

PM-SDR

Software Defined Radio



Manual
Assembly and Use

Version 1.1 of 23/02/2010 -
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Translated to English by;

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Thanks to the help of Georgina Platt, in this translation.

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Introduction

PM-SDR is a radio implemented in SDR technology, which can cover the range of frequencies between 100 kHz and 55 MHz. The radio comes pre-assembled and requires few simple steps to complete the assembly and finally enjoy the power of its excellent performance. The assembly is not particularly difficult but will make some small adjustments work more profitable and secure.

Warnings

- It is recommended to keep components away from children and pets household hazard if swallowed.
- Do not inhale the fumes of soldering. Use a filter or a device to keep them away by location.
- Ventilate the room after soldering operations.
- Once used the soldering iron, place only after the stylus is very cold.
- Do not weld on live circuits.
- Follow the instructions given in this manual.
- In case of doubt about the procedures used, ask for technical support.
- Do not grope to change parts of the circuit in position.

Before You Begin

The assembly process of the PM-SDR can be facilitated by a few small measures:

- Organize your work space in an appropriate manner.
- Use preferably a wooden table on which lay a sheet of antistatic rubber, to prevent the components fell to the ground bounce.
- Keep necessary tools at hand.
- Use a soldering iron tip in good condition.
- Use a solder for electronics possibly lead free.
- Use preferably a wrist strap connected to the ground closely through a 1 mega ohm resistor.
- The hurry is a bad counselor! Proceed calmly!

Tips for Soldering

To complete the kit is not particularly necessary to have sophisticated soldering equipment. Even with a good soldering iron (at least 30 watts of power) good results can be achieved. The key to the success of the soldering is the state of the tip. Tips ruined, lost the surface layer must be replaced. The tip, when heated, can be effectively cleaned by melting a small amount of solder and then passing it repeatedly on a damp sponge (not wet). The operation cleaning the sponge should be repeated periodically, in order to remove the flux residues and oxides that accumulate on it.

Preferable to use lead-free solder (RoHS), although welds in this case will not have a very bright and could be more difficult to complete. The diameter of the alloy used is simply related to habit. Considering the "step" of the components to be soldered, a solder with maximum diameter of 1 mm should be fully sufficient. Larger diameters can be difficult to manage; smaller diameters may require more sliding of the wire during the merger. It is not necessary to use flux paste or solid, since modern solders have a flux, fusing, performs the same functions of the dough firmly.

Soldering operations must be performed quickly and decisively. Some components (such as quartz) do not like very much that we insist on their leads with a soldering iron. The same applies to the processors. The solder should never be melted on the tip of the welder, but we're on the LEAD component soldering, heating of the same patent. After the merger begins you need to heat briefly (1 or 2 seconds) to complete the merger of flux and to ensure a good electrical contact. Do not overdo the amount which is wound on the leading wires, may be in excess of tin solder unsightly or short out adjacent pins.

Once the soldering phase, you should not blow on the solder. The convection cooling must take place very slowly. Particular attention should be paid to the soldering of the ground planes. In this If the large metal surface has a high heat capacity, and may be complex (especially if the welder is not very powerful) to be able to make a good weld. Even in this case is only a matter of time, induce the tip on the ground plane for a few seconds to warm it slightly and then proceed to use of the alloy solder.

If a mistake is the pond in excess can be removed with the de-soldering braid (Be careful not to burn your fingers too) or with a vacuum tin (or electric pump). Components must be removed when the solder has been carefully removed and use excessive force in their extraction. If the component is forced this will enhance removal of the bond. Using pliers or cutters may have result in irrecoverable damage to the PCB.

Preparation and Construction

The package containing the PM-SDR kit is finally here, so, remembering what was said in the first section, you must provide a space that allows you to plan and work comfortably.

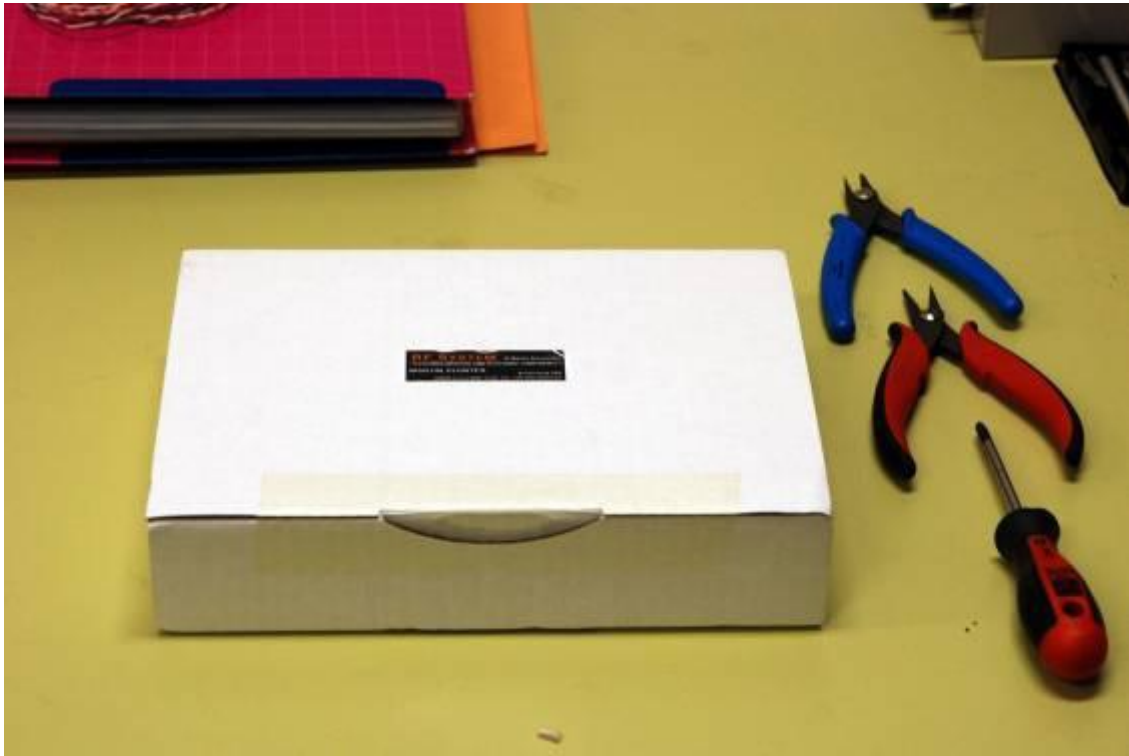


Figure 1 - The plan of work.

We can now proceed to opening the package. Inside, we find some bags packed with components and accessories



Figure 2 - The contents of the package.

Now is the time to recognize the components! The envelopes will be opened and only at the time of their use. If you do not need it, it remains tightly closed, to avoid the component being lost.



Figure 3 - The PCB



Figure 4 - PCB Components



Figure 5 - Contains the box



Figure 6 - Contains the display and the panel front

The whole of the envelope contained in Figure 4, there are numerous components that must find a place on the PM-SDR PCB. Before dealing with the plan for the assembly of components to make sure it is better to know all, to avoid having to go by trial and error in their positioning. In the remainder of the manual, it is assumed that the PCB is bound front of the operator, side connectors. In this way the space for double contacts will be in the top left



Figure 7 - Low Profile Quartz

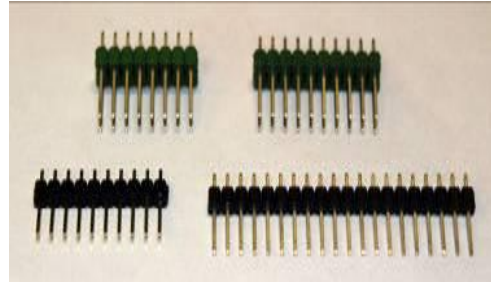


Figure 8 - Contacts



Figure 9 - LED Block

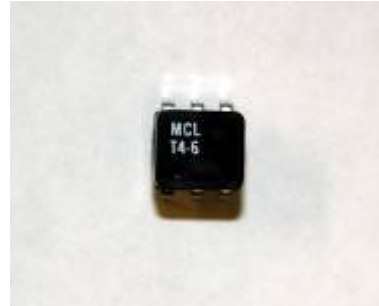


Figure 10 - Transformer



Figure 11 - 3.5mm Stereo Connection



Figure 12 - BNC Connector

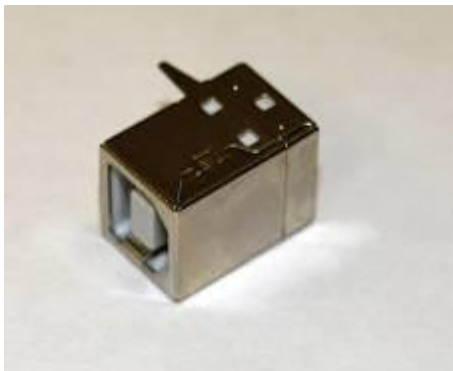


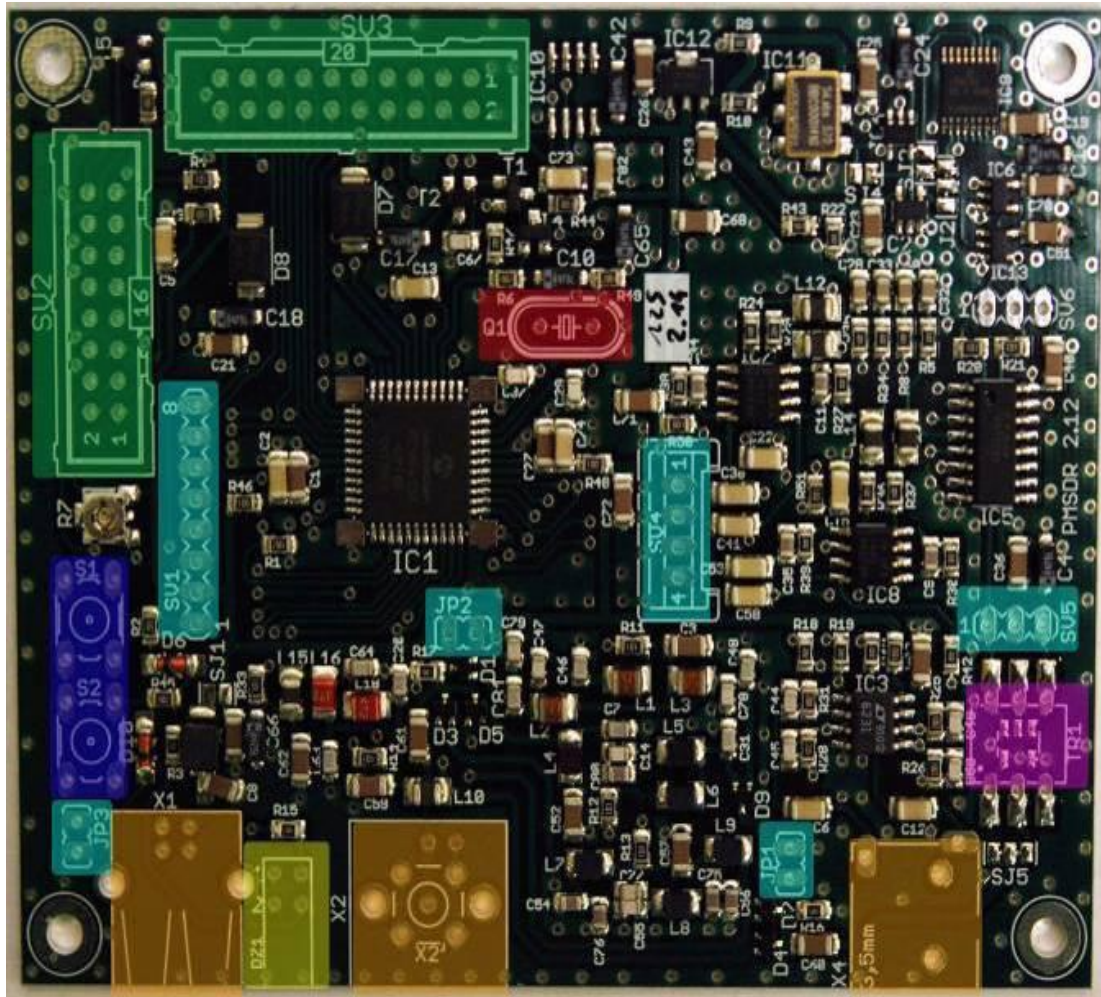
Figure 13 - USB Socket



Figure 14 - Micro Switch

Depending on the supplies that are available for RF-System, the components shown in previous figures may be slightly different from those that will be included in the kit. Once you have identified the components necessary to localize their mounting space.

The operation is greatly simplified by the presence of screen printing on the PCB and the following figure. The figure is shown on a separate page in order to preserve it separate during assembly.



Colour	Component
Red	Quartz Crystal
Yellow	LED Block
Green	Double Contact Station
Blue	Single Contact Station
Violet	Transformer
Orange	Connectors

Assembly plan

The assembly plan that follows has been prepared in order to make it easy to installation of individual components. Playing on their different heights on the printout, it is possible to make a simple rollover of the PCB can be maintained stationary components.

Quartz low profile

Quartz is a rather delicate component. He fears the high temperatures and, despite having a metal container must not be exposed to the soldering iron too long. Penalty is irreversible damage. The crystal should be mounted close to the microcontroller, as shown in detail.



As the first component to be installed we see in detail how to proceed. Insert the leads through holes in the quartz of the PCB. Holding the component with two fingers, flip the PCB on the solder side. The leads will be slightly "open" to maintain a stable component during soldering.

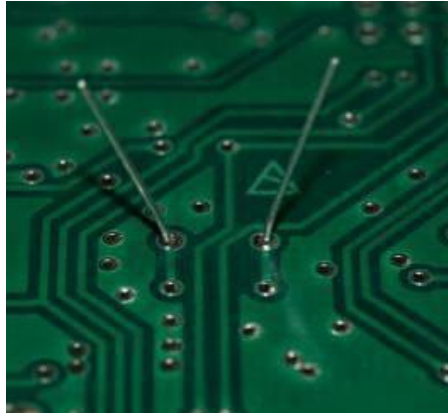


Figure 16 - Detail of the leads.

Once stabilized the component can perform the soldering, remember what has been said about this delicate operation. After soldering the leads, now in solidarity with the circuit, you must submit the following way:

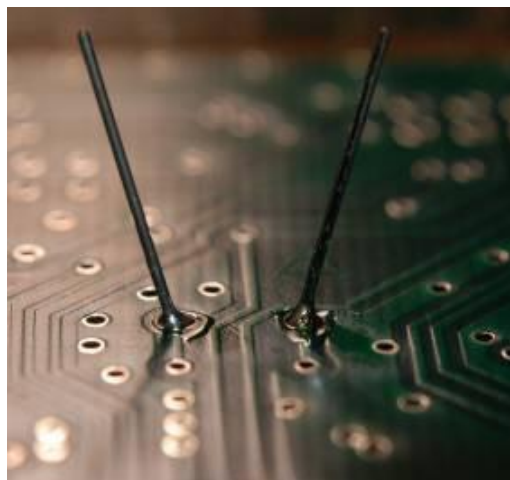


Figure 17 - Soldering completed.

Monitor the quality of the weld can be cut with wire cutters to cut satin, in excess of the leads. You should not exaggerate too much in wanting to reduce the protruding ends from the solder.



Figure 18 - cut wire leads.

Viewed from the side of the quartz components should appear like this:

- Is aligned to the screen printing.
- Plan is perfect.
- A contact with the PCB



Figure 19 - View of the quartz component side

Contact: 2x10 and 2x8 pin

These are two components which are easy. The mount point of the components is highlighted in green.

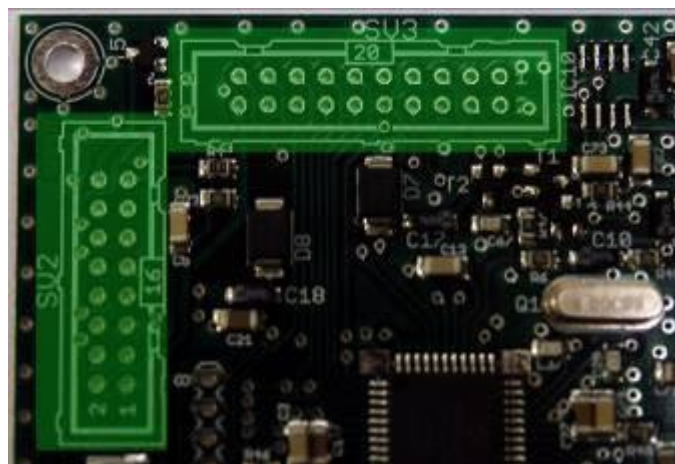


Figure 20 - Location of double contact.

For the soldering of this component it is recommended to proceed by setting two pins diagonally opposite, and then proceeding with the soldering of the remaining legs.

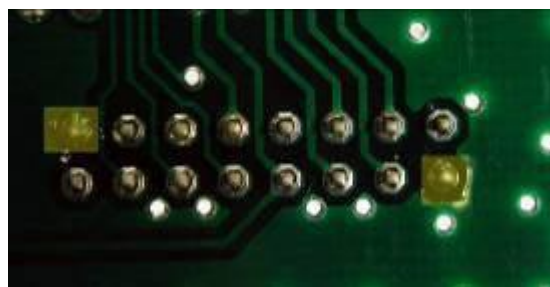


Figure 21 - Solder the diagonally opposite legs

It is recommended to solder quickly, avoiding damage to the plastic that holds the pins and aligned.

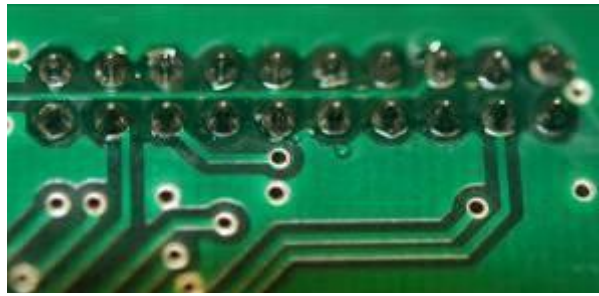


Figure 22 - Completion of the weld.

Once you have finished soldering the connectors they must be completely parallel to the PCB and aligned.

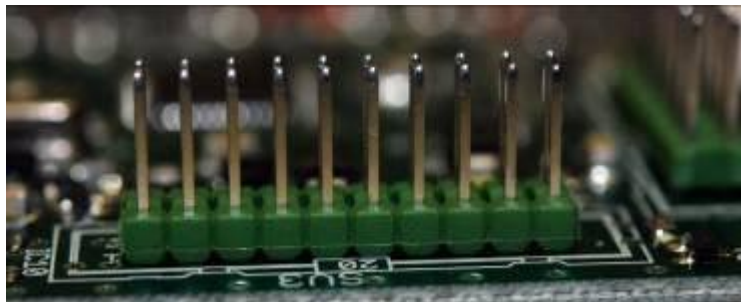


Figure 23 - Result of the assembly.

A view of the board with the connectors mounted.



Figure 24 - Overall view of the connectors assembled

The LED Block

Some small components require a degree of attention to the assembly. The mounting position is shown in the figure.

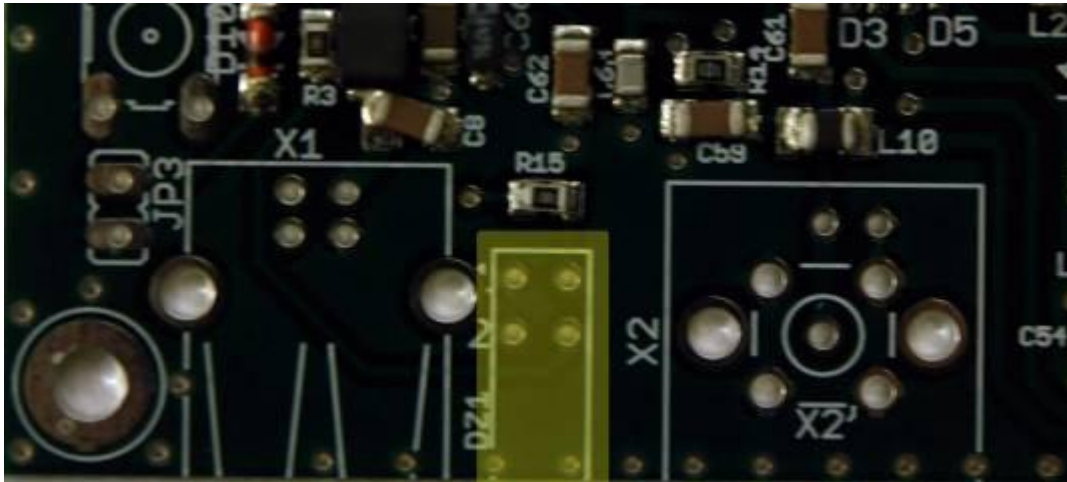


Figure 25 - Mounting led block.

Once inserted the small leads through holes of printed we reverse the board. The component, being quite "high" will be leaning on the countertop. To get a fitting perfectly orthogonal, it must be a mimic of dexterity. It should In fact, press the board on the table with a finger while the thumb and index help dispense the solder.

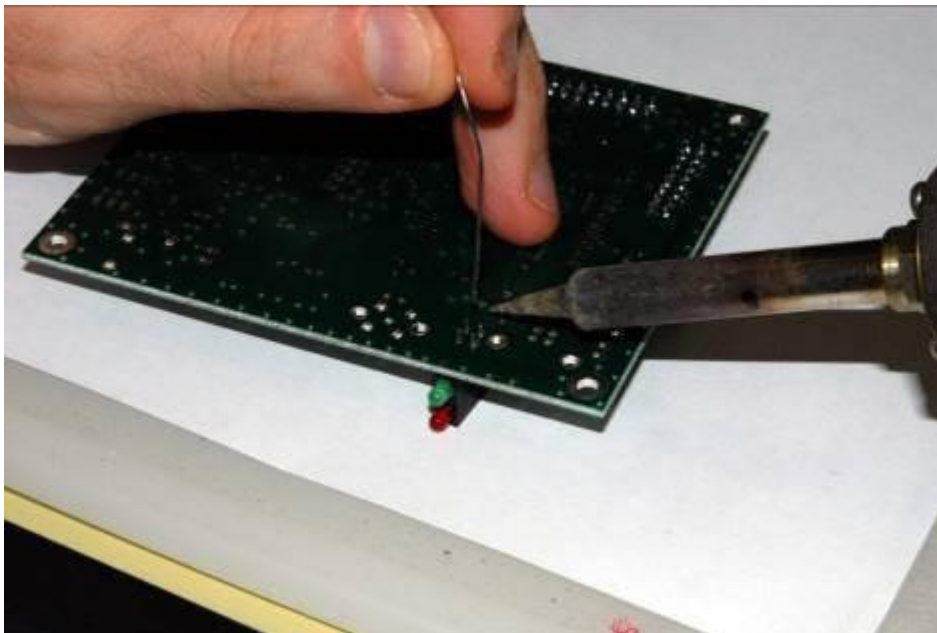


Figure 26 - Solder and hold the board.

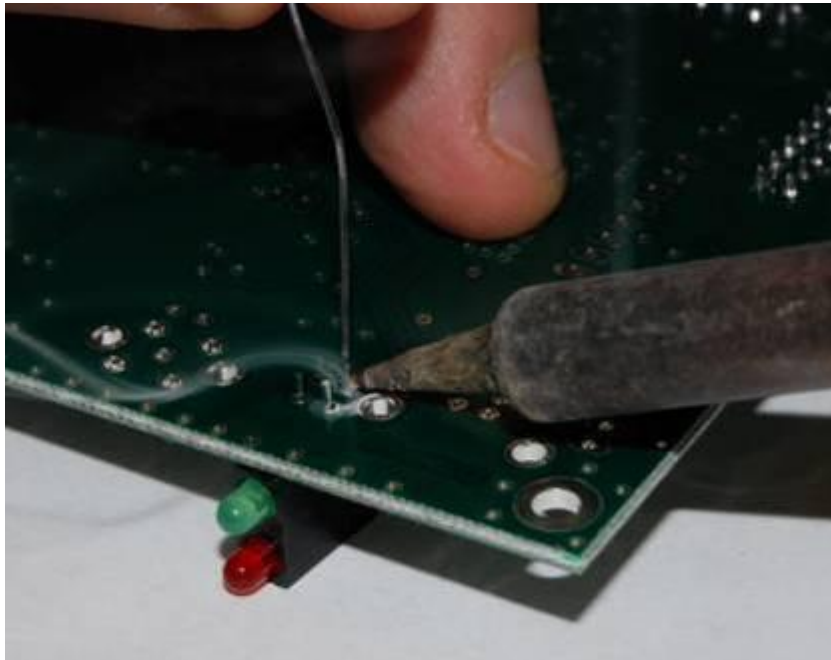


Figure 27 – Soldering Detail

Through figure 28 it is also possible to appreciate the position of the wire alloy solder, which remains far from the tip of the soldering iron and go immediately and affect the lead.

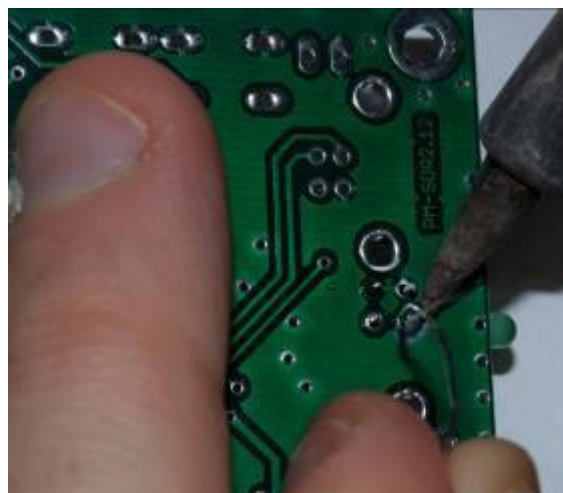


Figure 28 - Location of the solder.

When soldering the component it is perfectly aligned with the circuit.



Figure 29 - Result of the assembly

Contact a single row and jumpers

These contacts are not essential for the normal operation of the receiver, but are planned for future extensions. The contacts and jumpers provided in two strips which must be cut to size using wire cutters.

Install the following components:

- 1 x 8 pin, silkscreen SV1
- 1 x 4-pin, silkscreen SV4
- 2 x 3pin, screen SV5 and SV6
- 3 x 2-pin, silkscreen JP1, JP2 and JP3

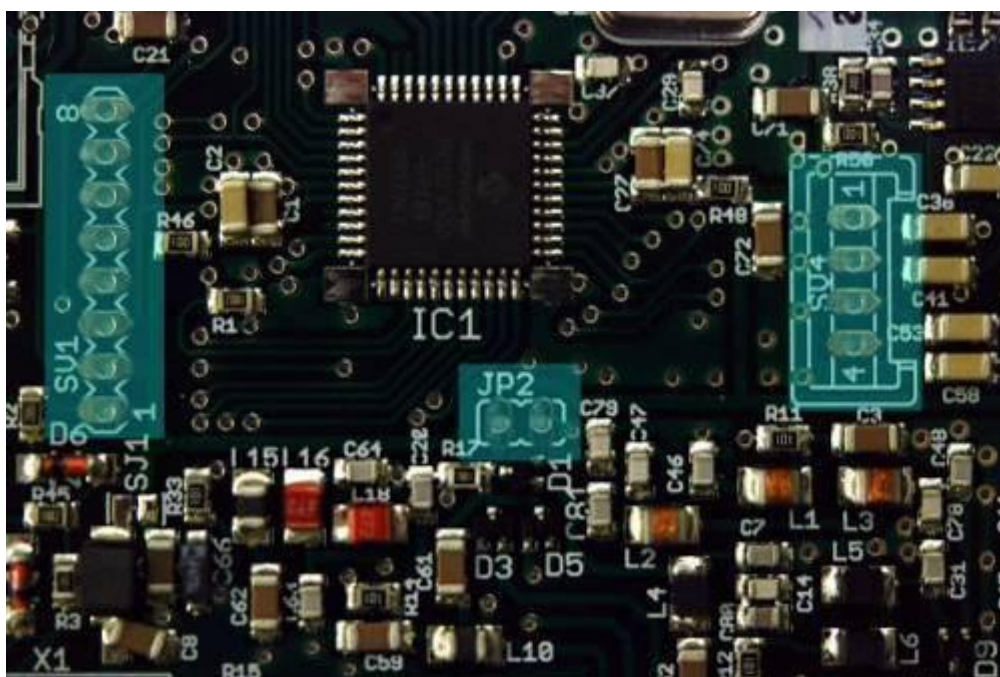


Figure 30 - Location of SV1 and SV4 JP2



Figure 31 - Location of JP3



Figure 32 - Location of SV6



Figure 33 - Location of SV5

Once the components are in position, cut to size the strips of contacts provided in the package.

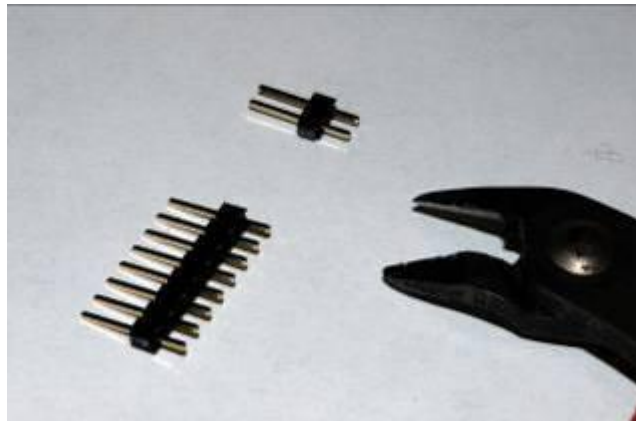


Figure 34 - Separation of contacts with wire cutters.

A small complication to this step comes from the fact that the contacts are components low, so you cannot keep still simply "flipping" the printed. You must enter an object to keep them well down, and possibly orthogonal to the PCB. Use an object that can withstand temperature without melting.



Figure 35 - Use of a thickness to stop the contacts.

To maintain the square contact with the PCB, you can apply a light pressure with a finger, similar to what was done for the installation of LED.

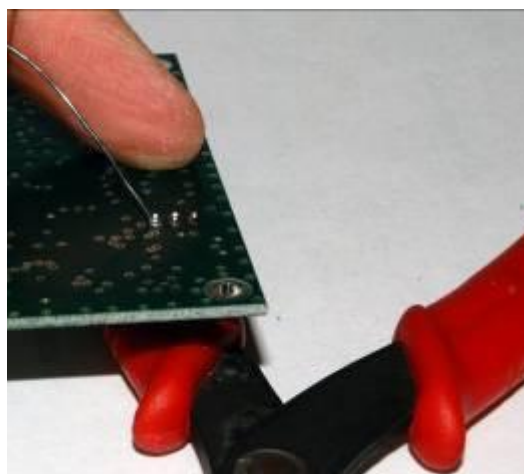


Figure 36 - Application of the pressure and the solder

Once stabilized, the facility can perform the soldering, taking care to keep the tool tip on the pitch and in contact with the lead.



Figure 37 - Location of the tip of the welder.

The Transformer

Component pin dual in-line rather delicate. The positioning of the transformer is shown in Figure 38.

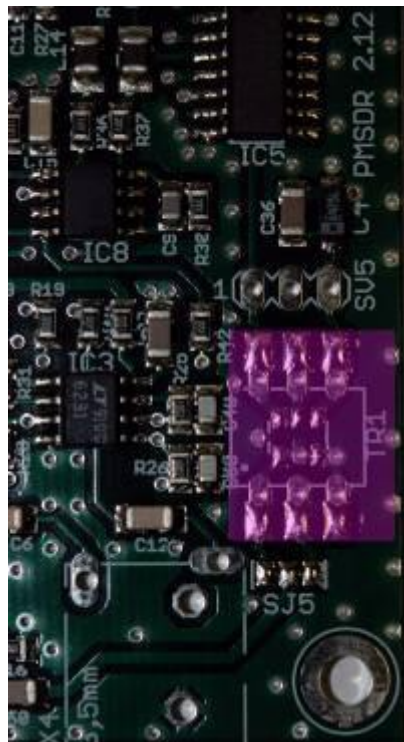


Figure 38 - Location of the transformer.

The transformer is equipped with 6 leads which are quite "wide". It should be very deforming gently press the transformer on the work surface, until it is perpendicular to the body of the transformer.

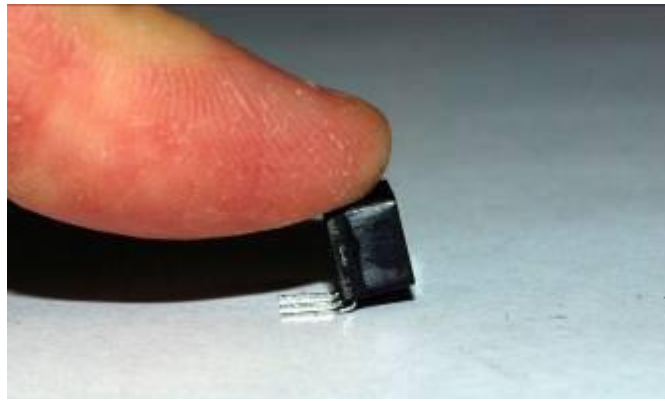


Figure 39 - Bend the legs of the transformer

Before soldering, care must be taken to the orientation of transformer. Look carefully at the component; you may notice a small sign on its surface (a round dot). This sticker should be placed in correspondence with the reference on the PCB.

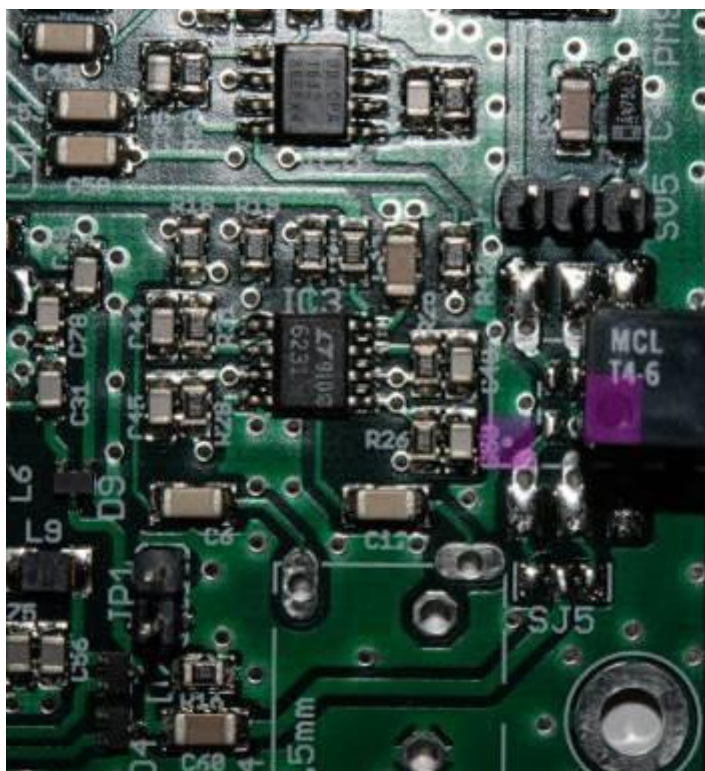


Figure 40 - Reference assembly.

Once the soldering is necessary to cut excess flush with the leads from the PCB to avoid touching the metal of the box.



Figure 41 - Trimming of the Ends

Stereo Connector

The mounting position of the connector is shown in the following figure;



Figure 42 - Assembly of the stereo connector.

The connector must be fully inserted into the mounting holes, taking care not to the folds of mass



Figure 43 - Assembly of the audio connector.

The welds require a minimum of attention, especially those of the ground plane that the holes are quite important. In this case you must use more solder in order to cover the hole.

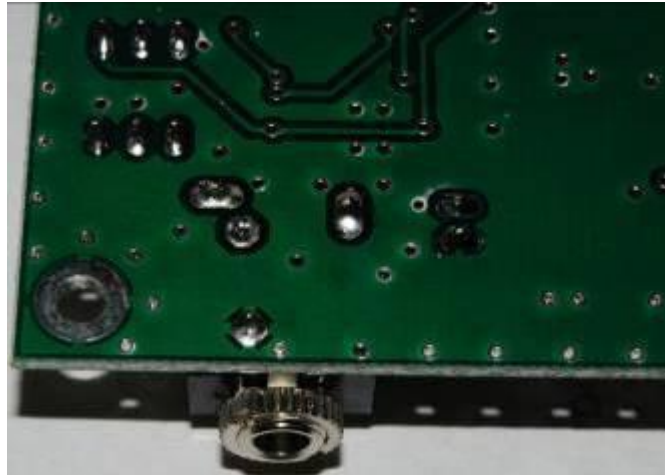


Figure 44 - Soldering completed

The BNC connector

It is difficult to solder a component, given the weight and the large amount of metal present. The mounting position is shown in the figure.

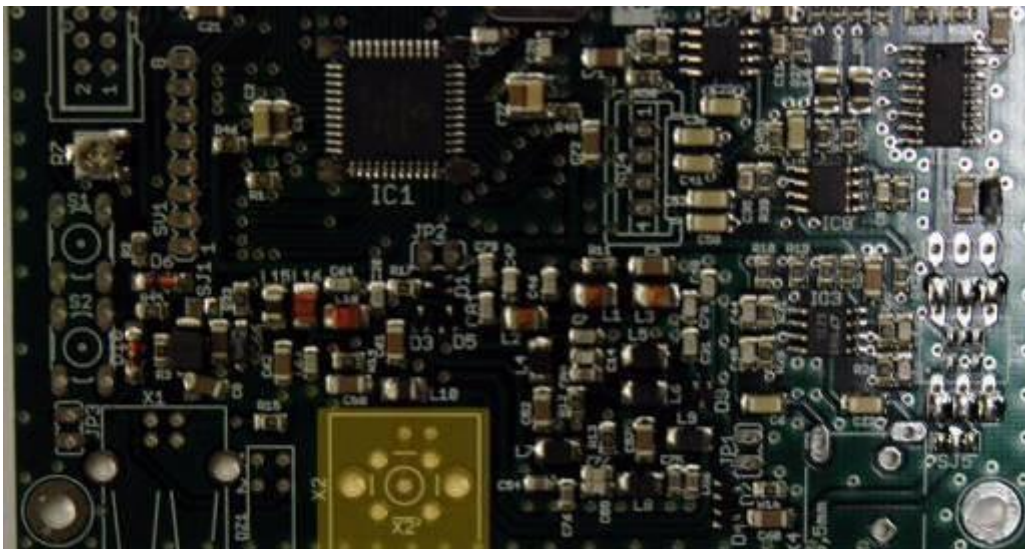


Figure 45 - Mounting the BNC Connector

Again it should help to hold the PCB with a finger while the soldering, the two contacts of BNC.

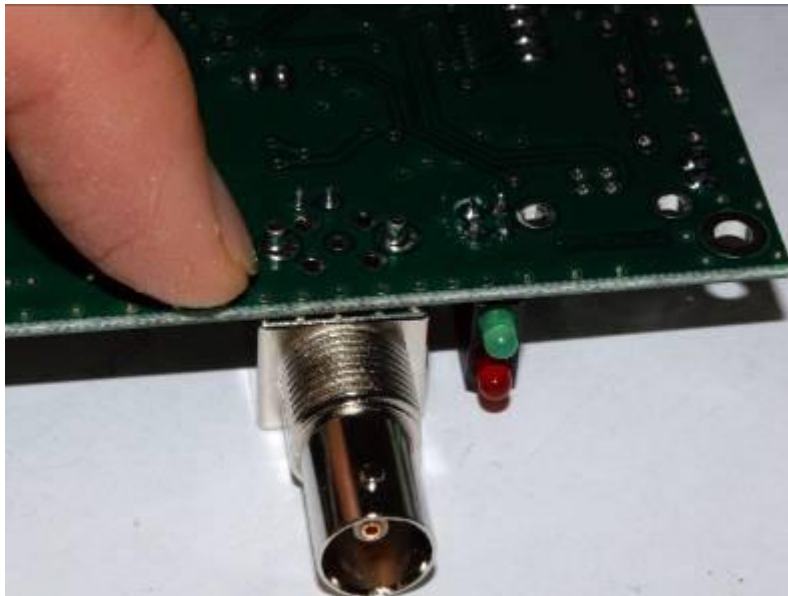


Figure 46 - Hold the PCB with a Finger

To contact soldering of mass, then a minimum of patience as they are connected to a large amount of metal that has a high heat capacity. The heat of the welder is dissipated and we risk creating a bad contact. Should then weld for (the power of the stylus in this case is a factor (important) on the lead diameter slightly warm the whole body of the BNC. If the heat of right leg is the solder will melt and will not hesitate in welds bright and personable. It is advisable to use a soldering iron of at least 60W power.

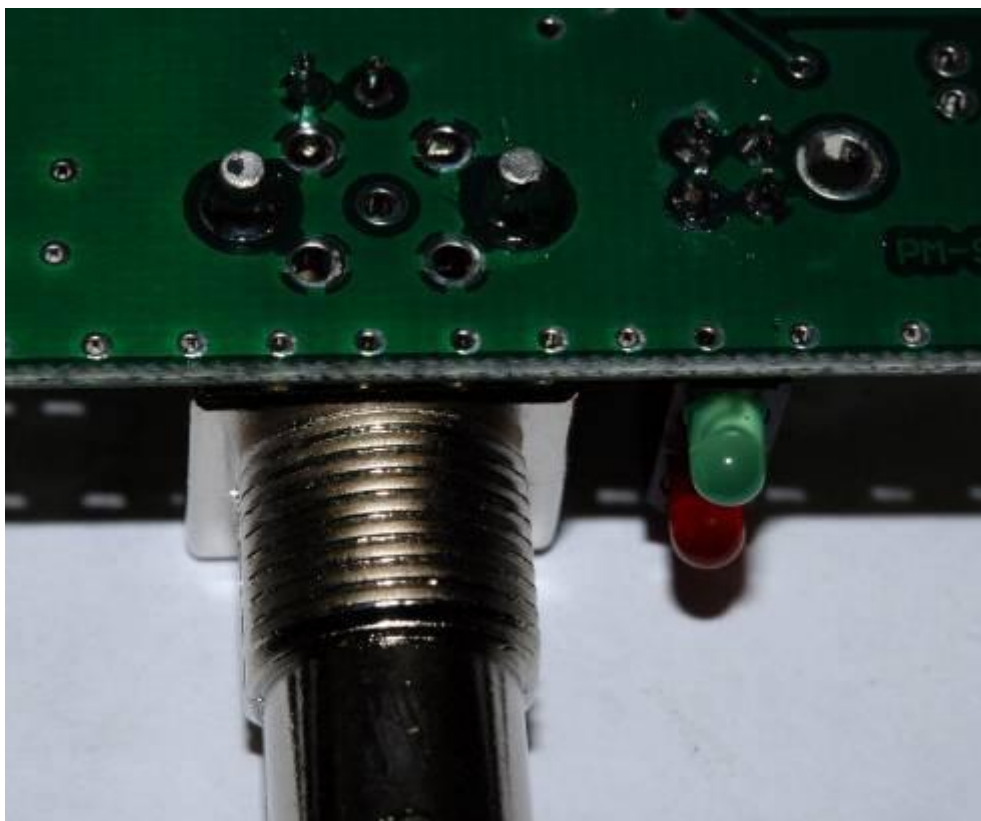


Figure 47 - Result of BNC Soldering

USB Connector

The USB connector is located next to the pair of LEDs.

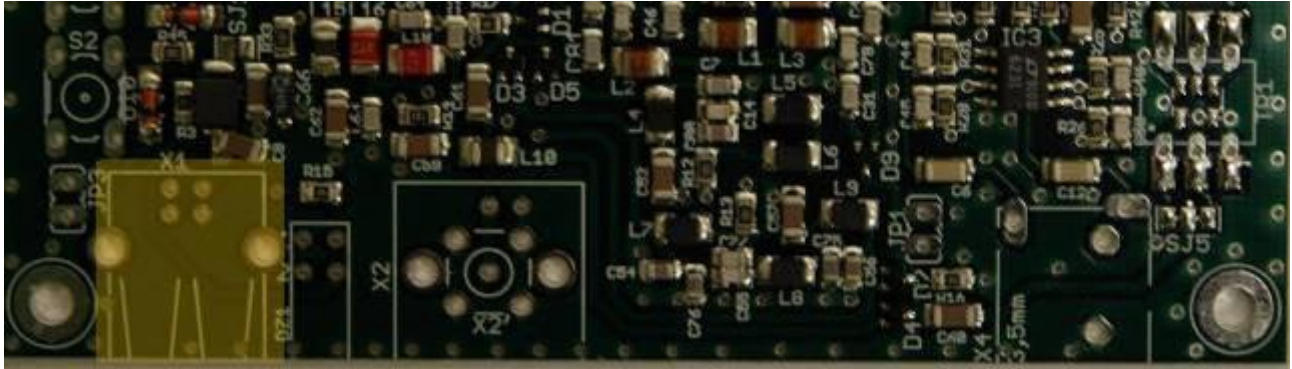


Figure 48 - Mounting the USB connector

The connector is quite low. Again, to keep it in place and aligned during soldering. Insert a small thickness. The exact positioning of these connectors is critical to proper assembly of the mask in aluminum supplied with the container.

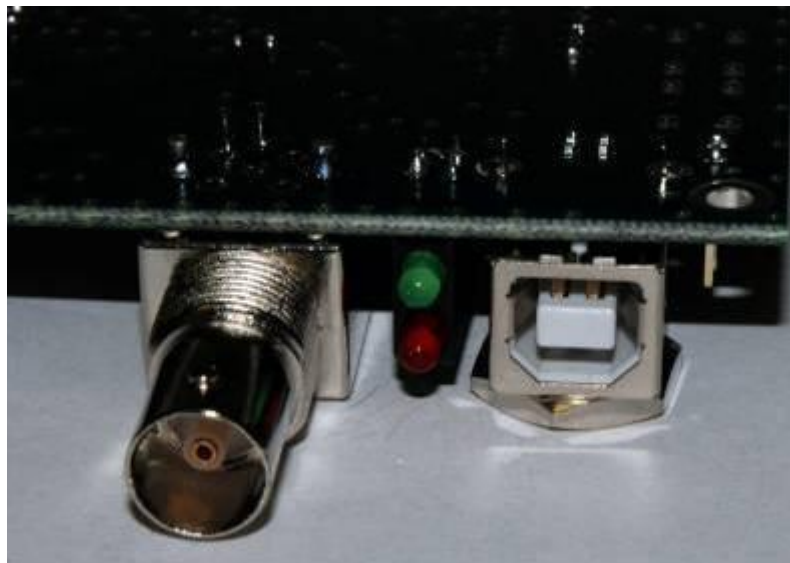


Figure 49 - Thickness under the Connector

Attention again to the soldering of the contacts of the masses. The holes are huge and in this case it is necessary to use a larger amount of solder.



Figure 50 - Soldering completed.

The Micro Switch

The position of soldered components is as follows;

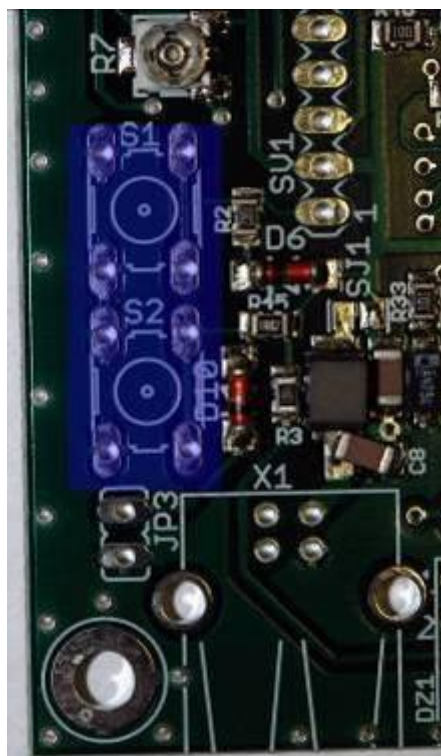


Figure 51 - Mounting of Micro Switch

These components require little care. Their leads are in fact shaped so hold on to the board. Therefore you need some force to insert inside the holes. Minimum force must be exerted perpendicular to the plane of work, so as not to bend anything. The correct placement of the buttons is highlighted by a sharp "click".

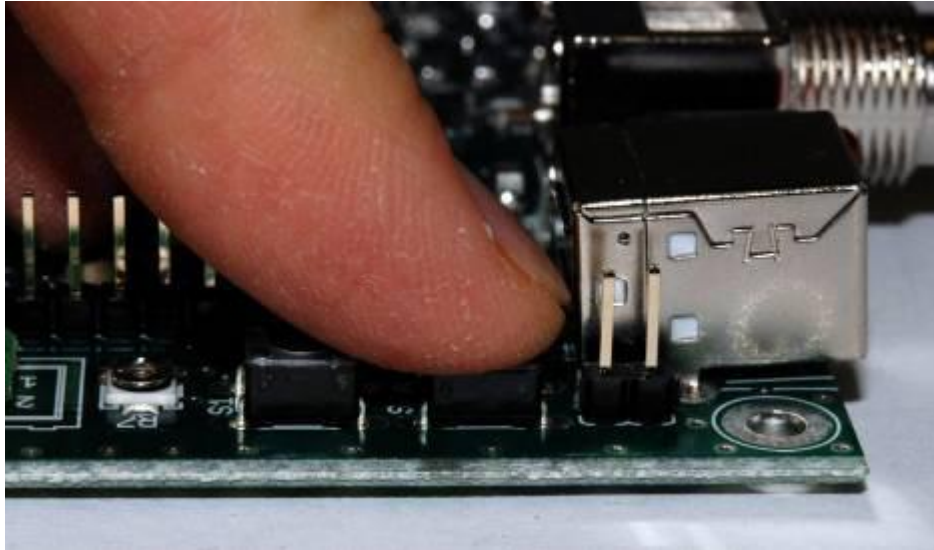


Figure 52 - Push the right buttons at the bottom

Solder and proceed as usual.



Figure 53 - Component soldered

Conclusion of part one

At this point the receiver is complete in its electrical part.

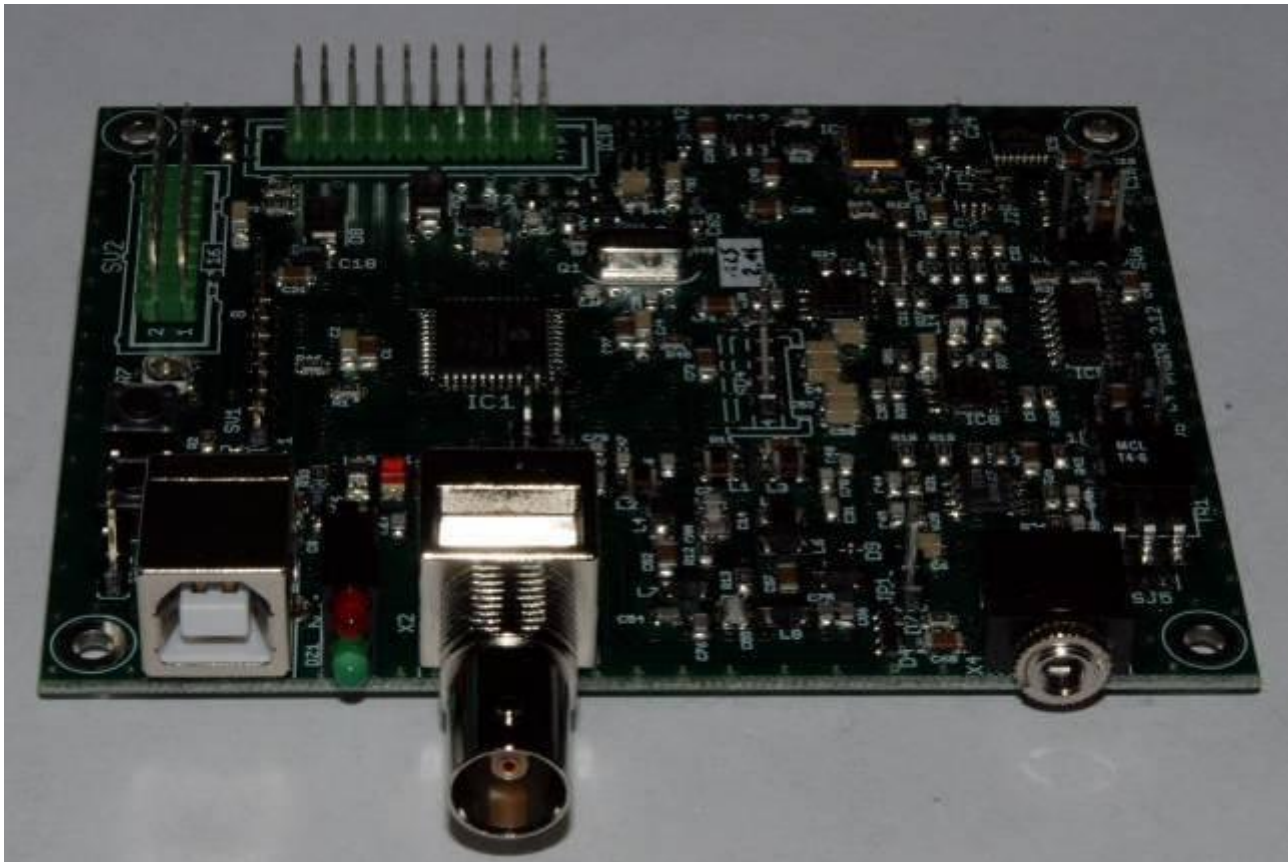


Figure 54 - Electrical Installation complete

The Mounting of the Box

The box is made of aluminum and comes complete with front, rear cover drilled and silk-screened and 8 screws for assembly.

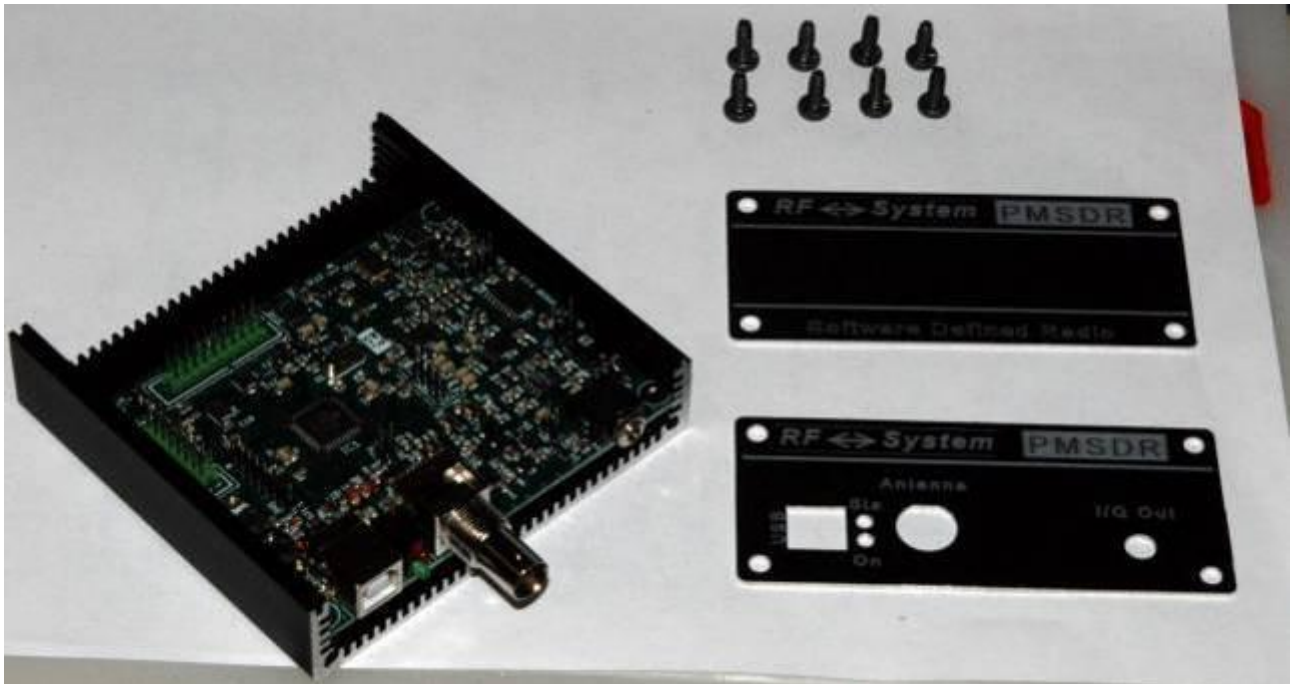


Figure 55 - The component parts of the Box.

On the lateral side panels are present within the recesses of which must be inserted printed circuit board. We put the circuit in the first channel. If during the insertion PCB power or foot down, pull it out without using force and accurately control the length of all the leads on the solder side. Excessively long leads can be shorted and damage, even permanently, the product.

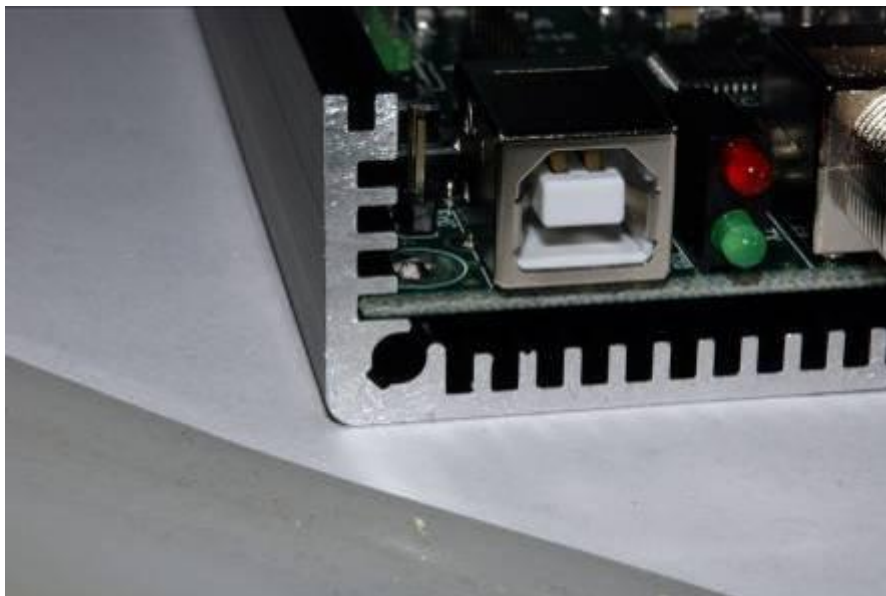


Figure 56 - Insertion of printed circuit board

Once inserted, the entire printed inside the box you can start fixing the rear panel.

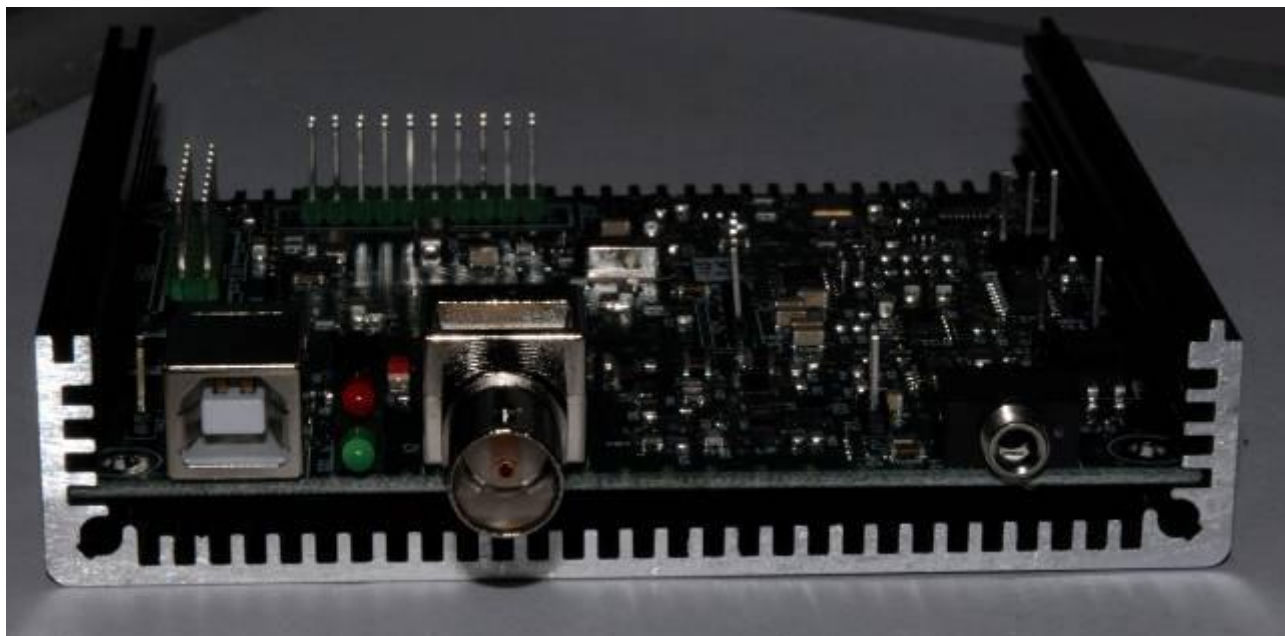


Figure 57 - Circuit board fully inserted.

The rear panel should be initially placed in the box, making sure that all assemblies with connectors are correct (see welds BNC connector and USB).



Figure 58 - Pair of rear panel

If the connections are correct you can start fixing. The screws provided in package require some effort into fixing what has to create a forum for their step (A small drop of mineral oil on the threads of these screws facilitate this operation). Use a star head screwdriver of appropriate size, it is strongly advised against the use of an electric screwdriver, which could only create problems. The screws should not be too narrow. The tension should be enough to make the panel solid without the games. The BNC connector nut can be tightened by hand without using tools.

Remember to put the lock washer in the BNC, and then the nut. Not forgetting the knurled nut to fix the stereo connector. The audio connector nut can be tightened by hand without the use of pliers which could result in damage to the rear panel.



Figure 59 - Attaching the Rear Panel

The layout of the rear panel installed as is the following;



Figure 60 - Rear Panel Mounted

Front panel

If the version of PM-SDR purchased does not accompany the display, you can proceed to attaching the front panel by simply tightening the screws. If you see the display, you must follow these instructions, the kit that is provided for the installation consists of the items shown.

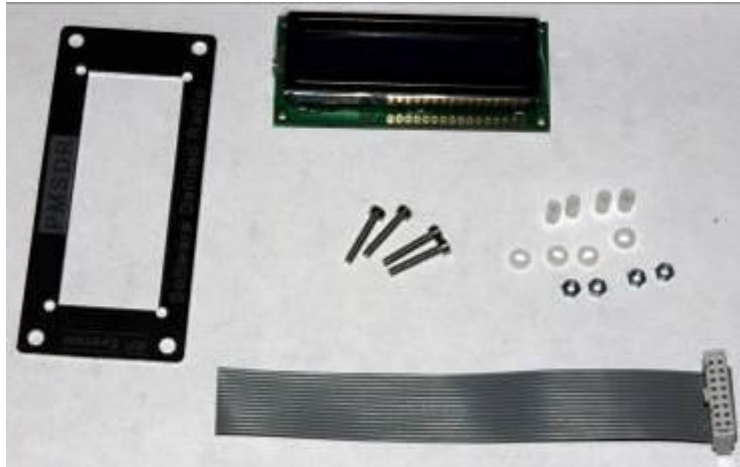


Figure 61 - Components for assembly of the display.

Pay particular attention to the plastic spacers that can easily get lost in the event fall on the ground.

Preparation of the cable

The cable is provided with a headed connector, locate the line number 1 (in match pin 1 on the card), and mark it with a marker, so able to immediately identify.

The free end of the cable, separate the wires numbered 1 to 6 and 11 to 16 for the length about 2 cm. The separation of the different conductors can be made simply using nails without using tools. In this way we are guaranteed to any injury and the possibility of inadvertently cut a few strands conductor.



Figure 62 - Separation of the conductors

To remove the insulation from the wires and then "stripping" the thread, it is not necessary use tools. Also in this case, the nails may be helpful. Otherwise use the classic cutter, being careful to use it "backwards". i.e. with the side cut out. The cables 70 to 10 must be removed.

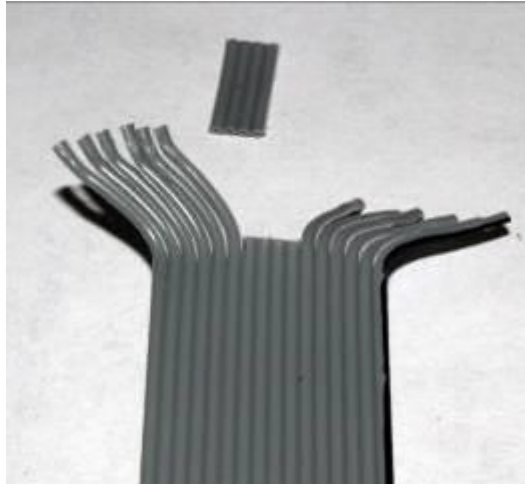


Figure 63 - Conductors and separate the middle removed.

After removing the insulation must pass the bare wire between your fingers to give re-ordered to form a conductor. The ends may be discovered tinned slightly to allow better editing. Before soldering the conductors must mount the front panel. To avoid mounting it on the other hand you can make a mark with a pen on the higher. Insert the screws into the interior of the panel (will be used to mount the display) and plastic insulation (along the tube).

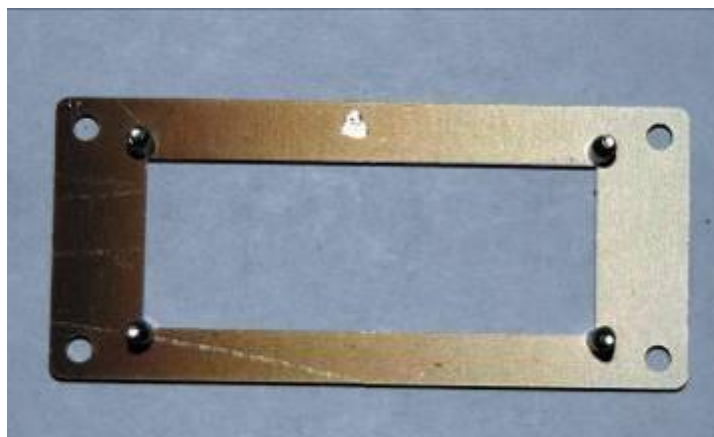


Figure 64 - The front panel.

Enter now the display, taking care to maintain contact at the top, at the point that we have drawn on the front panel. Note the position of the insulators and assembly of the plastic washer.



Figure 65 - Location of the insulators and the display.

The front panel is then assembled. Tighten the screws in not too strong, so prevent damage to the spacers.



Figure 66 - The panel mounted.

Push the front panel of the box and tighten the screws so that the integral the panel box. Do not over tighten the screws so as not to damage the panel.



Figure 67 - Front panel mounted.

Final assembly

Before you complete the soldering of the wires, insert the connector into contact station SV2. Enter now the conductors previously dipped into the holes present on the printed circuit of the display. If the tin has been done correctly the conductors will insert comfortably to wear. Insert the wire corresponds to pin 1 of the contact station at the pin 1 of the display (typically one on the right, looking at the display from behind). Once the wires are inserted through holes, you can stagnate on the opposite in order to avoid damaging the insulation.



Figure 68 - Soldering the Display Connectors

Conclusion

The process of mounting hardware is now complete. What has not deliberately been mentioned was the top cover, which will be installed only after adjusting the contrast the display. This, however, must first connect your computer to the SDR-PM, process explained in the manual later.

Installation and First Use

Once the hardware section, it is time to switch the interface between PM-SDR and computer. The elements needed for this match are as follows;

- Connecting the physical PM-SDR to the computer.
- Recognition by the operating system on new hardware.
- Installation of a program for signal demodulation I/O.
- Allow the program to control the functions of the PM-SDR and use the data.
- Optimisation of benefits.

Computer - Minimum Requirements

Are largely dictated by the software to be used for the control and demodulation. In general, the minimum specifications required are as follows;

- Processor Intel Pentium 4 1.4 GHz / AMD Athlon
- RAM 256 MB
- USB Port 1.0 or 2.0
- Card with Audio Input "line" stereo.
- Minimum screen resolution 1024x768
- Operating system: Microsoft Windows XP or Microsoft Windows Vista.

Particular attention should be paid to the choice of the sound card as the services offered by the device may influence the very heavy operation of the system. I therefore recommend the following records (to obtain optimal performance): Creative, EM 0202-U USB Maya 44 PCI.

Connecting the PM-SDR to the Computer

The connection to the computer must be carried out using two cables: a USB cable and an audio.



Figure 69 - Schematic of the connection to the computer.



Figure 70 - Data Link and audio.

The USB cable must be fitted with plugs for Type A and Type B should be of good quality. It would be better to use a cable certified to work with specific USB2.0 (USB or Hi-Speed). We do not recommend the use of excessively long cables (> 1.8 m).



Figure 71 - Specification Hi-Speed USB.

The plug type A (the largest) should be inserted into the computer, into an outlet that is identified by the symbol shown.

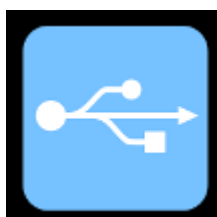


Figure 72 - Symbol USB



Figure 73 - USB connection to computer.

The connector type B (the smallest) will be placed on the rear panel instead of PM-SDR, at the USB port.



Figure 74 - Connecting the PM-SDR

Once connected, the LED should be lit green.



Figure 75 - Turn on the green LED.

The cable for connection to computer sound card must be provided with connectors 3.5mm ", this component must be of good quality and length. One end of the cable will be connected to the PM-SDR at Grip "I/O Out," while the other end is connected to an input line computer sound card. Typically, this socket is identified by color "Blue" (at least according to the standard Microsoft). Special attention in is required in the use of laptops. Some of the latest generation computers have only one input, dedicated the microphone. Despite this through the control software sound card integrated you can configure this input as "line". Make sure the panel control of your sound card correctly setting this value.



Figure 76 - Colour coding audio devices.



Figure 77 - Set a line as input.

A special mention to the use of external sound cards to the computer. Could be beneficial use to circumvent the hardware, limitations are often found in integrated boards. They usually offer the chance to work at 48KHz frequency sampling and 16 bit resolution. The best performance is achieved with cards they could work 24-bit and 192 kHz. These cards must be purchased separately. Their use provides for the installation of drivers provided by manufacturer card and connects to computer using USB or FireWire. For correct operation of the external sound card, see the manufacturer's manual. From operational point of view concerning the connection of PM-SDR does not change anything. The output of the I/O receiver must be supplied at the line sound card, in a similar way to what was done for the integrated card.

Recognition of the Device

Once connected the device to the computer system attempts to recognize the device automatically, looking for a suitable driver in its operation.



Figure 78 - Recognition of the device.

The operating system does not recognize the device itself, as you can also check the power of "Device Manager" of the operating system. In it we can see how the SDR-PM is associated with an icon with the symbol of the "point question", to indicate the lack of a suitable driver.

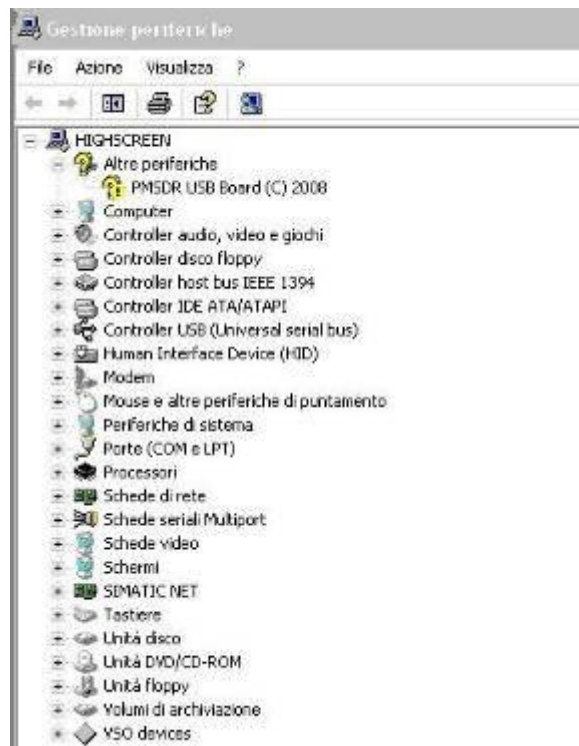


Figure 79 - Device Manager.

Warning

Despite the process of installing the drivers for the device and additional software are consolidated and tested IW3AUT Martin, assumes no liability by impairment of the operating system or computer, including the loss of data or their inaccessibility. It is therefore recommended to backup all data before installing the drivers and software.

It should at this point to install the USB driver from Microchip, provided in the CD folder "MCHPUSB Driver" or downloaded from the Internet at the following address:

http://www.iw3aut.altervista.org/files/MCHPUSB_Driver.zip

The first step is unpack the zip file using a software decompression (WinZip, WinRar or 7zip), within a folder. We will take care of note the location of the folder (eg C: \ driver_pm). Inside the box "Device Manager" select "USB PMSDR Board (C) 2008 "with a click. Then press the right mouse button and select "Update Driver". A window appears that lets you choose a procedure Driver Update:



Figure 80 - Window update drivers (Windows XP)

Selected with a checkmark the "Include this location in search" in the text box and insert the folder path in which we unzipped the drivers (in our example was c: \ driver_pm). Then press the button update and wait.

Upon completion the symbol "question mark" at the PM-SDR device has disappeared, indicating that the operating system is now able to properly use the device. If the operating system is Microsoft Windows Vista, the operations are completely similar. The system will bring up some windows asking for permission to perform potentially dangerous commands.

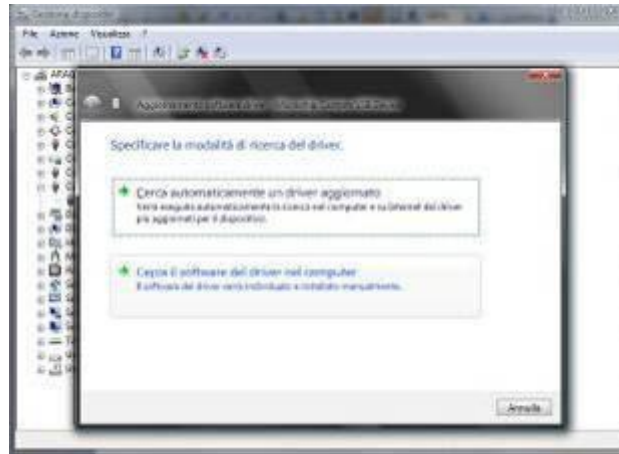


Figure 81 - Definition of the update method drivers

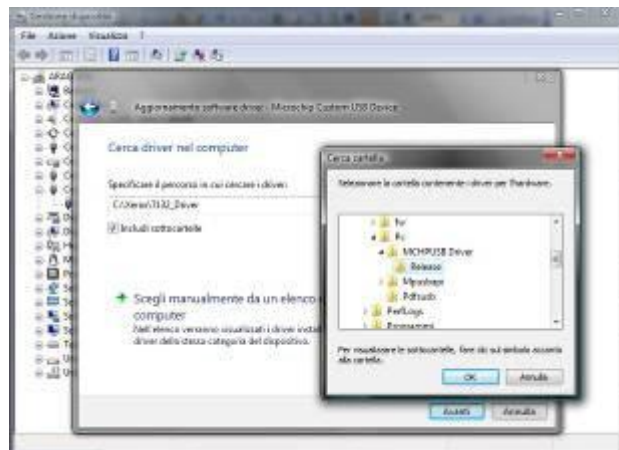


Figure 82 - Definition of the search path new drivers

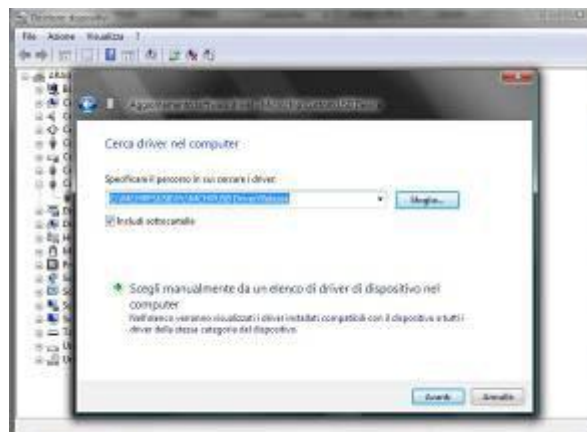


Figure 83 - Installing under Microsoft Windows Vista

On completion of the dialog "Device Manager" should not show any add a question mark symbol.

Adjusting the display contrast

Before installing the software is best to complete the work hardware with the contrast of the LCD. It is made by acting on a small potentiometer located next to the data connector of the display.



Figure 84 - Location of the trimmer.

Adjust the trimmer gently with a small screwdriver while see the display. The letters will always appear brighter.



Figure 85 - Adjusting the contrast.

Once you are finished adjusting the difference in the view of the characters.



Figures 86 - Display of the first adjustment contrast



Figure 87 - Display after adjustment contrast

When finished you can close definitively the top cover PM-SDR and enjoy its operation.

SDR Software Installation

There are no restrictions on the use of the software. The following programs can be used for demodulation and the control of PM-SDR;

- PowerSDR-IQ (<http://code.google.com/p/powersdr-iq/>)
- Winrad (<http://www.winrad.org/>)
- WinradHD (<http://freenet-homepage.de/winradhd/>)

This manual focuses on Winrad and WinradHD, which provide installation procedures similar and differ essentially only in the position to screen some of the components and options. For the installation of the software follows the procedures defined by the authors of the Code, you only need to keep in mind the location in which the software is installed (eg C: \ Program Files \ Winrad). After installing the program you must run some simple steps to ensure that the software can recognize and use all functions of the PM-SDR. It is inserted to the folder where the executable file, some library files (Have dll extension), using a copy operation. These files are available on CD or can be downloaded from the website of;

IW3AUT (Http://www.iw3aut.altervista.org/files/PMSDR_DLL_V31.zip)

Once you download the file, must first be opened with software for decompression (such as WinZip, WinRar or 7zip), the contents of the file is as follows:

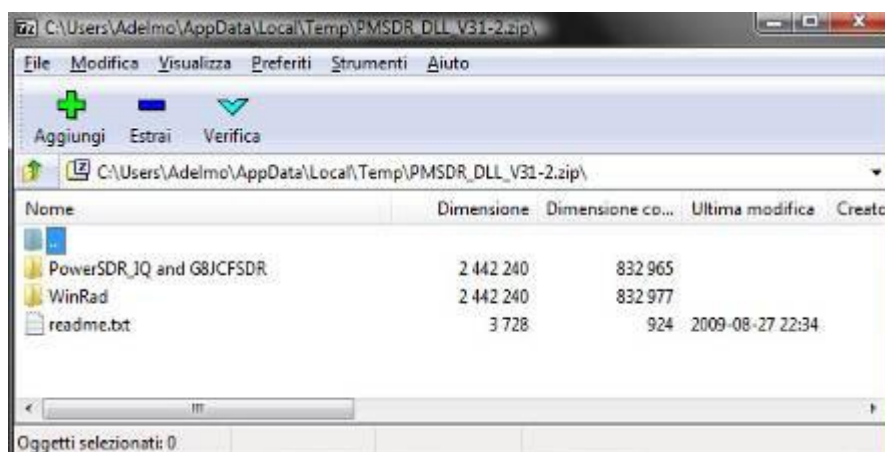


Figure 88 - Content of the driver files.

The drivers folders for the software of the same name. In the folder are Winrad contains the following files;

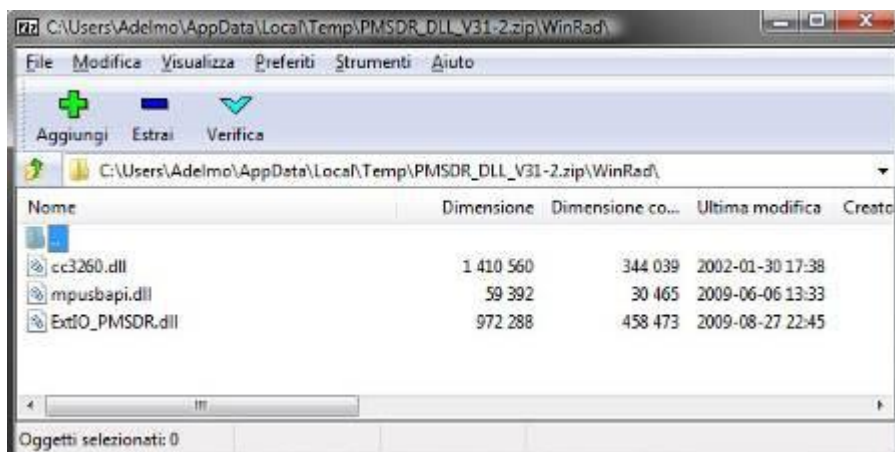


Figure 89 - Contents of the Winrad.

These files must be unzipped into the folder or Winrad WinRadHD, that typically (unless of different choices at the time of installation) is in the folder C: \ Program Files.

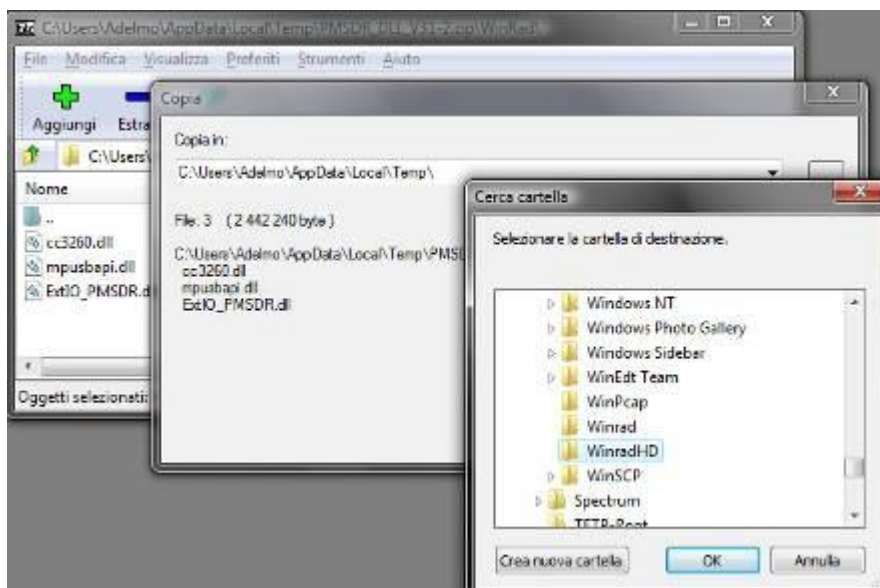


Figure 90 - Selection of the Path to Decompress Files

Once unpacked the files, folder software, the situation must be one shown in the figure.

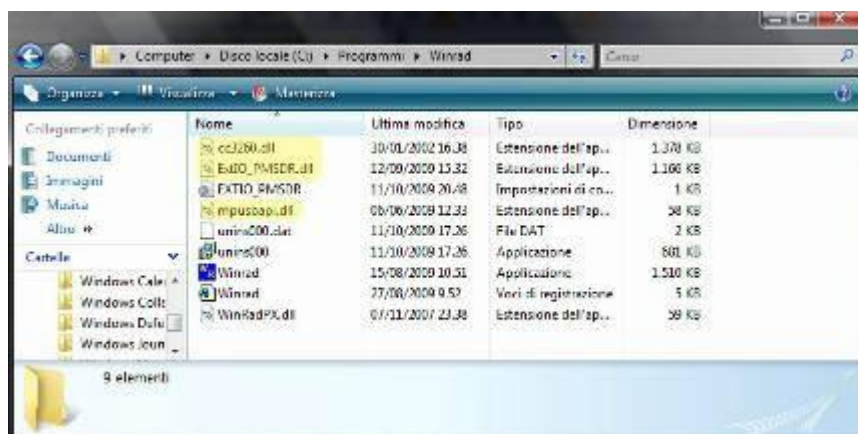


Figure 91 - Folder after decompression of the file.

Control software

There are many software solutions for demodulation of audio I/O from SDR hardware. The following pages show the settings necessary for the proper functioning of PM-SDR and with Winrad WinradHD

Winrad with PM-SDR

Before starting the software, make sure your receiver is properly connected to Computer (green LED) and audio output is connected to an input line the sound card. The startup screen for Winrad appears in this way.



Figure 92 - Start Screen of Winrad

In the top left under "Show Options" is necessary as a source of selection Input "PM-SDR" from the menu item "Select Input". This must be repeated each time you start the program.

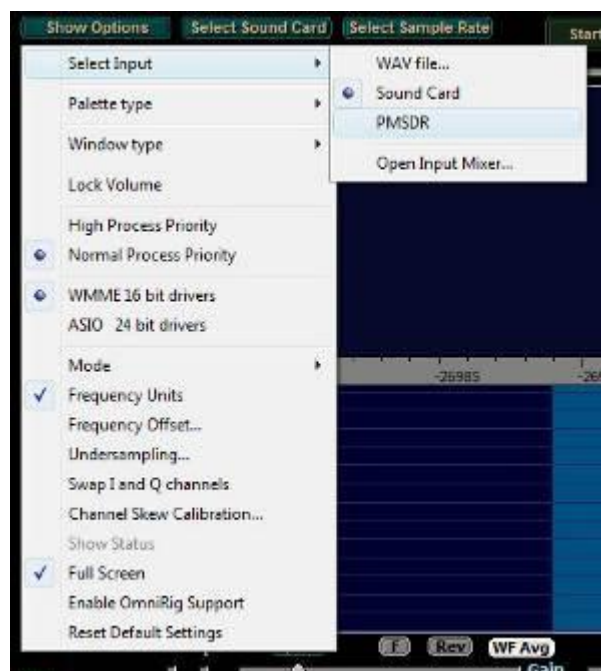


Figure 93 - Source Selection Input.

Once this is selected, it opens on the right of the screen, the window on Control of PM-SDR.



Figure 94 - SDR PM-control window.

Now we need to tell the program source from which we are acquiring the audio data I/O. In practice it comes to choosing the sound card that we are using. This option is of course very convenient in case of multi-installation card.



Figure 95 - Choosing a sound card

We now need to set the wave sample rate of the card to; take maximum advantage of the benefits of the same type of, you should set this value to the maximum of the hardware card.



Figure 96 - Selection of the Sampling Frequency

At this point you can start the operation of the program, taking into account good the fact that there has been no optimization of system operation, therefore there will be no performance.

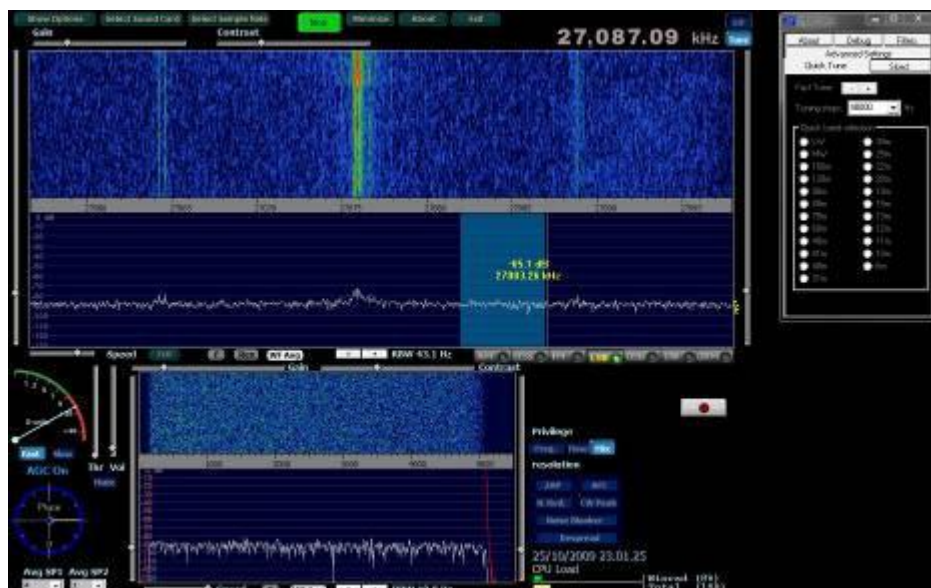


Figure 97 - First run the program.

WinRadHD with PM-SDR

Before starting the software, make sure your receiver is properly connected to Computer (green LED) and audio output is connected to an input line the sound card. The startup screen appears WinradHD in this way (much like Winrad, only changes the position of some elements).



Figure 98 - Start Screen of WinradHD

The configuration of the input source is, in this case, bottom left, as shown in the figure. Fortunately, not every time you need to set the type of input, since the program remembers.

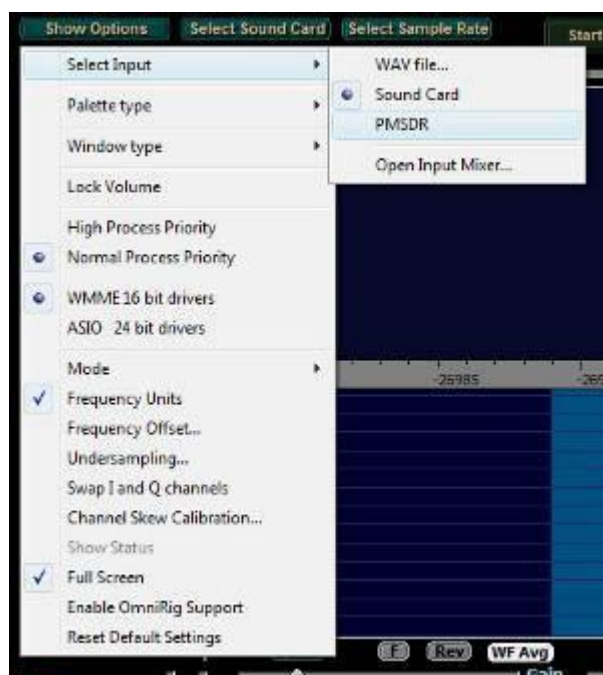


Figure 99 - Input Source Selection

The selection of the computer's sound card, to the inputs of which are present data in I/O is selected from the menu ever present in the lower left.



Figure 100 - Sound Card Selection

Also near this menu you can select the entry for the choice of audio sampling frequency.



Figure 101 - Selecting the Sampling Frequency

As is evident from the figures the operation of the two programs is definitely similar. There are only a few reasons compacted been reorganized and enhanced graphics some functions.

Common Options to Both Software

The menu item "Show Options" provides access to a rich menu of options allows you to customize the operation of the system both from a graphical and functional point of view.

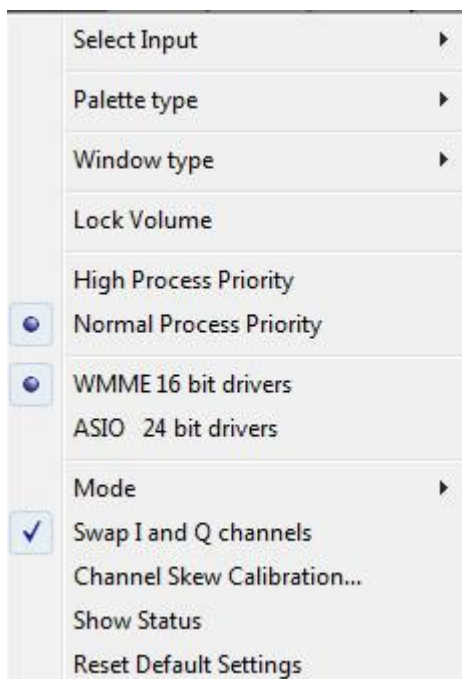


Figure 102 - Options.

Description of Options

- **SELECT Input:** Select the input data to software, including files (WAV) sound card and PMSDR.
- **Type Palette:** allows you to choose the colour scheme presented in screen.
- **Window Type:** select the window which is made FFT operation.
- **Volume Lock:** lock the volume control.
- **High / Normal Process Priority:** controls the way the process runs priority is controlled by the system operation high causes Winrad to dedicate more resources.
- **WMME / ASIO** allow you to choose the type of driver used to control the sound card. ASIO drivers (if supported) are typically low latency.
- **Swap I and Q channels:** allows you to swap audio channels with each other, so compensate for differences in the audio signal output from SDR. To see if the settings are correct tune in a station-band 14 MHz and try to receive it. If the channels are correctly set, then the station will be admissible in USB, LSB otherwise.
- **Channel Skew Calibration:** Allows you to calibrate and compensate for differences in amplitude and phase that can be found between the two channels of sound card. Requires the ability to generate a fixed and un-modulated carrier.
- **Show Status:** open a small window that shows some parameters operation of the software.
- **Reset Default Settings:** Reset the default options of the program.

The control panel for PM-SDR

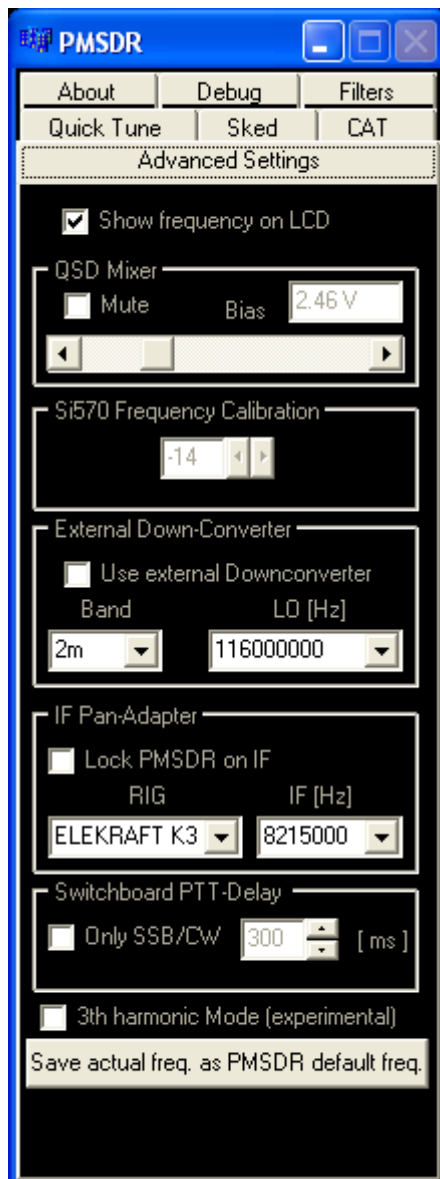


Figure 103 - Advanced Settings

- Show Frequency on LCD - Enables the display operating frequency on the display of PM-SDR.
- QSD Mixer – Check's the voltage BIAS QSD applied to the mixers. Useful as simple attenuator or optimize VHF operations.
- Si570 Frequency Calibration - This value can calibrate the end of LO clock generator on board the PMSDR
- Mute - Makes dumb PM SDR Particularly useful when abbianato the switch
- External Down Converter - Enables the use of a external frequency converter and set the frequency of local oscillator
- IF Pan-Adapter - Allows the use of PMSDR as Pan-Adapter in combination with an IF transceiver with an output of receiver. The value of the IF transceiver can be set to pleasure.
- Switchboard - PTT Delay If you have installed in PMSDR the "Switchboard", you can enable and set the delay of the PTT for transmissions in CW / SSB
- Save actual freq. As PMSDR default freq. If the firmware is to PMSDR version 2.1.7 or higher, then it is can save the current filter and LO frequency signals are PMSDR departures. This allows PMSDR to use a fixed frequency without connecting the USB port to PC, feeding separately PMSDR with a power supply of 5V stabilized.

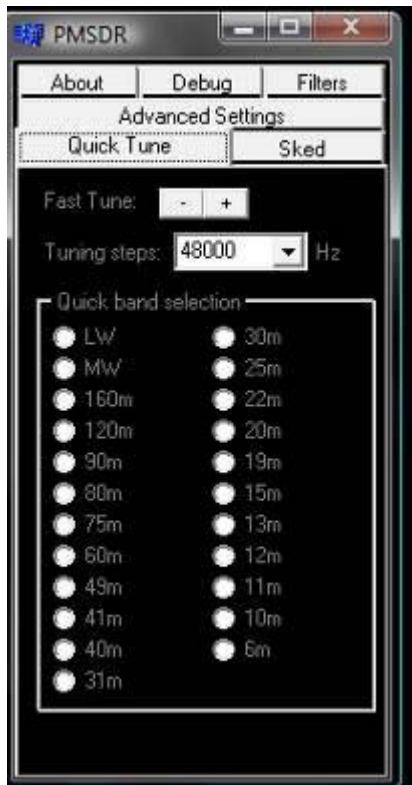


Figure 104 - Quick Tune

- **Fast Tune** - Allows you to change frequency operational quickly.
- **Tuning Steps** - Set the steps by which it is varied frequency using the "Fast Tune".
- **Quick Band Selection** - Allows you to "jump" by a gang another (bane OM and SWL) to push of a button. These "Memories" are defined in the file EXTIO_PMSDR.INI and can be changed and expanded at will.



Figure 105 - Sked Station

Connection to local database EIBI

(<http://www.eibi.de.vu/>) Shows the main issuers of Broadcast notes. Clicking on the name of one they are automatically tuned to the operating frequency. If you tune to a station and if they want to know the name, it will be shown leaving the pointer mouse over the line tuning.

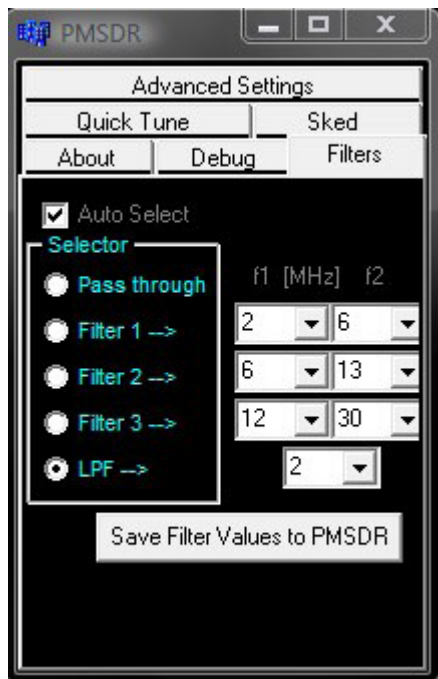


Figure 106 – Filters

- **Auto Select** - Lets give freedom to dll selecting the best filter for operating frequency.
- **Selector** - Allows you to manually select (by force) the use of a particular filter or exclude (Pass Through).
- **F1 f2 MHz** - Sets by hand cut off frequencies of the filter, useful in case have been modified values inductance and capacitance of the original project.
- **Save Filter Value to PMSDR** - You can store on the PMSDR values of f1 and f2 custom filters.

Window dedicated to display parameters operation of the PM-SDR. Through analysis of the values that are shown in screen you can appreciate the Si570 and operation of the integrated CY2239x divider.

In the bottom pane you can see an extract from the traffic and communication between the DLL and the PM-SDR.

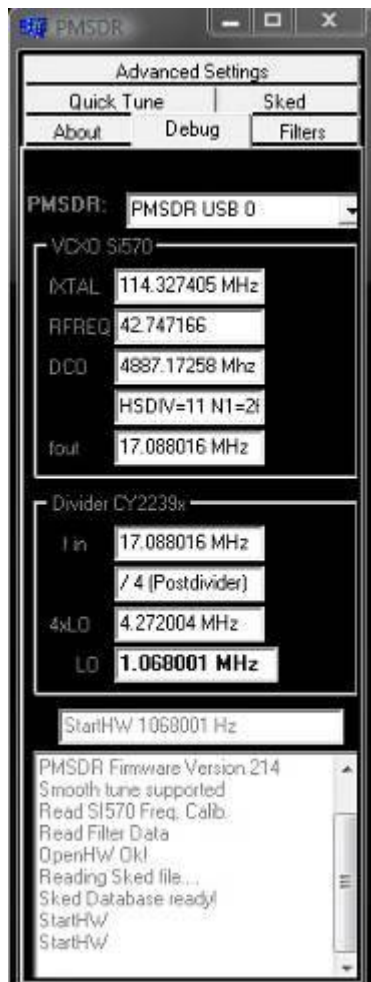


Figure 107 - Debug.

System Optimization

The optimization of system performance requires action on sound card settings and the way in which the audio signals are routed in operating system. It is not possible to provide a detailed manual as such Settings vary depending on operating system and hardware options installed.

- Disabling control panel signal output line. Speakers should get only the output signal from Winrad (or similar) and not directly from the entrance line. This can cause rapid performance deterioration acoustic system, making the signal available at output "does not try" by the software.
- Adjust the line level input so as to avoid overwhelming the input signal. Attention to the indication of the S-Meter should not be "Full scale" with the only background noise. It is worth repeating - to pay attention to how you configured your port audio input. Must be a line input and microphone to avoid system malfunction.
- The presence of a strong background noise can be caused by insufficient shielded audio cable, poor quality of the USB cable or the presence of equipment that produces noise in the vicinity. An example of this last case is represented by switching power supplies that come with laptops.
- The correct positioning of the signal I/O on the sound card can be controlled with a simple trick. 20m in the emissions are predominantly in USB. If I and O channels are exchanged between them, they will be admissible in LSB.

Effect of adjustment of the input signal

In the presence of very strong signals, the computer's sound card can give rise to egnali appearance of side effects (inter-modulation products). This phenomenon is well shown in the figure, in which it is supplied an input signal of -15dBm adjusting the input gain of your sound card to a minimum and then in half.

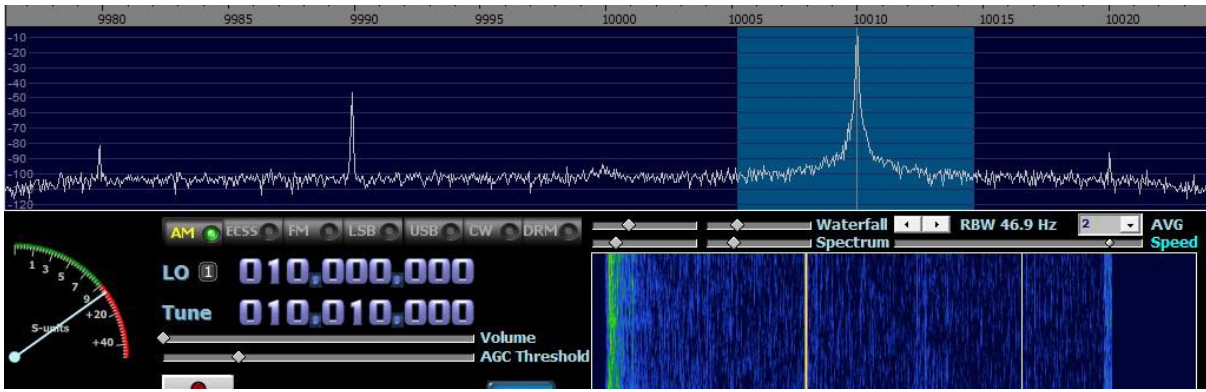


Figure 108 --15dBm input, volume at minimum.

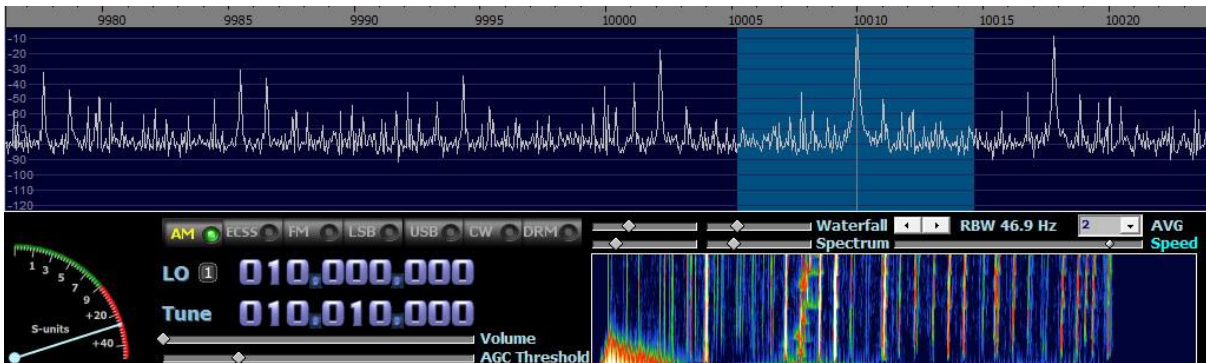


Figure 109 - Signal-15dBm, volume in half.

Event of an overload of the receiver can also be effectively controlled by varying the bias voltage of the mixer QSD, as shown in the explanation of functionality expressed by the panel of SDR.

Channel Skew Calibration

The procedure for adjusting the "Channel Skew" can be accomplished with a simple quartz oscillator or a signal generator professional. The settings are changed regarding the behavior of the sound card and not the PM-SDR. The window that allows you to adjust these parameters is shown in Fig 110. Also visible reference signal (located at 10010 kHz and 9990 kHz in his image). The adjustment procedure can greatly reduce the presence of signal image, until it is not visible on the screen. Clearly the process must be repeated with each audio signal.

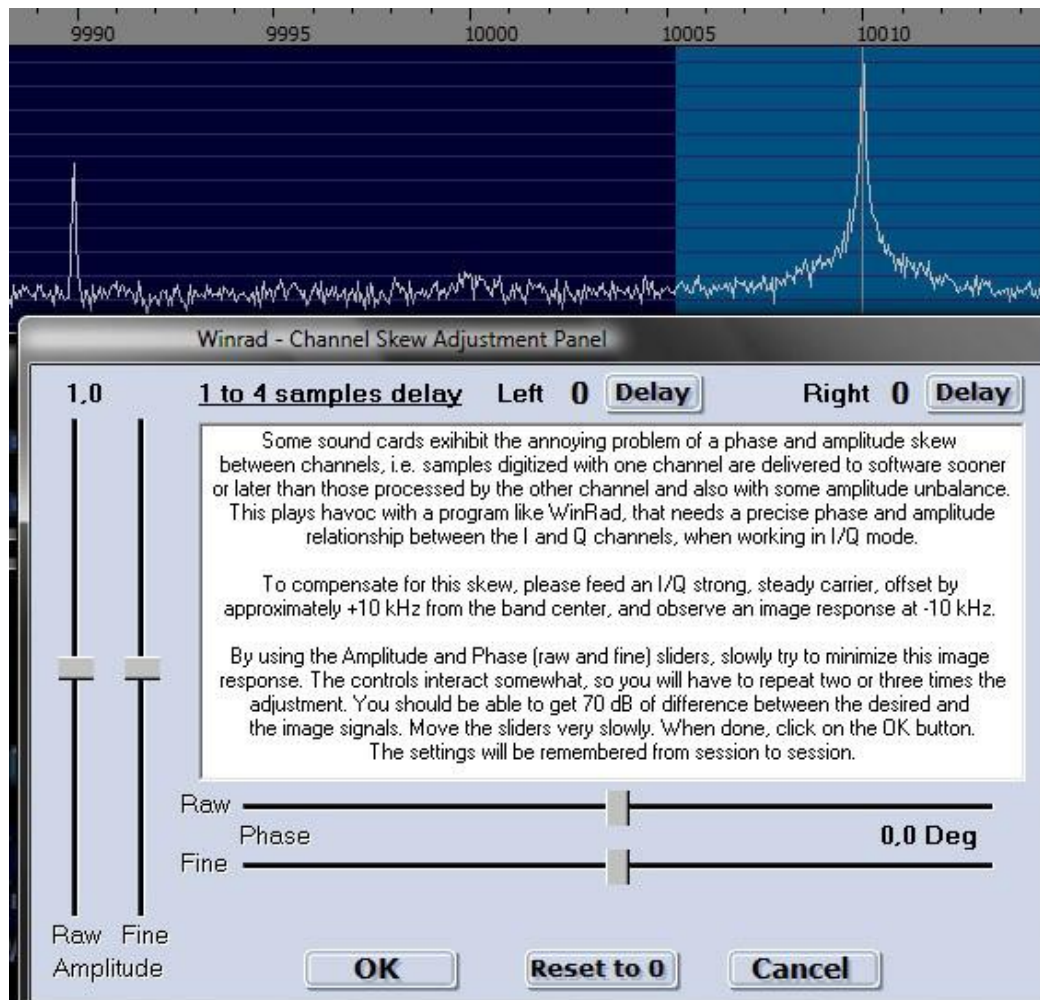


Figure 110 - Skew Calibration

After some adjustments (which take several steps to obtain a perfect balance), the situation you get is really optimal. The image signal is suppressed almost completely and do not emerge from the background noise.

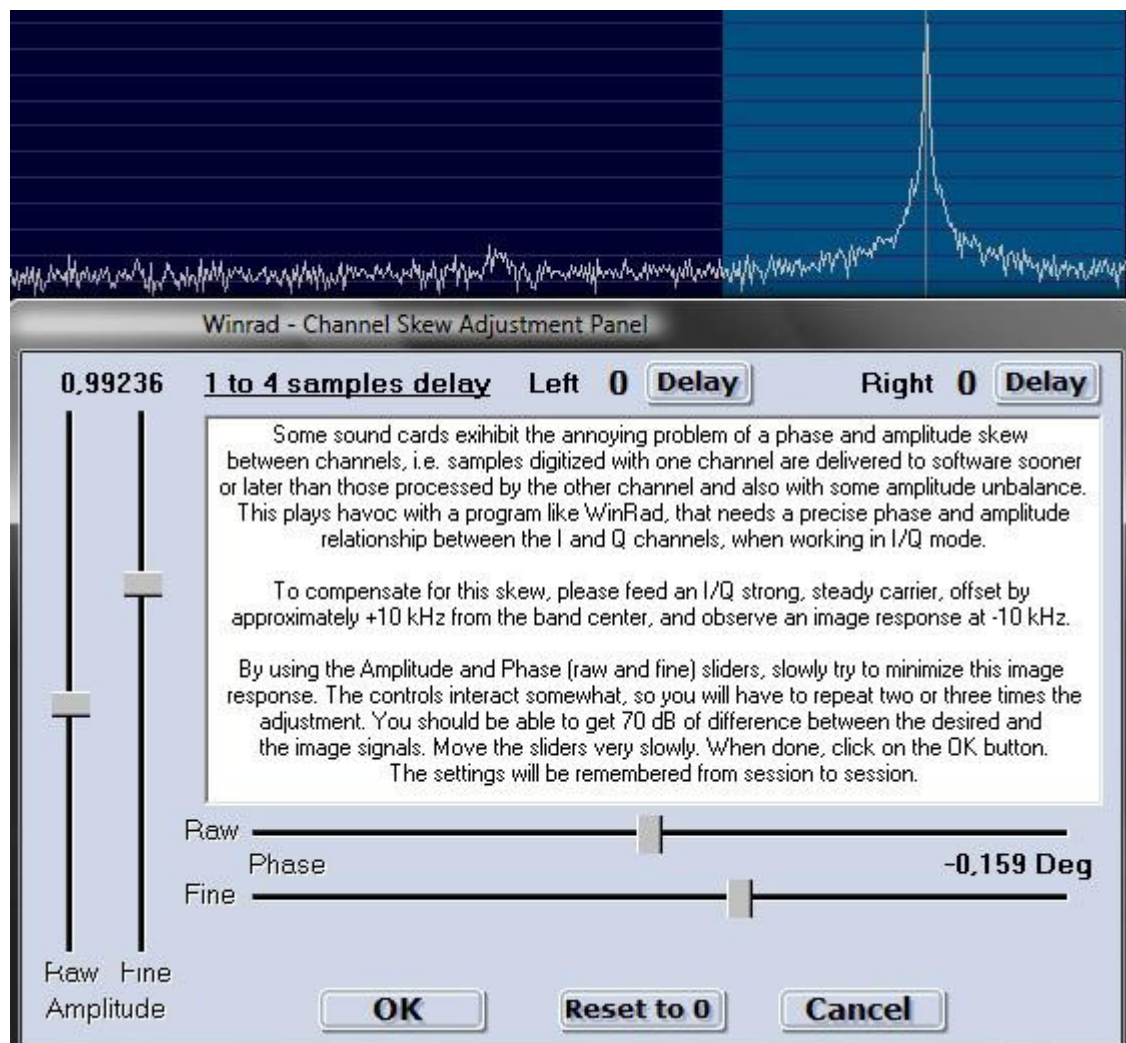


Figure 111 - Skew calibration is completed.

The data shown is for unique values for the sound card with which it was made testing. Must not be copied or used as a model. Each sound card has its characteristics and must be specifically calibrated.

Most of all have fun!