
YAMAHA
AFC
ACTIVE FIELD CONTROL

Enhance. Immerse. Inspire.

Throughout a uniquely prolific 130-year history of manufacturing world-class musical instruments and audio products, Yamaha has maintained a singular vision of providing artists with the tools and technologies to deliver their best performances with ease and enjoyment, while ensuring their audience is impacted by the full expressive power of every note they play. A live musical performance creates a special connection between artist and audience, allowing both to be swept away in the sounds, emotions, and irreplaceable moments that inspire us all as lovers of music. Yamaha's Active Field Control technology was designed to naturally enable and enhance this special bond and unite every person in a venue— from the stage to the exits— in the unmistakable magic that only a live music performance can provide.

AFC from Yamaha.

Strengthen the connection and savor the experience.

What is AFC?

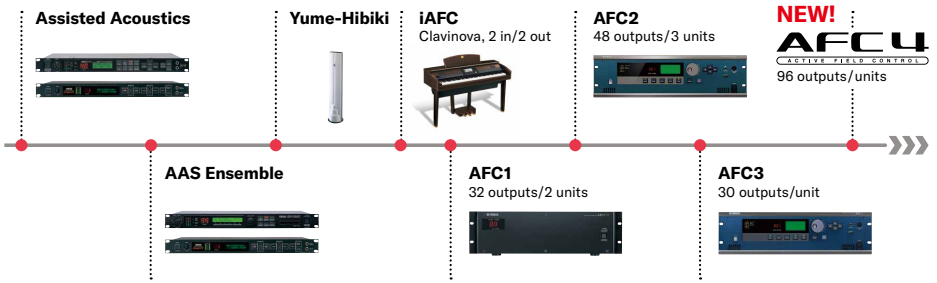
Active Field Control (AFC) enhances the sound of a space while making use of the natural acoustic properties of the existing structure. Unlike approaches that add artificial reverb to the source sound to create a different impression, AFC employs technology developed over many years to control sound propagation within the actual space so that reverberation and volume can be altered while the natural sounds of musical instruments and voices are maintained.
Relatively dead acoustic spaces such as event spaces, assembly halls, and banquet rooms that don't have much reverberation are fine for speech, but if a performance of classical music is held in such spaces the sound lacks depth, making difficult for the performers and audience to enjoy the sound. An AFC system can create an ideal sonic environment without the need for structural renovations.

AFC OFF
Not suitable for musical performance
(Minimal reverberation)

AFC ON
Ideal for musical performance
(Increased reverberation)

The Pursuit of Immersive Experience and AFC

How can we maximize the performer's experience of playing a musical instrument as well as the audience's enjoyment of the music created? Yamaha has approached this fundamental question from many angles.
In 1969 Yamaha launched acoustic consulting activities intended to find the ideal relationship between performer, audience, and space, and that quest has led to a deep understanding of acoustic technology in general, including structural acoustics, electronic acoustics, and noise control. The result is a solution we call AFC.
AFC has been gradually refined since it was initially introduced about 30 years ago as an acoustic design tool for customers who wanted to use a single space for multiple purposes. In its current form, AFC4 features advanced 96 kHz processing capability that supports outstanding sound and space control.

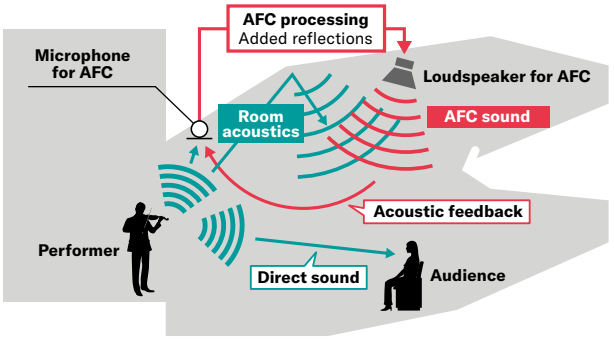


How AFC Works

AFC controls the acoustic environment via multiple microphones and loudspeakers strategically located throughout the space. This type of system generally employs one of the two following methods.

- "Regenerative approach" uses acoustic feedback, reproducing the sound picked up by the microphones via the loudspeakers and then picking up that sound affected by the room's acoustics once more, thereby creating an acoustic "loop" that amplifies the room's acoustic energy.
- "In-line approach" uses convolution signal processing to add a variety of synthesized reflected sound data (measured impulse responses) to the sound picked up via the microphones, to create the desired sonic environment.

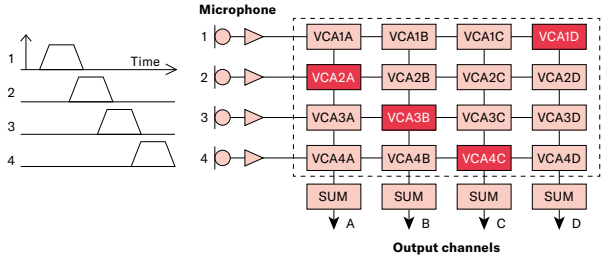
AFC is a hybrid system that employs both of these methods. Through detailed control of reverberation and early reflections that have a profound influence on auditory impression, the sound propagating throughout the room can be adjusted as required while retaining the natural acoustic properties of the room's structure.



Main AFC Technologies

EMR: Switching Function for Stability

AFC employs a feedback loop for acoustic control. For optimum effect it is necessary to feed back as much energy as possible, but the more energy is fed back the higher the risk of uncontrolled feedback (howling) becomes. To keep the feedback loop under control at all times, the AFC system uses EMR (Electronic Microphone Rotator) technology to apply time variation, evenly distributing the loop's frequency characteristics for dramatically increased howling resistance.

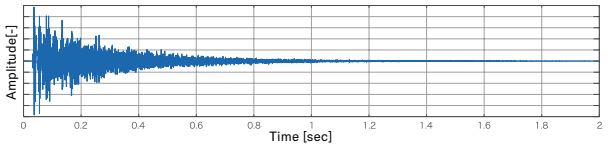


EMR: System output is time-shifted to evenly distribute the feedback loop's frequency characteristics. At any point in time the inputs are aligned with one of the outputs while the other outputs remain independent. The move from channel to channel is accomplished smoothly along with amplitude modulation (the allocation ratio for each channel remains constant).

*EMR is a patented Yamaha technology.

FIR Filters

The latest AFC4 system features much higher-density FIR processing power than previous versions so that extremely natural-sounding detailed reflection sound can be achieved even in dead spaces that have very little natural reverberation: Up to 10.666 sec at 48kHz / 5.333 sec at 96kHz.



AFC4 system components

Software

Model	Configurable FIR tap	Application
SK-AFC402	8 buses x 136 taps	Small to medium size concert halls and multi-purpose venues.
SK-AFC404	16 buses x 136 taps	Medium to large concert halls and auditoriums with under-balcony areas.
SK-AFC406	24 buses x 136 taps	Large performance spaces with dedicated systems for under-balcony, hall and stage.

Hardware

Model	Remarks
Processing Engine	As for specification, please ask Yamaha subsidiaries for details.
DANTE ACCELERATOR (AIC128-D)	128ch Dante I/O at 96kHz

AFC Experience

The Yamaha group has carried out acoustic design for more than 300 halls, theaters, lecture halls, and educational facilities, both at home and abroad.
AFC system has been installed at 150 venues all around the world, including Tokyo International Forum, The Grand Theater in Warsaw, etc.

Wylie E. Groves High School, USA

Nanyang Technological University, Singapore

Royal Swedish Opera, Sweden

West Gimhae Culture Center, South Korea

Castle Opera, Poland

Tokyo International Forum, Japan

"The Yamaha company has dipped its toe in this country
and I want to thank you a million for this initiative
because the hall has a whole new sound now.
The sound is flowing, the sound is soaring.
This is very important both for the performers
who take the stage and for the audience in the concert hall."

— Mr. Denis Matsuev

*A comment after the performance at the The Tyumen Music Hall in Russia, where AFC is installed.

YAMAHA
Make Waves

YAMAHA CORPORATION
P.O. BOX1, Hamamatsu Japan
www.yamaha.com/proaudio

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