



DECEMBER 2006



# MOSCODE 401HR

**Reviewers:** Marja & Henk

**Sources:** CEC TL5100, Audio Note tube DAC, Philips DVP 5500S SACD/DVD player

**Preamp/integrated:** TacT RCS 2.0 room control system; Lamm LL2 [on loan], KR Audio Model 150 [on loan], modified Audio Note Meishu with AVVT, JJ or KR Audio 300B output tubes; Moscode 401HR [in for review]; Trends Audio TA-10

**Speakers:** Avantgarde Acoustic Duo Omega; Avantgarde Acoustic Solo in HT 2.0 setting; Audio Note AN/Jsp silver-wired; Tannoy Glenair [in for review]; Quad ESL 2905 [in for review]; Mobile Fidelity OML-2 [in for review]; Von Schweikert VR5-SE [in for review]; Haliaetus Firebird [in for review]; Final Sound 1000i [in for review]; Velodyne 12DD [in for review]

**Cables:** Audio Note AN/Vx interconnects; Siltech Paris interconnects; Gizmo silver interconnect; Qunex 75 reference interconnect; Crystal Cable CrystalConnect Reference interconnect, CrystalDigit S/PDIF RCA/RCA and RCA/BNC, Y-cable, Crystal Cable Piccolo iPod to XLR, CrystalPower Reference AC-Eur/IEC; CrystalSpeak Reference, Audio Note AN-L, Gizmo silver LS cable; Virtual Dynamics Revelation power cords [in for review], Bocchino Morning Glory [in for review], Harmonic Technology Magic Woofer, Magic Tweeter & Pro AC11 [in for review]

**Power line conditioning:** Omtec PowerControllers

**Equipment racks:** Two double sets of Solid Tech Radius; Acoustic System amplifier shelf

**Sundry accessories:** IAR carbon CD damper; Denson demagnetizer CD; Nespa #1; TacT RCS calibrated microphone and software; Exact Audio Copy software; Compaq server w/Windows Server 2003 and XP; wood, brass and aluminum cones and pyramids; Xitel surround processor; Manley Skipjack; Boston Audio Design TuneBlocks; Furutech DeMag

**Room treatment:** Acoustic System Resonators; Gizmo's Harley Davidson cap

**Review component retail:** \$4,995 direct from website



Only the best have a chance at becoming a classic. Having reached classic status from this select group, only the very special entries stand a chance at growing into a legend. And from these legendary products, only a handful get a chance at being reborn. With the Moscode 401HR, a legend has been reborn. To explain why, let's return to the beginning.

It was in the 1930s that the first notions and experiments arose on output transformer-less or OTL amplifiers. During those halcyon days of early audio, tube amplifiers were the only game in town. It was commonly understood that the final part in these designs, the output transformer, was the weakest element which limited the amp's overall performance. The challenge was how to connect the high voltages of tubes to a loudspeaker without damage. Moreover, how to match the high impedance of tubes to the low impedance of speakers without a transformer?

The Second World War changed many things, not just in Europe but also in the US once they entered the war. A young Julius Futterman joined the Signal Corps after he got drafted and he was one of those solder slinger who, if he'd lived 50 years later, would have become a computer wiz. Back then the really hot thing was electrical circuit design. Just like kids of any era, there was an ultimate wet dream to go after. Today, it'd be the perfect computer hack job breaking into the CIA data base or crashing the Microsoft website. Then it was the design of the perfect OTL amplifier.

When the war was finally over, a whole generation of men had gotten trained using high quality tube circuitry. During the economic boom following, only a few diehard tinkerers held on to their OTL dream. Most segued into a standard existence and bought their audio gear off the shelf, mostly in DIY kit form.

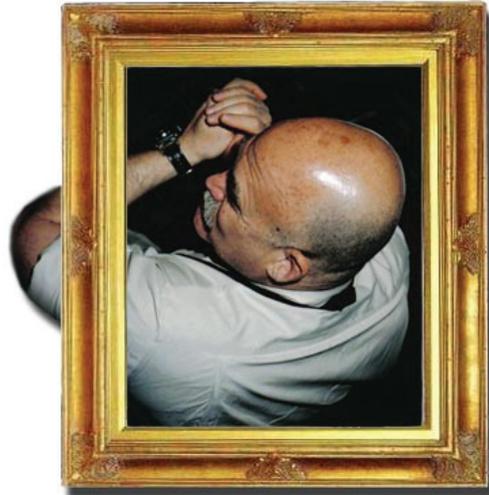
This post war period also watched the advent of television. TV sets used tubes and these valves were of superior quality than the tubes used earlier purely for audio applications. The new bottles were more reliable and with such glass on hand, Julius Futterman could finally create the amplifier of his dreams. He patented the Futterman OTL circuit in 1953 using power tubes like the 6082 or 12B4.

Even though the transistor shook up the world of electronics and audio in particular from 1954 on, Julius held firmly to his OTL tube concept. He was lucky that from the end of the 1960s forward, tube equipment was celebrating a modest revival. This made it possible for Julius to start his own company, a kitchen table effort where he fabricated amps for friends and enthusiasts and sold them in his NYC shop.

If synchronicity wasn't afoot already, it kicked into high gear when Julius Futterman met Harvey Rosenberg through a mutual acquaintance. Harvey was a tube aficionado and audio savant who bought almost any tube or tube amps he



could get his hands on. As long as it glowed, it was acquired. Now he managed to book a 20-year-old Futterman amplifier. This purchase changed his life - and those of many to come [in the UK, it started what would become Croft Laboratories which still exists - Ed.]. Originally a marketer and brand maker, Harvey -- Gizmo informally -- had wanted to launch an audio enterprise forever. He had designed circuitry and held a special interest in power supplies. For speakers, Gizmo used a pair of heavy modified Quad ESLs, the high-end standard of the day. When he connected the strange-looking Futterman to his cherished Quads, Gizmo was blown away. Until then, he'd been chasing his ultimate goal of tonal transparency in vain. None of the tubes, circuits or amplifiers had fulfilled his urge for the sought-after special quality. This combination of Futterman and Quad now had and gave it all.



Pursuing the idea of owning an audio business, Gizmo thought briefly on simply copying the seemingly very simple Futterman circuit and voilà, he'd be in business. Then sanity and morals thankfully interrupted his ecstatic head trip and Gizmo instead decided to visit Mr. Futterman in his 72nd Street shop just a few blocks over from his own posh flat. What a shock it must have been to enter Julius' digs. Every one of his amps was hand-made, each was unique. Each and every transformer was hand-wound. According to Rosenberg, bits and pieces, tubes and resistors were sprawling around in one giant mess through which Julius moved like Moses parting the sea to do his magic.

At the first meeting, Gizmo asked Mr. Futterman whether he would license his circuit to him. Julius declined, explaining that he'd already done so repeatedly to many renowned companies none of which, despite expertise and investments, had yet produced a single working unit. Harvey wasn't dissuaded in the least. What he saw inside his Futterman amplifier was so simple, it could not possibly be hard to replicate. He already entertained the notion of cleaning up what to him were sloppy solder connections and bizarre wire routing routines. Gizmo envisioned board mounting the parts for easier mass production. How wrong could he be?

For those who have known Gizmo and his charming chutzpah, it won't come as a surprise to learn that he indeed persuaded Mr. Futterman to license him the use of the circuit. Now Gizmo's life took a sudden turn. He sold off all his businesses, his apartment, left the Big Apple and founded New York Audio Labs or NYAL for short. NYAL was dedicated to commercialize the Futterman circuit. All of this happened quickly as though a higher power steered it so that just before Julius Futterman departed this dimension in 1979, Gizmo and his associates had been able to wrest almost all there was to know from the OTL magician. The NYAL version of Julius Futterman's idea -- after lots of trials and even more literally flaming errors -- finally became a viable statement amplifier.

Even though Futterman was a red-blooded tube guy, the fact that Gizmo & Co. remained the only outfit to manage producing OTL amplifiers to his specifications made something in the back of his mind click. He wanted to design an OTL that would use Mosfets in the output stage instead of tubes. This was based on the fact that Mosfets wouldn't require tube matching and outlive valves. Further, Mosfets seemed ideal to cope with the rise of inefficient loudspeakers with their extreme low impedances. A Mosfet-based amplifier could also provide almost infinite power compared to tube-based equivalents. And not lastly, Mosfets could be made to sound very similar to tubes.

Forward to 1982, the year when NYAL struck a deal with AFP Imaging, a manufacturer of medical and veterinary X-ray equipment, to form a joint venture. This company was viewed as an ideal partner since they had a complete automated electronics manufacturing system on hand. NYAL could now pursue Futterman's final dream of a Mosfet-based tube-type amplifier.

One of the problems NYAL had to face was finding a solution to drive the Mosfet's gate. This required a driver stage with low output impedance but enough current delivery. At the same time, the driver stage would be of crucial importance to the overall tone of the amplifier. With these prerequisites, a transistor driver was out of the question. The only possibility left was of course the beloved tube. Enter one NYAL associate who was working with cascaded triodes or cascodes as they were named. These cascodes were already employed in NYAL's phono preamps. George Kaye now adapted his cascode follower circuit as driver stage for the Mosfet. It just took seconds to come up with a name for his new hybrid circuit: Moscode.



The amplifiers built on this circuit sounded really good. All the very difficult loudspeakers with their extreme low impedances came to life and the voicing the cascades provided was unique and reminiscent of the original Futterman OTLs. Only the hyper-drive brain of Gizmo would come up with the notion of using a Moscode amplifier for a household appliance demonstration. A 600-watt Moscode was fed with a steady 60Hz signal and the output terminals of the amp were connected to a vacuum cleaner. Imagine Gizmo cleaning his room on Moscode power. Quite a useful break for an amplifier. Another Gizmological trick was using Moscode juice to power a blender for making Margaritas.

Gizmo so believed in his amplifiers that the owner's manual contained directions for an elaborate sacred ritual before unpacking the shipping box. The procedure began with a solitary bath since the presence of a lover would be mere distraction. Following this would be an ice-cold shower before relishing a massage to loosen up all muscles, especially those of the upper back, neck and face which are involved in the hearing process. Then a medium warm shower to finish up before one was directed to step into the silk bathrobe and -- if a smoker -- to light up the best one could afford and perhaps have a glass of excellent wine to go with it. Only after this turn-on sequence would one be physically and emotionally prepared to unpack the new Moscode. Now you get an idea why we loved Harvey and are still sad about his passing in July of 2001. When in the New York area, we pay our respects and honor him by putting a tube on his headstone.

Alright, fast forward to 2005. George Kaye and his business partner Gage Rommel set up a company called Moscode Corp. After twenty years, the time had come to revive the name and the tube/Mosfet hybrid concept. These 20 years hadn't just gone idly by. George had used them to play plenty of bass and to refine the original design. In reworking it, the strengths of the circuit have been left untouched. It is still a Mosfet power stage driven by tubes and it still sounds like how Gizmo originally voiced it. Today's incarnation simply uses modern fabrication techniques, current quality parts and then adds an important extra.

In the spiritual heritage of Harvey Rosenberg, the Moscode 401HR power amplifier is ultra modifiable. Harvey -- like any real man -- simply could leave no toy untouched. This obsession earned him his nickname after all. Whether it was a Harley-Davidson motorcycle, a Winchester rifle, a hand bow or even his cigar, everything had to be adjusted, tweaked or adorned with a mere piece of Ductape,





the ultimate tweaker's weapon. The 401HR as a true tribute to Gizmo would make him smile all over now.

When we start at the front of the amplifier -- it's available in semi black gloss or clear-anodized aluminum -- there's a flippan faceplate that can be pulled down. By doing so, you gain direct access to the two pairs of driver tubes visible behind the closed glass panel whose etched Moscode logo illuminates in operation and flashes during preheating. The two pairs of double triodes are swappable and the main attraction of this amp. Standard trim are Sovtek 6H30Pis



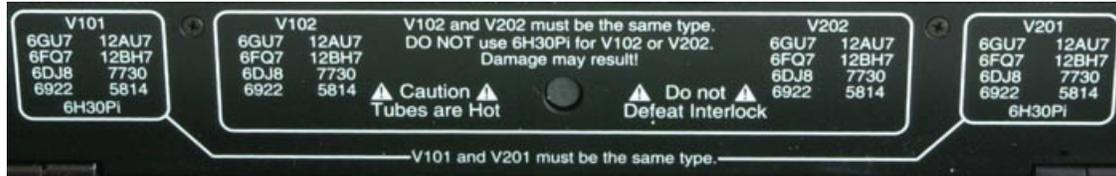
and Electro Harmonix 6FQ7s. The first pair -- the outer wing men so to speak -- is predominantly responsible for the overall sound and tone of the amp as it handles voltage gain. The second inner team is a follower pair. Its sonic influences are not as large. Since the chosen valves are very popular, a multitude of makes, production years and models are readily available on the market. George Kaye chose the stock glass to produce solid bass, attractive female vocals and a good soundstage. Rolling tubes as we shall see later is child's play because George incorporated a special circuit that enables hot swapping on the fly. At the back of the amplifier is as little as possible - an IEC power inlet and accompanying fuse, a pair of RCA inputs and a standard remote power trigger. Above and in the middle sits the front panel illumination control that adjusts the intensity of the LEDs behind the faceplate.





George Kaye opted for the special 5-way Edison Price Music binding posts, which use pure OFC copper without any plating and are direct-coupled to the output stage circuit board. These designer posts accept all manner of spade lugs, banana plugs or bare wire and are easy to fasten by hand. They need a little extra care now and then however to remove oxidation [and should not be over torqued to prevent stripping - the pure copper is softer than conventional binding posts - Ed].

The 401HR was designed with all kinds of customers in mind, so it adds a toggle in the back that selects between



stereo, vertical bi-amp and mute operation. Vertical bi-amping runs two 401HR amplifiers whereby each amplifier gets dedicated to one loudspeaker. One channel drives the woofer, the other the tweeter (or tweeter and midrange). The bi-amp switch thus routes a twin mono signal from a single input to both channels.

The manual is very clear on how to set up the 401HR. Special attention should be paid to the mains connection. The design of the amp grounds the chassis to AC ground. This could cause hum depending on the grounding of the connected equipment. We had to run a power cord from an ungrounded wall receptacle to the Moscode amp to eliminate 50-cycle hum.





But first things first. We connected the 401HR to the pre-out of our Audio Note Meishu and installed the supplied tubes. From the Edison Price binding posts we ran Crystal Cable to our Avantgarde Duo Omegas. After switching on the rest of the machinery, the large button at the front of the amp brought things to life. The LEDs were blinking during the initial warm-up phase and after about a minute, a soft relay click notified us that all passengers had boarded and we were ready for lift-off. The four tubes glowed cozily and the blue logo in the middle held steady.



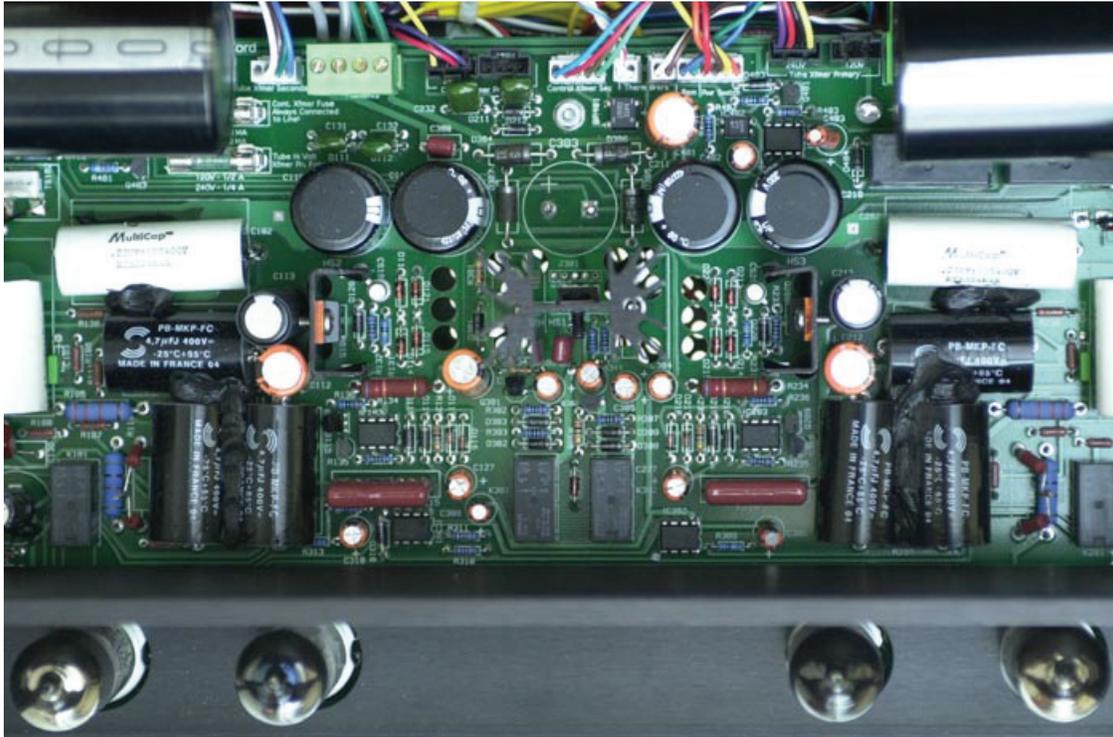
Rewiring the AC connection completely killed the ground loop after which the amp was as quiet as a church mouse even into our 107dB speakers. With 200wpc on tap, that was hardly a bad start. It took about 100 hours to loosen up the amp completely. At that time the first of a series of review loudspeakers arrived in our Rotterdam pad. With George's and Gage's consent, we decided to use the 401HR on all of 'em. Over the next few months, we ran Tannoy's Glenair, Mobile Fidelity's OML-2, Quad's ESL 2905, Von Schweikert's VR5-SE, Haliaetus' Firebird, Final's 1000i and our resident horns. To top things off, we even ran a Velodyne DD12 from the Moscode hi-level output. This group of loudspeakers represented goodly variety, ranging from dual-concentric and conventional dynamic drivers to two types





of electrostatic planar designs. Sensitivities ranged from 86dB to 107dB. To mix things up further, preamps like the Lamm LL2 and KR Audio Model 150 stopped over to insert into the signal chain as well.

To get an idea of what the Gizmological factor in the 401HR entailed, we set out on a hunt for alternative tubes. Who else to query but Peter van Willenswaard at his Audio Magic company? Peter is a walking tube encyclopedia with a substantial stock of NOS tubes. On our request, Peter assembled a short list of tubes we might like to try. We ordered them all just for Harvey's sake. A few days later and we had our little stack of Svetlana 6N1P, Tesla Prague E88CC SQ (for medium mu tubes) and Convaair 5814, GE 5814, RCA 6FQ7 and Thermionic 12BH7 for low mu variants. Together with the stock 6H30Pi and 6FQ7 low mu boosters, this made for quite a few possible permutations. All of these bottles could be seated in either position except for the 6H30Pis which tend to oscillate when used as a follower.



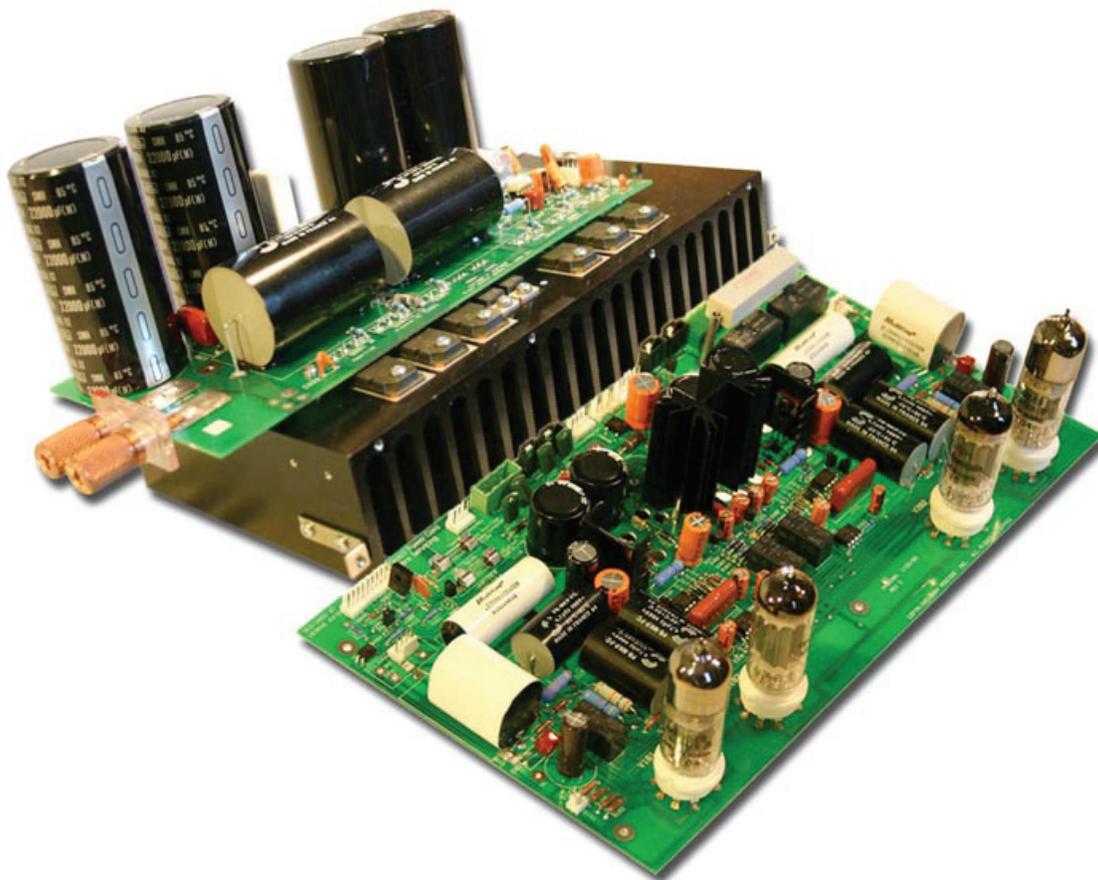
When we heard the Tannoy Glenair for the first time, we had an immediate association with Gizmo who was fully into their dual-concentric virtues via his own -- of course heavily modified -- Tannoy Westminsters. During the first listening session with the Glennies, it was evident that these hi-sensitivity loudspeakers could really rock. Their huge cones were capable of putting out a substantial amount of decibels when fed the proper diet. With the Moscode, we could shake the cups out of the cupboard if so desired. As George Kay states in the accompanying literature, he focused a lot on getting bass reproduction right. Our favorite bass player for now is Frenchman Renaud Garcia

Fons who proved the Moscode man right. The live version of Arcoluz contains many tracks with snapping bass transients and openly popped or bowed 40Hz strings of his monster 5-string upright. Renaud Garcia Fons often uses



his bow as a drumstick on the strings and you should have seen the Glenairs' cones flex. The Moscode controlled everything without breaking a sweat even under high pressures. At non-party levels too, this combination behaved as though made for each other. The strong point clearly was how brilliantly the tonality of each instruments was expressed. Tannoy's paper cones, great wood work on its cabinets and the 401HR's own voicing matched up most wonderfully.

A completely different kind of loudspeaker animal was the Quad ESL 2905, the larger of the two latest models. It was quite the treat to combine two reincarnations of legendary audio equipment. Even though the ESL now has a far more acceptable impedance curve than the ones Gizmo used to play with when he was toiling with his Futterman OTL design, the voicing of the Quad remains the same. The first tones from the Moscode/Quad combination were sheer magic, not for misty-eyed nostalgic reasons but purely how music was presented. Though we did run the ESL once into overload protection when we pushed the pedal to the metal too hard, the combination proved to be very good. To avoid overpowering the ESL, a preamp of modest gain would be the preference on the Moscode 401HR. The



Lamm wasn't ideal because its useful attenuation range was rather limited. A pair of Rothwell 10dB inline attenuators could have helped if we'd had 'em on hand at the time to lower the incoming DAC signal. Overall, the Moscode|Quad marriage with the Audio Note as preamp was blissful and it was mighty hard to let the 2905s return to their maker.

We were then asked to review the Mobile Fidelity OML-2 floorstander for a Dutch magazine. This budget-conscious ported two-way system was quite happy with the Moscode. We found the sound rather colored but not unpleasant though the Moscode's own special tonality was overruled and superseded by the OMLs. When we upgraded our Avantgarde Duo to Omega status, impedance rose to a whopping 17 ohms while sensitivity went to 107dB. One would assume that such high sensitivity isn't exactly a dream match for a 200wpc amplifier. Well, we connected the two nonetheless and were more than surprised. The urban legend has it that micro-powered DH SETs are the only serious ammunition for high-efficiency horns. Ahem - the legend should remain a legend. Direct-heated single-ended triodes are magic machines and in combination with horns can create sheer beauty. But don't rule out the beauty of unlimited power either. The Moscode proved to be a gentle giant, the beast that treated beauty with kid's gloves. In fact, the sound of the 401HR approached our 8wpc DH SET, albeit with huge balls. The Duo Omega could now shake the building under extreme dynamic peaks without losing any innate smoothness. In the all-important vocal band, the



401HR proved very SET-like on these speakers and rounded off smoothly in the extreme highs.

Albert von Schweikert's now renamed VR5-SE came to us with only a few hours of playing time. Even though the speakers had been to a few shows and thus chances for further run-in, they seemingly need 300 hours of full throttle punishment before coming to life. This requirement is hard to carry out when you live in an apartment building and want to stay there for a while longer. That review has thus been postponed until Albert delivers a properly seasoned pair.

From Paris came the Haliaetus Firebird for some playing time in our Rotterdam sand box. It is not the most sensitive speaker at 87dB but with 200 watts on hand, we suffered no shortage of power. With its trademark protruding aluminum nozzles that enhance the speaker's bass capabilities from its small 8-liter cabinet in combination with the hybrid amplifier, these modern creations were able to portray a realistic image of small and medium music formations. Gerardo Nuñez and Vicente Amigo's Flamenco with its fierce hand claps and strong vocals did very well.

Large orchestral tuttis were a bit beyond the Firebird's purview but to get such musical force parlayed convincingly is hard on any system. On Jazz Rock like that of the musically reincarnated Al di Meola or Mike Stern, the rocket science speakers however did well with the hybrid amplifier.



The last loudspeakers we were able to combine with the Harvey Rosenberg tribute was the Final 1000i. Final is a Dutch loudspeaker manufacturer who specializes in tall and narrow electrostatic transducers. Unique to Final and contrary to for instance Quad is their inverted drive scheme for the membranes. Their Inverter Technology applies the incoming signal not to the stators as conventional electrostats do but directly to the Mylar membrane. This allows for less expensive components and a simplified manufacturing process for more attractive pricing. An upcoming formal review will cover more details. With the Finals, we finally had a loudspeaker that truly required Moscode muscle.

All others could well live off a weaker amplifier but the Final 1000i with its dimensions of 199 x 36 x 5cm and rated at 86 dB/4-ohm loves current. It is also with this loudspeaker that we leashed up the Velodyne DD12 subwoofer in parallel, bananas over spades. This speaker combination now covered 20 to 20. Once again the Moscode was happy to provide whatever was needed.

Candidly, not a single loudspeaker managed to elicit one false note from the amp. Moreover, the Moscode prevailed throughout all marriages -- except for the Mobile Fidelity -- by retaining its own tonality, its very soul if you will that makes it a very pleasant machine. Those who seek a completely neutral wire-with-gain should pass on the Moscode and forever rest in piece. No tubes on their tomb stones for sure.

George Kaye designed this amplifier such that even when the driver tubes are changed, the typical Moscode sound remains. Driver tubes in a hybrid design are responsible for a great deal of the tonality but not all of it. Contrary to hybrid designs that use transistor drivers and tube outputs, tubes as drivers offer far more control over the naturalness of the sound. When small triodes are used as drivers as in the Moscode, their capacity of linear voltage amplification is fundamental to achieving noise-free transparency. George relies on a very quiet, passively regulated filament power

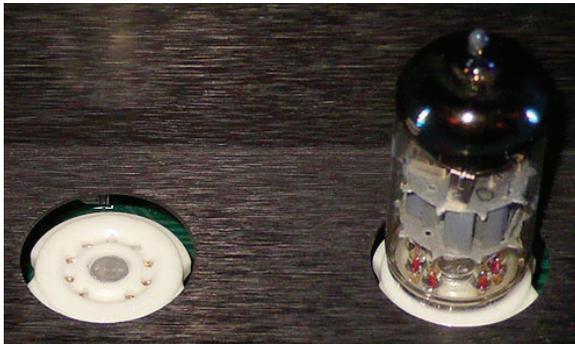


supply to achieve his very clear, detailed and open sound. Built like many preamplifiers, the Class-A input stage eschews all negative feedback. Only later in the circuit does the output from the first stage combine with negative feedback from the output to enter the follower stage which is capacitively coupled to the Mosfet power buffer. The tubes can drive the Mosfet directly, no intermediate transistors. The Mosfets are mere followers to the signal off the driver stage. To keep the Mosfets biased, George used an optically coupled circuitry in conjunction with a pair of film capacitors so the main 176.000  $\mu\text{F}$  capacitors do not have to be used for this purpose. All this results in the very tube like top end the Moscode evinces.

Tube rolling as already mentioned is the main attraction of Moscode ownership. Flip open the front plate, change a pair of tubes -- glove provided so no nasty burns -- close the panel and after a few seconds, there's music with a slightly different attitude. When inserting the tubes, the sockets give a little because they are suspended. Even tubes with a center-tapped filament may be used. An auto filament switcher senses the center tap and switches from a standard 2-wire filament circuit to the 3-wire version so tubes from the 12-Volt series like 12AU7s may be used.



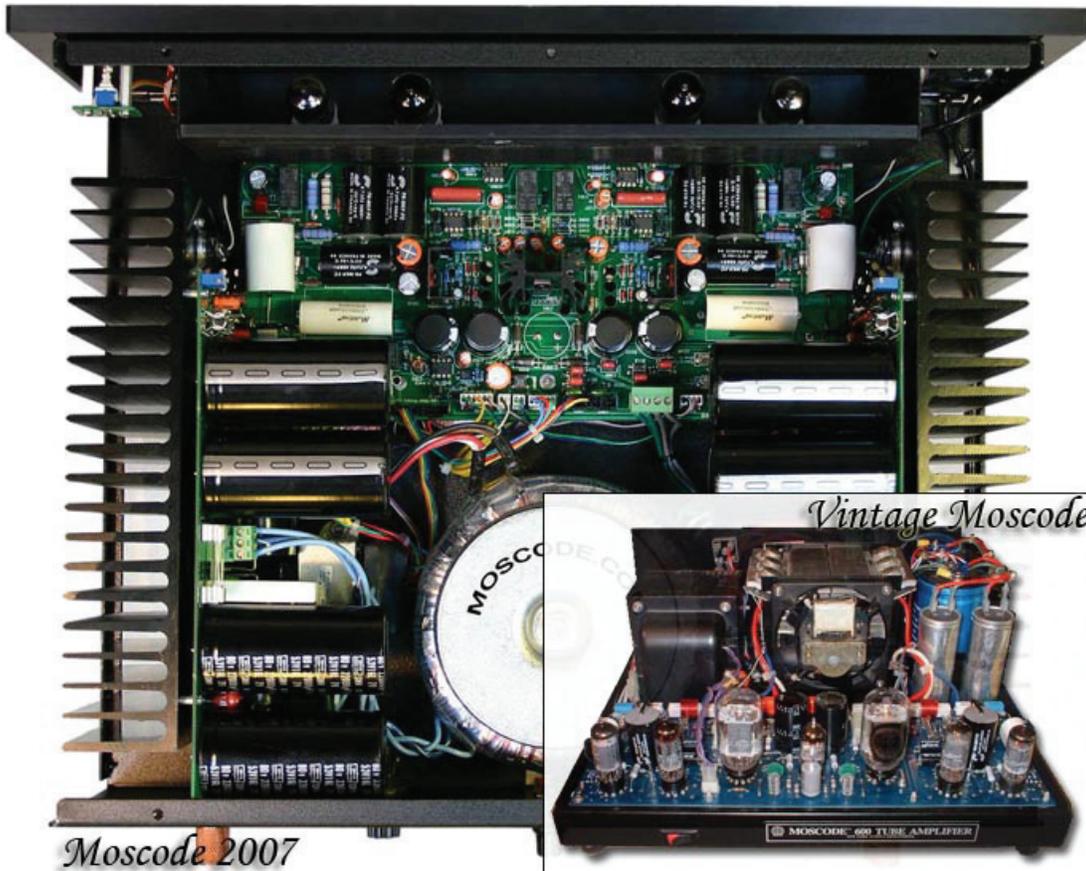
The small driver tubes usable can be divided into the low- $\mu$ /low-gain and medium- $\mu$ /higher-gain camps. The latter elicits higher negative feedback from the amp circuit. Generally speaking, a low- $\mu$  driver makes for a smoother sound with a slightly forward soundstage. Medium  $\mu$  valves tighten the bass and deepen the stage. From our notes, the medium  $\mu$  Svetlana 6N1P and Tesla E88CC SQ from the Prague factory (no. 32) resulted in a much more dynamic sound. Especially the Final electrostatics gained much to sound far more like 'real' electrostatic speakers with the 6N1Ps in use. Listening to Thierry 'Titi' Robin's live CD Anita became a real adventure, a tighter, richer and more full-bodied sound the result from the planars. Less forward and a little smoother was the verdict with the Tesla pair on the same speakers.



Low muosters like the Thermionic 12BH7 for voltage gain compared to a medium- $\mu$  valve netted more rounded middle frequencies and could thus be described as more musical - more wood, less metal. Using two pair of medium  $\mu$  tubes like the 6N1P for voltage gain and the Tesla E88CC SQ as follower mellowed the forwardness of the 6N1P and increased warmth while retaining dynamics. Each and every permutation involving the tube/loudspeaker combination

can result in eye openers, sheer blissfulness or revolting shivers when the combination isn't right. We spent some 200 valve Euros in total and had more than 10 times the fun. The Moscode hybrid is a real toy for a real man (who can of course be a woman as well).

In conclusion, the Moscode 401HR is the most tweakable, adaptable and thus funnest great-sounding amplifier presently available. It is neither neutral nor does it sound completely like a DH SET (nor like a big transistor or even switching amplifier). It sounds like a Moscode, period - powerful, fast and absolutely transparent. Summed up, this means this amp plays music and not merely sounds. Gizmo would be so proud if he could hear this legend reborn!



*Moscode 2007*

*Vintage Moscode*

*Dr. Marja Vanderloo &  
Dr. Henk 'Longbeard' Root*



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