



coverage made simple

## **Subject: Operational Description of ZEN 1900**

The ZEN 1900 Intelligent adaptive repeater operates in the 1900MHz PCS bands, for indoor RF signal enhancement. The system consists of a Network Access Unit (NAU), which receives and transmits RF signals to the base station and an indoor coverage unit (CU), which receives and transmits RF signals to wireless devices.

The Network Access Unit (NAU) has a maximum gain of 42dB, excluding antenna. On the downlink, the NAU applies the maximum gain for receive signals  $\leq$ -60dBm EiRP. For receive signals  $>$ -60dBm EiRP, the NAU implements automatic gain control for a leveled output power of -9dBm. All gain control is applied at the RF frequency and no down conversion is implemented. On the Uplink, the NAU applies the same gain as the DL for a maximum gain of 42dB, excluding antenna gain. The uplink circuitry of the NAU implements AGC if the output RF level reaches +18dBm. The NAU maintains a leveled RF output power at +18dBm on the uplink. All gain control is applied at RF frequency and no down conversion is implemented. The NAU has an integrated antenna with a directivity of +9dBi. The maximum radiated output power on the uplink by the NAU is +27dBm EiRP.

The Coverage Unit (CU) receives RF signals from the NAU via the coax cable and applies a fixed gain of +18dB on the downlink for a maximum RF output level of +3dBm. The CU also receives RF signals from the mobile devices and applies a gain of +18dB before conducting the same RF signal to the NAU. The CU has an omni-directional antenna with directivity of 0dBi in the azimuth plane. The maximum radiated output power on the downlink by the CU is +3dBm EiRP.

The coax cable between the NAU and the CU has a cable loss of 6dB.

### System Operating ranges

#### DL Operation

DL Minimum input Level	DL Low input level	DL Max Input Level	DL Gain at Min input	DL Gain at Low input	DL Gain at Max input
-95dBm EIRP	-60dBm EIRP	-40dBm EIRP	63dB	63dB	43dB

The leveled downlink output is +3dBm for maximum composite rated output power. The nominal antenna gain at the NAU receive input is 9dBi for the PCS band. The antenna gain at the CU downlink output is 0dBi nominal.

#### UL Operation

UL Minimum Input level	UL Low Input Level	UL Maximum Input Level	UL Maximum composite Output Power	UL Gain
<-65dBm	-36dBm	<-10dBm	27dBm EIRP.	Controlled by DL gain; Max Gain = 63dB and Min Gain = 37dB, including antenna gain

The maximum rated UL output power is +27dBm EIRP for all downlink input range.

#### NAU Tune-Up Procedure and DC voltage of the last stage Amplifier

The final amplifier stage in the downlink is a linear RF amplifier part number AM50-0012 (see attached PDF data sheet). This device is operated at a supply voltage of 5V, and current of 100mA. (This device is displayed on the schematics as U37). The input to the final stage amplifier is controlled by AGC attenuators, which in turn are controlled by the micro-controller such that the DL output is only  $\leq$ -9dBm. The downlink output from the NAU is transmitted down the coax cable to the CU.

The final amplifier stage in the uplink is a linear HBT amplifier, part number AWT6131 (see attached pdf data sheet). The device is operated at a supply voltage of 3.5vdc draws 200mA when operating at maximum rated output power. (This device is displayed in the schematics as U8). The UL output is controlled by the AGC attenuators, which in turn are controlled by the micro-



controller. The total composite output power on the UL never exceeds +18dBm at the duplexer port feeding the antenna.

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#### **CU Module**

#### **CU Tune-Up Procedure and DC voltage of the last stage Amplifier**

The CU applies a constant +18dB RF gain on both the downlink and the uplink. The last stage amplifier on the downlink output is MNA-6 (see attached pdf data sheet). The device is operated at a supply voltage of 5vdc at 95mA. The same amplifier is used for the last stage amplification on the uplink of the CU.

#### **Integrated PCS and Cellular Antennas**

The ZEN 1900 is provisioned with a wide band integrated antennas for the PCS band. The antenna gain on the NAU has a maximum gain of 9dBi. The antenna gain on the CU has a nominal gain of 0dBi.

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