

# CyberMax series amplifiers

And Universal Amplifier control Board v4.0

# 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!: 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 boards*

CyberMax series amplifiers are available for standard analog FM or DAB+ radio signal, analog or digital TV signal and also any 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 and control boards so great?**

- Smoother power adjustment than previous 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 low-level RF attenuator (perfect for DAB+ and other digital mode amplifiers)
- Automatic FAN activation at adjustable temperature (for higher current use relay please).
- Power, SWR, voltage, current, drive power and temperature read-out.
- Remote monitoring available for Windows

### **Technical specifications for units in rack enclosure:**

- Output RF connector: N female (0-900W), 7/16 (900W-3000W)
- Input RF connector: N female
- Drive power: Depends on the model, check our website for specifications (often set according to customer's requirement)
- Output power power: Depends on the model, check our website for specifications (often set according to customer's requirement). The control boards supports from 0 to 9999W so the 9999W is the maximum supported.
- AC mains power: 110-240V 50/60Hz universal, works everywhere on this planet
- Ambient temperature: -5° to +45°C
- External dimensions 200W/400W ( W x D x H ) 19" x depth (170mm) x height 2HE (88mm)
- External dimensions 600W, 800W ( W x D x H ) 19" x depth (170mm) x height 2HE (88mm)
- Physical weight 6Kg (200-400), 8Kg (600W), 9Kg (800W)
- External dimensions 1000W ( W x D x H ) 19" x depth (492mm) x height 2HE (88mm)
- Physical weight 15Kg (2H 1000W), volumetric weight up to 20Kg (2H 1000W)
- External dimensions 2000W ( W x D x H ) 19" x depth (550mm) x height 3HE (132mm)
- Physical weight 25Kg (2000W), volumetric weight up to 30Kg (2000W)

### **Thank you for purchasing CyberMax Amplifier or control board**

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

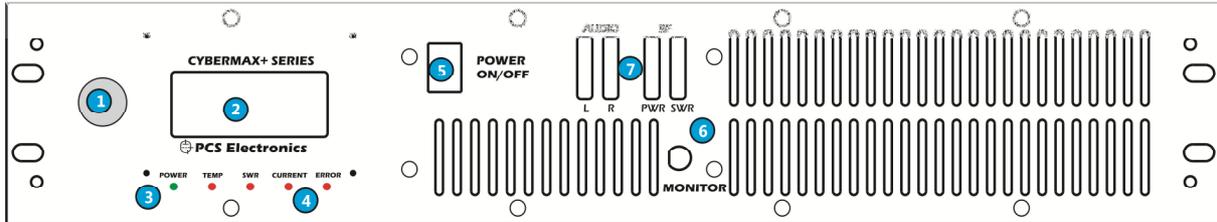


Fig. 1: Front panel in 2H model

Reference	Function
1	Rotary control button.
2	LCD display that lets you control the unit and monitor various parameters.
3	The green led. Green signals power is ON.
4	Red error led or leds. Turns on while SWR, TEMP or other alarm is active. Also while in stand-by.
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

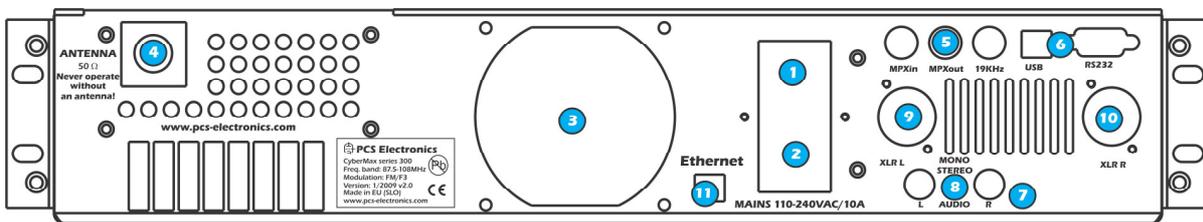


Fig. 2: Back panel for 2H model, actual positioning can vary slightly.

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	<b>Not shown. There is also N female RF input connector when used for amplifier.</b>

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.

### **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.
- Make sure your exciter is set to expected drive power before you connect it to the amplifier!
- Power up the exciter
- If necessary disengage the stand-by mode (flip the switch at the front). In case if it was not waiting for RF input but was in forced stand-by.
- Wait for the amplifier to ramp up the power to 25% as desired.
- 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.
- If your drive is excessive the amplifier may not be able to go low to desired power. In such cases reduce drive power.

## 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 PASSWIRD>. 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.

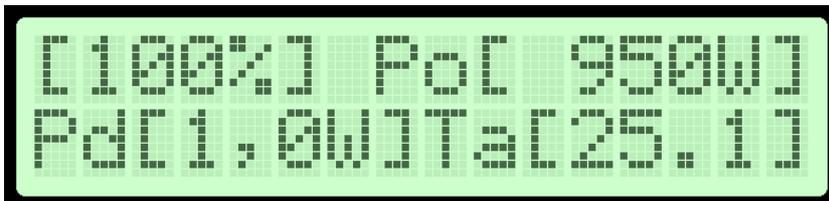


Fig. 3: Setting power, the power is set to 100% here, shown view type is display0

### <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.

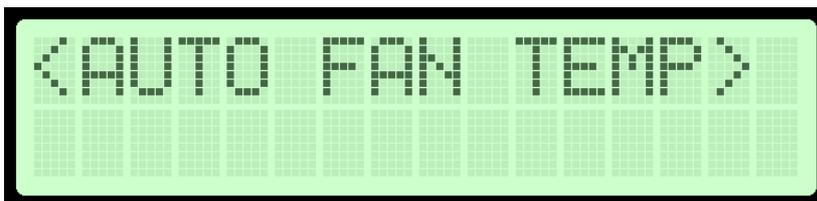


Fig. 4: Setting amplifier temperature at which the fan turns on automatically

### <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 hints 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.

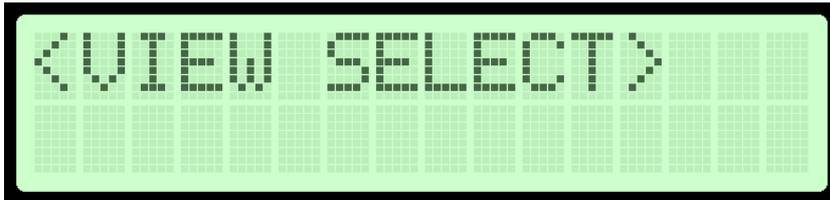


Fig. 5: Setting mode to stereo

### <LCD CONTRAST>

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

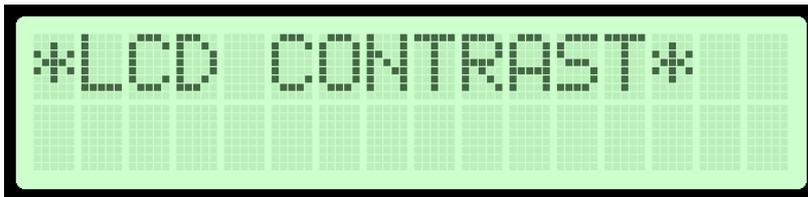


Fig. 6: Changing contrast

### <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:

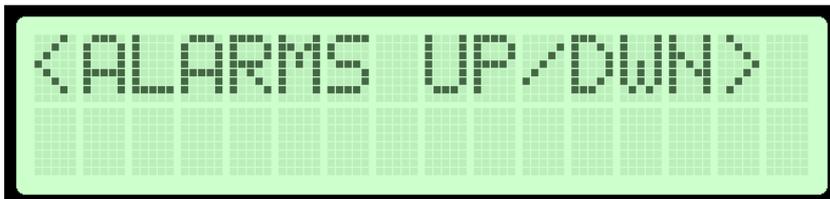


Fig. 7: Gateway to submenu dedicated to Alarms

### <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.

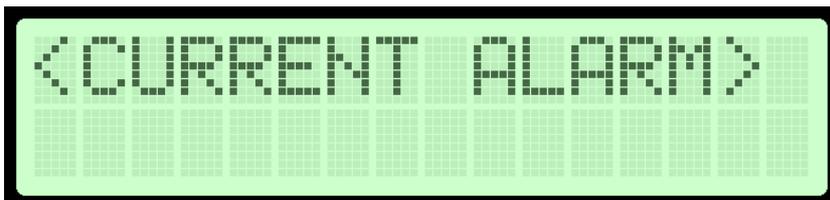


Fig. 8: Current alarm

### <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.

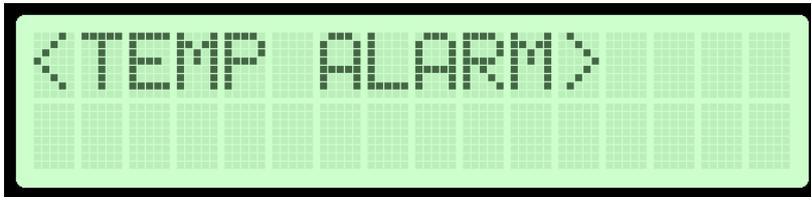


Fig. 9: Temperature alarm.

### <SWR ALARM>

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

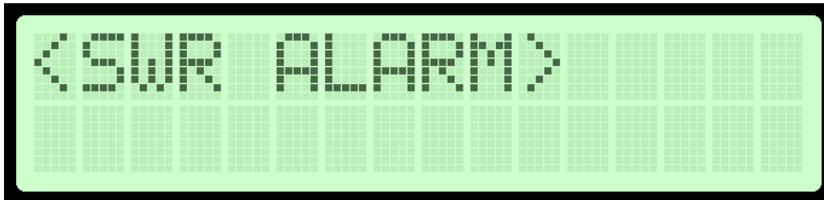


Fig. 10: Temperature alarm

### <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.

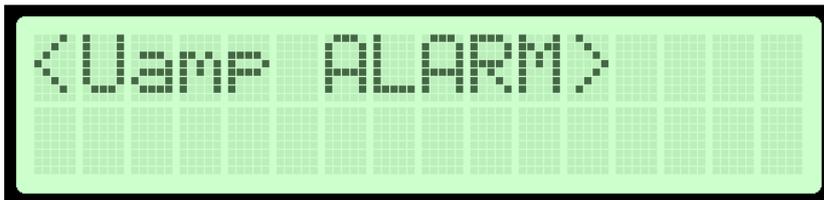


Fig. 11: Amplifier voltage alarm

### <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.

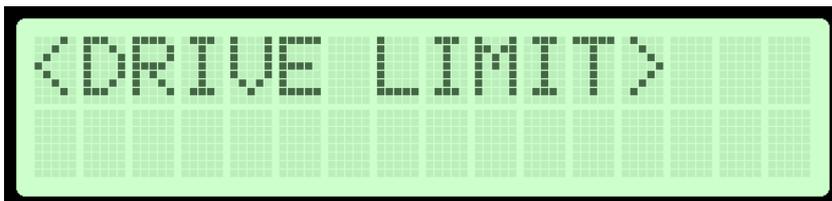


Fig. 12: Drive power limit

### <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).

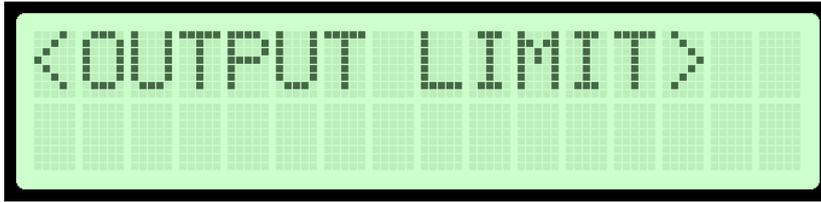


Fig. 13: Output power limit

### <FIRMWARE VER>

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

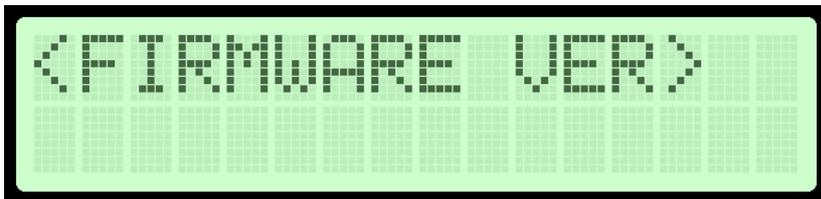


Fig. 14: Firmware version

### <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.

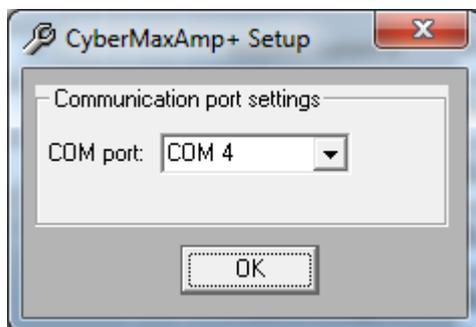


Fig. 16: COM port setup.

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, then click Device Manager:

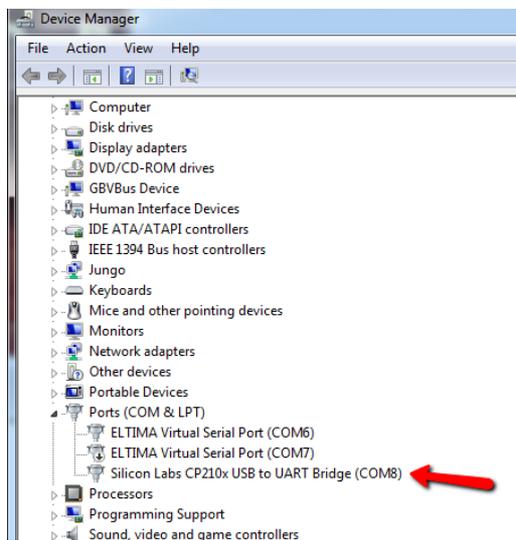


Fig. 17: COM port in device manager must match the one in CyberMaxAmp program.

## CyberMaxAmp+ program explained

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

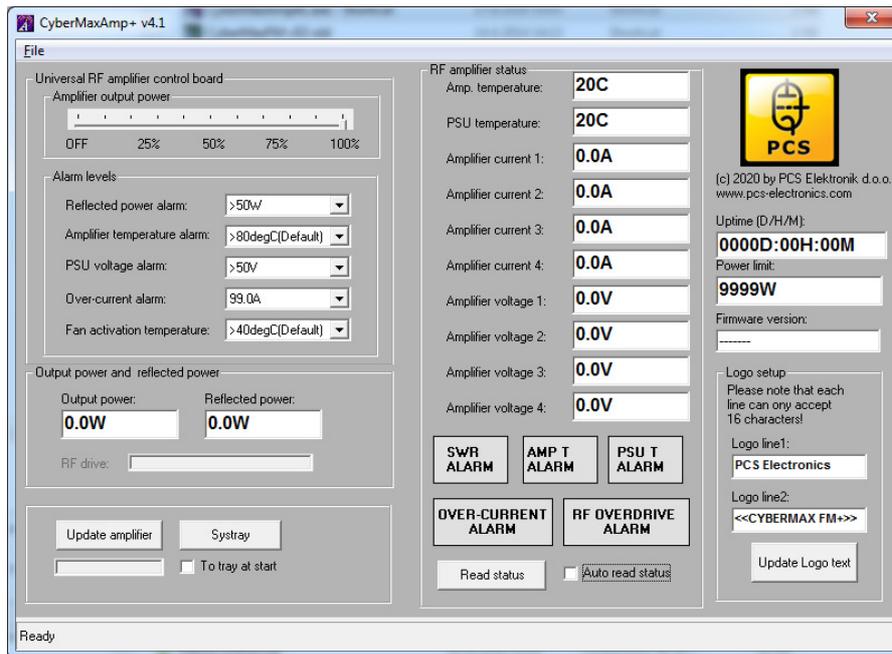


Fig. 18: Amplifier setup

### 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 excitors 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 19: So, do you think you can handle it? We think you sure can!

<b>PROBLEM DESCRIPTION</b>	<b>POSSIBLE SOLUTIONS</b>
Everything appears normal, but there is no RF power	<ol style="list-style-type: none"> <li>1. Wait a few more seconds, amplifier need about 20 seconds to get their power to full</li> <li>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</li> </ol>
Display shows Waiting for RF input or Stand-by, nothing is going on	<ol style="list-style-type: none"> <li>1. Turn on your exciter and make sure it is giving out power. With your exciter off your amplifier will go into stand-by mode and wait for RF input to appear.</li> <li>2. Make sure your unit isn't in forced stand-by mode, flip the stand-by/power switch at the front right of the LCD display.</li> </ol>
RF output power is too low	<ol style="list-style-type: none"> <li>1. Check the set power (in %)</li> <li>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.</li> <li>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.</li> <li>4. Exciter or driver may be too weak.</li> <li>5. Power limit may be set too low (it is shown at power-up time)</li> </ol>
LCD display keeps showing TEMP/SWR error warning	<ol style="list-style-type: none"> <li>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.</li> <li>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).</li> </ol>
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

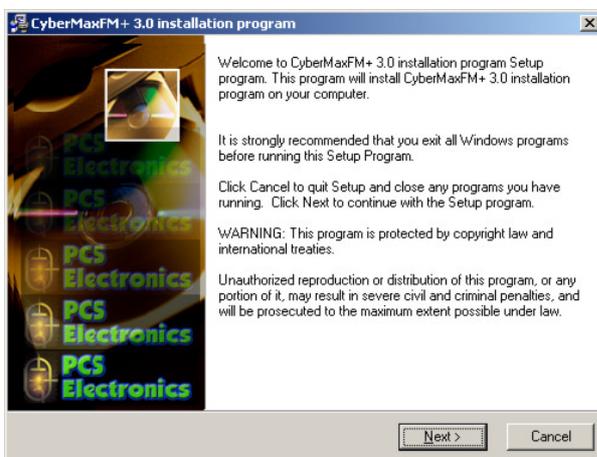


Fig. 20: Setup is about to start



Fig. 21: 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. 22: 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:

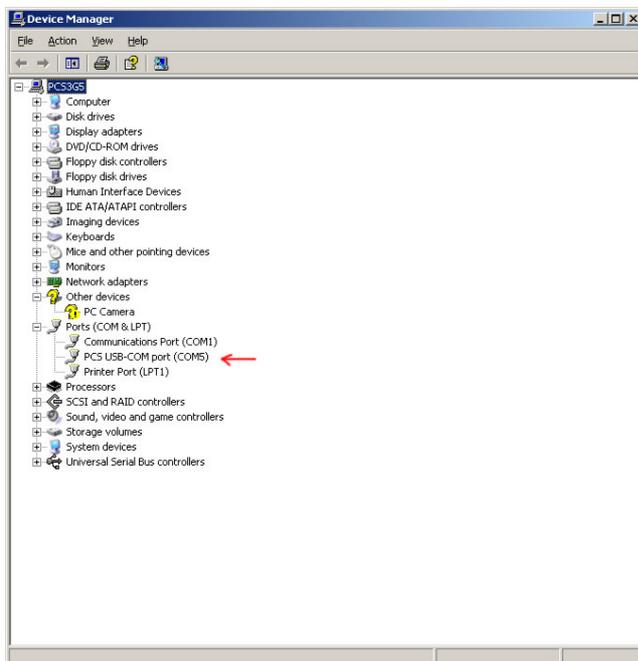


Fig. 23: Configuring Com port for USB driver

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:

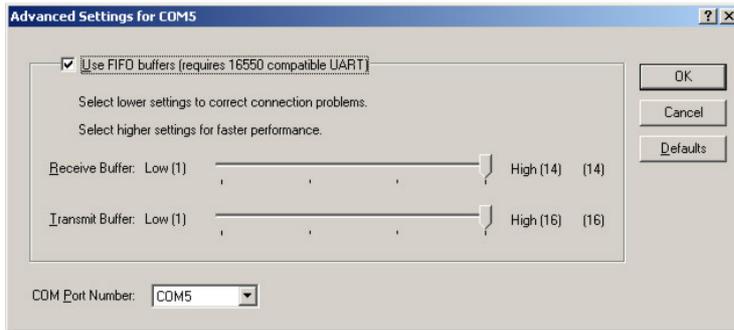


Fig. 24: Configuring Com port for USB driver

### 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.

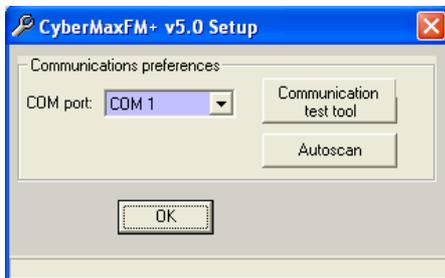


Fig. 25: Set COM port to 1 or 2 for RS232 IO board

## 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!

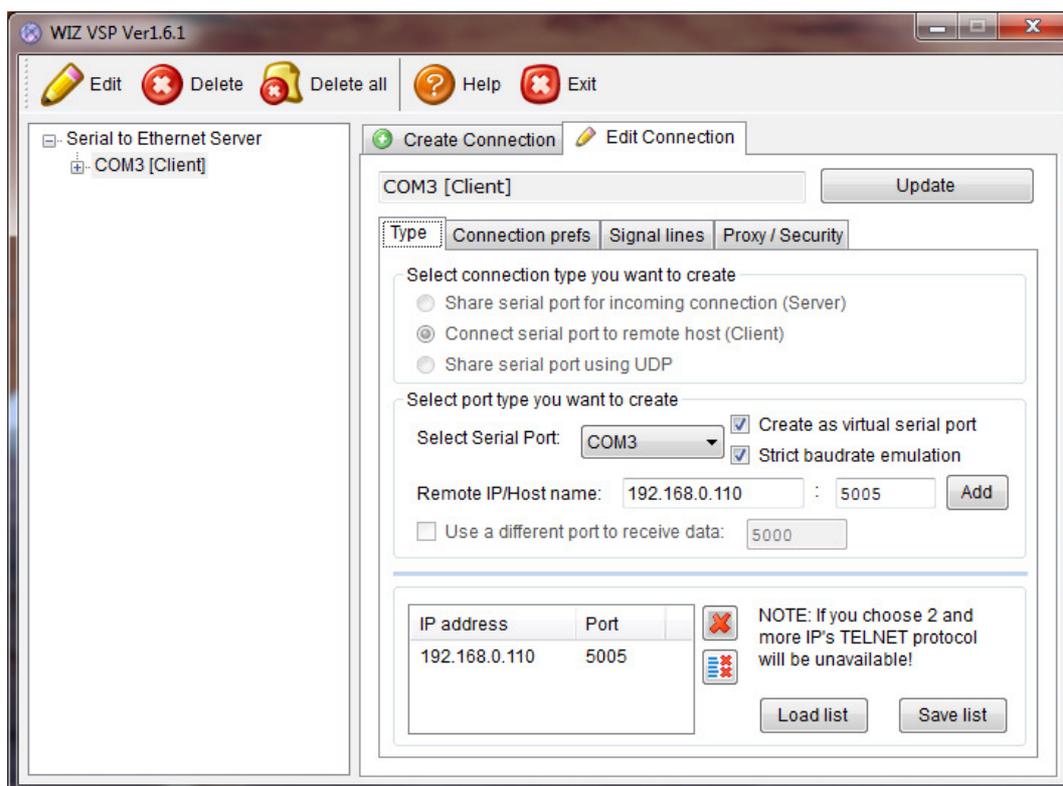


Fig. 26: Setting up Ethernet connection for CYBERMAXFM+, screen 1

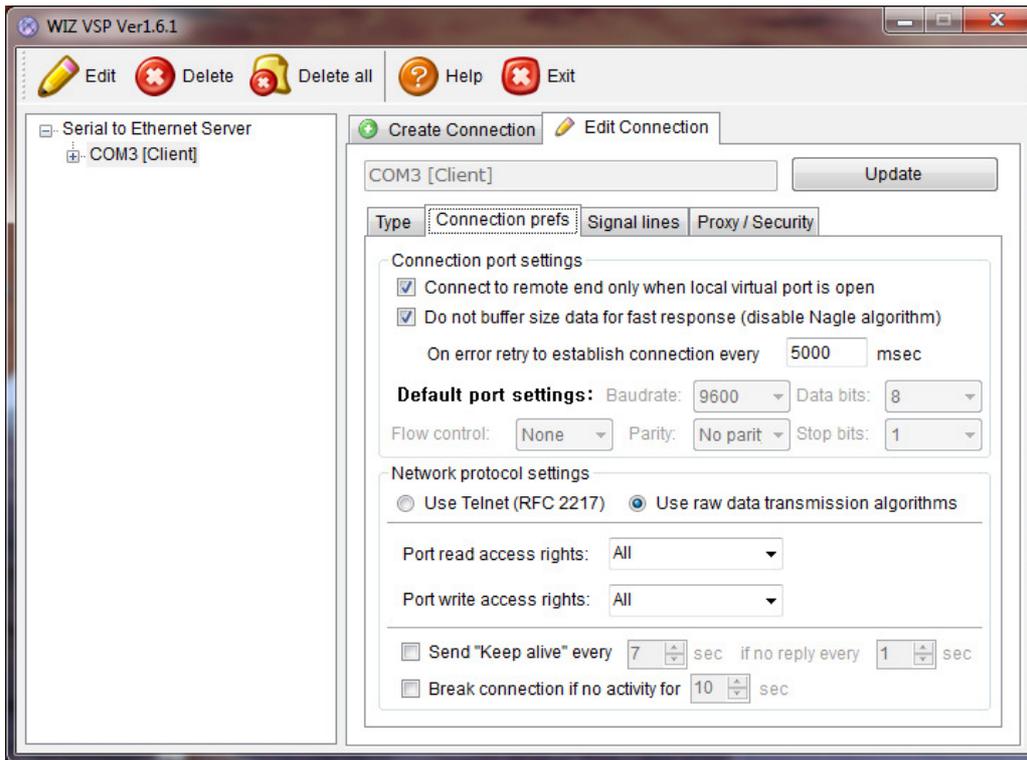


Fig. 27: Setting up Ethernet connection, screen 2

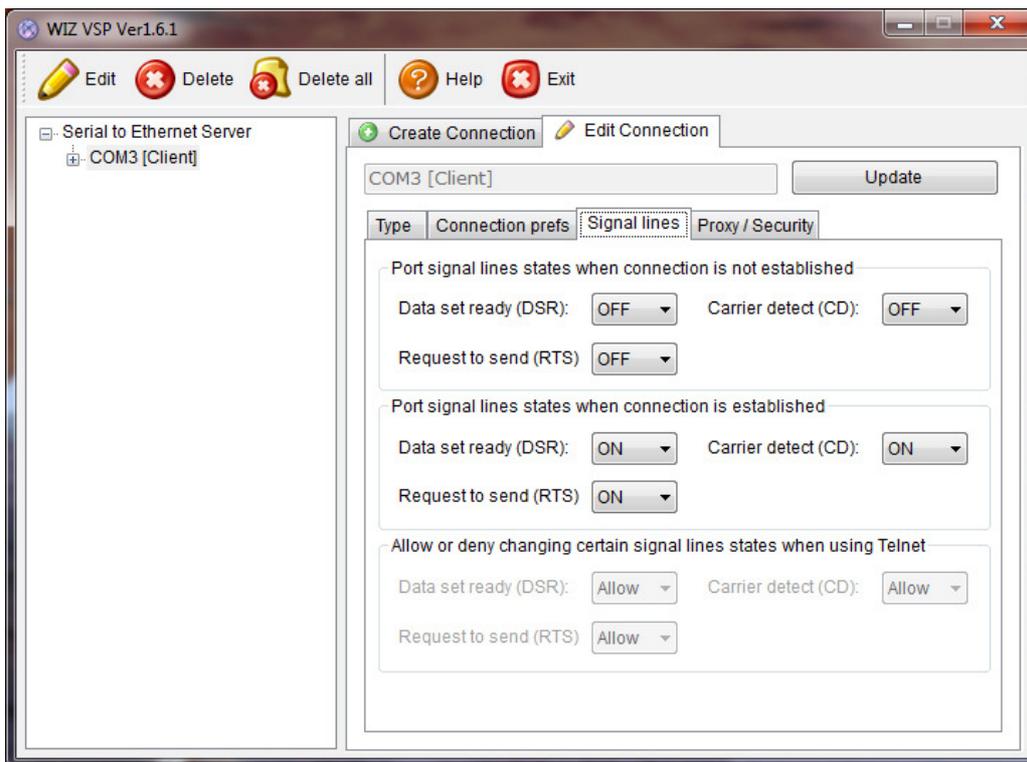


Fig. 28: Setting up Ethernet connection, screen 3

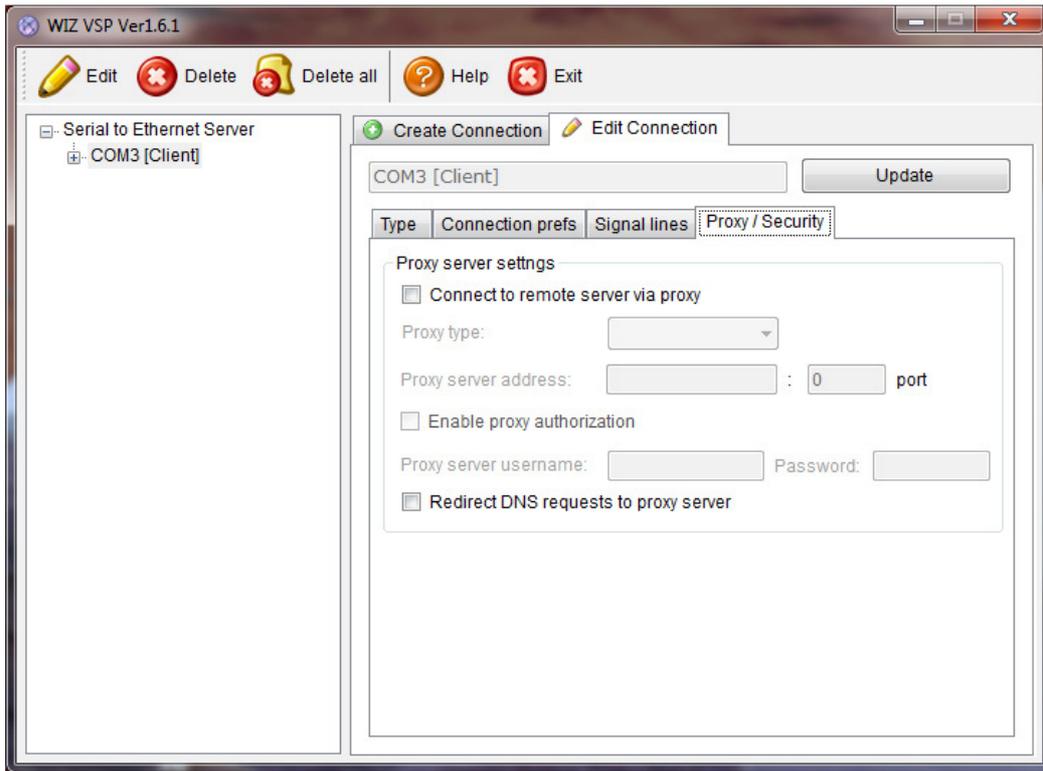


Fig. 29: Setting up Ethernet connection, screen 4

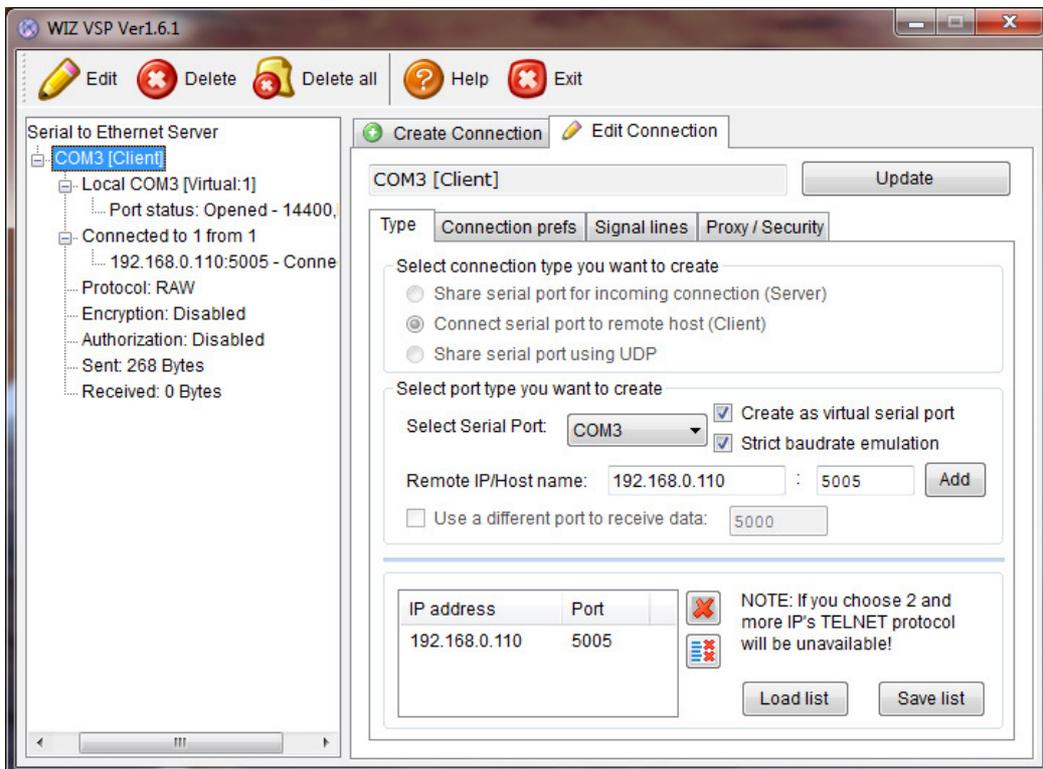


Fig. 30: Setting up Ethernet connection, overview



Ref.	Function
A	J12 - 17-50V DC mains power supply input
B	Power supply voltage control via resistance (requires LDR and LED to be active)
C	J15 - Automatic fan, 12V (powered through on-board DCDC). Total current for C+D = 2A max.
D	J16 - Automatic fan, 17-48V (powered through A). Note max current is about 1A so use a relay for stronger fans. Some fans have a very strong start-up current which can burn the fet.
E	J14 - Output from the on-board DC/DC power supply, 12-16V/2A. Use for fans or your exciter. This is permanently ON.
F	1K series trimmer for power supply control via resistance (requires LDR and LED to be active next to B)
G	LCD control module
H, I	Voltage and current measuring daughter boards
J	Digiamp interface
K	Power meter calibration / sensitivity
L	SWR meter calibration/sensitivity
M	Control voltage amplitude
N	Control voltage offset (control voltage can also extend into negative)
O	Three special purpose pins. Re1 and Re2 can be used for bias disable. One of them is negated. PTT is currently not used but
P	SWR/PWR sensitivity adjustment jumper
R	CAL is used to zero offset of the RF input detector. Turn the board off and disconnect RF input, install CAL jumper and power the board up. It will record the current voltage as zero. Now remove jumper and reboot. RF detector dc offset is now calibrated. This is important for RF input detection function and ensures amplifier powers down when there is no RF input.  JmpX is used to set direction of power adjustment voltage. It can be rising or falling depending on power control mechanism. With jumper installed the control voltage is falling.
S	RF input sensitivity adjustment
T	RF input overload protection (ignore)
U	RF input into resistor attenuator consisting of three resistors, change values as required
V	Output from simple resistor attenuator consisting of three resistors, change values as required.  This point is also input into adjustable attenuator via 1nF capacitor (remove capacitor if required)
X	Output from adjustable attenuator and input into on-board MMIC wideband amplifier. Note attenuator is controlled by power adjustment logic and the M+N trimmers also affect how this attenuator operates.
Z	Output from on-board MMIC wideband amplifier
1	LED inside stand-by switch
2	Stand-by switch
3	T power supply (Temp sensor, 10K NTC), this does not activate auto fan
3	T power supply (Temp sensor, 10K NTC), this does not activate auto fan
Ext amp	You can use this control voltage to adjust power, it can either control bias power via LED which changes resistance of LDR which can control power supply. Your creativity is required here.

Table 4: Description of various elements of the Universal Amplifier Control Board v4.0

### 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.

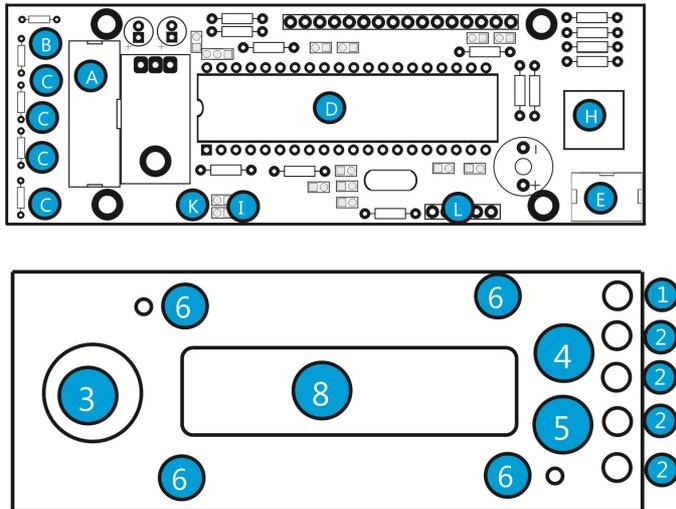


Fig. 32: LCD module layout, front and back, rotary encoder version 2x16

Reference	Function
3, H	Rotary button
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	PGM jumper, installing this jumper lets you set power limit (ALC) and access ramp up/down menu
K	LOCK jumper, installing this jumper lets you set password to lock the display

Table 5: Description of various elements of the LCD display module

## 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 which usually reduces also gain of amplifier (requires adjustable power supply)

### Controlling drive power

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. If you want to use an amplifier in situations where linearity is required adjustable attenuator comes into play, especially if you have access to low-level signal which can be used in our on-board attenuator. To use on-board adjustable attenuator:

- Set menu ramp to rising. JmpX is used to set direction of power adjustment voltage. It can be rising or falling depending on power control mechanism. With jumper installed the control voltage is falling so remove the jumper.
- Connect bias disable to Re1 or Re2 (one is for + disabled, the other is for zero disabled depending on pallet design make a choice).
- Connect digiamp or power/swr sensors, daughter boards for voltage and current, connect stand-by switch
- Connect low-level signal to point U or V, adjust attenuator values as desired. You can disconnect attenuator (cut lead). Maximum input into attenuator is about 100mW
- Take attenuated output from point X. Note there are some losses. If you wish you can take output from point Z which is amplified by MMIC wideband amplifier.
- Adjust trimmers M and N for best response (range of attenuation).
- Make sure to calibrate with CAL for zero reading with no RF input.

### Controlling bias voltage

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). This method is definitely not the best but sometimes the only feasible to control the amplifier. To use bias control:

- Set control voltage ramping from low to high or vice versa as required. JmpX is used to set direction of power adjustment voltage. It can be rising or falling depending on power control mechanism. With jumper installed the control voltage is falling.
- Connect bias disable to Re1 or Re2 (one is for + disabled, the other is for zero disabled depending on pallet design make a choice).
- Connect a sample of RF input power to U so that the board can detect that RF input is present.
- Connect digiamp or power/swr sensors, daughter boards for voltage and current, connect stand-by switch
- Connect low-level signal to point U or V, adjust attenuator values as desired. You can disconnect attenuator (cut lead). Maximum input into attenuator is about 100mW

- Take control voltage from point +Ext. This voltage will either go down or up as your power ramps up. Using a reverse polarized diode you can use this to pull bias voltage towards zero or even negative.
- Adjust trimmers M and N for best response (range of reduction of bias).
- Make sure to calibrate with CAL for zero reading with no RF input.

### **Controlling mains power supply**

The best results for FM band amplifiers 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. To use mains power control:

- Set control voltage ramping from low to high or vice versa as required. JmpX is used to set direction of power adjustment voltage. It can be rising or falling depending on power control mechanism. With jumper installed the control voltage is falling.
- Connect bias disable to Re1 or Re2 (one is for + disabled, the other is for zero disabled depending on pallet design make a choice).
- Connect digiamp or power/swr sensors, daughter boards for voltage and current, connect stand-by switch
- Connect a sample of RF input power to U so that the board can detect that RF input is present.
- Connect LED diode to -LED+ and make it illuminate LDR. Connect LCD (B) to trimmer in power supply. You can also use control voltage from EXT+ to control power supply. The LED-LDR combo must be encapsulated and protected from light (such devices can be purchased also).
- Adjust trimmers M and N for best response (range of reduction of bias).

This is definitely not easy and is not recommended for beginners. We recommend customers to buy a fully assembled product!



## **Appendix E – 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

V1.1 (Jan,2021): First update

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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