Softrónica
Ing. Electrónica Software y Comunicaciones

NOISE CANCELLING WITH RIDEL5000 GATES

Application Note

EHAG
ELECTRONIC HARDWARE AG
Industriestr. 8 CH-8618 Oetwil a/S.
T: +41 43 844 94 00 info@ehag.ch
F: +41 43 844 94 01 www.ehag.ch

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Index

1 INTRODUCTION

The presence of electromagnetic noise in different enviroments, coming from motors, inverters, and other electrical equipment has been traditionally a source of problems in the setup of RFID products. This is particularly true in long range RFID systems.

The coupling mechanism of the interferring signal has to be found in order to be able to reduce the interference effects. If the noise is being coupled through common impedance, induction on the cabling, or mains coupling, filtering, shielding and improving the ground scheme will be the ways to reduce the coupling factor.

But if the noise is affecting the system through the RFID antennas, and the noise is «in band», there were no simple and effective way to improve the performance of the whole system.

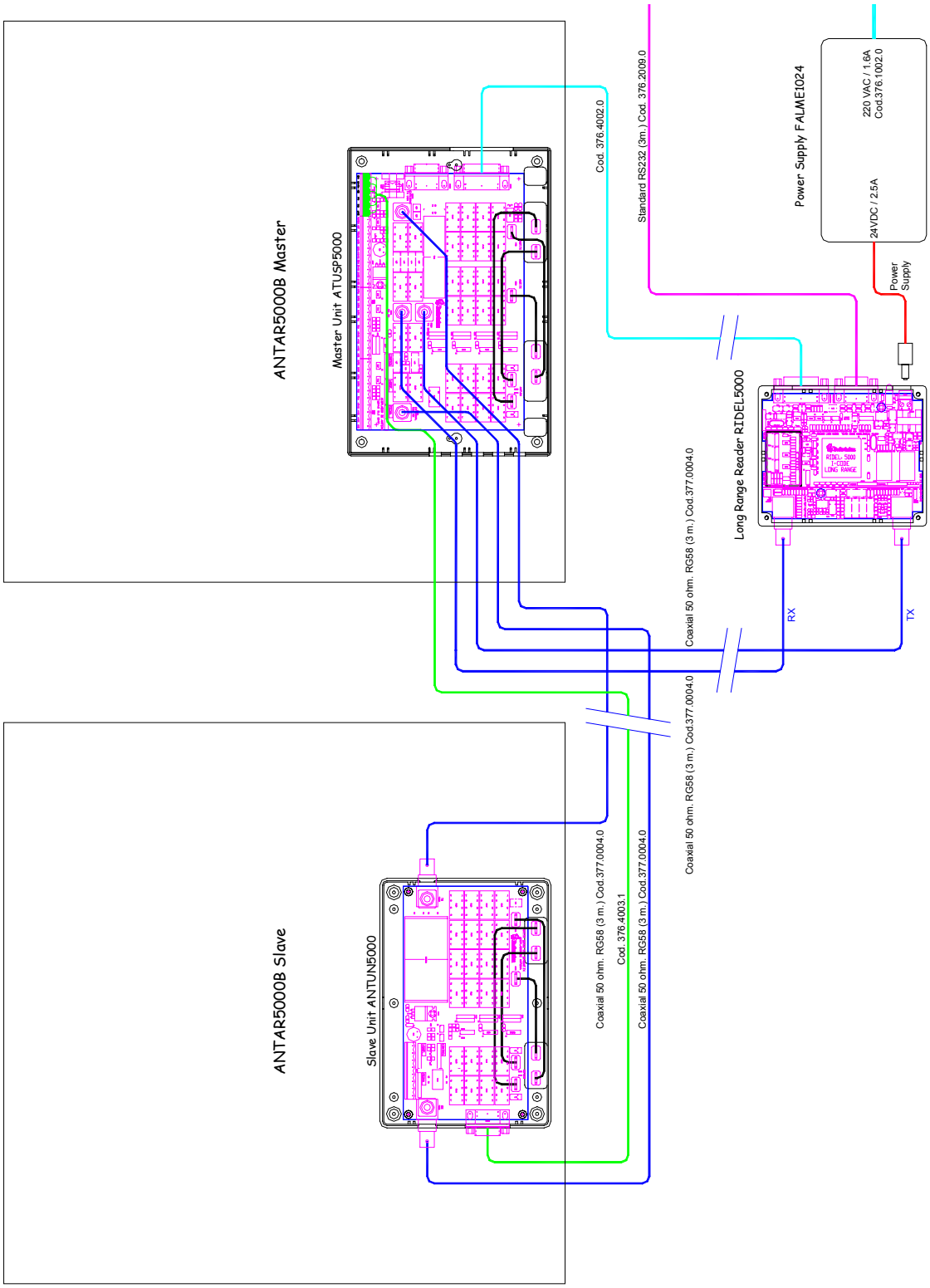
This method of noise cancelling takes into account the use of two separate combined transmission/reception antennas, and the use of a tuning unit for both reception antennas. Those features are typical in Softrónica range of RFID equipment.

It is assumed in the rest of the document that the demo program is used to control the equipment.

2 SYSTEM DIAGRAM

The minimum system configuration will be that of a standard «gate» with atuomatic tuning units for reception and transmission in both antennas. In the following diagram a ANTAR5000 gate can be seen, but the same procedure could be applied to a ANTLR5000 gate. See the ANTLR5000 GATE CONFIGURATION SETUP PROCECURE (cod. 115.0010.0) or the ANTAR5000 GATE CONFIGURATION SETUP PROCEDURE (cod. 115.0009.0) for details on the setup of this standard systems.

It is important to remember that the ANTAR5000 and the ANTLR5000 or ANTLR4000 models of antennas include separate reception and transmission antennas in the same enclosure.

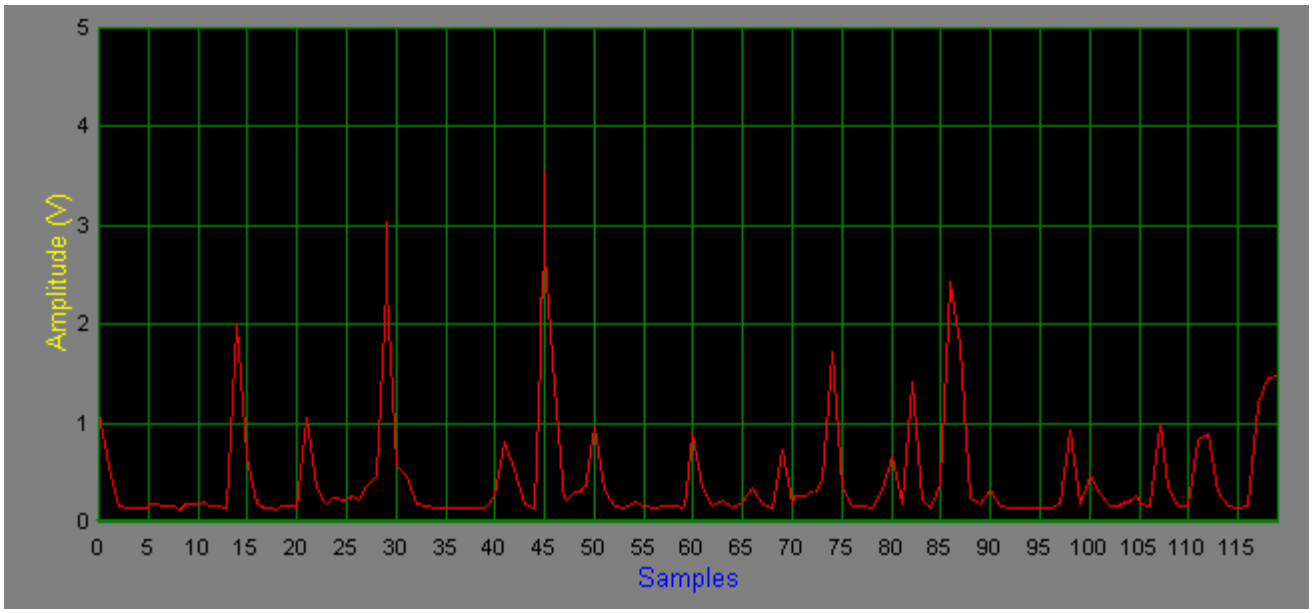

ANTAR5000B Master
Master Unit ATUSP5000
Cod. 376.4002.0
Standard RS232 (3m.) Cod. 376.2009.0
Power Supply FALME1024
220 VAC / 1.6A
Cod.376.1002.0
24VDC / 2.5A
Power Supply
Long Range Reader RIDEL5000
Coaxial 50 ohm. RG58 (3 m.) Cod.377.0004.0
RX
TX
Coaxial 50 ohm. RG58 (3 m.) Cod.377.0004.0
ANTAR5000B Slave
Slave Unit ANTUN5000
Coaxial 50 ohm. RG58 (3 m.) Cod.377.0004.0
Cod. 376.4003.1
Coaxial 50 ohm. RG58 (3 m.) Cod.377.0004.0

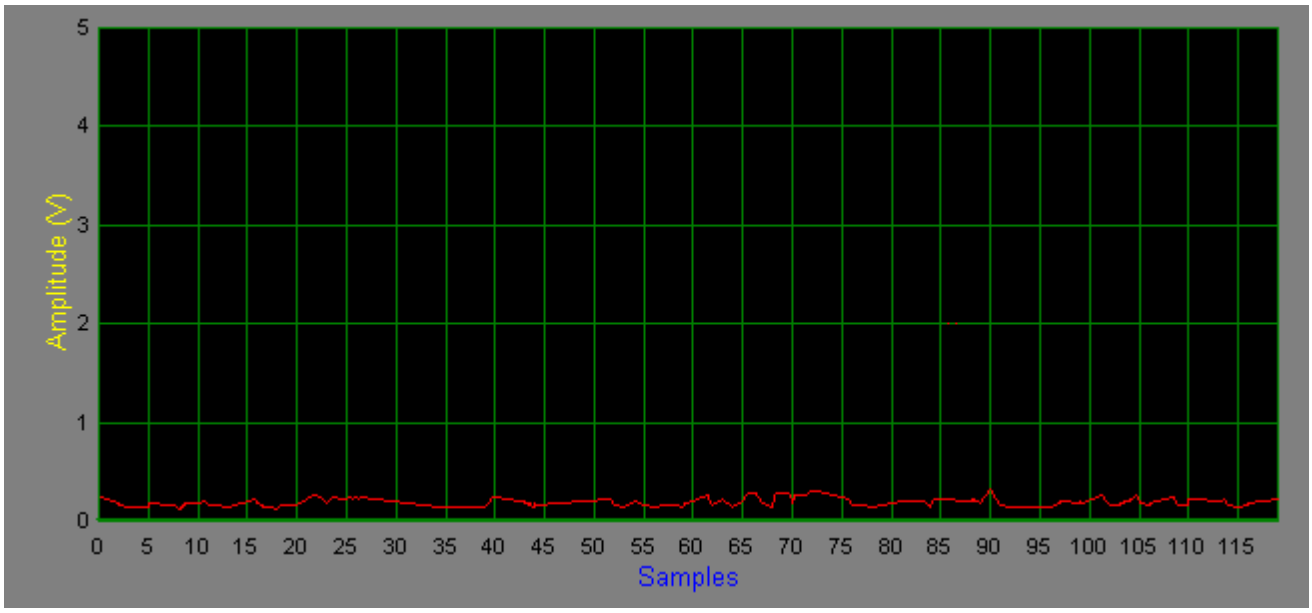
3 THEORY OF OPERATION

The operation is based on noise cancelling by phase shifting of the receiving antennas. The tuning of one of the receiving antennas is slilghtly changed in such a way

4 ANTENNA NOISE EVALUATION

The received noise level can be estimated with the demo software in the RX CONTROL wilndow. Pressing the AUTOMATIC UPDATE button, it will be possible to see the demodulated RX signal. If there is no tag present in the field, the signal should be in the bottom of the screen without any spike. The first drawing shows the signal in presence of moderate-to-high noise, while the second shows a clean signal.

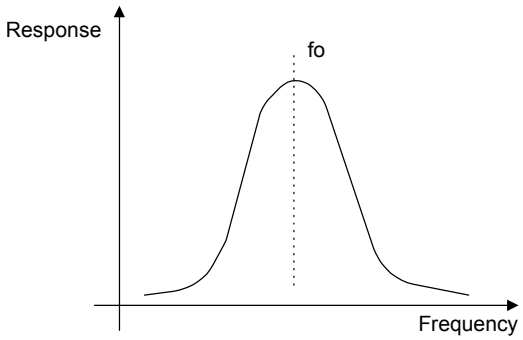




To be able to discriminate if the signal is being coupled through the antenna, the RFIN cable to the RIDEL5000 will be disconnected. If the noise dissapears after this operation, the antenna is picking the noise.

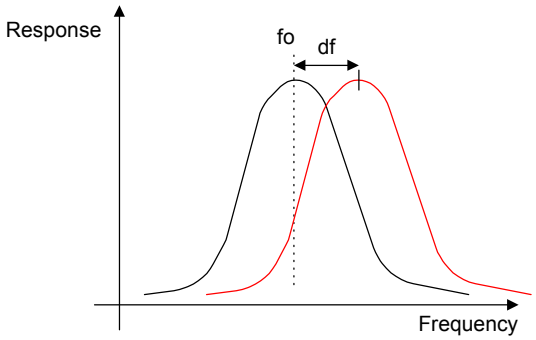
5 THEORY OF OPERATION

The response of the RX antennas can be seen on the following diagram:



This response is the same for both antennas when they are tuned, being the center frequency (fo) the receiving frequency, 13.137 or 13.983 MHz for ICODE.

By shifting the frequency of one of the antennas, the new situation is depicted next:



It can be seen that the center frequency of one of the antennas is moved a certain **df**, so that it is no longer centered at the receiving frequency. While the other antenna is picking the signal and the noise, this antenna is used as a reference for the noise. If the shift is selected so that the noise phase difference is 180º between both antennas, the noise will result cancelled.

6 OPERATIONAL PROCEDURE

The steps described next will be followed to obtain the best signal to noise ratio in a certain noisy environment.

- Configure the master antenna, by selecting the ATU MODE = 9 in the RX control window in the demo program.
- Set SC RX1 and SC RX2 to 0 in the same window (no capacitance in RX tuning units)
- Place a tag near the master antenna, and monitor the received signal pressing the AUTOMATIC UPDATE button.

- Increase the value of SC RX1 untill a maximum signal level is found on the screen. Write down the value in SC RX1.
- Set SC RX1 to 0 again
- Set ATU MODE=6 to select the slave antenna as active.
- Repeat the same procedure with this antenna and SC RX2.
- Set ATU MODE=0 (both antennas) and put the previously found values for maximum signal in SC RX1 and SC RX2.
- While monitoring the noise (without tag), move SC RX2 value up or down untill the noise level is minimized.
- Check that the performance of the tag is not affected.ç

The new values will be stored in the EEPROM so that the system will maintain this configuration at start-up.