

# CASE STUDY: MUSE RESEARCH

## Samsung Solid State Drives Amp Up Music Player Performance



### OVERVIEW

#### Customer Need

Muse Research and Development builds computing appliances for running music software used by top artists for studio recording and performing on-stage. Their software-powered music instrument product, called Receptor, enables musicians to use a MIDI keyboard, guitar, or drum controller to reproduce the sound of almost any instrument. But running virtual instruments places extreme demands on the computer host, especially for data throughput. Muse needed a high-performance storage device that could also stand up to the rigors of touring.

#### Samsung Solution

Muse Research turned to Samsung 840 Pro Solid State Drives (SSD) to speed the delivery of data to their system while delivering increased reliability over traditional Hard Disk Drives (HDD). Since Samsung SSDs contain no moving parts, they perform with faster speed and greater reliability, while lowering power consumption, reducing heat, and eliminating acoustic noise.

#### Results

By adding Samsung SSDs to the Receptor product line, Muse Research has cut the load time of virtual instruments in half and has substantially improved system performance. Musicians can use virtual instrument plug-in software with confidence, knowing that their sounds will play instantly, even in the most extreme conditions. Muse is expanding its offerings with new versions of the Samsung SSDs that offer higher performance on a 1 Terabyte drive.



# THE CUSTOMER

## Muse Research

Located in San Jose, California, Muse Research was founded by veterans from the music and software industries who wanted to revolutionize music creation and performance.

Together, they developed a way to enhance off-the-shelf software-based synthesizers and effects programs onto a dedicated hardware device.

Muse provides performing artists around the world with a computing appliance that can reproduce any sound imaginable.

The company's flagship product, the Receptor, is built on a Linux computing platform and uses a data storage disk to store very large samples of music instruments. The Receptor enables musicians to use one device for a wide range of instruments, including drums, guitars and pianos with studio sound quality on stage. The Receptor can be rack-mounted and can withstand the rigors of travel, setup, heat and on-stage vibration.

**“We did a tour in Canada where the temperatures were 30 below zero, and the equipment would sit in the cold for days. Later we were in Texas and it was over 100 degrees. This is all terribly taxing on our equipment.”**

- Korel Tunador

Keyboardist, Guitarist,  
Saxophonist and Singer with  
The Goo Goo Dolls



Musician Korel Tunador uses Muse Receptor with Samsung SSD

## THE CUSTOMER NEED

### Touring with a Storage Solution that Performs Under Pressure

The Muse Receptor is immensely popular throughout the music industry for its ability to generate studio-quality sounds required by any style of music. Some of the world's top rock bands, country singers, soul divas, blues players, and pop stars use Receptor because it allows them to make records using virtual instruments and effects and then perform live using the same sounds.

In designing the next generation Receptor, the company needed to improve the Receptor's load performance and ability to operate in adverse conditions.

“To speed performance and reduce latency, we required a data storage solution that could serve data more quickly to the Receptor's CPU, while simultaneously reducing heat and improving mechanical robustness in order to survive grueling tour environments,” says Bryan Lanser, VP of Product Development at Muse Research.

The faster the instrument sample data travels from the Receptor's storage drive into RAM, through to the CPU for processing, and on to the audio outputs, the faster a musician can move from one sound to another and the more sounds they can play at one time.

Faster spinning hard drives (HDD) might accelerate load times, but they generate more noise in the studio and more heat, which causes system cooling issues in hot outdoor concert venues.

HDDs are also more prone to damage if jarred on stage or subjected to rough handling in transport, which is common during touring.

“There are few environments as rough as a concert tour where your gear is being manhandled on and off stage, where outdoor temperatures can reach 120 degrees before show time, and the entire stage can be bouncing during a rousing performance,” says Lanser.

“We've looked at 10,000 RPM drives for use in our system. They get incredibly hot and their high-pitched squeal really annoys musicians in the studio,” says Lanser. “When you add to that the fact that our gear is subject to high levels of low frequency vibration on stage from drums and basses, replacing a spinning drive with an SSD delivers multiple benefits.”

The need for greater performance and reliability led the company to consider a Solid State Drive (SSD).

# THE SAMSUNG SOLUTION

Samsung Solid State Drives Take Center Stage

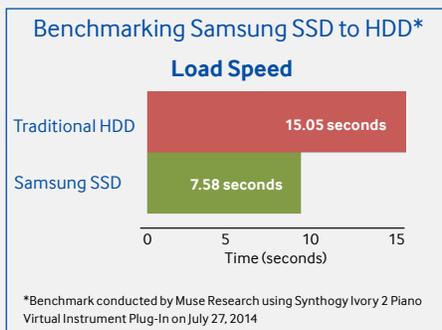
After considering a number of options, Muse Research selected Samsung 840 Pro SSDs. Samsung SSDs offer greater performance and reliability than traditional hard disk drives.

While HDDs work with spinning magnetic disks that can slow the delivery of data to a computer's CPU, Samsung SSDs have no moving parts and can send data directly and quickly to the CPU. Samsung SSDs are also less prone to damage during transport and adverse operating conditions in extreme hot and cold environments.

Muse conducted benchmark tests on music load time to compare Samsung SSD performance to traditional HDDs. With a standard hard drive, it took 15 seconds to load a large sampled piano program. But with Samsung SSDs, it took less than 8 seconds.

"To put this in perspective, if a performer is playing 25 songs a night, using the Samsung SSD will save 175 seconds of 'dead air time,'" Lanser says.

"For a performer who is standing in front of 20,000 screaming fans waiting for the



next song to start, five seconds is an eternity. It's really important that we get data off the drive and into the RAM and ready to play as quickly as possible. The Samsung SSD is a huge improvement."

Muse also benchmarked Samsung SSDs on a polyphony test (number of sounds that can be played simultaneously). "When we tested the Muse Receptor with traditional HDDs, we could play 900 simultaneous sounds, while Samsung SSDs Pro 840 exceeded the upper limit of the test – essentially breaking the test parameters," Lanser says. He expects even greater performance after Muse begins using the Samsung 850 Pro series that doubles the storage capacity with a 1 Terabyte drive.

## SAMSUNG'S LATEST OFFERING

### SAMSUNG 850 PRO SERIES SOLID STATE DRIVE



**FORM FACTOR:** 2.5-inch

**CAPACITY:** Available in 128GB, 256GB, 512GB & 1TB

**HOST INTERFACE:** SATA 6Gb/s (compatible with SATA 3Gb/s and SATA 1.5Gb/s)

**SEQUENTIAL READ SPEED:** Up to 550MB/s

**SEQUENTIAL WRITE SPEED:** Up to 520MB/s

**RANDOM READ SPEED:** Up to 100K IOPS

**RANDOM WRITE SPEED:** Up to 90K IOPS

**POWER CONSUMPTION:** 0.4W (idle) / up to 3.3W (active) / 2mW (Device sleep)

**ENCRYPTION:** AES 256-bit Full Disk Encryption / TCG/OPAL v2.0 & Encrypted Drive compliant

**ENVIRONMENTAL:** Operating Temperature of 32°F to 140°F

**WEIGHT:** 0.151b

**WARRANTY:** 10 years / 150TBW

**"There's just no comparison between the performance of spinning disks and Samsung SSDs because the access time is so much quicker. I'll never go back to using hard drives."**

- David Rosenthal

Musical Director, Keyboardist and Synthesizer Programmer for Billy Joel



Using the Receptor with Samsung SSD saves musicians program load time

# THE RESULTS

## Samsung SSDs Share the Spotlight on Stage

By embedding Samsung SSD into the Receptor, Lanser says their customers are more confident about dealing with the rigors of touring, while expanding the limits of what they can do on stage.

“When talking to customers, I now recommend that they install the Samsung SSDs,” he says. “Without a doubt, installing Samsung SSDs is the best way of improving the performance of our products. It trumps all other performance modifications you can make to the system.”

The performance gains and ability to load large instrument sample data faster in RAM has helped customers take advantage of software plug-ins that provide rich sounds that are not possible on systems with traditional hard drives.

For example, David Rosenthal, musical director, keyboardist and synthesizer programmer for Billy Joel, uses a Receptor with the Samsung 840 to run Synthogy Ivory II for Grand Pianos to create the sounds that Joel plays from a MIDI controller keyboard inside his grand piano. Synthogy Ivory is a large software plug-in with piano sound files that can be 5 to 10GBs and requires a high-level of streaming capabilities.

“The only way to get this software to stream without limitations is to have it streaming directly from a solid state drive,” Rosenthal says. “There’s just no comparison between the performance of spinning disks and Samsung SSDs because the access time is so much quicker. I’ll never go back to using traditional hard drives.”

Customers are also touring with greater confidence with Samsung 840 Pro inside the Muse Receptor.

Korel Tunador, keyboardist, guitarist, saxophonist and singer with the Goo Goo Dolls, says the systems are essential for any band that tours in extreme conditions. “We did a tour in Canada where the temperatures were 30 below zero, and the equipment would sit in the cold for days. Later we were in Texas and it was over 100 degrees,” he says. “This is all terribly taxing on our equipment, which is why Samsung SSDs are becoming a necessity for musicians like us who rely on technology. Anyone who doesn’t already have a Receptor with Samsung SSDs talks about getting one; they just see it as the way of the future.”



The Receptor with Samsung SSD enhances live performances for musicians in every environment

Learn more ▶ 1-866-SAM4BIZ | [samsung.com/business](http://samsung.com/business) | [@SamsungBizUSA](https://twitter.com/SamsungBizUSA) | [YouTube youtube.com/samsungbizusa](https://www.youtube.com/samsungbizusa)

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