CyberMax8000+ STEREO/RDS

High performance DSP FM stereo encoder/processor with 114x oversampling

Manual

IMPORTANT NOTE

Upon receiving your order inspect the packaging material and unit for apparent damage. Any damage should be reported immediately so we can make a claim with the shipping company. Take photos, if you can, they can be used as a proof.

Mains cable is typically not included with our mains power supplies and units. Since these cables vary from country to country and we had trouble finding the exact type we decided against including them, especially since finding them is so easy and cheap locally. They can be obtained in any radio/computer/hardware shop at the cost of about 1 US$. It is the type used in your PC for mains power.

Study local regulations and ensure you are operating in compliance.

Never ever operate any transmitter or amplifier without a properly tuned antenna!

Table of Contents

Introducing the CyberMax8000+ STEREO/RDS encoder

With DSP and digital audio input (USB) for completely noise-free audio experience

B ased on the new SE8000DSP+ is a high performance stereo encoder with DSP digital processor, split supply rails (via on-board DC/DC), balanced input buffers, a fairly complex and incredibly sharp filter with deep notch at 19KHz, pre-emphasis, limiter and LC MPX filter. Digital subsystem generates 19KHz pilot (32x oversampling) and generates DSB signal. 114x oversampled MPX ensures crisp stereo sound with excellent stereo separation. SE8000 DSP+ can be upgraded to RDS functionality simply by plugging-in a RDS IO board with integrated USB remote control via PC. It is perfect for a demanding broadcaster.

CyberMax8000+ will make sure your signal stays where you want it, providing high quality audio with excellent channel separation without causing interference to nearby channels. High quality components and printed circuit board assure 24/7 operation for years. In this manual you will find all of its exciting secrets.

Why is CyberMax8000+ Stereo/RDS so great?

- Perfect for any mono FM transmitter (turning it into stereo)

- Mix of analog/digital technology produces crisp natural sounding audio

- When digital audio input is used you can enjoy completely noise-free audio. Ground loops are gone. You have to hear it to believe it. You can now stream audio digitally directly from your PC/Laptop.

- Extremely sharp 15kHz low pass filters and a very deep notch at 19KHz!

- On-board XLR connectors

- Pilot level and pre-emphasis now selectable from the LCD

- Works either with separate LCD module or can be connected to LCD module of our exciters (requires new LCD type with encoder)

- Balanced XLR or unbalanced RCA audio inputs. This effectively eliminates annoying ground loops and hum.

- LC filtered MPX output signal.

- Built-in limiter, low pass filter and true compressor.

- Excellent stereo separation

- Support for RDS daughter board for easy upgrade to RDS

- MPXin/MPXout/19KHz header connects to IO board with 3 BNC connectors

- MAXLINK II makes it possible to connect to FM exciter without any soldering

.

Technical specifications:

Audio Response: 10Hz-15KHz, 15kHz lowpass filtered (standards require upper level at 15KHz max)

19KHz notch filter, >-60 dB typ

Precise pre-emphasis, 50uS, 75uS or none selectable from LCD display

Audio Input Impedance: 10K, balanced or unbalanced

Audio Input Level: 0 dB

Digital audio input: USB connector, Windows/Linux/Mac compatible

Distortion: <0.01%

S/N ratio: >85 dB

Separation: >60 dB typ.

Pilot Frequency: 19 KHz, DSP generated with 114x oversampling

Output Impedance: 75 Ohms

Power Requirements: 12-15VDC / 200mA

PC Board Size: 120x100mm

Audio connectors: all RCA jacks are mounted on the board, XLR are mounted on board

Power connector: 3-pin header, center is positive

Output level: 4V

Thank you for purchasing CyberMax8000+ stereo rds encoder

We hope you will enjoy it as much as we do and if you do remember to tell your friends and colleagues about it. Please feel free to leave your comments at our website or post your experience in our forum. And if you encounter a problem please let us know so that we may improve our products, offer advice and suggestion. From all of us we wish you happy broadcasting!

Your PCS Electronics team
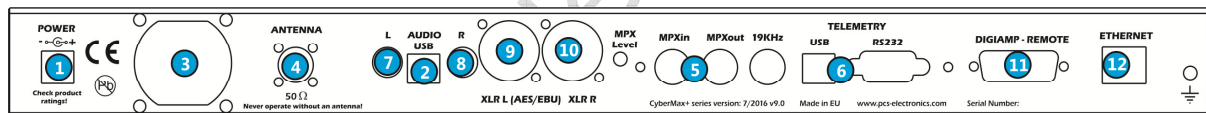
Wiring, setup and testing

Front and back panel layout

Front panel

Reference	Function
1	Rotary button or 3 keys
2	LCD display that lets you control the unit and monitor various parameters.
3	The green led. Green signals power is ON.
4	Red error leds.
5	Power switch

Description of front panel of CyberMax8000+ stereo rds

Back panel

Reference	Function
1	Power jack, center is positive. 12-15V DC, 3A (more for 25W model and up)
2	USB audio input (for PC)
3	Ventilation aperture, fan, not used for stereo processors
4	Antenna connector, BNC. Not used for stereo processors
5	BNC connectors for MPXin, MPXout and 19KHz pilot
6	RS232/USB for programming RDS parameters
7, 8	Audio inputs, RCA jacks for left and right channel.
9, 10	Balanced audio inputs, left and right channel XLR (Canon). Note XLR connectors are labeled wrong (right is on the left and vice versa).
11	Not used for stereo processors
12	Optional Ethernet remote control port

Description of back panel of CyberMax8000+ stereo rds processors

First power-up

Wiring up and testing transmitter is easy.

1. Place unit in a suitable well ventilated position. Connect audio inputs and connect MPX output to FM transmitters MPX input, ensure all connectors are firmly secured. XLR cables are more robust for inputs and are recommended.

2. Connect mains power supply and turn the unit on.

3. Turn on a radio receiver and set it to your intended transmitter frequency. Flip the POWER switch ON also for transmitter and wait for the unit to turn on. Wait a few seconds for the power to ramp up. Your radio should now start playing audio from your audio source or mute (if you did not connect any audio source yet).

4. You can now set MPX input level of your transmitter for correct deviation and verify audio performance. You should not sound louder than other stations, in fact unless you have an expensive high performance software or hardware sound processor you should sound a bit quieter than other stations.

5. Verify whether the left and right channel are set correctly. This may not be important for music but matters in movies. Exchange channels if needed. To see audio levels set View type to display Audio Levels. Access menu View by pressing the menu key or rotary button until this is shown, than change value to Audio Levels.

6. If your unit supports RDS, you can set RDS PS (Station name – 8 characters) and RDS RT (RadioText – 64 characters) and other RDS parameters. This requires connection to PC via USB or Ethernet to setup. Software setup is described later in this manual.

Setting up levels

CyberMax8000+ stereo rds is very easy to setup. What we do have to do however is match the output level of the encoder and input level of the transmitter so that the pilot tone (19 kHz) alone (no audio) gives a deviation of the exciter of 6.75 kHz (9 percent). This automatically sets the remaining audio levels. If you're using our line of FM exciters just connect the stereo encoder to the transmitter, set encoder to Stereo, set audio level on the fm transmitter to zero and keep increasing it until the stereo led on the receiver comes on.

Let's assume that you don't own an expensive peak:

1.) Disconnect one audio input source so that only one channel is connected. Apply audio to this source.

2.) Listen to the audio on a high-grade tuner and adjust the input volume pot for that audio channel so that the volume is only half that of a commercial station. The reason we want this is to be sure we are inside the **+/-** 75 kHz bandwidth. Over deviation will cause degradation of the stereo separation. We now should have the encoder correctly setup with only one channel of audio that is inside the +/-75 kHz bandwidth so separation should be able to be fine tuned without problems such as over deviation affecting our measurements. Turn your amplifiers balance control so that you are listening to only the channel with no audio on.

If everything is good and well then you should have this channel a lot quieter than the other channel. Turn the amplifier up in volume so you can hear the crosstalk between the channels. Now adjust trimmer (J) until the sound in the opposite channel disappears or is at least barely noticeable. You should be able to achieve your maximum separation. You can now reconnect the other channel and apply your audio at the correct level. The encoder is now aligned and ready for operation. **DO NOT FORGET TO DISABLE PREEMPHASIS AT THE TRANSMITTER WHEN YOU CONNECT IT TO THE STEREO PROCESSOR/ENCODER (failure to do so results in very poor stereo separation and distortion).**

Some useful tips

It is recommended that you read this section before you power your unit up for the first time. Let us clear up some basics you should know about. You will also find some useful tips in our guides and forum at http://www.pcs-electronics.com. Here is what you need to consider to get the best from your stereo encoder:

Mains power supply and mains power cable

Do not underestimate the importance of mains power supply, despite abundance of all kinds of cheap units available today they unfortunately do not always meet requirements. What you need is a stabilized DC 15V mains power supply that can supply at least 100mA of continuous current without overheating, introducing buzzing, dropping the voltage down below 12V (a classic case) or acting up in other way. Whenever in doubt please buy our mains power supply.

Digital audio streaming

If you want to drive your audio digitally, connect USB cable to the USB port on the computer and the stereo encoder. Your PC will detect the sound interface automatically. You can now play your audio digitally. In your media player look under options and make sure you output your audio to the "USB audio adapter". Whatever you play will be heard via your FM transmitter.

Which FM transmitters can be connected to CyberMax8000+ DSP stereo /rds encoders

Any FM transmitter with MPX input.

CyberMax8000+ LCD control module

Basically there are three push-buttons available for the menu system; **UP**, **DOWN** and **MENU**. By pushing **UP** or **DOWN** you change the selected parameter in corresponding direction. The third button (**MENU)** gives you an option to select and setup many of the options and DSP functions of this unit. LCD display with rotary encoder has a different setup, you need to press the rotary button to select menu. Rotating up or down changes the paremeter value.

Lcd control module menu system: Power and DSP functions

The UP and DOWN keys are used to change parameter values. In normal mode the LCD simply shows audio level for both channels. Menu key can be used to enter the menu mode, repeatedly pressing this key brings up the following menus: <STEREO MODE>, <TREBLE>, <BASS>, <COMPRESSION>, <THRESHOLD>, <ATTACK>, <DECAY>, <INTEGRATION>, <LCD CONTRAST>, <RIGHT CH VOL>, <LEFT CH VOL>, <PILOT LEVEL>, , <PREEMPHASIS>, <FIRMWARE VER>. Pressing the UP or DOWN key selects the desired parameter and allows you to modify its value. Another press on the MENU key and you're back to the normal mode. Note that all these settings except power and frequency are already set as they should be so changing them should not be necessary and is not recommended. Best values are marked with D, such as <50uS D>.

<STEREO MODE>

You can set your transmitter to MONO or STEREO here.

<TREBLE> and <BASS>

This option allows you to set the amount of TREBLE and BASS in your audio. Recommended values are marked with (D).
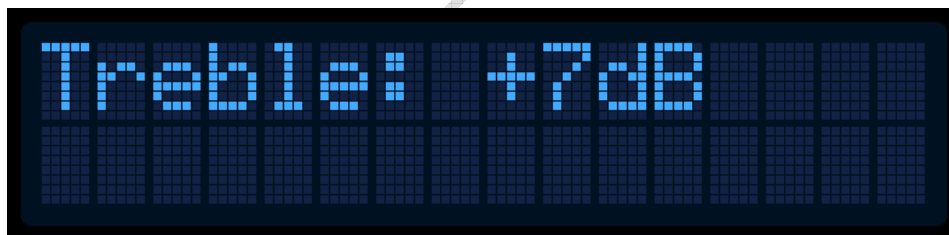

Setting treble

Setting bass

Compressor Settings (only with DSP stereo encoders)

A number of MENU settings control the operation of the compressor. Lets assume that the audio signal enters the transmitter at some low level. Compressor does nothing to the signal until at one point as the input signal increases the signal reaches the compression threshold. Digital signal processor starts compressing the signal beyond that point. The higher the compression ratio the higher the compression. For example, compression ratio of 1:∞ would in effect be a limiter.
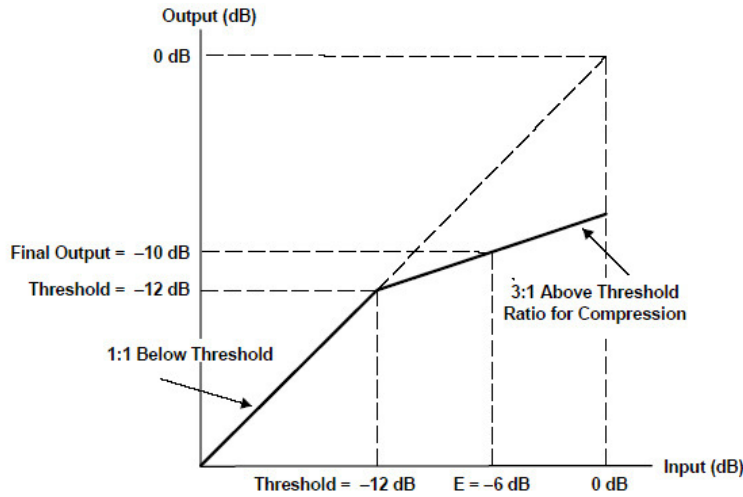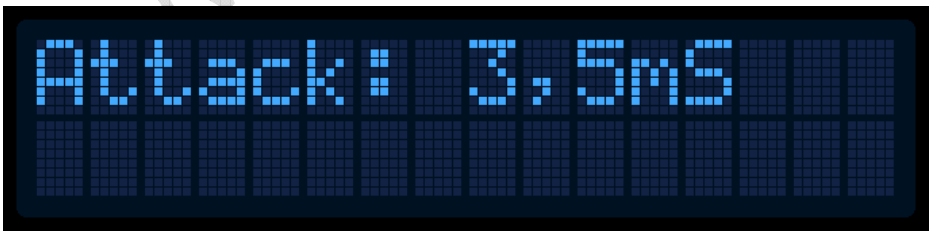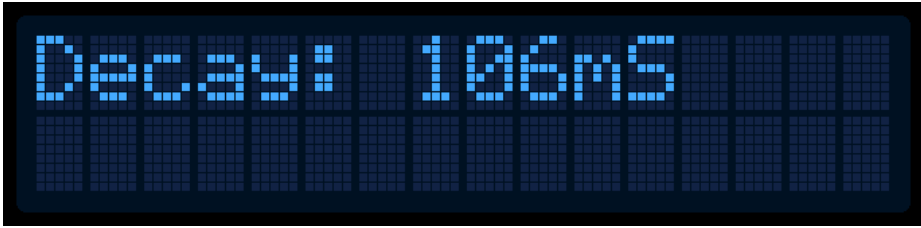

Explanation of the compressor settings
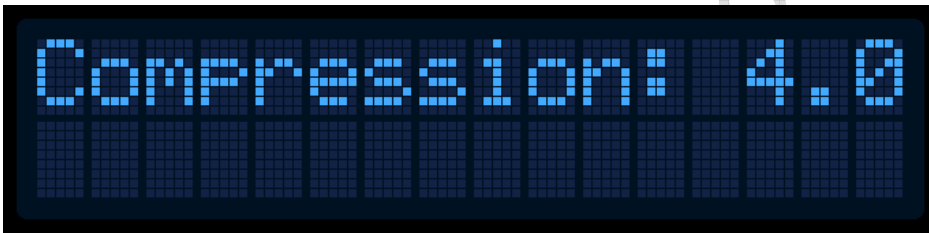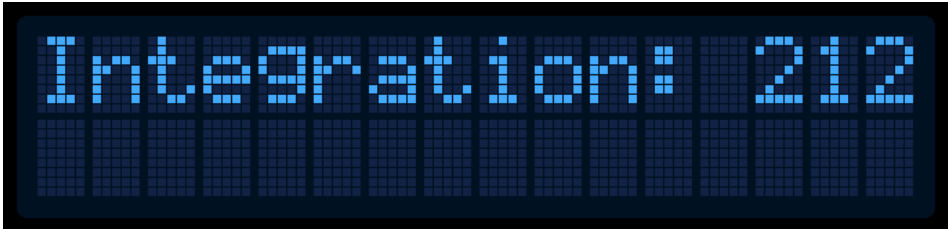

Setting the compression level

Setting the compression threshold

Setting the attack time, this is the time between the input signal and the actual response of the compressor

Setting the decay time, this is the time the compressor needs to respond after the input signal falls back to normal level (below threshold).

Setting the integration interval, this is the time the DSP evaluates the signal to establish whether it should respond or not

Integration interval determines the energy needed to trip the compressor. In simple words; it determines how long the audio needs to be loud for the compressor to respond by reducing the gain. This is not to be confused with attack time. Attack time of 50ms means the compressor will respond in 50ms after the signal spike is detected, regardless of duration of that spike, even if it is just a very short event. With longer integration interval, on the other hand, compressor only responds if a long spike or a substantial number of spikes is detected (meaning more signal energy).

<LCD CONTRAST>
Select for the best visibility. Contrast is slightly affected by ambient temperature and you can adapt it to your needs here.

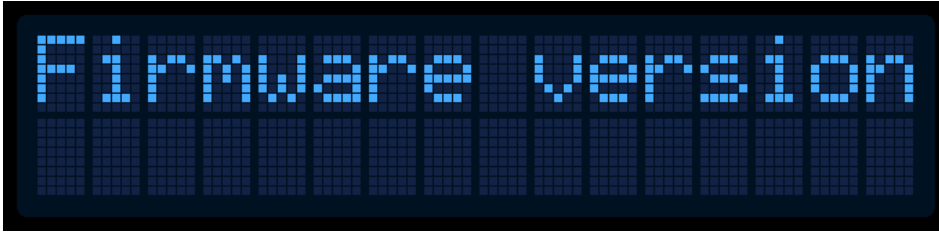Changing contrast

Left and right channel volume
This option allows you to precisely adjust the input sensitivity of both audio channels. This is very useful when your audio source has either too high or too low output level.

Changing right input channel gain

<FIRMWARE VER>

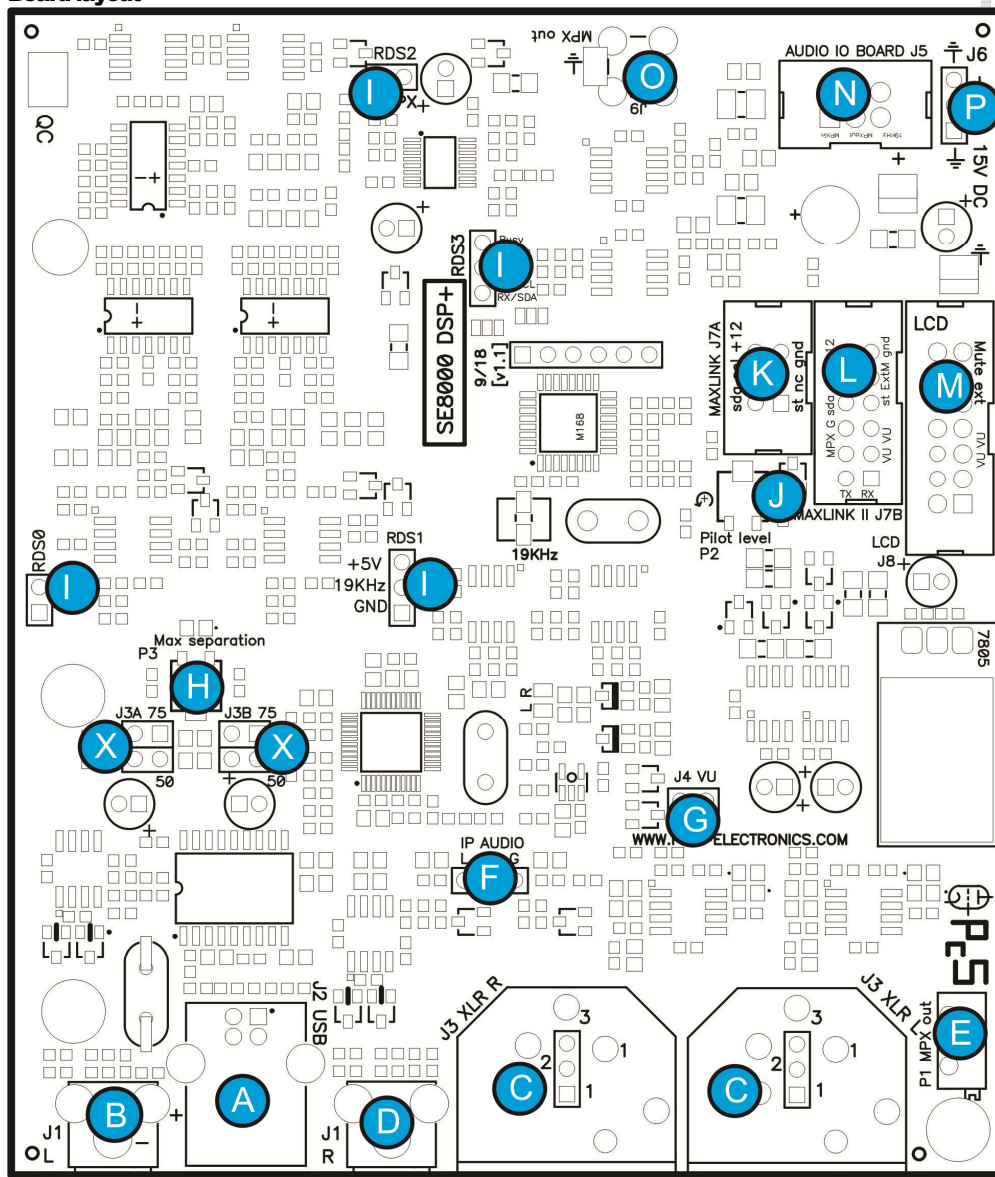This option allows you to display current LCD module firmware version.

Firmware version

Introducing the CyberMax8000+ STEREO/RDS encoder

Under the hood: SE8000DSP+ board layout

Board layout

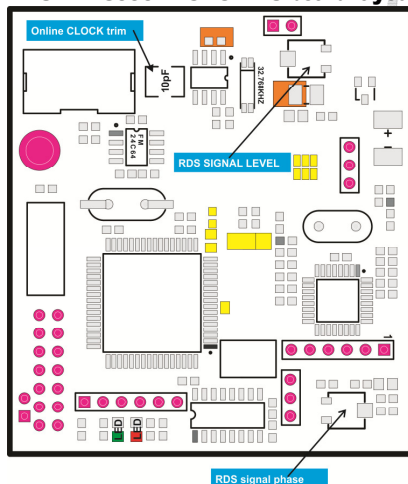SE8000+ board layout

Ref.	Function
A	Digital audio input, USB
B,D	Left and right analog audio input, RCA
C	Left and right XLR connectors
E	MPX out level, adjustable from inside (make holes into enclosure)
F	Connection to optional Ethernet audio streaming (Barix). Audio input.
G	You can connect VUMAX-1 led vu-meter unit here, it will show audio levels as bar graphs. The 2 remaining bar graphs can be connected to FM exciter to show power and SWR.
H	Separation adjustment. You can maximize for best stereo separation here.
I	Optional RDS daughter board is plugged in here.
J	Stereo pilot level can be adjusted here (frequency is adjusted with 19KHz trimmer to the left)
K	MAXLINK connector (for interfacing with MAXPRO2015, 6000 or 7000 series). **DO NOT CONNECT THIS TO LCD DISPLAY AS THAT CONNECTOR IS FOR RS232.**
L	MAXLINK II connector (for interfacing with MAXPRO8015, MAXPRO9015)
M	LCD control unit can be connected here (when used as stand-alone).
N	Connects to optional IO board with three BNC connectors (19KHz, MPX in and MPX out).
O	MPX out, this goes to FM exciter audio input (if MAXLINK II is not available)
P	Power supply (15V, 0.5A). Not needed when MAXLINK II is used.
X	Pre-emphasis jumpers. Set to 75 for USA and 50 for most of the world.

Description of various elements of the SE8000DSP+ stereo encoder board

RDSMAX8000 MICRO RDS board layout

RDSMAX8000 micro rds encoder board layout

Ref.	Function
A	Level of RDS signal. Set it as low as possible
B	Phase of RDS signal, set for minimal noise
C	Onboard clock trim, adjust if clock lags or advances after several days

Description of various elements of the RDSMAX8000 micro RDS encoder board

WINDOWS CONTROL PROGRAM

SOFTWARE INSTALLATION AND COMMUNICATION SETUP

Use the USB port!

Our processors have two USB ports, one serves as USB audio input. That one should not be used for remote control!

Installing USB driver

If you want to use USB to program and control our transmitter via PC, download the USB COM port driver, you can find it **here**: https://www.pcs-electronics.com/shop/fm-transmitters/cybermax-fm-transmitters/cybermaxfm-se-v3-15w-and-25w/ (look under additional information tab)

Download the USB driver for your operating system and run the setup file. Wait for the following screen (or very similar) to appear and select the installation directory (best left alone at default location). Click Install and wait for the installation to finish.

Installing USB driver
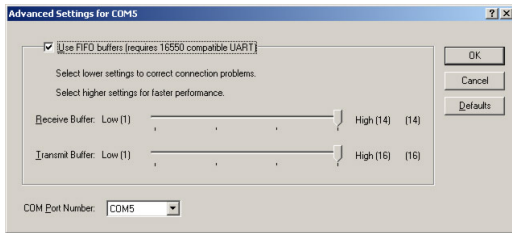
Configuring USB driver

In Windows go to Start > Settings > Control Panel > System > Hardware tab > Device Manager (This can vary depending on your Windows version). You should have something like this on your screen at this point:
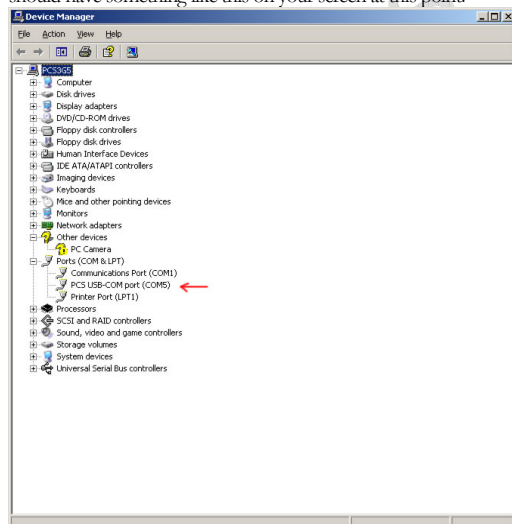
Configuring Com port for USB driver

Take note of the COM port number here, you will need it later to configure the COM port inside CyberMaxFM+ control program for Windows. If you wish to change this port right click on the PCS USB-COM or whatever Windows detected it

as, than select Properties. Now select the Port settings tab and click Advanced. Note you can set the COM port number as you wish:


Configuring Com port for USB driver

Installing correct program for controlling your FM transmitter

We are going to use a program that normally serves to control the FM transmitter, but when used for stereo processor the only thing that will work is the RDS encoder section. Everything else (DSP stereo parameters) will need to be set via LCD display. Download the **CyberMaxFM V6.4 setup program** from the page **mentioned earlier** (or newer version, if available). We also know which COM port it is from previous step.

Software installation

Download the latest setup file from the links above. Once you have the setup file run it and install the program on your computer. This process is very straight-forward and should only take a few minutes. Wait for the installation to complete and click Finish when done.
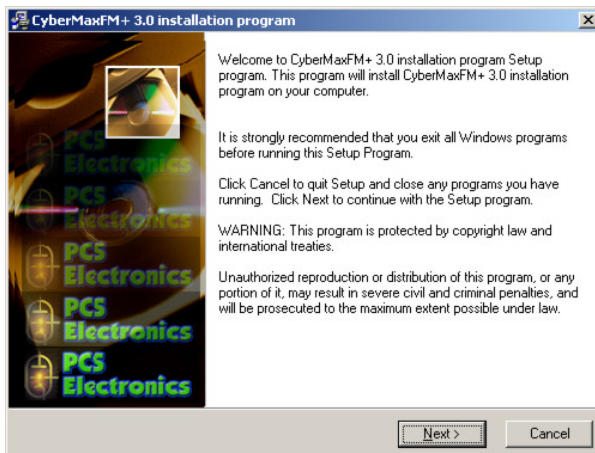
Welcome screen (from previous version of software)

Once the installation is done you are ready to start the program. But before you do please establish physical connection between the transmitter and the PC. **Always connect and power up the processor BEFORE you start the Windows control program! Failing to do this can cause the program to freeze (you will have to close it and start it up again). Also, close the Windows control program before powering off the transmitter.**
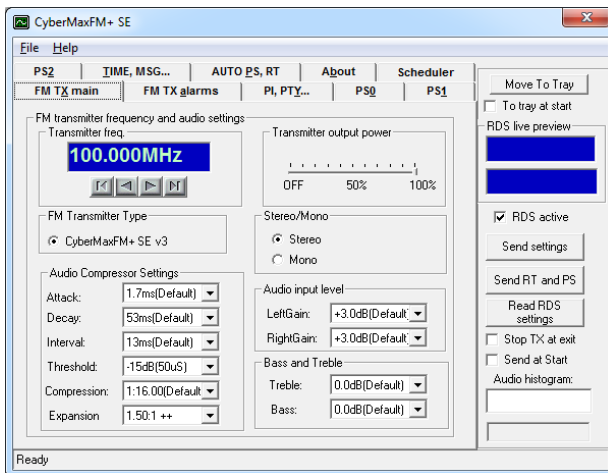
CyberMaxFM+ remote control software, depending on your model this screen can differ a little.

As you can see this program lets you control all the parameters of your FM transmitter including RDS parameters which is what we need.

Setting up com port in CyberMaxFM+ program

The only setup required is minimal. Start the CyberMaxFM+ program, the icon should now be on the desktop. Now click File and Setup. The following window will open. **It is best to set COM port manually as the Autoscan feature does not always work correctly** (same goes for test tool).
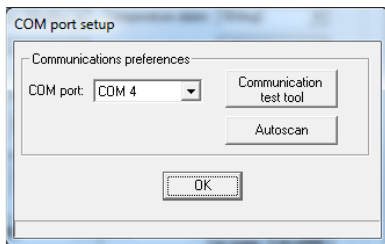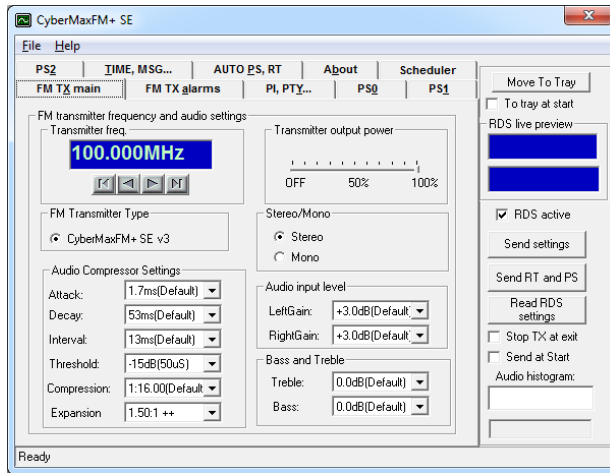

Set COM port for remote control.

Testing the connection

The easiest way to test the connection is to try to send data to the processor. If there is an error message you'll know something is wrong. Also, when you change PS the station name on receiver will be changed.

FM TX main tab – transmitter setup

FM transmitter setup

Not needed when used to control stereo processor

FM transmitter type

Not needed when used to control stereo processor

FM transmitter frequency

Not needed when used to control stereo processor

Transmitter output power

Not needed when used to control stereo processor

Stereo/Mono

Not needed when used to control stereo processor, change via LCD display.

Audio input level

Not needed when used to control stereo processor, change via LCD display.
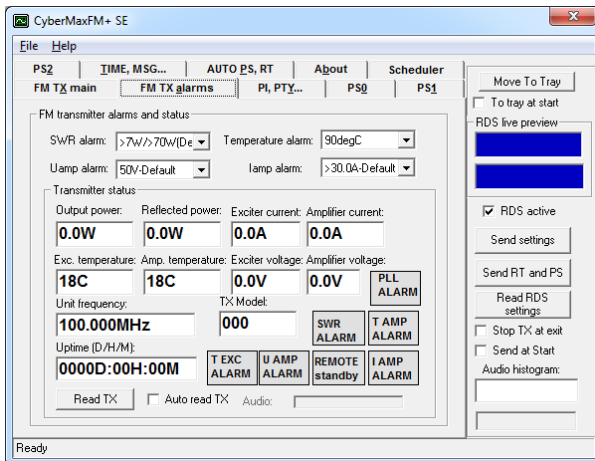
Bass and Treble

Not needed when used to control stereo processor, change via LCD display.

Audio Compressor Settings (only with DSP stereo encoders)

Not needed when used to control stereo processor, change via LCD display.

FM TX alarms

Setting up alarms

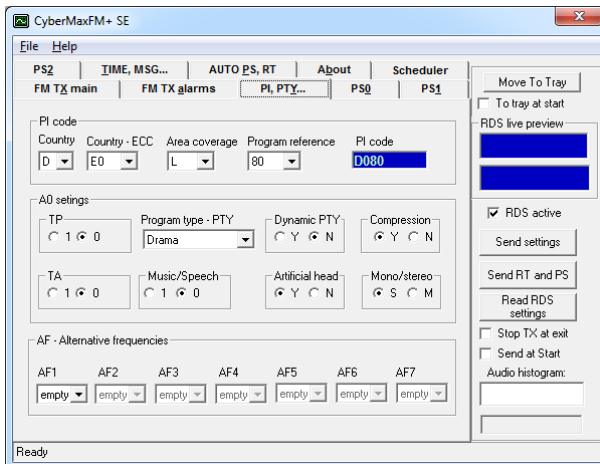Not needed when used to control stereo processor

Read TX

Not needed when used to control stereo processor

Auto read TX

Not needed when used to control stereo processor

PI, PTY... (RDS settings)

Setting up RDS

PI code

This information consists of a code enabling the receiver to distinguish between countries, areas in which the same programme is transmitted, and the identification of the programme itself. The code is not intended for direct display and is assigned to each individual radio programme, to enable it to be distinguished from all other programmes. One important application of this information would be to enable the receiver to search automatically for an alternative frequency in case of bad reception of the programme to which the receiver is tuned; the criteria for the change-over to the new frequency would be the presence of a better signal having the same Programme Identification code.

TP/TA flag

TP is a flag to indicate that the tuned program carries traffic announcements. The TP flag must only be set on programs which dynamically switch on the TA identification during traffic announcements. The signal shall be taken into account during automatic search tuning, so I recommend turning this flag on even though you don't transmit any traffic announcements.

Program type PTY

This is an identification number to be transmitted with each program item and which is intended to specify the current Program type within 31 possibilities. This code could be used for search tuning. The code will, moreover, enable suitable receivers and recorders to be pre-set to respond only to program items of the desired type. The last number, i.e. 31, is reserved for an alarm identification which is intended to switch on the audio signal when a receiver is operated in a waiting reception mode.

Music/Speech

This is a two-state signal to provide information on whether music or speech is being broadcast. The signal would permit receivers to be equipped with two separate volume controls, one for music and one for speech, so that the listener could adjust the balance between them to suit his individual listening habits.

AF - Alternative Frequencies

The list of alternative frequencies gives information on the various transmitters broadcasting the same program in the same or adjacent reception areas. This facility is particularly useful in the case of car and portable radios. When the PI code indicates local coverage-area, i.e. only one frequency is used, AF list may contain this frequency.

PS0
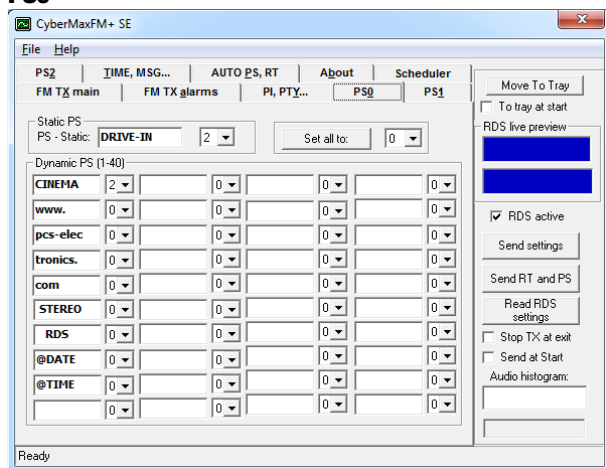
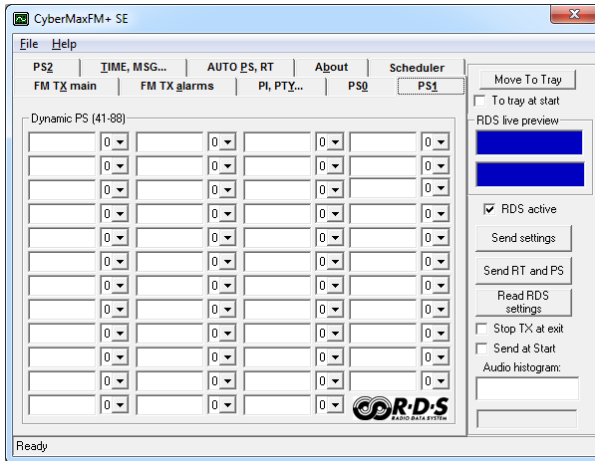Setting up RDS – PS fields

PS

This is the label of the program service consisting of not more than eight alphanumeric characters, which is displayed by RDS receivers in order to inform the listener what program service is being broadcast by the station to which the receiver is tuned. If you want to use just one PS setting please set delay for all others to 0. You can select delay for each of the PS labels. Note that setting a 0 disables associated PI. Labels will start at the start of the list once they reach the last defined PS label (they run in a loop). Do not exaggerate; fast changing PI labels can compromise driver safety!

More information about PS feature

This is the most interesting feature for 99% of customers out there so we will dedicate a bit more time to it. RDS standard provides for an 8-character PS string which is used to identify radio station and is displayed by RDS-enabled radio receivers. Some countries prohibit changing this text dynamically, but others don't. Whatever your decision may be, RDSMAX supports either static or dynamic PS. It is best to check with the local authorities before setting up the RDS encoder. The mechanism for handling dynamic (or static) PS text is best demonstrated by the following example: Imagine a train traveling in a round trip involving 100 train stations. The train starts on station 00 (PS00) and goes through stations 01, 02…. until it passes through station 99 and finally returns to station 00. Every time a train stops at the station it sends the message back to the headquarters (PS text shown on RDS receiver). The amount of time the train stays at the station (delay - PD00 to PD99) varies and can be from 0 minutes (train does not stop) to 9 minutes. I hope this little analogy has illustrated the process. You have 100 8-character strings (PS00 to PS99) which are displayed one after the other until the entire loop repeats itself. You can define how long each of these strings is displayed, the parameter which defines this is PD (PD00 to PD99).
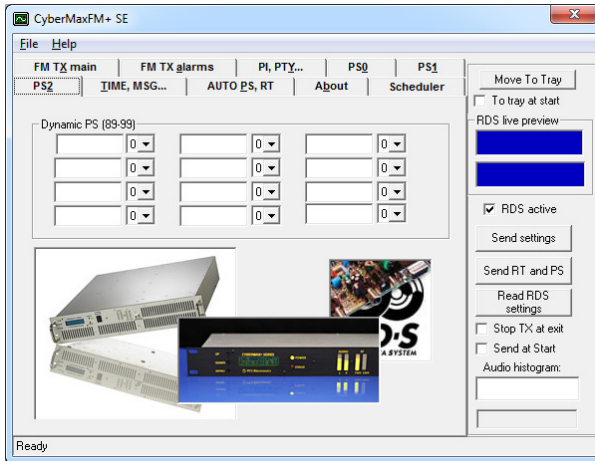
Example: If you wish to just have one static PS, set all delays to 0 and set just PD00 to 1. Then set PS00 to desired states PS, which will be displayed indefinitely.

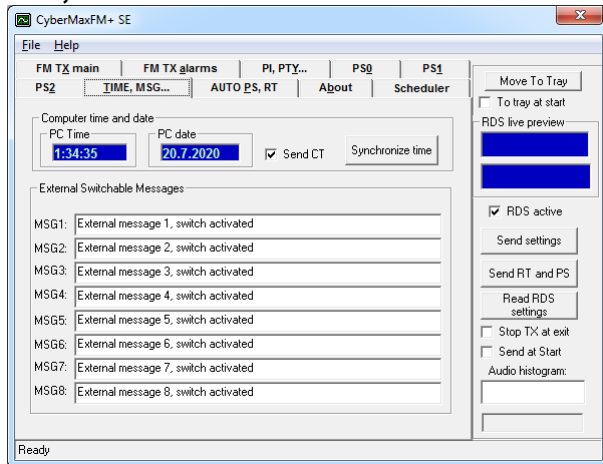## PS1

Setting up RDS – More PS fields, there are too many to fit on one page

PS2

Setting up RDS – More PS fields, there are too many to fit on one page

TIME, MSG...

Setting up time and external messages

Computer time and date

Select to Synchronize RDS RTC (Real Time Clock) with current PC clock. To send CT (time code) with RDS encoder make sure your computer is set to correct time! This can be off by a lot since many computers are not set correctly. Once you are sure your PC time is correct you can click Synchronize time to send time to RDS encoder in your FM transmitter. Send CT is enabled with a check-box.

External switchable messages

Not needed for drive-in cinema. To activate these messages attach 8 switches to header J10 (EXTMSG). These switches must be going to ground from each of the 8 pins and are activated when you ground the corresponding pin. Message is scrolled, if larger than 8 characters. This requires hardware changes (switches are inside the transmitter).

AUTO PS, RT...
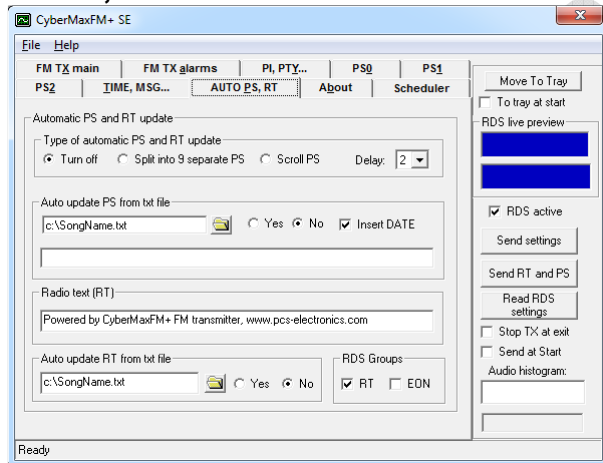
Setting up automatic PS and RT updating

Auto PS and RT update is another hugely popular feature. Basically you can take the song title from Winamp or another program via text file. Winamp must be setup to write its song info into a text file; this is done with TitleSpy plug-in. Most other playback programs can easily be setup to write song info into a text file. You can use this info to update PS or RT text. PS text is limited to 8 characters so the entire song title can either be scrolled or split into 8-character blocks. You can set the speed of scrolling on the panel above. You can also insert DATE at the end of the scrolling block. A really popular and nifty feature indeed. This feature requires your PC to be connected to the RDS encoder at all times during music playback.

Auto update PS from txt file

This mode makes it possible to have the PS updated automatically. A number of very useful features make this mode extremely useful. It is possible to insert time, date or song name from external file. This external file can be updated via Winamp or any other program. If you want to collect data from Winamp (MP3 ID tag, song name) please use winamp plug-in called VtitleSpy. This little program is usually packaged into installation file; you will find it in the installation folder

where you installed the program. Run the exe file and configure it to output winamp song info into your text file and then set CyberMaxFM+ program to read song name from that file. Also make sure you setup VtitleSpy plug-in to limit song name to 64 characters.

Auto update RT from txt file

This is another popular feature, RDS allows for 64-character text string to be displayed on the receiver. However this feature is rarely used as you need to press a button to display it (PS is always displayed by default). Another "nail in RTs' coffin" is the fact that typical receiver only displays a maximum of 8-characters at a time meaning the message needs to be scrolled. However popular or unpopular it may be, we support it. The field at the top (RT) shows the currently active RT message

The auto update RT field makes it possible to collect the RT from any text file. In order to pick RT from a text file select the text file with the browse button and enable auto update by selecting the Yes option. CyberMaxFM+ will check the file once every second and update the encoder automatically if it detects any changes of the text file. If you want to collect data from Winamp (MP3 ID tag, song name) please use winamp plug-in called VtitleSpy. This little program is usually packaged into installation file; you will find it in the installation folder where you installed the program. Run the exe file and configure it to output winamp song info into your text file and then set CyberMaxFM+ program to read song name from that file. Also make sure you setup VtitleSpy plug-in to limit song name to 64 characters.
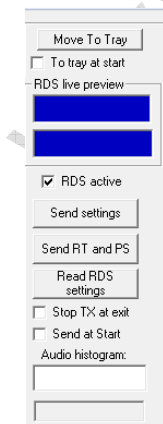
About
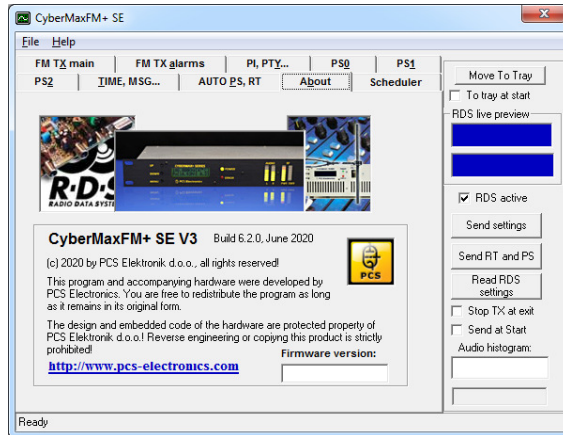
About…

Firmware version

Not needed when used to control stereo processor

Common controls

Common controls

These are common controls belonging to all program tabs.

Move to tray

Click *Move to tray* to move this program into taskbar. Check *To tray at start* checkbox to start the program minimized in system tray.

Preview

This window shows PS and RT preview. Select desired preview type by clicking appropriate radio button.

RDS active

Check this box to activate or deactivate RDS altogether.

Send settings

Send TX settings and *Send RT and PS* buttons may change their appearance and accessibility according to currently active tab. Use *Send settings* to send parameter values + PS00 and RT to RDS encoder.

Use *Send RT and PS* to send all PS and RT parameters to RDS encoder.

Stop TX at exit
Not needed when used to control stereo processor

Send settings at start
Check this box to automatically send TX settings at starting the program. This may come handy when *Shutdown TX at exit* is activated to automatically raise TX power when next time starting the program.
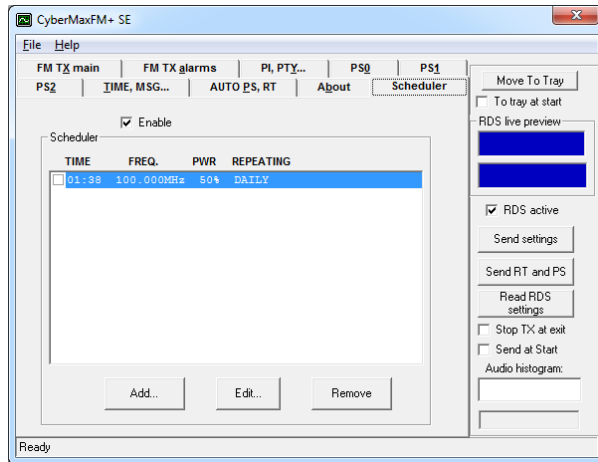
Audio histogram
Not needed when used to control stereo processor

Status window
Some communication activities can be observed here.

Scheduler

Scheduler

Built-in scheduler allows to user determine automatic switching of transmitting power and frequency according to predefined scheme. Schemes can be defined on daily or weekly basis. To accomplish this task the PC must be connected to the transmitter and the program must be running all the time!

Up to 20 controlling lines can be entered into list box. Each line defines transmitting power, frequency and switching time. Put a tick at the beginning of each line to make that line active. There can be many lines active if desired. It is recommended to be careful while entering lines not to make time-overlapping lines active at the same time.

Example: if you define a line on daily basis and at the same time another weekly based line is active the results may be unpredictable. You can always enter many lines and then decide which of them should be momentarily active by putting ticks into checkboxes.

Enable
Check this box to make the scheduler active in general.

Add...
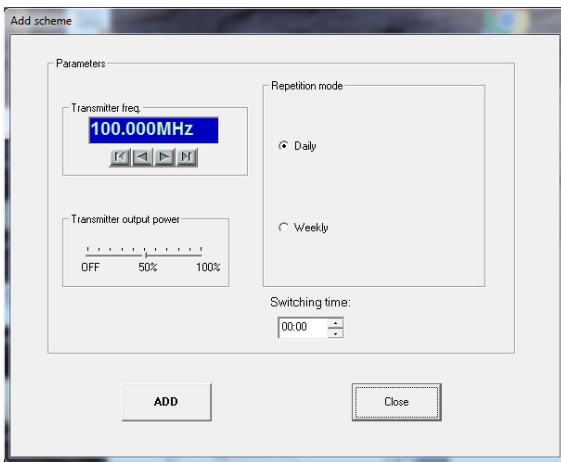Click Add... button to open Add form to add a new line into list box.

Edit
Select desired line first, then click Edit to open Edit form.

Remove
Select desired line first, then click Remove to delete it.

Add scheme dialog

Scheduler, adding scheme

Add scheme dialog lets you enter the following parameters: Transmitter frequency, transmitter power and repetition mode which can be either Daily or Weekly. Daily repetition mode switches every day at the same time. To make sense, at least two daily based lines should be active at the same time. Weekly repetition mode allows individual selection for each day in the week.

Add or Modify
Click this button to accept changes. In the case of adding lines more lines can be entered subsequently.

Close or Cancel
Click this button to finish adding lines or to cancel editing.

# Setting up remote control via Ethernet

Software installation

Download the latest EthernetVirtualPort.exe from our website. You can find it here:

https://www.pcs-electronics.com/shop/fm-transmitters/cybermax-fm-transmitters/cybermaxfm-se-v3-15w-and-25w/

Once you have the driver run the setup file and install the program on your computer. This process is very straight-forward and should only take a few minutes. Wait for the installation to complete and then start the program.

Connect the stereo processor to your network via Ethernet cable (cable not included). The Ethernet adapter is setup to accept IP from your router's DHCP server. It is possible to setup Ethernet adapter with fixed IP or to login directly to ADSL modem. If you need MAC address of the Ethernet adapter open the cover of the unit and look at the Ethernet adapter, the MAC address is shown on the adapter. Now create and configure a connection between the PC and stereo processor as shown below. Note the IP will differ, but make sure the port is set to 5005!
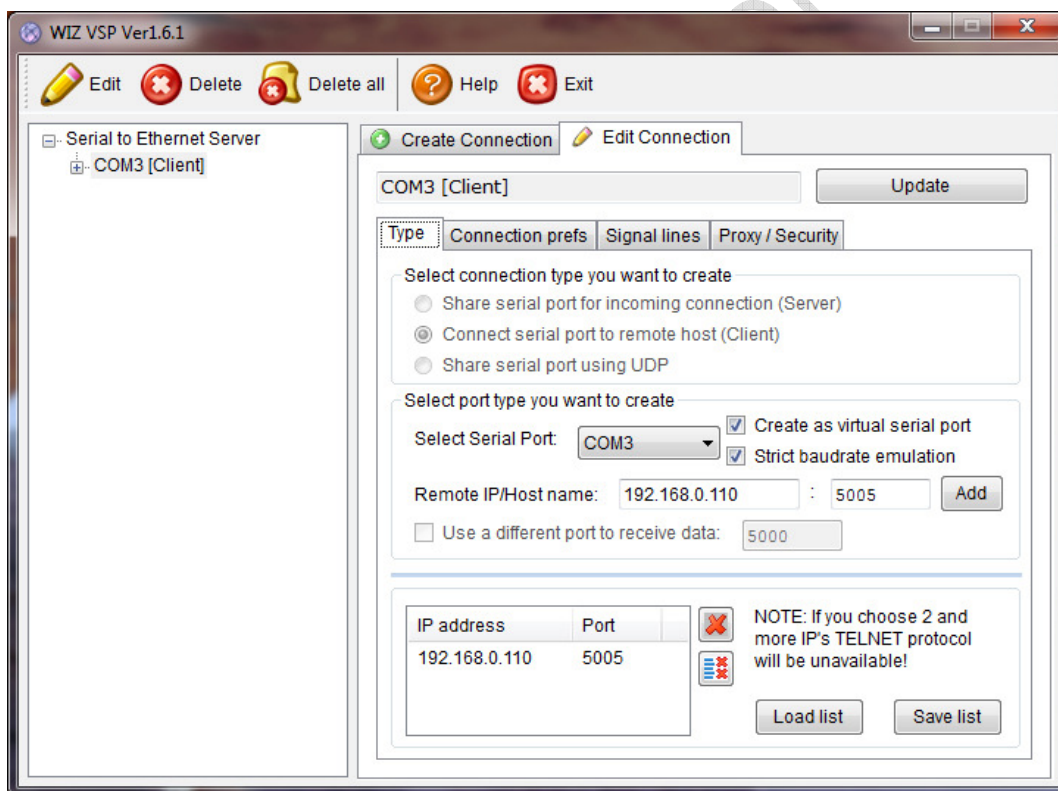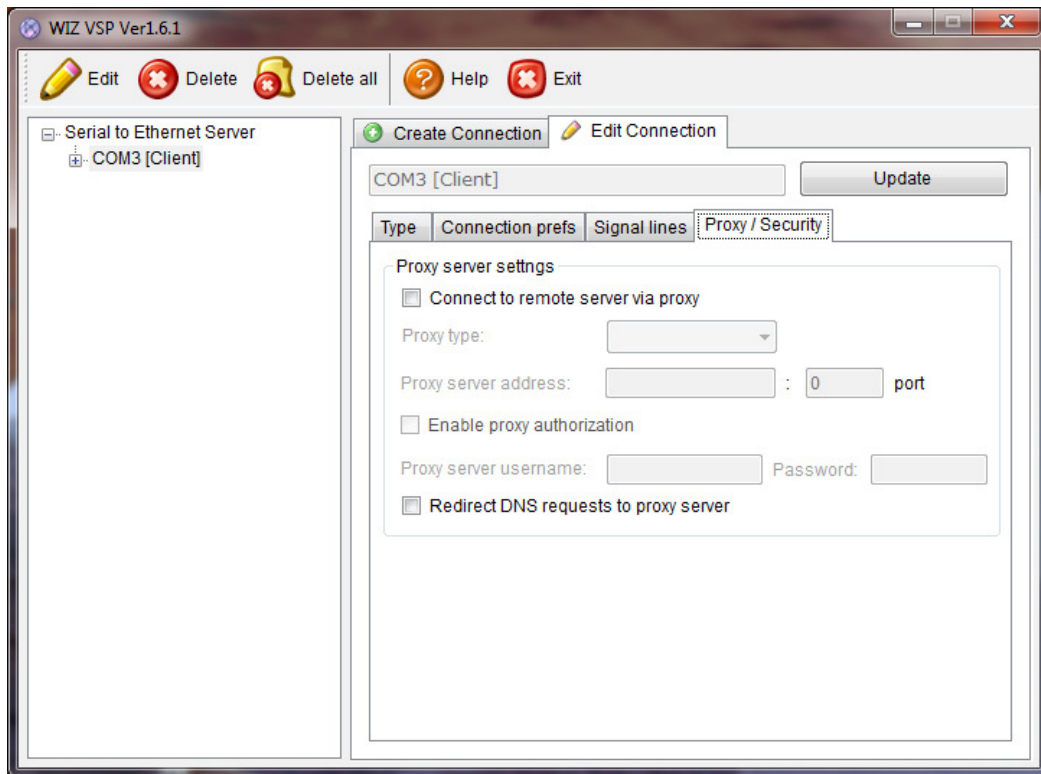

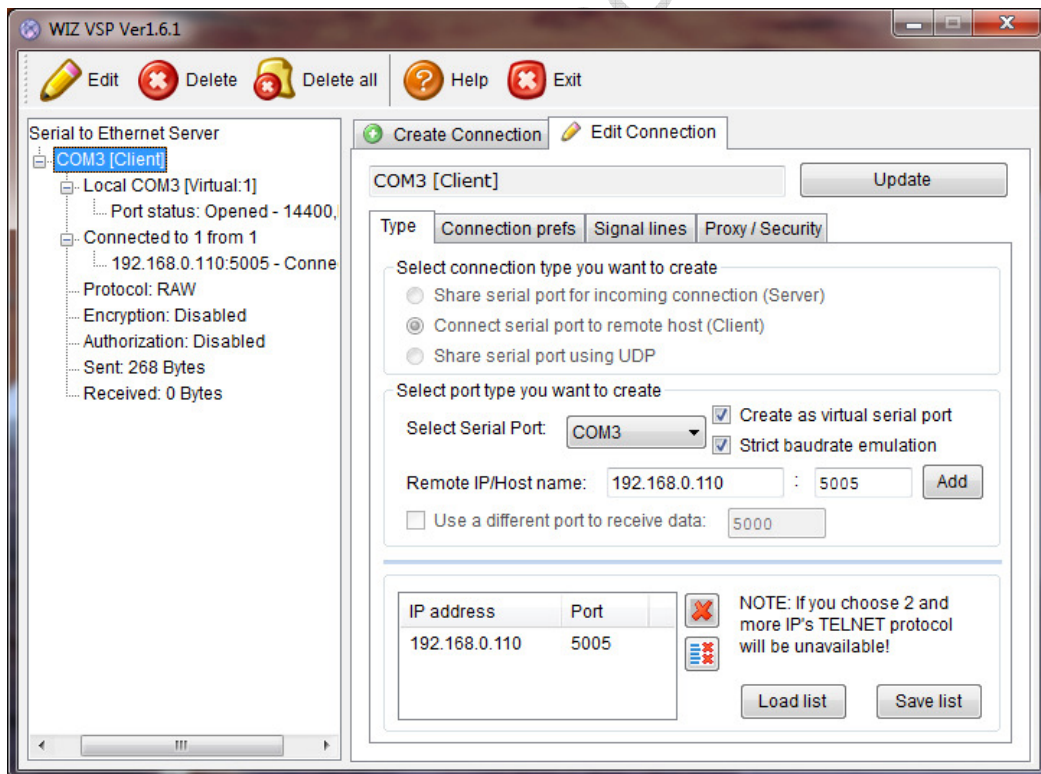Setting up Ethernet connection for CYBERMAX8000+, screen 1
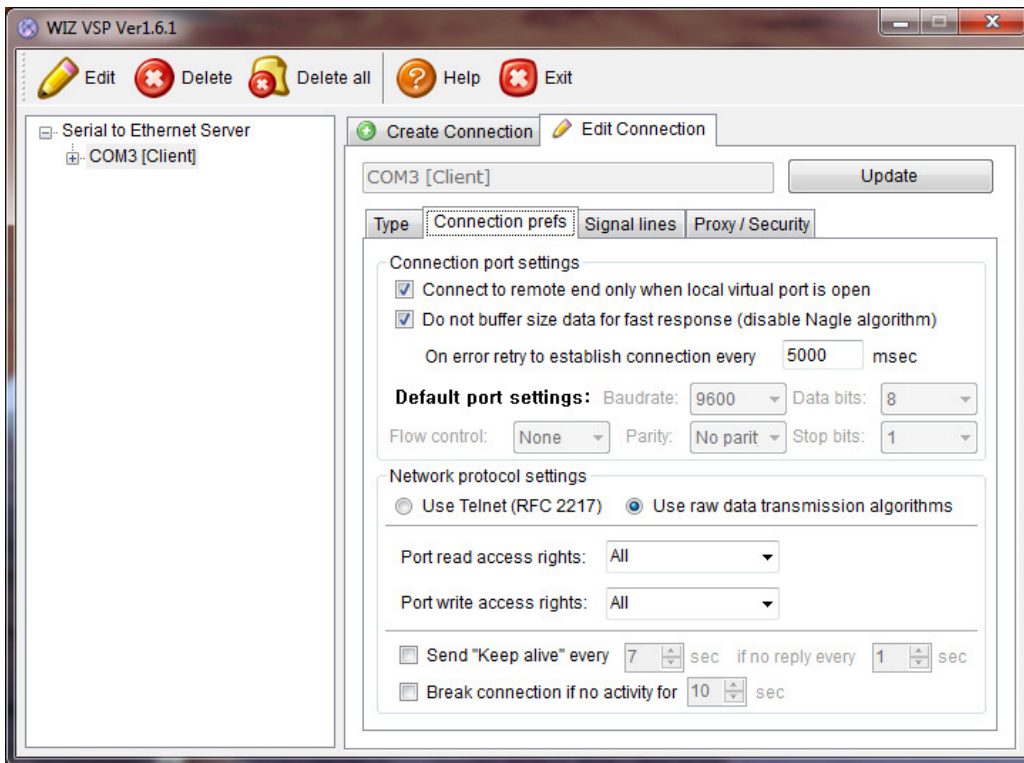
Setting up Ethernet connection for CYBERMAX8000+, screen 2
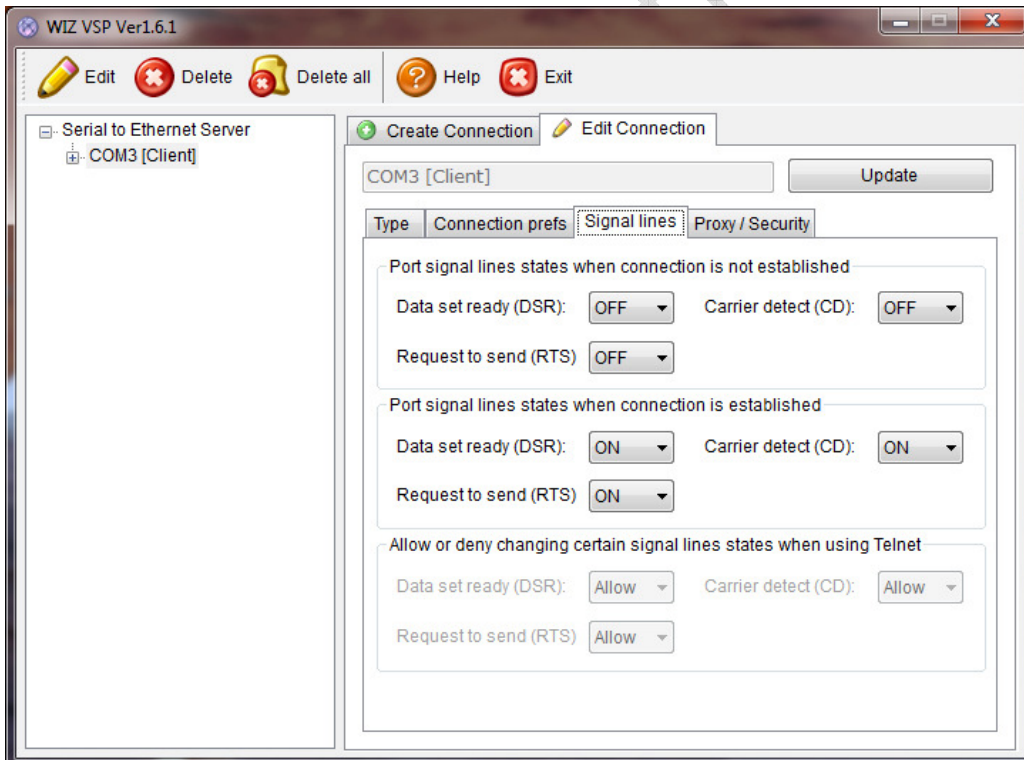
Setting up Ethernet connection for CYBERMAX8000+, screen 3

Setting up Ethernet connection for CYBERMAX8000+, screen 4

Setting up Ethernet connection for CYBERMAX8000+, overview

Troubleshooting

Troubleshooting

We hope you'll never get to this step. We all know bad things happen but do not despair! There is some basic polarity protection, the 1ohm thru-hole resistor closer to supply power connector is the first thing to check. Also make sure microphone/shielded audio cable leading from MPX output to the transmitter is not shorted. Next check the troubleshooting table on the next page. If you have problems you cannot solve yourself, please see our website for contact information and support resources in our forum.

Fig 15: So, do you think you can handle it? We think you sure can!

PROBLEM DESCRIPTION	POSSIBLE SOLUTIONS
Mono operation only, no stereo	1. Check supply power and voltage 2. Increase audio level in the FM exciter a little bit 3. Make sure you have disabled pre-emphasis in your FM exciter (set jumper to NONE).
Very poor stereo separation, strange audio	1. Make sure you disable pre-emphasis in your FM EXCITER. Check supply voltage
Audio without any treble	Set pre-emphasis on the stereo encoder board (either 50uS or 75uS).
There is HUM in audio	- Try with a different mains power supply. - Move antenna as far away from the transmitter and audio gear as possible - Use XLR audio connectors or digital audio, if possible (USB) - Make sure SWR is low - Keep audio cables short and away from antenna and RF coaxial cable - Form a coil from coaxial cable going to the antenna, make a few turns. This stops RF currents that might be flowing on the outer braid of the coaxial cable. This usually happens when you connect unbalanced cable to balanced antenna without proper BALUN (balanced-unbalanced convertor) resulting in coaxial cable becoming part of the antenna and radiating RF energy as well…causing hum.
Audio too quiet/loud	1. Open or close the MPX input level trimmer on FM transmitter a little bit. 2. Increase or decrease level on your audio source a little bit, start using software or hardware compressor
Audio too loud	Close the modulation level input trimmer on FM transmitter a little bit.
With no audio connected I can hear sort of digital noise	- This means RDS carrier is set too high or RDS phase is not adjusted. Set RDS carrier level to zero with trimmer, than slowly increase until RDS indicator turns on on the receiver. Than increase a tiny bit more. Now set phase for minimal/no noise. Best done with no audio input and radio speakers open to max. - This could also be caused by fan. Stop the fan and see if the noise dissapears
Sometimes/rarely the unit starts in MONO mode.	Restart the unit, the problem should go away. We have firmware update for this but you have to send the unit back for update. The problem is rare and only happens at the start. This firmware issue only affects some SE units. There is also hardware workaround that involves soldering one resistor and one capacitor. If you want to apply this, contact us and we'll guide you to apply the fix.
Power supply is blinking	Probably the same thing as above. Blinking power supply means its protection is shutting it off and back on, probably due to excessive current draw caused by burned unit or damaged power supply.
Audio distortion on high peaks, for example on "s" sound.	Your audio input level is slightly too high, reduce input audio level slightly at your audio source. Use some kind of compressor to remove over-modulation peaks. Use EQ to drop levels above 15KHz and below 30Hz.
There is HUM in audio	- Move antenna as far away from the transmitter and audio gear as possible - Use balanced audio inputs (XLR audio connectors) rather than RCA - Make sure SWR is low

	- Keep audio cables short and away from antenna and RF coaxial cable
	- In really extreme cases you can try to use isolation transformers, that always works.

Troubleshooting

Principles of operation
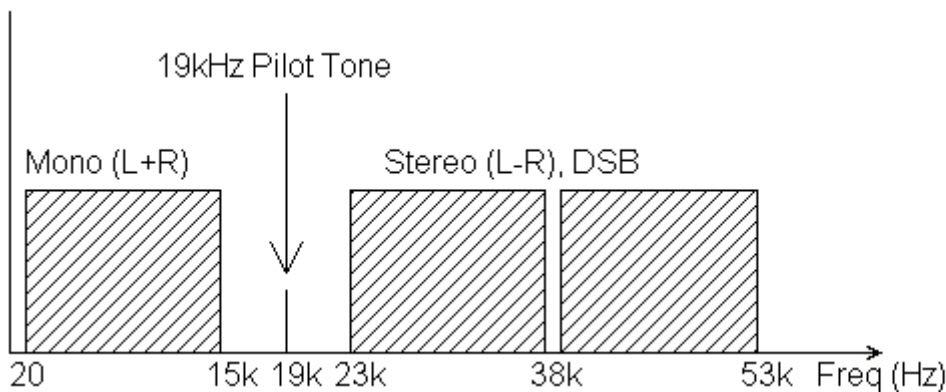
INTRODUCTION - PRINCIPLES OF OPERATION

Fig. 3: Theoretical frequency spectrum of the stereo multiplexed signal

Figure 3 above shows the theoretical frequency spectrum of the stereo multiplex signal (MPX-signal). The MONO signal on the far left goes from approx. 20Hz to 15KHz and is used to transmit the sum of both the left and right channel. This assures compatibility with older MONO receivers that only receive this part of the spectrum. Going from left to the right we stumble upon the 19 KHz pilot just above the MONO signal. This pilot has a couple of functions;

1.) It signals presence of the stereo signal; by detecting it the receiver switches to stereo

2.) It enables demodulation of the L-R signal and LEFT/RIGHT channel reconstruction

The 19 KHz signal is used to demodulate the DSB (Double Side Band Suppressed Carrier) signal stretching from 23 KHz to 53 KHz. This signal contains the L-R information (difference between the left and right audio channel). This is what the stereo encoder does to generate the Stereo Multiplex signal:

A.) Add Left and Right signals to get an L+R signal.

B.) Generate a Pilot Tone of 19 KHz.

C.) Generate a 38 KHz carrier for the Doubly Balanced Mixer (DBM)

D.) Generate the L-R (difference of the audio channels) signal for the DBM

E.) Modulate the 38 KHz carrier with the L-R signal using DBM (DBM suppresses the carrier in the process)

F.) Add up A, B and C above to get the complete MPX Signal.

G.) Use the above MPX signal to Frequency Modulate a carrier in the 87.5-108 MHz band.

Some facts about stereo

Even the best stereo encoder is by itself not enough to guarantee good channel separation at the receiving side over the whole audio frequency range. Many factors are involved:

The transmitter

The first problems usually occur at the transmitter. Badly designed audio stages of the modulator will produce low frequency phase shifts, affecting separation. But the main problem is the phase locked loop section of the transmitter. PLL tries to correct the frequency deviations caused by the audio effectively canceling modulation. The frequency correcting signal is passed through a low pass filter (loop filter). This loop filter dampens (smoothes and averages) the correcting pulses from the PLL circuit before passing the corrected voltage to the frequency control part of the modulator. The loop filter is usually the cause of the phase shifts due to not being able to sufficiently dampen and smooth the correcting pulses when the transmitter is fed with low frequencies. Variable frequency oscillators do not suffer from the problem at all due to no frequency correcting circuits (PLL). In short, a badly designed transmitter can be hugely detrimental to the stereo signal created by a stereo encoder Do not jump to the conclusion that the stereo sound that you are listening to is the stereo encoder only.

The receiver

Filter Bandwidth and Stereo Decoder of a receiver. Even if the transmitter adds no phase shifts to the multiplex signal transmitted, the receiver (radio) at the listening end can still cause trouble. The filters in the radio can cause phase shifts to the multiplex if too narrow in bandwidth. Many cheaper tuners have less filtering (less manufacturing cost) which although not great for selectivity provides for excellent separation in strong signal environments. The above is only true if the stereo decoder in the radio or tuner is ok. It is very hard to obtain any modern stereo decoder chips that give more than 35 dB of separation, some even give you only 25 dB. So even with modern day DSP (digital signal processor) stereo encoders which achieve separation of more than 70 dB, you will never hear it because the radio you will be listening to on will only allow 35 db at best. As you see, stereo is not just about a stereo encoder!

Circuit description

Left and Right audio signals are applied to the connectors J1 and J2. Make sure not to ground the outer shield of the RCA connectors, this will help reject the noise on your audio lines. Alternatively balanced inputs can be used. The audio signals are than fed into the compressor circuit, pre-emphasing stage, limiter, low pass filter, multiplexing stage, MPX filter and output buffer. On-board computer generates the pilot tone (19 KHz) via the D/A converter. All these signals (DSB and pilot) are summed up and sent out to your fm exciter and generate a perfect and crisp sounding MPX signal.

Appendix B – Warranty and legal info

Warranty and servicing!

Within one (1) year of receiving your order, if any product proves to be defective; please contact us via e-mail or our feedback form. Please DO NOT ship the product back to us without contacting us first and receiving return instructions. After we receive the defective merchandise, we will test it if need be, and we will ship back to you a non-defective replacement product. Please note that this doesn't cover final RF transistor as it can be damaged by using defective or poorly matched antenna. An exception is as well any mishandling or abuse by the customer. If the product is defective, you will receive a replacement. If you choose to return the defective item, rather than replace it, we will charge a 20% restocking fee and your original shipping and handling charges will not be refunded. The return of the product is at your expense. We believe that this is a fair policy because lower overhead results in lower prices for all of our customers.

Legal info

It may be illegal to operate this device in your county. Please consult local authorities before using our products! PCS Elektronik d.o.o. is not responsible for any damage to your PC arising from use of this product and will not be held responsible for any violation of local laws pertaining to the use of this product. It is entirely your responsibility that you make sure you operate in accordance with local laws and/or regulations.
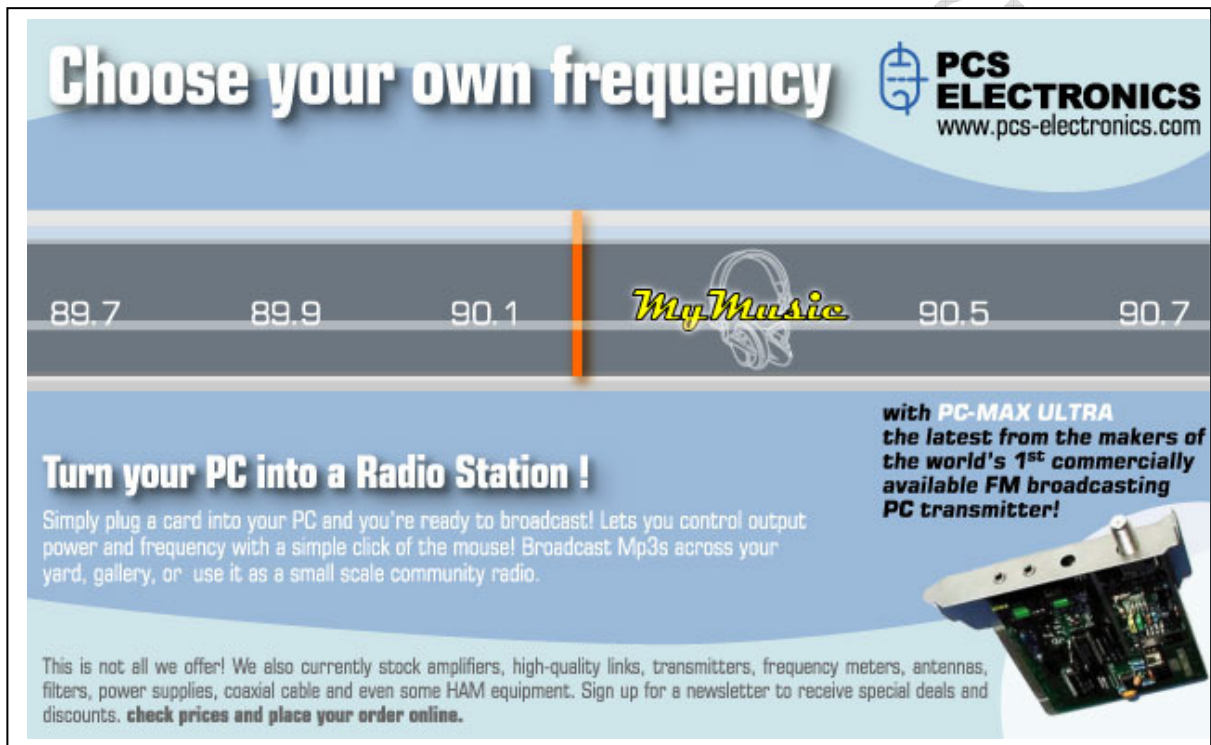
Limitation of liability

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Also available from www.pcs-electronics.com

We also carry a big range of:

- FM transmitters in assembled and KIT form

- TV transmitters in assembled and KIT form, VHF and UHF

- AM transmitters with extremely clear modulation (PWM design)

- Various accessories for professional and hobby FM radio stations

- A large assortment of hard to obtain RF components (RF transistors; MRF, 2SC, coils, silver plated wire, coaxial cable, capacitors, quartz crystals and many others)

- PC based FM transmitters (PCI MAX pc based FM transmitter turns your PC into a radio station)

- A large number of beginners guides to get you started

- A large selection of free schematics is as well available at our website.

If you can't get much range with your homebrew antenna, have a look at these: http://www.pcs-electronics.com

Revisions and errata

V1.0 (June 2022): Release version

Please report any errors you see in this manual, you will be helping us and many other users out there. Thank you!

Index

board layout, 14, 15
Ethernet, 28
Technical specifications, 6

Troubleshooting, 31