Statements of Compatibility with New FCC Rules Pertaining to Scanning Receivers (ET Docket 98-76)

WiNRADiO Communications produces scanning receivers which cannot be modified in order to receive cellular frequencies. This is achieved by a combination of several key design features described in detailed statements below.

(1) Statement assessing the vulnerability of WiNRADiO receivers (series WR-3000) to possible modifications and describes design features that prevent modifications of the receiver to receive cellular transmission (15.121 (a) (1)).

On the lowest level, the cellular frequency blocking is done inside a ROM-based (non-reprogrammable) micro-controller which resides on the WiNRADiO controller card. This micro-controller is used to control the parameters of the Phase-Locked Loop synthesizer of the receiver.

All input parameters which could potentially lead to the synthesis of a cellular frequency are intercepted and disallowed. This means that even third party PC-resident controlled software (which in any case would be very difficult to develop without a detailed knowledge of internal registers and command codes of the micro-controller chip) could not access the cellular frequencies.

The micro-controller disallows any frequencies within the frequency ranges 824-849 and 869-894 MHz by rejecting any combination of PLL parameters which would lead to the synthesis of these frequencies.

The PC-based control software (which is necessary to be able to operate the receiver) provides additional protection by disallowing keyboard entry of illegal frequencies. If any attempt is made to tune into any frequency within the restricted ranges, a message is issued on the screen: "Illegal frequency", thus further enhancing the low-level blocking effect of the micro-controller.

This dual blocking scheme has been used successfully in our earlier models of WiNRADiO receivers over several years, and no trespassing has ever been observed or reported.

No modifications of the RF circuitry can “open up” the cellular band. There are two reasons for it:

a. Bandpass filtering in the intermediate frequency amplifiers (which determine the outband rejection ratio) is given by specialized crystal and ceramic filters whose removal will cause the receiver to stop functioning. It would not be possible to achieve reception by attempting to reduce the image rejection ratio of the receiver.
b. Even if this was possible to change the characteristics of the filters, the receiver frequency plan was specially designed in such way, that no images of the cellular band frequencies can received at any combination of the VCO and IF frequencies (this is described in greater detail below).

(2) Statement that describes the design steps taken to make tuning, control and filtering circuitry inaccessible (see 15.121 (a)(2)).

Tuning and control of the WiNRADiO receivers is accomplished using a microcontroller chip which is one-time programmable and cannot be reprogrammed (note this is ***not*** a FlashROM chip).

The filtering circuitry consists of a number of IF amplifiers which use specialized custom-made crystal and ceramic filters. There are no commercially available replacements of these filters which would cause reduction of the receiver image rejection ratio, or enabled cellular reception using other means.

Even if the image rejection ratio was somehow reduced, this still would not allow the reception of cellular frequencies, as the frequency plan of the receiver is designed in such way that images of the cellular bands fall outside of the IF frequencies.

The following table shows the situation. (RFmin/Rfmax are the input ranges of the receivers, IF is the intermediate frequency, LO min/max are minimum and maximum local oscillator frequencies used for a range, and Imag min/max are image frequencies that can be received. All frequencies are in MHz.) It is obvious that no frequencies within 824-894 MHz range can be received as an image for any of input frequencies.

RF min	RF max	IF	LO min	LO max	Imag min	Imag max
0.150	0.945	556.325	556.475	557.270	**1112.800**	**1113.595**
0.950	1.795	556.325	557.275	558.120	**1113.600**	**1114.445**
1.800	29.995	556.325	558.125	586.320	**1114.450**	**1142.645**
30.000	117.995	556.325	586.325	674.320	**1142.650**	**1230.645**
118.000	399.995	556.325	674.325	956.320	**1230.650**	**1512.645**
400.000	807.995	249.125	649.125	1057.120	**898.250**	**1306.245**
808.000	1113.995	249.125	558.875	864.870	**309.750**	**615.745**
1114.000	1500.000	556.325	557.675	943.675	**1.350**	**387.350**

A down converter covers the range 1500 to 4000 MHz as follows:

RF min	RF max	LO	IF max (min)	IF min (max)	Imag max (min)	Imag min (max)
1500	2600	2700	1200	100	**3900**	**2800**
2600	4000	2500	100	1500	**2400**	**1000**

Again, the 824 to 894 MHz frequency range cannot be received on the image for any of the input frequencies.

Furthermore, **the following calculations show that it is not possible to receive frequencies within the ranges of 824-849 MHz and 869-894 MHz by mixing the harmonics of the LO fundamental frequency and the cellular phone signal.**

RF	IF	LO = (RF + IF)/3		RF	IF	LO = (RF + IF)/3
824.000	556.325	**460.108**		824.000	249.125	357.708
849.000	556.325	**468.442**		849.000	249.125	366.042
869.000	556.325	**475.108**		869.000	249.125	372.708
894.000	556.325	**483.442**		894.000	249.125	381.042
RF	IF	LO = (RF + IF)/5		RF	IF	LO = (RF + IF)/5
824.000	556.325	**276.065**		824.000	249.125	214.625
849.000	556.325	**281.065**		849.000	249.125	219.625
869.000	556.325	**285.065**		869.000	249.125	223.625
894.000	556.325	**290.065**		894.000	249.125	228.625

The LO frequency required in order to receive the cellular service falls out of the operating range of the LO which is 556.475 to 1057.125 MHz.

All radio frequency circuits are contained within a tight, metal-stamped enclosure which cannot be easily opened without a high likelihood of damaging the receiver. In any case, even if this enclosure is opened, the user cannot gain access to any circuits the modification of which would result in reception of the cellular frequencies.

(3) 38dB rejection ratio test data and description of test method to determine compliance with the 38dB rejection ratio.

As shown above, the frequency plan of the receiver is such, that no images of frequencies in the range 824-849 and 869-894 MHz fall within the IF frequencies of the receiver. The image rejection ratio for these frequencies is much higher than that required typically 100dB.

The following test has been done to verify this:

An 824 MHz –30 dBm FM modulated signal was applied at the input of the test receiver. The entire range of the receiver was scanned in the receiver's scanning mode. The signal was not found on any frequency. The generator frequency was

then incremented by 1 MHz, and the entire process was repeated to cover the entire cellular range 824-849 and 869-894 MHz.

(4) New label with the required wording as per (15.121 (f)).

WARNING: MODIFICATION OF THIS DEVICE TO RECEIVE CELLULAR RADIOTELEPHONE SERVICE SIGNALS IS PROHIBITED UNDER FCC RULES AND FEDERAL LAW.

This label will be made of plastic material and attached to the equipment by permanent adhesive. It is not readily detachable and will not deteriorate during the lifetime of the equipment.