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GUIDE to HOME THEATER

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September 1999

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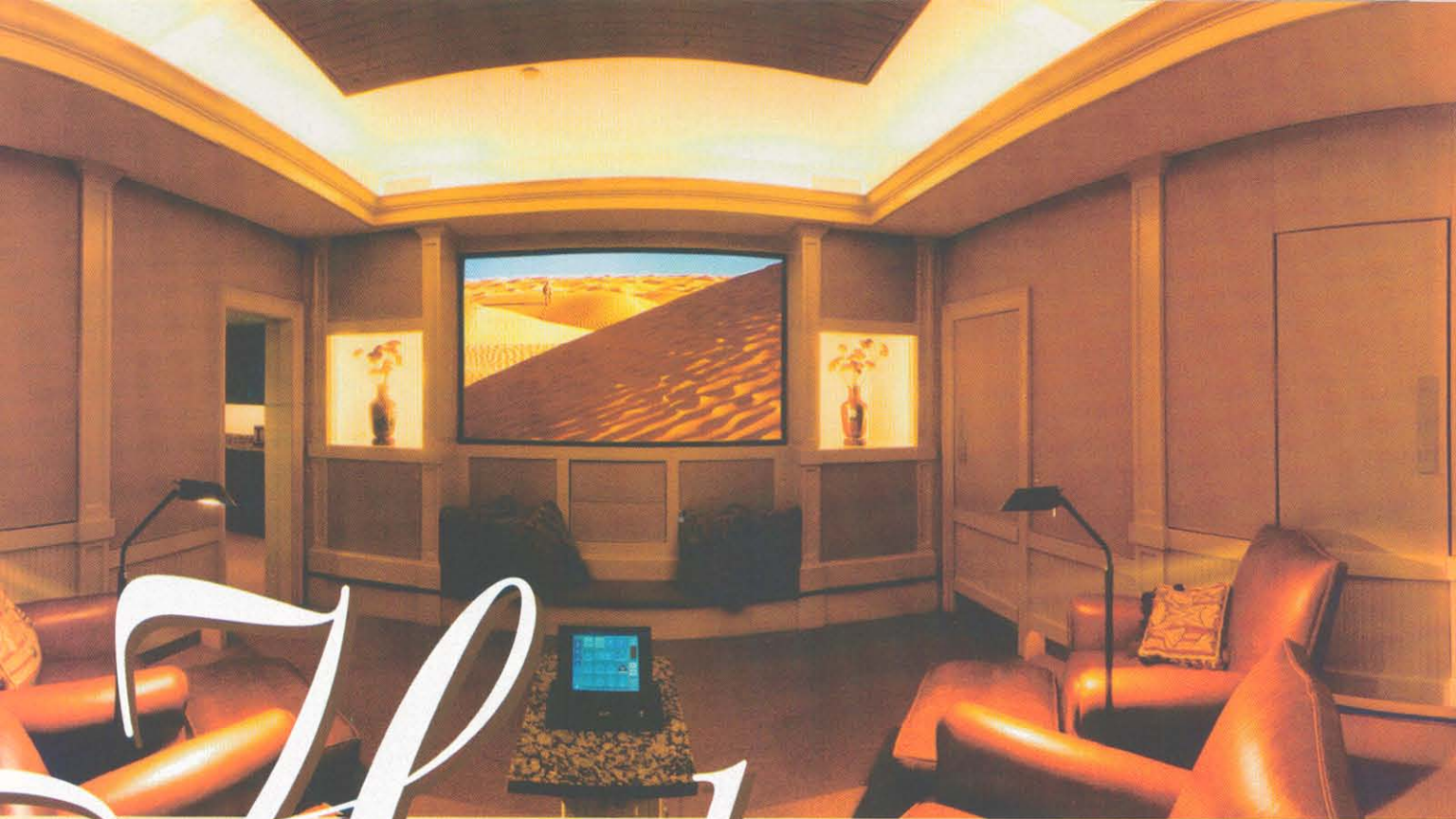
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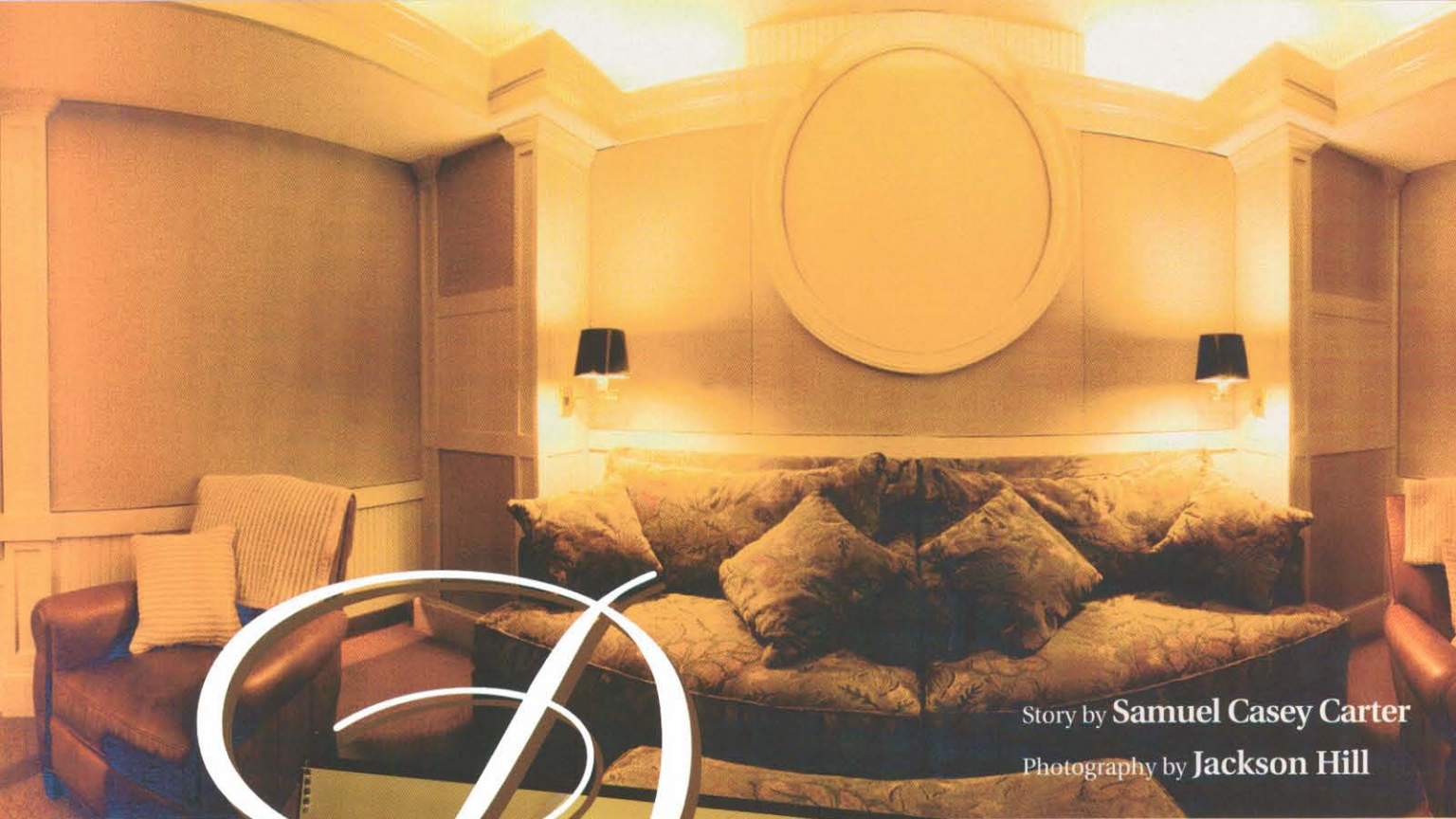
Halcyon

For this Washington, DC couple, flexibility was the path to sonic and visual perfection

If you're like most folks, you've probably entertained the fantasy of a luxurious retreat in a rustic setting, far from the hubbub of city life and the burden of daily stress. For one busy couple based in the Washington DC area, this fantasy has become a reality. Their time is spent in a historic Federal-style home located on the banks of the Tred Avon river a few miles upstream from the Chesapeake Bay. The property has been known as Halcyon since the late 1700s.

Above: A 360° view of the theater, where acoustically transparent fabric hides seven THX speakers, four large subwoofers, and a host of computer-modeled room treatments.

Among the activities they wished to pursue in their waterfront hideout was losing themselves in the stories that only a high-performance home



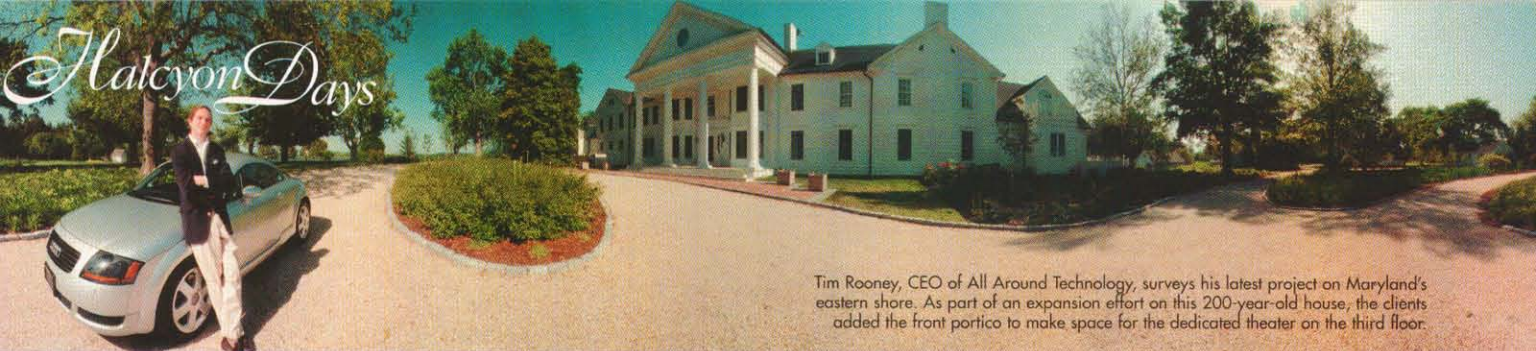
Story by **Samuel Casey Carter**

Photography by **Jackson Hill**

Days



The Stewart 93" x 50" Microperf screen provides optimum viewing angle for the primary seating position at 11'6". Below the screen, a folding panel conceals a compartment for future teleconferencing equipment.



Tim Rooney, CEO of All Around Technology, surveys his latest project on Maryland's eastern shore. As part of an expansion effort on this 200-year-old house, the clients added the front portico to make space for the dedicated theater on the third floor.

theater can deliver. In fact, they added a third floor to the house as an entertainment space, which was to include a top-notch A/V system.

But as with so many home-theater projects, what began as a simple initial concept soon became complicated. The large third-floor room would have yielded less-than-optimum performance from their A/V system. To tackle this problem, they contacted Tim Rooney, CEO of All-Around Technology, Inc., a custom audio/video design and installation firm in Bethesda, Maryland. The owners had worked with Rooney on several previous occasions, so they knew they were in good hands.

As Rooney recalls, "The clients wanted an informal entertainment area for watching movies and ball games and playing pool. They added an entire third floor to their home exclusively for this purpose. The luxurious space was an open area surrounded by cathedral-style bay windows on all four sides that commanded a 360° view of their riverfront property—a beautiful room, but not exactly appropriate for use as a home theater."

Less Than Optimum

At one end of the room a staircase came up through the floor, and a pool table was to occupy the corresponding location at the opposite end. The homeowners wanted seating for at least 12 people, facing a spectacular view of the water. But no matter how wide open and naturally bright this space was, the owners wanted to transform it into a high-performance media room at the push of a button.

"This type of home theater has been portrayed countless times in audio/video magazines," says Rooney. "Such rooms are spectacular achievements of automation, mechanization, and architectural problem-solving. But truthfully, they rarely yield the

Below: A simple and elegant design, merged with sophisticated acoustic treatment, create a rare intensity of experience.

Opposite: An architecturally significant window was preserved by integrating a concealed motorized blackout shade and a strategically aligned, acoustically reflective glass panel.



performance that the audio/video electronics are capable of delivering. Knowing that the owners wanted real performance, we considered the assignment, but we were dubious of its outcome."

Rooney and his partner, Rob Shapiro, analyzed the space and considered the aesthetics. No infrastructure was to be visible, and they determined that this would, in fact, be possible. But there seemed to be no way around some serious compromises in performance.

According to Rooney, "For the screen to be in the same plane as the front speakers, the seating distance would have been 21 feet from the screen—hardly a desirable location. A 15-foot viewing distance was also possible, but the anomalies with the front speakers would sound all the more glaring. In order to achieve separation, the speakers would have to be placed next to the walls near the front bay window, and all seating positions would suffer from early first reflections. Perhaps most significantly, there was no way to seal off the stairway from the light and sound of the house below. In short, no matter how much the clients wanted to use this space for a home theater, the performance would be less than optimum."

Rooney recommended that the owners find a more suitable home-theater location in another area of the house. "For these clients, sound quality is 80% of the movie experience. We knew they wanted a great theater. Half jokingly, we suggested they build a room in the back half of this space and build out over the front door. As an added benefit, they could also have a front porch on the first floor!"



Gear Guide

Home Theater

Audio/Video Sources

Sony SLV-R1000 S-VHS VCR
Faroudja DV-1000 DVD player
Sony SAT-A2 satellite receivers (2)
Gateway Pentium II computer

Video Display

Runco DTV 1000 projector
Faroudja VP-401 video processor
Stewart Snapper 93" x 50" Microperf
1.85:1 screen

Surround Sound System

Proceed AVP preamplifier
Proceed HPA-3 3-channel power amplifier
Proceed AMP-5 5-channel power amplifier
Rane PE-17 4-band parametric equalizers (2)
Rane THX-44 Home Theater Equalizers (2)

Speaker System

Triad In-Room Gold THX speakers (5)
Triad On-Wall Gold THX surround speakers (2)
Triad Platinum subwoofers (4)
Omnimount speaker brackets (4)

Remote Control System

AMX Accent3 RS-232 controller
AMX 8.5" color video touchpanel
Extron 60-199-01 RGB switcher
Extron 60-160-01 2-output VGA distribution amp
Knox Video 16x8AF A/V switcher

Burst 1x4 composite distribution amp
Burst KR-10-Y/C transcoders
Burst YC-2C S-video-to-composite converters (2)
Radio Design Labs power supply and relay

Acoustic Materials

Sonex 3" Techwedge (35")
Sonex 2" Techwedge (57")
ASC Tube Traps w/ceiling kit (2)
RPG FRG OmniFusors 2 x 2 (18)
RPG Skyline Diffusors 2 x 2 (4)
Binary Amplitude Diffusors 2 x 4 x 4 (8)
Omni 4" Safe Foam 2 x 4 (40)

Cables

Extron RGB
Bi-tronics S-video
Belden 8281 composite video
AudioQuest Turquoise interconnect
Liberty THX Low Cap speaker cable
Liberty Extra-Flex 22-gauge 2-pair shielded data and control

Power Conditioning

Panamax Rackmax surge protectors (2)
Equitech ET7.5W/SI 80 amp power

conditioner

APC 2400-watt UPS

Furman PL-8 power conditioners (5)

House Music System

Audio/Video Sources

Sony CDP-CA9ES 5-disc CD changer
Sony CDP-CX90ES 200-disc CD changer
Yamaha TX-950 AM/FM tuner
Sony SAT-A3 satellite receivers (2)
Magnum Dynalab ST-2 FM antenna

Processors/Preamps

Rane ME-15B stereo equalizer

Power Amps

Sonance SONAMP 260 amplifiers (13)

Speakers

Sonance TR-3000 ceiling speakers (25 pairs)
Sonance T-3000 in-wall speakers (2 pairs)
Sonance D-5500 in-wall speakers (1 pair)
Sonance EC-300 sauna speakers (1 pair)
Rockoustics Rocky Jr. outdoor speakers (8 pairs)
Velodyne HGS-10 subwoofer

Cables

Liberty Extra-Flex 16-4 speaker cable
Commscope F6SSVV RF interconnect and distribution
AudioQuest Turquoise interconnect

Rack System (theater and whole-house equipment)

Middle Atlantic Slim 5 37-space racks (5)
Middle Atlantic RSH-4S custom rack shelves (13)
Middle Atlantic TD-4 4-space rack drawers (7)
Middle Atlantic vent panels (21)
Middle Atlantic sliding shelves (5)

RF Distribution

Wineguard CA-7082 UHF/VHF antenna
Antennacraft preamplifier
Holand combiner and A/V modulator
Hughes Duo Dish
Spaun DSS distribution (24 locations)
ChannelPlus DA-1000 RF amplifier

Audio Control

AudioAccess PX-600 6-zone controllers (2)
AudioAccess/LiteTouch KPS keypads (15)
Sonance AF-8 stereo autoformers (3)

LiteTouch 5000 System

H Series keypads (sculpted) (61)
8-channel dimmer modules (15)
8-channel relay modules (17)
Quad dimmer modules (10)
4-module enclosures (11)
Dual power-supply modules (3)
5000LC CCU controller



The user interface was designed to be simple and inviting to use: guests are able to access basic system functions, while more advanced users can access powerful features hidden in deeper menus. The center console provides a simple, organized solution.



Plan B

Rooney might have been joking, but the owners took his suggestion seriously and redesigned the third floor to create a dedicated theater space. They added 10 feet to the front of the house, which resulted in an entirely new exterior, including the front porch on the first floor.

Now that All Around Technology had a reasonable space to work with, they could get on with the real job of designing the home theater. "We balanced price, performance, and ease of use until we arrived at the appropriate specifications," Rooney says.

"Because the client wanted optimum acoustical performance throughout the theater, we understood the need for a predictable, computer-modeled acoustic environment. At this point, we hired the Keith Yates Design Group to provide the acoustic design and infrastructural elements. [See Keith Yates' sidebar, "Supersonic Room," for the details on this aspect of the project.—Ed.] It was our job to design and install the media system while coordinating the various trades responsible for constructing the room."

Five Triad In-Room Gold THX speakers and two In-Room Platinum subwoofers are all placed behind acoustically transparent fabric—except for the center-channel speaker, which is mounted behind a Stewart microperf screen. Two additional Triad On-Wall Gold THX dipoles provide extra envelopment and are lined up with the first row of seats. All speakers are powered by Proceed amplification, and a Proceed AVP decoder processes surround-sound signals.

The owners wanted capabilities beyond the standard three or four video sources (DVD, LD, satellite, and VHS). The Runco DTV 1000 video projector had to accommodate computer data and graphics and support Web surfing, video teleconferencing, and other graphics-intensive computer applications.

Supersonic Room by Keith Yates

It began with a phone call from Tim Rooney of All-Around Technology, Inc. "This is my fourth project with this client," Rooney said. "He's a wonderful, no-nonsense guy who's beginning to suspect that the gear he's buying is only as good as the room we put it in."

So began a project that brought together an owner's passion, an architect's inspiration, a builder's pride and joy, an A/V firm's management and installation finesse, and, from the other coast, my drawings and specifications for the acoustical infrastructure to give shape to the magic we wanted to create together.

Shell Games

An extensive remodel project, the Halcyon Theater presented an immediate opportunity for the team to collaborate in reshaping the room's shell to improve its bass response. It's easy to be seduced by famous ratios or impressive-looking printouts, but they can be the prelude to a darker reality. Peek behind the spreadsheets and graphs and you'll discover that the calculations rest uneasily on a handful of fundamental assumptions, including one that forces the room to be a simple, shoebox-shaped affair with no eels, clipped corners, pitched ceilings, soffits, raised seating platforms, or other asymmetries or "flaws."

The real world is seldom so tidy, and the Halcyon is no exception. Framing considerations required clipping the two front corners at 45° and a similar but more extensive excision down the length of the room at ceiling level, which turned it into something of a cathedral-type ceiling with a flat-top haircut. This put the room designer in a quandary: how to deal

with the fact that the room can't possibly conform to the sanitized shape the software requires before it can start crunching the numbers?

I modeled the theater several different ways, beginning by ignoring the clipped corners and ceiling line—in other words, I assumed that the room was a geometrically primitive affair comprising the six unbroken planes of four walls, floor, and ceiling. Room dimensions with the smoothest pattern of axial, tangential, and oblique modes were printed and saved.

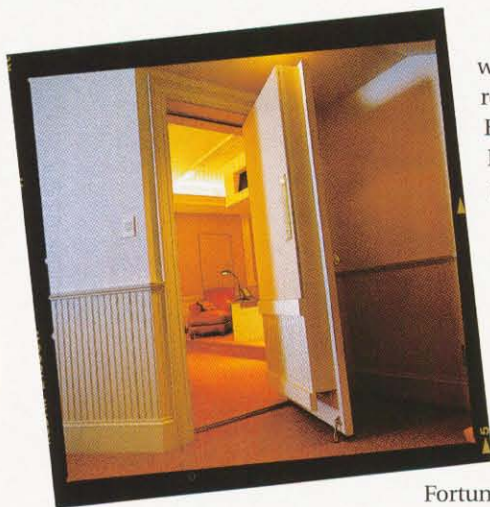
Next, a new round of simulations was launched, based on what might be called "dimensions of volumetric equivalence." For example, the ceiling height is treated as the distance above the floor that a flat but imaginary ceiling would be to yield a room with the same cubic footage as the real room.

The room's "primitive" and "equivalent" dimensions were adjusted and calculated an inch at a time, until the regimen turned up a handful that passed muster on both test methods. The Halcyon's sweepstakes winner turned out to be a room with a ceiling height of 10' 7" (measured from the floor in front of the screen to the flat portion of the ceiling), a width of 16' 1½", and a length of 23' 4".

Wall Construction

It has become commonplace for A/V designers to prescribe double- or triple-layer wallboard construction in home theaters. According to this theory, beefing up the walls increases sound isolation from adjoining rooms. (It does, but usually only slightly.) In addition, the added stiffness is said to improve bass

continued on p.44



This detail of one of four doors in the theater reveals, from the ground up: an acoustic seal, a light cove, and a diaphragmatic absorber.

"Additional inputs for computers, video games, camcorders, and future multimedia sources were required," says Rooney. "This called for a design that automated input switching and audio routing for RGB, component, S-video, and composite video sources. Our design team, headed by Bruce Yeatman, used the AMX Accent 3 controller to automate the routing functions of various Extron and Knox switchers. An 8.5-inch color video touchscreen solved the dual design requirement of an intuitive interface that still allowed for total system control by more advanced users."

One advanced application required by the owners was the ability to simultaneously display images from any two sources. Unlike a normal television with picture-in-picture, they wanted to display sources with different scan rates—for example, financial information from the Internet and off-air and satellite broadcasting. Simply using the video-capture capability of a computer was not acceptable; the owner considered the video image quality paramount.

Rooney's solution: "We decided to design the video system around the Faroudja 601, an upgrade to the company's benchmark 401 quadrupler; it was supposed to have the scaling capability necessary to provide multi-picture viewing from a projector. However, numerous sync and adjustment problems revealed that Faroudja's product was not ready for market.

Fortunately for us, Faroudja was willing to assist in reprogramming the AMX controller and making various other system modifications necessary to deliver the picture-in-picture functionality required by the client. We finally met this need by putting the second picture into a video window in the AMX touchpanel."

The Rest of the Story

As the new, dedicated theater space was being designed, All Around Technology turned their attention to the whole-house A/V and control system. The owners wanted multiroom audio, RF distribution for satellite and broadcast antenna signals, lighting control, telephone and data networks, and a security system. But even more important than the specific functions was simplicity of operation. Guests would often use the house when the owners were away, and the owners themselves demanded a simple and elegant solution.

Reliability was also a major issue—the house is located far from convenient service. Wall controls had to be simplified and consistent in appearance and operation throughout the house. In addition, the house might serve as a corporate retreat, so extended communications capabilities were also needed.

Rooney's team and the owners talked a lot about system integration. "Long-distance service calls are hard on everybody, making a strong case against a highly integrated solution," says Rooney. "We decided to let a

"Supersonic Room," continued

response. (It occasionally does, but it can often make the bass response worse by exaggerating the room's modal idiosyncrasies.)

As it turns out, however, the natural "give" in a sheet of standard ½-inch gypsum board can be quite effective in controlling excess bass energy in residential-size rooms. The Halcyon's wall specs thus called for a single layer of ½-inch USG Type X Sheetrock on wood studs spaced 16 inches apart. For additional low-frequency absorption, the painted-wood wainscoting ringing the room was recruited to function as a diaphragmatic absorber.

Varying the volume of the trapped-air cavity behind the bead-board facing allowed the wainscoting to be tuned to control specific regions of the bass spectrum. For example, the rear-wall wainscoting was detailed to soak up some of the 48Hz axial mode associated with the length of the room, while the side wall wainscoting addressed the 71Hz lateral mode at the rear half of the right wall.

Supplemental absorption "brackets" this mode (65Hz treatment at the left wall and a smaller section of 79Hz treatment on the right wall) to account for the slight but inevitable disparity between a textbook formula and real-world, as-built performance. These low-cost and essentially invisible measures contribute to good spectral balance in the room's natural reverberation, readily perceptible as enhanced articulation and punch throughout the bass range.

A Sense of Place

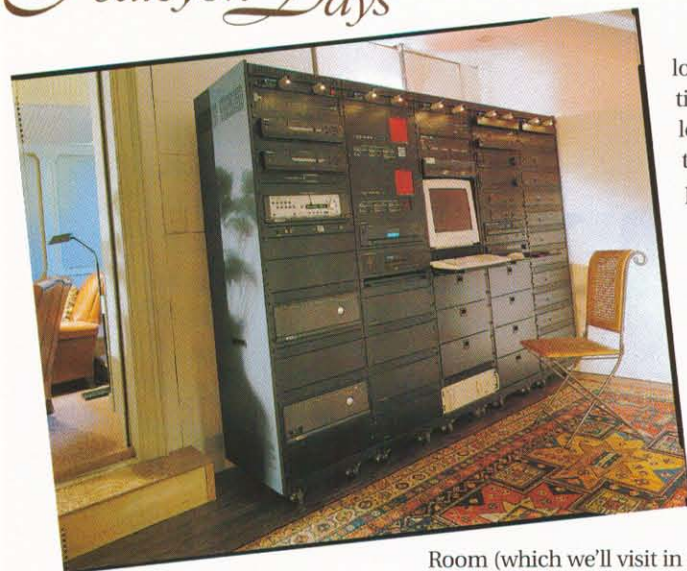
As any two-channel audiophile can attest, getting the most out of a play-

back system often comes down to the locations of the speakers and listening chair in the room. With its clutch of sound sources (speakers and subwoofers) and multiple fixed elements (cabinets, video screen, seats, etc.), a home theater is usually less accommodating of placement tweaks than an anything-goes music-listening space. Getting the most from speaker and listening layouts in a home theater requires careful planning before the speakers are even ordered.

Specifying the Halcyon Theater's speaker locations began by defining the allowable space in which a speaker could reasonably reside. For example, the center of the left channel's woofer had to be between 28 and 59 inches above the floor, between 22 and 37 inches from the left wall, and between 14 and 19 inches from the front wall. All speakers, subwoofers, and the primary listening location were similarly "bounded." The computer was then instructed to establish a layout and simulate the resulting acoustic behavior in the 20–300Hz range, both modally and in terms of speaker-boundary interference response.

In the Halcyon's case, the computer chewed through about 12,000 different layouts of the 11 speakers and "money seat" locations before exhausting all possibilities. Ultimately, the layout that best met my criteria presented new challenges of its own: Neither of the two Triad In-Room Platinum subwoofers could physically inhabit their prescribed locations because of those pesky clipped corners at the front wall. The solution was to have Triad fabricate a pair of custom enclosures with the same internal volume but with clipped corners of their own, which allowed us to get the

continued on p.46



A dedicated control room adjacent to the theater houses all theater and house-wide A/V equipment. Rolling equipment racks make service and upgrades a snap.

local company handle the security system. In addition, if the house was to function as a conference facility, the telephone/voice-mail system had to offer a level of sophistication that only a specialist could provide. We would install the telephone and data infrastructure and coordinate the installation of the telephone hardware with the specialist."

After these decisions were made, All Around Technology designed the lighting-control system. The clients' concern for reliability, simplicity, and future growth suggested the Lutron Homeworks or LiteTouch 5000 system. "They're similarly priced," says Rooney. "Lutron has the advantage of redundant processors that provide for increased reliability, plus a big-company name that makes a case for long-term serviceability. But in the end, the decision came down to aesthetics. Both companies make custom plates to integrate audio keypads. LiteTouch actually makes a front end for the audio system that we would eventually choose."

The lighting-control system would also be responsible for a number of other functions: motorized windows on the second floor, blinds in the River Room (which we'll visit in a moment), seven gas fireplaces, blinds in the master bedroom, the shade in the home theater, and the thermostat for the housewide HVAC system.

Music Throughout

Another overall requirement was housewide audio distribution. "The goal for a distributed audio system is to surround a living space in music," says Rooney. "The music should flow from room to room with little variation in timbre or volume. The house should convey the music without distraction. A well-designed system should be able to play background music quite loudly without interfering with conversation, and when it's used as a foreground system, the listener should be itching to dance."

An AudioAccess keypad-driven system was selected for multisource, multizone audio distribution. "The AudioAccess and LiteTouch systems are a natural fit," Rooney acknowledges. "Both the audio and lighting controls can be integrated into the same plate." For this system, the AudioAccess PX-600 controller yielded 12 zones, each independently operable from its own keypad. Each zone is powered by a separate Sonance 260 power amplifier.

On the first floor, 21 pairs of Sonance T-3000 and TR-3000 flushmount speakers were installed. With the excep-

"Supersonic Room," continued

acoustic centers of both subwoofer drivers in the optimized locations.

Acoustic Treatment

With the room's envelope finalized and the speaker and listener positions nailed down, the creative part of the acoustical program could begin: the shaping of the room's sonic personality by controlling how the room surfaces reacted to sound energy impinging on them.

In addition to enjoying a broad spectrum of movie genres, the Halcyon's owners wanted to be able to listen to classical-music CDs and entertain comfortably in the space without the dead, vaguely unpleasant effect often encountered in "acoustically treated" home theaters. The owner also had high expectations for sound quality in the far rear of the room.

"Oh, and one last thing," he slipped in. "My wife absolutely insists that we keep that big round window on the back wall." It was an understandable request, as the window forms an important part of the home's curb—make that waterfront—appeal.

Construction supervisor Tim Saulsbury and Graybanks Design Group responded with a clever way to conceal a motorized black-out shade in the window's casing and to accommodate my request for a new sheet of glass spaced a few inches in front of the existing window. This new pane was canted to steer sound upward, toward the acoustic treatment on the ceiling, which was designed to redistribute the energy spatially and temporally to enhance the sense of envelopment.

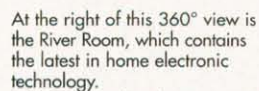
The general layout of diffusers, reflectors, frictional absorbers, pressure

traps, and other acoustic elements was guided by a desire to suppress the kind of reflection patterns that corrupt timbral and spatial fidelity in untreated rooms. At the same time, we wanted to maintain the high-frequency life and sparkle that treated rooms often lack. Exact positioning was then fine-tuned by computer ray-tracing, which maps the paths that sound takes in a room.

Acoustic devices were mounted to the face of the gypsum-board walls and ceiling, concealed behind acoustically transparent fabric stretched and tensioned on a Novawall track system that enables the material to be removed for cleaning, access, etc. The space between the fabric and wall surface was fairly typical for projects of this scope: 5 inches on each of the side walls and ceiling, 8 inches on the front and back walls, and about 22 inches in the room's four corners.

Ask anyone involved in a successful home-theater or screening-room project and you'll likely hear the phrase "team effort." In the Halcyon's case, the working team included the owner, whose drive for excellence led him to learn CAD software so he could remain in the loop with, and even direct, the rest of his team. This is a rare commitment, but entirely consistent with a project whose very name has, since antiquity, exuded a magical resonance.

Keith Yates Design Group is a California-based consulting firm providing architects, builders, and owners with design, engineering, and testing services for residential entertainment venues nationwide. Additional descriptions and drawings of the acoustical, electrical, mechanical, and structural elements of the Halcyon Theater can be viewed online at www.kydg.com.



A photograph of a white, rectangular control panel with a grid of buttons. The buttons are labeled with text in various colors (green, yellow, red, black) and are arranged in a structured layout. The panel is mounted on a textured, light-colored wall.

GAME MENU	RESTART	RELOADING	PAUSE
BACK	ATTACH	DESELECT	REL. OF
DOWN	UPWARD	UP SIDE	REL. DOWN
FE. SLIGHT	UPWARD	FE. SIDE SIDE	DOWN
DOWN			

The River Room presented a unique challenge. An acoustically live space, it is the focal point of the house, open to drawing rooms, the entry foyer, and hallways. "The sound in this area was considered important to the welcoming quality the owners wanted to create. It needed to acoustically match the other areas throughout the house, but because of its two-story height, extensive use of glass, and limited speaker locations, strong steps had to be taken to meet this design goal. These steps included separate amplification, $\frac{1}{3}$ -octave equalization, and a dedicated Velodyne HGS-10 subwoofer to supplement the four in-wall speakers."

Once All Around Technology had finished designing the audio and lighting systems, they addressed the RF, telephone, and data systems. All television locations get two RG-6U coax feeds and one CAT-5 phone wire. For now, one coax supplies an antenna feed, and the other carries the DSS satellite feeds. The CAT-5 wire supplies the satellite receivers with their dial-up connections, and they can be used later for other TV-related data services, if necessary. The antenna feed can also be multiplexed with additional satellite services (e.g., DSS-2) as they become available.

For telephone and data, they decided to run two CAT-5 phone wires to all telephone locations. One wire is used for the Panasonic telephone extensions and modem connections, and the other is for a housewide, dedicated computer network. Three-port plates were used throughout the home.

On a project of this size—or any size—Rooney stresses the importance of including an A/V expert in the design and implementation process. “This project was successful because the design team took our technical recommendations seriously. Too many times, the owner, architect, and builder don’t understand the complexities of a high-performance home theater or whole-house system, so they sadly compromise the performance of the client’s equipment.”

Fortunately for its owners, the Halcyon Theater suffers from no such problem. Thanks to the efforts of all members of the team, it provides exceptional performance in an idyllic setting that's perfect for whiling away the halcyon days of a life well-lived.

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