Installation & User Manual

CR100 Bi-Directional Repeater

SignalReach™

CR Series SOHO Cellular Repeater

AMPS • PCS • TDMA • GSM • CDMA• iDEN

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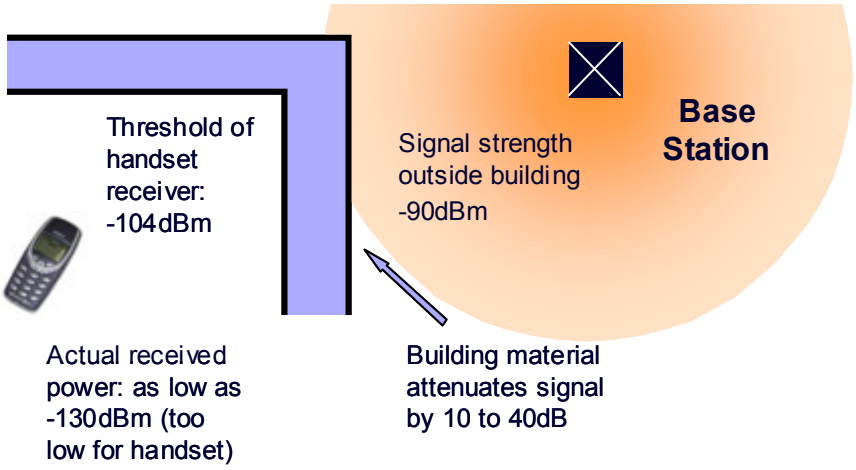
Introduction

In-building repeaters provide enhanced coverage of cellular telephone signals for areas that are confined or enclosed such as tunnels, underground parking garages, and within buildings. Many buildings are constructed of materials like metal, brick and concrete that attenuate cellular telephone signals. Symptoms such as dropped calls, broken audio and static indicate the need for an in-building repeater.

The SignalReach™ CR100 Small Office Home Office (SOHO) Cellular Repeater extends cellular services into buildings, parking garages, tunnels and other poor coverage areas. The CR100 is designed for use with 800MHz cellular telephones and offers a cost-effective solution for small business and residential applications. The repeater is useful in areas where cellular service is available outside of the building but marginal indoors.

The SignalReach™ CR100 is a stationary device that automatically reradiates signals from the base transmitters without channel translation, for the purpose of improving coverage of existing service by increasing the signal strength in dead spots. The repeater is a network-compatible device that amplifies cellular signals in both the uplink and downlink directions. The repeater is simple to install, and contains circuitry to ensure proper operating power levels, and as well, includes an automatic feedback and detection circuitry that detects, as a result of poor isolation between the subscriber and donor antennae. In this condition the repeater will adjust it's gain to compensate for the abnormality, and warn the user through a visual indicator LED. The CR100 will enhance the cellular telephone user's experience while complying with cellular network specifications. Linear operation is guaranteed under all conditions.

The CR100 allows up to two indoor antennas to be used without the need of external components. Its auxiliary indoor antenna port allows a second indoor zone to be easily connected. The repeater can be powered by its AC adapter or through the in-building primary subscriber antenna port using an optional power inserter.



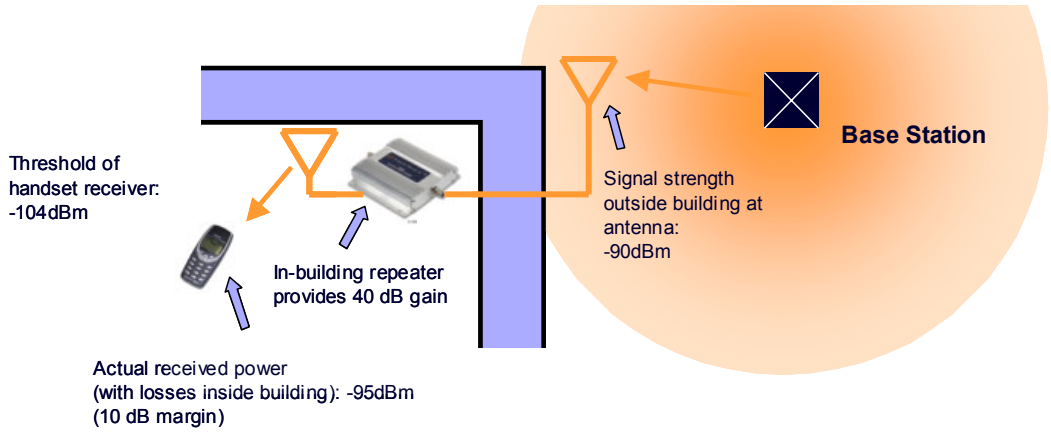
This product is designed for installations where cellular coverage is available outside the building, and indoor coverage is inadequate.

CR100 Features:

- Easy Installation – No calibration required
- Automatic feedback detection and warning circuitry
- Auxiliary in-building antenna port provides enhanced coverage
- Up to 20000sq.ft of free space coverage with only one interior antenna
- Network-compatible operation
- Auto levelling circuitry ensures linear operation
- FCC approved
- Optional power inserter available
- External fault output signal

Functional Description & Operation

The repeater works on the principle of receiving the handset signal through a subscriber (indoor) antenna, amplifying or 'boosting' its signal level, and then passing it on to the donor antenna located outside the building. Signals from the cellular tower (downlink) are also amplified and passed to the subscriber antenna.



Arrista's CR-100 in-building repeater is a Class B Broadband device, it will process the entire cellular 800MHz spectrum. Input and output duplexers and band pass filters in the downlink and uplink path provide the repeater's filtering and isolation. The maximum gain in each of the downlink and uplink path is 60dB. Both the downlink and uplink paths incorporate automatic gain/level control, to ensure that downlink and uplink power amplifiers are not overdriven and operate free of distortion. As well, the automatic gain/level control ensures that in normal operation the downlink and uplink gain mirror each other. The CR100 also has primary and secondary subscriber ports, allowing the repeater to double the in-building coverage area.

Installation Procedure

The repeater unit should be installed in a sheltered area, it's operating temperature range is extensive, but is not sealed to prevent water (rain) ingress. The repeater unit should not be installed in an area where the ambient temperature is expected to exceed +60°C.

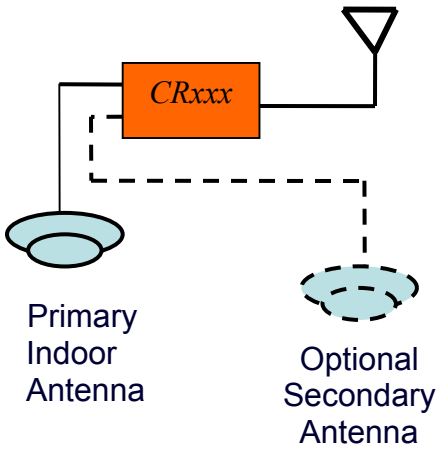
The indoor and outdoor antenna locations must be chosen carefully to avoid re-generative feedback. Re-generative feedback occurs when the subscriber antenna picks up the donor antenna transmit signal. A general rule of thumb is to locate the antennae where the isolation is at least 10 dB greater than the operating repeater gain. The Arrista repeater has a maximum gain of 60dB in uplink path, as a result, the isolation required between the subscriber and the donor antenna is in a range of 70dB. The line of sight separation between the subscriber and donor antenna represented by a free space loss of 70dB within a building is 17 meters (55 feet). The separation distance can be reduced if the donor antenna is mounted on the building exterior (i.e. on a roof), or using a directional donor antenna (narrow beam width).

The following table indicates separation distances for different installation configurations:

	Line of Sight in-building	Exterior Donor Antenna, with 20dB Attenuation[1]	Exterior mounted Directional Antenna[2]
Separation Distance meters (ft)	17 (55)	8 (26)	4 (13)

[1] The attenuation is indicative of the construction material that a signal has to penetrate through
[2] As in [1], but using a directional antenna with a typical front to back ratio of 20dB

It is not recommended that the donor and subscriber antennae be installed within sight of each other. Do not install the unit where a skylight or other low loss RF path exists between the donor or subscriber antenna.



Arrista recommends that the donor antenna be installed on the roof or on an

outside wall of a building. A cell phone can be used to determine if an adequate signal is present at the chosen location. Run a length of 50-ohm cable (LMR-240 is recommended for cable runs less than 15meters (50ft)) between chosen location and the repeater unit.

Warning Equipment Installation:

- Follow the local building codes for installation of antennae on buildings. Ensure that the exterior mounted donor antenna is properly mounted and grounded for lightening protection.
- To ensure compliance to FCC rules and regulations, Arrista recommends that trained technicians install this product.
- The SignalReach CR100 does not come packaged with cabling or any antennae. In order to satisfy FCC regulations pertaining to Maximum Permissible Exposure, specified antenna gain (dBi) for the outdoor donor antenna should be limited to 18 dBi or less, while the gain of the indoor subscriber antenna should be limited to 9dBi or less.
- When servicing or installing transmitting elements (i.e. antennae), all transmitting signal sources should be turned off to minimize exposure to non-ionizing radiation as mandated by FCC MPE requirements.
- During normal operation general public shall maintain a distance of 50 cm from any outdoor radiating donor antenna as well general public shall maintain a distance of 20 cm from any indoor radiating subscriber antenna.

Select a suitable location for the in-building subscriber antenna, and connect it to the primary port of the repeater (using a second length of 50-ohm cable if necessary).

If a second subscriber antenna is to be used, select a location that is at least 16 meters (55ft) away. Obviously, to maximize coverage area, it would be better to locate the two subscriber antennae in opposite directions. Once the antenna is connected, adjust the sliding switch to enable the secondary subscriber port,

If only one in-building subscriber antenna is to be used, flip the switch to disable the second subscriber port.

Verify all cables are connected properly and connect the provided AC to DC adapter to the unit. The power LED will illuminate, and the FAULT LED should briefly flash and then extinguish. If the FAULT LED remains on, it indicates an isolation (i.e. re-generative feedback) problem with the unit.

If the FAULT LED remains off, the repeater is now ready for use. The unit

has an open collector output than can relay the fault condition to an external device. This uses the third pin in the power connector. This pin is rated at 12V, 200mA and is at ground potential when a fault condition exists.

Product Maintenance

The CR100 does not require maintenance, as long as the it is properly installed following the guidelines stated in this manual. Arrista recommends that all RF connectors be periodically checked for corrosion, strain relief, and the integrity of power connections

Operation

The in-building repeater operates automatically and does not require user intervention. There are no user controls, except for a sliding switch to allow a user to connect additional subscriber antenna on the repeaters secondary port for increased coverage area.

The front panel has two system status lamps. A green 'Active' lamp indicates that the repeater is operating. An amber 'Warning' lamp indicates reduced performance.

Troubleshooting

Once installed, the repeater unit should give you years of service without requiring any maintenance. Indicator lights on the unit will tell you if it is functioning properly.

Symptom	Cause	Action
Fault LED is on steady, power LED is on.	The repeater is operating with reduced gain, usually a result of poor isolation between the subscriber and donor antennae; or between the two subscriber antennae.	Check both subscriber and donor antenna and cable. Relocate the indoor and/or outdoor antenna so they are further apart.
Fault LED is flashing, power LED is ON.	The repeater's temperature is abnormally high and is operating in a reduced performance mode	Determine the cause of the overheating. Is the unit installed in a hot environment with inadequate airflow? Relocate the unit

Specifications

RF Specifications

	Uplink	Downlink
Frequency Range	824-849 MHz	869-894 MHz
Maximum Output Power [1]	+ 20dBm	+15dBm
Maximum Gain	60 dB	60 dB
Poor Isolation Detection & Warning Indicator	If re-generative feedback between indoor and outdoor antennae is detected, condition will be indicated with an amber LED indicator	
Maximum Possible Exposure (MPE)	Human exposure to non-ionizing radiation meets or exceeds the permissible FCC mandated MPE specification	

[1] The RF output power specification is for a multi-carrier environment of up to 3 simultaneous TDMA carriers or 1 CDMA Carrier

General Specifications

Power Requirements	120V AC adapter included
Remote Alarm Output	An open collector output, third pin in the power connector. Contact rating: 12V, 200mA. Sense: ground potential on fault condition.
Operating Temperature Range	-40 to +60°C (-40 to 128°F), indoor use only
Dimensions	161mm L x 152mm W x 33mm H (6.38” L x 5.98” W x 1.30” H) without RF connectors
Net Weight	1.5 kg (3.2 lbs)
RF Connectors	TNC Female
Subscriber Antenna	Customer Supplied
Donor Antenna1	Customer Supplied
Included Accessories [2]	120V AC adapter, the adapter complies to UL and CSA safety standards
Optional Accessories	Power Inserter