

# A new toy in the Radio Shack: the ICOM PCR-1000 wideband receiver

Rev. 1v1

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Having been lurking for such a device already for quite some time recently I was able to get a second hand ICOM PCR-1000 receiver. This is a “black box” receiver, which features no control panel but a serial port to control it from externally like from a PC or a PDA. As you can see further down in this document there are multiple programs available offering different control panels. Here are pictures of the receiver and the accessories which come with it.

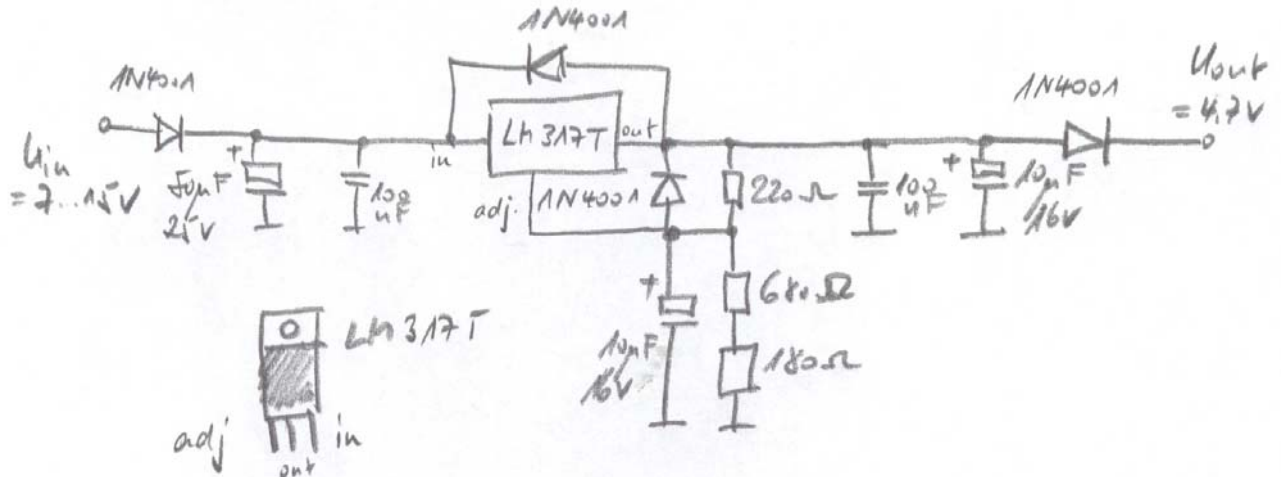


Well, the receiver on its own is pretty useless. It needs to be complemented by hardware and software to make it an efficient tool. In the sections below you will find brief descriptions of add-ons, changes, improvements and software which I made or use with my PCR-1000.

- A Palm IIIc to control the PCR-1000 when a PC is not available
- Software to run on the Palm to control the PCR-1000
- Interfacing the PCR-1000 to a PC and the struggle with USB-to-RS232 converters
- Software to run on Windows XP and control the PCR-1000
- Which antenna to use with the ICOM PCR-1000 ?
- Adding a UT-106 DSP module to the PCR-1000
- Modification of the PCR-1000 for DRM reception
- Windows software for DRM reception
- Summary

## A Palm IIIc to control the PCR-1000 when a PC is not available

When I got the PCR-1000 and noticed its small form factor it reminded me of my old PalmIIIc which was broken and laying in my drawer for years. I decided to fix it and give it a new purpose as a controller for the IC-PCR1000. This would enable me to use the receiver also when I would not want to carry the PC with me to control the PCR-1000. Beside mechanical fixes and a replacement of the outworn Li-Ion rechargeable battery I also decided to add a voltage regulator to the Palm so that I could power the whole setup by 12V DC. Here is the simple voltage regulator circuit I built into the Palm cradle:



As my old PalmIIIc was really broken badly I had to glue it into the cradle. I changed the hot-synch button of the cradle to make it an On/Off Switch because the original On/Off switch of the Palm was broken too. Here are some pictures of this neat setup:

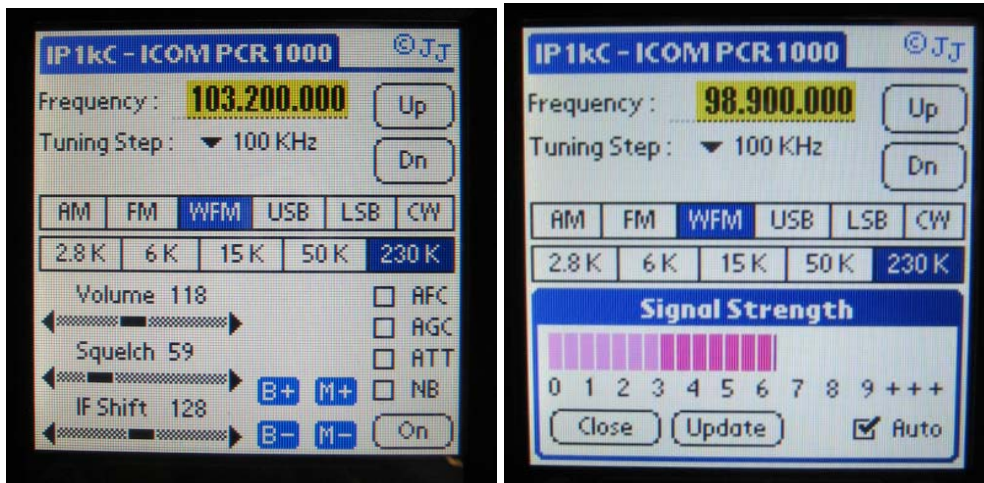


## Software to run on the Palm to control the PCR-1000

There are two excellent freeware programs available for the Palm Pilot to control the ICOM PCR-1000:

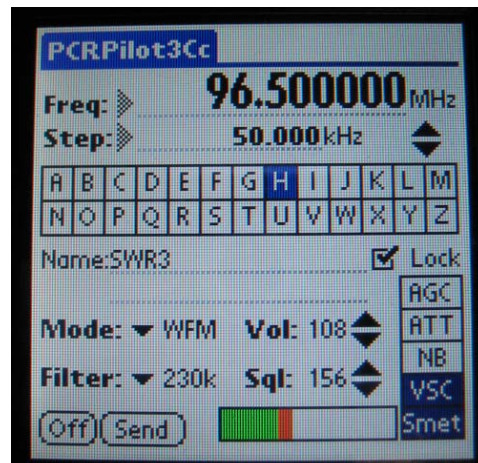
### 1.) IP1kC Version 1.2 by "JJ"

Here is a link to his Homepage: <http://www.geocities.com/jjintokyo/> and this is his Email address: [jjintokyo@hotmail.com](mailto:jjintokyo@hotmail.com). Below please find 2 screenshots of the program:



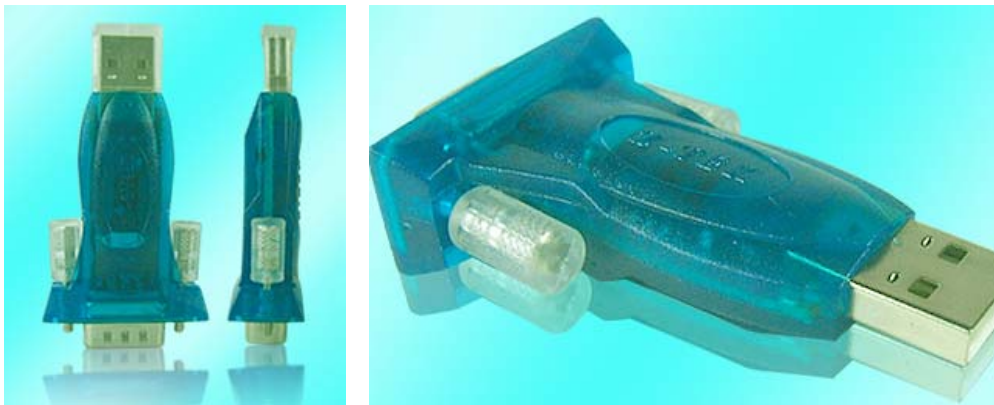
### 2.) PCR Pilot 3Cc by Geoff Wicks VK4KGL

This software seems to be no longer supported. His Email address [gwick@powerup.com.au](mailto:gwick@powerup.com.au) is bouncing. Nevertheless here is a screenshot of the program:



## Interfacing the PCR-1000 to a PC and the struggle with USB-to-RS232 converters

The PCR-1000 wideband receiver features a RS-232 port to control it from a PDA or PC. As most modern laptops are not offering a built in serial port (RS-232) any more the solution is to use a USB-to-RS-232 converter. I had to find out, that not all of these converters work properly with the PCR-1000. I recommend converters using a Prolific chipset (especially the chipset 2303). I specifically do not recommend using a converter with the ARK3116 chipset from ARK Pioneer Microelectronics Inc. (also called ArkMicro). I had trouble using such a converter. Other chipsets from ArkKicro may be ok but I do not know. Below please find pictures of the USB-to-RS232 converter based on the Prolific chipset which I have been using successfully.



The problem with some of the converters is that they initially seem to work but after approximately 10 seconds the communication with the receiver is suddenly interrupted. Furthermore the receiver will switch off after about 20 seconds. My guess is, that the RS-232 port of the ICOM receiver needs also the hardware handshake signals which are not supported by all converters.

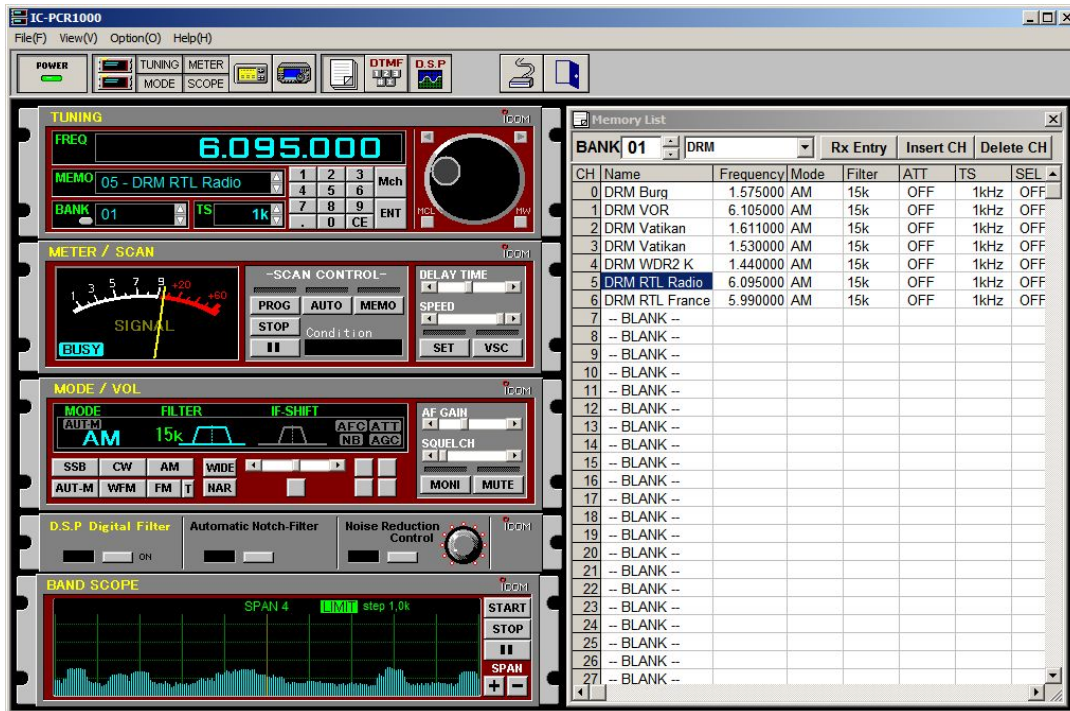
Here is an interesting information I found in the Internet (posted by Ted, WB5REA) which confirms my theory. It addresses the question, on how to keep the receiver on, with no cable or PC connected. It is necessary to pull the DTR (pin 4) and RTS (pin 7) lines high on the RS-232 serial port. This can be a little tricky if it's necessary to unplug the serial cable. A breakout box with the proper connections installed between the receiver and serial cable should work. Just don't unplug the breakout box. It isn't necessary to send periodic commands to the receiver. The receiver definitely 'goes to sleep' after 20 seconds if the serial cable is removed. Another feature is mentioned but isn't used by ICOM: you can force a remote reset of the receiver by pulling and holding the DTR/RTS lines low for approximately 20 seconds. This seems to work just as well as turning the front panel power switch off and back on.

Please note that I have not yet tried these modifications myself .

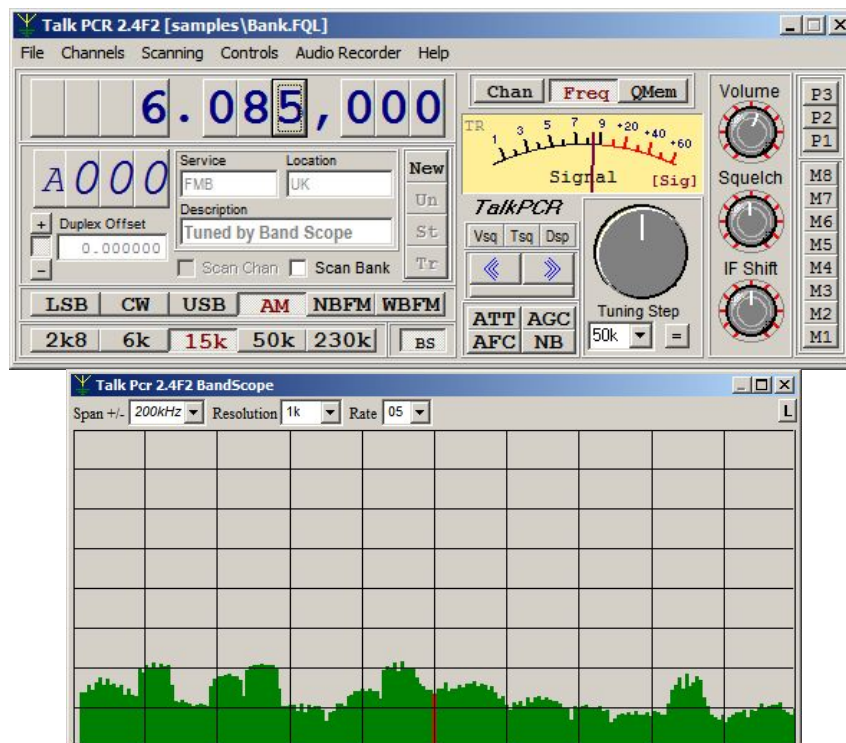
## Software to run on Windows XP and control the PCR-1000

Fortunately there are multiple programs for the Windows PC available and most of them being Freeware. Here are the ones which I tested so far:

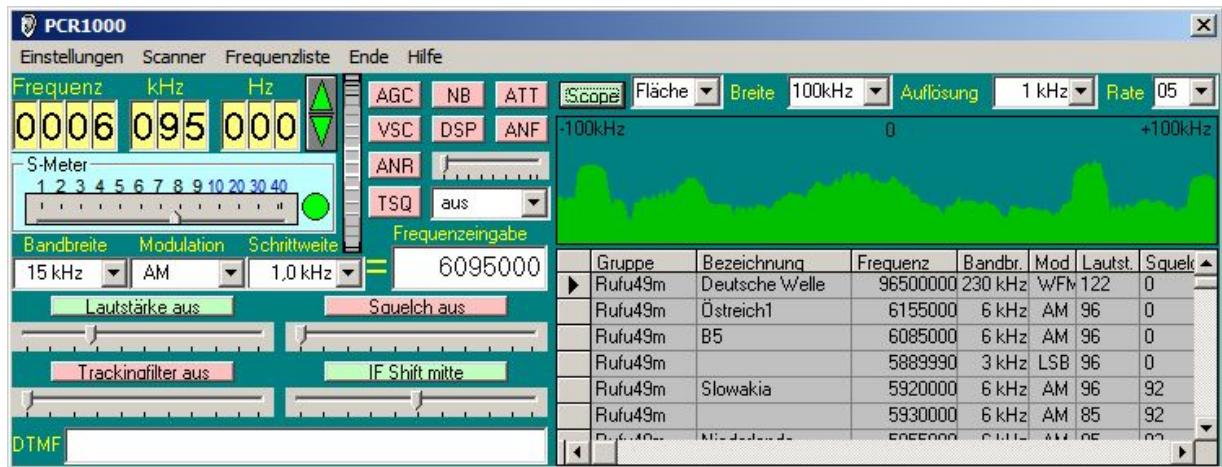
### 1.) The original program from ICOM delivered with the PCR-1000 is IC-PCR1000 v2.2



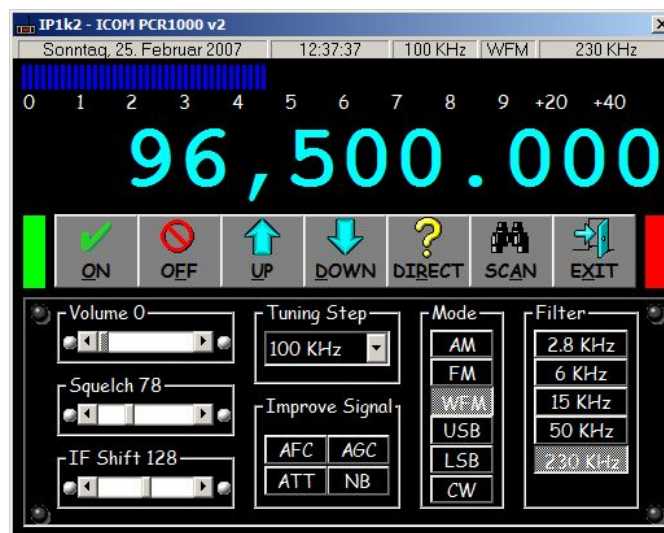
### 2.) TalkPCR v3.0 from P.D. Mahy which is meanwhile declared as Freeware (it can be downloaded from the files section of the Yahoo-Group "ICOM\_PCR1000")



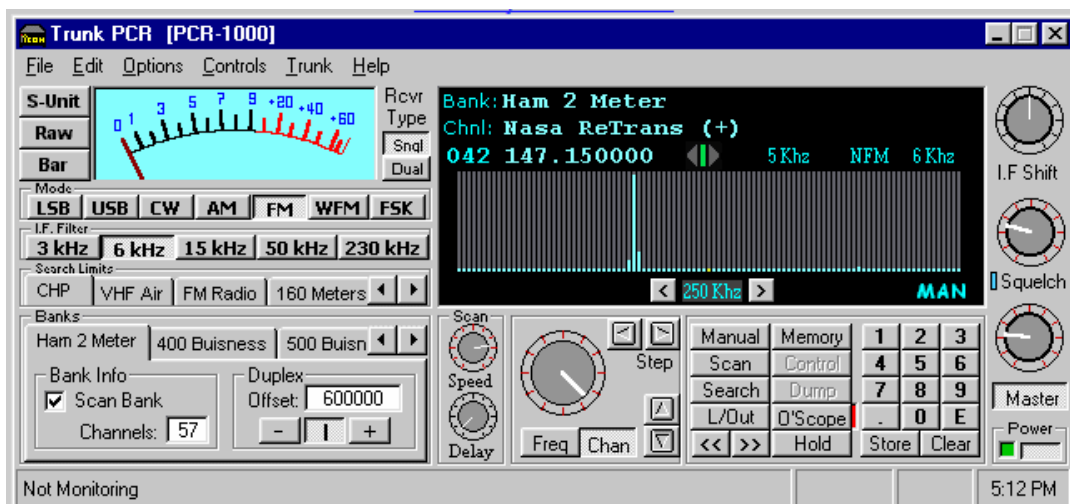
3.) "PCR1000" is a program from Umland Poller ([uhland.poller@t-online.de](mailto:uhland.poller@t-online.de))  
 His homepage can be found at <http://fraureuther.de/html/pcr1000.html>. At his page he also provides a link where his software in German language can be downloaded for free.



4.) IP1kC Vers. 2 by "JJ" for Windows. Homepage <http://www.geocities.com/jjintokyo/>



5.) TrunkPCR1K (<http://members.cox.net/fiftyone.50/TrunkPcr/TrunkPcr.html>)



## Which antenna to use with the ICOM PCR-1000 ?

I experimented with different antennas to find the best compromise with respect to performance and size for the various frequency bands. Of course I was looking for the holy grail which is one small antenna with excellent performance over the full frequency range. Yet I am afraid I did not find it ... but here is what I came up with and works fine for me.

### 1.) The Sony AN-1 active antenna for 100 kHz to 30 MHz

I could buy a second hand Sony AN-1 active antenna which is obsolete. It covers the frequency band from 100 kHz to 30 MHz and is comprised of a telescopic rod and an amplifier in its base. In addition it features a control box which includes a battery compartment. It is important to note, that this antenna needs a negative power supply voltage of -9 Volt referred to ground which is critical when powered from an external power supply.



## 2.) An active Antenna for 50 MHz – 2500 MHz

This vertical antenna is 40cm long with a sealed center-coil and features an RF amplifier built into its base. The gain of this amplifier is specified to be 18dB at 50 MHz, 15 dB at 860 MHz and is estimated to be 3dB at 2500 MHz. Please note that the built in high-pass filter is suppressing signals below 50 MHz and thus avoiding distortion of the amplifier by strong HF signals. It needs a DC supply of typical 6 V, 50mA (max. 9V) which is to be supplied via the coaxial cable. Therefore a Bias-T is needed to add this DC supply to the RF-output. It is included in the set which can be bought in Germany by “MicroConsult Hard- & Software Service GmbH” (Email: [wittsfeld@gmx.de](mailto:wittsfeld@gmx.de)). Here is a picture of this very compact antenna:



I have tested this antenna so far only briefly but have been very happy with its performance. I will post more detailed evaluation results once available.



## Adding a UT-106 DSP module to the PCR-1000

Meanwhile I was able to buy a UT-106 DSP module second hand and built it into my PCR-1000. It features noise reduction as well as a dynamic notch filter which is suppressing unwanted CW tones. It works fine. Unfortunately none of the Palm Pilot programs presently support the configuration of this DSP filter.

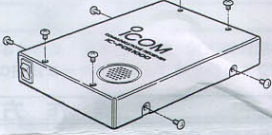


As you can see from the description below it is very easy to build the DSP module in the PCR-1000. There are no special tools like a soldering iron needed. Just a little screwdriver.

### ■ IC-PCR1000

#### INSTALLATION (IC-PCR1000)

① Remove the 8 screws from the cover as shown below. Remove the cover.



③ Remove the connection cable (P1) from J4. Connect the cable to J1 on the UT-106.

④ Plug the connection cable (P1) from the UT-106 into J4.

⑤ Plug the flat cable into J3 on the UT-106 and J3 on the IC-PCR1000.

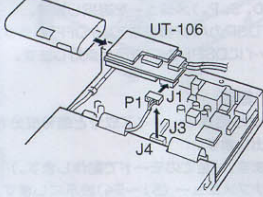
- Take care of the conductor direction.

⑥ Position the UT-106 as shown below.

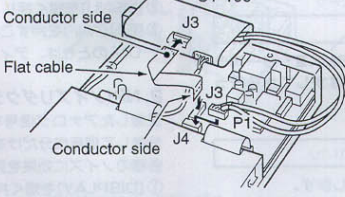
⑦ Replace the 8 screws and cover.

② Slide the insulating case onto the UT-106 as shown below.

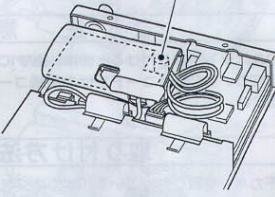
Insulating case



UT-106



Position the UT-106 so that the inside board does not touch this part.



NOTE: The Velcro tape is not used with the IC-PCR1000.

#### OPERATION (IC-PCR1000)

**◇ ANF (Automatic Notch Filter) function**

The automatic notch filter automatically attenuates beat tones, tuning signals, etc., even if they are moving. The automatic notch filter functions in SSB, FM and AM modes.

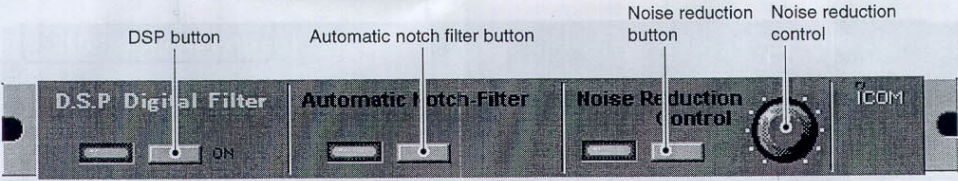
- ① Click the DSP (Digital Signal Processor) component button on the tool bar to display the DSP component.
- ② Push the DSP button to toggle the DSP functions ON and OFF (the LED lights).
- ③ Push the automatic notch filter button to toggle the function ON and OFF (the LED lights).

**◇ NR (Noise Reduction) function**

The noise reduction function reduces noise components and picks out desired signals which are buried in noise. The received AF signals are converted to digital signals and then the desired signals are separated from the noise. The noise reduction functions in all modes.

- ① Click the DSP (Digital Signal Processor) component button on the tool bar to display the DSP component.
- ② Push the DSP button to toggle the DSP functions ON and OFF (the LED lights).
- ③ Push the noise reduction button to toggle the function ON and OFF (the LED and knob readings light).
- ④ Set the noise reduction level for maximum readability. Right-click on the knob to increase the noise reduction level, left-click to decrease it.

  - Deep rotation results in audio signal masking or distortion.



## Modification of the PCR-1000 for DRM reception

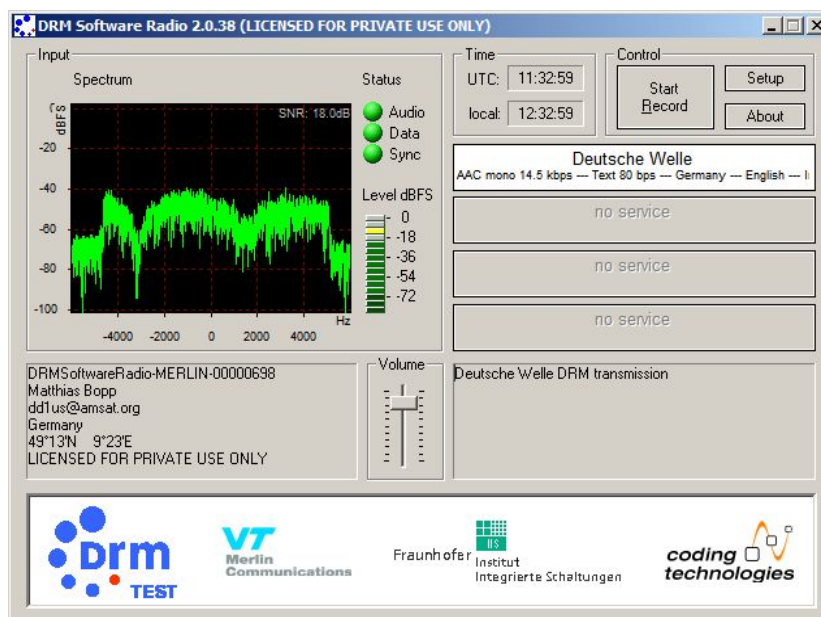
Some years ago I had already modified my ICOM IC-735 HF-transceiver for DRM and was always impressed about the excellent performance of the DRM (Digital Radio Mondiale) transmissions. These are digital transmission using OFDM modulation in the MW and HF bands. I decided to also modify my PCR-1000 and use it for DRM reception. The concept is to use the soundcard of a PC as the demodulator and run the decoding on the PC. The signal in the receiver is down-converted from its final IF of 450 kHz to 12kHz by means of an additional down-converter. This signal is then passed to the sound card input of the PC. Below please find pictures of the little PCB I use, which contains the necessary oscillator and mixer. It is based on a Philips SA612AN integrated circuit. You can buy this little low cost kit from Crispino Messina I5XWW who is very friendly and helpful (Homepage: <http://xoomer.alice.it/i5xww/>, Email: [crispinomessina@virgilio.it](mailto:crispinomessina@virgilio.it) ).



In general I followed the instructions of G. Dobson who published the “Modification of an ICOM PCR1000 For DRM Reception” on February 15<sup>th</sup> 2003. You can download his excellent article at [www.drmtx.org/mods/ICOM\\_PCR1000\\_DRMConversion.pdf](http://www.drmtx.org/mods/ICOM_PCR1000_DRMConversion.pdf)

## Windows software for DRM reception

I bought and use the “DRM Software Radio” at <http://www.drmtx.org/> to demodulate and decode the DRM transmissions using my PC. Here is a screenshot of this excellent and easy to use program. The best SNR (signal to noise ratio) I observed was exceeding 26dB.



As the number of DRM transmissions is growing continuously it is hard to keep track of the schedules. Fortunately C. Knütter wrote a very nice freeware program called “DRM Disco” which shows the schedules and calculates the DX conditions based on the propagation conditions. It automatically updates the schedule and the atmospheric data via the internet. It can be downloaded together with his other programs to analyze the DRM receptions from his homepage <http://home.arcor.de/carsten.knuetter/drm.htm>



## Summary

I like my PCR-1000 a lot and hope that I could get you more interested in getting one too. You have downloaded this information from my homepage [www.dd1us.de](http://www.dd1us.de). Please check it regularly for updated information and give me feedback on what you might want to see in addition. Of course I am especially interested if you have additional tricks you applied to your PCR-1000 to improve its performance or usability. Finally I will be happy to answer any questions you might have.

Please note that I cannot take responsibility that all information in this document is correct and any modifications (whether hardware or software) you might do are on your own risk!

Please feel to contact me by Email using the following address: [dd1us@amsat.org](mailto:dd1us@amsat.org).

With best regards - 55&73

Matthias DD1US