

CyberMax series amplifiers

based on Universal Amplifier control Board v4.0

Manual

Brought to you by PCS Electronics, www.pcs-electronics.com

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!: Before you power up an amplifier please first make sure that drive power is set correctly and does not exceed maximum allowable input power of the amplifier.

Ensure amplifier supply voltage does not exceed amplifier's specifications. It is recommended that you use reduced supply voltage for initial tests and first power up.

Never operate any amplifier without a properly tuned antenna or dummy load attached.

Mains voltage is lethal! Whenever handling mains voltage be very careful and observe safety regulations.

Study local regulations and ensure you are operating in compliance.

BEFORE YOU CONNECT AMPLIFIER TO THE EXCITER FIRST MAKE SURE EXCITER OUTPUT POWER DOES NOT EXCEED AMPLIFIER MAX. INPUT POWER. EVEN A VERY BRIEF OVERLOAD OF YOUR AMPLIFIER'S INPUT COULD CAUSE DAMAGE TO THE AMPLIFIER.

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CyberMax series amplifiers

With new v40 control board

CyberMax series amplifiers are available for analog or DAB+ radio signal, analog or digital TV signal and other special bands. They monitor output power, drive power, reflected power, amplifier supply currents and voltages and internal temperatures. They also help you control output power, let you set fan activation temperature and several alarm levels. Remote control via USB or Ethernet is possible.

What makes CyberMax amplifiers so great?

- Power adjustment without causing instability (adjustment range is limited depending on model)
- Automatically adjusts gain within reasonable limits to obtain desired output power (important for DAB+ and digital TV)
- On-board low-level RF preamplifier (important for DAB+ and digital TV)
- On-board variable RF attenuator (perfect for DAB+ and other digital mode amplifiers)
- Automatic FAN activation at adjustable temperature.
- Power, SWR, voltage, current, drive power and temperature read-out.
- Remote monitoring available for Windows

TECHNICAL SPECIFICATIONS VHF BAND III MODEL 400W/1200W:

- Output RF connector: 7/16, 50 ohms
- Input RF connector: N female, 50 ohms
- Drive power: 5mW per customers requirement
- Gain flatness: 1dB
- Frequency band: VHF band III (175-225MHz)
- Output power: Peak power 1200W, average power for digital modulations 250-400W
- AC mains power: 220-240V 50/60Hz universal, works everywhere on this planet
- Ambient temperature: -5° to +45°C
- External dimensions (W x D x H) 19" x depth (550mm) x height 3HE (132mm)
- Physical weight 22Kg

Thank you for purchasing CyberMax Amplifier

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

Front and back panel layout

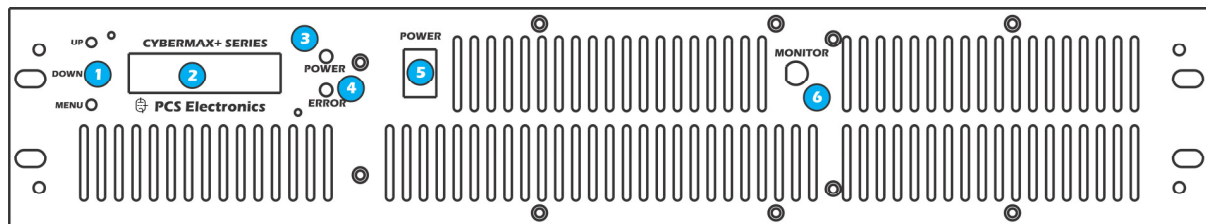


Fig. 1: Front panel in 2H model

Reference	Function
1	Three push buttons, the UP, DOWN and MENU keys or rotary button.
2	LCD display that lets you control the unit and monitor various parameters. 2x16 or 4x16 type.
3	The green led. Green signals power is ON.
4	Red error led or leds. Turns on while VCO is tuning into selected frequency and in case of SWR, TEMP or other error. There can be several of these depending on the model.
5	Power switch in the middle of the panel is actually a standby switch. To really fully disconnect the unit from mains power use the main switch at the back.
6	Monitor output at the front provides a small sample of the transmitter signal, this can be used to attach frequency counter, modulation index monitor, spectrum analyzer or similar equipment.
7	Some models also have VU meter (4 bars). When used for amplifier only last w bars work (power and reflected power).

Table 1: Front panel in 2H model

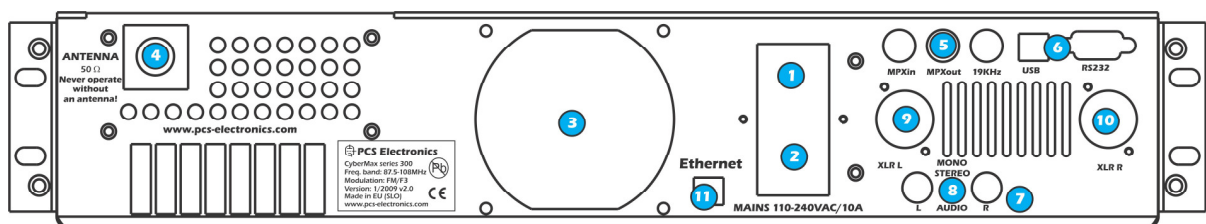


Fig. 2: Back panel for 2H model

Reference	Function
1	Mains power, universal input 110-240V, IEC jack (same as for PC)
2	Fuse and main mains switch (total off)
3	Ventilation aperture
4	Antenna connector, N female or 7/16. Do not operate without antenna.
5	BNC connectors for MPXin, MPXout and 19KHz pilot. Only when used as FM transmitter.
6	RS232/USB for remote control.
7	Audio inputs, RCA jacks for left and right channel. Only when used as FM transmitter.
8	STEREO mode indicator. Only when used as FM transmitter.
9, 10	Balanced audio inputs, left and right channel XLR (Canon). Only when used as FM transmitter.
11	Ethernet (optional) port for remote control.
12	Not shown. There is also N female RF input connector.

Table 2: Back panel for 2H model

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 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: <http://www.pcs-electronics.com> (guides section - 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).

I hope this basic introduction will not scare you too much, it should be sufficient for the time being although we encourage you to explore this exciting subject further with the help of a book such as the ARRL Antenna Book:

<http://www.amazon.com/exec/obidos/ASIN/0872598047/mightyspiraterad>

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

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.

Because most transmitters will deliver full power with a load VSWR of up to 2:1, 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 2:1. 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).

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 can eat a lot of your effective power out! Use it only for short runs. BELDEN makes terrific coaxial cable 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; RG58, RG213, H-500, H-2000 and H-155 have 50 Ohms, RG-59 and RG-6 have 75 Ohms. Most antennas and transmitters including ours 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. H-155 or H-200 are good choices! RG-142 with Teflon is recommended for wiring inside cabinets, for baluns, Wilkinson couplers and everywhere where resistance to heat is required as insulation won't melt during soldering or operation.

Connectors

Connectors come between coaxial cable and your amplifier, exciter or antenna. There are many standard VHF RF connector, such as BNC, N, 7/16, SO239 and others. Use good quality connectors as cheap types use 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.

Mains power supply and mains power cable

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.

Signal exciter for your amplifier

Make sure the driving exciter/signal source is of power level the amplifier is designed for. Over-driving and under-driving both results in poor performance or even damage.

Wiring everything together

Wiring things up and first power-up

Wiring the CyberMax series amplifier is easy, just make sure you read the previous chapter and setup antenna, cable and exciter properly.

- Make sure your antenna is ok (low reflected power).
- Now connect the antenna cable to the amplifier. Even better is to use dummy load, if you have it.
- Connect the mains cable to the amplifier (do not power up yet)
- Connect the jumper cable between amplifier and signal generator / exciter
- Now power up the amplifier and wait for it to boot-up. It will wait in stand-by until RF signal appears.
- Set desired power in percentage with the big rotary button. Maybe 25% for a start.
- Power up the exciter and make sure it is set correctly (set expected drive power)
- If necessary disengage the stand-by mode (flip the switch at the front)
- Wait for the amplifier to ramp up the power to 25%.
- Let it run for some time. If everything looks good you can increase power to 50% or 100%.
- Make sure there is no unexpected above-normal heating of connectors, coax or anything else.

Menu system and settings

LCD control module – two types

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

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

LCD control module menu system

The rotary button is used to change parameter values. In normal mode the LCD simply shows the output power and other parameters depending on view you select. Menu system can be entered by repeatedly pressing this rotary button which brings up the following menus: <AUTO FAN TEMP >, <VIEW SELECT>, <LCD CONTRAST>, <ALARMS UP/DWN>, -><CURRENT ALRM>, -><TEMP ALARM>, -><SWR ALARM>, -><U AMP ALARM>, -><DRIVE LIMIT>, <OUTPUT LIMIT>, <FIRMWARE VER>, <SET PASSWORD>, <RAMP UP/DOWN>. Pressing the UP or DOWN key selects the desired parameter and allows you to modify its value. Another press on the MENU key and you're back to the normal mode. Note that all these settings except power and frequency are already set as they should be so changing them should not be necessary and is not recommended.

Changing output power:

Shown with Display0 selected as view type. Simply rotate rotary button LEFT/RIGHT to set output power in %. The output power is shown in top right field. The drive power is shown in left bottom line. Amplifier temperature is shown in bottom right corner in degrees Celsius.

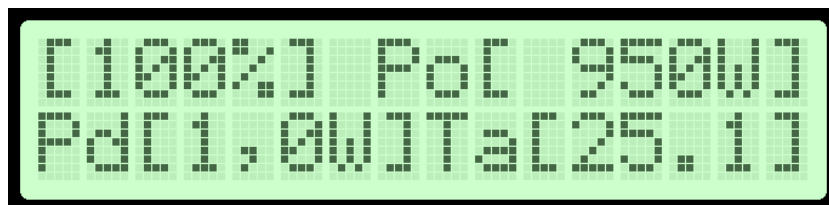


Fig. 3: Setting power, the power is set to 100% here, shown view type is display0

<AUTO FAN TEMP>

Select the temperature at which the fan will automatically turn on. You can also set it to run all the time or never turns on.

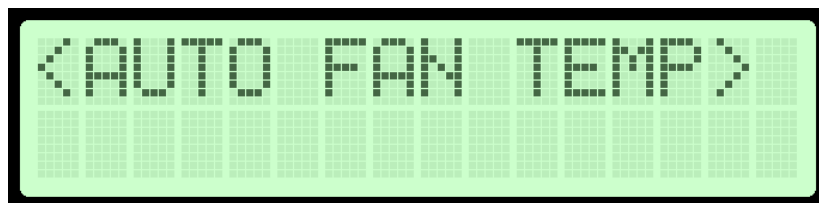


Fig. 4: Setting amplifier temperature at which the fan turns on automatically

<VIEW SELECT>

This unit is capable of displaying a number of various parameters. Since the LCD real-estate is limited to 2x16 or 4x16 characters depending on the model we prepared a number of pre-programmed views that only show a selected number of parameters. We recommend that you explore these options yourself but we are giving you some things below:

- [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 view shows each of the possible 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. Auto scroll is a recommended setting.

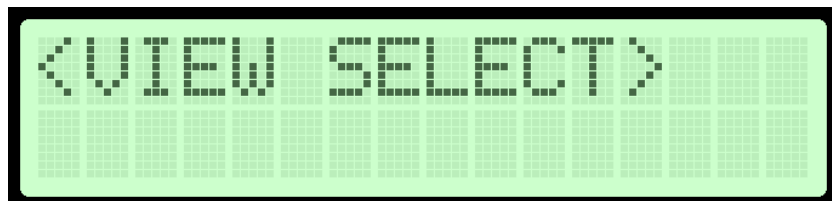


Fig. 5: Setting mode to stereo

<LCD CONTRAST>

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

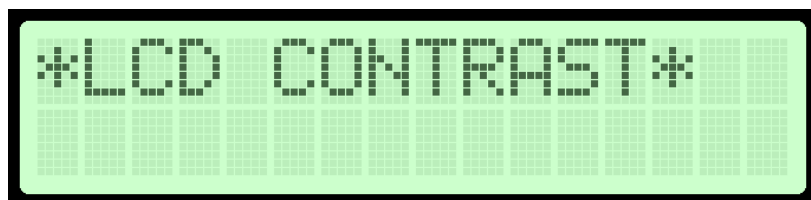


Fig. 6: Changing contrast

<ALARMS UP/DWN>

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

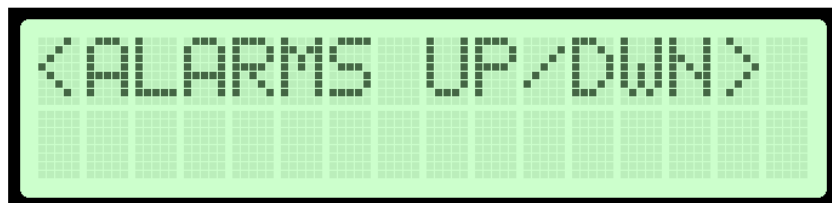


Fig. 7: Gateway to submenu dedicated to Alarms

<CURRENT ALARM>

You can set the sensitivity of amplifier current alarm here. We recommend you set these according to your amplifier. Current meter accuracy is not very high so allow for some tolerance. Some models don't have current meter enabled.

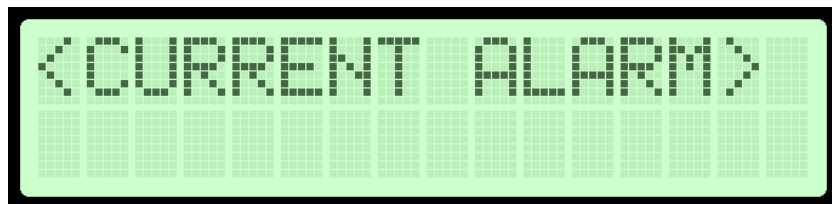


Fig. 8: Current alarm

<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.

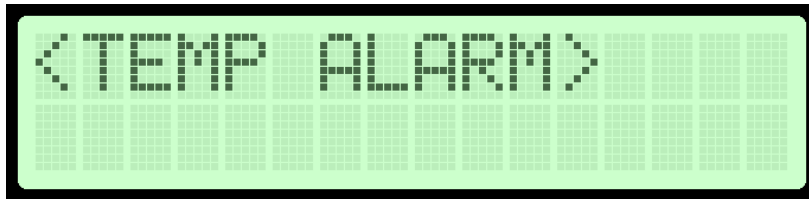


Fig. 9: Temperature alarm.

<SWR ALARM>

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

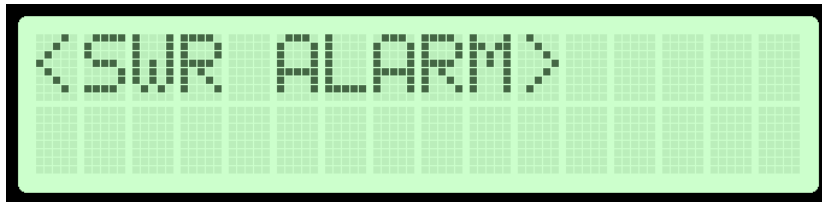


Fig. 10: Temperature alarm

<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.

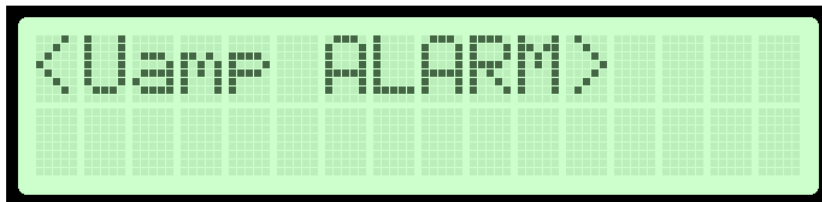


Fig. 11: Amplifier voltage alarm

<DRIVE LIMIT>

You can set the level of input drive at which the gain of amplifier will fall once this level is reached. This can help protect against excessive driving of amplifier.

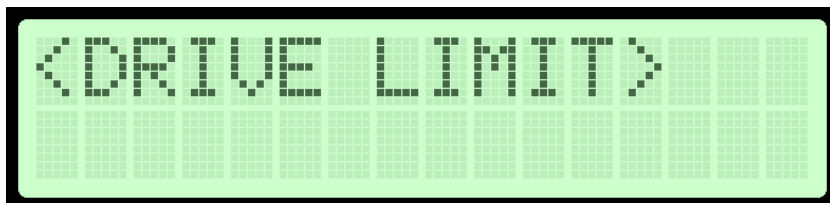


Fig. 12: Drive power limit

<OUTPUT LIMIT>

It is possible to set a limit power level (for example 500W) and amplifier will try to reduce its gain if needed to prevent overdriving; it ensures constant power even if drive power is fluctuating. This is disabled by default to prevent tinkering with the settings by unauthorized personnel; you can enable it by installing a jumper (contact support for help).

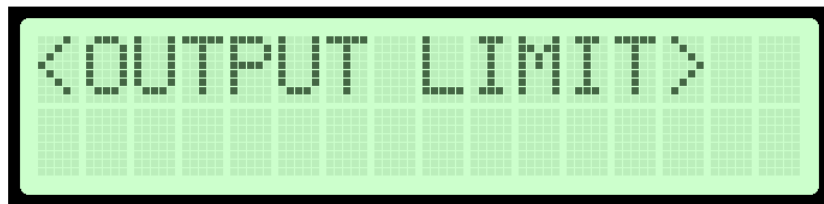


Fig. 13: Output power limit

<FIRMWARE VER>

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

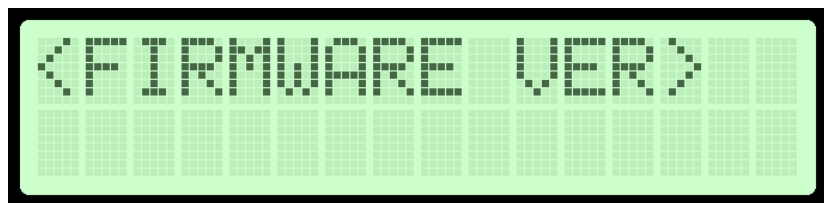


Fig. 14: Firmware version

<PASSWORD>

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

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

WINDOWS CONTROL PROGRAM – CyberMaxAmp+ v4.1

SOFTWARE INSTALLATION AND COMMUNICATION SETUP

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

COM PORT SETUP

Select correct COM port here.

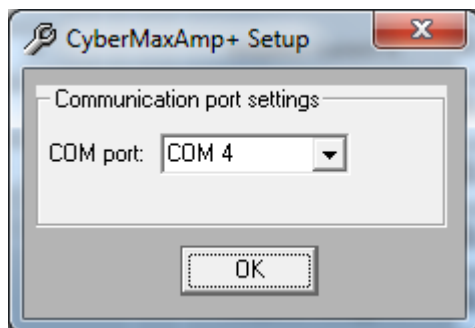


Fig. 15: COM port setup.

The selected COM port must match the COM port detected under Device Manager. To open device manager, enter “Device Manager” into search box in Windows, than click Device Manager:

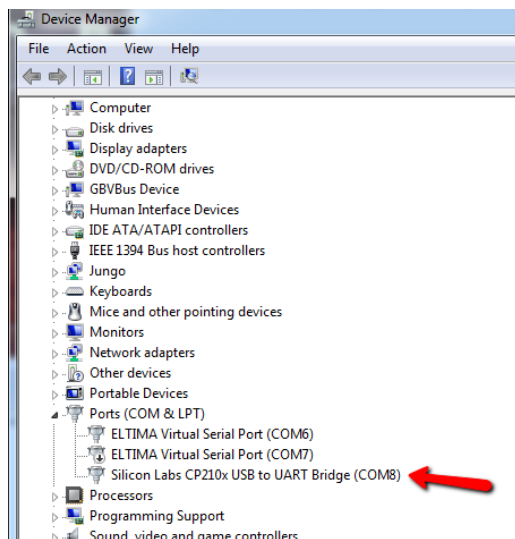


Fig. 16: COM port in device manager must match the one in CyberMaxAmp program.

CyberMaxAmp+ program explained

Main amplifier parameters are presented in this dialog, they are described below:



Fig. 17: Amplifier setup

Amplifier output power

Set power in % here, from 0 to 100%.

Alarm levels

You can set values at which various alarms trigger.

Output power and reflected power

Shows output and reflected power in watts.

Update amplifier button

Click to send settings to the amplifier

Systray

Click to send program to tray where it stays hidden until you need it.

ToTray at start

Check *To tray at start* checkbox to start the program minimized in system tray.

Auto read status

Check this box to activate automatic continuous hardware status reading.

RF amplifier status

Shows various currents and voltages inside the amplifier.

Alarm indicator buttons (SWR ALARM, PSU T ALARM and others)

These light-up when an alarm is triggered in the amplifier. Must be connected to amplifier and auto read enabled for this to work.

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).

Update logo

Changes the welcome text when you power-up the amplifier. This feature is experimental so we don't give you any warranty for changing logo – welcome text.

Troubleshooting

We hope you'll never get to this step. We all know bad things happen but do not despair! MAX PRO 6000+ 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 18: 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, amplifier need about 20 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 set power (in %) 2. Maybe one of the alarms was triggered and power was reduced, try to power off and power back on or wait a few minutes for power to recover. 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 or driver may be too weak. 5. Power limit may be set too low (it is shown at power-up time)
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).
Unit blows fuses and draws excessive current	You may have burned the output transistor.

Table 3: Troubleshooting amplifiers

Appendix A – IO board and PC remote control

Software installation

Download the latest CyberMaxAmp+ setup file from our website. Software and manual are available in our forum.

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. Follow instructions on the

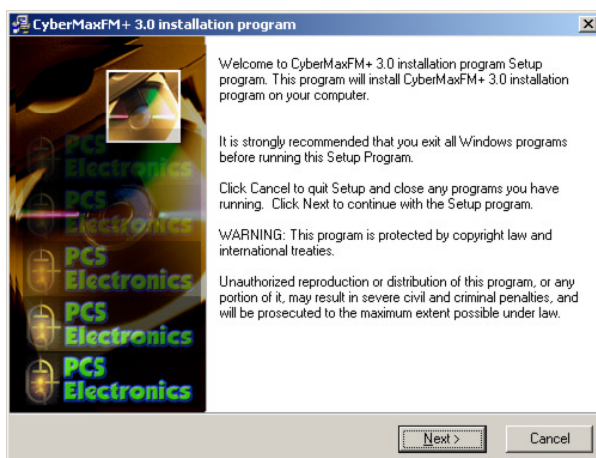


Fig. 19: Setup is about to start

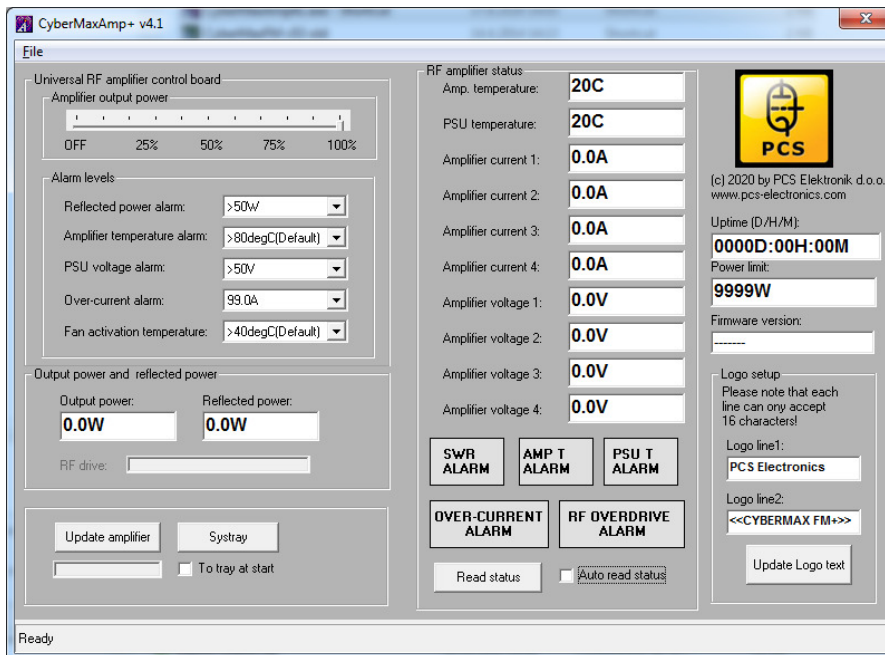


Fig. 20: CyberMaxAMP+ remote control software

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.

Using existing COM port

If you want to use the RS232 cable to connect to the transmitter board, connect the RS232 IO board and connect the RS232 cable to your computer. In this case the COM port to be used will usually be COM1 or COM2. Please note that our CyberMaxFM transmitters usually ship with only USB port active so to use RS232 you will have to open the cover and switch to RS232 internally. 99% of people nowadays prefer USB so this is not really a problem. Modern computers don't even have COM ports.

Installing USB driver (only for USB IO board)

Download the USB COM port driver, you can find it [here](#):

<http://www.pcs-electronics.com/phpBB2/viewtopic.php?t=2505>

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. 21: 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:

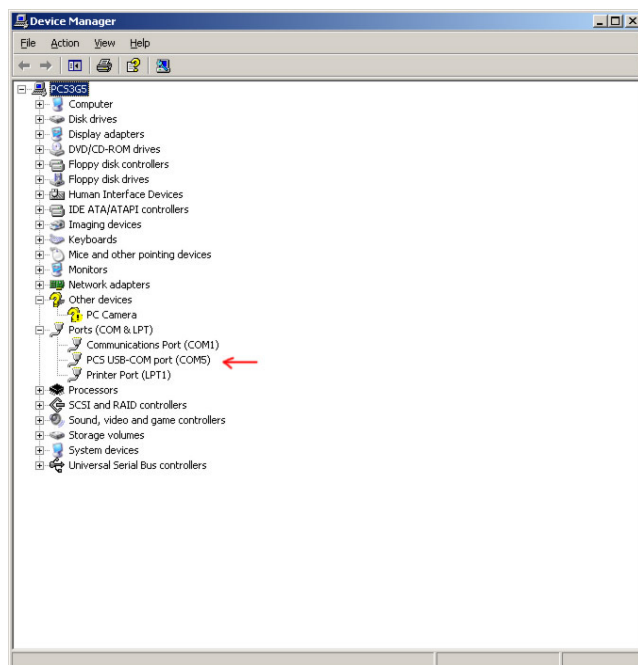


Fig. 22: Configuring Com port for USB driver

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:

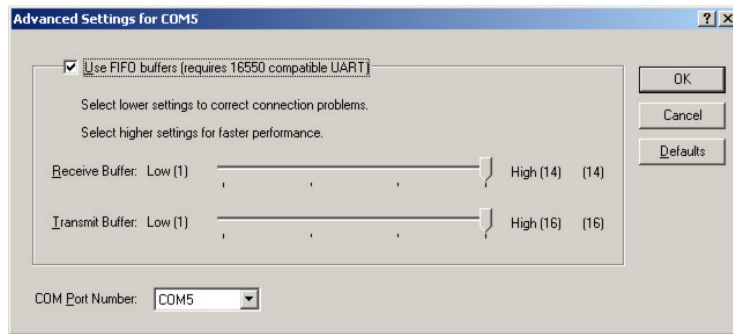


Fig. 23: Configuring Com port for USB driver

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 MAXPRO6000 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.

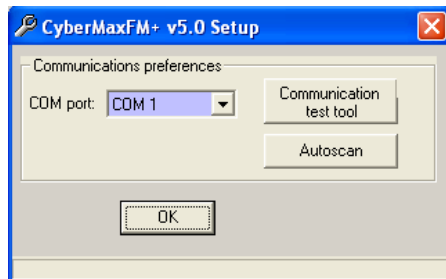


Fig. 24: Set COM port to 1 or 2 for RS232 IO board

Appendix B – 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 amplifier to your network via Ethernet cable. 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 CYBERMAXAMP+ as shown below. Note the IP will differ, but make sure the port is set to 5005!

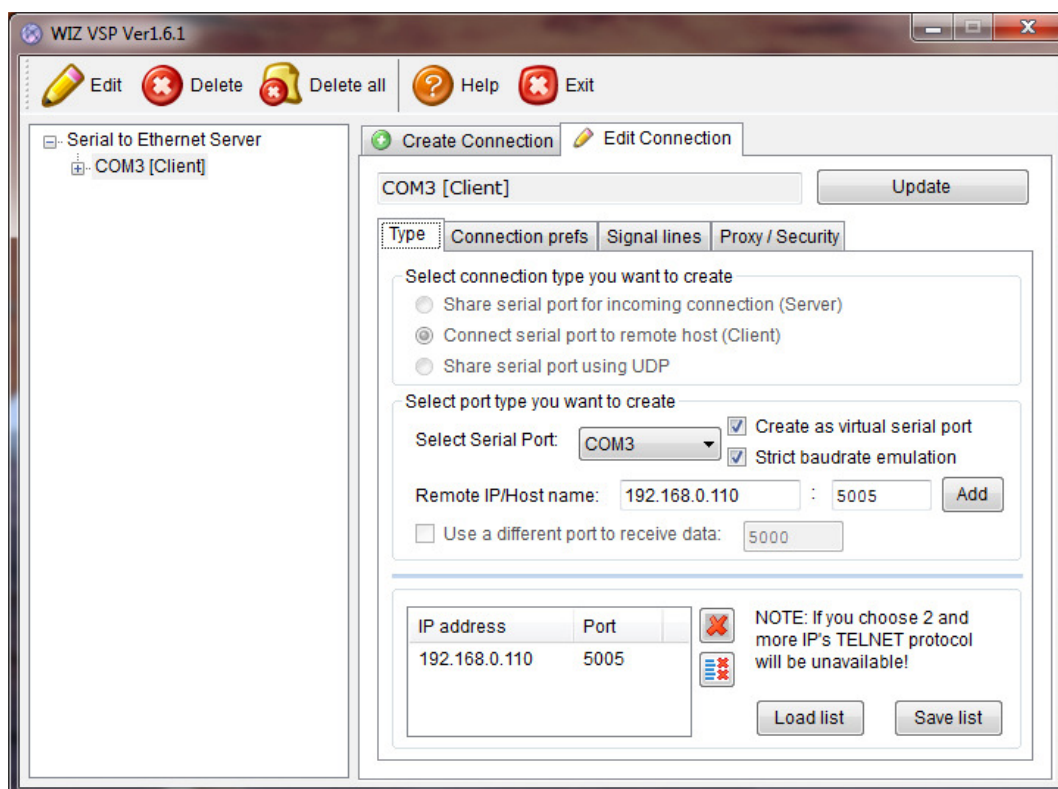


Fig. 25: Setting up Ethernet connection for CYBERMAXFM+, screen 1

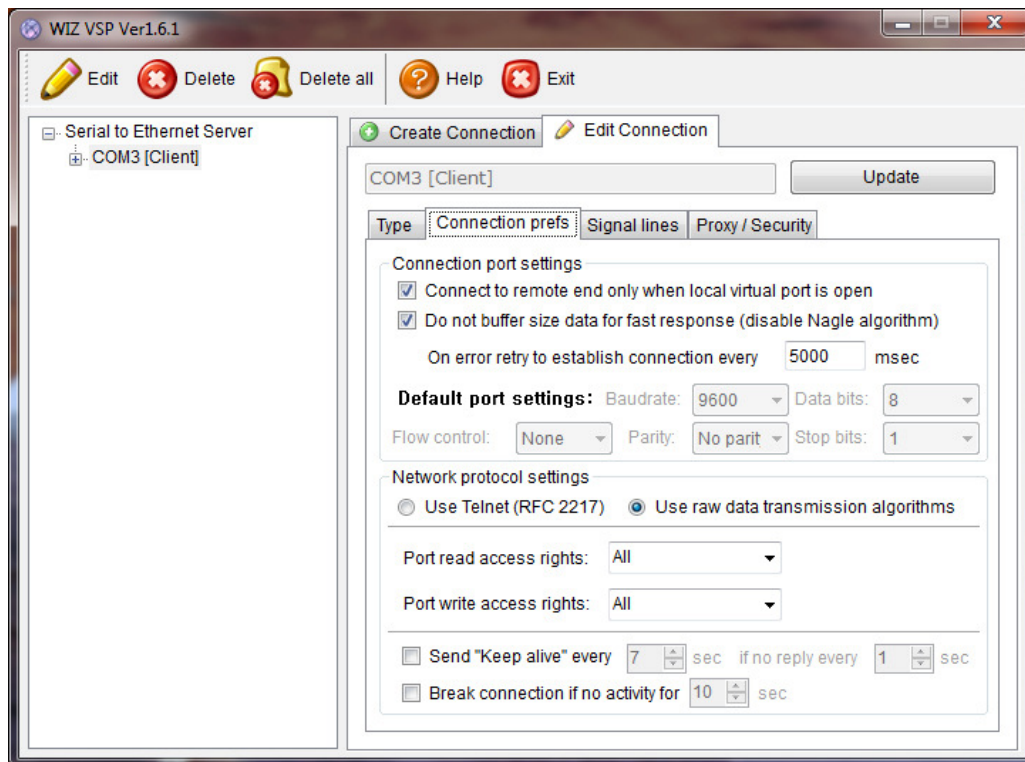


Fig. 26: Setting up Ethernet connection, screen 2

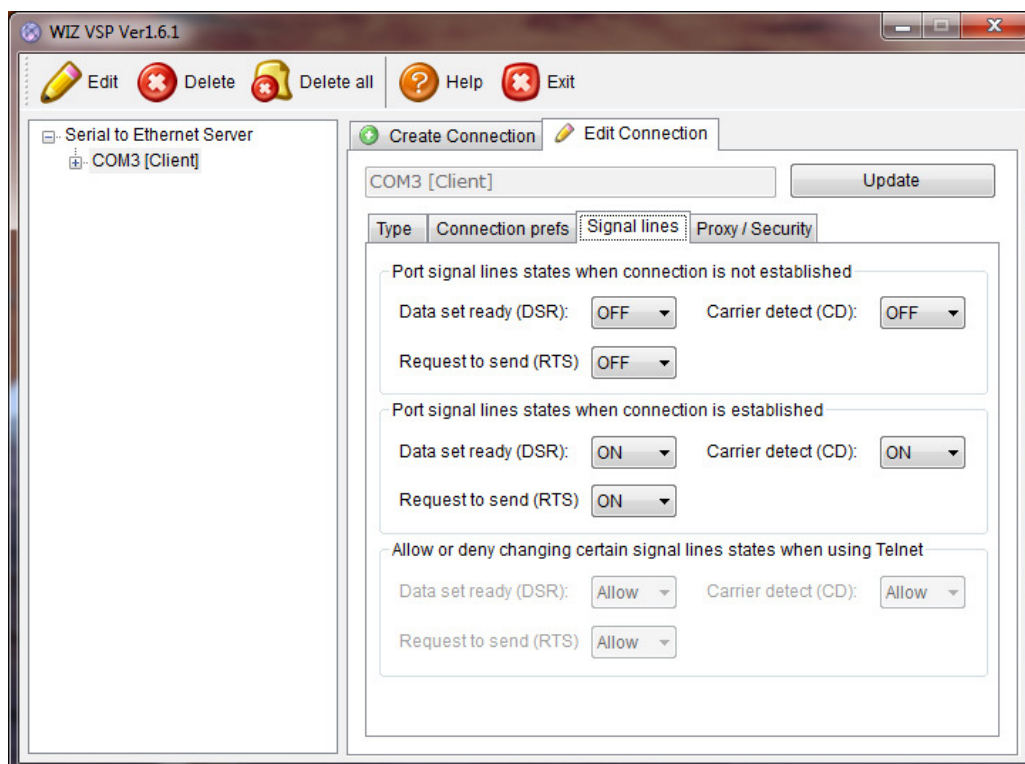


Fig. 27: Setting up Ethernet connection, screen 3

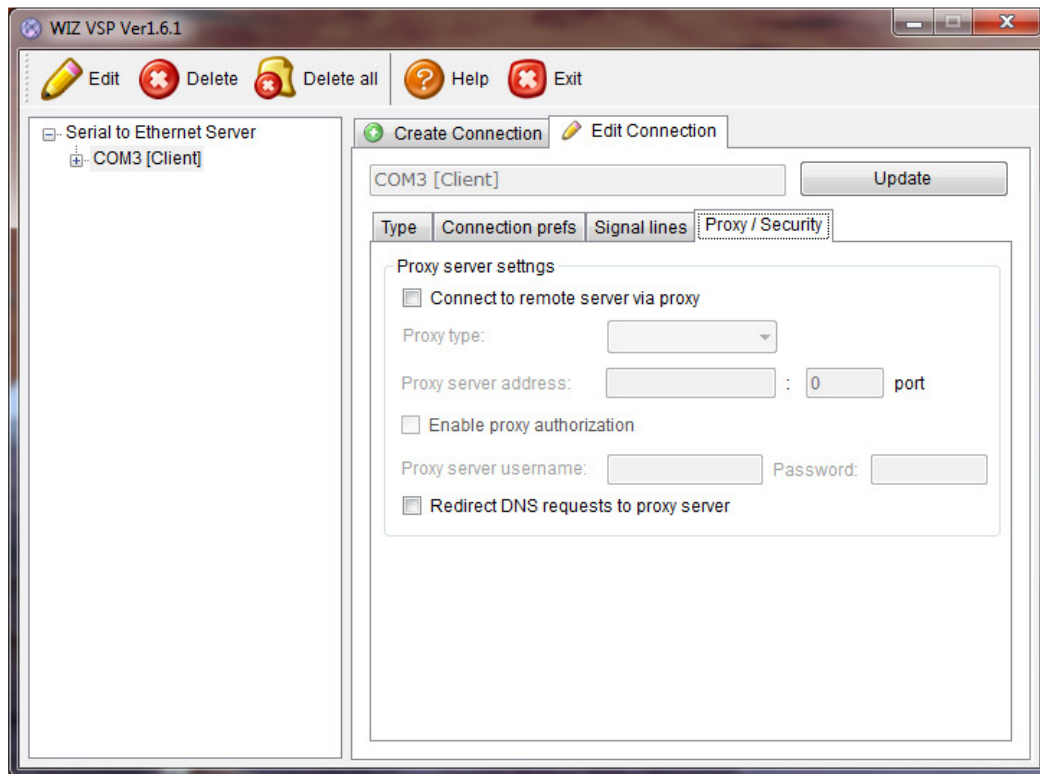


Fig. 28: Setting up Ethernet connection, screen 4

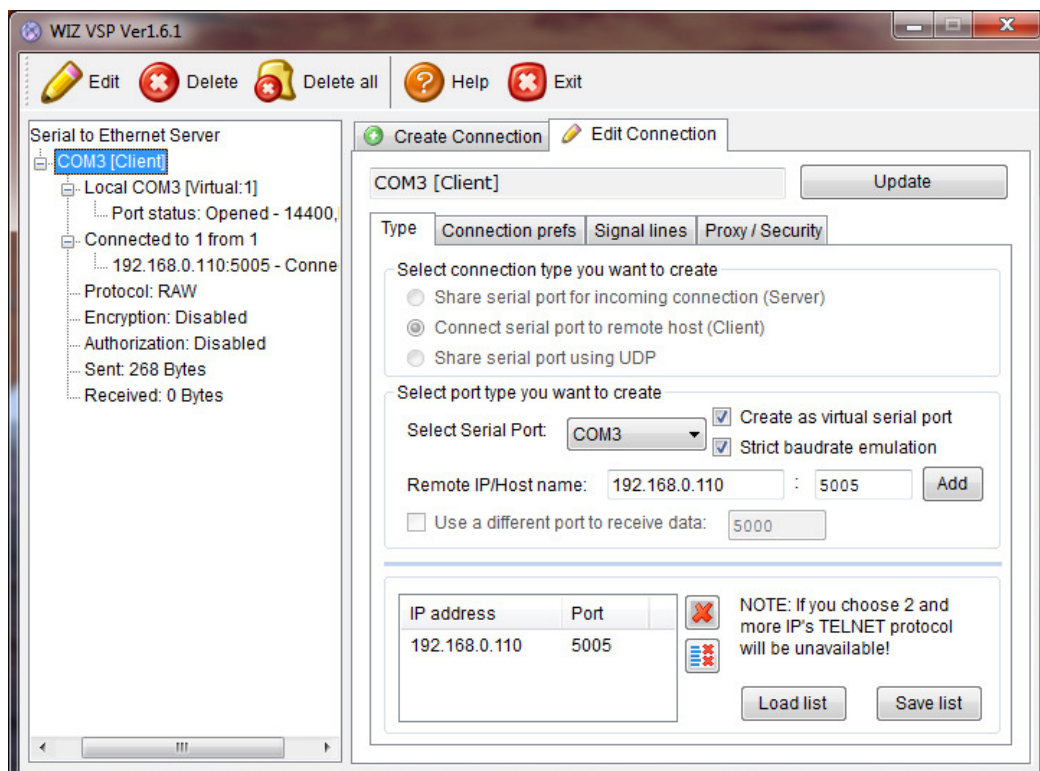


Fig. 29: Setting up Ethernet connection, overview

Appendix C – Universal amplifier control board layout

Main board layout

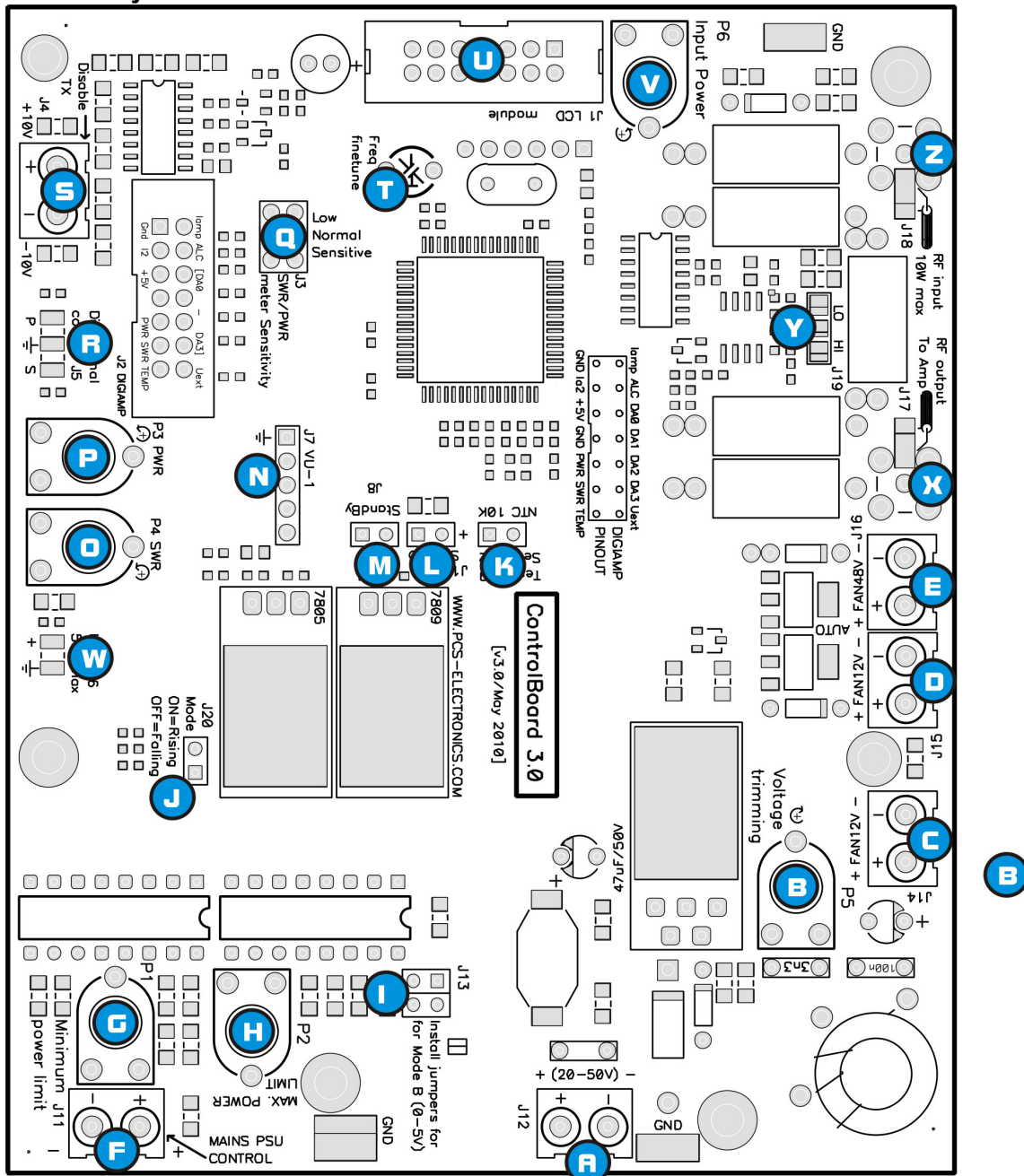


Fig. 30: Universal amplifier control board v4.0

Ref.	Function
A	J12 - 17-50V DC mains power supply input
B	P5 - Fine adjustment for on-board DC/DC power supply (12-16V)
C	J14 - Output from the on-board DC/DC power supply, 12-16V/2A. Use for fans or your exciter.
D	J15 - Automatic fan, 12V (powered through on-board DCDC). Total current for C+D = 2A max.
E	J16 - Automatic fan, 17-48V (powered through ref A)
F	J11, Control output. This output is used to control mains power supply voltage or drive power. Explained in detail later in this manual.
G	P1 - Control output minimum power limit. Explained in detail later in this manual.
H	P2 - Control output maximum power limit. Explained in detail later in this manual.
I	J13 - Install jumpers for mode B. In mode B the output gives DC control voltage, 0-5V, rising or falling depending on J20 (ref J)
J	J20 - Control output mode, either rising or falling (ON=RISING)
K	J9 - Power supply temperature sensor (Tpsu) – 10K NTC thermistor
L	J10 - Stand-by indicator LED
M	J8 - Stand-by switch
N	J7 - VU meter header. Connects to VUMAX-1. Shows output power and SWR on 2 of the 4 available LED bar graphs.
O	P4 - SWR meter adjustment
P	P3 - PWR meter adjustment
Q	J3 - PWR meter sensitivity adjustment, install jumper
R	J5 – Solder pads for external directional coupler (power/swr meter), no need to connect when you use Digiamp (pcs lpf 5000 or 6000).
S	J4 - Bias disable control voltage, either positive or negative. Make sure to check what your pallet needs!!
T	Fine tuning for frequency meter accuracy
U	J1 - LCD module
V	Input power alarm activation threshold
Z	J18 - RF input from exciter
X	J17 - RF output, going to amplifier/pallet
Y	J19 - Frequency meter range selection solder pads. Make sure to set the same range in the LCD module.
W	J6 – Amplifier voltage, connect to pallet supply voltage (after fuse), no need to connect when you use Digiamp (pcs lpf 5000 or 6000).
X1	J2 - Digiamp header, carries all relevant signals from PCS LPF 5000 PCS LPF 6000 filter boards (they include current meter), greatly simplifying design and assembly.

Table 5: Description of various elements of the Universal Amplifier Control Board v4.0

LCD module layout

LCD control module is pretty simple and self-explanatory, but let us have a quick look, note you can disable keys by soldering over the “Lock Keys” solder bridge:

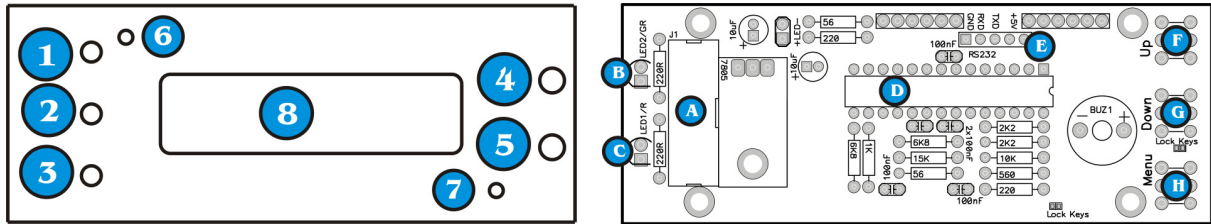


Fig. 31: LCD module layout, front and back

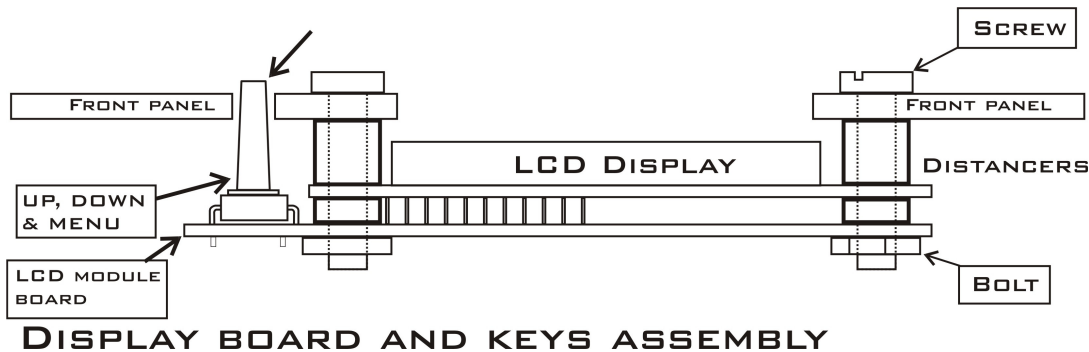


Fig. 32: Installing display board into an enclosure, side view

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	Connections to the IO board (RS232 or USB)

Table 6: Description of various elements of the LCD display module

LCD control module is pretty simple and self-explanatory, but let us have a quick look;



Appendix D – How does it work?

The primary task of the universal control board is to facilitate control of output power and help protect and monitor the amplifier. There are generally three ways to control the amplifier's output power:

- by varying its drive level (either by inline adjustable attenuator or by changing exciter output power)
- by varying the gain of the amplifier (usually by moving its working point).
- by varying its supply voltage (requires adjustable power supply)

Controlling drive power works very well for amplifiers operating in linear mode, but such amplifiers are almost never used in the output stages of FM band amplifiers due to poor efficiency and large amounts of generated heat. When you reduce drive level of a typical fm band amplifier you may at some point experience instability and rise of spurious output. Oscillations can even lead to premature failure of the final stages. This method is definitely not the best for FM radio and offers only limited range of reliable control.

Controlling ob bias point has its shortcomings as well, it can also lead to instability and its range of control is also limited.

Controlling of supply voltage enables full control of power practically down to zero. You may need to use it in tandem with controlling of drive power to prevent saturation (when used in linear mode – TV for example).

As you can see the best results can be obtained by controlling supply voltage to the amplifier. This guarantees power efficiency (no unnecessary heat generated in low power modes), stability and good control virtually down to zero watts output. Universal Amplifier Control Board v4.0 supports this mode of control of the amplifier, but it can also be used for the other two modes. This manual will show you how to implement all of these modes.

The block diagram of the amplifier control board in a system is shown below. It is simplified as the actual block diagram would be too complex for this manual. Only the basic building blocks are shown and briefly explained one by one.

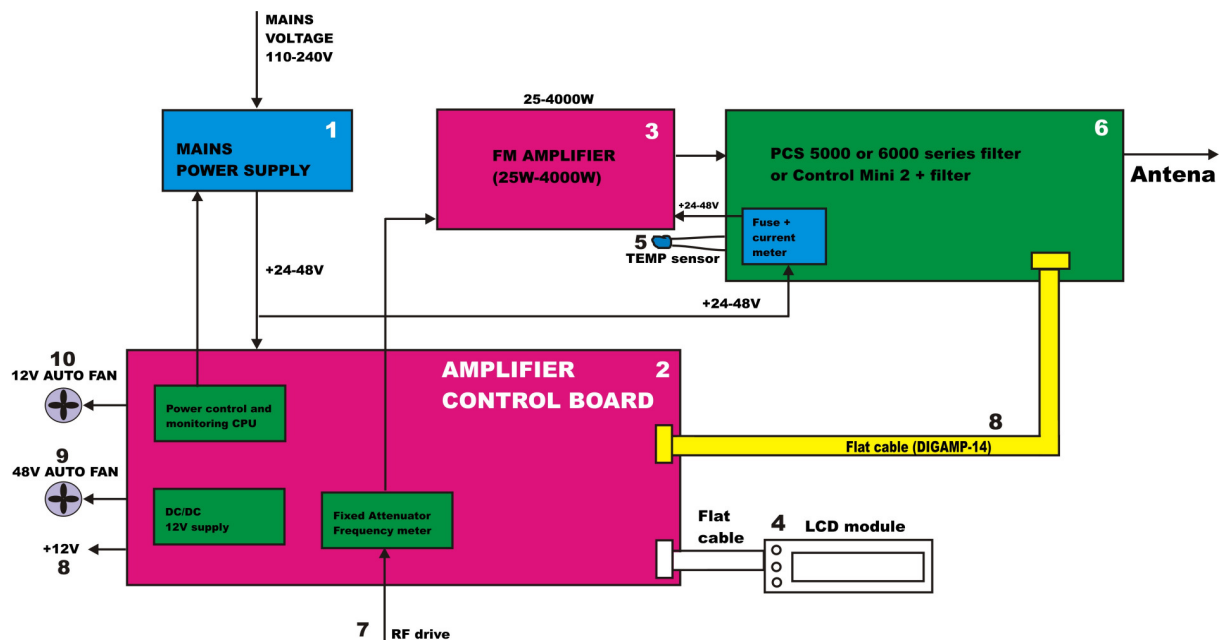


Fig. 35: Block diagram of the Amplifier Control Board v4.0

Reference	Function
1	Adjustable mains power supply
2	Universal amplifier control board v4.0
3	FM amplifier under control
4	LCD control module
5	TEMP sensor, 10K NTC resistor
6	5000 or 6000 series filter from PCS Electronics
7	RF drive
8	On-board 12V power from on-board DCDC converter, 2A max (including 12V fan)
9	Automatic 48V FAN
10	Automatic 12V FAN

Table 6: Description of various blocks of the Universal Amplifier Board v4.0

Controlling the power

As we established the most appropriate method of control is by varying the supply voltage of the mains power supply. Most mains power supply units have a trimmer that you can use to set the output voltage. You can remove that trimmer and connect two leads to the control board header J11 (F).

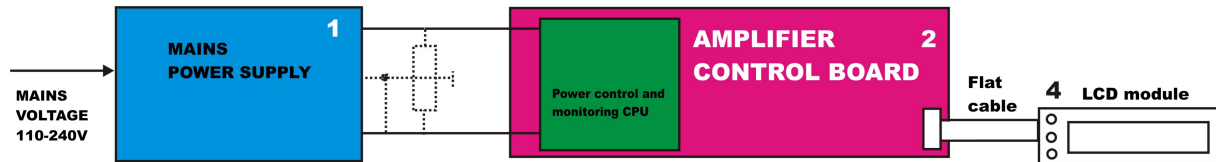


Fig. 36: Block diagram of the Amplifier Control Board v4.0

There are mains power supply units out there that have dedicated control voltage input, typically this control voltage needs to be in the 0-5V range. You can connect header J11 (F) directly to this control voltage input. In order for this to work you have to install the two jumpers J11. This mode of operation is called mode B.

Another thing to consider is that with some mains power supplies the output voltage rises proportionally with the control voltage and with other it is inversely proportionally to the control voltage. You can compensate for this with J20 (J). It lets you select falling or rising mode.

You can also use control voltage (mode B) to control adjustable attenuator. This is usefull in linear mode applications, such as TV amplifiers. Low power adjustable attenuators are relatively easy to construct.

For more advanced users here is a diagram of the control circuitry.

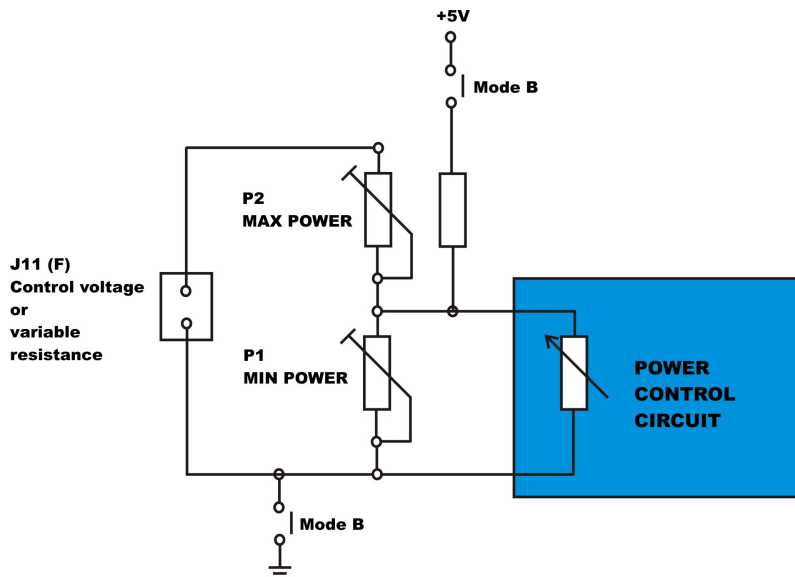


Fig. 37: Diagram of the control circuitry of the Amplifier Control Board v4.0

Appendix E – Wiring the Amplifier Control Board v4.0

Temperature sensors

Control board supports two temperature sensors. Amplifier temperature sensor and second sensor, which can be used either for monitoring power supply temperature or monitoring some other parameters.

Amplifier temperature sensor is connected via the DIGIAMP (J2) interface and the actual sensor is located on the PCS LPF 5000 or 6000 filter boards. If you do not want to use the PCS LPF 5000 or 6000 you can also connect amplifier temperature sensor to the DIGIAMP header manually. What you need is the 10K NTC resistor. Connect one end of this resistor to the TEMP pin and the other end to ground. The pinout of the DIGIAMP header is printed on the main board of the CONTROL BOARD V4.0, use the TEMP pin.

Second temperature sensor can be connected to K (J9). It is the same 10K NTC resistor. You can set alarms for both of the temperatures.

DIGIAMP interface

The digiamp interface greatly simplifies assembling an amplifier or transmitter. It easily connects to the PCS LPF 5000 or 6000 filters. Exact pinout is printed on the board. This 14-pin header connects the following lines:

- Amplifier current
- Amplifier supply voltage
- Measured Power and SWR lines
- ALC (used only for exciters)
- +5V and GND

Standby switch (J8) and LED (J10).

You can connect a switch with built-in LED diode here. Whenever you activate standby mode the supply voltage drops and bias disable is activated. Makes it possible to quickly disable RF output.

BIAS DISABLE output

Most pallets have bias control inputs, this input is designed to shut off the pallet by altering the work point of the amplifier. Bias disable function in control board helps shut off power either in standby mode or in alarm conditions (excessive SWR, temperature, excessive drive). Two voltages are provided here, positive and negative. Depending on the pallet type used you can use one or the other to disable the pallet under control.

With many pallets just pulling the bias disable input may be sufficient. To do this pull the bias disable low with the help of a small NPN transistor or N-Fet. To shut pallets off completely you may need to pull bias disable slightly to the negative. You can do this with the negative bias disable output.

To get the exact voltage needed feel free to use resistors, diodes/zener diodes or a simple NPN transistor.

ON-BOARD attenuator

Using a small attenuator at the input of an amplifier is recommended and levels up the matching between the exciter and the amplifier. The on-board attenuator can take about 5-7W of power and also supplies a small sample of the signal to the

frequency meter. If you do not wish to use it draw a small sensor wire from the RF input of the control board to the RF input of the amp (just couple it loosely via 1pF-10pF capacitor depending on used frequency band).

Appendix F – Warranty and legal info

Warranty and servicing!

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

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Revisions and errata

V1.0 (August,2020): Release version

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

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