Hitachi's High-definition Flat-panel TVs: 24 Combinations

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OVERVIEW: The market for FPD (flat-panel-display) TVs was one of the fastest growing segments of the electronic equipment sector in 2002 with 205,000 units shipped in Japan and all the major industry players are moving to add 26-inch and larger screen LCD (liquid-crystal-display) TVs to their product lines. In the domestic market for PDP (plasma-display-panel) TVs, Hitachi has emerged as the market leader with a 40% share in Japan (based on a Hitachi survey of gross sales data from October 2002 to March 2003). After moving decisively into the LCD TV market beginning in September 2003, Hitachi has now come out with a new series of FPD television products that integrates the company's core competence in PDP and LCD panels with an engine combining digital image processing technologies. Based on a consumer-oriented approach where users can choose from among six different sized flat-panel monitors and four different AVC (audio-visual-control) stations for a lineup of 24 potential combinations, Hitachi is a leader in providing innovative television solutions tailored to consumer needs in Japan.

INTRODUCTION

HITACHI assumed a leading role in driving the FPD (flat-panel-display) market (see Fig. 1) when its 32-inch PDP (plasma-display-panel) TV went on sale for the first time in April 2001, and the market has been expanding at phenomenal rate ever since. The number of units shipped in 2001 topped 85,000 for a ten-fold increase over the year before, and 205,000 units shipped in 2002, a 240% increase over the year before. It is projected that about 250,000 FPD TVs will be sold in 2003 (see Fig. 2).

Beginning in 2002 we have also seen very robust growth in the market for larger 30-inch screen LCD (liquid-crystal-display) TVs, a phenomenon that can largely be attributed to the gradual replacement of CRTs (cathode ray tubes) by PDP and LCD monitors. Hitachi was quick to migrate its business away from CRTs to FPDs, and this is one reason that the company has assumed such a strong position in the PDP TV marketplace. In 2003 Hitachi not only rolled out an extensive lineup of FPD TVs (32-inch, 37-inch, 42-inch, and 50-inch PDP TVs and 28-inch and 32-inch LCD TVs), but also moved to extend its production of FPDs to replace bulky CRT sets.

In a related development, the whole TV environment underwent a fundamental change and digitization gained momentum in December 2003 when digital terrestrial broadcasts were launched in parts of three main metropolitan areas of Tokyo, Nagoya, and Osaka. Thanks to the digital terrestrial licensing requirement to provide 50% or more HDTV (high-definition TV) programming each week coupled with HDTV satellite broadcasts that were launched in December 2000, the transition to HDTV programming

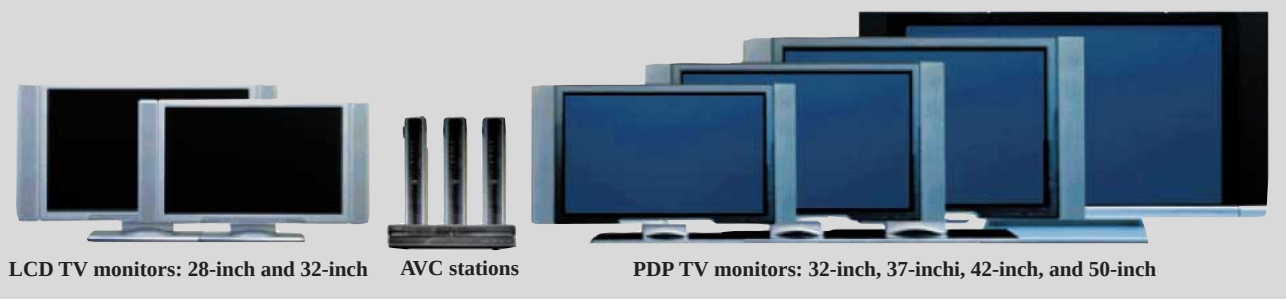

Fig. 1—High-definition Flat-panel TV Series.
All of Hitachi's LCD panels and PDP panels are high definition. Four sizes of PDP TV monitors on the right and two sizes of LCD TV monitors on the left can be combined with any of four different types of AVC (audio-visual control) stations for a total of 24 configurations in the lineup.

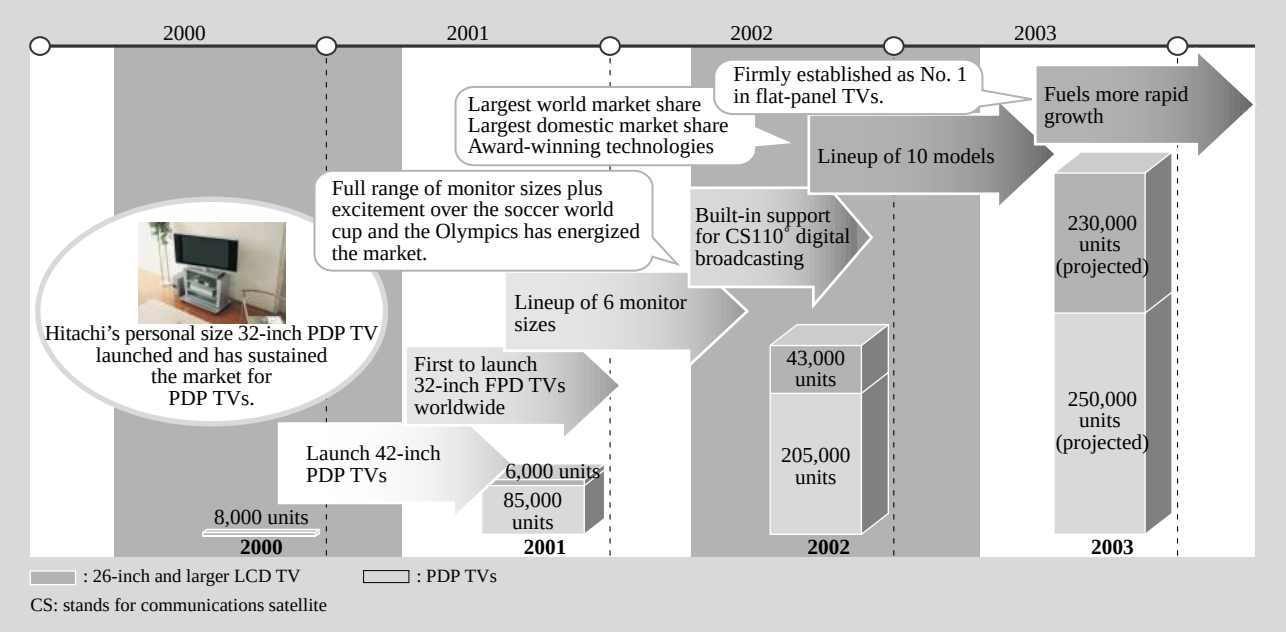

Fig. 2—Flat Panel TV Market Trends in Japan.
Roll out of Hitachi's 32-inch PDP TV in 2001 had a remarkable effect in stimulating the FPD market, and at the same time major manufactures began fabricating larger LCD panels. It is projected that 480,000 flat-panel TVs will be shipped in 2004.

has made remarkable headway.

This article will focus on the conceptual basis and the range of features provided by Hitachi's new series of FPD TVs.

WHAT MOTIVATES CONSUMERS TO BUY FLAT-PANEL TV

PDP and LCD TVs are based on fundamentally different technologies, and have different relative strengths (see Fig. 3). PDP TVs are generally superior in terms of color reproduction, displaying moving images, viewing angle, and dark room contrast (contrast in dark environments), while LCD TVs generally have a longer panel life, consume less power, and provide better contrast in lighted rooms. The different technologies also affect yield and productivity so that larger monitors ranging from 32-inch to 50-inch are more advantageously implemented in PDP while smaller, more personal sized TVs (15-inch to 32-inch) are generally implemented with LCD panels.

In light of these differences in performance and optimum size ranges of PDP TVs as opposed to LCD TVs, we conducted a survey to discover what functions and other factors motivated consumers to buy a particular type of flat-panel TV.

Consumers Make Decisions at Store

FPD TVs are not cheap, so most consumers come to a store to examine the different models first hand

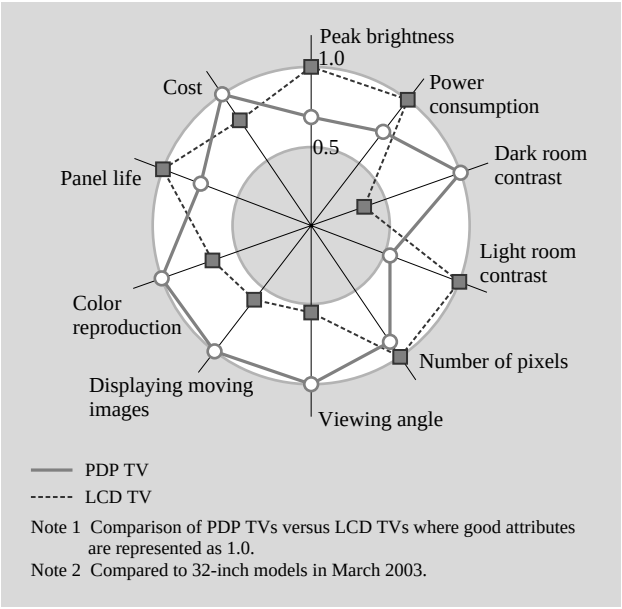

Fig. 3—Comparison of PDP Versus LCD TVs.
The basic disadvantage of PDP TVs is panel life, while the main drawback of LCD TVs is viewing angle.

before deciding what to buy. While evaluating the design and picture quality of the different TVs with their own eyes, consumers typically ask lots of questions of the sales staff, then make a final selection based on that information. Interestingly, we found that a sizable proportion of the respondents on our survey ended up buying a different type of TV than they were initially considering when they came to the store (see

Fig.4).

Specifically, about 10% of buyers ended up buying an LCD TV when they thought they were going to buy a PDP TV, and about 30% of the people taking the survey ultimately chose a PDP TV when they originally thought they would buy an LCD model. Significantly, the proportion of consumers who change their minds and end up buying a PDP TV when they initially planned to buy an LCD TV is quite high.

Why People Change Their Minds and User Expectations

The two biggest factors causing people to switch from an LCD TV and end up buying an PDP TV were
(1) picture quality and
(2) the larger screen size [see Table 1(a)].

In terms of picture quality, consumers focused on color reproduction and smooth, natural moving images, and also liked the larger size of the PDP TVs ranging from 32-inch to 50-inch [see Table 1(b)].

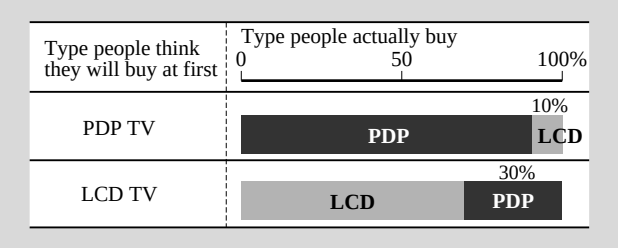

Fig. 4—Proportion of People who Change Their Mind at Store. Among people who change their mind at the store, more people end up buying a PDP TV when they walked into the store thinking they would buy an LCD TV than the other way around.

The main factors drawing people to the LCD TVs were the better contrast in light environments, the lack of reflection and glare which is a well-known advantage of LCD panels, the long panel life, and the lower power consumption of LCD panels.

Based on these findings, it is apparent that consumers are generally pretty well informed and base their buying decisions on a good understanding of the relative strengths of PDP versus LCD panels: they expect PDP TVs to be bigger and present a sharper picture, and they expect LCD TV to last longer and consume less power.

CONCEPTUAL BASIS AND LINEUP

Concept

Based on the above survey finding, Hitachi adopted a two-pronged product strategy that fully exploits the relative differences and strengths of LCD as opposed to PDP TVs. We came up with the concept of theater style for PDP TVs that calls attention to the larger screen size and crisp picture quality, and the concept of casual style for LCD TVs that highlights more personal sized TVs that can be viewed in brightly lit rooms. We further emphasized these different concepts in the design details of the TVs (see Fig. 5).

Lineup

Hitachi's new series encompasses six different kinds of HDTV monitors and four different kinds of AVC stations that include the tuner and picture processing circuitry. Specifically, the series includes 32-inch, 37-inch, 42-inch and 50-inch PDP displays; 28-inch and 32-inch LCD displays; and four AVC

TABLE 1. Main Factors Influencing Consumers to PDP or LCD TVs
Consumers switching from LCD to PDP were mainly motivated by picture quality and picture size, while those switching from PDP to LCD were primarily concerned about panel life and power consumption (a). Secondary factors in switching from LCD to a PDP TV were color, fast motion picture response, and other picture quality concerns, while those changing their mind and buying an LCD TV when they originally planned to buy a PDP TV were impressed by the absence of glare and reflection that is a characteristic of LCD panels (b).

(%)

	Picture quality	Viewing angle	Screen size	Thickness	Consumption power	Life	Price
Switch from LCD to PDP at the store	77	25	55	51	13	14	41
Switch from PDP to LCD at the store	80	12	45	48	48	54	36

(a)

(%)

	Color reproduction	HDTV	Resolution	High contrast	Natural moving images	Non-glare	Viewing angle
Switch from LCD to PDP at the store	56	41	28	32	27	9	24
Switch from PDP to LCD at the store	46	42	45	42	19	36	17

(b)

Fig. 5—Different Concepts of PDP and LCD TVs.
PDP TVs based on a concept of theater style while LCD TVs are based on a concept of casual style.

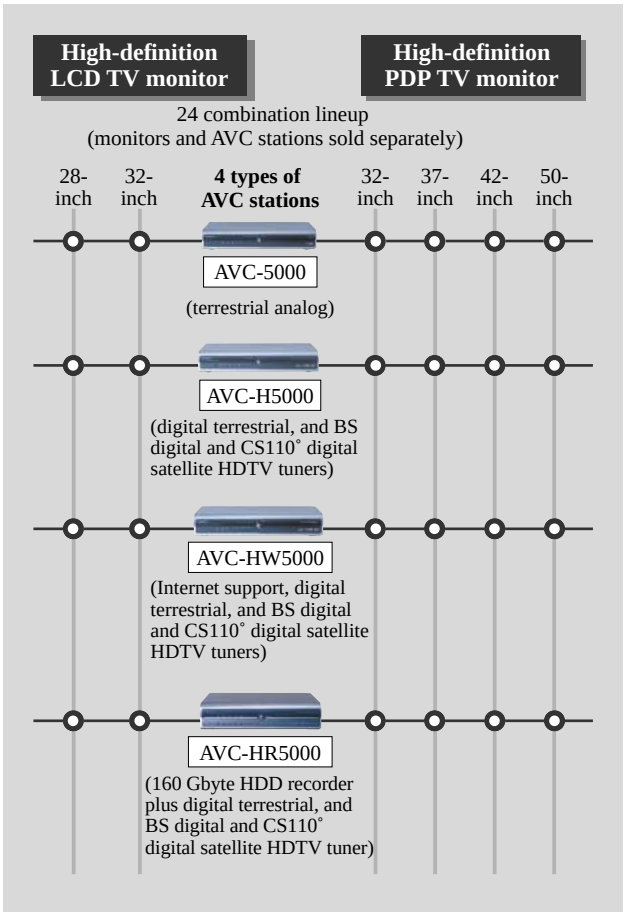

Fig. 6—New Series Selection.
Six different High-definition LCD and PDP TV monitors can be combined in any configuration with four different AVC stations for a total of 24 different configurations.

stations with different sets of features:
(1) a UHF/VHF tuner,
(2) digital terrestrial, and BS digital and CS110° digital satellite HDTV tuners,
(3) same as (2) plus Internet support,
(4) same as (2) plus a built-in HDD (hard disk drive).

The six HDTV monitors and four AVC stations are all available as separate units, so consumers can combine the optimum display with the tuner of choice for a total of 24 combinations to achieve a configuration that is tailor-made to the needs and preferences of each consumer (see Fig. 6).

The AVC stations can be combined with any of the PDP monitors, and of course consumers can later buy a different AVC station, say if they want to upgrade to obtain additional capabilities such as digital terrestrial broadcast reception that their conventional-model AVC does not support.

PICTURE QUALITY TECHNOLOGIES

Television Monitors

The new series PDP TV monitors (32-inch, 37-inch, and 42-inch) incorporate a newly developed advanced alternating lightning of surfaces panel*1 technology that provides a brighter, sharper picture while at the same time extending the panel life. The panel features new discharge gas and screen phosphors that deliver enhanced luminance of 1,100 cd/m^2 on the 42-inch model and 1,000 cd/m^2 on the 37-inch and 32-inch models, thus enabling unprecedented clear bright pictures. The new discharge gas scheme improves the color reproduction range and boosts the white color temperature to 12,000 K to produce crisp, clean whites. The panel also significantly reduces the wear on screen phosphors which extends the average panel life to around 60,000 hours for the 42-inch model under normal TV viewing use (see Fig. 7).

The LCD TV monitor features an advanced super-IPS (in-plane switching) LCD panel*2 with a newly developed wide view filter that significantly improves the viewing angle (see Fig. 8).

The wide view filter is sandwiched between the LCD panel and a polarizing plate, and is designed to compensate for even minuscule back-light leakage. A viewing angle of ±176° is realized with the filter, thus permitting beautiful reproduction of images comparable to a CRT regardless of the viewing angle. Motion responsiveness that has been the traditional

*1 A product of FUJITSU HITACHI PLASMA DISPLAY LIMITED.
*2 A product of Hitachi Displays, Ltd.

Number of pixels (horizontal × vertical)	1,024 × 1,024
Luminance (panel unit peak luminance)	1,100 cd/m^2
White color temperature	12,000 K (under normal TV use)
Panel life	60,000 hours (under normal TV use)

Fig. 7—Advanced Alternating Lightning of Surfaces Panel. A high-performance 42-inch PDP display panel is shown which combines bright, clear picture quality with long panel life.

Number of pixels (horizontal × vertical)	1,280 × 768
Luminance	450 cd/m^2
Viewing angle	± 176 degrees
Panel life	60,000 hours (under normal TV use)

Note: Estimated time assuming the back light luminance at 50% (Hitachi standard measurement).

Fig. 8—Advanced Super-IPS LCD Panel. Thanks to the newly developed filter, excellent luminance and sharp contrast are achieved regardless of viewing angle.

weakness of LCD TVs has also been significantly improved with an overdrive technology that matches the drive voltage to the liquid crystal shutter motion and with a super impulse display technology that practically eliminates after images by overwriting black data every 1/60 second when the TV image is changed.

AVC Stations

An advanced processor has been adopted for the image processing circuitry in the AVC station tuner module that features Hitachi's proprietary image enhancement algorithm. Both Hitachi's PDP and LCD TVs achieve the best picture quality in the industry with an advanced timing control function that further improves contrast and advanced digital color management that enables control of individual colors for pure whites, crisp blue skies, bright vibrant reds, and natural greens.

The newly developed AVC station with the built-in HDD recorder is the first product in which such a large-capacity HDD (160 Gbyte) has been installed with a slim profile FPD, and the HDD can record up to 14 hours of HDTV programming*.

Note that every one of these applied technologies—the FPD monitors, the image processing technologies, and the HDD technology—are all based on original technologies developed in-house by Hitachi Group companies.

CONCLUSIONS

This article highlighted the conceptual basis and the range of features provided by Hitachi's new series of FPD TVs.

Taking full advantage of the company's original technologies, Hitachi plans to make its FPD TVs available worldwide. Hitachi is also continuing research on even larger screen PDP TVs, and is adding a 55-inch PDP TV to its lineup in the spring of 2004. One of the chief advantages of implementing the tuner as an independent AVC station unit that can be sold separately, is that it can be loaded with a variety of different capabilities meeting different consumers' needs. Going beyond the AVC stations now providing Internet support and built-in HDD recording, we plan to further extend the potential of the AVC stations as a digital information platform by providing additional new capabilities and functions.

Guided always by the goal of creating best quality video products, Hitachi plans to follow up on its success with large-screen FPDs by creating DVD (digital versatile disk) video camcorders, LCD projectors, and a host of other products contributing to a richer, more vibrant quality of life.

This article has introduced Hitachi's lineup strategy for the Japanese market. Other Hitachi Group companies throughout the world plan to develop various products such as FPD TV and LCD TV focusing on built-in AVC (with terrestrial analog) and independent-monitor types to meet a wide range of consumer needs.

Please visit the following sites for more information on Hitachi foreign models.

USA: http://www.hitachi.us/tv/index_flash.shtml

EUROPE: http://www.hitachidigitalmedia.com/

* A product of Hitachi Global Storage Technologies, Inc.

ABOUT THE AUTHOR

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