

# Excel 10 W7753A Unit Ventilator Controller

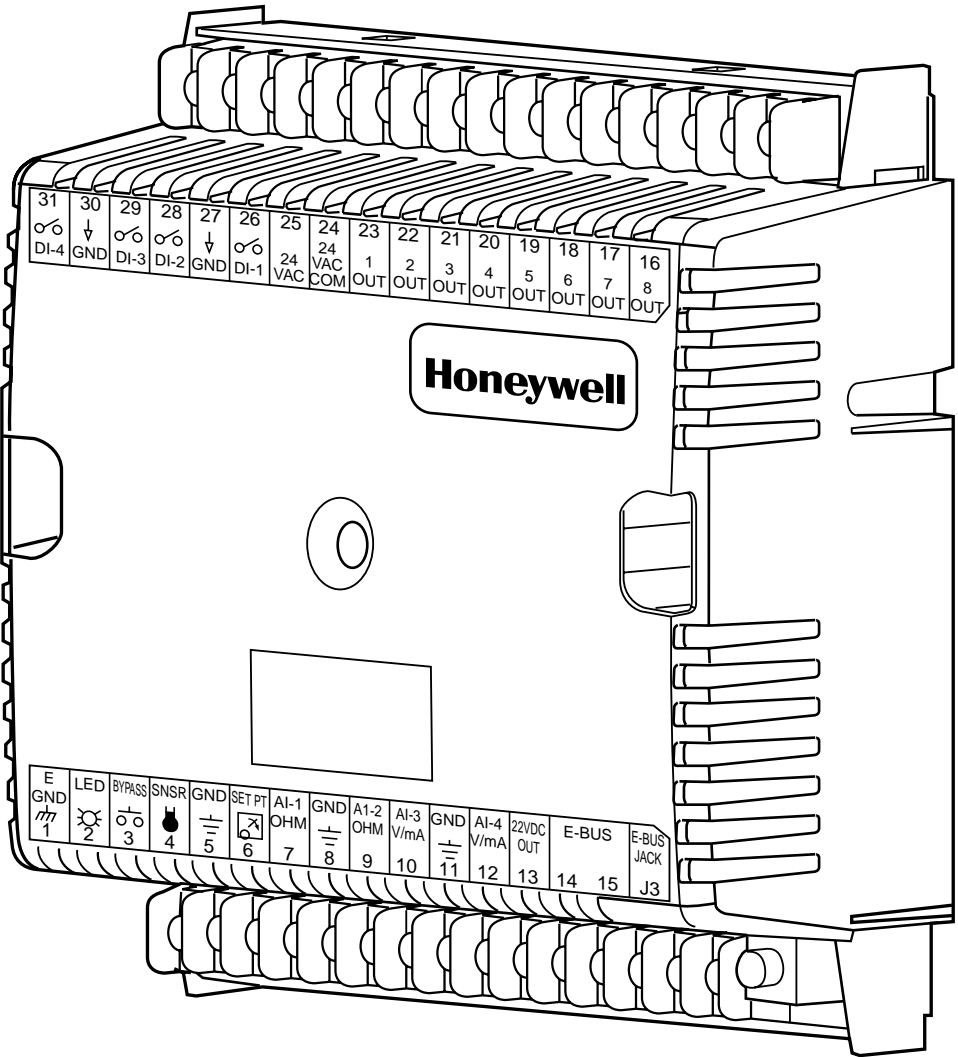


## INSTALLATION INSTRUCTIONS

### PRODUCT DESCRIPTION

The W7753A Unit Ventilator Controller is a Free Topology Tranceiver (FTT) LonMark® compliant Unit Vent controller in the Excel 10 family product line. See Fig. 1.

This controller can be used to monitor/control HVAC equipment, lighting, and other miscellaneous loads in a distributed network. The controller is field-mounted to the equipment that it controls, and the controller wiring is attached to the screw terminals located on the controller. See Fig. 1.



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Fig. 1. Excel 10 W7753A Unit Ventilator Controller.



The W7753A Controller communicates via the 78 kilobaud Echelon® LonWorks® E-Bus Network.

Allowable input/output connections consist of wall module points plus two additional resistive sensor inputs, two voltage/current inputs, four digital inputs and eight digital Triac outputs.

For the W7753A, any hardware driven by the Triac outputs must have a minimum current draw, when energized, of 25 mA and a maximum current draw of 500 mA.

## INSTALLATION

Mount the W7753A in a position that allows clearance for wiring, servicing and controller removal. Avoid mounting the W7753A in areas where acid fumes or other deteriorating vapors can attack the metal parts of the controller, or in areas where escaping gas or other explosive vapors are present. See Fig. 2 for mounting dimensions.

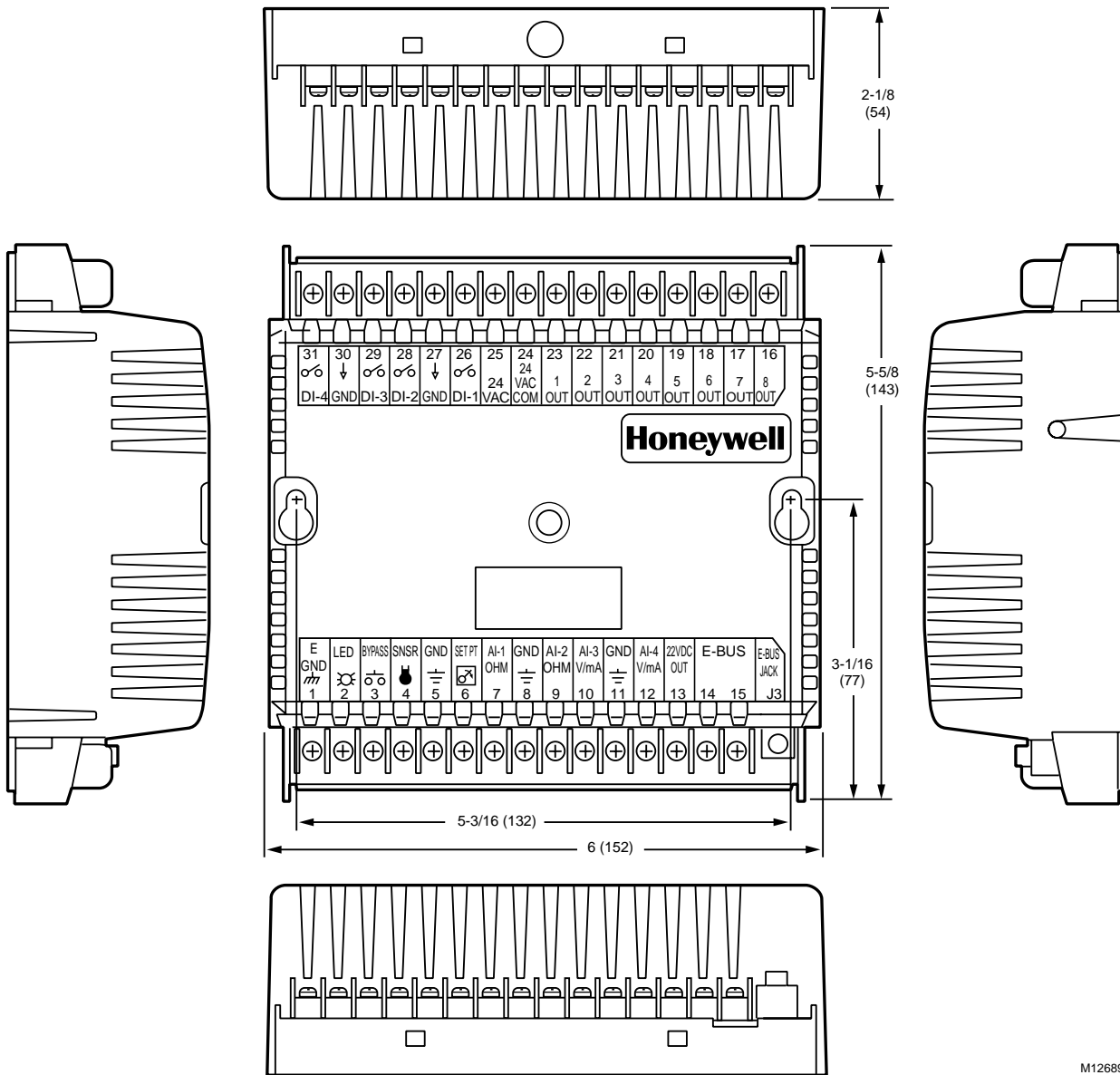
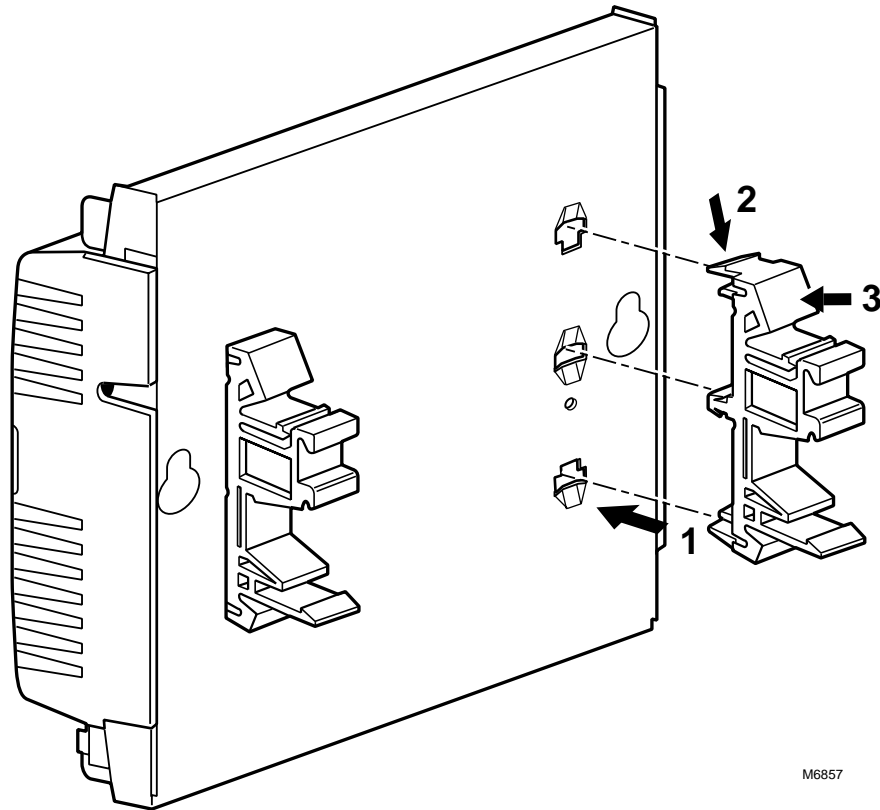


Fig. 2. W7753A mounting dimensions in in. (mm).

The controller enclosure on the W7753A is constructed of a sheet metal housing and a plastic factory-snap-on cover. The controller mounts using two screws inserted through the plastic cover. Use the screws appropriate for the mounting surface. 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.

The W7753A can also be mounted using DIN rail (obtain locally). If using DIN rail also purchase from Augat Inc. part number 2TK2D DIN rail (adapter) two each, see Fig. 3.



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Fig. 3. W7753A DIN rail mounting.

## Wiring

All wiring must comply with applicable electrical codes and ordinances or as specified on installation wiring diagrams. Controller wiring on the W7753A is terminated to the screw terminal blocks located on the top and the bottom of the controller.

### NOTES:

- For multiple controllers operating from a single transformer, the same side of the transformer secondary must be connected to the same power input terminal in each controller. The ground terminal (1 on the W7753A) must be connected to a verified earth ground for each controller in the group, see Fig. 5. (Controller configurations are not necessarily limited to three controllers, but the total power draw including accessories cannot exceed 100 VA when powered by the same transformer (U.S. only). See System Engineering form, 74-2964 for power wiring recommendations.)
- All loads on an Excel 10 W7753A Controller must be powered by the same transformer that powers the Excel 10 W7753A Controller. A W7753A Controller can use separate transformers for controller power and load power.
- Keep the earth ground connection (terminal 1) wire run as short as possible. Refer to Fig. 9 through 14.

- Do *not* connect the analog or digital ground terminals (5, 8, 11, 27 and 30) to earth ground. Refer to Fig. 9 through 14.

## Power

The 24 Vac power from an energy-limited Class II Power Source must be provided to each W7753A Controller. To conform to Class II restrictions (U.S. only), transformers must not be larger than 100 VA.

A transformer that meets CE mark requirements and that meets the Low Voltage Directive (LVD) requirements must be used in Europe for all installations of this product. More than one W7753A Controller can be powered by a single transformer. Fig. 4 shows power wiring details for a single controller and Fig. 5 depicts multiple controllers using one transformer.

### IMPORTANT

*Use the heaviest gauge wire available, up to 14 AWG (2.0 mm<sup>2</sup>) with a minimum of 18 AWG (1.0 mm<sup>2</sup>), for all power and earth ground wiring. Screw type terminal blocks are designed to accept up to two 14 AWG (2.0 mm<sup>2</sup>) conductors, one on each side of the terminal screw. More than two wires that are 14 AWG (2.0 mm<sup>2</sup>) can be connected with a wire nut. Include a pigtail with this wire group and attach the pigtail to one side of the terminal block.*

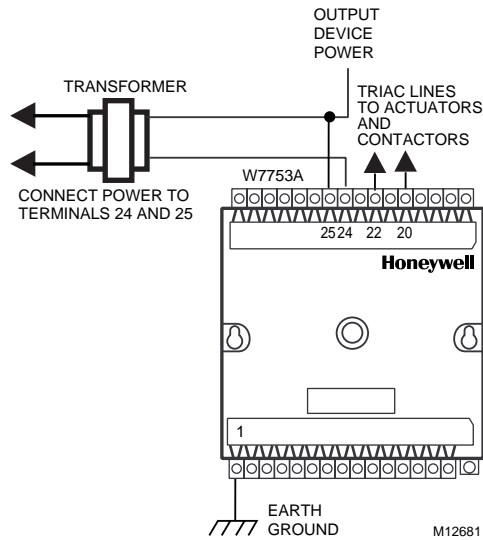


Fig. 4. Power wiring details for one Excel 10 per transformer.

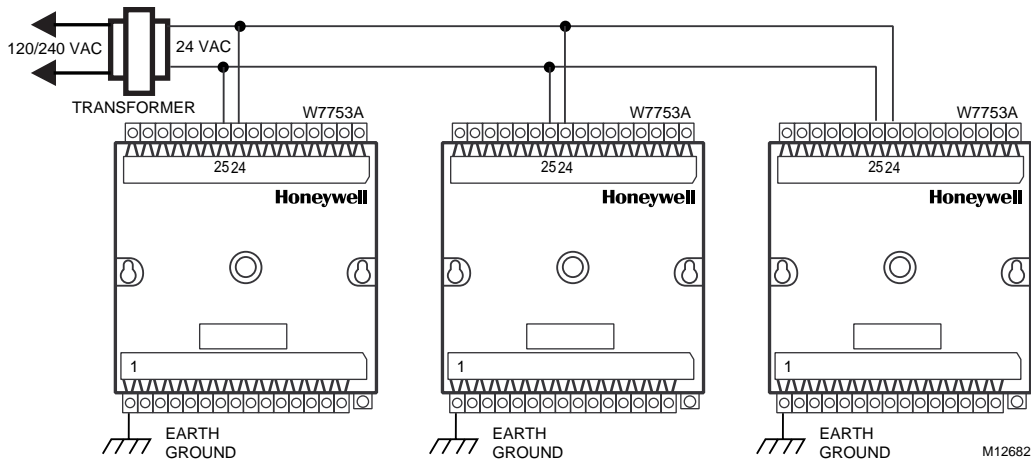


Fig. 5. Power wiring details for two or more Excel 10s per transformer.

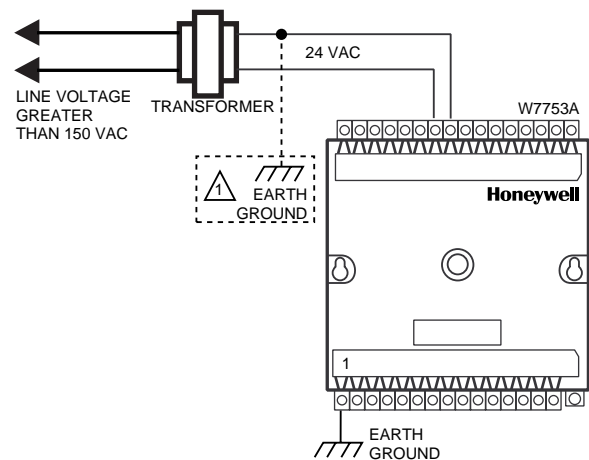
NOTES:

- Unswitched 24 Vac power wiring can be run in the same conduit as the E-Bus cable.
- Maintain at least a three-inch (76 millimeter) separation between Triac outputs and E-Bus wiring throughout the installation.

See the following **IMPORTANT** on Heating and Cooling Equipment (UL 1995, U.S. only).

**IMPORTANT**

If the W7753A Controller is used on Heating and Cooling Equipment (UL 1995, U.S. only) and the transformer primary power is more than 150 volts, connect the transformer secondary to earth ground, see Fig. 6. For these applications, only one W7753A Excel 10 controller can be powered by each transformer.



⚠ IF THE W7750 CONTROLLER IS USED IN UL 1995 EQUIPMENT AND THE PRIMARY POWER IS MORE THAN 150 VOLTS, GROUND ONE SIDE OF TRANSFORMER SECONDARY. M12680

Fig. 6. Transformer power wiring details for one Excel 10 used in UL 1995 equipment (U.S. only).

## Communications

Refer to E-Bus Wiring Guidelines form, 74-2865 for a complete description of E-Bus network topology rules. Approved cable types for E-Bus communications wiring is Level IV 22 AWG (0.34 mm<sup>2</sup>) plenum or non-plenum rated unshielded, twisted pair, solid conductor wire. For nonplenum areas, U.S. part AK3781 (one pair) or U.S. part AK3782 (two pair) can be used. In plenum areas, U.S. part AK3791 (one pair) or U.S. part AK3792 (two pair) can be used. Communications wiring can be run in a conduit, if needed, with *non-switched* 24 Vac or sensor wiring. If a longer E-Bus network is required, a Q7740A 2-way or Q7740B 4-way repeater can be added to extend the length of the E-Bus. Also 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.

Pull the cable to each device on the E-Bus and connect to communication terminals 14 and 15 (W7753A).

### Notes on Communications Wiring:

- All field wiring must conform to local codes and ordinances (or as specified on the installation drawings).
- Approved cable types for E-Bus communications wiring is Level IV 22 AWG (0.34 mm<sup>2</sup>) plenum or non-plenum rated unshielded, twisted pair, solid conductor wires. For nonplenum areas, U.S. part AK3781 (one pair) or U.S. part AK3782 (two pair) can be used. In plenum areas, U.S. part AK3791 (one pair) or U.S. part AK3792 (two pair) can be used.
- Unswitched 24 Vac power wiring can be run in the same conduit as the E-Bus cable.

- Do not bundle output wires with sensor, digital input or communications E-Bus wires.
- Do not use different wire types or gauges on the same E-Bus segment. The step change in line impedance characteristics would cause unpredictable reflections on the E-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, motor control centers, or lines containing lighting dimmer switches, and keep at least 3 in. (76 mm) of separation between noisy lines and the E-Bus cable.
- Each daisy-chained E-Bus segment that is on one side of a Q7751A,B Router (can contain up to 60 Excel 10s) and has a length greater than 1640 ft. (500m) must have two E-Bus 209541B Termination Modules, one at each end of the daisy-chain wiring run.
- Make sure that neither of the E-Bus wires is grounded.

NOTE: If a 209541B Termination Module is required at the UV controller, connect two of the three termination module wires to the E-Bus terminals. Selecting the appropriate two wires depends on the E-Bus network topology. Refer to the E-Bus Wiring Guidelines form, 74-2865, and the Excel 10 FTT Termination Module Installation Instructions form, 95-7554. For example, using a doubly terminated daisy-chained bus topology, if controllers are on either end of an E-Bus wire run, mount the termination module on the appropriate terminals as shown in Fig. 7.

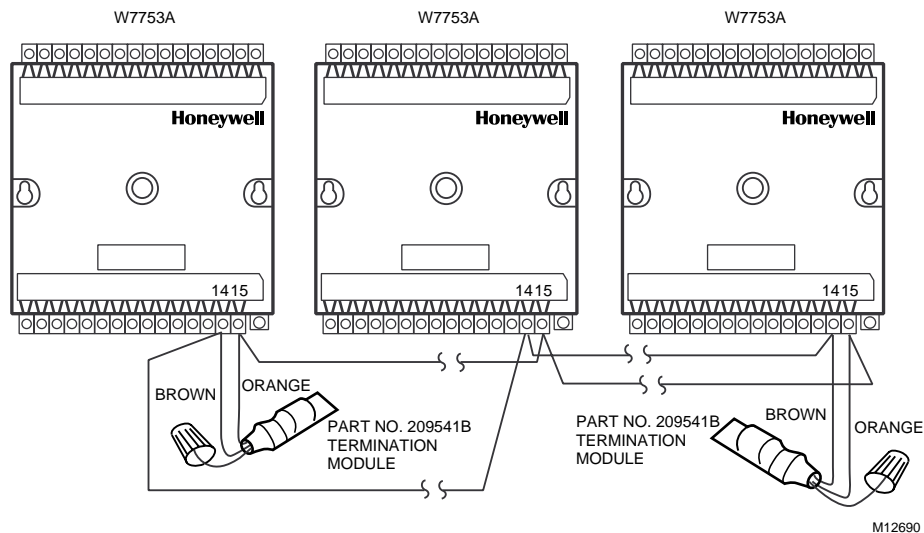


Fig. 7. Termination modules (place a wire nut on each remaining wire that is not connected to a controller or device).

When two or more wires are to be attached to the same terminal, other than 14 AWG (2.0 mm<sup>2</sup>), be sure to twist them together. Deviation from this rule can result in improper electrical contact. See Fig. 8.

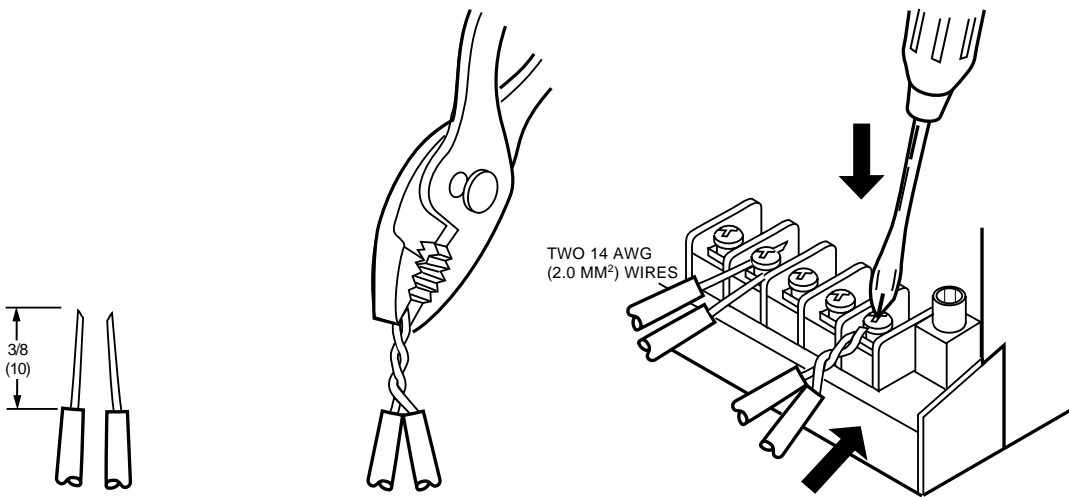
### Wiring Details

The W7753A Controller has the terminal arrangements shown in Fig. 9 through 14. Connection for operator access to the E-Bus is provided by plugging the Serial LonTalk® Adapter (SLTA) connector into the E-Bus jack.

**NOTE:** If an Excel 10 W7753A Controller or a 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 replacement of the controller. Refer to job drawings for specific installation wiring diagrams.

Wire to the terminal blocks as follows:

1. Strip 3/8 in. (10 mm) insulation from the conductor.
2. Insert the wire in the required terminal location and tighten the screw to complete the termination.
3. If two or more wires are being inserted into one terminal location, strip 1/2 in. (13 mm) of insulation from the conductors then twist the wires together a minimum of three turns before inserting them.
4. Cut the twisted end of the wires to 3/16 in. (5 mm) before inserting them into the terminal and tightening the screw.
5. Pull on each wire in all terminals to check for good mechanical connection.



1. STRIP 3/8 IN. (10 MM) FROM WIRES TO BE ATTACHED AT ONE TERMINAL.
2. TWIST WIRES TOGETHER WITH PLIERS (A MINIMUM OF THREE TURNS).
3. CUT TWISTED END OF WIRES TO 3/16 IN. (5 MM) BEFORE INSERTING INTO TERMINAL AND TIGHTENING SCREW. THEN PULL ON EACH WIRE IN ALL TERMINALS TO CHECK FOR GOOD MECHANICAL CONNECTION.

**Fig. 8. Attaching two or more wires at terminal blocks.**

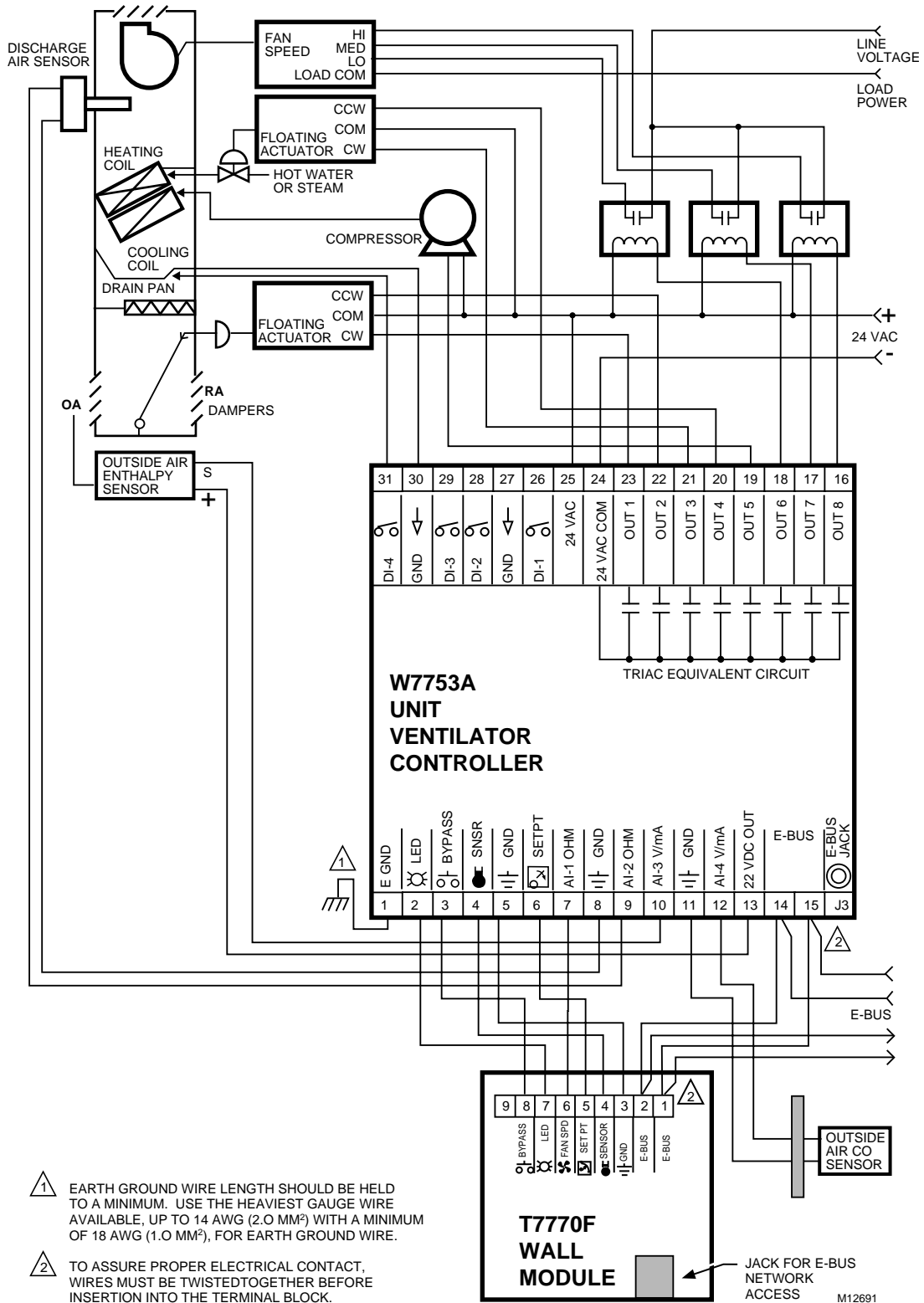
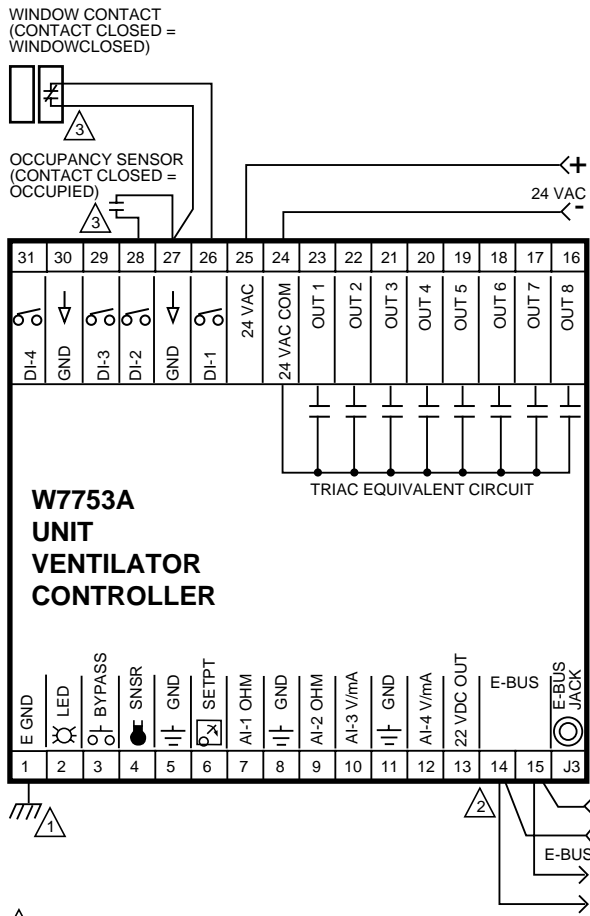
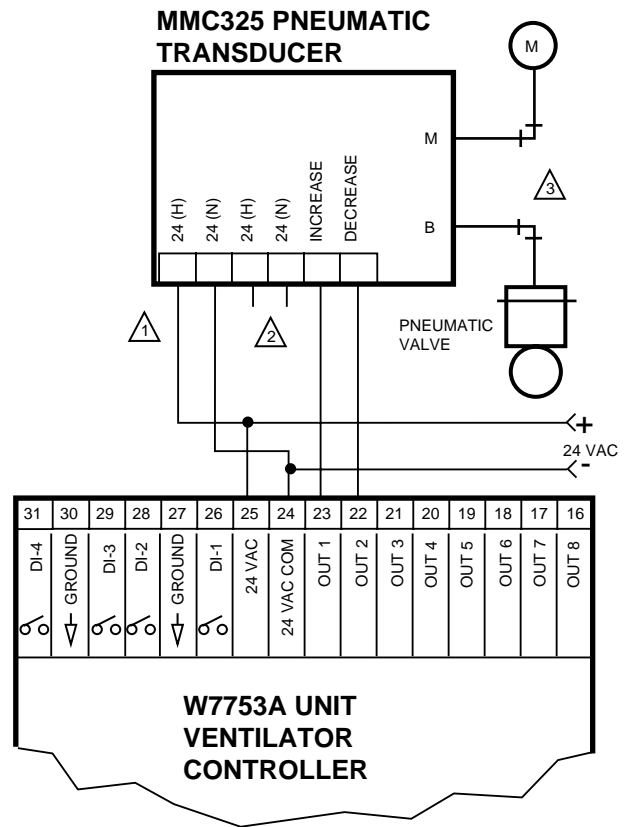


Fig. 9. Typical W7753A Unit Ventilator application wiring diagram with T7770F Wall Module. (For note 2, refer to Fig. 8.)



- 1 EARTH GROUND WIRE LENGTH SHOULD BE HELD TO A MINIMUM. USE THE HEAVIEST GAUGE WIRE AVAILABLE, UP TO 14 AWG (2.0 MM<sup>2</sup>) WITH A MINIMUM OF 18 AWG (1.0 MM<sup>2</sup>), FOR EARTH GROUND WIRE.
- 2 TO ASSURE PROPER ELECTRICAL CONTACT, WIRES MUST BE TWISTED TOGETHER BEFORE INSERTION INTO THE TERMINAL BLOCK.
- 3 CONTACTS MUST BE SUITABLE FOR DRY SWITCHING, 5V AT 10 mA. USE SEALED TYPE, GOLD FLASHED OR PIMPLED CONTACTS.

Fig. 10. Typical Window and Occupancy sensor wiring diagram. (For note 2, refer to Fig. 8.)



- 1 MAKE SURE ALL TRANSFORMER/POWER WIRING IS AS SHOWN; REVERSING TERMINATIONS RESULTS IN EQUIPMENT MALFUNCTION.
- 2 OPTIONAL 24 VAC WIRING TO NEXT CONTROLLER.
- 3 USE 1/4 IN (6 MM) PNEUMATIC TUBING. MINIMUM BRANCH LINE MUST BE 6 FT. (1.8M) OR LONGER.

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Fig. 11. Typical Pneumatic transducer to W7753A.

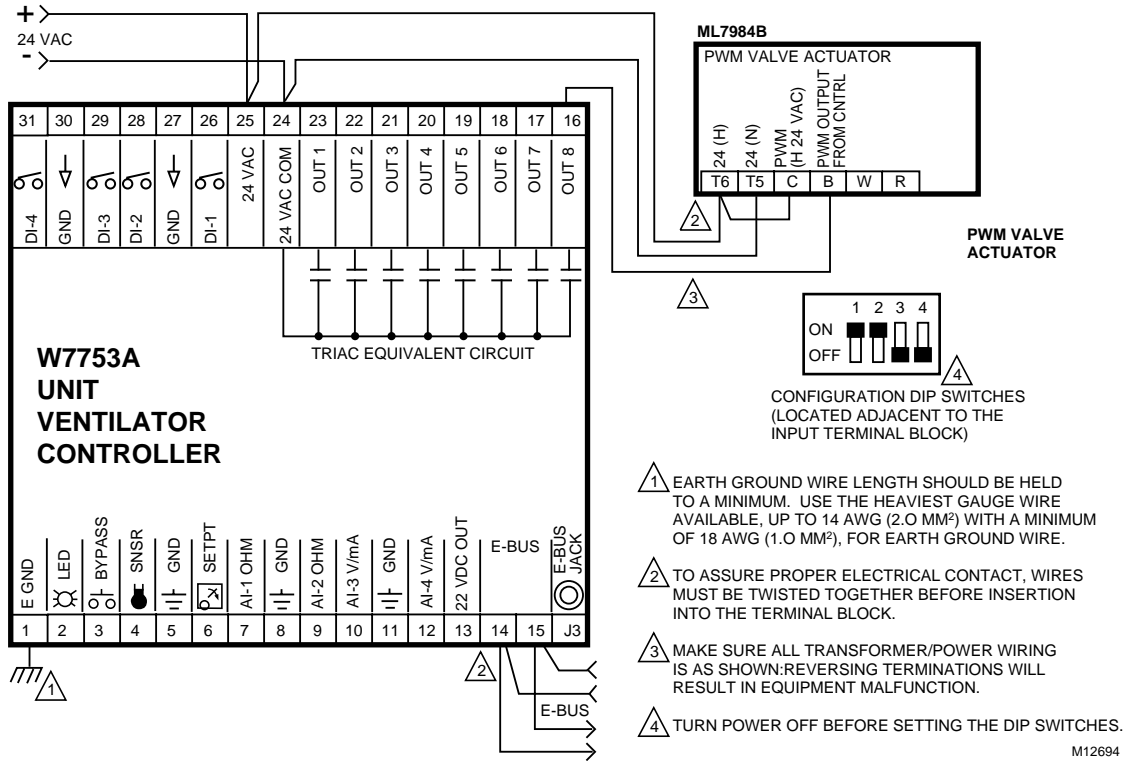


Fig. 12. Typical PWM Valve Actuator to W7753A. (For note 2, refer to Fig. 8.)

NOTE: Make sure to set the Configuration DIP Switch as shown in Fig. 12. Switches 1 through 3 set the timing of the ML7984B valve actuator to match the W7753A outputs (0.1 sec. Min. with a max. time of 25.6 sec.). Switch 4 determines the action of the actuator (Off = Direct Acting, On = Reverse Acting).

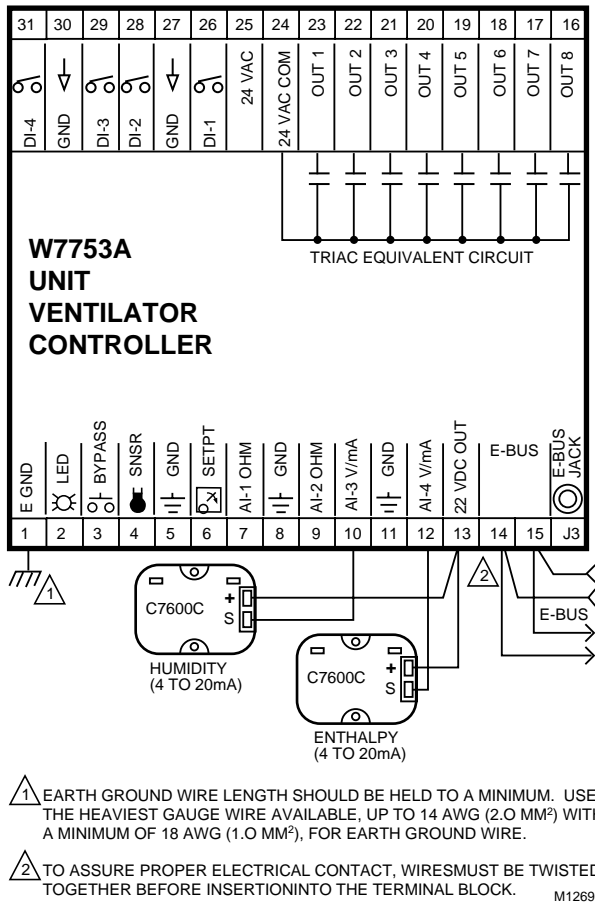


Fig. 13. Typical 4 to 20 mA Humidity and Enthalpy Sensor to W7753A. (For note 2, refer to Fig. 8.)

## CHECKOUT

### W7753A Checkout

#### Step 1. Check Installation and Wiring

Inspect all wiring connections at the W7753A terminals, and verify compliance with installation job drawings. If any wiring changes are required, *first* be sure to remove power from the controller *before* starting work. Pay particular attention to:

- 24 Vac power connections. Verify that multiple controllers powered by the same transformer are wired with the transformer secondary connected to the same input terminal numbers on each W7753A. See Fig. 5. (Controller configurations are not necessarily limited to three controllers, but the total power draw including accessories cannot exceed 100 VA when powered by the same transformer (U.S. only). See System Engineering form, 74-2964 for power wiring recommendations.
- Controller wiring. Be sure that each controller is wired (terminal 1) on the W7753A to a verified earth ground using a wire run as short as possible with the heaviest gauge wire available, up to 14 AWG (2.0 mm<sup>2</sup>) with a minimum of 18 AWG (1.0 mm<sup>2</sup>) for each controller in the group. See Fig. 4.

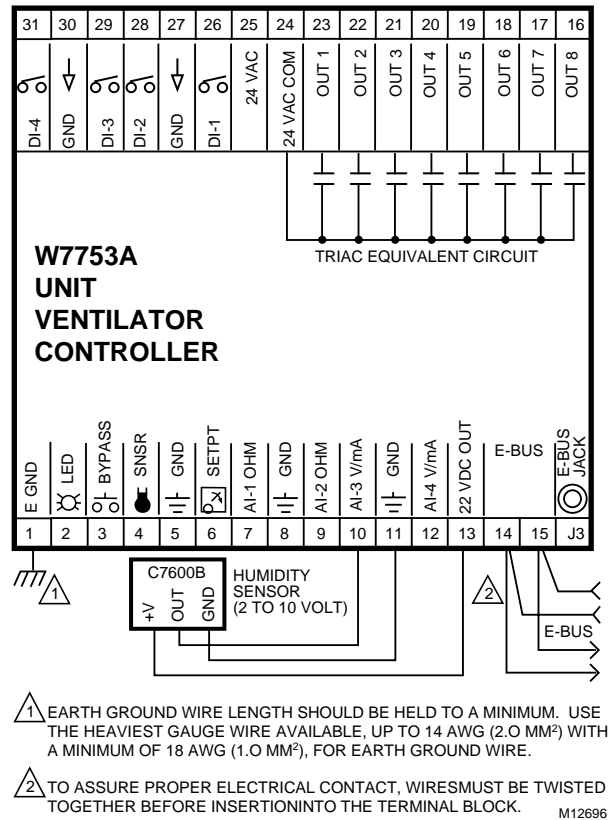


Fig. 14. Typical 2 to 10 Volt DC Humidity Sensor to W7753A. (For note 2, refer to Fig. 8.)

- Verify Triac wiring to external controllers uses the proper load power/24 Vac hot terminal (terminal 25 on the W7753A).

NOTE: All wiring must comply with applicable electrical codes and ordinances or as specified on installation wiring diagrams.

#### Verify Termination Module Placement

The installation wiring diagrams should indicate the locations for placement of 209541B Termination Module(s). Refer to the E-Bus Wiring Guidelines form, 74-2865, and the Excel 10 FTT Termination Module Installation Instructions form, 95-7554. Correct placement of the termination module(s) is required for proper E-Bus communications.

#### Step 2. Startup

##### W7753A Controller Status LED

The LED on the front and center of a W7753A Controller provides a visual indication of the status of the controller. See Fig. 15. When the W7753A receives power, the LED should appear in one of the following allowable states:

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

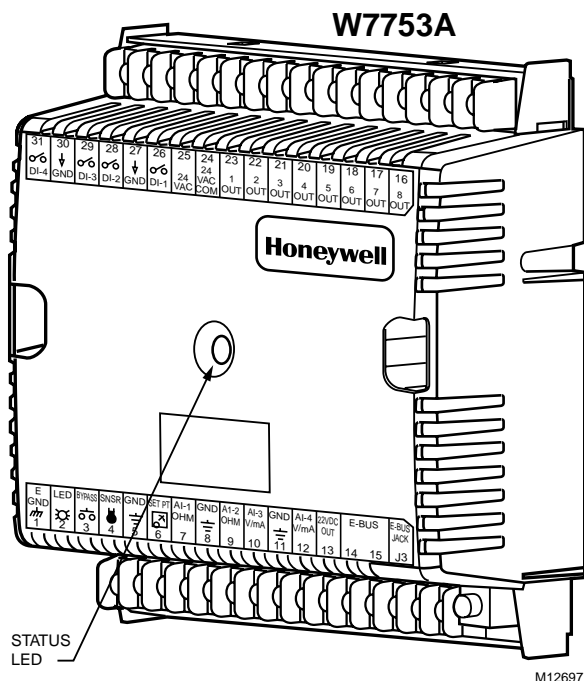


Fig. 15. LED location on W7753A.

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, or Small Building Controller). See Table 1. The information contained in an alarm message follows.

**Subnet Number:** This is the 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 of the router.

**Node Number:** This is the Excel 10 node that has the alarm condition (see Network Statics).

**Alarm Type:** The specific alarm being issued. An Excel 10 can provide the alarm types listed in Table 1.

Table 1. Excel 10 Alarms.

Name of alarm or error bit	Alarm type number	Meaning of alarm code or error bit
RETURN_TO_NORMAL	128	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.
ALARM_NOTIFY_DISABLED	255	The alarm reporting was turned off by the nviManualMode. No more alarms are reported until nviManualMode turns on alarm reporting or upon application restart.
NO_ALARM	0	No alarms presently detected.
INPUT_NV_FAILURE	1	One or more NV inputs have failed while receiving an update within their specified FAILURE_DETECT_TIME.
NODE_DISABLED	2	The control algorithm stopped because the controller is in DISABLED_MODE, or FACTORY_TEST mode. The control is shut down and disabled until power is cycled or the node is reset. See NOTE 1 below.
SENSOR_FAILURE	3	One or more sensors have failed.
FROST_PROTECTION_ALARM	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.
INVALID_SET_POINT	5	One of the Setpoints is not in the valid range.
LOSS_OF_AIR_FLOW	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. The alarm is not issued until FanFailTime seconds have elapsed since the loss-of-flow condition was first reported.
DIRTY_FILTER	7	The pressure drop across the filter exceeds the limit and the filter requires maintenance. The control runs normally.
SMOKE_ALARM	8	The smoke detector has detected smoke and the node has entered an emergency state.
IAQ_OVERRIDE	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.

Table 1. Excel 10 Alarms (continued).

Name of alarm or error bit	Alarm type number	Meaning of alarm code or error bit
LOW_LIM_ECON_CLOSE	10	The economizer has to close beyond the minimum position to prevent the discharge air temperature from going below the discharge temperature low limit.
DRIP_PAN_FULL	11	Drip pan maintenance is required. Cooling control is disabled. Fan continues to run.
FREEZE_STAT	12	Very Cold Temperature detected inside the Unit Ventilator Cabinet. Control closes OA Damper, and open heat valve.
OAQ_ALARM	13	The configured outdoor air quality sensor has detected CO or CO <sup>2</sup> levels that exceeds OaQStPt (plus 30 ppm hysteresis). When there is an OAQ_ALARM, the economizer damper is closed.

NOTES: The node can be reset by switching the node to MANUAL and then switching to the normal operating mode (using DestManMode).

Also, the Excel 10 network 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, XI584 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 is one method of broadcasting the Service Message from an Excel 10 W7753A Controller. This uses a hardware push button on the side of the controller (see Fig. 16).

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 service pin on the controller or the bypass button on a wall module causes the Service Message to be broadcast on the network. All other functions are normal in the SERVICE\_MESSAGE mode.

### Step 3. I/O Tests

The controller must be configured using the Excel 10 E-Vision PC configuration tool. Once this is done, the W7753A can be commanded to MANUAL mode, and each output can be exercised/viewed to verify proper wiring connections and equipment operation. See the Excel 10 E-Vision Users Guide form, 74-2588 for details on configuring and testing W7753A Controllers.

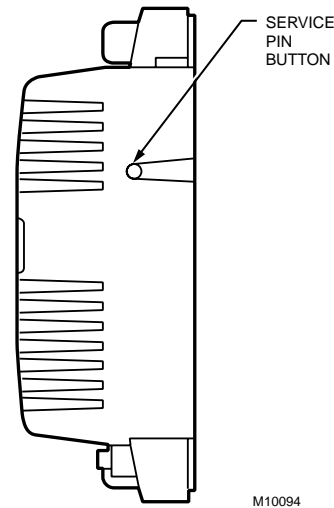


Fig. 16. Location of the Service Pin Button.

### Step 4. Verify Sequences of Operation

For the detailed descriptions of the sequences of operation, see the Excel 10 Unit Ventilator System Engineering form, 74-2964 Appendix B.

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