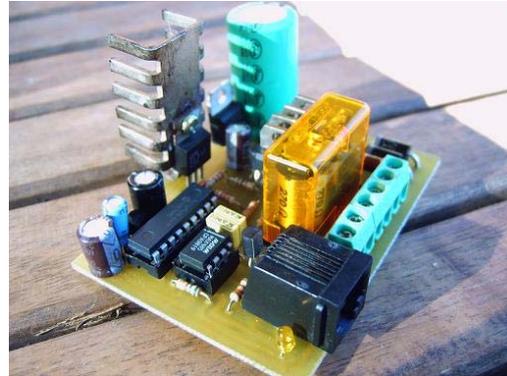


NanoX v.2

1.- Introduction

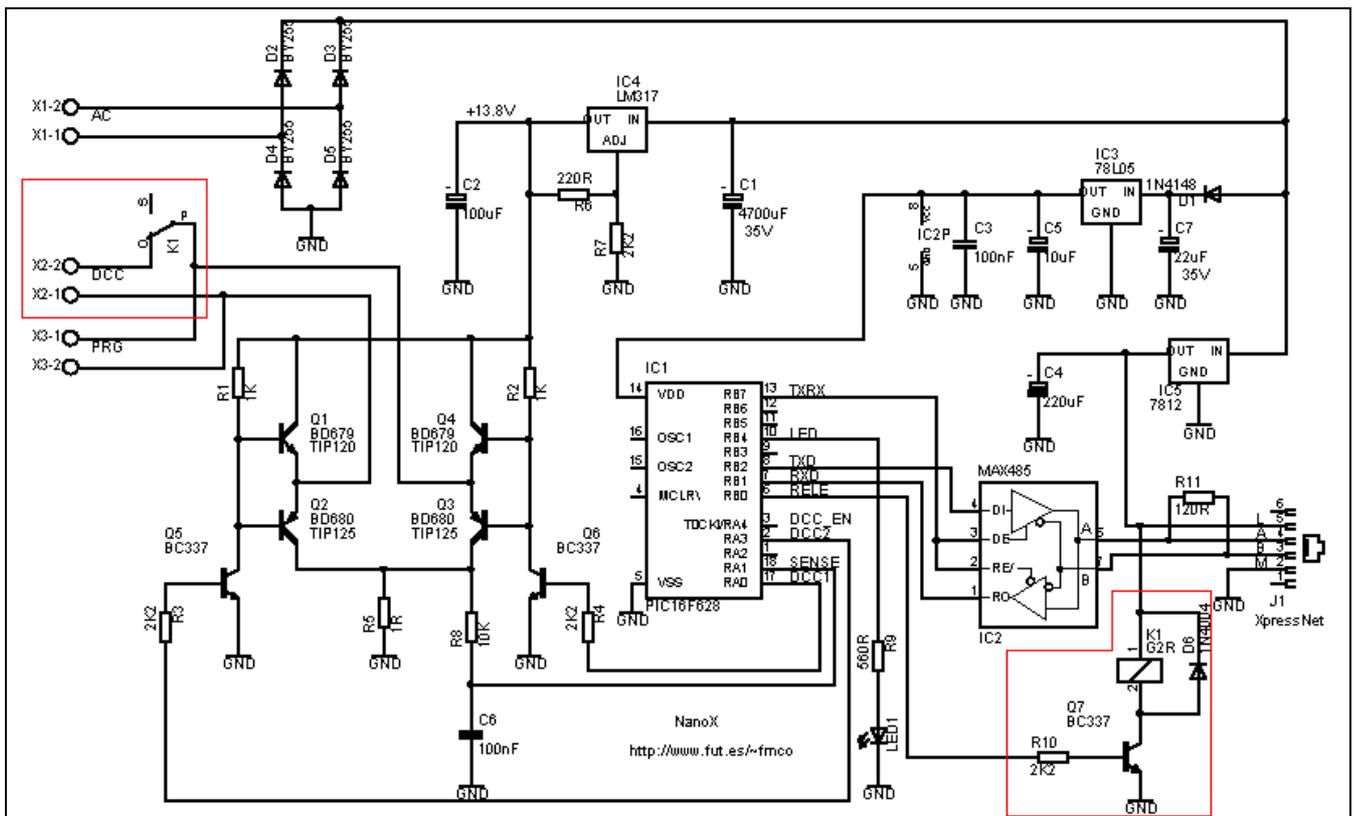
NanoX is a simple DCC command station, without pretensions, that includes XpressNet bus v.3 and can control:

- 16 locomotives simultaneously in the addresses 1 to 9999
- 1024 turnouts and signals
- 31 XpressNet throttles or devices (Lokmaus, Simplemaus, XbusTCO,...)
- Programming and reading DCC decoders in Direct, Paged, Register and PoM modes.
- With a 1,2A Booster including protection against short circuits
- Supports 14, 28 and 128 speed steps, functions FL and F1 to F12 for every locomotive



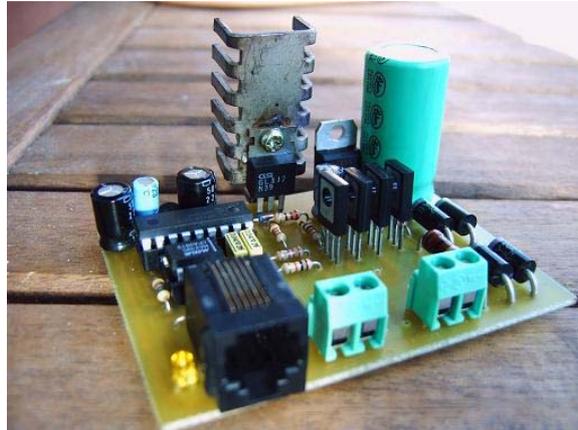
2.- Schematics

It only needs a PIC 16F628, a driver MAX485, six transistors and a few components more. As a option you can put a relay to disconnect main track from programming track when programming a decoder.



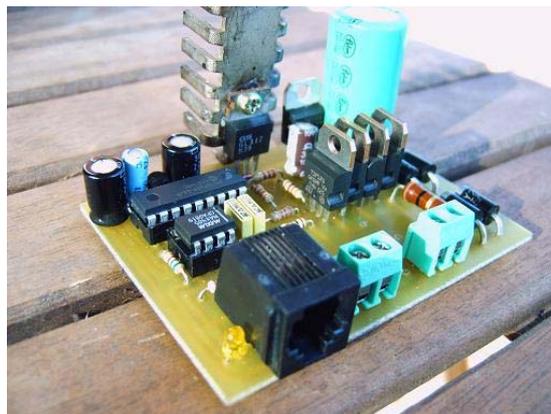
As a option you can put a relay to disconnect main track from programming track when programming a CV, only locomotive on programming track will be programmed (marked in red).

The cheapest option to build NanoX is to use BD679/BD680 transistors and don't mount the relay, but we'll have only one output to tracks (as Roco 10761 amplifier) and when programming all decoders connected to output terminals will be programmed.

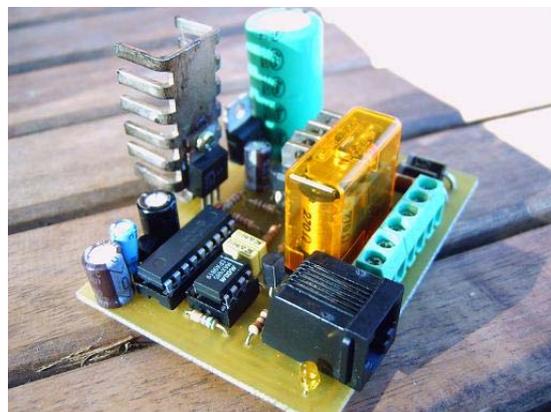


Is convenient to mount a heat sink in the LM317, be carefully to **DO NOT** touch 7812 otherwise a short-circuit is made.

You can change BD679/BD680 transistors by TIP120/TIP125, check orientation when you solder in the PCB:



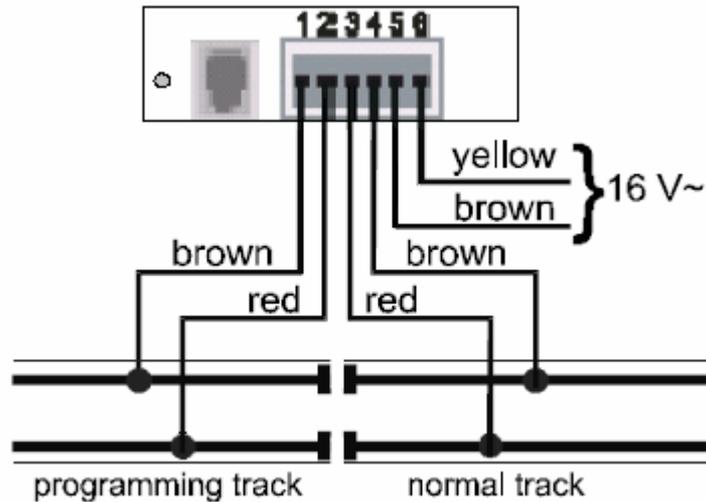
If relay is installed, we have a output for main track and other output for programming track:



3.- Installing

3.1.- Transformer and track

Connect transformer, main track and programming track in the 6 terminals as the figure:



- 1 Programming track (X3-1)
- 2 Programming track (X3-2)
- 3 Main track (X2-1) Not used if relay not mounted
- 4 Main track (X2-2) Not used if relay not mounted
- 5 Transformer power supply: 15V to 18V (X1-1)
- 6 Transformer power supply: 15V to 18V (X1-2)

Programming track is a piece of track used for programming and reading DCC decoders.



The programming track must be isolated from main track in both rails. During programming, the isolation gaps must not be crossed or bridged by locomotives or boogies, being this prejudicial to a good electrical insulation.

If programming track connection are exchanged, a short is made when locomotives passes across the gap.

If the output of Nanox (1,2A) is not powerful enough to supply your layout you can connect one or more optoisolated in terminals 3 and 4 to supply necessary power. Use only optoisolated boosters because voltage on terminals is track voltage, this boosters must have protection against short circuits.

Is convenient that these additional boosters disconnect track voltage when DCC signal is not present in their input, otherwise locomotives can run at their maximal speed when you press STOP button or enter in programming mode.

If you need to use more than one booster, divide your layout in power districts and supply each district with a booster with his own transformer, isolate both rails of every power district from the other. The power districts must have the same polarity; otherwise there will be a short when a locomotive crosses the dividing gap.

3.2.- XpressNet bus

NanoX can control up to 31 XpressNet devices. Every device has his own address, to assign an XpressNet address to a specific device please refer to the operating manuals for these devices.

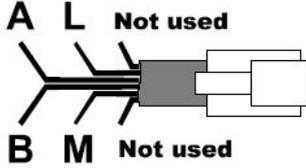
NanoX supplies the bus with a 12V, 1A voltage regulator; depending on power consumption you can connect more or few devices.

When connecting devices with a RJ11 connector check the correct order of the wires, not all the phone cables are valid.



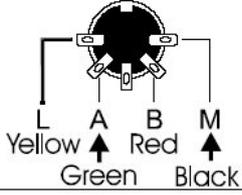


Pin #1



A L Not used
B M Not used

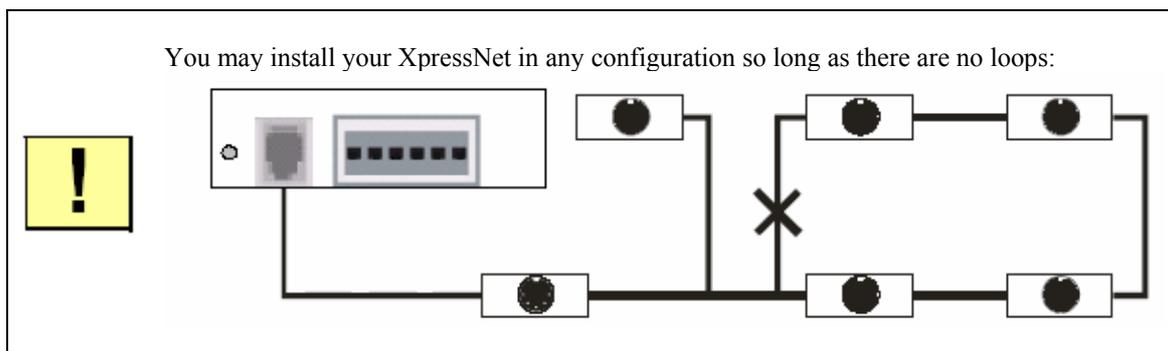
Din plug from rear



L Yellow
A Green
B Red
M Black

Pin #	Port A	Port B
Pin 1	"C" Control Bus Connection	No Connection
Pin 2	Ground "M"	Ground "M"
Pin 3	- RS-485 "B"	- RS-485 "B"
Pin 4	+ RS-485 "A"	+ RS-485 "A"
Pin 5	+12 volts "L"	+12 volts "L"
Pin 6	"D" Control Bus Connection	No C0nnection

To connect more than one throttle use a bus adaptor as LA152, NetBox or standard RJ12 splitter or Tee (check the correct wiring)



4.- Programming and reading CV

Due to limitations in XpressNet v.3 protocol from Lenz, only it's possible to program and reading CV1 to CV256 in Direct, Paged and Register modes (service mode). In PoM mode (main track) you can program all 1024 CV but you can't read it.

In order to read a CV, the decoder must draw a minimum of 200mA power consumption for reading pulses. If relay is installed, programming and reading CV in service mode it's only possible in programming track.

4.1.- Programming CV with Lokmaus

With Roco 10761 amplifier it's only possible to program CV, not reading, but with NanoX the Lokmaus can program and read CV.

Lokmaus only shows two digits, and then only CV1 to CV99 can be programmed with 0 to 99 values. If reading a CV, the value is greater than 99, Lokmaus shows E3 error. Some locomotive decoders as Zimo and CT Elektronik permit to program three digits programming a CV previously, read the decoder manual to know more about programming with Lokmaus.

When Lokmaus acts as slave, like when you connect to NanoX, the command transmitted is programming or reading in Direct mode, so NanoX only program or read CV in Direct mode, to do that in other modes use a capable Xpressnet throttle or NanoX with a PC interface like GenLI and a program as JMRI or TrainProgrammer.

To program with Lokmaus, press P key during 8 seconds, it will show EP (advanced programming). Select CV number (1 to 99) with arrow keys. To read the decoder press F1 and will show the stored value, E2 if it can't be read or E3 if value was greater than 99. To program, press F4, select the value (0 to 99) and confirm with P key. With STOP key you will exit from advanced program mode.

5.- Troubleshooting

The LED on the front of the NanoX is used to signal one of several conditions.

NanoX LED	Cause	Solution	
 LED does not light)	Power supply is interrupted; power plug of transformer is not in outlet. Terminals 5 and 6 is not connected to transformer	Ensure that the transformer is On. Check wiring from transformer to NanoX	
	LED continuously on	Normal operating condition.	
	LED continuously on, but locomotives do not run	The connection from the NanoX to the track is broken	Test and correct connections.
	LED flashes fast	Short or overload on the layout. STOP button pressed on one throttle	Check layout and fix the short circuit. Press the emergency stop key on your handheld to restart the system. Take locomotives off the track
	LED flashes slowly	System is in service mode	Finish programming the decoders. When service mode is exited the system will resume normal operation.