

MAXPRO8015/8025/8050 and 8100+ v5

High performance FM radio exciter and the perfect pallet driver

Manual

IMPORTANT NOTE

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

IMPORTANT!: If you want to connect an amplifier to this exciter please first make sure that output power is set correctly and does not exceed maximum recommended input power of the amplifier. See appendix for additional tips on driving amplifiers.

Study local regulations and ensure you are operating in compliance.

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

TABLE OF CONTENTS

INTRODUCING THE MAX PRO 8000+ FM EXCITER SERIES (V5.0)	5
WHAT MAKES THIS FM EXCITER SO GREAT?	5
HOW IS MAXPRO8000+ V5 SERIES BETTER THAN THE MAXPRO8000 V3?	5
TECHNICAL SPECIFICATIONS:	5
MAXPRO8000 SERIES + KEY FEATURES	6
THANK YOU FOR PURCHASING MAX PRO 8000+ SERIES FM EXCITER	6
MAXPRO8015/25/50/100W RF AND LCD BOARD LAYOUT	7
RF BOARD LAYOUTS	7
LCD MODULE LAYOUT – 3 KEYS MODEL	9
LCD MODULE LAYOUT – ROTARY ENCODER MODEL	10
WHAT’S UNDER THE HOOD?	15
BEFORE YOU START	16
ANTENNA	16
SWR – ANTENNA MATCHING	16
BNC CONNECTOR	17
MAINS POWER SUPPLY AND MAINS POWER CABLE	17
AUDIO SOURCE WITH MIXER, MICROPHONE ETC	17
ENCLOSURE AND COOLING FOR MAX PRO 8000+ SERIES EXCITERS	17
STEREO ENCODER FOR STEREO OPERATION	18
WIRING EVERYTHING TOGETHER	19
WIRING THINGS UP AND FIRST POWER-UP	19
USING THE MAX PRO 8000+ SERIES EXCITER	21
LCD CONTROL MODULE – TWO TYPES	21
<RF POWER>	21
CHANGING FREQUENCY	22
<STEREO MODE>	22
<VIEW SELECT>	22
<TREBLE> AND <BASS>	23
COMPRESSOR SETTINGS	23
<LCD CONTRAST>	24
LEFT AND RIGHT CHANNEL VOLUME (ONLY WITH DSP STEREO ENCODERS)	24
<PLL STEP>	25
<FIRMWARE VER>	25
<BAND SELECT>	26
<RF POWER ALC>	26
WINDOWS CONTROL PROGRAM - CYBERMAXFM+	27
SOFTWARE INSTALLATION AND COMMUNICATION SETUP	27
TROUBLESHOOTING	38
LIMITING MAXIMUM ADJUSTABLE POWER FOR DRIVING PALLETS	41
STEP1 – ESTABLISH NEEDED DRIVE POWER	41
STEP2 - SET MAXIMUM OUTPUT POWER TO 4W	41
STEP3 – REDUCE 4W DOWN TO THE NEEDED 3.5W WITH ATTENUATOR (OPTIONAL, BUT RECOMMENDED)	41
STEP4 – VERIFY PERFORMANCE BEFORE CONNECTING THE PALLET	42
STEP5 – WIRING UP THE PALLET AND FIRST POWER UP	42
STEP6 – FIRST POWER UP AND SETUP	42
STEP7 – CHECK THE ALC AND SET IT TO PREVENT OVERDRIVING	42
STEP8 – RF POWER ALC (SOFTWARE POWER LIMIT)	42

APPENDIX A: DIY ANTENNA AND IMPROVEMENT TIPS	43
SIMPLE GP ANTENNA DESIGN	43
SOME MORE IMPROVEMENT TIPS.....	43
APPENDIX B: CONNECTING STEREO ENCODER.....	44
APPENDIX C: ADDING AN AMPLIFIER – COMPLETE FM TRANSMITTER BLOCK BY BLOCK	45
APPENDIX D: DIGIAMP CONNECTOR PIN OUT	48
APPENDIX E: GENERAL TIPS FOR SETTING UP TRANSMITTERS	49
TYPICAL FM TRANSMITTER SETUPS	49
TYPICAL FM BROADCASTING ANTENNA SETUPS.....	50
WIRING ANTENNAS IN MULTI-BAY CONFIGURATIONS	51
APPENDIX F – USING WIRELESS AUDIO LINKS.....	52
APPENDIX G – IO BOARD AND PC REMOTE CONTROL	53
SOFTWARE INSTALLATION.....	53
INSTALLING USB DRIVER (ONLY FOR USB IO BOARD)	54
CONFIGURING USB DRIVER.....	54
SETTING UP COM PORT IN CYBERMAXFM+ PROGRAM	55
APPENDIX H – SETTING UP REMOTE CONTROL VIA ETHERNET	56
SOFTWARE INSTALLATION.....	56
APPENDIX I: COMMUNICATION PROTOCOL EXPLANATION	59
BAUD RATE AND COM PORT	59
PS (RDS PARAMETERS).....	59
RT (RDS PARAMETERS)	60
FORMAT DESCRIPTIONS FOR THE OTHER SUPPORTED PARAMETERS:	61
APPENDIX J – WARRANTY AND LEGAL INFO.....	65
IMPORTANT NOTICE!.....	65
WARRANTY AND SERVICING!	65
LEGAL INFO	65
LIMITATION OF LIABILITY.....	65
ALSO AVAILABLE FROM WWW.PCS-ELECTRONICS.COM.....	66
REVISIONS AND ERRATA	67
INDEX.....	67

Introducing the MAX PRO 8000+ FM exciter series (v5.0)

Next generation of FM exciters with new Qsonic III VCO/PLL and up to 100W of power

Designed either as a perfect pallet driver or a stand-alone FM exciter, MAX PRO8000+ series brings up to 100W of very clean RF power, updated Qsonic III double-speed PLL/VCO subsystem with impressive audio performance and excellent bass plus several brand new hot features.

What makes this FM exciter so great?

MAXPRO8015/8025/8050/8100+ displays a number of useful parameters on the LCD display: transmitted power, reflected power, temperature, voltage, frequency, current consumption, audio modulation level, amplifier voltage, amplifier power and swr, and amplifier temperature and power consumption. The new Qsonic III VCO/PLL subsystem is protected by a metal shield for even better performance. Power and all other parameters can be controlled with keys on the LCD module or remotely via RS232/USB interface. Let us not forget about the power output, 25W is more than enough to drive any big amplifier out there on the market. Of course this unit is completely no-tune, directly supports our new stereo encoders (SE8000 and up) and offers impeccable performance 24/7/365. Even as a stand-alone unit this exciter doubles as an excellent community radio station and can easily cover a small city with suitable antenna.

How is MAXPRO8000+ v5 series better than the MAXPRO8000 V3?

- Improved output filtering, added extra section for extra clean signal
- Stand-by signal wired to the LCD display now to reduce cable clutter.
- Further improved S/N ratio across the band, designed for maximum spurious signal rejection (>80dBc). Some high-end customers appreciate this feature. Depending on operating frequency dBc can be >95dB down relative to the carrier.
- PLL/VCO improved lock time
- Much faster power-up
- Improved audio response linearity across the entire FM band
- New more efficient output transistors
- New 50W and 100W revisions are now available, 50W and 100W versions easily reach and even exceed rated power (push pull configuration with large metal heatsink).

Technical specifications:

- RF output power at 15V DC: 0 to 15W (MAXPRO8015+), 0 to 25W (MAXPRO8025+), 0 to 50W (MAXPRO8050+), 0 to 100W (MAXPRO8100+)
- Output connector: BNC, 50 Ohms, optional N
- Frequency range: 87.5-108MHz
- PLL steps: 50 KHz
- Frequency stability: +/- 20Hz, input for TCXO (external high precision clock)
- Spurious/Harmonic rejection: Harmonics: >70dB, Spurious: >-80dB
- Power supply (15W): 13-15V or car battery (2.5A, PTC fuse)
- Power supply (25W): 13-15V or car battery (5A max, no PTC fuse)

- Power connector: 2-pin power jack or solder pads
- Quartz locked PLL frequency control, ultra stable & clean output
- No expensive test equipment required
- Audio performance: Flat sensitivity across FM band, less than 0.1% distortion, 20Hz-75 KHz
- RF output ruggedness: SWR protection
- Polarity protection, temp protection
- Over-current protection
- Pre-emphasis, 50uS, 75uS or none selectable
- Audio Input Impedance: 1Kohm, unbalanced, 2 - pin jumper and solder posts
- Audio Input Level: 0 dB
- S/N ratio: >90 dB
- PC Board Size (15W/25W/50W/100W): 100x125mm (see page 11 for drilling template)
- RF monitor output: Yes, solder pads, ~ -30dB

MAXPRO8000 series + key features

- Displays frequency, power, audio level, reflected power, temperature, exciter voltage, amplifier voltage and amplifier current (depends on used filter) on the LCD.
- Extreme VCO isolation and RF field immunity (our innovative design)
- SWR and TEMP protection with adjustable sensitivity
- Adjustable software power limit when driving external amplifier (up to 9999W, ask if you need more)
- Four power range jumpers which let you set output power range from 0-1W, 0-2W, 0-3W, 0-4W etc all the way to the full 0-15W (25W/50W/100W). If your pallet requires 4W simply set the power range to 0-4W for precise and convenient drive.
- High power (up to 100W)
- True wideband no-tune operation, constant power across entire FM band
- Flat audio response, excellent bass
- Directly supports our SE8000+ stereo encoders via LCD MENU system
- RF control board with directional couplers and SWR protection is available

Thank you for purchasing MAX PRO 8000+ series FM exciter

We hope you will enjoy it as much as we do and remember to tell your friends about it. Please feel free to leave your comments at our website or post your experience in our forum. From all of us we wish you happy broadcasting!

Your PCS Electronics team

MAXPRO8015/25/50/100W RF and LCD board layout

RF board layouts

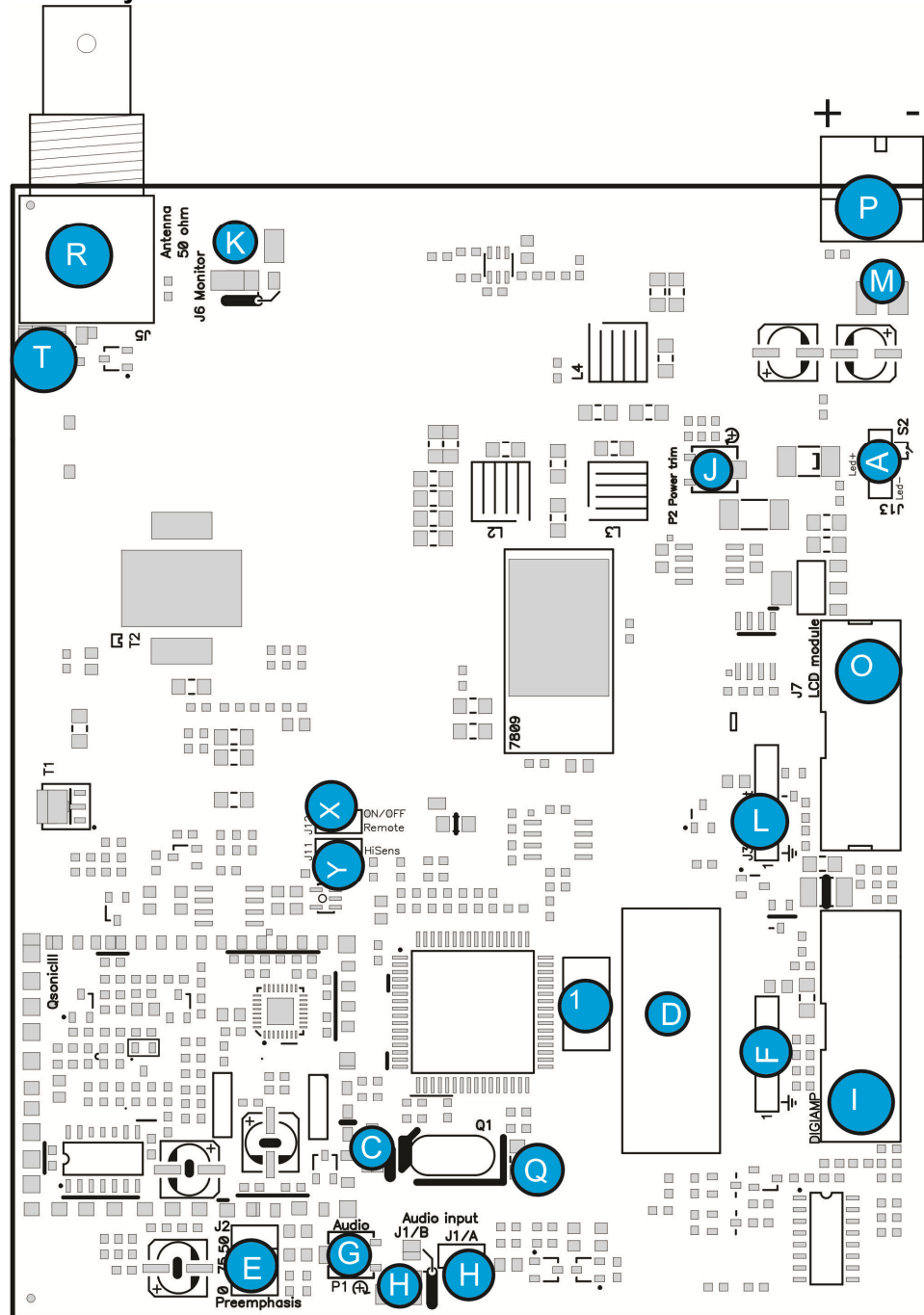


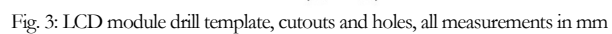
Fig. 1: MAX PRO 8015 RF board layout, other versions have very similar layout

Ref.	Function
A	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.
C	You can connect external TCXO (thermally stabilized reference oscillator). Frequency needs to be 16MHz, TTL. You will probably have to remove nearby quartz crystal, if you want to use this input. Contact us, if you get stuck.
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

Table 1: Description of various elements of the MAX PRO 8000+ FM exciter board

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

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



Reference	Function
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.

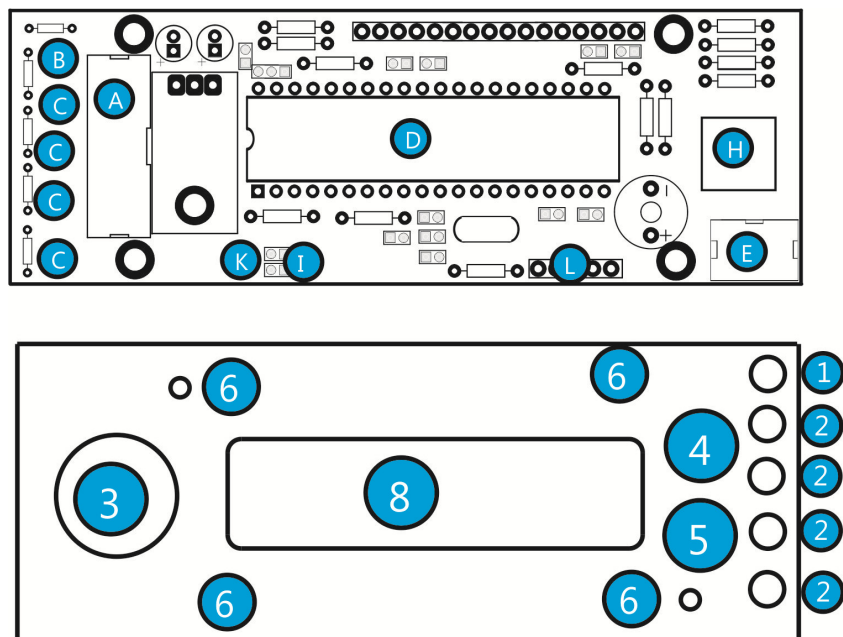


Fig. 4: LCD module layout, front and back, rotary encoder version 2x16

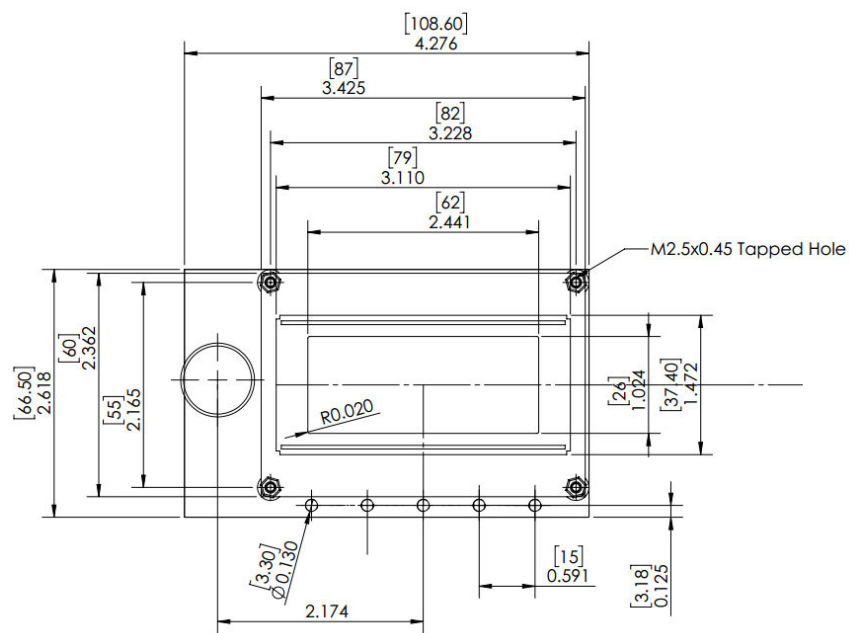


Fig. 5: LCD module with rotary encoder version 4x16

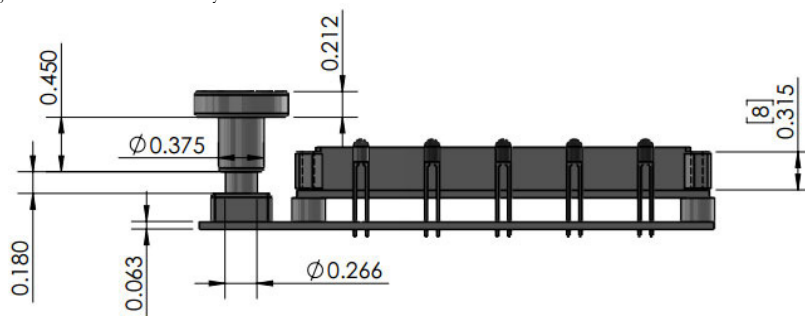


Fig. 6: LCD module with rotary encoder version 4x16, side view

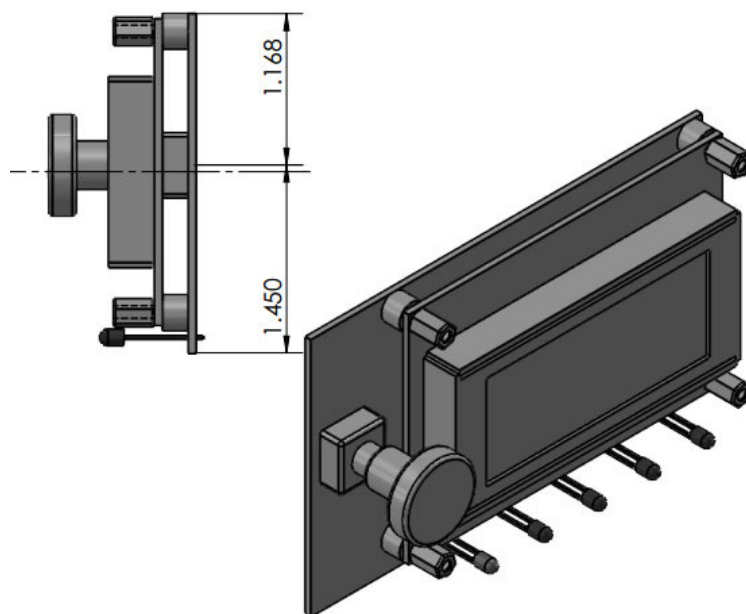


Fig. 7: LCD module with rotary encoder version 4x16

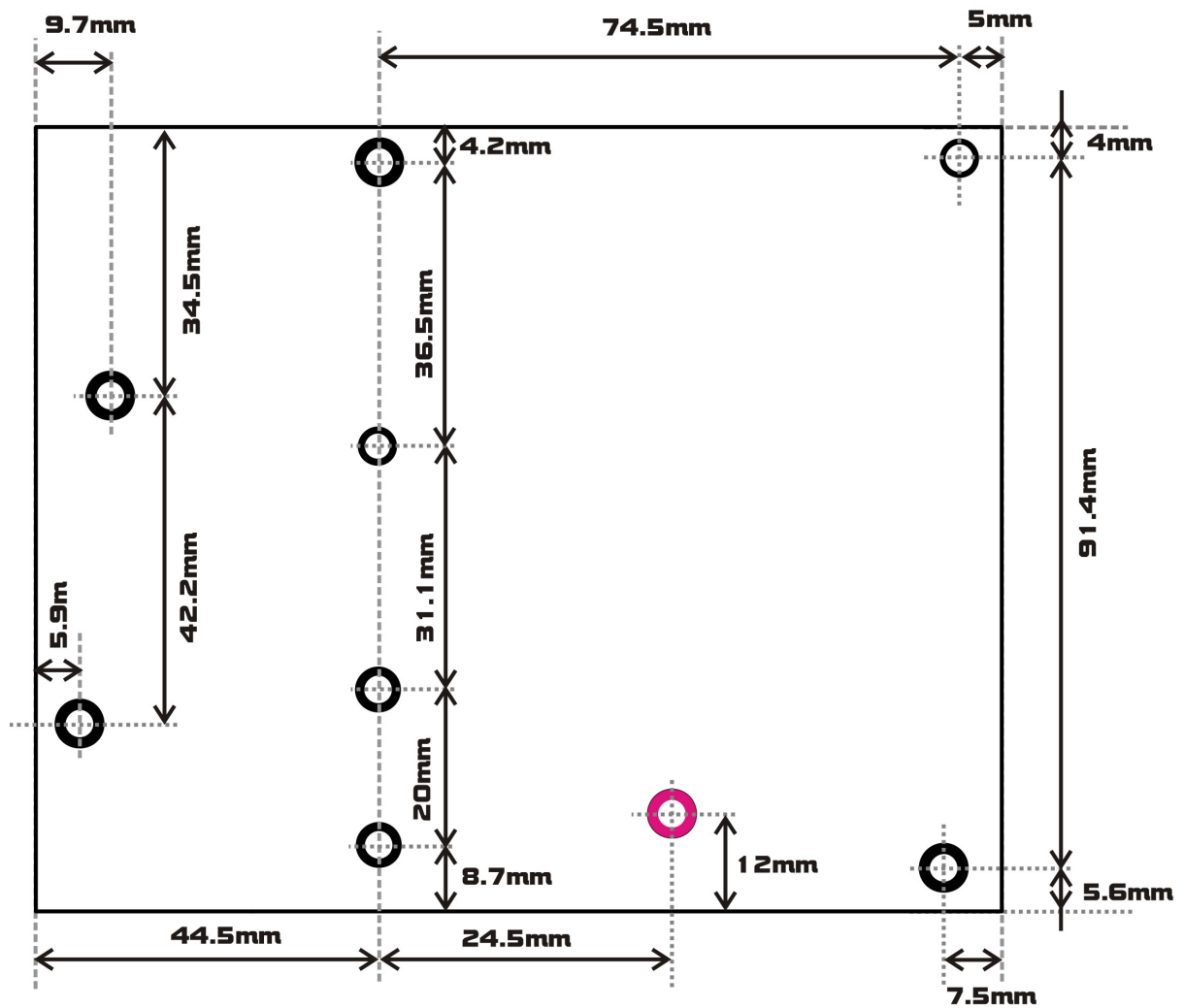


Fig. 8: RF module drill template for MAXPRO8015/25, all measurements in mm, all holes are for M3 metric screws. Board is 10mm above the enclosure due to heat sink running under the entire width of the board. Definitely use metal distancer under the pink hole as it also serves to cool the driver stage.

SE8000SE+ Board layout

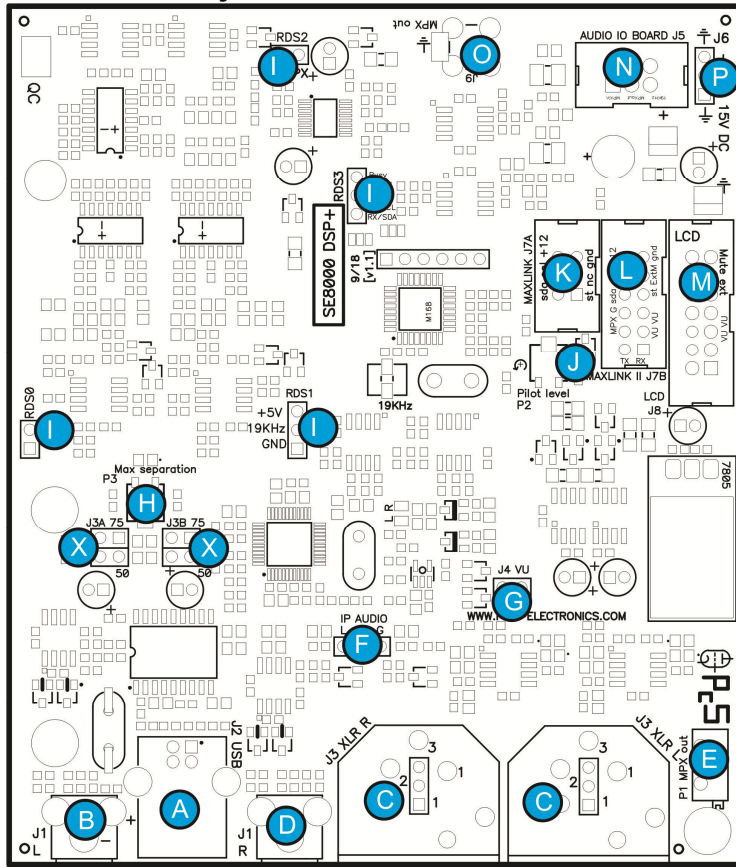


Fig. 9: SE8000DSP+ stereo encoder board layout (optional add-on board)

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.

Table 3: Description of various elements of the SE8000DSP+ stereo encoder board

RDSMAX8000 MICRO layout

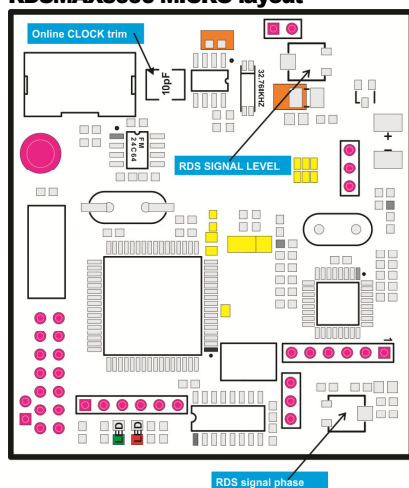


Fig. 10: RDSMAX8000 micro rds encoder board layout (optional add-on board)

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

Table 4: Description of various elements of the RDSMAX8000 micro RDS encoder board

What's under the hood?

The block diagram of the complete 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.

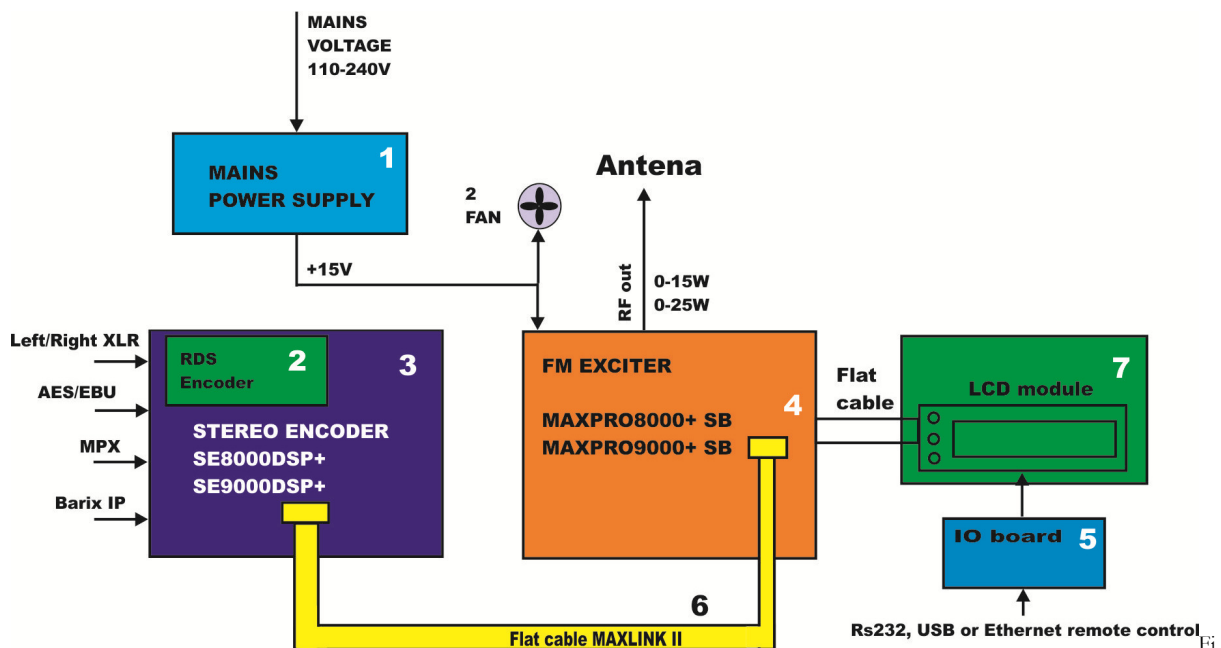


fig. 9: Block diagram of the MAXPRO8000+ series FM exciter

Reference	Function
1	Mains power supply powers the transmitter. Exciter runs on 15V DC.
2	RDS encoder (Radio Data 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

Table 3: Description of various blocks of transmitter built with the MAX PRO 8000+

Before you start

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

Antenna

Preferred type of antenna is affected by several factors, but mostly by desired radiation pattern, space available and your budget. If you are located in the middle of the area you want to cover you'll need an omni-directional antenna which transmits equally in all directions. If you are located at the edge of your desired coverage area you can beam the signal into the target area with a directional antenna. Directional antennas are also practical for point-to-point communications. Another thing to consider is that directional antennas usually have much higher gain than omni-directional antennas since the power which is radiated in all directions with omni antenna is concentrated mainly into one direction with directional antenna. Antennas with more gain thus have narrower beam. A compromise is usually made depending on budget and space available, higher gain antennas are often bigger and often more expensive.

Once you've chosen and installed your antenna there is another thing to consider. You can read more about it in the next section (So what is this SWR everyone talks about). 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. Aim for 2:1 or less. Use low power into the antenna when tuning it up and making adjustments. If you were using full power and a bit of the antenna came off in your hand the VSWR could be so bad as to blow the final transistor. For the same reason check the DC continuity of the antenna with an ohmmeter before plugging it in, to be sure it's what it's meant to be, either a short circuit or an open one, depending on the antenna type. For instructions regarding construction of antennas please see our website: <https://www.pcs-electronics.com/guides/antennas/>.

Antenna is a crucial part of the system so take special care. It is usually a good idea to place antenna away from your transmitter, power supply and audio system. Also any transmitter should be in a metal case which shields circuitry from the radiation of the antenna. If you cannot meet these requirements, you could experience feedback and other RF problems. We cannot guarantee proper operation of any transmitter/amplifier unless suitable antenna system is used and transmitters are in ventilated metal enclosure! This applies to any transmitter. Interestingly, strong RF field can make CD players and other digital devices go bezerk. Try placing antenna next to yours and see what happens. Most of the modern audio gear is not RF shielded – reducing costs is unfortunately the mantra today. This is why keeping antenna away from audio gear is a good idea.

If you are going to place your antenna outside, on your roof, please take care of the grounding. This should be done to prevent lightning hazard and should be done by a company specializing in lightning protection. You can read more about lightning protection in the book recommended below or many of the websites (Google up “lightning protection ham radio” for example).

SWR – antenna matching

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 artifacts, 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 your transmitter. It's a standard VHF RF connector for low power applications, just like the one used for older Ethernet networks. You might get it along with your antenna. 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

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 5 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 output power a bit. Supply voltage less than 15V may result in slightly reduced output power.

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 US\$. 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.

Audio source with mixer, microphone etc

You need some kind of audio source to drive your transmitter. This will typically be either a computer (just plug the cable into your sound card outputs, a mixer and a variety of audio sources, such as a microphone, CD player, DAT player, tape deck, gramophone, MP3 player etc.

Enclosure and cooling for MAX PRO 8000+ series exciters

Use metal (preferably aluminum) for your enclosures and allow some free space for future add-ons (stereo encoders etc.) and heat dissipation, also make ventilation holes at the top and/or back of the enclosure. Fix the PCB and heat-sink with all screws tightly. Read again, ALL screws. Make sure they make a good contact with the metal enclosure and if there is paint remember to remove it under the distancers. Use metal distancers, not plastic. Flat cable should be wired away RF sections or if you are not sure where that is move it away from the board in general. A fan is needed, 40x40x25mm will run quietly, you can connect it to the provided pads which also regulate fan speed according to output power. **Make sure you tightly screw the RF board to the enclosure as this is how the output transistor dissipates its heat!** Since 25W is quite a lot of power it is important that you follow these guidelines. If you still experience instability, make sure there are metal shields between compartments in your enclosure. You can also sand off the black anodizing off the heat sink where the heat sink meets the enclosure and board to ensure better contact. Anodizing creates isolating layer. You can remove that also for the top heat sink where it meets the board.

Stereo encoder for stereo operation

If you want to transmit in stereo, you also need a stereo encoder. The cool thing about MAXPRO+ is that it directly supports SE8000DSP+ stereo encoder. This makes it possible to set all audio parameters easily via LCD control module. SE8000DSP+ comes with excellent DSP filters and 19 KHz notch. When using other units look for good stereo separation, 19 KHz notch filters, a limiter and balanced inputs, if possible. Balanced inputs are an instant cure for most noise problems and this is why all professional installations usually take advantage of balanced inputs. Of course you can use any stereo encoder out there.

Wiring everything together

Wiring things up and first power-up

Wiring the MAXPRO8000+ is easy, just make sure you read the previous chapter and setup enclosure, antenna and coaxial cable correctly. Then proceed with the following:

- Install MAXPRO8015/25+ in a suitable enclosure and provide a small cooling fan which will blow across the board. If you have stereo encoder, you can install it in the same enclosure, but a metal separating/shielding wall is needed.
- Connect LCD module via flat cable
- Set the power limit jumper (J12) into the lowest position (2W or 4W), this will prevent any damage due to high SWR.
- If you don't have artificial load (dummy load) erect antenna tower and install antenna securely. Make sure your antenna is well away from any metal objects. Ensure your antenna tower is grounded securely. Connect one end of your 50ohm coaxial cable to the antenna. If you have SWR analyzer you can now verify SWR of your antenna. If your antenna is already tuned connect the other end of coaxial cable to the antenna connector (BNC) at the back of the transmitter. If you have SWR/POWER meter, you can wire that inline between antenna and transmitter as well. Make sure the SWR meter supports the frequency band required (87-108MHz).
- Ensure all connectors are firmly secured and antenna is mounted securely.
- While making sure power switch is off connect mains power cable into the mains power supply and connect mains power supply into the back of the exciter.
- Inspect all cables quickly again and make sure everything is secure.
- Turn on a radio receiver and set it to your intended transmitter frequency.
- Flip the POWER switch and wait for the unit to turn on. Enter the menu system by pressing the bottom key (Menu) repeatedly and look for the <RF power> menu item. Now set desired output power with the UP/DOWN keys. For tuning and testing use around 25-50% of full power. Press Menu again to exit back to main display. Now you can use the UP/DOWN keys to set the desired frequency of operation. Wait a few seconds for the red LED diode to turn off. Your radio should now mute since you did not connect any audio sources yet.
- 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. Remember, if you're using stereo encoder you do not need pre-emphasis so set it to none.
- Observe SWR and output power. If everything seems ok you can enter <RF power> menu again and increase power to full. Remove or reposition the power limit jumper (J12) if more power is desired.

Checking 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 audio/music 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. When using SE8000DSP+ set compression to 1:8 or 1:16. Keep other values at default.
4. SE8000+ units now 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.

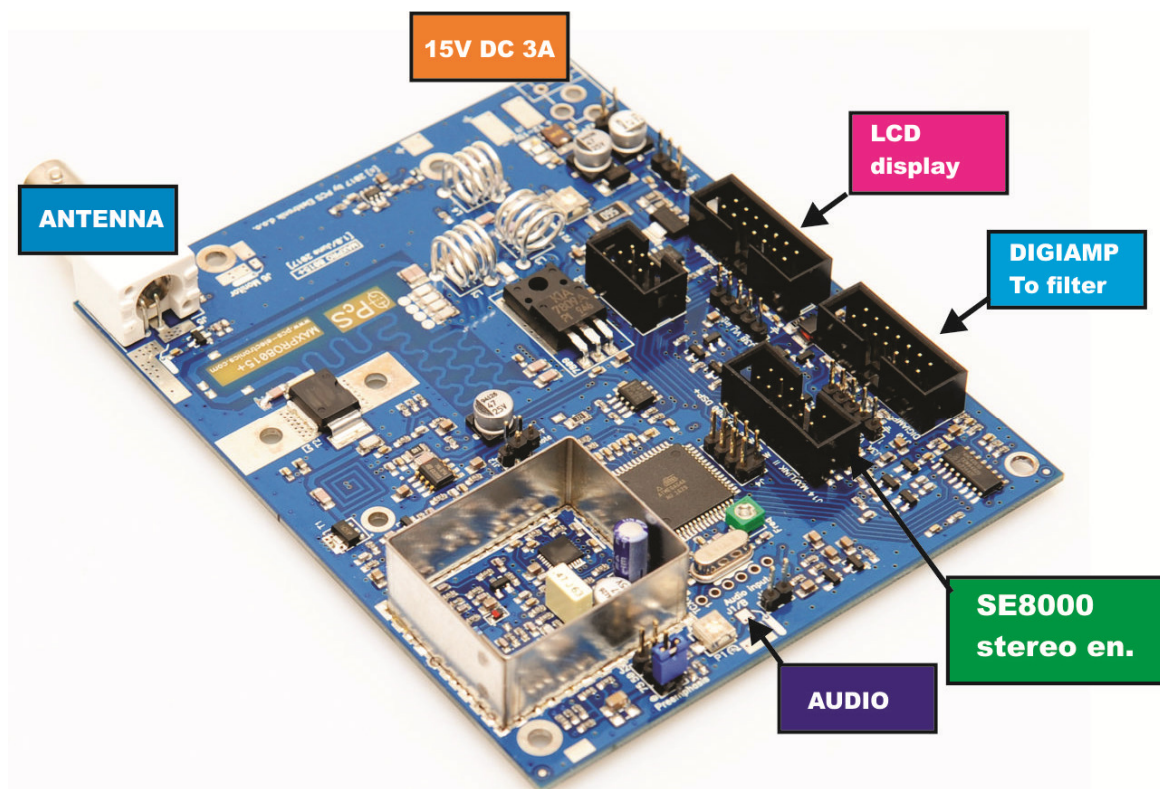


Fig. 10: Setting up MAXPRO8000+

Using the MAX PRO 8000+ series exciter

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.

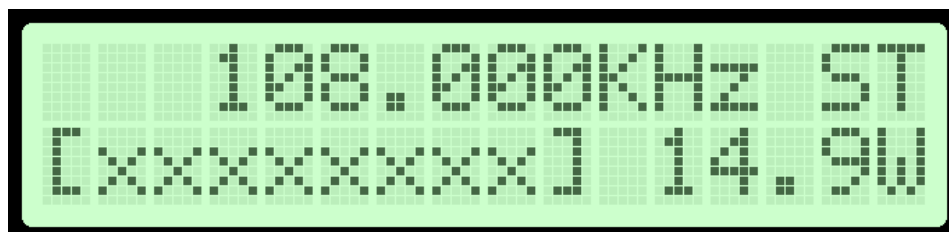


Fig. 11: Setting power, the power is set to full here, stereo mode is on

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.

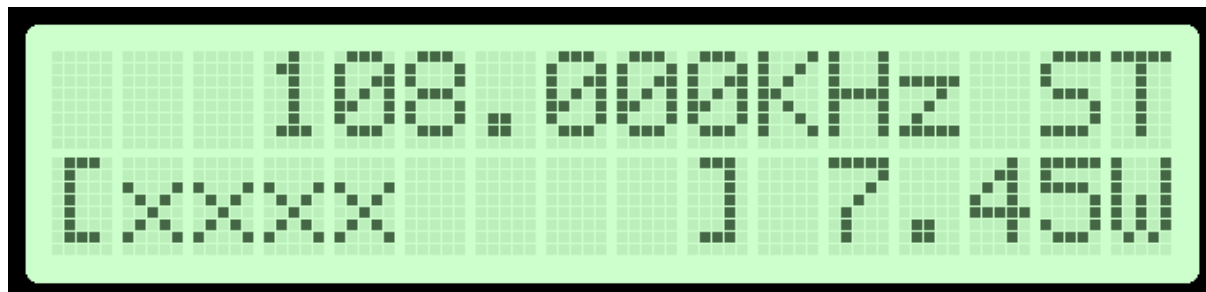


Fig. 12: Setting frequency and power, the power is set to 50% here, stereo mode is on

<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).

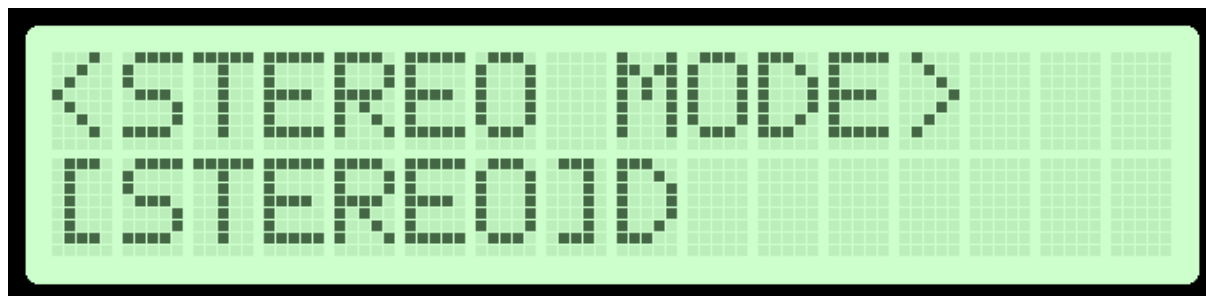


Fig. 13: Setting mode to stereo

<VIEW SELECT>

MAX PRO 8000+ 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 this to work you the W solder bridge on the LCD module needs to be closed-soldered.
- [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).

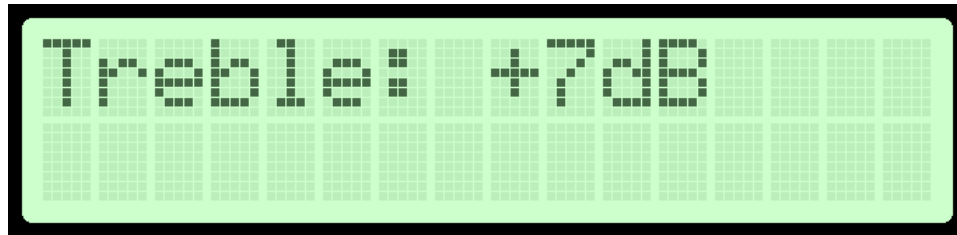


Fig. 14: Setting treble

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. 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.

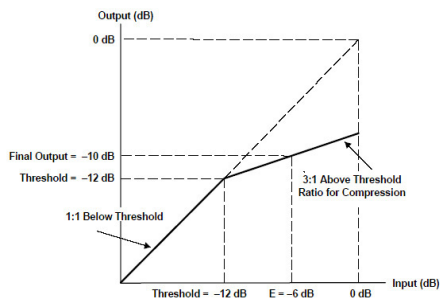


Fig. 12: Explanation of the compressor settings

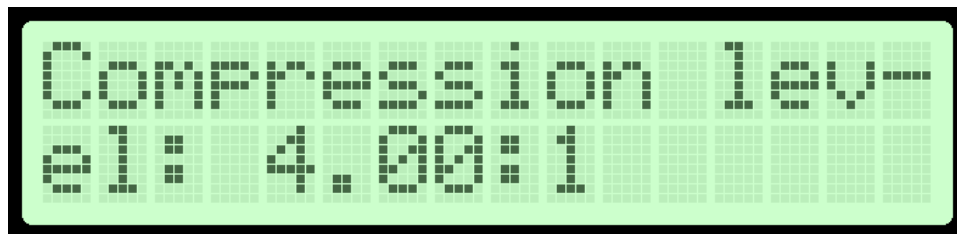


Fig. 15: Setting the compression level

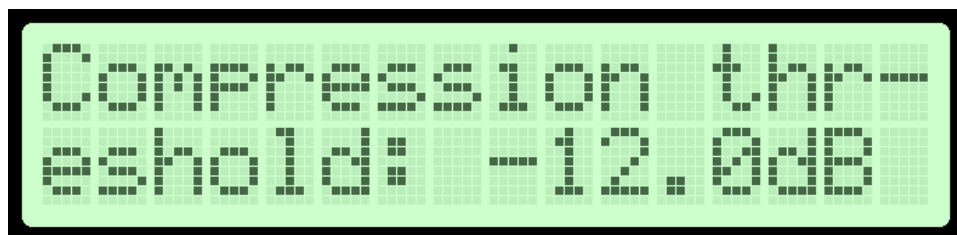


Fig. 16: Setting the compression threshold

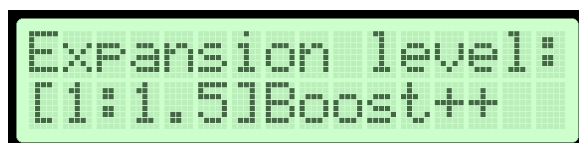


Fig. 17: Setting the expansion threshold

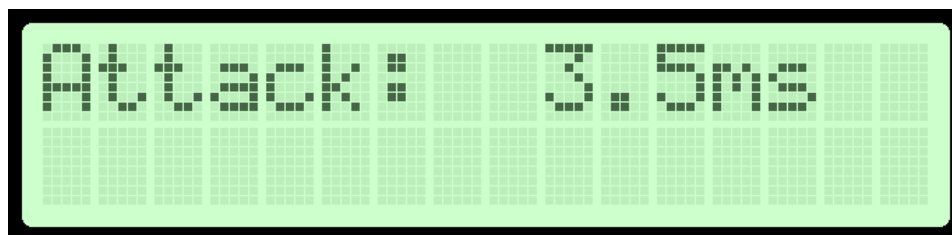


Fig. 18: Setting the attack time, this is the time between the input signal and the actual response of the compressor

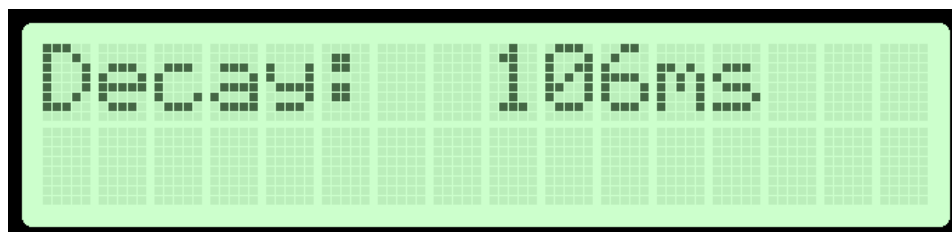


Fig. 19: Setting the decay time, this is the time the compressor needs to respond after the input signal falls back to normal level (below threshold).

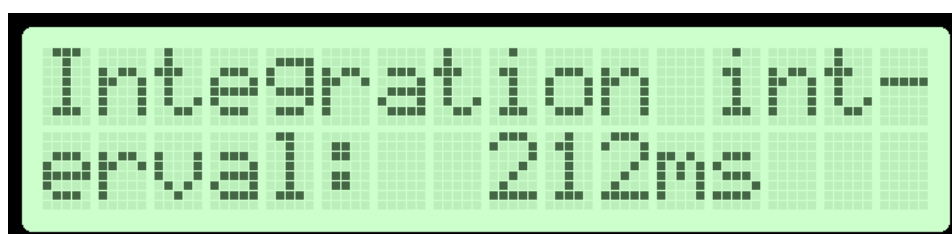


Fig. 20: Setting the integration interval, this is the time the DSP evaluates the signal to establish whether it should respond or not

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

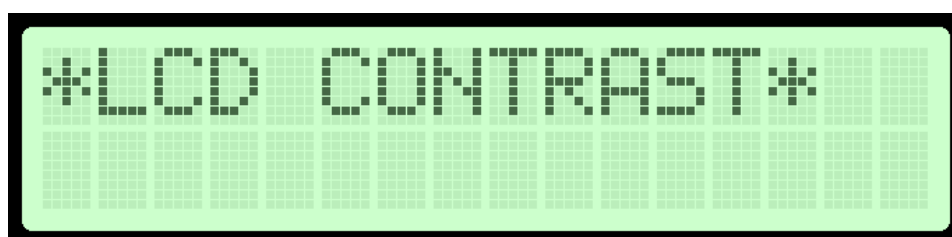


Fig. 20: Changing contrast

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.

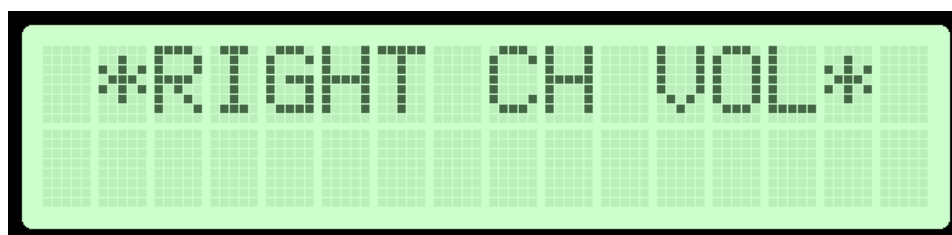


Fig. 21: Changing right input channel gain

<PLL STEP>

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.

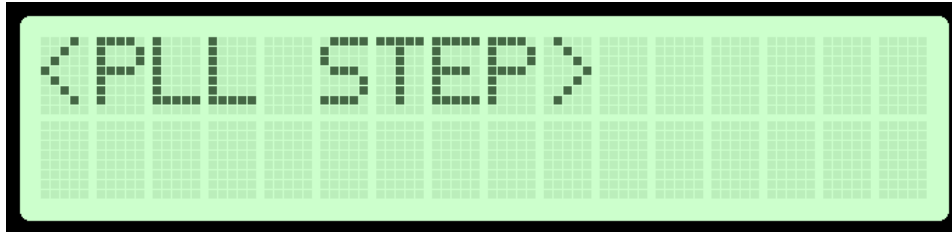


Fig. 22: Changing PLL step size

<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>

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.

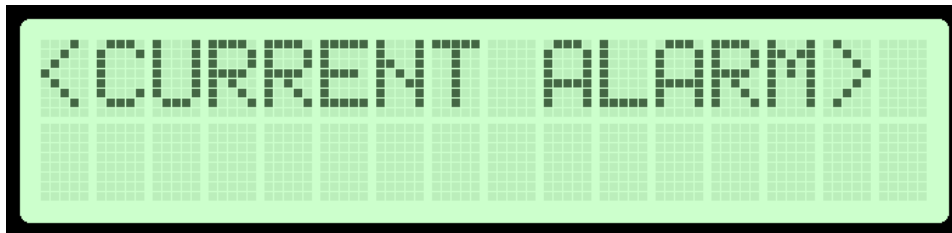


Fig. 23: Current alarm.

<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.

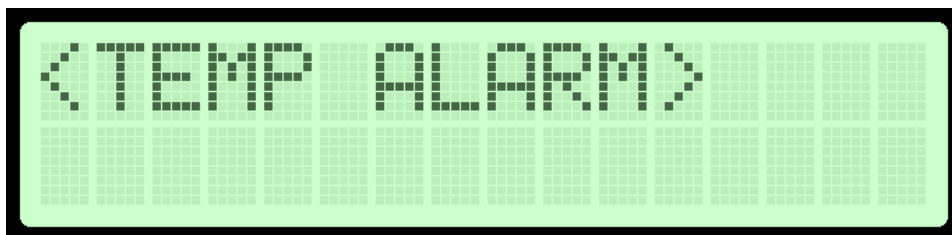


Fig. 24: Temperature alarm.

<SWR ALARM>

You can set the sensitivity of software driven SWR alarm here.

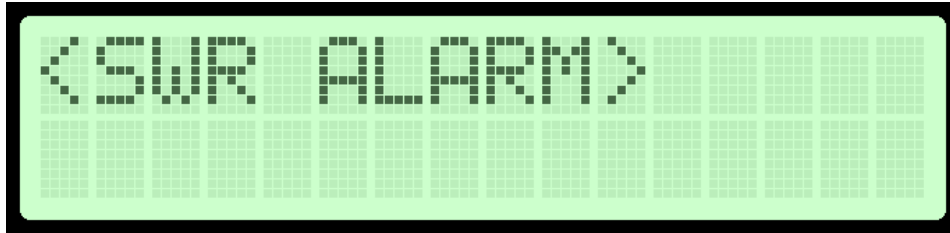


Fig. 25: Temperature alarm.

<U AMP ALARM>

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.

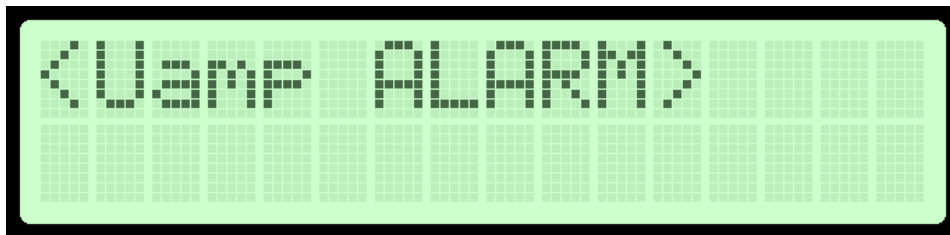


Fig. 26: Amplifier voltage alarm

<BAND SELECT>

MAXPRO8000+ excitors support 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. MAXPRO8000+ series exciter works perfectly across the entire band.

<RF POWER ALC>

This menu option is useful for situations where MAX PRO 8000 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.

WINDOWS CONTROL PROGRAM - CYBERMAXFM+

SOFTWARE INSTALLATION AND COMMUNICATION SETUP

Software installation and setting up connection via serial COM port or USB port are described in [Appendix I](#).

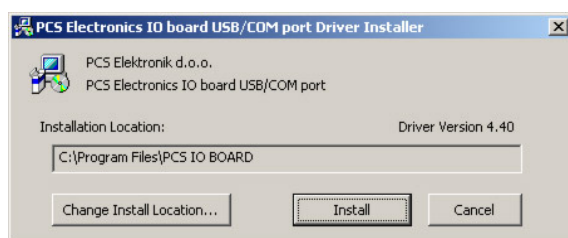
Use the correct USB port!

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, open [MAXPRO8015 product listing on our website](#) and scroll down under the “Add to cart” section and click Additional information tab, you will find links to USB driver, software and manual. Download USB driver first.

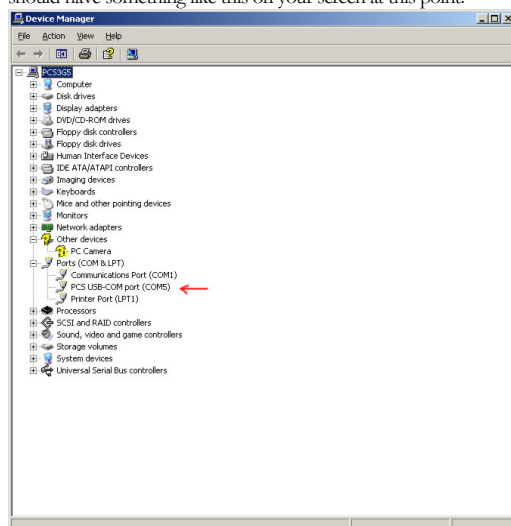
Run the setup file. Wait for the following screen (or very similar) to appear and select the installation directory (best left alone at default location). Click Install and wait for the installation to finish.



Installing USB driver

Configuring USB driver

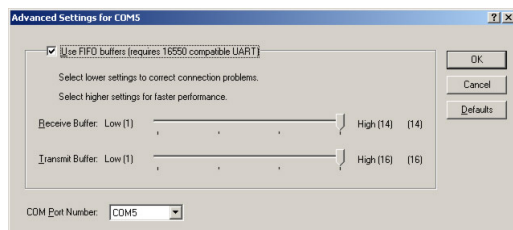
In Windows go to Start > Settings > Control Panel > System > Hardware tab > Device Manager (This can vary depending on your Windows version). You should have something like this on your screen at this point:



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, then 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. Look for windows control program to control MAXPRO2015 remotels. Open [MAXPRO8015 product listing on our website](#) and scroll down under the “Add to cart” section and click Additional information tab, you will find links to CyberMaxFM6.4 program (as well as USB driver and manual):

Prices shown are without VAT (paid only in EU)

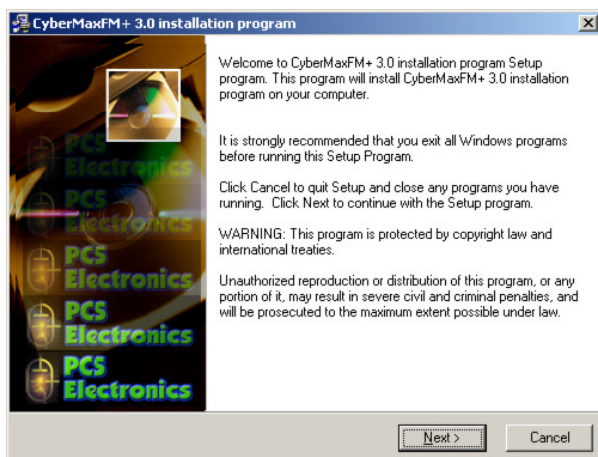
Add to cart

DESCRIPTION	ADDITIONAL INFORMATION	REVIEWS (0)
ADDITIONAL INFORMATION CYBERMAXFM+ SE V2 manual which also holds for SE V3 http://www.pcs-electronics.com/software/2018/manual_cybermaxfmSE2_en.pdf (V3 brings Expander functionality which can be used to boost quiet audio. Default setting of 1:1 means expander is disabled, a setting of 1:2 gives maximum boost. This function is great for drive-in cinemas to boost quiet sections a little bit.) Here's a program to control this unit remotely with a PC (RS232 or USB) for SE+ V3: http://www.pcs-electronics.com/software/2013/CyberMaxFM_v64_Setup.exe Here is the driver for USB port for XP, W2K, Vista and Windows7: http://www.pcs-electronics.com/software/2013/CyberMaxFM_v64_Setup.exe Here is the driver for USB port for XP, Vista and Windows7 that should work in 64 as well: http://www.pcs-electronics.com/software/archive_usb2comport_driver.zip And finally a USB driver for Windows 10: http://www.pcs-electronics.com/software/USB2VirtualComPort.exe We recommend this guide as it explains many useful things for any FM radio station. Section dedicated to software setup is also very helpful: https://www.pcs.si/software/2018/Setting_up_drive_in_cinema_FM_radio_by_PCS_Electronics.pdf		

Manual and drivers are located at the above tab

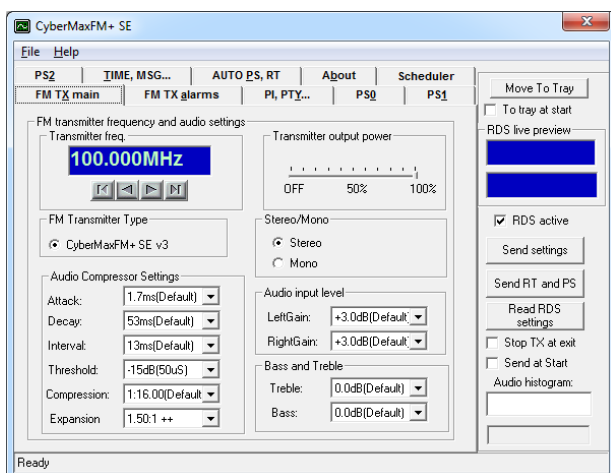
Software installation

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.**

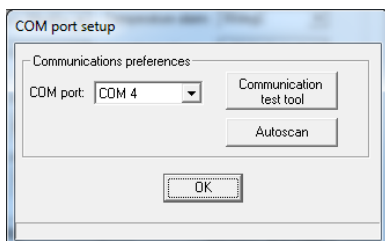


CyberMaxFM+ remote control software, depending on your model this screen can differ a little. Nano program looks similar.

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

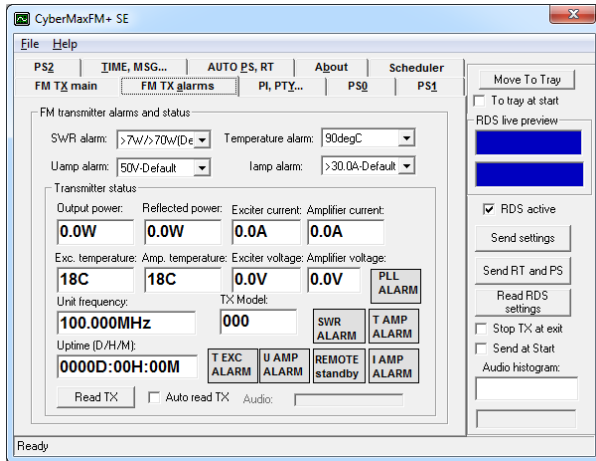
The only setup required is minimal. Start the CyberMaxFM+ program, the icon should now be on the desktop. Now click File and Setup. The following window will open. **It is best to set COM port manually as the Autoscan feature does not always work correctly** (same goes for test tool).



Set COM port for remote control.

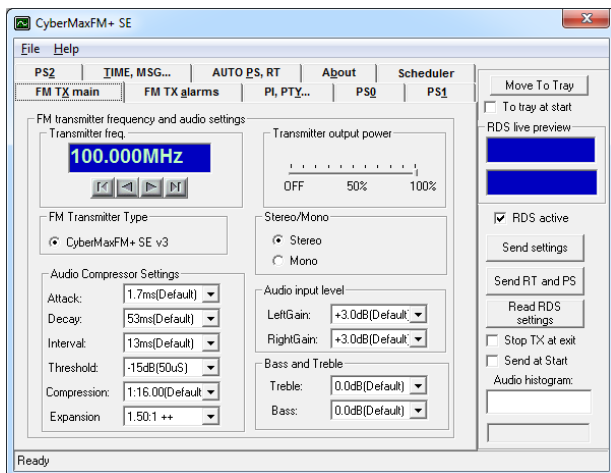
Testing the connection

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.

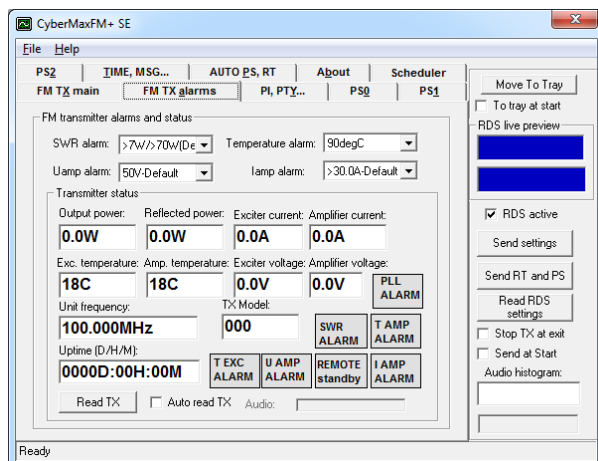
Bass and Treble

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.

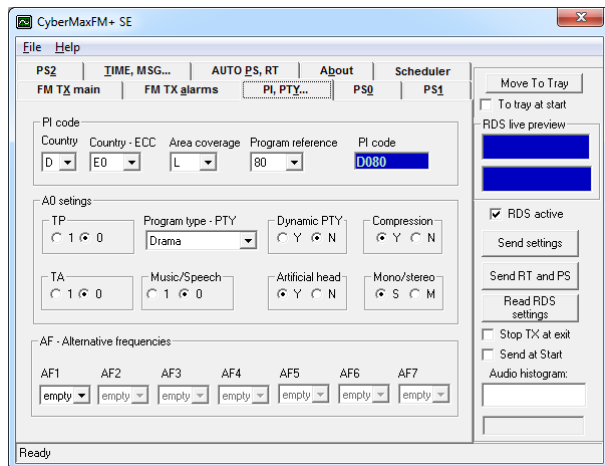
Read TX

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.

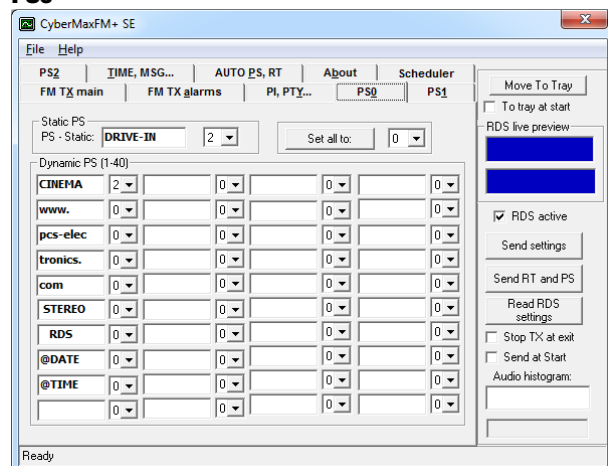
Music/Speech

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!

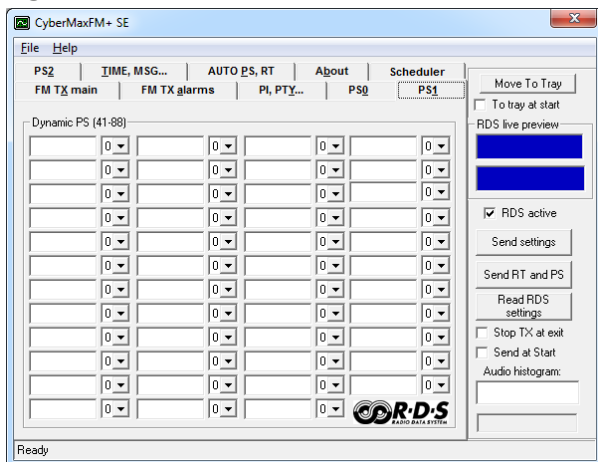
More information about PS feature

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).

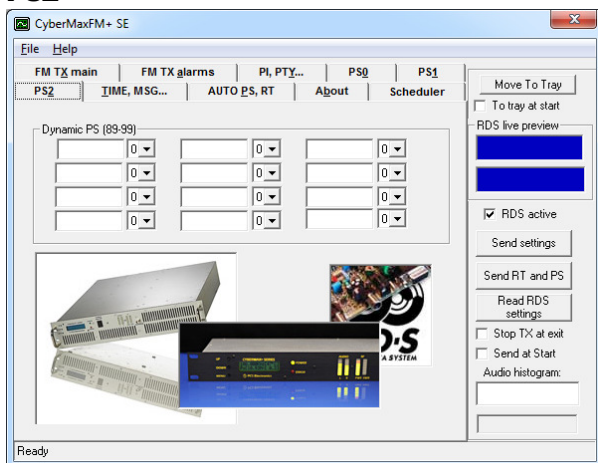
Example: If you wish to just have one static PS, set all delays to 0 and set just PD00 to 1. Then set PS00 to desired states PS, which will be displayed indefinitely.

PS1



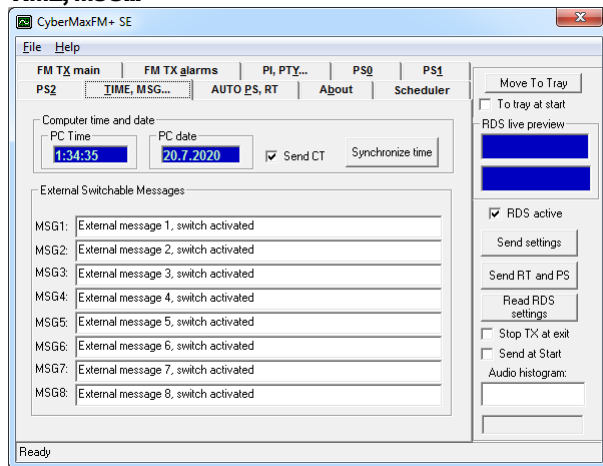
Setting up RDS – More PS fields, there are too many to fit on one page

PS2



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

TIME, MSG...



Setting up time and external messages

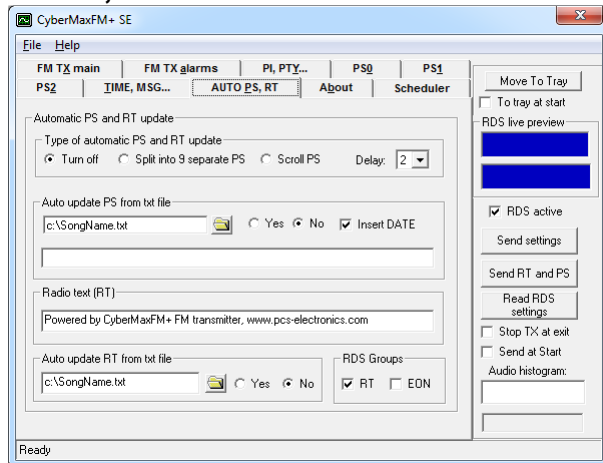
Computer time and date

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

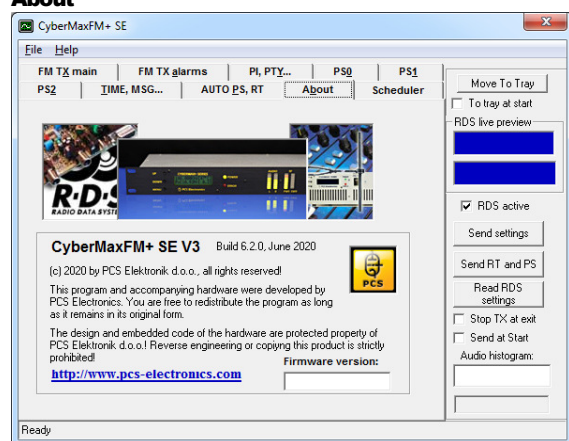
you installed the program. Run the exe file and configure it to output winamp song info into your text file and then set CyberMaxFM+ program to read song name from that file. Also make sure you setup VtitleSpy plug-in to limit song name to 64 characters.

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.

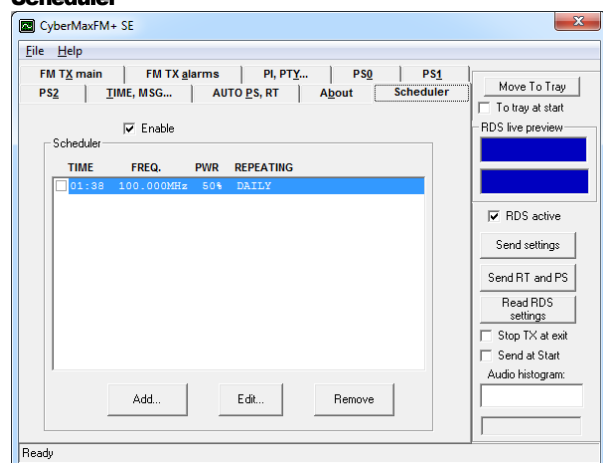
Audio histogram

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.

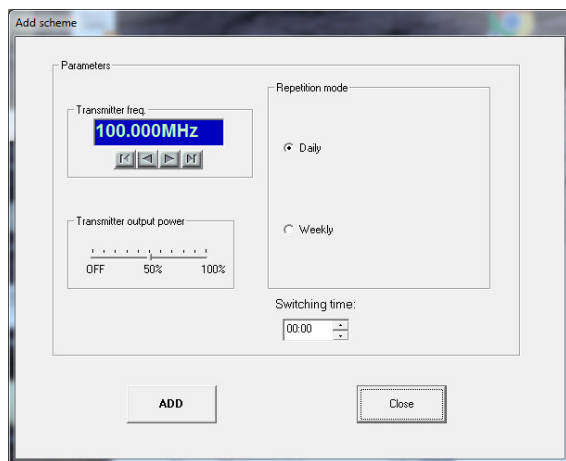
Edit

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! MAX PRO 8000+ series exciters 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, MAX PRO 8000 series exciters need 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. Check the power limit jumper J12 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 3. 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. 4. Exciter may not give full 15W/25W when you use a supply voltage of less than 15V.
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.
Audio without any treble	Set pre-emphasis to either 50uS or 75uS. If you're using stereo model, enable pre-emphasis there (see manual for stereo encoder module , SE5000, SE2000 or SE8000).
Unit blows fuses and draws excessive current	You have managed the impossible: 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.
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 (for your stereo encoder, SE5000 and SE2000 have XLR inputs) - Make sure SWR is low - Did you miss the part about metal enclosure? Put your unit in enclosure!! - Keep audio cables short and away from antenna and RF coaxial cable

	- Form a coil from coaxial cable going to the antenna, make a few turns. This stops RF currents that might be flowing on the outer braid of the coaxial cable. This usually happens when you connect unbalanced cable to balanced antenna without proper BALUN (balanced-unbalanced converter) resulting in coaxial cable becoming part of the antenna and radiating RF energy as well...causing hum.
The audio level bar graph does not move with audio	Look at the LCD module and look at the “W” solder bridge. This bridge should be soldered over for this function to work. If it is not please solder this.
Output power less than expected	Verify position of the J12 power limit jumpers. A jumper installed there will limit maximum power to 2W, 5W or 8W. If you want full power please remove the jumper.
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).

Table 6: Troubleshooting MAX PRO 8000+ series FM exciter

Limiting maximum adjustable power for driving pallets

MAX PRO 8015 (8025 is usually too strong for driving RF amplifiers) has been developed as a pallet driver and it is ideal for this task. Of course for most situations 15W will be too much and you will want to limit maximum output power of this FM transmitter to a lower value and at the same time prevent accidental setting of higher power via LCD module. This is especially important when you use this exciter to drive an amplifier. Most amplifiers will not appreciate over-driving the input and will eventually be damaged by excessive power on the input. There are scenarios and ways to limit output power, they are described below with their advantages and disadvantages. You should **PERFORM THESE ADJUSTMENTS BEFORE CONNECTING AMPLIFIER** as otherwise it may be too late, a short burst of full power before you turn the power off or adjust the trimmer may kill the amplifier. A very good design practice is also to use an attenuator (just a small 1-3dB) between exciter and amplifier, remember amplifiers input impedance can be a long way from prescribed 50 ohms and attenuator nicely equalizes that out.

Step1 – establish needed drive power

Check the datasheet/specs of your amplifier, it will state how much drive power is needed. For the purpose of simplicity let us assume that the datasheet asks for 3.2W of drive power. Since there is some variation from pallet to pallet and we want to have a tiny bit of headroom also for the attenuator lets set output power to 4W.

Step2 - set maximum output power to 4W

Look for power limit jumper J12, it is located close to the telemetry connector. Set J12 to 4W, this will limit output power to about 4W. Thanks to the new design of the MAXPRO8015+ this output power is flat across the entire FM band, this is a great advantage compared to our 3000+ and 4000+ series exciters.

Step3 – reduce 4W down to the needed 3.5W with attenuator (optional, but recommended)

As already mentioned before a very good design practice is to use an attenuator (just a small 1-2dB) between exciter and amplifier, remember amplifiers input impedance can be a long way from prescribed 50 ohms and attenuator nicely equalizes that out. We are going to use such an attenuator to bring 4W down to around 3.2W.

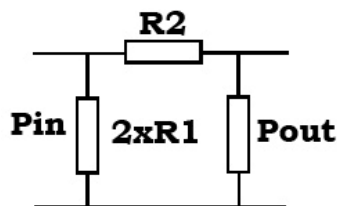


Fig 35: Attenuator

Loss in dB	R1 ohms	R2 ohms	Input power (Pin) for 3.2W output power (Pout)
1	870	5.8	4W
2	436	11.6	5.12W

Table 7: Resistor values for required attenuation

It seems 1dB will be just perfect. You can use 2x820ohm 2W resistors and 1x5.6ohm 2W resistor. Use regular carbon 2W resistors (not! wire-wound), they will work well for this purpose at 100MHz, just keep the leads very short.

Step4 – verify performance before connecting the pallet

Now you should have about 3.2W at the output of the attenuator, it is recommended that you now measure this output power to verify performance before you power-up the pallet. Don't worry if you get slightly more, we will focus on that later. You should worry about getting a lot more than 3.2W as that would mean something is not as it should be and excessive drive power could damage the pallet. After you're done with verification set power down to zero via LCD module and power off the exciter.

Step5 – wiring up the pallet and first power up

Make sure your exciter's output is set to zero and everything is powered off. Now connect the pallet, the filter and directional couplers (swr/pwr meters). We recommend PCS LPF 6000 or PCS LPF 7000, they can be easily connected to Digiamp. You can also use your own directional coupler, connect it to J8. Wire everything and verify it carefully to make sure there are no shorts. Make sure dummy load is connected for the test and wire power meter inline so you can monitor the power output. Set the sensitivity trimmers for SWR and PWR on the filters to maximum. Set ALC trimmer to zero (turn it towards digiamp connector).

Step6 – first power up and setup

Power up the entire setup and slowly increase drive power while observing the output power from the pallet on the power meter, also monitor temperature. Be careful never to exceed power rating of the pallet. A 500W pallet shouldn't be pushed beyond 500W. Setup the SWR and PWR trimmers on the filters so that the power shown on the LCD is the same as on the power meter. If you are getting SWR alarms you may need to reduce SWR trimmer.

Step7 – check the ALC and set it to prevent overdriving

Make sure that ALC (automatic level control) is not limiting your power, you can do so by turning it carefully. Set the ALC trimmer to start limiting a bit below your target power level, for example in a 500W setup you can set it to start limiting around 480W. If you still can't reach full power you need slightly more drive, look at the attenuator and reduce R2 a little. You can do that by connecting another resistor in parallel, for example 10 ohms.

Step8 – RF POWER ALC (software power limit)

We have included a very important new feature in MAXPRO8000 series excitors, we call it RF POWER ALC, and it is basically a software power limit. There is a menu option with this name and it lets you select the maximum power allowed. For example, you can set it to a number of pre-defined values, such as 50W, 300W, 500W, 1000W etc. This menu option is usually locked, to unlock it look at the LCD module board and solder a bridge across "Free". You will now be able to enter and change the RF POWER ALC setting. After changing this value please remove the solder bridge, accidental or malicious change will allow the exciter to overdrive the amplifier which will probably result in damage. How does it work? It relies on the accurate power signal from directional coupler. After start-up the exciter will increase its drive slowly until the amplifier reaches for example 500W. As soon as power limit is reached the exciter will stop increasing its drive. This ensures 500W across the band without any over-driving problems. Obviously this only works well when the directional couplers are setup properly and power readout needs to be calibrated correctly with trimmers such as the PWR trimmer on the LPFMAX1K+, LPFMAX2K+ or LPFMAX3K+ filter.

PERFORM STEPS 1-4 BEFORE CONNECTING AMPLIFIER/PALLET!

ALWAYS MAKE SURE OUTPUT POWER OF THE EXCITER DOES NOT EXCEED AMPLIFIER INPUT POWER!

Appendix A: DIY antenna and improvement tips

Simple GP antenna design

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

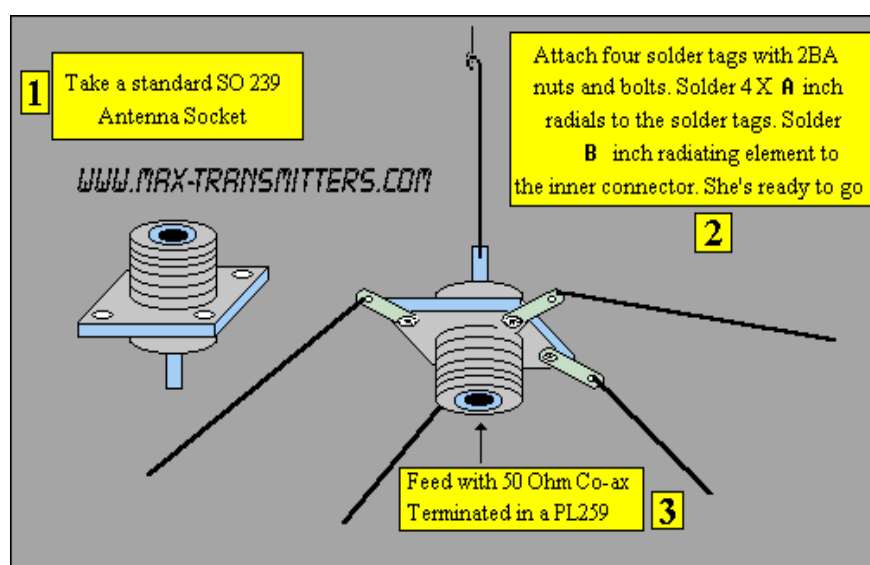


Fig. 39: »Do it yourself« GP antenna

If you have a SWR meter, leave a bit longer radiator and adjust it later by cutting to achieve minimum SWR.

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

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

For other antenna designs check our web site here: http://www.pcs-electronics.com/guide_antenna.php

Some more improvement tips

Think about purchasing SWR meter to tune and align your antenna. A good antenna system is extremely important and can make up for a lot of power. For a suitable SWR meter check:

<http://www.pcs-electronics.com/cn1011-daiwa-power-meter-p-347.html>

If you can't get much range with your homebrew antenna, have a look at these:

<http://www.pcs-electronics.com/antennas-c-38.html>

Still not enough range? Well, how about a 750W amplifier?

<http://www.pcs-electronics.com/750w-digital-amplifier-19inch-rack-p-1295.html>

Appendix B: Connecting stereo encoder

You will almost certainly want to upgrade to stereo capability at some point. Using our stereo encoders is a great idea as you can control all parameters through the same LCD unit used for FM exciter. Since the introduction of the new MaxLinkII interconnect system this is really easy to do, you do not have to fiddle with wires and soldering iron anymore. The MaxLinkII™ is a 12-wire flat cable interconnect system which is simply plugged into appropriate connector on the stereo encoder board and the other end into connector on FM exciter board. See fig. 19 below for wiring directions. You don't even have to wire a separate supply (12V) wire to the stereo encoder as the MaxLinkII cable delivers supply voltage as well as MPX signal and VU meter signals.

Remember to set the following:

Disable pre-emphasis in the MAX PRO 8000+ series exciter board (jumper in position "None"). Pre-emphasis is now handled by stereo encoder(SE5000/SE8000 or other), you can set it there either to 50uS or 75uS.

Set the audio level (P1) on MAX PRO 8000+ series exciter so that the stereo indicator on the radio just turns on, then increase it slightly more (make sure you are in stereo mode when you do this alignment).

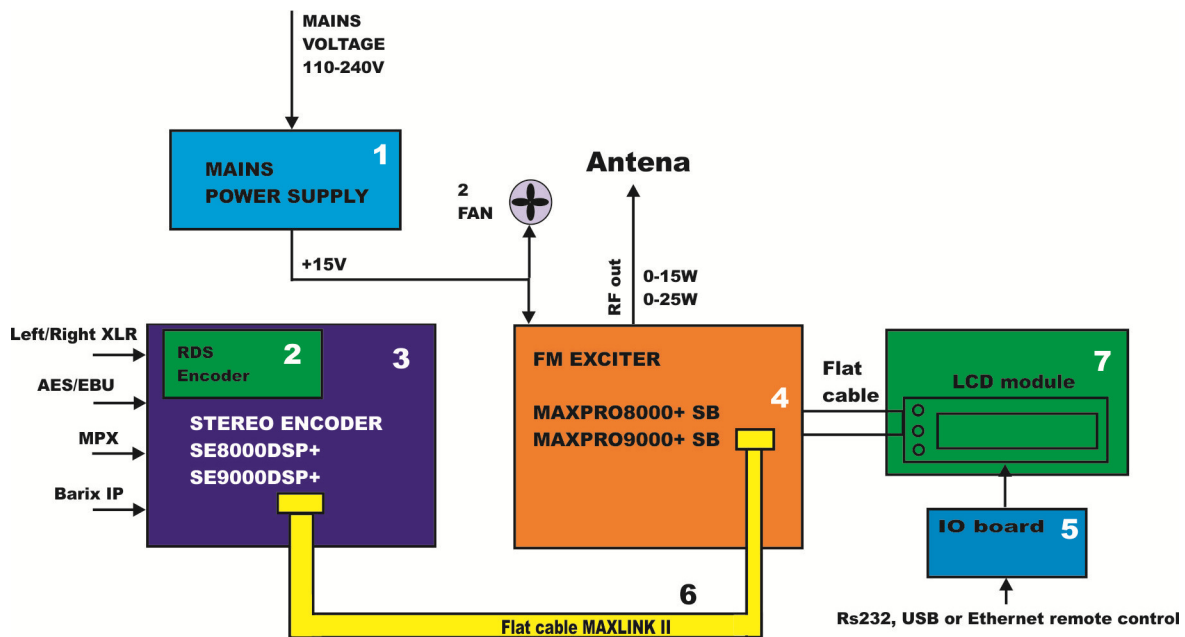


Fig. 40: Connecting stereo encoder to FM exciter.

Appendix C: Adding an amplifier – complete fm transmitter block by block

Now that you've connected stereo encoder and already have nice stereo sound, it may be time to increase your power output. How about adding an external amplifier? Some of you will say, sure, but will the nice power/swr meter built into MAX PRO 8000+ know how to measure power with this amplifier added and will it show it properly on the LCD display? The good news is that we have a solution for this. Not only does the MAX PRO 8000+ have ability to read power/swr with external amplifier installed, it can also read amplifier temperature and amplifier supply voltage. To top this off, swr and temperature protection still works just like before.

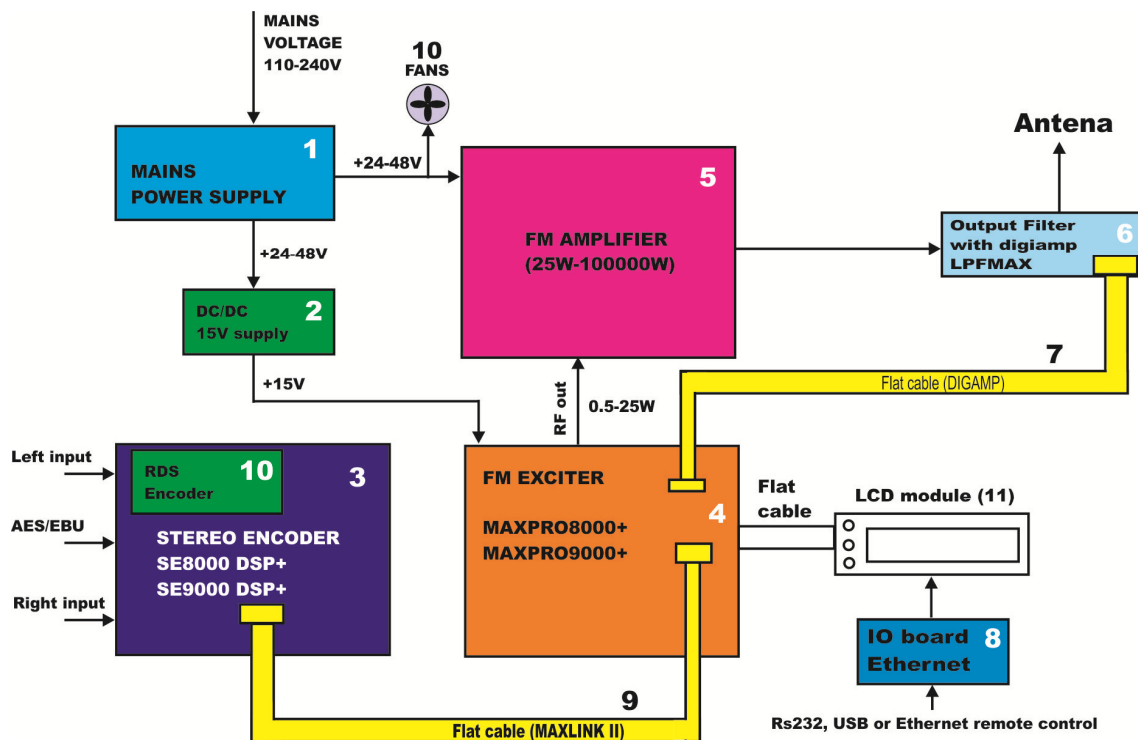


Fig. 41: Connecting an external amplifier module – Complete FM transmitter, block diagram

Diagram above explains the entire FM transmitter system, with mains power supply (1), DCDC converter (2), stereo encoder (3), FM exciter (4), FM amplifier pallet (5), output filter (6), Digiamp cable (7), interconnect system (8 & 9) and cooling fans. I will briefly explain each of the above subsystems:

1.) **MAINS POWER SUPPLY**: Provides power for the entire transmitter. Usually accepts mains voltage, from 110 to 240V, and outputs 24 or 48V DC. Exact power rating depends on the power consumption of the entire transmitter. A 300W transmitter usually consumes around 500W of power. A 1000W transmitter typically consumes around 1500W of power. An engineer should also consider safety margin and use a power supply that can provide 20-30% more power than needed. Voltage rating for mains power supply depends primarily on the type of amplifier used. Most pallets accept 24-28 or 48-50V. You can find all kinds of mains power supplies here at our website:

http://www.pcs-electronics.com/transmitter-accessories-mains-power-supply-c-71_74.html

2.) Stereo encoders and FM exciters typically operate from 12V DC stabilized voltage. Since at the moment we only have 24 or 48V inside our system shown in diagram above and we don't want to use another big 110-240V/12V mains power supply we are going to use own small DCDC converter. This conveniently converts any voltage from 17-50V down into 12-15V. Exact voltage can be adjusted with a trimmer. Another convenient bonus point for this tiny DC/DC converter is that it also provides power for fans (10). And you will need fans to cool the exciter, mains power supply and amplifier. Moreover, you can set temperature at which the fans start working or you can have fans work continuously.

You can find our DCDC converter with fan controller here at our website:

<http://www.pcs-electronics.com/2048v-dcdc-converter-p-1549.html>

3.) Stereo encoders, we covered this in detail above. You can find our stereo encoders here:

<http://www.pcs-electronics.com/stereo-encoders-c-36.html>

4.) Our FM exciters, at the moment MAX PRO 8000+ series, support all the mentioned functions. Make sure to **limit the maximum output power** of the exciter in order not to damage the amplifier. The procedure is described in **Chapter 7** of this manual. By limiting the maximum output power the LCD module still works, but its adjustment range is decreased to go from 0 to 2W for example or from 0 to 4W. Another very important advice is to use an attenuator between exciter and amplifier. Amplifiers almost always have input impedance that does not match 50 ohms across the entire FM band. By using 1-3dB attenuator this can be brought closer to 50 ohms. Our attenuators are available here, but you can also construct your own from regular resistors, you can contact us for a schematic diagram:

<http://www.pcs-electronics.com/mounted-attenuators-p-1105.html>

BEFORE CONNECTING AMPLIFIER ALWAYS MAKE SURE THAT EXCITER OUTPUT POWER DOES NOT EXCEED MAXIMUM ALLOWABLE INPUT POWER OF THE AMPLIFIER!

LIMIT MAXIMUM OUTPUT POWER OF THE EXCITER, PROCEDURE IS DESCRIBED IN CHAPTER 7 IN THIS MANUAL!

5.) FM amplifier. This is typically a pallet amplifier such as any of these on our website, they all come with ControlMini2 included. Also make sure to include a heat sink with pallets as they require one. It is often a good idea to insert a small attenuator between exciter and amplifier.

http://www.pcs-electronics.com/amplifiers-pallet-amplifiers-c-41_109.html

You can also use any of these here; these already contain filters and heat sink so your work is easier:

http://www.pcs-electronics.com/amplifiers-complete-amplifier-modules-c-41_111.html

Amplifiers can have input impedance that does not match 50 ohms across the entire FM band. By using 1-3dB attenuator this can be brought closer to 50 ohms.

6.) Low pass filter for FM band. You can use any of these here, but make sure they are strong enough to handle the power level of the amplifier (note that complete amplifiers with heat sink and low pass filter do not require extra filter):

http://www.pcs-electronics.com/transmitter-accessories-filters-transmitters-c-71_73.html

However, for best results use our filters with built-in DIGIAMP interface, such as LPFMAX1K+. Using this filter simplifies installation as most of the necessary signals are provided via DIGIAMP interface, also everything under 6 and 7 is than combined into one unit.

7.) DIGIAMP interface cable. It is better and easier to use DIGIAMP. Filter is connected to the MAX PRO 8000+ via flat DIGIAMP cable. It makes it possible for MAX PRO 8000+ to read POWER and SWR of the amplifier module. There is also a solder post for temperature sensor and amplifier supply voltage. The board contains directional couplers for power and swr, SWR protection and ALC system. For better description look at the next appendix.

8.) IO board for remote control via USB or Ethernet

9.) MAXLINKII flat cable connects stereo encoder with the FM exciter, it enables control and supplies 12-15V DC for the stereo encoder. You can purchase this cable along with stereo encoder here:

<http://www.pcs-electronics.com/se5000-stereo-encoder-p-1274.html>

10.) Fans are very important, they ensure proper cooling of your amplifier, mains power supply and exciter. Usual fans that you can buy in local shops are often not strong enough and can fail far too soon. We carry a line of professional fans with higher reliability and very high airflow, you can order them here:

http://www.pcs-electronics.com/amplifiers-amplifier-accessories-c-41_112.html

11.) You will need to place all these items in a nice enclosure. Aluminum works well and is not too heavy. Keeping it conductive is an advantage (most types of anodizing make aluminum's surface non-conductive). We carry a line of professional rack enclosures, designed so that the above mentioned items fit perfectly. Now you can build your FM transmitter yourself, all the way up to 2000W:

<http://www.pcs-electronics.com/rack-cabinets-boxes-c-93.html>

Finally, we recommend that you use Teflon coaxial cable for all internal coaxial connections. The reason is primarily that Teflon does not melt while soldering or use. You can be sure no short will form between the center and shield, either immediately at soldering or with time, if the cable is under a lot of thermal stress (coax can warm up nicely already in a 300W transmitter). Insulation in RG58 or similar lossy cheap coaxial cables can literally melt and cause a short between the center and shield already at moderate power levels around 300W. You can buy suitable Teflon coaxial cable here (I suggest RG188 for low power and RG142, RG316, R303 for higher power levels):

<http://www.pcs-electronics.com/semirigid-25ohm-other-special-coaxial-cable-p-1275.html>

Appendix D: DIGIAMP connector pin out

MAXPRO8000+ can read a variety of parameters from the amplifier. These parameters are shown based on signals received from the amplifier via DIGIAMP connector. Below is the pin out of the max pro 8000+ DIGIAMP connector:

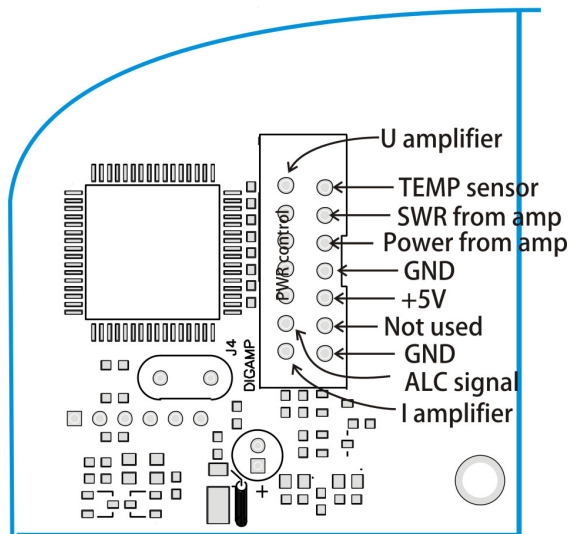


Fig. 41: DIGIAMP pin out

Below is explanation of internal wiring for our LPFMAX1K+ filter, it shows how directional coupler is wired and how ALC is wired. You can use this to construct your own ALC circuit with another directional coupler.

TEMP sensor is a 10K NTC resistor, connected to ground. There is also 12K resistor going from this NTC resistor to +5V.

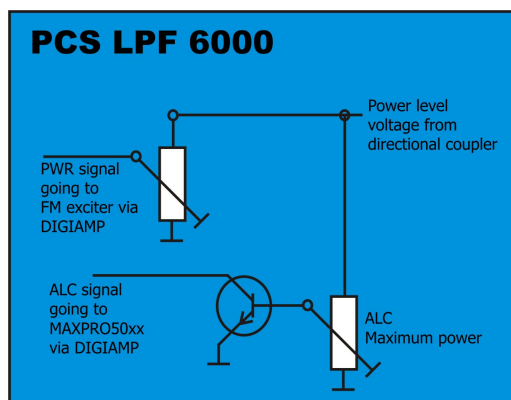


Fig. 42: DIGIAMP wiring for power and ALC

Appendix E: General tips for setting up transmitters

Typical FM transmitter setups

Below are several of the typical broadcasting systems that can be encountered worldwide.

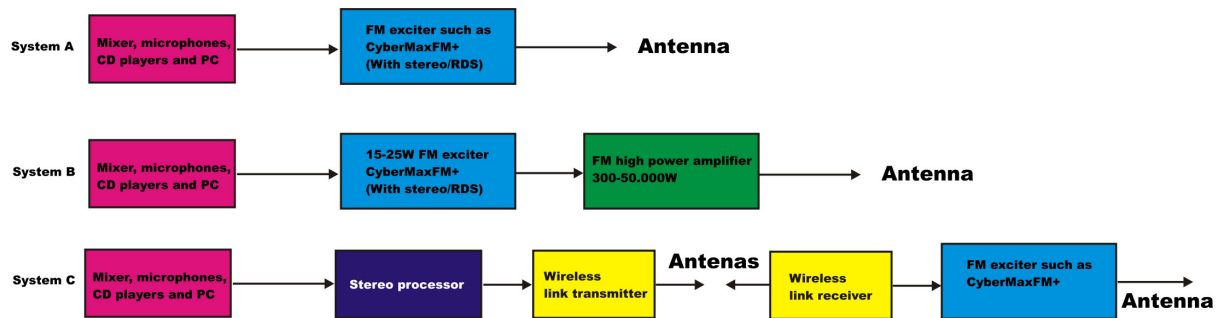


Fig. 43: Typical broadcasting systems

Let's look at **system A** first. It consists of audio source (mixer, microphones, CD players and a PC), FM exciter with integrated RDS and stereo encoder (such as our CyberMaxFM+ units from 15W-300W) and antenna. Note antenna in this system is located in the same location as the transmitter and studio, typically it would be placed on a small tower or a pole at the top of the building with studio. Disadvantage of this system is that you have to keep studio, transmitter and antenna close. Now you usually can't place studio on the top of a mountain for practical reasons so this limits your range. This is a typical small community radio with output powers of up to 300-500W.

System B is very similar to system A, but operators have decided to add an additional amplifier to boost the range. Such stations can go into kilowatts, but they are starting to hit another speed limit. Since the studio is typically located in a town, high RF powers aren't desirable due to interference with other services and safety regulations. So range is still limited compared to system C stations.

System C is radically different in one respect. Antenna and transmitter are no longer located at the same place with the studio. To accomplish this two audio channels are first combined with stereo processor. Resulting MPX signal is then passed to the STL wireless link transmitter (STL=Studio Transmitter Link). Up in the mountains is a STL wireless link receiver that receives the signal from the studio and passes it to the exciter. In this case exciter does not need to be stereo anymore since composite MPX signal is passed to its MPX input (all mono transmitters have this input). Such exciters can then optionally drive big amplifiers with powers going into tens of KW with maximum range.

You can check our amplifiers here: <http://www.pcs-electronics.com/fm-amplifiers-c-41.html>

You can check our wireless STL links here: <http://www.pcs-electronics.com/wireless-audio-links-c-42.html>

Typical FM broadcasting antenna setups

Below are several of the typical broadcasting antenna systems that can be encountered worldwide.

System A



System B



System C

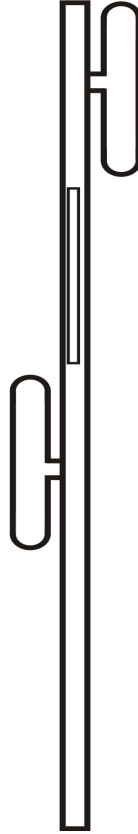


Fig. 44: Typical antenna setups

Let's look at **system A** first. It's a simple vertical dipole antenna, mounted on a pole. The gain of this antenna is 0dBd and if we assume that the coaxial cable does not have any losses the ERP of this system equals transmitter power. For example, a 1KW transmitter with this antenna system and perfect coaxial cable (losses=0) would have ERP of 1000W. Radiation pattern of this system is more-less omni-directional but since the metal pole holding the antenna blocks the signal there is a null of signal exactly on the opposite side of the pole.

System B has two simple dipole antennas mounted on a pole. The gain of this antenna is slightly less than 3dBd (due to losses in harness – splitter). If we assume that the coaxial cable does not have any losses the ERP of this system equals double transmitter power. For example, a 1KW transmitter with this antenna system and perfect coaxial cable (losses=0) would have ERP of 2000W. Note the antennas are mounted on the opposite sides of the pole to help make radiation pattern as omni-directional as possible.

System C has four simple vertical dipole antennas mounted on a pole. One of the antennas is behind the pole and is not visible. Note the antennas are mounted at an angle of 90 degrees between each other to help make radiation pattern as omni-directional as possible. The gain of this antenna is slightly less than 6dBd (due to losses in harness – splitter). If we assume that the coaxial cable does not have any losses the ERP of this system equals 4x transmitter's power. For example, a 1KW transmitter with this antenna system and perfect coaxial cable (losses=0) would have ERP of 4000W.

System C has theoretically double the range of the System A although in practice it takes 4-6x increase of power to double the range. 4x increase of power is equal to 6dB of gain. And you get 3dB of gain by doubling the number of dipoles. So to upgrade system C to 9dBd you'd need 8 dipoles. And for 12dBd you'd need 16 dipoles. 16 dipoles would in theory increase your range 4x compared to a single dipole. In practice there would be some losses in combining so many dipoles. You can use circular dipoles in very similar configurations.

Wiring antennas in multi-bay configurations

We have observed typical multi-dipole (called multi-bay) antenna configurations on the previous page. However there are some things to keep in mind.

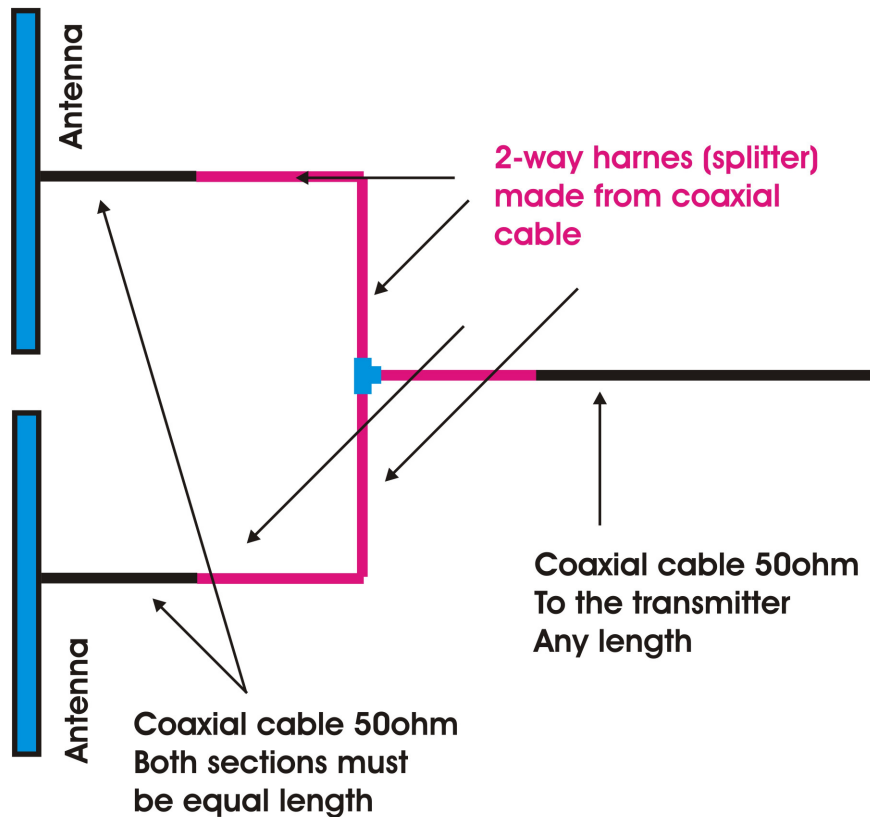


Fig. 45: Wiring multi-bay antennas

Look at the diagram above. This is a simple system with two dipole antennas and a 2-way coaxial splitter (harness). This splitter is made from sections of coaxial cable with such impedance and length which ensure perfect match at specific frequency. Do not attempt to assemble from regular 50-ohm coaxial cable. What is important here is that the two sections of coaxial cable going from antenna to the splitter should be of exact equal length. These two sections are shown in black. The same rule applies for system with more dipoles. It is also possible to have cables of different lengths, but you have to know velocity factor of the cable so we have omitted this for simplicity reasons. If you want more info please contact our technical staff.

Appendix F – Using wireless audio links

If you are going to place your transmitter up in the mountains, you may prefer to keep your stereo/RDS encoder in your studio and stream MPX signal up to the transmitter. For example this could be because you want to have easy access to your stereo/RDS encoder so you can change parameters, if needed. Here is what your system would look like for MPX wireless studio-transmitter link:

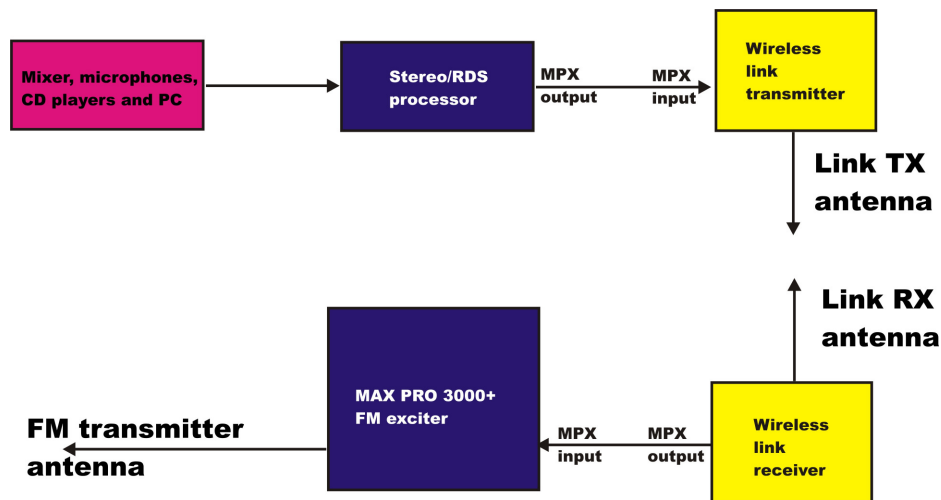


Fig. 46: Using external stereo/rds processor with wireless link

It is important that you set the pre-emphasis on the MAX PRO 60XX+ board to Off (None). If you get stuck or need our advice please contact our technical department.

Appendix G – IO board and PC remote control

Software installation

If you want to use USB to program and control our transmitter via PC, download the USB COM port driver, open [MAXPRO8015 product listing on our website](#) and scroll down under the “Add to cart” section and click Additional information tab, you will find links to USB driver, software and manual. Download USB driver first. Then the CyberMaxFM+ control program.

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.

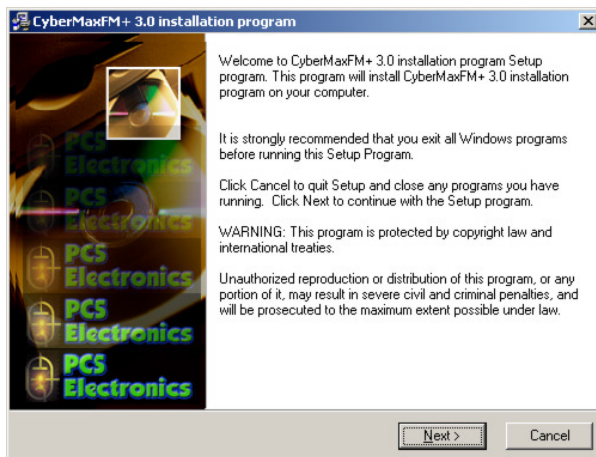


Fig. 47: Setup is about to start

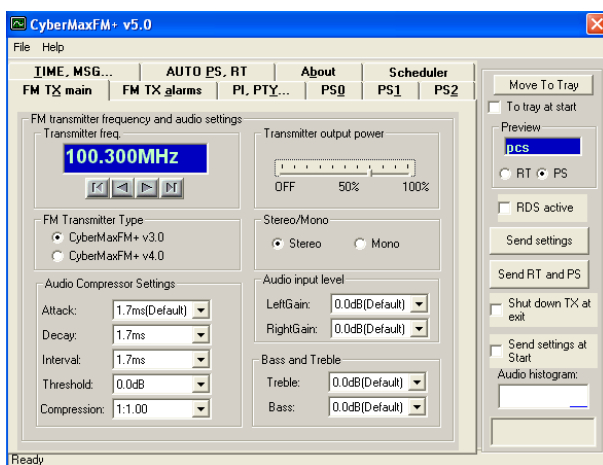


Fig. 48: CyberMaxFM+ remote control software

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. (you cannot read the RDS data, we are working on adding this functionality at some time in the future).

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, configure the COM port and take a note of the COM port used.

Installing USB driver (only for USB IO board)

Download the USB COM port driver. Now 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.



Fig. 49: 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:

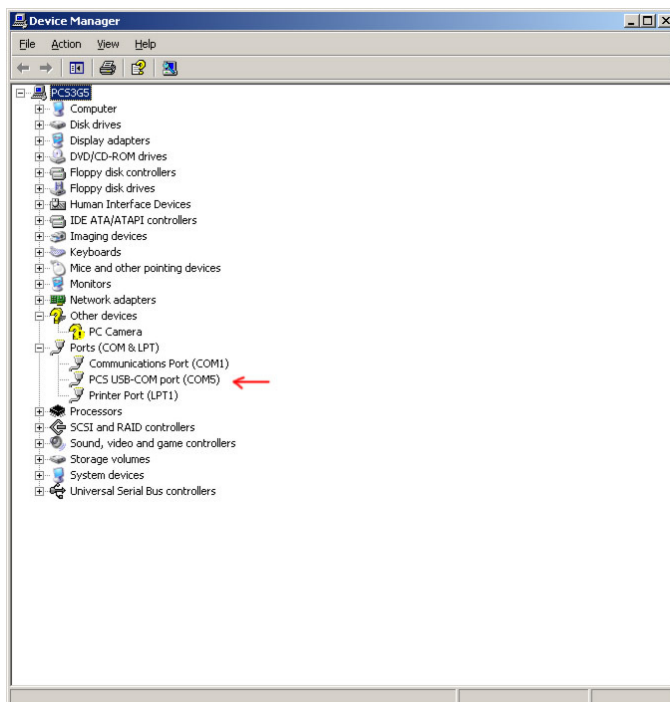


Fig. 50: Configuring Com port for USB driver

Take note of the COM port number here, you will need it later to configure the COM port inside CyberMaxFM+ windows control program. If you wish to change this port right click on the PCS USB-COM port and select Properties. Now select the Port settings tab and click Advanced. Note you can set the COM port number as you wish:

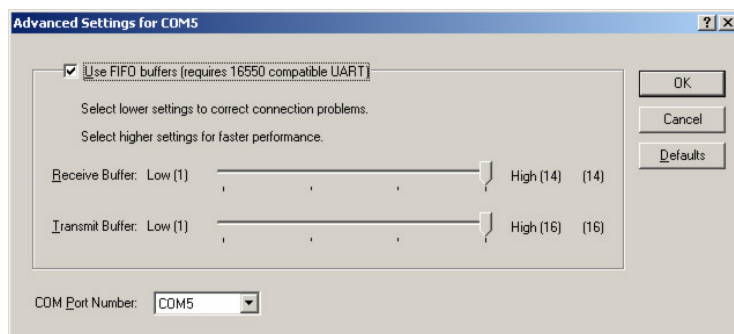


Fig. 51: Configuring Com port for USB driver

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. You can set COM port manually or you can use the Autoscan feature. Make sure to set FM Transmitter type correctly (4.0 for new versions of MAXPRO8000 series) and make sure the exciter board is turned on! A short guide for manual settings: read above and make note of the used COM port. If you are using USB it will usually be COM5, when using RS232 it will usually be COM1 or 2. You can use Communication test tool to verify the selected COM port.

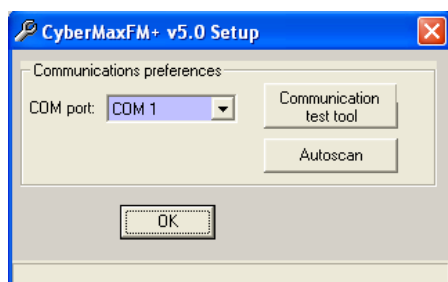


Fig. 52: Set COM port to 1 or 2 for RS232 IO board

Appendix H – 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 MAXPRO8000 series exciter or CYBERMAXFM+ FM transmitter (which contains this exciter board) 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!

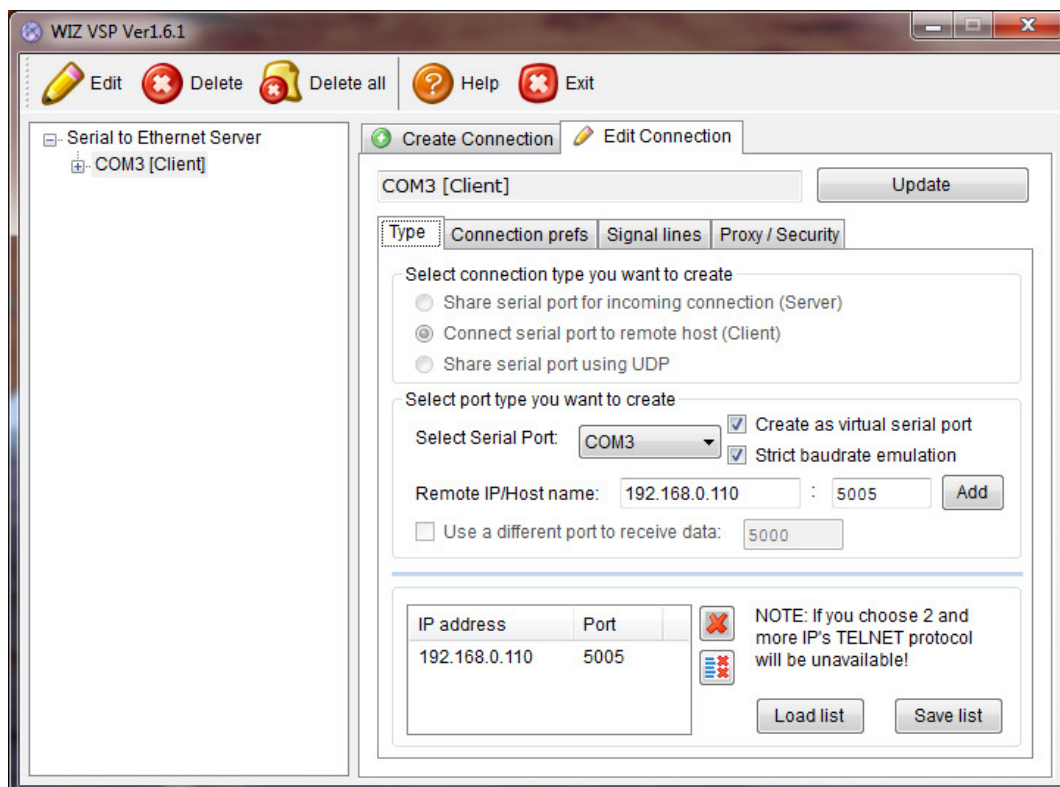


Fig. 53: Setting up Ethernet connection for CYBERMAXFM+, screen 1

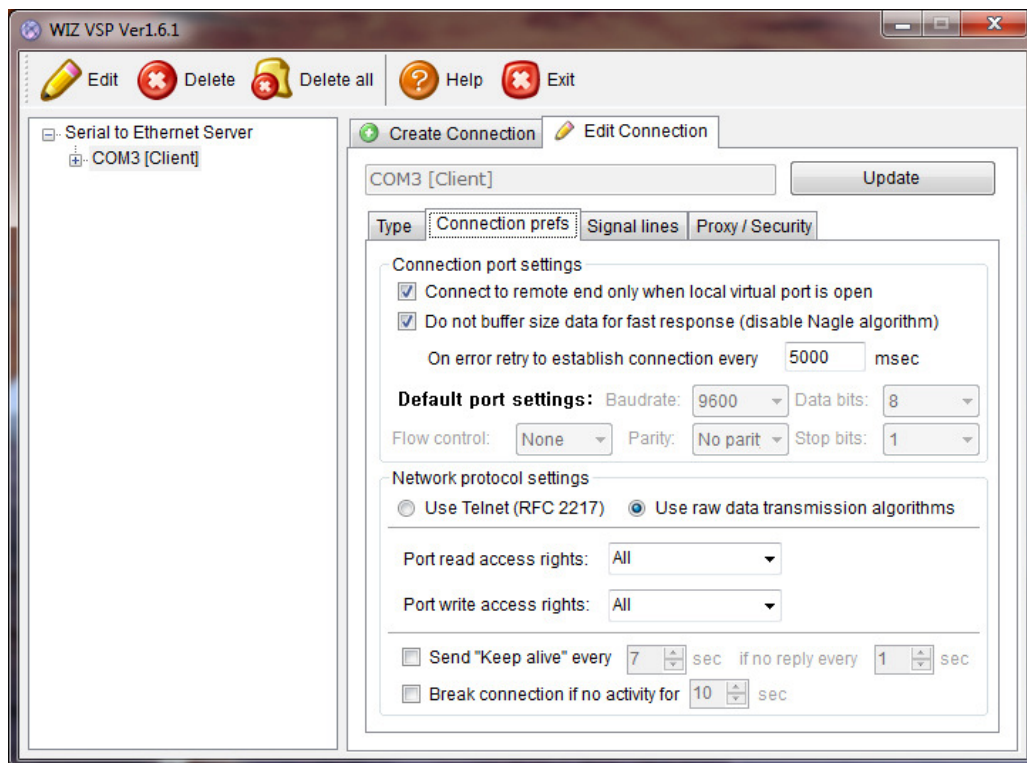


Fig. 54: Setting up Ethernet connection for CYBERMAXFM+, screen 2, please use baud rate of 57600!!

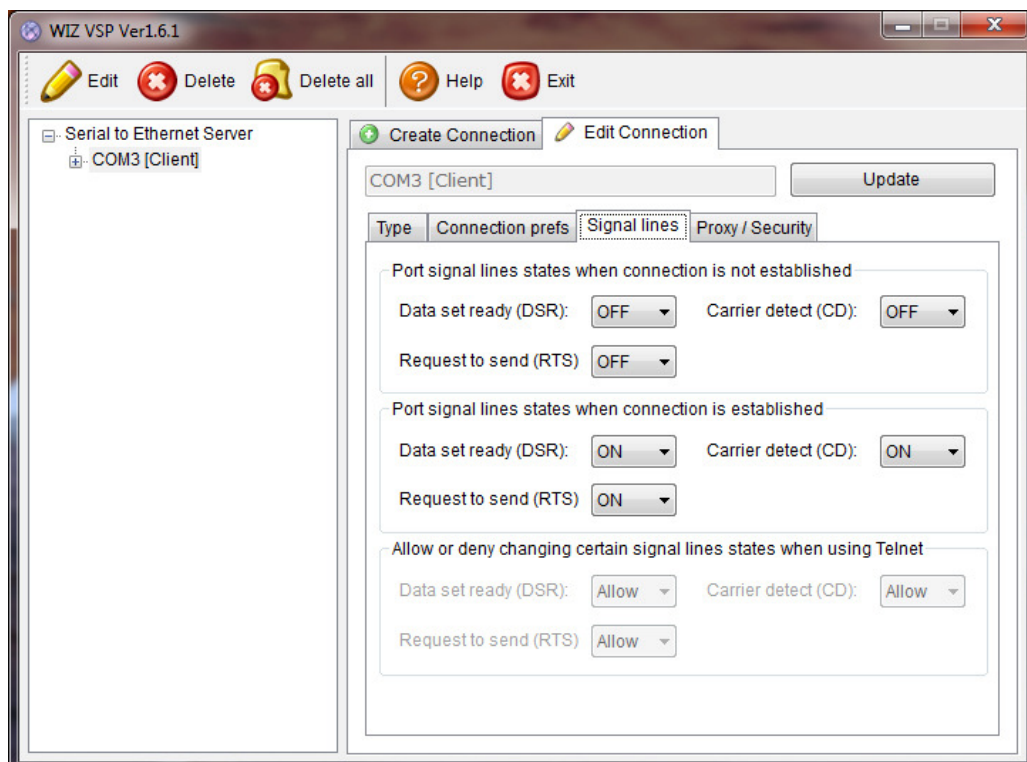


Fig. 55: Setting up Ethernet connection for CYBERMAXFM+, screen 3

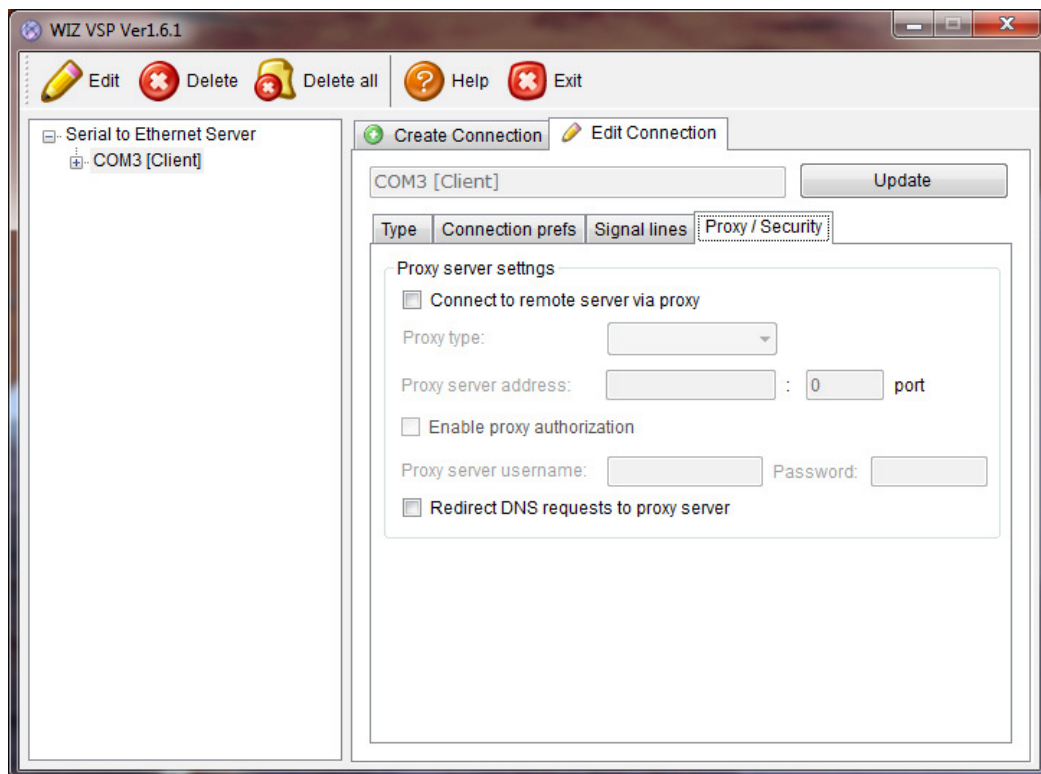


Fig. 56: Setting up Ethernet connection for CYBERMAXFM+, screen 4

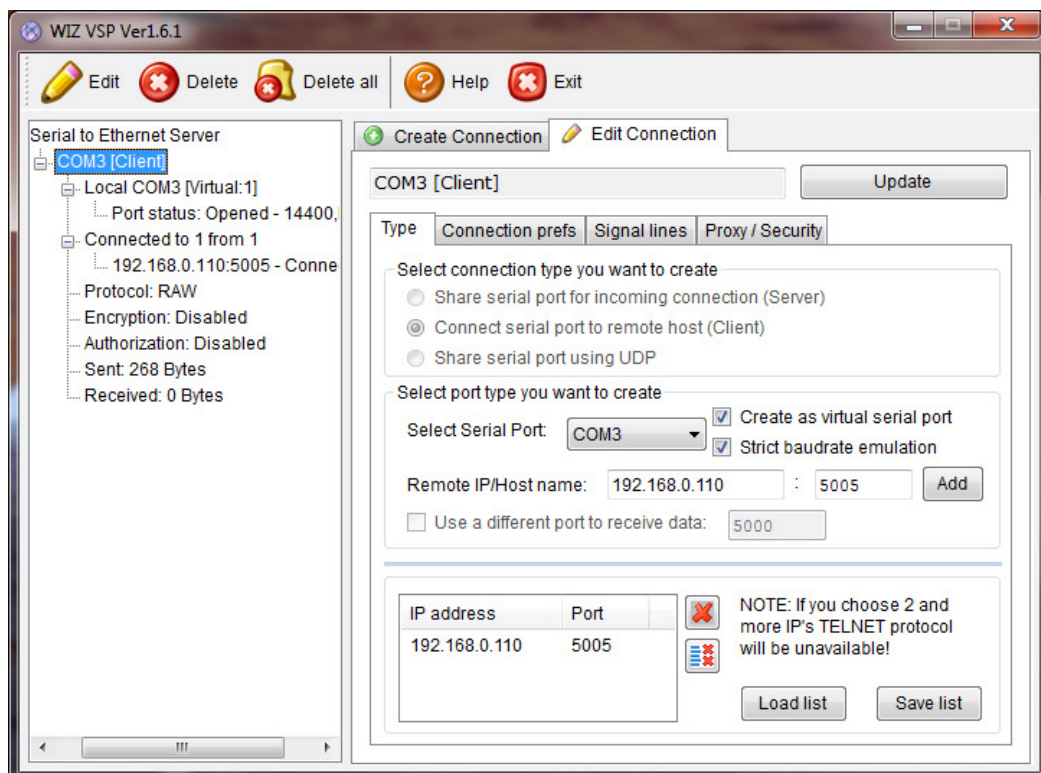


Fig. 57: Setting up Ethernet connection for CYBERMAXFM+, overview

Appendix I: Communication protocol explanation

If you are one of the many interested in developing your own remote control application, look no further. The entire protocol will be explained here in detail. If you want our sample VB application do drop us an email and explain what you are trying to do, we will probably be able to supply with the source code.

Baud rate and COM port

Communication with CyberMaxFM+ uses RS232 serial protocol even when used with USB. Supported speed is 57600 baud.

A simple VB code would look like this:

```
MSComm1.Settings = "57600,N,8,1"
```

```
MSComm1.InputLen = 0
```

```
MSComm1.PortOpen = True
```

General Command Format

This is the format of a typical command sent to the RDSMAX encoder:

<StartByte>**Command****<EndCommandByte>****Value****<EndByte>**

<StartByte>: Signals start of new incoming command/parameter

The hey/binary value of this byte is 0x00 (0b00000000).

VB basic example: MSComm1.Output = Chr\$(0) 'Start (0)

Command: Command/parameter that you wish to send to the encoder

Simply send the command/parameter in ASCII form.

VB basic example: MSComm1.Output = "TA"

<EndCommandByte>: Signals end of the new incoming command, tells encoder to expect incoming command/parameter value

The hey/binary value of this byte is 0x01 (0b00000001).

VB basic example: MSComm1.Output = Chr\$(1) 'End Command start of value(1)

Value: Command/parameter value that you wish to send to the encoder

The method varies a bit from parameter to parameter, but usually you can simply send the command/parameter value in ASCII form. Check each parameter individually for correct setting.

VB basic example: MSComm1.Output = "1" 'sets TA to ON

<EndByte>: Signals the end of complete incoming command including command/parameter value, it tells encoder to process the received data

VB basic example: MSComm1.Output = Chr\$(2) 'End Command and value

PS (RDS parameters)

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 a 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 static PS which will be displayed indefinitely.

General Command Format

This is the format of a PS00 command, which sets PS00 to ****TEST****:

<StartByte>PS00<EndCommandByte>TEST**<EndByte>**

VB basic example:

```
MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "PS00"
MSComm1.Output = Chr$(1) 'End Command start of value(1)
MSComm1.Output = "**TEST**"
MSComm1.Output = Chr$(2) 'End Command and value
```

This is the format of a PD00 command, which sets PD00 to 5:

<StartByte>PD00<EndCommandByte>5<EndByte>

VB basic example:

```
MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "PD00"
MSComm1.Output = Chr$(1) 'End Command start of value(1)
MSComm1.Output = "5"
MSComm1.Output = Chr$(2) 'End Command and value
```

It is recommended to put a short delay of 10ms after sending of each data packet. So the example above becomes:

```
MSComm1.Output = Chr$(0) 'Start (0)
Sleep 10
MSComm1.Output = "PD00"
Sleep 10
MSComm1.Output = Chr$(1) 'End Command start of value(1)
Sleep 10
MSComm1.Output = "5"
Sleep 10
MSComm1.Output = Chr$(2) 'End Command and value
Sleep 10
```

RT (RDS parameters)

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.

General Command Format

This is the format of a PS00 command, which sets PS00 to ****TEST****:

<StartByte>RT<EndCommandByte>THIS IS A TEST OF RADIO TEXT FEATURE**<EndByte>**

VB basic example:

```
MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "RT"
```



```

MSComm1.Output = Chr$(1) 'End Command start of value(1)
MSComm1.Output = "**THIS IS A TEST OF RADIO TEXT FEATURE**"
MSComm1.Output = Chr$(2) 'End Command and value

```

Format descriptions for the other supported parameters:

'Sending TP (RDS parameter)

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "TP"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
temp = Str$(TP)
temp = LTrim(temp)
MSComm1.Output = temp

```

'Sending STEREO/MONO status (FM transmitter parameter)

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "FS"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
temp = Str$(TXStereo)
temp = LTrim(temp)
MSComm1.Output = temp
MSComm1.Output = Chr$(2) 'Finish command

```

'Sending RDS active (PWR) (RDS parameter)

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "PWR" 'Program reference, lower byte of PI
MSComm1.Output = Chr$(1) 'End command and start of data (1)
If Check1.Value = 1 Then
temp = "1" 'turn RDS on
Else
temp = "0" 'turn RDS off
End If
MSComm1.Output = temp
MSComm1.Output = Chr$(2) 'Finished transmission

```

'Sending CCAC (RDS parameter)

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "CCAC" 'Program reference, lower byte of PI
MSComm1.Output = Chr$(1) 'End command and start of data (1)
temp = Str$(CountryCode * 16 + AreaCoverage)
temp = LTrim(temp)
If Len(temp) = 2 Then temp = "0" & temp
If Len(temp) = 1 Then temp = "00" & temp
If Len(temp) = 0 Then temp = "000"
MSComm1.Output = temp
MSComm1.Output = Chr$(2) 'Finished transmission

```

'Sending ProgReference (RDS parameter)

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "PREF" 'Program reference, lower byte of PI
MSComm1.Output = Chr$(1) 'End command and start of data (1)
temp = Str$(ProgramReference)
temp = LTrim(temp)
If Len(temp) = 2 Then temp = "0" & temp
If Len(temp) = 1 Then temp = "00" & temp
If Len(temp) = 0 Then temp = "000"
MSComm1.Output = temp
MSComm1.Output = Chr$(2) 'Finished transmission

```

'Sending PTY (RDS parameter)

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "PTY"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
temp = Str$(PTY)
temp = LTrim(temp)
If Len(temp) = 1 Then temp = "0" & temp
If Len(temp) = 0 Then temp = "00"
MSComm1.Output = temp

```

'Sending TP (RDS parameter)

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "TP"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
temp = Str$(TP)

```

```
temp = LTrim(temp)
MSComm1.Output = temp
```

'Sending **TA (RDS parameter)**

```
MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "TA"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
temp = Str$(TA)
temp = LTrim(temp)
MSComm1.Output = temp
MSComm1.Output = Chr$(2) 'Finish command
```

'Sending **MS (RDS parameter)**

```
MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "MS"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
temp = Str$(MS)
temp = LTrim(temp)
MSComm1.Output = temp
MSComm1.Output = Chr$(2) 'Finish command
```

'Sending **Did0 (RDS parameter)**

```
MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "Did0"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
temp = Str$(Did0)
temp = LTrim(temp)
MSComm1.Output = temp
MSComm1.Output = Chr$(2) 'Finish command
```

'Sending **AF0 (af number) (RDS parameter)**

```
MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "AF0"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
temp = Chr$(AFNum + 224 + 4)
MSComm1.Output = temp
MSComm1.Output = Chr$(2) 'Finish command
```

'Sending **AF1 (RDS parameter)**

```
MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "AF1"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
temp = Chr$(AF1 + 4)
MSComm1.Output = temp
MSComm1.Output = Chr$(2) 'Finish command
```

'Sending **RT (RDS parameter)**

```
MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "RT"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
temp = RT & Chr$(13) & Chr$(13) & String(64, Chr(13))
If Len(temp) > 64 Then temp = Left(temp, 64)
MSComm1.Output = temp 'RT
MSComm1.Output = Chr$(2) 'Finish command
```

'Send **PS (RDS parameter)**

```
MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "PS00"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
temp = "your text"
MSComm1.Output = temp
MSComm1.Output = Chr$(2) 'Finish command
```

'Sending **ECC (RDS parameter)**

```
MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "ECC"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
temp = Chr$(ECC + 4)
MSComm1.Output = temp
MSComm1.Output = Chr$(2) 'Finish command
```

'Sending **RF POWER status (FM transmitter parameter)**

```
MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "FO"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
```

```

If Option25(13).Value = True Then
temp = Chr$(Int(TXPower / 100 * 34) + 4)
Else
temp = Chr$(Int(TXPower / 100 * 44) + 4)
End If
MSComm1.Output = temp
MSComm1.Output = Chr$(2) 'Finish command

```

'Sending **Frequency (FM transmitter parameter)**

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "FF"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
temp = Chr$(Int(TXFrequency / 5) - Int(Int(TXFrequency / 5) / 128) * 128) + 4) 'low part of freq
temp = temp & Chr$(Int(Int(TXFrequency / 5) / 128)) + 4) 'high part of freq
MSComm1.Output = temp
MSComm1.Output = Chr$(2) 'Finish command

```

'Sending **DSP settings – Treble (FM transmitter parameter)**

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "FDT"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
MSComm1.Output = Chr$(Treble + 4)
MSComm1.Output = Chr$(2) 'Finish command

```

'Sending **DSP settings – Bass (FM transmitter parameter)**

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "FDB"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
MSComm1.Output = Chr$(Bass + 4)
MSComm1.Output = Chr$(2) 'Finish command

```

'Sending **DSP settings – Attack (FM transmitter parameter)**

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "FDA"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
MSComm1.Output = Chr$(Attack + 4)
MSComm1.Output = Chr$(2) 'Finish command

```

'Sending **DSP settings – Decay (FM transmitter parameter)**

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "FDD"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
MSComm1.Output = Chr$(Decay + 4)
MSComm1.Output = Chr$(2) 'Finish command

```

'Sending **DSP settings - Threshold**

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "FDH"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
MSComm1.Output = Chr$(Threshold + 4)
MSComm1.Output = Chr$(2) 'Finish command

```

'Sending **DSP settings – Compression (FM transmitter parameter)**

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "FDC"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
MSComm1.Output = Chr$(Compression + 4)
MSComm1.Output = Chr$(2) 'Finish command

```

'Sending **DSP settings – Integration (FM transmitter parameter)**

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "FDI"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
MSComm1.Output = Chr$(Integration + 4)
MSComm1.Output = Chr$(2) 'Finish command

```

'Sending **DSP settings - LeftGain**

```

MSComm1.Output = Chr$(0) 'Start (0)
MSComm1.Output = "FDGL"
MSComm1.Output = Chr$(1) 'End command and start of data (1)
MSComm1.Output = Chr$(LeftGain + 4)
MSComm1.Output = Chr$(2) 'Finish command

```

'Sending **DSP settings - RightGain**

```

MSComm1.Output = Chr$(0) 'Start (0)

```

```
MSComm1.Output = "FDGR"  
MSComm1.Output = Chr$(1) 'End command and start of data (1)  
MSComm1.Output = Chr$(RightGain + 4)  
MSComm1.Output = Chr$(2) 'Finish command
```

'Sending settings - **TEMP alarm**

```
MSComm1.Output = Chr$(0) 'Start (0)  
MSComm1.Output = "FAT"  
MSComm1.Output = Chr$(1) 'End command and start of data (1)  
MSComm1.Output = Chr$(TEMPAlarm + 4)  
MSComm1.Output = Chr$(2) 'Finish command
```

'Sending settings - **SWR alarm**

```
MSComm1.Output = Chr$(0) 'Start (0)  
MSComm1.Output = "FAS"  
MSComm1.Output = Chr$(1) 'End command and start of data (1)  
MSComm1.Output = Chr$(SWRAlarm + 4)  
MSComm1.Output = Chr$(2) 'Finish command
```

'Sending settings - **Uamp alarm**

```
MSComm1.Output = Chr$(0) 'Start (0)  
MSComm1.Output = "FAU"  
MSComm1.Output = Chr$(1) 'End command and start of data (1)  
MSComm1.Output = Chr$(UampAlarm + 4)  
MSComm1.Output = Chr$(2) 'Finish command
```

'Sending settings - **Iamp alarm**

```
MSComm1.Output = Chr$(0) 'Start (0)  
MSComm1.Output = "FAC"  
MSComm1.Output = Chr$(1) 'End command and start of data (1)  
MSComm1.Output = Chr$(IampAlarm + 4)  
MSComm1.Output = Chr$(2) 'Finish command
```

'Sending **Store command, commits changes**

```
MSComm1.Output = Chr$(0) 'Start (0)  
MSComm1.Output = "FW"  
MSComm1.Output = Chr$(1) 'End command and start of data (1)  
temp = 0  
MSComm1.Output = temp  
MSComm1.Output = Chr$(2) 'Finish command
```

Appendix J – 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.

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- 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.

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Revisions and errata

V1.0 (March,2022): Release version

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

Index

A

adjusting 17
Antenna 17

B

beam 17
block diagram 16
board layout 14, 15

D

directional antenna 17

E

Ethernet 57

F

feedback 17
final transistor 17

G

gain 17
grounding 17, 18

K

key features 7

L

LCD module layout 10, 11
Lock Keys 11

M

mains cable 18
mains power supply 18
MAX PRO 5015/5025/5040+ 6
menu system 22
metal case 17
module drill template 13

O

omni-directional antenna 17

P

perfect match 17

R

radiation pattern 17
RF board layout 8
RF shielded 17, 18

S

short circuit 17
SWR 17

T

Technical specifications 6
Troubleshooting 39
tune 17