

DRIVE-IN CINEMA

Setting up FM transmitters to deliver sound in drive-in cinema

Manual&Guide

IMPORTANT NOTE

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

IMPORTANT!: Never operate any FM transmitter without suitable tuned antenna. Study local regulations and ensure that you are operating in compliance.

www.pcs-electronics.com

The drive-in cinema concept

A drive-in theater or drive-in cinema is a form of cinema structure consisting of a large outdoor movie screen, a projection booth, a concession stand and a large parking area for automobiles. Within this enclosed area, customers can view movies from the privacy and comfort of their cars. Some drive-ins have small playgrounds for children and a few picnic tables or benches.

The screen can be as simple as a wall that is painted white, or it can be a steel truss structure with a complex finish. Originally, the movie's sound was provided by speakers on the screen and later by individual speakers hung from the window of each car, which were attached by wire. These systems were superseded by the more economical and easier to maintain method of broadcasting the soundtrack at a low output power on AM or FM radio to be picked up by a car radio. This also allows the soundtrack to be picked up in stereo by the audience on an in-car stereo system which is typically higher quality and fidelity than the simple speakers used in the old systems. This is where this manual/guide will come handy.

Drive-in cinema

Shown with dipole antenna

Ensure lightning protection of antenna tower.

Audio is transmitters to existing car radio receivers in individual cars!

Cinema screen



Typical drive-in cinema setup with FM transmitter and dipole antenna.

The antenna system and other accessories

The antenna

Types of used antennas for drive-in cinemas are typically GP or dipoles of various types. These all have omni-directional radiation pattern so are best located close to the middle of the area you want to cover; they transmit equally in all directions.

Antenna should be placed well above cars, but not too high. Area immediately below antenna could receive comparatively low signal as strongest EM radiation is in the direction 90 degrees from the antenna towards horizon (dipole mounted vertically). Cars have their antennas mounted vertically so it is best to also mount transmitter's antenna vertically. Before powering up your transmitter on the air you should tune your antenna to get minimal SWR. This is typically done by adjusting the position of the antenna and any adjustable pieces. For the purpose of drive-in cinemas where output power is usually very low you don't have to concern yourself too much with SWR and tuning. Also, some antennas (such as our wideband GP) are broadband and don't require tuning. For the purpose of low-power transmission for cinema you can just set your antenna according to tuning chart, if supplied with antenna (some antennas have these charts). If not, you can assume the antenna to be no-tune design for our purpose.

SWR is a measure of how well two devices are impedance matched to each other. Typical radio/TV transmission equipment is designed for 50 ohm load impedance, so we usually use 50 ohm cables and build or buy antennas that are specified for 50 ohm. While most cables have flat impedance over frequency (they measure 50 ohm at all frequencies you are likely to use) the same is not true of the antennas. A 1.0:1 VSWR is a perfect match. That means the load impedance is exactly 50 ohms. A 2.0:1 VSWR is obtained when the load impedance is either 25 ohms or 100 ohms. The pro way to go around these things is to just [use antenna analyzer](#) and check performance. RigExpert AA-230 does the job beautifully.

Antenna is a crucial part of the system so take special care. It is usually a good idea to place antenna well away from your transmitter, power supply, projector and audio system. Placing antenna too close to other electronics could cause RF problems such as audio artefacts, unexpected resetting and locking-up of electronics and other problems, even damage to equipment. We cannot guarantee proper operation of any transmitter unless suitable antenna system is used! This applies to any transmitter. Much of the modern audio/video gear is not RF shielded – reducing costs is unfortunately the mantra today. This is why keeping antenna away from gear is a good idea.

Please take care also of the grounding. This should be done to prevent lightning hazard since you're putting up antenna tower.

Coaxial cable

Coaxial cabling is commonly found in broadcast and networking systems. Most coaxial cables have a characteristic impedance of either 50 or 75 ohms. The RF industry uses standard type-names for coaxial cables. The U.S military uses the RG-# or RG-#/U format (probably for "radio grade, universal", but other interpretations exist).

Most broadcasting antennas and transmitters including ours are 50 ohm. Don't buy more than you need to make the long run to your antenna and don't make up a few "jumpers" to go between your exciter, VSWR meter and your antenna as all you'll do is create higher SWR and more line losses and potential weak contact spot. Belden H-155 (shorter runs) or H2000 (longer runs) are good choices for up to 20-25m!

BNC connector

A connector comes between coaxial cable and our 1H mounted transmitters. It's a standard VHF RF connector for low power applications, just like the one used for older Ethernet networks. We supply this for you. If not, try to find a good quality BNC connector as PC type usually uses cheap plastic instead of Teflon. The good ones are usually easily recognized by higher prices. Another reliable method is a test with soldering iron; Teflon won't melt while plastic will. BNC to N or BNC to SO239 converters are available and will make it possible to connect N or PL259 (CB type or UHF) connector directly.

Mains power supply and mains power cable

Some of our transmitters come with mains power supply mounted inside, others use typical desktop style. 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 well stabilized DC 15V mains power supply that can supply at least 3 amps of continuous current without overheating, introducing buzzing, dropping the voltage down to 12V or lower (a classic case) or acting up in other way. Whenever in doubt please buy our mains power supply. One final note, our units are set for 15V and if you use less this may lower your maximum output power a bit.

If you ordered and received our mains power supply (which is recommended) you'll notice the mains cable is not included, but can be obtained in any radio/computer/hardware shop at the cost of about 1€. It is the type used in your PC for mains power. Since these cables vary from country to country and we had trouble getting the exact type locally we decided against including them, especially since finding them is so easy locally.

FM transmitter

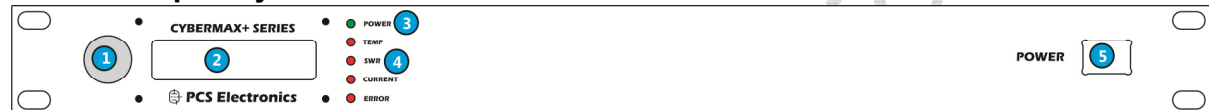
The heart of the system is of course the FM transmitter. It is important that the FM transmitter to be used handles high dynamic levels well. Our [CyberMaxFM SE V3](#) model has been specifically developed to perform well in such situations. There are several limiters and low-pass filters in the audio chain, together with compressor. Expansion gives a bit of a boost to quiet audio such as conversations. Excellent stereo separation and clean sounding modulation with super-bass are sure to impress you. SE V3 has really pushed the quality bar up.

Be smart, have a Backup FM transmitter or package ready

Our transmitters are very reliable but something can always go wrong. Ever dropped something? Spilled coffee over keyboard? A backup system, even if at 1W only, can save your face and keep your customers satisfied even if the unthinkable happens. Once your customers start rolling in you will be very glad you have a backup.

Wiring-up the transmitter

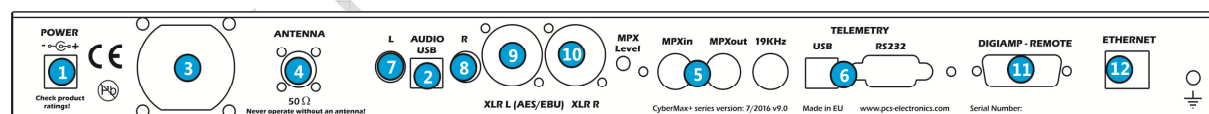
Front and back panel layout



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. Turns on while VCO is tuning into selected frequency and during various alarms.
5	Power switch in the middle of the panel is actually a standby switch. To really disconnect the unit from mains power use the main switch at the back.

Description of front panel of CyberMaxFM+ and CyberNanoFM+



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
4	Antenna connector, BNC. Do not operate without antenna.
5	BNC connectors for MPXin, MPXout and 19KHz pilot (nano models do not have MPXin, out and 19KHz wired internally as this is not supported)
6	RS232/USB for controlling your transmitter and 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	DIGIAMP (optional), for attaching amplifier module
12	Optional Ethernet remote control port

Description of back panel of CyberMaxFM+ SE V3

First power-up

Wiring up and testing FM transmitter is easy. It should be done hours before the evening show, in broad daylight so you can easily repair antenna system or spot irregularities.

1. Read and follow the previous chapter regarding antenna and coaxial cable. Once antenna is secured proceed.
2. Place FM transmitter in a suitable well ventilated position. Connect antenna and audio cables, ensure all connectors are firmly secured and antenna is mounted securely. XLR cables are more robust and are recommended.
3. While making sure power switch is off connect external mains power supply or mains power cable.
4. Inspect all cables quickly again and make sure everything is secure.
5. Turn on a radio receiver and set it to your intended transmitter frequency. Flip the POWER switch ON and wait for the unit to turn on. Enter the menu system by pressing the rotary key or bottom of the three keys (Menu) repeatedly and look for the <Frequency> menu item. Now set desired frequency by rotating the single button or with the UP/DOWN keys. Press MENU to exit. Now set the power to around 20% of full power with UP/DOWN keys or by rotating the button (depending on display type your unit has). 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).
6. You can now connect audio sources of choice 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 quieter than other stations.
7. 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 (SE model). Access menu View by pressing the menu key or rotary button until this is shown, then change value to Audio Levels. In Nano models with 3 keys you can't display that, it does not work!
8. If your unit supports RDS, you can set RDS PS (Station name – 8 characters) and RDS RT (RadioText – 64 characters). Nano units can be setup via LCD display or via software. SE units require connection to PC via USB to setup. Software setup is described later in this manual.

Checking parking-lot coverage

If you have a lot of metal nearby structures these might interfere with the signal in various ways. You may need to reposition your antenna to improve situation. It is thus best to check situation well before the show. For a start obtain a portable FM receiver and explore reception in the entire parking lot. You can also do that with a car. If you find dead spots you can try to:

1. increase output power
2. move antenna higher or away from a particular metal structure
3. choose alternative position for antenna
4. move antenna down, to the right or to the left.
5. switch to mono, mono is less sensitive to multipath fading/distortion.

Multipath distortion and solutions

You've probably experienced multipath fading without even knowing it. You pull your car up to a stoplight and the FM radio fades out, but you find you can bring the signal back in by scooting your car forward a few feet. When the FM signal died, two (or more) signals from the transmitter were arriving at your car exactly out of phase, and they canceled. Moving the car changed the phase difference between the arriving signals by a small amount and that can result in a large change in the received signal strength. If you have a lot of metal structures or structures in general nearby this can cause multipath effects. The effect of a reflection off a building can create high-order harmonic and inter-modulation products on the audio output of the receiver. Such distortion can be unpleasant. The situation is even worse when stereo signals are being broadcast.

Setting up audio levels, compression and EQ

While the potential dynamic range of movies can be as high as 120 decibels and more, FM radio is only about 50 dB and AM radio a mere 30 dB. With these severe limitations on dynamic range, compression becomes necessary in order to allow the changing dynamics in movie audio to be heard without distortion. Think about watching a movie late at home while others are sleeping. Explosions are extremely loud and you can't hear anyone talking. We recommend that you engage any compression/limiting available in your audio chain. If you have EQ in your system, drop the trimmers above 15KHz and under 30Hz. We recommend that you;

1. find a particularly loud section of the movie (shooting, explosions) and use this to setup input level to the transmitter so that no distortion can be noticed.

2. enable or install a compressor/limiter in your audio chain
3. in CyberMaxFM SE transmitter, set compression to 1:8 or 1:16. Keep other values at default. In Nano just set everything to default.
4. SE+ V3 units also have Expansion which makes it possible to boost quiet audio which is below threshold point. This is recommended for movies. Too much expansion can sound unnatural so be careful not to overdo. Set expansion to 1:1 to disable it.

FM transmitter types in our drive-in packages

We are offering two major types of transmitters for the Drive-in cinema market. The CyberMaxFM+ SE series which are for pro setups. And the CyberNanoFM+ series which is low-cost solution for remote areas. Their signal is not clean enough to be used in EU. The types available are represented in the table below:

	Antenna connector	Suitable for:	Expansion mode:	Ethernet/Barix	RDS setup	Software remote control for	Audio inputs
CyberMaxFM+ SE V2 1H (older units not on sale anymore)	BNC	EU	No	Optional	Via PC software (USB)	CyberMaxFM+ 5.5	RCA, XLR, USB audio, AES/EBU soon
CyberMaxFM+ SE V3 1H (latest model)	BNC	EU	Yes	Optional	Via PC software (USB)	CyberMaxFM+ 6.3	RCA, XLR, USB audio, AES/EBU soon
CyberMaxFM+ SE ECO (different enclosure version of SE V3)	N	EU	Yes	Not possible	Via PC software (USB)	CyberMaxFM+ 6.3	RCA, XLR, USB audio, AES/EBU soon
CyberNanoFM+ 1H (budget solution)	BNC	Remote rural areas, Africa, South America	No	Optional	Via PC software (USB) or via LCD	CyberMaxNanoV1	RCA, XLR, USB audio, AES/EBU soon
CyberNanoFM+ ECO (budget solution)	N	Remote rural areas, Africa, South America	No	Not possible	Via PC software (USB) or via LCD	CyberMaxNanoV1	RCA, XLR, USB audio, AES/EBU soon

More info, manual and software for CyberMaxFM+ SE V2 in 1H rack: <https://www.pcs-electronics.com/phpBB2/viewtopic.php?t=2931>

More info, manual and software for CyberMaxFM+ SE V3 in 1H rack and ECO box: <https://www.pcs-electronics.com/phpBB2/viewtopic.php?t=2935>

More info, manual and software for CyberNanoFM+ 1H and ECO: <https://www.pcs-electronics.com/phpBB2/viewtopic.php?t=2813>

Menu system

Menu system for both transmitter types is described in detail below. We recommend that you:

1. leave almost all settings at default (denoted with D right of the value)
2. in SE models set view type to “Audio Level”, this way you will be able to see audio level on the display. In Nano models with 3 keys you can't display that, it does not work.
3. set frequency and power. Only use as much power as needed or licensed for.
4. If your unit supports RDS, you will want to program that. Nano units can be programmed fully via LCD display or PC, SE units require PC to be connected to set RDS parameters. Setting PS (station name) will help people find the program. You can set RT with your contact information. Most people will only see RDS PS on their receivers as you have to press some buttons to display RT (and it is sometimes even not possible to display RT).
5. You will want to set compression high (8:1 or more if supported by your unit) and a bit expansion (if your unit supports it we recommend 1:1.5) to boost quiet audio.

Menu system for CYBERMAXFM+ SE units

LCD control module – two types

The basic LCD display is controlled with 3 keys. The advanced display is equipped with a rotary encoder instead. Basically with the keys there are three push-buttons available for the menu system; UP, DOWN and MENU. By pushing UP or DOWN you get a shift of frequency in corresponding direction. Hold any of these keys for a few seconds and the jumps will increase to 500 KHz. The new frequency is saved automatically. The third button (MENU) gives you an option to select and setup many of the options and DSP functions of this unit. Note that for most users setting frequency and power are the two important/useful settings, leave the rest alone at default. Default setting is depicted with [D].

Units with rotary encoder have exactly the same menu system. The only difference is that for UP and DOWN you have to rotate the knob in the corresponding direction. For MENU you have to push the rotary button. Everything else is the same.

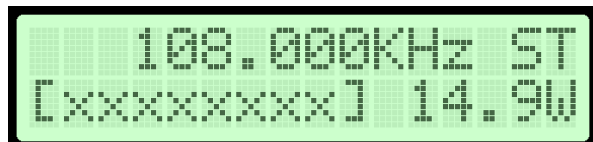
LCD control module menu system

The UP and DOWN keys are used to change parameter values. In normal mode the LCD simply shows the frequency and power or whatever view you select. Menu key can be used to enter the menu mode, repeatedly pressing this key brings up the following menus: <FREQUENCY>, <STEREO MODE>, <VIEW SELECT>, <TREBLE>, <BASS>, <COMPRESSION>, <EXPANSION>, <THRESHOLD>, <ATTACK>, <DECAY>, <INTEGRATION>, <LCD CONTRAST>, <RIGHT CH VOL>, <LEFT CH VOL>, <PLL STEP>, <FIRMWARE VER>, <CURRENT ALARM>, <TEMP ALARM>, <SWR ALARM>, <U AMP ALARM>, <BAND SELECT>, <SET PASSWORD> and <RF POWER ALC>. 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.

<RF POWER>

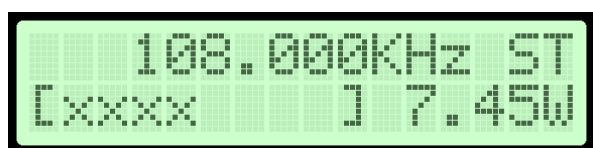
Select desired power with the UP/DOWN keys at any time. Selected power is displayed on the LCD as a line of bars. Think of this setting as an accelerator (gas) pedal in your car. Think of the power in watts that is shown on the LCD as the speed meter in your car. Depending on the road going uphill or downhill speed meter will show different values even if your accelerator pedal is fixed in the same position. If you go downhill your speed will be greater with same amount of gas pedal.

Likewise here your supply voltage can affect the actual output power slightly. After changing power the LCD display will go back to primary display mode (view 0) and after a while it will revert back to the view which you selected manually. Note: UP/DOWN keys change power also when you have set a view type which does not show frequency, such as UPTIME.



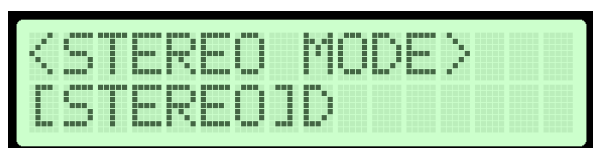
Changing frequency

Press MENU key or rotary button to enter menu system, select [Frequency] menu system. Simply press the UP/DOWN button to change frequency. Depending on PLL STEP setting your frequency will go down in 50/100/200KHz steps. If you keep pressing a key for a while the PLL STEP switches to fast tuning mode and jumps in 500 KHz steps.



<STEREO MODE>

You can set your transmitter to MONO or STEREO here. This only works when you connect stereo encoder to the MAX PRO 8000+ with MAXLINK cable (10-pin flat cable).



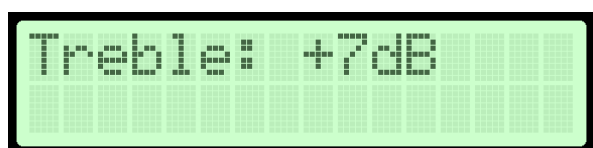
<VIEW SELECT>

CYBERMAXFM+ SE is capable of displaying a number of various parameters. Since the LCD real-estate is limited to 2x16 characters we prepared a number of pre-programmed views that only show a selected number of parameters. At the time of writing these views were available:

- [Freq+Mode+Pwr] – This view shows frequency, mono/stereo mode and output power
- [Fr+Ie+Te+Ue] – This view shows frequency, Exciter output stage current, exciter temperature and exciter supply voltage
- [Po+Pr+Uamp+Ta] – This view shows output power, reflected power, amplifier supply voltage and amplifier temperature
- [Po+Pr+Uamp+Ia] – This view shows output power, reflected power, amplifier supply voltage and amplifier current
- [Audio Level] – This view shows audio level bar graph for both channels. In Nano models with 3 keys you can't display that, it does not work!
- [Uptime D:H:M] – This view shows how long the transmitter has been operating without mains power going out. It is sometimes useful in diagnosing mains power failures.
- [Auto Scroll]D – This is the default view, it shows each of the above listed views for a short while and then moves on to the next in an endless loop. This way you can see all the relevant parameters without having to go through the menu system to change the view type; you just have to wait a few seconds for the view to change.

<TREBLE> and <BASS>

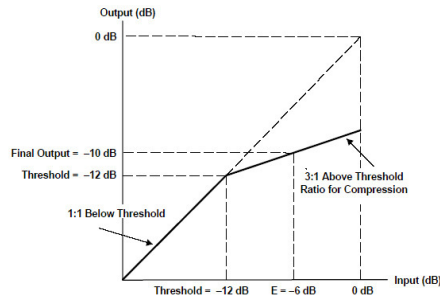
This option allows you to set the amount of TREBLE and BASS in your audio. Recommended values are marked with (D).



Compressor Settings

A number of MENU settings control the operation of the compressor. Let's 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 $1:\infty$ would in effect be a limiter. Maximum compression rating available is 1:16 which is very close to complete limiting. SE+ V3 units also have Expansion which makes it possible to boost quiet audio which is below threshold point. This is recommended for movies. Too much expansion can sound unnatural so be careful.



Compression level:
4.00:1

Expansion level:
[1:1.5]Boost++

Compression threshold:
-12.0dB

Attack: 3.5ms

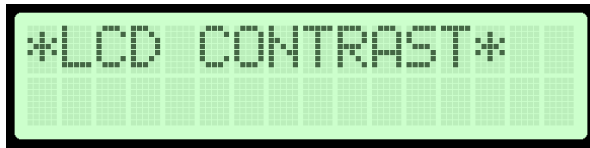
Decay: 106ms

Integration interval:
212ms

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 are detected (meaning more signal energy).

<LCD CONTRAST>

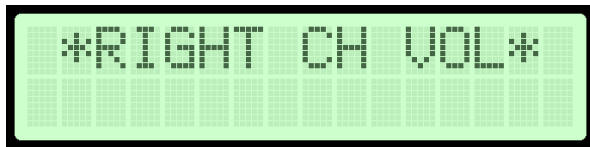
Select for the best visibility. Contrast is slightly affected by ambient temperature and you can adapt it to your needs here.



Changing contrast

Left and right channel volume (only with DSP stereo encoders)

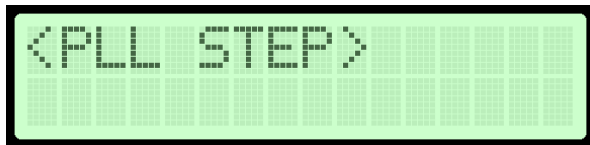
This option allows you to precisely adjust the input sensitivity of both audio channels. This is very useful when your audio source has either too high or too low output level.



Changing right input channel gain

<PLL STEP>

Not needed for drive-in cinema. Frequency can normally be adjusted in smallest steps of 50 KHz or larger steps of 100 KHz. We recommend you to select 100 KHz as this lets you change frequency fast and there is rarely need for fine tuning. However, you can enter this menu and select a PLL step of 5 KHz for example and take advantage of these small steps.



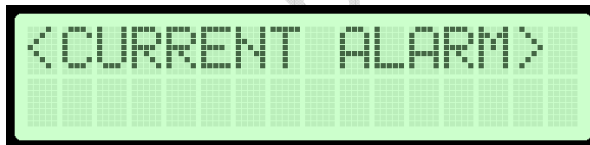
Changing PLL step size

<FIRMWARE VER>

This option allows you to display current LCD module firmware version. At the time of writing firmware version was [8xK v1.11SB]

<CURRENT ALARM>

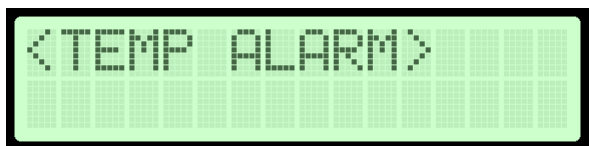
Not needed for drive-in cinema. You can set the sensitivity of amplifier current alarm here. We recommend you set these according to your amplifier. This alarm only works if you use our filter with MAXLINK interface and current sensor. Current meter accuracy is not very high so allow for some tolerance.



Current alarm.

<TEMP ALARM>

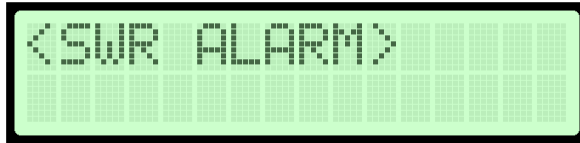
You can set the sensitivity of temperature alarm here. We recommend you set these to 70-80 degrees Celsius. A properly installed unit with a tiny fan will typically run at 55 degrees C at maximum output power. This alarm applies to externally sensed temperature if you are using external filter or directional coupler connected via DIGIAMP.



Temperature alarm

<SWR ALARM>

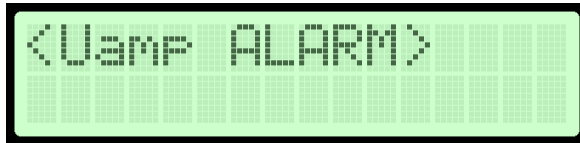
Not needed for drive-in cinema. You can set the sensitivity of software driven SWR alarm here.



Reflected power alarm

<U AMP ALARM>

Not needed for drive-in cinema. You can set the sensitivity of amplifier supply voltage alarm here. We recommend you set these according to your amplifier. Usually this is around 50V. This alarm only works if you use PCS LPF 6000/7000 filters with voltage sensor.



Amplifier voltage alarm

<BAND SELECT>

Not needed for drive-in cinema. CyberMaxFM+ SE supports FM band, if you want us to modify design for another frequency please let us know:

- [87.5-108MHz]D – This is default band, used in most of the world.

<RF POWER ALC>

Not needed for drive-in cinema. This menu option is useful for situations where CyberMaxFM+ SE drives FM amplifier. It is possible to set a limit power level (for example 500W) and exciter will reduce its output power if needed to prevent overdriving. This is a very useful feature when you are for example building a 500W, 1000W or stronger FM transmitter; it ensures constant power across the band without overdriving. This is disabled by default to prevent tinkering with the settings by unauthorized personnel, you can enable it by soldering a particular bridge on the LCD module.

Menu system for CYBERNANO FM+ units

LCD control module – two types

The basic LCD display is controlled with 3 keys. The advanced display is equipped with a rotary encoder instead. Basically with the keys there are three push-buttons available for the menu system; **UP**, **DOWN** and **MENU**. By pushing **UP** or **DOWN** you get a change of parameter or a shift of frequency in corresponding direction. Hold any of these keys for a few seconds and the jumps will increase to 500 KHz. The new frequency is saved automatically. The third button (**MENU**) gives you an option to select and setup many of the options and DSP functions of this unit. Note that for most users setting frequency and power are the two important/useful settings, leave the rest alone at default. Default setting is depicted with [D].

Units with rotary encoder have the same menu system. The difference is that for UP and DOWN you have to rotate the knob in the corresponding direction. For MENU you have to push the rotary button. Two more things, the rotary button version has password protection (you can lock the display). Also, position of frequency and power menu are exchanged.

LCD control module menu system

The UP and DOWN keys are used to change parameter values. In normal mode the LCD simply shows the frequency and power or whatever view you select. Menu key can be used to enter the menu mode, repeatedly pressing this key brings up the following menus: <RF POWER> or <FREQUENCY> depending on model of LCD display, <STEREO MODE>, <VIEW SELECT>, <LCD CONTRAST>, <DSP UP/DOWN>, <AUDIO INPUT>, <AUDIO FORMAT>, <COM/LIM MODE>, <COMPRESSION>, <THRESHOLD>, <ATTACK>, <DECAY>, <PREEMPHASIS>, <AUDIO LEVEL>, <MUTE L/R CHAN>, <ALARMS UP/DWN>, <CURRENT ALARM>, <TEMP ALARM>, <SWR ALARM>, <U AMP ALARM>, <RFSETUP UP/DN>, <PLL STEP>, <BAND SELECT>, <RF POWER ALC>, <FIRMWARE VER>, <MPX DEVIATION>, <19KHz PILOT D>, <RDS PILOT DEV>, <RDS SETTINGS>, <RDS ENCODER>, <RDS PTY>, <RDS TP>, <RDS TA>, <RDS M/S>, <RDS D3D2D1D0>, <RDS PS>, <RDS RT 0-15>, <RDS RT 16-31>, <RDS RT 32-47>, <RDS RT 48-63>, <RDS ECC>, <RDS PI setup>, <RDS groups>, <RDS AF>. 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.

Changing frequency: <FREQUENCY>

Press MENU key or rotary button to enter menu system, select [Frequency] menu system. Simply press the UP/DOWN button to change frequency. Depending on PLL STEP setting your frequency will go down in 50/100/200KHz steps. If you keep pressing a key for a while the PLL STEP switches to fast tuning mode and jumps in 500 KHz steps. Note 108.000KHz equals 108MHz. 1000 KHz=1MHz. 100.100KHz= 101.1MHz In some countries a decimal separator is a dot and in others a comma.



Setting frequency and power, the power is set to 50% here, stereo mode is on

Changing output power: <RF POWER>

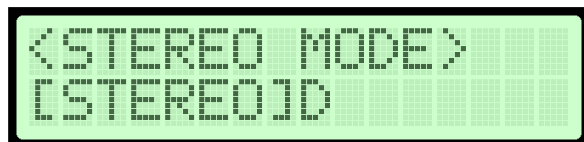
Select desired power with the UP/DOWN keys at any time. Selected power is displayed on the LCD as a line of bars. Think of this setting as an accelerator (gas) pedal in your car. Think of the power in watts that is shown on the LCD as the speed meter in your car. Depending on the road going uphill or downhill speed meter will show different values even if your accelerator pedal is fixed in the same position. If you go downhill your speed will be greater with same amount of gas pedal. Likewise here your supply voltage can affect the actual output power slightly. After changing power the LCD display will go back to primary display mode (view 0) and after a while it will revert back to the view which you selected manually. **Note:** UP/DOWN keys change power also when you have set a view type which does not show frequency, such as in UPTIME view.



Setting power, the power is set to full here, stereo mode is on

<STEREO MODE>

You can set your transmitter to MONO or STEREO here. This only works when you connect stereo encoder to the MAX PRO 8000+ with MAXLINK cable (10-pin flat cable).

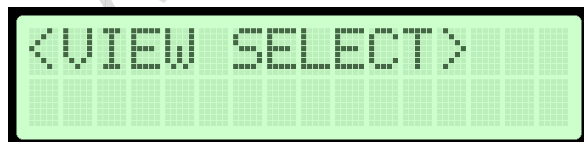


Setting mode to stereo

<VIEW SELECT>

MAX PRO 3015+ is capable of displaying a number of various parameters. Since the LCD real-estate is limited to 2x16 characters we prepared a number of pre-programmed views that only show a selected number of parameters. At the time of writing these views were available:

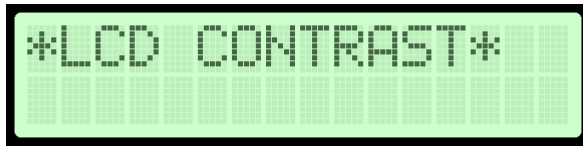
- [Freq+Mode+Pwr] – This view shows frequency, mono/stereo mode and output power
- [Fr+Ie+Te+Ue] – This view shows frequency, Exciter output stage current, exciter temperature and exciter supply voltage
- [Po+Pr+Uamp+Ta] – This view shows output power, reflected power, amplifier supply voltage and amplifier temperature
- [Po+Pr+Uamp+Ia] – This view shows output power, reflected power, amplifier supply voltage and amplifier current
- [Audio Level] – This view shows audio level bar graph. In Nano models with 3 keys you can't display that, it does not work!
- [Uptime D:H:M] – This view shows how long the transmitter has been operating without mains power going out. It is sometimes useful in diagnosing mains power failures.
- [Auto Scroll]D – This is the default view, it shows each of the above listed views for a short while and then moves on to the next in an endless loop. This way you can see all the relevant parameters without having to go through the menu system to change the view type; you just have to wait a few seconds for the view to change.



Setting mode to stereo

<LCD CONTRAST>

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



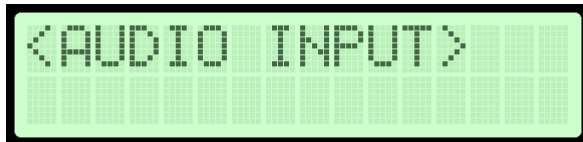
Changing contrast

<DSP UP/DOWN>

This is a gateway/entrance into to a group of settings. This was done to group similar settings into sub-categories and make setup easier. These settings all affect the way internal DSP processes audio. To enter sub-menu of settings you have to press UP or DOWN key (or turn rotary button up or down). Once inside sub-menu continue pressing the MENU key until you get to the desired setting. Settings listed inside <DSP UP/DOWN> are listed below:

<AUDIO INPUT>

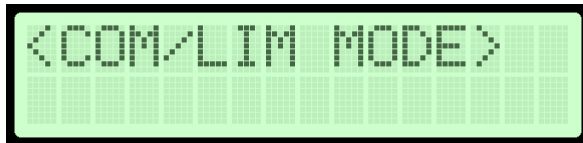
Lets you select audio input. Digital input is required for AES/EBU inputs (requires special input board).



Selecting audio input

<COM/LIM MODE>

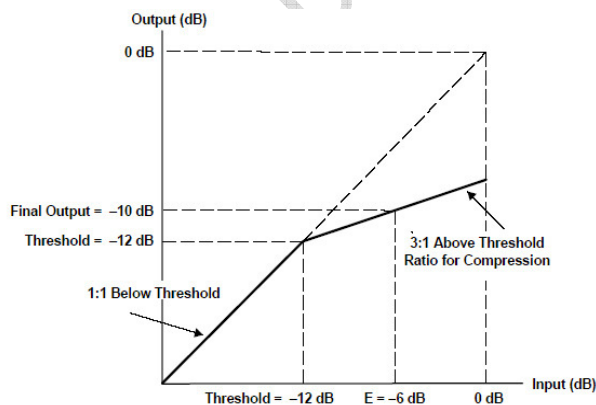
Selecting compressor-limiter mode.



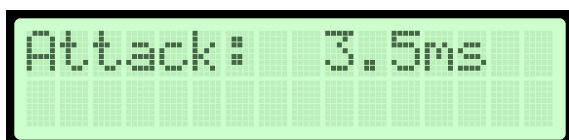
Selecting compressor/limiter mode

Compressor Settings

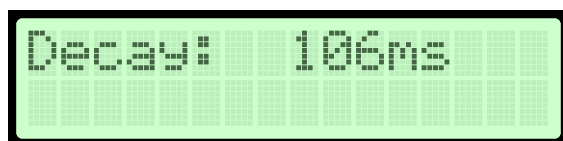
A number of MENU settings control the operation of the compressor. Let's assume that the audio signal enters the transmitter at some low level. Compressor does nothing to the signal until at one point as the input signal increases the signal reaches the compression threshold. Digital signal processor 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



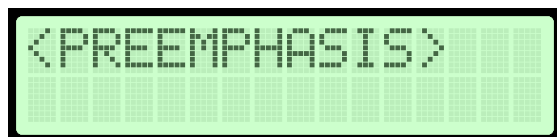
Setting the attack time, this is the time between the input signal and the actual response of the compressor



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

<PREEMPHASIS>

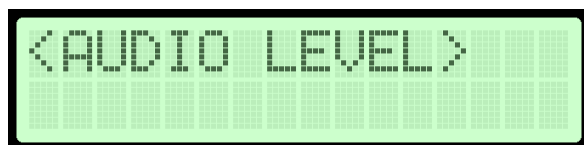
Selecting pre-emphasis for audio. 50uS is typical for EU, 75 for Japan and USA.



Selecting compressor/limiter mode

<AUDIO LEVEL>

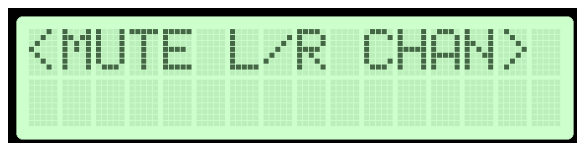
Selecting analog audio input sensitivity. Two settings are available.



Selecting analog audio input sensitivity

<MUTE L/R CHAN>

Lets you mute one or both of the audio channels.



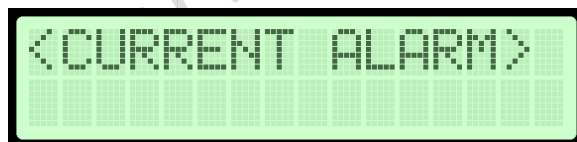
Selecting analog audio input sensitivity

<ALARMS UP/DWN>

This is a gateway/entrance into to a group of settings. This was done to group similar settings into sub-categories and make setup easier. These settings all affect sensitivity of the alarms. To enter sub-menu of settings you have to press UP or DOWN key (or turn rotary button up or down). Once inside sub-menu continue pressing the MENU key until you get to the desired setting. Settings listed inside <ALARMS UP/DWN> are listed below:

<CURRENT ALARM>

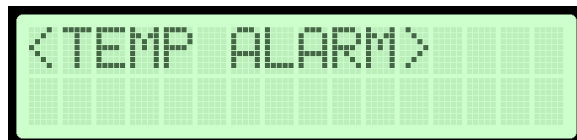
Not needed for drive-in cinema. You can set the sensitivity of amplifier current alarm here. We recommend you set these according to your amplifier. This alarm only works if you use our filter with MAXLINK interface and current sensor. Current meter accuracy is not very high so allow for some tolerance.



Current alarm.

<TEMP ALARM>

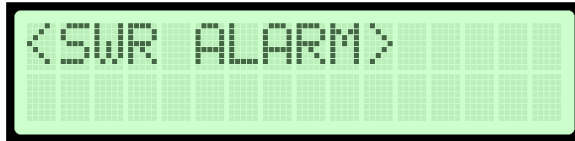
You can set the sensitivity of temperature alarm here. We recommend you set these to 70-80 degrees Celsius. A properly installed unit with a tiny fan will typically run at 55 degrees C at maximum output power. This alarm applies to externally sensed temperature if you are using external filter or directional coupler connected via DIGIAMP.



Temperature alarm.

<SWR ALARM>

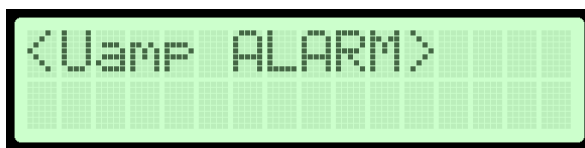
Not needed for drive-in cinema. You can set the sensitivity of software driven SWR alarm here.



Temperature alarm.

<U AMP ALARM>

Not needed for drive-in cinema. You can set the sensitivity of amplifier supply voltage alarm here. We recommend you set these according to your amplifier. Usually this is around 50V. This alarm only works if you use PCS LPF 6000/7000 filters with voltage sensor.



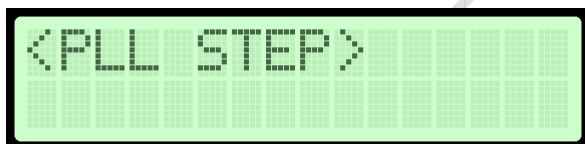
Amplifier voltage alarm

<RFSETUP UP/DN>

This is a gateway/entrance into to a group of settings. This was done to group similar settings into sub-categories and make setup easier. These settings all affect the RF section of the transmitter. To enter sub-menu of settings you have to press UP or DOWN key (or turn rotary button up or down). Once inside sub-menu continue pressing the MENU key until you get to the desired setting. Settings listed inside <RFSETUP UP/DN> are listed below:

<PLL STEP>

Not needed for drive-in cinema. Frequency can normally be adjusted in smallest steps of 50 KHz or larger steps of 100 KHz. We recommend you to select 100 KHz as this lets you change frequency fast and there is rarely need for fine tuning. However, you can enter this menu and select a PLL step of 5 KHz for example and take advantage of these small steps.



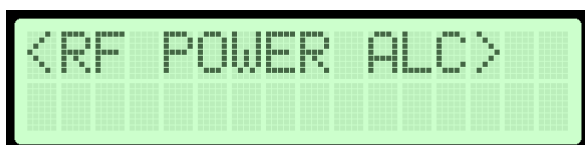
Changing PLL step size

Not needed for drive-in cinema. <BAND SELECT>

STMAX30XX+ exciter support FM band, if you want us to modify design for another frequency please let us know and we'll quote you a modified version. [87.5-108MHz]D – This is default band, used in most of the world.

<RF POWER ALC>

Not needed for drive-in cinema. This menu option is useful for situations where your exciter drives a pallet or other FM amplifier. It is possible to set a limit power level (for example 500W) and exciter will reduce its output power if needed to prevent overdriving. This is a very useful feature when you are for example building a 500W, 1000W or stronger FM transmitter; it ensures constant power across the band without overdriving. This is disabled by default to prevent tinkering with the settings by unauthorized personnel; you can enable it by soldering a particular bridge on the LCD module.



Changing amplifier power limit value

<FIRMWARE VER>

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

<MPX DEVIATION>

Not needed for drive-in cinema. This menu lets you select carrier deviation for FM radio signal. Leave at default (D).

<19KHz PILOT D>

Not needed for drive-in cinema. This menu lets you select carrier deviation for 19KHz stereo pilot signal. Leave at default (D).

<RDS PILOT D>

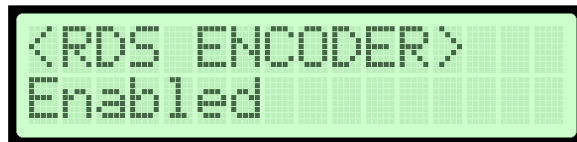
Not needed for drive-in cinema. This menu lets you select carrier deviation for RDS signal. Leave at default (D).

<RDS SETTINGS>

This is a gateway/entrance into to a group of settings. This was done to group similar settings into sub-categories and make setup easier. These settings all affect the RDS section of the transmitter. To enter sub-menu of settings you have to press UP or DOWN key (or turn rotary button up or down). Once inside sub-menu continue pressing the MENU key until you get to the desired setting. Settings listed inside <RDS SETTINGS> are listed below:

<RDS ENCODER>

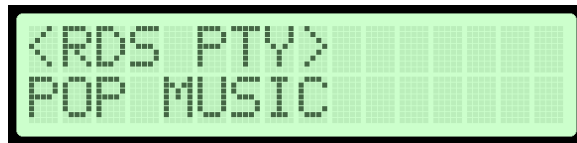
You can enable or disable RDS here. If interested about RDS google Radio Data System parameters.



Enabling or disabling RDS

<RDS PTY>

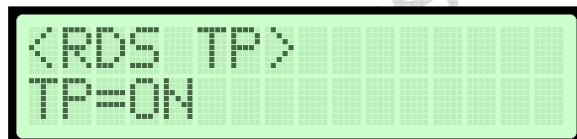
You can set program type for RDS here. If interested about RDS google Radio Data System parameters.



RDS PTY

<RDS TP>

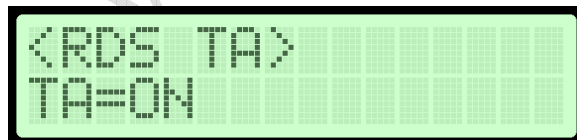
You can set Traffic Program flag for RDS here. If interested about RDS google Radio Data System parameters.



RDS TP

<RDS TA>

You can set Traffic Announcement flag for RDS here. If interested about RDS google Radio Data System parameters.



RDS TA

<RDS M/S>

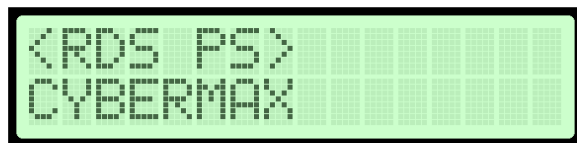
You can set Mono/Stereo flag for RDS here. If interested about RDS google Radio Data System parameters.

<RDS D3D2D1D0>

You can set D3, D2, D1 and D0 for RDS here. If interested about RDS google Radio Data System parameters.

<RDS PS>

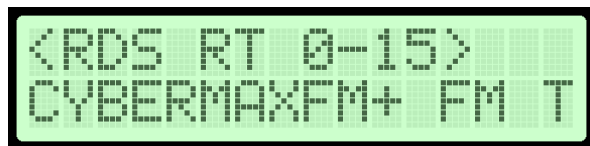
You can set PS (station name) here. This setting has 8 characters. Once you enter this sub-menu you will be able to change the highlighted letter with the up/down keys or rotary encoder up/down. Once you're happy with the high-lighted letter you can move on to the next one by pressing menu key. Starting from the left you slowly move towards the end until all letters are changed. If you make a mistake you will have to repeat the procedure. If it happens that you can't change a given character wait a few seconds and then try again. It is a known bug that sometimes happens; we are working on finding a solution.



Changing PS text, radio station name

<RDS RT 0-15>, <RDS RT 15-31>, <RDS RT 32-47>, <RDS RT 48-63>

You can set Radio Text for RDS here. RT has 64 characters. To simplify setup they are split into 4 groups of 16 characters. Once you enter this sub-menu you will be able to change the highlighted letter with the up/down keys or rotary encoder up/down. Once you're happy with the high-lighted letter you can move on to the next one by pressing menu key. Starting from the left you slowly move towards the end until all letters are changed. If you make a mistake you will have to repeat the procedure. If it happens that you can't change a given character wait a few seconds and then try again. It is a known bug that sometimes happens; we are working on finding a solution.



Changing RT text, first 16 characters

<RDS ECC>

You can set ECC here for RDS. ECC is extended country code.

<RDS PI>

You can set PI (program identifier) for RDS. Usually issued by national telecommunications agency to ensure each station has its unique PI.

<RDS groups>

You can select which RDS groups are transmitted for RDS.

<RDS AF>

You can select AF for RDS. AF stands for Alternative Frequency, this is used for networks of transmitters operating on several frequencies.

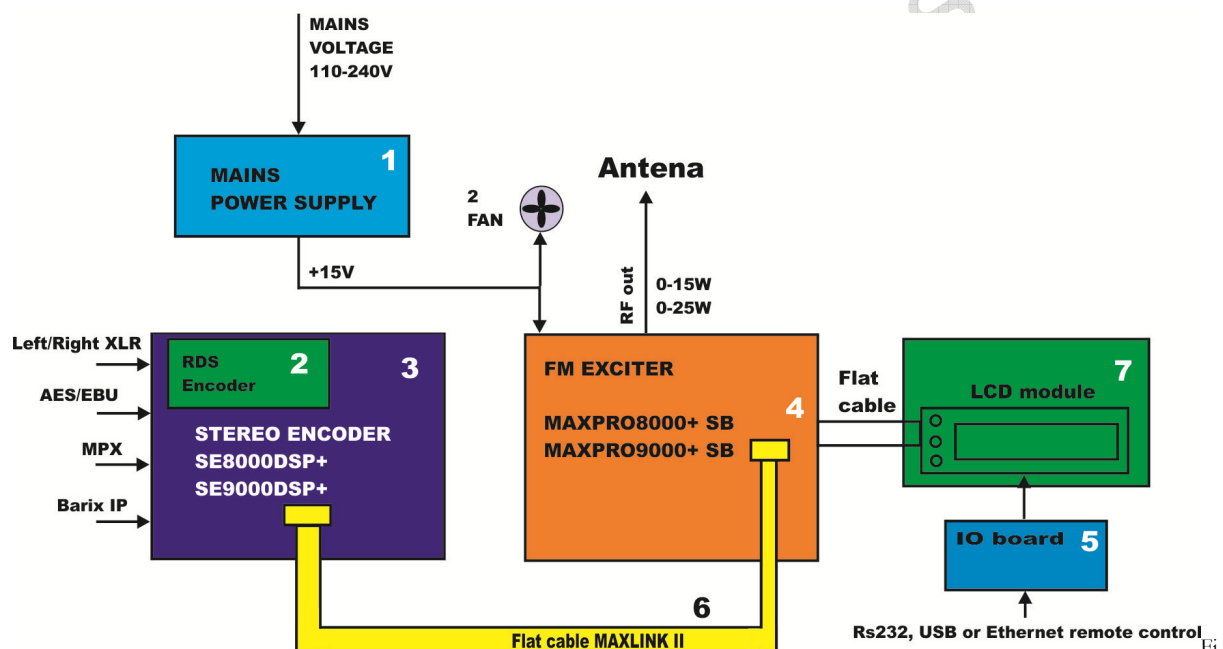
<PASSWORD>

Rotary display version of the display also lets you lock the display with a password. For this to work you have to install LOCK jumper to pins marked LOCK on the LCD display. Anytime you want to do something with the display you will have to enter password first. The LCD stays unlocked for about a minute after that.

Once you enter this sub-menu you will be able to change the highlighted number with the up/down keys or rotary encoder up/down. Once you're happy with the highlighted number you can move on to the next one by pressing menu key. Starting from the left you slowly move towards the end until all numbers are changed. Default password is 000.

Under the hood; the modules inside

The block diagram of the complete CyberMaxFM+ SE FM transmitter based on MAXPRO8000+ series exciter is shown below. It is simplified as the actual block diagram would be too complex for this manual. Only the basic building blocks of the system are shown and briefly explained one by one. The nano exciters have everything on one single board (STMAX3015).

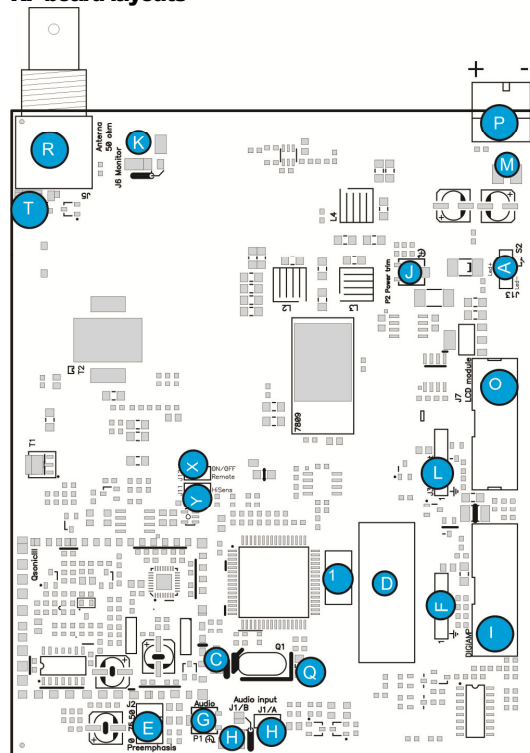


Block diagram of the CyberMaxFM+ SE series FM transmitter

1	Mains power supply powers the transmitter. Exciter runs on 15V DC.
2	RDS encoder (Radio Ddata System) is part of stereo encoder and enables station name and other information to be displayed on the LCD of the receiver.
3	Stereo encoder (SE8000) makes it possible to transmit audio in stereo. MAXPRO 8015 on its own requires MPX signal in order to transmit stereo signal.
4	MAXPRO8000 FM exciter board
5	IO board makes it possible to control the exciter via PC remotely
6	MAXLINK II flat cable connects stereo encoder and FM exciter
7	LCD module makes it possible to monitor and set many of the parameters of this transmitter.
8	FAN ensures cooling of the entire system, for 15W or 25W a small fan is more than sufficient

Description of various blocks of CyberMaxFM+ SE FM transmitter

RF board layouts

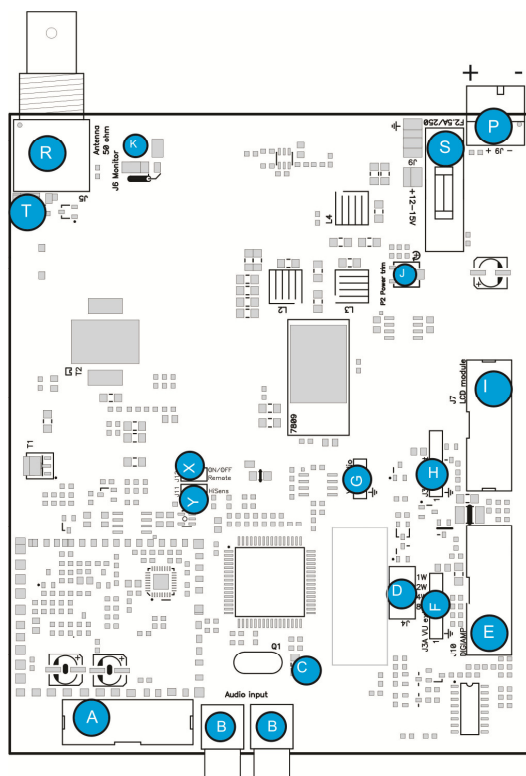


MAX PRO 8015 RF board layout (CyberMaxFM+ SE)

A	ON/OFF switch.
C	You can connect external TCXO (thermally stabilized reference oscillator). Frequency needs to be 16MHz, TTL.
D	MaxlinkII connector for easy connection with the SE8000 stereo encoders. This lets you connect and control both units from the same LCD control units. Our Cyber Max FM+ units use this arrangement. This connection is now almost completely solder-free; simply plug the connector in and connect MPX out to audio input of the exciter. Flat cable that runs between the units also carries supply voltage and stereo/mono switch for the stereo encoder.
E	Pre-emphasis. Use this jumper to set pre-emphasis. This can either be 50uS (EU and most of the world) or 75uS

	(USA). If you plan to connect stereo encoder to the MAXPRO8000+ board, place the jumper in position None (bottom - this disables pre-emphasis).
G	Audio input sensitivity adjustment.
H	Audio input – audio coaxial cable or 2-pin header.
I	Digiamp connector enables easy control of RF amplifiers. This greatly simplifies the process of building FM transmitters. You can read more about this connector in appendix. The flat cable is non-crossed type.
J	Internal power meter accuracy adjustment. If the internal power display on the LCD is a bit off you can correct its accuracy with this trimmer. You have to “reboot” to verify the setting as the power detector has some DC offset which is measured once when the unit powers up.
K	RF monitor output. This output contains a small sample of output signal, suitable for monitoring RF signal quality with instruments such as frequency meter, frequency analyzer or modulation monitor.
L	VU bargraph meter. Connect the 5-pin jumper to VU meter here. If connected here it will show SWR and PWR from internal power meter. The remaining 3 pins from VU meter connect to LCD display directly and show audio level.
M	Soldering posts for a small 12V fan. Output stage appreciates a bit of air flow, it does not have to be substantial for 15W. As long as the air slowly moves a bit it'll be more than enough for 15W unit. Use better fans for 25W and 50W models.
O	LCD control unit, attach your LCD control module here. Flat cable used is crossed.
P	Power supply connector, if barrel type than center is positive. DO NOT use more than 15V for 8015/8025.
Q	Do not touch unless you understand what this is. Lets you fine-tune the reference frequency. You can use this trimmer to set the frequency to exactly 100.000KHz if it's slightly off (for example if frequency meter shows 100.002KHz).
R	RF output connection. BNC jack. Use a properly matched FM band antenna. The range and success of your transmissions will depend primarily upon the quality and position of your antenna.
T	You can connect coaxial cable going to the pallet/amplifier here. RG-178 is recommended.
X	Remote stand-by, you can put unit in standby by closing/shorting these two pins. The power will go to zero immediately.
Y	Greatly increases sensitivity of external power and SWR meter, great when your directional couplers are not sensitive enough to produce proper reading.
1	Power range jumper J12, use to set output power range to 0-1W,0-2W, 0-3W, 0-4W or any other range all the way to 0-15W. Setting is binary, that is if you place 1W and 8W jumpers the power range will be 1+8=9W (0-9W). No jumpers = full power 0-15W

Description of various elements of the MAX PRO 8015+ v1 FM exciter board



STMAX3015/25/50/100+ v1 RF board layout (CyberNanoFM)

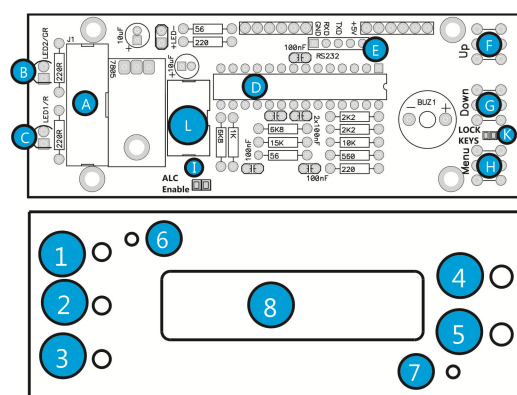
A	Audio input-extension board. You can connect audio input extension board here. The extension board contains balanced inputs, low pass filter and limiter. It can be connected via 14-pin flat cable.
B	Audio inputs, two RCA connectors.
C	Lets you fine-tune the frequency. You can use this trimmer to set the frequency to exactly 100.000KHz if it's slightly off (for example if frequency meter shows 100.002KHz).
D	Power range jumper J12, use to set output power range to 0-1W,0-2W, 0-3W, 0-4W or any other range all the way to 0-15W. Setting is binary, that is if you place 1W and 8W jumpers the power range will be 1+8=9W (0-9W). No jumpers = full power
E	Digiamp connector enables easy control of RF amplifiers. This greatly simplifies the process of building FM transmitters. You can read more about this connector in appendix. The flat cable is non-crossed type.
F	VU bargraph meter. Connect the 5-pin jumper to VU meter here. If connected here it will show SWR and PWR from external power meter.
G	VU bargraph meter for audio. Connect the 3-pin jumper to VU meter here.
H	VU bargraph meter. Connect the 5-pin jumper to VU meter here. If connected here it will show SWR and PWR from internal power meter. The remaining 3 pins from VU meter connect to stereo encoder.
I	LCD control unit, attach your LCD control module here. Flat cable used is crossed.
J	Internal power meter accuracy adjustment. If the internal power display on the LCD is a bit off you can correct its accuracy with this trimmer. You have to "reboot" to verify the setting as the power detector has some DC offset which is measured once when the unit powers up.
K	RF monitor output. This output contains a small sample of output signal, suitable for monitoring RF signal quality with instruments such as frequency meter, frequency analyzer or modulation monitor.
P	Power supply connector, if barrel type than center is positive. DO NOT use more than 15V for STMAX3015-3050 series. The connector for 100W is different and requires 48V.

R	RF output connection. BNC jack. Use a properly matched FM band antenna. The range and success of your transmissions will depend primarily upon the quality and position of your antenna.
S	Fast (F) fuse. Always replace with original type for continued protection against short-circuit, current rating depends on the model.
T	You can connect coaxial cable going to the pallet/amplifier here. RG-178 is recommended.
X	Remote stand-by, you can put unit in standby by closing/shorting these two pins. The power will go to zero immediately. It will recover slowly as at power-up.
Y	Doubles sensitivity of external power and SWR meter signals, great when your directional couplers are not sensitive enough to produce proper reading.

Description of various elements of the STMAX3000+ FM stereo RDS exciter board

LCD module layout – 3 keys model

This LCD module is based on 2x16 display with 3 keys, 2 leds and a buzzer.



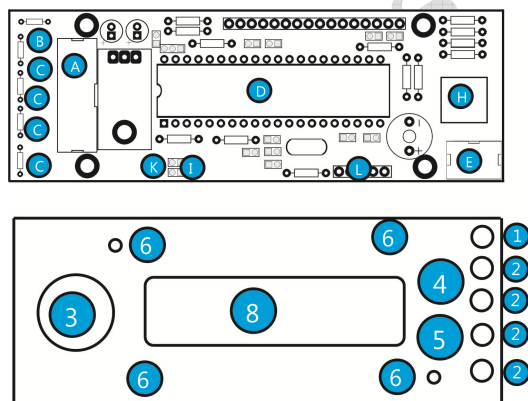
LCD module layout, front and back

1, F	UP key
2, G	DOWN key
3, H	MENU key
4, B	POWER indicator LED. Illuminated whenever you turn on the exciter.
5, C	ERROR indicator LED. This LED is activated when RF output stage is NOT active. For example, whenever if temperature protection is activated, this LED illuminates and RF power is reduced. Important: This LED is also illuminated whenever you change frequency as the control unit turns RF power off until adjustments are finished and VCO is locked. In such case this does not signal a problem with temperature or SWR.
6,7	Mounting screws, M2.5 metric screw is to be used here.
8	LCD module, with backlight
A	14-pin connector for flat cable going to the RF board
D	Microcontroller with software
E, L	Connections to the IO board (RS232, USB) for remote control
I	ALC enable, soldering this together lets you set power limit (ALC). Also lets you set band in STL model.
K	You can disable keys by cutting the lead between the two pads between the “Lock Keys” solder bridge. If you want to re-enable the keys, solder the two pads “Lock Keys” back again. You can also connect a lock-switch here.
+LED-	You can connect the LED diode here (usually used for the on/off switch).

Table 2: Description of various elements of the LCD display module

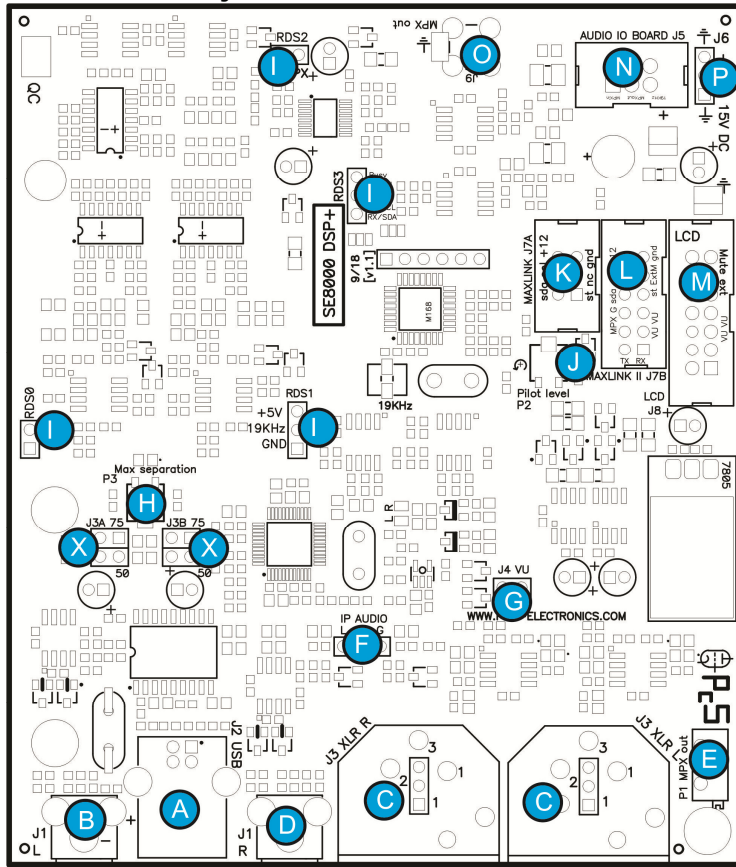
LCD module layout – rotary encoder model

Let us have a quick look at, note you can disable keys by cutting the lead between the two pads in the “Lock Keys” solder bridge. If you want to re-enable the keys, solder the two pads “Lock Keys” back again.



LCD module layout, front and back, rotary encoder version 2x16

SE8000DS+ Board layout

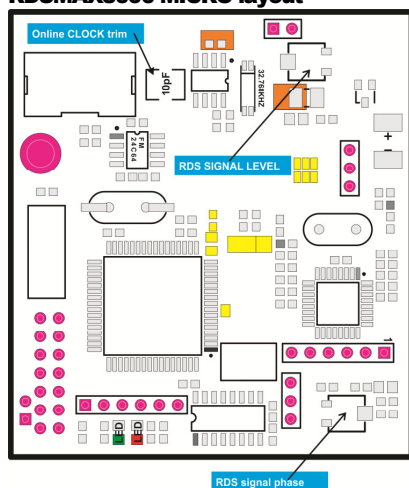


SE8000DSP+ stereo encoder board layout (used in CyberMaxFM+ SE)

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).
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 layout

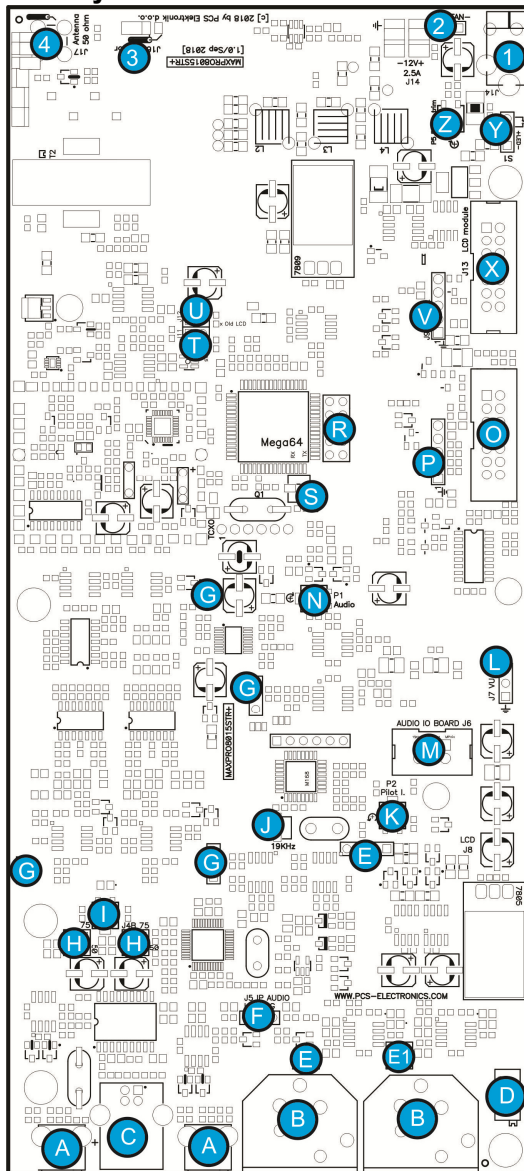


RDSMAX8000 micro rds encoder board layout (used in CyberMaxFM+ SE)

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

Board layout for MAXPRO8015STR+



MAXPRO8015STR+ RF board layout (Used in CyberMaxFM+ SE in ECO enclosure)

	Function
C	Digital audio input, USB
A	Left and right analog audio input, RCA
B	Left and right XLR connectors
D	MPX out level, adjustable from inside (make holes into enclosure)
E	Optional AES/EBU digital interface board
E1	Install two jumpers here when AES/EBU adapter board is not installed!
F	Connection to optional Ethernet audio streaming (Barix) audio input.
L, V, P	You can connect VUMAX-1 led vu-meter unit here, it will show audio levels and power and reflected power as bar graphs.
I	Separation adjustment. You can maximize for best stereo separation here.

G	Optional RDS daughter board is plugged in here.
K	Stereo pilot level can be adjusted here
X	LCD control unit is connected here.
M	Connects to optional IO board with three BNC connectors (19KHz, MPX in and MPX out).
J	Stereo pilot frequency
1	Power supply (15V, 2.5A).
H	Pre-emphasis jumpers. Set to 75 for USA and 50 for most of the world.
N	Modulation level – audio level – FM deviation level adjustment
O	Digiamp connector enables easy control of RF amplifiers. This greatly simplifies the process of building FM transmitters. You can read more about this connector in appendix. The flat cable is non-crossed type.
P	VU bargraph meter. Connect the 5-pin jumper to VU meter here. If connected here it will show SWR and PWR from external power meter.
V	VU bargraph meter. Connect the 5-pin jumper to VU meter here. If connected here it will show SWR and PWR from internal power meter.
S	Do not touch unless you understand what this is. Lets you fine-tune the reference frequency. You can use this trimmer to set the frequency to exactly 100.000KHz if it's slightly off (for example if frequency meter shows 100.002KHz).
R	Power range jumper, use to set output power range to 0-500mW, 0-1W,0-2W, 0-3W, 0-4W or any other range all the way to 0-15W. Setting is binary, that is if you place 1W and 8W jumpers the power range will be 1+8=9W (0-9W). No jumpers = full power 0-15W
U	Remote stand-by, you can put unit in standby by closing/shorting these two pins. The power will go to zero immediately.
T	Greatly increases sensitivity of external power and SWR meter, great when your directional couplers are not sensitive enough to produce proper reading.
Y	Connect ON/OFF switch here, but you can also just install a jumper. A LED diode can also be connected as shown on the image, series resistor for the diode is on board and is not necessary.
Z	Internal power meter accuracy adjustment. If the internal power display on the LCD is a bit off you can correct its accuracy with this trimmer. You have to “reboot” to verify the setting as the power detector has some DC offset which is measured once when the unit powers up.
1	Power supply connector, if barrel type than center is positive. DO NOT use more than 15V!
2	Soldering posts for a small 12V fan. Output stage appreciates a bit of air flow, it does not have to be substantial for 15W. As long as the air slowly moves a bit it'll be more than enough for 15W unit. Use better fans for 25W and 50W models.
3	RF monitor output. This output contains a small sample of output signal, suitable for monitoring RF signal quality with instruments such as frequency meter, frequency analyzer or modulation monitor.
4	RF output connection. SMA or MCX jack. Use a properly matched FM band antenna. The range and success of your transmissions will depend primarily upon the quality and position of your antenna.

Description of various elements of the MAXPRO8015STR+ v1 FM exciter board

WINDOWS CONTROL PROGRAM

SOFTWARE INSTALLATION AND COMMUNICATION SETUP

Using existing COM port

If you want to use the RS232 cable to connect computer to the transmitter, connect RS232 cable to your computer. In this case the COM port to be used will usually be COM1 or COM2. Be warned that there are many types of RS232 cables (with differently connected pins) so your cable may not be correct. It is a safer alternative to use our USB port. We **do not recommend USB/RS232 dongles**. There are many types and some are not compatible. If you want to use USB than use USB on our unit.

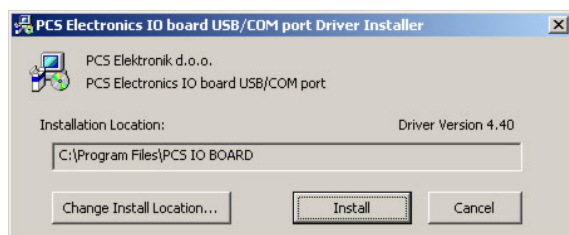
Use the correct USB port!

Our transmitters 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/phpBB2/viewtopic.php?t=2931): <https://www.pcs-electronics.com/phpBB2/viewtopic.php?t=2931>

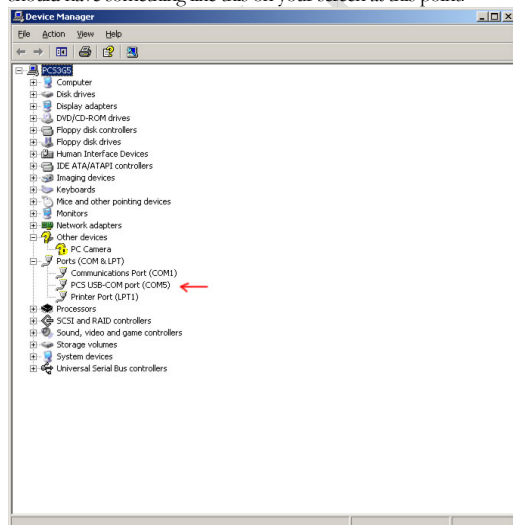
Run the setup file. Wait for the following screen (or very similar) to appear and select the installation directory (best left alone at default location). Click Install and wait for the installation to finish.



Installing USB driver

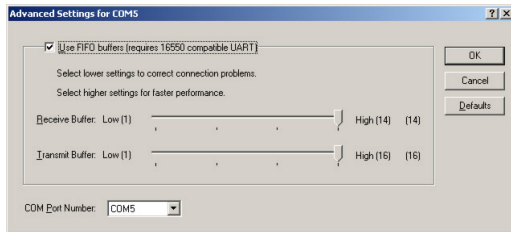
Configuring USB driver

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

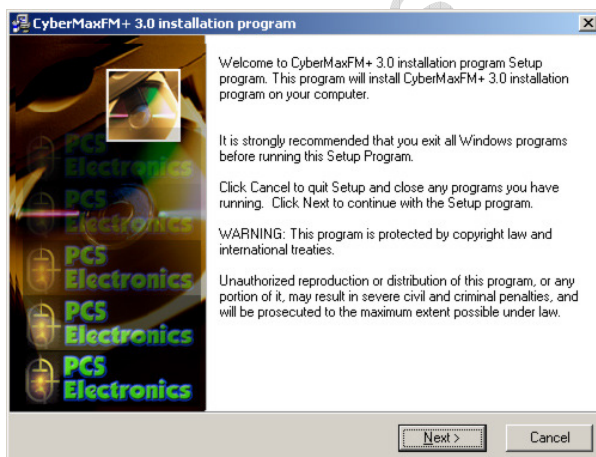
Now that we have USB driver installed we can talk to your FM transmitter via COM port. We also know which COM port it is from previous step.

They are represented in the table below:

Model/Series	Software for remote control	Location of program and manual
CyberMaxFM+ SE V2 1H	CyberMaxFM+ 5.5	https://www.pcs-electronics.com/phpBB2/viewtopic.php?t=2931
CyberMaxFM+ SE V3 and ECO	CyberMaxFM+ 6.3	https://www.pcs-electronics.com/phpBB2/viewtopic.php?t=2935
CyberNanoFM+ 1H and CyberNanoFM+ ECO	CyberMaxNanoV1	https://www.pcs-electronics.com/phpBB2/viewtopic.php?t=2813

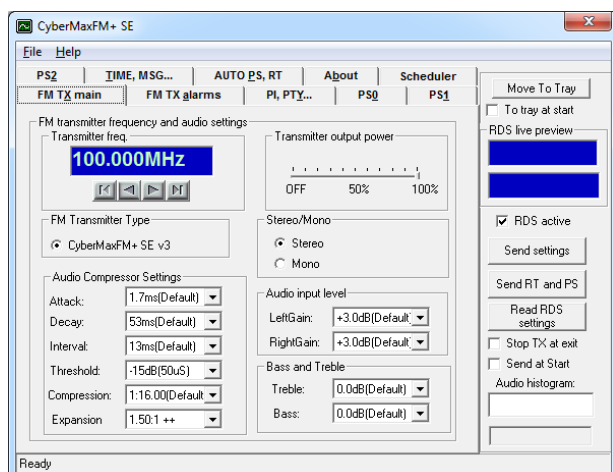
Software installation

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 transmitter 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.

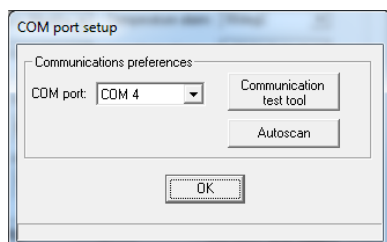


CyberMaxFM+ remote control software, depending on your model this screen can differ a little. Nano program looks similar.

As you can see this program lets you control all the parameters of your FM transmitter including RDS parameters. It also lets you read all of the available information, such as output power, temperature, frequency, uptime etc. Exact layout may vary depending on your transmitter model.

Setting up com port in CyberMaxFM+ program

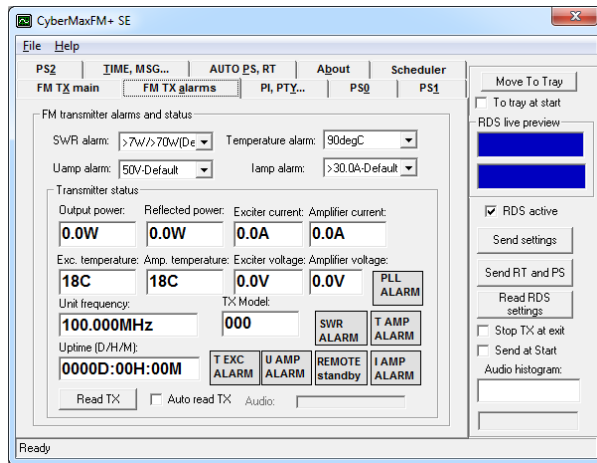
The only setup required is minimal. Start the CyberMaxFM+ program, the icon should now be on the desktop. Now click File and Setup. The following window will open. **It is best to set COM port manually as the Autoscan feature does not always work correctly** (same goes for test tool).



Set COM port for remote control.

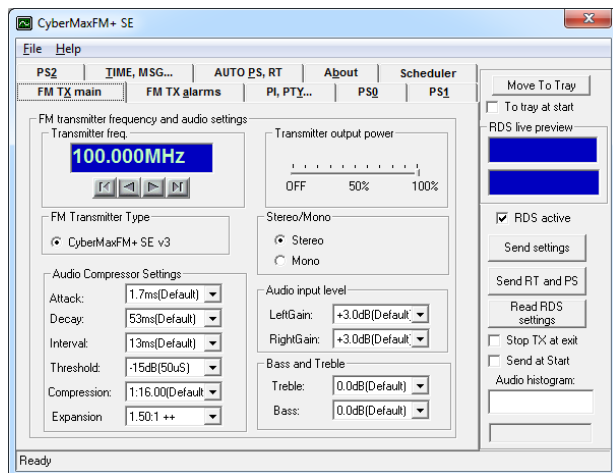
Testing the connection

The easiest way to test the connection is to open the FM TX Alarms tab. At the bottom of this tab check “Auto read TX”. Once you do this the program will start updating the info from the transmitter, including output power and other data. When this happens you know the connection is working both ways.



Checking the connection

FM TX main tab – transmitter setup



FM transmitter setup

Main FM transmitter parameters are presented in this dialog, they are described below. Most settings should be left at Default values.

FM transmitter type

Select your FM transmitter type or just leave it as it is set (the most advanced model supported/listed there).

FM transmitter frequency

Set the frequency by 0.5 or 0.05MHz steps. Note 100.000KHz = 100MHz. Different countries use different decimal delimiters.

Transmitter output power

Set the desired output power.

Stereo/Mono

Select stereo mode here.

Audio input level

Select audio gain for left and right channel separately.

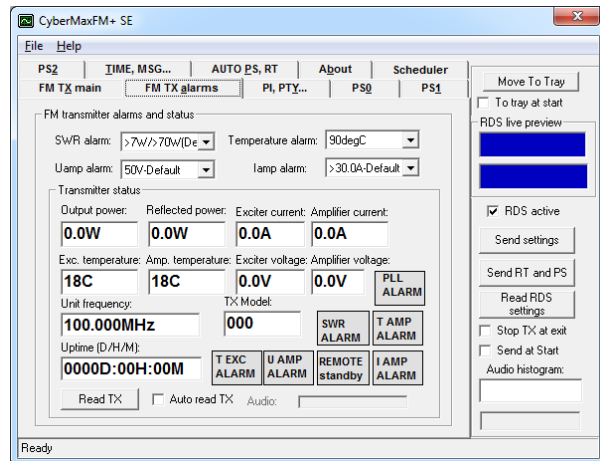
Bass and Treble

Select boost level for Bass and Treble.

Audio Compressor Settings (only with DSP stereo encoders)

These are settings which control the operation of the compressor/DSP.

FM TX alarms



Setting up alarms

In this tab you can observe several operating parameters including alarms. Threshold values of alarms can be set, too.

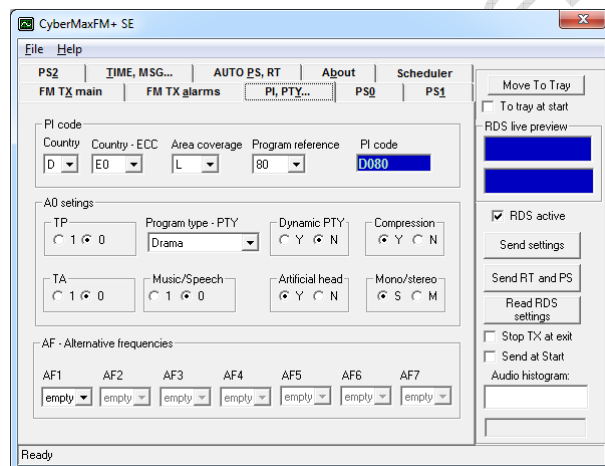
Read TX

Click this button to get the current status of your hardware.

Auto read TX

Check this box to activate automatic continuous hardware status reading.

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.

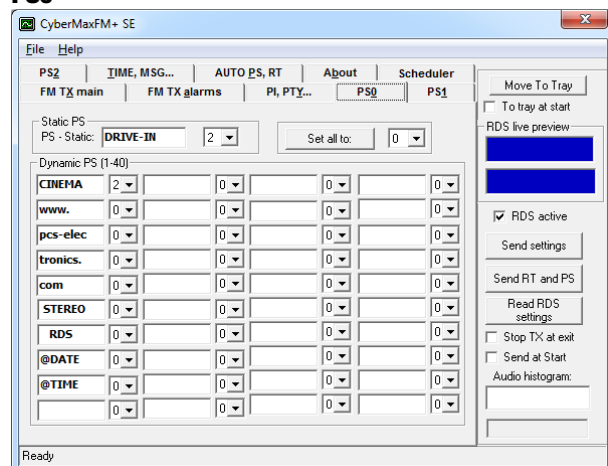
Music/Speech

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!

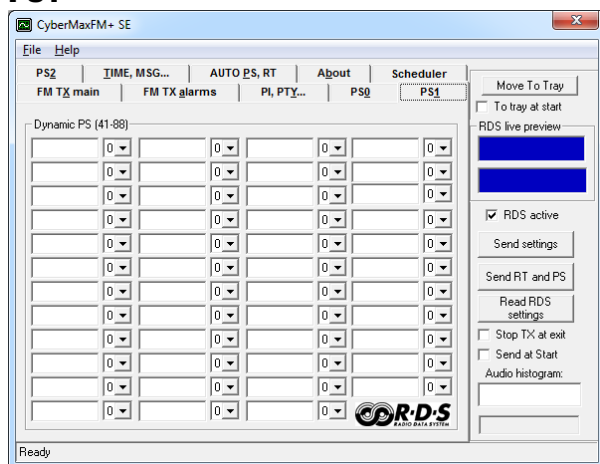
More information about PS feature

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).

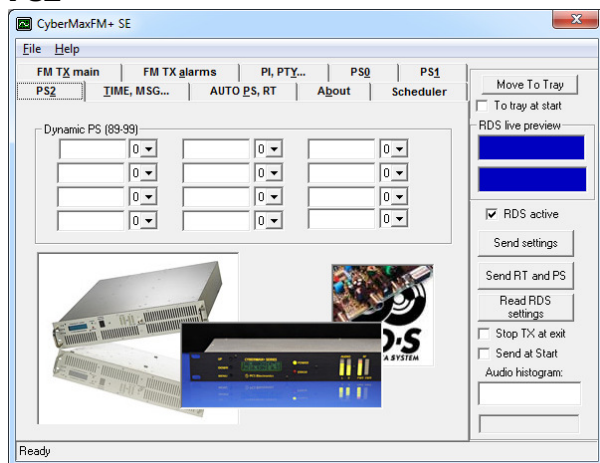
Example: If you wish to just have one static PS, set all delays to 0 and set just PD00 to 1. Then set PS00 to desired states PS, which will be displayed indefinitely.

PS1



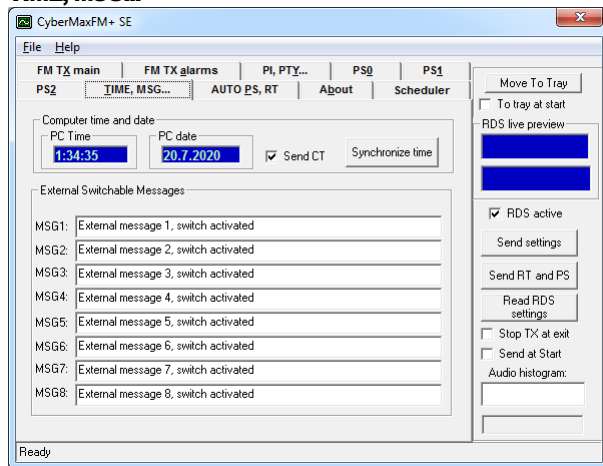
Setting up RDS – More PS fields, there are too many to fit on one page

PS2



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

TIME, MSG...



Setting up time and external messages

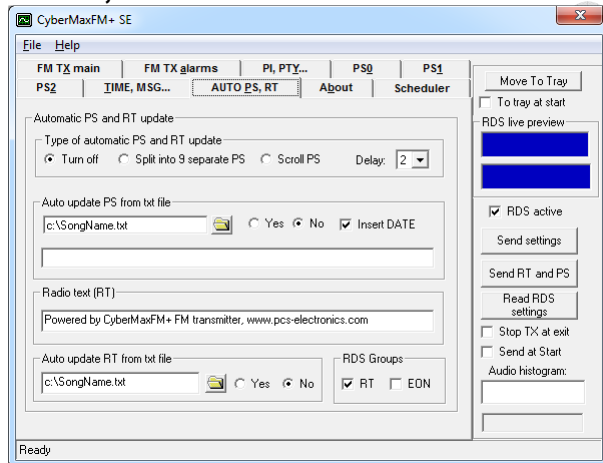
Computer time and date

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

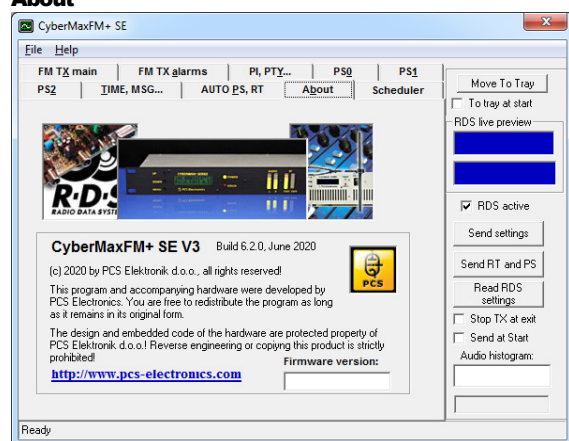
you installed the program. Run the exe file and configure it to output winamp song info into your text file and then set CyberMaxFM+ program to read song name from that file. Also make sure you setup VtitleSpy plug-in to limit song name to 64 characters.

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

This is the firmware version of your FM transmitter board. For this to display you need to read data from the transmitter at least once (Read TX or Auto read TX).

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

Check this box to automatically reduce transmitting power to 0 when exiting the program.

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.

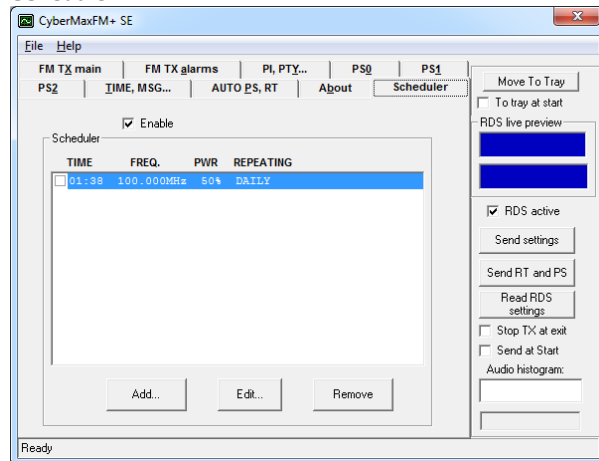
Audio histogram

Every time the transmitter status is read, a new audio level value is added at the histogram. Status may be read manually (by clicking *Read TX button*) or automatically (by checking *Auto TX read* checkbox). Levels above 80% are marked in red color.

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.

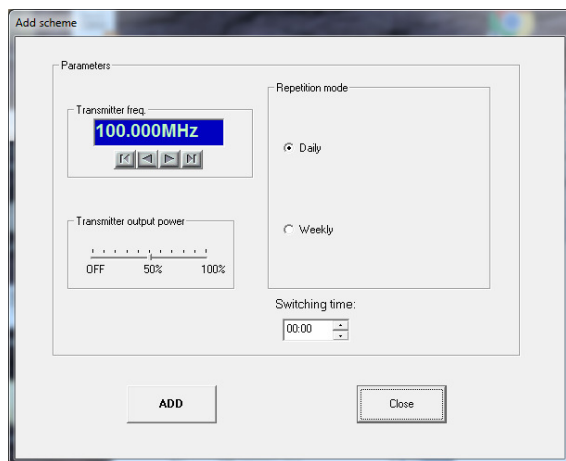
Edit

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.

Troubleshooting

We hope you'll never get to this step. We all know bad things happen but do not despair! CYBERMAXFM+ SE series transmitters are protected with a fuse, SWR and TEMP protection. Fuse is the first thing to check. Make sure your coaxial cable leading to the transmitter or antenna is not shorted or open. 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.



Do you think you can handle it ??

Fig 38: So, do you think you can handle it? We think you sure can!

PROBLEM DESCRIPTION	POSSIBLE SOLUTIONS
Everything appears normal, but there is no RF power	<ol style="list-style-type: none"> 1. Wait a few more seconds, transmitter needs about 10 seconds to get their power to full 2. Maybe one of the alarms was triggered and power was reduced, try to power off and power back on, whenever an alarm is triggered power may be reduced until you power off and back on
RF output power is too low	<ol style="list-style-type: none"> 1. Maybe one of the alarms was triggered and power was reduced, try to power off and power back on, whenever an alarm is triggered power may be reduced until the problem disappears 2. Find out which alarm was triggered, maybe your unit is over-heating or your antenna (SWR) may be way off. Let the unit cool off and ensure proper cooling in the future. Perhaps you adjusted TEMP ALARM or another alarm too low, set it slightly higher. 3. Exciter may not give full 15W/25W when you use a supply voltage of less than 15V. 4. Did you set power to full? All bars should be visible for full power.
LCD display keeps showing TEMP/SWR error warning	<ol style="list-style-type: none"> 1. Unit is probably over-heating or your antenna is faulty. Let the unit cool off and ensure proper cooling in the future. Perhaps you adjusted TEMP ALARM too low, set it slightly higher. 2. It is very likely that your antenna is not working correctly, check cable and check SWR. You may need to adjust SWR ALARM slightly higher (but first make sure your antenna and cable are OK).
Audio too quiet/loud	<ol style="list-style-type: none"> 1. Open or close the modulation trimmer on MAX PRO 8000+ series exciter board 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 trimmer on MAX PRO 8000+ exciter board a little bit.
With no audio connected I can hear sort of digital noise	<p>- 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.</p> <p>- This could also be caused by fan. Stop the fan and see if the noise disappears</p>
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.
RF signal cutting out, audio volume increasing by itself. If you place finger on top left corner of Mega64 on MAXPRO8015 board, you hear loud buzz in the audio.	This affects some SE units. We have firmware update for this but you have to send the unit back for update. The problem is rare. There is also hardware workaround that involves soldering one 56K-100K SMD resistor. If you want to apply this, contact us and we'll guide you to apply the fix.
Unit blows fuses and draws excessive current	You have burned the output transistor. You've probably tried to squeeze out more output power by using higher supply voltage above 15V or even changing the bias current. It is time to order a replacement final transistor and get the soldering iron. Next time think twice about doing these things.
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

	final.
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	<ul style="list-style-type: none"> - 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.
Output power less than expected	If unit is overheating it will start reducing output power, make sure it is sufficiently cooled! Reduced power will return only after you power off and on the unit (or change power setting).

Troubleshooting CYBERMAXFM+ SE or CYBERMAXNANO series FM exciter

Setting up remote control via Ethernet

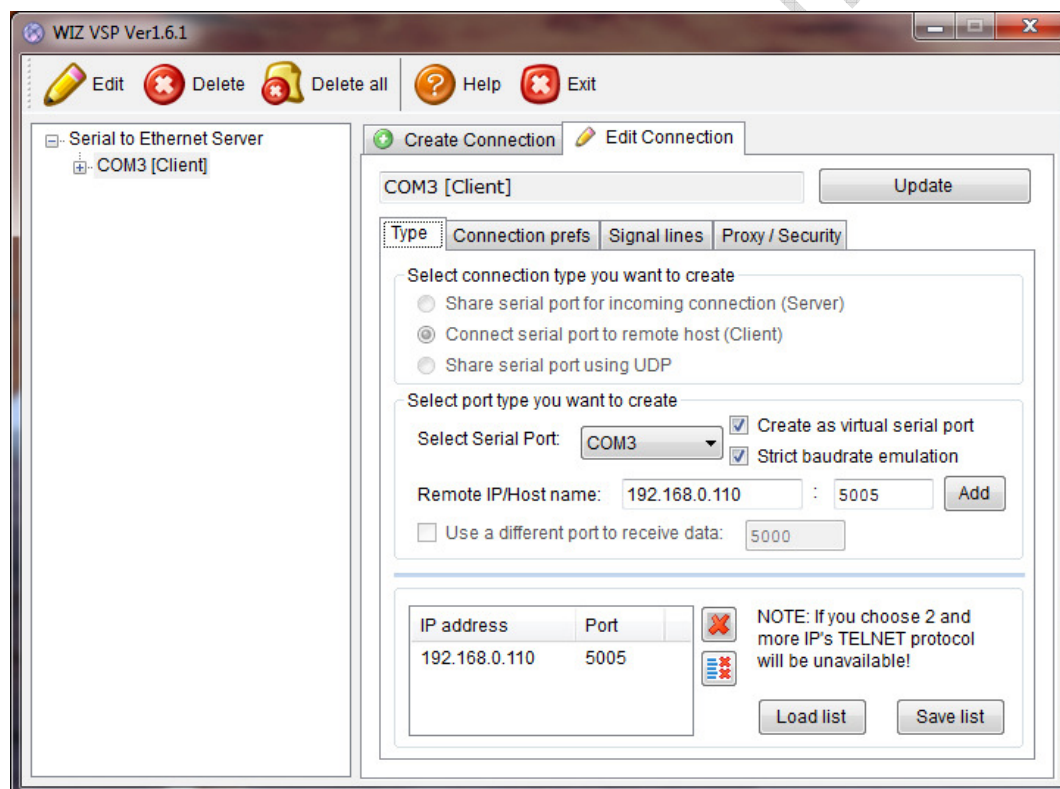
Software installation

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

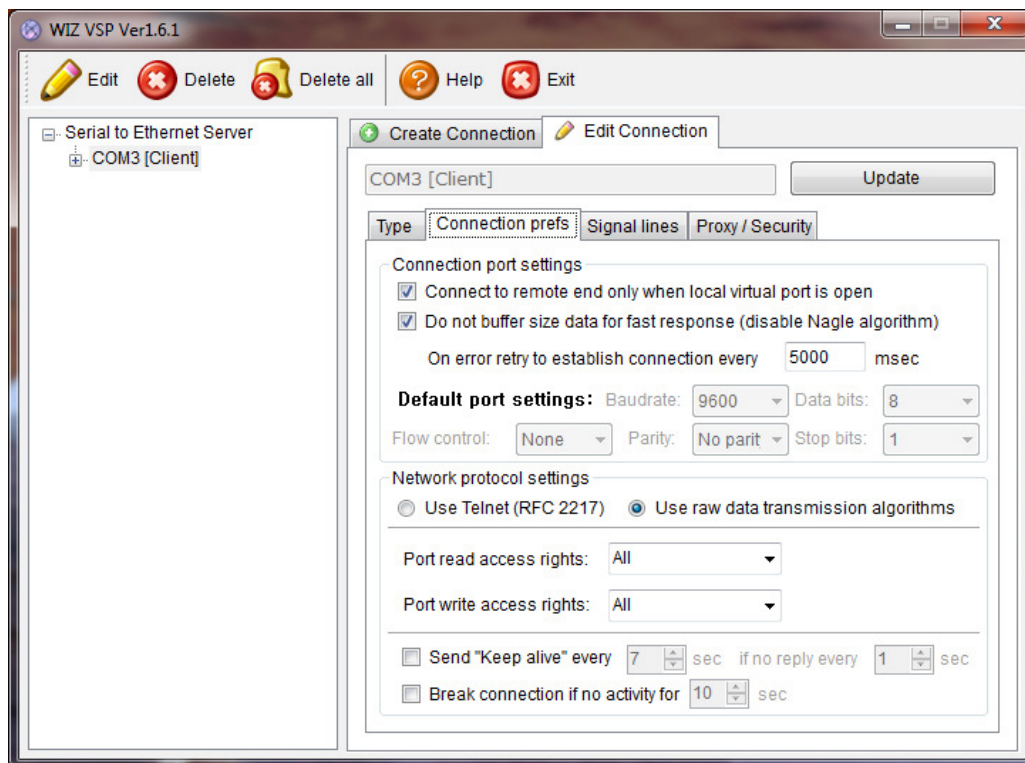
<http://www.pcs-electronics.com/phpBB2/viewtopic.php?t=2268>

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.

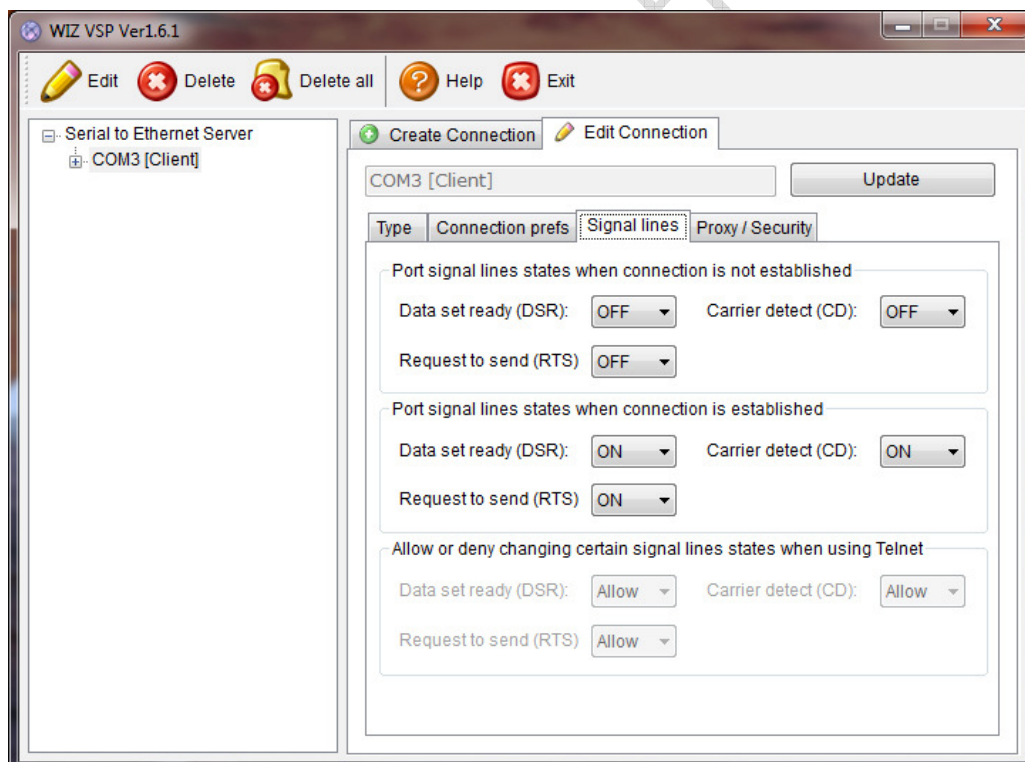
Connect the FM transmitter to your network via Ethernet cable (cable not included). The Ethernet adapter is setup to accept IP from your router's DHCP server. It is possible to setup Ethernet adapter with fixed IP or to login directly to ADSL modem. If you need MAC address of the Ethernet adapter open 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 CYBERMAXFM+ as shown below. Note the IP will differ, but make sure the port is set to 5005!



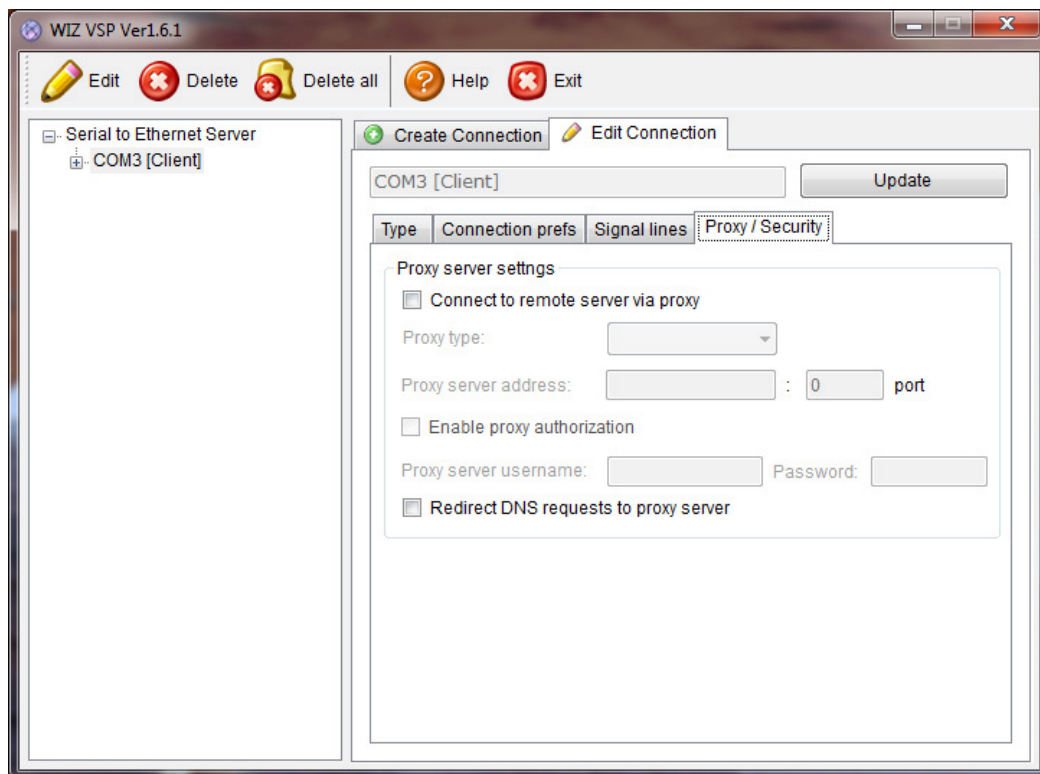
Setting up Ethernet connection for CYBERMAXFM+, screen 1



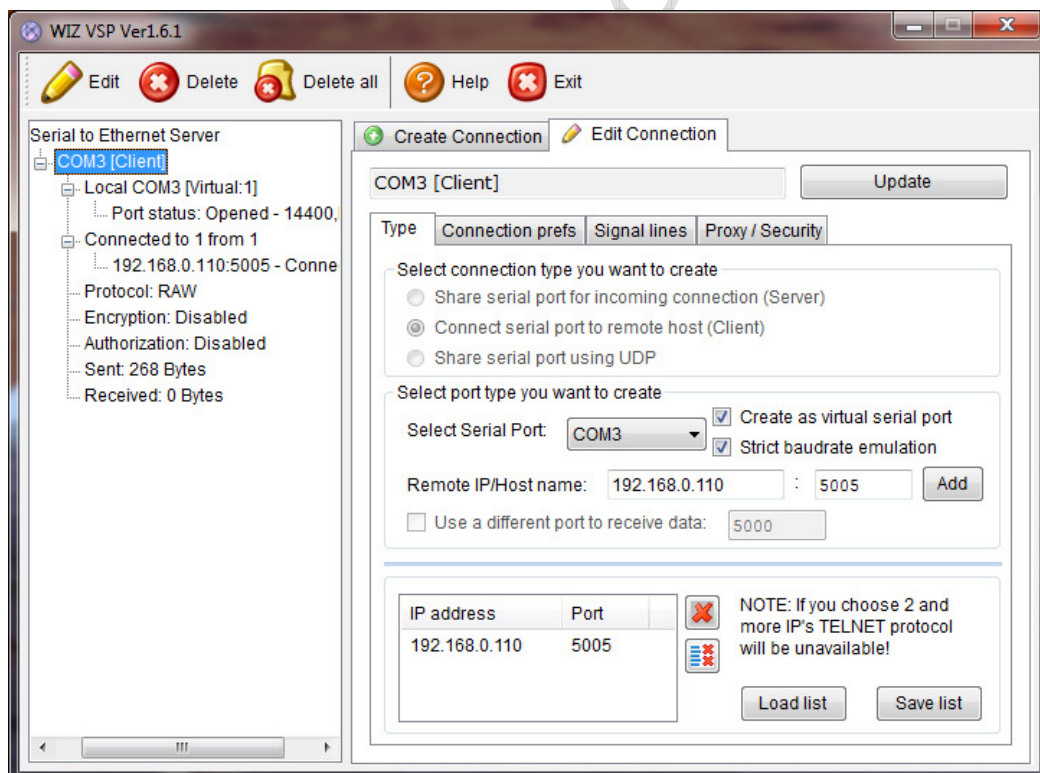
Setting up Ethernet connection for CYBERMAXFM+, screen 2



Setting up Ethernet connection for CYBERMAXFM+, screen 3



Setting up Ethernet connection for CYBERMAXFM+, screen 4



Setting up Ethernet connection for CYBERMAXFM+, overview

Appendix A – Warranty and legal info

Important notice!

Please remember to turn off the transmitter/amplifier when not in use! This goes especially for high powered transmitters. 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 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

To the law, in no event shall PCS Elektronik d.o.o. or its suppliers be liable for any special, incidental, indirect, or consequential damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information, or any other pecuniary loss) arising out of the use of or inability to use the PRODUCT, even if PCS Elektronik d.o.o. has been advised of the possibility of such damages. In any case, PCS Elektronik d.o.o.'s entire liability under any provision of this agreement shall be limited to the greater of the amount actually paid by you for the PRODUCT or U.S. \$5.00; because some states and jurisdictions do not allow the exclusion or limitation of liability, the above limitation may not apply to you.

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.
- Antenna analyzers

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

Choose your own frequency

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www.pcs-electronics.com

89.7 89.9 90.1 *My Music* 90.5 90.7

Turn your PC into a Radio Station !

Simply plug a card into your PC and you're ready to broadcast! Lets you control output power and frequency with a simple click of the mouse! Broadcast Mp3s across your yard, gallery, or use it as a small scale community radio.

with PC-MAX ULTRA
the latest from the makers of
the world's 1st commercially
available FM broadcasting
PC transmitter!

This is not all we offer! We also currently stock amplifiers, high-quality links, transmitters, frequency meters, antennas, filters, power supplies, coaxial cable and even some HAM equipment. Sign up for a newsletter to receive special deals and discounts. **check prices and place your order online.**

Final notes and acknowledgements

Version info: V1.0 (May 2020): Release version

Version info: V1.1 (July 2020): Added expansion, corrected many small errors, added links to software and SE V3

Parts of this document have been taken from:

- [Wikipedia](#)

www.pcs-electronics.com