Datasat Digital Entertainment

RS20i Surround Sound Processor And
RA7300 Seven-Channel Amplifier
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My first impression on hearing that I would be reviewing Datasat's processor and amplifier products was "Who is Datasat? And why is a satellite communications company selling home theatre products?" Datasat's story is interesting and perhaps surprising enough that it is worth spending a little time on. Datasat is a UK-based company that is an umbrella over three business groups. Datasat Communications has been involved in satellite data communications for about 25 years. Datasat Technologies develops sophisticated wireless wide-area networks. Datasat Digital Entertainment is responsible for the design and manufacture of professional digital cinema hardware, 35 mm film soundtrack encoding, and the design and manufacture of home theatre products. Datasat Digital Entertainment appeared in 2008 when Datasat purchased the DTS Digital Cinema business from DTS®, Inc. With the sale of the Digital Cinema business, DTS is now focused on licensing and developing new or updated codecs for home theatre and other platforms for personal entertainment (computers, mobile devices, gaming, etc.).

Because of the tie-in with DTS, it's appropriate to touch on some of the milestones in the history of DTS. The first big event for DTS was the 1993 release of Jurassic Park, with a DTS Digital Sound soundtrack featuring 5.1 discrete digital sound channels. This was the first time 5.1 discrete digital sound was heard in theatres. In the mid-1990s, DTS Digital Sound was launched for the LaserDisc format requiring DTS-encoded discs, a compatible LaserDisc player, and a DTS surround decoder. The format used for LaserDisc was developed with a type of codec called Coherent Acoustics that utilized a core-with-extensions architecture that would provide backward compatibility while allowing for expanded capabilities in the future. The DTS-HD formats found on Blu-ray Discs™ continue to build on this core-plus-extensions architecture so that a single soundtrack can provide both current high-definition digital sound as well as being compatible with earlier equipment that supports only legacy formats. By the year 2000, every major film was being released with a DTS Digital Sound soundtrack option. In 2003, DTS went public. By 2008 DTS had decided to focus their business on licensing and codec development for consumer audio and put their Digital Cinema business unit up for sale. That's when Datasat purchased the DTS Digital Cinema business that included the professional cinema hardware design and manufacturing business and the 35 mm film soundtrack encoding business that provided 5.1 cinema soundtrack encoding for movies released on 35 mm film. DTS Digital Sound was rebranded as Datasat Digital Sound and movies encoded with Datasat Digital Sound are compatible with both newer Datasat hardware like the AP20 cinema processor and with older DTS hardware the theatre may still use. These soundtracks are still delivered to theatres on two CDs (possibly more for longer movies) that synchronize with the projected images.

Datasat released their AP20 digital cinema processor in 2010 to fill the market need for theatres transitioning from 35 mm film projection to digital. The AP20 is a 16-channel processor supporting both film-based legacy formats and Digital Cinema's high-res digital audio soundtracks. Dirac Live room optimization makes the AP20 the premier processor for movie theatres. The RS20i home theatre processor ($18,995 MSRP) is an evolution of the AP20, adding circuitry and component upgrades,

features, and decoding that aren't required for movie theatres. For this review, Datasat also provided the companion RA7300 seven-channel amplifier (300 w/ch @ 8 ohms, hence the 7300 model number, $13,995 MSRP), a heavy brute of an amplifier that seemed to be the ideal complement to the RS20i processor. Datasat also manufactures the RS2400 amplifier ($11,995 MSRP), a stereo amplifier with 400 watts per channel into 8-ohm loads.

DTS Digital Sound and Datasat Digital Sound are both referred specifically to soundtracks released with movies on 35 mm film. DCPs (digital cinema packages, the entire digital movie that is transmitted to movie theatres) do not presently have encoded audio. They have uncompressed 5.1 or 7.1 soundtracks in 24-bit 48 kHz sample rate uncompressed LPCM. So there's no decoding going on in most digital cinemas right now. Audio processing is still needed for equalization and for room correction if the theatre has gone that far. Barco Auro 11.1 and Dolby® Atmos are both upcoming digital audio formats for cinema that could bring decoding of codecs back to digital movie theatres.

RS20i Processor

The RS20i is a first for me. It's a Linux computer in a stylish chassis. The machined faceplate had interesting 3D "wave" styling that brackets a large LCD touch screen in the center of the faceplate. The review unit had a black anodized finish with a silver power button that really only puts the computer in standby mode. The silver power button hinges open on one side to reveal a USB port used for saving or loading configuration data or for software updates if an Ethernet connection is not available. There is a circular knob on the front right side of the RS20i. It is used as a manual volume control when you are on the main screen or as a menu selector when you are navigating through the menu system on the touch-screen. The cooling fan continues to run even in standby mode. Startup is very quick, maybe five seconds or so. There are three expansion slots on the back panel with only one of them currently used. This allows Datasat to offer future upgrades as either swaps for existing boards or as entire new add-on circuit boards.

On the back panel, the RS20i looks very different than conventional processors since most of the connections are via DB-25 (25-pin d-shell connectors, much like 9-pin RS-232 d-shell connectors used with computers) rather than conventional RCA or XLR jacks. In the upper left corner, there's a power switch and 15-amp IEC power cord socket. Below that are one digital audio coax input (RCA jack) and two TosLink optical digital audio inputs. The other familiar inputs are two pairs of left and right analog stereo RCA jacks. An additional RCA jack is labeled "monitor out" and another is labeled "hearing impaired." There are four HDMI inputs and one HDMI output. There are two digital audio DB-25 input connectors with female sockets, and two DB-25 digital audio output connectors with male pins. Since the RS-20i is a 16-channel surround sound processor, the two input connectors are split so that channels 1 through 8 are on one connector and channels 9 through16 are on the other connector. There are also dual DB-25 connectors for analog channels 1 through 8 and 9 through 16. For the review, the two DB-25 analog output connectors were connected to Datasat's RA7300 seven-channel amplifier's DB-25 analog audio input jacks. I needed both connectors so the second subwoofer could be used and set up completely separately from the first subwoofer. The RS20i will support up to four subwoofers. There is no remote control supplied with the RS20i. Ninety-nine percent of installations are likely to include at

least theatre automation, if not whole-house automation controlled by a touch-screen controller from Crestron or one of the other major players.

Network control of the RS20i is possible using iOS or Android apps for portable devices or VNC apps for computers running Mac O/S or Windows. I used both an iPad app (VNC Lite) and an Android app (bVNC Free) with the RS20i. Each app duplicates the LCD front-panel touch screen on the portable device and you control the RS20i as if you were using the front panel touch screen. The Android app was actually easier to use because it would maintain the proper size of the menu screens. The iOS app initially displayed the screen much smaller than the iPad's screen and zooming to a larger size and keeping it at that larger size was tricky. Later, the iOS app began opening the menu screen so that it was too large for the iPad screen and it would not stay "de-zoom-ed." As soon as I removed my fingers from the screen, it would zoom back to "too large" size so I had to scroll around to see the entire screen. I wouldn't want to use either of these over the long haul. Perhaps I didn't use the best VNC app for either platform, but it seems to me integration into a system controller would really be the way you want to use the RS20i

After this brief description of the RS20i, you probably get the idea that the RS20i is not a typical consumer product you order online or get from a local home theatre store. Datasat sells their home theatre products only through system integrators and custom installers. An installer will come to your home and perform setup, integration, and do the room-correction measurements. The RS20i is massively programmable. Any loudspeaker location can be connected to any channel and the RS20i can be configured to locate them correctly. The RS20i supports 16 channels simultaneously and uniquely.

The RS20i's setup is straightforward, but the gear used for setup comes in a fairly pricey kit that Datasat initially intended to sell only to dealers. However, some advanced hobbyist/gear-head types have cut deals with their installer/integrator to purchase the room correction kit (Dirac software and hardware) for their own use. Datasat offers a $5,000 "factory calibration" option that brings a Datasat specialist to the installation location to perform the room correction measurements and verification. Datasat studied all the room correction options available to them and the winner of their "competition" was Dirac from Sweden. Dirac currently makes Mac or PC software room-correction software selling for €389 ($520) for stereo or €600 ($827) for up to 7.1 channels. There is also a mobile audio app intended to improve the sound of compressed music files played on your iPhone or iPod Touch. To get Dirac in the RS20i, Datasat required a version that would support up to 16 channels. Datasat's Dirac software is run on a laptop using a very carefully selected microphone. Measurements are made for each channel, one at a time, corrections are calculated, and the results are downloaded to the RS20i. Once in the RS20i, you can turn Dirac room correction on or off.

The RS20i can do some things with audio I've never encountered before. For example, you can apply equalization, parametric equalization, filters, and Dirac room correction all at the same time. You can also set up a conventional 7.1 system and add three more subwoofers, add two height channels, add two front width channels, and have one channel left over. And all of those channels can have unique equalization, unique parametric equalization, and unique room correction. You cannot do this with the two SHARC processors found in most surround sound processors, even in expensive models. The RS20i has eight SHARC processors so everything can be done at the same time to every channel without limitations. Surprisingly, most consumer processing products, even if they have 24/192 DACs, will process signals in 24/48 format. Datasat does all their internal processing at 24/96. The SHARC processors are assigned different primary tasks, but there may be a bit of overlap here or there.

Essentially, two of the SHARCs handle the 24/96 processing of all the audio codecs… Dolby, DTS and any new codecs that may come along. Two more SHARCs handle all the processing for applying the Dirac room correction in real time. And four of the SHARCs handle all of the 1/3-octave EQ, parametric EQ, crossovers, and bandpass filtering, and most everything else not done by the other four SHARC processors. You have probably noted that other processors and AVRs will let you have EQ or room correction, but not both at the same time. And other products that offer Dolby Pro Logic IIz may allow height channels or rear surround channels but not both at the same time. You may also have seen other products with some versions of Audyssey that support additional front width channels, but you can't have those at the same time as the rear channels. Those limitations are definitely processor constraints, so Datasat made sure that would not be an issue with the RS20i. Internally, in moments of whimsy (Sheldon Cooper-ism intentional), Datasat has referred to the RS20i as a "SHARC tank."

Datasat made a sort of unconventional design choice to not offer an all-analog signal path through the RS20i; the balanced multichannel analog input is digitized. There are also two analog stereo inputs, also digitized, processed (or not if you disable processing for those inputs), and converted back to analog to go to the amplifier. With other products often offering a Pure or Direct mode (or both) for analog inputs, it's surprising there's nothing like that in the RS20i. But Datasat is so confident in the quality of the A/D and D/A conversion they felt there was nothing to gain by offering an analog pass-through option.

One of the things you can do through the RS20i's front panel and mobile device apps is to turn individual channels on and off or change the volume level. This proved useful a number of times for TV programming that was clearly made without monitoring deep bass leading to either far too much deep bass information or to uncorrelated and distracting deep bass noise. Late night viewing was also aided by disabling the subwoofers so as not to disturb others in the house. Your installer can create custom setups that are selectable via new buttons. When the RS20i was installed here, an extra button was created for Stereo without Dirac so I could compare my highest-quality music with and without Dirac room correction. I won't spend any time on the RS20i's touch screen interface though. It's really not intended to be "the" user interface. It is more useful to installers and integrators than to an end user. But since most everyone owning an RS20i will have a custom user interface developed for their system, it's possible that nobody is using the same user interface for the RS20i. It's just not that kind of product.

When I found out, before the review equipment arrived, I decided to challenge Dirac processing to see what it would do with a haphazardly setup subwoofer. You may recall that the Hsu Research VTF-3 Mk IV that I currently use as the "front" subwoofer (a Vandersteen V2W is in the back of the room behind the second row of seats) has a fairly large complement of controls that permit a considerable amount of tuning, which is essentially impossible to do without measurements and graphs to see what each tuning option does for bass response. I documented my settings, then twiddled things and changed the port configuration, and ended up with pretty horrible and boomy bass from that subwoofer. I have to say that Dirac does an awesome job taming a mess like that and making it sound fantastic. One of my favorite songs for evaluating subwoofers with music is Ladysmith Black Mambazo's a capella "Wawusho Kubani? (Who Were You Talking To?)." This song is on their Grammy-winning Shaka Zulu album as well as at least one compilation disc. About halfway through the song the 12 or so members of the all-male chorus begin stomping on the stage in rhythm with the song. This would be a big fail if they were on a concrete floor, but when they are on a fairly lively raised stage, the unison stomping of a dozen adult males sounds fantastic. Other room-correction options improve the impression of the sound in useful

ways, but the Dirac system Datasat uses is the first in my experience that reveals individual feet working in unison to make that wonderful percussive accompaniment to the a capella performance. This was very impressive; especially considering the subwoofer was far less than optimum before doing the Dirac room-correction measurements.

The RS20i has no Internet media applications, no network media capabilities, and no video processing of any kind. HDMI signals are switched from input to output, but there's no processing or upconversion. Whatever goes in is exactly what comes out. If you need dual video outputs or video processing, a Lumagen Radiance processor would be an ideal complement for the RS20i. The RS20i also has no legacy video inputs; it's HDMI or nothing… unless you use an external video processor, of course. The RS20i does not currently support Ultra HD (4K/2160p) but Datasat is working on that. There are two open expansion slots so even if current hardware won't support Ultra HD, a board change or additional board would likely be all that's required. 3D is supported as are all the latest Dolby and DTS codecs. Datasat has also committed to supporting the Auro-3D codec in 2014. Auro-3D was developed by Galaxy Studios of Belgium and has already been released around the world as Barco Auro 11.1 in movie theatres. More than 30 films have been released with Auro 11.1 soundtracks including Ender's Game, The Croods, The Hunger Games: Catching Fire, Elysium, Turbo, Oz The Great And Powerful, Red Tails, and Rise Of The Guardians. Auro-3D for home theatre will support up to 13.1 discrete channels including the standard 7.1 system plus five height channels and an overhead channel. The other next-generation cinema sound format, Dolby Atmos, has not yet been announced for home theatre. But you have to believe that if Atmos becomes available for the consumer market, Datasat will support it.

RA7300 Seven-Channel Amplifier

The RA7300 seven-channel amplifier is a brutal product for a lone person to wrangle. At 123 pounds out of the box, it is a major handful. Shipping weight is around 160 pounds. The amplifier is so heavy, there is plywood inside the cardboard box to stiffen the packaging enough to keep it from falling apart. The review gear arrived by freight company on a pallet. So this is not something you slip into the back of your car and carry into the house. Moving an amplifier this heavy is something else. Luckily, in my setup it wasn't necessary to get the amplifier to a rack, I set a shelf board on the floor under the projection screen, hauled the amplifier up onto the board and that's where it sat for the duration.

The RA7300 is as heavy as it is because it's a powerhouse of an amplifier. With 300 watts per channel at 8 ohms, or 450 watts per channel at 4 ohms, it is so powerful that there are two power cords and two power switches. The power cords have 15-amp plugs, not so you can plug both into a single 15-amp duplex outlet. You really should use two separate and dedicated 15-amp power lines. I have dedicated 20-amp service for my theatre gear and the RA7300 sounded fine. But if I had a larger room and larger loudspeakers, you can bet I'd want 30 amps of dedicated power for this monster amplifier. The RA7300 has the lowest noise floor I've ever heard in my theatre room. It was really, really, really quiet. With seven loudspeakers in the room, any noise floor at all can be pretty audible when the noise is coming from so many sources. Looking at the noise spec, it is rated at better than -123 dB unweighted. With A-weighting, the noise spec improves to better than -125 dB, about 15 dB quieter than the best and most expensive amplifiers I've reviewed. At this low level, 15 dB is a big deal. The RA7300 doubles the voltage slew rate and halves the noise by using fully balanced circuitry. That increases cost considerably since

each of the seven amplifier circuit boards essentially has two amplifier circuits operating at the same time. The quietness of the amplifier is stunning and the transient capabilities are freaky-good, goose-bump good, and it's obvious for movies and music. Each amplifier channel has its own independent power supply right on the circuit board with the amplifier circuitry.

The RA7300 echoes the styling of the RS20i with the same 3D "wave" pattern on the front panel and the same silver power switch against the black anodized finish. The amplifier and processor are also available in silver. The amplifier is physically large so the back panel doesn't look all that crowded. But there is a lot going on back there. Conventional five-way binding posts with clear plastic insulation provide loudspeaker connections. Spades will fit, but only if they are the narrowest spades available. The best connection is probably banana plugs for most applications. There are RCA and XLR inputs plus DB-25 inputs and pass-through outputs, making connection to the RS20i a simple task. If you want 14 channels of amplification, you'd need two RA7300 amplifiers and you would run one DB-25 from the RS20i to each amplifier. If you need all 16 channels of amplification, you'd go for two RA7300 amplifiers and a single RA2400. In that case, you'd want to use the big powerful stereo amplifier for your two largest, most power-hungry loudspeakers, probably the front left and right channels since they get the biggest workout aside from the center channel.

On the back of the amplifier is a large bank of configuration switches used for assigning inputs to specific outputs (loudspeaker cable binding posts). This makes the RA7300 highly configurable and allows using the DB-25 connectors and reassigning channels as needed if you happen to not get the right input-to-output match on the first try with the DB-25 connectors. There are no external heat sinks, but there is a cooling fan that was fairly unobtrusive in operation. I never heard the fan speed increase above the low whisper speed during the entire review period, even when the soundtrack was energetic and loud in all channels. You do need some space behind the amplifier for the warm exhaust air to move away from the amplifier, but the integrator/installer should take care of that need.

The envelope please…

If I gave awards, the RS20i and RA7300 would win them all. This pair of products just leap-frogged everything I've heard to date and reset all expectations about what is possible in home theatre sound reproduction today. Music and movies are equally excellent. What makes the sound so… freakishly real is the neutrality. I never once heard even a hint of "color" in the sound. There is no identifiable character to the sound. It's not rich and warm or lean and tight or anything else. Sound seems to simply exist in the room. Engineer types (of which, I am one) can show you on paper all day long that "regular" amplifiers without balanced circuits and average/typical voltage slew rates will swing voltages plenty fast enough to reproduce every and any transient that can exist in the audio frequency domain from below 20 Hz all the way out to beyond 20,000 Hz which most adult males can't even hear. Yet I will sit here at my keyboard and tell you that, while I agree with the math that shows conventional amplifiers have sufficient voltage slew rates, every time I hear a fully balanced amplifier dance and sing they have all done something "regular" amplifiers seem to be missing. I'm not sure what it is or why it should exist when the math says it doesn't, but there is an effortless speed to the sound these components create that I have not heard since I reviewed a pair of stereo amplifiers that were internally bridged so that each stereo amplifier became a fully balanced mono amplifier. I say that balanced amplifiers sound fast,

but that's probably not right. I think the truth may be that balanced amplifiers sound natural and "conventional" amplifiers sound slower than real life, even though that pesky math says otherwise.

The title track from Madonna's Ray Of Light CD is a trippy modern dance-hall sort of thing with sounds covering probably the entire audible spectrum from very deep bass to the highest highs. Most of the time when I play this song in stereo, it's a fun thing to listen to but it seems, I don't know, like it can't quite defy gravity. Well, it defies gravity from beginning to end through the Datasat components. Never have I heard two loudspeakers disappear so completely to be replaced by what feels like a live performance in the room. Switching to 7.2 Neo:X puts me into orbit with the music. The sound is much bigger than the room and the room itself ceases to exist. Harp is really difficult for audio systems to reproduce. Dee Carstensen's "Angel" features her vocal and harp performance on this Jimi Hendrix classic from her Regarding The Soul album. The pluck and decay sounds are so much like live, and the image of the harp floats so convincingly in space that you'd swear you were in the presences of a real instrument.

Movie sound set a new standard for how enveloped and unaware I could feel during a movie. Oblivion has a great soundtrack with a mix of combat, pursuit, ambient (indoors and out), and dialogue. The Datasat gear did an incredibly convincing job with this soundtrack. I was supposed to be analyzing the sound, but as the movie went on, I'd find myself listening critically for a minute or two at most before being completely sucked-in and forgetting about the reviewing aspect of the movie experience. I just could not focus on critical listening for any length of time because the sound was so convincing and well recorded that I kept getting drawn into their world and forgetting mine. And that's what movies are all about. Don't even get me started on Avatar! I kept thinking "OMG, this did not sound this good in movie theatres." The big construction and heavy military gear were incredibly convincing, as were ambient sounds during quieter moments. The pursuit and flying sequences were heart pounding, even though I'm getting close to making this the one movie I've viewed more times than any other. This movie creates one of the best cinematic worlds ever, and the Datasat components push it to a level I've never experienced in my room or in a movie theatre before. There's something about the combination of ultra-quiet noise floor, neutrality, and transient speed that just makes the loudspeakers disappear, and the sound melds into a cohesive reality that is so convincing, my brain can't resist getting lost in the world of the movie. While not creating a whole new world, Skyfall does a great job of storytelling at a very high level. The Datasat components reveal everything and hide nothing. The final showdown scene is visceral and relentless, and I found my resting heart rate creeping up involuntarily because of the tension and conflict and how well it is all supported by the audio. The opening pursuit scenes were equally gripping as they transitioned from cars to motorcycles to the top of a train and to the fateful silent plunge. If you mute the audio during those scenes, you lose all interest very quickly. With the audio back on, you just can't stop watching. That's a beautiful testament to just how important audio is to the home theatre (or cinema) experience. Skyfall impresses in a bit of a different way than Oblivion or Avatar. It brings more worldly sounds into your room so convincingly you'd swear that you were inside the movie rather than in your home. Footfalls and conversation within very specific spaces ring so true to what you've likely experienced at some point in your life that the level of reality is beyond what you may have experienced from an audio system before.

The question I feel obligated to address in situations like this is magnitude. Clearly, I think a lot of the performance is due to these components, and I definitely hear something different in the performance.

But how big is the difference in general terms? Surprisingly, I wouldn't call Datasat's victory in sonic performance massively obvious. But if you hear differences between different sets of similarly priced loudspeakers, you won't have any difficulty hearing what is going on with the Datasat gear. If I leave the room and hear the sound from some other nearby room, the magic is not obvious. Other gear playing the same movie or music sounds about the same once you put some distance between you and the sweet spot. You really notice the magic once you are in the room and seated. It's not so much that other top-notch gear sounds bad, far from it. Other excellent components do produce highly enjoyable movie and music experiences. But the Datasat components make the sound more convincingly real sounding. If I was listening to other excellent equipment I might think, "That saxophone sounds great." But with the Datasat gear if it was well recorded, I would think, "That sax sounds real." It's not a slap-you-in-the-face difference, but I think most home theatre enthusiasts will have no trouble picking up on this. Obviously, you'd need associated gear that's up to the task of revealing what the Datasat gear can do. I had no trouble hearing exactly what the Datasat gear was doing with my circa $10,000 7.2 loudspeaker system.
I've never been impressed by the sound of music played over HDMI. It always seems flattened and dull compared to better options, like analog from a USB DAC. But the RS20i completely eliminates that issue, producing the same quality sound from music over HDMI as I was able to get from music played through the RS20i by any other means. Datasat's designers clearly noted the problem and did something different than what has been done in every other product I've used so far. I was beginning to think HDMI would never sound good for playing music until I heard what the RS20i could do. I've also never heard A/D conversion sound as good as high-quality D/A conversion. Generally, home theatre gear that converts analog to digital then back to analog sounds similar to music over HDMI… flattened and duller than it should be. But the RS20i manages to get around that limitation too. Once I realized that analog sources sounded great through the RS20i even though they were digitized, I lost all my reservations about the RS20i not having an all-analog signal path for analog sources.

Conclusions

Datasat has produced the high-end benchmark for audio performance in home theatre. I suppose it might be possible to someday produce something that might sound marginally better than these components, but it won't be easy or cheap. The RS20i and RA7300 combo produce the most visceral, life-like, and ultra-resolution sound I've ever heard from a home theatre system. Dirac Live room correction is the real deal, completely correcting severe subwoofer setup problems, resulting in the best bass detail and resolution heard to date. Are these components perfect? No. Off the top of my head, I'd really like to see an asynchronous USB input for streaming audio or video directly from a computer, and it would be nice for the Ethernet port to support the same functionality so that using a home media server would be no more complex than connecting the Ethernet cable. There are ways to get these functions, of course, but having it all integrated into the system controller would be nice. Aside from those incidentals, Datasat's home theatre products perform beyond everything else in my experience… so far.