

E528 Smart Digital Thermostat Product Guide

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Overview and General Concepts

INNCOM's e4 Smart Digital Thermostat is a powerful, multi-purpose Direct Digital Control (DDC) device that can control virtually any HVAC system found in hotel guestrooms.

The three e4 models meet different application requirements. The e528 and e527 are wired and are typically used for new installation. The e529 is battery-powered and is designed to meet the needs of existing properties where rewiring is not practicable.

This document describes Model e528; information on the e529 and e527 can be found in their respective product guides.



Figure 1. E528 Digital Thermostat

Application

In its most basic form, the e528 functions as a programmable DDC thermostat, automatically adjusting fan speeds and valves to achieve set temperature (**Note:** Guests can manually select heat or cool by pressing the OFF/AUTO button and cycling through OFF, AUTO, HEAT and COOL). The e528 is also an "intelligent" device capable of linking ancillary sensors and serving as an information gateway. For example, coupled with a magnetic door switch (wired or wireless), motion detectors, and other devices, the e528 becomes the brain of a highly effective Energy Management System (EMS) application, communicating EMS information requirements to central servers. It comes standard with five relays and can be equipped with an on-board Infrared (IR) or radio frequency (RF) transceiver and Passive Infrared (PIR) motion detector.

The e528 interfaces with all common HVAC unit voltage configurations (24 volt to 277 volt). The e528 can be installed in a wired or wireless INNCOM guestroom control system, which makes installation feasible and affordable in either new construction or retrofit installations.

Through interfaces with other devices and sensors, the e528 supports the following functions:

Remote HVAC control

- Guestroom HVAC diagnostics
- Remote room occupancy indication
- Automatic lighting control
- Remote mini-bar access reporting
- Remote smoke detector annunciation
- Central Electronic Lock control
- Humidity control
- Remote drape control
- Outside temperature display
- Peak demand load shedding
- Property/Building Management System (PMS/BMS) interface

A centrally controlled EMS package is created when the e528 is connected to the property's Central Interface Network (CINET) with a pair of low voltage wires or by the property's high-speed TCP/IP network with the addition of a TCT (an Ethernet gateway device). RF networking is possible with radio equipped models.

The e528 features a guest-friendly graphic interface with intuitive controls (Figure 2). A user guide for the e528, written primarily for installers and facility management personnel, is available (see References below).

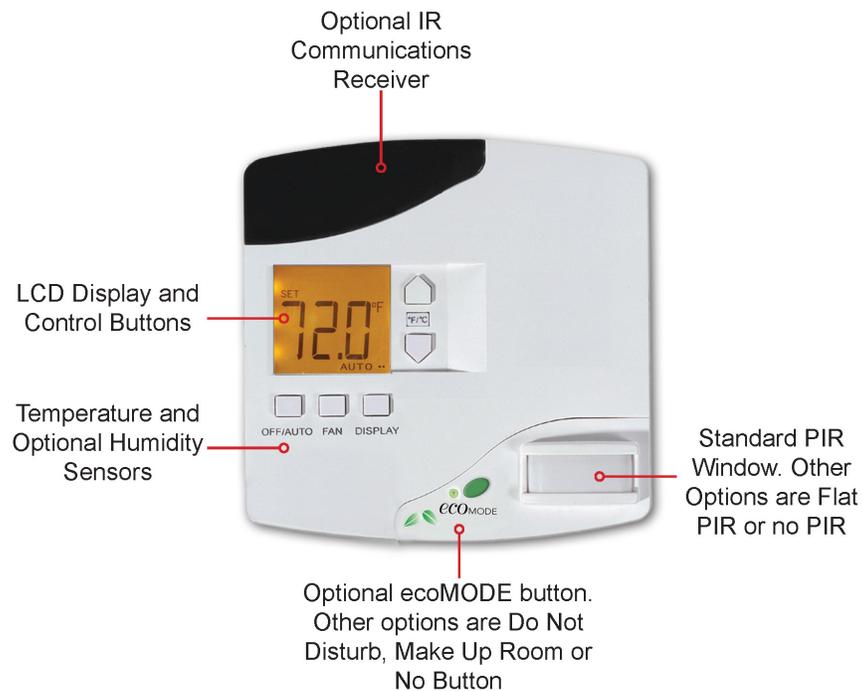


Figure 2. E528 Graphic Interface

Wireless Communication

2.4GHz Wireless RF

Table 1 e528 RF Characteristics

Performance	0dB	20dB
RF Data Rate	250kbps	250kbps
Antenna Type	SMT	SMT
Indoor Range	70ft	100ft+
Outdoor/RF line-of-site range	540ft	1000ft+
Transmit Power	1mW	10mW
Receive Sensitivity	-94.6dBm	-94.6dBm
Frequency Band	2.4GHz	2.4GHz
Encryption	AES-128	AES-128
Protocol	802.15.4	802.15.4
Frequency Channels	11-26	11-26

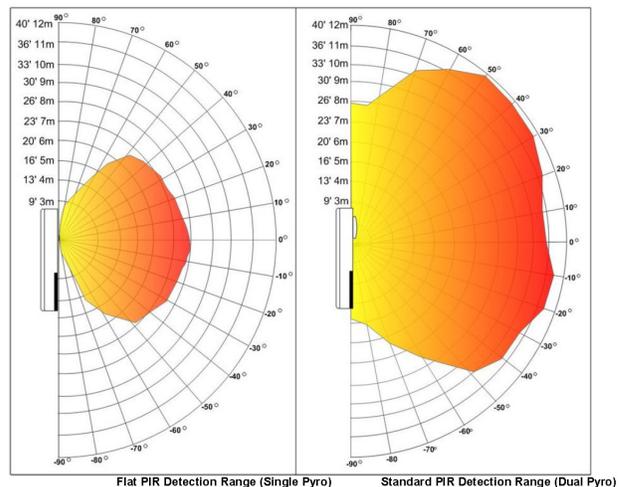
Installation Requirements

Location: The e528 must be located on a partitioning interior wall, approximately 1.5 m (5 ft) above the floor, in a site of average temperature. It is important to ensure that the thermostat is located away from direct sunlight or radiant heat, air discharge grills, stairwells, outside doors, steam or water pipes, warm air stacks, unheated/uncooled areas, or sources of electrical or radio interference. The unit should not be placed on an outside wall or behind a door. It is essential that the e4 is mounted flush to the wall and mounted level in both the horizontal and vertical planes; incorrect mounting can degrade IR, PIR, and temperature measurement performance.

Installation Requirements for e4 equipped with PIR Motion Detection

The e4 thermostat can be equipped with a PIR detector to augment the energy management scheme by detecting motion in the guestroom. Consider the PIR's view angle, range characteristics, and mounting position to ensure proper coverage. Figure 3 below shows the ranges of the flat and standard PIRs.

Figure 3. PIR Detection Ranges



Mounting

The e528 is usually mounted on a standard double-gang (4 x 4) junction box. If mounted on a single-gang box, the left side (display side) of the e528 overlaps the wall area to the left of the junction box. A low-voltage mounting plate, mud ring, or low-voltage caddy may be used for mounting 24 volt applications.

To mount the e528:

1. Remove the two small screws at the base of the e528.
2. Pull the bottom of the back-mounting plate slightly away from the front housing and then pull the back-mounting plate down.
3. Position the back plate insulator within the mounting plate as shown in Figure 4.
4. At this point, the e528 is ready to be mounted to the wall using the mounting screws provided with the raised

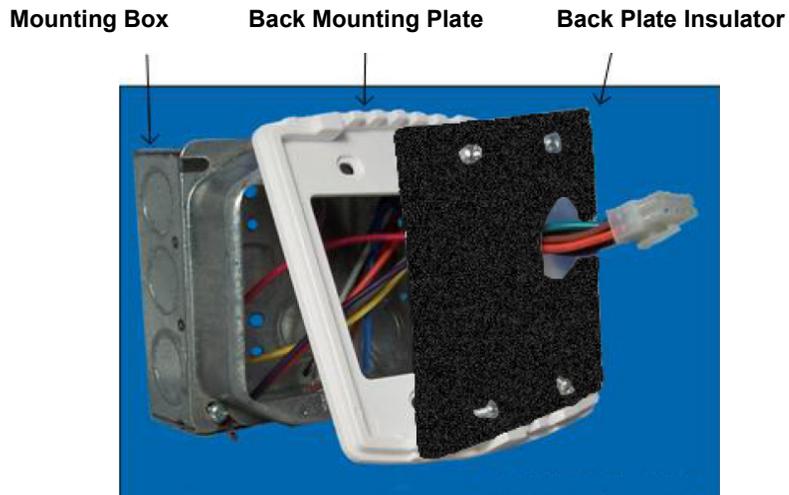
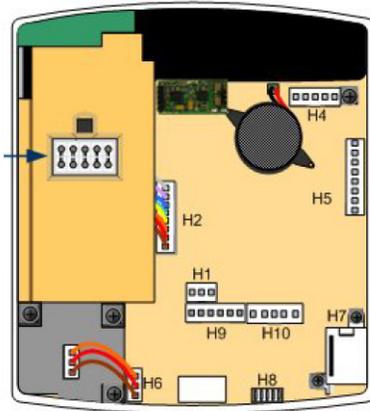


Figure 4 Mounting Assembly

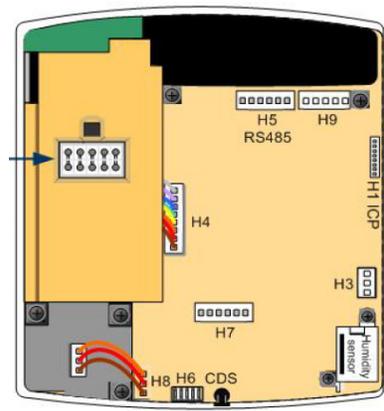
To simplify installing and removing the e528, the headers and sockets described below and shown in Figure 5 are located on the back of the e528. These accept pre-made wiring harnesses provided by INNCOM. **(Note:** Take care to note which e528 model is being used. Each model has slightly changed headers and connectors as identified in the drawings on the next page.)

E528 3G headers



10-pin Molex Socket Accepts the 10 pin Molex plug pre-wired with 8" color-coded leads. Connect to the HVAC unit's power, fan and valve signals.

E528 4G headers



10-pin Molex Socket Accepts the 10 pin Molex plug pre-wired with 8" color-coded leads. Connect to the HVAC unit's power, fan and valve signals.

- H1 – External Temperature Control Sensor
- H2 – Power Input
- H4 – IR Eye 5
- H5 – Microprocessor Programming
- H6 – PIR Sensor
- H7 – Humidity Sensor
- H8 – ES1 Key
- H9 – Low Voltage Comm/Device Connection
- H10 – RF Programming

- H1 – Microprocessor Programming
- H3 – External Temperature Control Sensor
- H4 – Power Input
- H5 – RS485 Network
- H6 – ES1 Key
- H7 – Low Voltage Comm/Device Connection
- H8 – PIR
- H9 – IR Eye 5

Input/Output

The I/O headers for the e528.3G* and 4G* thermostats are substantially different (see Figure 5 above). The statements and table below detail only the headers that differ in function.

Low Voltage comm / device connector: This header accepts the provided 6-pin harness used to connect low voltage communication, door/window position switch, and other room devices to the e528. Table 3 shows pinout and function for the 3G and 4G. For specifics, refer to the as-built wiring diagrams.

** "3G," and "4G" are internal INNCOM product designations used for convenience to differentiate individual hardware configurations. No difference in device capability or effectiveness is implied. Due to end-of-life for certain 3G components, the e528.4G is now the standard INNCOM install, but 3G installations are still supported.*

Table 3. E528 3G/4G Low Voltage Harness (P/N 62-1467) Pinout

Wire Color	Female Connector	Male Connector	Function	Comment
Brown	1	1	Common	GND
Red	2	2	12VDC Out/In	12VDC Supply
Orange	3	3	S5Bus Data Tx/RX or IN 2	Communication Bus
Yellow	4	4	IN 1	Door, Window, PIR, Other
Green	5	5	CNET B	RS485 Twisted Pair
Blue	6	6	CNET A	RS485 Twisted Pair

External temperature control sensor: This header accepts the wiring harness from an external temperature probe that can be used to supply the e528 with remote temperature measurements. The e528 uses a 10K 1% thermistor for external temperature measurement. This external temperature sensor can be used to monitor room temperature at a different location from where the e528 is mounted or to monitor pipe water temperature.

RS485 Networks: (refer to Figure 5)

E528.3G cannot act as the media gateway for in-room traffic towards the RS485 network. The most common way to connect the e528.3G is to connect a PC-485.S5 (P/N: 01-9905) on the S5bus.

E528.4G to 2G RS485 Networked Application: with or without door switch input (See Figure 6)

- Using the adapter (P/N 203-251), connect the harness from the wall box (P/N 62-1462) previously connected to the thermostat being replaced to H1 of the adapter.
- Connect the harness H3 (rainbow) of 203-251 to the low voltage comm/device connection of the e528.4G
- Connect the harness H2 (black) of 203-251 to the RS485 header of the e528.4G

NOTE: Take care to not reverse the connections to the e528.4G!

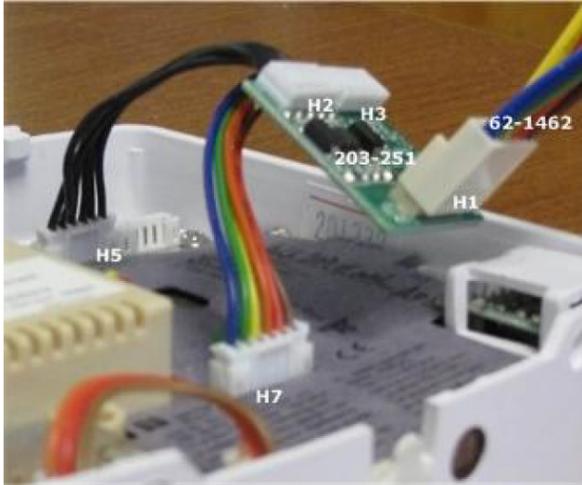


Figure 6. 4G to 2G RS485 Networked Application

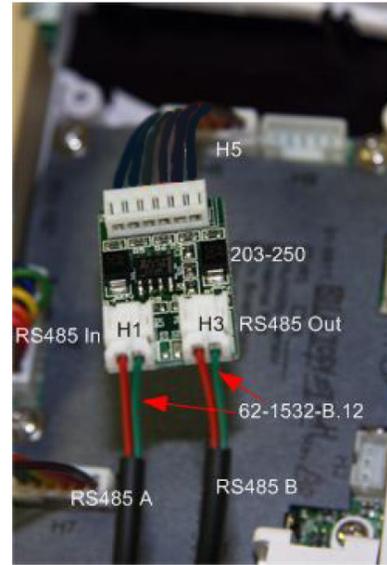


Figure 7. E527 4G New RS485 Networked Application

E528.4G New Installation

Stand alone application with/without door switch input

- Using the harness (P/N 62-1467), make the appropriate wire connections, then plug the harness into the low voltage comm/device connection of the e528.4G

RS485 Networked Application with/without door switch input (See Figure 7)

- Using the harness (P/N 62-1467), make the appropriate wire connections, then plug the harness into the low voltage comm/device connection of the e528.4G.
- Using the adapter (P/N 203-250) and P/N 62-1532-B.12 cables, connect the RS485 A pair to the two pin
- RS485 In header and the RS485 B pair going to the next thermostat to RS485 Out header on the 203-250.
- Connect the harness of 203-250 to the RS485 network header of the e528.4G.

The e528.4G can be used to retrofit an application where a legacy e528 was used. Follow the procedure below:

4G to 2G Standalone application: with/without door switch input (no backhaul network)

- Using the adapter (P/N 203-013) connect the harness from the wall box (P/N 62-1462) previously connected to the thermostat being replaced to H1 of the adapter (see Figure 8).
- Connect the harness of 203-013 to the low voltage comm/device connection of the e528.4G.

Molex 10-position female socket: This female socket accepts the provided 10-pin Molex connector pre-wired with 8-inch, color-coded wiring leads. These leads should be connected to the 24VAC or 100–277VAC power, valve/fan control wiring from the FCU, or other HVAC device with wire nuts inside the wall junction box in accordance with the wiring diagram provided by INNCOM.

Note: For installations in which all leads are not required, the extraneous leads should be cut off at the Molex connector.

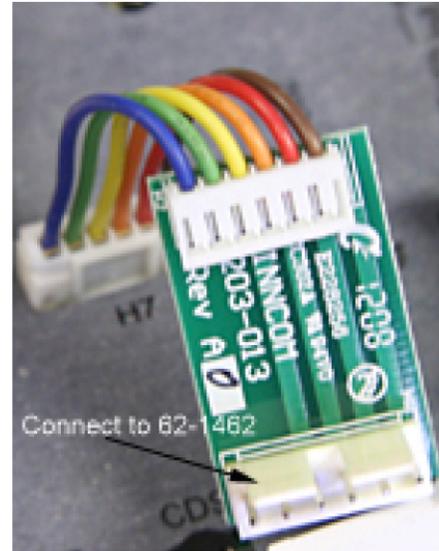


Figure 8 shows the pinout for the 10-position Molex male connector supplied with all relay output models of the thermostat. The end view of the male connector from the wire insertion side with the pin numbers is indicated. This is the same as looking at the female connector point on the back of the e528.

Typical functions for each wire are listed in Tables 4 and 5. For specifics, refer to the as-built wiring diagrams.

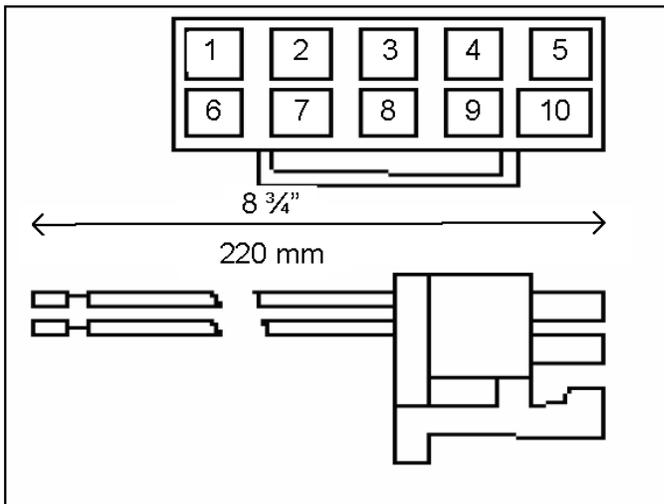


Figure 8 E528.4G to 2G standalone application

Table 4. 24VAC Harness Color Code, Pinout, and Typical Functions
24VAC Harness

Pin	Color	Typical Function
1	Green	Ground
2	Red	24VAC
3	Black	Common
4	Blue	High Fan
5	Brown	Medium Fan or Second Stage Heat
6	Yellow	Cold Water Valve (FCU) or Compressor Signal (Heat Pump)
7	White	Hot Water Valve (FCU) or Reversing Valve (Heat Pump)
8	Grey	Valve Power
9	Violet	Fan Power
10	Orange	Low Fan

Table 5. 100-277VAC Harness Color Code, Pinout, and Typical Functions

100-277VAC Harness

Pin	Color	Typical Function
1	Green	Ground
2	Black	Line
3	White	Neutral
4	Yellow	High Fan
5	Orange	Medium Fan or Second Stage Heat
6	Red	Cold Water Valve (FCU) or Compressor Signal (Heat Pump)
7	Brown	Hot Water Valve (FCU) or Reversing Valve (Heat Pump)
8	Grey	Valve Power
9	Violet	Fan Power
10	Blue	Low Fan

Wiring

The steps below provide an overview of the wiring process. Refer to the as-built wiring diagrams provided for exact details.

1. If applicable, use wire nuts to connect the 6-pin low-voltage harness wires to the applicable low-voltage communication (if e528 is part of a wired

RS485 centrally controlled system), door/window switch, or external PIR wiring within the electrical box (Figure 8). Plug the 6-pin low voltage harness onto the e528 low voltage comm. / device connection header.

2. Use wire nuts to connect the 10-pin Molex wiring harness to the power and valve/fan control signal wires within the electrical box.
3. Plug the pre-wired 10-pin connector into the female receptacle at the back of the e528.
4. Hook the tabs at the top rear of the e528 housing into the matching depressions at the top of the mounting plate and rotate the bottom of the housing toward the wall until it snaps into place on the mounting plate.
5. Secure the housing to the mounting plate with the two small screws removed in Step 1 of the **Mounting** section.
6. Apply power to the e528 by closing the applicable supply breaker. Verify that the e528 powers up. Several values should begin appearing on the LCD display.
7. Once installed and connected to power, the e528 Digital Thermostat typically requires some configuration, specifically:
 - If installing the e528 as part of a networked, centrally controlled EMS, a unique network address must be assigned to the e528. This is done by entering Service Parameter mode on the e528 and changing the values of Parameters 10, 11, and 12, which hold the 5-digit network address of the e528. This 5-digit number is typically the room number in most applications. A “Room List” document is typically available that lists all rooms and the associated values to set into Parameters 10, 11, and 12. Refer to Reference A, Section 5.1, for complete instructions for setting the e528 network address.
 - If the particular HVAC equipment installed was not known when the e528 was shipped, the fan and heat/cool control outputs of the e528 must be configured to correctly operate the installed HVAC equipment. Setting the appropriate HVAC control parameters of the e528 to the required values and resetting the device reconfigures the e528 to properly control most HVAC units. Refer to Reference A, Section 5.2, for instructions on changing the e528 HVAC related parameters.

NOTE: If installing 01-9560 64K memory e528 Digital Thermostats, be aware that these devices support the INNCOM ES-1 Flash Memory Module. The ES-1 provides the ability to copy HVAC related parameter settings from a “golden” e528 that has previously been installed in a room and had its HVAC related parameters set correctly and verified operationally with the HVAC equipment.

Once these settings are copied to the ES-1 module, plugging the ES-1 into a new thermostat automatically uploads the settings.

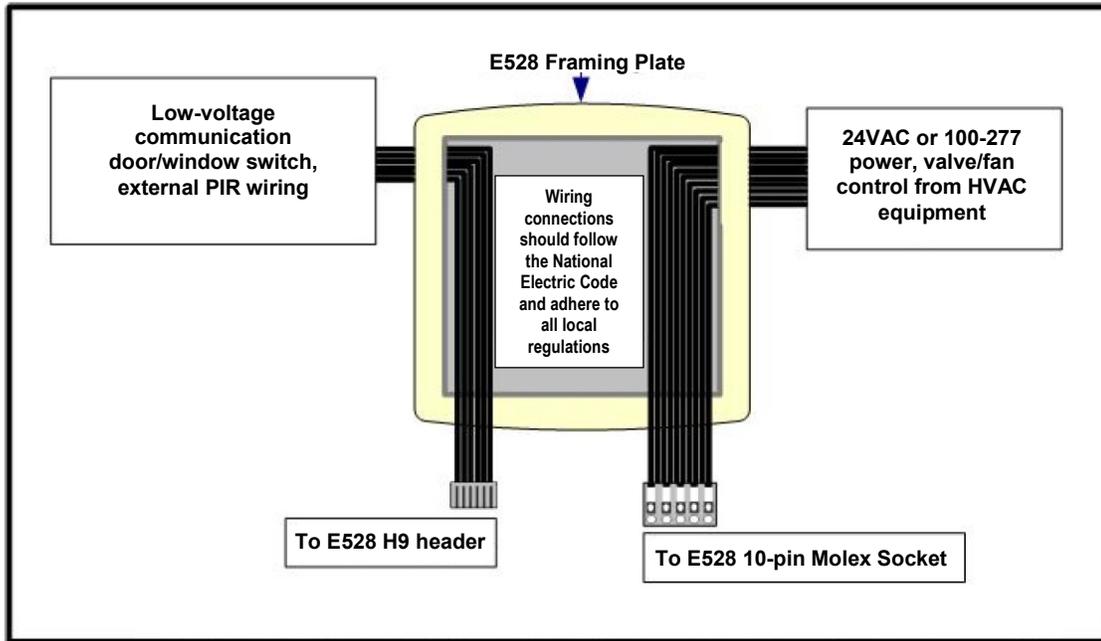


Figure 10 Electrical Box Connections Line and Low Voltage

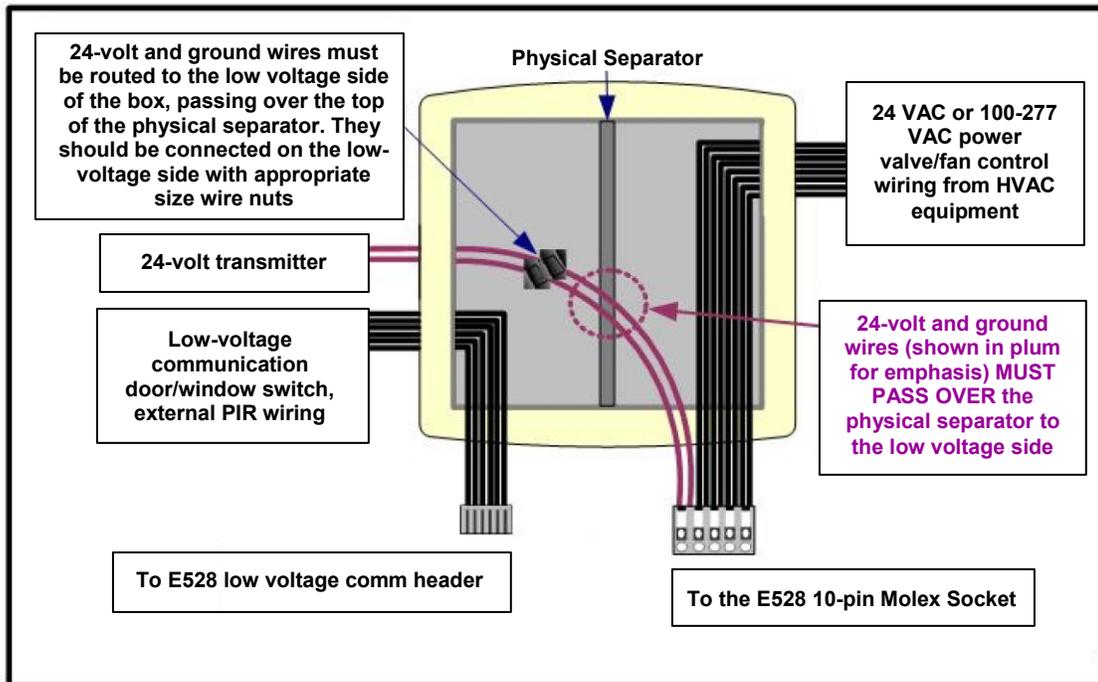


Figure 11. Electrical Box Connections 24VAC

Load Specifications

The following load specification table (Table 6) describes the submitted load characteristics for testing and UL certification of UL 873. The device complies with the requirements of CAN/CSA C22.2 No. 24-93.

Table 6. Load Specifications

Model	e528-A2L2-IOP0-00WH	e528-A3L2-IOP0-00WH	e528-A1L2-IOP0-00WH	e528-B0L2-IOP0-00WH	e528-C0L2-IOP0-00WH	e528-B1L2-IOP0-00WH
Voltage	24VAC	24VAC	24VAC	100-240VAC	220-277VAC	100-277VAC
Heat Relay K4-5	3 amps 125-277VAC General purpose	3 amps 125-277VAC General purpose	24 VA PD	24 VA PD	24 VA PD	3 amps 125-277VAC General purpose
Cool Relay K4-5	3 amps 125-277VAC General purpose	3 amps 125-277VAC General purpose	24 VA PD	24 VA PD	24 VA PD	3 amps 125-277VAC General purpose
High Fan Relay K1	3 amps 125-277VAC General purpose	3 amps 125-277VAC General purpose	2.2 LLA 13.2 LRA	2.2 LLA 13.2 LRA	2.2 LLA 13.2 LRA	2.2 LLA 13.2 LRA
Medium Fan Relay K2-3	3 amps 125-277VAC General purpose	3 amps 125-277VAC General purpose	2.2 LLA 13.2 LRA	2.2 LLA 13.2 LRA	2.2 LLA 13.2 LRA	2.2 LLA 13.2 LRA
Low Fan Relay K2-3	3 amps 125-277VAC General purpose	3 amps 125-277VAC General purpose	2.2 LLA 13.2 LRA	2.2 LLA 13.2 LRA	2.2 LLA 13.2 LRA	2.2 LLA 13.2 LRA

MFCC ID: GTC202150TXR, or GTC202152TXR

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IC ID: 1609A-202150TXR, or 1609A-202152TXR

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Technical Specifications

Table 7. Technical Specifications

Power Requirements	24 VAC at 50/60 Hz, 24 VDC nominal, 2.4 VA (e528-3xx/7xx and e528-4xx) 100 to 277 VAC at 50/60 Hz, 2.4 VA (e528-8xx)
Relay Contact Rating	See Table 4.
Triac Relay Contact Rating	50 m at minimum, 250 m at maximum (e528-4xx)
Recommended Wire Size	18 gauge
Thermostat Measurement Range	33 to 99 degrees F (1 to 37 degrees C)
Outdoor Air Temperature	0 to 99 degrees F (-18 to 37 degrees C)
Display Resolution	Whole degree F, 0.5 degree C (0.1 degree F in test mode)
Degrees C/Degrees F Display	Toggle Button located on front display
Standard Deadband	2 degrees F (1 degree C) between heating and cooling
Ambient Operating	41 to 149 degrees F (5 to 65 degrees C), 0-95% RH noncondensing
Ambient Storage	33 to 149 degrees F (1 to 65 degrees C)
Dimensions	(H x W x D) 4.7 x 4.7 x 1.2 in. (120 x 120 x 30 mm)
Shipping Weight	0.6 lb (0.27 kg)
Approvals	L listed #873, CAN/CSA C22.2 No. 24-93 File #E202540/Part 15 of the FCC Rules
RF Specifications	See TXT RF Product Guide

Document Revision History

REVISION	DATE ISSUED	REASON FOR CHANGE
First issue	26-Apr-2006	
v1	30-Jul-2007	Reformatted for consistency with other product guides. Information about the other e4 models added to the Overview section. Information on all ordering options and new features added to the Ordering section.
v2	Not issued	Product photos updated. Part number corrected. Figure 3 redrawn.
v3	27-Jun-2008	New Figure 2 added (PIR range figures) and figure numbers changed to accommodate the added figure.
v4	30-Jun-2008	Switched to new document format.
v5	30-Jun-2008	Error in Figure 4 corrected; font discrepancies corrected.
v6	18-Feb-2010	Reformatted to new template, RF data updated
v6.1	22-Apr-2010	OP/N rewritten to include old scheme; photos updated.
v6.2	28-Oct-2010	Added 3G pinout note
v7.0	05-Apr-2012	Added 4G information
v7.1	18-Dec-2012	Revised FCC/IC statements
v7.2	12-Feb-2013	Removed ordering information
V7.3	10-Feb-2014	Updated connector photos
V8	15-Dec-2016	Reformat to HON branding. Remove G2 Legacy info

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