application note NO. **HAN0046**

INFORMATION FOR DISTRIBUTORS

June 15, 2007

TO: ALL HEALTH CARE DISTRIBUTORS – U.S., CANADA & EXPORT

SUBJECT: RESPONDER® 4000 WIRELESS PHONE INTEGRATION

Introduction:

The following information will assist you in determining the feasibility of integrating a hospital's PBX with the Responder 4000 system.

Warning!

Note that NOT all phone systems (PBXs) have available CO lines capable of decoding Type II Caller ID; therefore, can not be integrated with the R4K system without additional cost. PBXs with just T1-PRI lines or PBXs with Caller ID signaling over a digital (T1 or E1) interface must purchase an analog CO card/modem capable of decoding caller ID plus the additional license fee to run the application.

A 2-wire Analog Trunk Line of a PBX:

The next module illustration provides the most versatile option for interfacing a wireless phone to a R4KPLI device. The R4KPLI device is wired to one 2-wire analog trunk line of a PBX. In order for the wireless phone to show the call display from the R4KPLI device, the Line Card installed in the PBX must be capable of decoding an incoming Type 2 Caller-ID message. The interaction between the R4KPLI device and the wireless phone is highly dependent on how the PBX is administered. For a phone to display inbound calls from the R4KPLI device, the PBX must be administered to direct calls from the R4KPLI device's trunk line to the phone. This "line coverage" (defined in the PBX) forwards the R4KPLI device's "room coverage" (defined in the Responder 4000 configuration) to a single wireless phone. *The user of the phone inherits the room coverage of the* R4KPLI device, *and cannot dynamically customize this coverage to his or her individual preference.*
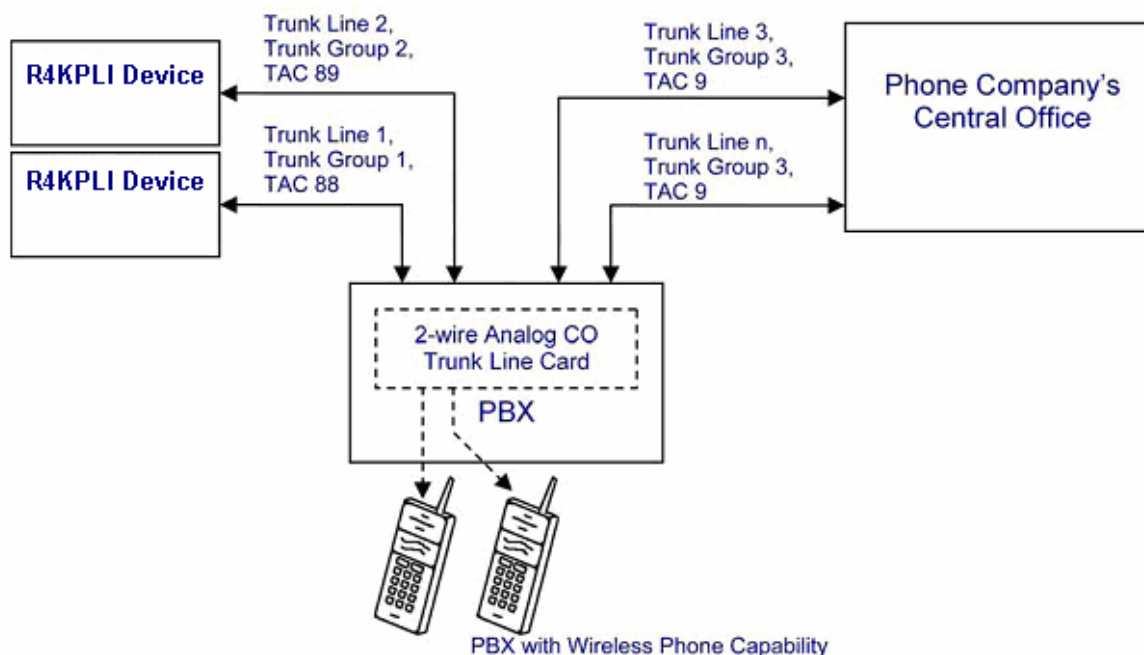
Figure 1: Wireless PBX configuration

To place an outbound call using the configuration shown in Figure 53, the wireless phone user must first enter a Trunk Access Code (TAC). The trunk lines that connect to the Central Office are typically administered as a "Trunk Group", which selects the first available outbound trunk line when the user dials a TAC of "9". Each trunk line wired to a R4KPLI device must be isolated in its own "Trunk Group" (containing only one trunk line), and assigned a unique TAC. If a wireless phone user wishes to originate a call to a destination outside of the facility, the user dials "9" followed by the remaining digits of the destination's Directory Number. To dial into the nurse call system, the user dials the TAC for a R4KPLI device ("88", for example) followed by the dialing number of the desired station within the nurse call system. Users can place calls between phones by simply dialing the extension (Directory Number) assigned to the destination phone. The numbering plan for a PBX restricts the digits used for extensions so that the PBX cannot mistake the first few digits of an extension for a TAC.

The recommended administration for a PBX used with R4KPLI devices can be summarized as follows:

- Each R4KPLI device is connected to a 2-wire analog CO Trunk Line.
- Each of these Trunk Lines is assigned to its own Trunk Group.
- Each of these Trunk Groups is assigned its own unique TAC.
- Each of these Trunk Groups is administered to direct inbound calls to a single phone.

This arrangement creates a 1-to-1 correspondence between R4KPLI devices and phones.

Application Planning
Specifying Phone System Connections:

The Line connection for a R4KPLI device mimics an analog Foreign Exchange Station (FXS) port, and it should be connected to a telephone device having the complementary Foreign Exchange Office (FXO) personality such as a 2-wire, analog, single line phone. The following table details the specifications for the Line connection:

R4KPLI Line Specifications	
DC Characteristics	
Off-Hook Detection Method	Loop Start
Loop Feed	Nominal -24 VDC with 50 mA current limit
Forced Disconnect (Disconnect Supervision)	The Loop Feed current is interrupted for 1 second when a call that was answered at a R4KPLI device is canceled at the patient station
AC Characteristics	
Nominal Impedance	600 ohms
CLASS * Support	Generates Caller ID signaling in Multiple Data Message Format (MDMF) between firts and second ring. Calling Number Delivery and Calling Name Delivery.
DTMF Detection	
Minimum On Time	50 ms
Minimum Off Time	50 ms
Ring Generator	
Ring Waveform	Nominal 85 VRMS, 20 Hz sine wave
Maximum Ringer Load	2.0B REN (Ringer Equivalence Number)
Cadence	2 seconds on, 4 seconds off

* CLASS is a service mark of Bellcore

Note that the open circuit Loop Feed voltage is 24 VDC. Some multi-line key phone systems measure the voltage on a phone line to determine if another telephone device (telephone, modem or fax machine) has already seized this line.

Lines with a low voltage measurement are marked as "busy" or "in use". Most systems assume that a line voltage below 12 VDC indicates that a line is in use, but some systems set this voltage threshold

closer to 48 VDC. This higher voltage threshold is not compatible with a R4KPLI device, and it will interfere with attempts to dial into the nurse call system through a R4KPLI device. You may be able to defeat this feature within the phone system or adjust the threshold voltage that it uses to sense a seized line.

Call Waiting Tones:

Once a user has connected to a R4KPLI device's line, the R4KPLI device does not report any additional nurse call activity within its coverage until the user disconnects. The *R4KPLI device does not* provide any "Patient Call Waiting" tone while the station is "off-hook". However, a multi-line key system or PBX may be able to provide a "Call Waiting" tone if the user is connected to another line, and the R4KPLI device's line starts ringing. Conversely, this feature could also provide a "Call Waiting" indication when the user is connected to a R4KPLI device, and another line starts ringing.

A Word About Caller ID:

Caller ID information is sent as a data message between the first and second bursts of ringer voltage while a R4KPLI device is ringing. Because the first ring burst lasts for 2 seconds and the data message requires an additional second for transmission, the call display appears approximately 3 seconds after the phone connected to the R4KPLI device begins to ring. If the call is answered before this three-second period has elapsed, the call display will not appear on the phone.

If a single line analog phone with Caller ID capability is directly connected to a R4KPLI device, the phone should have no difficulty displaying call information from the nurse call system. In more complicated installations, the existing phone equipment may provide features that "look like" Caller ID to an end user, but are not compatible with the Caller ID messages generated by a R4KPLI device.

Two features of this type are present on most multi-line key phone systems and PBXs. When calls are placed between stations connected to the phone system (internal or "intercom" calls), the text label administered in the phone system for one station appears on the other station's phone. Similarly, an external (trunk) line can also have a text label administered for it within the phone system, and this static label can be displayed on a phone when that line is ringing. The existence of these features *does not* guarantee that the phone system can dynamically decode and display Caller ID messages sent on inbound calls from external sources while the external line is ringing.

Another feature that is frequently available on large PBX systems is Caller ID signaling over a digital (T1 or E1) interface. Although this interface does provide Caller ID for inbound calls from external sources, a R4KPLI device is not designed to connect to this type of interface and cannot communicate through it. Most phone systems support the display of Caller ID information on proprietary digital phones connected to digital station ports. It is far less common for a phone system to pass Caller ID information on to an analog phone connected to an analog station port. Some phone system vendors offer enhanced analog station cards that implement this feature for an additional fee. While analog phones with integral Caller ID are attractively priced, the added cost of an enhanced analog station card may make phones with a digital interface a more economical choice.

In order for a phone and its associated phone system to use the Caller ID information generated by a R4KPLI device, the following conditions must be met:

- The phone system must support 2-wire analog CO trunks.
- The phone system must be able to decode Caller ID (CLASS) signaling on these trunks.

- The phone system must be able to forward the decoded Caller ID message to the phone through its station port.
- The phone itself must be able to display the Caller ID message.

Questions:

Based upon the answers you obtain to the questions in the following sections, you should be able to determine whether or not you can integrate the Responder 4000 system with the hospital's PBX

Questions – PBX:

- Who is the supplier of the hospital's phone system/PBX?
- What are the hardware/software version numbers of the phone system?
- Does the phone system support 2-wire analog CO trunks?
- Does the phone system support Trunk Access Code (TAC) functionality?
- Does the phone system decode Caller ID (CLASS) signaling on these trunks (2-wire analog CO trunks)? In other words does the Line Card installed in the PBX capable of decoding an incoming Type 2 Caller-ID message?
- Can you configure the phone system to administer direct calls from the R4KPLI device's trunk line to the wireless phone?
- Can you configure the phone system to forward the decoded Caller ID message to the wireless phone through its station port?

Questions – Wireless Phone System:

- Wireless Phone support Type II Caller ID message.
- Does the wireless phone system allow the wireless phones to have access to the TAC functionality of the PBX?

Additional Cost:

Below is only an example on how much more it would cost to integrate a Nortel Meridian Succession 3.0 PBX with T1-PRI lines & Sprectralink manufactured for Nortel" 2211 wireless phones with the R4K system.

CMOD 32 license CLASS modem
for East w/ SRS, switch ID 10230733
Please read assumptions in notes section

MatCode	Part Number	Description	QTY	Price	Extended
535102	NT5D60AA	Modem Card (CMC)	1	$ 3,017.89	$ 3,017.89
73026655	NTE905CA	8 PREM CLASS SET LIC	4	$ 768.50	$ 3,074.00
					$ 6,091.89

PRICING SUMMARY

TOTAL EQUIPMENT PRICE	$ 6,091.89
LABOR CHARGES	$ 1,055.00
SHIPPING & HANDLING	$ 121.84
TOTAL SYSTEM PRICE	$ 7,268.73
TOTAL MAINTENANCE PRICE	$ 820.16
TOTAL PRICE	$ 8,088.89