

HF2013DX-A

HF POWER AMPLIFIER



CAUTION

Before you turn the amplifier on, at least 2 hours should have expired since it was brought in and unpacked in the room where it will be used. Pay particular attention when you move it from a very cold into a very warm place - condensation is likely and this could result in damage to the high voltage circuits. In such a case, wait at least 4 hours. A similar effect can occur after a rapid warming of the operating room (for instance after switching on a powerful heater).

CAUTION

To avoid

Instruction Manual

Version 1.09

IMPORTANT SAFETY INSTRUCTIONS:

WARNING - GROUNDING

Have in mind that the grounding system may have to withstand currents over 20A with insignificant voltage drop on it. Therefore it may be necessary for you to improve it considerably. The grounding leads should be at least 8mm^2 (AWG 8 or SWG 10) or braid size of $\frac{3}{4}$ to 1 inch

CAUTION

If this is the first time you have used a high power amplifier in your station, pay attention to the coaxial cable type from the amplifier output. It must handle the increased power safely – particularly on the higher frequency bands. We recommend you use RG213, LMR400 or better coaxial cable. Similar good quality coaxial cable should be used throughout your antenna system. Check the power capability of the antenna selector, the matcher, and the antenna itself (especially multiband trap antennas)

WARNING HIGH VOLTAGE

This amplifier works with very high voltages up to 3300V, which is **LETHAL!** For your safety remove the power plugs and WAIT AT LEAST 30 minutes EACH TIME BEFORE you remove the cover of the amplifier. Do not touch any part inside while the amplifier is open as some residual voltages may still be present.

WARNING HIGH VOLTAGE

Never allow anyone, **ESPECIALLY CHILDREN**, to push anything into the holes in the case – this will cause electric shock. **NEVER TOUCH AN ANTENNA** during transmission – this may result in an electric shock or burn. **NEVER EXPOSE** the amplifier to rain, snow, or any liquids. **AVOID** placing the amplifier in excessively dusty environments or in direct sunlight..

WARNING

DO NOT OBSTRUCT AIRE INTAKE (real panel) and **EXHAUST** (top cover, left rear) areas of the amplifier. Keep a minimum distance of 10cm (4 inches) to the intake and 50cm (20 inches) to the exhaust. Do not undertake repairs, changes to hardware or software of the amplifier in order not to endanger your or others health and life and not to damage the amplifier and the equipment connected with it. Any such repair, change or modification will void the warranty. The manufacture is not liable for the action of another and responsibility shall be assumed by the owner.

- This amplifier contains **very high voltage circuits**. Never turn the amplifier on without the upper lid in place. **This high voltage is lethal!!!**
- The HF2013DX-A amplifier must not be used in a wet or humid environment nor to be exposed to rainfall.
- The amplifier must be installed so that free flow hot air from the tube is unrestricted. Do not install the amplifier in an area that could constrain airflow.

- 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 to your station earth.
- The amplifier must be installed to ensure unrestricted access to the rear power connectors.
- The amplifier will only operate if both 2kw power cables are connected. Insure that you have two independent 2kw a/c supplies that are capable of supplying 10 Amps each with a maximum working current of 18 Amps a/c
- Do not turn the amplifier on without having connected the antenna first. There is potential for a hazardous HF voltage build-up.
- Before opening the upper lid of the amplifier make sure that both power supplies have been disconnected for at least 10 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.
- This amplifier is an A category product. In a household it can interfere with other electrical appliances. In such cases the user is to take proper actions to mitigate this disturbance, by using proper station earth, use of Ferrite beads, high quality antennas and high quality coax such as LMR400 or better.

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GENERAL DESCRIPTION OF THE HF2013DX-A AMPLIFIER

The linear amplifier HF2013DX-A is designed for all short wave amateur bands from 1.8MHz to 29MHz (including WARC – bands) and all operating modes. It is equipped with a ceramic tetrode FU728F (4CX1500B). The HF2013DX-A is automatically tuned to the operating frequency of your TRX when the correct control cable is connected.


SPECIFICATION OF HF2013DX-A

Frequency coverage:	Amateur bands 1.8MHz – 29.7 MHz including WARC
Power output:	2000 W PEP in SSB and CW 1800W in RTTY, AM and FM
Drive Power:	usually 60 to 73 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	ICOM, ELECRAFT, KENWOOD, TEN-TEC, YEASU and ICOM transceiver protocol used by microHAM devices – CI-V OUTPUT
Tube:	FU728F Ceramic tetrode (similar to a 4CX1500B)
Cooler:	EBM Centrifugal blower + axial blower
Power supply:	2 x 230 VAC 2kw, 50 Hz one or two phases
Transformers:	2 x toroidal transformer 2.0 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 when top cover is opened.

5 INCH LCD COLOUR DISPLAY INDICATORS :

WAIT	- preheating of tube (150 sec)
WAIT	- preheating of tube completed.
STBY	- standby
OPR	- operating condition
FAULT	- failure, Will switch to STBY for 2 seconds and back to operate.
FPW	- Forward power output
SWR	- Standing Wave Ratio
RPW	- Reflected Power
TUNE	- Tune scale indicator

BUTTONS

	Lists items in menu
MAN	Manual Operation mode – See tuning section
AUTO	Automatic operating mode, settings recalled from

Memory.

TUNE	Tuning
SET	Confirmation of selected item in menu.
ON/OFF	Mains Power on / off
OPR/STBY	Operate and Standby modes.

OSD INDICATION

LCD display 2x32 Characters
Colour 5 inch LCD Information Panel

DIMENSIONS:

485 x 200 x 455mm (width x height x depth)

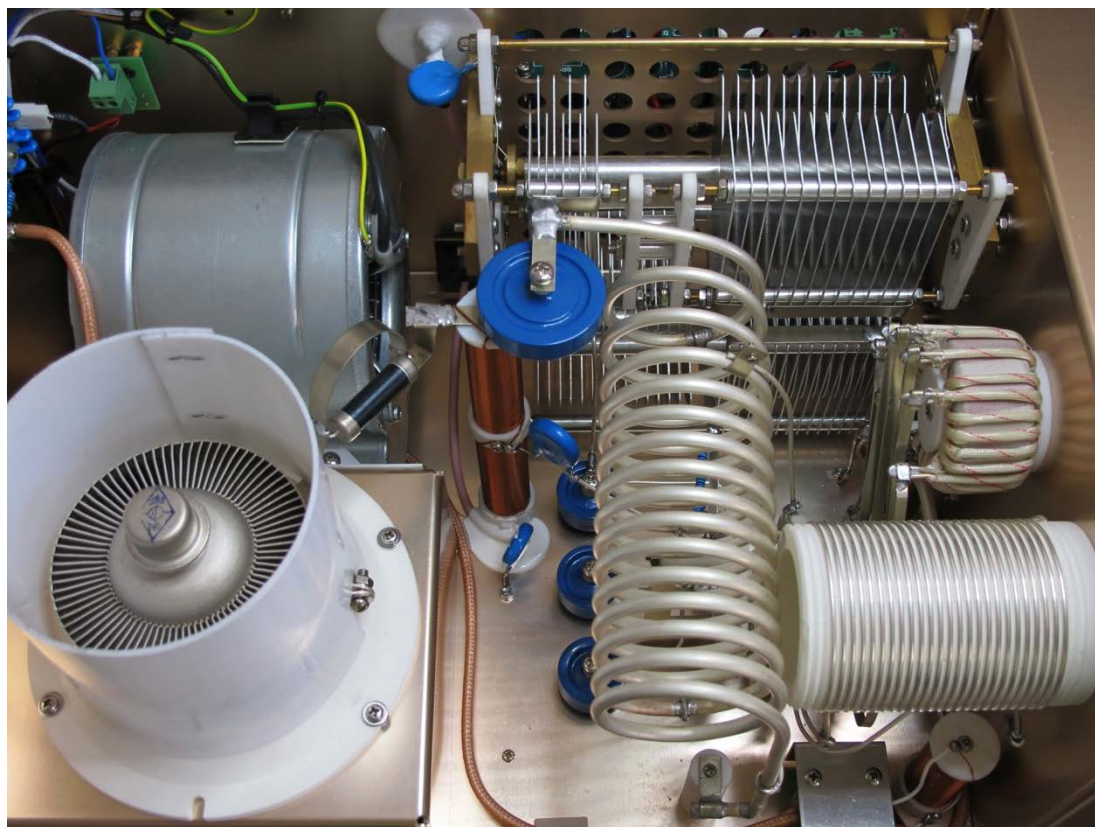
WEIGHT:

38 kg

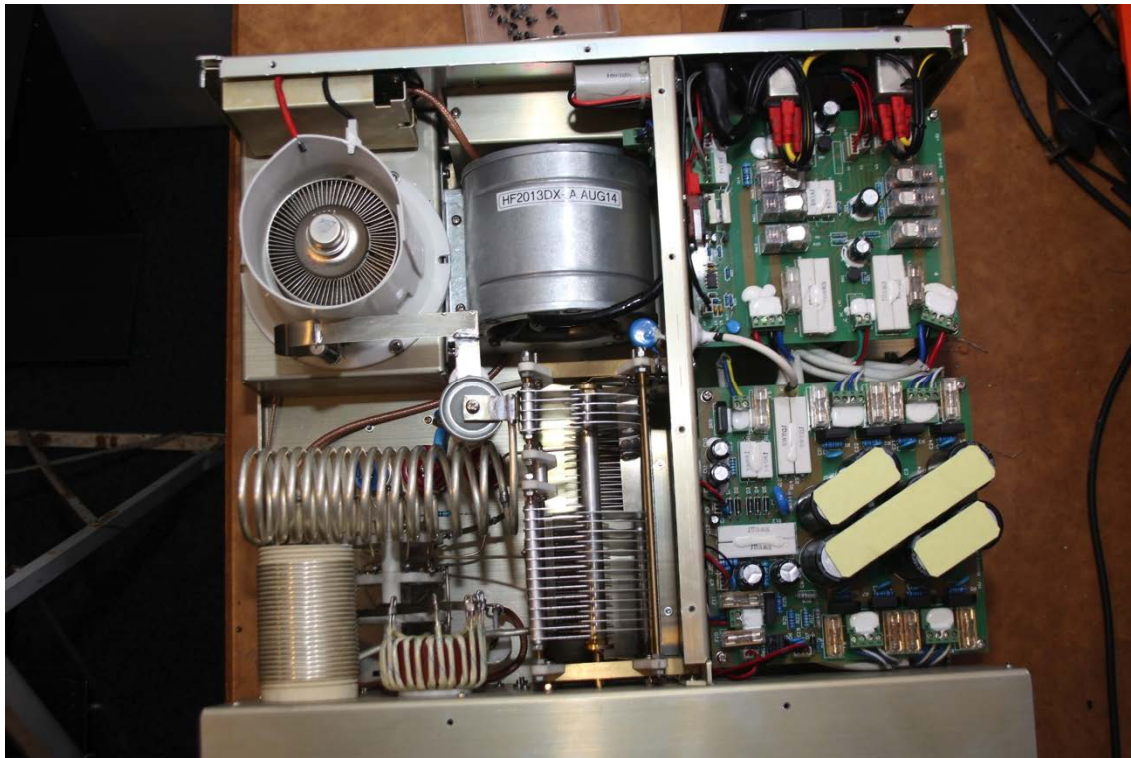
DESCRIPTION of HF2013DX-A POWER AMPLIFIER

In this amplifier a tetrode tube FU728F (similar to a 4CX1500B) 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.

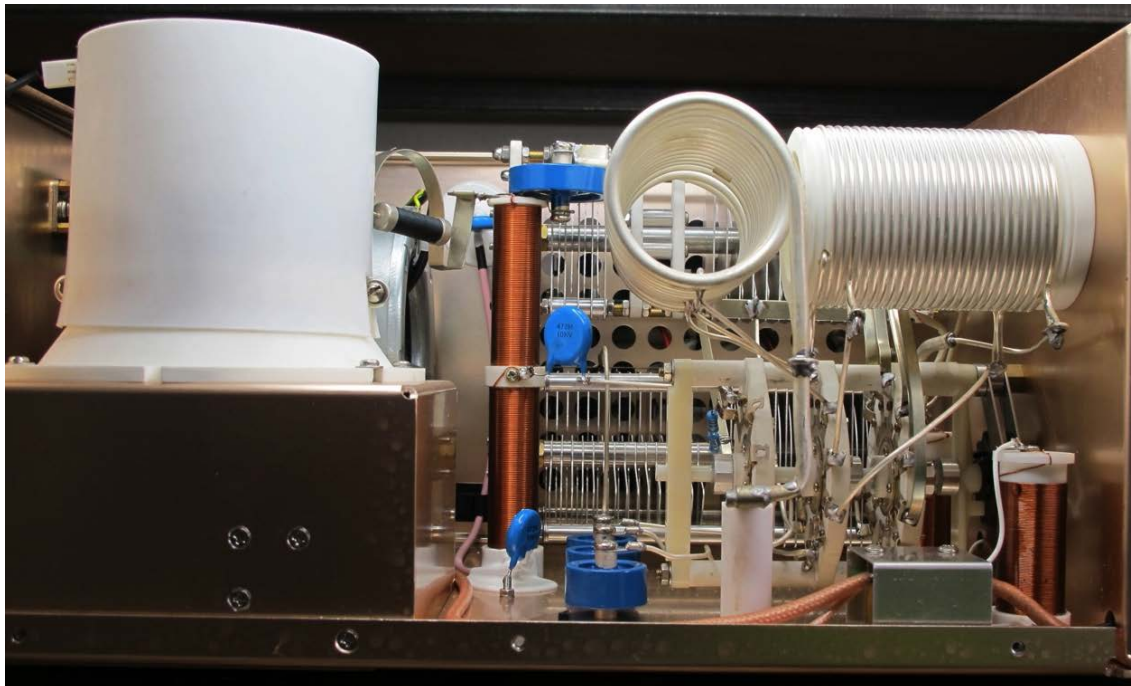
TOP VIEW OF OPENED HF2013DX-A



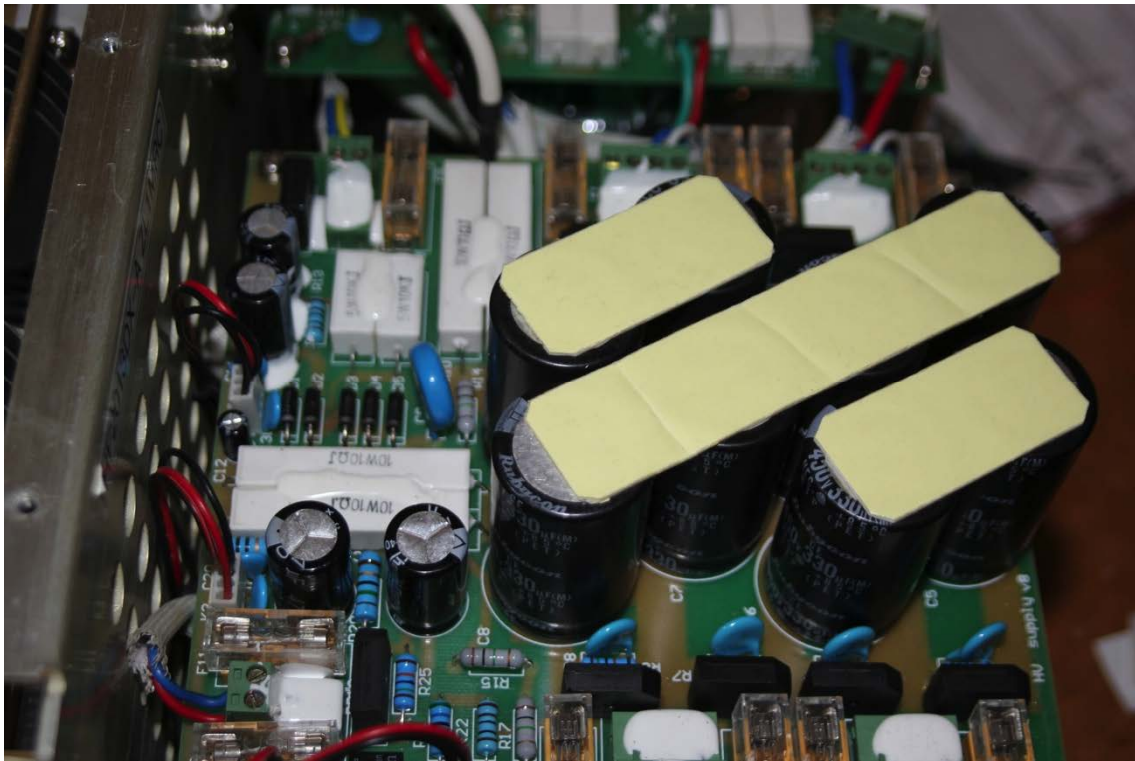
TOP VIEW OF OPENED HF2013DX-A



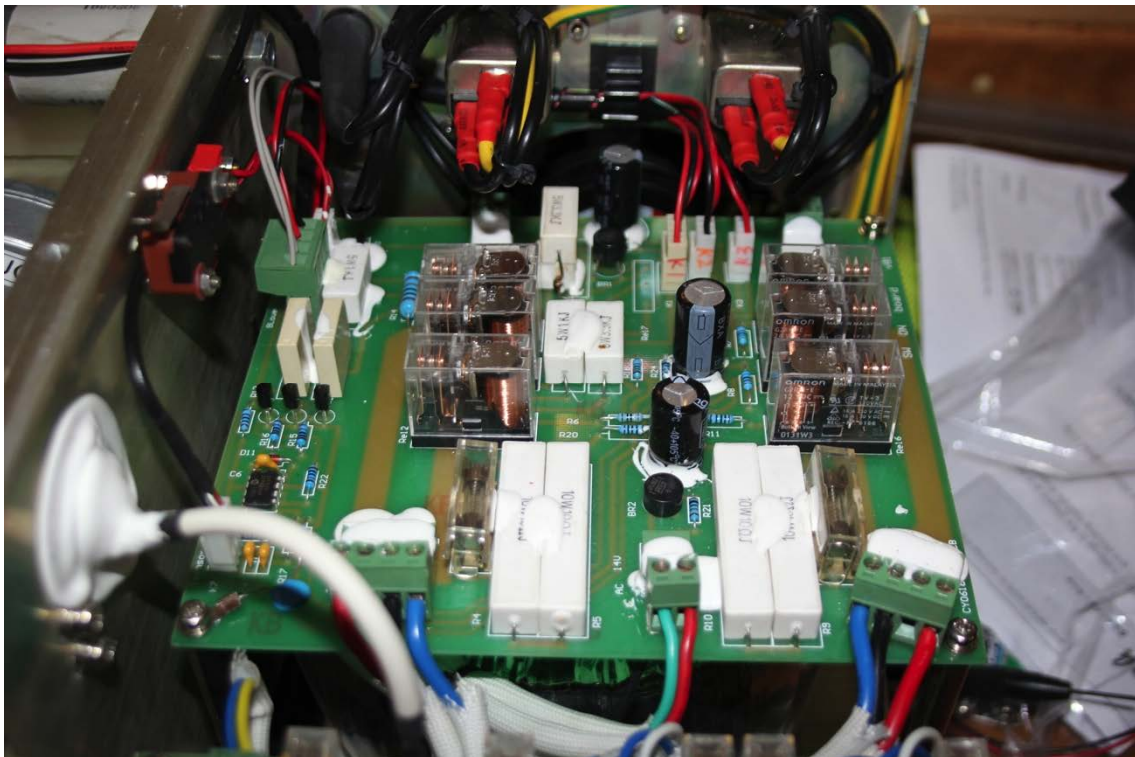
SIDE VIEW OF OPENED HF2013DX-A



POWER SUPPLY BOARD OF THE HF2013DX-A



SWITCH ON BOARD OF THE HF2013DX-A



AC POWER CONNECTORS AND COOLING FAN



TOROIDAL TRANSFORMER 2.0 KVA



The Power supply of the amplifier is made up of two 2.0 kVA toroidal transformers. A soft start process is initialized by resistors and relays circuits contained on the soft-start power supply board.

The high anode voltage consists of 8 times 420V (3300V) at 2Amps. Each of these contain there own rectifier and filter. In the high voltage circuit safety resistors are installed 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 using 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 RG58or better.The connection between the power amplifier and the antenna should becoaxial cable such as RG213, LMR400or better must be used. For INPUT and OUTPUT PL-259-sockets with Teflon isolation are used.

Rear view of the amplifier



MAIN SUPPLY

The amplifier is connected to230/240vac mains with 2 cables. Each cable needs to be connected to either another phase or to a single phase that will supply 2KW each. If connected to a single phase, ensure your mains supplyis able to deliver 4KW. Failure to do this will result in limited RF output and could cause issues with RFI.

GROUNDING

The amplifier has to be grounded properly! Connect the screw on the rear panel of the amplifier to your station grounding system with a copper-cable; use a cross-section of 8mm² or more. Your transceiver must be connected to this ground as well.

When using a power amplifier with high output you must ensure that your grounding system is operating correctly. All components have to be connected to this ground. Use short cables and make sure that they have good contacts! Failure to do this will risk damaging to your equipment, issues TVI/BCI and your signal may be distorted.

REMOTE

Control of the amplifier is possible using an optional remote control box. Connection distance must not be greater than 10 meters.

I / O PA INTERFACE

Control of the 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 your transceiver.

The relays of the HF2013DX-A 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 transmitter without time delay we recommend that you connect the PA so 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).

<i>CI-V</i>	Mono 3.5mm Jack for connection of ICOM TRXs. For successful operation selection of ICOM radio and correct baud rate is important (9600 default)
<i>TCVR</i>	DB-9 -serial port RS232 for YAESU 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.
<i>PC</i>	DB9 RS232 port is used for communication of your TRX with PC. Use setting that you would normally use as if using direct connected. I.e. TRX – PC connection.
<i>ALC</i>	RCA-Phono – Automatic Level Control is used when tuning the PA to block drive level. WARNING!!! We recommend to use this feature mainly while operating RTTY, FM and other 100% duty modes.
<i>CONTROL</i>	DB15 connector for use of single cable between PA and TRX PIN OUT: <ol style="list-style-type: none"> 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 DB-25 is used for switching of external HP BPF or external Antenna Switch device. Maximum switching parameters are 30V / 0.5A.

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 when you power on the PA and it is turned off when after-cooling has finished (approx. 1-5 min after switching off the PA depending on the temperature of the tube). The supplemental rear mounted fan is turned on depending on the temperature of the air exiting from the tube tower of the amplifier. It is activated when the exit temperature exceeds 70°C and is switched off at 60°C.

OPERATION



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 Power down the amplifier.

ON Power up the amplifier. Heating of tube takes 150 seconds, therefore there will be a delay before the amplifier is ready for operation. The **WAIT** indicator will remain lit until the unit is ready for operation. Once ready this indicator will display **WAIT**

OPR Enables amplifier ready for operation The LCD panel will display **OPR** – Please note that the WAIT indicator will need to display **WAIT** before you can operate the amplifier.

STBY Places Amplifier into Standby Mode. The LCD panel will display **STBY**
If the amplifier is in **STBY** your transceiver will be directly connected to the antenna. Maximum power throughput **must not exceed 200 Watts!**

FPW LCD Bar graph – shows PEP output power.

RFP LCD Bar graph – shows reflected power of the antenna. If the reflected power exceeds 350W the amplifier switches to STANDBY-mode.

HV Measures the Anode Voltage.

IA Measures the current of the anode in mA.

G2 Measures the current of the second grid in mA. Range from 0mA to +80mA

TEMP Measures the temperature of the exhaust from the ceramic tetrode

TUNE LCD Tune Indicator; Assists with the tuning of the Amplifier

SET button is 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

▲▼ selection of band, segment, parameter, menu options

CONFIGURING AND OPERATING THE HF2013DX-A POWER AMPLIFIER

When the Power switch is selected to the ON position the amplifier will start. This will also start the process of heating the ceramic tube. During this process the PA LCD will display **STBY** and **WAIT**. If there is a TRX connected to the correct port, and the communication settings are correct, and the AUTO button is selected, the PA will display the Radios frequency and type of Transceiver. After successful heating of the TUBE (150 seconds) the LCD will display **STBY** and **WAIT** and you can enter operating mode by pressing the **OPR** Switch. The LCD will display **OPR**

EXAMPLE OF AUTO MODE USING ICOM TRANSCEIVER



EXAMPLE OF SELECTING TCVR KENWOOD FROM MENU.



For communication with TCVRs, that are not supported by HF2013DX-A as an example JST-245 and older types of Kenwood transceivers, an external Interface / converter (IF-232) is to be used. Products such as microHAM MKII, MK2R+ etc, will process transceiver frequency information in ICOM format through the CI-V output. As an example 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, HF2013DX-A is connected to the CI-V output of a microHAM device.

EXAMPLE OF COMMUNICATION



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

ENSURE THAT YOU ADD FERRITE BEADS ON ALL COMMUNICATION CABLES BETWEEN THE PA AND THE TRANSCEIVER. ALSO INCLUDE FERRITE BEADS ON THE SEND RCA, CI-V AND THE ANTENNA OUT COAX.

EXAMPLE OF COMMUNICATION LOSS MESSAGE



TRX SUPPORT SETTINGS

Press **SET** button and scroll using **▲** and **▼** to CHOOSE TCVR



Confirm CHOOSE TCVR by pressing **SET** again and scroll **▲** and **▼** 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 **▲** and **▼** selects 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 a Yaesu TRX you will need to configure the **STOP BIT** parameter and confirm this selection with SET.

To exit the Communication settings menu press the **AUTO** button. The PA will enter AUTO mode only if all settings are correct and connection has been established. You can check that the correct frequency and TRX type has been displayed on the LCD OSD.

ANTENNA SWITCHING MENU

If you have an 3rd party external antenna switch connected to PA (i.e. Microham TEN SWITCH, Ameritron RCS-12LX etc) you need to configure the assignment of each port to specific band/antenna. By pressing **SET** and scrolling to ANTENNA SETTINGS you will then control the Antenna Options. Press **SET** again and you will get the current band and its antenna selection. By scrolling **▲** and **▼** you can select a BAND which you want to assign to an ANTENNA.



You then select how many antennas we want per current band (1 or 2) and then always confirm your selection by pressing **SET**. Please note that we are only currently supporting one antenna per band. i.e. Select 1. By scrolling **▲** and **▼** you assign which PORT is used on your external antennas switch. i.e. ANT 1 ON PORT 01



Configuration will continue to another antenna port selection. To finish Antennas switch configuration you can either press **AUTO** or **MAN**

BANDPASS FILTER SWITCHING

Switching an external band pass filters is automatic. Follow the pin out of the BPF connector. For more see section of ANT & BPF Switching

LOADING FACTORY DEFAULT SETTINGS

To restore factory default settings press **SET** and scroll using **▲** and **▼** to **LOAD DEF. VALUES** and confirm by **SET**



You will be asked to confirm DEFAULT Values. **TUNE** will erase all settings and load defaults. If you just want to default a single parameter use **▲** and **▼** to select which option and confirm by **SET**.

CONFIGURING THE MUTE OPTION (ALC)

When operating the PA with an ICOM TRX without TX INHIBIT for disabling TX, we recommend blocking the TX while tuning using ALC control. The ALC is mainly used when operating FM /RTTY/AM. The ALC Input of your TRX needs to be connected to ALC Out of HF2013DX-A. Using **SET** and scrolling **▲** and **▼** we select SET MUTE and confirm it by **SET**. You will need to configure the MUTE LEVEL for each band. Select a MUTE level that will ensure no power transmitted by TX when performing the TUNE procedure.



LCD SETTINGS MENU LCD

By pressing **SET** and scrolling **UP** / **DWN** and selecting LCD CONTRAST (Confirming by pressing **SET**). Adjustment of the contrast level can be made by pressing **UP** or **DWN**. When you have achieved the correct contrast confirm by pressing **SET**.



OPERATING IN MANUAL MODE



To enter Manual mode of the PA press **MAN**. By pressing **MAN** repeatedly you will select the desired band's segment. You can control the segment or band by scrolling using the **^** and **v** buttons.

TUNE

HF2013DX-A has been designed to deliver maximum output power at 50 Ohms load. To deliver maximum output into a real load, you will need to adjust the tuning according to your antenna impedance.

Entering TUNE mode is done by pressing the **TUNE** button. HF2013DX-A then switches the TRX to RTTY and sets the frequency to the corresponding segment. By changing the values of **TUNE** and **LOAD** capacitors you tune the PA. Optimally tuned PA delivers full output without reaching **maximum Screen current of 50mA and IA maximum current of 1500mA, however you should set G2 less than 50mA and IA less than 1500mA.** After tuning the PA, save the settings by pressing **SET** and PA will automatically tune the 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.



Dividing of bands into segments

Band - MHz	1.8	3.5	7	10	14	18	21	24	28
Width of segment in KHz	30	40	40	50	50	60	100	100	200

TUNING

The HF2013DX-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 very carefully. *The operation of a mistuned PA will cause malfunctions; the increase of grid current (the G2 will Alarm) and you will have problems with TVI/RFI.*

The grid-current is shown as the IA value (maximum value is 1500ma). If you overload the amplifier the output power increases the grid current at very small rates and the IA will display the grid current in RED. The safety devices will switch the PA to **STBY**. You must decrease the input power. The current of the screen grid is displayed as G2. The amplifier must be set to have a **G2 current less than 50mA and IA must be less than 1500mA.**

NOTE: To tune correctly, tune for Maximum RF output with minimum grid current, such as G2 less than 50mA and IA less than 1500mA.

At currents beyond these values the operating point will be shifted and IM-products (IM interference) is created through non-linear interaction of two or more co-site transmit signals whose emitted frequencies combine to create significant harmful.) will be rapidly increased. If these values are exceeded the PA will activate the safety devices will switch the amplifier to **STBY** mode.

TUNING INSTRUCTIONS

Please note: Before starting tuning you have to check you have connected the correct antenna or a 50 Ohms resistance load to the antenna output socket!

SWITCHING ON THE AMPLIFIER:

- Put the OPR/STBY switch to **STBY** position
- Press the **ON** button

The amplifier will follow the following steps:

- The toroidal transformers are switched on step by step.
- The blower of tube is switched on to low speed.
- The HV will display voltage of around 3.2kV
- The **WAIT** LCD lights up

After switching on you have to check the function of the blower. Air must be blown out of the exhaust Chimney from the ceramic tetrode. If there is any failure you must press the **OFF** button **immediately!**

Heating the tube takes about 150 seconds. After this time the **WAIT** LCD changes **WAIT** and the amplifier is ready for operation.

TUNING THE AMPLIFIER TO AN OUTPUT OF 2000 W PEP

HF2013DX-A will tune automatically to the TRX frequency via CAT interface.

1. Reduce the power output of your transceiver to the **0**.
2. Switch **OPR/STBY** to **OPR** position – The LCD will display **OPR**



3. Select the **TUNE** button
4. Key the TRX PTT and increase driver power to **10W** (OUTPUT power will be about 350W)

Please note!

If the input power is higher than 15W and the power amplifier is not correctly tuned, the safety devices will switch the PA to **STBY**. In such and event after you stop keying PTT the PA will automatically reset and switch back to **OPR**. There is a delay of approximately 5 seconds.

5. Set **TUNE** so the FPW reads maximum.
6. Set **LOAD** so that the TUNE LCD indicator lights within 1cm to the 'V' or 1cm to the right of the 'V' and you achieve maximum FPW.



7. Repeat tuning several times, follow steps 5 and 6.
8. Increase the input power to 73W and the output is approximately 2000W.
9. Repeat steps 5 and 6
10. Set **TUNE** to maximum output power
11. Set **LOAD** so that the **G2 Grid is less than 50mA** and **IA is less than 1500mA**
12. **Best practice is to Adjust for Maximum RF output power with minimum current on G2 and IA, such as G2 less than 50mA and IA less than 1500mA.**



After this procedure the amplifier is tuned correctly and ready to give 2000W PEP output power. **At optimal tuning and full output a positive less than 50mA current goes through thesecond grid and IA must not exceed 1500mA.**

Ideally tune for maximum RF output with minimum current, such as G2 less than 50mA and IA less than 1300mA

On 24 and 28 MHz bands optimal tuning can be achieved when one or two LCDs are litup to the left from the position "V". If less output is desired you can simply decrease the load of thetransceiver.

Please note: Should the amplifier demonstrate any malfunctions during tuning or should it not behave in accordance with the tuning instructions, STOP the tuning procedure immediately and check the amplifier. Be sure that you have followed the tuning instructions carefully. Be sure that SWR is not higher than 1:2 and input power is LOW!After excluding any human errors, this Amplifier will provide you a long service life.



INDICATION OF FAULT CONDITIONS

The HF2013DX-A has the following indications on the front LCD panel:

G2	Measure of the Grid current.
HV	Measure of anode voltage by LCD graph
IA	Measure of anode current by bar graph
FAULT	Fault Condition – See RED flashing indicators.
OPR	Amplifier in operation mode
STBY	Amplifier in standby mode
WAIT	Heating tube after switching on – Please wait 150sec
TEMP	Measuring of the tube exhaust temperature
G1MAX	Grid Current exceeded maximum

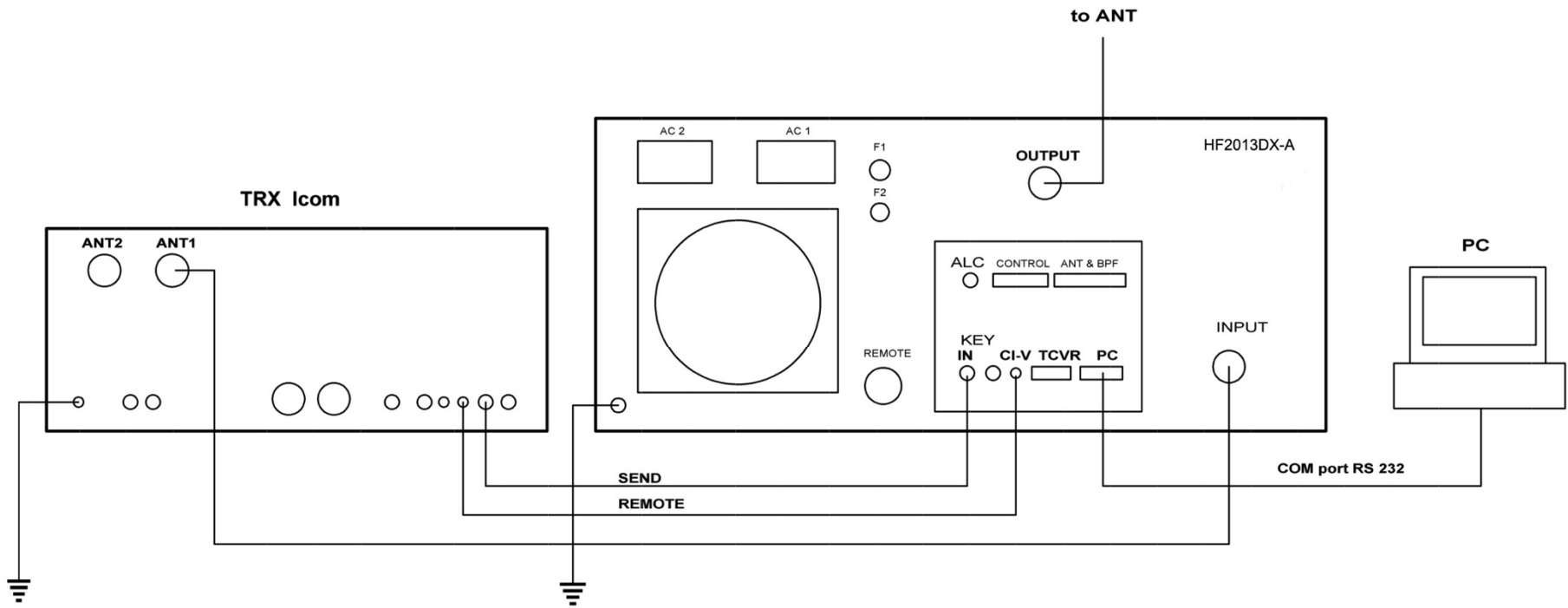
Should a fault condition appear during the tuning or operation of the amplifier the safety circuits of HF2013DX-A will react. The amplifier will be turned to **STBY** mode. After approx. 5 seconds the control circuits will switch the amplifier back to **OPR**. If the fault repeats 3 times, the control circuits will turn the amplifier to **STBY**. You must toggle the **OPR/STBY** switch to reset this fault condition. After the reaction of safety circuits the **FAULT** LCD will be lit up for approx. 5 to 10 seconds depending on the nature of the fault.

FLASHING LCD SIGNALS:

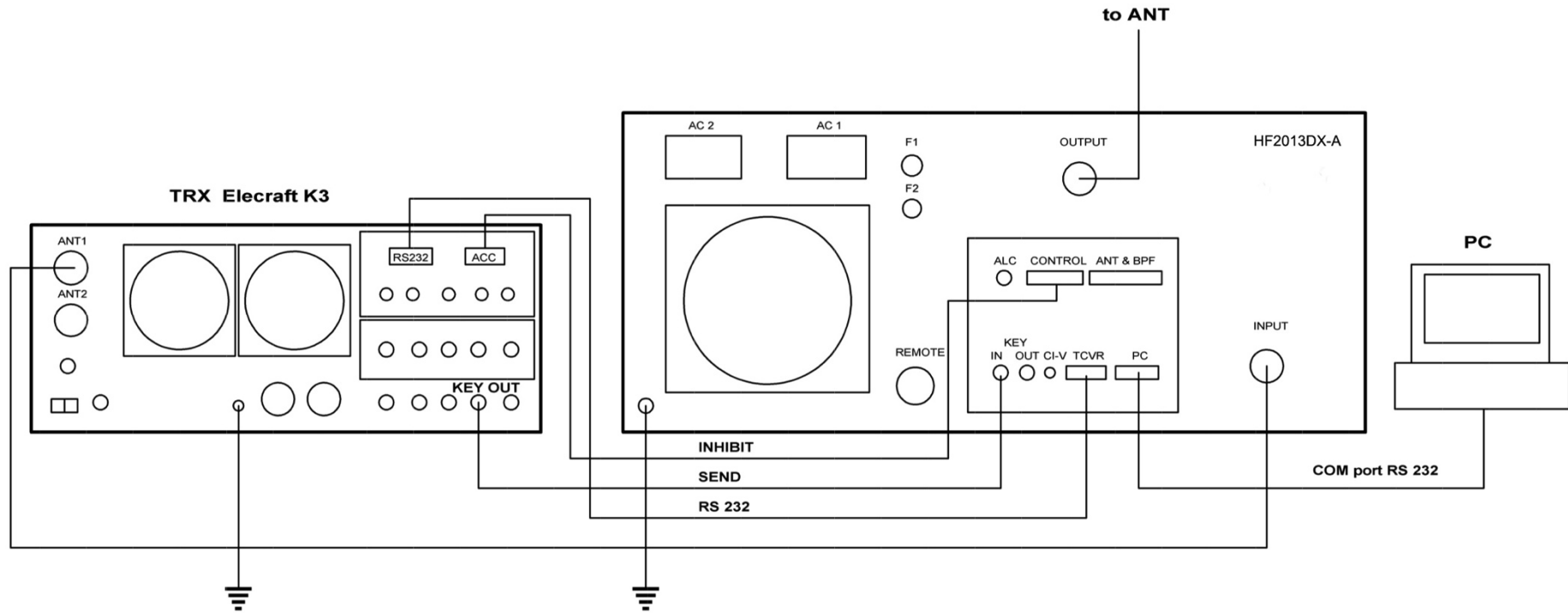
IP	anode current exceeded
HV	low anode voltage
FAULT	reflected output exceeded
GRID MAX	first grid current exceeded screen grid current exceeded
GRID MAX + HV	maximum load power exceeded
HV + IP	tuning fault, incorrect tuning of the Pi-L output circuit

In case your HF2013DX-A amplifier is not working correctly, please contact the manufacturer or your distributor.

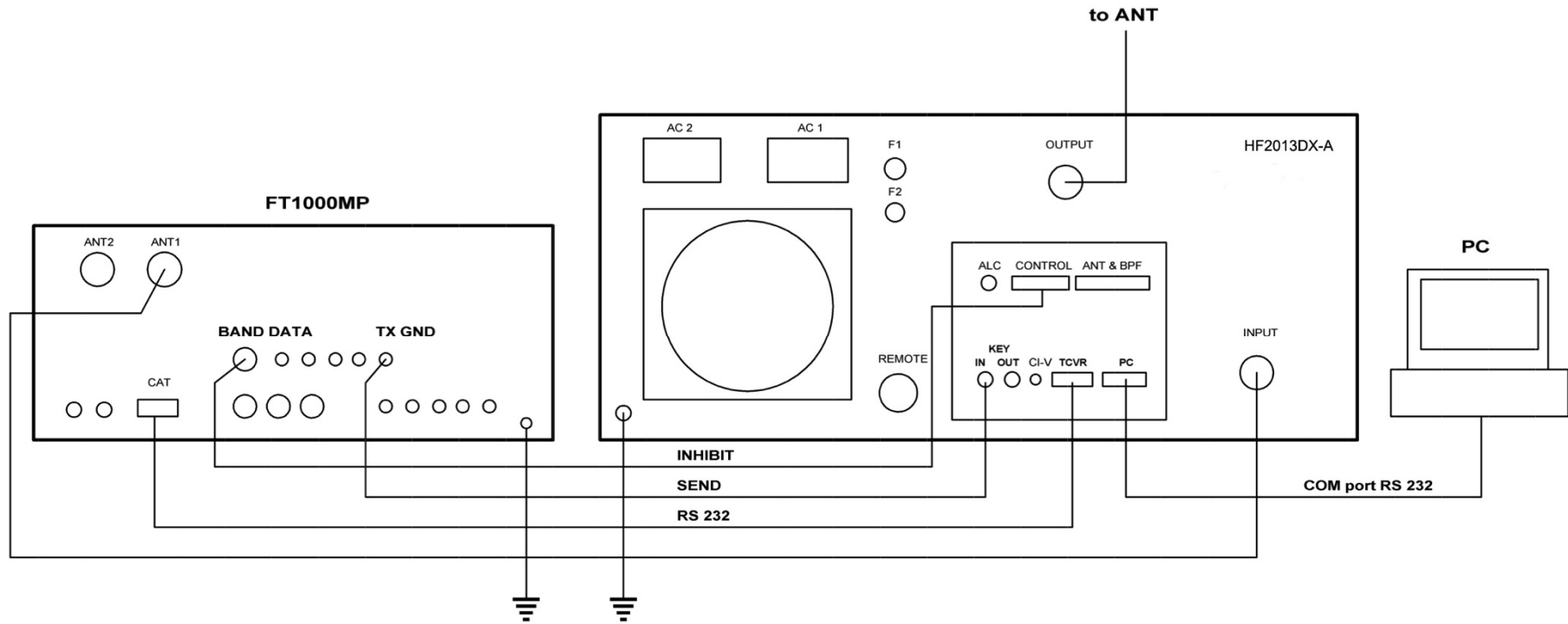
EXAMPLE OF CONNECTION TO AN ICOM



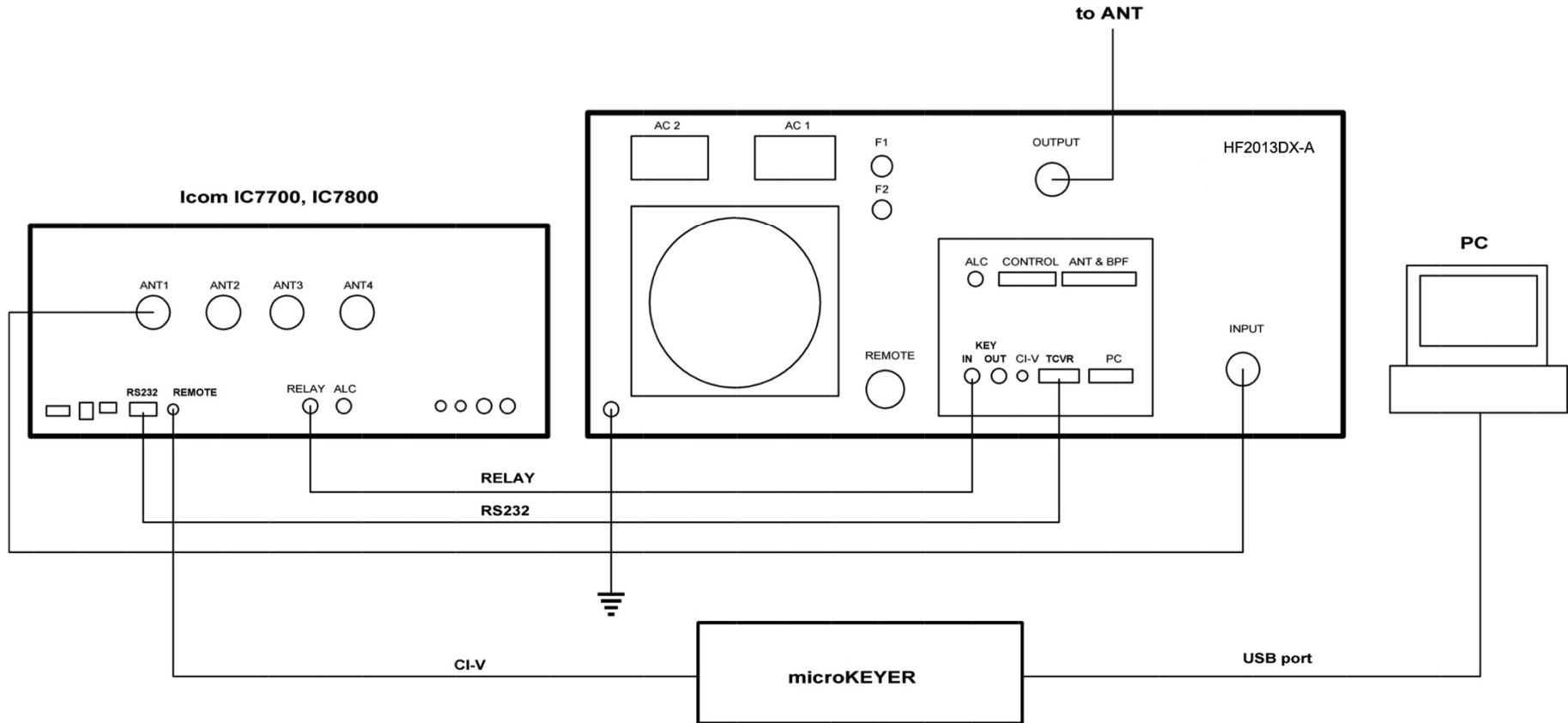
EXAMPLE OF CONNECTION FOR ELECRAFT



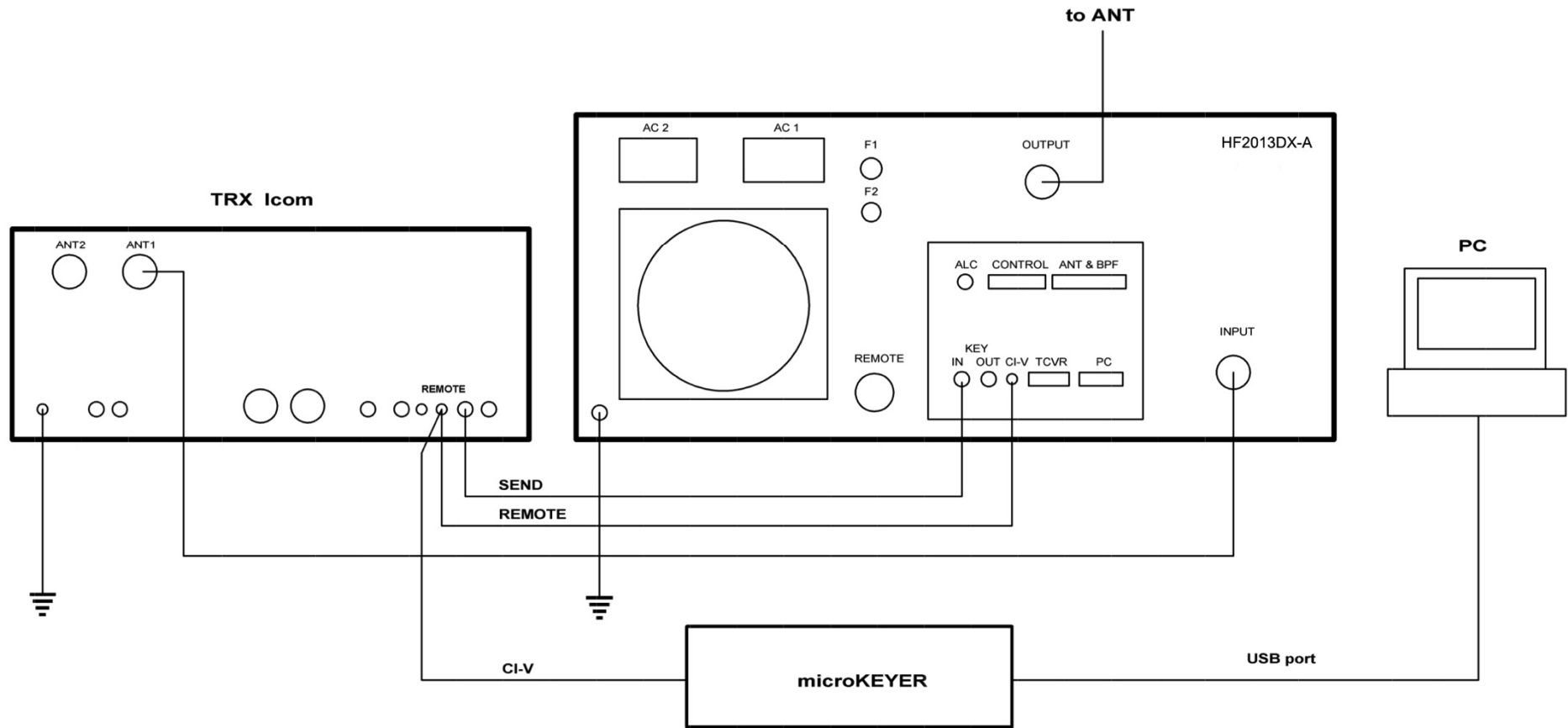
EXAMPLE OF CONNECTION WITH YEASU



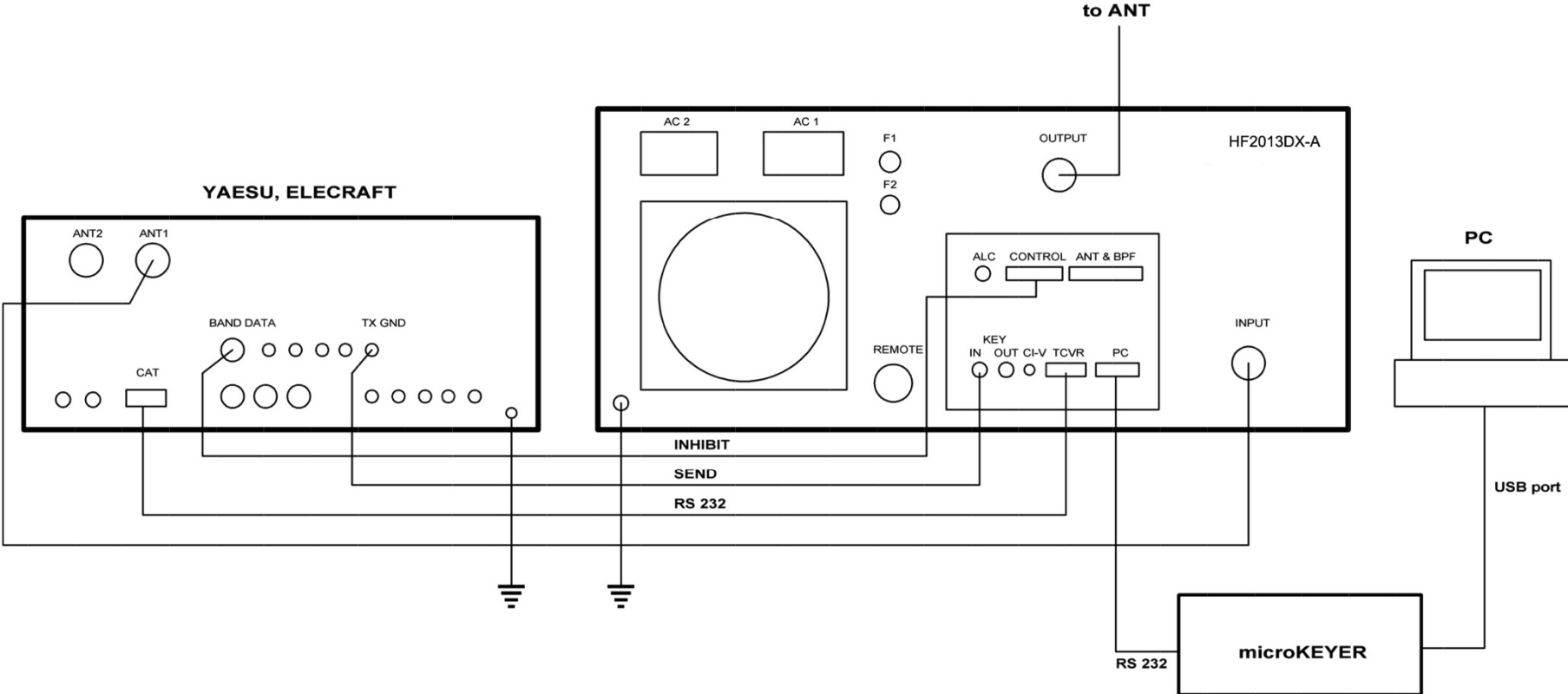
ICOM 7700/7800, WITH ACCESSORY USB MICRO KEYER II AND PC



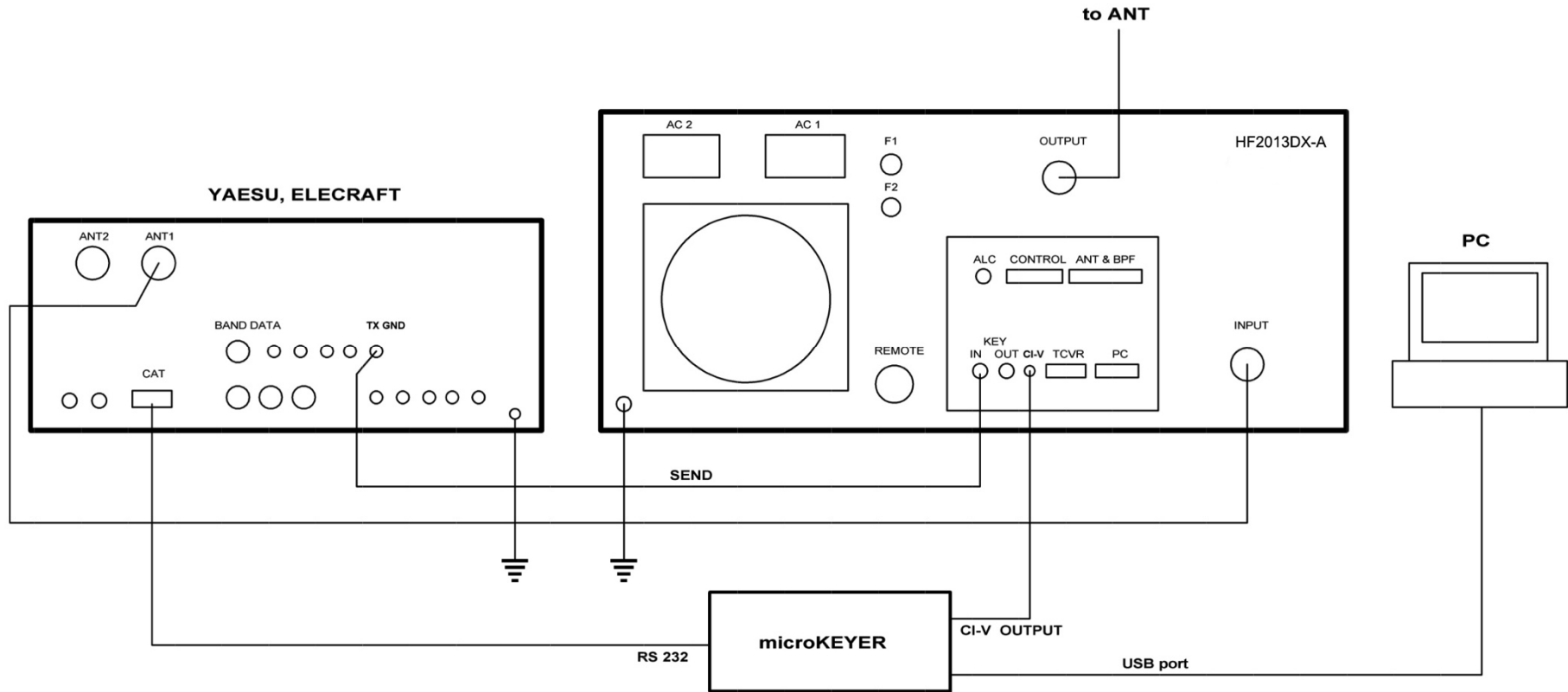
ICOM, WITH ACCESSORY USB MICRO KEYER II AND PC



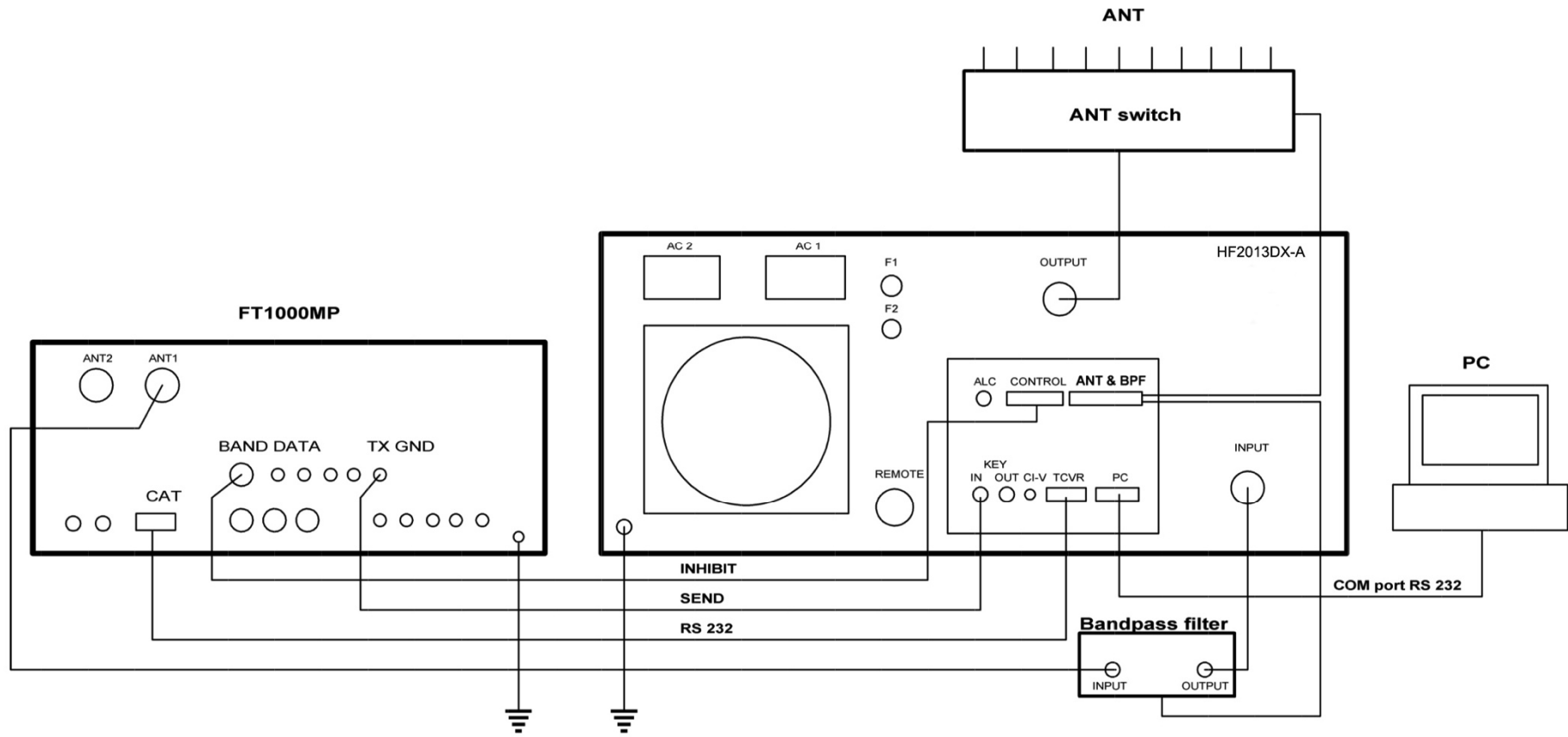
YEASU / ELECRRAFT, WITH ACCESSORY USB MICRO KEYER II AND PC



YAESU / ELECRAFT, WITH ACCESSORY USB MICRO KEYER II (MK2R+ ETC) WITH CI-V OUTPUT



YEASU WITH ACCESSORY ANTENNA SWITCH AND BPF CONNECTED TO PC



BLOCK DIAGRAM.

