

Digital Television (DTV)

Updated at the Consumers Electronics Show (CES) 2003

A Review and Analysis for Consumers

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The objective of this report is to benefit interested readers with reference material updated at CES 2003 to facilitate new purchases and upgrades of DTV technology with emphasis on HDTV.

Over 700 pieces of DTV related equipment are included on this report, I could not possibly review all specifications in detail, but an effort was made to cover and specify enough features to facilitate some comparisons and to help you determine if current and future 2003 DTV models would suit your needs when they become available.

The report assumes prior knowledge of the DTV industry and terminology, and the information provided might seem overwhelming to readers that feel the need to understand the basics first. For that purpose, some links with basic information are included at the end.

All types of display monitors and integrated DTVs are covered (RPTV rear projection, FPTV front projection, Plasmas, DLP, LCD, LCoS, D-ILA, etc). It also explores industry trends and manufacturers direction regarding new technologies. It includes an analysis of digital video connectivity (DVI and IEEE-1394 Firewire) and compatibility/content-protection. It reviews DTV related equipment such as D-VHS VCR (and D-Theater), HD-DVD playback/recording, and HD tuners (satellite, cable and over-the-air [OTA] reception).

Not included in this report are screen displays below the size of 40" diagonal, 4x3 displays (except for a few), computer related HD-tuner cards, computer Hard Disk Drives (HDD) for storage of HD video (similar to an HD Tivo PVR), C-Band satellite equipment, and some after-market modifications to HD-Set Top Boxes (STBs) for HD recording (such as 169time.com for DirecTV/OTA HD recording).

To the extent that was humanly possible all the information about models, prices, and specifications has been confirmed with products demonstrations, lab tests, industry press releases, technical articles and manufacturer interviews at CES. Although considerable effort was made to consolidate and verify the accuracy and completeness of the data on this report, this writer cannot assume responsibility for omissions or errors, any information you might want to contribute to enhance the usefulness of this report would be welcomed.

Quoted prices are in MSRP US dollars. Current products are indicated as TTM (Time To Market) current, many of those "current" models were just released a few months ago. Some products are quoted with "street \$" when such price is known, otherwise the price quoted is MSRP. Future products

prototyped at CES are mentioned with an estimated TTM date (as announced by the manufacturer, or TBA "To Be Announced").

The specifications of input/output connections mentioned on this report focus mainly on DTV-HD video connectivity. Connectivity via analog interfaces (such as component YPbPr, RGB/HV, VGA 15 pin D-sub), or digital interfaces (such as IEEE-1394 Firewire or Digital Video Interface - DVI or HDMI).

The DTV technology is gradually incorporating digital interfaces on equipment, but there are 4 million HDTVs sold since 1998 that have only analog interfaces. The transition during for that migration from analog to digital connectivity brings issues that could impede certain functionality on current equipment.

Not having digital connectivity could preclude one from recording HD on D-VHS tape, or, possibly in the near future, from viewing a copy-protected HD image on its full resolution (and view instead a downgraded version of it, if the image could be viewed it at all). The report highlights those issues.

In fact, DirecTV has just started DVI/HDCP content protection testing in December 2002; the testing is with consumer's HD-STBs at their homes. This subject will be covered in the HD-STB section.

Due to space, this report does not mention other typical NTSC input/output connectors (S-video, composite, RF), which are normally included/expected on all DTV equipment for backward compatibility with other analog NTSC equipment that will coexist with DTV for years to come, such as VHS VCRs.

Although DVD recorders are not considered High Definition a section on the subject was included due to the large base of early adopters that purchased DTV displays for playback of DVD wide-screen movies (as improved 480p progressive, rather than 480i playback on regular NTSC TVs).

While the industry takes the necessary time to resolve HD-DVD recorder issues of copy protection and format standard, the idea of investing on a newer generation DVD recorder might be attractive to some consumers. DVD has become an important part of the DTV implementation.

Ironically, most of the 4 million of HDTV sets sold since 1998 are "not" primarily used to actually display HDTV signals. Many video retailers still demonstrate these sets with DVD and NTSC satellite programming, rather than with a true HD signal, fortunately that method is changing.

As an added bonus this report also briefly covers the subject of DVD-Audio and Super-Audio, and includes an example of such equipment, some seen at CES. Many HDTVs are the centerpiece of a Home-Theater together with a multi-channel speaker/surround setup, that environment lends itself for DVD-Audio and Super-Audio.

DTV subject areas

DTV Deployment - FCC plan for OTA and Cable

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- Plans of the FCC to Speed up the Implementation Schedule
- Digital HD Cable equipment agreement
- Analysis of Cable Tuner Agreement and OTA Mandate on Integrated TVs
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 - Summary

Review and Analysis of HDTVs

- DTVs and HDTVs (CRT, LCoS, D-ILA and LCD front FPTVs and rear projection RPTVs)
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- Plasma Panels

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- HD-STBs/PVRs (satellite, cable, broadcast OTA)

HD Recording

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Connectivity / Copy Protection

- Digital Connectivity (DVI, 1394, HDMI)
- HD Networking (Wired and Wireless)

Washington D.C HD Broadcasting Status

- OTA DTV Channels Available
- OTA DTV Broadcasting Programming

DTV / Home Theater related subject areas

- Analysis and Review of DVD Recorders
- DVD Recorders

- Analysis and Review of Super-Audio and DVD-Audio
- SACD and DVD-Audio Players

- Interesting Technologies Brought to CES
- Manufacturers and DTV Information Links
- Acronyms

DTV Deployment - FCC Plan for OTA and Cable

The original plan for DTV targeted the ending of analog broadcasting by 2006. The FCC provided each station with one additional 6 MHz channel slot so they can broadcast their current analog channel and the DTV version of it simultaneously during the transition period.

In 2006, or when 85 percent of the nation receives DTV, each broadcaster is expected to return to the FCC one of the two channels lent for the transition. That space on the spectrum would then be available for auction by the FCC.

TV stations have until April 2003 to ensure that 50 percent of their analog programming is simulcast on the digital channel. The quota rises to 75 percent in 2004, and 100 percent in 2005.

The FCC adopted the simulcast rule in April 1997 on the theory that TV viewers would be reluctant to purchase digital receivers if that meant losing access to programs offered exclusively on the analog channel. On December 19, 2002, the National Association of Broadcasters filed a request to consider dropping or delaying the simulcast requirement.

A projection from the CEA showed that 2.7 million of DTV products would have sold in 2002 alone, 4 million would be sold in 2003, 5.4 million in 2004, 8 million in 2005 and 10.5 million in 2006. There are now approximately 4 million HDTVs sold since 1998.

The mandate is for DTV implementation, not HDTV (720p or 1080i). HDTV has been left optional.

The following table from the ATSC highlights the DTV formats as they were originally proposed:

Table 3 Compression Format Constraints

Vertical_size_value	Horizontal_size_value	aspect_ratio_information	Frame_rate_code	progressive_sequence
1080 ¹	1920	1,3	1,2,4,5	1
			4,5	0
720	1280	1,3	1,2,4,5,7,8	1
480	704	2,3	1,2,4,5,7,8	1
			4,5	0
	640	1,2	1,2,4,5,7,8	1
			4,5	0

Legend for MPEG-2 coded values in Table 3			
aspect_ratio_information	1 = square samples	2 = 4:3 display aspect ratio	3 = 16:9 display aspect ratio
frame_rate_code	1 = 23.976 Hz	2 = 24 Hz	4 = 29.97 Hz 5 = 30 Hz 7 = 59.94 Hz 8 = 60 Hz
progressive_sequence	0 = interlaced scan	1 = progressive scan	

¹ Note that 1088 lines are actually coded in order to satisfy the MPEG-2 requirement that the coded vertical size be a multiple of 16 (progressive scan) or 32 (interlaced scan).

HD Programming Currently Available

CBS, NBC, PBS WETA, ABC, HBO, Showtime, HDNet, Discovery HD Theater, and HD-PPV are already broadcasting in HDTV. Their programming varies from just some prime-time selected content (NBC, ABC, and CBS), to the 24x7 of PBS, HBO, Showtime, HDNet and Discovery HD Theater.

ESPN announced recently that they would soon broadcast in HD; HDNet announced plans to add more HD channels to their service soon. ABC had chosen to broadcast their HD programming in 720p, FOX had chosen not to broadcast in HD (it does in 480p DTV format only, DVD quality). All the remaining networks had chosen 1080i, although some affiliates that are not yet suited to repeat at 1080i resolution down-convert the programming.

DirecTV started their HD programming in 1999, and has now HBO, Showtime and HDNet. Starting in January 2003, they added a 24hr HD-PPV movies channel.

Dish Network has HBO, Showtime, HD-PPV, HD-Demo channel, Discovery HD Theater, and CBS east/west coast feeds for qualifying customers. They announced at CES the addition of HD-ESPN within the next few months and HDNet by mid-year 2003.

Comcast cable on the Washington D.C. area started in the 4Q02 with ABC, CBS, NBC and WETA PBS.

Cox cable in Fairfax County, VA started in the 4Q02 with Discovery HD Theater, NBC, ABC, Showtime and HBO. Their coverage for CBS is in the plans; according to Cox, they receive CBS on HD but do not repeat it as 1080i yet.

Charter cable has recently added HDNet movies 24 hrs x day.

There are other cable companies in other areas of the country that started HD programming services earlier.

Plans of the FCC to Speed up the Implementation Schedule

The FCC announced recently a voluntary plan for the increased broadcasting of compelling DTV content. The plan included networks, affiliates, cable, satellite and electronics manufacturers to insure DTV would be delivered over cable as follows:

- a) Broadcast/cable networks are requested to deliver HDTV (or other EDTV) service for 50% of prime time hours while local network affiliate stations in the top 100 markets were asked to pass those signals through unaltered by Jan 1, 2003.
- b) Cable systems with 750 MHz or greater channel capacity were asked to carry up to five DTV broadcast stations or other enhanced DTV programming for 50% of prime-time hours, while offering customers HD-capable set-top boxes with digital interfaces.
- c) Satellite TV providers were to carry up to five channels of HDTV or enhanced digital programming for 50 percent of their prime-time hours by Jan 1, 2003, and
- d) In the most controversial item, television manufacturers and retailers were asked to adhere to a phased-in schedule that would lead to terrestrial OTA DTV tuners in all television sets by Dec 31, 2006.

The FCC then mandated that all TV sets 13-inches and larger and other products that normally carry TV tuners -such as VCRs, personal video recorders, etc.- to include ATSC terrestrial DTV tuners by July 1, 2007.

Under the five-year phased-in guidelines DTV tuners are to be added to 50 percent of sets measuring 36 inches and larger by July 1, 2004, and 100 percent by July 1, 2005. After that, 50 percent of sets measuring 25 inches to 35 inches are to add DTV tuners by July 1, 2005, and 100 percent by July 1, 2006. The rest are to conform by July 1, 2007.

The Consumer Electronics Association (CEA) charged the decision would put an undue cost burden on consumers and filed a lawsuit to overturn the order in October 2002. One main factor for such appeal is the fact that approximately 70 percent of TV viewers receive their signal from cable, and those will be switching to a DTV cable set top box, not needing the DTV over the air tuner mandated on their new TV sets.

However, according to a CEA publication of Jan 09, 2003:

"Manufacturers will remain free to sell true monitors without a DTV tuner as long as they do not have NTSC tuners included (underline added), as many plasma displays and front projectors are sold today. Should the regulations remain in place, TV makers have the option of building sets with both digital and analog tuners or no tuner at all (underline added). The rules do allow companies to bundle an add-on digital tuner in a separate box, which would allow the sale of today's so-called DTV-ready sets. Most sources indicate it will be very unlikely that consumers will be willing to buy big sets without an NTSC tuner, smaller sets (24 inches and below) will probably have a DVI input to connect a STB, and no tuner, in part because some of these displays would be less expensive than the cost of adding the tuners".

On looking at 2002, the broadcasting DTV implementation shows the following:

Seventy percent of the country's commercial television broadcasters failed to meet the FCC mandated deadline to begin DTV broadcasting by May 1, 2002. Most of those were on smaller markets, and filed for extensions.

Approximately 550 stations of the nation's 1300 stations had begun transmitting digitally by the fall 2002. In the top 30 markets, covering about 54 percent of the TV households, 113 of 119 top-four network affiliates were on the air with DTV. Markets covering 91.9 percent of households were receiving DTV signals, according to the FCC.

Digital HD Cable Equipment Agreement

On December 2002, an announcement was made of an agreement between the consumer-electronics and cable television industries regarding digital cable interoperability.

The announcement was reported as follows:

"The agreement is part of a broad 'memorandum of understanding' between the two industries that is intended to lead to a 'plug-and-play' standard that was needed to link digital cable equipment and services with consumer electronics devices. Once the Federal Communications Commission approves the agreement, it is expected to help speed the adoption of HDTV.

The memorandum, along with a letter to FCC chairman Michael Powell, was signed by 12 consumer electronics companies and seven major cable multiple system operators (MSO) representing more than 75 percent of all cable subscribers. The memorandum is a package of voluntary commitments, specifications and proposals for rules covering digital television (DTV) cable hardware compatibility and content protection, and the FCC is expected to approve the recommendations".

It is expected the phased-in use of two digital interface connectors on new digital cable-ready TVs and/or cable set-top converter boxes, including a) IEEE-1394 'FireWire/iLink' connections with Digital Transmission Content Protection (DTCP) for recordable and networkable compressed video streams, and b) the non-recordable DVI/HDMI with High-bandwidth Digital Content Protection (HDCP) connections on digital televisions and cable set-top boxes.

The agreement prohibits cable providers who supply STBs with both FireWire and HDMI connectors to switch the outputs in order to restrict lawful recording. The agreement uses encoding rules that were part of the so-called 5-C agreement of copy protection.

The recommendations also cover a set of technical standards for cable systems and 'cable-ready' DTV products, such as adapters between the cable wall jack and an integrated DTV to provide 5C copy protection.

The announcement was reported as follows:

"Integrated DTVs mandated by the FCC will likely be completely cable-compatible as well under the terms of the agreement. The two sides also agreed to testing procedures to assure compatibility, a proposed regulatory framework for support of digital TV receivers, digital recorders with secure interfaces and other devices on cable systems, and a draft security technology license for the transfer of copyrighted material within a home network environment.

The two industries also agreed to work together on standards for future interactive, 'two-way' digital cable TV products starting in January. The FCC will still need to set an adoption timeline and settle any outstanding regulatory issues not covered in the agreement."

However, according to the Audio Video International Magazine " *While the deal outlines some copy-protection guidelines it was developed without key players in the copyright debate - namely, Hollywood studios and consumer groups - and that aspect of the DTV transition remains unresolved*".

It is not clear how those key players can affect the agreement.

Regarding the technology to be used: DFAST (Dynamic Feedback Arrangement Scrambling Technique) technology would be used in the POD (Point Of Deployment interface) of the Host Interface License Agreement (PHILA) inside TV sets.

According to "Broadband Week" (Jan 6, 2003): Consumers would buy TVs from a retailer, then receive a POD-authorizing card from their cable provider to "unlock" specific cable programming services offered by the local system.

By Dec 31, 2003, a cable company is expected to replace any leased HD-STB that does not include a 1394 interface with a box that has one, or to provide the software that would make such an interface functional, at no cost to the consumer.

The two groups will launch a "test suite" for the unidirectional digital-cable products that will begin on Jan 31.

It is important to note that the agreement was made for an integrated one-way only digital cable television receiver. Under this unidirectional agreement, features such as video-on-demand, impulse-pay-per-view, return path of the cable system, and the use of the electronic program guide services provided by the Cable Operator would not be available. However, the pay-per-view feature is supported under the unidirectional agreement.

Additionally, Samsung announced in January at the Las Vegas CES that it has become the first consumer electronics manufacturer to sign a license with Cable-Labs for a two-way interactive version of the POD.

By implementing this interactive version of POD, digital televisions will be able to directly receive interactive digital programs, video-on-demand, and premium services, as well as HDTV via cable through the "two-way" PHILA license, without the need for a digital set-top-box from their local cable provider.

Regarding the relationship of this cable agreement and the OTA tuner mandate, a CEA publication (Jan 09, 2003) commented that:

"A lot of the manufacturers are saying that it would be more cost effective to build cable compatibility into an OTA tuner that is already mandated into the TV, because so many of the components are in common, although reserving the option for the cable operators to use cable receivers for add-on services, premium channels, interactive TV and Internet services."

Analysis of Cable Tuner Agreement and OTA Mandate on Integrated TVs

Cost Analysis

Today several manufacturers offer current HDTV integrated versions with OTA/cable tuners. The integrated TV versions (w/HD tuners) cost now between \$500-\$1000 more than their monitor-only versions.

The difference is the cost of the tuner-required circuitry (which among other components, includes an MPEG-2 decoder so the digital signal can be uncompressed and converted for the TV to display, and 1394 outputs so the tuned compressed digital signal can be sent out for HD-recording).

To pick up one case, the difference between an already integrated Mitsubishi 65" (Platinum) and its monitor version (Gold Plus) is \$800 MSRP. The integrated set includes an ATSC OTA tuner, a QAM cable tuner, and three 1394 connectors.

Mitsubishi also offers a "Promise Module" HW/service to upgrade some of their non-integrated sets, current or older. The upgrade makes them tuner-capable (and 1394 capable), as their newer integrated versions. That promise module costs \$1000.

HD-STBs are currently costing between \$400 and \$900, and, with exception of one STB, they do not even have 1394 outputs for recording the tuned HD signal.

By mandating manufacturers to include tuners on their monitor sets one would expect that there would be an increase over the cost of those monitors, perhaps not exactly equal to the cost of a separate STB (\$700 average), but certainly not a nominal cost, not in the short term.

The cost of tuners is expected to be much lower by 2007, but the implementation plan has intermediate deadlines to meet, starting in 2004, which means manufacturers have to start working now, at the prices of today's tuners.

If monitors were allowed to be manufactured without any kind of tuners, as one of the announcements indicated as an option, it would mean that a consumer not wanting an integrated set could still have the option of tuning with an external device. A regular VCR could still provide the missing NTSC tuner.

Regarding cable tuners, although the industry announcement claimed that the inclusion of a cable tuner would be "voluntary" by the manufacturer, it also said that the FCC viewed the OTA tuner "mandate" as a first step to do "the same" with cable at a later date. Time would tell how voluntary the agreement would actually be, and how manufacturers would offer options in the middle of competition.

Today consumers have the choice to purchase a monitor only TV set, without any HD tuner (OTA, cable, etc), or an integrated set with tuners on it; that choice should continue.

In the medium to long-term it is reasonable to expect that HD tuners would reach economies of scale and eventually cost much less. At such time, there would be an opportunity for a logical and economical integration, and the simplification of equipment interfaces and connections.

Some industry leaders commented that consumers do not buy DTV today because there is no digital tuner in the TV, or because it is too complex to use a STB. I wonder if those consumers would start liking their STBs, if they were informed of the potential cost increase of monitors in the short term and the potential risk of technical problems of internal tuners within expensive TVs.

Recent statistics showed that most owners of HDTVs purchased their sets to enjoy wide-screen DVD playback as 480p. These 4 million owners could have also bought an HD tuner for \$700, but most did not. Perhaps due to the lack of HD programming at the earlier stages, or because they were happy enough playing their own DVD movies.

Many others postponed their STB purchase while waiting for less stormy weather regarding new digital connectivity and copy protection standards.

Near-future HD-DVDs content would certainly have the potential to accelerate HD adoption, although it could take a couple of more years to be implemented.

Let us analyze this scenario from other points of view for a minute.

Point of view a):

Let us look at those 4 million early adopters. Would those 4 million consumers had bought a HDTV when they did for \$700 more due to an included tuner?

Maybe the industry would not have sold 4 million HDTVs if those consumers were imposed the cost of a \$700 tuner on their monitors.

Maybe a good number of those consumers would have waited until later, when the total cost of ownership (with a cheaper mandated tuner) would have been more attractive to them, and in such case perhaps less than 1 million of those consumers would have purchased HDTVs (the approximate number of STBs actually sold to date).

Would you think on that scenario that the pace of adoption could have had benefited the HDTV deployment if a tuner mandate model would have been imposed on the first 4 years?

Point of view b):

Back in 1999 rear projection HDTVs cost between \$5,000 and \$10,000, most 42" plasmas started in the \$12,000 range, and many early adopters paid more than that for the first generations of HD. The year 1999 was expensive for early adoption HD.

At that time, HD-STB tuners were selling between \$400 and \$900 a pop. The relationship between a RPTV and a STB was about 10 to 1 on average.

Similar rear projection HDTVs cost now approximately \$2,000/\$3,000, and the 42" plasmas are now in the \$5,000 range, and both are better (better line-doublers, digital inputs, etc.).

The cost of a HD-STB today has not changed. The relationship between a RPTV and STB is today about 3 to 1 on average.

In other words, the cost of a STB today is much more expensive related to the cost of today's DTVs, than when comparing the same relationship over the last 4 years.

One could speculate:

Why people that thought at that time that a \$700 average HD-STB related to an expensive HDTV was not motivational enough and the relation was 10 to 1, would find motivation now to buy a HDTV with an integrated STB when the cost relation is now 3 to 1? Why would a mandate is believed to solve the problem when the real problem is the cost of tuners, frozen for 4 years.

Some manufacturers like Zenith think that there will be a significant reduction on the "cost to build" an OTA HD-STB tuner in the short term, in the order of \$75 by 2004 they say, and comparable to the cost of an analog NTSC tuner by 2007.

This is a "cost to build" estimate, but it looks like we are finally moving in the right "reduce cost" direction. However, the new 2003 models of integrated TVs cost at least \$500-\$1000 more than their monitor-only counterparts.

In summary, being the cost of a HDTV tuner as high as it was in 1999, and having a similar cost whether outside or inside the TV, there should be an option to buy it as a separate STB, when needed, when is technically mature enough, when the copy protection and connectivity issues are resolved, and the standards are clear.

Technical Issues Analysis

There are other reasons that make unpractical (and risky) to integrate tuners into TVs at this time.

Over the past 5 years, the HD early adopter community has experienced a considerable number of hardware and software difficulties (to put it lightly) with HD-STBs.

As I said recently on the HDTV Magazine:

"Over the last five years we have experienced all kinds of early adoption let downs regarding receiver-ends. Noisy fans, hot units, slow/unfriendly menus, weird software behavior, frozen units, dead units, killed units on firmware upgrades,..."

Many of the HD-STB tuners have improved but their operation and friendliness is still maturing, and they have not been exposed yet to the effect of copy-protection behavior and the new digital connections. It certainly seems risky to mandate that a component at that stage of maturity be incorporated within an expensive HDTV set in the short-term, regardless of price considerations.

A consumer might be put in a difficult position if the tuner needs service or is not performing well, and it is installed into a 300 pound piece of equipment. Having the tuner as a separate HD-STB the problem could be solved as easily as just replacing/servicing the STB, and probably at the cost of the cable company if it is a leased box.

Satellite service subscribers do not need the OTA tuner, nor they need a cable tuner. Those consumers would already have purchased a satellite HD-STB that has an OTA HD tuner circuitry included. Why pay for another OTA tuner on a mandated integrated TV?

Consumers change TV programming services, from cable to OTA, from cable to satellite, etc. (anyone there switch "to" cable? just kidding). Many people that bought their expensive HD-STB and need to replace them sell them to help pay for a new one that performs better, is upgraded, or, should I say, just "performs". Would they be able to do that if the mandated tuner is "within" a TV set? Pass the screwdriver please.

Now, related to cable tuners into HDTVs.

Could the cable-tuners installed on integrated HDTVs have the flexibility to be reprogrammed for premium services by the cable company via firmware, without dealing with the complexities of the TV circuitry itself? One certainly hopes so.

According to some of the information just disclosed to the public, the tuners "might" be upgraded or reprogrammed via the POD card supplied by the cable company, but is certainly difficult to assure and anticipate what those capabilities would be available until we start seeing products later in 2003.

Allow me to give an example of that uncertainty. The new Panasonic 56 " CRT RPTV to be released in September of 2003 with a cable tuner/POD card is said to be designed as "only unidirectional".

Technical Issues Analysis (cont.)

According to Panasonic, the unidirectionality would mean that there will not be interactivity for pay-per-view (although I assume they are referring to only the "impulse" PPV), nor will it have functionality for video-on-demand (VOD) services, and, their unidirectional implementation would disable the 1394 output for recording.

During the presentation of the RPTV Panasonic's engineers did not explain the reason for such limitation, but just recently I was informed that not until after March 03 the plans for 1394 output for the final product would be known. Panasonic plans to implement two-way interactivity later.

When and if this RPTV becomes available by the end of 2003 we would be able to confirm its actual capabilities. Should those limitations exist it would certainly not be a motivation to invest on this integrated cable HDTV that would preclude the owner from sending a tuned signal out for recording via the 1394 outputs.

A similar situation exists today with the top of the line of Scenium integrated RPTVs from Thompson which include ATSC tuners but do not output the tuned signal via the 1394 connector for recording.

The above are just some examples of how certain designs of integrated TVs with tuners could have limitations, in this case regarding recording via 1394, a feature that new external HD-STBs with digital outputs would be able to handle properly.

Currently, a subscriber of premium cable services "do" require a separate STB, regardless if his/her HDTV has an internal cable tuner. We certainly hope and expect that the implementation plan of newer integrated HDTVs would provide internal tuners with appropriate capabilities, avoiding the burden of a cable subscriber paying for two tuners (one "mandated" inside their new integrated HDTV, and another one as an external HD-STB for premium programming or for recording).

Summary

The plug-and-play make-it-simple integration concept might certainly have its merits and the good spirit for accelerating the mass adoption of DTV, but that business model requires attention to:

- a) Enough time for the economies of scale to bring down the prices of STBs into TVs,
- b) Tuner options for consumers to choose according to their needs (OTA, cable, none in the TV?)
- c) Manufacturers that continue building monitor-only versions to unable b) above, and
- d) A responsible and convenient upgradeability and serviceability deployment plan for tuners to mature at their own pace and be as replaceable as the separate HD-STBs are.

It would be interesting to witness the public response if integrated TVs can actually sell as cheap as the leaders anticipate for next year. There will be the reaction of new buyers that should feel they got a tuner almost free within their new integrated sets. There will also be the reaction of the recent buyers that would feel they overpaid for their \$700 HD-STB just a few months before.

Technical Issues Analysis (cont.)

Summary (cont.)

In parallel to the integration plans, the industry should accelerate work for reaching a much lower cost in manufacturing HD-STBs, and they should as soon as possible, not in 2007.

Many consumers would need an economy-level digital STB to convert DTV signals down to NSTC so they can still watch the new digital broadcast using their "still good" old analog TVs. Many consumers might not afford/need to retire analog TVs that still are in perfect conditions. Many would have several analog TVs on the house, and would then require several "low cost" STBs. In order for that to happen the cost of STBs need to be drastically reduced, there are now boxes that can do that down-conversion but they still are in the range of \$400.

People should be able to continue using their non-HD TVs for as long as their budget dictates, regardless of the DTV implementation schedule. The STB tuner industry should be more responsive to accelerate prices down over the next 4 years, and avoid repeating the experienced 1999/2003 frozen prices of STBs.

Review and Analysis of HDTVs

Many will look at this section to find a simple and magic answer, a winner HDTV set selling for next to nothing, with all the features, best looking image; the works.

I wish it could be that easy; you will see why; keep reading please.

Four years ago there were about 10-20 RPTV HD sets shown on the floors of CES, about one set per manufacturer, all looking rather impressive, all certainly expensive. Every year the number and variety of HDTV sets kept growing at CES. Now there were hundreds at the CES 2003 show, with all kinds of features, options, prices, technologies, etc. This is great for the HD industry, and for you.

The presence of DLPs, LCDs and Plasmas increased dramatically, compared to last year, and compared to CRTs, remember CRTs?

The CRT technology, as a front/rear projection or as a direct view sets, is still with us but has been increasingly challenged by the other technologies, now in larger number and variety. This does not necessarily mean that CRTs are surpassed in quality.

It is overwhelming the number of lines, models, and manufacturers from which to choose. Plasma panels were even showing their images at the Pioneer booth in an interesting fashion, on the floor, people walked on top of them; do not try this at home. However, the number of excellent quality sets was not proportionally higher as the effort that was made in producing more models and lines, allow me to explain.

Many manufacturers customarily add more sets and sizes to their lines but the quality is not the best they could do. They invent a couple of features, call those with a new name, like "Digital Video Imaging New Wonder", then put those features in 5 "improved" sets of a new line, and replace a line that was just released 3 months ago. Would this make people happy if they were among those buyers 3 months ago?

Not many manufacturers are seriously concerned with true quality improvement. It would be ideal for them to work on having the sets actually display more of the original resolution of the incoming HD image, rather than finding ways to just interpolate "calculated" pixels with a new video enhancement method. There is so much a new technique can truly improve an image by adding calculated pixels to a resolution that lacks sufficient original pixels due to internal design shortcomings.

The DTV manufacturers are not alone at this, broadcasters limit HD image resolution as well. It is well known that networks, affiliates and satellite/cable companies subject HD images to over-compression and resolution-reduction techniques to be able fit more digital channels on the space of one HD channel.

If you were paying top dollar for a new HDTV, would you be looking for more quantity of highly-pixelated channels? Or for quality. This is subject enough for another paper.

Review and Analysis of HDTVs (cont.)

Back to the DTV subject, I know you are looking for quick clues on what to buy.

Allow me to highlight which features to consider on a new set.

If I have to buy again.....

1) Would I buy a new HDTV today with tuners into it? No, not now, if am given the choice.

As I said before, HD tuners have been maturing as STBs on the early adopters hands over the last 4 years, and they are still being corrected for hardware and software problems. I would rather have a tuner on a separate STB until it has proven itself technically and in cost.

2) Would I buy a new HDTV today without DVI digital inputs? Not; nor would I buy a TV with DVI but without HDCP compliance.

Copy-protection over digital content is in the middle of an implementation battle and it might happen that the current analog component connection between STB tuners and DTVs loose in that battle when trying to view a copy-protected program, by either degrading the quality of the displayed image or by disabling completely the view when using that connection.

Should that happen, 4 million DTV early adopters would be very unhappy, to say the least.

This is just regarding the function of viewing a digital HD image; recording is more restrictive (this subject is also covered later on the report, D-VHS and HD-STB sections).

With DVI/HDCP inputs on the TV you can at least be compliant, and "have a better chance" to view what would be permitted under the future copy-protected rules. As I said before DirecTV is just testing this model, is it difficult to guess why?

You should also be aware that TVs that include a DVI input connector are not necessarily HDCP compliant, HDCP is the copy protection method adopted for such digital uncompressed connection. Some DTVs intended the DVI connection just to connect to a computer. If a content provider were to activate HDCP for a copy-protected program, the viewing would not be possible.

Therefore, make sure the DVI connection of your new TV is actually HDCP compliant. If the specification mentions only DVI and you cannot obtain confirmation of its HDCP capabilities, assume it is not compliant (and move on to another TV choice, you will do yourself a favor).

3) Would I want to buy a HDTV with 1394 FireWire connections? I would certainly want.

It would increase the possibility to have the TV connected to a digital home network, which would allow the view in one room while the HD signal is produced in another room, or from a PVR server in the basement.

Imagine for a minute not having all the duplicated equipment we have today on each place a TV is on the house (equipment such as a VCR, a STB, a DVD player, etc). Imagine the cost savings and the flexibility.

Review and Analysis of HDTVs (cont.)

The industry is also working in a wireless home network solution, for HD. At the end, a section talks about that. They have been busy.

Also, related to 1394, if the DTV has an internal tuner (OTA ATSC or QAM cable) a 1394 output would allow me to take the HD signal tuned in the TV out for recording on a HD-VHS tape recorder. There are two current HD-VCRs available today; both can "only" record HD from their 1394 inputs.

Beware though that the existence of 1394 connectors on a DTV set does not give the assurance that the recording capability is there. Some integrated sets are not yet able to take the tuned signal out even when having the 1394 outputs, one case is the RCA Scenium RPTV line of integrated sets just released. Some TVs use the 1394 connection for other proprietary purposes, such as iLink on Sony TVs. Therefore, check properly before you buy.

One option for this DVI and 1394 digital connectivity issue is to get an external tuner STB (out of the TV), and have that STB tuner connected with its DVI output to the TV for viewing, and connected with its 1394 output to a HD-VCR for recording.

There is "only one" HD-STB available today (Samsung SIR-165 recently introduced) that would allow you to do that, and is only for over the air broadcasting content, no satellite/cable recording. However, one side effect of this option (of not having 1394 on the DTV) is that it would eliminate the possibility of future networking of the TV itself.

Over the next couple of years, we certainly expect that these conditions settle down so connectivity would not be a concern, but we are not there yet. Many 2003 sets are certainly beautiful and affordable, and I am not saying "hold your purchase", I am just saying "know what you buy", know the restrictions and risks for future possible connectivity and copy protection standards, know that they have the potential of early obsolescence of a relatively new set if not having the adequate connections.

This might be an issue if you a) cannot afford the price of a HDTV replacement before due time, or b) cannot adjust to the viewing limitations of copy-protected content due to lack of DVI inputs, or c) need HD recording on D-VHS tape for time-shifting on media, and can not do it if the integrated set does not output the tuned signal via the 1394 connection.

Fortunately in 2003, many new DTV models are being introduced with DVI (or with the new version of DVI called HDMI, which is said to be backwards compatible with DVI via an adaptor). However, if you are looking for an integrated set think about the convenience of 1394 connections as well.

Regarding the growth of DLP (Digital Light Processing) HDTVs:

Dr. Larry Hornbeck invented the first Digital Micromirror Device (DMD) in 1987, at that time it was demonstrated with a short movie using a 512-element linear array. In 1992, Texas Instruments formed the Digital Imaging Venture Project to explore the commercial viability of DMD. The first business projector was then envisioned.

Review and Analysis of HDTVs (cont.)

Dr. Hornbeck believes that when DLP TVs reach \$1,500 to \$2,000, CRT products will face a huge market share cut, probably by 2006. Others expect the market to change much earlier than 2006; I agree with those, we are starting to see a rapid cost reduction with the 2003 models.

Texas Instruments has upgraded their DLP chip; it is now called HD-2 (Mustang). It operates at 12 degrees tilt (rather than 10 as it's predecessor), which claims to enhance blacks when farther away from the light path. The chip is 1280x720 and it works by modulating the light at each pixel point by pivoting micro-mirrors to reflect the light toward or away from the lens.

Texas Instruments indicated that the company has already developed the 1920x1080 chip. There are no immediate plans to release that chip to consumers, but when they do, it would possibly create market forces that would put DLP at the front of similar chip-based technologies.

Their demo included a small theater equipped with an Infocus ScreenPlay FTPV projector and a Stewart screen showing 1080i CBS broadcast content; the demo was of very good quality.

DTVs and HDTVs (CRT, LCoS, D-ILA and LCD front FPTVs and rear projection RPTVs)

Accurate Imaging Technologies

Digital Pathway Series CRT FPTVs

Accurate XL \$26,500, 8" CRTs

Accurate 8 \$34,000, 8" CRTs

Accurate 9 \$50,000, 9" CRTs

Two piece FPTVs

Modular 8

Modular 9

Ultimate Plus Enhancement \$10,000, upgrade to military spec quality of Accurate 8 & 9 components

Akay

RPTV

55" PT5598HD \$2,400, TTM April 03, 1080i/480p, component, line-doubler

Apex Digital

TTM 2Q03, 480p, 1080i, 2 HD component in, 3:2 pull-down line-doubler

40" GB40THD12W \$1,000, DVI

43" GB43HD12W \$1,300, DVI

51" GB51HD12W \$1,600 (also priced as \$1,500), DVI

51" GB51HD10 \$1,200

55" GB55HD09W \$1,800, no DVI

57" GB57HD12W \$2,000 (also priced as \$1,800), DVI

65" GB65HD09W \$2,500, no DVI

65" GB65HD12W \$2,500 (also priced as \$2,000), DVI

Cinepro

Reference Imaging CinePro 9x Elite, matched with the \$49,500 Teranex Xantus-One 3RU Video Computer

Crystal View, Inc

FPTV

Crystal View 1 \$60,000, 9" CRTs, liquid-coupled lenses, 150 MHz (-3dB) bandwidth, scan rates up to 152kHz, scanning beyond 1080p, 2 RGBHV inputs, includes ISF

Crystal View 2 \$45,000, 8" CRTs, air-coupled lenses, same bandwidth and scan rate as model 1

Crystal View 3 \$36,000, same 8" CRTs and lenses of model 2 above, 140 MHz (-3dB) bandwidth, scan rates up to 110 kHz.

Daewoo

LCD RPTV

60" DSJ-6000LN \$4,500 (also priced as \$6,000), 720p, TTM 1Q03, VGA/SWGA PC display, PC input 15 pin D-sub, 1 component input for 480p/720p/1080i, 1 component input for 480i only, stretch modes even on HD signals, NO 3:2 pull-down, NO DVI

CRT RPTVs TTM June 2003, 1080i/480p, component in, NO DVI, RGB D-sub 15 pin, 400:1 CR, 600 cd/m2 brightness

47" DSJ4710CRA \$1,400 (estimated)

55" DSJ5510CRA \$1,700 (estimated)

Elite Video

FPTVs TTM current

CRT projectors 1080i/720p/480p, RGBHB via BNC, HD component

EV-2600 \$13,000, 7" CRTs

EV-3600 \$23,000, 8" CRTs

EV-4600 \$33,000, 9" CRTs

LCD projectors

P-1200 \$7,000, 1024x768, RGBHV D-sub (2), scaler

P-1400 \$11,000, 1024x768, RGB via VGA, HD component, scaler

P-1500 \$9,000, 1024x768, RGB via VGA, HD component, scaler

P-2800 \$18,000, 1024x768, RGB via VGA, HD component, scaler, 2800 ANSI lumens

LCD-100 \$6,000, 3 panel, 720p, DCDi w/3:2 pull-down, 15-pin D-sub, DVI/HDCP

DILA projectors, RGB via VGA, HD component

DLA-M2000U \$24,000, 720p/480p, 2000 ANSI lumens

DLA-G15 \$18,000, 1080i/720p/480p, 1500 ANSI lumens

DLA-G150CL \$21,000, 720p/480p, 1000 ANSI lumens (this specification could not be verified)

Epson

LCD Powerlite TW100 \$5,000, 0.9" LCD image, 800:1 CR, 16:9/4:3/5:4 aspect ratio, 3000 hrs 150 watt bulb, RS-232, DVI-I (which can carry both analog or digital signals for a connection to a computer) NO DVI/HDCP (although it was also reported as "with DVI/HDCP"), 1 component in, PC D-sub 15 pin input, 1280x720, DCDi w/3:2 pull-down

Faroudja

D-ILA projector

FDP-DILA1 \$41,000 (w/NRS-DCS, or \$36,000 w/NRS), 1365x1024, anamorphic lens, includes either NRS-DCS or NRS processor

Faroudja (cont)

Processors/Advanced Scalers TTM current

Digital Cinema Source DVP2000 \$15,000, DVI input/output (NO HDCP yet, as reported recently), updated Digital Cinema Source (DCS) with Faroudja's processing, includes a DVD transport (processing in digital domain skipping A-D conversion step of typical scalers), DCDi w/3:2 pull-down, 1 HD-PC D15 male input, 1 component/RGB input on BNC, 1 RGBHV output on 5 BNCs and D15 female, "TrueLife" two dimensional non-linear luma/chroma video enhancer, HD transcoding YPbPr to RGBHV, HD RGB to DVI conversion, temporal and recursive 3D video noise correction, supports the following resolutions: 852x480, 800x600, 1280x1024, 1280x768, 1360x1024, 1024x768, 1280x720, 1366x768, 960p, 1920x540p, 1920x1080p, and Alis plasma panels, (underlined are the features absent of the other regular Digital Cinema Source unit below). DVI is not supported for 852x480, 960p, 1920x540p and 1920x1080p.

Digital Cinema Source \$10,000, DVI in/out, RGBHV, YPbPr, RGB BNC, DCDi, HD transcoding YPbPr to RGBHV, AR control, internal DVD drive, DVI not supported for 852x480 and 1920x540p, otherwise supports all the resolutions of the DVP2000 above (except the ones underlined).

Native Series Processor NRS-DVI \$4,000, updated, DCDi w/3:2 pull-down, scaling fitted at factory to operate at "any" specific scan rate, DVI input/output, component in/out, "TrueLife" two dimensional non-linear luma/chroma video enhancer, HDTV transcoding from YPbPr to RGB

GE

40" D40GW10 \$1,300 (street \$), TTM current, 5 element lens, 2 HD component

Hitachi

RPTVs

Horizontal resolution 1280, 7" CRTs, TTM current

XWX Director's series integrated projectors W/ATSC OTA tuner, DVI/HDCP, two 1394/DTCP bi-directional connections to network, D-VHS VCR or Echostar HD-STB, 0.52 mm lenticular screen, auto convergence and manual, 480i to 540p or 1080i, ISF calibration mode, 2 HD component inputs, 5 element lens, AV Network with simple remote.

51"	51XWX20B	\$4300
57"	57XWX20B	\$4800
65"	65XWX20B	\$5300

SWX monitors series, no 1394, DVI/HDCP, almost similar to XWX series.

51"	51SWX20B	\$2999
57"	57SWX20B	\$3499
65"	65SWX20B	\$3999

TWX series, no 1394, DVI/HDCP

57"	57TWX20B	\$2500
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Hitachi (cont)

TWX

65" 65TWX20B \$2999 (\$2,500 street \$)

UWX series, no 1394, DVI/HDCP, simple remote feature excluded

51" 51UWX20B \$2500

57" 57UWX20B \$2999 (\$2,500 street \$)

GWX series, no 1394, DVI/HDCP

51" 51GWX20B \$N/A,

57" 57GWX20B \$2,200

FWX series, tabletop, no 1394, no DVI

43" 43FWX20B \$2400 (\$1,800 street \$)

JVC

RPTVs l'Art Pro (TTM current, DVI/HDCP, 2 auto sensing component inputs, Natural Progressive line-doubling circuitry, "all" video sources upconverted to 1080i (DIST technology), 4 element lens, 0.52 mm pitch lenticular screen, 9 point convergence, Natural Cinema 3:2 pull-down for film, 7" CRTs, aspect ratio control for 480p, undefeatable SVM and red push (both detected on recent lab)

48" AV-48WP30 \$2,200 (\$1,800 street \$)

56" AV-56WP30 \$2,600 (\$2,200 street \$)

D-ILA

DLA-QX1G \$225,000, 2048x156 pixel array, 1000:1 CR, 7000 ANSI lumens of brightness

DLA-G150CL \$16,500, 1365x1024 pixel array, 3 devices of 0.9", DVI, 15 pin D-sub for PC, 3 component in, 600:1 CR, 1000 ANSI lumens of brightness, 1000 hr 420W xenon arc lamp (\$900), 1920x1080i images are linearly compressed 29% to fit the width of the screen resulting in 1365 x 727 pixels, horizontal scan rate up to 105 MHz

DLA-SX21 \$10,000, 3 x 0.7" D-ILA devices, needs no color wheel, each 1400x1050 (1400x768 for 16:9), 800:1 CR, 1500 ANSI lumens, 3rd generation scaler, DIST technology, DVI (NON HDCP compatible), BNC for RGBHV, RGB and YPbPr, accepts all HDTV formats including 1080/24p and 30p.

New models CRT RPTVs:

74 line NO ATSC tuner, DVI

48" AV-48WP74 \$1,700, TTM April 03

56" AV-56WP74 \$2,000, TTM April 03

65" AV-65WP74 \$2,700, TTM Mar 03

84 new line TTM Aug 03, D.I.S.T 1500i, new 16M 10 bit 3D/Y digital comb filter, selectable SVM, new emissive light universal remote, new HD range 75 MHz digital super detail, NO ATSC tuner, DVI

56" AV-56WP84 <\$2,500

65" AV-65WP84 <\$3,200

94 line Integrated, upgrade of 84 line models next Sep 03 with ATSC tuner, 1394

56" AV-56W94 \$2,900

65" AV-56W94 \$3,500

Key Digital

Processor only

HD-LEEZA scaler \$4,000, TTM current, DVI (HDCP optional) SDI, component, RGBHD, includes Panasonic DVD player model RP-62 modified with SDI output for processing on digital domain, Clear Matrix Pro Key Digital's de-interlacing/scaling technology with 3-2 pull-down, outputs any desired resolution, frames rates 48-72 Hz (multiples of 24 fps of film)

Loewe

Aconda direct view line (also on other finishes than high gloss piano black, 1 component in,)

30" ACO9303PB \$3,400

38" ACO9338PB \$5,500

LCD panel

40" LTM405W \$10,000, TTM fall 02, 1280x768

Madrigal

CRT FPTV

MP-8 \$35,000, TTM current, 8" CRTs, RGBHV via BNC, 720p/1080i

Marantz

61" PV6111W \$4,300, 1080i/540p, 2 HD component, 1 DVI, 3:2 pull-down line-doubler, 7" CRTs

Advanced Video Processors accept progressive and digital inputs/outputs, DVI digital progressive, RS-232, 3:2 pull-down, supports 4:3 & 16:9 anamorphic, VGA pass-through.

Maxx100 \$2,500

Maxx200 \$3,000

Maxx

LCOS FPTV

1400LCOS \$10,000, 3 panel LCOS, 4.5 Megapixel (1400 - 1050), 800:1 CR, 1600 ANSI lumens, 1125i >1125p scaling, 3:2 pull-down, 720p/1080i/1080p 24fps compatibility, DVI, RGBx2 (BNC & 15 pin D-sub), two direction keystone correction

Mitsubishi

16x9 RPTVS NO DVI (TTM current 2003 line, 480i/p/1080i, horizontal resolution 1200 lines, 2 component inputs for 480i/p (which also accept 1080i on the Gold, Gold Plus and Platinum series), 1 HDTV auto-select component in (RGB or RGBHV for 480i/p/1080i))

Mitsubishi (cont.)

Gold Series (NSTC and HD-upgradeable with promise module, removable Diamond screen shield (except on the 42"))

42"	WT-42311	\$1,900 (street \$), tabletop, 4 element lens, 0.52 mm pitch lenticular screen
48"	WS-48311	\$2,200 (street \$), 4 element lens, 0.52 mm pitch lenticular screen
55"	WS-55311	\$2,600, 4 element lens, 0.52 mm pitch lenticular screen
65"	WS-65311	\$3,200, 5 element lens, 2-piece cabinet, 0.72 mm pitch lenticular screen

Gold Plus Series (NSTC and HD-upgradeable with promise module, removable Diamond screen shield)

55"	WS-55411	\$2,800 (\$2,600 street \$), 5 elem. lens, 7" CRTs, 0.52 mm pitch lenticular screen
65"	WS-65411	\$3,300, 5 elem. lens, 2-piece cabinet, 7" CRTs, 0.72 mm pitch lenticular screen
73"	WS-73411	\$5,200, 6 elem. lens, 2-piece cabinet, 9" CRTs, 0.72 mm pitch lenticular screen

Platinum Series (HAVi system control, 3 digital IEEE 1394/DTCP FireWire input/outputs, 1 digital audio bit-stream SPIF coaxial jack, 1 VGA input 640x480, removable Diamond screen shield, RF digital antenna inputs/tuners for ATSC over the air and QAM unscrambled digital cable, 7" CRTs)

48"	WS-48511	\$3,300, 4 element lens, 0.52 mm pitch lenticular screen
55"	WS-55511	\$3,500, 5 element lens, 0.52 mm pitch lenticular screen
65"	WS-65511	\$4,100, 5 element lens, 2-piece cabinet, 0.72 mm pitch lenticular screen

Platinum Plus Series (HAVi system control, 3 digital IEEE 1394/DTCP FireWire input/outputs, 1 digital audio bit-stream SPIF coaxial jack, 1 VGA input 640x480, removable Diamond screen shield, RF digital antenna inputs/tuners for ATSC over the air and QAM unscrambled digital cable, 7" CRTs)

65"	WS-65611	\$4,300, 5 element lens, 2-piece cabinet, 0.72 mm pitch lenticular screen
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Diamond Series (HAVi system control, 3 digital IEEE 1394/DTCP FireWire input/outputs, 1 digital audio bit-stream SPIF coaxial jack, 1 VGA input 640x480, removable Diamond screen shield, RF digital antenna inputs/tuners for ATSC over the air and QAM unscrambled digital cable, Tru-Focus lens)

55"	WS-55711	\$5,500, element lens, 0.52 mm pitch lenticular screen, 7" CRTs
65"	WS-65711	\$6,000 (4,900 street \$), 2-piece cabinet, 5 element lens, 0.72 mm pitch lenticular screen, 7" CRTs
73"	WS-73711	\$8,500, 6 element lens, 2-piece cabinet, 0.72 mm pitch lenticular screen, 9" CRTs

Also:

55"	WS-B55	\$3,500, TTM current, 7" CRTs, 3 x 1394/DTCP, HAVi, 480p/1080i
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Other RPTVs 7" CRTs, 480p/1080i, line-doubling w/3:2 pull-down, HD component RGB or RGBHV

42"	WT-A42	\$2,100 (\$1,800 street \$)
48"	WS-A48	\$2,400
50"	VS-A50	\$2,000 (although the quote does not seem right)
55"	WS-A55	\$2,600
65"	WT-A65	\$3,200

Mitsubishi (cont.)

The Silver Series line HD sets (VS-50111 and VS-60111) are excluded due to their 4:3 format, although they can display 480p/1080i and are HD-upgradeable with the Promise Module.

In November 2002, a Mitsubishi distributor announced that the "Promise Module" would finally become available by December 02 (over 2 years of waiting for this product). Mitsubishi installs the Module via a service call; it costs \$1,000. With this upgrade Mitsubishi HDTVs that did not include IEEE 1394 can have that digital connectivity with 5C copy protection, and also an ATSC/cable tuner and a MPEG-2 decoder (and might bring connectivity to possible products on development such as a 1394 Digital DVD player and a AV-Disk which adds PVR functions).

The IEEE 1394 HAVi NetCommand 2.0 architecture for a digital home network, as implemented by Mitsubishi, permits to have only one MPEG-2 decoder (in the display device) rather than several redundant decoders located in each digital component (HD-VCR, Satellite receiver, etc) connected to the HD display. It also facilitates connectivity between the digital components by interfacing in a daisy chain method rather than each component wired to the display individually. Additionally, the architecture reduces overall system cost and permits centralized control from the television's remote.

Panasonic

Direct view Tau

34" CT-34WX52 \$2,300 (\$2,000 street \$), TTM current, 2 wide-bandwidth component inputs, 480p/1080i, NO DVI,

LCD (TTM current, 2 HD component, 12 element lens, 3:2 pull-down)

40" PT-40LC12 \$3,000 (street \$)
45" PT-45LC12 \$3,500, 1280x720

RPTVs (NO DVI, 1080i/480p, 5 element lens, 2 HD component, TTM current, 7" CRTs, progressive Cinema Scan w/3:2 pull-down, 1080i/480p)

47" PT-47WX42 \$1,600
47" PT-47WX52 \$1,800
53" PT-53WX42 \$1,800
53" PT-53WX52 \$2,000
56" PT-56WX42 \$2,300
56" PT-56WX52 \$2,500

4:3 models

51" PT-51HX42 \$1,700
61" PT-61HX42 \$2,400

Other Discontinued 16x9 models, progressive Cinema Scan w/3:2 pull-down, 1080i/480p

56" PT-56WX51 \$3,000 (\$2,000 street \$),
65" PT-65WX51 \$3,500 (also priced as \$2,800), HC component

Panasonic (cont.)

New LCD models

43" PT-43LC13 \$3,000, TTM Jun 03 (although Panasonic indicated as out of current plans)
50" PT-50LC13 \$3,700, TTM Jul 03, HDMI/HDCP, 1394/DTCP, component

New Integrated CRT RPTV Model TTM September 03

56" PT-56WXD63 \$2,500

ATSC/QAM cable tuners, 1394, component in, HDMI/HDCP, POD (Point of Deployment interface card) for cable (by Scientific Atlanta), part of the Host Interface License Agreement (PHILA) plan; the cable company is expected to upgrade the POD card and to provide firmware upgrades (although until the product is released it can not be confirmed), on this first release POD only supports one-way (which means no two-way interactivity for "impulse" PPV and VOD. Panasonic commented that it affects the 1394 output for recording, the final 1394 specs would not be fully confirmed until after March), it is expected to support two-way perhaps later in 2003.

A similar model as above but without tuner (PT-56WX53), will be released as well, it lists for \$2,000 (\$500 less), see below.

Panasonic stated that they did not increase the price of the TV sets when incorporating the cable tuner. They also stated that there are no plans to return to 720p on CRT RPTVs in the future.

New RPTV CRT Monitors, DVI/HDCP, TTM May 03

47" PT-47WX53 \$1,600
53" PT-53WX53 \$1,800
56" PT-56WX53 \$2,000

LCD FPTV New Model

PT-AE200U \$2,000, TTM March 03 (although, I just got an update from Panasonic that the unit would be for probably May 03), 854x454, 700 ANSI lumens, 700:1 CR, vertical keystone correction, PC D-sub 1 pin, 3 component, NO DVI

Philips

Implemented a new Pixel Plus technology to double the number of lines of resolution and the number of pixels per line in any analog video signal. The technology is incorporated into the external box for Plasmas.

TTM current, 7" CRTs, 3:2 pull-down, 1080/480p, HD component

46" 46PP9302 \$1,800 (also priced as \$2,000), NO DVI
51" 51PW9363 \$N/A, DVI, 1080i/480p
55" 55PW9383 \$N/A, DVI, 1080i/480p

Also the following RPTVs, TTM current, HD component, NO DVI, 3:2 pull-down

55" 55PP9352 \$2,400
60" 60PP9352 \$2,700

Philips (cont.)

Matchline Series RPTVs, DVI, 1 HD component in, 1080i/480p, TTM current, 3:2 pull-down

55" 55PP9502 \$2,800 (also priced as \$2,700)

60" 60PP9502 \$3,100 (also priced as \$3,000)

New CRT RPTV models for 3Q03, with DVI, Pixel Plus to replace the 9502 pair above, Digital Natural Motion technology

55" 55PP9753 \$N/A

60" 60PP9753 \$N/A

New LCoS Matchline Series RPTVs, TTM 3Q03, 1280x720, component, DVI, Pixel Plus, Digital Natural Motion technology, Digital Crystal Clear video processing, 2 tuners

44" 44PL9773 \$3,500

55" 55PL9773 \$4,000

New Epic Series LCoS models

\$ TBA, 1280x720, component, DVI, Pixel Plus, Digital Natural Motion, Digital Crystal Clear video processing, 2 tuners

44" 44PL9523 \$4,000, TTM summer 03

55" 55PL9523

LCD-TFT panel (join venture w/LG, prototype in Korea), 1920x1080 (2.07 million pixels), 176 degrees of wide viewing angle using proprietary Super-In-Plane-Switching (SIPS) technology with minimum of color shift, TTM 2004 (begin mass production late 2003).

52" model # N/A \$N/A

LCD FPTVs TTM current, line doubling/scaling, RGB 15 pin

cBrightSV2 \$4,000, 600x480, HD component

cBrightXG2 \$4,900, 768x1024, HD component

cBrightXG2 Impact \$5,100, 768x1024, HD component

cSmart \$3,300, 768x1024, HD component

ProScreen PXG20 \$8,900, 768x1024, HD and RGB component inputs

UGO X-lite \$5,000, 768x1024

UGO S-lite Impact \$3,200, 800x600

bSure SV1 \$3,160, 800x600, HD component

bSure SV1 \$3,600, 1024x786, HD component

cBright XG2 + \$4,900, 768x1024, HD component

cBright XG2 + Impact \$5,100, 768x1024, HD component

Pioneer

Elite Line Rear projectors (RPTVs), TTM November 02, new chassis, 5 element lenses, special new achromatic blue CRT gun to eliminate flaring and halos common on CRT based projectors, 2 DVI/HDCP inputs, 480p and 1080i, 3 Progressive scan inputs (1 D-sub 15 pin & 2 wide band component), 0.52 mm lenticular screen, RTM (Reference Theater Mode Pro) for 6500 color temperature (which turns off SVM, sharpness, flesh tone and black level expansion circuitry), new Pure Cinema III circuit for expanded up-conversion (including now of 480p to 1080i), support for Window's Media 9 System for MPEG 4 video files video.

64"	PRO-730HD	\$7,900 (also priced as \$7,500)
58"	PRO-630HD	\$6,900 (also priced as (6,700)
53"	PRO-530HD	\$5,900

CRT RPTV Regular Line, No DVI, 2 wideband component, 480p and 1080i, 3:2 pull-down, 7" CRT

53"	SD-533HD5	\$3,500
64"	SD-643HD5	\$5,300 (also priced as \$4,800)

Pioneer indicated that has no plans to service-upgrade older models for DVI capabilities.

LCD FPTV \$5,100, TTM current, 768x1024, 720p, 2 HD component, 15 pin D-sub

Runco

Recently purchased Vidikron and Projectavision names

Projectavision FP-T3 Formula Plus, \$5,000, 3 chip LCD, 964X544, 700 ANSI lumens, 800:1 CR

Processor

Virtual High Definition VHD-2 \$1,000, TTM October 02, 480p line-doubler, VIVIX technology for 3:2 pull-down, component in, DVI output

CRT FPTVs TTM current, 720p to 480i/1080i, HD RGB/component via ...

DTV-940	\$16,000, 7" CRTs, via BNC
DTV-947	\$19,000, 7" CRTs, via 15-pin D-sub
DTV-992 Ultra	\$33,000, 8" CRTs, via 15-pin D-sub, HD processor
DTV-1200	\$45,000, 9" CRTs, via 15 pin D-sub, HD processor, 1250 TVL lines

LCD FPTV with PFP processor, TTM current

Radiance Series DLC-2000HD \$20,000-\$23,500 (depending on lens option), 1366x768, 1080i/480p/540p signals scaled to 720p, HD RGB, HD component via D-sub 15 pin

Runco (cont.)

Vision One TTM Jun-Sep 03, projector \$80K-\$90K, w/DVD and anamorphic lens additional 40%, DVI, RGB, 1600x1200, 5000 ANSI lumens, 1000:1 CR



Sampo

34" SME34WHD5 \$2,000 (\$1,600 street \$), TTM current

Samsung

RPTVs 1080i/480p, TTM current, NO DVI, 7" CRTs, one HD component, no line-doubler with 3:2 pull-down

42"	HCM4215W	\$1,600 (\$1,500 street\$)
42"	HCM4216W	\$1,600
47"	HCL4715W	\$1,800
55"	HCM5525W	\$2,300 (\$2,200 street \$)

Tantus line TTM current, NO DVI, 7" CRTs, 1080i, 480p, HD component

42"	HCM422W	\$1,800
47"	HCL473W	\$2,000
55"	HCM553W	\$2,500
65"	HCM653W	\$3,000

LCD panels TTM current

40" LTM405W \$10,000, Neo design, 1280x768, 600:1 CR, 500 cd/m2 brightness

New model LCD TV Integrated (claimed by Samsung as the world's largest)

46" LTN468W \$11,000, TTM Oct 03 (begin production 1H03), TFT WXGA 768x1280, DVI/HDCP, DNIe, 170 degree viewing angle in all directions (PVA), 600:1 CR, 500 cd/m2 brightness, ATSC/QAM cable tuners

Samsung (cont.)

RPTVs CRT New models, DVI/HDCP, NO 1394, 3:2 pull-down, 480i (no line-doubling), 480p native, 720p, 1080i, stretch and scroll modes

42"	HCN426W	\$800, TTM Apr 03, 2 comp in (information need to be verified)
43"	HCN436W	\$1,500, TTM May/Jun 03, 3 comp in (information needs to be verified)
55"	HCN558W	\$TBA, TTM TBA, 3 comp in
47"	HCN477W	\$TBA, TTM TBA, 3 comp in`
55"	HCN552W	\$2,500, TTM May 03, 2 comp in
65"	HCN653W	\$3,000, TTM May 03, 3 comp in

New Integrated CRT RPTV models, Tantus line 2 NTSC tuners, QAM cable tuner (for unencrypted service)

52"	HCN-523WH	\$2,300
55"	HCN-553WH	\$2,400-\$2,600 suggested price
55"	HLN-5527WH	\$2,800, TTM may 03, DVI, 3:2 pull-down, 480i/p, 1080i, 30 watts stereo

Sanyo

(Innovations)

FPTV PLV-Z1, 800:1 CR, 700 ANSI lumens

Sharp

The company plans to replace all CRTs by LCDs by 2005 in Japan up to 40"-45" screen size; Plasma is considered a better cost-effective solution on sizes larger than that, according to Sharp. Conversion for the US market is expected by 2010 (Europe by 2006). Prices are targeted at about \$100 per inch based on a 30" size.

LCD Aquos High Vision line, TTM for Japan in November, TTM for US March 03, US prices not set yet

37"	LC-37BT5	\$8,000, 150 watt home theater speaker package (5 speakers & subwoofer)
37"	LC-37BD5	\$6,800, stereo speakers only,

RPTVs

TTM current, 2 HD component, 1 HD RGBHV 15pin, 1080i/540p, 5-element lens, twin ATSC tuners

55"	55R-WP5H	\$3499, to be replaced by the 55-UW7H
55"	55R-WP4H	same as above but without RGBHV
61"	61R-WP5H	
61"	61R-WP4H	same as above but without RGBHV

LCD FPTV

XV-Z7000U 1080i/720p, component in, RGB D-sub 15 pin, 450:1 CR, 1000 ANSI lumens, 1,440,000 pixels, 150 watt lamp (1500 hrs), RS-232 control

SIM 2 Seleco

FPTV CRT

SVP-420HB \$7900, "Multimedia" model, component YPbPr, 15-pin VGA, 7" guns, 900 ANSI lumens

SVD line FPTV CRTs, RGBHV via BNC, HD component 15 pin, 7" CRTs, TTM current

SVD50 HD Plus \$11,000, 480p/1080i
SVD800 HD \$17,700, 720p/1080i, 1024x768
SVD800 Millennium \$20,000, 720p/1080i

Sony

FD Trinitron XBR Wega Hi-Scan direct view TVs (TTM current, Digital Reality Creation (DRC) V1 circuitry user adjustable, line doubling to 960i or 480p, 2 HD component inputs, 1 component input, DVI/HDCP, front panel Memory Stick, 1080i/480p, CineMotion Reverse 3-2 Pull-Down, HD Detailer Wideband video amplifier)

36" KV-36HS500 \$2,000, DVI
34" KV-34XBR800 \$2,500 (also priced as \$3,000), 16X9, 720p conversion to 1080i, DVI
36" KV-36XBR800 \$2,300 (also priced as \$2,500), 4x3, 720p conversion to 1080i, DVI
40" KV-40XBR800 \$3,000 (also priced as \$3,500), 4x3, 720p conversion to 1080i, NO DVI

RPTVs, DVI, 4x3, TTM current

43" KP-43HT20 \$1,600, compression mode for 16x9, 2 component in, 3:2 pull-down, NO DVI

RPTV WS series (TTM current, DVI/HDCP, 4 element lens, 3:2 pull-down, auto convergence, DRC [NO V1], 2 HD component, HD Detailer Wideband video amplifier, NO memory stick on this series)

46" KP-46WT500 \$1,900, tabletop, 1080i, component, DRC (960i, 480p)
51" KP-51WS500 \$2,200 (street \$)
57" KP-57WS500 \$2,500
65" KP-65WS500 \$3,000 (street \$)

RPTV WV series (TTM current, DVI/HDCP, 2 HD component inputs, 480i>960i, 480p pass-thru, 720p>1080i, front slot for memory stick, 3:2 pull-down, auto convergence, 4 element lens, DRC V1, HD Detailer amp)

600 line

57" KP-57WV600 \$3,300 (\$3,000 street \$)
65" KP-65WV600 \$3,800 (\$3,500 street \$)

700 line (same as 600 line but with Uniform Screen Brightness Technology for a more consistent image expanding the sweet spot in the vertical pane, 5 element HD Achromatic lens system, double anti-reflecting coating on protective screen to eliminate glare.

57" KP-57WV700 \$4,000 (\$3,500 street \$)
65" KP-65WV700 \$4,500 (\$4,000 street \$)

LCD FPTVs "Cineza Series" TTM current

VPL-HS2 \$1,800, VGA 854x480 3 chip array, 1000 ANSI lumens, 600:1 CR, replaces VPL-HS1 Cineza earlier model

Sony (cont.)

VPL-HS10 \$3,000, XGA 1366x768 3 chip array, DVI/HDCP, Memory Stick slot, 700:1 CR, 1200 ANSI lumens, SideShot2 keystone correction for off-center axis mounting, HD component, RGBHV
VPL-VW12HT \$6,500, 1000 ANSI lumens, 1366x768 3 chip array, 1000:1 CR

LCD Grand Wega XBRs, TTM Oct 02, DVI/HDCP, 3 LCD panels of 1366x768, 2 HD component in, 720p
50" KF-50XBR800 \$4,000 (also priced as \$5,500)
60" KF-60XBR800 \$5,000 (also priced as \$6,500)

LCD Grand Wega RPTV (3 panel LCD)

60" KF-60XX100 \$6,000, TTM current, DVI, HD component, DRC, 3:2 pull-down, 720p

RPTVs Integrated 1080i, DRC, 3:2 pull-down, ATSC decoder, 2 component in, NO DVI, 7" CRTs

57" KDP-57XBR2 \$5,000

65" KDP-65XBR2 \$6,000

This information was also provided by could not be verified: 2x1394/DTCP (IN only), AVC networking

Also:

KD-34XBR2 integrated CRT Direct View of 34" for \$4,000 (with 1394/DTCP)

FPTVs CRT TTM current, 720p/1080i, DRC, RGB BNC, HD component inputs

VPH-G90U \$38,000, 9" CRTs

VPD-D50HTU \$11,300

Studio Experience

TTM current

LCD FPTVs

Cinema 20HD \$8,000, 2200 ANSI lumens, 900:1 CR, 1366x768, 3 lens array, component in, RGB, DVI

Cinema 13HD \$5,300, 1366x768, HD component

Matinee1HR \$2,400, 964x544 wide VGA, 800:1 CR, 700 ANSI lumens brightness, two direction keystone correction, NO DVI, RGB 15 pin for PC, component

Theater Automation WOW (TAW)

FPTV LCoS

"Evolution" \$22,000, 3 chip 1365x724 4:3 with built-in anamorphic lens to be able to use the entire resolution of the 4:3 panel for 16:9, 600:1 CR, 600 ANSI lumens of brightness, DVI, RGBHV (BNC), VGA 15 pin, upgradeable to SXGA (1365x1024) or WUXGA (1920x2000), future upgrade to 1920x1080 in 2003 by exchange (such later model to be called "Revolution"), Rock video processor capable of transmitting in lengths of up to 100 feet (\$25,000 w/Rock), for \$5,000 extra includes DVD player equipped with a SDI interface for all-digital connection from DVD player to Rock to projector

FPTVs CRT

HD800 \$30,000, 8" CRTs, 1800x1350, RGBHV, BNC and D-sub 15 pin, DVI (NO HDCP)

HD900 \$44,000, 9" CRTs, 2000x1500, RGBHV

Thompson

RPTVs RCA Scenium

Integrated w/ATSC tuner, DVI/HDCP, two 1394 inputs "in only" (DTV Link and AVC networking), 2 HD component in, Ethernet port for Web browsing, optical digital audio output, 1080i, 480p, 3:2 pull-down

52"	HD52W140	\$3,200
61"	HD61W140	\$3,800
65"	HD65W140	\$4,300 (w/conventional cabinet)

Monitors w/DVD player (optional ATSC tuner), TTM current, DVI/HDCP, no 1394, \$200 less without DVD player, 3:2 pull-down, 2 HD component

Direct view

34"	D34W135D	\$2,600 (D34W20 non-Scenium model \$2,400, 2 comp, NO VGA & 3:2 pull-down)
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RPTVs

40"	D40W135D	\$2,500, TTM current (\$2,100 street \$)
52"	D52W135D	\$2,700, TTM current (\$2,300 street \$)
61"	D61W135D	\$3,300

Other models TTM current, 2 HD component inputs, DVI, 7" CRTs, 480p/1080i

40"	D40W20	\$2,200
52"	D52W20	\$2,400 (\$2,000 street \$)
61"	D61W130	\$3,100

LCoS RPTV integrated

50" L50000 \$8,000, 1280x720, 3 LCoS devices, ATSC tuner, SYNCHROSCAN component in, dual NTSC tuner, 180 degrees horizontal viewing angle, optical digital audio out, NO DVI, NO 1394

The RCA/Thompson booth was relocated out of the LVCC and was not accessible for a visit to verify new products. Although some new announcements were rumored, it was not possible to obtain any information.

Toshiba

LCoS RPTV (Innovations)

57" 57HLX82 \$9000 (quoted as \$7,700 street \$), TTM 1Q03

Three 1080p LCoS chips (2,073,600 pixels x chip), true 1920 (standard LCOS are 1280x720), DVI/HDCP, digital audio input, 2 ColorStream HD component inputs, 8000 hr lamp, 1000:1 CR, 15 pin D-sub for XGA PC input (640x480p, 800x600p, 1024x768p), IDSC Digital (deinterlacer/scaler by Toshiba) for the upconversion to all incoming signals to 1080p (although it does not accept 1080p incoming), ultra fine pitch screen (0.1 mm), center channel in, accepts coaxial and optical digital audio and feeds the signal to the stereo speakers.

Toshiba declared that has plans to release a full line of integrated sets later in 2003. The plans will be announced in May 03. The integrated sets will be on both lines of RPTVs, the Theater Wide and the

Toshiba (cont.)

Cinema series. All models will have both, an 8-VSB terrestrial OTA tuner, and a QAM cable DTV tuner, with IEEE1394 and HDMI digital interfaces. The company also declared that they are committed to keep the recoding capability and the future-proof nature of their products.

Cinema Widescreen Models

DVI/HDCP, IDSC Pro Improved (for 720p input) and IDSC Pro Advanced (for 1080i/540p output), performs line doubling, frame doubling, horizontal pixel doubling, double sampling, 480i & 480p > 540p, 720p > 1080i, DVI/HDCP, 2 ColorStream HD component inputs, 0.52 mm pitch lenticular screen, adjustable SVM, 5 element lenses, 3:2 pull-down for film.

RPTVs

42" 42HDX82 \$2,200 (\$1,900 street \$)

50" 50HDX82 \$2,700 (\$2,400 street \$)

57" 57HDX82 \$3,000 (\$2,700 street \$)

65" 65HDX82 \$3,500 (\$3,200 street \$)

4:3 models (53HX71 & 53AX62) not included due to screen format, NO DVI.

Direct view

34" 34HDX82 \$2700, IDSC II, 1080i/480i > p, DVI/HDCP, 2 ColorStream HD component inputs

Theaterwide RPTV models

TTM current, DVI upgradeable (DVI 1.0 or HDMI/HDCP) via \$300 future jack pack (although it was not identified what items would be included and when, if it actually becomes available), 4 element lens, IDSC Pro Improved (for 720p input) and IDSC Pro Advanced (for 480i/p > 540p, 720p/1080i > 1080i), 2 ColorStream HD component inputs, 3:2 pull-down for film, 7" CRTs.

42" 42H82 \$2,000

50" 50H82 \$2,500 (\$2,200 street \$)

57" 57H82 \$2,800 (\$2,400 street \$)

65" 65H82 \$3,300 (\$3,000 street \$)

4:3 models (50H72 & 43H72) not included due to screen format, although they have 16:9 vertical compression, NO DVI.

FPTV

LCD TLP-MT7U \$6,000, 1280x720, 400:1 CR, RS-232 control, 1000 ANSI lumens, 720p, 1080i, RGB 15 pin D-sub, HD component.

Viewsonic

LCoS

36" VX3600 \$7,000, TTM current, DVI, HD component, 480p/720p/1080i

Viewsonic (cont.)

LCD FPTVs

TTM current, 480i/p/720p/1080, scaler, HD component, RGB D-sub 15 pin, 2000 hrs lamp, 3 panel LCDs
PJ350 \$3,100, 1024x768, 1100 ANSI lumens, 500:1 CR, DVI, RGB, vertical keystone adjustment (VKA)
PJ500 \$1,600, 800x600, 1200 ANSI lumens, 300:1 CR, VKA
PJ501 \$1,800, 800x600, 1500 ANSI lumens, 400:1 CR, VKA
PJ550 \$2,000, 1024x768, 1200 ANSI lumens, 300:1 CR, VKA
PJ551 \$2,300, 1024x768, 1500 ANSI lumens, 400:1 CR, VKA
PJ750 \$3,300, 1024x768, 2200 ANSI lumens, 400:1 CR, VKA, 2 RGB
PJ1065 \$5,000, 1024x768, 3500 ANSI lumens, 500:1 CR, horiz/vert keystone adjustment, 2 RGB
The model # PJ350 and price above could not be verified

Yamaha

LCD FPTV

LPX-500 \$5,000 (also priced s \$5,500), 3 LCD panels, DCDi, DVI, TTM September, 800:1 CR, 1280x720

Zenith

Integrated RPTVs

NO DVI, TTM current

61" IQ61W35 \$5,000, ATSC tuner, 7" CRTs, 5 elements lens, 9 point convergence, 15 pin RGB, Hi-Res component in, 1920x1080i resolution, discontinued according to booth

Other integrated Direct View CRTs

32" \$1,500

36" \$2,500

RPTV Monitors

(Discontinued according to booth's representative) 7" CRTs, 3:2 pull-down, 1080i or 540p scanning, 0.52 pitch lenticular screen, 1200 lines of resolution, 2 Hi-Res component in, calibration port

56" R56W28 \$2,400

65" R65W28 \$3,500 (also priced as \$3,300)

4:3 models R60V26 and R50V26 are excluded due to screen format, although they are HD monitors with 1080i/540p scanning and 1200 lines of horizontal resolution.

Other RPTVs

TTM current, HD component, 1080i/540p

61" D61W25 \$3,200

65" D65W25 \$3,500

New RPTV Monitors

TTM Mar 03, NO DVI, 2 HD component, line-doubler w/3:2 pull-down, 0.52 mm screen pitch, 540p/1080i

Zenith (cont.)

49"	R49W36	\$1,200 (estimated)
56"	R56W36	\$1,900 (estimated)

LCD

1280x720, NO DVI, 9 element lens, 200:1 CR, 3:2 pull-down, 2 RGB in, component in, calibration port, 680 cd/m2 brightness, 350:1 CR, viewing angle claimed as 100 degrees horizontally and 30 vertically, dual NTSC tuner, table-top

52"	D52WLCD	\$4,000, 3x0.96" LCD panels
60"	D60WLCD	\$5,000, 3x1.2" LCD panels

FPTV

TTM current

LXG-120 XGA native resolution, SXGA compressed resolution, 1220 ANSI lumens, 15-pin D-sub

DLP RPTVs & FPTVs

Barco

Versum 80 \$ TBA, TTM TBA, 1100:1 CR, 900 ANSI lumens brightness, digital link (Cine Versum SL and XL) to controller (below), SL for distances up to 15 meters, XL for distances up to 50 meters

Cine Versum Master controller, fully digital switcher/scaler, 8 digital/analog input modules, RGB, SDI, HD-SDI, DVI, all signals processed to 1600x1200 resolution

BenQ

FPTV HT-480W \$4,500, TTM current, 1024x768, HD component, RGB via BNC, RGB 15 pin D-sub

New FPTV models

\$ N/A, 600:1 CR, 1100 ANSI lumens

PE5100 800x600 native, 100 KHz refresh rate, 34 dB noise

PE8700 1280x720 native, 300 KHz refresh rate, 3:2 pull-down, digital keystone correction

Cinex

FPTV NHT-720 HD2 \$9,000 (w/o controller), TTM Feb 03, HD2 chip, 1280x720, 1000 ANSI lumens, 1700:1 CR, DCDi, 2 keystone correction, DVI/HDCP, 2 component, RGB D-sub 15 pin

Digital Projection International

FPTVs

TTM current

HIGHlite 4100gv \$30,000, 3 chip, 1024x768, DVI, RGBHV, component

HIGHlite 5100gv \$45,000, 3 chip, 1024x768, DVI, component, RGBHV

HIGHlite 4000Dsx \$47,000, Dark Metal 3 chip, 1280x1024, DVI, component, RGBHV

HIGHlite 6000Dsx \$58,000, Dark Metal 3 chip, 1280x1024, DVI, component, RGBHV

HIGHlite Gold HC \$70,000, 3 'Dark Metal' DMDs 1280x1024 each, projecting in 720x1280 (1080i x1920 signal mapped to 720x1280 and compressed about 33% horizontally and 29% vertically, but actually squeezed to only 498x886), 1200:1 CR, 2 BNC (RGBHV or YPbPr), HD-15 RGB, 1 extra BNC YPbPr, DVI (PC support up to 1280x1024 without copy protection), SDI (Standard Definition SMPTE259M or HD-SDI SMPTE 292M), PAL, SECAM

HIGHlite Platinum HC \$85,000, Dark Metal 3 chip, 1280x1024, DVI, component, RGBHV, 1200:1 CR

Dwin

FPTVs

TTM current

Transvision TV2 \$10,250, 1280x720, all formats to 720p, transcaler built-in, HD1 chip, supports seven scan modulations including HD & 540p/i, two lamps 150w or 270w, 2000 hrs lamp, 1000 ANSI lumens, 1200:1 CR, Carl Zeiss zoom lens, 3 component in, 2 RGB jacks, DVI, includes video controller

Transvision TV3 \$10,500, TTM Feb 03, 1280x720, 2 DVI, 2 RGB, 2 component, RS-232, HD2 chip, includes controller, Carl Zeiss zoom lens, 2000 hr/200 watt lamp, 1200 ANSI lumens, 1200:1 CR

TranScanner - TS3 Native Digital Processor \$3,500, TTM Feb03, scaler w/3:2 pull-down, 2 DVI, 2 RGB, 2 component, output resolutions 640x480, 840x480, 852x480, 800x600, 832x624, 1024x768, 1280x768, 1366x768, 480p, 720p, 1080i, and user defined

Elite Video

FPTVs

TTM current

EV-2800 \$55,000, 3 chip, 1024x768, 720p, RGB via VGA

EV-3000 \$80,000, 3 chip, 1024x768, 720p, RGB via VGA

LP530 \$7,500, 1080i, 720p, 480p, 800 ANSI lumens, RGB VGA (the information about this model could not be verified)

Faroudja

FPTV

TTM current

FDP-DLPHD10 \$14,500 with NRS chipset (\$24,000 w/DCS), 1280x720, modified version of the SIM2's HT300 Plus FPTV, 1000:1 CR, 1000 ANSI lumens brightness, DVI, DCDi w/3:2 pull-down, six segment color wheel, RGBHV, HD component, RS-232 control, double keystone adjustment

Hitachi

RPTV

55DMX01WD 2 PC VGA inputs, 2 component inputs, 1280x720

Infocus

FPTVs

TTM current, DVI/HDCP, 1000 ANSI lumens, six-segment color wheel

"Screen Play 7200" \$10,000, (Innovations), DCDi Plus FLI 2300, HD15 VESA, 1400:1 CR, 1280x720, Carl Zeiss optics, dual component, dual light output, TI HD2 chip, demo at TI with Stewart screen (very good quality)

Screen Play 110 \$5,000, 600:1 CR, 848x480 (800x600 4:3), component 480p in, RS-232, RGB, DCDi w/3:2 pull-down

Marantz

FPTVs

VP-12S2 (successor of the 12S1), \$12,500, TTM current, HD2 chip, DVI/HDCP, Minolta optics, 2600:1 CR, 3 DCDi chipsets, component input, RGB, 1280x720, 720p

VP-16 "high performance projector"

RPTV

55" DL5500 \$16,000, no DVI, HD1 chip

Mitsubishi

RPTVs

65" WD-65100 \$11,000, HD1 chip, HD-upgradeable with Promise Module, 1280x720, 3:2 pull-down for film mode, 9 element lens, 0.14 mm pitch lenticular screen, 2 component 480i/p, 1 PC inputs [15 pin D-sub VGA], 1 HD component RGBHV/RGB selectable,

NEC

FPTV DLP

HT1000 \$6,000, TTM current, 3000:1 CR, 1000 ANSI lumens, DCDi, six segment color wheel, 1024x768 (4:3), 1024x576 (16:9), DVI/HDCP, vertical image shift,

Optoma

RPTVs

TTM 2Q03, 1280x720p, DVI (NO HDCP, estimated \$200+- for HDCP service card), DVDO line doubler (sil 504), Oplus scaler, 1500:1 CR, TI HD2 chip, RGBHV w/BNC connectors, VGA, component in, 0.15 mm screen pitch

50" RD-50 \$5,000 (Innovations)

65" RD-65 \$6,000 (Innovations)

FPTVs

H50 \$4,000, TTM current, 800x600, 800:1 CR, 1200 ANSI lumens, 0.7" TI 4x3 chip, RGB 15 pin D-sub, DVI (NO HDCP), DVDO

H56 \$5,000, 1024x768, TTM current, DVI (NO HDCP), 4x3 chip, DVDO, 2000:1 CR, 1000 ANSI lumens, RGB 15 pin D-sub

H76 \$13,000, 1280x720, TTM 3Q03, 16x9 chip

Other FPTVs \$N/A, TTM current, vertical keystone correction only, DVI & VGA 15 pin for PC only

EzPro730 800x600, 480i/p, 720p, 500:1 CR, 1100 ANSI lumens

EzPro735 1024x768, 480i/p, 720p, 1080i, 500:1 CR, 1100 ANSI lumens

EzPro750 800x600, 480i/p, 720p, 1080i, 600:1 CR, 1600 ANSI lumens

EzPro753 1024x768, 480i/p, 720p, 1080i, 600:1 CR, 1600 ANSI lumens

EzPro755 1024x768, 480i/p, 720p, 1080i, 600:1 CR, 2000 ANSI lumens

EzPro737 1024x768, 0.7" TI chip, 1500 ANSI lumens, 1500:1 CR, NO DVI

Panasonic

RPTV

52" PT-52DL52 \$5,000, HD2 chip, \$ down from \$13K first generation, TTM fall 02, 1280x720, DVI/HDCP, 1000:1 CR, new Panasonic prism-less optical engine, 800cd/m brightness (2.5 times better than the previous model), 0.098mm lenticular screen pitch

FPTV

PT-D7600U \$30,000 (although I just received an update from Panasonic confirming the price now as \$35,000 and includes lens), 3 DLP 1280x1024 chips, SXGA, TTM Mar 03, 720p, linedoubler w/3:2 pull-down, 3000 ANSI lumens (6000 w/dual lamp), 1000:1 CR, NO DVI, awesome demo.

Plus Vision

FPTV

HE-3200 \$3,000, 848x480 (accepts 1080i/720 formats), VGA, DVI (NON HDCP, just for computers), component, TTM current, DVDO, 15 pin D-sub

Runco

TTM current

FPTVs "Reflexion" Series

CL-500 \$5,000, 1 chip, 16x9 or 4:3 dual mode, 848x600, RGB, component BNC, 1000 ANSI lumens, 900:1 CR

CL-500c \$7,000, same as above w/controller, component RCA

CL-700 \$10,000, 1280x720, HD1 chip, 3:2 pull-down, BNC component/RGBHV, component, 30:1 footlamberts of brightness, 900:1 CR, six-segment color wheel, digital keystone correction, supports screens up to 300" diagonal

CL-700c \$12,000, same as above w/PFP controller, 15-pin RGB

VX-1000c \$17,000, 1 chip, 16x9, 1280x720, RGB, HD component, 1000:1 CR, 15 pin RGB

VX-5000c \$27,000, 1280x720, horizontal/vertical lens shifting, 1000:1 CR, 6-65ft front projection distance, can be configured with one of five optional lenses for rear screen

VX-3x \$65,000, extra \$30,000 for anamorphic lens, 1024x768, HD RGB, component 15 pin

VX-5c \$90,000, extra \$30,000 for anamorphic lens, 1280x1024, HD RGB, component 15 pin

New FPTV models

\$N/A, TTM N/A

Rubino 1000 ANSI lumens, 848x600

Amica 1280x720, 900:1 CR, component in, RGB/component via BNC, RGB via VGA 15 pin

Runco's Vidikron line

Avanti \$10,000, TTM TBA, TI HD2 chip, Vivix technology for video scaling, 3:2 pull-down, DVI, 900:1 CR, 1000 ANSI lumens

Samsung

RPTVs

DVI/HDCP, 15 pin D-sub VGA, TTM 4Q02, broader distribution 1Q03, RS-232 control, aspect ratio control on progressive scan signals, DCDi w/3:2 pull-down, 2 HD component in

Samsung (cont.)

43" HLM437W \$4,000
50" HLM507W \$4,500 (\$4,200 street \$), tabletop
61" HLM617W \$6,000 (also priced as \$5,500), Tantus, 6000 hr lamp, 1280x720, Faroudja's 2300 DCDi chip scaling up to 720p, 0.8" DLP chip, 0.155mm fine-pitch screen

Other models

TTM current no DCDi, no DNIe, TTM current, H2 chip, DVI, 1280x720, 2 component in, XGA PC input
43" HLM4365W \$4,000
50" HLM5065W \$4,500 (also priced as 4,000, to be discontinued soon)

New monitor models

To be available on April 03 to replace the HLM line above, HD 2 chip, 1280x720, DNIe (Digital Natural Image Engine) video enhancer (in addition to DCDi), 3:2 pull-down, DVI/HDCP, XGA PC 15 pin input, 2 HD component, scroll and stretch functions

43" HLN437W \$3,500
50" HLN507W \$4,500
61" HLN617W (Innovations) \$5,500, one 480p component in

46" HLN467W \$4,500, TTM 2Q03, DCDi, DNIe
56" HLN567W \$5,000, TTM 2Q03, DCDi, DNIe

New Integrated models

With ATSC/cable tuners (NO 1394 out), other specs same as above

52" HCN529W \$2,300, TTM April 03
61" HCN691W \$6,000, TTM 4Q03, exact model as HLN617W but with tuners (\$500 more)

Sharp

FPTVs

Sharpvision XV-Z10000U \$11,000 (\$10,000 street \$), TTM Dec 02, DVI/HDCP (also PC compatible), two switchable contrast ratio modes: 2500:1 CR with 600 ANSI lumens of brightness, or 1500:1 CR with 1000 ANSI lumens of brightness, CV-IC II video processing, RS-232, 2 component in, PC D-sub 15 pin, 2000 hrs lamp, TI HD2 chip

XV-Z9000U \$11,000 (\$7,000 street \$ after rebate) 800 ANSI lumens, NO DVI, 2 component in, RS-232, PC D-sub 15 pin, first HD1 TI chip

XV-Z90U portable projector \$4,000, 0.55" chip, 800x600, 1200:1 CR, DVI w/HDCP, 600 ANSI lumens, component in, 480i/p, 720p, 1080i, 520 TV lines of resolution, D-sub 15 pin

Theago Personal Home Theater DT-200 (Innovations), \$4,000, 0.55" chip, two-way 848x480 in 16:9 mode and 800x600 in 4:3 mode, 1200:1 CR, DVI/HDCP, designed for large screens in small rooms, 2 direction keystone correction, 600 AL of brightness

Sim2 Multimedia

TTM current, DCDi

Grand Cinema RTX series HD2 chip

RPTVs

Trapezoidal shape cabinet, DVI (NO HDCP), component, RGBH/V, BNC RGBH/V, RS-232

45" RTX-45 \$11,000

55" RTX-55 \$13,000

Other models

HD component, RGB RCA and 15 pin D-sub

HT200 SWA \$7,000, 1024x768, 900 ANSI lumens, 720p/1080i

H200 DMF \$8,000, same as above

HT300 \$11,000, 1280x720, 720p, DCDi

New FPTVs

HT300 Plus \$14,000, 1800:1 CR (claims 62% more contrast than the replaced HT300, and 20% better brightness), 1280x720p native, DVI-D 24 pin input (for computer, NO HDCP), improved six segment color wheel (compared with HT3000 model that replaces), DCDi, connected via Fiber optic cabling up to 1640 feet away to an Digital Optical Image Processor (DOIP) switcher/controller, software upgradeable

HT-200DMF \$8,600, 848x600 chip dual-mode projector with Faroudja processing

Studio Experience

FPTV \$4,500, TTM current, 1024x768, 1000 ANSI lumens, lamp 200w/2000 hrs, 1000:1 CR, DVI, 15 pin RGB, 720p/1080i, 32dB quiet fan noise, DVDO w/3:2 pull-down

Thomson

New model integrated RPTV

50" \$4,500, TTM TBA, HD2 chip, 1280x720, ATSC/QAM cable tuners, 1394/DTCP, DVI/HDCP

Toshiba

FPTVs

TDP-MT8U (Innovations) \$10,000, TTM November 02, TI HD2 chip, 1280x720p, DVI/HDCP, DCDi Plus, all glass Carl Zeiss lens, 1400:1 CR, 2 HD component in, 15 pin D-sub RGB, RS-232 control, 6 segment color wheel, 1000 ANSI lumens, digital keystone correction

TDP-MT5U \$5,000, "EDTV" only 848x480 for 16:9 (800x600 for 4:3), 1000 ANSI lumens, 600:1 CR, DVI/HDCP, HD component in, 15 pin D-sub in

Yamaha (Innovations)

FPTV DPX-1000 \$12,000, TTM current, 1280x720, DCDi, DVI, component, RGB, DMD HD2 chip

Zenith

Integrated RPTV

52" DLP52W37 \$4,000 (estimated), TTM Oct 03, tabletop, QAM/ATSC tuners, NO 1394, NO DVI, needs separate cable STB for premium scrambled service (internal QAM tuner not designed to be replaceable other than service)

Plasma Panels

Akay

42" model # N/A \$3,500, TTM April 03, 480p

Barco

50" CineVersum \$TBA, 1280x768, two-piece system with XL/SL digital link

Daewoo

NO DVI, 620cd/m2 brightness

42" DSP-4280CM \$3,500 (street \$), TTM current, 853x480, 3000:1 CR

42" DP-42WMI same model as above with new #

50" DP-50GM \$6,500, TTM Aug 2003, 600:1 CR, 720p

Dwin

50" HD-50TS \$12,000, TTM 2Q03, "PlasmaImage", video controller connected via RGB, 1366x768, 3 component in and 2 RGB in (in controller), 15 pin D-sub RGB, HD component, 3000:1 CR, 500 cd/m2 brightness, 3:2 pull-down

Elite Video

TTM current, HD component, RGB, DVI

42" EV-42HD \$10,000, 1024x1024

50" EV-50HD \$13,000, 1280x768

Faroudja

Models include NRS processor (either DCS - Digital Cinema Source, or new DVI model), 29-pin DVI

42" FPP-42-HD10 \$13,000 w/NRS-DVI (or \$19,000 w/NRS-DCS) processor package, 1024x768, 3x digital zoom

61" FPP-61-HD10 \$30,000 w/NRS-DVI (or \$36,000 w/NRS-DCS) processor package, 1365x768, 9x digital zoom, split screen options, Advanced Mass Area Sampling to straighten diagonal lines and smoother curve lines

Fujitsu

Plasmavision SlimScreen

TTM current, 3000:1 CR, 1366x768, 600 candelas per meter squared of brightness, DVI/HDCP, UXGA computer input, HD component in, RGB, Advanced Video Movement (AVM) processor for motion artifacts and better vertical resolution, built-in line doubler for NTSC signals,

50" P50XHA10 \$11,000 (suggested)

Fujitsu (cont.)

Current models

42"	PDS-4241	\$8,000, 1024x1024
42"	PDS-4229	\$6,000, 852x480
42"	PDS-4233	\$6,000, 852x480
42"	PDS-4242	\$8,000, 1024x1024 (1080i), RGBHV BNC, component BNC, RGB VGA

Other current models: component, RGBHV 15 pin, DVI-D (no HDCP), RGB BNC, AVM signal processor, RS-232 control

50"	PDS-5002	\$10,000 (price further down due to new model 5004), 1366x768, 1080i/720p
50"	PDS-5003	\$10,000, 1366x768, 3000:1 CR
50"	PDS-5004	\$10,000 (\$8,200 street \$), 1366x768, 3000:1 CR
61"	PDS-6101	\$25,000, 1365x768, 700:1 CR

Gateway

42" GTW-P42M102 \$3,000, 852x480, DVI (NO HDCP) for PC, VGA 15 pin D-sub, 2 HD component, NTSC tuner, 480i> 480p w/3:2 pull-down, VGA output

Helios

TTM current

42"	PDTV-4203A	\$N/A, Mark II, fan less, 853x480, HD component, RS-232 control
42"	PDTV-4220A	\$N/A, next generation, NTSC tuner, 3:2 pull-down, dual component (YPbPr & YCbCr), RS-232 control
42"	HPTV-4200A	\$5,300, 853x480, RGB 15 pin
50"	HPTV-5000A	\$9,000, 1366x768, HD component, RGB 15 pin
60"	PDTV-6100A	\$N/A, 1365x768, HD component, RS-232 control, dual NTSC tuner

Hitachi

ALiS line

Both include AVC20 controller, TTM current, DVI/HDCP, 2 component, HD-15 VGA, 1080i

32"	32HDT20	\$6,000 (\$5,000 street), 852 x 1024i
42"	42HDT20	\$8,000 (\$7,000 street \$), 1024 x 1024i, 239:1 CR,

Also

42"	CMP4121HDU	\$8,000, 1024x1024
50"	CMP5000WXU	\$16,000, 1024x768 (or 1280x768, this pixel rate could not be verified), 900:1 CR, typical brightness of 340cd/m ² , HD ready with optional video card for DVI, 2 component and PC D-sub 15 pin inputs.

JVC

42" GMP20UG \$6,000
42" GDV4210 \$5,000 (4,200 street \$), TTM current
50" GDV500PZU \$15,450, 1600x1200 (or 1366x768 data could not be confirmed at the time of the report), 1080i, 1080p24 (this information could be in error), 720p, 480i/p

New Integrated Model

TTM Sep 03, 1280x768, ATSC tuner, DVI/HDCP, new 16M 10 bit 3 D/Y digital comb filter, 2 auto-sensing component inputs
42" PD-42WX94 <\$8,000 (estimated)

Luce

61" PDTV-61000A \$25,000, TTM current, 720p, 1280x720, HD component, RGB 15 pin D-sub

LG

Flatron Line

40" MU-40PA10B \$6,200, 640x480
42" MU-42PZ15B \$6,000, 852x480
50" MU-50PZ41B \$11,500, 1366x768
60" MU-60PZ11B \$14,600, 1280x720
60" MU-60PZ10 \$N/A, 1280x720, NO DVI, component in, HD 720p, 250:1 CR, PC video in
60" MU-60PZ12VB \$N/A, 1280x720

Marantz

DVI/HDCP (according to technical support), HD component, TTM current,

42" PD4293D \$10,000, 853x480
50" PD5020D \$16,000, 768p, 1365x768, 1200:1 CR, 320 cd/m2 brightness, 160 degrees viewing angle
61" PD6120D \$26,000, 768p, 1365x768, RGB 15 pin D-sub

Maxx

TTM N/A, DVI

42" 4250 \$4,400, 852x480, 2700:1 CR, 570 cd/m2 brightness, 15 pin RGB D-sub
42" 4250T \$4,585, same as 4250 w/ NTSC tuner card
50" 5000 \$8,000, 1366x768, component

Mitsubishi

50" PD-5010 \$13,000, TTM current, HD upgradeable via the "Promise Module", 1365x768, 1000:1 CR, scan rate compatibility 480i/p, 720p, 1080i (and PAL & SECAM scan rates), PC monitor for VGA, SVGA, XGA, SXGA, UXGA for 4:3 formats, and also W-VGA and W-XGA for 16:9 formats), 3:2

Mitsubishi (cont.)

pull-down for film, 1 component input, 2 PC-monitor inputs (mini D-sub 15 pin VGA and 5 BNC), 1 proprietary Mitsubishi digital interface with HD-5000 digital receiver.

NEC

PlasmaSync Line

42"	42PD3	\$7,500, 853x480
42"	42MP3	\$8,000, 853x480
42"	42MP4	\$9,500, 1024x768
50"	50PD2	\$10,000, 853x480
50"	50MP2	\$13,000, 1365x768
61"	61MP1	\$20,000, 1365x768

NetTV

42"	DTV-42V	\$8,000, TTM current, 480p/720p/1080i, component, RGB 15 pin, HD component
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Optoma

46"	PDP46	\$7,000, TTM TBA, 850:1 CR
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Panasonic

TTM current, 3000:1 CR

37"	PT-37PD4-P	\$4,500 (\$3,400 street \$), 852x480, EDTV
42"	PT-42PD3-P	\$5,000 (new reduced price for 2003, was \$6,000), 852x480
42"	PT-42HD4-P	\$7,000 (street \$ from \$8,000\$), 1024x768, 720p
50"	PT-50PD4-P	\$11,000, 1366x768, (replacement of previous model 3-P)

Additionally, I have visited the following plasmas in the China market (streets of Shanghai on Nov 02), TTM current, also PAL/SECAM, 15pin D-sub RGB, RS-232C, 220-240v 50/60Hz, 3000:1 CR, TY-42TM4Z/5H Control box with component, TU-PT600C Control box with component in and PC D-Sub 15

42"	TH-42PW5C	\$5,000, 852x480
50"	TH-50PHW5C	\$9,500, 1366x768, 1080i, 720p, 480p

Other models:

37"	TH-37PWD4UZ	\$5,000, 852x480
42"	TH-42PWD4UY	\$6,000, 852x480
42"	TH-42PHD5UY	\$8,000, 1024x768
50"	TH-50PHD3V	\$11,000, 1366x768

Newer models

852x480 (EDTV), 3000:1 CR, 2 NTSC tuners, DVI/HDCP

37"	TH-37PA20U	\$4,500, TTM Aug 03
42"	TH-42PA20U	\$5,000, TTM Jul 03

Philips

FT9964 outboard tuner for the units below extra \$1,000, TTM current, DVI, RGBHV, component

Matchline

42" 42FD9954 \$6,500 (street \$), 1024x1024

50" 50FD9955 \$10,000 (street \$), 1365x768 (1024x1024), 2 NTSC tuners

New outboard model for the above units:

FTR9965 \$N/A, TTM June 03, Pixel Plus video enhancement

42" 42FD9934 TTM June 03, 852x480

Pioneer

TTM current, NO DVI

Regular Line

43" PDP-4330HD \$8,000 (street \$), Pure Cinema II, includes Digital Media Receiver with 2 component in, 2 NTSC tuners for PIP, 1024x768

50" PDP-5031HD \$11,000 (street \$), 1280x768, Pure Cinema II, includes Digital Media Receiver with 2 component in, 2 NTSC tuners for PIP, 2 D-sub 15 pin

Elite line

Expansion card for DVI not yet available, estimated to cost \$600+- and TTM 1 year +-, although I did not see that was officially announced in a press release

43" PRO-800HD \$9,000, 1024x768, Pure Cinema II, D-sub 15 pin HD input, 2 component in, 1 RGB HD in, 160 degrees viewing angle (horizontal & vertical), expansion slot for optional DVI input card

50" PRO1000HD \$12,500 (\$11,000 street \$), 1280x768, Pure Cinema II, D-sub 15 pin HD input, 2 component in, 1 BNC RGB in, 160 degrees viewing angle (horizontal and vertical), RS-232

61" "Elite" prototype shown at CES 2002 was discontinued this year, this set looked stunning as a prototype one year ago, unfortunately the Elite line would not have the pleasure of that size of Plasma, just the industrial line (below)

Industrial Line

43" PDP-433CMX \$11,500, 1024x768, XGA with expansion slot

50" PDP-503CMX \$15,500, 1280x768 HD, optional touch screen device for interactivity, \$500 extra for video inputs card with 2 RGB, 1BNC, 15 pin VGA and DVI

61" PDP-610CMX \$24,000, 1365x768, XGA, VGA, DVI, expansion slot

Runco

42" PL-42CX \$16,000, 852x480, TTM current, HDRGB, HD component 15 pin D-sub

46" VP-46 \$13,000-\$16,000 (estimated), TTM N/A, 852x480, Vivix video processing, 850:1 CR, 300 cd/m2 brightness, component, RGB, DVI

50" PL-50HCX \$17,000 (model PL-50CX \$20,000 w/PFP processor), 1280x768, TTM current, HDRGB, HD component 15 pin input,

Runco (cont.)

61" PL-61CX \$30,000 (PFP controller included), 1366x768, HDRGB, HD component 15 pin, TTM Mar 03, 1000:1 CR, NO DVI

Other models

Two RGB BNC, HD component BNC/RCA, 1000:1 CR, DVI

42" CW-42 \$10,000, TTM Mar 03, 853x480

61" CW-61 \$25,000, TTM current, 1366x768

New Models

With Vivix processing, 720p, Expanded Dynamic Gamma, DVI/HDCP, PFP Vivix controller with HD component input, RS-232, TTM current, HDRGB

43" PL-43HDX \$13,000, 1024x768

50" PL-50HDX \$17,000, 1280x768, (\$20,000 w/PFP processor)

Processors

3:2 pull-down, pixel-per-pixel matched output Vivix, component, RGB, VGA pass-through, resolutions supported: 854x480, 800x600, 1024x768, 1280x720, 1280x768, 480p, 540p, 600p, 720p, TTM current

PFP-7 \$5,000

PFP-11 \$7,000

Sampo

TTM current

42" PME-42S6 \$5,000, 852x480 (EDTV), no fan, Motion DSC digital processor for 3:2 pull-down, component, DVI, RGB, optional NTSC/CATV tuner module

42" PME-42X6 \$6,000, 1024x1024, 580:1 CR, DVI, VGA, component, RS-232, optional NTSC tuner \$299, ALiS scaling (see description of technology at the end).

42" PME-42V3 \$5,000, 852x480

TTM Feb03

50" PME-50X6 \$7,000, 720p, DVI/HDCP, component, RGB

Samsung

Fan less cooling design, PIP, TTM current

42" SPL4225K \$5,000 (street \$), 852x480p, 600 cd/m2 brightness, 700:1 CR, component

50" HPL5025 \$10,000, 1366x768, 550 cd/m2 brightness, 600:1 CR

63" HPL6315 \$20,000, 1366x768, auto-pixel shift to prevent burn-in, 700:1 CR, 450 cd/m2 brightness

42" PPM42S2 \$6,500, 852x480

50" PPM50H2 \$13,000, 1366x768

63" PPM63H1 \$18,000, 1366x768

Samsung (cont.)

New models

TTM Jan 03

42"	SPM4227	\$6,000, 852x480, 600 cd/m2 brightness, 700:1 CR, component
42"	N/A	\$N/A, TTM March 03, same model above w/DVI
50"	HPM5027	\$10,000, 1366x768, 550 cd/m2 brightness, 600:1 CR

New models

TTM Mar-Apr 2003, DVI/HDCP, component inputs

42"	HPN4239	\$6,500, 852x480, 900 cd/m2 brightness, 1500:1 CR (model SPN4235 \$500+)
50"	HPN5039	\$9,000, 1366x768, 800 cd/m2 brightness, 1000:1 CR, 2 NTSC tuner inputs
50"	HPN5037	\$10,000, same as model 5039 but with base cabinet
63"	HPN6339	\$20,000, 1366x768, 900 cd/m2 brightness, 1200:1 CR

Sanyo

42"	PDP-42H1W	\$6,000, 1024x1024, 720p, HD BNC, component
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Sharp

TTM current, separate audio video controller box, Sharp's CV-IC deinterlacing w/3:2 pull-down, NO DVI, 2 x 15 pin D-sub RGB (HD and PC), 2 component inputs, RS-232-c, 830:1 CR

43"	PZ-43HV2U	\$9,000, XGA 1024x768
50"	PZ-50HV2U	\$12,000 (\$11,000 street \$), 1280x768

Sony

TTM current

Wega XBR

DRC (Digital Reality Creation), CCP (composite component processor), "floating glass" panel that connects to an outboard Media Receiver Unit with DVI.

42"	KE-42XBR900	\$12,000, 1024x768
50"	KE-50XBR900	\$15,000, 1365x768
42"	Wega KE-42TS2	\$7,000 (street \$), NTSC tuner, DVI, component, 1024x1024, 3:2 pull-down
42"	Wega KZ-42TS1	\$8,000, same as above but NO DVI
42"	PFM-42B1	\$8,000, 1024x1024, RGBHV, HD component
50"	PFM-50C1	\$10,500, 1365x768, 2 RGB VGA

Thompson

Scenium

50"	PHD50400	\$15,000, 1365x768, DVI/HDCP, 2 HD component, 3:2 pull-down
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Toshiba

TTM current

42" 42HP82 \$8,000 (\$7,000 street \$), 1024x768, DVI/HDCP, 1000:1 CR, 15 pin D-sub VGA, ColorStream HD component RGBHV, RS-232 control, 3:2 pull-down for film
50" 50HP82 \$11,000 (\$10,000 street \$), 1365x768, DVI/HDCP, 1200:1 CR, 15 pin D-sub VGA, ColorStream HD component RGBHV, RS-232 control, 3:2 pull-down for film

Viewsonic

TTM current

42" VP-W425 \$4,500 (street \$), 852x480 SVGA (displays 720p/1080i), DVI/HDCP, RS-232, component, RGB 15 pin, 3:2 pull-down, 550 cd/m2 brightness, 550:1 CR
50" VP-W505 \$8,000, 1366x768, 720p/1080i, DVI/HDCP, RGB 15 pin, 3:2 pull-down, 600 cd/m2 brightness, 550:1 CR, component

Yamaha

50" PDM-1 \$12,000, 1366x768, TTM September 02, accepts 720p/1080i, HD component, 3:2 pull-down

Zenith

DCDi Faroudja chip, street \$, TTM current, RGB 15 pin D-sub, Hi-Res component, RS-232C

40" P40V22 \$5,000, 640x480, NO DVI
40" P40V24 \$5,000, 640x480, NO DVI
42" P42W22/B \$4,500, 852x480, 650:1 CR, Sage scan converter
42" P42W24 same as above model, includes DVI
42" P42W26 \$6,000, 852x480
50" P50W26 \$9,500, 1366x768, 600:1 CR, 620 cd/m2 brightness, DVI, vertical display mode
60" P60W26 \$15,000, 1280x720, NO DVI, 550:1 CR, Sage scan converter

New Integrated models

TTM June 03, same \$ as current models above, add \$500 for internal ATSC, QAM & DVI

42" P42W36
50" P50W36
60" P60W36

HD Set-Top-Boxes (HD-STB) and HD-PVRs

General Review

DirecTV showed a demo of a new HDD PVR with satellite and ATSC OTA tuners. The company is negotiating who will manufacture this PVR. It is not yet decided how large the PVR will be. There are plans to release another Tivo version, which would cost subscriber fees for the service.

DirecTV also announced the introduction of a new channel (198) for 24 hrs HD-PPV movies. No other HD channel addition or changes were announced.

DirecTV stated now that when they mandated DVI only (and to exclude 1394) in January 2002 for any new HD-STBs planned for release after June 2002 they never actually obligated manufacturers of STBs to exclude the 1394 from their designs. In other words, the exclusion of 1394 was the manufacturer's own choice. It appears that DirecTV had initially set the "DVI only" direction but changed their mandate later in the year, and by that time the manufacturers of STBs were already committed with their production plans.

DirecTV might be re-evaluating their options to stay competitive in the HD business. DishNetwork demo their prototype of model 921 PVR one year ago having all three 1394/DVI/component connections at that time, it still has those connections now.

Those connections provide a way to tape HD satellite signals (and ATSC OTA) via the 1394 output, and at the same time be backward compatible with analog component inputs present on approximately 4 million HDTVs sold until today (sets that do not have digital connections).

When analyzing the options of the equipment listed below, it could be concluded that DirecTV satellite signals would not be able to be recorded into D-VHS tape in 2003, not with the equipment announced for this year. DishNetwork and JVC HD-STBs for satellite and OTA would.

In addition to the DishNetwork option, there is the option to record over the air broadcasting by using the only ATSC HD-STB w/1394 available (from Samsung), or by using the 1394 tuner outputs of some integrated TVs, as mentioned on the TV section.

Tape recording from HD-STBs could only be possible if permitted by content provider. It could be done by using the 1394 output port of the STB carrying compressed MPEG-2 HD video, and any of the two current models of HD-VCRs available today (from JVC and Mitsubishi).

According to the proposed agreement, cable providers are required to supply FireWire enabled HD-STBs on demand. By July 1, 2005, all cable boxes from cable providers and all DTVs with 36 inch and larger screens must include both DVI (or HDMI) and FireWire digital interfaces. FCC expects that DirecTV would comment to the agreement.

HD STBs - PVRs General Review (cont.)

In addition, under the proposed recommendations, all multi-channel TV providers (cable, satellite and others) will be prohibited from turning off the digital signal coming out of the FireWire spigot of the HD-STB to restrict digital recording. The satellite industry, however, currently allow this kind of selectable output, both as a safeguard against piracy, and because satellite operators may one-day adopt new business models, such as pay-to-record services.

If the FCC adopts the proposed recommendations, this prohibition on selectable outputs would be universal.

Analysis of HD Set Top Boxes and PVRs

During 2002, there has been a slow-down on the introduction of new HD-STBs. At about this time last year DirecTV mandated digital only DVI connections on any new HD-STB, and excluded digital 1394 as output, which could have allowed recording of DirecTV content. The message was clear, no HD recording from new DirecTV HD-STBs.

At the end of 2002, when Samsung released to the market a new HD-STB (SIR-160) with DirecTV tuner and DVI-only, DirecTV's direction was confirmed with an actual unit in production. It took almost a year to reach the market.

Samsung also released an OTA only model SIR-165, which has 1394 outputs (and DVI), allowing it to be connected to any of the current HD-VCRs (JVC and Mitsubishi, although Panasonic has another discontinued D-VHS) to permit HD recording of OTA signals, this unit does not have a satellite DirecTV tuner.

Although Dish Network has not yet released to the market their newer HD-STB (model 921 with PVR), it gives hope regarding connectivity. Dish Network estimates now the release for June 2003. The unit not only facilitates HD recording (OTA and satellite) into its PVR but also to an external D-VHS via its 1394 output.

As mentioned in the section of DTV deployment, cable has started to be more active on the last part of 2002 (under pressure from the FCC), although several regions of the country had the opportunity to experience cable HD already. This will bring a number of new cable HD-STBs to the market.

Connectivity is something to look at when buying a HD-STB. Most if not all DTVs have analog component/RGB inputs since 1998, most if not all HD-STBs have a similar connection (component YPbPr, 15 pin D-sub VGA RGBHV, or 5 BNC).

There are available simple adaptors and trans-coders to help match most connections. In general, the connectivity mismatch could be solved without forcing a buyer to move away from his/her preferred TV set or STB. These were, and still are, the times of analog component connections for HDTV.

Times had changed with the arrival of D-VHS, copy protection, and digital connections. Now it is not possible to record a HD signal from the analog component output connections of a HD-STB.

In addition, it might happen that eventually the signal transported by those analog component connections would be disabled or down-rez (resolution reduction from 1080i to 480i) when protected content is tuned by the HD-STB.

Under these possible scenarios, how a consumer could improve the chances of being able to view HDTV from a STB in the future? If a STB has DVI, analog component (as YPbPr, VGA/RGB, etc), and 1394 outputs, that STB would have better chances to survive the storm.

The DVI connection on the HD-STB would allow direct connection to the monitor, if the signal were protected by HDCP its viewing would follow the copy protection rules. As said before, some equipment

Analysis of HD STBs / PVRs (cont.)

has DVI but is not HDCP compliant. That condition is found more often in panels, where their DVI connection was planned only for PC connectivity.

The 1394 output on the HD-STB would allow connection to a D-VHS suited with 1394 inputs. If the signal were protected by DTCP (also called 5c) its viewing/recording would follow the copy protection rules set by the content provider. The 1394 connection could facilitate networking of the STB as well, such as the Mitsubishi HAVi products do.

The analog component connection could still be used from the HD-STB to a monitor or any other device with such input, but the signal transported on that connection "might eventually" be affected by the rules set by the content provider, which is out of the viewer's control.

All the satellite STBs are still being made with internal circuitries that have the ability to respond to the content provider's rules if required, and perform actions that might disable/affect the signal on the STB analog outputs. The feature is not used today, but it could if a law is passed that forces the satellite provider company to activate the copy protection flag.

Since the first DirecTV HD-STB arrived in 1999 (RCA DTC-100) early adopters got accustomed to the existence of this warning:

"Due to copyright restrictions, you may not be able to record or view some high definition programs in high definition format using this product. To view this type of programming in standard definition format, you must also connect the Audio/Video jacks to the monitor."

At this time, it has not actually been implemented copy protection for OTA, cable or satellite (except for some instances that appeared as accidents from the provider). But in the near future, when those copy protection rules are set, it might happen that DVI and 1394 would become the only way to view/record what is permitted, even for over the air programming from the networks.

In fact, DirecTV just started testing the DVI connection with HDCP content protection in December 2002. If your STB-to-HDTV connection is not DVI with HDCP protection, you might soon see this kind message when tuning to HD programming:

"Notice -Copy restrictions prevent the viewing of this program in the high definition format using the DVI HDCP output from your satellite receiver connected to a TV that does not support HDCP. You may view this programming in standard definition by selecting another input option on your TV. For more information see the owner's manual for your satellite receiver."

Which means you would still be able to see a HD 1080i program but degraded to a SD 480i resolution using the regular analog connections. This could certainly cause a problem to old equipment that is not DVI/HDCP compliant, but if you are in the market for a new HD-STB the choice is obvious.

HDMI is also coming as the successor of DVI, it claims that would be backward compatible to equipment with DVI connections (by using an adaptor). When implemented, HDMI would transport

Analysis of HD STBs / PVRs (cont.)

digital audio and certain control signals in addition of the uncompressed video, all in one cable. The lack of an HDMI output on an HD-STB should not be a reason for deferring purchases if the product has DVI, unless you rather wait for the audio feature of HDMI, again, assuming the backward compatibility would actually work with the adaptor as claimed.

You could choose a HD-STB with every possible connection on it (like the DishNetwork 921) but the display unit could still be a limiting factor on the viewing in your system; the DTV section covered its end of the subject.

We can only hope that if/when copy protection is operational it would protect personal viewing and recording rights, as much as it would protect the rights of the owner of such content. We also hope that it would protect the investment made by millions of early adopters that have DTV equipment with only analog connections.

One other factor to look into is if the STB is capable to output simultaneous HD and SD signals over the DVI, component, 1394 and S-video jacks. One might want to watch a HD program via the DVI while taping the downgraded SD version of the same program (via the S-Video connection to a S-VHS/DVD recorder), or while distributing the SD version of the signal to another place of the house for non-HD viewing. Some STBs cannot simultaneously do that.

In summary, if you are looking for purchasing a new HD-STB, look for these issues of connectivity, especially because HD-STBs are still selling at prices of 1999.

HD-STBs/PVRs (satellite, cable, broadcast OTA)

DirecTV

Model # N/A \$N/A, TTM end 2003, DVI, no 1394 on the prototype. No decision has made yet regarding the inclusion of 1394 on the final unit, but the representative doubted it would be included due to current company direction. We would have to wait until later in the year, maybe they change the policy. The unit also has component output, selectable output 1080i/720p using switch on the back, and record one/watch another program capability.

DishNetwork

Dish 6000U \$700, TTM current, includes optional OTA 8VSB adapter, model to be replaced by DP-811 by the end of 2003, 720p/1080i, component and RGB outputs, on screen caller ID, optical DD output, seamless channel surfing between off-air analog, off-air digital, standard definition and high definition satellite programming when using the optional 8VSB tuner cartridge.

Dish 211 \$TBA (low cost), TTM 3Q03, satellite only STB (no OTA) to match ATSC tuner/integrated HDTVs, 1394/HDCP, possibly upgraded in the future for PVR, 1394 designed for monitor connection, it could be possible that if used to dump to tape off the 1394 would be a problem since it would include menu graphics (this was not able to be verified).

DP-811 \$N/A, TTM end 2003, DVI, NO 1394, component out, planned to replace Dish 6000, NO PVR, tuner module included inside the unit, same selectable outputs of model 921, converts formats to any output.

PVR 921 (Innovations, satellite best of show winner), \$TBA, TTM 2Q03



HD-PVR 250 GB, up to 180 hrs SD, up to 40 hrs HD (although earlier reports also quoted it as 25 hrs), one DVI/HDCP, two 1394/DTCP, ATSC OTA tuner built in, one component out, USB for remote keyboard, records DD when available and over the air digital broadcasts, headphone and USB jacks in front panel, final unit to possibly keep a door shown on the demo unit for upgrades (not yet decided), records up to two programs in the PVR simultaneously (HD or any) and at the same time it is capable to play another HD program stored in the PVR (or from the 3rd HD tuner).

HD STBs / PVRs (cont.)

DishNetwork (cont.)

The 8VSB terrestrial antenna input for HD OTA will also receive NTSC broadcasts which can be decoded and displayed via the DVI, component and composite outputs - no PVR features are available when viewing NTSC. PVR recording of analogue sources is not possible.

Outputs 480p, 720p or 1080i selectable from screen, converts any format to any output, stores signal in native image resolution, remote antenna in the back for RF/IR universal 4 component remote w/PIP functions (included), two 8PSK satellite tuners. Recording is only possible via the internal tuners -2x HD Satellite and 1xHD ATSC.

Recording from the IEEE1394 output is possible, but DishNetwork is currently planning to support only the D-VHS from JVC. Although there are plans to make the 921 eventually interface with the other D-VHS VCRs available.

It is unknown whether the compatibility with the control software of the other two D-VHS units (Mitsubishi and Panasonic, a discontinued unit) would be implemented on the first release, if not, it is expected that such functionality could be added via software upgrade later.

The 921 can be used as a high definition tuner for the D-VHS recorder. Camcorders cannot be supported by the 1394 HW implementation. The 1394 support for TV's is possible but is not in the current specification. The two 1394 ports are actually to support daisy chaining of the 1394, not different types of output (as some have hoped, that one could be used for a D-VHS without graphics on the video, and another for the TV with graphics to be able to operate the 921 functions).

Some recent information claimed that a dump-selected HD content stored in the PVR would be erased from the PVR when dumped to a D-VHS tape recorder for archival functionality. According to Dish Network the archive process to D-VHS has not yet been defined - auto erasure is not in the current specification.

The 921 will output HD content (or SD content upscaled or native) on the DVI and component outputs simultaneously, in addition, a SD (480i) version is available on the RCA connectors and S-Video connector. No monthly charge for PVR features, pause live TV, skip forward 30 seconds, skip back 10 seconds, 4 fast forward and 4 reverse speeds (4x, 15x, 60x, 300x), slow motion and frame-by-frame, 7 day Electronic Program Guide (EPG) with search capability, on-screen caller ID, optical DD output.

As an historical perspective the following was the information provided at CES 2002 when DishNetwork introduced the "921" prototype above:

DishNetwork demo a prototype of their new Echostar (E) HD- STB with PVR. \$ N/A. TTM by the end of 2002. Outputs planned: DVI, 1394 and component. The PVR demo showed clean HD images at 0.5 slow motion, at fast 4X speed for reverse and forward, and at freeze frame. The unit is compatible with HD-VHS VCRs via 1394. It records 12/15 hrs of HD using a PVR 160GB HDD at 720p or 1080i. It converts stored signals to other ATSC formats in the output.*

The loop works as follows: The DishNetwork E STB tunes and sends a HD signal out via the 1394 output to a D-VHS VCR for recording, then the tape is played back from the D-VHS VCR and its signal is sent back to the E* STB via the same bi-directional*

HD STB / PVR (cont.)

DishNetwork (cont.)

1394, then the E* STB outputs the played signal to any current HDTV via the component analog connection. The same approach is for pre-recorded HD-VHS movie tapes when available.

The system seems to assure backward compatibility regarding connections with all HDTVs produced over the last 3 years that do not have digital inputs, and facilitate connectivity with new D-VHS VCRs that have only 1394 in/out.

DishNetwork also announced the channel addition of HD-ESPN within the next few months and HDNet by mid-year 2003.

DishNetwork also confirmed again this year that their STBs are suited with the capability of either down-rez or disable copy-protected signals directed to the analog component outputs, however, they believe that the feature would not be used.

Hughes

E-86HD \$650 (w/o dish), DirecTV/ATSC, 480i/1080i (all SD and HD to component 1080i), discontinued

HSYS-E876 Platinum HD \$800 (w/multi satellite dish), DirecTV/ATSC, 1080i, 480i, NO DVI, NO 1394, TTM current, component, optical digital audio, 480p/720p to 1080i conversion, this model could not be verified properly

JVC

DishNetwork HD-STBs

TU-6000RU \$500, TTM current, optional \$149 OTA & 8SPK adapters, 480i, 1080i, 720p outputs, NO DVI, NO 1394

TU-PVR9000RU \$700-800 (estimated), TTM 2Q03

NO ATSC OTA tuner (two tuner DishNetwork HD-STB), dual decoder HD/SD or SD/SD, up to 120 hrs SD recording time, slow motion/frame by frame/special features, internet access for web browsing, component out, 1394/DTCP (only one) to connect with HD-VCR for recording, DVI/HDCP out (possibly HDMI on final product), PVR with 120GB for 12 hrs (although there are other reports of up to 20 hrs) of HD content, universal remote, TosLink audio digital out, simultaneous HD and 480i outputs,

The following information was provided at CES 2002 when JVC introduced the prototype above:

JVC HD-STB TU-9000 with PVR, TTM June 2002, \$ N/A (but claimed to be competitive in price), PVR of 80GB HDD (maybe more GB by June), two 1394 in/out 4pin (two of 2 way each), dual decoder for PIP (HD/SD or SD/SD), DVI output, analog component output, 2 satellite inputs, No 8VSB tuner, optical audio out.

Macro Image

MDR-100 \$649 (also priced as \$450), TTM current, OTA only, component & RGB outputs

MDR-500 \$2,500, TTM N/A, OTA only, up 1080p output, component & RGB outputs, optional digital interface

Microtechnologies

Pace 550HD \$N/A, TTM early 03, DVI, 1394, 480i/p, 720p, 1080i

Mitsubishi

SR-HD400 \$799, discontinued

HD-5000 \$N/A, controller/ATSC tuner for plasmas, 1394/5C and HAVi, two NTSC tuners, component video input, NO DVI

Motorola

Cable STB for Comcast

HDD-200 \$1,600, C-band, adapter module, no OTA, needs 4DTV receiver, component, RGB, multiple output format 480p, 720p, 1080i, native, discontinued according to Motorola

DCT-5100 \$800 w/optional 1394 & DVI (\$40-\$50 less without), no OTA, component, DVI, USB, Ethernet

DCT-5200 \$900 w/80 GB HD-PVR (also as 40 and 60 GB), no OTA, TTM 3Q03, 1394 for external HDD, DVI

BMC-9000 \$N/A, with DVD player and HD-PVR, TTM 2003

According to Motorola a good number of parts from a \$800-\$900 STB would not be needed if the cable-tuner becomes part of an integrated TV, although an estimate of the cost of the included parts was not provided

Panasonic

TU-HDS-20 \$1000, discontinued

TU-DST52 \$399, ATSC/OTA only, component, select output 1080i/720p/480p/480i controlled by remote, DD optical

Panasonic representatives at the booth declared that the company does not have plans to continue the satellite STB business.

Philips

DSHD-800R \$849 (also priced as \$1,000), NO DVI, NO 1394, 480i, 1080i, similar to Hughes (some talks about replacement but no announcement was made)

Pioneer

Voyager 3511D \$N/A, ATSC, 1080i or down-convert, TTM late 2002

Voyager 3510HD \$N/A (estimated as \$300 the cost for cable operators), cable only, (NO OTA tuner), DVI/HDCP, 32 MB SD RAM, component out, up to 15 Mbps MPEG-2 decompression data rate, resolutions 704x480, 352x480 and 544x480

BT-M850W \$550, TTM 4Q03, PVR 80 GB (upgradeable to 120 GB), cable only (NO OTA tuner), DVI, 1394

Proscan

PSH-D105 \$549

Proton

HT-5060 \$400, TTM Mar 03, ATSC/QAM cable tuner, web browsing, optional HDD for PVR functionality, 2 x USB, Ethernet, DVI, NO 1394, RGBHV, component, RS-232

RCA

DTC100 \$549, DirecTV/ATSC OTA tuner, discontinued

DTC200 \$700 (also priced as \$549), ATSC/DirecTV tuner, advanced program guide, DVI/HDCP, NO 1394, component out, RGB+HV 15 pin D-sub VGA, coax & optical Dolby Digital audio out, selectable resolution of 1080i/720p/480p/i outputs, TTM 1Q03, simultaneous output to 480i connections w/ component signal

ATSC10 \$549, ATSC only, TTM 1Q03, RGBHV on 15-pin D-sub, HD component out, DVI/HDCP, NO 1394, coaxial and TosLink DD audio out, output resolution switchable to 1080i and 720p

Samsung

Specifications applicable to the HD-STBs below:

Outputs to 1080i, 720p, 480p/i via switch in back (no remote), and applies to both signals of DVI and component outputs, RGBHV 15 pin D-sub out, 1 component out, DVI, 1 Dolby Digital coax/optical, ATSC/NTSC, simultaneous s-video/component out

SIR-TS160 (Innovations) \$700, TTM Oct 02

Samsung (cont)

DirecTV/ATSC, NO 1394, no input for component 480p/i, composite, nor S-video, 1 s-video out, caller ID (but without name), DVI/HDCP (DVI cable included), component "or" VGA output selection switch on back (not simultaneously), red push (high chroma level problem), loses sound on OTA channel change (probably due to low signal strength), access card error messages, some problems attributed to PSIP below,

SIR-TS165 \$700 (also priced as \$800, \$500 street \$), TTM Oct 02

ATSC OTA only (and analog cable/NTSC but no digital QAM cable), DVI/HDCP, 1394 in/output interface w/JVC D-VHS, RS232 (SVC), 1 component in for 480p/i, 2 S-video in, 2 composite in, 2 S-video out, 15 pin RGBHV enabled simultaneously to the DVI output, no simultaneous DVI & component signals on output (this two last specifications could not be verified properly).

No progressive stretch, red push, scales up 480i component to component out 720p or 1080i, although the DVI output on other than 720p (and also the 480p input) revealed some problems on recent tests, the unit requires detection of at least static PSIP during set-up or manual add for it to lock on to an 8VSB carrier of a digital channel (otherwise it interprets it as analog), only 8VSB programs are passed through the Firewire port to record as MPEG-2. NTSC, D-VHS and ATSC are converted to digital DVI

(Digital signals are not converted to analog first), DVI cable excluded, jittering 480p input.

Other Models

SIR-T151 \$500 (\$400 street), TTM current, ATSC OTA only

SIR-T150 \$699, TTM current (this model information could not be verified properly)

Sanyo

DIR-2000 \$400, ATSC only 480i/p output, selling via web page directly, TTM spring 02, component, NO DVI, NO 1394

Scientific Atlanta

(HD-STB Explorer line for Time Warner Cable)

2000HD, component out, reportedly crashed 4 times on recent lab test

3100HD, newer model, all to 1080i, component out, VOD, SVOD (Subscription video on demand), web browsing, email, chat. 38,000 units delivered on 1Q02, NO DVI, NO 1394. USB port, no AR control

3250HD, TTM 4Q02, DVI optional, 1394 optional, component out, RGB adapter, selectable video resolution, USB port, AR control

8000HD, 1394, information related to possible PVR N/A, DVI optional, component out, RGB adapter, selectable video resolution, USB port, AR control

Explorer 4200HD home gateway, 1394/5c and DVI/HDCP optional, selectable outputs 480i/p, 720p, 1080i, internal DOCSIS cable modem for Internet connection, USB

Sharp

According to CES representatives Sharp does not have any HD-STB or HD-PVR in the plans

Sony

No plans for ATSC only STB or for 1394 out

SAT-HD100 \$799, discontinued

SAT-HD200 \$800 (also priced as \$900), TTM Sep 02

DVI/HDCP, NO 1394, cable, ATSC, DirecTV, component, when a format other than 480i is selected the component/s-video signals are not out at same time (limiting regular VCR and home networking capabilities if viewing is desired on 480p and above formats), no caller ID, IR only remote, RS -232 control (announced but owners reported that is not actually in the unit), variable out formats on front panel (let 720 out/everything else convert to 1080i, etc) also on the remote, includes DVI cable, owners claim as better unit on stretch modes

CSV-E77 (Cocoon), \$1,100 in Japan, 160 GB (possible exp to 320 GB), 15 hrs HD, 100 hrs SD, connection to always-on broadband Internet connection, TTM Nov 1 in Japan (not yet ready for the US).

Toshiba

DST-3000 \$700 (also priced as \$800 w/o a dish), discontinued, NO DVI, NO 1394, 480i, 1080i

DST-3100 \$700 (quoted as low as \$600 street \$ when out), TTM March 03, DVI/HDCP, NO 1394, DirecTV, ATSC, output select 480i/p, 720p, 1080i, plus hybrid automatic conversion to 480p or 1080i, simultaneous HD component out w/s-video, optical Dolby Digital out, IR/RF remote, component, multi satellite inputs (2), advanced program guide

Zenith

DTV-1080 \$800, discontinued

HD-SAT520 (Innovations), \$700, TTM October 02, 4th generation VSB, ATSC & DirecTV, DVI/HDCP, VGA RGB out, Hi-Res component out, optical digital audio output for DD, output format selectable via remote including 720p, native pass-thru modes, VGA not simultaneous to component signal out (switch in back), component out signal not simultaneous to A/V output, simultaneous signal to DVI not specified, calibration port, advanced program guide

HDV420 \$400, TTM October 02, ATSC OTA only, NO DVI, NO 1394, Hi-rez component out, RGB out, calibration port, optical/coaxial digital audio out. There are no plans for future support for 1394.

Zenith (cont.)

New models

No 1394 on any of the models

HD-SAT530 \$700, TTM Sep 03, 3rd generation STB, ATSC/DirecTV, Native, simultaneous HD and 480i outputs, DVI/HDCP, aligned to replace the HD-SAT520 model

HPD-220 \$N/A, TTM N/A, ATSC tuner and controller for Plasmas, simultaneous HD and 480i outputs, RGBHV, 2 component, DVI, selectable 1080i, 720p, 480p

HDR230 \$1,000, TTM 2Q03, ATSC, PVR 80 GB, 8 hrs HD recording, electronic program guide, DD recording, VBR, live pause, RGB, component, DVI not specified (NO is assumed, although it could not be verified properly)

HD-PVR330 \$TBA, TTM 3Q03, ATSC, PVR 80GB, 8 hrs HD recording, DD recording, DVI/HDCP, RGB, component

HDX330 \$600, TTM 4Q03, ATSC, DVD player, 3:2 pull-down, 5.1 DD audio, simultaneous HD and SD outputs, DVI/HDCP, RGB, component

HDV430 \$400, TTM 3Q03, ATSC and QAM cable tuners, simultaneous HD and SD outputs, 5.1 DD audio, selectable 1080i, 720p, 480p, 480i and native output resolutions, DVI/HDCP, RGB, component

HD DVD Players/Recorders

Three Competing Technologies on Two Laser Formats

Red laser format

Conforms to DVD Forum standardization, pre-recorded playback-only format

1) Warner Bros/Warner Home Video's HD-DVD-9 (now used for DVD) with MPEG-4 compression (H.264) for 135 minutes of HD data, bit rate of 5 to 7 Mbps, 8.5 GB capacity DVD disc, the company proposes that future players will accommodate for both blue and red laser readability for backward compatibility.

Philips developed backward compatibility for the HD-DVD-9 disc to be SD output from existing DVD players, the disk includes two video streams: a) SD video with MPEG-2, and b) a 'difference' stream encoded as MPEG-4 and carrying the difference between the original HD picture signal and the base SD signal.

The video streams are interleaved on the disc in a way that enables existing DVD players to read the base stream. Newer hardware with MPEG-4/10 decoding would use the two streams to reconstruct the HD signal

Blue laser formats

Recordable, playback pre-recorded, and computer data storage format

2) Blue-ray

Separate system that will not seek/need DVD forum approval.

Proponents Hitachi, LG, Matsushita, Pioneer, Philips, Samsung, Sharp, Sony, Thompson, and Toshiba.

The basic specifications were established in February 2002, complete specifications for licensing slated for release in 2003, out of the DVD forum (format to be handled separately by the individual companies), it requires an entirely new manufacturing process for pressing DVDs.

The format is not backward compatible with current recordable DVDs (for recording or playing, dyes used for DVD blanks are optimized for the reflectivity of red lasers), technically possible to use blue laser to read prerecorded DVD-videos (future recorders will probably incorporate DVD-video functionality under license for playback of legacy discs).

It uses MPEG-2 compression, 0.1 mm optical transmittance protection layer above the 1.1 mm substrate, 0.85 numerical aperture lens, DVD -R/RW & +R/RW type of land and groove track structure. Specs: 27 GB data on single side (54 GB w/dual layer), 2.5 hrs HD (15 Mbps), 13 hrs SD (3.8 Mbps, VHS quality), supports up to 36 Mbps data-transfer rate, encased in a protective caddy (which eventually would be eliminated),

HD DVD Players / Recorders (cont.)

3) Blue laser by Toshiba and NEC

Advanced Optical Disc format proposed to the DVD Forum, and it was just approved.

The use of MPEG-2 is not decided yet (could be MPEG-4 eventually), 36 Mbps data-transfer rate (same as Blue-Ray), short wavelength optical 405 nanometer blue laser, single-sided, dual-layer, playback of 15-30 GB pre-recorded HD-DVD discs.

Recording capacity of the 20GB to 40GB disc is planned for 2-3 hrs of HDTV quality signal on a single-sided dual-layer. It could be expanded to 4hrs with more advanced compression technology. Records 13 hrs + of SD programming, compatible with existing red-laser DVD manufacturing authorizing capacity, not compatible with Blue-ray system.

The blue laser lens numerical aperture is 0.65 (close to 0.60 used for DVD video), 1.2 mm-thick disc made by back-to-back bonding of two 0.6 mm discs, DVD-RAM type of land and groove structure, disc does not need protective caddy, playback compatibility with current pre-recorded discs via red laser on same pickup, inclusion of infrared laser for CD format playback not yet determined.

Some companies that have shown their HD-DVD equipment at CES

Sony

Demo Blue-Ray prototype, DVI, 1394 has not been agreed yet (is up to the alliance to agreed such feature, an it has not been decided yet), TTM in 2-3 years (1 year in Japan), estimated MSRP \$3,000.

Samsung

Demo BD-1000 Blue-Ray prototype (BD technology), estimated as \$2,000 when available, TTM in 1-2 years, 19 Mbps rate speed, 25 GB disk, ATSC tuner, component out, uses MPEG-2 compression algorithm, 3hrs in HD (5hrs in dual layer), 13 on SD (26 hrs in dual layer) on BD-RE rewritable disk, BD-ROM playback of 25GB disk (50 GB dual layer), NO DVI, NO 1394, nor analog component video input connections were in prototype unit (possible in the future).

Panasonic

Demo Blue-Ray prototype, component in/out, maybe 1394 and/or DVI when released, 5hr HD at 50GB, the company is working this year for a release of the product soon.

JVC, Zenith

Blue-Ray prototypes shown

Toshiba

Showed two prototypes (plans are for development during 2003, TTM N/A):

a) Red laser Player only, with MPEG-4-AVC, at 7.5 Mbps for HD (50% reduction vs. MPEG-2), 135 minutes of playback time, 8.5 GB capacity using HD-DVD9 format.

Toshiba (cont.)

b) Blue laser Recorder, with MPEG-2 now (possibly commercialized as MPEG-4 later), 4-6 hr HD on single layer, 15 GB play on single layer (20 GB recording), 30GB play in dual layer (40GB recording), 36 Mbps maximum data-rate, AOD format (Advanced Optical Disk recorder)

According to Toshiba, the MPEG-4 algorithm uses motion estimation and small blocks to obtain 50 % reduction compared to MPEG-2.

General Review and Comments

The issues regarding multiple formats and the copy-protection delays on implementation of this technology speak for themselves. No one wants to see multiple formats competing with each other, like with DVD recording, and DVD-Audio/Super-Audio.

Some industry analysts conjecture that D-VHS with D-Theater, recently introduced, is the transition bridge to this HD-DVD technology; others speculate that even within the HD-DVD technology there might be a need for a temporary and immediate implementation of the "play-only" red laser format.

The HD-DVD blue laser technology has been demonstrated for its third year at CES, still as prototypes and mockups, but now from a wider variety of manufacturers. This year there was some progress; a proposal of the HD-DVD system standard was submitted, and several industry meetings (with Hollywood) were held. There are also some designs developed that claimed to have backward compatibility, so HD-DVDs could be played back downgraded on regular DVD players.

However, unresolved copy protection issues and format wars might further delay the introduction of this technology. We hope that one day soon we would actually see final products using a single standard format. The implementation of this technology would certainly accelerate the public interest on HDTV monitors.

HD D-VHS Recorders

There are only two current D-VHS VCRs in the market and they both can tape HD from their 1394 input connections only. There is a third D-VHS from Panasonic that was discontinued a couple of years ago after its short introduction, that unit also uses a 1394 proprietary connection for recording.

Some HD-STBs are starting to come out with 1394 connections to be able to record from those; that subject has been addressed on the STB section.

Regarding recording from TV integrated tuners. At least three manufacturers of new integrated HDTVs have 1394 inputs (Hitachi, RCA and Mitsubishi on their top of the line integrated models), of those only the Hitachi and Mitsubishi TVs have 1394 outputs, which would facilitate external HD recording. The HDTV section would highlight which other TVs would have 1394 connections in the near future.

JVC implemented D-Theater as a copy-protected D-VHS format that several Hollywood studios have adopted for prerecorded HD movies, some already in the market. Those D-Theater studios are: 20th Century Fox, Universal, DreamWorks SKG, and Artisan. HD-Net has also produced some HD tapes; the owner of HDNet declared that his tapes would not be copy-protected. The Mitsubishi HD-VCR is not D-Theater compliant and cannot play D-Theater copy-protected prerecorded movies.

Another important difference between the two VCRs is that the JVC unit has analog component outputs to playback HD-VHS tapes on HDTVs with analog inputs. The Mitsubishi VCR does not have analog outputs, it can send out HD video only by using the 1394 connection, thus limiting its compatibility to only HDTVs that have such inputs, relatively very few at this time.

Neither of the two manufacturers have DVI outputs on their VCRs, although the new JVC model (HM-HD40000) planned for June 2003 was rumored as that it "could eventually" have DVI and an ATSC tuner, therefore not needing an external HD-STB to tune OTA for recording (and the cost associated with it), although these features might not be included when the unit is actually released.

JVC

New model

HM-HD40000 \$<1,000, TTM June 2003, D-Theater compliant, component out, auto HD/STD mode for easy recording, new LS5 mode for up to 35 hrs recording at about 480i digital quality (better than SP on VHS), 1394, possibly including an ATSC tuner when released, cards, NO DVI yet, 4hr recording.

Current model

HM-DH30000 \$1,300, (as low as \$700 street\$)

(Specs from CES January 2002 below)

DH30000U VCR, \$2000 MSRP, \$1300 street price, available now, NTSC tuner (but no ATSC tuner for DTV). 1394 in/out, component out (converts recorded MPEG-2 to Y/Pb/Pr analog component) to allow connection to most HDTVs, DVi input (iLink) for digital camera (DV to MPEG-2 conversion recording). Using the DF-480 cassette (50 GB), it records HD (720p or 1080i) up to 4hrs at 28.2 Mbps, SD (480p/i DTV) 8hrs at 14.1 Mbps, LP 24hrs at 4.7 Mbps.

JVC (cont.)

The internal MPEG2 CODEC can convert and encode 480i analog NTSC signals to digital and store them as digital 480i MPEG-2 (on any of the 3 speeds), and play them back as 480i decoded. For backward compatibility, it supports record/playback of VHS, S-VHS and VHS-ET. Audio optical out as DD 5.1ch or PCM 2ch (no dig-coax). It converts the 1080i recorded format to play as 1080i/480i, the 720p recorded format to play as 1080i/720p/480i, the 480p recorded format to play as 480p/i, and the 480i to play as 480i.

JVC developed the D-Theater content protection system and implemented it in this VCR (in addition to 5c of 1394) for the secure playback of prerecorded HD tapes.

Mitsubishi

TTM current, 2 IEEE 1394/DTCP inputs/outputs, also records in regular VHS, records HD signals tuned by external receivers, OTA or satellite, via 1394 inputs

HS-HD2000U \$1,050 (now down to \$599 street \$), S-VHS capabilities, recently reported as to not having repeating recording feature via 1394 w/Mitsubishi HDTV)

HS-HD1100U \$750 (now down to \$499 street \$), similar to model 2000 but no S-VHS connectivity/capability

Specs of current model HD2000U as per CES January 2002 report follows:

Mitsubishi HS-HD2000U, available now, \$1000 MSRP. Has two 1394 connections, each bi-directional. No component in/out. One S-video in, two out. RF antenna in for NTSC (and out), L/R analog audio in/outs.

The only CES demo of this unit was at the VividLogic booth, the software developer for the Mitsubishi FireBus (Mitsubishi did not have a booth at CES). There were two D-VHS VCRs, two 40GB Audio/Video Maxtor HDDs with 1394 in/out (and a power supply for the HDDs), and other components to show the HAVi network features controlled from the HDTV screen. All components were connected daisy chain via 1394 with the HDTV, the wiring on the back of the units looked neat.

The HDTV used at the demo was a new model with an integrated 8VSB OTA HD tuner. The way the systems works is: the 8VSB tuner of the HDTV tunes to a HD channel, the signal is sent out to the D-VHS VCR via 1394 for recording, later the tape is played back by the D-HVS VCR and its signal is sent back to the HDTV via the same 1394 connector, the HDTV decodes the incoming signal via its MPEG-2 decoder, and process it for display. They need each other to complete the loop.

Older Mitsubishi HD sets are offered an upgrade by the manufacturer called the "promise module" (which includes 1394 inputs, an 8VSB tuner and the MPEG-2 decoder). Mitsubishi offers this upgrade for \$1000 via a service call. Upgraded sets, in theory, would have similar capabilities than the new ones described above. The upgrade would be available later this year.

Sharp, Toshiba

No HD-D-VHS recorders in the plans

Digital Connectivity (DVI, 1394, HDMI)

DVI

The DVI (Digital Visual Interface) 1.0 specification was introduced in April 1999 by the Digital Display Working Group integrated by Silicon Image, Intel, Compaq, Fujitsu, Hewlett-Packard, IBM and NEC for the purpose of creating a digital connection interface between a PC and a display device. It is a connection with enough bandwidth for uncompressed HD signals.

The 1.0 DVI specification is a point-to-point solution that supports video content but not audio. DVI uses the Transition-Minimized Differential Signaling (TMDS) protocol developed by Silicon Image. PanelLink is the Silicon Image's proprietary implementation of TMDS.

The HDCP (High-bandwidth Digital Content Protection) 1.0 specification was developed by Intel with contributions from Silicon Image in February 2000 to protect DVI outputs from being copied by providing a secure link between a video source and a display device.

HDCP offers authentication, encryption, and renewability. The Motion Pictures Association (MPA) endorsed HDCP as the standard for the secure transmission of HD signals over DVI.

A good number of new DTV monitors and integrated displays have incorporated DVI inputs, although some panels are not HDCP compliant.

According to Noel Lee (Monster Cable), owners of HDTVs with no DVI connections would have available a "Legacy box" converter, but the resolution would be limited to 480i as it converts from DVI to analog. However, connecting a DVI-D source/plug to a VGA analog input monitor requires a digital to analog converting adapter, which currently cost around \$400.

The DVI standard is able to handle single or dual link connections. A single-link connection supports up to UXGA resolution of 1600 x 1200 at 60 Hz. Dual-link connections provide bandwidth for resolutions beyond QXGA (2048 x 1536).

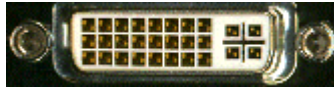
Each link has three data channels for RGB information with a maximum bandwidth of 165 MHz, which is equal to 165 million pixels per second. Dual-link connections have the double of that capacity.

Single link has a speed-rate capacity up to 4.9 Gbps, double link 9.9 Gbps.

DVI identifies and auto-configures the connected device. If source equipment is connected with DVI single link to a display configured as double link DVI, the image will experience a lower resolution. Some first generation single link DVI cables use double link connectors. DVI standard cables have typically a five-meter distance limitation, although with better quality wiring, such as fiber-optic, higher distances are possible.

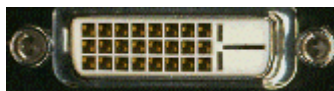
There are three types of DVI connectors:

DVI-I (integrated), carries a single or double-link digital signal, with an additional analog signal for legacy devices. The 29-pin DVI connector uses 24 pins for the digital datastream (12 for each link) and 5 pins (1 plus -shaped blade and 4 pins) to carry analog audio/video signals and ground.



DVI-I

DVI-D (digital) carries digital-only video data to a display. It is designed for 12 or 24 pin connections, and single/double link operation (notice the lack of 4 pins, 2 above/2 below the flat blade).



DVI-D

DVI-A (analog) will be available for legacy analog applications to carry analog signals to a CRT monitor or an analog HDTV (claims to be better than VGA). The three rows of eight pins have three pins missing in the first row, five missing in the second row and four missing in the third row, and that the "flat blade" contact seen to the left has two contacts above and below it. There is no single or dual link in analog cables.



DVI-A

Regarding connecting plugs to receptacles:

A DVI-D plug can be connected to either DVI-D or DVI-I receptacles,

A DVI-A plug can be connected to either DVI-I or VGA receptacles,

A DVI-A receptacle would accept DVI-I but not DVI-D.

A DVI-I plug can be connected to either DVI-I or DVI-A receptacles (the 'A' ignores 'I's digital pins)

1394

1394 is the short for IEEE1394, is a digital interface conceived by Apple Computer in 1986, and it was called "FireWire" for its fast speed of operation. In 1995, the Institute of Electrical and Electronic Engineers (IEEE) adopted the serial bus as its standard 1394. Sony trademarked their name iLink for their implementation of the 1394 bus as a 4-pin connector.

In March 2000 an updated specification was approved, the 1394a. The "a" standard supports speeds of 100Mbps, 200Mbps and 400Mbps over a distance of 4.5 meters, and up to 63 peer-to-peer nodes/devices.

1394 (cont.)

In 2001, the IEEE 1394 "b" standard emerged as a network technology (rather than as serial bus); it is capable of moving data streams at faster speeds over longer distances than the original.

The "b" standard can support up to 3,200 Mbps depending on the cable material, and supports cabling materials not supported by the "a" standard. It supports speeds up to 100Mbps over 100 meters of Category 5 wiring, 400 Mbps over 100 meters of plastic optical fiber, and up to 3,200 Mbps (or 3.2 Gbps) over 100 meters of glass optical fiber.

The "b" standard is compatible with the "a" standard; if an "a" device were plugged into a "b" component, the bus would deliver a maximum speed limited by the "a" standard (400Mbps). Each "b" device can be set up to 100 meters apart from the next in sequence, allowing the total network to be quite significant in cable length.

The licensing fee for the use of the patented technology is \$ 0.25 per system; chipsets are less than \$5 each in volume.

It supports hot swapping and plug-and-play, so a consumer's 1394 bus can recognize automatically a 1394 device when it is connected/disconnected, and reconfigure itself.

The connection is now being used by a growing number of DTV equipment manufacturers for the transmission of compressed HD signals, such as D-VHS recording and networking DTV equipment.

There are three types of cables used for 1394. The 6-conductor type has two separately shielded twisted pairs for data and two power wires in an overall shielded cable with 6-pin connectors on either side. The 4-wire cable uses two separately shielded data cables without power wires in an overall shielded cable with 4-pin connectors on either end. The third type of cable uses either type of actual cable, with a 6-pin connector on one side, and a 4-pin connector on the other side of the cable.

The 4-pin connector is more common on digital video camcorders and other small external devices because of it's small size, while the 6-pin connector is more common on PC's, external hard drives due to it's durability and support for external power for 1394 peripherals.



6-pin female connector on left.
4-pin female connector on the right



The 6-pin male
connector



4-pin male
connector

HD signals are broadcast in compressed MPEG-2 format at approximately 19 Mbps. D-VHS VCRs are able record compressed HD signals and require a 1394 connection to receive the digital data stream. HDTV monitors require a MPEG-2 decoder to decompress the signal for display, as oppose to DVI that is uncompressed.

1394 (cont.)

DTCP (Digital Transmission Content Protection) has been created for the purpose of copy protection over the 1394 connection. DTCP is also being known as 5c for the five companies that participated on the standard (Sony, Toshiba, Intel, Hitachi, and Matsushita).

During the last two to three years, there have been many discussions (and hype) about using these types of digital connections (DVI and 1394) for DTV equipment, rather than only the analog connections (component YpbPr, RGB, RGBHV, etc), for protecting HD digital content.

During 2003, many manufacturers are planned to release a variety of products adopting these two connections to enable their equipment for digital connectivity.

However, just when we seemed to have seen it all about digital connections, along comes HDMI in the horizon.

HDMI

On December 9, 2002, the seven founders of HDMI (High Definition Multimedia Interface) announced the 1.0 specification of this connectivity standard, the enhanced, more robust form of DVI.

The seven founders are Hitachi, Matsushita, Philips, Silicon Image, Sony, Thompson, and Toshiba.

The standard supports HD uncompressed video, 8-channel digital audio (reportedly up to 192 KHz), and some control signals on a single wire (15 mm, 19 pin), and still have some bandwidth available.

HDMI has capacity for up 5 Gbps of bandwidth; double of what a HD signal would require.

HDMI is claimed to be backward compatible with DVI by using an adapter.

Not included in the standard but used with HDMI is the HDCP (High-bandwidth Digital Content Protection) protocol. HDCP is licensed by Intel, designed to protect HDMI and DVI signals from piracy, and used for authentication between A/V products.

It is expected that after the specifications are issued manufacturers would be in a position to incorporate HDMI silicon chips in their next-generation of DTV products (possibly by the end of 2003, or 2004).

A license fee of five cents is applied to each product (four cents for HDMI, 1 cent for HDCP), that the manufacturer is to pay to the HDMI founders and Intel.

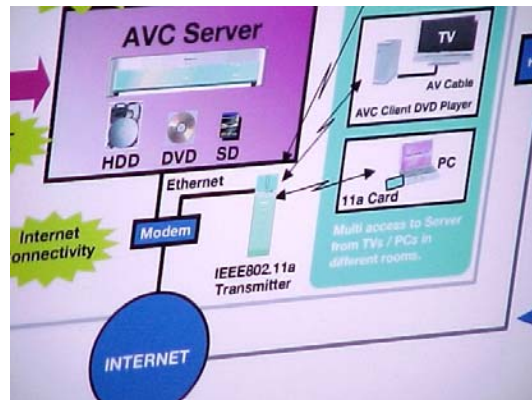
HD Networking (Wired and Wireless)

JVC

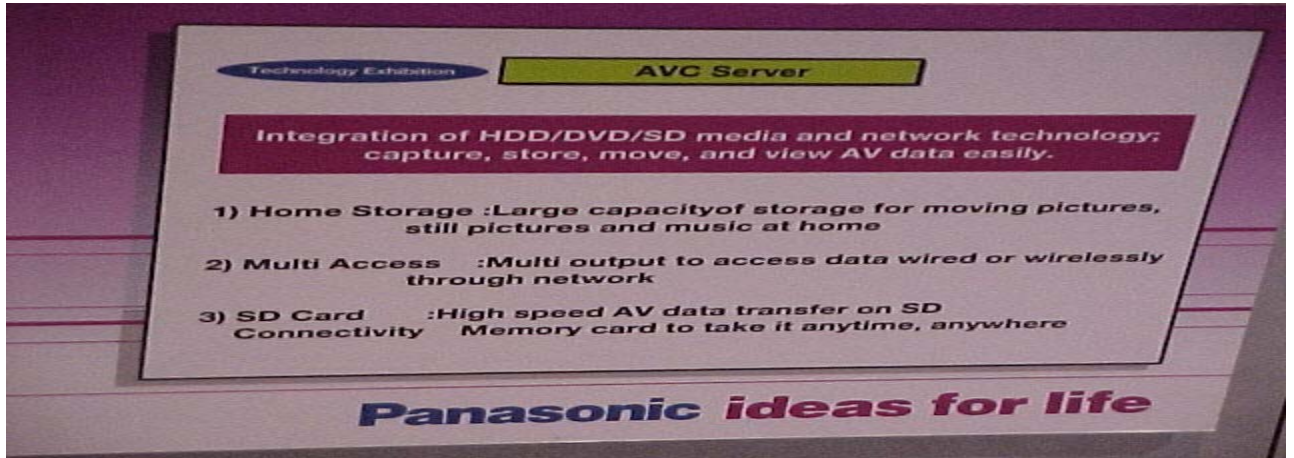
The company showed a mockup of the MediaBank networking server that is expected to distribute video over 802.11b network using MPEG-4 compression. The company showed an optical wireless HDTV image transmission system, \$N/A, TTM N/A, 1.25 Gbps for uncompressed images in HD, it uses laser diodes and high-sensitivity avalanche photodiodes, 10 meters distance for wireless home-theater, automatic adjustment between transmitter and receiver, and eye-safe technology.

Panasonic

The company showed a wireless HD media network prototype based on 802.11a to transmit several simultaneous DTV signals at high-speed high-quality 54Mbps bandwidth using a 5GHz channel (1 HD channel at 24 Mbps or 3 SD channels at 24 Mbps). The system enables remote control AV equipment from another room, simultaneous video transmission, and high-speed Internet connection.



Panasonic (cont).



Sharp

The company has plans to introduce Mobile Aquos and Broadband Aquos. The technology would allow a DVD player to transmit on the 5.2 GHz band images to any TV in a house; it also has a Smart Link wireless technology for 2.1 channels TV speaker system. However, this technology is not HD.

Texas Instruments

The company announced their 1394a/b bilingual chips that will transport digital audio and video from 1394a devices over a home-wide 1394b backbone. The short-range 1394a standard is intended to replace multiple cables between A/V components in a cluster. Mass production will start 1Q03. The hybrid chips will appear in 2003 in commercially available wall plates and deck-card-size hubs. Individual 1394a components in an A/V cluster could then be plugged into the 1394a/b wall plate or a/b hub for connection to the 1394b backbone, as expressed by the TI representative. The backbone would be capable of streaming multiple HDTV streams simultaneously.

XtremeSpectrum

The company showed its HDTV capability, introduced in June 02, as the only, claimed by the company, wireless technology that can handle multiple streams of MPEG-2 video, and multiple HDTV streams, with the same performance as a wired system. The system uses ultra-wideband Trinity chipset, and has an aggregated data-rate of 100 Mbps.



Washington D.C. OTA DTV Channels available

Channel, Network

48-2 NBC WRC
39-1,2 ABC WJLA
36-2 Fox WTTG
34-1 CBS WUSA
27-1,2,3,4 WETA PBS
42-3 WJN

Affiliates received from Baltimore

38-1 CBS
46-1 Fox
52-1,2 & 4 ABC
59-1 NBC WBAL

51 WB WBDC "expected" by Jan 1, 2003

Washington D.C. OTA DTV broadcasting programming

ABC

According to Jim
Alias
8 Simple Rules (4x3 w/side black bars)
Less Than Perfect
Life With Bonnie
My Wife and Kids
NYPD Blue (4x3 w/side bars from 39-1, 16x9 version on 52-2 from Baltimore)
The Drew Carey Show
The George Lopez Show
The Practice
Wonderful World of Disney

CBS

The Agency
Becker
CSI: Crime Scene Investigation
CSI: Miami
The District
Everybody Loves Raymond
The Guardian

CBS (cont.)

Hack

JAG

Judging Amy

The King of Queens

Presidio Med

Robbery Homicide Division

Still Standing

Touched by an Angel

Without a Trace

Yes, Dear

The Young and the Restless

NBC

American Dreams

Boomtown (4x3 letterboxed w 4 black bars)

Crossing Jordan (4x3 w/side bars)

Ed

ER

Frasier

Hidden Hills

Law & Order (4x3 w/side bars)

The Tonight Show with Jay Leno

Fox

All prime time in 16:9 480p DTV, no HD

WB (expected soon, perhaps by January 2003)

Everwood

Family Affair

Reba

Smallville

Analysis and Review of DVD Recorders

As with CES 2002, delays of the introduction of HD-DVD recorders could very likely motivate consumers to purchase regular DVD recorders to record DTV signals in that media, although by doing that the HD signal is down-graded to standard definition digital TV.

As described on their corresponding sections, the other two digital media recording technologies are D-VHS tape and HD-DVD (this last one not available to the consumer yet). The DVD recording technology does not compete with the level of video quality of these two but it is a temporary alternative, and is at a level of quality between S-VHS analog video and HD.

Both formats, D-VHS and DVD, have wide-screen presentation; D-VHS excels in the recordability of quality HD pictures, DVD excels in sound quality, scene access, special features, navigation, storage format, and price.

Many buyers of HDTV sets are purchasing digital displays to play wide-screen DVDs at the higher resolution of 480p. By using digital TVs viewers have the option of a) line-double 480i DVD movies by the digital TV sets to obtain 480p, or b) feed a 480p signal from a progressive DVD player (or external scaler) and let the display show 480p bypassing its internal line-doubler. Many DVD recorders are now providing a progressive output (some did not last year, like Panasonic DMR-20).

Compared to last year, DVD recorders have come down in price as expected, and new improved models have been released, now with PVRs.

HD satellite subscribers are currently unable to record with D-VHS VCRs (except for some modified versions of STBs). For those, the DVD media recording is an option to consider other than PVR.

The DVD recording market has four formats:

R, -RW, +RW, RAM, the last three are re-writable and competing with each other.

The R format is claimed to be playable on most DVD players. The DVD industry recommends this format to exchange and archive video, such as family videos.

Panasonic showed new models at CES but they still do not have included component inputs, as last year's model. The component output is now progressive, a 40 GD PVR has been included in one model, the units still use the rewritable RAM format, which is seen by many as a limitation regarding the playability of its disks on other DVD players, although it claims to offer better functionality due to the format. DVi is included this year but only in the higher-end model.

Pioneer's current model (DVR-7000) is now at the more competitive \$1000 price range (from originally \$2,000), except that this is now an old unit competing with improved models from other manufacturers, and those improved models have internal HDD PVRs and component video in, features that are missing on this unit. Consumers interested on PVR might not be attractive to this unit even at the new price and even having the "Elite" good quality de-interlacing, video controls, and functionality.

Analysis and Review of DVD Recorders (cont.)

Pioneer is planning to release two new models in the summer of 2003 (DVR-001 and DVR-002H). The model 002H has an 80 GB PVR, progressive component out, and DVi input for video cameras, it does not have component video inputs (as well as the current model), it is expected to sell for \$800 MSRP.

Philips, this year again, is putting together in one unit the features that are missing on the other manufacturers. Two new top-of-the-line units use the Faroudja DCDi 2300-upgraded chip for de-interlacing which brings with it the quality of Faroudja's reputation.

The new top of the line due on April 2003 (DVDR90 for \$1,000 MSRP), has now capabilities of upconverting to 1080i "using the analog component output connection" (although this claim by Philips could not be verified), is able to record in DD 5.1, and ports an "HDMI output". It has analog component input and DVi connection for digital video cameras (as the model 985).

The current model 985 is to be replaced in April 2003 by the DVDR75 (\$700 MSRP), a 6 hr recording mode unit. Philips is also releasing another two DVD recorder units on April 2003, both for \$800.

The new Toshiba RD-X2 DVD recorder was introduced as a prototype in CES 2002 on January as model # RS-2000 with 40GB of PVR. The unit was actually released for the consumer in late 2002 with 80 GB PVR.

It uses the RAM format, does not have DVi for video cameras, does not have component in, but the component out is progressive (although it does not have a 3:2 pulldown for film material, which is a common feature on most equipment).

However, for \$1500 MSRP even having the included HDD PVR is not as attractive as the Philips or Panasonic units, although if PVR is a must-to-have feature, Philips is disqualified.

If comprehensive editing (such as linear/non linear editing capabilities, and dubbing) is required, the buyer should carefully check those capabilities; there are units better suited than others.

In addition, other companies such as Apex, Thompson, Sharp, Zenith and Samsung are beginning to introduce later in 2003 new units at interesting low prices, down to \$500 MSRP. Pioneer has one to be released by summer for that price as well (DVR-001). However, some of these units are PVRs with DVD players, no DVD recorders.

Sony announced the release of a very interesting DVD recorder (RDR-GX7) by June 2003. The unit records in the -RW and the +RW standards (both). This feature broadens its compatibility of recorded DVDs to be playable by most DVD players. It is not a PVR at this release, but there are plans. This is the only unit in the market that covers both RW formats.

This general review does not cover performance issues. It is recommended to verify video performance lab tests before concluding that a given unit is better or is suitable to your purposes.

DVD Recorders

Apex Digital

New model # N/A \$499, TTM 2Q03, +RW

Panasonic

DMR-E30 \$700, (S: silver, K: black) (\$500 street), TTM current
3rd generation, -R/-RAM, one progressive component out (also I), NO component in, VBR (Variable Bit Recording) 60-360 minutes on 4.7 GB disc at 1.7 - 10 Mbps rate, records Dolby Digital as stereo, XP 1hr, other speeds lower than LD quality, 540 lines of resolution, no 1394, NO DVi input, timeslip function to view while continuing recording, simultaneous playback on disc, digital output only optical, picture quality improvement functions, video D/A converter 54MHz/10-bit.

DMR-HS2 \$1,000, TTM Sep 02

40 GB HDD (52 hrs EP, 8hrs XP, -RAM/-R, one progressive component out (also i), NO component in, front panel PC card slot (memory stick, etc), no 1394, DVi input, VBR recording 60-360 minutes on 4.7 GB disc at 1.7 - 10 Mbps rate, XP 1hr (10Mbps) and SP (5 Mbps) 2hrs (both 540 lines resolution), LP 4hrs at 240 lines, EP 6hrs (recent lab test reported that seems like every other video field is dropped), double hrs on all speeds using 9.4GB discs

No chapters on -R, no audio editing/mixing, records Dolby Digital as stereo, digital output only optical, picture quality improvement functions, video D/A converter 54MHz/10-bit, time-slip function to view while continuing recording, simultaneous playback on disc, copy from HDD to disc will erase HDD on material protected as single-generation only



DMR-E20 (now available for \$600)

At CES 2002 the now old DMR-E20 was highlighted as follows:

Panasonic DMR-E20, R & RAM, available now, \$1000 MSRP, street price of \$800, RAM format limited to few players, non-progressive component out (but non-progressive 480i), two sets of S-video/composite/L/R audio in/out on the back panel, NTSC RF antenna in/out, front panel set of S-video/composite/L&R as the only input for digital cameras (no DVi/iLink digital input, just analog), Phillips claimed this Panasonic unit is slow in finalizing the disk (2/3minutes) to make it playable on other players. The recording speeds/times with 4.7 GB RAM or R DVDs are: XP 1hr, SP 2hr, LP 4hr, EP 6hr, automatic variable bit rate, double the time with 9.4 GB RAM discs. Dolby digital 2ch recording, optical (no coax) digital audio output.

Panasonic (cont.)

New Models for 2003:

DMR-E50 \$599 (also priced as \$499), TTM Feb-Mar 03, replaces the E30 above, NO iLink, 12 hrs recording on DVD-RAM, Quick View x 1.3, MP3 playback, progressive scan output, time slip instant recording (for viewing a scene 30 seconds after it was recorded without disrupting the recording process), chasing playback.



Panasonic unveils its new aggressively priced DVD-RAM/DVD-R recording deck, model DMR-E50

Panasonic plans to release another new model to replace the DMR-HS2 with 80 GB HDD, \$N/A, TTM summer 03.

Philips

DVDR985 \$800 (\$700 street \$), TTM current, R & +RW, no need for finalization, VBR used for +R & +RW, recent lab tests reported the lack of user control for image and good edits, 2 component out (one i & one p), one component in, DVi in

At CES 2002 the unit specifications were mentioned as follows:

Phillips DVDR985, R & +RW, \$1000, TTM March 2002, up to 4hrs recording, +RW claimed to be playable on most DVD players, plays DVD and audio CD R/RW, DVi (iLink) for video camera digital input, one component input, two out (480p and 480i), variable bit rate, no need to finalize DVD, edits/index.

The unit uses the Faroudja DCDi de-interlacing chip. Recording types are: HQ (1hr, 9.72 Mbps) SP (2hr, 5.07 Mbps) at 720 horizontal pixels, and LP (3 hr, 3.38Mbps) EP (4hr, 2.54 Mbps) at 360 horizontal pixels.

Phillips has other two Hi-end units currently available DVDR-1000 (silver) for \$2000, street price at \$1500, and DVDR-1500 (black) for \$3000, which includes a Pronto remote. Phillips claims that this 985 new unit uses the same internals of the Hi-end units above, although the front cabinet finish is low quality.

New models

TTM April 03, +RW/+R, iLink

DVDR75 \$700, replaces the DVDR985 model, 6 hr recording mode (rather than just 4 hrs), component in

DVDR77 \$800, with PCMCIA card slot, media card

DVDR80 \$800, DCDi 2300 version, TV Guide from Gemstar

DVDR90 \$1,000, 5.1 DD recording, NO PVR, PCMCIA slot, HDMI, component in, DVi iLink, DCDi 2300 version, 480 upgraded to 1080i on component out (although this feature was not able to be properly verified if it actually send the 1080i via analog component, but rather HDMI only)

Pioneer

DVR-7000 \$2000 MSRP (TTM current, now reduced to \$1,000 on street)

The specs reported in the CES 2002 report are: R & -RW (and playback CD-R, CD-RW), DVi (iLink) input for cameras), 2 hrs standard DVD recording mode, 1-6 hrs (manual recording mode), NTSC tuner, 96k/24-bit audio D/A converter, Pure Cinema progressive scan component output (with 3:2 inverse telecine for film conversion), 3 S-Video & composite inputs (no component input), 2 S-video outputs, coax & optical (Toslink) audio digital outputs.

Most of the editing features are unavailable in the recording mode that allows a disc to be used in normal players.

New models

NO component in, Pure Cinema I, VBR, 6 hrs recording, component out, DD/DTS digital audio out

DVR-001 \$625 (estimated \$500 street), TTM summer (before the 002H)

DVR-002H \$999 (estimated \$800 street), TTM July 03, PVR with 80 GB, no service fee

Samsung

DVD-R3000 \$1,000, progressive output, no iLink (this data was not able to be verified properly)

DVD-R4000 \$N/A, TTM N/A

RAM/-R/RW playback, RAM/-R recording, progressive component out, NTSC antenna in, 12 Hrs on RVR-RAM (9.4 GB)

Sharp

DV-RW2U \$799, 2nd generation, TTM Feb 03

NTSC tuner, -R/RW, MP3 decoder, component progressive out, NO component in, non-linear editing, DVi input for video cameras, optical digital audio out, VCR Plus.

Sony

RDR-GX7 \$1,000 (estimated), TTM June 2003

Can record on both +RW & -R/RW, can playback +R also, linear and non-linear editing with editing software, progressive component out, detects film mode at pixel level not at flag, 108MHz video DAC at 12 bit, DVi iLink input for video cameras, NO HDD PVR at this release (in the plans), 1 hr HQ/6hrs LQ, or manual 90 minutes recording in HSP, 120 in SP, 180 in LP, 240 in EP 360 in LQ, NO component in, records in 480p (upconverts input 480i signals), NTSC and cable tuner.

Sony also announced at the CES show the Cocoon DVD recorder with HDD and network functionality but the unit is not yet for the US market (just Japan at this time).

Thompson

(Innovations) data on this group could not be properly verified

DRS7000N \$600, TTM September 02, DVD player

40GB HDD 30 hrs recording time, progressive component out (switchable), no subscription service on Gemstar GuidePlus+, optical and coaxial digital audio outs, USB (MP3s, etc), headphone jack

DRC8000N \$600, TTM June 03, +RW/+R DVD recorder, Gemstar GuidePlus+

DRC7005N \$N/A, TTM TBA, DVD player w/40GB PVR

LXR9000R \$1,200, TTM June 03, +RW/+R DVD recorder with Home Theater system, SACD, 6x75 watts amp

Toshiba

(Innovations)

RD-X2 \$1,300 (\$1,000 street), TTM fall 02

RAM/R and 80 GB HDD, audio recording formats PCM 1546kbs/DD1 192kbs/DD2 384kbs, progressive component out (no in), 104 hrs of lowest quality level recording on 80GB, dubbing at up to 8x from HDD to disc without deterioration of the MPEG-2 signal, optical/coaxial digital audio output, 500 lines resolution.

Variable bit recording, manual recording from 2.0Mbps to 9.2Mbps data rate, LP recording mode at 2.2 Mbps rate for 75 hrs on the HDD or 4h22min on the DVD, SP recording mode offers near-DVD quality at 4.6Mbps rate for 36 hrs on the HDD or 2 hrs on the DVD, NTSC antenna in/out, absence of 3:2 pull-down (digital cinema) is assumed due to the non-progressive connection (neither could not be confirmed).

Dolby Digital® 1 (192kbs), Dolby Digital® 2 (384kbs) and PCM (1546kbs), NO DVi (iLink 1394) for digital video cameras, VCR plus, no electronic program guide, disk library for up to 3000 titles, time slip, the demo at CES was very good.

In November 2002, Toshiba announced a licensing agreement with Tivo, which might cause a future implementation of Tivo on the RD-X2, perhaps as another upgraded model.

Yamaha

DRX-1 \$1,300, +R/RW, progressive scan out, DCDi, DVi 1394 for digital camcorders, TTM October

Zenith

DVR313 \$599, NO HDD, TTM summer 2003, NO VBR (also shown was another DVR314 tag that Zenith could not identify the existence of an actual unit)

XBH312 \$499, DVD player and HDD 40GB, NO DVI, TTM June 2003

Analysis and Preview of Super-Audio and DVD-Audio

Super-Audio

Sony introduced Super-Audio (SACD) in the fall of 1999. Warner Music launched DVD-Audio in early 2000 with a coalition of hardware manufacturers such as Toshiba, Panasonic, Pioneer, and Meridian.

Record labels wanted to prevent digital copying so the players would have only analog outputs; this means six cables for multichannel playback, which also requires a receiver/pre-pro with six pass-through inputs.

When Sony acquired Columbia records it decided that CD quality was not enough for archiving the musical heritage, and invented a digital storage medium of high density (1 bit resolution sampled at 2.83MHz) called Direct Stream Digital (DSD), later used as an archival format and recording medium for the next generation of SACDs.

The format was made able to record frequencies above 20KHz (the CD limit), which are inaudible but affect the audible range since they still modulate lower frequencies.

Dual-layer "hybrid" SACDs would contain the new format as well as the CD standard 16-bit/44.1 KHz "Red Book" (as published by Sony/Phillips) layer, which makes them backward compatible with CD & DVD players as well as on SACD players. The stereo tracks were a separate mix, not fold down from SACD multichannels.

Two-channel SACD was relatively well received by the audiophile community, a community that usually does not support surround, even though the eventual multichannel capability was made known, and finally got implemented.

There are approximately 1000 SACD discs released worldwide, half are distributed in the US, although most are readily available. About 67% of US titles are hybrid (2 channel and multi-channel), 40% are multi-channel, and 27% are both hybrid and multi-channel. The majority of SACD discs are reissues of 2-channel analog recordings.

DVD-Audio

A typical CD is PCM encoded into 16-bit words at a sampling rate of 44,100 per second. DVD-Audio can use a variety of PCM resolutions, from multichannel 24-bit/96KHz all the way up to 2-channel 24/192. Also included were sampling rates of 48kHz, 88.2 kHz, and 176.4kHz, as well as DTS and Dolby Digital datastreams. For better space utilization, some channels can be encoded with high resolution while others, like the surround, in lower resolution. A single-layer, single-sided DVD holds 4.7GB, enough for 40 minutes of six channels at 24/96.

DVD-Audio (cont.)

Six-channels of uncompressed 24/96 audio data require 13.8Mbps data speed while the DVD standard allows for up to 9.6 Mbps only, reason for which a lossless form of data compression was needed (Meridian Lossless Packing). MLP reduces storage and transfer-rate requirements by a factor of two without sacrificing quality (unlike "lossy" used on Dolby Digital and DTS)

There are approximately 400 DVD-A discs released so far. Many consider "AIX recordings" as the best representation of the DVD-A format.

The DVD Forum approved multi-channel digital connectivity via 1394 and 4C provisionally approved DTCP (for encrypted DVD-Audio discs) for DVD-Audio outputs. Meridian declared that "1394 is inherently jittery, HDMI promises low jitter and better picture quality than 1394".

General comments about both formats

There are now new "universal" players with both SACD and DVD-A capabilities. New players from Denon, Pioneer and Meridian have now proprietary digital connectivity that renders unnecessary the six analog cables to connect players to receivers if those accept such connectivity.

Some players (regardless of the format) are now incorporating bass management functionality, which is an issue when neither the player nor the pre/pro has the ability to redirect low frequencies to a subwoofer and the speakers are not full range type.

Most receiver/pre-pro equipment is not designed to perform bass management of the pass-thru analog inputs used for multi-channel connections from the player.

As alternative for bass management in analog connections is the Outlaw ICBM-1 outboard box (\$249), the unit can externally handle bass management but requires six cables in from the player and six cables out to the receiver/pre-pro.

SACD and DVD-Audio players

Below is a short representative example of the players of both formats:

Apex

Second-generation universal player, \$N/A, DVD-Audio, SACD, DD/DTS decoders, MP3, JPEG, WMA, progressive output, karaoke.

Denon

DVD-9000, \$3,500, the company offers to upgrade the unit with Denon Link digital-audio for multichannel audio (4c approved for encrypted discs), customers can return their products to Denon for a hardware/software upgrade (including the AVR-5803 \$4,300 receiver)

DVD-2900, \$1,000, new model, DVD, DVD-Audio, SACD, MP3, -R/RW, DVDO progressive output, 108 MHz/12 bit video DACs, 192 KHz/24 bit audio DACs, RS-232, bass-management
More universal models in 2003 are planned from Denon

Harman Kardom

New model SACD, DVD-Audio, DVD planned for mid-late 03

Integra

DPS-8.3, 1,200, progressive, SACD and DVD-A, THX-Ultra-certified,

Krell

\$4,000, multichannel SACD, TTM N/A

Lexicon

RT-10, TTM 1Q03, \$3,500, DVD, DVD-Audio, SACD multichannel, 24 bit/192kHz DACs for all six analog outputs

Linn

The Unidisk, TTM 1Q03, SACD, DVD-Audio, DVD, MP3, \$N/A

Marantz

DV8300, \$1500, TTM current, SACD & DVD-A, DVD player of -R/RW, full bass management in all modes, progressive output

McIntosh

MVP-851, \$3,500, DVD-A, progressive, TTM now, no bass management

Meridian

598, \$5,200-\$6,000, DVD-A, progressive, DCDi, proprietary Meridian Link digital connection

Motorola

DCP301HD, DVD, DVD-Audio, analog and ATSC video tuner, SD/HD digital cable tuner

Onkyo

New model DV-SP800, DVD, DVD-Audio, SACD, progressive, THX ultra, 108MHz/12 bit video DACs, 3:2 pull-down, 192 KHz/24bit audio DACs, VLSC

Panasonic

This year the company will ship nine new HTiBs with DVD-Audio and DVD capabilities, The new units will top a suggested \$1,000, up from the current max of \$700 - five models.

Philips

DVD962SA, \$500, SACD multi-channel, progressive/interlaced component DCDi, bass management, optical/coaxial digital audio outputs

DVD763SA, \$250, SACD multi-channel, progressive

DVD760AT (Innovations), progressive DVD, media slot, SACD, digital photo manager

DVD963SA (Innovations), \$N/A, progressive DVD, SACD multi-channel, CD-R/MP3

LX8000SA, SACD HTiB, \$1,000, 5 disc changer, MP3, TTM summer 03

MX5900SA, SACD HTiB, \$600, 5-disc changer, TTM current

Pioneer

DV45A Elite, DVD, DVD-A, SACD

DV47Ai Elite, \$1,000, TTM September 02, DVD, DVD-A, Super-Audio, dual 1394 outputs (no digital video) for serial or parallel interfacing and transfer of digital multi-channel audio, 12bit/108 MHz DAC, paired with the VSX-49TXi receiver.

HTD-630DV, HTiB, 5-disc player, Universal DVD-Audio, SACD, DD EX, DTS ES 6.1, wireless center-back speaker (the center back speaker receives all 3 surround channels and distributes wired signals to LS and RS)

HTD-530DV, HTiB, 5disc changer, MP3, WMA, Universal DVD-Audio, SACD

Samsung

DVD-HD931, DVD-Audio, upconverts DVD video to 1080i/720p via DVI, \$300, TTM June 03

Sony

DVP-NS999ES, \$1,200, TTM October (now current), DVD player with SACD multi-channel, progressive, 14 bit/108MHz DAC, bass management for SACD analog outputs

SCD-XA777ES, \$3,000, TTM current, Multi and 2-channel SACD, 6 SA-DAC converters

DVP-N5755V \$250 (street \$), DVD/multichannel SACD, CD/RW/MP3, progressive scan

Sony (cont.)

Sony CES representatives declared that Sony has no plans for multichannel digital 1394 audio connections

Yamaha

DVD-S2300, \$1,000, universal SACD & DVD-A, MP3, TTM October 02, bass management, progressive, DCDi, plays DVD +R/RW from Yamaha DRX-1 DVD+RW recorder, TTM October

DVD-C940, \$500, SACD, DVD, 5-disc, bass management, MP3, TTM April 03,

DVD-S840, \$400, DVD-Audio, DVD, single disc, TTM May 03,

Zenith

DVB318 <\$200, TTM 2Q03, Universal DVD-Audio, SACD, MP3, WMA, JPEG

The company is incorporating DVD-Audio into six of nine new DVD players (those 6 estimated as 180-\$200), one of them also with SACD for \$200.

Manufacturer Links

www.hitachi.com
www.jvc.com
www.mitsubishi-tv.com
www.pioneerelectronics.com
www.rca.com
www.samsungusa.com
www.plasmavision.com (Fujitsu)
www.sharp-usa.com
www.sonystyle.com
www.sel.sony.com
www.toshiba.com/tacp
www.yamaha.com
www.zenith.com
www.taw.biz (Theater Automation WOW)
www.info.epson.com
www.marantz.com
www.panasonic.com
www.philipsusa.com
www.sim2usa.com

Links with DTV Information

www.ilovehdtv.com
www.hdpictures.com
www.siliconimage.com (for DVI, 1394, HDCP, DTCP, etc)
www.hdmi.org
www.avsforum.com
www.dtvmax.com/dtv.htm
www.highdef.org/library/hddefined.htm
www.geocities.com/SiliconValley/Campus/3097/avdtv.htm
www.digitaltelevision.com/dtvcon0700.shtml
www.pbs.org/opb/crashcourse/index.html
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www.fcc.gov/mb/
www.henninger.com/library/hdtvfilm/
www.keohi.com/keohihdtv/index.htm
www.digitaltelevision.com/publish/dtvbook/toc.shtml
www.atsc.org/
www.100000watts.com/ (broadcast stations)
www.hometheaterspot.com/cgi-bin/ubbcgi/ultimatebb.cgi (forum)
www.hometheaterforum.com/htforum/index.php (forum)

Interesting technologies brought to CES

Mocomtech Co. (Innovations)

PACS System-100 PDP Type Anamorphic Cinema Screen

Shows original anamorphic images without hurting the original aspect ratio



Hitachi Plasma ALIS technology (used by 42" plasma)

ALIS (Alternating Lighting of Surface), this technology claims to increase the vertical resolution.

Technology on Conventional Plasmas (according to Hitachi): all horizontal lines appear at 60 times x second. Each line has two horizontal electrode strips with alternating RGB phosphors for each pixel behind the pair of electrodes. A non-luminous barrier separates each phosphor. Each pixel is activated by applying voltage across a pair of horizontal electrodes and a pair of vertical electrodes (address electrodes), which intersect at the desired pixel. Then the plasma gas at that location emits a UV ray, which causes the phosphors in the associated pixel to glow. A horizontal interval of non-luminous space between pairs of display electrodes is required to prevent interference between vertically adjacent phosphor cells. As a result, some of the screen real state is never used to display the image.

Technology on ALIS plasmas (according to Hitachi): uses NO non-luminous space between horizontal electrodes, they are non-broken vertical strips of phosphors so all areas between electrodes can be used for luminance (up to 500), the circuitry drives alternating rows of pixels 60 times x second. For example, on typical plasmas A/B, C/D, and E/F pairs of electrodes of 3 horizontal lines have 3 non-luminance spaces between the 3 pairs, ALIS doesn't, it does first A/B, C/D and E/F and then B/C, D/E electrodes every 60th of a second.

Samsung DVD-HD931 (Innovations)

DVD player that outputs (upconverts) to 720p/1080i using DCDi and DVI output, DNIe, DVD-Audio, TTM June 03, \$299, optical/coaxial digital audio outputs, component out (480i, 480p), MP3/HDCD/DTS decoders, the upconverted signal is sent over the DVI output only (as 480p/720p/1080i), 480p analog can not be output at the same time than DVI signals, 480i analog can.

JVC HD camera

GR-HD 1 TTM March 2003, MSRP estimated at around \$3,000

Records in Mini DV tape at native 720/30p, 480/60p, and 480i

Play back 1080i, 720p, 480p, and 480i

720p images are converted to 1080i for TVs incompatible with 720p

1/3 " 1.18 megapixel progressive scan CCD (1)

Panorama stills at 640x480, 848x480, 1280x960, and 1280x720

MPEG-4 video clips in memory card

Web cam, USB and 1394, new lens for HD F 1.8 (F 1.8 - F 1.9 x 10), all-glass spherical lens

New software for MPEG-2 HD editing using PC (image sound capture, file management for stills/movies/sound, easy non-linear MPEG-2 editing)

Uses same duration of current Mini DV tapes

Proprietary 'd' type connection that opens to component video plugs for connection with any DTV.

IEEE1394 DVi connector (digital camera connector) allows for DVD recording at 480i down-conversion.



<http://www.jvc-victor.co.jp/english/press/2003/gr-hd1.html>

Some acronyms used on this report

The following list is provided as a "simplified" description of terms only to facilitate the reading of the report. For the exact definitions or descriptions, please refer to appropriate reference material.

1394: IEEE1394, also known as FireWire and iLink (Sony). Connectivity standard that is used for compressed MPEG-2 digital video, i.e., for D-VHS tape recording or for networking DTV devices.

5c: Copy-protection protocol used by the 1394 digital connection. Also known as DTCP. The name originates from the group of five companies that developed the standard.

AR: Aspect Ratio. Relationship between the horizontal and vertical axis of a TV or image. For example: 4:3 is 4 times wide by three times tall (also expressed as 1.33:1, our NTSC TV standard for over 50 years); 16:9 is 16 times wide by 9 times tall, also expressed as 1.78:1 (the HDTV standard within DTV). Another related specification, OAR, for "original", is commonly used to identify the AR used by the director in wide-screen movies.

ATSC: Advanced Television Systems Committee, for the new DTV digital television system.

BNC: plug for analog connections for DTV signals. Also, see RGB.

D/A: Digital to analog converter (the inverse conversion is also mentioned as A/D).

D-Sub: Name associated with the VGA connection with 15 pins for RGBHV signals.

D-VHS: Digital VHS VCR that records compressed HD digital signals on videotape.

DCDi: Directional Correctional De-interlacing. Faroudja's proprietary name for their de-interlacing chip used now in many products.

DNIE: Samsung's proprietary name for their new video enhancement technology "Digital Natural Image" enhancement.

DTCP: Digital Transmission Content Protection. See 5c.

DTV: Digital Television System.

DVDO: Scaler/De-interlacer product manufactured by Silicon Image that converts 480i (NTSC images from broadcast, VHS or DVD) to 480p. Commonly utilized to bypass internal DTV line doublers when those are of unsatisfactory quality.

DVi: Also known as iLink 1394 digital connection for digital video cameras.

DVI: Digital Visual Interface (connectivity standard for digital uncompressed video).

EDTV: Enhanced Digital Television. Not a DTV format standard as originally established. The term was created by the CEA a couple of years ago to help consumers in the transition to DTV. See ¹

HD1: Original Texas Instruments chip for DLP.

HD2: Upgraded Texas Instruments chip for DLP, also called "Mustang".

HDCP: High-bandwidth Digital Copy Protection protocol used by the DVI and HDMI digital connections

HDMI: High Definition Multimedia Interface, connectivity standard for the transmission of uncompressed video, some control signals, and multi-channel digital audio, all within the same cable.

HDMI is the planned successor to DVI. Claims to be backward compatible with DVI with the use of an adapter. The implementation date has not been announced yet. Utilization is expected by late 2003.

HDTV: High Definition Digital Television. DTV television formats for 720p and 1080i resolutions in 16:9 aspect ratio images as originally established, although as explained above the CEA revised those so that a TV that can display an 810i 16x9 image is now considered as part of HDTV category.

MPEG-2: Moving Pictures Experts Group that designed the compression algorithm (-2) used in DTV broadcast transmissions.

N/A: Not Available "at the time the report was produced".

Some acronyms used on this report (cont.)

NTSC: National Television Systems Committee. Term also used to identify the current analog television system.

OTA: Over The Air DTV broadcasting. Digital signals tuned by a VHF/UHF antenna. This report sometimes uses the terms ATSC (the committee) or 8VSB (the tuning technology) to convey the same idea, although they are not the same.

POD: (Point Of Deployment interface) of the Host Interface License Agreement (PHILA) for cable tuners.

PVR: Personal Video Recorder (recording on internal hard drive, HDD), also known as Tivo.

RGB: Analog connection for video, VGA 15 pin D-sub type of wire/connector (also used for computer monitors), or five BNC connectors.

RGBHV: See RGB.

SDTV: Standard Definition Digital Television. DTV television formats for 480i and 480p resolutions as originally established; now the term is used only for 480i digital (480p has been promoted to EDTV).

STB: Also mentioned as HD-STB, Digital set to box to tune DTV via OTA, cable or satellite signals.

TTM: Time to Market, a term used on this report to identify when a product would be available.

TBA: To be announced later, the term is used when the manufacturer of a new product is not in a position to announce yet when a product would become available.

YPbPr: Analog component 3 wires connection.

ⁱ **EDTV (cont):** When the CEA created the term there were a number of 4:3 TV sets that manufacturers called HDTVs but only showed 810i lines of a 16:9 1080i image (25% less in the vertical resolution), those TVs chose that design to maintain the rectangular wide-screen geometry of the HD image within the 4:3 frame of the TV, the remaining 270 lines (1080i minus 810i) of the TV set were used to scan top/bottom black bars instead of using them for the actual incoming image (also know as letterbox).

The EDTV category was placed by the CEA between the originally approved SDTV and HDTV standards, but instead of putting those 4:3 sets on that EDTV category the CEA did the following: a) the 480p SDTV-only sets were promoted to the EDTV level, and b) the 810i (non-HDTV) 4:3 sets were promoted to the group of fully capable HDTV sets (720p or 1080i).

With time, a number of 4:3 sets were designed to adjust their scanning raster so they could show all the 1080i lines of incoming signal closer together, all within the displayed 16:9 image, in those TVs the blacks bars are dead space, the TV is not using resolution lines for the black bars (as opposed to the 810i style). It is recommended to verify how a 4:3 TV handles 16:9 images before the purchase.

Reference Material

Industry Press Releases

CEA publications

ATSC public records

FCC public records

The Guide to Digital Television, second edition, Silbergleid & Pescatore, Miller Freeman PSN, Inc

Digital Television Fundamentals, Robin & Poulin, Mc Graw Hill

DTV, Whitaker, Mc Graw Hill

Home Theater for Everyone, Harley, Acapella Publishing

DVD Demystified, second edition, Taylor, Mc Graw Hill

Complete Guide to High-End Audio, Harley, Acapella Publishing

Guide to HDTV Systems, Sams, Prompt Publications

Technical material from *Wide-Screen Review* and *The Perfect Vision Magazines*