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PCI MAX

PC based FM stereo transmitter card

PCI MAX is a high performance PLL controlled FM transmitter for the IBM PC compatible PC computers. It is perfectly suited for people that don't know much, if anything, about transmitters and electronics in general, but do know about personal computers. We hope you will enjoy it as much as we do. High quality components and printed circuit board assure 24/7 operation for years to come.

From all of us we wish you happy broadcasting!

Send us your comments to feedback@pcs-electronics.com
For tech support please send email to support@pcs-electronics.com

Before you start...

Let us clear up some basic things you need to know before we move on:

-Antenna You have to realize that antenna was, is and will always be crucial part of the system,

A PIECE OF WIRE WILL WORK, BUT YOUR RANGE WILL BE LIMITED!

especially if you need extra range. Special care has to be taken! It is usually a good idea to place antenna away from your transmitter and audio system. If you cannot meet these requirements, you could experience feedback and other RF problems. We cannot guarantee proper operation of PCI-MAX unless suitable antenna system is used!

-Coaxial cable The common RG-58 from Radio Shack is NOT the best you can do and will lower your effective power out! Use it only for short runs. BELDEN makes terrific coax in various qualities and with very low loss (measured in dB's...decibels)...figure 3 dB loss = 1/4 of your signal strength...either lost or gained. Watch out for the correct impedance...RG-8 and RG-58 have 50 Ohms. RG-59 and RG-6 (Low Loss Version of RG-59) have 75 Ohms. Don't buy more than you need to make the long run to your antenna and make up a few "jumpers" to go between your exciter, VSWR meter and your antenna as all you'll do is create a higher SWR and more line losses. Don't use cheap TV cable.

-Audio equipment. This is probably going to be your PC. WinAmp or any other MP3 player will be very useful here. Plug-ins are available that take care of limiting-compression, at least to some degree. Get a good sound board! Check <http://www.pcs-electronics.com> for tips.

INSTALLING PCI-MAX

PCI MAX installation basically consists of two major steps:

STEP 1 – SOFTWARE INSTALLATION

Insert the PCI MAX cd in the computer's cd-rom drive. NOTE: Some computers will start the cd automatically and others will not. If the CD does not begin after a couple of seconds, you need to manually run the "Setup.exe" file in the root directory of the CD. The install itself is pretty straight forward. Shut down the PC after you've installed the Setup program.

BEST RESULTS CAN BE OBTAINED
BY PLACING YOUR ANTENNA AS
HIGH AS POSSIBLE! DON'T
FORGET TO TAKE CARE OF
PROPER GROUNDING AND
LIGHTNING PROTECTION

STEP 2 – PCI MAX CARD INSTALLATION

You need one free PCI slot to install your PCI MAX. Remember to turn off your computer and remove the power cable from the wall or power strip. Open your PC, find an empty PCI slot and insert your PCI-MAX into that slot as you would any other PCI card. You may need to move your card to another slot, if Windows doesn't find it as you boot up. This usually happens with other cards as well (network cards, sound cards) so don't be alarmed. If you can, place your card as far away from other cards as possible. Also, move any cables as far as possible away from PCI-MAX. Finally secure your PCI-MAX with a screw. Make sure that none of the cards are in contact with each other.

Now its time to install antenna or at least a piece of wire (temporarily); plug it into the F connector (looks like a TV cable connector). Use the provided jumper audio cable to connect audio input to the sound card. Now that you've installed your card Windows should report finding new hardware. When it does, point the location of the driver to the CD-ROM (make sure you inserted installation CD first) or to the directory where you installed the program. Example below is for WindowsXP. Other operating systems will look similar.



Fig. 1: Windows has found new hardware and guess what, its PCI MAX!



Fig. 2: This is an example for WindowsXP. It looks similar in other operating systems. Point directory to either CD ROM or place where you installed the PCI MAX driver (if you did it before installing the card).



Fig. 3: This is an example for WindowsXP. Third panel.



Fig. 4: This is an example for WindowsXP. Fourth panel. In Windows XP you could see panels complaining about drivers not being certified or some bogus error messages. Just ignore them, card will work just fine.

USE AND FINAL NOTES

Select working frequency with the keys. Open your

WARNING: PLEASE BE SURE THAT YOU ARE TUNING IN TO AN AREA ON YOUR LOCAL FM BAND THAT HAS NO STATION BROADCASTING ON IT, YOU DO NOT WANT TO INTERRUPT ANYONE ELSE'S LISTENING TO LOCAL RADIO STATIONS, IT'S RUDE AND ALSO ILEGAL!

MP3 player or CD-ROM audio player. Turn on any fm radio and turn the tuning dial on the transmitter until you hear the computer's audio through the fm radio. You will need to adjust audio level so that the sound on the radio sounds naturally and without distortion. Too much volume may sound good on your radio, but will sound horrible a few hundred meters from the transmitter! You shouldn't sound louder as other FM stations. Now any audio you play through your computer will play through the transmitter to any fm radio tuned to the frequency you have the transmitter set to. You may want to try a few different stations because of better reception

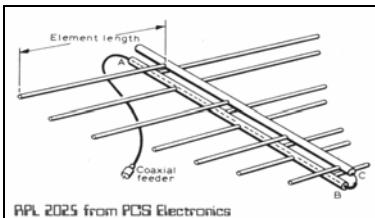
in different areas some spots on the dial may work better than others.

IMPORTANT NOTE!

Please remember to turn off the transmitter when not in use! This goes especially for the 5W booster. Make sure you turn it off until you start the program on the desktop and turn it off after you stop using the program! Remember that anything you broadcast through the transmitter can be heard by anyone tuning in to that frequency. Although it is unlikely certain weather conditions may allow the signal to go further than your immediate listening area so please don't broadcast anything you don't mind anyone else hearing.

WARRANTY

Any PCI-MAX unit that fails due to defects in workmanship and/or materials will be repaired or



replaced, at the discretion of the manufacturer, to the original purchaser who provides dated proof of purchase. Damages caused by abuse, misuse, negligence (i.e. Water damage, improper

installation, lightning strike) are considered to be avoidable.

Also available from PCS Electronics

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Professional MONO and STEREO excitors at power levels between 5 and 20 W. We can also ship aerials, stereo encoders and other equipment. For pictures and daily fresh prices check our web site: <http://www.pcs-electronics.com>

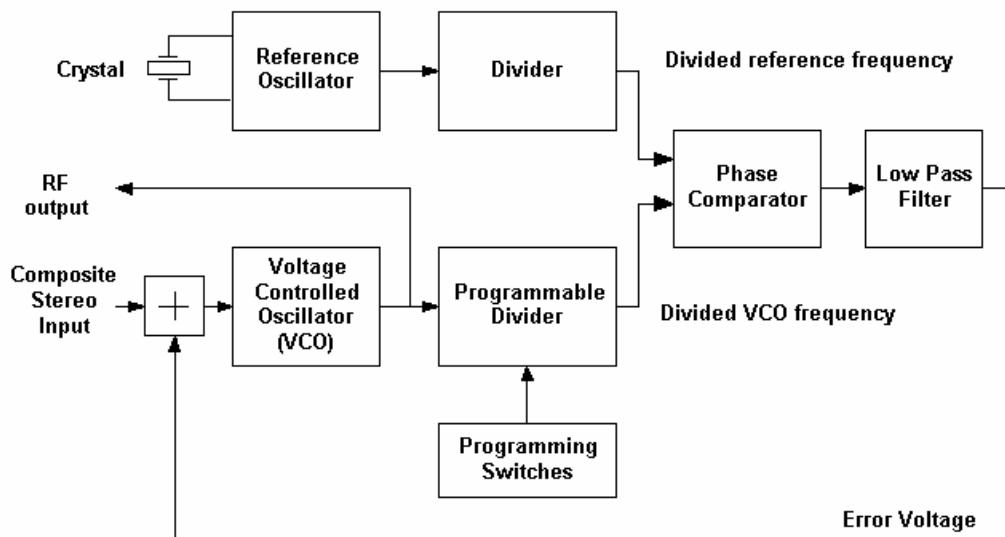
Appendix A: How to increase range?

First and most important, the best thing you can ever do to increase performance is to get better aerial and to move it higher!

Appendix B: The principles of operation

PCI-MAX features a Phase Locked Loop (PLL) oscillator. This combines the ease of tuning and wide deviation of a VFO with the frequency stability of a crystal oscillator. Let's look at the schematic diagram of the PLL:

Block Diagram of Phase Locked Loop Controlled Oscillator



A crystal oscillator is used to provide a reference frequency. This is digitally divided to a frequency of relatively low 50KHz. A VFO provides the wanted output frequency, which is also digitally divided to give another relatively low frequency. These two low frequencies are presented to a phase comparator which basically decides which frequency is higher by comparing the phases of the two signals. The phase comparator generates an error voltage which is connected back to the input of the VFO through a low pass filter (LPF). This is the loop bit. If the VFO is running too fast the phase comparator decreases the error voltage so as to slow it down till the phases at its input are the same. If it's running too slow the error voltage is increased to speed it until the phases are the same. All this happens instantaneously, of course so the output frequency remains constant. In this way the temperature stability of the VFO isn't important as its output frequency is phase locked to the crystal oscillator, and the frequency stability of this is very good. Clever eh? Two more things to explain. How do you change the output frequency? By making the VFO's divider programmable. Say it's set to divide by the number N. The phase comparator is a simple minded sort of soul, concerned only with equalising the phases at its inputs, it doesn't know what's really coming out of the VFO, which is N times the divided reference signal. Because this signal is so low compared to the VFO frequency N can be made to have hundreds of different values, giving hundreds of different output frequencies from the VFO. So changing the frequencies is just a matter of changing

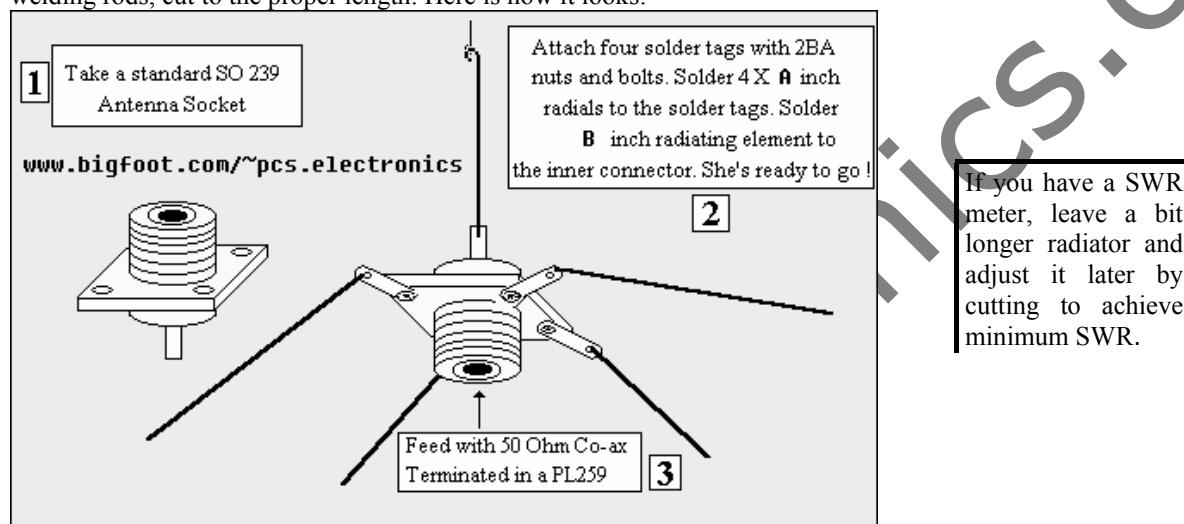
division ratio. Since this is taken care by the uCPU (IC5), all you have to do is push the button. By the way, almost all of the black boxes from the above diagram are contained in one single integrated circuit, IC 4.

VFO is being frequency modulated by the audio input, so its frequency at any given instant depends on the voltage of the audio output. We don't want this variation of the VFO's frequency to be ironed out by the PLL system thus we 'iron out' the error voltage from the phase comparator, so it just contains the underlying trend rather than what's happening at any split second. This is the purpose of the low pass filter. Programmable PLL oscillators are used in majority of the professional communications equipment, including broadcast transmitters. The digital part of PCI-MAX is your PC. It sets the divider ratio for PLL.

VFO is employing a single MOSFET transistor. Weak signal from VFO gets amplified to few mW (check our website) of pure power. Output filter helps to keep harmonics down to minimal level.

Appendix C: GP aerial design

You can build an inexpensive 1/4 wave antenna from 1 SO-239 chassis mount RF connector and 5 - 3' bronze welding rods, cut to the proper length. Here is how it looks:



Most designs on the web don't compensate for the fact that GP aerials are not wideband aerials. Here is a Freq/element length chart for this simple GP aerial, all element lengths are in millimeters:

Frequency	Radiator - B	Radials - A
108MHz	660	693
104MHz	684	720
100MHz	713	749
90MHz	792	819

For other aerial designs check our website.

Thank you for purchasing the PCI-MAX!

We hope you will enjoy it as much as we do and remember to tell your friends about it. Please feel free to send us your comments to feedback@pcs-electronics.com. For tech support please send email to techsupport@pcs-electronics.com

From all of us we wish you happy broadcasting!

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