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Hitachi 42HDT20 16:9 plasma television

Michael Fremer, December 2002

Until recently, plasma display technology has been more of a conceptual thrill than anything most serious videophiles would relish making the centerpiece of a home theater. True, thin is sexy, and, as they say, you can never be too thin or too sexy. But gray and washed-out is not sexy. Nor is mediocre resolution, that glazed look plasma displays often exhibit, or the high price of admission.

Industry watchers have been predicting that, as their prices drop and their performance improves, plasma displays will become an attractive alternative to CRTs. That's the goal of Fujitsu Hitachi Plasma Ltd. (FHP), the company responsible for the 16:9, 1024x1024-pixel display that's the heart of the two-piece Hitachi 42HDT20. As I reported in my July/August "Utopia Theater" column, in a joint venture, Fujitsu and Hitachi have built, on the Japanese island of Kyushu, a sprawling, almost self-contained factory dedicated to manufacturing 32- and 42-inch plasma displays. Their expressed intent is to attack the CRT market worldwide, especially in Europe and Asia, where living space is

scarce.

While it's not exactly inexpensive at a list price of $8999 (drop $1000 for the street price), the 42HDT20 pushes all the right buttons. Its high-quality picture performance, attractive physical appearance, and convenient operating features should help speed the flat-panel transition—especially for videophiles. More than just the next plasma display, the 42HDT20 is a complete video system—one of a handful of such plasma products. It includes an external switcher-processor, the AVC20, which has two cable-ready NTSC tuners for picture-in-picture display, and four rear-panel A/V inputs: two S-video/composite and two component/RGB (selectable from the remote control in the onscreen menu).

One of the component/RGB inputs is 15-pin D-sub RGBHV analog—the kind RCA used on its now-discontinued DTC-100 DirecTV high-definition set-top box. The other is the new digital DVI connector with HDCP copy protection, which will be standard on all new DirecTV HD STBs. DVI passes the digital signal directly from the satellite receiver to the monitor. On a fixed-pixel display, such as a plasma, this bypasses a D/A and A/D conversion cycle. The result should be an even better picture than what's currently available, but you can't record a copy-protected DVI datastream.

Behind the front-panel door of the AVC20 is another set of S-video/composite inputs, as well as some controls that owners will use only if they lose the remote. Also included is a 10W stereo amplifier to drive a pair of tall, skinny, reasonably decent-sounding flush-mount speakers that few SGHT readers will use. A subwoofer-out jack is included if you're stuck using these speakers and want some low bass. Two rear-mounted IR-blaster outputs go with the two included IR blasters, with which the AVC20 can control four components using Hitachi's A/V Network and Setup Wizard. I didn't use that, but I did find it really easy to get the extremely well-organized, backlit remote to control my DTC-100 and a number of DVD players.

Hey, ALIS!

The 42HDT20's plasma panel uses FHP's Alternating Lighting of Surface (ALIS) technology to increase vertical resolution. I provided a short explanation of this technology in my July/August "Utopia Theater" column, avoiding a complete discussion by saying that a full description would "have to wait for a full review"—not knowing I'd be doing the review. Here's a simplified explanation of how ALIS can provide twice the vertical resolution of conventional plasma technology while using the same number of horizontal electrode strips. Don't be surprised if, after reading this, you look as glazed as some plasma displays.

A conventional plasma panel displays an image by illuminating all of its horizontal lines of pixels simultaneously at a rate of 60 (actually, 59.94) times per second. A single display line consists of two electrode strips (let's label them A and B) fixed horizontally across the panel, with alternating red, green, and blue phosphors for each pixel arrayed horizontally behind the pair of electrodes. Each phosphor is separated from its neighbors by a nonluminous barrier. Individual pixels are independently activated by applying a voltage across the

pair of horizontal electrodes (called the display electrodes) and a pair of vertical electrodes called the address electrodes, which intersect at the desired pixel.

When voltage is applied to the display and address electrodes, the gas (plasma) emits ultraviolet rays, which cause the phosphors in the associated pixel to glow. A horizontal interval, or nonluminous space, between pairs of display electrodes is required to prevent interference between vertically adjacent phosphor cells. As a result, some of the screen real estate is never used to display any part of the picture.

ALIS technology spaces the horizontal electrodes evenly, with no nonluminous space between them. Instead, the phosphors run in unbroken vertical strips so that all areas between electrodes can be used for luminance.

Rather than displaying a frame with all pixels firing 60 times a second, ALIS drives alternating rows of pixels 60 times a second in a fashion similar to an interlaced CRT scan. Consider three adjacent horizontal lines in a conventional plasma display, which are driven by three pairs of horizontal electrodes (let's label them A/B, C/D, and E/F) with nonluminous spaces between each pair. In this case, the three lines fire simultaneously 60 times per second. With ALIS, the six electrodes have no nonluminous spaces between them, and they alternate their pairings: first, pairs A/B, C/D, and E/F fire, followed by pairs B/C and D/E, and so on, back and forth. This provides five lines in the space normally used for three. The voltage for the lines that are not supposed to fire is canceled out, so they remain dark during that period.

All of this requires a complex drive system, but the circuit, which FHP calls TERES (Technology of Reciprocal Sustainers), actually requires only half the voltage of conventional plasma drive systems, and, according to FHP, it cuts drive voltages and drive-circuit costs in half. What's more, FHP maintains, removing the nonluminous spaces from between electrode pairs can result in far greater brightness than traditional plasma designs, with a claimed contrast ratio of 500:1. Further improvements in the phosphor material and barriers used between vertical phosphor strips is claimed to increase brightness even more without affecting product life.

Setup

With its glossy black bezel and silver trim, the 42HDT20 is particularly handsome. The 86-pound display comes out of the box already mounted on an equally attractive two-column stand. The platform's footprint fit the top surface of my Mission M-Time receiver/speaker unit as if made for it. Hooking up the panel and the AVC20 was simple, as was connecting all my source components. Unlike the bulky, gray CRT that usually sits on the M-Time, the elegant-looking 42HDT20 made a handsome addition to my family room. "These things look so good turned off; too bad they always disappoint when you turn them on," I sighed.

The instructions were reasonably complete but disorganized. An experienced videophile might not have trouble connecting and setting up the display, but less knowledgeable buyers will find themselves flipping through the manual to find basic information that should be supplied in a more logical fashion. For instance, you'll find the setup instructions on p.55, where it says "Select setup when setting up your TV for the first time." That should be at the beginning of the manual.

The intuitive and easy-to-use onscreen setup menu is where you select the inputs (e.g., RGB or component), menu language, NTSC tuner channel-scan function, and clock. It's also where you'll find the screen-saver option, which is critical for preventing permanent screen burn-in from fixed graphic material. If you watch a lot of NBC, do you want the NBC peacock permanently burned into the corner of your screen? No. Selecting the screen saver shifts the entire picture by two pixels every 20, 40, or 60 minutes. If you do get a burned-in pattern, the 10-minute Screen Wipe can help.

Before doing any serious viewing, I tweaked the 42HDT20 using service-menu settings supplied by an ISF-certified technician who had calibrated another sample. He specified only two minor changes to the factory settings. Given the nature of plasma displays, I suspect these changes would probably be dead on, or close enough for the purposes of this review, but I didn't have the equipment necessary to do the calibration myself or verify the accuracy of the settings I was given. [See the sidebar for more calibration details.—TJN] In any case, the picture looked good enough before I made the adjustments, and better afterward.

Using the remote's joystick, setting Contrast, Brightness, Color, Tint, Sharpness, and the Advanced Settings was fast and easy. You can choose among three color-temperature settings; Standard corresponds to 6500K. Being a purist, I deactivated all such extras as Auto Contrast, Noise Reduction, and Black Expansion—and especially Black Side Panel, which can only help to burn in a permanent record of your 4:3 viewing time. Leave it gray. Once I had all the settings where I wanted them, using the Video Essentials DVD, I fired up the DTC-100 and tuned to HDNet.

Use

During the day, in a fairly brightly lit room, the picture was absolutely surprising—stunning, actually. It was worlds beyond my low expectations of plasmas in terms of brightness, contrast, and, especially, apparent resolution, sharpness, and lack of scaling artifacts. That's because the 42HDT20's panel doesn't vertically scale 1080i HD images, as most other plasma sets must in order to fit the image into their lower vertical resolution. Instead, it simply displays 1024 out of the 1080 lines. Yes, you lose some vertical information, but all sets, including this one, "overscan" anyway, so it's not really a problem. (Of course, plasma displays don't scan at all, but they do extend the picture slightly beyond the borders of the screen, just like CRT overscanning.)

From normal viewing distances, over-the-air and DirecTV 1080i HD signals were razor-sharp, but not unnaturally so, with near window-on-

the-event resolution—a first for me with a 42-inch plasma display (though the 42HDT20 was the first plasma set I've had in-house for review). Colors were natural and well-saturated, with excellent reds and just a bit of a yellow tinge to greens, which is normal for plasma. I first used a 15-pin RGB cable to patch the RCA DTC-100 directly into the AVC20, and the picture was impressive. But when I switched to a component-video input using Audio Authority's handy RGB-to-component box, for some reason the clarity and sharpness increased even more.

With any input, I saw a number of artifacts when I got close to the 42HDT20's screen, including a fine, grain-like structure that Hitachi mentions under "Important Notes" in the manual. But harping on artifacts visible only with my nose almost touching the glass is like the woman who picks up a chicken at the butcher's and, after smelling it all over, tells him, "Mister, this chicken stinks!" "Lady," the butcher replies, "could you pass a test like that?" From normal viewing distances—greater than about 5 feet—the HD picture looked far better than I'm used to seeing from plasmas of this size.

NTSC broadcasts via antenna indicated that the AVC20 processor's upconversion circuitry did an outstanding job with 480i, 4:3 signals. Occasionally, a few minor artifacts appeared during fast-motion sequences, but for the most part the picture looked natural and unprocessed when upconverted to 1080i. For 4:3 material, you have a choice of native 4:3, 4:3 Expanded (which stretches the edges of the image to fit the screen while leaving the middle untouched), and two Zoom modes. Even if you keep the side bars gray in 4:3 mode, you're advised to limit your 4:3 viewing to 15% of your watching to avoid uneven phosphor burn-in.

Finally, I watched some DVDs, feeding the AVC20 both 480i and 480p signals. Inputting 480p skips the internal deinterlacing process on the way to 1080i upconversion. To engage 3:2 pulldown for film-based sources, you must select Movies from among the viewing modes (the others are News, Sports, and Music). These presets affect color temperature, contrast, and even sound. (With some of these modes, the contrast shoots up to 100%—irresponsible, given the issue of phosphor burn.) Few SGHT readers will use anything but Movies, and the built-in 3:2 pulldown function will be overridden by the superior deinterlacing circuitry of the better progressive-scan DVD players, which produce clearer, sharper pictures.

I watched many movies during the time I had the 42HDT20. The inherent black-level limitations of plasma displays caused dark scenes to gray out slightly, and some details I can make out on CRT displays were obscured, but these problems were more than compensated for by what plasmas do provide: flicker-free images, uniform brightness, perfect geometry, focus uniformity, and cabinet depth. Dark City is tough for any video display, and this DVD once again demonstrated the plasma technology's inability to achieve the absolute states of the art in black level and contrast: Details visible in dimly lit scenes via CRT were obscured. But overall, the Hitachi's black-level performance was outstanding, and needed no excuses. For most of my two months of viewing, black levels were simply not an issue.

Occasionally, I saw false contouring, a problem common in plasmas: transitions from light to dark and from dark to light don't appear smooth, and are sometimes accompanied by visible video noise. But this, too, was rare, and no more an issue than screen flicker in a CRT display.

For most DVD material I watched, I felt that "film-like" would be a fair assessment of what I saw. And when there was fast movement, I was never aware of the smearing I've often seen at CES demos of plasmas. The only unexpected problem was an occasional and noticeable shift in black level just after scene changes. I suspect that this was a glitch in the review sample and not a design fault, because I spoke with other people who have the set, and they didn't see this problem. Hi-bit movies like Crouching Tiger, Hidden Dragon and The Fifth Element looked more film-like and less "electronic" than most plasma nay-sayers, myself among them, might have imagined.

Conclusions

Having the Hitachi 42HDT20 in-house produced more than just a pleasant surprise. Its performance far surpassed my low expectations, and convinced me that plasmas—this one, at least—can be capable of producing an outstanding picture under any viewing conditions. The 42HDT20 didn't need pampering to perform adequately—a critical factor if the technology is to appeal to mainstream users. In bright daylight in my white-walled, many-windowed family room, the Hitachi delivered a bright, sharp, high-contrast picture that was the equal of my 32-inch CRT in some ways, and better in others. It did so for broadcast TV, for DVDs, and, especially, for HDTV, where it produced the best high-definition images I've seen from a 42-inch plasma, and probably as good as I've seen from a plasma of any size.

Couple this performance with exceptional good looks and an ergonomically excellent operating system filled with useful real-world features, and you have a plasma product bound to attract hardcore video enthusiasts, hi-tech showoffs, and just plain folks. Still, the 42HDT20's $8999 list price is out of reach of most, and Hitachi must do something about the disorganized instruction manual. Knowing that prices will only come down and performance only improve tells you that flat-screen technology, whether plasma or LCD, will, sooner than later, replace CRT for both mainstream viewers and videophiles.

While some of Hitachi's competitors have cried foul, claiming that ALIS's "interlaced" display technology is not really HDTV, the proof is in the viewing. Those folks should find a better way than bellyaching to counter what FHP has achieved. I just glanced over at where the 42HDT20 used to sit, and I'm sad to say that ALIS doesn't live here anymore. When the price drops a bit, she probably will.

Specifications

42HDT20 42"-diagonal, 16:9 plasma television with AVC20 audio-video control center
Display resolution: 1024x1024
Light output: N/A
Contrast ratio: N/A

Video inputs: 2 component video, 2 RGB (15-pin D-sub analog, DVI digital), 4 composite/S-video
Dimensions: 42HDT20 monitor: 409/16" x 251/16" x 39/16" (WxHxD). AVC20: 1615/16" x 43/4" x 111/16" (WxHxD).
Weights: 42HDT20: 86 lbs with stand & speakers. AVC20: 9 lbs
Price: $8999

Manufacturer
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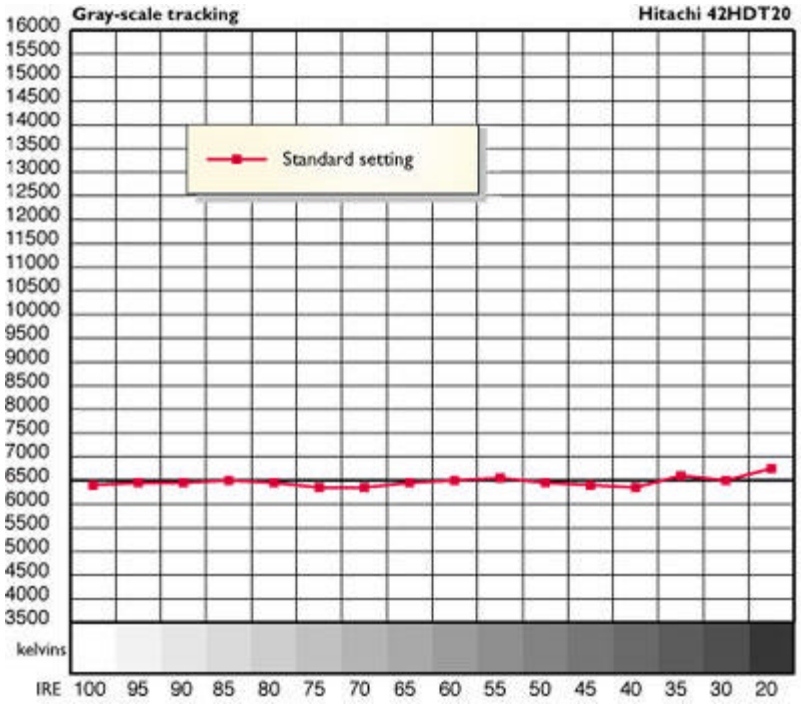
Review System

Sources
Arcam FMJ-DV27 DVD player
Camelot Technologies Round Table DVD player
RCA DTC-100 HD satellite receiver
Panasonic TU-DST50 HD tuner
Panasonic PV-HD1000 D-VHS VCR
Speakers
Mission M-Time (receiver, center speaker, subwoofer, 2 surrounds)
NHT Super One (2)
Cables
Video: Ultralink Platinum component, SXGA-SXGA Platinum HD 15-pin D-Sub
AC: Wireworld Electra Series III

Calibration



For logistical reasons, the sample measured was different than the one provided to MF, and its initial settings were as received from the factory. The Hitachi 42HDT20's overscan measured 3-4% on all sides. The set's DC restoration was fine, and its DVD resolution of 500 lines per picture height produced an exceptionally crisp image. Oddly, the reds seemed slightly misconverged to the left on test patterns, which shouldn't happen with a fixed-pixel plasma. This was not visible with most regular program material. Using an NTSC source (the Video Essentials test DVD), the phosphor color points revealed a slightly purplish-green blue and a deeper green than standard, though none of these deviations detracted from the set's subjectively excellent color.

Before measuring the contrast and gray scale, I first set the white level (Contrast control) to a setting that did not crush or clip the peak whites, then adjusted the blacks (Brightness control) using Video Essentials' PLUGE pattern (chapter 17-2). This resulted in an output of approximately 24 foot-Lamberts. I then measured the contrast four ways: full on (a 100 IRE white field) to full off (the full black field produced by switching to an open input) measured 171; a white window (VE, chapter 17-32, 100 IRE) to full off measured 239; the ANSI contrast, using a black-and-white checkerboard pattern, measured 104; and, finally, the ratio of a 100-IRE window to the average light output from the black border around it measured 175. For comparison, the plasma with the best blacks I have seen to date, the Fujitsu PDS-5002, produced contrast values of 436 (full white field/full off), 185 (ANSI), and 538 (white window/black border).

I came to the calibration prepared to do the usual service-menu tweaking, but it didn't prove necessary. The curve in the accompanying figure shows what the measured sample of the 42HDT20 produced, as delivered, in the Standard color-temperature setting. This is a remarkably good factory setup. Furthermore, the values were very close to the optimum D6500 across the entire brightness range. Reds were pushed a little; a reduction in the Color brought this into line without unduly desaturating the other colors. At the Medium setting, the temperature was just over 7000K across the board; at High, it drifted up from 8261K at the low end (30 IRE) to 8778K at the high (100 IRE).

After finishing the calibration, I spent a little time watching the Hitachi with conventional DVDs. As MF notes, there was relatively little

to complain about with respect to detail, color, brightness, and geometry. But I was a little more troubled than he about a few aspects of the set's performance. This may relate to the different sample, though it seems more likely due to differences in the program material we used. The Faroudja test DVD revealed a tendency of the set to drop in and out of 3:2 pulldown in the Movie mode, which may have caused the visible motion artifacts I saw with 480i sources. The waving flag and rocking pendulum on the Faroudja disc and the opening scenes in Star Trek: Insurrection, with its difficult pan across the village, had clearly visible jagged edges. MF, too, saw a few artifacts, but, as we both observed, these problems essentially disappeared when a 480p input from a good progressive-scan DVD player was used. Interestingly, I found the scaling on the Hitachi 51SWX20B rear-projection CRT I reviewed in the November 2002

issue to be superior to the 42HDT20's.

The 42HDT20's blacks were reasonably deep. But with the Brightness correctly set using a PLUGE pattern, dark scenes in some films exhibited serious posterization, or abrupt rather than gradual transitions in shadowed areas. For example, many of the facial close-ups in the low-contrast pteronodon sequence in Jurassic Park III looked like paint-by-numbers images. (MF noted this also, but wasn't as bothered by it.) The problem could be minimized by raising the brightness, but this slightly desaturated the image in brighter scenes and sacrificed the depths of blacks in darker ones—something plasmas can't really afford to compromise.—Thomas J. Norton