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# NC364A Telephone Interface

for use with the Tek-CARE® NC300II Nurse Call System

# Operation, Installation and Service Manual

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The NC364A Telephone Interface is designed to connect to TekTone®'s Tek-CARE® NC300II Nurse Call System, to enable interconnectivity with SpectraLink's Link 150 Model 3 or Link 3000 wireless telephone systems, consumer off-the-shelf stand-alone portable phone systems, and/or PBX systems. Specific system components are supervised for reliable operation.

# Operation, Installation and Service Manual

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**Illustrations**

# System Introduction

The NC364A Telephone Interface, when connected to the Tek-CARE® NC300II Nurse Call System, provides the ability to interface with SpectraLink Wireless Telephones (Link 150 Model 3 or Link 3000), consumer off-the-shelf stand-alone portable phones, and/or site PBX systems. This functionality allows various nurse call system functions to be accessed from wireless telephone devices that are carried by facility staff members.

The NC364A Telephone Interface has two primary functions. First, the NC364A serves as a three-line PBX system. Second, the NC364A provides increased mobility to the nursing staff by interfacing to a TekTone® Tek-CARE® NC300II Nurse Call System, monitoring system call activity, and signaling calls to the remote telephones that are connected to it.

The interface to the nurse call system provides the following functions: answer incoming phone calls, place outgoing calls, and control the central equipment via the normal master communication path (port). Both visual menu prompts and voice menu prompts are provided for the user, depending on the type of phone system being used with the interface. Visual menu prompts are available only with SpectraLink Wireless Telephone Systems. Voice prompts are supplied to guide the user through the menu selection steps for standard cordless telephones and PBX systems.

The NC364A Telephone Interface is designed to work with SpectraLink Wireless Telephones (Link 150 Model 3 or Link 3000). When ordering the SpectraLink equipment, SpectraLink's representative will assist you in selecting the correct equipment. As a guide, here are some important model numbers:

*For a Link 150 Model 3 System:*
    MOG500 – OAI Gateway.
    SCA508 – 8 Port Analog Master Control Unit (do not use digital models).

*For a Link 3000 System:*
    CSOxxx – Controller. Note the "O" for OAI enabled (example number: CSO301).
    CPA316 – 16 Port Analog Interface Module (do not use digital models).

# 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. 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 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:*** Installers must take care to discharge themselves before handling system components. This can be done by touching a grounded metal surface. To avoid a shock when 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 Operating Instructions ─────────────────

This section provides complete operating instructions for all NC364A Telephone Interface functions, as well as reference drawings for use in locating and describing all controls. System operators must read the following operating instructions concerning system equipment and the terms used in conjunction with the equipment.

## SpectraLink PTB400 Handset Controls and Indicators
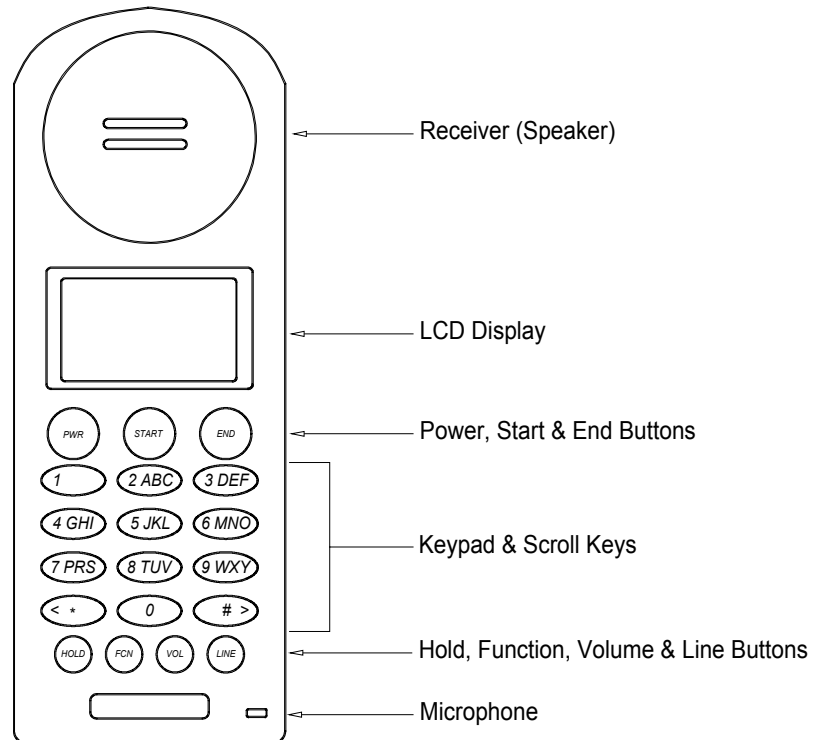


**Figure 1—SpectraLink PTB400 Handset**

*Receiver (Speaker):* Users will listen here during audio operations.

*LCD Display:* Call information and menu functions are displayed here.

*Power Button:* Turns the portable handset on and off.

*Start Button:* Initiates phone connection and menu activities.

*End Button:* Ends phone connection and menu activities.

*Keypad:* Used to enter numbers during menu functions, and for entry of numeric data. Alphabetic characters can be accessed during various functions by pressing the keypad number associated with the desired letter and then pressing **#>** to scroll to the desired letter. The **<\*** key can be used as a destructive backspace. Example: To enter the letter "L" (during an appropriate entry mode), press the **5** on the keypad and then press **# >** three times. Letter choices wrap from the last letter to the first letter of the key. The letter "Q" is one of the selections for the **7** and the letter "Z" is one of the selections for the **9**.

*Scroll Keys:* Used to scroll through available menu options (**<\*** scrolls left; **#>** scrolls right).

*Hold Button:* This key serves no function with the NC364A Telephone Interface.

*Function (FCN) Button:* Pressing this key before a numeric key initiates operational functions. Specific usage of this button will be outlined later in this manual.

*Volume Button:* Pressing this key will alternate between a lower and higher audio level.

*Line Button:* This key serves no function with the NC364A Telephone Interface.

To prevent accidentally leaving the handset audio open, all calls reset after 60 seconds. If a higher priority call occurs on the system, such as code, then audio paths will reset within 12 seconds to allow the user to be notified of the call.

## Consumer Off-the-Shelf Stand-Alone Portable Phone Controls and Indicators

These devices are widely available from many manufacturers and in many configurations. The functionality required from such devices is as follows:

TALK *or other "off-hook" button or switch:* Activation of this button or switch sends a signal to the interface indicating an off-hook state. This will normally activate the voice-guided menu system.

*Numeric Keypad:* These keys are used to enter menu selections and other numeric data.

*\* (Star/Asterisk) Key:* This key resets or clears the current operation, where applicable

*# (Pound) Key:* This key is used in conjunction with the numeric keys to make menu selections.

## PBX System Controls and Indicators

These systems are widely available from many manufacturers and in many configurations. Functionality can vary from system to system. Refer to the operator's instruction manual for specific keystroke and command selections. The system must be able to dial extensions. When the extension assigned to the telephone interface is dialed, the voice-guided menu system is engaged. Use the numeric keys and the **#** (pound) key to make menu selections and enter numeric data. Use the **\*** (star/asterisk) key to reset or clear operations (except exiting PBX mode, which uses the command **# 8**).

## SpectraLink PTB400 Handset —Roving Master Mode

This mode of operation is used when SpectraLink phones are directly connected to the telephone interface (Note: 3 phones maximum can be in this mode of operation). Operate the PTB400 Handset by making selections from the scrollable menu that is displayed on the LCD screen. These options are displayed when a call is received, and when the user activates the handset.

To prevent accidentally leaving the handset audio open, all calls reset after 60 seconds. If a higher priority call occurs on the system, such as code, then audio paths will reset within 12 seconds to allow the user to be notified of the call.

When a call is received, the LCD screen displays the appropriate information, as shown in the following figure:
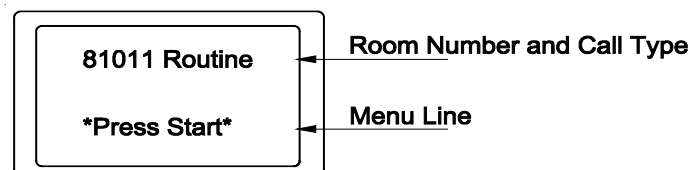


**Figure 2—Call Received on LCD Display**

Use the scroll keys **<\*** and **#>** to scroll through the various menu options. If multiple calls are placed, the display shows the highest priority and/or oldest call.

The following menu options are available. Certain menu options appear only when they can be properly accessed.

< 0-Last Call >   Pressing **0** moves to the next highest priority call.

< 0-Last ST-Talk >   Pressing **0** moves to the next highest priority call. Pressing **START** connects to the currently displayed call.

< 0-Next Call >   Pressing **0** moves to the next lowest priority call.

< 0-Next ST-Talk >   Pressing **0** moves to the next lowest priority call. Pressing **START** connects to the currently displayed call.

< 0-Place Call >   Pressing **0** causes the message "Dialing:" to appear in the LCD display. To call a specific room, enter the room station ID number and press **START.**

< 0-Nurse Snd >   Pressing **0** causes the message "Dialing:" to appear in the LCD display. To initiate a Nurse Request for a specific room, enter the room station ID number and press **START.**

< 0-Aide Snd >   Pressing **0** causes the message "Dialing:" to appear in the menu display area. To initiate an Aide Request for a specific room, enter the room station ID number and press **START.**

< ST-Page Zones >   Pressing **START** pages all zones assigned to the phone.

< ST-Page Staff >   Pressing **START** pages rooms where staff members are registered within the zones assigned to the phone.

< ST-All Call >   Pressing **START** pages all stations on the system.

< 0-Capture Zns >   Pressing **0** displays the zones currently assigned to the phone (in lower case letters), and allows the user to reassign those zones. Starting from the left, press **#>** to assign a zone to the phone (which will appear as a capital letter), or press **<\*** to remove a zone. The 16 available zones are A–P, and each time a scroll key is pressed, the cursor moves to the next available zone. The cursor wraps around when the last zone selection is entered, allowing the user to start again from the beginning. Press **START** to save zone settings when complete, or press **END** to exit with no changes.

< ST-For PBX >   Pressing **START** connects the phone to the PBX system (if PBX system is connected and PBX line is available).

< 0-Master Sttn>   Pressing **0** causes the message "Dialing:" to appear in the LCD display. To call a master station, enter the master station ID number (1–7) and press **START**.

< 81011:0-Reset >   This option is displayed while communicating with a patient station. (In this example, the user is speaking with room 8101-1.) Pressing **0** resets (ends) the call.

< ST-Stat Snd >   This option is displayed only while communicating with a patient station. To initiate a STAT Request for that station, press **START**.

< ST-Nurse Snd >   This option is displayed only while communicating with a patient station. To initiate a Nurse Request for that station, press **START**.

< ST-Aide Snd >    This option is displayed only while communicating with a patient station. To initiate an Aide Request for that station, press **START**.

PBX: End to Quit    Pressing **END** exits the PBX call mode and returns the phone to standby mode, breaking any audio connections. However, pressing **END** does not reset the call—the call will register on the phone again, until it is correctly reset.

### For example: To answer a call

Press **START** to connect to telephone interface, then press **START** to connect to displayed station and converse with the patient station.

Press **0** to end conversation with patient station and then press **END** to hang up.

## SpectraLink PTB400 Handset—Via-PBX Operation

This mode of operation is used when SpectraLink phones are connected to available analog lines on a PBX system. This alternate mode of operation supports up to 4 phones, but has fewer menu options than the standard operating mode.

In Via-PBX operating mode, SpectraLink phones do receive call indications, but do not have direct audio access to the nurse call system. Menu options that enable audio usage are disabled.

Connect indirectly to the telephone interface via the PBX by pressing **START** twice and then entering the telephone interface's assigned extension number. Once connected to the telephone interface, follow the procedures described for the **Consumer Off-the-Shelf Stand-Alone Portable Phone Operation**. (Option *#1 – Connect to the highest priority call on the system* is disabled in PBX operating mode. Instead, respond to the call shown on the phone's LCD display using Option *#2 – Place a call to a station*.)

### For example, to answer a call:

Press **START** (to connect to NC364A), press **START** (to connect to PBX), press **34** (dial the telephone interface's extension on the PBX. This number varies based on the site).

Wait for a voice prompt. Press **# 2** (dial a room from voice prompt). Enter the room number for example, 01001. Converse with the room.

To end call, press **\*** (disconnect from room), press **# 8** (disconnect from PBX), press **END** (hang up).

## Consumer Off-the-Shelf Stand-Alone Portable Phone Operation

The telephone will ring as dictated by zone and call type programming. Press **TALK** (or other off-hook button) to initiate access to the telephone interface. A voice-prompt menu will then describe the available options, as described below.

If the incoming call is medium or high priority (such as code or emergency), a repeating background tone will sound during the voice-prompt menu. No background tone will sound for routine calls. Medium and high priority calls must be answered in person.

Select one of these options from the voice-prompt menu by pressing the **#** key and then the appropriate number. If an error is made entering a room number, if there are no calls on the system, or if no nurses are present in available rooms during paging, a voice prompt will notify of improper operation and will prompt another menu selection after two (2) seconds.

*#1 – Connect to the highest priority call on the system.*
This option automatically connects to the highest priority call on the system for audio communication. (This function is disabled when using SpectraLink handsets via the PBX system.)

*#2 – Place a call to a station.*
When this option is selected, users are prompted to enter a 4-digit room number and 1-digit bed number. This opens an audio connection to the desired patient station. When the conversation is completed, press **\*** to reset the call and return to the voice-prompt menu, or simply press the **TALK** key if no further use of the interface is required.

*#3 – Set Nurse request.*
When this option is selected, users are prompted to enter the 4-digit room number and 1-digit bed number for which the nurse request is to be made. Nurse requests may also be selected during communication with a patient station by entering **#** and then **3**.

*#4 – Set Aide request.*
When this option is selected, users are prompted to enter the 4-digit room number and 1-digit bed number for which the aide request is to be made. Aide requests may also be selected during communication with a patient station by entering **#** and then **4**.

*#5 – Page a Nurse.*
Select this option to page a room where nurse presence is registered. When the page is completed, enter **\*** to reset the call and return to the voice-prompt menu, or simply press the **TALK** key if no further use of the interface is required.

*#6 – Place a call to a master station*
When this option is selected, users are prompted to enter the 1-digit master station number (1–7). This opens an audio connection to the desired master station. When the conversation is completed, press **\*** to reset the call and return to the voice-prompt menu, or simply press the **TALK** key if no further use of the interface is required.

*#7 – Page all stations within assigned zones.*
Select this option to page all rooms within zones assigned to this phone. When the page is completed, enter **\*** to reset the call and return to the voice-prompt menu, or simply press the **TALK** key if no further use of the interface is required.

*#8 – Disconnect PBX from telephone interface.*
Select this option to disconnect from the telephone interface after having dialed into it using a PBX system telephone.

*#9 – Dial up an outside telephone number.*
Select this option to dial an external phone number. This requires a PBX system or analog phone line to be connected to the telephone interface's PBX input. If an analog line is connected, the user will hear a dial tone. If a PBX system is connected, the user must perform the PBX required function to access an outside line after selecting this menu item (example: Dial **9** after entering **# 9**).

*#0 – Set STAT request.*
Select this option during communication with a patient station to set a STAT request for that station.

*\* – Resets and allows further operation.*
Instead of hanging up, select this option to complete a previous command or connection, and then use the interface connection again.

To prevent accidentally leaving the handset audio open, all calls reset after 60 seconds. If a higher priority call occurs on the system, such as code, then audio paths will reset within 12 seconds to allow the user to be notified of the call.

## PBX System Operation

When using a PBX system extension phone, connect to the telephone interface by entering the telephone interface's assigned extension number. Refer to the PBX operational literature (provided by the PBX manufacturer) for the specific steps needed to connect to an extension. Once connected to the telephone interface, follow the procedures described for the **Consumer Off-the-Shelf Stand-Alone Portable Phone Operation**.

To prevent accidentally leaving the handset audio open, all calls reset after 60 seconds. If a higher priority call occurs on the system, such as code, then audio paths will reset within 12 seconds to allow the user to be notified of the call.

## Additional Operation Information

### *Fault Condition*

The telephone interface communications to the Tek-CARE® NC300II central equipment are supervised. When communications between the two devices have been established, a fault indication will be displayed on the Tek-CARE® NC300II master station display if the Tek-CARE® NC300II central equipment cannot detect the telephone interface. Refer to the IL715 Tek-CARE® NC300II Operation, Installation and Service manual for more information about the Tek-CARE® NC300II Nurse Call System.

The telephone interface has been designed to prevent interference with Tek-CARE® NC300II master station operation during a fault condition, if connected using an in-line configuration.

# System Installation ─────────────────────────────

The NC364A Telephone Interface uses nurse call master station address #8, to allow the central equipment to communicate with the telephone interface exactly as it does with a master station. Therefore, no more than 7 master stations can be connected to a Tek-CARE® NC300II system that uses a telephone interface. Without changing its station address, the NC364A Telephone Interface can be connected to any of the physical ports on the NC351 Central Equipment, or it can be connected in-line with one of the existing master stations, sharing a single audio path. **NOTE: The integral port connections on the NC364A Telephone Interface cannot be connected in line with a master station. Only PM364A Expansion Modules can be connected in line with master stations.**

Step 1: Read the following information prior to installing the NC364A Telephone Interface. The installer must be familiar with the system and its installation requirements and guidelines.

Step 2: Determine the equipment locations.

Step 3: Install the system wiring.

Step 4: Install the NC364A cabinet.

Step 5: Use an ohmmeter to check for shorts and grounds in system wiring. **NOTE: This is a critical and necessary step to avoid installation problems later.** When checking for shorts between shields, remember that the provided interconnection cable harnesses already have the shields connected together internally as a preparation to their introduction to the central equipment's ground.

Step 6: Set interface address and control module settings (dipswitches and headers). Refer to the **Equipment Programming, Configuration and Settings** section for more information. Be aware that there is a setting change necessary in the associated NC351 Series Central Equipment. The change is outlined within this manual.

Step 7: Connect the NC364A Telephone Interface to the NC351 Series Central Equipment. Power up the telephone interface with dipswitch 5 on the PM365 Control Module in the **ON** position to clear the interface's flash memory. Once the device is powered up and running, return this switch to the **OFF** position.

Step 8: Perform a full operational test of the telephone interface.

Step 9: Train system operators.

## Problems to Avoid

- Do not use wire nuts for wire connections. Wire connections must be made with compression-type connectors, rated for stranded wire, that use a ratcheting-type tool for installation.

- Do not short shields together, as this allows for noise transference from the data lines to the audio lines.

- 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.

- The capacitance on the data wires is critical (<24 pF/ft.). If the cable capacitance exceeds this level, data signal degradation will occur and interfere with normal system operation.

- 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.

## Equipment Descriptions, Requirements and Locations

Locate the NC364A Telephone Interface 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.

### NC364A Telephone Interface:

The NC364A Telephone Interface connects the Tek-CARE® NC300II Nurse Call System to SpectraLink Wireless Telephone Systems (Link 150 Model 3 and Link 3000), consumer off-the-shelf stand-alone portable phones and/or PBX systems via its line, PBX and RS232 connection ports. The telephone interface is electrically isolated from the nurse call system, and connects to the NC351 or NC351/2 Central Equipment via one of the master station ports in place of a master station. Add PM364A Expansion Modules to connect masters in line for additional audio paths.

**NOTE: When connected in line with an NC304 or NC304LCD Master Station, the NC364A uses the same audio path as the master station. When the master station is active, the audio path will not be available on the telephone interface. If users attempt to connect the telephone interface to the audio path during this time, they will receive a "Port Busy" indication.**

The device consists of two circuit assemblies: The NC364A motherboard and the PM365 Control Module. PM365 settings will be covered in the **Equipment Programming, Configuration and Settings** section.

Locate the telephone interface within 1000' of the NC351 or NC351/2 Central Equipment (CE), if not being used in conjunction with an NC304, NC304LCD or NC306 Master Station. If the NC364A is used in line with an NC304 or NC304LCD Master Station, mount the NC364A within the 1000' limit between the master station and the CE. If the NC364A is used in line with an NC306 Master Station, mount the NC364A within 15' of the CE, between the master station and the CE, to prevent voltage loss. **Total cable length from the master station through the NC364A and on to the CE must not exceed 1000'.** Locate the NC364A within 25' of SpectraLink equipment and/or off-the-shelf stand-alone portable phone equipment. Locate the NC364A within 500' of PBX equipment.

The NC364A provides a 3-terminal block for 115 VAC connections and must be 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. The device must be wall mounted in an area with a consistent temperature of approximately 26°C. Relative humidity should not exceed 80%.

### PM364A Expansion Module:

The PM364A Expansion Module is designed as a plug-on addition to the NC364A, which allows for an additional connection between the NC364A Telephone Interface and the NC351 or NC351/2 Central Equipment. This provides an additional audio path to be used simultaneously with the existing NC364A audio path. The NC364A can support a maximum of three of these devices, providing a total of four simultaneous audio paths (3 for wireless telephone applications and 1 for PBX applications). These connections may be made independently from master stations or in conjunction with them (see NC364A Telephone Interface information earlier in this section).

The PM364A module is located inside the NC364A and is subject to the same environmental requirements. The device provides a PCB mounted connector to connect to the NC364A. Refer to the **Wiring Diagrams** section for mounting and connection information.

## Wiring Installation

The bulk of the necessary wiring information can be found in the **Wiring Diagrams** section at the end of this manual. Some of this information will be redundant, since some of the listed requirements will already have been met by the Tek-CARE® NC300II Nurse Call System requirements as set out in the IL715 Tek-CARE® NC300II Manual. The following list includes important wiring installation items critical to a successful installation. The NC364A Telephone Interface has the following ports:

*Central Equipment Master Port (CT210 interconnect cable provided):*

This port connects to one of the master ports located on the NC351 or NC351/2 Central Equipment. If the NC364A is not connected in line with an existing NC304 or NC304LCD Master Station, this port connection can be a maximum of 1000' from the central equipment. If PM364A Expansion Modules are installed and a master station is connected in line with the NC364A, the master station can be a maximum of 1000' feet from the central equipment, and all connections to the telephone interface must be included within this total. Use the following wiring specifications for the interconnecting cable:

- **Data Wires:** #18 AWG, 1 twisted pair (8 twists per foot) plus 1 conductor (3 conductors, 7 str. BC) with 100% aluminum/Mylar shield and #20 AWG TC drain wire. Nominal insulation 0.017", nominal OD 0.245", and capacitance <24pF/ft. Recommended conductor colors are **ORANGE**, **YELLOW** and **GREEN**. Overall jacket.

- **Power Wires:** #18 AWG, 3 conductors (7 str. BC) with 100% aluminum/Mylar shield and #20 AWG TC drain wire. Nominal insulation 0.009" and nominal OD 0.175". Recommended conductor colors are **BROWN**, **RED** and **BLUE**. Overall jacket.

- **Audio Wires:** #18 AWG, 1 twisted pair (8 twists per foot, 2 conductors, 7 str. BC) with 100% aluminum/Mylar #20 AWG TC drain wire. Nominal insulation 0.017", nominal OD 0.235", and capacitance <24 pF/ft. Recommended conductor colors are **VIOLET** and **GRAY**. Overall jacket.

- **Ground Wire:** #16 AWG, 1 conductor (26 str. BC) with nominal OD 0.101". Recommended color is **BLACK**.

*Master Station Port (CT318 interconnect cable provided):*

This port connects to an NC304 or NC304LCD Master Station if the NC364A has PM364A Expansion Modules installed and is being installed in an "in line" configuration. See the notes in the **Central Equipment Master Port** section for further details and interconnection cabling specifications.

*Line/PBX Cable (CT217 interconnect cable provided):*

This port (RJ-45 Jack) connects to the SpectraLink system, a stand-alone wireless telephone system and/or a PBX system. The maximum distance between the telephone interface and the SpectraLink system is 25'. The maximum distance between the telephone interface and a stand-alone wireless telephone system is 500'. The maximum distance between the telephone interface and a PBX system is 500'.

- **Line Connection Cable:** 3 Twisted Pair #24 AWG Solid Conductor Cable (6 conductors total). **NOTE:** These lines can be divided between the SpectraLink system and stand-alone wireless telephone systems (example: 2 pairs to the SpectraLink system and 1 pair to a stand-alone wireless telephone system).

- **PBX Connection Cable:** 1 Twisted Pair #24 AWG Solid Conductor Cable (2 conductors total).

*SpectraLink OAPI Port (CA365 null modem interconnect cable provided):*
> This port connects to the SpectraLink 150 Model 3 or Link 3000 Wireless Telephone System (9600 Baud, 8, 1 and None). The maximum distance between the NC364A telephone interface and the SpectraLink system is 25'.

> • **Connection Cable:** 5 #22 AWG conductor cable.

*PC OAI Port (CT234 Interconnect Cable Provided):*
> This port connects to a PC that is used for programming setup (115200 Baud, 8, 1 and None). The maximum distance between the telephone interface and the programming PC is 25'.

> • **Connection Cable:** 5 #22 AWG conductor cable.

## Equipment Programming, Configuration and Settings

*NC364A Programming Configuration:*
> Review this entire section to ensure that all necessary setup operations are performed. The telephone interface will power up with default settings, as described in this section. These can be changed as described through the various configuration methods listed.

*Patient Station Information:*
> After the NC364A has been connected to the Tek-CARE® NC300II Nurse Call System, it must detect the patient station information in order to function properly. To accomplish this, perform the **6 Restore Local Database** function (on the **System Functions** menu) on one of the NC304 or NC304LCD Master Stations connected to the nurse call system (see the IL715 Tek-CARE® NC300II Manual for further details). This function transfers the current system information to the interface. If the NC364A remains connected to the nurse call system, future updates will be incorporated automatically. The NC364A will be programmed with the default station ID numbers if this function is not performed or if no programming changes have been made to the nurse call system.

*Integral Audio Path Connection and PM364A Expansion Modules:*
> The NC364A will, by default, configure the ports that connect to the NC351 series central equipment in the following manner:

Module 0 (integral) – This is the integral module included with the NC364A motherboard. Defaults to master port 1.

Module 1 (optional) – This is the first PM364A Expansion Module. Defaults to master port 2. Refer to **PM364A Installation Diagram** in the **Wiring Diagrams** section for module number assignment shunt settings.

Module 2 (optional) – This is the second PM364A Expansion Module. Defaults to master port 3.

Module 3 (optional) – This is the third (and final) PM364A Expansion Module. Defaults to master port 4.

*Programming PC:*
> **Before proceeding, notify facility personnel that the nurse call system will not annunciate calls while the telephone interface is being programmed.** To access the PC programming port on the NC364A, connect a PC with a terminal program to the NC364A. Plug one end of the included CT234 cable into a COM port on the programming PC (typically COM1). Plug other end of the CT234 cable into the *PC OAI Port* of the telephone interface (see the **Wiring Diagrams** section for connection point). The terminal program must be communicating to the COM port where the CT234 cable is plugged in on the programming PC. The port settings should be 8 data bits, 1 stop bit and no parity (8, 1 and None) at a speed of 19200 baud. Set the Flow Control (if applicable) to none. The terminal program can be used to enter programming information, to provide real-time diagnostic printing (for telephone interface), and to update the NC364A firmware.

To activate the terminal program, slide dipswitch #6 to the **ON** position and then toggle dipswitch #1. This menu prompt will appear on the laptop's screen:

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
* MENU OF NC364A SETUP OPTIONS *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                                                *
*PG – PAGER SETUP               *
*PS – PROGRAM STATION           *
*PH – PROGRAM PHONE             *
*PM – PROGRAM MODULE            *
*PB – PROGRAM PBX LN            *
*PX – PROGRAM VIA PBX           *
*LP – LEAVE PROGRAMMING         *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

Return dipswitch #6 to the **OFF** position. Type **/** and press **ENTER** to return to the menu any time during programming.

> **PG–Pager Setup:** This command programs radio pagers on the Tek-CARE® NC300II system, via the same method used by NC306 Master Stations. The radio pager programming options are, in order: Pager Number Assignments, Zone Assignments and Call Type Assignments.
>
> • Type **PG** and press **ENTER**. The display will show all the pager numbers (0–47) and their associated pager cap codes.
>
> • Type the pager number (0–47) to be programmed, and press **ENTER**. The display will show the cap code currently assigned to that pager number. Type a new 3-digit cap code, and press **ENTER**.
>
> • Type the zone letters (A–P) assigned to this pager, separated by commas (or type **0** for no zones), and press **ENTER.**
>
> • Type the letters of call types to be sent to this pager, separated by commas (or type **0** for no call types), and press **ENTER.** Valid call types are shown on the display. They are:

| | | | | | |
|---|---|---|---|---|---|
| A | – Code | F | – Cord Out | J | – Personal Attn |
| B | – Fire | G | – Priority | K | – Routine |
| C | – Emergency | H | – Duty | L | – Stat Request |
| D | – Monitor | I | – Staff | M | – Staff Request |
| E | – Bath | | | | |

> • Type **#** (pound) and press **ENTER** to save the settings for this pager.

> **PS–Program Station:** This command programs NC306 Master Station selector buttons on the Tek-CARE® NC300II system, via the same method used by NC306 Master Stations. By default, stations are assigned to the NC306 selector buttons beginning with the lowest physical address on the lowest numbered port. The stations are assigned to the selector buttons sequentially, starting with the top button in the left row (selector button 0), continuing down each row in sequence, and ending with the bottom button in the right row (selector button 49). After all 50 selector buttons have been assigned to stations, any additional stations are ignored—unless an NC255 Master Station Expander is used to add 50 more selector buttons to the NC306 (adding selector buttons 50 through 99). The Program Station function allows the selector button assignments to be changed from the defaults, so that a particular selector button can be associated with any station on any port.

The station programming options are, in order: Assign Station to Selector Button, Station ID, Bed Numbers, Station Labels Single/Dual Patient Stations, Audio Page On/Off, Online/Offline, Privacy, Call Priority and Station Zones.

- Type **PS** and press **ENTER**.

- Press **ENTER** to skip to next option, or
  Type the physical address of the port and station physical address to be assigned to this selector button, and press **ENTER**. (Example: "**07**, **15**, **ENTER**" assigns the station on port 7 with dipswitch setting 15 to this selector button.)

- Press **ENTER** to skip to next option, or
  Type the 4-character alphanumeric room ID to be assigned to the station associated with this selector button, and press **ENTER**. (Station IDs are used by event printing, pagers and NC304/LCD masters.)

- Press **ENTER** to skip to next option, or
  Type the bed number(s) to be assigned to the station, and press **ENTER**. (Example: "**R**, **L**, **ENTER**" changes the bed1 and bed2 extensions of a dual station to R and L. The extensions are used by event printing, pagers and NC304/LCD masters.)

- Press **ENTER** to skip to next option, or
  Type a 1–16 character alphanumeric label for bed1, and press **ENTER**. (Alphanumeric labels are displayed on NC304/LCD masters with VGA display monitors.)

- Press **ENTER** to skip to next option, or
  Type a 1–16 character alphanumeric label for bed2, and press **ENTER**.

- Press **ENTER** to skip to next option, or
  Type **N** and then press **ENTER** to turn Station Paging Off, or
  Type **Y** and then press **ENTER** to turn Station Paging On. (When station paging is on, the station will receive audio pages.)

- Press **ENTER** to skip to next option, or
  Type **N** and then press **ENTER** to take the Station Offline, or
  Type **Y** and then press **ENTER** to put the Station Online. (Take a station offline when it must be switched off or physically removed from the system.)

- Press **ENTER** to skip to next option, or
  Type **N** and then press **ENTER** to set Station Privacy Off, or
  Type **Y** and then press **ENTER** to set Station Privacy On. (When station privacy is on, the master station cannot receive audio from the patient station unless the patient station initiates the call. The patient station will still be able to hear audio from the master station.)

- Press **ENTER** to skip to next option, or
  Type **0**, and then press **ENTER** to set Station Priority to Routine, or
  Type **1**, and then press **ENTER** to set Station Priority to Personal Attention, or
  Type **2**, and then press **ENTER** to set Station Priority to Priority.

- Press **ENTER** to skip to the end, or
  Type the zone letters (A–P) assigned to this station, or press **0** (zero) to assign no zones to this station, and press **ENTER**.

- To save changes, press **#** (pound) and then **ENTER**, or
  To discard changes, just press **ENTER**.

**PH – Program Phone:** This command programs the settings for SpectraLink and off-the-shelf phones connected to the NC364A's three lines.

- Type **PH** and press **ENTER**. The user will be prompted to take the phone to be programmed "off hook" by pressing the **TALK** or the **START** button. (Take only one phone off hook. If a problem is encountered, verify that all other phones are hung up.)

- If programming a SpectraLink phone, press **Y** on the laptop computer and then press **FCN, 0** on the phone. If programming an off-the-shelf phone, press **N** on the laptop.

- Press **ENTER** to skip to next option, or
  Type the zone letters (A–P) assigned to this phone (or type **0** for no zones), and press **ENTER**.

- Press **ENTER** to skip to the end, or
  Type the letters of call types to be sent to this phone, separated by commas (or type **0** for no call types), and press **ENTER.** Valid call types are shown on the display. They are:

  | | | |
  |---|---|---|
  | A – Code | F – Cord Out | J – Personal Attn |
  | B – Fire | G – Priority | K – Routine |
  | C – Emergency | H – Duty | L – Stat Request |
  | D – Monitor | I – Staff | M – Staff Request |
  | E – Bath | | |

- To save changes, press **#** (pound) and then **ENTER**, or
  To discard changes, just press **ENTER**.

**PM–Program Module:** This command specifies which Tek-CARE® NC300II master port each PM364A Expansion Module is connected to. **This information must be programmed accurately, or the telephone interface's audio functions will not work correctly.** The integral module included with the NC364A motherboard is module 0 and defaults to master port 1. The remaining modules are incremented in the same order that they are physically stacked on the motherboard. (The first add-on module is 1 and defaults to master port 2. Module 2 defaults to master port 3, and module 3 defaults to master port 4.)

- Type **PM** and press **ENTER**.

- The display will show each PM364A Expansion Module (0–3) and its current programming data. For each of the 4 modules, enter the master port number (1–8) that it is connected to and press **ENTER**. If a module is not in use, press **ENTER** to skip to the next module without changing programming.

**PB–Program PBX Ln:** This command is used to program zones and call types for the PBX line, and works similar to **PH–Program Phone**. Zone information is provided for voice paging functionality. Call type settings are provided for future functionality. The system cannot ring extensions on the PBX system.

**PX–Program via PBX:** This command is used to program using SpectraLink phones connected via the PBX system, and works similar to **PH–Program Phone**. Up to 4 phones (0–3) are supported in this mode.

**LP–Leave Programming:** This command exits programming mode and resumes normal operating mode. Type **LP** and press **ENTER**. Verify that dipswitch #6 has been returned to the **OFF** position.

### PM364A Expansion Module Settings:

See the **PM364A Installation** diagram in the **Wiring Diagrams** section of this manual for details.

### PM365 Control Board Settings:

See the **PM365 Settings** diagram in the **Wiring Diagrams** section of this manual for details.

### NC351 Series Central Equipment Settings:

In the device, locate the PM353 processor card (see the IL715 Tek-CARE® NC300II Manual for further detail). On the PM353 processor card, set dipswitch 3 of the 7-position S1dipswitch to the **ON** position. If this switch is not placed in the **ON** position, the NC364A will appear to operate correctly, but no audio path will be established when calls are placed, and no call responses will be passed to the remote telephones.

### NC364A Telephone Interface Firmware Upgrade Instructions:

**Note: Obtain the send.exe utility and current NC364A firmware from TekTone prior to performing any upgrade steps.**

- Copy send.exe and 381_0x.bin to the desktop of the laptop computer (where x is the file's version number, for example: 381_04.bin).

- Turn on dipswitch #7 on the NC364A Telephone Interface, wait 5 seconds and then turn OFF dipswitch #3 inside of the NC351 Series Central Equipment. Reference the IL715 manual in the Equipment Configuration and Settings for the PM353 Processor Card (dipswitch #3 on the horizontal dipswitch). This will take the telephone interface offline so that no faults are generated during the update process.

- Disconnect power from the NC364A Telephone Interface by unplugging the power cable as indicated in the NC364A Connections Fan Out diagram.

- Move the jumper on the PM365 to the programming position as indicated by the PM365 Settings wiring diagram.

- Re-connect power to the telephone interface. Connect a standard serial cable from the laptop computer to the serial port on the NC364A Telephone Interface (this is the SpectraLink OAPI port, see NC364A Connections Fan Out Diagram). If a SpectraLink system is in use at the facility, disconnect the cable from the OAPI port before connecting the serial cable. Reconnect this cable when upgrade is complete. NOTE: The laptop computer must be running on battery power, and must not be connected to 120 VAC power.

- On the laptop, open a DOS or COMMAND window. This should bring you to the C:\WINDOWS directory.

- On the laptop, type cd desktop and press the **ENTER** key. This will move you into the C:\WINDOWS\DESKTOP directory, where the files are located.

- On the NC364A, move dipswitch number 1 to the ON position and then back to the OFF position.

- On the laptop, type send 381_0x.bin (where x is the file's version number, for example: send 381_04.bin) and press the **ENTER** key.

- As packets are sent, information will be displayed on the laptop's screen. There will be 4095 packets sent.

- Disconnect power from the telephone interface and disconnect the serial cable between the laptop and the NC364A.

- Place the programming jumper back in its original position, and move dipswitch number 7 back to the OFF position.

- Reconnect power to the NC364A and restore dipswitch #3 within the NC351 Series CE to the ON position.

## System Test Instructions

This section provides guidelines for testing the NC364A Telephone Interface. 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, and

- verify that all configuration and programming functions have been performed.

Using the **System Operating Instructions** section 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 be performed once 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 periodically tested as indicated in the **System Test Instructions** to verify that the system is in good operating condition. If problems are encountered, contact qualified service personnel for system repair or maintenance. The next section, **System Maintenance Instructions**, indicates which items may be serviced by on-site maintenance personnel.

# System Maintenance Instructions ———————————————

*SpectraLink PTB400 Handset Battery Replacement:*
- Push the black oval button on the back of the device while pulling on the bottom, rear half of the handset. The battery section should slide downward and away from the handset.

- Lay the new battery section flat on the back of the handset and align the battery top with the line presented on the exposed battery replacement label.

- Press and hold the power button until a double-chirp is heard. Verify that the device is receiving service and has powered up.

  **NOTE: Only model PTS330 NiCAD battery modules should be used for replacements.**

*Consumer Off-the-Shelf Stand-Alone Portable Phone:*
- Refer to the owner's manual for proper battery replacement and for serviceable components.

*PM364A Expansion Module:*
- See the **PM364A Installation** diagram in the **Wiring Diagrams** section of this manual for installation/replacement instructions.

# System Troubleshooting Guide

This section provides guidelines for troubleshooting the NC364A Telephone Interface. It covers general troubleshooting practices, as well as specific suggestions for various problems.

**NOTE: Installers must always exercise care when troubleshooting problems that might 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.**

**Direct Connection** is a classic troubleshooting technique. If a problem is encountered, an installer directly connects components, to eliminate external influences. 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. 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 interchanges a known-good piece of equipment into the location in question and moves 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. When swap testing is performed, the system must be powered down during the actual swapping process, or damage may result. Do not "hot swap."**

As an example, a PM364A module that demonstrates a problem can be "swapped" with another module (if more than one is in use) that is known to be working acceptably. **NOTE: Also "swap" the shunt settings.** 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 also be used to test cable connections to the Tek-CARE® NC300II components.

## 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. Refer to the **NC364A Connection Fan Out** diagram in the **Wiring Diagrams** section.

*Master Port Connections:* Taken at the NC351 Series Central Equipment, the NC364A Telephone Interface master and central connection ports, and (if present) the NC304 Series Master Station wall plate.

| Wire Color | Description | Voltage Reading |
|---|---|---|
| Gray | Audio A | +5.5 to 6.5 VDC |
| Yellow | 485B | 0 to +5 VDC fluctuation |
| Orange | 485A | 0 to +5 VDC fluctuation |
| Blue | VOX | 0 or +11 VDC (dependent on VOX circuit state) |
| Green | Ground | 0 VDC |
| Violet | Audio B | +5.5 to 6.5 VDC |
| Brown | Not used | |
| Red | +12 VDC | +10.5 to 12 VDC (dependent on wire run length) |
| Shields | Ground | 0 VDC |

***RJ-45 CT217 Cable:*** Taken at the NC364A Telephone Interface.

| Wire Color | Description | Voltage Reading | | | |
|---|---|---|---|---|---|
| | | *Telco* | *Telco* | *PBX* | *PBX* |
| | | On-Hook | Off-Hook | On-Hook | Off-Hook |
| White | PBX Line (Tip) | -48 VDC | -6 VDC | -24 VDC | -6 VDC |
| Brown | PBX Line (Ring) | -48 VDC | -6 VDC | -24VDX | -6 VDC |
| | | | | | |
| | | On-hook | Off-hook | | |
| Yellow | Line 1 (Tip) | -24 VDC | -6 VDC | | |
| Green | Line 1 (Ring) | -24 VDC | -6 VDC | | |
| Red | Line 2 (Tip) | -24 VDC | -6 VDC | | |
| Black | Line 2 (Ring) | -24 VDC | -6 VDC | | |
| Orange | Line 3 (Tip) | -24 VDC | -6 VDC | | |
| Blue | Line 3 (Ring) | -24 VDC | -6 VDC | | |

***SpectraLink OAPI Port & CA365 Null Modem Cable:***

| Pin # | Description | Voltage Reading | |
|---|---|---|---|
| | | *Idle State* | *Active State\** |
| 1 | Ground | 0 VDC | 0 VDC |
| 2 | Transmit (TX) | -8 to −12 VDC | +12 to −12 VDC |
| 3 | Receive (RX) | -8 to −12 VDC | +12 to −12 VDC |
| 4 | No connection | None | None |
| 5 | No connection | None | None |
| 6 | No connection | None | None |
| 7 | Ready To Send (RTS) | -8 to −12 VDC | +12 VDC to −12 VDC |
| 8 | Clear to Send (CTS) | -8 to −12 VDC | +12 VDC to −12 VDC |
| 9 | No connection | None | None |

**\* NOTE: During active states, the data signal voltage level will fluctuate within the specified parameters.**

***PC OAI Port & CT234 Straight RS232 Cable:***

| Pin # | Description | Voltage Reading | |
|---|---|---|---|
| | | *Idle State* | *Active State\** |
| 1 | Ground | 0 VDC | 0 VDC |
| 2 | Transmit (TX) | -8 to −12 VDC | +12 to −12 VDC |
| 3 | Receive (RX) | -8 to −12 VDC | +12 to −12 VDC |
| 4 | No connection | None | None |
| 5 | No connection | None | None |
| 6 | No connection | None | None |
| 7 | Ready To Send (RTS) | -8 to −12 VDC | +12 VDC to −12 VDC |
| 8 | Clear to Send (CTS) | -8 to −12 VDC | +12 VDC to −12 VDC |
| 9 | No connection | None | None |

**\* NOTE: During active states, the data signal voltage level will fluctuate within the specified parameters.**

## Symptoms and Suggestions

*Audio does not work:*
- Locate the PM353 processor card in the NC351 Series Central Equipment (see the IL715 Tek-CARE® NC300II Manual for further detail). On the PM353 processor card, verify that dipswitch 3 of the 7-position S1dipswitch is set to the **ON** position.
- Review the **Equipment Programming, Configuration and Settings—Programming PC** section and verify that module settings have been programmed correctly. A module's *PM-Program Module* settings must match the physical port on the NC351 Series Central Equipment that the module is connected to. (Example: a PM364A programmed for master port 5 must be physically plugged into that port.)
- Verify that cable connections from the interface to the NC351 Series Central Equipment are continuous.

*Consumer Off-the-Shelf Stand-Alone Portable Phone is inoperable:*
- Refer to the manufacturer's instructions to verify that the phone is properly charged and turned on.
- Move closer to the base station transmitter to determine if the problem is caused by signal interference. Installers should locate the base station for maximum transmission range, and test phones to determine if proper coverage exists. Refer to the manufacturer's instructions for additional information.

*Consumer Off-the-Shelf Stand-Alone Portable Phone does not receive voice prompt menu:*
- Verify that phones are correctly programmed.

*Tek-CARE® NC300II Nurse Call System displays "Master Failure":*
- Verify that the connections from the interface to the NC351 Series Central Equipment are continuous.
- Verify that the connections from the interface to the NC304 Series Master Station are continuous.
- Verify that the NC304 Series Master Station is still functional by directly connecting it to the interface and then to the NC351 Series Central Equipment. The master station may also be swap tested with another master station (if available); remember to re-address the swapped master stations accordingly during the test.

*Tek-CARE® NC300II Nurse Call System displays "Telephone Interface Fail":*
- Verify that dipswitch #1 on the PM365 module is in the **OFF** position (the PM365 is mounted to the NC364A motherboard).
- Check connections for continuity from the telephone interface to the NC351 Series Central Equipment.
- If feasible, directly connect the telephone interface to the NC351 Series Central Equipment.

*SpectraLink PTB400 Handset displays default room-numbering information:*
- Perform the **6 Restore Local Database** function on the **System Functions** menu on any one of the NC304 or NC304LCD Master Stations connected to the nurse call system (see the IL715 Tek-CARE® NC300II Manual for further details). This updates the memory in the NC364A telephone interface unit.

*SpectraLink PTB400 Handset is inoperable:*
- Verify that the handset is on by holding the power button and waiting for the double-chirp. The display will activate if the device was off.
- Replace the battery as outlined in the **System Maintenance Instructions**.
- Verify that the LINE1, LINE2 and LINE3 connections on the **CT217** RJ-45 cable are continuous.

*SpectraLink PTB400 Handset displays a "NO SVC" message:*
- This may result if the user is in a transmitter "dead zone." Installers will make an effort to mount the transmitters to prevent these areas from occurring, as outlined in the SpectraLink system documentation. Move to a location where a transmitter is visible, and observe if the "NO SVC" message goes away.
- If the message does not clear, then the handset should be suspect and examined for problems.
- Refer to the SpectraLink system documentation for further information.

*SpectraLink PTB400 Handset receives voice prompt menu and display is inactive:*
- Verify that phones are correctly programmed.

*NC364A Telephone Interface fails, but Tek-MICRO® II Nurse Call System does not display "Master Failure":*
- The nurse call system is having trouble communicating to the SpectraLink via the RS232 connection.

# Figure 3—NC364A Block Wiring Diagram #1

**Notes:**

1. Read this entire manual and review all wiring diagrams to ensure that all necessary information is provided for installation

2. The NC364A device will support up to three more central equipment connections (providing connections for up to 4 central equipment connections). Each additional central equipment connection requires a PM364A Interface Module, which mounts inside of the NC364A (maximum 3 for 1 NC364A). Note: Master stations need not be plugged in via the NC364A and can be directly connected to the central equipment. See manual text for more information.

3. The maximum distance between the NC364A and the NC351 or NC351/2 central equipment is 1000' if not connected in line with a master station. Maximum total cable length from a master station to an in-line NC364A and on to the central equipment is 1000'. If connecting in line with an NC306 Master Station, the cable distance maximum for the NC306 remains the same, but the NC364A must be within 15' (cable distance) of the central equipment to prevent voltage loss. The maximum distance between the NC364A and the SpectraLink WTS System or off-the-shelf stand-alone portable phone equipment is 25'. The maximum distance between the NC364A and PBX equipment is 500'.

4. PC interconnection is required for programming and set up steps. See text for PC requirements. The maximum distance between NC364A and the PC is 25'.

5. The integral port on the NC364A main board cannot be connected in-line with a master station. The PM364A Expansion Modules (when installed, to a maximum of 3) can be connected in-line with a master station to provide additional audio path access.

A = Data Wires: #18 AWG, 3 conductors (7 str. BC) with 100% aluminum/Mylar shield and #20 AWG TC drain wire. Nominal insulation 0.017", nominal OD 0.245" and capacitance <24pF/ft. Recommended conductor colors are ORANGE, YELLOW and GREEN. Overall jacket.

Power Wires: #18 AWG, 3 conductors (7 str. BC) with 100% aluminum/Mylar shield and #20 AWG TC drain wire. Nominal insulation 0.009" and nominal OD 0.175". Recommended conductor colors are BROWN, RED and BLUE. Overall jacket.

Audio Wires: #18 AWG, 2 conductors (7 str. BC) with 100% aluminum/Mylar shield and #20 AWG TC drain wire. Nominal insulation 0.017", nominal OD 0.235" and capacitance <24pF/ft. Recommended conductor colors are VIOLET and GRAY. Overall jacket.

Ground Wire: #16 AWG, 1 conductor (26 str. BC) with nominal OD 0.101". Recommended color is BLACK.

B = 5 #22 Conductor Cable

C = 3 #24 Twisted Pair Solid Conductor Cable (6 Cond. Total)

D = 1 #24 Twisted Pair Solid Conductor Cable (2 Cond. Total)

1 D per Via-PBX WTS Phone (max. 4)

PBX System (Optional)

Spectralink PTB400 WTS Phones (Via-PBX Mode)

Spectralink PTB400 WTS Phones (Regular Mode)

Spectralink's 150 Model 3 or Link 3000 Wireless Telephone System (WTS)

NC351 or NC351/2 Central Equipment

NC364A Telephone Interface

NC304 Series or NC306 Master Station

NC304 Series or NC306 Master Station

NC304 Series or NC306 * Master Station

\* -- See IL715 for NC306 restrictions.
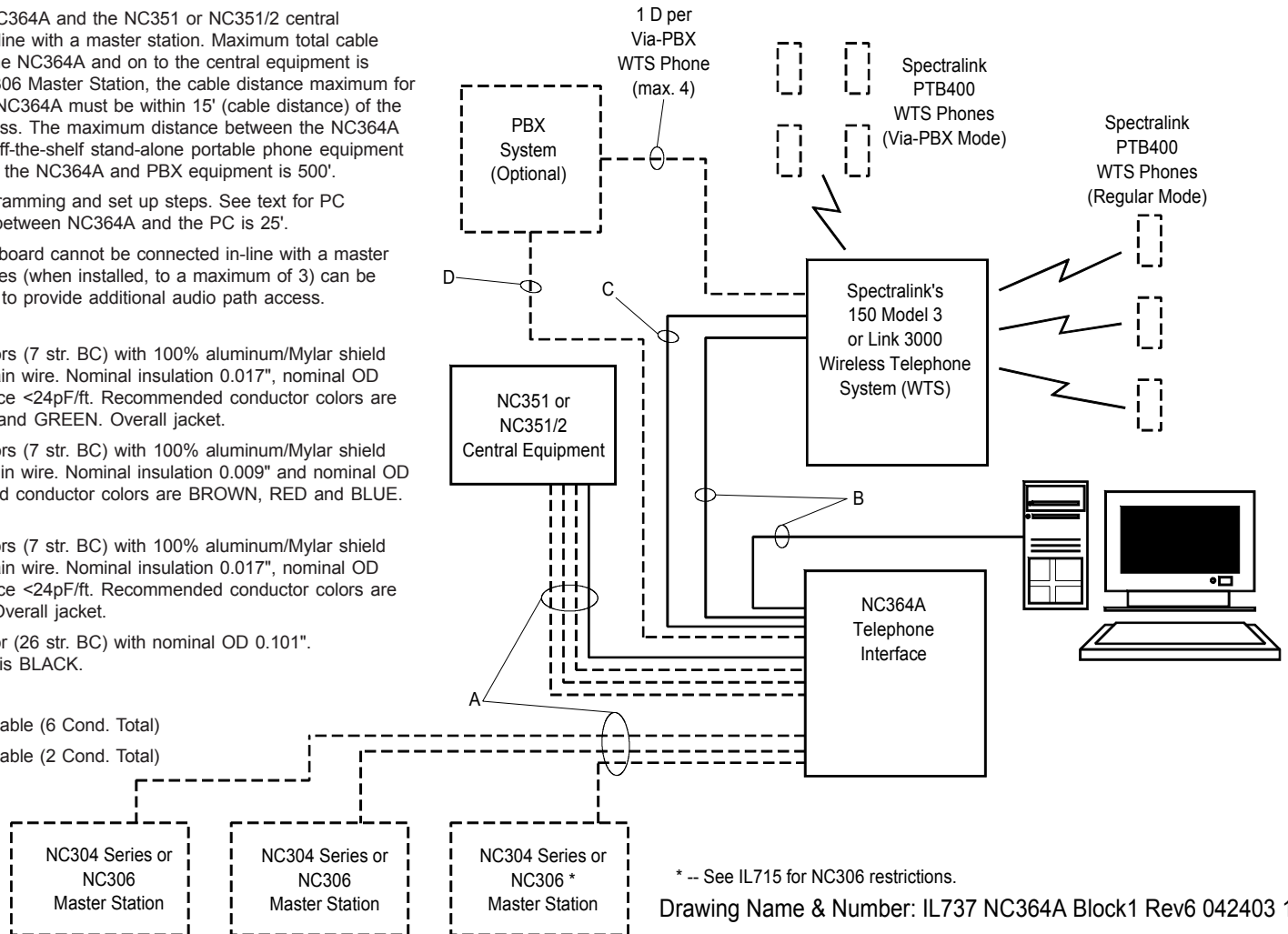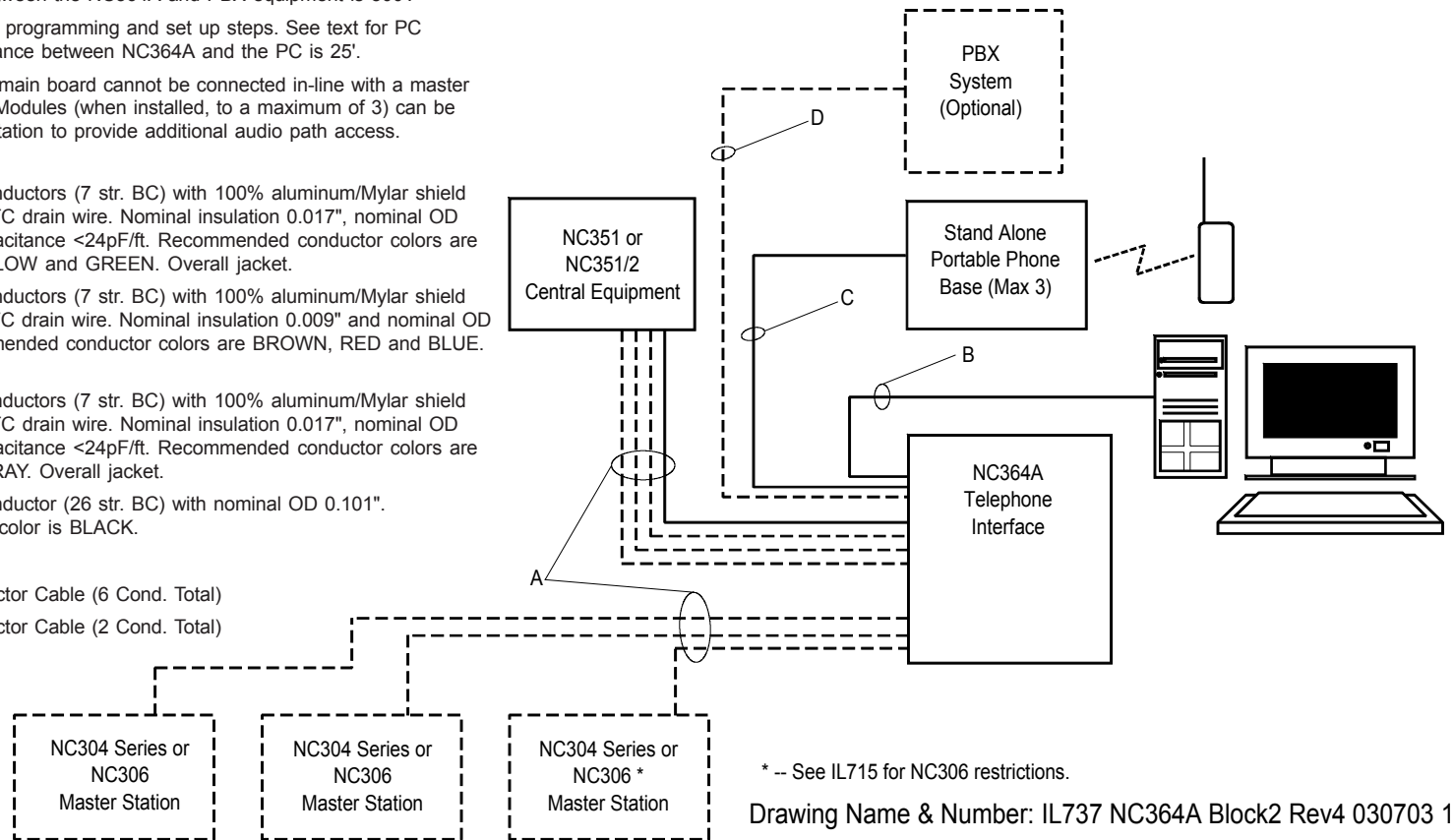
Drawing Name & Number: IL737 NC364A Block1 Rev6 042403 1

# Figure 4—NC364A Block Wiring Diagram #2

**Notes:**

1. Read this entire manual and review all wiring diagrams to ensure that all necessary information is provided for installation

2. The NC364A device will support up to three more central equipment connections (providing connections for up to 4 central equipment connections). Each additional central equipment connection requires a PM364A Interface Module, which mounts inside of the NC364A (maximum 3 for 1 NC364A). Note: Master stations need not be plugged in via the NC364A and can be directly connected to the central equipment. See manual text for more information.

3. The maximum distance between the NC364A and the NC351 or NC351/2 central equipment is 1000' if not connected in line with a master station. Maximum total cable length from a master station to an in-line NC364A and on to the central equipment is 1000'. If connecting in line with an NC306 Master Station, the cable distance maximum for the NC306 remains the same, but the NC364A must be within 15' (cable distance) of the central equipment to prevent voltage loss. The maximum distance between the NC364A and the SpectraLink WTS System or off-the-shelf stand-alone portable phone equipment is 25'. The maximum distance between the NC364A and PBX equipment is 500'.

4. PC interconnection is required for programming and set up steps. See text for PC requirements. The maximum distance between NC364A and the PC is 25'.

5. The integral port on the NC364A main board cannot be connected in-line with a master station. The PM364A Expansion Modules (when installed, to a maximum of 3) can be connected in-line with a master station to provide additional audio path access.

A = Data Wires: #18 AWG, 3 conductors (7 str. BC) with 100% aluminum/Mylar shield and #20 AWG TC drain wire. Nominal insulation 0.017", nominal OD 0.245" and capacitance <24pF/ft. Recommended conductor colors are ORANGE, YELLOW and GREEN. Overall jacket.

Power Wires: #18 AWG, 3 conductors (7 str. BC) with 100% aluminum/Mylar shield and #20 AWG TC drain wire. Nominal insulation 0.009" and nominal OD 0.175". Recommended conductor colors are BROWN, RED and BLUE. Overall jacket.

Audio Wires: #18 AWG, 2 conductors (7 str. BC) with 100% aluminum/Mylar shield and #20 AWG TC drain wire. Nominal insulation 0.017", nominal OD 0.235" and capacitance <24pF/ft. Recommended conductor colors are VIOLET and GRAY. Overall jacket.

Ground Wire: #16 AWG, 1 conductor (26 str. BC) with nominal OD 0.101". Recommended color is BLACK.

B = 5 #22 Conductor Cable

C = 3 #24 Twisted Pair Solid Conductor Cable (6 Cond. Total)

D = 1 #24 Twisted Pair Solid Conductor Cable (2 Cond. Total)

PBX System (Optional)

NC351 or NC351/2 Central Equipment

Stand Alone Portable Phone Base (Max 3)

NC364A Telephone Interface

NC304 Series or NC306 Master Station

NC304 Series or NC306 Master Station

NC304 Series or NC306 * Master Station

\* -- See IL715 for NC306 restrictions.

Drawing Name & Number: IL737 NC364A Block2 Rev4 030703 1

# Figure 5—NC364A Connection Fan Out

No Connect 1
Transmit (TX) 2
Receive (RX) 3
No Connect 4
Ground 5
No Connect 6
Ready to Send (RTS) 7
Clear to Send (CTS) 8
No Connect 9

No Connect 1
Transmit (TX) 2
Receive (RX) 3
No Connect 4
Ground 5
No Connect 6
Ready to Send (RTS) 7
Clear to Send (CTS) 8
No Connect 9

(Straight Connection RS232)
CT234
DB9

CA365
(Null Modem RS232)
DB9

PBX Line
1 White (Tip)
2 Brown (Ring)
Line 1
3 Yellow (Tip)
4 Green (Ring)
Line 2
5 Red (Tip)
6 Black (Ring)
Line 3
7 Orange (Tip)
8 Blue (Ring)

CT217     RJ-45

## NC364A Cabinet

4 Pin Header
7 Position DipSwitch
CT214   50 Pin Conn.   CT216
3 Pin Header
16 Pin Conn.   2 Pin Header
CT215   PM365 Control Board

PC OAI Port (19200 Baud)
Spectralink OAPI (9600 Baud)
4 Pin Header
PM364A Connector
No Connection
To Central Equipment Master Port   Motherboard

Fastening Nuts

Line
Neutral
Ground
110 VAC Terminal Block

Power Cable   SS106 Transformer

DB9
CT210

Drawing Name & Number: IL737 NC364A Connection Rev2 061303 1

To Master Station Port on NC351 or NC351/2 Central Equipment
DB9
CT318

Audio + / Gray / Pin 1
Audio - / Purple / Pin 6
Data Com. / Green / Pin 5
Data In / Orange / Pin 3
Data Out / Yellow / Pin 2
+12 VDC / Blue / Pin 4
+24 VDC / Brown / Pin 7
Negative / Red / Pin 8
Shields / Silver / Pin 9

## Figure 6—NC364A PM364A Installation

Motherboard

Shunt Settings

PM364A Connector

PM364A Mounting Holes

PM364A Outline

To Central Equipment
Master Port

To Master Station
(In-Line Connection)

Module 3
Module 2
Module 1
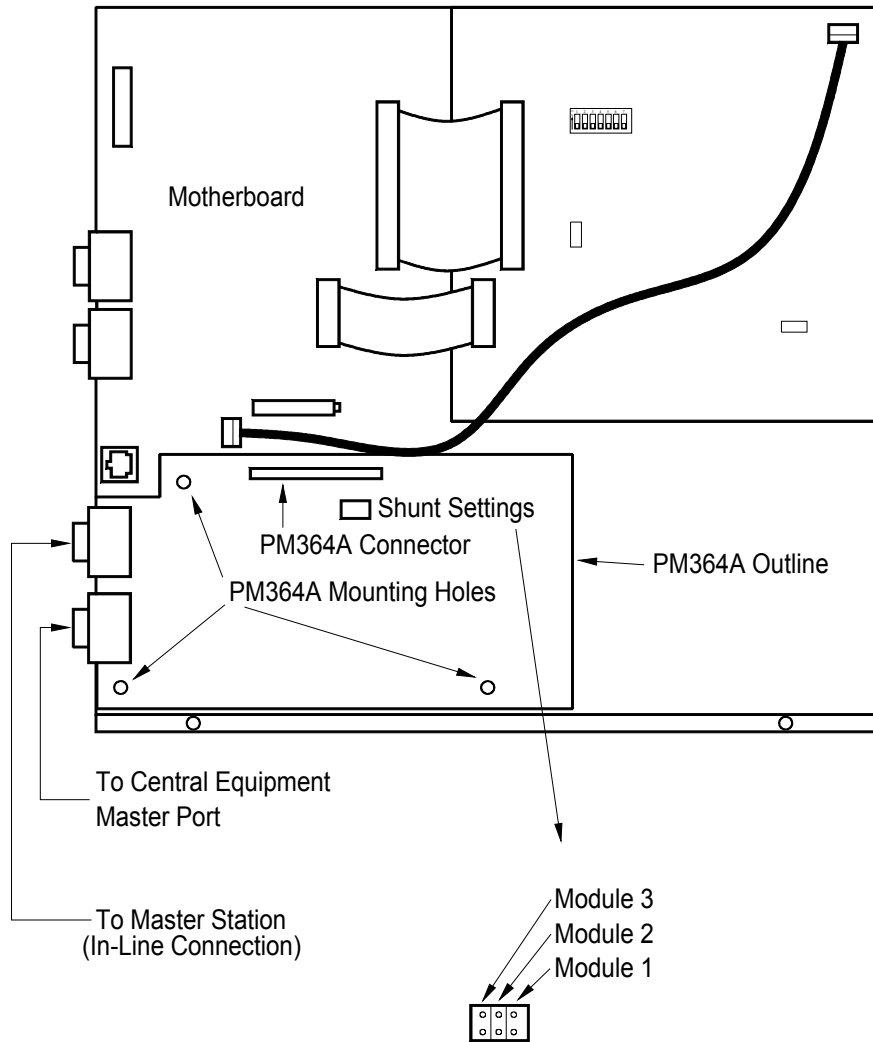
To mount the PM364A remove the three screws from the NC364A Motherboard as indicated on the diagram to the left (PM364A Mounting Holes).

On the bottom two holes, screw in two of the plastic stand-off's included with the PM364A (TekTone® part number HW270). Take the remaining HW270 and attach it to the PM364A through the top mounting hole, using one of the included plastic screws (TekTone® part number HW248).
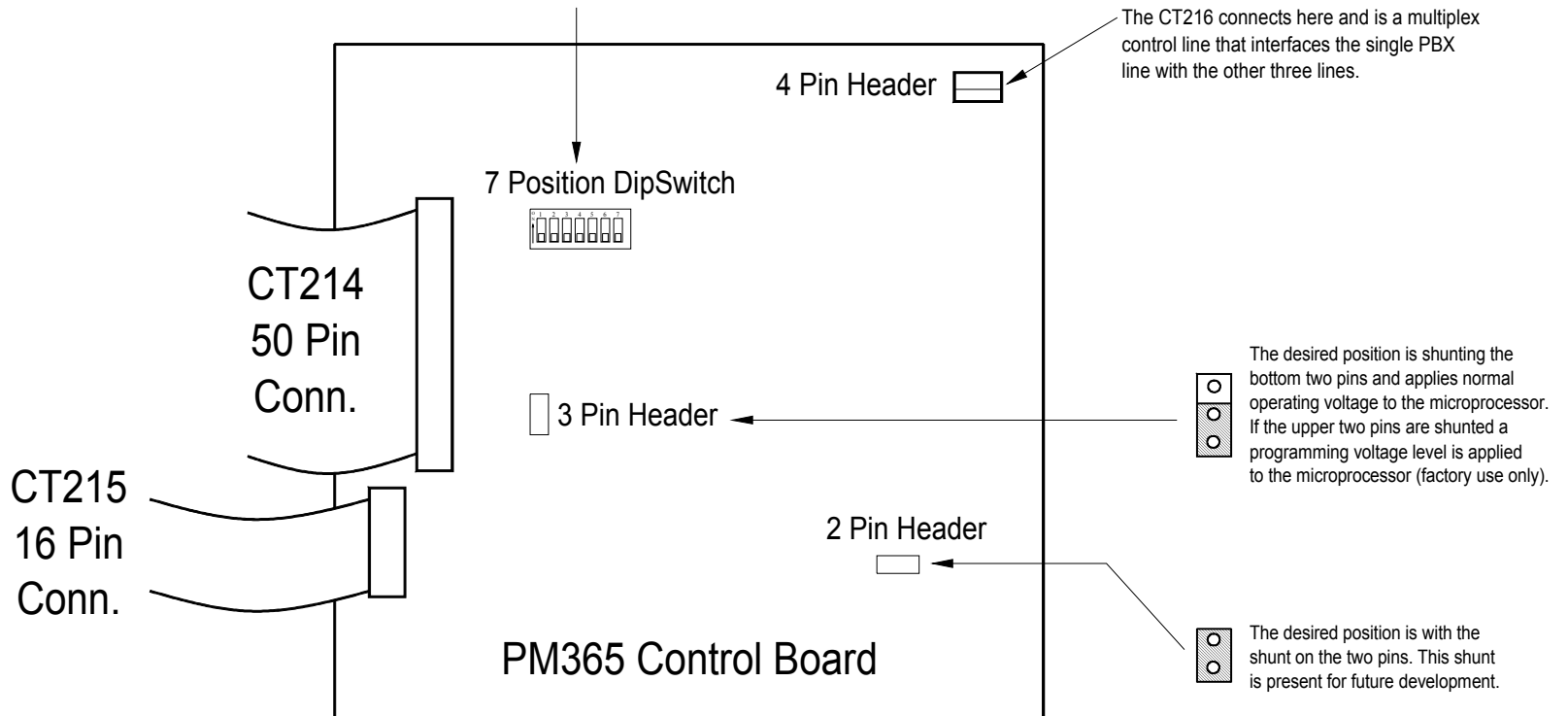
Connect the PM364A to the NC364A by inserting the connector on the bottom of the PM364A into the indicated connector on the motherboard. Ensure that the mounted HW270 stand off inserts into the matching hole on the motherboard.

Take the remaining two HW248 plastic screws and screw them into the two bottom mounting holes on the PM364A. These will pass through the board and screw into the two HW270 plastic stand-offs mounted earlier in this procedure.

Set the shunt on the card based on which module it is. See diagram.

Drawing Name & Number: IL737 PM364A Install Rev1 020603 1

# Figure 7—NC364A PM365 Settings

| Dipswitch | Function | Desired Setting |
|---|---|---|
| 1 | Reset Processor | Off |
| 2 | Slave Present | Off |
| 3 | None | Off |
| 4 | Default Phones/Modules | Set ON and toggle 1 (reset) to restore phone/module programming to default. |
| 5 | Default Station Information | Set ON and toggle 1 (reset) to restore all station information to default. |
| 6 | Programming Mode | Set ON and toggle 1 (reset) to activate programming mode (using laptop computer) |
| 7 | Code Update Request | DO NOT USE without reading the firmware upgrade instructions! |

The CT216 connects here and is a multiplex control line that interfaces the single PBX line with the other three lines.

4 Pin Header

7 Position DipSwitch

CT214 50 Pin Conn.

CT215 16 Pin Conn.

3 Pin Header

The desired position is shunting the bottom two pins and applies normal operating voltage to the microprocessor. If the upper two pins are shunted a programming voltage level is applied to the microprocessor (factory use only).

2 Pin Header

The desired position is with the shunt on the two pins. This shunt is present for future development.

PM365 Control Board

Drawing Name & Number: IL737 PM365 Settings Rev3 032604 1