

# Mosscade

## Saturn 12 Subwoofer



### Mosscade by BC Acoustique

The company behind the Mosscade Saturn 12 is French company BC Acoustique. It's a relatively young company, having been founded only in 1993. The company takes its name from its two founders, Bruno Roux and Christian Avedissian. The two shared a passion for sound and music in their youth, which they indulged by building speakers while still studying at university. As they became more serious about going into loudspeaker manufacturing as a business, they started using the resources of the *Laboratoire National d'Essais* in Paris—which offered not only the largest anechoic chamber in Europe, but semi-anechoic and reverberant rooms as well—to evaluate their designs. Their first commercial product, the three-way Araxe (named after a river in Armenia), went into production on April 1, 1993, though the fledgling company's first official sale was not recorded until August of that year. Although the company's next model, a small two-way design known as the 'Hudson' (yes, another river!), achieved modest sales, it was the company's third model, the Niger, released in 1995, that firmly established BC Acoustique as a successful manufacturer. It was very well-reviewed in European audio magazines and was responsible for the company's first award, a Diapason d'or. So successful was the Niger that BC Acoustique was forced to move to a larger factory in Alfortville, at which time Dr Jean-Marc Trochon joined the company. In 1999, BC Acoustique registered the name Mosscade as a brand, intending it to be used exclusively on subwoofers.

It somehow seems appropriate that the world's first review of the Mosscade Saturn 12 subwoofer should be published in Australia, because the unusual driver configuration inside it, which has a pair of drivers bolted together, cone facing cone, with one wired 'out of phase' with the other, was popularised and perfected right here in Australia in the 1950s, by loudspeaker pioneer John E. (Ernie) Benson, though his developments were based on the original concept proposed by Harry Olson.

### The Equipment

This method of mounting drivers in a cabinet is technically known as a 'compound woofer system', though because there are various different ways of implementing it, it's also known as a 'constant pressure system' or an 'isobaric' system. It's not often used because it's an extraordinarily expensive method, requiring the use of two very high-quality bass drivers, perfectly matched to each other, before the system can work as intended. The pay-offs from a compound system are many, however, and

very significantly affect both the sound quality and the 'saleability' (i.e. cabinet size!) of any subwoofer that uses it.

Taking sound quality first, mounting two drivers in a compound arrangement effectively results in all odd-order driver non-linearities being completely cancelled, so the result is dramatically reduced distortion. So far as cabinet size is concerned, a compound pair of drivers require only half the volume that would be required by a cabinet with a single woofer, so the subwoofer, can be—literally—half the size yet deliver the same level of bass as a much larger unit.

It's often claimed by manufacturers that the sensitivity of the compound system is doubled, but in fact the 3dB gain derived from paralleling the two drivers is cancelled by the fact that cone mass is doubled. In fact in the Saturn 12, designers Bruno Roux and Christian Avedissian do something quite unusual, which is that they wire the two drivers in series. Their rationale is that this effectively increases the damping factor (the ratio between the driving amplifier's output impedance and the impedance of the speakers). *'This brings higher stability and better control of the drivers,'* they say. The beauty of the compound driver system for any designer is that the Qts and Fs are the same as for a single driver, which means that all the standard Theile/Small equations still apply.

(Speaking of which, I have been under the impression for the last thirty or so years that Dr Richard H. Small was an Australian, but I recently discovered that although he lectured here at Sydney University for 21 years, he was born and raised in California. Neville Theile, however, is 100 per cent Australian, having been born in Queensland. Theile told Steve Mowry, of *Voice Coil* magazine, that he, Small and Benson were at one time known as 'the Australian loudspeaker Mafia'.)

The drivers used in the Mosscade Saturn 12 are impressive, to say the least. Built specifically for Mosscade on pressed steel frames that are 305mm in diameter, the huge polypropylene cones have 50mm voice coils that operate from a huge, vented, double-magnet system. Each magnet measures 156mm across and is 20mm thick. Driver orientation is such that the drivers are down-facing, so the enclosure makes use of the floor

for additional acoustic loading. However, unlike all the down-firing subwoofers I've ever seen, the Mosscade Saturn 12 also has a rectangular 'slot' measuring 265 × 90mm on the rear of its enclosure, below the amplifier's heatsink array.

According to Dr Jean-Marc Trochon, of BC Acoustique [See accompanying panel 'Mosscade by BC Acoustique'], the single circular, metal-meshed floor-facing vent is insufficiently large on its own to radiate the enormous pressure generated by the two drivers, and so must be augmented by the rear-mounted slot. This being the case, it seems to me there's a case for mounting the drivers so they could be side-firing. This would have additionally eliminated the *bête noire* of large down-firing woofers, which is that the cone motion is inherently non-linear, because gravity assists cone motion when the cone is moving downwards, but hinders it when the cone is moving upwards. The effect is slight, of course, and must be traded off against the fact that if a large cone is vertically mounted, it should be removed and rotated every year, to ensure the suspension 'sags' equally as it gets older. Rotating a single woofer is quite easy, but rotating a compound driver system, as in the Saturn 12, would be more difficult.

The Saturn 12 uses a conventional Class-AB power amplifier rated at 300-watts. For such a powerful amplifier it appeared to have a relatively small heatsink and in fact, when I was burning-in the sub prior to auditioning (the review sample was one of the first off the production line) I found that after running the sub non-stop with a high-level signal burn-in signal for 48 hours, the whole amplifier plate—including the heatsink—was very hot, indicating that it can't really dissipate 300-watts continuously. However, in normal everyday use, playing back signals from two-channel and multi-channel CDs and DVDs, the plate barely became warm. In any event, BC Acoustique has included not only over-heating protection for the amplifier, but also 'over-power' protection to protect the drivers from potential damage. It does this not with a simple limiter, like most subwoofers, but with a frequency selective circuit, so that if the amplifier begins to overload at, say, 35Hz, the circuit can contain the level at 35Hz without affecting the level of any other

## Mosscade

**Brand:** Mosscade  
**Model:** Saturn 12  
**Category:** Powered Subwoofer  
**RRP:** \$2,600  
**Warranty:** One/Two Years  
**Distributor:** Alex's Audio Pty Ltd  
**Address:** PO Box 1171  
 Mittagong  
 NSW 2575  
**T:** (02) 4872 4530  
**F:** (02) 4872 4530  
**E:** alexsaud@bigpond.net.au  
**W:** www.mosscade.com

frequencies. This circuit appeared to work very well, because when I was adjusting the power of the pink noise signal during the burn-in, I couldn't hear any 'poling' even when I turned the amplifier level too high for comfortable listening.

The amplifier plate is well-equipped, with speaker-level inputs and outputs as well as line-level inputs and outputs. Although left-channel and right-channel line inputs are provided, the two are paralleled internally, so you can connect a receiver's LFE output to either the left or right input and enjoy proper operation. However, to avoid any confusion, BC Acoustique has additionally labelled the left-channel RCA terminal with an 'LFE' identifier. The line outputs immediately to the right were originally intended to be high-pass filtered, and this was the advice in my preliminary manual, but BC Acoustique has since changed its mind and the Saturn 12's line outputs are now full-range, and not filtered at all. Neither is there any filtering on the high-level (speaker) outputs.

Phase is adjustable only by inversion (180°) rather than continuously, which is accomplished with a single two-way switch. Immediately below the phase control is a Low-Pass filter switch that can be used to allow the input signal to bypass the rotary Low-Pass filter immediately to its right. This 'Bypass' mode would be used if you're pre-filtering the signal you send to the subwoofer using a software-controlled filter inside a home theatre receiver. The switch is simply labelled 'On' and 'Off.' In the 'On' position, the rotary control is active, and should be used to tune the subwoofer to match your main speakers. If you're doing the filtering in your receiver, you need to



set the switch to 'Off.' I found this 'On/Off' nomenclature rather confusing and feel 'On' and 'ByPass' labelling would be more intuitive.

The rotary low-pass filter has a smooth action over its range (no detents) and has an indicated range of action of 50Hz to 150Hz. The level control immediately to its right has a similarly smooth range of action and is simply labelled with 'Min' and 'Max' volume indications. The 220V power switch at the far left of the subwoofer has only two positions: Auto-On and Off. When switched to Auto-On, the subwoofer will turn itself on whenever it detects an audio signal. If it doesn't detect a signal, it will wait five minutes before switching itself to Standby mode. A chameleon LED immediately above the switch indicates operational status: red (standby) and green (off).

Although it's also available in piano black or gloss white colours, my review sample was a very attractive cherry veneer. Despite being relatively small (370mm wide, 431mm high and 430mm deep) it weighs a substantial 33kg.

### Listening Sessions

It's important to remove the Saturn 12 from its packing using the correct method. If you try to lift it from the box by grasping what appears to be a handy protrusion on the rear panel, you'll very likely damage the subwoofer. The reason is that Mosscade has designed a wooden 'Trim

Plate' to make the rear of the subwoofer look more attractive. This trim plate is attached to the subwoofer by six plastic studs and, as you can see from our photograph, has a thin section (just 20mm thick) right at the top where it crosses above the amplifier's control panel. If you attempt to lift the subwoofer using this thin section of the trim plate, it's likely you'll either break the wood or snap off one or more of the plastic studs. I was alerted to be careful of this by the local Australian distributor. There was no warning on the outside of the Saturn 12 packaging, and even if there were a warning in the manual, it would likely be too late. I understand that Mosscade will in future be fixing suitable removal instructions to the exterior of the Saturn 12 carton, advising buyers of the correct—and safe—method of removing the subwoofer from its packaging.

Once I'd extricated the Saturn 12 from its box, I was pleased to find that it's all ready to go, because four rubber feet were pre-attached. And what unusual rubber feet they are! Rather than standard hard rubber, BC Acoustique has started with an unusually soft and flexible type of rubber then formed it into a shape that resembles the bottom half of an eggshell. The result of all of this is that if the Mosscade Saturn 12 is placed on a hard surface and given a sharp push, the cabinet will 'wobble' slightly back and forth. What this means is that any cabinet vibrations (of which

there are very few, as I was to discover) will not be transmitted through the feet to the surface on which the subwoofer is standing. This means that if you live in an apartment, you won't be getting complaints from the person who lives in the apartment below!

The rubber feet supplied put the base of the Saturn 12 cabinet just 30mm above the floor, which was fine when I operated the subwoofer on a solid floor. However, when I placed it on a thick, deep-pile carpet, the subwoofer sunk into it far enough to cover the circular grille on the bottom panel. This would completely muffle the output of most subwoofers with down-firing drivers, but in the case of the Saturn 12, bass continued to be produced—seemingly unaffected—from the rear-facing slot. Nonetheless, if you have a carpeted floor and want the performance intended by the designers, you'll need to place a slab of granite or marble the same width and depth as the Saturn 12 on the carpet, then place the Saturn 12 on this. Alternatively (and far more straightforward!) you could just replace the rubber feet with spikes. The rubber feet simply screw off, and use the standard thread. (Mosscade apparently provides spikes, but a previous reviewer had forgotten to re-pack them!)

The clarity and purity of the bass that burst forth from the Saturn 12 amazed me when I finally got around to hooking it into my reference system. Its performance is irrefutable proof—if you needed it—of the advantages of compound woofer mounting. It was immediately obvious to me that distortion was very, very low, so I would have no hesitation in recommending the Saturn 12 to partner electrostatic loudspeakers, which are renowned for their low levels of distortion (and lack of bass!). Distortion is so low, indeed, that the Saturn 12 delivers a tuneful, musical sound quality even when the low-pass control is set to 150Hz, which is a desirable attribute that very few subwoofers can claim. The difference in sound this makes when playing back piano and cello, in particular, is simply remarkable.

Also remarkable is the extended frequency response of the Saturn 12. Most subwoofers with cabinets the size of the Saturn 12 have very restricted responses, even if they use a passive

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cone (usually on the opposite side to the driven cone) in order to extract maximum performance. The Saturn 12's response extends right down to the bottom-most music frequencies and beyond: to those frequencies that most often appear as part of FX sounds on movie soundtracks. Equally important, the sound tracks down very smoothly with frequency. Certainly the volume fades out as the frequencies get lower, but there's no sense of any 'shelving' or premature 'cut-off' when playing music—as there is with other small-cabinet subwoofers.

As for volume level, if you live in an apartment and turn the volume up on the Saturn 12 you'll certainly annoy all your neighbours... indeed it's likely you'd do so even if you live in a free-standing dwelling on a fair-sized parcel of land. The Saturn 12 can be played very, very loudly indeed, not least because of the driver/amplifier combination, but also because the sound is delivered so cleanly that there's no sense of their being an upper limit on achievable volume. This feeling of limitless volume is helped along by the Saturn 12's protection circuit, which doesn't clamp down prematurely. You may not ever need the high volume levels the Saturn 12 can comfortably deliver, but it's nice to know they're there!

## Conclusion

Many audiophiles refuse to put subwoofers in their systems, claiming that the sound they deliver is too 'slow' and their tone 'too thick' to enable them to properly interface with their primary speakers. If you count yourself among them, I'd sincerely recommend you go out of your way to audition Mosscade's Saturn 12, because the bass it produces is not only fast and tonally accurate, but also exceptionally tight and controlled.



greg borrowman

LAB  
REPORT

Readers interested in a full technical appraisal of the performance of the Mosscade Saturn 12 Subwoofer should continue on and read the LABORATORY REPORT published on the following pages. All readers should note that the results mentioned in the report, tabulated in performance charts and/or displayed using graphs and/or photographs should be construed as applying only to the specific sample tested.

## TEST RESULTS

### Test Results

Newport Test Laboratories measured the frequency response of the Mosscade Saturn 12 with the low-pass filter first set to 50Hz and then to 150Hz. The test stimulus was pink noise, and the measured traces were smoothed to one-third octave. The two traces shown on Graph 1 have been manually moved apart slightly to make the graph easier to read. When the low-pass filter is set to 150Hz the frequency response of the Mosscade Saturn 12 was measured as extending from 27Hz to 120Hz  $\pm 3$ dB, which is excellent.

When the low pass filter is set to 50Hz, the response extends from 25Hz to 90Hz  $\pm 3$ dB—also excellent. As you can see on the graph, at the 50Hz setting the response rises at 12dB per octave between 20Hz and 42Hz and is then very flat and linear to 60Hz, after which the response rolls off at 18dB per octave. When the low-pass filter is set to 150Hz, response rises to 40Hz then stays at this level ( $\pm 1$ dB) up to 80Hz, after which it rolls off smoothly, again at 18dB/octave. The performance of this subwoofer suggested to me that it has been designed primarily to extend the bass reach of larger stand-mount speakers as well as floor-standing designs.

Steve Holding

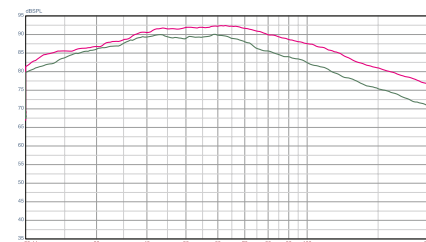


Figure 1: Pink noise frequency responses (smoothed to one-third octave) at 2.0 metres with crossover control at 50Hz and 150Hz.



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