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for today... and tomorrow*

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Tek-CARE[®]400 Nurse Call System

UL[®] 1069 Listed and cUL[®] Listed

Installation Manual

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The Tek-CARE[®]400 Nurse Call System is designed for hospitals, nursing homes and congregate living centers. It utilizes microprocessor and VoIP technology to provide communications between facility staff and patients, as well as an array of information system features and tools. Specific system components are supervised for reliable operation.

Tek-CARE[®]400 Installation Manual

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System Introduction

The Tek-CARE®400 Nurse Call System is a supervised microprocessor-based nurse call system that provides a complete range of two-way audio and visual signaling, combined with programmable system configuration and information tools. These functions permit easy communication between facility staff and patients, as well as between staff members.

The master station(s) comprise the nursing control station where patient calls are registered and displayed in order of priority and time of origin. The master station provides features to monitor staff, as well as all patient call activity, with an easy-to-use interface for programming the master, system and remote station configurations. These features will be reviewed in greater detail in the *System Configuration and Programming* section.

The system is completed by a variety of patient stations and peripheral devices to meet all staff and patient needs. The equipment uses a simplified wiring scheme and plug-in modular components, allowing them to be expanded and interchanged as needed in existing and new facilities.

NOTE: The Tek-CARE®400 Nurse Call System is not tested as a fire alarm system and is not intended as a primary means of evacuation.

A Word about ESD (Electrostatic Discharge)

What Is It? Static electricity is a result of triboelectric charging of two dissimilar nonconductive materials that are rubbed together, such as rubbing your feet on a carpet on a cold winter day or in a dry climate. The resulting charge is detected when you reach out to touch a doorknob or some other metallic object. The resulting discharge may only be startling or, in severe cases, it may even be painful. The actual electrical charge is dependant on the materials being rubbed together, humidity, the rate of separation, and other factors.

What Can It Do? While this effect may be disturbing to humans, the effect on electronic equipment is often more serious, ranging from operational disruption to actual component damage. These effects result from the high voltages that may be developed. The simple act of walking across a carpet may develop as much as 30,000 volts, and changing a bed sheet may create a charge of 100,000 volts or more. Such voltages readily cause arcing (the spark that can be observed when you grab a doorknob after walking across a carpet, etc.). The arcing is evidence of the discharge path. Due to the high voltage involved, the discharge current can jump to any nearby metallic or non-metallic object. If the discharge is to or through an electronic device, such as the nurse call system, the operation of the device may be affected. If the discharge current passes through internal components, these components may be damaged or their operation degraded.

What Can We Do About It? The manufacturer of the nurse call equipment has already taken steps to protect the equipment from electrostatic discharge (ESD) effects. Our peripheral equipment has been tested and listed by UL® to withstand discharges of up to 30K volts. However, since the cause is not in the equipment, but in the environment, further measures are required of the installer and the user to achieve complete protection.

What The Installer Can Do: In humid climates or in places where the relative humidity is kept at 65% or greater, there will likely be few problems with ESD. Where problems may occur the following measures can be taken.

- Ground all exposed metal surfaces. Grounding should be to a #16 gauge or larger conductor.
- Install nurse call system wiring in metal conduit. This conduit may be used to ground panels.
- Use shielded cable (where specified) for nurse call system station-to-station wiring. The use of open conductors invites inductive coupling of discharge currents, which can cause the same problems as direct discharge currents.
- Ground your body before handling system components. This can be done by using a wrist strap, or simply by contacting a grounded metal surface. Use caution to avoid hazardous voltages while grounded.

What The User Can Do: The most common generation of ESD in hospitals is due to changing linen on hospital beds while the patient call cord or pillow speaker is still connected to the nurse call system. The following precautions will help.

Remove the call cord or pillow speaker from the bed before changing the linen. It will be necessary for the nursing staff to discharge themselves by contacting a grounded metal object before placing the call cord or pillow speaker back on the bed; otherwise a spark will jump to the nurse call equipment, causing the very damage they are trying to avoid. To avoid a shock while discharging static electricity on the body, hold a metal object, such as a key, and use that object to contact the grounded surface.

This information is provided to make you aware of ESD problems so that precautions may be taken to avoid damage and disruption of system operation.

System Configuration and Programming

Configuration and Programming using Master Stations

Configuring and programming the Tek-CARE®400 must be carried out by qualified administrative personnel prior to general staff operation. After completion, the installation should require minimal programming changes to comply with periodic facility modifications.

NOTE: Certain menu functions will erase system programming and affect operational characteristics. Before performing any menu functions, resolve all patient calls and other important system activity.

The master stations were not designed to be the primary setup interface for the system. For complete or initial system setup, use the supplied *LS450 Config Tool* programming software running on a laptop or personal computer with an ethernet connection to the PM451 Hub Control Module.

Upgrading Software Components

PLEASE READ THIS ENTIRE SECTION PRIOR TO UPGRADING ANY SOFTWARE COMPONENTS!!!

In order to upgrade the system firmware, it is necessary for the system to have a PM451 Hub Control Module installed.

Equipment needed:

- PM451 Hub Control Module, installed and turned on.
- Straight-through or crossover network cable.
- Personal or laptop computer with 10-BaseT network port, 10Mb-100Mb.
- *LS450 Config Tool* programming software installed on personal or laptop computer.
- Most recent version of *LS450 Config Tool* programming software from TekTone®.

Procedure:

- Install the most recent version of the *LS450 Config Tool* programming software on the personal or laptop computer. It is not necessary to uninstall the previous version.
- Connect the personal or laptop computer to any PM451 Hub Control Module on the nurse call network. Run the *LS450 Config Tool* programming software. Follow the onscreen prompts. Further instructions for the upgrade process are found in the *IL855 LS450 Config Tool Manual*.

System Installation

- Step 1:** Read the following information prior to installing the Tek-CARE®400 system equipment. The installer must be familiar with the system and its installation requirements and guidelines, and must have successfully completed the TekTone® Training Program for system installation. In general, the installation will proceed along the lines spelled out below.
- Step 2:** Determine equipment locations.
- Step 3:** Install system wiring.
- Step 4:** Install housings.
- Step 5:** Use a cable tester capable of testing both 6P6C modular connectors and 8P8C modular connectors to check integrity of cable and connections. **NOTE: This is a critical and necessary step to avoid installation problems later.**
- Step 6:** Set addresses of patient, staff and duty stations, and zone and corridor lights.
- Step 7:** Connect equipment to system wiring.
- Step 8:** Verify connections.
- Step 9:** Perform full operational test of the system, including all peripheral devices.
- Step 10:** Read *IL855 LS450 Config Tool Programming Software Installation & Operating Instructions*, and configure system.
- Step 11:** Train system operators.

TIP: Before the above process begins, consider this brief comment on troubleshooting. The transition between **Step 8** and **Step 9** is a very important one. It is during this phase of the installation process that the system is first powered up with field wiring, patient stations and peripheral devices. This is the time when most installers encounter problems with wiring and equipment. To reduce troubleshooting time and prevent damage to the system components, the installer must take the following precautions:

- Do not connect the entire system together for initial power up. It is suggested that just the central equipment and the first master station be connected for test. Next, connect the remaining master stations one by one, until all are connected and functional. This allows the installer to establish a “known good” test point to work from, as well as immediately identifying problems as they are introduced to the system.
- Do not connect all patient station runs to the central equipment at once. Connect individual runs to the central equipment one by one until all are connected and functional. This allows the installer to more easily locate and recognize problems in the field with wiring or equipment.

These procedures may appear to take longer to perform than it would to connect the entire system together and power it up, but following them reduces troubleshooting time markedly.

Problems to Avoid

- Do not use wire nuts for wire connections.
- Do not exceed the maximum specified cable distances. Pay extra attention during the planning stages when running cable to areas that add hidden length to cable runs.
- Do not run system cabling in close proximity to other electrical system cables or building power cables. These systems can induce noise, resulting in system operational problems and/or audio noise.

Central Equipment Descriptions, Requirements & Locations

Locate Tek-CARE®400 System equipment in accordance with the following information. The installation of all system equipment, cabling and enclosures must be in accordance with the National Electrical Code (ANSI/NFPA 70-1999), the Healthcare Facilities Code (ANSI/NFPA 99-1999), and all applicable state and local codes.

NC450 Central Equipment (CE) (Figures 1–2)—The microprocessor-based NC450 is the core piece of equipment for the Tek-CARE®400 Nurse Call System. All master stations and patient stations connect to the CE and receive their power from it. Each NC450 CE cabinet holds up to five PM453 Master & Station Modules, PM455 P5 Master & Station Modules and/or PM456 NC300/II Head End Modules. Each PM453, PM455 and PM456 module accommodates two NC401TS or NC401VFD master stations.

- Each PM453 module also accommodates 32 addressable 400-series stations (patient, duty, staff, zone, etc.) on two ports—up to 16 per port.
- Each PM455 module also accommodates 64 addressable P5 stations (patient, duty, staff, zone, etc.) on two port pairs—up to 32 per port pair, up to 16 per run.
- Each PM456 module also accommodates 64 addressable NC300, NC300II or HC345 stations (patient, duty, staff, zone, etc.) on two ports—up to 32 per port.

Up to 15 NC450 CEs may be networked together using PM452 CE Communications Modules. A total of up to 20 PM453 Master & Station Modules, PM455 P5 Master & Station Modules, and PM456 NC300/II Head End modules may be installed per CE network, for a maximum of 640 patient stations (with the PM453) or 1280 patient stations (with the PM455 or PM456) per CE network. All master and patient station ports are protected by self-resetting current-limiting circuits. Optional battery backup is provided using TekTone®'s BA450K Battery Backup Kit.

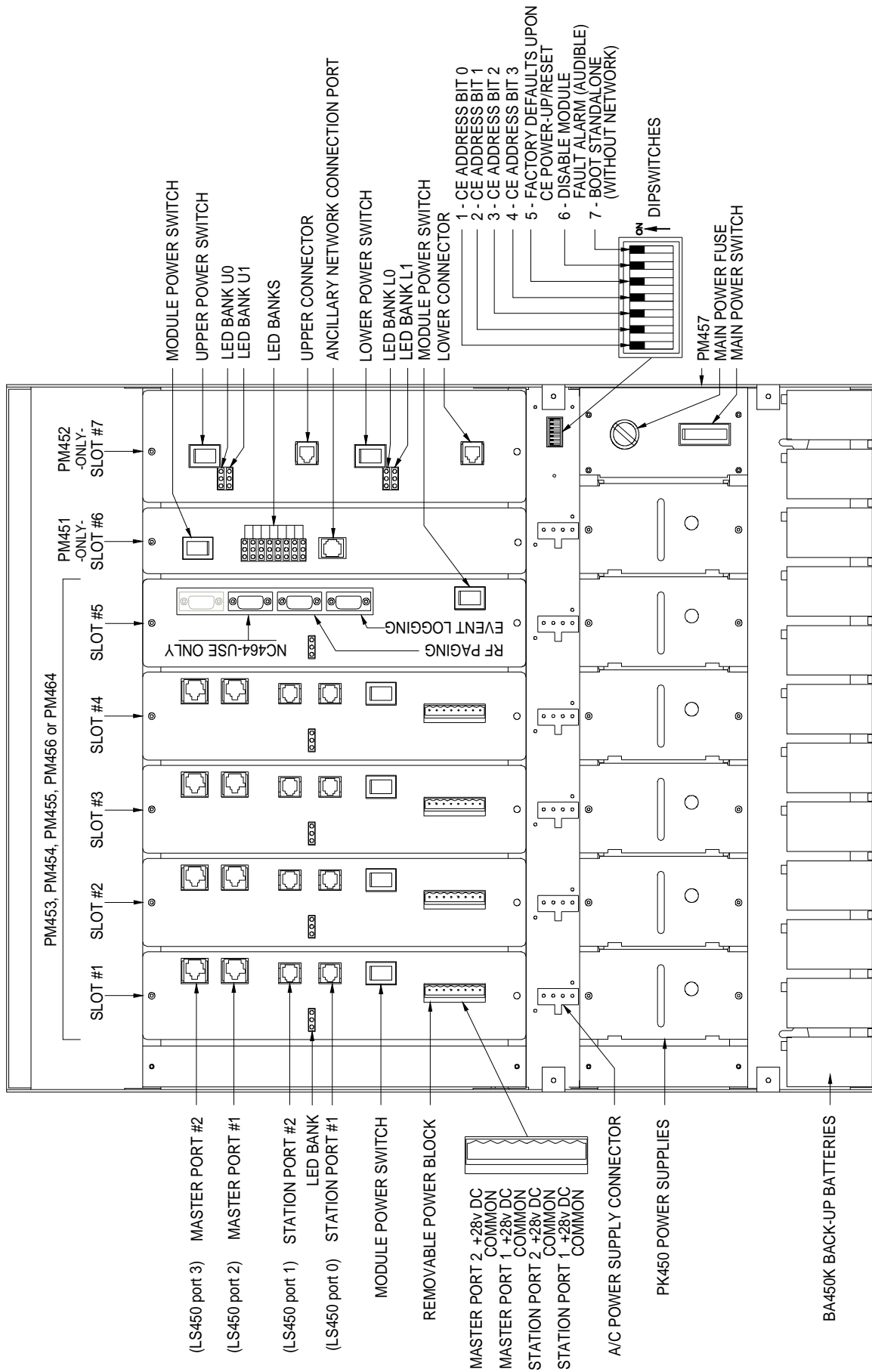
Locate the CE near a 120 VAC, 20A dedicated circuit, connected to the Emergency Branch of the facility's Essential Electrical System (i.e., connected to a backup power source), suitable for computer-grade equipment. To minimize wiring distances, centrally locate the CE to the master and patient stations. Shelf- or desk-mount the CE in an area with a consistent temperature of approximately 26°C and relative humidity not exceeding 80%.

When installing PM451, PM452, PM453, PM454, PM455, PM456 and PM464 modules, orient the modules so that the left to right, LEDs are green-yellow-red, and so that the connector on the back edge of the card is towards the bottom. Using both hands, insert the module card into the top and bottom white card guides, and slide the module in until its connector snaps into the backplane slot at the back of the CE cabinet. Be sure to seat modules correctly, or audio may not work. Secure the module at the top and bottom using the provided thumbscrews.

NC450 Backplane Removal Instructions

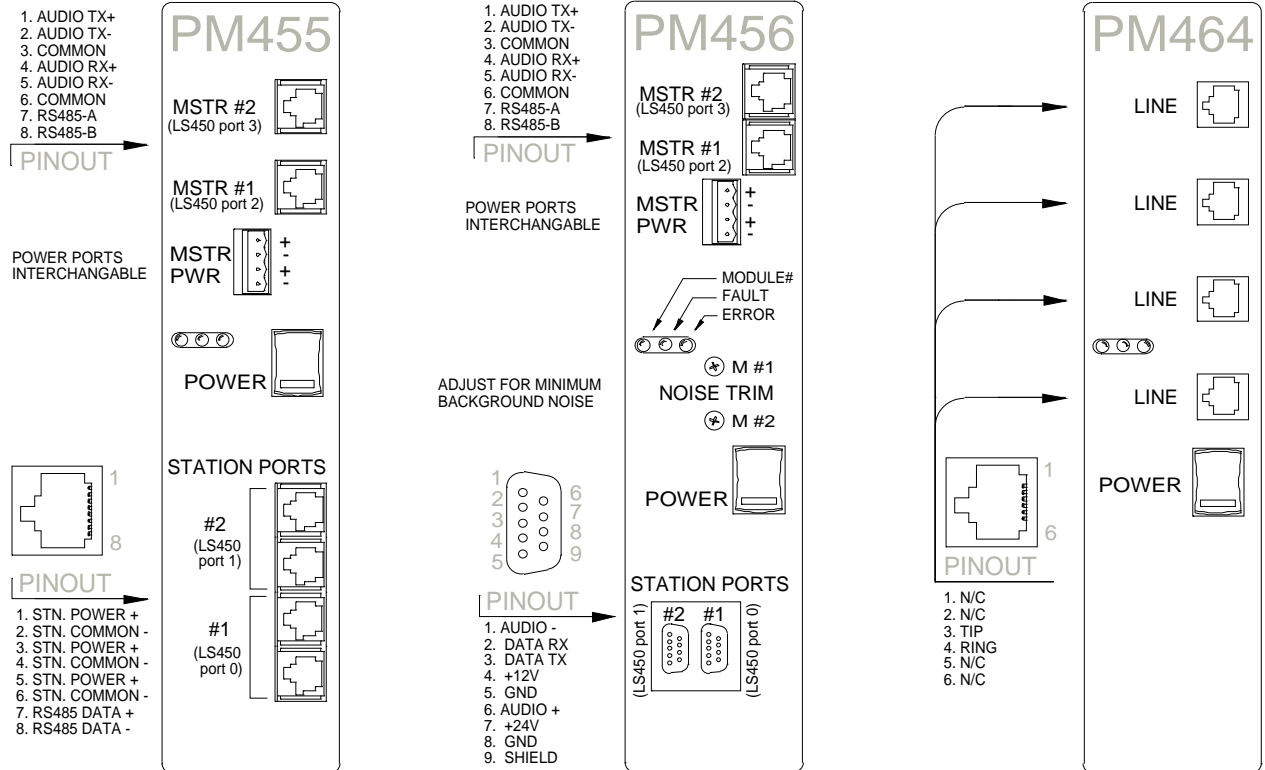
1. Remove thumb-screws from top and bottom of all modules, power supplies and main power supply, noting where each one was installed.
2. Remove all modules, power supplies and main power supply, noting where each was installed.
3. Loosen (*but do not remove*) the nuts on the inside left and inside right of the cabinet that secure the *lower* four horizontal brackets (see *Figure 3*).
4. Remove *lower module bracket*.
5. Remove the seven screws connecting the *supply bus plate* to the *upper power supply bracket*.
6. Remove *supply bus plate*, *upper power supply bracket* and *lower power supply bracket*, noting where each was installed.
7. Remove the six mounting screws that secure the backplane to the case, noting where each was installed.
8. Using a pair of pliers, carefully pinch each of the nylon snap-on connectors holding the backplane. Apply even pulling pressure to the backplane as each snap-on connector is released.

Figure 1—NC450 Central Equipment Internal View



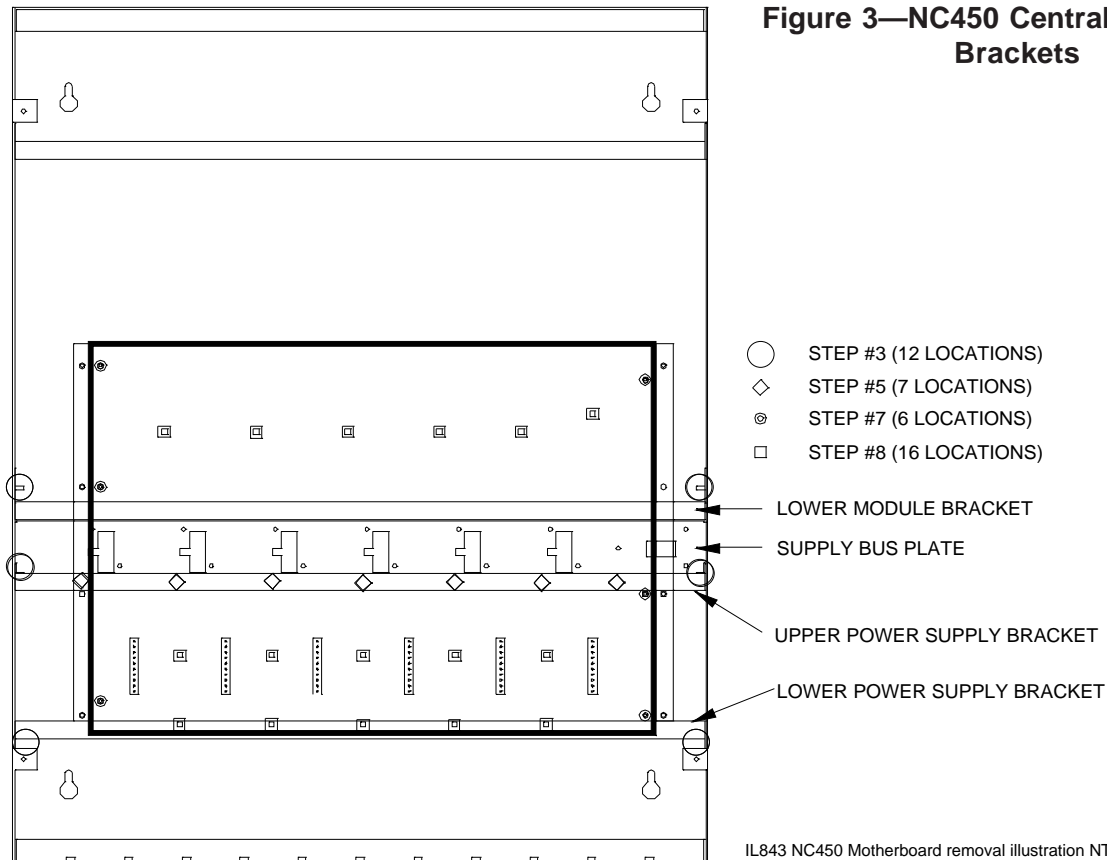
IL843 NC450 INTERNAL VIEW REV12 112310 1

Figure 2—PM455, PM456, PM464 Modules



IL843 PM456 PM464 Modules R2 112210.dc

Figure 3—NC450 Central Equipment Brackets



IL843 NC450 Motherboard removal illustration NTB Rev1 040407 3

NC450 Backplane Re-Installation Instructions

1. Align backplane with nylon snap-on connectors.
2. Using even pressure, carefully snap backplane into position. Verify that all snap-on connectors have engaged.
3. Replace the six backplane mounting screws
4. Replace the *lower power supply bracket* and tighten the four nuts securing it.
5. Replace the *upper power supply bracket* and tighten the four nuts securing it.
6. Replace the *supply bus plate* and tighten the four nuts securing it.
7. Replace the *lower module bracket* and tighten the four nuts securing it.
8. Reinstall all modules and power supplies into their original locations.
9. Reinstall all thumb-screws to secure modules and power supplies.

PM451 Hub Control Module (Figure 4)—The PM451 Hub Control Module is a switching hub with 8 network interface ports. The PM451 provides intercommunication between various CE modules. It is required both for system programming, and for any system that has more than one PM453 Master & Station Module, PM455 P5 Master & Station Module, or PM456 NC300/II Head End Module. Front panel controls include a power switch, status LEDs for each of the 8 ports, and an ancillary network connection port. The ancillary network connection port is used for such functions as complete system programming via personal computer/laptop, interconnection to a Tek-MMARS®400 Management Monitoring and Reporting System, and firmware updates. Install the PM451 into CE slot #6. Note: The *LS450 Config Tool* programming software must be installed for system setup.

PM452 CE Communications Module (Figure 5)—The PM452 CE Communications Module supplies the CE with the network interface port used to interconnect up to 15 CE cabinets. Front panel controls include two network interface ports—each with a separate power switch and status LEDs. Install the PM452 into CE slot #7.

PM453 Master & Station Module for IR400-series stations (Figure 6)—The PM453 Master & Station Module supplies the CE with two master station connection ports, two station connection ports (each capable of serving 16 IR400-series stations), and status indicator LEDs for module activity and faults. Up to five PM453 modules may be installed per CE, for up to 10 master stations and 160 IR400-series patient stations per CE. A maximum of 20 PM453 modules may be installed per CE network. Install PM453 modules into one or more of slots #1–5. **Note: Before connecting or disconnecting master or station power leads, either pull out the PM453's Removable Power Block or turn off the module's power switch.**

PM454 Pager Module (Figure 7)—The PM454 Pager Module supplies the CE with one port for a compatible paging transmitter, one for system event logging and factory troubleshooting, and two ports (AUX1 and AUX2) designated for future use. Install the PM454 into one of slots #1–5.

PM455 P5 Master & Station Module (Figure 8)—The PM455 P5 Master & Station Module supplies the CE with two master station connection ports, four P5 station connection jacks (each capable of serving 16 P5 stations), and status indicator LEDs for module activity and faults. Up to five PM455 modules may be installed per CE, for up to 10 master stations and 320 P5 patient stations per CE. A maximum of 20 PM455 modules may be installed per CE network. Install PM455 modules into one or more of slots #1–5. **Note: Before connecting or disconnecting master power leads, either pull out the PM455's Removable Power Block or turn off the module's power switch.**

**Figure 4—
PM451
Hub Control
Module**



**Figure 5—
PM452
CE Communications
Module**



**Figure 6—
PM453
Master & Station
Module**



**Figure 7—
PM454
Pager
Module**



**Figure 8—
PM455
P5 Master & Station
Module**



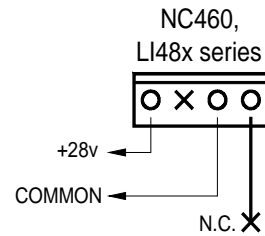
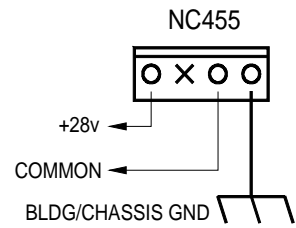
**Figure 9—
PM456
NC300/II Head End
Module**



**Figure 10—
PM464
Telephone Interface
Module**



**Figure 11—NC455, NC460,
LI48x-series Connections**



IL843 NC455 NC460 LI CONNECTIONS REV2 092007 1.dc

PM456 NC300/II Head End Module (Figure 9)—The PM456 NC300/II Head End Module supplies the CE with the ports needed to connect Tek-CARE®NC300, NC300II and HC345 patient stations to the Tek-CARE®400 system, without rewiring the commons bus. The PM456 includes two master station connection ports, two Tek-CARE®NC300/NC300II/HC345 station connection ports (each capable of serving 32 stations), and status indicator LEDs for module activity and faults. Up to five PM456 modules may be installed per CE, for up to 10 master stations and 320 patient stations per CE. A maximum of 20 PM456 modules may be installed per CE network. Install PM456 modules into one or more of slots #1–5. **Note: Before connecting or disconnecting master or station power leads, either pull out the PM456's Removable Power Block or turn off the module's power switch.**

PM464 Telephone Interface Module (Figure 10)—The PM464 Telephone Interface Module supplies the CE with four POTS ports to connect to the facility's PBX for ancillary staff to patient communications. Each PM464 POTS port accommodates a maximum of two telephones. Up to five PM464 modules may be installed per CE, for up to 20 telephones per CE. Install the PM464 into one of slots #1–5. Refer to the *IL877 Telephone Interface Manual* for complete wiring and usage instructions.

NC455 Chassis Short Monitor (Figure 11)—The NC455 Chassis Short Monitor monitors the integrity of field wiring for shorts to earth ground. Use one NC455 for each PM453 Master & Station Module, PM455 P5 Master & Station Module, or PM456 NC300/II Head End Module. Locate it where its alarm may be heard and seen by appropriate personnel, and where it can be accessed for testing. Install it in a single-gang back box. Wire the NC455 to the removable power block of the PM453, PM455 or PM456; see *Figure 1* and *Figure 11* for wiring connections.

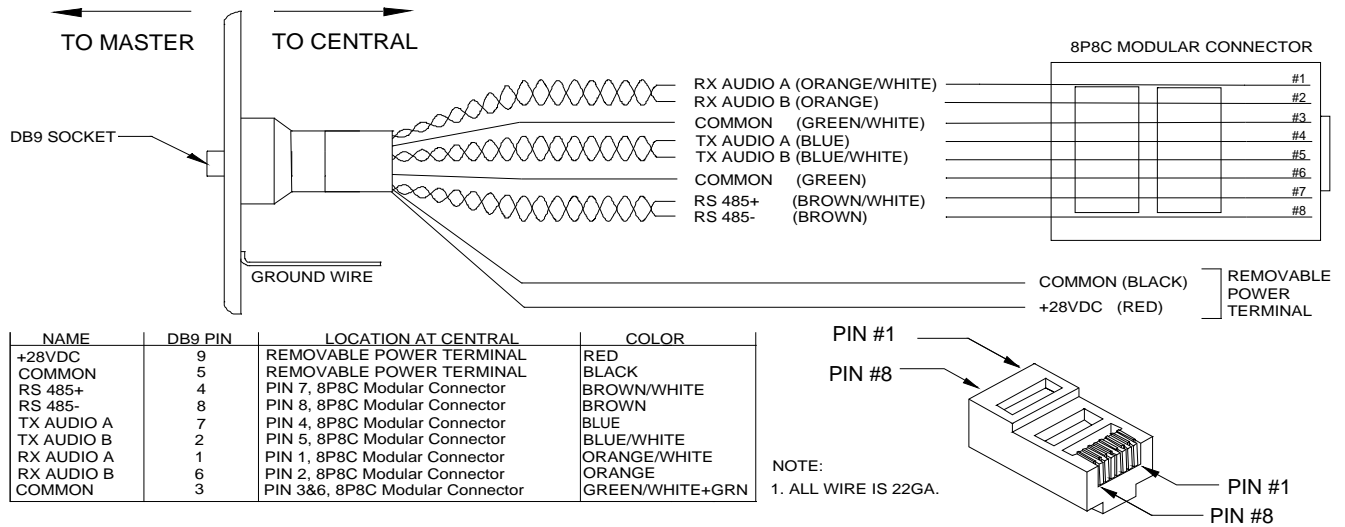
NC460 Power Fault Monitor (Figure 11)—The NC460 Power Fault Monitor provides separate power-fault monitoring using a 9-volt battery, and generates an alarm tone to notify staff of the loss of power. Use one NC460 for each port used on the PM453 Master & Station Modules (up to four per PM453), for each port used on the PM455 P5 Master & Station Modules (up to four per PM455), and for each port used on the PM456 NC300/II Head End Modules (up to four per PM456). Locate it where its alarm may be heard and seen by appropriate personnel, and where it can be accessed for testing. Connect a 9-volt battery to the NC460, and install both in a single-gang back box. Wire each NC460 to a single master or station port's connections on the removable power block of the PM453, PM455 or PM456; see *Figure 1* and *Figure 11* for wiring connections.

PK450 Power Supply—PK450s provide DC power to the system. They connect directly to the NC450 CE's backplane and to the power entry strip, and require a dedicated AC power source connected to the facility's Emergency Power Circuit (i.e., connected to a backup power source), suitable for computer-grade equipment. Above each PK450 Power Supply is a power-good LED indicator on the backplane. If the power supply fails, the LED turns off to indicate that power is being supplied by backup batteries, and a message is displayed on master stations to inform staff of the failure.

Master Station Descriptions, Requirements & Locations

NC401TS, NC401VFD Master Stations (Figures 12–13)—Master Stations are used by facility staff to interface with the nurse call system via the preprogrammed buttons, control buttons and numeric keypad. The master stations provide call indication on an integral screen. Staff may answer calls via the loudspeaker (controlled by the TALK button) or via the handset. The master station is usually located on a desk or countertop, within easy reach of facility staff. **The pre-wired wall plate mounts on a single-gang ring or box, and is connected to the master station using a supplied 6-foot cable. The wall plate must be within 1000 cable-feet of the central equipment.** Locate the master station in an area with a consistent temperature of approximately 26°C and relative humidity not exceeding 80%. See *Wiring Installation* section for additional details.

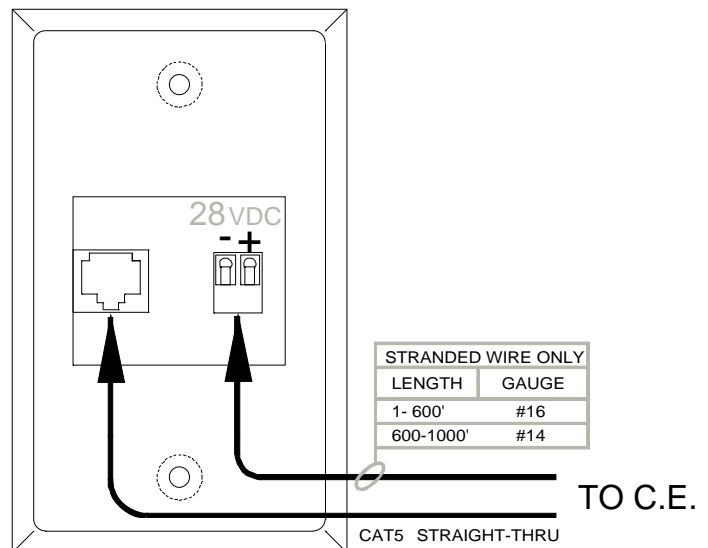
Figure 12—NC401TS, NC401VFD Master Station Connections



IL843 NC401TS NC401VFD CONNECTIONS REV6 121010 1

Figure 13—CT424 Master Station Wall Plate Connections

CT424 (REAR VIEW)



IL843 CT424 CONNECTIONS REV0 040910

IR400-series Station Descriptions, Requirements & Locations

IR400-series Stations (General Information) (Figure 14)—All IR400-series devices have electronics that are mounted on a flame-retardant (UL® 94V-0) plastic panel. Nylon mounting screws are provided with all IR400-series stations to ensure compliance to the latest UL® 1069 requirements, which now include ESD testing. Users must observe ESD precautions when handling these devices as they may be damaged if improperly handled. Each of the IR400-series stations requires a unique address, which is set using on-board dip switches. (For addressing, see *System Installation—Equipment Configuration and Settings* section.) Plug-on connectors are provided for easy installation.

Up to eleven switches can be connected to each IR400-series station. Connect one presence station (SF450/2 or SF450/4). Connect another four switches (SF437, SF439, SF440 or SF441) using the call type jumpers on the back of the switches to configure them with unique call types: Emergency, Emergency2, Code Blue and Bath (see *Figures 30–33*). Connect the remaining six switches using three PM423 Auxiliary Input Modules for two switches each (see *PM423 Auxiliary Input Module* section).

IR400-series stations use the RACO 692 backbox. If either a PM421 or PM422 Pillow Speaker & Bed Interface Module is installed, use the RACO 697 backbox. The minimum clearance from current-carrying parts to dead-metal parts must be no less than 0.5". Each IR400-series station includes a flying ground wire that must be connected to building/earth ground, via either a separate conductor or a grounded backbox. Proper grounding provides a separate path for ESD discharge that does not involve the nurse call system, and it is required to provide maximum ESD resistance.

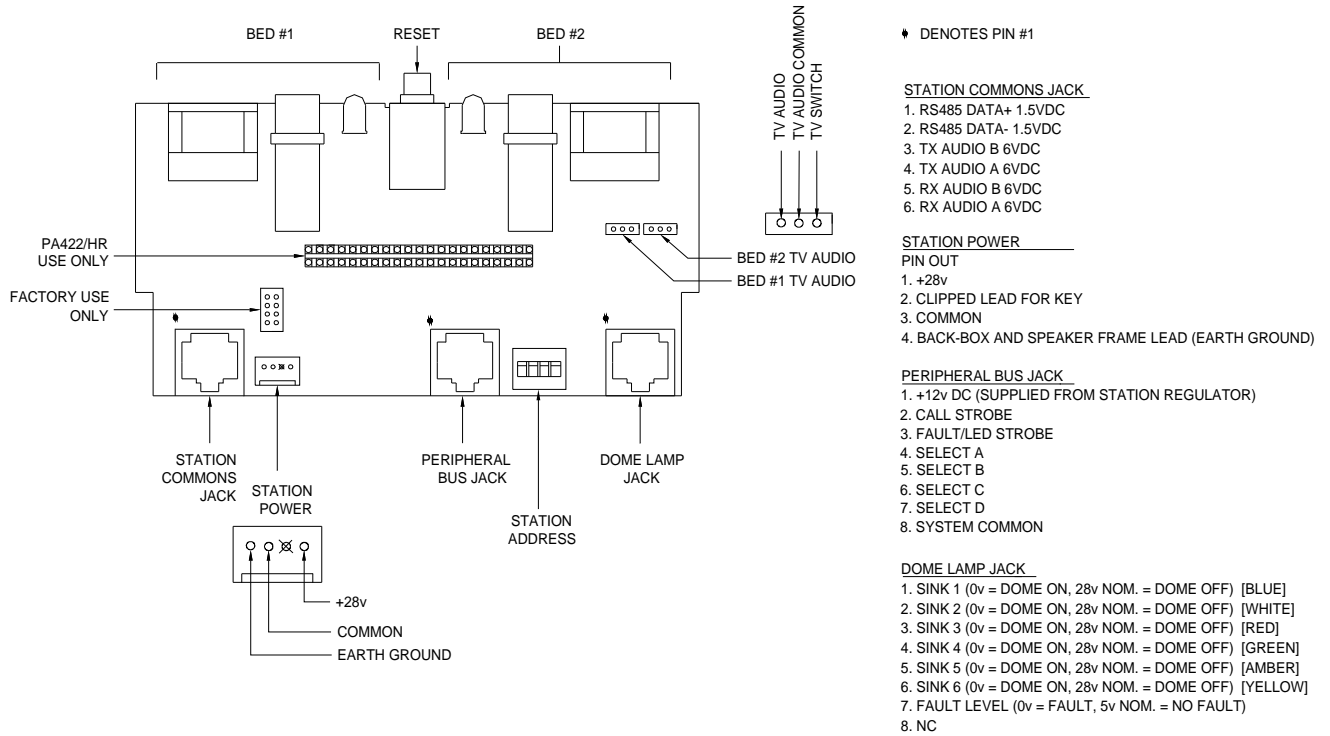
IR400-series stations are typically located for convenience—most commonly at the head of the patient's bed, unless specified otherwise. Locate IR400-series stations so that station runs do not exceed 1000 total cable-feet per port; and so that furniture, curtains and other features do not interfere with audio communication. The operating environment for IR400-series stations is 10–40°C with relative humidity not exceeding 80%.

IR400 Multipurpose Stations (Figure 15)—The IR400 Multipurpose Stations support remote devices such as switches, contact closures, speakers and other signal originating devices. Practical applications for the IR400 include: an input for ICU code emergency call stations, a corridor paging amplifier interface, a control point for exit/entry doors and narcotics cabinets, an input for bath emergency call stations in public bath areas, or an access control input/output for a remote door intercom station. The IR400 may be connected directly to a 60 Ohm, 1 Watt speaker for paging. If connected to overhead paging, a transformer must be used. Always use grounded, shielded transformers to prevent current leakage to the nurse call system's isolated circuits. The IR400 provides the same peripheral inputs and corridor light indications as patient stations, but does not have the controls, LEDs or speakers associated with patient stations. For connections to the IR400 Multipurpose Station, see *Figure 15*.

IR019C Remote Speaker/Microphone Station—The IR019C is used in conjunction with the IR400 to provide a ceiling- or remote-mounted speaker/microphone. The IR019C is located where needed and mounts on a standard two-gang ring or backbox. The device must be located within 50 cable-feet of the associated IR400. The operating environment for the IR019C is 10–40°C with relative humidity not exceeding 80%.

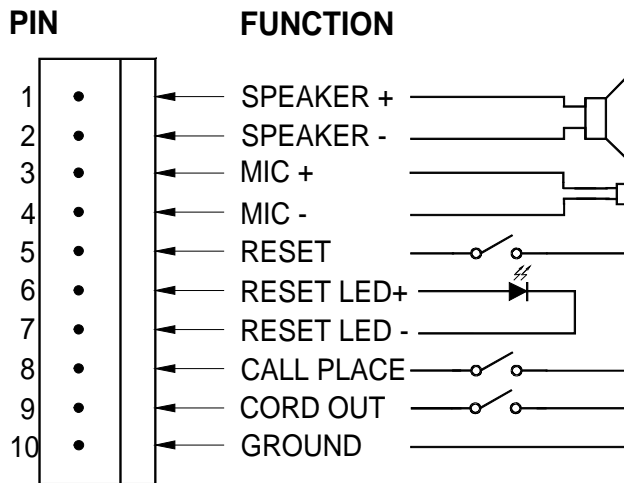
IR411 Single, IR412 Dual Patient Stations—The IR411 and IR412 provide reliable hands-free communication between the patient and facility staff. The IR411 includes one DIN call cord jack and one ¼" phono jack; the IR412 includes two DIN jacks and two ¼" jacks. The ¼" jacks accommodate devices with ¼" phono plugs, such as IV pumps or SF301-series and SF302-series call cords, and place Monitor calls for all default Station Behaviors. Call cord presence is supervised, and the system provides an indication when a cord has been removed and not replaced. To avoid a *cord out* call when removing a cord, hold

Figure 14—IR400-series Station Connections



IL843 IR412EPB CONNECTIONS NTB REV3 042810 1

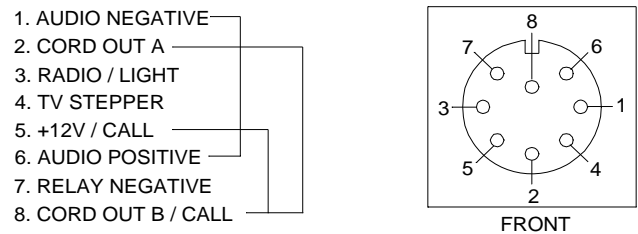
Figure 15—IR400 Multipurpose Station Pinout



Output suitable for 60 Ohm 1 Watt speaker or equivalent.
If connected to overhead paging equipment, an appropriate matching transformer must be used.

IL843 IR400 PIN OUT REV0 111506 1

Figure 17—IR400-series and P5 Station DIN Jack Pinout



IR STATION DIN JACK PINOUT REV2 062507 1

down the **RESET** button until the yellow call light is illuminated; while continuing to depress the **RESET** button, remove the cord. The patient stations have indicators for call placement assurance and in-use status. A reset button is also provided to reset calls locally. These stations can interface with the PM421 or PM422 Pillow Speaker & Bed Interface Modules.

IR411EPB Single, IR412EPB Dual Patient Stations—The IR411EPB and IR412EPB are identical to the IR411 and IR412, except that the ¼" phono jack is replaced with a pushbutton that places a Bed Emergency call for all default Station Behaviors. Headers are provided for specific pillow speaker-only connections—one for the IR411EPB and two for the IR412EPB (see *Figure 14*). These stations can interface with the PM421 or PM422 Pillow Speaker & Bed Interface Modules.

PM421, PM422 Pillow Speaker & Bed Interface Modules (Figures 18–20)—The PM421 (for IR411 and IR411EPB) and PM422 (for IR412 and IR412EPB) modules redirect the nurse call system audio from the patient station to the pillow speaker. SF401P, SF401DIG, SF41ZDL or SF41ZKL pillow speakers are required for this application. If the connected call cord or pillow speaker does not support this function, audio reverts to the patient station. The modules plug directly onto the back of patient stations and are subject to the same environmental requirements. The modules also enable SF401DIG, SF41ZDL or SF41ZKL pillow speakers to activate control relays that can be linked via dry contacts to control overhead and table lighting. The control relays are brought out on two (side A and side B) 6-pin headers, pins 1–3 (see *Figure 19*). **NOTE: To avoid shorting out the station, do not hot swap IR400-series patient stations that have PM421 or PM422 Pillow Speaker & Bed Interface Modules installed and are mounted to a metal box or frame.**

The PM421 and PM422 also provide an interface for the Hill-Rom® SideCom® or compatible bed. This enables the SideCom® bed's intercom, call placement indication, and in-use indication functions to work with the Tek-CARE®400 nurse call system. The SideCom® bed's lamp and lighting controls are connected to the lighting control system and do not need to interface with the nurse call system. The interface also detects the disconnection of the (low voltage) signaling cable from the wall jack and places a non-cancellable call to the nurse master station. The Hill-Rom® P376 series plug-in adapter must be installed within 10' of the interface. The operating environment for the module is 10–40°C with relative humidity not exceeding 80%. **WARNING: Connect only Class 2, Power Limited circuits (in accordance with ANSI/NFPA 70, ANSI/NFPA 99 and ANSI/UL® 1069) to the PM421 or PM422. If in doubt, contact the manufacturer.**

PM423 Auxiliary Input Module (Figures 21–23)—The PM423 Auxiliary Input Module provides the ability to interface up to 6 auxiliary devices to each IR400-series station. It is not used with P5 stations. The PM423 features two inputs, each of which may be set to latching or momentary. These inputs are via a pair of flying leads: *Input A* is white/gray, and *Input B* is red/black. Each PM423 occupies one of three positions on the peripheral bus reserved for these modules. The PM423's position is determined by its dip switch setting. See *Figure 22* for default calls and dip switch settings.

The PM423 uses the system's 28 VDC to sense the state of the inputs. Or use an external +5 VDC to +28 VDC or +5 VAC to +16 VAC source by connecting the source common with the module's input common. See *Figure 23* for examples of external switch connections. The two inputs may also use separate input sources. Use #22, max 50' wire for call inputs.

The PM423 is encased in an insulation sheath, allowing it to be placed in a metal backbox without electrical shorts. The PM423 module daisy-chains on the peripheral bus of any IR400-series patient station.

IR410 Staff Station—The IR410 Staff Stations provides a communication point for staff members to call the master station for staff to staff communication. A programmable call button, reset button, staff emergency button, call-placed indicator and in-use status indicator are provided.

IR415 Duty Station (Figure 24)—The IR415 Duty Station is similar to the IR410 Staff Station, but provides the extra features of call annunciation and zone lamp operation. Duty stations provide additional points of annunciation for the nurse call system in locations that are not within sight or hearing of the master station. The IR415 includes a call button, reset button, call-placed light, in-use status light and emergency indicator.

Figure 18—PM421, PM422 Pillow Speaker & Bed Interface Modules

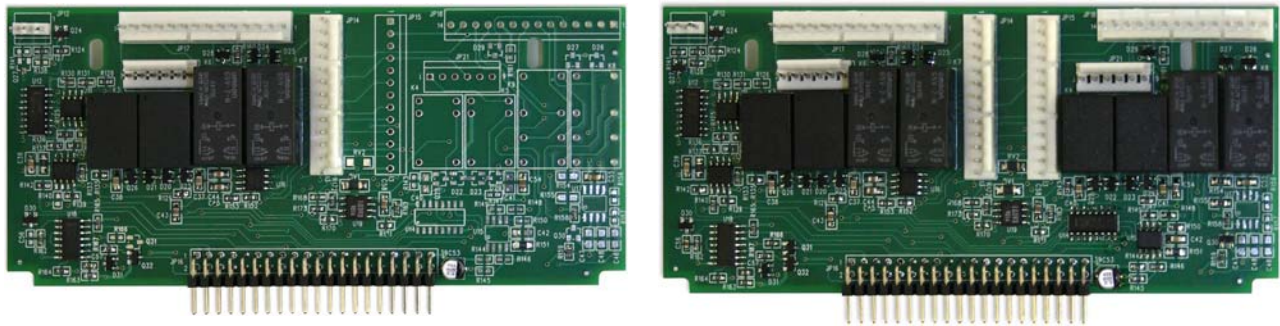
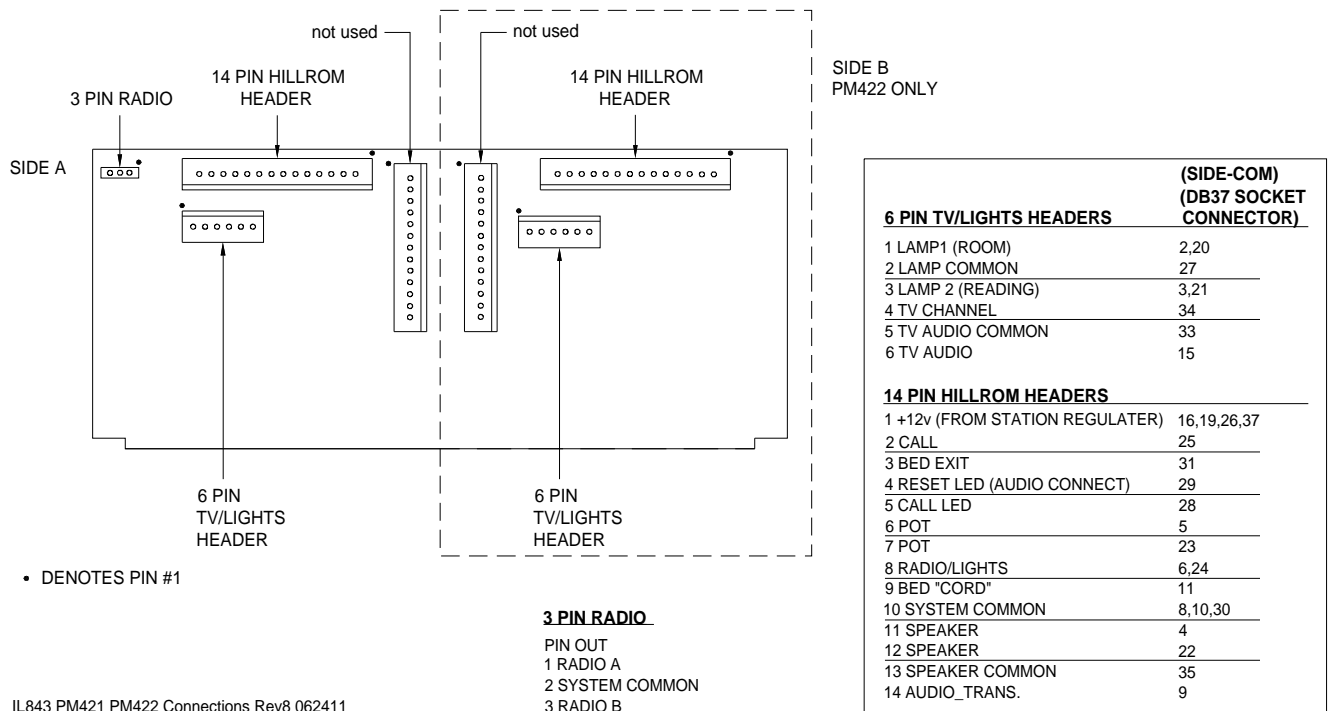
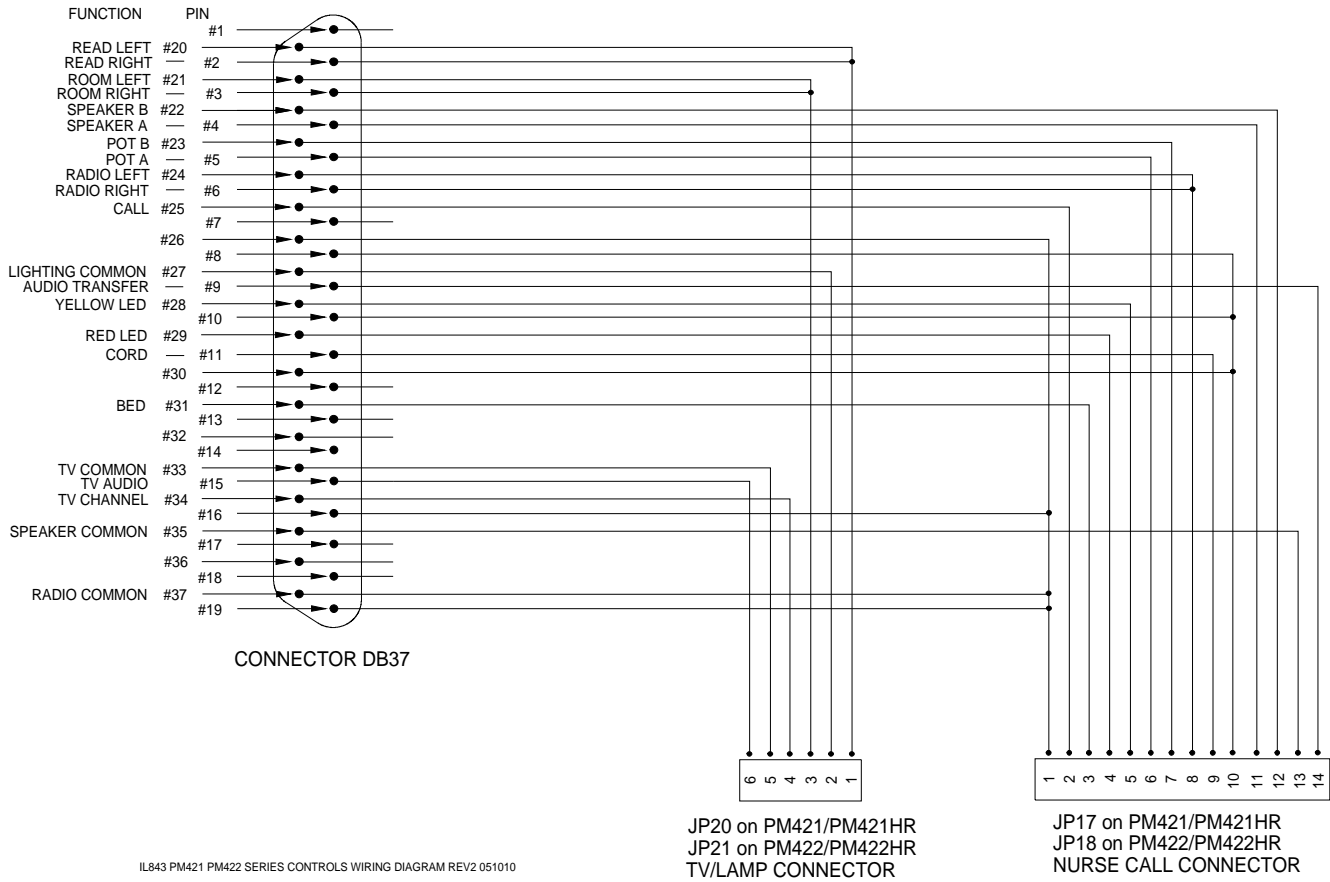


Figure 19—PM421, PM422 Pillow Speaker & Bed Interface Module Connections



IL843 PM421 PM422 Connections Rev8 062411

Figure 20—PM421, PM422 Pillow Speaker & Bed Interface Module Controls



IL843 PM421 PM422 SERIES CONTROLS WIRING DIAGRAM REV2 051010

JP20 on PM421/PM421HR
JP21 on PM422/PM422HR
TV/LAMP CONNECTOR

JP17 on PM421/PM421HR
JP18 on PM422/PM422HR
NURSE CALL CONNECTOR

DB37 / P-37 PIN#	PM421		PM422	
	JP20	JP17	JP21	JP18
1	-	-	-	-
2	1	-	1	-
3	3	-	3	-
4	-	11	-	11
5	-	6	-	6
6	-	8	-	8
7	-	-	-	-
8	-	10	-	10
9	-	14	-	14
10	-	10	-	10
11	-	9	-	9
12	-	-	-	-
13	-	-	-	-

DB37 / P-37 PIN#	PM421		PM422	
	JP20	JP17	JP21	JP18
14	-	-	-	-
15	6	-	6	-
16	-	1	-	1
17	-	-	-	-
18	-	-	-	-
19	-	1	-	1
20	1	-	1	-
21	3	-	3	-
22	-	12	-	12
23	-	7	-	7
24	-	8	-	8
25	-	2	-	2

DB37 / P-37 PIN#	PM421		PM422	
	JP20	JP17	JP21	JP18
26	-	1	-	1
27	2	-	2	-
28	-	5	-	5
29	-	4	-	4
30	-	10	-	10
31	-	3	-	3
32	-	-	-	-
32	5	-	5	-
34	4	-	4	-
35	-	13	-	13
36	-	-	-	-
37	-	1	-	1

IL843 PM421 PM422 SERIES CONTROL WIRING CHART REV1 031010 1.xls

Figure 21—PM423 Auxiliary Input Module

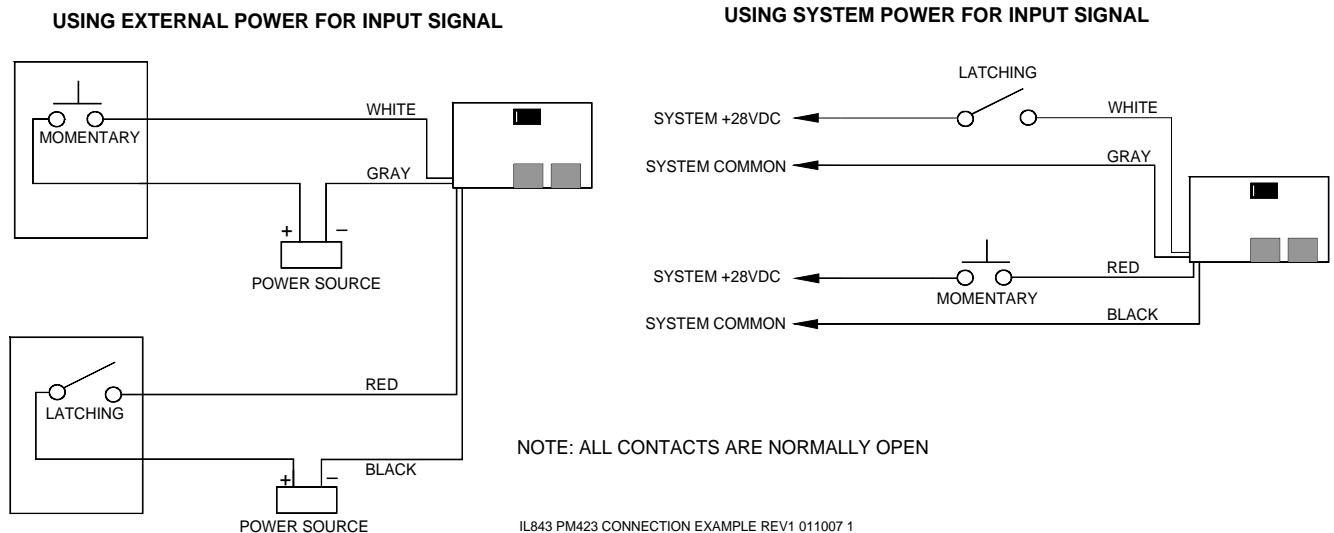


Figure 22—PM423 Auxiliary Input Module Default Calls & Dip Switch Settings

MODULE #	DIPSWITCH SETTING	INPUT TYPE		DEFAULT CALL DISPLAYED ONSCREEN		
		RED / BLACK INPUT A	WHITE / GRAY INPUT B	INPUT A	INPUT B	FAULT MESSAGE
MODULE #1		MOMENTARY	MOMENTARY	AUX 1A	AUX 1B	AUXILIARY 1 FAULT
MODULE #2		LATCHING	LATCHING	AUX 2A	AUX 2B	AUXILIARY 2 FAULT
MODULE #3		MOMENTARY	LATCHING	AUX 3A	AUX 3B	AUXILIARY 3 FAULT

IL843 PM423 CONFIGURATION OPTIONS REV5 121010 1

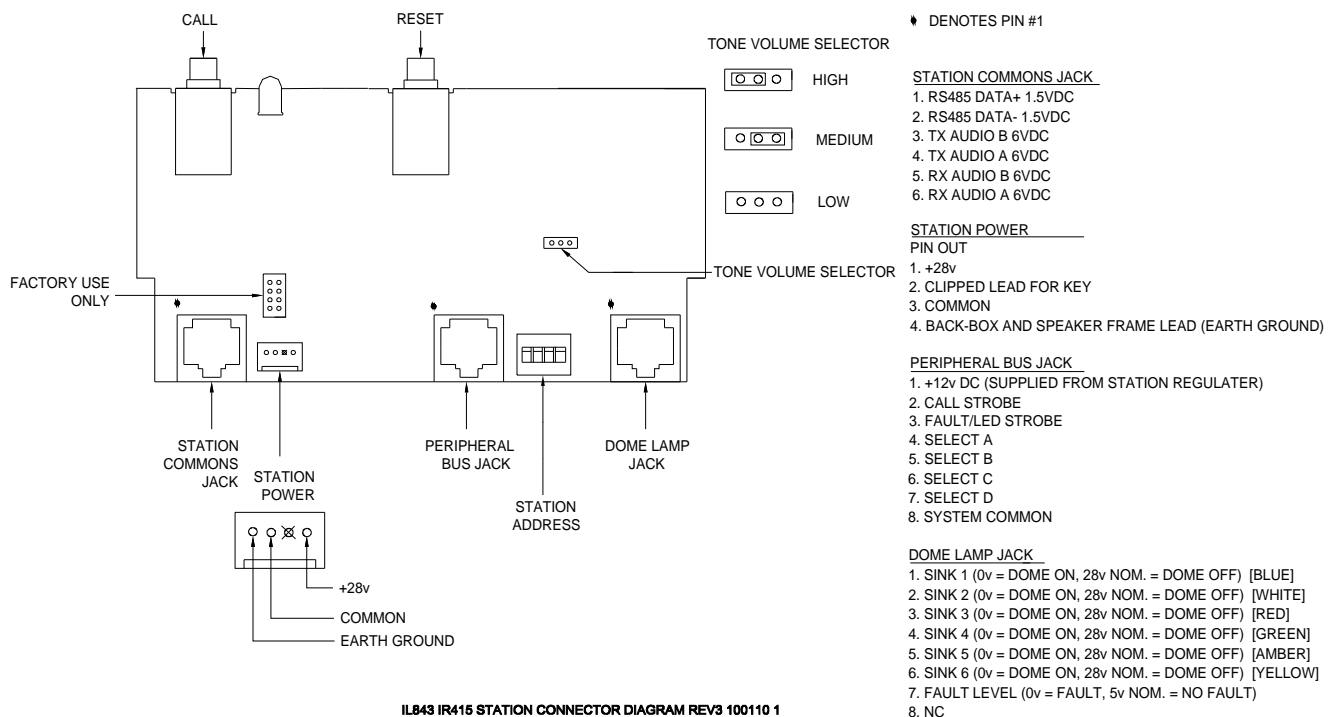
Figure 23—PM423 Auxiliary Input Module External Switch Connections (Examples)



Call Cords and Pillow Speakers:

SF301A	Push button call cord, 7' cord, ¼" plug, oxygen safe, waterproof
SF301A/10	Push button call cord, 10' cord, ¼" plug, oxygen safe, waterproof
SF301A/20	Push button call cord, 20' cord, ¼" plug, oxygen safe, waterproof
SF302	Dual push button call cord, 7' cord, ¼" plug, oxygen safe, waterproof
SF302/10	Dual push button call cord, 10' cord, ¼" plug, oxygen safe, waterproof
SF301G	Squeeze bulb call cord, 6' cord, ¼" plug, oxygen safe, geriatric
SF302G	Dual squeeze bulb call cord, 6' cord, ¼" plug, oxygen safe, geriatric
SF401A	Push button call cord, 7' cord, DIN plug, oxygen safe, waterproof
SF401A/10	Push button call cord, 10' cord, DIN plug, oxygen safe, waterproof
SF401A/15	Push button call cord, 15' cord, DIN plug, oxygen safe, waterproof
SF401A/20	Push button call cord, 20' cord, DIN plug, oxygen safe, waterproof
SF401DIG	Pillow speaker, 8' cord, DIN plug, oxygen safe, intercom, and controls for lights, digital TV, and radio
SF401G	Squeeze bulb call cord, 6' cord, DIN plug, oxygen safe, geriatric
SF401P	Pillow speaker with 7' cord, DIN plug, intercom and analog TV controls
SF401P2L	Pillow speaker, DIN plug, intercom, and controls for lights, analog TV
SF41ZDL	Pillow speaker, DIN plug, intercom, and controls for lights, digital TV
SF41ZKL	Pillow speaker, DIN plug, intercom, and controls for lights, digital TV
SF401EX	Strain relief cable, 6", DIN plug and DIN jack

Figure 24—IR415 Duty Station Connections



Dome Lights for IR400-series Stations—Descriptions, Requirements & Locations

LI481, LI482, LI484, LI486 Corridor Lights—Corridor lights provide visual indication from IR400-series stations and associated peripheral devices. Colored lenses allow the devices to indicate all system call types with various flash rates and color combinations. When connected to an IR415 Duty Station, the corridor light functions as a zone light. Corridor lights use Steel City’s H2BD backbox with a 2GC plaster ring; refer to *Figure 25* for mounting. The minimum dimensions for the backbox must be not less than 4"×4"×1.5", and the minimum clearance from current-carrying parts to dead-metal parts must be no less than 0.5". Locate the corridor light above or beside the doorway of its associated room, and mount it so that unobstructed visibility is provided. When used as zone lights, mount them at corridor heads or junctions so that facility staff can readily identify the associated zone area. The lights must be within 50 cable-feet of associated patient stations. The operating environment is 10–40°C with relative humidity not exceeding 80%. See *Wiring Installation* section for additional details.

LI482LED, LI484LED, LI484LED-1 Corridor Lights (Figure 27)—These lights provide the same functionality as LI482 and LI484 corridor lights, but use long-lasting LEDs instead of incandescent bulbs.

LI484SUP, LI486SUP Supervised Corridor Lights—These lights provide the same functionality as LI484 and LI486 corridor lights, plus supervisory circuitry to monitor the lamps’ condition. When a lamp fails, the system indicates a lamp fault for the associated room location.

LI484Z, LI486Z Zone Lights—Addressable standalone zone lights provide the same indication functionality as the LI484 and LI486 Corridor Lights, plus support electronics to make them suitable for zone indication applications. Mount them at corridor heads or junctions so that facility staff can readily identify the associated zone area. Each zone light requires a unique address, which is set using on-board dip switches. (For addressing, see *System Installation—Equipment Configuration and Settings* section.)

LI484ZLED Zone Light (Figure 28)—With its jumper removed, the LI484ZLED is an addressable standalone zone light that provides the same functionality as the LI484Z zone light, but uses long-lasting LEDs instead of incandescent bulbs. Mount zone lights at corridor heads or junctions so that facility staff can readily identify the associated zone area. With its jumper in place, the LI484ZLED can be used with an emergency and/or code switch as a standalone addressable corridor light. When used as a standalone addressable corridor light, program the device to watch no zones. See *Wiring Installation* section for additional details.

Figure 25—Mounting Corridor Lights

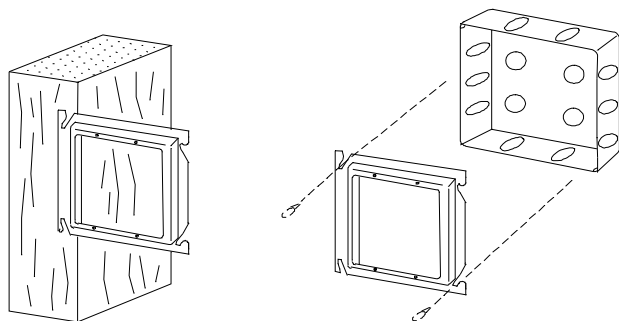


Figure 26—Mounting SF400-series Peripherals

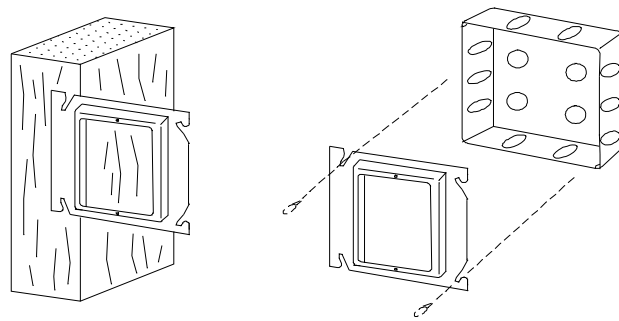


Figure 27—LI482LED, LI484LED and LI484LED-1 Wiring Diagrams

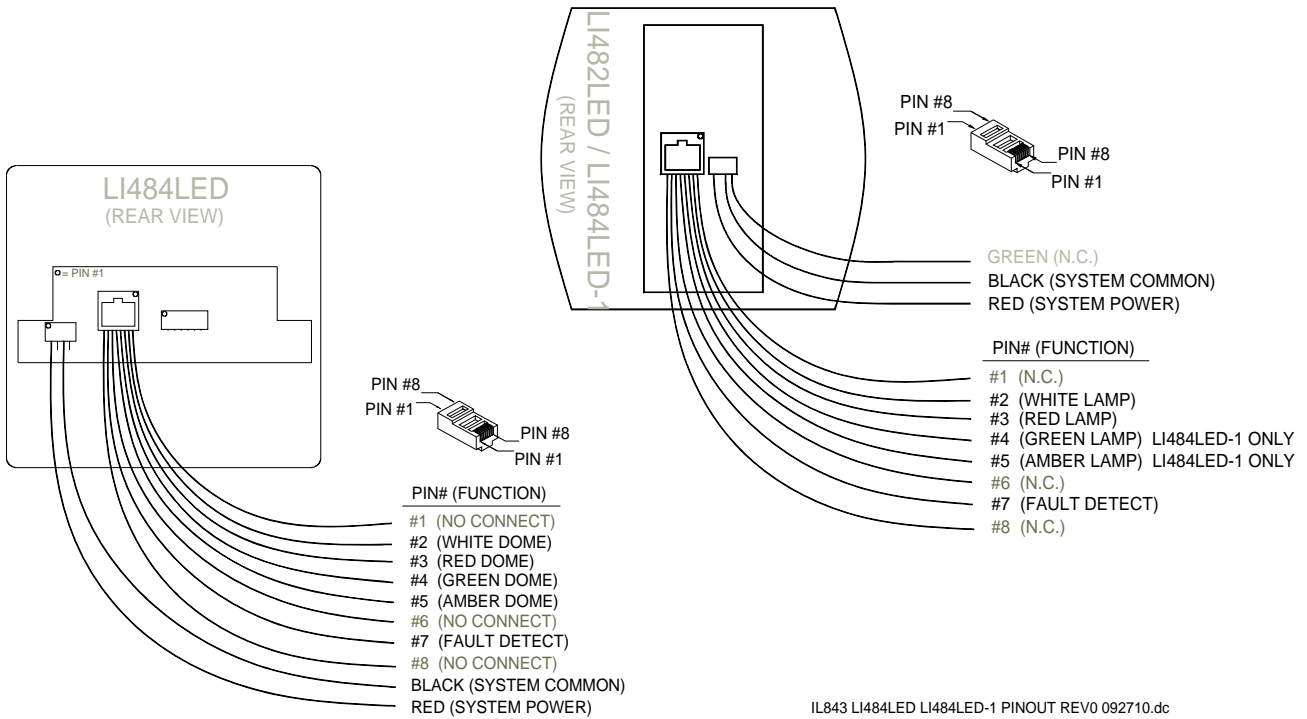
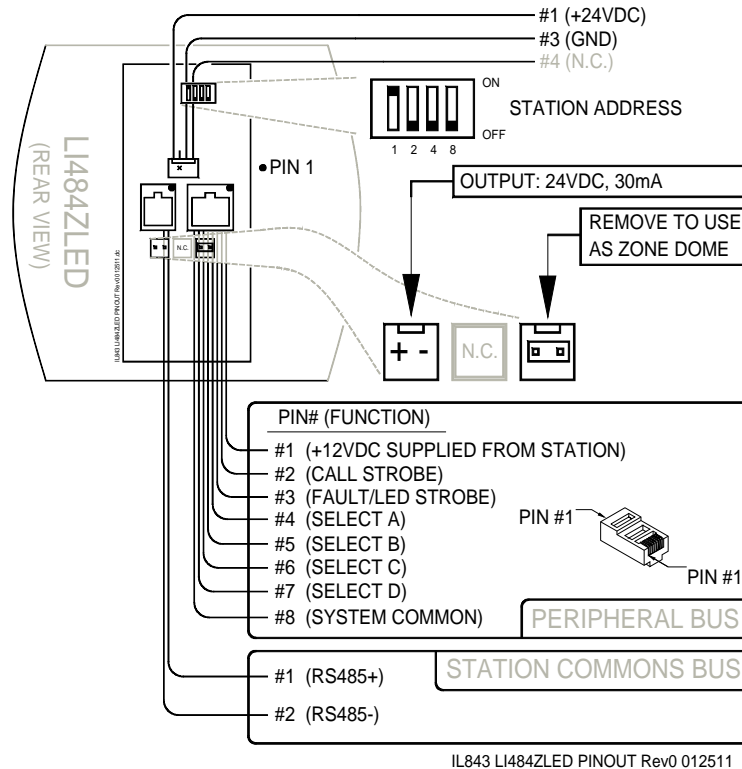


Figure 28—LI484ZLED Wiring Diagram



Peripherals for IR400-series Stations—Descriptions, Requirements & Locations

SF480-series Standalone Code and Emergency Stations for IR400-series stations (General Information)—All SF480-series stations have electronics that are mounted on a flame-retardant (UL® 94V-0) plastic panel. Users must observe ESD precautions when handling these devices as they may be damaged if improperly handled. SF480-series stations are wired directly to the commons bus of the PM453 Master & Station Module. Each of the SF480-series stations requires a unique address, which is set using the on-board dip switch. (For addressing, see *System Installation—Equipment Configuration and Settings* section.) Plug-on connectors are provided for easy installation.

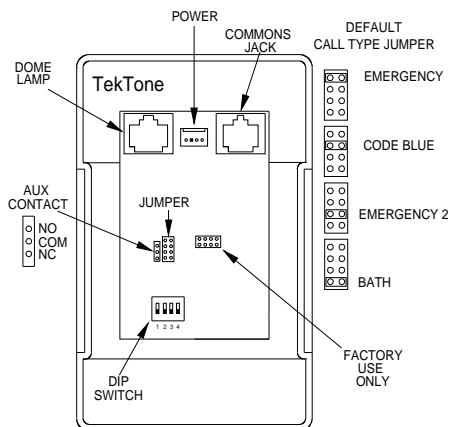
SF480-series stations are mounted on single-gang rings or boxes; minimum ring opening not to be less than 1.75"×2.75" (see *Figure 26*). The minimum clearance from current-carrying parts to dead-metal parts is no less than 0.5". Locate SF480-series stations so that station runs do not exceed 1000 total cable-feet per port. The operating environment for the SF480-series stations is 10–40°C with relative humidity not exceeding 80%.

SF483 Standalone Bath Emergency Station (Figure 29)—The SF483 allows patients to initiate a bath call to inform staff members that they require assistance in restroom areas. The station is designed to be mounted in wet areas, when properly installed using the included gaskets for the panel and screws. The station can be activated by hand with the red pull down lever, or by pull-cord (if installed). It includes a call-placed indicator.

This station is typically located in toilet, bath and shower areas, and is mounted at a height convenient for use. If the station is being mounted to a tile wall or other irregular surface, the installer must provide extra sealant to fill tile seam points or other gaps. If the station is being used with pull-cord activation, the included cord must be installed through the guide tab and red pull-down lever and secured with a double knot. Mounting location and cord length must be such that a prone patient can reach the call cord to activate the station. The operating environment for the SF483 is 10–40°C, and the station is water resistant when correctly installed.

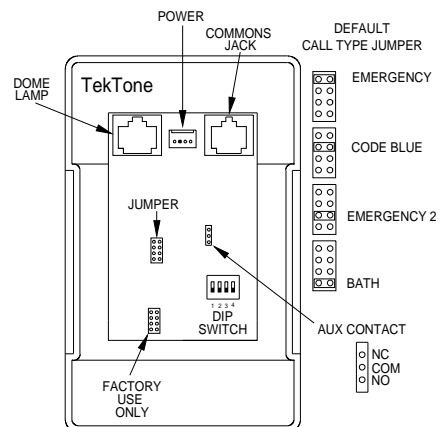
SF481 Standalone Emergency Station (Figure 30)—The SF481 provides the same operational functionality as the SF483, except that it is not suitable for moist or wet environments. The operating environment for the SF481 is 10–40°C with relative humidity not exceeding 80%.

Figure 29—SF483 Standalone Emergency Bath Switch Connectors



IL843 SF483 CONNECTOR LAYOUT REV0 082108 1

Figure 30—SF481 Standalone Emergency Switch Connectors



IL843 SF481 CONNECTOR LAYOUT REV0 082108 1

SF482 Standalone Code Call Station (Figure 31)—The SF482 allows patients and staff members to initiate high priority “code” calls. The station includes a call-placed indicator, and is activated by pulling down the blue lever. Locate the SF482 for convenient operation in areas that require code call initiation, such as ICU/CCU areas. The environment for the SF482 is 10–40°C with relative humidity not exceeding 80%.

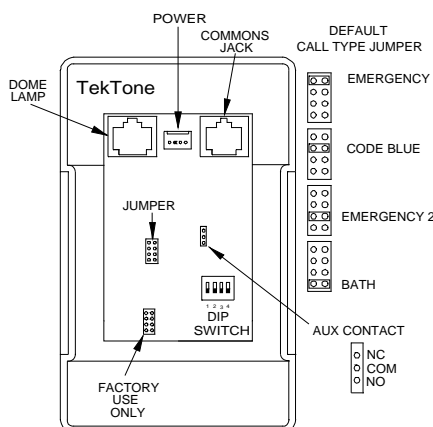
SF400-series Peripheral Devices for IR400-series stations (General Information)—The SF400-series peripheral devices’ electronics are mounted on flame-retardant (UL® 94V-0) faceplates. Mount each SF400-series device within 50 cable-feet of the IR400-series station to which it will be connected. Up to five SF400-series peripheral devices may be connected to each IR400-series station. SF400-series devices are mounted on single-gang rings or boxes; minimum ring opening not to be less than 1.75"×2.75" (see Figure 26). Nylon mounting screws are provided with all SF400-series peripheral devices to ensure compliance to the latest UL® 1069 requirements, which now includes ESD testing. The minimum clearance from current-carrying parts to dead-metal parts is no less than 0.5". Plug-on connectors are provided for easy installation. The SF437, SF439, SF440 and SF441 each includes an auxiliary NO/NC contact for an ancillary device; connect using the CT557K Auxiliary Contact Connector Kit (see Figures 30–33 for location of auxiliary contact).

SF437 Emergency Shower Switch (Figure 32)—The SF437 allows patients to initiate a bath call to inform staff members that they require assistance in restroom areas. The device is designed to be mounted in wet areas, when properly installed using the included gaskets for the panel and screws. The device can be activated by hand with the red pull down lever, or by pull-cord (if installed). It includes a call-placed indicator. Call type placed is determined by the jumper setting.

This device is typically located in toilet, bath and shower areas, and is mounted at a height convenient for use. If the device is being mounted to a tile wall or other irregular surface, the installer must provide extra sealant to fill tile seam points or other gaps. If the device is being used with pull-cord activation, the included cord must be installed through the guide tab and red pull-down lever and secured with a double knot. Mounting location and cord length must be such that a prone patient can reach the call cord to activate the device. The operating environment for the SF437 is 10–40°C, and the device is water resistant when correctly installed.

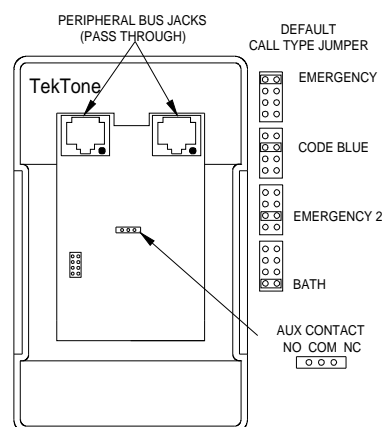
SF439 Mushroom-style Pushbutton Emergency Switch (Figure 33)—The SF439 includes a locking mushroom-style switch, and is for use in any location where activation of an

Figure 31—SF482 Standalone Code Call Switch Connectors



IL843 SF482 CONNECTOR LAYOUT REV0 082108 1

Figure 32—SF437 Emergency Shower Switch Connectors



IL843 SF437 CONNECTOR LAYOUT REV0 111306 1

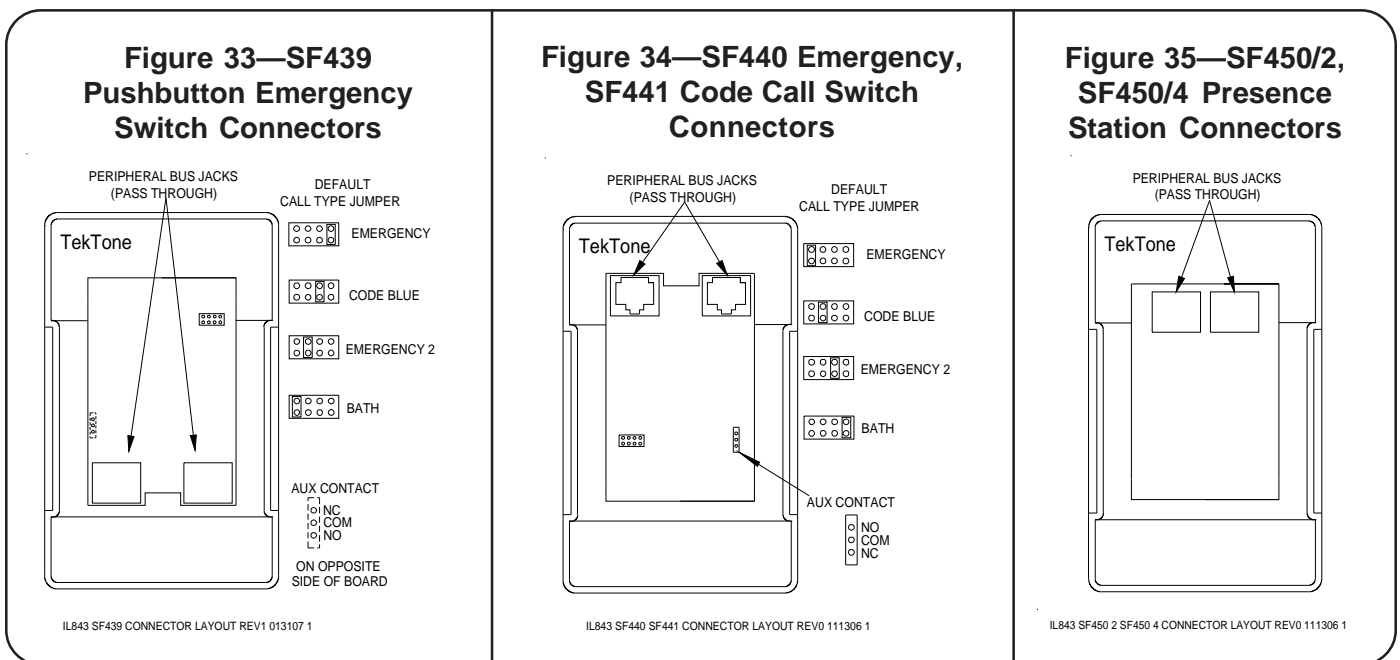
emergency signal is required. The device is designed to be mounted at a height and location in which a staff can easily activate the large mushroom style button using an elbow, shoulder, etc., when using the hands is inconvenient or inappropriate. Call type placed is determined by the jumper setting. The operating environment for the SF439 is 10–40°C with relative humidity not exceeding 80%.

SF440 Emergency Switch (Figure 34)—The SF440 provides the same operational functionality as the SF437, except that it is not suitable for moist or wet environments. Call type placed is determined by the jumper setting. The operating environment for the SF440 is 10–40°C with relative humidity not exceeding 80%.

SF441 Code Call Switch (Figure 34)—The SF441 allows patients and staff members to initiate high priority “code” calls. The device incorporates a supervisory circuit to monitor the wiring connection to the patient station, as well as a call-placed indicator. The device is activated by pulling down the blue lever. Call type placed is determined by the jumper setting. Locate the SF441 for convenient operation in areas that require code call initiation, such as ICU/CCU areas. The environment for the SF441 is 10–40°C with relative humidity not exceeding 80%.

SF450/2 Presence Station (Figure 35)—The SF450/2 works in conjunction with the staff presence registration features of the nurse call system. It allows staff to register their presence with a simple button press, and activates a similarly colored lamp on the associated corridor light. Pressing either presence button automatically transfers the nurse follower feature from room to room as nursing staff proceeds with rounds. SF450/2 Presence Stations have two color-coded switches associated with user defined staff levels (green—level 1, and amber—level 2). Locate the SF450/2 for staff convenience, typically within the associated room near its entrance. The environment for the SF450/2 is 10–40°C with relative humidity not exceeding 80%.

SF450/4 Presence Station (Figure 35)—The SF450/4 functions in the same manner as the SF450/2 but has four color-coded switches (red—staff emergency, green—staff level 1, amber—staff level 2, and yellow—staff level 3). Pressing the green, amber or yellow presence button automatically transfers the nurse follower feature from room to room as nursing staff proceeds with rounds. Pressing the red button initiates a staff emergency call that must be reset in person.



P5 Station Descriptions, Requirements & Locations

P5 Stations (General Information) (Figures 36–37)—All P5 devices have electronics that are mounted on a flame-retardant (UL® 94 HB) plastic panel. Nylon mounting screws are provided with all P5 stations to ensure compliance to the latest UL® 1069 requirements, which now include ESD testing. Users must observe ESD precautions when handling these devices as they may be damaged if improperly handled. Each of the P5 stations requires a unique address, which is set using on-board dip switches. (For addressing, see *System Installation—Equipment Configuration and Settings* section.) Plug-on connectors are provided for easy installation.

Up to eight switches can be connected to each P5 station. Connect one presence station (SF350B); one code station (SF341B); and one each emergency and bath stations (SF337C, SF339, SF340B). (See *Figure 37*). Two latching switches and two momentary switches for monitoring ancillary devices can also be connected—JK300A and JK300/2 Monitor Call Interfaces may be used. Latching and momentary switches place Monitor calls for all default station behaviors.

P5 stations use either the RACO 692 masonry backbox, or the Steel City #H3BD backbox with Steel City #3GC plaster ring. If either a PM421P5 or PM422P5 Pillow Speaker Module is installed, use the RACO 697 masonry backbox, or the Steel City #H3BD backbox with Steel City #3GC plaster ring. Conduit access for masonry boxes must be through the top. The minimum clearance from current-carrying parts to dead-metal parts must be no less than 0.5".

P5 stations are typically located for convenience—most commonly at the head of the patient’s bed, unless specified otherwise. Locate P5 stations so that station runs do not exceed 1000 total cable-feet per run; and so that furniture, curtains and other features do not interfere with audio communication. The operating environment for P5 stations is 10–40°C with relative humidity not exceeding 80%.

IR400P5 Multipurpose Stations (Figure 38)—The IR400P5 Multipurpose Station supports remote devices such as switches, contact closures, speakers and other signal originating devices. Practical applications for the IR400P5 include: an input for ICU code emergency call stations, a corridor paging amplifier interface, a control point for exit/entry doors and narcotics cabinets, an input for bath emergency call stations in public

Figure 36—P5 Station Connectors

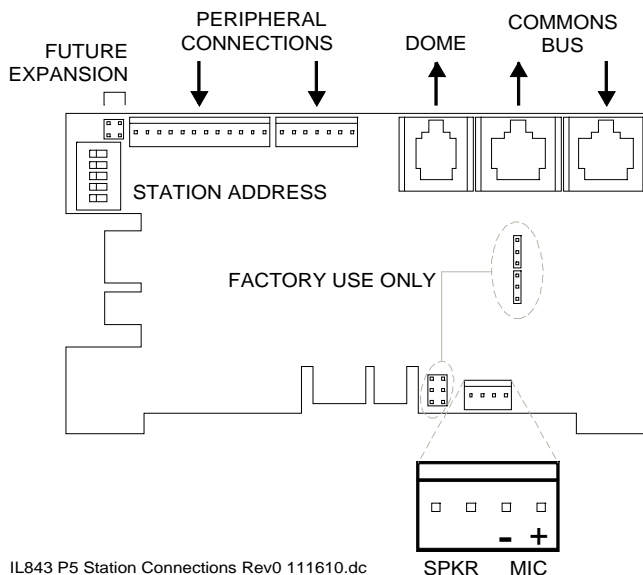
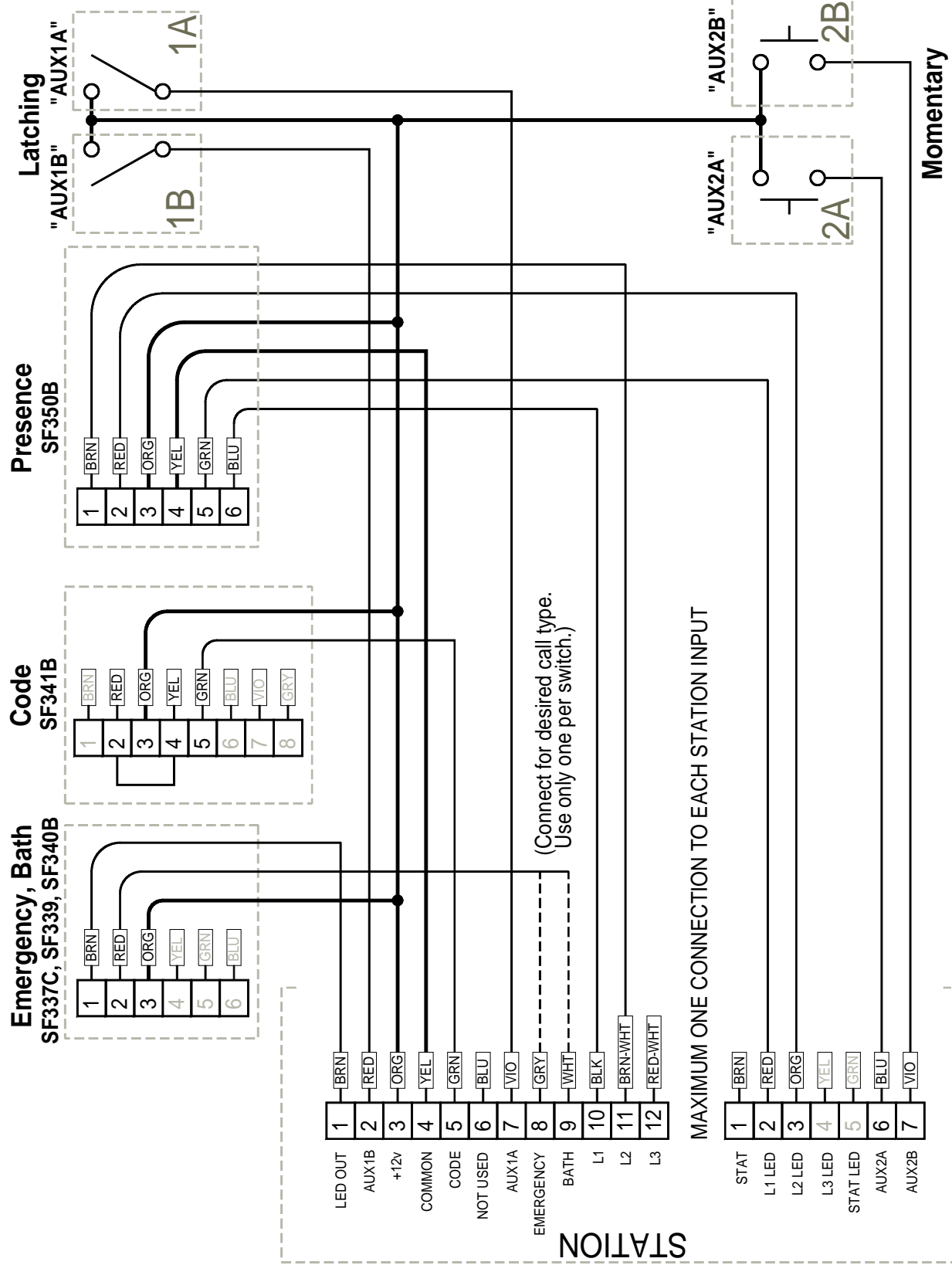


Figure 37—P5 Peripheral Connections



IL843 P5 Peripheral Connections 1 Rev2 120710.dc

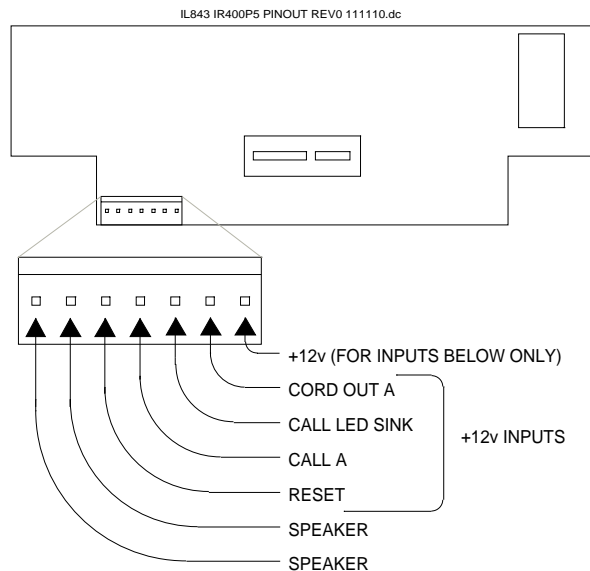
bath areas, or an access control input/output for a remote door intercom station. The IR400P5 may be connected directly to a 60 Ohm, 1 Watt speaker for paging. If connected to overhead paging, a transformer must be used. Always use grounded, shielded transformers to prevent current leakage to the nurse call system's isolated circuits. The IR400P5 provides the same peripheral inputs and corridor light indications as patient stations, but does not have the controls, LEDs or speakers associated with patient stations. For connections to the IR400P5 Multipurpose Station, see *Figure 38*.

IR019C Remote Speaker/Microphone Station—The IR019C is used in conjunction with the IR400P5 to provide a ceiling- or remote-mounted speaker/microphone. The IR019C is located where needed and mounts on a standard two-gang ring or backbox. The device must be located within 50 cable-feet of the associated IR400P5. The operating environment for the IR019C is 10–40°C with relative humidity not exceeding 80%.

IR411P5 Single, IR412P5 Dual Patient Stations—The IR411P5 and IR412P5 provide reliable hands-free communication between the patient and facility staff. The IR411P5 includes one DIN call cord jack, and the IR412P5 includes two DIN jacks. Call cord presence is supervised, and the system provides an indication when a cord has been removed and not replaced. To avoid a *cord out* call when removing a cord, hold down the **RESET** button until the yellow call light is illuminated; while continuing to depress the **RESET** button, remove the cord. The patient stations have indicators for call placement assurance and in-use status. A reset button is also provided to reset calls locally. These stations can interface with the PM421P5 or PM422P5 Pillow Speaker Modules.

PM421P5, PM422P5 Pillow Speaker Modules (Figure 39)—The PM421P5 (for IR411P5) and PM422P5 (for IR412P5) modules redirect the nurse call system audio from the patient station to the pillow speaker. SF41ZDL or SF41ZKL pillow speakers are required for this application. If the connected call cord or pillow speaker does not support this function, audio reverts to the patient station. The modules plug directly onto the back of patient stations and are subject to the same environmental requirements. The modules also enable SF41ZDL or SF41ZKL pillow speakers to activate control relays that can be linked via dry contacts to control room and reading lights. The control relays are brought out on two (bed A and bed B) 6-pin headers (see *Figure 39*). The operating environment for the module is 10–40°C with relative humidity not exceeding 80%. **NOTE: To avoid shorting out the station, do not hot swap P5 patient stations that have PM421P5 or PM422P5 Pillow Speaker Modules installed and are mounted to a metal box or frame.**

Figure 38—IR400P5 Pinout



IR410P5 Staff Station—The IR410P5 Staff Station provides a communication point for staff members to call the master station for staff to staff communication. A programmable call button, reset button, staff emergency button, call-placed indicator and in-use status indicator are provided.

IR415P5 Duty Station—The IR415P5 Duty Station is similar to the IR410P5 Staff Station, but provides the extra features of call annunciation and zone lamp operation. Duty stations provide additional points of annunciation for the nurse call system in locations that are not within sight or hearing of the master station. The IR415P5 includes a call button, reset button and call-placed light, plus code, emergency, staff and call lights.

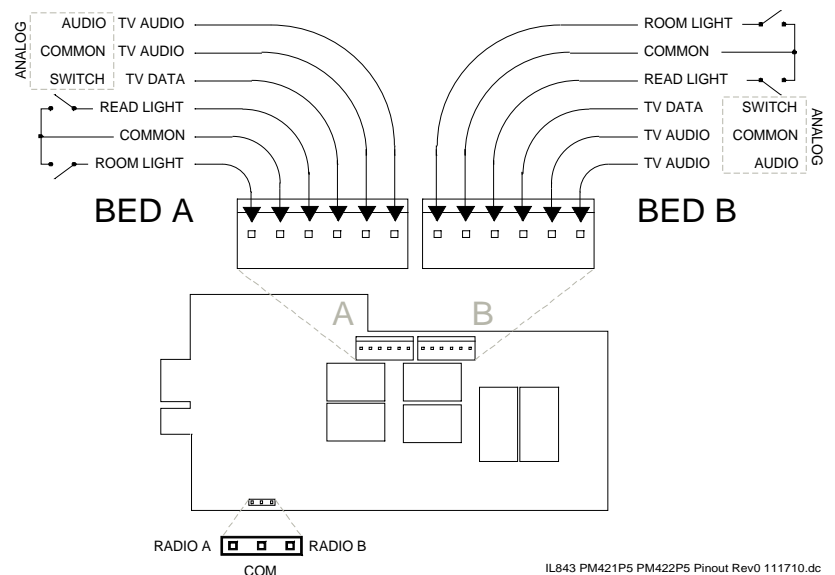
IR418P5 Resident Station—The IR418P5 Resident Station provides reliable hands-free communication between a facility’s residents and staff. It is designed primarily for use in retirement facilities. The IR418P5 includes a pull cord, a call-placed light and a reset button.

IR445P5 Resident Station with Check-In—The IR445P5 Resident Station provides reliable hands-free communication between a facility’s residents and staff. It is designed primarily for use in retirement facilities, and includes a check-in function to eliminate “up and about” checks. The IR445P5 includes a pull cord, a call button, two indicator lights and a combination reset/check-in button.

Call Cords and Pillow Speakers:

SF401A	Push button call cord, 7' cord, DIN plug, oxygen safe, waterproof
SF401A/10	Push button call cord, 10' cord, DIN plug, oxygen safe, waterproof
SF401A/15	Push button call cord, 15' cord, DIN plug, oxygen safe, waterproof
SF401A/20	Push button call cord, 20' cord, DIN plug, oxygen safe, waterproof
SF401G	Squeeze bulb call cord, 6' cord, DIN plug, oxygen safe, geriatric
SF41ZDL	Pillow speaker, DIN plug, intercom, and controls for lights, digital TV
SF41ZKL	Pillow speaker, DIN plug, intercom, and controls for lights, digital TV
SF401EX	Strain relief cable, 6", DIN plug and DIN jack

Figure 39—PM421P5, PM422P5 Pinout

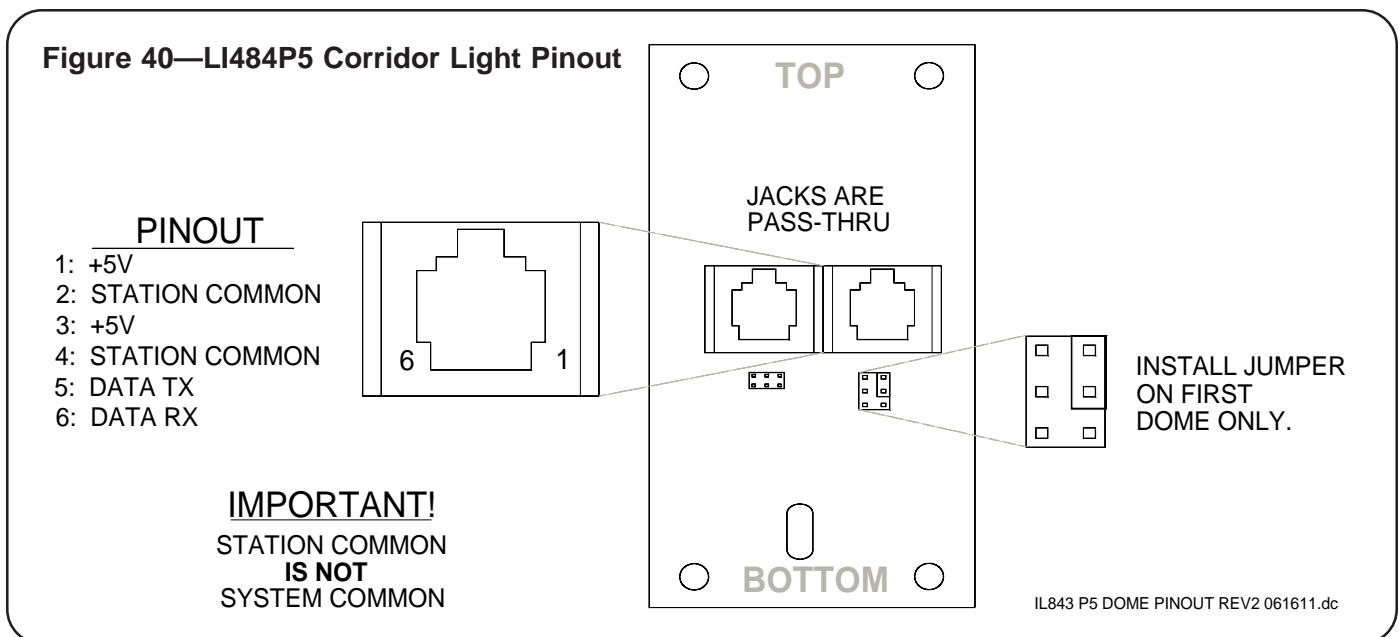


IL843 PM421P5 PM422P5 Pinout Rev0 111710.dc

Dome Lights for P5 Stations—Descriptions, Requirements & Locations

LI484P5 Corridor Lights (Figure 40)—LI484P5 corridor lights provide visual indication from P5-series stations and associated peripheral devices. Four multicolored LEDs can each be programmed to display any color, allowing the LI484P5 to indicate all system call types with various flash rates and color combinations. Up to two LI484P5 corridor lights may be connected to each P5-series station; both connected corridor lights display calls using the same flash rate and color combinations. When connected to an IR415P5 Duty Station, the corridor light functions as a zone light; when used with a PM484ZP5 Zone Light Module, the corridor light functions as an addressable standalone zone light. LI484P5 lights use a standard single- or dual-gang ring; refer to *Figure 25* for mounting. The minimum clearance from current-carrying parts to dead-metal parts must be no less than 0.5". Locate the corridor light above or beside the doorway of its associated room, and mount it so that unobstructed visibility is provided. When used as zone lights, mount them at corridor heads or junctions so that facility staff can readily identify the associated zone area. Standalone LI484P5/PM484ZP5 zone lights connect to the P5 station bus; other LI484P5 corridor and zone lights must be within 50 cable-feet of their associated P5 stations. The operating environment is 10–40°C with relative humidity not exceeding 80%. See *Wiring Installation* section for additional details.

PM484ZP5 Zone Light Modules for LI484P5 (Figure 41)—Adding a PM484ZP5 plug-on module to an LI484P5 corridor light converts the LI484P5 to an addressable standalone zone light on the P5 station bus. Each zone light requires a unique address, which is set using on-board dip switches. (For addressing, see *System Installation—Equipment Configuration and Settings* section.) The PM484ZP5 module also includes inputs for one bath switch and one code switch. When used as a standalone switch, program the zone light to watch no zones. See *Wiring Installation* section for additional details.



Peripherals for P5 Stations—Descriptions, Requirements & Locations

SF300-series Peripheral Devices for P5 stations (General Information)—The SF300-series peripheral devices' electronics are mounted on flame-retardant (UL® 94V-0) faceplates. Mount each SF300-series device within 50 cable-feet of the P5 station to which it will be connected. One SF350B staff presence switch may be connected to each P5 station. Up to three switches may be connected to each P5 station, using the emergency, bath and code inputs (see *Figure 37*). Use SF337C, SF339, SF340B or SF341B switches for these inputs. SF300-series devices are mounted on single-gang rings or boxes; minimum ring opening not to be less than 1.75"×2.75". Nylon mounting screws are provided with all SF300-series peripheral devices to ensure compliance to the latest UL® 1069 requirements, which now includes ESD testing. The minimum clearance from current-carrying parts to dead-metal parts is no less than 0.5". Plug-on connectors are provided for easy installation.

SF337C Emergency Shower Switch—The SF337C allows patients to initiate a bath or emergency call to inform staff members that they require assistance in restroom areas. The device is designed to be mounted in wet areas, when properly installed using the included gaskets for the panel and screws. The device can be activated by hand with the red pull down lever, or by pull-cord (if installed). It includes a call-placed indicator.

This device is typically located in toilet, bath and shower areas, and is mounted at a height convenient for use. If the device is being mounted to a tile wall or other irregular surface, the installer must provide extra sealant to fill tile seam points or other gaps. If the device is being used with pull-cord activation, the included cord must be installed through the guide tab and red pull-down lever and secured with a double knot. Mounting location and cord length must be such that a prone patient can reach the call cord to activate the device. The operating environment for the SF337C is 10–40°C, and the device is water resistant when correctly installed.

SF339 Mushroom-style Pushbutton Emergency Switch—The SF339 includes a locking mushroom-style switch, and is for use in any location where activation of an emergency or bath call is required. The device is designed to be mounted at a height and location in which a staff can easily activate the large mushroom style button using an elbow, shoulder, etc., when using the hands is inconvenient or inappropriate. The operating environment for the SF339 is 10–40°C with relative humidity not exceeding 80%.

SF340B Emergency Switch—The SF340B provides the same operational functionality as the SF337C, except that it is not suitable for moist or wet environments. It places an emergency or bath call. The operating environment for the SF340B is 10–40°C with relative humidity not exceeding 80%.

SF341B Code Call Switch—The SF441 allows patients and staff members to initiate high priority code calls. The device incorporates a supervisory circuit to monitor the wiring connection to the patient station, as well as a call-placed indicator. The device is activated by pulling down the blue lever. Locate the SF341B for convenient operation in areas that require code call initiation, such as ICU/CCU areas. The environment for the SF341B is 10–40°C with relative humidity not exceeding 80%.

SF350B Presence Station—The SF350B works in conjunction with the staff presence registration features of the nurse call system. It allows staff to register their presence with a simple button press, and activates a similarly colored lamp on the associated corridor light. Pressing either presence button automatically transfers the nurse follower feature from room to room as nursing staff proceeds with rounds. SF350B Presence Stations have two color-coded switches associated with user defined staff levels (green/nurse=level 1, and amber/aide=level 2). Locate the SF350B for staff convenience, typically within the associated room near its entrance. The environment for the SF350B is 10–40°C with relative humidity not exceeding 80%.

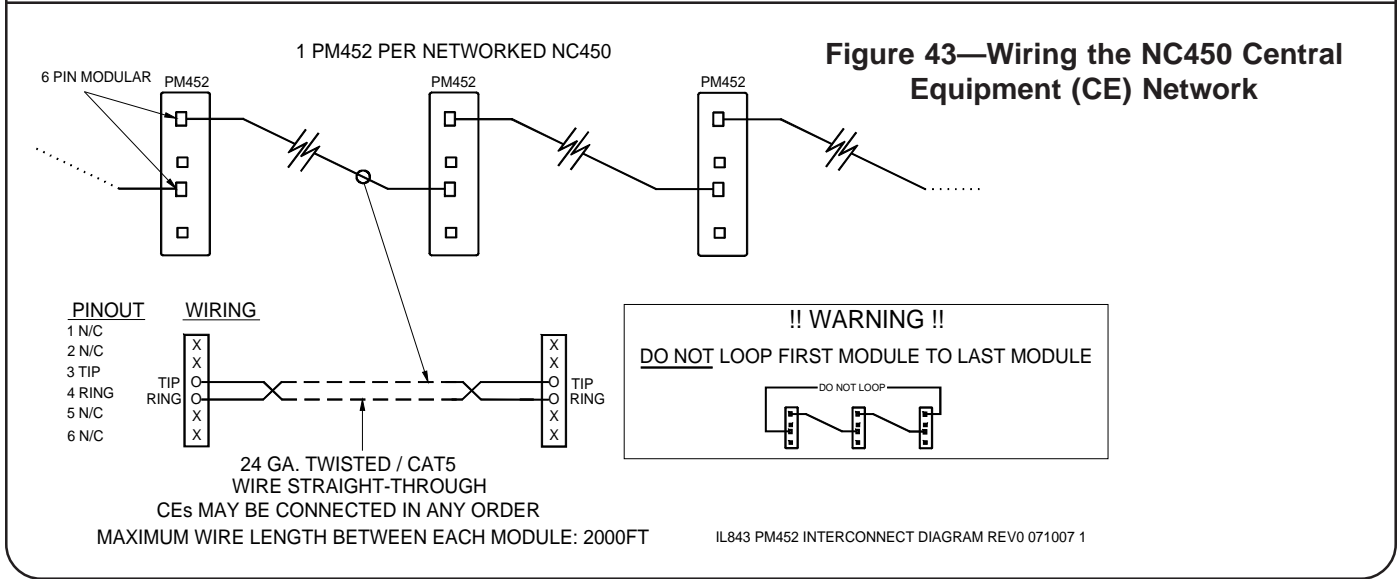
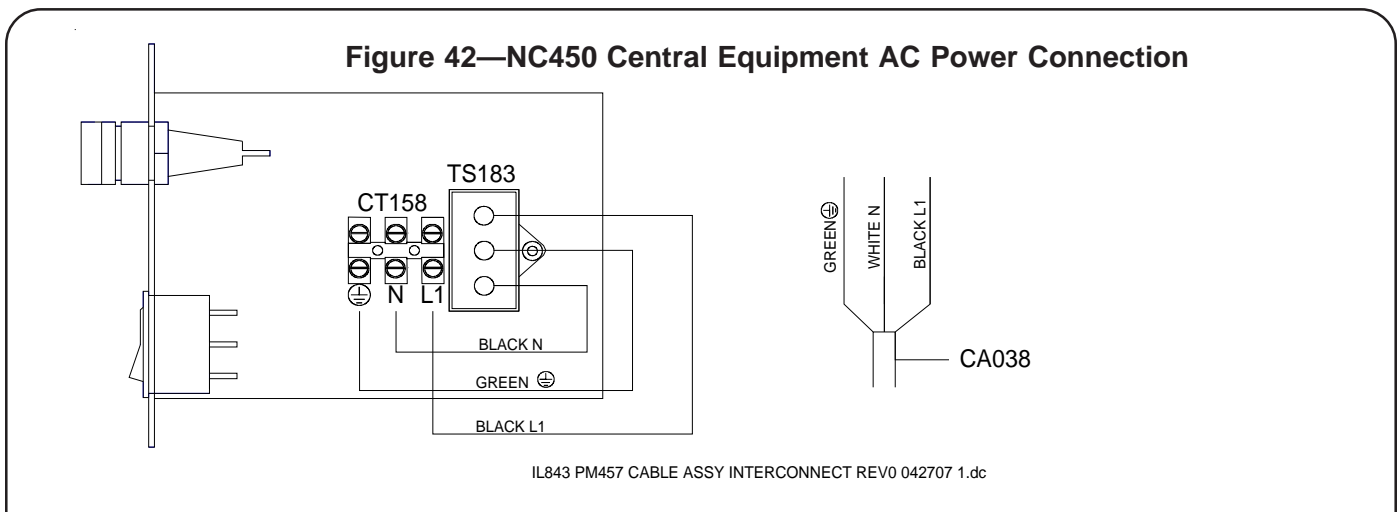
Wiring Installation

The following is a list of important wiring installation items critical to a successful installation. Use crimp-style connectors for all wire connections. Do not use wire nuts.

Cabling for master station ports, patient station ports and serial ports is described separately, including the connection specifics (see *Figures 42–49*).

Central Equipment (CE) Networks—Up to 15 CEs may be networked together. Each networked CE requires a PM452 CE Communications Module and is connected to the next CE by a maximum of 2000' of #24 AWG twisted pair (Cat5 is acceptable). See *Figure 43* for complete wiring information.

Master Station Ports (PM453 Master & Station Module, PM455 P5 Master & Station Module, PM456 NC300/II Head End Module)—Each supports one master station and a maximum of 1000' of interconnecting cable. Master stations must be home run to the central equipment. The following is the wiring specification of the interconnecting cable to master stations. **Note: Before connecting or disconnecting master station power leads, either pull out the Removable Power Block on the PM453, PM455 or PM456, or turn off the module's power switch.**



Master Runs—#18–#24 AWG, 4 twisted pairs (Cat5 is acceptable) and 8P8C modular connectors, plus 1 pair for power/common (see table below for gauge). Wire using the T568B straight-through Ethernet cable pinout (see *Figure 48a*.)

Power/Common Cable Length	Power/Common Cable Gauge
0' – 600'	#16 AWG
601' – 1000'	#14 AWG

Patient Station Ports on PM453 Master & Station Modules—Each PM453 patient station port supports up to 16 addressable stations and zone lights, plus 16 non-addressable corridor lights, and a maximum of 1000' of interconnecting cable. This maximum distance does not include peripheral wiring connections, and only reflects the common wiring between all of the addressable stations on that particular port and their associated connection to the central equipment. The common wiring used by the PM453 is the same type as specified above for the master station connection. **Note: Before connecting or disconnecting addressable station power leads, either pull out the *Removable Power Block* on the PM453 or turn off the module's power switch.**

PM453 Commons Bus—#18–#24 AWG, 3 twisted pairs (Cat5 is acceptable) and 6P6C modular connectors, plus 1 pair for power/common (see table below for gauge). Cables are wired straight-through: 1-1, 2-2, 3-3, 4-4, etc. Wire the 6P6C connectors with one twisted pair each to pins 1&2, 3&4 and 5&6.

Power/Common Cable Length	Power/Common Cable Gauge
0' – 600'	#18 AWG
601' – 1000'	#16 AWG

The following must be observed for addressable station wiring:

- Each cable run must have no more than 16 addressable devices. Multiple runs to a single port are allowed, as long as the total cable length connected to the port does not exceed 1000'.
- Do not run cables to the bottom of the addressable station backboxes, because there is no access for cable passage.
- Each patient station port has just one audio path. If a system is known to have a small number of stations that will occupy only one or two ports, the installer should consider redistributing the devices evenly among all of the available station ports. This makes all of the audio paths available for use in system operation, allowing more simultaneous paths, and increasing call response efficiency.

PM453 Dome Bus—#18–#24 AWG, 8 conductors (Cat5 is acceptable) and 8P8C modular connectors, plus 1 pair for power/common (see table below for gauge). Cables are wired straight-through: 1-1, 2-2, 3-3, 4-4, etc. Maximum cable length from patient station to LI48x-series corridor light is 50'. Wire using the T568B straight-through Ethernet cable pinout (see *Figure 48a*.) (Also acceptable: wire one twisted pair each to pins 1&2, 3&4, 5&6 and 7&8.)

Power/Common Cable Length	Power/Common Cable Gauge
0' – 600'	#18 AWG
601' – 1000'	#16 AWG

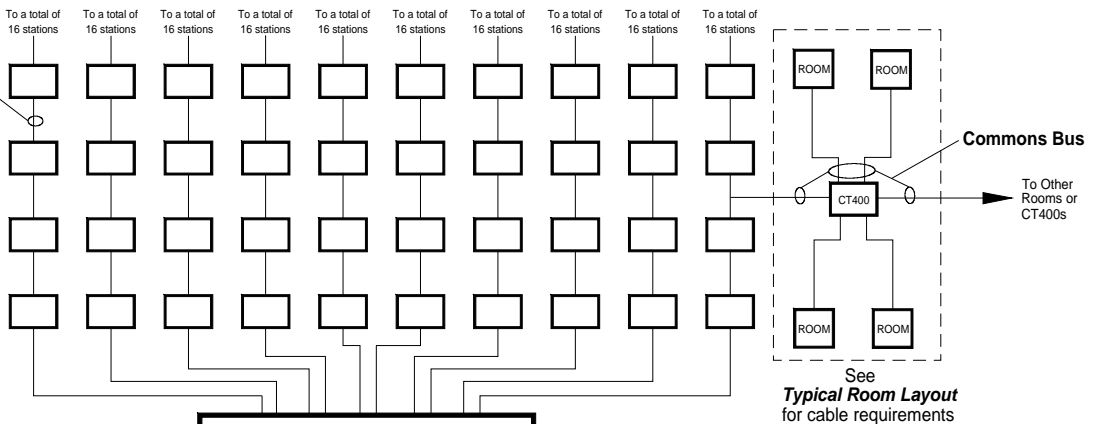
CT400 Trunkline Splitters accommodate 6-pin modular plugs. Therefore, when using a CT400 between the patient station and corridor light, connect pins 1–6 only and clip conductors 7–8. **Note: When using CT400 Trunkline Splitters, supervision of corridor lights is not available.**

Figure 44—Block Wiring Diagram for PM453 Modules & IR400-series Stations

Commons Bus:

3 twisted pairs, #18 to #24 (Cat 5 acceptable) plus power/common (0-600' use #18; 601-1000' use #16).
Total wire length cannot exceed 1000'.
Wire one twisted pair each to pins 1&2, 3&4 and 5&6.

NOTE: 32 Stations Per PM453 (16 Stations Per Port)



2000' Max. #24 Twisted Pair, Cat 5 acceptable
From Other CE Units → CE Network

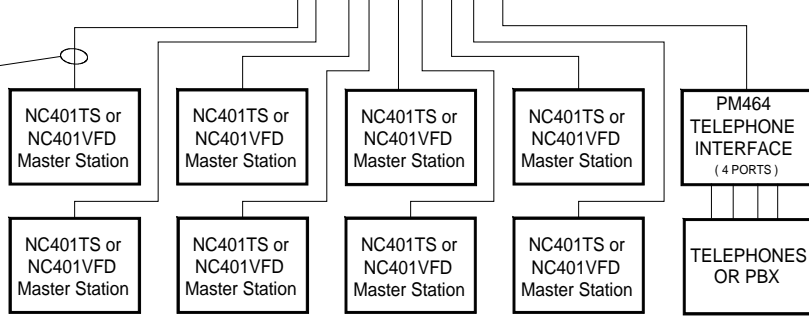
NC450
Central Equipment (CE)

MAXIMUMS
5 PM453 Per NC450
20 PM453 Per Installation
15 NC450 Per Installation

2000' Max. #24 Twisted Pair, Cat 5 acceptable
CE Network → To Other CE units

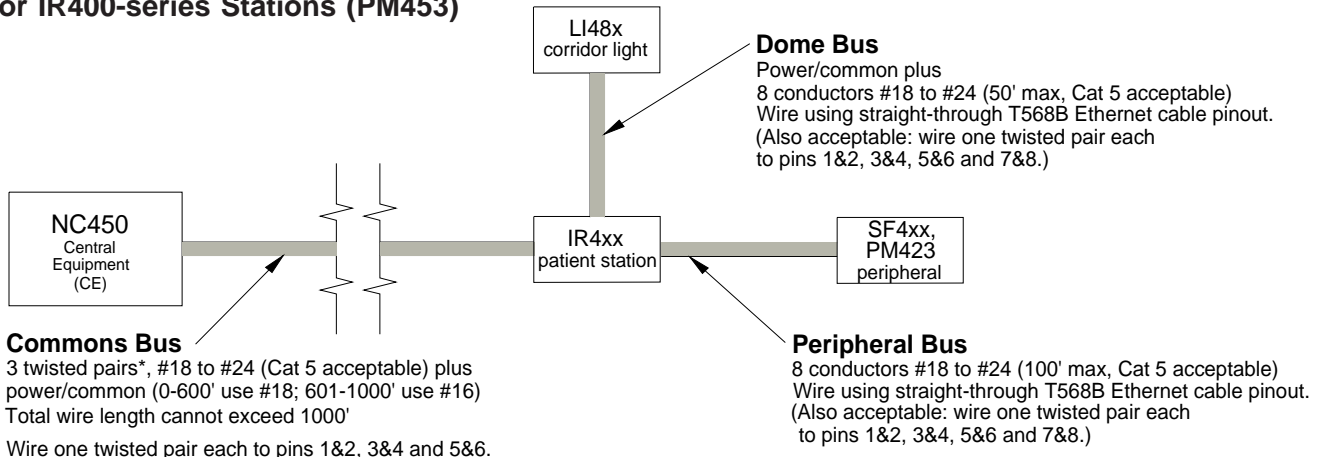
Master Runs:

4 twisted pairs #18 to #24 (Cat 5 acceptable) plus power/common (0-600' use #16; 601-1000' use #14).
Total wire length cannot exceed 1000'.
Wire using straight-through T568B Ethernet cable pinout.



NOTE: 2 Masters Per PM453 (1 Master Per Port)

Figure 45—Typical Room Layout for IR400-series Stations (PM453)



Commons Bus
3 twisted pairs*, #18 to #24 (Cat 5 acceptable) plus power/common (0-600' use #18; 601-1000' use #16)
Total wire length cannot exceed 1000'

* Wire one twisted pair each to pins 1&2, 3&4 and 5&6.

Dome Bus
Power/common plus 8 conductors #18 to #24 (50' max, Cat 5 acceptable)
Wire using straight-through T568B Ethernet cable pinout. (Also acceptable: wire one twisted pair each to pins 1&2, 3&4, 5&6 and 7&8.)

Peripheral Bus
8 conductors #18 to #24 (100' max, Cat 5 acceptable)
Wire using straight-through T568B Ethernet cable pinout. (Also acceptable: wire one twisted pair each to pins 1&2, 3&4, 5&6 and 7&8.)

IL843 Typical Room Layout Rev9 062811

Figure 46—Two Stations, One Corridor Light Layout for IR400-series Stations (PM453)

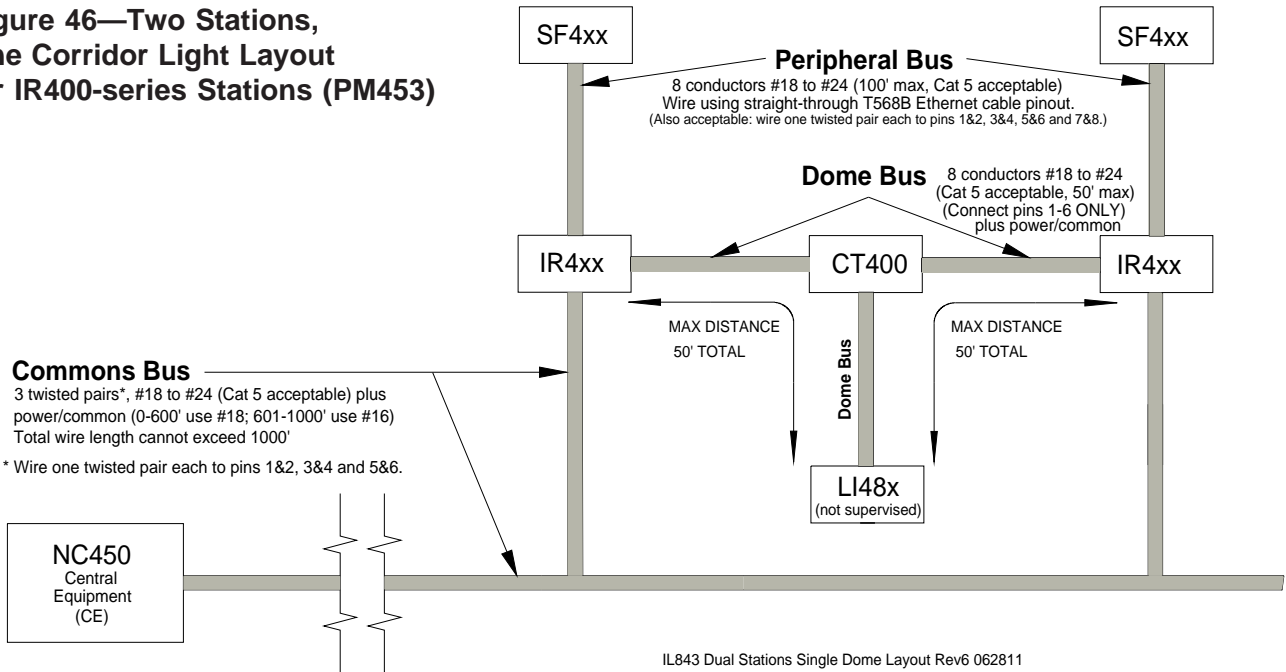


Figure 47—One Station, Two Corridor Lights Layout for IR400-series Stations (PM453)

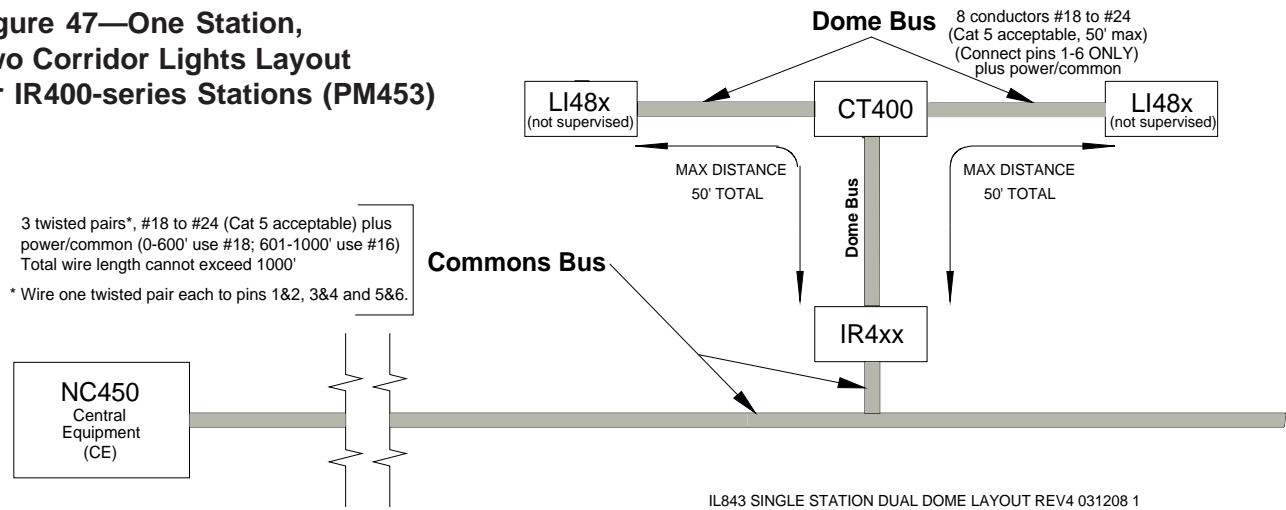
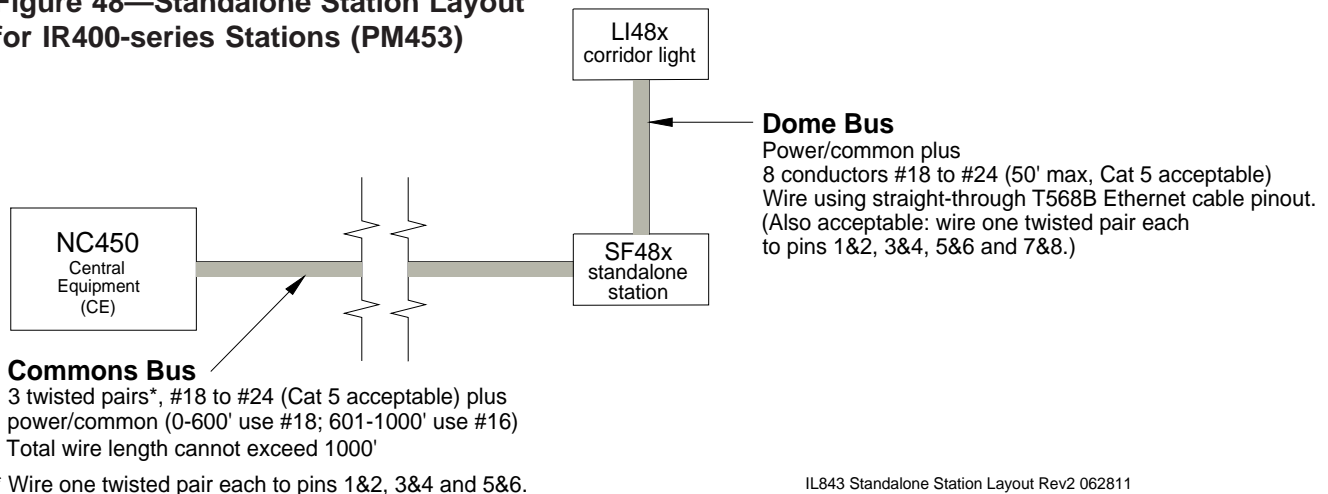


Figure 48—Standalone Station Layout for IR400-series Stations (PM453)



PM453 Peripheral Bus—#18–#24 AWG, 8 conductors (Cat5 is acceptable) and 8P8C modular connectors. Cables are wired straight-through: 1-1, 2-2, 3-3, 4-4, etc. Maximum cable length from patient station to peripheral is 100'. Wire using the T568B straight-through Ethernet cable pinout (see *Figure 48a.*) (Also acceptable: wire one twisted pair each to pins 1&2, 3&4, 5&6 and 7&8.)

Patient Station Ports on PM455 P5 Master & Station Modules—The PM455 has two patient station ports, consisting of two jacks each. Each jack supports up to 16 addressable stations and zone lights, plus 16 non-addressable corridor lights, and a maximum of 1000' of interconnecting cable. This maximum distance does not include peripheral wiring connections, and only reflects the common wiring between all of the addressable stations on that particular jack and their connection to the central equipment.

PM455 P5 Commons Bus—Cat5 cable and 8P8C modular connectors. Cables are wired straight-through: 1-1, 2-2, 3-3, 4-4, etc. Wire using the T568B straight-through Ethernet cable pinout (see *Figure 48a.*) (Also acceptable: wire one twisted pair each to pins 1&2, 3&4, 5&6 and 7&8.) The data conductors, 7 and 8, must be a twisted pair. Insert an EOL termination plug in the unused commons bus jack of the furthest station on each run. (Four EOL termination plugs are included with each PM455.)

The following must be observed for addressable station wiring:

- Each cable run must have no more than 16 addressable devices. Plug only one cable run into each jack. The total cable length connected to each jack must not exceed 1000'.
- Do not run cables to the bottom of the addressable station backboxes, because there is no access for cable passage. Conduit access for masonry boxes must be through the top.
- Each patient station port has just one audio path. If a system is known to have a small number of stations that will occupy only one or two ports, the installer should consider redistributing the devices evenly among all of the available station ports. This makes all of the audio paths available for use in system operation, allowing more simultaneous paths, and increasing call response efficiency.

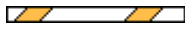

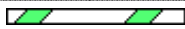

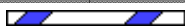



PM455 Dome Bus—Cat5 cable and 6P6C modular connectors. Cables are wired straight-through: 1-1, 2-2, 3-3, 4-4, etc. Wire one twisted pair each to pins 1&2, 3&4 and 5&6. Standalone LI484P5/PM484ZP5 zone lights connect to the P5 station bus; other LI484P5 corridor and zone lights must be within 50 cable-feet of their associated P5 stations. Up to two LI484P5 corridor lights may be connected to each P5-series station.

PM455 Peripheral Wiring—#22 AWG, number of conductors varies (see below). Maximum cable length from patient station to peripheral is 50'. Maximum one staff presence, three switches (emergency, code and bath) and four auxiliary switches per addressable station (one per input). See *Figure 37* for wiring specifics.

Conductors	Switch type
2	SF341B Code Switch, Auxiliary switches
3	SF337C, SF339, SF340B Emergency & Bath switches
6	SF350B Staff Presence

Patient Station Ports on PM456 NC300/II Head End Modules—Each PM456 patient station port supports up to 32 addressable stations, plus up to 32 corridor/dome lights, with a maximum of 16 corridor/dome lights per power run. See the *IL715 Tek-CARE®NC300II manual* for wiring specifications of the interconnecting cable for the PM456 patient station ports.

Figure 48a—T568B Straight-Through Ethernet Cable Pinout

8P8C Pin #	Wire Color (T568B)
1	White/Orange 
2	Orange 
3	White/Green 
4	Blue 
5	White/Blue 
6	Green 
7	White/Brown 
8	Brown 

Used for all Tek-CARE®400 8P8C wiring:

- PM453, PM455 & PM456 Master Runs
- PM453 Dome Bus
- PM453 Peripheral Bus
- PM455 P5 Commons Bus

Figure 49—Block Wiring Diagram for PM455 Modules & P5 Stations

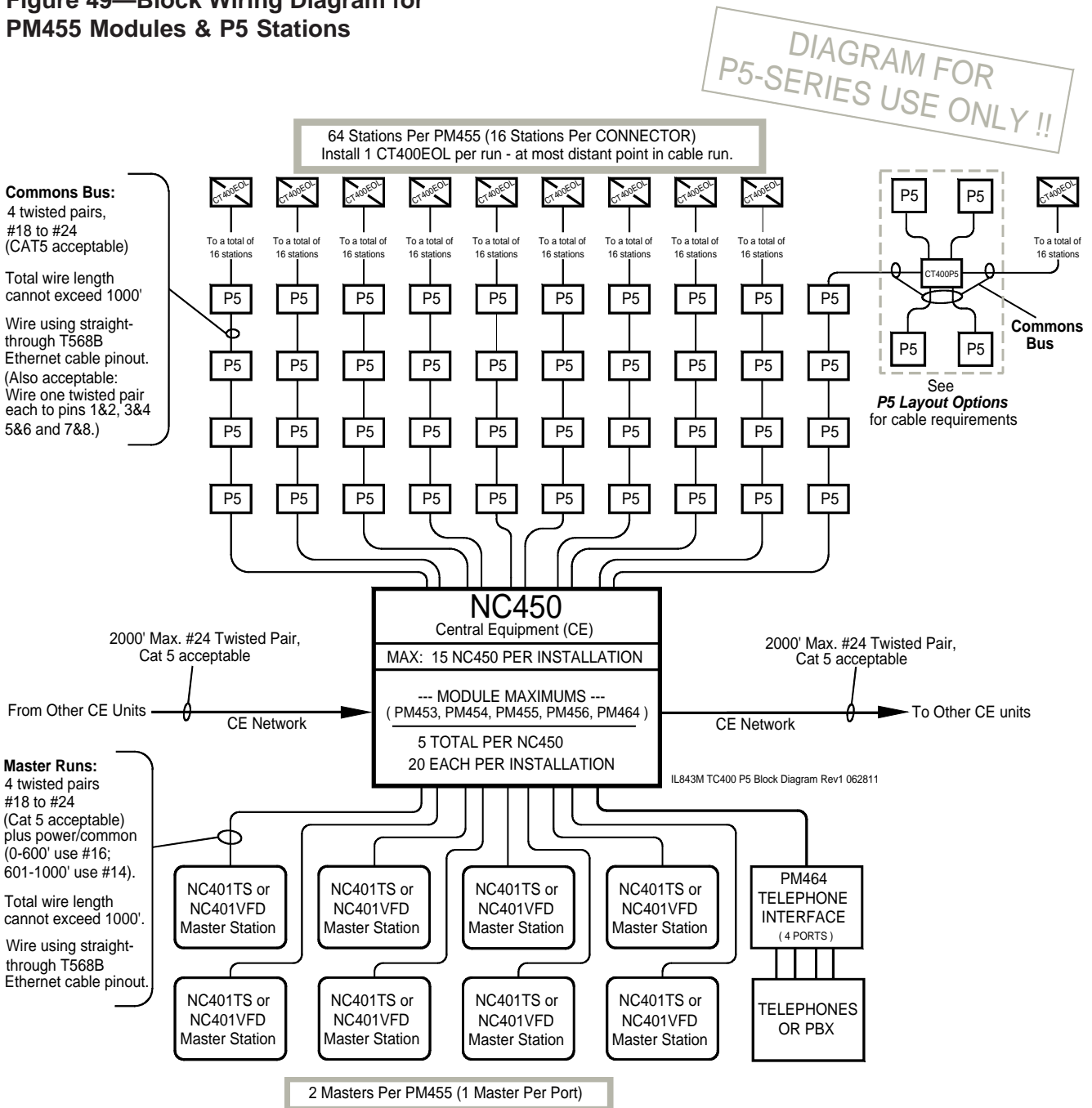
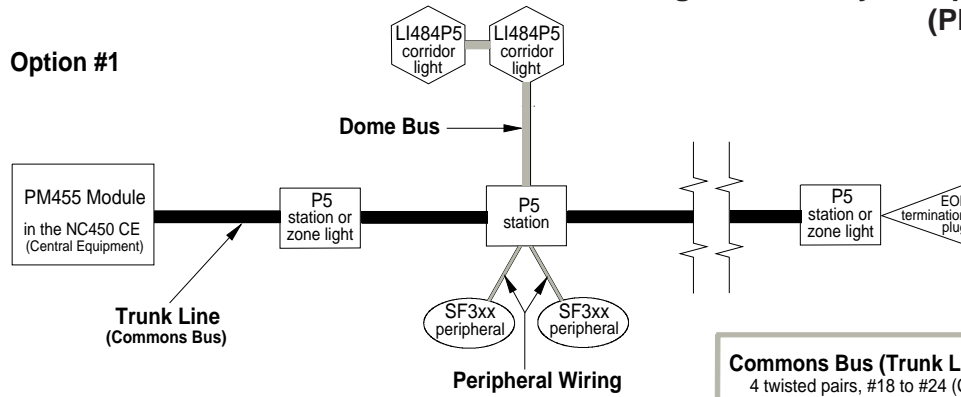


Figure 49a—Layout Options for P5 Station Runs (PM455)

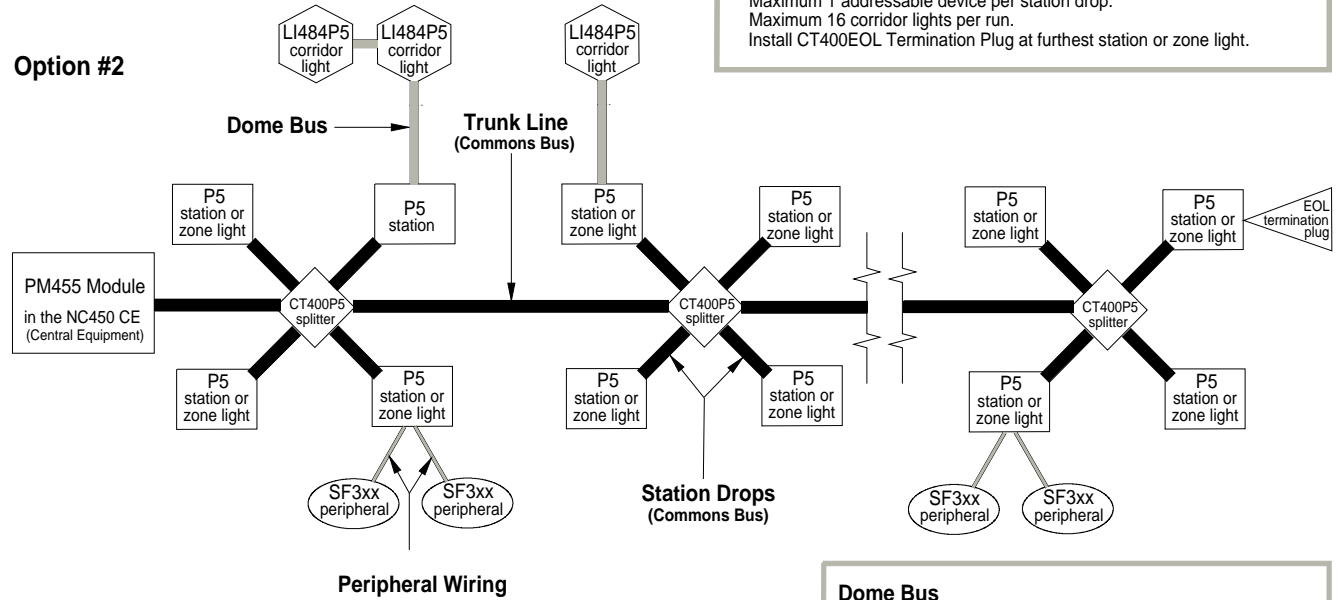
Option #1



Commons Bus (Trunk Line + Station Drops)

4 twisted pairs, #18 to #24 (Cat 5 acceptable)
 Wire using straight-through T568B Ethernet cable pinout.
 (Also acceptable: wire one twisted pair each to pins 1&2, 3&4, 5&6 and 7&8.)
 Maximum 1000' total wire for trunk line plus all station drops.
 Maximum 16 addressable devices (stations & zone lights) per run.
 Maximum 1 addressable device per station drop.
 Maximum 16 corridor lights per run.
 Install CT400EOL Termination Plug at furthest station or zone light.

Option #2



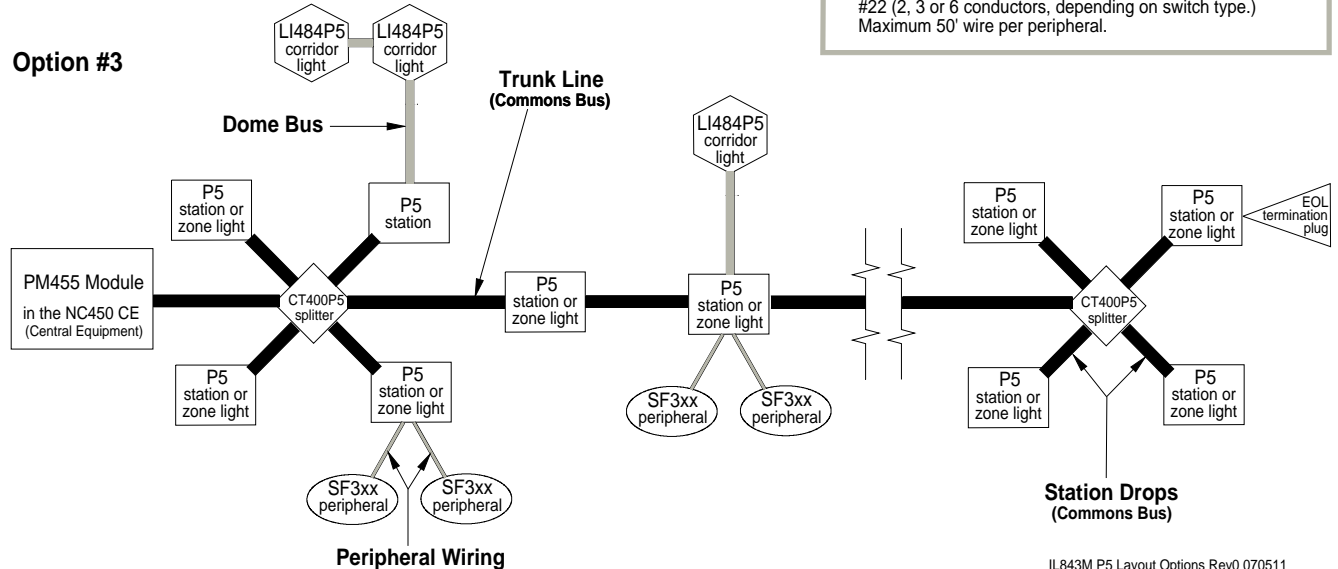
Dome Bus

6 conductors #18 to #24 (Cat 5 acceptable)
 Wire one twisted pair each to pins 1&2, 3&4 and 5&6.
 Maximum 2 dome lights per station, maximum 50' total wire.

Peripheral Wiring

#22 (2, 3 or 6 conductors, depending on switch type.)
 Maximum 50' wire per peripheral.

Option #3



IL843M P5 Layout Options Rev0 070511

Equipment Configuration and Settings

Central Equipment (CE) (Figure 50)—The CE is configured through software. Each CE has a dip switch that must be set prior to use. This dip switch sets the CE number (1–15). Each CE address must be unique if multiple CE cabinets are interconnected. The dip switch functions are as follows:

Switch#	Function
1	CE address bit #0
2	CE address bit #1
3	CE address bit #2
4	CE address bit #3
5	Resets to factory default settings upon CE power-up.
6	Disables module fault alarm.
7	Boots up standalone (without network).

PM451, PM452, PM453, PM454, PM455, PM456, PM464 Modules—The module number is based on CE number and module position within the CE. The left-most module in a CE has the lowest module number, and the module numbers increase in value from left to right. Use the following table to determine a station’s module number.

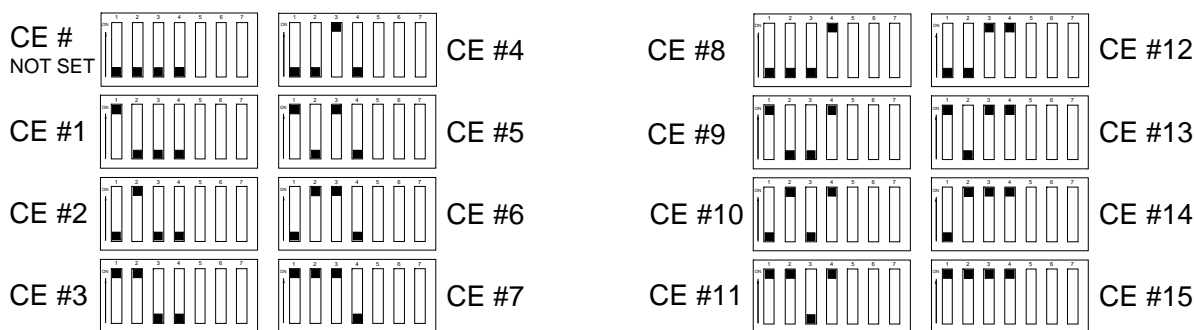
CE#	Module numbers	CE#	Module numbers
1	01–05	9	41–45
2	06–10	10	46–50
3	11–15	11	51–55
4	16–20	12	56–60
5	21–25	13	61–65
6	26–30	14	66–70
7	31–35	15	71–75
8	36–40		

Master Station—The master station’s 4-digit address is configured automatically upon port connection, as follows:

- The first two digits are the module number of the PM453 Master & Station Module, PM455 P5 Master & Station Module, or PM456 NC300/II Head End Module,
- The third digit is an “M” (for master),
- The fourth digit is the PM453, PM455 or PM45 master station port number—“1” for the bottom port; “2” for the top port.

If the master station is being connected to a port previously configured with another master station, the previous master’s configuration will be automatically transferred into the new unit.

Figure 50—NC450 Central Equipment Dip Switch Addresses



NOTE: Dipswitches 5-7 (not shown) used for other functions.

IL843 NC450 DIPSWITCHES REV2 011711

IR400-series & SF480-series Stations; LI484Z, LI486Z & LI484ZLED Zone Lights—

Each station and zone light must have a unique 4-digit address, which is its default room number. The first two digits are the module number of the PM453 Master & Station Module; the last two digits are its station number (00–31).

The station number is based on station dip switch settings and PM453 port number. A station's 4-switch dip switch uses a binary configuration method (dip switch 1=1, dip switch 2=2, dip switch 3=4, dip switch 4=8). See *Figure 51* for the table of dip switch addresses. See *Figure 66* for the programming worksheet.

The station number for a station on port 1 (bottom port) of a module is the sum of the values of all switches that are turned on. For example, if switches 2 (value 2) and 4 (value 8) are turned on, the station number is 10 (2+8=10). If that station is on module #3 of CE #1, its unique address is 0310.

The station number for a station on port 2 (top port) of a module is 16 plus the sum of the values of all switches that are turned on. For example, if switches 2 (value 2) and 4 (value 8) are turned on, the station number is 26 (16+2+8=26). If that station is on module #3 of CE #1, its unique address is 0326.

P5 Stations—Each station must have a unique 4-digit address, which is its default room number. The first two digits are the module number of the PM455 P5 Master & Station Module; the last two digits are its station number (00–63).

The station number is based on station dip switch settings and PM455 port number. The station's 5-switch dip switch uses a binary configuration method (dip switch 1=1, dip switch 2=2, dip switch 3=4, dip switch 4=8, dip switch 5=16). See *Figure 52* for the table of dip switch addresses. See *Figure 67* for the programming worksheet.

The station number for a station on port 1 (bottom two jacks) of a module is the sum of the values of all switches that are turned on. For example, if switches 2 (value 2) and 5 (value 16) are turned on, the station number is 18 (2+16=18). If that station is on module #3 of CE #1, its unique address is 0318.

The station number for a station on port 2 (top two jacks) of a module is 32 plus the sum of the values of all switches that are turned on. For example, if switches 2 (value 2) and 5 (value 16) are turned on, the station number is 50 (32+2+16=50). If that station is on module #3 of CE #1, its unique address is 0350.

NC300, NC300II and HC345 Stations—Each station must have a unique 4-digit address, which is its default room number. The first two digits are the module number of the PM456 NC300/II Head End Module; the last two digits are its station number (00–63).

The station number is based on station dip switch settings and PM456 port number. The station's first 5 dip switches (of the 7 available), use a binary configuration method (dip switch 1=1, dip switch 2=2, dip switch 3=4, dip switch 4=8, dip switch 5=16). See *Figure 52* for the table of dip switch addresses. See *Figure 67* for the programming worksheet.

The station number for a station on port 1 (left port) of a module is the sum of the values of all switches that are turned on. For example, if switches 2 (value 2) and 5 (value 16) are turned on, the station number is 18 (2+16=18). If that station is on module #3 of CE #1, its unique address is 0318.

The station number for a station on port 2 (right port) of a module is 32 plus the sum of the values of all switches that are turned on. For example, if switches 2 (value 2) and 5 (value 16) are turned on, the station number is 50 (32+2+16=50). If that station is on module #3 of CE #1, its unique address is 0350.

**Figure 51—Dip Switch Addresses for IR400-series & SF480-series Stations;
LI484Z, LI486Z & LI484ZLED Zone Lights**

Dip Switch # (value)				1st Port	2nd Port
1 (1)	2 (2)	3 (4)	4 (8)	Station #	Station #
-	-	-	-	00	16
ON	-	-	-	01	17
-	ON	-	-	02	18
ON	ON	-	-	03	19
-	-	ON	-	04	20
ON	-	ON	-	05	21
-	ON	ON	-	06	22
ON	ON	ON	-	07	23
-	-	-	ON	08	24
ON	-	-	ON	09	25
-	ON	-	ON	10	26
ON	ON	-	ON	11	27
-	-	ON	ON	12	28
ON	-	ON	ON	13	29
-	ON	ON	ON	14	30
ON	ON	ON	ON	15	31

Figure 52—Dip Switch Addresses for P5, NC300, NC300II & HC345 Stations

Dip Switch # (value)					1st Port	2nd Port
1 (1)	2 (2)	3 (4)	4 (8)	5(16)	Station #	Station #
-	-	-	-	-	00	32
ON	-	-	-	-	01	33
-	ON	-	-	-	02	34
ON	ON	-	-	-	03	35
-	-	ON	-	-	04	36
ON	-	ON	-	-	05	37
-	ON	ON	-	-	06	38
ON	ON	ON	-	-	07	39
-	-	-	ON	-	08	40
ON	-	-	ON	-	09	41
-	ON	-	ON	-	10	42
ON	ON	-	ON	-	11	43
-	-	ON	ON	-	12	44
ON	-	ON	ON	-	13	45
-	ON	ON	ON	-	14	46
ON	ON	ON	ON	-	15	47
-	-	-	-	ON	16	48
ON	-	-	-	ON	17	49
-	ON	-	-	ON	18	50
ON	ON	-	-	ON	19	51
-	-	ON	-	ON	20	52
ON	-	ON	-	ON	21	53
-	ON	ON	-	ON	22	54
ON	ON	ON	-	ON	23	55
-	-	-	ON	ON	24	56
ON	-	-	ON	ON	25	57
-	ON	-	ON	ON	26	58
ON	ON	-	ON	ON	27	59
-	-	ON	ON	ON	28	60
ON	-	ON	ON	ON	29	61
-	ON	ON	ON	ON	30	62
ON	ON	ON	ON	ON	31	63

IR415 Duty Station—In addition to the dip switch address settings, the IR415 also has a tone control adjustment (via a three-pin header) to set annunciation tone levels. Refer to *Figure 24* for header settings.

Installing the RF (Pocket) Paging System

Connect NC365A, NC365AT or NC369 Tek-PAGING™ Transmitter/Control Unit to the PM454 Pager Module using the null modem cable that is included with the paging transmitter. Follow the instructions in its manual to locate and set up the paging transmitter. Refer to *Figure 53* for null modem cable configuration.

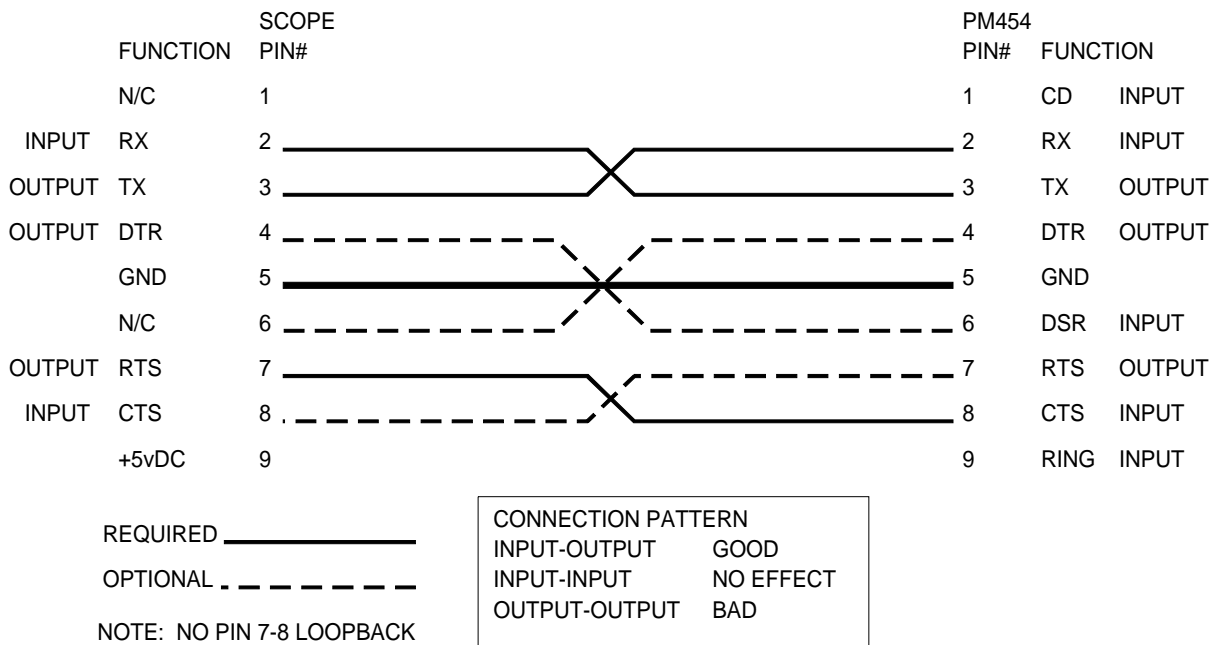
Note: The connection between the PM454 and the transmitter/control unit is not supervised. Therefore, no fault will be displayed if the transmitter/control unit is disconnected from the PM454 Pager Module.

Using the *Pagers* tab of the LS450 Config Tool, use these protocol settings for the paging transmitter:

	<u>NC365A/AT</u>	<u>NC369</u>
Base Type	Scope	Scope
CAP Base	10000	10000
Scope Baud	Fast	Normal

Using the *Pagers* tab of the LS450 Config Tool, add pager CAP codes. Using the *Staff Assignments* tab of the LS450 Config Tool, add staff shifts, if desired. Then using either the LS450 Config Tool or the NC401TS Master Station (see *System Operating Instructions—NC401TS Master Operation—Set up RF Pocket Pagers* in the *IL843U User Guide*), add staff, groups and staff assignments.

Figure 53—PM454 Null Modem Cable Configuration



IL843 PM454 NULL MODEM CABLING R0 102907 1

Adding or Replacing a PM453, PM455 or PM456 Module

The Tek-CARE®400 system's complete operational code and network configuration are maintained on each PM453 Master & Station Module, PM455 P5 Master & Station Module, and PM456 NC300/II Head End Module. Therefore, when adding or replacing one of these modules in an existing system, the system must be synchronized using the LS450 Config Tool programming software. Follow these steps to add or replace a PM453, PM455 or PM456 module:

1. Load the current network configuration into the LS450 Config Tool programming software (Menu | File | Load Config From Network).
2. Save the current network configuration onto the laptop's hard drive (Menu | File | Save As).
3. Install the new PM453 Master & Station Module, PM455 P5 Master & Station Module, or PM456 NC300/II Head End Module into the NC450 Central Equipment. Turn on all modules; the system may report a *Configuration Fault*.
4. Synchronize the hardware types (Menu | Tools | Sync Hardware Data).
5. If the system reports a *Firmware Version Fault*, update the modules to the current software version (Menu | Tools | Upgrade Modules).
6. Commit changes to the network configuration (Menu | File | Commit Changes). This command updates the code if necessary, adds the new module and stations to the existing network configuration, and then commits the new configuration to all PM453, PM455 and PM456 modules.
7. Save the new network configuration onto the laptop's hard drive (Menu | File | Save As).

For more information about the LS450 Config Tool programming software, please see the *IL855 LS450 Config Tool Manual*.

System Test Instructions

This section provides guidelines for testing the Tek-CARE®400 system. As mentioned previously, we recommend that the installer connect and test the system in sections, to allow for easier identification of problem locations. Before testing a system, perform a complete walk-through of the facility, and be certain to verify that:

- all components of the system to be tested are completely installed.
- call cords are attached to all patient stations that require them.
- all pull cord and hand pull stations are in the *reset* position.

Using the *IL843U User Guide* for reference, activate and observe the system operation for every component connected to the system. While initial testing must be performed in sections, a complete system test must also be performed after all components are connected to the system. This entails activating every system component and verifying its operation a final time before considering the installation complete.

We recommend that the system be tested periodically as described here to verify that the system is in good operating condition. If problems are encountered, contact qualified service

System Maintenance Instructions

NOTE: Certain maintenance and upgrade operations may require the nurse call system to be deactivated. Facility staff must be notified before system deactivation and given an estimated length of time that the system will be off.

Master Station

The only user servicable parts are the handset and cord. To replace the handset:

- To remove the handset from the cord, depress the modular jack's locking tab and pull the cord away from the handset. This should occur easily if the locking tab is properly depressed.
- Insert the cord into a new handset. Gently pull on the cord to ensure that the locking tab is engaged and the cord does not pull out.
- Test the new handset by placing a call to a patient station, using the handset for communication (refer to the *IL843U User Guide* for details).

To replace the cord:

- To remove the handset from the cord, depress the modular jack's locking tab and pull the cord away from the handset. This should occur easily if the locking tab is properly depressed.
- To remove the cord from the master station base, depress the modular jack's locking tab and then pull the cord away from the master station base. This should occur easily if the locking tab is properly depressed.
- Insert the new cord into the handset. Gently pull on the cord to ensure that the locking tab is engaged and the cord does not pull out.
- Insert the new cord into the master station base. Gently pull on the cord to ensure that the locking tab is engaged and the cord does not pull out.

Main Power Fuse

When the PM457 Power Entry Module's fuse cap is lit, the main power fuse (part number FZ013) must be replaced. Refer to *Figure 1* for the location of the main power fuse.

- Disconnect the 115 VAC power plug. **WARNING: Failure to disconnect the 115 VAC power prior to replacing the fuse could result in a dangerous shock!**
- Remove the fuse cap by turning counter-clockwise.
- Remove the old fuse from the holder and insert a new fuse.
- Reinsert the fuse and cap, locking into place by rotating clockwise until it locks into place.
- Reconnect power to the central equipment and turn it on.

Patient Station Call Cords

Call cords may be replaced if a problem is encountered. To do so perform the following steps:

- To remove the call cord, firmly grip the plug and pull straight away from the patient station. To avoid a *cord out* call during this procedure, hold down the **RESET** button until the yellow call light is illuminated. While continuing to depress the **RESET** button, remove the cord.
- To insert the new call cord, hold the plug and push the end straight into the call cord jack on the patient station.
- Test the cord by pressing the button on the other end. This should initiate a call and light the call indicator. Press the **RESET** button on the patient station to reset the call. Observe the station for 10 seconds to ensure that no *cord-out* call occurs.

Patient Station Pillow Speakers

Pillow speakers may be replaced if a problem is encountered. To do so perform the following steps:

- To remove the pillow speaker, firmly grip the plug and depress the locking tab. Pull straight away from the patient station. To avoid a *cord out* call during this procedure, hold down the **RESET** button until the yellow call light is illuminated. While continuing to depress the **RESET** button, remove the cord.
- To insert the new pillow speaker, hold the plug and push the end straight onto the call cord jack on the patient station.
- Test the pillow speaker by depressing the red nurse call button. This should initiate a call and light the call indicator. Press the **RESET** button on the patient station to reset the call. Observe the station for 10 seconds to ensure that a *cord-out* call does not occur.

Corridor and Zone Lights

Lamp bulbs must be replaced if they no longer light. To do so, perform the following steps:

- Remove the bulb by grasping the glass portion gently, so as not to break it. Push inwards, rotate it counter-clockwise, and pull it straight away from the metal socket.
- If a color bulb cover is used, remove it and transfer it to the new bulb.
- Hold the new bulb by the glass portion gently, so as not to break it. Push it straight into the new socket and rotate it clockwise.
- Replace the cover lens.
- Test the lamps by triggering the appropriate call to illuminate the new bulb.

Replacement Part Numbers

Part #	Description	Used by
CA033	Handset Cord	Master Station
FZ013	20A 250 VAC	Central Equipment
LI028	28v lamp	Corridor & Zone lights
SF301A	7' Call Cord, ¼" plug	Patient Stations
SF301A/10	10' Call Cord, ¼" plug	Patient Stations
SF301A/20	20' Call Cord, ¼" plug	Patient Stations
SF302	7' Dual Call Cord, ¼" plug	Patient Stations
SF302/10	10' Dual Call Cord, ¼" plug	Patient Stations
SF301G	Geriatric Call Cord, ¼" plug	Patient Stations
SF401A	7' Oxygen-safe Call Cord, DIN plug	Patient Stations
SF401A/10	10' Oxygen-safe Call Cord, DIN plug	Patient Stations
SF401A/15	15' Oxygen-safe Call Cord, DIN plug	Patient Stations
SF401A/20	20' Oxygen-safe Call Cord, DIN plug	Patient Stations
SF401EX	Strain Relief Cable, DIN plug	Patient Stations
SF401G	Geriatric Call Cord, DIN plug	Patient Stations
SF41ZDL	Pillow Speaker, DIN plug (lights, digital TV, channel up/down, CC, mute)	Patient Stations
SF41ZKL	Pillow Speaker, DIN plug (lights, digital TV, channel keypad, CC, mute)	Patient Stations
TA043	Handset	Master Station

Upgrade Part Numbers

Part #	Description	Used by
PM451	Hub Control Module	CE, LS450 Config Tool, Tek-MMARS®400
PM452	CE Communications Module	Central Equipment for multiple CEs
PM453	Master & Station Module	CE, masters & patient stations
PM454	Pager Module	CE, paging transmitter
PM455	P5 Master & Station Module	CE, masters & P5 patient stations
PM456	NC300/II Head End Module	CE, masters, and NC300, NC300II & HC345 patient stations
PM464	Telephone Interface Module	CE for telephone interface
PK450	Power Supply	Central Equipment
BA450K	Battery Backup Kit	Central Equipment

System Troubleshooting Guide

This section provides guidelines for troubleshooting the Tek-CARE®400 system. It covers general troubleshooting practices, as well as specific suggestions for various problems.

As mentioned in the *System Installation* section of this manual, there are some general troubleshooting techniques that installation personnel must follow during the installation of the system equipment. **NOTE: Installers must exercise care when troubleshooting problems that involve high current or high voltage damage. Installers must also exercise extreme caution and be aware of equipment or wiring that uses or handles high voltage, as these sources are potentially lethal.**

Do not connect the entire system together for the initial power up. Connect only the central equipment and the first master station for testing. Then connect the remaining master stations one at a time until all are connected and functional. This allows the installer to establish a “known-good” test point to work from, and to immediately identify problems as they are introduced to the system.

Do not connect all patient station runs to the central equipment at one time. Connect individual runs to the central equipment one by one until all are connected and functional. This allows the installer to more easily locate and recognize the introduction of wiring or equipment problems in the field.

Direct Connection is a classic troubleshooting technique. If a problem is encountered, an installer may directly connect a master station or a patient station to the central equipment. If the problem ceases, then the source of trouble is located in the field (i.e., wiring or mounting related problems), whereas if the problem remains, it is equipment-based. This can also be applied to patient station peripheral devices, which can be directly connected at the patient station location. While this is not an absolute test, it can provide a strong indication of where to look when troubleshooting.

Swap Testing is another well-known method of problem identification. If a problem is identified, an installer can interchange a known good piece of equipment into the location in question and move the device having problems to the location that the known good device previously occupied. **NOTE: If a device or wiring indicates high current or high voltage damage, this technique must be delayed until the source of the original problem is located.** As an example, a patient station in one room that demonstrates a problem can be “swapped” with a station from another room that is known to be working acceptably. (Change the test station’s dip switch address to agree with that of the station being replaced.) If the symptom follows the original problem device, the problem is equipment-based. If the problem remains in the original location, a field problem is indicated (i.e., wiring or mounting related problems). This technique can be applied to master stations, master station control equipment, central equipment ports, etc. **NOTE: To avoid shorting out the station, do not hot swap the following, if they are mounted to a metal box or frame:**

- **IR400-series patient stations that have PM421 or PM422 Pillow Speaker & Bed Interface Modules installed.**
- **P5 patient stations that have PM421P5 or PM422P5 Pillow Speaker Modules installed.**

System Event Logging

Although generally used for factory testing, the event logging port on the PM454 Pager Module may also be used to log system events for troubleshooting purposes.

Components Required

- A personal or laptop computer with a serial port, or an NC470 Tek-BRIDGE™ PC.
- A terminal emulator program capable of logging text received via the serial port to a file.
- A standard DB9 null modem or *crossover* cable.

Using a Generic Terminal Emulator Program

- Connect the computer serial port to the PM454 event logging port.
- Configure the terminal emulator for 9600 bits per second, 8 bit data, 1 stop bit and no parity. If flow control settings exist, set to no flow control.
- Connect, if the program requires it.
- Generate some system events to test the connection.
- Configure the terminal emulator to log events to a file.

Using Microsoft® HyperTerminal:

- Connect the computer serial port to the PM454 event logging port.
- Start HyperTerminal (Start | All Programs | Accessories | Communications | HyperTerminal).
- Throughout this procedure, disregard or cancel all warnings and requests for dialing information, since this information is not required to log system events.
- Type a name for the connection, choose an icon to represent it, and click **OK**.
- Select the desired COM port to in the *Connect using:* drop-down box, and click **OK**.
- Set the port settings as follows: Bits per second: 9600, Data bits: 8, Parity: none, Stop bits: 1, Flow control: none, and click **OK**. (If not automatically prompted for port settings, access them as follows: Verify that HyperTerminal indicates *Disconnected* in the lower left corner. Choose File | Properties, and click on **CONFIGURE**.)
- If HyperTerminal indicates *Disconnected* in the lower left corner, choose Call | Call to connect.
- Generate some system events to test the connection.
- To configure HyperTerminal to log events to a file, choose Transfer | Capture Text. Browse to or type a name for the desired text file, and click the **START** button.

Voltage Readings

See the Appendix for voltage readings to the PM456 NC300/II Head End Module. The following readings can be taken using a standard voltage meter. All readings are taken using the system ground as a reference. NOTE: All readings shown below are approximations and must be used only as rough guidelines. This is due to the variables created by each job site, such as wire lengths, number of stations, etc.

Master Station Connections—Taken at the CE with the master station connected.

Wire #	Description	Voltage Reading
1	TX Audio A	6VDC
2	TX Audio B	6VDC
3	COMMON	0VDC
4	RX Audio A	6VDC
5	RX Audio B	6VDC
6	COMMON	0VDC
7	RS485 Data +	~2 VDC
8	RS485 Data -	~2 VDC

IR400-series Station Connections—Station Commons:

Wire#	Description	Voltage Reading
1	RS485 Data +	1.5VDC
2	RS485 Data -	1.5VDC
3	TX Audio B	6VDC
4	TX Audio A	6VDC
5	RX Audio B	6VDC
6	RX Audio A	6VDC

IR400-series Station Power Connections—See Figure 14.

Power Wiring—0v, 28v.

P5 Station Connections—P5 Station Bus:

Wire#	Description	Voltage Reading	
		Mains Powered	Battery Powered
1	Power	26 VDC	~23 VDC
2	Common	0VDC	0VDC
3	Power	26 VDC	~23 VDC
4	Common	0VDC	0VDC
5	Power	26 VDC	~23 VDC
6	Common	0VDC	0VDC
7	Data	0-5 VDC	0-5 VDC
8	Data	0-5 VDC	0-5 VDC

PM453, PM454, PM455 & PM456 Module LEDs

Normal Operation—Red and Yellow LEDs are off; Green LED is flashing. The module's address is indicated by the number of flashes. The format is: *[long pause] Tens digit [short pause] Ones digit [repeat]*. Count the number of flashes for each digit. A zero (0) is indicated by three quick flashes.

Download Mode—Yellow on constantly, with red and green alternating—The module is downloading new code or waiting for code to download.

Error Codes—Red and Yellow LEDs are solidly lit; Green LED is flashing. The error code is indicated by the number of flashes. The format is: *[long pause] Tens digit [short pause] Ones digit [repeat]*. Count the number of flashes for each digit. A zero (0) is indicated by three quick flashes.

Error

Code Description

0	The module is in test mode. Most likely a backplane problem as Module Test Mode is selected by selecting a CE and SLOT combination not used in any applications.
1	An error occurred while initializing the UART, either the UART could not be accessed or cannot transmit or receive data.
2	An error occurred while opening a CODEC, cannot access the CODEC.
10	The module thinks the CE's address is set to 0 or is misreading the address bits.
11	The module's software had trouble setting the IP address.
12	The wrong version of downloader is loaded for this application.
13	An error occurred opening a serial port.
14	The power monitor encountered an error updating its code.
99	An invalid error code was passed to the error code display function.

PM451 Hub Control Module LEDs

The PM451 has 8 banks of LEDs that provide information about its connections with the 8 network interface ports.

Bank

(top to bottom) Connection

Bank 1	This PM451's Ancillary Network Connection Port
Bank 2	Lower Communications port on the PM452 Module
Bank 3	Upper Communications port on the PM452 Module
Bank 4	The module in slot 5 of this CE
Bank 5	The module in slot 4 of this CE
Bank 6	The module in slot 3 of this CE
Bank 7	The module in slot 2 of this CE
Bank 8	The module in slot 1 of this CE

For Each Bank of LEDs

Green—Connection Speed: on = 100 Mbps; off = 10 Mbps.

Yellow—Collision Detect.

Red—Link/Activity.

PM452 CE Communications Module LEDs

Top Bank of LEDs

Green—Indicates a VDSL data/collision error on the port.

Yellow—Indicates that the port is configured as a Network Termination (NT).

Red—Indicates that the port is configured as a Line Termination (LT). NT and LT are mutually exclusive; the port will be configured for either one or the other.

Bottom Bank of LEDs

Green—Indicates that there is Data Activity on the port.

Yellow—Indicates that the port is connected to the Ethernet Hub Module.

Red—Indicates that the port is synchronized with its peer CE Communications Module.

Symptoms and Suggestions

See the *Symptoms and Suggestions* section of the Appendix to troubleshoot former Tek-CARE®NC300/II stations connected to the Tek-CARE®400 system via a PM456 NC300/II Head End Module.

Code Fault Indication

- Confirm that the station actually has a code device connected to it.
- Verify the cabling between the code station and the room station.
- The code station and associated patient station can be swap tested with other “known-good” devices.

Station Fault Indication

- Determine whether the station fault is singular or a large group of addressable stations.
- If the faults are a large group, then examine the associated common wiring to that section of rooms for opens, shorts and grounds. The actual architectural room numbers can assist in the physical location. If the faults represent all of the stations on the patient station port, then the port may no longer be working. Swap testing between ports can be performed.
- If the fault is a single device, verify the local station wiring (connections and plug-on connector) for continuity, opens, shorts and grounds. The addressable station may also be swap tested with another “known-good” device for verification. (Change the test station’s dip switch address to agree with that of the station being replaced.) Swapping the station with one from an unoccupied room can help isolate whether the problem lies in the local station or the local wiring.

Communication Fault Indication

- The master displaying this fault is no longer communicating with the central equipment.
- Swap test the master station with another “known-good” master station.
- Connect the master station directly to the central equipment, using a short cable.
- Verify master-to-central-equipment connections.

Master Fault Indication

- Observe the number displayed with this message. This number represents the address of the master that is no longer communicating with the central equipment. This also represents the port that the master must be plugged into.
- Swap test the master station with another “known-good” master station.
- Connect the master station directly to the central equipment, using a short cable.
- Verify master-to-central-equipment connections.

Master Version Fault Indication

- If the Master Version Fault occurs immediately after a system software update, one or more master stations may not have updated automatically. To force each master station to update its code to the version stored on the central equipment:
 1. At each NC401VFD Master Station, use the MENU key to navigate to the *User Options* screen. Choose *Console*, then *Force SW Update*.
 2. At each NC401TS Master Station, press the MENU membrane button. On the onscreen menu, touch *About* and then touch *Force SW Update*.

IR019C has no audio communications

- Measure the speaker coil resistance with an ohmmeter. It must read approximately 45 ohms.
- Directly connect the IR019C to the associated IR400 Multipurpose Station and verify function (refer to *Figure 15*). If it begins to operate, the interconnecting wire should be suspect. If it does not, then swap test the multipurpose station.

Patient Station is not placing calls

- Swap test the associated call cord.
- Swap test the patient station with another “known-good” patient station.
- If the problem encompasses an entire port, see *Station Fault Indication* section above.

Patient Station has a constant “Cord Out” message

- Verify that the call cord is properly inserted.
- Swap test the call cord with another “known-good” call cord.
- Swap test the patient station with another “known-good” patient station. (Change the test station’s dip switch address to agree with that of the station being replaced.)

Duty Station or Z-series Zone Light is not annunciating calls

- This is a software-controlled feature. Zone light must be set to watch the desired zones.

Lamp Fault Indication

- Check the bulbs for open filaments. This can also be verified by swap testing the bulbs with “known-good” bulbs.
- Verify the connections between corridor light and patient station.
- Swap test the patient station with a “known-good” device. (Change the test station’s dip switch address to agree with that of the station being replaced.)

LI480-series Corridor Light is not lighting

- Verify that the bulb filaments are not broken or open. This can also be verified by swap testing the bulb in question with a “known-good” lamp bulb.
- If the bulbs are functional, verify the connections between corridor light and patient station.
- The patient station may also be swap tested. (Change the test station’s dip switch address to agree with that of the station being replaced.) Check station circuit board for signs of high current damage.

Master Station is not displaying calls or is not handling calls as intended

- Review master’s programmed settings and data to verify information, especially zone settings and call filter settings.

Master Station touchscreen is not working correctly

- Perform *Touch Screen Calibration* (in the Menu).

Pillow Speaker Intercom is not working and audio is coming from the patient station

- Verify that the pillow speaker is TekTone® SF401P series, SF401DIG, SF41ZDL or SF41ZKL.
- Verify that the pillow speaker is properly inserted into the associated DIN jack. Also check the pins inside the jack for signs of bending that might prevent all connections from being made.
- Try the pillow speaker with another patient station that is known to be working correctly.
- Remove the patient station from the wall and verify that a Pillow Speaker & Bed Interface Module or a Pillow Speaker Module has been installed on the patient station. If a module is present, verify the seating of the module and the plug-on connector seating.
- Swap test the Pillow Speaker & Bed Interface Module or Pillow Speaker Module with a “known-good” module.
- Swap test the patient station with another “known-good” patient station. (Change the test station’s dip switch address to agree with that of the station being replaced.)

Emergency Switch or Code Call Switch is not placing calls

- Verify that two SF400-series peripherals on the same IR400-series station do not have the same jumper settings (see *Figures 31–34*).
- Swap test the device with another “known-good” device. (For SF400-series peripherals, change the test device’s jumper settings to agree with that of the station being replaced—see *Figures 31–34*.) If the device works correctly in another location, examine the interconnection wiring. If it does not work, the device is suspected bad and should be replaced or repaired.
- If the emergency or code call switch and wiring appear to be correct, then the patient station can also be swap tested with another “known-good” patient station.

Presence Station is not registering or is not working correctly

- If the device is operating but the LEDs are not lighting, check to see if the corresponding corridor lights are working. If both are out, swap test the patient station and examine the peripheral connector’s continuity.
- Using the *LS450 Config Tool*, check the station behavior settings of the associated station.

Appendix: PM456 NC300/II Head End Module

The PM456 NC300/II Head End Module allows the Tek-CARE®400 CE to replace the head end (central equipment) of a Tek-CARE®NC300 or Tek-CARE®NC300II nurse call system, or a Tek-CARE®HC345 senior check-in system. Each PM456 module accommodates:

- two NC401TS or NC401VFD master stations.
- 64 addressable stations (patient, duty, staff, etc.) on two ports—up to 32 per port. (Valid station addresses are 00–31.)
- 64 corridor/dome lights on two ports—up to 32 per port, up to 16 per run.

The total cable length of all the runs on a single port must not exceed 1000'.

This appendix includes voltage readings, troubleshooting information and wiring diagrams for the Tek-CARE®NC300 and NC300II nurse call systems, and the Tek-CARE®HC345 senior check-in system. This information is derived from the *IL715 Tek-CARE®NC300II manual* and the *IL427 Tek-CARE®HC345 manual*. See those manuals for additional information.

Voltage Readings

The following readings can be taken using a standard voltage meter. All readings are taken using the system ground as a reference. **NOTE:** All readings below are approximations and must be used only as rough guidelines. This is due to the variables created by each job site, such as wire lengths, number of stations, etc.

Patient Station Connections: Refer to *Figure 55—Connector Circuit Interconnections for Addressable Stations*, *Figure 56—IR300/A/B/C/E/F Series Connections to Peripheral Devices*, and *Figure 57—IR300/A/B/C/E/F Series Connections with Supervised Dome Light*.

Common Connector:

<u>Wire Color</u>	<u>Description</u>	<u>Voltage Reading</u>
Gray	Audio -	The levels on this line can vary, but must not be a constant +12 or +24 VDC.
Violet	Audio +	The levels on this line can vary, but must not be a constant +12 or +24 VDC.
Blue	+12 VDC	+11 to 12 VDC.
Green	Data Common	0 VDC.
Yellow	Data Out	See information below.
Orange	Data In	See information below.
Red	Negative	0 VDC.
Brown	+24 VDC	+24 VDC.

Yellow Data Out—To calculate the average voltage for this line, subtract the total number of patient stations connected to a port from 132. Divide the result by 126, then multiply by 12. For example, 10 patient stations would be: $((132 - 10) \div 126) \times 12 = 11.62$ VDC.

$$\text{Yellow wire's average voltage level (VDC)} = ((132 - P) \div 126) \times 12 \text{ VDC}$$

where P = the number of patient stations on the port.

Orange Data In—To calculate the average voltage for this line, add 186 to the total number of patient stations connected to a port. Divide the result by 442, then multiply by 12. For example, 10 patient stations would be: $((10 + 186) \div 442) \times 12 = 5.32$ VDC.

$$\text{Orange wire's average voltage level (VDC)} = ((P + 186) \div 442) \times 12 \text{ VDC}$$

where P = the number of patient stations on the port.

These formulas produce more accurate results if the nominal 12 VDC reading value is used instead of 12 VDC. Take the nominal 12 VDC reading from the *Blue* wire, using the *Red* wire as a reference. This number is also an approximation and may vary slightly from field tolerances.

Note: During CE power up stages, the data lines can be in standby or unknown states. This could result in a reading of approximately 12 VDC. Take readings for the yellow and orange wires when the system is in a running state after boot up is complete.

Peripheral Connector:

<u>Wire Color</u>	<u>Description</u>	<u>Voltage Reading/Test Suggestion</u>
Yellow/White	Aide Input	0 VDC / Momentary application of +12 VDC will toggle call status.
Green/White	Nurse Input	0 VDC / Momentary application of +12 VDC will toggle call status.
Orange/White	Bath Input	0 VDC / Constant application of +12 VDC will initiate bath call.
Red/White	Emergency Input	0 VDC / Constant application of +12 VDC will initiate emergency call.
Brown/White	Monitor Input	0 VDC / Momentary application of +12 VDC will initiate a Monitor call that is reset by pressing the reset button on the station. NOTE: A fire call can be triggered by applying a constant +12 VDC to both Red/White and Brown White at the same time.

<u>Wire Color</u>	<u>Description</u>	<u>Voltage Reading/Test Suggestion</u>
Black	Code A	Call active: +9 to 10 VDC. Call inactive: +12 VDC. This input works in conjunction with Code B. When this input is active, a trickle current runs constantly through the wires and code station with an approximate load of 47,000 ohms. Shorting these lines together will trigger a code call manually.
White	Code B	Call active: +7 to 8 VDC. Call inactive: +1 to 2 VDC. / See Black (Code A) information.
Gray	Negative	0VDC.
Violet	+12 VDC	+11 to 12 VDC.
Blue	Lamp Fault	This input must receive a constant +24 VDC input, or a lamp fault will be triggered.
Green	Red Dome Output	+24 VDC when lamp is off and 0 to +1 VDC when lamp is on.
Yellow	Green Dome Output	+24 VDC when lamp is off and 0 to +1 VDC when lamp is on.
Orange	Yellow Dome Output	+24 VDC when lamp is off and 0 to +1 VDC when lamp is on.
Red	White Dome Output	+24 VDC when lamp is off and 0 to +1 VDC when lamp is on.
Brown	Peripheral LED Output	+1 to 2 VDC when no calls are active. A constant pulsing to +12 VDC when a bath or emergency call is placed.

Standalone Bath and Code Station Connections: Refer to *Figure 64—SF381/SF382 Wiring Diagram.*

Common Connector:

<u>Wire Color</u>	<u>Description</u>	<u>Voltage Reading</u>
Gray	Red Dome Output	+24 VDC when lamp is off; 0 to +1 when lamp is on.
Violet	White Dome Output	+24 VDC when lamp is off; 0 to +1 when lamp is on.
Blue	+12 VDC	+11 to 12 VDC.
Green	Data Common	0VDC.
Yellow	Data Out	+8 to 11 VDC.
Orange	Data In	+4 to 6 VDC.
Red	Negative	0VDC.
Brown	+24 VDC	+24 VDC.

Symptoms and Suggestions

Code Fault Indication (SF341B)

- Confirm that the station actually has a code device connected to it.
- If a code station is present, then verify the trickle current loop path. Disconnect the Code A and Code B lines from the peripheral connector on the back of the patient station. Using an ohmmeter, read across the two lines for the loop resistance (approximately 47,000 ohms). Wiring continuity must also be verified.
- The code station and associated patient station can be swap tested with other “known-good” devices.

Comm. Fault Indication (patient station fault)

- Determine if the comm. fault is singular or a large group of patient stations. (If using NC306 Master Station, press the “ZONE” button twice to have master station indicate which points are in fault.)
- If the faults are a large group, then the associated common wiring to that section of rooms must be examined for opens, shorts and grounds. The actual architectural room numbers can assist in the physical location. If the faults represent all of the stations on the patient station port, then the port may no longer be working. Swap testing between ports can be performed. The installer will need to perform the **Detect System Stations** command from the **System Functions** menu (see *System Configuration and Programming* of the IL715 Tek-CARE®NC300II manual for details). Once the problem has been identified, corrected, and the ports returned to their original configuration, the **Detect System Stations** command will need to be executed again.
- If the fault is a single device, verify the local room wiring (connections and plug-on connector) for continuity, opens, shorts and grounds. The patient station may also be swap tested with another “known-good” device for verification.

Data or Polling Noise

- Verify that common cable shield drain wires have been kept isolated and fed through at splice points. At the end of a cable run, the shields must be isolated and taped back. Noise transference is a cumulative effect and is worsened for each error in connection. **NOTE:** The included connection harness (“pigtail” or “whip” connector) brings the shields together prior to entering the central equipment chassis. Thus, if an ohmmeter is used to check for continuity between shields, the connection harness must be removed prior to taking the reading.

IR019C has no audio communications

- Measure the speaker coil resistance with an ohmmeter. It must read approximately 45 ohms.
- Directly connect the IR019C to the associated IR300B/C/E Multi-Purpose Station and verify function (refer to *Figure 63—6 & 7-PIN Connector Outputs for IR300/A/B/C/E/F Series Stations*). If it begins to operate, the interconnecting wire should be suspect. If it does not, then swap test the IR300B/C/E station.

IR300/A/B/C/E/F Series Patient Station is not placing calls

- Swap test the associated call cord.
- Swap test the patient station with another “known-good” patient station.
- If the problem encompasses an entire port, see *Comm. Fault Indication* section above for port swapping information.

IR300/A/B/C/E/F Series Patient Station has a constant “Cord Out” message

- Verify that the call cord is properly inserted.
- Swap test the call cord with another “known-good” call cord.
- Swap test the patient station with another “known-good” patient station.

IR300A/B/C/E/F Series Patient Station that has been installed is not recognized by the system

- The installer will need to perform the **Detect System Stations** command from the **System Functions** menu (see *System Configuration and Programming* of the IL715 Tek-CARE®NC300II manual for details).

IR310B/C/E Staff Station is placing “Routine Calls”

- The IR310B/C/E station has a special “routine call” feature that is triggered by turning on dip switch 7. If this feature is not desired, the dip switch must be turned off. **NOTE:** This will effectively change the station’s address (triggering a comm. fault), so the **Detect System Stations** command must be run from the **System Functions** menu as per see *System Configuration and Programming* of the IL715 Tek-CARE®NC300II manual for details to complete the change process.

IR315B/C/E/F Duty Station or LI386/A/B/C Dome/Zone Lamp is not annunciating calls

- This is a software-controlled feature and is described in the *System Configuration and Programming* section of the IL715 Tek-CARE®NC300II manual. The duty station or dome zone lamp must have the same zones active as the zones that are to be annunciated by the device.

POLLING PROCESSOR FAIL indication

- This indicates that there has been a processor failure on the PM353 module within the NC351(A) or NC351(A)/2 Central Equipment.
- Reset the central equipment.
- Power down the system and re-seat all of the internal modules.

Lamp Fault Indication

- Determine the type of lamp being used with the station reporting the lamp fault (supervised or unsupervised).
- If the lamp is supervised, check the four bulbs for open filaments. This can also be verified by swap testing the bulbs with “known-good” bulbs. If all four bulbs are intact, verify the connection to the *Lamp Fault Input* (blue wire on the 15-pin peripheral connector on the associated patient station). During normal operation, the supervised dome lamp provides a steady +24 VDC input to prevent the lamp fault from being triggered. This ceases when a filament opens.
- If the lamp is unsupervised, check the connection from the *Lamp Fault Input* to the +24 VDC common wire. If this connection is present, verify its continuity. If the voltage is present, swap test the patient station with a “known-good” device.

LI380 Series Lamp is not lighting

- Verify that the bulb filaments are not broken or open. This can also be verified by swap testing the bulb in question with a “known-good” lamp bulb.
- If the bulbs are functional, verify the connections to the patient station. The dome lamp may also be tested by directly connecting it to the patient station peripheral connector.
- The patient station may also be swap tested. Observe station circuit board for signs of high current damage.

Pillow Speaker Intercom is not working and audio is coming from the patient station

- Verify that the pillow speaker is an SF301PI series, SF401PI series, SF301DIG, SF401DIG, SF41ZDL or SF41ZKL.
- Verify that the pillow speaker is properly inserted into the associated 8P8C modular jack or DIN jack. Also check the pins inside the jack for signs of bending that might prevent all connections from being made.
- Try the pillow speaker in another room that is known to be working correctly.
- Remove the patient station from the wall and verify that a PM311C or PM312C (for IR311B/C/E, IR312B/C/E, IR319/A/B or IR320/A/B) has been installed on the patient station. If a PM311C or PM312C module is present, verify the seating of the module and the plug-on connector seating.
- Swap test the PM311C or PM312C module with a “known-good” module.
- Swap test the patient station with another “known-good” patient station.

SF337C or SF340B Bath Stations not placing calls

- Swap test the device with another “known-good” device. If the device works correctly in another location, examine the interconnection wiring. If it does not work, the device is suspected bad and must be replaced or repaired.
- To verify the device, review these 3 connections: brown wire—LED drive from the patient station, red wire—signal line to the patient station’s Bath Input, and orange wire—+12 VDC in from the patient station. When the device is operated, the +12 VDC from the orange wire is connected to the red wire to trigger the Bath Input on the patient station. This in turn activates the LED output on the patient station, which applies ground to the LED circuit, causing it to light via the brown wire.
- If the bath station and wiring appear to be correct, then the patient station can also be swap tested with another “known-good” patient station.

SF341B Code Station is not placing calls

- See *Code Fault Indication* for troubleshooting advice.

SF381 Standalone Bath Station or SF382 Standalone Code Station is not placing calls

These devices look like peripheral devices, but they function electronically just like IR300/A/B/C/E/F Series Patient Stations. They interact directly with the central equipment, rather than through an IR300/A/B/C/E/F Series Patient Station. Therefore, refer to these troubleshooting sections:

- *Comm. Fault Indication (patient station fault)*
- *IR300/A/B/C/E/F Series Patient Station is not placing calls*
- *IR300/A/B/C/E/F Series Patient Station that has been installed is not recognized by the system*

SF350B Nurse/Aide Presence Station is not registering or is not working correctly

- If the device is operating, but the LEDs are not lighting, check to see if the green or yellow dome lamps are working. If both are out, swap test the patient station and examine the peripheral connector's continuity.
- If only the lights are not working and the dome outputs are working, verify that there is roughly +12 VDC across the orange and yellow wires at the SF350B device's location. Verify the continuity of the red and green wires back to the peripheral connector on the patient station.
- If the device is not operating, the inputs on the patient station can be manually triggered by the application of the +12 VDC line (refer to *Voltage Readings* in this appendix for more details). The device can be directly connected for testing, and may also be swap tested with another "known-good" device for verification.

SF250 Staff Presence Station is not registering or is not working correctly

- If the device is operating, but the LED is not lighting, check to see if the green dome lamp is working. If the LED and lamp are both out, swap test the patient station and examine the peripheral connector's continuity.
- Verify that there is roughly +12 VDC across the purple and gray wires. Verify the continuity of the three wires going to the SF250.
- If the device is not operating, the input on the patient station can be manually triggered by the application of the +12 VDC line (refer to *Voltage Readings* in this appendix for more details). The device can be directly connected for testing, and may also be swap tested with another "known-good" device for verification.

Figure 54—NC351(A) & HC345 Wiring Diagram Using Individual Cables

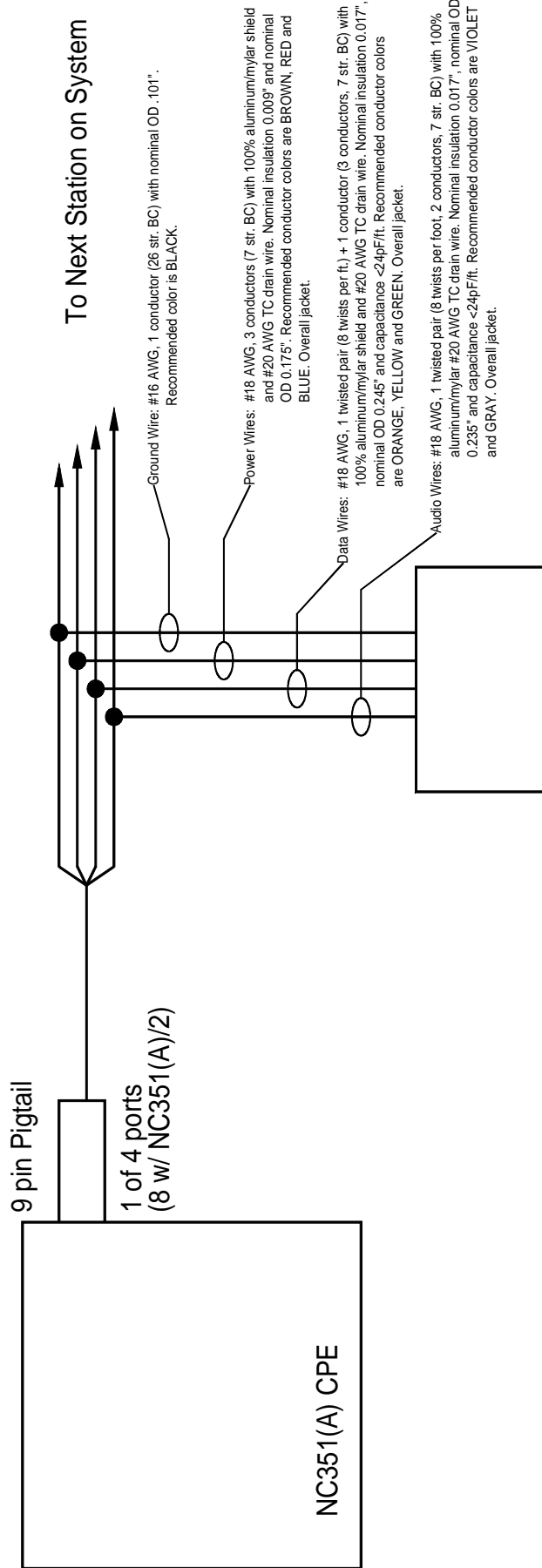
NC351(A) Cable Requirements Using Individual Cables

Maximum number of stations on any one cable run: 32 without DOME LAMPS
16 with DOME LAMPS

Maximum number of stations on a port: 64

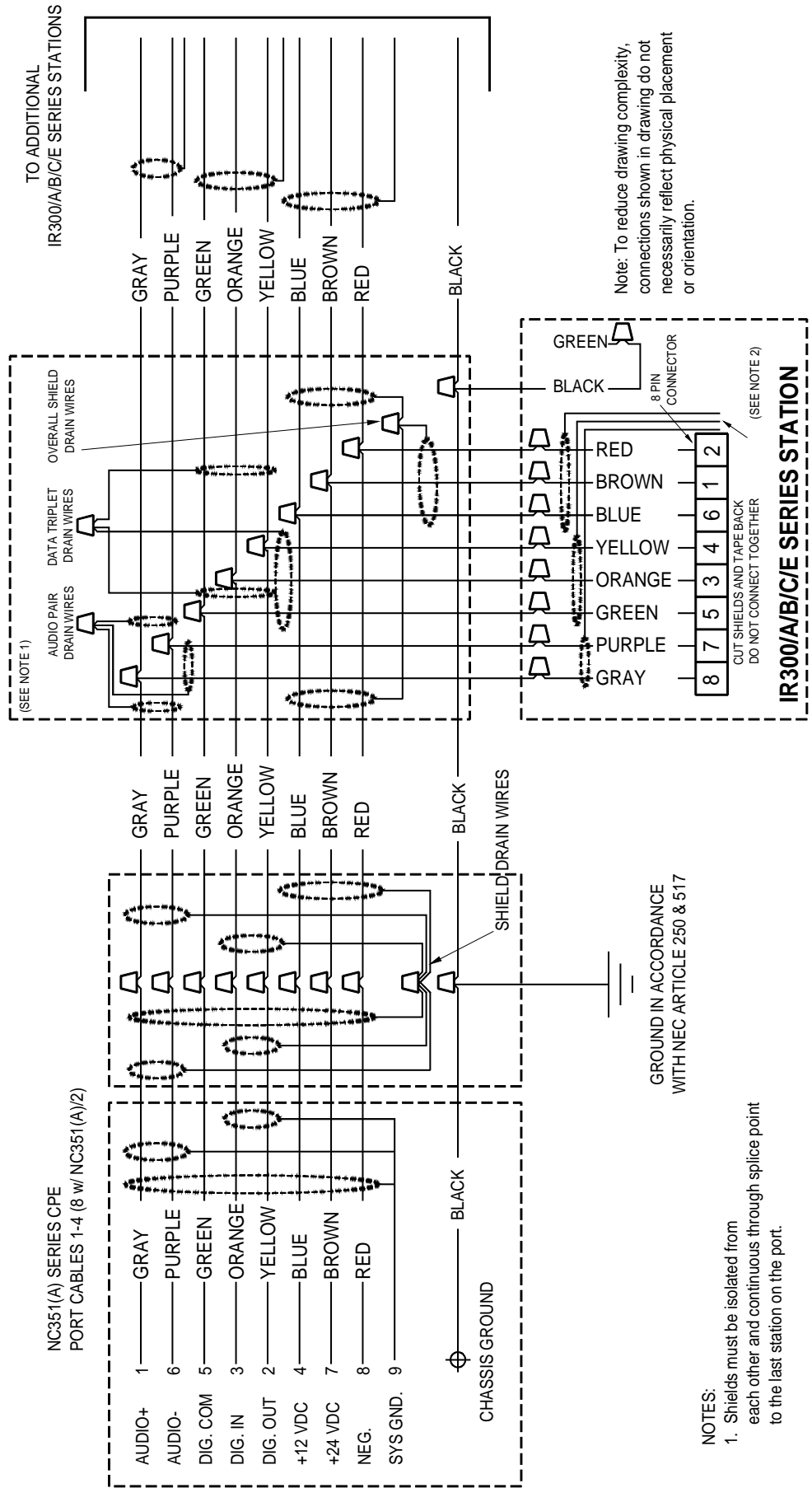
Note: Total combined cable lengths using #18 wire cannot exceed 1000 ft.

NOTE: Please read the entire Wiring Installation section in the text section of the manual as it provides additional wiring information.



IR300/A/B/C/E SERIES STATION

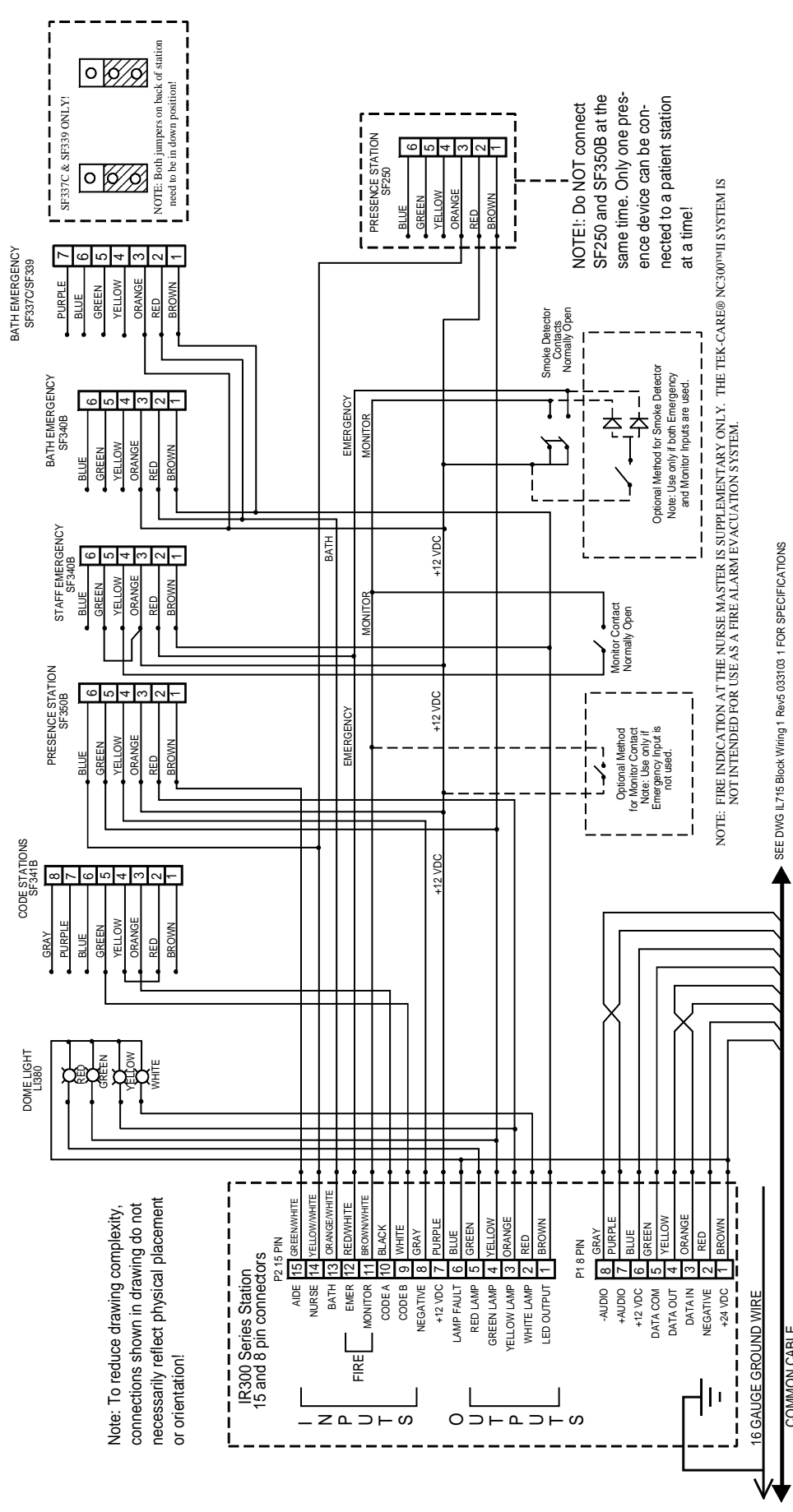
Figure 55—Connector Circuit Interconnections for Addressable Stations



Note: To reduce drawing complexity, connections shown in drawing do not necessarily reflect physical placement or orientation.

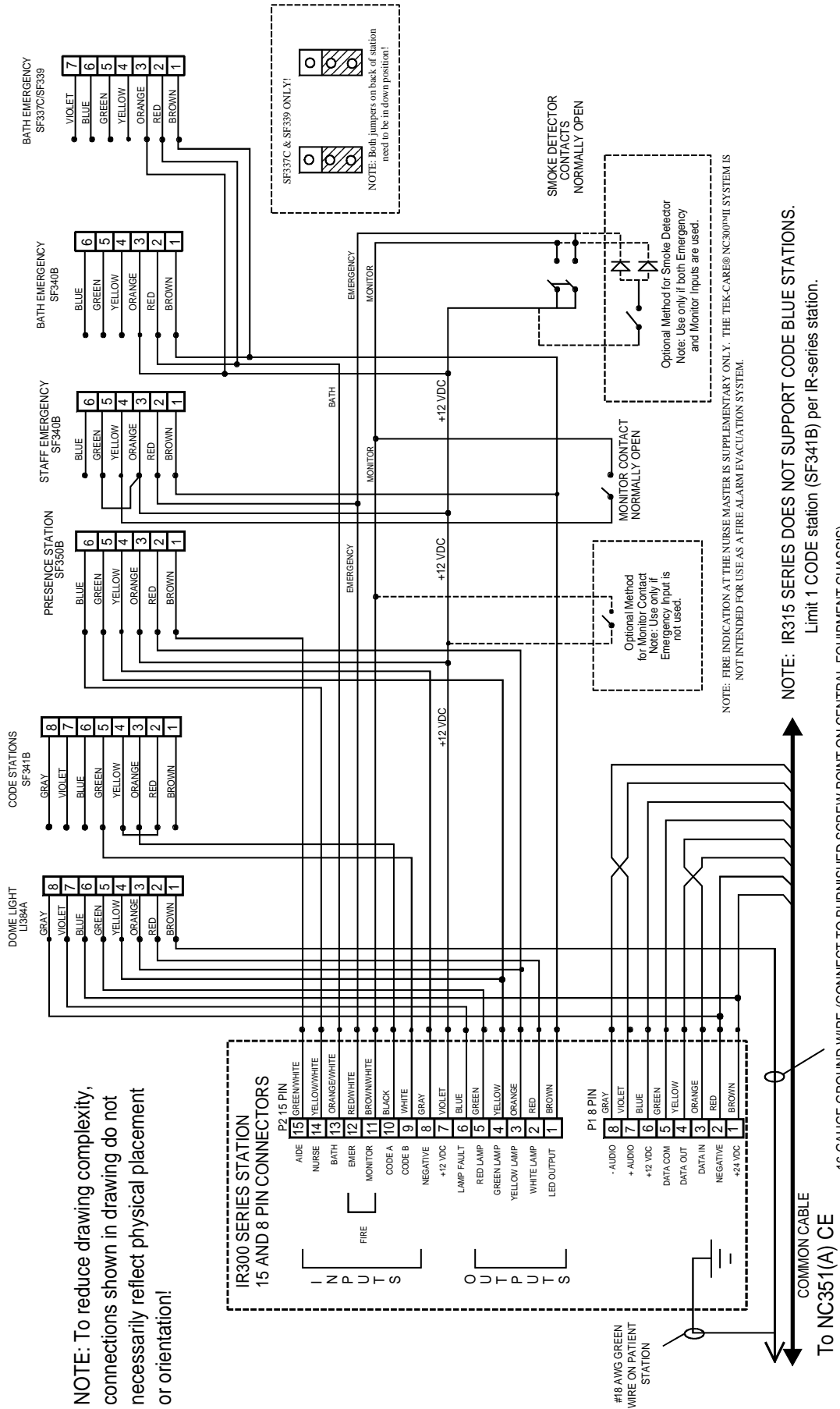
- NOTES:**
1. Shields must be isolated from each other and continuous through splice point to the last station on the port.
 2. Shields must be isolated from each other and from any ground.

Figure 56—IR300/A/B/C/E/F Series Connections to Peripheral Devices



NOTE: IR315 series stations do not support CODE BLUE Stations.
Limit 1 CODE station (SF341B) per IR-series station.

Figure 57—IR300/A/B/C/E/F Series Connections with Supervised Dome Light



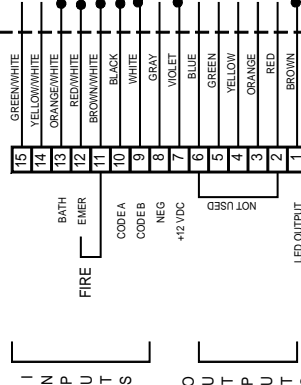
Drawing Name & Number: IL715 IR300 Series Wiring 2 Rev8 041105 1

Figure 58—LI386/A/B/C Dome/Zone Light Wiring Diagram

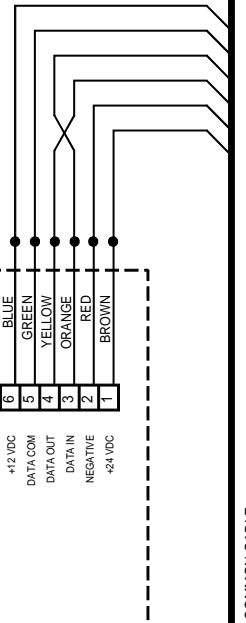
NOTE: To reduce drawing complexity, connections shown in drawing do not necessarily reflect physical placement or orientation!

LI386 Series DOME/ZONE LIGHT

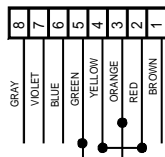
15 AND 8 PIN CONNECTORS



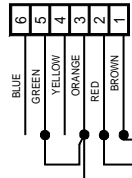
Do NOT connect.



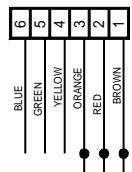
CODE STATIONS SF341B



STAFF EMERGENCY SF340B



BATH EMERGENCY SF340B



BATH

EMERGENCY

+12 VDC

NOTE: FIRE INDICATION AT THE NURSE MASTER IS SUPPLEMENTARY ONLY. THE TEK-CARE® NC300™ (IL421) or TEK-CARE® NC300™II (IL715) SYSTEM IS NOT INTENDED FOR USE AS A FIRE ALARM EVACUATION SYSTEM.

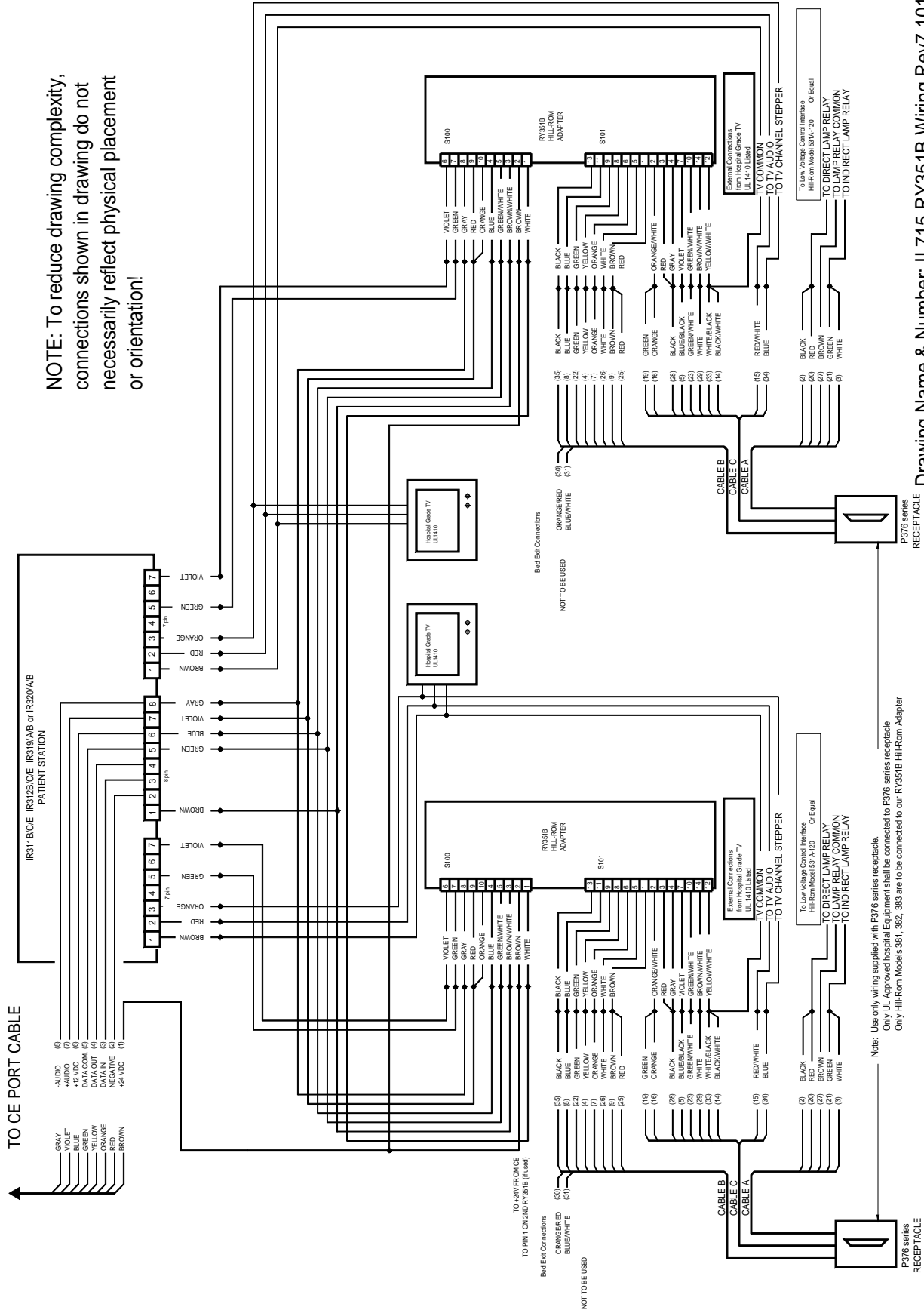


Optional method for smoke detector.
Note: Use only if Emergency input is used.

To NC351(A) (IL715) or NC350C (IL421) Series CE

Drawing Name & Number: IL715 IL421 L1386 Series Wiring Rev6 041105

Figure 59—RY351B Wiring Diagram



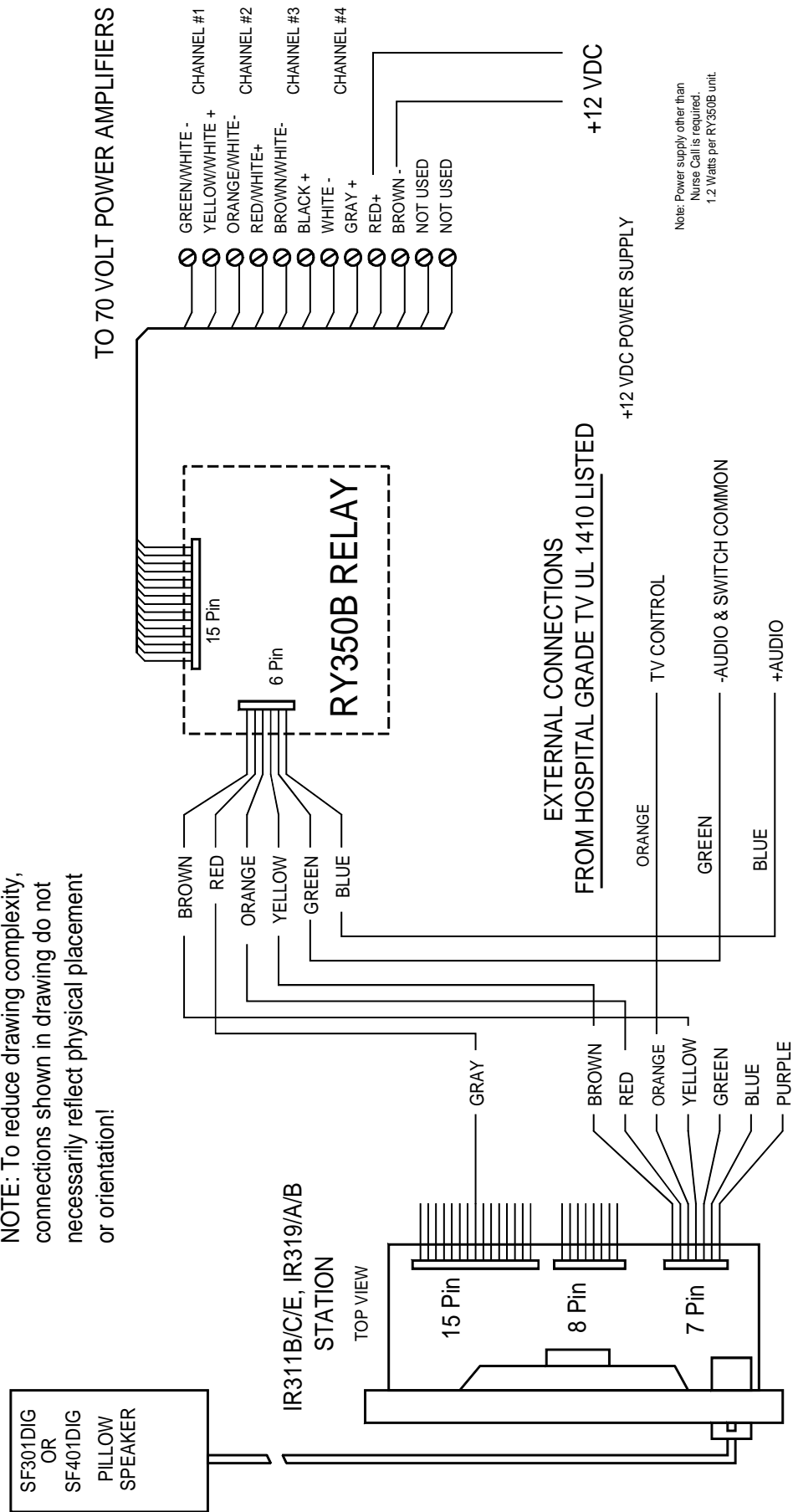
NOTE: To reduce drawing complexity, connections shown in drawing do not necessarily reflect physical placement or orientation!

Note: Use only wiring supplied with P376 series receptacle.
Only UL Approved hospital Equipment shall be connected to P376 series receptacle.
Only Hill-Rom Models 381, 382, 383 are to be connected to our RY351B Hill-Rom Adapter

Drawing Name & Number: IL1715 RY351B Wiring Rev7 101306 1

Figure 60—RY350B Wiring Diagram

NOTE: To reduce drawing complexity, connections shown in drawing do not necessarily reflect physical placement or orientation!

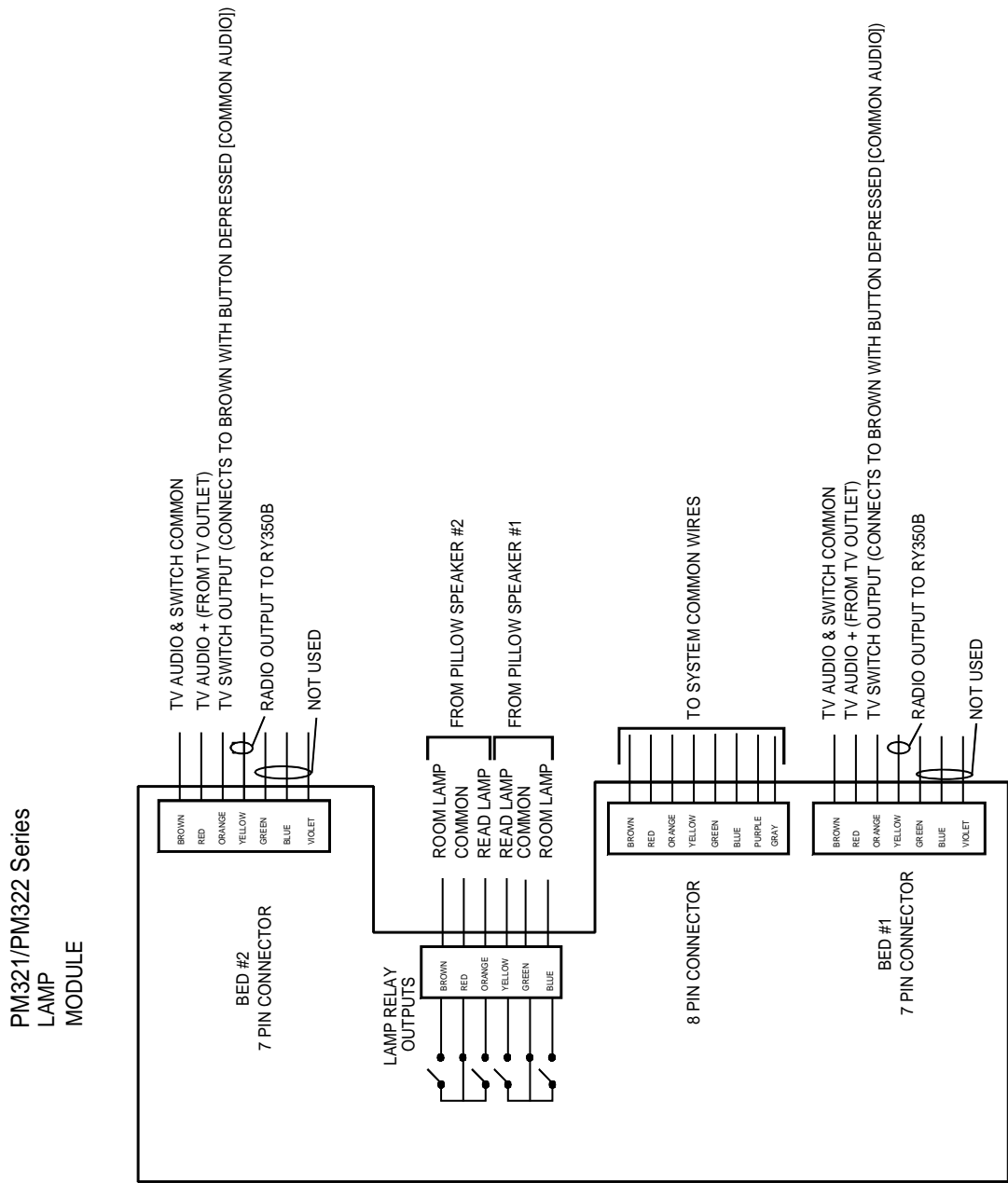


Note: Power supply other than Nurse Call is required. 1.2 Watts per RY350B unit.

Note: For remaining connections see diagrams:
 IL715 IR300B-C Ser Wiring 1 Rev5 033103 1
 IL715 IR300B-C Ser Wiring 2 Rev4 033103 1

Note: This should be duplicated for IR312B/C/E or IR320/A/B Dual Patient Stations
 Drawing Name & Number: IL715 RY350B Wiring Rev6 101806 1

Figure 61—PM321B/PM322B Lamp Module Wiring Diagram



NOTE: PM321B lamp does not include top 7-pin module.

Figure 62—LI384A Multiple Stations

NOTE: To reduce drawing complexity, connections shown in drawing do not necessarily reflect physical placement or orientation!

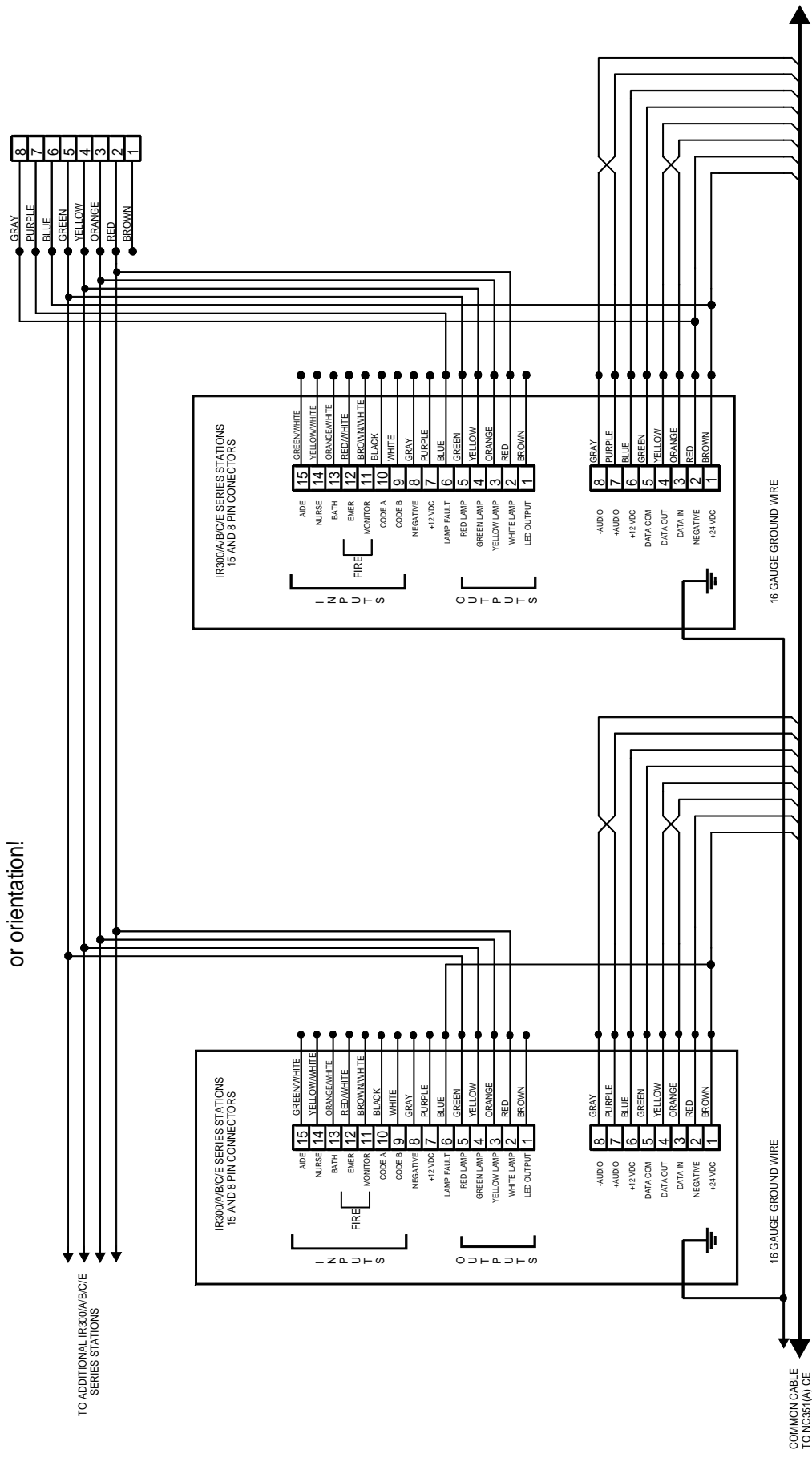


Figure 63—6 & 7-PIN Connector Outputs for IR300/A/B/C/E/F Series Stations

**7 PIN CONNECTOR
IR300B/C STATION**

PURPLE	7	+12 VDC
BLUE	6	CORD OUT INPUT
GREEN	5	IN-USE LED OUTPUT
YELLOW	4	CALL INPUT +12 VDC
ORANGE	3	CANCEL INPUT +12 VDC
RED	2	+ AUDIO OUT
BROWN	1	- AUDIO OUT

**7 PIN CONNECTOR
IR311B/C/E, IR312B/C/E, IR319/A/B, IR320/A/B STATION**

PURPLE	7	CALL LED OUTPUT
BLUE	6	CONTROL (PM311C/PM312C ONLY)
GREEN	5	CALL INPUT +12 VDC
YELLOW	4	RADIO OUT +12 VDC
ORANGE	3	TV ON/OFF SWITCH
RED	2	TV + AUDIO
BROWN	1	TV - COMMON

**6 PIN CONNECTOR
IR300A STATION**

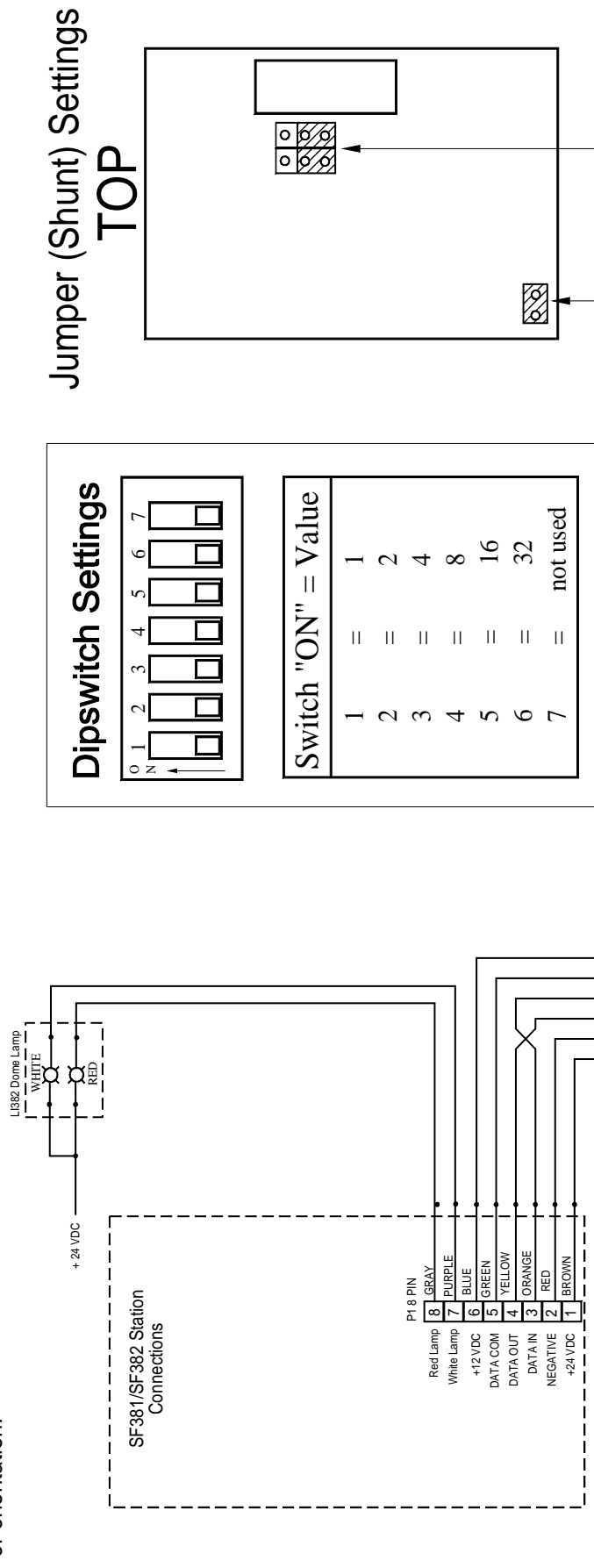
BLUE	6	+12 VDC
GREEN	5	CALL LED INPUT
YELLOW	4	CALL INPUT +12 VDC
ORANGE	3	CANCEL INPUT +12 VDC
RED	2	+ AUDIO OUT
BROWN	1	- AUDIO OUT

**6 PIN CONNECTOR
IR311A, IR312A STATION**

BLUE	6	CALL LED INPUT
GREEN	5	CONTROL (PM311C/PM312C ONLY)
YELLOW	4	RADIO OUTPUT +12 VDC
ORANGE	3	TV ON/OFF SWITCH
RED	2	TV + AUDIO
BROWN	1	TV COMMON

Figure 64—SF381/SF382 Wiring Diagram

NOTE: To reduce drawing complexity, connections shown in drawing do not necessarily reflect physical placement or orientation!



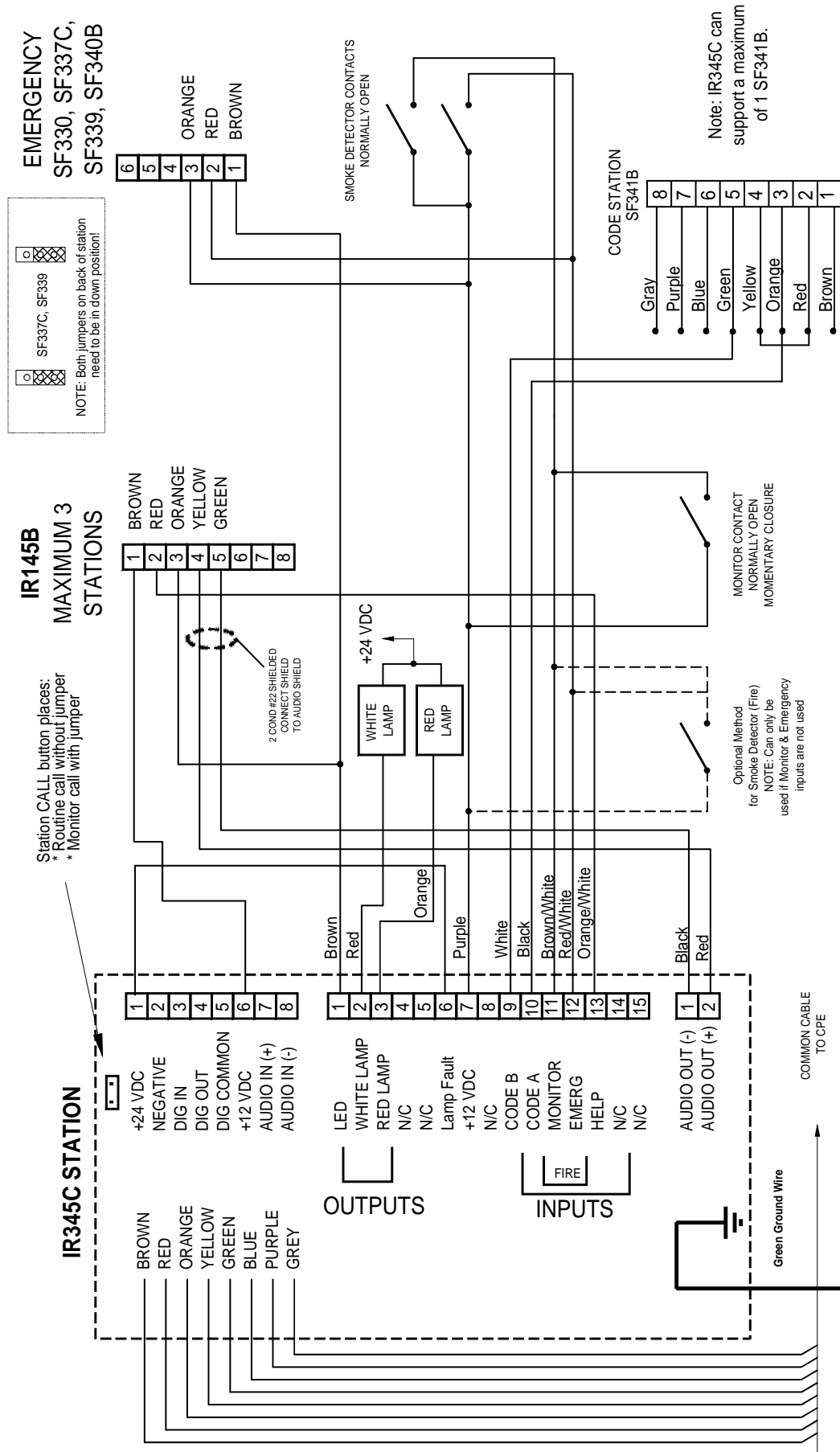
SEE DWG IL715 Block Wiring 1 Rev6 051002.1 FOR SPECIFICATIONS

To NC351(A) (IL715) or NC350C (IL421) Series CE

**Install as shown for SF381, remove for SF382.
Factory set as shown, DO NOT change.**

Drawing Name & Number: IL715 IL421 SF381 SF382 Wiring Rev3 042004 1

Figure 65—Wiring Diagram for IR345B/C Resident Station with Check-In & IR145B Occupant Help Station



IL427 IR345 Series WIRING REV6 041105 1

Figure 66—Programming Worksheet for PM453 Stations

CE # (1–15): 1
 CE Slot # (1–5): 1
 Module # (1–75): 1

SAMPLE

Download this Excel spreadsheet from
 TekTone®'s TEP website, or contact TekTone®
 Technical Support at (800) 327-8466, option 2.

Rev. 0 • 11/2010

Card Port	Station Dip Switch	Default Room #	Architectural Room #	Online (Y/N)	Label A	Label B	Zones
L	00 ↑	0100					
L	01 ↑	0101					
L	02 ↑	0102					
L	03 ↑	0103					
L	04 ↑	0104					
L	05 ↑	0105					
L	06 ↑	0106					
L	07 ↑	0107					
L	08 ↑	0108					
L	09 ↑	0109					
L	10 ↑	0110					
L	11 ↑	0111					
L	12 ↑	0112					
L	13 ↑	0113					
L	14 ↑	0114					
L	15 ↑	0115					
U	00 ↑	0116					
U	01 ↑	0117					
U	02 ↑	0118					
U	03 ↑	0119					
U	04 ↑	0120					
U	05 ↑	0121					
U	06 ↑	0122					
U	07 ↑	0123					
U	08 ↑	0124					
U	09 ↑	0125					
U	10 ↑	0126					
U	11 ↑	0127					
U	12 ↑	0128					
U	13 ↑	0129					
U	14 ↑	0130					
U	15 ↑	0131					

Module# = ((CE# × 5) + Slot# – 5)
 Room# = MMSS (MM=Module#, SS=Dip Switch Value)

Card Ports: L=Lower (1st) station port on PM453
 U=Upper (2nd) station port on PM453

Figure 67—Programming Worksheet for PM455 & PM456 Stations

CE # (1–15): 1
 CE Slot # (1–5): 1
 Module # (1–75): 1

SAMPLE
 Download this Excel spreadsheet from
 TekTone®'s TEP website, or contact TekTone®
 Technical Support at (800) 327-8466, option 2.

Rev. 0 • 11/2010

Card Port	Station Dip Switch	Default Room #	Architectural Room #	Zones
1	00 ↑	0100		
1	01 ↑	0101		
1	02 ↑	0102		
1	03 ↑	0103		
1	04 ↑	0104		
1	05 ↑	0105		
1	06 ↑	0106		
1	07 ↑	0107		
1	08 ↑	0108		
1	09 ↑	0109		
1	10 ↑	0110		
1	11 ↑	0111		
1	12 ↑	0112		
1	13 ↑	0113		
1	14 ↑	0114		
1	15 ↑	0115		
1	16 ↑	0116		
1	17 ↑	0117		
1	18 ↑	0118		
1	19 ↑	0119		
1	20 ↑	0120		
1	21 ↑	0121		
1	22 ↑	0122		
1	23 ↑	0123		
1	24 ↑	0124		
1	25 ↑	0125		
1	26 ↑	0126		
1	27 ↑	0127		
1	28 ↑	0128		
1	29 ↑	0129		
1	30 ↑	0130		
1	31 ↑	0131		

Card Port	Station Dip Switch	Default Room #	Architectural Room #	Zones
2	00 ↑	0132		
2	01 ↑	0133		
2	02 ↑	0134		
2	03 ↑	0135		
2	04 ↑	0136		
2	05 ↑	0137		
2	06 ↑	0138		
2	07 ↑	0139		
2	08 ↑	0140		
2	09 ↑	0141		
2	10 ↑	0142		
2	11 ↑	0143		
2	12 ↑	0144		
2	13 ↑	0145		
2	14 ↑	0146		
2	15 ↑	0147		
2	16 ↑	0148		
2	17 ↑	0149		
2	18 ↑	0150		
2	19 ↑	0151		
2	20 ↑	0152		
2	21 ↑	0153		
2	22 ↑	0154		
2	23 ↑	0155		
2	24 ↑	0156		
2	25 ↑	0157		
2	26 ↑	0158		
2	27 ↑	0159		
2	28 ↑	0160		
2	29 ↑	0161		
2	30 ↑	0162		
2	31 ↑	0163		

Module# = ((CE# × 5) + Slot# - 5)
 Room# = MMSS (MM=Module#, SS=Dip Switch Value)

Card Ports: 1=lower 2 jacks on PM455; right port on PM456
 2=upper 2 jacks on PM455; left port on PM456