

# Clear Voice Dual Band Cell Phone Repeater

## Installation and Operation Manual



Telecom Technologies (USA) LLC  
26112 Hitching Rail Road,  
Laguna Hills, CA 92653

[www.cellboosterstore.com](http://www.cellboosterstore.com)

Tel: (800) 653-3040  
Fax: (949) 480-9637  
Email: [support@telecomtek.com](mailto:support@telecomtek.com)

Congratulations on purchasing a Clear Voice repeater!



### Safety First!

For your safety and to prevent injury to the installer or the operator, it is essential to read this manual carefully before your new unit is installed and operated.

#### **Personal safety**

This unit is powered by small AC adaptor unit. Turn off the electricity supply if you have to do any rewiring or making alterations to wall sockets.

The equipment should be used only for amplifying mobile (cellular) phone signals and not for any other purpose.

Should the unit fail to operate, any repairs should be carried out by qualified personnel ONLY.

#### **Lightning Protection**

If you plan on installing the external antenna on your roof or at a height, we highly recommend the use of a lightning surge protector for your protection.

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## Introduction

Almost all of us have experienced dropped calls or “Service Not Available” messages on our cell phones. This occurs because there is inadequate signal strength from the cell towers that provide network coverage. You can see the cellular towers along roadsides, on top of communications towers, and installed on buildings.

There are many causes of weak cellular signal:

- There may simply be no cell tower within range.
- Natural landscape features such as hills, valleys, or buildings may block and attenuate the signal.
- Reflected signals may cause interference, reducing the signal strength in a particular location.

Full coverage is quite rare, and due to poor reception cell phone users experience interruption of conversations, voice distortion and dropped calls.

The Clear Voice Cellular Repeater is the solution to this problem. Repeaters amplify the cellular signal, and in doing so, improve cellular reception. Improved reception means that your phone no longer needs to struggle to maintain the connection with the cell phone tower – so your phone’s battery life is also extended.

## Optional Pre-Amplifier Kit

The Clear Voice Dual Band **Ultra** Kit includes a pre-amplifier that offers up to 12dB of extra gain. The Clear Voice Dual Band Ultra Kit (shown above) adds a 12dB pre-amplifier to our standard Dual Band Kit. Depending on the donor signal strength, the Ultra kit can provide up to 10,000 square feet coverage, compared to 2,500 square feet for the standard kit.

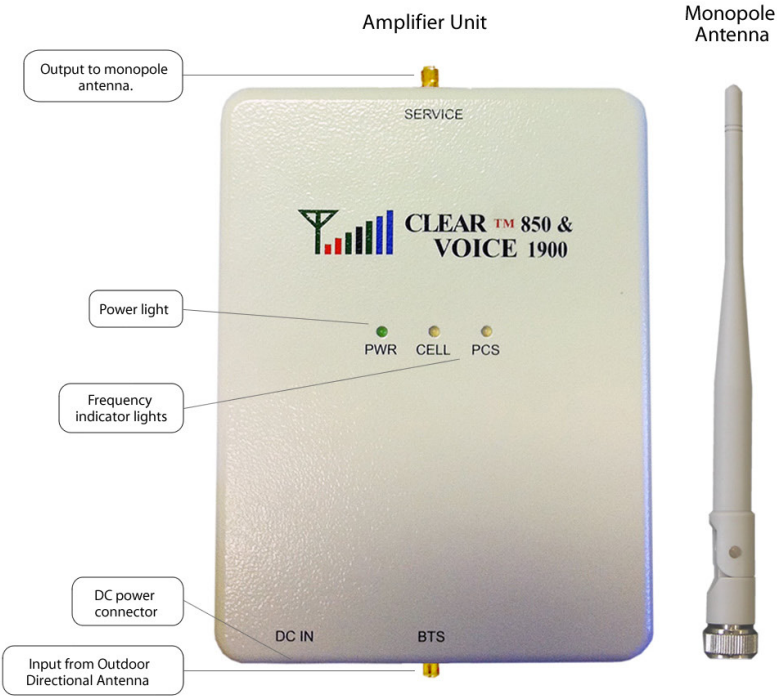
We highly recommend using the Dual Band Ultra Kit if you have very weak outdoor signal (2 bars or less), or if you have stronger signal and need coverage in a large area or multiple floors.

## What to expect

After installing your cell phone repeater, you should no longer experience dropped calls or poor call quality. However, there are a number of things to consider:

- You will experience the largest improvement in signal strength when you are near the repeater unit. With the repeater properly installed, your phone should display full bars when you are near the repeater's antenna.
- Our repeaters offer a coverage area of up to 2,500 square feet. However, the actual effective coverage area may be reduced as signals are absorbed by walls in your home.
- If you have less than 2 bars of signal outside your home, you should consider using the Clear Voice Dual Band Ultra Kit. If you have this sort of low-signal situation, contact us for a Yagi Antenna upgrade.
- Indoor coverage can be improved by using dome antennas and in some building layouts using a pannel antenna. Consult our website and look for accessories for more details.

# Kit Contents



**Outdoor Directional Antenna**



**AC Adapter**



**Low-Loss Cable**



**Pre-Amplifier Kit**  
(included in Ultra Kit only)



## Repeater Terminology

Here are a few terms that you'll need to be familiar with in order to use this instruction manual. Please read carefully.

### *Directional Outdoor Antenna*

This is the antenna that is used to collect and route signal to the cell phone tower.

### *Monopole Antenna*

This smaller antenna is attached to the top of the Clear Voice amplifier and rebroadcasts the signal inside your home or office. Other types of rebroadcast antennas are also available and can offer a better in-door coverage. Please see accessory section for further information.

### *Oscillation (also feedback)*

If your repeater is set up incorrectly, oscillation may occur. Oscillation is also known as feedback. Oscillation occurs when there is not enough isolation between the directional outdoor antenna and the repeater unit. A lack of isolation means that the cellular signal being rebroadcast by the repeater is recaptured by the directional antenna and reamplified, causing a feedback loop that prevents the repeater from working correctly. To improve the isolation and prevent this from happening, the amplifier unit and directional antenna must be well separated, and the directional antenna must be kept facing away from the amplifier unit.

### *Auto Shut-Off*

When oscillation occurs, the repeater "auto shut-off" feature is triggered to prevent harm to the repeater and the cellular network. The red LED will turn "ON" if the input signal is too strong. This will not normally happen unless there is insufficient isolation. The repeater will have to be restarted: You can manually restart the repeater by disconnecting and reconnecting the AC adapter.

### *Automatic Level Control (ALC)*

Our Clear Voice amplifiers have ALC built in. This feature automatically adjusts the signal output level to prevent oscillation from occurring in case signal conditions change after the repeater has been installed.

## Installation

Installing the repeater is a simple process, but please make sure to read each step thoroughly before starting. The performance of your repeater kit is very sensitive to the installation.

There are three steps to installing your repeater:

Step 1: Locating the Optimum Position for the Outdoor Antenna

Step 2: Setting up the Cellular Repeater

Step 3: Aligning the Directional Antenna

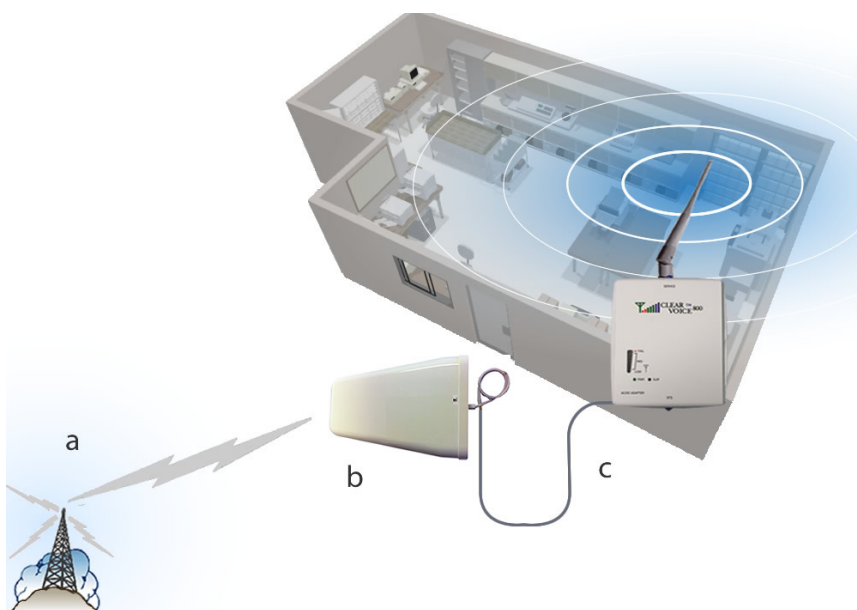
Step 4: Finalizing the Cellular Repeater Installation



## Step 1: Locating the Optimum Position Position for the Outdoor Antenna

The first thing you need to do before installing your Clear Voice system is to determine where you want to install the system. Look at the diagram below for an idea of how the cellular repeater works:

- The cell signal is transmitted to/from the cell tower.
- The directional outdoor antenna collects the signal.
- The Clear Voice repeater amplifies the signal and rebroadcasts it about your home/office.



You need to pick the best location for your antenna and amplifier.

### *Ideal Directional Antenna Installation Location:*

- Outside the building, in the location with the most cell phone signal (at least 2 bars).
- Pointing away from the Clear Voice amplifier unit that is installed inside.

### *Ideal Internal Amplifier Location:*

- Inside the building, as central as possible (this is to maximize the coverage area).
- In the room where you will be most often using your cell phone. This room will receive the best coverage.

To find the strongest cellular signal outside your home or office simply walk around with your cell phone on. You should use a cell phone on the network whose signal you are trying to improve. The "Signal Strength" bars on your cell phone will tell you where the signal is strongest. Your cell phone's signal strength bars take up to 30 seconds to update, so you should wait in each location before moving on.

The place you choose should register at least 2 bars of signal on your cell phone. If you cannot find a strong enough signal, you will need to use a Yagi antenna – visit our website or call us for more information.

In many cases, placing the directional antenna in an elevated position (for example on your roof) will improve the quality of the signal.

We provide 30 feet of low-loss cabling with our Clear Voice repeater kits (40 feet with the Ultra Kit). If you need more cable, you can purchase from our website or call us. You should note that using additional cable attenuates the signal, and lowers the coverage area. However, if using 30 feet of extra cable would allow you to reach an area with one extra bar of signal, then this is highly recommended.

In many cases, placing the directional antenna in an elevated position (for example on your roof) will improve the quality of the signal.

If you are unable to install the directional antenna outside or above your home, it can also be installed in an attic or by a window where signal strength is 2 bars or more. However, an external installation is always preferable.

Once you have identified the locations for the amplifier and the external directional antenna, move onto the next step.

## Step 2: Setting up the Cellular Repeater

Once you have established what part of your home has the best signal, you are ready to set up the Clear Voice repeater system.

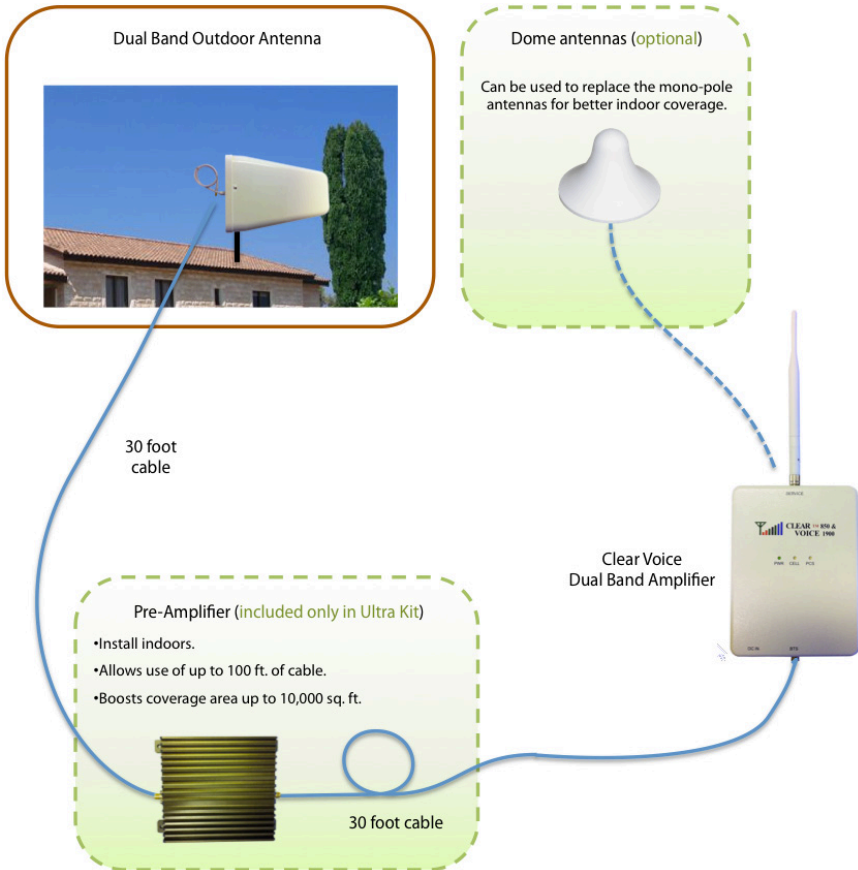
1. Temporarily place the directional outdoor antenna in the location with the best signal and connect it to the 30 foot cable.
2. Connect the rest of the equipment as shown in the diagram to the right.

When selecting a location for the internal amplifier, make sure that you choose a location is at least 15 feet away from the directional outdoor antenna. This ensures isolation between the two antennas, and prevents feedback and oscillation from occurring. Installing the outdoor antenna at an elevation or making sure that there is a wall between the outdoor antenna and the amplifier will further improve isolation.

3. Connect the power adapter to the port marked "DC IN" on the bottom side of the repeater. **WARNING: The DC Power Adapter is labeled: Output 3.8V, 3.0A. DO NOT use other adapters.** The PWE light will turn on, and the CEL and PCS lights on the front of the unit will turn from Green to Orange and finally to Red before turning back to Green, which indicates normal operation.

Move onto Step 3 to find out how to align the directional antenna.

*Make sure that the directional outdoor antenna is pointing away from the indoor amplifier before continuing.*



### FCC Separation Warning

The inside antenna used with this amplifier must have a separation distance from all persons that is at least 20cm. The amplifier must not be co-located or operating in conjunction with any other antenna or amplifier.

### Step 3: Aligning the Directional Antenna

***Special note for iPhone users:***

If you own an iPhone or iPhone 3G/3GS, you can use the in-built "Field Test Mode" to align the outdoor directional antenna.

To use this feature, browse to the keypad screen and enter \*3001#1245#\* then press dial. In the top left of the screen, in place of the signal bars, the signal level in dBm is shown. A less negative number means stronger signal (e.g. -80 represents stronger signal than -100).

***Special note for Android users:***

Android users can download the "OpenSignalMaps" app from the Android Market. The app's signal meter will show the strength of received signal.

*Please read this entire section carefully before proceeding.*

In order for the amplifiers to work with your carrier's network, you must align the directional antenna. This is a very sensitive part of the installation, and spending some time to carefully align the antenna will maximize the coverage area of your repeater system.

Throughout the alignment procedure, make sure that the external antenna does not point in the direction of the indoor repeater and antenna, as this will cause oscillation.

You will need two people to align the directional antenna:

- One person should adjust the direction (and height) of the external outdoor antenna.
- A second person should stay approximately 5 feet away from the indoor amplifiers with a cell phone in their hands.

Adjust the position of the outdoor antenna, trying different directions and heights. With each direction, check the number of bars on the cell phone. The more bars showing on your cell phone, the stronger the signal and the better the alignment of the outdoor antenna.

Your cell phone's signal indicator bars will take between 15 and 20 seconds to update, so make changes slowly and wait before checking the signal strength.

You should find that the cell phone shows full bars after a small amount

of alignment. Now, to fine-tune the alignment of the outdoor antenna, have the person holding the cell phone move between 20 and 30 feet away from the amplifier. The number of bars on their cell phone should now fall. Repeat the procedure above, fine-tuning the direction of the external outdoor antenna to get the maximum number of bars on your cell phone.

Once the repeater is correctly aligned, you should receive between 3-5

*If you have any problems in the alignment of the directional antenna, or if the alarm or signal lights on the amplifier start flashing, refer to the troubleshooting section at the end of this manual.*

bars on your cell phone at a distance of approximately 20 feet

#### **Step 4: Finalizing the Cellular Repeater Installation**

Once you have found the direction with the best signal, you will need to fix the outdoor antenna in that direction. The outdoor antenna comes with all the fixtures that you need. Find a suitable place and install the outdoor antenna onto a vertical pole. The fixture's direction is horizontally adjustable, and can be locked in a particular direction by tightening the nuts on the fixture.

Finalize the position of the Clear Voice amplifier unit by making sure that it is as central as possible to your home or office. Make sure that the amplifier unit is not close to any large metallic objects. You can hang the Clear Voice amplifier unit from a wall if you wish (a wall-hanging fixture is provided on the back of the unit). In general the unit should be placed approximately at head-height (i.e. 6 feet from the floor). The monopole antenna should always be kept vertical.

Now you're ready to enjoy improved cell phone reception. Simply pick up your phone and make a call!

## Troubleshooting

### 1. The CEL and PCS lights on the front of the amplifier unit are yellow or red.

If the light labeled CEL (for 800 MHz band) or the PCS (1900 MGHZ band) turns YELLOW it means that the automatic level control (ALC) is in action to limit the emitted power. There is no cause for concern and the operation can continue.

If either of two lights turn RED, the input power is exceeding the safe level or the unit is oscillating. The red lights indicate that oscillation is occurring and the repeater's auto-shutdown feature has been triggered. Oscillation occurs when the signals being broadcast by the repeater are recaptured by the directional antenna and re-amplified. This "feedback" causes oscillation and triggers the red alarm light. The red alarm lights can also be triggered by an unusually strong incoming signal.

If either the CEL or PCS lights turn red, try the following suggestions (you will need to reset the repeater each time by disconnecting and reconnecting the AC adapter):

- Point the outdoor antenna away from the repeater unit at all times.
- Try to keep the outdoor antenna facing open space. If the directional antenna is directly facing a wall, some of the transmitted signal will reflect back, thereby increasing the chances of oscillation.
- Try to position the outdoor antenna so that it is as separate as possible from the repeater unit in order to improve isolation. This can be aided by positioning the repeater system so that walls and doors lie between the outdoor antenna and the Clear Voice amplifier unit.
- Make sure that the connections of the 30-foot cable to the directional antenna and amplifier unit are hand-tight.
- Make sure that both the directional antenna and the amplifier units are not near any large metal objects, high-voltage lines, or a concentration of electrical equipment.
- Try placing the directional antenna at an elevated position.

Increasing the height of the directional antenna relative to the repeater unit helps improve the level of isolation.

Please contact us by email or phone if you continue to have problems.

**2. One of the Clear Voice amplifier's LED indicator lights is blinking. What is the problem?**

This may happen if the strength of incoming signals might be very low on a particular channel and below the unit's threshold. This might happen to the Cell or the PCS bands. The units may still work, but if you are not receiving adequate performance you should adjust the direction and position of the outdoor antennas.

**3. My phone shows full bars, but I am still dropping calls.**

This problem usually indicates that the directional antenna is not positioned correctly. To improve the alignment, use the technique described in Step 3. You may need to try some different locations around the building in order to find the location with the best signal.

If you have relatively weak signal outside the building (2 bars or less), you should use the Pre-Amplifier Kit to improve the signal strength. Call us or visit our website for more information.

**4. My phone shows full bars near the Clear Voice repeater. However, when I move away, the signal strength falls quickly.**

This problem usually indicates that the directional antenna is not positioned correctly. To improve the alignment, use the technique described in Step 3. You may need to try some different locations around the building in order to acquire a better signal.

If you have relatively weak signal outside the building (2 bars or less), you should use the Pre-Amplifier Kit to improve the signal strength. Call us or visit our website for more information.

**5. I have set up my repeater, but there is no improvement at all on my cell phone.**

Try moving the directional antenna to different sides of the building. If you continue to have problems, please call our technical support line or



e-mail us.

## **6. I have less than 2,500 square feet of coverage.**

The Clear Voice repeater system will only provide a coverage area of 2,500 square feet in open space. Attaining this coverage area requires a reasonably strong signal where the directional antenna has been installed.

Attenuation of the signal due to absorption by walls will decrease the actual coverage area; typical coverage areas are between 1,500 and 2,000 square feet. The greatest improvement in signal will be directly near the repeater, with the signal strength dropping as you move away. It is often possible to make calls with a lower number of bars once the cellular repeater has been installed, since the signal quality will be higher than before the implementation of the repeater system.

If you want to increase the coverage area of your repeater, you should use the Pre-Amplifier Kit to improve the signal strength. Call us or visit our website for more information.

## **Common Customer Questions**

### **Is it possible to purchase and use an extension cable?**

Using an extension cable with your Clear Voice repeater is possible, however there is a tradeoff since additional cable attenuates and weakens the cellular signal.

If an additional 30-feet of cabling allows you to acquire one or more bars of signal, then we recommend purchasing an extension cable by visiting our website or calling us. Our extension cables come with the required adapter to extend your existing cable.

In situations where there is strong signal outside the building (3 bars or more), using 30-60 feet of cable is not a problem. However, if you have 2 bars or less of source signal, using an extension cable should be avoided if possible.

### **Will the repeater improve signal on more than one level of my home or office?**

Due to the nature of the omni directional antenna used with our repeater (and with almost all other commercial repeaters) the improvement in signal coverage is largely limited to the level on which the repeater is installed (though some improvement will be seen on adjacent levels). For this reason, you should install the Clear Voice amplifier unit on the same level where you will be using your cell phone.

### **Is the repeater system waterproof? Can it be installed outside?**

The directional outdoor antenna is waterproof, and can be installed outside. However the Clear Voice amplifier unit is not waterproof and must be installed indoors in a controlled temperature environment (maximum ambient temperature for correct operation is 45°C).

### **Does the repeater support multiple network carriers?**

The repeater will amplify the signal on all carriers operating on the frequency band of the repeater in your area (either 800 or 1900 MHz, depending on the model you have purchased).

Feel free to call or email us with any other questions you may have.

## **Customer Support and Warranty Information**

### **Customer Support**

If you have any questions, comments, on problems, with installation or with your Clear Voice Repeater Kit you can contact us at:

Email: [support@telecomtek.com](mailto:support@telecomtek.com)

Phone: 1-800-653-3040

### **30-Day Money-Back Guarantee**

In order to be eligible for our 30-day money-back guarantee, the equipment must be in original condition. Items damaged through negligence or misuse are not refundable.

Items returned in a soiled or surface-damaged condition may be rejected or subject to whatever charges are incurred to restore them to their original condition.

To return your unit within the 30-day period, first contact us by e-mail or call us at 1-800-653-3040 to receive authorization.

### **Warranty**

All our products come with a one-year return-to-base parts and labor warranty. If you have any problems with your repeater after the 30-day money back period, contact us by email or phone for support.

## Clear Voice Kit Technical Specifications

### Clear Voice Amplifier Unit

	Clear Voice 800	Clear Voice 1900
Downlink Frequency:	869-894 MHz	1850-1910 MHz
Uplink Frequency:	824-849 MHz	1930-1990 MHz
Input Level:	-45dBm Max	
Output Level:	+7dBm Max	
Gain:	60 $\pm$ 2 dB	
Inband Flatness:	5 dB	
V.S.W.R. :	1.5:1 Max	
Uplink Noise Figure:	8 dB	
Delay Time:	5 $\mu$ s Max	
Connectors:	2 x SMA-Female, 50 Ohms	
Casing:	Cast Aluminum	
Operating Temperature:	-10° to 40° C	

### Low-Loss Cable

Cable Type:	LMR-200
Color:	Ivory
Connectors:	SMA-Male
Length:	30 feet
Total Run Attenuation	4.4 dB

### Directional Outdoor Antenna

Gain:	>10dBi
Beamwidth:	60° (H), 55° (V)
Connectors:	SMA-Female
Impedance:	50 Ohms
Operating Temperature:	-30° to 70° C
Polarization:	Vertical