Product Summary, CA12CD Cordless Push-to-Talk Adaptor

1 Document Information

This document summarizes features of the CA12CD cordless push-to-talk headset adaptor. It is intended for customers who need general information about this product as an aid to their purchasing and planning decisions. Specific details concerning installation and use of the CA12CD are available in the CA12CD User Guide and the Audio-Level Settings Card, both of which are available online at the Plantronics website.

Portions of this document are based to a large extent on the Engineering Support Document, "CS50 General Guidelines," Revision 1.5, by Steve Cahill.

1.1 Publication History

Revision	Date	Description
1	27 Mar 06	First release
2	22 Jun 06	Revise
3	20 Jul 06	Charge LEDs were amber
4	9 Aug 06	Add labels to Figure 1
A	2 Oct 06	Production release
B	14 Mar 07	Add CA12CD/A
C	03 Jan 07	Add sections on voice privacy, range and density, subscription, and audio performance; delete material duplicated in user guide.

1.2 Document Approval

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1.3 Table of Contents

Titles **Page No.**

1.4 List of Illustrations

Titles **Page No.**

Figures:

2 Product Description

2.1 Summary of Features

- Push-to-talk (PTT) switch that is robust and field-proven
- Spare battery pack
- Two charging wells—one for the remote unit, one for the spare battery pack
- Lithium-ion batteries
- Eight hours talk time, minimum
- Quick Disconnect™ for compatibility with all Plantronics H-Series headsets
- Receiving coarse- and fine-adjust sensitivity controls
- Selectable sending-sensitivity ranges to emulate carbon, electret, and dynamic mics
- Sending-sensitivity fine-adjust control
- DECT™ (Digital Enhanced Cordless Telecommunications) radio operating in the UPCS band (CA12CD) for North-American applications and full DECT version (CA12CD/A and variants) for areas such as the European Union and Australia.
- Compatible with most air-traffic-control and public-safety-dispatch voice switches
- Ten-foot coiled interface cable with PJ-7 connector (other connectors available upon request)
- LEDs for RF link, PTT, base power, and battery-charging status
- Audible indicators for such conditions as out-of-range, low battery, and sending- and receiving-sensitivity changes
- Encryption in compliance with USA regulation 45 CFR 164.312(a)(2)(iv), and therefore compliance with the Health Insurance Portability and Accountability Act (HIPAA).

Figure 1: Model CA12CD

2.2 Functional Description[1]

The CA12CD is a cordless push-to-talk (PTT) headset adaptor made to provide wireless communications and PTT functionality for Public Safety Dispatch and Air Traffic Control facilities (see Figure 1). The CA12CD has a Quick Disconnect and is compatible with all Plantronics H-Series headsets.[2] The CA12CD consists of a base unit and a remote unit.

The base has two charging wells, sending- and receiving-sensitivity controls, status LEDs and a 10-foot coil cord with a PJ-7 connector. The charging wells accommodate the remote and a spare battery pack. The LEDs show battery-charge status, power, and PTT status. The sending controls consist of a configuration switch to emulate

[1] Unless otherwise specified, all references to the CA12CD also apply to the CA12CD/A and its variants.

[2] Examples of H-Series headsets commonly used in air-traffic control and public-safety dispatch are the H31 StarSet®, H251 SupraPlus®, H171 DuoPro®, and H91 Encore®, along with the noise-canceling versions of these headsets. Binaural versions of some of these headsets are also available. Please see the Plantronics website for further information.

the outputs of different microphone types and a sending-sensitivity fine-adjust control. The receiving-sensitivity control selects among four different sensitivity ranges, and the receiving sensitivity can be fine-tuned by a control on the remote. The console interface cable connects to the base via a 6-pin modular connector and is typically wired on the console end with sending on the PJ-7 tips, receiving on the sleeves, and PTT on the rings. When the user presses the PTT switch on the remote unit, a relay is closed in the base that places a short circuit across the PJ-7 rings. This short circuit "keys up" the communications console to which the CA12CD is connected and allows the user to transmit over the communications radio.

The remote unit has a PTT switch, an On-Off switch with incorporated LED, a metal belt clip, a receiving-sensitivity fine-adjust control, and a twelve-inch cable terminated in a Quick Disconnect to which any Plantronics H-Series headset can be connected.

The On-Off switch enables audio and PTT. As long as the base is powered up, the RF link is maintained regardless of whether audio/PTT is enabled. Even when the base is powered down, the remote will continue to run so that the link can be reestablished should the base be turned on again. Therefore, to completely power-down the remote unit, it is necessary to remove the battery.

The CA12CD/A and its variants operate in the European DECT band of 1880 to 1900 MHz.

The CA12CD for North America also uses DECT technology, but it operates in the Unlicensed Personal Communications Services (UPCS) 1920- to 1930-MHz band.

The DECT protocol is used for its power efficiency, which allows extended operation from a relatively small battery pack. A new, freshly-charged battery will provide about eight hours of talk time.

2.3 Product Architecture

2.3.1 Base Unit

The block diagram of the Model CA12CD base is shown in Figure 2.

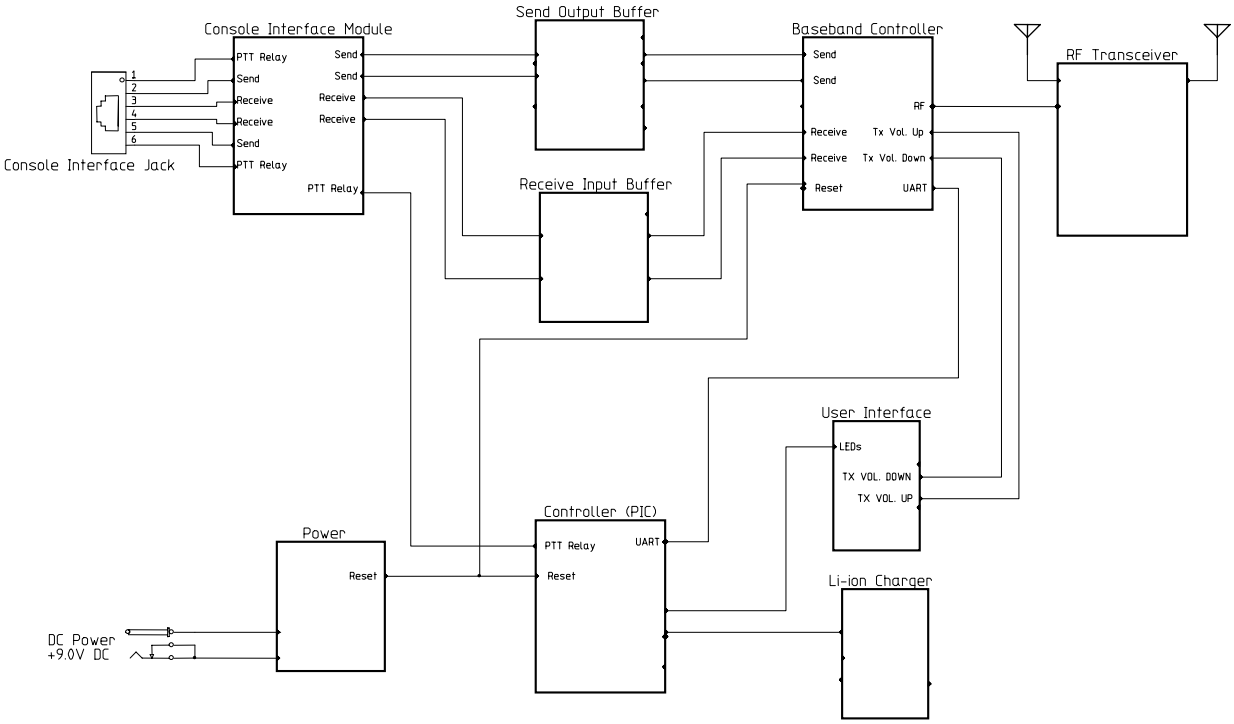

Figure 2: Base-Unit Block Diagram

2.3.2 Remote Unit

The block diagram of the remote unit is shown in Figure 3.

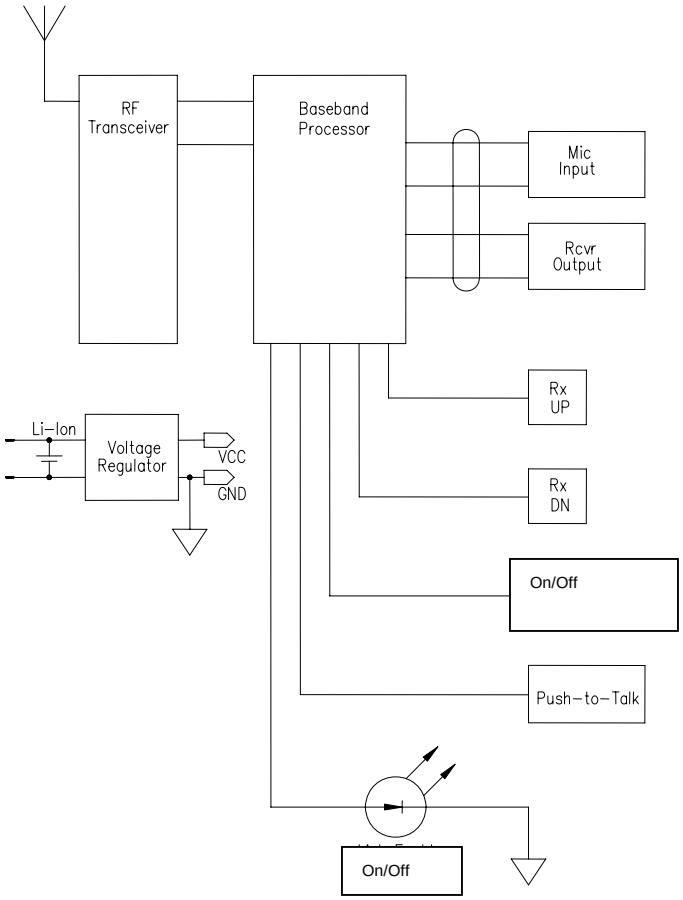

Figure 3: Remote-Unit Block Diagram

3 Audio Performance

The CA12CD audio processing is 32k ADPCM, telephony bandwidth. A wide range of audio levels can be achieved using the coarse-adjust and fine-adjust controls provided for both the transmit and the receive channels. See the User Guide and the Audio-Level Settings card (both available online) for details on optimizing these controls for the best audio performance.

3.1 Sidetone

For some installations the user may hear distorted sidetone: They hear their own voice in the headset as they speak, and it sounds harsh or rattley. Following the steps outlined on the audio-level settings card should help the user to avoid this problem. The

general procedure for avoiding sidetone problems is to avoid unnecessarily-high transmit-volume levels and to keep the sidetone controls on the installation—if present—set to their minimum positions. The sidetone controls may be user-accessible, or they may be accessible only to service personnel.

The reason for minimizing sidetone from the customer equipment is due to the delay introduced by the digital architecture (TDMA[3]) of the DECT radio link. Sidetone generated in the customer equipment is delayed by about 20 mS by the time it reaches the user's ears. This is enough of a delay to be unpleasant to the user. Under normal conditions, a local echo canceller in the base stops sidetone and network-generated echoes from reaching the user, but if the transmit signal is too high, or if there is non-linear processing in the sidetone path, sidetone breakthrough will occur, and the user will hear the distorted audio described above. A sidetone generator in the remote replaces the sidetone that has been removed by the local echo canceller.

3.2 Interference

The CA12CD shares its frequency band with other radio products. Sometimes interference occurs due to other products using the same band. Interference may result in buzzing or pops in the talk or listen audio, or irregular mutes of the talk or listen audio, or may result in shortened range. The following steps may improve the performance of a CA12CD that is experiencing interference:

- Repositioning the base
- Limiting the distance between the base and the headset while in use
- Repositioning the interference source, if known

If the CA12CD base or remote is placed within a few inches of a cellular phone, the CA12CD may experience interference. Reposition the cellular phone or the CA12CD base or remote to increase the separation if this problem occurs.

4 Range and User Density

Range is as much as 100 feet. The effective limit to range is set by the onset of audio artifacts as the user gets further away from the base. Range can be reduced within a building by the obstruction of interior walls, or by the presence of other equipment operating in

[3] Time Division Multiple Access

the CA12CD's frequency band, or by the presence of a large number of other CA12CDs in the immediate area.

Range can be maximized by taking the following steps:

- Maximizing the amount of separation between the CA12CDs
- Placing the CA12CDs so that they are separated by items such as cubicle walls and furniture
- Turning off all unused bases (and removing the batteries from the remotes to prevent them from discharging)
- Insuring that no other equipment is operating in the same frequency band as the CA12CD: Interference may come from systems well outside the coverage area, as the range for interference is greater than the coverage range

As a general guideline, maximum range will probably be realized in a low-density installation of 5 units separated from each other by at least 10 feet. In a high-density installation of 30 units at 18-inch spacing, the range could be as little as 10 feet. The worst case for these coverage limits will occur when a user is distant from their own base but close to other bases or remotes.

In a high-density installation the CA12CD may take some time to reestablish connectivity with its base when the user returns to the coverage area after having been out of range. It normally takes a few seconds for the remote to find the base's signal as the user reenters the coverage area, but this process can take a minute or so in a high-density installation.

Regardless of the installation's density, if the user has been out of range for more than 10 minutes, the link will not be automatically reestablished: In this case, the user will have to press the On/Off button on the remote unit to reestablish the link.

Predicting the effective range and region of susceptibility to interference for individual environments and building layouts is of sufficient complexity as to be beyond the scope of this discussion. The preceding information is provided as a reference for system planning, and the performance of individual installations may vary.

5 Voice Privacy

The CA12CD provides excellent security against eavesdropping. This security is achieved through frequency hopping and encryption.

5.1 Frequency Hopping

The CA12CD avoids two users sharing the same channel and timeslot under normal circumstances because it chooses the best available channel, and will change channels if the channel in use experiences interference from another user. In the event of operation in a high-density installation where no better channel and timeslot is available, two users near each other and sharing the same channel and timeslot will experience occasional mutes of the receive or transmit audio and occasional audio distortion artifacts, rather than intercepted audio.

The CA12CD uses fixed-rate adaptive frequency hopping during the idle-locked state, which is when the base and the remote are in range but audio is not enabled. This was done to ensure that the base and the remote are compensating for changes in the radio signal spectrum due to other users and the presence of interferers, and thus to improve the reliability of the link, but it has the effect of adding a layer of security. The hop sequence is random, on the basis of the physical environment.

The CA12CD uses aperiodic adaptive frequency hopping when the audio link is enabled. The system is aperiodic because in this mode, rather than changing channels at a fixed interval of time, the system hops channels whenever there is another user sharing the same channel and producing interference. In an environment with many users, this adds a layer of security because users change channels from time-to-time, rather than staying in a fixed channel. This adaptive approach offers improved security relative to other systems which use a single, common and fixed hop sequence.

5.2 Encryption

The protection against deliberate eavesdropping is through user authentication and 64-bit true digital encryption of voice data according to the standard algorithm of EN 300 175-7. A description of the public portion of this encryption algorithm is available through the website of the European Telecommunications Standards Institute (ETSI) at www.etsi.org. Individuals and organizations having a credentialed need for more detail regarding the encryption scheme should contact Plantronics Engineering through the Technical Assistance Center. The CA12CD in particular and the DECT standard in general are considered secure-enough for commercial applications requiring voice privacy. This assurance is based on the 64-bit digital encryption of speech and the internationally-recognized and standardized encryption algorithm used.

6 Subscription

The CA12CD remote and base are paired uniquely. The process by which the remote and the base are paired is called, “subscription.” Please see the User Guide for step-by-step instructions for subscribing a base and a remote to each other.

The communications protocol permits audio exchange only between a remote and a base that are paired. The user can subscribe a new remote to an existing base to create a new pairing, or an existing remote can be subscribed to a new base, but a base can be paired with only one remote at a time, and a remote can be paired with only one base at time. When a new pairing is established, the old pairing is lost.