

CellCom 10

DIGITAL WIRELESS INTERCOM

P R O D U C T G U I D E

CellCom 10 Product Guide
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IMPORTANT SAFETY INSTRUCTIONS

Please read and follow these instructions before operating a CellCom 10 wireless communication system. Keep these instructions for future reference.

Please read and follow these instructions before operating a CellCom 10 wireless communication system.

- (1) **WARNING:** To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.
- (2) Do not use the apparatus near water.
- (3) Clean only with a dry cloth.
- (4) Do not block any ventilation openings. Install in accordance with the manufacturer's instructions. Install the CellCom 10 wireless communication system according to the directions in the Installation Chapter of this manual.
- (5) Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat. Do not place naked flame sources such as candles on or near the matrix.
- (6) Do not defeat the safety purpose of the polarized plug or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- (7) Protect power leads from being walked on or pinched particularly at plugs, at convenience receptacles, and at the point where they exit from the apparatus.
Note: A "convenience receptacle" is an extra AC power outlet located on the back of a piece of equipment, intended to allow you to power other equipment.
- (8) Only use attachments/accessories specified by the manufacturer.
- (9) Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
- (10) Unplug the apparatus during lightning storms or when unused for long periods of time.
- (11) Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as a power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
- (12) The CellCom 10 wireless communication system contains a non-user serviceable battery.

CAUTION: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type.

Lithium batteries can overheat or explode if they are shorted. When you handle the CPU card or a loose battery, **DO NOT** touch any external electrical conductors to the battery's terminals or to the circuits that the terminals are connected to.

Please familiarize yourself with the safety symbols in Figure 1. When you see these symbols on a CellCom 10 wireless communication system, they warn you of the potential danger of electric shock if the system is used improperly. They also refer you to important operating and maintenance instructions in the manual.



This symbol alerts you to the presence of uninsulated dangerous voltage within the product's enclosure that might be of sufficient magnitude to constitute a risk of electric shock. Do not open the product's case.



This symbol informs you that important operating and maintenance instructions are included in the literature accompanying this product.

Figure 1: Safety Symbols

EMC AND SAFETY

The CellCom 10 wireless communication system meets all relevant CE, FCC, UL, and CSA specifications set out below:

EN55103-1 Electromagnetic compatibility. Product family standard for audio, video, audio-visual, and entertainment lighting control apparatus for professional use. Part 1: Emissions.

EN55103-2 Electromagnetic compatibility. Product family standard for audio, video, audio-visual, and entertainment lighting control apparatus for professional use. Part 2: Immunity.

BS EN 60065:2002 Audio, video, and similar electronic apparatus. Safety requirements.

And thereby compliance with the requirement of Electromagnetic Compatibility Directive 89/336/EEC and Low Voltage Directive 73/23/EEC as amended by 93/68/EEC.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

GETTING STARTED: AN INTRODUCTION TO CELLCOM 10

CELLCOM 10 BASIC DESCRIPTION

CellCom 10 uniquely blends digital matrix technology with a locally distributed wireless “network”—operating license-free in the 1.9 GHz frequency band using DECT technology, the international standard accepted by more than 100 countries. To this capability the system adds broad connectivity to party-line and digital matrix intercom systems. With CellCom 10, beltpack-to-beltpack and small-group communication is finally possible within a wireless system.

CellCom 10 may be used stand-alone or connected with party-line and/or digital matrix intercom systems. These systems are typically used to coordinate the actions of production staff in television broadcast, live theatre and performance, event production, industrial, and government/aerospace applications.

A CellCom 10 system consists of three basic elements: the base station, wireless beltpacks, and antennas.

With the basic three elements you can design a complete interference-free wireless communications system.



Figure 1: A CellCom 10 Base Station, Beltpack, and Transceiver/Antenna

The CellCom 10 system consists of three elements:

- Wireless beltpacks,
- A base station that provides routing of communications to and from those beltpacks, and
- Transceiver/antennas that can be located at intervals remotely from the base station, providing customized coverage areas where the beltpacks function.

In addition, up to six wired full-duplex communications channels, plus program in and stage-announce out, can all be connected and used simultaneously.

FEATURES

CellCom 10 brings the power of matrix communications to a wireless system, blended with the coverage flexibility of a local cellular matrix. Features of CellCom 10 include:

- Ten wireless beltacks in 1 RU.
- Point-to-point and small group wireless communications.
- Up to six communications routes per beltack.
- Custom coverage zones with up to ten remote transceiver antennas.
- Transceiver/antennas can be located up to 1,000 meters (3,200 feet) from the base.
- Five-character labels for each beltack and connector.
- Customize, name, and assign groups.
- Two party-line and four 4-wire connectors.
- Operates in 1.9 Ghz—above television and other wireless communications.
- License-free in countries accepting the DECT standard.
- Frequency-hopping DECT technology automatically finds clear spectrum.
- Base functions like a digital matrix; each beltack has a “virtual port” timeslot.
- Secure system—beltacks are registered to a particular base and can frequency hop.
- Two bases can be connected for a 20-beltack system.

The CellCom 10 base station functions as a full-duplex digital matrix switcher and router for voice communications.

Each transceiver/antenna can support communications with up to five CellCom 10 wireless beltacks operating within its coverage zone.

CELLCOM 10 THEORY OF OPERATION

CellCom 10 is quite different from other wireless intercom systems. Wireless intercoms typically pair individual beltack transmitters with individual base-station receivers on the same frequencies, with the resulting signals mixed and re-transmitted by the base to common receiver boards in the beltacks – achieving a wireless party-line.

The CellCom 10 base station functions as a full-duplex digital matrix switcher and router for voice communications. Within the base, time slots are allocated to each of the up to 10 wireless beltacks, each of the full-duplex party-line and 4-wire connectors on the rear panel, the program input / stage-announce output, and the front-panel intercom headset connector. This technology gives the advantage of multiple point-to-point and small-group conversations being possible simultaneously within the system.

Audio is sampled from each of the headset microphones, is processed and combined as needed in the CellCom 10 base, and is then sent to each of the beltacks and wired connectors in turn. The wireless beltacks in effect each have

a “virtual port,” as their data and digital audio is sent to and from each beltack in a particular time slot.

Each of these beltacks and wired connections can be named (labeled) with a unique 5-character alphanumeric designation, and these individual connections can be combined into groups. All of the rear-panel wired communications connections can also be labeled. This programming is done via menus within the base station, and is stored in non-volatile memory.

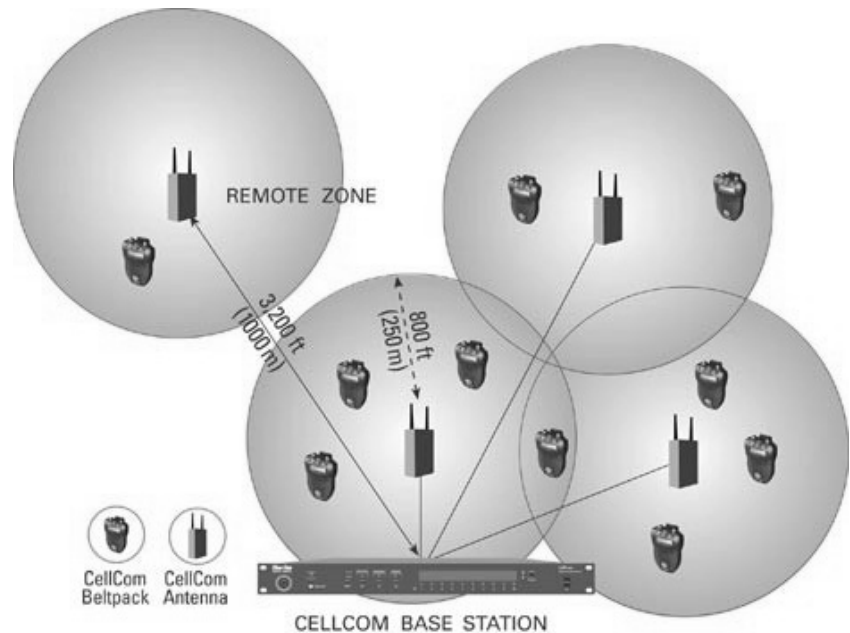


Figure 2: A CellCom 10 Digital Communication System

Each beltack has a unique “ID” which is registered with the base station and assigned to a particular time slot. When the base station is turned on and communicating via its remoted transceiver/antennas, the wireless beltacks immediately receive all of their “identity” and communications routing information from the transmissions from the base – acting as specialized portable communications terminals. Changes made to the communications routing on the base are transferred to the beltacks, so another source can be added to a group or a talk/listen button on a beltack can be reassigned in real time.

The wireless link between the base station and the beltacks is accomplished by transceiver/antennas that transmit and receive digital data and audio within a circular coverage area with a maximum radius of 250 meters (about 800 feet) under ideal conditions, but typically somewhat less depending on location and obstructions. The base will support up to 10 of these transceiver/antennas, which can be located throughout a production area to provide seamless coverage for the wireless beltacks.

It is also possible to remote one or more of these coverage zones independent of the others. Transceiver/antennas, which connect with the base station (or via the antenna splitter to the base) via 4-pair CAT-5 cable, can be positioned up to 1,000 meters (3,200 feet) from the base.

Each transceiver/antenna can support communications with up to five CellCom 10 wireless beltacks operating within its coverage zone. As the beltack user walks among the coverage zones created by overlapping the coverage of multiple transceiver/antennas, the communication between that beltack and the base is “handed off” to the next transceiver/antenna, without interruption.

If more than five CellCom 10 beltacks will be operating in a certain coverage zone, a second transceiver/antenna will be co-located with the first – one per every five beltacks working in the particular zone. The theoretical maximum number of CellCom 10 beltacks able to be supported in one zone is 50, and the practical number is between 30 to 35.

The transmissions between the wireless beltacks and the transceiver/antennas are done using a customized application of the DECT protocol, operating in the 1.92 to 1.93 GHz band. CellCom 10 can be used without regard to existing analog and digital UHF television transmissions, wireless mics and in-ear monitors, and other wireless intercom. Transmissions are digital, and the technology automatically seeks clear and unused “channels” within the overall bandwidth allotted to the CellCom 10 system, changing as required by the immediate circumstances.

Along with the digital nature of the transmission and the random changing of channels, the unique ID of the beltack is only registered to the particular CellCom 10 base. Its transmission is only available to that base, and other CellCom 10 systems being used in the same vicinity will not “see” it. Therefore, though the system is not technically “encrypted”, it is virtually impossible to capture and decipher these transmissions.

CellCom 10 wireless beltacks can be added to the base rather simply, up to the maximum of 10 per base. Registration is available through the a software utility, and a 3.5 mm TRS jack on the beltack accesses its digital ID. If an existing beltack in a system is lost or destroyed, a new unit can be registered in its place; it will then take on the identity and communications routes of its predecessor.

The CellCom 10 base station also has a variety of connections for adding wired party-line, digital matrix, and other communications. Two channels of party-line and 4-channels of 4-wire / digital matrix can be connected via rear-panel connectors. Each of these may be accessed individually by the wireless beltacks, or they may be grouped together in any way desired. Just like the beltacks, each of these full-duplex connectors has its own time slot and can be labeled. In addition, a line-level program input and a line-level stage-announce / paging output with associated relay is also provided.

DECT TRANSMISSION THEORY

Different that typical FM wireless communications systems, where each transmitter has a corresponding receiver and is set to a particular frequency (even in frequency-agile systems), CellCom 10 automatically seeks its own clear frequencies. CellCom 10 operates in a different frequency band than wireless microphones, in-ear monitors, and wireless intercoms, and its dynamic channel selection and allocation capability means that the system does its own frequency coordination continually while in use. DECT systems in general, and the

CellCom 10 digital wireless intercom in particular, do not require the frequency coordination and the intensity of frequency planning that is necessary for FM systems. Details of the technology are below.

CellCom 10 is based on a specialized application of the DECT (Digital Enhanced Cordless Telecommunications) standard, which was originally developed in Europe in the beginning of the 1990's. It is an open standard for site-specific radio access in the 1.88 to 1.90 GHz band (enhanced bands up to 1.93 GHz are included), allowing manufacturers to design compliant technologies that can coexist in a user location and be used without interference in adjacent locations.

In DECT terminology, the beltpack is called the Portable Part (PP) and the transceiver/antenna is called the Fixed Part (FP). In essence, this means that the transceiver/antenna stays in one place, while the beltpacks move with their users. Each of these units has its own role. The FP creates the coverage zone for the PP, and the portable part is the user interface, and also takes the initiative in signaling the fixed part that it is in the coverage zone and seeking to establish and keep a communications link. CellCom 10 and other DECT-based systems have multiple fixed parts and portable parts.

DECT uses a Multi-Carrier (MC), Time Division Multiple Access (TDMA), Time Division Duplex (TDD) radio-access methodology, and combines that with a continuous Dynamic Channel Selection and Allocation capability. Basically, it divides up the allocated 20 MHz of spectrum into bands and channels, uses a fast time clock to sort out the various communications by assigning each a time slot, and further dividing the time to allow two-way (full duplex) conversations. To deal with potential interference and conflicts between these different communications, the technology continually scans for open and used channels, selecting the best one at any given time that won't interfere with other channels already in use.

The result of combining all of these technologies into DECT is that high-capacity, high-density communications networks can be assembled at a local level, and can function well even in environments with much RF "traffic." DECT is very efficient in finding and using open frequencies without interference, all without active effort from the user. The fact that these systems are localized, relatively low-power, and rely on distributed transceivers throughout the desired coverage area, lead to the term "pico-cellular systems" – or very small cellular systems.

The 20 MHz spectrum used in a DECT system is divided into 10 carrier frequencies, which is the multi-carrier portion of the technology. The actual bandwidth of each carrier is 1.728 MHz. Time, in the form of TDMA, is divided into time frames that are accessed every 10 milliseconds, each containing 24 time slots into which a single audio stream may be inserted. In typical consumer DECT with its more limited audio bandwidth, two time slots are required for a duplex conversation – one for talk and one for listen.

The special application of CellCom 10 with its better audio bandwidth gives two time slots for each audio stream (user's voice), so a full-duplex conversation requires a total of four time slots. CellCom 10 uses a 2 Mb/s (two megabits per second) data stream from the base station transceiver ports.

Doing the math in the case of FreeSpeak Lite, a transceiver/antenna in a given location selects a particular unused carrier frequency, and uses four time slots for each full-duplex conversation with a CellCom 10 beltpack. Combined, the five beltpacks that this transceiver/antenna can support use 20 of the 24 available time slots (5 times 4). The remaining 4 timeslots are used to support the recognition and handoff of other beltpacks as they move around and through this coverage zone, and other related functions.

To support up to 10 beltpacks in a given location, for example, two transceiver/antennas are placed to operate side by side using different clear carrier frequencies. Given that these are relatively short-range, localized signals, a carrier frequency that is being used in one physical location is likely to be clear again in a nearby location – even within the same overall system installation.

A theoretical maximum of 50 CellCom 10 beltpacks can be used within a given coverage zone, if 10 transceiver/antennas are co-located together. The practical limit within a particular zone is in the range of 30 to 35 beltpacks in one zone.

The CellCom 10 transceiver/antennas, via the base station, are continuously transmitting status and identity information on particular DECT carrier frequencies, and the CellCom 10 beltpacks are able to receive and analyze that information. The beltpacks put out a “pulse” at regular intervals to signal their presence and ID. Through this interchange, the system will determine whether the beltpack is registered to the base station (and through the base station to the local transceiver/antenna) and is able to establish a connection.

This method of positive identification that a beltpack “belongs” to a system has practical benefits in preventing interference or eavesdropping. For example, a CellCom 10 beltpack whose unique ID is not registered with the particular base will not be able to establish a communication link with that base. This means that users of two different CellCom 10 systems that happen to be operating in the same location – such as a large production event – will not accidentally or otherwise connect with each others’ systems.

Since the beltpack user is continually moving, often through different coverage zones created by multiple transceiver/antennas connected with the base station, it must have a way to measure the strength of the signal connection, and to establish a connection with the transceiver/antenna offering the highest signal level. A protocol called RSSI (Received Signal Strength Indication) tells the beltpack which available signal is both strongest and available to establish a connection, as it scans through all the available possibilities.

For example, as a beltpack user passes from one coverage zone to another, it is detecting the signal strength of both transceiver/antennas. Say that an adjacent transceiver/antenna zone has less than five beltpacks currently connected through it, so is available for another beltpack. Its signal strength is stronger than the moving beltpack’s current connection with the other transceiver/antenna by a threshold amount. In this circumstance, the beltpack will transfer its connection to the new transceiver/antenna – in a “make before break” type of connection.

CellCom 10 and other DECT devices also provide security to communications in several ways. First, the unique ID of a beltpack is registered with the base station, and it must be recognized and authorized before a communications link

is authorized. Second, the transmission is digital, and does have a ciphering-type encryption incorporated in the protocol to prevent eavesdropping. Third, the dynamic changing of carriers and use of time slots means that a particular conversation cannot be located or locked onto in any meaningful fashion.

2 THE CELLCOM 10 BASE STATION

BASE STATION (CEL-BASE)

The CellCom 10 (CEL-BASE) base station provides all of the intelligence and signal routing for the CellCom 10 digital wireless intercom system. The base station is effectively a full-duplex digital matrix communications system, with virtual “ports” for the wireless beltpacks rather than physical ports.

In its memory, the base station contains all of the labels and communications paths assigned to each CEL-BP beltpack, and this information is sent to the beltpacks via the CEL-TA transceiver/antennas as soon as they are switched on and recognized by the base. Through the front-panel display and controls, all system programming is accomplished.

The base station also functions as the interface between wired and wireless communication devices. The two party-line intercom connectors, four 4-wire connectors, and program input/stage-announce output each have their own full-duplex time slot. They can be labeled, added to communication groups, and assigned to beltpacks as desired.

BASE STATION FRONT PANEL

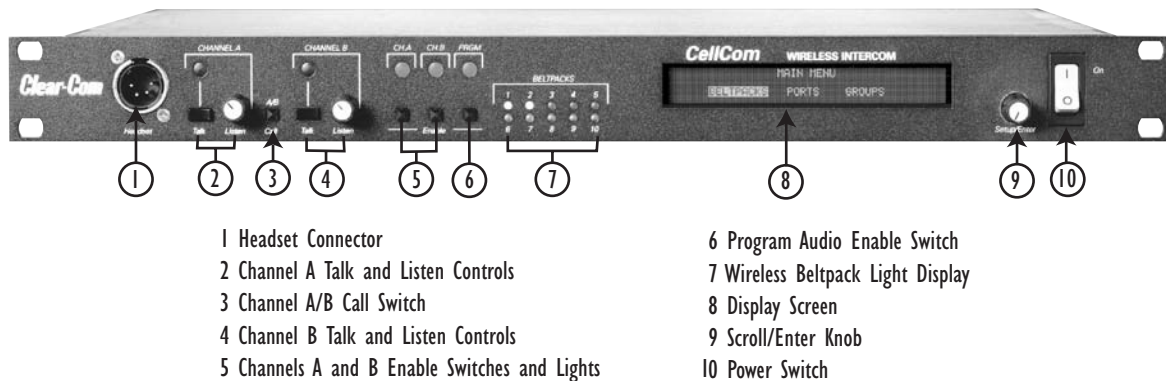


Figure 1: CellCom 10 Base Station Front Panel

① Headset Connector

The 4-pin male XLR-type headset socket connects to Clear-Com headsets and other headsets with 4-pin female connectors. This headset connector is for the onboard two-channel intercom, with controls just to the right of the connector.

② Channel A Talk Switch and Light/Listen Level Knob

The channel A talk switch and associated light, and listen level knob, allow full-duplex conversations with any CellCom 10 wireless beltacks or other communications systems wired to the rear of the base station to which the onboard Channel A has been assigned. Assignments are done via the front-panel programming.

The talk switch is momentary/latching, such that pressing it and holding down will create a talk path that ends when the user releases the switch, while quickly tapping it will latch the talk, and a second tap will release it. The LED lights red when a talk is active.

Turning the listen level knob clockwise will allow the user to hear the other party's voice, increasing the level to maximum when fully clockwise.

③ A/B Call Switch (Reserved for Future Use)

The A/B call switch does not function. It is reserved for future use.

④ Channel B Talk Switch and Light/Listen Level Knob

The channel B talk switch and associated light, and listen level knob, function the same as the controls for Channel A.

⑤ Enable Switch and Lights for Channels A and B

The channel A and channel B enable switches and associated lights activate the connection on the rear-panel to party-line intercom channels A and B. Activating one or both of these switches makes duplex communications between the wireless beltacks and the wired party-line intercom occur. These switches may be "locked" via the front-panel SYSTEM programming menu so that they may not be disengaged accidentally.

⑥ Enable Switch and Light for Program Audio

This latching switch makes any program audio signal that enters via the rear-panel line-level 3-pin XLR connector available to be assigned to wireless beltacks, either separately or mixed with communications groups. This switch may be "locked" via the front-panel SYSTEM programming menu so that it may not be disengaged accidentally.

⑦ Wireless Beltpack Light Display

These green LEDs, one for each of the ten CEL-BP wireless beltacks that the base will support, light when a beltack is on and connected with the system. For example, the beltack that is registered with the base in the BPK03 time slot will light the LED under number 3 when turned on.

⑧ Display Screen

The display screen shows all of the menus and programming options that are available within the CellCom 10 system. The user can select a particular beltpack and view all of its current talk/listen assignments, or see all of the current members of a particular group. Via the screen and rotary encoder, labels (5-character user names) can be created and/or changed, new members assigned to groups, input and output levels adjusted, and so on.

⑨ Scroll/Enter Knob

The scroll/enter knob is used to scroll through the various menu options within the CellCom 10 base, in order to discover specific information regarding users or to program communications routes and groups. Turning the knob clockwise scrolls display items toward the right, and turning the knob counterclockwise scrolls display items toward the left.

When a desired menu item is highlighted, pushing the scroll/enter knob inward will select that item. The lists of available beltpacks and groups typically span two or more screens, so when the highlight is at the leftmost or rightmost part of the screen and the user continues to turn the rotary encoder in that direction, the display will jump to the next screen selections [Example: in the beltpack sections, the first screen shows beltpacks 1 through 5, and the second shows 6 through 10.]. The “BACK” menu button can only be reached by turning the scroll/enter knob clockwise.

⑩ Power Switch

The power switch will turn the CEL-BASE base station on and off.

BASE STATION REAR PANEL

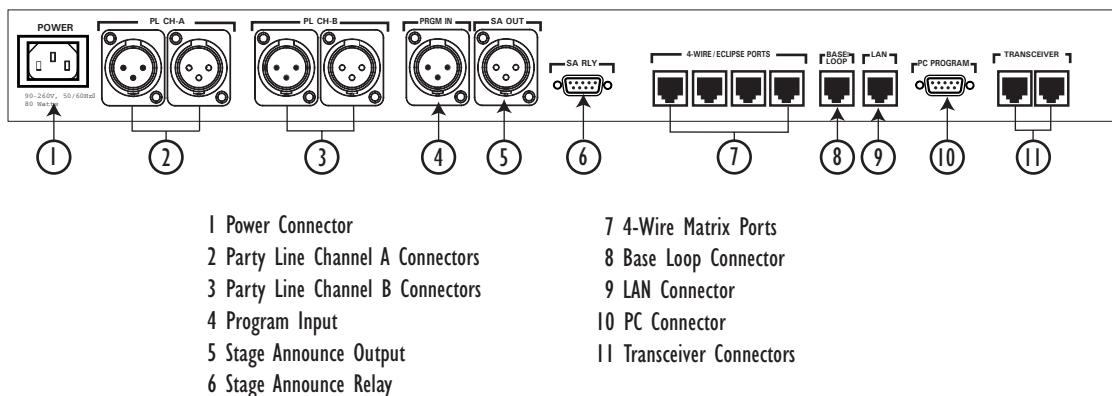


Figure 2: CellCom 10 Base Station Rear Panel

① IEC Power Connector

The 3-conductor AC power connector and universal power supply accepts voltages from 90 to 250 volts, at 50/60 Hz. Power consumption is 80 watts.

② Party Line Channel A Connectors

This pair of female and male 3-pin XLR connectors joins a channel of party-line intercom to the CellCom 10 base station, allowing communication between the wired system and CellCom 10 wireless beltacks. Input and Output level control is set via the front-panel display programming.

The second connector is a loop-through, so that the party-line connection may be continued to another CellCom 10 base station or to another party-line beltack or station. This connector auto-detects a connection with a powered party-line channel (30-VDC on Pin 2), and the base's internal 200-ohm party-line termination and DC voltage to power PL beltacks is not activated.

Alternatively, when a wired, unpowered party-line beltack (up to four) is connected to PL CH-A with standard two-conductor shielded microphone cable, the base station engages the 200-ohm termination and supplies 24-VDC to the beltack(s) – allowing them to operate and communicate with the wireless beltacks in the system.

③ Party Line Channel B Connectors

These connectors are the same as those for PL CH-A.

④ Program Input Connector

This female 3-pin XLR connector accepts a line-level audio signal from an outside source such as a mixing console or audio player. It is transformer-isolated. Level adjustment is done via the front-panel display programming. The program input shares a time slot with the stage announce output, described below.

⑤ Stage Announce Output Connector

This male 3-pin XLR connector allows a line-level audio signal, typically a voice from a wireless beltack user, to be sent to a paging system or other audio system. It is transformer-isolated. Level adjustment is done via the front-panel display programming. One beltack at a time can access this output, and it must be programmed to a CEL-BP. It is activated by pushing the talk on the beltack rotary encoder to which the SA Output is assigned.

⑥ Stage Announce Relay

This DB-9 male connector provides a relay closure that is triggered simultaneously with the SA Output. The relay may be used to open an audio pathway for the signal from the SA Output, or could also be used to activate a

light or lock or some other device. The relay may be wired for normally closed or normally open operation, and the signal appears on pins 1 & 6 or 2 & 6. It is rated to a maximum of 30-VDC at 1 amp.

⑦ 4-Wire Matrix Ports

These four RJ-45 connectors can connect four full-duplex (input pair and output pair) audio connections from a 4-wire communications device, digital matrix intercom, or similar – making them available to the wireless beltpacks. The first two RJ-45's have both audio and data connections, to be used in the future for intelligent communications routing. The second two have audio connections only. Each of these connectors has its own time slot, and can be addressed separately from a beltpack, or combined with other beltpacks and rear-panel connectors in a group. Level adjustment is done via the front-panel display programming.

⑧ Base Loop Connector

The base loop RJ-45 connector is used to join two CellCom 10 base stations to form one larger – up to 20 wireless beltpacks – communications system. It passes the digital audio signals and time slot data between the two bases. Point-to-point communication is possible from a CEL-BP wireless beltpack assigned to one base to a wireless beltpack assigned to the other base.

⑨ LAN Connector

This RJ-45 connector is used for rapid system software upgrades, and in the future will be used for intelligent connection with the Clear-Com Eclipse digital matrix systems, and for remote access to the CellCom 10 base. It is essentially a 10BaseT Ethernet port.

⑩ PC Connector

This female DB-9 is used for firmware updates and monitoring of the system configuration. It functions as a serial port.

⑪ Transceiver Connectors

These two RJ-45 connectors are used to communicate with the remote CEL-TA transceiver/antennas, which create the wireless coverage areas that connect the CEL-BP wireless beltpacks to the base station. In the basic CellCom 10 system, these transceiver connectors together support up to four CEL-TA transceiver/antennas – with the addition of the CEL-SP antenna splitter to make sufficient ports for each of the antennas. All CEL-TA transceiver/antennas must be connected to a CEL-BASE transceiver port (or to it via a CEL-SP antenna splitter) as a “home run.” The addition of the optional CEL-EXP antenna expansion board (connects internally within the base station) supports six more transceiver/antennas, for a maximum of ten.

CONNECTING THE BASE STATION TO PARTY-LINE INTERCOM SYSTEMS

Up to two channels of party-line intercom can be connected to the FreeSpeak LiteCellCom 10 base. The descriptions below will discuss connections with Clear-Com and compatible party-line, RTS party-line, the ability of CellCom 10 to power a few Clear-Com beltacks by itself, and the front-panel settings associated with these party-line connections.

Using the front-panel display and rotary encoder, the user may go into the PORTS menu, select the desired party-line channel, and create a five-character alphanumeric label for it. This is the label that would then appear on any CellCom 10 wireless beltacks to which that party-line connection was assigned for communications. In the GROUPS menu, the party-line connection can be assigned as a member of any of the groups, as desired.

CLEAR-COM AND COMPATIBLE PARTY-LINE

Clear-Com and Clear-Com-compatible wired party-line intercoms connect to the PL CH-A and PL CH-B connectors in a similar manner to connecting beltacks or remote stations to the intercom line. Typically that wired intercom connection would have a 30-VDC current on Pin 2, coming from a main station or an intercom power supply. The second connector in the pair may be used as a loop-through to go to other wired party-line stations or beltacks, or to a second CellCom 10 base station.

When the CellCom 10 base detects a wired party-line being connected with 30-VDC on Pin 2, it automatically disables the 200-ohm termination on that connector, and also does not enable the 24-VDC power supply that the CellCom 10 base station supplies to the connector to support a handful of locally-connected wired party-line beltacks. The base station then appears to the wired party-line system as a remote station.

Caution! Make sure that the CellCom 10 base station is disconnected (either physically or via the enable buttons) from the party-line system when you are turning it on, and/or that no speaker stations are on and no one is wearing headsets connected to the party-line system. During the power-up cycle, for the 10 or so seconds until the base reaches its programming screen, a loud and high-pitched series of noises may be injected onto the party-line. The party-line system can be powered up after the CellCom 10 base has stabilized, or the connectors can then be plugged into the CellCom 10 base; this noise will not happen under those conditions.

CONNECTING CLEAR-COM PARTY-LINE BELTPACKS DIRECTLY TO FREESPEAK LITE

PL CH-A and PL CH-B have the ability to directly support up to four Clear-Com RS-501 or RS-601 party-line beltacks each, without any other connection to a wired party-line system. This feature gives the convenience of being able to add a few wired beltacks when needed to a CellCom 10 installation.

Connect a standard two-conductor shielded microphone cable to the PL CH-A connector, and then connect it to a Clear-Com single-channel party-line beltpack. The base will detect that the beltpack has been connected, and will enable the required 200-ohm termination, and will supply 24-VDC to Pin 2 to power the beltpack(s).

You can daisy-chain up to four beltpacks, or use an intercom XLR splitter at the base to feed mic cables connected to the individual beltpacks. Because it is a 24-volt rather than a 30-volt current, the maximum length of cable that can be connected (the sum of all of the runs) will be shorter than what is expected with the standard party-line voltage. Do the same with PL CH-B to support an additional four beltpacks.

CONNECTING TO AN RTS™ WIRED BELTPACK

RTS beltpacks place two channels of party-line intercom on a single 3-pin XLR connector. Pin 1 is Ground, Pin 2 contains one channel of signal plus 30-VDC, and Pin 3 contains the other channel of signal. With the following modification, CellCom 10 will connect to those two communications channels.

Because each of the connectors on the rear-panel of the CellCom 10 base station is separate and has its own time slot (similar to the ports in a digital matrix intercom system), an external splitter cable must be used to split the two channels of party-line on the single RTS 3-pin XLR cable into two XLR connectors – each carrying one of the channels.

Use an XLR-3F connector for the connection with the intercom line from the RTS-TW system. Using two lengths of shielded two-wire (microphone) cable, split into two XLR-3M connectors.

For the connector that will deliver channel 1 of the RTS communication, pin 1 (common) of the XLR-3F will connect to pin 1 of the XLR-3 M connector. Pin 2 (audio 1 plus DC) of the XLR-3F will go to both pin 2 and pin 3 of the XLR-3M. Thus it will have signal and DC appearing on both pins 2 and 3. CellCom 10 will use the DC on pin 2 to deactivate the 200-ohm termination on that connector, and will use the signal on pin 3 for the audio.

For the connector that will deliver channel 2 of RTS communication, connect pin 1 (common) of the XLR-3F to pin 1, of the XLR-3M connector. Similarly, connect pin 2 to pin 2, and pin 3 to pin 3 – so that the XLR-3M is identical to the pin wiring of the XLR-3F. CellCom 10 will use the DC on pin 2 to deactivate the 200-ohm termination on that connector, and will use the signal on pin 3 for the audio.

FRONT-PANEL ADJUSTMENTS FOR PARTY-LINE CONNECTIONS

To connect the party-line channels to CellCom 10 and make the communication available to the rest of the system, press the CH-A and/or CH-B Enable switches. The LED will light, and the connection is made. To disconnect the party-line connections, press these switches again. The switch may be “locked” in the SYSTEM menu so that the party-lines may not be disconnected.

Because party-line intercom does not have global level control on a channel, input and output level controls are provided via the front panel programming. Scroll to PORTS on the main display screen and press the rotary encoder to select. Scroll to 4-WIRE and press to select. Go to CALLS and press to select. Doing so creates a route to the selected destination. If you save your changes, the route will be reinstated at power up. You can also set this option to NONE.

Use the rotary encoder to adjust the numerical level – clockwise to increase the level and counter-clockwise to decrease the level. Make the estimated changes in level and press the rotary encoder to save the changes. Test the levels between the party line and CellCom 10 beltpack, and make additional changes as needed. When the levels are set as desired, press to select and the display will go to the previous INPUT/OUTPUT screen. When both are adjusted, select BACK on each screen until you return to the main screen.

CONNECTING THE BASE STATION TO 4-WIRE AND DIGITAL MATRIX INTERCOM

Up to four channels of 4-wire/digital matrix intercom can be connected to the CellCom 10 base. The descriptions below will discuss connections with Clear-Com Matrix Plus digital matrix, Clear-Com Eclipse digital matrix, other brands of digital matrix intercoms, other 4-wire audio devices, and the front-panel settings associated with these 4-wire connections.

Using the front-panel display and rotary encoder, the user may go into the PORTS menu, then scroll to 4-WIRE and press to select. Go to CALLS and press the ENABLE button on the FreakSpeak Lite front panel. Doing so creates a route to the selected destination. If you save your changes, the route will be reinstated at power up. You can also set this option to NONE.

In the GROUPS menu, the 4-wire port can be assigned as a member of any of the groups, as desired.

CONNECTING WITH CLEAR-COM MATRIX PLUS

The connection between a Matrix Plus digital intercom port and a CellCom 10 4-wire port is accomplished with a standard 4-pair CAT-5 data cable with RJ-45 connectors on both ends. In the current generation of FreeSpeak Lite, the audio input and audio output pairs are all that will be used.

In the Matrix Plus PGM-WIN configuration software, set the matrix port that is connected to the CEL-BASE base station 4-wire port to “4-Wire.” If you will be putting the label of this CellCom 10 4-wire port onto more than one intercom panel within the matrix system, and you want to allow any and all people who have activated an talk/listen to that port to be able to hear each other as well as hearing the person talking to them from the CellCom 10 wireless beltpack, also check “Party-Line Enable” for that 4-Wire connection in the configuration software.

Within the configuration software, the user can adjust the input and output level for that port. Alternately, the input and output levels can be adjusted on the CellCom 10 base for the particular 4-wire port, using the front-panel display.

Repeat the procedure for each CellCom 10 4-wire port that is connected with the Matrix Plus system. Note that CellCom 10 does not currently generate a call signal to the Matrix port.

CONNECTING WITH CLEAR-COM ECLIPSE DIGITAL MATRIX

Currently, the procedure to connect between a CellCom 10 4-wire port and the Eclipse digital matrix is similar to that of Matrix Plus 3. An identical connection is made with 4-pair CAT-5 cable between an Eclipse port and the CellCom 10 port.

Within the Eclipse configuration software, set the port to “4-Wire.” This will allow intercom stations in the Eclipse system to converse with the CellCom 10 base and beltacks. Because there is not a “Party-Line Enable” within Eclipse, if several users of intercom stations connected with Eclipse need to hear each other as well as the wireless CellCom 10 beltack, another procedure will need to be added. Within the configuration software, the user would create a new party-line label, with members including the desired intercom stations and the particular CellCom 10 4-wire port. That label would then be assigned to a key on each of the intercom stations, allowing connection with the CellCom 10 4-wire port and the other members of the new party-line.

Within the configuration software, the user can adjust the input and output level for that port. Alternately, the input and output levels can be adjusted on the CellCom 10 base for the particular 4-wire port, using the front-panel display. Repeat the procedure for each CellCom 10 4-wire port that is connected with the Eclipse system.

CONNECTING WITH OTHER DIGITAL MATRIX INTERCOM SYSTEMS

Because CellCom 10 features standard 4-wire ports, with an input pair and an output pair, virtually any 4-wire signal can be connected with it. Make sure to properly match the input and output pairs between the digital matrix port and the CellCom 10 4-wire port (see diagram below).

The pinouts for the first two 4-wire ports contain both audio and data connections, though the data connections are not currently used. Those pinouts are shown in the following table.

PIN	FUNCTION
1	Data Tx+
2	Data Tx-
3	Audio Out+
4	Audio In+
5	Audio In-
6	Audio Out-
7	Data Rx+
8	Data Rx-

Table 1: Pinouts for Connecting to Other Digital Matrix Intercom Systems

The remaining two 4-wire connections are audio only, and the data connections are unterminated.

Within the configuration software of the other digital intercom system, configure its connected port to 4-wire or similar. Adjust the input and output levels either at matrix side or within the CellCom 10 front-panel display for the particular CellCom 10 4-wire port.

CONNECTING WITH OTHER 4-WIRE DEVICES

Various other 4-wire audio devices can be connected with FreeSpeak Lite. The Clear-Com EF-1M 4-wire interface can be used to attach additional party-line channels to FreeSpeak Lite, converting them from party-line on the wired side to 4-wire on the CellCom 10 side. The Clear-Com IF4-B interface can be used similarly. The audio input side of the CellCom 10 4-wire connectors could be used for additional program or other audio inputs that could then be accessed by CellCom 10 beltacks. The audio output side of the CellCom 10 4-wire connectors could be used to route a CellCom 10 wireless beltack user's voice out of the system for paging or other reasons, similar to the SA OUT connector.

When using the CellCom 10 4-wire ports in this way, make sure that proper connections are made between CellCom 10 and the other device. Adjust the input and/or output levels either at the 4-wire device or within the CellCom 10 front-panel display for that particular 4-wire port.

CONNECTING TO A PROGRAM AUDIO SOURCE

CellCom 10 can connect with a program audio source, making it accessible to be assigned by itself to a communications path to one or more CEL-BP wireless beltacks, or to be added to a group with other communications and assigned to beltacks. Using the two separate rotary encoder volume controls on the beltack, the user could monitor the program on one control while talking and listening on an intercom channel with the other.

The balanced female 3-pin XLR connector accepts a standard audio signal from a mixing console or similar, with Pin 1 ground, Pin 2 audio hot (+), and Pin 3 audio cold (-). This connector is transformer-isolated.

To make the program input signal available to the system, the front-panel PRGM Enable button must be pushed. The red LED above it will light, indicating that it is now available. This front-panel switch may be "locked" to prevent accidental disengagement, using the front panel display.

Using the front-panel display and rotary encoder, the user may select PORTS and give the connector a five-character alphanumeric label. The user may assign that program input by itself to a beltack using the BELTPACKS menu, or using the GROUPS menu may assign the program input to any group.

CONNECTING TO THE STAGE ANNOUNCE OUTPUT

The stage announce feature allows a CEL-BP wireless beltpack user to route their voice to an external paging system or other audio destination by pressing one of the rotary encoders to which the SA OUT connector is assigned. The adjacent SA RELAY is simultaneously triggered. One beltpack user at a time may use this feature, though the capability may be assigned to any or all of the wireless beltpacks, as desired.

Connect a microphone cable to the male 3-pin XLR connector on the rear of the CellCom 10 base station, and connect the other end to the external audio system. When the output is activated, the beltpack user's voice will be sent at line-level to the audio system. The audio output ceases when the beltpack user stops pressing the rotary encoder; it is good practice to make sure that any rotary encoder to which the SA OUT is assigned is set to momentary/non-latching mode.

The associated SA RELAY can be assigned to open an audio route for the paging or announcement, or can be assigned to initiate any other event such as turning on a light or activating a lock. It is rated at a maximum of 30-VDC at 1 amp. The relay can be wired to be either normally open or normally closed, using the following pinout information:

PIN	FUNCTION
1	Normally Closed 6- Pole
2	Normally Open 7- N/C
3	N/C 8- N/C
4	N/C 9- N/C
5	N/C (No Connection)

Table 2: Pin Assignments for Stage Announce Connector

BASE STATION DATA CONNECTIONS

CONNECTING VIA THE SERIAL PORT

The PC serial port on the rear of the CellCom 10 base station is mainly used for firmware version upgrades of the system. This procedure will rarely be done by the user.

A specially wired cable is required for these updates, consisting of two 9-pin D-type connectors for the PC and the CellCom 10 ends. On the CellCom 10 end, a male 9-pin D connector is used, and is wired as follows in relation to the D connector pins on the PC end. Pin 2 goes to pin 3, pin 3 goes to pin 2, and pin 5 goes to pin 5; in other words, the data Tx and Rx lines on pins 2 and 3 are reversed. Those are the only wiring connections on the CellCom 10 end of the cable.

On the PC end, a female 9-pin D connector is used. Make sure that the data connections of pin 2 to pin 3 and pin 3 to pin 2 are followed, and that pin 5 goes through to pin 5. Then short pins 1, 4, 6, and 8 together on the PC end of the cable. The cable will now be ready to use with the any upgrade files from the factory.

CONNECTING VIA THE LAN PORT

The LAN port is mainly reserved for future use in FreeSpeak Lite. This connection will be used for rapid firmware updates, as well as in the future for system configuration and intelligent connection with the Eclipse digital matrix.

The following table gives the pinouts of the LAN port.

PIN	FUNCTION
1	Transmit +
2	Transmit –
3	Receive +
4	Receive –

Table 3: Pin Assignments for LAN port

LINKING TWO BASE STATIONS TO FORM LARGER SYSTEMS

Two CellCom 10 base stations may be joined via the rear-panel BASE LOOP connection to create larger communications systems that will support up to 20 wireless beltacks, plus all of the available rear-panel connectors on both bases. The labels on each base are available to the other base, groups may be created and assigned that contain beltacks and rear-panel inputs from both bases, and point-to-point conversations between beltacks registered with the two different bases are possible.

The one limitation to this expanded system is that the CEL-TA transceiver/antennas connected to “Base #1” will only communicate with the CEL-BP wireless beltacks registered with “Base #1.” So some care will need to be taken when assigning particular beltacks to locations and users in the production area, to most efficiently use the transceiver/antennas.

Use a specially wired four-pair CAT-5 data cable to connect the BASE LOOP connectors on the two bases together. *This cable must have a maximum length of 1 meter (3 feet).* The pinouts of this cable are shown in the following table.

PIN	FUNCTION
1	Tx+ to Pin 3 Rx+
2	Tx- to Pin 6 Rx-
3	Rx+ to Pin 1 Tx+
4	Clk+ to Pin 4 Clk+
5	Clk- to Pin 5 Clk-
6	Rx- to Pin 2 Tx-
7	Dectsync+ to Pin 7 Dectsync+
8	Dectsync- to Pin 8 Dectsync-

Table 4: Pin Assignments for Base Loop Connectors

TRANSCEIVER/ANTENNA (CEL-TA) CONNECTIONS

CONNECTING ONE TRANSCEIVER/ANTENNA (CEL-TA) DIRECTLY TO A TRANSCEIVER PORT

A CEL-TA transceiver/antenna connects to the transceiver port on the CellCom 10 base station using a standard 4-pair CAT-5 data cable with RJ-45 connectors. It may be located up to 1,000 meters from the base station, creating a coverage area for up to five CEL-BP wireless belt packs in that location. The port is able to provide the required power to the transceiver/antenna at a distance of up to 300 meters (approximately 900 feet); beyond that distance, the CEL-TA transceiver/antenna must be locally powered via its in-line external universal power supply.

To know that a CEL-TA transceiver/antenna is active, observe the green power LED and the yellow signal LED on the face of the unit where the RJ-45 connector is connected. Both must be lit. Also, CEL-BP wireless belt packs in the vicinity of the active transceiver/antenna will be connected to the system and their displays will show labels and other information.

Using both transceiver ports, a CEL-BASE base station may be connected with up to two CEL-TA transceiver/antennas via a direct connection with the base. For the best, most reliable coverage, it is advisable to use a minimum of two transceiver/antennas in any installation, positioned in different locations in the coverage area. When more CEL-TA's are required to support a larger coverage area or more wireless belt packs, a CEL-SP antenna splitter will need to be introduced between the base station and the transceiver/antennas.

CONNECTING TRANSCEIVER/ANTENNAS WITH A SPLITTER (CEL-SP)

A splitter (CEL-SP) will connect up to five transceiver/antennas to one of the transceiver ports on the CellCom 10 base station, creating up to 5 coverage zones that can be overlapped to make large areas where CEL-BP wireless belt packs can have continuous coverage. The use of the splitter also extends the distance that the CEL-TA transceiver antennas can be located from the base to beyond 1,000 meters (3,200 feet).

For example, a splitter can be used to connect to a CellCom 10 base that is located in a production truck outside an arena or stadium, with a single CAT-5 cable going to the splitter which is then located just inside the stadium. From that splitter, up to five CEL-TA transceiver/antennas are distributed throughout the stadium to create wide coverage – each with a run of CAT-5 cable back to the splitter. A similar arrangement may be used in a large theatre or performing arts facility.

The connection between a transceiver port on the CellCom 10 base station and a CEL-SP splitter is accomplished with standard 4-pair CAT-5 data cable with RJ-45 connectors. It is connected to the port labeled MATRIX on the splitter. This cable can be as long as 1,000 meters (3,200 feet). The splitter must be locally powered via its DC IN connector, using the in-line external universal power supply. The RJ-45 ports on the splitter labeled “1” through “5” are the connections to the CEL-TA transceiver/antennas. Transceiver/antennas connected to the splitter can be powered at a distance of up to 300 meters (900 feet); beyond that distance they will need to be locally powered.

The CEL-BASE CellCom 10 base station has internal processing to support up to four CEL-TA transceiver antennas. In order to support up to the maximum of ten that a base can handle, the optional CEL-EXP “daughter” circuit board must be installed into the base station. This board enhances the capabilities of the two transceiver ports. See the section on the CEL-EXP for more details.

3

THE CELLCOM 10 WIRELESS BELTPACK

WIRELESS BELTPACK (CEL-BP)

The CEL-BP wireless beltpack gives the user simultaneous access to two channels of talk/listen communication, with the ability to switch among three pairs of communications routes/channels as desired. Any or all of these six routes (two channels times three pairs) may be kept open during use. Listen levels may be individually adjusted using the two push-to-talk rotary encoders, so that one conversation can be monitored in the background while a primary conversation is held.

The front-panel display contains the name (label) of the beltpack user, identifies the two talk/listen labels currently selected by the user, and gives other information such as signal strength and battery level. In the local programming mode, it displays all of the menus and adjustments available. A 4-pin male headset connector is provided for connection with a standard Clear-Com headset or similar. The CellCom 10 beltpack will operate for up to 8 hours on four AA alkaline or rechargeable NiMH batteries.

BELTPACK TOP CONTROL SECTION

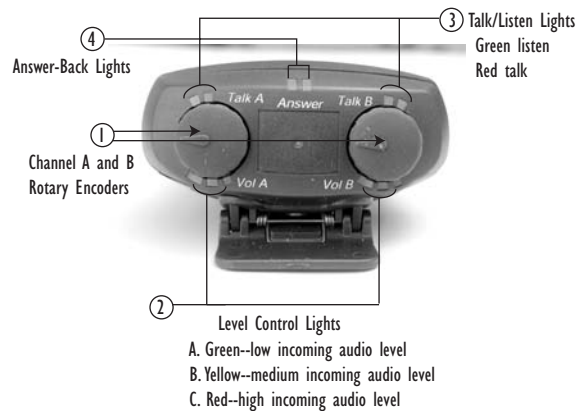


Figure 1: View of Top of Beltpack

① Channel A and Channel B Rotary Encoders

This rotary encoder functions as a level control for incoming communications assigned to channels A and B. A clockwise turn increases the level to maximum, and a counterclockwise turn decreases the level to minimum.

Pressing the top of the rotary encoder knob pushes it in momentarily, engaging the “talk” for that channel of communication. The talk capability may be momentary only, where the user’s voice is only sent to the listener as long as the knob is pressed down. Alternatively, it may be latched, where a quick push will latch it on “talk” until another quick push releases it.

② Channel A and Channel B Level-Control Lights

A series of three level-control lights are arrayed beside each rotary encoder. The first light is green, the second is yellow, and the third is red. With the level control knob turned fully counterclockwise, only the green LED is lit. Turning the knob clockwise, low audio level is heard in the headset. Turning the knob more, both the green and yellow LED’s light, and higher audio level is heard. This continues through the maximum audio level, indicated by only the red light being lit.

③ Channel A and Channel B Talk/Listen Lights

On the opposite side of the rotary encoder, a green “listen” LED and a red “talk” LED are side-by-side. When another beltpack user whose label is displayed (on the beltpack LCD display) underneath the rotary encoder pushes their talk button to initiate a conversation, the green LED begins to blink. When the local beltpack user presses down the rotary encoder to activate a momentary or latching talk, the green button lights steadily and the red talk button also lights. The red talk button on the beltpack that initiates the conversation and flashes until the person receiving the “call” presses their talk in order to answer.

④ Answer-Back Lights

The red and green lights in the front-center of the talk panel are used to indicate that a user that is not on the beltpack’s presently selected communication routes is trying to call and initiate a conversation. The green LED begins flashing when a call is coming in. By pressing the larger center blue button on the front face of the beltpack, the call is answered and the user can talk to the caller. The green LED lights steadily and the red LED lights, until the conversation is ended by again pushing the center button.

BELTPACK FRONT/DISPLAY SECTION



Figure 2: View of Front of Beltpack

① Backlit LCD Display

The display screen shows the various communications routes and other information relevant to the beltpack. The backlighting comes on when any action is taken with the scroll or enter buttons, and remains on for approximately 10 seconds. During the answer-back process, the label of the individual calling is displayed in the lower center of the display.

② Left and Right Scroll Buttons

These buttons are used to scroll across the screen to the left and right, in order to change communication “pages,” survey menu options, or adjust levels within the menu selections. They work in conjunction with the Enter button, described below.

③ Enter/Answer-Back Button

This button has two primary purposes. Within the menu structure, it functions as an ENTER button to select the desired options and to exit the menus by following and selecting the up arrow icon. During normal beltpack operation it functions as the answer-back key, activating a talk when the beltpack is called and the central LED on the top panel begins to flash (see description in “Beltpack Top Control Section” above).

BELTPACK REAR/BATTERY SECTION

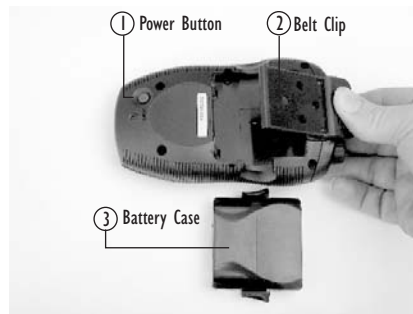


Figure 3: View of Back of Beltpack

① Power Button

The recessed power button is used to turn the CellCom 10 beltpack on and off. Press and hold the button for about three seconds to turn the unit on. To turn the unit off, again press and hold the button for about three seconds.

② Battery Case

The removable battery case will hold four alkaline AA or four NiMH (nickel-metal hydride) rechargeable batteries. These batteries alternate, with the

negative pole contacting the spring and the positive pole contacting the plate inside the case. To remove the battery case, press on the top of the belt clip to lift it off the case, and with the thumb and middle or ring finger of the other hand squeeze the side tabs of the case and lift it out, slightly tilting the lower (toward the bottom of the beltpack) portion of the pack out first. To insert the battery pack, follow the above instructions in reverse. Note that the battery case has a clip-on lower cover; make sure to put it back in place before putting the battery case back into the beltpack.

Caution: Do not put battery packs containing alkaline batteries into a recharger, or recharge them in the beltpack. Serious damage or injury could result.

③ Belt Clip

The belt clip is spring-loaded, with enough tension to hold the beltpack to the user's belt and against the hip. Note that the upper portion of the rear of the beltpack, connected to the belt clip, is a separate piece; the entire belt clip assembly may be replaced in case of damage.

BELTPACK BOTTOM CONNECTOR SECTION



Figure 4: View of Bottom of Beltpack

① Data Connector

This 3.5 mm (1/8 inch) tip-ring-sleeve (TRS) connector is used to identify the beltpack to the base station during initial registration and system setup. It may also be used if an upgrade to the beltpack firmware is ever required in the future, to add new features and capabilities. See the section “Registering the Beltpack with the Base Station” for further details.

② Headset Connector

The male 4-pin headset connector provides audio pathways for the headset microphone and headset earpiece(s). This connector supports all Clear-Com and compatible headsets using female 4-pin connectors. It will support dynamic microphones.

③ Battery Recharger Connector

The CellCom 10 beltpack features an internal battery charger when the user inserts four AA-format NiMH batteries to power the unit. The recharger circuit includes a thermistor that senses the temperature of the battery pack to prevent overcharging. To use this internal recharger, plug in the small barrel connector on the supplied universal power supply into the beltpack connector, and then plug the supply into the local AC current. It takes approximately 3 hours to recharge a fully discharged set of batteries in the beltpack.

CellCom 10 beltpack usage time is dependent upon the batteries used. Some batteries require more charge/discharge cycles than others to reach their rated capacity.

Caution: Do not put battery packs containing alkaline batteries into a recharger, or recharge them in the beltpack. Serious damage or injury could result.

BELTPACK TURN-ON SEQUENCE

After pressing the POWER button on the rear of the beltpack for approximately three seconds, the top control panel LED's will flash and the display will light. The display will say "FreeSpeak Lite" and "Searching for Network." It will briefly say "Getting Roles", and then will go to the main user screen.

The beltpack will always begin on Page 1, which has the first two communications routes assigned to the beltpack. When programming communications routes for the users in the system, it is best to put the most commonly used ones on this page.

BELTPACK TURN-OFF SEQUENCE

To turn off the beltpack, press and hold the POWER button on the rear of the beltpack for about three seconds. The main screen will close, followed by a screen that says "FreeSpeak Lite" and "Shutting Down." Since all of the routing and "intelligence" of the beltpacks is in the base station, it will become available again when the beltpack is turned on.

POWERING THE CELLCOM 10 BELTPACK

The supplied battery pack holds four AA-sized batteries. Standard AA alkaline batteries will provide between 7 and 8 hours of typical use. The batteries alternate in the battery case, with the spring on the negative end and the tab on the positive end.

For best performance, use fresh alkaline batteries that have been properly stored and kept away from excessive heat. As with all other battery-powered electronic items, when the CellCom 10 beltpack is stored for extended periods of time, remove the batteries to prevent damage from possible leakage of the alkaline cells.

WARNING: Make sure that CellCom 10 battery packs loaded with alkaline batteries are not put into a battery charger, or that the internal beltpack charger is used to attempt to charge them. Damage and possible injury will result.

Rechargeable AA-size NiMH (nickel-metal hydride) batteries may be used with the CellCom 10 beltpack. Select good quality batteries with high amperage ratings for the best and longest performance. These batteries will last for many charge cycles, and will power the beltpack for approximately 8 hours.

Note: CellCom 10 beltpack usage times are dependent upon the batteries used. Some batteries require more charge/recharge cycles than others to reach their rated capacity.

The beltpack front-panel display has an icon that shows the battery condition. It has five vertical lines to signify the remaining charge. When the icon has dropped down to the last two lines, or if it drops quickly after being turned on after previous use, it will be time in the next few minutes to recharge the batteries (if rechargeable ones are being used) or replace them. The beltpack will turn off by itself at low battery levels.

Within the menu structure of the beltpack, a low-battery alarm is available and may be set. When activated and when the battery level is sufficiently low (approximately 20 minutes of remaining battery life) the headset user will hear a beep at intervals to indicate that the batteries must be replaced or recharged soon. This setting is available under Alarm Options.

The CellCom 10 beltpack features an internal battery charger circuit, with intelligent circuitry to prevent overcharging. It is powered via the pin connector on the bottom of the beltpack, using the supplied universal power supply. A thermistor (temperature-sensing device) measures the change in temperature of the battery when charging, letting the circuit know when to cease charging the batteries.

An optional sealed rechargeable battery pack is available for the CellCom 10 beltpack. It features high-amperage NiMH batteries. A companion 5-bay battery charger unit for these batteries is also available from Clear-Com. (Available in later 2004.)

ACCESSING THE TALK PATHS ON THE CELLCOM 10 BELTPACK

The CEL-BP beltpack can access up to three sets of two talk/listen paths, which are assigned to the left and right rotary encoders. One set can be accessed at any given moment, and the user can easily select the next set via the beltpack scroll buttons. The assignments are done at the CellCom 10 base through the front-panel display menus (see section on system programming).

When the CEL-BP beltpack is first turned on and connected with the base station, the unit defaults to “page” 1 of the assignments to that beltpack. This first set of talk/listen paths may immediately be accessed. To access one of the two other sets that may be assigned to the beltpack, press the left or right scroll buttons on the face of the beltpack.

The user will hear beeps in the headset, with the number of beeps heard corresponding with the page number (3 beeps means the user is on page 3). Each push of the button advances one page. The scroll buttons go through the list continually, so scrolling either to left or right will access all “pages.” The display will also highlight the particular page that is currently selected.

As soon as the page is reached, those talk/listen paths are accessible. Pushing one or both rotary encoders will activate talks back to those conversations. Activated talks and listens on the other pages will remain operational. The user may return to the previous ones in the same manner, using the left and right scroll buttons.

SETTING AND ADJUSTING LISTEN LEVELS

Two stages of setting levels are available on the CellCom 10 beltpack. The first is within the menu structure, and controls the global maximum level that may be set. This option may be found under Audio Options/Headset Options/Master Level. The user is presented with a bar graph on the display, and the level can be adjusted up or down using the left and right scroll keys. Once the desired level is reached, pressing the center ENTER button saves it and the display returns to the preceding screen. Typically this level control will be set around 2/3 of maximum.

The second stage of setting levels is done using the rotary encoders for the individual talk/listen paths that are assigned to them. As the user is talking and listening, turning these controls clockwise will increase the listen level for that conversation to maximum, and turning them counterclockwise will decrease it to minimum. As the user goes between the three “pages” of talk/listen assignments, the listen levels for each of them are kept. For example, raising or lowering the level on the left rotary encoder when on page 2 will not affect the level that was set for that rotary encoder on page 1 or page 3.

The LED indicators above each of the rotary encoders give a visual representation of the levels that have been selected at any given time. The set of LED's goes from green at the lowest listen level through yellow and to red at the highest level. The absolute position of the rotary encoder has no bearing on the level that is heard or that is indicated by the LED's.

Turning counterclockwise will take the listen level to minimum, and only the green LED will be lit; continuing to turn the encoder in that direction will have no further effect. Similarly, turning the encoder clockwise until the red LED alone is lit achieves the maximum audio level. The change in direction of the turn is what brings about the level change.

USING THE BELTPACK ANSWER-BACK FUNCTIONS

The answer back feature on CellCom 10 has two basic functions. The first is to provide a convenient way to answer a call from someone whose label is assigned to your beltpack when the beltpack is not currently scrolled to that page. The second is to allow a beltpack user in the system to call another beltpack that does not have a reciprocal link back to the caller.

When a beltpack-to-belpack or a group label is assigned to one of the three pages on a beltpack, and the user currently is on another page, the caller who pushes a talk to initiate a conversation will activate the answer-back function on the called beltpack. The longer green LED in the top center section of the beltpack will begin to flash, and the caller's voice will be heard at whatever level was set via the rotary encoder for that caller's label.

This call may be answered in two ways. Pressing the larger blue center button on the front of the beltpack will establish a return talk path to the calling beltpack; this button can be pressed and held for momentary operation or tapped quickly to latch. Alternately, the user can use the smaller blue scroll buttons on the face of the beltpack to go to the page where the caller's label is displayed. The flashing green LED of the call then moves from the answer-back position to the particular rotary encoder where that caller is assigned, and the rotary encoder may be used as normal to establish a talk to the caller.

As an example, say that a director beltpack labeled DIR is trying to contact a lighting director beltpack labeled LD. Each of them has the other's label on page 1 of their beltpacks, but the LD is currently on page 3. When the DIR beltpack pushes a talk to the LD label, the green answer-back LED on the lighting director's beltpack will begin to flash. To answer back, the LD can either push the center button on the face of the beltpack, or can scroll back to page 1 and push the talk on the rotary encoder above the DIR label.

The other application of the answer-back function is for a called beltpack to be able to answer a call from another beltpack when the caller is not assigned to their beltpack. This allows the possibility for a supervisor to directly contact other staff on a one-to-one basis as needed, without giving them an accessible link back to the supervisor. Those "one-way" routes would need to be pre-assigned to the supervisor's beltpack via the base-station programming.

In this manner, a stage manager labeled STMGR could contact a particular other beltpack such as PROP3 by having that label assigned to a key on the STMGR beltpack. By pushing the talk associated with that key, the stage manager could initiate the answer-back function on PROP3's beltpack and have a private conversation. However, the props person could not initiate a direct conversation back to the stage manager.

REGISTERING BELTPACKS WITH THE BASE STATION

The PC to Beltpack serial cable is used to register beltpacks with the basestation. It can also be used to upgrade the firmware of the beltpacks. A PC software utility program called CellCom 10 Toolkit is used in conjunction with this cable to register the beltpacks.

For instructions on registering beltpacks with the basestation, and for upgrading the firmware, see the CellCom 10 Toolkit User Guide.

The cable consists of a female 9-pin D type connector (PC connection) and a 3.5 mm (1.8-inch) stereo jack plug (beltpack connection). Care must be taken to select a jack plug that fits completely through the plastic surround of the connector at the bottom of the beltpack.

The data connections between the D connector and the stereo jack plug are as follows: pin 2 to tip, pin 3 to ring, and pin 5 to sleeve. Pins 1,4,6 and 8 on the PC connector are shorted together, as with the PC to CEL-BASE cable.

REMOVING REGISTERED BELTPACKS FROM THE BASE STATION

Beltpacks can be removed from the base station and new ones substituted by using the CellCom 10 Toolkit program. The base station must be “told” that the particular beltpack is no longer registered to it by entering “0000” as the beltpack serial number. New beltpacks, either additional ones or replacements, will be added as above in “Registering the Beltpacks.”

BELTPACK MENU OPTIONS

The CellCom 10 beltpack presents the user with a number of adjustable parameters. The main categories of the adjustments are: Alarm Options, Audio Options, View Status, and Adjust Contrast. An icon of an upward pointing arrow designates EXIT or BACK, and is available on each menu page. Selecting this icon and pressing the center ENTER button takes the user to the previous screen, and exits to the main beltpack operating screen from the main menu.

ALARM OPTIONS

Low Battery Alarm

The low-battery alarm has two settings: On and Off. Using the scroll keys, select the desired setting and then press the center ENTER key. When activated and when the battery level is sufficiently low (approximately 20 minutes of remaining battery life) the headset user will hear a beep at intervals to indicate that the batteries must be replaced or recharged soon.

Low Signal Alarm

The low-signal alarm has two settings: On and Off. Using the scroll keys, select the desired setting and then press the center ENTER key. When activated, a beeping will be heard in the user headset when the user is almost out of the range of the transceiver/antenna, and will soon lose connection with the system.

Two quick beeps are heard at approximately one-second intervals when the display signal level icon is at the second-lowest increment. They are also heard when the user goes completely out of range and connection is lost with the transceiver/antenna (and the base). These beeps continue until the user moves into an area where the signal is stronger.

This setting may be especially useful when a user is learning to establish the coverage area for a particular location. Because the signal level when the alarm is first activated is still strong enough for conversations to happen (though possibly with occasional audio dropouts), it may not be desirable to keep this alarm on during normal operation of the system. This low signal alarm is also useful for checking out the coverage in a location when first setting up transceiver/antennas, for either a temporary or permanent installation.

AUDIO OPTIONS

Headphone Off Level

This control allows the user to choose the signal threshold when the headphone audio “turns off.” Level settings are -6, -12, -18, and -70 dB. The typical setting is -70 dB, which functions as “always on.”

Page Lock

The Page Lock option puts the beltpack into a mode in which the page change keys must be held down for two seconds to remove the page lock.

Headphone Limiter

This control introduces a limiter into to headphone audio circuitry, to control excessive levels and resulting stress on the ear of the user. Level settings are -6, 0, +6, +12, and +16 dBu. The typical setting is -6 dBu.

Microphone Type

This control allows the user to select the proper setting for the headset microphone being connected to the beltpack. The settings are Dynamic (Balanced) Mic and Dynamic (Unbalanced) Mic. For most Clear-Com and other headsets, the Dynamic (Unbal) Mic setting is proper.

Microphone Level

This control allows the user to set the level of the beltpack’s headset mic, increasing or decreasing its gain going into the system. The gain settings are 40, 50, and 60 dB. The typical setting is 50 dB.

Headset Options

Three headset options are offered: Master Level, Sidetone Level, and Configure PTT Switch. The Master Level control accesses a slide bar going from “-” to “+”, and controls the overall maximum level that can be heard through the headphones. This gain control permits adjustment among headsets with different sensitivities, and for different use conditions (quiet studio versus loud live performance environment). Typical setting is 2/3 to 3/4 of the way toward “+”.

Sidetone Level controls the amount of the user’s own voice (local sidetone) that is injected into the headphone from the headset mic. It is activated when the user pushes a “talk” or an Answer Back, letting the user know that the microphone is on. It is not heard when no talk is pushed, or when the user goes outside of the coverage area of a transceiver/antenna and is no longer connected with the system.

The Configure PTT Switch has two settings which are global to all the talks in the beltpack. The typical setting is PTT Switch Disabled.

VIEW STATUS

Role Information

Role Information gives the label (user name) that has been assigned to the particular beltpack, and also gives a numerical Role Number which the system uses – typically starting with 700 for the first beltpack and going up from there.

Beltpack Version

Beltpack Version gives the current software version on the beltpack, and a CRC number. Use these numbers to determine whether the beltpacks contain the latest software version, and to confirm the success of a software upgrade.

Beltpack ID

Beltpack ID, also known as IPEI, gives the unique identification number for the transceiver in the CellCom 10 beltpack.

RF Carrier Mask

The RF carrier mask tells the base station and beltpacks which of the standard DECT carrier frequencies to use. In Europe, for example, the standard carriers 0 to 9 (1880 to 1900 MHz) are designated as “0x03FF000000.” Other parts of the world, such as South America, use Extended Carriers, such as 18 to 27 (1910 to 1930 MHz), designated as “0x0000007FE0.” The DECT stacks in both the CEL-TA transceiver/antenna and the CEL-BP beltpack must be told which group of 10 carrier frequencies to use via the “mask”, when they are first initialized.

Connection Info

Connection Information defines all of the various DECT information for the beltpack transmission and link to the transceiver/antenna. It also gives the Carrier Number and Slot that the beltpack is currently using (this can dynamically change as needed during use). In addition, the Received Signal Strength Indication (RSSI) is numerically indicated, with 55 being the highest value; also, the error percentage is shown.

ADJUST CONTRAST

Adjust Contrast provides a slide bar going from “-“ to “+”, allowing the user to adjust the contrast on the display. Typical range is between 1/2 and 3/4 toward “+”.

4

THE CELLCOM 10 TRANSCEIVER/ANTENNAS

TRANSCEIVER/ANTENNAS (CEL-TA)

The CellCom 10 transceiver/antennas (CEL-TA) form the transmission link between the CellCom 10 beltacks and the CellCom 10 base. Multiple units are used to support the beltacks and to create larger, customized coverage areas. Each CEL-TA is connected to the CellCom 10 base, either directly or via a CEL-SP splitter. The unit has two flanges on the rear side that permit the unit to be screwed or otherwise attached to surfaces.



Figure 1: CellCom 10 Transceiver/Antenna

CEL-TA TOP PANEL

Omnidirectional Antennas

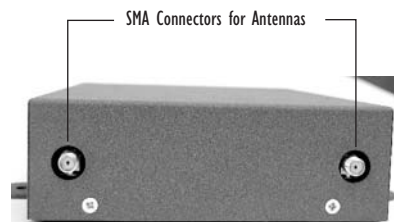


Figure 2: Top Panel of CellCom 10 Transceiver/Antenna

A pair of omnidirectional antennas are provided with the transceiver/antenna. They are screwed into a standard, gold-plated SMA connector.

Antennas with different coverage patterns (directional units) that are appropriate for the 1.9 GHz range may be substituted for the provided antennas, if variations in coverage pattern are required.

CEL-TA BOTTOM/CONTROL PANEL

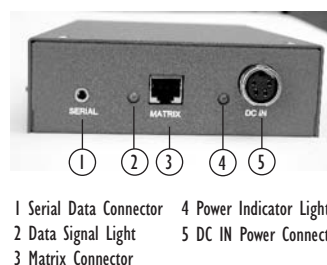


Figure 3: CellCom 10 Transceiver/Antenna Bottom/Control Panel

① Serial Data Connector

This 3 mm (1/8 inch) tip-ring-sleeve (TRS) connector is used for upgrading the firmware in the CEL-TA. It will typically be unused.

② Data Signal LED

This yellow LED indicates that a connection has been established between the CellCom 10 base and the transceiver/antenna, and that it is actively creating a coverage zone within which the beltpacks can operate. If it is off, check the cable connections at both ends, as well as the powering.

③ Matrix Connector

This RJ-45 connector is used to connect the bi-directional signal from the CellCom 10 base, directly or via the splitter. Up to 1,000 meters of 4-pair CAT-5 cable can be used for this connection between base and transceiver/antenna.

④ Power LED

This green LED indicates that the CEL-TA is receiving power, either from its local power supply or from the connected CAT-5 cable (distances up to 300 meters, or 925 feet, from the base or the splitter) being powered via the CellCom 10 base.

⑤ DC In Power Connector

This connector is used to locally power the transceiver/antenna with the supplied universal power supply. Use of local power is required when the CEL-TA is located more than 300 meters (925 feet) from the CellCom 10 base or the splitter, and is recommended even when the unit is closer whenever it is available and convenient.

CABLING THE CEL-TA TRANSCEIVER/ANTENNAS

Each CEL-TA transceiver/antenna receives its necessary data and digital communications audio via a direct connection with the CEL-BASE base station transceiver ports. Between these two ports, up to 10 transceiver/antennas can be supported. A CEL-TA may either be directly connected to a base station port using 4-pair CAT-5 data cable with RJ-45 connectors on each end, or it may be connected to the base through a CEL-SP antenna splitter.

BELTPACK SUPPORT CAPACITIES FOR TRANSCEIVER/ANTENNAS

Each CEL-TA transceiver/antenna can support up to five CEL-TA beltacks within one coverage zone. With the supplied omnidirectional antennas, the coverage pattern is circular or donut-shaped, with a maximum range of up to 250 meters (800 feet), but with typical range between 50 meters and 150 meters – depending on the use environment.

When designing the system, determine how many beltack users will be in or passing through a given coverage zone. If it will be 5 or fewer users, then place one CEL-TA transceiver/antenna in the center of that area. If it is between 6 and 10 users, place two CEL-TA's next to each other, both with a direct connection to the CellCom 10 base or splitter. In larger systems – approaching 20 beltacks – it is wiser to allow one CEL-TA for every 3 to 4 users to ensure smooth handoffs between transceiver/antennas.

If a sixth beltack user goes into a coverage zone with only one CEL-TA transceiver/antenna, and that user is out of range from another CEL-TA in the overall system to which that beltack is currently connected, it will lose connection with the system. This is because the CEL-TA has a maximum capacity of 5 beltacks at a time. If one of the existing users in that coverage area turns off a beltack or leaves the area, then the sixth beltack will find an open slot and will be reconnected with the system.

The proprietary technology within CellCom 10 permits the beltack user to go between coverage zones created by different CEL-TA transceiver/antennas connected to the CellCom 10 base, and for the system to hand over the communication between beltack and base from one CEL-TA to the next one. Thus, a larger, customizable communications area may be designed.

COVERAGE AREAS UNDER VARIOUS CONDITIONS

Just as with any other product communicating via radio waves, the effective distance between the beltack and the transceiver/antenna (the range) will differ depending on the particular environment in which it is being used. Radio waves can be attenuated by walls, floors, ceilings, trees and shrubbery in an outdoor setting, the human body (such as an audience), and numerous other objects. They can be reflected and or stopped by metallic objects such as structural beams, safety doors, lighting equipment and truss, bodies of water, and so on.

Under ideal conditions, the maximum range between a CellCom 10 beltack and a transceiver/antenna is 250 meters (about 800 feet). Typical distances are

between approximately 50 meters (about 160 feet) and 150 meters (about 485 feet), depending on the particular environment.

As the CEL-TA transceiver/antenna requirements for a particular installation are being determined, keep in mind both the number of belt-pack users who will be working in a particular area (based on the 5-belt-pack capacity of each CEL-TA), and the layout and potential RF attenuating and reflecting items in the location. Be conservative in your distance estimates to make sure that you include enough transceiver/antennas to provide the necessary coverage for the installation. Also note that additional CEL-TA's may be added to a base, up to a maximum of 10.

TRANSCEIVER/ANTENNA SETUP RULES AND TIPS

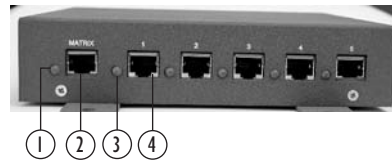
Keep the following general rules and tips in mind:

- Keep antennas high (typically, though lower placements away from interfering objects can at times be beneficial) and line-of-sight.
- Keep them away from larger metallic objects and surfaces, and from lighting truss.
- With the CEL-TA with the provided omnidirectional antennas, the coverage is circular so put the transceiver/antennas in the center of the area in which you want coverage.
- In outdoor settings with line-of-sight, the absence of beneficial reflections of the radio waves may lead to shorter than expected range; directional antennas may be of benefit here.
- When overlapping the coverage zones of transceiver/antennas to create larger continuous coverage areas, test the in-between areas with a belt-pack for potential areas of low RF signal; adjust the positioning of the CEL-TA's as needed.
- Because of potential body shielding as the user moves, it will be useful to place two transceiver/antennas in different locations within larger working areas to minimize low-level signals and potential signal dropouts.
- Going between a larger area and a corridor via a door, especially a heavy or shielded one, or where the walls are thick, place a second antenna in the corridor near the doorway to assure continual coverage.

TRANSCEIVER/ANTENNA SPLITTER (CEL-SP)

The CEL-SP splitter is the device that connects multiple CEL-TA transceiver/antennas to the CellCom 10 base station. It has an RJ-45 connector that carries the data between a base transceiver port and the splitter, and five RJ-45 connectors to feed that information to and from up to five CEL-TA's. The splitter is always locally powered via the supplied external in-line universal power supply.

CEL-SP FRONT CONNECTOR PANEL



- 1 Base Connection Indicator Light
- 2 Matrix (CellCom Base) Connector
- 3 Splitter-to-Transceiver/Signal Indicator Lights (5)
- 4 Transceiver/Antenna Connectors (5)

Figure 4: CellCom 10 Splitter Front Connector Panel

① Base Connection Indicator Light

This yellow light indicates that the CEL-SP splitter is receiving data from the CellCom 10 base.

② Matrix (CellCom 10 Base) Connector

This RJ-45 connector accepts a 4-pair data cable from the CellCom 10 base station transceiver port. This cable can be up to 1,000 meters in length.

③ Splitter-to-Transceiver/Antenna Signal Indicator Light

These yellow lights indicate that a connection from the CellCom 10 base is available to the particular CEL-TA transceiver connected to that port.

④ Transceiver/Antenna Connectors

These five RJ-45 connectors are used to connect up to five remote CEL-TAs to the splitter, and via the splitter to the CellCom 10 base station. Each of these cables can be up to 1,000 meters in length.

CEL-SP REAR PANEL



- | | |
|-------------------------|---------------------------|
| 1 Serial Data Connector | 4 Reserved for future use |
| 2 Power Indicator Light | 5 Reserved for future use |
| 3 DC IN Power Connector | |

① Serial Data Connector

This 3.5 mm (1/8 inch) tip-ring-sleeve (TRS) connector is used for upgrading the firmware in the CEL-SP. It will typically be unused.

② Power Indicator

This green LED indicates that the splitter is receiving power from the external power supply.

③ DC IN Power Connector

This connector is used to locally power the CEL-SP antenna splitter with the supplied universal power supply. Use of local power is required.

④ EXP IN Connector

This male DB-15 connector is reserved for future use.

⑤ EXP OUT Connector

This female DB-15 connector is reserved for future use.

CONNECTING THE CEL-SP TO CELLCOM 10 BASE AND CEL-TA TRANSCIVER/ANTENNAS

After the connections have been made between the splitter and the transceiver/antennas, make sure that the data LED's are lit at the individual ports on the CEL-SP splitter. Also make sure that the both the green Power LED and the yellow Data LED is lit on each CEL-TA transceiver/antenna. If all are properly lit, then the connection has been successfully made and the coverage zones will be active and will support belt packs. If the transceiver antennas are not lit, check the connections.

5

INSTALLATION

INITIAL SYSTEM SETUP

A CellCom 10 system can work out of the box, as long as the beltacks are registered to the base, using the generic user labels for the beltacks and the rear-panel connections. The first stage in setup is placing the base station in a convenient location, knowing that it is the central routing unit of the CellCom 10 system. It is also the means of programming the system, creating and changing user labels, and creating and modifying the groups and communications paths within the overall system. You will want to make it accessible.

At this stage, if they are unregistered, you may want to register the beltacks, or at least one or two for system setup and testing, with the base station. Follow the instructions in the section titled Registering Beltacks with the Base Station in the CEL-BP beltack section of the manual.

The next step is to determine where the CEL-TA transceiver/antennas will be located to provide the necessary coverage areas for all of the beltacks [See section below on System Installation and Defining Coverage Areas]. What areas will have more than 5 active beltack users in them at any time? Co-locate a second CEL-TA there.

Is there a central place to locate a transceiver/antenna so that it will provide omnidirectional (all directions / circular) coverage? Are there balcony areas, corridors, or other rooms or areas that will require coverage with transceiver/antennas? Then figure out where the CEL-SP splitter(s) that feed these transceiver/antennas will be safely located. [For systems with only one or two CEL-TA transceiver/antennas, the cable runs will go directly from the two transceiver ports on the base station.]

Run 4-pair CAT-5 cable from the CellCom 10 base to the splitter, and determine that the splitter is showing both power (green LED lit) and signal (yellow LED lit when the base station is on). Run 4-pair CAT-5 cable from the splitter to each of the CEL-TA transceiver/antennas. Make sure that the local power supplies are plugged into the CEL-TA's, unless they are close enough to the base station to draw power from the attached CAT-5 cable.

You will know that the CEL-TA has sufficient power from the cable if the green power LED and the yellow data LED light up. If you have several longer runs and are attempting to power the transceiver/antennas from the base / splitter connection, check each one again when they are all connected. The local powering for the CEL-TA is recommended in most cases to provide the most reliable long-term CellCom 10 installation.

Note that 4-pair CAT-5 cable with RJ-45 connectors on each end is specified for connection between the CEL-BASE base station and the CEL-TA

transceiver/antennas. Use of other cable can result in markedly shorter distances of cable runs and other possibly other performance problems.

During the initial system setup, before walking through the system with a beltpack to check for gaps in coverage, it is wise to avoid “permanently” installing the CEL-TA transceiver/antennas. Hold them in place in some temporary way until their optimal position is determined.

Once the base, splitter(s), and transceiver/antennas have been placed and wired, turn on a CEL-BP beltpack (assuming that it has been registered with the base station) and walk the coverage area – ideally speaking with someone else via the on-base headset or a party-line or matrix connection with the base. Alternately, use the “site survey” mode on the beltpack (see the System Installation and Defining Coverage Areas section below). It is often best to begin with one transceiver/antenna in place, and then place additional units to enhance coverage.

Walk through all of the areas where beltpack users will typically be moving, and note any areas of weak signal, dropout, or disconnection from the system. Pay special attention to the overlap areas between CEL-TA coverage zones, making sure sufficient signal strength is there from each of the transceiver/antennas to make a clean handoff between them for the beltpack.

Finally, when the CEL-TA coverage zones have been properly and effectively set up, it is time to program the system. Programming involves creating the desired user labels for each beltpack and rear-panel connection, putting these individual items into groups as needed, and then assigning individual and group labels to each of the beltpacks to establish the desired communication routes. See the Initial System Programming section below for more details.

INITIAL SYSTEM PROGRAMMING

Programming of a CellCom 10 system has three basic stages. The first is creating individual labels for the beltpack users and the rear-panel wired connections. Labels are alphanumeric and can be up to 5 characters long. These could be actual user names such as “John” or “Susan”, designations of roles such as “DIR” or “AUDIO”, or connections such as “PL_A” or “MTX_3”. Creating labels is done in the BELTPACKS menu subsection and the PORTS menu subsection, under the LABEL heading.

The second stage is creating communications groups from the individual beltpacks and rear-panel wired connections. Groups may also be labeled with a unique five-character alphanumeric designation. Up to ten groups can be created, with as many members as desired, and stored within the CellCom 10 base station. Creating and labeling groups is done in the GROUPS menu subsection, under the EDIT and LABEL headings.

The third stage is to assign the desired group labels or individual labels to each beltpack. Up to 6 group and/or individual labels may be assigned to each beltpack on one of three beltpack “pages”, each of which has places for two labels corresponding with the two rotary encoder push-to-talk level controls. Assigning communications routes to beltpacks is done in the BELTPACKS menu subsection, under the KEYS heading.

SAVING PROGRAMMING CHANGES

Changes made on the CellCom 10 base station are not programmed into the system memory until the save procedure is done. Going through this procedure writes those changes into the flash ROM of the system and they remain that way until further changes are made.

The save procedure may be initiated in two ways. The simplest method is to press and hold the rotary encoder for about 3 seconds. This can be done anywhere in the menu structure. The display screen will then show a “saving changes” message for a few seconds, after which they are in effect. Exit the menu where the change has been made.

Alternatively, go to the SYSTEM menu on the main screen, as shown in Figure 1, and select it. Then scroll to the SAVE item, highlight it, and press the rotary encoder. The same save procedure as above is initiated.

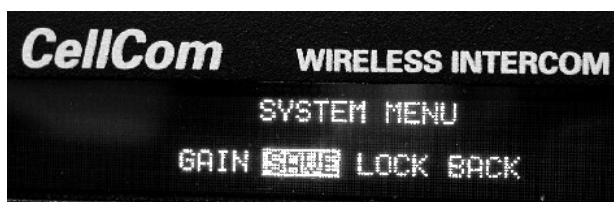


Figure 1: SYSTEM Menu on Main Screen

CREATING BELTPACK LABELS

Belpack labels are created on the base station, under the BELTPACKS menu shown on the CellCom 10 base station display. Using the rotary encoder, scroll to that menu item and press the rotary encoder to select. A second menu will be shown; scroll to and select the EDIT menu item.



Figure 2: Select “Beltpacks” from the Main Menu



Figure 3: Select “Edit” from the Belpack Menu

A page showing the first 5 beltpacks will appear, with the generic BPK01 through BPK05 position designation on the top row, and an editable five-character label

under each one. By scrolling all the way to the right, and then continuing to scroll, BPK06 through BPK10 will appear. Use the rotary encoder to scroll to the desired beltpack label (note the moving “highlight”), and then push the rotary encoder to select.



Figure 4: Scroll through the available beltpacks and push the rotary encoder to select

A menu to edit that beltpack will appear, as shown in Figure 5, that will say “Selected Beltpack BPKxx – label”, with the first item being LABEL. Since it is the first item in the list, it will be highlighted. Press the rotary encoder to select.



Figure 5: When “Label” is highlighted, press the rotary encoder to select

The current five-character designation will appear, as shown in Figure 6, with the highlight on the first character. Pressing the rotary encoder will select that character, and then turning the encoder clockwise or counterclockwise will change the character, going through the entire sequence of possible characters at one character per “click.” Once the desired character is reached, press the rotary encoder to select it, and scroll to the next character to edit.



Figure 6: The current five-character designation will appear

After editing each in turn, click on the last (fifth) character to return to the previous level of the menu.

Note: If you are creating a label that is shorter than five characters, you will still need to go to the fifth character location and press the rotary encoder twice in order to exit the label-selection menu – even if it is blank.

The character set goes from capital letters to lower-case letters, then to two sets of specialized alphabetical characters, to symbols, and then to numerals.

To go back to the menu level above to select another beltpack to edit, scroll clockwise to the BACK command to go up one level. Note that BACK can only be reached by scrolling clockwise.

CREATING PORT LABELS

Port labels for the rear-panel wired connectors are created on the base station, under the PORTS menu shown on the CellCom 10 base station display, as shown in Figure 7.



Figure 7: Select "Ports" from the Main Menu

Using the rotary encoder, scroll to that menu item and press the rotary encoder to select. A page showing the first 5 ports will appear, with the generic HDSTA (front-panel headset A) through 4WIR3 (the third 4-wire connector on the rear panel) position designation on the top row, and an editable five-character label under each one, as shown in Figure 8.



Figure 8: A page with the first five ports will appear

By scrolling all the way to the right, and then continuing to scroll, 4WIR4 through STGAN (stage announce) will appear.

Use the rotary encoder to scroll to the desired port label (note the moving "highlight"), and then push the rotary encoder to select. A menu to edit that port will appear that will say "Selected XXXX – label", with the first item being LABEL, as shown in Figure 9. Since it is the first item in the list, it will be highlighted. Press the rotary encoder to select.



Figure 9: Select "Label" to edit that port label

The current five-character designation will appear, with the highlight on the first character. Pressing the rotary encoder will select that character, and then turning the encoder clockwise or counterclockwise will change the character, going through the entire sequence of possible characters at one character per "click." Once the desired character is reached, press the rotary encoder to select it, and

scroll to the next character to edit. A five-character editable label is shown in Figure 10.



Figure 10: Five-character editable label

After editing each in turn, click on the last (fifth) character to return to the previous level of the menu, as shown in Figure 11.



Figure 11: After editing the label, return to the previous menu

Note: If you are creating a label that is shorter than five characters, you will still need to go to the fifth character location and press the rotary encoder twice in order to exit the label-selection menu – even if it is blank.

To go back to the menu level above to select another port to edit, scroll clockwise to the BACK command to go up one level. Note that BACK can only be reached by scrolling clockwise.

CREATING GROUP LABELS

Group labels that combine selected individual beltpack and rear-panel labels are created on the base station, under the GROUPS menu shown on the CellCom 10 base station display. (See Figure 12.) Using the rotary encoder, scroll to that menu item, and press the rotary encoder to select.



Figure 12: Select "Groups" from the Main Menu

A page showing the first 5 groups will appear, with the generic GP#01 (first group, initially labeled GP00 in the editable field) through GP#05 position designation on the top row, and an editable 5-character label under each one. (See Figure 13.) By scrolling all the way to the right, and then continuing to scroll, GP#06 through GP#10 will appear.



Figure 13: A page showing the first five groups appears

Use the rotary encoder to scroll to the desired group to label (note the moving “highlight”), and then push the rotary encoder to select. A menu to edit that group will appear that will say “Selected GP#xx – label”, with the first item being LABEL. (See Figure 14.) Since it is the first item in the list, it will be highlighted. Press the rotary encoder to select.



Figure 14: A menu for editing the selected group appears

The current five-character designation will appear, with the highlight on the first character. Pressing the rotary encoder will select that character, and then turning the encoder clockwise or counterclockwise will change the character, going through the entire sequence of possible characters at one character per “click.” Once the desired character is reached, press the rotary encoder to select it, and scroll to the next character to edit.



Figure 15: Five-character group label

After editing each in turn, click on the last (fifth) character to return to the previous level of the menu.

Note: If you are creating a label that is shorter than five characters, you will still need to go to the fifth character location and press the rotary encoder twice in order to exit the label-selection menu – even if it is blank.

To go back to the menu level above to select another port to edit, scroll clockwise to the BACK command to go up one level. Note that BACK can only be reached by scrolling clockwise.

CREATING AND EDITING GROUPS

Once a group has been given a unique label, if desired, the user may “populate” that group by assigning beltpacks and rear-panel wired connections to it. Use the following procedure for creating and/or editing groups.

From the main CellCom 10 menu screen, first scroll to the GROUPS menu item and press the rotary encoder. The resulting page shows the first five of the possible ten groups available within FreeSpeak Lite. Scroll through the groups until the desired group label is highlighted, and then press the rotary encoder to select. On the resulting menu page, scroll to MEMBERS and select. The message on the top of the screen will say “Editing Members of GP#xx – label”. (See Figure 16.)



Figure 16: First five of the possible ten groups



Figure 17: Second five of possible ten groups

On that set of pages will be all of the base-station connectors, from HDSTA (headset A) through STGAN (stage announce), followed by the labels for all ten CellCom 10 beltpacks. Scroll through this list to find the desired members for the group being created. Pressing the rotary encoder when a particular item is highlighted will select that label as a member of the group, and a box will be put around it.

Any labels which have already been selected as members of that particular group will have a box around them. To de-select any labels that have already been selected, highlight that label and press the rotary encoder. Pressing the rotary encoder effectively works as a toggle switch, first selecting the item by putting a box around it, and then de-selecting it and removing the box.

When all of the desired beltpack labels and base-station connection labels have been selected and have boxes around them, scroll clockwise to BACK and press the rotary encoder to exit the selection process. Then scroll to the BACK command in the next menu and press the rotary encoder. The selected members of that particular group may now be saved in the system memory.

To edit a group that already has members, go through the procedure above to reach the member labels. Scroll through the list, using presses of the rotary encoder to select new members and de-select members that are no longer desired

to be members of that particular group. Exit as above, and save the changes in the system memory.

ASSIGNING LABELS TO BELTPACKS

Once all of the beltpacks and base-station connections have been labeled and saved as desired, and groups have been labeled and assigned members, it is time to assign these communication routes to the individual beltpacks. For this explanation it is assumed that the beltpack assigned to position one – BPK01 – is having its communications routes assigned. The procedure is identical for all remaining beltpacks.

From the main base station menu, select BELTPACKS with the rotary encoder. Then select the EDIT command, and the list of available beltpacks will appear. Scroll to and select the desired beltpack, in this case BPK01. The display will say “Selected BPK01-label.” On the editing menu that appears, highlight the KEYS command, and press the rotary encoder.



Figure 18: Highlight the “Keys” Command

The message “Select T/L Key to be Edited” will appear at the top of the page, and the numerals “1, 2, 3, 4, 5, 6” will be available with “1” being highlighted. (See Figure 19.)

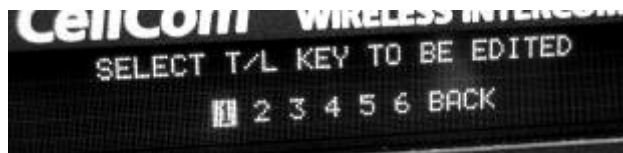


Figure 19: Select Push-to-Talk/Level Control Key to Edit

These numbers correspond to the combination of the level control/push-to-talk rotary encoders on the CellCom 10 beltpack, with “1” being the left/”Talk A” rotary encoder on beltpack “page 1,” and “2” being the right/”Talk B” rotary encoder in beltpack “page 1.” The combinations “3, 4” are those same rotary encoders on beltpack “page 2,” and “5, 6” are for beltpack “page 3.” Thus, the three pairs of communications routes available for assignment on a CellCom 10 beltpack can be programmed via these numerals 1 through 6.

On the base station display, scroll to the desired key to assign on the beltpack currently being programmed. For this example, say that it is key page 1 on the beltpack, and left-hand rotary encoder. Press the rotary encoder to select. A list will appear that starts with the base-stations connections (headset, party-line, 4-wire, etc.), followed by each of the ten individual beltpacks, and finally by the ten available groups. Scroll through this list, either clockwise or counterclockwise since they are in a continuous loop, until the desired label is highlighted.



Figure 20: Select the label to assign to that beltback key

Press the rotary encoder to select the label to assign to that beltback key, and a box will appear around it. After approximately 3 seconds, the display will automatically return to the beltback editing menu, and they communications path to that particular beltback and key “1” will have been assigned. To assign the other keys in turn to that beltback, scroll to the KEYS menu item, select it, scroll to the next numeral – Pg. 1-2 through Pg. 3-2 – and use the same procedure to choose a label to assign to it.

When the particular beltback has had assignments made to all of its keys, select BACK on the beltback editing menu and return to the list of available beltbacks. Highlight and select the next beltback for key assignment, and repeat the above procedures.

BASE STATION SYSTEM MENU

The base station SYSTEM menu offers several system-wide capabilities, including overall system gain, an alternative means to save programming changes, and the ability to lock the front-panel enable buttons.

By selecting GAIN, the overall system gain can be increased or decreased. The levels are numerical, ranging from level 0 to 3 dB. After making a change, save it to the base station memory using the save procedure.

Highlighting SAVE and pressing the rotary encoder initiates the save procedure for any programming changes that have been made. Using this method has the same effect and pressing and holding the rotary encoder for approximately three seconds.

The LOCK menu allows the user to select whether to lock or unlock the front-panel enable buttons for wired party-line connectors A and B, and the wired program input. By selecting ON for the lock, the current state of those enable buttons is maintained, and is retained even when the unit is turned off and restarted. The buttons can be locked in either the enabled or the disabled position, in any desired combination. Selecting OFF allows the buttons to be toggled on and off with a single push.

The following feature is not in the SYSTEM menu, but is an overall system item. To determine the version number of the base station firmware, press and hold all three of the front-panel enable buttons simultaneously. The version number and its date will appear on the display screen. The IP address and system

identification number are also given. To close this display and go back to the main screen, push the rotary encoder.



Figure 21: Main Menu

SYSTEM INSTALLATION AND DEFINING COVERAGE AREAS

The coverage area of any given CEL-TA transceiver/antenna depends on the particular environment in which it is located – what RF absorptive or reflective barriers and objects are between it and the beltpacks that it is to support. So as in all cases of placing antennas for radio transmission, measurement and best estimates are combined with some level of actual testing with the equipment in the environment. Wireless intercoms are lower power devices, and do not approach the range of simplex devices like walkie-talkies.

The maximum range between a CellCom 10 transceiver/antenna and a beltpack is 250 meters (about 800 feet) under ideal circumstances. In normal practice, expect between 50 meters and 150 meters, and plan accordingly. When trying to provide coverage through thick walls and when plenty of metallic obstructions are present, expect the range in that direction to be on the shorter side. Plan to place a transceiver/antenna on the other side of the wall, or in the corridor. For more open, line-of-sight places, you can expect that the range will be better in that direction.

The CellCom 10 beltpack has a “site survey” mode that is invaluable when setting up coverage areas. This mode is entered by holding down the left and right scroll buttons on the front panel of the beltpack while at the same time pressing the power switch on the rear panel to turn the unit on.

The screen that appears contains various connection information. For setting up the system and coverage areas, the most important section is the RSSI (Received Signal Strength Indication) designation in the lower left-hand corner of the display. To the right of “RSSI:” will be a number, ranging from 55 at the highest signal strength to 0 at the lowest.

This signal strength number will fluctuate as you move through the coverage area, and may even fluctuate as you stand still. Best system performance will be obtained if the signal strength remains at 30 or above – which is approximately equivalent to the lowest two “squares” being shown in the signal-strength icon on the main screen of the CellCom 10 beltpack during normal operation.

A similar process can be done with a beltpack that is in standard mode, and is connected with a headset. Press one of the talks so that the headset’s mic is activated. You will hear your own voice in the earpiece, unless the local sidetone in the beltpack menu is completely turned down. Alternatively, you can inject a

program source into the PRGM connector or a 4-wire connector and assign it to the beltack.

Walk the area and talk, either to someone else connected to the system or test-talking. Also watch the signal-strength icon on the display. Listen for audio dropouts, and look for low signal indication. The beltack will lose its connection to the base and display "Searching for Network" when the range has been completely exceeded.

Once the first CEL-TA transceiver/antenna has been placed and its limits have been explored and noted, place other CEL-TA's in locations where their coverage will overlap with the weak-signal areas that were noted with the first transceiver/antenna. Then walk between those coverage areas to determine that the coverage is continuous and complete; if not, reposition the additional antennas. Use this method to create the entire desired coverage area.

Now, co-locate other CEL-TA transceiver/antennas in any areas where more than five beltacks will be operating at any time. Run an additional CAT-5 cable from the base / splitter, and attach the new transceiver/antenna adjacent to the existing one.

6

SPECIFICATIONS

CellCom 10 CEL-BASE Base Station

Base-to-Beltpack Frequency Response	100 Hz – 7.1 kHz
Number of CEL-BP Beltpacks per Base Station	10
Number of CEL-TA Transceiver/Antennas Supported by Base:	
Basic Base	4
With CEL-EXP Expansion Card	10
Number of Transceiver/Antenna Ports	2
Number of Base Loop Ports	1 (combines 2 bases into one 20-beltpack system)
Programming Port	DB9
Relay Port	DB9; normally open and normally close wiring
Party-Line Intercom A and Intercom B (each)	XLR-3F with XLR-3M loop through, on/off termination switch (via software), Clear-Com RTS selection (via software)
4-Wire/Matrix Connection	4 RJ-45 for 4-wire (Intercom 3 – 6)
Program Input	XLR-3F, transformer isolated, line-level input
Stage Announce Output	XLR-3M, transformer isolated, line-level output
Front-Panel Headset	4-pin male connector with 2-channel, mono-summed capability and individual talks and listens
Front Panel Display	254 x 32 dot-graphic VFD
Front Panel Indicators	2 Talk LED's for front-panel headset; CH A and B party-line enable LED's; Program Input enable LED; 10 individual beltpack LEDs

Base-Station Programming/Editing	Push-to-enter rotary encoder
Dimensions	1-RU unit, 44 x 483 x 312 mm (hwd) (1.75 x 19.0 x 12.5 inches)

Weight Approx. 10 lb.

CellCom 10 CEL-BP Beltpack

Beltpack Frequency Response	100 Hz – 7.1 kHz
Beltpack Assignment-Select Buttons	3, used to scroll and select talk/listen “pages” and also to edit beltpack menu options
“Label” Assignments per Select Button	2 (two simultaneous talk/listen paths or channels)
Number of Full-Duplex Audio Paths	6 (3 pairs), with individual level control
Level/Talk Controls	2 top-mounted push-to-talk rotary encoders
Headset Connector	4-pin male, Clear-Com standard
Microphone Type	Dynamic or electret, selectable in beltpack menu
Microphone and Headset Limiters	Selectable in beltpack menu
Powering	Alkaline Battery, 4 AA alkaline cells Rechargeable, 4 NiMH cells in AA format
Battery Charging	In unit, via supplied external power supply connected to beltpack
Battery Life	Approximately 8 hours with 4 fresh AA alkaline batteries or 4 AA high-amperage NiMH cells
Range from Single CEL-TA Transceiver/Antenna	Up to 250 m from transceiver/antenna in ideal, line-of-sight conditions; typical range each from 50 m to 150 m; use multiple CEL-TAs for larger, custom coverage areas
Dimensions	Tapered design, at largest points approx. 38 x 87 x 144 mm (dwh) (1.5 x 3.5 x 5.75 inches)
Weight (with batteries)	Approx. 13 oz.

Transceiver/Antenna

Belpacks Supported Per Transceiver/Antenna	5, in one cellular zone
Transceiver Antenna Transmission Range	Up to 250 m (800 ft.), line of sight
Maximum Distance, Base to Transceiver Via Base Port	1,000 m (1,600 ft.)
Maximum Distance, Transceiver Powered By Base Port	300 m (975 ft.)
Local Powering	Via 24VDC power supply
Range per CEL-TA Transceiver/Antenna	Up to 250 m from transceiver/antenna in ideal, line-of-sight conditions; typical range each from 50 m to 150 m; use multiple CEL-TA's for larger, custom coverage areas
Connection to CellCom 10 Base	RJ-45
Transceiver/Antenna Connector Type	SMA, 2; supplied omnidirectional whip antennas
Mounting	Via integral tabs with holes for screws
Dimensions	38 x 125 x 153 mm (dwh) (1.5 x 5.0 x 6.1 inches)
Weight	Approx. 9 oz.

Transceiver/Antenna Splitter

Number of Transceiver/Antennas Supported	5
Number of Splitters Per Base	2
Connection Between Base and Splitter	4-pair CAT5 cable with RJ-45
Connection Between Splitter and Transceiver/Antennas	4-pair CAT5 cable with RJ-45
Powering of Splitter	Locally powered via external power supply

Transmission Method

Method of RF Operation	DECT standard, using two DECT bands per beltpack for wider frequency response
Modulation	QPSK
Frequencies of Operation	1.92 – 1.93 GHz
RF Output	250 mW burst, average level 2 - 4 mW

Overall System

Maximum Users in a Cell Location	Theoretical: 50 Practical: 30 - 40
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Theory of Operation

Dynamic allocation of frequencies and handoff of beltpacks among the transceiver/antennas up to their individual limit of 5 connected beltpacks at a time; each beltpack is assigned a “virtual port” within the CellCom 10 base.

7

APPENDIX

DECT CARRIER FREQUENCY CHART

RFC	CARRIER FREQUENCY	RFC	CARRIER FREQUENCY
0	1897.344	17	1911.168
1	1895.616	18	1912.896
2	1893.888	19	1914.624
3	1892.160	20	1916.352
4	1890.432	21	1918.080
5	1888.704	22	1919.808
6	1886.976	23	1921.536
7	1885.248	24	1923.264
8	1883.520	25	1924.992
9	1881.972	26	1926.720
10	1899.072	27	1928.448
11	1900.800	28	1930.176
12	1902.528	29	1931.904
13	1904.256	30	1933.632
14	1905.984	31	
15	1907.712	32	
16	1909.440		

8

GLOSSARY

Base Station All communications and data flow through the 1-RU CellCom 10 base station. The base station supports up to 10 wireless beltacks. Because each beltack has its own timeslot, it can be individually addressed by the base—allowing multiple combinations of beltack-to-beltack and small-group conversations to happen simultaneously.

Beltack The unit from which you talk and listen. Up to six communication routes can be assigned to a CellCom 10 beltack.

DECT The Digital Enhanced Cordless Telecommunications Standard (DECT) provides a general radio access technology for wireless telecommunications. DECT is designed to provide access to any type of telecommunication network, thus supporting numerous applications and services. Exclusive radio frequencies protect DECT from interference from other radio systems. The DECT standard is used in more than 110 countries worldwide, including the whole of Europe.

Transceiver/Antenna The communication between the CellCom 10 beltacks and the base station is done through the CEL-TA Transceiver/Antennas. Unlike other wireless intercom systems, where the receive and transmit functions are in the base, CellCom 10 places that function within the transceiver/antennas.

9

VITEC GROUP COMMUNICATIONS INC. LIMITED WARRANTY

- *Return authorization numbers are required for all returns.*
- *Both warranty and non-warranty repairs are available.*

This product is guaranteed by Vitec Group Communications, Inc. to be free of manufacturing defects in material and workmanship under normal use for two years from the date of purchase.

The Vitec Group Communications warranty does not cover any defect, malfunction, or failure caused beyond the control of the Group, including unreasonable or negligent operation, abuse, accident, failure to follow instructions in the manual, defective or improperly associated equipment, attempts at modification and repair not authorized by the Group, and shipping damage. Products with their serial numbers removed or defaced are not covered by this warranty.

This warranty is the sole and exclusive express warranty given with respect to Vitec Group Communications products. It is the responsibility of the user to determine before purchase that this product is suitable for the user's intended purpose.

Any and all implied warranties, including the implied warranty of merchantability, are limited to the duration of this express limited warranty. Neither Vitec Group Communications nor the dealer who sells the Group's products is liable for incidental or consequential damages of any kind.

For your own records fill in the information below:

Model No. _____ Serial No. _____

Date Purchased _____

Purchased from (dealer) _____

Address _____

City _____ State _____ ZIP _____

FACTORY SERVICE

All equipment returned for repair must be accompanied by documentation stating the return address, telephone number, date of purchase, and a description of the problem.

Before returning equipment for repair, you must obtain a return authorization number. To obtain a return authorization number, call our customer service department at the number listed below. By talking with our representatives, many problems can often be resolved over the phone. You can also fax our customer service department or send an email to support@clearcom.com.

After obtaining a return authorization number, send equipment to be repaired to:

Customer Service Department
Clear-Com Intercom Systems
4065 Hollis Street
Emeryville, CA 94608-3505
Telephone: (510) 496-6666
Fax: (510)496-6610
Web site: www.clearcom.com

WARRANTY REPAIR

If in warranty, no charge will be made for the repairs. Equipment being returned for warranty repair must be sent prepaid and will be returned prepaid.

NON-WARRANTY REPAIR

Equipment that is not under warranty must be sent prepaid to Clear-Com. If requested, an estimate of repair costs will be issued prior to service. Once repair is approved and repair of equipment is completed, the equipment will be shipped freight collect from the factory.

NOTE: Equipment can be returned for repair to your local distributor as well as directly to the factory. This includes equipment that is covered by the warranty and equipment that is not covered by the warranty. Consult the Vitec Group Communications Web site at www.vitecgroupcomms.com for the location of your local distributor.

