HONEYWELL TECHNICAL TRAINING PROGRAM

Core
Technical Training

Part 1 - HVAC

Study guide

CONTENTS

Product Number Note:

INNtool is a ordering/configuration application available from INNCOM. The INNtool should be used when ordering a new project, but it is important to understand the part numbering logic associated with each component. This guide describes part numbering for training purposes on part number logic only. **ALWAYS refer to the latest product order guide** and/or INNtool when ordering devices.

SECTION 100   HVAC AND EMS SYSTEM COMPONENTS

This section describes INNCOM's HVAC and EMS (Energy Management System) components. The INNCOM product line has 4 main types of thermostats with numerous options available for each type.

1. The **E528.4G** Smart Digital Thermostat is INNCOM's top selling model and features a modular design with power supply options from 24VAC to 277VAC. The most popular option has 5 built in relays for outputs to heat, cool, and 3 fan speeds and is ideal for direct control of fan coil units and PTACs.

2. The **E529.4G** Battery Powered thermostat is popular for existing buildings where it would be difficult to pull power and/or communication wires to a desired thermostat location. The battery powered thermostat requires a separate relay pack to control the HVAC unit because the thermostat acts as a wireless remote control. The thermostat and relay pack communicate to each other via Radio Frequency (RF) by means of a PC502 RF transceiver.

3. The **E527.4G** is a low profile thermostat designed to fit a European style electrical box (86mm x 86mm) or an American standard double gang box using an adapter back plate. The E527.4G requires a separate relay pack and is powered by 12VDC. The relay pack is connected to the E527.4G via low voltage wiring for communication and power (S5Bus).

4. The **MODEVA™** designer glass series thermostats have a sleek capacitive touch glass surface and are available in US gang horizontal, US gang vertical and British gang versions. This line of thermostats requires a separate relay pack and is powered by 12VDC. The relay pack is connected directly to the MODEVA thermostat via low voltage wiring for communication and power (S5Bus).

INNCOM EMS components consist of motion detectors, entry door and window/balcony switches. Both wired and wireless versions of each component are available. Through interfaces with other devices and sensors while on a networked system, the INNCOM thermostat family supports the following functions:

*   Remote HVAC control and diagnostics

*   Room occupancy indication

*   Remote smoke detector annunciation

*   Central Electronic Lock (CELS) network

*   Dehumidification

*   Outside temperature display

*   Peak demand load shedding

*   Property/Building Management System (PMS/BMS) interface

*   Mini-bar status reporting

100.1 E528.4G SMART DIGITAL THERMOSTAT

100.1.1   E528.4G DESCRIPTION

The E528.4G is an intelligent configurable thermostat and is a core member of INNCOM's Integrated Room Automation System (IRAS). The E528.4G is built around a Direct Digital Control (DDC) processor capable of controlling virtually any fan coil unit, heat pump or packaged terminal air conditioner found in guestrooms. The E528.4G includes an easy to read illuminated liquid crystal display and five built-in relays. It is equipped with an on-board radio frequency (RF) transceiver and can be equipped with a passive infrared occupancy sensor (PIR), humidity sensor, outside temperature display, and the award winning, patented ecoMODE® green button.

The E528.4G can be installed as a standalone thermostat or as part of a wired or wireless guestroom control system. When coupled with ancillary devices such as a magnetic door switch, motion detectors, and other devices, the E528.4G becomes the brain of an Integrated Room Automation System (IRAS) and acts as a highly effective local Energy Management System (EMS). In turn the E528.4G can communicate with a Central EMS Server for expanded EMS applications. The E528.4G model supports all common HVAC unit voltage configurations from 24 volts to 277 volts. Refer to the latest E528 Product Guide for specifications.

100.2 E7 DDC THERMOSTAT

100.2.1 E7 DESCRIPTION

The INNCOM E7 Thermostat is a direct digital control programmable thermostat that is the newest member of the INNCOM smart thermostat. This next generation thermostat offers simple solutions that reduce complexity in most HVAC applications. It is the main component of the INNCOM technology enabling platform that provides integrations with more third party technologies which range from property management systems to in-room voice control. The INNCOM E7 thermostat also provides real-time and trended data, when deployed in a networked application, for INNcontrol™3 to furnish room status, energy management, equipment alarm reporting, integration to PMS, BMS and other systems, allows the property to proactively manage the environment to ensure the most satisfying in-room experience.

100.3 E7W WIRELESS THERMOSTAT

The E7W combined with a PC502 and an X47 Relay Module delivers comfort, convenience, and energy savings in a quick install wireless design.

The E7W is battery powered and therefore ideal for certain installations, especially retrofitted in pre-existing properties. The E7W is built around a Direct Digital Control (DDC) processor capable of controlling virtually any fan coil unit, heat pump or packaged terminal air conditioner found in guestrooms. The E7W includes an easy to read display and an onboard radio frequency (RF) transceiver The E7W IS equipped with an on-board passive infrared occupancy sensor (PIR), an optional humidity sensor and outside temperature display

100.4 E527.4G SMART DIGITAL THERMOSTAT

100.4.1 E527.4G DESCRIPTION

INNCOM's E527.4G Smart Digital Thermostat is a powerful, multi-purpose Direct Digital Control (DDC) device. It is designed to control virtually any HVAC system found in hotel guestrooms. The E527.4G is a sleek, low-profile device that has been designed specifically on a smaller scale to meet the needs of properties using a British single-gang electrical box. The E527.4G has an optional mounting plate that is used for American double-gang box assembly. The E527.4G does not have local relays for HVAC controls so it is always paired with an INNCOM HVAC controller/relay pack.

In its most basic form, the E527.4G functions as a programmable DDC thermostat, automatically adjusting fan speeds and valves to achieve set temperature. The E527.4G is also an "intelligent" device capable of linking sensors and performing information gateway functions. For example, in an Energy Management System (EMS) application, the E527.4G monitors door switches and motion detectors and communicates with central servers to fill EMS information requirements. It can be equipped with a humidity sensor and/or a sleek, low-profile Passive Infrared (PIR) motion detector. Coupled with a magnetic door switch (wired or wireless), the E527.4G becomes the brain of a highly effective EMS. The E527.4G is also equipped with an RF radio. Refer to the latest E527 Product Guide for specifications.

When combined with the appropriate INNCOM relay controller, the E527.4G can interface with all common HVAC unit voltage configurations (24-277-volt) and can be installed as part of a networked EMS system.

100.5 E529.4G SMART DIGITAL THERMOSTAT

100.5.1 E529.4G DESCRIPTION

PC502

X47

E529.4G

The E529.4G is an intelligent configurable thermostat and is a core member of INNCOM's Integrated Room Automation System (IRAS). The E529.4G is battery powered and therefore ideal for certain installations, especially retrofitted in pre-existing properties. The E529.4G is built around a Direct Digital Control (DDC) processor capable of controlling virtually any fan coil unit, heat pump or packaged terminal air conditioner found in guestrooms. The E529.4G includes an easy to read illuminated liquid crystal display and an onboard radio frequency (RF) transceiver A separate X47 relay pack along with a PC502 RF transceiver is required for HVAC control. The E529.4G may also be equipped with an on-board passive infrared occupancy sensor (PIR), humidity sensor, outside temperature display, and the award winning, patented ecoMODE® green button.

The E529.4G can be used in standalone applications or with an Integrated Room Automation System (IRAS). When coupled with devices such as a magnetic door switch, motion detectors, and other devices, the E529.4G system becomes a highly effective local Energy Management System (EMS).

100.6 MODEVA™ GLASS SERIES THERMOSTAT

100.6.1 MODEVA™ THERMOSTAT DESCRIPTION

MODEVA Thermostat

X47
(Alternative X05B/X06
not shown)

RT1
Remote Temperature
Probe
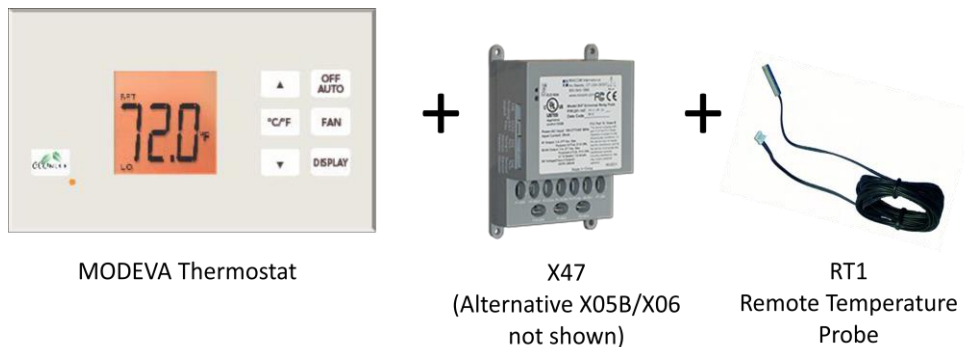
The MODEVA™ thermostat is an elegantly designed and easy to use guest interface system for controlling temperature. The user interface features a backlit, capacitive glass surface. This thermostat is available in both a

horizontal and vertical orientation for American gang boxes. A single orientation British gang version is also available.

The MODEVA™ thermostat functions as a low voltage programmable DDC thermostat controller, automatically adjusting fan speeds and valves to achieve set temperature. The MODEVA™ thermostat is also an intelligent device capable of linking sensors and performing information gateway functions. For example, in a networked Energy Management System (EMS) application, the MODEVA™ thermostat monitors door switches and motion detectors and communicates with a central server.

When combined with the appropriate INNCOM relay controller, the MODEVA™ thermostat can interface with all common HVAC unit voltage configurations (24-277-volt). The MODEVA™ thermostat should be thought of as a control pad and it cannot directly control an HVAC unit without the additional relay controller component. The **MODEVA™ thermostat does NOT have an on-board temperature probe**. A wired or wires room temperature probe is required with all MODEVA™ thermostats in order to detect room temperature. With the addition of RF or RS485 components, the MODEVA™ thermostat can also be part of a networked EMS system.

100.6.2 MODEVA™ THERMOSTAT ORDERING INFORMATION

This image is a sample part number for a MODEVA™ thermostat The MODEVA™ order guide describes the details of each part number. Always reference the latest order guide when translating part numbers.
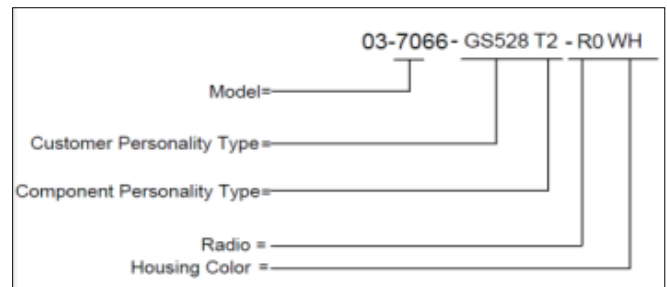
Ordering Example:

03-7066-GS528T2-R0WH = An American Single Gang Vertical MODEVA™ Thermostat, Sample Customer Personality, without a 2.4 GHz RF transceiver, on a standard white frame.

NOTE: This assembly requires the use of a metal mounting bracket PN 251-104. The American Gang MODEVA™ Thermostat equipment is not compatible with the WBI Actuator System. They are available with on-board Low-Voltage Adapters (LVA) only. No need to order the LVA separately.

Customer Personality Type

The personality code must always be 5 characters long.
The customer personality of the MODEVA™ System controller defines the customized functionality of the MODEVA™ System Controller, more specifically:
- This corresponds with the model in the switch matrix drawings
- The software configuration
- The switch silk screen / artwork
- The location of the MODEVA™ System Controller within the guestroom

Component Personality Type

This table shows the values for the thermostat component personality type.

CODE	Description
T1	Standard British MODEVA™ Thermostat
T2	Standard American MODEVA™ **Vertical** Thermostat
T3	Standard American MODEVA™ **Horizontal** Thermostat

Radio Options

This character set defines the RF radio options available.

CODE	Description
R0	An RF radio is NOT available on the MODEVA™ thermostats

Color

This character set defines the outer plastic housing color (NOT printed glass artwork).

100.7 X47 SERIES OF HVAC CONTROL MODULES

The X47 provides five relay outputs used to control a variety of loads, such as fan coil units, pilot duty, and light duty lighting and drape motor loads. This device may be ordered to control line voltage (110-277 VAC) or low voltage (24VAC). The relays are accessed via blade connectors for the line voltage version and via a 10 pin molex connector for 24 VAC. The X47 also has plugs or headers for low voltage communication and control signals. The X47 can integrate with and receive data from multiple points throughout the room automation system using wired communication (S5bus) or wireless RF communication with the addition of a PC502. It is typically the HVAC controller of choice when the thermostat application requires an additional relay pack for HVAC controls because the X47 has an integrated 12 vdc transformer. This means the X47 can provide power to the MODEVA™ and E527.4G thermostats without the need for an additional 12vdc power supply. Refer to the product guide for specific relay ratings.

This device is a backwards compatible replacement for the obsolete X07.

100.8 X05R HVAC CONTROL MODULES

The X05R is a customizable DIN rail mountable relay device. When used to control HVAC, the X05R receives signals from an INNCOM thermostat (except the E529.4G) via S5Bus to switch a wide variety of loads for many different applications. The X05R has a small footprint and provides eight 15A relays (120–240VAC) sharing a single common for every two relays. The top and bottom housings protect the internal circuitry and provide DIN rail mounting capability. This product requires an external 12VDC power supply, typically the PS564.DIN.

Since the X05R requires an additional power supply and does not have any inputs, it is not typically used in a standard HVAC control environment. The X47 would be used in these standard cases. However, if the HVAC unit requires more than 5 outputs or if the system designer wants to incorporate some basic lighting control along with HVAC control, the X05R provides the flexibility to satisfy these requirements. For example, if an FCU with floating valves requires a signal to both open AND close the valves, the X47 would not have enough relays for all the required signals. The X05R with its additional relays could be used in this scenario. See the latest X05R Product Guide for specifications.

100.9 X05B HVAC CONTROLLER CARD

The X05B general purpose logic board provides a variety of input/output functionality. As part of the guestroom EMS, the X05B receives control signals from an INNCOM thermostat (the X05B cannot be controlled directly by an E529.4G thermostat). The X05B logic board receives control signals from an E528.4G, E527.4G or MODEVA™ thermostat via the hardwired S5bus in-room communication bus, or wirelessly via RF with the addition of a PC502. The X05B is typically mounted on top of an X06 relay pack to transfer messages from a thermostat to the relays on the X06 board. The X05B is powered by 12VDC which is supplied by the X06 onboard transformer. The X05B may be powered via the S5 Bus or external 12 VDC power supply in applications where an X06 is not used. This device is typically used in cases where the X47 relays are not powerful enough to satisfy the requirements of the HVAC unit. See the latest X05B Product Guide for specifications.

100.10 X06 UNIVERSAL RELAY PACK

The X06 relay pack extends or expands Smart Digital Thermostat functionality for the INNCOM IRAS. When coupled with the X05B, it provides the logic and up to five 30A general purpose load switching controls for a variety of HVAC, lighting, and drape control applications. The X06 receives control signals from the logic board mounted on top, and opens and closes relays depending on the signal. This device is powered by line voltage and has an onboard transformer for supplying 12 VDC to the board mounted on top. It provides up to 5 relay outputs to switch a variety of load requirements. Each relay is rated for 30 amps up to 277 VAC. This device is screw mountable and is typically installed inside the HVAC unit. Refer to the X05-X06 Product Guide for specifications.

100.11 X06.DIN RELAY PACK

The X06.DIN is a customizable DIN rail mountable relay device. When used to control HVAC, the X06.DIN receives signals from an INNCOM thermostat (except the E529.4G) via S5Bus to switch a wide variety of loads for many different applications. The X06.DIN has a larger footprint than the X05R and provides a total of 5 relays rated up to 277VAC. Note: Voltage and Amp ratings for the relays depend on regional approval marks. Refer to the X06.DIN product guide for specifications. This product requires an external 12VDC power supply, typically the PS564.DIN.

The X06.DIN is typically used in scenarios where the relay specifications on the X05R do not meet the project needs AND where the X05B/X06 combination is undesirable. The X06.DIN being DIN rail mountable and having a plastic cover enclosing the circuit boards can make it preferable to the X05B/X06 in some cases despite the need for the additional 12vdc power supply.

100.12 EMS SYSTEM COMPONENTS

The E series thermostats have optional built-in EMS components. These built-in components, along with auxiliary EMS components and 3rd party PMS interfaces, are used to create the INNCOM energy management system. MODEVA™ thermostats do not have the same built-in options as the E-Series thermostats and therefore they must use at a minimum use an auxiliary motion detector for EMS functionality.

100.12.1 E SERIES THERMOSTATS - BUILT IN ENERGY MANAGEMENT COMPONENTS

The E527.4G, E528.4G and E529.4G thermostats are all available with built-in EMS components including a light sensor, a PIR motion detector and the ecoMode button. These options make it possible for some level of energy savings to be achieved by the thermostat alone. However, the best method for achieving energy savings is by adding in an entry door switch to the system. Additional monitoring of any window or balcony that exposes the room to outside air also increases the level of energy savings. The various EMS modes of operation and logic will be described in a later lesson.

Built in Energy Management Components

E-Series (E527.4G, E528.4G, E529.4G)

MODEVA™ Thermostat

Thermostat

Motion Sensor

ecoMode Button

Light Sensor

ecoMode
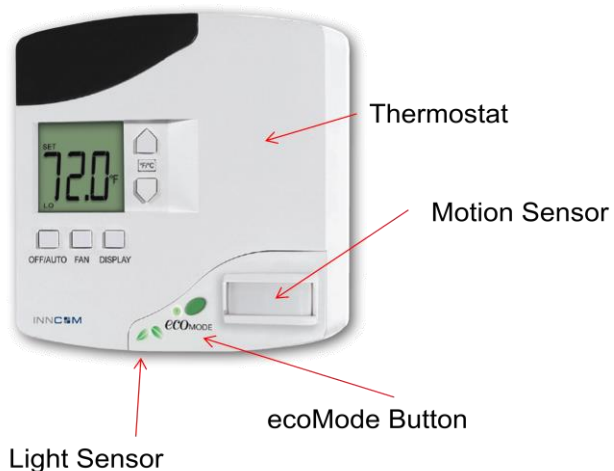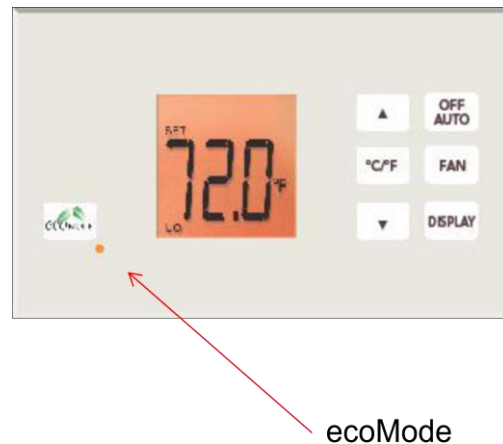
100.12.2 REMOTE MOTION SENSORS

Additional wired or wireless motion sensor can be added to the EMS System.

K594 Motion Detector
- Passive infrared (PIR) motion detector
- Wired connection
- Available as either a wall or ceiling mount

K594.RF Motion Detector
- Battery powered
- Passive infrared (PIR) motion detection
- Wireless RF communication.
- Surface mounted with a swiveling head to improve the view angle and motion detection range in hard to reach locations.

K595.RF Motion Detector
- Battery powered
- Passive infrared (PIR) motion detection
- Wireless RF communication
- Flush mounted
- Easy to install magnetic mounting design

100.12.3   DOOR SWITCHES

For the best possible EMS control the INNCOM guestroom control system should be combined with an entry door switch.

S241 Magnetic Door Switch – Hard wired contact
- Provides open/closed status of a door
- Can be used in combination with an S541.RF for wireless systems.

Surface Mounted Door Switches

Flush Mount Door Switches

S541.RF Wireless Door Switch/Transmitter Switch
- Used in conjunction with the S241 Door Switch
- RF wireless transmitter

S541.RTF Remote Temp/Humidity Probe
- **Same footprint and power as S541.RF, but no cable attached**
- **2 Flavors**
    - RT3 = Temperature Probe only
    - RT4 = Temperature and Humidity probe

CELS: Central Electronic Lock Interface – 3rd party lock interface

- Lock provides door position signal to thermostat
- Magnetic switch is not needed
- Interface will be detailed in a later section

SECTION 110   HVAC AND EMS ARCHITECHURE

This lesson describes a variety of the wiring and communication configurations that can be used with the INNCOM thermostats, relay controllers and EMS (Energy Management System) components. The scenarios described cover control of the most common HVAC types used for individual room control such as in a hotel guest room. These include the Packaged Terminal Air Conditioner (PTAC), the Packaged Terminal Heat Pump (PTHP), and 4 pipe and 2 pipe Fan Coil Units.

Note: INNCOM thermostats can be used without EMS in a strictly standalone HVAC control scenario, but this configuration is very rare. It is most common for INNCOM thermostats to be used with some level of EMS.

110.1 THERMOSTAT INSTALLATION

110.1.1   THERMOSTAT LOCATION

The INNCOM thermostats 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, un-heated/un-cooled 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 thermostat is mounted flush to the wall and mounted level in both the horizontal and vertical planes; incorrect mounting can degrade performance of the passive infrared (PIR) motion detection and temperature measurement.

110.1.2   THERMOSTAT MOUNTING

Mounting the E528.4G
The E528.4G 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 E528.4G 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.

1. Locate the screws included with the E528.4G.
2. Pull the bottom of the back-mounting plate slightly away from the front housing and then pull the back mounting plate down.
3. Attach the mounting plate to the junction box, using the mounting screws provided with the E528.4G. Ensure that the plate is mounted with the raised arrow pointing UP.
4. Pull the wiring through the foam insulator and attach the insulator to the back mounting plate
5. Attach the thermostat to the mounting at the top of the bracket first and then secure with two screws as indicated in the image on the right.
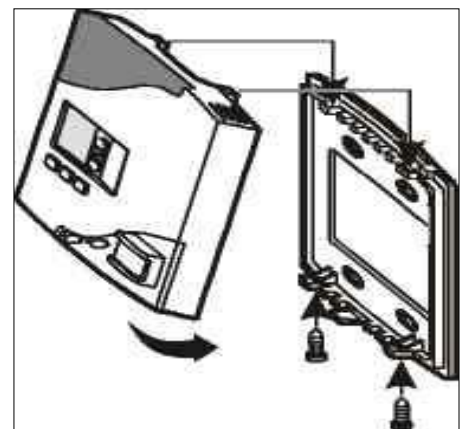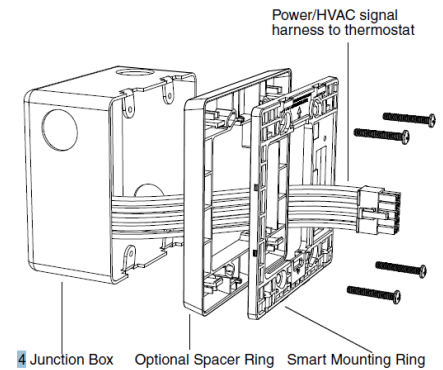

Mounting the E7
The E7 thermostat is typically mounted on a standard double-gang (4x4) junction box. The installation kit provides a Smart Wall Mounting Plate and an optional Spacer Ring. The optional Spacer Ring is only required when a standard double gang (4x4) junction box is not available, or when more space is required for wiring.

To mount the E7 complete the following steps.

1. Position the optional spacer ring (if used) and Smart Wall Mounting Plate as show in in Fig 1
2. Ensure the optional spacer ring (if used) and Smart Plate are oriented with the raised arrow pointing UP. Attach them to the junction box using the mounting screws provided
3. Use wire nuts to connect the Power and HVAC wiring harness to the power and valve/fan control signal wires within the electrical box. See the pre-defined commissioning document for the application-specific wire connection
4. To connect the unit to the input power and the relays to the loads, plug the pre-wired power and HVAC signal connector into the female receptacle at the back of the E7 (HI). When using mixed voltage, voltage separation must be maintained. Line voltage must reside in the left side of the gang box. Low voltage must reside in the right side of the gang box.
5. Hook the tabs at the top rear of the E7 housing into the matching depressions at the top of the Smart Mounting Plate and rotate the bottom of the housing toward the wall until it snaps into place
6. Secure the housing to the Smart Mounting Plate with the two small captive screws at the bottom of the housing.
7. Apply power to the E7 by closing the applicable supply breaker. Verify that the E7 powers up. Values should begin appearing on the LCD display

Mounting the E529

Since RF is critical to the e529.RF's operation, placement of the device and careful consideration of possible sources of interference are important. For instance, the unit should not be placed close to floor or ceiling or near pipe or other metal pieces.

1. Separate the E529.4G body and the mounting plate by pulling the bottom of the mounting plate away from the E529.4G body and then pull the mounting plate down.
2. Attach the mounting plate to the wall or electrical box with the arrow embossed on the mounting plate pointing upward.
3. Install the four AA alkaline batteries provided into the battery compartment.
4. Verify that the E529.4G display is now showing information.
5. Hook the tabs at the top rear of the E529.4G housing into the matching depressions.
6. Secure housing to the mounting plate with the two small screws.
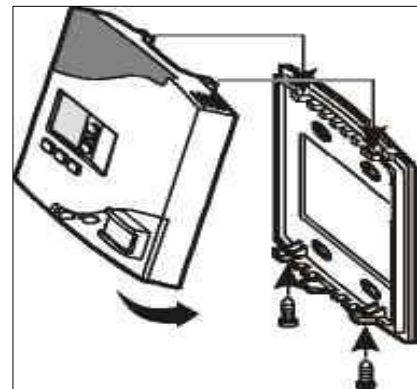
Mounting the E527.4G

The E527.4G is designed to be mounted on a standard British-style single-gang electrical box.
For use with an American box, the E527.4G can be installed in an optional frame by means of two screws.

1. Separate the E527.4G body and the mounting plate by pulling the bottom of the mounting plate away from the thermostat body and then pull the mounting plate down.
2. Attach the mounting plate to the wall or electrical box with the arrow embossed on the mounting plate pointing upward.
3. Attach the mounting plate to the junction box, using the mounting screws provided with the E527.4G.
4. Attach the E527.4G to the mounting plate by inserting the hooks into the top of the E527.4G and the two mounting screws provided.
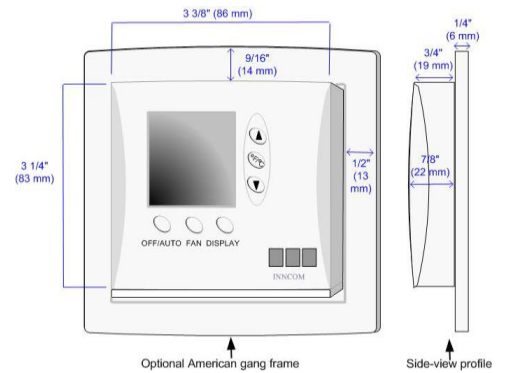

Mounting the MODEVA™ Thermostat

1. Attach the appropriate metal mounting bracket for the MODEVA Thermostat to the wall box using the 2 supplied screws. Note the arrows and the text "Top" indicating the orientation of the metal wall mounting bracket. Ensure the side with the text and the countersink screw holes is facing away from the wall. Loosely screw the bracket to the mounting posts—DO NOT OVER TIGHTEN SCREWS! Over tightening the screws will bend the mounting bracket, thereby preventing a flush installation of the MODEVA assembly. The image shows a load assembly that is used only with MODEVA™ light switches that are controlling a load. The "Load Assembly" is not used with a MODEVA™ thermostat.

2. Make the necessary wire connections to a 3-wire S5bus header on the back of the MODEVA assembly. NOTE: the second 3-pin connector is used for S5bus, 12VDC, and GND daisy-chaining. Both headers have the same pin assignments.
3. Allow the magnets of the MODEVA Assembly to snap to the metal mounting bracket.
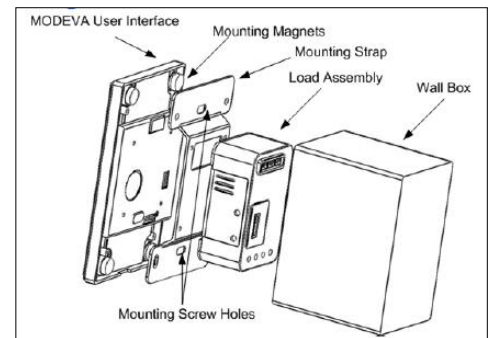
PIR Motion Coverage

It is vital to consider the motion coverage of a thermostat during installation. The images below highlight the difference in motion coverage of the flat vs. standard PIR on an E528.4G.

E528 Flat PIR

E528 Standard PIR
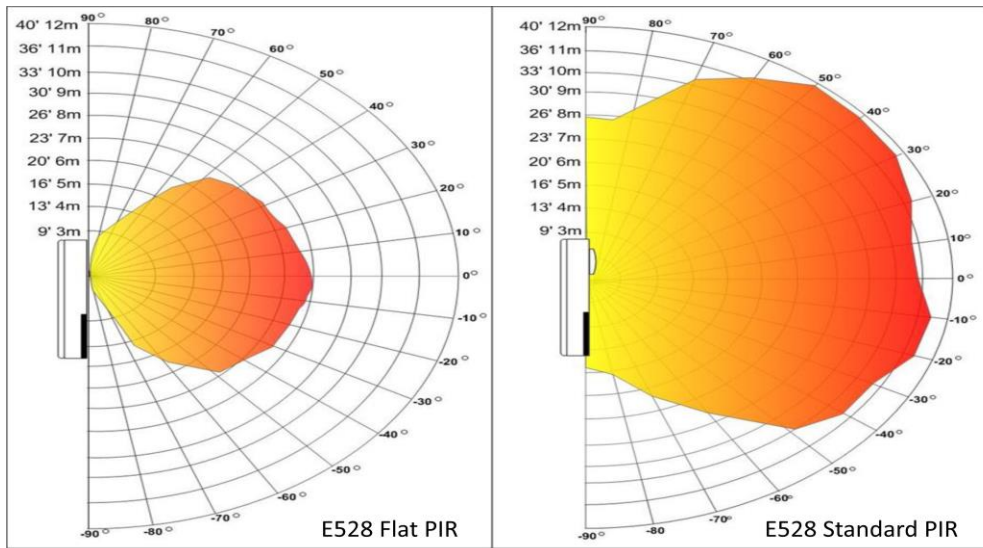
S5 Bus – In-room Communication Bus

- In-room communication bus with 12 vdc power option
  - NOT for building network communication Only communications in the guest room between INNCOM devices
- Standard S5Bus cable is 3 pin.
  - Orange = Communication
  - Red = 12 vdc power
  - Brown = Common
- If devices are already powered, they may only use the brown and orange wires to communicate

110.2 PTAC SYSTEMS

110.2.1 DESCRIPTION OF PTAC

PTAC stands for Packaged Terminal Air Conditioner. A PTAC which is commonly pronounced P-tack is similar to a home window air conditioner. The unit is installed through a hole in the exterior wall of the room and is powered by line voltage.

All the components required to cool and heat the room are all packaged together in one unit. This includes a fan, compressor for cooling, and an electric heat strip for heating. In cooling mode, the PTAC energizes the compressor which cools copper coils. The fan passes air through the coils and discharges cooling into the room. In heating mode, the electric heat strip is energized and the fan passes air over the hot heating element and discharges heat into the room.

110.2.2   PTAC/PTHP - ROOM LAYOUT USING E528.4G OR E7 DIRECTLY TO LOW VOLTAGE

E528 Thermostat

Thermostat hardwired to 24 VAC interface on HVAC Unit

PTAC/PTHP Mounted through outside wall
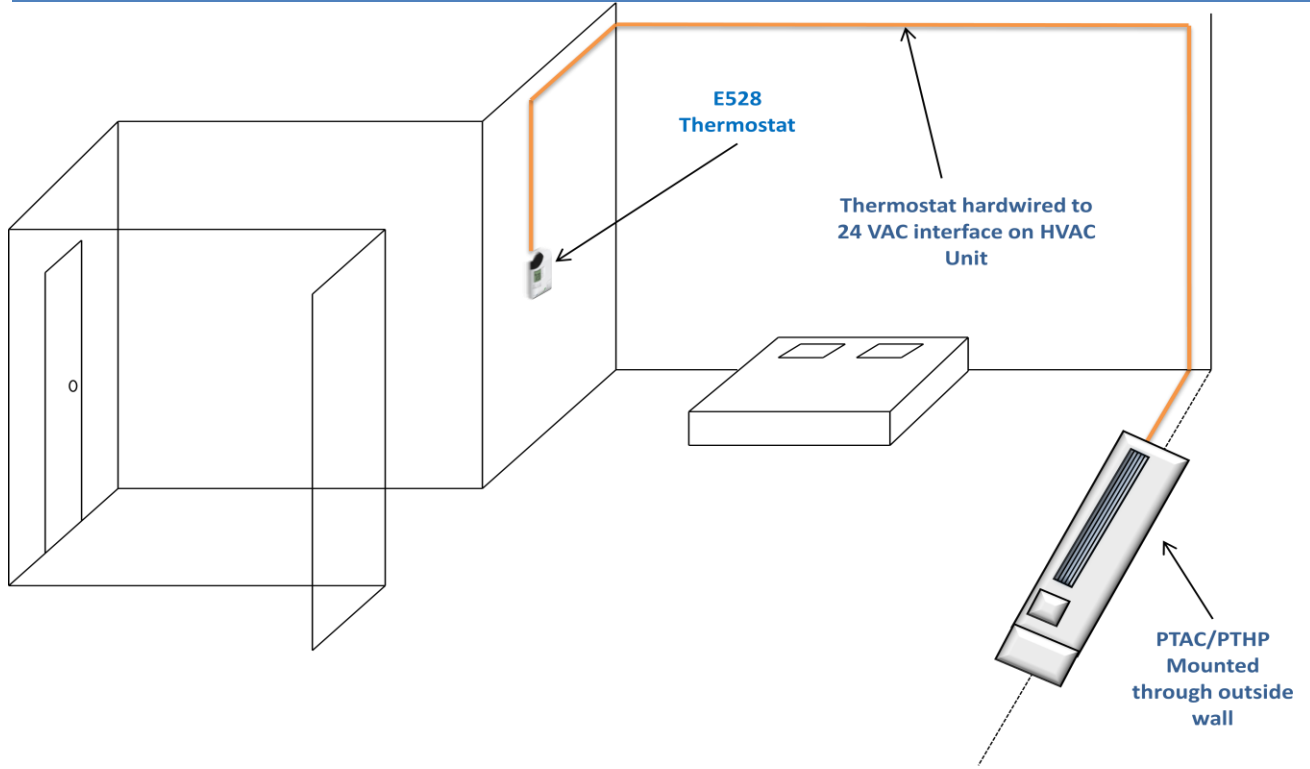
110.2.3   PTAC/PTHP - ROOM LAYOUT USING E528.4G OF E7 3-WIRE S5BUS

E528 Thermostat

Thermostat hardwired S5Bus to controller mounted in PTAC/PTHP 3 Conductors

X47 Wired to PTAC Controls

Inside PTAC/PTHP Controls

PTAC/PTHP Mounted through outside wall
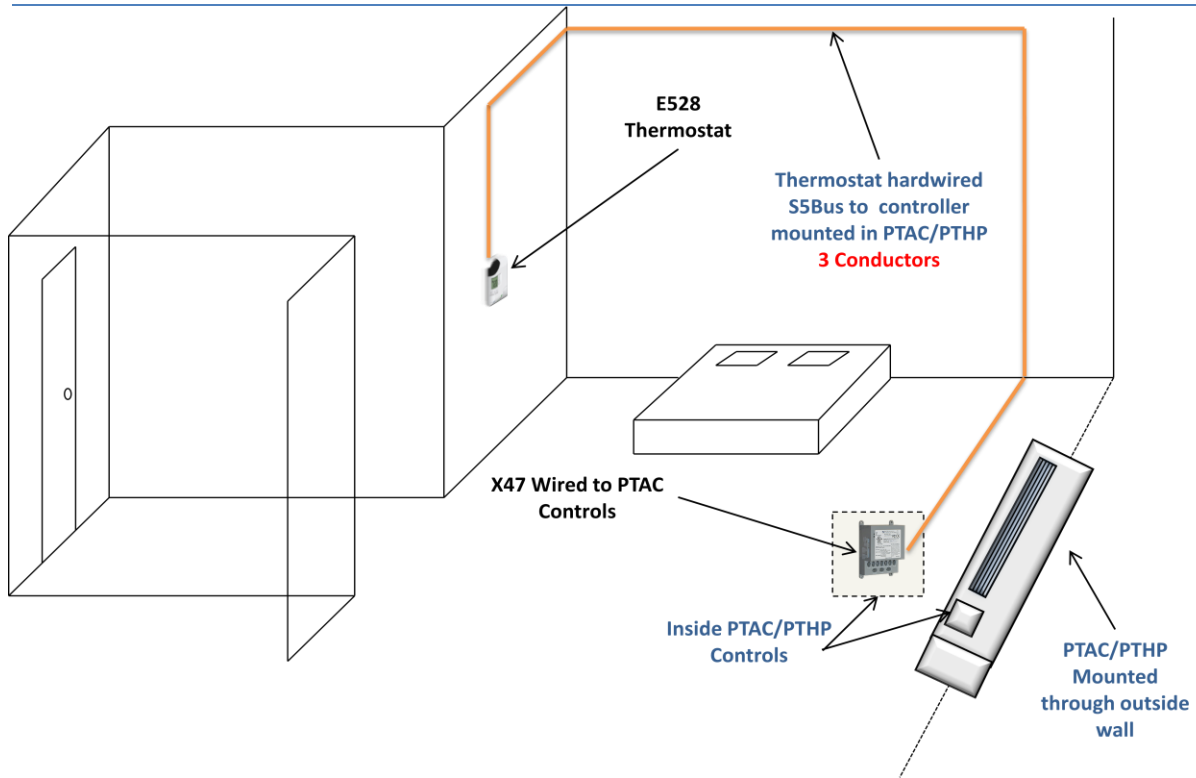
110.2.4   PTAC/PTHP - ROOM LAYOUT USING E529.4G

E529.4G wireless RF to PC502

E529.4G Thermostat

PC502 wired to controller Mounted 12" or higher off ground at or near HVAC Unit

X47 Wired to Unit Controls

Inside PTAC/PTHP Controls

PTAC/PTHP Mounted through outside wall
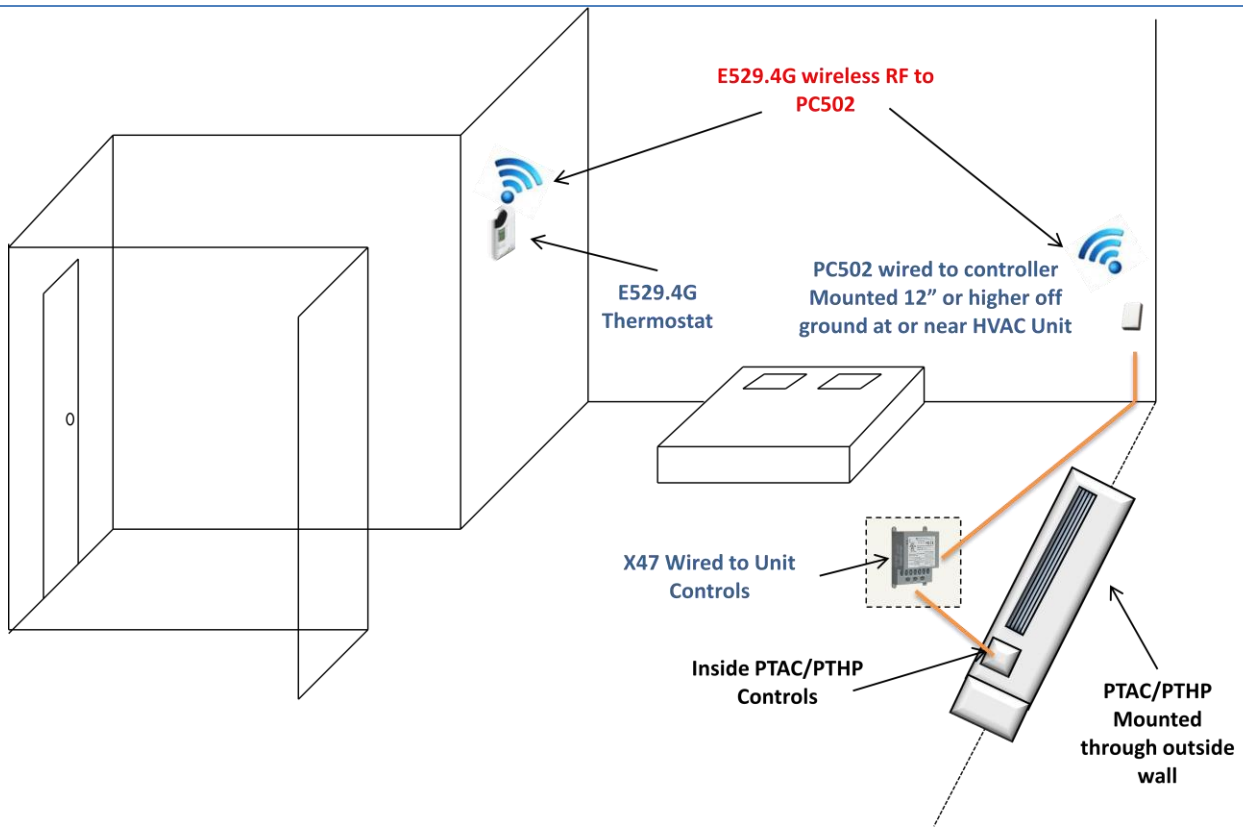
110.2.5   PTAC - ROOM LAYOUT USING E527.4G

E527.4G Thermostat

Thermostat hardwired to controller mounted in PTAC/PTHP

X47 Wired to PTAC Controls

Inside PTAC/PTHP Controls

PTAC/PTHP Mounted through outside wall
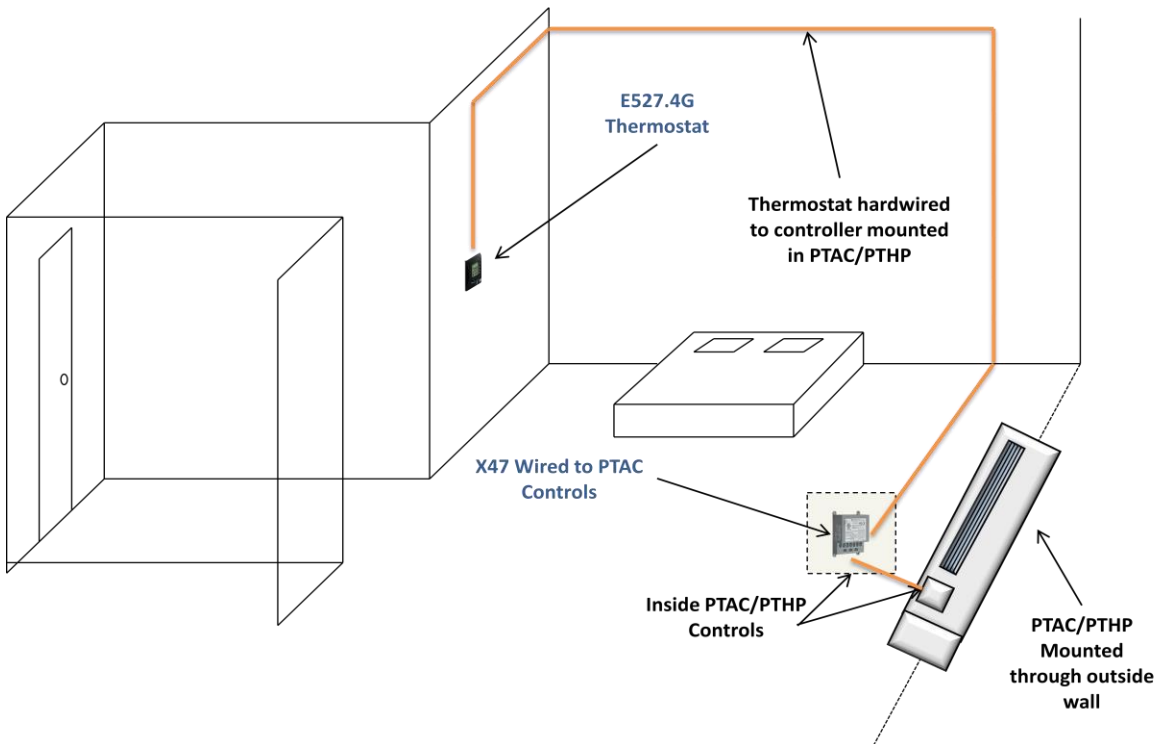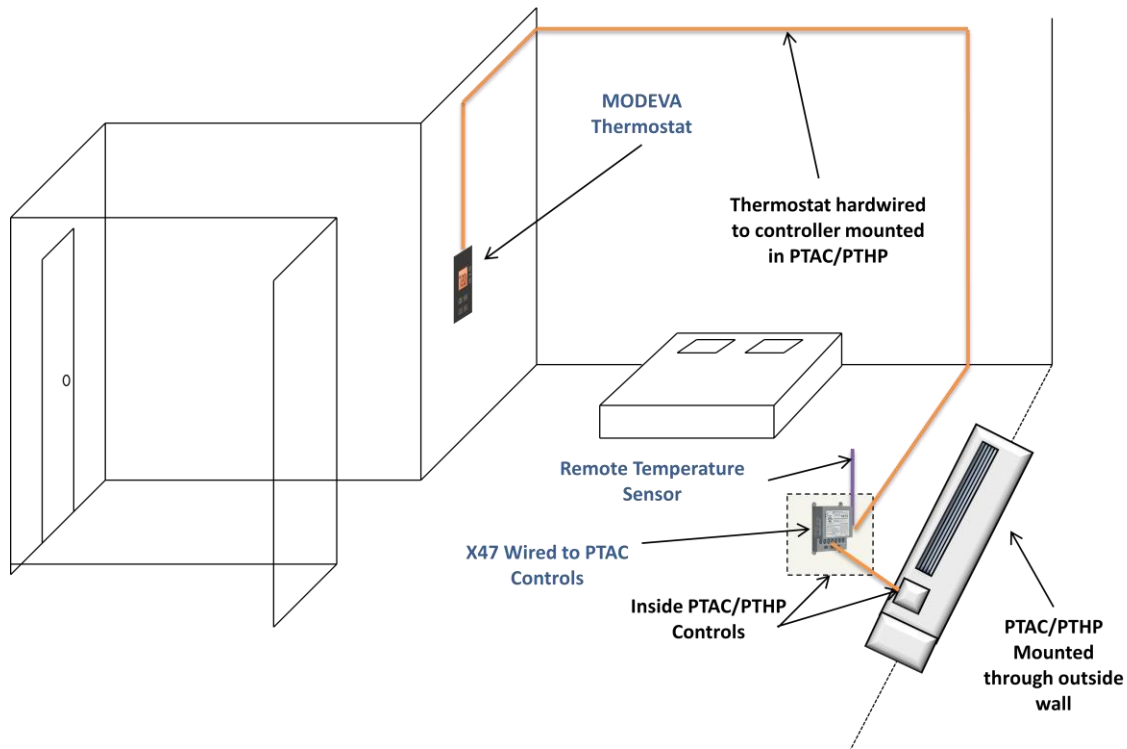
110.3 PTHP SYSTEMS

110.3.1   DESCRIPTION OF PTHP

The PTHP (Packaged Terminal Heat Pump) looks and acts very similar to the PTAC, but has one important difference. That difference is a reversing valve on the refrigeration cycle that allows the compressor to produce both heating and cooling in the room. There are two types of PTHP units: type B and type O. The difference is in the default position of the refrigeration cycle. The Type B unit refrigeration cycle is set to cooling by default. When the reversing valve is energized, the refrigeration cycle is reversed to produce heat. The Type O refrigeration cycle is set to heat in the default position and when the reversing valve is energized, the cycle reverses to produce cooling. A fan inside the unit is used to transfer the heat or cool from the refrigeration coils into the room.

If the outside air is too cold, the compressor will not be able to efficiently generate heat in the room. In some cases, a PTHP will have a secondary electric heat strip that is energized if the first stage of heat from the compressor is not able to heat the room. In mild climates, the addition of an electric heat strip is often not needed because the compressor produced heat is sufficient.

Some helpful ways to remember each type:
Type **O**: Reverse to c**OO**l
Type **B**: Reverse to heat, "**B**oil" starts with the letter B, boiling signifies heat

110.3.2   PTHP - ROOM LAYOUTS
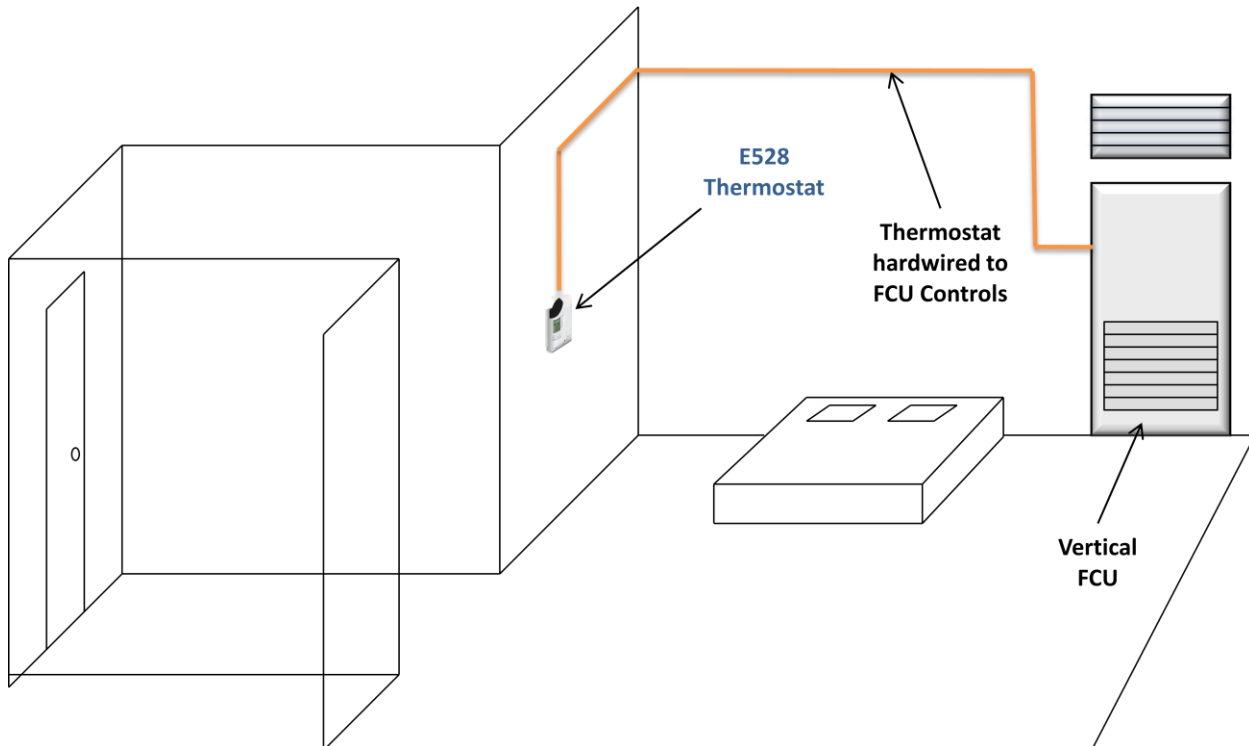
Same as PTAC Systems

110.4 4 PIPE FAN COIL SYSTEMS

110.4.1   DESCRIPTION OF 4 PIPE FAN

The 4-Pipe FCU needs a continuous supply of both hot and cold water. This means the building must have a hot and cold water system running at all times which increases the expense. In cooling mode, the valve connected to the cold water supply is opened and cold water fills the coils in the unit. The fan is energized to blow air over the cold water coils discharging cool air into the room. The heating valve is turned to the closed position during cooling mode.   In heating mode, the opposite occurs where the heat valve is opened, cool valve is closed and the fan discharges warm air into the room. Controlling a 4 pipe FCU requires control of each fan speed, the hot water valve and the cold water valve.
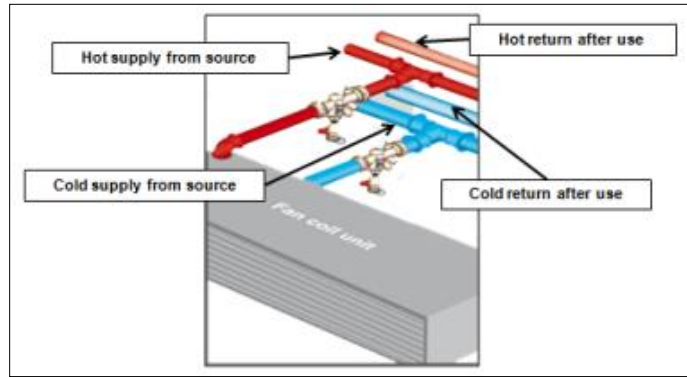
110.4.2   4 PIPE FAN COIL - ROOM LAYOUT USING E528.4G OR E7

110.4.3   4 PIPE FAN COIL - ROOM LAYOUT USING E529

e529 wireless RF to PC502

PC502 wired to X47

X47 wired to FCU Controls

E529 Thermostat

Inside FCU Controls

Vertical FCU

110.4.4   4 PIPE FAN COIL - ROOM LAYOUT USING E527.4G

E527 Thermostat

Thermostat hardwired to X47 controller mounted in FCU

Vertical FCU
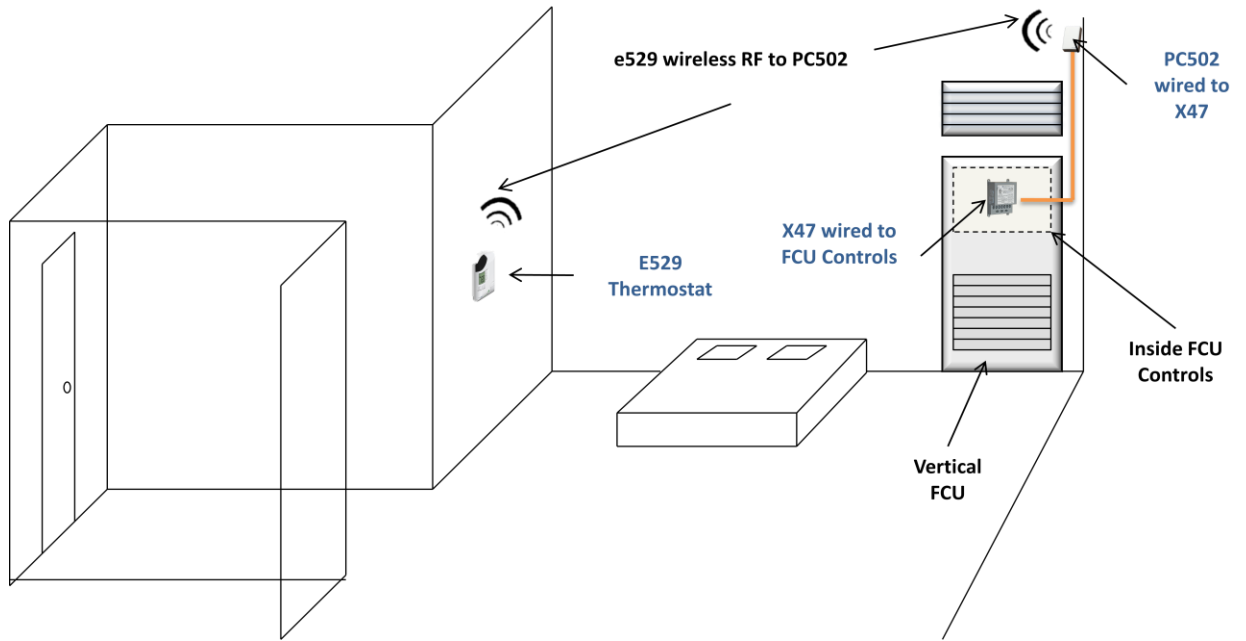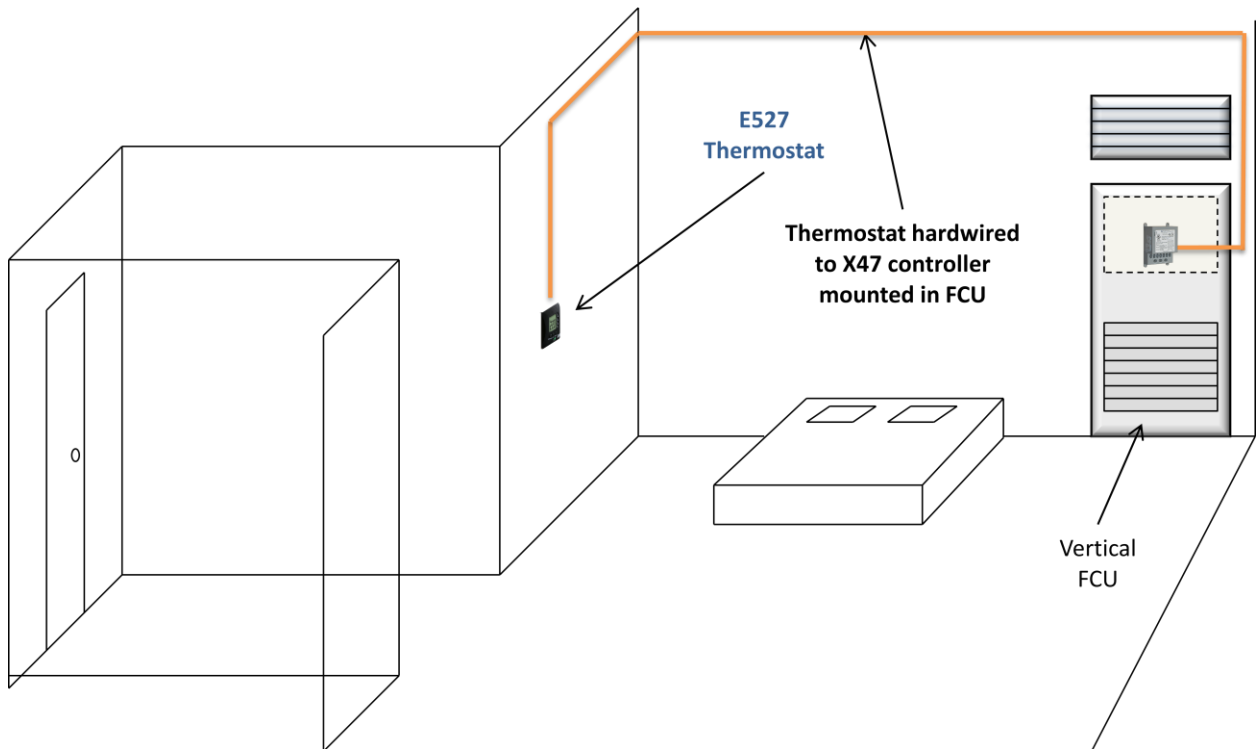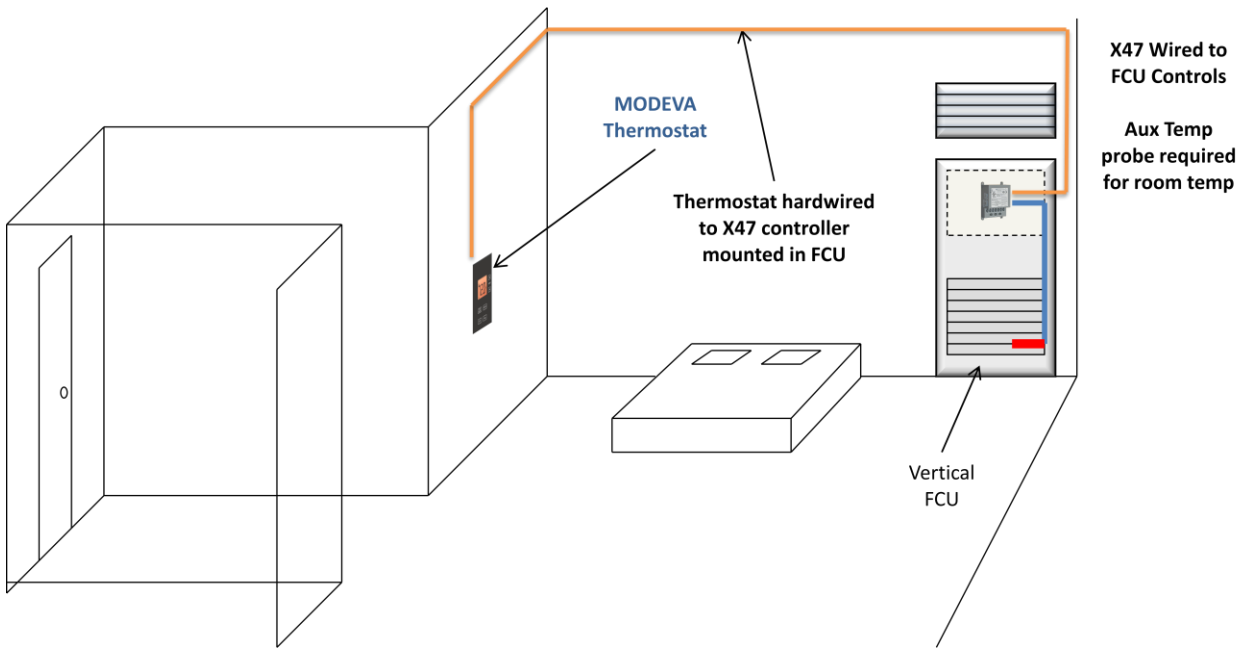
110.5 2 PIPE FAN COIL SYSTEMS

110.5.1   DESCRIPTION OF 2 PIPE FAN COIL

The 2-Pipe FCU has only one water temperature available at a time. In some climates, only one water temperature is needed year round. These systems are 'cool-only' or 'heat-only' systems. In other climates, the building manager selects the appropriate temperature for the supply water based on seasonal changeover conditions. In either case, the comfort of the room inhabitant may be compromised if the user wishes to adjust the room temperature in a direction that is not available (i.e. cooling a room in the winter when there is only hot water in the pipes).

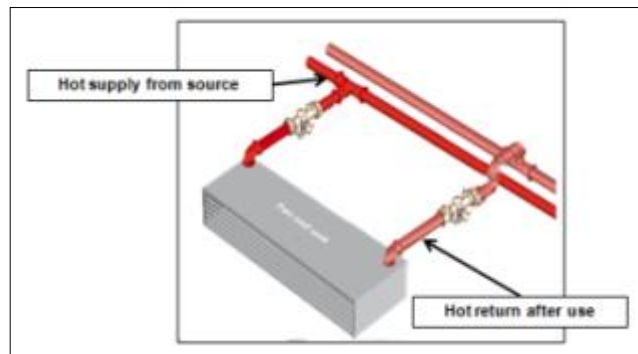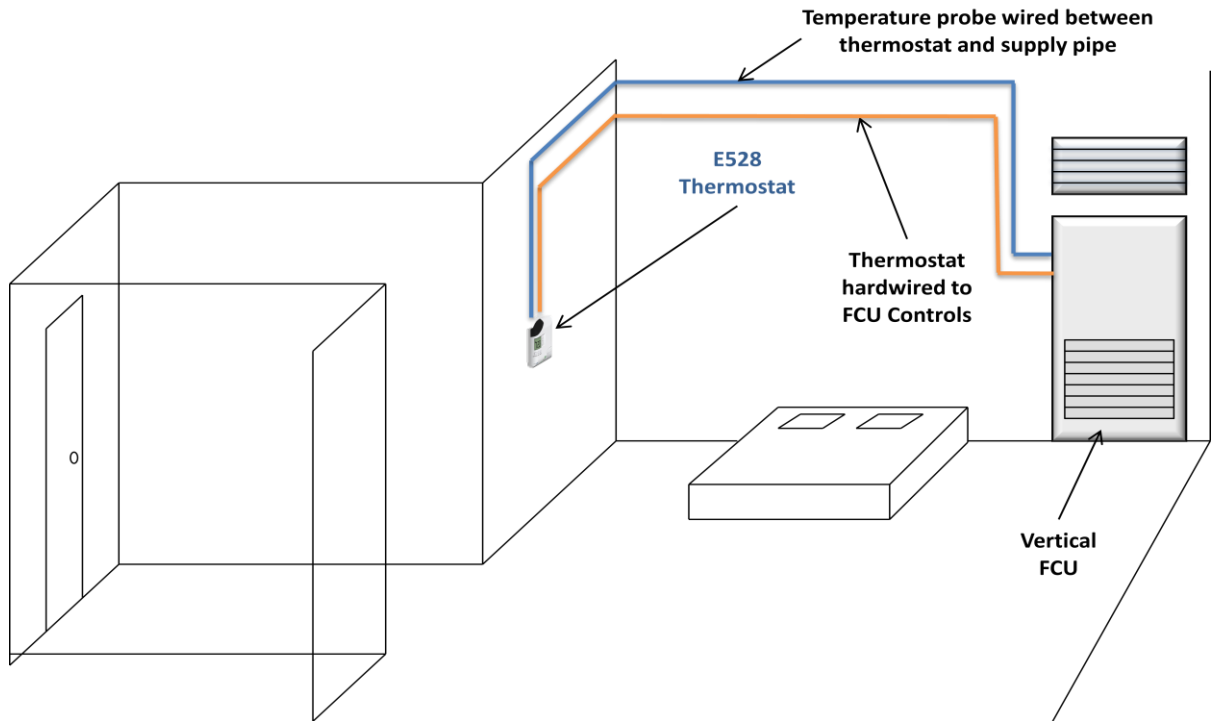Controlling a 2 pipe FCU is different than a 4 pipe unit. The Fan control is the same, but the control of heat and cool depends on the unit configuration. If the system is cool-only or heat-only, the thermostat will be configured to use only one type of energy. In a system with seasonal changeover, the INNCOM thermostat must be told what water temperature is available in the room. When a user calls for heat or cool from a thermostat, the control system determines which energy source is available before the single water supply valve is opened. This may be achieved at the thermostat level using a pipe temperature sensor input or the water temperature may be broadcasted over the network if available.

110.5.2   2 PIPE FAN COIL WITH SEASONAL CHANGEOVER - ROOM LAYOUT USING E528.4G

Temperature probe wired between thermostat and supply pipe

E528 Thermostat

Thermostat hardwired to FCU Controls

Vertical FCU

110.5.3   2 PIPE FAN COIL WITH SEASONAL CHANGEOVER - ROOM LAYOUT USING E529

e529 wireless RF to PC502

PC502 wired to X47

X47 wired to FCU Controls

E529 Thermostat

Vertical FCU

Temperature probe wired between X47 and supply pipe

110.5.4   2 PIPE FAN COIL WITH SEASONAL CHANGEOVER - ROOM LAYOUT USING E527.4G

E527 Thermostat

Thermostat hardwired to X47 controller mounted in FCU

X47 Wired to FCU Controls and Temperature Probe wired between X47 and Supply Water Pipe

Vertical FCU
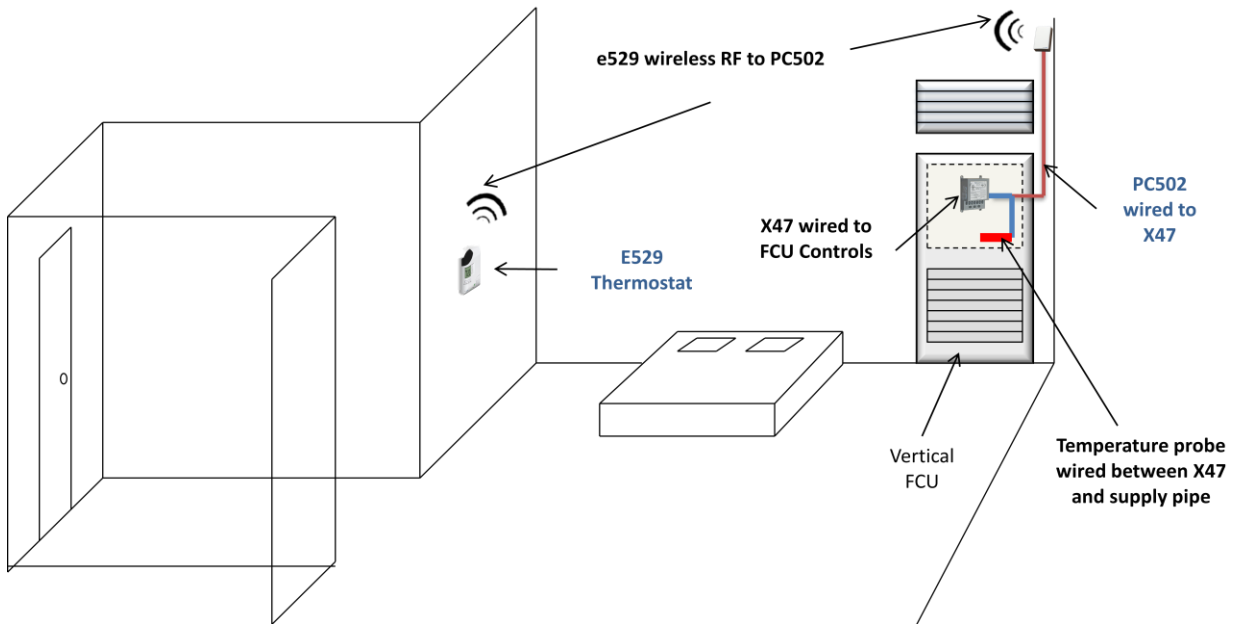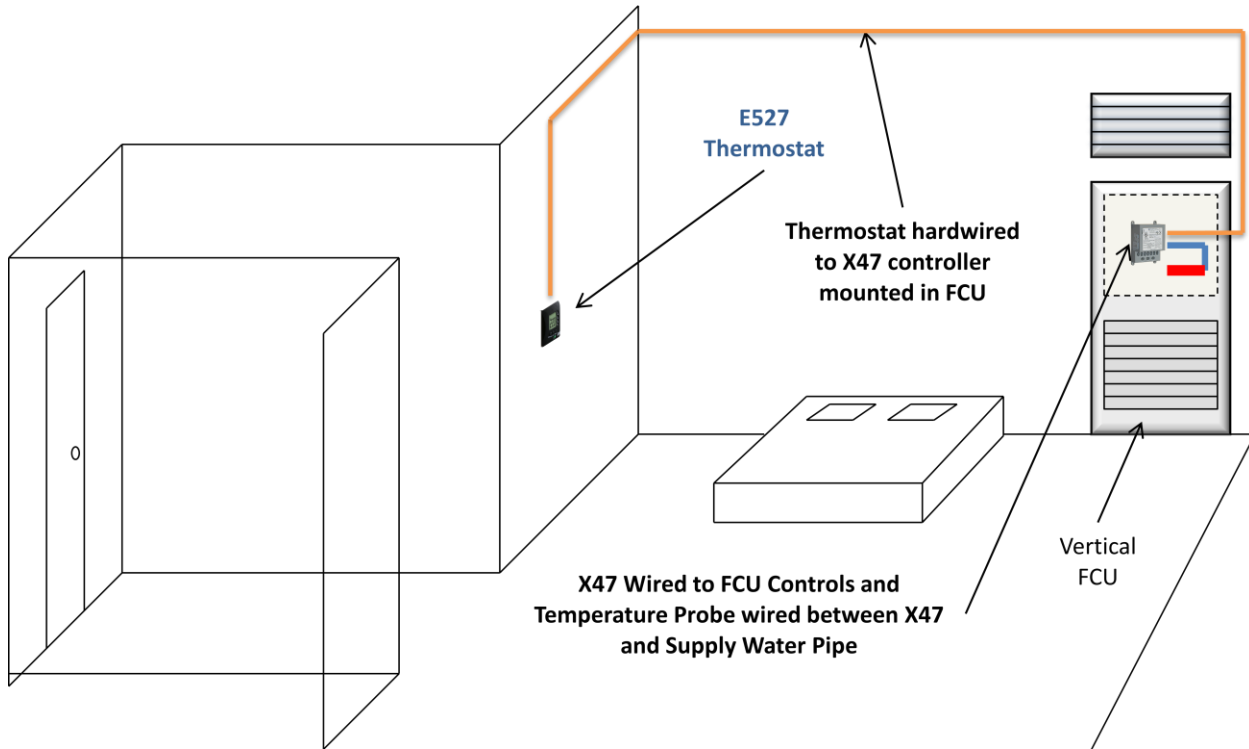
110.5.5   2 PIPE FAN COIL WITH SEASONAL CHANGEOVER - ROOM LAYOUT USING MODEVA™

Thermostat hardwired S5Bus to X47 controller mounted in FCU

S541.RTF RF Room Temp Sensor RF to PC502 Battery Powered

MODEVA Thermostat

PC502 RF to Room Temp Probe. S5Bus to X47

X47 Wired to FCU Controls and Temperature Probe wired between X47 and Supply Water Pipe

Vertical FCU

Wired Pipe Temp Probe in Aux Temp 2
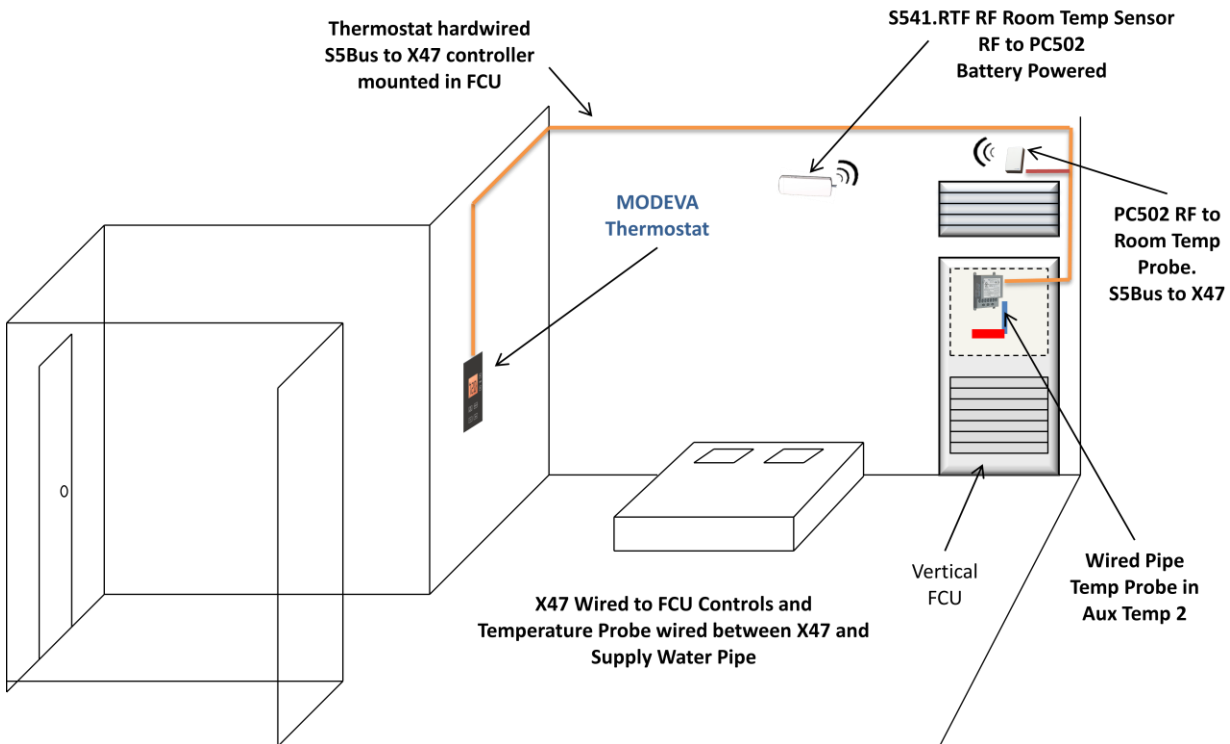
110.6 EMS ARCHITECTURE

110.6.1 EMS IN-ROOM ARCHITECTURE – WIRED DOOR SWITCH

E528 Thermostat

Thermostat wired to PTAC/PTHP via Thermostat Cable

Cat 5 or similar cable 2 Conductors wired to thermostat input

PTAC/PTHP Mounted through outside wall

Flush Mounted Door Switch Magnet installed in door Switch installed in door frame
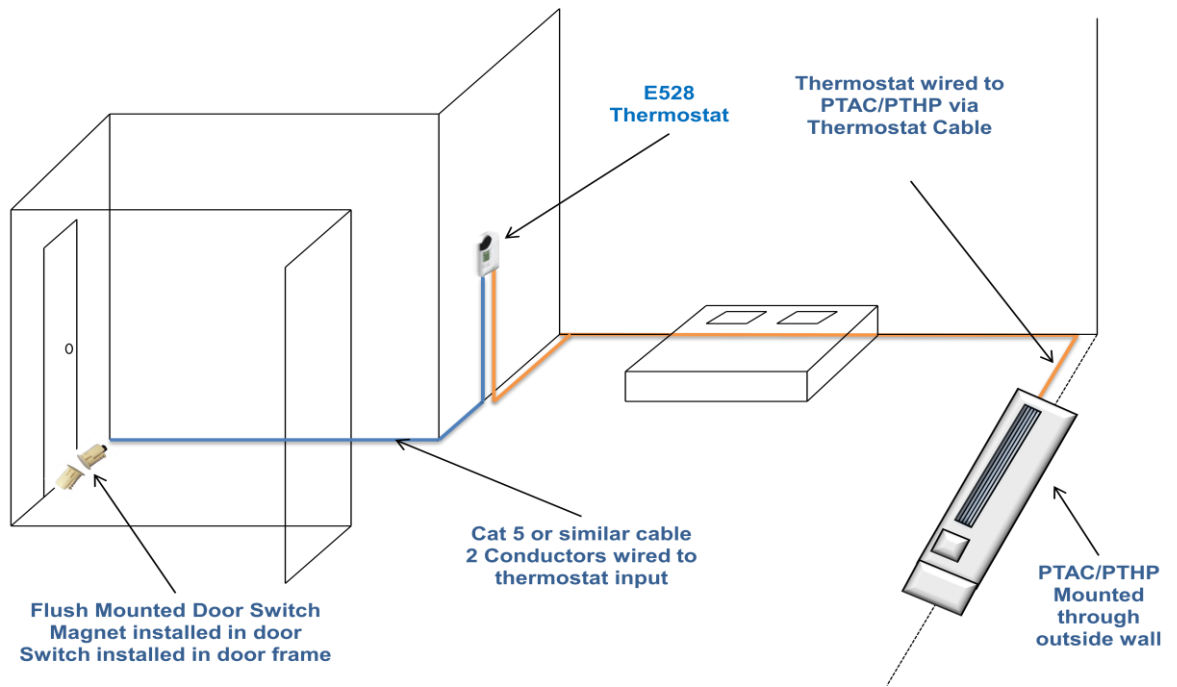
110.6.2 EMS IN-ROOM ARCHITECTURE – WIRELESS DOOR SWITCH

Option 1

S541.RF transmitter attached to S241 magnetic door switches Sends door signal to thermostat

E528 Thermostat

Thermostat wired to PTAC/PTHP via Thermostat Cable

Option 2

Compatible electronic door lock sends door signal to thermostat

PTAC/PTHP Mounted through outside wall
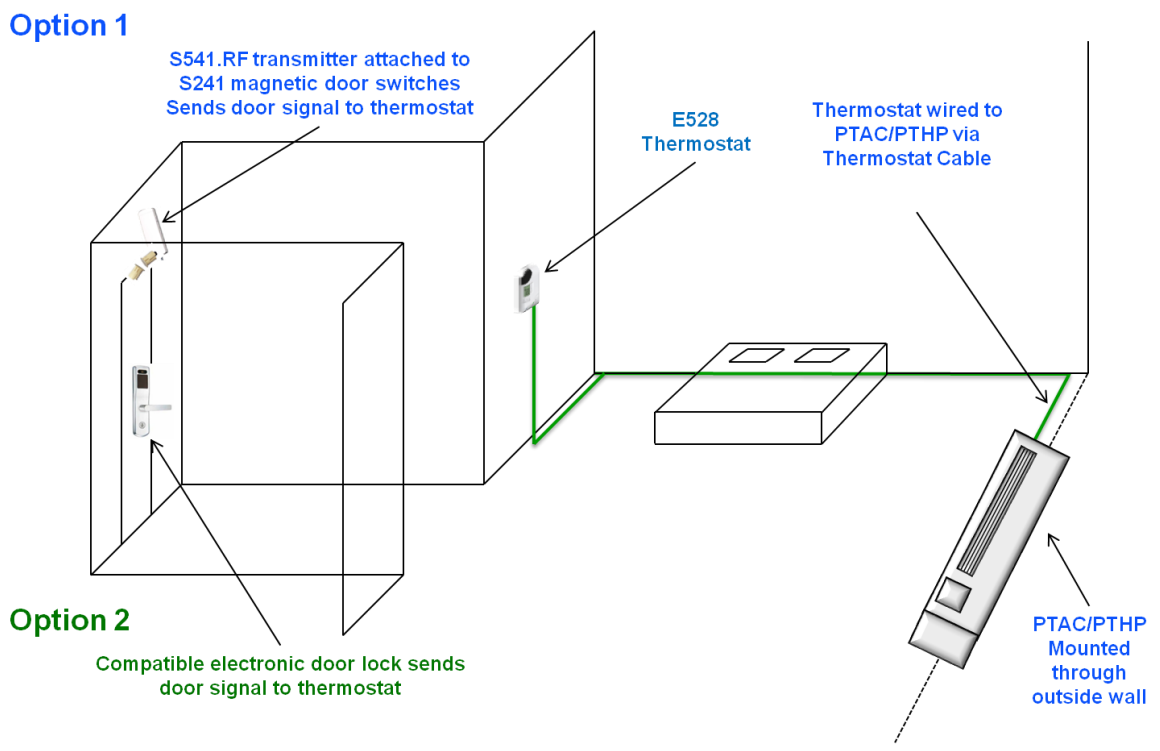
110.7 DEVICE WIRING

This section describes common device wiring. Wiring may vary depending on the project and application. Always refer to your project's commissioning and wiring diagrams when installing, commissioning or troubleshooting.
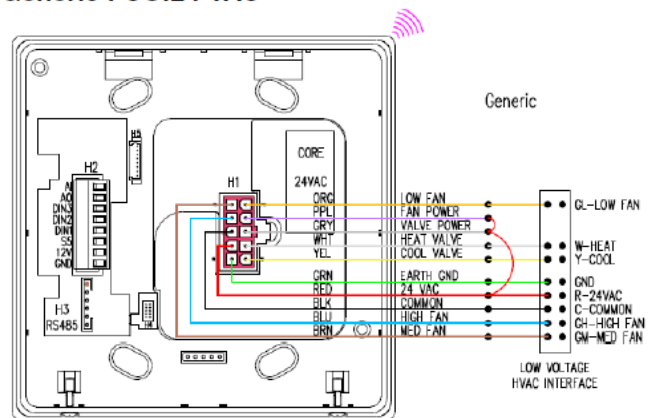
110.7.1   E528.4G WIRING

This image shows the standard wiring for a Line Voltage E528.4G thermostat. Refer to the E528.4G user guide and/or the INNtool wiring diagrams for additional information.
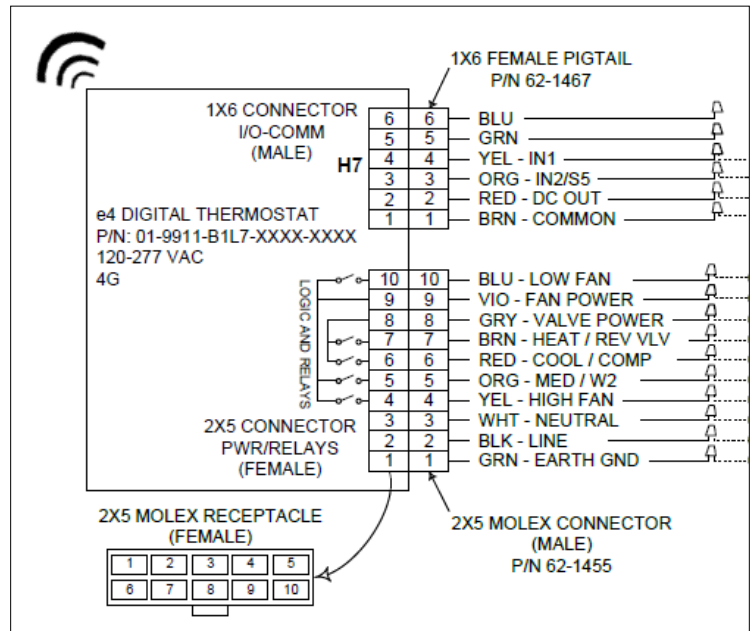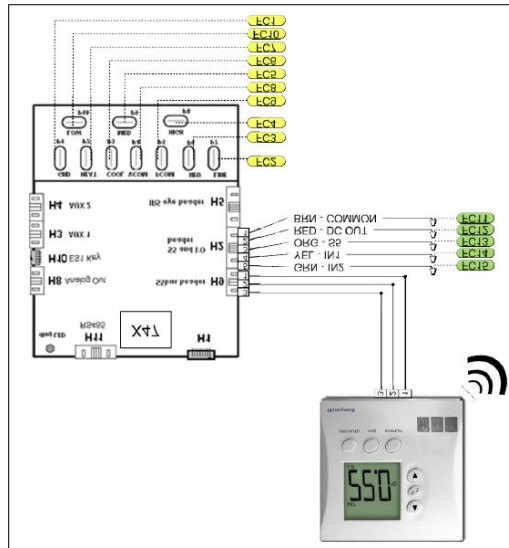

110.7.2   E7 WIRING

This image show the generic wiring diagram for the E7 thrmostat to a 24VAC HVAC unit. See the E7 instruction manual for additonal wiring diagrams

110.7.3   E527.4G WIRING

The images below show the standard wiring for a Line Voltage E527.4G thermostat. Refer to the E527.4G user guide and/or the INNtool wiring diagrams for additional information.

HVAC INTERFACE		LOW VOLTAGE INTERFACE		
Connection	Function	Connection	Color	Function
FC1	EARTH GROUND	FC11	Brown	DC GROUND
FC2	LINE	FC12	Red	DC OUT
FC3	NEUTRAL	FC13	Orange	S5 BUS
FC4	HIGH FAN RELAY	FC14	Yellow	INPUT 1
FC5	MED FAN RELAY/ HEAT RELAY(STAGE 2)	FC15	Green	INPUT 2
FC6	COMPRESSOR CONTACTOR			
FC7	HEAT RELAY(STAGE 1)/ REVERSING VALVE			
FC8	VALVE POWER			
FC9	FAN POWER			
FC10	LOW FAN RELAY			

The images below show the standard wiring a E529.4G thermostat, X47 and PC502 in a line voltage application. Refer to the E529.4G user guide and/or the INNtool wiring diagrams for additional information.

| HVAC INTERFACE			LOW VOLTAGE INTERFACE		
Connection	Color	Function	Connection	Color	Function
FC1	Green	EARTH GROUND	FC11	Brown	DC GROUND
FC2	Black	LINE	FC12	Red	DC OUT
FC3	White	NEUTRAL	FC13	Orange	S5 BUS
FC4	Yellow	HIGH FAN RELAY	FC14	Yellow	INPUT 1
FC5	Orange	MED FAN RELAY/ HEAT RELAY(STAGE 2)	FC15	Green	INPUT 2
FC6	Red	COMPRESSOR CONTACTOR			
FC7	Brown	HEAT RELAY(STAGE 1)/ REVERSING VALVE			
FC8	Grey	VALVE POWER			
FC9	Violet	FAN POWER			
FC10	Blue	LOW FAN RELAY			

The images below show the typical wiring of a MODEVA™ thermostat, X47 and PC502 (optional) in a line voltage application. The PC502 is only required if RF communication is needed in the design. Refer to the MODEVA™ user guide and/or the INNtool wiring diagrams for additional information.

HVAC INTERFACE			LOW VOLTAGE INTERFACE		
Connection	Color	Function	Connection	Color	Function
FC1	Green	EARTH GROUND	FC11	Brown	DC GROUND
FC2	Black	LINE	FC12	Red	DC OUT
FC3	White	NEUTRAL	FC13	Orange	S5 BUS
FC4	Yellow	HIGH FAN RELAY	FC14	Yellow	INPUT 1
FC5	Orange	MED FAN RELAY/ HEAT RELAY(STAGE 2)	FC15	Green	INPUT 2
FC6	Red	COMPRESSOR CONTACTOR			
FC7	Brown	HEAT RELAY(STAGE 1)/ REVERSING VALVE			
FC8	Grey	VALVE POWER			
FC9	Violet	FAN POWER			
FC10	Blue	LOW FAN RELAY			

110.7.6   X05R WIRING DETAILS

The images below show the wiring of an X05R. Since the outputs are highly customizable, there is not one generic wiring schematic for HVAC control.
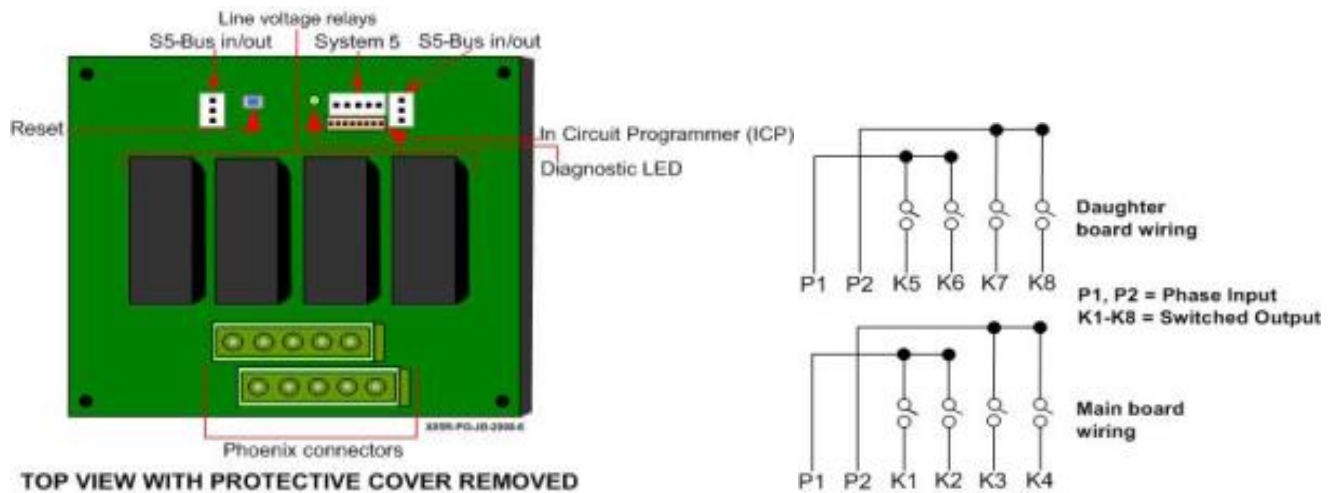
110.7.7   X05B/X06 WIRING DETAILS

In this detailed view of the X05B, you can see that the board is actually comprised of two logic boards mounted together. There are analog inputs and outputs available along with digital inputs. The X05B has LED indicators for both the outputs and inputs which vary based on software and application.

For a standard HVAC control application with 3 fans speeds heat and cool, the LEDs indicate when each call is active:

D7 = low fan,
D6 = medium fan
D5 = high fan
D4 = cool
D3 = heat
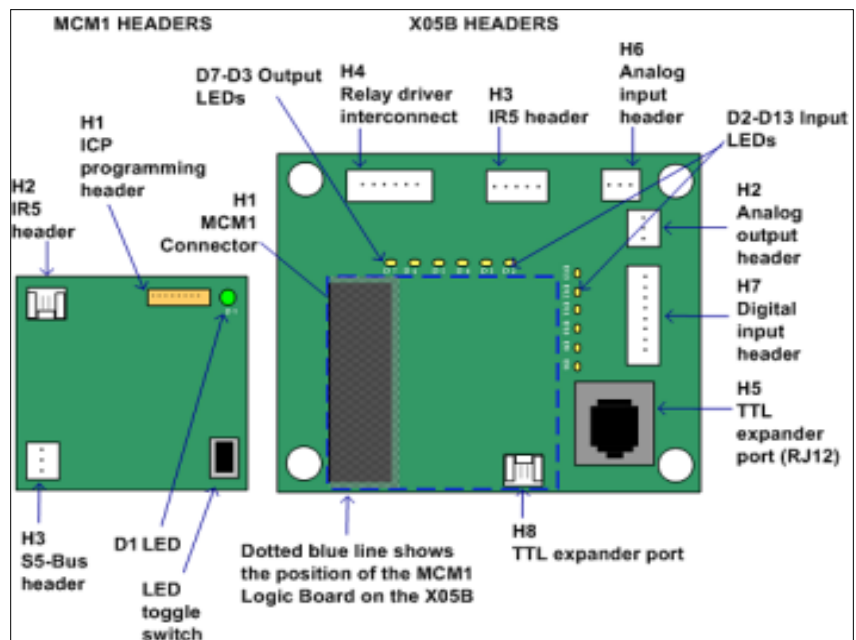
The corresponding X06 relay outputs for this typical FCU configuration are shown in the image below.
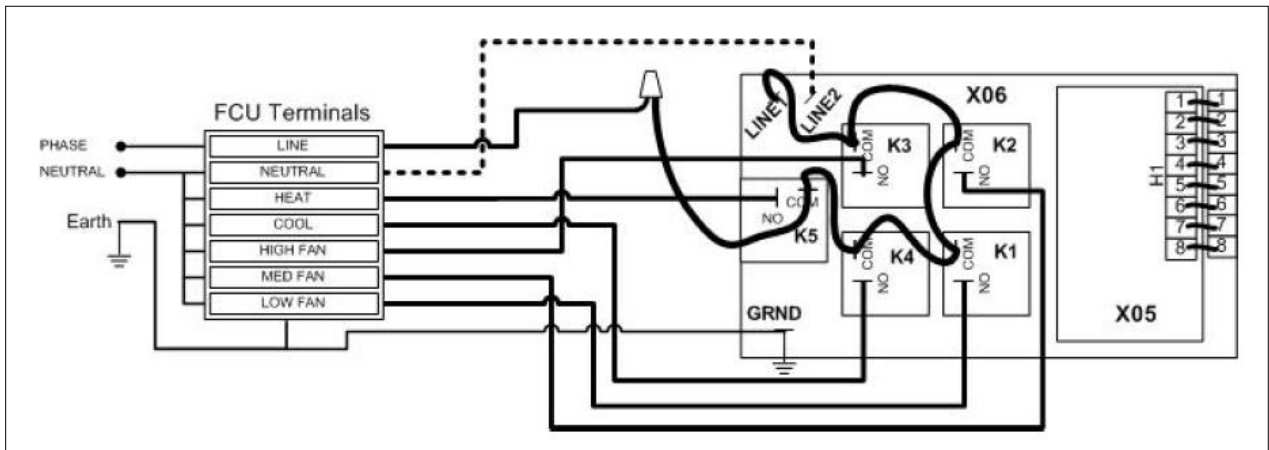
110.7.8   X06.DIN WIRING DETAILS

In this detailed view of the X06.DIN you can see that the board is actually comprised of a small MCM3 logic board attached to a relay pack. Relays K1-K3 are smaller with lower amp ratings than Relays K4 and K5. Relays K4 and K5 have optional spade connectors in addition to the Phoenix screw terminal connectors. In applications where 277 VAC is used, the spade terminal connectors must be connected in place of the Phoenix connectors for K4 and K5. This image shows a typical wiring configuration for a 4 Pipe FCU. Note the amp ratings for the relays on this device vary by regional approval marks i.e. UL, CCC, CE Mark. Refer to the X06.DIN product guide for detailed specifications.

SECTION 120   EMS LOGIC
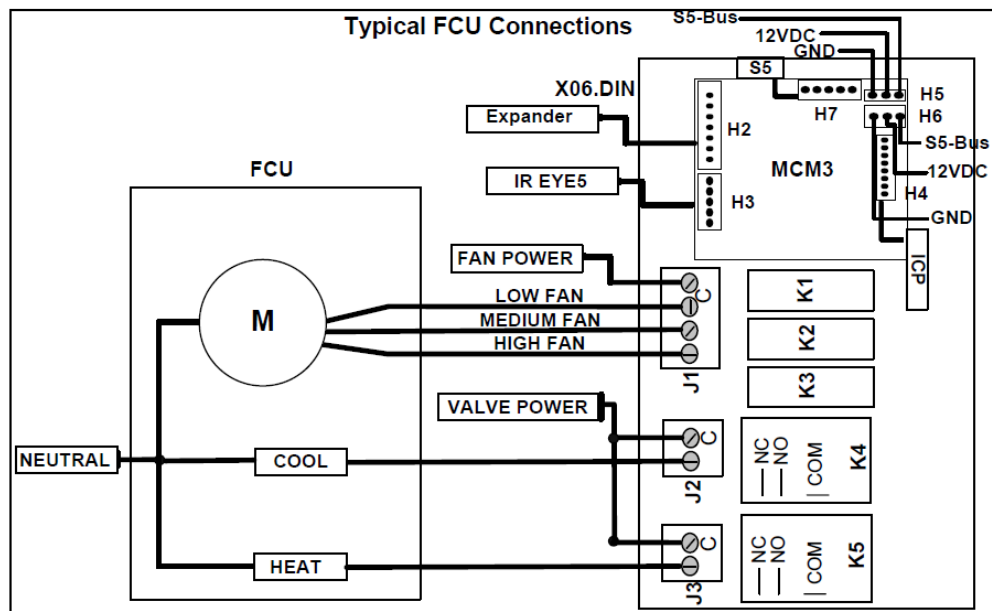
120.1 EMS SYSTEM OVERVIEW

An INNCOM energy management system uses different combinations of in-room light sensors, motion detectors and door contacts to determine the room occupancy status. In a networked system, Rental Status can be communicated to the thermostat immediately via an interface with the Property Management System (PMS).

This section describes various energy management modes and logic for both a standalone and networked EMS system.

- **Standalone EMS**
    - Thermostat is NOT networked to a central computer
    - System has EMS components such as a motion sensor, door switch and ecoMODE.
- **Networked EMS**
    - Thermostat IS networked to a central computer
    - System has EMS components such as a motion sensor, door switch and ecoMODE

120.1.1   ENERGY MANAGEMENT MODES

Less

EMS

More
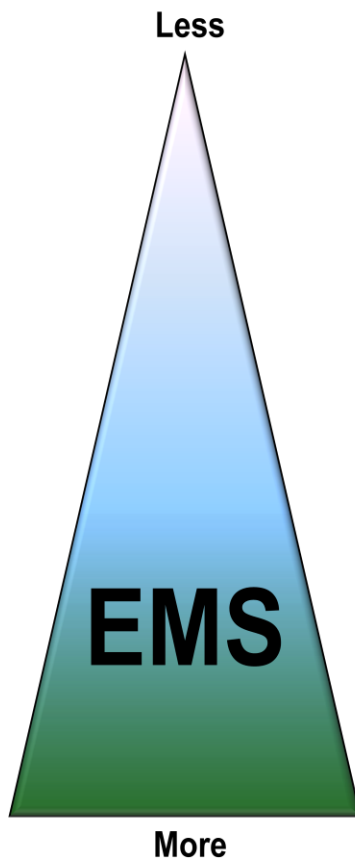
- **Rented Occupied**
    - **Room is rented and a person is in the room.**

- **Rented Unoccupied**
    - **Room is rented and nobody is in the room.**

- **Un-rented Occupied (Staff Occupied)**
    - **Room is not rented and a person is in the room (such as housekeeping).**
    - **Networked EMS ONLY**

- **Un-rented Unoccupied**
    - **Room is not rented and nobody is in the room.**

PMS Check-in

A person checks in to the hotel at the front desk

Room is declared Rented

Thermostat turns on to an initial "check-in" temp of **72°F (22.2°C)**

Temperature is maintained **+/-2°F (1.1°C)** around the target temperature
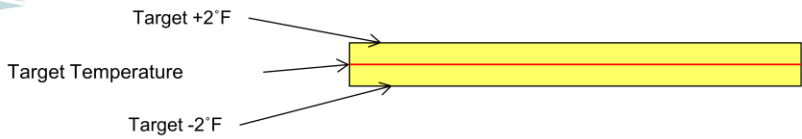
Target +2°F

Target Temperature

Target -2°F

Rented/Occupied Mode

Door switch signals the thermostat as a person enters

Motion is detected within **10 minutes**

Room is declared Rented/Occupied

Temperature is maintained **+/-2°F (1.1°C)** around the target temperature

Target +2°F

Target Temperature

Target -2°F

Guest uses thermostat

Target +1°F

Target Temperature

Target -1°F

Temperature band tightens to **+/-1°F (0.5°C)** around the target temperature

Values in **bold** print are adjustable

Rented/Unoccupied Mode

Door switch signals the thermostat as person exits

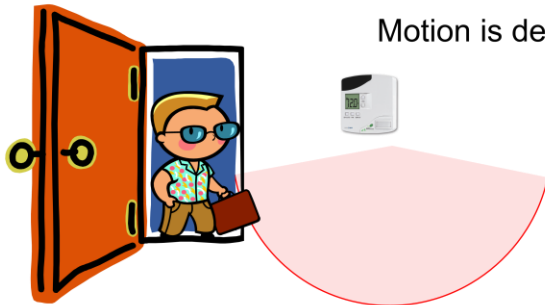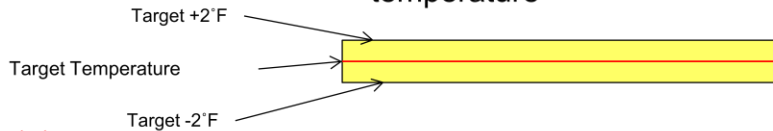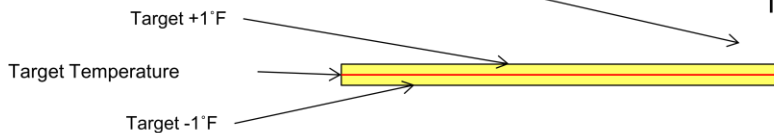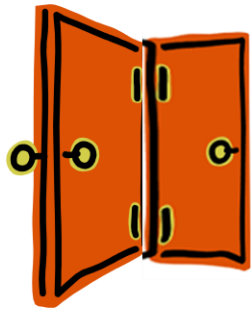Motion is NOT detected within **10 minutes**

Room is declared
Rented/UNOCCUPIED

Temperature is maintained **+/- 4˚F (2.2˚C)**
around the target temperature

Target +4˚F

Target Temperature

Target -4˚F
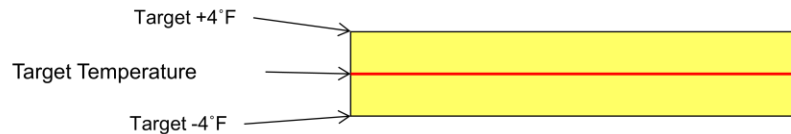
Values in **bold** print are adjustable

Occupancy Correction

- *The motion detector is always active on the INNCOM thermostat.*

- *If a thermostat transitions into unoccupied mode by mistake (i.e. two guest are in the room and one guest leaves while the other guest is in the bathroom), then the thermostat will correct itself back to occupied mode as soon as motion is detected.*

- **Scenario:**
    - Tom and Jane are in a guestroom. Jane goes to take a bath (there is no motion detector in the bathroom)
    - Tom leaves the room
    - The thermostat does not see motion for 10 mins. The room will go **Unoccupied**.
    - Jane comes out of the bathroom and the motion detector will immediately correct the occupancy back to **Occupied** mode.

Bathroom

Check-out

A person leaves the room and checks out of the hotel at the front desk

Room is declared Unrented/Unoccupied

Thermostat turns set point to 'Off" and begins to hold Unrented/Unoccupied bands

Temperature is maintained between **60˚F (15.5˚C)** and **85˚F (29.4˚C)**

85˚F

60˚F
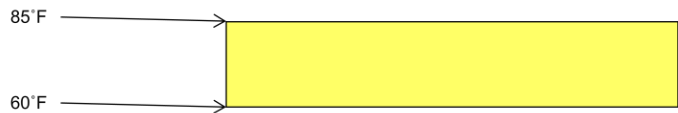
Un-Rented/Occupied Mode

Door switch signals the thermostat as a staff person enters

Motion is detected within **2 minutes**

Room is declared Un-Rented/OCCUPIED

If no previous staff member adjusted the target temp after the checkout, the temp is maintained between **60˚F (15.5˚C)** and **85˚F (29.4˚C)**

If the staff person uses the thermostat, temp is maintained between **+/-2˚F (1.1˚C)** around the new staff target temp.

Staff Clipping prevents heating higher than **75˚F (23.9˚C)** and cooling below **68˚F (20˚C) .**

Target +2˚F

Target Temperature

Target -2˚F

Max Heating to 75˚F

Max Cooling to 68˚F
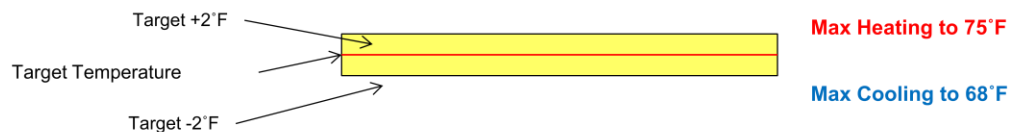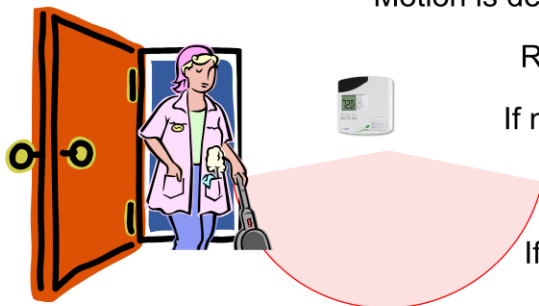
The next staff member to enter this room will be treated to the same staff set point left by the previous staff person if they interacted with the thermostat.

Un-Rented/Unoccupied Mode

Door switch signals the thermostat as the staff person exits

Motion is NOT detected for **2 minutes**

Room is declared Un-Rented/UNOCCUPIED

Temperature is maintained between **60˚F (15.5C)** and **85˚F (29.4˚C)**

85˚F

60˚F
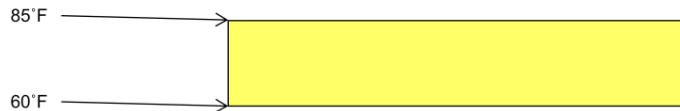
120.3 STANDALONE EMS – DOOR SWITCH AND MOTION SENSOR

Check-in

Room was in Unrented/Unoccupied mode before entry.
Entry door switch signals the thermostat.

Virtual Check-in occurs

Thermostat turns on to an initial "check-in" temp of **72˚F (22.2˚C)**

Motion is detected within **10 minutes**
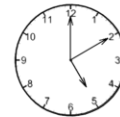
Room is made Rented/OCCUPIED

Temperature is initially maintained **+/- 2˚F (1.1˚C)** around the target temperature

Target +2˚F

Target Temperature

Target -2˚F

Guest uses thermostat

Target +1˚F

Target Temperature

Target -1˚F

Temperature band tightens to **+/-1˚F (0.5˚C)** around the target temperature
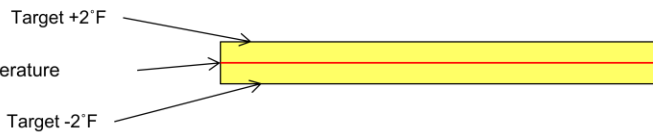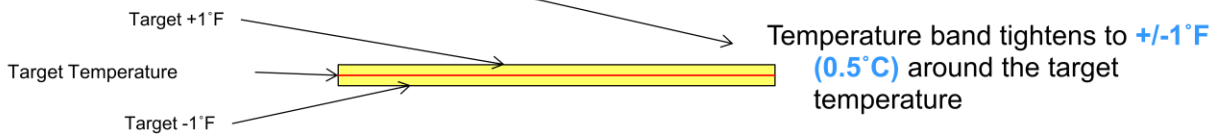
Values in **bold** print are adjustable

Rented/Unoccupied

Door switch signals the thermostat as person exits

Motion is NOT detected within **10 minutes**

Room is declared
UNOCCUPIED

Temperature is maintained **+/- 4 ˚F (2.2˚C)** around the target temperature

Target +4˚F

Target Temperature

Target -4˚F
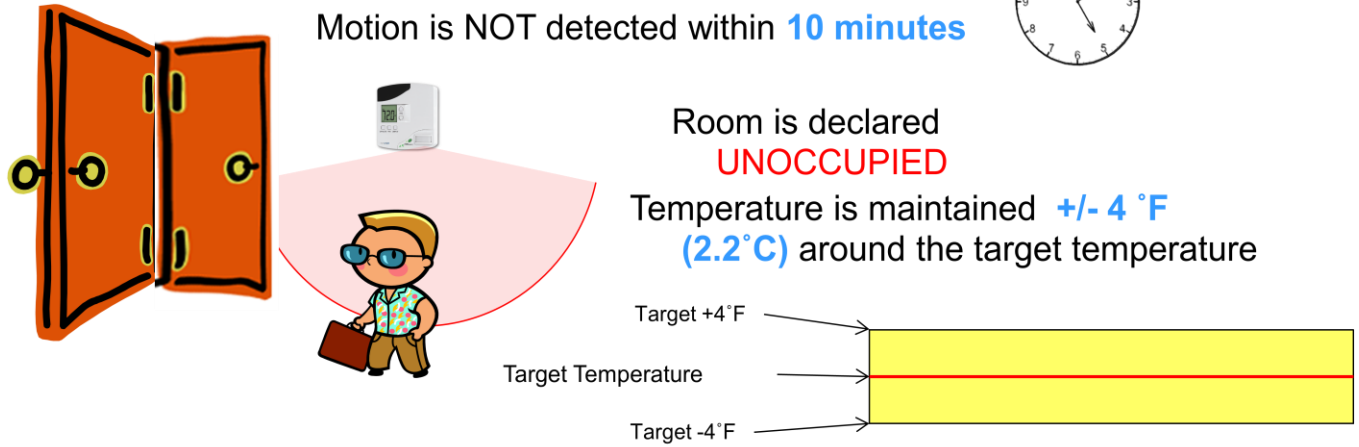
Rented/Occupied

Door switch signals the thermostat as a person enters

Motion is detected within **10 minutes**

Room is declared
OCCUPIED

Temperature is maintained **+/- 1˚F (0.5°C)** around the target temperature

Target +1˚F

Target Temperature

Target -1˚F
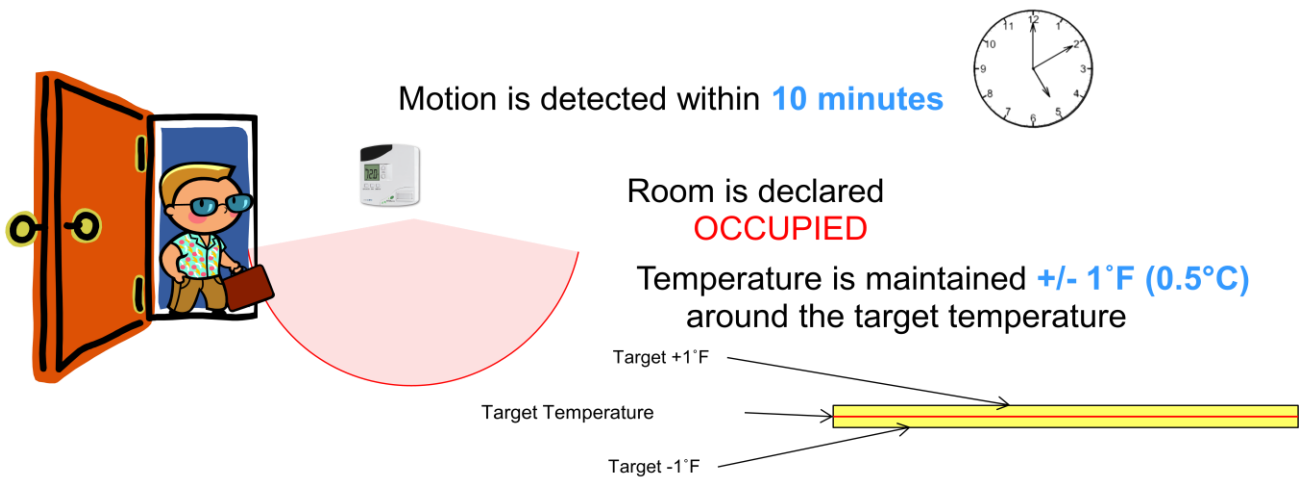
Unrented/Unoccupied

Room first goes UNOCCUPIED **10 minutes** after the person leaves
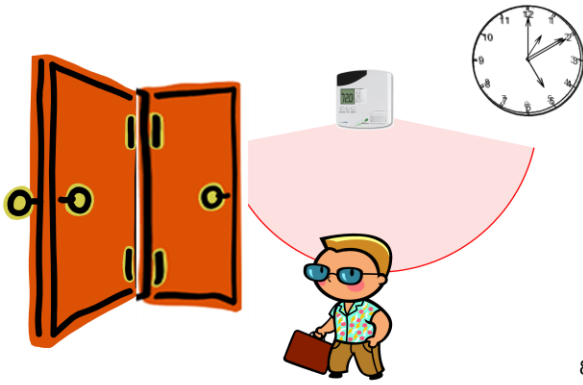
Then, no if motion is detected for
an additional **8 hrs**

Room is declared UN-RENTED/Unoccupied

Temperature is maintained between
62˚F (16.7˚C) and **80˚F (26.6˚C)**

80˚F

62˚F
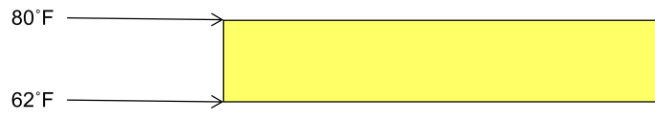
120.4 STANDALONE EMS - MOTION SENSOR ONLY

It is highly recommended to include a door switch as part of the INNCOM energy management system. INNCOM can also provide energy management using a motion sensor alone, but this motion-only EMS is less efficient and less guest-friendly.

Check-in

Room was in Unrented/Unoccupied mode before entry.
Guest enters room and creates motion in front of the thermostat

Thermostat turns on to an initial "check-in" temp of **72˚F (22.2˚C)**

Room is declared
Rented/OCCUPIED

Temperature is initially maintained **+/- 2˚F (1.1˚C)**
around the target temperature

Target +2˚F

Target Temperature

Target -2˚F

Guest uses thermostat

Target +1˚F

Target Temperature

Target -1˚F

Temperature band tightens to **+/-1˚F (0.5˚C)** around the target temperature
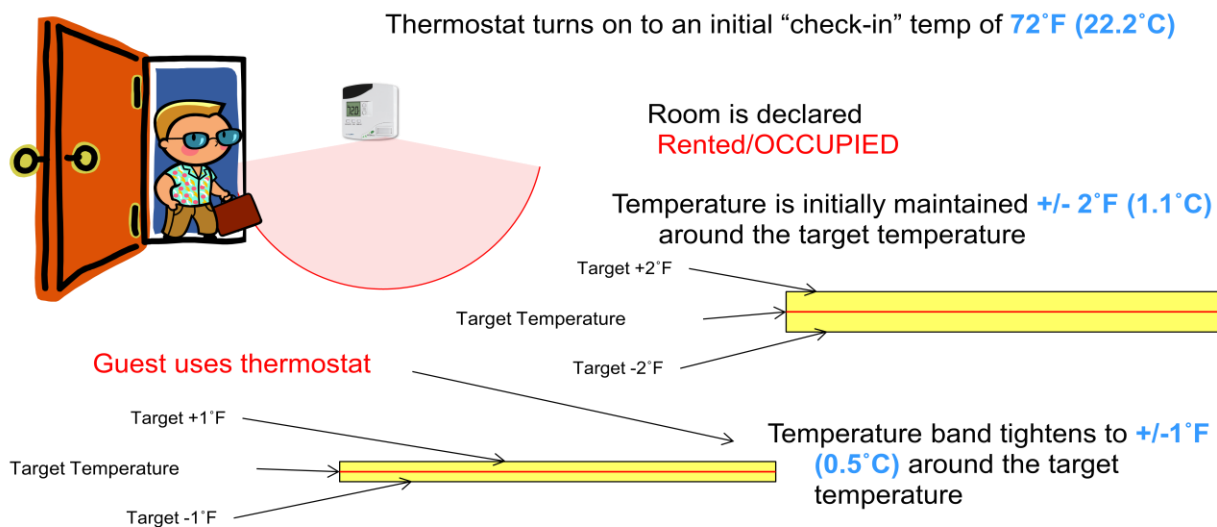
Values in **bold** print are adjustable

M*otion-only Occupied*

Room is in occupied mode as long as the thermostat detects motion within a specified timeout

When there is light in the room, the thermostat must see motion at least once every **4 hours** to remain in Occupied mode

When the room is dark, the thermostat must see motion at least once every **8 hours** to remain in Occupied mode

In Occupied Mode the temperature is maintained **+/- 1˚F (0.5˚C)** around the target temperature

Target +1˚F

Target Temperature

Target -1˚F
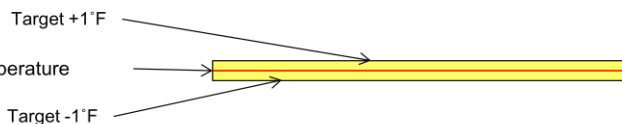
Values in **bold** print are adjustable

Motion-only Unoccupied

Room will transition to unoccupied mode if no motion is detected within a specified timeout

In a bright room, if motion is not detected for **4 hours** then the room will become Unoccupied.

In a dark room, if motion is not detected for **8 hours** then the room will become Unoccupied
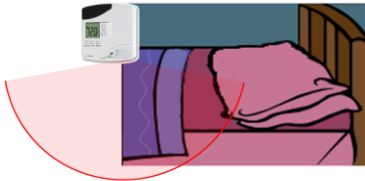
In Unoccupied Mode the temperature is maintained **+/- 4˚F (2.2˚C)** around the target temperature

Control band ramps wider as the room moves towards Unoccupied

Occupied → Time → **Unoccupied**

Target +1˚F — Target +4˚F

Target Temperature

Target -1˚F — Target -4˚F

Values in **bold** print are adjustable
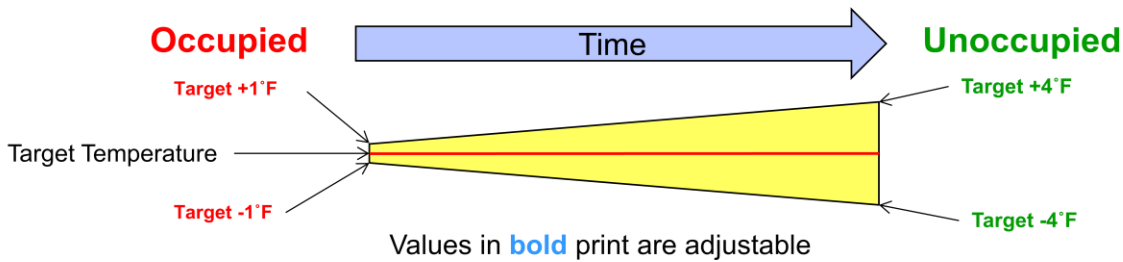
Motion-only Check-out

AFTER the room transitions into unoccupied mode, the room will begin the Un-Rented motion timeout
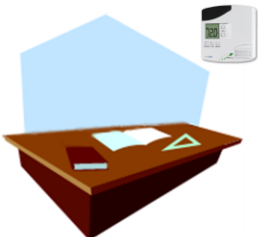
In a bright room, if motion is not detected for a total of **12 hours** then the room will become Unrented.

In a dark room, if motion is not detected for **16 hours** then the room will become Unrented

In an Un-Rented room the temperature is maintained between **62˚F (16.7˚C)** and **80˚F (26.6˚C)**

80F

62˚F
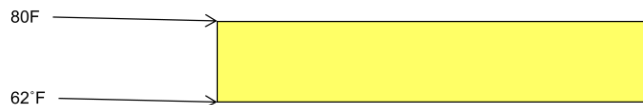
Motion-only Logic with MODEVA

- *MODEVA™ Thermostats do not have a light sensor*

- *If there is another INNCOM device in the room that has a light sensor, it will tell the MODEVA™ the light condition.*

- *If there are no other light sensor devices in the system, the MODEVA™ Thermostat will treat the space as if it were always DARK.*

Force Unrented/Unoccupied

- When a member of the staff services an un-rented room, their entry causes the room to switch into the Rented Occupied mode.
- The Staff Override may be used to manually set the room back to Un-rented Mode.

> • **Use the following procedure to set the room back into Un-Rented Mode.** (E528.4G + E527.4G only)

- Press and hold the Off/Auto button for 3 seconds then release

- The thermostat begins a count down from 180 to 0

- Leave the room within 3 minutes

- The room is set to Unrented Unoccupied when the counter reaches 0

- The display returns to normal view

This section describes additional energy management modes available with all thermostat configurations.

EMS Lite Mode

EMS Lite Mode temporarily disables energy management logic in the INNCOM thermostat and it expands the selectable range of set temperatures.

- **EMS Logic is disabled while EMS Lite is turned on**
- **The selectable range of temperatures is expanded**

Unoccupied Mode
EMS Lite **OFF**
(Uses Rented/Unoccupied Delta)

Target **+4˚F**
Target Temperature
Target **-4˚F**
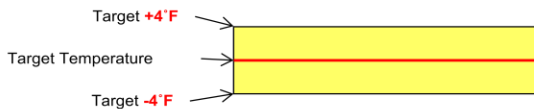
Unoccupied Mode
EMS Lite **ON**
(Uses Rented/Occupied Delta)

Target **+1˚F**
Target Temperature
Target **-1˚F**
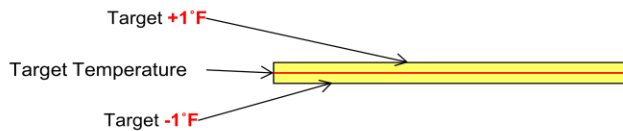
Upper Selectable Limit

EMS Lite **ON** = **85˚F (29.4˚C)**
EMS Lite **OFF** = **80˚F (26.7˚C)**

Lower Selectable Limit

EMS Lite **OFF** = **65˚F (18.3˚C)**
EMS Lite **ON** = **60˚F (15.5˚C)**

ETM Reference Mode

ETM (Energy Transfer Monitoring) Reference Mode is used to show a comparison of the runtime that would be used by a non-EMS thermostat vs. the INNCOM EMS thermostat. INNCOM thermostats transition in and out of ETM mode randomly. At any one time, about 2% of the building will be in ETM mode. While in ETM mode, the thermostat will maintain +/- 1 degree F of the target temperature regardless of Rental and Occupancy status. The thermostat collects the runtime data for heating, cooling and fan for the test period. In a networked system, this runtime data is automatically reported to the server where it is shown compared with runtime from EMS thermostats in INNcontrol 3™. In standalone systems without a network, a manual ETM test can be conducted. The procedure to run a standalone ETM test and harvest the runtime from the thermostats is included on the course USB drive.

Rented/Occupied
Rented/Unoccupied
Un-rented/Occupied
Un-rented/Unoccupied
ETM ON

Target +1˚F
Target Temperature
Target -1˚F
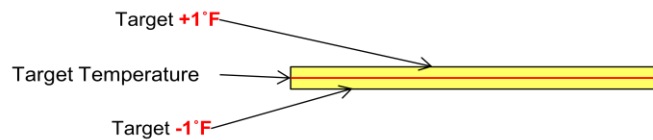
ecoMode

- ECO Mode - when enabled increases the deadband by +/- 1°F (.5°C) in unoccupied mode.

eco Mode Off

Target +4˚F
Target Temperature
Target -4˚F

eco Mode On

Target +5˚F
Target Temperature
Target -5˚F
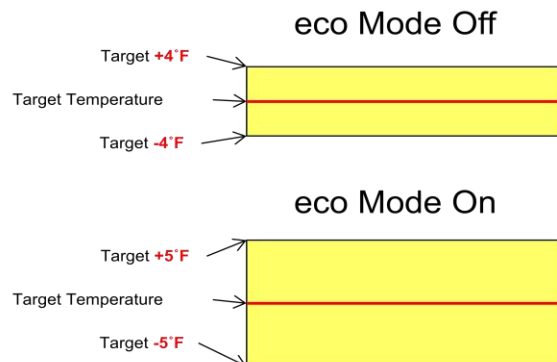
eco button and Status Led

Balcony/Window

If the room has a window or balcony that exposes the room to outside air, INNCOM can monitor the position of that window/balcony to prevent energy wasted to the outside. The basic principle is that heating and cooling are disabled while the balcony door is open.

The 4G thermostats have a variety of options surrounding this function of **Exposure**. For example, it is possible to delay turning off of the HVAC equipment when the balcony is opened to allow time for a guest to exit and close the door behind them. This delay is especially helpful in systems that use a compressor. You may also configure the balcony open to turn the unit completely OFF or to have the balcony open to the danger bands. Using danger bands helps to prevent pipes from freezing if a window/balcony is opened in the winter. In the event that the balcony is opened and the room temp drops below the danger band, heating would be turned on even though the door is open.

- **When the Balcony / Window is open heating and cooling operation will be disabled.**
  - **Option 1:**
    - Thermostat expands bands to OFF Mode/Danger Bands (50-90F)
    - Turns back on to target temp when the balcony is closed
  - **Option 2:**
    - Thermostat turns to OFF Mode and applies OFF/Danger bands
    - Thermostat remains in OFF mode when the balcony is closed
    - Guest must turn thermostat back ON when
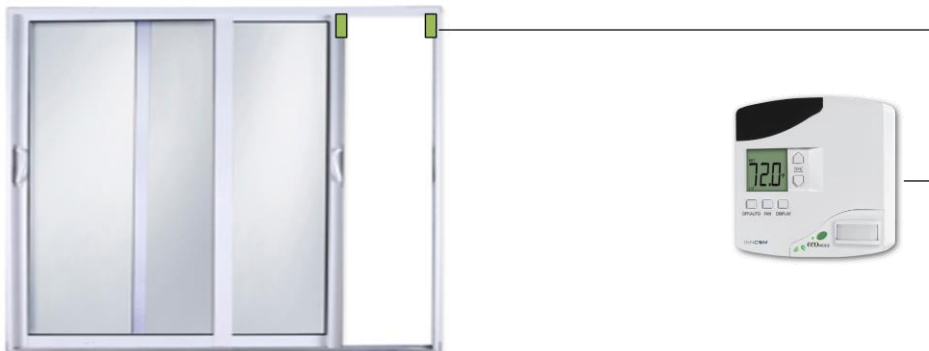
SECTION 130   SOFTWARE LOADING TOOLS

INNCOM has a variety of methods for upgrading and/or copying software configuration onto 4G thermostats and other devices. This section describes the most common tools used to upgrade or copy software to devices. The ES-1 key is a memory module used to copy software from a model thermostat and load it into a new thermostat. The ST-Link tool is used to load a thermostat with a software package from a computer. The ST7 tool is used for older INNCOM devices that are not yet upgraded to the 4G software format. The CC Debugger is used to load radio software.

130.1 ES-1 KEY

ES-1 (External Storage 1) is a companion memory module that is compatible with INNCOM's E527.4G, E528.4G and X47. It is used to store thermostat software allowing for a simple (plug-in) software upgrade.

130.1.2 HANDLING THE ES-1 - PRECAUTIONS

1. Do not touch the pins on the connector of the ES-1. Electric discharge can damage the electronic devices in the unit.

2. Do not touch the pins or come close to the pins of the ES-1 receptacle on the E528.4G thermostat. Electric discharge can damage the electronic devices in the thermostat. If possible, discharge your body of static electricity before removing the receptacle cap.

3. For thermostat protection, always cover the ES-1 receptacle with the rubber cap after using the ES-1.

The image below shows a drawing of the ES-1 Key and the receptacle on the thermostat. Both the E527.4G and the E528.4G.RG have similar ES-1 Key receptacles on the bottom of the thermostat.
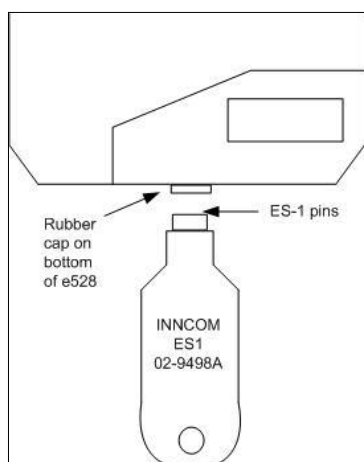
130.2 ST-LINK STM32 PROGRAMMING TOOL

The ST-Link STM32 Programming tool is used to load CBL 32 software from a computer to a 4G thermostat or other CBL 32 device. The STM32 ST-Link Utility software is installed on the computer and functions as the software loading interface.

- Used on CBL32 Devices ONLY
    - All 4G thermostats including MODEVA™
    - EVORA™ Light Switches
    - MODEVA™ Light Switches
    - X47
    - PC502.4G
- Device software has **.SREC** file extension
- Connects to computer via USB

Note:
The ST-Link tool hardware is modified by INNCOM so it can power the target device via the tool's USB power vs. requiring an external power supply to the target device. ST-Link/V2 tools modified by INNCOM have a label attached to the tool designating it as an INNCOM modified PCB. If your tool has not been modified, you will need to power the target device during programming. DO NOT power the target device separately if the ST-Link has been modified to provide power from the USB. Powering from the USB while also powering the device externally will result in damage to the device, programming tool and computer.

For detailed information and instructions on using the ST-Link, refer to application note document: AN355 Inncom Programming Tools Reference Guide.pdf

130.2.1 USING THE ST-LINK/V2 TOOL AND SOFTWARE

Installing the STM32 ST-Link Utility Software on a computer

Equipment Necessary
- ST-LINK flash programmer (Modified by INNCOM)
- Mini B to A USB Cable (included in product box)
- Modified 20 pin to 8 pin programming cable (provided by INNCOM)

Program Files and Software Necessary
- Setup.exe application installer for the STM32 ST-LINK Utility

1. Locate the installer for STM32 ST-LINK Utility and double-click to install the application.
2. Follow the installer prompts to install the software utility.
3. A shortcut to the STM32 ST-Link Utility will be located on the desktop of your computer.

Using the STM32 ST-Link Software Utility

This section describes how to use the STM32 ST-Link Software Utility to load software onto an INNCOM CBL 32 device.

1. Connect the USB cable between the ST-Link/V2 tool and your computer.
2. If you are using a modified ST-Link/V2 tool hardware, **make sure your target device is NOT POWERED**. Connect the programming cable between the ST-Link/V2 tool and the programming header on your target device.
   a. Use the H1 ICP header for the E528.4G.
3. Open the STM32 ST-Link Software Utility.
4. Click the Target menu.
5. Click Settings.
6. Click the radio button next to SWD and then click OK. (The tool will remember this setting so you only need to do this step the first time you use the utility).

7. Click the File menu and select "Open file…" to navigate to the software you would like to load in your target device
8. Click the Target menu and then select "Program & Verify…"
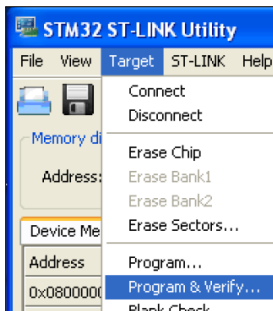
9. A new window opens describing the software it has successfully opened, but has not downloaded to the device. Click **OK** to download the software to the device.

10. A new window opens. Click Program.
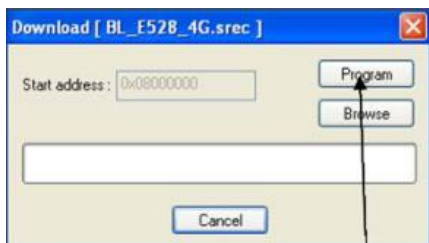
11. After pressing program the programmer will load and verify software, the red LED on the ST-LINK programmer will flash and the device will be loaded with desired software.

130.3 ST7 ICP TOOL

The ST7 is an in-circuit programming (ICP) tool used to load software on CBL 8 devices (no 4G devices). The ST7 tool connects to the computer via a serial connection. Flashbash is the user interface application used to load the ST7 tool with device software.

- Used on CBL8 Devices ONLY
    - X05B and X05R
    - X07 HVAC Controller (NOT X07.X529)
    - MCM4
    - S series light switches
    - D254.DIN
- Device software has **.S19** file extension
- Connects to computer via serial

IMPORTANT: Not all USB to Serial converters are compatible with the ST7 and Flashbash software.

For detailed information and instructions on using the ST7 ICP Tool, refer to application note document: AN355 Inncom Programming Tools Reference Guide.pdf

130.4 CC DEBUGGER RADIO SOFTWARE TOOL

The CC Debugger tool is used to load software in devices that have a separate non-integrated RF radio.

Device with Radios Programmed with the CC Debugger Programmer
S541.RF   S541.RT3   S541.RT4   SL210(DS22)K594.RF
K595.RF   L506 Lamp Module   S217.RF (Radio only) *
L208.RF (Radio Only) * L206.RF (Radio Only) * Modeva (Radio Only) *

CC Debugger Programmer
(Texas Instruments CC2430/CC2530)

IMPORTANT! The CC2430/CC2530 radio chip DOES NOT typically get re-programmed in the field. It is a "fixed" software loaded into the radio at the factory. It does not require property specific customization like a thermostat. However, programming the CC2430/CC2530 radio chip is covered in case there is the need to upgrade the CC2430/CC2530 software in the field. Devices with an "*" after the name have both a CC2430 radio chip and a separate microprocessor chip installed and have 2 programming headers on the device.

All of the other devices have JUST the CC2430/CC2530 radio chip.

For detailed information and instructions on using the CC Debugger, refer to application note document: AN355 Inncom Programming Tools Reference Guide.pdf

HONEYWELL TECHNICAL TRAINING PROGRAM

Core
Technical Training

Part 2 – Networks

SECTION 200 WIRELESS NETWORK ARCHITECTURE

This section describes the architecture of INNCOM's Deep Mesh wireless network.

200.1 DEEP MESH NETWORK ARCHITECTURE

INNCOM E-Series thermostats and PC502 room gateway devices can communicate wirelessly to a central server via a Deep Mesh RF (Radio Frequency) network. Thermostats communicate via RF to a B574/8 Edge Router and the B574/8 passes the data to the INNCOM server over Ethernet via UDP broadcast.

Figure 210.1.1.a below shows the basic structure of a Deep Mesh network where thermostats or room gateway act as router/repeaters for network communication to a B574/8 Edge Router.

Figure 210.1.1.a
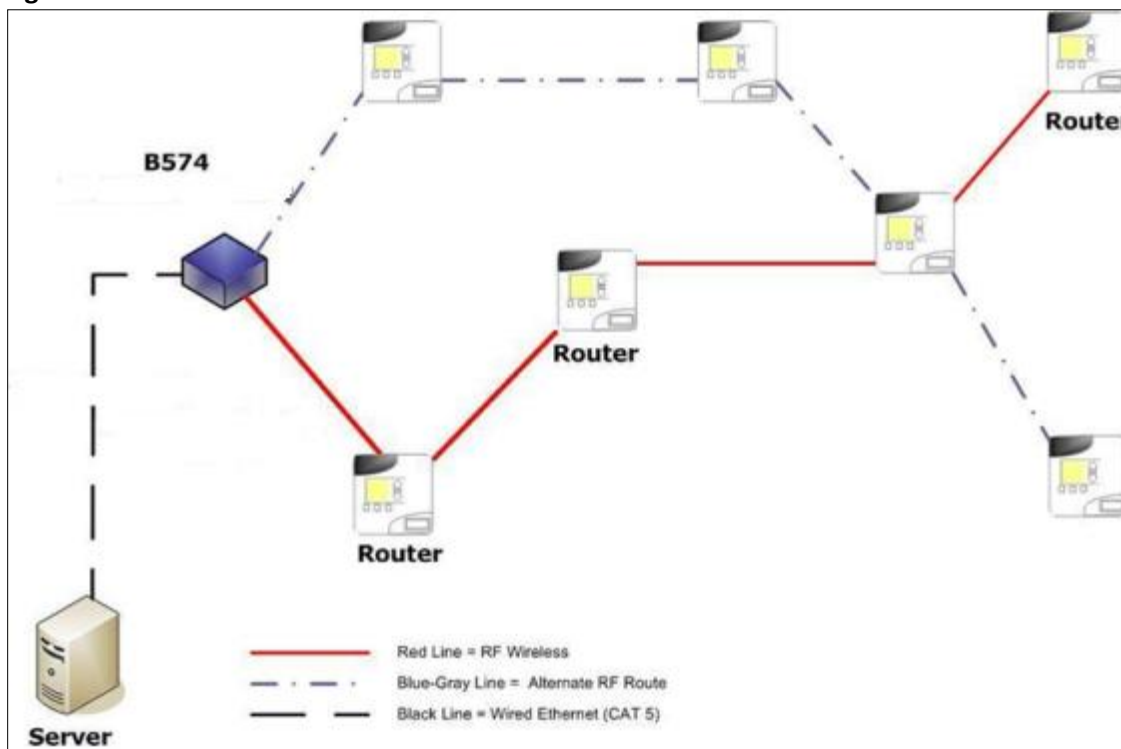
Figure 210.1.1.b below shows one typical example of how INNCOM thermostats can be segmented on a Deep Mesh network. In this example, 3 floors are connected to one edge router that is physically located at a central location on the middle floor. This segmentation works well in environments where RF signals are able to reliably pass through walls horizontally and floors/ceilings vertically. By adding multiple floors, the density of the mesh is richer allowing for more potential communication routes to the edge router vs having just a single horizontal floor on each edge router. The edge routers are then wired via Ethernet switches to communicate with the INNCOM server.

Figure 210.1.1.b
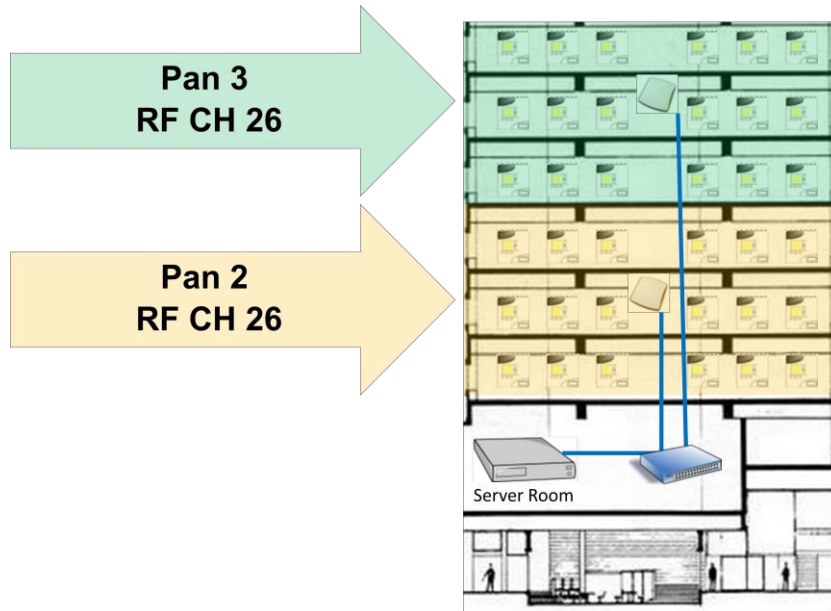
Figure 210.1.1.c below shows another typical example of how INNCOM thermostats can be segmented on a Deep Mesh network. In this example, the permeation of RF signals horizontally is very poor, while permeation vertically between floors is good. In some properties, primarily in hurricane areas, reinforced concrete walls exist between ever two or so rooms. Here, you can build your PANs to be narrow and spread vertically instead of horizontally.

Figure 230.1.1.c
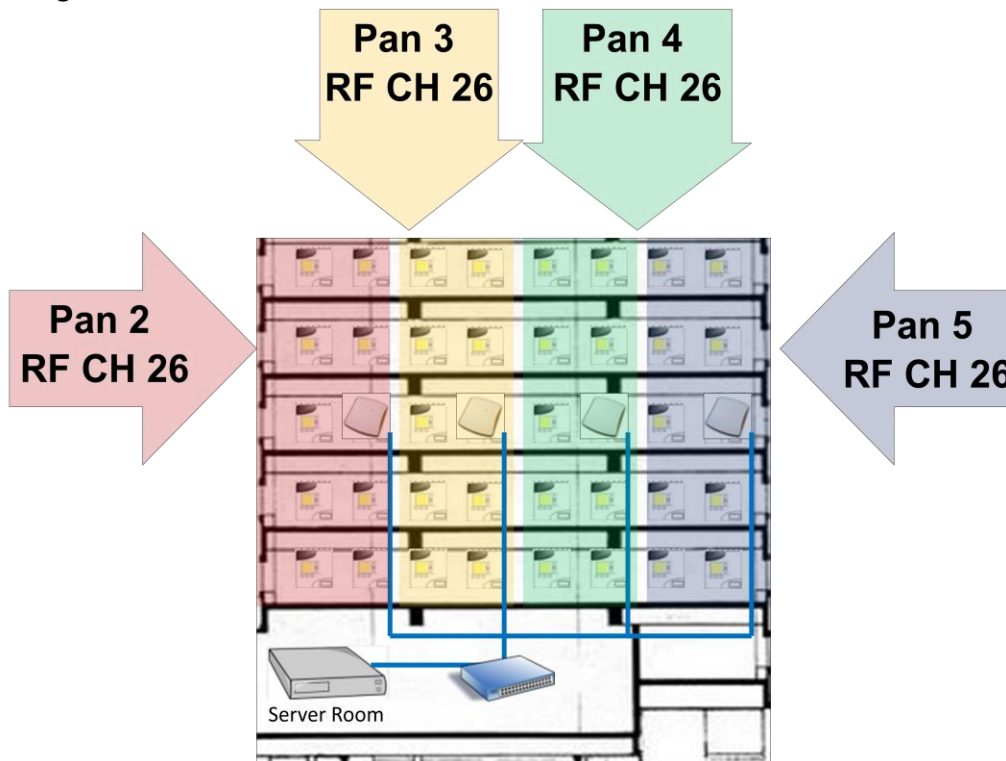
200.2 ROOM LEVEL HARDWARE CONSIDERATIONS

200.2.2 ROOM LEVEL HARDWARE

All thermostats (or PC502 in the case of MODEVA™) on a Deep Mesh network must be configured with the following information:

- Room ID (Typically the Room Number)
- PAN ID (Matches the PAN ID of the Edge Router it's designed to communicate with)
- RF Channel (Matches the RF Channel of the Edge Router it's designed to communicate with)

200.3 B578 EDGE ROUGER SPECIFICATIONS

200.3.2 B578 EDGE ROUTER SPECIFICATIONS

The B578 Edge Router communicates wirelessly via RF to an RF room gateway. All E-series thermostat systems automatically have an RF room gateway. If a MODEVA thermostat is used, then a PC502 is required to become an RF gateway for the B578.

The B578 Edge Router may be powered by 12 VDC or Power Over Ethernet (POE) where available. **The B578 Edge Router does not automatically come equipped with POE capability. If using POE, you must order the model with POE included.** A network cable connects the B578 Edge Router to an Ethernet backbone. The Edge Router may be connected to an existing/shared Ethernet backbone or it may be segmented on its own Ethernet backbone. The Edge Router broadcasts UDP frames over port 23211 towards the server.

Din Rail Mounted   Surface Mounted

The Edge Router may be configured with a static IP address and subnet or it may be setup for DHCP automatic IP address assignment. The Edge Router must also be configured with a PAN ID, RF channel and unique Edge Router ID (typically the same as the PAN). Full configuration requirements will be covered in the commissioning section.

B578 Edge Router Basics:
- Routes RF information from thermostats towards a central server
- Power options: POE or 12 VDC
- RF Range ~100 ft
- 2.4 Ghz RF/20dB radio
- Recommended between 50 to 200 communicating thermostats per edge router
- Static IP or DHCP
- Communicates UDP to server via port 23211

What impacts the required # of Edge Routers?

- 3rd Party Traffic
    - Bartech
    - CELS
- Poor RF Environment
    - Hurricane areas (reinforced concrete)
    - Plaster walls with metal mesh
    - Poor location of Edge Routers (Close to Elevators or Metal Pipes)
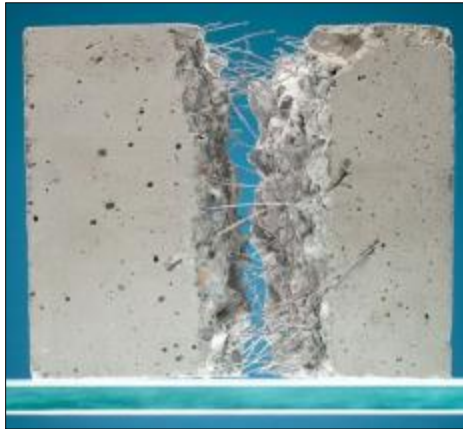
SECTION 210 ALTERNATE NETWORK SOLUTIONS

This section describes the network architecture of 2 types of wired networks available for the INNCOM system. The first option is a twisted pair RS485 network (also called DM485 for Deep Mesh 485) which requires at least one CAT6 pair to be pulled to each guestroom. The 2nd type is an Ethernet based network where INNCOM can use new or existing Ethernet network cabling to each guestroom.

210.1 TWISTED PAIR DM485 HARDWIRED NETWORK ARCHITECTURE

The INNCOM RS485 architecture requires a home-run or star configuration. Daisy-chain architecture is not supported due to the extreme troubleshooting burden a daisy-chain style network presents in the hospitality environment. A single pair is used to carry RS485 A and RS485 B communication between the thermostat/room controller and the B576 network bridge.

Preferred cable: Low voltage communication cable, shielded twisted 2 pair, 24 AWG minimum, 120OHM impedance, 12-16 PF/FT capacitance (Beldin 3170A 2 pair or equivalent).

Home Run

A typical home run architecture is pictured in Figure 220.1.1.a below. This shows the room controllers home run to a termination block and connected to a B576 floor bridge installed on every other floor. The floor bridges are connected TCP/IP to the INNCOM server. The B576 may be isolated on their own network or they may ride on an existing building network.

Figure 220.1.1.a

1. **Each room has a cable back to a termination panel**
2. **Pairs from rooms are linked on a termination panel**
3. **Group of pairs from termination panel connects to COM port on the B576 bridge**
4. **B576 Bridge connects to INNCOM server via Ethernet**
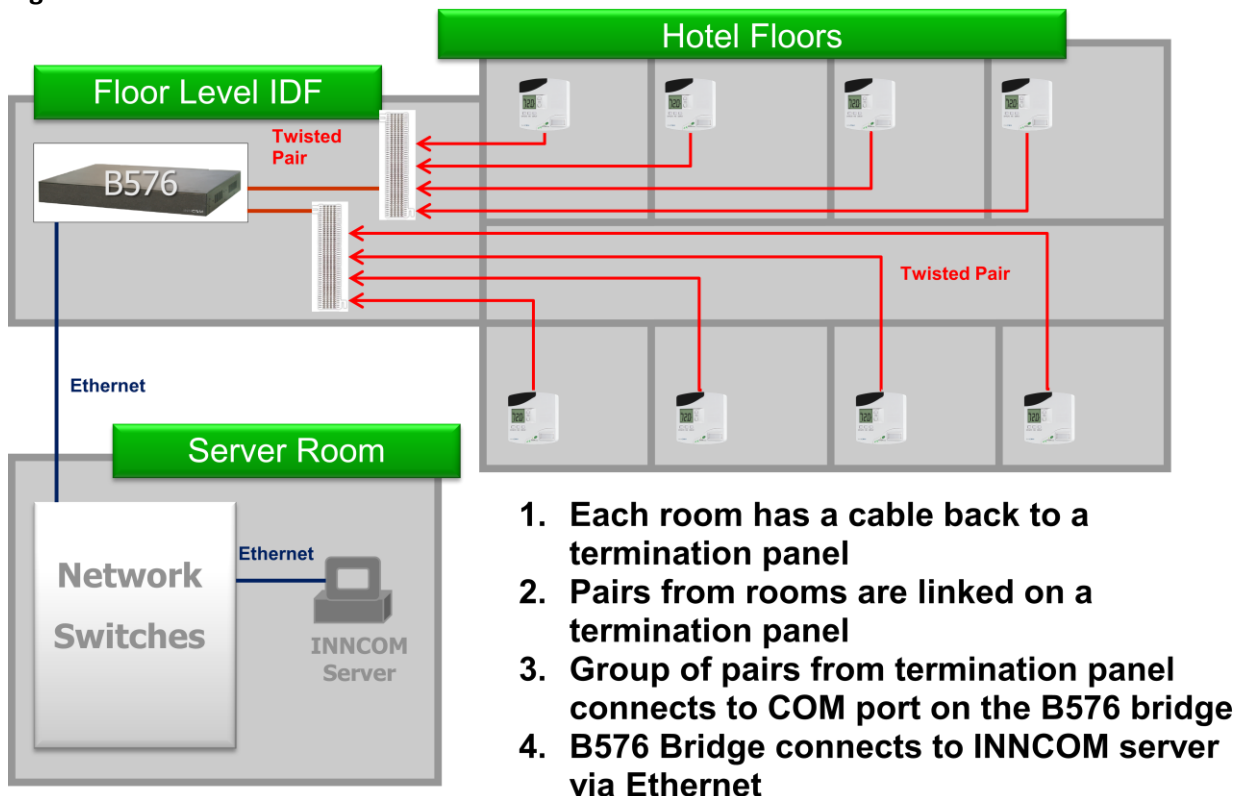
210.2 ROOM LEVEL HARDWARE CONSIDERATIONS – DM485 NETWORK

There are different hardware requirements for the various thermostats to communicate on the INNCOM RS485 network. This section describes the requirements for an E527.4G, E528.4, E529.4G/X47 and MODEVA™.

210.2.1   E527.4G ON A DM485 NETWORK

The RS485 communication is integrated on the E527.4G thermostat. The back of the E527.4G has a 6 pin header where the RS485 A and B are connected to pins 6 and 5 respectively. Figure 220.2.1.a below shows the back view of the E527.4G and the pinout of the H6 RS485 header.

Figure 220.2.1.a

Pin	Function	Comment
1	Common	GND
2	12VDC	Min 10V Nom 12V Max 14V
3	S5bus	Communication bus
4	Dry Input	Input
5	RS485B	RS485 Twisted Pair
6	RS485A	RS485 Twisted Pair
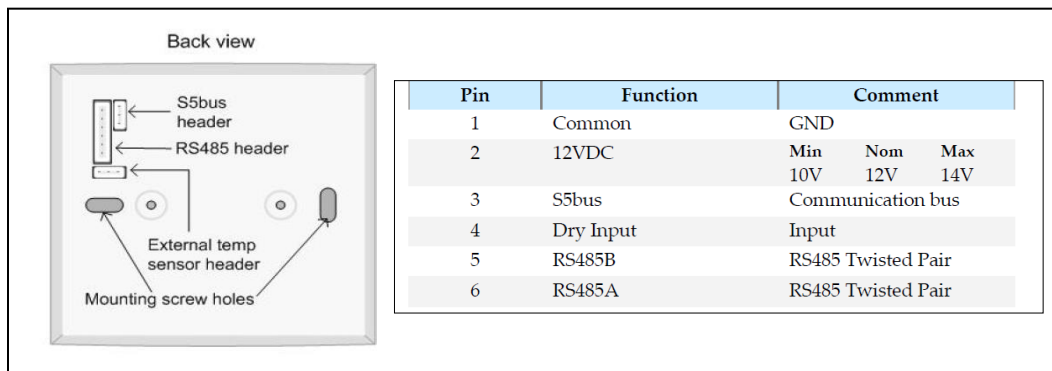
210.2.2   E528.4G AND E7 ON A DM485 NETWORK

The RS485 communication is NOT integrated in the E528.4G and an additional hardware component connected to the thermostat is required.

Figure 220.2.2.a below shows the additional board PN: 203-250 connected to the H5 header on the back of the e528 thermostat and the H3 or RS485 header on the E7 thermostat. This RS485 board has two headers for RS485 connections – RS485 In and RS485 out. Both RS485 headers are the same and the homerun pair can be connected to either header. The 2 pin cable PN: 62-1532-B.12 is connected to the RS485 board. The red conductor on this cable is wired to RS485 A and the green conductor is RS485 B.

Figure 220.2.2.a
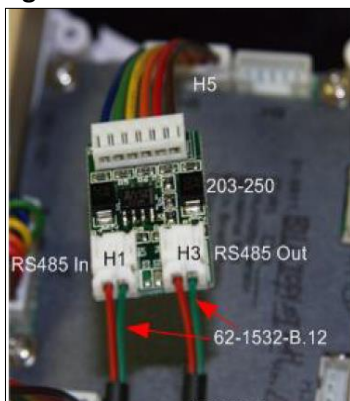
The RS485 communication is NOT integrated in the MODEVA™ or E529.4G. To connect an RS485 network to a MODEVA™ or E529.4G, use the dongle 203-250 (same as dongle for the E528.4G). This dongle will plug into header H11 on the X47. The dongle does NOT connect to the MODEVA™ or E529.4G thermostat directly.

210.3 DM485 B576 NETWORK BRIDGE SPECIFICATIONS

The DM485 communication from the room thermostats terminates at a B576 floor bridge.

- 1U Rack-mount or surface mount
- 2 RS485 communication ports
- Up to 35 thermostats/room gateways per communication port
- Up to 70 room gateways per B576
- Powered by 12 vdc
- Grounding is required

IT Requirements:
- Requires an IP address, static or DHCP is acceptable
- Communicates to the INNCOM server by means of UDP over **port 23211**

NOTE: If there is heavy traffic on the network due to an 3rd party interface or if there is excessive distance on the RS485 cable, use 30 or less thermostats per com port. The B576 must be grounded to the same earth ground as the thermostats or X47 that is using a RS485 dongle.

210.4 ETHERNET NETWORK ARCHITECTURE

INNCOM thermostats can communicate to a central server over an Ethernet backbone with the addition of a PC803 protocol converter. The PC803 converts communication from a guestroom RF transceiver to an Ethernet based UDP broadcast for communication to a central server. This section describes the architecture of the INNCOM Ethernet network. Figure 220.1.1.a below shows a typical Ethernet network backbone.

Figure 220.1.1.a
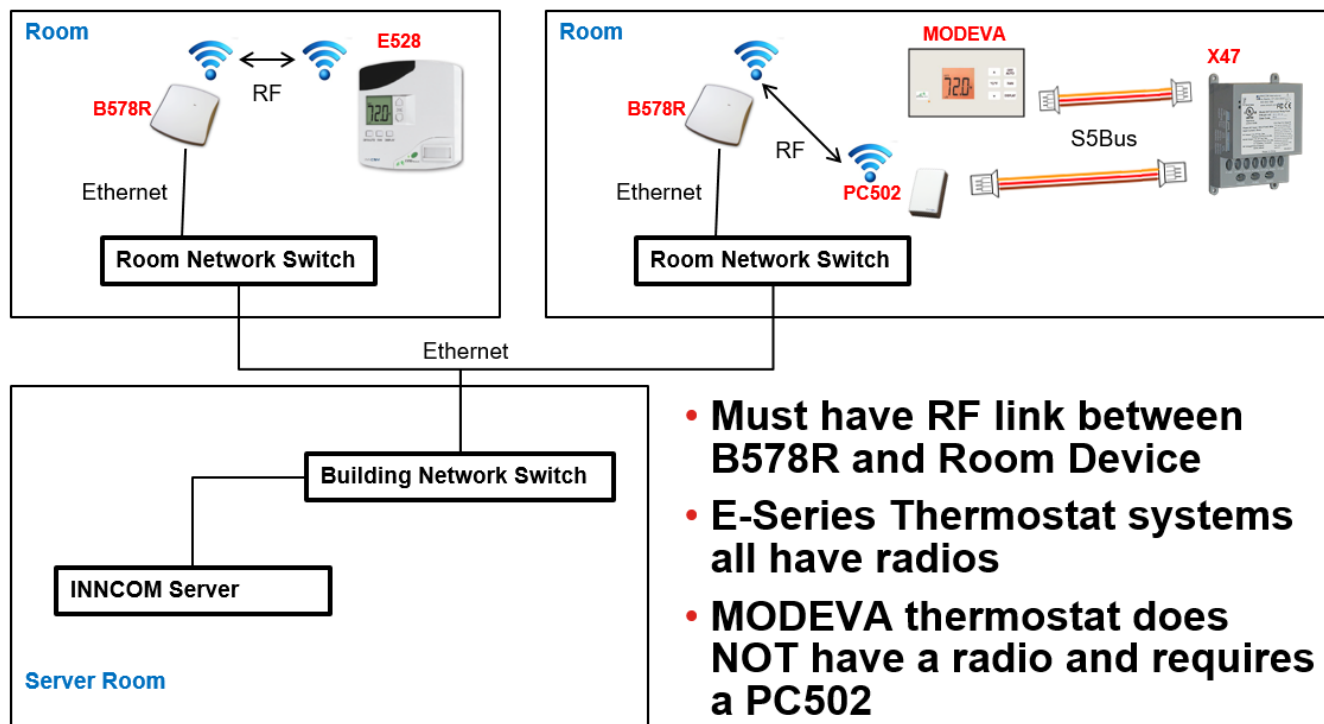
210.5 ROOM LEVEL HARDWARE CONSIDERATIONS – ETHERNET BACKBONE

210.5.1   B578R

The b578r protocol converter is a guestroom device where typically one PC803 is used for each communicating thermostat. In suites with multiple thermostats, you may have up to 7 suite thermostats connected to a single B578R.

The B578R communicates wirelessly via RF to an RF room gateway and E-series thermostat systems automatically have an RF room gateway. If a MODEVA thermostat is used, then a PC502 is required to become an RF gateway for the router.

Din Rail Mounted   Surface Mounted

The B578R may be powered by 12 VDC or Power Over Ethernet (POE) where available. **Note that the B578R does not automatically come equipped with POE capability. If using POE, you must order the model with POE included.** A network cable connects the router to an Ethernet backbone which may be an existing/shared Ethernet backbone or it may be segmented on its own Ethernet backbone. The B578R broadcasts UDP frames over port 23211 towards the server. Full configuration requirements are listed in the commissioning section.

- Routes RF information from thermostats towards a central server
- Power options: POE or 12 VDC
- RF Range ~100 ft
- 2.4 Ghz RF/0dB radio
- 1 PC803 per room, up to 7 suite rooms may be connected to the same PC803
- Static IP or DHCP
- Communicates UDP to server via port 23211

210.5.2   THERMOSTATS – ETHERNET NETWORK

Each networked thermostat (E527.4G or E528.4G) or PC502 RF room gateway (MODEVA or E529.4G) must be configured with a Room ID, PAN ID and RF Channel for communication to the B578R. The Room ID must be a unique 5 digit number and is typically the room number. The thermostat or PC502 must be set to the same RF Channel and PAN ID as the B578R.

210.5.3   ADDRESSING – ETHERNET NETWORK

Thermostats or PC502s on an Ethernet backbone must have a unique Room ID which is typically the room number just like all other INNCOM networks. The PAN and RF Channel must match the PC803 in the guestroom. Since the limitation on PAN IDs is from 2-255, the available unique PAN IDs would be used up after only 254 rooms. In properties with more than 254 rooms/PC803s, the PAN IDs will need to be duplicated/reused. It is important that the B578R with the same PAN and RF channel do not cross each other in the RF realm. All B578R's will also contain a unique "Edge Router" ID number that uniquely identifies them to the INNCOM server even though they have the same PAN and RF Channel. The Edge Router ID limitations are the same as the Thermostat Rooms IDs (1-65535).

PAN/RF Ch Configuration in each room:
- **Start at PAN 2/RF Ch 26 on the first room and go up numerically to PAN 255/RF Ch 26**
- **Once you reach the max PAN 255 restart numbering of PAN IDs.**

Figure 220.6.3.a below shows a typical addressing scheme for an Ethernet backbone.

Figure 210.6.3.a

Room 1201 and Room 101 are both **PAN2/RF26**, but they are far enough apart to prevent cross-talk

Floor 12	Room: 1201 PAN: 2 RF Ch: 26	Room: 1202 PAN: 3 RF Ch: 26		Room: 1220 PAN: 21 RF Ch: 26
Floor 2	Room: 201 PAN: 22 RF Ch: 26	Room: 202 PAN: 23 RF Ch: 26		Room: 220 PAN: 41 RF Ch: 26
Floor 1	Room: 101 PAN: 2 RF Ch: 26	Room: 102 PAN: 3 RF Ch: 26		Room: 120 PAN: 21 RF Ch: 26

*Rooms with SAME PAN/RF Ch **MUST NOT Cross***

SECTION 220   INN*control*™ 3 USER ACCOUNTS AND WORKSTATIONS

This section describes how to configure user accounts and customize visible features within INNcontrol™3. In addition, this section covers INNcontrol™ 3 workstation installation and troubleshooting.

220.1 USER SCRIPT FILES

This section describes the script files used to add users in INN*control*™ 3.

PURPOSE OF USER ACCOUNTS

User accounts provide specialization for what each INN*control*™ 3 user can view, clear or set within the application. The specialized views and controls are designed to follow the user, so the user will have the same views and controls at any workstation they login to.

220.1.1   USER ACCOUNT SCRIPT FILE LOCATION AND SYNTAX

Location

Users are managed by the **DCAccess.cfg** file located in C:\INNCOM\Scripts folder **on the INNCOM server ONLY**. This file is not used on the workstation computers.

Syntax

Users are defined in the DCAccess.cfg with 3 parameters:

      Username (no spaces allowed)
      Department (e,f,h,i,m,s) Note that department letters are lowercase.
      Trust Level (1-7)

The syntax to add a user in this script file is:

User=username,department,trust Level
Note that the **U in User is a capital letter**.

Example from default script included on the INNCOM server:
;User=housekeeping,h,1
;User=housekeepingmngr,h,2
;User=frontdesk,f,3
;User=frontdeskmngr,f,4
User=engineer,e,5
;User=engineermngr,e,6
;User=IT,i,7
User=inncom,e,7

This default script file has a number of pre-configured user account types. These accounts include two different trust levels for Engineering, Housekeeping and Front Desk along with an IT and INNCOM user. The user

department and trust level relate to preconfigured policies setup to cover the typical controls used by each group. For example, the engineer user is a trust level 5 member of the e department and the corresponding policies are configured for the typical engineer. The engineermngr user has a higher trust level and would have access to more advanced controls. Note that only the engineer and INNCOM users are active in the default script. To activate other users, remove the semicolon in front of the user name. You may copy any of these pre-configured user accounts and change the username to add customized users to the system.

Reset forgotten password

The user password is generated on the first login to INNcontrol™ 3 and is maintained in an encrypted file on the INNCOM server called "Username".USR.

Delete the "Username".USR file from the C:\INNCOM\Scripts folder on the server to clear out a forgotten password. The next time the user logs into INNcontrol™ 3, the password they enter will be saved as the new password.

220.1.2 DEPARTMENT AND LEVEL DEFINITIONS

There are 6 department groups available to select for INN*control*™ 3 users. These departments are indicated with 6 lowercase letters in the DCAccess.cfg file (e,f,h,i,m,s). The default policies.cfg script is configured to allow standard view and control of department related status items. For example, all departments can view rental status, but only engineers can control target temperature. This section describes the departments and the types of features available with each.

Departments

e = engineering/maintenance department
This user department contains the features most commonly used by engineering and maintenance departments including HVAC related items, Rental Status, Occupancy Status and DND Status.

f = front desk/office department
This user department contains the features most commonly used by front desk/office departments including basic HVAC, Rental Status, Occupancy Status and Guest Amenities Status.

h = housekeeping department
This user department contains the features most commonly used by housekeeping departments including Make-up-Room, DND, Rental Status, Occupancy Status and other Guest Amenities Status.

i= IT or Software Admin
This user department contains all features related to room communication and other IT based tasks.

220.2 FEATURE ENABLE/DISABLE SCRIPT FILES

This section describes the script files used to enable/disable features in INN*control*™ 3.

220.2.1 FEATURE SCRIPT FILE LOCATION AND SYNTAX

Location

Features may be enabled or disabled using the **Policies.cfg** script file. This file is located in the C:\INNCOM\Scripts\"Property Name" folder on the INNCOM server AND every workstation. It is recommended to make any changes needed to the Policies.cfg script on the INNCOM server prior to creating and installing workstations. This way, you do not need to update this script on each workstation.

If changes are made to the Policies.cfg script after workstations have been installed, the new Policies.cfg file will need to be copied to the C:\INNCOM\Scripts\"Property Name" folder of each workstation.

Syntax

The Policies.cfg file has a section that lists all the available features in INN*control*™ 3. There are two lines for each feature. The first line begins with a semicolon and is a text description of the feature. The line below (with no semicolon) is the active feature line. The second comma field of the feature line is the enable/disable location. This field will either be a 1 for enable or a 0 for disable. See Figure below for an example:

Policies example


```
1 = feature is enabled

; Set Temp
feature=58,1,0,4,4

; Set Temp
feature=58,0,0,4,4

0 = feature is disabled
```

The default policies.cfg file is preconfigured with the most common feature available in a basic Networked EMS system. You only need to edit the policies.cfg file if you need to enable a feature that is not available in the default configuration or disable a feature that was included in the default configuration.

220.3 PREPARING FOR WORKSTATION INSTALLATION

Complete all INNcontrol 3 design changes on the INNCOM server prior to installing workstations. Workstations are created by copying configuration and application files from the INNCOM server. If changes are made to INNcontrol 3 configuration on the server AFTER workstations are installed, each workstation will need to be updated with the modifications. A workstation installation folder will be included with the INNcontrol 3 server files and this folder may be used to install a workstation if no changes have been made to the INNcontrol 3 files or applications since they were initially designed/delivered.

220.3.1 APPLICATIONS REQUIRED FOR INNCONTROL 3 WORKSTATION

The following applications are required on each INNcontrol 3 workstation:

INNcontrol.exe
WSCon.exe

All resource and script files associated with these applications are also required.

220.3.2 CREATE WORKSTATION INSTALL FOLDER

The first step in creating a workstation is to prepare a Workstation Install folder on the INNCOM server. This folder will contain the files and applications necessary for the workstation. This section describes how to create a workstation installation folder on your INNCOM server.

1. Create a new folder on the desktop of your server and name this folder "INNCOM Workstation"
2. Make sure the INNcontrol 3 application is closed on the server. (Other applications like WinP5PT, Netcom, Dcenter, WSCon, DMSPC etc. may remain open).
3. Navigate to C:\INNCOM folder on the server
4. Copy the following folders
    a. Bin
    b. Res
    c. Scripts
5. Paste these folders in the "INNCOM Workstation" folder on the desktop
6. Open the desktop\INNCOM Workstation\Bin folder
7. Delete all files except for:
    a. INNcontrol.exe
    b. WSCon.exe
    c. Any file with extension .dll
8. Open the desktop\INNCOM Workstation\Scripts folder
9. Edit WSCon.cfg using notepad
    a. Locate the line:
    b. DSC5=localhost,3001
    c. Change localhost to the IP address of the server computer
   d. Save and close the file

This completes the creation of your workstation installation folder.

220.4 INSTALL WORKSTATION

This section describes the procedure of installing an INNcontrol 3 workstation using the INNCOM Workstation folder you have previously created on the INNCOM server.

220.4.1 INSTALLING THE INNCONTROL 3 WORKSTATION

1. Copy the INNCOM Workstation folder to C drive of your workstation computer

2. Designate a name for the location of your workstation installation and verify Server IP Address

   a. Navigate to C:\INNCOM Workstation\Scripts on your workstation

   b. Open the WSCon.cfg using **Notepad**

   c. Find the line that reads: SiteIdentification=XYZ

   d. Change the XYZ to the computer name or other description of your workstation (i.e. WS_ENG_SHOP)

   e. Scroll to the line that reads: DSC5=[IP Address],3001

      i. Verify that the IP address is the correct IP of the INNCOM server at your property

   f. Save and Close the WSCon.cfg file

3. Navigate to C:\INNCOM Workstation\Bin on the workstation

4. Create shortcuts for WSCon.exe and INNcontrol.exe

   a. Right-click on WScon.exe and choose "Create Shortcut"

   b. Right-Click on INNcontrol.exe and choose "Create Shortcut"

5. Place the WSCon.exe – Shortcut file in the Startup Folder for All Users (Note: If you do not have permissions to edit the startup folder for all users, please see your system administrator for support in placing the shortcut in this folder).
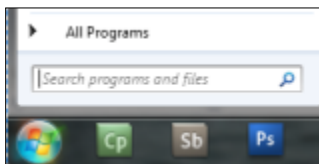
   a. Click the start menu, then select "All Programs"
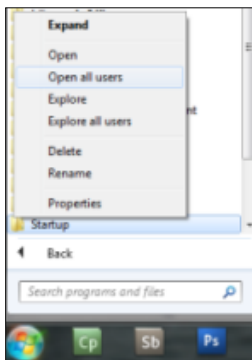
   b. Right-Click on the "Startup" folder and select "Open all user"

c.
Place the WSCon.exe - Shortcut here

6. Place the shortcut to INNcontrol.exe on the Desktop for All Users. (Note: If you do not have permissions to edit the desktop folder for all users, please see your system administrator for support in placing the shortcut in this folder).

   a. Navigate to C:\Users\Public\Public Desktop
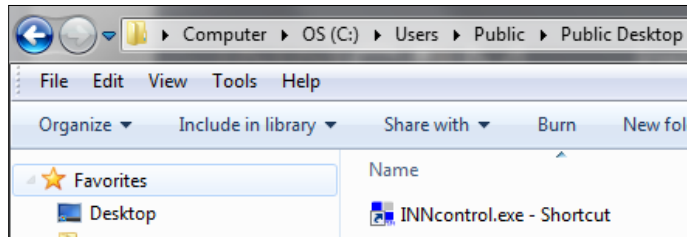
   b.
   Place the INNcontrol.exe – Shortcut here

7. Manually open the WSCon.exe application by double-clicking on the WSCon.exe – Shortcut from your Startup Folder. This application should automatically startup the next time the computer is restarted.

220.5 VERIFY CONNECTIVITY BETWEEN WORKSTATION AND SERVER

This section describes how to verify connectivity between the workstation and the INNCOM server.

220.5.1 VERIFY COMMUNICATION BETWEEN INNCONTROL 3 WORKSTATION AND SERVER

1. The WSCon.exe application started during the installation will display the version and then minimize to the system tray as a Green/White Pie icon (communicating to the server) or a grey pie icon (not communicating to the server) . If your WSCon icon is grey, see the troubleshooting section below. WSCon is designed to remain running and connected to the INNCOM server while the workstation is on. This application will close on shutdown. To manually close the application, you must end the WSCon.exe PROCESS using the task manager.

2. Open INNcontrol.exe – Shortcut from the desktop and login using the Username and Password provided by the install or training technician.

220.5.2 TROUBLESHOOTING

1. WSCon icon is grey indicating no connection to the INNCOM Server
   - Verify the INNCOM Server is up and running.
   - Verify the INNCOM Server IP address is correctly written in the WSCon.cfg script file.
   - WSCon uses port 3001 to communicate TCP to the INNCOM server DCenter application. Verify that this port is available for the application to use for two-way communication between the

workstation and INNCOM server. Verify that Windows Firewall or other Firewall application is not blocking WSCon.exe and/or port 3001.

- If opening WSCon via the Startup folder or desktop, verify that you are using a SHORTCUT and not an accidental COPY of the application. WSCon.exe must run from the C:\INNCOM\Bin location. Therefore you must use a SHORTCUT to this application in the startup and/or desktop folders.

2. INNcontrol Error when trying to Open:
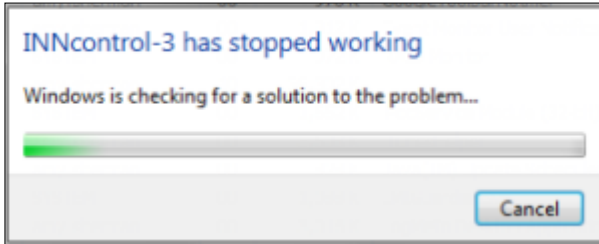
- This error appears if you are attempting to open the INNcontrol.exe application from a location other than the C:\INNCOM\Bin directory. If opening the application from the desktop, verify that you are using a SHORTCUT to INNcontol.exe running out of the C:\INNCOM\Bin folder or open the INNcontrol.exe application directly from the C:\INNCOM\Bin folder.

3. The following Microsoft .NET Framework error message appears when starting INNControl:
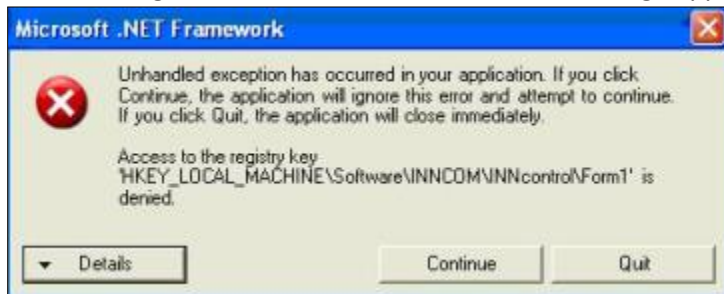
- The user account logged onto the workstation does not have appropriate access rights to the INNcontrol registry folder. Follow the steps below to change permissions to this registry folder.

    1. Logon to the workstation as an administrator.
    2. Open Windows Registry Editor – Click Start then type regedit into the search box and press enter
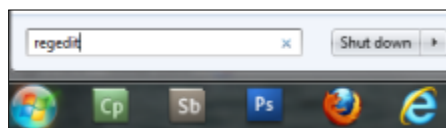
    3. In the registry , drill down to the following registry key:
        HKEY_LOCAL_MACHINE\SOFTWARE\INNCOM\INNcontrol\Form1
    4. Right-click on "Form1" , then select "Permissions.." from the menu.
    5. On the "Permissions for Form1" window that opens, find and add the user (or group the user belongs to), and allow Full control by checking the "Allow" checkbox for Full Control.
    6. Click the "Apply" button then click "OK", and then exit the Registry editor.

SECTION 230   3RD PARTY INTERFACES

230.1 PMS INTERFACE

This section describes the benefits of including a Property Management Interface (PMS) interface on a networked INNCOM system.

230.1   PMS INTERFACE BENEFITS

The PMS provides INNCOM with information on the Rental Status of a hotel guestroom. The INNCOM system uses the Rental Status information to enhance the energy management of the guestroom. This interface also provides increased guest comfort with automation of a target check-in temperature.

Here are three key benefits of including the PMS interface:
1. Enhanced Energy Management
   a. When Unrented, the room automatically expands energy management. Energy management is more aggressive since there is no waiting for extended motion delay to activate wide temperature control bands.
2. Guest Comfort
   a. When Rented, the room turns on to a check-in target temperature to begin heating/cooling the moment the guest checks in at the front desk.
3. Staff Productivity
   a. Building engineers can view rental status of the room in the INNcontrol 3 software application, eliminating the need to look up rental status in another application.
   b. When used in conjunction with room occupancy detection, the ability to view rooms that are Un-rented AND Occupied highlights potential theft of a room after normal staff hours. (i.e. The security team may quickly view a list of all Un-rented rooms that are physically occupied in the evening hours to investigate potential theft of the room).

230.1.1   PMS VENDORS AND PROTOCOL

INNCOM interfaces with many different PMS vendors. Some vendors offer RS-232 serial interfaces while others provide TCP/IP interfaces.

Table 230.2.1.a below lists PMS Vendors that offer serial interfaces along with the protocol used for each vendor and the interface connection method.

Table 230.2.1.a

PMS Vendor	Inncom PMS Protocol Used
Micros Opera, (also called Opera)	BAT PMS90
Fidelio	BAT PMS90
Libeca	BAT PMS90
Agilysys	BAT PMS90
Hilton 21, Hilton	Sci-Atlanta
OnQue	Sci-Atlanta
Springer Miller (RS-232 Serial)	Sci-Atlanta
Scientific-Atlanta	Sci-Atlanta
Visual One/Comtrol	Sci-Atlanta
Maestro (Scientific-Atlanta)	Sci-Atlanta
Encore	Sci-Atlanta
Fosse (Marriot)	Sci-Atlanta
HIS	PM PMS90
HSI	PM PMS90
HSS	PM PMS90
MSI	PM PMS90
Galaxy	PM PMS90
LMS/IAD	PM PMS90

INNCOM can also interface via TCP/IP with vendors using the PM protocol.

230.1.2   SERIAL CONNECTION PINOUT INFORMATION

Typical serial cable wiring examples showing details on the serial cable used to connect the Inncom and PMS servers are presented below.

Figure 230.2.2.a displays the pinout when the INNCOM server has a DB-9 Female serial port connector and PMS server has a DB-9 Female serial port connector.
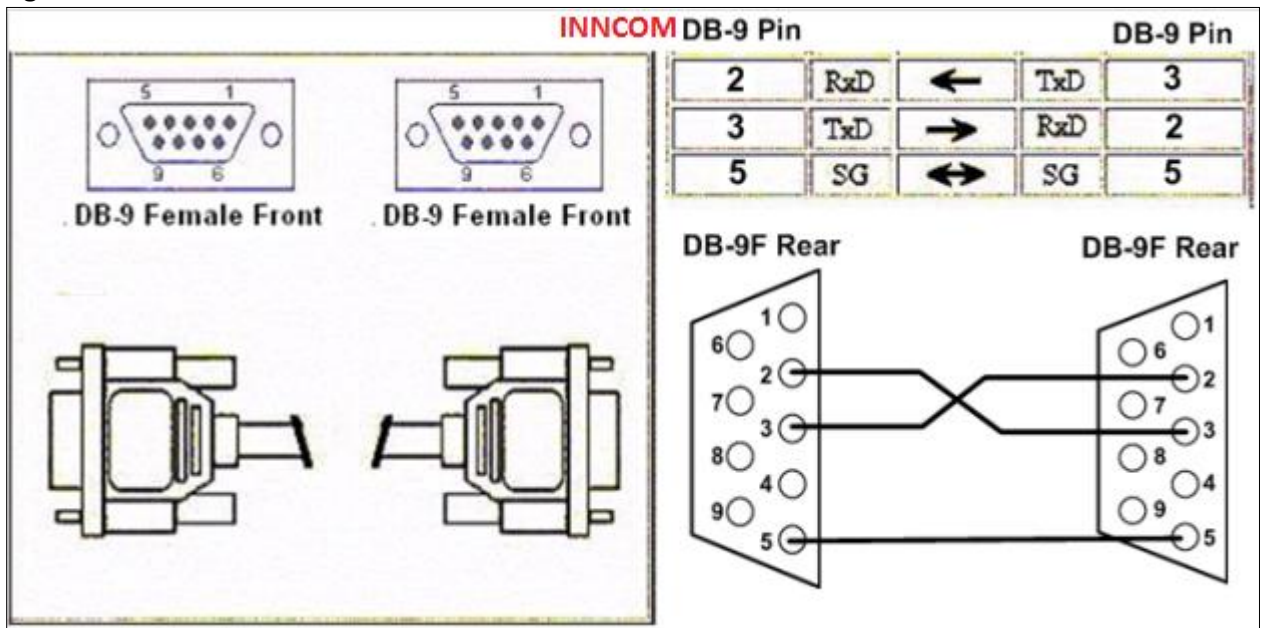
Figure 230.2.2.a

Figure 230.2.2.b below shows when an Inncom server has DB-9 Female serial port connector and PMS server has DB-25 Female serial port connector

Figure 230.2.2.b
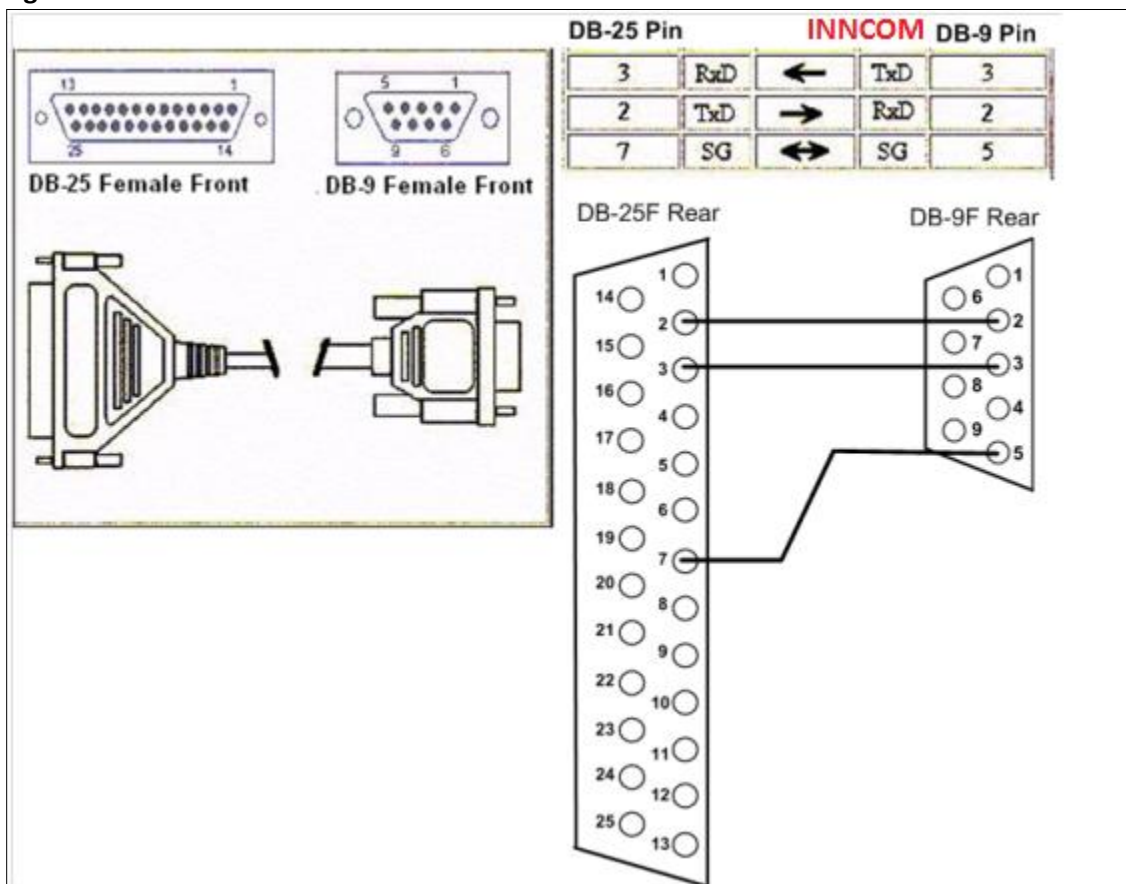
Figure 230.2.2.c shows when the INNCOM server has DB-9 Female serial port connector and PMS server has Digi Serial Port Adapter Box. Pin out the DB9/RJ adapter according to the table below and use a "straight-through" RJ ribbon cable to connect the desired port on the Digi adapter box to the DB-9/RJ adapter.

Figure 230.2.2.c

INNCOM

Modular Adapter DB Pinout	DB9	DB25	RJ45 10 Pin	RJ12 8 Pin	RJ12 6 Pin	RJ11 4 Pin	Modular Adapter RJ Socket Pinout
Rx	2	3	5	4	3	2	Tx
Tx	3	2	6	5	4	3	Rx
Gnd	5	7	7	6	5	4	Ground
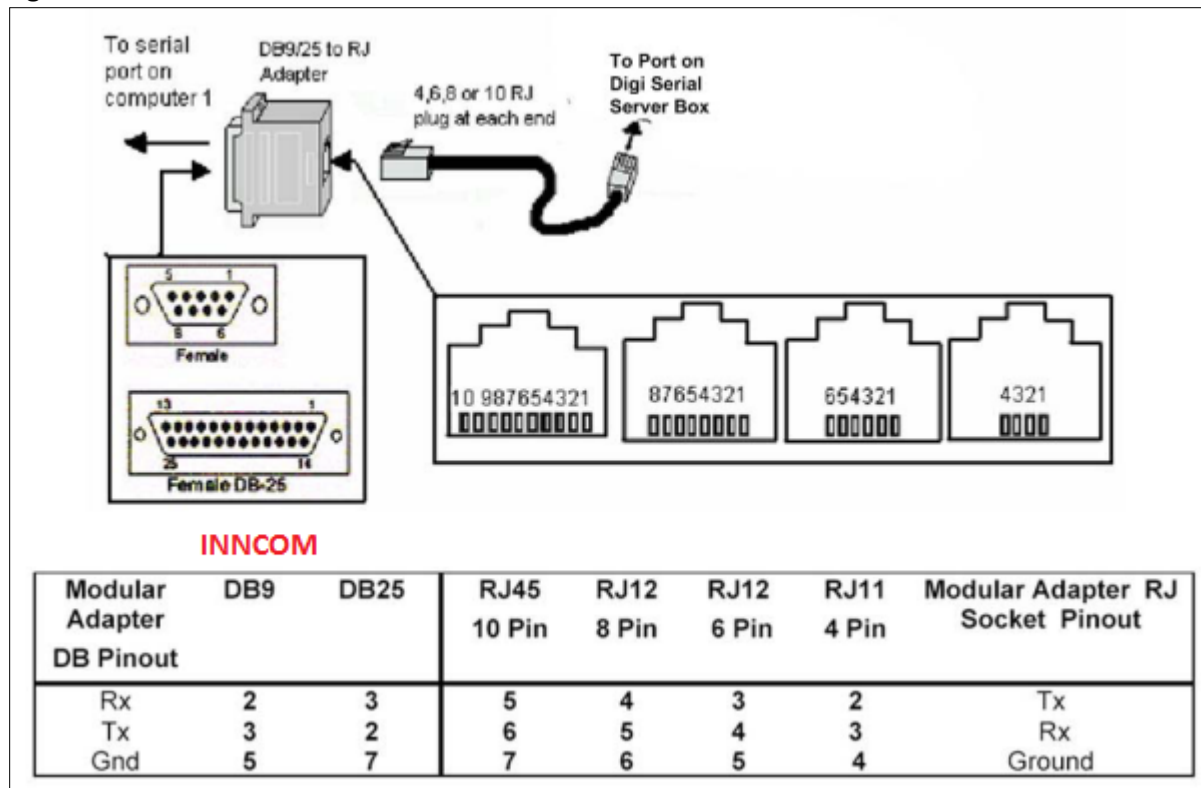
230.1.3   CONFIGURE PMS INTERFACE ON INNCOM SERVER

The INNCOM application Netcom.exe is responsible for communication to the PMS vendor. This section describes how to configure Netcom to communicate to a PMS vendor. The procedure to configure a serial vs. TCP/IP interface differs slightly.

Serial Configuration

If using a serial interface, use the following procedure to configure Netcom:

1. Determine the PMS Vendor and Protocol that will be used for the interface
2. Navigate to C:\INNCOM\Scripts on the INNCOM server
3. Open Netcom.cfg using notepad
4. Scroll down to the section called "ComPortDriver" (See Figure 230.3.1.a below)

Figure 230.3.1.a

```
;-------------------------------------------------------------
; ComPortDriver
;-------------------------------------------------------------
; Installs a number of statically configured COM port drivers.
;-------------------------------------------------------------
; Parameters:
;   com_port (COM1, COM2, ...), keep the com_port a unique!
;   logical_name ("TCS", "PMS90", ...), keep the logical_name a unique!
;   share_flag (0=non shared, 1=shared)
;   static_flag (0=dynamic, 1=static)
;   baud_rate (300, 600, ..)
;   data_bits (7, 8)
;   parity ( n (none), e (even), o (odd) )) — make sure the n , e , or o is lower case
;          Netcom version must be 1.23 or later to support even or odd parity
;   stop_bits (1, 2)
;   protocol (see NetComDef.h)
;   DriverID (protocol specific)
;-------------------------------------------------------------
;ComPortDriver=COM1,"PMPMS90",  0,1,9600,8,n,1,5,0
;ComPortDriver=COM2,"BAT_OUT",  0,1,9600,8,n,1,6,0
;ComPortDriver=COM3,"TCS",      1,0,9600,8,n,1,3,0
;ComPortDriver=COM4,"COM4",     0,0,9600,8,n,1,1,0
;ComPortDriver=COM5,"BIGCOM",   0,1,9600,8,n,1,4,0
;ComPortDriver=COM1,"B271R_1",  0,1,9600,8,n,1,7,1
;ComPortDriver=COM1,"BATPMS90", 0,1,9600,8,n,1,8,0
;ComPortDriver=COM1,"SCI_ATL",  0,1,9600,8,n,1,9,0
;ComPortDriver=COM1,"FPS",      0,1,9600,8,n,1,10,0
```

This section lists a series of preconfigured lines for each type of serial protocol. A text summary describing the code parameters is included above the ComPortDriver lines.

5. Find the line that lists the protocol for your PMS interface and remove the Semi colon from in front of that line.
6. Edit the COM# to the comport on the INNCOM server that you are using to connect to the PMS vendor
7. Edit the Baud Rate, Data Bits, Parity, and Stop Bits of the connection to match the PMS vendor connection
8. Save and close the file
9. Restart the Netcom.exe application

Examples of typical PMS serial configurations are shown below in Figure 230.3.1.b.

Figure 230.3.1.b

Un-comment the following line if **HIS , HSI , HSS , MSI , Galaxy or LMS/IAD:**
ComPortDriver=COM**1**,"PMPMS90", 0,1,**9600,8,n,1**,5,0

Un-comment the following line if **Micros Opera , Fidelio , Agilysys or Libeca:**
ComPortDriver=COM**1**,"BATPMS90", 0,1,**9600,8,n,1,**8,0

Un-comment the following line if **Hilton 21 (or Hilton or Hilton OnQue) , OnQue , Scientific Atlanta, Fosse ,Encore,Maestro or VisualOne/Comtrol.** Note that the Baud Rate, Stop Bits and Parity are typically are one of the following:

ComPortDriver=COM**1**,"SCI_ATL", 0,1,**1200,7,o,1**,9,0
                 OR
ComPortDriver=COM**1**,"SCI_ATL", 0,1,**9600,8,n,1**,9,0

TCP/IP with the Micros FISA (Fidelio) PMS

- **Requirements**
    - **The Micros server must be configured to accept the TCP**
    - **INNCOM Micros FISA Interface software on INNCOM server**
    - **INNCOM WSCon 1.27 or later**
- **Configuration on INNCOM Server (MicrosFISAInterface.cfg)**
    - **The "Fidelio_IP" and "Fidelio_Port" lines provide the IP address and port of the Micros FISA (Fidelio) server**
    - **The "Inncom_IP" and "Inncom_Port" lines provide the address and port on the INNCOM (defaults typically used)**

```
; Micros FISA (Fidelio) Interface


Fidelio_IP=xx.xx.xx.xx
Fidelio_Port=5006
Inncom_IP=localhost
Inncom_Port=3002
;Room_Equipment=Y
```
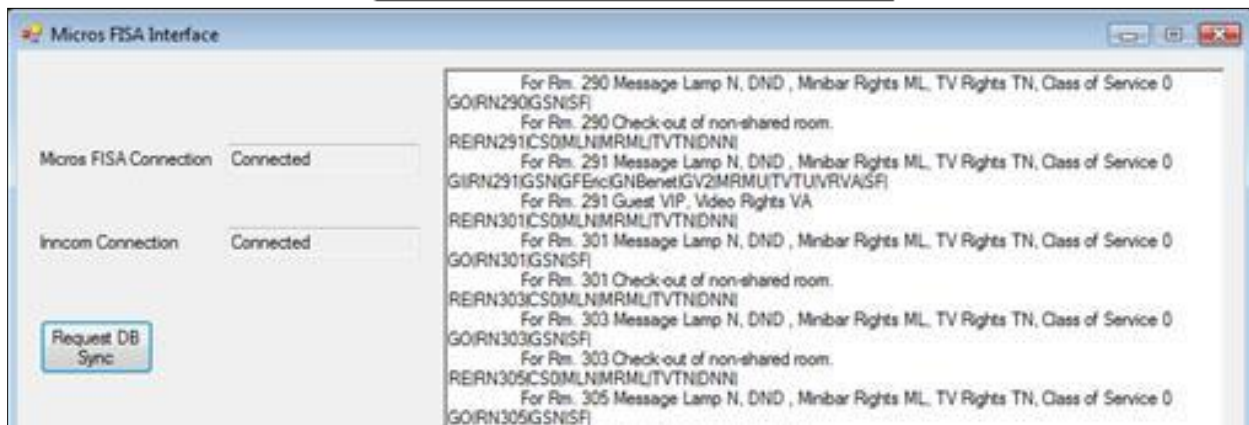

230.1.4   VERIFY COMMUNICATION FROM THE PMS USING TRACER

The i5Tracer application is used to monitor traffic over Netcom. This tracing application will display live data on the PMS serial interface with Netcom. This section describes how to use tracer to view/verify PMS activity.

Using the following procedure to open Tracer.exe and view PMS data:

1. Navigate to C:\INNCOM\Bin on the INNCOM server
2. Double-click Tracer.exe to open the i5Tracer (See Figure 230.4.1.a below)

Figure 230.4.1.a
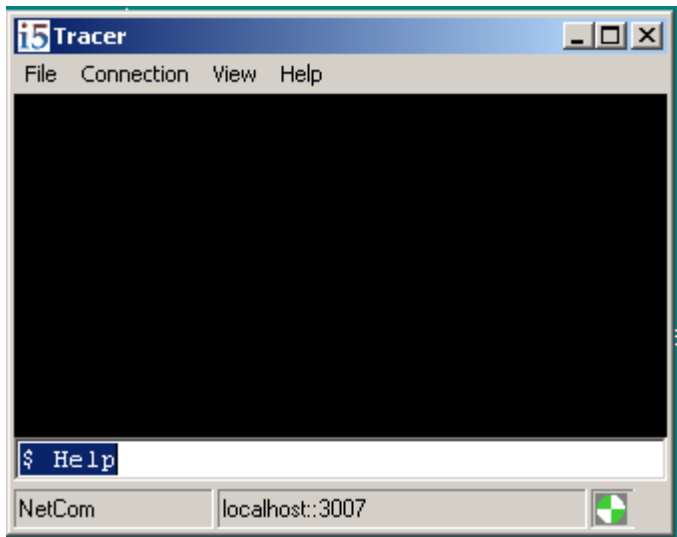
3. To trace PMS data click the bottom text box and replace $ Help with $ trace pms and press the "Enter" key. This will start the trace of PMS data on the message window. (See Figure 230.4.1.b below)

Figure 230.4.1.b
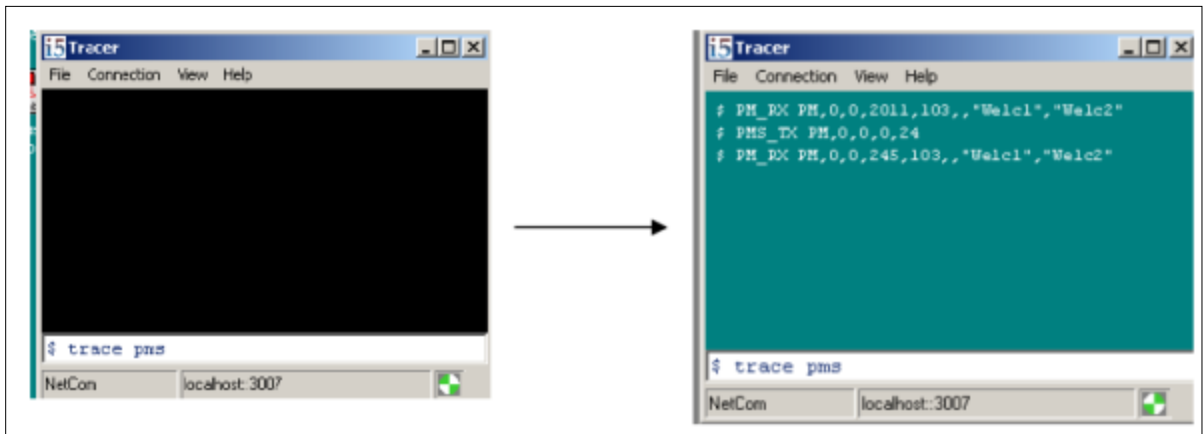
4. The data in tracer will differ based on the type of PMS protocol.
    a. Figure 230.4.1.c shows a description of the PM Protocol
    b. Figure 230.4.1.d shows a description of the BAT Protocol
    c. Figure 230.4.1.e shows a description of the Sci-Atlanta Protocol

Figure 230.4.1.c

For PM Protocol PMS (HIS , HSI , HSS , MSI , Galaxy or LMS/IAD)
X—Sequence # but typically not used and = 0   YY—Usually Guest Name   ZZ—Usually blank

For a room Check-In: $ PM_RX PM , X , X , RoomID , 103 , X , "YY" , "ZZ"
For a room Check-Out: $ PM_RX PM , X , X , RoomID , 104
To set a room to Rented: $ PM_RX PM , X , X , RoomID , 101
To set a room to Un-Rented: $ PM_RX PM , X , X , RoomID , 102

"Beacon" message sent by : $ PM_TX PM , 0 , 0 , 0 , 24   sent by Inncom
Inncom Server to verify PMS $ PM_RX PM , 0 , 0 , 0 , 24   reply from PMS server
Server is online. PMS server
should immediately reply
with the same message

Complete room update. Inncom $ PM_TX PM , 0 , 0 , 0, 110   INNCOM requests full room update
requests a complete update of $ PM_RX PM , X , X , 201 , 101   PMS—set room 201 Rented
the rental status of all rooms. $ PM_RX PM , X , X , 202 , 102   PMS—set room 202 Un-Rented
PMS server replies by sending a $ PM_RX PM , X , X , 203 , 101   PMS—set room 203 Rented
series of 101 or 102 commands $ PM_RX PM , X , X , 204 , 101   PMS—set room 204 Rented
to set the rental state of all rooms $ PM_RX PM , X , X , 210 , 102 PMS—set room 210 Un-Rented

Figure 230.4.1.d

For BAT Protocol PMS (Micros Opera , Fidelio, Agilysys or Libeca)

YY—Usually Guest Name

For a room Check-In: $ BAT_RX ZONE=RoomID:PAR=WELCOME1:SET="YY":BAT=CHECKIN
For a room Check-Out: $ BAT_RX ZONE=RoomID:BAT=CHECKOUT
To set a room to Rented: $ BAT_RX ZONE=RoomID:BAT=RENTED
To set a room to Un-Rented: $ BAT_RX ZONE=RoomID:BAT=UNRENTED

Complete room update. INNCOM $ ZONE="HOTEL":MSG="RM_STAT?"   INNCOM requests full update
requests a complete update of $ ZONE=201:BAT=RENTED   PMS—set room 201 Rented
the rental status of all rooms. $ ZONE=202:BAT=RENTED   PMS—set room 202 Rented
PMS server replies by sending a $ ZONE=203:BAT=UNRENTED   PMS—set room 203 Un-Rented
series of commands to set the $ ZONE=204:BAT=RENTED   PMS—set room 204 Rented
rental state of all rooms $ ZONE=2011:BAT=UNRENTED   PMS—set room 2011 Un-Rented

Figure 230.4.1.e

For Sci-Atlanta Protocol PMS (Hilton21 , Hilton OnQue , Hilton , OnQue , Scientific Atlanta , Fosse, Maestro or VisualOne/Comtrol)

XXXX—Room ID. If room ID length <4, a 0 or space can be inserted.   0101 or 101 will work
Y—1 digit checksum that is the right-most digit of the sum of the room ID digits
     Room ID = 345 , sum=12 so checksum =2
     Room ID = 2050 , sum=7 so checksum =7

To set a room to Rented: $ PMS_SCIAT_RX EXXXXY
To set a room to Un-Rented: $ PMS_SCIAT_RX VXXXXY

Examples: Set room 306 Rented $ PMS_SCIAT_RX E03069

230.2 CELS INTERFACE

This section describes the Central Electronic Lock (CELS) interface on a networked INNCOM system.

- **Big advantages to a lock having connection to the lock server**
- **INNCOM has a network, so we share communication path.**
- **We also use info from door state and key card for occupancy and staff vs. guest operations**
- **Vendors: Saflok, Timelox/Ving, Hafele, Salto**
- **CELS is lock provider talking over our network.**
- **RF message packets only FIT over DeepMesh (RF or DM485) networks.**
  - **Message is too long to travel over our S5-Bus**
  - **CELS proxy must be Room Gateway**

	Saflok	Haefele	VingCard	Salto
Defaulk P5 address of lock	67	68	65	69
Proxy E528.4G	✓	✓	✓	✓
Proxy Evora	✓	✓	✓	✓
Proxy PC502 (CBL32)	✓	✓	✓	✓
Proxy E528.3G	✓	✓	✗	✗
Proxy Modeva	✓	✓	✗	✗
Proxy S217	✓	✓	✗	✗

230.2.1 CELS INTERFACE BENEFITS

Benefits for the INNCOM System:
1. Electronic Door Lock transmits "Door Open" and "Door Closed" messages for use in the INNCOM EMS strategy
2. Door Ajar, Low Lock Batter and other indicators available in IC3 for increased productivity within the IC3 software. Note: Not all lock vendors provide all these additional status indicators.

Additional benefits for Property and Lock System:
1. Broadcast card cancel – quickly cancel a master key for all communicating locks in the event that a master key is lost or stolen. This eliminates the need to visit every door lock individually with a cancel card.
2. Centralized security logs of lock activity on the lock server.
3. Remote room changes – In the event that the guest doesn't like the room when they arrive, the front desk can reassign the guest's key to a new room and cancel the card for the existing room. This prevents the guest from having to return to the front desk to change rooms.

230.3 BARTECH MINI-BAR INTERFACE

- **Bartech Minibar wants to report to its server that items have been used from the minibar so they can be charged and restocked.**
- **Bartech in-room can talk to INNCOM Proxy, which forwards the info to the Edge Router**
- **Bartech gets data DIRECTLY from the edge router instead of getting it from IC3**
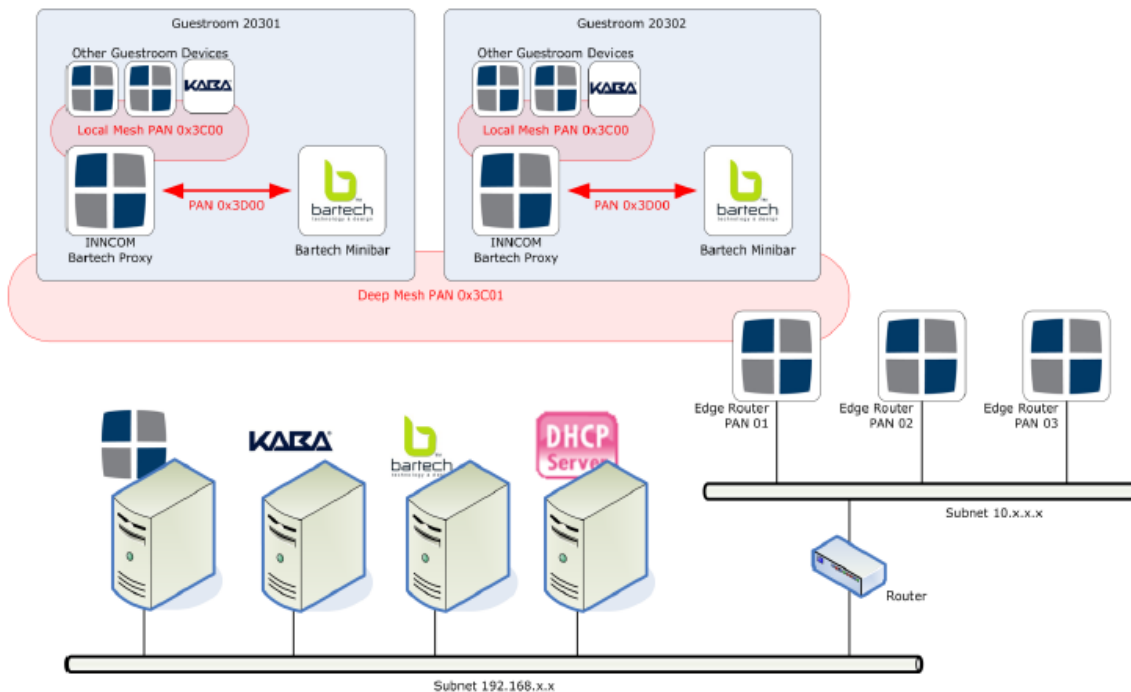
230.4 WORK ORDER SYSTEM INTERFACE

This section describes the basic concept of the HotSOS work order system interface. For detailed information on this interface, refer to interface document: **S2S_MTech Engineering Manual.pdf**

- **INNCOM Codes / States to send**
  - Aux 0 / Aux 1 alarm
  - Food Tray Removal / Valet / Butler / Shoe Shine
  - SOS
  - Door Lock Battery LOW
  - Door Ajar (closed, not latched)
  - Door Open too long
  - HVAC Equipment / Comfort alarm
  - DND / MUR
  - Rental / occupancy

HotSOS can then be configure
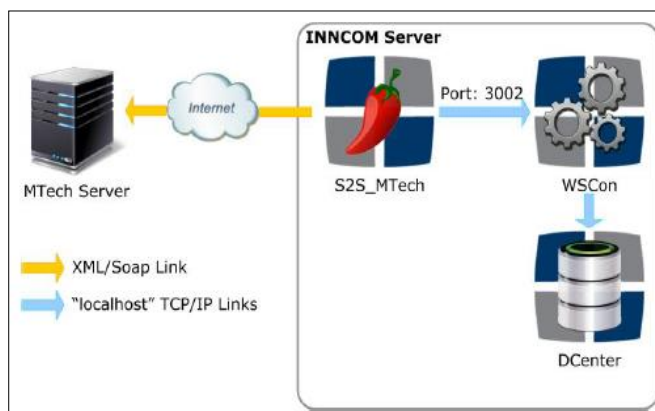
HONEYWELL TECHNICAL TRAINING PROGRAM

Core
Technical Training

Lighting and Amenities

SECTION 300   LIGHT AND GUEST AMENITIES COMPONENTS

INNCOM by Honeywell has a portfolio of controls and dimmers to meet nearly any requirement for the hotel guestroom. MODEVA™, EVORA™, Designer Series™ and S-Series offer a wide range of control points for lighting, drapes, and door chimes. These systems also combine status indication for functions such as Do Not Disturb, Make Up Room, Butler call and other functionality. When used as a component within the IRAS, the system expands to transform the guestroom into an energy efficient, beautifully illuminated and comfortably controlled environment to meet the needs of the most demanding guest.

Features and Benefits

- **Provides complete IRAS capabilities**
    - Differentiates Honeywell in the market

- **Benefits property owners**
    - Energy savings
    - Unique customized design
    - Delighted guests

- **Benefits hotel guests**
    - Security
    - Ease of use
    - Convenience

- **Lighting Features**
    - Utilize occupancy detection for additional energy savings- turn lights off on unoccupied
    - Can delay lights off for bathroom, etc
    - Can control individual lights or "Master Relay" for entire room's loads
    - Convenient "Master Off"
    - Can define reaction upon guest return or entry

INNCOM Lighting control includes both light control devices and switches along with lamp control devices. This section describes the family of light control devices and switches uses for lighting. Device specifications including control and communication types are described for information purposes only. Always refer to the latest product guide for device specifications.

300.1   LIGHT CONTROL DEVICES

Light control devices are connected to control circuits and communicate to switches on the INNCOM IRAS system. Typically the light control devices are installed in a lighting termination panel where line voltage light control terminates and they communicate to the INNCOM switches via S5Bus or RF with the addition of a PC502. This section describes light control devices.

300.1.1   X05B/X06 – RELAY LIGHT CONTROL

The X05B/X06 device may be configured to control light circuits and other signals such as an external chime. There are 5 relays available and each relay has an option for normally open or normally closed configuration. The device is powered by line voltage (120-277 VAC 60Hz) and the relays have the following specifications:

- Normally Closed Configuration
    - 30A, 240VAC
- Normally Open Configuration
    - 40A, 240VAC

The X05B board communicates to other INNCOM Devices via S5Bus. A PC502 may be added to the system for RF wireless communication on the INNCOM system.   The X05B receives control signals from INNCOM switch devices for instruction on which circuit to open/close.

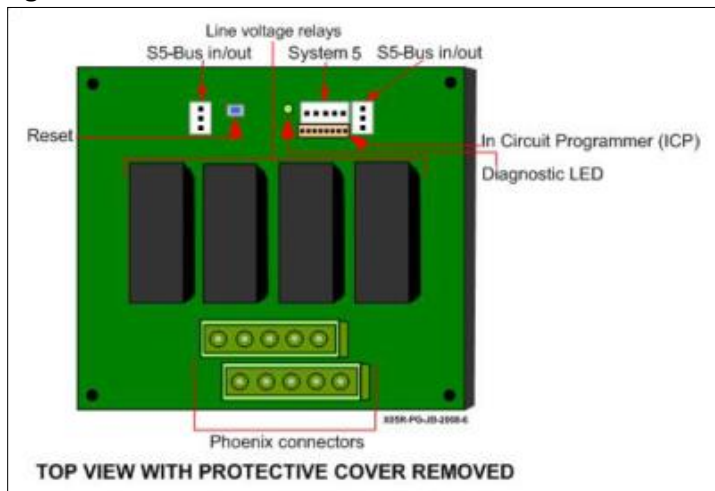### 300.1.2   X05R – RELAY LIGHT CONTROL

The X05R device is a DIN rail mountable device that has a built-in logic board with either 4 or 8 available relays. The logic board on this device must be powered by 12 vdc and it communicates on the INNCOM S5Bus. .   The X05R receives control signals from INNCOM switch devices for instruction on which circuit to open/close. Control circuits are wired to the X05B relays via phoenix connectors attached to the device.

Product Specifications include:

- DIN rail mountable
- Voltage: 12VDC (Requires power suppy)
- Relay contact rating: 100–240VAC 15A
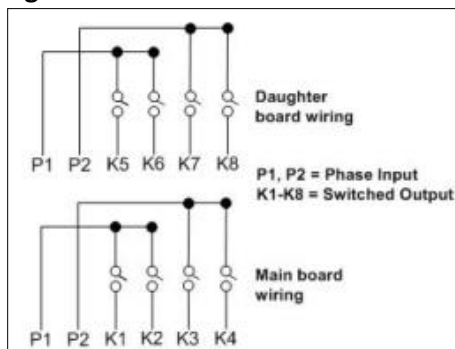- 1 digital input
- Wired S5bus communication

Figure 300.1.2.a below shows a drawing of the X05B with the cover plate removed.

Figure 300.1.2.a

The internal relay wiring of the device is shown in Figure 300.1.2.b below.

Figure 300.1.2.b

300.1.3   X06.DIN – RELAY LIGHT CONTROL

When coupled with the MODEVA, EVORA, Designer Series or S-Series switch, the X06.DIN provides the actuation required for lighting and drape control applications. The X06.DIN participates in the IRAS via wired S5bus communications or via PC502 for wireless RF communications. The X06.DIN is specifically designed with CE Mark / International applications in mind.

Product Specifications include:

- Voltage: 12VDC (Requires power supply)
  - **K1-K3 100-240 15A,**
  - **K4/K5 100-277V 30A (cannot use the Phoenix connectors for 277V)**
- 2 analog inputs
- 2 digital outputs
- 1 general purpose I / O
- Wired S5bus communications

NOTE: Specifications differ depending on regional approval marks like UL, CCC, etc.

Figure 300.1.3.a below shows a drawing of the X06.DIN with the cover removed.
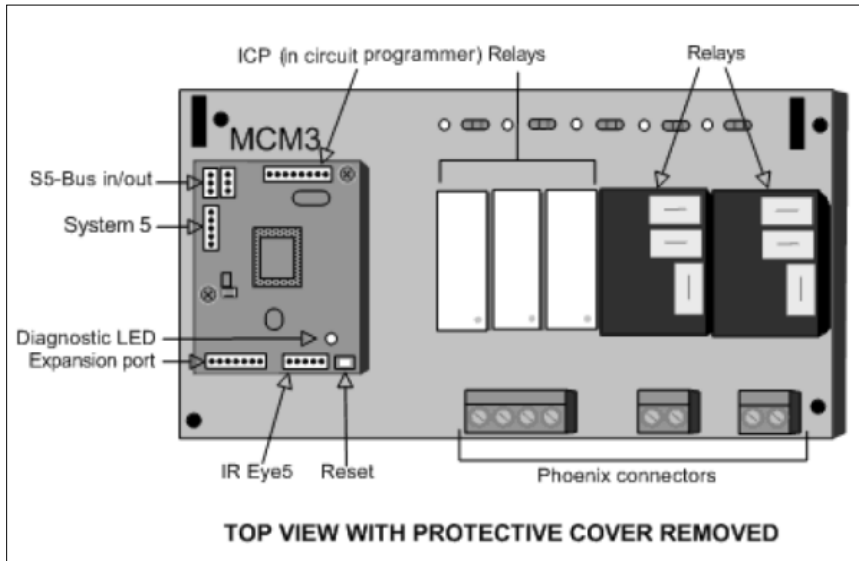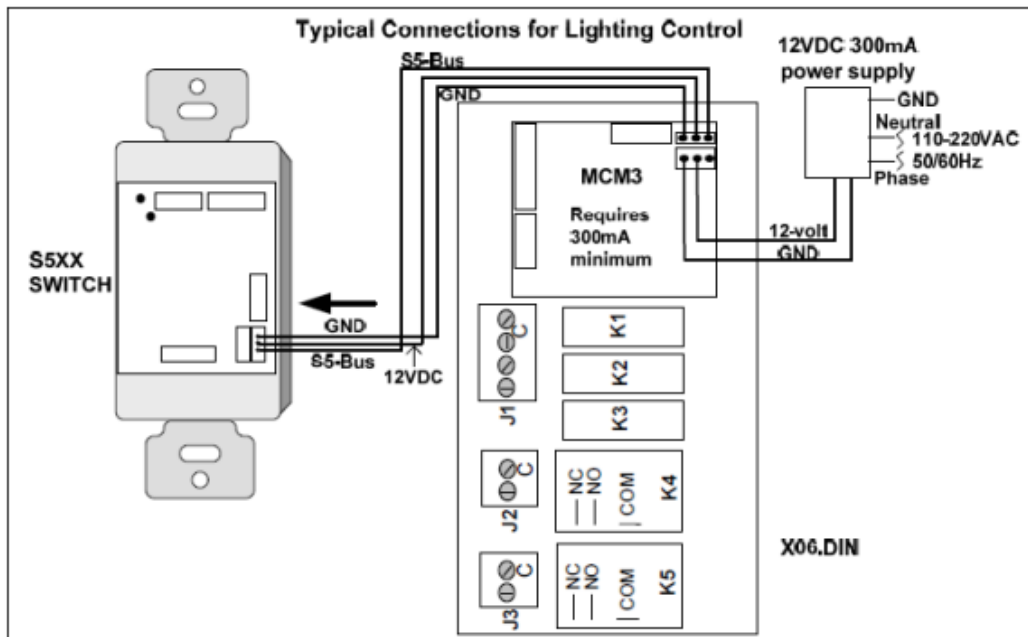
Figure 300.1.3.a

Figure 300.1.3.c below shows a sample wiring diagram of the X06.DIN connected to an S-Series switch for light control.

Figure 300.1.3.c

The D254.DIN is a DIN rail mountable device with a 2 channel dimmer. There are two different varieties of D254: **leading edge TRIAC and trailing edge MOSFET**. The leading edge dimmers are ideal for circuits with tungsten, resistive and inductive loads, including incandescent lamps, halogen, and low-voltage lamps with a compatible electronic transformer. The trailing edge dimmers are ideal for incandescent lamps, dimmable CFL and LED lamps. Utilizing a trailing edge dimmer also provides the quietest style of dimming for projects where noise is an issue. The INNCOM leading and trailing edge dimmers are equipped with over-current protection and an air-gap relay to protect the circuitry from power surges and brownouts. These features also increase the life of the lamp while protecting the engineer during maintenance activities.

Product Specifications Include:

- Voltage: 100VAC–240VAC 50 / 60Hz
- Dimming: 100–240VAC, 2 x 600W leading edge or 2 x 400W trailing edge
- Relay contact rating:120–240VAC, 1500W. Used for air-gap circuit disconnect
- Wired S5bus communication
- Quick disconnect terminal block connectors

Figure 300.1.4.a below shows a sample wiring configuration for the D254.DIN.
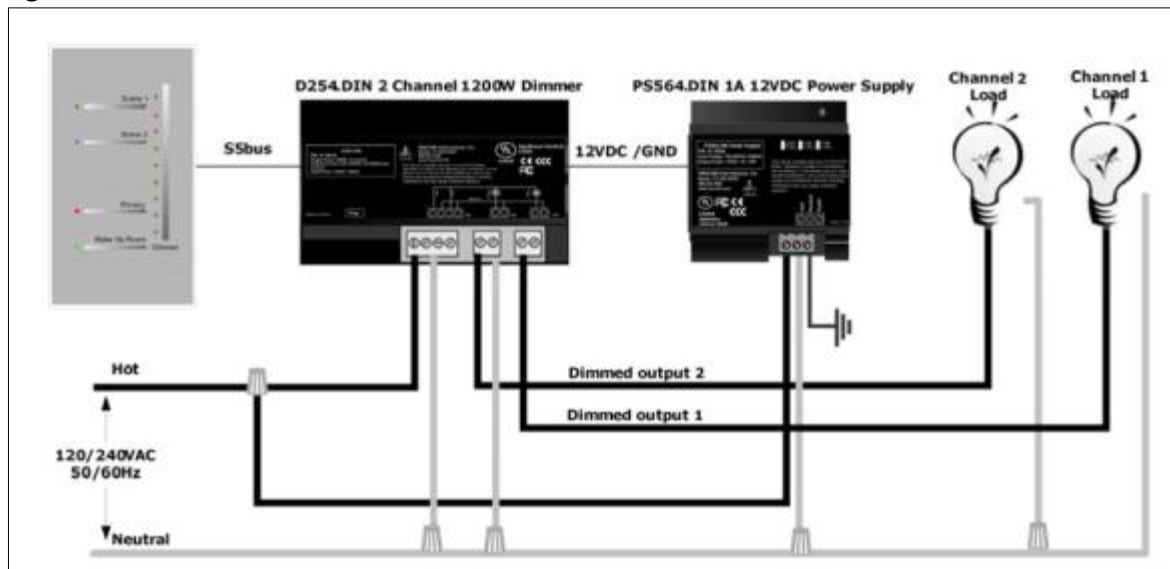
Figure 300.1.4.a

Figure 300.1.4.b below shows the D254.DIN line voltage connections.
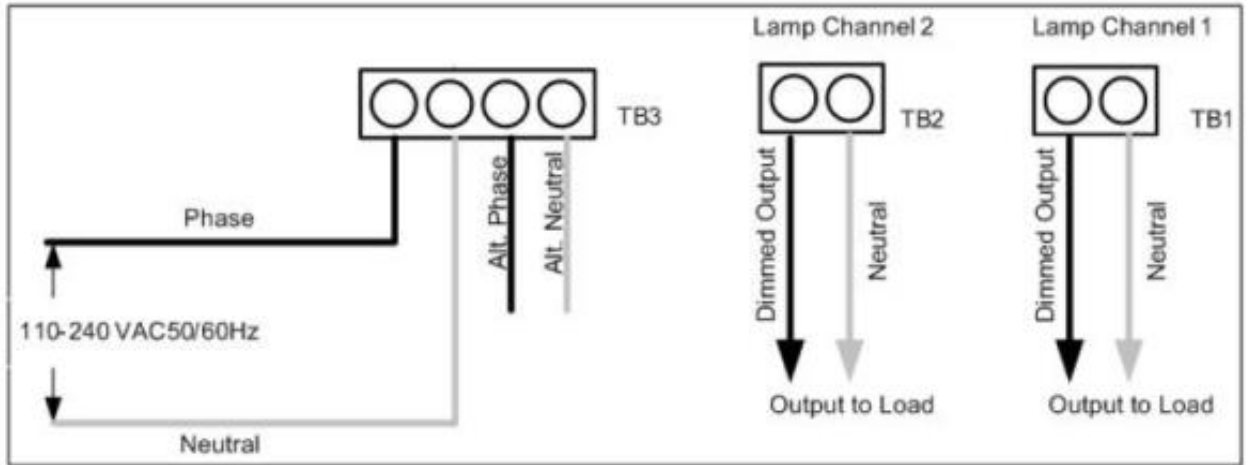
Figure 300.1.4.b

Figure 300.1.4.c below shows the low voltage connections for the D254.DIN. A grounded 12vdc power supply is needed to power the D254.DIN. Typically the PS564.DIN is used to power the D254.DIN via a standard S5Bus cable connection.
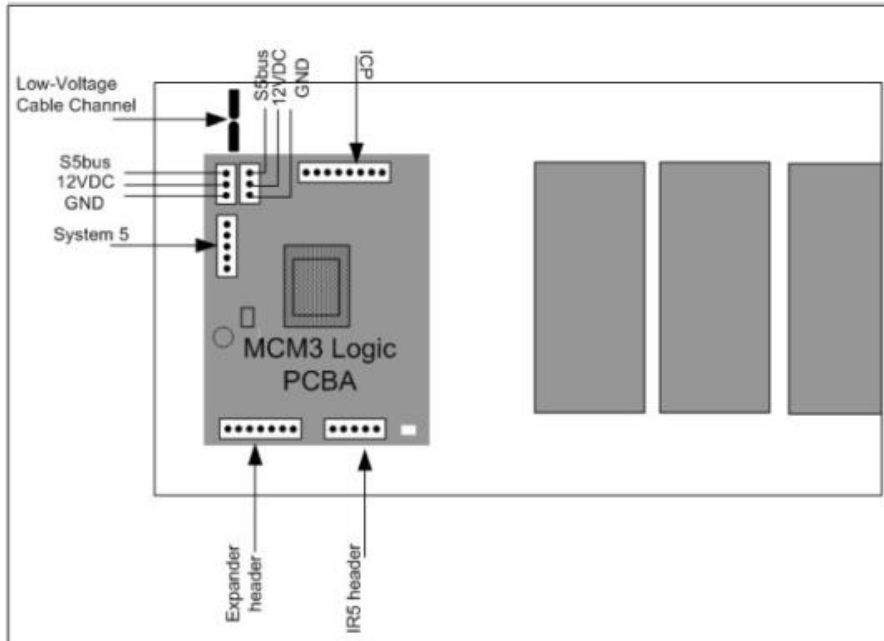
Figure 300.1.4.c

Figure 300.1.4.d

TRIAC Ratings

Load Types	UL Listed US Ratings 100-120VAC	UL Listed US Ratings 250VAC	International Ratings CE Mark, CQC) 100-240VAC
Tungsten/Filament Lamp Load	60hz 5.5A	60hz 2.5A	50/60hz 2.5A
Inductive/Magnetic Transformer Load	60hz 5.5A	60hz 2.5A	50/60hz 2.5A
Resistive/Electronic Transformer Load	60hz 5.5A	60hz 2.5A	50/60hz 2.5A
Electronic Ballast for FL Load*	60hz 1.0A	60hz 1.0A	50/60hz 1.0A
Line Voltage LED Light Load	60hz 1.5A	60hz 1.5A	50/60hz 0.5A

*The purpose of testing and approving these specialty light fixtures is to assure that ballast noise and start-up behavior can meet the application requirements.

MOSFET Ratings

Load Types	UL Listed US Ratings 100-120VAC (60Hz) Single Channel	UL Listed US Ratings 100-120VAC (60Hz) Dual Channel Parallel
Tungsten / Filament Lamp Load	5.5A at 100Vac 4.5A at 120Vac	8A at 100Vac 6.6A at 120Vac
Resistive/ General Use	4.5A	6.6A
Electronic Ballast	500VA	750VA

300.2 LIGHT CONTROL SWITCHES

A variety of INNCOM light control switch are available. Most switches have optional direct control of a light circuit along with serving as a low voltage switch signal for a light control device. This section describes the available light control switch options.

300.2.1   EVORA™ - RELAY, DIMMING, LOW VOLTAGE

EVORA is a beautifully designed, easy to use lighting, temperature, drape, and amenities control system. EVORA uses a traditional keypad with up to 5 keys per device to provide an easy to use, powerful control point for the INNCOM IRAS. The EVORA key pad is gently backlit, and INNCOM will work with the Hotelier to define the key functionality and key artwork. The EVORA system uses a range of leading and trailing edge dimmers, non-dimming actuators, and low-voltage interfaces to meet nearly any gang box or load center lighting, temperature, drape, or amenities application.

Product specifications include:

- Controls lighting, temperature, drapes and amenities
- 1-5 programmable keys
- Gently backlit keypad
- Fits standard Decora covers and plates
- Available in 4 standard colors
- Voltage: 120VAC–240VAC 50 / 60Hz for gang box dimming / switching applications
- Voltage: 12VDC for load center applications
- Dimming: 120–240VAC, 500W leading edge or 350W trailing edge dimmer per control point
- Relay contact rating: 120–240VAC, 500W per control point
- Wired S5bus and RF Deep Mesh wireless communication
- Nightlight model with 2 programmable keys
- Doorbell model with 2 programmable keys and programmable chime

The EVORA™ switch is available as a low voltage switch or it may be ordered with a WBI Actuator for direct control of a light circuit. Figure 300.2.1.a below shows a drawing of each type.
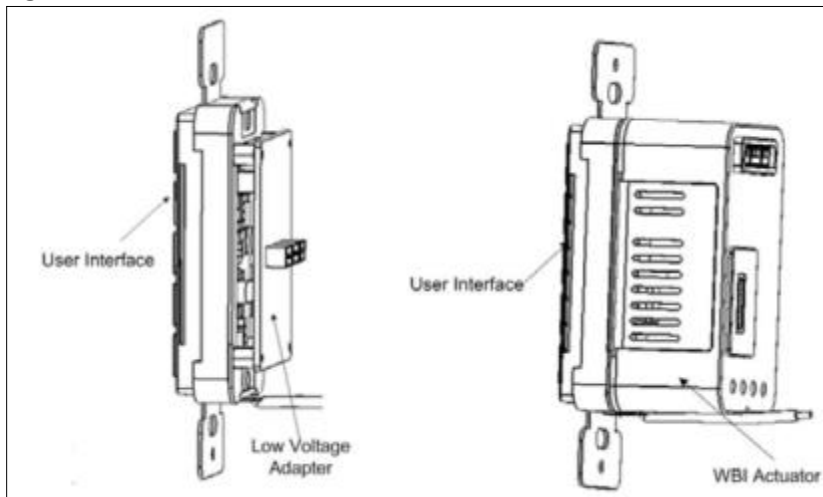
Figure 300.2.1.a

Figure 300.2.1.b below shows a sample drawing of an EVORA™ switch with a WBI actuator option wired to a light load.
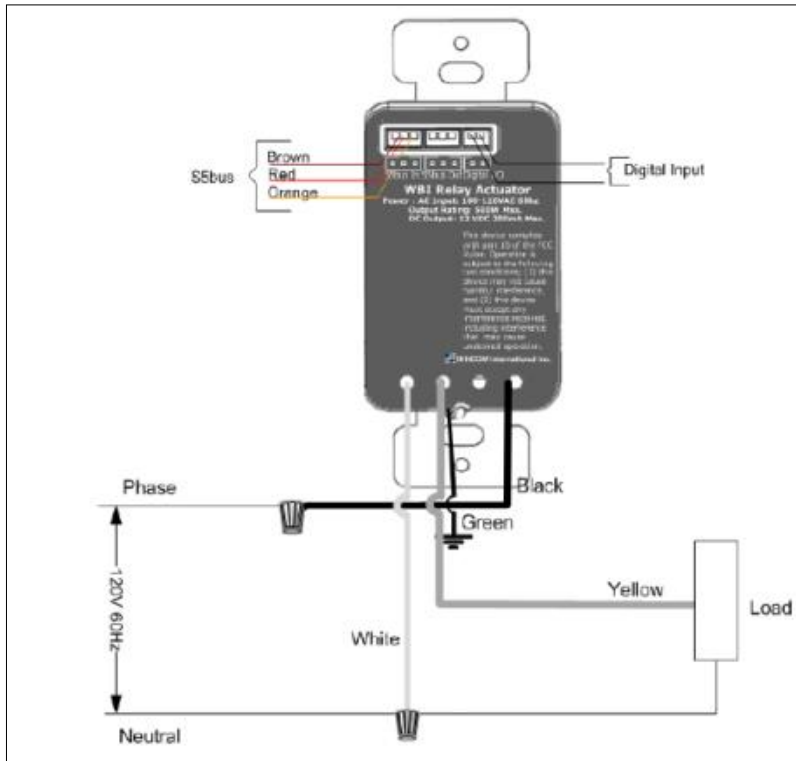
Figure 300.2.1.b

Figure 300.2.1.c below displays the ratings for the various light control actuators available for the EVORA™ series switches.

Figure 300.2.1.c

Actuator	Ratings				Actuator	Ratings			
	Voltage	Frequency	Power/ Amperes	Load Type		120 Vac	60 Hz	2.9 A	Resistive
						120 Vac	60 Hz	2.9 A	General Purpose
Relay Actuator	120-240 Vac	50/60 Hz	4.1 A	Resistive	TRIAC Dimmer	120 Vac	60 Hz	500 W	Tungsten / ELV
	120-240 Vac	50/60 Hz	4.1 A	General Purpose		120 Vac	60 Hz	250 VA	Electronic Ballast
	120-240 Vac	50/60 Hz	500 W	Tungsten / ELV		120 Vac	60 Hz	2.9 A	Resistive
	120-240 Vac	50/60 Hz	250 VA	Electric Ballast		120 Vac	60 Hz	2.9 A	General Purpose
					MOSFET Dimmer	120 Vac	60 Hz	350 W	Tungsten / ELV
						120 Vac	60 Hz	250 VA	Electronic Ballast

The S-Series system provides dimmers, switched outputs, and low-voltage interfaces to meet nearly any gang box or load center lighting, temperature, drape, or amenities application. The S-Series uses a traditional keypad with up to 5 keys per device to provide an easy to use, powerful control point for the guestroom. INNCOM will work with the Hotelier, interior designer or architect to define the key functionality and key artwork.


Product specifications include:

- Controls lighting, temperature, drapes, and amenities
- Available in American single gang for gang box dimming and load center applications
- 1–5 programmable keys
- Silkscreen or laser etch key text
- Fits standard Decora covers and plates
- Available in 4 standard colors
- Voltage: 100–120VAC 50 / 60Hz
- Dimming: 400W leading edge dimmer
- Relay contact rating:100–240VAC, 500W
- Voltage: 12VDC for load center applications
- Wired S5bus and RF wireless communication
- Nightlight and Doorbell models available

S55X S-Series

The S55X Series switches are low voltage control only. They are powered by 12vdc and communicate to IRAS devices via S5Bus. Figure 300.2.2.a below shows a drawing of the S55X switch.

Figure 300.2.2.a
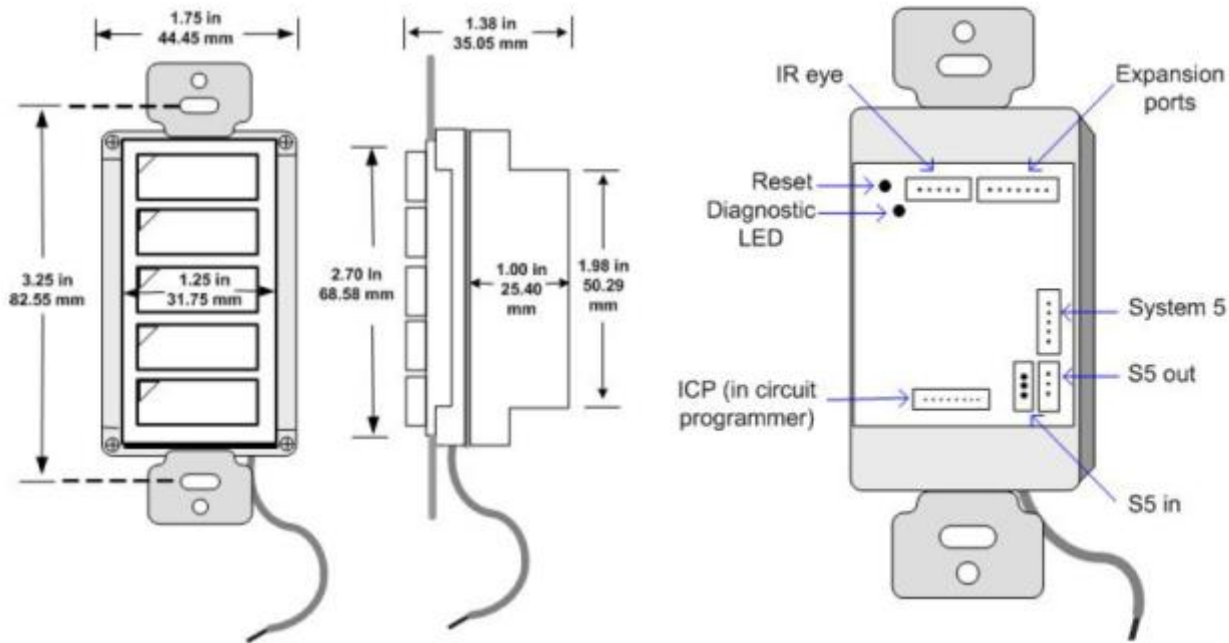
S217 S-Series

S217 S-Series switches are available as low voltage controllers and can also control a relay or dimmable light circuit directly. Figure 300.2.2.b below shows drawing of the S217 dimensions
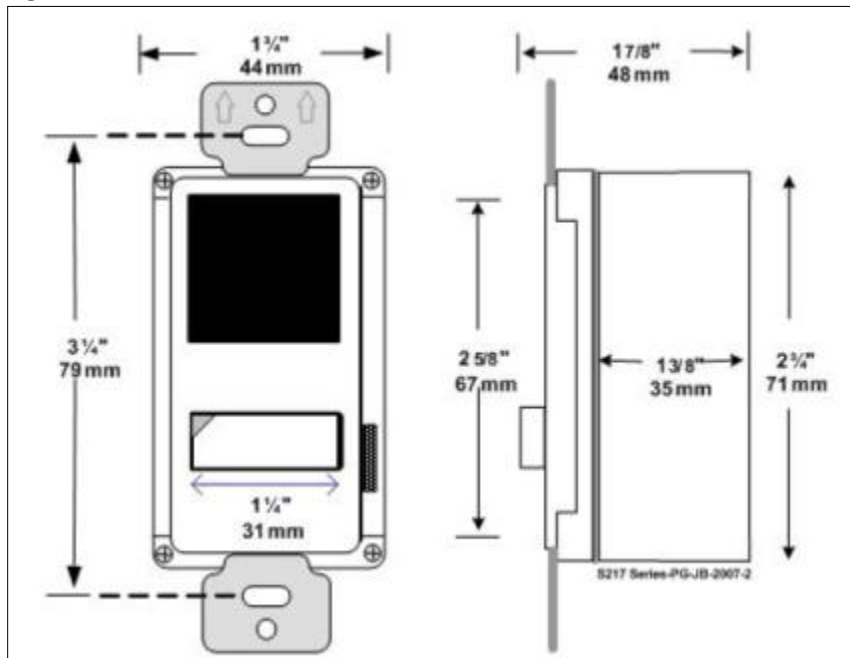
Figure 300.2.2.b

Figure 300.2.2.c below shows a sample wiring configuration of an S217 S-Series switch controlling a light load.

Four 18 gauge leads are provided to connect AC line voltage wiring. Connect the line voltage wiring to the S217 leads using wire nuts or other approved means. External wiring should be at a minimum 18 gauge stranded rate for 300VAC.
- AC Input power is connected to the S217:
    - HOT (BLACK) lead
    - NEUTRAL (WHITE) lead
    - The S217 MUST have a Neutral connection to function.
- Lighting circuit being controlled is connected to the switched HOT (YELLOW) lead.
- Earth GND **MUST** be connected to the S217. Connect the Green earth GND lead to a proper earth GND.
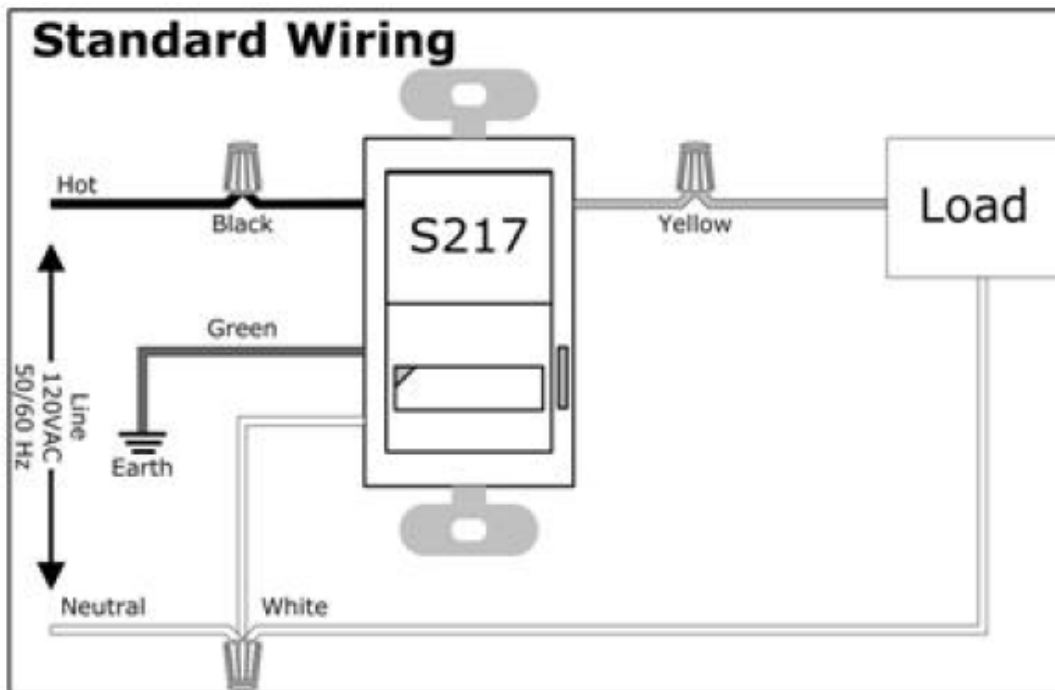
Figure 300.2.2.c

Figure 300.2.2.d below describes the power rating information for the S217 S-Series switch.

Figure 300.2.2.d

Power	100-110VAC, 3.5A, 400W dimmable output
	110-240VAC, 4.5A, 500W switched

MODEVA™ is an elegantly designed, easy to use lighting, temperature, drape, and amenities control system. MODEVA™ uses a capacitive touch and screw-less user interface for a sleek, modern, and highly configurable look. INNCOM will work directly with the Hotelier to design a unique user interface and create a brand standard for guestroom controls. The MODEVA™ system uses a range of leading edge and trailing edge dimmers, non-dimming actuators, and low-voltage interfaces to meet nearly any gang box or load center lighting, temperature, drape, or amenities application. The MODEVA™ system is offered in a wide range of standard sizes from American single gang to British double gang to bedside controllers such as the TBL-70. **This section focuses on MODEVA™ lighting control.**
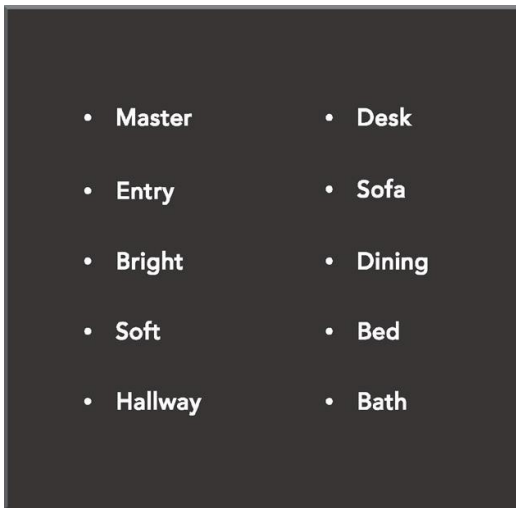
Product specifications include:

- Controls lighting, temperature, drapes, and amenities
- Fully customizable programmable capacitive touch user interface
- Soft background illumination
- Screw-less magnetic mounting system
- Voltage: 120VAC–240VAC 50 / 60Hz for gang box dimming / switching applications
- Voltage: 12VDC for load center applications
- Dimming: 100–240VAC 500W leading edge or 350W trailing edge per control point
- Relay contact rating:120–240VAC, 500W per control point
- Wired S5bus or RF Deep Mesh wireless communication

MODEVA devices are equipped with magnets that attach to a metal plate screwed to a wall box. Figure 300.2.3.a below shows a drawing of MODEVA components as they are attached to a wall box.
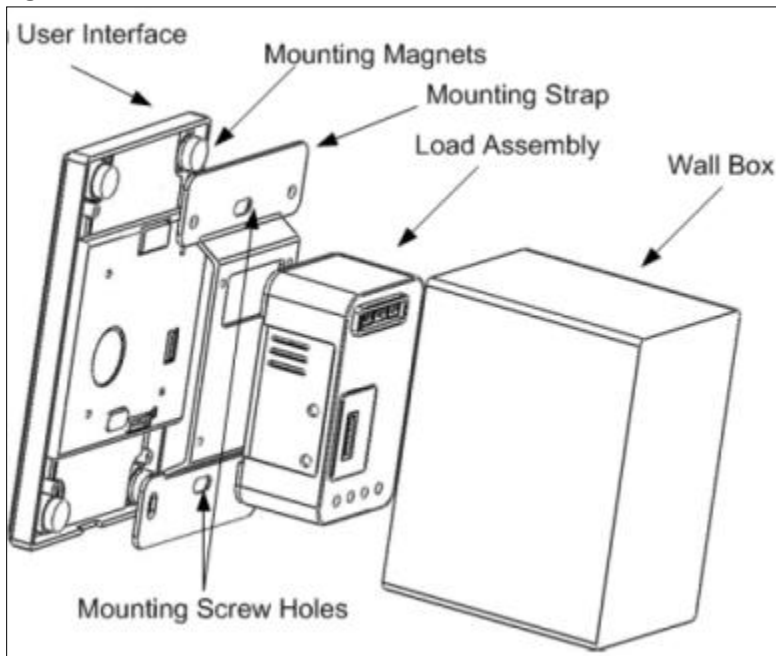
Figure 300.2.3.a

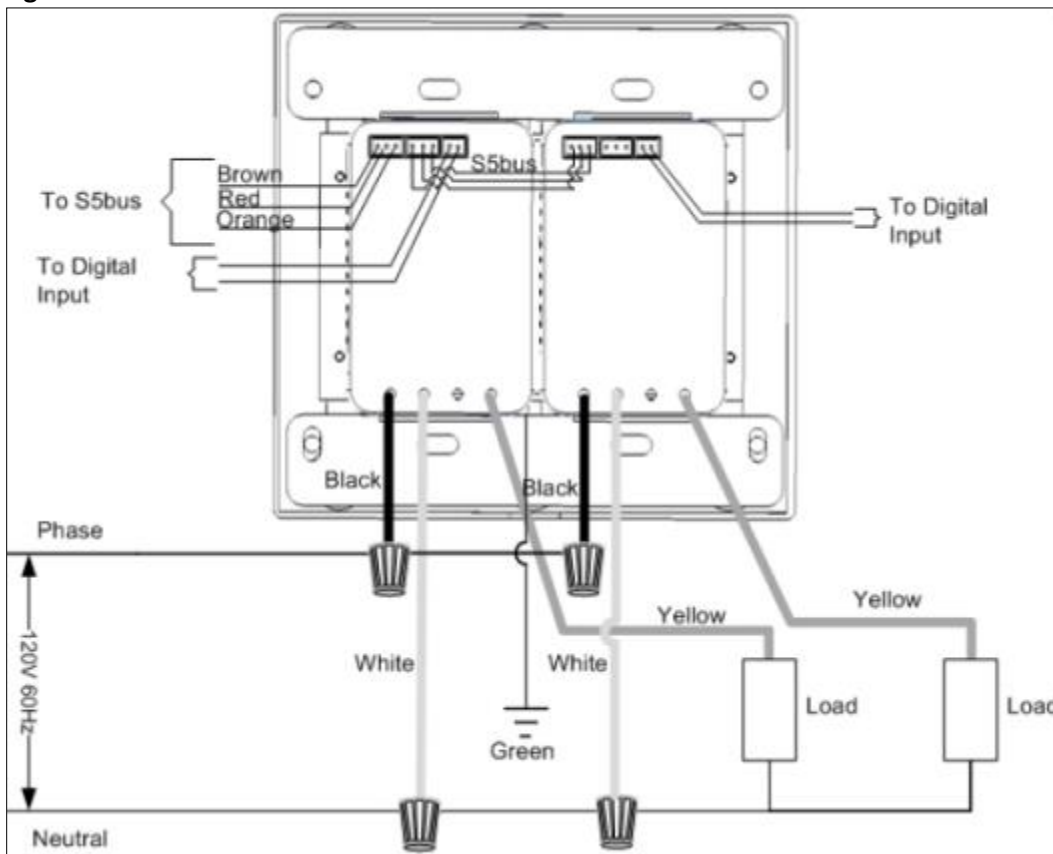Figure 300.2.3.b below shows a sample wiring diagram of a double gang MODEVA™ switch.

Figure 300.2.3.b

Figure 300.2.3.c below shows the device ratings for a single gang installation.

Figure 300.2.3.c

Actuator	Ratings			
	Voltage	Frequency	Power / Amperes	Load Type
SMPS	120-240Vac	50/60Hz	200mA	+12VDC Output Only
Relay Actuator	120-240 Vac	50/60 Hz	4.1 A	Resistive
	120-240 Vac	50/60 Hz	4.1 A	General Purpose
	120-240 Vac	50/60 Hz	500 W	Tungsten / ELV
	120-240 Vac	50/60 Hz	250 VA	Electronic Ballast
	120 Vac	50/60 Hz	1/10 HP	Motor
TRIAC Dimmer	120 Vac	60 Hz	2.9 A	Resistive
	120 Vac	60 Hz	500 W	Tungsten / ELV
	120 Vac	60 Hz	250 VA	Electronic Ballast
	120 Vac	60 Hz	1/10 HP	Motor
MOSFET Dimmer	120 Vac	60 Hz	2.9 A	Resistive
	120 Vac	60 Hz	2.9 A	General Purpose
	120 Vac	60 Hz	350 W	Tungsten / ELV
	120 Vac	60 Hz	250 VA	Electronic Ballast
Master Contactor	120-240 Vac	60 Hz	30A	Resistive
	120-240 Vac	60 Hz	30A	General Purpose
	120-240 Vac	60 Hz	960W	Tungsten / ELV
	120-240 Vac	60 Hz	5A	Electronic Ballast

The double and triple gang assemblies may be any combination of relay, switches, MOSFET Dimmer or TRIAC Dimmer. The table below provides the de-rated output based on the configuration. Figure 300.2.3.d below shows the device ratings for a multi-gang installation.

Figure 300.2.3.d

Actuator	Ratings			
	Voltage	Frequency	Power / Amperes	Load Type
TRIAC Dimmer	120 Vac	60 Hz	2.9 A	Resistive
	120 Vac	60 Hz	2.9 A	General Purpose
	120 Vac	60 Hz	400 W	Tungsten
	120 Vac	60 Hz	250 VA	Electronic Ballast
MOSFET Dimmer	120 Vac	60 Hz	2 A	Resistive
	120 Vac	60 Hz	2 A	General Purpose
	120 Vac	60 Hz	250 W	Tungsten
	120 Vac	60 Hz	250 VA	Electronic Ballast

300.2.4   DESIGNER SERIES (DS) – LOW VOLTAGE

The Designer Series DS12 is a multifunctional key equipped with status indicators for Doorbell, Do Not Disturb, Make Up Room, Butler call, lighting control, and other programmable functions. The DS12 is uniquely designed to be mounted into millwork or third-party hallway plates or to use INNCOM by Honeywell's screw-less

magnetic mounting plates for American and British gang boxes. The DS12 may be engraved or silk screened with icon or text to indicate switch function. Optional materials textures and colors for the key cap, barrel, and mounting give designers freedom to accommodate both functionality and fancy. Typically this product is coupled with the MCM4 for S5bus communications to the IRAS to perform doorbell, lighting, and drape functions.

DS12 Designer Series

DS12 Designer Series product specifications include:

- Programmable key functionality when equipped with MCM4 Micro Controller Module
- Can be installed in millwork or gang boxes
- Can be used as standalone dry contact input
- Gently backlit key which can be used for status indication
- 5 / 8" diameter DS12 barrel dimension

MCM4—DS12 Controller

MCM4—DS12 Controller Product specifications include:

- Provides logic for programmed DS12 functionality
- Supports 1–6 DS12s
- Provides up to 6 digital inputs for third-party interfaces
- Voltage: 12VDC for load center applications
- Wired S5bus communication

Figure 300.2.4.a below shows a drawing of the DS12 switches connected to an MCM4 Controller

Figure 300.2.4.a
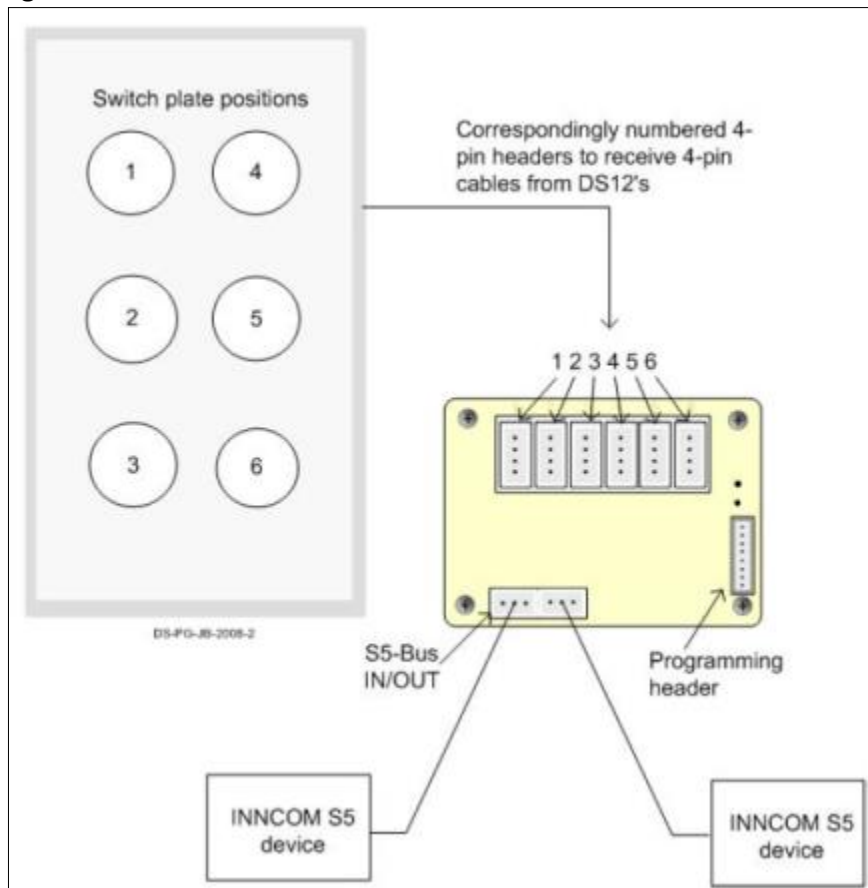
300.3 LAMP CONTROL OPTIONS

INNCOM by Honeywell's S-Series lamp controllers enable or enhance remote control capability for freestanding guestroom lighting while maintaining local switching. These controllers allow lamp participation in the IRAS through wired S5bus or wireless RF communications. Most can provide variable illumination control (either dimming or low-medium-high settings).

300.3.1   L506.RF LAMP MODULE

The L506.RF lamp socket dimmer is a compact, easy to use, easy to install trailing edge lamp dimmer designed for tungsten, CFL, and LED lamps. The L506 provides remote control of the lamp for the MODEVA™, EVORA ™, S-Series and Designer Series systems, and can be used in conjunction with the SL210 to replace the lamp's inline switch.

Product specifications include:

- Easily screws into existing lamp E26 socket
- Voltage: 100–120VAC 60Hz
- MOSFET Dimming: Up to 100W trailing edge dimmer
- Onboard switch replaces existing lamp switch
- Wireless RF Deep Mesh communications

Figure 300.3.1a below displays the ratings for the L506.RF.

Figure 300.3.1.a

Maximum Ratings		
	Vertical Base Down (bulb up) or Horizontal	Vertical Base Up (bulb down)*
Incandescent	100W	60W
Dimmable CFL	35W	20W
LED	25W	10W

*Open air only. If fixture enclosed, further derating is necessary

300.3.2   L206.RF

The L206 lamp dimmer replaces the standard lamp Edison socket to provide remote control of the lamp for the MODEVA™, EVORA™, S-Series, and Designer Series systems. The L206 is a leading edge dimmer designed for tungsten lamps. The L206 is equipped with a rotary switch which allows local dimming in low, medium, and high settings.
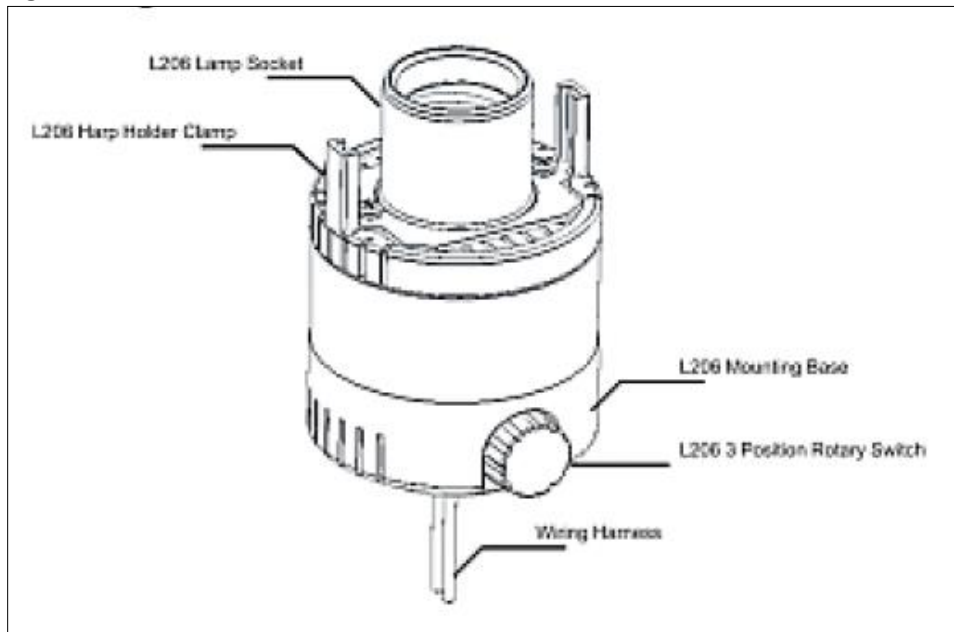
Product specifications include:

- Voltage: 100–220VAC
- Dimming: 100W leading edge dimmer
- Onboard rotary switch replaces existing lamp switch
- Wireless IR or RF Deep Mesh communications

Figure 300.3.2.a below shows a drawing of the L206 components.
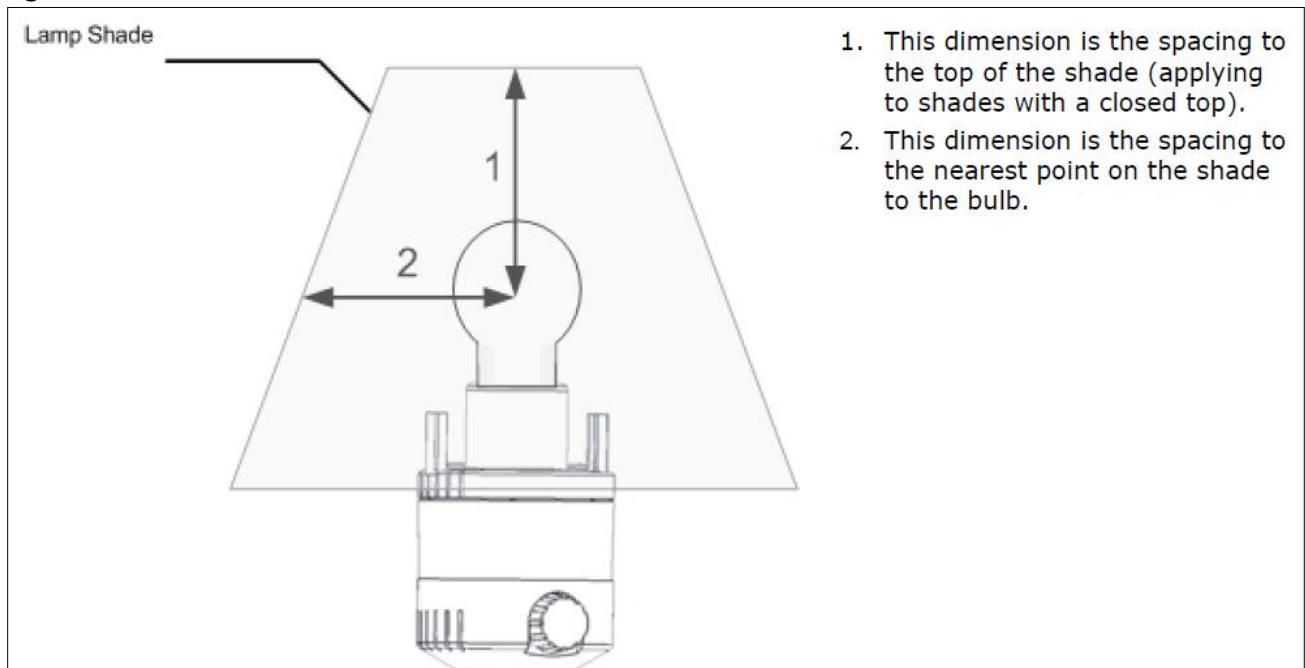
Figure 300.3.2.a

Mounting considerations:

It is critical to note and maintain proper spacing between the bulb and lamp shade. When the L206 Lamp Controller is installed, the distance between the bulb and the shade should be equal to or greater than required by the original UL listing for the lamp base. See Figure 300.3.2.b below.

Figure 300.3.2.b

1. This dimension is the spacing to the top of the shade (applying to shades with a closed top).
2. This dimension is the spacing to the nearest point on the shade to the bulb.

In addition the position of the L206 may be oriented vertical to horizontal. It may NOT be installed inverted. See Figure 300.3.2.c below.
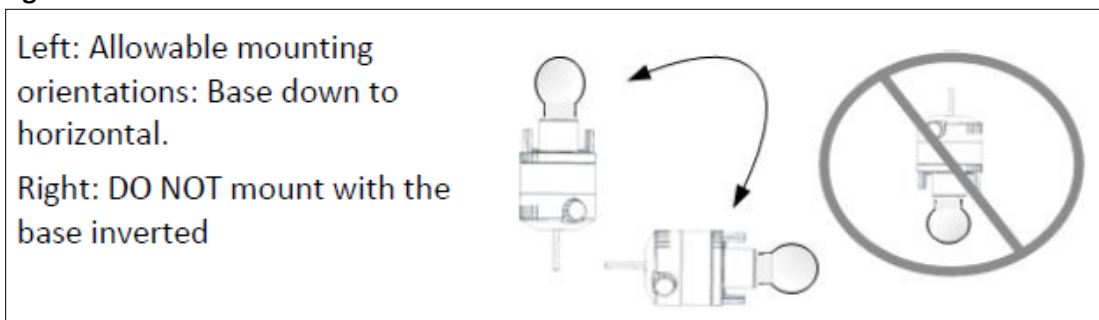
Figure 300.3.2.c

Left: Allowable mounting orientations: Base down to horizontal.

Right: DO NOT mount with the base inverted

Figure 300.3.2.d below shows an image of sample wiring to an L206.

Figure 300.3.2.d

Module Black to power cord "Hot" side and one side of the switch

Module White to "Cold" (neutral) side of the cord

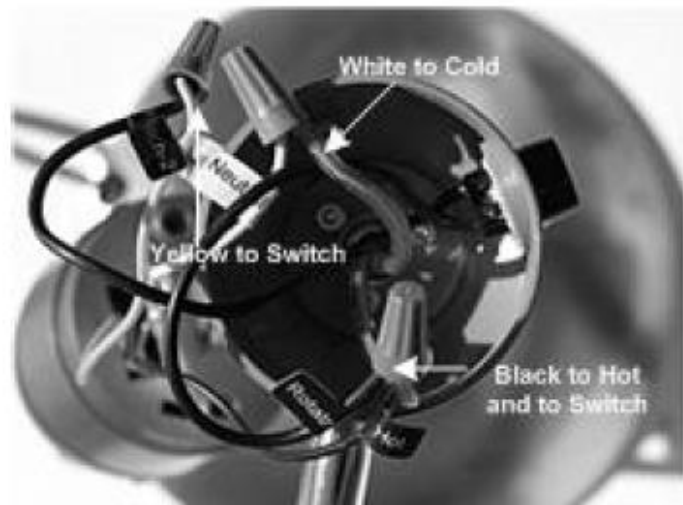Module Yellow to the other side of the switch

Figure 300.3.2.e below describes the ratings and lumens based on the orientation of the L206.

Figure 300.3.2.e

Orientation	Ratings	Lumens
Base Down	100W Incandescent	~1750
	80W Halogen	~1750
	25W CFL	~1750
Base Down to Horizontal	80W Incandescent	~1400
	60W Halogen	~1400
	20W CFL	~1400

300.3.3   L208.RF LAMP SWITCH/DIMMER CONTROL

The L208 floor or desk lamp dimmer provides remote control of the lamp for the MODEVA™, EVORA™, S-Series and Designer Series systems. It is available with a 400W leading edge dimmer and a 500W non-dimmable output. The L208 mounts discretely out of sight or to a wall. The L208 uses wired S5bus and RF for communications. The L208 can be equipped with the SL208.1 or SL210 to provide local and remote control.

Product specifications include:

Product specifications include:

- Voltage: 100–120VAC
- Dimming: 400W forward phase dimming
- Relay contact rating:120–240VAC, 500W
- Wired S5bus and IR or RF Deep Mesh wireless communication
- Wall mounting bracket

The L208 provides direct local lamp control using a low voltage built-in switch or remote switches. In most applications, a low voltage momentary switch is incorporated into the lamp design (INNCOM's low voltage switch designation is the DS12, as depicted below in Figure 320.3.4.a). Figure 320.3.4.b shows how wall switches or other INNCOM devices (e.g., the SL208.1 and Sl208.4) can be used as an indirect lamp "switch." All switches can be ordered with low voltage cables pre-terminated with RJ type jacks for "plug and play" installation.

Figure 300.3.3.a below displays a sample wiring of the L208.RF
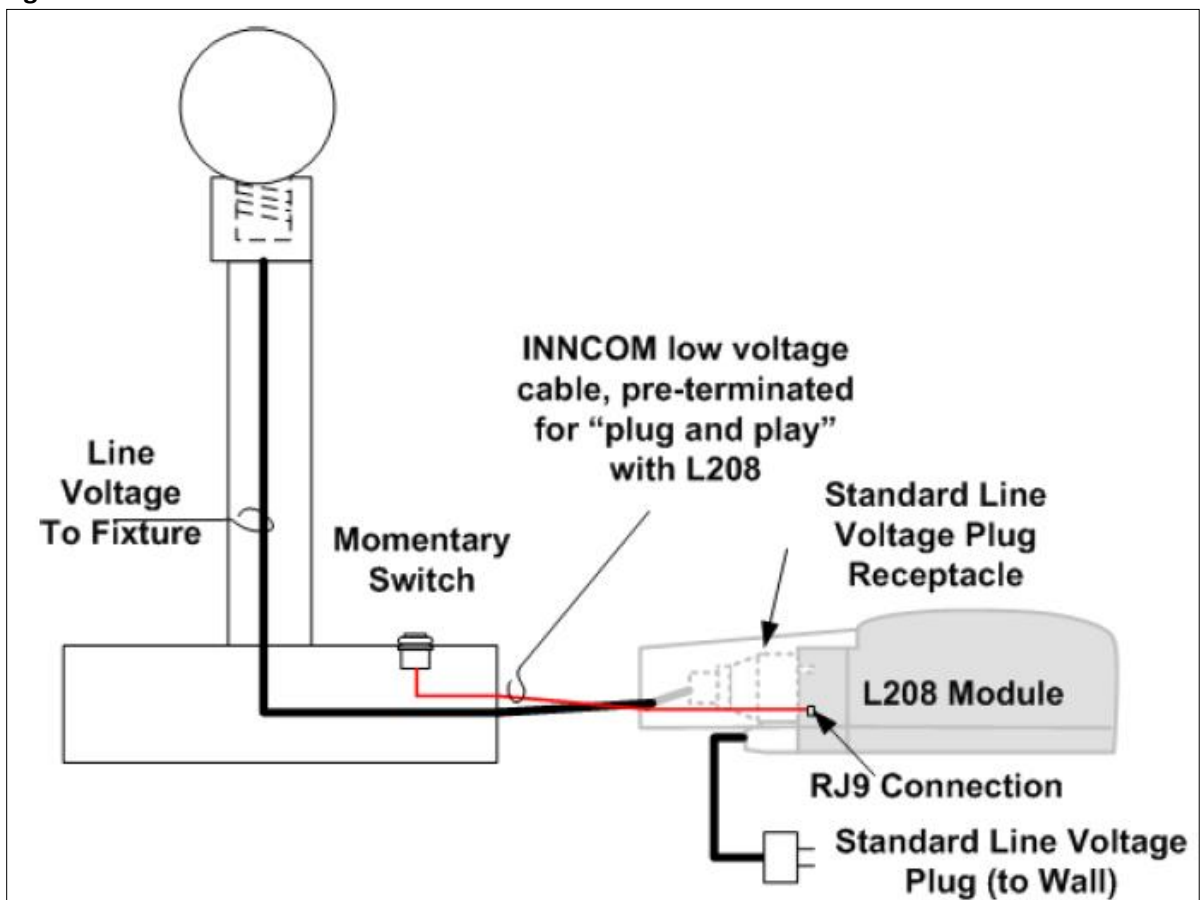
Figure 300.3.3.a

Figure 300.3.3.b below shows a variety of optional switches that may be used to control the L208 light load. NOTE: the SL208.4 is not longer available.
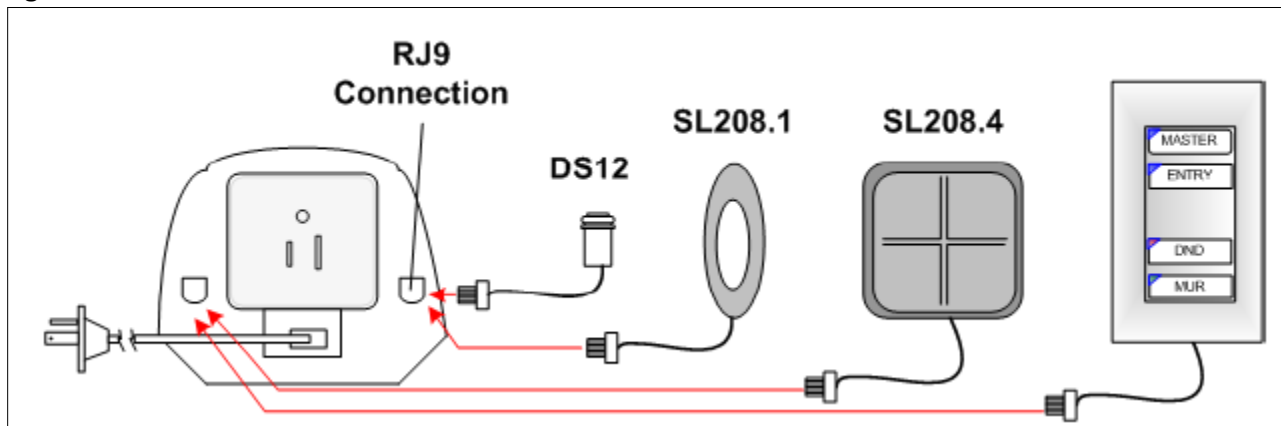
Figure 300.3.3.b

Figure 300.3.3.c below displays the load specifications for the L208.

Figure 300.3.3.c

	L208 (400W Dimmable)	L208 (500W Switched)
Tungsten/ Filament Lamp Load	3.5A @ Supply Voltage 100-110VAC	4.50A @ Supply Voltage 100-110VAC
Magnetic Transformer to Halogen Load‡	3.5A @ Supply Voltage 100-110VAC	4.50A @ Supply Voltage 100-110VAC
Electronic Transformer to Halogen Load*	3.5A @ Supply Voltage 100-110VAC	4.50A @ Supply Voltage 100-110VAC
Electronic Ballast for dimmable FL Load*	1.5A @ Supply Voltage 100-110VAC	N/A
Line Voltage LED Light Load	1.0A @ Supply Voltage 100-110VAC	1.0A @ Supply Voltage 100-110VAC

300.4 INNTOUCH

The INNtouch system is a two-part device (plus power supply) that provides guests with a convenient method of communicating their privacy and service preferences. INNtouch contributes to the ability of the Housekeeping staff to respond to guests' needs efficiently. In addition, the system eliminates the need for doorknob tags, which can be inadvertently altered from the corridor.

In the INNtouch system, the P564 Room Annunciation Plate is located inside the guestroom and provides a guest interface. The guest can press a button to request privacy or room cleaning. The P563 Corridor Annunciation Plate is located in the corridor outside the guestroom and displays to staff the preference selected by the guest from inside the room. If the guest presses PRIVACY, the word 'PRIVACY' is written in red on the P563; if the
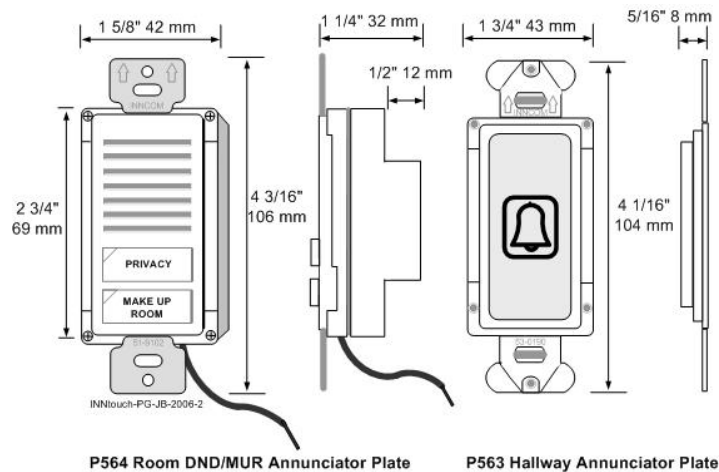
guest presses MAKE UP ROOM, a green light appears on the P563 to alert staff. The P563 also contains a doorbell, which chimes in the guestroom via the P564.

For further convenience, with the addition of a door switch and small motion sensor inside the guestroom, the INNtouch system allows staff to determine occupancy without ringing the doorbell. This option can further enhance staff efficiency and reduce the need to interrupt guests.
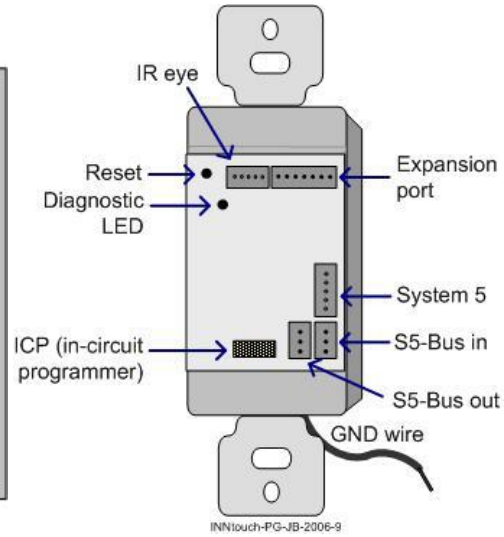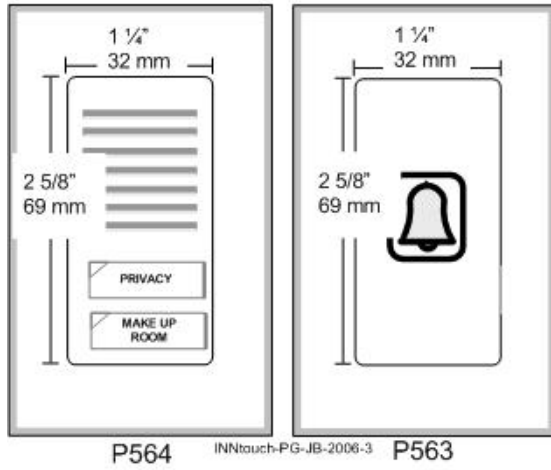
The INNtouch system can operate alone or be integrated with other INNCOM products and systems, including INNCOM's centrally controlled Energy Management System (EMS). Integration with INNCOM's EMS offers remote display of guestroom status to Housekeeping and other hotel departments for greater operational efficiency.

INNtouch Features

- **Higher security for guests**
- **Provides guests with greater control over staff intrusions**
- **Low cost installation**
- **Low-voltage wiring**
- **Occupancy detection**
- **Customizable housing colors, indicator LEDs, key fonts and icons**
- **Staff Efficiency**
    - Lists of Make-up-Room requests may be generated at any time
    - Visit rooms in order of request
    - Instant Service – Work order system interface can send MUR request
    - Avoid walking to DND rooms (maintenance or service)
- **Historical Data**
    - **View trend history of when DND and MUR requests were active in a guestroom**

P564 Room DND/MUR Annunciator Plate   P563 Hallway Annunciator Plate

DIMENSIONS OF FACE OF P564 AND P563, SHOWN IN DECORA COVER

1 ¼"
32 mm

2 5/8"
69 mm

PRIVACY

MAKE UP ROOM

P564   INNtouch-PG-JB-2006-3   P563

1 ¼"
32 mm

2 5/8"
69 mm

IR eye

Reset

Diagnostic LED

Expansion port

System 5

ICP (in-circuit programmer)

S5-Bus in

S5-Bus out

GND wire

INNtouch-PG-JB-2006-9

MODEVA INNtouch

- **Requires additional hardware:**
  - External Chime
  - Chime signal control device (Typically X05B or PC485)
- **May be Wireless or S5Bus**
- **Wireless RF is built-in to MODEVA (No PC502 is required for RF communication)**
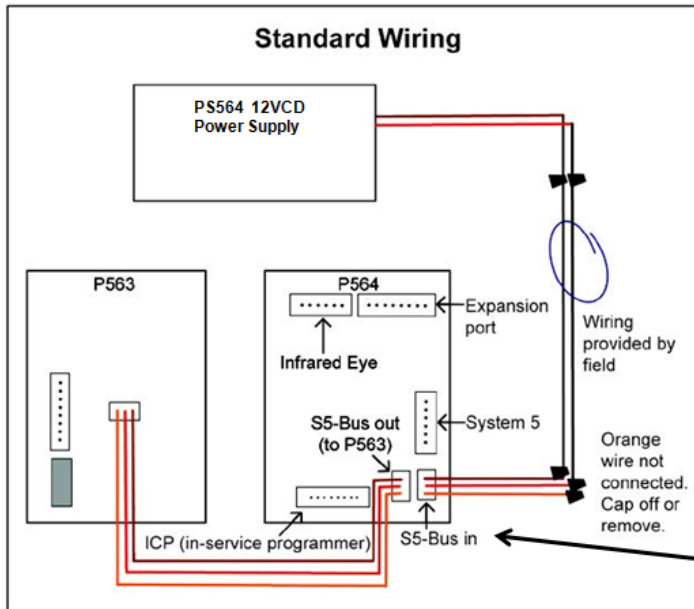
PC485

External Chime

X05B/X06

Standalone INNtouch wiring

Standard Wiring

PS564 12VCD
Power Supply

P563

P564

.... ←Expansion port

Infrared Eye

S5-Bus out
(to P563) ←System 5

ICP (in-service programmer)   S5-Bus in ←

Wiring provided by field

Orange wire not connected. Cap off or remove.
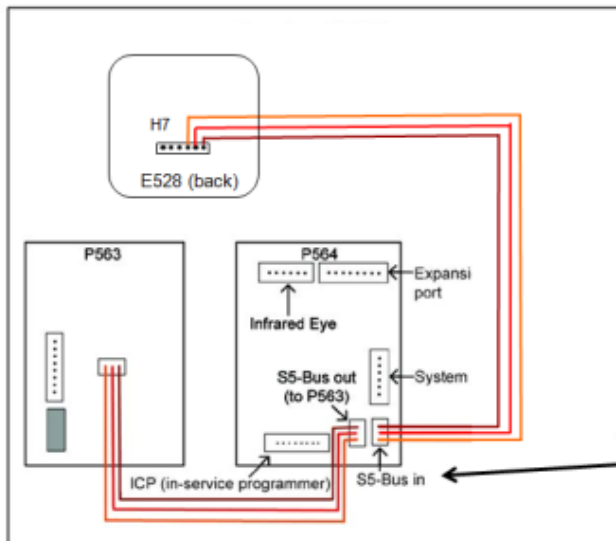
The Expansion Port is a good location for connecting in a hardwired door switch

S5Bus In/Out is the same

IRAS Wiring to Thermostat

H7
....
E528 (back)

P563

P564

.... ←Expansi port

Infrared Eye

S5-Bus out
(to P563) ←System

ICP (in-service programmer)   S5-Bus in

S5Bus In/Out is the same

SECTION 310 LIGHT CONTROL DESIGN BASICS

310.1 LIGHT CONTROL FEATURES AND BENEFITS

INNCOM by Honeywell lighting control offers a wide variety of features and benefits to an IRAS installation. Increased energy management is achieved using automated light control based on room occupancy. Bathrooms or other areas that would be sensitive to automation may be configured with additional delay or eliminated from participating in automatic "lights off" functionality. In addition to individual light control, INNCOM by Honeywell devices can be configured as a master relay contactor for other loads in the room. Welcome scenes can be designed to provide the guest with the desired ambiance when entering the guestroom. Additional features include the ability to provide multi-point control of lights and scene settings without the need for line voltage wiring to each switch location.

310.2 WELCOME SCENE OPTIONS

A welcome scene may be used to set a desired light ambiance for the guest entering or re-entering the room. Welcome scenes are designed to occur when a person enters into a room that was previously unoccupied. If a guest walks into a room that is already occupied, the welcome scene would NOT be activated.

Available Welcome Scene Logic:

- **Welcome FIRST**
    - **Establish MOOD/SCENE on first guest entry into unoccupied room after a check-in.**
- **Welcome RESTORE**
    - **Upon guest return, lights restore to where the guest had left them.**
- **Welcome ALWAYS**
    - **Establish same MOOD on EACH guest entry into <u>unoccupied</u> room.**

310.3 LIGHTING CONTROL TYPES

There are four basic ways INNCOM can control lighting in a guestroom. This section describes the types of light control available with INNCOM devices. These different types of light control are used in various combinations to achieve the appropriate light control design.

- **Individual light**
    - **One button to one circuit**
- **Group of lights**
    - **Bathroom lights, "bed" to include bed left, bed right, reading left, reading right (logical group)**
- **Scene/Mood**
    - **Each light in room can "participate" in the mood or ignore it**
    - **If it participates, it can participate to ON or OFF (relay) or to a specific percentage (dimmer)**
- **All on/off**

310.4 DIMMING LIGHT COMMANDS

Section 21 described a number of dimming light control devices. This section describes the terminology used when designing the type and functionality of dimming controls.

Dimming light commands:

- **Dim up = light ON (start toward on)**
- **Dim down = light OFF (start toward off)**
- **Dim stop will stop a dimmer's ramping**
- **Dim set to a specific value (set to 45%)**
- **Dim toggle**
    - **If to an individual light, "pure" toggle**
    - **If to a logical group or ALL, the switch decides which way to go next, and sends specific UP or DOWN.**

310.5   MOOD LIGHT COMMANDS

Mood light commands are used to design how a switch or light control device will behave in a given mood. The following terminology is used in mood light design.

Mood light commands:
- **Mood set: All lights that participate go to that level, ON, OFF or %**
    - **Lights that do not participate remain unchanged**
- **Mood clear: All lights that participate go OFF**
- **Mood toggle**
    - **May chose not to use (mood/scene as SET only)**
    - **If used, switch translates to mood set or clear**

## 310.6   LIGHTING DESIGN CONSIDERATIONS

This section outlines the most important questions to answer when designing light controls using INNCOM devices. The answers to these questions will be used when mapping out the light control hardware and software requirements.

- **What light circuits will INNCOM control?**
- **Any other controls (DND/MUR, Drape, Butler call)?**
- **Where are user interfaces to be placed?**
- **What buttons on what switches?**
- **What is the simplest way to achieve desired outcome?**

310.7   LIGHT SCENES

Light scenes are used to instruct a group of lights to behave in a certain formation. For example, the customer may request a series of scenes that the guest can easily select for various activities like watching TV, Working, Relaxing etc. The INNCOM controlled lights can be set to various dim levels and on/off states for each scene. There are 16 available scenes for use in the INNCOM light design and range from Scene 0 through Scene 15. Scene 0 is reserved as the welcome scene, leaving 15 possible scene configurations for light design. Figure 320.7.a below shows an example of how a scene controls various lights. In this example, a designer series switch with 4 buttons is used as the guest interface. Button 3 on this switch is used to set Scene 3. There are 4 lights controlled in this example and the highlighted section shows the dim level each light will be set to when Scene 3 is selected. In this example, all 4 lights participate in Scene 3, but it is possible to configure a light to NOT PARTICIPATE in a scene. Non participating lights will not change status when that scene is set.

Figure 320.7.a
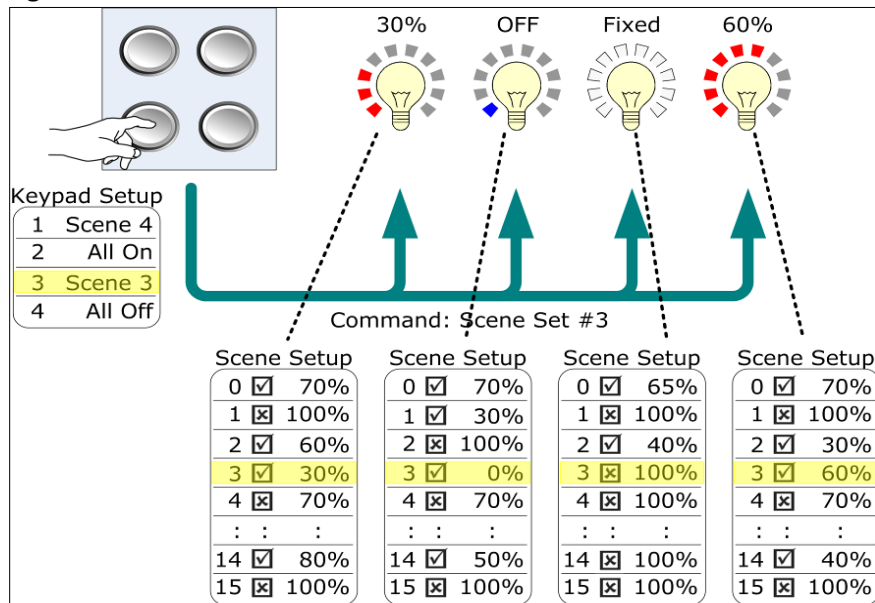
310.8   ADDRESSING DEVICES IN A ROOM

In order for IRAS devices to communicate to eachother, each device must have a unique device address. While there are no strict rules for device addressing, there are some guidelines recommended by INNCOM engineering.

Room addressing guidelines:

- **Each device in the room is assigned an address.**
    - **Each device address is unique in the room.**
- **Typical Addresses**
    - **Dimmers 20-2x**
    - **Relay packs (x06din, x05R): 201-2XX**
    - **Switches: 31-3X**

310.9   LIGHT MAP/FUNCTION TABLE

A light map or switch function table is used to map out, organize and define functionality of switches and light controllers in each room type. INNCOM engineering uses the switch function table for hardware and software design. Figure 320.9.a below is a sample piece of a switch function table describing the functionality of switch "S4, S552, Bath".

Figure 30.9.a

310.10   LIGHTING PROGRAMMING LANGUAGE

The language used in INNCOM lighting devices is called Common Business Logic (CBL). There are versions of this software currently used in INNCOM lighting devices: CBL8 and CBL32. CBL32 is an advanced version of the software with increased memory and functionality potential. CBL8 was the original version of the software and it is still being used in many light control devices.

- CBL32 lighting devices:
    - MODEVA™
    - EVORA™

- CBL8 Lighting devices include:
    - S-Series S5XX and S217
    - D254.DIN
    - X05R
    - X05B/X06
    - X06.DIN
    - MCM4
    - L-Series Lamp Controllers