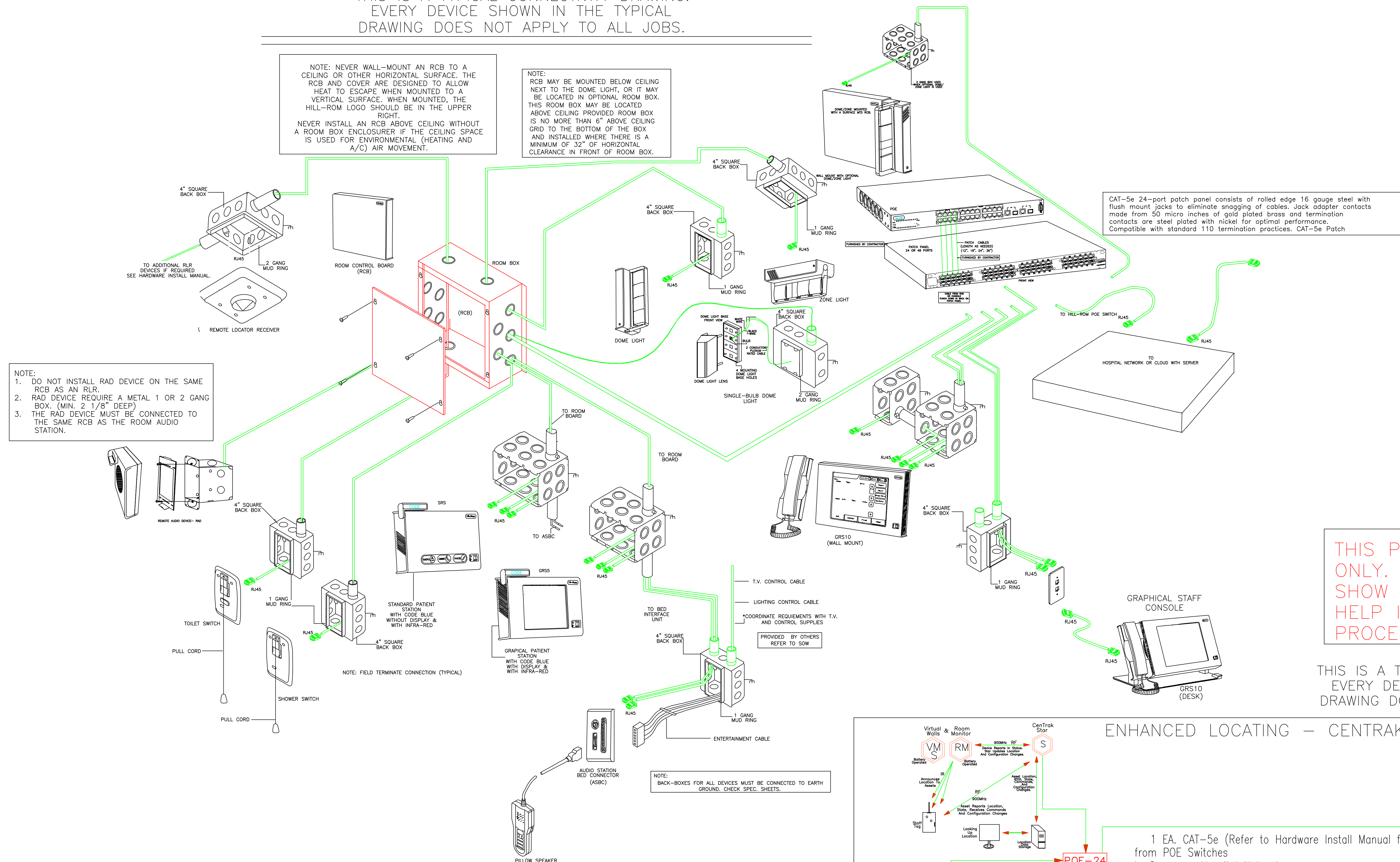
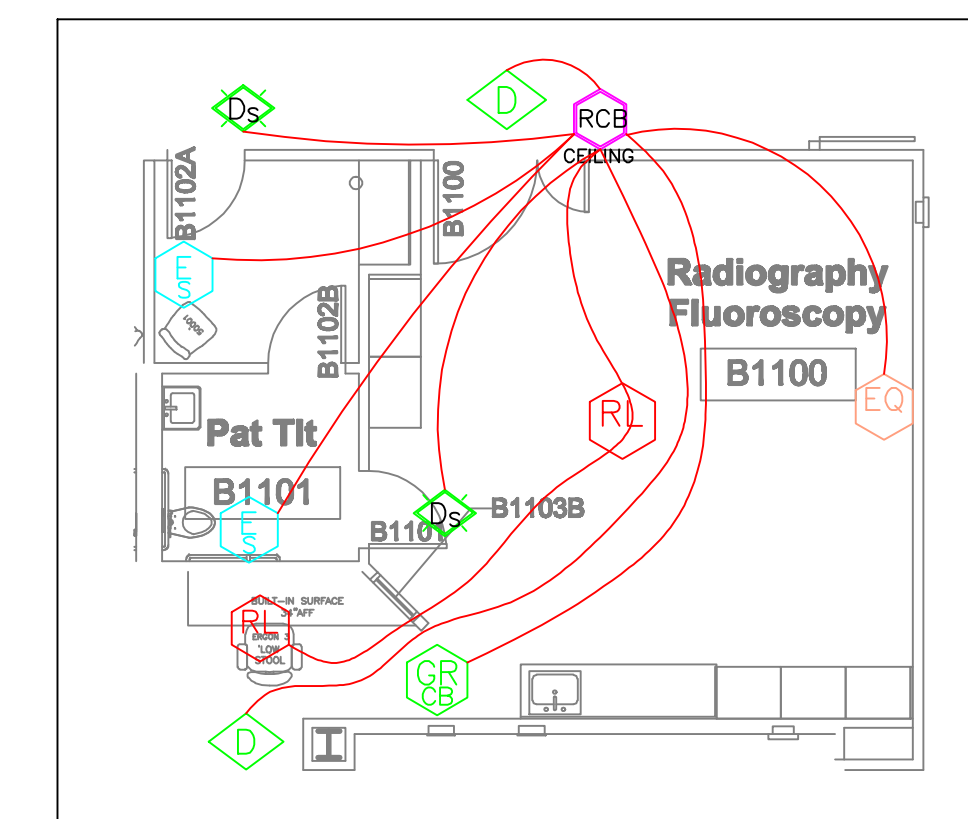


THIS IS A TYPICAL CONNECTIVITY DRAWING.  
EVERY DEVICE SHOWN IN THE TYPICAL  
DRAWING DOES NOT APPLY TO ALL JOBS.

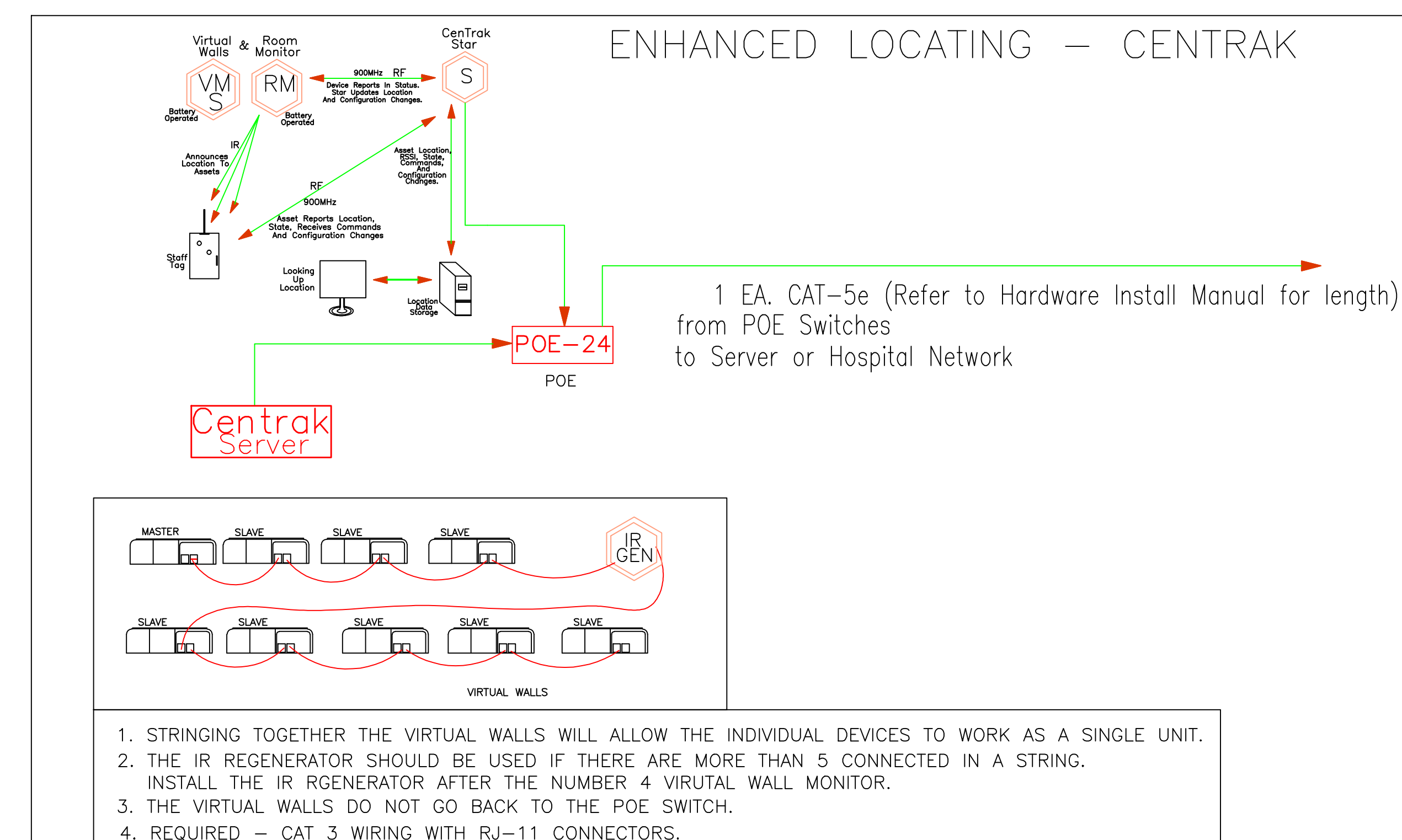


TYPICAL WIRING DIAGRAM  
IS JUST A GUIDE.



THIS PLAN IS FOR REFERENCE ONLY. THIS IS DESIGNED TO SHOW DIAGRAMS THAT MAY HELP IN THE CONSTRUCTION PROCESS.

THIS IS A TYPICAL CONNECTIVITY DRAWING.  
EVERY DEVICE SHOWN IN THE TYPICAL  
DRAWING DOES NOT APPLY TO ALL JOBS.



NOTES:

1. USE TYCO PART#2-231652-1 TO TERMINATE RJ-45 CONNECTORS TO CAT5E CABLE.
2. FOR CABLE LENGTH REQUIREMENTS, REFER TO HARDWARE INSTALL MANUAL.
3. ALL GLASS WALLS, GLASS DOORS, AND INTERIOR WINDOWS MUST BE INDICATED TO INSURE THE PROPER FUNCTIONALITY OF INFRARED SIGNALS.
4. MASONRY BOXES ARE NOT REQUIRED, ALL BOXES ARE REQUIRED TO BE METAL BOXES.

Revision Date	Revised by	Comments
Revision History		

**HILL-ROM IT SOLUTIONS**  
1225 CRESENT GREEN  
SUITE 200  
CARY, NC 27518  
[www.hill-rom.com](http://www.hill-rom.com)



Customer Information
----------------------

**HILL-ROM IT SOLUTIONS**  
1225 CRESCENT GREEN, STE 300  
CARY NC 27518

Project Information
---------------------

## NNC-Centrak Connectivity

1/24/2014

Drawing Information
---------------------

**LAB01041.dwg**  
Sheet Number

Total Sheets  
2

Drawing Scale  
 $1/4" = 1'$









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## SUBMITTAL COVER SHEET

Keystone Electric Division of Zenith Systems approves and submits these shop drawings and samples and thereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data and that he has checked and coordinated each shop drawing and sample with the requirements of the work and of the contract documents and with work of other contractors.

Date: January 18, 2018

Project: VAMC Community Living Center Minor

Contract Number:

Keystone Electric  
Division of Zenith Systems

Project Number: 16.57033

Signature: *Jacob Post*

Specification Section: 27-52-23-2.4-G-2 & 3

Product: Nurse Call Hospital Bed & Lighting Interface

Submittal Number: Forty (41)

Supplier: Hill Rom

Manufacturer: Navicare

Remarks: Please Review & Return

**KEYSTONE ELECTRIC  
DIVISION OF ZENITH SYSTEMS  
P.O. BOX 10245  
ERIE, PENNSYLVANIA 16514**

**APPROVED**

**BY : Jacob Post  
DATE: 1/18/2018**



## **ASBC Installation Cut Sheet**

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# ASBC Installation

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## ASBC Installation Hazard Statements

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The following notes and hazard statements pertain to the installation of ASBCs.



**Caution:**

Only UL-approved pillow speakers or other bedside call devices can be connected to an ASBC.



**Caution:**

The parent RCB must be powered down prior to installing or removing an associated ASBC. You must disconnect ASBCs from power when installing or removing them. Failure to do so can result in damage to equipment.



**Caution:**

Always use a low voltage controller when connecting to a facility's lighting system. Failure to do so can result in serious damage to equipment and loss of data.



**Caution:**

When installing a ASBC in a bed locator, never install the ASBC so that the bottom is facing the wall. Doing so can obstruct access to the bottom screw that attaches the front cover to the assembly.



**Caution:**

NNC does not support ASBCs and NIUs in the same nursing unit. There can be nursing units with ASBCs and nursing units with NIUs in the same configuration, but no nursing unit can have a mix of ASBCs and NIUs.



**Caution:**

Do not use a box eliminator to install a bed connector.



**Caution:**

Each back box must be properly grounded in accordance with the appropriate sections of NFPA 70 (e.g., Sections 250-96 and 517-13A).

## About ASBCs

---

An Audio Station Bed Connector (ASBC) provides an interface for connecting beds, siderail devices, and pillow speaker devices to the system through a room station.

Audio Station Bed Connector (ASBC) can be installed standalone or adjacent to a Standard Room Station (SRS) or Graphical Room Station 5 (GRS-5).



**Note:**

Connecting a bed to NNC does not interfere with the bed's local alarms.



27 52 23  
2.4 - G - 2 and 3

**Figure 1: Audio Station Bed Connector (ASBC)**

## ASBC Specifications

### Back Box Requirements

The ASBC must be mounted in a back box that is a minimum 2.5" deep or 12.5 cubic inches. Make sure the back box space is big enough to accommodate two CAT5/5e/6 cables and the wiring and splices for entertainment and lighting connections, as needed. If bed locators and headwalls are used, the chase or adjacent box should be used to accommodate cables and splices.



#### Caution:

Each back box must be properly grounded in accordance with the appropriate sections of NFPA 70 (e.g., Sections 250-96 and 517-13A).

- 1 standalone ASBC:
  - New construction: 4" square box with a 1-gang mud ring
  - Renovation: 1-gang box
- GRS-5 or SRS with 1 adjacent ASBC: 4-gang box

### Dimensions

Width	2.75"
Height	4.5"
Depth	0.5"

### Front Connectors

An ASBC can connect a pillow speaker, a SideCom<sup>®</sup> unit, and an auxiliary device simultaneously.

- 20-pin connector for a pillow speaker
- 37-pin connector for a bed
- 1/4" jack auxiliary equipment or call cord

### Rear Connectors

- RJ45 for connecting the ASBC to a room station
- Equipment alarm connection for ancillary hospital equipment such as a ventilator or IV pump
- 14-pin connector for lighting and entertainment wiring

## ASBC Placement

- ASBCs can be mounted standalone or adjacent to a room station.
- A maximum of two ASBCs can be connected to each room station.
- Place connectors 18" above the finished floor.
- Place standalone connectors in an open area that is easy to access and free of other equipment where the interface will not be hit or damaged.
- Do not place a standalone connector behind a bed as it may get damaged and will be hard to access.



### Caution:

NNC does not support ASBCs and NIUs in the same nursing unit. There can be nursing units with ASBCs and nursing units with NIUs in the same configuration, but no nursing unit can have a mix of ASBCs and NIUs.

## Mounting an ASBC

Parts needed:

- ASBC assembly
- #6-32 mounting screws (2)
- CAT5/5e/6 cables (2)
- Appropriate back box configuration (refer to ASBC Specifications)
- Entertainment cable assembly

These instructions are for mounting a standalone ASBC. To mount an ASBC adjacent to a room station, refer to instructions for mounting GRS-5s and SRSs.

1. Plug the cables through the back box into the ASBC assembly.

The ASBC has RJ45 jacks for 2 connections to the SRS or GRS-5.

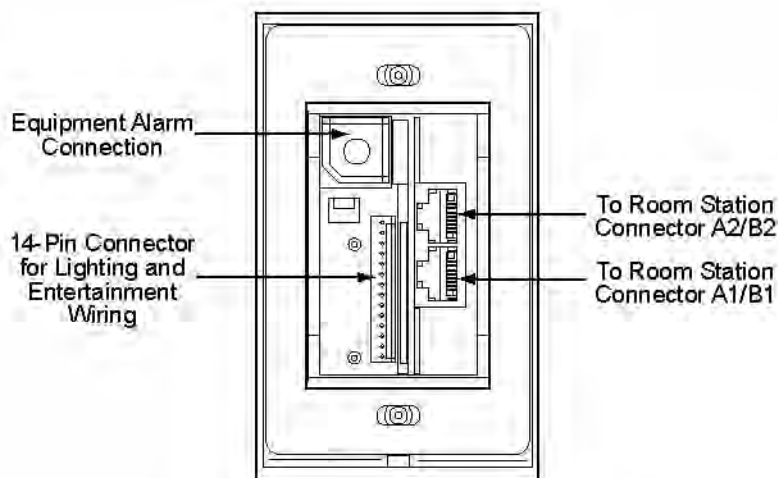
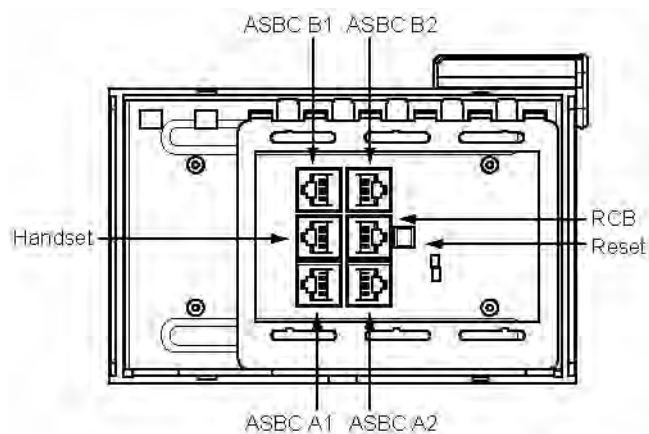
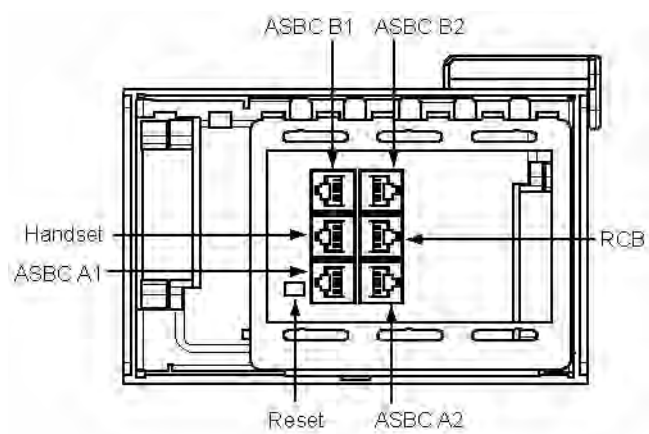


Figure 2: ASBC Connections





**Figure 3: GRS-5 Connections**



**Figure 4: SRS Connections**

2. Attach the ASBC assembly to the back box using 2, #6-32 mounting screws.

Adjust the ASBC from side-to-side as necessary.

Make sure the ASBC is installed in the proper orientation:

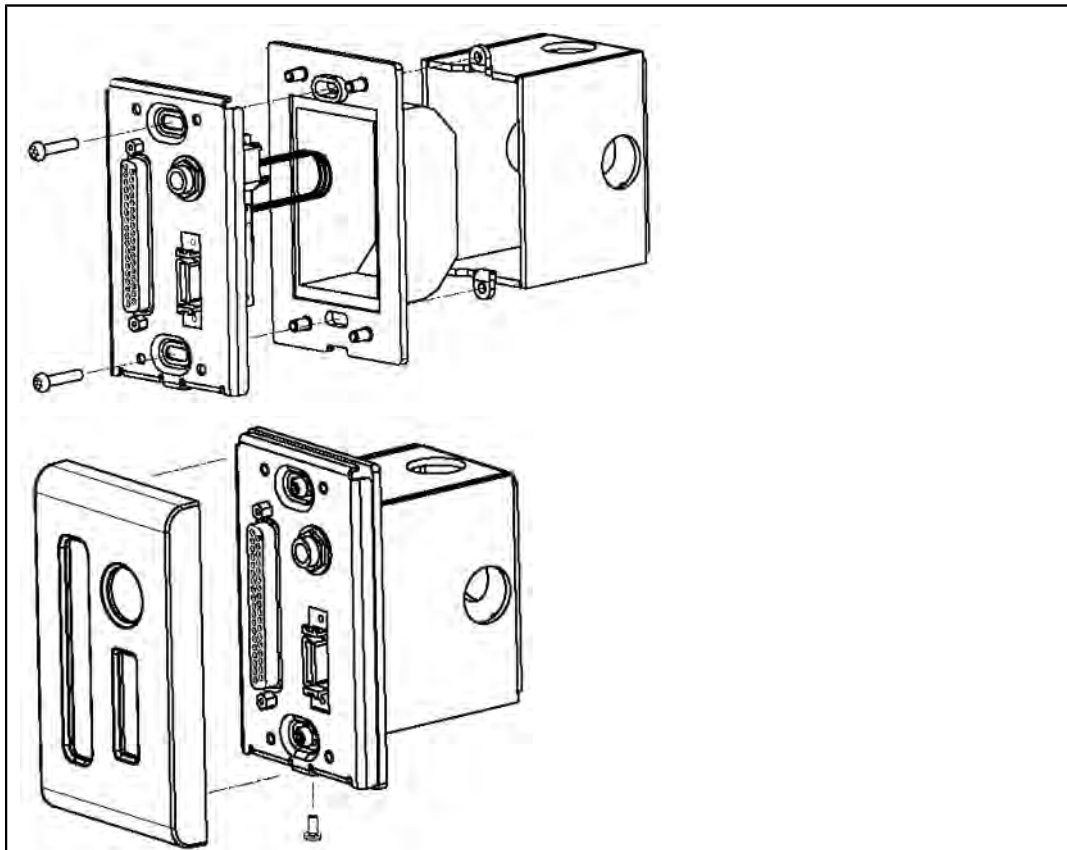
- For installing on a wall, make sure the 1/4" phone jack is in upper-right corner.
- For installing on a bed connector, make sure the 1/4" phone jack is towards the wall.



**Caution:**

When installing a ASBC in a bed locator, never install the ASBC so that the bottom is facing the wall. Doing so can obstruct access to the bottom screw that attaches the front cover to the assembly.

3. Attach the front covers to the ASBC assemblies by hooking the tab on the top inside edge of the front cover into the slot on the ASBC assembly and then fastening with the bottom screw.



**Figure 5: ASBC Installation**



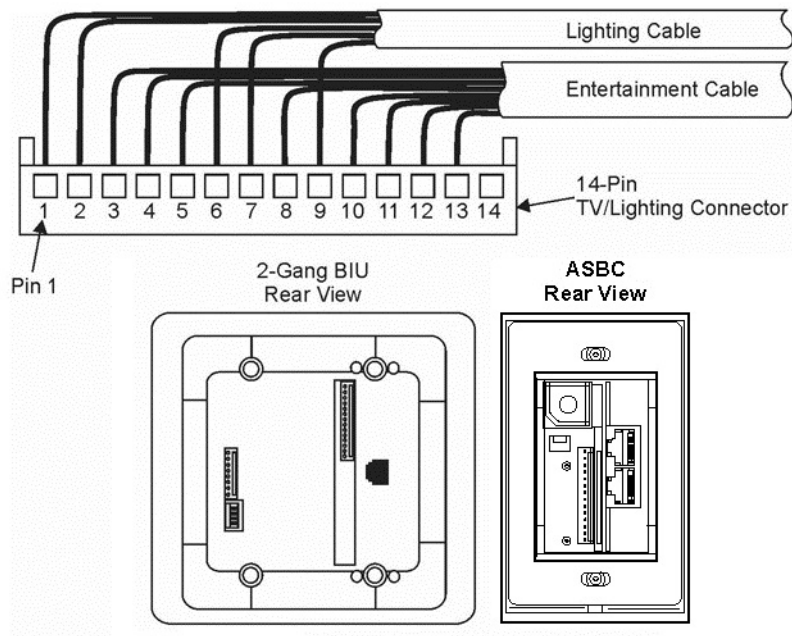
**Figure 6: Place for Bed Connector in a Bed Locator**

## Lighting and Entertainment Cable Assembly Installation

Cable assemblies provide interconnection between wall-mounted bed connectors (ASBCs) and the room lighting, radio, and television controls. Cable assembly is available as 18" long and 10' long. Both assemblies work with all bed connector models. NNC may only be connected to entertainment and lighting equipment which is listed for use in Health Care Facilities in Patient Care areas.



**Note:** The NNC connection from the pillow speaker to the entertainment controls is a straight pin-to-pin connection (pass-through).



**Figure 7: Lighting and Entertainment Cable Assemblies**

A 14-pin connector on each cable assembly connects to the header on the back of the ASBC. Two cables interface with the lighting/entertainment devices.



**Note:** These cables are keyed so that the cable connector fits onto the ASBC lighting and entertainment pins only one way.

## Lighting and Entertainment Cable Hazard Statements

The following notes and hazard statements pertain to the installation of lighting and entertainment cables.



**Caution:**

You should never connect the system to televisions and low voltage lighting controls unless they are UL-certified and medical grade.



## Lighting and Entertainment Cable Assembly Installation Drawings

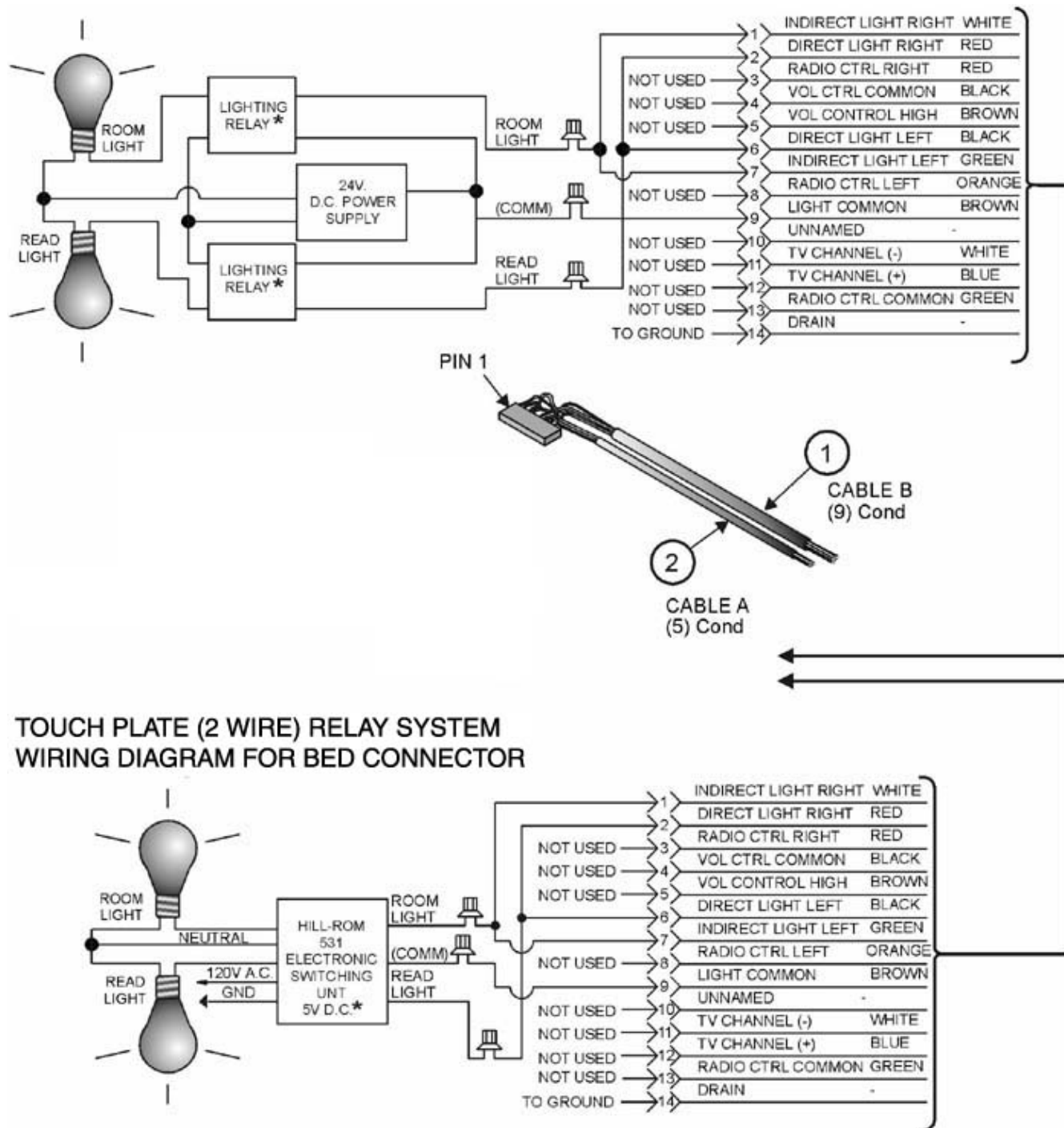
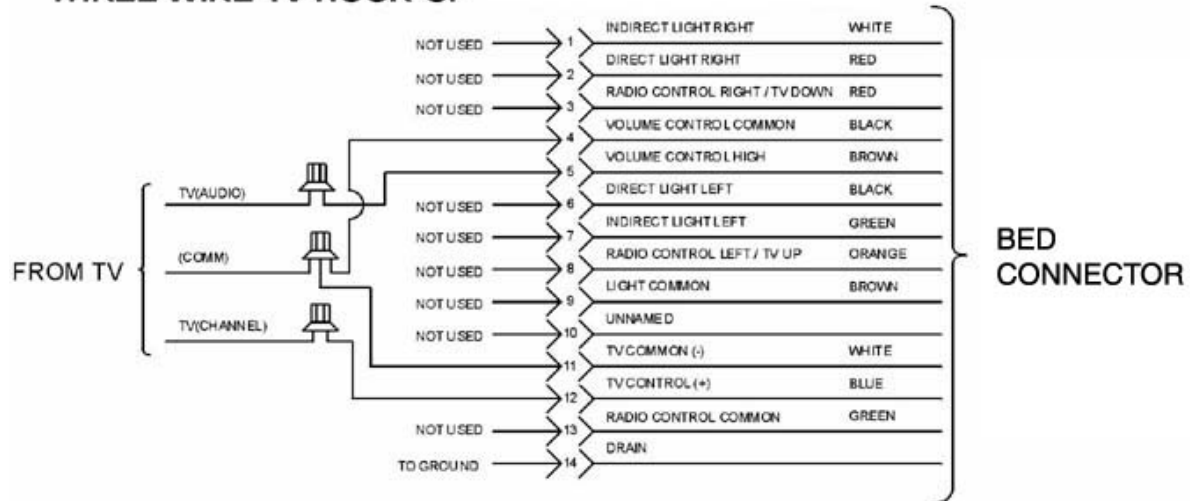


Figure 8: Lighting Controls

### THREE WIRE TV HOOK-UP



Pin #	Wire Color	Pin Description
2	RED	DIRECT LIGHT RIGHT
1	WHITE	INDIRECT LIGHT RIGHT
6	BLACK	DIRECT LIGHT LEFT
7	GREEN	INDIRECT LIGHT LEFT
9	BROWN	LIGHT COMMON
3	RED	RADIO CONTROL RIGHT / TV DOWN
4	BLACK	VOLUME CONTROL COMMON
5	BROWN	VOLUME CONTROL HIGH
8	ORANGE	RADIO CONTROL LEFT / TV UP
11	WHITE	TV STEPPING CONTROL (-)
12	BLUE	TV STEPPING CONTROL (+)
13	GREEN	RADIO CONTROL COMMON
14		DRAIN
10	NO CONNECTION	

Note:  
TV channel up and  
channel down are  
normally used only  
for five wire TV  
hook-ups.

### FOUR WIRE TV HOOK-UP

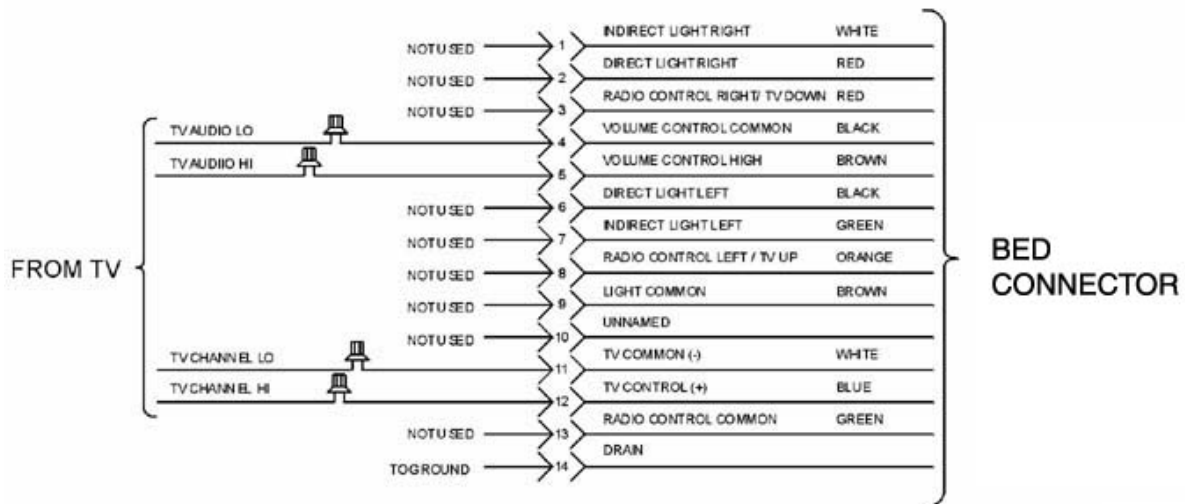
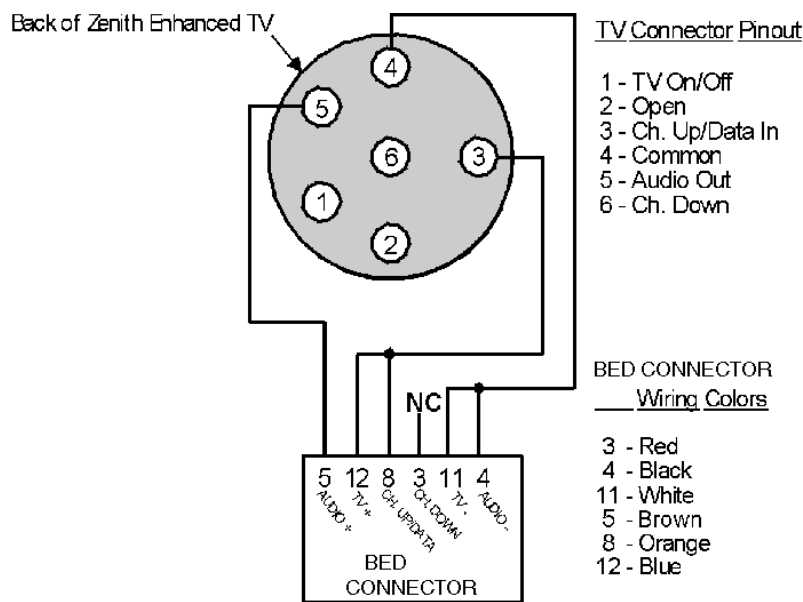
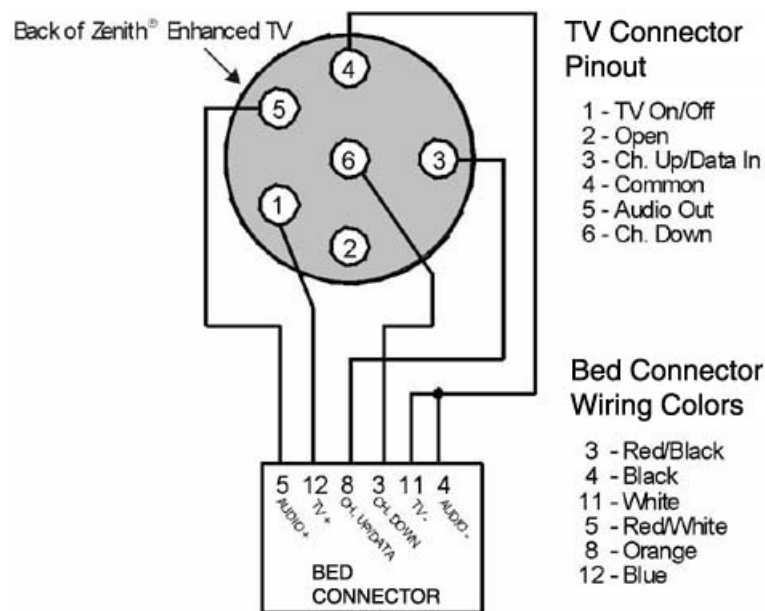


Figure 9: TV Controls - Three Wire Hook-up



NOTE: This Configuration is intended to be used when the hospital has a Zenith® Digital series pillow speaker and a bed with only one TV button or a universal TV interface module.

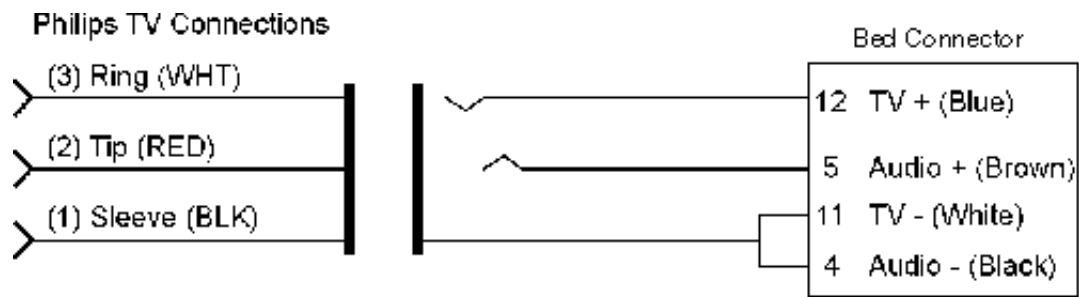
**Figure 10: 3-wire Interface for Zenith® Enhanced Digital TV Control Wiring**



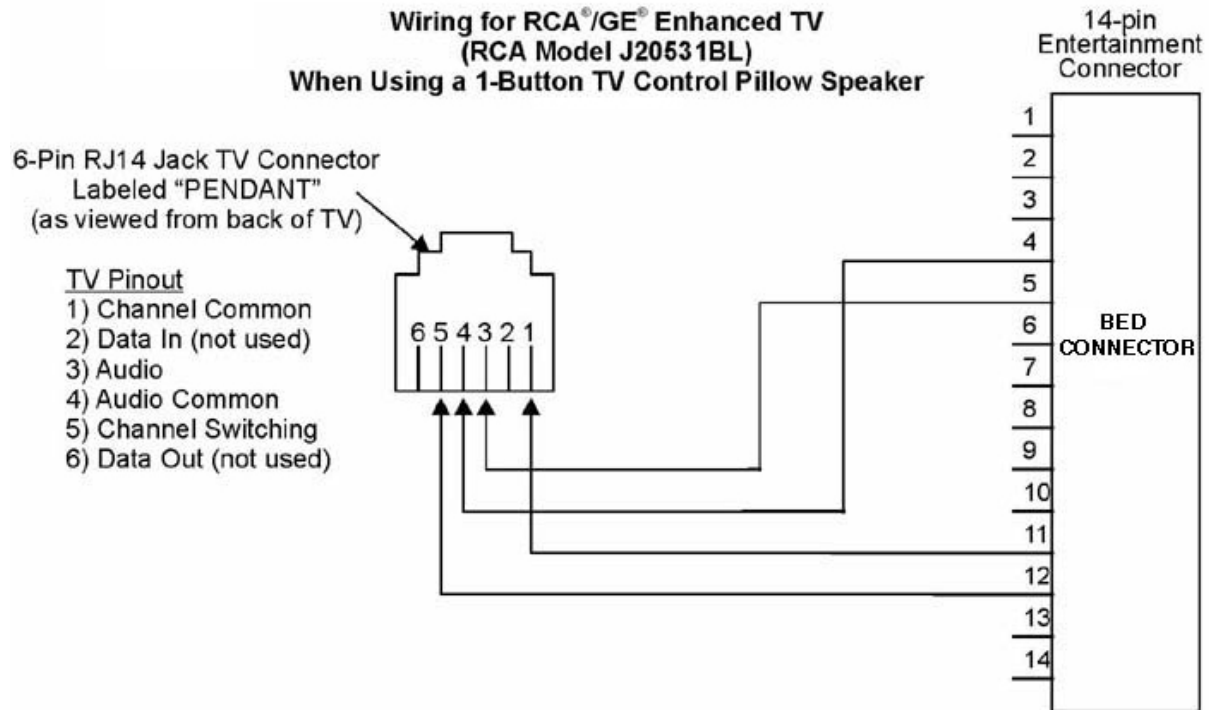
NOTE: If a 28 series pillow speaker will be used then a 4 wire configuration is required and it is NOT necessary to connect to pin 1 on the TV connector.

**Figure 11: 5-Wire Zenith® Enhanced TV Control Wiring**

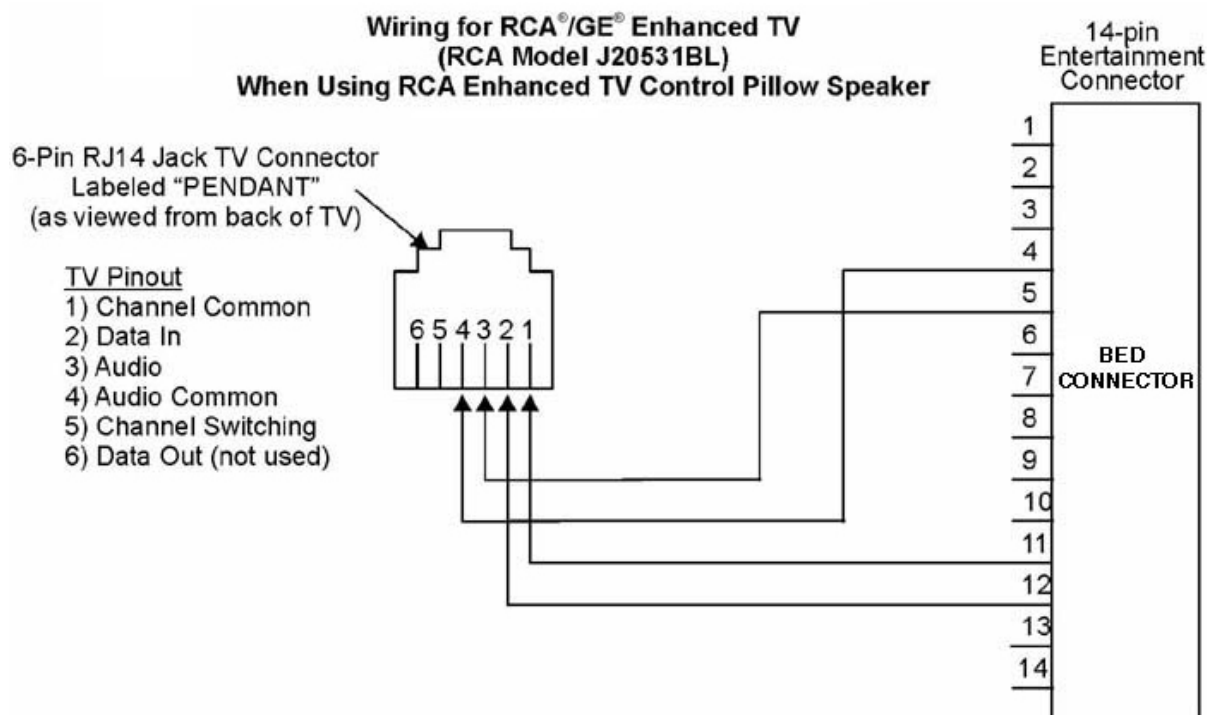




**Figure 12: 3-Wire Interface for Philips TV Control Wiring**



**Figure 13: RCA® TV Control Wiring (Analog)**



**Figure 14: RCA® TV Control Wiring (Enhanced and Digital)**

## Installing a Light Controller



**Caution:**

You should never connect the system to televisions and low voltage lighting controls unless they are UL-certified and medical grade.

### Wiring Color Code for Connecting to the Hill-Rom Light Controller (5 conductor cable)

The following table cross-references the wires in cable A to their connections on the lighting controller (a Hill-Rom controller is assumed). Although the controller wire colors will not be the same for other brands of controllers, sufficient information is provided to connect the ASBC to other low voltage light controllers.

**Table 1: Wiring Color Code for Connecting to the Hill-Rom Light Controller (5 conductor cable)**

Pin #	Lighting Cable Wire Color	Light	Hill-Rom Light Controller
1	White	Room	Blue
2	Red	Reading	Red
6	Black	Aux. Reading	Red
7	Green	Aux. Room	Blue
9	Brown	Light Common	Brown

### Wiring Color Code for Entertainment Connections (8 conductor cable)

The following table cross-references the wires in cable B to their connections on the entertainment facilities (television and television with radio). The table provides information to connect the ASBC to standard (3-wire) television sets including RCA<sup>®</sup>, Zenith<sup>®</sup>, and GE<sup>®</sup> enhanced television, radio steppers, and the enhanced Zenith<sup>®</sup> (5-wire) television.

**Table 2: Wiring Color Code for Entertainment Connections (8 conductor cable), 1 of 2**

Pin #	Cable color	Standard TV Enhanced GE & RCA (No Radio)	Destination TV Input	Standard TV w/ Radio	Destination TV/Radio Inputs
3	Red	N/C		Radio Control (R)**	Radio Control
4	Black	TV Audio Common*	TV Common	TV/Radio Audio Common*	TV/Radio Audio Common
5	Brown	TV Audio	TV Audio	TV/Radio Audio	TV/Radio Audio
8	Orange	N/C		Radio Control (L)**	Radio Control
11	White	TV Control Common*	TV Common	TV Control Common*	TVControl Common
12	Blue	TV Control	Data In	TV Control	TV Control
13	Green	N/C		Radio Common	Radio Common
* TV Control Common and TV Audio Common are typically wired together					
** Radio Control (L) and Radio Control (R) are typically wired together					

**Table 3: Wiring Color Code for Entertainment Connections (8 conductor cable), 2 of 2**

Pin #	Cable color	Zenith 5-wire 3- button enhanced TV	Destination TV Input	Zenith code-driven enhanced TV	Destination TV Input
3	Red	TV Channel Down	TV Channel Down	N/C	
4	Black	TV Audio Common*	TV Common	TV Audio Common*	TV Common
5	Brown	TV Audio	TV Audio	TV Audio	TV Audio
8	Orange	TV Channel Up	TV Channel Up	TV Control	Data In
11	White	TV Control Common*	TV Common	TV Control Common*	TV Common
12	Blue	TV On/Off	TV On/Off	N/C	
13	Green	N/C		N/C	
* TV Control Common and TV Audio Common are typically wired together					
** Radio Control (L) and Radio Control (R) are typically wired together					



## Connecting an Entertainment and Lighting Device

---

**Caution:**

You should never connect the system to televisions and low voltage lighting controls unless they are UL-certified and medical grade.



**Note:** NNC should only be connected to entertainment and lighting equipment which is listed for use in Health Care Facility Patient Care areas.

1. Ensure that the ASBC is not powered by disconnecting the home-run cable from the RCB.
2. Pull the lighting and entertainment cables from the cable assembly through the back box that houses the ASBC.
3. Run 0.5' conduit from the low voltage box (as shown on the drawings) to the ASBC back box.
4. Pull a four- or six-conductor cable from the relay switching box to the ASBC back box.
5. Run cable A (lighting) to the low voltage lighting controller.
6. Run 0.75' of conduit from the bed interface back box to above the ceiling for open wiring on the TV; terminations must be made in a four square back box.
7. Pull a three- or five-conductor cable from the TV back box to the ASBC back box through the conduit.
8. Run cable B (entertainment) to the television/radio stepper wiring.
9. Reconnect the cable to the RCB.
10. Test the ASBC and all entertainment functions.



**Note:** Always use a low voltage controller when connecting to a facility's lighting system. Failure to observe this restriction may result in serious damage to equipment and possible loss of data.



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## SUBMITTAL COVER SHEET

Keystone Electric Division of Zenith Systems approves and submits these shop drawings and samples and thereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data and that he has checked and coordinated each shop drawing and sample with the requirements of the work and of the contract documents and with work of other contractors.

Date: January 18, 2018

Project: VAMC Community Living Center Minor

Contract Number:

Keystone Electric  
Division of Zenith Systems

Project Number: 16.57033

Signature: *Jacob Post*

Specification Section: 27-52-23-2.4-N

Product: Nurse Call Sysytem Cabling

Submittal Number: Forty Two (42)

Supplier: Graybar

Manufacturer: Commscope

Remarks: Please Review & Return

**KEYSTONE ELECTRIC  
DIVISION OF ZENITH SYSTEMS  
P.O. BOX 10245  
ERIE, PENNSYLVANIA 16514**

**APPROVED**

**BY : Jacob Post  
DATE: 1/18/2018**



## Cabling Cut Sheet



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# Cabling

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## Cable Installation Hazard Statements

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The following notes and hazard statements pertain to the installation of the NNC cable installation.



**Caution:**

NNC system components should be field-connected using minimum CAT 5e CMP or better solid copper wire communications cable. All NNC field wiring circuits comply with NFPA 70 (National Electrical Code) requirements for Class 2 circuits which include Listed information technology (computer) equipment limited power circuits.



**Caution:**

Use of any cables other than cables specified for use in this documentation may not comply with installation code requirements. Hill-Rom reserves the right to withhold certification of the system if the installation does not comply with these instructions. Failure to observe this restriction may result in serious damage to equipment and possible loss of data.



**Caution:**

You must follow ANSI/TIA/EIA 568 cable standards and all applicable local, federal and state regulations. Failure to comply with these regulations may result in serious damage or malfunction to the equipment and system.



**Caution:**

You must always use a shielded CAT5/5e cable to connect a desk-mounted GRS-10 to a wall jack. Never use unshielded cable from a desk-mounted GRS-10 to a wall jack.



**Caution:**

Make sure to run cables so that they do not present a tripping hazard.



**Note:**

When running cable for a desk-mounted GRS-10, make sure that the wallplate has two jacks that connect to the PoE switch: one jack for connecting to the GRS-10, and a second jack for connecting a laptop for service purposes.

## Cabling Considerations

---

Before you begin placing any of the network components in a room or area, take some time to plan the design and cabling needs of the system:

- Understand how the various components connect to the rest of the system and how this may affect placement and cable length. Be sure to calculate the home run cable length to properly locate the cabinet and other components of the system.
- Learn where each component should be installed. The shop drawings indicate the approximate location for each device.
- Understand where and how the cables are to be installed. Perform a walk through of the facility, if possible, in order to ascertain cable footage and component placement.
- Verify that none of the home run cables will exceed the maximum length. Refer to [Cable Lengths](#) for details.



**Note:**

You must follow ANSI/TIA/EIA 568 cable standards and all applicable local, federal and state regulations. Failure to comply with these regulations may result in serious damage or malfunction to the equipment and system.

## Lighting and Entertainment Cable

Lighting and entertainment cables are connected through ASBCs. Cable assemblies provide interconnection between ASBCs and the room lighting, radio, and television controls. Cable assemblies are available in 18 in. and 10 ft. All assemblies work with all ASBC models. The NNC system should only be connected to hospital grade UL-certified TV and lighting control devices. Obtain information from the facility as to the type of TV/entertainment and lighting systems they are using:

- In order to connect to lighting, a hospital-grade Low Voltage Controller (LVC) is required. Determine if the hospital has one or if it needs to obtain one. The LVC is not supplied with the NNC system and should be supplied either by the hospital or contractor.
- Certain pillow speakers may be required for certain TV systems (i.e., the type of TV will dictate the type of pillow speaker needed for the facility).
- Obtain manufacturer and model numbers.

## Cable Specifications

NNC requires the cables, connectors, and crimpers described here.



### Caution:

Use of any cables other than cables specified for use in this documentation may not comply with installation code requirements. Hill-Rom reserves the right to withhold certification of the system if the installation does not comply with these instructions. Failure to observe this restriction may result in serious damage to equipment and possible loss of data.

NNC requires the use of CAT5, CAT5e, or better rated cable.

Hill-Rom highly recommends the use of AMP Seafoam CAT5e cable (Hill-Rom P/N P2536A0412, Mfg P/N 1499385-2) during installation. Using the seafoam color will facilitate in troubleshooting efforts during and after installation. However, other colors are available by various vendors as referenced in the following table:

Manufacturer	Manufacturer P/N
Helix	LF24P0045
Alpha	9504F
SWC	661827-02
AMP	219513
Belden	1585A
Berk-Tek	231378

The CAT5/e cable can be ordered with outer jackets in multiple colors. Using cable with an outer jacket of a different color from existing systems will assist in troubleshooting an NNC installation.

## Cable Lengths

The following tables describe the maximum cable lengths for hardware connectivity.

**Table 1: PoE Switch Cable Lengths**

PoE Switch to...	Maximum Cable Length
RCB	328'
GRS-10	<ul style="list-style-type: none"> <li>20' between the wall jack and the GRS-10 (shielded)</li> <li>308' between the wall jack and the PoE switch (unshielded)</li> </ul>
Nursing Unit Controller	328'

**Table 2: RCB Cable Lengths**

RCB to...	Maximum Cable Length
GRS-5 or SRS	98'
GRS-10	98'
RLR	98'
Dome Light	98'
Enable/Disable Switch	98'
Remote Audio Device	98'
Remote switch	98'
Equipment Receptacle	98'
Daisy-chained RCB	98'

**Table 3: GRS-10 Cable Lengths**

GRS-10 to...	Maximum Cable Length
Handset	9'
DVI-D (optional monitor)	6.5'
USB device (optional mouse or keyboard)	6.5'

**Table 4: GRS-5 and SRS Cable Lengths**

GRS-5/SRS to...	Maximum Cable Length
ASBC	49'
Handset	9'

## Cable Running Requirements

---

Installation drawings are provided by Hill-Rom that indicate the approximate location for each device. Installation technicians should consult the Regional Project Manager or Network Engineer for exact mounting locations.

When pulling cables, observe all ANSI/TIA/EIA 568B industry standards as well as the following:

- Store cable in a protected, moisture-free area.
- Plenum-rated jacketed cable is required for all NNC installations.
- Maintain the same pin-pair assignment throughout the entire job site.
- Cable spans should be no more than 4' apart.
- Do not drag cables over sharp surfaces, and avoid torn jackets due to over twisting or snags.
- Do not step on the cable.
- Cables may be routed in cable trays, neatly dressed out loosely in the ceiling, or run through conduit, depending on the facility's needs and local codes.
- Maintain a bend radius of four times the diameter of the cable (usually 1").
- Avoid unnecessary bends in the cable.
- Do not splice, bridge tap, or repair the cable. Do not use couplers.
- Avoid ninety degree bends whenever possible, and never exceed a ninety degree bend.
- Minimize the amount of jacket twisting.
- Apply cable ties loosely, and at random intervals.
- Maintain a minimum distance of 12" from fluorescent lights.
- Do not use staple guns. Do use Velcro straps, nail-on cable clamps, and D-rings to support and position cables.
- Avoid sources of heat, such as heating ducts and hot water pipes.
- Avoid all sources of electromagnetic interference (EMI).
- Do not exceed the maximum pulling tension of twenty-five pounds.
- Do not run power cables in conduit with telecommunication cables.
- Mark field terminated cables with appropriate labels/color codes at both ends.
- Route cables away from knee/foot areas of the nurse's station/console/desk in order to minimize system outages due to damaged or disconnected cables.

### Cable Requirements for a Desk-Mounted GRS-10

The desk-mounted GRS-10 must maintain a connection to earth ground based on the following requirements.

- The shielded cable must be connected from the GRS-10 to a shielded UL-listed Keystone-style jack such as a Leviton 5S180-SH5.
- The Keystone-style jack must be installed in a UL-listed stainless steel wallplate such as a Leviton 43080-1S1.
- The jack and the wallplate must be securely mounted to a grounded metal gang box with unpainted metal screws.
- The CAT5/5e cable running between the PoE switch and the shielded UL-listed Keystone-style jack must be unshielded. Note that manufacturer-included instructions for installing the shielded UL-listed Keystone-style jack may only show punch-down instructions for shielded cables. In this case, any specific punch-down steps for shielded cables should be disregarded since an unshielded cable must be used from the PoE switch to the shielded UL-listed Keystone-style jack.
- When all requirements are followed correctly, the desk-mounted GRS-10's ground path is provided through the shielded CAT5/5e cable, to the UL-listed Keystone-style jack, to the UL-listed stainless steel wallplate, through the unpainted metal screws, and finally to the grounded metal gang box.



#### Caution:

You must always use a shielded CAT5/5e cable to connect a desk-mounted GRS-10 to a wall jack. Never use unshielded cable from a desk-mounted GRS-10 to a wall jack.



**Note:**

When running cable for a desk-mounted GRS-10, make sure that the wallplate has two jacks that connect to the PoE switch: one jack for connecting to the GRS-10, and a second jack for connecting a laptop for service purposes.

## Cable with Conduit Requirements

---

The procedure for running cables is slightly different when installing the NNC in facilities or locations that require cable be protected with conduit from end to end.

Requirements for installing cable with conduit vary. Refer to NEC, state, and local codes and requirements.

In general, keep the following in mind:

- 3/4" conduit can hold up to six CAT5 cables. Use larger sizes as needed.
- All end-to-end conduit installations require that the RCB be installed within a room box enclosure.

## Labeling Cable

---

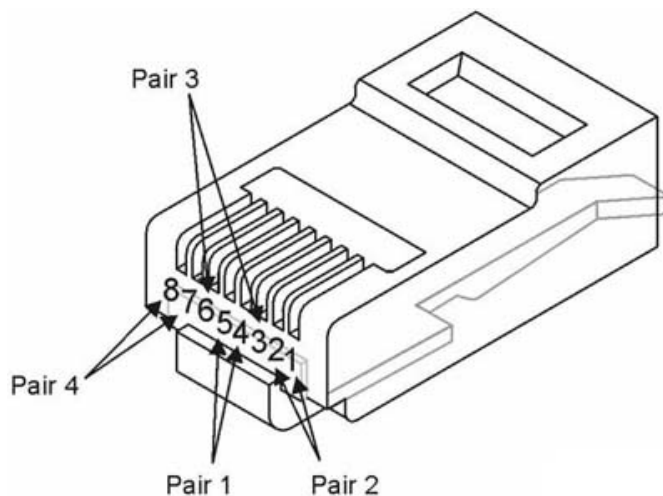
Use the following guidelines to label NNC cable:

- All cables coming into a PoE switch or RCB must be labeled at both ends with standard cable marking tape.
- It is best to use labels made by a label maker.
- The labels should clearly indicate which device the cable is connecting.
- It is not recommended to use color-coding to label cable.
- You should apply labels 2–6" from the end of the cable so the label can be viewed without needing to unplug the cable.

## Cable Termination

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NNC uses the T568B cable wire pairing termination standard.



**Figure 1: T568B**

## Cable Termination Specifications

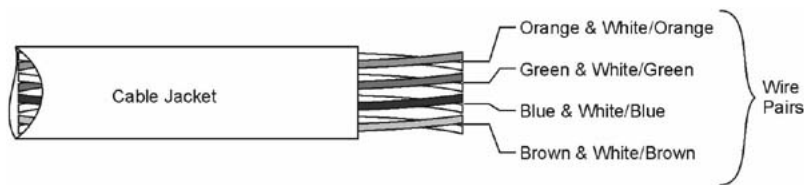
Hill-Rom requires AMP/Tyco High Performance (Category 5e or better) RJ45 connectors for all nurse call wiring. Cable must be terminated with approved AMP/Tyco termination tool and compatible die-set for the RJ45 connector selected. Since Category 5e and Category 6 dies are not cross-compatible, it is critical that the correct die be used for

the chosen connector. Refer to the TE Connectivity website at [www.te.com](http://www.te.com) for current part numbers and compatibility lists.

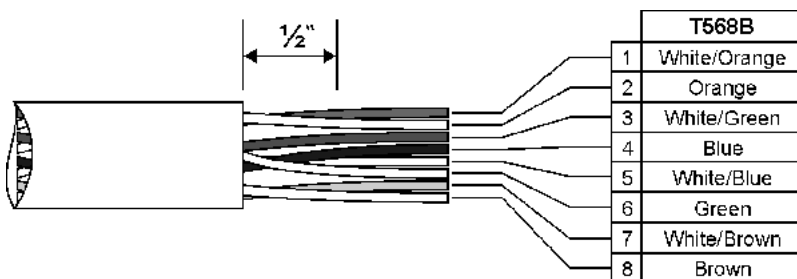
Pin Number	Wire	T568B
1	T2	White/Orange
2	R2	Orange
3	T3	White/Green
4	R1	Blue
5	T1	White/Blue
6	R3	Green
7	T4	White/Brown
8	R4	Brown

## Terminating Cable

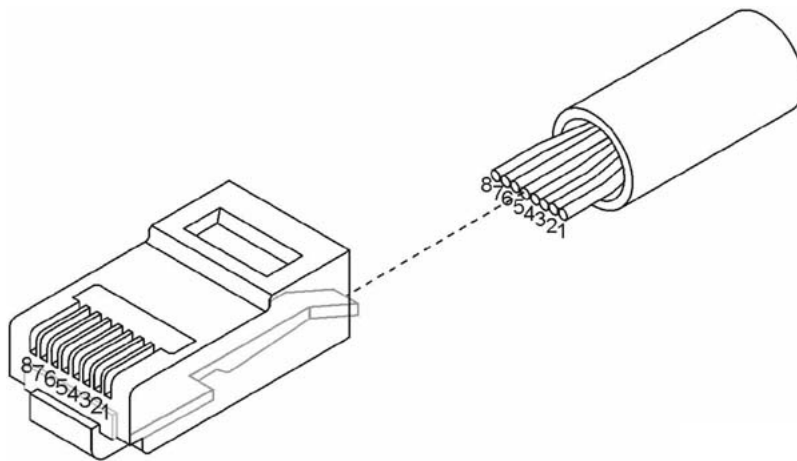
1. Using a cable stripper, strip the outer cable jacket 2" to reveal the four pairs of twisted cables.
2. Position the four pairs of wires as illustrated below.



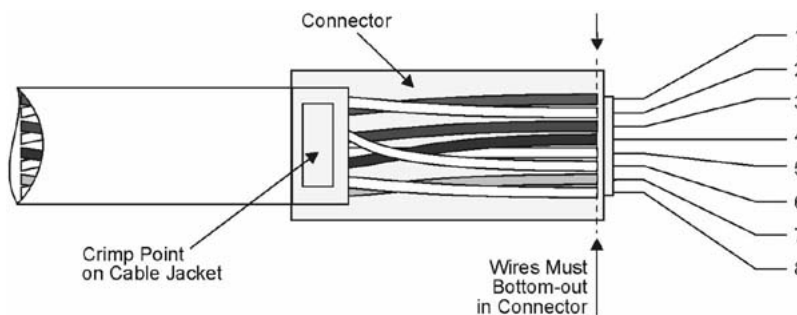
3. Untwist the four exposed pairs. Smooth out the twist on each wire and position them in the correct order for termination as illustrated below.



4. Hold the wires in place and cut them straight across (perpendicular to the connector body), and cut the wires evenly, leaving  $\frac{1}{2}$ " exposed.
5. Carefully insert the RJ45 connector over the arranged wires.  
Make sure the wires do not cross.



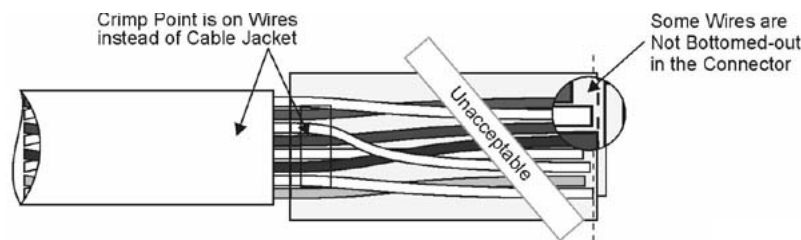
The ends of the conductors must bottom-out in front of the RJ45 connector, and the jacket must extend beyond the crimp point.



6. Carefully place the connector into the RJ45 hand tool and crimp the RJ45 connector onto the wires.

The cable restraint crimp (crimp point) must be intact and securing the sheath of the cable. If the “dimple” at the crimp point is broken or missing, the plug must be replaced.

Make sure that the jacket is secure in the plug. If the jacket is not secure in the plug, the cable is unacceptable.



7. Visually inspect the connection through the connector to ensure that the wires fan out and are completely inserted into the RJ45 connector body.

## Certifying Cable

Every cable must be certified with a time-domain reflectometer before it is used to connect NNC hardware. The necessary level of testing varies based on the cable type. Conventions for cable test data notation are listed in the table below.

Cable certification test results must be provided to a Hill-Rom project manager for review before certification. Save all cable test results to a CD-ROM for certification and review. Hill-Rom reserves the right to withhold certification if the installation does not comply with the required testing procedures.



**Note:** Cable certification is required for *new* NNC components. If the implementation is a migration from NCM to NNC and existing NCM components, such as bath switches, are being reused, the original NCM cabling does NOT need to be re-certified for NNC, and will only be retested if specifically requested during the proposal phase of the project.

The information in the following sections provide guidelines for the minimum tests that each cable must pass for certification.

## Ethernet

Ethernet cables must meet the minimum standards for the following specifications and uses:

- Wire map (cross pairs, opens, shorts)
- Near End Crosstalk (NEXT)
- Far End Crosstalk (FEXT)
- Length. (Less than 328 feet)
- Attenuation

## Non-Ethernet

### Room Bus

Non-Ethernet cables must meet the minimum standards for the following specifications and uses:

- Wire map (cross pairs, opens, shorts)
- Length

### Category 5/5e/6, Level II Cable Testers

Field test instruments used to verify cable performance must be compliant with Level IIe requirements specified in ANSI/TIA/EIA-568-B.2 specification, (for example, FLUKE - DSP 2000/4000, Pentascanner +, Datacom Technologies - LANcat, Wavetek - LANTEK PRO).

## Conventions for Cable Test Data Notation

NNC Device	Abbreviation
Ethernet to Primary Console	PC ETH
Ethernet to Secondary Console	SC ETH
PoE switch to facility network switch	POE FAC ETH
Ethernet to VoIP Controller machine	VOIP ETH
Ethernet to Nursing Unit Controller	NUC ETH
Ethernet to machine running both the VoIP Controller and Nursing Unit Controller	VOIP NUC ETH
Ethernet to External relay	RLY ETH
Ethernet to wall-mounted GRS-10	GRS10 ETH
Room Station (GRS-5)	GRS5 A or B + room number
Room Station (SRS)	SRS A or B + room number

NNC Device	Abbreviation
Remote Audio Device (RAD)	RAD + room number
Audio Station Bed Connector (ASBC)	ASBC + A or B + room number
Call Cord Interface	CCI# + room number
Shower Switch	SS# + room number
Code Blue Switch	CB# + room number
Code Pink Switch	CP# + room number
Dome Light	DL + room number. If dual dome, use DLA or DLB for audio A and B, respectively.
Zone Light	ZL + room number
Enterprise Server to Ethernet	SRV ETH
PoE switch to Room Control Board (RCB)	Room number
Supervised Interface Module	SM + room number
Staff Emergency Switch	SE# + room number
Toilet Switch	TS# + room number
Spares	Room number





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## ***SUBMITTAL COVER SHEET***

Keystone Electric Division of Zenith Systems approves and submits these shop drawings and samples and thereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data and that he has checked and coordinated each shop drawing and sample with the requirements of the work and of the contract documents and with work of other contractors.

Date: January 18, 2018

Project: VAMC Community Living Center Minor

Contract Number: \_\_\_\_\_

Keystone Electric  
Division of Zenith Systems

Project Number: 16.57033

Signature: *Jacob Post*

Specification Section: 27-52-23-2.4-H

Product: Nurse Call Dome Lights

Submittal Number: Forty Three (43)

Supplier: Hillrom

Manufacturer: Navicare

Remarks: Please Review & Return

**KEYSTONE ELECTRIC  
DIVISION OF ZENITH SYSTEMS  
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ERIE, PENNSYLVANIA 16514**

**APPROVED**

**BY : Jacob Post  
DATE: 1/18/2018**



## **Dome Light Installation Cut Sheet**

# Contents

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Dome Light Specifications.....	5
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# Dome Light and Zone Light Installation

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## Dome Light Hazard Statements

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The following notes and hazard statements pertain to the installation of Dome Light fixtures.



**Caution:**

Never install a Dome Light so that the sides of the assembly are flush against any object. Doing so will prevent access to the screws that attach the assembly to the mounting plate. Make sure that there is at least 3" of space on the sides of the Dome Light.

If you are installing a Dome Light adjacent to an RCB, make sure there is 3" of space on the right side of the Dome Light. The left side of the Dome Light, which sits adjacent to the RCB, does not need a screw to hold the assembly in place.



**Caution:**

Each back box must be properly grounded in accordance with the appropriate sections of NFPA 70 (e.g., Sections 250-96 and 517-13A).



**Caution:**

Do not use a box eliminator to install Dome Lights or Zone Lights.

## About Dome Lights

---

A Dome Light is a signaling device placed outside of each patient room near the door that informs you about various events occurring in the patient room. Dome Lights have either 8 or 4 configurable LEDs. A Dome Light can also be configured to be a Zone Light, which is placed in a ward or hallway and informs you about various events occurring in a specified zone instead of in a single patient room. The same hardware is used for both Dome Lights and Zone Lights; the only difference is where they are placed and how they are configured.

Dome and Zone lights provide signals for the following events:

- Staff emergency
- Code call placed
- Normal call from a patient bed
- Staff member in the room
- Staff member needed in the room
- Patient safety alert

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**Figure 1: Dome Light (Wall-Mounted)**



**Figure 2: Dome Light (Ceiling-Mounted)**





**Figure 3: RCB with Dome Light Attached**

## Dome Light Specifications

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### Back Box Requirements

Dome lights must be mounted in a box that is a minimum 2.5" deep or 12.5 cubic inches. When mounting a dome light next to a door, mount it 80" above the finished floor. When mounting a dome light above a door, center it between the top of the door and the ceiling.

- Standalone dome light: 1-gang box
- RCB with adjacent dome light: 3-gang box

A 2-gang to 1-gang adapter plate can be used for retro-fitting, though a 1-gang back box is preferred.



### Caution:

Each back box must be properly grounded in accordance with the appropriate sections of NFPA 70 (e.g., Sections 250-96 and 517-13A).

### Connectors

A dome light has one RJ45 for connecting to an RCB.

### Dimensions

Width	3"
Height	7.6"
Depth	3.6"

**Electrical**

Input voltage (nominal)	5VDC
Power (nominal)	3W

**Dome Light Placement**

The scenarios for placing Dome Lights are listed in the following table. During the design phase, determine which configuration works best.

Scenario	Dome Light	Zone Light	Single Bulb Dome Light
Ceiling mount	Yes	Yes	Yes
Wall mount	Yes	Yes	Yes

**General Zone and Dome Light Placement**

- Dome Lights mount either on a wall or on the ceiling. The hospital should specify which type of mount they prefer during the walk-through as the placement could affect the design of the system. Determine space limitations during the design phase and ensure that there is enough space (~10") to mount the Dome Lights.
- Make sure that there is a few inches of clearance on both sides of the Dome Light so that you can access the screws that attach the assembly to the mounting plate.

**Dome Light Placement**

- Every patient room with a room station requires a Dome Light.
- One Dome Light can annunciate calls for a maximum of eight beds. For rooms or bays that have more than eight beds, multiple Dome Lights are required, one per every eight beds.

**Zone Light Placement**

- Zone Lights are physically similar to Dome Lights, except that in some cases the A and B symbols on the dome lights are replaced by rectangles on Zone Lights. Also, Zone Lights service a group of rooms or locations instead of a single patient room.
- A maximum of one Zone Light can be configured per RCB.
- Zone Lights annunciate actions in all rooms within a defined zone, mimicking the actions of the associated Dome Lights. When a call is placed from any of these rooms, the Zone Light is activated along with the Dome Light for the room originating the call.

**Single-Bulb Dome Lights**

- Single-Bulb Dome Lights are not supervised, so emergency remote switches that are configured as alternate locations that illuminate Single-Bulb Dome Lights must also be assigned to a Zone Light.
- The system can support up to 7 Single-Bulb Dome Lights and each can be configured to one of three flash types (slow, fast or solid).

**Mounting a Dome Light**

Parts required:

- Dome Light assembly
- Dome Light mounting plate

- #6-32 screws (2)
- M3 flat head screws (2)
- 1-gang back box

Jumper configuration:

1. Determine if the dome light is to be used as a primary dome light.
2. Configure the dome light.
  - Remove the jumper from the zone port unless the dome light is to behave exactly like a primary dome light.
  - Leave the jumper in the zone port to configure the dome light to behave exactly like a primary dome light.

These instructions are for mounting a standalone Dome Light. To mount a Dome Light adjacent to a Room Control Board (RCB), see instructions for mounting an RCB to a wall.



**Note:**

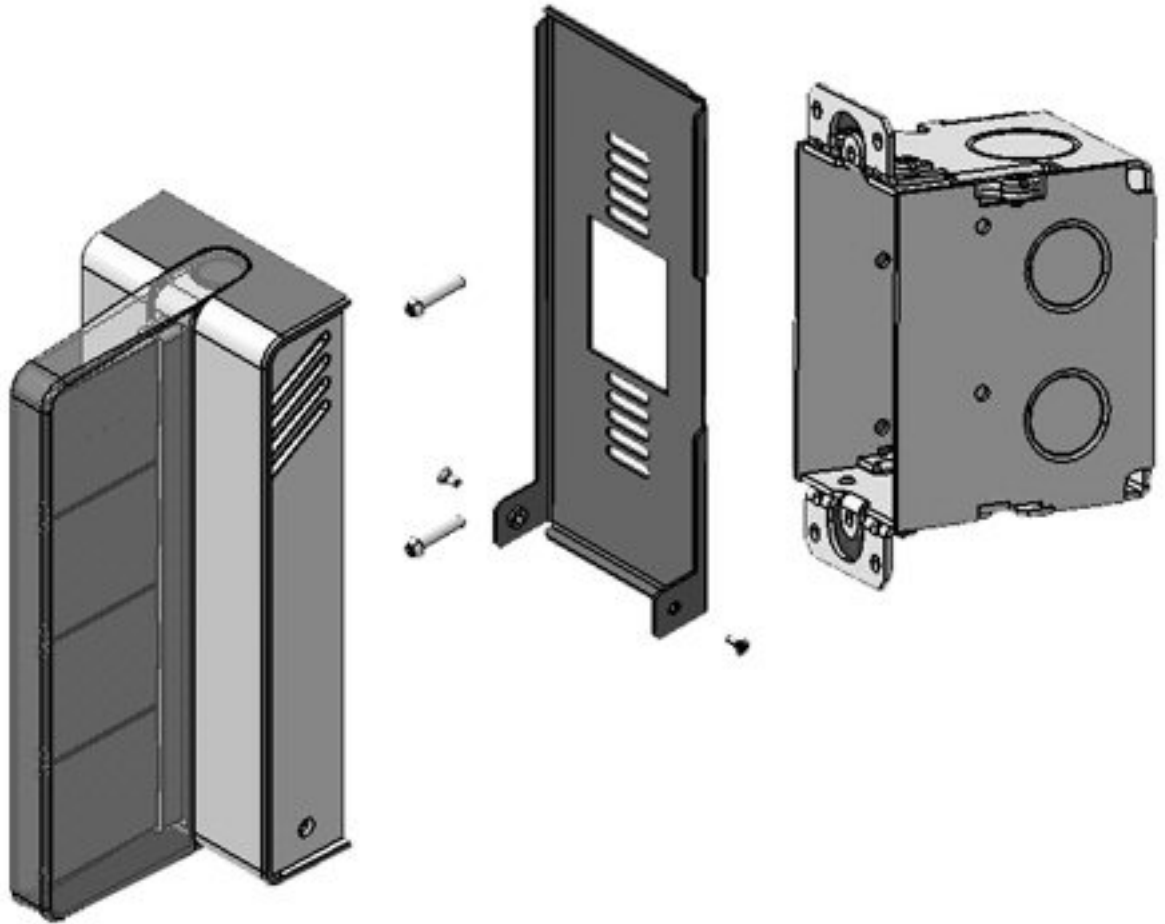
The Dome Light mounting plate can be adjusted up-and-down as well as side-to-side, as necessary.



**Note:**

The minimum space requirement when mounting a dome light between the door frame and the ceiling is 7 inches.

1. Use the 2, #6-32 mounting screws to attach the Dome Light mounting plate onto the single gang box.  
Make sure to install the mounting plate so that when the Dome Light is mounted, the vents face left and the M3 flat head screws face downward.
2. If the Dome Light will be configured as a Zone Light, then follow these steps:
  - a) On the back of the Dome Light assembly, remove the 2-position jumper.
  - b) Re-attach the jumper to only one of the 2 pins so that the 2 pins are not shorted.
3. Plug the cable from the RCB into the RJ45 connector on the back of the Dome Light assembly
4. Hang the Dome Light assembly onto the Dome Light mounting plate using the mounting tab on the top of the plate and the ribs on the Dome Light assembly.
5. Use the 2, M3 flat head cover screws to attach the Dome Light assembly to the Dome Light mounting plate.



**Figure 4: Dome Light Installation**

# Single-Bulb Dome Light Installation

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## About Single-Bulb Dome Lights

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A Single-Bulb Dome Light is used like a Dome Light except that it can only be configured for one flash type (slow, fast, or solid). Single-Bulb Dome Lights connect to the terminal block of an RCB or External Relay and annunciates selected call signals, such as signals from call cords, bath and shower switches, and smoke detectors.



**Figure 5: Single-Bulb Dome Light**

## Single-Bulb Dome Light Specifications

---

### Back Box Requirements

The single-bulb dome light requires a 2-gang back box.



**Caution:**

Each back box must be properly grounded in accordance with the appropriate sections of NFPA 70 (e.g., Sections 250-96 and 517-13A).

### Connections

Connectors	Options include wire nuts, scotch locks, and dolphin connectors.
Cable requirements	2 conductor, 24 AWG, CAT5/CAT5e plenum rated

### Dimensions

Width	4.57"
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Height	4.57"
Depth	3"

### Mechanical

Front plate	White flame-retardant ABS plastic
Power	24 VDC from Room Control Board (RCB)
Weight	0.41 lbs.
Bulb type	LED
Bulb rating	24 VDC, 30 mA
Back box (renovation) RACO 500 Gangable (2 required)	Height: 3" Width: 2" Depth: 2 1/2" or minimum 12.5 cubic inches
Back box (new construction) RACO 231 - 4 Square box RACO 778 - Ring	Height: 4" Width: 4" Depth: 2 1/8"

## Mounting a Single-Bulb Dome Light

Parts needed:

- Single-Bulb Dome Light lens
- Single-Bulb Dome Light base
- 2-gang back box
- Plenum-rated four twisted pair cable (1)
- #6-32 screws (4)
- Wire nuts or wire joints



**Note:** You can also use a 2-conductor, plenum-rated communication cable between 24AWG and 18AWG. Make sure the cable is UL-listed.



**Note:** A trained Hill-Rom Service Representative or the facility's NNC System Administrator must configure the terminal block in the Enterprise Configuration Tool (ECT).

1. Install a 2-gang back box for the dome light.
2. Run plenum-rated four twisted pair cable from the Room Control Board (RCB) to the Single-Bulb Dome Light location shown on the shop drawing.

The cable must have a minimum of two 24 AWG conductors. CAT5/5e/6 cable is the suggested cable type; however, all unused conductor must be capped off or taped back to the cable to prevent them from shorting to the RCB.



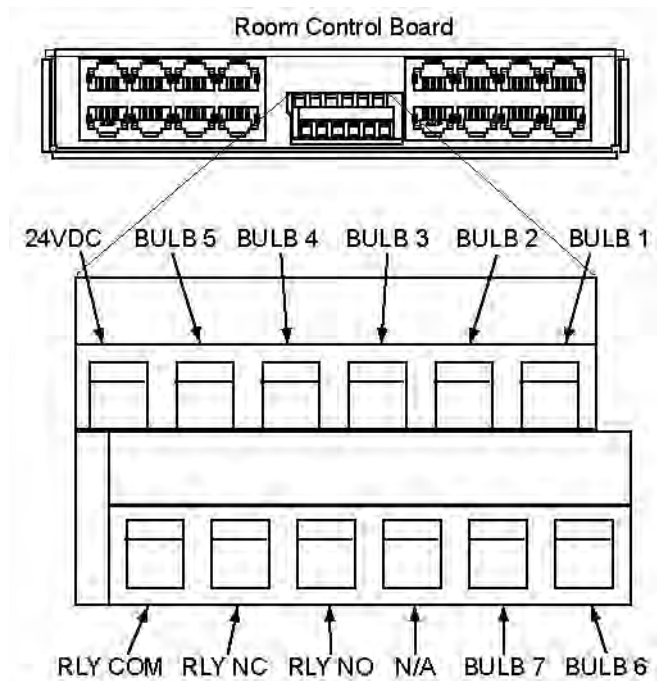
**Note:** The wires must be joined as shown in the figure below.

3. Attach the Single-Bulb Dome Light base to the back box with the 4, #6-32 screws.
4. Attach the Single-Bulb Dome Light lens to the base.
5. Attach the cable to the terminal block on the RCB.
  - The black wire connects to the 24VDC terminal.

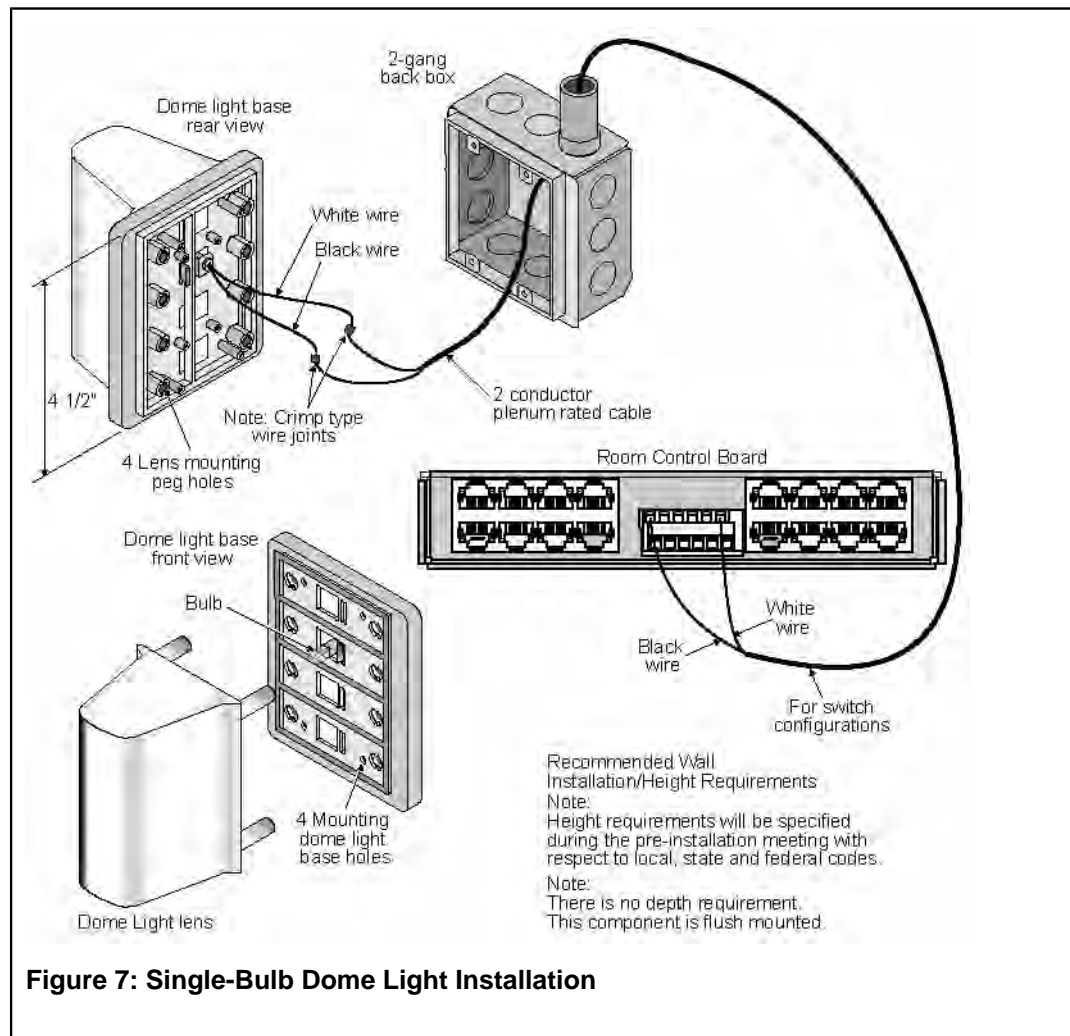
- The white wire connects to the assigned bulb terminal for the corresponding switch. For example, if the switch that triggers the Single-Bulb Dome Light is plugged into the SW-3 port on the RCB, then the white wire needs to connect to the BULB 3 terminal.



**Note:** The Single-Bulb Dome Light is polarity-sensitive. Incorrect wiring will prevent the lamp from functioning.



**Figure 6: RCB Terminal Block**





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## SUBMITTAL COVER SHEET

Keystone Electric Division of Zenith Systems approves and submits these shop drawings and samples and thereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data and that he has checked and coordinated each shop drawing and sample with the requirements of the work and of the contract documents and with work of other contractors.

Date: January 18, 2018

Project: VAMC Community Living Center Minor

Contract Number:

Keystone Electric  
Division of Zenith Systems  
Project Number: 16.57033 Signature: *Jacob Post*

Specification Section: 27-52-23

Product: Nurse Call Graphical Room Station

Submittal Number: Forty Four (44)

Supplier: Hillrom

Manufacturer: Navicare

Remarks: Please Review & Return

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ERIE, PENNSYLVANIA 16514**

**APPROVED**

**BY : Jacob Post  
DATE: 1/18/2018**



## **GRS-5 Installation Cut Sheet**

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    About GRS-5s.....3

    GRS-5 Specifications.....4

    Room Station Placement..... 5

    Mounting a GRS-5..... 5

**Forcing the Calibration of a GRS-5..... 11**



# GRS-5 Installation

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## Room Station Installation Hazard Statements

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The following notes and hazard statements pertain to the installation of room stations.



**Caution:**

Do not install a room station so that the bottom of the room station assembly is flush against any object. Doing so will prevent access to the bottom screws. Make sure that there is at least 3" of space below each room station.



**Caution:**

Do not overtighten the screws when installing a mounting plate to a headwall. Doing so will cause the mounting plate to bend and the room station to mount improperly.



**Caution:**

If the face of the back box is not flush with the wall surface, then the mounting plate will need to be shimmed. Failure to do so will cause the mounting plate to bend and the device to mount improperly.



**Caution:**

Do not use a box eliminator to install room stations.



**Caution:**

Only UL-Certified Information Technology Equipment, Medical Equipment, or Nurse Call Equipment can be connected to the desk-mounted console GRS-10 USB or DVI-D ports. No equipment can be connected to the wall mount GRS-10 USB or DVI-D ports.



**Caution:**

You must always use a shielded CAT5/5e cable to connect a desk-mounted GRS-10 to a wall jack. Never use unshielded cable from a desk-mounted GRS-10 to a wall jack.



**Caution:**

Each back box must be properly grounded in accordance with the appropriate sections of NFPA 70 (e.g., Sections 250-96 and 517-13A).

## About GRS-5s

---

The Graphical Room Station 5 (GRS-5) is a room station with a small touchscreen display that has a subset of the GRS-10 features. A GRS-5 can be used as a staff station, duty station, or patient station, but it cannot be a Staff Console.

The GRS-5 can be configured to function as any of the following:

- Staff station - A staff station is a room station placed outside of patient room that can be used for staff-to-staff communications and to audibly annunciate calls.
- Duty station - A duty station is a staff station configured for the primary purpose of audibly annunciating calls.
- Patient station - A patient station is a room station inside of a patient room that is used for patient-staff communications.
- Visitor station - A visitor station is a room station that is used for visitor-to-staff communications and is commonly found in a visitor lounge.
- Kiosk - A station used exclusively to display web applications.



**Figure 1: GRS-5**

## GRS-5 Specifications

---

### Back Box Requirements

The GRS-5 must be mounted in a back box that is 2.5" deep, minimum.

- Standalone: 2- or 3-gang box
- With 1 adjacent ASBC: 4-gang box
- With 2 adjacent ASBCs:
  - 2-gang box with 2 1-gang boxes
  - 3-gang box with 2 1-gang boxes
  - 4-gang box with 1 1-gang box

### Dimensions

Width	7.7"
Height	4.9"
Depth of device	1.5"

### Electrical

Input voltage (nominal)	36VDC
Power (nominal)	4W

### Connectors

The GRS-5 has 6 RJ45 connectors:

- 1 for connecting to the RCB
- 4 for connecting to 2 ASBCs (2 ports per ASBC)
- 1 for connecting to a handset

## Room Station Placement

---

### General Room Station Placement

- Do not place a room station so that the bottom of the room station assembly is flush against any object. Doing so will prevent access to the bottom screws. Make sure that there is at least 3" of space below each room station.
- For additional information on issues regarding room station placement, refer to [Room Configurations](#).
- Never place a room station near a hand hygiene station.

### Staff Console Placement

Primary Staff Consoles:

- Primary Staff Consoles should be located in a nurse's station.
- Primary Staff Consoles will typically be mounted to a desk stand, not to a wall.
- Primary Staff Consoles will typically have a handset.

Secondary Staff Consoles:

- A secondary Staff Console can be used in a subunit of a nursing station to allow the staff in that subunit to run the unit independently of the primary Staff Console.
- A secondary Staff Console can be placed in areas that are common to more than one nursing unit, such as staff rooms or conference rooms.

### Staff Station Placement

- Staff stations are generally located in staff rooms, conference rooms, or in hallways.
- A staff station can only be used within the nursing unit where it is placed. A staff station cannot receive calls from outside the nursing unit or make calls to other nursing units.
- The GRS-5 is recommended for use as a staff station.

### Duty Station Placement

- Duty stations are generally located in utility closets.
- The SRS is recommended for use as a duty station.

### Patient Station Placement

- Patient stations should be located in patient rooms close to patient beds to ensure that audio quality is clear.
- The preferred location for patients stations is in the headwall above a patient bed.
- Each patient station can have a maximum of 2 ASBCs connected to it.
- If the infrared receiver will be used with locator badges, make sure to consider locations that best optimize locating capabilities. For details, refer to [Locating Considerations](#).
- The Standard Room Station (SRS) is recommended for use as a patient station.

### Visitor Station Placement

- Visitor stations should be located in or near a visitor's lounge.
- Visitor stations can also be placed outside of a mental health ward or ICU for use by a patient's family members to gain access to the floor or unit area.

## Mounting a GRS-5

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Parts required (standalone):

- GRS-5 assembly
- GRS-5 mounting plate
- #6-32 screws (4)
- 3-gang back box
- CAT5/5e/6 cables (1)

Additional parts required per adjacent ASBC:

- ASBC assembly
- ASBC mounting plate
- #6-32 screws (2)
- CAT5/5e/6 cables (2)

Back box requirements:

- GRS-5 (standalone): 3-gang back box
- GRS-5 with 1 adjacent ASBC: 4-gang back box



**Caution:**

Do not install a room station so that the bottom of the room station assembly is flush against any object. Doing so will prevent access to the bottom screws. Make sure that there is at least 3" of space below each room station.



**Caution:**

If the face of the back box is not flush with the wall surface, then the mounting plate will need to be shimmed. Failure to do so will cause the mounting plate to bend and the device to mount improperly.

1. Attach the mounting plate to the back box or headwall using 4, #6-32 screws.

For back box installations, make sure that you do not align the screws with the headwall grooves if you are installing any adjacent ASBCs.

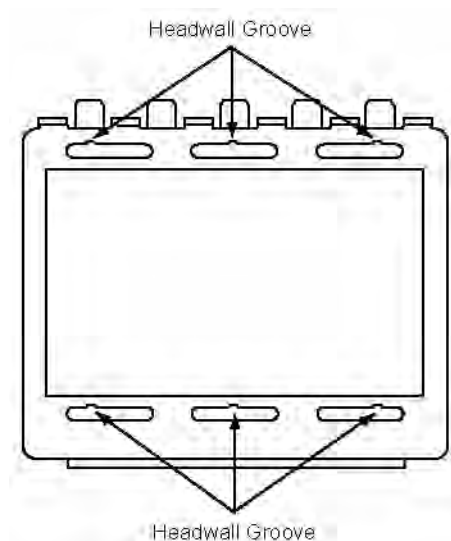
For headwall installations:

- We recommend using self-tapping screws. The headwall grooves have no threading.
- Make sure to align the screws with the headwall grooves.



**Caution:**

Do not overtighten the screws when installing a mounting plate to a headwall. Doing so will cause the mounting plate to bend and the room station to mount improperly.

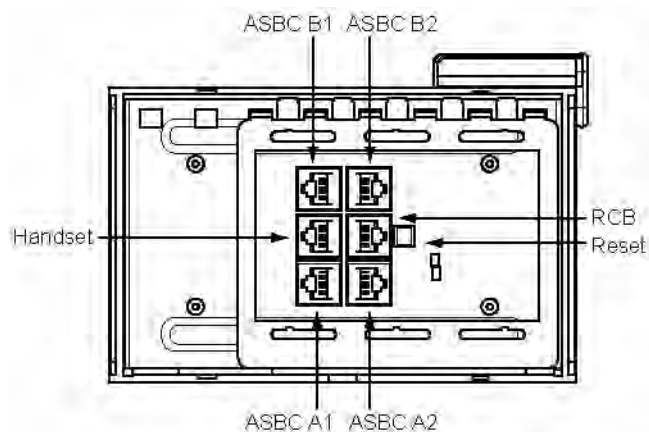


**Figure 2: Headwall Grooves on the Mounting Plate**

2. Plug the cables through the back box into the appropriate connectors

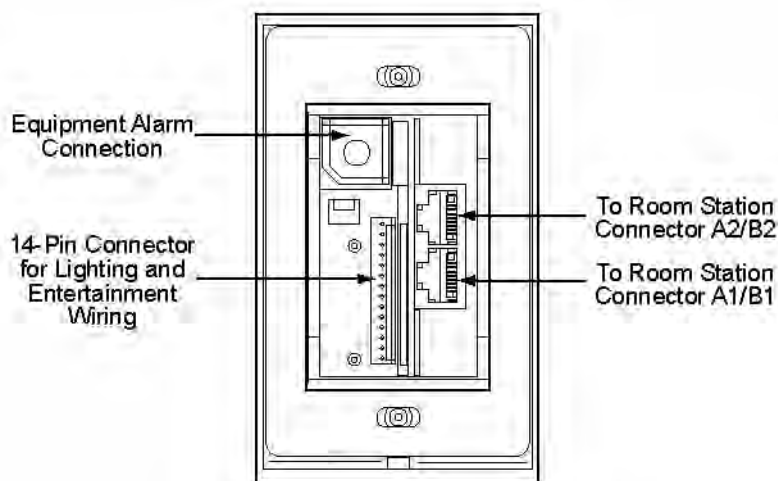
The GRS-5 has RJ45 jacks for 6 connections:

- Connection to RCB
- Connection to optional handset
- Two connections to ASBC for bed A
- Two connections to ASBC for bed B



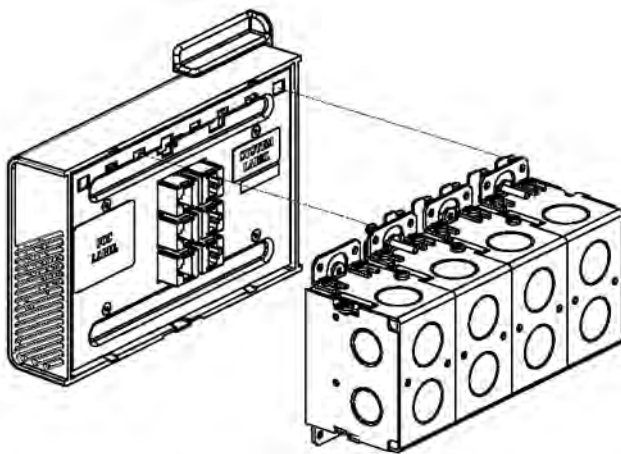
**Figure 3: GRS-5 Connections**

3. If you are attaching adjacent ASBCs, do the following:
    - a) Plug the cables through the back box into the ASBC assemblies.
- The ASBC has RJ45 jacks for 2 connections to the GRS-5.



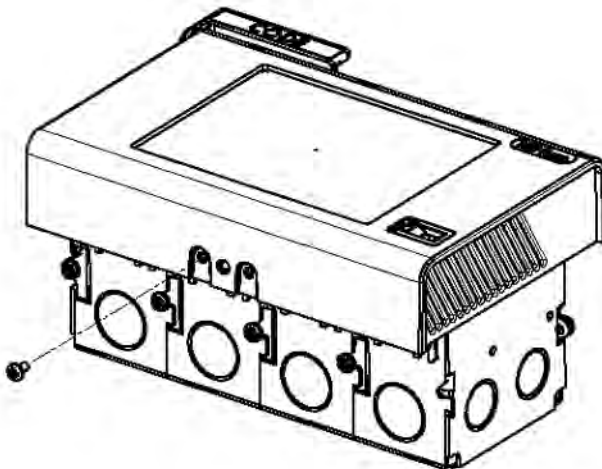
**Figure 4: ASBC Connections**

- b) Attach the ASBC assembly to the back box using 2, #6-32 mounting screws.  
Adjust the ASBC from side-to-side as necessary, leaving enough room for the GRS-5 assembly. When you are installing a GRS-5 with two adjacent ASBCs, there will be slight gaps between the GRS-5 assembly and the ASBCs.
  - c) Attach the front covers to the ASBC assemblies by hooking the tab on the top inside edge of the front cover into the slot on the ASBC assembly and then fastening with the bottom screw.
4. Position the GRS-5 assembly in a center, right, or left position on the mounting plate by lining the hook fingers of the mounting plate up with the correct slot in the GRS-5 assembly.  
If you are installing adjacent ASBCs, the room station assembly should fit snug against the ASBC assembly. If not, readjust the position of the mounting plate and ASBC assemblies appropriately.



**Figure 5: GRS-5 Mounting Plate Installation**

5. Secure the assembly to the mounting plate using 2, #6-32 mounting screws on the bottom of the GRS-5 assembly.

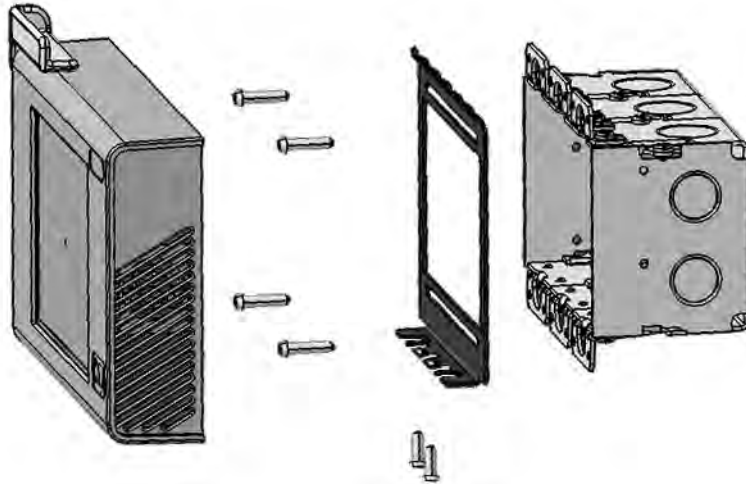


**Figure 6: GRS-5 Mounting Screws**

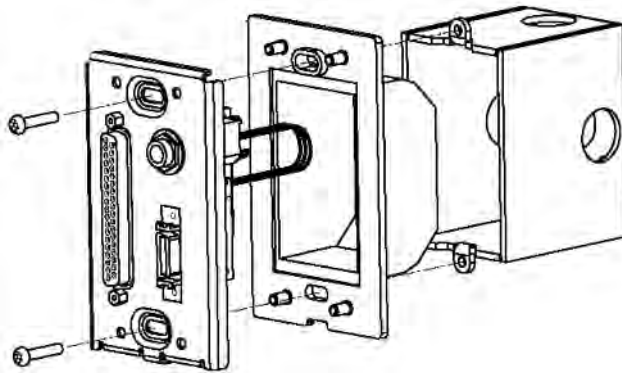


**Caution:**

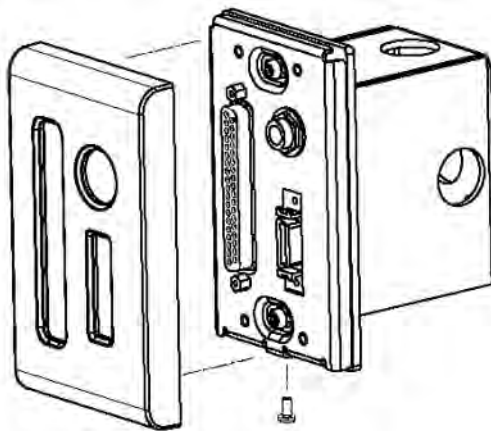
When mounting a room station to its mounting plate, do not use a screw longer than 1/2" in length. A longer screw will damage the room station.



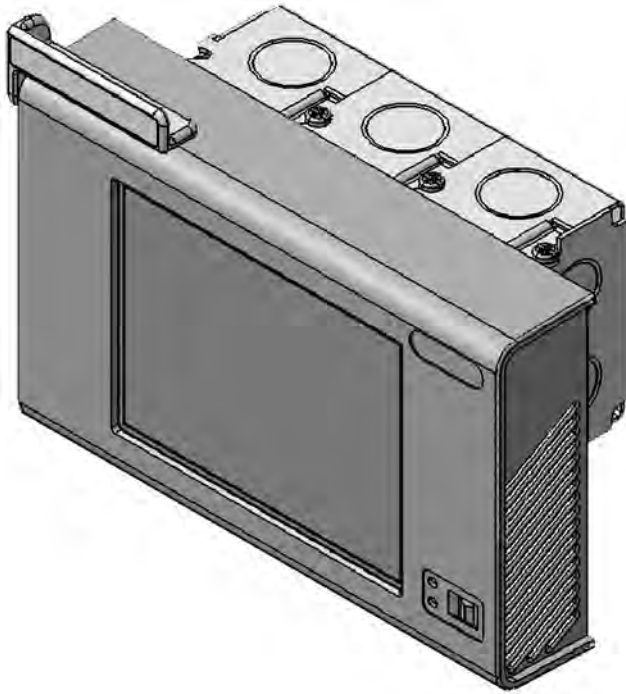
**Figure 7: GRS-5 Installation**



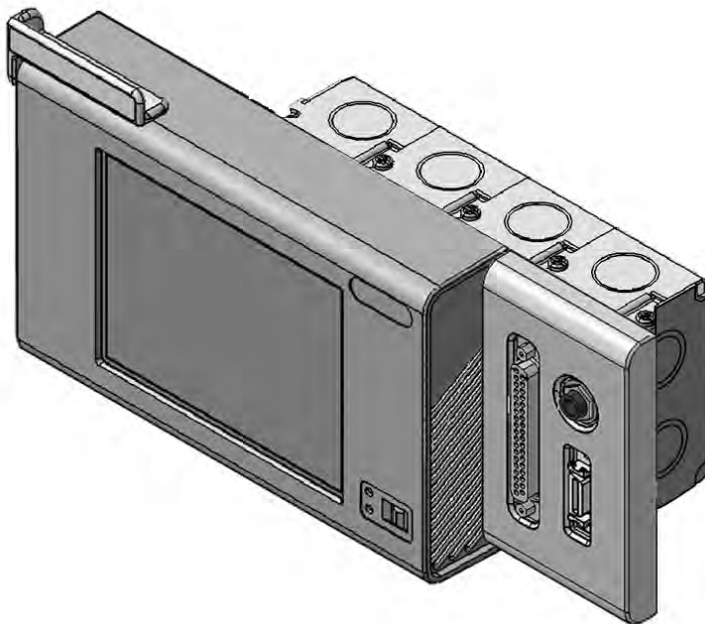
**Figure 8: ASBC Installation 1**



**Figure 9: ASBC Installation 2**



**Figure 10: GRS-5 Installed (standalone)**



**Figure 11: GRS-5 Installed (1 adjacent ASBC)**



## Forcing the Calibration of a GRS-5

Use the following instructions to force a calibration of a GRS-5.

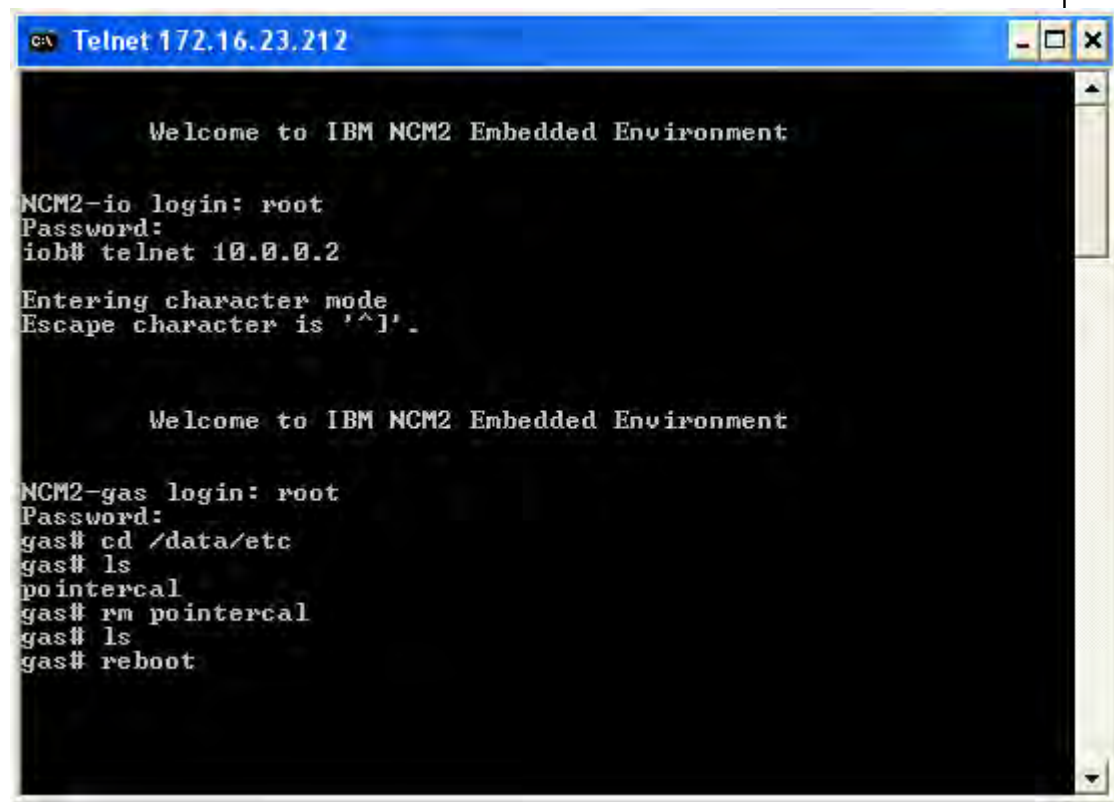
1. Change the speed of the GRS-5 to PPP by completing the following steps:
  - a) In the Enterprise Configuration Tool (ECT), select the **Tools > Discover Unconfigured Devices** menu item.
  - b) Click **Advanced Diagnostics**.

The Advanced Diagnostics screen is displayed.

- c) Next to **IP Address**, type the IP address of the RCB.

- d) If the GRS-5 is on port 1, click **Change Gas speed to PPP on Port 1**. If the GRS-5 is on port 2, click **Change Gas speed to PPP on Port 2**.
2. Telnet to the RCB using root.
  3. From the RCB telnet session, telnet to the GRS-5:
    - To telnet to port 1, type `telnet 10.0.0.2`.
    - To telnet to port 2, type `telnet 10.0.0.6`.
- The login is **root** and the password is **root**.
4. Navigate to the /data/etc directory by typing `cd /data/etc`.
  5. Remove the "pointercal" file by typing `rm pointercal`.
  6. Reboot the device by typing `reboot`.

The following screen example shows steps 2 through 6.



```
Telnet 172.16.23.212

Welcome to IBM NCM2 Embedded Environment

NCM2-io login: root
Password:
iob# telnet 10.0.0.2

Entering character mode
Escape character is '^]'.

Welcome to IBM NCM2 Embedded Environment

NCM2-gas login: root
Password:
gas# cd /data/etc
gas# ls
pointercal
gas# rm pointercal
gas# ls
gas# reboot
```



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## ***SUBMITTAL COVER SHEET***

Keystone Electric Division of Zenith Systems approves and submits these shop drawings and samples and thereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data and that he has checked and coordinated each shop drawing and sample with the requirements of the work and of the contract documents and with work of other contractors.

Date: January 18, 2018

Project: VAMC Community Living Center Minor

Contract Number: \_\_\_\_\_

Keystone Electric  
Division of Zenith Systems

Project Number: 16.57033

Signature: *Jacob Post*

Specification Section: 27-52-23

Product: Nurse Call Room Control Board

Submittal Number: Forty Five (45)

Supplier: Hillrom

Manufacturer: Navicare

Remarks: Please Review & Return

**KEYSTONE ELECTRIC  
DIVISION OF ZENITH SYSTEMS  
P.O. BOX 10245  
ERIE, PENNSYLVANIA 16514**

**APPROVED**

**BY : Jacob Post  
DATE: 1/18/2018**



## **RCB Installation Cut Sheet**

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# Room Control Board (RCB) Installation

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## RCB Installation Hazard Statements

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The following notes and hazard statements pertain to the installation of a Room Control Board (RCB).



**Caution:**

Use care when installing an RCB; the edges of an RCB enclosure can cut you.



**Caution:**

When installing the RCB with an adjacent Dome Light, the RCB must be positioned on the left side of the Dome Light so that it does not block the vents. Failure to do so can cause equipment to overheat.



**Caution:**

Always power down an RCB prior to plugging devices into the RCB. Never plug a device into the RCB while it is powered up. In addition, disconnect both ends of the cable before performing any cable work including re-crimping cables or cutting cables. Hot-plugging devices to an RCB can cause unexpected behavior or even cause damage to the RCB.



**Caution:**

When mounting the RCB in a room box enclosure, make sure to remove the decorative cover. Failure to do so can cause equipment to overheat.



**Caution:**

Never wall-mount an RCB to a ceiling or other horizontal surface, without prior Hill-Rom approval and design. The RCB and cover are designed to allow heat to escape when mounted to a vertical surface. When mounted, the Hill-Rom logo should be in the upper-right.



**Caution:**

Never install an RCB above a ceiling without a room box enclosure if the ceiling space is used for environmental (heating and A/C) air movement.



**Caution:**

Each back box must be properly grounded in accordance with the appropriate sections of NFPA 70 (e.g., Sections 250-96 and 517-13A).



**Note:**

An RCB that is installed in a patient care area must be installed outside the Patient Vicinity as defined in the Health Care Facilities Handbook, NFPA 99, section 3.3.140. To comply with this regulation, the RCB must be installed at least 6' horizontally away from the patient bed, treadmill, etc. or at least 7' 6" above the floor in a patient care area.



**Note:**

If two room stations are connected to the SRS ports on the same RCB, then only one of the audio stations will have an open audio channel at a time. To enable maximum functionality, Hill-Rom strongly recommends that you connect each room station to a separate RCB. This limitation does not apply to the GRS10 port.



**Note:**

California's OSHPD system requires Special Seismic Certification Pre-Approval for Nurse Call System control equipment which includes PoE switches, Message Processing Controllers, VoIP Controller Machines, Uninterruptible Power Supplies, Room Control Boards, and Racks. Refer to OSHPD Special Seismic Certification Pre-Approval OSP-0179-10 for details. Particular attention needs to be paid to the location of components and the total installed weight in the racks as specified on page 3 of OSP-0179-10.

- [http://www.oshpd.ca.gov/FDD/Pre-Approval/special\\_seismic\\_cert\\_pre-approval.html](http://www.oshpd.ca.gov/FDD/Pre-Approval/special_seismic_cert_pre-approval.html)
- <http://www.oshpd.ca.gov/FDD/Pre-Approval/OSP-0179-10.pdf>

## About RCBs

A Room Control Board (RCB) is the connection point between room devices and PoE switches. Each RCB is associated with a location in a nursing unit. An RCB can also be used to run a Nursing Unit Controller (NUC) when there are too many RCBs in the nursing unit for the NUC to run on the Primary Console.

RCBs used as room controllers can be installed in the inside of ceilings or walls without a cover, or they can be installed outside of walls with a cover. RCBs installed outside of walls can be mounted to ceilings or walls and can have a dome light attached. See photos below for example configurations.



**Figure 1: RCB without Cover, without Circuit Board Enclosure**



**Figure 2: RCB without Cover, with Circuit Board Enclosure**



**Figure 3: RCB with Cover**



**Figure 4: RCB with Cover and Adjacent Dome Light**

## About RCB Installation

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The RCB can be installed in the following configurations:

- Wall-mounted with a circuit board enclosure and cover (vertical)
- Wall-mounted with a circuit board enclosure and cover adjacent to a Dome Light
- Mounted above the ceiling without a cover or circuit board enclosure in a room box

Due to ventilation requirements, an RCB cannot be mounted horizontally above a ceiling with a cover.



**Note:**

The RCB cover and room box are sold separately.



## RCB Specifications

### Back Box Requirements

A Room Control Board (RCB) must be mounted on a 2-gang, 3-gang, or 4-gang back box that is 3.5" (8.9 cm) deep, unless it is being installed in an existing room box, where the RCB is mounted to the room box.

For a new installation, it is recommended to use a 2-gang box for a standalone RCB and a 3-gang box for an RCB installed with an adjacent Dome Light.

For installations that require conduit, back boxes are not required. Conduit installations require that each RCB is mounted without a cover and in a room box enclosure.



#### Caution:

Each back box must be properly grounded in accordance with the appropriate sections of NFPA 70 (e.g., Sections 250-96 and 517-13A).

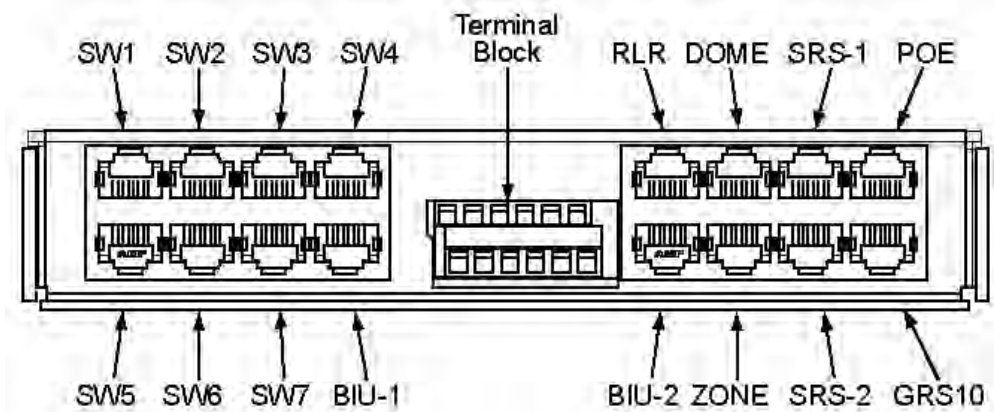
### Dimensions

Width	9.3" (23.6 cm)
Height	8" (20.3 cm)
Depth	1.6" (4.1 cm)

### Electrical

Input voltage (nominal)	48VDC (connected to PoE switch) 36VDC (connected to another RCB)
Terminal Block	24VDC
Power (nominal)	4W

## RCB Port Usage

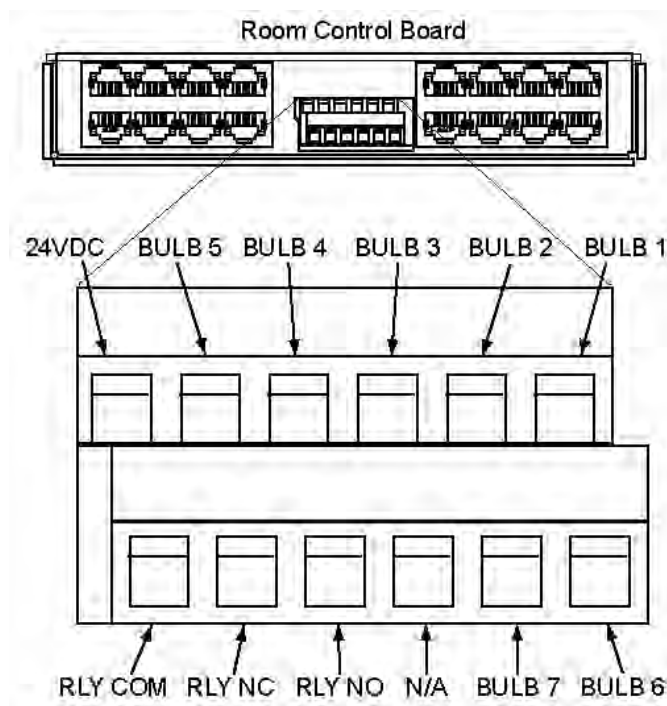


RCB Port	Usage
SW1, SW2, SW3, SW4, SW5, SW6, SW7	Remote switches, Equipment Receptacles, and Supervised Interface Modules

RCB Port	Usage
RLR	Remote Locator Receiver (RLR)  A maximum of 3 daisy-chained RLRs can be connected to this port. One RCB can support a maximum of 4 RLRs.
DOME	Dome Light
ZONE	Zone Light or Dome Light
SRS-1, SRS-2	Room stations (SRS or GRS-5)  See Note below.
POE	Power over Ethernet (PoE) switch
GRS10	Daisy-chained RCB, Staff Consoles (GRS-10)
BIU-1, BIU-2	RLRs and Remote Audio Devices  A maximum of 3 daisy-chained RLRs can be connected to each of these ports. One RCB can support a maximum of 4 RLRs.  One RCB can support a maximum of 2 RADs (one on each port).  RLRs and RADs cannot be connected to the same RCB.
Terminal block	Single-Bulb Dome Light, STAT Clock/Timer

**Note:**

If two room stations are connected to the SRS ports on the same RCB, then only one of the audio stations will have an open audio channel at a time. To enable maximum functionality, Hill-Rom strongly recommends that you connect each room station to a separate RCB. This limitation does not apply to the GRS10 port.



Terminal Block Port	Usage
24VDC	AC power
RLY COM	Common relay
RLY NC	Normally closed relay
RLY NO	Normally open relay
BULB 1, BULB 2, BULB 3, BULB 4, BULB 5, BULB 6, BULB 7	Data for call annunciation device

## RCB Placement

For examples of RCB placement in different room configuration scenarios, refer to [Room Configurations](#).

- RCBs can be placed inside or outside the walls.
- If the RCB is placed outside a wall, then it must have a cover (ordered separately).
- If the RCB is placed inside a wall (above the ceiling), then the RCB must be without a cover. An RCB installed above the ceiling must be inside of a room box (ordered separately) if the ceiling space is used for environmental (heating and A/C) air movement.
- Retrofit and conduit installations typically require that the RCB is installed in a room box. For new installations, the RCB should always be outside of the wall for easier maintenance.
- Two RCBs can be daisy-chained together, but there are power limitations when doing so. The second daisy-chained RCB (the RCB not connected to the home run cable) can only have switches connected to it.
- If the RCB is placed outside the wall, then you can attach a Dome Light adjacent to the RCB (see figure below).
- If two room stations are connected to one RCB, then only one of those room stations will be able to establish a voice connection at a time. An RCB can only handle one voice connection.
- If two locations are connected to one RCB, then both locations will swing if a Staff Console operator chooses to swing one of the rooms. Any location that should never be swung together with a different location should be connected to its own RCB.



### Note:

If two room stations are connected to the SRS ports on the same RCB, then only one of the audio stations will have an open audio channel at a time. To enable maximum functionality, Hill-Rom strongly recommends that you connect each room station to a separate RCB. This limitation does not apply to the GRS10 port.

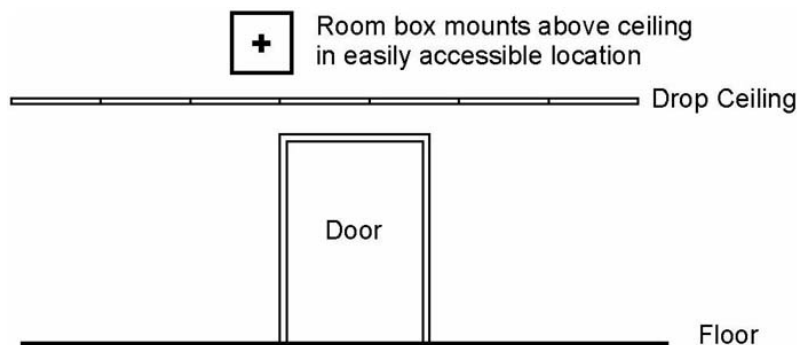


Figure 5: Room Box Mounting Location

## Mounting an RCB to the Wall

Parts required (standalone):

- RCB main assembly

- RCB decorative cover
- #6-32 screws (4)
- M3 flat head mounting screws (2)
- 2-, 3-, or 4-gang back box

Additional parts required for installation with an adjacent Dome Light:

- Dome Light assembly
- Dome Light mounting plate
- #6-32 screws (2)
- M3 flat head mounting screws (2)



**Note:**

You cannot use an 2-gang box when installing an RCB with an adjacent Dome Light.

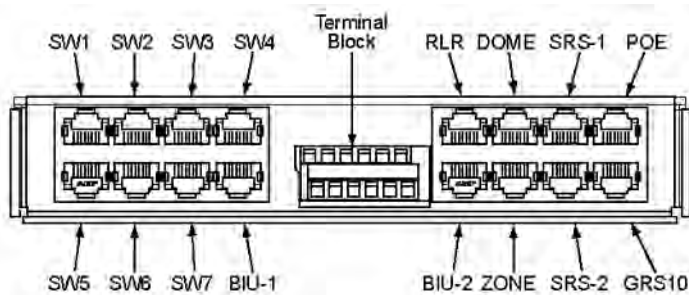
**1. Do one of the following:**

- Attach the RCB main assembly to the 2-gang box using 4, #6-32 mounting screws.
- Attach the RCB main assembly and the Dome Light mounting plate to the 3-gang box using 6, #6-32 mounting screws.

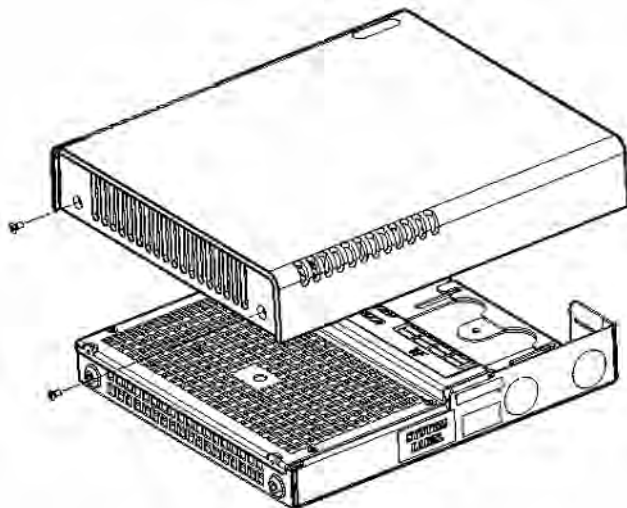


**Note:** If you are mounting an RCB adjacent to a Dome Light, then do not tighten the screws on the Dome Light mounting plate yet. Doing so will prevent you from attaching the Dome Light assembly to the mounting plate after the RCB cover has been attached. Make sure that the Dome Light mounting plate can slide from side-to-side.

**2. Route and plug all cables from the gang box as needed.**



**3. Hook the tabs in the RCB decorative cover into the RCB main assembly and secure the cover to the assembly using 2, M3 flat head mounting screws.**



**Figure 6: RCB Mounting Screws**

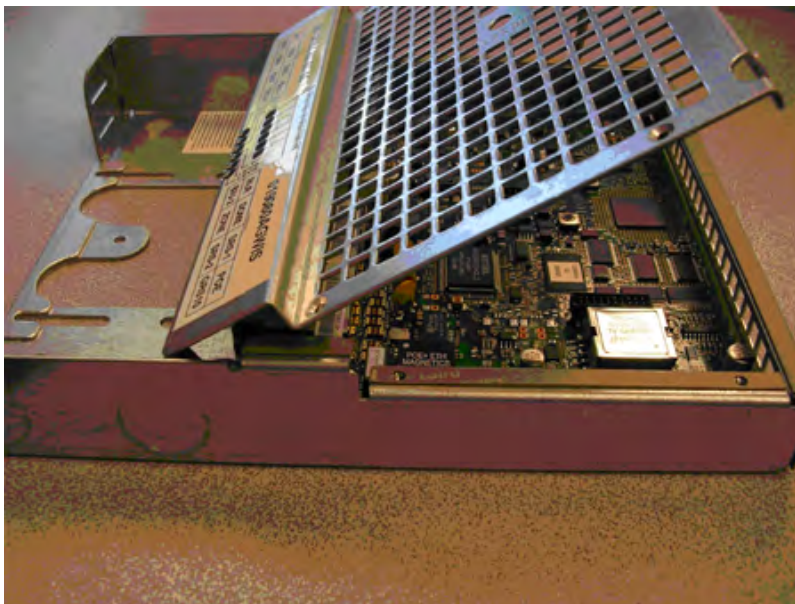
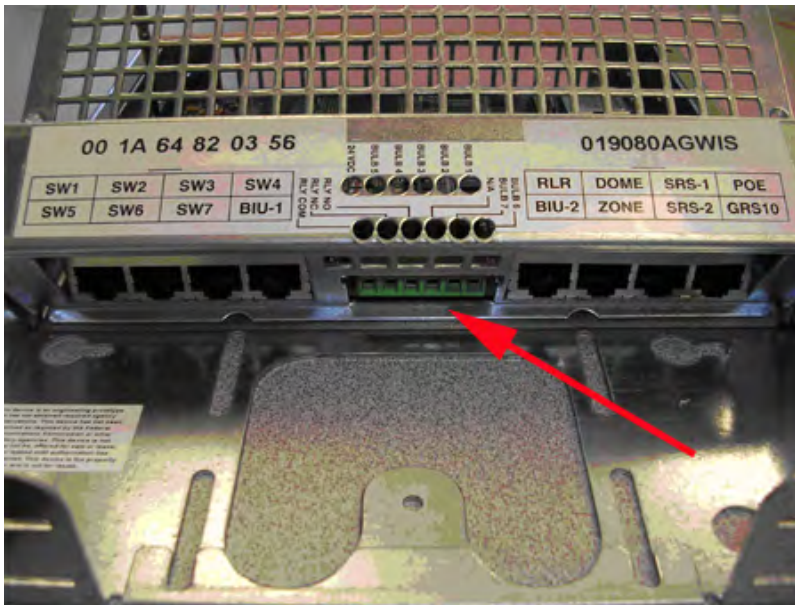
**4. If you are installing an adjacent Dome Light, do the following:**

- a) Plug the CAT5 cable from the RCB into the RJ45 connector on the back of the Dome Light assembly.
  - b) Hang the Dome Light assembly onto the Dome Light mounting plate using the mounting tab on the top of the plate and the ribs on the Dome Light assembly.
  - c) Use 1, M3 flat head cover screw to attach the right side of the Dome Light assembly to the Dome Light mounting plate.
  - d) Slide the Dome Light until it is flush against the RCB cover.
5. Record the room number and MAC Address for the RCB on the network connections spreadsheet.

## Replacing the Metal Cover on an RCB

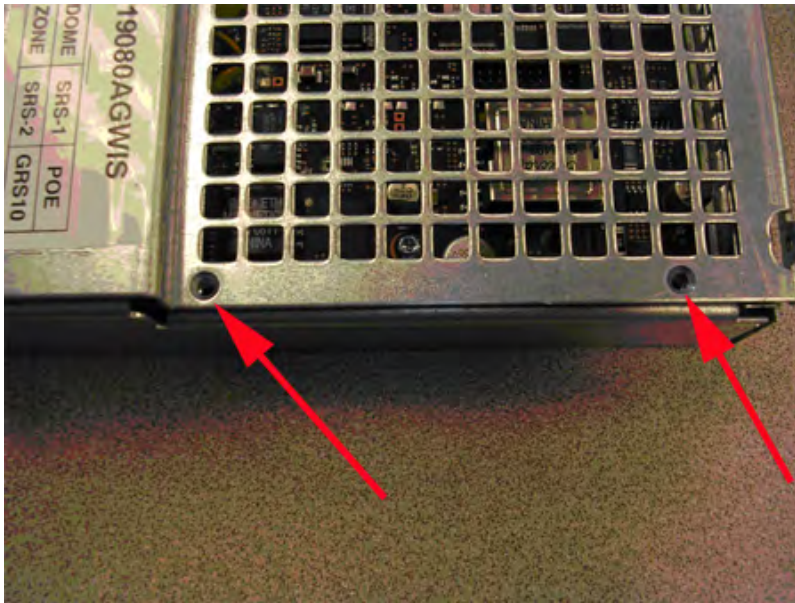
Use the following instructions to replace the metal cover on an RCB. Scenarios when the cover needs to be removed include removing the RCB from a room box enclosure and gaining access to the serial diagnostic connector.

1. Position the metal cover at an angle, ensuring that the bottom lip is engaged under the connector block.



2. Close the cover until the screw holes are aligned.





3. Replace the screws.

## Mounting a RCB in a Room Box

This section provides the steps for installing a Room Control Board (RCB) inside of a wall in a room box enclosure, including room box installation steps. These steps can be used for an RCB without a cover as well as for an RCB without a cover or a circuit board enclosure.



### Caution:

Each back box must be properly grounded in accordance with the appropriate sections of NFPA 70 (e.g., Sections 250-96 and 517-13A).



### Note:

Conduit installations require that each RCB is mounted in a room box enclosure.



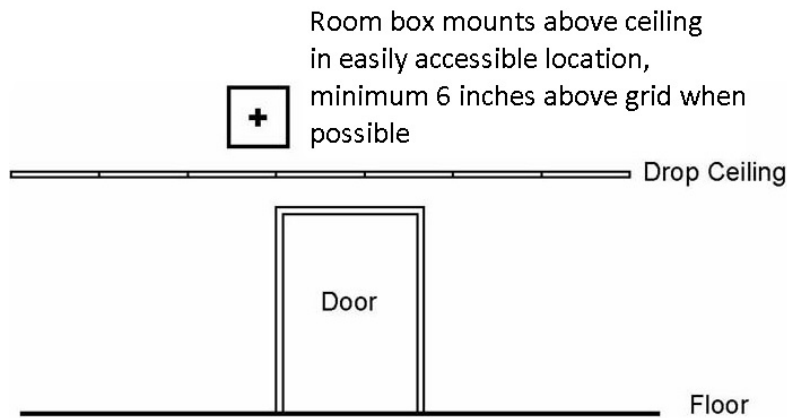
### Note:

An RCB without a circuit board enclosure is secured to a metal plate at the factory with standoffs and screws. The design of the metal plate allows the entire assembly to be installed inside the room box used in the field.

## Planning the Room Box Location

The shop drawings provided by Hill-Rom indicate the approximate location where each device is to be installed. Consult a Hill-Rom representative for exact mounting locations.

Prior to installation, be sure to inspect the area and the ceiling for the presence of other equipment, duct work, plumbing, light fixtures, or other objects that may interfere with the installation procedure. Ensure the room box is placed in a safe, secure, and accessible area. Whenever possible, install the room box above the ceiling of the hallway outside the patient room. If you install it in the room, service providers might not be able to perform maintenance when the room is occupied.



**Figure 7: Room Box Mounting Location**

## Mounting the Room Box



### Caution:

Never install an RCB above a ceiling without a room box enclosure if the ceiling space is used for environmental (heating and A/C) air movement.

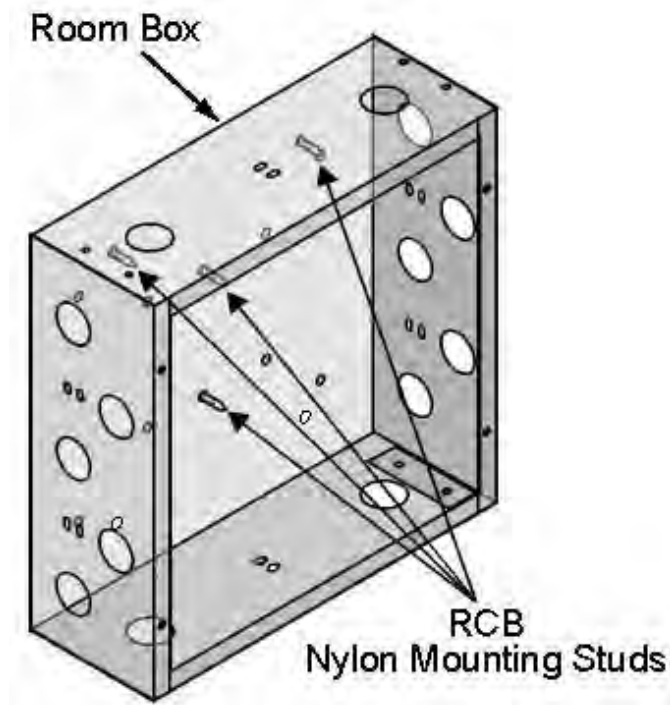
1. Remove knockouts from the room box as needed.

Up to four cables can be routed through each knockout. Count the number of devices that must attach to this room box and remove additional knockouts as needed.

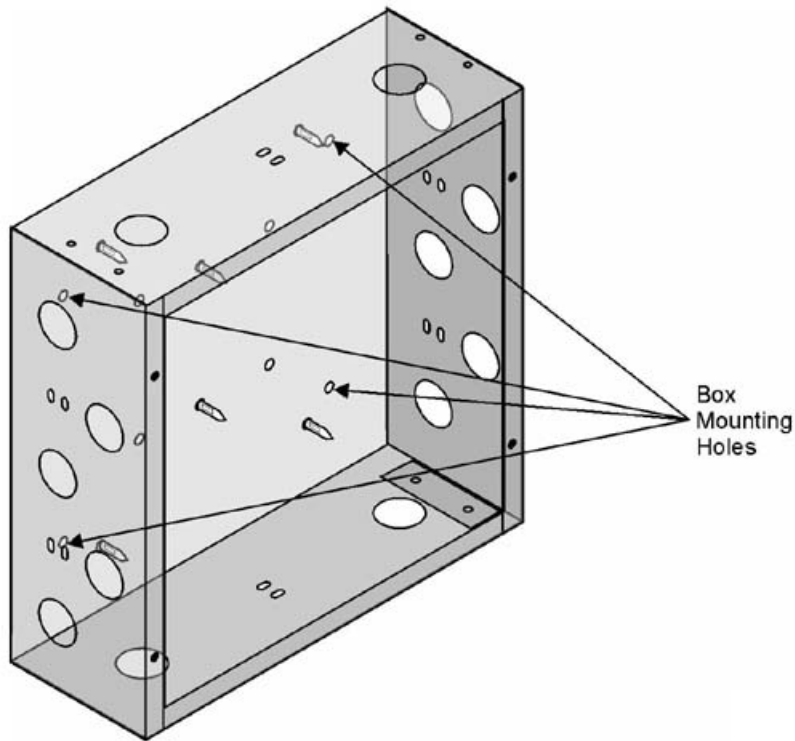
2. Install the plastic bushings in each open knockout hole that will be used for cables.

Each room box includes four snap bushings and two hole plugs. If you need additional snap bushings, you may have to borrow some from another room box. Save any unused hole plugs in case you need them elsewhere.

3. Make sure that the four nylon mounting studs have been inserted through the back of the room box before mounting the box.



4. Install the room box on the wall above the finished ceiling in the corridor outside the room that it serves, as indicated by the shop drawings.
  - a) Use four screws, one in each of the mounting holes.
  - b) To attach the room box to a concrete surface, use 1.5" sheet metal screws with plastic anchors.
  - c) To attach the room box to a drywall surface, use 1.5" sheet metal screws with Zipit anchors.

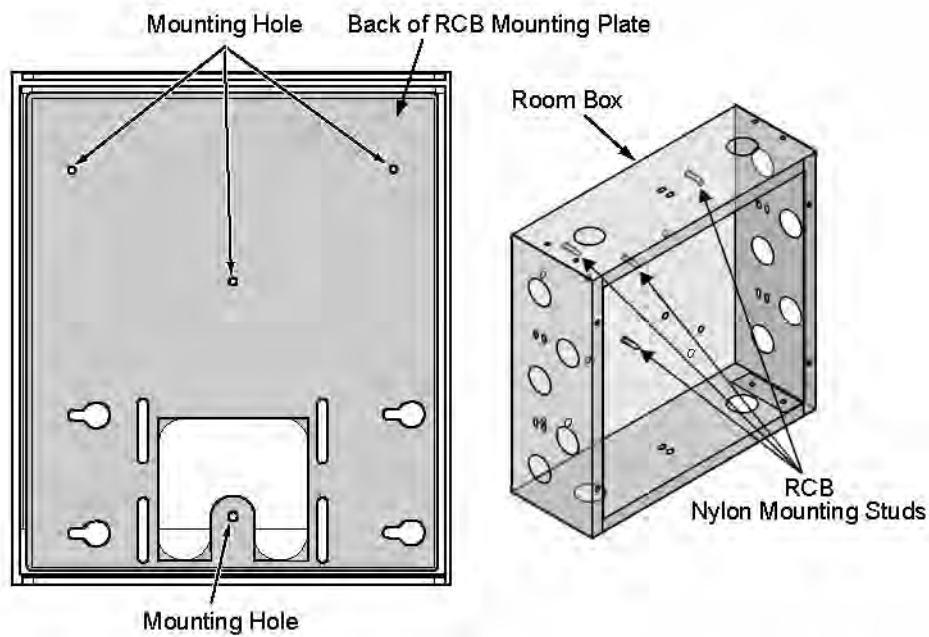


5. Repeat this procedure for each room box that you install.
6. Number the bottom of each room box and add the number to the shop drawings.  
The drawings will then reflect the number and location of each room box.

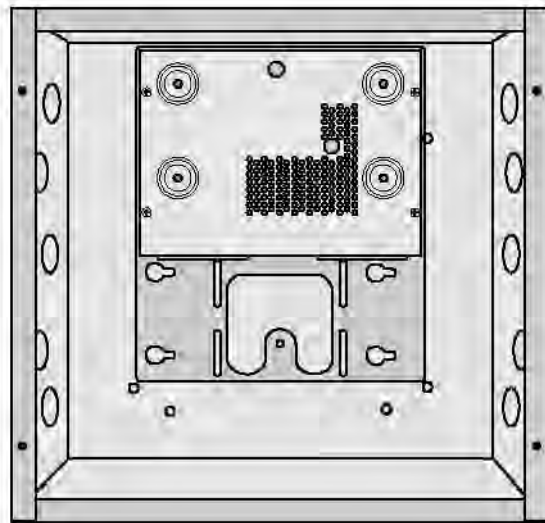
### Installing the RCB in a Room Box

1. Locate the four mounting holes on the RCB and insert the nylon mounting studs.



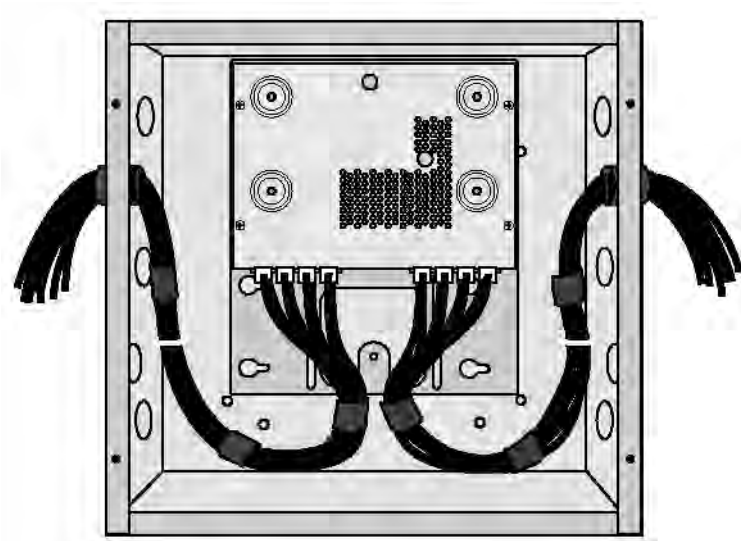


2. Align the RCB over the nylon mounting studs and press gently on the outer corners at the top of the RCB until the top three studs lock through the RCB.
3. Press gently on the bottom of the RCB until the bottom stud locks through the RCB.



## Routing the Room Box Cables

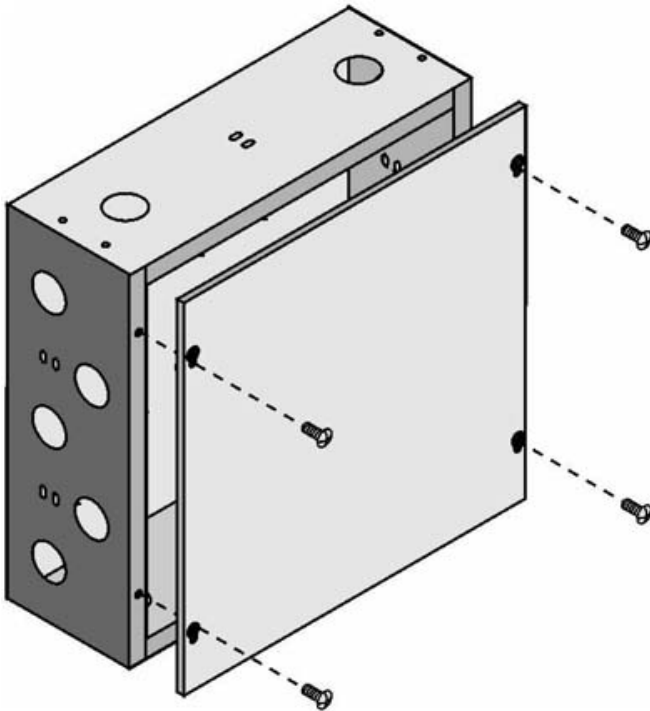
1. Install plastic grommets in the holes to be used.
2. Pull the switch and device cables in through the bottom holes in the right side of the box.
3. Route each cable to the remote switch receptacles past the tie wrap slots on the right side of the box, leaving about one foot of slack as a service loop.



4. Cut and terminate the cables to length and tie wrap them to the inside of the box.
5. Feed the dome light and room station cables through the top hole in the right side of the box.
6. Route each cable to the dome light and room station receptacles, past the tie wrap slots on the top and left side of the box, leaving about one foot of slack as a service loop.
7. Cut and terminate the cables to length and tie wrap them to the top and side of the box.
8. Route the cables out of the box.
9. Block unused holes with the supplied covers.

### Completing the Room Box Installation

1. Record the room number and MAC Address for each RCB on the network connections spreadsheet.
2. Attach the room box cover to the room box using the provided screws.



3. Mark the room number on the bottom of the box with a permanent marker. Do not write the room number on the box cover.



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## SUBMITTAL COVER SHEET

Keystone Electric Division of Zenith Systems approves and submits these shop drawings and samples and thereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data and that he has checked and coordinated each shop drawing and sample with the requirements of the work and of the contract documents and with work of other contractors.

Date: January 18, 2018

Project: VAMC Community Living Center Minor

Contract Number:

Keystone Electric  
Division of Zenith Systems

Project Number: 16.57033

Signature: *Jacob Post*

Specification Section: 27-52-23-2.4-H

Product: Nurse Call Remote Switch

Submittal Number: Forty Six (46)

Supplier: Hillrom

Manufacturer: Navicare

Remarks: Please Review & Return

**KEYSTONE ELECTRIC  
DIVISION OF ZENITH SYSTEMS  
P.O. BOX 10245  
ERIE, PENNSYLVANIA 16514**

**APPROVED**

**BY : Jacob Post  
DATE: 1/18/2018**



## **Remote Switch Installation Cut Sheet**

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    - Fitting the Call Switch in the Headwall.....11
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# Remote Switch Installation

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## Remote Switch Hazard Statements

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The following notes and hazard statements pertain to the installation of remote switches.



**Caution:**

The "Push to Call" Switch is intended to be used for generic (programmable) non-emergency call types only. A "Push to Call" Switch must not be used for emergency calls. For push-button switches, Hill-Rom only authorizes Code and Staff Emergency switches to be used for emergency calls.



**Caution:**

- Push-button switches should never be installed in a shower.
- The recommended configurations for bath switches and code switches should not be used in a shower.



**Caution:** The bath switch without cancel is the only switch device authorized for use in the shower. The bath switch must not be installed in the direct flow of water. Any reference to a shower switch refers to a bath switch without cancel installed in a shower.



**Caution:**

Each back box must be properly grounded in accordance with the appropriate sections of NFPA 70 (e.g., Sections 250-96 and 517-13A).



**Caution:**

Do not use a box eliminator to install a remote switch.

## About Remote Switches

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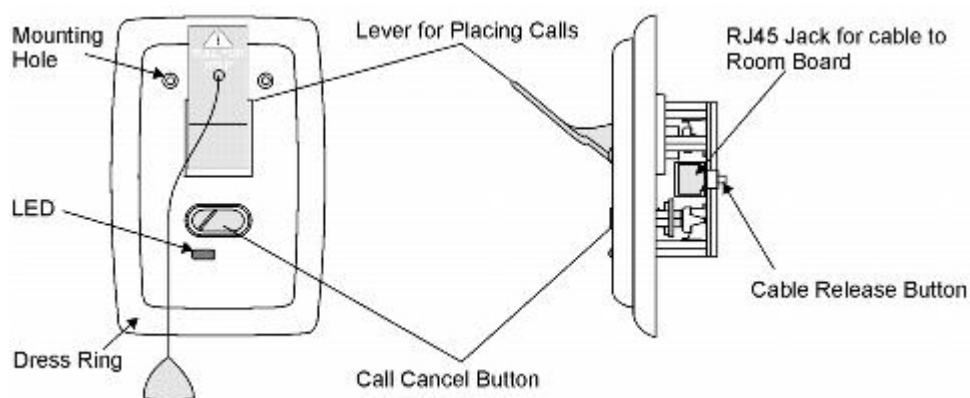
A remote switch is a lever-based or push-button device that is used to make a nurse call. Some remote switches can initiate an emergency call, such as a call initiated by a Code switch or Staff Emergency switch. Other remote switches indicate that a patient requires assistance. Depending on the use and the location of the switch, a remote switch might use a push-button or a lever with an attached cord.



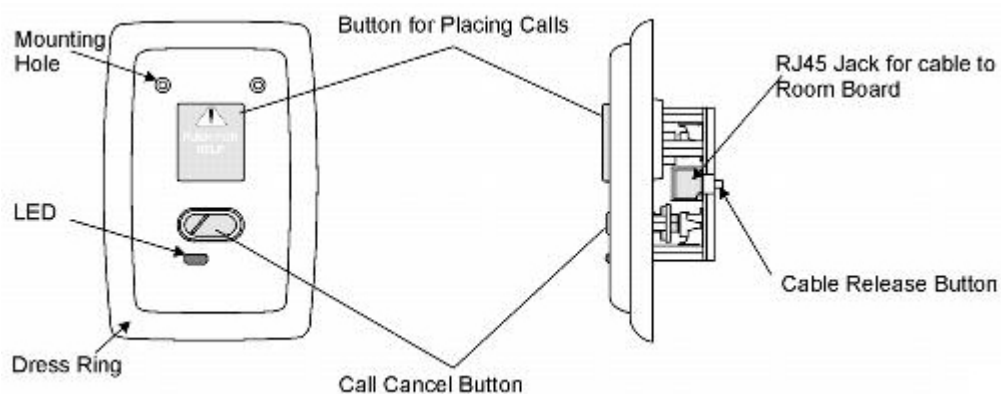
**Figure 1: Remote Switch Example: Pull Switch with Cord**



**Figure 2: Remote Switch Example: Push-Button Switch**



**Figure 3: Pull-lever Switches**



**Figure 4: Push-button Switches**

## Remote Switch Specifications

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### Back Box Requirements

Remote switches require the following:

- Dress ring: 5-3/8" x 3-5/8" x 3/8"

- Back box: 1-gang box a minimum of 2.5" deep or 12.5 cubic inches, or 4" square box with a 1-gang mud ring
- Uses a 1-gang box when mounted in a headwall system

Remote switches are mounted at various height depending upon the type of switch.



**Caution:**

Each back box must be properly grounded in accordance with the appropriate sections of NFPA 70 (e.g., Sections 250-96 and 517-13A).

**Dimensions (with dress ring)**

Width	3 11/16"
Height	5 7/16"
Depth into back box	1 1/16"

**Electrical**

Cable requirements	8-conductor, CAT5/CAT5e, unshielded twisted pair, RJ45 connector termination
Operating voltage	5VDC

## Remote Switch Placement

**General Switch Placement**

- Obtain information from the hospital as to which type of device they might need for each area of the facility. For example, psych wards may require push button or key switch devices with tamper-proof screws.
- A pull cord should be no more than 4" from the floor.
- Check the local building code requirements for the exact location of the switches and the length of the pull cord.
- When a switch is activated, it can be configured to announce the event by lighting a Single-Bulb Dome Light that is attached to the RCB.
- Some switches connected to the RCB can actually be in a different location than the room that the RCB serves. When the switch is activated, the call sent to the staff station displays the name of this location instead of the room number assigned to the RCB.
- Remote switches can be connected to any of the following types of RCB connections:
  - **Standard** - Unsupervised, these switches can fail or be disconnected without giving notice and will continuously generate a call of that call type that cannot be canceled.
  - **Supervised** - These switches always pass electrical current through the line. If the cable to the switch is damaged, becomes disconnected, or certain failure mode in the switch itself occurs, the RCB detects the loss of electrical current. If the switch fails, a system alert will be placed.
  - **Call Cord** - Supervised, but the system also generates a disconnect call if disconnected. The supervision applies ONLY to the cabling to the wall plate, and not through the call cord and button. The call cord is unsupervised.
  - **Pt Equip via RCB** - Supervised, but the system also generates a Patient Equipment Unplugged if disconnected. The supervision applies ONLY to the wall plate, and not through the cable that goes from the wall plate to the patient equipment device. The patient equipment is unsupervised.



**Note:**



Any switch installed in a location that does not have a room station **must** have a Cancel button. This means that bath switches using a pull-lever must have a Cancel button, and switches with call cords must be attached to the system using a connection point that has a Cancel button.

### Remote Code and Staff Emergency Switch Placement

- These switches are usually mounted on a wall in a location where the audio capabilities of a room station are not required, but the ability to declare a code blue/pink or staff emergency situation is required.

### Shower Switch Placement

- Shower switches are usually mounted on a wall inside a shower.
- Shower switches contain a gasket to help prevent water seepage and make them water resistant only. They should not be mounted in direct water spray.
- Depending on the layout of the bathroom, a shower switch can be positioned so that it can also function as a toilet switch.

### Toilet Switch Placement

- Toilet switches should be on a wall within arm's reach of a toilet.

## Mounting a Remote Switch

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Parts needed:

- Switch assembly
- Dress ring
- One of the following back boxes:
  - 1-gang box a minimum of 2.5" deep or 12.5 cubic inches
  - 4" square box with a 1-gang mud ring
  - Can also be mounted in headwall system (1-gang box)
- CAT5/5e/6 cable (1)
- #6x32 screws (4)

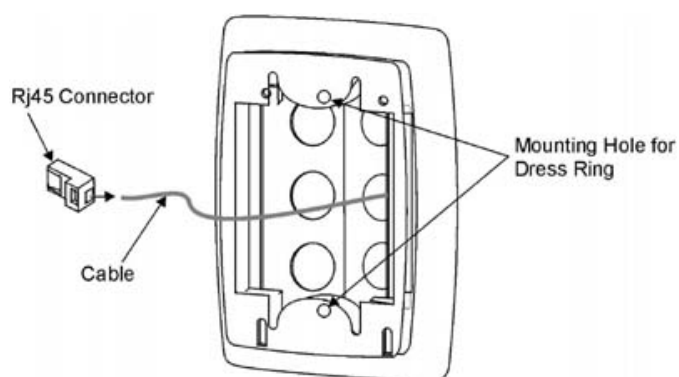
Mounting instructions are the same for both a push-button remote switch and a lever-type remote switch. The difference between the two is in the cable connections to the SW connectors on the Room Control Board (RCB).



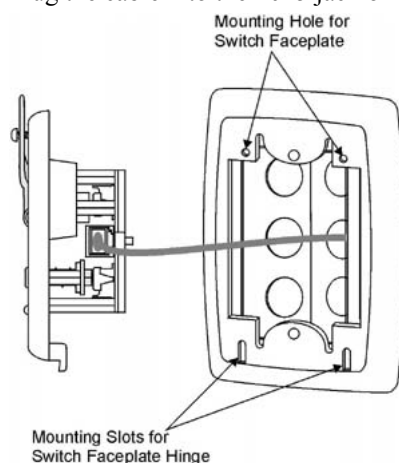
#### Note:

Check the local building code requirements for the exact location of the switches and the length of the pull cord.

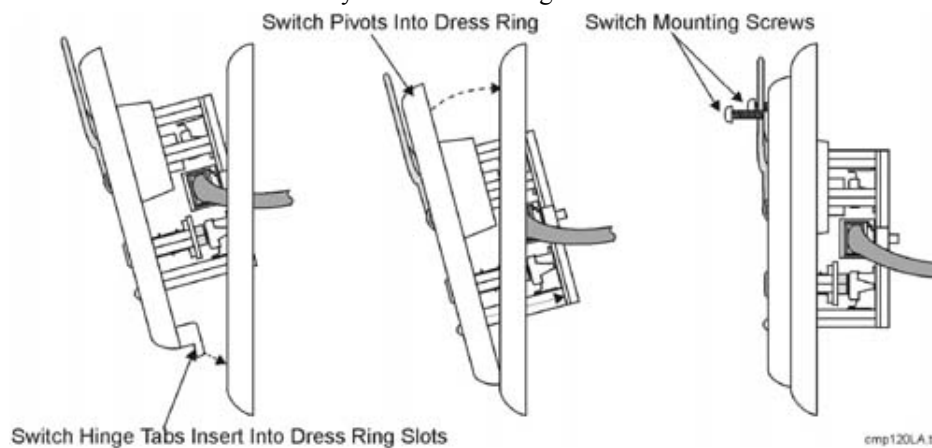
1. Install a back box and pull the cables.
2. Install the dress ring onto the back box with the two screws provided.
3. Terminate and label the cables.



4. Plug the cable into the RJ45 jack on the remote switch.



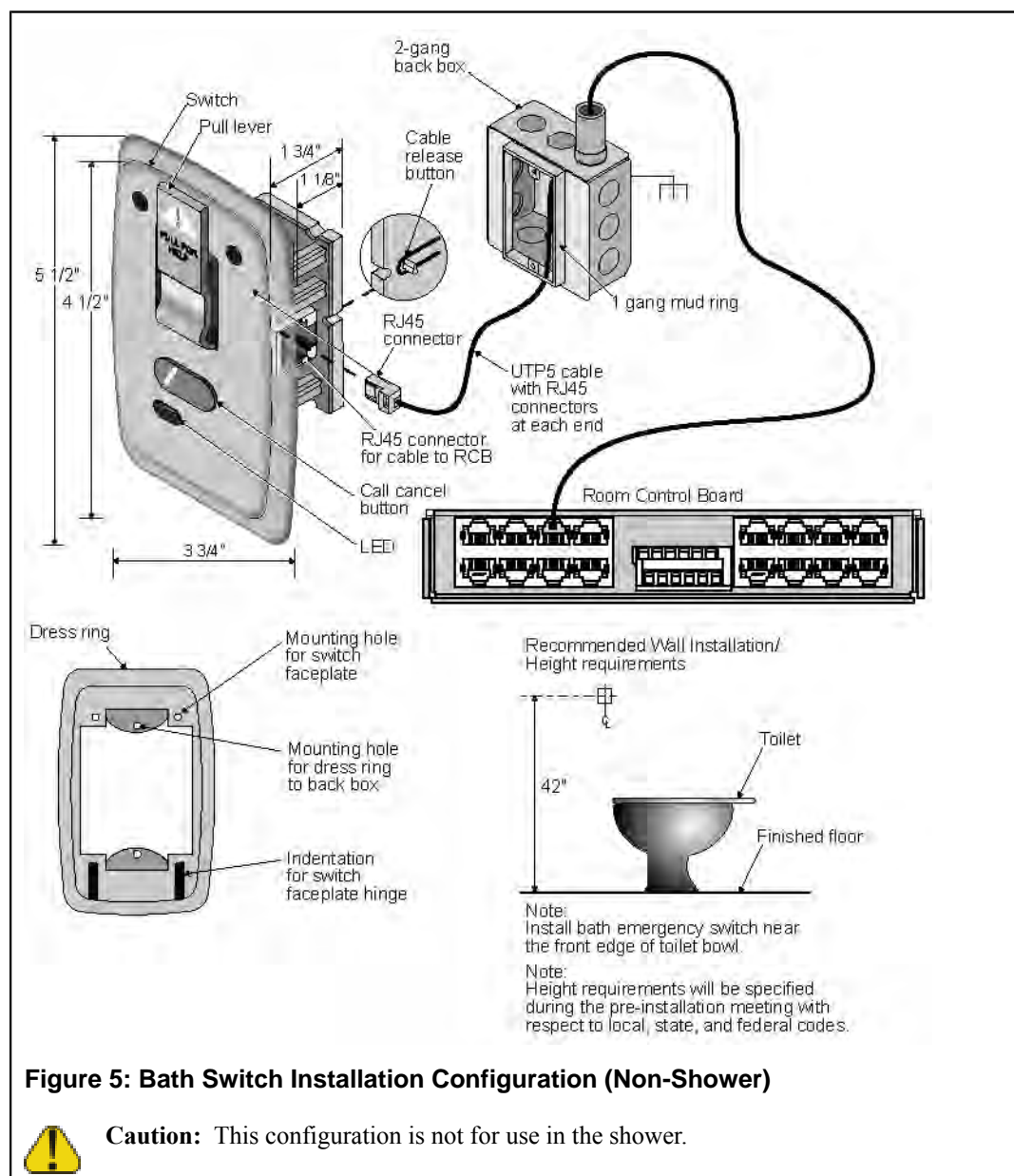
5. Install the code switch assembly into the dress ring.

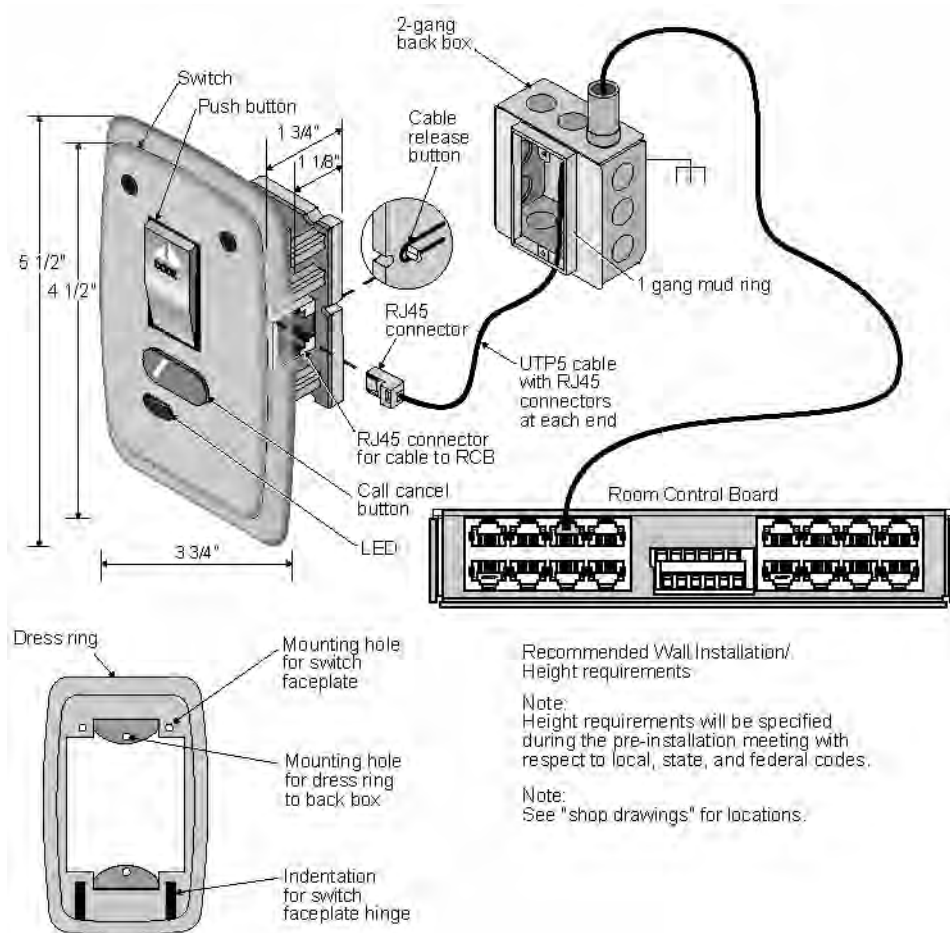


6. Connect the switch cable (terminated with an RJ45 connector) to one of the connectors on the RCB.



**Note:** Before a remote switch can work properly, a trained Hill-Rom Service Representative or the hospital system administrator must configure the software to recognize the device.

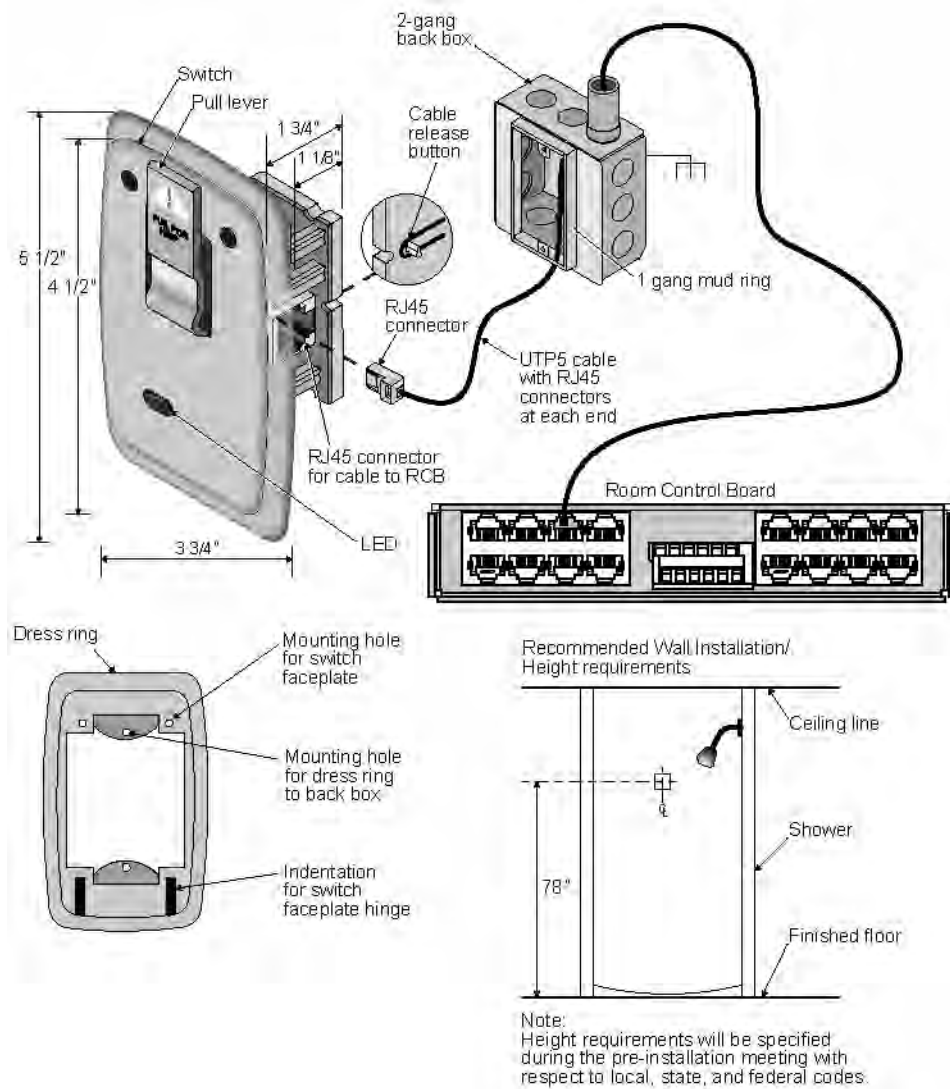




**Figure 6: Push Button Installation Configuration**



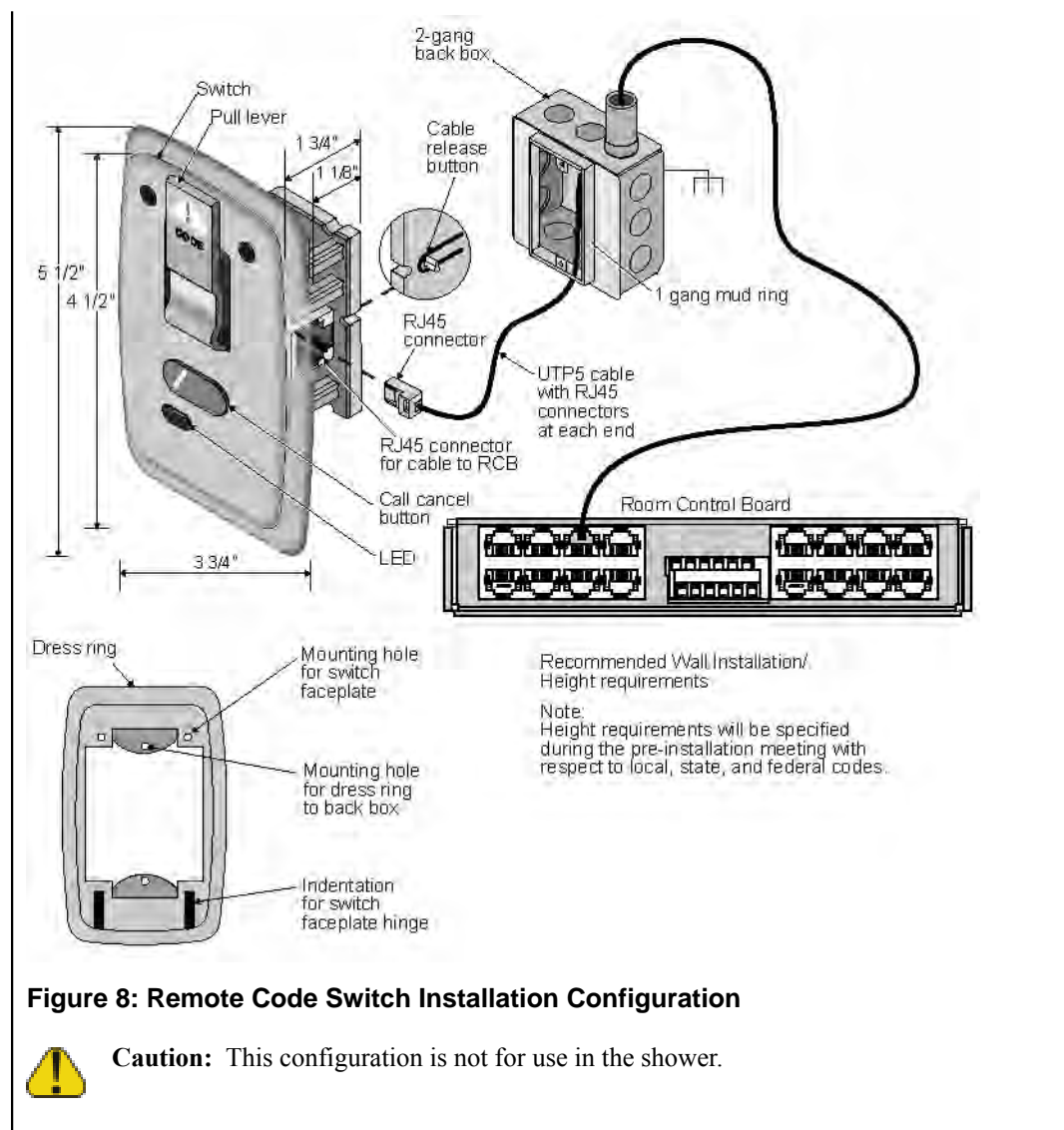
**Caution:** This configuration is not for use in the shower.



**Figure 7: Shower Switch Installation Configuration**



**Caution:** The bath switch without cancel is the only switch device authorized for use in the shower. The bath switch must not be installed in the direct flow of water. Any reference to a shower switch refers to a bath switch without cancel installed in a shower.



## Modified Remote Switch Installations

This section provides instructions on how to install a remote switch in the headwall.

### Modifying a Headwall

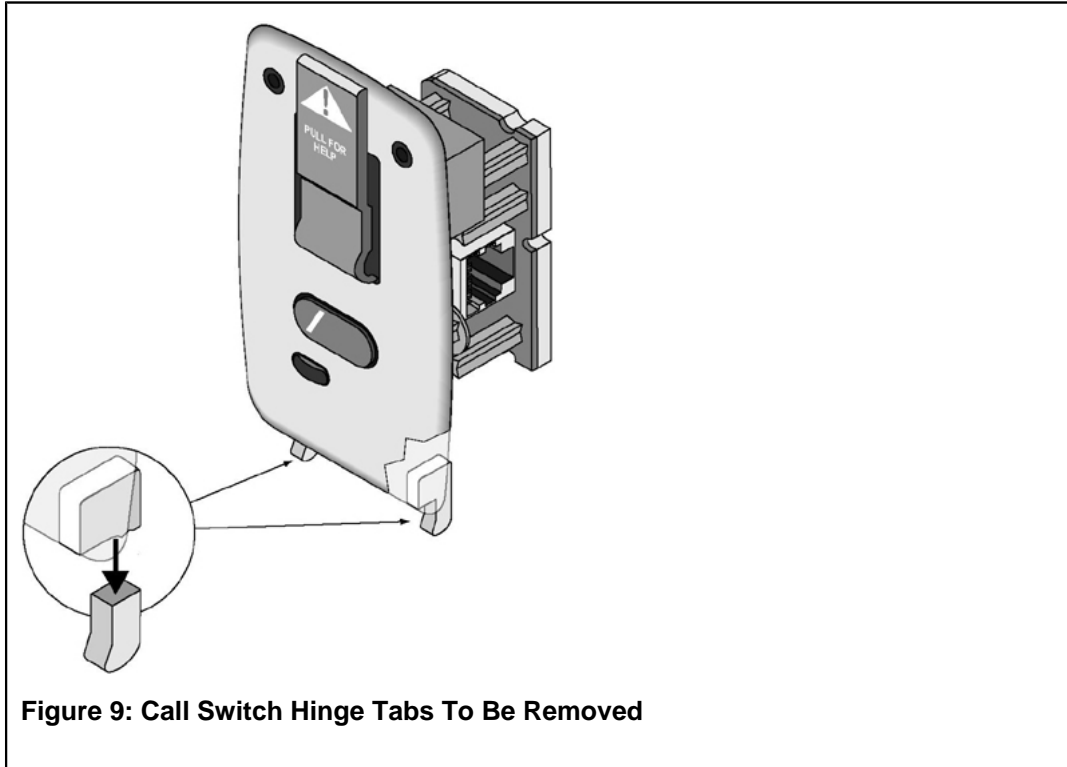
This topic provides instructions for installing a remote switch without a back box on a 3" vertical centerline into an Integris Headwall.

1. Locate the device's upper mount hole location.  
The hole centers are  $3 \frac{9}{32}$ " apart vertically.
2. From this hole, measure  $25/32$ " horizontally on both sides of the hole and mark the centerline.
3. Drill a  $7/64$ " diameter hole through the 16-gage device mount plate only.

### Fitting the Call Switch in the Headwall

1. Using a band saw, flush cutters, or other sharp cutting instrument, remove the two switch-hinge tabs from the call switch.  
Use caution not to damage the faceplate.

2. Install the call switch into the headwall using two #6 - 20 x 1/2" oval head screws.



## Installing a Pull Cord Assembly onto a Pull Switch



### Note:

Monofilament pull cords have replaced the pull cords made of braided polyester. When replacing a pull cord on a pull switch, use the monofilament pull cord assemblies for pull switches.

1. Cut the old pull cord, remove both ends from the pull switch, and discard.
2. Remove the new pull cord assembly from shipping package.  
One end should be terminated with an end cap, the other end being free flowing.
3. Cut the free-flowing end to give cord assembly the desired length.
4. Thread the free-flowing end through the hole in the pull switch lever.
5. Tie a half-hitch or other appropriate knot in the free-flowing end to prevent the cord from slipping out of the hole in the pull switch lever.
6. Apply a small but sufficient amount of glue to the knot to prevent the knot from loosening or untying.
7. Allow the glue to dry sufficiently to hold the knot in place.
8. After the glue has dried sufficiently, test by pulling the lever several times to ensure that the knot will hold.