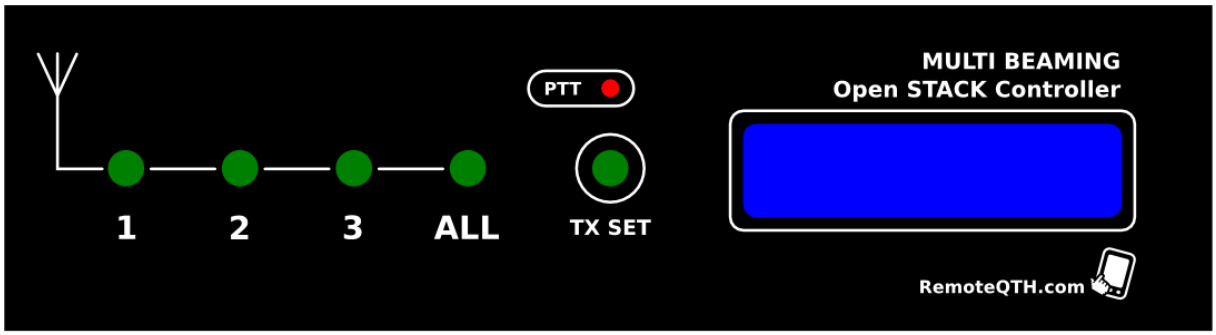
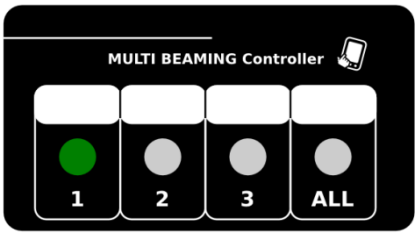
MULTI BEAMING
Open STACK Controller
by the RemoteQTH.com





Version HW: *v 2.0*

Doc rev.: *013 / 2015*

Date: *10 / 2015*

By: *Jan Šustr, OK2ZAW* *www.remoteqth.com*

Obsah

1. Overview

The MULTI BEAMING Open STACK controller by RemoteQTH.com is the black box designed to controll the stack match as the multibeaming switch. You can easily switch antennas systems to the independant combinations for the receiving and transmitting directions. There is PTT and hot switch protection builded in. You can control all by the ethernet. With your owen web system or use the internal one.

I would like to thanks Mike DM5XX for the FW work, Dan OK1HRA for HW help and graphic and Pavel OK1MU for another support :)

2. Main features

RX:

- INDEPENDANT RX positions
- One or two ports can be ONLY for RX antennas
- HOT switch protection
- Hand keypad for fast switching

TX:

- INDEPENDANT TX positions
- One, two or all three ports can be use for TX
- PTT sequencer
- HOT switch protection

PTT:

- PTT sequencer
- Stack match is protected by the timing between RX and TX
- HOT switch protection

Remote control:

- Web page builded in
- You can use your owen system to control it

3. Technical parameters

DC power consumption:	+12 - 14 V DC, 0,5A , 6W + stack match consumption
RX combinations:	*1 , 2 , 3 , 1 + 2 + 3*
TX combinations:	*1 , 2 , 3 , 1 + 2 , 1 + 3 , 2 + 3 , 1 + 2 + 3*
PTT lead time:	*0 to 100ms – set up in FW*
PTT tail time:	*0 to 100ms – set up in FW*
LCD colour:	orange, blue, green, OLED green

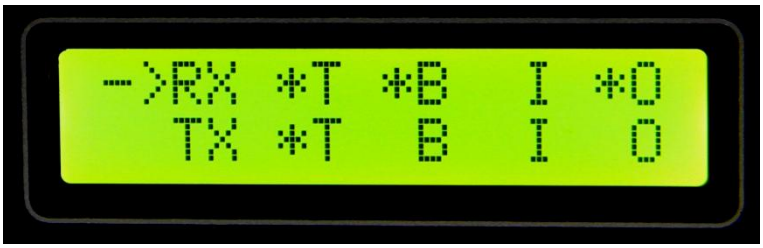
3. Front panel

Buttons 1 to 3	-	ports on stack match – independant antenna systems
Button ALL	-	switch on ALL ports
TX SET	-	select independant TX directions in all combinations
PTT	-	light RED when PTT IN
LCD	-	shows statuses (feature use...)
Hand KEYPAD	-	the same as the buttons on main box

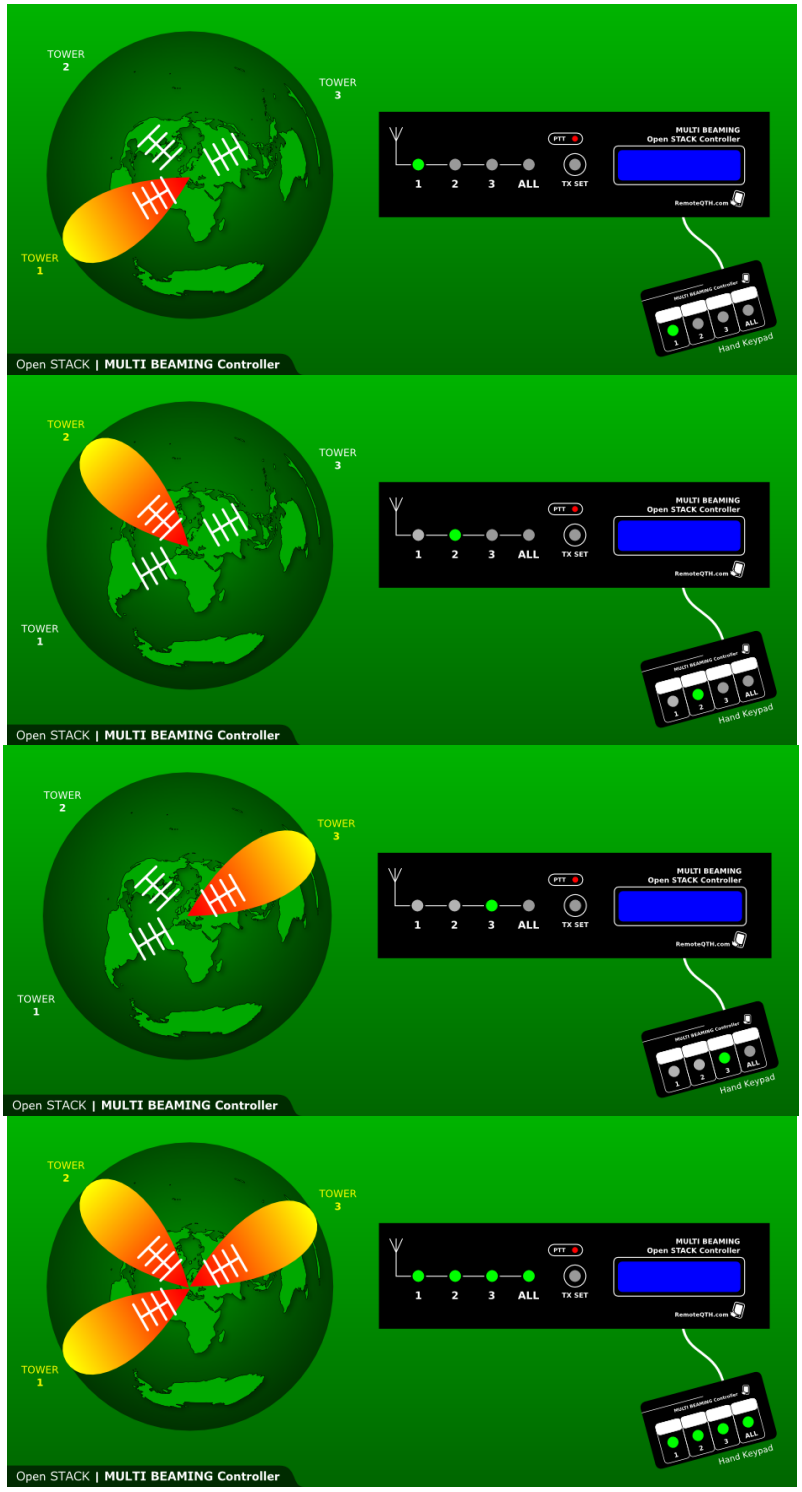
4. Rear panel

DC - 12 to 14V
PTT IN - PTT input for from TRX keyer or TRX (TRX: Send, Relay, PTT out)
PTT OUT - PTT for PA or Driver
LAN - Ethernet 10/100 Mbit for the remote operation
USB - USB 2.0 for Firmware upload (later features... log SW)
OUTPUT T. R. - Output connector for the Stack Match connection
EXTERNAL K. - External hand keypad

5. LCD colours



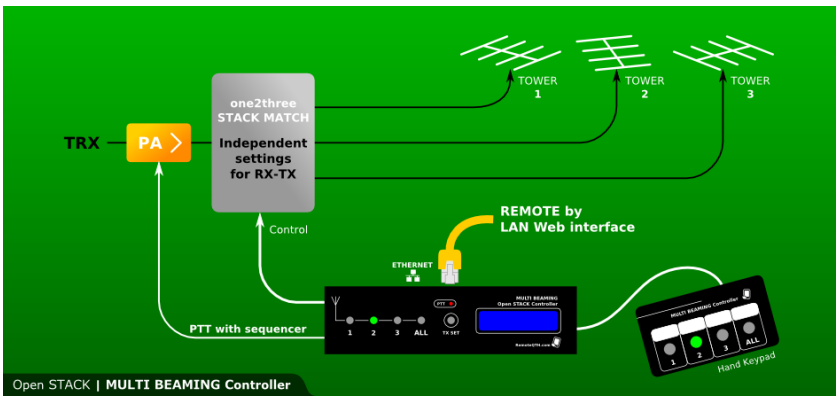
6. Multi beaming principle



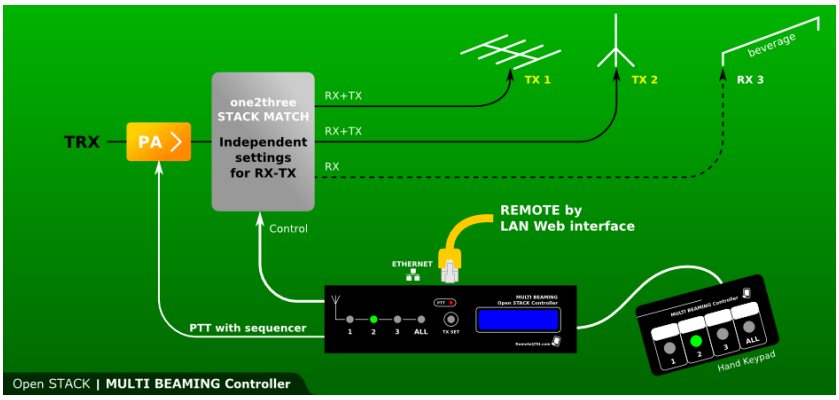
As you can see, this box can help you to control up to three transmitting and receiving antennas. It all independant to each other. You can TX into two antennas but receive from all etc. Selecting RX antennas can help you to avoid QRM from different direction. You can switch to antenna to JA to copy JA stations and do not have QRM from antenna to NA etc.

7. RF principle

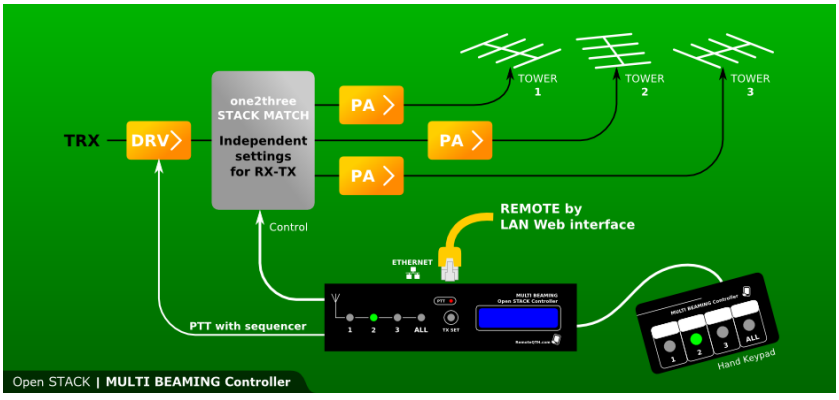
There are examples of Multi beaming with single PA dividet to more antennas – systems (1). You can set up one, two or all antennas to TX.



1. *Multibeaming with one PA.*



2. *Multibeaming with one PA two TX systems and third only RX.*



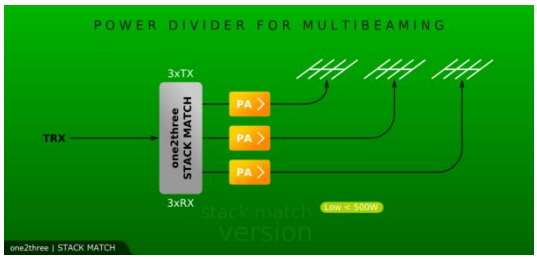
3. *Multibeaming with more PA and driver.*

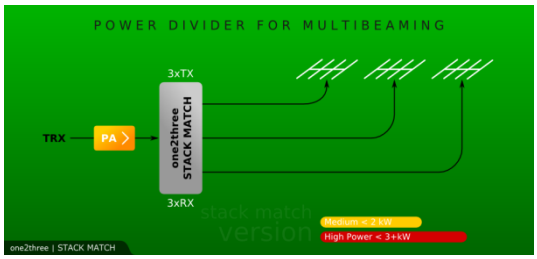
8. Set up TX antennas

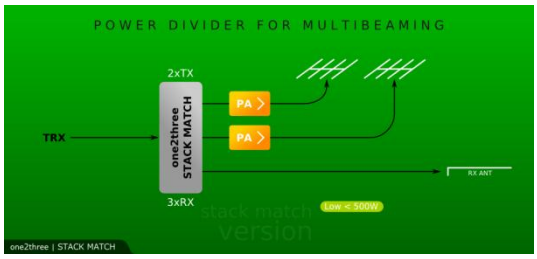
During normal operation – RX – you can select antenna where are you listening from. If you want to set antennas where you want to TX to, do:

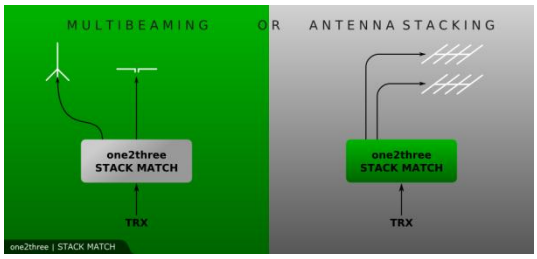
- Press TX SET button
- Button light blue
- Set antennas where you want to TX (press 1 and 2 to TX to 1 and 2 etc)
- Press TX SET again to save settings.

For example:









9. Stack match connection

One2three stack match by QRO.cz - www.remoteqth.com***:***

Stack match Inputs

Selected	A1	A2	A3	Balun
A1	H	L	L	L
A2	L	H	L	L
A3	L	L	H	L
A1+2	H	H	L	H
A2+3	L	H	H	H
A+1+2+3	H	H	H	H

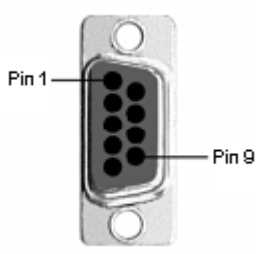
H: +12 V / L: GND

Tip:
If you want to use different Stack Match, please contact us!

Stack match to Multi beaming controller connection:

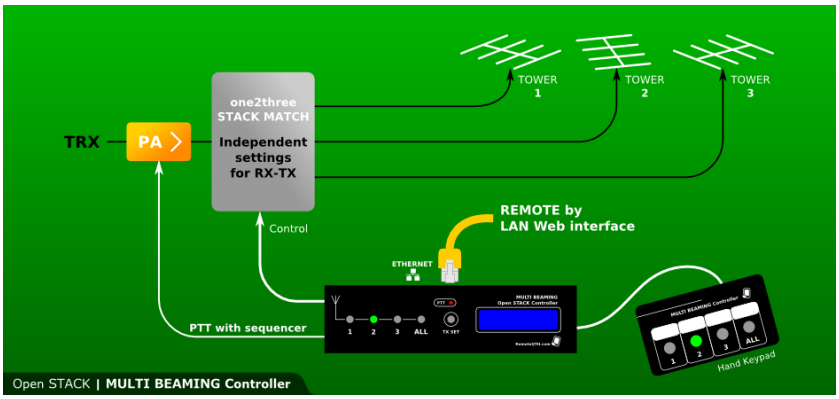
SUBD 9 pin MB ctrl	*Stack match by QRO.cz*
1	*A1*
2	*A2*
3	*A3*
4	*Balun*
5	*-*
6	*(to pin 7 on controller)****
7	*(to pin 6 on controller)*
8	*-*
9	*GND*

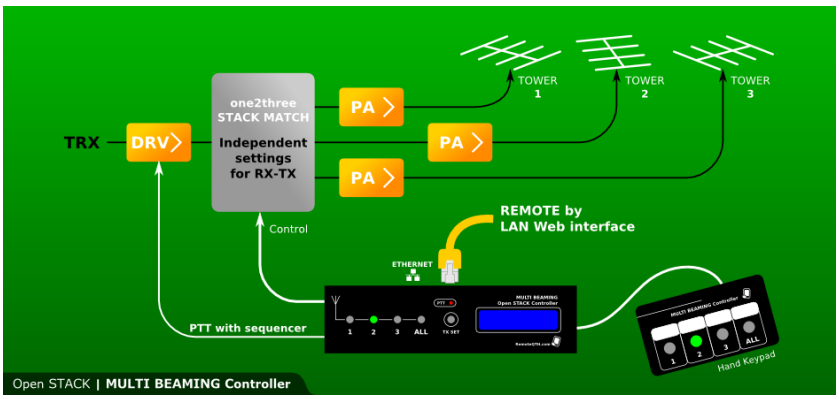
SUBD 9 pin FEMALE:

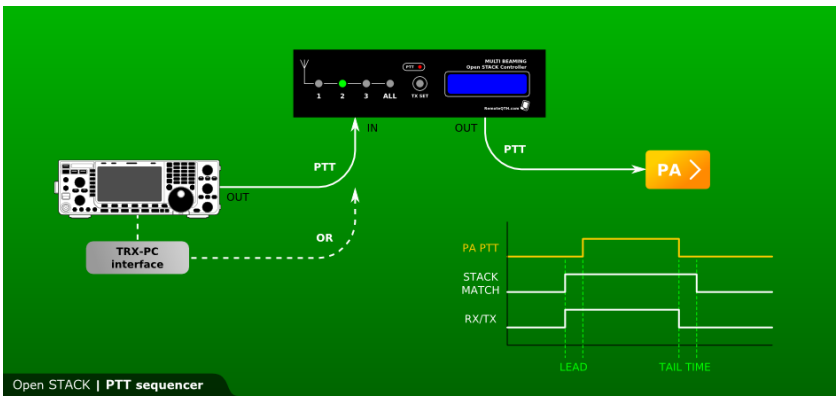


**** You can use external power supply connected to pin 6 (PIN7 is internal supply)*

10. PTT wiring and sequencing







Tip:

You can set up PTT lead and tail time in arduino sketch:

```
int leadIn = 15;
int leadOut = 20;
```

11. PTT TRX / keyer / logger setup

The most important thing!

11.1 Icom TRX settings – IC-7600, IC-7700, IC-7800...

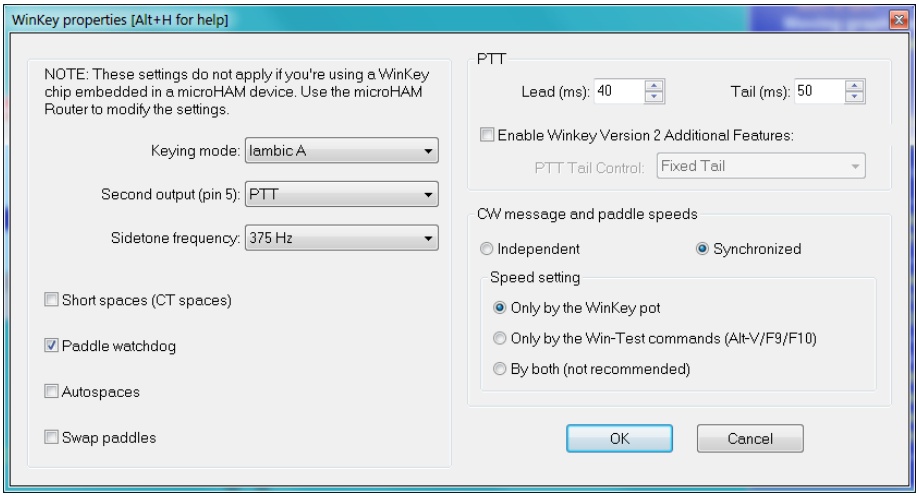
■ Others set mode

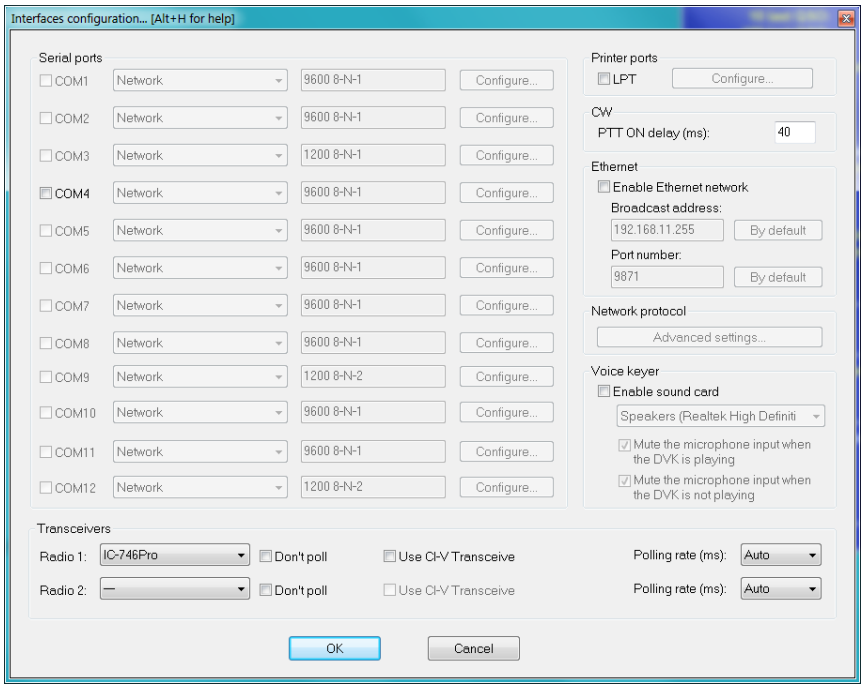
TX Delay (HF)	OFF
Sets the transmission's timing for the HF bands. When an external device, such as a vacuum tube linear amplifier or a receiver preamplifier, is connected to the transceiver and you use the SEND line, a problem could possibly occur. If the device's transmit/receive switching time is slower than the time for the Icom transceiver, the device may not yet ready for a transmitted signal, and could be damaged by the transceivers RF power. If necessary to prevent damage to the external device, set an appropriate TX delay.	• OFF : The transmission delay is disabled. (default) • 10 to 30ms: After transmit operation, the TX output is delayed for the set period of time (10, 15, 20, 25 or 30 milliseconds).

Set TX Delay HF to 30ms.

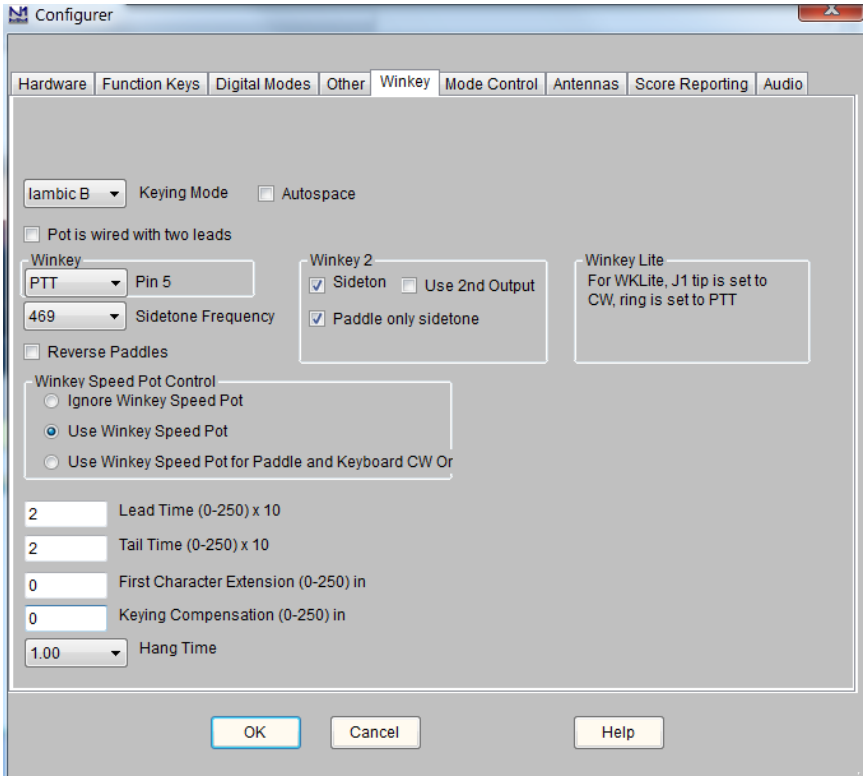
11.2. Winkey / N1MM+ / Microham setup

Set up the Winkey PTT times. The **Lead** and **Tail** time set to **minimal** value of **40ms** ! This is the stack match relay protection.

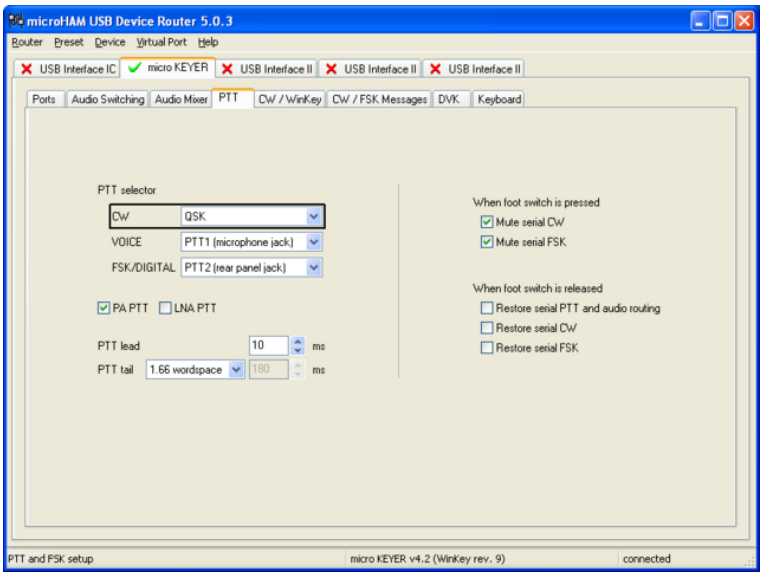


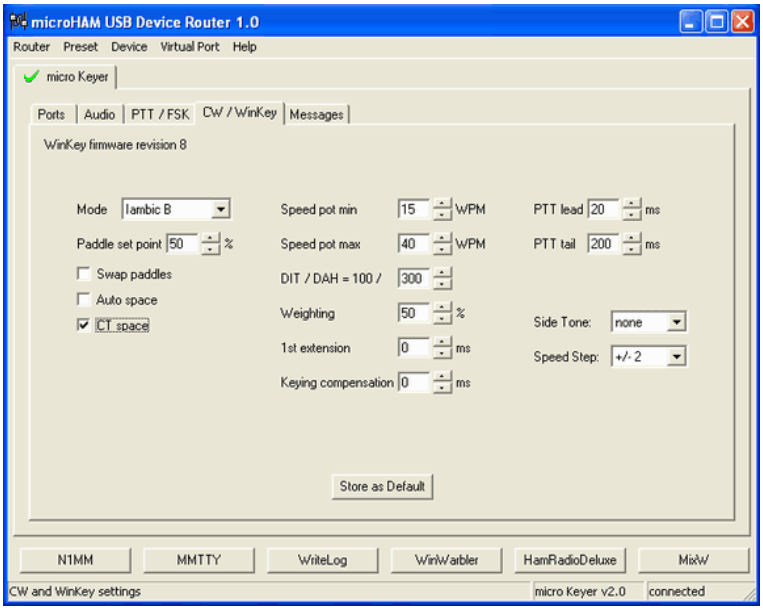


Or if you use PC serial com CW and PTT than set **PTT ON delay** to min **40 ms**.



N1MM **Lead** time and **Tail** time to **4.**

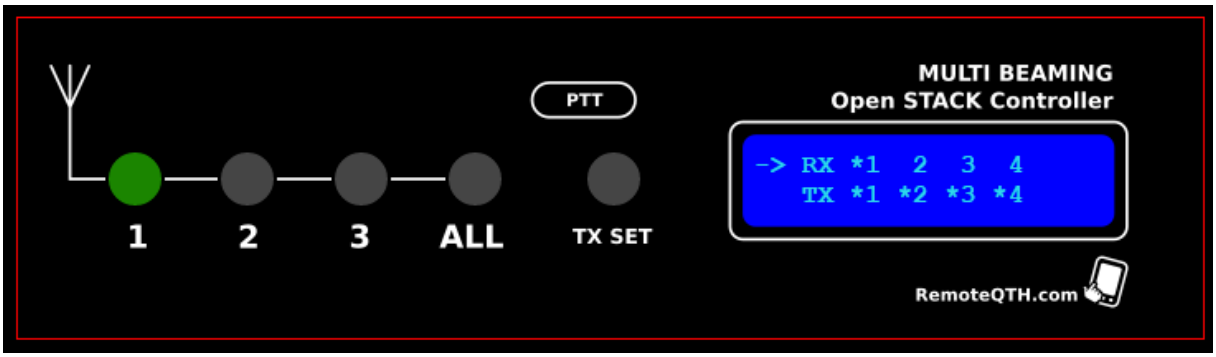


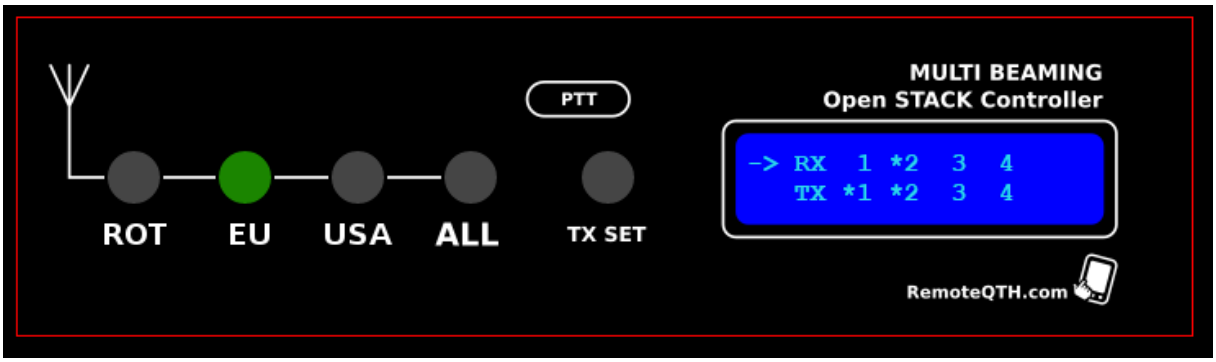


PTT lead and PTT tail time to 40ms.

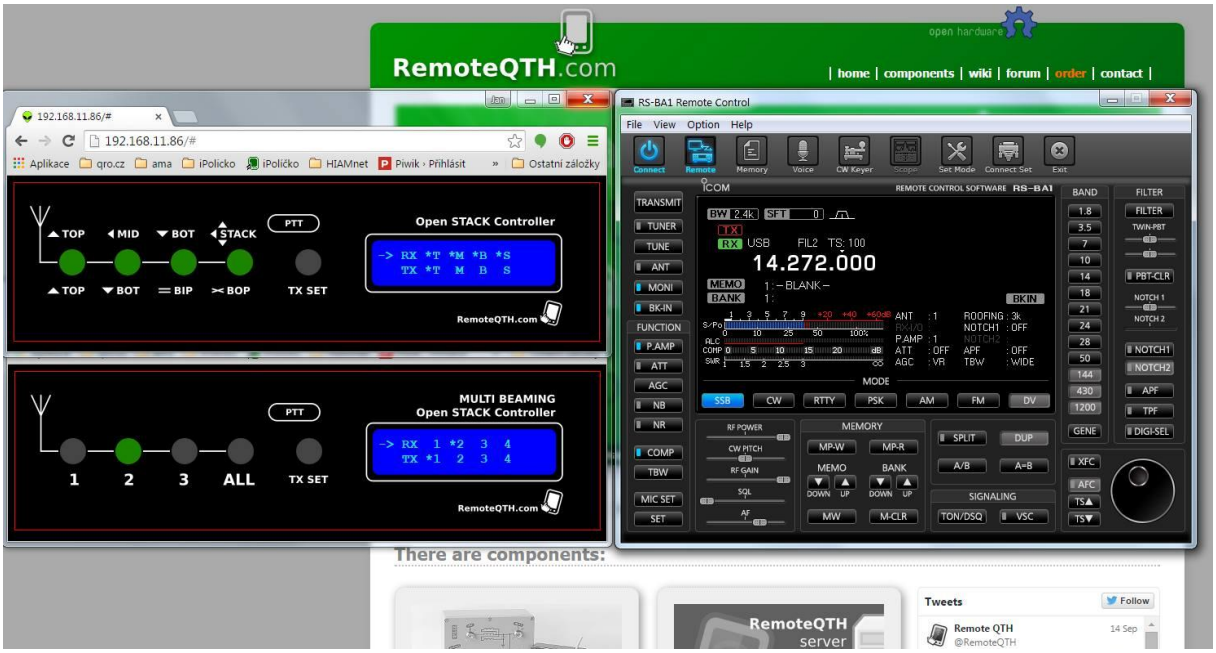
12. Remote controlling – ethernet

Webpage screen: default and customized (HamBuy)





Example:

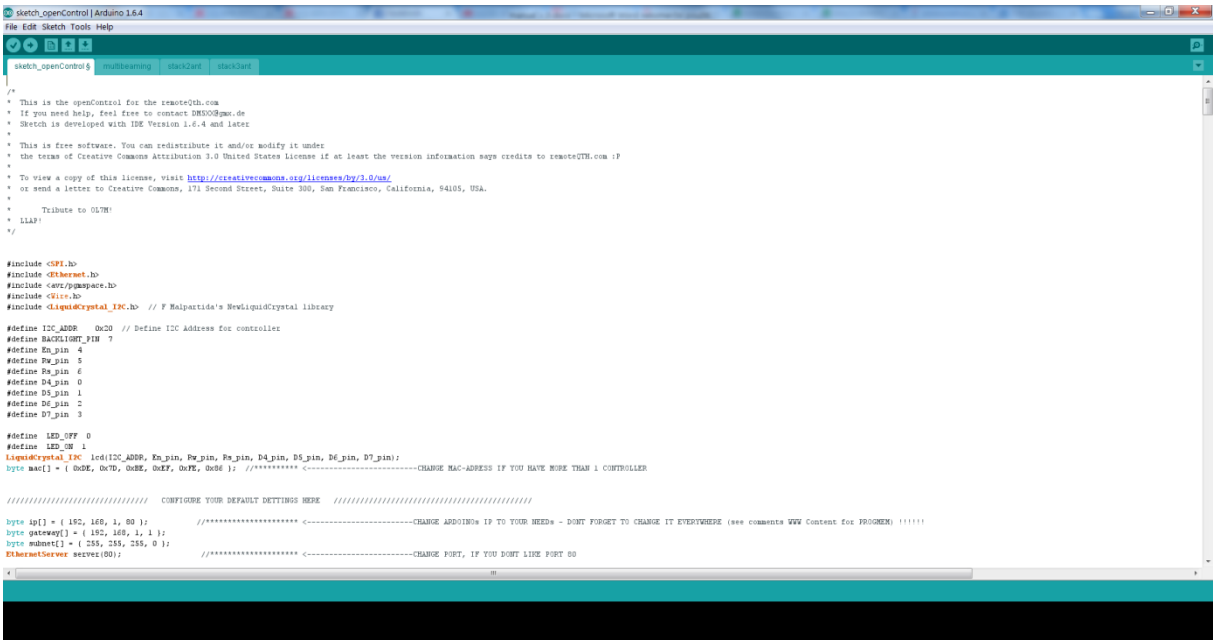


Tip:
You can control it with your owen software or web app:
Example: http://192.168.1.180/Set/1/0101 to Set 1 (TX) to 0101 (off-on-off-on), use 0 to set RX

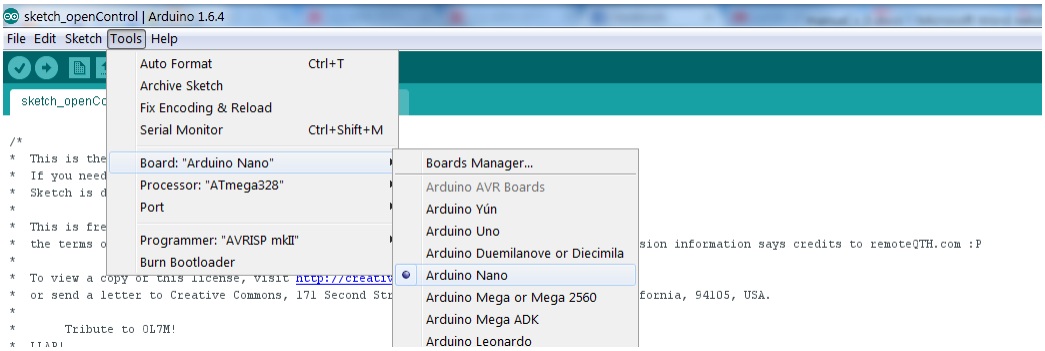
13. Firmware setup and upload

Source codes: https://github.com/dm5xx/remote_openController

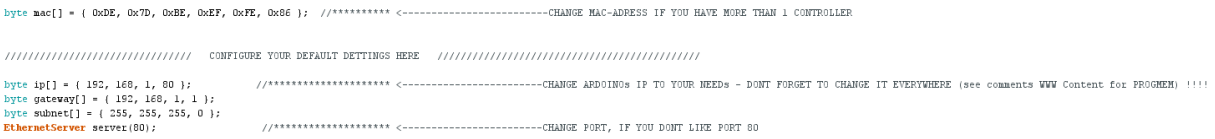
Arduino IDE http://ok2zaw.com/FW/Arduino_no_install-1.6.4.zip



Select right board and port



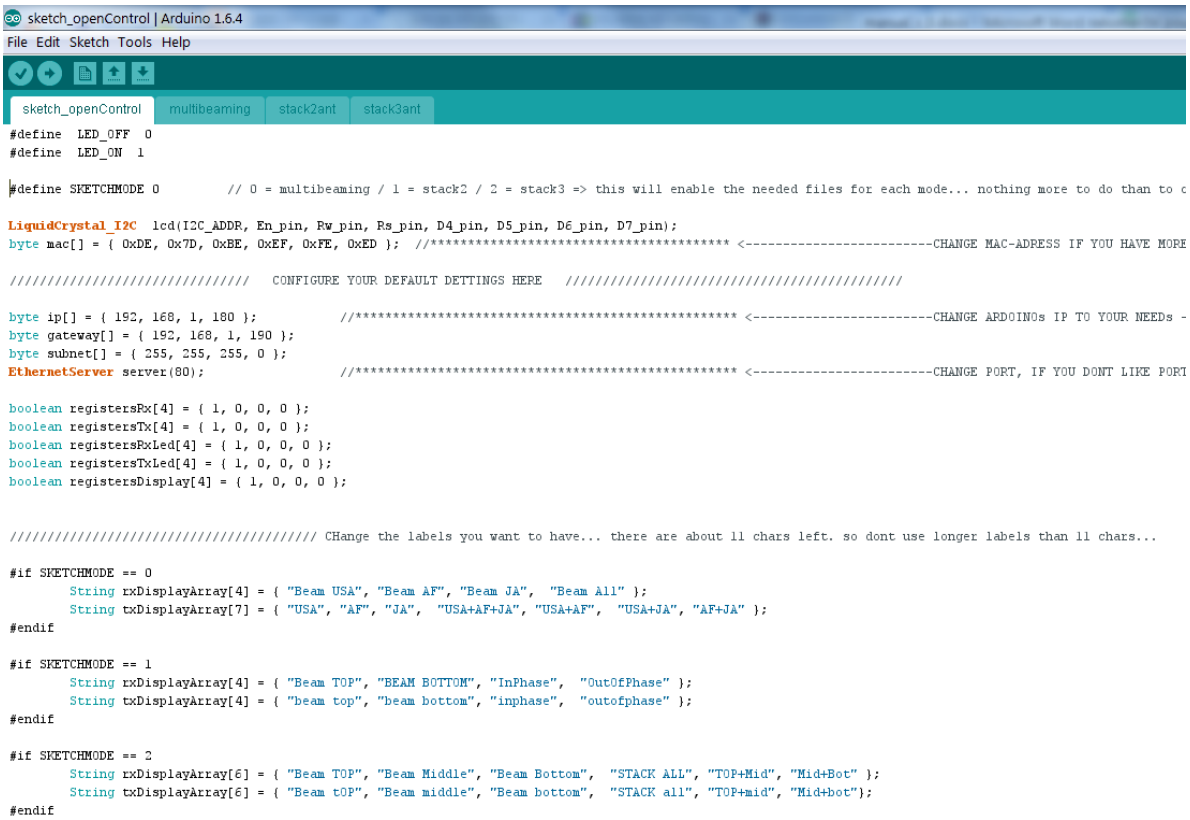
Set IP address settings:



Set Sketchmode:

0 – Multibeaming, 1 – stack match 2 ants with BiP/BoP, 2 – stack match with 3 antennas

Set LCD lables for each position:




```
#define  LED_OFF  0
#define  LED_ON  1

#define SKETCHMODE 0          // 0 = multibeaming / 1 = stack2 / 2 = stack3 => this will enable the needed files for each mode... nothing more to do than to c

LiquidCrystal_I2C  lcd(I2C_ADDR, En_pin, Rw_pin, Rs_pin, D4_pin, D5_pin, D6_pin, D7_pin);
byte mac[] = { 0xDE, 0x7D, 0xBE, 0xEF, 0xFE, 0xED };  //************************************* <-------------------------CHANGE MAC-ADRESS IF YOU HAVE MORE

////////////////////////////////   CONFIGURE YOUR DEFAULT DETTINGS HERE   ////////////////////////////////////////////

byte ip[] = { 192, 168, 1, 180 };           //************************************************** <-------------------------CHANGE ARDOINOs IP TO YOUR NEEDs -
byte gateway[] = { 192, 168, 1, 190 };
byte subnet[] = { 255, 255, 255, 0 };
EthernetServer server(80);                  //************************************************** <-------------------------CHANGE PORT, IF YOU DONT LIKE PORT

boolean registersRx[4] = { 1, 0, 0, 0 };
boolean registersTx[4] = { 1, 0, 0, 0 };
boolean registersRxLed[4] = { 1, 0, 0, 0 };
boolean registersTxLed[4] = { 1, 0, 0, 0 };
boolean registersDisplay[4] = { 1, 0, 0, 0 };


////////////////////////////////////////// CHange the labels you want to have... there are about 11 chars left. so dont use longer labels than 11 chars...

#if SKETCHMODE == 0
        String rxDisplayArray[4] = { "Beam USA", "Beam AF", "Beam JA",  "Beam All" };
        String txDisplayArray[7] = { "USA", "AF", "JA",  "USA+AF+JA", "USA+AF",  "USA+JA", "AF+JA" };
#endif

#if SKETCHMODE == 1
        String rxDisplayArray[4] = { "Beam TOP", "BEAM BOTTOM", "InPhase",  "OutOfPhase" };
        String txDisplayArray[4] = { "beam top", "beam bottom", "inphase",  "outofphase" };
#endif

#if SKETCHMODE == 2
        String rxDisplayArray[6] = { "Beam TOP", "Beam Middle", "Beam Bottom",  "STACK ALL", "TOP+Mid", "Mid+Bot" };
        String txDisplayArray[6] = { "Beam tOP", "Beam middle", "Beam bottom",  "STACK all", "TOP+mid", "Mid+bot"};
#endif
```