COMBITRONICS
THE RADIO COMPANY

Introduction:

Since there is a lot of projects on Dstar, I decided to start using a board that was designed by Guus (PE1PLM). Great hardware, and quality is good, as well as the way it can be used. To connect to reflectors it is possible to use the PD7LIM software, or the command-tool that is included by Jonathan Naylor. The only item that lacks in these tools is the way to connect to CCS. That was a reason to design a simple board that can connect in a simple way to the AMBE3000 board, but also has the ability to interface to the Icom ID51 for example.
In this manual some brief information is given on how to use and connect the hardware.

Description:

The board has been designed to interconnect 1 on 1 to the AMBE3000 board. It includes a 2.5Watt audio amplifier, and a dedicated dtmf chip. It is controlled by an Arduino mini-pro, and interfaces a simple keypad (4x4), or even can use a Yeasu MH48. If you want, you can simply connect 2 connectors (2.5 and 3.5 mm jack to the 4-pin connector, and use the board to interface to an Icom radio. The main advantage is the DTMF as one of the features, but imagine this board in your car. Us a handmicrophone and a speaker, and you can use it as a carkit!

The board has means of setting the output level of the DTMF-generator via a multiturn potmeter on the left of the board. *If you use the board on an AMBE3000 board, you do not need to adjust this potmeter, it comes pre-alligned!* On the board is an audio-mux, which in normal situation connects the audio of the microphone to the AMBE3000 / Icom radio. Once DTMF is to be sent, the MUX will switch to DTMF and mutes the microphone. This assures good quality of DTMF-tones with no distortion.

Allignment procedure:

If for any reason you do need to align the level, you need to be aware that the board has a special function for this. To align the board, connect an oscilloscope to Mic out (pin 4), and ground (pin 1) of the 4 pin connector. (see image 1 at the top). To start the 1 minute testtone, please connect the 2 pins of the testmode shortly. Once you do this, PTT is keyed, and a single tone is being generated. Allign the output to the level you prefer. For the AMBE3000 it is typically aligned to aproximately 80mVpp.
As soon as you are ready, press the reset button on the Arduino-mini, or wait until the unit stops after the total time of one minute.
Note: The level of the alignment-potmeter does NOT influence the microphone level!

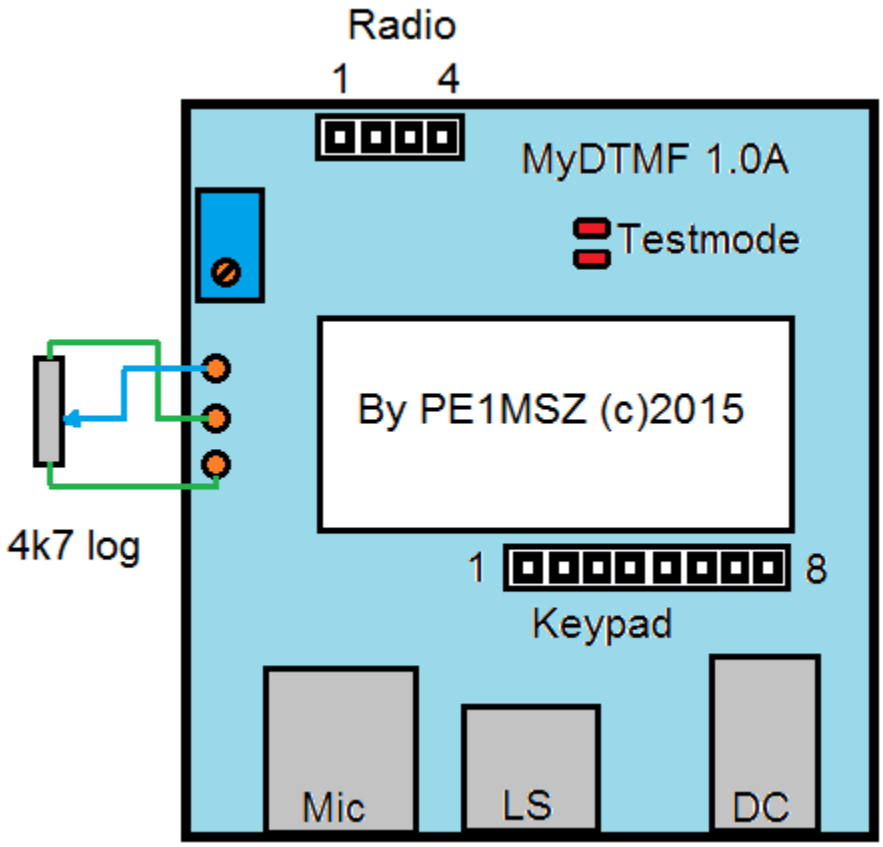

Image 1 : The board and it's connections.

Usage of the board:

To use the board, just connect the speaker, microphone (Yeasu MH48 or compatible), and/or a keypad (see image 2 for more detail). Connect power, and the LED on the Arduino-mini will light.

Sending DTMF: to be able to send the code you want as 1 message, you need to end every message with the #. Now in some cases it is possible you need to send a disconnect message which is a # sign. No worry, just type ##, and the board will send a single #. (Keyclick is enabled by default)
Example:
Connect to REF001C : *00103#
Disconnect REF : ##
If you use the Yeasu MH48 microphone, same way as described above. If you press either of the UP/DN button on the top of the microphone, it clears previous typed characters.
Note: sending dtmf while receiving audio, will not send any code. You will have to wait until there is nothing being received!

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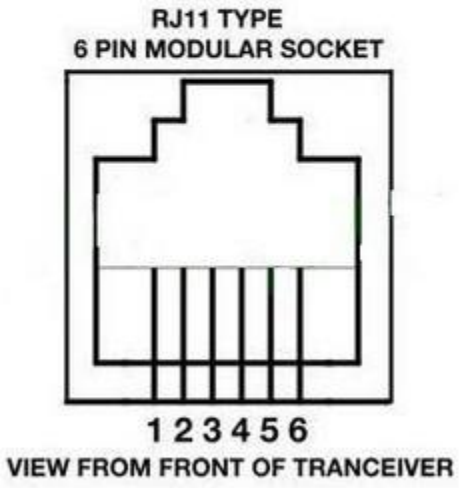
Connectors, pinout and extra information:

YAESU MH48.

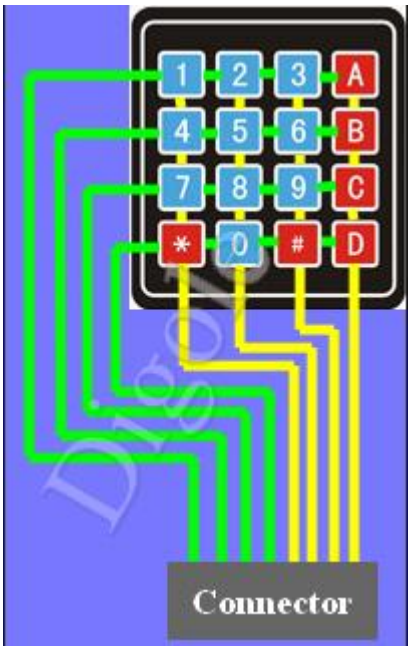


1: Keypad 1
2: Keypad 2
3: DC5V from board to Microphone
4: Ground/Shield
5: Microphone Audio
6: PTT (active low)
Note: The microphone audio gets Phantom power from the board, no extra components needed!

Power connection: Centre pin is +12VDC, outside is ground.

For the speaker, use a mono Jack 3.5mm, standard connection for a speaker.

Keypad wiring, and compatible hardware:



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You can connect another keypad, just look at the diagram.

1: ROW 1
2: ROW 2
3: ROW 3
4: ROW 4
5: COLUMN 1
6: COLUMN 2
7: COLUMN 3
8: COLUMN 4

So if you do connect the compatible keypad as shown above, the backside of the keypad is pointed to the Arduino-board.

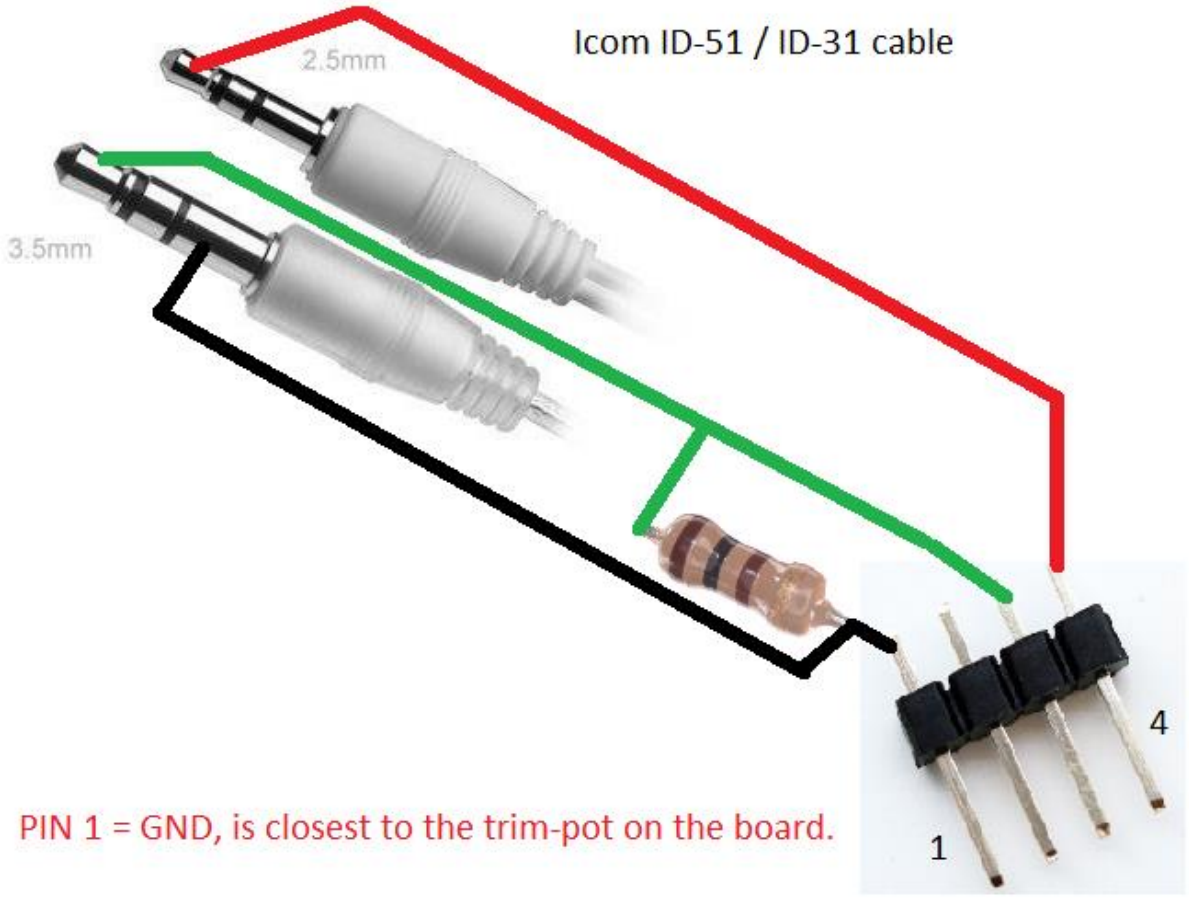
For more information: http://www.combitronics.nl
Email : ruud@combitronics.nl

Connecting the board to an Icom ID-51 / ID-31:

Materials needed:

- Stereo jack (slim), 2.5mm
- Stereo jack (slim), 3.5mm
- Resistor 100 Ohm
- SIL-header, 4 pins.

Now wire as shown on the image below:



Usage:

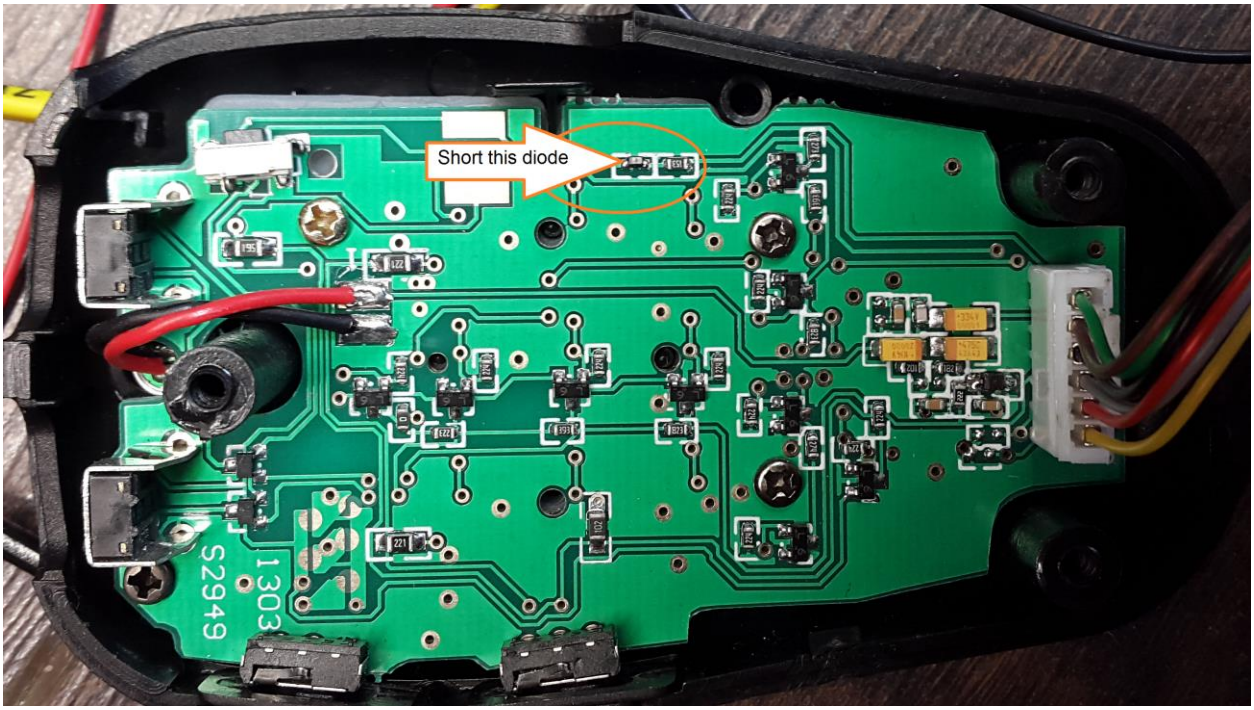
Connect as described above, and insert both jacks in the radio. Power up the radio, and set volume to 10 (ID-51). Power up the board, and you will be able to hear the portable radio's audio through the amplifier's speaker. To send DTMF, use same procedure as above.
In some cases the PTT of the Yeasu microphone is not correctly handled by the radio, please take a look at the next page to modify this microphone.

Yeasu MH-48 modification:

Why this modification?

- Some radio's might be a bit insensitive for the PTT-signal of this microphone. There is a diode in this microphone causing this issue. *It is NOT needed to modify the microphone for the use with the AMBE3000 board!*
- If you want the PTT-light to light in the microphone when transmitting the DTMF, you can also do this mod.

Modification is just a matter of shorting the diode on the circuit-board. See image below:



The microphone shown is the Yeasu DTMF Microphone model MH-48A6J.

