Watchtower Ultimate Overdrive

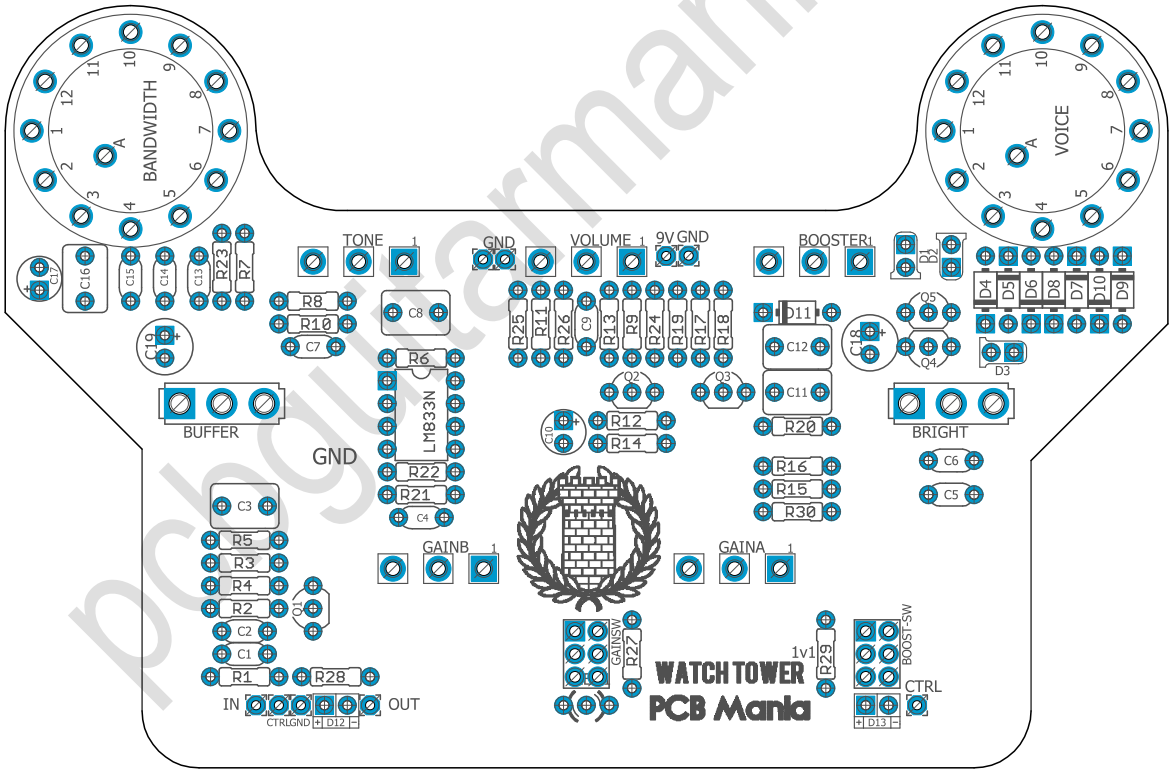
Based on:
EQD Palisades
Effect type:
Ultimate Overdrive
Build difficult:
Advanced

Amount of parts:
High, total 79 components
Technology:
Dual op-amp
Power consumption:
45mA (9v)

Enclosure type:
1790NS/1590XX
Get your board at:
Watchtower
Get your kit at:
Das Musikding (Europe)

Project overview:
The Watchtower is the most complete and versatile overdrive ever made, based on Earthqueaker devices Palisades.

With roots in the legendary Ibanez Tube Screamer, which features 6 different clipping voices, 5 bandwidth settings, 2 gain channels, and an additional booster, takes the possibilities to the limit.



Real measures from the extremes:

130mm width x 85mm height

5.12” width x 3.35” height

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Introduction

The Watchtower has the skeleton of the classic TS-808 including almost every possible modification to achieve the tone you want.

Dual-Channel Gain, voice rotary to select in between the diodes, buffer toggle, bright switch, band-switch to choose the capacitor and the response of it. All these mods take the roots of the classic tube screamer to the limits.

The booster acts as a volume boost after the main drive as in the original, but won't be difficult to add an order flipper switch if you wanna reverse the order.

This project uses 2 3PDT for the on/off switches of the main drive and the booster. Also, a DPDT footswitch is required for the gain channel control.

Controls

- Voice: The clipping voices determine how transparent and open or tight and crunchy the distortion is. Choose between 6 diodes configurations.
- Bandwidth: Sets the frequency response of the distortion and goes from thin, light, and cleanth fat heavy and crunchy.
- Buffer: Turns the input buffer on or off. ON is a tighter and brighter tone while OFF is a warmer tone with more sag. The buffer is part of the drive circuit & is only available when the main effect is activated.
- Tone: Brighter clockwise, warmer counterclockwise.
- Booster: Foot switchable volume boost with adjustable level to take your leads over the top
- Gain Switch: Select between two different gain channels.
    - Gain A: lower gain with a wider range of grit great for strumming open chords.
    - Gain B: Higher gain with a tighter range great for palm muting and/or shredding solos.

Bill of materials

Resistors	
Part	**Value**
R1	1m
R2	1k
R3	560k
R4	10k
R5	22k
R6	1k
R7	10k
R8	1k
R9	560k
R10	330r
R11	1k
R12	100r
R13	10k
R14	1m
R15	1m
R16	100k
R17	1k
R18	10m
R19	10k
R20	47k
R21	10k
R22	22k
R23	1k
R24	100r
R25	10k
R26	10k
R27	2k7-4k7
R28	2k7-4k7
R29	2k7-4k7
R30	Jumper

Capacitors	
Part	**Value**
C1	100pf
C2	100nf
C3	1uf
C4	47pf
C5	68nf
C6	150nf
C7	330nf
C8	1uf
C9	100nf
C11	1uf
C12	1uf
C13	33nf
C14	68nf
C15	220nf
C16	1uf

Electrolytic Capacitors	
Part	**Value**
C10	10uf
C17	10uf
C18	100uf
C19	47uf

Potentiometers	
Part	**Value**
GAINA	500K A
GAINB	1M B
TONE	5K B
VOLUME	100K B
BOOSTER	100K B

Transistors	
Part	**Value**
Q1*	MPSA18
Q2	MPSA18
Q3	MPSA13
Q4	2N7000
Q5	2N7000

ICs	
Part	**Value**
LM833N	LM833N

Switches	
Part	**Value**
BRIGHT	SPDT On/On
BUFFER	SPDT On/On
BANDWIDTH	1P12T
VOICE	1P12T
GAINSW	DPDT footswitch
BOOSTSW	DPDT On/On

Diodes	
Part	**Value**
D1	3mm green led
D2	3mm green led
D3	3mm red led water clear
D4	1n916
D5	1n916
D6	1n916
D7	1n4148
D8	1n4148
D9	bat41
D10	bat41
D11	1n5817
D12	3mm LED
D13	3mm LED
LED1	led dual common cathode

Shopping list

Resistors		
Qty	**Value**	**Parts**
1	47k	R20
2	560k	R3, R9
2	22k	R5, R22
3	2k7-4k7	R27, R28, R29
6	1k	R2, R6, R8, R11, R17, R23
3	1m	R1, R14, R15
7	10k	R4, R7, R13, R19, R21, R25, R26
1	10m	R18
2	100r	R12, R24
1	100k	R16

Capacitors		
Qty	**Value**	**Parts**
2	100nf	C2, C9
1	100pf	C1
1	150nf	C6
5	1uf	C3, C8, C11, C12, C16
1	220nf	C15
1	330nf	C7
1	330r	R10
1	33nf	C13
1	47pf	C4
2	68nf	C14, C5

Electrolytic Capacitors		
Qty	**Value**	**Parts**
1	100uf electrolytic	C18
2	10uf electrolytic	C10, C17
1	47uf electrolytic	C19

Potentiometers		
Qty	**Value**	**Parts**
1	500K A	GAINA
2	100K B	BOOSTER, VOLUME
1	1M B	GAINB
1	5K B	TONE

Transistors		
Qty	**Value**	**Parts**
2	MPSA18	**Q1***, Q2
1	MPSA13	Q3
2	2N7000	Q4, Q5

ICs		
Qty	**Value**	**Parts**
1	LM833N	LM833N

Switches		
Qty	**Value**	**Parts**
2	1P12T Rotary Switch	BANDWIDTH, VOICE
2	SPDT On/On	BRIGHT, BUFFER
1	DPDT FOOTSWITCH	GAINSW
1	DPDT On/On	BOOSTSW

Diodes		
Qty	**Value**	**Parts**
2	bat41	D9, D10
1	LED Dual Common Cathode	LED1
2	3mm LED	D12, D13
2	3mm green led	D1, D2
1	3mm red led water clear	D3
1	1n5817	D11
2	1n4148	D7, D8
3	1n916	D4, D5, D6

Jacks		
Qty	**Value**	**Parts**
1	DC Jack	-
2	Audio Jack	-

Components Recommendations

This board has been tested using Film box capacitors for most of the values over 1nf, and ceramics discs for the ones under 1nf. However, high-quality components such as Wilma's Capacitors and Panasonic's electrolytic can deliver a better performance.

The BOM and Shopping list are exclusive regarding this project. It doesn't include all the hardware like the 3PDT bypass switch, audio/dc jacks, enclosure, etc.

For this project, you need 2 3PDT switches, one for the on-off main drive, and one on-off for the booster section. For the gain switch, a 2PDT on-off switch will be enough.

Rotary Switch link: https://www.musikding.de/Rotary-switch-1P12T-sealed-pcb

2PDT Footswitch: https://www.musikding.de/2PDT-footswitch

The Rotary switches are 1P12T, 1 pole, and 12 positions. For the Voice switch we need only 6 positions and for the bandwidth 5 positions. You can set the number of positions with the ring and the washer of it. Check on the numeration above it to know where to place the ring.

For Q1 and Q2 I recommend placing sockets to test different NPN transistors such as 2n3904 (low gain) and 2n5088 (medium gain) for a different response on the input and output buffer.

The same concept applies to the Ic. The EQD version uses an LM833 dual Op-amp, and works great, but feel free to experiment with any other dual op-amp such as TL072 or the LM4558 of the classic TS-808.

Build Notes

If this is one of the first projects I recommend you take a look at our Pedal Building Guide

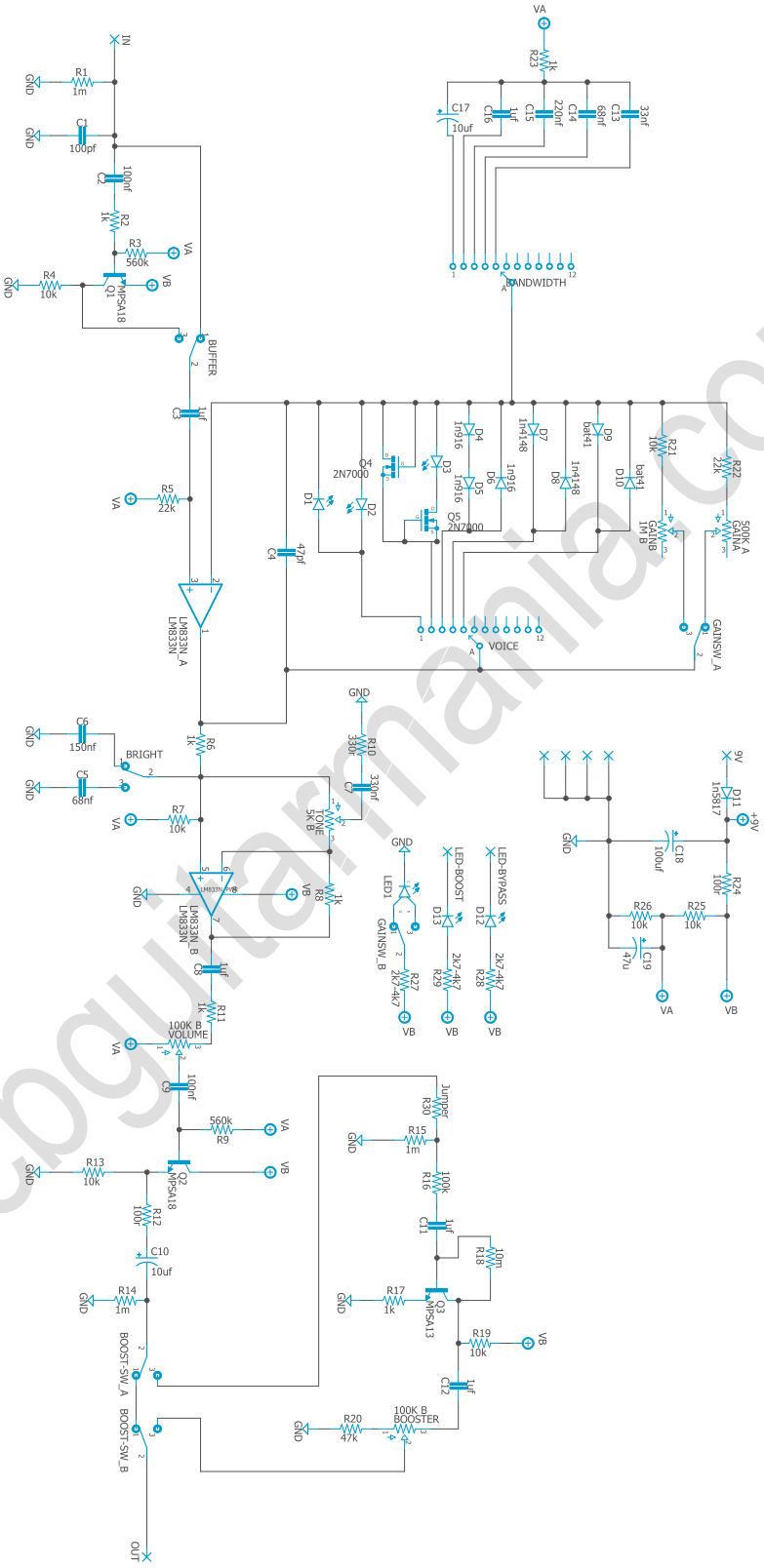
For a successful and tidy build it's recommended the following order:

1. SMD Transistors
2. Resistors & diodes
3. Capacitors, starting with the smaller ones and the ceramic ones.
4. Electrolytic capacitors (always check the polarity)
5. Transistors
6. Wires
7. Potentiometers and switches
8. Off board wiring

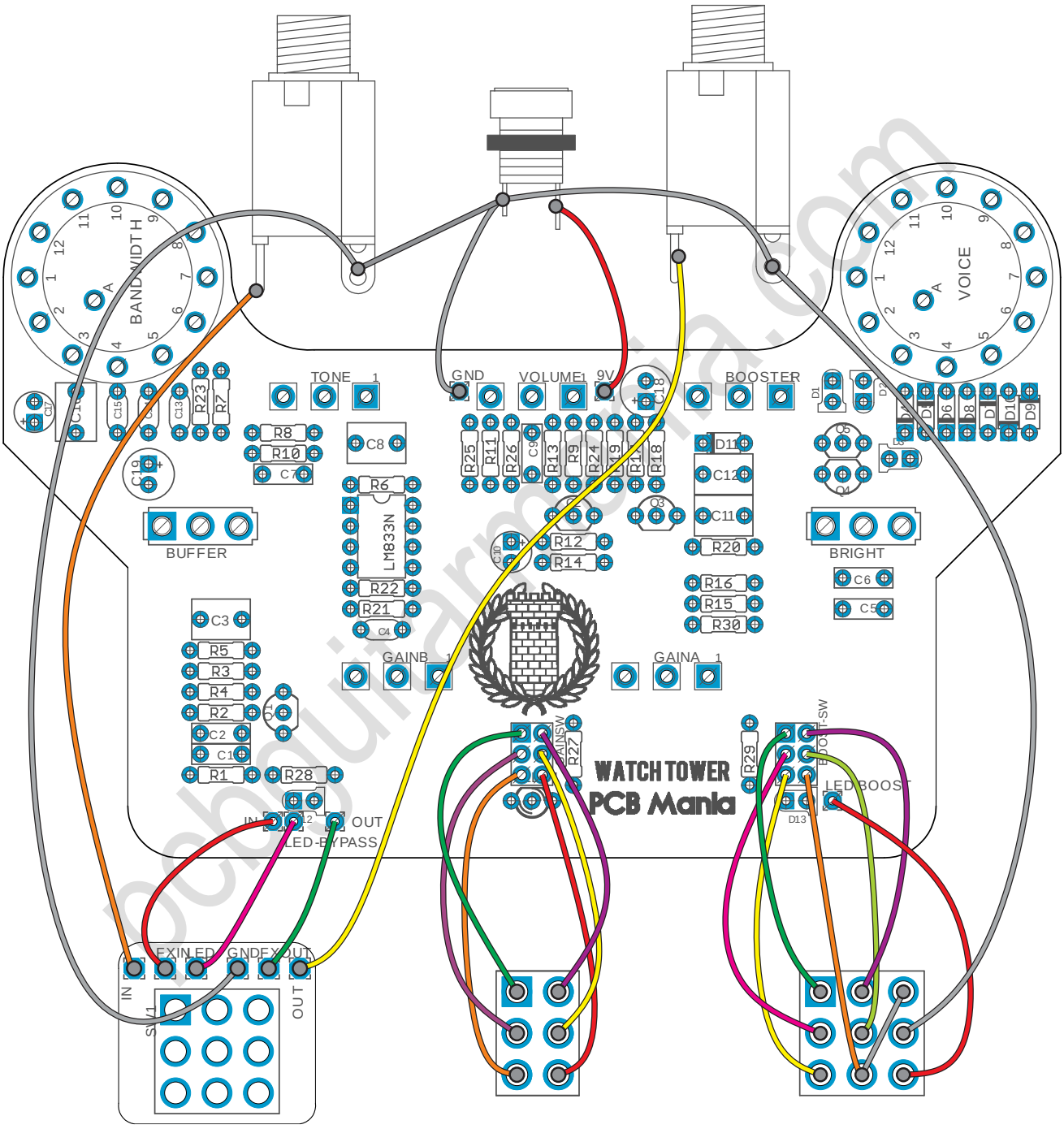
Q1*

There is a mistake on the silkscreen; when placing the transistor, you need to flip it 180°.

Schematic



Wiring Diagram



Drill Template

This Project has been planned to fit into a 1790NS/1590XX enclosure type (145 X 121 X 39.5mm approx.)

Check the Attached “Drilling templates” to drill the box properly. The files are on Scale 1:1, ready to print in a A4 page.

Licensing and Usage

We really appreciate your trust and support buying this PCB, as well as your will to dive into the DIY electronics world. That’s why for us is really important that you can make this project work properly and to enjoy not only the building process, but also to experiment and play with it on your rig.

We try to reply to every question we receive on our email or in our social media, but we try to encourage all our customers to join our PCB Guitar Mania – Builders Grup on Facebook, in order to post all your doubts, issues, suggestions or request, as well to share your builds and have some feedback from us and other fellow builders!

All of our projects have been tested following this same guide on their standard configurations. Although, not all of the variations and mods have necessarily been tested. These are suggestions based on the schematic analysis, and on the experiences and opinions of others. Feel free to share with us your opinions and suggestions regarding the mods our your own personal experimentation.

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