

### *Horizontal “desktop” cases CAN be better cooled and quieted ... with a little effort*

I started thinking about a new computer in the late summer of 2007. My five-year old existing Compaq system started acting a little funky. The fan started throttling and had to be replaced. The speakers in the LCD screen started to crackle. (For that, I bought a basic of Logitech S-100 speakers ... midnight black, a clean look and only \$12 at my local shop ... \$7 anywhere on the net).

Then I began to wonder and worry. Is the power in the older home I just purchased just not clean enough? Is the ambient in the new den/office just too warm? Is the MTBF on that OEM hard drive more than five years ... or less?

I kept the Compaq system in an antique cabinet I had bought just for that purpose. The Compaq mini-tower was designed neither to be horizontal nor in an enclosed space. Horizontal PCs went out of fashion in the early 1990s, and have only recently appeared again, mostly built these days to accommodate home theatre set-ups (ie, HTPCs). So if you wanted a retail PC gone horizontal, you pretty much had no choice but to turn a tower on its side like this. It’s certainly not the way the optical and floppy drives were meant to run ... and the box certainly wasn’t designed to deal with the incremental heat of the enclosure. To allay my fear of heat, I installed a “Blue Ice” cooling system ... meaning that stuff that you put in the fridge to use in beer coolers. I switched it out twice a day. Laugh if you will, but it only cost five bucks, it only took one minute to install ... and no else one I know of claims an ambient temperature just above freezing.



Add all that to the fact that the Athlon XP 2000+ 1.67GHz Palomino processor was maxing out more and more ... and, well, like it or not, it was time to go shopping. This time, I decided not to ever again be bound by proprietary devices & companies, so it was going to be a DIY. I’m no gamer/overclocker—my priorities were cool, quiet, stable, stylish ... and horizontal.

I actually first became mesmerized by the Antec P182 case. Plenty cool, as it accommodates five 120mm fans. Insulated case material for quiet. And with other features such as an area under the motherboard for cable-stashing and easy slide-out drive cases, it certainly appealed to my anal-retentive nature. Stylish and understated look. No wonder it is the best selling case in Japan. Hmm. It’s not horizontal, though. Then I bumped into Antec’s P182SE (special edition, limited run), the exterior dressed in mirror-polished stainless steel and a flat-black interior. This thing’s not just stylish ... it’s an eyeful of sexy and classy at the same time !! I immediately immersed in designing the rest of the system with the P182SE in mind.



Then, when it came time to start buying all my goodies, it hit me. What happened to the “horizontal” part? I was taking the easy way out, dodging the heat issue by planning for a sexy case that just didn’t belong in an enclosure, meaning it would be easier to cool anyway. I scratched those plans and went back to square one, looking for the “right” *horizontal* case.

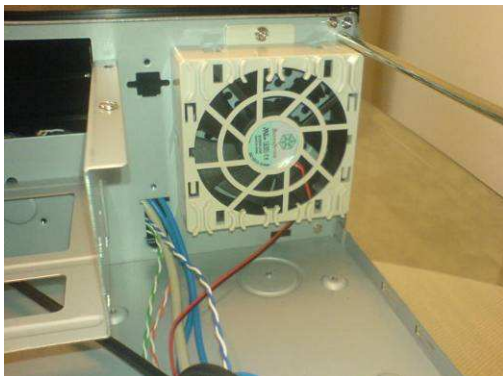
And I found it in Silverstone's LaScala LS13. It is designed with an stylish, understated look to match well with other home theater components, coming in either piano black or brushed aluminum. However, lacking a big volume knob, a text display and such, it also has a look that suits a stylish horizontal PC as well. And unlike most other HTPC-targeted cases, it has plenty of bays—two external 5¼" and even *two external* 3½" as well—all tastefully hidden behind a drop-down, gear-driven front panel. This puppy is essentially a standard mid-tower turned on its side. It will even take on an extended-ATX size board. Yes, I thought. This is the case. There is no other case. This is the case (to steal a catch-phrase from Paul Newman, *The Verdict*, 1982).



I bought the LS13 from the folks at FrozenCPU. Their price was competitive and, for an extra \$50, they carefully and thoroughly lined the case cover with sound-deadening material. The slide-on/slide-off *is* more difficult with the material in place. I also picked up most of my wiring/cabling from FrozenCPU as well, they have a wide selection and, for a little extra, FrozenCPU will sheath them—and fan tails as well—in colors/materials of your choice. Attention to cable management (dressing, sheathing, stashing, etc.), among other things, effects a positive contribution to cooling. Actually, I ended up buying a LOT of the parts from FrozenCPU.



The LS13 ships with a front 92mm intake fan and twin 60mm exhaust fans at back. Most of the reviews found these fans to be somewhat less-than-quiet so they were removed, to be replaced by other fans that have been well-tested as to be virtually silent.



The next step was to install the power supply. I chose the Seasonic M12 500W. The modular wiring does away with most excess cabling. The main 120mm fan faces against, and will therefore contribute to cooling, the processor area. Plus it has a secondary 60mm fan at back that kicks in as needed. It comes with loads of long-enough and well-sheathed cables. The M12 (as well as its non-modular parent, the S12) is consistently reviewed as being very quiet. In addition, Seasonic has a strong commitment to quality of product. I wish Seasonic had modularized *all* the cables, including the ATX and



motherboard cabling. (The Silverstone ST “Strider” series is one example of a totally modularized power supply with varying lengths of OEM cabling available.) That would have made it possible to use the shortest cables required. I was able to stash the excess 4-pin ATX and motherboard cabling by tying it off along the upper center spine of the LS13, allowing them to dangle down over where they plug to the motherboard. There was also a useless un-modularized 8-pin ATX cable that had to be stashed. It was bundled and tied up to an adhesive wire tie mount. The bundle does clear the 3½” internal drive bracket (removed for this picture) that hangs

off of, and below, the 5¼” external drive bays.

From the front fascia into the chassis ran OEM cables for:

- Firewire—shielded in black, with an 2x5 Intel connector block and seven dangled individual pins (for non-Intel applications). It also had a signal ground (S-GND) mount dangling out at the front panel end, best suited to do nothing other than to cause a ground loop. Not a chance I’ll use Firewire and there’s a back-board header anyway. I unplugged the wire entirely ... and camouflaged the front panel Firewire port with a Gold Mudflap Girl case badge.
- USB—two separately shielded 5-wire bundles (in blue), fed into a 2x5 Intel connector block. Most of this was bundled up and tied to the front outside of the chassis with an adhesive tie mount. There’s about one inch of space between the front fascia and the front face of the chassis at the bottom to work with ... as long as the area where the fascia’s air intake (at left bottom) is avoided. Sheathed 10-pin extension cables will make the connection. One advantage to this approach is that either the motherboard or the front fascia can be disconnected without disconnecting the other.
- Front panel audio—shielded in gray, with two Intel connector blocks, one for Intel HD Audio, the other dangling and unshielded to support outgoing AC’97. Plus it’s not going to reach across the case to the mobo port header at the back end. This was also bundled and tied to the front chassis with an a couple of adhesive tie mounts, with sheathed 10-pin extension cables assigned to do this work as well. I tied the AC’97 block against the cable, then flipped the wire, so it would be on the stashed end.



- Front panel power—three unshielded twisted pairs, one each for power on/off, two-color power LED & HDD LED (There's no reset button on the LS13). And they are way, way too long. Mostly bundled and left loose in the fascia/chassis space. The inside of the case will feature short, shielded extension cables (color-keyed to the mobo block) instead.



Now on to the front fan. According to one reviewer, the 92mm intake fan up front is an EverFlow F129025SL 92mm, running 39 CFM, 2100 RPM, 21 dBA. Most of the reviewers found it too noisy. One probable source of racket is that mount box vibrating and echoing ... right up into the front chassis.

Surprise ... when I unscrewed the single screw holding the front fan mount box in place, the front chassis revealed ... a drill pattern for *an 80mm fan*. Somewhere along the way, apparently after the chassis was in production, someone realized buyers preferred a bigger fan and that the case had the room for one. ... and implemented the box mount solution as an afterthought. This made a convenient home for a very, very quiet 80mm fan, the Noctua NF-R8.



At 12V, the Noctua runs 31CFM, 1800RPM, 17dBA (Less than 19 dBA is considered inaudible). This is highest CFM/dBA ratio on the market. I also used the supplied “LNA”—Low Noise

Adapter—an inline resistor to reduce delivered voltage. Under the LNA, the Noctua delivers 22.9 CFM, 1200RPM, 10 dBA (the latter being an extrapolated, hence somewhat questionable, number). Yes it *is* pushing less air this way ... but, down the road, if more cooling and less quiet is required, the LNA resistor can be very easily yanked.

The Noctua also arrives with little silicone fan mounts that replace the fan screws. These little rubbery posts simply pull through the holes to mount. The ring closest to the head insulates the physical connection between the fan and the case, preventing transfer of vibration noise into the aluminum. It's as though the fans are sitting on little bouncy shock absorbers.

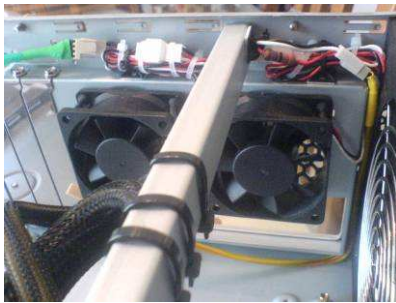


The fan tail and the LNA resistor were shoved through a large, square unused hole in the front of the chassis (at the upper left corner of the stock fan) and left loose so that they can be retrieved, need be, without removing the front fascia. A sleeved white extension cable pokes back out to make the connection. Any of its excess will be also shoved back into the hole after everything's done.

On to the rear fans. The LS13 paperwork cites the OEM twin exhaust fans as running at 3000 RPM, 25 dBA. Those are being replaced with the quietest 60mm fans I could find, those being the AcoustiFan Dustless Silent model. The AcoustiFan spec sheet, at 12V, is 13.7 CFM, 2700 RPM, 16.9 dBA.



To bring the sound down further, it is under-volted to 7V by using a Zalman 56-ohm in-line resistor, a device similar to the Noctua LNA. At 7V the fan is probably running at about half CFM & RPM. All this under-volting might seem a little nervy. But, again, it can be changed out very quickly, need be. And besides the generous ventilation provided by the Seasonic, there's plans for a bit more compensating air yet to come. The AcoustiFans arrived



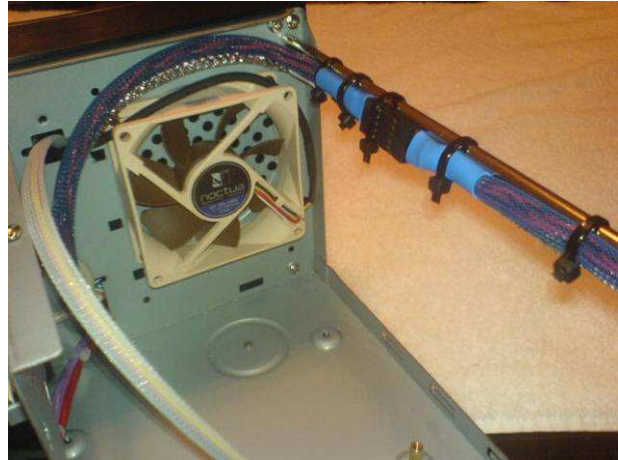
with a cumbersome wiring attachment, designed to accommodate several voltage settings and power connections, depending upon how you pin it up. The attachment was left unused. To add more quiet, I employed the supplied Acoustic Ultra Soft Anti-Vibration Fan Mounts (similar to, but better than, those supplied with the Noctua). Buy extras of all these silicone mounts if you can—they can cut against the screw holes pretty easily, but once in place, they're solid. The fan tail and Zalman resistor for each fan was bundled and tied off to a 1/2" adhesive tie wire mount just above the fan. A yellow and a green sleeved fan cable extension from FrozenCPU will be used to make the mobo connections.

Now here comes some extra quiet and cooling. The Silverstone FP53—an aluminum enclosure for a 3 1/2" internal drive that occupies an external 5 1/4" bay, under \$25 at NewEgg. The look integrates well with the LS13 case. The aluminum serves as both heatsink and sound insulation. The drive mounts onto four internal insulating rubber pads to inhibit vibration transmission. Up front is a cooling manifold and, behind it, a 40mm fan with a 4-pin molex attached for power. I removed the OEM 40mm fan and replaced it with what is likely the quietest premium 40mm fan, The Scythe Mini-Kaze (which, by the way, ships without mounting screws). The Silverstone HD cooler unit has a lot going for it, but it was definitely not designed for ease of fan replacement. Removing the FP53 head reveals that Silverstone could have easily designed in two ... or even three ... 40mm fans wired together, enough to claim the FP53 contributes significant intake beyond just what cools a hard



drive. I didn't, but you can drill a few extra mount holes and make that claim on your own. The Mini-Kaze spec sheet predicts, at 12V, 4.11 CFM, 3500 RPM, 14 dBA. The Mini-Kaze also gets the Zalman resistor treatment. With the resistor, about half of that volume and RPM is expected. Mounted in the top 5 1/4" external bay, the FP53 exhaust flows almost directly into the (on-demand) 60mm fan at the back of the Seasonic power supply. With the twin fans in back and all, we've run out of mobo fan connections. Rather than a cabling mess coagulating the entire area between FP53 and the Seasonic ... 3-pin-to-molex, then 12 inches of molex-to-Seasonic ... a sleeved 3-pin Y-connector from FrozenCPU is used to split the fan pin connector at the front of the board.

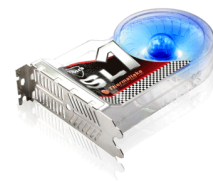
I was also able to find a way to “drape” the other motherboard cables as well. The only structural metal running the left side of the case is a metal bar with sole purpose to provide rigidity. The bar clears the case cover by at least 1/2” (not counting that sound-proofing material, that is) so I used it to run those cables up the length of the case. The blue cable routes the USB from the front to the board, the silver routes the audio from the front (to the connector at the back end of the motherboard) and the green routes one of the rear fans to the PWM 4-pin fan motherboard connector. So far, the mobo is looking to be pretty free of cable clutter.



Now for the guts: an Intel DP965LT LGA775 board, an Intel Core 2 Duo E6600 Conroe and 1Gx2 Crucial RAM. To raise cooling, the Intel cooler included in the retail box was nixed and the chip was instead crowned with the light and well-respected ThermalRight XP-90 cooler and a matching Noctua NF-R8 80mm fan (down). When I unpacked the cooler, I discovered the thermal compound syringe discharged during shipment. Lovely. Luckily, the plastic bag around the cooler served well as a prophylactic. I had planned on using Antec Silver anyway. The (non 775) mount was trashed, but, hey, I didn’t need it. This picture shows the crown outfitted with one of those resistors ... but later I thought better of it and removed it. That corner of the box ought now be pretty well cooled—there’s also the 120mm power supply fan and the twin 60mm exhausts right there all together. I just hope I am “Goldilocks” on the thermal goop used during the crowning. Into the box it goes.



After adding the EVGA GeForce 8600GT graphics card (I hope the fan is quiet), in went some more cooling ... a Thermaltake TMG SL1 A2414 80mm Blue LED Dual PCI Slot Fan. Supposedly quiet and effective, this exhaust fan takes up the space for two slot cards and exhausts out the back. It doesn’t actually plug into the slots, rather it takes its power from a 4-pin Molex plug. Installing it over the two adjacent (and generally unused) PCI Express x 1 slots makes sense, but I gave up one classic PCI slot to give it more room to work with. Plug and dress the wires (a lot of the remaining wiring is easily stashed in the dead space under the drive cages) ... and it’s Ready Freddy.





Will it be cool enough? There's a good chance. They'll be ... count 'em up ... **NINE** fans at work in this box, plus the hard drive heatsink, an effective CPU heatsink ... and a lot of airspace/greenspace resulting from all the wire planning & dressing.

And, no matter what anyone thinks ... the Blue Ice system ... she's a'gonna stay.





### Kudos

There was a wealth of excellent product reviews/reviewers found online that were very, very helpful toward pre-planning. Among those, especially helpful websites were:

3DGameman.Com/Rodney Reynolds  
AcousticPC.Com  
ATrueReview.Com  
EndPCNoise.Com  
ExtremeMHz.Com  
FrozenCPU.Com  
HardwareLogic.Com  
InsaneTek.Com  
ModTheBox.Com

NCIX.Com  
NewEgg.Com  
Performance-PCs.Com  
QuietPCUSA.Com  
SilentPCReview.Com  
SilverStoneTek.Com  
TechGage.Com  
TigerDirect.Com  
Virtual-Hideout.Net

I also found the current edition of the book *Building The Perfect PC* a very useful resource.



## System Components, Prices and Sources

<b>Case</b>	Silverstone LaScala LC13 Black Aluminum. \$99.99, FrozenCPU. Add Professional Sound Dampening Installation, \$49.99.
<b>Processor</b>	Intel Core 2 Duo E6600 Conroe 2.4GHz 4M L2 Cache. \$229.99, NewEgg.
<b>Motherboard</b>	Intel BOXDP965LTCK LGA 775 Intel P965 Express ATX. \$96.99, NewEgg.
<b>RAM</b>	Crucial 1GBx2 DIMM DRR2-667 1.8v RAM. \$75.99, the pair.
<b>CPU Cooler</b>	Thermalright XP-90 CPU Cooler. \$34.99, FrozenCPU. Thermalright LGA775 RM XP-90 Retention Bracket (adaptor for Intel 775 Socket). \$5.99, FrozenCPU.
<b>CPU Cooler Fan</b>	Noctua NF-R8 80mm Fan. \$18.99, FrozenCPU.
<b>Hard Drive</b>	Seagate Barracuda 7200.9 160GB 7200RPM 8MB Cache SATA 3.0Gps ST3160812AS-RK (Retail Kit). \$69.99, JR.Com.
<b>Hard Drive Cooler</b>	SilverStone FP-53 Black Hard Drive Cooler. \$23.99, NewEgg. Scythe Mini Kazi SY124010L 40mm Fan. \$4.45, FrozenCPU. 3-Pin Fan Extension Cable. \$2.50 plus \$3.99 for sheathing (white), FrozenCPU.
<b>Optical Drive</b>	Samsung SH-S183L SuperWriteMaster 18x Internal Double-Layer DVD±RW/CD-RW SATA I (ie, 1.5Gb/s) Drive w/ LightScribe. \$59.99 (Retail Box), BestBuy (on closeout).
<b>3.5 Inch Floppy Drive</b>	Samsung Internal SFD321B/LBL1, OEM. \$6.99, New Egg. 10" Copper Rounded Single Device Floppy Cable. \$6.00, FrozenCPU. [ 4-pin to 4-pin Molex Sheathed Power Cable Provided with Seasonic Power Supply ]
<b>Power Supply</b>	Seasonic M12 500 ATX12V v2.2 Power Supply. \$124.99, NewEgg.
<b>Front Fan</b>	Noctua NF-R8 80mm Fan. \$18.99, FrozenCPU.

3-Pin Fan Extension Cable. \$2.50 plus \$3.99 for sheathing (white), FrozenCPU.

3-Pin Fan Y Splitter Cable. \$2.50 plus \$3.99 for sheathing (white), FrozenCPU. [ To split power off between Front Fan and Hard Drive Cooler ]

## Rear Fans (2)

(2) AcoustiFan Dustproof, 60mm. \$25.95@, QuietPC.

(2) Zalman RC56 7V Noiseless Resistor 3-pin Fan Cable. \$2.75@, QuietPC.

AcoustiFan Ultra Soft Anti-Vibration Fan Mounts AFM02B 8-Pack Retail. \$5.75, QuietPC.

(2) 3-Pin Fan Extension Cable. \$2.50 plus \$3.99 for sheathing (1 green, 1 yellow), FrozenCPU.

## PCI Slot Fan

Thermaltake TMG SL1 A2414 80mm Blue LED Dual PCI Slot Fan. \$17.99, FrozenCPU.

[ 4-Pin Molex Sheathed Power Cable Provided with Power Supply ]

## Monitor

Samsung SynchMaster 245BW 24" WideScreen. 1920x1200, 16:10, native. Contrast 1000:1 (DCR 3000:1). DVI/VGA. List: \$499.00. Circuit City. A Black Friday special ... \$50 Circuit City POS discount + \$50 mail-in Samsung rebate + \$70 mail-in Circuit City rebate + a \$20 anytime Circuit City coupon = \$309.99 before tax. A real steal. It's blasting the back of my eyeballs something silly. [ N.B.: Samsung has a history of rebate scamming and never delivered its portion of the rebates.]

## Speakers

Altec Lansing FX3020 SoundBar. \$65.85, Amazon. A fabricated 24" power wire taps into the audio speaker power outlet in the Samsung (for the optional speaker bar that Samsung never actually marketed). On SoundBar end, use Radio Shack Size K Coax plug, SKU 274-1567. On Samsung end, use Radio Shack 4.0x1.7mm plug (yellow tip with slits in inside diameter), SKU 274-1532. The height of the SoundBar force the user to give up about 0.75" from the lowest possible screen adjustment.

## Graphics Card

EVGA GeForce 8600GT 256MB / GDDR3 / PCI-E / SLI-Ready / Dual-DVI / HDTV Graphics Card. \$94.99 (with \$20 mail-in rebate), TigerDirect.

## Thermal Compound

Antec 77063 Silver Thermal Compound. \$5.49, NewEgg.

ArctiClean 1 & 2 (Thermal Material Remover and Surface Purifier) 60ml Kit. \$5.95, FrozenCPU.

**Misc. Cables/Items**

(2) 12" 10-Pin Internal USB 2.0 Extension Cable. \$8.99 plus \$3.99 for sheathing (blue), FrozenCPU. [ For USB, From Front Panel to Motherboard ]

(3) 12" 10-Pin Internal USB 2.0 Extension Cable. \$8.99 plus \$3.99 for sheathing (silver metallic material w/ white heatshrink), FrozenCPU. [ For audio, From Front Panel to Motherboard ]

Standard Motherboard Power LED Extension Cable. \$1.99 plus \$3.99 for sheathing (purple), Frozen CPU.

Standard Motherboard Power Switch Extension Cable. \$1.99 plus \$3.99 for sheathing (red), Frozen CPU.

Standard Motherboard HDD LED Extension Cable. \$1.99 plus \$3.99 for sheathing (orange), Frozen CPU.

(1) Adhesive Zip Tie Mount, 5-pack, 13/16<sup>th</sup> Inch, White. \$1.75, FrozenCPU.

(1) Adhesive Zip Tie Mount, 5-pack, 1/2", Black. \$1.50, FrozenCPU.

Do-it-Yourself Case Badges, Sheet of 6. \$10.00, Directron.Com.

Windows XP Chrome Case Badge. \$3.80, FrozenCPU.

Mud Flap Girl Gold Case Badge. \$3.80, FrozenCPU.

Intel Inside White Case Badge. \$3.80, FrozenCPU.

Intel Core Duo Chrome Case Badge, \$3.80, FrozenCPU.

A gazillion wire ties from the local hardware store. Priceless.