

MAX PRO IV+

Highly Reliable High Performance Wideband FM Transmitter

MAX PRO IV+ (MAX PRO 4 PLUS) is a new product in our line of new, innovative, high quality products, set to replace the now legendary MAX PRO I, our first product. The now obsolete MAX PRO I was one of the most successful FM exciter boards ever designed, but now new technology is available making it possible to provide even better performance at approximately the same price. MAX PRO IV+ is a truly no-tune/wideband 10(15)W FM mono transmitter with digital power adjustment via LCD display, SWR protection, temperature protection and selectable pre-emphasis. It is possible to connect this unit to our SE4 DSP+ stereo encoder, which makes it possible to use the same LCD display unit to set Mono/Stereo operation, Pre-emphasis, Compressor/limiter settings (attack time, decay time, compression ratio etc) and Bass/Treble. Simple assembling procedure, high quality components and printed circuit board assure 24/7 operation for years. Provided parts list and instructions for increasing power output make this unit an incredible value.

MAX PRO IV+ is a new member of our new "plus" family, represented only by especially carefully designed products, which were repeatedly analyzed, tested, redesigned and retested until all design flaws were eliminated. Therefore expect high reliability from any product, denoted with + at the end of its type designation.

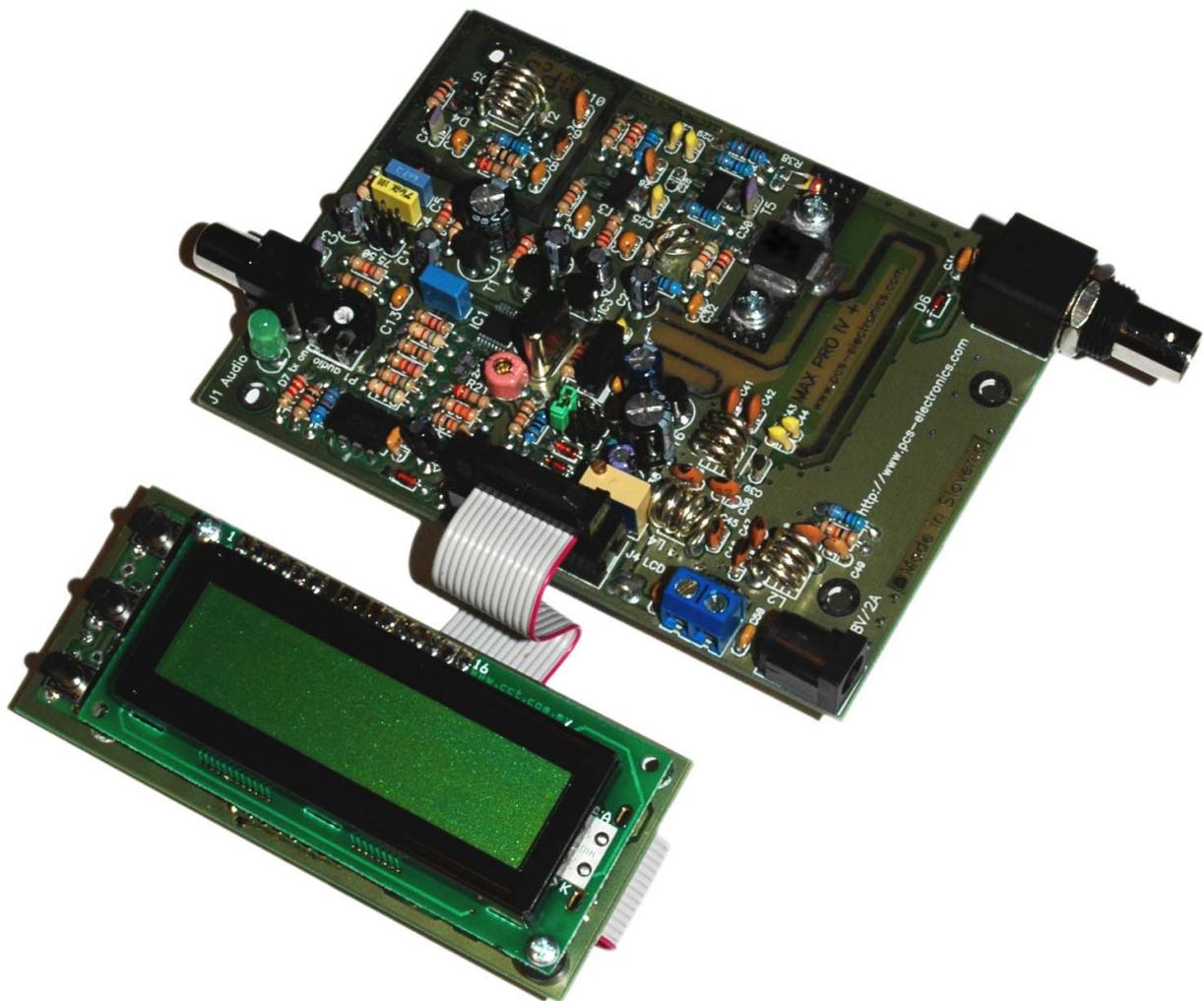


Fig. 1: MAX PRO IV+, replaces the old and legendary MAX PRO I (The top heat sink was removed for better view)

Technical specifications:

- RF Output Power: 0 to 10Watts (15W can be obtained easily)
- RF power adjustment: LCD digital control
- Output connector: BNC
- Output Impedance: 50 Ohms
- Frequency Range: 87.5-108MHz (50-200MHz on special request)
- PLL Steps: 50KHz
- Frequency stability: +/- 10Hz (can be adjusted to 0 via trimmer)
- Spurious rejection: -90dB
- Harmonic rejection: -60dB
- Power Supply: 12-15V/3A or battery
- Quartz Locked PLL Frequency Control
- Ultra Stable, Ultra Clean Output
- No Expensive Test Equipment Required
- Audio performance: Less than 0.01% distortion, 20Hz-75KHz
- RF output ruggedness: SWR protection
- Temperature protection
- Polarity protection

Why is MAX PRO IV+ so great?

- True wideband no-tune operation
- High power, 10W (can be extended to 15W easily), making it possible to drive most RF amplifiers directly, but you can also easily reduce power to 1W or 4W
- Power can be internally limited to any level between 0 and 10W (New Zealand etc.)
- Directly supports our SE4 DSP stereo encoder via LCD MENU system, no extra charge for this function
- SWR, temp and polarity protection
- Power and audio jack on the PCB
- Reference oscillator fine adjustment trimmer for advanced users
- Selectable pre-emphasis (jumpers)
- Supports SE4 DSP+ via menu system and I2C connection

What is the difference between MAX PRO III and MAX PRO IV+?

- Digital power adjustment is included in MAX PRO IV+ (In MAX PRO III you pay extra for this)
- MAX PRO IV+ is smaller
- MAX PRO IV+ contains only a few pre-installed SMD parts, it is easier to fix by customer (MAX PRO III is manufactured almost entirely in surface mount technology)
- MAX PRO IV+ is available as a KIT (MAX PRO III comes in assembled form only)

Where is it better to use MAX PRO III instead of MAX PRO IV+?

- MAX PRO III is better for designs which require high immunity from strong RF fields, this is in applications where multiple transmitters are operating close to each-other or where you have strong RF amps in the same enclosure. For example, we use them for our Cyber Max FM series of transmitters.
- For small FM transmitters that will never be exposed to the above conditions we recommend that you use MAX PRO IV+.

Why is MAX PRO IV+ better than MAX PRO I?

- True wideband no-tune operation
- Higher power, 10(15)W versus 4-7W with MAX PRO I
- 50uS or 75uS pre-emphasis is now selectable via jumper
- Directly supports our SE4 DSP+ stereo encoder via LCD MENU system, no extra charge for this function
- SWR and temp protection
- Power adjustment via LCD menu system
- Reference oscillator fine adjustment trimmer for advanced users

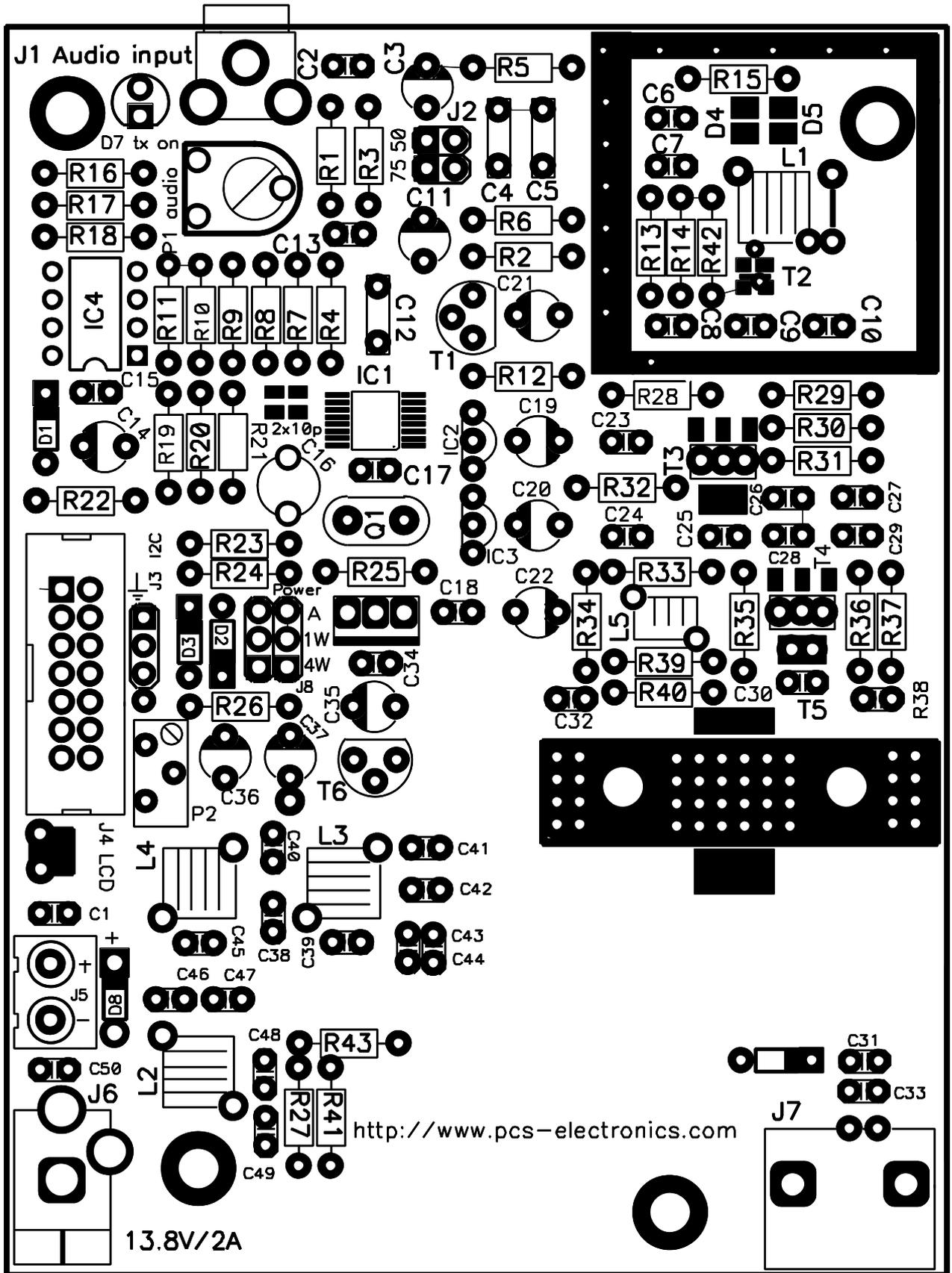


Figure 2: MAX PRO IV+ board layout

THANK YOU FOR PURCHASING THE MAX PRO IV+!

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!

PCS Electronics team
www.pcs-electronics.com

BEFORE YOU START...

Let us clear up some basic things you need to know before we move on. You will find some very useful tips, a forum and tips on antennas and hooking things together at <http://www.pcs-electronics.com> so it's generally a good place to check before putting your MAX on the air.

Here is what you need to get MAX PRO IV+ on the air:

Antenna

Preferred type of aerial is affected by several factors, but mostly by transmitting site. In the middle of the area you want to cover you'll need an omni-directional aerial which transmits equally all ways, while outside your coverage area you can beam the signal in with a directional aerial. Before going on air get a low VSWR by adjusting the position of the aerial and any of it's adjustable pieces. Aim for 2:1 or less. Use low power into the aerial when tuning it up and making adjustments. If you were using 100's of watts and a bit of the aerial 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 aerial 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 aerial type. For instructions regarding construction of antennas please see our website: <http://www.pcs-electronics.com> (guides section).

You should have realized by now that antenna was, is and will always be a crucial part of the system. Special care has to be taken! It is usually a good idea to place antenna away from your transmitter, power supply and audio system. If you cannot meet these requirements, you could experience feedback and other RF problems. We cannot guarantee proper operation of MAX PRO IV+ unless suitable antenna system is used! Interestingly, RF energy can make CD players and other digital devices go bezerk. Try placing antenna next to yours, most of the modern audio gear is not RF shielded – reducing costs is unfortunately the mantra today.

| |
|--|
| A PIECE OF WIRE OR TV ANTENNA IS NOT SUITABLE ANTENNA FOR MAX PRO IV+ OR ANY OTHER RADIO EXCITER! |
|--|

Coaxial cable

Coaxial cable is an electrical cable consisting of a round, insulated conducting wire surrounded by a round, conducting sheath, usually surrounded by a final insulating layer. The cable is designed to carry a high-frequency or broadband signal, usually at radio frequencies. Coaxial Cabling is a two conductor closed transmission medium that is often used for the transmission of RF energy. It yields excellent performance at high frequencies and superior EMI control/shielding when compared to other types of copper cabling. 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).

The common RG-58 from Radio Shack is NOT the best you can do and will lower your effective power out! Use it only for short runs. BELDEN makes terrific coax in various qualities and with very low loss (measured in dB's...decibels). 3 dB loss = 1/4 of your signal strength - either lost or gained. Watch out for the correct impedance...RG-8 and RG-58 have 50 Ohms. RG-59 and RG-6 (Low Loss Version of RG-59) have 75 Ohms. Most antennas are 50 ohm. Check our website for good coax. 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. Finally, don't use cheap TV cable!

So what is this swr (vswr) everyone talks about?

VSWR is a measure of how well two devices are impedance matched to each other. Typical radio 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.

Because most transmitters will deliver full power with a load VSWR of up to 2.0:1, this value is usually considered the limit for acceptable operation. Many prefer to keep their VSWR below that however, but for all practical purposes, it is unnecessary to spend time or money trying to get much below a VSWR of 1.5:1. The benefits will be hard to measure and even harder to notice.

On the other hand, coaxial cable losses increase rapidly, for a given frequency of operation, when the antenna VSWR exceeds 2.0:1. This can even, in some extreme cases, result in the coaxial cable burning, even when running 100 W. Using a higher grade of cable will definitely improve things, but even high quality coaxial cable becomes very lossy when VSWR exceeds 3.0:1 at higher HF frequencies (or VHF and higher).

BNC connector

A connector comes between coaxial cable and your transmitter. BNC type is a standard VHF RF connector for low power applications, just like the one used for 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 much higher prices. BNC to SO239 converters are available and will make it possible to connect PL259 (CB type or UHF) connector directly. We encourage customers to use N-type instead of PL259 where possible.

Power supply

You will need a good regulated 12-15 volt, 3A regulated power supply. You can always use a lead acid car battery and re-charge it when you are off the air. HAM or CB power supply units do the job nicely in most cases. Poor power supply can add hum to your signal! MAX PRO IV+ gives more output power when you increase the supply voltage. We have tested it up to 15V and had no problems, but we do not recommend using more than 15V. Of course too much voltage can fry your output transistor, especially if your antenna is not matched well. You can build your own power supply or get one from our website. Try our web site for schematics, if you want to build one yourself.

Fuse

It is a good practice to put a fuse inline with power supply. Fast 2.5A-3A should protect your transmitter from polarity reversal (polarity protection diode in MAX PRO IV+ will blow fuse) or any problem, resulting in excessive current consumption. If your transmitter keeps blowing the fuse, contact our support before thinking about jumpering it with a piece of cable. The fuse will in most cases save your output transistor or other component from damage. Eliminating the fuse from the circuit will not cure the problem and will probably allow the current to destroy some part of the circuitry if there is something wrong with it.

-Audio equipment

For the start all you need is a simple CD player or a cassette deck. If you want that really professional sound, you will eventually need low noise audio mixer, good microphone, audio limiter-compressor and possibly stereo - encoder (for stereo). Our SE4 DSP+ stereo encoders provide stereo functionality and audio processing for your FM radio station (pre-emphasis, limiter, balanced inputs, low pass filter, stereo pilot notch filter and compressor). Moreover, you can control all of these parameters via the LCD module, used to control MAX PRO IV+ (see appropriate menu options at the end of this document). To enable audio processing options, simply connect your MAX PRO IV+ to SE DSP+ board via I2C cable (simple 3-wire cable).

A number of cheap stereo encoders can be purchased online, but be careful. Look for these features:

- low pass filter. Lack of appropriate low pass filter will allow audio content to mix with stereo pilot and the multiplexed signals. This will produce flickering of the stereo LED on the receiver and degrade stereo separation.
- stereo pilot notch filter: Similar to the above problem, will produce flickering of the stereo LED
- balanced inputs: They provide excellent rejection of interference, created by ground loops or noise sources close to your transmitter. Many audio problems simply disappear once you start using balanced inputs. Problems usually manifest as buzz (brum) with the frequency of 50Hz or 100Hz. Especially useful when using PC as audio source and experiencing brum due to ground loops. Using isolation transformers is another option to cure such problems.
- limiter/compressor: Limiter prevents the signal from over-modulating and spreading into adjacent channels, generating interference to other stations. Compressor does the same and reduces the excessive dynamic range of your CD or microphone to a level that FM stations can handle. Both are an absolute must have for a serious station.

Needles to say, our SE4 DSP+ covers all of the above and offers the convenience of controlling the parameters via the same LCD display module.

-Enclosure

Use metal, allow some free space for future add-ons (stereo encoders etc.) and heat dissipation, and make ventilation holes at the top and/or back of the enclosure. Fix the PCB with all screws tightly. Take care with the heatsink, there are two pieces, one comes installed at the top, the other under the PCB. Apply a bit of thermal transfer grease to the top of the transistor. Once heatsink is installed, push the temperature sensing NTC close to the heatsink. You can attach it to it with a bit of glue for better thermal conductivity.

There should be a shield between the RF and LCD board or enough distance; flat cable should be wired away from the VCO assembly (L1). If you plan to run the unit for extended periods or intend to attempt to extend its power output, use a small fan. A bit of air flow makes a lot of difference. Move the fan away from the RF circuitry as it can cause audible buzz in your signal and isolate its power supply with LC filter, if needed.

MAKE SURE YOU SCREW THE RF BOARD TO THE ENCLOSURE AS THIS IS HOW THE OUTPUT TRANSISTOR DISSIPATES the HEAT!

Finally, if you know nothing or little about electronics, we selected a few books we found extremely well written and useful. The links to them are on our homepage. We suggest you start with the ARRL HANDBOOK, the holy bible of amateur radio and electronics in general. It is an extremely valuable resource for every broadcaster.

ASSEMBLING THE MAX PRO IV+ INTO AN ENCLOSURE

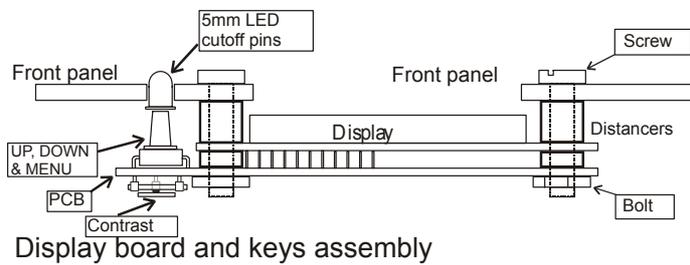


Fig 3: Installing the LCD display board to the enclosure



Fig 4: Installing the bottom and top heatsink (bottom heatsink is not visible here as it is mounted under the PCB)

HOUSTON, WE'RE READY FOR LIFT-OFF

Connect dummy load, SWR meter and power supply. Use a 2.5-3A fuse inline the power supply circuit. If you can adjust voltage, use 10-12V for the first power-up. This will minimize damage in case of a problem. Make sure you screw the board to a large metal plate, such as enclosure, to ensure proper heatsinking of the final transistor.

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

Finally power up the unit. Now you should see the welcome message on your LCD. You might need to adjust contrast trimmer on the LCD display module to get good visible contrast. You will also hear a beep after power up. Make sure nothing is overheating and there are no other visible problems. If anything seems out of the ordinary, shut the power off immediately, check the wiring and contact support, if necessary. You **SHOULD NOT** be generating more than 10-15W! Read the tips section in this document for instructions on decreasing maximum available power, if you're seeing more than 15W. If all is well, try to alter working frequency with the UP/DOWN keys. Now turn on your MP3 player, CD audio player or other AUDIO source. Turn on any fm radio and turn the tuning dial until you hear the MAX PRO IV+'s audio through the fm radio. You will need to adjust audio level so that the sound on the radio sounds natural and without distortion. Too much volume may sound good on your radio, but will sound horrible a few hundred meters from the transmitter! You shouldn't sound louder than other FM stations; rather you should sound a bit quieter since you're not using limiters/compressors (yet). When you sound as loud as other stations and you're not using audio processing, you're actually over-modulating. Unfortunately many commercial stations over modulate nowadays, it's a sad fact. You may want to try a few different frequencies because of better reception in different areas. Some spots on the dial may work better than others. Now slowly increase the power and keep an eye on your SWR meter and transmitter board. If you see a problem, turn the unit off and try to eliminate the problem. Tune your antenna, if necessary. Do it at 1/3 of maximum power to protect the output transistor. MAX PRO IV+ features SWR protection, but it is better to be safe than sorry.

We tried to cover all the bases here, but for most users this setup comes down to:

- 1.) Install into enclosure
- 2.) Connect all the wiring (antenna, power supply, insert LCD module connector, audio cable)
- 3.) Power up
- 4.) Set frequency and power

SWR AND TEMP PROTECTION

TEMPERATURE protection starts to decrease output power as the transmitter becomes hotter. If you want to get maximum power from your MAX PRO IV+, ensure good ventilation/cooling. This will prevent MAX PRO IV+ from throttling down and ensure maximum power output. Make sure NTC sensing resistor (R38) is close to the output transistor.

SWR protection works in a similar way. It will start to decrease RF output power. You may be able to notice fast and relatively hard to see blinking of the LED diode. You can also notice reduced current draw (Amp meter). This circuit protects the output transistor from damage in most situations and may "save your life" in many cases. However, if you want to disable it, read the appendix below.

TROUBLESHOOTING

We hope you'll never get to this step. We all know bad things happen. But do not despair! First, MAX PRO IV+ is reverse polarity protected so it should blow a fuse if you reverse polarity. If you have problems that you cannot solve yourself, please see our website for contact information and support resources in our forum.

THINGS TO REMEMBER

Please remember to turn off the transmitter when not in use! 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.

It may be illegal to operate this device in your county without a special permit. Please consult local authorities before using MAX PRO IV+!

NEWSLETTER

You may want to sign up for our newsletter so that you can receive the latest news and special deals. Also check our forum and discuss tips and tricks with other users, you never know you just may learn something. You can sign up at www.pcs-electronics.com

USING THE MAX PRO IV+

Basically 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 access to other functions, such as output power and many of the DSP functions of this unit (only active if you connected MAX PRO IV+ to our SE4 DSP+ stereo encoder).

LCD CONTROL MODULE MENU SYSTEM: POWER AND DSP FUNCTIONS

It is possible and recommended that you connect MAX PRO IV+ to our SE-4 stereo encoder. The provided 3-pin header can be found on the RF board next to the LCD control unit's connector. MAX PRO IV+ will automatically detect SE4 and enable all of the DSP functions.

The UP and DOWN keys are used to change parameter value. In normal mode the LCD simply shows the frequency. Menu key can be used to enter the menu mode, repeatedly pressing this key brings up the following options: POWER, TREBLE, BASS, COMPRESSION, THRESHOLD, ATTACK, DECAY, INTEGRATION INTERVAL and PREEMPHASIS. Pressing the UP or DOWN key selects the desired parameter and allows you to modify its value. Press the MENU key and you're back to normal mode.

POWER

This setting allows you to set the output power of MAX PRO IV+. Select desired power with the UP/DOWN keys and press MENU key to exit the menu system and return to normal operation. Selected power is continuously displayed on the LCD with a bar of squares in the lower half of the screen. More squares equals more power.

TREBLE and BASS

This setting allows you to set amount of TREBLE and BASS in your audio. Recommended value would be about 0dB. This function requires SE4 DSP+ stereo encoder.



MAX PRO IV+: Setting the treble, one of the many menu settings

COMPRESSOR SETTINGS

A number of MENU settings control the operation of the compressor. Lets assume that the audio signal enters the transmitter at some low level. Compressor does nothing to the signal until at one point as the input signal increases the signal reaches the compression threshold. Digital signal processor starts compressing the signal beyond that point. The higher the compression ratio; the higher the compression. For example, compression ratio of 1:∞ would in effect be a limiter. This function requires SE4 DSP+ stereo encoder.

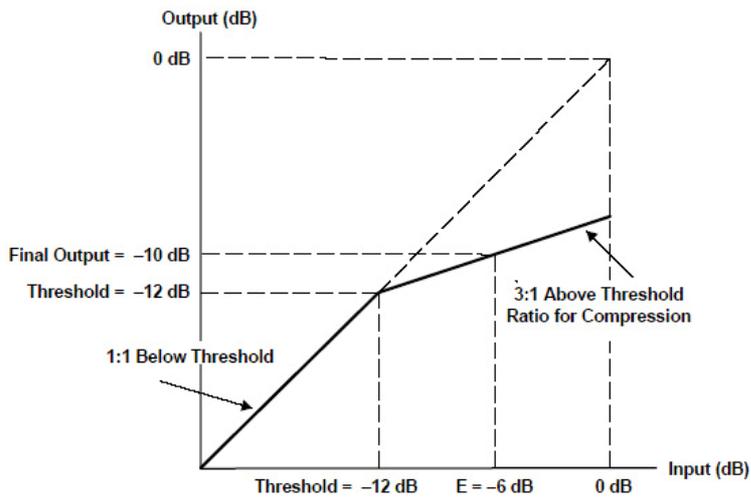


Figure 5: Explanation of the compressor settings

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Compression level: 4.00:1
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MAX PRO IV+: Setting the compression level, levels between 1:2.00 to 1:8.00 are recommended

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Compression threshold: -12.0dB
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MAX PRO IV+: Setting the compression threshold, levels between -12 and -21dB are recommended

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Attack: 3.5ms
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MAX PRO IV+: Setting the attack time, this is the time between the signal rise and the actual response of the compressor

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Decay: 106ms
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MAX PRO IV+: Setting the decay time, this is the time the compressor needs to respond to a decrease of the signal

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Integration interval: 212ms
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MAX PRO IV+: Setting the integration interval, this is the time the DSP extracts the samples

PRE-EMPHASIS

It is possible to adjust the pre-emphasis of the transmitter to either 50uS (standard for EU and most of the world) or 75uS (United States and Canada). If you are using SE4 DSP+, set pre-emphasis in the menu system and disable both jumpers in J1 (leave pre-emphasis to stereo encoder).

JUMPERS, CONTROLS AND TERMINALS

| Jumper | Function | Default setting |
|--------|------------------------------------|--|
| J1 | Audio input, 600 ohms | |
| J2 | Pre-emphasis | 75uS, 50uS or none |
| J3 | I2C cable to SE4 DSP+ | See wiring diagram at the end of this document |
| J4 | LCD control unit | Watch polarity, do not install backwards |
| J5 | Power supply wires, watch polarity | |
| J6 | Power supply wires, watch polarity | Positive in the centre |
| J7 | BNC antenna connection | Connect antenna here |
| J8 | Output power adjustment | Position A (Controlled by LCD display module, 0 to 10-15W) Position 1W (Output power about 1W) Position 4W (Output power adjusted by P2 from 0 to about 4W max.) |
| P1 | Audio level | |
| P2 | Output power in position 4W | Output power in position 4W |
| C16 | Reference oscillator adjustment | For advanced users only, enables very precise adjustment down to 1Hz |

AUDIO LEVEL ADJUSTMENT

Adjust audio level with trimmer (P1) on the RF board so that you sound a bit less loud than other radio stations. This prevents interference to adjacent channels as you probably do not own expensive audio equipment that radio stations usually employ to make their stations sound louder. Remember to disable pre-emphasis, if you're using a stereo encoder (usually a stereo encoder or limiter include their own pre-emphasis circuit).

APPENDIX A: HOW CAN I INCREASE PERFORMANCE?

I'm pretty sure you are all interested in this, or at least you will be after a while. First let me warn you that some of you might have stability problems if you try to push MAX too far. You'll also have to account for additional heat. Here is a list of simple things you can do to raise output power of MAX PRO IV+:

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

1. Increase supply voltage to 14-15V
2. Tune (compress or expand a bit) L2, L3, L4, L5 for maximum power
3. Purchase a better antenna or an amplifier
4. You can also set the working point of the mosfet a bit higher and give it a bit more gain. **ONLY DO THIS** if you're unable to get 10-15W in points 1, 2 and 3. You can try to do this by replacing R37 with a 1K8 resistor and placing a 5K precision trimmer in parallel. Now you can use the trimmer to set your maximum power to 10W or 15W precisely. It is possible to reach up to 20W, but keep in mind that exaggerating at this point leads to destruction of the final transistor, which is one of the reasons why final transistors are not covered by warranty. You may also have to disable SWR protection as it could be throttling down the power above 10W.

APPENDIX B: CAN I DISABLE SWR or TEMP PROTECTION?

Sometimes, when using MAX PRO IV+ to drive amplifiers, SWR protection starts decreasing output power for no justified reason. Indeed, RF amplifiers sometimes represent a truly unmatched load. If you want to disable SWR protection in such cases, simply remove R43.

Disabling TEMP protection is not recommended, but if you really want to do so, simply push the NTC resistor (R38) away from the heatsink.

APPENDIX C: THE RESISTOR COLOR CODES

The easiest method is to get radio Shack part number 271-1210 for \$1.19; it is a pocket sized card with spin dials. Just spin the dials to show the correct colored bands and read the resistance off the card. Sort of a resistor slide rule.

RESISTOR COLOUR CODE

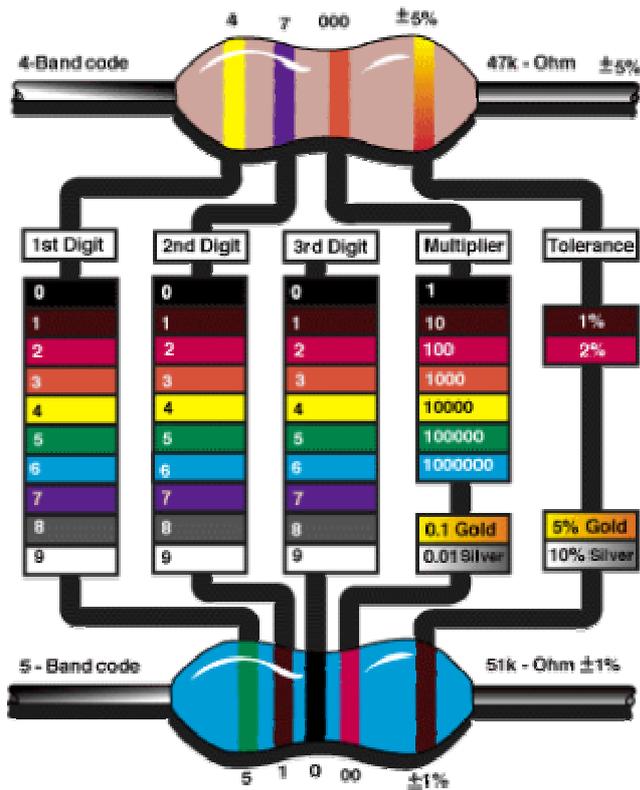


Fig 10: Resistor color codes, if there are only four bands, omit the 3rd digit.

MAX PRO IV+ BILL OF MATERIALS

| QTY | Reference | Value | Type | Description |
|-----|---|----------|-------------|-------------|
| 11 | C1, C7, C8, C13, C15, C17, C23, C24, C31, C32, C34, C50 | 100nF | Ceramic | 2,5mm pitch |
| 5 | C2, C6, C10, C26 | 100pF | Ceramic | 2,5mm pitch |
| 8 | C3, C11, C14, C19, C20, C22, C34, C35, C36 | 10uF | Elko - mini | 16V min |
| 1 | C12 | 470nF | Stryoflex | 5mm pitch |
| 6 | C18, C25, C27, C29, C43, C44 | 1nF | Ceramic | 2,5mm pitch |
| 1 | C28 | NOT USED | NOT USED | |
| 1 | C4 | 4n7 | Stryoflex | 5mm pitch |
| 1 | C5 | 6n8 | Stryoflex | 5mm pitch |
| 1 | C21 | 47uF | Elko - mini | 16V min |
| 1 | C37 | 100uF | Elko | 25V min |
| 1 | C30 | 150pF | Ceramic | 2,5mm pitch |
| 2 | C41, C42 | 47pF | Ceramic | 2,5mm pitch |
| 3 | C9, C40, C46 | 22pF | Ceramic | 2.5mm pitch |

| | | | | |
|---|-----------------------------|--------------------|-----------------------|--|
| 2 | C38, C47 | 27pF | Ceramic | 2.5mm pitch |
| 1 | C16 | 22pF trimmer | 22pF trimmer | 22pF trimmer |
| 1 | C45, C49 | 10pF | Ceramic | 2.5mm pitch |
| 1 | C39 | 2p2 | Ceramic | 2.5mm pitch |
| 1 | C48 | 8p2 | Ceramic | 2.5mm pitch |
| 1 | C33 | 6p8 | Ceramic | 2.5mm pitch |
| | | | | |
| 3 | R1, R24, R26 | 560Ω | Metal 1/4W 1% | Green, Blue, Black, Black, Brown |
| 2 | R15, R17 | 1K | Metal 1/4W 1% | Brown, Black, Black, Brown, Brown |
| 1 | R37 | 1K5 | Metal 1/4W 1% | Brown, Green, Black, Brown, Brown |
| 1 | R18 | 6K8 | Metal 1/4W 1% | Blue, Grey, Black, Brown, Brown |
| 1 | R10 | 56K | 1/4W 5% | Green, Blue, Orange, Gold |
| 5 | R2, R5, R7, R11, R39 | 5K6 | 1/4W 5% | Green, Blue, Red, Gold |
| 5 | R31, R35, R36, R41, R42 | 56Ω | 1/4W 5% | Green, Blue, Black, Gold |
| 2 | R25, R40 | 22Ω | 1/4W 5% | Red, Red, Black, Gold |
| 1 | R20 | 3K3 | Metal 1/4W 1% | Orange, Orange, Black, Brown, Brown |
| 2 | R16, R30 | 2K2 | 1/4W 5% | Red, Red, Red, Gold |
| 1 | R33 | 15K | Metal 1/4W 1% | Brown, Green, Red, Red, Brown |
| 5 | R8, R19, R22, R23, R27, R28 | 10K | 1/4W 5% | Brown, Black, Orange, Gold |
| 3 | R13, R21, R32 | 220Ω | 1/4W 5% | Red, Red, Brown, Gold |
| 1 | R3 | 12K | 1/4W 5% | Brown, Red, Orange, Gold |
| 1 | R14 | 10Ω | 1/4W 5% | Brown, Black, Black, Gold |
| 1 | R4 | 1K2 | 1/4W 5% | Brown, Red, Red, Gold |
| 1 | R34 | 100Ω | Metal 1/4W 1% | Brown, Black, Black, Black, Brown |
| 1 | R29 | 150Ω | 1/4W 5% | Brown, Green, Brown, Gold |
| 1 | R38 | NTC 33K | Drop shape | Orange |
| 3 | R6, R9, R12 | 22K | 1/4W 5% | Red, Red, Orange, Gold |
| | | | | |
| 1 | P1 | 500 ohm | | Audio level |
| 1 | P2 | 2K or 2K5 | Precision 64Y type | Power for J8 in position 4W |
| | | | | |
| 3 | IC1 | PLL (preinstalled) | | |
| 1 | IC2 | 78L10 | | |
| 1 | IC3 | 78L05 | | |
| 1 | IC4 | NE5532 | | |
| | | | | |
| 1 | J1 | RCA jack | Audio input | |
| 1 | J2 | Jumper | Pre-emphasis select | US=75uS, rest of the world 50uS |
| 2 | J3 | I2C | For SE4 DSP+ | |
| 1 | J4 | LCD unit | Flat cable connector | Connects to LCD module |
| 2 | J5, J6 | Power supply | Center = positive (+) | |
| 1 | J7 | BNC | Antenna connector | |
| 1 | J8 | Jumper | Power selection | Position A (Controlled by LCD display module, 0 to 10-15W) Position 1W (Output power about 1W) Position 4W (Output power adjusted by P2 from 0 to about 4W max.) |
| | | | | |
| 1 | T1 | BC547 | | |
| 1 | T2 | SMD mosfet | | |
| 1 | T3 | RF driver | | |

| | | | | |
|---|-----------------------|---------------|---------------------|-------------------------------|
| 1 | T4 | RF driver | | |
| 1 | T5 | 20W RF final | | |
| 1 | T6 | 2N7000 | | |
| 1 | T7 | BD135-137 | | |
| | | | | |
| 1 | D7 | LED 5mm | TX on indicator | TX is OFF when the LED is OFF |
| 2 | D4, D5 | BB varicap | SMD | |
| 1 | D1, D6 | BAT85 | | |
| 1 | D8 | 1N4007 | | |
| 1 | D2 | Zener 12V | | |
| 1 | D3 | Zener 11V | | |
| | | | | |
| 1 | Q1 | 4.000MHz | Quartz crystal, low | |
| 4 | L1, L2, L3, L4 | Coil, 4 turns | CuAg 1mm wire | |
| 1 | L5 | Coil, 2 turns | CuAg 1mm wire | |
| | | | | |
| 1 | Printed Circuit Board | | | |
| 1 | Heat sink for T5 | | | |

APPENDIX D: IMPROVEMENT TIPS

Add STEREO capability with DSP processing to your MAX PRO IV+:

http://www.pcs-electronics.com/en/products.php?sub=stereo_encod#B_Stereo2

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/en/products.php?sub=accessories>

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

<http://www.pcs-electronics.com/en/products.php?sub=antennas>

Still not enough range? Well, how about a 300W amplifier?

<http://www.pcs-electronics.com/en/products.php?sub=amplifiers>

APPENDIX E: CONNECTING MAX PRO IV+ TO SE4 DSP+

Add STEREO capability with DSP protection to your MAX PRO IV+, connect it with SE4 DSP+. Here is how you can do it:

- 1.) Purchase SE4 DSP+
- 2.) Connect the power supply (+12-15V) to both units
- 3.) Connect MPX OUT (SE4 DSP+) to audio input (MAX PRO IV+)
- 4.) Disable pre-emphasis on MAX PRO IV+ (remove all jumpers from J2)
- 5.) Connect the I2C cable (3 wires) to SE4 DSP+ and MAX PRO IV+ as per diagram on next page.
- 6.) Set the desired settings in the MAX PRO IV+ menu system (treble, bass etc).
- 7.) Enjoy the amazing sound and incredible stereo separation

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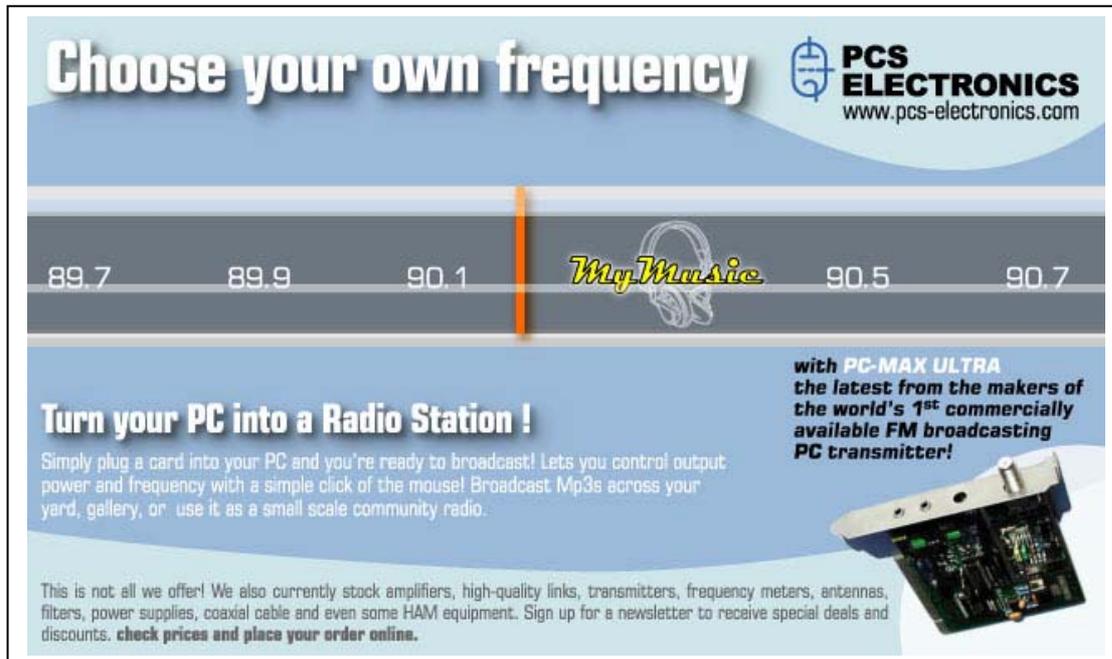
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LEGAL INFO

It may be illegal to operate this device in your county. Please consult local authorities before using MAX PRO IV+!

THANK YOU FOR PURCHASING MAX PRO IV+!

We hope you'll enjoy it as much as we do and remember to tell your friends about it. From all of us we wish you happy broadcasting!

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