

## Instruction Manual



# OM3500A

## SHORTWAVE POWER AMPLIFIER

OM POWER, s. r. o. 930 30 Báč 126  
SLOVAKIA

## **Important safety instructions:**

- The amplifier contains high voltage circuits. Never turn the amplifier on without the upper lid in place.
- The OM3500A amplifier is neither to be used in a wet or humid environment nor to be exposed to rainfall.
- The amplifier must be installed in such a way that free flow of hot air from the tube is allowed. The amplifier must not be installed in a constrained surrounding (i.e. tight shelves etc.)
- During long operation the upper lid and the vent grid of the amplifier can reach high temperatures that can cause burn injuries. Do not touch these parts of the amplifier during operation.
- The amplifier must be grounded during operation.
- During operation the amplifier must be installed in such a way that the rear power supplies are accessible.
- The amplifier can be operated only if both supply cables are connected. OM3500A reaches optimal parameters when it is connected to 2 phases.
- Do not turn the amplifier on without having connected the antenna. A hazardous HF voltage may build up on the antenna connector after turning the amplifier on with no antenna connected.
- Before opening the upper lid of the amplifier make sure that both power supplies have been disconnected for at least 5 minutes allowing the electrolytic capacitors to discharge fully. Never turn the amplifier on without the upper lid in place.
- Make sure that all screws holding the case together are properly in place and tied before carrying the amplifier by the handles.
- 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.

## General description of the OM3500A Amplifier

The linear amplifier OM 3500A is designed for all short wave amateur bands from 1.8 till 29 MHz (including WARC – bands ) and all modes . It is equipped with a ceramic tetrode GU78b. The OM3500A is automatically tuned to operating frequency of your TRX.

### Specification of OM3500A

Frequency coverage:	amateur bands 1.8 – 29.7 MHz including WARC
Power output:	3500 W in SSB and CW 3000 W in RTTY, AM and FM
Drive Power:	usually 60 to 80 W for full Output Power
Input impedance:	50 Ohm VSWR < 1.5 : 1
Output amplification:	17 dB
Output impedance:	50 Ohm unbalanced
Maximum output SWR:	2:1
SWR protection:	automatic switching to STBY , when reflected power is 350W or higher
Intermodulation distortion :	32 dB below nominal output
Suppression of harmonics:	< -50 dBc
Tuning	manual or AUTO
Response speed of AUTO	less than 0,5s within same BAND Less than 3s if out of BAND
Supported TRXs-CAT	<b>ICOM, ELECRAFT ,KENWOOD, TEN-TEC ORION , YEASU and Icom transceive protocol using by microHAM devices – CI-V OUPUT</b>
Tube:	GU78b Ceramic tetrode
Cooler:	Centrifugal blower + axial blower
Power supply:	2 x 230 V - 50 Hz one or two phases
Transformers:	2 pcs of toroidal transformer 2,5 kVA
Protection circuits:	- SWR too high - Anode current too high - screen current too high - grid current too high - Mistuning of power amplifier - Hot switching protection - Soft start for protecting your fuses - “switch –on blocking “ at opened amplifier
Bar graph indications:	- Power output – bar graph 50 LED - reflected power – bar graph 20 LED - screen current ( Ig2 – bar graph 10 LED ) - anode voltage, anode current, tuning – bar graph 30 LED
LED indicators :	grid current ( Igl – 2 LED ) WAIT – preheating of tube (180 sec ) STBY - standby OPR – operating condition FAULT – failure , switching off for abt. 2 sec
OSD Indication	LCD display 2x16 Characters
Parameters:	485 x 200 x 455mm (width x height x depth)
Weight:	43 kg

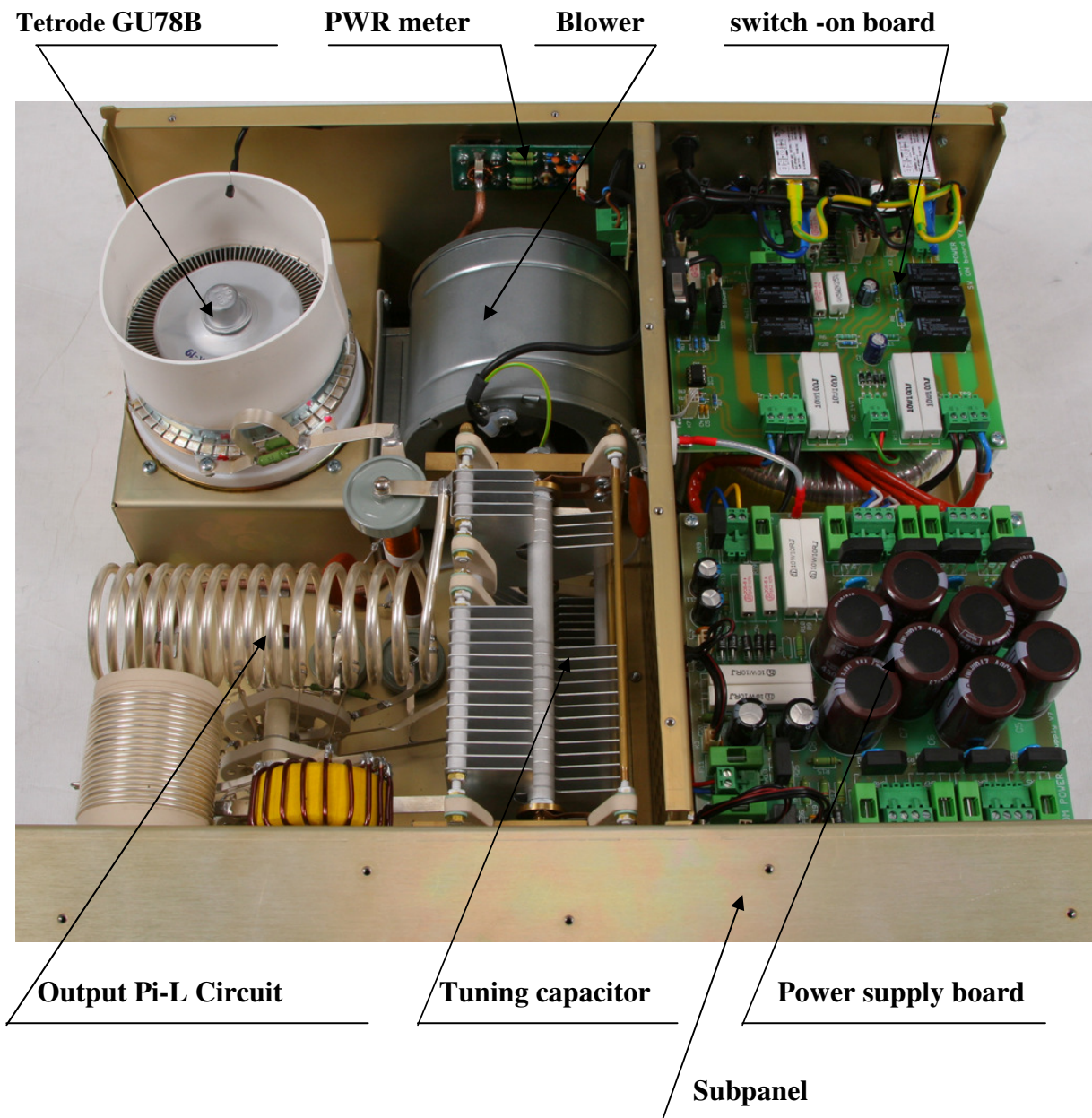
# General Description of OM3500 A POWER AMPLIFIER

## HF PART

In this amplifier a tetrode GU 78b 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 short-wave 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 change.

## Top view on the opened OM3500A



## POWER SUPPLY

Power supply of the amplifier is effected by two 2,5 kVA toroidal transformers. A soft start is realized with the help of relays and resistors.

The high anode voltage consists of 8 times 420V and 2A. Each of them has its own rectifier and filter. In the high voltage circuit safety resistors are employed to protect the amplifier against overload.

The source for screen grid is stabilized by a parallel stabilization with BU508 transistors and delivers a voltage of 360V at 100mA.

The -120V for the control grid is stabilized by means of zener diodes.

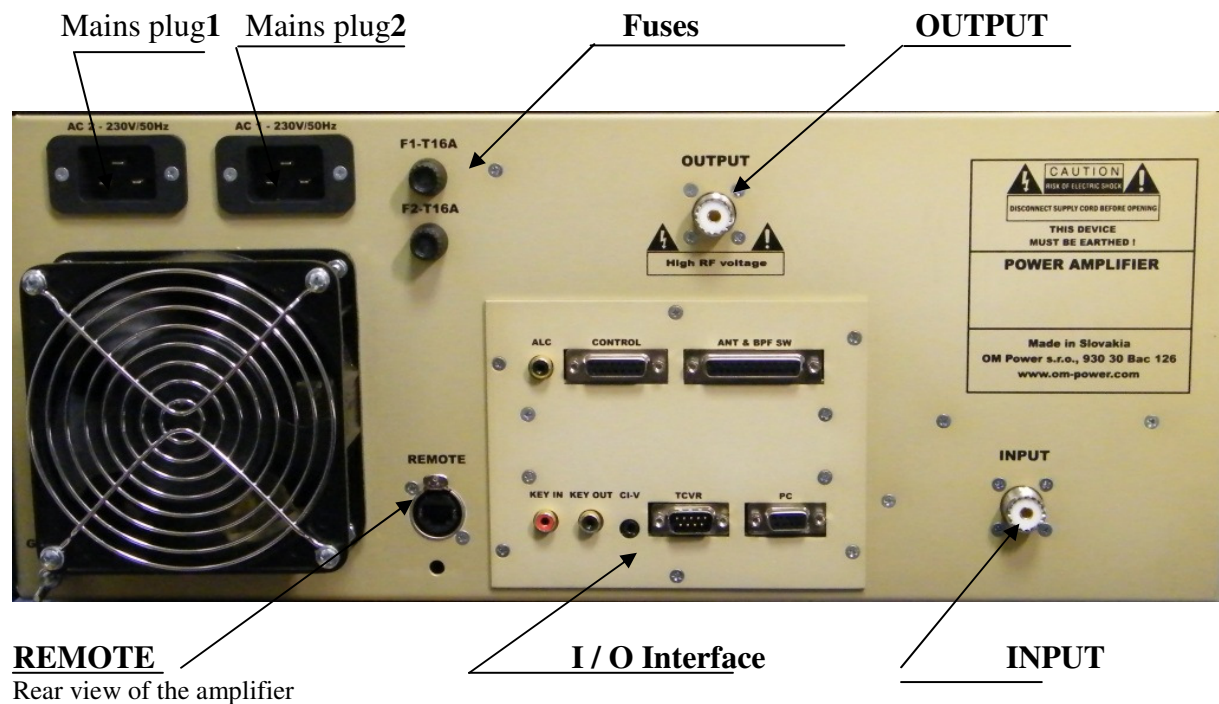
## SAFETY DEVICES

Control and monitoring circuits ensure control and safety of the circuits of the device during malfunction of the PA. They are placed on the Control board, which is located on the subpanel.

## Putting the power amplifier into operation

### Coaxial cable

The output of the transceiver is to be connected with 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 this high power is to be used. For INPUT and OUTPUT PL-259-sockets with Teflon isolation are used.



## **MAIN SUPPLY:**

The amplifier is connected to the mains with 2 cables with a EURO end. Each cable is to be switched to another phase of your main supply system! Both of them have to be able to deliver a power of 2.5 kVA !

If you use only one phase, you have to connect both cables to this one phase ! Your main supply has to be able to deliver 5 kVA on this one phase! In this case the power amplifier can't deliver full output!

## **ATTENTION:**

**In each case the power amplifier has to be connected to your main supply system with 2 cables! Normally the amplifier is used with 2 phases. If there is only one phase - connect both cables to the single one!**

## **Grounding**

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 mm<sup>2</sup> at least.

Connect your transceiver to the same grounding system of your shack carefully!

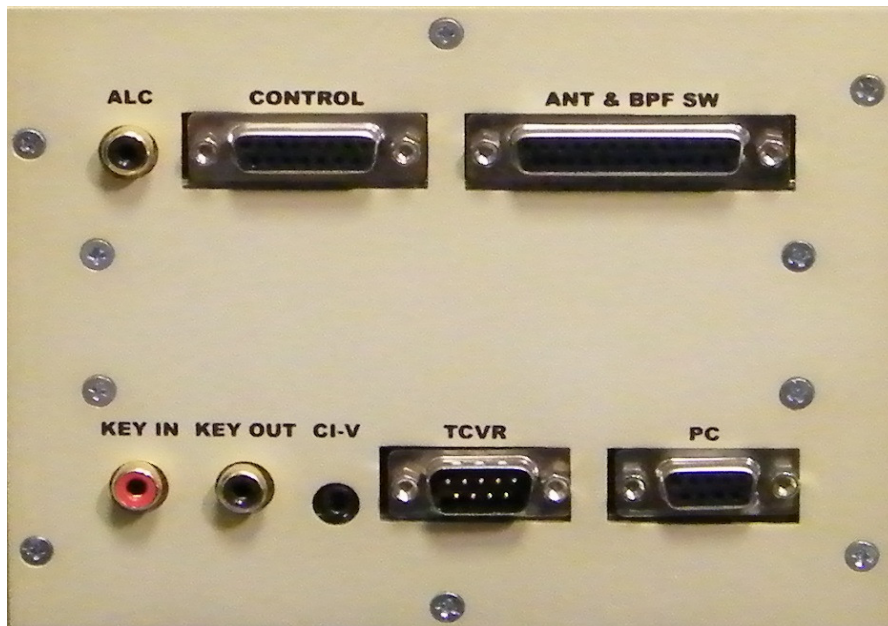
If you use a power amplifier with higher output you have to be aware that your grounding system works properly. **All parts have to be grounded to the same system.** Use short cables and make sure that there are good contacts! Otherwise you run the risk of damaging your equipment, having problems with TVI/BCI or your signal may be distorted.

## REMOTE

Control of the amplifier is possible remotely by using REMOTE BOX (optional). Connection is done by REMOTE socket, maximum cable length of 10 meters.

## I / O box

Control of Amplifier and communication with TRX as well as antennas / BPF switching can be done via I / O Interface



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

## 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 OM3500A have to be switched earlier than HF is applied (cold switching). Modern transceivers have a time delay between PTT switching and power output. 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 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 two safety devices, which ensure that the Output relay is not switched under power mistakenly (hot switching).

- CI-V** - Mono 3.5mm Jack for connection of ICOM TRXs. For successful operation selection of ICOM radio and correct baud rate is important (9600 default)
- TCVR** - DB-9 -serial port RS232 for YAESU, **KENWOOD, ORION** and ELECRAFT TRXs. Correct baud rate and TRX type is a must for successful operation. If both CI-V and TCVR cables are used then CI-V wins over RS232. Otherwise selection of interface is done via TRX type.
- PC** - DB9 RS232 port is used for communication of your TRX with PC. Please use setting you would normally use as if using direct TRX – PC connection.
- ALC** - RCA-Phono – Automatic Level Control is used when tuning the PA to block drive level . We recommend to use this feature mainly while operating RTTY, FM and other 100% duty cycles modes.
- CONTROL** - DB15 connector for use of single cable between PA and TRX  
PIN OUT:
1. ALC Out
  2. NC
  3. INHIBIT Control voltage
  4. TX INHIBIT for Yaesu and Elecraft – this supersedes ALC output
  5. NC
  6. KEY OUT
  7. NC
  8. KEY IN
  9. –
  15. GND



## ANT & BPF SW

- r DB-25 is used for switching of external HP BPF or external Antenna Switch. Maximum switching of 30V / 0.5A is possible.

PIN OUT:

1. antenna port 1
2. antenna port 2
3. antenna port 3
4. antenna port 4
5. antenna port 5
6. antenna port 6
7. antenna port 7
8. antenna port 8
9. antenna port 9
10. antenna port 10
11. COMMON port of ANT SW
12. NC
13. GND
14. BPF 160m
15. BPF 80m
16. BPF 40m
17. BPF 30m
18. BPF 20m
19. BPF 17m
20. BPF 15m
21. BPF 12m
22. BPF 10m
23. COMMON BPF port
24. NC
25. GND

## Cooling

The centrifugal blowers provide the necessary cooling of the amplifier, even during long contests. The main blower is activated by switching the PA on and it is turned off when after-cooling is finished (approx. 1-5 min after switching off the PA depending on the temperature of the tube). The supplemental fan is turned on depending on the temperature of the air exiting from the amplifier. It is switched on at 70°C and switched off at 60°C.

# Operation

## Operating elements (see photo)



**TUNE** - Anode capacitor for tuning, tuning of higher frequencies to "0", Lower frequencies to „100“.

**LOAD** - Output capacitor tunes antenna load resistance to amplifier.  
**Capacity is low at „100“ and high at "0" on the scale.**

**OFF** - You switch off the amplifier by pressing this button.

**ON** - You switch on the amplifier by pressing this button.  
Heating of tube is on and after 3min of delay the amplifier will be ready for operation.

**OPR/STBY** - „OPERATE“ puts unit ready for operation.  
At STBY, if WAIT-LED is on or the amplifier is off your transceiver is in bypass-mode directly connected to antenna. Maximum 400 Watts!

**RF OUTPUT** - Bar graph – shows output power .

**REFLECTED POWER** - Bar graph – shows reflected power of the antenna. 350W maximum or amplifier switches to STANDBY-mode

**Ig2** bar graph – measures the currenxy of the second grid in the range from -20mA to +80mA

**HV/IP/TUNE** bar graph – measure the anode voltage, anode currenxy or tuning of the amplifier



**INHIBIT** – indicates interruption of operation during the tuning process of the PA. If indicated by RED LED then PA is in STBY mode. If retuning within same BAND then PA will retune according to QRG of TRX. When changing the BAND – INHIBIT will stay lid till KEY IN is triggered for even short period and tuning process will start. After that PA is automatically ready for operation.

ANT, ANT1, ANT2 –PA is capable of automatic antenna switching (ie. 80m CW and 80m SSB can be split between two antennas. PA will automatically select desired antennas by selecting last used antenna on given frequency.

- SET** - button for:
- MAIN MENU
  - Confirmation of selection
  - Saving of selected value
  - Saving of tuning parameters
- TUNE** - selection of TUNE mode
- AUTO** - selection of Automatic mode
- MAN** - selection of manual mode
- DWN / UP** - selection of band, segment or parameter

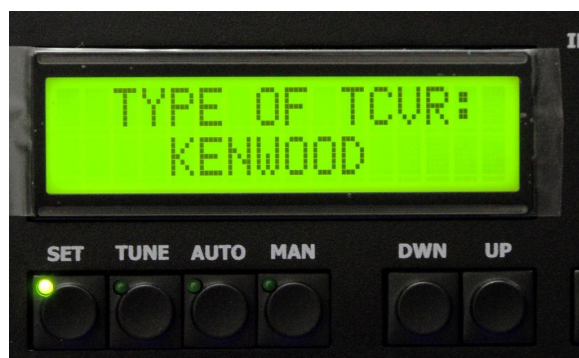
## Configuring and Operating the OM3500A Power Amplifier

When the button ON is pressed, amplifier will start and will heat the ceramic tube. While this is being done, PA will have STBY and WAIT LED lid on. If there is TRX connected to the correct port and all communication settings are right correct operating frequency and AUTO with type of transceiver will be indicated on the alphanumeric display. After successful heating of the TUBE (3 mins) you can enter operating mode by pressing the OPR button..

Example of AUTO mode using ICOM TRX



Example of AUTO mode using Kenwood TRX



**For communication with TCVRs**, that are not supported by OM3500A as for example JST-245 and older types of Kenwood an external IF-232 converter is to be used. You can use universal products of microHAM <https://www.microham.com> as MKII, MK2R+ etc., which process information about the frequency in ICOM format through the CI-V output. Then the PA will be connected in the following configuration:

JST-245 <=> DB37- JST-245 cable <> MKII ( or other device from microHAM , which has a CI-V output ) <> PC , OM3500A is connected to the CI-V output of a microHAM device.

Example of communication



If TRX is not connected or communication settings are incorrect the message COMMUNICATION LOST will be displayed. You can still use PA by entering MANUAL mode (MAN Button) or by fixing the communication problems

Example of Communication loss message



### **TRX support settings**

Press SET button and scroll using UP / DWN to CHOOSE TCVR



Confirm CHOOSE TCVR by pressing SET again and scroll UP / DWN to desired TRX Type.  
Confirm the selection by pressing SET

Continue by selecting Baud Rate

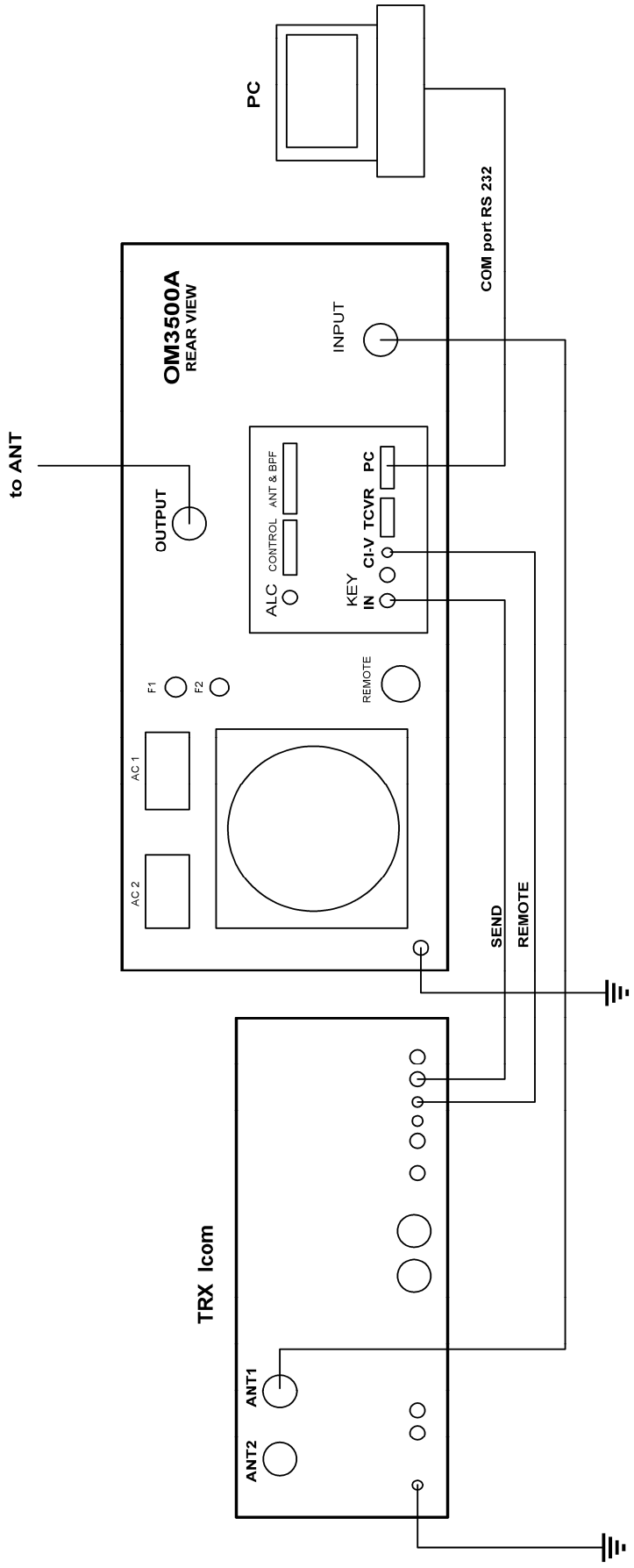
Below – Baud rate for TRX – PA communication displayed by OSD



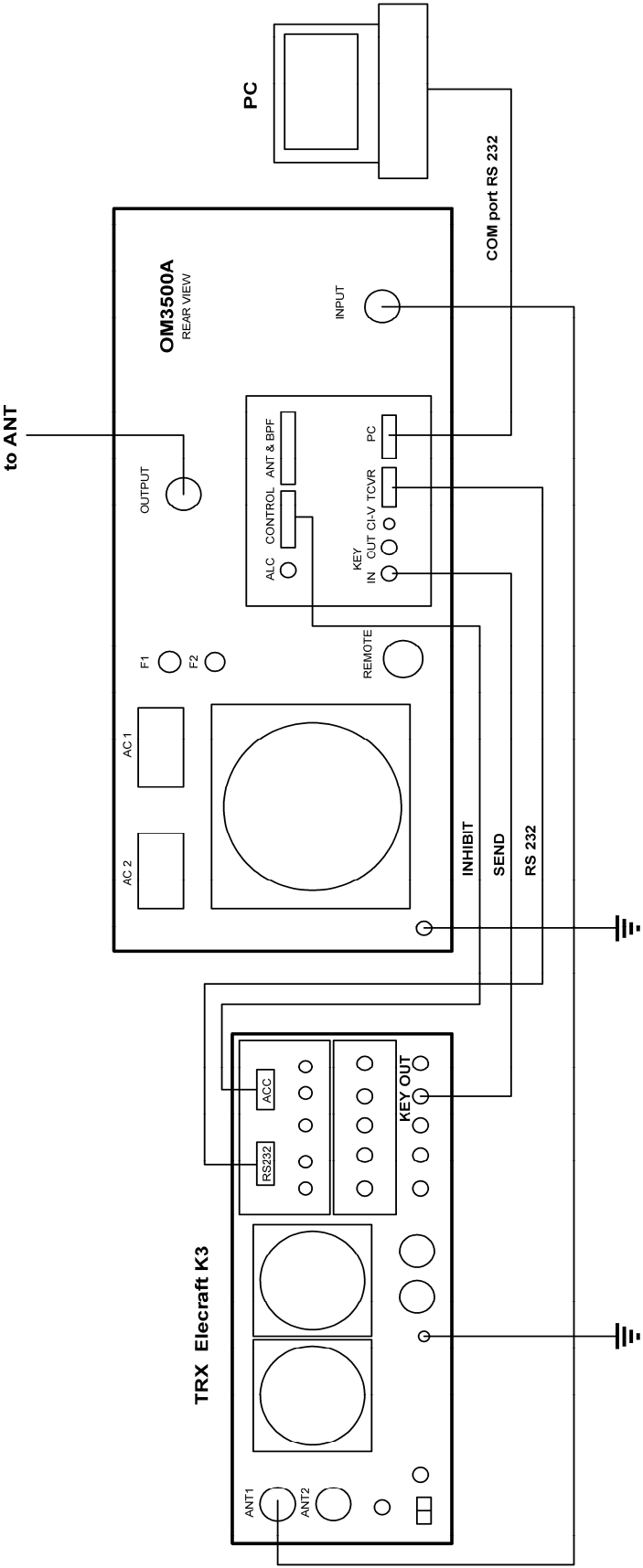
By scrolling UP / DWN select desired Baud Rate which must be same as baud rate used by connected TRX.( please refer to your TRX user guide)To confirm your selection press SET. When using Yaesu TRX you need to configure STOP BITs parameter and confirm selection with SET.

Communication settings menu can be left by pressing AUTO by pressing the AUTO button PA will enter AUTO mode but only if all settings are correct and connection has been established. You can check if correct frequency and TRX type has been displayed on OSD

**Example of connection for Icom**

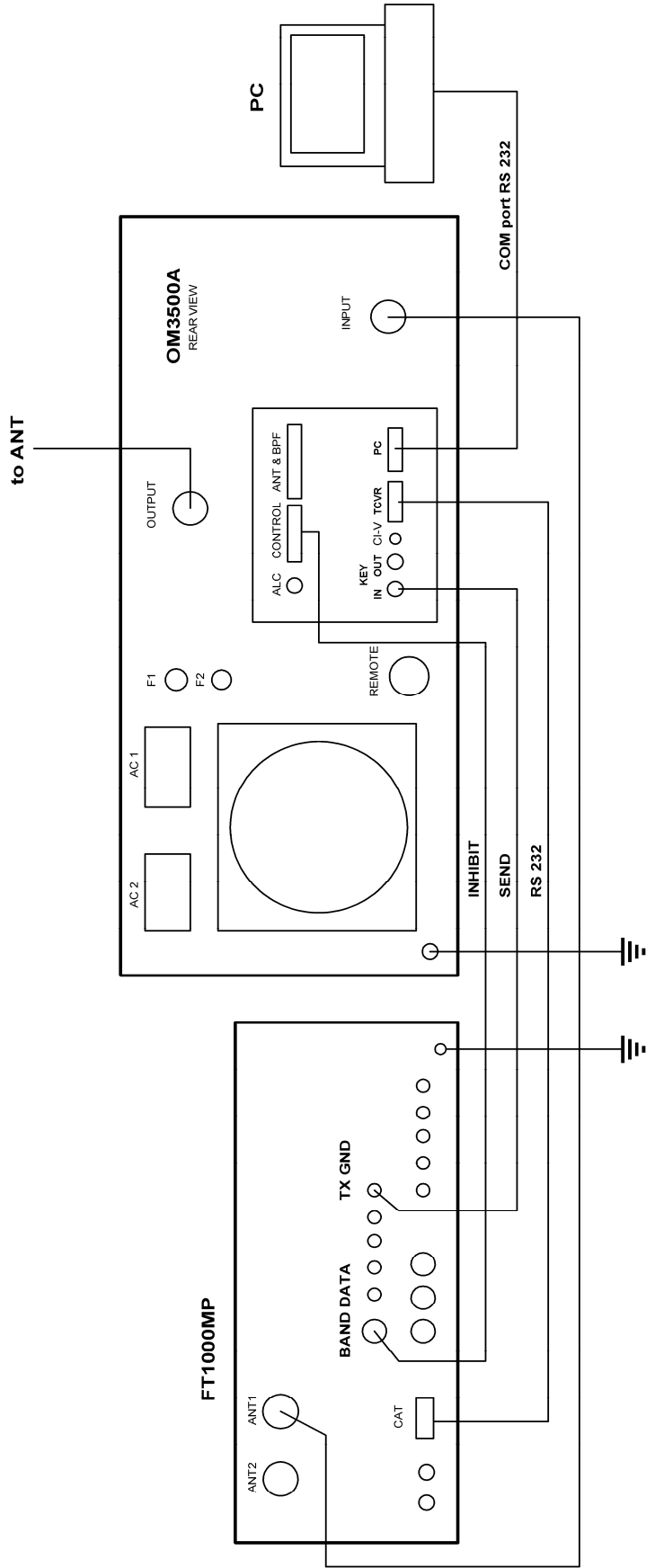


**Example of connection for ELECRAFT**





# Example of connection with Yeasu





## Antenna Switching Menu

If you have 3<sup>rd</sup> party external antenna switch connected to PA ( i.e. Microham TEN SWITCH) you need to configure assignment of each port to specific band/antenna.

By pressing SET and scrolling to ANTENNA SETTINGS and confirming by SET you get current band and its antenna selection. By scrolling UP / DWN you can select BAND which you want to assign to current ANTENNA selected.



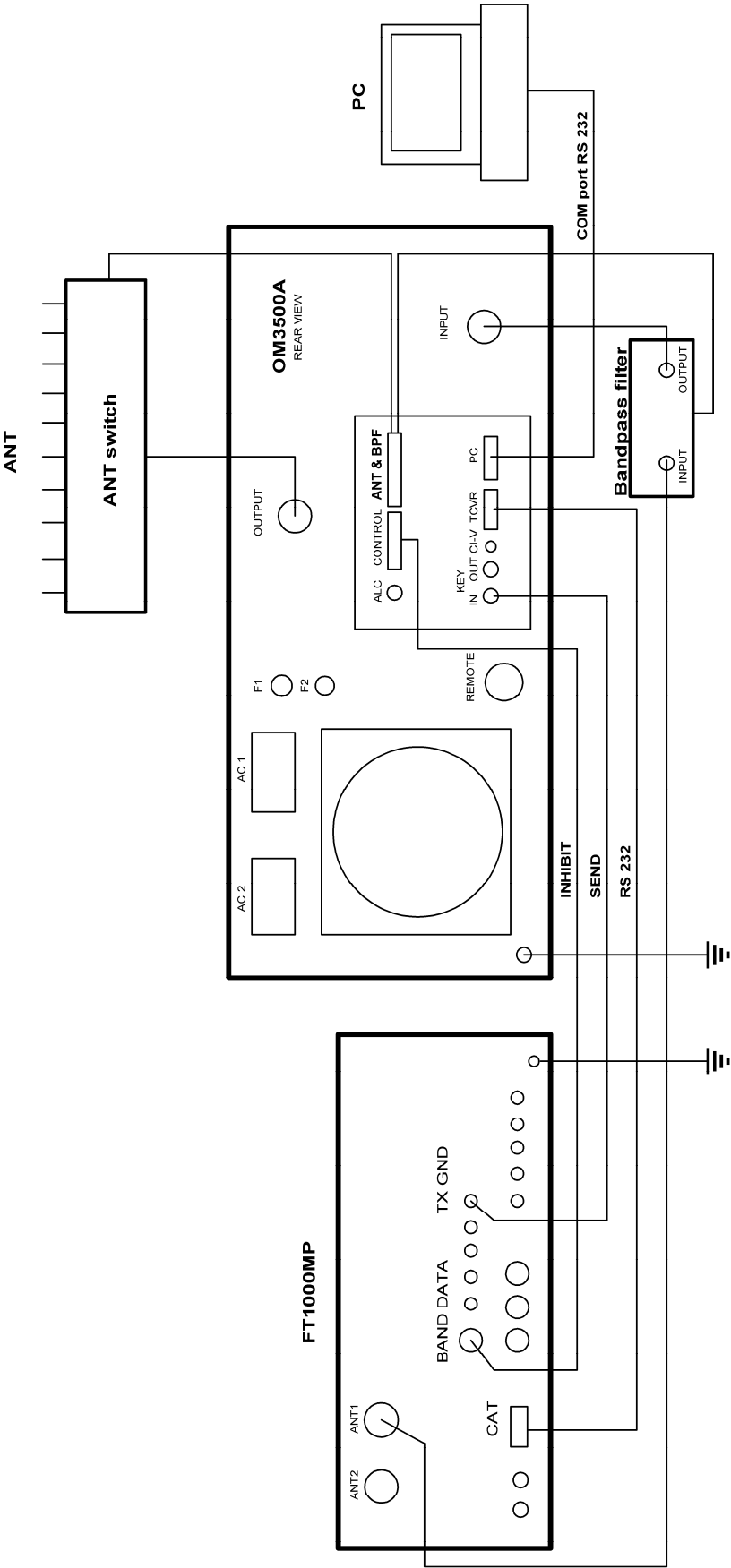
Then we select how many antennas we want per current band (1 or 2) always confirm your selection by pressing SET. Then by scrolling UP / DWN you assign which PORT is used on your external antennas switch for this particular antennas. (ANT 1 ON PORT 01)



Should you decide to use 2 antennas for this band then after confirming that with SET configuration continues to other antenna selection / port selection.

To finish Antennas switch configuration you can either press AUTO or MAN

**Example of connection with antenna switch and BPF**



## Bandpass filter switching

Switching of external band pass filters is automatic and needs to follow pin out of BPF connector. For more see section ANT & BPF Switching

## Loading factory default settings

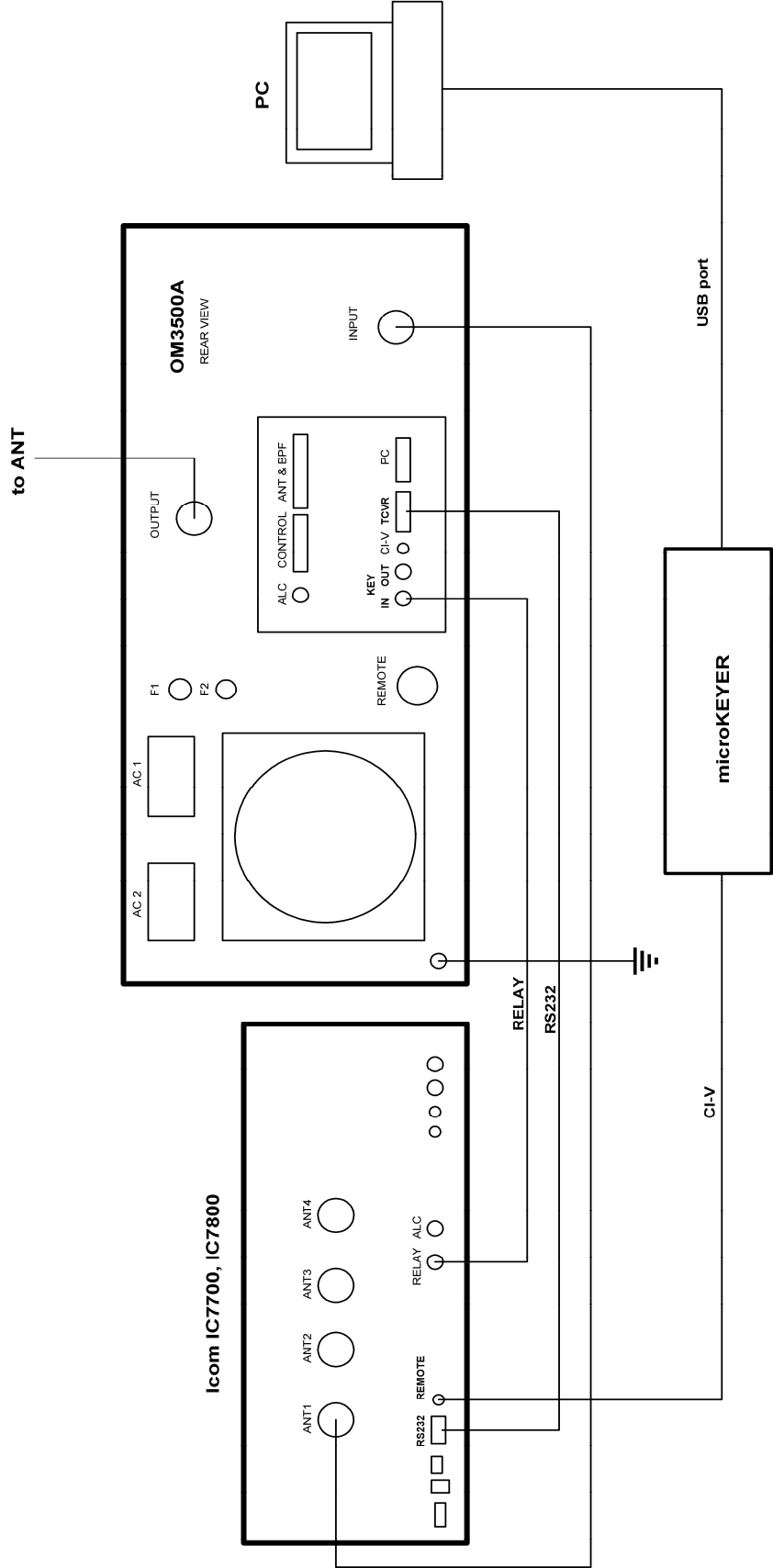
In rare case of need to restore factory default settings press SET and scroll using UP / DWN to LOAD DEF VALUES and confirm by SET.



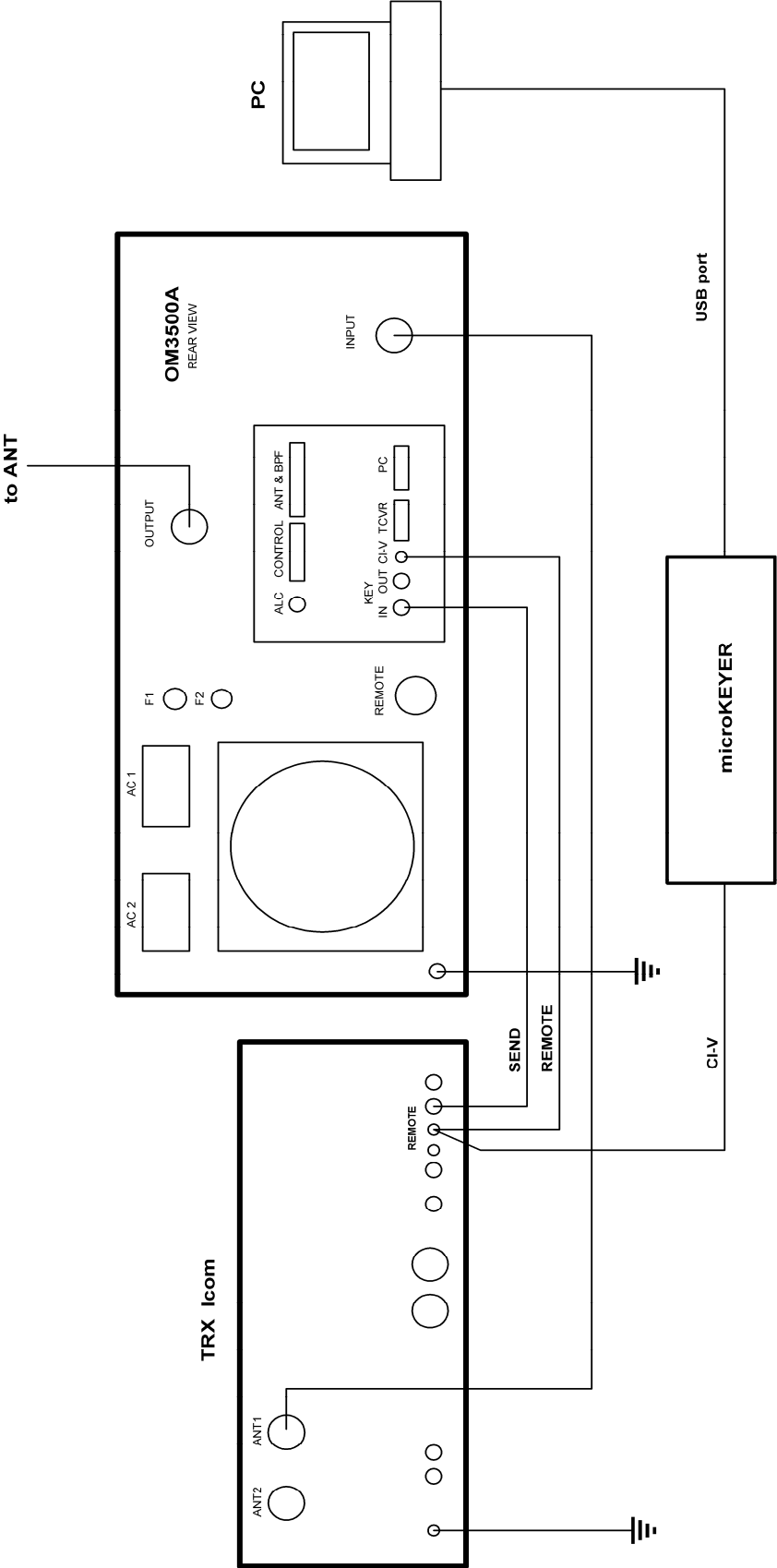
Then we select if want to erase all settings (pressing TUNE) or just one settings parameter (SET button). In case we are defaulting just single parameter use UP / DWN to select which option and confirm by SET.



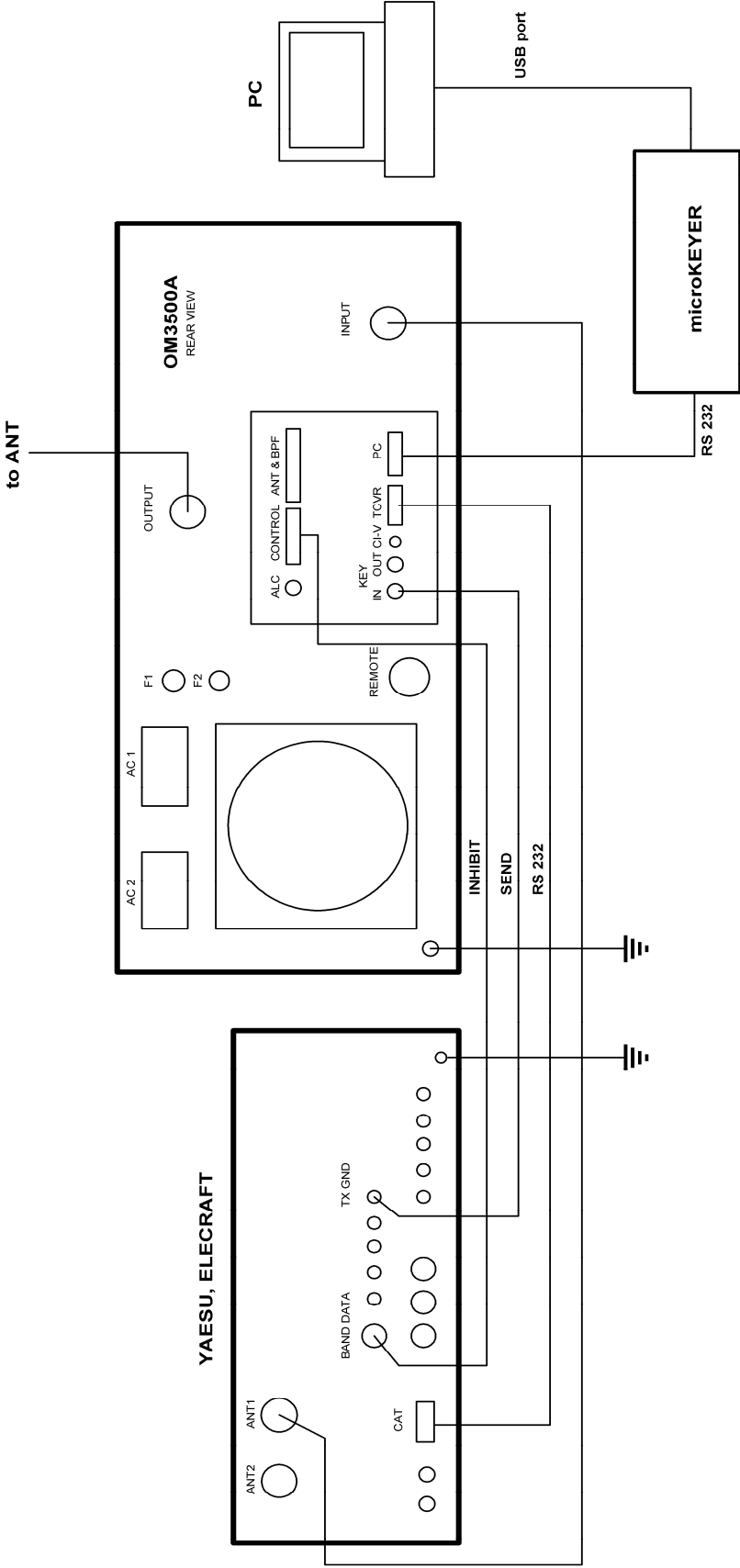
**Example for connection with another accessories , for example USB micro KEYER II with IC7800 and IC7700**



**Example for connection with another accessories , for example USB micro KEYER II with another Icom's**



**Example for connection with another accessories , for example USB micro KEYER II with Yeasu and ELECRAFT**





## Configuring the MUTE option

When operating PA with Icom TRX without TX INHIBIT for disabling TX we recommend blocking of the TX while tuning using ALC control.(mainly while operating FM /RTTY/ AM) ALC Input of your TRX needs to be connected to ALC Out of OM3500A.

Using SET and scrolling UP / DWN we select SET MUTE and confirm it by SET. Then we configure MUTE LEVEL for each band so it results in no power being transmitted by TX when performing TUNE procedure.



### LCD Settings Menu

By pressing SET and scrolling UP / DWN and selecting LCD CONTRAST (Confirming by SET) and pressing Up or DWN we can set Level on Contrast. After we are happy with the result we confirm the setting by pressing SET.



### Operating in MANUAL mode



To enter Manual mode of the PA please press MAN. By pressing MAN repeatedly you select BAND and band's segment You can control the segment or band by scrolling the UP / DWN buttons.

## TUNE

OM3500A has been design to deliver maximum output power at 50 Ohms load. To deliver maximum output to real load you need to adjust the tuning according to your real antenna impedance.

Entering the TUNE mode is done by pressing the TUNE button. OM3500A then switches the TRX to RTTY and sets the frequency to corresponding segment. By changing the values of TUNE and LOAD capacitors we tune the PA as per manual tuning instructions (below in next part of manual) Optimally tuned PA delivers full output without reaching maximum Screen Current of 30mA!!!

After tuning the PA we save the settings by pressing SET and PA will automatically tune frequency of TRX to next band segment. Follow the same procedure for all bands and segments if needed.



By pressing MAN or AUTO buttons PA and TRX will return to standard operating mode.

### Deviding of bands into segments

<b>Band (MHz)</b>	1,8	3,5	7	10	14	18	21	24	28
<b>Width of the segments (kHz)</b>	30	40	40	50	50	60	100	100	200

# TUNING

The OM3500 A amplifier is operated in class AB. Thus it's possible to obtain a maximum output power at an excellent linearity. For this purpose the amplifier has to be tuned carefully.

The operation of a mistuned PA will cause malfunctions, the increase of grid current (the GRID-MAX-LED will light up) and problems with TVI/BCI.

The grid-current is shown with 2 LED diodes. It's normal if the green LED is flashing or may be shining a little bit during peak operation. If you overload the amplifier the output power increases the grid current at very small rates and the red GRID-MAX-LED is shining and the safety devices switch the PA to STBY. You must decrease the input power.

In SSB you will have a good output power if the green LED lights up a bit. The current of screen grid is measured and shown in a Bar graph indicator. The amplifier has to be tuned in such a way that the current is between - 20 mA to +50 mA. At currents beyond these values the operating point will be shifted and IM-products will be rapidly increased. If a value of + 70mA is exceeded, the safety devices will switch the amplifier to STBY mode.

## Tuning instruction :

### **Please note:**

**Before starting tuning you have to check if the right antenna or a 50 Ohms load resistance is connected at the antenna output!**

### **Switching on the amplifier:**

- put the switch at the multimeter to HV position
- put the OPR/STBY switch to STBY position
- press the „ON“ button

The amplifier is prepared for operation with the following steps:

- the toroidal transformers are switched step by step.
- the blower of tube is switched on.
- the multimeter bar graph measures the high voltage; the normal value is 3.4 kV
- the WAIT LED lights up

After switching on you have to check the functioning of the blower. Air must be blown out of the ventilating apertures above the tube. ( If there is any failure you have to press the „OFF“-button immediately !)

Heating the tube takes about 150 seconds. After this time the WAIT LED goes out and the amplifier is ready for operation.

## Tuning the amplifier to an output of 3000 W

OM3500A will tune automatically to either TRX frequency via CAT interface or by frequency sampled by PA.

1. Reduce the power output of your transceiver to the **0**.
2. Switch **OPR/STBY** to „**OPR**“ position (OPR LED lights up)
3. Choose **TUNE** position of multimeter.
5. Switch the PA and increase driver power to **10W** (OUTPUT power will be abt. 500W)

### Please note!

If the input power is higher than 15 W and the power amplifier is not correctly tuned, the safety devices will switch to STBY.

After switching the amplifier to PTT, the amplifier will automatically reset and switch back to OPR mode after approximately 2 seconds.

5. Set TUNE in such a way, that the TUNE-LED lights up maximum left.
6. Set LOAD in such a way, that the TUNE LED on the TUNE scale lights up under the “V” sign. If it is possible to obtain the LOAD in 2 positions, set the position that is father to the right.
7. Repeat tuning several times according to 5 and 6.
8. Increase the input power until an output power of approximately 3500 W is reached.
9. Repeat steps 6 and 7
10. Set TUNE to maximum output power

After this procedure the amplifier is tuned correctly and ready to give 3500W output power in all operation modes. At optimal tuning and full output power a positive 50mA voltage goes through the second grid. On 24 and 28 MHz bands optimal tuning can be achieved when one or two LEDs are lit up to the left from the position “V”. If less output is desired you can simply decrease the load of the transceiver.

**Please note: Should the amplifier demonstrate any malfunctions during tuning or should it not behave in accordance with the description, interrupt the tuning procedure immediately and check the amplifier! Be sure to have not done any mistakes in choosing bands or TUNE/LOAD values!**

**Be sure that SWR is not higher than 1:2 and input power is LOW! After excluding human mistakes you will be able to work for long time with this amplifier!**

## Indication of fault conditions

OM3500 A has the following indication LED on the front panel:

GRID MIN	- indication of first grid current
GRID MAX	- max. First grid current exceeded
HV	- measuring of anode voltage by bar graph
IP	- measuring of anode current by bar graph
FAULT	- fault
OPR	- amplifier in operation mode
STBY	- amplifier in standby mode
WAIT	- heating of tube after switching on the amplifier

Should a fault condition appear during the tuning or operation of the amplifier the safety circuits of OM3500A will react. The amplifier will be turned to STBY mode. After approx. 1 sec the control circuits will switch the amplifier back to OPR. If the fault will repeat 3 times after each other the control circuits will turn the amplifier to STBY. Bringing the amplifier to OPR is enabled by using the OPR/STBY switch.

After the reaction of safety circuits the FAULT LED will be lit up for approx. 5 sec depending on the nature of the fault.

### Flashing LED signalizes:

IP	- anode current exceeded
HV	- low anode voltage
FAULT	- reflected output exceeded
GRID MAX	- first grid current exceeded
	- screen grid current exceeded
GRID MAX + HV	- maximum load power exceeded
GRID MAX + IP	- zero output power during tuning
HV + IP	- tuning fault, incorrect tuning of the Pi-L output circuit

**In case your OM3500A amplifier is not working correctly, please contact the manufacturer or your distributor,**

**Manufacturer's contacts: OM POWER, s.r.o.**

**930 30 Báč 126**

**SLOVAKIA**

**e-mail:**

**ompower@nextra.sk**