March 1, 2013

APPLICATION BULLETIN

SUBJECT: **RF Call Box Applications**

USES: **Gate Entry**
Golf Courses
Ground to Container Crane
Parking Garages/Parking Lots
Temporary Communications
- **Construction Sites**
- **Sporting Events**
- **Parades**

Schools/Campuses
Amusement Parks
Walk Paths
Campgrounds
Nature Parks

Model CB194-00X

Model CB195-00X
(Shown installed in a 238-002 wall mount enclosure)

GAI-Tronics' RF Call Boxes have introduced our well-known telephony enclosures to the world of wireless communications. Each call box model (**CB195-00X**-Pushbutton, Flush or Surface-mount and **CB194-00X**-Handset, Surface-mount) is basically a radio in a box, providing two-way, half-duplex communications via the RF airwaves (UHF and VHF only).

The intent of this application bulletin is to provide the reader with a solid understanding of the RF Call Box operating parameters as well as some ideas for packaged systems using GAI-Tronics peripheral devices.

Models

Each -001 and -002 version RF Call Boxes is provided complete with an integral RF transceiver (VHF or UHF). **A customer-provided, external Yagi or omni-directional antenna is required for each installation.** Each -003 version RF Call Box is provided without an RF transceiver and is intended for use with a customer-provided Kenwood TK170 series portable radio (when used with adapter kit no. 190-3170K). Model numbers and descriptions are as follows:

CB194-001 (VHF, Surface Mount, Noise-canceling Handset, 136-174MHz)
CB194-002 (UHF, Surface Mount, Noise-canceling Handset, 450-470MHz)
CB194-003 (Surface Mount, Noise-canceling Handset, No RF Transceiver)
CB195-001 (VHF, Flush Mount, Pushbutton, 136-174MHz)
CB195-002 (UHF, Flush Mount, Pushbutton, 450-470MHz)
CB195-003 (Flush Mount, Pushbutton, No RF Transceiver)

Mounting

The CB194-00X series RF Call Boxes are designed for surface mounting via four (4) concealed mounting holes (mounting bolts are customer-provided). They can also be pole mounted, utilizing the **230-001 Pole Mounting Kit**.

The CB195-00X series RF Call Box is designed for flush-mounting on any flat surface (cut-out required) or for installation in GAI-Tronics' 234 series stanchions. They can be surface-mounted using the model **238-002 Stainless Steel Enclosure**. Utilizing this enclosure, they may also be pole mounted using the **231-001 Pole Mounting Kit.**

Enclosure Access

Each RF Call Box includes tamper-resistant front panel screws. Access will require the use of a TORX T-25 bit or GAI-Tronics' **Model 233-001 Tamper-resistant Screwdriver**.

Transmit Power

Each RF Call Box can be operated in either Low Power (2 Watts) or High Power (5 Watts) mode. The greater the power, the greater the distance covered. A customer-provided, external antenna is required for all applications.

The range (distance between the RF Call Box and base radio) in low power mode with the external antenna is 1/4 to 1/2 mile in almost any condition (excluding major obstructions) or 1 mile with line of site. If much further than 1 mile is needed or if the terrain is questionable, the high power setting is recommended.

Power Source Options

The RF Call Box requires 12Vdc to function (15 Vdc is charging a back-up battery). This can be obtained via:

- Battery power
- Solar power
- External power supply (with battery back-up)

Note: The following power options are all purchased separately from the RF Call Box.

Battery Only Operation

- Using Internal 1.3Ah Battery Back-Up Kit (**190-001BB**):
  - **Battery must be charged for a full 24 hours prior to use (charger no. 40408-009)** prior to use for battery only operation
  - Battery will provide 300 uses over a 7-day period on low power setting and 100 uses over a 7-day period on high power setting, based on a usage cycle of 6 seconds transmit, 6 seconds receive, and 10 seconds standby
  - Battery will have to be monitored and replaced when low

- Using External Long-life Battery, 18Ah (**XB001 Enclosure and 40201-008 Battery**):
  - **Battery must be charged for a full 12 hours prior to use (charger no. 40408-011)**
  - Battery will provide 20,000 uses over a 30-day period on low power setting and 6,300 uses over a 30-day period on high power setting, based on a usage cycle of 6 seconds transmit, 6 seconds receive, and 10 seconds standby
  - Battery part no. is **40201-008** and battery enclosure is Model **XB001**
  - Battery will have to be monitored and replaced when low

Solar Power (2 options)

- Light usage, primarily emergency operation:
  - Call Box will operate primarily from the battery
  - Solar panel will provide a trickle charge to the battery to maintain its charge
  - Suitable for applications with low to medium usage (walk paths, remote areas, low-volume gate entry, safety applications, etc.)
  - **Recommended**: GAI-Tronics' Model **SPK100 Solar Panel Kit** includes a 5W solar panel array, mounting hardware for surface or pole mounting (up to 4"), 10 feet of cable (attached

to panel), and a charge regulator module that installs inside the RF Call Box. This kit must be used in conjunction with the Model **190-001BB Battery Back-Up Kit**)

- Medium to heavy usage:
  - Call Box will operate primarily from the battery.
  - Solar panel will provide a trickle charge to the battery to maintain its charge.
  - Solar panel operation is suitable for applications with medium to heavy usage (high traffic areas, 9th tee box food orders, heavy gate entry traffic, etc.).
  - **Recommended**: GAI-Tronics' Models **GTRFP7784-108 30-Watt Solar Panel**, **XB001 Long-life Battery Enclosure**, **40201-008 18Ah battery**, and **SPK200 Solar Panel Interface Kit** combine to provide substantially more battery life than the SPK100. The SPK200 kit includes all solar panel mounting hardware as well as wiring harnesses and a charge regulator module that mounts inside the XB001 enclosure.

  Note: It is strongly recommended that any battery used in a solar power application should be charged for a full 24 hours prior to being put into service. This will insure that the RF Call Box is fully operational upon deployment.

External Power

- GAI-Tronics' Model **190-002PS** Power Supply Kit will provide 15.0 VDC (adjustable) to the RF Call Box.
- The power supply will accept 85-264VAC input.
- The power supply will trickle charge the 40201-004 battery (included in Model **190-001BB** Battery Back-up Kit), which will be used solely for back-up purposes.
- The 190-002PS includes a power supply, 2-gang electrical box (with gasket and cover), mounting bracket, 3" pipe nipple, ½" Myers hub, and tamper resistant screws. It is intended for mounting directly beneath a surface-mounted RF Call Box and is suitable for direct outdoor installation.
- Recommend for use in applications of medium to heavy use (8th or 9th tee box golf course food/refreshment ordering, high-volume gate entry, any high traffic area requiring regular use) when AC power is available, greatly reducing the cost of solar panel operation.

Programming

All programming tools are purchased separately from the RF Call Box. The Call Box and the RF Module inside the - 001 and -002 version Call Boxes each requires programming and separate software is available for each:

- GAI-Tronics Model **19101-024** Programming Kit is used to program the frequency and PL code (DPL or TPL) into the RF Module (kit includes a power cable, programming cable, and Windows® based programming software
- GAI-Tronics' Model **XAC4000B** Software Bundle Flash Drive is used for programming the Call Box operating parameters
- GAI-Tronics' **XAC0004A** Programming Cable is used for connecting the RF Call Box to the programming PC (serial connection)

Note: The XAC4000B Software Bundle Flash Drive is also used to program all GAI-Tronics programmable desksets, consoles, Addressable Amplified Speakers, and the PL1877A (MRTI 2000) Telephone Interconnect.

Programmable Parameters

The following is a list of programmable operating parameters (refer to Figure 1):

- **Radio or Telephone Interconnect Select** selects between radio-to-radio or radio-to-telephone operation
- **Go Ahead Tone Enable** enables or disables the beep tone generated by the Call Box that directs the user to begin speaking
- **Go Ahead Tone Volume** adjusts the Go Ahead Tone audio level heard from the speaker or handset receiver
- **ANI Enable** enables the ability to enter an ANI DTMF code, transmitted by the Call Box for caller identification
- **ANI Code** (2 to 8 digits)
- **ANI Repeat Mode** selects how often the ANI is transmitted
- **ANI DTMF Transmit Level** adjusts the DTMF transmit level
- **ANI Repeat Delay Time** adjusts the length of inactive time required to force the Call Box to retransmit its ANI code on the next PTT
- **Initial Minimum Talk Time** (factory set at 4 seconds)
    - The amount of time the unit will automatically transmit even if the PTT button is prematurely released (wake-up or initial call activation only)
- **Maximum Talk Time** (factory set at 20 seconds)
    - The amount of time the unit will remain in transmit even if the PTT button is held for a longer duration……intended to protect the RF module and limit air time
- **Standby Time** (factory set at 10 seconds)
    - The amount of time the unit will wait for new talk/listen activity before entering sleep mode (if Standby Forever is not selected)
- **Standby Forever** prevents the Call Box from going into its power saving mode (requires a constant external power source)
- **Maximum Off-hook Time**, CB194 series only (factory set at 60 seconds)
    - The amount of time the unit waits for PTT activity or on-hook condition following call termination….if time-out is reached in either condition, an “off-hook error” ANI code will be transmitted
- **Telephone Number** (2 to 20 digits, telephone mode only)
- **Busy Channel RF Lockout Retry Time** sets the time that the Call Box will wait after detecting airwaves activity for the channel to become clear
- **Carrier Detect Check Enable** enables or disables the monitoring of the channel prior to transmission
- **Carrier Detect Power Up Delay** sets the time that the Call Box will wait after waking from its power saving mode before it will sample the RF channel for carrier
- **Low Battery Warning Select** enables or disables the beep tone transmitted to the telephone line when the battery level is low (applies only when in “Telephone Interconnect” mode of operation)

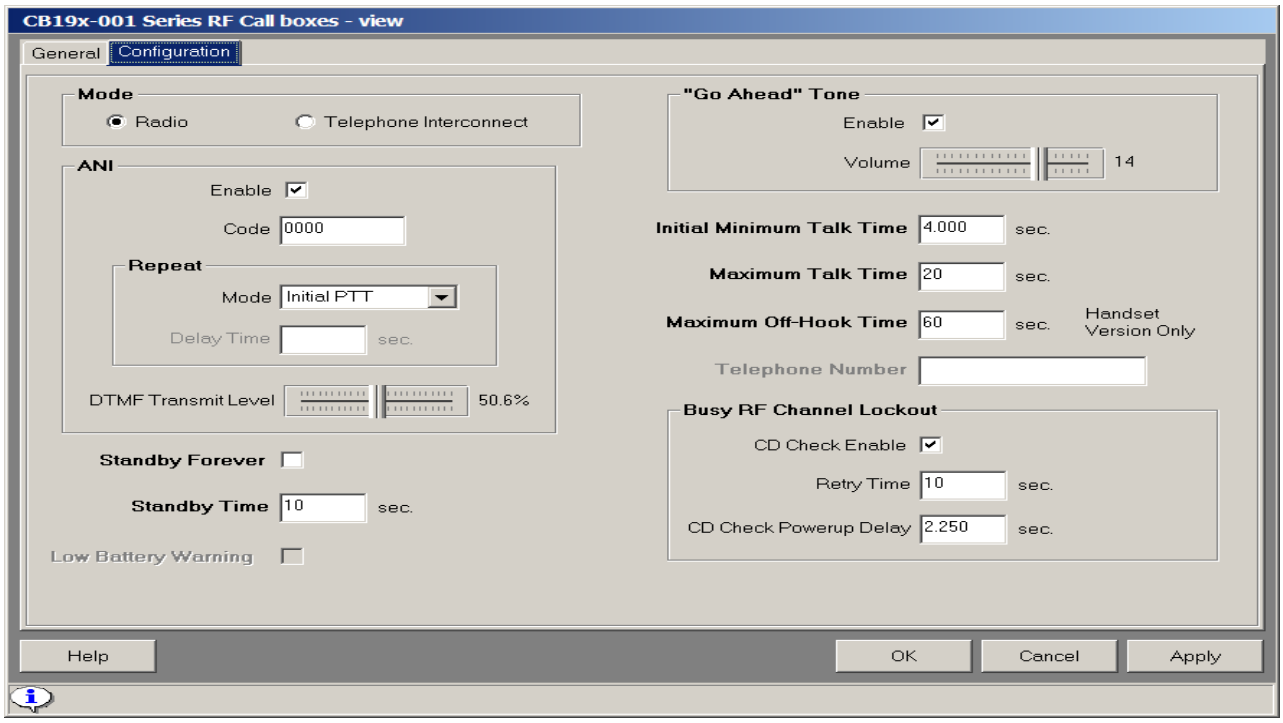


Figure 1

Manual (local) Adjustments

The RF Call Box's main circuit board is equipped with two adjustment potentiometers, one for transmit or microphone level adjustment and one for receive or speaker/handset level adjustment. This permits speaker and microphone level adjustments without requiring the use of a PC.

Standard RF Call Box-to-Radio Operation

- Factory programming has each call box in "sleep mode", designed to conserve battery power.
- Pressing the PTT switch will "wake up" the call box, allowing it to send its ANI code (a DTMF form of caller ID).
- Pressing the PTT switch should be maintained while speaking. If the initial activation of the PTT is only momentary, the unit will remain in transmit mode for a preprogrammed amount of time (see "Minimum Transmit Time").
- After pressing and holding the PTT switch, a splash tone will be heard over the speaker or handset receiver, indicating the line is clear and it is okay to talk.
- The status lamp will illuminate green when talking (PTT button pressed) and red when listening (receiving). It will flash red when the frequency is already in use (busy).
- Continued operation is PTT - RTL (pushbutton on CB195-00x and handset pressbar on CB194-00X).
- The call box will return to sleep mode if there is no talk or listen activity after a preprogrammed amount of time.
- "Sleep" mode requires the call to be initiated at the call box. This mode can be disabled via programming to remain in "receive" mode when not in use (like a normal radio). This will allow incoming calls to be heard over the speaker (CB195 only). An external power source is required for this application.

Standard Radio-to-Telephone Operation (not recommended for emergency applications)

- As stated above, the call box is factory programmed for "sleep mode". It is also factory programmed for radio-to-radio operation and will have to be changed to telephone operation via the XAC4000BProgramming Bundle CD. This operating feature requires the use of a base radio and **Model PL1877A** (MRTI 2000) Telephone Interconnect (purchased separately).
- Momentarily pressing the PTT switch will "wake up" the call box. The front panel status lamp flashes red, indicating a wait signal. During this time period, the RF Call Box is interfacing with the Telephone Interconnect. When accessed, the Telephone Interconnect dials a pre-programmed telephone number. When the telephone line is accessed, the front panel status lamp changes to a steady red. A ringing (or busy) signal will be heard on the integral speaker or handset receiver.
- After the person on the receiving end answers the call and can be heard speaking, the call box operator must press the PTT button or handset pressbar while speaking, to respond. When the PTT switch is pressed, the status lamp will light green as a signal to talk. The operator should speak in a normal voice at arm's length from a pushbutton call box and directly into the handset microphone of the handset model while holding the handset pressbar. Release the PTT switch when finished speaking. The radio ceases transmission and waits for receive audio. The status lamp again turns red when receive audio is present. Operation continues as push-to-talk, release-to-listen.
- The telephone line disconnects after no RF activity is detected for a pre-programmed amount of time. The call box will return to sleep mode if there is no communication activity after a preprogrammed amount of time.

DTMF ANI Code

The ANI code is a packet of data that is transmitted from the RF Call Box to the receiving radio (if programmed to do so). Either the receiving radio must be capable of interpreting this code or a Model IPE2500A (or other DTMF decode device) must be connected to the radio to interpret the code. In either case, an "alias" (name/location/identifier) can typically be programmed into the receiving unit so initial activation of the RF Call Box will alert the base location operator to the call box location. The ANI code will be transmitted either upon initial activation (wake-up) of the RF Call Box or with each PTT activation (programmable).

The RF Call Box will transmit a separate ANI code to indicate when the battery is low. The RF Call Box's status lamp will also flash amber once every 30 seconds under low battery condition.

The CB194-00X will also send an ANI notification that its handset is off-hook for a preprogrammed amount of time (see "Maximum Off-hook Time").
Note: The ANI code transmission in radio-to-radio mode can be disabled via the programming software, if not required.

GAI-TRONIC'S DESKTOP REMOTE CONTROLLERS

GAI-Tronics' remote controllers are considered a radio accessory that provides radio control from a remote location. The controllers noted in this bulletin are the ILD1000A, ITR1000-001, and IPE2500A. Each of these devices replicates the functions and controls located on the front of the radio to which it is connected. It is hard-wired to a radio or tone adapter that is typically located in a closet or telephone/equipment room. Besides being more aesthetically appealing than the typical radio base station, up to ten (10) deskset controllers can be connected to a single radio. The ILD1000A Local Deskset Controller connects directly to its associated radio or via the XLD0001A Local Junction Box (each junction box accommodates up to four desksets). It requires a dedicated 7-conductor cable and can be located up to 1,000 feet from the radio. The ITR1000-001 and the IPE2500A are Tone Remote Controllers. They can connect to a leased or private telephone line with no distance limitations. The IPE2500A is PC programmable with our CARD Suite Software Application and is the only deskset that will provide DTMF decode for Call Box identification. A

sales brochure for each of these controllers is located on the GAI-Tronics website at www.gai-tronics.com. Each brochure includes a typical interconnection diagram.

APPLICATION PACKAGES

A few application packages have been assembled to provide a better understanding of an integrated approach to the market. Each application can be applied to a variety of uses.

Application No. 1

This package is as simple as it gets…radio to radio communications without ANI reporting capability, unless the base radio provided includes DTMF decode. It includes only the RF Call Box(es) and a customer-supplied radio.

Application No. 2

This package adds a local deskset controller to Package No. 1. This package is also without ANI reporting capability, has a 1000-ft. max. distance between deskset and base station, and allows single frequency operation.

Application No. 3

This package switches to tone remote control, allowing greater distance between the deskset controller and the base station…still no ANI reporting capability but up to four-frequency control available. It includes a tone remote deskset and adapter.

Application No. 4

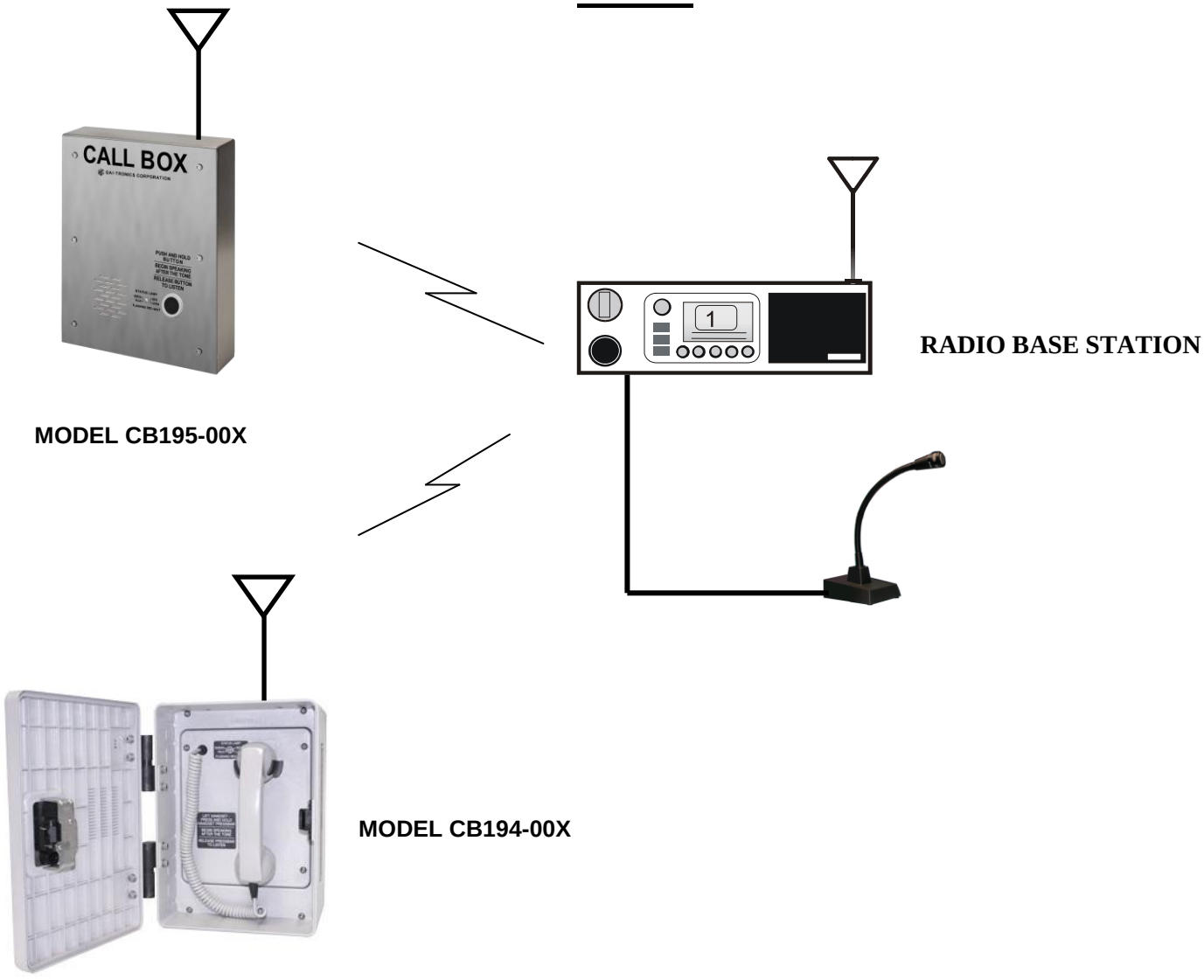
This package is similar to Package No. 3 but will provide up to 16-frequency control and ANI DTMF decoding/reporting. The deskset in this package requires programming with the XAC4000A Software Bundle.

Application No. 5

This package provides the ability for an RF Call Box to dial-access a telephone landline and transmit a 2-20 digit telephone number. The number dialed could be a PBX extension, a standard 10-digit telephone number (landline or cellular, or even 911. GAI-Tronics' Model PL1877A Telephone Interconnect is required to make the telephone connection. **Note: This configuration is not recommended for "emergency" communications usage (up to a 10-second delay may occur while the RF Call Box communicates with the PL1877A Telephone Interconnect before communications can begin).**

RF CALL BOX APPLICATION NO. 1

BASIC



MODEL CB195-00X

RADIO BASE STATION

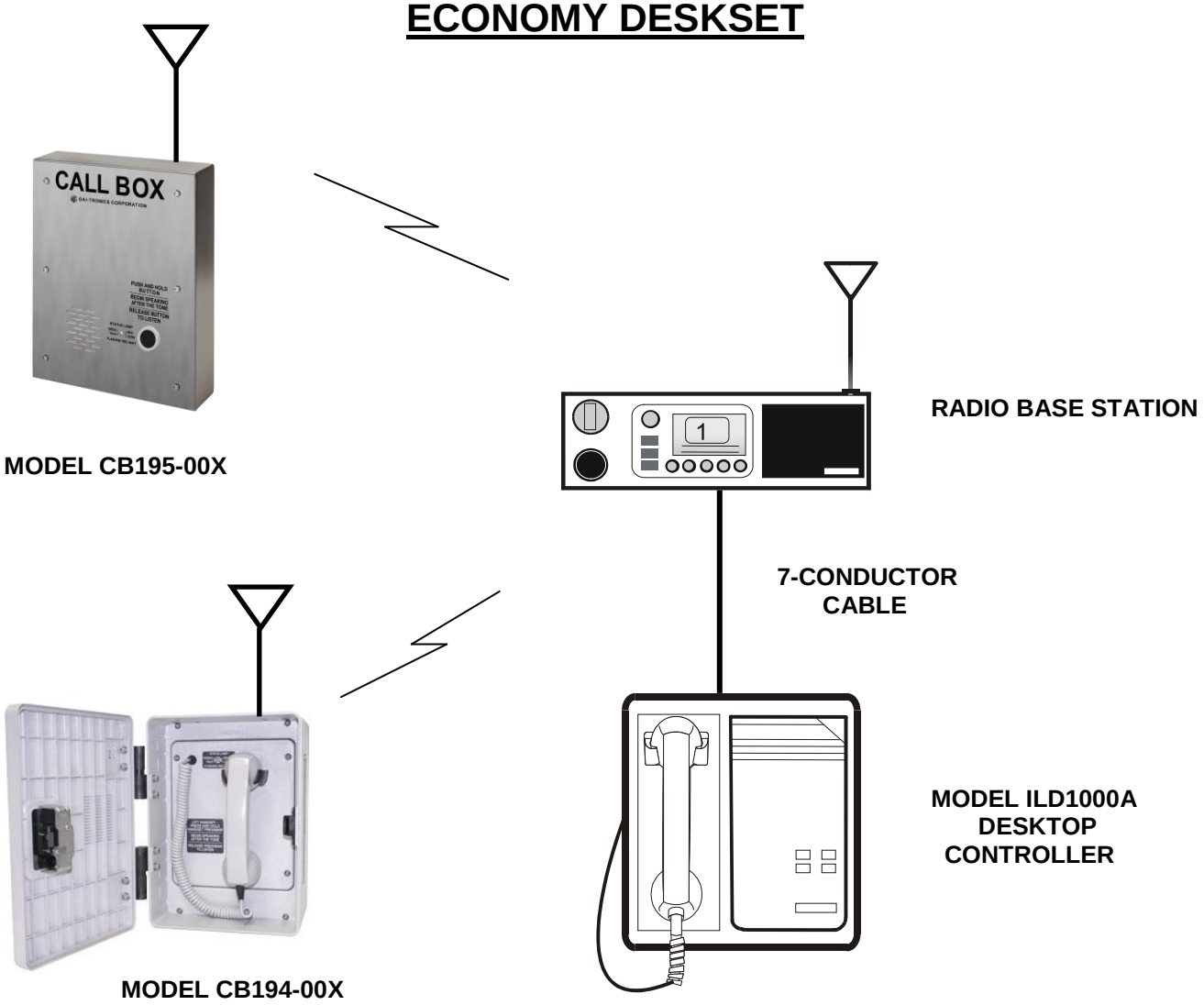
MODEL CB194-00X

APPLICATION NOTES:

- SIMPLE RADIO TO RADIO COMMUNICATIONS
- NO ANI DISPLAY
- LINE OF SITE REQUIRED BETWEEN CALL BOX AND BASE STATION ANTENNA
- 3,000 FEET NOMINAL DISTANCE BETWEEN RF CALL BOX AND BASE STATION AT 2-WATT POWER SETTING
- GREATER DISTANCE CAPABLE AT 5 WATT SETTING
- UHF OR VHF LICENSED FREQUENCY REQUIRED
- TONE OR DIGITAL PL (PRIVATE LINE)
- MULTIPLE RF CALL BOXES CAN BE ON SAME OR SEPARATE FREQUENCIES

RF CALL BOX APPLICATION NO. 2

ECONOMY DESKSET



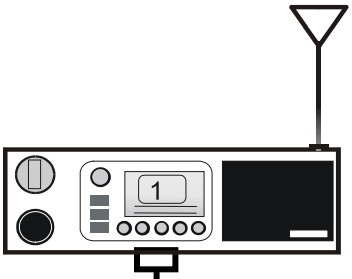
APPLICATION NOTES:

- SINGLE FREQUENCY APPLICATION (LIMITED BY DESKSET), MULTIPLE RF CALL BOXES MUST BE ON SAME FREQUENCY
- NO ANI DISPLAY
- MAX DISTANCE BETWEEN DESKSET AND BASE STATION IS 1,000 FEET
- DESKSET END OF CABLE IS HARD-WIRED….RADIO END REQUIRES FIELD INSTALLATION OF RADIO CONNECTOR
- AT LEAST TEN (10) DESKSETS CAN BE CONNECTED TO THE RADIO (ILD0001A LOCAL JUNCTION BOX AVAILABLE TO SUPPORT FOUR DESKSETS…..JUNCTION BOXES MAY BE PARALLELED)
- LINE OF SITE REQUIRED BETWEEN CALL BOX AND BASE STATION ANTENNA
- 3,000 FEET NOMINAL DISTANCE BETWEEN RF CALL BOX AND BASE STATION AT 2-WATT POWER SETTING
- GREATER DISTANCE CAPABLE AT 5 WATT SETTING
- UHF OR VHF LICENSED FREQUENCY REQUIRED
- TONE OR DIGITAL PL (PRIVATE LINE)

RF CALL BOX APPLICATION NO. 3

MID-RANGE DESKSET

MODEL CB195-00X

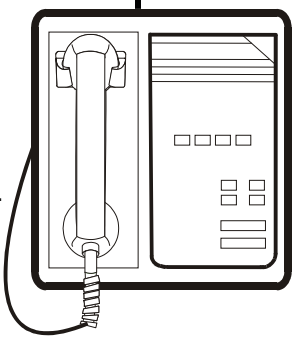


RADIO BASE STATION

15-CONDUCTOR CABLE

MODEL CB194-00X

MODEL ITA2000A
TONE REMOTE ADAPTER



MODEL ITR1000-001
TONE REMOTE
DESKSET

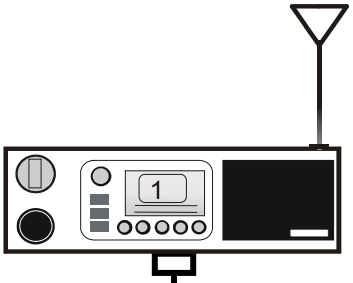
APPLICATION NOTES:

- MULTIPLE RF CALL BOXES CAN SHARE UP TO FOUR (4) FREQUENCIES
- NO ANI DISPLAY
- LEASED OR PRIVATE TELEPHONE LINE CONNECTION, NO DISTANCE LIMITATION BETWEEN DESKSET AND ADAPTER
- AT LEAST (10) DESKSETS CAN BE CONNECTED TO A SINGLE ADAPTER (MULTIPLE MONITOR LOCATIONS)
- LINE OF SITE REQUIRED BETWEEN CALL BOX AND BASE STATION ANTENNA
- 3,000 FEET NOMINAL DISTANCE BETWEEN RF CALL BOX AND BASE STATION AT 2-WATT POWER SETTING
- GREATER DISTANCE CAPABLE AT 5 WATT SETTING
- UHF OR VHF LICENSED FREQUENCY REQUIRED
- TONE OR DIGITAL PL (PRIVATE LINE)

RF CALL BOX APPLICATION NO. 4

HIGH-END DESKSET

MODEL CB195-00X

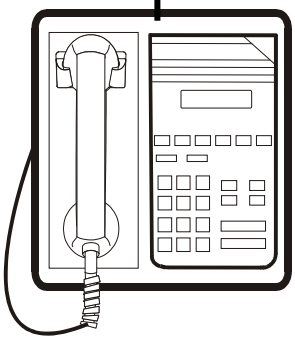


RADIO BASE STATION

15-CONDUCTOR CABLE

MODEL ITA2000A
TONE REMOTE ADAPTER

MODEL CB194-00X



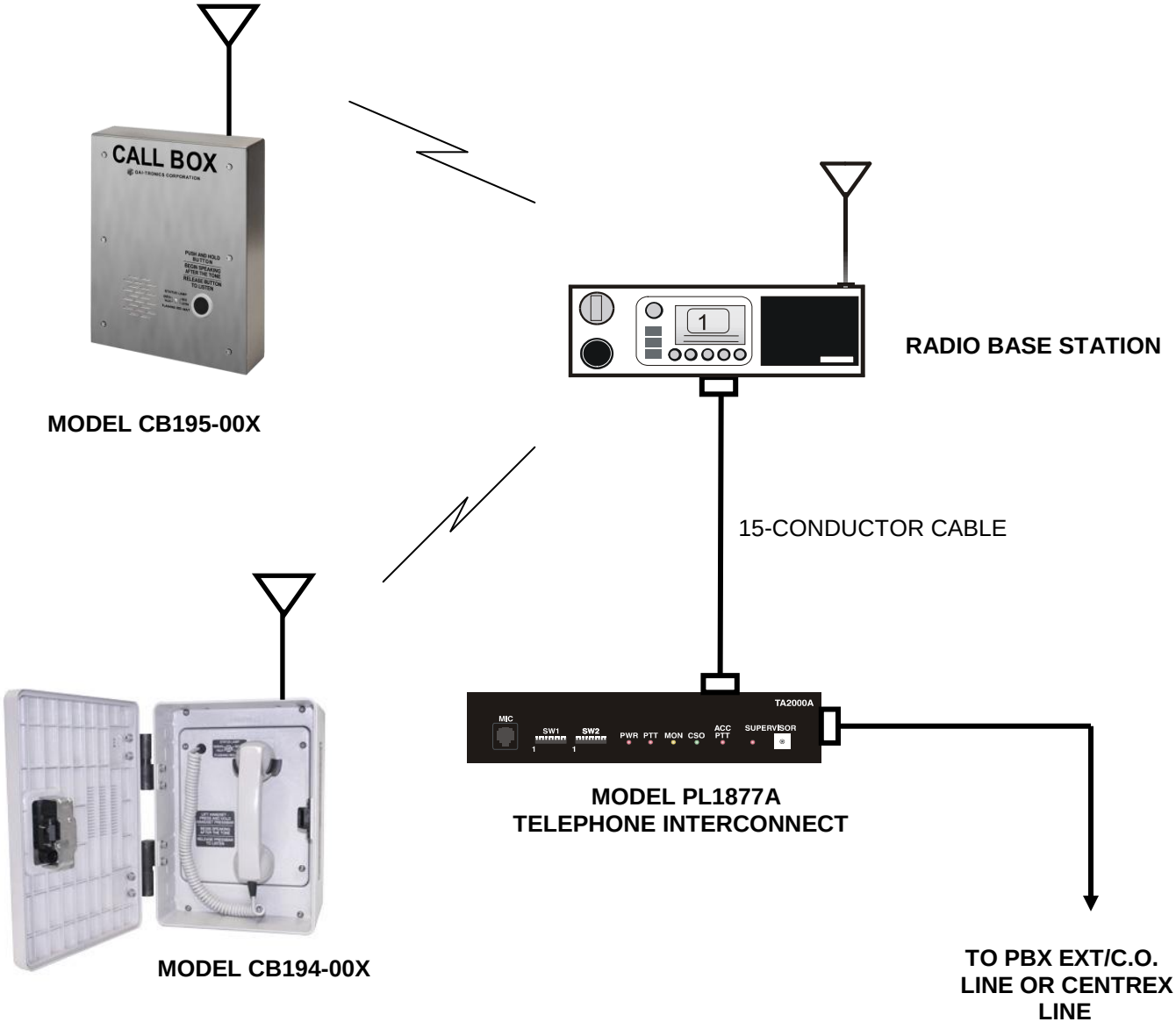
MODEL IPE2500A TONE
REMOTE DESKSET

APPLICATION NOTES:

- MULTIPLE RF CALL BOXES CAN SHARE UP TO SIXTEEN (16) FREQUENCIES
- DTMF DECODE **WITH ANI DISPLAY** (ALIAS CAN BE PROGRAMMED FOR LOCATION I.D.)
- LEASED OR PRIVATE TELEPHONE LINE CONNECTION, NO DISTANCE LIMITATION BETWEEN DESKSET AND ADAPTER
- DESKSET IS PC PROGRAMMABLE UTILIZING CARD SUITE SOFTWARE APPLICATION.
- AT LEAST (10) DESKSETS CAN BE CONNECTED TO A SINGLE ADAPTER (MULTIPLE MONITOR LOCATIONS)
- LINE OF SITE REQUIRED BETWEEN CALL BOX AND BASE STATION ANTENNA
- 3,000 FEET NOMINAL DISTANCE BETWEEN RF CALL BOX AND BASE STATION AT 2-WATT POWER SETTING
- GREATER DISTANCE CAPABLE AT 5 WATT SETTING
- UHF OR VHF LICENSED FREQUENCY REQUIRED
- TONE OR DIGITAL PL (PRIVATE LINE)

RF CALL BOX APPLICATION NO. 5

RF CALL BOX-TO-TELEPHONE OPERATION



APPLICATION NOTES:

- APPLICATION FOR RF CALL BOX DIALING A TELEPHONE NUMBER (2 TO 20 DIGITS)
- ONE-WAY OPERATION (RADIO-T0-TELEPHONE)
- NO ANI DISPLAY
- LINE OF SITE REQUIRED BETWEEN CALL BOX AND BASE STATION ANTENNA
- 3,000 FEET NOMINAL DISTANCE BETWEEN RF CALL BOX AND BASE STATION AT 2-WATT POWER SETTING
- GREATER DISTANCE CAPABLE AT 5 WATT SETTING
- UHF OR VHF LICENSED FREQUENCY REQUIRED
- TONE OR DIGITAL PL (PRIVATE LINE)
- **NOT RECOMMENDED FOR EMERGENCY USE**