TinyGate

USB Digimode Interface

Instructions for Assembly

and user's manual

(Last change: 20/12/2020)

RF<>SYSTEM

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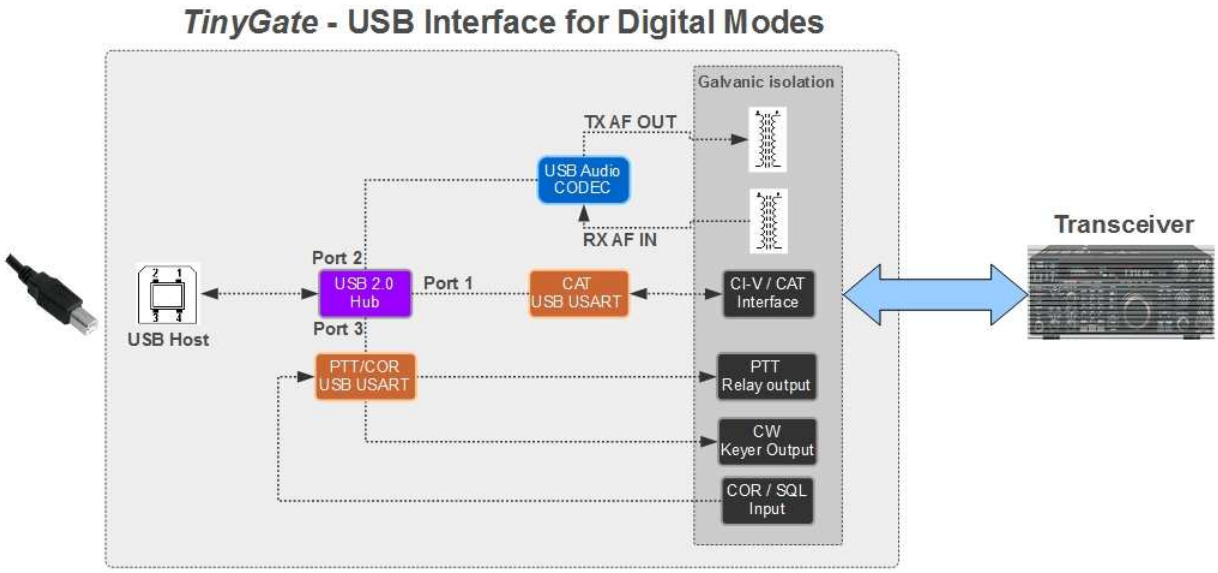
Introduction

The TinyGate Interface was created by Martin, IW3AUT and it's a compact USB interface for transceivers, which allows operation in digital modes via PC such as for example: PSK31, RTTY, WSPR, SSTV, EchoLink, APRS, Pactor, ROS as well as many others.

As a **3-in-1 interface i**t makes available via a USB port a **sound card interface, a CAT / CI-V interface and a PTT / SQL / CW / FSK** with a galvanic isolation between the transceiver and the PC with transformers and optocouplers. The **TinyGate Interface** can be used with a wide variety of software applications for digital modes, which are available as freeware, shareware or as commercial products. As a result, this provides the amateur radio operator with easy and manageable access to the world of digital modes, thanks to the wide flexibility of adaptation of this interface to almost any transceiver.



Warnings

Disclaimer

This assembly box is made exclusively for radioamateur and educational-experimental use. As a result, it should be assembled and used by an expert with experience in the assembly of electronic circuits.
We do not accept any responsibility for bodily or material damage caused by the construction and use of this assembly box. As a result, assemble and use this kit at your own risk.

The operation may not be guaranteed, and even less so its eligibility for use of certain applications. The user should verify its applicability for their own applications and is responsible for the latter.
Errors of access and use are factors that are beyond our control, we are therefore not responsible for bodily or material harm caused by these errors or inexperience.
The guarantee applies exclusively to the individual parts (on the condition that these are assembled correctly) and not to the assembled product. The aforementioned RF-SYSTEM reserves the right to make modifications and/or improvements to the assembly box at any time, without updating this manual.
The two kits, once assembled, may not be resold if the necessary legal authorisations have not been previously requested and obtained.

Before using with a transceiver or receiver, the bridges on the JP1 socket must be configured correctly.
Incorrect configuration of these bridges may cause damage to the TinyGate and/or to the connected transceiver or receiver.

· It is advised that the parts are kept out of reach of children and away from pets, as they are a choking hazard.
· Do not inhale the fumes from the welding. Use a filter or device to remove these from the work station.

· Aerate the room after the welding activity.

· When using a soldering iron, place it down only once the rod has cooled down properly.
· Do not solder on live circuits.
· Carefully follow the instructions provided in this manual.
· In case of any doubt concerning the procedures to be followed, seek technical assistance.
· Do not try to modify the parts of the circuit that have already been assembled.

Technical characteristics

- ***3-in-1 USB interface, just only one USB cable to your PC: built-in USB 2.0 High speed Hub***
- **Full galvanic isolation** between radio and USB interface
- **Integrated USB sound device:**

  The power supply from the USB host is filtered additionally to keep a low noise on the A/D and D/A converters
  Supported by the following operating systems: Windows XP, Windows 7, Windows 8, Windows 10, Macintosh OS X and LINUX.
  Compliant with USB Audio Device Class Specification v1.0, there are no custom device drivers necessary.

- Provides 2 independant integrated USB COM-Ports:

  1) CAT/CI-V serial interface:
  Support for following radio control ports: CI-V, FIF-232, IF-232 (RXD+TXD)
  Supported by the following operating systems: Windows XP, Windows 7, Windows 8, Windows 10, Macintosh OS X and LINUX.

  2) PTT/SQL/CW/FSK interface:
  Squelch(COR) input, positive or negative logic (for Echolink and remote control applications)
  PTT relay output: direct keying control without VOX circuit
  CW/FSK solid state output (can also be used as PTT: The smart jumper system allow to use either a relay or a solid state output as PTT)
  Supported by the following operating systems: Windows XP, Windows 7, Windows 8, Windows 10, Macintosh OS X and LINUX.

- Controls for receiver and transmitter audio level
- Quick change USB and Radio interface connectors
- RJ45 connector for transceiver connection with a flexible pin selection jumper socket (attached to MIC connector, accessory or data port works with virtually all transceiver). A detachable radio cable can be made easily with a standard unterminated RJ45-FTP network patch cable (get a

patch cable and cut/remove one of both RJ45 connectors), where you can solder a suitable connector for your transceiver. Here as example the cable for a ICOM IC7400 transceiver:

- Leds for USB Audio device, PTT and CAT RXD/TXD activity
- **All communication software which support a standard sound card and a serial port for the PTT can work with the TinyGate**. Due the independent sound interface and COM-Ports it can be used also with any combination of CAT, remote operation and data software like MixW, Hamradio Deluxe, DigiPan, MixW, FLDigi, RemAud etc.

Technical specifications

- USB 2.0 High speed interface
- USB Power requirements: 5V, max. 120mA
- Board size: 65x80mm
- USB sound interface (codec):

  Chip: CMedia CM108AH
  48 / 44.1kHz Sampling Rate for Both Playback (D/A) and Recording (A/D)
  88 dB (typical) dynamic range
  16-Bit DAC Output and 16-Bit ADC Input with a 22dB Microphone Boost
  Audio Output:
  Level 3Vpp max. @1kΩ typical (AC-coupled)
  Frequency response (1 dB bandwidth): 0,02 – 11,5 kHz typical (D/A frequency response conditions: measured with a E-MU0202, include isolation transformer)
  Second harmonic: -70 dB typical
  Total harmonic distortion (THD): 0.06% typical
  D/A Sampling rates: 44.1, 48 kS/s

Audio Input:

  Input impedance: 600Ω, (AC-coupled)
  max. input level: 3Vpp, (Microphone Boost=OFF)
  max. input level: 220mVpp, (Microphone Boost=ON)
  Frequency response (1 dB bandwidth): 0,02 – 15 kHz typical (A/D frequency response conditions: measured with a E-MU0202, include isolation transformer)
  Noise floor screen capture (span: 0 to 5kHz, 48 kHz Sampling Rate, disconnected input, microphone Boost=OFF)
  Noise floor screen capture (span: 0 to 5kHz, 48 kHz Sampling Rate, disconnected input, microphone Boost=ON)
  Dynamic Range: 88 dB typical
  A/D sampling rates: 44.1, 48 kS/s

  Audio transformers crosstalk attenuation: 60dB

- USB COM-Ports:
- Chip: FTDI FT232RL
  Multi-Standard: CAT, FIF-232 (5V TTL), IF-232 (5V TTL), Inverted (for Elecraft, only for TinyGate board revision B). Max. guaranteed serial baudrate: 19200 baud
  Interface power:
  external powered from the transceiver / internal powered from the USB (internal powered works only without galvanic isolation)
  PTT output: reed relay driven from RTS, max. 100V/0,5A
  CW/FSK output: optoisolated open collector driven from DTR or TXD, max. 50V/50mA
  Squelch input: optoisolated logic high or low to activate CTS, 4-20VDC
- Radio connector (RJ45):

  Available signals: RX Audio, TX Audio (MIC), PTT, CW/FSK, COR, CAT/Logic Supply 8-15VDC

Before beginning

The assembly procedure of the TinyGate may be facilitated by certain small steps:

· Organise the work space for the procedure.
· Preferably use a wooden table with a sheet of antistatic map placed on top to prevent any parts that may fall from bouncing to the ground.
· Keep the necessary tools within arm's reach.
· Use a soldering iron whose tip is in good condition. Eventually change it as a preventative measure.
· Use a free solder alloy for electronics possibly without lead.
· Preferably use a rigorously earthed antistatic bracelet connected to through a resistor of 1 MegaOhm.
· Rushing is bad practice! Proceed with the most calm approach possible!!!

Soldering advice

For the assembly of the kit, no particularly sophisticated soldering equipment is necessary. Even with a good pen soldering tool (at least 30 watts of power) you can obtain optimum results. The key point for successful soldering is certainly the state of the tip. Damaged tips or tips which have lost the silver surface layer should be replaced. The tip, once heated, may be effectively cleaned by melting a small amount of solder alloy on it and then passing it repeatedly on a damp sponge (not soaking). The operation of cleaning with the sponge should be repeated regularly, in order to eliminate residues of fluxing and oxidising agents that may build up on it.
Preferably use lead-free solder alloys, even if the soldering in this case will not have a very shiny appearance and may as a result be more difficult to complete. The diameter of the alloy to be used simply depends on habit. Taking into account the "step" of the parts to be soldered, a soldering alloy with maximum diameter of 1mm should be entirely sufficient. Larger diameters may be difficult to manage, and smaller diameters may require more wire feeding during the fusion operations. One should not use fluxing agents or soldering pastes since modern soldering irons have a core that, upon melting, carries out the same function as the soldering paste.
Soldering operations should be carried out in a fast and decisive manner. Certain components (such as crystal) do not increase in size such that their leading wires must be insisted upon with the soldering iron. The same is true of the transformers. The soldering alloy should never be liquefied on the tip of the soldering iron, but on the leading wire of the part that is being soldered, following the heating of the same. After the fusion has begun it is necessary to apply the heat for several moments (1 or 2 seconds) so as to complete the fusion of the deoxidising agent and to guarantee optimal electrical contact. Do not exaggerate the quantity of tin that is melted on the leading wires, excesses tin may result in aesthetically awkward soldering or in short-circuits with the adjacent feet.
Once the soldering phase is complete, one should never blow on the soldering alloy. The cooling should take place slowly by convection.
Particular attention should be paid to the airtightness of the ground planes. In this case the large metallic surface has an elevated thermal capacity, and it may therefore be difficult (especially if the soldering iron is not overly powerful) to produce good soldering results.

Also in this case it is only a question of time, keeping the tip on the ground plane for a few seconds, such as to lightly heat it and then proceed to the use of the soldering alloy.
If an error is made, the excess tin may be removed with a desoldering braid (make sure it does not touch your fingers too much) or with tin remover (electrical or pump). The parts should be removed only when the soldering alloy has been correctly removed and without exerting too much force in the extraction. If the component is “stuck”, remove the tin more efficiently. Applying force with pliers or wire cutters may lead to insoluble damage to the printed circuit.

Preparation and setup

The pack containing the TinyGate kit has finally arrived, so, remembering what was said in the first section, the necessity is for a space that allows us to work comfortably and calmly.

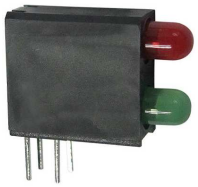
Assembly

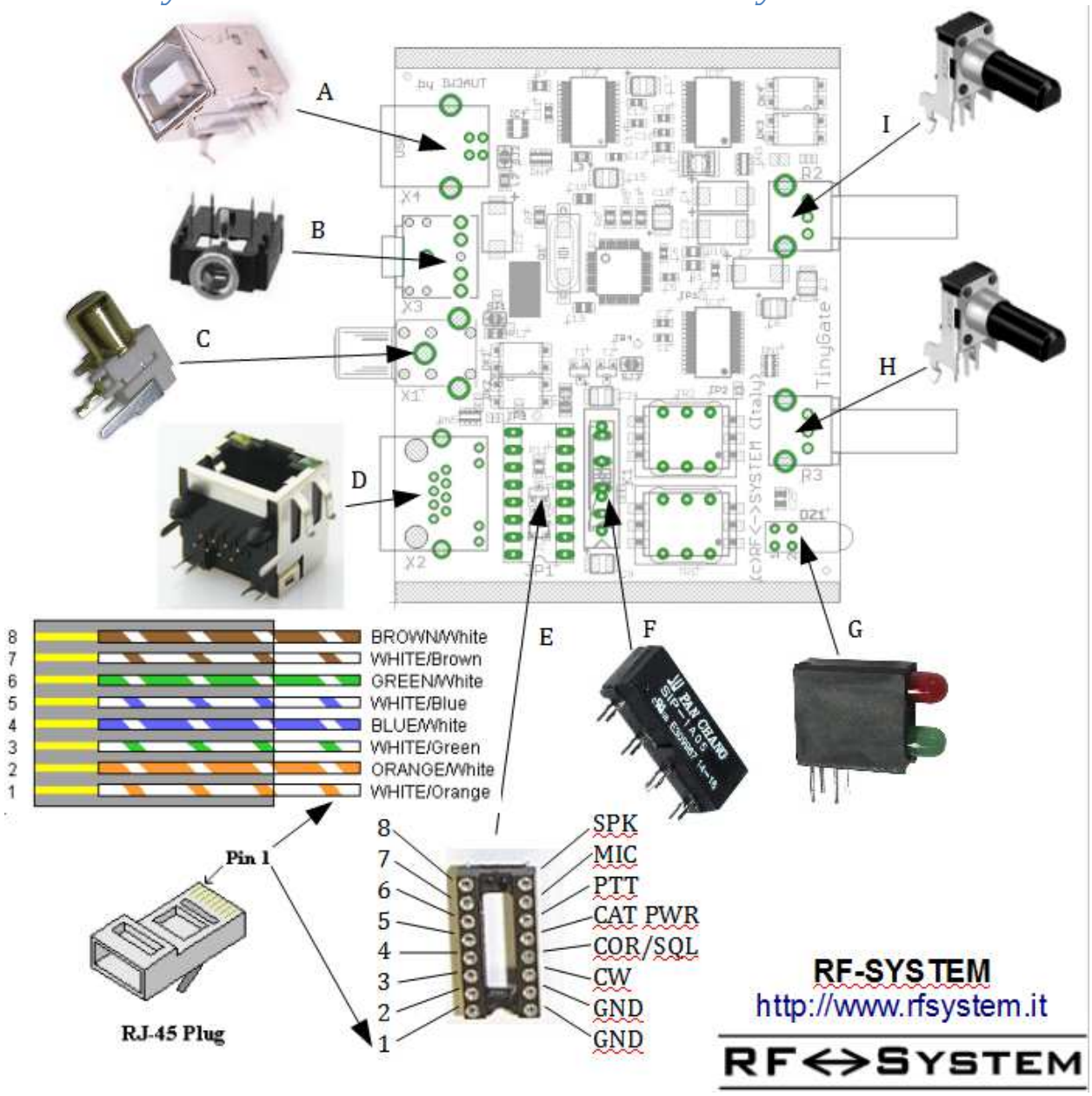
Circuit board

Once the preparations are complete, you may proceed with the assembly of the small parts remaining to be soldered. The parts represented in the following figures may be slightly different from those present in the kit.
Once the components have been identified it is necessary to proceed to the localisation of their assembly position. The operation is considerably simplified by the presence of the white silk screen printing on the printed circuit. For this one may also make reference to the assembly scheme at the end of the table that follows. Pay particular attention to the precise parallel alignment of the connectors and potentiometers with the edge of the board.

List of the parts to be soldered

Pos.	*Description*	*Desc.*
To	USB connector 	X4
B	Jack stereo 3.5mm 	X3
C	RCA connector (insert the part completely until the 6 white plugs are inserted entirely in the printed circuit) 	X1
D	RJ45 socket with LED 	X2
E	16 pin jumper socket 	JP1
F	Reed Relays (The orientation of this component does not matter because of the symmetrical pinout) (SIP-1A05 or MS05-1A87-75LHR) 	K1

G	Dual LED (Red/Green) This led block should be aligned with the edge of the printed circuit. 	DZ1
H / I	Potentiometers 10kOhm with dial knobs   	R2 / R3


A
B
C
D
E
F
G
H
I
8 BROWN/White
7 WHITE/Brown
6 GREEN/White
5 WHITE/Blue
4 BLUE/White
3 WHITE/Green
2 ORANGE/White
1 WHITE/Orange
Pin 1
RJ-45 Plug
8 SPK
7 MIC
6 PTT
5 CAT PWR
4 COR/SQL
3 CW
2 GND
1 GND
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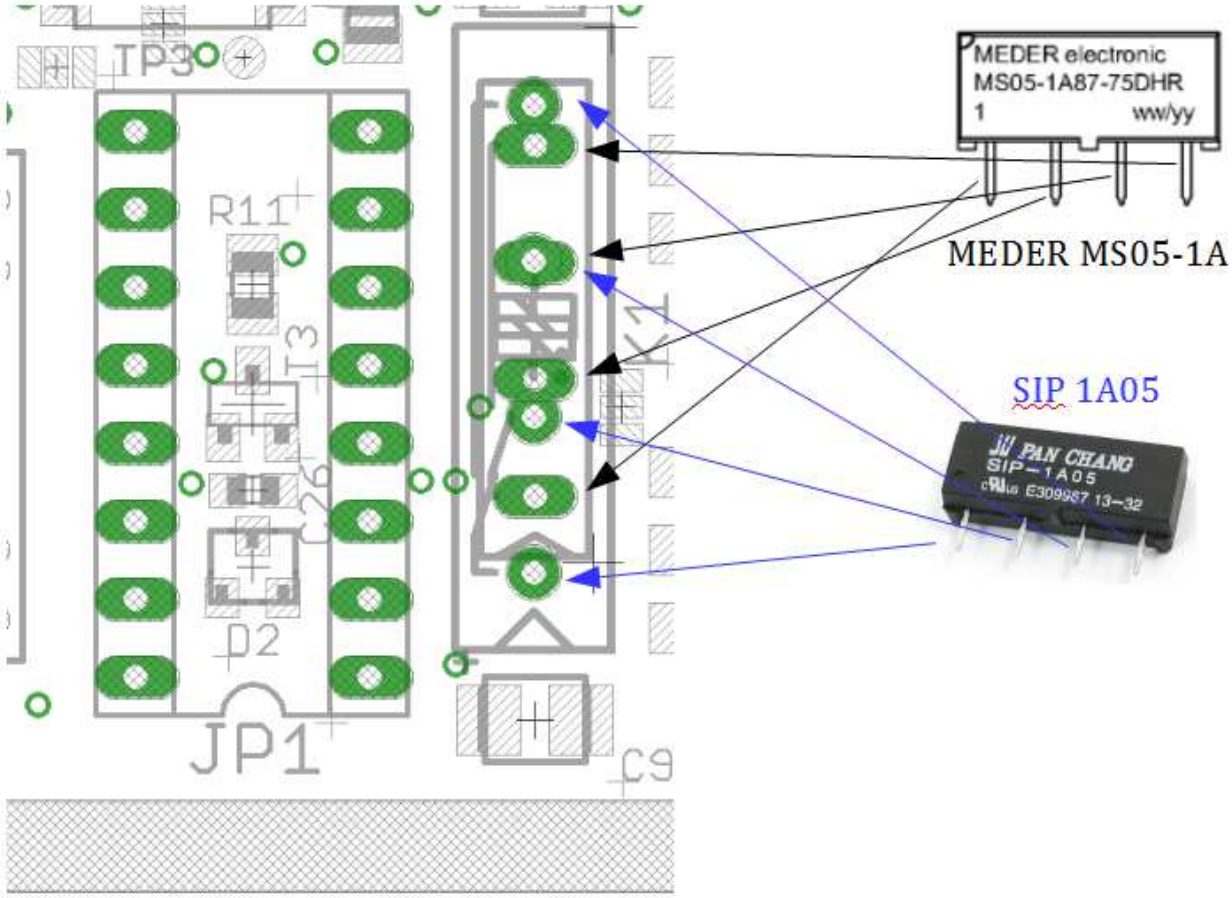
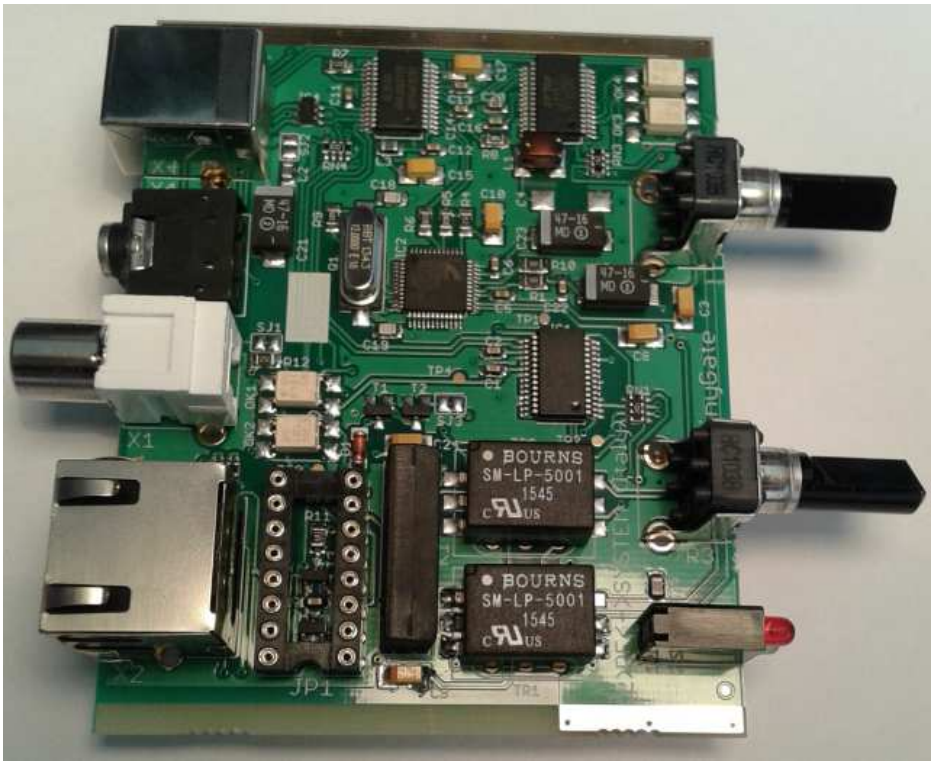
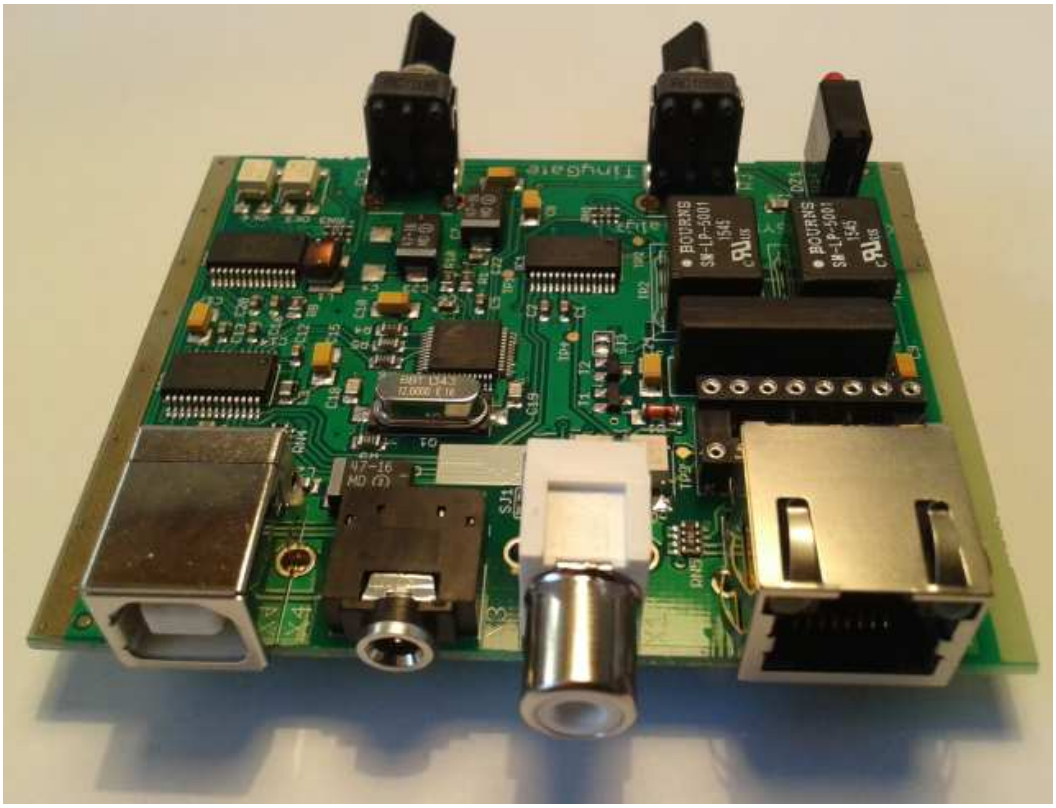
For the relay (F) there are present overall in the printed circuit 7 holes with associated soldering pads. Nonetheless, the relay has only four pins: this is because the board is prepared for two different relays with different pinout pitch. If you find in the kit a relay type SIP-1A05, it should be connected in **three round holes and in one oval**. For the relays of type MEDER MS05-1A87-75LHR are supposed to use **4 oval-shaped pads.** The orientation of the relay is immaterial because of the symmetrical pin assignment. In all of these cases, the position and the distance between the holes make it almost impossible to connect the relay incorrectly.

Relay pinout details:

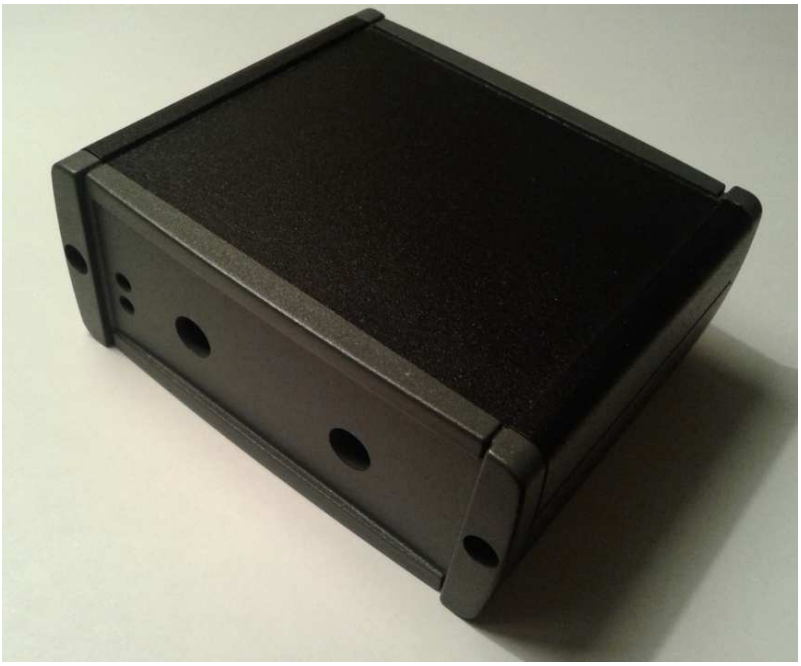


View of the full assembled board:



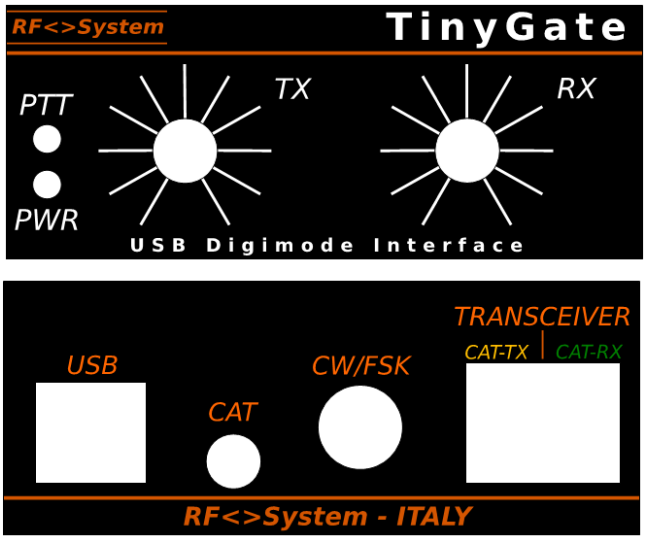


Enclosure kit - Box



There is also available an enclosure kit for the TinyGate, cut to fit the TinyGate board and two panels which are already perforated.

The two panels (front and back panel) are thus ready to be completed by applying the two polyester self-adhesive labels.



The two masks have been cut with precision and for this reason they should be aligned with the centre of the holes present on the two covers. For this, we recommend you try the alignment first without taking off the protective film, because the adhesive on these masks is very strong, and so it is difficult to re-position the masks once they have been attached.

CAUTION:
Before assembling the board in the enclosure the jumpers must be inserted on JP1, which define the assignment of the pins with the RJ45 X2 socket: see ***Assignment of pin for the transceiver cable***

The assembly of the board in the enclosure is very easy: it is sufficient to insert it in the aluminium edging, using the second base guide as a seat for the board. The board is slightly longer than the aluminium box, but this is necessary to allow you to block in a stable way once fixed the two panels with the respective self-threading screws supplied with the enclosure.
After the assembly of the covers the two dial knobs may be applied for the two "TX" and "RX" potentiometers on the front panel. Before inserting the dial knob in the shaft it is necessary to ensure that both the potentiometers are turned anticlockwise, the position corresponding to the first white mark present on the adhesive label. Right on this mark the dial knob that is going to be inserted in the shaft should also be aligned. The dials should be lined up manually (at approx. within 2-3mm of the mask) but without using equipment such as a hammer or similar tools.

Connection cable for the transceiver

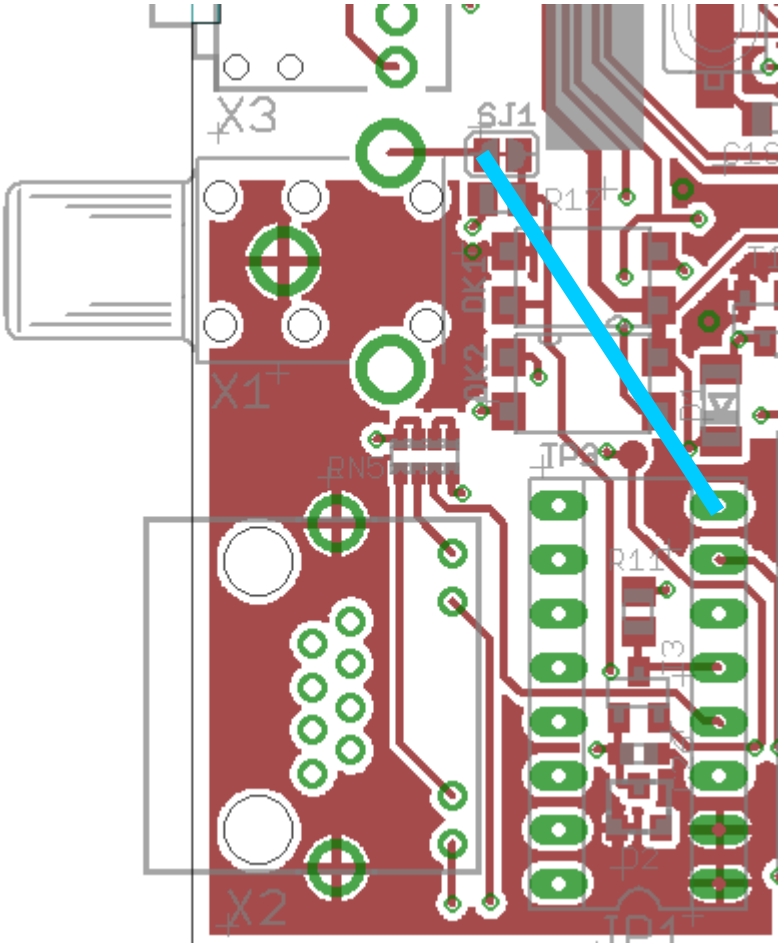
TinyGate allows you to freely define the assignment of the pins on the RJ45 X2 connector. The transceiver is connected to this connector via a patch cable that is supplied in the kit, to which may be assigned the following signals available on the JP1 socket:

Signals	*Description*
SPK	**Input for the audio signal reception coming from the demodulator (AC-coupled)** This signal, according to the transceiver model, may be available on the microphone socket, DATA, the ACCessory socket or else on a jack. You can find indications in the manual of your transceiver if and where an audio output is available.  Advice: Not all transceivers have all of the necessary signals (SPK, MIC et PTT) available on a single connector. The RCA X1 (CW / FSK) socket may be for example also used as an audio input (or else as any other kind of input or output) if there is not a necessity to use it as CW/FSK output. This is the case in where not all signals (SPK, MIC and PTT) are available on a single connector, but where for example the receiver audio output signal is present on a separate socket. One should thus remove-cut the copper trace on SJ1 and take the signal with a wire from the left pad to the desired signal pin on the right row of the socket JP1 (see image below). This solution requires an extra wire, but avoids avoids having to assemble a Y-cable between X2 and the transceiver.
MIC	**Audio output to the microphone input (AC-coupled)** This signal, according to the function of the transceiver model, may be available on the microphone connector, on the DATA or ACCessory connector. In the event that a DATA or ACCessory connector is available, it is recommended to use these in order to leave free the microphone socket, and consequently also the microphone itself.
PTT	**Relay output for the PTT - (Max 100VDC / 0.5A)** It is a contact that is normally open(NA) to the ground (GND)
CAT	**power supply input for the CAT/CI-V interface**

PWR	Given the galvanic isolation of the interface CAT/CI-V it is necessary to supply it with external power (8-15VDC / 20mA). This power may for example be taken directly by some transceivers from the microphone connector, the DATA or ACCessory socket. In the case the CAT/CI-V interface of TinyGate is not used or in cases where galvanic isolation is not required, **it is not necessary** to get any power supply from the transceiver.
COR/ SQL	**Input - Squelch** Certain applications, (e.g. Echolink) support and use for the carrier detection and/or channel busy detection by this signal from the transceiver, but only some transceivers have this output available on a connector. On several transceivers of this sort it is necessary to get the SQUELCH signal from inside. The SJ6 and SJ13 bridges define whether this signal should be interpreted with a positive or negative logic.
CW/ FSK	**Output - CW or else FSK (max. 50VDC / 50mA)** It is a transistor output from a optocoupler. If necessary, you may connect this output with a 1.5kOhm-resistor to +5V (Pull-Up) through the SJ11 solder bridge.
GND	**Ground (GND), connected to the shield of the RJ45 X2 socket and the RJ45 cable towards the transceiver.** This ground is separated from the USB-ground of the circuit on the board and should be connected to the ground of the transceiver via the RJ45 patch cable or the CW / FSK cable.
GND	**Ground (GND), connected to the shielding of the RJ45 X2 socket and the RJ45 cable towards the transceiver.** This ground is separated from the USB-ground of the circuit on the board and should be connected to the ground of the transceiver via the RJ45 patch cable or the CW / FSK cable.

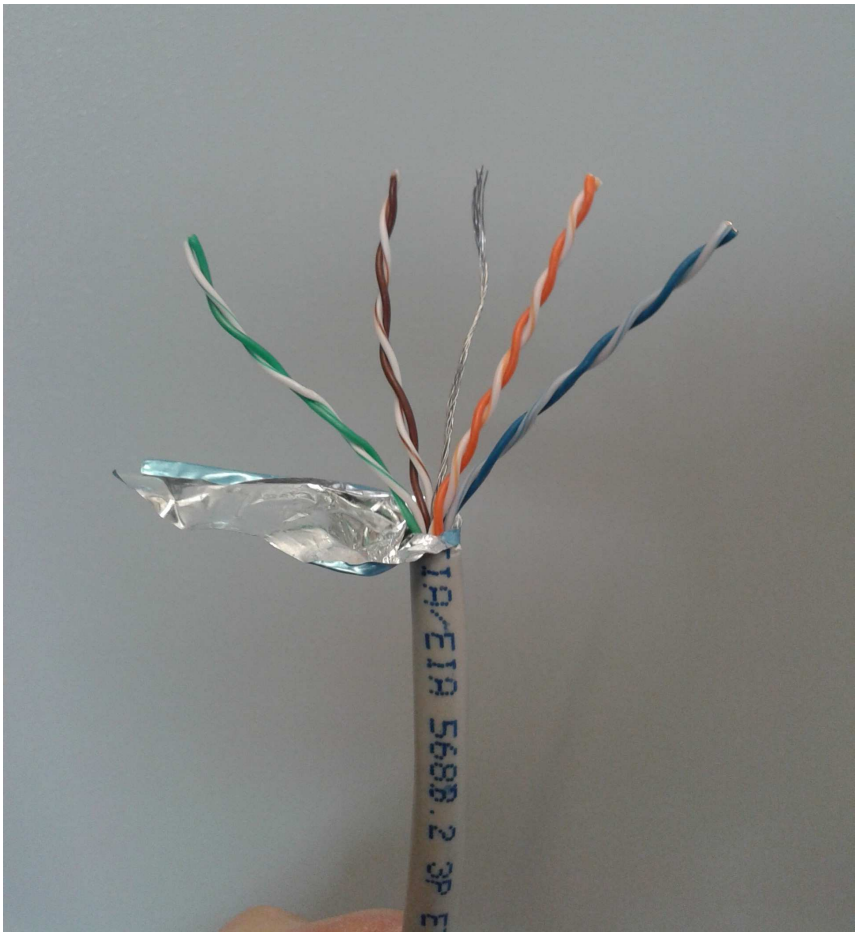
The RJ45 socket X2 is exclusively provided for the connection of a transceiver and not an Ethernet network port. Hence, a network device, such as a DSL router or similar device for example, must not be connected, otherwise it may be damaged by the TinyGate and/or the connected network device!

The RCA X1 (CW / FSK) socket may for example also be used as an audio input (or else as any other kind of input or output) if there is not the need to use it as a CW/FSK output. This is necessary in cases where not all signals (SPK, MIC and PTT) are available on a single connector, but where for example the receiver audio output signal is present on a separate socket. For this reason remove-cut the copper trace on SJ1 and bring the signal with a wire from the left pad to the desired signal pin on the right row of the socket JP1.
In the following example, the RCA X1 socket has been reconfigured as an audio input:

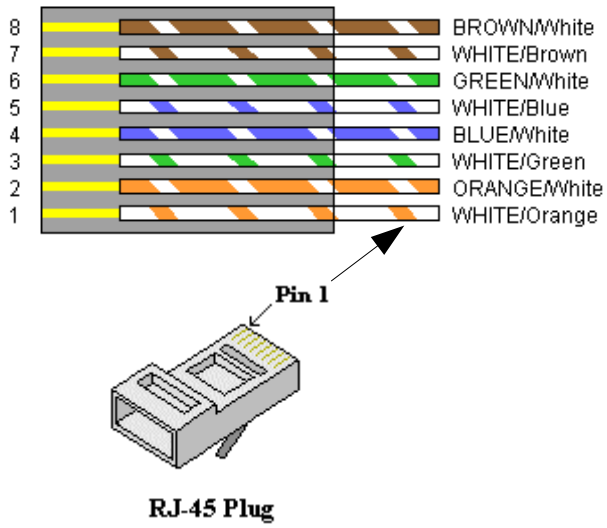


The transceiver cable

With the assembly kit there is a CAT5-FTP cable provided with a shielded RJ45 connector. If the cable in the kit should have two shielded RJ45 connectors and the transceiver has a different type of connector, it is then possible to remove one of these, cutting the cable near the connector. Certain transceivers have a RJ45 type microphone connector, in this case the cable with two RJ45 may become useful.
The transceiver should be connected to the RJ45 X2 socket via this cable, which should be set up on the open side (that which faces the transceiver) with a suitable connector for your transceiver itself. The necessary available signals have been described in the previous chapter "***Cable for connection to the transceiver***».



The shielded cable is made up of 4 twisted pairs of wires, which have the following colour code and assignment on the connector:



RJ-45 Plug

The shield is already attached to the ground (GND signal) in a fixed way from the board via the RJ45 X2 socket. As previously described, the signals present on the JP1 may be freely assigned to each pin of this connector. In any case, it is advised to connect at least the MIC and SPK signals on two different wire pairs, in order to thus obtain a better de-coupling between these signals.
This means that MIC and SPK should always be paired with a wire that is connected to ground (GND).

Examples of connection with transceivers

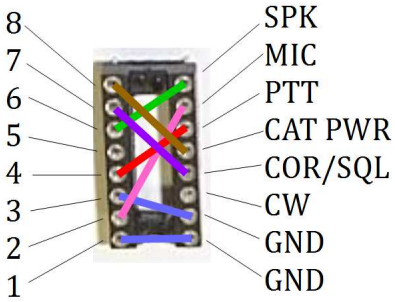
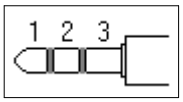
In the following tables there is an illustration of the assignment of the pins and wires for the cable towards some transceivers.

In any case errors are not excluded, and so, there should be considered as examples and only as guidelines for the cables assembly and not as guaranteeing the proper functioning with every specific transceiver.

In the assembly kit, there is also provided a piece of rigid and insulated copper wire which is suitable to build the jumpers to insert in JP1.

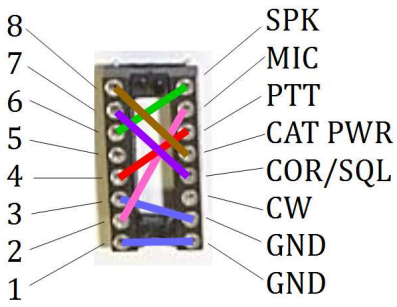
Elekraft KX3

The assignation of pins for the transceiver cable (X2 <-> PHONES + MIC):

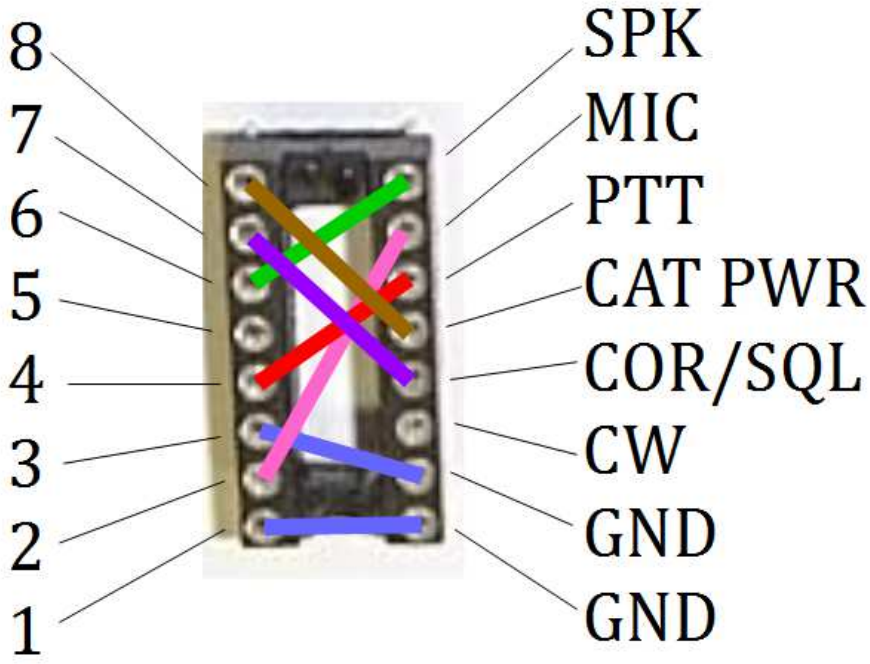
X2 Pin	*Jumpers on JP1 towards the signals*	*Wire Colour*	*Pin on PHONES + MIC side panel view*
			 
1	GND	WHITE/Orange	3 (MIC)
2	MIC	ORANGE/White	1 (MIC)
3	GND	WHITE/Green	3 (PHONES)
4	PTT	BLUE/White	2 (MIC)
5		WHITE/Blue	
6	SPK	GREEN/White	1 (PHONES)
7		WHITE/Brown	
8		BROWN/White	

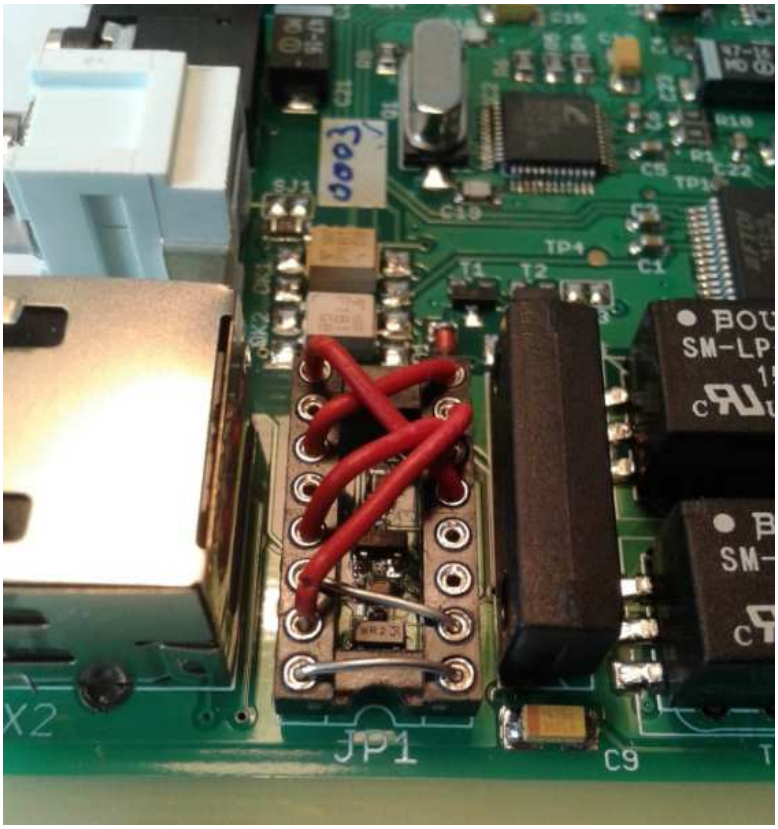
Icom IC275, IC725, IC726, IC728, IC729, IC735, IC736, IC737, IC738, IC746PRO, IC756PROIII, IC761, IC765, IC775, IC781, IC820, IC821, IC910, IC970, IC7400, IC7600, IC7700, IC7800

The assignation of pins for the transceiver cable (X2 <->ACC1):

X2 Pin	*Jumpers on JP1 towards the signals*	*Wire Colour*	*Pin on ACC (1)*
			 Rear panel view
1	GND	WHITE/Orange	2
2	MIC	ORANGE/White	4
3	GND	WHITE/Green	2
4	PTT	BLUE/White	3
5		WHITE/Blue	
6	SPK	GREEN/White	5
7	COR / SQL	WHITE/Brown	6
8	PWR	BROWN/White	7

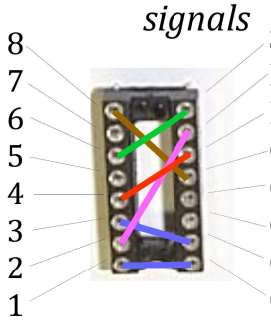
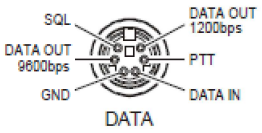
JP1 - Jumpers example for the cable described above:





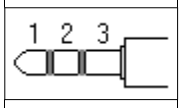
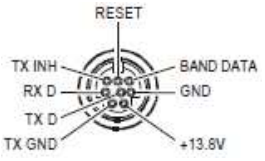
Yaesu FT100D, FT817, FT857, FT897

The assignation of pins for the transceiver cable (X2 <-> DATA transceiver):

X2 Pin	*Bridge on JP1 towards the signals*	*Wire Colour*	*Pin on the DATA Rear panel view*
			
1	GND	WHITE/Orange	GND
2	MIC	ORANGE/White	DATA IN
3	GND	WHITE/Green	GND
4	PTT	BLUE/White	PTT
5		WHITE/Blue	
6	SPK	GREEN/White	DATA OUT 1200
7	COR / SQL	WHITE/Brown	SQL
8	PWR (only necessary for a galvanic isolated CAT interface)	BROWN/White	

Option: CAT control via the CAT interface of the TinyGate:

Pinout of the CAT cable

Pin CAT X3 input 	*Description*	*PIN on CAT / LINEAR* 
1	TXD	RX D
2	RXD	TX D
3	GND (Ground of the transceiver)	GND

CAT / CI-V Interface mode solder bridge setting (SJ10):

solder bridge SJ10 on the position **2-3 (**FIF232, IF232 mode**)**

We suggest to use the internal USB supply for the CAT interface to avoid to get the "+13,8V" from the CAT/LINEAR socket as external supply:

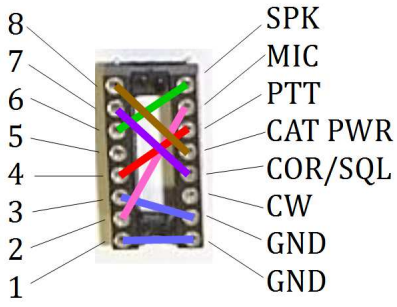
CAT / CI-V Interface Supply mode Jumper setting (SJ7 / SJ9):

SJ7 Pos.	*SJ9 Pos.*	*CAT Power supply port*
1-2	1-2	Internal (USB)

See also ***CAT / CI-V power supply***

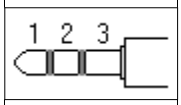
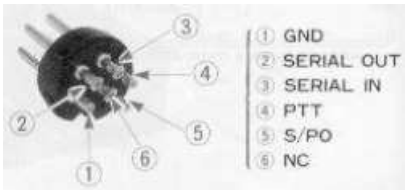
Yaesu FT1000 MARK-V, FT1000, FT990

The assignation of pins for the transceiver cable (X2 <-> PACKET Transceiver):

X2 Pin	*Jumpers on JP1 towards the signals*	*Wire Colour*	*Pin on the PACKET*
			 *rear panel view*
1	GND	 WHITE/Orange	2
2	MIC	 ORANGE/White	1
3	GND	 WHITE/Green	2
4	PTT	 BLUE/White	3
5		 WHITE/Blue	
6	SPK	 GREEN/White	4
7	COR / SQL	 WHITE/Brown	5
8	PWR (only necessary for a galvanic isolated CAT interface)	 BROWN/White	PIN4 (9V) on the socket DVS-2 (FT990) 

Option: CAT control via the CAT interface of the TinyGate:

Pinout of the CAT cable for FT990 and FT1000D

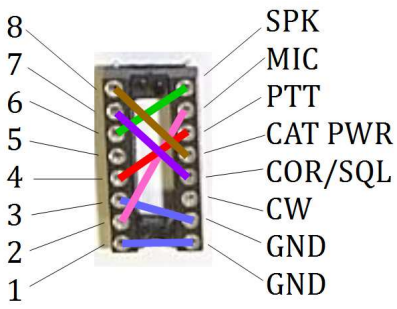
Pin CAT X3 input 	*Description*	*PIN on the CAT socket* 
1	TXD	3 SERIAL IN
2	RXD	2 SERIAL OUT
3	GND (Ground of the transceiver)	1 GND

CAT / CI-V Interface mode solder bridge setting (SJ10):

solder bridge SJ10 on the position **2-3 (**FIF232, IF232 mode**)**

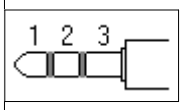
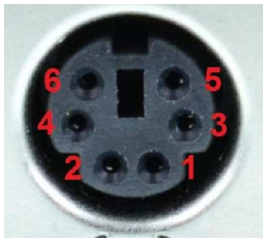
Yaesu FT840

The assignation of pins for the transceiver cable (X2 <-> Transceiver MIC and AF-OUT):

Pin X2	*Jumpers on JP1 towards the signals* 	*Wire colour of* CAT5-FTP cable	*Pin on the MIC (front panel view)* 	*AF-OUT socket (rear panel view)* 
1	GND	WHITE/Orange	7	
2	MIC	ORANGE/White	8	
3	GND	WHITE/Green		Ground (ring)
4	PTT	BLUE/White	6	
5		WHITE/Blue		
6	SPK	GREEN/White		Center pin
7		WHITE/Brown		
8	PWR (only necessary for a galvanic isolated CAT interface)	BROWN/White		Center pin of „+13.5V“ 

Option: CAT control via the CAT interface of the TinyGate:

Pinout of the CAT cable for FT840

Pin CAT X3 connector 	*Description*	*PIN on the CAT socket* 	*Notes*
1	TXD	3 SERIAL IN	Add a 150 Ohm resistor between pin 3 and pin 1
2	RXD	2 SERIAL OUT	
3	GND (Ground of the transceiver)	1 GND	

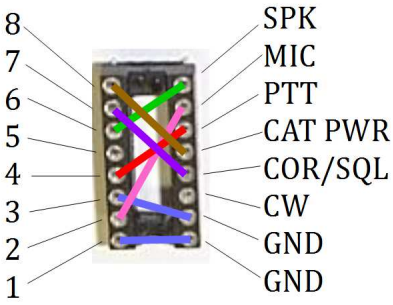
CAT Serial baudrate: 4800 Bps

CAT / CI-V Interface mode solder bridge setting (SJ10):

solder bridge SJ10 on the position **2-3 (**FIF232, IF232 mode**)**

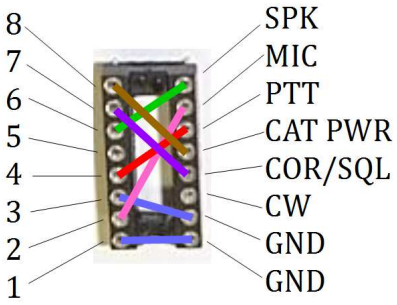
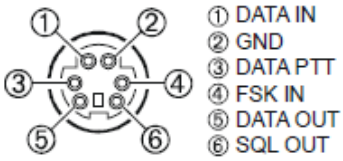
Yaesu FT2000, FT920

The assignation of pins for the transceiver cable (X2 <-> PACKET Transceiver):

X2 Pin	*Jumpers on JP1 towards the signals*	*Wire Colour*	*Pin on the PACKET*
			 *rear panel view*
1	GND	WHITE/Orange	2
2	MIC	ORANGE/White	1
3	GND	WHITE/Green	2
4	PTT	BLUE/White	3
5		WHITE/Blue	
6	SPK	GREEN/White	4
7	COR / SQL	WHITE/Brown	5
8		BROWN/White	

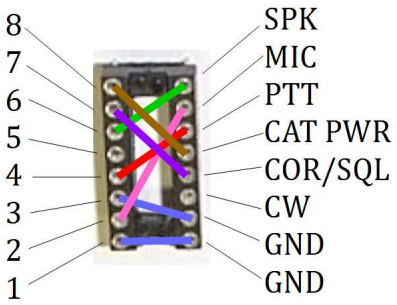
Yaesu FT450, FT950, FT991
Icom IC2720H, IC2725E
Kenwood TS480, TM255, TM455, TM-G707, TM-V7, TM-D700x

The assignation of pins for the transceiver cable (X2 <-> transceiver RTTY/PKT/DATA):

X2 Pin	*Jumpers on JP1 towards the signals* 	*Wire Colour*	*Pin on* RTTY/PKT/DATA *Rear panel view* 
1	GND	WHITE/Orange	2
2	MIC	ORANGE/White	1
3	GND	WHITE/Green	2
4	PTT	BLUE/White	3
5		WHITE/Blue	
6	SPK	GREEN/White	5
7	COR / SQL	WHITE/Brown	6
8		BROWN/White	

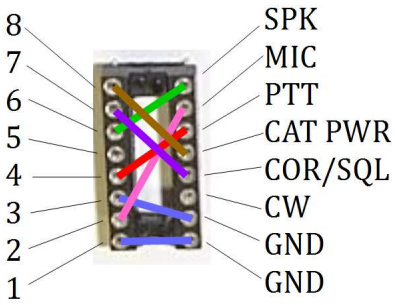
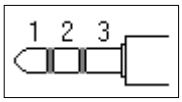
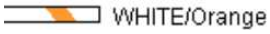
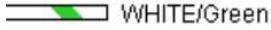
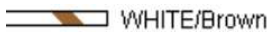
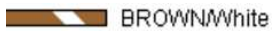
Kenwood TS140, TS440(S), TS450S, TS570, TS590, TS680, TS690, TS850, TS870S, TS940(S), TS950S, TS990, TS2000(X)

The assignation of pins for the transceiver cable (X2 <-> ACC Transceiver):

X2 Pin	*Jumpers on JP1 towards the signals*	*Wire Colour*	*Pin on ACC rear panel view*
			
1	GND	WHITE/Orange	4
2	MIC	ORANGE/White	11
3	GND	WHITE/Green	8
4	PTT	BLUE/White	9
5		WHITE/Blue	
6	SPK	GREEN/White	3
7	COR / SQL	WHITE/Brown	5
8		BROWN/White	

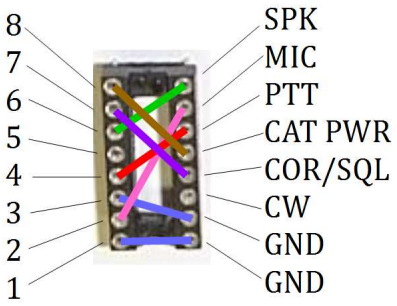
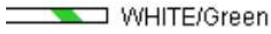
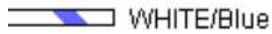
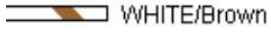
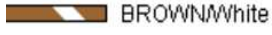
Kenwood R1000

The assignation of pins for the receiver cable (X2 <-> RECORD):

X2 Pin	*Jumpers on JP1 towards the signals*	*Wire Colour*	*Pin on RECORD front panel view*
			 
1			
2			
3	GND		3
4			
5			
6	SPK		1
7			
8			

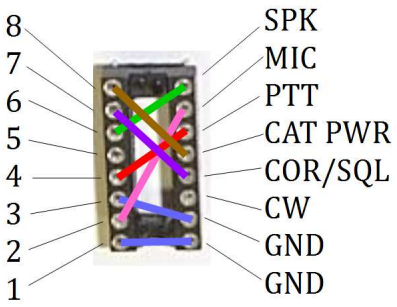
Kenwood TS50S

The assignation of pins for the transceiver cable (X2 <-> MIC Transceiver):

X2 Pin	*Jumpers on JP1 towards the signals*	*Wire Colour*	*Pin on MIC front panel view*
			
1	GND		7
2	MIC		1
3	GND		8
4	PTT		2
5			
6	SPK		6
7			
8	PWR (only necessary for the CAT)		5

Icom IC703, IC706, IC718, IC7000, IC7100, IC7200, IC7300, IC7410, IC9100

The assignation of pins for the transceiver cable (X2 <-> ACC Transceiver):

X2 Pin	*Jumpers on JP1 towards the signals*	*Wire Colour*	*Pin on ACC rear panel view*
			
1	GND	WHITE/Orange	2
2	MIC	ORANGE/White	11
3	GND	WHITE/Green	2
4	PTT	BLUE/White	3 + 7
5		WHITE/Blue	
6	SPK	GREEN/White	12
7	COR / SQL	WHITE/Brown	13
8	PWR (only necessary for the CAT)	BROWN/White	8

CAT / CI-V interface

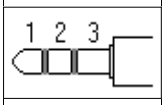
CAT/CI-V connections

The TinyGate has a dedicated serial port for the control of a transceiver with a CAT/CI-V interface. The jack socket X3 allows a direct connection with a ICOM transceiver which support the CI-V, with the help of a simple audio cable with two 3.5mm-Jack plugs (stereo or mono).

The CAT/CI-V interface may be configured in two different modes:

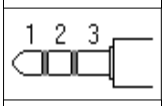
1. CI-V mode
   This mode is used by numerous ICOM transceivers and is essentially a TTL single wire serial port. **The TinyGate board is supplied already configured for the CI-V mode and for the external power supply of the CAT / CI-V Port.**

CI-V: Signals (socket "CAT" X3):

Pin 	*Description*
1	CI-V RXD / TXD
2	
3	GND (Ground of the transceiver)

2. FIF-232, IF-232 mode
   This mode provides two separate signals for RXD and TXD, and is essentially a serial port with TTL levels (0/5V).

FIF-232, IF-232 signals (socket "CAT" X3):

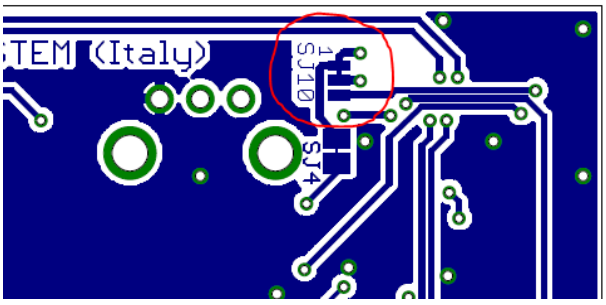
Pin 	*Description*
1	TXD
2	RXD
3	GND (Ground of the transceiver)

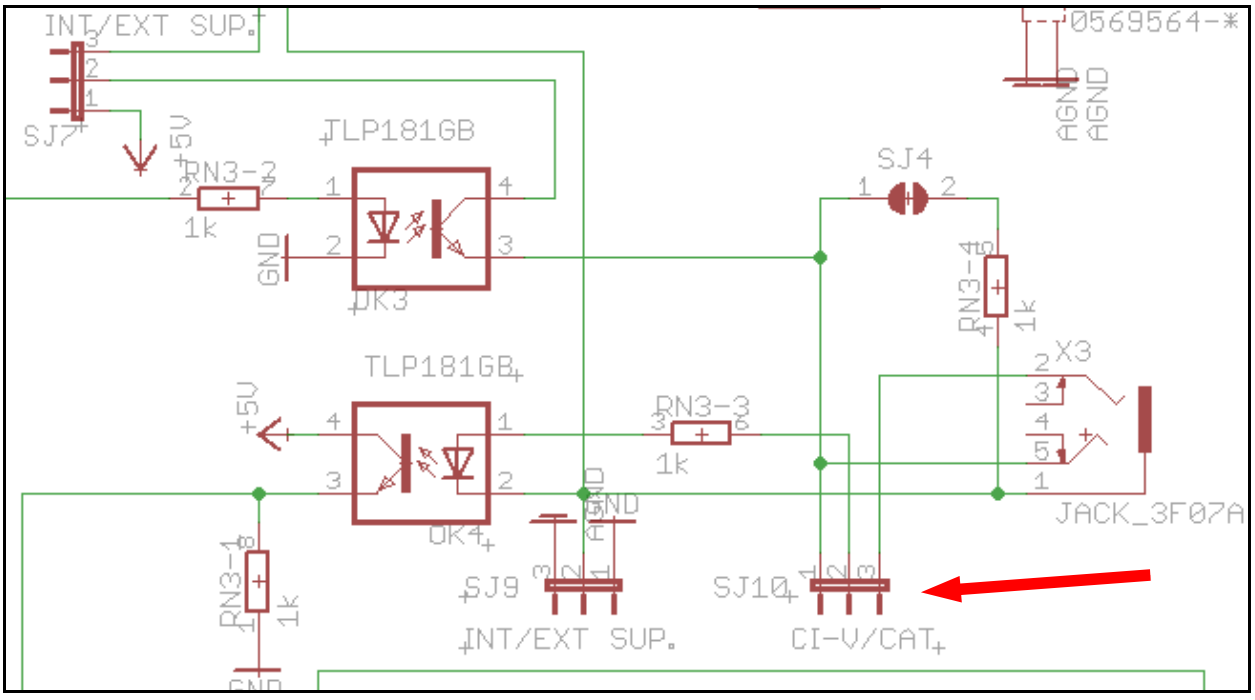
To define the mode FIF232 (IF232), we have to set the SJ10 solder bridge as follows:

CAT / CI-V Mode Jumper setting (SJ10)

Pos. SJ10	*CAT Interface Mode*
1-2	**CI-V (default)**
2-3	FIF232, IF232, Elecraft

All of the solder bridges are on the bottom side of the board to simplify access to these. For the pre-set, subtle copper trace are used, which can be removed and opened with a cutter. In the following image there is an illustration of the position of SJ10 and SJ4:



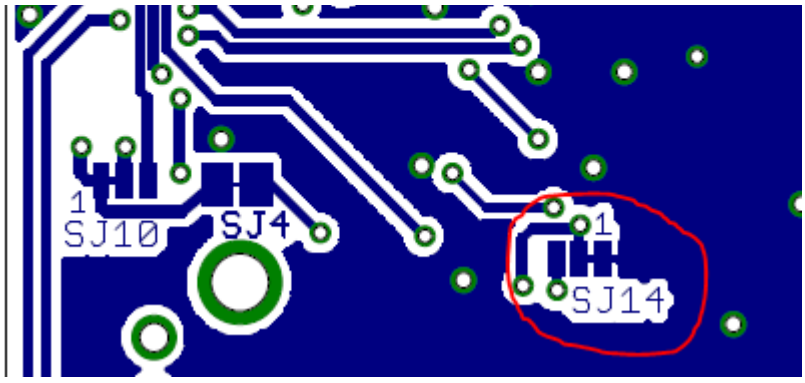


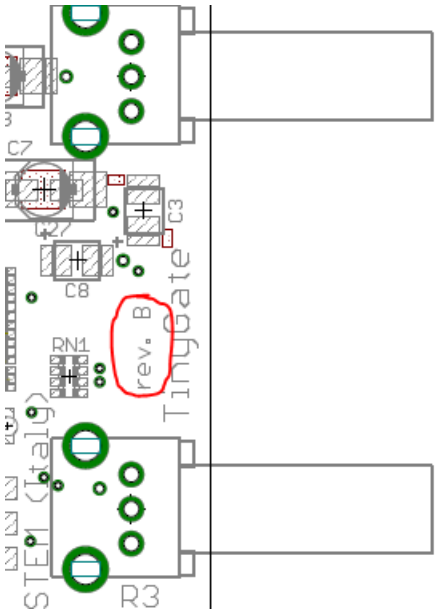
CAT for ELECRAFT-Transceivers

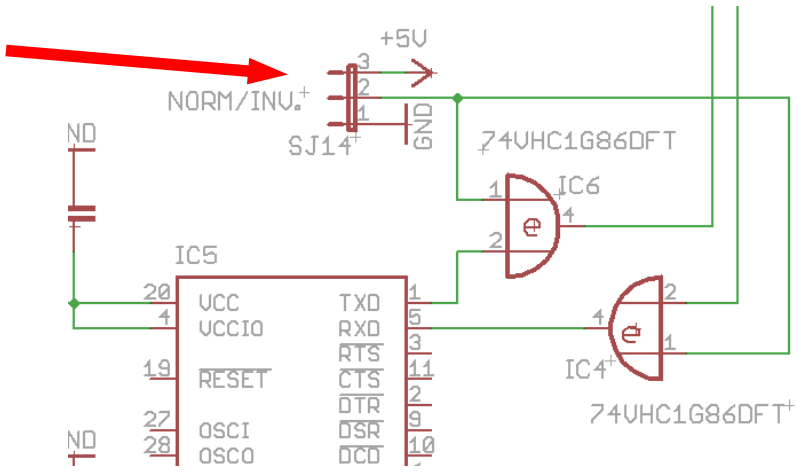
An inverted logic level on the serial data lines is required to connect the CAT-interface to a Elecraft-Transceiver (models K2, K3, KX2, KX3). T**his option is only available since the TinyGate board revision B** and can be set through the SJ14 solder bridge as follows:

Serial Data Line Mode jumper setting (SJ14)

Pos. SJ14	*Inverted logic RXD and TXD*
1-2	**Not inverted (default)**
2-3	Inverted (for Elecraft)







We have also to set the mode FIF232 (IF232), therefore it's necessary to set the SJ10 solder bridge to pos. 2-3 as follows:

CAT / CI-V Mode Jumper setting (SJ10)

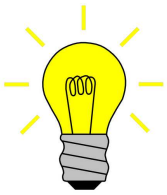
Pos. SJ10	*CAT Interface Mode*
1-2	**CI-V (default)**
2-3	FIF232, IF232, Elecraft

The jack socket X3 allows a direct connection with a ELECRAFT transceiver which support the CAT, with the help of a simple audio cable with two 3.5mm-stereo Jack plugs.

CAT / CI-V power supply

The TinyGate has a very flexible interface, which allows it to be adapted to a wide range of transceivers.

To ensure the galvanic isolation of the CAT / CI-V port, an external power supply is necessary (8-15VDC). This may for example be directly take from the transceiver. See also ***Connection cable to the transceiver***



If an external power supply isn't available directly from the transceiver, so it's possible to use the X1 (CW / FSK) socket to connect an external power supply. One should thus remove-cut the copper trace on SJ1 and add a wire jumper between pin 3 and pin 5 on the socket JP1.

The power supply to the CAT / CI-V port may be chosen as internal (from the USB) or external:

CAT / CI-V Interface Supply mode Jumper setting (SJ7 / SJ9)

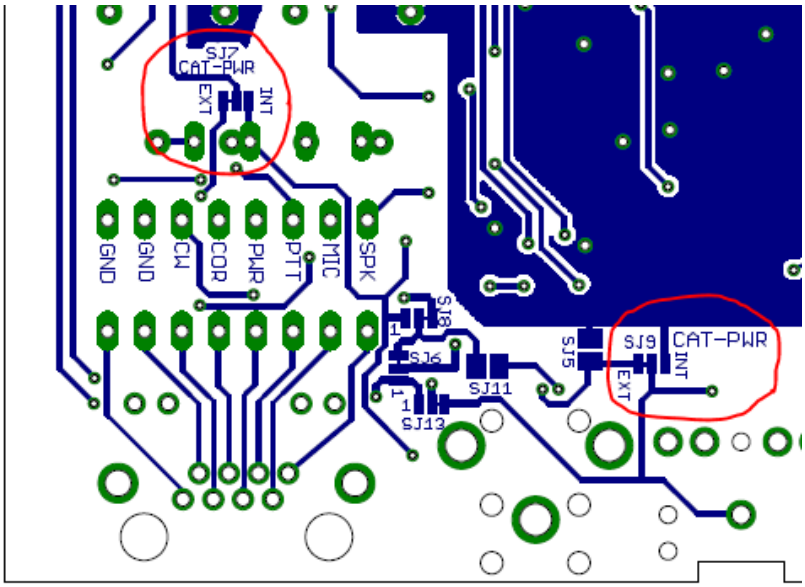
SJ7 Pos.	*SJ9 Pos.*	*CAT Power supply port*
2-3	**2-3**	**External (default)**
1-2	1-2	Internal (USB)

1. External
   The power supply for the CAT/CI-V port comes from the RJ45 X2 socket. This power is reduced inside the TinyGate with a linear voltage regulator (D2, T3) to about 5.1V. **The TinyGate board is pre-configured for the external power supply of the CAT / CI-V Port.**

2. Internal
   The electrical supply to the CAT/CI-V port is internally taken from the USB port of the TinyGate.

CAUTION! Due to a common ground it is not possible to have a galvanic isolation between the TinyGate (the PC) and the CAT port of the transceiver if you use the internal supply!

The CAT/CI-V port and the SQL (COR) input use a common ground (defined with the SJ9 bridge), as a result, they should both be powered from the same supply (internal or external)!

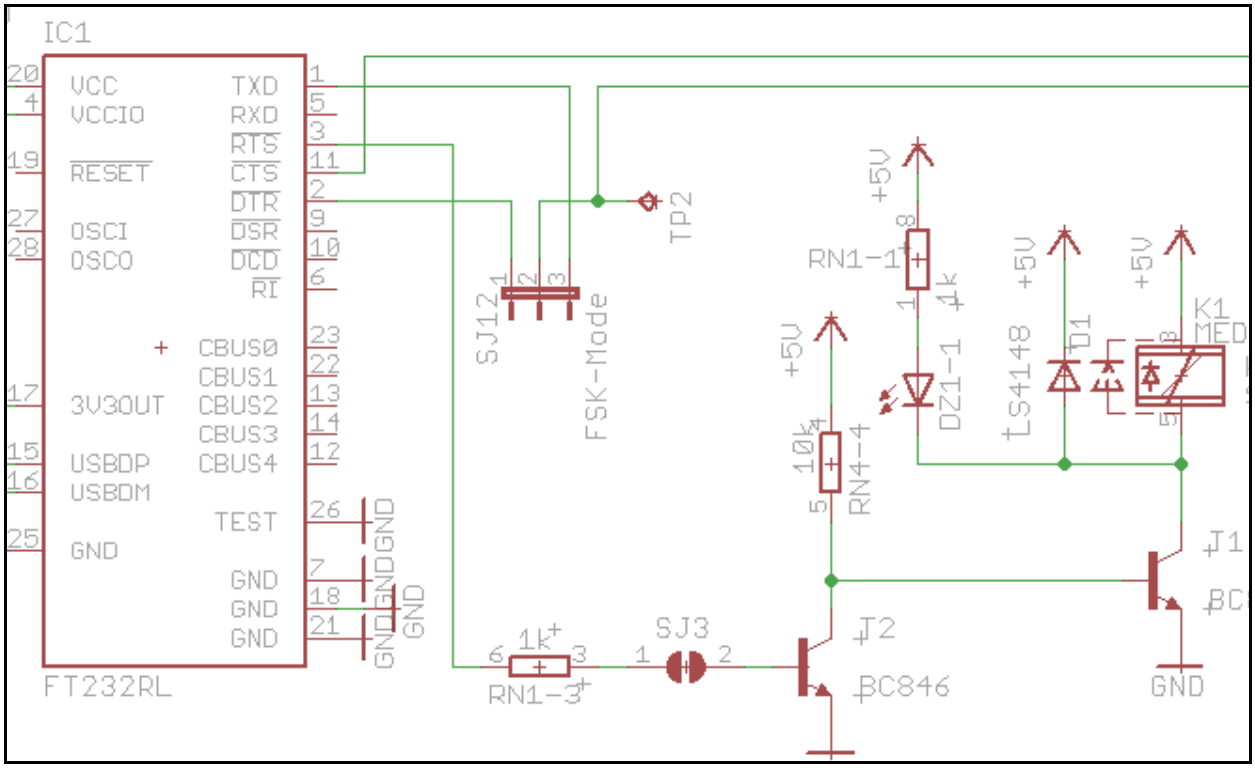


PTT / CW / FSK outputs

PTT:
The PTT output is driven by the RTS control line of the serial port. This output is a normally open switch from the reed relay K1, which closes towards the ground of the transceiver.
In the event that someone wishes for example to add a switch to disable the relay manually, they may do so on the SJ3 solder bridge.

Note: that the red LED "PTT" on the front panel is illuminated when the PTT relay K1 is switched on.

CW / FSK:
The CW / FSK output is driven by the DTR control line or by the TXD data line (defined with SJ12) of the serial Port. It is an output transistor (open collector), which may also be connected to +5 V (internal or external power) with a pull-up resistor of 1.5kOhm through the SJ11.
If this output is driven by the TXD data line of the serial port, it is an FSK application.

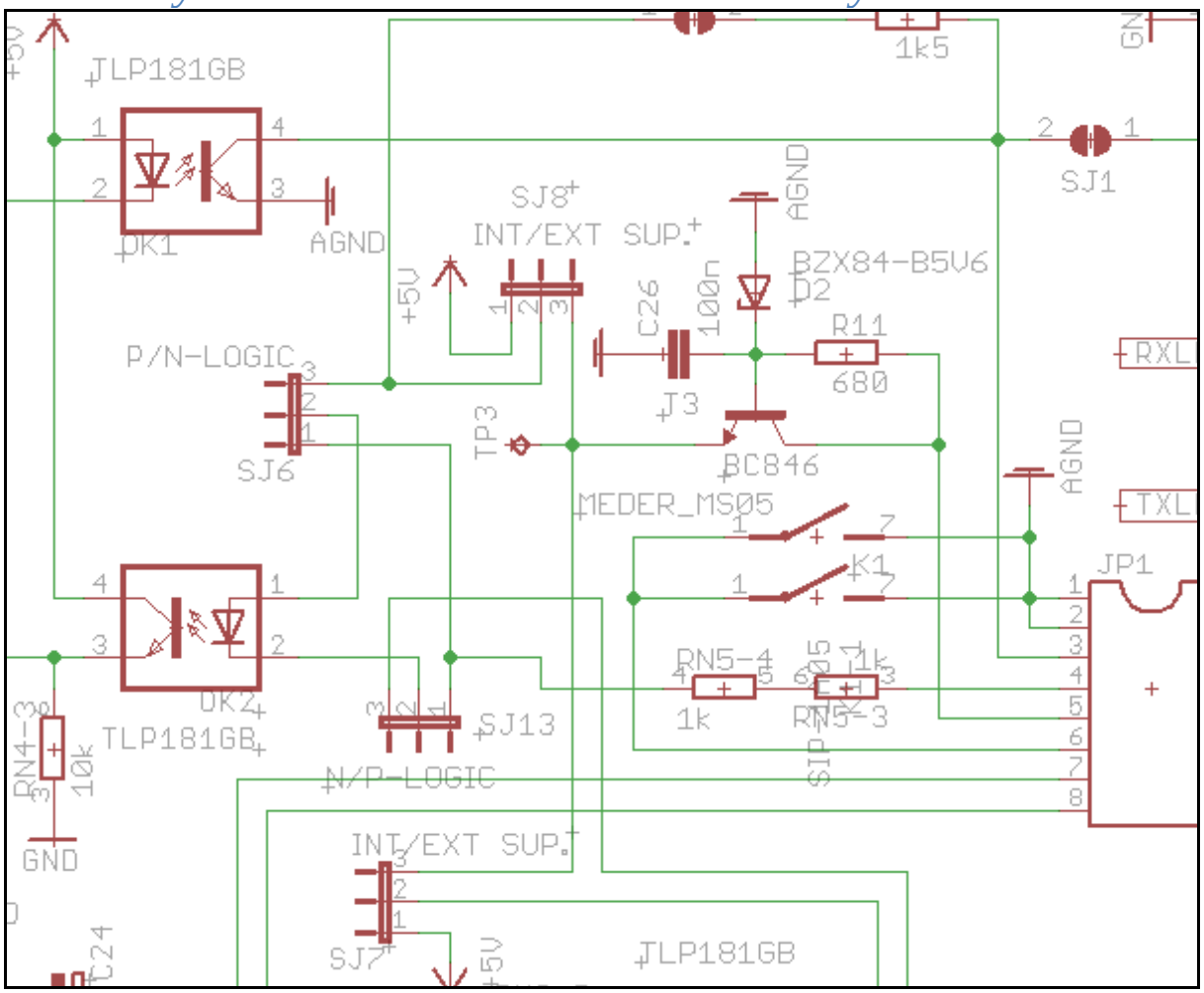


CW / FSK control line setting (SJ12)

Pos. SJ12	*CW / FSK line of control (Mode)*
1-2	**DTR (CW-Mode) (default)**
2-3	TXD (FSK mode)

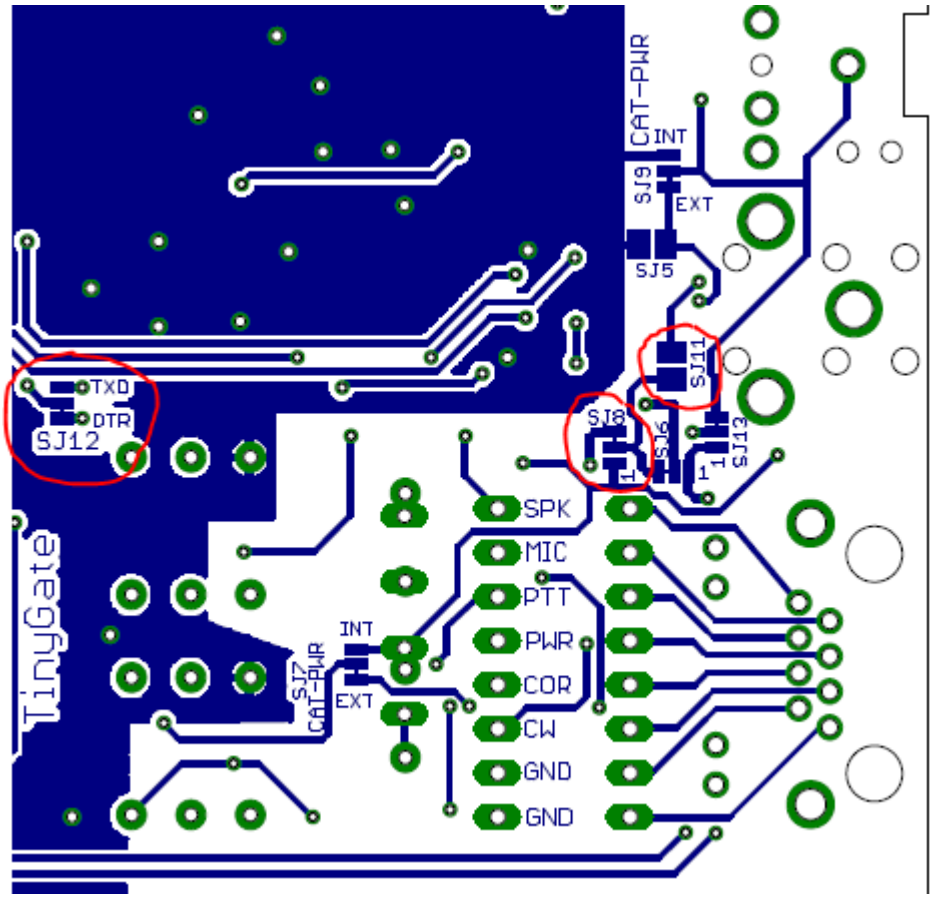
CW / FSK Pull-up resistor (SJ11)

Pos. SJ11	*CW / FSK pull-up resistor (1.5kΩ)*
open	**disabled (by default)**
close	enabled



CW / FSK Pull-up and SQL (COR) negative logic supply source (SJ8)

Pos. SJ8	Supply source for CW/FSK pull-up and negative logic SQL (COR)
1-2	Internal (USB)
2-3	**external (default)**



SQL (COR) Input

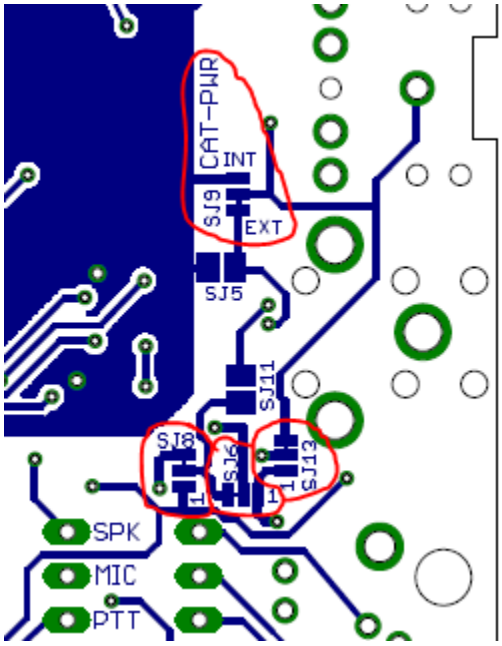
The SQL (COR) input is connected through a optocoupler to the CTS control line of the serial serial port (the same port used by the PTT / CW). The input of this optocoupler is an LED, which may be biased with a 2kΩ resistor with positive or negative logic (defined by SJ6 and SJ13). With SJ8 (see also Pull-Up resistor for the CW / FSK output) you can set the supply source (internal or external) in the case of negative logic. This supply voltage is also about 5.1V.

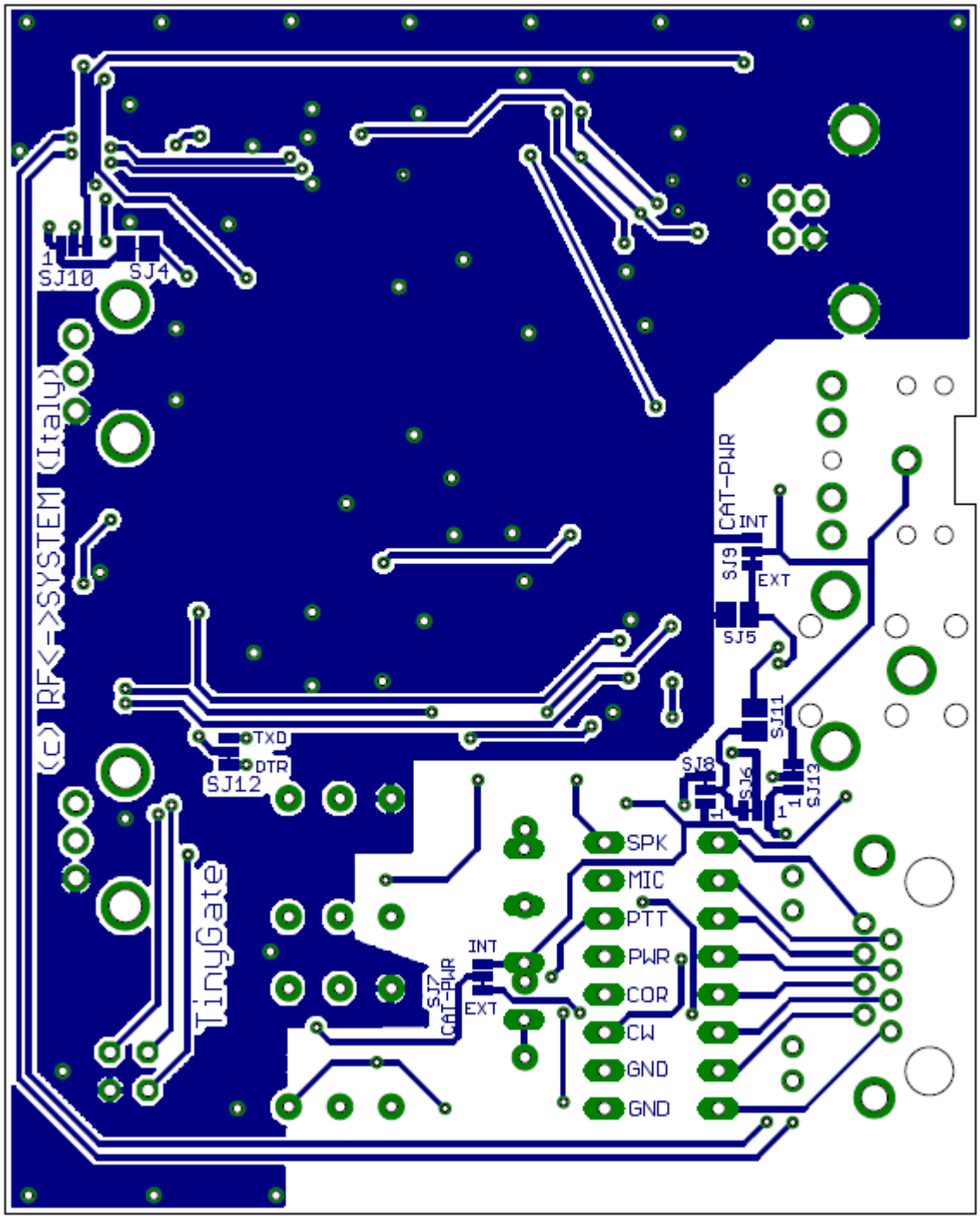
Power supply source for CW / FSK Pull-up resistor and negative logic SQL (COR) input (SJ8)

SJ8 Pos.	*SJ9 Pos.*	CW / FSK pull-up resistor / SQL (COR) negative logic entry
1-2	1-2	Internal (USB)
2-3	**2-3**	**external (default)**

SJ6 Pos.	*SJ13 Pos.*	SQL (COR) entry logic
1-2	**2-3**	**positive (default)**
2-3	1-2	negative

The CAT / CI-V port and the SQL (COR) input use a common ground (defined with the SJ9 bridge) as a result, they should both be supplied from the same supply source (internal or external)! See also *"CAT / CI-V Supply"*




SJ10
SJ4
(c) RF<->SYSTEM (Italy)
CAT-PWR
INT
SJ9
EXT
SJ5
SJ11
SJ8
SJ6
SJ13
TXD
DTR
SJ12
TinyGate
SPK
MIC
PTT
PWR
COR
CW
GND
GND
INT
SJ7
CAT-PWR
EXT

Test – Initial operation

For the first use or test you may simply connect the TinyGate to your PC using the USB cable supplied with the kit. The operating systems should normally recognise TinyGate immediately, however it may occur that MS Windows requires the installation of the driver for the FTDI serial ports on theTinyGate. This driver may simply be downloaded from ***the web page of the manufacturer*** and installed. In the event that someone should have doubts or questions on the installation of the FTDI driver they may find a detailed description for numerous operating systems on the ***site for the installation guide***.

Important note! : The enclosure is connected to the ground of the USB Port and as a result to the ground of the connected PC!

When the TinyGate audio interface is recognised by the operating system, the green LED "PWR " should light up on the front panel:

Note: the green LED "PWR" on the front panel flashes when a software application accesses the TinyGate audio interface. **The "PWR" LED remains off until the operating system starts up and the relative audio drivers are loaded.**

In the following chapters, you will find a brief description with some screenshots about how to verify with Windows XP, Windows7 and Windows 10 whether the TinyGate has been correctly recognised.

Windows XP

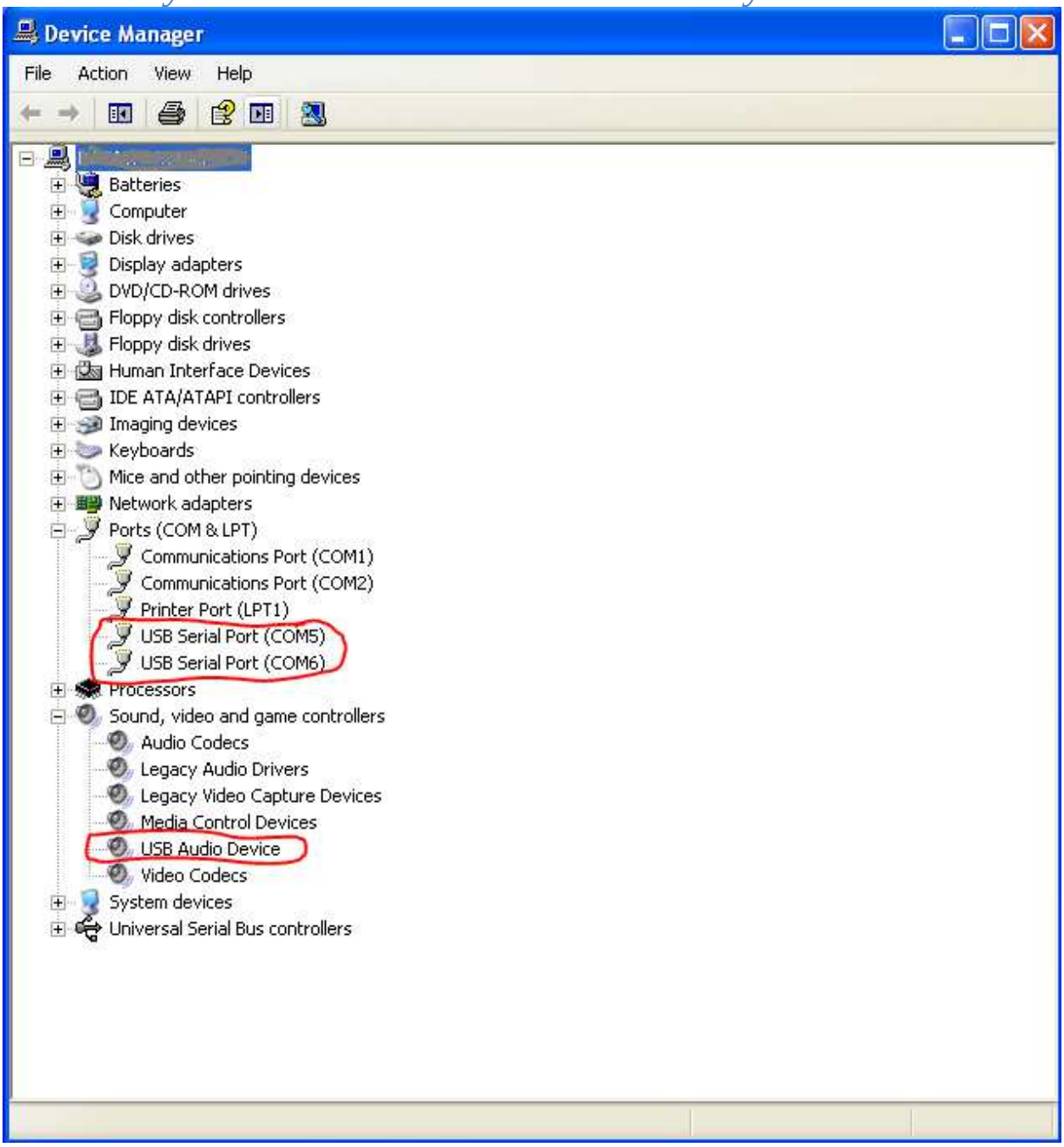
If you connect the TinyGate for the first time, the following messages appear:

Once the operating system has installed the drivers, these messages shall disappear.

Now the device management:
A quick way of opening the device management is by going on

Start ->Control Panel -> System -> Hardware -> Device management

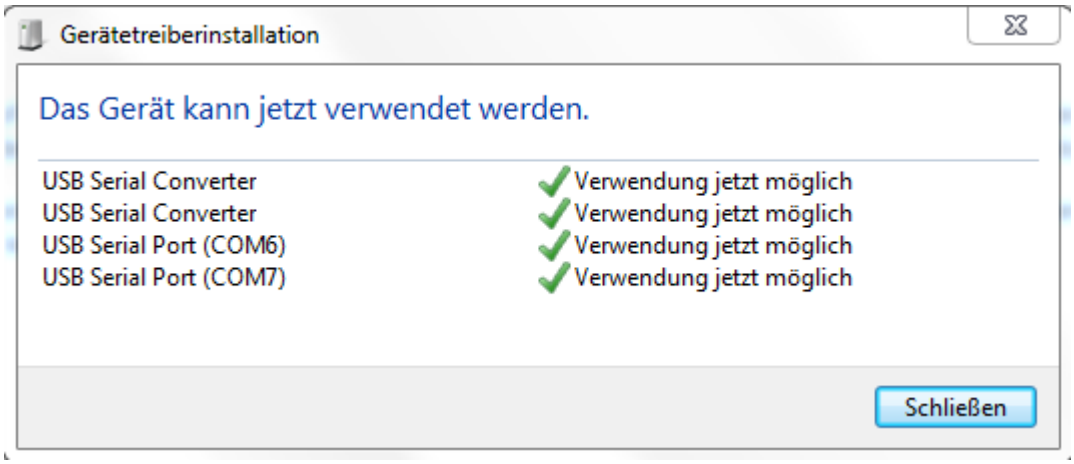
If the TinyGate is correctly recognised and all of the drivers have loaded, then following devices should result in the in the device manager:



It is useful to note that the progressive numbering of the two serial ports (COMx) depends on the PC and operating system, so it is possible that this should differ from PC to PC.

Windows 7

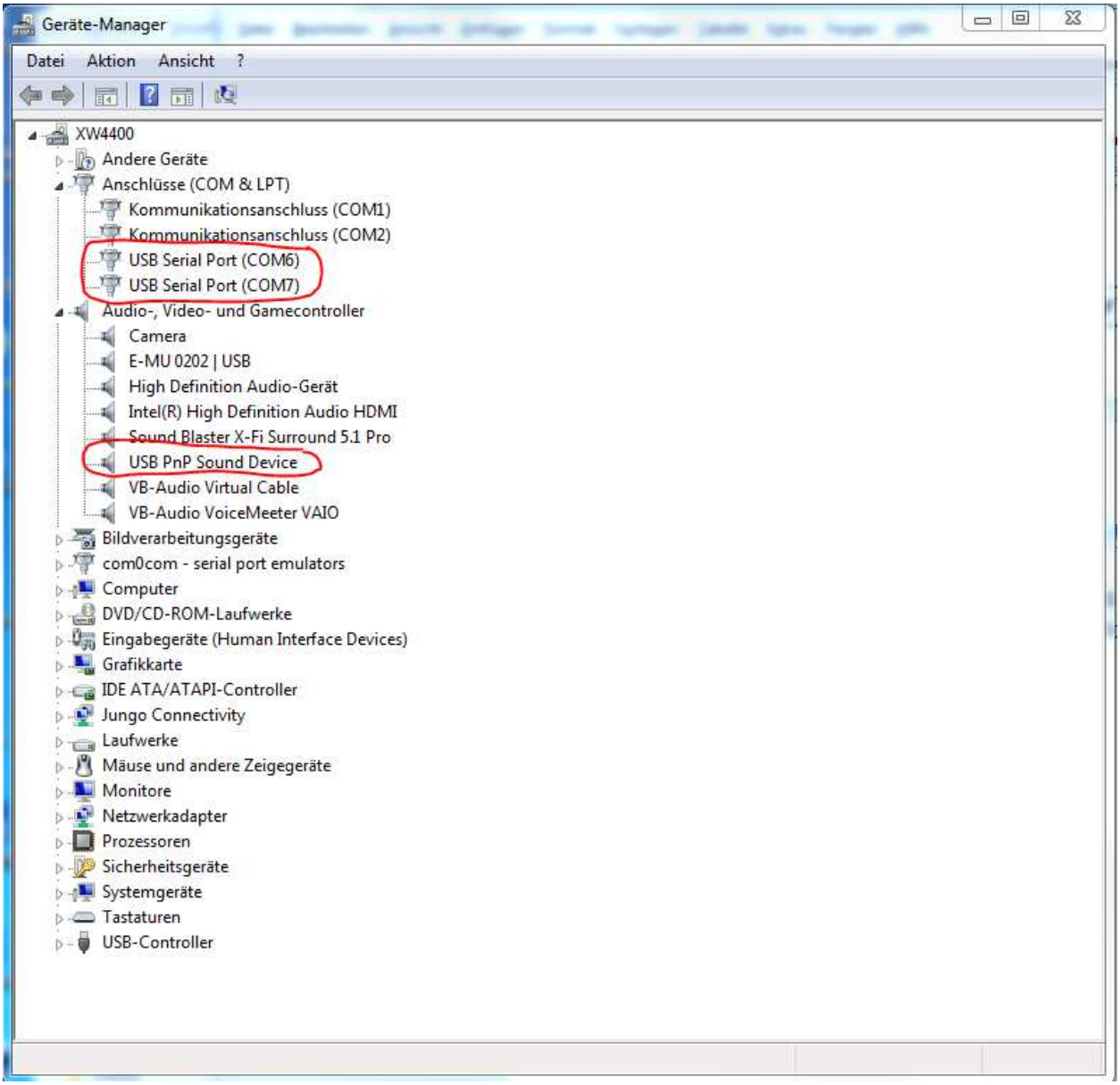
If you connect the TinyGate for the first time, the following messages appear:



Once the installation of the drivers is complete these windows may be closed.

Now the device management:
A fast way of opening the device manager is going on "Start" and inserting the text "Device management" into the search field and clicking on the result "Device management".

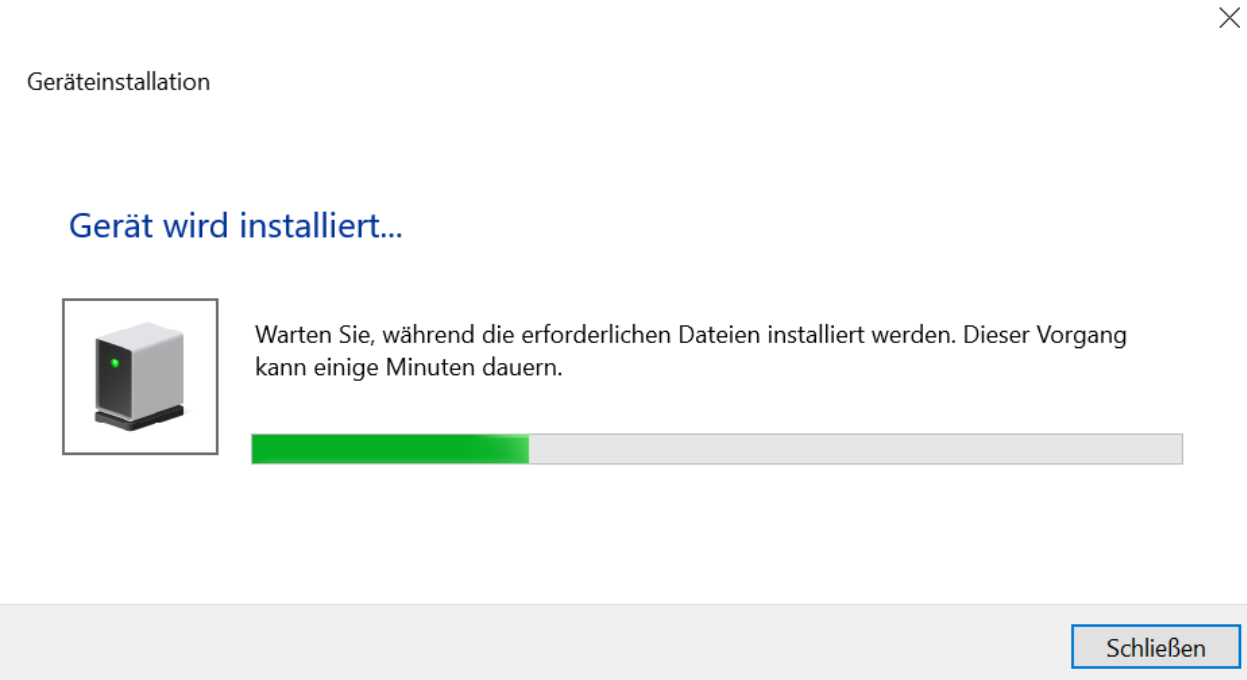
If the TinyGate is correctly recognised and all of the drivers have loaded, then this should result in the following devices in the device manager:



It is useful to note that the progressive numbering of the two serial ports (COMx) depends on the PC and operating system, so it is possible that this should differ from PC to PC.

Windows 10

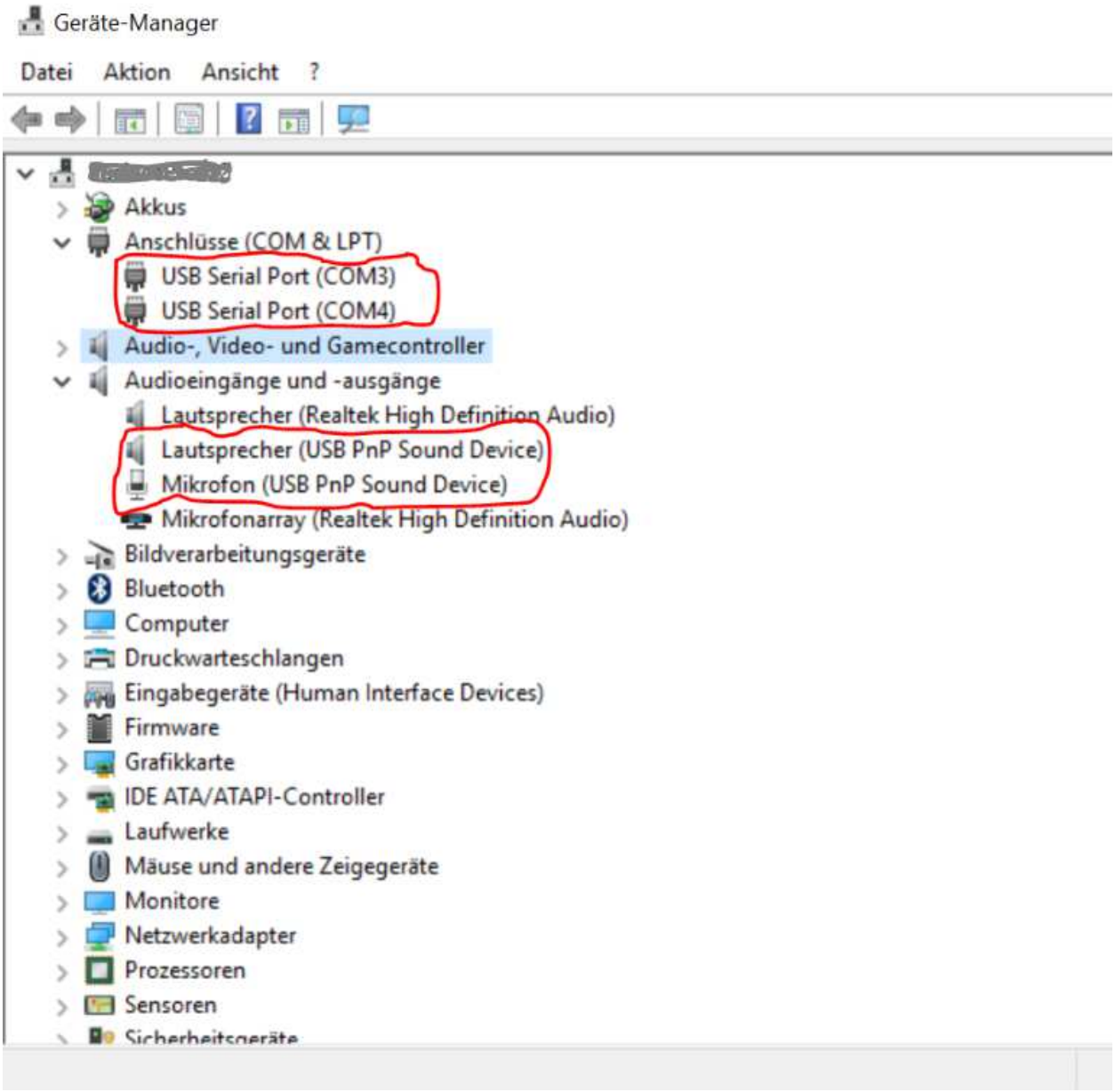
If you connect the TinyGate for the first time, the following messages appear:



Once the installation of the drivers is complete these windows may be closed.

Now the device management:
A fast way of opening the device manager is going on "Start" and inserting the text "Device management" into the search field and clicking the on the result "Device management".

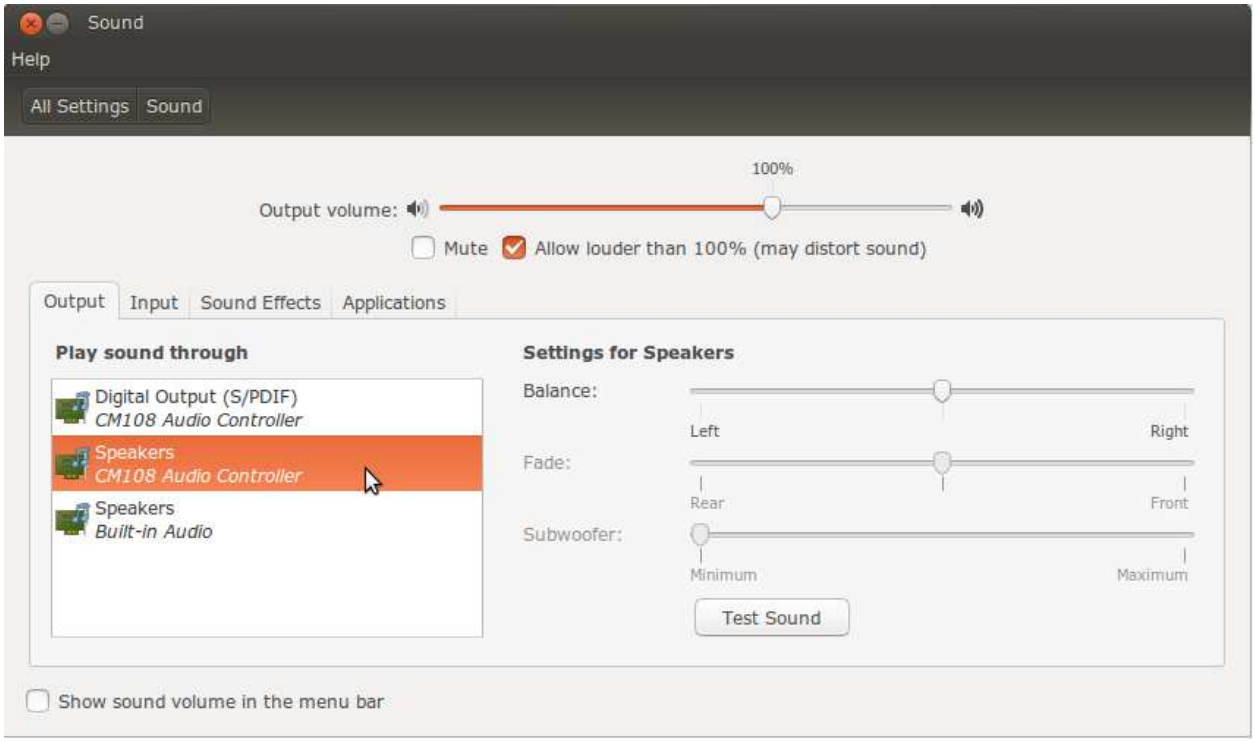
If the TinyGate is correctly recognised and all of the drivers have loaded, then this should result in the following devices in the device manager:

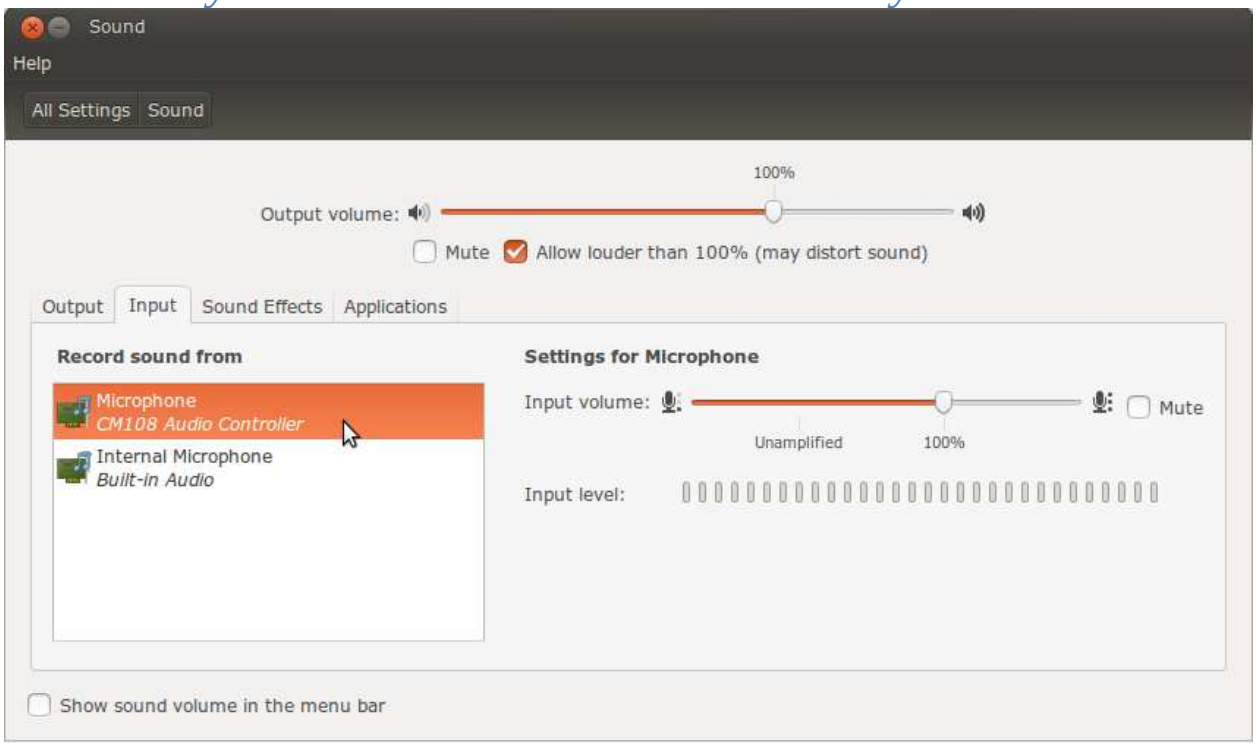


It is useful to note that the progressive numbering of the two serial ports (COMx) depends on the PC and operating system, so it is possible that this should differ from PC to PC.

Linux - Ubuntu

If you connect TinyGate to the PC, you will find the following CM108 audio devices on on the "sound setting panel":





From the line of command it is possible to verify the presence of the TinyGate USB devices using the command "lsusb":

```
Bus 002 Device 060: ID 0403: 6001 Technology Devices Future In-
ternational Ltd FT232 serial (UART) IC
Bus 002 Device 059: ID 0d8c: 013C C-Media Electronics, Inc. CM108
Audio Controller
Bus 002 Device 060: ID 0403: 6001 Technology Devices Future In-
ternational Ltd FT232 serial (UART) IC
Bus 002 Device 057: ID 05e3: 0608 Genesys Logic, Inc. Hub
```

ln this case we see the following TinyGate USB devices :

the fourth is the USB hub
the first and the third are the serial ports
the second is the sound card

To check that the sound card has really been recognised by the system you may use the following command:

```
cat / proc / asound / cards
```

```
0 [HDMI]: HDA-Intel - Intel HDA HDMI
HDA Intel HDMI at 0xf0630000 irq 63
1 [PCH ]: HDA-Intel - HDA Intel PCH
CTRL + S HDA Intel PCH at 0xf0634000 irq 64
2 [Device ]: USB-Audio - USB PnP Sound Device
C-Media Electronics Inc. USB PnP Sound Device at usb-0000: 00:
14,0 à 1,2, full spe
29 [ThinkPadEC]: ThinkPad EC - ThinkPad Console Audio Control
ThinkPad Console Audio Control at EC reg 0x30, fw unknown
```

In this case, we see the device n ° 2 (C-Media Electronics Inc. USB PnP Sound Device) as the sound card of TinyGate.

To verify that the serial ports have really been seen by the system you may use the following command:

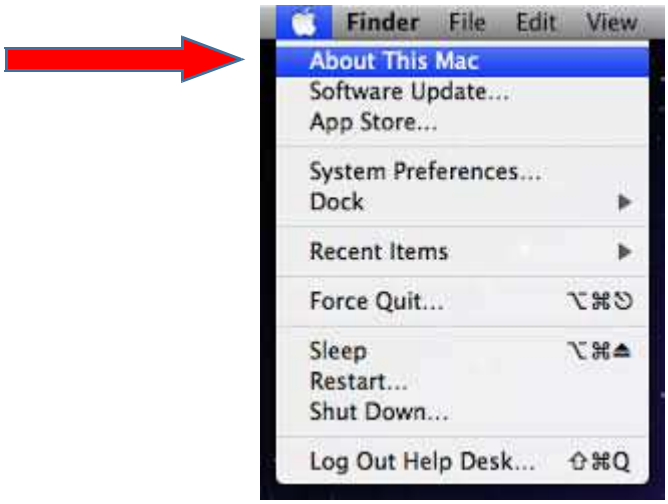
```
ls -alrt /dev/ttyUSB*
```

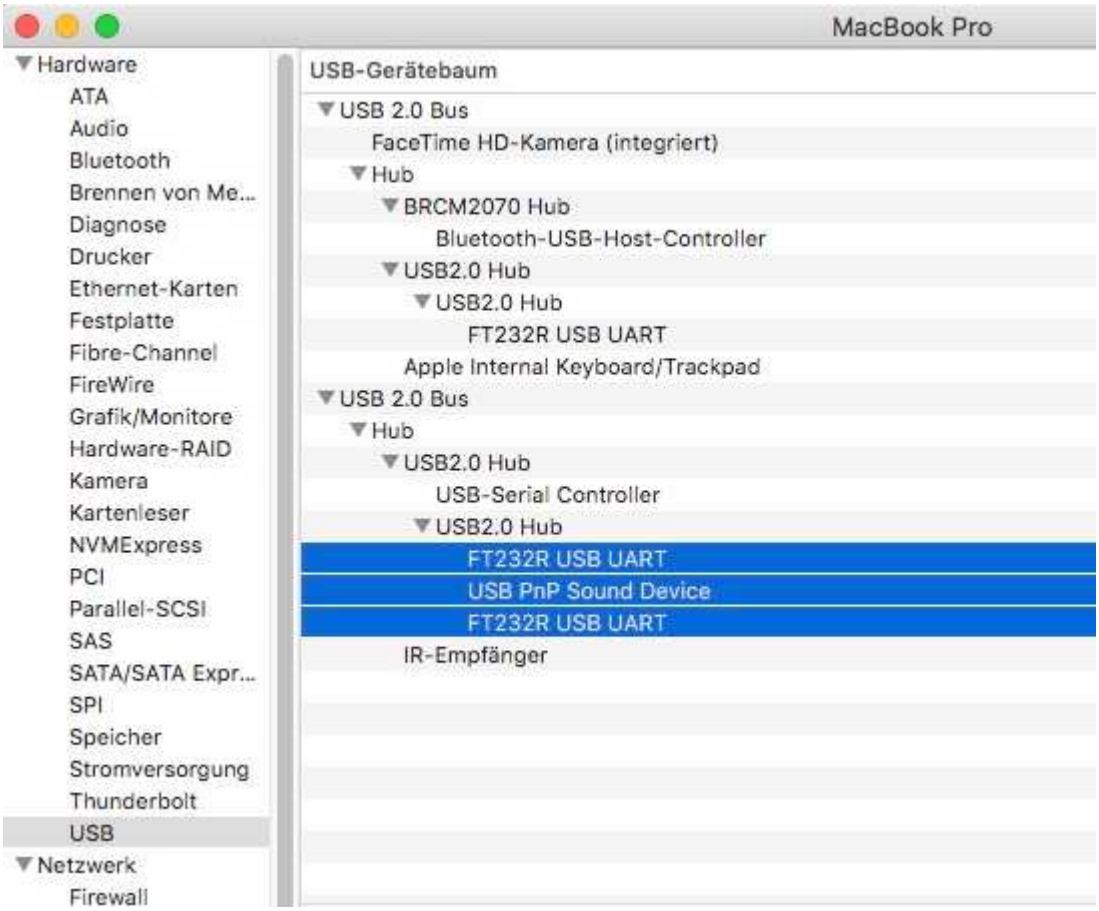
```
crw-rw---- 1 root dialout 188, 0 apr 30 22:07 /dev/ttyUSB0
crw-rw---- 1 root dialout 188, 1 apr 30 22:07 /dev/ttyUSB1
```

Caution! It is useful to note that the progressive numbering of the two serial ports (ttyUSBx) depends on the PC and operating system, so it is possible that this should differ from PC to PC.

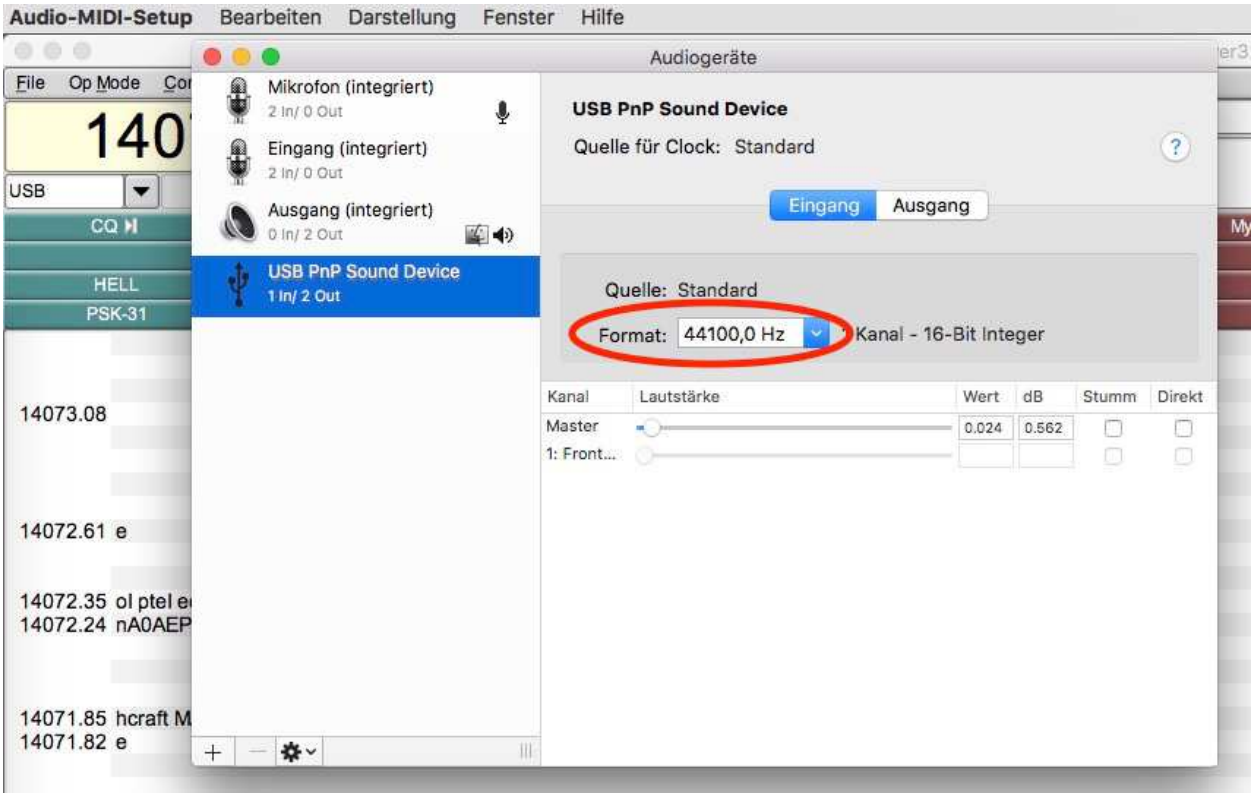
MacOS -X

If the TinyGate is correctly recognised and all of the drivers have loaded, then this should result in the following devices in the System Report:




MacBook Pro
Hardware
ATA
Audio
Bluetooth
Brennen von Me...
Diagnose
Drucker
Ethernet-Karten
Festplatte
Fibre-Channel
FireWire
Grafik/Monitore
Hardware-RAID
Kamera
Kartenleser
NVMExpress
PCI
Parallel-SCSI
SAS
SATA/SATA Expr...
SPI
Speicher
Stromversorgung
Thunderbolt
USB
Netzwerk
Firewall
USB-Gerätebaum
USB 2.0 Bus
FaceTime HD-Kamera (integriert)
Hub
BRCM2070 Hub
Bluetooth-USB-Host-Controller
USB2.0 Hub
USB2.0 Hub
FT232R USB UART
Apple Internal Keyboard/Trackpad
USB 2.0 Bus
Hub
USB2.0 Hub
USB-Serial Controller
USB2.0 Hub
FT232R USB UART
USB PnP Sound Device
FT232R USB UART
IR-Empfänger

Important note! : You have to set the “Format” to 44100Hz for the TinyGate Sound device inside “Audio-MIDI-Setup”. This setting must be repeated one time on each USB port on your MAC. So if you change the USB port, the MAC will remember this setting above.



Examples of configurations for digital modes applications

Fundamentally TinyGate offers three available peripheral USBs:

- 2 serial ports
- 1 audio interface

As described in the previous chapter, the progressive numbering of the two serial ports (COMx) depends on the PC and operating system, so it is possible that this should differ from PC to PC.

Example: Let us suppose that, once the TinyGate is connected to a USB port of the PC, we have the following serial ports available:

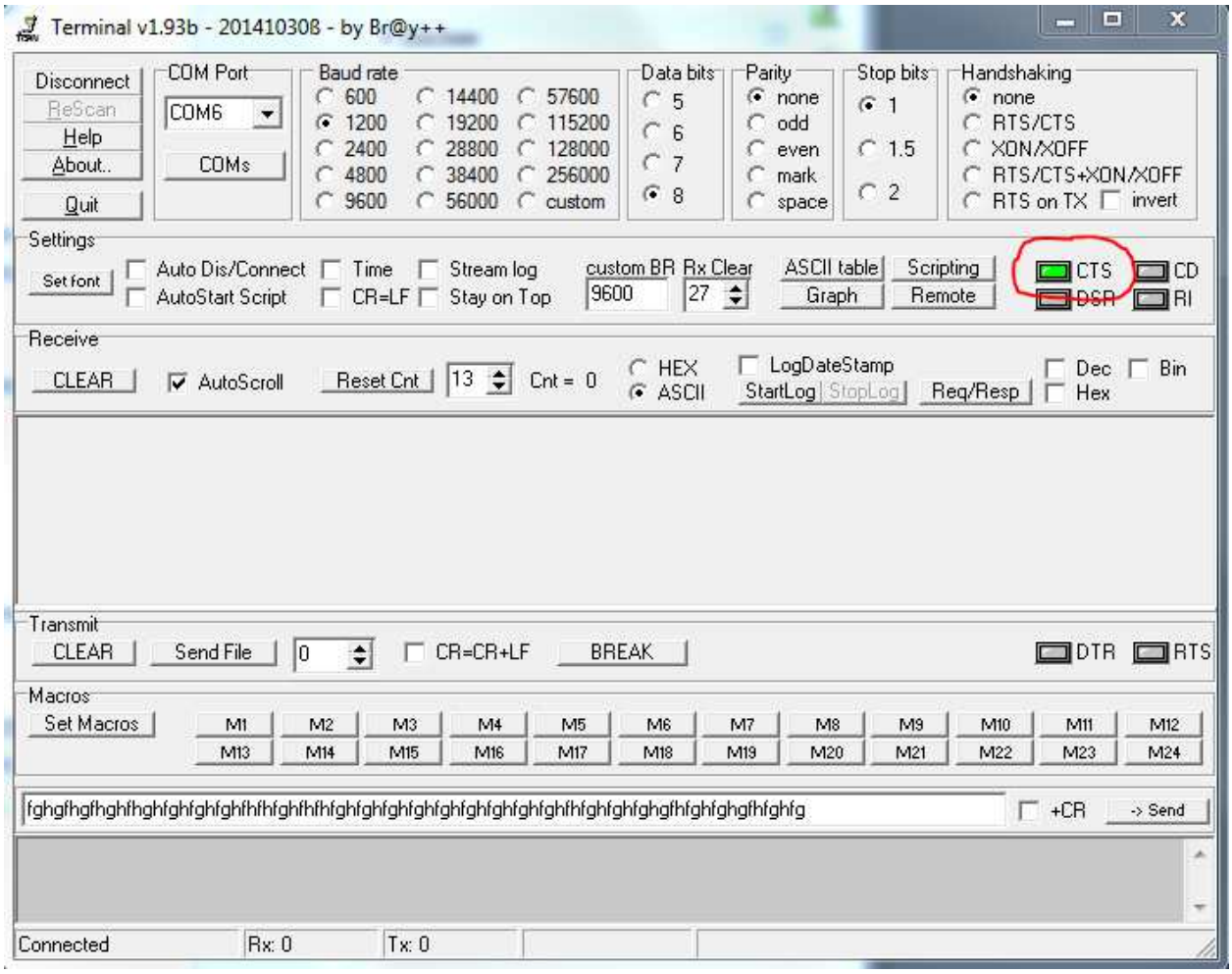
USB Serial Port COM6
USB Serial Port COM7

Now we need to determine which of the two serial ports is for the CAT and which is for the PTT/CW. For this there are the following methods:

1. For those who have experience and familiarity with software applications in digital modes they may simply try which of the two ports is capable of activating the PTT. As a result the other serial port is the one for the CAT.

2. For example a terminal programme is used with the cable disconnected from the transceiver and after having launched it the serial port to be tried is selected and you click on "Connect". In our case, we will turn to and try the COM6.

If after having clicked "Connect" the green light illuminates "CTS" then we have identified the serial port for PTT / CW and SQL. As a result, the serial port COM7 is for the CAT.

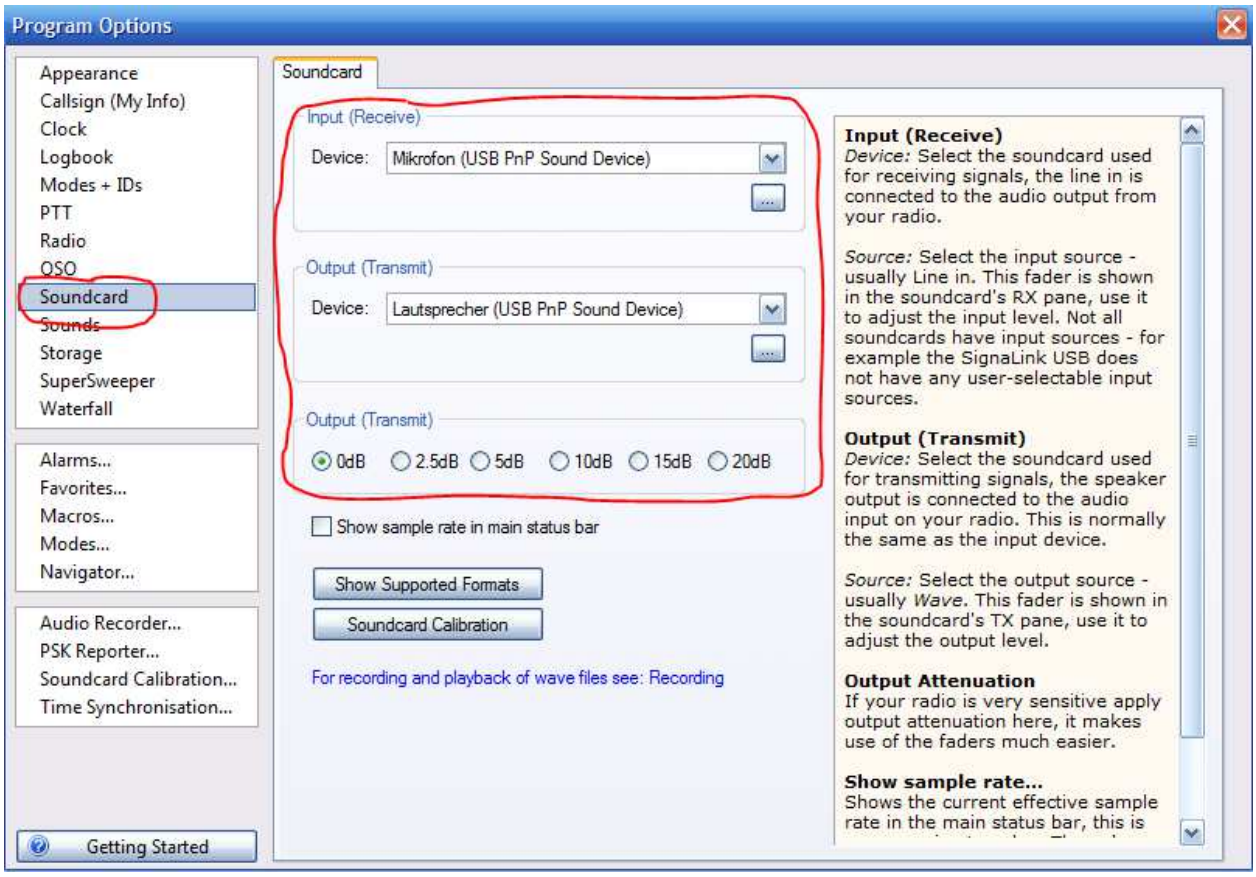


The two LEDs on the "TRANSCEIVER" X2 socket indicate when the CAT/CI-V serial port has transmitted or received data. If, for example, we try to transmit data on the CAT port without having connected any transceiver, we see a brief flashing of the yellow "CAT-TX" LED:

Ham Radio Deluxe V 5.24- Digital Master 780

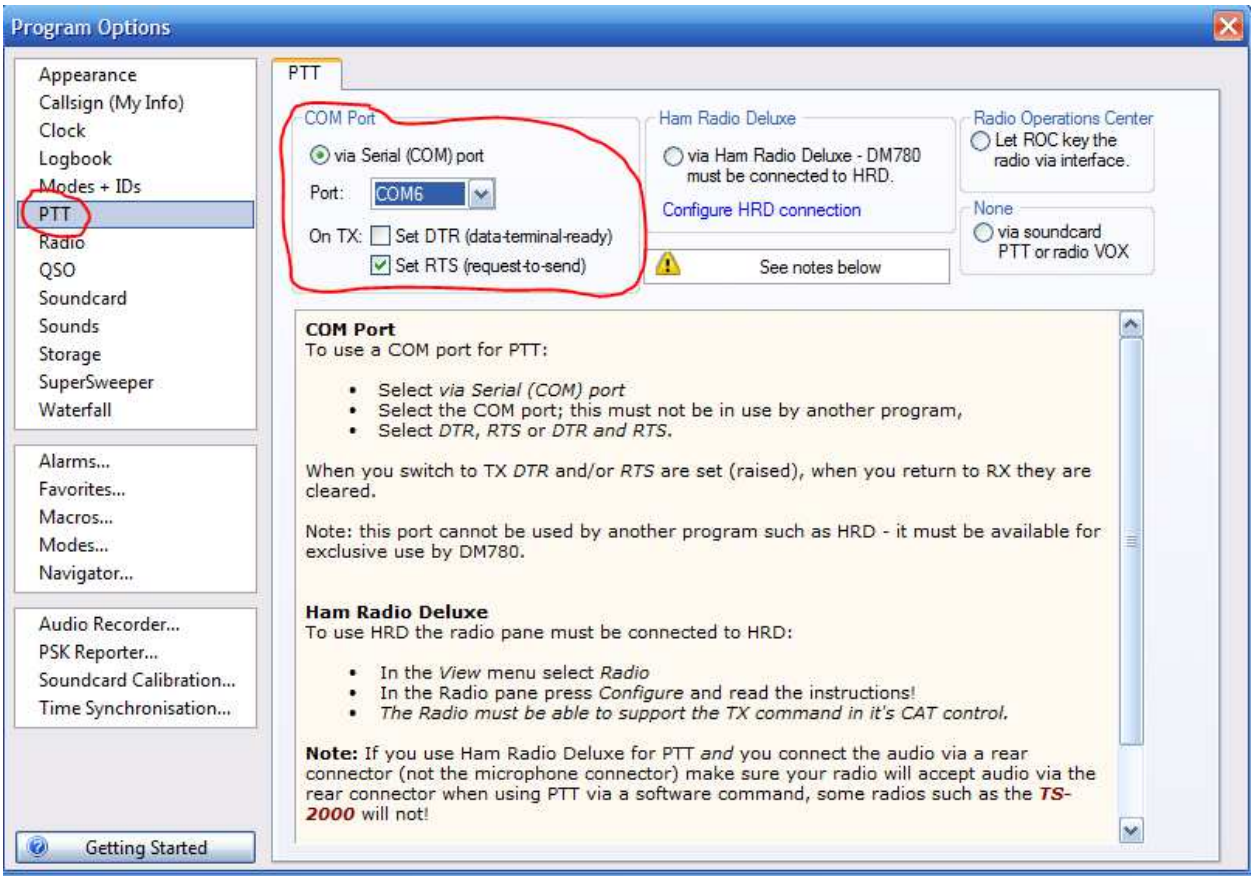
As already explained, the TinyGate may be used with a wide range of software applications for digital modes. Below are illustrated configuration examples for some popular software in amateur radio, focused on the aspects linked to the parameters of the TinyGate hardware.

First of all, the sound card should be configured for use (audio input and output on TinyGate) under the menu "Program Options" -> "Soundcard":



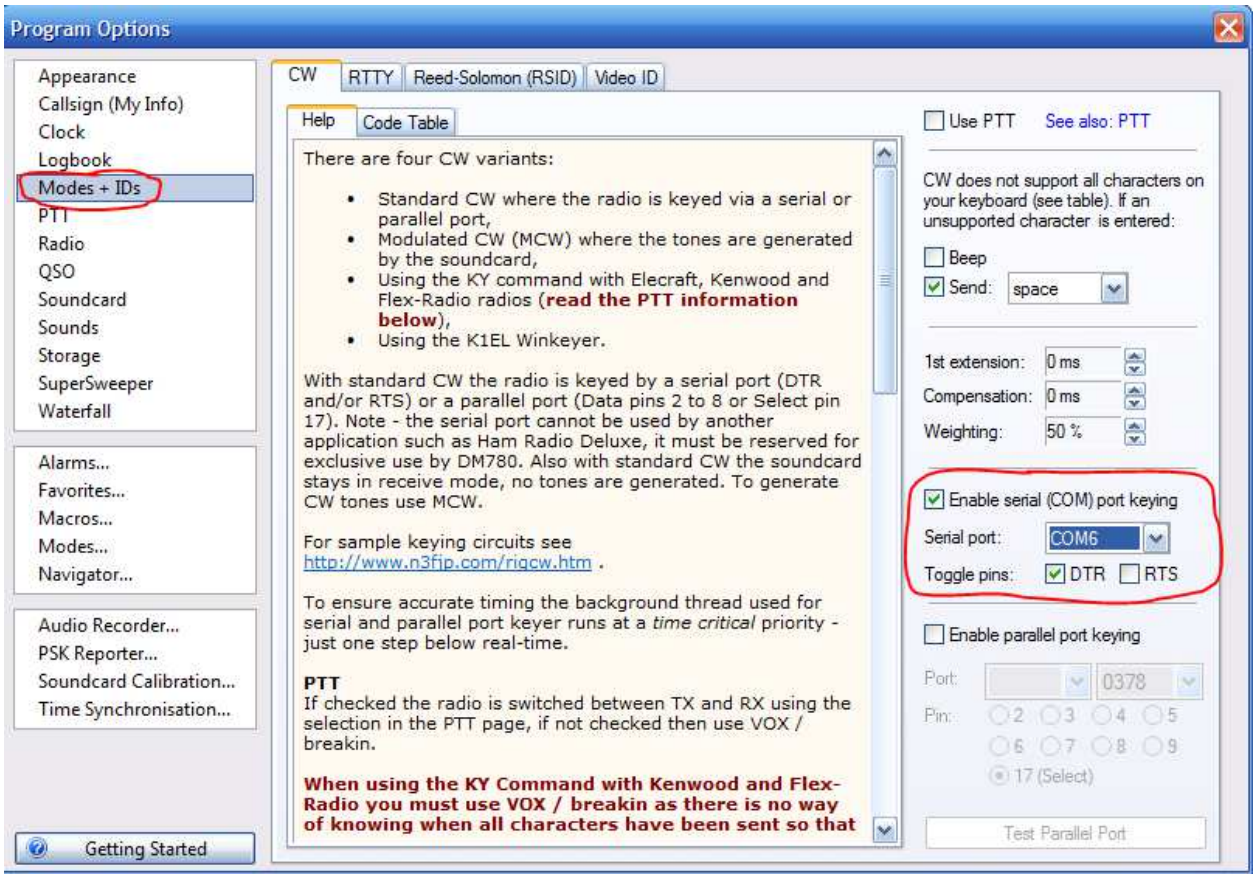
Then, the serial port for the PTT should be chosen in the "PTT" sub-menu:

The relay of the PTT-Relay is controlled by default from the control line "RTS" of the serial port for the PTT / CW. See also „PTT/CW/FSK outputs".

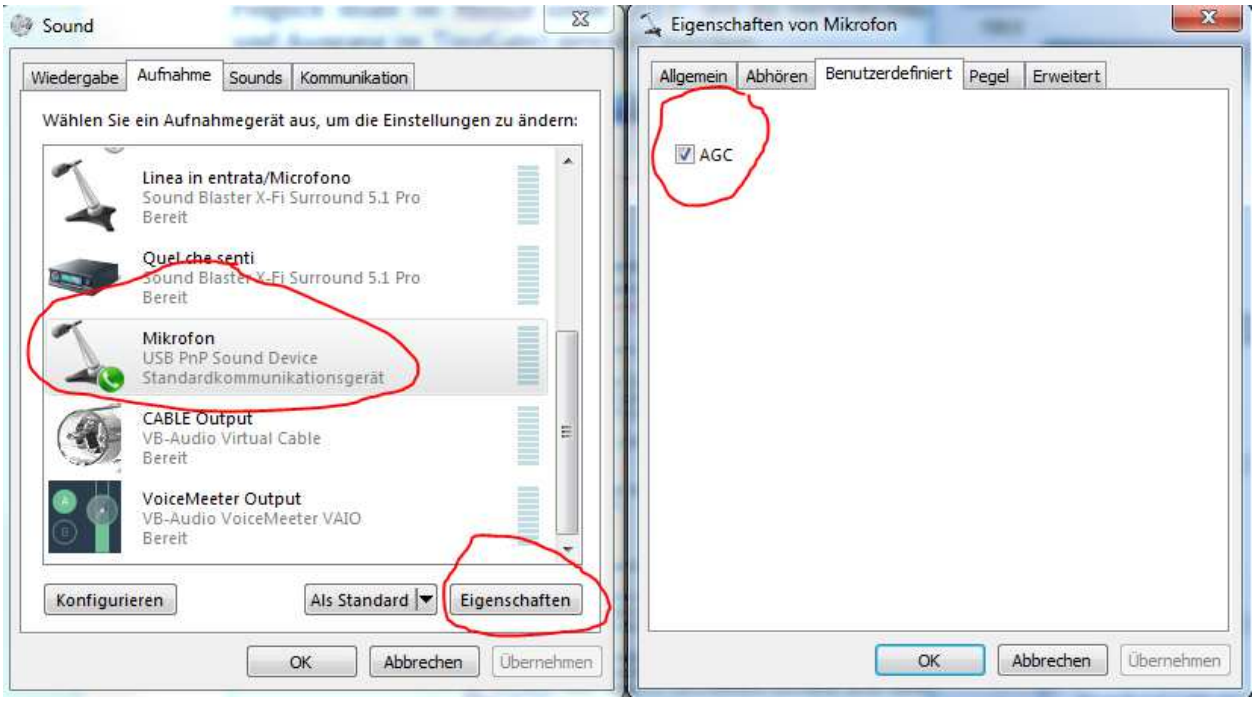


If someone want to work in CW with the Keyer input of the transceiver, they should choose the same serial port used for the PPT in the submenu ”Modes + IDs", but using the "DTR" control line.

The CW output is preset to be controlled by the "DTR" command line of the serial port for the PTT. See also “PTT/CW/ FSK Outputs”.

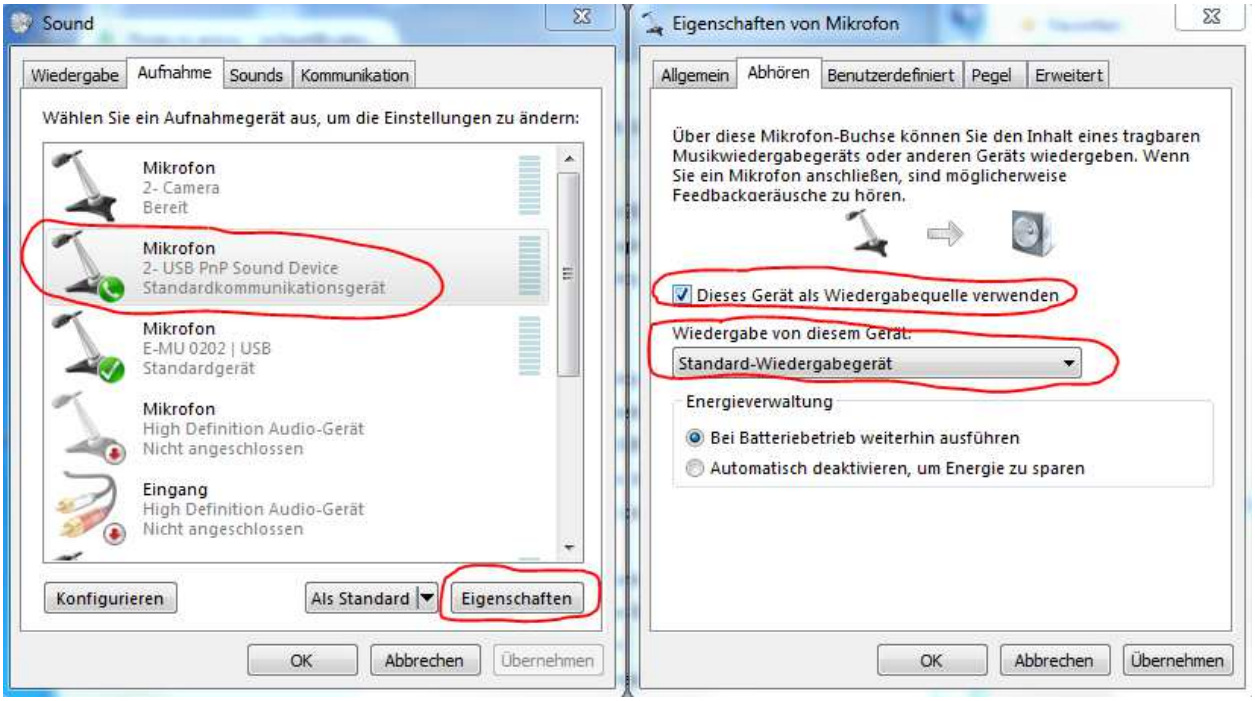


The TinyGate integrated sound card has a preamplifier on the microphone input, that is activated via the software through the audio control panel of the operating system. Unfortunately, the term «AGC» for the preamplifier is not really self-explanatory.....:



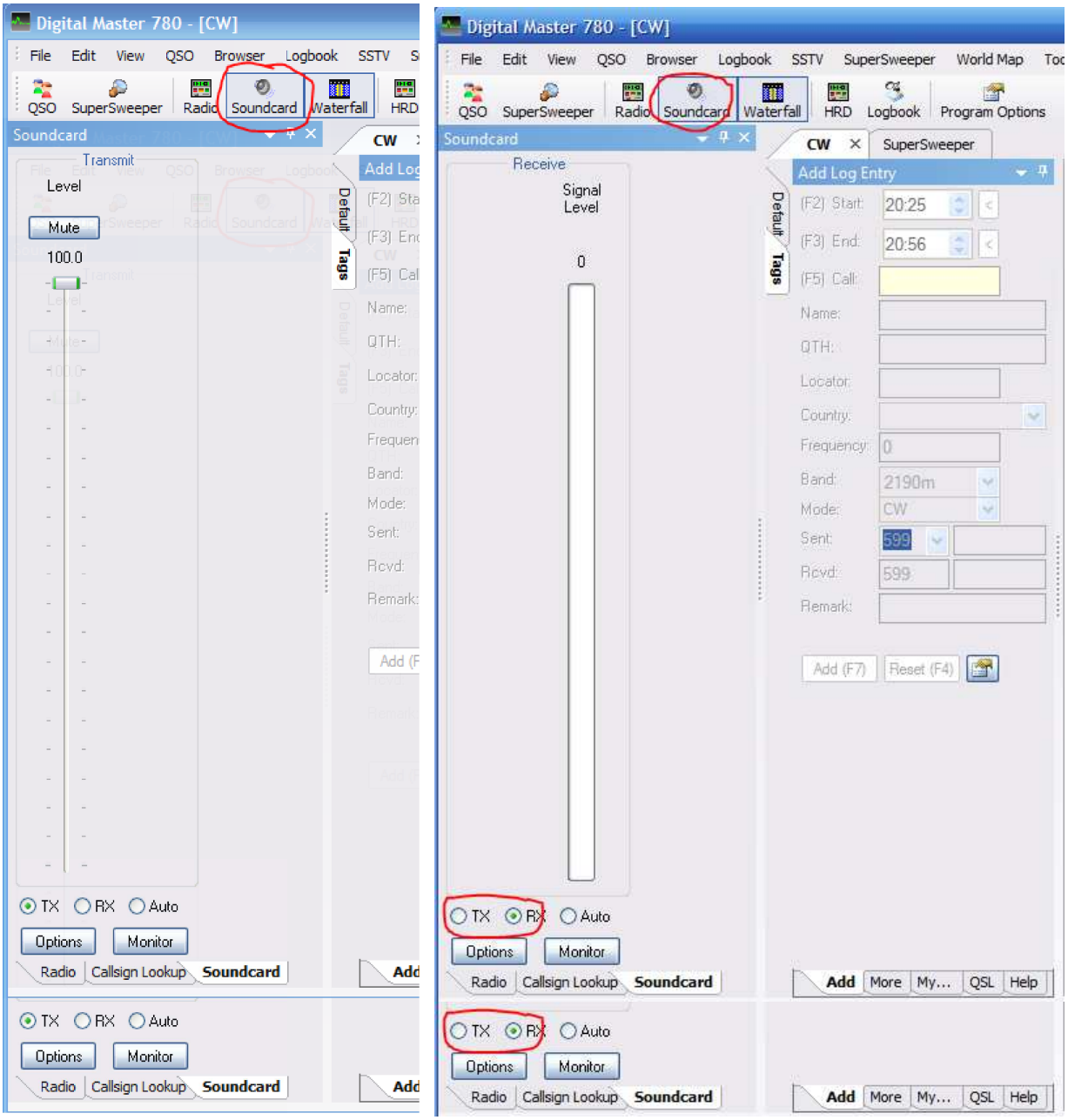
In any case it is advisable to deactivate the preamplifier first and controlling the audio output level of the transceiver. Only if this was not sufficiently high despite the “RX” potentiometer being at maximum, then one may try and activate the preamplifier with “AGC”.

Those who wish to listen the audio signal coming from the transceiver through the speakers of the predefined system or other audio outputs of the PC, may do so by activating the audio input of the TinyGate sound card as a source for playing:



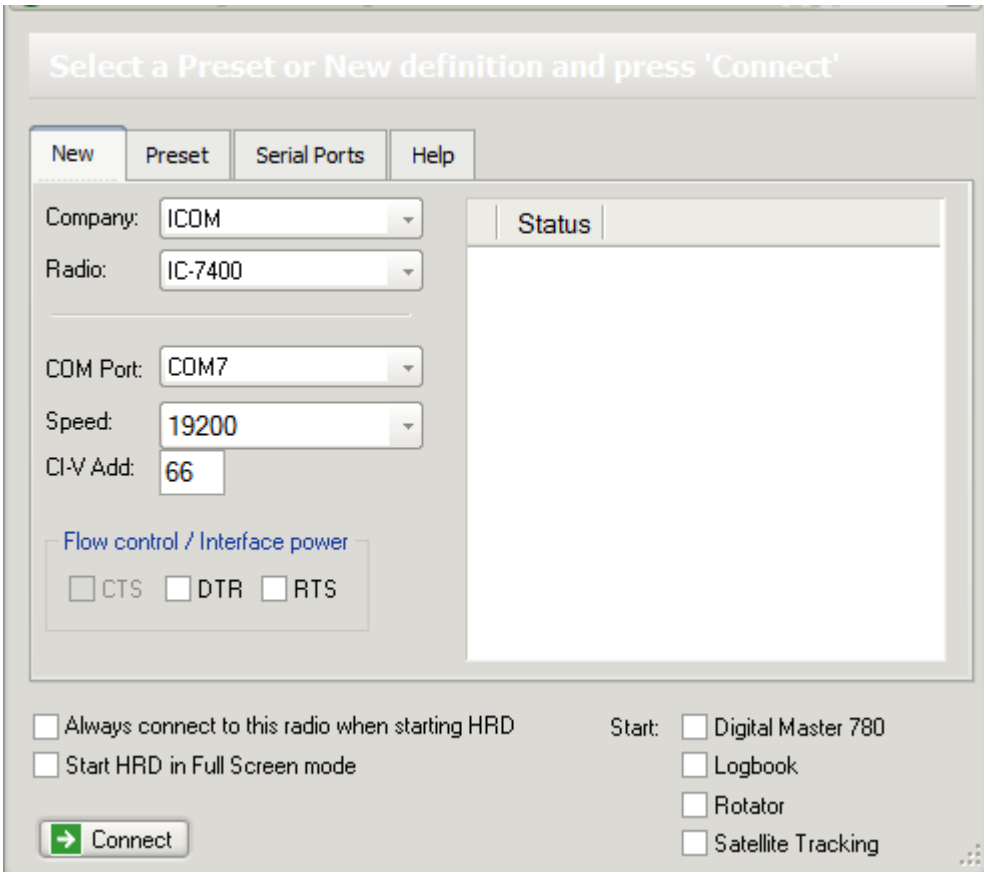
In the "Soundcard" window, selecting "RX" at the bottom, the “Signal Level" vertical bar is displayed, with the actual audio signal level coming from the transceiver. .

Selecting "TX” on the other hand, there is displayed the output sound level regulator of the TinyGate audio interface.



The output level may be regulated here via software, but may also be regulated with the "TX" potentiometer on the front panel. The software is not advised for use at an output level of 100%. On the other hand, it would be more indicated to put it at 50% and carry out the final regulation with the "TX" potentiometer. In any case, it should be noted that these two regulators are placed in series. This signifies for example, if you define the output level in the software as 0%, you will not manage to obtain any signal at the output even if the “TX” potentiometer is set to the maximum, either in a clockwise direction or the opposite.

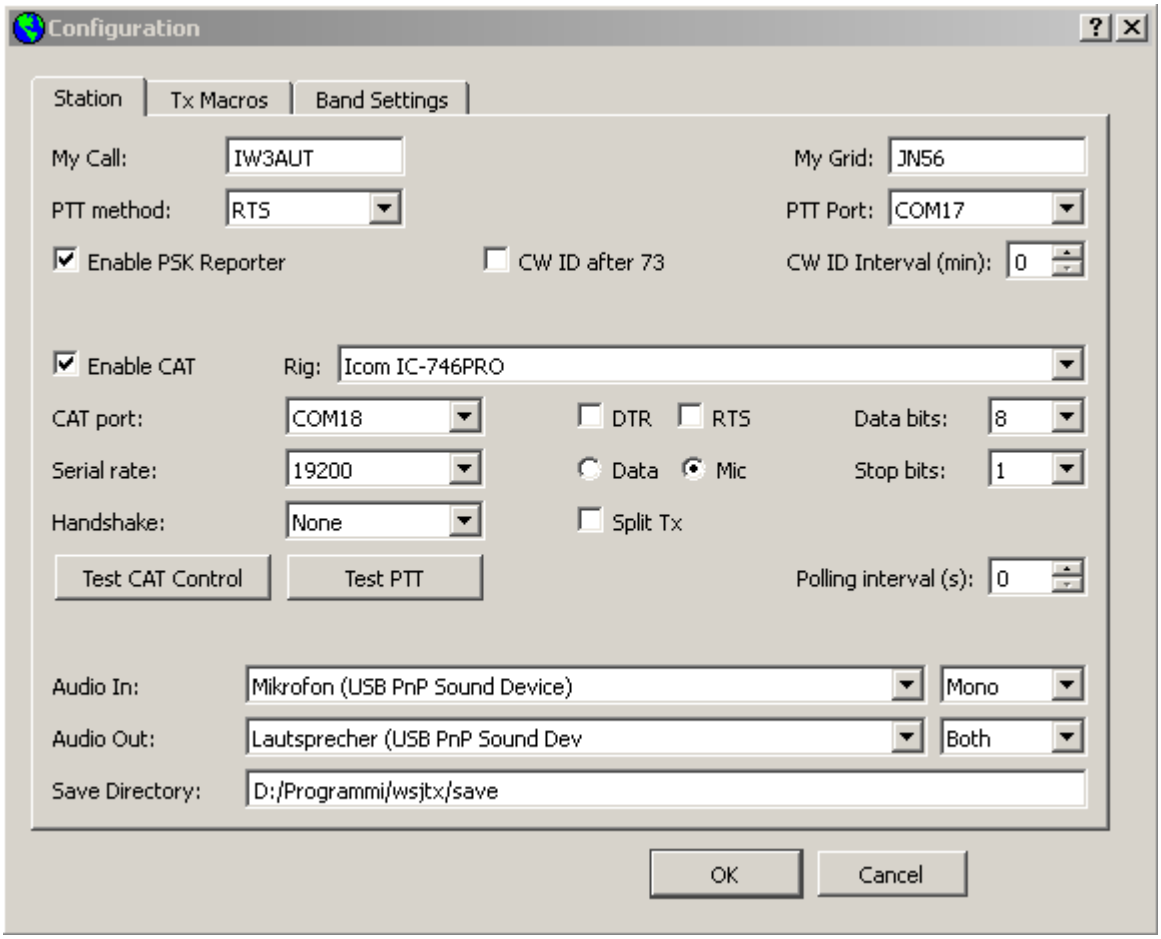
When you start HamRadioDeluxe, you will be asked to select the transceiver model and the relative serial port for the CAT. In the following case, we have the CI-V/CAT-Port serial port of the TinyGate available as COM7:



WSJT-X

Here, we show a few examples of the configuration for WSJT-X, focussing on the aspects linked to the parameters of the TinyGate hardware.

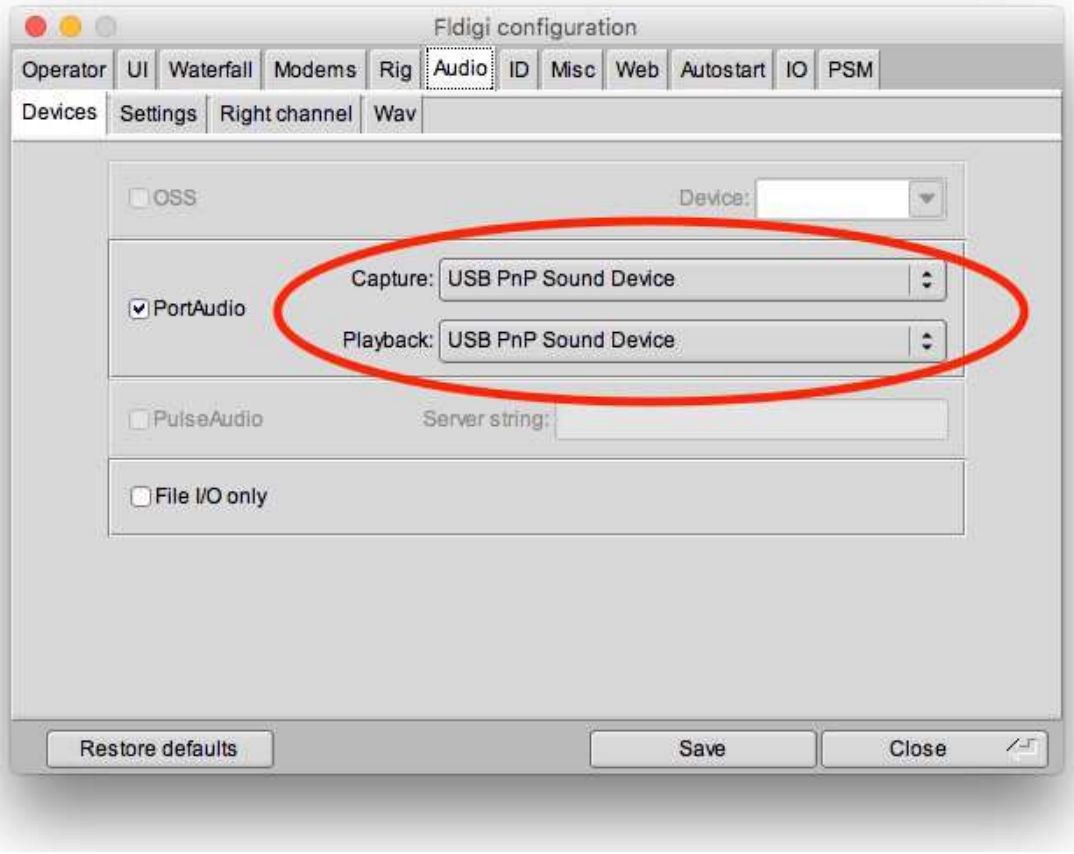
In the "Settings" of the “File”, the audio interface should be chosen (“Audio IN” input and “Audio Out” output of the TinyGate audio interface), as well as the serial port used for the PTT "PTT Port" with the "PTT method" on RTS and the serial port for CAT, "CAT port":

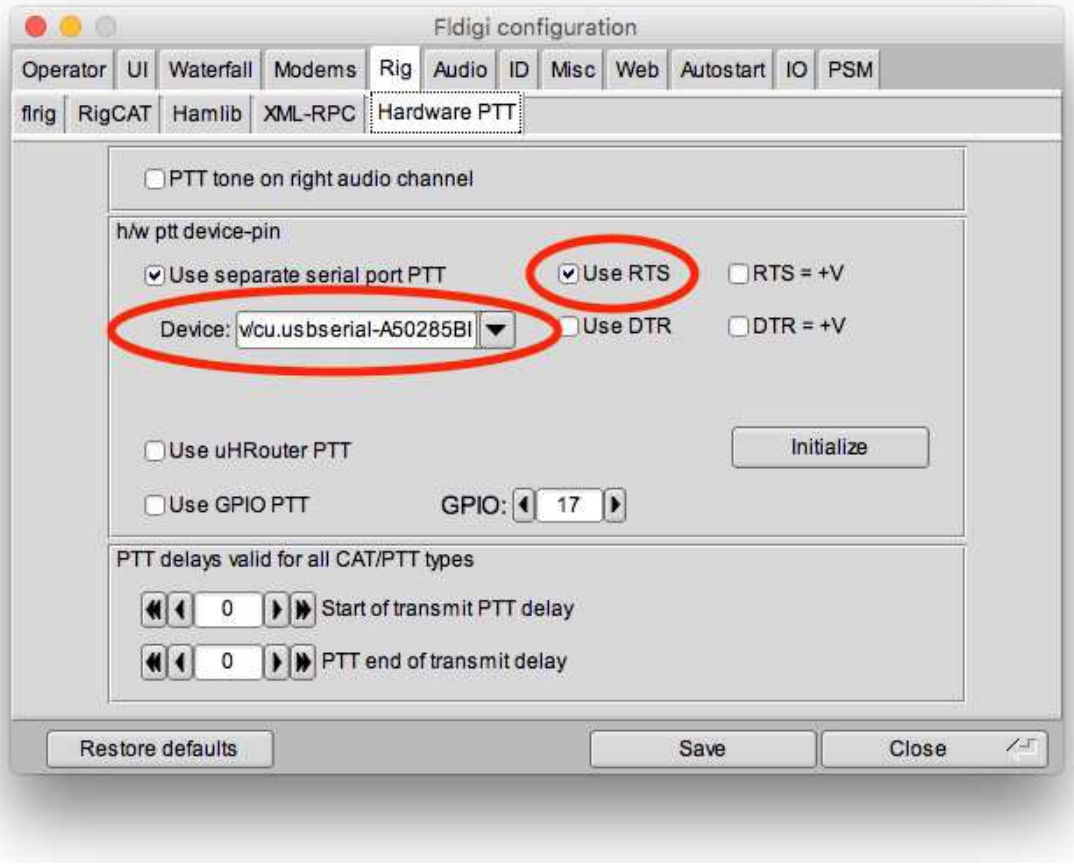


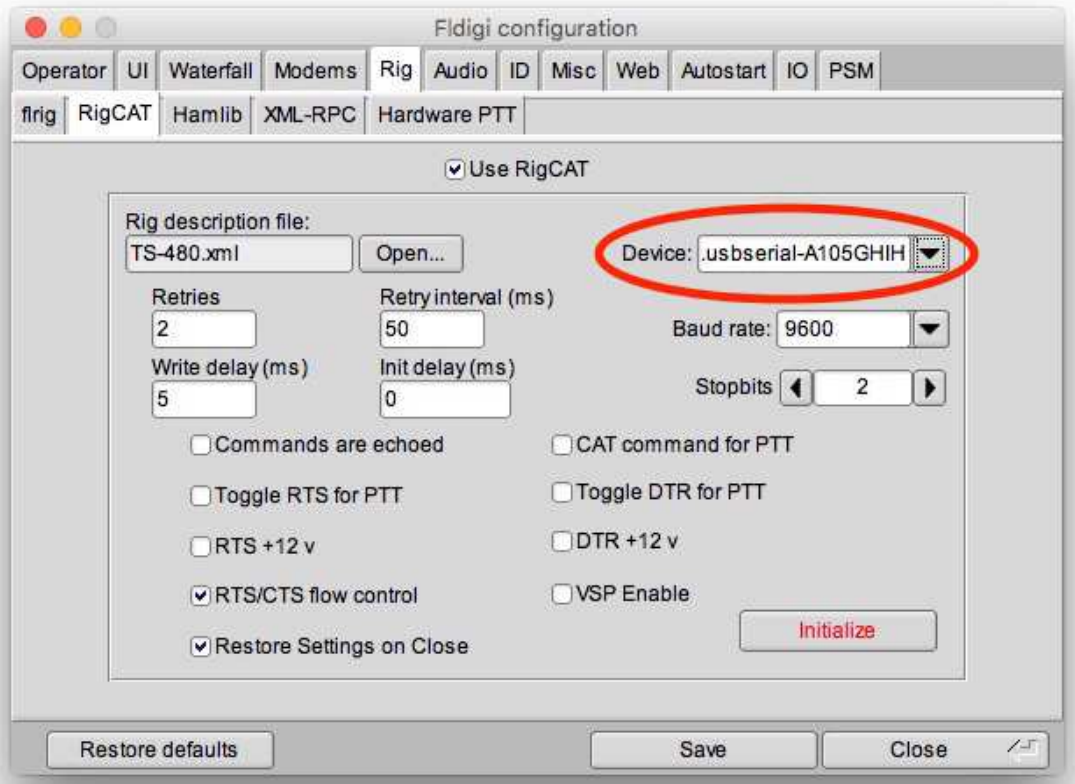
FLDIGI & MacOS

Here, we show a few examples of the configuration for FLDIGI on MacOS, focussing on the aspects linked to the parameters of the TinyGate hardware.

In the "Audio" of the “Devices”, the audio interface should be chosen (“Capture” input and “Playback” output of the TinyGate audio interface), as well as the serial port used for the PTT "RIG – Hardware PTT" with the "Use RTS" and the serial port for CAT, "RIG – RigCAT":




Fldigi configuration
Operator
UI
Waterfall
Modems
Rig
Audio
ID
Misc
Web
Autostart
IO
PSM
flrig
RigCAT
Hamlib
XML-RPC
Hardware PTT
PTT tone on right audio channel
h/w ptt device-pin
Use separate serial port PTT
Use RTS
RTS = +V
Device: v/cu.usbserial-A50285BI
Use DTR
DTR = +V
Use uHRouter PTT
Initialize
Use GPIO PTT
GPIO: 17
PTT delays valid for all CAT/PTT types
0
Start of transmit PTT delay
0
PTT end of transmit delay
Restore defaults
Save
Close


Fldigi configuration
Operator
UI
Waterfall
Modems
Rig
Audio
ID
Misc
Web
Autostart
IO
PSM
flrig
RigCAT
Hamlib
XML-RPC
Hardware PTT
Use RigCAT
Rig description file:
TS-480.xml
Open...
Device:
usbserial-A105GHIH
Retries
2
Retry interval (ms)
50
Baud rate:
9600
Write delay (ms)
5
Init delay (ms)
0
Stopbits
2
Commands are echoed
CAT command for PTT
Toggle RTS for PTT
Toggle DTR for PTT
RTS +12 v
DTR +12 v
RTS/CTS flow control
VSP Enable
Restore Settings on Close
Initialize
Restore defaults
Save
Close