

## NAGRA'S 300B AMPLIFIER



This 4-page photo reportage is the final chapter to my Nagra factory tour of exactly one year ago. Here I fill a few holes of the prior narrative while focusing on the company's new 300i and 300p amplifiers. Due to a delayed release - during this visit for example a production power supply board underwent a last-minute modification - these two models look set to become the stars of Nagra Audio's 60th anniversary celebration next year. The factory tour already had a number of interesting shots of the prototype triode amp during assembly. Three of those photos feature again. For various screen captures of the hi-tech multi-layer mother board and exploded views meanwhile, please refer to the original report to avoid repetition.



Encased in Nagra's trademark compact chassis familiar from their preamps and 60wpc MSA, the 300B amp with signature modulometer makes 20 watts RMS in pure class A from a pair of push/pull direct - heated triodes which are protected / adorned by Pyrex glass chimneys. Unusually, the power bottles are driven from bipolar transistors for a reversal of the usual tube/transistor hybrid. Also unusual are the 40-section toroidal output transformers which stack two up inside the casing on deck. That casing attaches with just three bolts, three guide pins and a 10-pole slip contact socket to ship separately. During transit this physical separation protects the top-heavy architecture. The 31 - wire toroidal mains transformer tucks below deck.

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Full-power THD is 0.8%, bandwidth 15Hz to 55kHz @ -3dB and input impedance 100kohm. Output impedance is about 1/10th of each respective tap, i.e. 0.4 at 4 ohms, 1.6 at 16 ohms. S/N ratio is between -105 and -108dB. Input sensitivity is 2V (input 'D' of the integrated is 4V to accommodate hi-gain sources). The 300p has selectable RCA or floating balanced inputs. The integrated gets 3 x RCA and 1 x XLR inputs plus Nagra's second generation RCU-II remote from which to control input selection, volume and balance.

Seen flying solo in his kit helicopter next, Jean-Claude Schlup is the quite legendary manager of Nagra Audio's R&D team. In his office away from the audio campus he explained his preference for no global feedback (thus no pentodes), bipolar drivers (Nagra's compact form factor didn't allow for input/driver valves) and toroidal transformers (Nagra perfected complex split-core toroidal designs decades ago but as a push/pull design, the 300 needed no gap).

For photographs, Schlup's version of the mad scientist's lab was fair game. The man himself was not. As you'd expect, his lab was crammed with test kit. He also had a Thorens turntable right adjacent to his Windows PC and an Internet connection that was slowed down by Nagra's extensive in-house security scans.

sEcurity and Nagra are joined at the hip. Air-lock doors and security clearance to enter buildings and specific areas (Nagra Audio's marketing manager

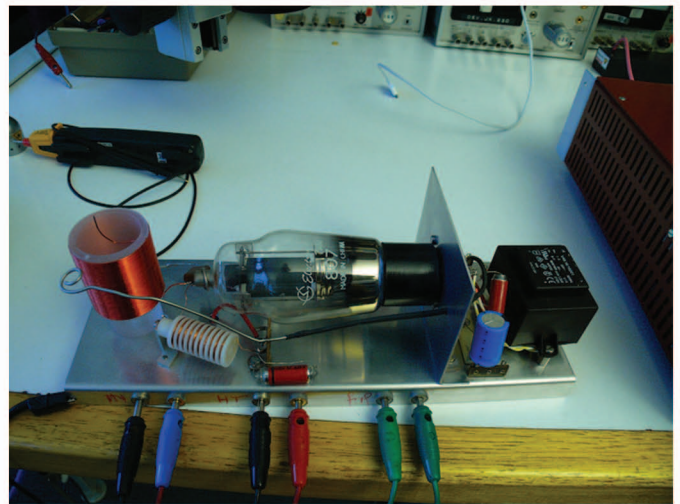
showing me around again didn't have universal clearance to require override access for certain zones) are just the beginning. An in-house team led by Mr. Kudelski's son Henri oversees their IT products' immunity to hackers. A mirror to Nagra's main server connected via custom fiber optics lives in a different building. Under accidental fire, its room gets automatically doused in fire-extinguishing Argon. A sign on its door warns you to under such conditions vacate the room immediately to not suffer gas exposure.



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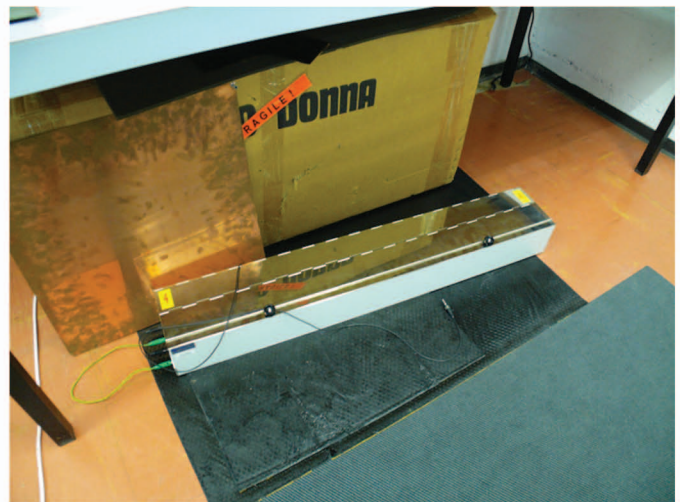
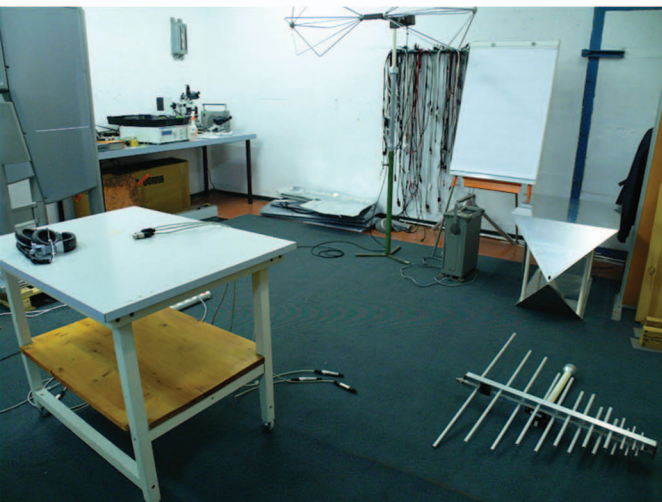


Back to Mr. Schlup's lab, here is one of his personal benches.



Here is his vintage Thorens with Nagra's BPS phono stage.... and an exploratory plasma tweeter. It's here then where all of Nagra Audio's models are first conceptualized, blessed for development next and finally signed off before they hit dealer shelves. It's Nagra's birth & benediction central for all audio matters and the work place of Jean-Claude Schlup who for lack of a formal photo shall remain its éminence gris.

Around the corner from Schlup's lair is Nagra's CE and UL approval test facility. It stocks all the necessary tools to disturb or damage inferior circuitry such as a high-power RF antenna to simulate intense ultrasonic interference...



... AC line zappers and other 'catastrophic' condition stimulators. They all help generate a complete battery of tests to assure and certify that Nagra equipment conforms with all international safety and emission codes for consumer electronics and other products.

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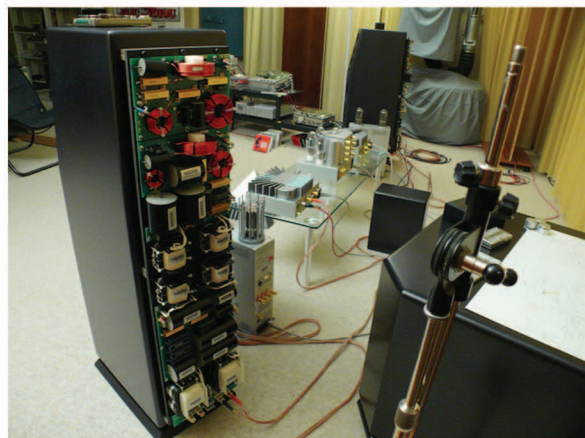
About other products, in the same room this day were samples of card-triggered ski lift gates wired up for their own test. As my factory tour chronicled, Nagra's penetration of different industries is far more widespread than the average audiophile would suspect. Audio in fact is the puniest part of this empire.

Each time Swiss drivers drop coins in a parkomat, the till at Nagra rings. That's because they own the company which installs and runs our domestic parking-fee machines. Ditto for ski lifts of course.

Still on the main campus and close to Schlup's quarters was Nagra Audio's second audition room, something my factory tour didn't cover the first time around.



Dating back to the days when industry pundits proclaimed with absolute certainty that no high-end audio firm could possibly survive without a presence in home theater, this room was designed as a private cinema with six terraced actual Swissair 1st class seats which were refurbished to tilt like they do in an airplane. The resident speakers were



naturally Nagra's own, albeit not in production but one-upped for this application. A look at their backsides demonstrated what Schlup casually called "a crossover for grownups".

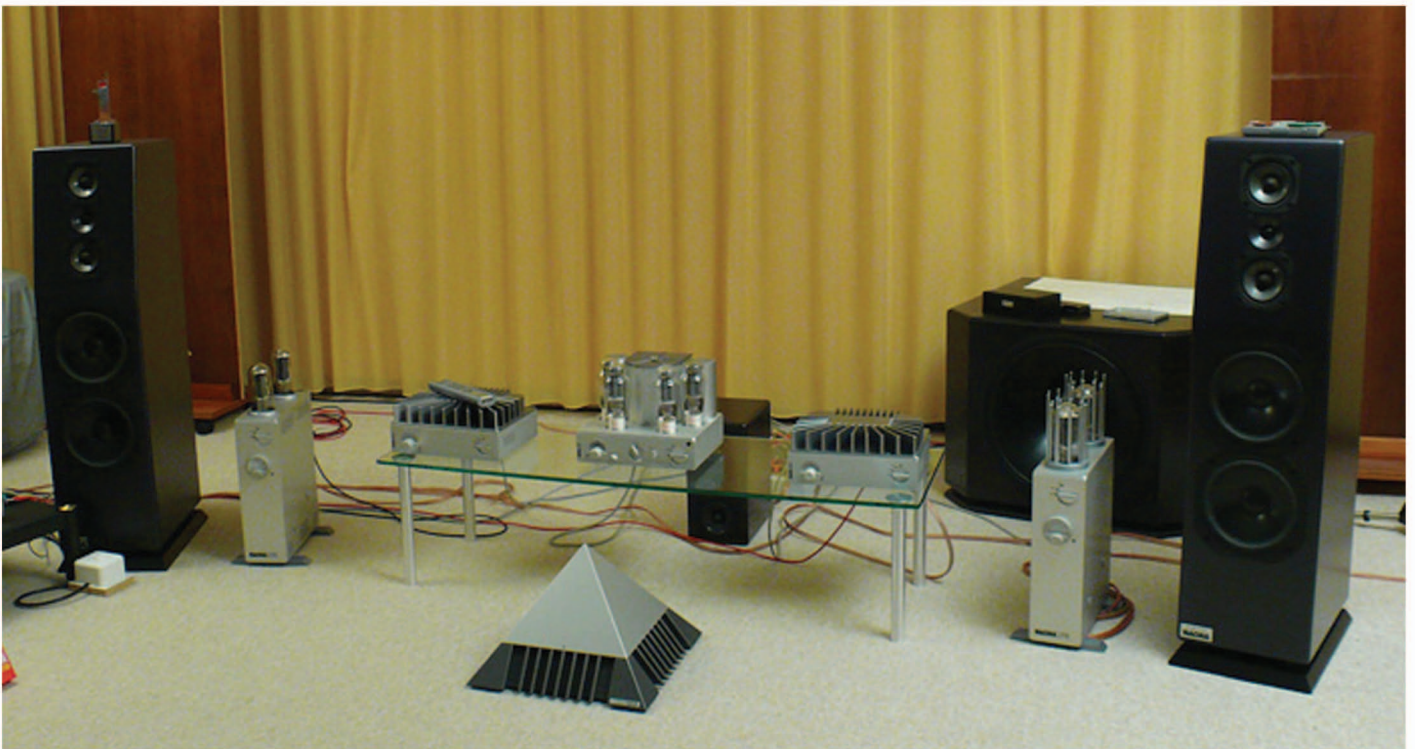


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Few will know that Nagra in those days had their own multi-channel processor which was aborted in the 11th hour.

'twas a multi-channel format company which killed the project. Having worked religiously with the Dolby/DTS CD-ROM of certification requirement specs, Schlup was still visibly flustered to recall that Nagra had dispatched a sample for formal certification only to have it rejected. As was subsequently learnt, Nagra was sent an out-of-date CD-ROM when the project began. Afterwards nobody bothered to submit revised actual specifications to their soon-to-be licensee for a successful conclusion. As the Swiss learned, the revisions required to conform to the new specs would have meant a complete product redesign. Schlup pulled the plug instead.

At the time of my visit, he was engaged in a small tussle with Apple. Keen to assess whether tapping an iPod's digital signal held any sonic potential for a future Nagra product, Schlup was ill-prepared for the 50-page contract he got in response. He wasn't ready to apply for Apple certification. He wanted to first test whether Apple's authentication chip could perform to his standards. Would he stomach the considerable red tape to make that assessment? The future might tell.



This and the home-theater interlude illustrate an ongoing disconnect between big corporate entertainment industries and smaller high-end audio firms. The latter can never catch up with the furious pace at which formats and software protocols change. This is especially true of PC audio and so-called music servers. Audio companies with products committed to maintaining perpetual electronic handshakes with computers must vigilantly respond to emerging incompatibilities with code patches, firmware updates or circuit redesigns. Nagra expects its products to remain in the market for decades. That makes the PC interface proposition a daunting prospect. Nonetheless an eventual Nagra music



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server concept is being entertained.

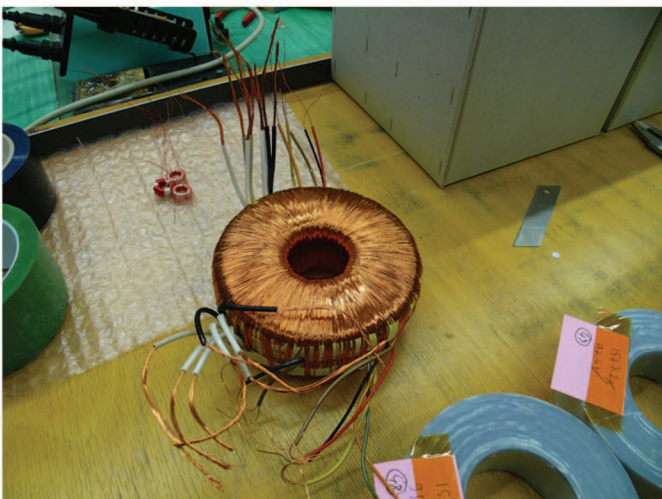
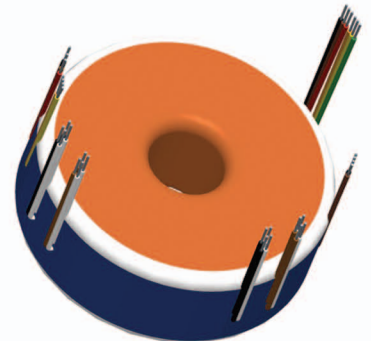
We'll now enter the audio production area. A sign advises anyone entering to protect their shoes in the anti static slippers available right behind the door. Employees working here must also wear anti static wrist bands.

Here is Nagra's in-house transformer winding center. Old lion Siegfried was supposed to retire shortly after I met him a year ago. Now he really had only had a few more weeks before his replacement could fly solo. Had Siegfried taught him everything in the intervening year? "Probably not. But he can always call me if he needs help. I'll be happy to come to the factory to explain something in person."



Here is the 31-wire power toroid for the 300 amps. It is wound by hand, takes approximately five man hours to complete and there's only one gent at Nagra now who knows how to do it. Subcontractors, Schlup found, simply aren't up to the task.

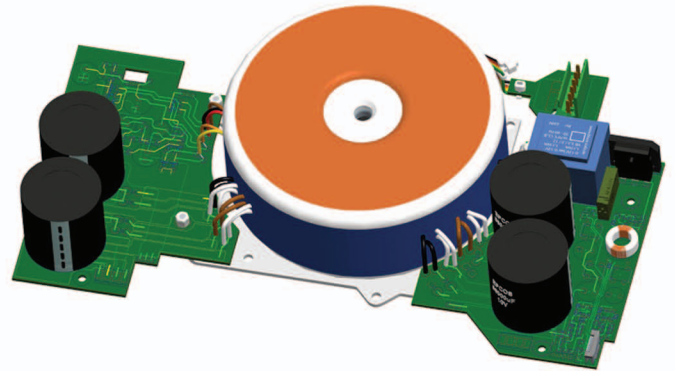
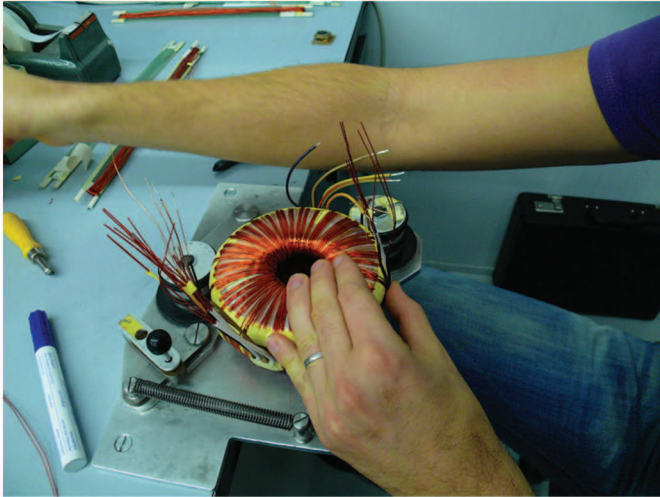
The tool used for hand winding a transformer looks very much like a weaving loom's shuttle.



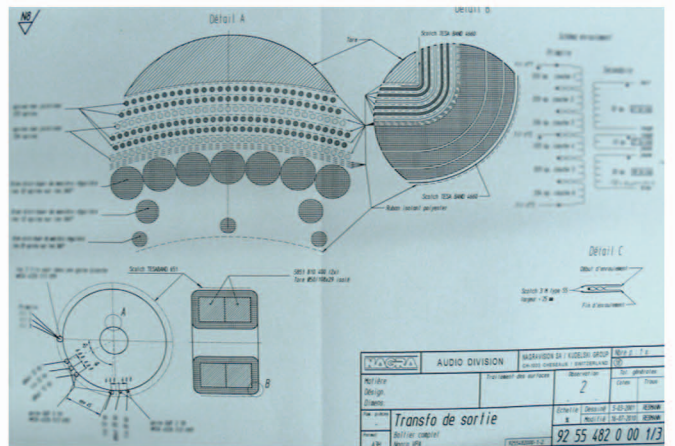


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Here is Siegfried's protégé/apprentice Adel with a 300 mains transformer.

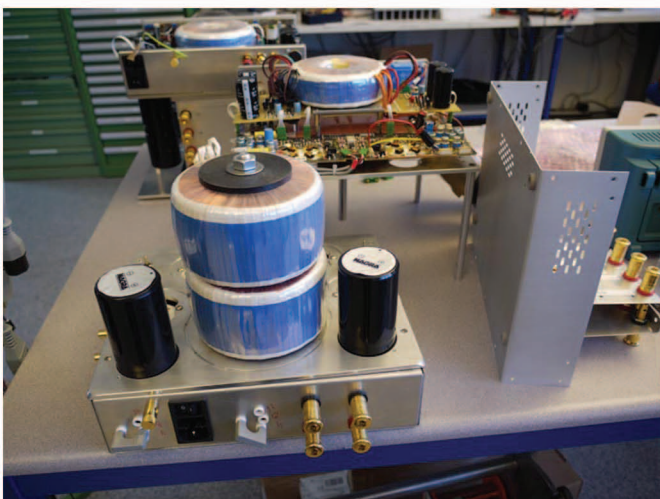


This is how the mains transformer installs.



Now we're at a screen shot of the very complex 300 transfo de sortie. Its specifics are Nagra's intellectual property of course so I intentionally blurred out certain details of the schematic while still showing enough to communicate its complexity.

When asked why he didn't specify a more expected double C-core unit—my single-ended Yamamoto A-09s is the only other commercial 300B amp I know of to run a toroid OPT — Schlup explained that unlike Nagra, most audio designers lack the experience and skill to design proper toroidal transformers."They prefer EI or C cores by habit. There's nothing

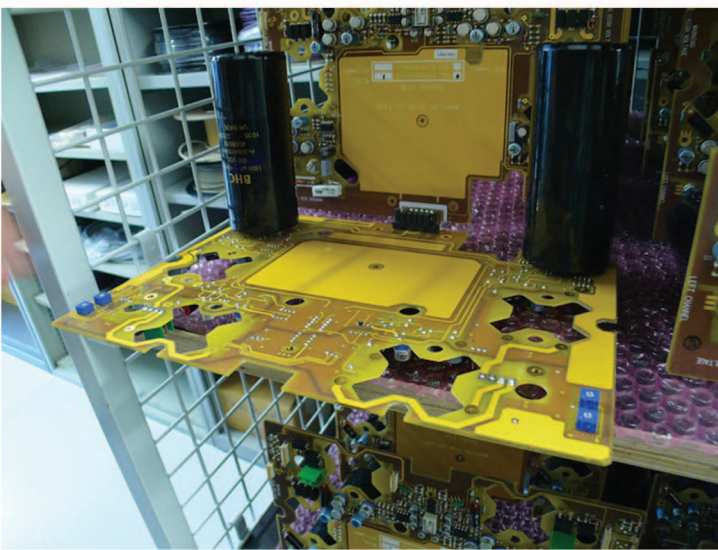




# ΠΑΓΡΑ'S 300B AMPLIFIER

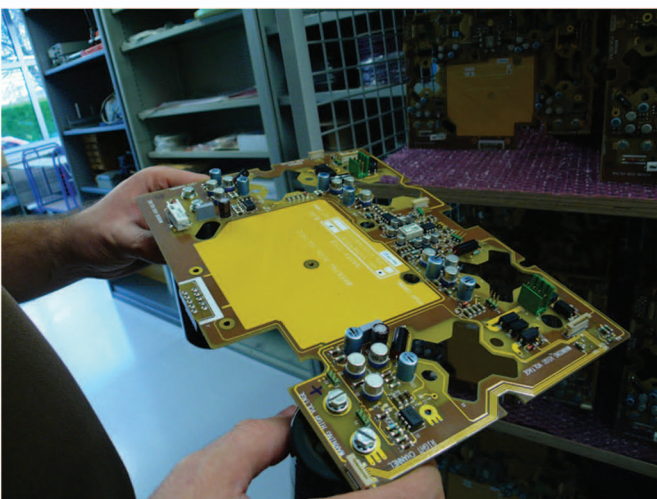
inherently superior in those. We have worked with this type of toroid since 1975. We know how to do it properly." [Below is the prototype from a year ago. It shows the double-decker output transformer stack above deck.]

Here we encounter various 300 sub assemblies. I spotted enough mother boards to build 160 amps. At about \$20,000 retail each in Switzerland, that's significant production volume for a niche model. And yes, this was the first run which had to satisfy initial dealer and early customer orders. Matthieu Latour joked how he was "dead already. I've promised them delivery months ago. If you want to take any forbidden photos, go ahead. They can't kill me twice."



Here is the main 4-layer circuit board whose outward appearance doesn't betray the considerable complexity of three-dimensional 100 micron traces crisscrossing inside its modest thickness. The blue trim posts are of course for the 300B bias current. Adjustments are dialed in with the modulometer.

Here we see the same bias pots as actual users will—hidden beneath top-panel opening—and the corresponding display selector and modulometer readout.

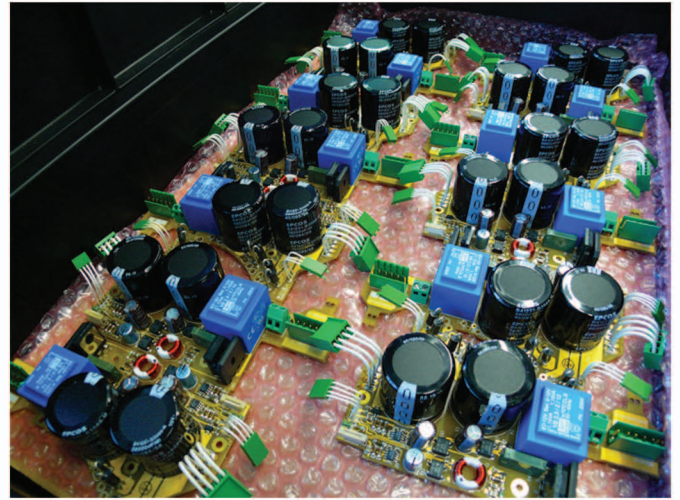
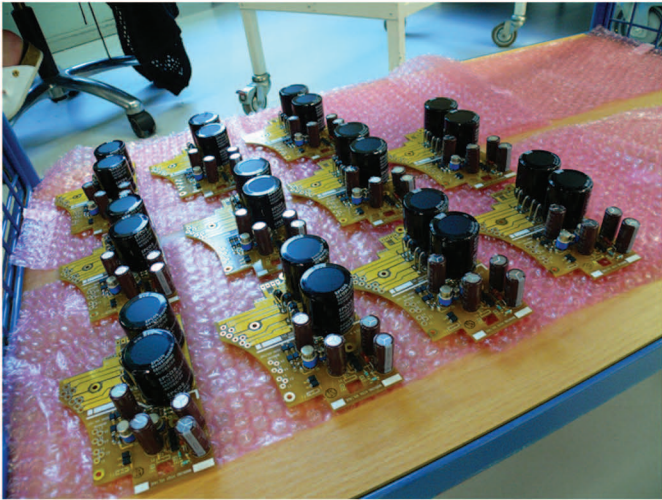


Here we're back with the mother board from its other side..... and a stack of another 40 amps in the making.

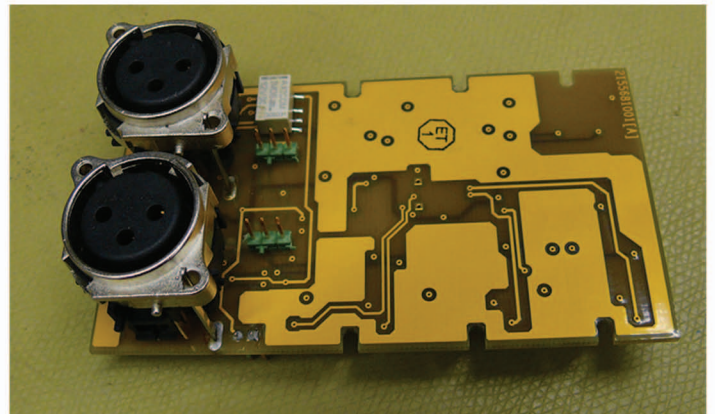
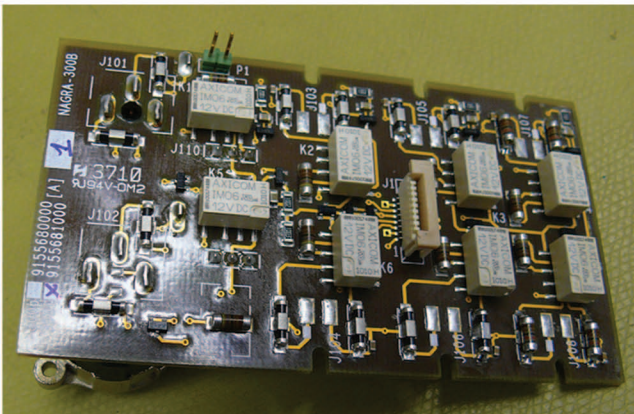




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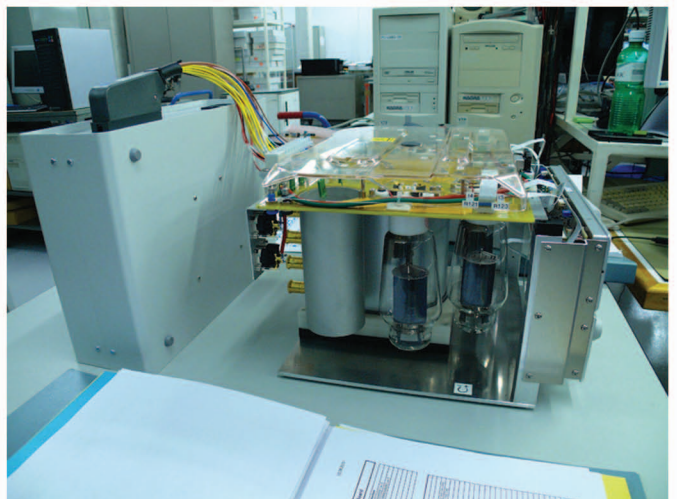
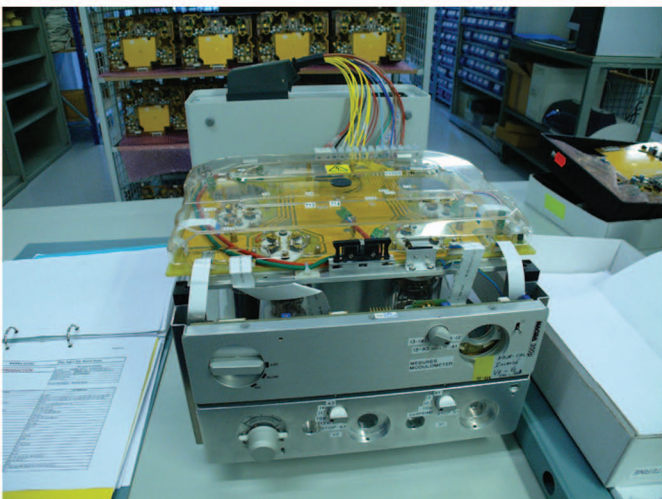


One half of the power supply surrounding the mains transformer... .. and the other half with a mains filter.



One side of the 300i input board...

... and the other side.

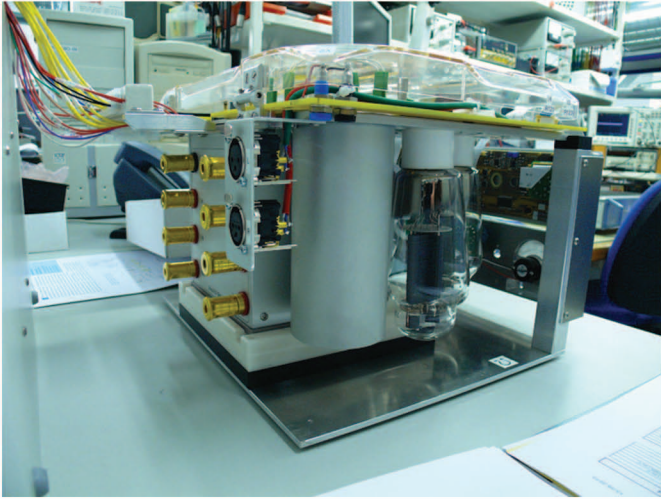


Here we're at a 300 test station for the signal circuitry. Its lid was a repurposed Nagra tape-recorder cover.

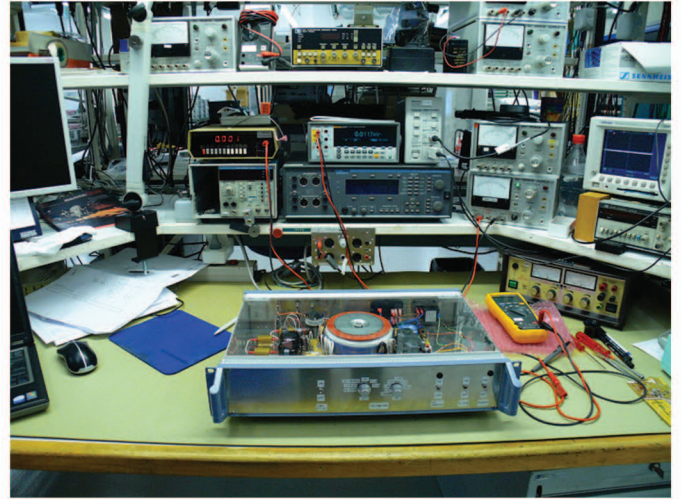
The test station power supply connected via flying leads and a massive multi-pin socket.



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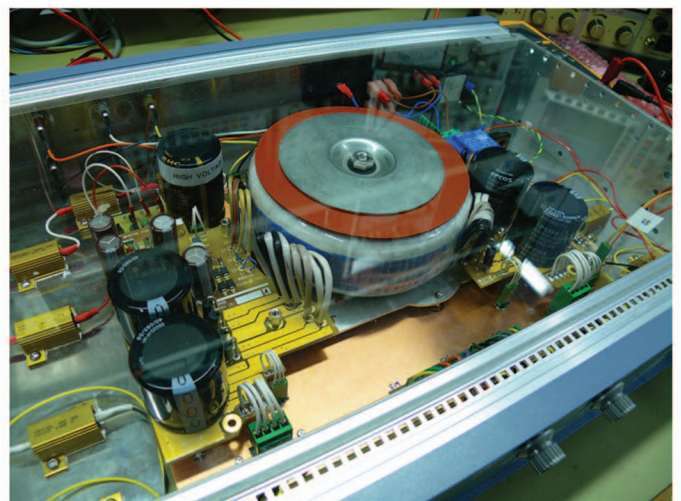
The JJ power tubes - Nagra necessarily has to provide current rather than NOS valves and acquired an initial inventory of 700 bottles from this Slovak supplier - hung upside down for the occasion.



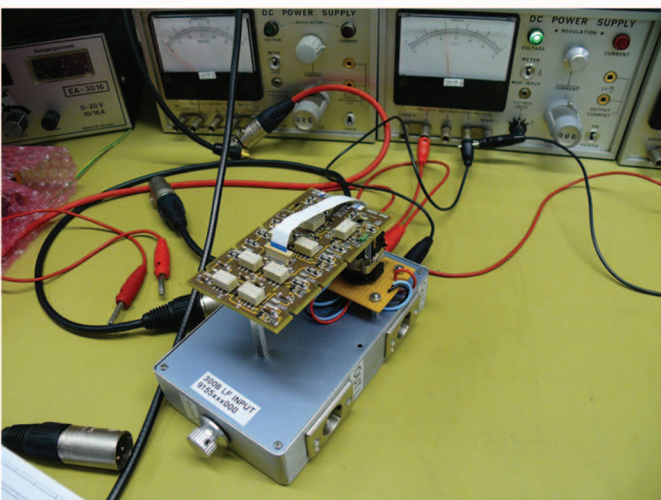
Here is the equivalent test station for the 300's power supply circuitry without an operator...



... and with.



A closer look at how the supply terminated into load resistors for the occasion.



Here is a 300 input board being put through its paces.



Elsewhere in this area a lady judge checked up on a fully assembled MSA.

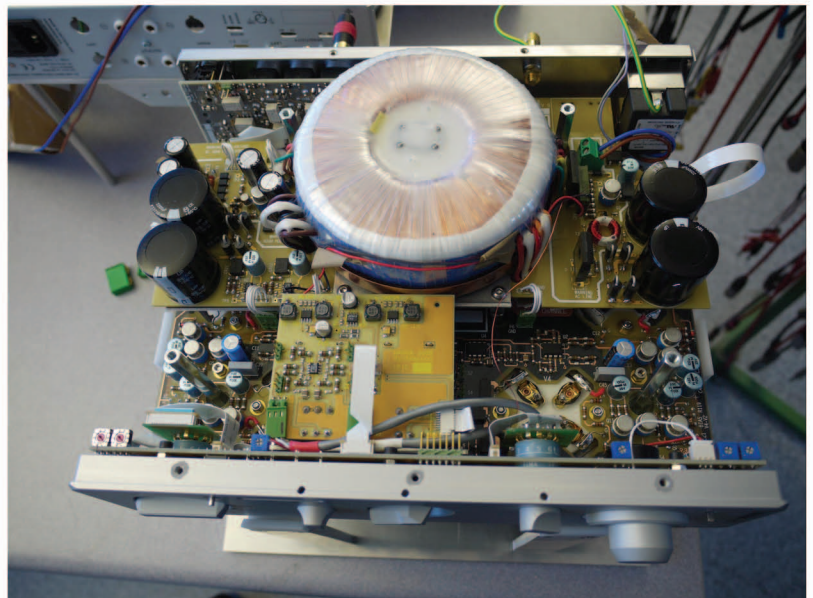
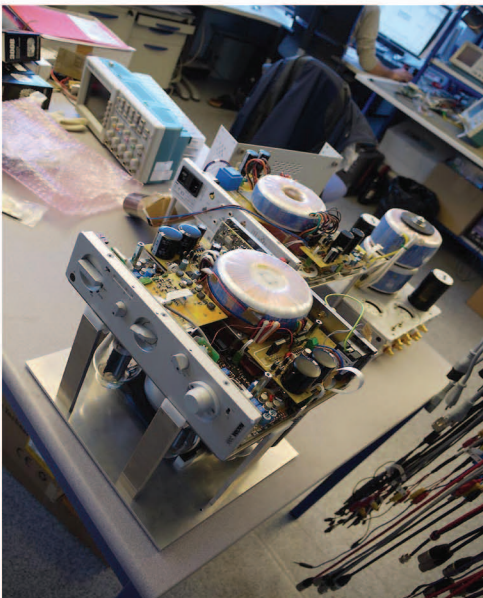


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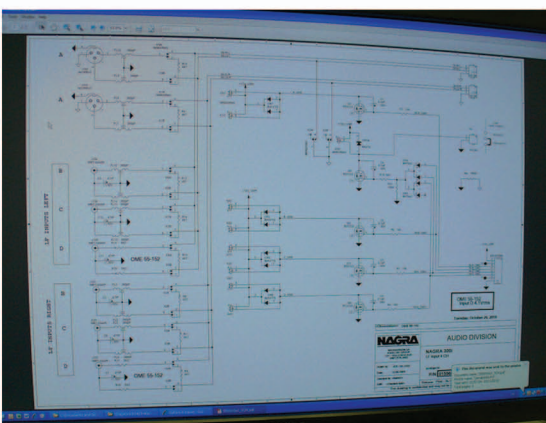


Nagra prides itself on being an equal - opportunity employer. Their machine shop for example is run by a young lady. The assembly area here had more women than men.

Test gear at Nagra mushrooms as though it was cheap Electric Avenue kit rather than serious Audio Precision laboratory stuff.



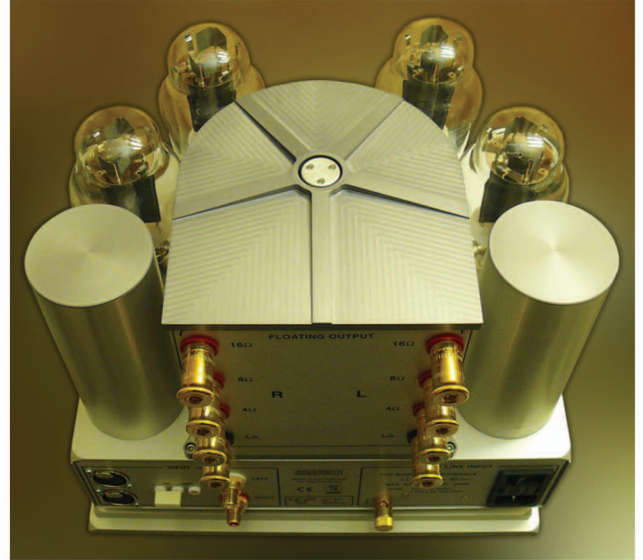
Here are two more images from the prior factory tour. A year ago, this was still a prototype assembly. Here is a close up that shows the proto's mains transformer and power supply and input boards above the mother board.



While we're still in guts & glory mode, here is a screen shot of part of the 300i's schematic.


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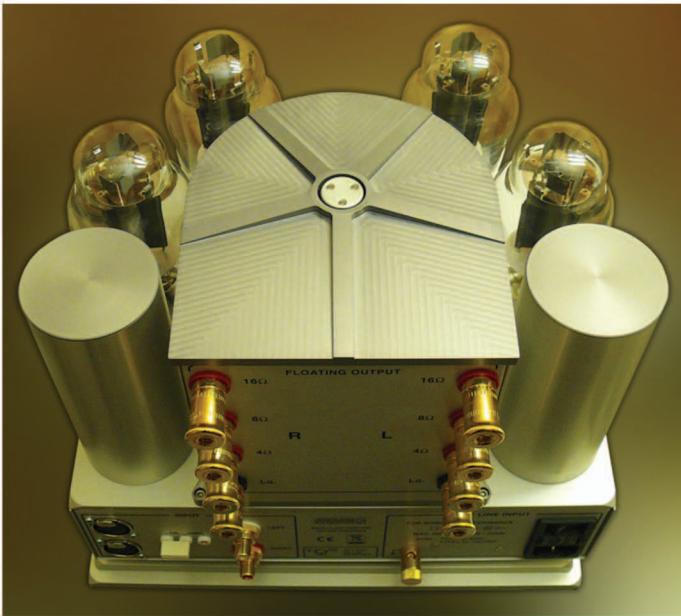
For how all these circuit boards and sub assemblies finally come together, here we face Nagra's 300p power amp just as you'd see it on top of your equipment rack without the decorative and protective Pyrex chimneys. The top view affirms how the design does max out all available real estate which Nagra's signature foot print and form factor imposed. Schlup abhors gigantomania electronics. He prefers compact and smart.

The 300i and 300p offer 4, 8 and 16-ohm outputs to complement a wide variety of conventional and esoteric speaker mates (HighEnd Zürich 2010 used B&W 804Ds as shown next).

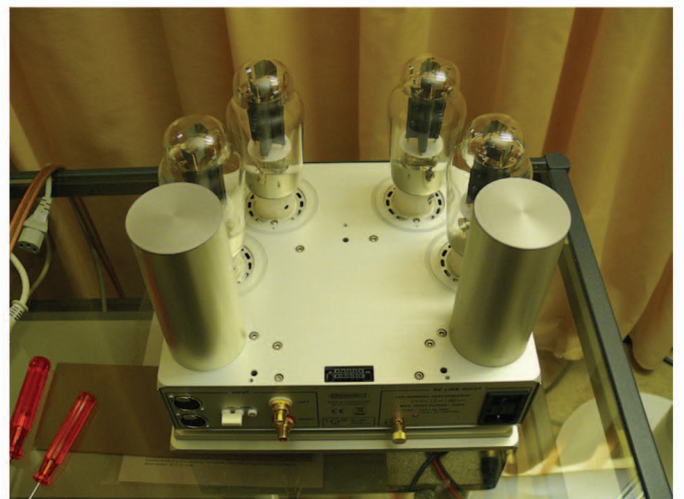


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The amplifier is provided with rounded spike footers. While the twin-plinth VFS absorption platform with viscoelastic decouplers and strategically lined-up dimples for the support component spikes is an option for other Nagra models, it is standard issue for the 300i and 300p.



With four power triodes on deck, densely packed innards and a substantial transformer tower, there really was no room for small-signal input tubes anywhere. Career rollers will cry foul, others will applaud one less chance of tube aging and possible noise.



In this montage we see just how easily the OPT module dis- and reattaches in the final production version. To remount takes three bolts and a bit of a steady hand with three pins as guide. It's no more involved than screwing in a light bulb.

Here we go topless one last time before my tour guide intervened for some suit 'n' tie culture.

Prior to my Chesaux visit, he'd emailed me an invitation to a public unveiling of the 300i at Château d'Aigle later in the month. This castle in the vineyards is a 10-minute drive from my house. He rightly assumed that I might like to attend. Nagra does things in style.



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Confusing the dates however, my wife and I had made tracks to the château on the wrong weekend. Because our stint happened to fall on an exceptionally sunny day, I took some preemptive photos in case the real day a few weeks later would prove to be gloomy. These images shall wrap up today's reportage with some impressions of the Chablais region — about 30 minutes east of Nagra's Chesaux digs—during the fall season.

It's admittedly a bit like fairytale postcard land. Working the vineyards rather than sampling wine in the château's tasting room would get you right back to earth of course but let's not spoil the mood.

The castle is vacant over the winter but available for occasions. Here it had been rented for two weddings. The glamorous wedding planner who spoke a bit of English had never heard of Nagra and was confused why'd anyone expect anything as nerdy as audio at 'her' château that day. Duly exposed, any attempts at crashing those weddings had been foiled.

**SONS** & **SENS**  
 1ère rencontre des audiophiles, mélomanes et amateurs du goût  
 Château d'Aigle  
 19 et 20 novembre 2010

<b>VENDREDI 15:00 A 18:00</b>	<b>SAMEDI 10:00 A 18:00</b>
	Démonstration de matériel audio NAGRA, Verity, Carminis et Stenheim Première présentation en Suisse romande du NAGRA 300B Parcours des sens ludique au Musée de la vigne et du vin Exposition Didier Voiriol Artiste travaillant le fer
<b>VENDREDI 20:00</b> (CONCERT ACOUSTIQUE WORLD, JAZZ) STRINGS AND WOOD suivi d'un accord vin & fromage Réservation souhaitée - CHF 50.--	
<b>SAMEDI 19:30</b> (REPAS GASTRONOMIQUE L'EVEIL DES SENS) Accord mets, vin & musique Menu composé par Jean-Luc Vermorel Chef du Restaurant La Gare à Cully Sur réservation - CHF 140.--	

Renseignements et réservations - Château d'Aigle 024 466 21 30 ou autour du vin - Pascale Sierro-Rey - pascale@autourduvin.ch 078 860 05 33



A look southeast at the surrounding vineyards. Here's a quick squinty glance into the sun for some retina burn before it would set behind the mountain range. And that's it.



If some of these images were a bit bright...  
 ... and others cast the long shadow, that perhaps is the most appropriate way to bow out. À bientôt!

*Srajan Ebaen*