CD Flatfish - CD Transport, version June 3rd, 2008

Thread:
http://www.diyaudio.com/forums/showthread.php?s=&threadid=120229&perpage=25&pagenumber=1

Parts to buy:
Shigaraki Parts

Digikey:
(1) 300-8441-ND CRYSTAL 16.9344 MHZ CYL TYPE
(2) LM7808CT-ND IC REG VOLT 8V 1A TO-220
(1) HM548-ND TRANSFORMER 115VAC 24VCT 4A
(1) AC Socket Q212-ND
(1) Fuseholder F1504-ND
(2) MSR860GOS-ND

PartsConnexion:
(1) Riken  62066 91R .5 Watt $2.70, see Thread page 13, "Theoretically it should be 375 and 93.75 Ohm"
(1) Riken  62074 390R .5 Watt $2.70
(1) BG STD 1000/25  60222 $5.75
(1) BG FK 2200/35 60194 $24.50
(2) BG PK 4.7/50
(1) BG N 10/50 60099 $4.25
(1) BG N 33/16 60093 $4.50
(1) BG NX 47/6.3 60206 $2.50
-->(1) BLKGATE- 60091 NX Hi-Q 0.1 50v $1.85

Chips Set
model RC-EZ31B, pilot, na pokladzie LA9242, LC7860, cena 169 pln.

Original Flatfish SPDIF Output
```
>DOUT -> --- 390 ohm --- *----------> SPDIF out
> !
>91 ohm
> !
> *GND
```

playermods.pdf file
This great document list step by step all the transport mods to be done. However, some informations were missing to correlate these informations
with the EZ31B service manual CD Circuit schematic. I found the missing informations so you can see on the schematic what was modified:

Parts Replaced:
ID, Schematic Designation, Original Part Value
R1,R2: C945, C964
R3: C942 - 200uF, 16V
R4: L901
R5: C952 - 470uF, 10V

Parts Exchanged:
ID, Schematic Designation, Original Part Value
E1: C939 - 100uF, 10V
E2: C953 - 200uF, 16V
E3: C939 - 2.2uF, 50V
E4: C934 - 10uF, 25V
E5: C916 - 200uF, 16V
E6: C906 - 0.1uF, 50V
E7: X901 - Ceramic Resonator

SMD Parts to remove (PCB other sides)
3. C963
4. C917
Jumper from 5A to 5B: Seems to apply +8V to line going from IC902, pin 49 to IC901, pin 33

Mods Summary:
The mods presented in pdf file are changes that suited my needs and my equipment, don't do them all at once.
Start with clean PS: remove all ceramic caps, choke and 470uF cap (on board) mentioned in pdf file, then build external PS: good transformer with 24V CT or similar, 2 x MSR860 diodes,
LM7808 regulator and 2 x 1000uF caps. BG STD is good choice after requaltor, before regulator you may try the same cap, BG FK or whatever else you find available and suitable.
Then start replacing caps on board: you may find my choices working fine, or you may find that something else works better FOR YOU.
But don't do it all at once, as you will loose track of what works and what not.
The untouched board, with just PS mods, works quite well and some of you may find that additional adjustement are not needed at all.
What I found though, is that mechanical build was quite important and it's definitely worth to do some work here.
I started with acrylic platform, later switched to spruce board and only then found heavy frame on springs even better. It's also recommended to mount the
mechanism on two standoffs only; it really sounds better that way... and I wouldn't try if I didn't see it in Shigaraki

Power Supply:
Here's the PS schematic. I tried some popular regulators (LM317, LM2937, LT1086, LT1129) as well dual regulation and separate regulation for 5V.
Nothing worked better for me than a single LM7808 from National.
I also tried few diode types, including 31DQ09 Schottkies that are supposedly used in Zanden, but again, MSR860 worked best.
Using BG STD 1000/25 after regulator is quite critical, before regulator you see BG FK 2200/35. I later switched to not available any longer BG F 1000/35
which provided more high frequency extention. You could use BG STD 1000/25 with BG N 4.7/50 bypass to compensate slight brightness but you may loose some liquidity and naturalness.

Latest PD remark on Power Supply:
Q: Hi Peter. I built the upgrade 8V supply, but if using only the transport assy and not the main audio board as well, is it necessary to build a new sequenced supply as this one, see picture, or the 8V supply is all that is needed?
A: 8V external supply is all that is needed, no need for sequencing. There is another 5V supply on transport PCB, but you don't need to change there anything.

Transformer:
As to transformer, I wouldn't recommend really small units and 50VA could probably be reasonable minimum.
I also have slight preference for 96VA Hammond EI over same type 50VA unit.

Belkin Synapse interconnect

Frame:
The frame is made of bronze nad copper and weighs 5kg.
I came to this matrial choice by accident, when I decided to try the copper frame I had originally made for CD-Pro. Adding later bronze base and springs improved things further.
The frame you see in the pics is the second generation where I had to compromise few things in order to gain more functionality.
Originally I had the mechanism mounted on acrylic board and later on spruce board.
Bronze/copper and springs add more dimentionality and refinement. Brass is a bit ringy, but depending on application it may worked as well.

The mechanism works best if mounted on two standoffs only, it sounded dull when I tried to hang it underneath brass frame with more contact surface.
Here the pics of one prototype that did not work as I expected: PD_Frame
When suspending mechanism from the bottom, using two spacers like this worked better than direct mount:

The Flatfish weighs approx 2.2kg and the aluminum platform is 6.7 x 9.6 x 0.6" Looking at the pics one may not figure out what those weired spiked legs are for,
but they actually act as horizontal spring like suspention with resonant freq of 3-4Hz.
The bars have been cut on table saw and smoothed out on belt sander, they are connected with 10-32 screws (two per each corner).
The size is approx 7 x 7.5 x 1.25" There is 3/16 copper plate attached on a bottom and it holds the mechanism:

Latest PD comments on frame (2May2008):
Only built it like that as I had scrap metal i could use. If you decide to buy it, it may be quite expensive and maybe aluminum mixed with copper be a better solution.
The main bars are bronz: 6.3 x 1.9 x 1.5.  Side panels are 7" copper which I got by cutting 1.5 square bar in half
I wpuldn't recommend brass, it's too "ringy".
There is 3/16 copper plate attached to the bottom, the springs rest directly on the bar and there are cutouts in bottom plate to acommodate it. A good source for springs can be Brofasco.
Top plastic plate: It's a froasted acrylic plate: one side is matte, the other shiny. I bought it surpluss years ago, but should be available from Plastic Warehouse stores.

Metal Finishing (Peter Daniel):
"I use belt sander to brush aluminum, usually 80 grid.  Later, fine polish with Scotch Brite pads. The finishing method is all the same for aluminum, copper and brass. Aluminum gets alodined, the other two metals treated with patina and thin coat of Danish Oil which prevent oxidation.
The CD drive stands on two brass standoffs (3/8" dia) and is screwed directly to standoffs, no rubber bushings."
"Patina: Here you are: http://www.sciencecompany.com/patinas/patinaformulas.htm, I use  Light to Dark Brown"

Caps and Digital Out Resistors:
Beside all that, there are few components that I replaced on original board (replacing too many will kill the sonics).
I basicaly removed the main filter cap and replaced all other electrolytics tied directly to rails with BG N caps and also removed their SMD bypasses.
One other cap was replaced to ERO 1830, 0.1uF and that's basically all. Okapi will post PDF when it's ready.

Parts Replacement Reasons:
R4 is a choke that probably isolated the rest of the boombox circuitry from digital section, it is not needed now and actually found to degrade the sound.
R5 is a main filter cap (470uF): you don't need it if using large cap after LM7808 regulator (and if parallel with a new cap it will degrade the sound)
R1 and R2 are analog output coupling caps. You may leave them, but I needed that space to simplify wiring.
R3 is DAC bypass caps, I don't use internal DAC so I removed it; again that cap in parallel with other caps may degrade the sound.

You may try the output transformer, but I never liked them as they mess up the sound. IMO proper resistors are way better.

If the DAC is connected directly to transport's output, you may bypass the output resistors completely,. Some people reported certain gains. I use 6ft digital interconnect and it works better with resistors in place.

Springs:
The springs I'm using are approx 2" long and 1" dia, pretty stiff, under load they compress by apprx 0.1" and resonance frequency is approx. 10Hz.
Adding some dumping material inside (but not too much) seems to be beneficial and helps reduce the ringing. I bought last 4 pcs localy, but I'm pretty sure similar type can be found at McMastercarr

Digital Cable lenght (From UHF Magazine)
"When a transition is launched into the transmission line, it takes a period of time to propagate or transit to the other end. This propagation time is somewhat slower than the speed of light, usually around 2 nanoseconds per foot, but can be longer…
When the transition reaches the end of the transmission line (in the DAC), a reflection can occur that propagates back to the driver in the transport. Small reflections can occur in even well matched systems. When the reflection reaches the driver, it can again be reflected back towards the DAC. This ping-pong effect can sustain itself for several bounces depending on the losses in the cable. It is not unusual to see 3 to 5 of these reflections before they finally decay away. So, how does this affect the jitter? When the first reflection comes back to the DAC, if the transition already in process at the receiver has not completed, the reflection voltage will superimpose itself on the transition voltage, causing the transition to shift in time. The DAC will sample the transition in this time-shifted state and there you have jitter.
If the rise-time is 25 nanoseconds and the cable length is 3 feet, then the propagation time is about 6 nanoseconds. Once the transition has arrived at the receiver, the reflection propagates back to the driver (6 nanoseconds) and then the driver reflects this back to the receiver (6 nanoseconds) = 12 nanoseconds). So, as seen at the receiver, 12 nanoseconds after the 25 nanosecond transition started, we have a reflection superimposing on the transition. This is right about the time that the receiver will try to sample the transition, right around 0 volts DC. Not good. Now if the cable had been 1.5 metres, the reflection would have arrived 18 nanoseconds after the 25 nanosecond transition started at the receiver. This is much better because the receiver has likely already sampled the transition by this time."