

Instruction Manual



OM1500

SHORTWAVE PLUS 50 MHz POWER AMPLIFIER

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1. SAFETY INSTRUCTIONS

Read these safety instructions carefully first, before you will start to install and operate power amplifier.

WARNING! DANGEROUS HIGH VOLTAGE!

The OM1500 power amplifier is using high voltage up to close 3000V DC, which is very dangerous for human life! Follow strictly all the safety instructions listed below, please!

WARNING! NEVER ALLOW CHILDREN to play around PA, to touch power amplifier or connected cables in working condition or to insert anything into the case holes!

WARNING! The amplifier contains high voltage circuits. Never turn the amplifier on without the upper lid in place. **DO NOT ATTEMPT TO SHORT OR BYPASS** safety switch under upper lid!

WARNING! To prevent damage which may result in fire or electric shock hazard, do not expose this equipment to rain or moisture. The OM1500 HF amplifier is neither to be used in a **WET** or **HUMID** environment!

WARNING! Do not turn the amplifier on without having connected the **ANTENNA** or properly rated **DUMMY LOAD**! A hazardous HF voltage may build up on the antenna connector after turning the amplifier on with no antenna or dummy load connected!

WARNING! Before opening the upper lid of the amplifier make sure that power supply has been disconnected **AT LEAST 10** minutes allowing the electrolytic capacitors to discharge fully. Disconnect power cord from the outlet!

CAUTION! The amplifier must be installed in such a way that free flow of hot air from the tube is allowed. Do not block any ventilation holes. Do not install this equipment in a confined space such as a tight shelves, bookcase or similar unit. Leave rear side of the amplifier accessible.

CAUTION! The OM1500 power amplifier must be grounded properly during operation.

CAUTION! The amplifier is an A category product. In a household it can influence other electric appliances. In such cases the user is to take proper actions to mitigate this disturbance.

CAUTION! Read this manual carefully. Follow all of instructions during installation and operation to avoid damage to the amplifier not covered by manufacturer's warranty! Do not attempt to perform any change of hardware or software!

2. GENERAL INFORMATION

2.1. Introduction

The OM Power model OM1500 is a manual tuning power amplifier, designed for use on all short wave amateur bands from 1.8 to 29.7 MHz (incl. WARC bands) + 50 MHz and all modes. It is equipped with one GS23B ceramic tetrode.

2.2. Specification

2.2.1. Parameters

Frequency Coverage	Amateur Bands 1.8 – 29.7 MHz incl. WARC + 50 MHz
Power Output	1500+ W in SSB/CW on HF bands 1000 W CW/SSB on 50 MHz 1000+ W in RTTY
Input Power	40 to 60W for full Output Power
Input Impedance	50 Ohm, VSWR < 1.5 : 1
Power Gain	typically 14 dB
Output impedance	50 Ohm unbalanced
Maximum output SWR	2:1
SWR protection:	Automatic switching to STBY, when reflected power is 250W or higher
Intermodulation distortion	-32 dBc
Suppression of harmonics	< -50 dBc
Tube	GS23B Ceramic tetrode
Cooler	Centrifugal blower
Power supply	Selectable 220, 230, 240VAC - 50 Hz
Transformer	1 piece of toroidal transformer 2,3 kVA
Dimensions	390mm x 195mm x 370mm (width x height x depth) 15.4" x 7.7" x 14.6"
Weight	22 kg (48 lb)

2.2.2. *Protection Circuits*

There is several special protection circuits used in the amplifier. They are activated when one or more of next parameters exceed defined values or some unwanted occasion occurs.

- VSWR too high
- Anode current too high
- Anode voltage error
- Screen current too high
- Screen voltage error
- Grid current too high
- Grid voltage error
- Heating voltage error
- Mistuning of Power Amplifier
- Temperature too high
- Soft start for protecting your fuses
- “switch-on blocking “ at opened amplifier
- Blower error

2.2.3. *Indicators*

Number of indicators visible on the front panel will inform you about value of some parameters or operation status:

OLED display	4 x 20 characters
Analog Wattmeter	Double system meter for forward and reflected power measuring
LED Indicators	ON AIR – amplifier in transmitting mode STBY – standby mode FAULT – failure, switching off for abt. 4 sec ON – ON status TUNE – assists in tuning the amplifier (3 LEDs)

2.2.4. *Features*

Manufacturer implemented some of the company's current development results with most wanted operating and safety features into this new model:

- High level of protections
- Antenna switch for 3 different antennas
- Memory for faults and warnings, easy maintenance
- Automatic set-up anode current (BIAS) – no need to adjust manually after changing the tube
- Automatic set-up of blower speed according to temperature
- Full QSK with silent relay
- Many operational parameters to display
- Easy transport due to detachable HV transformer option
- The smallest and lightest 1500W PA on the market at the end of 2012

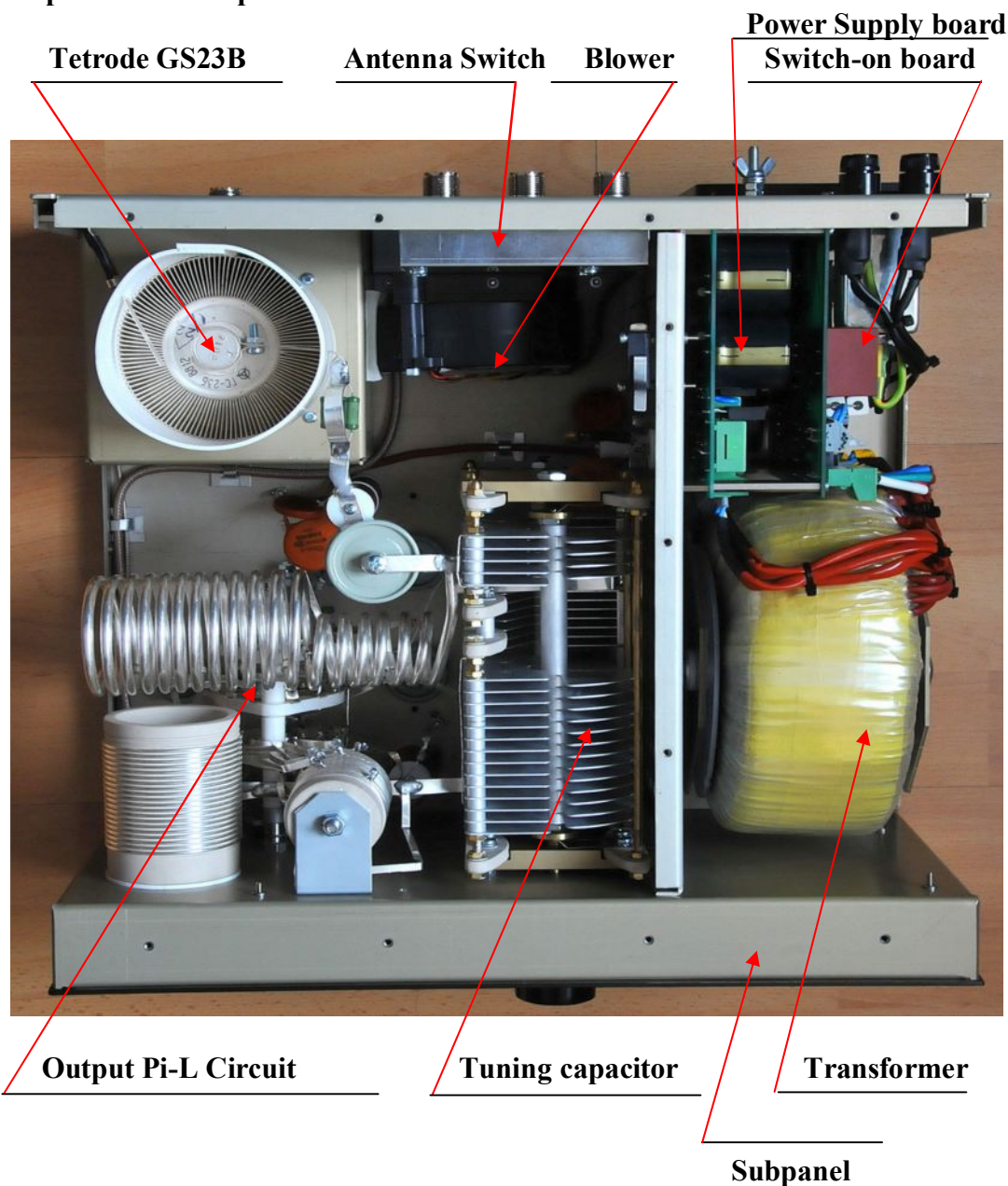
3. GENERAL DESCRIPTION

3.1. HF part

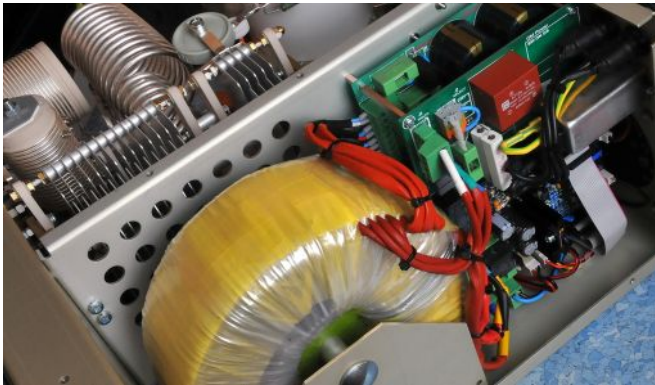
In this amplifier a tetrode GS23B is used in a grounded-cathode circuit (input into control grid). This amplifier achieves excellent linearity by the voltage stabilization of the control grid bias and the screen voltage. The power input is given to the control grid, using a broadband input circuit with an input impedance of 50 Ohms. This adaptable input circuitry ensures a good input SWR (better than 1.5:1) on all amateur bands.

The output of the amplifier is a Pi-L circuit. The ceramic capacitor for TUNE and LOAD are divided. This enables the amplifier to be tuned exactly and makes it possible to easily return to the previously set positions after band changes.

Top view on the opened OM1500



3.2. Power Supply



Power amplifier is using a 2.3 kVA toroidal transformer. A soft start is provided using relays and resistors (on the front board).

The high anode voltage is made by combining 1x600 V and 3x800V sections (total 3000V) @ 1A. Each section has its own rectifier and filter. In the high voltage circuit, safety resistors are employed to protect the amplifier against overload (rear board).

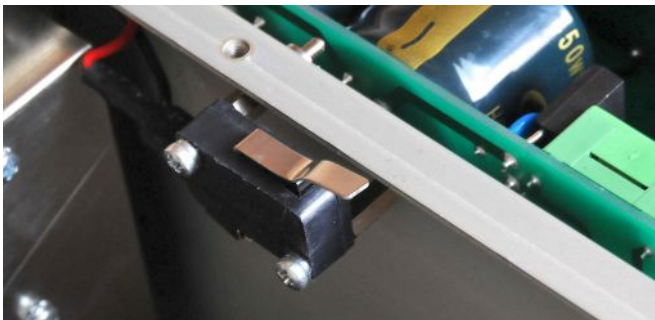
The source for screen grid is taken from 600V section, regulated by parallel stabilization with BU941 and delivers a voltage of abt. 480V at 80mA. The -75V for the control grid is regulated by PWM from uP.

CAUTION

Primary section of the transformer is switchable for 220 - 240 VAC. Factory setting is 230VAC. If the AC voltage in your network is 220 or 240 Volts, you need to set the correct value before first starting of the PA. See part 7.1. for more information.

3.3. Safety Devices

Control and monitoring circuits ensure control and safety during malfunctions of the PA. These are on the Control board, which is located on the chassis subpanel.



One of the very important safety elements is mechanical switch for transformer primary (AC) blocking at opened amplifier.

4. INSTALLATION

NOTE

Read this chapter carefully prior you will start installation. Before unpacking inspect shipping carton first, if it is not damaged. Keep all of packing parts for possible future shipment. Check unpacked power amplifier. If you find some damaging, contact your dealer immediately to keep full warranty.

During installation go step by step according to the next parts.

4.1. Grounding

CAUTION

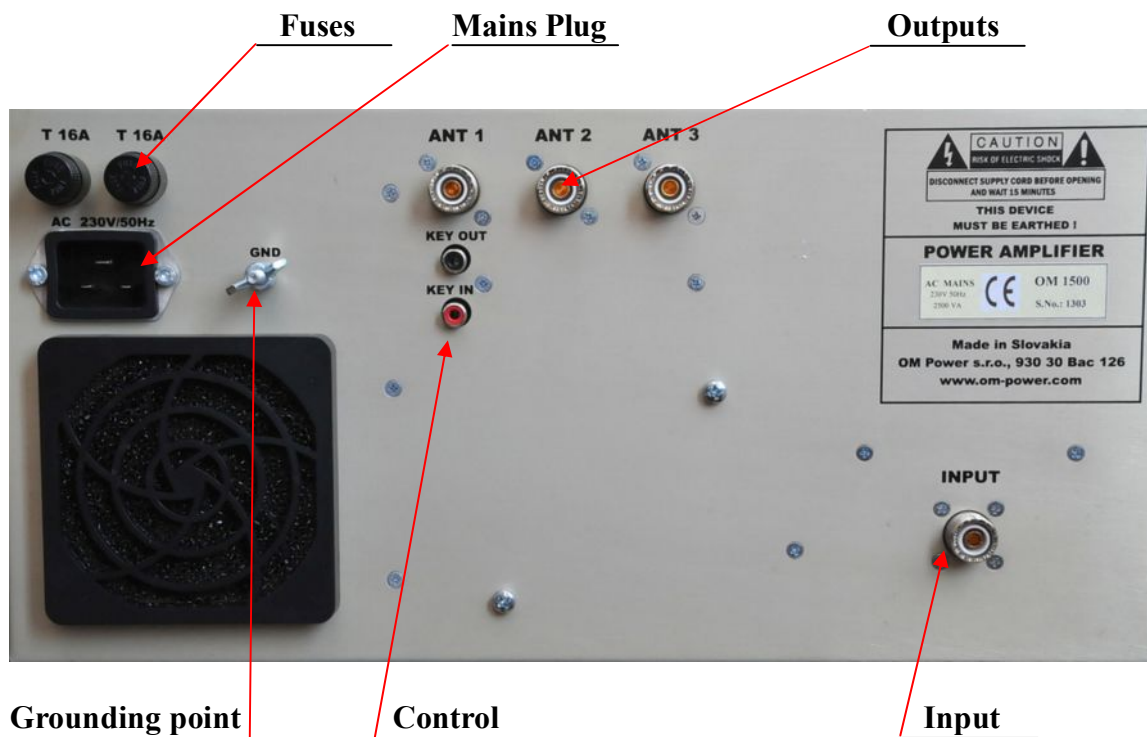
The amplifier has to be grounded properly! Connect the screw on the rear panel of the amplifier to your local grounding system with a copper cable; use a cross-section of 4 mm² at least.

Connect your transceiver to the same grounding system of your shack carefully! Use minimum length cables and make certain that the connections are both physically and electrically sound. With poor grounding, you may risk damaging your equipment, having problems with TVI/BCI or your transmitted signal may be distorted.

4.2. Coaxial Cable

The output of the transceiver is to be connected to the input of the amplifier via RG58 or similar cable. For the connection between the power amplifier and the antenna, RG213 or similar coaxial cable suited for high power is recommended. All the INPUT and three OUTPUT (ANT1, ANT2, ANT3) SO-239 sockets with Teflon insulation are used.

Rear view of the amplifier OM1500



4.3. Control Cable

Control cable maintains TX / RX switching of the PA (TX GND). The cable is shielded. On the side of the power amplifier a CINCH-socket is used. On the side of your transceiver you have to use a socket suitable for this transceiver. During transmitting the middle pin is connected to the ground. The relays of the OM1500 have to be switched earlier than HF is

applied (cold switching). Modern transceivers they have a time delay between PTT switching and power output.

CAUTION

If you are using an older transceiver or transmitters without time delay, we recommend to connect the PA in such a way that the transmit/receive switch (foot switch for example) is connected with the KEY IN socket of the amplifier. The KEY OUT socket is to be connected with the PTT socket at the transceiver.

The amplifier is equipped with safety devices, which ensure that the output relay is not switched under power mistakenly (hot switching).

KEY IN	RCA Phono - Input signal PTT switching voltage / current 5V / 2mA)
KEY OUT	RCA Phono - Output signal PTT (maximum switching of 30V / 50mA)

4.4. Main Supply

CAUTION

Be sure you got PA with properly terminated line cable, corresponding with your power system's outlet. If not, contact your dealer. In such a case you should make the necessary changes using a licensed electrician.

WARNING!

Be sure that your power system is correctly wired and properly rated! To use adequately sized and connected grounding system is also very important.

4.5. Cooling

CAUTION

The amplifier must be installed in such a way that free flow of hot air from the tube is allowed. Do not obstruct air intake and exhaust areas of the PA.

The centrifugal blower provides the necessary cooling of the amplifier, even during long contests. The blower is activated by switching the PA on and it is turned off when cooling is finished (approx. 1-5 min after switching off the PA depending on the temperature of the tube). Blower speed is setting automatically according to the tube temperature. If the tube temperature is below 40 deg. Celsius, the blower speed is minimal (abt. 18 %). Between 40 degrees and 80 degrees Celsius the speed is rising from 19% to 100% of maximal RPM.



Detailed view on the tube and blower area. Antenna switch is installed inside the metal box.

5. OPERATION

WARNING!

Before switching PA on, make sure that amplifier is grounded, antenna or dummy load is connected, and line cord is putted to the outlet. Be sure you selected AC input by 7.1.

CAUTION

Before switching PA on, check all connections between PA and TCVR.

CAUTION

Do not turn PA on for at least 2 hours after unpacking it and locating in its operating location. Especially when amplifier is moved from a cold place to a warm one because not visible condensation may develop, and this could result in damage to the high voltage circuits of the PA.

CAUTION

Never try to change antenna output during a transmission to avoid warranty loss.

NOTE

When you decide to have a short operating break, place the amplifier in the standby mode rather than switch it off.

5.1. Operation Elements

There is couple of operational elements accessible or visible on the front panel.



BAND - Band selector switch

TUNE - Anode capacitor for tuning
(higher frequencies to "0"; lower frequencies to „100“).

- LOAD** - Output capacitor tunes antenna load resistance to the amplifier. Capacity is low at „100“ and high at "0" on the scale.
- TUNE LED** - Three LEDs assists in tuning the amplifier
- WATMETER** - Analog double system meter for forward and reflected power measuring



- ON / OFF** - Long press (abt. 1 sec.) to switch PA ON/OFF
- RESET** - Short press to reset faults or warnings

0 / I Power ON small 12V APU for logic and protection circuits
You can switch Antenna ports even if PA is switched OFF.



S1

S2

S3

S4

- ON AIR** - Transmitting mode LED
- STBY** - Standby mode LED
- FAULT** - Failure LED
- ON** - PA is „ON“ LED
- S1** - **OPER / STBY** - Press to switch between Standby and Operation mode
ESC - Return to the previous level
- S2** - **MENU** - Enter the Menu
DOWN - Scroll down
- S3** - **DSP** - Change display (DSP1, DSP2, DSP3)
UP - Scroll up
- S4** - **ANT** - Change Antenna output (ANT1, ANT2, ANT3)
ENT - Confirm the selection

More functions of S1 – S4 buttons will be described in next parts of this manual.

5.2. *Preparation for operation*

The first necessary thing after connecting AC to the power amplifier is switching main (green) switch to „I“. Welcome message and then starting information appears on the display:



After switching main switch ON welcome message appears shortly.



Starting message shows, which antenna port is connected. To switch PA ON press ON/OFF button for abt. 1 second.



Warming time takes abt. 210 seconds. It is possible to enter **MENU** during this time, but with limited possibilities (display settings can be changed, for example).

You can change **ANT** output, if necessary.

If you change **DSP** during warming time, you lost count down information. Press **BACK (S1)** to restore starting message.



When warming time expires, PA switches itself automatically to the **STBY** mode.

You have **two possibilities** now - switch PA to **OPER** mode and start operation, **OR** to go thru **MENU** and submenus to set display parameters, some hardware parameters or to enter the service menu.

In the **STBY** mode Antenna output can be changed (**ANT1, ANT2, ANT3**) by pressing **S4**.



Display information can be changed, too. Press **S3** to do it.



There are 3 different display settings possible in the OM1500. To set display parameters, go to the next part of this manual for more details.

5.2.1. Display menu

The OLED display shows couple of parameters or texts. Display has 4 lines. Three of them are editable. In every line user can select different parameters, using **MENU**. See next pictures.



After pressing **MENU** (S2) S1–S4 buttons changed their functions. To edit display parameters, press **DISP** button.



Now you can define parameters for first three rows. Start with first line, press **1Row** button.



Go **UP** or **DOWN** to select desired parameter. Press **ENT** to confirm selection.

There are 4 possible settings for the first line (one bar-graph or three pairs of different parameters):

- Forward bar-graph
- Forward Power _ Reflected Power
- Forward Power _ SWR
- Plate voltage Up _ Plate current Ip

Second and third line are divided to the left and the right side, editable independently. To each of these positions one of the 15 different parameters should be set.



If you finish first line settings, press **ESC** to go back to the row selection.

To start edit second line, press **2Row** button.



S2 and S3 now changed their functions.

To edit left side of the second line, press **LEFT** button



Go **UP** or **DOWN** to select desired parameter. Press **ENT** to confirm selection.



If you finish left side settings, press **ESC** to go back to the side selection.

To start edit right side, press **RIGHT** button....etc.

Second and third line programmable parameters are:

- Forward Power
- Reflected Power
- Input Power
- SWR
- TUNE
- Turns of blower in %
- Frequency
- Plate voltage – Up
- Plate current – Ip
- Screen voltage – Us
- Screen current – Is
- Screen current – graph
- Grid voltage – Ug
- Grid current Ig
- Heating voltage – Uf

5.2.2. *Settings menu*

Settings menu offers EBS settings, factory default parameters restoring and display contrast settings (software version 4.2. or higher).

Electronic Bias Settings (EBS) is one of significant feature of the power amplifier. It allows to set low plate current after pressing the PTT regardless of whether you have CW or SSB mode, until RF signal is no present at the input. At the moment when RF signal comes to the input of PA, bias will automatically change to its working value.

EBS level means level of the Input power, where EBS starts working. Default EBS value is 1 watt. We recommend using EBS ON. Significant accompaniment of used EBS is temperature reducing.



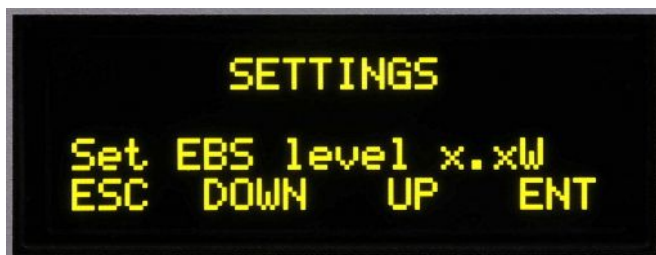
To enter Settings menu, go to **MENU** first, then press **SET** button.



Use **UP** or **DOWN** button to select EBS ON/OFF. Press **ENT** to enter EBS status settings.



Press **ON** or **OFF** to set status of EBS. Press **ENT** to confirm selection. Press **ESC** to go one level back.



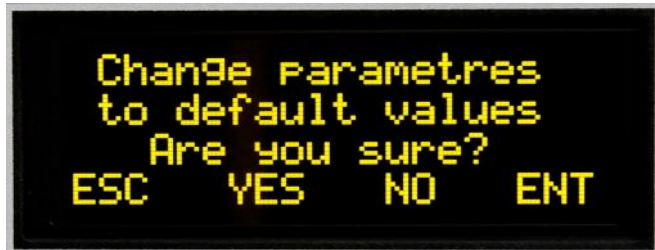
Use **UP** or **DOWN** button to select EBS level parameter. Press **ENT** to enter EBS level settings.



Use **UP** or **DOWN** button to set EBS level value. Press **ENT** to confirm EBS level value. Press **ESC** to go one level back.



If you wish to **restore** factory default parameters, use **UP** or **DOWN** button to select Restore default parameters. Then press **ENT**.



Press **YES** to confirm restoring.



Use **UP** or **DOWN** button to select LCD contrast. Press **ENT**.



Use **UP** or **DOWN** button to set contrast value. Press **ENT** to confirm settings.

5.2.3. Service menu

In the Service menu it is possible to verify **software version**. This menu allows user to check total **operating hours** and listing in the memory, where reported **faults and warning messages** are stored. You can display particular warning messages and particular error messages. See chapter 6 for more information regarding to warnings and faults occurrence. There you can find a coding table together with a limited values for the safety circuits activation also.

In the Service menu a value of **EBS1 and EBS2 can be automatically adjusted**. This is used for example when it is necessary to make adjustment **after replacing the tube**. Automatic control of EBS, however, can be done at any time. EBS1 default value is 20mA of Ip, EBS2 default value is 250mA of Ip.

Minimal turns of the blower are the matter of settings in the Service menu, too.



Use Service menu after replacing the tube. This is step No. 1.

To enter Service menu, go to the **MENU** first, then press **SERV** button.



Use **UP** or **DOWN** button to check software version.



Use **UP** or **DOWN** button to select Time ON parameter. Press **ENT** to see total operating hours of the PA.



Press **ESC** to go back to the Service menu.



Use **UP** or **DOWN** button to select Faults. Press **ENT** to see fault numbers or letters (see the table in chapter 6).



Press **ESC** to go back to the Service menu.



Use **UP** or **DOWN** button to select Warnings. Press **ENT** to see warning numbers or letters (see the table in chapter 6).



Press **ESC** to go back to the Service menu.



Use this procedure after replacing the tube. This is step No. 2.

Scroll **UP** or **DOWN** to select EBS1 settings. Press **ENT** to start automatic adjustment of EBS1 (20 mA).



Screen voltage increases automatically during adjustment process, grid voltage increases step by step also. In the moment, when I_p reaches 20mA, adjustment stops. Press **ESC** after stopping.



Use this procedure after replacing the tube. This is step No. 3.

Scroll **UP** or **DOWN** to select EBS2 settings. Press **ENT** to start automatic adjustment of EBS2 (250 mA).



Screen voltage increases automatically during adjustment process, grid voltage increases step by step also. In the moment, when I_p reaches 250mA, adjustment stops. Press **ESC** after stopping.



Use **UP** or **DOWN** to select Calibration Ip & Is. Press **ENT** to do it.



Ip and Is calibration runs in the background. Result only is visible on the display.

Press **ESC** to go one level back.



Use **UP** or **DOWN** to select Min. turns of blower. Press **ENT** to enter settings.



A value from 40 to 256 is selectable using **UP** or **DOWN** button. Press **ENT** to confirm selection.

Press **ESC** twice to leave Service menu. Press **ESC** again to leave Menu.

5.3. *Operation mode*

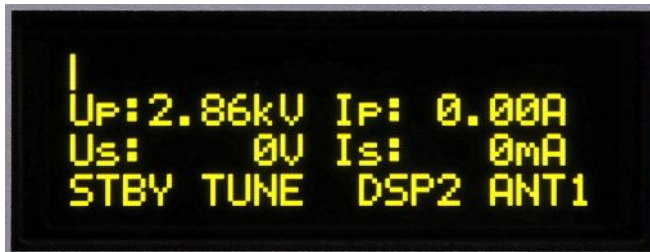
CAUTION

In STBY the amplifier is in bypass-mode and your transceiver is directly connected to the antenna. Maximum allowed power in bypass mode is 100 Watts! Passing RF power is measured with analog wattmeter only. It is not displayed if PA is either in standby mode or turned OFF.

Press **OPER** button to activate operation mode.



PA is in operation mode. STBY LED switched OFF.



Changing of **DSP** allows user to watch couple of basic parameters of the PA in operation mode without input RF signal. Notice: These are three default display settings (software version 4.2.)



Check all connections again. Set BAND selector, TUNE and LOAD capacitors according to TCVR parameters and delivered tuning table (see next part for more details). Apply **low input power** and press PTT. Check Analog wattmeter first. Try to tune PA for maximum output power and minimum SWR.

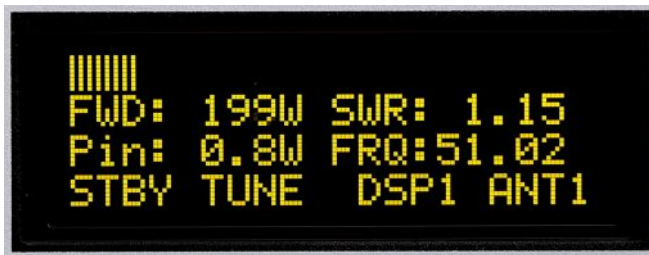
Look at our example. We used small handy on 50 MHz with abt. 1 watt as an input signal source (display parameters were changed in this example).



Using foot switch in „KEY IN” we activated transmitting mode of the PA first.

“ON AIR” LED is ON.

In the transmitting mode all 4 buttons (S1, S2, S3, and S4) are blocked!



Then we applied input power from handy TCVR. Basic parameters are visible on the display.

Notice: Frequency measurement is only approximate, **NOT exact**. It serves the needs of control circuits, mainly.



Screen current -5mA is inside the possible working range (from -30mA to +50mA).



If you need to change the display, interrupt TX mode first.

Grid parameters and the blower speed are visible on different display.....



Output power and SWR is visible on the Analog wattmeter, too. This double system meter helps quickly and clearly reaches maximum output power and minimum SWR using both tuning capacitors (TUNE and LOAD)

5.4. Tuning of the Power Amplifier

The OM1500 power amplifier is operated in class AB. Thus it's possible to obtain a maximum output power at excellent linearity. For this purpose the amplifier has to be tuned carefully.

CAUTION

The operation of a mistuned PA will cause malfunctions, the increase of grid current and problems with TVI/BCI.

CAUTION

If the input power is higher than 10W and the power amplifier is NOT correctly tuned, the safety devices will switch it to STBY. After switching the amplifier to STBY, you need to switch it back to the OPER mode by pressing RESET button shortly.

A tuning table is delivered with the power amplifier. For **coarse tuning** select a band with **BAND** switch and choose the setting of “TUNE” and “LOAD” capacitors according to the table.

Band	Tune	Load
1.8	60	67
3.5	65	35
7	42	78
10	76	11
14	60	35
18	60	40
21	32	67
24	50	47
28	25	62
50	21	88

NOTE

Delivered tuning table was made for 50 Ohm loading of PA (dummy load). Each amplifier should have different values depending on used frequency and used type of antenna. **Make your own table** valid for your real conditions.

There are two ways how to do fine tuning. **The first method** uses a gradual increase in the input power when tuning the PA (as most operators accustomed). In every case we recommend adjust the display for both of methods so it shows two parameters important for fine tuning - TUNE and **Is graph** ($>1<$).



First line will show output power bar graph.

Press **OPER** to enter operation mode. Apply **low input power** and press PTT. Be sure you selected right **BAND**, **TUNE** and **LOAD** knob positions. If you made some mistake, fault message appears:



Safety circuit stopped transmitting, fault LED is **ON** (Fault code 4 is saving to the memory).

Release PTT, set proper positions of **BAND**, **TUNE** and **LOAD** according to the table and **press PTT** again.

Another mistake can occur, if you have antenna connected to the wrong output. In such a case „**SWR is too high**“ error message appears. Change antenna output using **S4** button.



This is not an optimal result, **TUNE** indicator must go between both arrows. Use **TUNE knob to get maximum output power** and **LOAD knob to get indicator between arrows**.



This is a **good result** of tuning.

Now **increase** the Input power slowly and watch the display.



Two of important information is visible – **screen current increased**, but still is within the allowed limits. Turn **LOAD knob slightly to get TUNE indicator between arrows**.



Display indicates the **correct tuning** of the Power amplifier.

Remember

Always use **TUNE** knob to get maximum output power. Use **LOAD** knob to get TUNE indicator on the display to the middle position between both arrows. Simultaneously check if **Is graph** indicator stays within the boundaries. Repeat both steps more times.

Tip

Try to watch DSP2 and DSP3 at the maximum output power also. You can easily convince the „hardness” of your AC network.



Without RF power the plate voltage is 2.85 kV. It is not good enough.



During transmitting the plate voltage drops to 2.55 kV,



...and the heating voltage drops to 6.2V.

Proper operation mode of GS23 requires the plate voltage to be close to 3 kV all the time. Pictures show the two problems. First, anode voltage is low, even without RF power. Second, anode and heating voltages dropped down during transmitting. First problem can be eliminated by changing primary AC voltage selector one step down (if possible). Second problem - significant decrease in the voltage during full output power - can not be solved via the same way! Selector changing could cause high voltage in an unloaded condition! This problem relates to the „soft” AC network and is solvable only by „changing” the network...

Press **S2 (TUNE)** button in **OPER** mode to start **the second method** of fine tuning.



PA is in the operation mode. After **TUNE** button (S2) was pressed, it changes its function. Now **STOP** is blinking.
Do not press STOP button yet!

By pressing PTT the **input attenuator is automatically included** first. Apply input power according tune table (or lower) for selected band and press **PTT**. Use **TUNE** knob to get maximum output power. Use **LOAD** knob to get Is graph indicator within the boundaries.



Effect of included input attenuator is visible; power output is low. TUNE position (third row) is not a good. Use **LOAD** knob to move it to the center.

In the moment when TUNE indicator on the display is **approx. in the middle**, input **attenuator is automatically bypassed** and you can make more fine adjustment of the output power.

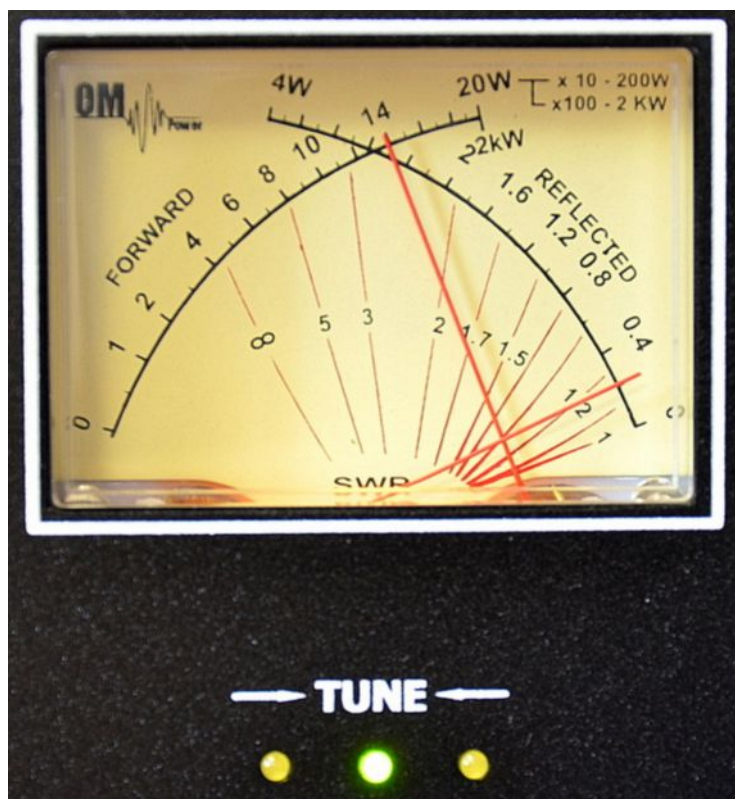


Display shows properly tuned PA. TUNE indicator is in the middle, Screen current is higher, but still inside the limits.

TUNE LEDs placed under the analog power meter start tuning indication also. Yellow LED shows direction for **LOAD** knob moving.



If only green LED lights, right LOAD knob position was found successfully. Release the PTT and press S2 (STOP) to stop fine tuning finally.



View on the properly tuned PA. Analog meter shows forwarded and reflected power, green LED confirms right tuning.

After this procedure the amplifier is tuned correctly and ready to give 1500W output power in all operation modes. At optimal tuning and full output power a positive max. 50mA current goes through the second grid.

CAUTION

If the amplifier demonstrate any malfunctions during tuning or it does not behave in accordance with the description, interrupt the tuning procedure immediately and check the amplifier! Be sure not to do any mistakes in choosing bands or TUNE/LOAD values! Be sure that VSWR is not higher than 2:1 and input power is LOW!

After excluding possible human mistakes you will be able to work for long time with this amplifier!

6. MAINTENANCE

6.1. Indication of Fault Conditions

If a fault condition appears during the operation of the amplifier, the safety circuits of OM1500 will react. There are several warning or fault messages possible to appear on the display, when some of the protection will be activated. The OM1500 power amplifier can report one of the following messages:

- | | | |
|---|---|--|
| 1 | - | Power Out is too high |
| 2 | - | Refl. power too high |
| 3 | - | Power In is too high |
| 4 | - | Low output power (tune) |
| 5 | - | Plate current too high |
| 6 | - | Grid current is high |
| 7 | - | Screen current error |
| 8 | - | Cooling error |
| 9 | - | Heating voltage error |
| A | - | HARD FAULT (from 3.1 software version) |
| B | - | Plate voltage error |
| C | - | Grid voltage is low |
| D | - | Screen voltage error |
| E | - | SWR is too high |
| F | - | Amplifier is too hot |

NOTE

Most of safety circuits are preset for two levels of exceedances. First level is a warning level. In such a case a warning message appears on the display, fault **LED will flash**, but power amplifier will stay in **normal operation**. See the table below for warning and fault conditions.

NOTE

When a fault condition appears during the tuning or operation of the amplifier, the safety circuits will **block transmitting** and **FAULT LED starts blinking**. The amplifier stays in **OPER** mode. After approx. 1 sec the control circuits will automatically switch the amplifier back to the transmitting mode. If problem persists, safety circuit will react again.

CAUTION

If the fault will repeat 3 times during 10 seconds, the safety circuits will turn the amplifier to STBY mode. FAULT LED stays ON. To cancel fault status, press RESET shortly. Power amplifier will stay in STBY mode.

All the warning and fault messages are stored in the memory. You can display particular warning messages and particular error messages. See the Service menu in the 5.2.3., how to select service display. All of messages are stored and displayed as a numbers or letters as indicated in this chapter (1 - 9; A - F). They are stored one by one to the memory. You can see them on the display in three lines, on every second display position (maximum 10 per row, maximum 30 messages for warnings and 30 messages for errors). If memory is full, every new message will delete oldest one and move rest of them one position back. It means that every time last 30 messages are visible on the display.

Next table shows limited values for the safety circuits activation.

Fault code	Parameter	Warning level	Fault level
1	Power Output is too high	1700W	1800W
2	Reflected power is too high	250W	300W
3	Power Input is too high	80W	100W
4	Low output power (tune)		> 3dB below*
5	Plate current is too high	1.3A	1.5A
6	Grid current is too high	40mA	50mA
7	Screen current is too high	50mA	60mA
8	Cooling error		Stop running**
9	Heating voltage error	+/- 1V ***	+/- 2V
A	HARD FAULT (from 3.1 version)		Plate current >1.6A ****
B	Plate voltage error	Min. 1800V Max. 3400V	Min. 1500V Max. 3500V
C	Grid voltage is low	-15V	-10V
D	Screen voltage error	Min. 350V Max. 550V	Min. 300V Max. 600V
E	SWR is too high		3:1
F	Amplifier is too hot	80 deg. C *****	90 deg. C *****

- * This fault indicates mistuning of the PA. It works for Input power higher than 10W. If output power decreases more than 3dB below value corresponding with the applied Input power, fault message „**Low output power**“ appears. You have to tune the PA correctly.
- ** **Cooling error** means that the blower stops running. In that moment safety devices will switch PA immediately OFF, only error message will stay on the display (see next pictures). Try to switch ON PA again and check if blower starts running. If not, contact the manufacturer, please.
- *** When the heating voltage exceeds boundaries 6,3V +/- 1V, warning message „**Heating voltage error**“ appears. Contact the manufacturer or your dealer, please.
- **** „**HARD FAULT**” appears if the plate current exceeds 1,6A. In such a situation hardware will immediately disconnect high voltage from the plate. Fault is signed with the letter „A” in the memory. Consult this situation with the manufacturer, please.
- ***** If temperature sensor inside the PA detects of 80 deg. Celsius, warning message „**Amplifier is too hot**“ appears on the display. At 90 degrees protection circuit will automatically block transmitting (fault condition). You have to decrease the power or wait couple of minutes to be ready transmitting again. Fault is signed with the letter „F” in the memory.



An example shows situation when Input power is too high. By pressing PTT safety circuit will react quickly, error message appears and FAULT LED starts blinking. In this case screen current exceeds limited value (60mA).

After abt. 1 sec. PA returns to TX mode. Reduce Input power to avoid fault repeating.



This is the situation, when problem with high Input power persists. Safety circuits reacted 3 times, and then switched PA to STBY mode. Permanent fault appears.

To return PA to the normal operation, decrease Input power first, then reset fault status and go back to the OPER mode.



Another example shows situation, when blower stops running. Safety circuits immediately switch PA OFF. Fault message stays on the display only.

A new error message was added from the software version 4.2.:



If resistor R1 or fuse F1 is damaged, safety circuit stops starting of the PA and fault message appears on the display. If this occurs, contact your dealer, please.



Fuse F1

Resistor R1

If there is a fault condition, always try to remove the cause first. If it is not a hardware failure, it usually succeeds. For example high VSWR, high Input power, mistune of PA, high temperature, etc.

In the case of some hardware failure or if your power amplifier is not working properly, please contact the manufacturer or your dealer.

WARNING!

Never try to change or move any part inside the amplifier except of tube or fuses. Substitution of parts may void intrinsic safety!

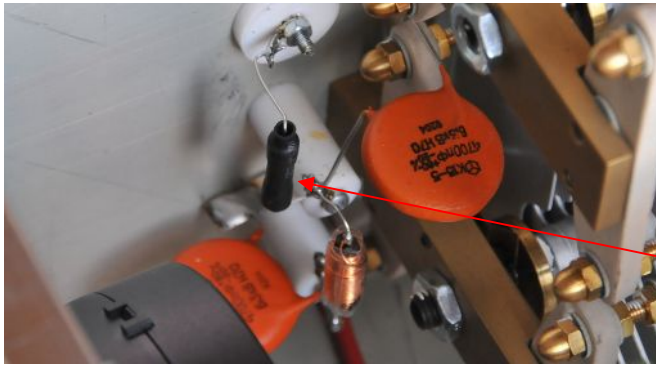
Manufacturer's contacts: **OM POWER, s.r.o.**
930 30 Báč 126
SLOVAKIA
Email: om-power@om-power.com

6.2. Fuse Replacemeent

The user is allowed to change mains fuses (6,3 x 32mm), accesible from the rear panel, only. In the case of fuse (fuses) interruption inside the power amplifier, contact your dealer, please. Internal fuses are located mainly on the SWITCH-on board (next to the HV transformer).



One special fuse is used in the model OM1500. In the case of an accidental discharges in the tube this fuse saves HV supply circuits.



Fuse is installed behind TUNE capacitor, close to the blower.

Fuse F3

6.3. *Tube Replacement*

In the case of vacuum tube damaging, contact the manufacturer or your dealer for ordering new one. You will get instructions how to change it. **Be very careful, you will do it only on your own risk!** After tube replacing **automatic BIAS adjustment** must be done. Read the Service menu (5.2.3.) and see pictures on the page No. 20 for more details.

If you are not comfortable to replace vacuum tube itself, contact the manufacturer, please.

6.4. *Cleaning*

To prevent damage to amplifier surface and plastic components do not use aggressive chemicals for cleaning. Do not open the amplifier for cleaning. Outer surface may be safely accomplished by using piece of soft cotton cloth moistured with clean water or window cleaner.

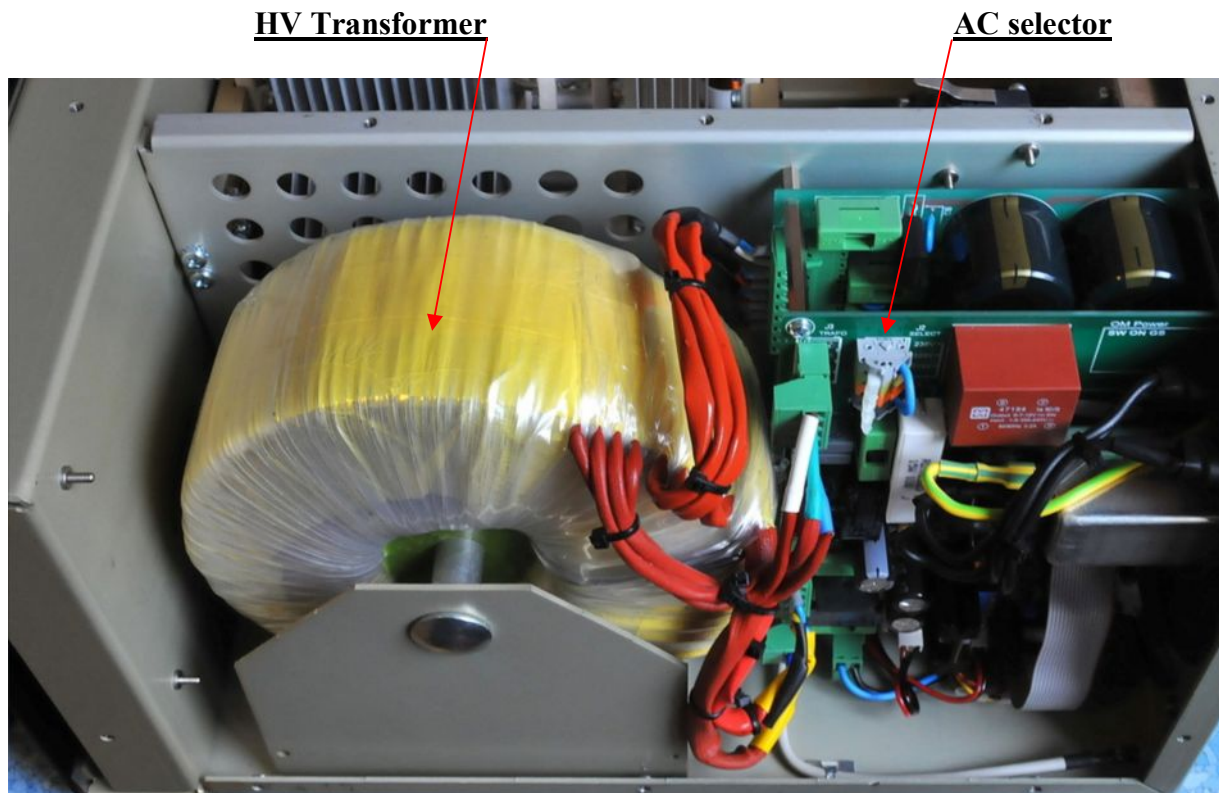


7. *APPENDIX*

7.1. *Primary AC voltage selection*

Primary section of the HV transformer is switchable for three values of AC voltage (220, 230, 240V). Factory settings is 230VAC. Before first starting of the PA we recommend to check the correct value according to the AC voltage in your network. Change the settings, if necessary.

Side view on the opened OM1500



Remove the upper lid first. On the right side of the PA, next to the HV transformer there are two PCBs mounted. On the left upper side of the front (switching) board connector J2 is located.

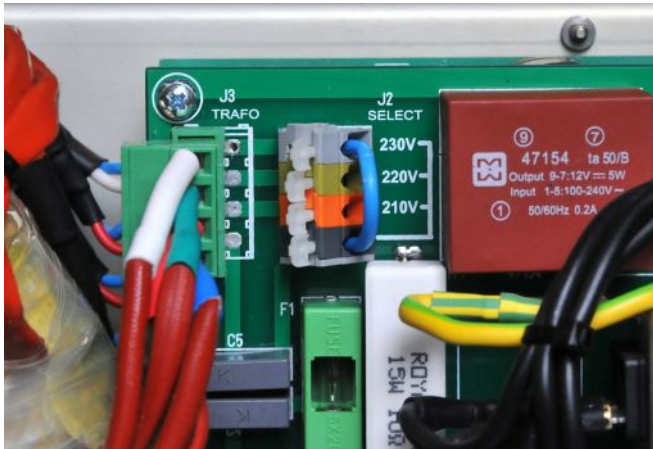


Use flat screwdriver or finger and press carefully the white stick to release contact and move upper end of the black jumper to the proper position, if necessary.

Jumper must be connected between bottom contact and one of remaining contacts. AC voltage is marked next to every contact.

NOTE

AC selector range can be changed in the production according to the specific conditions in individual countries.



If necessary, manufacturer can prepare selector for other AC range. Here, for example, AC selector was made for the range of 210 – 230 VAC.

7.2. *Removing HV transformer*

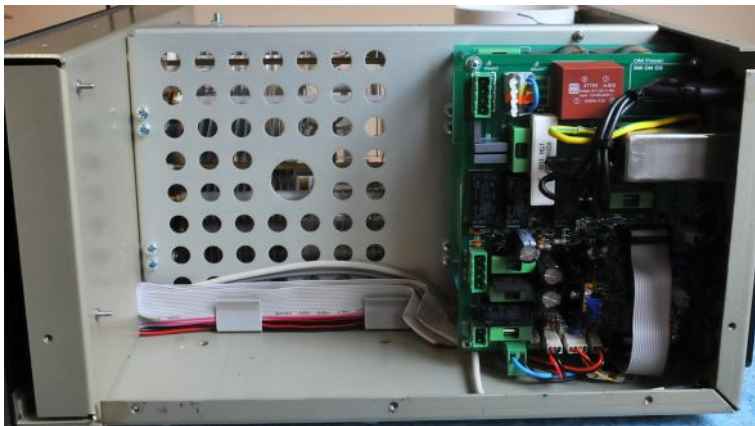
For simpler and easier transport of the PA, HV transformer can be removed and taken separately. This distributes the weight of the PA (22 kg) about half and half. Follow next steps to do it.

1. Remove upper lid from the PA.
2. Turn the PA on the left side (transformer is up).
3. Disconnect **3 connectors** from the front board and **1 connector** from the rear board.
4. Release **4 screws** from the bottom side of the PA. Use Philips screwdriver P2. During the release of the last 2 screws hold the transformer by hand. Do not worry about its weight, it will move down just 1 cm and remains on the central rung of the PA.
5. Use both hands to take transformer away from the chassis.



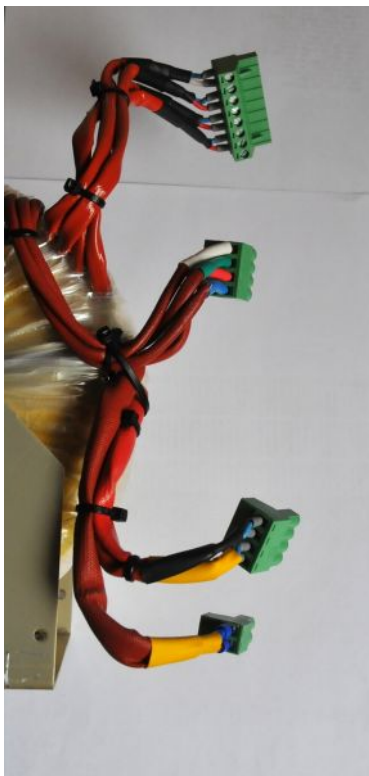
Watch the released terminals,
when moving the transformer!

Do not damage the transformer
insulation!



Weight of the PA was distributed (transformer has 12 kg, rest of the PA cca 10 kg).

When refitting the transformer, watch to the correct location of individual sections and wires. An older version of transformer termination shows the next picture.



Transformer secondary wiring connector
Connect to the rear board – **J1**

Transformer primary wiring connector
Four colour shrink foils, 4 pole connector
Connect to the front board – **J3**

AC 55V in black foil, 4 pole connector
AC 20V in yellow shrink foil
Connect to the front board – **J7**

AC 6.3 Volts, 2 pole connector, yellow foil
Connect to the front board - **J11**

NOTE

Manufacturer reserves the right to make future changes in the way of connecting the transformer to the board. Always mark the position of the terminals before disconnecting the transformer.



Latest the manufacturer changed the type of connectors for transformer termination. New WAGO connectors they have different colour for every contact. This corresponds approx. to the shrink foil colour of transformer terminals (white, yellow, orange, blue - primary wiring - J3 connector).

7.3. Block Diagram of OM1500 Power Amplifier

