

UP4DAR startup

General information

Internet: <http://www.up4dar.de/>

Mailing list: <http://groups.yahoo.com/group/up4dar>

GitHub Repository: <https://github.com/dl1bff>

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1 Preface

UP4DAR (Universal Platform for Digital Amateur Radio) is a multi-purpose unit for digital Amateur radio modes. The UP4DAR software is Open Source and available to all Radio Amateurs.

Available features of the UP4DAR depend on the software. The „Operating System“ of the controller is Open Source and licensed under GNU General Public License Version 2 and available for free.

The UP4DAR can either be used as repeater or as terminal equipment as well.



Note

This manual specifies available hardware interfaces and the startup using the Configurator and operating in the D-STAR mode.

Since UP4DAR is „universal“ other digital operating modes like APRS and Packet Radio 9k6 can be realized.

Section 3 of this manual doesn't apply to other operating modes and you should refer to the software documentation for further details.

Further technical details are available at www.up4dar.de in the documentation section.

2 Introducing the board

2.1 Available interfaces on the UP4DAR board

A multitude of interfaces is available to connect peripheral equipment.

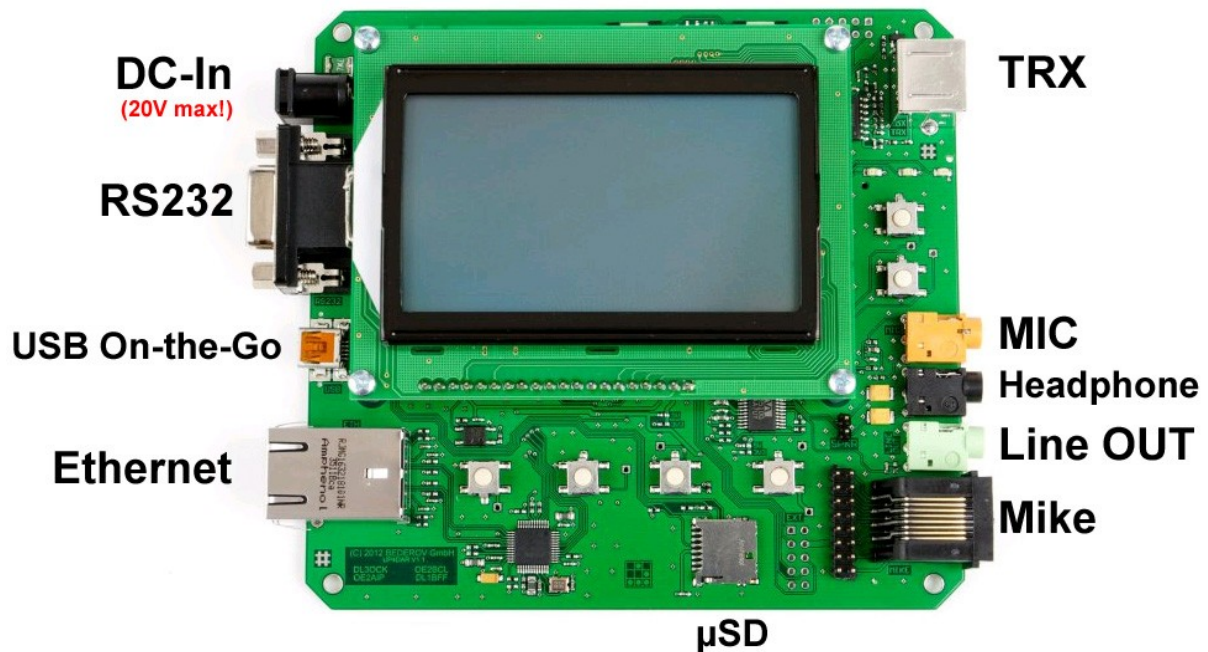


Figure 1: UP4DAR interfaces

2.1.1 „DC-In“

Supplies power to the board. Voltages may range from 4V to a maximum of 20V DC.



The maximum input voltage is 20V DC! Exceeding it may damage the board.

Attention

The board can provide 5V or 8V for microphones if wired at the patch field.



Note

5V are only available on the board when „DC In“ is between 6V and 20V and for 8V on the board the input voltage has to be between 8.5V and 20V.

2.1.2 „RS232“

An optional GPS receiver can be connected. Using the feature D-PRS in D-STAR mode, positioning data can be transmitted.

2.1.3 „USB“

Connect any compatible peripheral equipment to the Universal Serial Bus.



Note

Support for peripheral equipment, e.g. a keyboard, depends on the software.

2.1.4 „Ethernet“

Connect to any computer network and utilize the internet or HAMNET.

This interface is used to configure the board including updates and for repeater operation in a network or terminal equipment in a network, e.g. in DCS mode.

2.1.5 „TRX“

Connect a transmitter or receiver interfacing to HF using a mini-DIN 6pin socket also called „Data“ on commercial amateur radios.

Pinout of the mini-DIN 6pin socket:

| Pin | name | remarks |
|-----|-------|--------------------|
| 1 | TX_AF | max. 2400mVpp |
| 2 | GND | |
| 3 | PTT | Ground to Transmit |
| 4* | RX_AF | max. 2200mVpp |
| 5 | -- | |

Table 1: Pinout of mini-DIN 6pin („DATA“-socket)

*) Also called „9600 Packet Operation Output“.



Connect the TRX to „DATA“ for „Single user operation“. This transforms the setup into a digital voice station using any amateur radio. This type of connection is also used as HF-Gateway with TRX, e.g. Simplex-Gateway.

Note

Is the UP4DAR part of a digipeater (digital HF-repeater, half-duplex) using different transmit and receive frequencies, signals for transmit and receive must be separated.

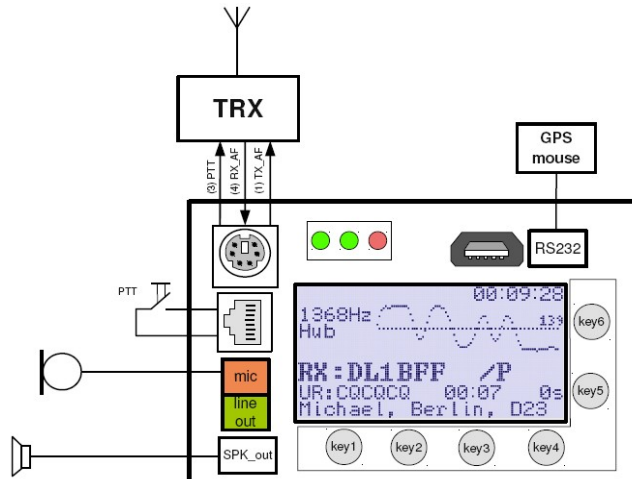


Figure 2: Example for „Single user operation“ and TRX connection



Note

Is the UP4DAR used in a network only mode, e.g. DCS via internet or similar, there is NO signal processing on the DATA socket. The UP4DAR operates as terminal equipment or „user“ in a network.

Further details for interfacing with TRX are available from the circuit diagram¹ at www.up4dar.de.

2.1.6 „MIC“

Connect a microphone (3.5mm mono phone jack), e.g. also used on headsets. It can also be used to connect an analogue signal source instead of using the „Mike“ interface.



Note

Using a microphone via the 3.5mm phone jack, still needs PTT to be triggered via the „Mike“ interface.

¹ <http://www.up4dar.de> --> „Dokumentation“ --> „Technische Informationen zu UP4DAR“ --> „UP4DAR-Schaltplan“

2.1.7 „Headphones“ / „Line out“

Pass the audio signal on to an amplifier, an audio recording device, a computer or analogues radio equipment or simply plug in headphones.

2.1.8 „SPKR“ pins on the board

The board pins named „SPKR“ can be connected to a low impedance speaker (no GND!) used as monitor speaker. This is called „radio speaker“ of your station in single user mode. The „SPKR“ interface is an alternative to headphones/ line out using an external audio amplifier or speaker.

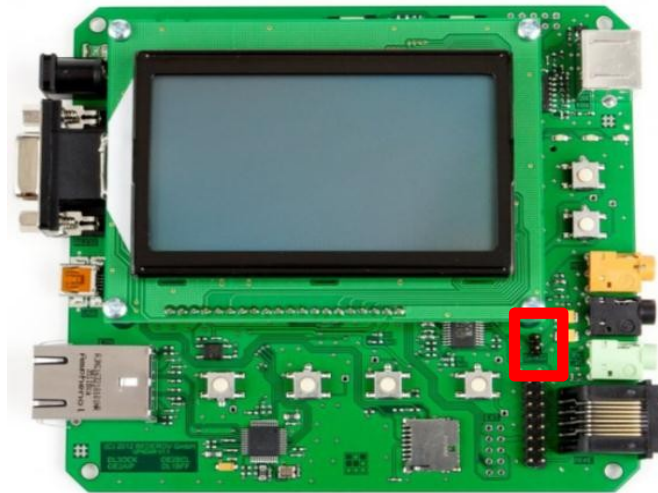


Figure 3: SPKR-Pins to connect a speaker



Attention

Make sure you **don't** shortcircuit the „SPKR“ pins. Failure to do so may cause damage to the integrated audio amplifier. Power the UP4DAR off before dis/connecting a speaker to these pins.

Never attempt to plug in a jumper (widely used in computers)!

2.1.9 „Mike“ and the Microphone patch field

Connect a radio microphone or just trigger PTT. There are no patches wired by default.



Note

Using a microphone via the 3.5mm phone jack, still needs PTT to be triggered via the „Mike“ interface.

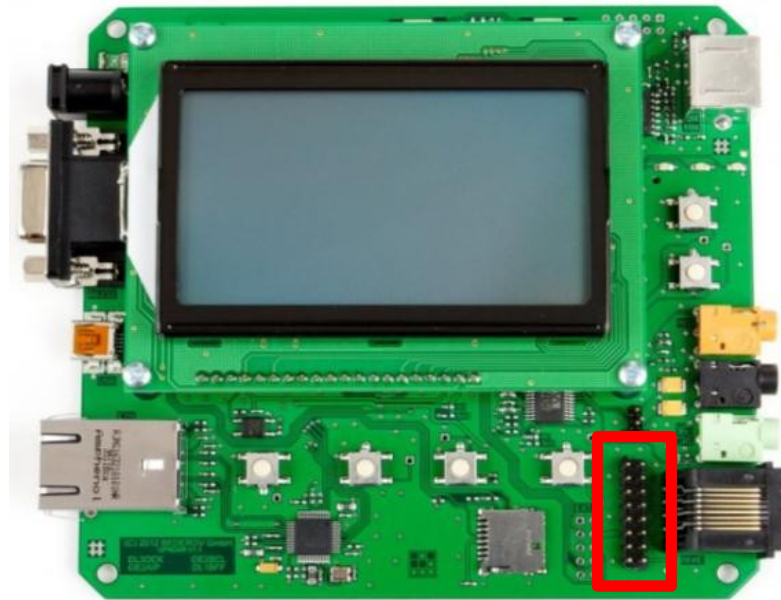


Figure 4: „Mike“ patch field

In order to suit and be able to connect a variety of microphones to your UP4DAR, the patch field can be used to customize the pinout of the modular jack. Table 2 shows examples of microphone pinouts.

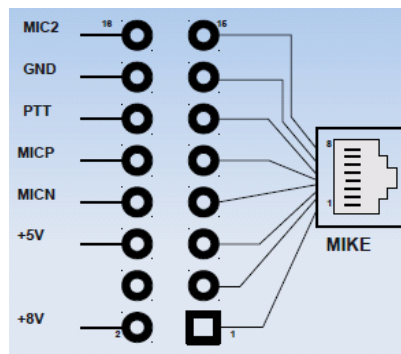


Figure 5: „Mike“ patch field signals

| Kenwood | YAESU | ICOM |
|------------------|--------------|---------------------|
| 8 = UP | 8 = n.c. | 8 = Data IN |
| 7 = +8V | 7 = SW2 | 7 = GND |
| 6 = GND | 6 = SW1 | 6 = MIC |
| 5 = PTT | 5 = +9V | 5 = GND (MIC) |
| 4 = GND (MIC) | 4 = GND | 4 = PTT |
| 3 = MIC | 3 = MIC | 3 = +8V control IN |
| 2 = n.c. | 2 = PTT | 2 = Channel UP/DOWN |
| 1 = DWN | 1 = n.c. | 1 = +8V |

Table 2: Examples of microphone pinout



Note

Please double check the pinout in the manual of your microphone because it might be different to the one shown in table 2!
Microphone pinouts can also be searched in the internet and are widely available.

2.1.10 „Mirco-SD“

Plug in a micro-SD memory card.



Note

Available feature for using the a memory card depend on the software.

2.2 F-Keys on the board/ display unit

There is a total of 6 keys. The mapping of the keys depends on the software and the operating mode.

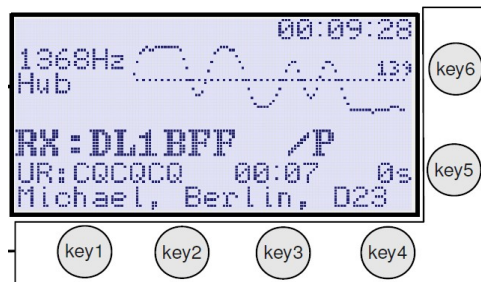


Figure 6: F-keys

2.3 Display

The display unit connects to board either via a connecting plug or ribbon cable. Displayed information will depend on the software version, the operating mode and usage of F-keys.



Figure 7: Display unit

2.4 PHY status lights

Used to indicate the PHY's status.

| | |
|-------------------|--|
| RX (green) | Receiving a D-STAR cycle of data. |
| SYNC (red) | Flashes on „Sync“ flag detection, i. e. every 420ms under normal circumstances during a D-STAR cycle (approx. twice per second). |
| TX (red) | Transmitting a D-STAR cycle. |

3 UP4DAR Configurator

3.1 Connecting the UP4DAR board via Ethernet to your LAN or computer

The UP4DAR can be configured via Ethernet connection using the UP4DAR configurator software. Therefore, it must be connected to the same network the computer is, you want to configure it from. This is achieved using a network switch of any type, e.g. built-in your ADSL modem, which your computer is connected to as well.

Once the UP4DAR is connected to the LAN, „100FD“ is displayed, i.e. 100Mbit/s full duplex or any other negotiated link speed. It is configured DHCP and gets its IP address assigned now. This process is indicated by an inverse „100FD“ display. „100FD“ changes back to normal after an IP address is successfully assigned to the UP4DAR.

3.2 Downloading the UP4DAR-Configurator software

The most recent version of the UP4DAR-Configurator software is available for download at <http://www.up4dar.de/> . Save the zipped file and extract it into a dedicated folder. Any other files are for development purposes only. Further details for programming are available at https://github.com/dl1bff/UP4DAR_Configurator .

In order to run UP4DAR-Configurator.jar a Java Runtime Environment (JRE) must be installed on your computer. Should you need to install the Java Runtime Environment go to <http://www.java.com/> and download a release for your computer's operating system. Linux users will find the JRE in their distribution repository.

3.3 Running the UP4DAR-Configurator software

Starting the software can be achieved by either double clicking UP4DAR_Configurator.jar (located in „dist“ folder) or selecting the file and hitting Enter/Return.

The file is not executable by default but in order to run it, the executable flag must be set (usually via file properties).

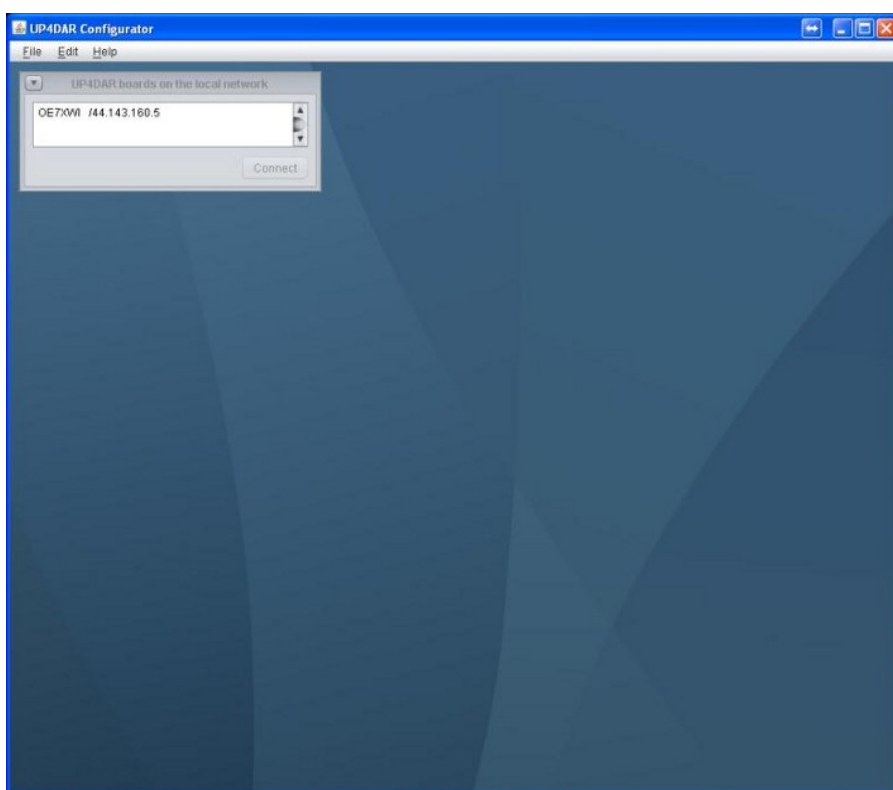
The very first startup of the JRE will show a firewall warning. Depending on the security level of your system and your personal preference you can either allow or deny internet access for the JRE.

3.4 Connecting the UP4DAR and running the Configurator



Microsoft Windows security warning if the JRE starts for the first time.

Figure 8: MS Windows security alert



Once the Configurator has started up, the connected UP4DAR device will be available in the list.

Select the device (if more than one is available) and „connect“.

Note: The IP address depends on the DHCP server configuration.

Figure 9: Configurator: connecting device

3.5 Tab „Callsign“

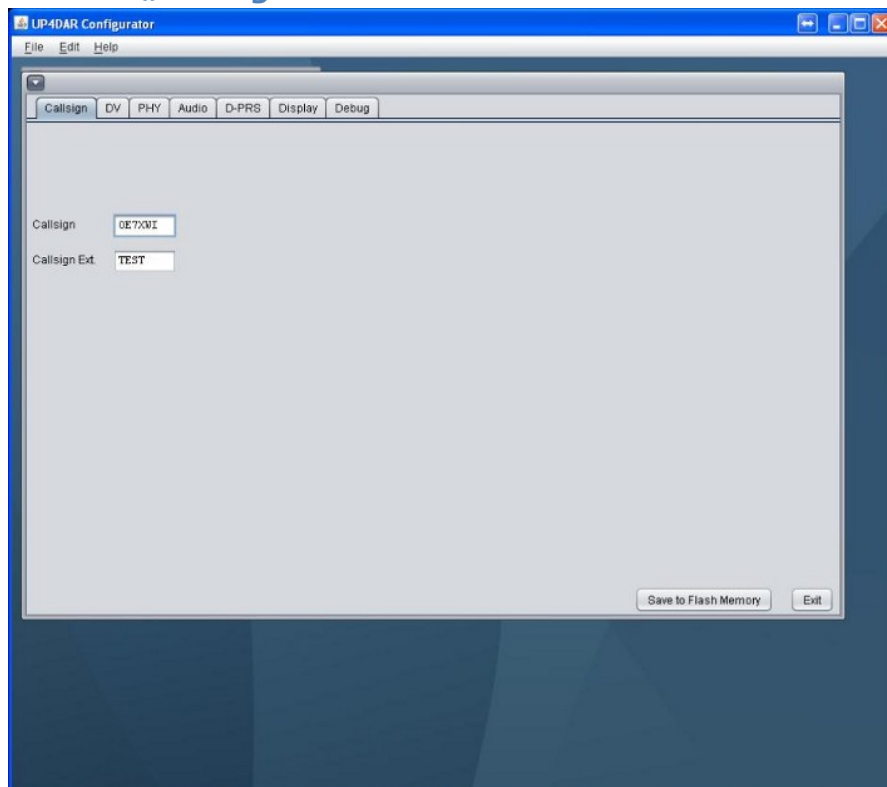


Figure 10: Tab „Callsign“

Enter your callsign and an optional extension.

Note: Please delete any white spaces. As of this screenshot „OE7XWI /TEST“ would be displayed at the QSO partner's end.

3.6 Tab „DV“

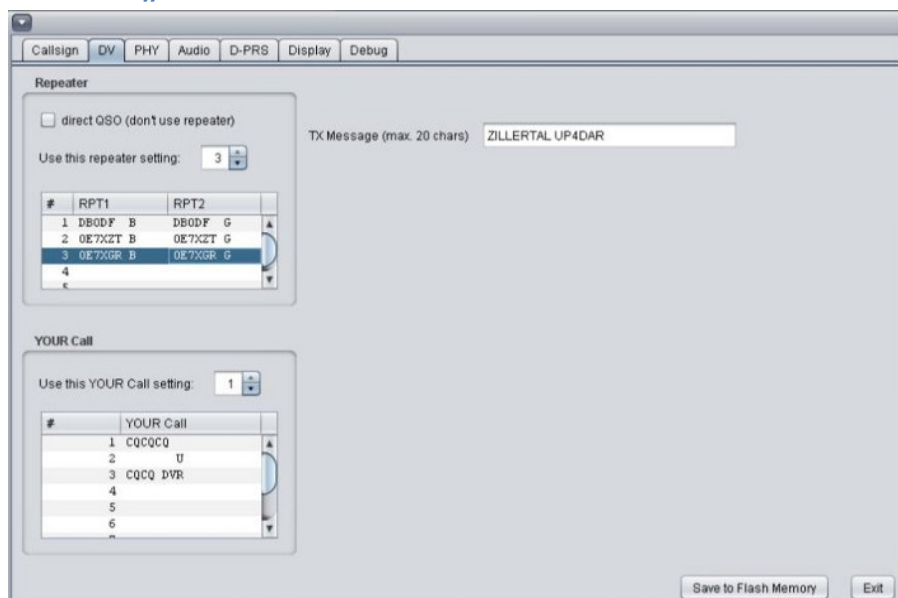
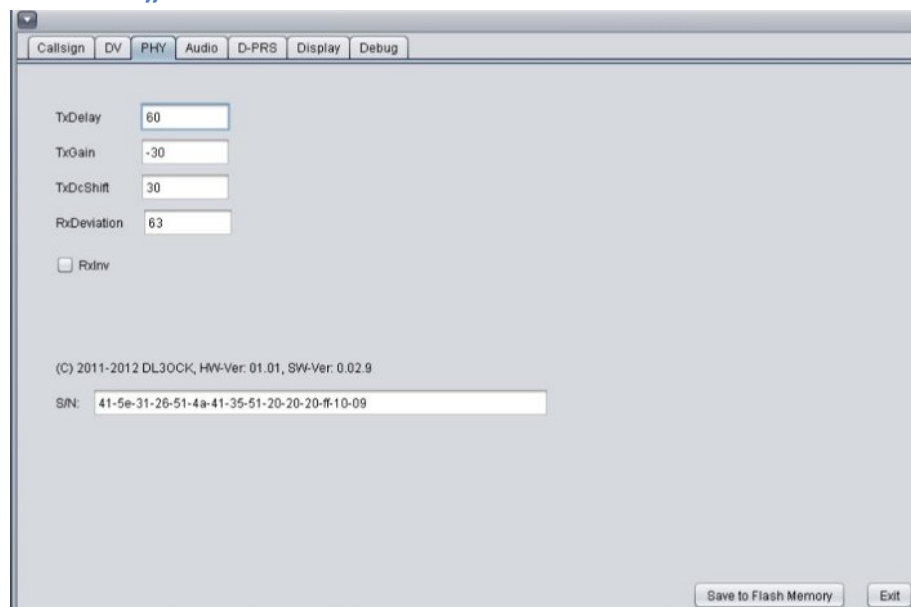


Figure 11: Tab „DV“

These are the HF settings to operate via repeater and for YOUR call.

A column is edited by double clicking and a table entry will be created. An entry is selected by matching the row to the number in the box. Any text in „TX message“ will be displayed at your QSO partner's end.

3.7 Tab „PHY“



The setting in tab PHY depend on your TRX of choice.

Figure 12: Tab „PHY“

3.7.1 Guideline for a choice of different radios

| Radio | Band | Tx-Delay | Tx-Gain | Tx DC-Shift | Rx De- viation | RxInv |
|------------------------|------|----------|---------|-------------|----------------|-------|
| Standard C5200D | 70cm | 80 | 10 | 0 | 26 | Off |
| Yaesu FT7800 | 70cm | 70 | -30 | 0 | 63 | Off |
| Yaesu FT-897 | 70cm | 60 | 20 | 0 | 75 | Off |
| Kenwood TM-V7E | 70cm | 60 | -50 | 0 | 45 | On |
| Kenwood TM-D700 | 70cm | 75 | 60 | 0 | 31 | Off |
| Kenwood TH-F7E | 70cm | 60 | -33 | 0 | 37 | On |
| ICOM IC-E2820 | 70cm | 96 | 26 | 0 | 36 | Off |
| ICOM IC-7000 | 70cm | 50 | -4 | 0 | 45 | On |

Table 3: Guideline for a choice of different radios

3.7.2 Optimizing PHY parameters

First, connect the UP4DAR to your VHF/UHF transceiver. Please be aware the 6-pin mini-DIN plug data cable is straight, i.e. pin 1 on one end connects to pin 1 on the other end of the cable and so on. Set the transceiver's mode to „Packet Radio 9600“.

Second, transmit on the desired frequency with your D-STAR radio or just listen to a D-STAR repeater cycle. Listening should cause the display to show received data and the speaker to play audio. Should there be nothing at all, the signal between the radio and the UP4DAR is most likely inverted. Activating the PHY parameter „RxInv“ solves the situation and D-STAR data can be received.



Some VHF/ UHF radios need different settings for the parameter „RXInv“ on 2m and 70cm band!

Note

Furthermore, check the deviation on the display.

Deviation is measured at the beginning of each cycle and shown left of the oszillograph curve. Change the parameter „RxDeviation“ until it displays approximately 1200Hz.



Figure 13: Deviation

The parameter „TxDcShift“ will be about „0“ in most cases.

Now, the critical transmit parameter „TxGain“ will be adjusted.

It can range from -127 to +127 and affects the deviation (~1200Hz) of the transmit signal and a calibrated receiver can be used to get the deviation to the desired value. Should there be no calibrated receiver handy, a second UP4DAR board can be used for the reading. Another approach adjusting „TxGain“ roughly, is using a D-STAR radio. It is still unknown whether „TxGain“ has to be positive or negative. Therefore, set it to „10“ first and change it to „-10“. This procedure is done in steps of 10 until one's own transmission is received. Please do not increase „TxGain“ any further without detailed measurements to prevent jamming or stations!

Finally, the parameter „TxDelay“ needs to be adjusted. Increase „TxDelay“ until the header information can be decoded in the receiver.



Note

This applies for any software version until further notice:

The parameters „TxDelay“, „TxGain“ „TxDcShift“ and „RxInv“ are only set in the PHY by either powering on the UP4DAR or by changing the operating mode (KEY3).

It's recommended to power the device off and on again after any change of the PHY parameters.

3.8 Tab „Audio“

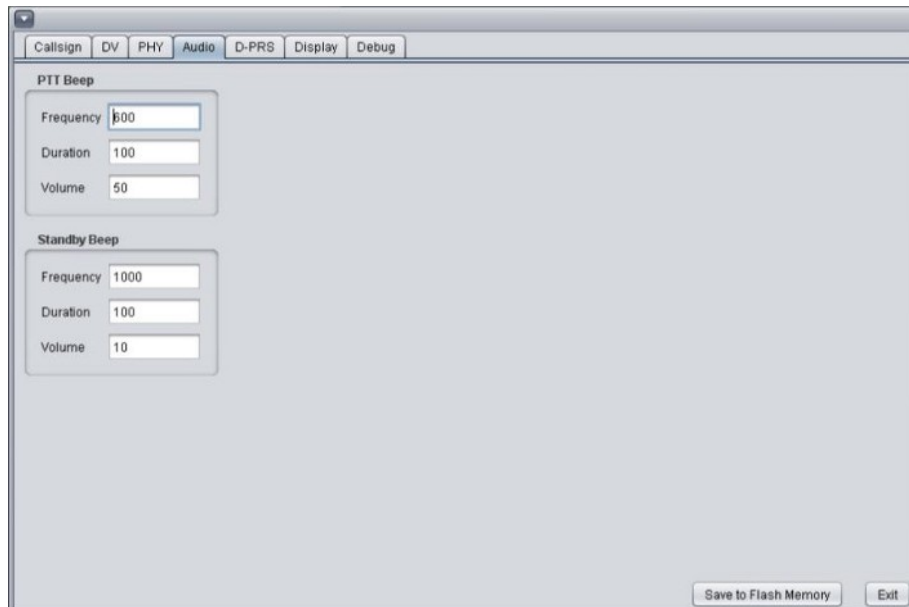


Figure 14: Tab „Audio“

Different audio settings can be adjusted to suit your needs.

3.9 Tab „D-PRS“

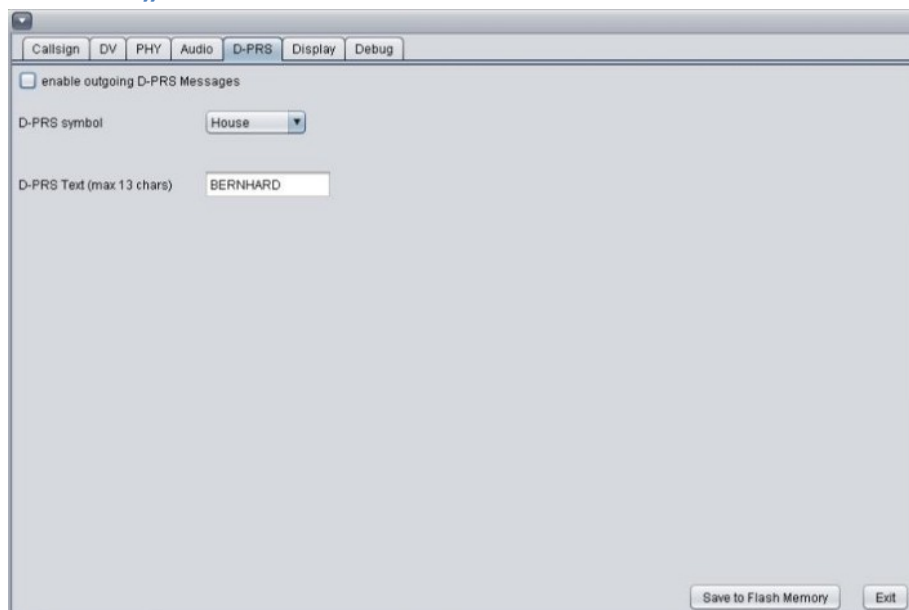
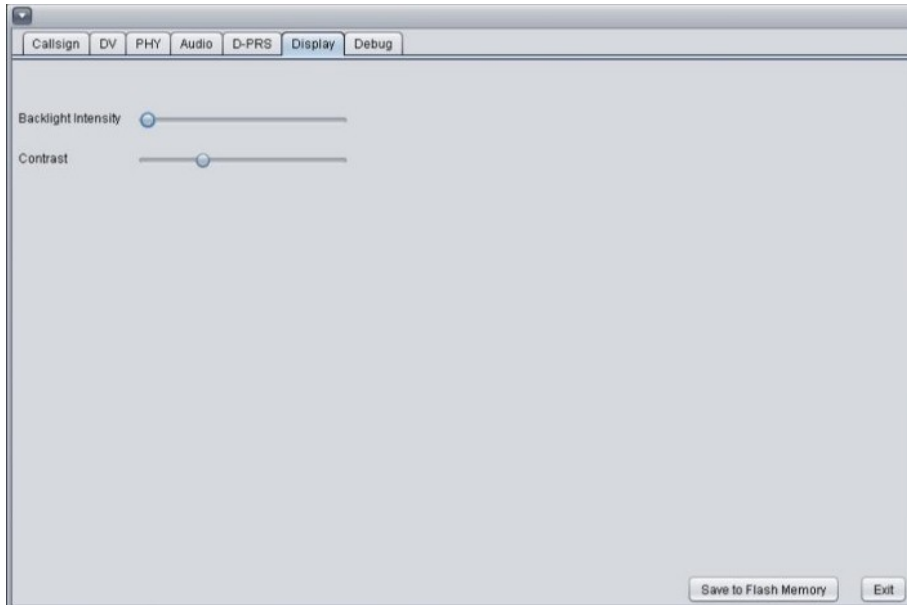


Figure 15: Tab „D-PRS“

Activate/ deactivate the D-PRS feature.

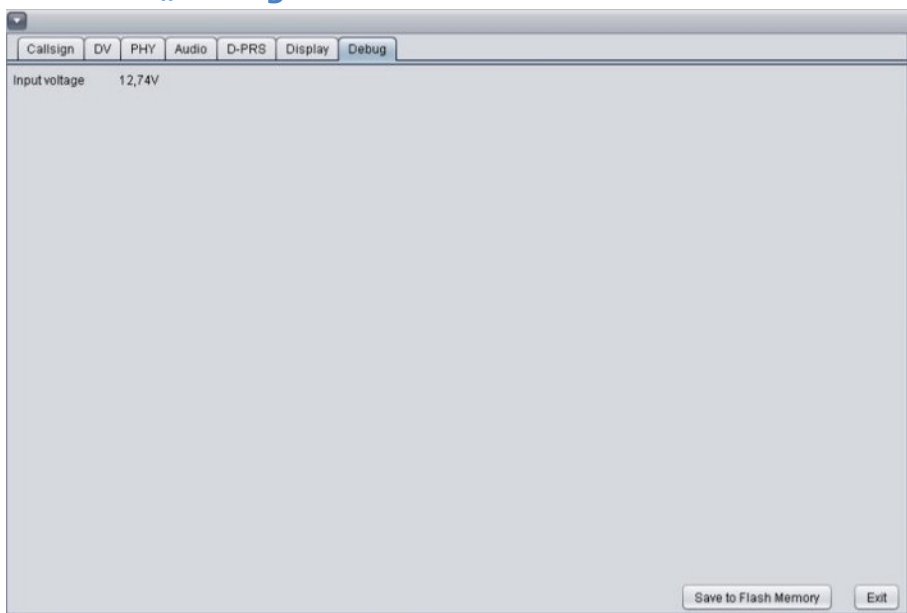
3.10 Tab „Display“



Adjust brightness and contrast of the display unit to your needs.

Figure 16: Tab „Display“

3.11 Tab „Debug“



Used to display status and error messages.

Figure 17: Tab „Debug“

3.12 Saving the settings

„Save to Flash Memory“ sends all settings to the flash memory of the UP4DAR board.

4 Notes

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5 The Manual's change log

| | |
|----------------------------|---|
| Revision 0.1 03.10.2012 | Initial Version; Thomas OE7OST, Denis DL3OCK, Bernhard OE7BKH |
| Revision 0.2 03.10.2012 | minor changes, typos; Thomas OE7OST |
| Revision 0.3 08.10.2012 | - added chapter „Preface“ - reorganized chapter „Introducing the board“,notes added and general rework of text - minor changes in chapter „UP4DAR Configurator“ - added figure figure and table index; Markus OE7FMI, Thomas OE7OST |
| Revision 0.4 28.10.2012 | - added PHY reference values for radio IC-7000 (txs to Franz, DF9PV) - added chapter 2.4 covering PHY status lights - added „The Manual's change log - added chapter 4 „Notes“ - changed table of content and figure/ table index; Denis DL3OCK, Thomas OE7OST |
| Revision 0.5 01.01.2013 | - updated chapter 3.2 „Downloading the UP4DAR-Configurator“; Thomas OE7OST |

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