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Consumers aren't the only ones who lust over high-tech, high-end, dedicated custom home theaters. You can bet yourself a steak dinner that these carefully-designed, elegant rooms with plush surroundings and expensive equipment make custom installers' hearts flutter, too. The stakes are so much higher on this kind of project, and it doesn't take a rocket scientist to figure out that the profit margin can be higher, too. But not everyone gets to graduate to rooms like these; only a select group of individuals have reached the level where they can build and enjoy the ultimate entertainment experience.

The Climb to the Top

It's a fact of life; we all like to strive for higher ground: faster Internet access, taller buildings, cars that go further with less fuel, etc. The same goes for custom home theaters. You start out just working on the basics: get a bigger TV, hook it to a sound system, use surround processing, throw in a little center and surrounds, and voila! You've put together your first system. But you can't stop there. What's next? Well, people generally expect custom things to look pretty and operate smoothly, so your next step is to hide the wires and add centralized remote control. You make these kinds of step-by-step improvements on your systems until you finally reach the big jump: a dedicated room!

Now, at first it might seem easier to do a dedicated room. Obviously, you and your system are the main attraction! There will be no compromises with other uses. However, dedicated rooms inherently mean expectations for much higher performance than a big TV with loud sound. How do you achieve such a high level of performance?

Dedicated rooms also generate expectations of system automation (not just of the audio and video gear, but of things like lights, HVAC, security, door cameras, etc.) interior design, and themed or styled seating. In short, you've got to make the whole experience into an event that will entertain upwards of ten people for several hours.

All those expectations for performance, integration, and lifestyle are what make the process of doing a high-end project so complex. And don't kid yourself: the high-end audio and video products that go into these dedicated rooms aren't quite as easy to work with as a \$200 receiver from Best Buy – just like a thoroughbred isn't as easy to handle as a draft horse.

By now you should have realized that this move into the upper echelon of home theater isn't all fun and games. You're going to need some help to get there – and that's *absolutely* nothing to be ashamed about. Nobody knows how to do something before they've done it. Fortunately, custom home theater has one of the best “helps” out there in the form of CEDIA. Every year at EXPO, CEDIA offers what amounts to the best education available for home theater enthusiasts and professionals alike. Don't go to EXPO just to see the cool new stuff. Take the courses and attend the seminars. There's much to learn, and all the knowledge is crucial. You're going to need it out there in the field!

Once you're trained to the hilt, something will become obvious. In fact, you probably already know it. There are two aspects involved in this climb to the top. The first is technical. You physically can't design a reference quality home theater if you don't know how to do it. The second is financial. I don't care how technically savvy you are; if you don't have the time and money to dedicate to the project, you're not ready to branch out into the realm of high-end.

The Technical Nitty-Gritty

Before I talk about what to do, there are some performance goals everyone should target for a high-end project. You can pretty much break down the goals for audio into 8 items:

- High dialog clarity and musical articulation
- Precise sound localization
- Smooth sound movement
- Spacious surround
- Smooth tonal balance
- Tight bass
- Full dynamics
- Every seat a good seat

The same goes for video. There are 7 basic issues to mind when quantifying the picture performance:

- Sharpness
- Size (viewing angle)

- Brightness
- Contrast (from black to white)
- Color accuracy
- Absence of artifacts
- Every seat a good seat

With those performance goals in mind, what are the critical technical elements of sound system and video system layout that you must master? CEDIA courses will cover these topics in depth, but the basics are:

1. Seating: All seats should face the screen, have proper sightlines, and offer long-term comfort.
2. Projection Screen: An acoustically transparent, 16x9 screen of proper size (typically around 0.6 times the seating distance) is a must. Remember that bigger is *not* better if bigger is *not sharp!*
3. Projector: It must have enough light to produce 16 foot-Lamberts from the screen.
4. Room Décor: Dark and neutral colors are vital for a high-quality viewing experience.
5. Light Control: Ambient light and the color of the room work against any front-projection video system. Cut the light *way* back, but leave enough to alleviate eye strain – a very real, but oft-ignored occurrence.
6. Sound Isolation: Keep outside noises out and inside noises in. You don't want the garbage man outside to interrupt Tom Cruise cracking into the CIA's Langley spy database. Remember how quiet he had to be? Neither do you want the Death Star exploding in the theater to scare the wits out of the infant in the next room.
7. Noise Control: It goes hand-in-hand with Sound Isolation, but Noise Control deals with things *in* the room that make noise *in* the room. Quite simply, they must be made to *not* make noise. That's not always so simple...
8. Sound Reflection Control: Oh for a world where speakers radiated sound directly to our ears, without any reflections from walls, floors, ceilings, and coffee tables. Leave that world to your favorite Sci-Fi director and take measures to control all those reflections.
9. Front Speakers: You have probably heard by now that the Left, Center, and Right speakers should all be exactly alike. Yes, that means identical horizontal/vertical orientation, too. They should also be at or slightly above seated ear height and *always* aimed. The Center goes behind the acoustically transparent screen. The Left/Right subtend a 45 degree angle at the main seat. Dubbing stages (the places where movies are mixed) and cinemas are all laid out like this. If a home theater isn't, it's just a big TV with loud sound.

10. Side Speakers: They must be located correctly to integrate with the fronts and still have good dimensional contrast. That puts them somewhere between 90 and 110 degrees' rotation from front center, and about 5 to 6 feet high.
11. Rear Speakers: These are tricky little buggers. Deciding how many to use and where to put them can be the most difficult challenge of speaker layout. The rears have to integrate with the sides to form a seamless soundfield. They also have a nasty habit of suffering from psychoacoustic reversal, an effect whereby sounds panned to the rear appear to be coming from front center. You have to play with the number of speakers and the positioning of the speakers to balance these two issues.
12. Subwoofer Location: Much research has been done to predict good subwoofer locations in rectangular rooms. Find it, read it, and you will know how to place subwoofers around the room for the smoothest bass response and most even coverage. The most common guidelines from the latest research call for four subwoofers in a cross pattern, with one in the middle of each wall.
13. Subwoofer Output: Nothing distances a high-end home theater from a big TV with loud sound like adequate bass output. You would probably be astounded to know how much sub-woofing power is required to achieve a cinematic effect in a small room. The room really should be able to clear 115dB all the way down to 20 Hz, but consider that you've done your job well if you get 110dB.

A few parting thoughts on the technical side. Learn acoustics or hire a professional. Acoustics is not a black art; it's actually very scientific and logical once you get to know it. However, you might not be in a position to become familiar with it yourself. That's OK. Most people aren't. That's why there are a number of acousticians who specialize in home theaters. There's nothing wrong with seeking one out. It doesn't take anything away from you or your abilities.

Learn optics or hire a professional. Like acoustics, optics is tricky (although scientific). You don't want to get the colorimetry or the ratios wrong, or else nothing you install in the way of video equipment will look right.

Learn networking and automation or hire a professional. I can't begin to tell you how frustrated people get trying to bring automation systems online. The popular automation products we currently have to work with are not friendly to programmers, no matter how you slice it. If you need to bring in a good programmer, do it.

Perhaps the most important point of all is to understand the technologies involved in a home theater. There are audio formats (Dolby Digital, DTS, DSD on SACD, MLP on DVD-A), video formats (480i, 480p, 720p, 1080i, 1080p), display technologies (DLP, D-ILA, LCD, LCoS, Plasma), aspect ratios (Anamorphic, 16x9, 4x3, 1.85:1, 2.35:1, 1.78:1),

scan converters and projection lenses, and a whole host of automation-related technologies like Internet Protocol, Cresent, etc.

Project Management

In an ideal world you could play designer all the time, never having to actually earn a living. That approach probably won't get you very far in today's world, so learn process management. High-end design and installation is complex, with lots of pitfalls and random turns. You had better find creative ways to incorporate the unexpected in your planning.

It is also important to develop relationships with architects, interior designers, and builders. Learn how architects and interior designers work. Don't assume that you can work in vacuum and then present a final masterpiece that everyone else on the project will ooh and aah over, kowtowing to your every wish. Design is an interactive process. If you include architects and interior designers in your work, you benefit from the collective talent each field brings to the table.

Learn how builders work, too. You'll discover that they don't automatically know how to build things like sound isolation shells. You may have to help them understand the function of certain products, and you may even have to source some of the products for them.

Be very vigilant about change orders. Make sure everyone involved with the project submits a change order the *minute* something diverges from the original plan. You may not be happy with the large number of change orders that come in, but at least you've been warned that there's a change and potentially a cost increase.

Finally, realize that how you conduct yourself is just as important as the grade of performance you bring to the project. You want to be remembered as the one who wasn't a pain in the tush.

Climbing the high-end home theater ladder is not easy, but the rewards are there for people who enjoy a challenge. The satisfaction you get from successfully completing a big project is worth every minute of classes, study, late nights at the computer, and long days in the field. You won't regret it. I guarantee it!

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