



HDTV



A CONSUMER'S GUIDE TO THE WONDERFUL WORLD OF HDTV



Consumer Electronics Association

www.CE.org/hdtv

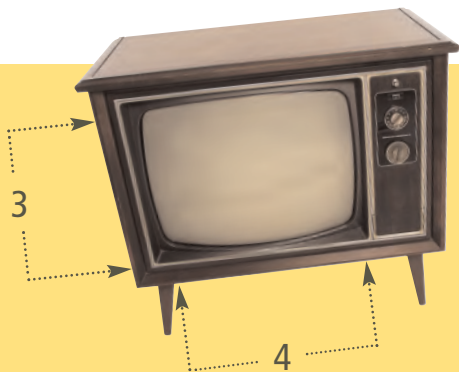
why you want HDTV



HIGH-DEFINITION TELEVISION

EXPERIENCE TELEVISION LIKE NEVER BEFORE. PICTURES SO SHARP AND CLEAR YOU'LL THINK THEY'RE REAL. SURROUND SOUND THAT PUTS YOU IN THE MIDDLE OF THE ACTION. SIMPLY PUT: THE HDTV EXPERIENCE IS AMAZING.

HIGH-DEFINITION TELEVISION (HDTV) DELIVERS PICTURE AND SOUND QUALITY THAT ARE A QUANTUM LEAP ABOVE YOUR CURRENT TV SET. IT'S JUST LIKE A MOVIE THEATER WAS PLACED IN YOUR LIVING ROOM! EVERY SHOW YOU WATCH—NO MATTER IF IT'S THE LOCAL NEWS OR A CHAMPIONSHIP SPORTS EVENT—TAKES ON A VIVID BRILLIANCE THAT SIMPLY HAS TO BE SEEN TO BE APPRECIATED.



NTSC



The Incredible **Picture...** The **Awesome Sound!**

The image seen on the best HDTV set has five times more detail than analog televisions. Now watching a big football game feels like you're 15 rows up on the 50-yard line as you see every inch of the field—even the scuffs on the quarterback's helmet. Not only is the picture more realistic—like looking through a sparkling clean picture window—HDTVs have wider, rectangular screens like movie theaters and deliver the same Dolby Digital surround sound that thrills audiences at the local Cineplex.

HDTV is revolutionizing television as CD players did for music. CDs eliminated scratches and hisses from records, while HDTVs eliminate ghosts, static, snow and poor-quality video. When you see an HDTV program, it's exactly the same as the one that left the TV station: colors are crisp, text is easier to read and the higher quality audio embedded into the signal supercharges the viewing experience.

HDTV is only one part of "digital television (DTV)," an umbrella term covering all of the digital formats for the standard approved by the Federal Communications Commission (FCC) in 1996. The official name is the Advanced Television Systems Committee (ATSC) standard. There are several different DTV

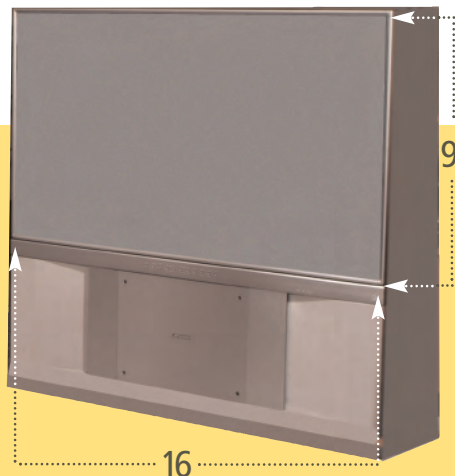
picture formats offering varying levels of quality; HDTV with its widescreen picture and Dolby Digital sound is the pinnacle.

Just as there is a wide variety of DTV picture formats, there are different types of digital televisions. The most affordable is capable of showing Standard Definition TV (SDTV). The next best category is Enhanced Definition TV (EDTV), capable of displaying a higher-quality 480 progressive image. An EDTV set has a digital tuner built-in, while an EDTV monitor requires a digital set-top box.

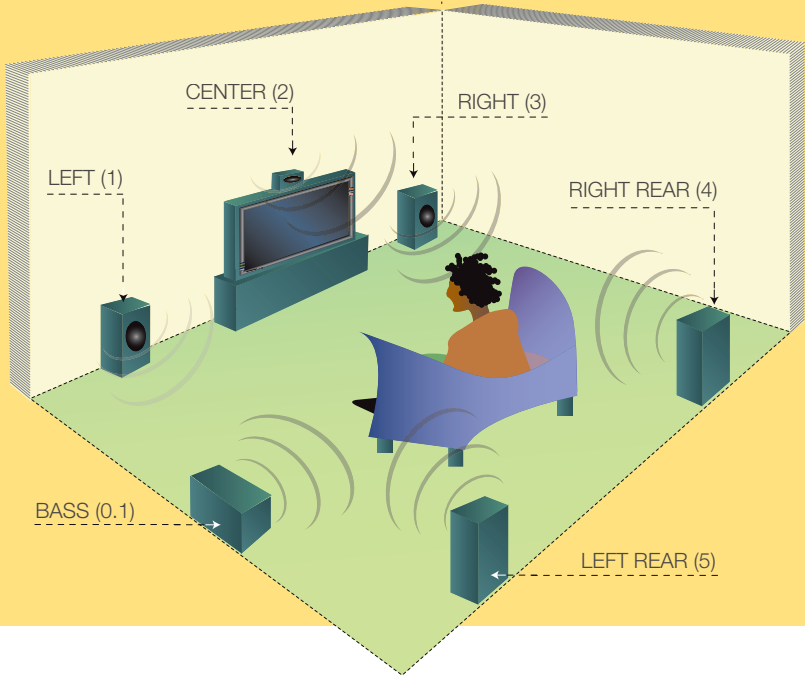
The highest picture quality models are HDTVs (720p, 1080i) with a widescreen 16:9 aspect ratio. This television lets you see uncropped widescreen movies without the black bars on top and bottom used for "letterbox" presentations (letterboxing is the method typically used to "fit" rectangular CinemaScope movies onto a square 4:3 screen). As with all DTV products today (SD, ED), HDTVs are available as HDTV sets with built-in tuners or HDTV monitors that require a digital receiver.



BETTER PICTURE
BETTER SOUND
DIGITAL



Six Channel (5.1) Dolby Digital Sound



How HDTV Differs from Analog TV

HDTV has higher resolution meaning sharper, clearer pictures: The image on a television is composed of small picture elements called pixels. The pixels in HDTV are closely packed together to provide a highly detailed picture. Current analog TVs display an image of 200,000 pixels. The minimum DTV signal shows 300,000 pixels and hits a maximum of two million for HDTV, the best of the 18 ATSC formats.

HDTV has a widescreen format: In addition to providing improved picture quality with more visible detail, HDTV is transmitted in a widescreen display commonly referred to as a 16:9

format, meaning that the picture is 16 units wide by 9 units high. A conventional analog display is 4 units wide by 3 units high, or 4:3. Thus the 16:9 display provides a wider image area that more closely matches the movie theater experience.

HDTV has better sound: Many HDTV programs also contain six-channel (5.1) Dolby Digital surround sound to provide an immersive audio experience to complement the improved picture quality on HDTV. This is particularly beneficial within a home theater system.

The DTV Standard

On December 24, 1996, the U.S. FCC adopted the major elements of the ATSC DTV standard, mandating its use for digital terrestrial television broadcasts in the U.S. Within the DTV standard are 18 different picture formats. The FCC did not mandate use of the specific HDTV and SDTV formats contained in the ATSC standard, but these have been uniformly adopted on a voluntary basis by broadcasters and receiver manufacturers. All digital receivers (set-top boxes) and HDTV sets receive them all. A DTV receiver, which looks like a VCR or a cable or satellite receiver, gathers and translates the digital signal for the DTV monitor.

In 1997 the FCC adopted companion DTV rules, assigning an additional 6 MHz channel to approximately 1,600 full-power broadcasters in the U.S. to permit them to offer digital terrestrial broadcasts in parallel with their existing analog services during a transition period, while consumers made the conversion to digital receivers or set-top boxes. In accordance with the FCC plan, digital television service was launched in the U.S. November 1, 1998.

The two most commonly used signals by local broadcast stations are EDTV and HDTV. With the current analog system, TV images are created by interlace scanning, which uses two fields of alternating horizontal scanning lines to form a full picture. This picture is referred to as "480 interlace," or 480i. With many DTVs, the number

of scanning lines are more than doubled to 1,080 (1080i). This is HDTV and delivers a more detailed image that practically jumps off the TV screen.

HDTV also may be broadcast and displayed as a "progressive image" (720p), like a computer monitor. Here, a full frame fills the screen from top to bottom, eliminating lines altogether so the picture has a more film-like feel. EDTV quality is referred to as 480p for its 480 progressive lines of resolution.

In the new digital era, broadcasters can offer free, over-the-air television of higher resolution and better picture quality than is possible under the current system. If broadcasters so choose, they can deliver HDTV with theater-quality pictures and CD-quality sound. Or a broadcaster can offer several different TV programs at the same time (called "multicasting"), but in a lower resolution – SDTV. Even with fewer than 480 lines of resolution, the picture and sound quality of SDTV still is better than analog TV. The target date for completion of the analog-to-DTV transition is 2006, or 85 percent household penetration, whichever occurs later.

A bounty of beautiful shows

Broadcasters are offering an ever-increasing array of high-definition programming. . . you will be knocked out when you see them. When you get your new HDTV home, you'll have an amazing palette of digital entertainment from which to choose—right in your living room. No matter if you love soap operas, prime-time favorites from network TV and premium cable networks, Hollywood blockbusters or almost every sport you can imagine, you'll likely find sparkling HDTV versions available today.

To find out what programs are airing in HDTV in your town, check out Titan TV (www.titantv.com), a free online program guide from Decisionmark in conjunction with CEA. The National Association of

Broadcasters' (NAB) website also is a good source for the latest list of DTV broadcast stations in your area (<http://www.nab.org>).

Your new HDTV also is a great companion for the many affordable progressive scan output DVD players widely available on the market. While these players don't provide a high-definition image, connect one to your HDTV and you'll see a beautiful, seamless picture that exceeds even the quality of a standard DVD player.

With thousands of DVD titles available and all the new DTV programming on-air, there's no shortage of digital entertainment for your new HDTV.

What is HDTV *and why is it so important?*

HDTV is an entirely new system that will ultimately replace today's existing analog "NTSC" television system. The term "HDTV" refers to a television system that can transmit, receive and display high-quality digital images.

Once the DTV standard was set in 1996, the Federal government subsequently mandated a nationwide transition for the nation's 1,600-plus television stations to move from analog to digital transmission. In order to facilitate this, the FCC allocated an

additional channel to all broadcast TV stations. This second channel is dedicated for digital broadcasts and upon completion of the transition (the year 2006 or 85 percent household penetration, whichever occurs later), the original analog channel must be returned to the government. The FCC will eventually auction the analog channel spectrum.

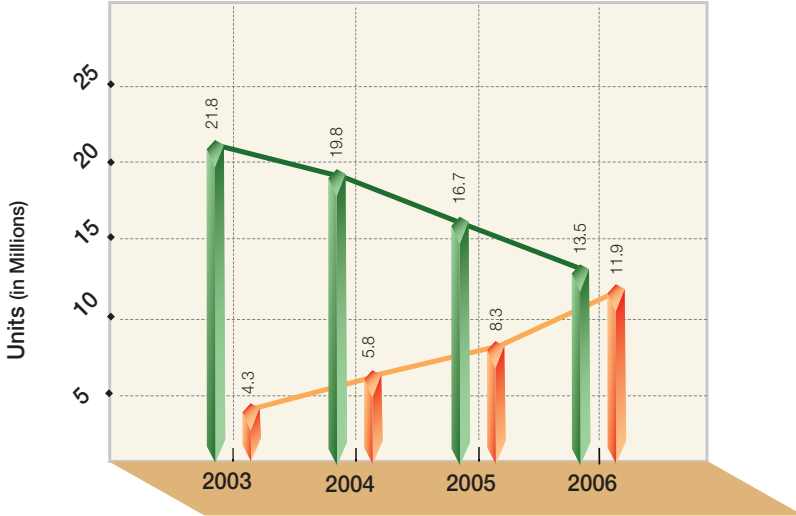
The World of Television Goes Digital

Analog vs. Digital Sales Projections

2003 – 2006



UNITS

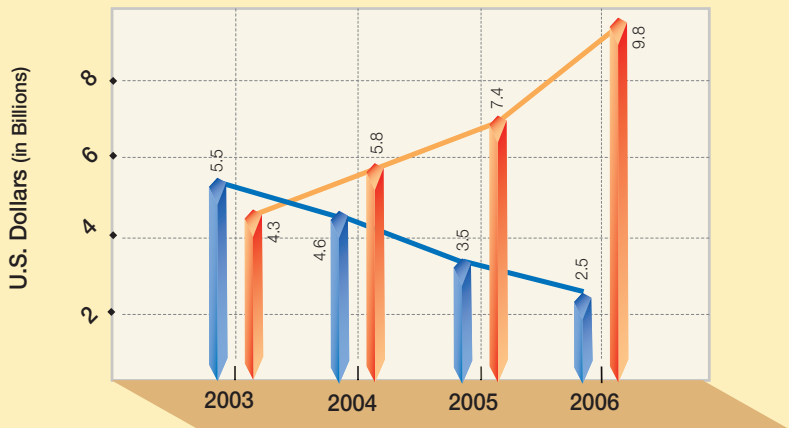
 Digital  Analog



HDTV's great picture, the increasing amount of programming combined with the falling prices of HDTVs, is providing consumers with a great incentive to go digital.

U.S. DOLLARS

 Digital  Analog



What makes HDTV better than today's television?

HDTV offers incredibly detailed, life-like picture quality with up to five times the sharpness of today's television along with digital surround sound capability and a widescreen format.

Is my current TV obsolete?

No, analog televisions will continue to receive analog broadcasts at least through 2006, and probably longer. After that, consumers will be able to connect an inexpensive receiver to their existing TV to decode TV broadcast signals, just not in high-definition. Of course, current televisions will continue to work with cable, satellite, VCRs, DVD players, camcorders, video game consoles and other devices for many years.

What can I watch in HDTV?

The great news for consumers is that Hollywood is creating more and more digital programming at the highest levels of resolution and sound quality.

What is the difference between "digital cable," "digital satellite" and "HDTV?"

Just because a program arrives through a digital cable or digital satellite doesn't mean it is in high-definition. Much of today's programming – even that received from a digital satellite, digital cable or even a digital channel broadcast over-the-air – is delivered in SDTV. You'll get a better picture than you get with the analog broadcasts TV has used for years, because a digital picture will be free from the "ghosts" and "snow" that can plague analog transmissions. At a minimum, over-the-air SDTV offers a picture 640 pixels wide by 480 pixels high, totaling 307,200 pixels – about 50 percent more than today's analog TV. A standard definition picture will be good, but not nearly as sharp and crisp as high-definition, which can go up to two million pixels.

2-PART SOLUTION: Monitor + Receiver



MONITOR



TERRESTRIAL



SATELLITE



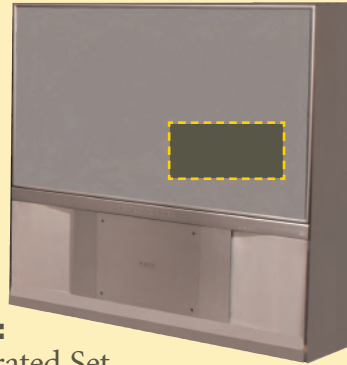
CABLE

RECEIVER
(SET-TOP BOX)



SIGNAL DELIVERY

how to receive HDTV



MONITOR WITH
INTEGRATED RECEIVER



SIGNAL DELIVERY

1-PART SOLUTION: Integrated Set

How Do I Receive HDTV?

There are several components required to watch a program in HD. Generally, it's simple and just like receiving traditional TV:

- The program must be transmitted in high-definition. Viewers can receive HDTV signals through one of three ways: over-the-air broadcast, cable, or direct broadcast satellite.
- At the consumer's home, the signal must first go from the antenna, dish, or cable through a receiver. Again, HDTV Sets have receivers built in (often referred to as "integrated sets");
- others require a separate set-top receiver. Cable and satellite subscribers currently need a special HDTV set-top box.
- The program must be viewed on an HDTV Set or Monitor. In addition to a receiver (integrated or via a set-top box), a consumer needs a standalone monitor or integrated set capable of displaying high-definition images.

How do I know what to buy?

Start by doing your homework just as you would for any long-lasting household purchase. This primer is a good start. CEA also collects HDTV retailer listings and posts this information on its website – www.cea.org/hdtvguide. These retailer listings are part of a larger print and online resource titled the "HDTV Guide."

Additionally, CEA is working with other industries involved in the transition to promote HDTV and properly educate retail sales personnel so that once you set foot in a consumer electronics store, you'll be guided to the best HDTV purchase for your

needs. One partnership CEA has established with Decisionmark is the Titan TV Retail Zone. This program lets retailers enter the address of their customers and quickly determine which local, off-air TV stations are broadcasting in digital, and which programs are available in HDTV. The RetailZone even helps retailers recommend the optimal antenna required to receive DTV at consumers' homes by incorporating CEA's off-air antenna color coding scheme (<http://www.antennaweb.org>).

Digital TV Shopping Guide

Before you walk into a consumer electronics store, it's important to know some key phrases that describe the advanced TV you'll be buying. The good news? There are hundreds of HDTV products available today, and prices are more affordable than ever.

Digital Television

Television Type	Resolution	Aspect Ratio	Audio	Rating
High Definition Television	Vertical Resolution from 720p to 1080i	Widescreen (16:9)	Receives and reproduces and/or outputs Dolby Digital 5.1	Best
Enhanced Definition Television	Minimum vertical resolution of 480p	Widescreen (16:9) or traditional (4:3)	Receives and reproduces and/or outputs Dolby Digital 5.1	Better
Standard Definition Television	Less than 480p	Widescreen (16:9) or traditional (4:3)	Receives and reproduces and/or outputs useable audio	Good

Over-the-Air Broadcast

At this stage in the analog-to-HDTV transition, consumers need the right equipment for their specific programming wishes and the area in which they live. Currently, the predominant way to watch your local stations' HDTV channel is with an over-the-air antenna. Most cable and satellite providers do not yet carry your local digital channels (check with your cable or satellite provider). This is changing every day as more cable companies join the HDTV bandwagon. Until then, over-the-air HDTV reception is a free and spectacular viewing experience!

If you want over-the-air reception, you will need an antenna. The type of antenna required – rooftop or indoors – depends on your location, the distance from the station's transmitters and the local terrain. In many instances a rooftop antenna will be more effective, but you might have a set of old rabbit ears that work just fine. It varies from household to household. To find out what antenna works for your home, use the CEA antenna selector map program located at www.antennaweb.org. This easy-to-use online tool lets you enter your zip code to see a map plotting your home's proximity to the various HDTV stations in your area. The site also tells you whether you will need a multi-directional or a uni-directional antenna. Again, CEA also has created a color-coded labeling system on antennas to further aid consumers when they shop.

Satellite

To receive HDTV via satellite, you will need a specific receiver, as well as a special satellite dish. Both are readily available from local electronics retailers. DIRECTV and Dish Network are actively promoting their HDTV services. See your dealer or their websites for more details.

Cable

The consumer electronics and cable industries have agreed upon a national standard for HDTV over cable systems that will allow consumers to buy DTVs that connect to digital cable without a set-top box and enjoy easy access to HDTV services offered by cable operators. This "plug-and-play" agreement ensures that "Digital Cable Ready" TVs (DCRs) soon will be available at your local consumer electronics retail store and will allow the millions of cable households in the country to seamlessly transition to HDTV by simply plugging their new DCR HDTV into their cable jack and turning on the set. HDTV service and programming may vary from region to region, so call your cable provider to inquire about HDTV service in your particular area.



The best television sets currently available are HDTVs with 16:9 widescreen aspect ratios capable of displaying either 720p, 1080i or higher resolutions. HDTV sets also have built-in digital receivers/decoders and deliver Dolby Digital sound. HDTV sets are available as either direct view (familiar tube TVs), rear or front projection models.



There are also HDTV monitors that offer the same high picture and sound quality as HDTV sets, but require separate receiver boxes to decode digital signals. HDTV monitors are available in either direct view, rear or front projection versions.



HDTV tuners are the key to the exciting new digital kingdom. You must have one – either inside or connected as a set-top box – in order to see DTV programs. HDTV tuners decode all ATSC formats and send 480p, 720p or 1080i signals to an HDTV monitor. It also outputs Dolby Digital audio. They are often called set-top boxes, receivers or digital decoders.



Like the highest quality HDTV, Enhanced Definition Television (EDTV) is an all-in-one unit—a display with a built-in decoder in either direct view or rear projection design. In this case, you'll see at least a 480p image, rather than 720p or 1080i. The screen can either be square-shaped (4:3 aspect ratio) or widescreen (16:9). It receives, reproduces and outputs Dolby Digital sound.



An EDTV monitor has the same display parameters as an EDTV, but does not have a built-in decoder. Occasionally, this type of TV is referred to as a multimedia monitor.



The Enhanced Definition TV tuner receives all digital signals, but outputs them to a TV at 480p resolution, rather than 720p or 1080i.



Standard Definition TV (SDTV) sets deliver a digital picture that's better than your current analog TV, but less than the 480p of EDTVs. It has a built-in decoder, but no aspect ratio is specified by CEA.



The Standard Definition TV tuner is the one most owners of current analog TVs are expected to purchase in the years ahead. This tuner receives all digital formats and outputs an analog (NTSC) signal. However, it does handle Dolby Digital audio.

The Changing Shape of Television

New digital display technology (DDT) is enabling engineers to create widescreen TVs, flat TVs, wall TVs and, eventually, televisions that you can fold up like newspapers. Here is a layman's look at the basic terms that explain how digital display technology works:

Direct View TVs consist of a picture tube called a cathode ray tube (CRT) and range in screen size from less than a foot (measured diagonally) up to about 40". These sets typically rest on a TV stand or tabletop.

Projection TVs are available in two basic configurations – front and rear projection.

The most popular are one-piece, self-contained rear projection systems with screen sizes ranging from 40-inches to 80-inches. In rear projection TVs the images are reflected by mirrors inside the set onto the screen. Many rear-projection models come complete with built-in surround sound, multi-channel audio systems that create a home theater experience in one unit.

Alternative, two-piece projection systems employ either front- or rear-firing projectors that can sit on small tables or are permanently mounted on ceilings to cast projected video images on separate video screens. These systems produce pictures of 100-inches and larger.

HDTV sets are available today in many shapes, sizes and price ranges and all are designed to fit a certain consumer need.

Currently, most TV projectors – front and rear – use a combination of three CRTs that project images in the red, green and blue color spectrum. It produces large full-color pictures when the three separate images converge on the screen. But new alternatives now further reduce size, eliminate problems related to the misalignment of the CRTs and produce brighter and sharper images. Liquid crystal on silicon (LCOS), digital light amplification (DLA) and digital light processing (DLP) are examples of these newer display technologies.

Digital Light Processing (DLP)

uses a digital micromirror device to modulate reflected light. An optical semiconductor chip also adds brightness and clarity to a large screen picture. On opening day in 1998, the Texas Rangers baseball team used DLP technology to display an HDTV picture of the game on an 18-foot diagonal screen.

Liquid Crystal on Silicon (LCOS)

technology manages ultra-bright light to deliver high-contrast, sharply focused color images. Utilizing one or three reflective light imagers and a sophisticated prism and lensing system, light is transformed into a laser-like beam and imprinted with a high-definition image that is then magnified and displayed in a perfectly aligned widescreen format.

Digital Light Amplification

(DLA) is an electronic valve technology that uses liquid crystal on silicon to enable manufacturers to create a brighter picture on a larger screen.

Flat Panel TVs can be hung on the wall like a picture. “Flat panel” and “flat screen” often are used interchangeably, but these are two distinct terms. A flat screen TV is not necessarily a flat panel TV. Many CRT displays have a flat screen rather than the traditional curved glass screen, but they are not flat panel and therefore, cannot be hung on the wall. Plasma and liquid crystal displays (LCD) are both flat panel display technologies.

Plasma Display Technology does not require a tube and enables manufacturers to create a larger flat-panel TV, up to 60-inches. A plasma display consists of pixels — gas in the plasma state reacts with phosphors in each sub-pixel to produce what engineers call “colored light.” That explains how a plasma TV can display such a clear picture with the lights on.

Liquid Crystal Display (LCD) technology now is used on everything from digital clocks to microwaves. These thinner displays require less power than CRTs found in most televisions. Many TV makers are using LCDs to create ultra-thin sets that can display HDTV pictures.

CONSUMER BENEFITS OF NEW DISPLAY TECHNOLOGIES:

New digital display technology (DDT) can dramatically improve the clarity and brightness of the picture, particularly in a well-lit room. It will no longer be necessary to turn out the lights to view your favorite movie. DDT sets also provide distortion-free images at the corners and edges of the screen. A DDT set with HDTV will deliver the best picture available on the market. Additionally, the slimness of a flat panel TV will give consumers more options in organizing the home. Few can look at a flat-panel TV without saying, “Wow.”



Compatibility of Cable TV and DTV

“Plug-and-Play”

New Rules Make DTV Transition Easier

The FCC has adopted rules reached between the cable and consumer electronics industries that will help smooth the transition to DTV for millions of Americans. These “plug-and-play” rules will ensure that most cable systems are compatible with DTV receivers and related consumer electronics equipment. This is crucial toward building products, developing services and maintaining a market-friendly environment for HDTV.

The cable plug-and-play rules are important to the DTV transition because they will facilitate the direct connection of digital navigation devices or customer premises equipment, such as television receivers, set-top boxes, and digital recorders that are purchased from retail outlets to cable television systems.

Plug-and-Play DTV

A “plug-and-play” DTV is a television that you can plug directly into your cable system and receive analog and most digital cable services without the need for a set-top box. The cable and consumer electronics industries have dubbed these types of televisions “**digital cable ready**” or **DCR**. More and more cable services are being provided in digital format, and broadcast stations are in the midst of the transition from analog to an all-digital service. Currently, plug-and-play is available for most analog services over cable, but not for digital.

Benefits of Plug-and-Play

- Many consumers like the convenience (and cost savings) of receiving cable programming without the need of a set-top box. If nothing else, it’s one less remote control to keep track of!
- You will be able to take your plug-and-play set virtually anywhere in the country and know it will work on cable systems offering digital services.
- Plug-and-play will allow you to fully utilize the features and functions provided by the television set that often are disabled when connected to a cable set-top box.
- Manufacturers will also be able to make other kinds of innovative new plug-and-play products, such as Digital Cable Ready hard-drive recorders, DVD recorders and personal computers. These products will be able to receive digital cable without the need for a set-top box provided by the cable operator.

“CableCARD™”

Digital plug-and-play will not work quite like analog. For digital plug-and-play, you’ll probably need to get a security card (also known as a “CableCARD™”) from your local cable operator. The security card will permit you to watch scrambled programming and premium services, to which you’re subscribed.

FAQ

Will I Need A Set-Top Box If I Have A Plug-and-Play Set?

The first generation of plug-and-play sets will be able to receive one-way programming only, including analog basic, digital basic, and digital premium cable programming. If you want to receive certain advanced digital cable services like video-on-demand, the cable operator-enhanced program guide, or interactive data-enhanced television service, using a first generation set, you will need to use a set-top box. You may also need a set-top box to receive other cable operator-provided services.

Negotiations are underway between the cable and consumer electronics industries to establish standards that would permit plug-and-play sets to provide advanced two-way services as well.

Availability of Plug-and-Play Sets

Plug-and-play sets built pursuant to the new standards may be available as early as the second half of 2004. To know if you are

buying a plug-and-play set, ask your retailer if the set is "digital cable ready." Manufacturers that use that label must meet certain technical standards and complete a testing and verification process.

Negotiations are underway between the cable and consumer electronics industries to establish standards that would permit plug-and-play sets to provide advanced two-way services as well.

Watching HDTV On A Plug-And-Play Set

Plug-and-play will permit you to watch digital programming, but as with all DTV sets, only HDTV plug-and-play sets will display full high-definition quality. To be sure, check with your retailer on whether the set displays full high-definition quality or a lower resolution. You should also ask your local cable provider if they offer HDTV programming.

**See also the Federal Communications Commission fact sheet on plug-and-play at www.fcc.gov.*



Plug-and-Play

FEDERAL COMMUNICATIONS COMMISSION (FCC)

– The FCC, under the leadership of Chairman Michael Powell, has taken a strong and active role in the HDTV transition. Although its website deals primarily with policy rules and regulations, it also has Consumer Alerts and Fact Sheets. (www.fcc.gov)

ADVANCED TELEVISION SYSTEMS COMMITTEE (ATSC)

– The Advanced Television Systems Committee is an international, non-profit organization developing voluntary standards for digital television. The ATSC member organizations represent the broadcast, broadcast equipment, motion picture, consumer electronics, computer, cable, satellite and semiconductor industries. (www.atsc.org)

NATIONAL ASSOCIATION OF BROADCASTERS (NAB)

– The National Association of Broadcasters is a full-service trade association that promotes and protects free, over-the-air local radio and television stations' interests in Washington and around the world. (www.nab.org)

NATIONAL CABLE AND TELECOMMUNICATIONS

ASSOCIATION (NCTA) – The National Cable and Telecommunications Association, formerly the National Cable Television Association, is the principal trade association of the cable television industry in the United States. (www.ncta.com)

SATELLITE BROADCASTING COMMUNICATIONS ASSOCIATION

(SBCA) – The SBCA is the national trade organization representing all segments of the satellite consumer services industry. (www.sbca.org)

additional
HDTV
resources

A SPECIAL CEA WEBSITE – has a wealth of information on the analog-to-digital television transition. Most of this information is stored on the HDTV Web page, but additional resources, such as policy filings, press releases and publications, may be found through the CE.org search engine. (www.ce.org/hdtv)

HDTV GUIDE – Intended as a resource tool for the industry, the *HDTV Guide* also contains useful information for consumers, such as a detailed listing of HDTV products available with manufacturers' suggested retail prices.

HDTV UPDATE E-NEWS – CEA produces this e-mail newsletter at least once a quarter in order to highlight the latest developments in HDTV programming, policy and related issues. The E-News archive is available online at www.ce.org/hdtv.



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