CS10, CA10 and CT10 technical notes
Rev 1.2, Oct. 4th, 2000

The following are general guidelines and recommendations for installation and use of CA10, CT10 and CS10 cordless products.

Technology used
The CA10, CS10 and CT10 products are designed to conform with the requirements of 47 CFR Ch. 1 ss 15.249, the regulations established by the Federal Communications Commission of the United States. These products also conform to the regulations of Canada, RSS-210 6.2.2 (m2). These regulations limit output signal level to 50 millivolts per meter at a distance of three meters. To meet these limits, transmit power is limited to about 0.00075 watts effective isotropic radiated power (EIRP), or three-quarters of a milliwatt. For comparison, cellular phones in the US can have transmit power up to 0.6 watt, almost 1000x higher.

The CA10, CS10 and CT10 products operate in the 902 – 928MHz portion of the bands authorized under the cited regulations. The voice modulation method used is frequency modulation (FM). The transmitted signal is constant-envelope during talk mode.

Channel selection
The CA10 and CS10 have the ability to operate in either automatic channel selection or in fixed channel selection mode. The channel selection wheels on the back of the base determine mode and operating channel. Automatic channel selection mode is chosen by setting the channel selection wheels to 00. When the wheels are set to 00, the system looks for an unused channel when the Talk button is pressed to initiate a connection, and the user can change channels by pressing the Channel button during the connection. Pressing the Channel button on the remote will cause the system to step through the channels in increments of three to the next unused channel, to permit the user to avoid interference.

Fixed channel selection mode is chosen by setting the channel selection wheels to 01 – 40. The left wheel is the 10's digit, and the right wheel is the units digit, looking at the base from the back. Selecting channel 01 sets the base to transmit on 902.8MHz and the remote to transmit on 925.3MHz; selecting 02 sets the base to transmit on 902.85MHz and the remote to transmit on 925.35MHz, and so on in increments of 0.05MHz up to channel 40, which sets the base to transmit on 904.75MHz and the remote to transmit on 927.25MHz. Setting the wheels above 40 selects channel 40. The Channel button on the remote is disabled when the system is in fixed channel selection mode. Fixed channel selection mode is provided to permit planned dedicated channels for individual users in an environment with many users, to avoid interference and accidental evesdropping.

To select a particular channel, press the Talk button to release the connection. With the remote removed from the base, change the channel selection wheels on the back of the base to the desired channel. Then set the remote in the base to train the remote. When the Talk button is next pressed, the channel used will be the newly selected channel.

Changing the channel selection wheels while the Talk light is lit or while the remote is in the base will not result in the system changing channels until the next time the remote is placed in the base with the Talk light unlit.

Interference and noisy audio

The CA10, CS10 and CT10 operate in a frequency band shared with other radio products. Sometimes interference occurs. Interference may result in buzzing or pops in the audio, or may result in shortened range. The CA10 and CS10 permit manual channel pre-assignment to avoid interference from other CA10 or CS10 users; the CT10 and both the CA10 and CS10 in automatic mode have some capability to detect and avoid interference on a single channel when a phone call is first initiated. The CT10 system will always change channels to find a clear channel prior to initiating a call, and the CA10 and CS10 will do so if in automatic channel selection mode. This does not protect the user once a phone call is started, as the check is only done prior to initiating each call. This protection is also only effective if the interference source stays on one channel. The system cannot protect itself against frequency-hopping systems.

Guidelines on planning a density site.

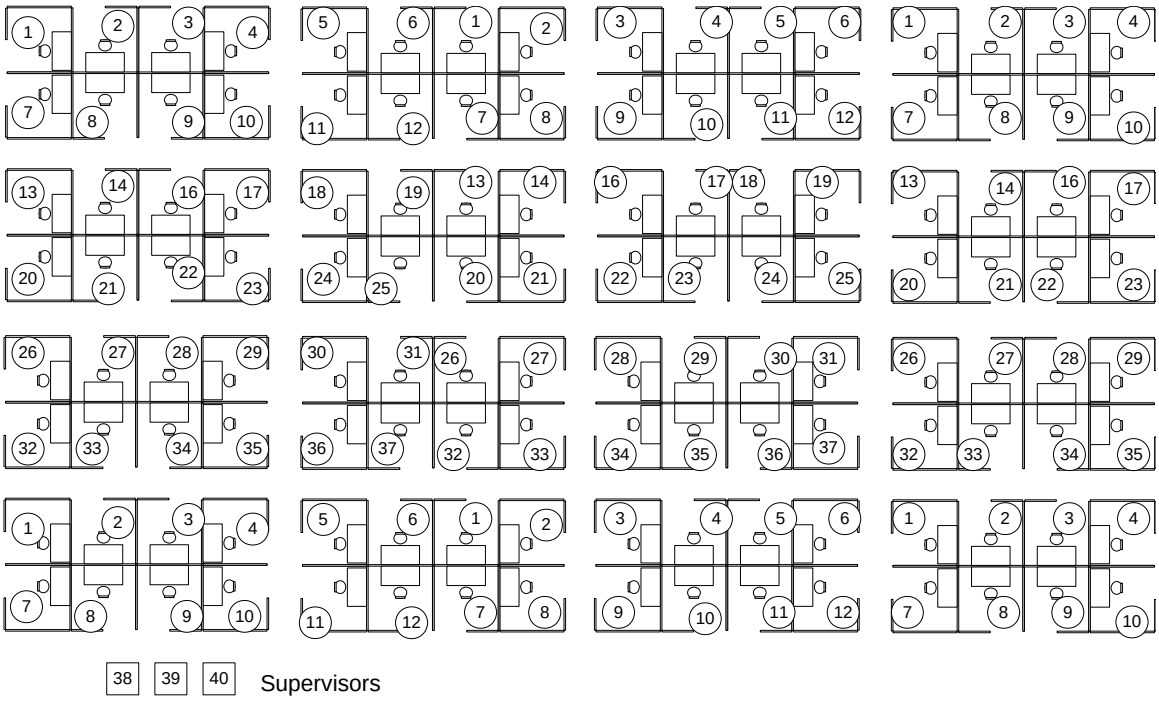
As long as manual channel setting is done, the CA10 and CS10 can be used in a high-density application for up to 39 users without limitations. Beyond 39 users, channel reuse is required, which compromises mobility. Channel setting must be done according to a plan that maximizes the distance between the users of a particular channel. Channel reuse limits the mobility of each user, but ensures that each user has clear audio within the user's mobility area. That is, in a density application, the users are provided each with a dedicated manually-set channel. The users channel selection is done according to a physical layout which a way that each user is as far as possible from other users on the same channel.

Achievable density for a high-density application beyond 39 users is dependent on the building layout, and on other environmental factors. In most environments, users in a cubical grid for a system with channel-reuse will probably get clear audio within their own cubicle as long as they are facing the base and the wearing position of the remote gives it a line-of-sight path to the base. Best reliability for the audio will occur if the user is sitting at the desk on which the base is placed. Users will both receive and be a source of interference if they leave their work area while a call is in progress. If channel-reuse is required, users in a higher-density application without cubical walls may not be able to get acceptable audio quality unless they are at their desk and the remote is worn on a lanyard, rather than clipped to the belt. Environmental factors greatly affect usable range and susceptibility to interference from other users.

Supervisory useage is possible with greater mobility for a high-density application. This is done by separating the channel assignments into two sets; one set for users, and one set for supervisors. The user channels are each assigned to several users, with interference controlled by physical separation. The supervisor channels are assigned to individual supervisors without reuse, to permit the supervisors to have long range without interference from other users of the channel.

A total of 40 channels can be manually set for the CA10 and CS10. 39 channels are usable; do not select channel 15, which is always used by the CA10 system for a moment when the remote is dropped into the base. Using channel 15 will result in momentary interference to the unit which has channel 15 selected from all other units each time the other remotes are cradled.

A sample layout is shown below with 128 users and three supervisors.



This layout is based on dividing the 39 usable channels into 36 manually selected user channels arranged in a 6 x 6 user grid, leaving 3 channels free for assignment to supervisors. Each user is physically separated from another user on the same channel by 5 cubicles. The channels could also be divided into 25 user channels and 14 supervisor channels, separating same-channel users by 4 cubicles, at the price of some shrinkage of the interference-free range for each user within their cubicle.

In high-density applications it is important not to have other 902 – 928 MHz cordless products in use in the area. Interference may come from systems well outside the coverage area, as the range for interference is greater than the coverage range.

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.

CA10/CS10 telephone compatibility

CA10 and CS10 are compatible with most telephones on the market when the user sets the proper Transmit Level Switch position and Configuration Switch position. The CA10/CS10 Cordless Adapter may require the Configuration Switch and / or Transmit Level Switch to be adjusted for optimum performance. These switches determine how the adapter interacts with a particular telephone.

The CA10 Transmit Level Switch provides three levels: "**1**" (high), "**2**" (medium) and "**3**" (low). The Configuration Switch has two settings: "**A**" and "**B**". The default setting is **2-B;** this setting supports the majority of Electret telephones, which are the most common type on the market. If changes are necessary, set the Transmit Level Switch and / or the Configuration Switch per the User's Guide.

The CA10 and CS10 are not directly compatible with some telephones for any combination of switch settings. For example, the Lucent 'Merlin' phone has a unique wiring configuration. If a CA10 or CS10 is connected to certain Merlin phones, the end user must use cable adaptor kit part number 47521-01. (The cable adaptor kit must be ordered separately – it does not ship with the standard package.) The Merlin phones that require the kit have a smaller mouthpiece than earpiece on the handset.

The following matrix describes a few examples of some of the combinations of different switch settings and the type of telephone each switch setting supports:

CA 10 Switch Position	Comments
1-B	Carbon Phones
2-B	Lucent 'Merlin' Model Phones with kit part # 47521-01
2-B	Electret Phones
1,2 or 3-A	GE Phones

For further information, or application support, please contact the Plantronics Technical Assistance Center @ (800) 544-4660.