Notes on building the BATC v2 Minitiouner

The board should be easy to build as it uses through hole parts. The components list and schematic can be found in annex A. There is no particular need to fit components in any specific order. I recommend fitting in order of component height. Do not fit the tuner module, the FTDI module or the J2 jumper at this stage.

The DC-DC converter module can be fitted on PCB headers or with wire offcuts. Use pliers to bend the regulator pins so that when fitted their mounting tabs align with the holes in the PCB. It's best to bolt down before soldering, this holds them in place and ensures alignment. The two socket headers for the FTDI module must be flat to the PCB. There is no need to fit J5 – J8 unless you intend to use them, they are for future expansion. If you would rather have the power LED on the front panel, fit a 2 pin header instead of the LED on the PCB. The result should look like figure 1.





Figure 2 – DC-DC module

Figure 1 – BATC board ready for commissioning

Commissioning

The DC-DC module needs to be set to 3.7-4 V output. You may want to do this before soldering it in, in case it doesn't work as expected. If you are not using the DC-DC you should feed 3.7-4 V into J2 as indicated on the PCB and then skip the next paragraph.

To set up the DC-DC, check again that the jumper on J2 is NOT fitted. Connect 6-18V supply – ideally via a regulated, current limited supply. Connect a voltmeter to the output of the DC-DC converter. Assuming no egress of smoke you will should find the output can be adjusted. Mine was originally set to 12V and the pot needed to be turned clockwise. Once you have checked and re-checked the DC-DC output really is in the 3.7-4.0 V range, fit a jumber on J2.

You should now measure the supply rails, there are three and the easiest place to measure is on the top of the ferrite RFCs, L1 = 3.3 V, L2 = 1.1 V, L3 = 3.3 V. If any of these are outside specification find out why and fix it. The tolerable range for the 1.1 V supply is 1.05-1.25 V. The actual value will depend on the tolerances of the regulator, R2 and R3. Expect about 1.1 V with the values suggested.

The Serit module can now be fitted. It should snap in reasonably easily but take care not to bend any pins. Making sure it is sitting properly on the PCB, solder the end tabs to hold it in position. Check again it is correctly aligned and then solder the 40 pins.

Fit the FTDI module checking it lines up and there are no bent pins. It can be a little reluctant to push down into the sockets. The result should look like Figure 3.



Figure 3 – Completed board

The Case

The board is designed to fit into a standard Hammond 1455N1201 Metal Enclosure. I went for BATC blue 1455N1201BU Digikey part no 1455N1201BU-ND, Farnell part no 2361595. Different colours or sizes will not affect performance. Figure 4 shows the rear panel and Figure 5 how it fits, note I have added the power LED to the panel. You may want to add other elements, e.g. LNB power switching. If you keep the bezels on this enclosure, you can trim the corners of the PCB to allow the board to mount flush to the panel. Use packing washers between the F-connectors and panel, the threads are 3/8-32 UNEF and are available from Digikey or can be salvaged from redundant satellite tuners.



Figure 4 – Panel layout (Optional)



Figure 5 – Mounting in box

Analogue 3.3V Digital 3.3V Digital 1.1V MCP18265-3302EAB MCP1826S-3302EAB MCP18265-ADJ DCDC U1 Alt 5V 3k3 R1 Vin Vout Vin Vout 56k R2 /in Vou 1A + C6 +[C4 28C0236-0JW-10 F1 22u _____ 22u GND GND EN ADJ 1A +Vin Vout 3A + C1 680u \sim 2 C2 + C7 2 Ov Ov 2A Ov Ov 4 4A 2 1.00 4 ٤b -MLO 1N5404 CONN_01X02 U2 U3 3 GND F2_ GND 2 ☑ / <u>1</u> 300mA + C11 + C9 C12 C18 C14 1000u 100n 100m 470u 100n U7B ₽ 74HC10 5 C16+ C13 FT2232H_Module U6 CHASSIS_GND CHASSIS_GND LNB_A2 470u 100n GND 3 3-1r VBUS 3-3 vcc GND - 4 CS GŇD 2-1 V3V3 3.3VT 3-7 DATA $\frac{2-3}{2-5}$ $\sqrt{3}\sqrt{3}$ $\frac{2-5}{2-11}$ $\sqrt{10}$ TS1D0 6 CLK 3-6 3k3 R4 3k3 R5 ×2-5 V3V3 CLK 3-5, ×2-5 V3V3 PWREN 3-6, ×2-11 VIO RESET# 2-8, ×2-21 VIO SUSPEND# 2-25, ×3-12 VIO SUSPEND# 2-25, ×3-22 VIO SUSPEND# SUSPEND# 7 TS1D1 TS1D2 TS1D3 2 2 4 TS1D4 11 **TS1D5** 12 TS1D6 8 CONN_01X06 6 4 -2 13 TS1D7 -<u>j</u>_10 9 14 °...... TS1CLK 100n Syg 11 2 12 15 - N M J W TS1VALID 13 14 GŇI 16 LO TS1SYNC 15 16 2 - 18AC0 BC0 17 TS1ERR 2 - 17BC1 3-16 BC2 3-15 BC2 3-15 AC1 18 × GND AS1 2-20 6 5 AC2 19 22K_RX1 2-19 BC3 3-14 AC3 20 × 22K_TX1 - 4 2-22 BC4 3-13 BC5 3-11 BC5 3-10 AC4 21 SDA 2-24 AC5 3 5 22 SCL 2-23 AC6 BC6 3-10 BC7 3-9 2 4335 3.3VD 2-26 AC7 <u>1</u> 18 BC7 AS0 24 - 3k3 -2-7 BD0 3-26 25 AD0 1.1VD TS2D0 26 2-10 AD1 BD1 3-25 2-9 3-24 TS2D1 AD2 BD2 2-9 AD2 2-12 AD3 2-14 AD4 2-13 AD5 2-16 AD6 2-15 AD7 S 28 3-23 TS2D2 BD3 F TS2D3 29 3-21 BD4 30 3-20 BD5 TS2D4 TS2D5 31 BD6 3-19 BD7 3-18 32 TS2D6 33 TS2D7 34 TS2CLK 35 TS2VALID MINITIOUNER - Designed by F6DZP. PCB by G4EWJ and G0MJW CHASSIS_GND CHASSIS_GND 36 TS2SYNC 37 TS2ERR RESET 38 39 22K_RX2 22K_TX2 40 10 U7C Sheet: / 41 U7A ₽ 74HC10 File: SERIF.sch ⊋ 74HC10 11

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Title: MINITIOUNER V2.1 Size: A4 Date: March 2017 KiCad E.D.A. kicad (2017-03-10 revision de30dc9f5)-makepkg

Annex A – Schematic and parts list

Rev: 1.0

ld: 1/1

Designator	Qty	Value	Digikey	Notes
C1	1	680u	493-1829-ND	25V if you intend to feed with 18V
C11	1	1000u	493-1497-ND	>6V
C2,C8,C10,C12,C14,C15,C1 6	7	100n	BC2665CT-ND	5mm spacing
C3,C4,C6,C7	4	22u	493-11627-1-ND	>6V – must be low ESR < 10HM
C9,C13	2	470u	493-15716-ND	>6V
D1	1	1N5404	1N5404DICT-ND	
D2	1	LED 3mm	1080-1113-ND	Any 3mm LED is fine, I used a white one.
D3	1	5.6V Zener	1N5339BTPMSCT-ND	Could also be 5.1V
F1	1	PCB Fuseholder	F6245-ND	
F2	1	500mA	MF-R050-ND	Choice here – 300mA to 1A.
J1	1	DC_Jack	EJ508A-ND	
J3,J4,J2	3	CONN_01X02	952-2262-ND	
J5	1	CONN_02X08	A33163-ND	Only needed for 2nd Tuner
J6,J8	2	CONN_01X06	A31116-ND	
J7	1	CONN_01X05	A31115-ND	
L1,L2,L3	3	28C0236-0JW-10	240-2493-ND	
R1,R4,R5,R6,R7	5	3k3	PPC3.3KBCT-ND	Anything will do
R2	1	56k	PPC56.2KXCT-ND	Use 1% or select on test
R3	1	33k	PPC33.2KXCT-ND	Use 1% or select on test
U1	1	DC-DC Converter		EBAY - Note – must be set to under 5V – ideally about 3.7V
U3,U2	2	MCP1826S-3302EAB	MCP1826S-3302E/AB-ND	
U4	1	MCP1826S-ADJ		BATC Shop
U5	1	FTS-4335		BATC Shop
U6	1	FT2232H_Module	768-1030-ND	BATC Shop – needs programming
U7	1	74HC10	296-12774-5-ND	
Headers for FTDI Module	2	CONN_02X13	S7116-ND	Not strictly necessary but advisable
Fuse 1A 5x20mm	1	1A Fuse	F2392-ND	Higher value if higher LNB current