events causing a controller to switch to this mode
Override Modes (User Address: StatusOvrd)		
OCCUPIED	Controller occupancy mode was overridden to Occupied mode	Network input (CmdManualOcc) containing a time-of-day schedule override signal of OCCUPIED from the Excel 10 Zone Manager or other E-Bus device.
STANDBY	Controller occupancy mode was overridden to Standby mode	Network input (CmdManualOcc) containing a time-of-day schedule override signal of STANDBY from the Excel 10 Zone Manager or other E-Bus device.
UNOCCUPIED	Controller occupancy mode was overridden to Unoccupied mode	Network input (CmdManualOcc) containing a time-of-day schedule override signal of UNOCCUPIED from the Excel 10 Zone Manager or other E-Bus device.
BYPASS	Controller occupancy mode was overridden to Bypass the current Unoccupied mode	DI (Bypass) was pressed, and the Bypass duration timer has not yet expired, or the network input CmdManOcc has a value of BYPASS.
NOT ASSIGNED	No Bypass action	No Override input received.
Operational Modes (User Address: StatusMode)		
START-UP AND WAIT	On power-up, provides a staggered start sequence to evenly apply the load to the electrical system.	This mode occurs on controller power-up, and after downloading to the controller from the configuration tool. Temperature control loops are disabled.
COOLING	The Excel 10 is controlling the Cooling mode.	Space temperature has risen above the current cooling setpoint, or the network input (CmdHvacMode) is COOL.
HEATING	The Excel 10 is controlling the Heating mode.	Space temperature has fallen below the current heating setpoint, or the network input (CmdHvacMode) is HEAT.
EMERGENCY HEAT	Compressors are disabled and only Auxiliary Heat stages are allowed to operate.	The network input (CmdHvacMode) is EMERG_HEAT.
OFF MODE	The heat/cool control is turned off immediately. The node is not running its normal temperature control.	Network input (CmdMode) containing AHU operational mode information from C-Bus has value of MORNING WARM-UP.
DISABLED MODE	The heat/cool control and frost protection are turned off immediately. The node is not running its normal temperature control.	—
SMOKE EMERGENCY	The node has entered a smoke emergency. The fan and dampers are then set to the conditions configured by SmkCtlMode. The control remains in SMOKE_EMERGENCY until power is cycled or the node receives DestEmerg set to EMERG_NORMAL.	Network input (DestEmerg) containing smoke control signal from another E-Bus device has value of SMOKE_EMERG.
FREEZE PROTECT	The temperature control is set to HEAT with the setpoint set to the frost limit setpoint 46.4°F (8°C).	The Window digital input detects an open window.
MANUAL POSITION	The physical outputs are being controlled manually. The temperature control loop is turned off.	Typically this is done by the user through E-Vision or XBS by setting the point CmdMode to MANUAL mode.
FAN ONLY	Control algorithm is disabled, except that the fan is turned on.	The space temperature sensor has failed, or the network input (CmdHvacMode) is FAN ONLY.
DISABLED	Control algorithm is shut off.	Network input (ManMode) containing AHU operational mode information from C-Bus has value of DISABLED.

NOTE: During all modes all digital and analog physical inputs are periodically read, the diagnostic output network variables can be polled, the input network variables are received, and the output network variables are sent periodically.

APPLICATION STEPS

Overview

The seven application steps shown in Table 4 are planning considerations for engineering an Excel 10 W7753A System. These steps are guidelines intended to aid understanding of the product I/O options, bus arrangement choices, configuration options and the Excel 10 W7753A Controller role in the overall EXCEL 5000® OPEN™ SYSTEM architecture.

Table 4. Application Steps.

Step No.	Description
1	Plan The System
2	Determine Other Bus Devices Required
3	Lay Out Communication and Power Wiring
4	Prepare Wiring Diagrams
5	Order Equipment
6	Configure Controllers
7	Troubleshooting

Step 1. Plan The System

Plan the use of the W7753A Controllers according to the job requirements. Determine the location, functionality and sensor or actuator usage. Verify the sales estimate of the number of W7753A Controllers and T7770 Wall Modules and T7780 DDWMs required for each model type. Also check the number and type of output actuators and other required accessories.

When planning the system layout, consider potential expansion possibilities to allow for future growth. Planning is very important to be prepared for adding HVAC systems and controllers in future projects.

The T7770 Wall Modules can be installed as either hardwired I/O-only devices or additional wiring can be run to them (for the E-Bus network) to allow a CARE/E-Vision operator terminal to have access to the E-Bus. The application engineer needs to determine how many wall modules, T7770s and T7780s are required. T7780s are connected to the E-Bus and occupy a node address. All DDWMs and T7770 Wall Modules, except the T7770A1006 and the T7770A1014, can be connected via the E-Bus network access jack. Also the application engineer needs to know how many T7770s without E-Bus network connections are being installed on the job, and then clearly document which wall modules (if any) have network access. This information is required during installation to ensure that the proper number and type of wires are pulled to the wall modules, and the building operators are informed about where they can plug in to the E-Bus network with a portable operator terminal (see Fig. 14, 15 and 16). Refer to Step 4. Prepare Wiring Diagrams for details, about the about the wiring differences between the two types.

The FTT communication loop, (E-Bus) between controllers is a free topology wiring scheme that supports star, loop, and/or bus wiring. Refer to the E-Bus Wiring Guidelines

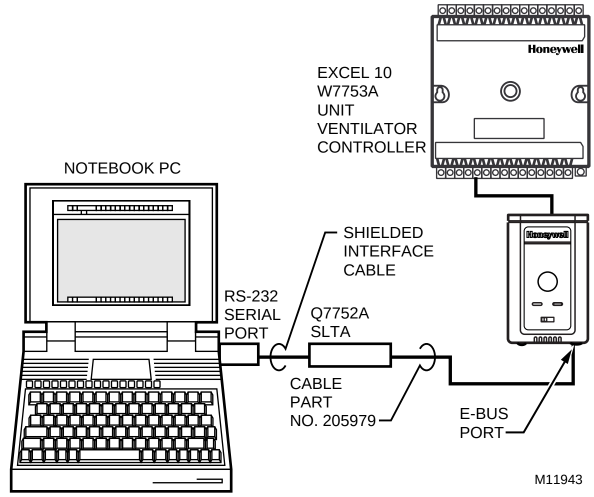


Fig. 14. Connecting the portable operator terminal to the E-Bus.

form, 74-2865 for complete description of network topology rules. See Application Step 3. Lay Out Communications and Power Wiring, for more information on bus wiring layout, and see Fig. 22 through 26 in Application Step 4. Prepare Wiring Diagrams, for wiring details.

The application engineer must review the Direct Digital Control (DDC) job requirements. This includes the Sequences of Operation for the W7753A Controllers, and for the system as a whole. Usually there are variables that must be passed between the W7753A Controllers and other zone controller(s), or central plant controller(s) that are required for optimum system-wide operation. Typical examples are the TOD Occ/Unocc signal, the outdoor air temperature, demand limit control signal, and smoke control mode signal.

It is important to understand these interrelationships early in the job engineering process to ensure implementing when configuring the controllers. (See Application Step 6. Configure Controllers, for information on the various Excel 10 parameters and on Excel 10 point mapping.)

Step 2. Determine Other Bus Devices Required

A maximum of 62 nodes can communicate on a single E-Bus segment. Each W7753A UV Controller or T7780 DDWM constitutes one node. If more nodes are required, a Q7751A Router is necessary. Using a router allows up to 125 nodes, divided between two E-Bus segments. The router accounts for two of these nodes (one node on each side of the router); a Q7750A Excel 10 Zone Manager takes one node and two nodes are available for operator terminal nodes, leaving 120 nodes available for Excel 10 Controllers and T7780 DDWMs. All 120 controllers and T7780 DDWMs are able to talk to each other through the router. A Q7750A Excel 10 Zone Manager is required to connect the E-Bus to the standard EXCEL 5000® System C-Bus. Each Excel 10 Zone Manager can support no more than 120 Excel 10 Controllers and T7780 DDWMs. This limit is set in the Excel 10 Zone Manager database as an absolute maximum.

Each E-Bus segment is set up with two unused nodes to allow for a CARE/E-Vision operator terminal to be connected to the E-Bus. Multiple CARE/E-Vision terminals can be connected to the bus at the same time. Table 5 summarizes the E-Bus segment configuration rules.

Table 5. E-Bus Configuration Rules And Device Node Numbers.

One E-Bus Segment Example	**Maximum Number of Nodes Equals 62**
One Q7750A Excel 10 Zone Manager	1 node
Port for operator terminal access (CARE/E-Vision)	1 node
Maximum number of Excel 10s and T7780 DDWMs	60 nodes (T7780 DDWMs are E-Bus nodes)
Total	62 nodes
Two E-Bus Segments Example	**Maximum Number of Nodes Equals 125**
One Q7750A Excel 10 Zone Manager	1 node
One Q7751A Router	2 nodes (1 in each Bus Segment)
Ports for operator terminal access (two CARE/E-Vision terminals)	2 nodes (1 in each Bus Segment)
Maximum number of Excel 10s and T7780 DDWMs in segment number one	60 nodes (T7780 DDWMs are E-Bus nodes)
Maximum number of Excel 10s and T7780 DDWMs in segment number two	60 nodes (T7780 DDWMs are E-Bus nodes)
Total	125 nodes

Refer to the E-Bus Wiring Guidelines form, 74-2865 for complete description of network topology rules and the maximum wire length limitations. If longer runs are required, a Q7740A 2-Way or Q7740B 4-Way Repeater can be added to extend the length of the E-Bus. A Q7751A Router can be added to partition the system into two segments and effectively double the length of the E-Bus. Only one router is allowed with each Excel 10 Zone Manager, and each network segment can have a maximum of one repeater.

In addition, all E-Bus segments require the installation of a Bus Termination Module for a singly terminated E-Bus or two Bus Termination Modules for a doubly terminated E-Bus. For more details on E-Bus termination, refer to the E-Bus Wiring Guidelines form, 74-2865, or see Application Step 3. Lay Out Communications and Power Wiring, and the E-Bus Termination Module subsection in Application Step 4.

Step 3. Lay Out Communications and Power Wiring

E-Bus Layout

The communications bus, E-Bus, is a 78-kilobit serial link that uses transformer isolation and differential Manchester encoding. Approved cable types for E-Bus communications wiring is Level IV 22 AWG (0.34 mm^2) plenum or non-plenum rated unshielded, twisted pair, solid conductor wire. For nonplenum areas, use Level IV 22 AWG (0.325 mm^2), such as U.S. part AK3781 (one pair) or U.S. part AK3782 (two pair). In plenum areas, use plenum-rated Level IV, 22 AWG (0.325 mm^2) such as U.S. part AK3791 (one pair) or U.S. part AK3792 (two pair). See Tables 9 and 10 for part numbers. Contact Echelon® Corp. Technical Support for the recommended vendors of Echelon® approved cables. The FTT communications bus, E-Bus, supports a polarity insensitive, free topology wiring scheme that supports star, loop, and/or bus wiring.

E-Bus networks can be configured in a variety of ways, so refer to the E-Bus Wiring Guidelines form, 74-2865 for complete description of network topology rules. Fig. 15 and 16 depict two typical E-Bus network topologies; one as a singly terminated bus segment that has 60 nodes or less, and one showing a doubly terminated segment. The bus configuration is set up using the Network Manager tool from within CARE (see the CARE Excel 10 Zone Manager User's Guide, form 74-1392).

NOTE: For wiring details see the E-Bus Termination Module subsection in Step 4. For wall module wiring, U.S. part AK3782 (non-plenum) or U.S. part AK3792 (plenum) can be used. These cables contain two twisted pairs (one for the run down to the wall module, and one for the run back up to the controller) for ease of installation.

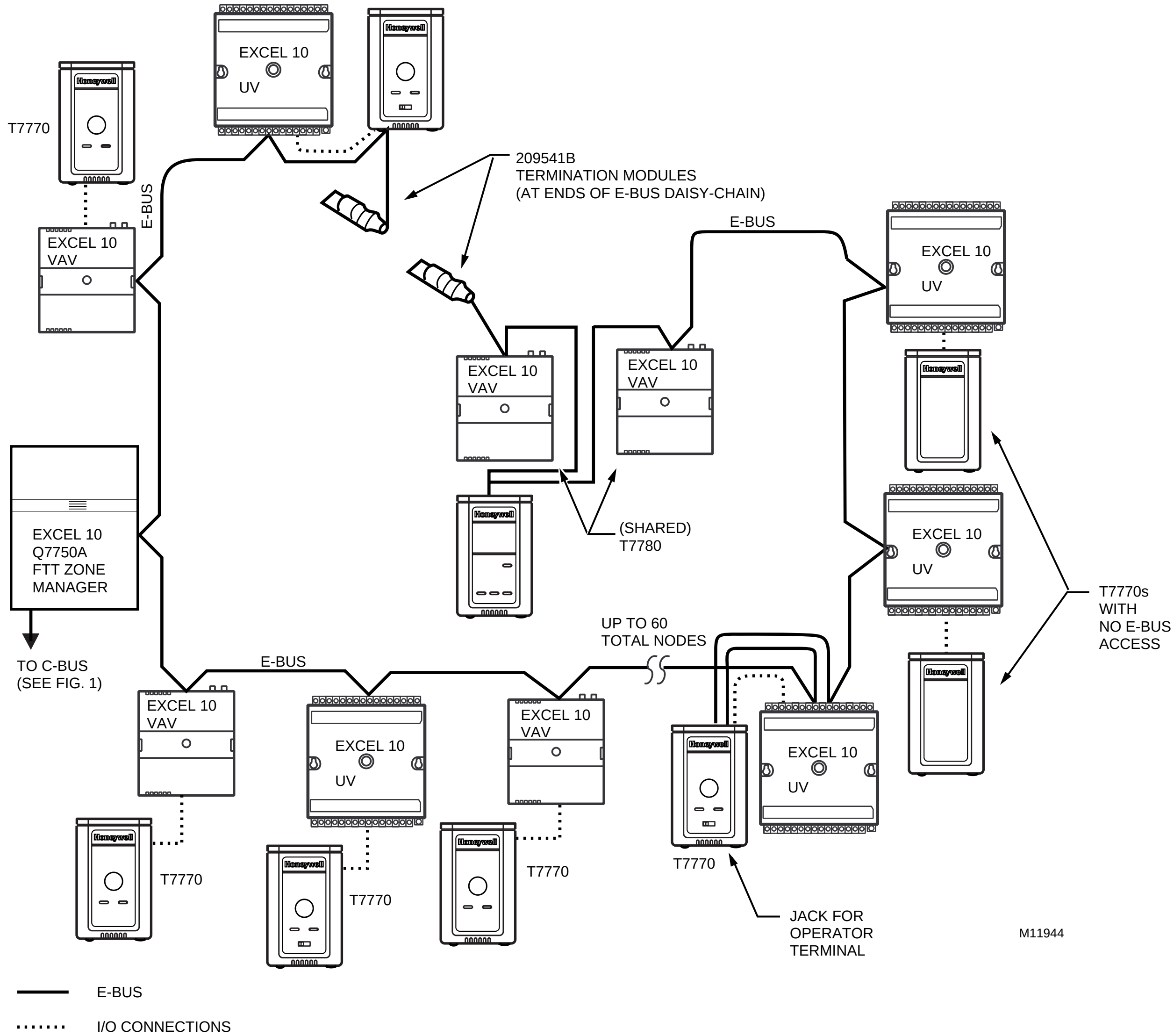


Fig. 15. E-Bus wiring layout for doubly terminated daisy-chain E-Bus segment.

NOTE: See the E-Bus Termination Module section for wiring details.

IMPORTANT

Notes on communications wiring:

- *All field wiring must conform to local codes and ordinances or as specified on installation wiring diagrams.*
- *Approved cable types for E-Bus communications wiring is Level IV 22 AWG (0.34 mm^2) plenum or non-plenum rated unshielded, twisted pair, solid conductor wire. For nonplenum areas, use Level IV 22 AWG (0.34 mm^2), such as U.S. part AK3781 (one pair) or U.S. part AK3782 (two pair). In plenum areas, use plenum-rated Level IV, 22 AWG (0.34 mm^2) such as U.S. part AK3791 (one pair) or U.S. part AK3792 (two pair). See Tables 7 and 9 for part numbers. Contact Echelon® Corp. Technical Support for the recommended vendors of Echelon® approved cables.*
- *Unswitched 24 Vac power wiring can be run in the same conduit as the E-Bus cable.*
- *Do not use different wire types or gauges on the same E-Bus segment. The step change in line impedance characteristics causes unpredictable reflections on the bus. When using different types is unavoidable, use a Q7751A Router at the junction.*
- *In noisy (high EMI) environments, avoid wire runs parallel to noisy power cables, or lines containing lighting dimmer switches, and keep at least 3 in. (76 mm) of separation between noisy lines and the E-Bus cable.*
- *Make sure that neither of the E-Bus wires is grounded.*

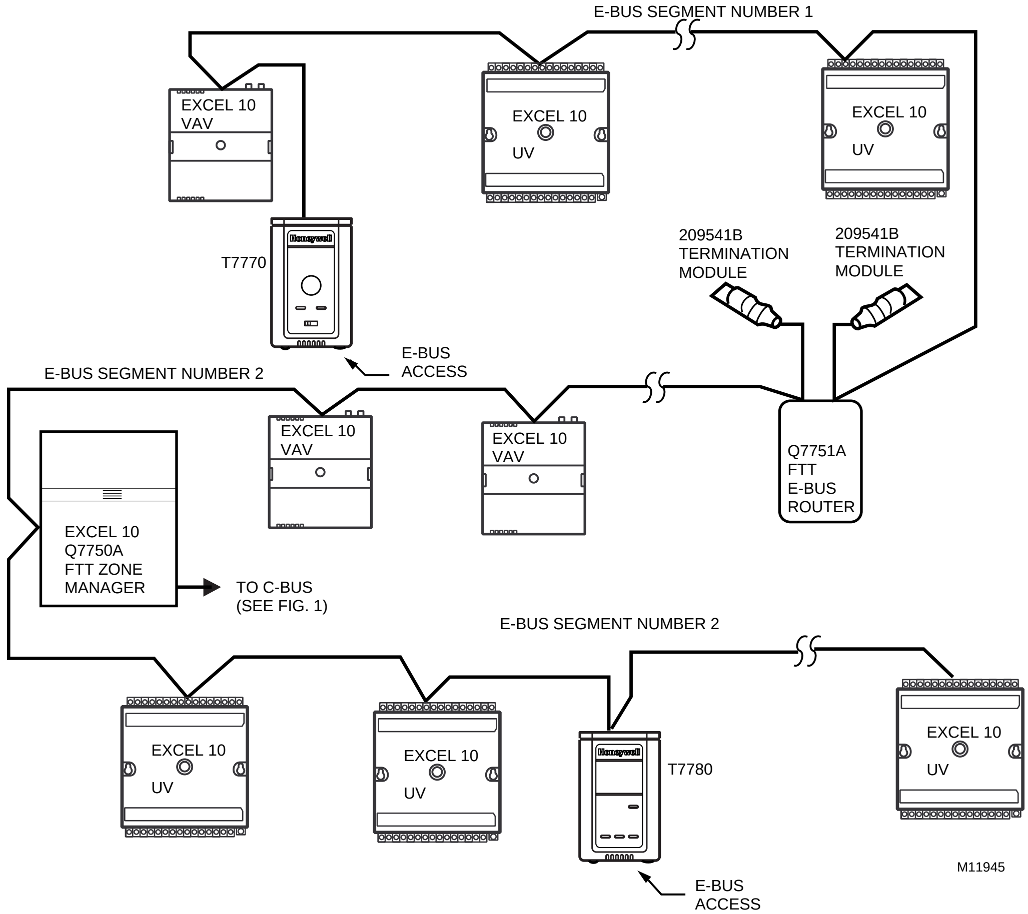


Fig. 16. Bus wiring layout for two singly terminated E-Bus segments.

Power Wiring

A power budget must be calculated for each Excel 10 W7753A Controller to determine the required transformer size for proper operation. A power budget is simply the summing of the maximum power draw ratings (in VA) of all the devices to be controlled by an Excel 10 W7753A Controller. This includes the controller itself, the equipment actuators (ML6161, or other motors) and various contactors and transducers, as appropriate, for the Excel 10 configuration.

Power Budget Calculation Example

The following is an example power budget calculation for a typical W7753A Excel 10 Controller.

Assume a W7753A unit with a fan, two stages of D/X cooling, modulating steam valve for heating, and modulating economizer dampers. The power requirements are:

Device	VA	Information Obtained from
Excel 10 W7753A Controller	6.0	W7753A Specification Data
ML6161 Damper Actuator	2.2	TRADELINE® Catalog
R8242A Contactor fan rating	21.0	TRADELINE® Catalog in rush rating
D/X Stages	0.0	(NOTE: For this example, assume the cooling stage outputs are wired into a compressor control circuit and, therefore, have no impact on the power budget.)
M6410A Steam Heating Coil Valve	0.7	TRADELINE® Catalog, 0.32A at 24 Vac
TOTAL	29.9	

The Excel 10 System example requires 29.9 VA of peak power; therefore, a 40 VA AT72D Transformer is able to provide ample power for this controller and its accessories. Alternatively, a 75 VA AT88A Transformer could be used to power two Excel 10 Systems of this type, or a 100 VA AT92A Transformer could be used to power three of these controllers and meet NEC Class 2 restrictions (no greater than 100 VA). See Fig. 18 and 19 for illustrations of power wiring details. See Table 6 for VA ratings of various devices.

Table 6. VA Ratings For Transformer Sizing.

Device	Description	VA
W7753A	Excel 10 W7753A Controller	6.0
T7780	DDWM	0.8
ML6161A/B	Damper Actuator, 35 lb-in.	2.2
R8242A	Contactor	21.0
R6410A	Valve Actuator	0.7
MMC325	Pneumatic Transducer	5.0
ML684	Versadrive Valve Actuator	12.0
ML6464	Damper Actuator, 66 lb-in.	3.0
ML6474	Damper Actuator, 132 lb-in.	3.0
ML6185	Damper Actuator SR 50 lb-in.	12.0

For contactors and similar devices, the in-rush power ratings should be used as the worst case values when performing power budget calculations. Also, the application engineer must consider the possible combinations of simultaneously energized outputs and calculate the VA ratings accordingly. The worst case, that uses the largest possible VA load, should be determined when sizing the transformer.

Line Loss

Excel 10 Controllers must receive a minimum supply voltage of 20 Vac. If long power or output wire runs are required, a voltage drop due to Ohms Law (I x R) line loss must be considered. This line loss can result in a significant increase in total power required and thereby affect transformer sizing. The following example is an I x R line-loss calculation for a 200 ft (61m) run from the transformer to a W7753A Controller drawing 37 VA using 18 AWG (1.0 mm^2) wire.

The formula is:

Loss = [length of round-trip wire run (ft)] x [resistance in wire (ohms per ft)] x [current in wire (amperes)]

From specification data:

18 AWG twisted pair wire has 6.52 ohms per 1000 feet.

Loss = [(200 ft) x (6.52/1000 ohms per ft)] x [(37 VA)/(24V)] = 4.02 volts

This means that four volts are going to be lost between the transformer and the controller; therefore, to assure the controller receives at least 20 volts, the transformer must output more than 24 volts. Because all transformer output voltage levels depend on the size of the connected load, a larger transformer outputs a higher voltage than a smaller one for a given load. Fig. 17 shows this voltage load dependence.

In the preceding I x R loss example, even though the controller load is only 37 VA, a standard 40 VA transformer is not sufficient due to the line loss. From Fig. 17, a 40 VA transformer is just under 100 percent loaded (for the 37 VA controller) and, therefore, has a secondary voltage of 22.9 volts. (Use the lower edge of the shaded zone in Fig. 17 that represents the worst case conditions.) When the I x R loss of four volts is subtracted, only 18.9 volts reaches the controller, which is not enough voltage for proper operation.

In this situation, the engineer basically has three alternatives:

1. Use a larger transformer; for example, if an 80 VA model is used, see Fig. 17, an output of 24.4 volts minus the four volt line loss supplies 20.4V to the controller. Although acceptable, the four-volt line-loss in this example is higher than recommended. See the following ***IMPORTANT***.
2. Use heavier gauge wire for the power run. 14 AWG (2.0 mm^2) wire has a resistance of 2.57 ohms per 1000 ft which, using the preceding formula, gives a line-loss of only 1.58 volts (compared with 4.02 volts). This would allow a 40 VA transformer to be used. 14 AWG (2.0 mm^2) wire is the recommended wire size for 24 Vac wiring.
3. Locate the transformer closer to the controller, thereby reducing the length of the wire run, and the line loss.

The issue of line-loss is also important in the case of the output wiring connected to the Triac digital outputs. The same formula and method are used. The rule to remember is to keep all power and output wire runs as short as practical. When necessary, use heavier gauge wire, a bigger transformer, or install the transformer closer to the controller.

IMPORTANT

No installation should be designed where the line loss is greater than two volts to allow for nominal operation if the primary voltage drops to 102 Vac (120 Vac minus 15 percent).

To meet the National Electrical Manufacturers Association (NEMA) standards, a transformer must stay within the NEMA limits. The chart in Fig. 17 shows the required limits at various loads.

With 100 percent load, the transformer secondary must supply between 23 and 25 volts to meet the NEMA standard. When a purchased transformer meets the NEMA standard DC20-1986, the transformer voltage-regulating ability can be considered reliable. Compliance with the NEMA standard is voluntary.

The following Honeywell transformers meet this NEMA standard:

Transformer Type	VA Rating
AT20A	20
AT40A	40
AT72D	40
AT87A	50
AK3310 Assembly	100

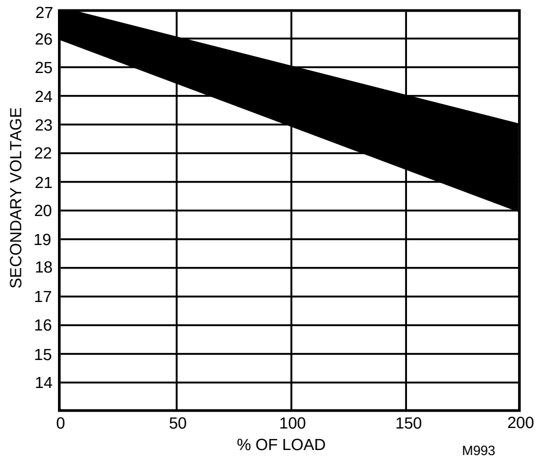


Fig. 17. NEMA class 2 transformer voltage output limits.

Attach earth ground to W7753A Controller terminal 1. See Fig. 18, 19 and 20, 22 through 26.

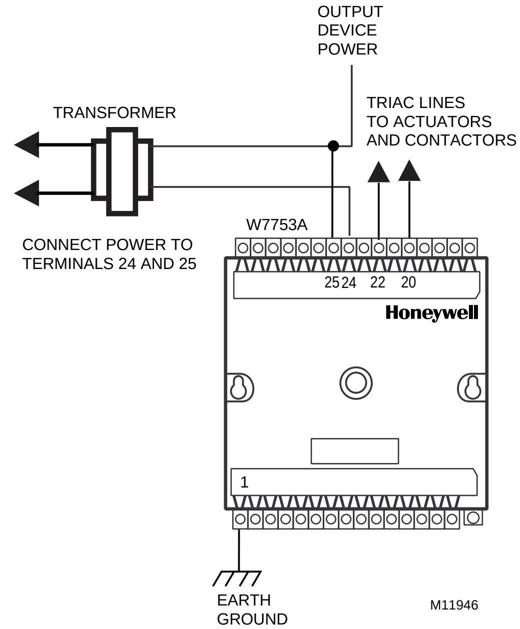


Fig. 18. Power wiring details for one Excel 10 per transformer.

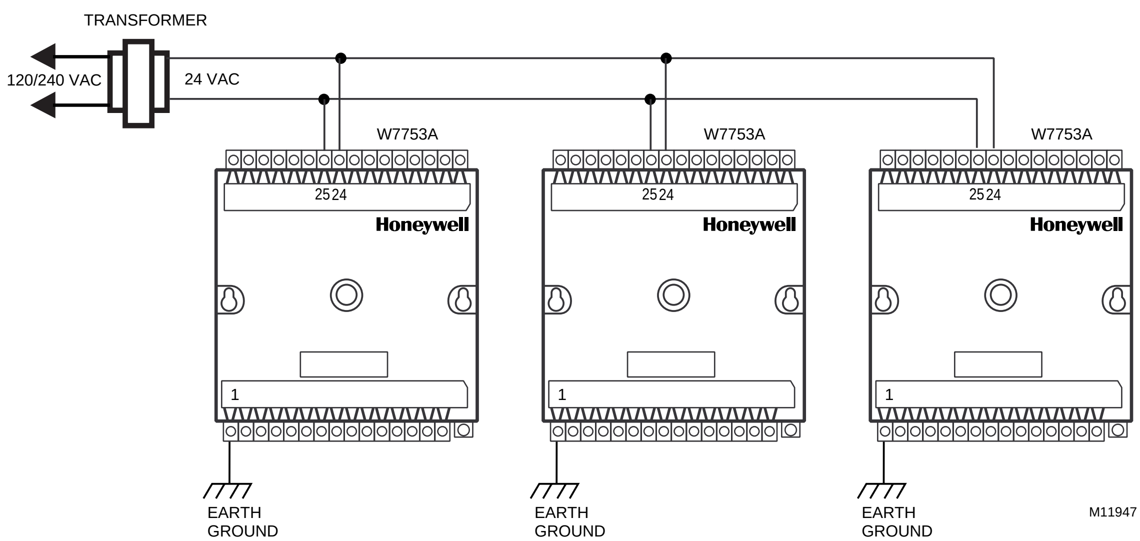


Fig. 19. Power wiring details for two or more Excel 10s per transformer.

IMPORTANT

*If the W7753A Controller is used on **Heating and Cooling Equipment (UL 1995 U.S. only**) devices and the transformer primary power is more than 150 volts, connect the transformer secondary to earth ground, see Fig. 20.*

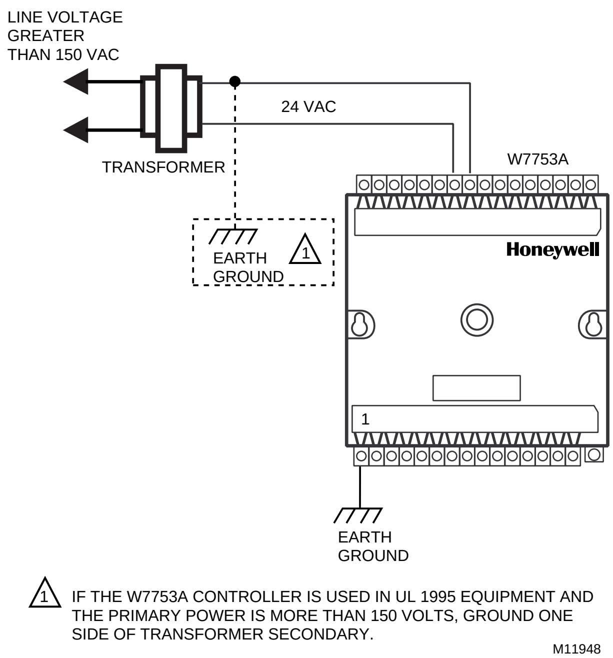


Fig. 20. Transformer power wiring details for one Excel 10 used in UL 1995 equipment (U.S. only).

IMPORTANT

Notes on power wiring:
- *All field wiring must conform to local codes and ordinances or as specified on installation wiring diagrams.*
- *To maintain NEC Class 2 and UL ratings (U.S. only), the installation must use transformers of 100 VA or less capacity.*
- *For multiple controllers operating from a single transformer, the same side of the transformer secondary must be connected to the same input terminal in each controller and the ground must be connected to a verified earth ground for each controller in the group. See Fig. 19. (Controller configurations are not necessarily limited to three devices per transformer.)*
- *For the W7753A Controller, all output devices must be powered from the same transformer as the one powering the Excel 10 W7753A Controller.*
- *Use the heaviest gauge wire available, up to 14 AWG (2.0 mm^2) with a minimum of 18 AWG (1.0 mm^2) for all power and earth ground connections.*
- *To minimize EMI noise, do not run Triac output wires in the same conduit as the input wires or the E-Bus communications loop.*
- *Unswitched 24 Vac power wiring can be run in the same conduit as the E-Bus cable.*
- *Make earth ground connections with the shortest possible wire run using 14 AWG (2.0 mm^2) wire. A good earth ground is essential for W7753A operation. Ideally, connect the earth ground to the ground bus at a motor control center or circuit breaker panel. However, if the nearest ideal earth ground is inaccessible, consider an alternate source for earth ground. Metal water pipe is generally a good ground, but do not use sprinkler pipe if prohibited by local codes. Attention must be given when duct work, conduit, or rebar are to be considered as ground sources. It is the responsibility of the installer to assure that these structures are tied back to a known earth ground.*

Step 4. Prepare Wiring Diagrams

General Considerations

The purpose of this step is to assist the application engineer in developing job drawings to meet job specifications. Wiring details are included for the W7753A and the T7770 and T7780 DDWM. The drawing details I/O, power, and communication bus wiring connections.

NOTE: For field wiring, when two or more wires are to be attached to the same connector block terminal, be sure to twist them together. Deviation from this rule can result in improper electrical contact. See Fig. 21.

The connector block terminals on the W7753A and on the T7770 and the T7780 DDWM accept 14 through 22 AWG (2.0 to 0.34 mm^2) wire. Table 7 lists wiring types, sizes, and length restrictions for Excel 10 products.

W7753A Controllers

Fig. 22 through 26 illustrate W7753A Controller wiring for various configurations. Connections to the wall module terminals (2 through 6) and the communications terminals (14 and 15) are made at terminal blocks. Connection for access to the E-Bus is provided by plugging the connector into the communications jack.

NOTE: If an Excel 10 W7753A Controller or Zone Manager is not connected to a good earth ground, the controller internal transient protection circuitry is compromised and the function of protecting the controller from noise and power line spikes cannot be fulfilled. This can result in a damaged circuit board and require replacing the controller.

Table 7. Field Wiring Reference Table.

Wire Function	Recommended Minimum Wire Size AWG (mm^2)	Construction	Specification or Requirement	Vendor Wire Type	Maximum Length ft (m)
E-Bus (Plenum)	22 AWG ($0.34\ mm^2$)	Twisted pair solid conductor, nonshielded or Echelon® approved cable.	Level IV 140°F (60°C) rating	Honeywell AK3791 (one twisted pair) AK3792 (two twisted pairs)	Refer to E-Bus Wiring Guidelines for maximum length
E-Bus (Non-Plenum)	22 AWG ($0.34\ mm^2$)	Twisted pair solid conductor, nonshielded or Echelon® approved cable.	Level IV 140°F (60°C) rating	Honeywell AK3781 (one twisted pair) AK3782 (two twisted pairs)	Refer to E-Bus Wiring Guidelines for maximum length
Input Wiring Sensors Contacts	18 to 22 AWG (1.0 to $0.34\ mm^2$)	Multiconductor (usually five-wire cable bundle). For runs >200 ft (61m) in noisy EMI areas, use shielded cable.	140°F (60°C) rating	Standard thermostat wire	1000 ft (305m) for 18 AWG 200 ft (61m) for 22 AWG
Output Wiring Actuators Relays	14 AWG ($2.0\ mm^2$) (18 AWG ($1.0\ mm^2$) acceptable for short runs)	Any pair nonshielded (use heavier wire for longer runs).	NEC Class 2 140°F (60°C) rating	Honeywell AK3702 (18 AWG) AK3712 (16 AWG) AK3754 (14 AWG) or equivalent	Limited by line-loss effects on power consumption. (See Line Loss subsection.)
Power Wiring	14 AWG ($2.0\ mm^2$)	Any pair nonshielded (use heavier wire for longer runs).	NEC Class 2 140°F (60°C) rating	Honeywell AK3754 (14 AWG) twisted pair AK3909 (14 AWG) single conductor or equivalent	Limited by line-loss effects on power consumption. (See Line Loss subsection.)

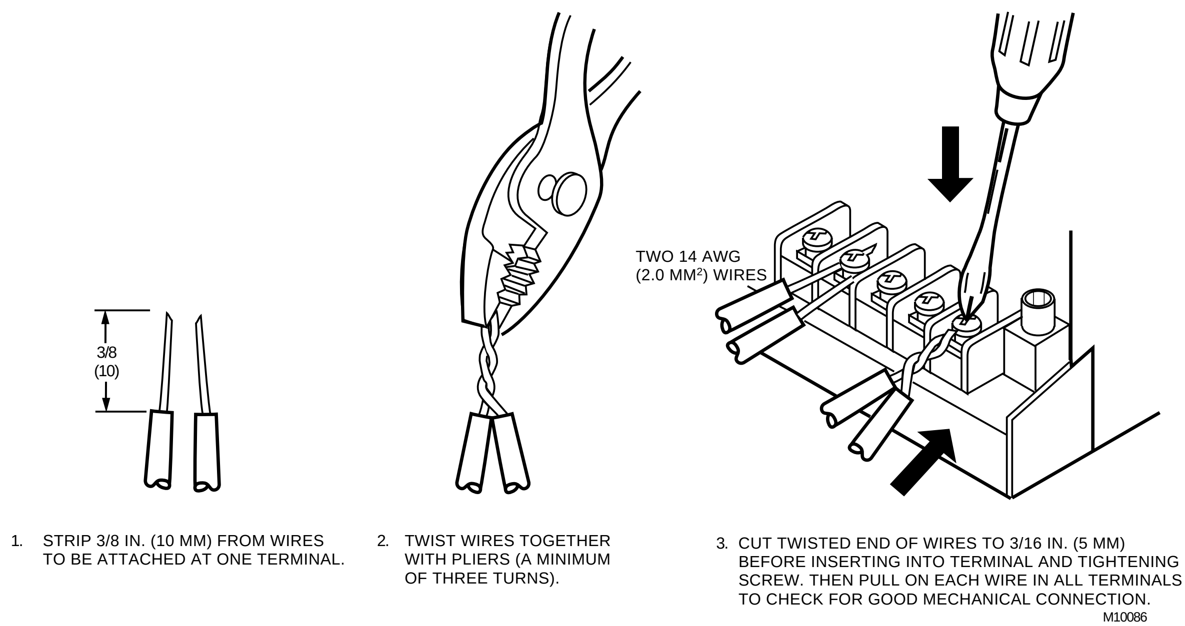


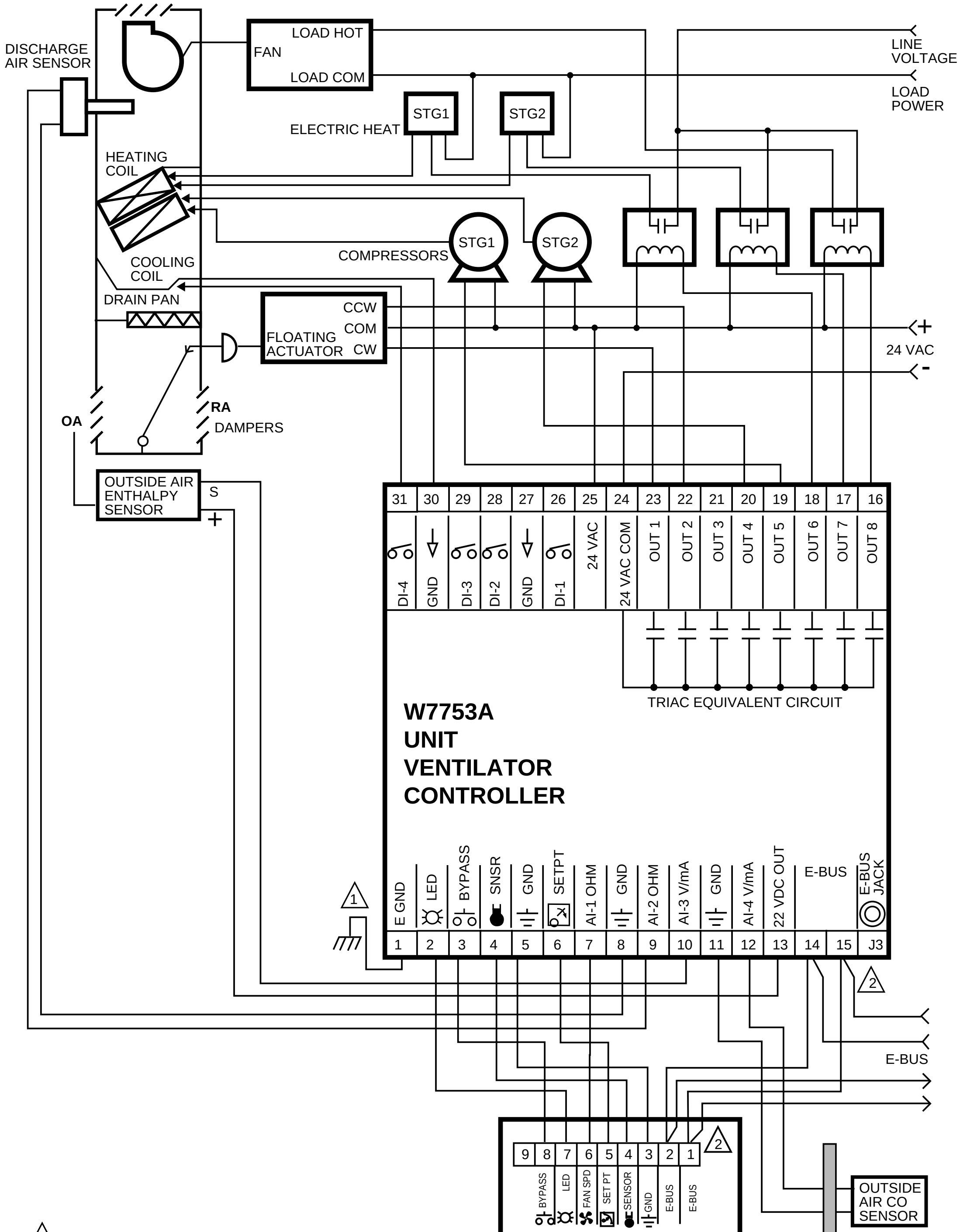
Fig. 21. Attaching two or more wires at terminal blocks.

See Table 8 for a description of the W7753A terminals.

Table 8. W7753A Version I/O Description.

Terminal	Terminal Number	Description
DO8	16	Digital output 8
DO7	17	Digital output 7
DO6	18	Digital output 6
DO5	19	Digital output 5
DO4	20	Digital output 4
DO3	21	Digital output 3
DO2	22	Digital output 2
DO1	23	Digital output 1
COM (N)	24	Return for power to controller
+24Vac (H)	25	Power for the controller
DI-1	26	Digital Input 1
DGND	27	Digital Ground
DI-2	28	Digital Input 2
DI-3	29	Digital Input 3
DGND	30	Digital Ground
DI-4	31	Digital Input 4
E-Bus	14 and 15	Echelon® communications (E-Bus) screw terminals
22VDC OUT	13	22 VDC source for Voltage/Current sensor (Max 50mA)
AI-4 V/mA	12	Analog Input 4 (Voltage or Current)
AGND	11	Analog ground
AI-3 V/mA	10	Analog Input 3 (Voltage or Current)
AI-2	9	Analog Input 2 (Resistive)
AGND	8	Analog ground
AI-1	7	Analog Input 1 (Resistive)
SETPT	6	Space temperature setpoint pot
GROUND	5	Wall Module
SENSOR	4	Space temperature sensor
BYPASS	3	Space override button
LED	2	Space LED for indication of manual occupancy status
EARTH GND	1	Earth Ground

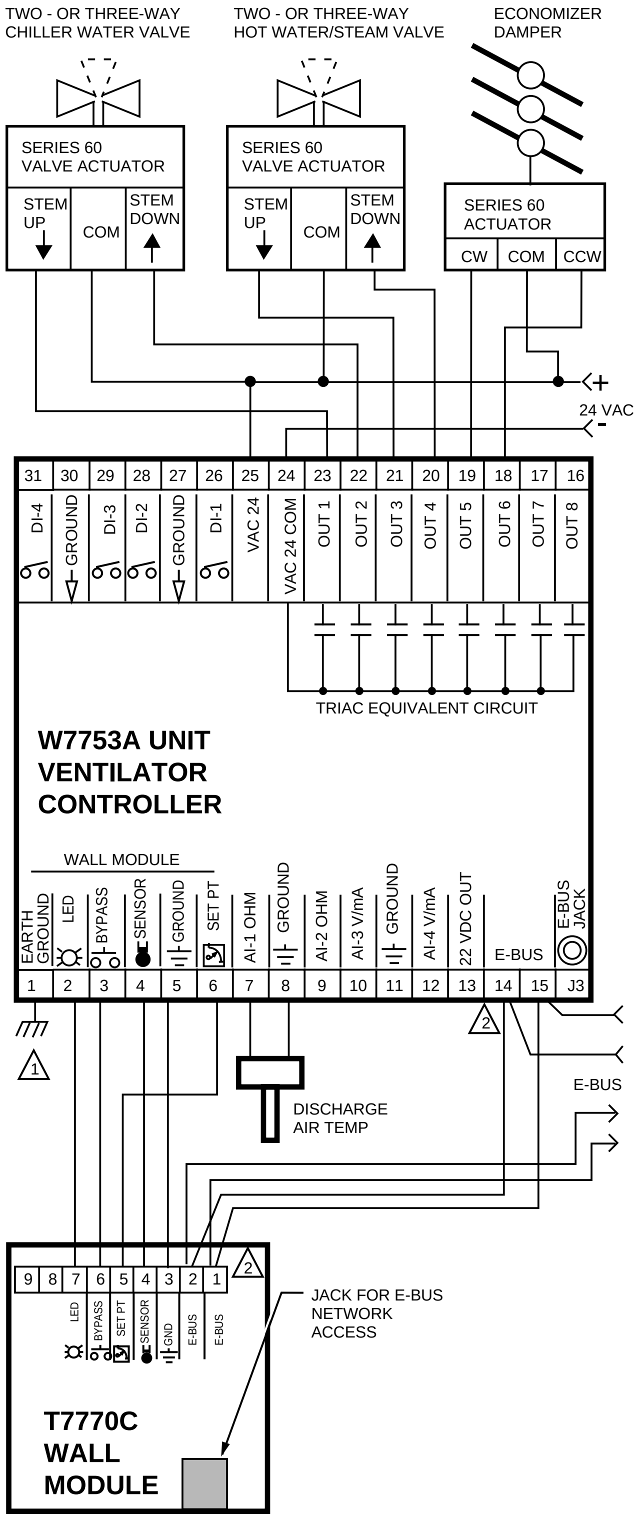
See Fig. 26 to wire a pneumatic transducer to a W7753A.



1. EARTH GROUND WIRE LENGTH SHOULD BE HELD TO A MINIMUM. USE THE HEAVIEST GAUGE WIRE AVAILABLE, UP TO 14 AWG (2.O MM^2) WITH A MINIMUM OF 18 AWG (1.O MM^2), FOR EARTH GROUND WIRE.

2. TO ASSURE PROPER ELECTRICAL CONTACT, WIRES MUST BE TWISTEDTOGETHER BEFORE INSERTION INTO THE TERMINAL BLOCK.

Fig. 22. Typical W7753A Controller with two stages heating and two stages of cooling wiring diagram. (For more information on note 2, refer to Fig. 21.)

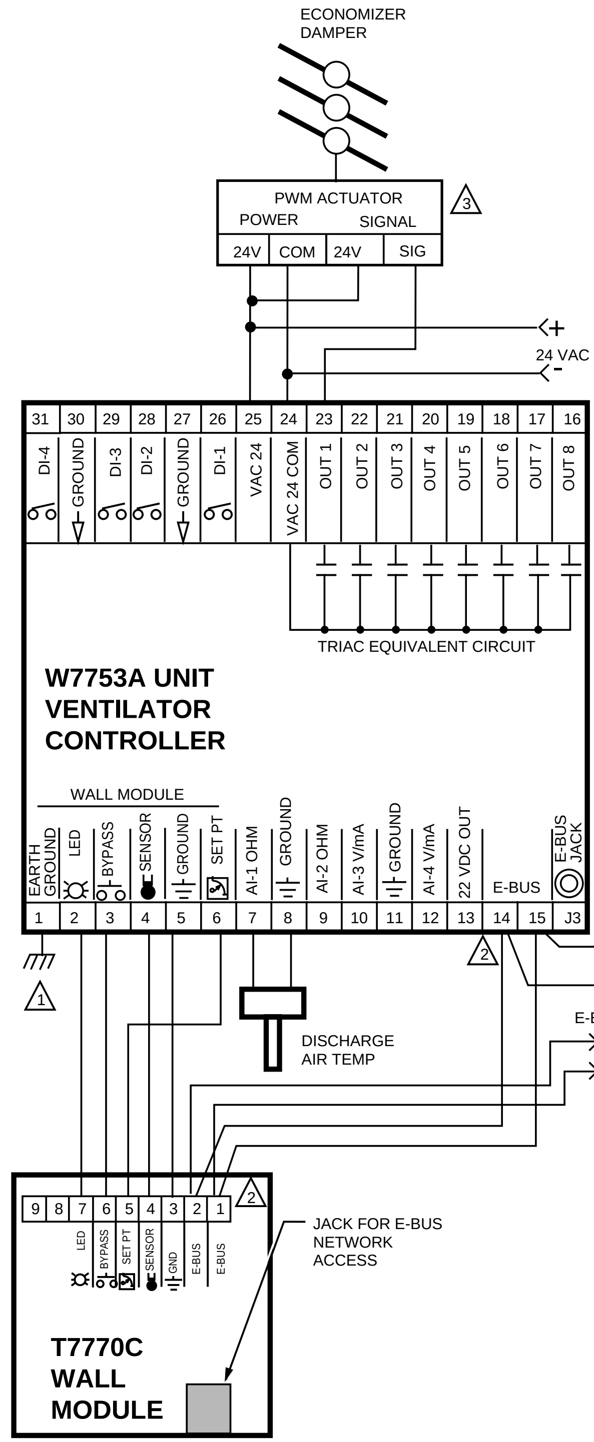


1 EARTH GROUND WIRE LENGTH SHOULD BE HELD TO A MINIMUM. USE THE HEAVIEST GAUGE WIRE AVAILABLE, UP TO 14 AWG (2.O MM^2) WITH A MINIMUM OF 18 AWG (1.O MM^2), FOR EARTH GROUND WIRE.

2 TO ASSURE PROPER ELECTRICAL CONTACT, WIRES MUST BE TWISTED TOGETHER BEFORE INSERTION INTO THE TERMINAL BLOCK.

M11950

Fig. 23. W7753A Controller with floating heating, cooling and economizer wiring diagram. (For more information on note 2, refer to Fig. 21.)



1 EARTH GROUND WIRE LENGTH SHOULD BE HELD TO A MINIMUM. USE THE HEAVIEST GAUGE WIRE AVAILABLE, UP TO 14 AWG (2.O MM^2) WITH A MINIMUM OF 18 AWG (1.O MM^2), FOR EARTH GROUND WIRE.

2 TO ASSURE PROPER ELECTRICAL CONTACT, WIRES MUST BE TWISTED TOGETHER BEFORE INSERTION INTO THE TERMINAL BLOCK.

3 FOR WIRING DETAILS FOR PWM DEVICES, REFER TO DOCUMENTATION INCLUDED WITH PWM DEVICES.

M11951

Fig. 24. W7753A Controller PWM damper actuator wiring diagram. (For more information on note 2, refer to Fig. 21.)

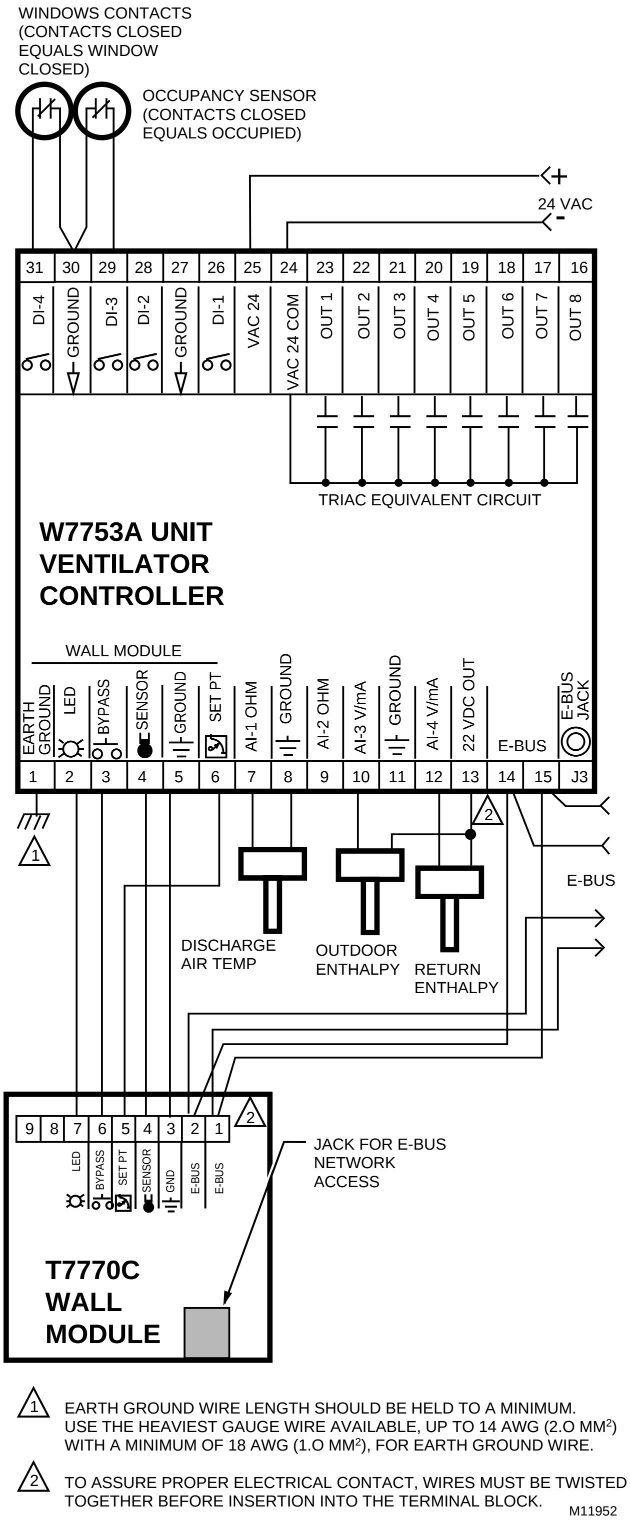


Fig. 25. W7753A Controller with C7400A 4 to 20 mA enthalpy sensor wiring diagram. (For more information on note 2, refer to Fig. 21.)

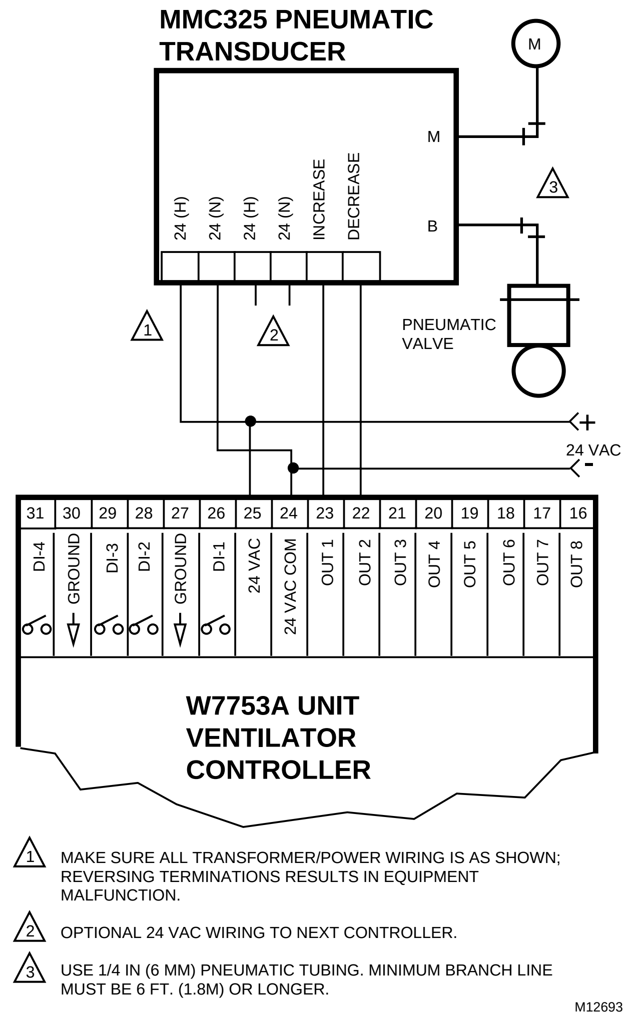


Fig. 26. Pneumatic transducer to W7753A.

E-Bus Termination Module

One 209541B Excel 10 FTT Termination Module is required for a singly terminated E-Bus. Two 209541B Excel 10 FTT Termination Modules are required for a doubly terminated E-Bus. Refer to E-Bus Wiring Guidelines form, 74-2865 for termination module placement rules (see Fig. 27).

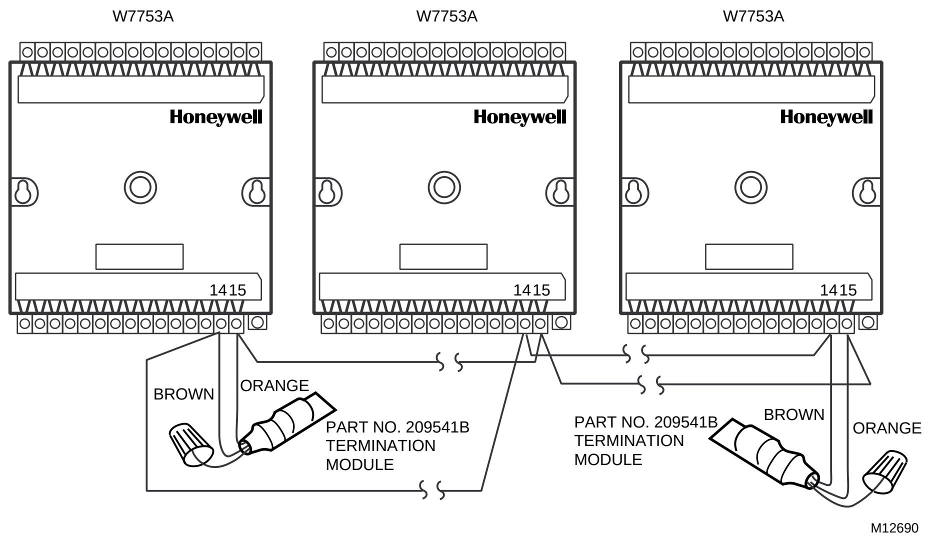
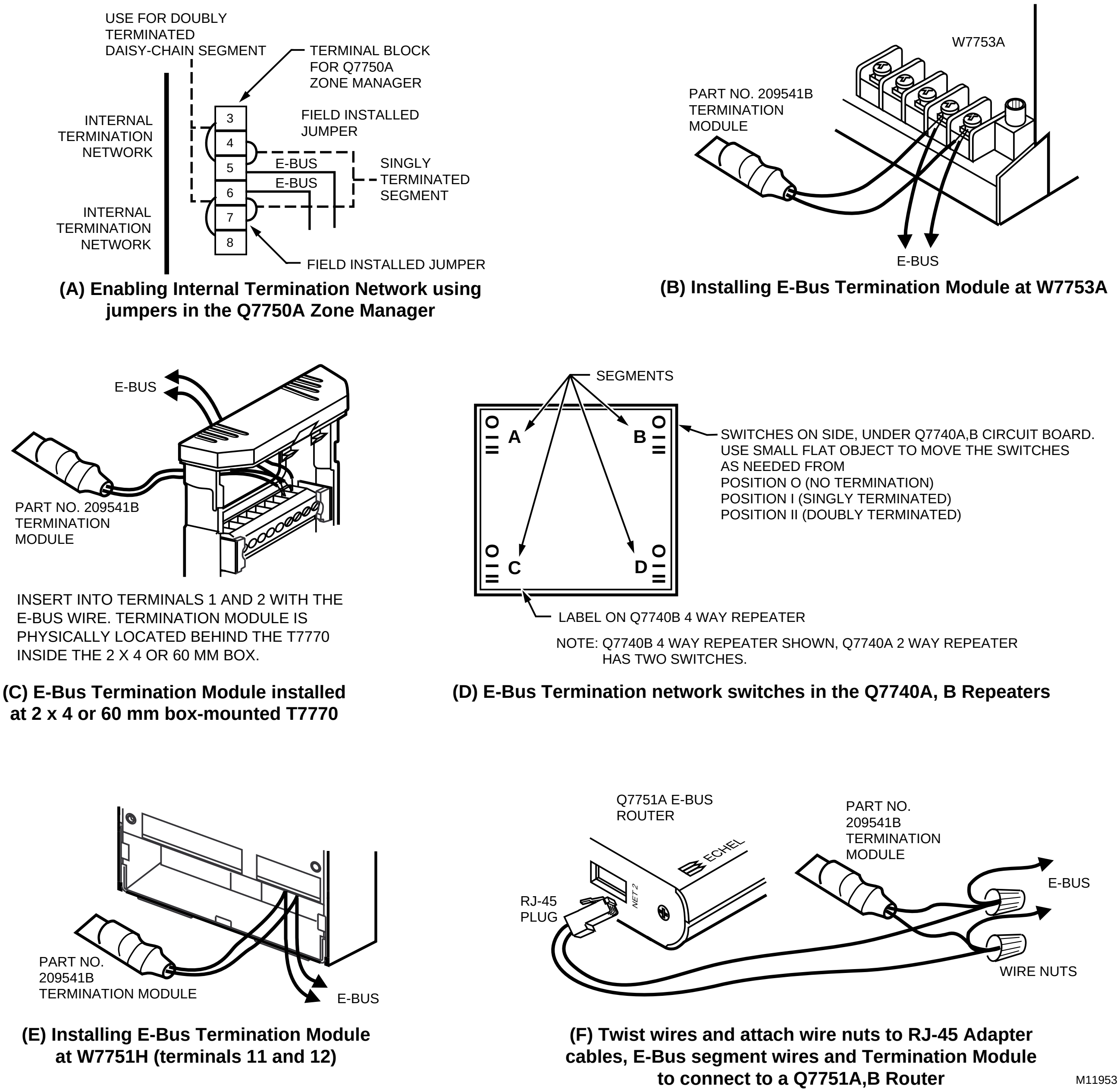


Fig. 27. Typical E-Bus termination module wiring diagrams (place a wire nut on each remaining wire that is not connected to a controller or device).

See Fig. 28 for E-Bus termination wiring options.



(A) Enabling Internal Termination Network using jumpers in the Q7750A Zone Manager

(B) Installing E-Bus Termination Module at W7753A

(C) E-Bus Termination Module installed at 2 x 4 or 60 mm box-mounted T7770

(D) E-Bus Termination network switches in the Q7740A, B Repeaters

(E) Installing E-Bus Termination Module at W7751H (terminals 11 and 12)

(F) Twist wires and attach wire nuts to RJ-45 Adapter cables, E-Bus segment wires and Termination Module to connect to a Q7751A,B Router

Fig. 28. E-Bus termination wiring options.

Step 5. Order Equipment

After compiling a bill of materials through completion of the previous application steps, refer to Table 9 for ordering information. Contact Honeywell for information about Controllers and Wall Modules with no logo.

Table 9. Excel 10 W7753A Controller Ordering Information.

Part Number	Product Description	Comments
Excel 10 W7753A Controllers:		
W7753A2002	Unit Ventilator Controller (W7753A)	Six Analog Inputs, Five Digital Inputs and Eight Triac Outputs
T7770 Wall Modules:		
T7770A1006	Sensor with Honeywell Logo	Used with Excel 5000 and Excel 10 Controllers
T7770A1014	Sensor with No Logo	Used with Excel 5000 and Excel 10 Controllers
T7770A2004	Sensor with Network Jack and Honeywell Logo	Used with Excel 5000 and Excel 10 Controllers
T7770A2012	Sensor with Network Jack and No Logo	Used with Excel 5000 and Excel 10 Controllers
T7770B1004	Sensor with Setpoint and Network Jack, Honeywell Logo	Degrees F Absolute
T7770B1046	Sensor with Setpoint and Network Jack, Honeywell Logo	Relative Setpoint
T7770B1012	Sensor with Setpoint and Network Jack, No Logo	Degrees F Absolute
T7770B1020	Sensor with Setpoint and Network Jack, Honeywell Logo	Degrees C Absolute
T7770B1053	Sensor with Setpoint and Network Jack, No Logo	Relative Setpoint
T7770B1038	Sensor with Setpoint and Network Jack, No Logo	Degrees C Absolute
T7770C1002	Sensor with Setpoint, Bypass/LED and Network Jack, Honeywell Logo	Degrees F Absolute
T7770C1044	Sensor with Setpoint, Bypass/LED and Network Jack, Honeywell Logo	Relative Setpoint
T7770C1010	Sensor with Setpoint, Bypass/LED and Network Jack, No Logo	Degrees F Absolute
T7770C1028	Sensor with Setpoint, Bypass/LED and Network Jack, Honeywell Logo	Degrees C Absolute
T7770C1051	Sensor with Setpoint, Bypass/LED and Network Jack, No Logo	Relative Setpoint
T7770C1036	Sensor with Setpoint, Bypass/LED and Network Jack, No Logo	Degrees C Absolute
T7770D1000	Sensor with Bypass/LED and Network Jack, Honeywell Logo	Degrees F Absolute
T7770D1018	Sensor with Bypass/LED and Network Jack, No Logo	Degrees C Absolute
T7780A1004	Sensor, Digital Display Wall Module with Network Jack, Honeywell Logo	Degrees F Absolute (default)
T7780A1012	Sensor, Digital Display Wall Module with Network Jack, No Logo	Degrees F Absolute (default)

(continued)

Table 9. Excel 10 W7753A Controller Ordering Information (continued).

Part Number	Product Description	Comments
Sensors		
C7770A1006	Air Temperature Sensor. 20 Kohm NTC nonlinearized	Duct-mounted sensor that functions as a primary and/or secondary sensor.
C7031J1050	Averaging Discharge/Return Air Temperature Sensor. 20 Kohm NTC	Duct element cord length 12 ft. (3.7m)
C7031B1033	Discharge Air or Hot Water Temperature Sensor. 20 Kohm NTC	Use 112622AA Immersion Well
C7031C1031	Duct Discharge/Return Air Sensor. 20 Kohm	18 in. (457mm) insertion length.
C7031D1062	Hot or chilled Water Temperature Sensor. 20 Kohm NTC	—
C7031F1018	Outside Air Temperature Sensor. 20 Kohm NTC	—
C7031K1017	Hot or chilled Water Temperature Sensor. 20 Kohm NTC	Strap-on
C7100A1015	Averaging Discharge/Return Air Temperature Sensor. PT3000	13 in. (330mm) insertion length.
C7170A1002	Outdoor Air Temperature Sensor. PT3000	—
Echelon® Based Components and Parts:		
Q7750A2003	Excel 10 Zone Manager	Free Topology Tranceiver (FTT)
Q7751A2002	Router	(FTT)
Q7752A2001	Serial Interface	(FTT)
Q7740A1008	Excel 10 2-Way Repeater	Used to extend the length of the E-Bus. Contains built in termination modules.
Q7740B1006	Excel 10 4-Way Repeater	Used to extend the length of the E-Bus. Contains built in termination modules.
XD 505A	Standard C-Bus Communications Submodule	—
XD 508	C-Bus Communications Submodule (1 megabit baud rate)	—
209541B	Termination Module	One or two required per E-Bus segment
205979	Operator Terminal Cable for E-Bus	Serial interface to wall module or controller
Accessories:		
EL7680A1008	Wall Mounted Wide View Infrared Occupancy Sensor	—
EL7628A1007	Ceiling Mounted Infrared Occupancy Sensor	—
EL7611A1003, EL7612A1001	Ultrasonic Occupancy Sensors	—
EL7630A1003, EL7621A1002, EL7621A1010	Power Supply/Control Units for Occupancy sensors	—
C7400A1004	Solid State Enthalpy Sensor (4 to 20 mA)	For outdoor and return air enthalpy
C7600B1000	Solid State Humidity Sensor (2 to 10 V)	For outdoor and return air humidity
C7600C1008	Solid State Humidity Sensor (4 to 20 mA)	For outdoor and return air humidity
C7600C1018	Solid State Humidity Sensor (2 to 10 V)	For outdoor and return air humidity

(continued)

Table 9. Excel 10 W7753A Controller Ordering Information (continued).

Part Number	Product Description	Comments
Accessories:		
MMC325-010, MMC325-020	Pneumatic Retrofit Transducers. Select pressure range: (010) 0 to 10 psi (68.97 kPa) or (020) 0 to 20 psi (137.93 kPa).	Use to control Pneumatic reheat valves
MMCA530	DIN rail adapter for MMC325 Transducers	—
MMCA540	Metal enclosure for MMC325 Transducers	—
ML7984B3000	Valve Actuator Pulse Width Modulation (PWM)	Use with V5011 or V5013 F and G Valves
ML6161B1000	Damper Actuator Series 60	—
M6410A	Valve Actuator Series 60	Use with V5812/V5813 Valves
ML684A1025	Versadrive Valve Actuator with linkage, Series 60	Use with V5011 and V5013 Valves
ML6464A1009	Direct Coupled Actuator, 66 lb-in., Series 60	—
ML6474A1008	Direct Coupled Actuator, 132 lb-in. torque, Series 60	—
ML6185A1000	Direct Coupled Actuator, 50 lb-in. spring return	Series 60
V5812A	Two-way terminal unit water valve; 0.19, 0.29, 0.47, 0.74, 1.2, and 1.9 C_V 1/2 in. npt (13 mm) or 2.9 and 4.9 C_V 3/4 in. npt (19 mm)	Use with M6410 Valve Actuator. Close-off rating for 0.19 to 1.9 C_V is 65 psi; for 2.9 and 4.9, C_V is 45 psi. (Coefficient of volume or capacity index C_V = gallons per minute divided by the square root of the pressure drop across the valve.)
V5813A	Three-way mixing terminal unit hot water valve; 0.19, 0.29, 0.47, 0.74, 1.2, and 1.9 C_V 1/2 in. npt (13 mm) or 2.9 and 4.9 C_V 3/4 in. npt (19 mm)	Use with M6410 Valve Actuator. Close-off rating for 0.19 to 0.74 C_V is 55 psi; 1.2, and 1.9 C_V is 22 psi; 2.9 and 4.9 C_V is 26 psi.
R8242A	Contactor, 24 Vac coil, DPDT	—
AT72D, AT88A, AK3310, etc.	Transformers	—
EN 50 022	DIN rail 35 mm by 7.5 mm (1-3/8 in. by 5/16 in.)	Obtain locally: Each controller requires 5 in.
—	Augat Inc. part number 2TK2D DIN rail (adapter)	Purchase from Augat Inc. two DIN rail adapters for each controller
Cabling:		
—	Serial Interface Cable, male DB-9 to female DB-9 or female DB-25.	Obtain locally from any computer hardware vendor.
Honeywell AK3791 (one twisted pair) AK3792 (two twisted pairs)	E-Bus (plenum): 22 AWG (0.34 mm^2) twisted pair solid conductor, nonshielded or Echelon® approved cable.	Level IV 140°F (60°C) rating
Honeywell AK3781 (one twisted pair) AK3782 (two twisted pairs)	E-Bus (nonplenum): 22 AWG (0.34 mm^2) twisted pair solid conductor, nonshielded or Echelon® approved cable.	Level IV 140°F (60°C) rating
Honeywell AK3725	Inputs: 18 AWG (1.0 mm^2) five wire cable bundle	Standard thermostat wire
Honeywell AK3752 (typical or equivalent)	Outputs/Power: 14 to 18 AWG (2.0 to 1.0 mm^2)	NEC Class 2 140°F (60°C) rating
Honeywell AK3702 (typical or equivalent)	18 AWG (1.0 mm^2) twisted pair	Non-plenum
Honeywell AK3712 (typical or equivalent)	16 AWG (1.3 mm^2) twisted pair	Non-plenum
Honeywell AK3754 (typical or equivalent)	14 AWG (2.0 mm^2) two conductor	Non-plenum

Step 6. Configure Controllers

Excel E-Vision PC Software is used to configure W7753A Controllers to match their intended application. The E-Vision User Guide, form number 74-2588 provides details for operating the PC software.

W7753A Controllers are shipped from the factory with a default hardware configuration. On power-up, the controller configuration parameters are set to the default values listed in Table C-1 in Appendix C. The controller can operate normally in this mode (if the equipment and wiring match the default setup), and given valid sensor inputs, the outputs are controlled appropriately to maintain space temperature at the default setpoint. The default I/O arrangement for the W7753A is printed on the terminal labels. Also see the wiring details in Fig. 22 in Step 4, Prepare Wiring Diagrams. The labeled I/O terminals are defined in Table 8.

Step 7. Troubleshooting

Troubleshooting Excel 10 Controllers and Wall Modules

In addition to the following information, refer to the Installation Instructions and Checkout and Test manual for each product. See the Applicable Literature section for form numbers.

Temperature Sensor and Setpoint Potentiometer Resistance Ranges

The T7770 or T7780 DDWM or the C7770A Air Temperature Sensor has the following specified calibration points, which are plotted in Fig. 29:

Temperature (°F)	Resistance Value (ohms)
98	11755
80	18478
70	24028
60	31525
42	52675

The T7770 Wall Module setpoint potentiometers have the following calibration points:

Temperature (°F)	Resistance Value (ohms)
85	1290
70	5500
55	9846

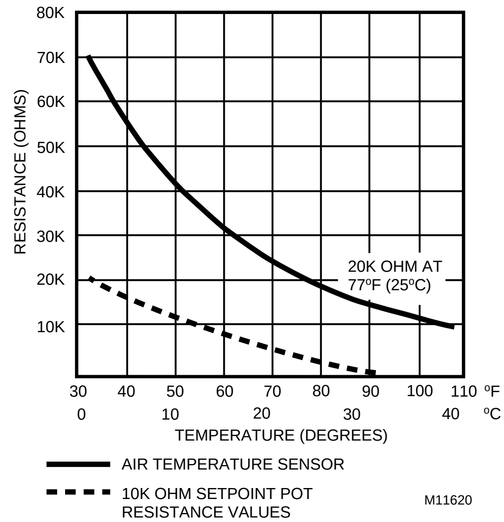


Fig. 29. Temperature sensor and setpoint potentiometer resistance plots.

Alarms

When an Excel 10 has an alarm condition, it reports it to the central node on the E-Bus (typically, the Excel 10 Zone Manager). See Table 10. Information contained in an alarm message is:

- Subnet Number:
  E-Bus subnet that contains the Excel 10 node that has the alarm condition. Subnet 1 is on the Zone Manager side of the router; Subnet 2 is on the other side.
- Node Number:
  Excel 10 node that has the alarm condition (see Network Status).
- Alarm Type:
  Specific alarm being issued. An Excel 10 can provide the alarm types listed in Table 10.

Table 10. Excel 10 Alarms.

Name of alarm or error bit	Alarm type number	Meaning of alarm code or error bit
RETURN_TO_NORMAL	128U	Return to no alarm after being in an alarm condition. This code is added numerically to another alarm code to indicate that the alarm condition has returned to normal.
AlarmNotifyDisabled	255U	The alarm reporting was turned off by CmdMode. No more alarms are reported until CmdMode turns on alarm reporting or on application restart.
NoAlarm	0	No alarms presently detected.
CommFailAlrm	1	One or more NV inputs have failed in receiving an update within their specified FAILURE_DETECT_TIME.
NodeDisableAlrm	2	The control algorithm has stopped because the controller is in DISABLED_MODE, MANUAL or FACTORY_TEST mode. No more alarms are reported when the controller is in the DISABLED_MODE. Alarms continue to be reported if the controller is in the MANUAL or FACTORY_TEST mode.
SensorFailAlrm	3	One or more sensors have failed.
FrostProtectAlrm	4	The space temperature is below the frost alarm limit 42.8°F (6°C) when the mode is FREEZE_PROTECT. The alarm condition remains until the temperature exceeds the alarm limit plus hysteresis.
InvalidSetPtAlrm	5	One of the Setpoints is not in the valid range.
LossAirFlowAlrm	6	The Fan Status DI indicates that there is no air flow when the node is commanding the fan to run. The control is shut down and disabled until power is cycled or the node is reset. See NOTE below. The alarm is not issued until FanFailTime seconds have elapsed since the loss-of-flow condition was first reported.
DirtyFilterAlrm	7	The pressure drop across the filter exceeds the limit and the filter requires maintenance. The control runs normally.
SmokeAlrm	8	The smoke detector has detected smoke and the node has entered an emergency state.
IaqOverRideAlrm	9	The indoor air quality sensor has detected that the indoor air quality is poorer than the desired standard and additional outdoor air is being brought into the conditioned space.
LowLimEconClose	10	The economizer has to close beyond the minimum position to prevent the discharge air temperature from going below the discharge temperature low limit.
DripPanFullAlrm	11	The drip pan is full. The fan continues to run but the cooling is disabled.
FreezeStatAlrm	12	The coil is about to freeze and the controller is taking action.
OaQualityAlrm	13	The outdoor air quality is poor. If there is a working outdoor air quality sensor configured and CO or CO_2 exceeds OaQStPt. There is 30 ppm hystersis on this sensor. When there is an OaQualityAlrm, the economizer damper is closed.

NOTE: The node can be reset by switching the node to MANUAL and then to the normal operating mode.

Also, the Excel 10 variables, *AlarmLogX* where *X* is 1 through 5, that store the last five alarms to occur in the controller, are available. These points can be viewed through XBS or E-Vision.

Broadcasting the Service Message

The Service Message allows a device on the E-Bus to be positively identified. The Service Message contains the controller ID number and, therefore, can be used to confirm the physical location of a particular Excel 10 in a building.

There are two methods of broadcasting the Service Message from an Excel 10 W7753A Controller. One uses a hardware service pin button on the side of the controller (see Fig. 30). The other involves using the PC Configuration tool, as follows.

When an *Assign ID* command is issued from the commissioning tool, the node goes into the SERVICE_MESSAGE mode for five minutes. In the SERVICE_MESSAGE mode, pressing the Occupancy Override button on the remote wall module (refer to Fig. 32 and 33 for override button location) causes the Service Message to be broadcast on the network. All other functions are normal in the SERVICE_MESSAGE mode. Even if an Excel 10 W7753A Controller does not have an Override button connected, it can broadcast the Service Message on the network by temporarily shorting the

Controller Bypass Input terminal to the Sensor Ground terminal on the W7753A (short terminals 3 and 5).
The commissioning tool is used to perform the ID Assignment task (see the E-Vision User's Guide, form 74-2588).

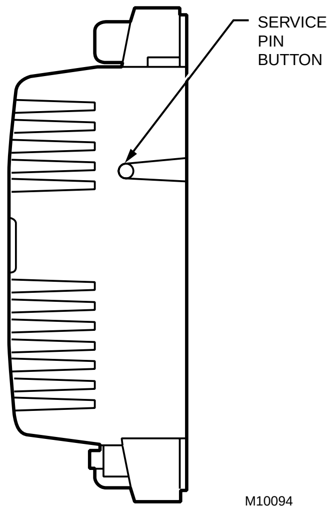


Fig. 30. Location of the Service Pin Button.

W7753A Controller Status LED

The LED on the front and center of a W7753A Controller provides a visual indication of the status of the device.

See Fig. 31. When the W7753A receives power, the LED should appear in one of the following allowable states:

1. Off—no power to the processor.
2. Continuously On—processor is in initialized state.
3. Slow Blink—controlling, normal state.
4. Fast Blink—when the Excel 10 has an alarm condition.

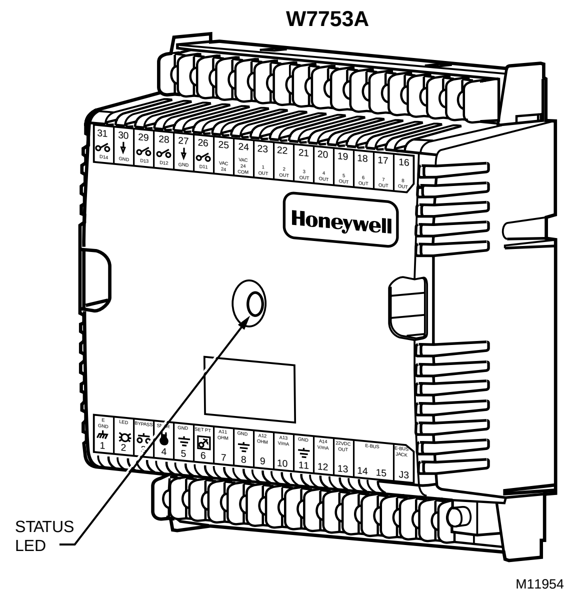


Fig. 31. LED location on W7753A.

T7770C,D,E,F Wall Module Remote Override LED

The remote override LED, located on either the T7770C,D,E,F Wall Modules in Fig. 32, displays the Manual Override mode of the controller. The modes are:

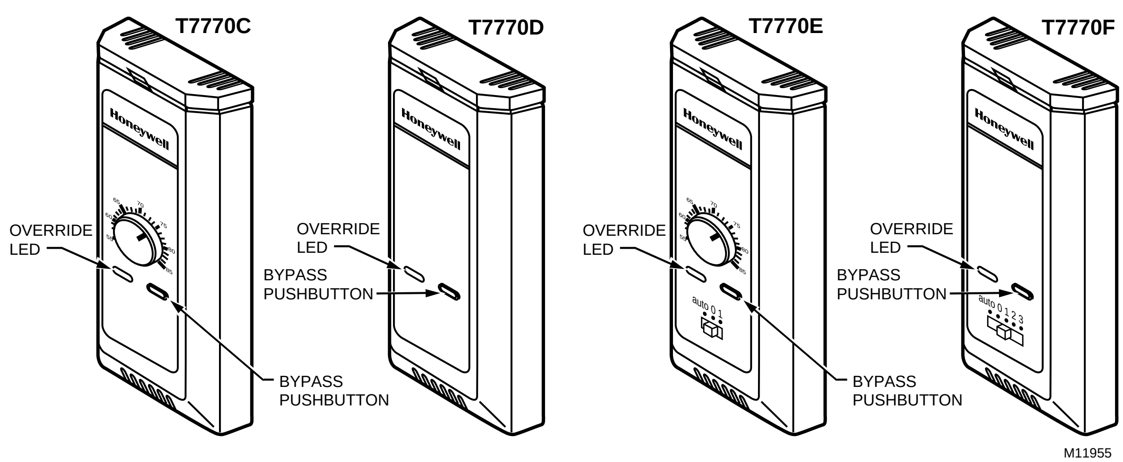


Fig. 32. LED and Bypass pushbutton locations on T7770 Wall Modules.

1. LED = Off. No override active.
2. LED = Continuously on. Bypass mode (timed Occupied override).
3. LED = One flash per second. Continuous Unoccupied override.
4. LED = Two flashes per second. Remote only, continuous Occupied override.

- shorting two pads or winking.

T7780 DDWM Bypass Pushbutton

See Fig. 33 for the T7780 DDWM bypass pushbutton location (occupied or unoccupied). The T7780 DDWM has two methods for generating its neuron ID, shorting two pads or winking. The T7780 DDWM is in wink mode (LCD) shows **WINK** when E-Vision sends a Service Message out on the E-Bus.

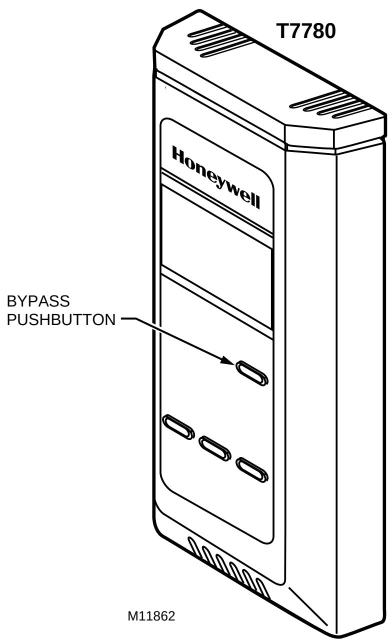


Fig. 33. Bypass pushbutton location on T7780 DDWM.

APPENDICES

Appendix A. Using E-Vision to Commission a W7753A Controller.

SENSOR CALIBRATION

The space temperature, the optional resistive and *voltage/current* inputs can all be calibrated. The wall module setpoint potentiometer *can not* be calibrated. Perform the sensor calibration by adding an offset value (either positive or negative) to the sensed value using E-Vision menus (see E-Vision user guide, form number 74-2588).

When calibrating voltage/current sensors on the W7753A, the offset amount entered by the user is in volts, regardless of the inputs actual engineering units. See Appendix E for information on how to derive the proper voltage value to enter as an offset during calibration.

SETTING THE PID PARAMETERS

The W7753A is designed to control a wide variety of mechanical systems in many types of buildings. With this flexibility, it is necessary to verify the stability of the temperature control in each different type of application. Occasionally, the PID parameters require tuning to optimize comfort and smooth equipment operation.

The Excel 10 Unit Ventilator Controllers are configured by E-Vision with default values of PID parameters that are based on the specific mechanical equipment controlled by the W7753A. These default values (see Table A-1) are based on past experience with the applications and in most cases do not require further adjustment.

Table A-1. Default PID Parameters.

	Default Values Provided by E-Vision								
Equipment Configuration	**Heat Prop. Gain**	**Heat Integ. Gain**	**Heat Deriv. Gain**	**Heat Control Band**	**Cool Prop. Gain**	**Cool Integ. Gain**	**Cool Deriv. Gain**	**Cool Control Band**	**Econ Control Band**
Single Stage	2	3000	0	0	2	3000	0	0	0
Two Stages	3	2000	0	0	3	2000	0	0	0
Series 60 Mod-ulating (Floating)	2	750	0	15	2	750	0	15	15
PWM Modulating	2	900	0	15	2	900	0	15	15

If the PID parameters require adjustment away from these values, use caution to ensure that equipment problems do not arise (see CAUTION below). If any change to PID control parameters is made, the adjustments should be gradual. After each change, the system should be allowed to stabilize so the effects of the change can be accurately observed. Then further refinements can made, as needed, until the system is operating as desired.

⚠ CAUTION

If large or frequent changes to PID control parameters are made, it is possible to cause equipment problems such as short cycling compressors (if the stage minimum run times were disabled in User Addresses DisMinClTime or DisMinHtTime). Other problems that can occur include wide swings in space temperature and excessive overdriving of modulating outputs.

If adjustment of PID parameters is required, use the following. In the items below, the term, error, refers to the difference between the measured space temperature and the current actual space temperature setpoint.

— The **Proportional Gain** (also called Throttling Range) determines how much impact the error will have on the output signal. Decreasing the Proportional Gain amplifies the effect of the error; that is, for a given error, a small Proportional Gain causes a higher output signal value.

— The **Integral Gain** (also called Integral Time) determines how much impact the error-over-time has on the output signal. Error-over-time has two components making up its value: the amount of time the error exists; and the size of the error. The higher the Integral Gain, the slower the control response. In other words, a decrease in Integral Gain causes a more rapid response in the output signal.

— The **Derivative Gain** (also called Derivative Time) determines how much impact the error rate has on the output signal. The error rate is how fast the error value is changing. It can also be the direction the space temperature is going, either toward or away from the setpoint, and its speed—quickly or slowly. A decrease in Derivative Gain causes a given error rate to have a larger effect on the output signal.

— The **Control Band** is used only for discharge temperature control of modulating outputs, which includes controlling the economizer dampers, and heating and cooling valves using Cascade Control. The Control Band dictates the span through which the discharge temperature must travel to cause the output signal to go from fully closed to fully open. Also, 10 percent of the Control Band value is the size of the *deadband* around the setpoint where no actuator motion occurs. For example, if controlling a cooling valve with Cascade Control enabled and with the discharge temperature within 0.1 X DaTempClCtrlBd of the discharge setpoint, there is no change in the current valve position.

The smaller the Control Band, the more responsive the control output. A larger Control Band causes more sluggish control. Be careful not to set the Control Band too low and cause large over or under shoots (hunting). This can happen if the space or discharge sensors or wiring are in noisy environments and the value reported to the controller is not stable (such that it bounces). The Control Band is used only in modulating control, and has no purpose when staged control is configured.

Appendix B. Sequences of Operation.

This Appendix provides the control sequences of operation for the Excel 10 W7753A UV Controller. The W7753A Controller can be configured to control a wide variety of possible equipment arrangements. Table B-1 and B-2 (copied from Table 2) summarize the available options. This Appendix provides a more detailed discussion of these options.

Table B-1. Common Configuration Options Summary For The W7753A Controller.

Option	Possible Configurations for the W7753A
Supply Fan	1. Mandatory Digital Output
Occupancy Sensor	1. None
	2. Connected: Contacts closed equals Occupied.
	3. Network (Occ/Unocc signal received via the E-Bus network).
Window Sensor	1. None
	2. Physically Connected: Contacts closed equals window closed.
	3. Network (Window Open/Closed signal received via the E-Bus).
Wall Module Option	1. Local (direct wired to the controller)
	2. Network (sensor value received via the E-Bus network).
Wall Module Type (All seven types can have an optional E-Bus access jack)	1. Sensor only
	2. Sensor and Setpoint adjust
	3. Sensor, Setpoint adjust and Bypass
	4. Sensor and Bypass
	5. Sensor, Setpoint adjust , Bypass and 3 position fan switch
	6. Sensor, Setpoint adjust , Bypass and 5 position fan switch
	7. Sensor, Bypass and 5 position fan switch
Smoke Emergency Initiation	1. None
	2. Physically Connected: Contacts closed equals smoke detected.
	3. Network (Emergency/Normal signal received via the E-Bus).

Table B-2. Configuration Options Summary For The W7753A.

Option	Possible Configurations for the W7753A
Type of Heating	1. One stage
	2. Two stages
	3. Series 60 Modulating electric valve, or pneumatic via transducer.
	4. Pulse Width Modulating electric valve, or pneumatic via transducer.
	5. None
Type of Cooling	1. One stage
	2. Two stages
	3. Series 60 Modulating electric valve, or pneumatic via transducer.
	4. Pulse Width Modulating electric valve, or pneumatic via transducer.
	5. None
Type of Economizer	1. Digital Output Enable/Disable signal for controlling an external economizer package.
	2. Series 60 Modulating electric damper motor, or pneumatic via transducer.
	3. Pulse Width Modulating electric damper motor, or pneumatic via transducer.
	4. None
IAQ Option	1. None
	2. Local IAQ Digital Input—directly wired to the controller. (Contacts closed means poor IAQ is detected.)
	3. Network (IAQ Override signal received via the E-Bus network).
	4. Local CO_2 Analog Input—directly wired to the controller. (The sensor must be a 0 to 10V device representing 0 to 2000 ppm CO_2.)
	5. Local CO Analog Input—directly wired to the controller. (The sensor must be a 4 to 20mA device representing 0 to 300 ppm CO.)
Filter Monitor Option	1. None
	2. Local Dirty Filter Digital Input—directly wired to the controller. (Contacts closed means that the filter is dirty.)
	3. Local Analog Input for Differential Pressure across the Filter (directly wired to the controller). The sensor must be a 2 to 10V device representing 0 to 5 inw (1.25 kPa).

Common Operations

The Excel 10 W7753A Controller applications have many common operations that are applicable regardless of the type of heating, cooling, or economizer equipment configuration. These operations, and the I/O and network configurations for them are summarized in Table B-1. Available input options are from the wall module and the hard-wired analog and digital inputs. Each application can have only a subset of these devices configured based on the number of physical I/O points available. However, some of the inputs are available over the E-Bus network.

NOTE: Each W7753A Controller *must* have a space temperature sensor input either wired directly to the controller, or shared from another E-Bus device, and must have a digital output configured for controlling the supply fan. In addition, if modulating economizer control is desired, a discharge air temperature sensor *must* be physically connected to the Excel 10 W7753A Controller. A discharge temperature signal *cannot* be brought into the controller through the E-Bus network.

Room Temperature Sensor (RmTemp)

This is the room space temperature sensor. This sensor is the T7770 Wall Module or the T7780 DDWM. When it is configured, it provides the temperature input for the W7753A temperature control loop. If it is not configured, it is required that a room temperature sensor value be transmitted from another E-Bus device like the T7780 DDWM. If no valid room temperature value is available to the W7753A Controller, the temperature control algorithm in the controller is disabled, causing the heating, cooling, and economizer control outputs to be turned off. If the W7753A Controller is configured for Continuous Fan (rather than Intermittent Fan (see Fan Operation in this Appendix), and the mode is Occupied when the RmTemp value becomes invalid, the fan continues to run.

Remote Setpoint (RmtStptPot)

This is the Setpoint Potentiometer contained in the T7770 Wall Module. When configured, this occupant value is set to calculate the actual cooling or heating Occupied Setpoint. There are two options for how to calculate the actual setpoint to be used by the temperature control algorithm: (Offset) and (Absolute Middle). When SetPtKnob is set to Offset, the Wall Module setpoint knob represents a number from -9° to +9°F (-5° to +5°C) which is added to the software occupied setpoints for the heat and the cool modes (CoolOccSpt and HeatOccSpt). When SetPtKnob is set to Absolute Middle, the setpoint knob becomes the center of the Zero Energy Band (ZEB) between the cooling and heating occupied setpoints. The size of the ZEB is found by taking the difference between the software heating and cooling occupied setpoints; therefore, for Absolute Middle, the actual setpoints are found as follows:

ActualCoolSpt = RmtStptPot + (CoolOccSpt - HeatOccSpt) / 2

ActualHeatSpt = RmtStptPot - (CoolOccSpt - HeatOccSpt) / 2

During Standby and Unoccupied times, the remote setpoint pot is not referenced, and the software setpoints for those modes are used instead.

Setpoint Limits (LoSetptLim and HiSetptLim)

Remote setpoint pot limits are provided by LoSetptLim and HiSetptLim. The occupied setpoints used in the control algorithms are limited by these parameters. When the setpoint knob is configured to be of type Absolute Middle, the lowest actual setpoint allowed is equal to LoSetptLim, and the highest actual setpoint allowed is equal to HiSetptLim. When the setpoint knob is configured to be an Offset type, the lowest actual setpoint allowed is equal to HeatOccSpt - LoSetptLim, and the highest allowed is equal to CoolOccSpt + HiSetptLim.

Bypass Mode (StatusOvrd and StatusLed)

During Unoccupied periods, the facility occupant can request that Occupied temperature control setpoints be observed by depressing the Bypass pushbutton on the wall module. When activated, the controller remains in Bypass mode until:

1. Bypass Duration Setting has timed out (BypTime), or
2. User again presses the Wall Module pushbutton to switch off Bypass mode, or
3. Occupancy schedule (StatusSched network input or TimeClckOcc digital input) switches the mode to Occupied.
4. User sets the CmdManualOcc network point to Not Assigned.

The LED on the Wall Module (StatusLed) indicates the current bypass mode status (see the T7770C,D,E,F,G Wall Module Override LED section).

BypassTime

BypassTime is the time between the pressing of the override button at the wall module (or initiating OC_BYPASS via DestManOcc) and the return to the original occupancy state. When the bypass state has been activated, the bypass timer is set to BypassTime (default of 180 minutes).

OverrideType

OverrideType specifies the behavior of the override button on the wall module. There are three possible states that have the following meanings:
NONE disables the override button.
NORMAL causes the override button to set the OverRide state to OC_BYPASS for BypassTime (default 180 minutes), when the override button has been pressed for approximately 1 to 4 seconds, or to set the OverRide state to UNOCC when the button has been pressed for approximately 4 to 7 seconds. When the button is pressed longer than approximately 7 seconds, then the OverRide state is set to OC_NUL (no manual override is active).
BYPASS_ONLY causes the override button to set the OverRide state to OC_BYPASS for BypassTime (default 180 minutes), on the first press (1 to 7 seconds). On the next press, the OverRide state is set to OC_NUL (no manual over ride is active).

OverridePriority

OverridePriority configures the override arbitration between DestManOcc, nviBypass.state, and the wall module override button. There are two possible states which have the following meanings:

LAST specifies that the last command received from either the wall module or DestManOcc determines the effective override state.

NET specifies that when DestManOcc is not OC_NUL, then the effective occupancy is DestManOcc regardless of the wall module override state.

Cycles per Hour (HeatCycHr and CoolCycHr)

HeatCycHr specifies the mid-load number of on / off cycles per hour (default is 6), when the mode is HEAT. CoolCycHr specifies the mid-load number of on / off cycles per hour (default is 3), when the mode is COOL. This is to protect the mechanical equipment against short cycling causing excessive wear. In addition the cycle rate specifies the minimum on and off time according to Table B-4.

T7770C,D,E,F,G or T7780 DDWM Bypass Pushbutton Operation

The Wall Module Bypass pushbutton, located on both the T7770C,D,E,F,G and the T7780 DDWM in Fig. 32 and 33, can change the controller into various occupancy modes as follows (see Table B-3):

Table B-3. Wall Module Bypass Pushbutton Occupancy Modes.

If Pushbutton is Held Down for at Least	But for Not More than	Resulting Mode is
<1 second	1 second	No Override active
1 second	4 seconds	Bypass mode (timed Occupied override)
4 seconds	7 seconds	Continuous Unoccupied override

NOTES: If pushbutton is held down for longer than seven seconds, the controller reverts back to No Override and repeats the cycle above. See Fig. B-0.
Continuous Occupied override mode can only be initiated remotely; that is, over the E-Bus network.
An error condition is displayed as three short blinks and one long blink when the Bypass pushbutton is held down or shorted. The short must be removed to return the controller to proper operation.

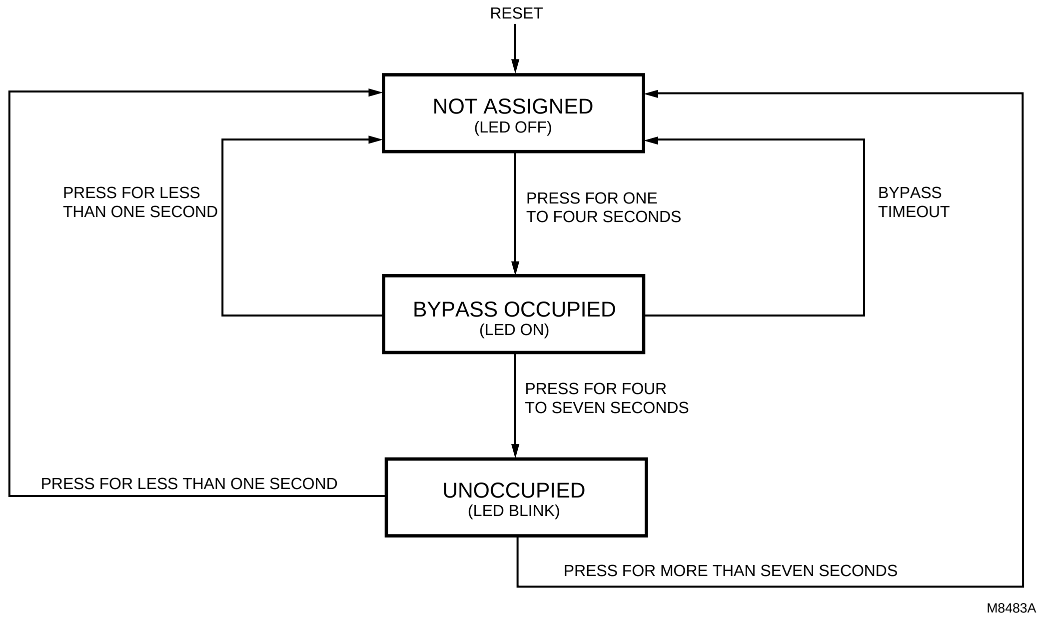


Fig. B-0. LED and Bypass pushbutton operation.

Standby Mode (StatusOcySen)

The digital input for an occupancy sensor (usually a motion detector or possibly a time clock) provides the controller with a means to enter an energy-saving Standby mode whenever people are not in the room. Standby mode occurs when the scheduled occupancy is Occupied, and the occupancy sensor detects no people currently in the room (digital input contacts Closed means people are in the room, and contacts Open means the room is Unoccupied). When in Standby mode, the Excel 10 W7753A Controller uses the Standby Cooling Setpoint for cooling (CoolStbySpt), or the Standby Heating Setpoint for Heating (HeatStbySpt) as the Actual Space Temperature Setpoint. The occupancy sensor signal can also be a network input from another E-Bus device, so that no physical sensor is required at the receiving W7753A Controller.

IMPORTANT

When the W7753A Controller is in Standby mode, the economizer minimum position setting is not *observed. This means the fresh air dampers will go fully closed if there is no call for cooling.*

Continuous Unoccupied Mode

This mode is entered when a wall module is configured with a Bypass pushbutton that was pressed for four to seven seconds causing the wall module LED to blink. This mode can also be entered via a network command (ManualOcc set to Unoccupied). If the controller is in this mode, it reverts to the Unoccupied setpoints for temperature control, and the economizer does not observe its minimum position setting. The controller remains in this mode indefinitely until the Bypass pushbutton is pressed to exit the mode or a network command is sent to clear the mode. A configuration parameter is available to disable wall module initiation of Continuous Unoccupied mode (OvrdType).

Occupancy Mode and Manual Override Arbitration

The W7753A has multiple sources for occupancy schedule information and, therefore, it employs an arbitration scheme to determine the current actual mode. Time-of-day (TOD) schedule status comes from two sources, a configured digital input for TimeClckOcc or the StatusSched network input received from a central control. If the digital input source is configured, it has highest priority and determines the Occupancy mode. This digital input is either ON (shorted = occupied), OFF (open = unoccupied), or not active (not configured); otherwise, the status is determined by the StatusSched input from the network source. The StatusSched has three possible states, occupied, unoccupied or standby.

Manual Override Status can be derived from three sources and governed by two selectable arbitration schemes. The two schemes are:

Network Wins or Last-in Wins, as set in OvrdPriority.

The three sources of manual override status are:

CmdManualOcc - Has possible states: Occupied, Unoccupied, Bypass, Standby and Not Assigned (not active). This input source has the highest priority in determining manual override status for a Network Wins arbitration scheme, and in the event there is more than one source change at a time in the Last-in Wins arbitration scheme. Here, bypass initiates a self-timed bypass of the control unit and expires upon completion of the defined timed period. The controller then treats the bypass status of this input as Not Assigned until the next change in status.

DestBypass - Has possible states: Bypass On, Bypass Off or Not Assigned (not active). This input places the controller in an *untimed* bypass state or turns off the bypass mode. This source is second in priority to CmdManualOcc under the same arbitration schemes mentioned above.

Override Button - The wall module Override pushbutton can command status of Bypass, Continuous Unoccupied and Not Assigned. This source has the lowest priority status in the above mentioned schemes. The above mention sources of override must be either Not Assigned or Off before the Override pushbutton affects the manual override status in the Network Wins scheme. All actions, in this case, taken from the Override pushbutton are locked out.

Bypass status is a controller-timed event whose duration is set in BypTime. Upon expiration of the timer, the status returns to Not Assigned. The status of this input can be overridden with the receipt of Not Assigned from CmdManualOcc. This, in effect, cancels a timed bypass or a continuous unoccupied mode.

The Override pushbutton can be configured as Normal (all of the above mentioned states are possible), Bypass Only (Bypass and Not Assigned only) or None (effectively Disabling the Override pushbutton).

Time Clock (TimeClckOcc)

TimeClckOcc is the state of the digital input configured and wired to a time clock. When the digital input is detected to be Closed (Occupied), the scheduled occupancy will be OC_OCCUPIED. If the detected state of the digital input is Open (Unoccupied), then the scheduled occupancy will be OC_UNOCCUPIED. If the Occ_Time_Clock is not configured, then either the StatusSched network input received from a central control or the time clock that is broadcast from a Sched_Master configured W7753A, will control the occupied mode.

Setpoint Ramping

The W7753A Controller incorporates a ramping feature that gradually changes the space setpoints between occupancy modes. This feature is only operational if the network variable inputs StatusSched, TodEventNext, and Time Until Next Change Of State (TUNCOS) are being used to change the W7753A Occupancy mode. The applicable Setpoints are HeatRamp (for HEAT mode operation), and CoolRamp (for the COOL mode operation). See Fig. B-1 and B-2 for a pictorial representations.

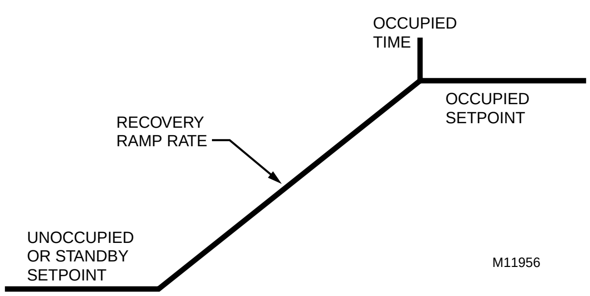


Fig. B-1. Heating Recovery Ramp – HeatRamp, default 8.0 degrees F/Hr (4.5 degrees C/Hr).

NOTE: Recovery ramping applies between scheduled heating or cooling setpoint changes from UNOCCUPIED to STANDBY, UNOCCUPIED to OCCUPIED, and STANDBY to OCCUPIED. Scheduled setpoint changes from OCCUPIED to UNOCCUPIED or OCCUPIED to STANDBY do not use a ramped setpoint but instead use a step change in setpoint. Recovery ramps begin before the next scheduled occupancy time and are ramped from the setpoint for the existing scheduled occupancy state to the setpoint for the next occupancy state.

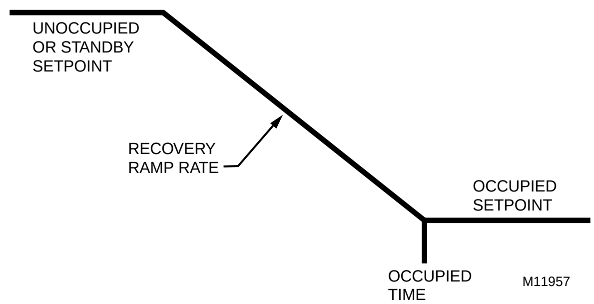


Fig. B-2. Cooling Recovery Ramp – CoolRamp, default 3.0 degrees F/Hr (1.7 degrees C/Hr).

NOTES: The setpoint used during the COOL recovery period is similar to the heat mode in Fig. B-1, except the slope of the line reverses for cooling.

Recovery ramping applies between scheduled heating or cooling setpoint changes from UNOCCUPIED to STANDBY, UNOCCUPIED to OCCUPIED, and STANDBY to OCCUPIED. Scheduled setpoint changes from OCCUPIED to UNOCCUPIED or OCCUPIED to STANDBY do not use a ramped setpoint, but instead, use a step change in setpoint. Recovery ramps begin before the next scheduled occupancy time and are ramped from the setpoint for the existing scheduled occupancy state to the setpoint for the next occupancy state.

Fan Operation

The W7753A supply fan can be controlled in one of two different ways. In Continuous Fan mode, the fan runs whenever the controller is in Occupied mode. When in Standby or Unoccupied modes, the fan cycles on with a call for cooling (or heating if the FanOnHtMode parameter is set). In Intermittent Fan mode, the fan cycles on with a call for cooling (or heating if the FanOnHtMode parameter is set), and cycles off when the space temperature control is satisfied.

The fan control supports an optional (Proof of Air flow) digital input, that allows monitoring of the supply fans status. If the fan is commanded on, the Proof of Air flow digital input is checked to verify that the fan is running *after* an initial delay of FanOnDelay seconds (user-settable 20 to 60 seconds). Also, the W7753A Controller provides fan-run-on operation that keeps the fan running for a short time after heating or cooling shuts off. The amount of time that the fan continues to run is set in FanRunOnHeat for heating mode and FanRunOnCool for cooling mode.

Window Sensor (StatusWndw)

The digital input for a window contact provides the algorithm with a means to disable its temperature control activities if someone has opened a window or door in the room. When a window is detected to be Open (digital input contacts Open equals window open), the normal temperature control is disabled, and the W7753A Controller enters the Freeze Protect mode. Freeze Protect mode sets the space setpoint to 46.4 °F (8°C) and brings on the fan and heat if the space temperature falls below this setpoint. Normal temperature control resumes on window closure. The Window sensor signal can also be a network input from another E-Bus device, so that no physical sensor is required at the receiving W7753A Controller.

Smoke Control

The Excel 10 W7753A Controller supports three smoke-related control strategies:

1. Emergency Shutdown (all outputs off).
2. Depressurize (fan on, outdoor air damper closed).
3. Pressurize (fan on, outdoor air damper open).

The controller is placed in one of these three control states whenever the W7753A mode becomes SMOKE_EMERGENCY, which can be initiated via a network command (DestEmerg) or from a local (physically connected) smoke detector digital input. When in SMOKE_EMERGENCY mode, the W7753A Controller uses the control strategy found in SmkCtlMode (one of the three listed above), and the normal temperature control function is disabled. If a W7753A local smoke detector trips, the SrcEmerg network variable (for other E-Bus devices to receive) is set to the Emergency state.

Demand Limit Control (DLC)

When The E-Bus network receives a high-electrical-demand signal, the controller applies a DlcBumpTemp amount to the current actual space temperature setpoint value. The setpoint is always adjusted in the energy-saving direction. This means that if the W7753A Controller is in Cooling mode, the DLC offset bumps the control point up, and when in Heating mode, bumps the control point down.

Dirty Filter Monitor

The air filter in the Unit Vent can be monitored by the W7753A and an alarm issued when the filter media needs replacement. The two methods of monitoring the filter are:

1. A differential pressure switch whose contacts are connected to a digital input on the W7753A; or
2. A 2-to-10V differential pressure sensor wired to a current input on the W7753A. If the analog input sensor is used, its measured value 0 to 5 inw (0 to 1.25 kPa) is compared to a user-selectable setpoint (FltrPressStPt—valid range: 0 to 5 inw (0 to 1.25 kPa), and the Dirty Filter alarm is issued when the pressure drop across the filter exceeds the setpoint.

Start-Up

START_UP_WAIT is the first mode after application restart or power-up. During START_UP_WAIT, the analog and digital inputs are being read for the first time, no control algorithms are active, and the physical outputs (fan and heat/cooling stages) are in the de-energized position**.** The node remains in the START_UP_WAIT mode for a pseudo-random period (depending on neuron_id) between 12 and 22 seconds and then transitions to one of the operating modes, depending on the inputs that are read from the physical and network inputs**.** The pseudo random period prevents multiple controllers from simultaneously starting major electrical loads when power is restored to a building**.**

NOTES: After a controller download via Care/E-Vision, the delayed reset time is bypassed and the controller starts after a 40-second initialization.
Not all network inputs can be received during the START_UP_WAIT period because many network variables are updated at a slower rate; therefore some control decisions can be considered temporarily inappropriate.

Temperature Control Operations

See Fig. B-3 for a diagram of a typical W7753A Unit Ventilator.

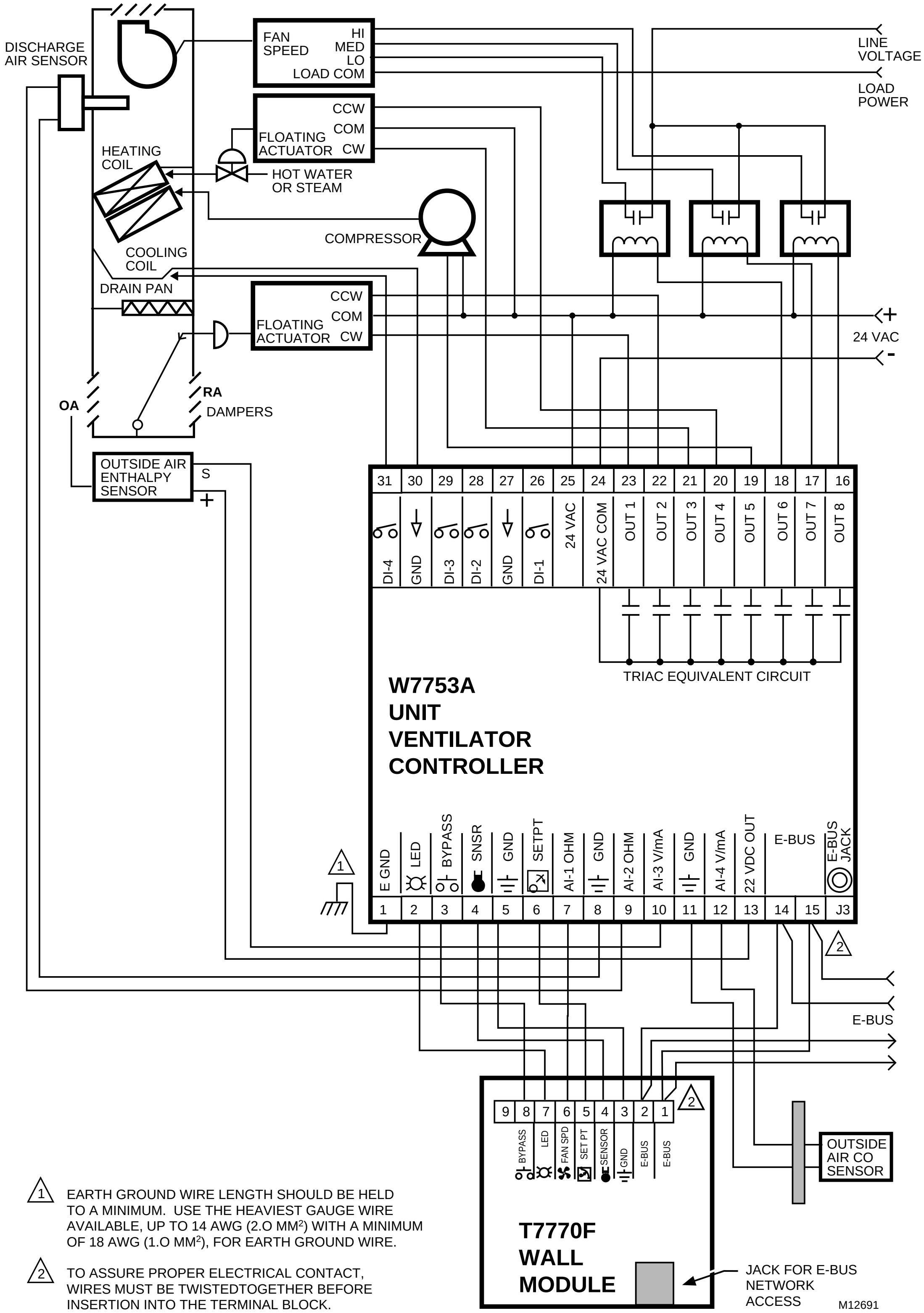


Fig. B-3. Schematic diagram for a typical W7753A Unit Ventilator.

Staged Cooling Control

The Excel 10 W7753A Controller supports up to two stages of D/X cooling. As space temperature rises above the current Cooling Setpoint, the controllers mode of operation is switched to the COOL mode. When in the COOL mode, all heating outputs are driven closed or off (with the exception that occurs during IAQ Override Operation, see above), and the staged cooling outputs are enabled for use. When in the COOL mode, the PID cooling control algorithm compares the current space temperature to the EffectiveCoolSetPt, and calculates a PID error signal. This error signal causes the cooling stage outputs to be cycled as required to drive the space temperature back to the setpoint. Fig. B-4 illustrates the relationship between PID error and staged output activity. As the error signal increases and the space temperature is getting farther away from setpoint, or is remaining above setpoint as time elapses, additional stages of cooling are energized until, if PID error reaches 100 percent, all configured stages are on.

If economizer dampers are configured, and the outdoor air is suitable for free cooling, the economizer operates as the first stage of cooling. For example, if a controller was configured with two stages of mechanical cooling and an economizer, the application should be viewed as a *three*-stage system.

Setpoints for the PID gains allow for unit-by-unit adjustment of the control loop, if required; however, any change from the default values should be minimal.

The PID control algorithm used to control staged cooling is anticipator-driven, and is similar to the algorithm used in the T7300 commercial thermostat. All staging events are subject to a minimum interstage time delay, which is based on the cycles per hour user setting (CoolCycHr). The minimum interstage time delay ranges from 90 seconds (at 12 cycles per hour) to 8.5 minutes (at two cycles per hour), see Table B-4. The user has the option to disable the minimum run timer (DisMinClTimer for cooling). If the minimum run timer is disabled, the interstage time delay is fixed at 20 seconds. The cycling rate is separately selectable for heating and cooling between 2 and 12 cycles per hour (cph).

Table B-4. Interstage Minimum Times

Cycles/Hour Selection	Minimum On/Off Time (Minutes)
2	8.5
3	5.5
4	4.0
5	3.5
6	3.0
7	2.5
8	2.0
9	2.0
10	2.0
11	1.5
12	1.5

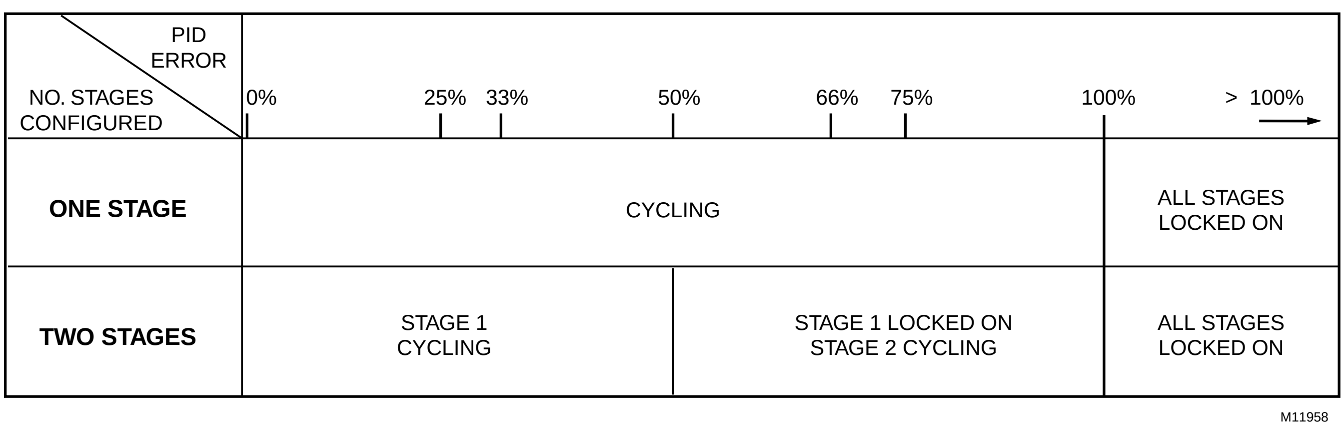


Fig. B-4. Staged output control versus PID Error.

Staged Heating Control

The Excel 10 W7753A Controller supports up to two stages of heating. As space temperature falls below the current Cooling Setpoint, the controller mode of operation is switched to the HEAT mode. When in the HEAT mode, all cooling outputs are driven closed or off, and the staged heating outputs are enabled for use. When in the HEAT mode, the PID cooling control algorithm compares the current space temperature to the EffectiveHeatSetPt, and calculates a PID error signal. This error signal causes the heating stage outputs to be cycled, as required, to drive the space temperature back to the Setpoint. There is a relationship between PID error and staged output activity. As the error signal increases, the space temperature gets further away from the setpoint, or is remaining below the setpoint as time elapses, additional stages of heating are energized until, if PID error reaches 100 percent, all configured stages are on.

The PID control algorithm used to control staged heating is anticipator-driven, and is similar to the algorithm used in the T7300 commercial thermostat. All staging events are subject to a minimum interstage time delay, that is based on the cycles per hour user setting (HeatCycHr). The minimum interstage time delay ranges from 90 seconds (at 12 cycles per hour) to eight minutes (at two cycles per hour). See Table B-4. The user has the option to disable the minimum run timer for heating (DisMinHtTimer). If the minimum run timer is disabled, the interstage time delay is fixed at 20 seconds. The cycling rate is separately selectable for heating and cooling between two and 12 cycles per hour (cph).

Setpoints for the PID gains allow for unit-by-unit adjustment of the control loop, if required; however, any change from the default values should be minimal.

Cascade Control of Modulating Cooling/Heating

The Excel 10 W7753A Controller supports modulating cooling and heating valves. These valves can be controlled directly from the space temperature (like the staged control) or, if the CascCtrl flag is set, they are modulated to maintain the discharge air temperature at its setpoint. The discharge air setpoint is calculated based on the space temperature deviation from the space setpoint. This is commonly called cascade control. In the W7753A Controller, cascade control is available for use with Series 60 and PWM modulating heating and cooling, but not for use with staged heating/cooling.

Setpoints for the PID gains and for the control band allow for unit-by-unit adjustment of the control loops, if required; however, any change from the default values should be minimal. Also, the W7753A Controller uses an adaptive algorithm (patent pending) to continuously assess the validity of the calculated discharge setpoint, and adjust it, as needed, to ensure precise, accurate control.

Series 60 Modulating Control

Series 60 Control is also commonly referred to as Floating Control. The Excel 10 W7753A Controller can drive Series 60 type actuators to control a modulating cooling valve, a heating valve, and economizer. When floating control is used, the full-stroke motor drive time of the actuator must be entered into the configuration parameter CoolMtrSpd (for cooling), HeatMtrSpd (for heating), or EconMtrSpd (for the economizer dampers).

Pulse Width Modulating (PWM) Control

The Excel 10 W7753A Controller can drive a PWM-type actuator to control a modulating cooling valve, a heating valve, and economizer dampers. PWM control positions the actuator based on the length, in seconds, of the pulse from the digital output. The controller outputs a pulse whose length consists of two parts, a minimum and a maximum. The minimum pulse time represents the analog value of zero percent (also indicates a signal presence) and the maximum pulse length that represents an analog value of 100 percent. If the analog value is greater than zero percent, an additional time is added to the minimum pulse time. The length of time added is directly proportional to the magnitude of the analog value. If PWM control is used, the configuration parameters for the PWM operation must be specified. These are PwmPeriod, PwmZeroScale, and PwmFullScale. These three parameters are shared by all configured PWM outputs; this means the heating, cooling, and economizer actuators must be configured to accept the same style of PWM signal.

Example: To find the pulse width of a valve actuator (for example stroke mid position - 50 percent) with the PwmZeroScale = 0.1 seconds, PwmFullScale = 25.5 seconds, and the PwmPeriod = 25.6 seconds. There are 256 increments available, so the number of increments required for 50 percent would be (0.5 X 256) or 128. The time for each increment for this industry standard pulse time is 0.1 seconds. The pulse width is the minimum time (0.1 second) + the number of increments (128 times the seconds added 0. 1) = 12.9 seconds. The W7753A Controller would command the valve output on for 12.9 seconds every 25.6 seconds to maintain the valve position at 50 percent.

AquaStat

The Excel 10 W7753A Controller supports a digital input for an Aquastat that would be used for Heat/Cool changeover. The aquastat can be either contacts-closed-on-temp-rise or contacts-close-on-temp-fall. The digital input must be configured for the appropriate device through Care/E-Vision . The Aquastat would indicate to the control algorithm in the controller that if heating is available, the cooling coil or DX would be locked out. Conversely, if the Aquastat indicated that heating was no longer available, the cooling coil or DX would be enabled. The Aquastat will not change the Heat/Cool mode of the controller, only lock out or enable the cooling coil.

Outdoor Air Lockout of Heating/Cooling

A mechanism is provided in the W7753A to disable the heating equipment if the outdoor air temperature rises above the OaTempHtLkOut setpoint. Similarly, the cooling equipment is disabled if the outdoor air temperature falls below the OaTempClLkOut setpoint. The algorithm supplies a fixed 2°F (1.1°C) hysteresis with the lock-out control to prevent short cycling of the equipment.

ASHRAE Control Cycles

ASHRAE classifies the control of unit ventilators as follows:

- Cycle I Fixed Maximum Percentage of Outdoor Air (100 percent - no user adjustable parameter).
- Cycle II Fixed Minimum Percentage of Outdoor Air (usually 10 to 33 percent, adjustable from 0 to 100 percent).
- Cycle III Variable Outdoor Air (Mixed air control – typically 55 to 60 degrees F.).

Cycles I, II, and III differ in the sequence of damper action in response to a rise in space temperature and in the amount of outdoor air admitted at various temperatures. Each of the ASHRAE cycles will be explained in the following sections on the damper control.

Standby/Warmup

In the Standby/warmup state (can be used with any of the three ASHRAE cycles), the fan is shut down (manually, time clock, or network override). The outdoor air damper is closed and the heating coil is full open to heat. The heating coil acts as a convector as air circulates by gravity across the coil. The room thermostat modulates the valve, closing the valve as space temperature rises above the room setpoint. The fan does not typically operate in the standby mode. If the network variable FanOnHtMode is set to true, then the fan will cycle on and off with a demand for heating when the effective occupancy is standby. During the warm-up mode, the fan is running and the unit ventilator recirculates space air and controls the heating valve for a rapid rise in the space temperature.

Cycle I Damper Control – Fixed Maximum Percentage of Outdoor Air

The outdoor air damper and heating coil valve operate in sequence. When cycle I begins, the heating valve is full open and the outdoor air damper is full closed. As space temperature rises, the controller modulates the damper to its maximum open position. The fixed maximum position is normally 100 percent open. As the space temperature continues to rise, and after the damper moves to its maximum position, the heating coil valve modulates closed. If a cooling coil is installed in the unit, then the cooling coil valve will modulate open as space temperature rises further.

If the discharge air temperature falls below the low-limit setpoint, the controller will override the space temperature control and modulates the heating coil valve open to maintain a minimum discharge temperature.

Cycle II Damper Control – Fixed Minimum Percentage of Outdoor Air

Cycle II control provides a fixed minimum percentage of outdoor air (usually 10 to 33 percent, adjustable from 0 to 100 percent) during the occupied mode. At low space temperatures, the outdoor air damper is closed and the heating coil valve is full open. As the space temperature rises, the outdoor air damper moves to its minimum position. On a further rise in the space temperature, the heating coil valve modulates toward the closed position. As the space temperature rises above the space setpoint, the outdoor and return air dampers modulate to the 100 percent outdoor air at the top of the throttling range. The low limit controller can limit opening of the outdoor air damper to prevent the discharge air temperature from dropping below the low limit setpoint.

Whenever the fan shuts off, the fan interlock causes the outdoor and return air dampers to go to the 100 percent return air position.

A mixed-air economizer damper package can be controlled to assist mechanical cooling in maintaining the discharge air at setpoint. Therefore, if modulating economizer damper control is desired, a discharge air temperature sensor is required. If the outdoor air is not currently suitable for cooling use (see the Economizer Enable/Disable Control section), the outdoor air damper is held at the user-settable minimum position (EconMinPos) for ventilation purposes.

Because the outdoor air can be used to supplement mechanical cooling, the economizer operates as if it were the first stage of cooling. So, if the outdoor air is suitable for cooling use, the mechanical cooling (either staged or modulating) is held off until the economizer has reached its fully open position. Then, if the discharge temperature continues to be above setpoint, the mechanical cooling is allowed to come on. If the outdoor air is *not* suitable for cooling use, the economizer is set to its minimum position, and mechanical cooling is allowed to come on immediately.

When the controller is in the Heat mode, the economizer is held at the minimum position setting (EconMinPos). The minimum position setting is only used during Occupied mode operation. When in Standby or Unoccupied modes, the outdoor air dampers are allowed to fully close if there is no call for cooling, or if the outside air is not suitable for cooling use.

Cycle III Damper Control – Variable Outdoor Air Maintaining Constant Mixed Air Temperature

Cycle III control provides a variable percentage of outdoor air depending on the outdoor air temperature. The mixed air control modulates the outdoor and return air dampers, to maintain a constant mixed air temperature (typically 55 to 60 degrees F.). There is no outdoor air damper minimum position setting for cycle III, therefore it can not be used in areas with minimum ventilation codes. The space temperature control maintains the room at setpoint by modulating the heating and cooling coil valves or stages as needed.

Whenever the fan turns off, the outdoor and return air dampers will move to the 100 percent return air position. The heating coil valve will open (cooling coil valve will go closed), and the unit ventilator will function as a convector.

Indoor Air Quality (IAQ) Override

The Excel 10 W7753A Controller supports an IAQ override feature that upon detection of poor air quality in the space, allows the economizer dampers to be opened above the standard minimum position setting to a value set in EconIAQPos. Two different methods of detecting poor air quality are supported, The first is by using an IAQ switch device connected to a digital input on the W7753A Controller, where a contact closure indicates poor air quality and initiates the IAQ override mode. The second, is through an analog input that connects to a CO_2 Sensor (0 to 10V). The measured value of CO_2 from this sensor (0 to 2000 ppm) is compared to the setpoint IAQSetpt. When the CO_2 level is higher than the setpoint, the IAQ override is initiated.

When the W7753A Controller is in the COOL mode during an IAQ override, it is possible for the *heating* outputs to be activated. This can occur if the outdoor air temperature is cold enough to cause the discharge air temperature to drop below the DaTempLoLim setpoint when the dampers open to the EconIAQPos position, *and* the IaqUseHeat flag is set. If this situation occurs, the heating is controlled to maintain the discharge air temperature at 1°F (0.65°C) above the DaTempLoLim setpoint.

Outdoor Air Quality (OAQ) Override

The Excel 10 W7753A Controller supports an OAQ override feature that upon detection of poor air quality in the Outdoor air, allows the economizer dampers to be closed below the standard minimum position setting to a value set in (EconMinPos). Two different methods of detecting poor air quality are supported, The first is through an analog input that connects to a CO_2 Sensor (0 to 10V). The measured value of CO_2 from this sensor (0 to 2000 ppm) is compared to the setpoint OAQSetpt. When the CO_2 level is higher than the setpoint, the OAQ override is initiated. The second, is through an analog input that connects to a CO Sensor (4 to 20mA). The measured value of CO from this sensor (0 to 300 ppm) is compared to the setpoint OAQSetpt. When the CO level is higher than the setpoint, the OAQ override is initiated.

Discharge Air Low Limit Control

If the discharge air temperature falls below the user-settable discharge air low limit setpoint (DaTempLoLim), an alarm is issued, and the controller will modulate the heating coil valve open to maintain a minimum discharge temperature (cycle I). For cycle II and III, if the discharge air temperature falls below the user-settable discharge air low limit setpoint (DaTempLoLim), an alarm is issued, and the outdoor air damper could be driven below the minimum position setting to prevent the discharge temperature from dropping below the low limit. If necessary, the damper can go completely closed even during Occupied mode operation. As the discharge temperature warms up, the economizer modulates open until the minimum position setting is reached. At this point, the low limit alarm is cleared.

Economizer Enable/Disable Control (pertains to ASHRAE Cycle II and III)

The W7753A Controller has inputs to determine if the outdoor air is suitable to augment cooling. The economizer dampers can be enabled/disabled for using outdoor air as the first stage of cooling based on one of ten allowable strategies:

1. **Digital Input En/Disable**—contact closure enables economizer.
2. **Outdoor Temperature**—when the outdoor temperature is less than OaEconEnTemp, then the outdoor air is suitable to augment cooling.
3. **Outdoor Enthalpy, Type A**—when the outdoor enthalpy meets the H205 type A requirements, the outdoor air is suitable to augment cooling.
4. **Outdoor Enthalpy, Type B**—when the outdoor enthalpy meets the H205 type B requirements, the outdoor air is suitable to augment cooling.
5. **Outdoor Enthalpy, Type C**—when the outdoor enthalpy meets the H205 type C requirements, the outdoor air is suitable to augment cooling.
6. **Outdoor Enthalpy, Type D**—when the outdoor enthalpy meets the H205 type D requirements, the outdoor air is suitable to augment cooling.
7. **Differential Temperature**—the difference between outdoor temperature and return air temperature is compared to DiffEconEnTemp to determine whether outdoor air or return air is more suitable for use to augment mechanical cooling.
8. **Single Calculated Enthalpy**—the calculated outdoor enthalpy in btu/lb (kJ/kg) is compared to the enthalpy setpoint (OaEnthEn) in btu/lb (kJ/kg), and the outdoor temperature is compared to the outdoor temperature limit setpoint (OaEconEnTemp) for a high limit. The compared difference determines whether outdoor air is suitable for use to augment mechanical cooling.
9. **Differential Enthalpy, Either Sensed or Calculated**—the difference between outdoor enthalpy and return air enthalpy determines whether outdoor air or return air is more suitable to augment mechanical cooling. When enthalpy sensors are configured, they are used for comparing enthalpy. If no enthalpy sensors are available, then enthalpy is calculated using outdoor and return air humidity and temperature sensors. The switching differential is fixed at 1.0 mA for enthalpy sensors, and 0.25 btu/lb (0.582 kJ/kg) for calculated enthalpy.
   NOTE: If no return temperature sensor is configured, space temperature is used to calculate return air enthalpy.
10. **Network Enabled**—the network input (EconInValue) controls the enabling and disabling of the economizer.

APPENDIX C. COMPLETE LIST OF EXCEL 10 W7753 UNIT VENTILATOR CONTROLLER USER ADDRESSES.

C1. Input/Output Points.
C2. Control Parameters.
C3. Energy Management Points.
C4. Status Points.
C5. Calibration Points.
C6. Configuration Parameters.
C7. LonMark® Points.
C8. Direct Access And Special Points.
C9. Data Share Points.

Table C-0 lists the applicable Engineering Units for the analog points found in the W7753A.

Table C0. Engineering Units For Analog Points.

Measured Item	English Units (Inch-Pound)		Standard International Units (SI)	
	Description	**Abbreviation**	**Description**	**Abbreviation**
Temperature	Degrees Fahrenheit	F	Degrees Celsius	C
Relative Temperature	Delta Degrees Fahrenheit	DDF	Degrees Kelvin	K
Relative Humidity	Percent	%	Percent	%
Air Flow	Cubic Feet per Minute	CFM	Liters per Second of gas	m3h
CO_2 Concentration	Parts Per Million	PPM	Parts Per Million	PPM
Enthalpy	British Thermal Units per Pound of Air	btu/lb	kiloJoules/kilogram	kJ/kg
Differential Pressure	Inches of Water Column	inw	kiloPascal	kPa

Tables C-1 and C-2 list all network variables associated with the W7753A Controller and the default User Address names. Table C-1 lists the Configuration Parameters, which are the values stored in the controllers EEPROM memory. Table C-2 lists the Network Variable Inputs and Outputs, which are stored in RAM memory. Tables provides point attributes as follows:

Engineering Units— This field indicates the point valid range and displayed Engineering Unit. For digital points, the valid states and the corresponding enumerated values are shown.

Default— The value or state of the point on controller start-up.

Shareable— The point can be set up for data sharing in Command Multiple Points, Read Multiple Points, or Refer Excel 10 Points as either a data source or a destination.

Mappable— The point can be converted into a C-Bus point by C-Bus devices. A mappable point has a one-to-one relationship with a C-Bus User Address.

Direct Access— The point is accessible through the Subsystem Points mechanism in XBS.

E-Vision Monitor— These points are viewable within the E-Vision Controller Monitoring on-line screen. PAR refers to control parameters settable in the Application Selection dialog boxes in E-Vision.

Hardware Config— These are points that involve controller I/O configuration. Any change to HW Config. points causes the W7753A to perform an application reset; therefore, these points can only be modified off-line.

Manual— These points are used to set the controller outputs when in manual mode. The W7753 is placed in manual mode through a menu selection in the E-Vision Controller Monitor screen.

NOTES:

1. Mapped points can be viewed and changed, *if applicable*, on C-Bus devices such as an XI581, XI582 and XI584 and on an XBS central and E-Vision.
2. All Excel 10 points, mappable and calibration, configuration and internal data sharing points, can be viewed and changed, *as allowed*, via Direct Access (DA) mode in the XBS subsystem menu or via XI584.

NOTE:

E-Vision - These points are displayed to the user and polled during the E-Vision monitor function. Monitor (M) indicates the point appears in the Software list box. Schematic (S) indicates the point is to be displayed on the schematic air handler diagram directly. Calibrate (C) - These points are calibratible and the calibration dialog (either the temperature or air flow dialog) is displayed. These points are displayed in a listbox by selection of the menu item Controller, Calibration. When the user double clicks on these points the calibration dialog is displayed. Parameter (P) - This information is displayed to the user in the Application Selection screens. These fields are read/write when offline and read only when online.

HW cfg - This information is displayed to the user in the Application Selection screens. These fields are read/write when offline or online.

Manual - These points can be placed in the manual mode. When the user double clicks on these points the manual dialog is displayed, this contains radio buttons; one for Auto and one for Manual.

Test (Test Mode) - These points are commandable when the controller is placed in the test mode via the menu item Controller, Diagnostics, Test Mode. When the user enters this mode, a list box will display the points that can be commanded in this mode.

NOTE: Table C-1. User Addresses For W7753A Configuration Parameters. (Configuration Parameters are stored in EEPROM - limited to 10,000 *writes*. Do NOT use as outputs from Control Strategies, Time Programs, or Switching Tables. If these points are changed more than 10,000 times, irreversible hardware failure results).

Table C1. Input/Output Points (Left).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
AI1TempSensr	nvoIO	AI1Sensr	Degrees F 30 to 122 Degrees C (-1 to 50)	Invalid	0
AI2TempSensr	nvoIO	AI2Sensr	Degrees F 30 to 122 Degrees C (-1 to 50)	Invalid	0
AI3Enthalpy	nvoIO	AI3Sensr (AI3Enthalpy)	mA 4 to 20	Invalid	0
AI4Enthalpy	nvoIO	AI4Sensr (AI4Enthalpy)	mA 4 to 20	Invalid	0
AI3FltrPress	nvoIO	AI3Sensr (AI3FltrPress)	0 to 5 inw (0 to 1.25) kpa	Invalid	0
AI4FltrPress	nvoIO	AI4Sensr (AI4FltrPress)	0 to 5 inw (0 to 1.25) kpa	Invalid	0
AI3Humidity	nvoIO	AI3Sensr (AI3Humidity)	Percent 10 to 90	Invalid	0
AI4Humidity	nvoIO	AI4Sensr (AI4Humidity)	Percent 10 to 90	Invalid	0
AI3PPM	nvoIO	AI3Sensr (AI3PPM)	PPM 150 to 2000	Invalid	0
AI4PPM	nvoIO	AI4Sensr (AI4PPM)	PPM 150 to 2000	Invalid	0
AI3Volts	nvoIO	AI3Sensr (AI3Volts)	Volts 1 to 10	Invalid	0
AI4Volts	nvoIO	AI4Sensr (AI4Volts)	Volts 1 to 10	Invalid	0
Model	nvoIO	ModelIn Byte Offset = 13 Bit Offset = 3	FALSE TRUE	0 1	FALSE

(continued)

Table C1. Input/Output Points (Right).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
		X					AI1Sensr: is a signed integer with the engineering unit always in degrees F (C). This is the value of analog sensor (resistive type) connected to AI1.
		X					AI2Sensr: is a signed integer with the engineering unit always in degrees F (C). This is the value of the analog sensor (resistive type) connected to AI2.
		X					AI3Sensr is a signed integer with the engineering unit is as defined by the sensor selection in nciIoSelect. AI3Enthalpy is the value of analog sensor connected to AI5
		X					AI4Sensr is a signed integer with the engineering unit is as defined by the sensor selection in nciIoSelect. AI4Enthalpy is the value of analog sensor connected to AI6
		X					AI3Sensr is a signed integer with the engineering unit is as defined by the sensor selection in nciIoSelect. AI3FltrPress is the value of analog sensor connected to AI5
		X					AI4Sensr is a signed integer with the engineering unit is as defined by the sensor selection in nciIoSelect. AI4FltrPress is the value of analog sensor connected to AI6
		X					AI3Sensr is a signed integer with the engineering unit is as defined by the sensor selection in nciIoSelect. AI3Humidity is the value of analog sensor connected to AI5
		X					AI4Sensr is a signed integer with the engineering unit is as defined by the sensor selection in nciIoSelect. AI4Humidity is the value of analog sensor connected to AI6
		X					AI3Sensr is a signed integer with the engineering unit is as defined by the sensor selection in nciIoSelect. AI3PPM is the value of analog sensor connected to AI5
		X					AI4Sensr is a signed integer with the engineering unit is as defined by the sensor selection in nciIoSelect. AI4PPM is the value of analog sensor connected to AI6
		X					AI3Sensr is a signed integer with the engineering unit is as defined by the sensor selection in nciIoSelect. AI3Volts is the value of analog sensor connected to AI5
		X					AI4Sensr is a signed integer with the engineering unit is as defined by the sensor selection in nciIoSelect. AI4Volts is the value of analog sensor connected to AI6
							ModelIn: is a byte that represents a physical digital input. If the input is shorted to ground, the bit is a zero or FALSE. If the input is open, the bit is one or TRUE.

(continued)

Table C1. Input/Output Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
RmTempSensr	nvoIO	RmTempSensr	Degrees F 40 to 100 Degrees C (4 to 38)	Invalid	0
RmtStptPot	nvoIO	RmStptPot	Degrees F -9 to 85 Degrees C (-23 to 29)	Invalid	0
OvrdSw	nvoIO	OverrideSw Byte Offset = 14 Bit Offset = 7	FALSE TRUE	0 1	FALSE
StatusDI1	nvoIO	DigitalIn1 Byte Offset = 13 Bit Offset = 7	FALSE TRUE	0 1	FALSE
StatusDI2	nvoIO	DigitalIn2 Byte Offset = 13 Bit Offset = 6	FALSE TRUE	0 1	FALSE
StatusDI3	nvoIO	DigitalIn3 Byte Offset = 13 Bit Offset = 5	FALSE TRUE	0 1	FALSE
StatusDI4	nvoIO	DigitalIn4 Byte Offset = 13 Bit Offset = 4	FALSE TRUE	0 1	FALSE

(continued)

Table C1. Input/Output Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M S	X	X					SpaceTemp is the measured space temperature. If the sensor is not configured or has failed, the value is SI_INVALID. NOTE: The reported temperatures includes the offset correction provided by Config.ResistiveOffsetCal.
		X	X				RmStptPot: SetPointTemp is the wall module setpoint temperature. When nciConfig.SetPointTemp is ABSOLUTE_COOL or ABSOLUTE_MIDDLE, the reported value is the absolute setpoint temperature. When Config.SetPntKnob is OFFSET, the reported value is the offset (from the current active TempSetPts) temperature. If the input is not configured or has failed, the value is SI_INVALID.
							OverrideSw: OverrideSw indicates the status of the wall module override push button. The wall module switch is always present and is not selectable (or configurable). If the override button is not pressed there will be an open circuit (False). If the override button is pressed there will be an closed circuit (True).
							DigitalIn1: is a byte that represents a physical digital input. If the input is shorted to ground, the bit is a zero or FALSE. If the input is open, the bit is one or TRUE.
							DigitalIn2: is a byte that represents a physical digital input. If the input is shorted to ground, the bit is a zero or FALSE. If the input is open, the bit is one or TRUE.
							DigitalIn3: is a byte that represents a physical digital input. If the input is shorted to ground, the bit is a zero or FALSE. If the input is open, the bit is one or TRUE.
							DigitalIn4: is a byte that represents a physical digital input. If the input is shorted to ground, the bit is a zero or FALSE. If the input is open, the bit is one or TRUE.

(continued)

Table C1. Input/Output Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
StatusDO1	nvoIO	DigitalOut1 Byte Offset = 12 Bit Offset = 0	FALSE TRUE	01	FALSE
StatusDO2	nvoIO	DigitalOut2 Byte Offset = 12 Bit Offset = 1	FALSE TRUE	0 1	FALSE
StatusDO3	nvoIO	DigitalOut3 Byte Offset = 12 Bit Offset = 2	FALSE TRUE	0 1	FALSE
StatusDO4	nvoIO	DigitalOut4 Byte Offset = 12 Bit Offset = 3	FALSE TRUE	0 1	FALSE
StatusDO5	nvoIO	DigitalOut5 Byte Offset = 12 Bit Offset = 4	FALSE TRUE	0 1	FALSE
StatusDO6	nvoIO	DigitalOut6 Byte Offset = 12 Bit Offset = 5	FALSE TRUE	0 1	FALSE
StatusDO7	nvoIO	DigitalOut7 Byte Offset = 12 Bit Offset = 6	FALSE TRUE	0 1	FALSE
StatusDO8	nvoIO	DigitalOut8 Byte Offset = 12 Bit Offset = 7	FALSE TRUE	0 1	FALSE

(continued)

Table C1. Input/Output Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
							DigitalOut1: is a byte with a bit representing the state of the physical digital output. On is a 1 (TRUE) and off is a 0 (FALSE).
							DigitalOut2: is a byte with a bit representing the state of the physical digital output. On is a 1 (TRUE) and off is a 0 (FALSE).
							DigitalOut3: is a byte with a bit representing the state of the physical digital output. On is a 1 (TRUE) and off is a 0 (FALSE).
							DigitalOut4: is a byte with a bit representing the state of the physical digital output. On is a 1 (TRUE) and off is a 0 (FALSE).
							DigitalOut5: is a byte with a bit representing the state of the physical digital output. On is a 1 (TRUE) and off is a 0 (FALSE).
							DigitalOut6: is a byte with a bit representing the state of the physical digital output. On is a 1 (TRUE) and off is a 0 (FALSE).
							DigitalOut7: is a byte with a bit representing the state of the physical digital output. On is a 1 (TRUE) and off is a 0 (FALSE).
							DigitalOut8: is a byte with a bit representing the state of the physical digital output. On is a 1 (TRUE) and off is a 0 (FALSE).

(continued)

Table C1. Input/Output Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
DigIn1TypeSel1	nciIoSelect	Digital1	UNUSED_DI OCC_SENSOR PROOF_AIR_FLOW IAQ_OVERRIDE_IN SMOKE_MONITOR DIRTY_FILTER_IN SHUTDOWN WINDOW_OPEN MONITOR COIL_FREEZE_STAT AQSTAT_MAKE_TMP_RISE AQSTAT_BREAK_TMP_RISE TIME_CLOCK DRIP_PAN_FULL_IN ECON_ENABLE	15 0 1 2 3 4 5 6 7 8 9 10 11 12 13	UNUSED_DI
DigIn2TypeSel1	nciIoSelect	Digital2	See Digital1Eng. Units/States column above for selections.		UNUSED_DI
DigIn3TypeSel1	nciIoSelect	Digital3	See Digital1Eng. Units/States column above for selections.		UNUSED_DI
DigIn4TypeSel1	nciIoSelect	Digital4	See Digital1Eng. Units/States column above for selections.		UNUSED_DI
DigOutput1Type	nciIoSelect	DigitalOut(0)	UNUSED_DO COOL_STAGE_1 COOL_STAGE_2 HEAT_STAGE_1 HEAT_STAGE_2 AUX_ECON OCCUPANCY_STATUS ECON_OPEN ECON_CLOSE COOL_OPEN COOL_CLOSE HEAT_OPEN HEAT_CLOSE FREE1 ECON_PWM_OUT HEAT_PWM_OUT COOL_PWM_OUT FAN_SPEED_1 FAN_SPEED_2 FAN_SPEED_3	-1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	FREE1

(continued)

Table C1. Input/Output Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
		X		X			Digital1: specifies the sensor type and function connected to Digital1 through Digital4. The valid enumerated list of logical digital states for Digital1 is listed in the Eng. Units/States column.
		X		X			Digital2: Refer to the description for Digital1.
		X		X			Digital3: Refer to the description for Digital1.
		X		X			Digital4: Refer to the description for Digital1.
		X		X			DigitalOut(0): specifies which logical digital output function is assigned to the digital physical output according to the enumerated list that is shown in the Eng. Units/States column. DigitalOut(0) through DigitalOut(7) are available.

(continued)

Table C1. Input/Output Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
DigOutput2Type	nciIoSelect	DigitalOut(1)	Refer to the Eng. Units/States column for DigitalOut(0) for selections available.		FAN_SPEED_1
DigOutput3Type	nciIoSelect	DigitalOut(2)	Refer to the Eng. Units/States column for DigitalOut(0 for selections available.		COOL_STAGE_1
DigOutput4Type	nciIoSelect	DigitalOut(3)	Refer to the Eng. Units/States column for DigitalOut(0) for selections available.		COOL_STAGE_2
DigOutput5Type	nciIoSelect	DigitalOut(4)	Refer to the Eng. Units/States column for DigitalOut(0) for selections available.		HEAT_STAGE_1
DigOutput6Type	nciIoSelect	DigitalOut(5)	Refer to the Eng. Units/States column for DigitalOut(0) for selections available.		HEAT_STAGE_2
DigOutput7Type	nciIoSelect	DigitalOut(6)	Refer to the Eng. Units/States column for DigitalOut(0) for selections available.		ECON_OPEN
DigOutput8Type	nciIoSelect	DigitalOut(7)	Refer to the Eng. Units/States column for DigitalOut(0) for selections available.		ECON_CLOSE
PowerFrequency	nciIoSelect	FiftySixtyHz	SIXTY FIFTY	0 1	FIFTY

(continued)

Table C1. Input/Output Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
		X		X			DigitalOut(1): Refer to the description for DigitalOut(0).
		X		X			DigitalOut(2): Refer to the description for DigitalOut(0).
		X		X			DigitalOut(3): Refer to the description for DigitalOut(0).
		X		X			DigitalOut(4): Refer to the description for DigitalOut(0).
		X		X			DigitalOut(5): Refer to the description for DigitalOut(0).
		X		X			DigitalOut(6): Refer to the description for DigitalOut(0).
		X		X			DigitalOut(7): Refer to the description for DigitalOut(0).
		X		X			FiftySixtyHz: specifies the mains frequency. Correctly selecting FiftySixtyHz decreases the noise picked up by analog sensor wiring from the power mains. When FiftySixtyHz is 1, the mains frequency is fifty Hz and when FiftySixtyHz is 0, the mains frequency is sixty Hz.

(continued)

Table C1. Input/Output Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
SetPntKnob	nciIoSelect	SetPntKnob	SET_PNT_UNUSED OFFSET ABSOLUTE_STPT	15 0 1	ABSOLUTE_STPT
SpaceSensor	nciIoSelect	SpaceSensor	SPACE_UNUSED T7770 USE_RETURN_TEMP USE_DISCHARGE_TEMP	15 0 1 2	T7770
TempInput1Type	nciIoSelect	Resistive1	UNUSED_RAI OUTDOOR_TEMP_PT3000 DISCHARGE_TEMP_PT3000 RETURN_TEMP_PT3000 MIXED_AIR_TEMP_PT3000 FAN_SWITCH DISCHARGE_TEMP_20KNTC RETURN_TEMP_20KNTC MIXED_AIR_TEMP_20KNTC	15 0 1 2 3 4 5 6 7	UNUSED_RAI
TempInput2Type	nciIoSelect	Resistive2	See Resistive1 Eng. Units/States column above for selections		UNUSED_RAI
VoltInput3Type	nciIoSelect	Voltage1	UNUSED_VAI RTN_HUM_C7600C RETURN_ENTHALPY OD_HUM_C7600C OUTDOOR_ENTHALPY OUTDOOR_CO FILTER_STATIC_PRESS_DIFF SPACE_CO_2 OUTDOOR_CO_2 MONITOR_SENSOR1 RTN_HUM_C7600B OD_HUM_C7600B	15 0 1 2 3 4 5 6 7 8 9 10	UNUSED_VAI
VoltInput4Type	nciIoSelect	Voltage2	See Voltage1 Eng. Units/States column above for selections		UNUSED_VAI

Table C1. Input/Output Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
		X		X			SetPntKnob: Refer to the description for SpaceSensor.
		X		X			SpaceSensor: specifies which logical sensor is assigned to which physical analog input sensor channel according to the enumerated list that is shown in the Eng. Units/States column.
		X		X			Resistive1: specifies which logical sensor is assigned to which physical analog input sensor channel according to the enumerated list that is shown in the Engineering Units/States column.
		X		X			Resistive2: Refer to the description for Resistive1.
		X		X			Voltage1: specifies which logical voltage or current sensor is assigned to which physical analog input sensor channel according to the enumerated list that is shown in the Eng. Units/States column.
		X		X			Voltage2: Refer to the description for Voltage1.

Table C2. Control Parameters (Left).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
BypTime	nciBypassTime		minutes 0 to 240		180
CoolRamp	nciAux1SetPt	ubClRampS0	Degrees F/Hr 0 to 20 Degrees C/Hr (0 to 11)		3
DaTempClCtrlBd	nciAux2SetPt	ubDisCbCoolS0	Degrees F 5 to 30 Degrees C (3 to 17)		20
DaTempEcCtrlBd	nciAux2SetPt	ubDisCbEconS0	Degrees F 5 to 30 Degrees C (3 to 17)		20
DaTempHiLim	nciAux1SetPt	siMaxDisAirTempHeatS7	Degrees F 65 to 135 Degrees C (18 to 57)		100
DaTempHtCtrlBd	nciAux2SetPt	ubDisCbHeatS0	Degrees F 5 to 30 Degrees C (3 to 17)		20
DaTempLoLim	nciAux1SetPt	siLowLimitDischAirTempS7	Degrees F 0 to 60 Degrees C (-1 to 16)		45
DiffEconEnTemp	nciAux1SetPt	ubDiffEconEnableTempS0	Degrees F 0 to 90 Degrees C (-18 to 32)		4
DlcBumpTemp	nciAux1SetPt	siDlcBumpTempS7	Degrees F 0 to +10 Degrees C (-18 to -12)		3
EconIAQPos	nciAux1SetPt	ubEconIaqPosS0	Percentage 0 to 100		80
EconMinPos	nciOAMinPos		Percentage 0 to 100		
FltrPressStPt	nciAux1SetPt	ubFilterPressStPtS5	inw 0 to 5 kPa (0 to 1.25)		0.5
GainCoolDer	nciAux2SetPt	siKdCoolS0	Seconds 0 to 9000		0
GainCoolInt	nciAux2SetPt	siKiCoolS0	Seconds 0 to 5000		2050
GainCoolProp	nciAux2SetPt	ubKpCoolS2	Degrees F 2 to 3 Degrees C (1 to 17)		5

(continued)

Table C2. Control Parameters (Right).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
P		X					BypTime is the time between the pressing of the override button at the wall module (or initiating Bypass via CmdManualOcc) and the return to the original occupancy state. When the bypass state has been activated, the bypass timer is set to BypTime.
P		X					CoolRamp is the cool recovery ramp rate in degrees F (C) per hour. This value is used to control the recovery ramp rate during the COOL recovery period. The setpoint is changed at CoolRamp degrees F (C) per hour. NOTE: For HeatRamp the conditions for recovery ramping also apply.
	X	X	P				DisCbCool is the throttling range used for the cooling portion of the discharge air temperature cascade control loop.
	X	X	P				DisCbEcon is the throttling range used for the economizer control loop.
P		X					When the mode is HEAT, and the CascadeControl is enabled, the discharge air temperature is controlled to a value not to exceed MaxDisAirTempHeat.
	X	X	P				DisCbHeat is the throttling range used for the heating portion of the discharge air temperature cascade control loop.
P		X					When the discharge air temperature falls below LowLimitDischAirTemp, the outdoor air dampers are closed to a position that corrects the low temperature problem. If mechanical cooling is active when the discharge air falls below LowLimitDischAirTemp, the mechanical cooling cycles off after the minimum run times are obeyed to allow the dampers to return open and provide free cooling.
P		X					If Config.EconEnable is DIFF_TEMP, and return air temperature minus outdoor air temperature is greater than DiffEconEnTemp, then outdoor air is judged suitable to augment mechanical cooling.
P		X					When DestDlcShed is not 0 then the setpoint is shifted by DlcBumpTemp in the energy saving direction. When DestDlcShed changes from 1 to 0, the setpoint shift ramps back to 0 over a 30 minute interval.
P		X					The control overrides the economizer damper to EconIaqPos when poor indoor air quality is detected.
P		X					EconMinPos applies to ASHRAE cycle III only.
P		X					If a filter pressure sensor is configured by IoSelect and the filter pressure reported in Data2 FilterPressure exceeds FilterPressStPt, then a DIRTY_FILTER alarm is generated and Data1.DirtyFilter is set to 1.
P							This is the derivative portion of the PID loop gain for the cooling control loop.
P							This is the integral portion of the PID loop gain for the cooling control loop.
P							This is the throttling range for the proportional portion of the PID loop gain for the cooling control loop.

(continued)

Table C2. Control Parameters (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
GainHeatDer	nciAux2SetPt	siKdHeatS0	Seconds 0 to 9000		0
GainHeatInt	nciAux2SetPt	siKiHeatS0	Seconds 0 to 5000		2050
GainHeatProp	nciAux2SetPt	ubKpHeatS2	Degrees F 2 to 30 Degrees C (2 to 17)		5
HeatRamp	nciAux1SetPt	ubHtRampS0	Degrees F/Hr 0 to 20 Degrees C/Hr (0 to 11)		8
HtSrcTemp	nciAux1SetPt	ubHtSrcTempS0	Degrees F 0 to 100 Degrees C (-18 to 38)		86
IAQSetpt	nciSpaceCO2Lim		PPM 0 to 2000		800

(continued)

Table C2. Control Parameters (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
P							This is the derivative portion of the PID loop gain for the heating control loop.
P							This is the integral portion of the PID loop gain for the heating control loop.
P							This is the throttling range for the proportional portion of the PID loop gain for the heating control loop.
P		X					HeatRamp is the heat recovery ramp rate in degrees F per hour. This value is used to control the recovery ramp rate during the HEAT recovery period. The setpoint is changed at HeatRamp degrees F per hour. NOTE: Recovery ramping applies between scheduled heating or cooling setpoint changes from OC_UNOCCUPIED to OC_STANDBY, OC_UNOCCUPIED to OC_OCCUPIED, and OC_STANDBY to OC_OCCUPIED. Scheduled setpoint changes from OC_OCCUPIED to OC_UNOCCUPIED or OC_OCCUPIED to OC_STANDBY do not use a ramped setpoint but instead use a step change in setpoint. Recovery ramps begin before the next scheduled occupancy time and are ramped from the setpoint for the existing scheduled occupancy state to the setpoint for the next occupancy state.
P		X					HtSrcTemp is used to determine whether heating or cooling energy is being supplied to the mechanical equipment controlled by the node. DestSourceTemp is the temperature of the water being supplied to the mechanical equipment controlled by the node. When DestSourceTemp is greater than HtSrcTemp then heating energy is being supplied to the equipment. When DestSourceTemp is less than HtSrcTemp then cooling energy is being supplied to the equipment. If DestSourceTemp is Invalid then DestSourceTemp is not being supplied by an external sensor.
P		X					When an analog CO_2 sensor is configured and the sensed CO_2 is greater than IAQSetpt, then poor indoor air quality is detected and Data1.OverRide is set to 1. When the sensed CO_2 is less than IAQSetpt, then the indoor air quality is considered acceptable and StatusIaqOvr is set to 0. StatusIaqOvr is used to set the economizer damper to Aux1SetPt. EconIaqPos and to possibly turn on the heat according to the state of Config.IaqUseHeat.

(continued)

Table C2. Control Parameters (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
InUseNumber	nviInUse		0 to 65534		0xFFFF
MixedAirStPt	nciAux1SetPt	ubMixedAirSetPtS1	Degrees F 40 to 80 Degrees C (4 to 27)		55
OaDmprMinPos	nciOAMinPos		Percent 0 to 100		10
OaEnthEn	nciAux1SetPt	ubOdEnthalpyEnableS2	btu/lb 0 to 65 kj/kg (0 to 69)		25
OaEconEnTemp	nciAux1SetPt	ubOdEconEnableTempS0	Degrees F 0 to 90 Degrees C (-18 to 32)		70
OAQSetpt	nciAux1SetPt	siOaQualityLimitS0	PPM 0 to 2000		0
OaTempCltLkOut	nciAux1SetPt	ubOdClLockOutTempS0	Degrees F 0 to 90 Degrees C (-18 to 32)		50
OaTempHtLkOut	nciAux1SetPt	ubOdHtLockOutTempS0	Degrees F 0 to 90 Degrees C (-18 to 32)		70

(continued)

Table C2. Control Parameters (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
							InUseNumber is used by a management node to indicate to all other management nodes that it is logged on to the Excel 10 node and that they should not try to interact with any of the Excel 10s network variables. Before the management node reads or writes any network variables, the management node checks InUseNumber for a zero value meaning no other management nodes are already logged on and that a management node can log on to the node. Then the management node writes a number, 1 through 65534, to InUseNumber and periodically writes the same value to indicate that the management node is still logged on. If there are no writes made to InUseNumber for approximately 60 seconds, then the Excel 10 resets InUseNumber to zero to automatically log off the management node. Before interacting with any network variables, the management node verifies that the InUseNumber has not changed. The management node logs off by writing 0 to InUseNumber. During power up, an application restart, or return to on-line from off-line, the Excel 10 sets InUseNumber to 65535 to indicate to the management node that it has returned to on-line.
P		X					When UVCycleMode is Cycle3, MixedAirStPt setpoint used to control the mixed air temperature.
P		X					The minimum allowed position of the outdoor air damper for HEAT and COOL is OaDmprMinPos. (applies to ASHRAE cycle 2 only).
P		X					If Config.EconEnable is SINGLE_ENTH, and calculated outdoor enthalpy is less than OdEnthalpyEnable, and outdoor temperature is less than OaEconEnTemp, then outdoor air is judged suitable to augment mechanical cooling.
P		X					If Config.EconEnable is OD_TEMP, and the outdoor temperature is less than OaEconEnTemp, then outdoor air is judged suitable to augment mechanical cooling. If Config.EconEnable is SINGLE_ENTH and outdoor temperate is less than OaEconEnTemp (high limit), then outdoor air may be judged suitable to augment mechanical cooling depending on the relationship between calculated outdoor enthalpy and OdEnthalpyEnable.
P		X					If the outdoor CO or CO_2 contents is greater than OAQSetPt, then the economizer damper is closed completely. The economizer damper is closed until the outdoor CO or CO_2 contents drops below the OAQSetPt value and then resumes normal control.
P		X					When the outdoor air temperature is less than OdClLockOutTemp, the cooling is disabled.
P		X					When the outdoor air temperature is greater than OdHtLockOutTemp, the heating is disabled.

(continued)

Table C2. Control Parameters (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
PwmFullScale	nciAux1SetPt	siPwm100pcntS4	Seconds 0 to 2047		25.5
PwmPeriod	nciAux1SetPt	siPwmPeriodS4	Seconds 0 to 2047		25.6
PwmZeroScale	nciAux1SetPt	siPwm0pcntS4	Seconds 0 to 2047		0.1
StptKnobHiLim	nciAux2SetPt	siHighStPtS7	Degrees F -9 to 90 Degrees C (-23 to 23)		85
StptKnobLowLim	nciAux2SetPt	siLowStPtS7	Degrees F -9 to 90 Degrees C (-23 to 23)		55

Table C2. Control Parameters (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
P							When pulse width modulation is used, the period of a pulse for full scale output (damper or valve at open position) is Pwm100pcnt seconds. The smallest resolution is 0.1 seconds.
P							When pulse width modulation is used, the period of one pulse width modulation cycle is PwmPeriod seconds. The smallest resolution is 0.1 seconds.
P							When pulse width modulation is used, the period of a pulse for zero percent output (damper or valve at closed position) is siPwm0pcntS4 seconds. The smallest resolution is 0.1 seconds.
P		X					StptKnobHiLim is the highest value reported for the setpoint knob. Dependent on the configuration of the setpoint knob (see Config.SetPntKnob) this setting is either absolute degrees Fahrenheit 50 to 90 degrees Celcius (10 to 32.2) in case of absolute setpoint knob configuration or relative delta degrees Fahrenheit -9 to +9 degrees K (-5.4 to +5.4) in case of relative setpoint knob configuration.
P		X					StptKnobLowLim is the lowest value reported for the setpoint knob. Dependent on the configuration of the setpoint knob (see Config.SetPntKnob) this setting is either absolute degrees Fahrenheit 50 to 90 degrees Celcius (10 to 32.2) in case of absolute setpoint knob configuration or relative delta degrees Fahrenheit -9 to +9 degrees K (-5.4 to +5.4) in case of relative setpoint knob configuration.

Table C3. Energy Management Points (Left).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
DestBypass	nviBypass	value	0 to 100		0
	nviBypass	state	SW_OFF SW_ON SW_NUL	0 1 -1	SW_NUL
DestDlcShed	nviDlcShed		NO_DLC_SHED MIN_DLC_SHED	0 1	NO_DLC_SHED
DestFree1	nviFree1	value	0 to 100		0
	nviFree1	state	SW_OFF SW_ON SW_NUL	0 1 -1	SW_NUL
SrcBypass	nvoBypass	value	Percent 0 to 100		0
	nvoBypass	state	SW_OFF SW_ON SW_NUL	0 1 -1	SW_NUL

Table C3. Energy Management Points (Right).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M	X	X	X		X		DestBypass: The bypass state of one node may be shared with the bypass state of another node using nviBypass and nvoBypass. This allows a wall module at one node to be used to override the scheduled occupancy of another node. The node with Bypass bound normally does not have a wall module. See the Data1.EffectOcc and Data1.OverRide for more details. The valid states are as follows: If the state is SW_ON and the value is not zero then the node should bypass the time of day schedule (subject to occupancy arbitration logic). If the state is SW_NUL, the input is not available because it is not bound, the input is no longer being updated by the sender, or OC_BYPASS is no longer being called. This means the same as SW_OFF. If the state is SW_OFF or other, the node should not bypass the time of day schedule. If the state is SW_ON and the value is 0, then the node should not bypass the time of day schedule. If the node receives this combination of state and value, then state is set to SW_OFF.
							Refer to DestBypass.
M	X	X	X		X		DestDlcShed is an input from an energy management system. When DestDlcShed is NO_DLC_SHED, the temperature control algorithm operates in a normal mode. When DestDlcShed is MIN_DLC_SHED, the setpoint is shifted by Aux1SetPt.DlcBumpTemp in the energy saving direction.
M	X	X	X		X		DestFree1 network variable controls the spare or Free digital output for auxiliary functions. nviFree1 controls the FREE1_OUT, FREE1_OUT_PULSE_ON, and FREE1_OUT_PULSE_OFF outputs. The states have the following meaning: If the state is SW_OFF, the corresponding free logical output (and therefore the physical output, if configured) is off. If the state is SW_ON and the value is 0, then the corresponding free logical output (and therefore the physical output, if configured) is off. If the node receives this combination of state and value, then state is set to SW_OFF. If the state is SW_ON and the value is not zero, then the corresponding free logical output (and therefore the physical output, if configured) is on. If the state is SW_NUL or other, then the network variable is not bound, the communications path from the sending node has failed, or the sending node has failed. The corresponding free logical output does not change if the network variable input fails.
							Refer to DestFree1.
M							SrcBypass is the current occupancy state of the node for the bypass schedule. The states have the following meanings: If the state is SW_OFF and the value is 0, then Data1.EffectOcc is not OC_BYPASS. If the state is SW_ON and the value is 100 percent, then Data1.EffectOcc is OC_BYPASS.
							For nvoBypass.state, refer to SrcBypass.

Table C4. Status Points (Left).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
AlarmNode	nvoAlarm	Node	0 to 127		0
AlarmSubnet	nvoAlarm	Subnet	1 to 255		0
AlarmType	nvoAlarm	type 0 to 255	NO_ALARM INPUT_NV_FAILURE NODE_DISABLED SENSOR_FAILURE FROST_PROTECTION INVALID_SET_POINT LOSS_OF_AIR_FLOW DIRTY_FILTER SMOKE_ALARM IAQ_OVERRIDE LOW_LIM_ECON_CLOSE DRIP_PAN_FULL FREEZE_STAT OAQ_ALARM rINPUT_NV_FAILURE rNODE_DISABLED rSENSOR_FAILURE rFROST_PROTECTION rINVALID_SET_POINT rLOSS_OF_AIR_FLOW rDIRTY_FILTER rSMOKE_ALARM rIAQ_OVERRIDE rLOW_LIM_ECON_CLOSE rDRIP_PAN_FULL rFREEZE_STAT rOAQ_ALARM ALARM_NOTIFY_DISABLED	0 1 2 3 4 5 6 7 8 9 10 11 12 13 -127 -126 -125 -124 -123 -122 -121 -120 -119 -118 -117 -116 -115 -1	NO_ALARM
BugFixVer	nroPgmVer	BugVer			0
	nroPgmVer	Id()			UV1
MajorVer	nroPgmVer	MajorVer			1
MinorVer	nroPgmVer	MinorVer			0
	nroPgmVer	NodeType			13

(continued)

Table C4. Status Points (Right).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
							AlarmNode: is the LonWorks® node number (in domain entry 1 of the nodes domain table) assigned to the node.
							AlarmSubnet: is the LonWorks® subnet number (in domain entry 1 of the nodes domain table) to which the node is assigned.
							AlarmType: is the alarm type being issued. When an alarm condition is no longer TRUE, type is set to the sum of the alarm conditions numeric value and the RETURN_TO_NORMALs numeric value. The type also is recorded in nvoAlarmLog. When a new alarm is detected, just the corresponding numeric value for the alarm is reported. Refer to table 10 (Excel 10 Alarms) in the System Engineering Guide for all the error conditions that may be reported.
		X					Software version.
							A four byte ASCII string indicating the type of node (model).
		X					Software version.
		X					Software version.
							The NodeType is a numeric identifier that is stored in EPROM that identifies the Excel 10 node type. Whenever a new software version or upgrade is issued, this is reflected in nroPgmVer which typically is read by a network management node to identify the node type. The contents of nroPgmVer contain compatible model type information and is fixed at the time when the node software is compiled.

(continued)

Table C4. Status Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
AlarmLog1 AlarmLog2 AlarmLog3 AlarmLog4 AlarmLog5	nvoAlarmLog	AlarmTypeLog1 AlarmTypeLog2 AlarmTypeLog3 AlarmTypeLog4 AlarmTypeLog5	NO_ALARM INPUT_NV_FAILURE NODE_DISABLED SENSOR_FAILURE FROST_PROTECTION INVALID_SET_POINT LOSS_OF_AIR_FLOW DIRTY_FILTER SMOKE_ALARM IAQ_OVERRIDE LOW_LIM_ECON_CLOSE DRIP_PAN_FULL FREEZE_STAT OAQ_ALARM rINPUT_NV_FAILURE rNODE_DISABLED rSENSOR_FAILURE rFROST_PROTECTION rINVALID_SET_POINT rLOSS_OF_AIR_FLOW rDIRTY_FILTER rSMOKE_ALARM rIAQ_OVERRIDE rLOW_LIM_ECON_CLOSE rDRIP_PAN_FULL rFREEZE_STAT rOAQ_ALARM ALARM_NOTIFY_DISABLED	0 1 2 3 4 5 6 7 8 9 10 11 12 13 -127 -126 -125 -124 -123 -122 -121 -120 -119 -118 -117 -116 -115 -1	NO_ALARM

(continued)

Table C4. Status Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
		X					AlarmTypeLog1 through AlarmTypeLog5 0 to 255 (AlarmTypeLog) A supervisory node may poll the nvoAlarmLog output for a short alarm history. The last five alarm reports sent via nvoAlarm are reported via nvoAlarmLog. When ALARM_NOTIFY_DISABLED is entered into the log, further alarms or return to normals are not entered into the log, until alarm reporting is again enabled. If nvoAlarm is bound and not being acknowledged, the last alarm report entered into nvoAlarmLog is the one that was not acknowledged. See nvoAlarm and nvoAlarmStatus for related subjects. type (n) specifies the alarm that was issued via nvoAlarm. See nvoAlarm for the alarm types used in nvoAlarmLog. The newest alarm is reported in type(0) and the oldest is reported in type(4). When a new entry is made to the log, the oldest entry is lost.

(continued)

Table C4. Status Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
CntrlFieldNo	nvoData (nvoCtlDataG)	FieldNo	UPDATE_ALL_FIELDS UPDATE_NO_FIELDS Mode_FIELD EffectOcc_FIELD OverRide_FIELD SchedOcc_FIELD NetManOcc_FIELD SenOcc_FIELD BypassTimer_FIELD TempControlPt_FIELD SpaceTemp_FIELD DischargeTemp_FIELD SupplyTemp_FIELD FreshAirRatio_FIELD BoxFlowControlPt_FIELD BoxFlow_FIELD BoxHeatFlow_FIELD DamperPos_FIELD ReheatPos_FIELD PeriphHeatPos_FIELD FanSpd_FIELD HeatStages_FIELD PeriphHeatOn_FIELD Free1On_FIELD AuxOn_FIELD FanOn_FIELD DlcShed_FIELD HeatCoolSwitch_FIELD WindowOpen_FIELD MonSwitch_FIELD LowFlowAlarm_FIELD	0 127 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29	UPDATE_ALL_FIELDS
StatusAlmTyp	nvoAlarmStatus	alarm_bit(0) Byte Offset = 0 Bit Offset = 0 (CommFailAlrm)	FALSE TRUE	0 1	FALSE
	nvoAlarmStatus	alarm_bit(0) Byte Offset = 0 Bit Offset = 1 (NodeDisableAlrm)	FALSE TRUE	0 1	FALSE
	nvoAlarmStatus	alarm_bit(0) Byte Offset = 0 Bit Offset = 2 (SensorFailAlrm)	FALSE TRUE	0 1	FALSE
	nvoAlarmStatus	alarm_bit(0) Byte Offset = 0 Bit Offset = 3 (FrostProtectAlrm)	FALSE TRUE	0 1	FALSE
	nvoAlarmStatus	alarm_bit(0) Byte Offset = 0 Bit Offset = 4 (InvalidSetPtAlrm)	FALSE TRUE	0 1	FALSE

(continued)

Table C4. Status Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
							FieldNo: nvoData and nvoCtlDataG are output network variables indicating the node status. The information contained in these network variables are typically used to display the node status on an operator terminal, used in a trend log, or used in a control process. The information contained in nvoCtlDataG and nvoData are identical. nvoData is a polled network variable and must be polled by the receiver. nvoCtlDataG uses the Significant event notification with Guaranteed Period Update with Changefield (SGPUC) mechanism. FieldNo indicates which other data field in the SGPUC network variable has changed since the last time it was sent on the network according to the SGPUC mechanism.
							alarm_bit(0) Byte Offset = 0 Bit Offset = 0 (CommFailAlrm) alarm_bit (n) contains a bit for every possible alarm condition. Each alarm type has a corresponding bit in alarm_bit(n) (nvoAlarm.type: 1.24, without RETURN_TO_NORMAL).
							alarm_bit(0) Byte Offset = 0 Bit Offset = 1 (NodeDisableAlrm)
							alarm_bit(0) Byte Offset = 0 Bit Offset = 2 (SensorFailAlrm)
							alarm_bit(0) Byte Offset = 0 Bit Offset = 3 (FrostProtectAlrm)
							alarm_bit(0) Byte Offset = 0 Bit Offset = 4 (InvalidSetPtAlrm)

(continued)

Table C4. Status Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
	nvoAlarmStatus	alarm_bit(0) Byte Offset = 0 Bit Offset = 5 (LossAirFlowAlrm)	FALSE TRUE	0 1	FALSE
	nvoAlarmStatus	alarm_bit(0) Byte Offset = 0 Bit Offset = 6 (DirtyFilterAlrm)	FALSE TRUE	0 1	FALSE
	nvoAlarmStatus	alarm_bit(0) Byte Offset = 0 Bit Offset = 7 (SmokeAlrm)	FALSE TRUE	0 1	FALSE
	nvoAlarmStatus	alarm_bit(0) Byte Offset = 1 Bit Offset = 0 (IaqOverRideAlrm)	FALSE TRUE	0 1	FALSE
	nvoAlarmStatus	alarm_bit(0) Byte Offset = 1 Bit Offset = 1 (LowLimEconClose)	FALSE TRUE	0 1	FALSE
	nvoAlarmStatus	alarm_bit(0) Byte Offset = 1 Bit Offset = 2 (DripPanFullAlrm)	FALSE TRUE	0 1	FALSE
	nvoAlarmStatus	alarm_bit(0) Byte Offset = 1 Bit Offset = 3 (FreezeStatAlrm)	FALSE TRUE	0 1	FALSE
	nvoAlarmStatus	alarm_bit(0) Byte Offset = 1 Bit Offset = 4 (OaOverRideAlrm)	FALSE TRUE	0 1	FALSE

(continued)

Table C4. Status Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
							alarm_bit(0) Byte Offset = 0 Bit Offset = 5 (LossAirFlowAlrm)
							alarm_bit(0) Byte Offset = 0 Bit Offset = 6 (DirtyFilterAlrm)
							alarm_bit(0) Byte Offset = 0 Bit Offset = 7 (SmokeAlrm)
							alarm_bit(0) Byte Offset = 1 Bit Offset = 0 (IaqOverRideAlrm)
							alarm_bit(0) Byte Offset = 1 Bit Offset = 1 (LowLimEconClose)
							alarm_bit(0) Byte Offset = 1 Bit Offset = 2 (DripPanFullAlrm)
							alarm_bit(0) Byte Offset = 1 Bit Offset = 3 (FreezeStatAlrm)
							alarm_bit(0) Byte Offset = 1 Bit Offset = 4 (OaOverRideAlrm)

(continued)

Table C4. Status Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
StatusError	nvoError	error_bit Byte Offset = 0 Bit Offset = 7 (SpaceSensorError)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 0 Bit Offset = 6 (SetPtKnobError)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 0 Bit Offset = 5 (AI1Error(AI1))	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 0 Bit Offset = 4 (AI2Error (AI2))	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 0 Bit Offset = 3 (AI3Error (AI3))	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 0 Bit Offset = 2 (AI4Error (AI4))	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 0 Bit Offset = 1 (ADCalError)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 1 Bit Offset =7 (nvSpaceTempError)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 1 Bit Offset = 6 (nvSetPtOffsetError)	FALSE TRUE	0 1	FALSE

(continued)

Table C4. Status Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
		X					SpaceSensorError: nvoError is a polled output containing a list of the current errors detected by the node. A search for error conditions in the node is made periodically. A diagnostic tool may poll nvoError for all of the current errors. nvoError uses one bit for each possible error condition. nvoError contains all the detected current errors even though they may be suppressed for reporting by nvoAlarm. There is a correspondence between the error conditions and alarm types. nvoError includes sensor failure errors and input network variable failure detect errors. Any sensor failure errors result in a SENSOR_FAILURE alarm. Failure to receive any bound network variable periodically results in an INPUT_NV_FAILURE alarm. nvoError tells which sensor(s) or network variable(s) have failed. See nvoAlarmnvoAlarmLog, nvoAlarmStatus for related subjects.
							SetPtKnobError: Refer to the description for SpaceSensorError above. Upon a failure of the local setpoint, the control loop will use the default occupied setpoints to control space temperature.
							AI1Error (AI1): Refer to the description for SpaceSensorError above.
							AI2Error (AI2): Refer to the description for SpaceSensorError above.
							AI3Error (AI3): Refer to the description for SpaceSensorError above.
							AI4Error (AI4): Refer to the description for SpaceSensorError above.
							ADCalError :All control functions associated with the failed sensor are disabled as if the sensor was not configured.
							nvSpaceTempError: All control functions associated with the failed sensor are disabled as if the sensor was not configured.
							nvSetPtOffsetError: All control functions associated with the failed sensor are disabled as if the sensor was not configured.

(continued)

Table C4. Status Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
	nvoError	error_bit Byte Offset = 1 Bit Offset = 5 (nvOccSchdError)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 1 Bit Offset = 4 (nvApplicModeError)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 1 Bit Offset =3 (nvOccSnsorError)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 1 Bit Offset = 2 (nvEconEnError)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 1 Bit Offset = 1 (nvOaTempError)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 1 Bit Offset = 0 (nvOaHumError)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 2 Bit Offset = 7 (nvByPassError)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit(2) Byte Offset = 2 Bit Offset = 6 (nvDlcShedError)	FALSE TRUE	0 1	FALSE

(continued)

Table C4. Status Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
							nvOccSchdError: All control functions associated with the failed sensor are disabled as if the sensor was not configured.
							nvApplicModeError: All control functions associated with the failed sensor are disabled as if the sensor was not configured.
							nvOccSnsorError: All control functions associated with the failed sensor are disabled as if the sensor was not configured.
							nvEconEnError: All control functions associated with the failed sensor are disabled as if the sensor was not configured.
							nvOaTempError: All control functions associated with the failed sensor are disabled as if the sensor was not configured.
							nvOaHumError: All control functions associated with the failed sensor are disabled as if the sensor was not configured.
							nvByPassError: All control functions associated with the failed sensor are disabled as if the sensor was not configured.
							nvDlcShedError: All control functions associated with the failed sensor are disabled as if the sensor was not configured.

(continued)

Table C4. Status Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
	nvoError	error_bit Byte Offset = 2 Bit Offset = 5 (nvFree1Error)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 2 Bit Offset = 4 (nvIaqOvrError)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 2 Bit Offset = 3 (nvOaEnthError)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 2 Bit Offset = 2 (nvOaQualityError)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 2 Bit Offset = 1 (nvHtSourceError)	FALSE TRUE	0 1	FALSE
	nvoError	error_bit Byte Offset = 2 Bit Offset = 0 (nvSrcTempError)	FALSE TRUE	0 1	FALSE

(continued)

Table C4. Status Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	SH	MA	DA	HW	MN	TS	Comments
							nvFree1Error: All control functions associated with the failed sensor are disabled as if the sensor was not configured.
							nvIaqOvrError: All control functions associated with the failed sensor are disabled as if the sensor was not configured.
							nvOaEnthError: All control functions associated with the failed sensor are disabled as if the sensor was not configured.
							nvOaQualityError: All control functions associated with the failed sensor are disabled as if the sensor was not configured.
							nvHtSourceError: All control functions associated with the failed sensor are disabled as if the sensor was not configured.
							nvSrcTempError: All control functions associated with the failed sensor are disabled as if the sensor was not configured.

(continued)

Table C4. Status Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
SrcEmerg	nvoEmergOverride		EMERG_NORMAL EMERG_PRESSURIZE EMERG_DEPRESSURIZE EMERG_PURGE EMERG_SHUTDOWN EMERG_NUL	0 1 2 3 4 -1	EMERG_NORMAL
	nvoData1 (nvoCtlDataG1)	FieldNo	UPDATE_ALL_FIELDS FStatusMode FStatusOcc FStatusOvrd FStatusSched FTimeClckOcc FstatusManOcc FstatusOcySen FstatusEconEn FsaFanStatus FoaEnthCalc FraEnthCalc FbypTimer FcoolPos FheatPos FeconPos FheatSource FfanSwitch FheatStgsOn FcoolStgsOn FsaFanSpd Ffree1Stat FoccStatOut FstatusEconOut FeconFloatingSynch FdlcShed FstatDripPanFull FstatusIaqOvr FstatusSmoke FstatusWndw FstatusFilter FstatFreezeStat FshutDown FmonitorSw UPDATE_NO_FIELDS	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 127	UPDATE_NO_FIELDS

(continued)

Table C4. Status Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M							SrcEmerg is an emergency output reflecting the state of the locally wired smoke detector. If SrcEmerg is EMERG_NORMAL, then no smoke is being detected by the local sensor or that the smoke detector input is not configured. If SrcEmerg is EMERG_PURGE, the locally wired smoke sensor is indicating a smoke condition. EMERG_PRESSURIZE, EMERG_DEPRESSURIZE, and EMERG_SHUTDOWN are not supported by SrcEmerg. If SrcEmerg is not configured then it is set to EMERG_NUL
							FieldNo: nvoData1 and nvoCtlDataG1 are output network variables indicating the node status. The information contained in these network variables are typically used to display the node status on an operator terminal, used in a trend log, or used in a control process. The information contained in nvoCtlDataG1 and nvoData1 are identical. nvoCtlDataG1 uses the SGPUC mechanism to update the status or values. The fields in nvoData are updated when network variables are polled by the receiver. Then every six seconds the difference between the field in nvoData and nvoCtlDataG is calculated. If the difference is significant the field is updated according to the SGPUC mechanism. FieldNo indicates which other data field in the SGPUC network variable has changed since the last time it was sent on the network according to the SGPUC mechanism. If FieldNo is UPDATE_ALL_FIELDS, then all fields have been updated. If FieldNo is UPDATE_NO_FIELDS, then no fields have been updated recently.

(continued)

Table C4. Status Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
StatusMode	nvoData1 (nvoCtlDataG1)	Mode	START_UP_WAIT HEAT COOL OFF_MODE DISABLED_MODE SMOKE_EMERGENCY FREEZE_PROTECT MANUAL FACTORY_TEST FAN_ONLY	0 1 2 3 4 5 6 7 8 9	START_UP_WAIT
StatusOcc	nvoData1 (nvoCtlDataG1)	EffectOcc	OC_OCCUPIED OC_UNOCCUPIED OC_BYPASS OC_STANDBY OC_NUL	0 1 2 3 -1	OC_NUL
StatusOvrd	nvoData1 (nvoCtlDataG1)	Override	OC_OCCUPIED OC_UNOCCUPIED OC_BYPASS OC_STANDBY OC_NUL	0 1 2 3 -1	OC_NUL
StatusSched	nvoData1 (nvoCtlDataG1)	SchedOcc	OC_OCCUPIED OC_UNOCCUPIED OC_BYPASS OC_STANDBY OC_NUL	0 1 2 3 -1	OC_NUL
TimeClckOcc	nvoData1 (nvoCtlDataG1)	OccTimeClock	ST_OFF ST_LOW ST_MED ST_HIGH ST_ON ST_NUL	0 1 2 3 4 -1	ST_NUL

(continued)

Table C4. Status Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M		X	X				StatusMode: The result of the controller determining which mode of operation it currently is in. At each power-up, the controller remains in the Start-Up and Wait mode (a random time from 0 to 20 minutes that is based on the units network number). After that period, the mode changes to initialize actuators that will fully close the damper and valve actuators to insure full travel when under program control. The various other modes are due to normal operation as well as manual and network commands.
M		X	X				StatusOcc: The result of a controller supervising the various Occupied controlling inputs and deciding which one to use. See StatusinOcy, StatusSched, ManualOcc and StatusOvrd.
M		X	X				StatusOvrd: Is the effective manual override state arbitrated from StatusManOcc, the wall module override button and the Bypass Timer.
M		X	X				StatusSched is calculated from TimeClckOcc and nviTodEvent.CurrentState using the following logic: If nviTodEvent.CurrentState is OC_OCCUPIED and TimeClckOcc is ST_NUL, then StatusSched is OC_OCCUPIED. If nviTodEvent.CurrentState is OC_UNOCCUPIED and TimeClckOcc is ST_NUL, then StatusSched is OC_UNOCCUPIED. If nviTodEvent.CurrentState is OC_STANDBY and TimeClckOcc is ST_NUL, then StatusSched is OC_STANDBY. If TimeClckOcc is ST_ON, then StatusSched is OC_OCCUPIED. OC_OCCUPIED means the space is scheduled to be occupied. OC_UNOCCUPIED means the space is scheduled to be unoccupied. OC_STANDBY means the space is scheduled to be in a standby state somewhere between OC_OCCUPIED and OC_UNOCCUPIED.
M		X	X				TimeClckOcc shows the state of the physical time clock input via nvoIO. TimeClckOcc ORed with nviTimeClk. Valid enumerated values are: ST_OFF means OC_UNOCCUPIED when either the time clock input is configured and nvoIO. TimeClckOcc is 0 and nviTimeClk is not SW_ON or nviTimeClk.state is SW_OFF and nvoIO.OccTImeClock is not 1. ST_ON means OC_OCCUPIED when either the time clock input is configured and nvoIO. TimeClckOcc is 1 or nviTimeClk.state is SW_ON. ST_NUL means that the local time clock input is not configured by nciIoSelect and nviTimeClk.state is SW_NUL. There is no time clock configured or bound to the node.

(continued)

Table C4. Status Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
StatusManOcc	nvoData1 (nvoCtlDataG1)	NetManOcc	OC_OCCUPIED OC_UNOCCUPIED OC_BYPASS OC_STANDBY OC_NUL	0 1 2 3 -1	OC_NUL
StatusOcySen	nvoData1 (nvoCtlDataG1)	SenOcc	OC_OCCUPIED OC_UNOCCUPIED OC_BYPASS OC_STANDBY OC_NUL	0 1 2 3 -1	OC_NUL
StatusEconEn	nvoData1 (nvoCtlDataG1)	EconEnable	ST_OFF ST_LOW ST_MED ST_HIGH ST_ON ST_NUL	0 1 2 3 4 -1	ST_NUL
SaFanStatus	nvoData1 (nvoCtlDataG1)	ProofAirFlow	ST_OFF ST_LOW ST_MED ST_HIGH ST_ON ST_NUL	0 1 2 3 4 -1	ST_NUL
OaEnthCalc	nvoData1 (nvoCtlDataG1)	siCalcODEnthalpyS7	btu/lb 0 to 100 kj/kg (0 to105)		INVALID

(continued)

Table C4. Status Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M		X	X				StatusManOcc reports the network manual occupancy state from DestManOcc. The valid enumerated states are: OC_OCCUPIED indicates occupied OC_UNOCCUPIED indicates not occupied OC_BYPASS indicates that the space is bypass occupied for nciAux2SetPt.uiBypassTime seconds after DestManOcc is first set to OC_BYPASS OC_STANDBY indicates that the space is standby. OC_NUL means that no manual override is active.
M		X	X				StatusOcySen indicates the current state of the sensed occupancy and is calculated from nviSensorOcc and the local occupancy sensor via nvoIO.OccupancySensor. The local sensor and nviSensorOcc are ORed together. If either the local sensor or nviSensorOcc shows occupancy, then StatusOcySen shows occupancy. The valid enumerated values are: OC_OCCUPIED means that occupancy is sensed by one or more sensor. OC_UNOCCUPIED means that no occupancy is sensed by any sensors. OC_NUL means no local sensor is configured and nviSensorOcc has failed to be received periodically (bound or not bound).
M		X	X				StatusEconEn indicates the current suitability of outdoor air for use in cooling used by the control process StatusEconEn is periodically calculated either from the sensor(s) specified by nciConfig.EconEnable or from nviEcon. When nviEcon.state is not SW_NUL, then the local inputs are ignored and nviEcon.state is used instead. See nciConfig.EconEnable. The valid enumerated values are: ST_OFF means the outdoor air is not suitable to augment cooling. ST_ON means the outdoor air is suitable to augment cooling. ST_NUL means no local sensor is selected by nciConfig.EconEnable, or the selected local sensor has failed or has not been configured by nciIoSelect, and that nviEcon.state is SW_NUL. The outdoor air is considered unsuitable for cooling.
		X	X				SaFanStatus indicates the current state of the SaFanStatus switch used by the control process and is read by the local sensor via nvoIO.ProofAirFlow. The valid enumerated values are: ST_OFF means air flow is not detected. ST_ON means air flow is detected. ST_NUL means no air flow switch is configured.
M		X	X				OaEnthCalc is the calculated outdoor air enthalpy in btu/lb (kj/kg) calculated from the OaTemp and OaHum. OaEnthCalc is used to determine the suitability of outside air for cooling when nciConfig.EconEnable is SINGLE_ENTH and both outdoor temperature and humidity sensors are present. OaEnthCalc is compared to the enthalpy setpoint stored in nciAux1SetPts OaEnthEn.

(continued)

Table C4. Status Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
RaEnthCalc	nvoData1 (nvoCtlDataG1)	siCalcRAEnthalpyS7	btu/lb 0 to 100 kj/kg (0 to 105)		INVALID
BypTimer	nvoData1 (nvoCtlDataG1)	uiBypassTimer	minutes 0 to 2880		0
CoolPos	nvoData1 (nvoCtlDataG1)	sbCoolPosS0	Percentage 0 to 100		0
HeatPos	nvoData1 (nvoCtlDataG1)	sbHeatPosS0	Percentage 0 to 100		0
EconPos	nvoData1 (nvoCtlDataG1)	sbEconPosS0	Percentage 0 to 100		0
StatHtSource	nvoData1 (nvoCtlDataG1)	HeatSource	SW_OFF SW_ON SW_NUL	0 1 -1	SW_NUL
StatusFanSw	nvoData1 (nvoCtlDataG1)	FanSwitch	ST_OFF ST_LOW ST_MED ST_HIGH ST_ON ST_NUL	0 1 2 3 4 -1	ST_NUL
HeatStgsOn	nvoData1 (nvoCtlDataG1)	HeatStagesOn	0 to 4		0
CoolStgsOn	nvoData1 (nvoCtlDataG1)	CoolStagesOn	0 to 4		0

(continued)

Table C4. Status Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M		X	X				RaEnthCalc is the calculated return air enthalpy in btu/lb (kj/kg) calculated from the RaTemp and RaHum. RaEnthCalc is used to determine the suitability of outside air for cooling when nciConfig.EconEnable is DIFF_ENTH and both outdoor and return (or space) temperature sensors and humidity sensors are present. Sensors may be physically connected to the node or available over the network.
M		X	X				BypTimer: The time left in the bypass timer is BypTimer minutes. If BypTimer is zero, then the bypass timer is not running. If BypTimer is not zero, it is decremented every minute.
M		X	X				CoolPos: If the node is configured for modulating cool, CoolPos shows the current position of the cooling modulating output.
M		X	X				HeatPos: If the node is configured for modulating heat, HeatPos shows the current position of the heating modulating output.
M		X	X				EconPos: If the node is configured for modulating economizer, EconPos shows the current position of the economizer modulating output.
M	X	X					In a two pipe system, the StatHtSource indicates whether hot or cold water is being supplied to the equipment being controlled. StatHtSource is calculated from DestHtSource, DestSourceTemp, HtSrcTemp, and either the AqstatMakeTmpRise or AqstatBrkTmpRise physical input. If StatHtSource is SW_ON, that indicates hot water is being supplied to the equipment being controlled. If StatHtSource is SW_OFF, that indicates cold water is being supplied to the equipment being controlled. If StatHtSource is SW_NUL, then no heating source sensor is connected or sensor communications has failed.
M	X	X					StatusFanSw is the commanded fan speed by the wall module fan switch arbitrated with DestFanSpeed. If DestFanSpeed is null (not configured), then the wall module fan speed switch will control the speed of the fan. Refer to the description for DestFanSpeed.
M		X	X				HeatStgsOn indicates how many heating stages are on. If the node is controlling a heat pump, HeatStgsOn indicates how many auxiliary heating stages are turned on.
M		X	X				CoolStgsOn indicates how many compressor stages are on. If the node is controlling a heat pump, compressor stages are turned on for both heating or cooling.

(continued)

Table C4. Status Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
SaFanSpeed	nvoData1 (nvoCtlDataG1)	FanSpeed	ST_OFF ST_LOW ST_MED ST_HIGH ST_ON ST_NUL	0 1 2 3 4 -1	ST_NUL
StatusFree1	nvoData1 (nvoCtlDataG1)	Free1Stat	FALSE TRUE	0 1	FALSE
OccStatOut	nvoData1 (nvoCtlDataG1)	OccStatusOut	FALSE TRUE	0 1	FALSE
StatusEconOut	nvoData1 (nvoCtlDataG1)	AuxEconOut	FALSE TRUE	0 1	FALSE
EconFloatSynch	nvoData1 (nvoCtlDataG1)	EconFloatSynch	FALSE TRUE	0 1	FALSE
DlcShed	nvoData1 (nvoCtlDataG1)	DlcShed	FALSE TRUE	0 1	FALSE
StatDripPanFull	nvoData1 (nvoCtlDataG1)	StatDripPanFull	FALSE TRUE	0 1	FALSE
StatusIaqOvr	nvoData1 (nvoCtlDataG1)	IaqOverRide	FALSE TRUE	0 1	FALSE

(continued)

Table C4. Status Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
		X	X				If SaFanSpeed is not ST_NUL, SaFanSpeed determines the fan speed. If SaFanSpeed is ST_NUL (not configured), or auto position, then the control process determines FanSpeed. SaFanSpeed is the result from wall module fan switch (if configured) or the control process.
		X	X				StatusFree1 indicates the state of Free1Stat digital output. 1 means on (True), and 0 means off (False).
		X	X				OccStatOut indicates the state of the OCCUPANCY_STATUS_OUT digital output. 1 means on (not OC_UNOCCUPIED), and 0 means off (OC_UNOCCUPIED).
		X	X				StatusEconOut indicates the state of the AUX_ECON_OUT digital output. 1 means that the packaged economizer is enabled, and 0 means the economizer is disabled. A packaged economizer is always treated as the first stage of cooling when an economizer is configured by nciIoSelect.
							EconFloatSynch indicates that the economizer damper motor is being synchronized with the reported economizer position by driving the damper for a period longer than it takes to fully close the damper. The reported economizer position is synchronized whenever an endpoint is reached (full open or full close).and when the elapsed time since the last synchronization is 24 hours.
		X	X				DlcShed indicates the state of DestDlcShed. When DlcShed is 1, demand limit control set by an energy management node is active. If the effective occupancy is OC_OCCUPIED or OC_STANDBY when demand limit control is active, then the setpoint is shifted by nciAux1SetPt DlcBumpTemp in the energy saving direction. When DlcShed is 0, demand limit control is inactive. If DestDlcShed fails to be received periodically or DestDlcShed becomes 0, then the setpoint is ramped back to the original setpoint over a 30 minute interval.
M		X	X				StatDripPanFull indicates the current state of the drip pan sensor. A value of 0 (False), indicates that the drip pan is not full or a drip pan sensor is not configured. A value of 1 (True), indicates that the drip pan is full. Cooling is turned off and a DripPanFullAlrm is generated.
M		X	X				StatusIaqOvr: When an economizer is configured, StatusIaqOvr indicates the current state of the indoor air quality, and is used by the control process to open the economizer damper to let in more outside air. 1 means poor indoor air quality, and 0 means indoor air quality is OK. When StatusIaqOvr is 1, the IAQ_OVERRIDE alarm is initiated. StatusIaqOvr indicates poor air quality if the analog sensor or a digital sensor (local or via network) shows poor air quality. Specifically, if CO2Sens is not SI_INVALID, and exceeds nciAux1SetPt.siCO2IaqLimitS0, then poor air quality is detected. Also if nviIaqOvr.state is SW_ON, then poor air quality is detected. Or if a local digital input is configured as IAQ_OVERRIDE_IN and nvoIO.IaqOverRide is 1 then poor air quality is also detected. When poor air quality is detected, the economizer minimum position is set to nciAux1SetPts EconIAQPos, instead of nciAux1SetPts.ubEconMinPosS0. When an economizer is not configured, StatusIaqOvr is 0.

(continued)

Table C4. Status Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
StatusSmoke	nvoData1 (nvoCtlDataG1)	SmokeMonitor	FALSE TRUE	0 1	FALSE
StatusWndw	nvoData1 (nvoCtlDataG1)	WindowOpen	FALSE TRUE	0 1	FALSE
StatusFilter	nvoData1 (nvoCtlDataG1)	DirtyFilter	FALSE TRUE	0 1	FALSE
StatFreezeStat	nvoData1 (nvoCtlDataG1)	CoilFreezeStat	FALSE TRUE	0 1	FALSE
StatusShutDown	nvoData1 (nvoCtlDataG1)	ShutDown	FALSE TRUE	0 1	FALSE
MonitorSw	nvoData1 (nvoCtlDataG1)	MonSwitch	FALSE TRUE	0 1	FALSE
	nvoData2 (nvoCtlDataG2)	FieldNo	UPDATE_ALL_FIELDS FrmTempActSpt RrmTemp FdaTemp FdaSetpt FraTemp FraHum FraEnth FoaTemp FoaHum FoaEnth Foaquality FfilterPress FCO2Sens FmonitorSens FmixedAirTemp UPDATE_NO_FIELDS	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 127	UPDATE_NO_FIELDS
RmTempActSpt	nvoData2 (nvoCtlDataG2)	siTempControlPtS7	Degrees F 50 to 85 Degrees C (10 to 29)		INVALID

(continued)

Table C4. Status Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M		X	X				SmokeMonitor indicates the current state of the SmokeMonitor input used by the control process and is read from another node via DestEmerg or the local sensor via nvoIO.SmokeMonitor. If either DestEmerg is not EMERG_NORMAL or nvoIO.SmokeMonitor is 1, then SmokeMonitor is 1 meaning that smoke is detected. Otherwise SmokeMonitor is 0, meaning smoke is not detected. When smoke monitor is 1, the algorithm controls as per the settings found in nciConfig.SmokeControl.
M		X	X				StatusWndw indicates the current state of the window sensors and is calculated from nviWindow state and the local occupancy sensor via nvoIO.WindowOpen. The local sensor and nviWindow are ORed together. If either the local sensor or nviWindow shows that the window is open (nvoIO.WindowOpen = 1 or nviWindow.state = SW_ON), then StatusWndw shows that the window is open. 1 means that the window is open and 0 means that the window is closed. When the window is open, the controller mode is switched to FREEZE_PROTECT.
M		X	X				StatusFilter indicates the state of the air filter via the nvoIO.DirtyFilter digital input or the nvoData1.siFilterPressureS10 analog input. If nvoData1.siFilterPressureS10 exceeds nciAux2SetPt FltrPressStPt, a dirty filter is indicated. StatusFilter is set to 1 when a dirty filter has been detected by either method for one minute. StatusFilter is set to 0 when a dirty filter has not been detected by either method for one minute. When StatusFilter is 1, a DIRTY_FILTER alarm is generated.
M		X	X				StatFreezeStat indicates the state of the Unit Ventilators coil, 0 (False) if it is not freezing or 1 (True) if it is freezing.
		X	X				StatusShutDown indicates the state of the ShutDown input via nvoIO.ShutDown. 1 means a ShutDown is being commanded and 0 means normal operation.
		X	X				MonitorSw is the state of the digital input wired to a general purpose monitor switch via nvoIO.MonSwitch. 1 means that the switch is closed and 0 means that the switch is open.
							nvoData2. FieldNo: nvoData2 and nvoCtlDataG2 are output network variables indicating the node status. The information contained in these network variables are typically used to display the node status on an operator terminal, used in a trend log, or used in a control process. The information contained in nvoCtlDataG2 and nvoData2 are identical. nvoData2 is a polled network variable and must be polled by the receiver. nvoCtlDataG2 uses the SGPUC mechanism. FieldNo indicates which other data field in the SGPUC network variable has changed since the last time it was sent on the network according to the SGPUC mechanism.
M		X	X				RmTempActSpt: The current temperature control point (such that, the current actual space temperature setpoint which the controller is presently trying to maintain in the conditioned space) is calculated from the various setpoints, operating modes, network variable inputs, and optimum start-up parameters. The final result is stored in RmTempActSpt.

(continued)

Table C4. Status Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
RmTemp	nvoData2 (nvoCtlDataG2)	siSpaceTempS7	Degrees F 40 to 100 Degrees C (4 to 38)		INVALID
DaTemp	nvoData2 (nvoCtlDataG2)	siDischargeTempS7	Degrees F 30 to 122 Degrees C (-1 to 50)		INVALID
DaSetpt	nvoData2 (nvoCtlDataG2)	siDischargeSetPtS7	Degrees F 30 to 122 Degrees C (-1 to 50)		INVALID
RaTemp	nvoData2 (nvoCtlDataG2)	siReturnTempS7	Degrees F 30 to 122 Degrees C (-1 to 50)		INVALID
RaHum	nvoData2 (nvoCtlDataG2)	ubReturnHumidityS1	Percentage 10 to 90		INVALID
RaEnth	nvoData2 (nvoCtlDataG2)	siReturnEnthalpyS7	mA 4 to 20		INVALID
OaTemp	nvoData2 (nvoCtlDataG2)	siOutdoorTempS7	Degrees F -40 to 122 Degrees C (-40 to 43)		INVALID

(continued)

Table C4. Status Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M		X	X				RmTemp is the space temperature used by the control process and is read from another node via nviSpaceTemp or a local sensor via nvoIO.siSpaceTempS7 or nvoIO.siReturnTempS7. If the network input is not SI_INVALID, then the network input has priority. The local sensor is selected by nciConfig.ControlUsesRtnAirTemp. When nciConfig.ControlUsesRtnAirTemp is 0, then the space temperature sensor is selected. When nciConfig.ControlUsesRtnAirTemp is 1, then the return temperature sensor is selected. If the network input and the selected local sensor has failed or are not configured, RmTemp is SI_INVALID.
M		X	X				DaTemp is the discharge air temperature used by the control process and is read from the local sensor via nvoIO.siDischargeTempS7. If the sensor has failed or is not configured, DaTemp is SI_INVALID.
M		X	X				DaSetpt is the calculated desired discharge air temperature when cascade control is being used.
M		X	X				RaTemp is the return air temperature used by the control process read from the local sensor via nvoIO.siReturnTempS7. If the sensor has failed or is not configured, RaTemp is SI_INVALID.
M		X	X				RaHum is the return air humidity used by the control process and is read from the local sensor via nvoIO.ReturnHumidity. If the sensor has failed or is not configured RaHum is SI_INVALID.
M		X	X				RaEnth is the return air enthalpy used by the control process and is read from the local sensor via nvoIO.siReturnEnthalpyS7. If the sensor has failed or is not configured, RaEnth is SI_INVALID.
M		X	X				OaTemp is the outdoor air temperature used by the control process and is read from another node via nviOdTemp or the local sensor via nvoIO.siOutdoorTempS7. If the network input is not SI_INVALID, then the network input has priority. If both the network input and the local sensor have failed or are not configured, OaTemp is SI_INVALID.

(continued)

Table C4. Status Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
OaHum	nvoData2 (nvoCtlDataG2)	ubOutdoorHumidityS1	Percentage 10 to 90		INVALID
OaEnth	nvoData2 (nvoCtlDataG2)	siOutdoorEnthalpyS7	mA 4 to 20		INVALID
OaQuality	nvoData2 (nvoCtlDataG2)	uiOutsideQualityS0	PPM 0 to 2000		INVALID
FilterPress	nvoData2 (nvoCtlDataG2)	siFilterPressureS10	inw 0 to 5 kPa (0 to 1.25)		INVALID
CO2Sens	nvoData2 (nvoCtlDataG2)	siSpaceCo2S0	PPM 150 to 2000		INVALID
MonitorSens	nvoData2 (nvoCtlDataG2)	siMonitor1S10	volts 1 to 10		INVALID
MaTemp	nvoData2 (nvoCtlDataG2)	siMixedTempS7	Degrees F 30 to 122 Degrees C (-1 to 50)		INVALID

(continued)

Table C4. Status Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M		X	X				OaHum is the outdoor air humidity used by the control process and is read from another node via nviOdHum or the local sensor via nvoIO.OutdoorHumidity. If the network is not SI_INVALID, then the network input has priority. If both the network input and the local sensor have failed or are not configured, OaHum is UB_INVALID.
M		X	X				OaEnth is the outdoor air enthalpy used by the control process and is read from another node via DestOaEnth or the local sensor via nvoIO.siOutdoorEnthalpyS7. If the network input is not SI_INVALID, then the network input has priority. If both the network input and the local sensor have failed or are not configured, OaEnth is SI_INVALID.
M		X	X				OaQuality is the outside air CO content used by the control process and read from the local sensor via nvoIO. If the local sensor has failed or is not configured, OaQuality is INVALID.
M		X	X				FilterPress is air pressure across the air filter used by the control process and is read from the local sensor via nvoIO.siFilterPressureS10. If the local sensor has failed or is not configured, FilterPress is SI_INVALID.
M		X	X				CO2Sens is the indoor air CO_2 content used by the control process and read the local sensor via nvoIO.siSpaceCo2S0. If the local sensor has failed or is not configured, CO2Sens is SI_INVALID.
M		X	X				MonitorSens is the voltage applied at the monitor input terminals. If the sensor is not configured or has failed, the value is SI_INVALID.
M		X	X				MaTemp is the mixed air temperature used by the control process read from the local sensor via nvoIO. If the sensor has failed or is not configured, MaTemp is INVALID.

(continued)

Table C4. Status Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
	nvoStatus	CommFailure	FALSE TRUE	0 1	FALSE
	nvoStatus	disabled	FALSE TRUE	0 1	FALSE
	nvoStatus	ElectricalFault	FALSE TRUE	0 1	FALSE
	nvoStatus	FailSelfTest	FALSE TRUE	0 1	FALSE
	nvoStatus	FeedbackFailure	FALSE TRUE	0 1	FALSE
	nvoStatus	InAlarm	FALSE TRUE	0 1	FALSE
	nvoStatus	InOverride	FALSE TRUE	0 1	FALSE
	nvoStatus	InvalidId	FALSE TRUE	0 1	FALSE
	nvoStatus	InvalidRequest	FALSE TRUE	0 1	FALSE
	nvoStatus	LockedOut	FALSE TRUE	0 1	FALSE
	nvoStatus	ManualControl	FALSE TRUE	0 1	FALSE
	nvoStatus	MechanicalFault	FALSE TRUE	0 1	FALSE
	nvoStatus	ObjectId	0 TO 65535		0
	nvoStatus	OpenCircuit	FALSE TRUE	0 1	FALSE
	nvoStatus	OutOfLlimits	FALSE TRUE	0 1	FALSE
	nvoStatus	OutOfService	FALSE TRUE	0 1	FALSE
	nvoStatus	OverRange	FALSE TRUE	0 1	FALSE
	nvoStatus	SelfTestInProgress	FALSE TRUE	0 1	FALSE
	nvoStatus	UnableToMeasure	FALSE TRUE	0 1	FALSE
	nvoStatus	UnderRange	FALSE TRUE	0 1	FALSE

Table C4. Status Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	SH	MA	DA	HW	MN	TS	Comments
							CommFailure: This field is not supported and is set to 0 (FALSE).
							disabled: This field is not supported and is set to 0 (FALSE).
							ElectricalFault: This field is not supported and is set to 0 (FALSE).
							FailSelfTest: This field is not supported and is set to 0 (FALSE).
							FeedbackFailure: This field is not supported and is set to 0 (FALSE).
							InAlarm: If there are currently any active alarms reported by UnitInAlarm, or UnitInAlarm is set to AlarmNotifyDisabled, then InAlarm is set to 1 (True), otherwise InAlarm is set to 0 (False). When nviRequest.object_request is RQ_REPORT_MASK, then disabled and in_alarm are set to 1 (True) to indicate that these functions are supported while all other fields are set to 0 (false).
							InOverride: This field is not supported and is set to 0 (FALSE).
							InvalidId: If ObjectIdIn is not a valid object, invalid_id is set to 1 (TRUE) otherwise it is set to 0 (FALSE).
							InvalidRequest: If ObjectRqst is not a valid request for the object addressed, invalid_request is set to 1 (TRUE) otherwise it is set to 0 (FALSE).
							LockedOut: This field is not supported and is set to 0 (FALSE).
							ManualControl: This field is not supported and is set to 0 (FALSE).
							MechanicalFault: This field is not supported and is set to 0 (FALSE).
		X	M				ObjectId: is set to the current value of nviRequest.object_id
							OpenCircuit: This field is not supported and is set to 0 (FALSE).
							OutOfLlimits: This field is not supported and is set to 0 (FALSE).
							OutOfService: This field is not supported and is set to 0 (FALSE).
							OverRange: This field is not supported and is set to 0 (FALSE).
							SelfTestInProgress: This field is not supported and is set to 0 (FALSE).
							UnableToMeasure: This field is not supported and is set to 0 (FALSE).
							UnderRange: This field is not supported and is set to 0 (FALSE).

Table C5. Calibration Points (Left).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
RawK1	InfoRaw	Raw K1 Raw K2 Ai1Resistive Ai2Resistive Ai3Voltage Ai4Voltage RawSpaceTemp RawSetPoint	Counts 0 to 65535		0

Table C5. Calibration Points (Right).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	SH	MA	DA	HW	MN	TS	Comments
							raw_data contains the analog to digital converter counts measured from the analog input channel.

Table C6. Configuration Parameters (Left).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
ApplicationType	nciApplVer	application_type	0 to 255		0
DeviceName	nciDeviceName				ASCII Blanks
FileAddress	FileDir	pData			
FileSize	FileDir	Size			
FileType	FileDir	Type			
FileVersion	FileDirHeader	NumFiles			
FileVersion	FileDirHeader	Version			
Time1Jan70	nciApplVer	time	seconds		0
VersionNumber	nciApplVer	version_no	0 to 255		0
CascCntrl	nciConfig	CascadeControl	FALSE TRUE	0 1	FALSE
CoolCycHr	nciConfig	ubCoolCph	2 to 12		3
CoolMtrSpd	nciConfig	ubCoolMtrTimeS0	Seconds 20 to 240		90

(continued)

Table C6. Configuration Parameters (Right).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
							ApplicationType identifies the current application number of the Excel 10.
							DeviceName is an 18 character field used to identify the node uniquely as one object at the site or project. The contents of the DeviceName is maintained by a management node. If DeviceName is all ASCII blanks, it is considered unconfigured.
							pData (FileAddress) specifies the address in the Excel 10 at which the file is located.
							For each file there is a record containing the FileSize, FileType, and FileAddress. FileSize is the length of the file.
							FileType specifies the LonMark® file type entered into the file directory. Type 1 is a configuration parameter value file. Type 2 is a configuration parameter template file.
							NumFiles is the number of files in the directory. There is a FileSize, FileType and FileAddress record for each file following the NumFiles.
							FileVersion specifies the major/minor version of the file.
							The time stamp of the last change to the Excel 10 application configuration. Time meets the ANSI C time stamp requirement specifying the number of seconds elapsed since midnight (0:00:00), January 1, 1970. It is represented in the Intel Format.
							VersionNumber identifies the version number of the Excel 10 application.
P		X					When CascCntrl is 0 (FALSE), then the discharge air temperature is not directly controlled and heating and cooling equipment are modulated to maintain space temperature. When CascCntrl is 1 (TRUE), then the discharge air temperature is controlled by an additional control loop based on the error signal from the space temperature control loop. CascCntrl is applicable to modulating heating/cooling only (not staged).
P							CoolCycHr specifies the mid-load number of on/off cycles per hour when the mode is COOL. In addition the cycle rate specifies the minimum on and off time. Refer to Table B-4 Interstage Minimum Times of the System Engineering Guide for the actual values.
P							CoolMtrSpd specifies how long it takes the cooling damper or valve motor to travel from fully closed to fully open. This time is used to calculate the reported position of the cooling damper or valve and to determine the length of over drive time required to assure that it is fully closed or open.

(continued)

Table C6. Configuration Parameters (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
DisMinClTime	nciConfig	DisableCoolMinTime	FALSE TRUE	0 1	FALSE
DisMinHtTime	nciConfig	DisableHeatMinTime	FALSE TRUE	0 1	FALSE
EconMode	nciConfig	EconEnable	DIGITAL_IN OD_TEMP OD_ENTH_A_TYPE OD_ENTH_B_TYPE OD_ENTH_C_TYPE OD_ENTH_D_TYPE DIFF_TEMP SINGLE_ENTH DIFF_ENTH ECON_NUL	0 1 2 3 4 5 6 7 8 -1	ECON_NUL
EconMtrSpd	nciConfig	ubEconMtrTimeS0	Seconds 20 to 240		90
FanFailTime	nciConfig	ubFanFailTimeS0	Seconds 1 to 20		10
FanMode	nciConfig	FanMode	AUTO_FAN CONTINUOUS_FAN	0 1	AUTO_FAN
FanOnHtMode	nciConfig	FanOnHeat	FALSE TRUE	0 1	TRUE
FanRunOnCool	nciConfig	ubFanRunonCoolS0	Seconds 0 to 120		0
FanRunOnHeat	nciConfig	ubFanRunonHeatS0	Seconds 0 to 120		0

(continued)

Table C6. Configuration Parameters (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
P		X					If DisMinClTime is 0 (FALSE), the cooling stages are on or off for a minimum time determined by CoolCph (Refer to Table B-4 Interstage Minimum Times of the System Engineering Guide). If DisMinClTime is 1 (TRUE), the cooling stages are on or off for a 30 second minimum time.
P		X					If DisMinHtTime is 0 (FALSE), the heating stages are on or off for a minimum time determined by HeatCph (Refer to Table B-4 Interstage Minimum Times of the System Engineering Guide). If DisMinHtTime is 1 (TRUE), the heating stages are on or off for a 30 second minimum time.
P							EconMode specifies the method used to determine when outside air is suitable for use to augment cooling. The valid values are according to the enumerated list that is shown in the Engineering Units/States column.
P							EconMtrSpd specifies how long it takes the economizer damper motor to travel from fully closed to fully open. This time is used to calculate the reported position of the damper and to determine the length of over drive time required to assure the damper is fully closed or open.
P		X					Each time FAN_OUT is energized, then the node waits for FanFailTime seconds to sample the ProofAirFlow input. If ProofAirFlow shows that the fan is not running for FanFailTime consecutive seconds, then the control is shut down for the minimum off time. Then the control (including the fan) is restarted and ProofAirFlow is again tested. If ProofAirFlow shows air flow, then the control continues to operate, but if ProofAirFlow fails to show air flow, then the control is again shut down for the minimum off time. After three unsuccessful restarts, a LOSS_OF_AIR_FLOW alarm is issued and the control stays in the DISABLED mode with the FAN_OUT off.
P							FanMode specifies the operation of the fan. If the FanMode is 0 (AUTO_FAN), then the fan cycles on and off with demand for cooling and may cycle with heating if FanOnHeat is TRUE. If the FanMode is 1 (CONTINUOUS_FAN), then the fan runs continuously when the effective occupancy is OC_OCCUPIED or OC_BYPASS. The fan cycles on and off with demand for cooling and may cycle with heating if FanOnHeat is TRUE during the OC_UNOCCUPIED or OC_STANDBY modes.
P							FanOnHtMode specifies the operation of the fan during HEAT mode. If FanOnHtMode is 1(TRUE), then the fan is on when the mode is HEAT. If FanOnHtMode is a 0 (FALSE) the fan is never turned on when the mode is HEAT, and typically a thermostatically controlled switch sensing heated air temperature turns on the fan.
P		X					FanRunonCool specifies how long the fan runs after all the cooling stages have turned off. The fan is turned off FanRunonCool seconds after all the cooling demand has turned off.
P		X					FanRunonHeat specifies how long the fan runs after all the heating stages have turned off. The fan is turned off FanRunonHeat seconds after all the heating demand has turned off.

(continued)

Table C6. Configuration Parameters (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
HeatCycHr	nciConfig	ubHeatCph	2 to 12		6
HeatMtrSpd	nciConfig	ubHeatMtrTimeS0	Seconds 20 to 240		90
IaqUseHeat	nciConfig	IaqUseHeat	FALSE TRUE	0 1	FALSE
OvrdPriority	nciConfig	OverridePriority	LAST NET	0 1	NET
OvrdType	nciConfig	OverrideType	NONE NORMAL BYPASS_ONLY	0 1 2	NORMAL
RmTempCal	nciConfig	RmTempCal	Degrees F -5 to 5 Degrees C (-3 to 3)		0
SmkCtlMode	nciConfig	SmokeControl	FAN_OFF_DAMPER_CLOSED FAN_ON_DAMPER_OPEN FAN_ON_DAMPER_CLOSED	0 1 2	FAN_OFF_DAMPER_CLOSED
TempOffstCal1	nciConfig	TempOffstCal1	Degrees F -15 to 15 Degrees C (-9 to 9)		0
TempOffstCal2	nciConfig	TempOffstCal2	Degrees F -15 to 15 Degrees C (-9 to 9)		0
UseWallModSt Pt	nciConfig	UseWallModStPt	FALSE TRUE	0 1	TRUE

(continued)

Table C6. Configuration Parameters (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
P							HeatCycHr specifies the mid-load number of on/off cycles per hour when the mode is HEAT. In addition the cycle rate specifies the minimum on and off time. Refer to Table B-4 Interstage Minimum Times of the System Engineering Guide for the actual values.
P							HeatMtrSpd specifies how long it takes the heating damper or valve motor to travel from fully closed to fully open. This time is used to calculate the reported position of the heating damper or valve and to determine the length of over drive time required to assure that it is fully closed or open.
P		X					When the effective occupancy is OC_OCCUPIED and IaqUseHeat is 0 (FALSE), then no heating stages or modulating heating are turned when the discharge air temperature goes below the low limit. Energy has priority over ventilation. When the effective occupancy is OC_OCCUPIED and IaqUseHeat is 1 (TRUE), then the heating stages or modulating heating are turned on to prevent the discharge air temperature from going below the discharge air temperature low limit. Ventilation has priority over energy cost.
P							OvrdPriority configures the override arbitration between ManOcc, Bypass.state, and the wall module override button. If OvrdPriority is 0 (LAST), then the last command received from either the wall module or ManOcc determines the effective override state. If OvrdPriority is 1 (NET), this specifies that when ManOcc is not OC_NUL, that the effective occupancy is ManOcc regardless of the wall module override state.
P							OvrdType specifies the behavior of the override button. If the OvrdType is 0 (NONE) then the override button is disabled. An OvrdType of 1 (NORMAL), causes the override button to set the OverRide state to OC_BYPASS for nciBypassTime minutes when the override button has been pressed for approximately 1 to 4 seconds, or to set the OverRide state to UNOCC when the button has been pressed for approximately 4 to 7 seconds. When the button is pressed longer than approximately 7 seconds, then the OverRide state is set to OC_NUL. If the OvrdType is 2 (BYPASS_ONLY), the override button sets the OverRide state to OC_BYPASS for nciBypassTime minutes on the first press. On the next press, the OverRide state is set to OC_NUL.
		X		X			RmTempCal provides offset calibration for the space analog sensor input and is added to the sensed value. The range of RmTempCal is between -5 and 5 degrees F (-3 and 3) degrees C.
P		X					SmkCtlMode specifies the operation of the economizer damper and the fan when the mode is SMOKE_EMERGENCY.
		X		X			TempOffstCal1: provides offset calibration for the resistive analog sensor input and is added to the sensed value. The range of TempOffstCal1 is between -15 and 15 degrees F (-9 and 9) degrees C.
		X		X			TempOffstCal2: Refer to the description for TempOffstCal1.
P		X					UseWallModStPt specifies the OC_OCCUPIED temperature setpoint source. If UseWallModStPt is 0 (FALSE), then the occupied TempSetPts are used when the effective occupancy is OC_OCCUPIED. If UseWallModStPt is 1 (TRUE), then the wall modules setpoint knob is used when the effective occupancy is OC_OCCUPIED. DestSetPt overrides all.

(continued)

Table C6. Configuration Parameters (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
UVCycleSelect	nciConfig	UVCycleSelect	CYCLE_1 CYCLE_2 CYCLE_3	0 1 2	
VoltOfstCal1	nciConfig	VoltOfstCal1	counts -4000 to 4000		0
VoltOfstCal2	nciConfig	VoltOfstCal2	counts -4000 to 4000		0

Table C6. Configuration Parameters (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	SH	MA	DA	HW	MN	TS	Comments
	X	X	P				UVCycleSelect allows the user to select one of three control strategies from the list of ASHRAE Unit Ventilator Cycles. Cycle I Fixed Maximum Percentage of Outdoor Air, Cycle II Fixed Minimum Percentage of Outdoor Air, and Cycle III Variable Outdoor Air.
		X		X			VoltOfstCal1 is a network input variable stored in EEPROM used to further apply any correction to the sensor value in engineering units. The voltage/current offset provided in this NV is added to the analog sensor values.
		X		X			VoltOfstCal2 is a network input variable stored in EEPROM used to further apply any correction to the sensor value in engineering units. The voltage/current offset provided in this NV is added to the analog sensor values.

Table C7. LonMark® Points (Left).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
	nviRequest (SNVT_obj_request)	object_id	0 to 65535		1
	nviRequest (SNVT_obj_request)	object_request	RQ_NORMAL RQ_DISABLED RQ_UPDATE_STATUS RQ_SELF_TEST RQ_UPDATE_ALARM RQ_REPORT_MASK RQ_OVERRIDE RQ_ENABLE RQ_RMV_OVERRIDE RQ_CLEAR_STATUS RQ_CLEAR_ALARM RQ_ALARM_NOTIFY_ENABLED RQ_ALARM_NOTIFY_DISABLED RQ_MANUAL_CTRL RQ_REMOTE_CTRL RQ_PROGRAM RQ_NUL	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 -1	RQ_NORMAL
CoolOccSpt	nciSetpoints (SNVT_temp_setpt)	Occupied_cool	Degrees F 50 to 95 Degrees C (10 to 35)		23
CoolStbySpt	nciSetpoints (SNVT_temp_setpt)	Standby_cool	Degrees F 50 to 95 Degrees C (10 to 35)		25
CoolUnoccSpt	nciSetpoints (SNVT_temp_setpt)	Unoccupied_cool	Degrees F 50 to 95 Degrees C (10 to 35)		28
DestEmerg	nviEmergOverride (SNVT_hvac_emerg)		EMERG_NORMAL EMERG_PRESSURIZE EMERG_DEPRESSURIZE EMERG_PURGE EMERG_SHUTDOWN EMERG_NUL	0 1 2 3 4 -1	EMERG_NORMAL
FileDirAddress	nroFileDirectory (SNVT_address)				Assigned by LonBuilder

(continued)

Table C7. LonMark® Points (Right).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
							nviRequest provides the mechanism to request a particular status report (via nvoStatus) for a particular object within this node. Object_id selects the object being referenced by nviRequest. The only valid value of object_id is 1 for the Unit Ventilator object and all others are invalid.
							When object_request is RQ_NORMAL or RQ_UPDATE_STATUS then the status (via nvoStatus) will be reported for the object addressed by object_id. When object_request is RQ_REPORT_MASK then the status bits will be reported that are supported in nvoStatus by the object addressed by object_id. Bits that are supported by the object are set to one. All other object_request items are not supported at this time and will return an invalid_request (nvoStatus) in the object status.
M P		X	X				The CoolOccSpt is used if no wall module setpoint pot is configured as the standard Occupied Cooling Setpoint. Actual Cooling Setpoint can be affected by various control parameters (such as DlcShed, SrcRmtTempSpt, etc). Actual room temperature Setpoint is reflected in RmTempActSpt. Overriden by nviSetPt. Used to compute ZEB.
M P		X	X				When the controller is in the Standby mode (typically via an occupancy sensor), the base Cooling Setpoint is determined by the CoolStbySpt. Also, when a wall module setpoint pot is configured, this value serves as the upper limit on the user adjustable remote setpoint pot (wall module).
M P		X	X				When the controller is in the Unoccupied mode, the unit responds to a call for cooling based on the CoolUnoccSpt.
M	X	X	X		X		DestEmerg is an emergency input from a device that determines the correct action during a given emergency (such as a fire). If DestEmerg is EMERG_NORMAL the fan and economizer damper are controlled by the heating and cooling control algorithm. If DestEmerg is EMERG_PRESSURIZE, then the fan is controlled on and the economizer damper is open. If DestEmerg is EMERG_DEPRESSURIZE, then the fan is controlled on and the economizer damper is closed. If DestEmerg is EMERG_SHUTDOWN, then the fan is controlled off and the economizer damper is closed. If DestEmerg is EMERG_PURGE, the fan and damper go to the state specified by Config.SmokeControl. If Emerg is not configured then it is set to EMERG_NUL.
							FileDirAddress specifies the address in Excel 10 at which the configuration parameter directory is located. Address is in hexadecimal format and assigned by the LonBuilder.

(continued)

Table C7. LonMark® Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
HeatOccSpt	nciSetpoints (SNVT_temp_setpt)	Occupied_heat	Degrees F 50 to 95 Degrees C (10 to 35)		21
HeatStbySpt	nciSetpoints (SNVT_temp_setpt)	Standby_heat	Degrees F 50 to 95 Degrees C (10 to 35)		19
HeatUnoccSpt	nciSetpoints (SNVT_temp_setpt)	Unoccupied_heat	Degrees F 50 to 95 Degrees C (10 to 35)		16
NodeSendT	nciNodeSendT (SNVT_time_sec)		seconds 0 to 600		0
RcvHeartBeat	nciRcvHrtBt (SNVT_time_sec)		seconds 0 to 600		0
SendHeartBeat	nciSndBt (SNVT_time_sec)		seconds 0 to 600		0
SrcEconEnable	nvoEconEnable (SNVT_switch)	value	Percent 0 to 100		0
	nvoEconEnable (SNVT_switch)	state	SW_OFF SW_ON SW_NUL	0 1 -1	SW_NUL
SrcOaHum	nvoOutsideRH (SNVT_lev_percent)		Percent 10 to 90		INVALID

(continued)

Table C7. LonMark® Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M P		X	X				When the controller is in the Occupied mode, if the space temperature drops below the HeatOccSpt, the unit switches to the Heating mode. This Setpoint is used only when there is no wall module setpoint pot configured. Overriden by nviSetPt. Used to compute ZEB.
M P		X	X				When the controller is in the Standby mode (typically via an occupancy sensor), the base Heating Setpoint is determined by the HeatStbySpt. Also, when a wall module setpoint pot is configured, this value serves as the lower limit on the user adjustable remote setpoint pot (wall module).
M P		X	X				When the controller is in the Unoccupied mode, the unit responds to a call for heating based on the HeatUnoccSpt.
		X					NodeSendT is the maximum time between updates of network variable outputs (nvoStatus) from the node object.
		X					RcvHeartBeat: is the failure detection time for network variables outputs. NOTE: RcvHeartBeat should be set to 300 seconds by a management node to be compatible with a Honeywell system.
		X					SendHeartBeat: is the SGPUC and SGPU time (heart beat time) between updates of network variable outputs. NOTE: SendHeartBeat should be set to 55 seconds by a management node to be compatible with a Honeywell system.
M	X						SrcEconEnable allows one controller to determine the suitability of outdoor air for free cooling and share this with other nodes and is typically bound to SrcEconEnable on other nodes. If the economizer function is configured by Config.EconEnable, Econ is periodically calculated from the local sensor specified by Config.EconEnable and is sent on the network. The output has the following states: If the state is SW_OFF and the value is 0, then the outdoor air is not suitable for free cooling. If the state is SW_ON and the value is 100 percent, then the outdoor air is suitable for free cooling. If the state is SW_NUL and the value is 0, the corresponding economizer function is not enabled because Config.EconEnable is ECON_NUL, DIFF_TEMP, or DIFF_ENTH or because the selected sensor has failed.
							For nvoEconEnable.state, refer to SrcEconEnable.
M							SrcOaHum allows one outdoor humidity sensor at a node to be shared by many other nodes. When nviOutsideRH is not INVALID, then the local sensor, is ignored by the local control algorithm and SrcOaHum is used instead. If the value is outside the allowed range (10 to 90 percent), then the node uses the value of the nearest range limit.

(continued)

Table C7. LonMark® Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
SrcOaTemp	nvoOutsideTemp (SNVT_temp_p)		Degrees F -40 to 122 Degrees C (-40 to 50)		INVALID
SrcOccSensor	nvoSensorOcc (SNVT_occupancy)		OC_OCCUPIED OC_UNOCCUPIED OC_BYPASS OC_STANDBY OC_NUL	0 1 2 3 -1	OC_NUL
SrcUnitAlarm	nvoUnitStatus (SNVT_hvac_status)	In_alarm	FALSE TRUE ALARM_NOTIFY_DISABLED	0 1 -1	FALSE
SrcUnitCool	nvoUnitStatus (SNVT_hvac_status)	Cool_output	Percent 0 to 100		0
SrcUnitEcon	nvoUnitStatus (SNVT_hvac_status)	econ_output	Percent 0 to 100		0
SrcUnitFan	nvoUnitStatus (SNVT_hvac_status)	fan_output	Percent 0 to 100		0
SrcUnitHeat	nvoUnitStatus (SNVT_hvac_status)	heat_output_primary	Percent 0 to 100		0
SrcUnitSecHeat	nvoUnitStatus (SNVT_hvac_status)	heat_output_secondary	Percent 0 to 100		0
SrcUnitStatus	nvoUnitStatus (SNVT_hvac_status)	mode	HVAC_AUTO HVAC_HEAT HVAC_MRNG_WRMUP HVAC_COOL HVAC_NIGHT_PURGE HVAC_PRE_COOL HVAC_OFF HVAC_TEST HVAC_EMERG_HEAT HVAC_FAN_ONLY HVAC_NUL	0 1 2 3 4 5 6 7 8 9 -1	HVAC_NUL

Table C7. LonMark® Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M							SrcOaTemp: allows the local outdoor temperature sensor to be shared with other nodes and is typically bound to DestOaTemp on other nodes. If the local sensor is configured, then SrcOaTemp is periodically sent on the network. If the local sensor is not configured or currently showing an error, the value is INVALID.
M	X						SrcOccSensor is an output showing the current state of the hard wired occupancy sensor. The valid states are as follows: OC_OCCUPIED indicates that the space is occupied. OC_UNOCCUPIED indicates that the space is not occupied. OC_NUL means no output is available because it is not configured.
							When there is an alarm reported by AlarmStatus, then SrcUnitAlarm is set to 1 (TRUE), otherwise SrcUnitAlarm is set to 0 (FALSE). If alarm reporting is suppressed via ManualMode, then SrcUnitAlarm is set to ALARM_NOTIFY_DISABLED.
							SrcUnitCool reports the current percent of cooling stages or modulating cooling that is turned on.
							SrcUnitEcon: If there is a modulating economizer configured, SrcUnitEcon reports the percent that the economizer damper is opened. If no economizer is configured, econ_output reports 0.
							SrcUnitFan: When the fan is running, SrcUnitFan is 100 percent. When the fan is not running, SrcUnitFan is 0 percent
							SrcUnitHeat reports the current percent of heating stages or modulating heating that is turned on. If the node is controlling a heat pump, heat_output_primary reports the current percent of compressor stages turned on when the node is in the HVAC_HEAT mode.
							SrcUnitSecHeat is always set to zero.
M	X		X				SrcUnitStatus: This mode is set according to the Data1.mode. If Data1.mode is START_UP_WAIT, SMOKE_EMERGENCY, or FREEZE_PROTECT, mode is set to HVAC_NUL which indicates that the node is in a mode not supported by the SNVT_hvac_mode data type. If Data1.mode is HEAT, then mode is set to HVAC_HEAT which indicates that heating energy is being supplied to the controlled space. If Data1.mode is COOL, then mode is set to HVAC_COOL, which indicates that cooling energy is being supplied to the controlled space. If Data1.mode is OFF_MODE or DISABLED_MODE, then mode is set to HVAC_OFF which indicates that the node is not running its normal temperature control and the outputs are not turned off. If Data1.mode is MANUAL or FACTORY_TEST, mode is set to HVAC_TEST which indicates that the node is in a manual or test mode. If Data1.mode is FAN_ONLY, mode is set to HVAC_FAN_ONLY which indicates that the fan is running but the space temperature control is turned off.

Table C8. Direct Access And Special Points (Left).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
DestEconEnable	nviEconEnable	value	Percent 0 to 100		0
	nviEconEnable	state			Null
DestFanSpeed	nviFanSpeedCmd	value	Percent 0 to 100		0
	nviFanSpeedCmd	state			Null
DestHvacMode	nviApplicMode		HVAC_AUTO HVAC_HEAT HVAC_MRNG_WRMUP HVAC_COOL HVAC_NIGHT_PURGE HVAC_PRE_COOL HVAC_OFF HVAC_TEST HVAC_EMERG_HEAT HVAC_FAN_ONLY HVAC_NUL	0 1 2 3 4 5 6 7 8 9 -1	0
DestManOcc	nviOccManCmd (SNVT_occupancy)		OC_OCCUPIED OC_UNOCCUPIED OC_BYPASS OC_STANDBY OC_NUL	0 1 2 3 -1	OC_NUL

(continued)

Table C8. Direct Access And Special Points (Right).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M	X	X	X		X		DestEconEnable allows one outdoor air sensor that determines the suitability of outdoor air for free cooling to be shared by other nodes. When DestEconEnable is not Null, then the local sensor selected by EconMode is ignored and DestEconEnable is used instead. The inputs states have the following meanings. If nviEconEnable.state is off or unspecified the outdoor air is not suitable for free cooling. If nviEconEnable.state is on and the value is 0, then the outdoor air is not suitable for free cooling. If the node receives this combination of state and value, then state is set to Off. If nviEconEnable.state is on and the value is not zero, then the outdoor air is suitable for free cooling. If nviEconEnable.state is Null, then the network variable is not bound, the communications path from the sending node has failed, or the sending node has failed. Outdoor air is not suitable for free cooling with this condition.
							nviEconEnable.state: Refer to the description for DestEconEnable.
M	X	X	M		X		DestFanSpeed controls the speed of the fan after arbitration with the local wall module fan switch. If DestFanSpeed is not null, then DestFanSpeed will have a higher priority than the wall modules fan switch. If DestFanSpeed is a value of SW_OFF is a value of 0, the fan is off. If DestFanSpeed is a value of SW_ON and DestFanSpeed is of 0, the fan is off. If DestFanSpeed is a value of SW_ON and DestFanSpeed is greater than 0 for a single speed fan, then the fan is turned on. For a two speed fan, if DestFanSpeed is a value of SW_ON and DestFanSpeed is 0.4 to 50 percent, then the fan will be commanded ST_LOW. For a two speed fan, if DestFanSpeed is a value of SW_ON and DestFanSpeed is greater than 50 percent, then the fan will be commanded to ST_HIGH. For a three speed fan, if DestFanSpeed is a value of SW_ON and DestFanSpeed is 0.4 to 33 percent, then the fan will be commanded to ST_LOW speed (DestFanSpeed of 33.4 to 66.4 percent - ST_MED or greater than 66.4 percent - ST_HIGH).
							nviFanSpeedCmd.state. Refer to the description for DestFanSpeed.
M	X	X	X		X		DestHvacMode is an input that coordinates this controller with any other supervisory controllers or operator interfaces. If DestHvacMode is HVAC_OFF, then the system is off. If DestHvacMode is HVAC_COOL, then the mode is COOL. If DestHvacMode is HVAC_HEAT, then the mode is HEAT. If DestHvacMode is HVAC_MRNG_WRMUP, HVAC_NIGHT_PURGE, HVAC_PRE_COOL, HVAC_TEST, HVAC_EMERG_HEAT, or HVAC_NUL these modes are not supported. If received, the default setting of Auto is assumed.
M	X	X	X		X		DestManOcc is an input from a network connected operator interface or other node that indicates the state of a manual occupancy control thus overriding the scheduled occupancy state. DestManOcc is used along with other occupancy inputs to calculate the effective occupancy of the node. The valid enumerated values have the following meanings: OC_OCCUPIED indicates occupied. OC_UNOCCUPIED indicates not occupied. OC_BYPASS indicates that the space is occupied for Aux2SetPt.BypassTime seconds after ManOcc is first set to OC_BYPASS. The timing is done by the bypass timer in this node. If ManOcc changes to another value the timer is stopped. OC_STANDBY indicates that the space is in standby mode. OC_NUL and all unspecified values means that no manual occupancy control is requested. When ManOcc changes from OC_OCCUPIED, OC_UNOCCUPIED, OC_BYPASS, or OC_STANDBY to OC_NUL, any bypass condition is canceled.

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Table C8. Direct Access And Special Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
DestManMode	nviManualMode		MODE_ENABLE MODE_DISABLE MODE_MANUAL SUPPRESS_ALARMS UNSUPPRESS_ALARMS	0 1 2 3 4	MODE_ENABLE
DestManOcc	nviOccManCmd (SNVT_occupancy)		OC_OCCUPIED OC_UNOCCUPIED OC_BYPASS OC_STANDBY OC_NUL	0 1 2 3 -1	OC_NUL

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Table C8. Direct Access And Special Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M P	X	X	X				DestManMode is an input which is used to disable the Excel 10s control algorithms and to manually set the physical outputs. DestManMode remains unchanged until another mode has been commanded or an application restart has been performed. The valid enumerated values are: MODE_ENABLE enables the node so that the control algorithm determines the operating mode, and controls the physical outputs. MODE_ENABLE is the default state after power restore or application restart. If the mode was MANUAL and DestManMode is set to MODE_ENABLE, the node then goes through application_restart. MODE_DISABLE sets the node to the DISABLED_MODE. The alarm NODE_DISABLED is initiated, all control loops are disabled, and the physical outputs are turned off. The physical inputs, network variable inputs, and network variable outputs are still functioning when the node is in the DISABLED_MODE. MODE_MANUAL sets the node into the MANUAL mode. The alarm NODE_DISABLED is initiated, all control loops are disabled, and the physical outputs are controlled manually. The nodes configuration variables are used to set valves, dampers, and / or digital output to the desired manual positions or state(s). The physical inputs, network variable inputs, and network variable outputs are still functioning when the node is in the MANUAL mode. SUPPRESS_ALARMS causes nvoAlarm.type to be set to ALARM_NOTIFY_DISABLED, and AlarmLog to no longer record alarms. If alarms are suppressed, UNSUPPRESS_ALARMS causes Alarm.type and AlarmLog to be returned to reporting alarms. See Alarm for more details. All unspecified values are the same as MODE_ENABLE.
M	X	X	X		X		DestManOcc is an input from a network connected operator interface or other node that indicates the state of a manual occupancy control thus overriding the scheduled occupancy state. DestManOcc is used along with other occupancy inputs to calculate the effective occupancy of the node. The valid enumerated values have the following meanings: OC_OCCUPIED indicates occupied. OC_UNOCCUPIED indicates not occupied. OC_BYPASS indicates that the space is occupied for Aux2SetPt.BypassTime seconds after ManOcc is first set to OC_BYPASS. The timing is done by the bypass timer in this node. If ManOcc changes to another value the timer is stopped. OC_STANDBY indicates that the space is in standby mode. OC_NUL and all unspecified values means that no manual occupancy control is requested. When ManOcc changes from OC_OCCUPIED, OC_UNOCCUPIED, OC_BYPASS, or OC_STANDBY to OC_NUL, any bypass condition is canceled.

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Table C8. Direct Access And Special Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
DestOaHum	nviOutsideRH (SNVT_lev_percent)		Percent 0 to 100		INVALID
DestOaTemp	nviOutsideTemp (SNVT_temp_p)		Degrees F -40 to 122 Degrees C (-40 to 50)		INVALID
DestOccSensor	nviOccSensor		OC_OCCUPIED OC_UNOCCUPIED OC_BYPASS OC_STANDBY OC_NUL	0 1 2 3 -1	OC_NUL
DestRmTemp	nviSpaceTemp (SNVT_temp_p)		Degrees F -40 to 122 Degrees C (-40 to 50)		INVALID
DestRmTempSpt	nviSetPoint (SNVT_temp_p)		Degrees F 50 to 95 Degrees C (10 to 35)		INVALID
DestSchedOcc	nviOccSchedule	CurrentState	OC_OCCUPIED OC_UNOCCUPIED OC_BYPASS OC_STANDBY OC_NUL	0 1 2 3 -1	OC_OCCUPIED

(continued)

Table C8. Direct Access And Special Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M	X	X	X		X		DestOaHum allows one outdoor humidity sensor at a node to be shared by many other nodes. When DestOaHum is not INVALID, then the local sensor, is ignored by the local control algorithm and DestOaHum is used instead. If the value is outside the allowed range (10 to 90 percent), then the node uses the value of the nearest range limit.
M	X	X	X		X		DestOaTemp allows one outside air temperature sensor at a node to be shared by many other nodes. When DestOaTemp is not SI_INVALID, then any local sensor is ignored by the local control algorithm and DestOaTemp is used instead. If the value is outside the allowed range of -40 to 122 degrees F (-40 to 50) degrees C, then the node uses the value of the nearest range limit.
M	X	X	X		X		DestOccSensor allows an occupancy sensor at another node to be used as the occupancy sensor for this node and is typically bound to OccSensor of another node. The DestOccSensor input must show OC_UNOCCUPIED for 300 seconds before it is used by the controller for triggering UN_OC operation. This makes it possible for several occupancy sensors to be ORed together by binding them all to DestOccSensor. If any one bound occupancy sensor shows occupancy, then OccSensor shows occupancy for up to 300 seconds after the last sensor shows OC_OCCUPIED. The valid states have the following meanings: OC_OCCUPIED indicates occupied. OC_BYPASS, OC_STANDBY, and all unspecified values indicates the same as OC_OCCUPIED. OC_UNOCCUPIED or OC_NUL indicates not occupied.
M	X	X	X		X		DestRmTemp is the space temperature sensed by another node and is typically bound to DestRmTemp of another node having a space temperature sensor. If DestRmTemp has a value other than SI_INVALID it is used as the sensed space temperature by the node rather than using any local hardwired sensor. If the value is outside the allowed range of -18 to 90 degrees F (-10 to 50) degrees C, then the node uses the value of the nearest range limit. When DestRmTemp is not bound to another node, DestRmTemp may be used to fix the sensed temperature. A management node may write a value other than SI_INVALID, causing the node to use DestRmTemp instead of the hardwired sensor. An application restart or power failure causes the fixed sensor value to be forgotten and DestRmTemp to be returned to SI_INVALID.
M	X	X	X		X		DestRmTempSpt is an input network variable used to determine the temperature control point of the noce. If the setpoint is not SI_INVALID, then it is used to determine the control point of the node. If the setpoint is SI_INVALID, then other means are used to determine the control point. See Data2.TempControlPt for more information.
M		X	X				DestSchedOcc indicates the current scheduled occupancy state to the node. DestSchedOcc is used along with other occupancy inputs to calculate the effective occupancy of the node. The valid states and meaning are as follows: SCHED_OCC means the energy management system is specifying occupied. SCHED_STDBY means the energy management system is specifying that the space is presently between occupied and unoccupied. SCHED_UNOCC means the energy management system is specifying that the space is presently unoccupied. EVENT_ONE, EVENT_TWO, and all unspecified values have the same result as SCHED_OCC.

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Table C8. Direct Access And Special Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
DestSourceTemp	nviSourceTemp (SNVT_temp_p)		Degrees F 32 to 212 Degrees C (0 to 100)		INVALID
DestSptOffset	nviSetptOffset (SNVT_temp_p)		Degrees F -18 to 18 Degrees C (-10 to 10)		0
SrcRmTemp	nvoSpaceTemp (SNVT_temp_p)		Degrees F 14 to 122 Degrees C (-10 to 50)		INVALID
SrcRmTempActSpt	nvoEffectSetpt (SNVT_temp_p)		Degrees F 50 to 95 Degrees C (10 to 35)		INVALID
TestAuxEcon	nviManValue	AuxEconOut	OFF ON	0 1	OFF
TestEconPos	nviManValue	sbManEconPosS0	Percent -127 to 127		0
TestFree1	nviManValue	Free1Out	OFF ON	0 1	OFF
TestHCPos	nviManValue	sbManHeatCoolPosS0	Percent -127 to 127		0
TestHtClMode	nviManValue	HeatCoolMode	OFF ON	0 1	OFF
TestHtClStg1	nviManValue	HeatCoolStage1	OFF ON	0 1	OFF
TestHtClStg2	nviManValue	HeatCoolStage2	OFF ON	0 1	OFF

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Table C8. Direct Access And Special Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M	X	X	X		X		DestSourceTemp is the temperature of the water being supplied to the mechanical equipment controlled by the node. When DestSourceTemp is greater than HtSrcTemp then heating energy is being supplied to the equipment. When DestSourceTemp is less than HtSrcTemp then cooling energy is being supplied to the equipment. If DestSourceTemp is Invalid then DestSourceTemp is not being supplied by an external sensor.
M	X	X	X		X		DestSptOffset is input from an operator terminal or from an energy management system used to shift the effective temperature setpoint by adding DestSptOffset to the otherwise calculated setpoint. If the value is outside the allowed range of -18 to +18 degrees F (-10 to +10) degrees C, then the node uses the value of the nearest range limit.
M							SrcRmTemp is the sensed space temperature from the locally wired sensor. SrcRmTemp is typically bound to nviSpaceTemp of another node which can not have its own space temperature sensor but control the same space. The reported space temperature includes the offset correction nciConfig.siSpaceTempZeroCalS7. If the space temperature sensor is not connected or is shorted, or if nviSpaceTemp is bound to another node, then SrcRmTemp is set to INVALID.
M							SrcRmTempActSpt is the current temperature control point (such that, the current actual space temperature setpoint which the controller is presently trying to maintain in the conditioned space). SrcRmTempActSpt is updated according to the SGPU mechanism where a significant change is plus or minus 0.13 degrees F (0.07) degrees C.
						X	TestAuxEcon: During Manual StatusMode, TestAuxEcon turns the corresponding output on when the field is True and off when the field is False.
						X	TestEconPos: During Manual StatusMode, TestEconPos sets the modulating position of the economizer motor (if configured) to the specified position. If TestEconPos is less than zero or greater than 100, the motor is overdriven for a period longer than the motor time to ensure that it is at the end of travel. At the moment when the node transfers to Manual StatusMode, TestEconPos is set the current motor position.
						X	TestFree1: During Manual StatusMode, OccStatusOut turns the corresponding output on when the field is True and off when the field is False.
						X	TestHCPos: During Manual StatusMode, TestHCPos sets the modulating position of the heating or cooling motor (if configured) to the specified position. If TestHCPos is less than 0 or greater than 100, the motor is overdriven for a period longer than the motor time to ensure that it is at the end of travel. The heat motor is driven when HeatCoolMode is True and the cool motor is driven when HeatCoolMode is False. At the moment when the node transfers to Manual StatusMode or HeatCoolMode is changed, TestHCPos is set to the current motor position.
						X	During Manual StatusMode, TestHtClMode determines whether heating or cooling outputs are turned on or off manually. When TestHtClMode is False, then cooling loads are controlled. When TestHtClMode is True, then heating loads are controlled.
						X	TestHtClStg1: During Manual StatusMode, these parameters turn the corresponding heat, or cool stage to on (True) or off (False). When HeatCoolMode is False, then cooling loads are controlled. When HeatCoolMode is True, then heating loads are controlled.
						X	TestHtClStg2: During Manual StatusMode, these parameters turn the corresponding heat, or cool stage to on (True) or off (False). When HeatCoolMode is False, then cooling loads are controlled. When HeatCoolMode is True, then heating loads are controlled.

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Table C8. Direct Access And Special Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
TestMode	nviManValue	OutDrive	NormalOp Test1On Test2On Test3On Test4On Test5On Test6On Test7On Test8On TestAllOff TestAllOn TestAllDisabled	0 1 2 3 4 5 6 7 8 9 10 11	NormalOp
TestOccStat	nviManValue	OccStatusOut	OFF ON	0 1	OFF
TestSaFan	nviManValue	FanOut	ST_OFF ST_LOW ST_MED ST_HIGH ST_ON ST_NUL	0 1 2 3 4 -1	
TodEventNext	nviOccSchedule	NextState	OC_OCCUPIED OC_UNOCCUPIED OC_BYPASS OC_STANDBY OC_NUL	0 1 2 3 -1	OC_OCCUPIED
Tuncos	nviOccSchedule	uiTimeToNextState	minutes 0 to 65534		0

Table C8. Direct Access And Special Points (Right Continued).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
					X		FactoryTestOutput: nviManValue. FactoryTestOutput is used for factory testing only.
						X	TestOccStat: During Manual StatusMode, TestOccStat turns the corresponding output on when the field is True and off when the field is False.
						X	TestSaFan: During Manual StatusMode, TestSaFan causes the fan to be run using the logical outputs corresponding to the state of TestSaFan.
M			X				TodEventNext indicates the next scheduled occupancy state to the node. This information is required by the Excel 10 to perform the optimum start strategy. The space expected effective occupancy will be TodEventNext in Tuncos minutes. The valid states and meaning are the same as for CurrentState.
M			X				Tuncos is the time in minutes until the next change of scheduled occupancy state.

Table C9. Data Share Points (Left).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
DestHtSource	nviHeatSource	Value	Percent 0 to 100		0
	nviHeatSource	state	SW_OFF SW_ON SW_NUL	0 1 -1	SW_NUL
DestIaqOvrd	nviIaqOvr	value	Percent 0 to 100		0
	nviIaqOvr	state	SW_OFF SW_ON SW_NUL	0 1 -1	SW_NUL
DestOaEnth	nviOdEnthS7		mA 4 to 20		INVALID
DestOaQuality	nviOaQuality		PPM 0 to 2000		INVALID
SrcIaqOvr	nvoIaqOvr	value	Percent 0 to 100		0

(continued)

Table C9. Data Share Points (Right).

Share (SH), Map (MA), Direct Access (DA) E-Vision (EV): Calibrate (C), Monitor (M), Parameter (P), Schematic (S) Hardware Configuration (HW), Manual Point (MN), Test (TS)							
EV	**SH**	**MA**	**DA**	**HW**	**MN**	**TS**	**Comments**
M	X	X	X		X		DestHtSource is bound to a node that indicates whether heating or cooling energy is being supplied to the mechanical equipment being controlled by this node. If nviHeatSource.state is is on and the value is 0, then Cooling energy (Cold water) is being supplied. If nviHeatSource.state is on and the value is not zero then Heating energy (Hot water) is being supplied. If nviHeatSource.state is Null then it is not configured or failed to receive failure detect network variable.
							For nviHeatSource.state, refer to DestHtSource.
M	X	X	X		X		DestIaqOvrd allows an indoor air quality sensor to be shared by many other nodes. The states are follows: If the state is SW_ON and the value is 0, then the indoor air quality is acceptable. If the node receives this combination of state and value, then state is set to SW_OFF. If the state is SW_ON and the value is not zero, then the indoor air quality is not acceptable and additional outdoor air is needed to bring it back to acceptable. If the state is other, then the network variable is not bound, the communications path from the sending node has failed, or the sending node has failed. The indoor air quality is acceptable.
							For IaqOvr.state, refer to DestIaqOvrd.
M	X	X	X		X		DestOaEnth allows one outdoor enthalpy sensor at a node to be shared by many other nodes. When DestOaEnth is not INVALID then any local sensor is ignored by the local control algorithm and DestOaEnth is used instead. If the value is outside the allowed range (4 to 20 mA), then the node uses the value of the nearest range limit.
M	X	X	X		X		DestOaQuality allows one DestOaQuality sensor at a node to be shared by many other nodes. When DestOaQuality is not INVALID, then the local sensor, is ignored by the local control algorithm and DestOaQuality is used instead. If the value is outside the allowed range (0 to 2000 PPM), then the node uses the value of the nearest range limit.
M	X						SrcIaqOvr allows an indoor air quality sensor to be shared with other nodes and is typically bound to SrcIaqOvr on other nodes. If Data2.siSpaceCo2 is not INVALID, and exceeds Aux1SetPt.CO2IaqLimit, then poor air quality is detected. In addition, if a local digital input is configured for IAQ_OVERRIDE_IN and IO.IaqOverRide is 1 (TRUE) then poor air quality is also detected. The state has the following meanings: If the state is SW_OFF and the value is 0, then the indoor air quality is acceptable. If the state is SW_ON and the value is 100 percent, then the indoor air quality is not acceptable and additional outdoor air is needed to bring it back to an acceptable state. If the state is SW_NUL and the value is 0, then the economizer for this node has not been configured or there is no sensor or the only configured sensor has failed.

(continued)

Table C9. Data Share Points (Left Continued).

User Address	NvName	Field Name	Engineering Units: English (Metric) or States plus Range	Digital State or Value of State	Default
	nvoIaqOvr	state	SW_OFF SW_ON SW_NUL	0 1 -1	SW_NUL
SrcMonSw	nvoMonSw	value	Percent 0 to 100		0
	nvoMonSw	state	SW_OFF SW_ON SW_NUL	0 1 -1	SW_NUL
SrcOaEnth	nvoOdEnthS7		mA 4 to 20		INVALID
SrcOaQuality	nvoOaQuality		PPM 0 to 2000		INVALID

APPENDIX D. Q7750A EXCEL 10 ZONE MANAGER POINT ESTIMATING GUIDE.

Memory size approximation is shown below: (all sizes in bytes)

When *memory size* is less than 110,000 bytes, the size is OK.

When *memory size* is between 110,000 and 128,000 bytes, the application may be too large. The user must expect to reduce the application complexity, reduce the number of attached Excel 10s or distribute the Excel 10s over more than one Zone Manager.

When *memory size* is greater than 128,000, the size is too large. The application size must be reduced as described above.

Approximate Memory Size Estimating Procedure.

1. Determine the number of points per controller required at the Central (for example, XBS).

   NOTE: All remaining points that are not mapped can be accessed through the *Direct Access* feature.

2. Calculate the number of Excel 10 Zone Manager program points that are used in control logic and in the switching table.
3. Estimate the program complexity of the Zone Manager (one of three levels).
   a. No time programs, control logic, or switching tables.
   b. 10K of control logic (one time program, five switching tables, and five control loops).
   c. 20K of control logic (multiple time programs, ten switching tables, and ten control loops).

   Use Fig. D-1 to determine the number of Excel 10s that can be connected to the Zone Manager.

   NOTE: More than 60 Excel 10s requires a Router.

4. Repeat for each Q7750A Excel 10 Zone Manager in a project.

The exact equation for calculating memory size follows:
Memory size = 21,780
+ 4096 (in case of a time program).
+ CARE Control Program.
+ 14 x time points x Excel 10 units.
+ 50 x Excel 10 units.
+ map complexity x Excel 10 units x mapped points.
+ 57 x C-Bus points.
+ 7488 x Excel 10 types.

Where:
Time points = number of switch points in time program per Excel 10.
Excel 10 units = number of attached Excel 10s.
C-Bus points = including mapped points and others; for example, remote points.
Mapped points = number of mapped points per Excel 10, including One-to-Many and Many-to-One mechanism.
Excel 10 types = number of different Excel 10 types (currently three)
Map complexity =
20 = using One-to-Many and not using points with read/write.
30 = average.
45 = many points with read/write ability.

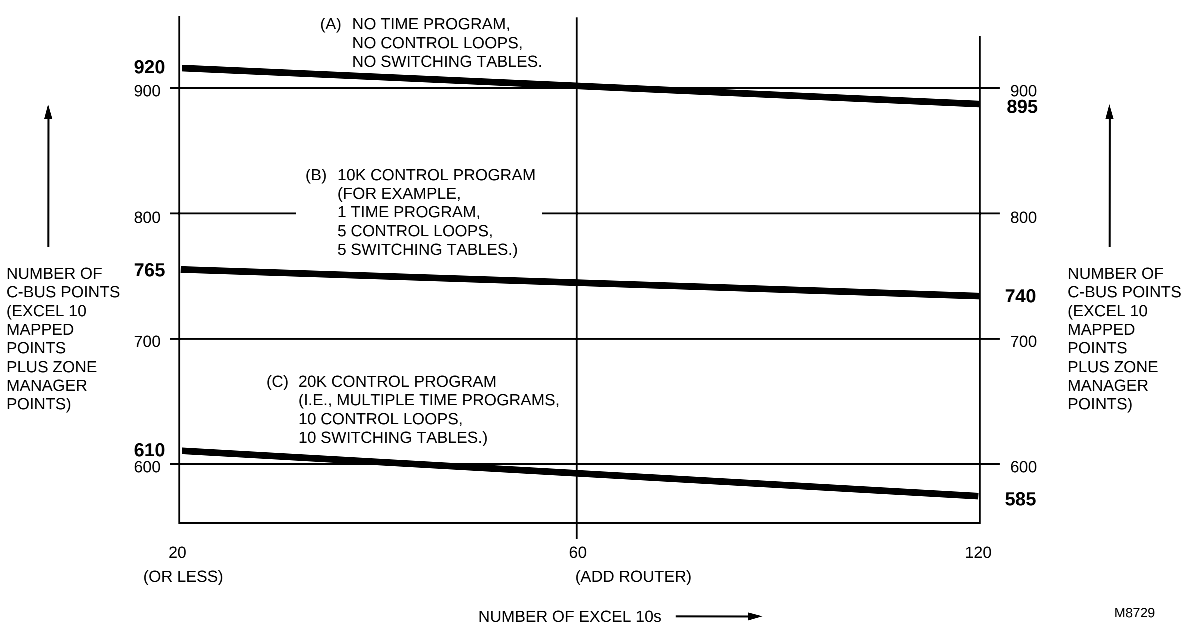

Fig. D-1. Point capacity estimate for Zone Manager.

APPENDIX E. SENSOR DATA FOR CALIBRATION.

Resistance Sensors.

Sensor Type:
C7100A1015, (and C7170A1002).

Sensor Use:
Discharge air, Outdoor air.

Table E-1 lists the points for Sensor Resistance versus Temperature. Fig. E-1 shows the graph of these points.

Table E-1. Sensor Resistance Versus Temperature.

°F (°C)	Resistance Ohms
-40 (-40)	2916.08
-30 (-34.5)	2964.68
-20 (-28.9)	3013.28
-10 (-23.3)	3061.88
0 (-17.8)	3110.48
10 (-12.2)	3159.08
20 (-6.7)	3207.68
30 (-1.1)	3256.28
40 (4.4)	3304.88
50 (10)	3353.48
60 (15.6)	3402.08
70 (21.1)	3450.68
80 (26.7)	3499.28
90 (32.2)	3547.88
100 (37.8)	3596.48
110 (43.4)	3645.08
120 (49)	3693.68

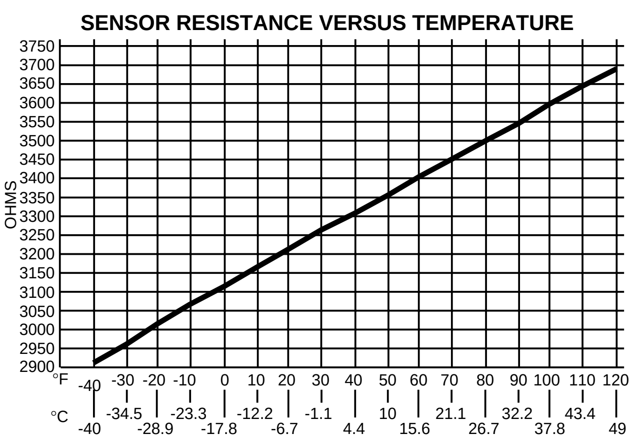

Fig. E-1. Graph of Sensor Resistance versus Temperature.

Sensor Type:
C7031B1033, C7031C1031, C7031D1062, C7031F1018, C7031J1050, C7031K1017.

Sensor Use:
Return Air, Discharge Air Temperature.

Table E-2 lists the points for Sensor Resistance versus Temperature. Fig. E-2 shows the graph of these points.

Table E-2. Sensor Resistance Versus Temperature.

°F (°C)	Resistance Ohms
30 (-1.1)	1956.79
35 (1.7)	1935.79
40 (4.4)	1914.79
45 (7.2)	1893.79
50 (10)	1872.79
55 (12.8)	1851.79
60 (15.6)	1830.79
65 (18.3)	1809.79
70 (21.1)	1788.79
75 (23.9)	1767.79
80 (26.7)	1746.79
85 (29.4)	1725.79
90 (32.2)	1704.78
95 (35)	1683.78
100 (37.8)	1662.78
105 (40.6)	1641.78
110 (43.3)	1620.78
115 (46.1)	1599.78
120 (48.9)	1578.78

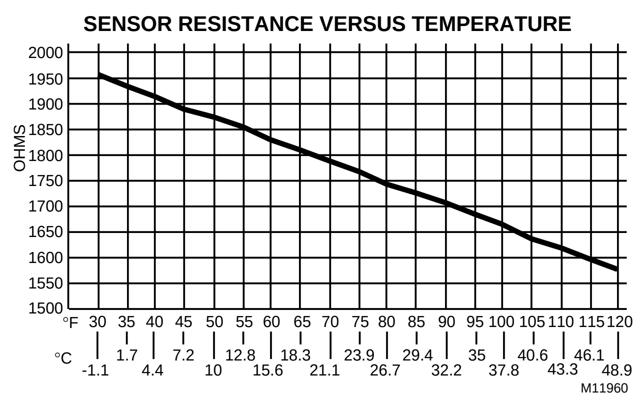

Fig. E-2. Graph of Sensor Resistance versus Temperature.

Sensor Type:
T7770A,B,C,D,E,F,G and C7770A.

Sensor Use:
Space Temperature and Discharge/Return Air Temperature.

Table E-3 lists the points for Sensor Resistance versus Temperature. Fig. E-3 shows the graph of these points.

Table E-3. Sensor Resistance Versus Temperature.

°F (°C)	Resistance Ohms
40 (4.4)	9961.09
45 (7.2)	9700.90
50 (10)	9440.72
55 (12.8)	9180.53
60 (15.6)	8920.35
65 (18.3)	8660.16
70 (21.1)	8399.98
75 (23.9)	8139.79
80 (26.7)	7879.61
85 (29.4)	7619.42
90 (32.2)	7359.24
95 (35)	7099.06
100 (37.8)	6838.87

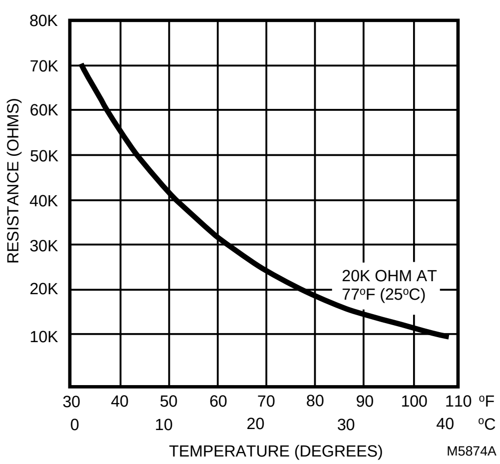

Fig. E-3. Graph of Sensor Resistance versus Temperature.

Sensor Type:
T7770B,C,E,F 10K ohm setpoint potentiometer (Relative).

Sensor Use:
Offset Setpoint Temperature.

Table E-4 lists the points for Sensor Resistance versus Temperature. Fig. E-4 shows the graph of these points.

Table E-4. Sensor Resistance Versus Temperature.

°F (°C) Above and Below Setpoint	Resistance Ohms
-9 (-5.4)	8877.41
-8 (-4.8)	8832.14
-7 (-4.2)	8786.87
-6 (-3.6)	8741.60
-5 (-3.0)	8696.33
-4 (-2.4)	8651.06
-3 (-1.8)	8605.79
-2 (-1.2)	8560.52
-1 (-0.6)	8515.25
0 (0)	8469.98
1 (0.6)	8424.71
2 (1.2)	8379.45
3 (1.8)	8334.18
4 (2.4)	8288.91
5 (3.0)	8243.64
6 (3.6)	8198.37
7 (4.2)	8153.10
8 (4.8)	8107.83
9 (5.4)	8062.56

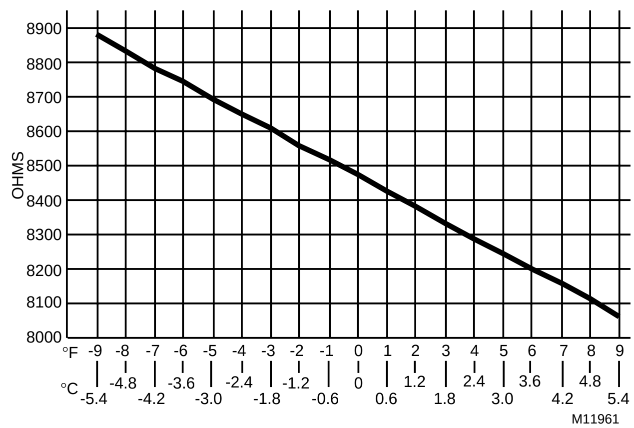

Fig. E-4. Graph of Sensor Resistance versus Temperature.

Sensor Type:
T7770B,C,E,F 10K ohm setpoint potentiometer (Absolute).

Sensor Use:
Direct Setpoint Temperature.

Table E-5 lists the points for Sensor Resistance versus Temperature. Fig. E-5 shows the graph of these points.

Table E-5. Sensor Resistance Versus Temperature.

°F (°C)	Resistance Ohms
55 (12.8)	8877.42
60 (15.6)	8741.62
65 (18.3)	8605.82
70 (21.1)	8470.02
75 (23.9)	8334.22
80 (26.7)	8198.42
85 (29.4)	8062.62

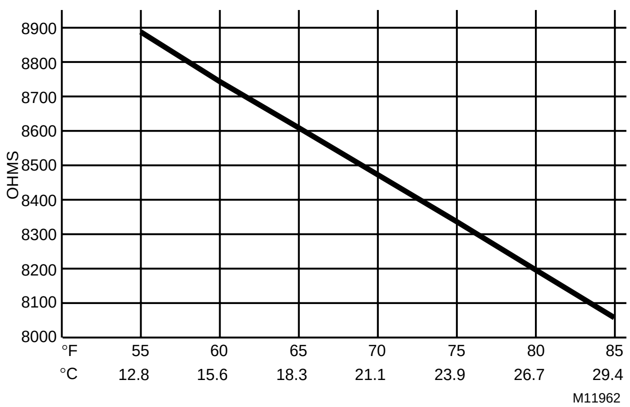

Fig. E-5. Graph of Sensor Resistance versus Temperature.

Voltage/Current Sensors.

Sensor Type:
C7600B1000 (Decorative Wall Mount) and C7600C1018 2 to 10V.

Sensor Use:
Humidity.

Table E-6 lists the points for Sensor Voltage versus Humidity. Fig. E-6 shows the graph of these points.

Table E-6. Sensor Voltage Versus Humidity.

Humidity Percentage	Sensor Voltage
10	2.67
15	3.08
20	3.48
25	3.88
30	4.28
35	4.68
40	5.08
45	5.48
50	5.88
55	6.28
60	6.69
65	7.09
70	7.49
75	7.89
80	8.29
85	8.69
90	9.09

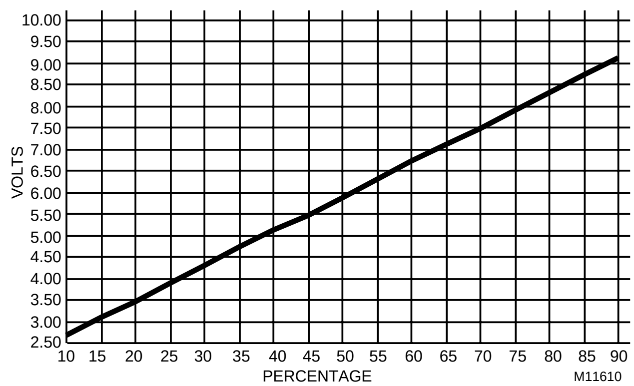

Fig. E-6. Graph of Sensor Voltage versus Humidity.

Sensor Type:
C7600C1008 (4 to 20 mA).

Sensor Use:
Humidity.

Table E-7 lists the points for Sensor Current versus Humidity. Fig. E-7 shows the graph of these points.

Table E-7. Sensor Current Versus Humidity.

Humidity Percentage	Sensor Current
10	5.6
15	6.4
20	7.2
25	8.0
30	8.8
35	9.6
40	10.4
45	11.2
50	12.0
55	12.8
60	13.6
65	14.4
70	15.2
75	16.0
80	16.8
85	17.6
90	18.4

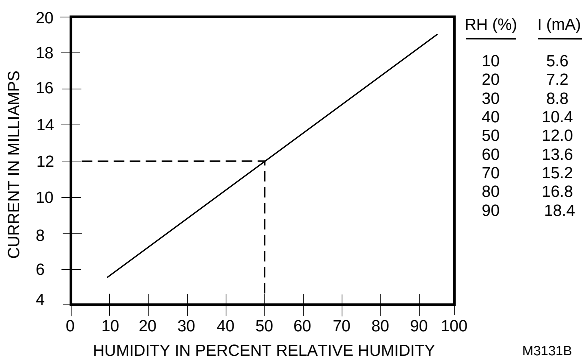

Fig. 7. C7600C output current vs. humidity.

Sensor Type:
C7400A1004.

Sensor Use:
Enthalpy.

Table E-8 lists the points for Sensor Current versus Enthalpy (volts). Fig. E-8 shows the graph of these points.

Table E-8 Sensor Current Versus Enthalpy (volts).

Enthalpy (volts)	Sensor Current (mA)
4	1
5	1.25
6	1.49
7	1.74
8	1.99
9	2.24
10	2.49
11	2.74
12	2.99
13	3.24
14	3.49
15	3.74
16	3.98
17	4.23
18	4.48
19	4.73
20	4.98

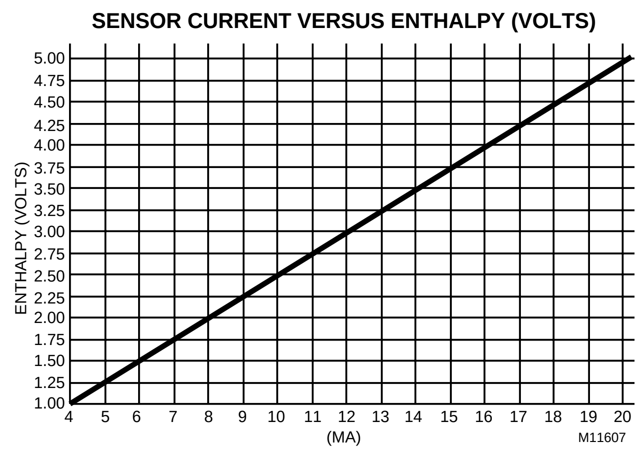

Fig. E-8. Graph of Sensor Current versus Enthalpy (volts).

See Fig. E-9 for a partial psychometric chart for the a C7400A Solid State Enthalpy Sensor.

CONTROL CURVE	CONTROL POINT APPROX. °F (°C) AT 50% RH
A	73 (23)
B	70 (21)
C	67 (19)
D	63 (17)

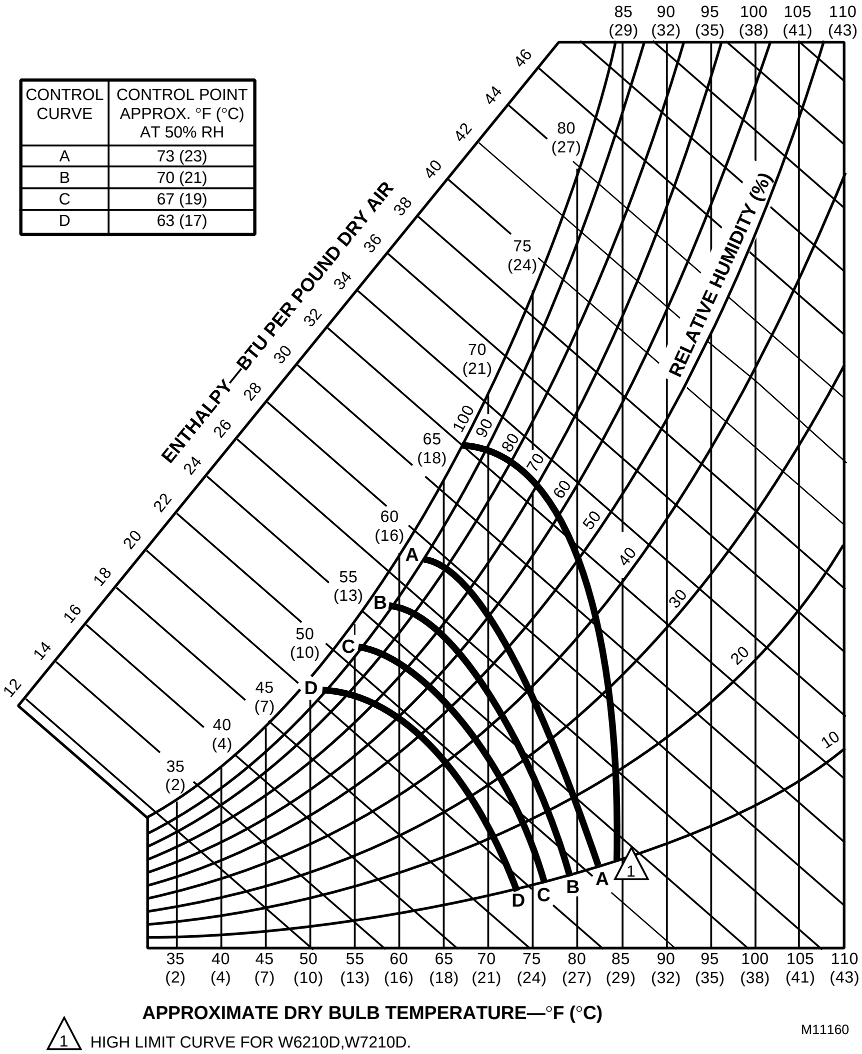

Fig. E-9. Partial psychometric chart for a C7400A Solid State Enthalpy Sensor.

See Fig. E-10 for a C7400A Solid State Enthalpy Sensor output current versus relative humidity.

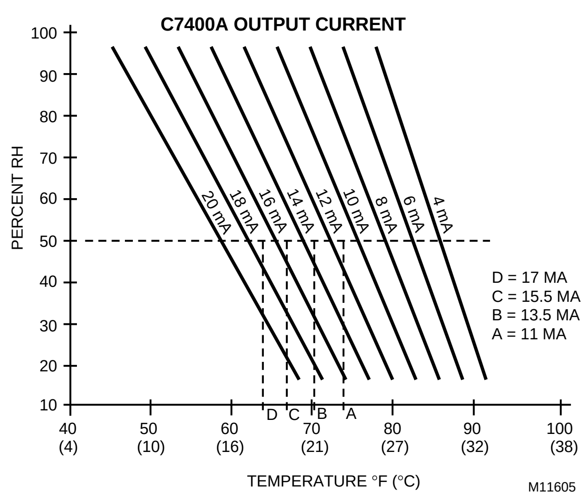

Fig. E-10. C7400A Solid State Enthalpy Sensor output current vs. relative humidity.

Sensor Type:
T7242 or equivalent.

Sensor Use:
CO_2 concentration

Table E-11 lists the points for Sensor Voltage versus CO_2 concentration. Fig. E-11 shows the graph of these points.

Table E-11. Sensor Voltage Versus CO_2 Concentration.

CO_2 Concentration PPM	Sensor Voltage
0	0.00
100	0.50
200	1.00
300	1.50
400	2.00
500	2.50
600	3.00
700	3.50
800	4.00
900	4.50
1000	5.00
1100	5.50
1200	6.00
1300	6.50
1400	7.00
1500	7.50
1600	8.00
1700	8.50
1800	9.00
1900	9.50
2000	10.00

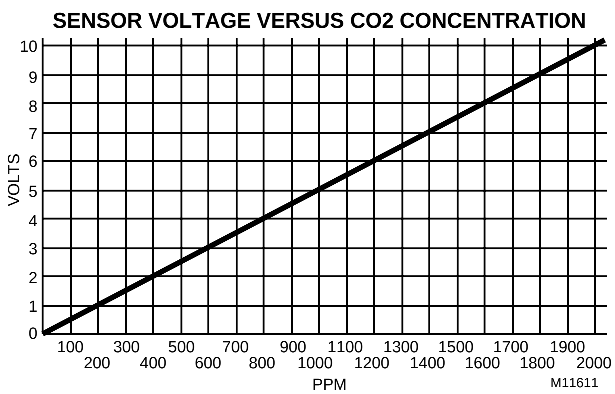

Fig. E-11. Graph of Sensor Voltage versus CO_2 concentration.

Sensor Type:
Third party (2 to 20V).

Sensor Use:
Monitor voltage.

Table E-12 lists the points for Sensor Voltage versus input Voltage to A/D. Fig. E-12 shows the graph of these points.

Table E-12. Sensor Voltage Versus Input Voltage To A/D.

Voltage to A/D	Sensor Voltage
0.00	0.00
0.50	0.25
1.00	0.50
1.50	0.75
2.00	1.00
2.50	1.25
3.00	1.50
3.50	1.75
4.00	2.00
4.50	2.25
5.00	2.50
5.50	2.75
6.00	3.00
6.50	3.25
7.00	3.50
7.50	3.75
8.00	4.00
8.50	4.25
9.00	4.50
9.50	4.75
10.00	5.00

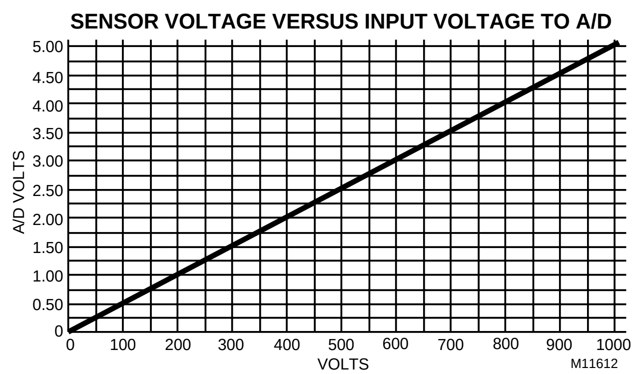

Fig. E-12. Graph of Sensor Voltage versus input Voltage to A/D.

Sensor Type:
Third party.

Sensor Use:
Sensor Voltage (Vdc)/Pressure Inw (kPa) 2 to 10V, 0 to 5 inw (0 to 1.25 kPa).

Table E-13 lists the points for Sensor Voltage (Vdc) versus Pressure Inw (kPa). Fig. E-13 shows the graph of these points.

Table E-13. Sensor Voltage (Vdc) Versus Pressure Inw (kPa).

Pressure Inw (kPa)	Sensor Voltage (Vdc)
0.00 (0.00)	2.00
0.50.(0.13)	2.80
1.00 (0.25)	3.60
1.50 (0.37)	4.40
2.00 (0.5)	5.20
2.50 (0.62)	6.00
3.00 (0.75)	6.80
3.50 (0.87)	7.60
4.00 (1.00)	8.40
4.50 (1.12)	9.20
5.00 (1.25)	10.00

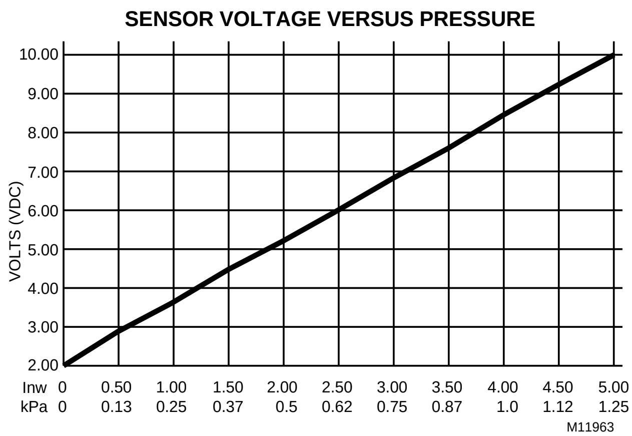

Fig. E-13. Graph of Sensor Voltage (Vdc) versus Pressure Inw (kPa).

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